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Ohio State University
Columbus, Ohio

CHEMICAL ABSTRACTS

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No. 1

1—APPARATUS AND PLANT EQUIPMENT

W. L. BADGER

Laboratory humidity cabinet. IRVING C. MATTHEWS AND ALOSCO M. BURGESS. Eastman Kodak Co., Rochester, N. Y. *Ind. Eng. Chem.* 20, 1239-40(1928).—A cabinet is built of alberene stone 1.5 in. thick, with all casings, ducts, etc., of Cu or brass, with a fresh air intake, water or steam spray nozzle, a series of eliminator plates of baffles, a blower to circulate air through the chamber, and thermostatically controlled steam coil as a heating unit, and with recording and automatic control instruments for both temp. and humidity. The cabinet can be used to simulate even tropical conditions, as it maintains temps. of 80-120° F. and any degree of humidity desired. It has proved satisfactory in making accelerated weathering tests on metals and other materials. It cost about \$1200, plus installation.

W. C. EBAUGH

Visible-action continuous-distillation apparatus for laboratory study of fractionation. RALPH H. ESPACH. Bur. Mines, *Repts. of Investigations* No. 2892(1928), 7 pp.—A detailed description of a tower which gives "very sharp and definite *seps.*" of petroleum products.

J. H. MOORE

Rapid filter for quantitative filtrations. NEO S. SERINIS. *Chemist-Analyst* 17, No. 4, 17(1928).—It is recommended to fill the pores of a Buchner funnel with asbestos, as in prepg. a Gooch crucible, and to place on top of the thin asbestos layer either a fluted or unfolded filter paper.

W. T. H.

Working with membrane filters. GUSTAV ECKERLIN. Staatl. Mainwasseruntersuchungsamt., Wiesbaden. *Kl. Mitt. Ver. Wasserversorg. Abwässerbeseitig.* 2, 119-23(1926); *Chem. Zentr.* 1927, II, 1743.—By careful operation and choice of the right kind of filter, just as accurate results can be obtained with membrane filters as with paper filters.

C. C. DAVIS

Electro-filters in the chemical industry. NACHTWEH. *Chem. Fabrik* 1928, 582, 593.—An elementary description of the Cottrell process, as practiced in Germany.

W. C. EBAUGH

Toy balloons and filtration. JOHN W. GARRETT AND C. D. HURD. Northwestern Univ., Evanston, Ill. *Ind. Eng. Chem.* 20, 1130(1928).—Instead of using rubber dams as aids in pressure filtration in the lab., as recommended by Gortner, *et al.*, ordinary toy balloons have been employed with success. Thus for the ordinary Buchner funnel a common toy balloon, when properly inflated, is of the proper size. Place it on top of the funnel after most of the solvent has been removed, but while the ppt. is still in a pasty condition.

W. C. EBAUGH

Suction as a filtering aid. GEORGE L. HOCKENYOS. Univ. Ill. *Chemist-Analyst* 17, No. 4, 18(1928).—To prevent using too much vacuum and possibly tearing the filter paper, it is recommended to use a water trap on the other side of the suction bottle. The trap consists of a stout test tube partly filled with water stoppered by a 2-holed rubber stopper carrying a tube that leads to the suction bottle and another tube that dips into the water and extends upward into the air. By varying the height of the water in the trap, the degree of suction can be regulated.

W. T. H.

Acid centrifugal pump. ALFRED KARSTEN-SALMONY. *Chem.-Ztg.* 52, 796(1928).—A new non-leaking pump of high-Si Fe, made by Wesseling Gusswerk Rheinguss, Wesseling.

J. H. MOORE

Centrifugal pumps with automatic equipment. N. C. BYR. *Iron Steel Eng.* 5, 332-3(1928).—A system of remote control of centrifugal pumps with automatic features is described. As the level in a water tower falls, a main pressure regulator starts a priming pump which exhausts the air from a main pump through a priming line and vacuum breaker. As the air is exhausted, the rising water fills the main pump casing up to the vacuum breaker. Here, the water raises a float closing the vacuum breaker switch starting the main pump motor and shutting down the priming pump motor. With increase in speed, the main pump motor develops enough pressure to shut off the

vacuum breaker, and at full speed, the pressure opens the main line check valve, and the water tower is filled, when the main pressure regulator opens and shuts the pump down. Simultaneously, the decrease in speed closes the main line check valve. Diagrams of (1) the general layout; (2) the automatic pumping system, (3) the vacuum breaker and (4) the elementary wiring system are given, together with an explanatory description.

S. L. B. ETHERTON

A new heating centrifugal. CARL HÜTTER. *Chem. Fabrik* 1928, 543-4(1928).—The app. is designed to sep. minerals by means of fused baths of salts of different sp. gravities. Small elec. fusion ovens are substituted for the baskets on the arms of the common type of lab. centrifugal. A motor in the base drives the app. at 2000 r. p. m. The powd. minerals and salts are fused in the ovens which may be heated to 600-900° and whirled for 3-5 mins., which is usually sufficient for a sharp sepn.

J. H. M.

Importance of standard thermometers in the testing of materials. W. H. FULWEILER. U. G. I. Co., Philadelphia. *Intern. Congress Testing Materials* 1927, II, 689-712.—When definite specifications are laid down for thermometers for various tests, the accuracy and reproducibility of the tests are increased. The cost of the thermometers is greatly reduced because "specially made types" are no longer necessary. Specifications are given for thermometers for the following A. S. T. M. tests: general purposes (3 ranges), distn. (high and low), Saybolt viscosity (3 ranges), softening or melting point (high and low), flash point in closed app. (high and low), flash point in open app., melting point of paraffin and petroleum, cloud and pure test (high and low), loss on heating, distn. of turpentine, heating test of tung oil (cf. *C. A.* 22, 2857). A tentative standard is proposed for the A. S. T. M. thermometer for Cleveland open cup.

G. CALINGAERT

Temperature control. ALVIN M. STOCK. *Ceramic Age* 12, 94-5(1928).—A brief description is given of the various types of pyrometers in common use.

W. H. R.

The development of automatic temperature control for industrial heating apparatus. A. N. OTIS. *Fuels and Furnaces* 6, 1387-94(1928).

E. H.

Pendulum viscosity tester. ALBRECHT AND WOLFF. *Petroleum Z.* 24, 551-5(1928).—The app. manufactured by Spindler and Hoyer, Göttingen, is described and calcn. methods are given.

M. B. HART

The Wolff lime tester for making a series of calcium carbonate determinations. A. HOCK. *Chem. Fabrik* 1928, 548.—Description of an app. for making several simultaneous volumetric CO₂ detns.

H. J. MOORE

A new condensation hygrometer. LEONARDO MARTINOZZI. *Nuovo Cimento* [N. S.] 5, No. 4, 137-42(1928); cf. *C. A.* 22, 3554.—M. describes a modification of the usual condensation type of hygrometer in which cooling is obtained by the evapn. of ether from the container holding the thermometer. It is provided with an indicator and direct reading scale. The instrument checked very well with an Assman psychrometer.

L. T. FAIRHALL

The pycnometer, its standardization and uses, with some notes on the accuracy of the instrument. WM. L. O. WHALEY AND ELLIS W. COATES. *Chemist-Analyst* 17, No. 4, 3-4(1928).—The difference between *sp. gr.* and *d.* is discussed and exptl. data are given showing the degree of accuracy that can reasonably be expected in work with the pycnometer of the type that is fitted with thermometer and capillary outlet tube.

W. T. H.

Practical study of the pyrometer. G. B. BROOK AND H. J. SIMCOX. *Heat Treating and Forging* 14, 1063-5(1928).—Means of preventing errors occurring in pyrometers are given. To insure against induction, the following arrangement is adopted. A Weston Elec. millivoltmeter (4" × 5") is placed in a Swedish Fe shell and so surrounded by another that between the 2 there is an air-gap. The instrument is read with a lens arrangement, the error never being greater than 0.5 m. v. or 8°. In order to eliminate errors due to the leads from the cold junction to the recorder controlling the reheating furnace, it has been found necessary to use Pb-covered paper-insulated cable laid in underground ducts. Cast Fe, protected with a coating of equal parts of French chalk and graphite in 10% Na₂SiO₃ applied daily 1/16" thick, is found to be the best material for sheathing couples used in Al-reheating furnaces. To protect the couple, in gas-fired furnaces, against SO₂ and other furnace gases the last 2-3 ft. of the sheathing is covered by a jacket contg. lime. A quick-reading couple, which eliminates the time lag introduced by a sheathed couple and is used for frequently detg. casting temps., is constructed according to Marsh (*Foundry* 55, 213(1927)). It is insulated by a silica tube wound with asbestos to within 1/2" of the end of the couple, the contacts being made by the molten metal. The ends are cut off when they become alloyed,

thus making the life of a thermocouple 2 months; if it is 36" long and 20 immersions are made in a day.

A simplified cataphorizer. W. D. HORNG., Hershey Corp., Hershey, Cuba. *Ind. Eng. Chem.* 20, 1147(1928).—A convenient cataphoresis app., with simplified connections, for use especially in sugar work, is described. Disadvantages of the ordinary type are eliminated by discarding the usual glass connections and passing over each stopper end a short piece of heavy rubber tubing, which holds snugly an ordinary cork through which pass a glass tube of 2 mm. internal diam. and a Pt wire about 0.5 mm. in diam.

W. C. EBAUGH

The vacuum tube voltmeter and its use for p_H determinations and in electrometric titration. HEINRICH THIELE. *Gas u. Wasserfach* 71, 854-6(1928).—The use of the vacuum tube voltmeter is discussed and diagrams are given for 2 set-ups. R. W. R.

A magnetic micro-balance. E. WOEKIND. *Z. angew. Chem.* 41, 771-4(1928).—A modification of the well-known Pascal set-up for measuring the properties of weakly diamagnetic or paramagnetic compds. The balance is replaced by a micro-balance and the magnet is improved. The principle of the Pascal method remains unchanged. The details and diagrams needed for practical use are given.

A. L. HENNE

Standardized stirring machinery in the chemical industry. HANS WOLLENBERG. *Chem.-Ztg.* 52, 815-6(1928).—Although chem. factories cannot be standardized like automobile works, parts of chem. app. can be so prepd. American practice in designing and building stirring app. is cited as an example, and the hope expressed that in Germany a similar method of operation may be developed.

W. C. EBAUGH

"Hydro" density recorder for liquids. ERIK K. H. BORCHERS. *Chem. Fabrik* 1928, 504-5.—A process and app. for the automatic recording of the sp. gr. of liquids are described. Two tubes are dipped into the liquid to different depths, and compressed air is forced through them in the form of bubbles. The difference in pressure of air in the 2 tubes is a measure of the density of the liquid itself, and this is then transferred to the recording instrument.

W. C. EBAUGH

A protected reservoir and buret. BARNETT COHEN. Hygienic Laboratory, U. S. Public Health Service, Washington, D. C. *Ind. Eng. Chem.* 20, 1238(1928).—A reservoir bulb has a 2-way stopcock above, one opening leading up to an inlet for inert gas and the other to a by-pass tube connected with a buret below the reservoir. At the lower end of the reservoir is also a 2-way stopcock; one opening leads to a tube through which liquid may be drawn into the reservoir, and the other to the buret below. By proper manipulation of these valves the app. can be flushed out with inert gas, filled with a liquid as desired, and everything protected from access to air.

W. C. E.

A wing-top oxygen-gas burner. G. ROSS ROBERTSON. Univ. of California at Los Angeles, Calif. *Ind. Eng. Chem.* 20, 1240-1(1928).—To give a wing-top burner suitable for working glass when natural gas is used as a fuel, the needle valve mechanism of 2 Tirrill burners had $\frac{3}{4}$ in. S. A. E. standard male threads cut in them, and were then fitted into a short length of 1-in. brass rod bored out and tapped with corresponding threads. A short section of the original tube from the burner is inserted into the top of the device, while below it a section of $\frac{1}{2}$ in. brass rod connects with a galvanized iron floor flange used as a base for the burner. A current of natural gas is first run through one side of the burner, and then O is admitted through the other side under pressure regulation so as to keep the flame barely non-luminous. The burner does not work with H alone nor with water gas, but will operate if even 15% natural gas be mixed with the above. Even 75% H and 25% natural gas worked well.

W. C. EBAUGH

The "Analytical Ultra Lamp" for fluorescent analytical investigations. FELIX MÜLLER. *Chem. Fabrik* 1928, 561-2(1928).—Description of a C filament lamp contg. Fe and W which gives a continuous ultra-violet spectrum and may be used in open day light for a large no. of investigations.

J. H. MOORE

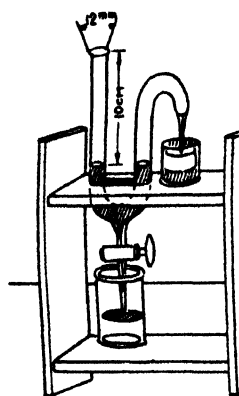
New Orsat adsorption tube. A. H. MOODY AND G. E. STEVENS. *Chemist-Analyst* 17, No. 4, 15(1928).—A diagram is shown of an improved type of absorption tube for use in the standard Orsat app. for the measurement of CO_2 , O_2 and CO in flue gases. The absorption tube consists of 2 concentric glass cylinders sealed to each other at both ends. At the upper end connection is made to a short length of glass capillary tubing by means of which the gas to be analyzed is introduced. The outer glass cylinder carries at the top a goose-neck tube for venting the tube to the atm., to a rubber bag or to another tube used as a water seal. There is also at the top a $\frac{3}{8}$ in. opening carrying a short length of $\frac{1}{8}$ in. glass tubing for convenience in filling the absorption tube. The cylinders are sealed off square at the bottom to form a shoulder which acts as a support when the tube is placed in the Orsat cabinet. An opening with 0.5

in. glass is made at the bottom of the inner cylinder to facilitate the introduction or removal of glass tubes used to increase the absorbing surfaces. Entrance between the inner and outer cylinders at the bottom is made through $10 \frac{3}{16}$ in. holes placed 0.25 in. from the bottom of the inner cylinder. The filling openings at the top and bottom can be closed by rubber stoppers. W. T. H.

The efficiency and economy of so-called "colloid mills." FELIX HEBLER. *Chem. Fabrik* 1928, 581-2.—Although mills (e. g., Plafson's) designated as "colloid mills" can reduce a portion of their charge to colloidal dimensions and disperse these in a given medium, the quantity of material thus converted is so small compared to the total charge, and the time of grinding and input of power are so great, one cannot consider them as either efficient or economical. Expts. are reported to support this view. W. C. EBAUGH

Improved method for cleaning platinum ware. CARL GOODRICH. *Chemist-Analyst* 17, No. 4, 18(1928).—Instead of pouring out the $K_2S_2O_7$ fusion, continue heating the crucible over a Meker burner, while rotating the contents, until the material is spread out as a dry solid over the entire surface of the dish and there is no further evolution of vapors from the mass. Then rinse under the tap. W. T. H.

A method for the determination of carbon dioxide tension in small quantities (5 to 10 cc.) of fluid. A. BECK. *Chirurgische Universitätsklinik Kiel. Biochem. Z.* 199, 21-8(1928).—A description of app. S. MORGULIS



Some technical improvements in Czapek's apparatus for determining surface tension. V. I. KAMINSKII. *Kujalnitzki Liman, Odessa. Zhurnal expl. Biol. Med.* 10, 21-2(1928).—The app., as shown in the figure, is adapted to measure the surface tension of a soln. by detg. the water pressure in the left-hand branch of the U-tube necessary to force air through the capillary end of the bent right-hand branch which dips 1-1.5 mm. below the surface of the tested soln. The first appearance of an air bubble is the end point, and the amt. of H_2O added is measured from a buret. The greater the surface tension the more H_2O will be required. A stop cock is provided for draining and setting the initial level in the app. S. MORGULIS

Type of hydrogen electrode vessel useful for solutions of high resistance. R. J. BEST. Univ. of Adelaide. *Australian J. Expl. Biol. Med. Sci.* 5, [3], 233-6(1928).—The construction and operation of the app. are illustrated and described. The sensitiveness of the app. was such that the point of balance on the potentiometer could be ascertained to within a tenth of a millivolt when working with a soln. of as low a cond. as 10^{-8} mhos. L. W. RIGGS

Industrial furnace design. R. S. WILE. *Ceramic Age* 12, 58-9(1928).—Recuperators and tunnel kilns are recommended to effect economy. W. H. RISING

Recuperator unit for industrial furnaces burning oil. A. E. WALDEN. *Iron Steel Eng.* 5, 334-5(1928).—The unit was designed to be placed in the off gas flues but can be adapted for other places. The superheater section is a steel tube upon which are placed cast iron rings or fins. The tube is rolled into steel or cast iron flanges at one end and into a U tube at the other. Inside there may be a flat twisted strip to induce a rotation of the air, or a thin closed tube to increase the velocity of the air. Steam superheaters have a heat transfer of 6-13 B. t. u. per sq. ft., and air heaters from 2 to 6 B. t. u. The 2-in. recuperator unit has fins $3 \frac{1}{2}$ in. outside diam. and 2 sq. ft. of area per foot of length. The 4 in. unit has fins 6 in. outside diam. and 6 sq. ft. per foot run and 13 sections per foot. For such a metallic heater unit the limits of superheating should not exceed $1000-1200^\circ$ but it has been more. For the best results the air pressure should be at least 16 oz. and the air from the unit will run about $500-700^\circ F$. The unit saves upwards of 15% of the fuel cost on the forge furnace. S. L. B. ETHERTON

Air conditioning equipment. WALTER BURR. *Iron Steel Eng.* 5, 328-31(1928).—In the fabric filter the air is forced through a cloth screen, but the dirt restricts the openings and makes resistance excessive. In the air washer effective for soot, metallic and oily particles the dust particles impinge on wet eliminator plates. In the water spray filter, the metallic parts corrode in a very short time. Corrosion is avoided in the viscous filter. This unit is more effective for particles which have no affinity for water. The air is drawn through a series of metal deflecting surfaces coated with a viscous oil. Different forms of automatic self-cleaning viscous filters suited for

various purposes are described. The total cost of operation of air conditioning equipment on a 3750 h. p. motor is between \$215 and \$225 a year. The air velocity through the filter varies from 400 to 450 ft. per min. and the pressure drop from 0.25 to 0.4 lb. A useful discussion is given.

S. L. B. ETHERTON

The use of wrinkled pipe in the new steamer "Bremen." W. PAUL. *Apparatebau* 40, 242-3(1928).—The pipe is wrinkled, or creased, on the inner side of the bend. Cf. C. A. 22, 3320.

J. H. MOORE

Modern foam (fire-) extinguishing apparatus. J. HAUSEN. *Chem. App.* 15, 232-3(1928).—A detailed description of a large continuous foam generator in which the dry material is stored in the top and sifted down through a funnel into a chamber where it mixes with hydrant H₂O to produce foam. Also 2 types of small app. for using dry material are shown.

J. H. MOORE

Factors in modern methods of pulverizing (HARDINGE) 13. Apparatus for the estimation of electroendosmosis (SCHONFELDT) 4.

Toggle-jointed gripping device for holding hot beakers or other laboratory apparatus. RUDI STARK (to Central Scientific Co.). U. S. 1,688,404, Oct. 23.

Inverted-reading thermometer for low-temperature measurements. J. CASARELLI. *Brit.* 286,425, Feb. 2, 1927. Structural features.

Liquid-expansion thermometer. SOC. ANON. DES PISTONS IDEAL ET SEGMENTS ETANCHES. *Brit.* 285,882, Feb. 24, 1927. Structural features.

Colorimeter. R. A. LEGENDRE. *Brit.* 285,848, Feb. 23, 1927.

Filters. FILTRATION ENGINEERS, INC. Fr. 638,478, June 11, 1927. A reinforcing network or sep. elements such as endless flexible cords are provided for the filter cake to form on. The network may be removed and passed over drying cylinders.

Filtering apparatus. MARIUS GERRIT WAGENAAR HUMMELINCK. Fr. 636,437, June 22, 1927.

Flexible tube filter. MASCHINENFABRIK BETH AKTIENGESSELLSCHAFT. Fr. 636,274, June 20, 1927.

Filter for liquids, particularly wines and alcohols. LUCIEN BEURET. Fr. 32,558, Nov. 19, 1926. Addn. to 545,009.

Rotary vacuum filtration apparatus. WALTON C. GRAHAM. U. S. 1,687,863, Oct. 16.

Light filter. FRANZ ZERNIK. U. S. 1,688,259, Oct. 16. Hydroxyquinolinesulfonic acids in which the H of the OH group may be substituted by Me or other hydrocarbon radical are used in filters for ultra-violet rays.

Reticulated filter and cooperating scraper blades for cleaning the filter. CHARLES ST. C. BURNS (one-half to Foist Kay). U. S. 1,689,277, Oct. 30.

Bag filters for air or other gases. NEW HAVEN SAND-BLAST CO. *Brit.* 286,128, April 5, 1927.

Filter for air or other gases. ANTONIN BOULADE (to Soc. de Carburateur Zenith). U. S. 1,688,326, Oct. 23.

Device for purifying air. W. H. YARDLEY. *Brit.* 286,356, Dec. 1, 1926. A device is described which may be suspended in the atm. of a room and which circulates air over a purifying liquid placed in the device.

Device (with a funnel containing a sieve and jet pipe) for separating coarse particles and aggregates from finely divided pigments or other materials. GEORGE GALLIE and BENJAMIN D. PORRITT (to Research Association of British Rubber and Tyre Manufacturers). U. S. 1,688,307, Oct. 16.

Distillation apparatus. I. G. FARBERIND A.-G. Fr. 638,254, July 26, 1927. In an app. for distn., rectification or evapn., the vapor has its speed increased by passing through a narrowed portion of the neck of the container and then suddenly greatly reduced in a wide portion which is so shaped that vapor is caused to descend before again ascending, and at this point solid or liquid particles drop from the vapor and are led back to the distn. vessel.

Bubble plate column apparatus for fractional distillations. THEODORE BAKER and WILLIAM A. PETERS, JR. (to E. I. DuPont de Nemours & Co.). U. S. 1,688,515, Oct. 23. Various details of construction are specified.

Apparatus for separating the first and last runnings in the distillation of alcohol or other liquids. LOUIS EMILE RIVASSEAU DIT RIVASSEAU-CHOCARD and ALCIDE DAGAND. Fr. 636,429, June 22, 1927. A densimeter controls the flow of liquid towards one or another receiver.

Specific gravity registers for milk, gasoline or other liquids, flowing through dispensing apparatus, etc. WALTER J. ALBERSHEIM. U. S. 1,689,858-9, Oct. 30.

Liquid manometer and associated devices for metering the flow of gases. CLARENCE A. DAWLEY. U. S. 1,689,776, Oct. 30.

Cooling and straining device for separating oil or other vapors from gases. D. M. SHANNON. Brit. 285,928, Aug. 26, 1926.

Rotative apparatus for washing gas with automatic circulation of the washing liquid. FRITZ HAGER. Fr. 636,266, June 30, 1927.

Annular radiator for vacuum evaporating, particularly sugar solutions. AUGUST GRÄNTZDÖRFFER. Fr. 638,584, July 30, 1927. Constructional details.

Luminous neon tube. RAYMOND R. MACHLETT (to Rainbow Light, Inc.). U. S. 1,689,146, Oct. 23. Electrodes are used having an area less than 1 sq. dm. per amp. and the walls of the tube adjacent the cathode are provided with a mirror of electro-positive metal such as Cs. Cf. C. A. 22, 3556.

Vacuum tube for producing soft x-rays. KARL W. DAUMANN (to C. H. F. Müller Röntgenrohrenfabrik). U. S. 1,688,854, Oct. 23. Structural features.

Electric vacuum tubes. F. Y. ROBINSON AND METROPOLITAN-VICKERS ELECTRICAL CO., LTD. Brit. 285,784, Nov. 9, 1926. Several filaments are connected in parallel and various structural details are described. After being mounted, the filaments may be coated as described in Brit. 285,538 (C. A. 22, 4279) with oxide or with a metal or compd. subsequently converted to oxide or may be otherwise treated to reduce the "work function," e. g., thoriated W filaments may be treated with a reducing agent such as C. Cf. C. A. 22, 2689.

Röntgen tube. SIEMENS-REINIGER-VEIFA GESELLSCHAFT FÜR MEDIZINISCHE TECHNIK M. B. H. Fr. 638,464, July 30, 1927. The electrodes of a soft-ray tube are carried by a single insulating base. The walls are of very thin glass or of metal with a window of Be.

Röntgen-ray tube construction. NAAMLÖÖZE VENNOOTSCHAP PHILIPS' GLOEI-LAMPENFABRIEKEN. Brit. 286,436, Feb. 14, 1927. The anticathode forms the armature or rotor of a motor and may comprise a Cu cylinder with an inner cylinder of Fe. Various structural features are described.

Röntgen-ray apparatus. K. MAYER. Brit. 286,283, March 3, 1927. Structural features.

Cathodes of electron emission tubes. LA RADIOTECHNIQUE. Fr. 637,962, Nov. 26, 1926. Cathodes which can be used directly in industrial currents have a core of refractory metal such as W, a covering sheath of insulating refractory material such as MgO and a layer of metal capable of emitting electrons.

Electron discharge device with a cathode of misch metal. JAMES E. HARRIS (to Western Electric Co.). U. S. 1,689,338, Oct. 30.

Electric discharge tubes. B. JAMES. Brit. 285,949, Nov. 16, 1926. Luminous elec. discharge tubes or lamps filled with Ne, He or other rarefied gas are provided with electrodes made of wire or metal strip and wound into a conical coil. The tubes around the electrodes may be protected, strengthened or cooled by coatings of materials treated with P₂O₅, "carbonic snow" suspended in acetone, Hg or CHCl₃ or by an evacuated shell or a shell contg. "liquids or chemicals." Various details are described.

Electric discharge devices. C. V. IREDELL (to Westinghouse Lamp Co.). Brit. 285,884, Feb. 24, 1927. Thermionic electrodes are formed of a refractory metal having incorporated with it a metal of good electron emissivity and a small proportion of a metal of the Ce group. Thoriated W is preferably used as the main body but Zr, U or V may be incorporated in Mo. The metal of the Ce group and the electron-emitting metal are present as oxides or reduced metal. Numerous details of prepg. the material are given. Cf. C. A. 22, 1501.

Infra-red-ray generator. HECTOR P. MACLAGAN (to McIntosh Electrical Corp.). U. S. 1,688,124, Oct. 16.

Acetylene generator. R. NIER, E. E. NIER, E. NIER and M. EHMER (trading as Nier & Ehmer). Brit. 285,898, Feb. 26, 1927.

Acetylene generator. JEAN PIERRE GOUJON. Fr. 637,983, Nov. 30, 1926. Constructional details.

Heat exchange system and apparatus for heating water, etc., by combustion gases. RAY C. NEWHOUSE. U. S. 1,689,927, Oct. 30.

Heat exchange apparatus suitable for use with petroleum oils, water, etc. ARTHUR P. BROCKLEBANK (to Foster Wheeler Corp.). U. S. 1,689,910, Oct. 30.

Glass-coated pipe coil suitable for heat exchange between foods, etc., and heating agents. EDWIN J. HANSON (to Glascote Co.). U. S. 1,689,435, Oct. 30.

Rotary heat exchange apparatus suitable for use with industrial wastes. FRANK S. BROADHURST. U. S. 1,689,189, Oct. 30.

Furnaces suitable for heating metal sheets or other articles in annealing boxes, etc. FORREST W. MANKER (to Surface Combustion Co.). U. S. 1,688,393-4, Oct. 23.

Furnaces. WM. STEFF. Fr. 636,195, May 18, 1927. Construction of mech. grate furnace in which the fuel is fed into the hottest part of the furnace.

Tilting furnace and charging apparatus construction. DEMAG A.-G. Brit. 286,224, Feb. 28, 1927.

Furnace for heating tubes, rods, etc. HIRSCH, KUPFER UND MESSINGWERKE A.-G. AND M. TAMA. Brit. 285,893, Feb. 26, 1927.

Furnace rabble arm construction. EDWARD J. FOWLER (to Nichols Copper Co.). U. S. 1,687,935, Oct. 10.

Apparatus for rocking the hearth of a furnace. WESTINGHOUSE ELECTRIC & MANUFACTURING CO., LTD. Fr. 636,457, June 22, 1927.

Apparatus for generating steam for power purposes utilizing caustic soda, etc. ERNST KOENEMANN. U. S. 1,687,941, Oct. 16.

Apparatus for pressure treatments. HIPPOLYTE MARCEL LAMY TORRILHON. Fr. 637,969, Nov. 27, 1926. To enable distn. and other app. in which increased or reduced pressure is employed to be made of Al or other weak material not attacked by the reagents used, the whole app. is enclosed in a strong metallic casing in which a pressure can be produced equal to that in the app.

Washing apparatus for coal, slimes, etc. OZÉE DELPLAN AND ALBERT QUAIRIAUX. Fr. 636,341, May 19, 1926.

Ozono-sterilizer of high frequency. MAURICE MORGENSTERN. Fr. 636,323, Apr. 16, 1927.

Revolving vacuum drying apparatus. AUGUSTINUS EDVARD JONSSON. Fr. 636,188, Oct. 14, 1926.

Vibrating apparatus for use in crystallizing or other operations. A. KUHN. Brit. 285,638, Feb. 2, 1927.

Apparatus for the continuous treatment of liquids. AKTIEBOLAGET SEPARATOR. Fr. 636,254, June 20, 1927. An app. is described for mixing a liquid with another liquid or solid and sepg. the two or their products of reaction, the sepg. means comprising fixed elements in a sepg. field of force which divide the mixt. into relatively thin layers having an angle with the direction of the lines of force considerably smaller than the angle of friction of all the matters present.

Apparatus for drying or cooling flour, starch or similar materials. ALEX G. HUHN (to A. Huhn Mfg. Co.). U. S. 1,690,013, Oct. 30.

Storage tank for gasoline or other volatile liquids. CLEON R. JOHNSON (to Standard Oil Development Co.). U. S. 1,690,072, Oct. 30. The tank roof is supported by a plurality of columns, a portion of which are encircled by an expansible chamber which is connected with a vent leading through the tank roof.

Apparatus for catalytic reactions. THE SILICA GEL CORP. Fr. 638,252, July 26, 1927. Improvements in catalytic app. are described, whereby the catalyst is brought in contact with a gas, the gas and catalyst are sepd. and the catalyst is treated to remove poisons and brought back into the operation. Non-treated gas is caused to pass transversely through the reaction zone. The catalyst may be a hard silica gel and may be introduced into and carried along by the gas current.

Annealing pot. JAMES H. TAYLOR. U. S. 1,688,999, Oct. 23. An upper enlarged portion of the pot is thickened by compression in the direction of the axis of the pot.

Thermionic valves. C. H. F. MÜLLER A.-G. Brit. 285,843, Feb. 22, 1927. Control electrodes (which may be wound to form a grid) comprise parallel or twisted wires insulated from each other.

Thermionic valve. C. B. UFF (to Westinghouse Elec. & Mfg. Co.). Brit. 285,810, Feb. 21, 1927. A thermionic cathode is used with at least one other metallic electrode such as an anode or control electrode the surface of which includes C to prevent emission of electrons, e. g., an electrode of Ni or W may be carbonized by heating in illuminating gas, or to a temp. of 800-1000° in C₂H₂ for 1-2 hrs. and then annealed during several hrs. while gradually reducing the temp. The cathode may comprise W or Ni coated with a mixt. of BaO and SrO.

Thermostat. EVERETT H. WARR. U. S. 1,689,542, Oct. 30.

Thermostat for controlling electric circuits. LAWIS J. GREENAWALT (to Westinghouse Elec. & Mfg. Co.). U. S. 1,687,664, Oct. 16.

Thermostatic devices. PORTER H. BRACE (to Westinghouse Elec. & Mfg. Co.). U. S. 1,689,814, Oct. 30. An element formed of a Ni alloy having a relatively high temp. coeff. of expansion, such as "invar" or Monel metal, is used with another element formed of an alloy contg. Fe 1-3 and Ni 1 part and also contg. Co 1-20%. Cf. C. A. 22, 703, 1256.

Thermostatic electric switch. VICTOR G. VAUGHN (to Westinghouse Elec. & Mfg. Co.). U. S. 1,689,809, Oct. 30.

Thermostatic electric switch. ROGER W. MCBRIEN. U. S. 1,689,210, Oct. 30.

Thermostatic electric switch. AUGUST J. MORTAU (to Westinghouse Elec. & Mfg. Co.). U. S. 1,689,795, Oct. 30.

Thermostatic electric switch plug. CHARLOTTE ARNESEN. U. S. 1,689,007, Oct. 23. Structural features.

Thermostatic valve construction. ENOCH THEANDER. U. S. 1,688,291, Oct. 16. A valve is specified which is suitable for controlling the flow of gas to burners of water heaters, etc.

2—GENERAL AND PHYSICAL CHEMISTRY

GEORGE L. CLARK AND J. H. REEDY

Leo Hendrick Baekeland. L. V. REDMAN. *Ind. Eng. Chem.* 20, 1274-5(1928).—A brief biography, with portrait. E. J. C.

Lucius Pitkin. ERSKINE B. MAYO. *Ind. Eng. Chem.* 20, 1275-6(1928).—A brief biography, with portrait. E. J. C.

Theodore William Richards. Obituary. GREGORY P. BAXTER. *Science* 68, 333-9 (1928). E. H.

Henry Clay White (1848-1927). H. W. WILEY. *J. Assocn. Official Agr. Chem.* 11, No. 4, iii-iv(Nov. 15, 1928).—An obituary with portrait. A. PAPINEAU-COUTURE

Centenary of P. Schutzenberger. G. URBAIN. *Bull. soc. chim.* 43, 913-22(1928). E. H.

Teaching of college chemistry. W. S. HALDEMAN. *J. Chem. Education* 5, 1276-8 (1928). E. H.

Lecture demonstrations for general chemistry. C. HARVEY SORUM. *J. Chem. Education* 5, 1287-8(1928). E. H.

The work of the exceptionally gifted student in chemistry and chemical engineering. JOHN C. OLSEN. *J. Chem. Education* 5, 1282-6(1928). E. H.

A few suggestions for testing in high-school chemistry. G. ALBERT COOK. *Chem. Education* 5, 1272-3(1928). E. H.

Chemistry contests in the high schools in California. MARION TARBELL. *J. Chem. Education* 5, 1274-5(1928). E. H.

Order of precedence of laboratory work and recitation in high-school chemistry. FRANK M. GREENLAW. *J. Chem. Education* 5, 1300-6(1928). E. H.

An outline of pandemic chemistry. JOHN R. SAMPEY. *J. Chem. Education* 5, 1243-9(1928). E. H.

Laboratory work for a course in pandemic chemistry. JOHN R. SAMPEY. *J. Chem. Education* 5, 1249-54(1928). E. H.

The trend of thought in modern colloid chemistry. H. R. KRUYT. *Rec. trav. chim.* 47, 883-95(1928). E. H.

Presidential address on "some aspects of modern physics." A. OGG. *Trans. Roy. Soc. S. Africa* 17, 1-13(1928). E. H.

Some Bohemian alchemists. J. G. F. DRUCE. *Pharm. J.* 121, 2(1928).—The following alchemists and their works are noted: Jan Smil of Pardubice (about 1400); John of Tetschen (early 15th century), John Černý ("Johannes Niger") 1480-1530, Bavor Rodovsky (born 1526), Jacob Dobrensky (born 1632) and Christopher Bergner, 1721-1793. S. WALDBOTT

Nottingham's new university buildings. A. O. BENTLEY. *Pharm. J.* 121, 33-5 (1928).—History and photograph, and description of the departments of chemistry, physics, pharmacy and biology. S. WALDBOTT

The function of the technical press in complementary education. H. MOUNIER. *Fédération Internationale de la Presse Technique. Chimie et industrie Special No.*, 914-6(April, 1928). A. PAPINEAU-COUTURE

The ninth international chemical conference. JEAN GÉRARD. *Chimie et industrie* 20, 405-13(1928).—A summary of the work of the various committees presented at the conference of July 18-20, 1928, at The Hague. A. PAPINEAU-COUTURE

Criterion

RAOUL PICRET.

Arch. sci. phys. nat. [5], 8, 293-329 (1926).—

R. gives reasons for his belief that the ether possesses the attributes of mass, vol. and inertia, and hence fulfills the criteria of a reality which may be used in the equations of mechanics. The weight of a cu. km. of ether is calcd. to be 0.000,119,158 kg. The theory is advanced that each atom or mol. is inseparably surrounded by an envelope of ether. When spherical atoms or mols. approach in collision they can never actually touch each other, but the kinetic energy of their motion is transformed into the potential energy of deformation, which their ether envelopes undergo when they are in a position of close proximity. When the particles rebound the potential energy of their deformed ether envelopes reappears as kinetic energy. Heat, light and other types of radiation arise from the vibratory commotion of the ether envelopes which is supposed to result when impact occurs. With heat, the mean amplitude of such vibratory oscillations of masses of ether is the sole measure of temp. In reality, one can speak only of the temp. of a solid body whose center of gravity is immobile. The temp. of a gas is detd. practically by that of the solid walls which confine it. The work applied in compressing a gas is divided between increasing the potential energy of deformation of the ether envelopes and increasing the velocity of the mols. Only the work corresponding to the latter action contributes to the rise in temp. of the gas caused by compression. If 2 atoms which collide are cylindrical, it may be shown that they will reach a state of equil. in which their ether envelopes merge with one another, surrounding both atoms and forming a very difficultly separable system which is considered to represent a chem. mol.

R. H. LOMBARD

The evolution of the chemical elements. B. CABRERA. *Anales soc. españ. fis. quím.* 26, 186-205 (1928); cf. *C. A.* 22, 1271.—A review, with particular reference to the Aston curve.

E. M. SYMMES

The new singular elements—a plane and a solid angle in space. V. J. NIKOLAEV. *Ann. inst. anal. phys. chim.* (Leningrad) 3, 553-61 (1927); cf. *C. A.* 21, 3528 (1927).

G. B. KISTIAKOWSKY

The atoms per unit volume curve of the elements, a study of the specific weights of the elements in the liquid state. L. H. BORGSTRÖM. *Finska Kemistsamfundets Medd.* 36, 76-81 (1927).—The sp. grs. of the elements in the liquid and solid states are found to be nearly alike, which indicates that the at. radii must be nearly the same. The sp. gr. at the m. p. is also found in nearly all cases to be 10 to 20% greater at the f. p. than at the m. p. even though the temp. differences may vary from a few up to 1000°. The atoms per unit vol. curve is preferable to Meyer's at. vol. curve because equally large differences in d. have the same magnitude at high and low ds. The curve shows that 2 successive values tend to fall in the ratios of whole nos.; that in many cases the points fall on straight lines; that the slight bend in the at. vol. curve between Ti and Cu does not appear; and that the values tend to be multiples of the element at the nearest min. As regards polymerized elements it is pointed out that the atoms per unit vol. (at. wt./sp. gr.) in liquid O₂ and O are as 0.106 to 0.071, or as 2:3.

H. C. DUUS

X-rays do not always give the true lattice of crystals. CH. MAUGUIN. *Compt. rend.* 187, 303-4 (1928).—The remarks of Friedel (*C. A.* 22, 3074) that the true unit cell of a cryst. lattice is not always indicated by x-rays is substantiated by 2 types of minerals, i. e., by biotite (black mica) and by the chlorites. In both cases the unit cell is "3 times too small."

A. L. HENNE

X-ray examination of the anhydrous sodium sulfate-aluminum sulfate system. F. A. STIGGLE. Penn. State College. *Science* 68, 156-7 (1928).—Exptl. work was done to det. whether the anhyd. products obtained by the evapn. of aq. solns. contg. Na₂SO₄ and Al₂(SO₄)₃ are solid solns. or mech. mixts. or contain new chem. compds. Evapn. was carried out at the h. p. and the resulting solids were heated to 400°. The x-ray examn. was made with the powd. material, Mo K α radiation being used. This procedure was followed with a series of 10 samples, various proportions of the Na and Al salts being used. The equimol. mixt. showed no lines characteristic of either Na₂SO₄ or Al₂(SO₄)₃ but gave a characteristic diffraction pattern of its own, indicating a new individual. Samples richer in Al₂(SO₄)₃ showed lines of Al₂(SO₄)₃ superimposed on the pattern due to the new compd. which remained unchanged. Samples contg. an excess of Na₂SO₄ showed lines due to the new compd. with other lines not due to Na₂SO₄. These observations show that NaAl(SO₄)₂ is a definite compd. and not a mech. mixt. or a solid soln. There must also be another double sulfate contg. more Na₂SO₄ than NaAl(SO₄)₂. The complexity of the patterns indicates a low cryst. symmetry and no attempt at an analysis has been made.

A. W. KENNEY

The symmetry of the growth form of pentaerythritol. H. SEIFERT. *Z. anorg.*

allgem. Chem. 474, 318-20(1928).—A note on the work of Schleede and Hettich (*C. A.* 22, 4293). S. confirms symmetry class S_6 (cf. *C. A.* 22, 1711). S. shows that growth of pentaerythritol crystals results in twinning, not agreeing with Schleede's statement. He formulates the twinning as a mirror image symmetry in reference to the base (001). Single etch figures on the prism faces in classes C_6 and S_6 show simple asymmetry rather than "polar" or "unpolar" conditions as Schleede and Hettich give. Liebisch's "pyroelectric" effects (*Grundriss der physikalischen Kristallogr.* Leipzig 1896, p. 141) depend on subdivision, and are probably related to piezoelectricity. G. R. Y.

A new method for measuring deliquescent crystals. E. E. FLINT. *Trans. Inst. Econ. Mineral Met.* (Moscow) 1928, No. 34, 73-6.—F. describes new equipment for shielding deliquescent crystals on a goniometer. It consists of a spherical glass shield which fits a small glass salver in which the desiccating agent is placed. The crystal is supported upon a rod passing through the center of the salver.

R. L. HERSHEY

A study of crystal structure and its applications. Diffraction of light by crystals. W. P. DAVEY. *Gen. Elec. Rev.* 31, 496(1928).—A detailed review. C. G. F.

X-ray studies of the structure of salt adsorbed on cellulose. R. H. ABORN AND R. L. DAVIDSON. *Mass. Inst. Tech. Nature* 122, 440(1928).—Three possibilities are suggested for the adsorption of salts by cellulose: (1) a mech. holding in which both cellulose and the salt retain their original structure, (2) a reaction forming a new structural arrangement, and (3) a mol. or ionic dispersion of the salt throughout the cellulose units, the cellulose being structurally unchanged. X-ray investigations with cellulose and starch and with the salts NaCl and $\text{Na}_2\text{WO}_4 \cdot 2\text{H}_2\text{O}$ show that below a certain concn. the salt is molecularly or ionically dispersed (possibility 1) while above this concn. crystals of salt exist as such (possibility 3). This concn. is about 30 g. of tungstate to 100 g. of starch, and about 5 g. of NaCl to 100 g. of starch. Since these quantities of the salts are in proportion to their mol. wts., the phenomenon may be a mol. one.

JAMES M. BELL

The applicability of Fresnel's law in deducing evidence in favor of surface structure from surface reflectivity. S. S. BHATNAGAR, D. L. SHRIVASTAVA AND N. G. MITRA. *J. Indian Chem. Soc.* 5, 329-42(1928).—Light reflected from the surface of a liquid contg. polar groups such as OH, COOH, NH_2 , etc., should have a different intensity from that calcd. from Fresnel's law, provided the first reflection takes place from mols. in the surface layer. The app. used to measure the reflected light is sensitive between 70° and 30° reflection and is described at length. The ratio of the observed deflection of the liquid compared to H_2O at their resp. Brewsterian angles for the following liquids are: H_2O 1.000, EtOH 1.125, PrOH 1.245, iso-PrOH 1.200, BuOH 1.269, iso-BuOH 1.271, AmOH 1.269, Me_2EtCOH 1.259, AcOH 1.167, propionic acid 1.222, butyric acid 1.302, isobutyric acid 1.241, benzene 1.550, toluene 1.532, *m*-xylene 1.524, MeOAc 1.141, EtOAc 1.183, PrOAc 1.214, iso-BuOAc 1.213, $\text{C}_2\text{H}_4\text{Cl}_2$ 1.403, PhNH_2 1.750, PhNHFt 1.686, PhNMe_2 1.704, PhNEt_2 1.659, $\text{MeC}_6\text{H}_4\text{NH}_2$ 1.720, $\text{MeC}_6\text{H}_4\text{NMe}_2$ 1.637, $\text{Cu}_2\text{Fe}(\text{CN})_6$ soln. 1.000, gelatin soln. 1.000. Calcd. ratios of intensities at various angles of deflection are not equal to observed ratios of deflections in all cases, probably because of the wrong values of refractive indices for the effective wave lengths. Compds. having polar groups show observed values greater than those calcd., while the reverse holds for others. The differences are always greater for compds. contg. polar groups. For aromatic hydrocarbons and amines the observed values are less than those calcd. at high angles of incidence. The amines alone show greater values at small angles, probably because of at least 1 orienting radical. In the aliphatic compds., observed values are always greater than calcd. values. The mean deviations from calcd. values are greater for aromatic amines, presumably having mol. orientation, than for aromatic hydrocarbons. Study is being continued along similar lines as well as on colloidal solns. with monochromatic light from ultra-violet to infra-red regions.

RAYMOND H. LAMBERT

The "viscosity of structure" of some sols of polymerized carbohydrates. S. TSUDA. *Keijo Univ. Kolloid Z.* 45, 325-31(1928).—T. describes a viscometer with horizontal capillary for the study of the rate of flow of structurally viscous colloids. The viscosity of starch paste follows the law of Ostwald, and not that of Hagen-Poiseuille. The concn.-viscosity relationship for starch paste is approx. expressed by the formula of Arrhenius, in which the consts. are a function not only of the material but also of the dimensions of the viscometer and of the pressure. The viscosity of sols of agar follow the law of Hagen-Poiseuille at 50° and of de Waele-Ostwald at 80° . Reheated to 50° , it follows the latter at first, and returns to its original state only after a long time.

G. CALINOARET

The structure of matter. 1. The periodic classification of the elements. OTTO RAINMUTH. *J. Chem. Education* 1312-20(1928); cf. *C. A.* 22, 4049. E. H.

Reactions in the solid state. E. KORDS. *Glastech. Ber.* 6, 44-50(1928).—A summary of the work of G. Tammann and others on the interaction of crystals, relation of the crit. temp. to the m.p.s. of the substances and the amplitude of the vibrations of the atoms in the crystal lattice. The effect of a change in the crystal structure of one of the components is discussed and applied to the reactions between quartz and CaCO_3 , Na_2CO_3 , and K_2CO_3 . E. VALDEN

Gases with molecular attraction. KAMEKICHI SHIBA. *Bull. Inst. Phys. Chem. Research (Tokyo)* 7, 740-7, English Ed. 1, 65-6(1928).—Continuation of S.'s previous papers (*C. A.* 22, 3326). S. discusses the fundamental assumptions of the classical kinetic theory of gases and proposes a simple correction. The discussion is made mainly on the method of statistical mechanics, and the result is that the so-called ergodic hypothesis (quasi-ergodic) may not be used with 2 or more systems in thermal equil. The following expression is proposed as a correction of Maxwell's law of distribution of mol. velocities: $e^{-\frac{3m}{2\epsilon} (u^2 + v^2 + w^2)}$, where ϵ is the mean kinetic energy depending on the sp. vol.; this holds probably true, at least in sufficiently rarefied gases at sufficiently high temps. Some qual. results of the above corrections are pointed out. Remarks are made on the new statistics of ideal gases. A. L. HENNE

The behavior of gases in thin foams. ERNST BIESALKI. *Tech. Hochschule, Berlin. Z. angew. Chem.* 41, 853-6(1928).—It is well known that when the gas contained in the bubbles of a foam is a mixt. of O and H, it will not react on contact with a flame or a red-hot metal. But if colloidal Pd is present in the foam, reactions will be favored. H and O, C_2H_4 and H, C_2H_2 and H will react very smoothly. Salicylic acid and oleic acid have been hydrogenated by this method with much more ease than by the customary Paal method. A. L. HENNE

Homopolar union in excited hydrogen molecules. EGIL A. HYLLERAAS. *Z. Physik* 51, 150-8(1928).—A mathematical treatment of the case of action between 2 H atoms, one ordinary and one excited, leads to 4 solns., 2 leading to elastic collision and 2 to mol. formation. Both of the latter have symmetrical kernels, one with asymmetric and the other with symmetrical electron, corresponding to para term and an ortho term of the H mol. The curve shows a reduction of dissocn. work and an increase of moment of inertia against the ordinary state. G. B. TAYLOR

The rate of evaporation of molten cadmium in a high vacuum. ARTHUR A. SUNIER. *Univ. of Rochester. J. Phys. Chem.* 32, 1516-21(1928).—Sixty evapns. of Cd were carried out in Pyrex equipment at temps. from 335° to 425° at a pressure usually reaching 2×10^{-4} mm. by the end of the evapn. The av. rate of evapn. in g. per sq. cm. of surface per hr. ranged from 2.0 g. to 12.6 g. The widest variation at a given temp. (352°) was from 2.1 g. to 10.0 g. The theoretical rate of evapn. is calcd. from Herz equation $m = p\sqrt{M/2\pi RT}$, where m = g. evapd. from 1 sq. cm. in 1 sec., p = vapor pressure in bars, and M = mol. wt. The actual rate of evapn. varied from 4.2% to 40% of the theoretical rate. It seems probable that the low rates of evapn. were due to the fact that the surface of the Cd was dirty on account of the presence of CdO. D. H. P.

The absolute velocity of water molecules which are emitted from crystal hydrates upon dehydration. A. PREVDITSEV. *Inst. Physics and Biophysics, Moscow. Z. Physik* 51, 126-49(1928).—By means of a torsion and a micro-balance the dehydration velocities of $\text{H}_2\text{C}_2\text{O}_4 \cdot 2\text{H}_2\text{O}$, $\text{Na}_2\text{S}_2\text{O}_3 \cdot 5\text{H}_2\text{O}$ and $\text{Na}_2\text{B}_4\text{O}_7 \cdot 10\text{H}_2\text{O}$ were measured. The abs. velocities of the H_2O mols., leaving the hydrates were calcd. and from these the heats of hydration. The heats agreed with values in the literature. G. B. TAYLOR

The volume isobars of water up to the melting-point curve. G. TAMMANN AND W. JELLINGHAUS. *Z. anorg. allgem. Chem.* 174, 225-30(1928).—The results obtained by Bridgman and Amagat are discussed critically. Tables and curves are given to substantiate the discussion. T. and J. repeated the measurements of the vol. pressure relationships up to 1500 kg./sq. cm. Their results show that Bridgman's values for 1000 and 1600 kg./sq. cm. are decidedly too great. The expl. method is briefly described, with references to a more detailed description. L. L. Q.

Properties of aqueous solutions, especially of sodium chloride solutions. A. A. LÄRRNER. *Tech. Hochschule, Dresden. Arch. Wärmewirt.* 9, 233-42(1928).—The sp. heat of NaCl solns. was studied between 20 and 100° in an adiabatic calorimeter with elec. heating. In a 3% soln. the sp. heat rises from 0.98 to 0.99 in this range; in a 26% soln. the sp. heat is about 0.75 at 25°, falls linearly to 0.69 at 75°, and then curves off to 0.51 at 100°. Values for intermediate comps. fall between these, but no

numerical data are given. L. then illustrates the formation of total heat curves, and their use for calcg. heats of diln. JAMES W. THIELE

An accurate method for observing the meniscus of liquids confined in small tubes. J. T. LLOYD. *Am. J. Pharm.* 100, 601(1928).—To overcome the refractive power of test tubes and make clear observation of their contents possible, the tube is submerged in a sq., wide-mouthed bottle of cedarwood oil of the same n as the glass of the tube. Naturally a bottle with plain sides must be selected. By this method the sides of the tube are apparently practically obliterated and clear observation of the films is made possible. W. O. GAESSLER

Can atmospheric oxygen be kept out by means of superimposed layers of different fluid substances? HANS SCHMALFUSS AND WILHELM PESCHKE. *Chem. Staatsinstitut, Univ. Hamburg. Biochem. Z.* 198, 487-93(1928).—Of the 13 fluid substances tested amyl alc. was most effective, anisole least effective in keeping out atm. O_2 . One or another fluid was found preferable, depending on whether it is intended for a long or brief period. The depth of the superimposed layer is of little significance. The O_2 enters the soln. not through the upper layer of protecting fluid but through the space between the container and the substance; this can be demonstrated with the aid of indicators (alk. pyrogallol). The O_2 can be kept out for long periods either by covering the soln. with melted paraffin which cools and solidifies very quickly, or in case the soln. has too high a temp., by covering it with a layer of a substance boiling at that temp., such as ether, and with the aid of a reflux condenser keeping this from evap. A 2-mm. layer is sufficient. S. MORGULIS

The electrolytic coagulation of colloids. V. Pure silicic acid sols. E. LASKIN. *Kolloid-Z.* 45, 129-36(1928).—The p_H of SiO_2 sols was detd. by the H electrode, by the quinhydrone electrode and by cond. measurements. Results are in fair agreement. Various sols were prepd. and the coagulating actions of such materials as $CaCl_2$, $BaCl_2$, $LiCl$, $AlCl_3$, $La(NO_3)_3$, $Th(NO_3)_4$ and $FeCl_3$ were studied. Dyes such as night blue, neutral red, rhodamine 6 G and methylene blue also have a coagulating action but SiO_2 is pptd. as fine flocs or as a powder and the material is deeply dyed. The principal factor in coagulation with electrolytes appears to be the dehydrating action on the colloid particle by ions which are strongly hydrated. Acid dyes produce no coagulation. These sols closely resemble mastic sols but are sharply distinguished from sols like As_2S_3 or WO_3 in which the existing H ion is neutralized by other cations. R. H. L.

Adsorption phenomena in solutions. XIV. Studies of the adsorption of homologous monobasic acids. BORIS NEKRASOV. *Z. physik. Chem.* 136, 18-33(1928).—The influence of the solvent on adsorption is not yet clear. Five charcoals were prepd. in these expts.: (1) blood charcoal known as "Carbo medicinalis Merck"; (2) no. 1 purified by the method of M. Dubinin (cf. *C. A.* 22, 3329), (3) wood charcoal for gas masks; (4) no. 3 purified as in (2); (5) sugar charcoal. The purification yields charcoals which adsorb the ions of HCl equally. The best adsorbent for I from $KI-H_2O$ solns. was purified blood charcoal; the poorest adsorbent was sugar charcoal. Adsorption of 0.01 M formic, acetic, propionic, butyric, valeric, caproic, and heptylic acids from water solns. on the 5 charcoals and stearic acid showed that the purification increased the activity of the blood charcoal, decreased the activity of the wood charcoal, and that the results for sugar charcoal contradict Traube's rule. Stearic acid showed no adsorption for the first 4 acids. In Et_2O and $EtOH$ solns., by using the 5 charcoals and adding caprylic, pelargonic, lauric, myristic, palmitic and stearic acids to the above list the purification of the charcoals showed the same results as those for water solns. Traube's rule holds for part of the series only, a min. occurring at 7-12 C atoms. Sugar charcoal adsorbs only the lower members of the series. 0.01 M solns. of the fatty acids in water, $MeOH$, $EtOH$, $MeCOMe$, $EtOEt$, petroleum ether, benzene, toluene, $CHCl_3$, CCl_4 , CS_2 on the unpurified charcoal showed that the results could be divided according to solvents into 2 groups, O-contg. and non-O-contg. solvents. Those in the former show sharp minima in the adsorption curve with the exception of water, and for all of them Traube's rule holds from about butyric acid up the series. For the second group the min. adsorption is very weak or absent, and a weak or no tendency to obey Traube's rule. Petroleum ether falls between the 2 groups, undoubtedly because it is a mixed solvent, in which minima are often observed. There is no parallelism between surface tension of the solvent and adsorption. Dielec. strength gives a qual. regularity for the first group but none for the second. Charcoals are composed of 3 constituents: (A) pure C, (B) hydrocarbons of high mol. wt. and (C) chem. active and inactive (SiO_2) ash. Blood and wood charcoal have different proportions of A and B, while sugar charcoal is practically pure A. This classification brings the results in agreement with Rehbinder's "displacement" rule. XV. Hydrolytic and molecular adsorption of alkaline earth

halides on charcoal. MARK CHEPELEVSKII. Inst. Political Economy, Moscow. *Ibid* 34-44.—Systematic investigation of adsorption of alk. halides on active charcoals measured at the same initial concn. showed that adsorbability depends on the cation. The series for cations is: $\text{Li} > \text{Na} < \text{K} < \text{Rb} < \text{Cs}$; for anions: $\text{I} > \text{Br} > \text{Cl}$. The halides of Be, Mg, Ca, Sr, and Ba were studied in 1/60 *N* solns. on Merck's blood charcoal and on sugar charcoal. The adsorption of the anions of Merck's charcoal was of the same order; Be. showed a very high adsorbability, the remaining cations about the same lower order. Sugar charcoal gives about the same results with the exception of Ba, which shows a high adsorption, due undoubtedly to adsorbed CO_2 from the activating process. The bicarbonate formed by the CO_2 reacts with the adsorbed cation, pptg. BaCO_3 in the pores. Proof of this is shown by the parallelism of carbonate soly. with the cation adsorption and non-dependence on anion. Mol. adsorption is a complicated process and may be due to secondary reactions as shown above.

ARTHUR FLEISCHER

Adsorption from concentrated solutions and the adsorption of liquids. R. DEFAY. *Bull. soc. chim. Belg.* 37, 63-87(1928).—The Ostwald theories have been tested experimentally; they are correct with charcoal and aq. solns. of AcOH . D. criticizes the assumption that the solute and the solvent are adsorbed independently of each other. The results are equally well explained without this assumption; he uses Schmidt's idea of the adsorption max. A method has been devised for measuring the adsorption of a liquid on a solid and has been applied to the measurement of the adsorption of water by kieselguhr.

A. L. HENNE

The adsorption of vapors. ARTHUR FLEISCHER. *Yale Univ. Am. J. Sci.* [5], 16, 247-58(1928).—The Zsigmondy view of adsorption as a combination of surface adsorption and capillary condensation as the explanation of vapor adsorption is held as leading to the type of curve often obtained with vapor systems. Langmuir's views are adopted for the surface adsorption and Anderson's equation is applied for capillary condensation. It is shown that Coolidge's hypothesis of the particular form of curve applicable to polar liquids is inadequate and that Patrick's interpretation must be modified. A. F.

Studies on the physical chemistry of resorption. I. P. I. JURŠIĆ. *Pathol. Inst. Charité, Univ. Berlin. Biochem. Z.* 196, 223-45(1928).—The diminution in attraction or repulsion effect of ions on the electrically charged water column in the pores of a charged membrane is not in agreement with the results obtained in model expts. If NaCl is present on one side of a membrane and a salt of a multivalent ion on the opposite side, the flow of water is in the direction from the first to the latter, the velocity of the transport being directly proportional to the concn. of both isotonic solns. If on one side of the membrane there is a univalent cation and on the other a multivalent ion, the water flows in the direction cation \rightarrow anion, the velocity again being proportional to the concn. of the 2 isotonic solns. Theoretical discussion of the significance of these exptl. observations should be consulted.

S. MORGULIS

Coagulation studies on quartz suspensions. J. A. HANLEY. *Kolloidchem. Beihefte* 25, 281-99(1927).—Quartz powder was sepd. into fractions contg. particles approx. the same size by a sedimentation process. Suspensions of 4 such fractions were prepd. and observations were made of the process of coagulation on the addn. of gradually increasing amts. of lime water to the several fractions separately and to certain mixts. The flocculation of single fractions takes place in 5 steps. (1) The particles tend to stick together. This tendency increases with size of particles and with the addn. of electrolyte. (2) Permanent clusters and flocks are formed which are not very dense. (3) Dense clusters appear which behave like individual particles of larger size. (4) The small clusters coalesce into larger flocks, which settle out quickly. The supernatant liquid may remain cloudy for a long time. (5) Chain-like aggregates are formed by the coalescence of small groups. Beyond this, further addn. of electrolyte has no effect. With mixts. of fractions the larger particles attract the smaller ones, the latter concg. on the larger particles in a given clump. The addn. of electrolytes does not result in fractionation according to particle size. The phenomena are illustrated by photomicrographs.

HARRY B. WEISER

Preparation of a chemically indifferent quartz material of well-defined size of grain and character of surface. G. KRAUSS. *Kolloidchem. Beihefte* 25, 299-314(1927).—By a sedimentation process a suspension of quartz powder was made contg. particles less than 0.02 mm. in diam. This was treated with concd. HCl and the ppt. obtained was extd. repeatedly with HCl during 3 or 4 days and finally with distd. H_2O to the pptn. concn. of the acid. The last trace of acid was removed by heating in a Pt dish. The powder was again suspended in water and the suspension boiled from 1/2 to 1 hr. in a thin-walled flask over a free flame. This operation served to sterilize the particles

and thus to prevent the growth of a micro-vegetation which covers the particles with a slimy film. Finally the purified particles are sepd. into fractions as uniform as possible by a process of elutriation, which is described in detail. Photomicrographs are given which show the uniformity of several fractions.

HARRY B. WEISER

Slipping phenomena in the sedimentation on an inclined surface. G. KRAUSS AND R. RÜGER. *Kolloidchem. Beihefte* 25, 314-8(1927).—Detns. were made of the angle of slipping of quartz particles in very dil. solns. of HCl, KCl, CaCl_2 , $\text{Ca}(\text{HCO}_3)_2$, AlCl_3 , $\text{Ca}(\text{OH})_2$, KOH, and NH_4OH . The app. consisted essentially of a rectangular glass vessel in the bottom of which were placed wedges made of black glass. The method was as follows: 0.27 g. of quartz, diam. of grains 0.01-0.02 mm., was suspended in 200 cc. of electrolyte and allowed to settle on a glass wedge. With 0.002 N CaCl_2 the surface of the wedge was uniformly covered with quartz when the angle was between 1.5° and 28° . With larger angles the particles showed a tendency to slip and at 47° the slipping was sufficiently great in 5 min. to give a white streak at the base of the black wedge. This was taken as the end point. The angle of slipping is altered by changing the elec. repulsion between the quartz granules and the glass surface. In accord with Schulze's law the discharging action of the 3 ions Al^{+++} , Ca^{++} , and K^+ was found to be in the ratio 1000:10:1. On the other hand, the discharging action of univalent H^+ was greater than that of bivalent Ca^{++} .

HARRY B. WEISER

The influence of dilute solutions of electrolytes on the mobility of suspended quartz-sand filter. M. STORZ. *Kolloidchem. Beihefte* 25, 319-53(1927).—The amt. of suspended quartz retained by a sand filter depends on the amt. of suspension flowing through and the electrolyte content of the suspension and of the wash water. In a sp. case 53.3% of fine quartz was washed out with a given amt. of H_2O contg. no HCl, 29.5% with 0.0001 N HCl, 6.2% with 0.00025 N HCl, and 2.8% with 0.005 N HCl. A small quantity of electrolyte below the pptn. value greatly decreases the amt. of fine quartz washed out from a sand filter and tends to prevent rearrangement of particles in the filter. This is of great importance in practice. The electrolyte content which detts. the retention and proper distribution of particles capable of moving also detts. the permeability of the filter to water.

HARRY B. WEISER

The influence of small concentrations of electrolytes on the sedimentation of quartz suspensions. H. SALLINGER. *Kolloidchem. Beihefte* 25, 353-60(1927).—Fifty cc. of CO_2 -free suspension contg. 2 to 6 g. of quartz was pipetted into a glass cylinder of 4 cm. internal diam., dild. with 50 cc. of H_2O and finally mixed with 50 cc. of electrolyte. This was allowed to stand 5 hrs., and a 5-cc. sample was withdrawn 6 cm. from the top and the quartz content detd. The following conclusions are reached. Curves showing the effect of increasing concn. of electrolyte on the degree of sedimentation are similar in form. There is an initial region in which the effect is slight, followed in turn by regions in which the sedimentation is (a) greatly increased and (b) not greatly changed. With the strongly adsorbed electrolytes such as AlCl_3 and $\text{Ca}(\text{OH})_2$, it is necessary to start with higher initial electrolyte concns. for coned. suspension than for dil. if comparable results are to be obtained. Observations with the strongly adsorbed AlCl_3 and $\text{Ca}(\text{OH})_2$, on the one hand and the weakly adsorbed KCl on the other show that the pptn. value for strongly adsorbed electrolytes increases with increasing suspension concn. and for weakly adsorbed electrolytes, decreases with increasing suspension concn. The curves for KCl, NaCl, and Na_2CO_3 are very similar. The weak action of Na ions as compared with K ions is shown at all chloride concns. Na_2CO_3 acts less strongly than NaCl because of the peptizing action of OH ion formed by hydrolysis.

HARRY B. WEISER

Adsorption measurements on quartz. H. SALLINGER. *Kolloidchem. Beihefte* 25, 360-78(1927).—Adsorption measurements on quartz were made with varying concns. of the following electrolytes $\text{Ca}(\text{OH})_2$, $\text{Sr}(\text{OH})_2$, $\text{Ba}(\text{OH})_2$, LiOH, NaOH, KOH, NH_4OH , Li_2CO_3 , Na_2CO_3 , K_2CO_3 . The adsorption values with hydroxides were made within an hr., since the quartz is attacked by prolonged action of the bases. The exponent n of the adsorption isotherm increases with the amt. of quartz. The n value decreases in the series Ca, Sr, Ba, and in the series Li, Na, K. This order is the reverse of the order of radius of the unhydrated ions. With $\text{Ca}(\text{OH})_2$, $\text{Sr}(\text{OH})_2$, and $\text{Ba}(\text{OH})_2$ the n values are proportional to the reciprocal of the square of the cation radius. The theoretical significance of this is not known.

HARRY B. WEISER

Theoretical deductions from the measurement of the angle of slipping. H. SALLINGER. *Kolloidchem. Beihefte* 25, 384-401(1927).—Equations are deduced for calcg. (a) the charge on quartz particles from the angle of slipping, (b) the abs. value of the quartz water potential, (c) the thickness of the elec. double layer from the observations on slipping and the adsorption measurements with quartz, and (d) the dependence of the

elec. charge of the quartz particles on the valence and concn. of ions from the slipping observations. The data of Krauss and Rüger on slipping of quartz particles and the adsorption measurements of Sallinger (see preceding abstracts) were used to test the validity of the equations.

HARRY B. WEISER

Model of the Pickering emulsion. R. E. LIESEGANG. Inst. physik. Grundlagen Med., Frankfurt a. M. *Kolloid. Z.* 45, 370-1 (1928).—CHCl₃ and powd. NaCl are shaken with a dil. soln. of Löffler's methylene blue. The drops of CHCl₃ are prevented from running together by the undissolved NaCl. The preps. keep very well, especially if the H₂O phase is satd. with NaCl.

G. CALINGAERT

New Hypotheses as to the cause of the formation of layers in suspensions. G. KRAUSS. *Kolloidchem. Beihefte* 25, 378-84 (1927).—Investigations of Ehrenburg and Ungerer (C. A. 16, 1169) led them to conclude that layer formation was due to variations of any kind which sep. the particles into well-defined groups. The setting of the particles into layers follows Stokes' law. Every layer corresponds to a definite grain size and the individual layers show distinct differences in weight and size of particles. K. favors the hypothesis that layer formation is due to discontinuity in the rate of fall of particles. Sharp differences in particle size in natural soil, regular d. differences and complicated explanations of the stepwise velocity of fall appear less probable than the explanation advanced by Ehrenburg and Ungerer.

H. B. W.

Contribution to the theory of adsorption from dilute solutions. H. SALLINGER. *Kolloidchem. Beihefte* 25, 401-12 (1927).—Adsorption measurements on quartz were made with the hydroxides of Ca, Sr, Ba, Li, Na, and K. The detd. adsorption values are in good agreement with the values calcd. by means of the equation $\ln \frac{S}{S-x} \cdot \frac{c}{S} = K_s$,

where x is the adsorption value, S is the satn. value of the adsorption, c the concn. and K_s a const. For the bivalent hydroxides the K_s values are practically the same (0.49), while for univalent hydroxides, the values are quite different (0.16 for LiOH, 0.32 for NaOH, and 0.93 for KOH). This is accounted for by assuming the const. K_s to be the quotient of 2 opposing forces: the quartz action which tends to hold the cations on the surface of the quartz and the H₂O action which tends to hold the ions in soln. If the quartz action is assumed to be approx. const. the reciprocal of the K_s values in a group of like-valent ions will give a relative measure of the H₂O action. Taking the degree of hydration as a measure of the H₂O action $K_s = f(r_h^3 - r_u^3)$, where r_h and r_u represent the radius, resp., of the hydrated and unhydrated ion and f is a const. for like-valent ions. The degree of hydration of bivalent ions differs much less than of the univalent ions; hence the K_s values for the hydroxides of Ca, Sr, and Ba are nearly the same, while for the hydroxides of Li, Na, and K, the K_s values vary appreciably. The relative K_s values for Ca, Sr, and Ba are shown to be in the ratio 1:1:1 and for Li, Na, and K the ratio is 1:2:5.8. Conclusion: the K_s values within a group of like-valent cations are approx. inversely proportional to the degree of hydration of the ion.

HARRY B. WEISER

Dependence of the mass (x) of an adsorbed material on the mass (m) of the adsorbent. H. SALLINGER. *Kolloidchem. Beihefte* 25, 412-22 (1927).—An attempt was made to show the dependence of the amt. adsorbed (x) on the amt. of adsorbent (m) by means of the equation $x = K \cdot m \cdot \log d/d_0$, in which $d = v/O = v/mO_1$ and d_0 is the thickness of the adsorption layer which for a const. y/v is taken as const. K is a const. and O_1 is the surface of 1 g. of adsorbent. This equation relating the 2 values held for observations of Schmidt (C. A., 5, 416) on the adsorption of I₂ from Cl₄ by sugar charcoal, Freundlich's data (*Kapillarchemie* (1922) 237; cf. C. A. 16, 1803) on the adsorption of AcOH from soln. by blood charcoal, and the adsorption of Ba(OH)₂ from aq. soln. by quartz. If d_0 is known, it is possible to calc. the sp. surface O_1 of the adsorbent from absorption data with variable (m) and const. (y/v) by means of the equation $O_1 = v/m \cdot d_0 \cdot 10^3 / K \cdot m$.

HARRY B. WEISER

Calculation of the hydrolysis constant of dissolved sodium carbonate by means of adsorption measurements on quartz-sodium carbonate and quartz-sodium hydroxide. H. SALLINGER. *Kolloidchem. Beihefte* 25, 423-4 (1927).—The hydrolysis const. of Na₂CO₃, K_h , was calcd. from the adsorption data by means of the expression $K_h = [2c' \cdot (c' + x) / (c - [x - 2c'])] \cdot 10^{-4}$, in which c is the amt. of dissolved hydroxide, c' the entire alkali titer of the soln. after adsorption and x the amt. of adsorbed hydroxide. c and x are obtained from adsorption measurements on quartz-Na₂CO₃ and c' can be calcd. by means of x from the adsorption isotherm for quartz-NaOH. In a sp. case a value of $K_h = 3.4 \times 10^{-4}$ was obtained as compared to Auerbach and Pick's (C. A. 6, 10) value 1.9×10^{-4} at 25°.

HARRY B. WEISER

Calculation of the electrolytic dissociation constant of ammonia from adsorption

data on quartz-ammonia and quartz-potassium hydroxide. H. SALLINGER. *Kolloid-chem. Beihefte* 25, 424-7(1927).—The dissozn. const. k of NH_4OH was calcd. from the adsorption data by means of the equation $k = (c')^2/V(t + c')$, in which V is the volume of the soln. in cc. and c the total amt. NH_3 and c' the active mass of NH_4OH in millimoles in V cc. after adsorption. c is detd. directly and c' is calcd. by means of x from the adsorption isotherm of quartz-KOH. In a sp. case the value of K by the method was found to be 2.5×10^{-5} .

HARRY B. WEISER

Orange-colored and orange-red colloidal gold solutions. P. P. VON VEIMARN. *Kolloid Z.* 45, 366-70(1928).—True orange-colored Au sols leave a clear colorless dispersoid after the Au has been dissolved by KCN. W. prepares them by reducing $\text{AuCl}_3 \cdot \text{HCl}$ with Na citrate. Upon addn. of KCN the orange-red sols turn orange, showing that the red particles are dissolved first. The orange Au sols prepd. by the reduction with tannin owe their color to the yellow dispersoid after the tannin has been oxidized by the Au salt.

G. CALINGAERT

The identification of unreduced gold compound in red gold sols by the ammonia test. P. P. VON VEIMARN. *Kolloid-Z.* 45, 203-7(1928).—A study has been made of the ring formed when NH_3 is added to a test tube contg. Au sol and known to contain some Au compd. Na citrate causes the colloid Au to become highly dispersed. The ring need not be formed quickly nor need it assume a blue color. Three groups of Au compds. may be obtained by the NH_3 test, i. e., those forming a blue ring quickly, those showing practically no ring and those showing a ring from purple-red to blue after a long time. Au is a very difficult material to use for dispersoidal studies since it is a multivalent element forming complex compds. V. expects to prep. a sample of disperse Au which will be contradictory to the view now held by many as to this process.

R. H. L.

Unprotected homogeneous silver hydrosols. III. J. VOIGT AND J. HEUMANN. *Z. anorg. allgem. Chem.* 173, 27-44(1928); cf. *C. A.* 22, 2502.—Ag hydrosols were prepd. by reduction of Ag_2O solns. by hydrazine sulfate, hydrazine hydrate and formol. The presence of alkali greatly influences the sols obtained. No treatment with Au or Ag nuclei was given. Hydrazine sulfate produces the finest sol and formol the poorest. On concg. from 0.001 to 0.005% Ag the sol became relatively unstable although a no. of particles did not appear to change. Coagulation was studied by observation of color change. The method of prepn. affects the first stage of coagulation while in later stages the properties of the medium are of most importance.

R. H. LAMBERT

The "solution" of colloidal silver in hydrogen peroxide. H. KOLLER-AEBY. *Kolloid-Z.* 45, 371-4(1928).—K. repeats the expt. under various conditions, and describes an intermediate stage in which the $\text{Ag}-\text{H}_2\text{O}_2$ system is colored a beautiful steel blue.

G. CALINGAERT

The solution of a metal in a melted salt. WILHELM EITEL AND BRUNO LANGE. *Z. anorg. allgem. Chem.* 171, 168-80(1928).—A study has been carried out with "pyrosols" by means of a specially heated ultramicroscope, which is described. Photographs aid in giving a clear picture of the app. Pb in PbCl_2 was first studied and no colloidal particles could be detected. The same results were found with Cd in CdCl_2 . By calcn. from Stoke's law, particles 35.5μ in diam. should be present if colloidal. A study of pyrosol with a Tyndall beam shows that no change in polarization occurs on adding Pb to melted PbCl_2 , giving evidence of compd. formation. Thermodynamic considerations favor mol. dimensions of particles. There is strong evidence that subhalides may exist which may dissociate with heating; the free metal formed causing color in the melt. On solidification, ultramicroscopic particles are observed.

R. H. L.

The growth action of sols of iron hydroxide, aluminum hydroxide, silicic acid and manganese peroxide. V. N. SIMAKOR. *Kolloid-Z.* 45, 207-30(1928).—Sols of $\text{Fe}(\text{OH})_3$, $\text{Al}(\text{OH})_3$, SiO_2 and MnO_2 were prepd. and the effect of electrolytes on their coagulation was studied. The first 2 have a pos. charge, while the latter 2 are charged negatively. The electrolytes used for coagulation were NaCl , BaCl_2 and Na_2SO_4 . The coagulation effect of a pos. on a neg. sol and the reverse action were studied both in the presence and absence of electrolytes. Dil. SiO_2 sol has a higher coagulation threshold than concd. sol. A sol. coagulating a mixt. of 2 oppositely charged sols does so in an additive manner in equiv. concn. Electrolyte greatly affects the reciprocal coagulation of oppositely charged sols.

RAYMOND H. LAMBERT

The viscosity change at the beginning of gelatinization of dilute agar-sols. H. G. BUNGENBERG DE JONG. *Rec. trav. chim.* 47, 797-818(1928).—The study of change from a sol to a gel has been made from viscosity measurements. The viscosity of a 1/1% agar sol increases steadily with time at 40° . A characteristic curve appears at lower temps. which is very pronounced at 35° . Two phases appear which may be de-

ected by the gelatinization curve, the first part of which is reproducible and rises steadily. A const. viscosity occurs after a time; then it again rises but in an erratic manner. This is explained by aggregation of particles which at first does not affect the mech. passage of material through a capillary but finally the particles become so large that errors are introduced. Electrolytes have a strong lyotropic influence at 0.2 *N* in the following series K_2SO_4 — KCl — KBr — KNO_3 — KI — $KCNS$, the last salt causing the least hydration. Ultramicroscopic examn. verifies the flocculation explanation.

RAYMOND H. LAMBERT

Relation between hydration and stability of sols and the bivalent nature of fluoride ions. S. GHOSH AND N. R. DHAR. *J. Indian Chem. Soc.* 5, 303–11(1928); cf. *C. A.* 22, 1512.—Sols have been classified as those in which viscosity decreases and surface tension and cond. increase on aging (i. e., become more hydrated), and those having the opposite tendency. The coagulation of $Zr(OH)_4$, $Cr(OH)_3$, and $Al(OH)_3$ by electrolytes has been studied and the pptn. values are greater for sols prepd. in the cold than in the hot. The difference is small for $Zr(OH)_4$ with the following increasing order for both sols: ferrocyanide > sulfate > oxalate > tartrate > fluoride > chloride > bromide > iodide. Additive amts. of KCl and K_2SO_4 are required to coagulate the sol. The order for coagulating $Cr(OH)_3$ or $Al(OH)_3$ prepd. either cold or hot is: sulfate > tartrate > oxalate > fluoride. Less electrolyte is necessary to ppt. either sol prepd. hot than in the cold. Stability is not assoc. with amt. of hydration. Jellies are formed more readily with $Zr(OH)_4$, V_2O_5 and $Ce(OH)_3$ than with $Fe(OH)_3$, $Cr(OH)_3$ and $Al(OH)_3$. Tendency to form jellies is connected with high degree of solvation and is therefore a good criterion of lyophile colloids. Fluoride ions act as bivalent ion ($F_2^{''}$).

R. H. LAMBERT

A contribution to the knowledge of activated silicic acid (silica gel). E. BEYL AND H. BURKHARDT. *Z. anorg. allgem. Chem.* 171, 102–25(1928).—The prepn. of 3 silica gels is described: one according to Patrick, another in which Na_2SiO_3 soln. was added to a mixt. of HCl and $NaCl$ and also the reverse at about 20° and finally repeating at about 5°. The heat of wetting for benzene and H_2O was detd. and activity was found to depend on degree of dryness of the gel after prepn. The absorption of crystal violet in a no. of liquid media was studied and only from tetralin did absorption take place strongly. Shaking greatly increases absorption. An isotherm of water vapor for silica gel as well as that of a mixt. of H_2SO_4 — H_2O is given at 13° for the various gels prepd. The absorption of I_2 from a hydrogel and a benzogel was studied. Drying at various temps. *in vacuo* and by alc., acetone and benzene shows that it is impossible to remove all the water. Silica gel was also made by addn. of aniline- HCl . The greater the diln. of materials, the greater is the porosity of the completed gel. The time of washing a gel plays an important role in activity. The aniline gel gives a far greater neg. vapor pressure on absorption of water than any other substance tested.

R. H. LAMBERT

An herapathite suspension. EMIL HATSCHKE. *Kolloid-Z.* 45, 195–7(1928).—Herapathite (quinine iodosulfate) was chosen for this study because it crystallizes from many solns. into single crystals and in many liquids it remains dissolved although it is decompd. The crystals are doubly refractive and very thin; giving purely linearly polarized light on transmission. Figures are given showing exceptional dichroism. At very low concn. of quinine no crystals are observed while supersatn. enters at high concn. Glycerol tetrachloroethane, tetrachloromethane and benzyl alc. were used as liquid media. Cellulose acetate and nitrate were tried as protective colloids; the former behaves like gelatin, changing from sol to gel on cooling below 40°. Violent shaking of the suspension causes it to acquire the optical properties mentioned.

R. H. L.

The electrokinetic potential of silicic acid gels. II. The influence of electrolytes. S. GLIXELLI AND J. WIERTELAK. *Kolloid-Z.* 45, 197–203(1928); cf. *C. A.* 22, 341.—The electrokinetic potentials of silicic acid gels measured in different ways do not give concordant data. Water is bound up in the gel on account of the presence of electrolytes. The potential drops with increasing concn. of acid for HNO_3 , HCl , H_2SO_4 , $H_2C_2O_4$ and H_3PO_4 and with decrease in valence of the acid radical. For the salts KNO_3 , $Ba(NO_3)_2$ and $La(NO_3)_3$ the potential is a linear function of concn., and decreases with valence of the cation. H^+ plays an important part on the elec. double layer. For inorg. salts the formula $\delta = a - k \log c$ is obtained, where δ is the electrokinetic potential, a and k are consts. and c is the concn. of electrolyte.

R. H. L.

Thermodynamic theory of the colloidal condition. A. MARCH. *Kolloid-Z.* 45, 97–112(1928); cf. *C. A.* 22, 3088.—A rigorous thermodynamic treatment is given to general colloidal systems. The energy, vol. and entropy of a disperse system are considered in terms of pressure and temp. where in thermodynamic equil. The disperse phase is imagined to be made up of particles of many sizes in a definite distribution. The surface tension is shown to be greater than 10 for particles greater than $r = 10^{-7}$

cm., shown by Ostwald and Hulett for the system $\text{CaSO}_4\text{-H}_2\text{O}$. The thermodynamics to electrolytic disson. and the influence of the elec. double layer on the stability of colloid systems are subjects discussed. The free energy of a protective colloid about particles of the disperse phase at equil. does not decrease steadily outward but passes through a sharp max. An explanation of coagulation is also given. The degree of dispersion of a suspensoid increases with increasing temp. and decreasing concn.

RAYMOND, H. LAMBERT

Permeabilities of colloidal substances to gases. KAZUO KANATA. Tokyo Imp. Univ. *Bull. Chem. Soc. Japan* 3, 183-8(1928).—The relative permeabilities of rubber, gelatin and celluloid for O , H , CO_2 , SO_2 and NH_3 have been detd. In the cases of celluloid and gelatin at least, the sorption of these substances are not adsorption phenomena. The mechanism of permeability and absorption is discussed. Conclusion: The permeability and hence the absorption is caused by the solution of gas in the colloidal substance.

A. L. HENNE

The ionic activity of gelatin. H. S. SIMMS. Rockefeller Inst. *J. Gen. Physiol.* 11, 613-28(1928).—Anions of ampholytes obey the modified Debye-Hückel equation. Gelatin solns. were titrated potentiometrically in the absence of salts and in the presence of NaCl , MgCl_2 , K_2SO_4 and MgSO_4 . From the data, the values of $S = v^2 - (v-1)^2$, where $v^2 = v^2 - (v^2 - v)r_s/18$, have been calcd. The max. and min. values of S with NaCl were used to calc. the mean distance (r_s) between like charges in gelatin. This distance is about 18 A. U. between acid or basic groups agreeing with the probable value. The data with NaCl are normal and obey the equation found to hold for simple, weak electrolytes. By using the NaCl data as a standard, the deviations produced by the other salts were calcd. and were also found to agree closely with those derived for simple, weak electrolytes. The deviations are related to the "apparent valences," i. e., values which are a function of the true valence and the distance between the groups. The "apparent valences" of gelatin are 2.4 for acid groups in alk. soln. and 1.8 for basic groups in acid soln. "The data indicate that gelatin is a weak multivalent ampholyte having distant groups and that the mol. has an arborescent structure with interstices permeated by mols. of the solvent and other solutes. The size and shape probably vary with the p_H ." The nature of the ionizable groups in proteins. *Ibid* 629-40.—Analysis of titration curves shows that gelatin contains acid groups with disson. indexes ($p_K = -\log K$) at p_H 2.9 to 3.5 corresponding with the amt. of dicarboxylic amino acids present. The acidic groups at p_H 9.4 in egg albumin agree with the amt. of tyrosine. The amts. of histidine and lysine in these 2 proteins agree with basic groups at p_H 6.1 and 10.4-10.6, resp. The quantity of arginine (p_H 8.1) in these proteins is considerably less than the amt. found on hydrolysis, the deficiency being compensated by a basic group at p_H 4.6. This basic group should be similar to aniline and cytosine, i. e., an amino group on a conjugated unsatd. (perhaps cyclic) system. The basic group at 4.6 is probably disrupted on hydrolysis, producing arginine. This prearginine has an important effect upon the properties of proteins, for otherwise the isoelec. point of gelatin would be 8.0 instead of 4.7 and that of egg albumin 6.6 instead of 4.8. Deamination of gelatin does not decrease prearginine, arginine and histidine groups but removes most of the lysine group.

C. H. RICHARDSON

Dialysis with stirring. M. KUNITZ AND H. S. SIMMS. Rockefeller Inst. *J. Gen. Physiol.* 11, 641-4(1928).—Substances to be purified are placed in collodion bags contg. a toy marble or a bubble of air, the bags then being stoppered and placed in glass tubes in a rocking machine. Distd. water is circulated around the bags while the machine is in motion. The rolling of the marbles or bubbles causes stirring making it possible to remove salts from protein solns. in 24-48 hrs. by this method.

C. H. R.

The effect of gelatin on the polymorphic transformation of mercuric iodide. JITSUSABURO SAMESEMA. Tokyo Imp. Univ. *Bull. Chem. Soc. Japan* 3, 189-91(1928).— HgI_2 contg. gelatin shows hysteresis of the transition temp., i. e., it is necessary to heat considerably higher than 127° to transform the red modification into the yellow one; on the other hand, the yellow modification remains unchanged for an indefinite length of time at room temp. Gelatin acts as a protective colloid in a solid phase. A lecture demonstration is described which shows the behavior of the protected supercooled HgI_2 . The transformation of the metastable form into the stable one is accelerated by light energy.

A. L. HENNE

Absorption of water by gelatin. II. The nitrate system. DOROTHY JORDAN-LLOYD AND WINIFRED BERTHA PLEASS. *Biochem. J.* 22, 1007-18(1928); cf. *C. A.* 22, 1078.—In acid swelling gelatin can absorb 70 times its own weight of water and still retain its cohesive properties. In alk. swelling the capacity for holding water in a jelly phase is of the same order. In salt swelling the capacity for holding water is only about half

salt appears to set in very rapidly, once a crit. water content has

solubility of poorly soluble salts. BENJAMIN HARROW. *KUNIO ANDO*. D. Biochem. Lab., *J. Biochem.* 9, 215-31 (1928).—The colloidal stability of poorly sol.

HgI, PbCrO₄, Cu₂Fe(CN)₆, ThFe(CN)₆, etc., was investigated.

but very sparingly sol., substances are classed as facultative col-

loids. The powder its elec. charge must be taken into consideration, but

expts. do not support the view that this is the most essential factor.

The cations:

are almost always more stable with an excess of anions than of

hydroxyl is more stable in an excess of KI than of KNO₃ soln. S. M.

of silver chloride and other sparingly soluble substances in gelatin.

A. C. CHATTERJI AND N. R. DHAR. *J. Indian Chem. Soc.* 5, 175-81 (1928).—In opposition to the common belief that sparingly sol. substances exist in a supersatd. condition in gelatin sol, a colloidal state is conceived. The cond. is lower and velocity of diffusion is far less than in cases of high ionization. The elec. cond. of various concns. of AgCl gelatin has been obtained. There is no sharp break in elec. cond. in passing from satd. to supersatd. soln. This is confirmed by others. E. m. f. measurements show Ag⁺ is present to about 40% of total Ag in soln. No definite relation between amt. of gelatin and non-ionic Ag exists.

R. H. LAMBERT

The empirical equation for gelation velocity. Studies on coagulation. II. KOZO HIRORO. Inst. Physiology, Kyoto Imperial Univ. *J. Biochem. (Japan)* 9, 103-15 (1928).—An empirical formula for gelation of gelatin, $\eta - \eta_1 = \mu/1 + (\mu/\lambda)t$, was confirmed at different concns. between 2.5 and 5.0% of Merck's powd. gelatin, the crit. concn. where $\lambda = \infty$ being 3.8%. The const. μ increases with the concn. of gelatin in a linear proportionality. The rate of increase is different in dil. and in concd. sol than at the critical concn., and is smaller than in the latter. Gelation of the agar-agar sol of 0.05 to 0.175% seems to bear a resemblance to the gelation of gelatin of low concns. The applicability of the empirical formula to this process has not been confirmed. The max. viscosity attained by gelation increases with the sol concn. Heating the sol at 98° gradually denatures it and reduces the max. viscosity.

S. MORGULIS

The conductivity method and proteolysis. II. An interpretation of the conductivity changes. HARRY D. BAERNSTEIN. Univ. Wisc. *J. Biol. Chem.* 78, 481-93 (1928); cf. *C. A.* 21, 3379.—There are 2 regions on the p_H scale in which the cond. changes and the amino N changes are identical in albumin digests. The changes in cond. produced by the addn. of ampholytes to HCl solns. may be quant. accounted for in some cases by the change in the H ion while in other cases the dicarboxylic acids must also be considered. It is questionable whether the Ag-AgCl electrode gives accurate results in Cl-ion detns. when protein materials are present because of the binding of the Ag ions by the protein. The H ions are probably bound in accordance with the mass law. Bjerrum's theory of ampholytic dissocn. apparently applies to one of the cases studied.

H. J. DEUEL, JR.

A new rock and a new rhythmic process in rock. Rhythmic ring formation. MAX STORZ. *Kolloid-Z.* 45, 231-8 (1928).—A study has been made of rhythmic banding in rock obtained from south Africa. Three classes are distinguished, i. e., coarse dispersions made of elastic sediment, colloidal dispersion called gelite and mol. dispersion or chem. sediment. The rock is about 94% SiO₂ and H₂O with a little over 2% Fe oxides. Photographs are given and a description follows of the growth of bands in the rock. The vivid coloring is due not to specific properties of color but to heterogeneous or chromolytic coloring as claimed by Ostwald. An explanation is given of the process of rhythmic formation which is believed to be a new discovery. A full explanation is given of 6 photographs included in the article.

RAYMOND H. LAMBERT

Secondary periodicity of Liesegang rings. B. DOGADKIN. *Kolloid-Z.* 45, 136-40 (1928).—The secondary periodicity obtained in Liesegang-ring formation cannot be explained by any theory so far proposed for primary Liesegang rings. By the use of small capillaries this phenomenon can be made more distinct and therefore can be more carefully studied. It is not characteristic of Liesegang-ring formation but must be explained by some synchronizing change in the ppt. formed. The soly. of the pptd. material is an important factor in the effect. Ag₂CrO₄ was specifically studied and an analysis of the Ag content was made by distance of diffusion. A typical diffusion curve is obtained. This is contrary to the wave-forming curve obtained for Liesegang rings. This secondary effect was also studied with respect to light action and was found to be absent when the system was protected from light.

R. H. LAMBERT

The dependence of internal pressures in solutions upon the nature of the dissolved substance. G. TAMMANN. *Z. anorg. allgem. Chem.* 174, 231-43 (1928).—T. discusses

the detn. of the effect of pressure upon the temp. of the max. supercooling, and the relations existing between the internal pressure and the concn. of the soln. ΔK is a measure of the attraction of the mols. of the dissolved substance for the solvent. The effect of the nature of the dissolved substance upon the concn. of the soln. is summarized, as follows: (1) For strong electrolytes the attraction of the mols. for those of the water is a complicated additive property, corresponding to their concn. in the soln. up to a concn. where n , the no. of moles dissolved in 1000 g. of water, is 1. The attraction of the individual ions is very different and decreases with the ionic vol. (2) Non-volatile, weak electrolytes or nonelectrolytes whose internal pressures are greater than those of water exhibit an attraction which is not essentially different from that of the electrolytes, but which may exceed that of the ions. Tables of ΔK values are given. (3) Volatile nonelectrolytes whose internal pressures are less than those of water, i. e., alc., show a complicated relationship between the mol. attraction and the concn. In dil. solns., the attraction of the mols. of the solute for those of the water may be smaller than that of the mols. for one another, giving a neg. ΔK value. With increasing concn., the attraction of the dissolved mols. for those of the water increases, the ΔK value passing through a min. However, if this min. is not observed the first additions of the solute have less effect upon the internal pressure than those of the following addns.

L. L. Q.

The variation of the temperature of the minimum volume of water as affected by the pressure compared with the variation of solutions as affected by the concentration. G. TAMMANN AND E. SCHWARZKOPF. *Z. anorg. allgem. Chem.* 174, 216-24 (1928).—The vol. isobars of water as detd. by Bridgman are discussed in connection with the effect of the concn. of various solutes as K_2SO_4 , Na_2SO_4 , H_2SO_4 , K_2CO_3 , Na_2CO_3 , $CaCl_2$, KOH and NH_3 , upon the change of the min. vol. of the soln. Graphs showing the relation between the temp. of the min. vol. and the concn., and between the temp. and the internal pressure are given. The t - p curves for Na_2CO_3 and $CaCl_2$ may possibly be in error. The relation between the temp. of the min. vol. and pressure seems to be linear up to 500 atm. The effect of supercooling while observations are being made is discussed for C_2H_5OH and HCl . The dilatometric method used is described briefly, as is the method of calcn. of results. The vol. isobars of solns. of $LiCl$, C_2H_5OH and HCl are given. The temps. of min. vol. are -57.5° for $LiCl$, -2.8 for C_2H_5OH and -12° for HCl .

L. L. Q.

Cryoscopic studies on the transition points of the compounds of organic solvents and salts. I. HAJIME OSAKA. *Bull. Inst. Phys. Chem. Research (Tokyo)* 7, 873-87 English Ed. I, 80-2 (1928).—To a known amt. of Me_2CO is added a sufficient amt. of salt (NaI) to form a satd. soln. and a solid phase, at a temp. 1° or 2° above the transition point (25.5°). The system is then supercooled; a crystal of the new phase ($NaI \cdot 3Me_2CO$) is added, and the highest temp. to which the thermometer rises is observed. It is then possible to calc. the cryoscopic const. for acetone. When mol. weights are to be detd. the lowering of the transition point is observed, instead of the customary lowering of the m. p. The following equation is to be used, in which the quantity

between parentheses represents the cryoscopic const. K : $\Delta T = \left(\frac{RT^2}{H} \frac{58.05}{100(c+i)} \right) \frac{100}{WM}$

where T = transition point, ΔT = the observed temp. lowering, R = gas const. H = heat of fusion of 1 mol. of the acetone compd., 58.05 = mol. wt. of Me_2CO , n = number of the Me_2CO mols. contained in 1 mol. of the compd., c = no. of Me_2CO mols. per mol. of salt in the satd. soln. at the transition point, i = the degree of dissocn. of the salt in the soln. plus unity, W = weight of Me_2CO , w the weight of the solute and M the mol. weight of the solute. Expts. with Me_2CO and NaI gave a cryoscopic const., $K = 24.0$, which was used for the mol. wt. detn. of naphthalene, camphor, benzoic acid and benzil by observation of the lowering of the transition point. Values were obtained within 4, 6, 1.5 and 2%, resp., of the theoretical values.

A. L. HENNE

Varying valency of platinum with respect to mercaptanic radicals. VII. PRAPULLA CHANDRA RAY, KSHITISH CHANDRA BOSE-RAY AND SACHINDRANATH RAY-CHAUDHURY. *J. Indian Chem. Soc.* 5, 139-47 (1928); cf. *C. A.* 22, 1922.—The action of benzyl sulfide on H_2PtCl_4 produces $PtCl_2 \cdot 2(PhCH_2)_2S$, $PtCl_2 \cdot 2(PhCH_2)_3S$ and $Pt_2Cl_4 \cdot 4(PhCH_2)_2S$. The first 2 have been subjected to the action of NH_3 , benzylamine, ethylenediamine, pyridine, aniline, dimethylaniline and piperidine, and the resulting products were analyzed. The compds. are mostly of the Werner type. In the absence of an ionizing solvent, the Cl outside the nucleus could not be shown directly to be ionizable, but it has been shown to be reactive by its action with bases. In $PtCl_4 \cdot 4NH_3$ both Cl atoms appear ionizable. The same is true for $PtCl_4 \cdot 4Py$. The methods of prepn. and identification are carefully described.

R. H. L.

The effect of salts on weak electrolytes. II. Calculation of overlapping constants. HENRY S. SIMMS. Rockefeller Inst., Princeton, N.J. *J. Phys. Chem.* 32, 1494-1515 (1928); cf. *C. A.* 20, 2774.—The potentiometric titration data of oxalic, malonic, succinic and azelaic acids are presented. The previously described method of calcg. titration indices of acids with overlapping consts. is reviewed. When a multivalent acid has titration consts. close together, the titration indices are correct only if the ionic strength is the same in all the exptl. points. A new method was devised for calcg. accurate titration indices from data with various ionic strengths R. L. DODGE

Activity coefficients and mass-action law in electrolytes. L. ONSAGER. Johns Hopkins Univ. *J. Phys. Chem.* 32, 1461-6 (1928).—The consideration of Soper (cf. *C. A.* 22, 1083), which lead to other limiting formulas for the activity coeffs. of electrolytes than those given by Debye and Hückel, are analyzed mathematically and shown to be erroneous. The fact that Soper's formulas agree better with the expts. considered by him is attributed to his applying the limiting square-root formulas at too high concns. R. L. DODGE

Extinction coefficient of mixtures of ferric chloride and organic acids in the ultra-violet as experimental evidence in favor of formation of unstable intermediate compounds. II. JNANENDRA CHANDRA GHOSH AND BHUPENDRA NATH MITRA. *J. Indian Chem. Soc.* 5, 191-202 (1928); cf. *C. A.* 22, 1899.—The intermediate products formed on photochem. oxidation of org. acids by ferric salts have been studied by measuring extinction coeffs. of the mixt. These coeffs. can be explained on the basis of an existing equil. due to the formation of loose complexes and that such complexes have a definite mol. extinction coeff. for each wave length. The concns. of such complexes have been calcd. from the data for the action of FeCl_3 on formic, acetic, propionic, oxalic, malonic, succinic, glycolic, lactic, tartaric, citric and mandelic acids. The range of concns. of the inorg. salt was so chosen that Beer's law would hold. The concn. of FeCl_3 was in most cases $\mu/1000$, although some data were collected at $\mu/3000$, where higher wave lengths could be measured. The value of K was assumed correct when extinction coeffs. could be reproduced. K diminishes as the mol. wt. in an homologous series increases. It increases, however, if a H atom of a CH_3 group is replaced by a COOH group. The same holds true if the H atom is replaced by an OH group. R. H. L.

Effect of electrolytes on the distribution of acetic acid between benzene and water. RAMPROSAD MITTRA. *J. Indian Chem. Soc.* 5, 209-19 (1928).—The partition of AcOH between C_6H_6 and H_2O and the influence of inorg. salts on the distribution have been studied. The salts used were NaCl , KCl , BaCl_2 , KNO_3 , K_2SO_4 , LiCl , $\text{Na}_2\text{C}_2\text{O}_4$, Li_2SO_4 , and Na_2SO_4 . Concns. of acid and salt were varied. E. m. f. measurements were made to obtain the change in activity of the H ion on addn. of neutral salts. Six tables of data are given which include calcd. ion strengths and concn. of acid in the 2 phases. Only a qual. discussion is given of the results since the quantity of acid in the benzene which obviously contains water is not accurately known. The neg. activation decreases in the order $\text{K} > \text{Na} > \text{Li}$ for sulfates and is probably present for all sulfates at sufficiently low concn. It is believed this neg. activation is due to the sulfate ion and that a pos. activation in a reverse direction occurs with the cation. Chlorides increase activation of the H^+ ion within the range studied, but it does not parallel activation of the AcOH mol. The agreement with the Debye equation is believed fortuitous and undissocd. mols. in aq. soln. are believed to exist. R. H. LAMBERT

Kinetic salt effect. I. The reaction between sodium monochloroacetate and sodium thiosulfate. A. N. KAPPANNA. *J. Indian Chem. Soc.* 5, 293-8 (1928).—The kinetics of the reaction between Na monochloroacetate and $\text{Na}_2\text{S}_2\text{O}_3$ have been studied at 50° , 60° and 70° and at various concns. The velocity const. increases with ion concn. in accordance with the theory of Brønsted. The temp. coeff. near 60° is 2. The activity coeff. does not change greatly between 50° and 70° but is much less than at 25° . Ten neutral salts have the following relative sp. effects with respect to ions: $\text{K} > \text{NH}_4 > \text{Na} > \text{Li}$ and $\text{Cl} > \text{NO}_3 > \text{SO}_4$. RAYMOND H. LAMBERT

The velocity of esterification of amides in alcohol. H. AUSTIN TAYLOR AND THOMAS W. DAVIS. New York Univ. *J. Phys. Chem.* 32, 1467-80 (1928).—The velocities of esterification of benzamide, formamide and acetamide were measured at 25° in dry and in aq. alc. solns., with HCl as a catalyst. The reactions indicate the kinetics of a bimol. reaction. Formamide possibly contains a tautomer that catalyzes its esterification. Small concns. of NH_4Cl or NH_4Br do not show any marked effect on the reaction velocity. Addn. of small quantities of water accelerates the reactions, a max. effect appearing between 8 and 12%. The acceleration is explained by assuming that a collision between alc. and amide mols. giving rise to an addn. compd.

precedes esterification. Water makes the crit. intermediate complex more unstable toward reactants than resultants. R. L. DODGE

Experiments on the electrocatalytic reduction of carbon monoxide. G. FOSTER AND M. SCHWAZAPPA. *Z. anorg. allgem. Chem.* 171, 163-7 (1928).—A "filter cathode" was used, consisting of a wire gauze covered with a thick layer of Ni powder through which gas could be bubbled. A diagram of the cell is given. The electrolyte was a mixt. of H_2SO_4 and $\text{H}_3\text{V}_2\text{O}_7$. HCHO , formed in small quantities, was the principal reduction product. Expts. without the Ni powder, with CO alone or mixed with H_2 and with NiSO_4 soln. as the electrolyte and other cathodes such as Cu, with or without Cu powder, Pb with or without Pb powder and nicked Pb, gave at most only traces of reduction products, among which HCHO could not be detected.

RAYMOND H. LAMBERT

The catalytic oxidation of carbon monoxide. IV. The pore volume of the catalysts manganese dioxide, copper oxide and mixtures of these oxides. HAL D. DRAPER. Univ. of Calif. *J. Am. Chem. Soc.* 50, 2637-53; cf. *C. A.* 17, 3824; 20, 2443, 3260.—The component oxides of a mixed catalyst retain their characteristic properties in mixts., and mixts. are more active catalytically than either pure component and thus the "mixture effect" is probably due to an acceleration of the electronic rearrangement postulated in the mechanism of catalytic reactions. Expts., completed in 1922, on the previously described catalysts deal with the pore vol. and related phys. properties. True d. and pore vol. of the catalysts were detd. by Hulett's immersion method (*C. A.* 14, 1073). No slow "drift" in the d. of the granules similar to that found with charcoal was noted, indicating either that there are very few small micro-capillaries or that the resistance to filling is less. Since compound formation is accompanied by a departure from linearity in the sp. vol.-compn. curve, the observed departure of 2% indicates the lack of any definite compd. being formed. Further indication of compd. formation by measuring the heat effects produced on mixing the oxides points to the same conclusions, as this was only 10 cal. per mole of 1 oxide. The observed enhanced porosity of the mixts. above that of the pure oxides is explained in terms of colloid-chem. phenomena. From the consideration of a theory of formation of the porous granule, a formula giving the vol. of water sorbed by a porous body in terms of the radius of curvature of the water surface corresponding to the equil. pressure of the water vapor, the no. and the radii and av. length of the capillaries of the solid, is derived. The slope of the vapor pressure-vol. curve is independent of the av. length of the capillaries and depends upon the no. and the radii of the capillaries present and the ratio of the satn. to the equil. pressure. Sorption curves on the catalysts show that the poorest catalysts have the finest-grained structure; the best, the ones with highest porosity and the smallest no. of fine pores and the largest no. of cavities. No explanation of the mixt. effect is offered. In the region of true adsorption all the curves except one coincide; this indicates that the ratio of surface exposed to pore vol. of granules is the same, in spite of the great difference in pore size.

ALBERT THOMAS FELLOWS

The influence of acids and bases on the inhibitory effect of gelatin upon the catalytic decomposition of hydrogen peroxide by colloidal platinum. H. V. TARTAR AND N. K. SCHAFER. Univ. of Washington. *J. Am. Chem. Soc.* 50, 2904-10; cf. *C. A.* 19, 2769.—This study of the influence of acidity and alk. on the inhibitory effect of gelatin upon the catalytic decompn. of H_2O_2 by colloidal Pt refutes Groh's (*C. A.* 9, 7) and Iredale's (*C. A.* 15, 2758; 16, 189) statement that the inhibitory effect of protective colloids is approx. proportional to their protective properties as measured by Zsigmondy's "gold number" and strengthens Tartar and Lorah's and Reinders' (*C. A.* 20, 1545) contention that the variation is in accordance with the known amphoteric character of the proteins. Bredig's Pt sol peptized with KOH was pipetted into 100-cc. flasks and isoelec. gelatin, acid or base added and dild. to 95 cc. and 5 cc. H_2O_2 added; 5-cc. portions of the reaction mixt. were removed and titrated at intervals in order to follow the course of the decompn., the H-ion concn. being detd. electrometrically. Results are expressed in terms of the half period and reaction const. from the unimol. formula were calcd. The results were excellently reproducible with alkalis and fairly so with acids. Time of dild. of the Pt and the duration of the catalysis must be controlled. Results with HOAc, H_2SO_4 and H_3PO_4 show that the inhibition increases rapidly to p_n 3.5-4 but beyond this point it constantly increases with HOAc, decreases with H_3PO_4 and first decreases and then increases with H_2SO_4 . This difference is attributed to the effect of the anions, as the inhibitory effect should increase to p_n 4.7; thus the inhibitory effect is not comparable to the protective effect. Data for KOH, NaOH, and $\text{Ba}(\text{OH})_2$ show that the OH ion is dominant in the catalysis, probably peptizing the Pt and directly decomposing the H_2O_2 . Careful standardization of the method is impera-

tive as the catalysis is influenced by the character and extent of the Pt surface and the concn. of the H_2O_2 .

ALBERT THOMAS FELLOWS

The new mass law. IV. The relation between the original mixture and the equilibrium mixture. RICHARD LORENZ AND P. WOLFF. *Inst. physik. Chem., Univ., Frankfurt a. M. Z. anorg. allgem. Chem.* 174, 181-70 (1928); cf. *C. A.* 21, 1743.—In studying condensed chem. systems, L. and W. classify equilibria upon the basis of the original compn. of the mixt. as follows: (1) Those having 2 constituents, a metal and a dissimilar salt. The relative amts. in both phases, the metal and the salt, are therefore defined by a detd. equil. (2) Those having 3 constituents, 2 metals and a salt, or 2 salts and a metal. The relative amts. in this case vary somewhat for a detd. equil. (3) Those having 4 constituents, 2 metals and 2 salts, where again the relative quantities are variable. L. and W. consider this case as superfluous. These classifications are explained by means of mathematical and graphical schemes, with various mixts. of Sn, $SnCl_2$, $CdCl_2$ and Cd as examples. The discussion as presented by L. and W. applies only to those systems in which equil. is reached without a change in the total no. of atoms or mols.; that is, the same no. of metal atoms will react as salt mols. in causing the equil. The no. of the different atoms and mols. present at equil. will depend upon the original quantities used and the nature of the constituents. L. and W. picture the method of reaching equil. by saying that the point which represents the original mixt. and which lies either at the corner or on the side of the graph, depending on the no. of constituents, moves in a straight line toward the point of equil. with a momentary velocity as detd. by the quantity and nature of the original materials used, at a const. temperature. Therefore the equiv. points lie upon the diagonals of the square. The reaction is more complicated, however, because of the formation of metal clouds. This effect exerts a min. effect and may be disregarded. The system $2Tl + CdCl_2 \rightleftharpoons Cd + Tl_2Cl_2$ is given as an example of an equil. in which the metathesis is represented by equiv. quantities rather than by equal quantities of atoms and mols. The systematic method of studying the system $Sn + CdCl_2 \rightleftharpoons Cd + SnCl_2$ is described. V. The mole number and the position of the equivalence point. RICHARD LORENZ AND GEORG SCHULZ. *Inst. physik. Chem. Univ., Frankfurt a. M. Ibid* 171-8.—Whether equations for equilibria involving substances which may be assocd. should be written as $Pb + 2AgCl = 2Ag + PbCl_2$ or $Pb + Ag_2Cl_2 = 2Ag + PbCl_2$ and $2Tl + CdCl_2 = Cd + 2TlCl$ or $2Tl + CdCl_2 = Cd + Tl_2Cl_2$ is discussed briefly. Graphs are given which compare the ideal equilibria curves, from the ideal mass law $(x/1-x) \cdot (1-y/y) = C$, with actual curves which follow the new mass law expression $(x/1-x) \cdot (1-y/y) = Kx^a$, where $u = f(x, y, a, b)$, where x and y refer to the mole fraction of the metal phase and salt phase, resp., and a and b refer to the van der Waals consts. Reactions of the following types are discussed: $A + B \rightleftharpoons C + D$; $A + 2B \rightleftharpoons C + 2D$; $A + B \rightleftharpoons C + 2D$. The method of detg. the locus of the equivalence point for these equations is given. It is not possible to conclude what the position of the equivalence point will be from the number of mols. entering into a reaction.

L. L. Q.

A homographical method for converting percentage by weight into atomic percents for ternary systems. O. REDLICH. *Z. anorg. allgem. Chem.* 174, 285-9 (1928).—R. indicates by means of simple mathematical equations and graphs, a method of converting the percentage by weight of the constituents of a ternary system into at. percents.

L. L. Q.

An explanation of the phase rule. O. REDLICH. *Z. anorg. allgem. Chem.* 174, 281-4 (1928).—R.'s explanation is summarized as follows: (1) For the identity of 2 closed systems, which are in equil., a similarity in the quantities, by weight, of the components, is a necessary condition, as well as total energy and total vol. (2) Those cases only shall be considered in which this condition regarding the components is satisfied, and in which it is assumed that all cases are included which are in complete equil., and which are not acted upon by any outside forces except that due to the pressure of the surrounding walls. (3) The quantities by wt. of the phases are independent of one another. (4) There is no relation between the quantities of phases and the intensive properties. These relations are expressed mathematically, and the usual phase rule expressions derived therefrom.

L. L. Q.

The development of the electrolytic theory and the scientific work of Svante Arrhenius. TRÓFILO ISNARDI. *Anales asocn. quim. Argentina* 16, 5-48 (1928).

E. M. SYMMES,

Equilibrium diagram of the system: antimony-arsenic. QASIM ALI MANSURI. Aligarh Muslim Univ., Aligarh, India. *J. Chem. Soc.* 1928, 2107-8.—By the method of thermal analysis this system, up to 80% As, is shown to consist of 1 series of solid solns. with a min. m. p. of 805° at 13% As.

JAMES M. BELL

Polyiodide equilibrium in aqueous and salt solutions. JOHN S. CARTER. Univ. Leeds. *J. Chem. Soc.* 1928, 2227-30.—From soly. measurements at 25° of I in aq. solns. of NaI and in aq. solns. of NaI contg. Na₂SO₄, the values of $K = \frac{[I_2][I_2]}{[I_3]}$ have been detd. on the assumptions that the only polyiodide is the triiodide, that the iodide and triiodide have no influence on the soly. of I as such, and that both salts are completely ionized. Although the values of K are not const., they are approx. the same for the 2 series at similar concns. of NaI. This agreement is much closer than would be anticipated from the activity theory. The data indicate the presence of polyiodides more complex than the triiodide in the more concd. solns. J. M. B.

Solutions. I. Freezing-point diagrams and latent heats of evaporation of binary mixtures of volatile liquids. WILFRED F. WYATT. Univ. Sheffield. *Trans. Faraday Soc.* 24, 429-38(1928).—F.-p. diagrams are found for the systems: (I) acetone-CHCl₃, (II) EtOH-CCl₄, (III) EtOH-C₆H₆, and (IV) C₆H₆-CHCl₃. In I an equimol. compd. is formed, m. -99.5°. In II a transition point occurs at 44.6% of CCl₄, temp. -47.6°. In III there is no transition point but the curve is displaced to the alc. side. A normal curve was found for IV. The solids sepg. were isolated and analyzed, and extended series of solid solns. are indicated. The transition point in II is due to conjugate solid solns., with a difference in mol. concn. at the transition point of about 5%. To investigate mol. forces in these binary mixts., preliminary considerations of latent heats are presented. Plotting internal mol. heat against concn. shows marked changes of slope in the first three cases. For I there is a similar change of slope when molal heat capacity is plotted against mol. concn. JAMES M. BELL.

Heat capacity at low temperatures of zinc oxide and of cadmium oxide. RUSSELL W. MILLAR. Pacific Exp. Sta., U. S. Bur. Mines, Berkeley, Calif. *J. Am. Chem. Soc.* 50, 2653-6(1928).—The heat capacities of ZnO and CdO from 70° to 300° abs. are detd. Calcns. from these values give the entropy at 298° abs. of ZnO as 10.28 cal. per degree, and of CdO as 13.17 cal. per degree. At this temp. ΔH for ZnO is -83130 cal. and for CdO ΔH is -54200 cal. JAMES M. BELL.

Surface energy of solid sodium chloride. III. The heat of solution of finely ground sodium chloride. S. G. LIPSETT, F. M. G. JOHNSON AND O. MAASS. McGill Univ., Montreal, Canada. *J. Am. Chem. Soc.* 50, 2701-3(1928). The heat of soln. of finely divided salt, a . . diam. of particles 1.3 μ , is 25 to 40 cal. less, numerically, than the heat of soln. of coarse salt at the same temp. and concn. Calcns. for the heat of soln. of sublimed salt of the same av. particle size give a heat of soln. only 11 cal. less than that of coarse salt. The difference is probably due to the uneven surface of the finely ground salt, giving a larger surface area than for the sublimed salt which appears definitely cubic when examd. under a microscope. JAMES M. BELL.

The heat of dissociation of oxygen as estimated from photochemical ozonization. OLIVER R. WULF. Univ. of California. *Proc. Natl. Acad. Sci.* 14, 614-7(1928). The heat of dissocn. of O₂ has been estd. by Warburg (cf. *C. A.* 14, 1637), as 138,000 cal. and by Born and Gerlach (cf. *C. A.* 16, 873), as 162,000 cal. W. believes that the latter est. rests upon a mistaken assumption. A recent study of the existing data on the absorption of light by gaseous and liquid O indicates that the est. of Warburg's is likewise in error in that it pertains probably to the mol. O₂, a polymer of O₂, rather than to O₂. If this is so, the true heat of dissocn. is lower than the value now generally accepted. R. I. DODGE.

Physical methods in the chemical laboratory. V. Production and measurement of high temperatures. ERICH SCHROER. *Z. anorg. Chem.* 41, 757-60(1928).—A review with up-to-date compilation of the German literature. **VI. Production and measurement of low temperatures.** MARTIN RUHEMAN. *Ibid.* 44, 50-51.—A review of the production of low temps., gas liquefaction, the adsorption process and low-temp. measurements, with 28 references almost exclusively German and Dutch.

The applicability of resonance methods for determination of dielectric constants of conducting liquids. HEINRICH KNIEPKAMP, Berlin. *Z. Physik* 51, 95-107(1928). Attempts were made to det. dielec. consts. of sugar and urea solns. by resonance methods. An inductionless shunt across the capacity in an oscillating circuit showed the position of current resonance depended on the shunt. This was not the case for potential resonance. The latter method has decided advantages for measuring the dielec. consts. of weakly conducting liquids. Measurements were made at various concns. with a wave length of 530 m. G. B. TAYLOR.

The absolute zero of internal energy and entropy, and the corresponding inertness of matter. R. D. KLEEMAN. *Science* 68, No. 1758, 235-6(1928).—The first and second differential coeff. with respect to the temp. of the internal energy, pressure and

vol. of a condensed substance are zero at $T = 0$ either at const. pressure, vol., or at equil. pressure. Matter thus possesses a remarkable inertia to temp. changes at $T = 0$. This suggests that at $T = 0$ an atom differs considerably from what it is at higher temps., this difference being no doubt assocd. with change of electronic configuration. This is in accordance with M.'s deduction (C. A. 21, 2416) that at $T = 0$ the internal heat of vaporization L is zero and that a substance in the gaseous state at $T = 0$ possesses an abnormally large sp. heat which may amt. to thousands of cal. per g. These results may be explained by supposing that during evapn. an atom undergoes a change in electronic configuration which gives rise to a decrease in internal energy equal to the work done against the at. forces of attraction and that on heating the vapor an approx. equal increase of internal energy takes place with corresponding reversal of electronic configuration.

F. R. BICHOWSKY

The entropy of vaporization of unassociated liquids. JOHN CHIPMAN. Georgia School of Technology. *J. Phys. Chem.* 32, 1528-31(1928).—The empirical equation of Trouton, Nernst, Bingham, Forcrand, Kistiakowsky and Mortimer expressing the heat of vaporization as a function of the b. p. are compared. The equation of Kistiakowsky (I), $\Delta S = R \ln V$ (where V is the natural log. of the mol. vol. of the vapor in equil. with the liquid) is found to be valid over a wide range of temp. for unassocd. liquids. By calcg. the entropy of vaporization to a concn. of 0.00507 moles per l. for a no. of gases and solids it is found that I is less reliable at lower temp. than at the b. p. By subtracting I from Sackur's equation for the entropy of a monatomic gas, where $S = R \ln (T^{3/2} H^{3/2} V) + C$ an expression is obtained by which the entropy of a monoat. liquid in the neighborhood of its b. p. may be roughly estd. since $S = \frac{1}{2} R \ln (TW) + C$.

D. H. POWERS

Quinhydrone electrode. F. J. MAFFEI. Polytechnic School of S. Paulo. *Bol. soc. chim. S. Paulo* 1, 61-6(1928). The colorimetric method for the detn. of H-ion concn. is simple, convenient, but is not very sensitive; the natural color of the soln. interferes, and salts and protein matter are not without action. The potentiometric method, with the H ion electrode, though more sensitive, is not very convenient, since time is required before equil. is set up between soln. and electrode, and the electrode is influenced by O, by reducers and by unsatd. substances necessitating special app. to obtain pure H. Hence the quinhydrone electrode deserves attention. Haber, Russ, Granger and Nelson have shown that in an aq. soln. of benzoquinhydrone the dissocn. can be represented by: $C_6H_4(OH)_2 \rightleftharpoons C_6H_4O_2 + 2H^+ + 2(-)$. An electrode of Pt or Au is placed in the soln. and acts as a H electrode, the potential being $E = E_0 + (K/2) \log [C_6H_4O_2 / C_6H_4(OH)_2] + K \log [H^+]$. This may be written $E = E_0 + K \log [H^+]$ or $\log 1/[H^+] = p_H = (E - E_0)/K$. Working against the calomel or satd. KCl electrode the expression becomes $\log 1/[H^+] : p_H = (0.4557 - 0.00028 t - E)/(0.0541 + 0.00021)$. Billman preps. the soln. to be used thus: a soln. of 100 g. Fe NH₄ alum in 300 cc. water is added to a soln. of 25 g. hydroquinone in 300 cc. water, and cooled, filtered and washed 4 or 5 times. LaMer and Parsons concluded that the quinhydrone electrode is a satisfactory substitute for the H electrode as long as an alky. of p_H of 8 is not exceeded and oxidants and reducers are absent. Autoxidation must be guarded against. Subsequent work confirms the statement that at 18° the quinhydrone electrode gives good results in solns. whose p_H is less than 8 though near $p_H = 7$ the results may be a little low. Cullen and Billman and also Grossman used the quinhydrone electrode for blood. Schaefer and Schmidt use it for gastric juices, the cerebrospinal fluid and urine. Kolthoff found errors in the presence of proteins, Harris used the electrode for amino acids, Wegner and McGill for alkaloids and Watson for sugar liquors. A bibliography is given of 24 references mostly in English, French and German.

S. L. B. E.

The influence of electrostatic fields on the dielectric constants of bodies in nematic phase (liquid crystals). MIECZYSLAW JEZEWSKI. *Phys. Inst., Cracow. Z. Phys.* 51, 159-64(1928).—Dielec. consts. of *p*-azoxyphenetole and *p*-azoxyanisole were measured in fields from 0 to 1000 v. per cm. at various temps. The dielec. consts. decrease with applied voltage at all temps. until a temp. was reached where only the amorphous phase of the substance existed. Here the decrease with field strength was insignificant.

G. B. TAYLOR

Experimental proof of negative dispersion. H. KOPFERMANN AND R. LADENBURG. Kaiser Wilhelm Inst. f. phys. Chem. u. Elektrochem., Berlin-Dahlem. *Nature* 121, 1-8-9(1928).—By considering the dispersion of a gas in the neighborhood of an isolated spectral line, a formula is derived for the change in n . This formula contains a term for the "negative dispersion" effect. This term is considerable if the gas is excited strongly and if the difference of energy between the 2 quantum states is not too large.

Such "negative" dispersions" have been found experimentally when Ne is electrically excited by c. ds. beyond 100 milliamps. per sq. cm. JAMES M. BELL

The action of salt mixtures on copper. A. LAUNERT. *Compt. rend.* 187, 206-7 (1928); cf. Peczalski (*C. A.* 19, 2022).—L. heats Cu rods 3.55 cm. in diam. and 20 cm. long in the presence of the pure KCl, BaCl₂, and SrCl₂, and their 3 binary mixts. in various proportions, and measures the resistance and diam. of the rods at temps. below the eutectic point of the pairs of salts. Conclusion.—The slight variations observed can be explained by the absorption of salt vapors by the metal. G. CALINGAERT

GUÉRIN, GEORGES: Osmose, dialyse, ultrafiltration. Paris: Dunod. Reviewed in *Tiba* 6, 1199(1928).

3—SUBATOMIC PHENOMENA AND RADIOCHEMISTRY

S. C. LIND

Physical methods in chemical laboratories. VII. The significance of spectroscopy for chemical investigation (2nd Part). EUGEN RABINOWITSCH. *Z. angew. Chem.* 41, 1021-8(1928); cf. *C. A.* 22, 4017. W. C. EBAUGH

Testing the Schrödinger theory. J. L. SNOEK, JR., AND L. S. ORNSTEIN. *Z. Physik* 50, 600-8(1928).—Absorption of lines in the Balmer spectrum of H is measured in the fine structure of H α and H β by means of an echelon spectroscope and the method of photographic photometry. The ratio of the total absorption of H α to H β is found to be in satisfactory agreement with the theoretical value, 5.37. W. F. MEGGERS

The propagation of Schroedinger waves in a uniform field of force. G. BREIT. Dept. of Terrestrial Magnetism, Carnegie Institution of Washington. *Phys. Rev.* 32, 273-6(1928).—The phase-difference between a Schroedinger wave refracted by a uniform field of force and the primary wave is calcd. The results are shown tabularly and graphically. As the wave length increases, the phase difference decreases, reaches a min., and then increases again. It is suggested that the intensity of some crystal reflections should vary anomalously as a result. BERNARD LEWIS

The structure of acetylene. JARED K. MORSE. Univ. Chicago. *Proc. Natl. Acad. Sci.* 14, 645-9(1928).—Since C₂H₂ can be considered as an C₂H₄ mol. (*C. A.* 22, 1879) from which 4 H atoms have been removed and since the infra-red bands have recently been analyzed, it is possible to write down the coordinates of the dynamic isomers of C₂H₂, compute the moments of inertia of these structures and compare them with the moments of inertia obtained from the band spectra analysis. The moment of inertia of 2.5 $\times 10^{-39}$ g. sq. cm. which represents the moment of inertia of the most abundant of the dynamic isomers calcd. on the basis of the model presented in the paper from abs. values of the radius of the C atom (diamond) and the length of C-H bond (solid C₂H₆) obtained from x-ray expts. is in remarkable agreement with the value 2.4 $\times 10^{-39}$ g. sq. cm. obtained by Levin and Meyer by means of the quantum theory from the analysis of the infra-red absorption bands of gaseous acetylene. MARIE FARNSWORTH

The assignment of quantum numbers for electrons in molecules. I. ROBERT S. MULLIKEN. Washington Square Coll., New York Univ. *Phys. Rev.* 32, 186-222 (1928).—The problem of making a complete assignment of quantum nos. for the electrons in a (non-rotating) diatomic mol. is considered. A tentative assignment of such quantum nos. is made in this paper for most of the known electronic states of diatomic mols. composed of atoms of the first short period of the periodic system. The assignments are based mainly on band-spectrum and to a lesser extent on ionization-potential and positive-ray data. The methods used involve the application and extension of Hund's theoretical work on the electronic states of mols. Although the actual state of the electrons in a mol., as contrasted with an atom, cannot ordinarily be expected to be described accurately by quantum nos. corresponding to simple mech. quantities, such quantum nos. can nevertheless be assigned formally, with the understanding that their mech. interpretation in the real mol. (obtained by adiabatic correlation) may differ markedly from that corresponding to a literal interpretation. With this understanding, a suitable choice of quantum nos. for a diatomic mol. appears to be one corresponding to an atom in a strong elec. field, namely, quantum nos. n , l , σ , and s , ($s_r = 1/2$ always) for the r th electron and quantum nos. s , σ_1 , and σ_2 for the mol. as a whole (σ_1 and σ_2 represent quantized components of l , and s , resp., with reference to the line joining the nuclei). These quantum nos. may be thought of as those assoc. with the imagined "united atom" formed by bringing the nuclei of the mol. together. A notation is proposed whereby the state of each electron and of the mol. as a whole can be desig-

nated, e. g., $(1s)^2 (2s)^2 (2p)^2$, 3P for a seven-electron mol. with $\sigma_1 = 1$, $s = 1/2$, in a symbol such as $2s^2$ the superscript denotes l , the main letter, σ_1 , thus $2s^2$ means that the electron in question has $l = 2$, $l = 1$, $\sigma_1 = 0$. Electrons with $\sigma_1 = 0$, 1, 2,—are referred to as s , p , d —electrons. It is shown that in a mol. it is usually natural to define a group of equiv. electrons giving a resultant $\sigma_1 = 0$, $s = 0$ as a *closed shell*; in this sense, two s electrons, or four p , or d , f —, electrons form a *closed shell*. The possible mol. states corresponding to various electron configurations are deduced by means of the Pauli principle. Electrons which undergo an increase in their n values (principal quantum nos.) when atoms unite to form a mol. (Hund) are here called *promoted electrons*. The electrons in a mol. may be classified according to their *bonding power*, positive, zero, or negative. Electrons whose presence tends to hold the mol. together, as judged by the fact that their removal from a stable mol. causes a decrease in the energy of dissociation D or an increase in the equil. internuclear sepn. r_0 may be said to have *positive bonding power*, and are identified with, or defined as, *bonding electrons*. Bonding power in terms of changes of D and of changes of r_0 are distinguished as "energy-bonding-power" and "distance-bonding-power." On the whole, promoted electrons should tend to show negative energy-bonding-power, unpromoted electrons positive energy-bonding-power, but much should depend on "orbit dimensions." Certain rules governing the relations of the electronic states of a mol. to those of its dissociation products are discussed; in addn. to theoretical rules established by Hund in regard to σ_1 and s values, another rule is here proposed, namely, that the σ_1 values of all the at. electrons before union should be preserved in the mol. (σ_1 conservation rule). Selection rules for electronic transitions are also discussed; in addn. to rules given by Hund, the following are proposed: $\Delta l = \pm 1$ for intense transitions: $\Delta \sigma_1 = 0, \pm 1$. *Results*.—The key to the assignment of quantum nos. made here is found in the fact that the mols. BO , CO^+ and CN show an *inverted* 3P state instead of the normal 3P which should occur if this state were analogous to the ordinary 3P states of the Na atom. The existence of such a low-lying inverted 3P indicates that in these mols. there exists a closed shell of p electrons from which one is easily excited. It is concluded that this is a $(2p)^4$ shell. The identification of 2 other closed shells, of s electrons, very likely $(3s)^2$ and $(3s')^2$, follows; the electrons in these and the $(2p)^4$ shell are roughly equal in energy of binding. According to this interpretation, the electron jumps involved in the band spectra of BO , CN , CO^+ and N^+ are more analogous to x-ray than to optical electron transitions. From this beginning, proceeding to CO , N_2 , O_2 , O_3^+ , F_2 , C_2 , etc., a self-consistent assignment of quantum nos. is built up for most of the known states of the various mols. treated in this paper. The spectroscopic analogies of CN , N_2 , NO , etc., to Na , Mg , Al are justified and the partial failure of these analogies such as the chem. resemblance of CN to a halogen, are explained. Nearly all the hitherto observed ionization potentials of the mols. discussed can be accounted for by the removal of a *single* electron from one or another of the various closed shells supposed to be present. The N_2^+ band fluorescence produced by short wave-length ultra-violet light (Oldenberg) is accounted for as the expected result of photo-ionization of a $3s^2$ electron. The steadily decreasing heat of dissociation in the series, $N_2 - NO - O_2 - F_2$, is accounted for by the successive addn. of promoted $3p^2$ electrons with strong neg. bonding power. Starting from N_2 , whose normal state corresponds to a 1S configuration of closed shells, we add one $3p^2$ electron to give the 3P normal state of NO , and O_2^+ , two to give the 1S normal state of O_2 , four to give a closed shell, $(3p)^4$, which accounts for the 1S normal state of F_2 . In N_2 (probably also in O_2 and the other homopolar mols.) band systems for which $\Delta l \neq 1$ are notably lacking, thus giving support to Hund's predicted selection rule for homopolar mols., in the analogous heteropolar mol. CO , many systems occur with $\Delta l = 0$ than those for which $\Delta l = \pm 1$. On account of this strict selection rule in N_2 certain levels should be metastable, in particular the final level of the α afterglow bands of *active nitrogen*. There is evidence for the existence of a strict selection rule $\Delta s = 1$ in homopolar mols.

BERNARD LEWIS

Artificial disintegration by means of alpha particles from polonium. HANS PETERSSON. Radium Inst., Vienna. *Arkiv Mat. Astron. Fysik* 21A, No. 2, 11 pp. (1928).—Since the α -rays from Po are sufficiently powerful to cause disintegration, Po is a more convenient source of radiation than the shorter-lived $Ra C$. From an investigation on the disintegration of C by means of α -particles from Po , it is shown that only with α -particles of a range less than 2 cm. no at. fragments of retrograde direction are observable from this element by the scintillation method. These results are contrary to the results of Bothe and Fränz (*C. A.* 22, 1902), who are not able to disintegrate C with Po .

MARIE FARNSWORTH

The artificial disintegration of atoms and their packing fractions. HANS PETERSSON.

son. Radium Inst., Vienna. *Arkiv Mat. Astron. Fysik* 21A, No. 1, 16 pp. (1928).—Starting from the assumptions that mass and energy are equiv., and that to each kind of stable atom must be ascribed a definite at. mass agreeing with the values found by Aston's precision measurements, the mass-energy balance for various hypothetical disintegration processes is worked out. It is found that, from an energy point of view, the simple release of a proton from the C or from the O nucleus by means of α -particles from Ra C is not compatible with Aston's measurements. If, on the other hand, the release of an H-particle is supposed to involve also the capture of the α -particle by the residual nucleus as has been found to be the case with certain light elements, the disintegration of C and O is compatible with Aston's measurements. Also, with an analogous nuclear synthesis between a Br nucleus, Br₇₆ and a colliding α -particle forming a nucleus of Kr₈₂ with a proton escaping, a positive mass energy balance is found, indicating that this process should be possible. On the other hand, the same reasoning applied to bombarded He shows that the fraction of the kinetic energy of an α -particle from Ra C which is available for disintegration work at its collision with a free He nucleus is much too small to cover the neg. mass energy balance involved in the ensuing synthesis of a Li₇ nucleus and a free proton, indicating that this kind of He disintegration is not possible. From the general validity of the whole-no. rule with the heavier elements and their isotopes, inferences are drawn which run against the assumption that the He nucleus is the dominant subnuclear unit. With regard to the supposed compn. of the C and the O nuclei from He-subnuclei only, it is shown, that the excess of packing responsible for keeping these together is less than the mass equiv. of the kinetic energy available for disintegration work at their collision with an α -particle from Ra C. Hence, granted the existence of subnuclear He⁺⁺ units within these at. nuclei, the release of a secondary α -particle and residual C nucleus from an α -bombarded O atom ought to be possible as well as the complete disintegration of C into He by the same means.

MARIE FARNSWORTH

The energy output of the β recoil of thorium B. I. WERTENSTEIN. Radiologische Lab. der Warschauer Wiss. Ges., Warsaw. *Z. Physik* 40, 463 (1928).—Answering the criticism of K. Donat and K. Philipp (cf. C. A. 22, 538), W. recalls the exptl. conditions in which his collaborator A. Muszkat performed her work, and shows that the results of D and P. do not contradict M.'s results and are perfectly compatible with them.

A. L. HENNE

The γ -ray spectrum of protoactinium and the energy of the γ -rays accompanying α - and β -ray transformation. LISE MEITNER. *Z. Physik* 50, 15-23 (1928).—In the γ -ray spectrum of Pa 3 rays of wave lengths 130, 41.9 and 38.2×10^{-11} cm. have been detected by the method of deflecting β -particles in a magnetic field. A comparison of the γ -rays of Ra B, Ra C, Ra D, Th B, Th C, Pa, RdAc and Ac X, shows that (1) if they accompany β -ray emission variations in the radiated energy as great as 1 to 50 exist, whereas if the γ -rays accompany the emission of α particles the radiated energies are all approx. the same; (2) of the elements of a series emitting α -particles the one of longest half-period emits the γ -ray of greatest energy, and of the elements of a series emitting β -particles the one of shortest half period emits the γ -ray of greatest energy.

C. C. KIESS

Note on thermionic emission. LEWIS TONKS. General Elec. Co., Schenectady N. Y. *Phys. Rev.* 32, 284-6 (1928).—Electron emission expts. can throw light on the surface heat of charging only if the density of electrons in equil. with an emitting surface is the same whether evapn. occurs with const. surface charge or with surface charge equal (and opposite in sign) to evapn. charge. This equality is proved thermodynamically in the present note.

BERNARD LEWIS

The critical potentials of metallic vapors: I. Copper. H. B. WAHLIN. Univ. of Wisconsin, Madison, Wis. *Phys. Rev.* 32, 277-83 (1928), cf. C. A. 22, 533. By using a method for detg. the crit. potentials of metallic vapors in which the vapor is produced in the neighborhood of a gauze by vaporization of the gauze, it has been found possible to det. a no. of crit. potentials in Cu vapor in the region 0 - 20 v. The values found in the region 0 - 11 v. can be identified from the spectroscopically known energy levels. The interpretation of those above 11 v. is incomplete. Some of them agree with certain soft x-ray levels, and some with second ionization potentials. Whether the remaining levels correspond to spark terms or not remains to be seen.

BERNARD LEWIS

Oscillations in ionized gases. IRVING LANGMUIR. Gen. Elec. Co. *Proc. Natl. Acad. Sci.* 14, 627-37 (1928).—In strongly ionized gases at low pressure, e. g., in the Hg arc, the free electrons have a Maxwellian velocity distribution corresponding to temps. that may range from 5000-60,000, although the mean free path of the electrons may be so great that ordinary collisions cannot bring about such a velocity distribution.

Electrons accelerated from a hot cathode, which originally form a beam of cathode rays with uniform translational motion, rapidly acquire a random or temp. motion which must result from impulses delivered to the electrons in random directions. Such scattering might be caused by elec. oscillations of very high frequency and of short wave length. Oscillations with amplitude less than 0.2 v. and frequencies up to 1.2×10^9 have been observed. These oscillations are discussed from a math. and phys. viewpoint.

MARIE FARNSWORTH

Reflection and refraction of electrons by a crystal of nickel. C. J. DAVISSON AND L. H. GERMER. *Bell Tel. Labs. Proc. Natl. Acad. Sci.* 14, 630-27(1928); cf. *C. A.* 22, 4354.—If a homogeneous beam of electrons is directed against a 111-face of a Ni crystal at various angles of incidence, in which observations are made on the intensity of scattering in the plane of incidence as a function of bombarding potential and direction, it is found that the incident beam of electrons is regularly but selectively reflected from the crystal face. At a given angle of incidence the reflected beam is observed whenever the speed of the incident electrons is comprised within any of certain ranges, and within each of these ranges the intensity of the beam is characterized by a sharply defined max. The phenomenon is interpreted as a wave-mechanics analog of the regular selective reflection of monochromatic x-rays from a crystal face. Contrary to the results found for x-rays, the intensity of the reflected beam is not a max. when the wave length of the incident beam satisfies the Bragg formula; and the wave length of the beam of the scattered electrons as calcd. from the de Broglie formula is never the same (except in a special case) as that of the corresponding beam of x-rays. Reasons for these discrepancies are discussed.

MARIE FARNSWORTH

The velocity distribution of photoelectrons produced by soft x-rays. E. RUDBERG. King's Coll., London. *Proc. Roy. Soc. (London)* A 120, 385-422(1928).—A special method of magnetic analysis was used to det. the distribution of velocity among the photoelectrons produced in solid conductors by soft x-rays. This depended on the application of a variable magnetic field to prevent the electrons of low velocity from reaching a cylindrical electrode. Data are given for the electron emission from Ag, Cu, Al, C and a transparent Ag film deposited on quartz. In all cases the emission consisted of 1 group of electrons with energies corresponding to a few v., and a much smaller group having energies chiefly in the region 200-280 v. The first group is reduced by about 50% by baking the targets at 400°. The second group is not appreciably affected by this treatment. Unlike the other metals, Al did not show any reduction of the first group on heating. It is suggested that the second group of photoelectrons, which has about the same magnitude for all the metals except Al, consists of fast primary electrons produced directly by the incident radiation and that the group of slow-moving electrons is the secondary emission resulting from the presence of rapidly moving electrons in the target. The energy distribution among the fast electrons is satisfactorily accounted for by assuming an incident radiation consisting of the C K α line. The distribution of energy among electrons of the first group compares well with the data of other investigators for the secondary emission produced by electrons of corresponding energy. The energy distribution in the secondary emission is to some extent detd. by energy losses in the target before they escape. Preliminary measurements indicate an absorption coeff. of 3×10^5 /cm. for the radiation used in this work.

A. W. K.

The dielectric constant of air at radio frequencies. A. B. BRYAN AND I. C. SANDERS. The Rice Inst. *Phys. Rev.* 32, 302-10(1928).—A radio-frequency method has been used to measure the dielec. const. K of dry air free from CO₂, the value obtained being 1.0005893 for standard conditions of temp. and pressure. The probable error due to accidental variations is 0.34%. The method is a modification of the usual heterodyne beat arrangement. Capacity changes produced when the pressure in the test condenser is changed are compensated by a suitable condenser in parallel. The beat note frequency is compared with that of a fork by means of Lissajou's figures. The test condenser is made of invar to avoid temp. effects. Short connecting wires are used to minimize lead-inductance effects. A few preliminary measurements made with a large d. c. voltage across the condenser indicate no change in the dielec. const. of air H₂ or NH₃. There is some indication that a discharge through the gas decreases its dielec. const. but the effect is probably spurious.

BERNARD LEWIS

Association in liquid dielectrics. J. ROLINSKI. *Techn. Hochschule Warsau Physik. Z.* 29, 658-67(1928).—The elec. polarization of binary mixts. of dipole-free liquids (C₂H₆, CS₂ and CCl₄) is detd.; the independence of the mol. polarization on the concn. and the validity of the additivity law for the vol. polarization is established. A binary mixt. of a dipole substance (ethyl ether, chlorobenzene and quinoline) with a dipole-free substance (benzene) is studied and it is shown that the mol. polarization

of these dipole substances are not const. but decrease with rising concn; this indicates assocn. of the mols. On the basis of the fact that in the substances being studied, the dipole moment of 2 assocd. mols. vanishes, the assocn. degree, i. e., the proportion of the assocd. mols. to the total go. is calcd. and it is found that it increases with increasing concn. and at equal concns. it is larger, the stronger the dipole moment of the assocd. liquid. The additivity law in the binary mixts. of the above dipole liquids is not fulfilled for vol. polarization and the deviation is explained by assocn. M. F.

Further Röntgen spectroscopy measurements in the L- and M-Series of rhenium. H. BRÜHSE. *Z. Physik* 50, 762-8(1928); cf. *C. A.* 22, 1276.—The weaker lines of the L-series of Re, the L-absorption bands and the strongest lines of the M-series are measured and the corresponding term values are calcd. The detn. of the wave lengths of weaker lines forms an extension of the earlier work on the L-series of Re (cf. *C. A.* 22, 1276). The wave lengths of 25 L-series lines ranging from 991.0 to 1627.3 X. U. are tabulated; the L-absorption limits are measured at 1173.8, 1034.0, and 987.1 X. U., and 4 M-series lines are measured at 6708, 6692, 6491 and 5875 X. U. W. F. M.

Theory of the double x-ray spectrometer. M. M. SCHWARZSCHILD. Columbia Univ. *Phys. Rev.* 32, 162-71(1928).—The geometric factors in the construction and use of the double x-ray spectrometer are examd. in detail. The resolution of the instrument is not affected by the width of the slits but the height of the slits must be limited to preserve resolution. A formula is given for the limiting value of the ratio of the av. height of effective slits to the distance between effective slits for any particular width of observed line, in order that the width observed be the result principally of the physical factors. The phys. factors, namely, crystal imperfection, line width, diffuseness of absorption limits, are also discussed and formulas are derived by means of which the exptl. curves found with the instrument may be interpreted physically. B. L.

Further x-ray investigation of long-chain compounds (*n*-hydrocarbon). ALEX MÜLLER. *Proc. Roy. Soc. (London)* A 120, 437-59(1928).—The present investigation was made with a single crystal of the natural hydrocarbon $C_{29}H_{60}$. This material was carefully purified and its compn. checked not only by analysis but also by the comparison of its powder x-ray diagram with similar diagrams of the synthetic products $C_{30}H_{62}$ and $C_{31}H_{64}$. The natural product by this method was clearly indicated as C_{29} . The minute crystal was attached to a thin glass fiber and placed in the goniometer of an x-ray spectrograph so that complete rotation and oscillation photographs could be taken with copper radiation. The *d*, determined by the flotation method, was 0.95. The chief interest of the investigation was in the development of the appropriate geometrical structure factor for long-chain compounds of which this is a typical example. The application of this method made it possible to fix the structure quite definitely and the following numerical data were obtained: The crystal belongs to the orthorhombic space group Q_{16}^H . The unit cell has the dimensions $a = 7.45$ A. U., $b = 4.97$ A. U., $c = 77.2$ A. U. (error approx. $\frac{1}{2}\%$). There are four mols. to the unit cell. The cross-section area occupied by one mol. is 18.5×10^{-16} square cm. The distance between two consecutive scattering centers on either of the two lines of C atoms in the mol. is 2.537 A. U. (error approx. $\frac{1}{2}\%$). The distance between two consecutive diffracting centers in the chain is between 2.0 and 1.8 A. U. The distance between the two rows of C atoms in the mol. is between 1.6 and 1.2 A. U. The zigzag angle of the carbon chain is between 76° and 92° . The angle between the plane of the two rows and the symmetry plane in the crystal is between 23° and 39° . The gap between the ends of two consecutive mols. in the crystal, measured along the C axis, is 3.09 A. U. The distance of nearest approach between two diffracting centers on two neighboring mols. side by side is between 3.6 and 3.9 A. U. The distance of nearest approach between two diffracting centers on neighboring mols. end to end is about 4.0 A. U.

A. W. KENNEY

X-ray diffraction in liquids: a comparison of isomers of normal heptane and of certain carbon chains. G. W. STEWART. Univ. of Iowa. *Phys. Rev.* 32, 153-61(1928).—With the K_α doublet of Mo, diffraction ionization curves are reported on synthetic decane, 2,2,4-trimethylpentane, 2-methyl-2-hexylene and the following 8 isomers of *N* heptane: 2,2,3-trimethylbutane, 3,3-, 2,3-, 2,2- and 2,4-dimethylpentane, 3-ethylpentane, 3-methylhexane and 2-methylhexane. The expts. are a continuation of former work (cf. *C. A.* 21, 3549; 22, 1098 and Stewart and Skinner, *C. A.* 22, 1098). The diffraction peak of synthetic decane occurs at precisely the same angle as that of the other *N* paraffins contg. from 5 to 15 C atoms so that the diam. of the *N* paraffin chain throughout this range, as computed by Bragg's diffraction law, is 4.04 A. U. The experience with *N* decane was a repetition of that with *N* pentane previously reported. The length of the chain is in agreement with the formula, $L = (1.24 n +$

2.70) $\times 10^{-8}$ cm. if n is the no. of C atoms, and if the mols. may be regarded as longitudinally parallel and in square array in the plane normal to their lengths. The agreement is within less than 1%. With the exception of 2-methylhexane wherein 2 diams. are found, and of 3-ethylpentane which is a sym. branched structure, all the other heptane isomers, 6 in no., have diams. that are 1.04 A. U. larger than the N paraffins. A consideration of this fact and of the alterations in density not in agreement with the formula just cited brings the conclusion that the mol. chains of the isomers are distorted either by bending or by another type of atom sepn. A tentative conclusion is that the attachment of 2 CH_3 groups to the same atom may or may not increase the diam. by the same amt., this depending upon whether a third CH_3 branch is attached to an adjacent atom or to the next but one. The attachment of a CH_3 group on the next to end C atom seems, in the case of 2-methylhexane and 2-methyl-2-hexene, to produce 2 sym. branches of one CH_3 group each. Both this and the preceding conclusion are highly tentative but suggest the possibility of learning more of the nature of the chain by more extended expts. on isomers of N paraffins. The foregoing expts. contribute to our knowledge of mol. structure and to the evidence for the cybotactic state as one of importance in fundamental phenomena in liquids. B. L.

Methods of x-ray analysis. C. GOTTFRIED. *Glastech. Ber.* 6, 177-83(1928).—A summary of the methods used in x-ray crystal analysis with a brief description of the theory used to interpret the exptl. results. The application of x-ray analysis to glass technology is touched upon and some of the results obtained are mentioned, viz., the devitrification of window glass with the formation of tridymite and wollastonite; the devitrification of Ce glass with the formation of crystals of CeO_2 ; the presence of fine crystals of Pb when a Pb glass is strongly heated; and the presence of cryst. Cu in copper ruby. E. VALDEN

The intensities of Röntgen spectrum lines, especially of the K-series of aluminum as dependent on the voltage of the tube. EGON LORENZ. *Z. Physik* 51, 71-94(1928).—The effect of very high exciting voltages on the intensities of x-rays was measured, first qualitatively for W, and then quantitatively for Al. The stray rays emitted by a W anticathode are attributed to excitation by secondary electrons coming from the focus of the primary electron stream. The difference between the voltage corresponding to the stray rays of shortest wave length and that of the shortest ray directly excited by the primary electrons determines the x-ray levels from which the secondary electrons are ejected. When the voltage applied to the tube becomes 40 times that required to excite an electron in a particular level the liberation of secondary by primary electrons becomes nil; i. e., the intensity of the corresponding series lines becomes zero. Quant. results of the same character, derived from expts. on Al in which thick Al and very thin foil were used for anodes, show that the intensities of the K-series increase as the square of the tube voltage until a voltage twice that of the excitation potential is reached. Thence the increase is more gradual, reaching a max. at a voltage 11 times the excitation potential. At higher voltages there is a decline in intensity, until at 40 times the excitation potential (for the foil) the intensities are zero. C. C. KRISS

Intensities of K-series x-rays from thin targets. D. L. WEBSTER, H. CLARK, R. M. YEATMAN AND W. W. HANSEN. *Proc. Natl. Acad. Sci.* 14, 679-86(1928).—The intensities of the Ag K_α lines were measured as a function of the voltage, the Ag targets being films deposited on Be and so thin (280 A. U. thick and less) that there was no appreciable retardation of the cathode rays. The results, which give the relative probability of direct K-electron ionization as a function of the energy of the cathode rays, are only in qual. agreement with the theories of Davis, of Rosseland, and of Thomas. An empirical equation is given which satisfies the observed data. C. C. KRISS

The spark spectra of selenium and tellurium. LÉON AND EUGÈNE BLOCH. *Compt. rend.* 187, 562-4(1928); cf. *C. A.* 22, 543.—Lists of wave lengths, comprised between 3400 and 2200 A. U., are presented, which belong to the following spectra: Se IV, Te II, Te III, and Te IV. The behavior of the lines in highly condensed spark discharges was the method employed for assigning them to various ions of Se and Te. C. C. KRISS

The presence of predicted iron lines in the solar spectrum and the terms in the arc spectrum of iron. CHARLOTTE E. MOORE AND HENRY N. RUSSELL. *Astrophys. J.* 68, 151-64(1928).—A new table of terms is presented for the Fe arc spectrum which includes all known to date. All the possible term combinations have been calcd. with the result that wave lengths of lines which should occur but have not yet been observed in lab. sources are now available. Of these, 289 have been identified among the solar lines of hitherto unknown origin. A table lists the new lines together with their term com-

binations and solar identifications. A prolonged exposure to the Fe arc has brought out a no. of these previously unobserved lines. C. C. KIESS

The influence of various substituents on the color and absorption spectra of indigo, thioindigo and indirubin. J. FORMANEK. *Z. angew. Chem.* 41, 1133-41(1928).—See C. A. 22, 3583. E. H.

The K-Röntgen absorption spectrum of potassium in various compounds. ORRO STELLING. *Z. Physik* 50, 626-9(1928).—Since it is of theoretical interest to know the the K-absorption spectrum of a positive ion in different compds., the K-limit of the free element K and of 27 salts of K is accurately measured. The wave length for the element is 3431.0 X. U., but for compds. contg. K it is 3.1 to 5.5 X. U. smaller. W. F. MEGGERS

Measurements of the M-series in the Röntgen spectra of the elements from uranium to gadolinium. ERNST LINDBERG. *Z. Physik* 50, 82-96(1928).—A careful survey has been made of the M-series of the elements from U(92) to Gd(66) including Re(75) and Hf(72). A Siegbahn precision vacuum spectrometer was used in the work, and the results cover the wave-length interval from 2.5 to 11.5 A. U. The wave-length measurements for each element are listed in comprehensive tables, as are also the values of V/R and $\sqrt{V/R}$ derived from them. C. C. KIESS

Investigation of the band spectrum of mercury hydride. E. HULTHÉN. *Z. Physik* 50, 347-62(1928).—New bands have been observed in the spectrum of HgH , in particular one at 4902 A. U., which corresponds to the long wave convergence point conditioned by the dissociation of the mol. This band and also the ones at 3500 A. U., and 3274 A. U. of the system $^2P - ^2S$ have been analyzed on the basis of the new wave-length measurements. New bands, degraded toward the red, in the region 3100 to 2900 A. U., have been analyzed and assigned to the system $^2S - ^2S$. The term analysis of these systems is in all points in harmony with Hund's theory (C. A. 21, 1226, 1930, 3310) including the fine structure relationship. C. C. KIESS

Interpretation of band spectra. II. R. DE L. KRONIG. *Z. Physik* 50, 347-62(1928).—A theoretical investigation of the diatomic mol. on the basis of the wave mechanics (cf. C. A. 22, 1278). C. C. KIESS

The band spectrum of beryllium oxide. ERNST BENGTSSON. *Arkiv Mat. Astron. Fysik* 20A, no. 28, 1-18 pp.(1928).—Analysis of the 2 groups of bands of BeO at 4709 A. U. and 4427 A. U. shows that the lines belong to either simple P or R branches. The formula derived for the null lines is $\nu_0 = 21196.9 + 1363.0 n' - 8.0 n'^2 - 1417 n'' + 10.15 n''^2$, in which n' and n'' are resp. the quantum nos. of the nuclear vibrations in the initial and final states. From the rotational terms determined empirically are derived values for the initial and final moments of inertia of the mol. and also for the separ. of the at. nuclei. For the dissoci. energy a value of 6.1 v. or 140 cal. was found. In the ultra-violet a group of bands was measured of which the wave nos. are given by $\nu = 31890 + 1006 n' - 10 n'^2 - 1126 n'' + 10 n''^2$. C. C. KIESS

The oscillation and rotation spectrum of a molecule of the type of methane. W. ELERT. *Z. Physik* 51, 6-33(1928).—Hund has given the theoretical term scheme for mols. with more than 2 nuclei (C. A. 21, 3310). His method is here extended to mols. of the type of CH_4 but limited to the vibration-rotation spectrum. On the assumption that the equil. position of the nuclei is a regular tetrahedron with the 4 similar nuclei at the vertices and the fifth occupying the center, the symmetry relations of the vibration and rotation characteristic functions are derived, and the term scheme is worked out. The results thus obtained are used in calcg. the sp. heats of methane. C. C. K.

Interpretation of the atmospheric oxygen bands; electronic levels of the oxygen molecule. R. S. MULLIKEN. *Nature* 122, 505(1928). The electron configuration which gives rise to the normal state, 3S , of the mol. O_2 also gives rise to the metastable states 1D and 1S , the latter lying 1.62 v. above the normal 3S . The atm. bands of O_2 which appear in the red end of the solar spectrum are attributed to the transition $^3S \rightarrow ^1S$, the initial 3S being the state which combines with the normal 3S to give the Schumann-Runge bands in the ultra-violet. C. C. KIESS

The wide bands of continuous absorption in the halogens. P. BOVIS. *Ann. phys.* 10, 232-344(1928).—By the standard methods of spectrophotometry the absorption spectra of extremely thin lamina of Br and I are studied in the visible and ultra-violet. The absorption spectra of certain salt solns. serving as photometric standards are first investigated. These include 0.1 N solns. of CuSO_4 , CuCl_2 , $\text{Cu}(\text{C}_2\text{H}_3\text{O}_2)_2$, CoSO_4 , CoCl_2 , mixt. of CuSO_4 and CoCl_2 , NiSO_4 , NiCl_2 and K_2CrO_4 . The stability of these solns. has been tested during 4 years and their absorption spectra are found to be practically invariable. The violet and ultra-violet absorption of liquid Br is investigated between 5° and the b. p. of Br at normal pressure. By comparing the results with

liquid Br and with gaseous Br it is seen that in the 2 different states Br possesses a violet band in common; the max. absorption occurs for $\lambda 0.421 \mu$. But the max. optical density referred to the same mass of Br traversed by the light is 2 times greater for the liquid than for the gas. While the abrupt side of the absorption band is toward longer wave lengths according to theory the absorption bands of the halogens actually face in the opposite direction. The effect of temp. on the opacity of liquid Br is the same as if its coeff. of expansion were 70 times greater than it really is. The absorption of dil. solns. of Br in water, CHCl_3 , CCl_4 , CS_2 and EtOH is also observed. Besides the violet band of Br which is more or less displaced and widened a strong narrow band is measured in the ultra-violet near 0.260μ . The absorption spectrum of solid I in layers about 0.5μ thick was measured; a wide band with max. intensity at 0.255μ appears to correspond to the region of continuous absorption reported for I vapor in the region 0.206μ . The absorbing properties of solid I are complicated by phenomena of pleochroism, of which a brief study was also made.

W. F. MEGGERS

Spectra of mercury at atmospheric pressure. W. H. CREW AND L. H. DAWSON. *J. Optical Soc. Am.* 17, 261-70 (1928).—Light from a Hg arc in quartz, operating at atm. pressure, and excited by various elec. means was photographed through a quartz spectrograph. With very high currents through the arc some 13 lines were found to be self-reversed, 2 of which are spark lines. The reversal of one of these ($\lambda 1942$) supports the view of Carroll, Turner and Compton that it is a member of the first doublet of the principal series of Hg^+ . Lines of the diffuse series of Hg appear to be the most readily reversed. With relatively low currents through the arc the continuous spectrum appears in 4 discrete bands, 3 of which have intensity maxima lying close to the 3 spectral series limits: $\lambda 4580$; $\lambda 3320$; $\lambda 2240$. A modification of Bohr's theory, which attributes bands of continuous radiation to the recombination of electrons with at. or mol. ions, agrees very well with the observed facts.

W. F. MEGGERS

Wave lengths and Zeeman effects in the yttrium spectra. WM. F. MEGGERS. *Bur. Standards J. Research* 1, 319-41 (1928).—The wave lengths corresponding to approx. 1000 lines photographed in the arc and spark spectra of Yt were measured relative to secondary standards in the Fe spectrum. The values extend from 2127.99 Å. U. in the ultra-violet to 9494.81 Å. U. in the infra-red. Comparison of relative intensities and other characteristics of lines in the different sources permitted a sharp discrimination between 4 classes of lines; about 500 are ascribed to neutral atoms (constituting the Yt I spectrum), 240 originate with singly ionized atoms (Yt II spectrum), 10 belong to doubly ionized atoms (Yt III spectrum), and most of the remainder describe the band spectrum characteristic of mol. compds., presumably Yt oxide. Measurements of Zeeman effects for 220 Yt lines ranging in wave length from 3173 Å. U. to 6896 Å. U. are included.

W. F. MEGGERS

Supplements to the spectra of neon, argon and krypton. W. GREMMER. *Z. Physik* 50, 716-24 (1928).—A 4-m. concave grating was used to photograph the spectra of Geissler tubes contg. Ne, Ar, or Kr. Exposures of 36 to 60 hrs. revealed some new red and infra-red lines which with Ne and Ar are in large part explained as members of known *sp*-, *ps*- or *pd*-series. The Kr spectrum shows similarity in structure with the Ne and Ar spectra; 4 *s*-terms are established from their sepns. which appear as const. differences between the wave nos. of Kr lines; the sepns. are 655.0, 4275.1 and 944.9 cm^{-1} .

W. F. MEGGERS

Isotopes of neon. T. R. HOGNESS AND H. M. KVALNESS. Univ. California. *Nature* 122, 441 (1928).—The isotope Ne^{21} has always been observed while Ne is used as a calibrating gas. The possibility of a hydride of Ne^{20} is eliminated since no ion of mass 23 was found, which would correspond with the hydride of Ne^{22} . Atm. Ne is composed of 10% of Ne^{21} , 2% of Ne^{22} and the remainder Ne^{20} . JAMES M. BELL

Anomalous dispersion of unexcited gases. III. Transformation and density of unexcited atoms in neon: statistical equilibrium in the positive beam. HANS KOPFERMANN AND RUDOLF LADENBURG. *Z. Physik* 48, 51-61 (1928); cf. *C. A.* 22, 4364.—From the values for anomalous dispersion of the yellow-red Ne lines the relative oscillator strength f_{ij} , and the transformation probability A_{ij} , have been calc. for the corresponding lower state j . The values thus obtained are independent of current and pressure. The relative at. densities have been calc. for the S_2 , S_1 and S_0 states. The ratios $N_2:N_1:N_0$ approximate to 100:60:20 of the statistical equil. at very high temps., when the current increases (independently of pressure). From these values, the A value of all the lines has been calc. By using the f summation law the same result is obtained. Finally, the abs. values of the oscillator strengths, the transformation probabilities, the life period and the atom densities in the unexcited S state have been estd.

S. L. B. ETHERTON

Investigations on anomalous dispersion in calcium, strontium and barium vapor. V. PROKOPIEV. *Z. Physik* 50, 701-15(1928).—By the app. and method (Hook method of Roschdestwensky) described elsewhere (*Z. Physik* 48, 276 (1928)), the anomalous dispersion in Ca, Sr and Ba vapor is investigated in the vicinity of the resonance lines $1^1S_0 - 2^1P_1$ and $1^1S_0 - 2^3P_1$. The ratio of the no. of dispersing centers for the first and second line decreases rapidly with increasing at. no.; for Ca it is 33,000, for Sr 1660, and for Ba, 146. The relative probability A_2 of the spontaneous transition of the intercombination line $1^1S_0 - 2^3P_1$, assuming the probability of spontaneous transition of $1^1S_0 - 2^1P_1$ as unity, satisfies the interpolation formula $A_2 = \frac{1}{2}(\Delta\nu/\delta\nu)^{1.44}$ in which $\Delta\nu$ and $\delta\nu$ signify the term differences $2^3P_1 - 2^3P_0$ and $1^1S_0 -$ center of gravity of $2^3P_{0,1,2}$ in cm^{-1} . The relative probabilities for Mg and Zn are calcd. from this relation. W. F. MEGGERS

Note on the extinction of the D-lines in flames by addition of chlorine. J. FRANCK AND G. E. GIBSON. *Z. Physik* 50, 691(1928).—The extinction of the D-lines of Na in a flame when Cl is added may be explained either by the transformation of free Na atoms into NaCl, or by the return of excited Na atoms to the normal state through collisions of the second kind with Cl. Comparison of the disappearance of the D-lines in absorption with their extinction in emission indicates that the extinction of the D-lines is due to the disappearance of free Na atoms. W. F. MEGGERS

The carrier of the Fulcher spectrum of hydrogen. E. HIEDEMANN. *Z. Physik* 50, 618-25(1928).—It is well known that the portion of the "many-lined" spectrum lying between H_α and H_β , the so-called Fulcher bands, react differently to variations in excitation conditions than the remainder of spectrum. A detailed discussion of all the observational material leads to the conclusion that the Fulcher bands are emitted from a lower excitation level of the H_2 mol. than the remaining lines; and that they do not belong to the H_2 mol. as others have stated. W. F. MEGGERS

Favoring the appearance of the Balmer lines by the addition of argon. E. HIEDEMANN. *Z. Physik* 50, 609-17(1928).—Observing the discharge in a tube contg. pure H at 0.5 mm. Hg pressure and operated by high-frequency oscillations showed the first 3 Balmer lines and the "many-lined" spectrum with about equal intensity, the Fulcher bands appearing especially strong. Addn. of A to the H did not weaken the Balmer spectrum appreciably but the many-lined spectrum was completely extinguished, the Fulcher bands being the last to disappear. The action of A on the excitation processes is thought to be the following: with increasing addn. of A lower excitation stages are preferred and the short-wave portion of the many-lined spectrum therefore vanishes before the Fulcher bands. The relatively strong Balmer spectrum is due to the relatively long life and strong excitation of the H atoms formed, and the frequency of their formation is increased by collisions of the second kind which simultaneously depress the many-lined spectrum. W. F. MEGGERS

The absorption spectrum of cesium. IRENE MAUD MATHEWS. *Proc. Roy. Soc. (London)* A 120, 650-4(1928).—The light from a C arc after passing through a steel tube 3 ft. 6 in. long contg. Cs vapor was photographed with a concave grating of 10 feet radius; 32 members of the principal series of Cs were recorded as absorption lines. The doublets could not be resolved beyond the 8th. An effort was made to measure the wave lengths to an accuracy of about 0.02 Å. U., thus improving on the earlier measurements by Bevan (*C. A.* 7, 300) whose estd. error for most lines was 0.2 Å. W. F. M.

The first spark spectrum of krypton. P. K. KICHLU. *Proc. Roy. Soc. (London)* A 120, 643-9(1928).—Analysis of the published data on the spark spectra of Kr has revealed 42 levels in the spectrum of Kr^+ . Combinations of these levels account for about 160 spectral lines. The normal state of the Kr^+ atom is represented by a 3P term with sepn. of 5371 cm^{-1} . A Rydberg sequence of 3P terms gives the limit as 214,000, which corresponds to an ionization potential of 26.4 v. This is somewhat lower than the value 28.25 measured by Dejardin, but the discrepancy is perhaps due to the fact that the spectroscopic value is based upon an extrapolation from only the first 2 nos. of a series (cf. *C. A.* 22, 27 3837). W. F. MEGGERS

The quantum mechanics of the rotational distortion of multiplets in molecular spectra. E. HILL AND J. H. VAN VLECK. *Univ. of Min. Phys. Rev.* 32, 250-72 (1928).—The purpose of this paper is to give frequency and intensity formulas, for diatomic mols., applicable to the transition stage intermediate between the limiting cases (a) and (b) of Hund (*C. A.* 20, 2283; 21, 1228, 1930), namely, for very tight coupling and for very weak coupling, resp., of the spin axis. The treatment is by the new quantum mechanics, which has the advantage of yielding a simple frequency formula for the doublet case as well as exact expressions for the intensities. The last section is devoted to a consideration of " σ -type doubling." Interaction of σ -type

degeneracy is not treated here so that this section deals primarily with singlet states.

BERNARD LEWIS

An approximation method and application to some HCl bands. D. G. BOURGIN. Dept. of Math., Univ. of Illinois. *Phys. Rev.* 32, 237-49(1928).—A method of approximation applicable to some exptl. investigations is based on the inversion for $\mu(\nu)$ of the integral equation, $A(x) = \int_0^\infty (1 - e^{-\mu(\nu)x}) d\nu$. The general nature of the interdependence of $A(x)$ and $\mu(\nu)$ is described and a practicable method of characterizing certain types of $\mu(\nu)$ is developed in sufficient detail to permit of immediate application of the results. B.'s previously published data (*C. A.* 21, 2224; *Phys. Rev.* 31, 704 (1928)), for the HCl fundamental band lines has been approximated by line patterns based on the hypothesis of (a) Doppler broadening or error curve structure, (b) a Stark broadening due to the mol. force field set up by neighboring mols. and (c) an interrupted absorption process or dispersion curve type. The modifications attendant on recognizing the isotopic doubling of the lines are predictable from the calcn. for a doublet structure of infinite component sepn. The values of the line intensities and breadths and the Einstein coeffs. A_{10} and B_{10} are given for each of the assumed structures. Kinetic-theory considerations make it improbable that the Doppler effect is the primary detg. influence as regards line shape. The Lorentz line with a possible Doppler broadening superposed would seem to reproduce the exptl. data satisfactorily. The results are in keeping with an at. binding for HCl and if the at. character of the dissocn. products be accepted, it appears that the dielec.-const. measurements lead directly to the order of magnitude of the values for $\int_0^\infty \mu(\nu) d\nu$. This lends further support to Van Vleck's (*C. A.* 21, 2840) criticism of that explanation of the discrepancy between the extrapolated optical and direct measurements of the dielec. const. of HCl which depends on an appeal to the infra-red vibration bands. Some aspects of the recent work on the coupling effect in gases are examd. and Badger's (*C. A.* 21, 2844), data in the pure rotational spectrum of HCl have been studies on the assumption of a line structure derived on the basis of such "coupling" pressure broadening. The value for the line intensity found here is in slightly better agreement with the new quantum theory but the discrepancy is still excessive.

BERNARD LEWIS

The rotational structure of the blue-green bands of Na. F. W. LOOMIS AND R. W. WOOD. Alfred Loomis Lab., Tuxedo Park, N. Y. *Phys. Rev.* 32, 223-36 (1928).—Because of the theoretically impossible structure of these bands, as reported by previous observers, the authors have measured them, in absorption, in the 3rd-order spectrum of a 7-in. plane grating mounted in a 40-ft. spectrograph. Each band consists of only one P, one Q and one R branch. This accords with Mulliken's (*C. A.* 21, 206, 1057) theory that the electronic transition is $^1P - ^1S$, and with the nature of the fluorescence series. Moreover, the absorption series correlate properly with the fluorescence series. The combination relations have been applied to all measured bands and found to hold, rigorously with the exptl. error, except for the expected PQR defect, which is very small. The more important consts. of this band system are: $B_0'' = 0.15431$, $I'' = 179.5 \times 10^{-40}$ g. sq. cm., $r_0'' = 3.08 \times 10^{-8}$ cm., $\alpha'' = 0.00082$, $B_0' = 0.12541$, $I_0' = 220.9 \times 10^{-40}$ g. sq. cm., $r_0' = 3.41 \times 10^8$ cm., $\alpha' = 0.00094$. These extremely large internuclear distances correspond to weak mol. binding, which is in accord with the low heat of dissocn. reported by Loomis (*C. A.* 21, 1227-8). The locus of most intense vibrational transitions calcd. from these consts. and the previously reported vibrational consts., by the method of Franck and Condon, is a good representation of the observed distribution. There is no evidence of alternating intensities. B. L.

Extreme ultra-violet spectrum of argon excited by controlled electron impacts. K. T. COMPTON, J. C. BOYCE AND H. N. RUSSELL. Princeton Univ. *Phys. Rev.* 32, 179-85(1928).—Circulating purified A was excited by electrons from a Wehnelt cathode at various voltages up to 150 v., with gas pressures of about 0.05 mm. and currents of about 100 milli-amp. Such excitation has been shown to arise from single rather than multiple electron impacts. The spectrum was photographed with the aid of a high-vacuum spectrograph equipped with a glass grating. Eighty-eight lines, all believed to be due to A, have been found in the wave-length region 1066 to 461. Twenty of these belong to the known arc spectrum. Of the remaining 68 spark lines, 44 have not previously been reported. Previously known A III lines were not excited, so that the authors attribute the 68 spark lines to A II. Thirty-seven spark lines have been classified. Twelve of these classifications have been checked by numerous combinations involving lines in the near visible region (6883-2300). Tables of lines, terms and combinations are given. Three series of 2 members each give the series limit as 223, 363, so that the ionization potential is 27.82 ± 0.05 v. Adding the first ionization potential

15.69 v. gives 43.51 v. as the min. potential for double ionization. These refer to ionization to the 3P_2 limit, the lowest energy state of A III. A tentative term value of -33230 (relative to 3P_2) is given to the higher 1D limit. BERNARD LEWIS

The spectrum of sulfur, S II. S. B. INGRAM. Cal. Inst. of Tech. *Phys. Rev.* 32, 172-8(1928).—One hundred and eighty-three lines are classified in the spectrum of S II. 33 terms of the quartet system, 36 of the doublet system are detd. and correlated with the electron configurations by means of the Hund theory. The ionization potential of the S II ion is fixed at 23.3 ± 0.1 v. BERNARD LEWIS

The near infra-red absorption of artificial and natural sylvin. CLEMENS SCHAEFER AND CARL BORMUTH. *Z. Physik* 50, 363-5(1928).—The absorption bands at 3.23μ and 7.23μ observed by Coblenz, by Reinkober, and by the authors, in natural crystals of sylvin, are not exhibited by artificial crystals. This leads to the idea that these bands are due to an impurity in the natural crystal. It is pointed out that this impurity may be NH_4Cl , since the NH_4 group has 2 bands at exactly 3.22μ and 7.08μ . C. C. KIESS

Recombination light of the halogens. V. KONDRAT'EV AND A. LEIPUNSKII. *Z. Physik* 50, 366-71(1928).—A tube containing I vapor heated to 1000° glows with yellowish light, which consists of bands in the red, yellow and green. These bands correspond with those observed in absorption, and extend into the region covered by the absorption bands to wave lengths shorter than the convergence point; thus indicating that in the formation of the mol. I_2 , a normal and an excited atom combine with emission of energy equal to $h\nu$. Similar results were obtained with Br and Cl. C. C. KIESS

Remark on the broadening of spectrum lines by the vapor density of the absorbing atoms. ECKHART VOGT. *Z. Physik* 50, 395-6(1928).—It is pointed out that Trumpy's results for widening of lines, due to coupling as distinguished from widening due to impact by a foreign gas, range from 300 to 600 times larger than those obtained by Schütz. C. C. KIESS

The magneto-optical determination of the intensities of the first two members of the principal series of potassium and the vapor pressure of potassium. J. WEILER. *Z. Physik* 50, 436-9(1928).—From measurements of the magnetic rotation in the vicinity of absorption lines the intensities of the lines may be derived. For the first pair of the principal series of K an intensity ratio of 1.96 was thus detd.; and 1.94 for the second pair. The intensity of the first pair was detd. as 96 times that of the second. The measurements furnish as an empirical formula for the vapor pressure $\log pT = (20000/4.571T) + 9.866$. C. C. KIESS

The infra-red absorption spectra of organic sulfur compounds. II. Aryl groups containing mercaptans and sulfides. FREDERICK K. BELL. *Ber.* 61B, 1918-23(1928).—The absorption spectra of benzyl mercaptan, thiophenol, thio-*p*-cresol, dibenzyl sulfide and diphenyl sulfide were measured between 1.0μ and 12.0μ . The mercaptans are characterized by a pronounced band at 3.9μ , which is not present in the sulfides, and which serves as a test for distinguishing the 2 classes of compds. The 3.9μ band is most intense for pure aryl mercaptan and least so for pure alkyl mercaptan, its intensity for aryl-alkyl and alkyl-aryl mercaptans lying between these limits and approx. of the same magnitude. Curves illustrating the absorption of the compds. are given. C. C. KIESS

Series spectra of cadmium-like atoms. J. B. GREEN AND R. J. LANG. *Proc. Nat. Acad. Sci.* 14, 706-10(1928).—A classification of the spectrum Sb IV is given. The lowest term is $5^1S = 340,000 \text{ cm.}^{-1}$, from which an ionization potential of 42 v. is calcd. An extended classification of In III is also presented. C. C. KIESS

The band systems in the spectrum of I_2 vapor. PETER PRINGSHEIM AND B. ROSEN. *Z. Physik* 50, 1-14(1928).—A new system of ultra-violet absorption bands of I_2 vapor, which appear only when the gas is heated to 500° or more, is described. The wave nos. of these bands satisfy the formula $\nu = 41,900 + 70 n' - 90 n$, in which the no. n' refers to the position of a band within a group, and n to the position of the group within the system. In the near infra-red addnl. bands extending the systems already known have been observed. A term scheme is set up in which the new bands are linked with all the previously known band systems of I_2 . C. C. KIESS

A note on the series spectra of Sn IV and In III. K. R. RAO, A. L. NARAYAN AND A. S. RAO. *Indian J. Physics* 2, 477-83(1928).—With the aid of Lang's results (C. A. 21, 2433) it has been possible to extend the classification of Sn IV indicated by Rao (C. A. 21, 3828) and to place the lowest term 1^2S at $328,671 \text{ cm.}^{-1}$, giving 40.57 v. as the fourth ionization potential of Sn. For In III a new list of terms is given upon which the

classification is based. The lowest term $1^2S = 226,133$ gives an ionization potential of 27.91 v. C. C. KIESS

The spectrum of the hydrogen molecular ion. C. J. BRASEFIELD. *Proc. Nat. Acad. Sci.* 14, 686-89(1928).—It has previously been shown that at very low pressures the particles in the luminous canal-ray beam in H are practically entirely H_2^+ ions. The spectrum of this beam should therefore consist solely of bands emitted by H_2^+ . The wave lengths measured from plates obtained at pressures of 0.001, 0.002, 0.003, 0.004, 0.005, 0.006, 0.008 and 0.014 mm. are presented, and it is shown that some of them can be arranged into 3 Q branches degrading toward the red. The heads of the 3 bands are represented by the simple Rydberg formula $\nu = 27,743 - 4R/(m + \mu)^2$, where $m = 8, 9, 10$ and μ is approx. zero. C. C. KIESS

The absorption spectrum of nitrogen dioxide. LOUIS HARRIS. *Proc. Nat. Acad. Sci.* 14, 690-4(1928).—Expts. are described for obtaining the absorption spectra of NO_2 and $(NO_2)_2$. The single mols. absorb a large no. of bands, many with fine structure, from 6000 A. U. to 2250 A. U. The absorption of the double mols. in the gaseous state is continuous. The band of NO_2 at 2490 A. U. seems to be best for analysis of its structure, its lines being represented by the relation $Q_m = 40129.7 + 3.7 m^2$, where m varies from 0 to 12. C. C. KIESS

A new class of spectra due to secondary radiation. I. C. V. RAMAN AND K. S. KRISHNAN. *Indian J. Physics* 2, 399-419(1928).—When light from a quartz Hg lamp is scattered within a liquid a large no. of new lines, not in the incident light, are observed in the spectrum of the scattered light. Each liquid investigated (benzene, toluene, pentane, ether, MeOH, H_2O) shows a characteristic scattered spectrum, but for liquids having similar chem. groups in their compn. certain general similarities appear in the spectra. Measurements of the scattered spectrum of benzene show that for each line in the incident spectrum 7 scattered lines appear, of which 6 have wave nos. lower than that of the exciting ray and one has a higher wave no. The wave-no. differences between the exciting and scattered lines agree with certain characteristic infra-red frequencies of the mol. of the scattering liquid (C. A. 22, 4060). The phenomena are accounted for on the assumption that part of the incident energy is absorbed and part scattered by the mol. If the mol. is raised from its normal to a higher state the scattered radiation will be of lowered frequency, but if it is brought from a high energy state to a lower, the scattered radiation will be of higher frequency than the incident radiation. C. C. KIESS

The series spectra of mercury-like atoms (Tl II and Pb III). K. R. RAO, A. L. NARAYAN AND A. S. RAO. *Indian J. Physics* 2, 467-76(1928).—In the spectra of Tl II and Pb III multiplets have been found which represent the combinations $1^3D - 1^3F$, $1^3P - 1^3D$ and $1^3P - 1^3S$, and in addn. in Pb III, $2^3P - 1^3S$, $2^3P - 2^3S$ and $2^3P - 1^3D$. By assuming values for 3F the values of 1^3S , the lowest term of each spectrum, have been calcd., from which ionization potentials of 20.3 v. and 31.5 v. have been found for Tl^+ and Pb^{++} , resp. C. C. KIESS

Wave-length measurements in the arc and spark spectra of hafnium. WM. F. MEGGERS. *Bur. Standards J. Research* 1, 151-87(1928).—With the purest available samples of Hf salts the arc and spark spectra characteristic of this element were photographed with concave-grating and quartz-prism spectrographs. Wave-length measurements were made on about 2100 lines, but 600 of these were discarded as impurities, identified mainly as Cb, Zr and Ti. Nearly 1500 lines remain to describe the Hf spectra between the wave-length limits 2155.72 A. U. in the ultra-violet and 9250.27 in the infra-red. In this investigation an attempt has been made to improve upon an earlier description of these spectra, (1) by extending observations to shorter and to longer waves, (2) by increasing the precision of the wave-length measurements to ± 0.01 A. U. and (3) by making a more crit. differentiation between lines characterizing neutral atoms (Hf I) and those ascribable to ionized atoms (Hf II). Comparison of these results with the earlier measurements of Zr spectra proves that Hf was invariably present as an unrecognized impurity. The most sensitive Hf I and Hf II lines for spectrochemical identification are tentatively selected; the *rate ultime* for neutral Hf atoms is probably 4093.17 A. U. and for ionized atoms the line at 2773.37 A. U. The stronger Hf II lines are identified with faint Fraunhofer lines in the sun's spectrum. W. F. MEGGERS

The spectrum of doubly ionized magnesium. J. E. MACK AND R. A. SAWYER. *Science* 68, 306(1928).—An investigation of the condensed spark discharge in vacuum between electrodes of pure metallic Mg has revealed the levels of the most stable 3 configurations of the doubly ionized atom, isoelectronic with Ne. Relative values of the spectral terms of Mg^{++} arising from electron configurations $2p^4$, $2p^33s$ and $2p^23s^2$

are published and an ionization potential of 80 ± 2 v. is deduced for the Mg^{++} atom.

W. F. MEGGERS

The Zeeman effect for the spectrum of tantalum. J. C. McLENNAN AND A. M. I. A. W. DURNFORD. *Proc. Roy. Soc. (London)* A 120, 502-10(1928).—The Zeeman effects for 55 lines in the arc spectrum of Ta between 5584 Å. U. and 6676 Å. U. are photographed with a concave grating of 3 m. radius, the source being an arc in a magnetic field of about 21,500 gauss. Almost all of the patterns are measured as triplets but there is evidence that many of the lines are more complex.

W. F. MEGGERS

Tables of theoretical Zeeman effects. C. C. KIESS AND W. F. MEGGERS. *Bur. Standards J. Research* 1, 641-84(1928).—Landé has shown (C. A. 17, 2992) that the anomalous Zeeman effects can be expressed in terms of the normal triplet by multiplying it by a coeff. gm , in which m is the magnetic quantum no. and g is the splitting factor, a function of the quantum nos. R , K and J . In the present paper extensive tables give the theoretical Zeeman patterns based on Landé's g 's, for all term combinations of the doublet, quartet, sextet and octet even multiplicity systems; for the triplet, quintet and septet odd systems; and for the corresponding inter-systems.

C. C. KIESS

Series in the arc spectrum of chlorine. T. L. DE BRUIN AND C. C. KIESS. *Science* 68, 356-7(1928).—At the Bureau of Standards the arc spectrum of Cl has been photographed out to 9900 Å. U. in the infra-red. The new lines have been classified as members of the doublet and quartet systems. The lowest term is 2P coming from the electron configuration s^2p^4 . The other terms which have been established are 3P and 4P coming from s^2p^4 , and two sets of doublet and quartet S , P and D terms arising, respectively, from s^2p^4 and s^2p^4 .

C. C. KIESS

Supplementary note to "an interpretation of the continuous spectrum of hydrogen." YUTAKA TAKAHASHI. *Sci. Reports Tôhoku Imp. Univ. (Japan)* 17, 963-6(1928); cf. C. A. 22, 3834. (In English).—A theory is proposed to account for the continuous H spectrum which is analogous to the theory of the continuous x-ray spectrum. It is supposed that a moving free electron collides with a H mol. of which the disson. potential is 4.38 v. and the resonance potential about 11 v. corresponding to the wavelength limits 2820 Å. U. and 1100 Å. U., resp. Even though the probability of the emission of radiation by the collision is small, there should be a fairly strong continuous spectrum if the gas pressure in the discharge tube is sufficiently high. Since not all the energy of the colliding electron is imparted to the mol. and radiated as continuous spectrum the result will be to displace the spectrum to wave lengths longer than 2820 Å. U. These assumptions will account for the spectrum previously described (C. A. 22, 3834).

C. C. KIESS

The spark spectrum of argon. II. T. L. DE BRUIN. *Z. Physik* 51, 108-13(1928).—The analysis of A II previously reported (C. A. 22, 2326) is here extended by the discovery of more doublet and quartet terms made possible by new wave-length measurements. In all, 46 terms have been identified of the 59 theoretically possible. The terms and the classified lines, 180 in all, are presented in tables. The lowest term is $^2P_2 = 224,758 \text{ cm.}^{-1}$ from which an ionization potential of 27.75 v. is derived for A'.

C. C. KIESS

The Zeeman effect of the argon spark spectrum (A II). C. J. BAKKER, T. L. DE BRUIN AND P. ZEEMAN. *Z. Physik* 51, 114-35(1928).—Of the A spark lines classified by de Bruin (cf. preceding abst.) 110 have been examd. in the magnetic field. The data for these are tabulated. Although many of the patterns are in agreement with those given by Landé's theory (C. A. 17, 2992) others, for lines originating in the higher terms, exhibit deviations from it. The terms resulting from the $4s$ electron all have the theoretical g 's; of those coming from $4p$, 7 of the 8 quartet terms have normal g 's but the 5 doublet terms all have abnormal g 's. All the terms from the $5s$ electron have abnormal g 's, which is a contradiction of Preston's rule that the same Zeeman effects are exhibited by series lines resulting from term combinations of the same type.

C. C. KIESS

Further studies on light absorption in the ultra-violet by α -amino acids, polypeptides, 2,5-diketopiperazines and betaines. EMIL ANDERHILDEN AND ERNST ROSSNER. *Univ. Halle. Z. physiol. Chem.* 178, 156-63(1928); cf. C. A. 22, 3172.—Absorption curves are given for glycylglycine, *dl*-leucylglycine, glycyl-*dl*-leucine, and the 2 corresponding anhydrides, all of which lie very close together. A redetn. of the curve for the tripeptide *dl*-leucylglycylglycine gave a somewhat different result from that previously reported because of greater purity of the material. Curves are plotted also for betaine and hordenine and their HCl salts. In order to det. whether highly purified cysteine reverts spontaneously to cystine, the curve was plotted for a freshly prepd. soln. and again after the same soln. had been allowed to stand 2, 5 and 12 days, observing

elaborate precautions such as the use of quartz vessels to avoid any possible contamination. The position of the curve gradually shifted until it occupied a position intermediate between that of cystine and that of freshly dissolved cysteine.

The absorption of the mercury line 1941.5 A. U. in the positive column and the optical determination of the concentration of mercury ions. W. DE GROOT. *Z. Physik* 50, 559-69(1928).—An expt. is described which demonstrates that the Hg line 1941.5 A. U. ($1^1S - 2^3P_{1/2}$ of ^{199}Hg) is absorbed in the pos. column of a tube contg. a mixt. of Hg vapor at 2 to 4 mm. pressure with A at 0.25 mm. pressure. The source was a low-voltage arc contg. Hg in an atmp. of Ne at 17 mm. The observations consisted in measuring the absorption of 1941.5 as a function of the current used to excite the vapor in the absorption tube. From these observations the no. of Hg ions per cc. ranged from 1.6 to 3.2×10^{10} for a tube with a pos. column 80 cm. long and 2.6 cm. diam., carrying current of 100 milliamp. at 150 v. C. C. KIESS

The intensities of forbidden lines in the magnetic field. W. C. VAN GEEL. *Z. Physik* 51, 51-61(1928).—In the Zn I spectrum the forbidden lines P_0D_1 , P_1D_1 and P_0D_2 of the multiplet at 3345-3282 A. U., were excited in a magnetic field and their intensities were measured in relation to the non-forbidden lines. For P_0D_2 and P_1D_1 it was possible to measure also the intensities of their Zeeman components. The observed intensities although showing a satisfactory agreement with the theoretical values are in general somewhat larger than the calcd. values. But for the positions of the Zeeman components the observed values differ from the theoretical by amounts greater than the permissible errors of measurements. This is attributed to a perturbation of the term 3D by the term 1D , which lies very near it. C. C. KIESS

Calculation of intensities for incipient Paschen-Back effect. A. ZWANN. *Z. Physik* 51, 62-70(1928).—The matrix theory of the Zeeman effect given by Heisenberg and Jordan (*C. A.* 21, 1753) has been developed to give the intensities of the Zeeman components of the triplet PD multiplet, with special reference to the forbidden lines corresponding to the quantum jumps $\Delta j = 2$ and 3. The theory was tested on the observations made by van Geel (see preceding abs.). C. C. KIESS

The band fluorescence of mercury vapor. S. MROZOWSKI. *Z. Physik* 50, 657-90 (1928).—The excitation conditions and the structure of the Hg fluorescence bands are investigated. Changing structure which accompanies change in the density of Hg vapor is ascribed to reabsorption, but the annihilation of fluorescence at high temp. is probably due to diminished absorbing capacity of the bands. Every spectral line lying in the absorption range of Hg vapor excites the fluorescence but the structure of the spectrum depends on the method of excitation. A plausible assignment of the bands to the 2^3P states of the atom is found and from the convergence limit of the bands the heat of dissociation of the Hg mol. is detd. at about 15 kg. cal. W. F. MEGGERS

The measurement of ultra-violet quanta by fluorescence photometry. WM. T. ANDERSON, JR., AND LESTER F. BIRD. Hanovia Chem. & Mfg. Co., Newark, N. J. *Phys. Rev.* 32, 203-7(1928).—The relative intensities of monochromatic ultra-violet light detd. throughout the ultra-violet Hg spectrum by the use of a fluorescence photometer employing widely different chem. substances check the intensities of the light given by a thermopile. The agreement between the photometric and thermopile measurements indicates that both methods may be employed for measuring accurately the energy in the ultra-violet region. BERNARD LEWIS

The Raman phenomenon in xylene. C. E. BLEEKER. *Z. Physik* 50, 781-6 (1928).—Raman has shown that when liquids are irradiated with Hg light the scattered light contains, besides the original Hg lines, new lines and a continuous spectrum. The new lines are explained by assuming that the incident radiation is partly absorbed by the liquid mols. and partly scattered with modified wave length. The spectra of Hg light scattered by benzene, toluene, xylene and CCl_4 were photographed but results are published for xylene only. The wave lengths and intensities of about 30 lines were measured in the interval 4098 to 6557 A. U. From the wave no. differences between the modified lines and the exciting Hg lines the wave lengths of 16 infra-red absorption bands are calcd. These range from 3.27μ to 303.0μ ; 11 of them, viz., 3.27, 3.42, 4.00, 6.20, 6.47, 6.83, 7.25, 9.05, 9.45, 9.91, 13.65μ agree closely with absorption bands observed in xylene by Coblentz at 3.25, 3.40, 5.25, 6.20, 6.73, 6.86, 7.20, 8.9, 9.5, 9.8μ , 15.6μ . No anti-Stokes lines were found in xylene. W. F. MEGGERS

The Raman effect. PETER PRINGSHEIM AND B. ROSEN. *Z. Physik* 50, 741-55 (1928).—By illuminating with the light of a Hg lamp the spectrum of light scattered in a no. of simple org. compds. is photographed with a glass-prism spectrograph. The compds. studied are CH_2Cl_2 , CHCl_3 , CCl_4 , $\text{C}_6\text{H}_5\text{Cl}_2$, C_2Cl_4 , $\text{C}_2\text{H}_2\text{Cl}_4$, C_6H_6 , $\text{C}_6\text{H}_5\text{Cl}$ and $\text{C}_6\text{H}_5\text{CH}_3$. In each case a no. of modified lines are found in the spectral range 4100 to

5700 A. U. The estd. intensities, wave lengths and corresponding wave nos. of these lines are given and practically every one is assocd. with a particular Hg line. The new lines are explained on the assumption that the incident radiation is partly absorbed by the mols. of the liquids and partly emitted as light of increased (or decreased) wave lengths (Raman effect). The difference in wave no. of the exciting line and the modified scattered line is thought to be the wave no. of an absorption band characteristic of the liquid. Comparison with the infra-red band spectra of the above-mentioned liquids shows that every Raman line can be ascribed to a known infra-red frequency, but not every infra-red band has a Raman line assocd. with it. Anti-Stokes lines are present in considerable no. but decrease rapidly in intensity as their distance from the exciting line increases. The Raman spectrum of SiCl_4 is extremely weak and has no recognizable similarity to that of ClCl_4 . Crystal quartz gave a no. of lines but only part of them can be interpreted with known absorption bands; fused quartz on the other hand, does not give any modified lines in its scattered light. W. F. M.

The Raman effect in highly viscous liquids. S. VENKATESWARAN. *Nature* 122, 506(1928).—To det. the influence of the state of mol. aggregation on the Raman effect observations of the scattering of light from the Hg arc were made with dry glycerol at various temps. and with glycerol- H_2O mixts. of various strengths. The continuous spectrum excited by the line 4358.3 A. U., is very intense with dry glycerol but weakens when the glycerol is heated to 120° . Similarly, in the mixts. with H_2O the continuous spectrum weakens as the proportion of glycerol in the soln. is diminished. C. C. K.

Origin of the electrically excited helium. L. S. ORNSTEIN, H. C. BURGER AND W. KAPUSCINSKI. *Z. Physik* 51, 34-50(1928); cf. *C. A.* 22, 2512.—A vacuum thermocouple was used to measure the intensities of lines emitted by He sources which afforded observations for gas pressures ranging from 0.3 mm. to 40 mm. For sources with pressures of 0.01 to 0.05 mm. photographic methods were employed. The variations in the intensities with current strength and pressure, and with diam. of the capillary of the discharge tubes are shown graphically for the lines 20,582, 7281, 6678, and 5016 A. U. of the singlet system, and 10,830, 7065 and 5876 A. U. of the triplet system. From these results it is concluded that only a part of the emitted light comes from the recombination of electrons with ions; the rest is due to direct excitation or to at. impact. From a comparison of the intensities, for different pressures, of lines representing similar term combinations in the triplet and singlet systems, e. g., $2^3P - 3^1D$ with $2^1P - 3^1D$, etc., it is shown that a selection principle governing electronic impacts holds which is analogous to the selection principle governing radiation. C. C. KIESS

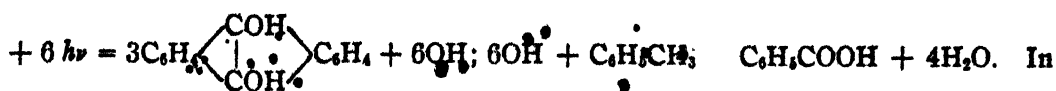
• **Chemical rays.** H. PLAUSON. Hamburg. *Chem.-Ztg.* 52, 337-40(1928).

S. L. B. ETHERTON

The mechanism of photo-sensitization and photo-inhibition from the point of view of absorption spectra. B. K. MUKERJI AND N. R. DHAR. *J. Indian Chem. Soc.* 5, 411-5(1928).—The absorption spectra have been photographed of the various constituents of systems which react or are inhibited from reacting in the presence of photocatalysts. The photo-sensitizing reactions examd. include: reduction of Fehling's soln. in the presence of $\text{UO}_2(\text{NO}_3)_2$ and of FeCl_3 ; of oxalic and chromic acids in the presence of MnSO_4 and H_2SO_4 ; CuSO_4 and $\text{K}_2\text{C}_2\text{O}_4$ in the presence of $\text{UO}_2(\text{NO}_3)_2$ and of FeCl_3 . The reactions examd. from the point of view of photo-inhibition include: formic and chromic acids in the presence of MnSO_4 ; oxidation of benzaldehyde in the presence of hydroquinone, and in the presence of phenol. A study of the spectrograms shows that the addn. of U or Fe salts to mixts. reacting photochemically causes an increase in light absorption by the entire reacting system and that in the presence of photoinhibitors no such increase in absorption occurs. C. C. KIESS

Photooxidation of anthraquinone. KARL PFEILSTICKER. *Biochem. Z.* 199, 8-11 (1928).—The exptl. evidence that the 2 carbonyl groups of anthraquinone become reduced under the action of photooxidation leads to the following considerations: The photochem. reaction is considered as the sum of cathodic and anodic phenomena, the mol. group taking up the light acting as the cathode. It may also be regarded as a reaction involving a splitting of H_2O , the H^+ attaching itself to the light-sensitive group. This fundamental reaction requires 1 electron for each H-atom in the electrolysis. According to Einstein one light quantum is needed for the work of the photochem. reaction: $\text{H}_2\text{O} + 1 h\nu \rightleftharpoons \text{H}^+ + \text{OH}^-$. In anthraquinone the light-sensitive carbonyl groups add on H atoms under the influence of quanta, generally 1 atom for 1 quantum, while the corresponding OH groups are taken up by the oxidizable substances. The

oxidation of toluene to benzoic acid can thus be formulated: $3\text{C}_6\text{H}_5 \begin{array}{c} \diagup \text{CO} \\ \diagdown \text{CO} \end{array} \text{C}_6\text{H}_5 + 6\text{H}_2\text{O}$



the presence of free O_2 the anthrahydroquinone is reconverted to anthraquinone and H_2O_2 which can oxidize some of the substances and thus reduce the no. of quanta required for the reaction if it were only photooxidation. It is pointed out that chlorophyll acts similarly to anthraquinone.

S. MORGULIS

The combination of hydrogen and oxygen by electric discharges. ROGER D. RUSK. North Central Coll., Naperville, Ill. *Phys. Rev.* 32, 287-92(1928); cf. *C. A.* 22, 3841.—*Combination of H_2 and O_2 in the Geissler discharge, low-voltage arc and electrodeless discharge.*—It was noted that combination ceased to be explosive in equiv. vols. of the 2 gases at pressures below 3 cm. Logarithmic decrease in pressure was obtained in equiv. vols. in the Geissler discharge for const. current, whereas excess O_2 increased and excess H_2 decreased the rate of combination, a similar change in rate having been noted by Lind (*C. A.* 13, 1183) in α -ray expts. *No. of H_2O mols. formed per pair of ions, as function of pressure.*—From a consideration of the no. of ions present in the Geissler discharge, it appears that the no. k , of H_2O mols. formed per pair of ions at the lower pressure is much less than unity, but that it increases with increasing pressure and may approach Lind's value at somewhat higher pressures. The pressure at which k approximates unity is such that the time between mol. collisions is of the order of magnitude of the life of an excited H atom. This is consistent with the view that combination may be due to some similar type of excitation produced by a process secondary to ionization.

BERNARD LEWIS

"After-effect" in certain photochemical reactions. II. B. K. MUKERJI AND N. R. DHAR. *J. Indian Chem. Soc.* 5, 203 8(1928).—The "after-effect" observed in many photochem. reactions is of common occurrence and is observed in FeSO_4 and I, oxalic acid and I, NaNO_2 and I, the bleaching of dicyanine, Na malonate and I, Na formate and HgCl_2 , Na lactate and I, decompn. of Fehling's soln. in presence of FeCl_3 , CuSO_4 and NH_4 oxalate in presence of FeCl_3 and in the decompn. of K mangani-oxalate. Reaction velocities were measured in hollow transparent quartz cubes kept at const. temp. The most noticeable "effect" appears in the decompn. of K mangani-oxalate. The life-period of activated mols. in photochem. reactions in solns. is considerably prolonged and the slow reversion of activated mols. into the inactive state is the main cause of the phenomenon of "after-effect."

RAYMOND H. LAMBERT

Criterion of realities (PICTET) 2. Absorption spectra of derivatives of acetophenone (TASAKI) 10.

Vessels for radioactive liquids. EUGÈNE LEVOUX. *Fr.* 637,980, Nov. 29, 1926. To prevent contact with the air, vessels for contg. and drawing off radioactive liquids have piston-like stoppers with rubber disks between Al disks of slightly smaller diam.

4—ELECTROCHEMISTRY

COLIN G. FINK

Electric normalizing and annealing. ANON. *Iron Age* 122, 818-21(1928).—The installation of 8 elec. furnaces at the Timken Roller Bearing Co. is described. These include 2 pit furnaces for annealing high-C chrome steel, each rated at 850 kw. and 50 tons capacity; pusher type furnace for normalizing, rated at 700 kw. with capacity of 150,000 lb. per day; 300 kw. double-end furnace for heat treating bar or tube stock; 2 car type furnaces for annealing miscellaneous bar stock—one is 315 kw. and the other 460 kw. Projected installation will raise the connected load from 3600, at present, to 5450 kw.

A. D. SPILLMAN

An improved spark gap generator for high-frequency furnaces. WALTER ROSENHAIN AND FRANK ADCOCK. *Electrician* 101, 395(1928).—The regulation of power input to a moderate capacity Northrup furnace is improved by making the Cu electrodes fixed, and varying the level of the Hg pool. The movable reservoir mentioned by Northrup (*C. A.* 13, 1046) has not been applied; instead, the Hg is connected by a rigid pipe to a reservoir contg. an eccentrically mounted Fe armature. Turning the armature through 90° changes the Hg level by $1/8$ in. (2.2 cm.), which is twice the required range. Higher power can be employed, and less H is consumed.

BENJAMIN MILLER

Electric heat treating. A. N. ORIS. *Elec. World* 92, 979-82(1928).—An abstract outlining a variety of elec. furnaces for heat treatment. Since the cost of heat for most products is about 1% of their value, the difference between fuel and elec. heating, if any, is small enough in most cases to have no appreciable effect on production costs. Any such difference is easily outweighed by any reduction of rejects, or retreats, greater uniformity, and the permitting of higher speed of cutting operations, lower labor cost, facility in handling rearrangements. Several types of furnaces are illustrated.

W. H. BOYNTON

Carboly (tungsten-cobalt-carbide)—a new tool material. SAMUEL L. HOYT. *Gen. Elec. Rev.* 31, 585-91(1928).—A discussion of the characteristics of certain W-carbide tool materials, which have been given the trade name of "carboly." The hardness is between that of natural sapphire and the diamond. Means of measuring its hardness and comparing with other hard materials are outlined. Carboly is featured by low thermal expansion and thermal cond., great chem. stability and retention of strength and hardness at elevated temps. It will take and retain a sharp cutting edge. A no. of unusual applications of carboly as a cutting tool are given. These include making of certain alloys of Cu-Sn-C, commutators of elec. motors consisting of alternate layers of Cu and mica, insulating materials, bakelite, etc.

W. H. B.

Electrochemical reduction of solid electrodes. III. The explanation of the behavior of chromites. KURT FISCHBECK and ERICH EINECKE. *Z. anorg. allgem. Chem.* 175, 335-40(1928); cf. *C. A.* 22, 544.—If a stick of fused synthetic cuprous chromite or ferrous chromite is used as an intermediate electrode, chromic acid is found only in the anolyte. If a stick of natural ferrous chromite is used, chromic acid is found in the catholyte also. But if Hg be substituted for the electrolyte on one side of the electrode, the mineral behaves normally, and chromic acid is formed only when the chromite is anode. It is shown that when the mineral is an intermediate electrode the chromic acid formed at the anode end electroendosmose through the porous electrode under the influence of the potential drop along it. This potential drop is relatively great because natural chromite is a poor conductor. No specific values are given, but a piece having a vol. of 3-4 cc. has a resistance of 20-40 kilo ohms. The resistance is less when the electrode is anode. The resistance decreases with c. d. The pore volume was detd. in 2 ways. The first consisted of driving out the air and measuring it. This gave a value of 0.4 cc. per 100 g. The other value, 0.15 cc. per 100 g., was obtained by weighing a sample in the air-dried condition and after baking at 180°. The sample had first been water soaked, so that the difference in weight gives the vol. The second method is held to be better, as the air held in the capillary pores of the mineral is under pressure. **IV. Reduction of several sulfides.** *Ibid* 341-2.—NiS and CoS were prepd. from the sulfates. The powd. sulfides were placed on a Pb cathode in 2% H₂SO₄ electrolyte. H₂S was evolved, and the metals went into soln. C. d. was varied from 0.5 to 20 milliamps. per sq. cm. Current efficiencies, measured by subtracting the vol. of H from the equiv. vol., decreased with time and with increasing c. d. A Zn blende of unknown origin was powdered and treated in the same way. The cathode gas contained H₂S, and notable Zn ppts. were obtained. The c. d. averaged 10 milliamps. per sq. cm.

BENJAMIN MILLER

Theoretical potentials of sodium, potassium and calcium. PAUL DROSSBACH. *Z. Elektrochem.* 34, 205-11(1928).—D. believes that more reliable values for the potentials of light metals can be obtained by calcn. from thermal data on the basis of Nernst's heat theories, than can be obtained by direct or indirect measurement. This is accomplished for K and Na from thermal data on the chlorides and for Ca from thermal data on the hydrate. The theoretical potentials obtained are as follows: $e_{Na} = -2.52 \pm 0.02$ v., $e_K = -2.73 \pm 0.02$ v., $e_{Ca} = -2.39$ v.

H. SROBARTZ

The behavior of various metals when used as electrodes for alternating current electrolysis. A. P. ROLLET. *Compt. rend.* 185, 457-460(1927).—The metals investigated were polished to a mirror surface, and only one side of the electrode was exposed to the soln. 50 cycle sine wave a. c. was used. The temp. was 20°. The critical c. d. as defined by Shipley and Goodeve (*C. A.* 21, 1597) is independent of the voltage between the electrodes. Though the c. d. be above the critical value, no gas bubbles form unless the voltage between electrodes (e_{max}) is greater than a critical value. This critical voltage is equal to the decompn. voltage in d. c. electrolysis. In general, the c. d.-voltage relation can be graphed as a straight line passing through the origin. But if the electrode area is less than 1 sq. mm. the graph is curved below the critical voltage, and the critical c. d. cannot be exceeded. The critical c. d. increases with the concn. of electrolyte to a limit value, then remains const. The concn. at which this limiting critical c. d. is reached increases with the electrode area, but the limiting

value is const. No explanation is given for these 'area' effects. Limiting critical c. ds. are given for 8 metals in KOH and for Au and Pt in H_2SO_4 . B. MILLER

Investigations on the electrodeposition of silver, with special reference to the use of sodium cyanide. EDWARD B. SANISAR. *Trans. Faraday Soc.* 24, No. 91, 45-55, Preprint(1928).—A study is made of the effect of the different bath constituents on the deposit, and the behavior of Ag-plating solns. contg. NaCN in place of KCN to det. whether the salts are interchangeable or not. A scratch hardness test is employed in which the width of the scratch is measured by a micrometer eye-piece. A loaded diamond is the scratching agent. The hardness

figure = $\frac{1}{\text{breadth of scratch in micrometer divisions}} \times 10,000$. The hardness figures are purely arbitrary, but the hardest deposit has the highest hardness figure, which is in keeping with the usual methods of expressing hardness. The test is applied to det. the change of hardness of deposited Ag with variation in: (1) carbonate content; (2) % excess of free CN; and (3) c. d. Also, to record the effect of using mixts. of NaCN and KCN. Conclusions from the exptl. work are: (1) NaCN may replace KCN and a bath consisting of $AgNO_3$ 35 g./l., NaCN 40.4 g./l., Na_2CO_3 80 g./l. and 100% excess CN gives good, satiny deposits at c. ds. of 0.302 amp./sq. dm. and upwards; (2) increasing carbonate content causes a softening in the Ag deposit; (3) increasing free CN up to 200% excess makes for softer Ag deposits, after which the type of deposit changes and becomes harder, the amt. of free CN largely detg. the hardness of the deposit; (4) variation of c. d. has little influence on the hardness, high values favoring soft deposits; (5) with pure salts good Ag deposits are obtained from baths contg. both Na and K cyanides, but the 2 cyanides should not be used together indiscriminately where there is danger of impurities in the baths. W. H. B.

Electrodeposition of aluminum. D. B. KEYES, SHERLOCK SWANN, JR., W. KLABUNDE AND S. T. SCHICKTANZ. Univ. of Illinois. *Ind. Eng. Chem.* 20, 1068-9(1928).—Al is deposited from low-melting org. compds. using an Al anode and Cu cathode. A smooth coating is obtained at 20° from diethyl aluminum iodide or ethyl aluminum diiodide, the electrodes being 1 cm. apart, c. d. 0.02 amp./sq. cm., and voltage 40, while with a mixt. of tetraethyl ammonium bromide and $AlBr_3$ at 100° with 0.2 amp./sq. cm. and 16 v., the deposit is only partially adherent. An x-ray diffraction pattern of the Al deposit shows that it is made up of small crystals in random orientation, the size being within the range of 10^{-4} - 10^{-3} cm. H. STOERTZ

Stain spotting of cast metals (after plating). W. P. BARROWS. *Metal Ind.* (N. Y.) 26, 397-8(1928).—A progress report of a study of "crystal spots" and "stain spots" which appear on cast metals after cleaning and plating, brass, bronze and malleable or gray Fe castings being employed. It is stated that stain spots may occur on either oxidized or unoxidized finishes, while crystal spots occur only on the finishes which contain S, such as the oxidized finishes or black Ni deposits. Stain spots occur on both lacquered and unlacquered, plated and unplated specimens, while crystal spots occur only on lacquered objects. The presence of humidity appears to be necessary. Conclusion: Stain spots are usually due to pores in the castings, hygroscopic compds. being occluded or formed in these pores by the action of the cleaning, plating or coloring solns. The spotting might be prevented by eliminating pores from the castings, preventing staining compds. from entering into or remaining in the pores, or by excluding moisture from access to the pores after the articles are finished. H. S.

Polishing compositions for the electroplating industry. LESLIE WRIGHT. *Metal Ind.* (London) 33, 369-72(1928).—A survey of the abrasives and greases used in making polishing compds. BENJAMIN MILLER

A modern silverplate flatware factory. F. A. WESTBROOK. *Metal Industry* 26, 123-8(1928). E. H.

Electrolysis at high current density (ozone). EML. DUHME AND HANS GERDIEN. *Wiss. Veroffentlich. Siemens-Konzern* 7, 304-6(1928).—By pumping intensely cooled H_2SO_4 at high velocity through hollow electrodes it was possible to use a c. d. of 450 amp. per sq. cm. without sparking and surface alteration at the electrodes. A 9% yield of ozone was obtained. The app. is described. B. MILLER

New apparatus for the estimation of electroendosmosis. NIKOLAUS SCHONFELDT. *Wiss. Veroffentlich. Siemens-Konzern* 7, 301-3(1928).—An app. is pictured and described. The soln. to be investigated is floated on glycerol, and the glycerol on concd. $ZnSO_4$ soln., in which are placed the Zn electrodes. The original should be consulted for details. B. MILLER

Investigation on diaphragma. II. Porosity and endosmosis. K. ILLIG AND

N. SCHONFELDT. *Wiss. Veröffentlich. Siemens-Konzern* 7, 294-300 (1928); cf. C. A. 22, 733.—The elec. charges on various diaphragms in KCl and CuSO_4 solns. have been measured with new app. The results show that if the Helmholtz formula is valid the charges on diaphragms decrease as the porosity increases. A simple method for detg. pore vol. is described. B. MILLER

Electrical precipitator for brown coal dust. ANON. *Siemens Z.* 8, 573-81 (1928).—A popular review of the development of the Siemens-Schuckert electrical dust precipitator and of its application to powdered coal driers. Various constructional features and safety devices are described. There are about 400 installations. Drier capacities are increased 10-40%. Purification efficiency is better than 98%. The energy consumption is about 0.05 kw. hr. per 1000 cu. m. BENJAMIN MILLER

Electrical dust precipitation. EDWIN H. LEWIS. *J. West Scot. Iron & Steel Inst.* 35, Part VI, 98-100 (1928).—The gases from a rotary cement kiln are treated with an Oski elec. precipitator. This differs from the Cottrell precipitator in that poorly conducting, reinforced concrete, collecting electrodes are used rather than metallic electrodes. This eliminates loss due to "back ionization." The dust is allowed to accumulate until it falls of its own weight. In addn. to the elimination of electrode-tapping, the power consumption is lowered. The gases must be cooled to about 200° to protect the concrete. This is done by water sprays, from ordinary oil burner nozzles. The power consumption is about 6 watt-hrs. per 1000 cu. ft.; the water consumption is about 1 gallon per 1000 cu. ft. The special electrically-conducting concrete is made from granulated blast-furnace slag, well-burned red ashes and cement. B. MILLER

Electrically heated pusher type furnaces used in carburizing automobile parts. I. STANLEY WISHOSKI. *Fuels and Furnaces* 6, 1395-8 (1928). E. H.

Electric heating and tempering furnaces. H. TAMELE. *Apparatebau* 40, 210-2, 221-5, 236-40, 245-8 (1928).—A review of indirect heating ovens, resistance elements, Ni-Cr heating elements, steel, rod and brass ovens, shaft furnaces, "Silit" muffles, and on metal and salts bath ovens with connections and regulators, and comparative costs of gas, oil and elec. heating. J. H. MOORE

The production of copper castings having high electrical conductivity. GEORG MASING AND CARL HAASE. *Wiss. Veröffentlich. Siemens-Konzern* 7, 322 (1928). Molten Cu absorbs gases and vapors, especially O and S. Melting under a protective layer of C or slag does not entirely prevent contamination. The purest electrolytic Cu carries traces of electrolyte, so that a certain content of O and S must always be expected in technically melted Cu. This would not be particularly troublesome, were it not for the fact that SO_2 is formed, which escapes during solidification, and causes a porous structure. Since it is practically impossible to avoid SO_2 , it is necessary to get rid of it chemically. P is the preferred reagent, since it is easily handled, its amt. can be readily controlled, does not require high temp. for reaction, and gives castings with a good surface. Its great defect is that it leads to lowered cond. In the effort to improve the cond. castings were made with extremely low P content. The cond. was not improved as much as expected. This was found to be due to the low density, since the same material had much higher cond. after drawing and annealing. Li, Be, Mg, Ca, Al, Si and boron suboxide were tried. Li gave good results, but required extreme care. Be gives good results, but is expensive. Mg, Ca and Al give poor surface. Si is not so good as P, and boron suboxide requires high and controlled temps. The best results were obtained with an alloy of Be 80%, Al 20%. This is much cheaper than pure Be, and as effective. B. MILLER

Electric conduction in hard rubber, Pyrex and fused and crystalline quartz. HERBERT H. RACE. *J. Am. Inst. Elec. Eng.* 47, 788-91 (1928). Polarization and conduction both result in the conversion of elec. energy into heat, producing local and general heating, which may be contributing causes to the progressive deterioration and final break-down of the insulation. The const. potential method described provides a means of studying the inherent voltage-current-time relations which may be masked, where alternating applied potential is employed. The object of the tests was to det. curves of elec. current flow as functions of time, through certain solid dielectrics, after const. potential has been either applied to or removed from opposite faces of a flat plate of the sample. Means of making tests and exptl. results on 4 materials are given. Expts. were conducted with an air gap and with intimate contact. Several curves are included. Peculiar reversals are noted in the charge and discharge curves for fused quartz. W. H. B.

A high-resistance liquid rheostat. ANDREAS GYEMANT. *Wiss. Veröffentlich. Siemens-Konzern* 6, 58-66 (1928). The object of the investigation was to develop a usable rheostat of the order of one million megohms. The final form was a glass tube, 2 cm

in diam., 1 m. long, filled with a soln. of picric acid in a mixt. of benzene and EtOH. With the picric acid content kept at 0.7%, the resistance varied from 0.01 megohm per cm. at 100% EtOH to 1,000,000 megohms per cm. at 100% benzene. The resistance value is permanent if the soln. is protected from air (best by sealing the tube), but small quantities of water lower the resistance. The temp. coeff. changes with the alc. content; it is 0.013 at 100% EtOH, drops to a min. of -0.0252 at 5% EtOH, then rises to 0.024 at 0% EtOH. Ohm's law applies to the highest p. d. used, 4 kv. per cm.

BENJAMIN MILLER

Theory of the electric arc. JOSEPH SLEPIAN. *J. Western Soc. Eng.* 33, 173-83 (1928).—A popular review.

B. MILLER

Materials with high initial permeability. E. GÜMLICH, W. STEINHAUS, A. KUSSMANN AND B. SCHARNOV. *Elek. Nachr. Tech.* 5, 83(1928); cf. Elmen, C. A. 17, 2856.—A slightly different heat treatment is added. The influence of small quantities of Mn is to improve working qualities, with slight sacrifice of magnetic qualities.

B. MILLER

The electrostatic forces on the filament wires of vacuum tubes. K. POHLHAUSEN. *Wiss. Veröffentlich. Siemens-Konzern* 7, 109-19(1928).—The usual single wire filament of a vacuum tube is the axis of the cylindrical anode. To get high capacity multi-wire filaments are used, the wires being parallel to the axis. With several wires residual electrostatic forces must be considered, whereas the symmetrically placed single wire is force-free. These forces are proportional to the square of the voltage; in high-voltage rectifying tubes they may reach dangerous values, and possibly destroy the filament. Formulas are derived for calcg. these forces in tubes with and without central supports, neglecting end effects. A 100 kv. rectifier, with anode radius 3.75 cm., 10 filament wires of 0.025 cm. radius on a circle of 2.25 cm. radius, is taken as an example. Each filament wire must withstand a force of 2.12 g. per cm. of length. An axially placed support of 0.25 cm. radius increases the force by 7%.

B. MILLER

Direct-current generators of very high voltage. S. R. BERGMAN. *Gen. Elec. Rev.* 31, 596-9(1928).—A novel type of high voltage d. c. generator for use in radio, telegraphy and telephony is described and illustrated. The characteristics of the machine depend upon the fact that the armature reaction is completely neutralized by the compensating winding. There is no distortion of the field flux which leads to the following advantages: (1) no extra load losses due to field distortion; (2) the field may be weakened without any penalty; (3) the machines run without sparking; and (4) the absence of field distortion leads to a stable commutating zone.

W. H. BOYNTON

Electric firing and stained glass (PEARSON) 10. Electric heating of glass annealing furnaces (TAMEL) 19. Hydrometallurgical laboratory [electrodeposition of Fe] (TRAILL) 9. Electrolytic corrosion prevention of condenser tube corrosives (PHILO) 14. Deposition of rubber (Fr. pat. 638,504) 30. Sugar crystals (Fr. pat. 638,328) 28. Wire for uninsulated electric conductors (Brit. pat. 286,264) 9. Apparatus for producing artificial silk (Brit. 286,086) 23.

Dry cell electric battery. WM. M. TURNLEY. U. S. 1,688,565, Oct. 23. Structural features.

Electric dry cell battery. CHARLES A. GILLINGHAM (to National Carbon Co.). U. S. 1,688,073, Oct. 16. Structural features.

Electric battery with supplementary electrode for indicating fall in level of the electrolyte. E. ELWESS. Brit. 285,622, Jan. 7, 1927. Various structural features are specified.

Storage battery grids. ROBERT L. ELLERY. U. S. 1,687,752, Oct. 16. Structural features.

Storage battery plates. WILLARD L. REINHARDT (to Willard Storage Battery Co.). U. S. 1,688,399, Oct. 23. Plates are treated with a soln. such as glue or "sol. cellulose" which when dry will leave a moisture-excluding coating on the plates and the plates are then heated in an inert gas, e. g., in superheated steam.

Separators for storage batteries. WILLIAM L. KANN. U. S. 1,688,336, Oct. 23. Wood of the Myristicaceae family such as Kwatta wood is used for manuf. of separators. Cf. C. A. 22, 3846.

Cover for storage batteries. COMPAGNIE GÉNÉRALE D'ÉLECTRICITÉ. Fr. 636,309, March 2, 1927.

Insulating ring for storage batteries with bipolar electrodes. COMPAGNIE GÉNÉRALE D'ÉLECTRICITÉ. Fr. 636,304, Feb. 16, 1927.

"Splash-preventing" device for electric batteries. J. STONE & Co., LTD., A. H. M. J. WARD AND S. C. DAVEY. Brit. 285,993, Nov. 25, 1926. Structural features.

Electrolytic rectifier. JAMES K. ELDERKIN (to Forest Elec. Corp.): U. S. 1,689,819, Oct. 30. Structural features.

Cell for electrodeposition of metals. ROBERT D. PIKE, GEORGE H. WEST and BENJAMIN P. LITTLE (West and Little to Pike). U. S. 1,689,597, Oct. 30. A porous diaphragm seps. anode and cathode compartments and a const. level of liquid is maintained in both compartments. Various structural features are described of an app. adapted for deposition of Fe or Zn.

Electrodeposition of metals. SIEMENS & HALSKE A.-G. Brit. 286,457, March 8, 1927. In electrodeposition of metals or alloys from a molten mass on to metallic bodies, a mass is employed having a m. p. at least 100° below that of the article on which the deposition is made. Cr, Ni, Mo, W or the like may be deposited alone or simultaneously with other metals from a molten bath composed chiefly of B compds., sulfates, bisulfates, silicates or cyanides. Cr is deposited on Fe from a mass contg. Cr oxide 15, borax 40 and Na metaphosphate 50 parts, at a temp. of about 950° employing a current of about 1000 amp. per sq. m. of cathode; a Ni compd. may be added to deposit Ni with the Cr.

Apparatus for electrodeposition of metals from circulating electrolyte solutions. I. G. FARBENIND. A.-G. Brit. 285,824, Feb. 21, 1927.

Electrolysis of water. GEORGE FRANCOIS JAUBERT. Fr. 638,346, Dec. 1, 1926. See Brit. 281,674 (C. A. 22, 3591).

Electrolytic production of metals, metalloids or compounds. JEAN LUCIEN ANDRIEUX. Fr. 638,345, Dec. 1, 1926. A fusion bath composed of boric acid or borax with the addn. of fluorides, chlorides or phosphates is used to dissolve oxides of metals or metalloids or other O compds. from which the elements or their borides, or compds. of metals and metalloids may be obtained by electrolysis.

Electrolytic aluminum. SOC. ANON. POUR L'IND. DE L'ALUMINIUM. Fr. 638,465, Jan. 21, 1927. In the production of pure Al from crude or impure Al, solid electrodes in an electrolytic bath of lower m. p. than the m. p. of the cathodes are used. The electrolyte may be halogen compds. or sulfides of Al and of alkali or alk. earth (including Mg) meta's. The electrodes may be alloys of Fe and Si contg. at least 1 atom of Si for 1 atom of Fe.

Electrolytic separation of chromium. CHROM INDUSTRIE MAX WOMMER. Fr. 636,424, June 22, 1927. Salts of feeble acids having a disson. const. less than 10^{-7} are added to the aq. chromate solns. in the electrolytic sepn. of Cr. By this means a change of anions is obtained, the result of which is that the strong acid drives out the feeble acid from its salt and thus lowers the concn. of H ions to a favorable value, so that a sepn. of Cr at relatively feeble current densities becomes possible.

Coating metals with chromium. SIEMENS & HALSKE A. G. Fr. 638,238, July 26, 1927. Large objects are coated electrolytically with Cr bit by bit, the uncoated part being protected by flowing part of the soln. used over it, or enclosing the article in an atm. of H.

Drying electrolytic iron or other corrodible materials. ALBERT PEARSON (to Western Electric Co.). U. S. 1,687,588, Oct. 16. A non aq. solvent such as denatured alc. is added to moist particles of electrolytic Fe or other corrodible materials, the mixt. is agitated and the liquid portion is then withdrawn, and these operations are repeated until the moisture originally present on the particles is replaced by the solvent; the latter is then removed by evapn.

Electrical condenser. ARTHUR J. WEISS (to Dubilier Condenser Corp.). U. S. 1,688,478, Oct. 23. Condenser bodies which may be formed of paper and metal foil are impregnated with a heated insulating material such as melted paraffin and then are immersed while heated in another material such as petrolatum which has a lower m. p. than the material used for the first impregnation, and the condenser is cooled while immersed in the second material.

Continuously loaded electric conductors. OLIVER E. BUCKLEY (to Western Electric Co.). U. S. 1,689,324, Oct. 30. The magnetic properties of a loaded conductor are improved by passing it through a magnetizing coil.

Stifling electric discharges. SIEMENS-SCHUCKERTWERKE G. M. B. H. Fr. 636,520, June 24, 1927. Elec. discharges are stifled or their production is prevented by placing in the probable path of the discharge substances which will remove so large a no. of electrons or ions that the remainder are not sufficient to carry the current. Thus, to prevent an arc in safety fuses with fusible Ag wire, halogens or their compds. may

be used, e. g., I_2O_5 becomes dissocd. at the temp. produced and combines with the Ag ions.

Heating reacting or other liquids by electric current. GUSTAV BAUM (to Niagara Electro Chemical Co.). U. S. 1,688,679, Oct. 23. An elec. conductive liquid such as HOAc and EtOH (to form EtOAc) is passed through ceramic material or other suitable elec. non-cond. structure with multiple channels and elec. current is passed through the liquid to heat it. An app. is described. U. S. 1,688,680 also relates to app. for this purpose.

Apparatus for electrically heating metal bars. ERNEST S. JEFFERIES (one-third to Ebenezer A. W. Jefferies). U. S. 1,689,876, Oct. 30.

Hammer device for removing dust from electrodes of dust precipitation plants. LODGE-COTTRELL, LTD. AND L. LODGE. Brit. 286,390, Dec. 11, 1926.

Direct-humidity recording apparatus. ERNEST B. WOOD (to Western Electric Co.). U. S. 1,689,313, Oct. 30. Various features of elec. app. are specified.

"Synthetic" pig iron. AKTIESELSKAPET NORSK STAAL (ELEKTRISK-GAS-REDUKTION) AND E. EDWIN. Brit. 286,067, Feb. 12, 1927. See Can. 283,386 (C. A. 22, 4102).

Nickel flakes. COMPAGNIE GÉNÉRALE D'ÉLECTRICITÉ. Fr. 638,013, July 5, 1927. Flakes of Ni for addn. to the active mass of elec. storage batteries are made by deposition of layers of Ni alternately with an anodic polarization of their surface, and treating with an acid, e. g., 10% H_2SO_4 which will penetrate the capillary spaces between the layers and sep. them by liberation of H. Fr. 638,014 describes a process for making the flakes in which alternate layers of Ni and Cu are deposited, the Cu being afterwards dissolved out by solns. of ferric salts contg. neither Cl nor free acid. $Fe_2(SO_4)_3$ is preferred, and air, O, persulfates or O carriers such as Ce sulfate.

Hydrogen peroxide. I. G. FARBENINDUSTRIE AKTIENGESSELLSCHAFT. Fr. 636,330, May 6, 1927. The cathodes used for the reduction of O to H_2O_2 are made of non-precious metals or Ag or their alloys having a smooth or polished surface, the conductivity of the electrolyte being assured by using acids or salts which do not attack the metals used. Examples are given of a cathode of polished leaf steel V₂A of Krupp, with an electrolyte of 1% HNO_3 , and of Ag and an electrolyte of 0.7% H_3PO_4 .

Clarifying alcohol. OVIDIO LEONORI. Fr. 636,550, June 24, 1927. Anhyd. alc. is freed from suspended substances, such as metallic carbides used for dehydrating it, by passing through it an elec. current of feeble intensity and low tension, which produces a deposition of the particles on one of the electrodes.

Open electric furnaces. SOCIÉTÉ ÉLECTRO-MÉTALLURGIQUE DE MONTRICHER. Fr. 32,778, Dec. 28, 1926. Addn. to 608,404.

Electric resistance furnace. ROLLO B. LINCOLN (to Westinghouse Elec. & Mfg. Co.). U. S. 1,687,676, Oct. 10. Structural features.

Resistor for electric furnaces. GEORGE M. LITTLE (to Westinghouse Elec. & Mfg. Co.). U. S. 1,687,677, Oct. 16. Resistors are formed of adjacent contacting plates of alternately hard and soft carbonaceous resistor material.

Electric furnace and electrode crane construction. ALBERT E. GREENE. U. S. 1,687,937, Oct. 16.

Electric air-heating furnace. WM. DOHERTY. U. S. 1,688,270, Oct. 16. Structural features.

Electric furnace for annealing metal strips by induction current. MANUEL TAMA. U. S. 1,689,309, Oct. 30.

Working electric annealing furnaces. BROWN, BOVERI & CIE. Fr. 636,414, June 22, 1927.

Steel finishing in an electric arc furnace. ALBERT E. GREENE. U. S. 1,687,936, Oct. 16. A bath of molten steel in the furnace with a covering of slag is prepd. for the finishing treatment; silica sand is then added under an electrode on top of the slag and a carbonaceous reducing agent is added on top of the sand and the mixt. is subjected to the heat of the arc until silica is reduced and the steel underneath is deoxidized and finished.

Mercury-vapor lamps. QUARELAMPEN-GES. Brit. 286,317-8, March 4, 1927. structural features

Mercury vapor lamp. HEINRICH PFERDMENGES. Fr. 638,338, July 27, 1927. In a Hg vapor lamp the irradiation chamber is formed by a U-shaped socket in the luminous bulb and has a tube extending nearly to the bottom. The liquid to be submitted to the action of the rays flows down the tube and returns in the space outside of it acting as a cooling means.

Incandescent electric lamp. RICH HENKEL and HANS WOLFF (to General Electric Co.). U. S. 1,687,496, Oct. 16. Lamps are formed with filaments such as W

and with a filling of a suitable gas such as Ar or Ne contg. also a halogen NH_4 compd., e. g., NH_4Cl , which serves to lessen the chance of short circuiting.

Gas-filled electric incandescent lamp. JAN BERGMANS and THEODORUS J. J. A. MANDERS (to General Electric Co.). U. S. 1,688,777, Oct. 23. Structural features.

Filaments for electric lamps. JACQUES ANTOINE MARIE HAWADIER. Fr. 638,349, Dec. 1, 1926. See Brit. 281,685 (C. A. 22, 3593).

5—PHOTOGRAPHY

C. E. K. MEES

Practical notes on photography. HARRY R. URQUIHART. *Pharm. J.* 120, 416-7 (1928).—Practical notes on aperture and exposure, treatment of too weak or too dense negatives, plates from films, leaf prints, microscopic objects, etc. S. WALDBROTT

Panchromatic photography. "POLYCHROME." *Pharm. J.* 120, 415 6(1928).—Definition of the term, and discussion of methods and detail of manipulation. S. W.

Formation of fine grains in developing. A. LUMIÈRE, L. LUMIÈRE AND A. SEYEWETZ. *Chimie et industrie Special No.*, 501-6(April, 1928).—Reduction in the size of the Ag grains obtained on developing seems possible only provided the original grains of the emulsion are of a definite size, below which $p\text{-C}_6\text{H}_4(\text{NH}_2)_2$ developer cannot modify the dimensions of the grains. The modification in the size of the grains by the developer depends on the nature of the emulsion used. With a rapid Lumière plate (blue label) the following results were obtained: (1) $p\text{-C}_6\text{H}_4(\text{NH}_2)_2$ developer contg. Na_2SO_3 but no alkali gives the finest grains. Developing is rather slow, but can be accelerated without increasing the size of the grains by addn. of borax; greater acceleration is obtained with a small quantity (1%) of Na_2CO_3 , but with slight increase in the size of the grains. (2) Introduction of a Ph or $\text{C}_6\text{H}_4\text{NH}_2$ group in one of the NH_2 groups of $p\text{-C}_6\text{H}_4(\text{NH}_2)_2$ does not modify the above properties; but they do not persist in mono- and dimethyl derivs., which seem to increase the size of the grains. (3) By using borax and a large excess of Na_2SO_3 instead of Na_2CO_3 in metol-hydroquinone and metoquinone developers, the size of the grains can be reduced slightly. (4) Addn. of NH_4Cl to an alk. developer, such as normal hydroquinone or genol-hydroquinone developer, appreciably reduces the size of the grains, but less than does $p\text{-C}_6\text{H}_4(\text{NH}_2)_2$, and in addn. the negative is considerably fogged. With emulsions in which the AgBr grains are appreciably finer than the blue label Lumière plates (rapid micro Lumière plates, slow Lumière plates (red label)) there is no appreciable difference in the results obtained with ordinary alk. developers and with Na_2SO_3 - $p\text{-C}_6\text{H}_4(\text{NH}_2)_2$ developers.

A. PAPINEAU-COUTURE

The sensitizing, ripening substances in gelatin. A. STEIGMANN. *Kolloid Z.* 46, 57-9(1928). By expt. and observation it has been proved that *Thiosinamin*, the halogen silver salt sensitizer, which is active through formation of Ag_2S nuclei, is not present as a natural component of the gelatin raw material. The theory of the formation of Ag_2S nuclei in photographic sensitization is not limited herewith.

L. F. MAREK

Toning of stereoscopic transparencies. OLINDO VERATTI. *Il progresso fotografico* 35, 256-66(1928).—Transparencies for toning are made on chlorobromide plates giving black tones, Ag lactate plates being suitable for ferricyanide toning. It is important to wash thoroughly and dry before toning. Dark browns and reds are obtained with U and transparency is increased by treatment with very weak thiosulfate and Na_2CO_3 , which also stabilizes the image. The U color can be modified by mordanting basic dyes on to it. Good colors are also obtained by toning with Cu, the usual Cu ferricyanide toner being employed. Basic dyes can be mordanted to this tone; the yellow tinge left by Cu is more easily eliminated than the color of the U mordant. Ferricyanide and dichromate bleaching were found unsatisfactory as a mordanting method for basic dyes. To obtain satisfactory mordanting, it is necessary that Ag should be present in addn. to the U or Cu. Single metals by themselves do not act well as mordants.

R. SANSONE

Glycerol and its substitutes [in photographic industry] (DARKE, LEWIS) 27.

Silvering photographic films. PALMIRE HENRI NICOLLE and MAURICE JEAN EDMOND CLAUDE. Fr. 638,556, Dec. 10, 1926. Films are silvered by applying a thin layer of a soln. of the Ag salt used, then reducing either by applying a reducing soln. or submitting the layer to the action of ultra-violet rays.

Photographic developers. I. G. FARBENINDUSTRIE AKTIENGESELLSCHAFT. Fr. 636,478, June 23, 1927. 4-Hydroxyethylamino-1-hydroxybenzene and 4-dihydroxyethylamino-1-hydroxybenzene are used as photographic developers.

Photographic printing layer. I. G. FARBENIND. A.-G. Brit. 286,233, Feb. 28, 1927. Paper or the like is sensitized with a salt of 1,2-naphthoquinone-4-sulfonic acid and is developed (e. g., after exposure under a tracing) with an org. compd. contg. a free amino group (such as aniline hydrochloride or 1-methyl-2,4-diaminobenzene, both of which yield red images, or 1-amino-4-hydroxybenzene, which yields a violet image). Gelatin may be used as a carrier for the sensitive material when placed on glass, paper, celluloid or other support.

Photomechanical printing surfaces. K. H. SCHWIMMER and H. PAWECK. Brit. 286,204, March 3, 1927. In processes such as described in Brit. 273,688 (C. A. 22, 1918), a print of a half-tone positive produced on a film or the like is transferred reversed, before the washing and swelling process, to a glass plate so that all the points detd. for printing are contained in a plane. White or dark patches are thus avoided.

Color photography. R. RUTH and AKTIEBOLAGET SVERIGES LITOGRAFISKA TRYCKERIER. Brit. 285,977, Nov. 23, 1926. In prep. a color-screen film with screen particles of the same optical and phys. qualities as the film base, the latter is superficially softened on one surface only as by a rapidly evapg. liquid applied by rollers and the screen powder is then spread (in a manner described) and the surface is subjected to the action of a blower or suction device to remove non-adherent particles. The film is then passed between pressure rollers of which only the roller in contact with the screen grains is heated.

Color photography. LOUIS DUFAY and COMPAGNIE D'EXPLOITATION DES PROCÉDÉS DE PHOTOGRAPHIE EN COULEURS LOUIS DUFAY. Fr. 32,845, July 24, 1926. Addn. to 619,592. The selection screen obtained by known methods is transformed, after obtaining the photographic image, into a positive synthesis screen, allowing the said screen to be seen by reflection. To make this transformation the colorimetric intensity of the constituent elements of the screen is diminished by washing or by chem. agents.

Filters for color photography. SOC. CIVILE POUR L'ETUDE DE LA PHOTOGRAPHIE ET DE LA CINEMATOGRAPHIE EN COULEURS. Brit. 286,223, Feb. 28, 1927. A color filter interposed between a condenser and film comprises juxtaposed cylindrical tubes through which are circulated solns. of colored salts. The red liquid may contain chromic acid and Co chloride, or KMnO_4 and $\text{K}_2\text{Cr}_2\text{O}_7$; the green may contain Cu nitrate and $\text{K}_2\text{Cr}_2\text{O}_7$; and the blue Cu nitrate and dil. NH_3 or Cr sulfate. A thermo-siphon circulation system may be employed.

Color filter system for color cinematography. C. ALSTRUP and V. JENSEN. Brit. 286,250, March 2, 1927. Optical and structural features.

Cinematography in natural colors. "CHROMO" FILM-GESELLSCHAFT M. B. H. Fr. 637,878, July 18, 1927. A color screen for use in projecting color-record images comprises concentric annular filter sectors sepd. by opaque sectors, one set of filters contg. one more color than the other set.

Optical and color screen system for color photography. MERRILL W. SEYMOUR (to Eastman Kodak Co.). U. S. 1,689,258, Oct. 30.

Color screen for cinematography. J. R. ROBERTSON. Brit. 286,052, Jan. 22, 1927. Screens are used comprising a vacuum chamber contg. a gas and provided with means by which an electron discharge can be passed through the gas so that it acts as a light filter. Gases giving red, blue and green colors may be employed. Various structural details are described.

Projection screen. A. M. MARTIN. Brit. 286,448, Feb. 25, 1927. Hessian cloth is stiffened and coated with a thin layer of distemper and provided with an overlying coating of metallic paint. Waterglass may be used as the stiffening agent and second layers of distemper and metallic paint may be applied.

6—INORGANIC CHEMISTRY

A. R. MIDDLETON

Some reactions in the evolution flask. SANSEI KITASHIMA. *Bull. Inst. Phys. Chem. Research (Tokyo)* 7, 832-7; English Ed. I, 76-7(1928).—K. studies the transformation of S into H_2S in the so-called "Evolution flask." S may exist in iron as sulfide or sulfate and sometimes as the free element. Expts. have been made to det. to what degree of perfection the element is converted into H_2S . Free S is not attacked

by HCl, when it is present alone, but is attacked by the same reagent in the presence of a large quantity of Fe, giving H_2S . CuS is always attacked by 4-4.5 *N* HCl at room temp. or by 0.3-0.35 *N* boiling HCl; the evolution of H_2S is accelerated by the presence of Fe. Fe-, Cd- and $MnSO_4$ are not reduced, even by boiling HCl in the presence of Fe. Thus, when S is present in the original sample as sulfate or another form not attacked by HCl in the presence of Fe, it remains in the flask as insol. residue, or goes in soln. after the sample has been treated in the evolution method. When S is present in a slowly attacked form, it remains in the residue of the evolution flask, but its quantity is so inconsiderable as to be negligible. A. L. HENNE

Investigation on chain reactions in the halogen group. RAGNAR LYDÉN. Univ. of Helsingfors. *Finska Kemistsamfundets Medd.* 37, 20-34(1928).—The reaction $2KBrO_3 + I_2 \rightleftharpoons 2KIO_3 + Br_2$ takes place directly without the addn. of catalysts, and without the formation of free acid. In the presence of KI the further reaction $2KI + Br_2 \rightleftharpoons 2KBr + I_2$ takes place. With excess KI in excess over $KBrO_3$ the quantity of free I remains unchanged; with excess $KBrO_3$, free Br is formed. The reaction also takes place with $KClO_3$, but does not go to completion. The difference is ascribed to the formation of free acid. HANS C. DUUS

The action of metals on persulfates. OSSIAN ASCHAN. *Finska Kemistsamfundets Medd.* 37, 40-4(1928).—Zinc dust has been found to react with $K_2S_2O_8$ as follows: $KOSO_3OOSO_3OK + Zn \rightarrow KOSO_3OZnOSO_3OK$. The product is cryst. and takes up 6 mols. of H_2O of crystn. The reaction is strongly exothermic. Other metals reacting in the same way are Mg, Zn, Cd, Fe (ous), Ni, and Co, and possibly Be, and Hg (ic). $(NH_4)_2S_2O_8$ reacts the same way, but $Na_2S_2O_4$ takes up the metal and crystallizes with 4 mols. of H_2O . The procedure consists in dissolving the persulfate in water and adding finely divided metal until a temp. rise is no longer noted. After filtration the soln. may be evapd. over a water bath. Expts. are under way to test the reaction with bivalent Mn, Cr, Cu, Ca, and possibly Sn and Pb. H. C. D.

Investigation on the formation of iodates from iodides. RAGNAR LYDÉN. Univ. of Helsingfors. *Finska Kemistsamfundets Medd.* 36, 126-41(1927).—Quant. studies have been made on the reactions which take place when KI is melted with $KClO_4$, $KClO_3$, and $KBrO_3$. The first gives the best yield of iodate when excess iodide is present, although there is a considerable evolution of O_2 . The yields for $KClO_4$:KI ratios ranging from 1:1 to 1:2 vary from 41.67% to 62.01% of the calcd. With $KClO_3$ the best yield, 71.94%, is obtained with a $KClO_3$:KI ratio of 1:2 while a 3:4 ratio gives 57.45% yield. An excess of $KClO_4$ reduces the thermal effect of the reaction. With $KBrO_3$ the yields range from 81.30% for a 1:2 ratio of $KBrO_3$:KI to 69.44% for a 1:1 ratio. This reaction takes place with a smaller heat change than the reaction with the chlorate and the velocity is less. HANS C. DUUS

The chemistry of ruthenium. H. GALL. Tech. Hochschule, Munich. *Z. anorg. Chem.* 41, 1070-1(1928).—A reply to F. Krauss (cf. C. A. 22, 4074). Gall maintains that the blue soln. obtained upon reducing Ru soln. is due to the presence of Ru^{II} and not Ru^I , as is claimed by some. W. C. ERAUGH

Basic carbonate of magnesium. TSUNEKICHI NISHIMURA. *Bull. Inst. Phys. Chem. Research (Tokyo)* 7, 838-72; English Ed. I, 77-80(1928).— $MgCO_3 \cdot 3H_2O$ has been exposed to the atm. for 1 year. Decompn. occurred rapidly at the start, the sample losing a max. of 6.7% CO_2 , but the loss was gradually recovered, becoming 4.3% at the end of the year. Some change in the structural nature of the solid probably occurred. $MgCO_3 \cdot 3H_2O$ was suspended in H_2O , and a rapid current of air passed through. After 15 days, the final stage was reached, the carbonate being transformed into $4MgCO_3 \cdot Mg(OH)_2 \cdot nH_2O$. The same expt. performed with $Mg(OH)_2$ as a starting material yields $3MgCO_3 \cdot Mg(OH)_2 \cdot nH_2O$. Both basic carbonates are perfectly stable in the dry state. A. L. HENNE

Preparation of neutral zinc carbonate. JANIS DAYS. *Acta univ. Latvianis* 18, 539-48(1928).—Attempts to prep. neutral and cryst. Zn carbonate under the conditions and according to the methods of Kraut and St. Claire Deville (pptn. cold of a Zn salt by bicarbonate of Na or NH_4) demonstrate that it is impossible to obtain neutral cryst. products; basic carbonates of variable compn. or a mixt. of basic carbonates and neutral carbonate are obtained instead. Length of contact of the ppt. obtained by means of an excess of alk. bicarbonate with the mother soln. has no influence on the cryst. product. NATHAN VAN PATTEN

Organic addition compounds of calcium chloride and calcium iodide. FREDERICK R. GREENBAUM. *Am. J. Pharm.* 100, 600-1(1928).—The compds. prepd. were addn. compds. with urea and thiourca or their derivs. and they combine as long as both amino groups or at least one of the amino group are not substituted. Starting out

with the well-known pharmaceutical compd., CaCl_2 -urea, called "Afenil," the following addn. compds. were prepd.: CaCl_2 -thiourea, CaCl_2 -hexamethyleneamine, CaCl_2 -thiosinamine, CaCl_2 -urethan, CaCl_2 -antipyrine, CaCl_2 -monoacetylurea (acetylafenil), CaCl_2 -acetylthiourea, and CaCl_2 -monophenylurea. From the CaI_2 compds. the following were prepd.: CaI_2 -urea, CaI_2 -thiourea, CaI_2 -hexamethyleneamine, CaI_2 -thiosinamine, CaI_2 -urethan, CaI_2 -antipyrine, CaI_2 -monoacetylurea, CaI_2 -monoacetylthiourea, and CaI_2 -monophenylurea. These addn. compds. are stable, less hygroscopic than CaCl_2 and CaI_2 ; they possess a definite cryst. shape different from the crystals of CaCl_2 and CaI_2 . They are only formed, when CaCl_2 as well as CaI_2 and the org. compds. are readily sol. in the same solvent. These compds. were prepd. for pharmaceutical purposes with the idea in mind of detoxifying the CaCl_2 and CaI_2 by the addn. of these org. bases.

W. G. GAESSLER

Complex salts of amphoteric hydroxyquinoline derivatives. EDUARD HERTEL AND HANS KLEU. Chem. Inst. Univ. Bonn. Ber. 61B, 1653-4(1928).— CuSO_4 converts 5,7-dibromo-8-hydroxyquinoline into an amorphous ppt. which is changed to a yellow cryst. Cu salt on heating. This salt and its chloro analog dissolve in halogen acids, giving rise to the following salts: $(\text{CuCl}_2):(\text{H} \cdot \text{NC}_9\text{H}_6\text{Br}_2\text{OH})_2 + 2\text{H}_2\text{O}$, light yellow, (I), $(\text{CuCl}_2):(\text{H} \cdot \text{NC}_9\text{H}_6\text{Br}_2\text{OH})_2 + 2\text{H}_2\text{O}$, orange yellow, (II), $(\text{CuBr}_4):(\text{H} \cdot \text{NC}_9\text{H}_6\text{H}_2\text{OH})_2 + 2\text{H}_2\text{O}$, reddish violet, (III), $(\text{CuBr}_4):(\text{H} \cdot \text{NC}_9\text{H}_6\text{Br}_2\text{OH})_2 + 2\text{H}_2\text{O}$, violet, (IV), $(\text{CuI}_4):(\text{H} \cdot \text{NC}_9\text{H}_6\text{Br}_2\text{OH})_2 + 2\text{H}_2\text{O}$, copper red (V). I, II, and V lose $2\text{H}_2\text{O} + 4\text{HX}$ on being heated to 90° ; II and III are more resistant to heat. All 5 salts are decompd. by H_2O .

DAVID DAVIDSON

7—ANALYTICAL CHEMISTRY

W. T. HALL

Physical methods in the chemical laboratory. VIII. Electric titration methods. ERICH THILO. Z. angew. Chem. 41, 1057-61(1928).—The theory and practice of potentiometric and conductometric titrations are described.

W. C. EBAUGH

Micro-analysis. LUIS BERMEJO Y VIDA. Univ. Centrale, Madrid. *Chimie et industrie* 20, 221-2(1928).—An investigation into the *micro-Carius method* for the detn. of Cl in org. compds. carried out on a large no. of compds. (details given in Bosch's Thesis (Madrid)) showed that: (1) The resistance of halogens to elimination from the mol. is inversely proportional to their chem. activity. (2) Increase in the no. of halogen atoms combined to the same C increases the difficulty of removing it, considerable differences existing between the different halogens in this respect. (3) Halogens are easily removed from acid radicals. (4) The above conclusions also hold for aromatic compds., but longer time and higher temps. are required. (5) The removal of halogens from a C_6H_6 ring requires a higher temp. than from side chains. (6) Compds. contg. a halogen and another group substituted in the C_6H_5 nucleus are more easily decompd. than those contg. 2 halogens in the nucleus. (7) In poly-substitution products the time and temp. required decrease with tetra and higher derivs. (8) Presence of NO_2 in the aromatic ring facilitates the removal of the halogen. The *micro-Kjeldahl N detn.* is extremely sensitive and suitable for biochem. as well as for org. chemistry investigations; the indicator was modified to increase the sensitiveness of the titration (details in F. Anadon's Thesis (Madrid)). In the *micro-detn. of C and H*, it was found that at Madrid the straight tubes usually used for the H_2O and CO_2 absorption showed considerable variations in wt. during the spring and summer, but not during the winter; no such trouble was encountered with U-tubes having slightly capillary ends. With the charge recommended by Pregl, difficulty is encountered in the combustion of products with high S contents, but by increasing the proportion of PbCrO_4 satisfactory combustion is obtained, even of CS_2 . By addn. of small quantities of Fe or Ni oxide and of $\text{K}_2\text{Cr}_2\text{O}_7$ and PbCrO_4 fluxes, satisfactory combustion of simple org. and inorg. cyanides, complex cyanides, ferrocyanides, etc., was obtained (details in Mingarro's Thesis (Madrid)). For the *micro-detn. of S* by combustion, investigation of some 20 catalyzers for the oxidation of SO_2 to SO_3 showed that none of them was satisfactory as a substitute for the Pt strips recommended by Pregl (details in Rancano's Thesis (Madrid)).

A. PAPINEAU-COUTURE

Radiometric microanalysis. V. RUDOLF EHRENBERG. *Physiol. Inst., Göttingen. Biochem. Z.* 197, 467-75(1928).—The principle of the method is pptn. of the analyzed substance in conjunction with the radioactive Thorium B which serves as an indicator. After centrifuging, the β -radiation is detd. in an aliquot portion by means of an electrometer. A known vol. of 0.001 N $\text{Pb}(\text{NO}_3)_2$ contg. Th B is treated with a Pb-pptg.

agent (0.001 N K_2CrO_4), and the Th B becomes distributed between the ppt. and fluid in the ratio of the Pb amts. in both. For the detn. of N the following procedure is followed. NH_3 is distd. off in a quartz app. and collected in a 10-cc. flask contg. 5 cc. 0.001 N inactive $Pb(NO_3)_2$. After dilg. to 10 cc. and removal of the pptd. $Pb(OH)_2$ by centrifuging, 0.5 cc. of 0.001 N $Pb(NO_3)_2$ contg. Th B and 0.5 cc. 0.001 N K_2CrO_4 are added to 1 cc. of the supernatant liquid, and after centrifuging again the radioactivity is detd. in 1.0 cc. A standardization is made with known amts. of 0.001 N NH_4Cl , and the quantity of NH_3 N thus measured. The method is also applied for detg. adsorption. Thus, 2 mg. of specially prepd. G are shaken with 2 cc. 0.001 N inactive $Pb(NO_3)_2$, and after centrifuging off the ppt. 0.5 cc. of each active Pb soln. and K_2CrO_4 are added to 1.0 cc. In expts. with 10% gelatin solns. by this method it was found that the adsorption is affected by the preliminary treatment of the gelatin so far as temp. and the duration of action are concerned. An improved type of electrometer is described. For Fe detn. the following method is recommended. Solns. of Fe of a concn. of 5 mg. per l. are pptd. in neutral soln. by a reagent made up of 10 cc. 0.1 N K_2CrO_4 to which a few drops acetic acid and a piece of Th-coated Pt plate are added. The concn. of the Fe must be kept low because of the fact that the activity curve shows no direct proportionality to the amt. of Fe except over a small range. For the detn. of K the method of Kramer and Tisdall is followed at first, but the final stages in the $KMnO_4$ titration are carried out again in accordance with the radiometric procedure. An application to the formol titration as well as to the C detn. is also described.

S. MORGULIS

Perchloric acid. General data concerning its various forms. G. FREDERICK SMITH. Univ. Ill. *Chemist-Analyst* 17, No. 4, 20-21 (1928). The fact that the 72.4% const. boiling $HClO_4$ is not dangerous to handle and is particularly suitable for many analytical operations is pointed out; a brief and incomplete bibliography of some important applications is given and methods for testing are outlined. W. T. H.

β -Methylumbelliferone as a fluorescent indicator. C. BULOW AND W. DICK. Univ. Tübingen. *Z. anal. Chem.* 75, 81 (1928). This compd. is easily prepd. from resorcinol and acetoacetic ester. In aq. acid solns. it is colorless but in alk. solns. it shows a blue fluorescence. The color change occurs at pH 6.7. The fluorescence is also shown under the light of a quartz lamp. The indicator can be used in solns. which are of themselves colored sufficiently to interfere with the use of the usual indicators with which a change of color without fluorescence takes place. W. T. H.

Two new methods of potentiometric titration. ERICH MÜLLER AND HERBERT KOGERT. Inst. Elektrochem. der Sachs. Techn. Hochschule. *Z. physik. Chem.* 136, 446-50 (1928).—The first method described is applicable to rapid work where no great accuracy is desired. If the soln. from a buret is allowed to enter the mechanically stirred soln. so that it is immediately forced upon one of the electrodes, there is established soon a condition of over-titration at this electrode while the e. m. f. of the secondary electrode, which is of the same metal, is that of an under-titrated soln. Just before the end point the e. m. f. between the 2 electrodes becomes suddenly greatly diminished. The second method is the same in principle as methods which have been used by Pinten and by Kamiński, although this fact was not known until this paper had been printed. One electrode is a wire wound around the stirrer and the other electrode is a wire at the bottom of the titration vessel. In this case, there is a max. throw of the galvanometer needle at the end point. These methods are probably inapplicable for accurate oxidimetric titrations but work well for the titration of Pb with ferrocyanide, halogenide with Ag and for the titration of acids and bases in the presence of quinhydrone. W. T. H.

Use of monometallic electrode pairs for potentiometric titrations. ERICH MÜLLER AND HERBERT KOGERT. Inst. elektrochem. und physik. Chem. Dresden. *Z. physik. Chem.* 136, 437-45 (1928). In non-reversible reactions such as the titration of Fe^{++} with dichromate or permanganate, arsenite with $KBrO_3$, I_2 with $Na_2S_2O_3$, etc., the simplest method yet described for detg. the end point electrometrically is to take 2 pieces of Pt foil of about 3 sq. cm. area, platinize one by depositing Pt upon it and heating until the deposit turns gray, and connect them by wires through a millivoltmeter (of 30 millivolts throw on either side and an internal resistance of about 3228 ohms) and a suitable resistance. The max. difference in the e. m. f. between the 2 electrodes is obtained at the end point. The end point is easier to find than when bimetallic electrodes are used as recommended by Roberts and Hostetter or by Willard and his co-workers. W. T. H.

A new reagent for potassium, ammonium, rubidium and cesium ions. T. GASPAR Y ARNAL. *Anales soc. españ. fis. quim.* 26, 184 5 (1928).—A soln. contg. equiv. quanti

ties of Na_2CrO_4 and $\text{UO}_2(\text{NO}_3)_2$ is very sensitive to K^+ , with which it forms a yellow ppt. Rb and Cs react similarly, the soly. of the ppt. increasing from K to Cs. NH_4 also ppts., but can be detected otherwise. E. M. SYMMES

Desiccators (anhydrous barium perchlorate-Smith). Its use as an economical drying agent and ammonia absorbent. G. FREDERICK SMITH. Univ. Ill. *Chemist-Analyst* 17, No. 4, 21-22(1928).—References to the literature, method of prep. the reagent, comparison with CaCl_2 as a drying agent and methods of testing are given. W. T. H.

Preparation of stable ammonium molybdate solution. J. P. MEHLIG. Oregon State Agr. College. *Chemist-Analyst* 17, No. 4, 6(1928).—Dissolve 380 g. of MoO_3 in 550 cc. of concd. NH_4OH and 1030 cc. of water. Place this soln. in a separatory funnel and allow it to drop very slowly through a filter paper into 6 l. of 6 N HNO_3 , which is being stirred continuously. Such a soln. has been kept 7 months without deterioration. W. T. H.

New reagents for the determination of small quantities of free chlorine. KNUT ALPHTAN. *Finska Kemistsamfundets Medd.* 36, 109-12(1928).—One cc. of 0.1% of dimethyl-*p*-phenylenediamine-HCl is added to 100 cc. of the water to be tested. The acidity of the sample may range from 5 to 25 cc. 0.1 N HCl per l. One cc. of 0.0115% methyl red (Kahlbaum) in 100 cc. acidified water gives the same color as 0.01 mg. Cl in 100 cc. water with the new reagent. The analysis is carried out by taking 100 cc. water in a glass cylinder, acidifying with 2 cc. 0.1 N HCl, adding 1 cc. of the reagent, and letting the soln. stand 2 min. Methyl red (1.15% soln.) is then added to a similar cylinder until the 2 give the same color. Cl to a min. of 0.01 mg./l. may be detd. HANS C. DUUS

Carbon and hydrogen determinations using a metal tube. S. AVERY. Univ. Neb. *Ind. Eng. Chem.* 20, 1232-4(1928).—A Cu tube protected by an outer jacket of Ni is non-breakable, durable and inexpensive. Water jackets at the ends of the tube protect the stoppers. A series of combustions of typical substances indicates that precise results can be obtained in a minimum time with the Cu tube. W. T. H.

Some notes on the determination of aluminum with special reference to the use of hydroxyquinoline as a reagent. N. SINGLETON. *Chem. Age* (London), Monthly Met. Sect. 19, 25-6(1928). W. T. H.

Quantitative separation of barium and calcium. MME. M. AND M^r. LEMARCHANDS. *Compt. rend.* 187, 601-3(1928). At 100°, 12-30 mg. of BaSO_4 dissolve in 1 l. of water, depending upon the grain size of the sample. The soly. of BaSO_4 in HCl solns. increases with the content of HCl but not proportionately. The solvent action of CaCl_2 is much less and is practically the same between 0.1 and 0.3% content. If a soln. contains 0.039 g. of H_2SO_4 , and 1 g. of HCl, when a ppt. of BaSO_4 is formed at 100°, soly. detns. indicate that 7.6 mg. of BaSO_4 will remain in soln. W. T. H.

Determination and separation of bismuth with cupferron. A. PINKUS AND J. DERNIES. Univ. Brussels. *Bull. soc. chim. Belg.* 37, 267-83(1928).—Soly. measurements indicate that cupferron and Bi give a ppt. practically insol. in H_2O or mineral acids of moderate concn., whereas many cations ppt. with cupferron only in neutral or very weakly acid solns. The sepn. and detn. of Bi consist in pptg. this metal with an excess of cupferron in HCl or HNO_3 soln., oxidizing the ppt. by moderate calcination and weighing as Bi_2O_3 . This procedure may be used in the presence of Cl or SO_4 ions. The sepn. of Bi from Na, K, NH_4 , Cd, Zn, As, Al, Mn, Cr, Ni, Ag and Pb is quant.; the same must be true with quinquevalent Sb, Co^{++} and Hg^{++} . All these metals may be titrated by the customary methods in the filtrate and washing waters, without removal of the cupferron excess. Pb and Cd are quantitatively pptd. by an excess (1.5) of cupferron in neutral solns. This property could probably be used in the Cd-As and Cd-Sb sepn. A. L. HENNE

Standard methods of analysis of pure copper. A. E. LEIGHTON. *Australia Dept. of Defence Munitions Supply Board*, May 1926, 11 pp.—"Procedure A." Dissolve 10 g. of metal in 70 ml. of "stock acid" (350 ml. of concd. HNO_3 dild. to 1250 ml. and added slowly to 500 ml. of concd. H_2SO_4). Evap. to fumes, dil. to 180 ml. and electrolyze overnight with 1 amp. per sq. dm. After 15 hrs. reduce the current to 0.5 amp. and as soon as H_2 begins to be evolved, reduce to 0.4 amp. Finish as usual and weigh the deposit. "Procedure B." Dissolve 5 g. of sample in 42 ml. of the "stock acid," drive off nitrous fumes, dil. to 150 ml. and electrolyze. *Modification of Procedure B when considerable As or some Sb, Te, Bi or Ni is present.*—Dissolve 5 g. as above but evap. the soln. to fumes, add 70 ml. of water and 3 ml. of $\text{Fe}(\text{NO}_3)_3$ soln. contg. 0.03 g. of Fe. Ppt. with an excess of NH_4OH , filter and wash. Conc. the filtrate to a small vol. and repeat the pptn. of the Fe, dissolving the first ppt. in dil. H_2SO_4 . Make the

combined filtrates slightly acid with H_2SO_4 , add 3 ml. of concd. HNO_3 and electrolyze as above in a vol. of 150 ml. Instead of this procedure, when traces of As and Bi are present but not enough Se and Te to interfere, it is recommended to ppt. Se and Te in the H_2SO_4 soln. obtained as above by boiling with SO_2 , igniting the ppt., extracting the ash with 2 ml. of concd. HNO_3 and adding this soln. to the original filtrate and then electrolyzing. In this case no Fe is added to the soln. and there is no ammonia pptn. Or, if As is the only interfering element, dissolve the sample in 66 ml. of "stock acid" instead of 42 ml. and continue as in "B." *Detn. of As, Sb and Sn.*—Two methods of attack are suggested. (a) Dissolve 50 g. in 200 ml. of concd. HNO_3 , added in small portions. Boil off fumes and evap. 15 min. in a l. beaker uncovered, heating on the hot plate. Cool and dil. to 300 ml. (b) Dissolve 100 g. in 400 ml. of concd. HNO_3 . Boil off fumes, cool and dil. to 300 ml. In either case, neutralize with NH_4OH until enough basic Cu salt has formed to cover the bottom of the beaker. Add an aq. soln. of 5 g. ferric alum and dil. to 500 ml. for each 50 g. of Cu. Boil 30 min., dil. to 1.5 l. for 100 g. Cu or to 0.75 l. for 50 g. Cu. Allow the ppt. to settle and filter. Pass the filtrate through a second filter or, when more than 0.002% of As is present, add 1 g. more of ferric alum and ppt. as before. Dissolve the ppt. in hot 6 N H_2SO_4 , reppt. with NH_4OH in a small vol. and filter through the original filter. To recover traces of As, add this filtrate to that originally obtained, make acid if necessary, reppt. with NH_4OH and filter through the same paper. In this way an Fe ppt. is obtained on which all of the Fe and Sb should be adsorbed. *Detn. of As.*—Dissolve the $\text{Fe}(\text{OH})_3$ ppt. in HCl, add Cu_2Cl_2 and KBr together with additional FeCl_3 , distil off AsCl_3 and titrate As iodometrically in the distillate. *Detn. of Sb.*—Dil. the HCl soln. obtained from the AsCl_3 distn. until the HCl concn. is about 2 N, sat. the soln. with H_2S , filter, subject the Sb_2S_3 ppt. to the usual purification and finally weigh as Sb_2O_3 . If, however, Sn is present, take the second Sb_2S_3 ppt., which has been freed from members of the Cu group, and boil it with 100 ml. of oxalate soln. (5 g. oxalic acid and 5 g. $(\text{NH}_4)_2\text{C}_2\text{O}_4$ in 100 ml. of water) until dissolved. Treat the residue with HF in Pt crucible and digest the residue now obtained with fresh oxalate soln., adding this extract to that originally obtained. Boil and sat. with H_2S . Use the filtrate for the Sn detn. and ignite the Sb_2S_3 to Sb_2O_3 , using concd. HNO_3 to assist the oxidation. *Detn. of Sn.*—Boil off the H_2S and electrolyze the oxalate soln. for Sn. Or, the filtrate from the Sb_2S_3 sepn. can be evapd. with an excess of H_2SO_4 to remove oxalate and the Sn then pptd. as sulfide and weighed as oxide. *Detn. of Pb, Fe, Zn, Ni and Co.*—Dissolve 50 g. in 320 ml. of "stock soln." Evap. to fumes, dil. to 700 ml. and electrolyze at 5 amps with a rotating cathode. Reserve the anode for the Pb detn. After the Cu has all been deposited, evap. the soln. and heat the residue till most of the NH_4HSO_4 formed is decomposed. Add 10 drops of concd. HCl, and 50 ml. of water. Sat. with H_2S , filter and wash with H_2S water. Heat to boiling and again sat. with H_2S . Reject these sulfide ppts. unless a check is desired on the Sb detn. *Detn. of Pb.*—After suitable drying, weigh the anode obtained above. Dissolve the PbO_2 , etc., in 100 ml. of 4 N HNO_3 contg. some H_2O_2 . Evap. to 50 ml. and add 120 ml. of "lead acid" (see analysis of aluminum metal) and take to fumes. Cool, filter into a Gooch crucible, ignite and weigh as PbSO_4 . *Detn. of Fe.*—Conc. the filtrate obtained in the preliminary sepn., add Br_2 , boil off the excess, add 5 g. of NH_4Cl and ppt. the Fe as hydroxide. Ignite and weigh as Fe_2O_3 . *Detn. of Zn.*—In the filtrate from the Fe detn., ppt. the Zn as sulfide from acid formate soln., ignite and weigh as ZnO . *Detn. of Co and Ni.*—Electrolyze the filtrate from the Zn detn. for Ni and Co after adding NH_4OH and $(\text{NH}_4)_2\text{SO}_4$ from ammoniacal sulfate soln. Weigh the deposit and dissolve it in 7.5 N HNO_3 . Add 5 ml. of H_2SO_4 , evap. to fumes, dil. to 200 ml., neutralize with NH_4OH , add 5 ml. of HCl and ppt. the Co as the nitroso- β -naphthol salt. Ignite and weigh as Co_3O_4 . *Detn. of Bi.*—Dissolve 50 g. in 200 ml. of concd. HNO_3 , expel nitrous fumes and dil. to 1 l. Add $\text{Fe}_2(\text{SO}_4)_3$ and 5 ml. of satd. $(\text{NH}_4)_2\text{HPO}_4$ soln. Heat to boiling and filter. Dissolve the ppt. in hot 6 N H_2SO_4 , reserving the filter. Dil. and sat. with H_2S . Filter through the same filter and extract the members of the Sn group by treatment with $(\text{NH}_4)_2\text{S}_2$ soln. Dissolve the residual sulfides in 2 N HNO_3 and reject any residue. Make alk. with NH_4OH and add KCN. Again sat. the soln. with H_2S , filter and dissolve the washed ppt. in 2 N HNO_3 . Det. the Bi colorimetrically by the iodide method. *Detn. of P.*—Using 3 g. of sample dissolved in 25 ml. of HNO_3 and 10 of HCl, carry out the Handy method of alkalimetric titration of a phosphomolybdate ppt.

Low's short iodide method for copper, modified. H. F. BRADLEY, *Chemist Analyst* 17, No. 4, 14(1928).—Moisten 0.5 g. of ore with a few drops of water, add a little KClO_3 if sulfides are present, and decompose with 5 cc. of concd. HNO_3 and a few drops of HCl. Digest 5 mins. and if brown fumes are evident, add a few drops

of HCl-H₂O, mixt. Add 7 cc. of concd. H₂SO₄ and boil to copious fumes. Cool, add 3 cc. of water and cautiously introduce 123 cc. of concd. NH₄OH. Add to this slightly acid soln. a concd. NH₄OAc soln. (made by mixing equal vols. of concd. NH₄OH and glacial AcOH) until the red color of Fe(OAc)₃ appears and then add 5 cc. in excess. Cool, add 0.5 g. of NaF, stir till the red color disappears, add 3 g. of KI, stir till dissolved and titrate as usual.

W. T. H.

Simultaneous determination of iron, copper and arsenic by potentiometric titration. E. ZINTL AND F. SCHLOFFER. *Z. angew. Chem.* 41, 956-60(1928).—In an atm. of CO₂, good electrometric end points are obtained, in the absence of HCl or HNO₃, and in the presence of 2-15% H₂SO₄, for the reduction of Fe⁺⁺⁺ to Fe⁺⁺ and of Cu⁺⁺ to metallic Cu by titration with CrSO₄ soln. The presence of quinquivalent As has no effect on the titration but the presence of Sb make it harder to recognize the Cu end point. If not more than 5 mg. of Sb is present the titration is not seriously affected in a vol. of 200 cc. For the detn. of tervalent As, bivalent Cu and tervalent Fe, first boil a short time under CO₂ to remove dissolved O₂, then add a measured excess of K₂Cr₂O₇ to the soln. contg. 5% of H₂SO₄, and titrate with 0.1 N CrSO₄. Three sharp end points are obtained, the first corresponding to the reduction of the excess Cr₂O₇⁻⁻⁻ to Cr⁺⁺⁺, the second to the reduction of the Fe⁺⁺⁺ to Fe⁺⁺ and the third to the reduction of Cu⁺⁺ to metal. The advantage of this method of titration is shown by the fact that the following procedure gives the Fe and Cu contents of a sample of pyrite within an hour. Dissolve 0.5 g. of finely powd. pyrite and 10-20 g. of K₂S₂O₈ by heating carefully in a 100 cc. Kjeldahl flask with 20 cc. of concd. H₂SO₄. Heat first with a very low flame to avoid wasting the persulfate. After 5 min. gradually raise the temp. so that at the end of 10 min. the b. p. is reached. Cool, dil. with water to 200 cc. and boil under CO₂ for a min. Then titrate with CrSO₄ under potentiometric control.

W. T. H.

Determination of manganese in steel, with a note on sampling. WM. F. POND. *Chemist-Analyst* 17, No. 4, 11(1928).—Mn-steel is so hard that it is difficult to obtain good samples. The steels can be obtained in thin plates by pouring some of the melt into cold water. Then by grinding off the oxidized surface and hammering, suitable fragments, the size of a match head, can be obtained. The method described is the well-known bismuthate procedure.

W. T. H.

Standard methods of analysis of pure nickel. A. E. LEIGHTON. *Australia Dept. of Defence Munitions Supply Board*, May, 1926, 6 pp.—"Procedure A." *Detn. of Si.*—Dissolve 5 g. in 50 ml. of HNO₃ and continue as in the Drown method for analyzing Fe and steel for Si. *Detn. of Cu.* Introduce H₂S into the filtrate from the SiO₂ detn., filter, wash and weigh as CuO. *Detn. of Co.*—Boil the filtrate from the CuS pptn. to expel H₂S, dil. to 500 cc. and take 50 cc. for the Co detn. Neutralize with NH₄OH and add 100 ml. of 10 N NH₄OH in excess. Add 3 g. of (NH₄)₂SO₄ and electrolyze at 40° with 3 amps. and a rotating electrode. Dry and weigh the deposit of Ni and Co. Dissolve in 7.5 N HNO₃, add 5 ml. of concd. H₂SO₄ and evap. to fumes. Cool, dil. to 200 ml., neutralize with NH₄OH and add 5 ml. of strong HCl. Heat to boiling and add 2 ml. of nitroso-β-naphthol soln. (2 g. in 75 ml. of glacial AcOH, dild. with 75 ml. of water). Filter, wash with dil. HCl and then with water, ignite carefully and weigh as Co₂O₃. *Detn. of Fe.*—Take 400 ml. of soln. from which the Cu has been removed, ppt. three times with NH₄OH in the usual way and weigh as Fe₂O₃. "Procedure B." *Detn. of Si.*—Treat 5 g. of metal with 50 ml. of 6 N HNO₃, add 30 ml. of HCl, evap. to dryness and continue in the usual way. *Detn. of S.*—Heat the filtrate from the Si detn. to boiling and ppt. with BaCl₂, etc. *Detn. of C.*—The dry combustion method is recommended.

W. T. H.

A micro-chemical method for the detection of potassium as potassium picrate. DR. OLURSEN. *Mikrokosmos* 22, 15-6(1928); cf. C. A. 20, 3716.—K is easily identified by the instantaneous formation of characteristic crystals of C₆H₅(NO₂)₃OK when plants or their sections are treated with satd. solns. of picric acid in 96% EtOH; the ash of plant material is easily tested with the same reagent; Na, Ca and NH₄ do not interfere with the test since the difference in the cryst. structure of these picrate salts is easily distinguishable. A list of plants, the fruits, leaves, stems, etc., of which were tested in this manner, is given.

N. A. LANGE

Investigations into the analytical chemistry of tantalum, columbium and their mineral associates. XIII. New method for the separation of zirconium and hafnium from tantalum and columbium. W. R. SCHÖLLER AND E. F. WATERHOUSE. Sir John Case Techn. Inst. *Analyst* 53, 515-20(1928).—One method is based on the pptn. of the oxalo-earth acids by tannin in weakly acid soln., zirconyl oxalate remaining dissolved (Method A). A second method is based upon the fusion of the mixed oxides with

K_2CO_3 , a procedure which has been perfected so that a single fusion may be sufficient for the sepn. of the bulk of the earth acids. The fusion can be used as a sensitive test for detecting traces of earth acids in zirconia (Method B). To carry out Method A, fuse the mixed oxides with $K_2S_2O_7$ in a silica crucible and dissolve the melt in a satd. soln. of $(NH_4)_2C_2O_4$ contg. about as much of this salt as the wt. of $K_2S_2O_7$ taken. To the boiling soln., add 0.2 g. of tannin dissolved in hot water and introduce 7.5 N NH_4OH dropwise until the discoloration of the ppt. indicates incipient co-pptn. of Zr. Pure Zr salt gives a white tannin ppt. The main ppt. will be yellow, orange or red according to the ratio of Ta:Cb. Allow the liquid to settle in a warm place, filter and wash with 2% NH_4Cl . Ignite the ppt. in the same crucible as that used for the pyrosulfate fusion. To obtain a ppt. free from Zr, repeat the treatment but with less pyrosulfate and less oxalate. Then for the pptn. of the sulfate-oxalate soln., which should not exceed 50 cc. in vol., add dil. NH_4OH while boiling, stopping as soon as a cloudiness is perceptible. Then add just enough 6 N HCl to clear the soln., 1 g. of NH_4Cl and some freshly prepared 1% tannin soln. Add the tannin in small portions, stopping as soon as the soln. is decolorized, which usually requires less than 10 cc. After standing 2 hrs. at 50–70°, filter, wash, ignite and weigh as $(Ta,Cb)_2O_5$. All the reagents must be free from Ca salts as otherwise a ppt. of CaC_2O_4 will be formed in the original oxalate soln. If this appears, filter before neutralizing. In Method B, fuse the mixed oxides with 6 times as much K_2CO_3 in a Pt or Au crucible. Digest the melt with 1 g. of KOH and enough water to cover the melt, heating the contents of the covered crucible for 2 hrs. on the hot plate. Transfer to a small beaker, add filter-paper pulp and filter. Wash the ZrO_2 residue with 2% K_2CO_3 soln., ignite and weigh. If heavy, and derived from a mixt. rich in Ta_2O_5 , repeat the above treatment. Make the final K_2CO_3 soln., from which all ZrO_2 has been removed, acid with HCl and boil with a slight excess of NH_4OH . Filter, ignite strongly and weigh as $(Ta,Cb)_2O_5$. Ignite the above impure ZrO_2 in a Pt crucible, moisten with dil. H_2SO_4 and dry. Fuse with $K_2S_2O_7$ and dissolve in oxalate soln., etc., as in the other method. W. T. H.

Standard methods of analysis of pure tin. A. E. LEIGHTON. *Australia Dept. of Defence Munitions Supply Board*, May 1926, 4 pp. *Detn. of Sb.*—Dissolve 5 g. of metal in 50 ml. of aqua regia. Add 5 g. of tartaric acid and heat to dissolve it. Neutralize with 40% $NaOH$, adding a slight excess. Add 20 ml. of Na_2S soln. (sat. 100 ml. of 20% $NaOH$ with H_2S and mix with an equal vol. of 20% $NaOH$). Filter and wash the ppt. Dissolve the sulfide ppt. in the original beaker with HCl and a little $KClO_3$. Boil off Cl , add 0.5 g. of tartaric acid and treat with $NaOH$ and Na_2S . Filter and unite the 2 filtrates. Add HCl just short of the quantity necessary to ppt. the sulfides of Sn and Sb and boil down to 300 cc. Add 150 ml. of concd. HCl and warm to dissolve the SnS_2 . Sat. the soln. with H_2S , filter and wash the Sb_2S_3 ppt. 3 times with 25% HCl . Transfer the ppt. to a beaker, dissolve it in concd. HCl , boil off H_2S , dil. with an equal vol. of hot water and titrate hot with 0.05 N $KBrO_3$ soln. using methyl orange as an indicator. *Detn. of Pb.*—Dissolve the sulfides obtained in the Sb detn. in as little concd. HCl as possible. Add 120 ml. of "lead acid" and continue as described in the analysis of metallic Al. *Detn. of Bi.*—Neutralize the filtrate obtained on filtering off the $PbSO_4$ in the Pb detn. with NH_4OH , make acid with HCl and ppt. with H_2S . Dissolve the ppt. in HNO_3 , filter if necessary, and ppt. the Bi by adding NH_4OH and $(NH_4)_2CO_3$. Filter and reserve the filtrate for the Cu detn. Wash the Bi ppt. into a crucible with 6 N HNO_3 , evap. to dryness and weigh as Bi_2O_3 . *Detn. of Cu.*—Neutralize the filtrate from the Bi detn. with HCl and ppt. the Cu by adding H_2S . Filter, wash, ignite and weigh as CuO . Dissolve in dil. HNO_3 , filter, nearly neutralize with NH_4OH , add HCl , sat. with H_2S , filter, ignite and weigh. As a check ignite and weigh the residue obtained after dissolving the first CuO in HNO_3 . *Detn. of Fe.*—Take the filtrate from the first H_2S pptn. on the detn. of Bi, oxidize with HNO_3 , add NH_4Cl , make ammoniacal, filter, ignite and weigh the Fe_2O_3 . W. T. H.

Determination of vanadium in steel. F. IBBOTSON. *Univ. Sheffield. Analyst* 53, 531(1928).—The method of Evans and Clarke (*C. A.* 22, 4081) gives good results with an alloy steel contg. Cr, Mo, W, Ni and Co but when much Ni is present the method is difficult because the filtration of the $Ni_2(Fe(CN)_6)_3$ is practically impossible. If, however, the Ni is not removed, a ppt. of Ni and V ferrocyanides is less difficult to filter. W. T. H.

Standard methods of analysis of white metal alloys. A. E. LEIGHTON. *Australia Dept. of Defence Munitions Supply Board*, May 1926, 7 pp. *Detn. of Sn.*—Dissolve 10 g. of metal in 100 ml. of concd. HCl which has been satd. with Br without boiling. When all the metal has dissolved, boil off excess Br, add 300 ml. of concd. HCl and dil. to 1000 ml. Take 20 ml. of the soln., add 100 ml. of concd. HCl and 200 ml. of water and

titrate the Sn iodometrically after reduction with Sn in the usual way. *Detn. of Pb.*—In a Kjeldahl flask, digest 1 g. of metal drillings with 20 ml. of H_2SO_4 . Cool, add 40 ml. of water and boil a few mins. Filter through a Gooch crucible but retain as much of the ppt. as possible in the flask. Add 10 ml. of concd. H_2SO_4 and boil 15 min. Cool, add 30 ml. of water and filter. Ignite and weigh as PbSO_4 . Weigh the residue insol. in NH_4OAc . *Detn. of Sb.*—Heat the filtrate from the PbSO_4 detn. and add a measured excess of standard KMnO_4 . Shake 1 min. and titrate the excess with standard ferrous soln. *Detn. of Cu.*—To the soln. after the Sb detn., add 10 g. of tartaric acid and NH_4OH to alk. reaction. Add 2 ml. of H_2SO_4 and heat nearly to boiling. Add 2 g. of $\text{Na}_2\text{S}_2\text{O}_8$ and 10 ml. of 10% KCNS soln. Filter and dissolve the washed ppt. in 40 ml. of 10% NaOH . Heat to 50° and titrate with standard KMnO_4 soln. *Detn. of Pb. Alternate Method.*—Dissolve 1 g. of sample in 20 ml. of aqua regia, add 2 g. of tartaric acid and 10 ml. of concd. H_2SO_4 , evap. to fumes, dil. with 50 ml. of water, allow to stand and filter. Weigh as PbSO_4 . *Detn. of Fe.*—Dissolve 1 g. in 40 ml. of concd. HCl and a little KClO_3 . Dil. the soln. to 200 ml. with cold water and sat. with H_2S . When the Ca and Pb are pptd. add an excess of NH_4OH and continue passing in H_2S . Filter, wash the ppt. and discard the filtrate. Dissolve out the FeS from the ppt. by treatment with hot 2 N HCl . Filter and dil. to make 0.2 N in HCl . Sat. the soln. again with H_2S and filter. Oxidize the filtrate and ppt. as $\text{Fe}(\text{OH})_3$, etc. If Al is present, carry out the NaOH sepn., finally reprecip. with NH_4OH . *Detn. of Ni.*—Dissolve 1 g. in 20 ml. of aqua regia and evap. off all HNO_3 . Dil. with 25 ml. of cold water and add 3 g. of tartaric acid. Then ppt. the Ni as the dimethylglyoxime compd. with the usual precautions. *Detn. of As.*—Treat 5 g. of metal with 25 ml. of H_2SO_4 and conc. to a paste. Add 200 ml. of water, cool and add 50 ml. of concd. HCl . Cool and filter through asbestos. Warm the filtrate and ppt. the As by treatment with pure ZnS . Dissolve the ppt. in NaOH soln., make strongly acid with 3 N HCl and reprecip. with ZnS . Dissolve the ppt. in concd. HNO_3 , add 15 ml. of H_2SO_4 and 3 g. of KHSO_5 . Fume for 15 mins. Cool, add 0.5 g. of tartaric acid, make ammoniacal and then slightly acid with dil. H_2SO_4 . Titrate the trivalent As with I_2 in the presence of excess NaHCO_3 .

W. T. H.

Standard methods of analysis of brasses. A. E. LEIGHTON, *Australia Dept. of Defence Munitions Supply Board*, May 1926, 9 pp.—*Detn. of Sn.* If the brass contains more than 2% of Sn, det. this metal as in bronze. Otherwise take 5 g. of sample, decomp. with 50 ml. of 6 N HNO_3 and analyze as described for the detn. of Sn in bronze but using only 40 ml. of hot water for digesting the impure SnO_2 residue obtained by evapn. of the HNO_3 soln. *Detn. of Pb.*—Use the filtrate from the first pptn. of metastannic acid and proceed as described for the analysis of Al metal. This gives results sufficiently accurate for most purposes. If it is desired to det. traces of Pb with greater accuracy, treat 100 g. of brass with enough aqua regia to dissolve it, boil off excess Cl_2 , add 5 g. of Mohr's salt, add 5 ml. of concd. HNO_3 and boil 10–15 mins. Cool, add an excess of ammonia and filter. The $\text{Fe}(\text{OH})_3$ ppt. will occlude all of the Pb. Dissolve the ppt. in HCl , add "lead acid" and continue as in the detn. of Pb in Al metal. After weighing the PbSO_4 ppt. wash it with hot NH_4OAc soln., heat and weigh the insol. residue. *Detn. of Cu.* For the volumetric detn. of Cu, take $\frac{1}{10}$ of the filtrate from the PbSO_4 pptn., or dissolve 0.5 g. of brass in 10 ml. of aqua regia. In either case, boil off most of the excess acid, cool and add Na_2CO_3 until a slight blue ppt. is obtained. Dissolve the ppt. in an excess of AcOH , filtering if a scum of basic ferric acetate forms. Add 2.5 g. of KI and titrate with thiosulfate. For the electrolytic detn. take $\frac{1}{10}$ of the filtrate from the PbSO_4 or dissolve 1 g. of brass in 30 ml. of 7.5 N HNO_3 and boil to expel brown fumes. Dil. to 150 ml. and neutralize with NH_4OH . Add 1 ml. of concd. H_2SO_4 and heat to 40° . Electrolyze this soln. at 3 amps. for 40 min., adding 0.5 g. of urea after electrolyzing 15 min. *Detn. of Fe.*—To the remainder of the filtrate from the Pb detn., add 5 ml. of HNO_3 , boil, add 5 g. of NH_4Cl and ppt. with NH_4OH . Dissolve the first $\text{Fe}(\text{OH})_3$ ppt. in HCl and repeat the pptn., finally weighing as Fe_2O_3 . Usually the Al content is negligible. *Detn. of Fe and Al.*—Instead of igniting the Fe ppt., dissolve it in HCl , carry out the NaOH method of sepg. Fe and Al, finally pptg. each constituent as hydroxide with NH_4OH . *Detn. of Ni.*—Brass does not usually contain Ni. If present, take 1 g. of sample and remove Cu by electrolysis as described for the detn. of Cu. To the electrolyzed soln. add 0.5 g. of tartaric acid and det. the Ni by the conventional dimethylglyoxime method. *Detn. of Zn.*—In ordinary routine work, find Zn by difference. To det. Zn, use the soln. which has been electrolyzed for Cu or dissolve 1 g. of brass in 20 ml. of 6 N H_2SO_4 and take to fumes. Dil. to 150 ml., filter off any insol. Pb or Sn compd. and ppt. Cu by H_2S . Filter, wash and boil off H_2S from the filtrate. To the soln. obtained in either way, add 10 ml. of concd.

HNO_3 , boil a few min., cool, add 30 ml. of indicator soln. (450 g. $\text{KHC}_2\text{H}_3\text{O}_6$, 45 ml. of 10% FeCl_3 soln. and 2.5 l. of water), neutralize with ammonia and add 5 ml. in excess (omit the excess NH_4OH if less than 1% of Zn is present). Titrate at 80° with standard ferrocyanide soln., using glacial AcOH as outside indicator on a waxed plate. The end point is reached when a drop of the assay gives a light blue coloration with AcOH .

Detn. of Mn.—Dissolve 1 g. of brass in 20 ml. of 7.5 N HNO_3 , evap. to dryness, add 100 ml. of hot water and boil for 5 mins. Allow to stand 30 mins. in a warm place, filter, evap. to 30 ml., add 5 ml. of concd. H_2SO_4 and evap. to 20 ml. Then add AgNO_3 and $(\text{NH}_4)_2\text{S}_2\text{O}_8$ and carry out the persulfate detn. in the usual way, ending with the arsenite titration of MnO_4^- .

Detn. of P.—Dissolve 3 g. in 30 ml. of aqua regia, digest short of boiling for 10 min., add 15 ml. of water and digest another 15 min. Cool, add NH_4OH and carry out the Handy method as in the analysis of steel with acid molybdate soln., finally titrating the phosphomolybdate ppt. alkalimetrically.

Detn. of As.—A modified Gutzet procedure is described with considerable detail as well as a complicated evolution method which involves double pptn. of basic ferric salt, which adsorbs AsO_4^{---} anion, soln. of the final ppt. in HCl , evolution of AsCl_3 by distn. in the presence of Cu_2Cl_2 , KBr , FeCl_3 and concd. HCl and iodometric titration of the distillate in NaHCO_3 soln.

Detn. of Bi.—Dissolve 20 g. of brass in a small quantity of 7.5 N HNO_3 , nearly neutralize with Na_2CO_3 and add 1.5–2 g. of NaHCO_3 . Boil, allow to settle and filter. Dissolve the ppt. back into the original beaker, using 9 N H_2SO_4 as solvent. Add a slight excess of KI and sufficient H_2SO_4 to turn the soln. a pale brown and 1 drop in excess. Dil. to 500 ml., mix and take 50 ml. for the colorimetric test. In a 100 ml. Nessler tube, add 10 ml. of 9 N H_2SO_4 , sufficient H_2SO_4 to reduce all free I_2 and 1 drop in excess. Add a small crystal of KI to a second Nessler tube, dissolve in water and treat with H_2SO_4 and H_2SO_5 as just described. Transfer the 2 tubes to a colorimeter and match colors, adding standard $\text{Bi}(\text{NO}_3)_3$ soln. to the second tube till a match is obtained.

W. T. H.

Standard methods of analysis of bronzes. A. E. LEIGHTON. *Australia Dept. of Defence Munitions Supply Board*, May 1926, 8 pp.—*Procedure "A" for Pb, Sn and Cu.*—Dissolve 1 g. of bronze (or 0.5 g. if more than 10% of Sn is present) in 60 ml. of 9 N H_2SO_4 and 5 ml. of concd. HNO_3 . If the soln. is clear, add 3 ml. more of HNO_3 , dil. to 200 and electrolyze for Cu as in the analysis of brass. If the soln. is not clear, a gelatinous residue indicates P or As and a white ppt. indicates Pb in the alloy. Metastannic acid should not be formed; if it does, start again with a smaller wt. of sample. To the soln. contg. the ppt. add 20 ml. of dil. H_2SO_4 and take to fumes. Cool to room temp. and add quickly 150 ml. of cold water while stirring to prevent overheating. Cool in running water and filter off and weigh any PbSO_4 after the usual treatment. Electrolyze the filtrate from the PbSO_4 pptn. Then pass H_2S through the soln. to ppt. Sn, filter, wash with dil. NH_4NO_3 , ignite and weigh as SnO_2 .

Procedure "B" for Sn, Pb and Cu.—Treat 1 g. of bronze with 10 ml. of concd. HNO_3 , evap. to a paste and take up in 75 cc. of water. Filter and det. Sn iodometrically as described for the analysis of Al metal. In the filtrate, det. Pb as described for the analysis of Al metal. Det. Cu iodometrically in a fresh sample as explained for the analysis of brass.

Detn. of Fe, Al and Zn.—Proceed as described for the analysis of brass.

Detn. of Ni.—Digest 2 g. of sample with 30 ml. of 7.5 N HNO_3 , evap. almost to dryness and take up with 100 ml. of hot water. Remove SnO_2 and electrolyze the HNO_3 soln. After this, add tartaric acid and carry out the dimethylglyoxime method in the usual manner.

Detn. of Mn.—Proceed as with brass.

Detn. of P.—Use 3 g. if less than 0.15%, 2 g. if 0.16–0.4%, 1 g. if 0.41–0.80% and 0.5 g. if more than 0.81% of P is present. Decompose with a mixt. of 25 ml. HNO_3 and 10 ml. HCl , digest 10 mins. just below the boiling temp. and continue as described in the analysis of brass.

— W. T. H.

Standard methods of analysis of aluminum alloys. A. E. LEIGHTON. *Australia Dept. of Defence Munitions Supply Board*, May 1926, 7 pp.

Detn. of Si. Treat 1 g. of sample with 35 ml. of an acid mixt. (obtained by mixing 1.2 l. of 2.5 N H_2SO_4 , 0.6 l. of 10.5 N HCl and 0.2 l. of 15.5 N HNO_3). Heat until the sample is well decompd., the excess HCl and HNO_3 are removed and copious H_2SO_4 fumes are evolved. Cool, add 10 ml. of 2.5 N H_2SO_4 and 100 cc. of water. Boil, filter, wash and continue in the usual manner.

Detn. of Cu, Pb, Fe, Mg and Ni. Treat 5 g. of metal with 125 ml. of 25% NaOH soln. When all the Al has dissolved, add 100 ml. of water, filter and wash with hot 2% NaOH soln. Treat the filtrate with NaOH ; if no ppt. is formed, Zn is absent. If Zn is present, det. it in a fresh sample of metal as described below. Wash off the residue undissolved by NaOH back into the original porcelain dish and pour 20 ml. of hot, 7.5 N HNO_3 through the filter into the dish. Boil until all the residue has dissolved, dil. with 50 cc. of hot water, filter through the original filter and wash

the filter well with hot water. Retain the filtrate for the detn. of Cu, Pb, Mg and Ni. Reject the residue because some of the Sn is dissolved by the original treatment with NaOH. *Detn. of Pb.*—To the last-mentioned filtrate, add 120 ml. of "lead acid" (mix 300 ml. of concd. H_2SO_4 with 1.8 l. of water and pour into it a hot soln. of 1 g. $\text{Pb}(\text{OAc})_2$ in 300 ml. of water). Evap. to copious fumes and det. the Pb as PbSO_4 in the usual way, washing the ppt. with 50% alc. and heating the Gooch crucible to redness inside another porcelain crucible. *Detn. of Cu.*—Neutralize the filtrate from the PbSO_4 with NH_4OH , add 0.5 ml. of HNO_3 and det. the Cu by electrolysis. *Detn. of Fe.*—To the electrolyzed soln., add 5 ml. of concd. HNO_3 and boil to make sure that the Fe is all oxidized. Ppt. as $\text{Fe}(\text{OH})_3$, twice and ignite to Fe_2O_3 . *Detn. of Ni.*—Take one-half of the last filtrate and det. the Ni with dimethylglyoxime, in a soln. which is at first barely acid with HCl and is finally made slightly ammoniacal. *Detn. of Mg.*—In the other half of the filtrate from the Fe detn. ppt. Zn and Ni with H_2S , filter, make the filtrate acid, boil off H_2S , add $(\text{NH}_4)_2\text{S}_2\text{O}_8$ to oxidize any pptd. S., add 1 g. of tartaric acid and 30 ml. of satd. microcosmic salt soln. to ppt. the MgNH_4PO_4 . Ignite and weigh as $\text{Mg}_2\text{P}_2\text{O}_7$. *Detn. of Mn.*—Use 0.1 g. of sample if 1.5% of Mn is present, or corresponding wts. as the Mn varies. The method described is the well-known persulfate method as used in the rapid detn. of Mn in steel. The sample is dissolved in 25 ml. of 18 N H_2SO_4 and a little HNO_3 added to oxidize the Fe before adding the AgNO_3 and $(\text{NH}_4)_2\text{S}_2\text{O}_8$. *Detn. of Zn.*—Treat 1 g. of sample with 25 ml. of 6 N HCl and, when mostly dissolved, add 1 ml. of concd. HNO_3 . Boil to expel nitrous oxides, dil. to 200 ml., sat. with H_2S , filter and wash with 3.6 N H_2SO_4 which has been satd. with H_2S . Boil off H_2S from the filtrate, neutralize with NH_4OH using methyl orange as indicator, add 25 ml. of a soln. prepared by mixing 400 ml. of formic acid with 60 ml. of concd. NH_4OH and dilg. to 2 l., heat to boiling and introduce H_2S , until the soln. is cool. Filter and wash with 2.5% HCO_2H satd. with H_2S . Dissolve the impure ZnS ppt. in hot N HCl , add 1 g. of citric acid, neutralize with NH_4OH , add 20 ml. of the formic acid mixt. and again ppt. with H_2S as before. Dissolve the well-washed ppt. in dil. HCl , transfer the soln. to a Pt dish or crucible, add H_2SO_4 and evap. to fumes. Add HNO_3 as necessary to destroy org. matter, evap. to dryness and weigh as ZnSO_4 . *Detn. of Sn.*—If less than 2% of Sn is present, treat 2 g. of metal with 90 ml. of 5 N HNO_3 , evap. to 10 ml., add 40 ml. of hot water, keep warm for 15 min., filter, wash with 2% HNO_3 , ignite and weigh as impure SnO_2 . Fuse with Na_2CO_3 and S in a covered porcelain crucible, leach with water, adding $\text{Na}_2\text{S}_2\text{O}_8$ soln. until the soln. is a pale yellow, filter, wash with dil. Na_2S soln., then with dil. H_2S soln., ignite and weigh. Deduct this wt. from that of the impure SnO_2 . If more than 2% of Sn is present it is better to det. Sn iodometrically. Treat 1 g. of metal with 10 ml. of concd. HNO_3 , evap. to a paste, add 75 ml. of hot water and boil a few min. Filter while hot through asbestos, keeping back as much as possible of the SnO_2 ppt. and wash with hot, very dil. HNO_3 . Transfer the asbestos and ppt. back to the original 250 ml. Erlenmeyer flask in which the sample was dissolved, add concd. H_2SO_4 equal in vol. to the water used in transferring the ppt. (about 20 ml.) and boil vigorously for 3 min. Add 50 ml. of concd. HCl and boil 2 min. longer to dissolve all of the SnO_2 . Add 1 g. of powdered Sb and boil 3 min., remove from the heat, insert a rubber stopper and cool so that NaHCO_3 is sucked into the flask while cooling. Finally unstopper, add a small piece of marble and titrate with 0.05 N I_2 soln.

W. T. H.

Standard methods of analysis of copper-nickel and copper-nickel-zinc alloys.

A. E. LEIGHTON. *Australia Dept. of Defence Munitions Supply Board*, May 1926, 12 pp. — *Detn. of Cu.*—Electrolysis of the HNO_3 soln. is described. The use of the iodide method is optional. *Detn. of Ni.*—Take the filtrate from the Cu detn., add 4 ml. of H_2SO_4 and evap. to fumes. Cool, add 75 ml. of water and sat. with H_2S . Filter, boil off H_2S and electrolyze the soln. after adding NH_4OH and $(\text{NH}_4)_2\text{SO}_4$. If Co is present, dissolve the ppt. and det. Co by the nitroso- β -naphthol method. It is also permissible to det. the Ni by the dimethylglyoxime method without electrolyzing and then in the filtrate the Co can be detd. *Detn. of Si.*—Treat 20 g. of sample with HNO_3 , evap. with HCl and continue in the usual way. *Detn. of S.*—Take the filtrate from the Si detn. and ppt. as BaSO_4 . Care must be taken to prevent outside contamination and Fe should be removed first if it is present. *Detn. of Zn.*—After the removal of Cu, Ni and Co as described above, evap. with HNO_3 and H_2SO_4 and det. the Zn by the ferrocyanide titration, using the indicator described for the analysis of brass. *Detn. of Fe.*—Dissolve 5 g. in 7.5 N HNO_3 , avoiding an excess. Add Br_2 aq. and NH_4OH in slight excess. Heat to boiling and allow to stand for several hrs. Filter, dissolve in hot, dil. HCl , make neutral with Na carbonate and add 3 ml. of 33% AcOH . Boil, filter, ignite and weigh as Fe_2O_3 . *Detn. of Mn.*—Carry out the persulfate method as

in the analysis of brass. *Detn. of graphitic C.*—Treat 10 g. of sample with 300 ml. of 4 $NHNO_3$, filter, burn the residue in a combustion tube, running a blank. *Detn. of As.*—A modified Gutzeit procedure is recommended but an evolution method is permitted as in the analysis of brass. W. T. H.

Electrometric determination of chromic acid in the presence of vanadic acid with the aid of induction and catalysis. E. ZINTL AND P. ZAIMIS. Univ. Freiburg. *Z. Elektrochem.* 34, 714-5(1928).—Lang and Zwerina (*C. A.* 22, 3600) criticised a former paper of Z. and Z. (*C. A.* 22, 556) but some of the grounds for the criticism do not appear to be well-founded. W. T. H.

Acidimetric determination of phosphate. M. HEGEDÜS. *Z. anal. Chem.* 75, 111-20(1928).—If a soln. of a primary phosphate is treated with $AgOAc$, a ppt. of Ag_3PO_4 is formed and after filtering off the ppt. and removing the excess Ag as $AgCl$, the PO_4^{---} can be detd. indirectly by titrating with $NaOH$, phenolphthalein being used as indicator. $H_2PO_4^- + 3Ag^+ \rightarrow Ag_3PO_4 + 2H^+$. Dissolve the phosphate (0.05-0.1 g. of P_2O_5) in a little dil. HNO_3 and boil to decompose any carbonate present, and cool. Dissolve, in the same vol. of water, 0.1 g. of pure KH_2PO_4 . To both solns. add a drop of methyl orange soln. and add 0.1 N $NaOH$ soln. free from carbonate till the color of the first soln. is the same as that of the second. Then, to each soln. add at least 10 cc. of satd. $AgOAc$ soln. for each 0.01 g. of P_2O_5 present. Allow to stand 15 min., filter and wash with cold, CO_2 -free water. Add 2-3 g. of $NaCl$, and 0.5 cc. of phenolphthalein soln.; titrate with 0.1 N $NaOH$, free from carbonate. The method succeeds in the presence of carbonate, chloride, nitrate and sulfate (when not more than 10 times as much of the last-mentioned is present) but is inaccurate in the presence of NH_4 salts, alk. earths and earths. W. T. H.

Detection of pentathionic acid in the presence of sulfurous acid. ADOLF CZERNOTZKY. Techn. Hochschule Brünn. *Z. anorg. allgem. Chem.* 175, 402-4(1928).—The detection of $S_5O_6^{---}$ in aq. soln. is often based upon the fact that it decomposes into $S_4O_6^{---}$ and S in the presence of OH^- . There is, however, no deposition of S when SO_3^{---} is also present. Similarly the test with ammoniacal Ag soln. fails in the presence of sulfite. If, however, $HCHO$ is first added to the soln., the sulfite ion reacts quickly to form $CH_3O.HSO_3^-$ and then the S deposition characteristic of $S_5O_6^{---}$ in alk. soln. can be obtained. About 1 millimol. of $S_5O_6^{---}$ in the presence of 25 times as much SO_3^{---} can be detected in this way. W. T. H.

Notes on the determination of polythionates. E. H. RIESENFELD AND G. SYDOW. *Z. anorg. allgem. Chem.* 175, 74-9(1928).—If 1 g. of trithionate is treated with 30 cc. of 10% $CuCl_2$, 100 cc. of 10% $BaCl_2$ and 20 cc. of 6 N HCl and the mixt. is boiled 1 hr., all of the S will be obtained as $BaSO_4$. This test succeeds in the presence of tetrathionate, thiosulfate and sulfite. The reaction is noteworthy inasmuch as CuS and SO_4^{---} are said to be formed in the absence of Ba^{++} . When Ba is present, the reaction can be represented by the equation: $S_3O_6^{---} + 8Cu^{++} + 6H_2O \rightarrow 3SO_4^{---} + 8Cu^+ + 12H^+$. The di-, tri- and tetrathionates can be oxidized to sulfate by the action of a stronger oxidizer such as I_2 . To make the reaction go quantitatively it is best to heat in a sealed tube at 100° for an hr. Then the excess I_2 can be titrated with thiosulfate after adding acid. W. T. H.

Quantitative separations and determinations by volatilization with hydrogen chloride gas. VII. Separation and determination of the constituents of tungstates. GERHART JANDER AND DIETRICH MOJERT. Univ. Göttingen. *Z. anorg. allgem. Chem.* 175, 270-6(1928); cf. *C. A.* 22, 4080.—By heating $Na_2WO_4 \cdot 2H_2O$, $BaWO_4$ and $Na_{10}W_{12}O_{41} \cdot 28H_2O$ to about 600° in a stream of HCl contg. a little $CHCl_3$, all of the W can be easily volatilized and condensed in dil. HCl . The weight of the residual chloride corresponds to that of the Na or Ba present and in the distillate the W can be detd. by evapg. with HNO_3 , dissolving the residue in NH_4OH , filtering and pptg. with $HgNO_3$. W. T. H.

Use of liquid amalgams in volumetric analysis. XI. Determination of phosphoric acid using zinc or cadmium amalgam. KIN'CHI SOMEYA. Tôhoku Imp. Univ. *Z. anorg. allgem. Chem.* 175, 347-56(1928).—The method recommended is the same as the Blair method for the detn. of P in steel, except that the yellow phosphomolybdate ppt. is dissolved in dil. NH_4OH , the soln. is concd. into a small vol. and reduced by treatment with 200-300 g. of liquid amalgam, 5-10 cc. of 18 N H_2SO_4 and 50 cc. of water. The reduction of MoO_4^{---} to Mo^{+++} is complete in an atm. of CO_2 and the Mo^{+++} is oxidized back to MoO_4^{---} by $KMnO_4$. Cf. *C. A.* 22, 2122. W. T. H.

Standard methods of examination of mineral jelly. A. E. LEIGHTON. Australia Dept. of Defence Munitions Supply Board, May 1926, 8 pp.—Acidity or alkalinity.—Treat 10 g. of jelly with 100 ml. of hot water and shake until the jelly solidifies. Test

the aq. ext. with methyl orange. If alk., titrate with 0.01 *N* HCl, running a blank test at the same time and reporting the alk. in terms of Na_2CO_3 . Test a similar aq. ext. in the same way with phenolphthalein. If it is not alk. to this indicator, titrate with 0.01 *N* $\text{Ba}(\text{OH})_2$ soln., expressing the results in terms of H_2SO_4 . **Acidity.**—Melt about 11 g. of the jelly and, while still liquid, treat with 100 ml. of ether. Add 2 ml. of phenolphthalein indicator soln. and 100 ml. of abs. alc. Allow to stand overnight and titrate 101 ml. with 0.05 *N* KOH. Run a blank at the same time. **Saponifiable matter.**—Boil 10 g. of sample with 25 cc. of benzene and 25 ml. of 0.1 *N* KOH in abs. alc. under a reflux condenser. Cool, add 50 ml. of abs. alc. and titrate with 0.1 *N* HCl using phenolphthalein. **Suspended matter and solid mineral matter.**—To 10 g. of molten jelly, add 100 ml. of ether and shake in a 250 ml. bottle till the jelly has all dissolved. **Filter.**—If the sample is for the manuf. of cordite, wash the paper with ether, ignite and weigh. **Mineral matter.**—Carefully ignite 20 g. of sample, weigh the residue, calc. the % of ash and exam. it for grit on a glass slide with a glass spatula or rod. **Volatile matter.**—According to the specifications under which the jelly is purchased, det. the loss in wt. after heating 12 hrs. on the boiling water bath, by heating to const. wt. on the water bath, or by heating 6 hrs. at 100°, finally cooling in a desiccator in all cases. **Water.**—Soak sheets of filter paper in 2% $\text{K}_3\text{Fe}(\text{CN})_6$ soln., dry thoroughly and keep in a desiccator. When required for use, dust finely powdered copperas over the surface of the paper and shake off the excess. Place 50 g. of sample in a tall 100 ml. beaker, cover with a freshly dusted filter paper and heat on a hot plate to about 110°. The development of a blue color indicates the presence of moisture in the sample. **Melting point.**—Dip the standard thermometer, reading to tenths of a degree, into the melted fat so that on withdrawal a drop of fat is left hanging to the bulb. Place the thermometer in a test tube and clamp in an upright position. Place the test tube in a beaker of water and allow to stand 24 hrs. Then slowly raise the temp. of the water and note the temp. at which the drop falls off. The reading of the thermometer should be corrected for stem exposure. **Dropping point.**—Directions are given for using the Ubbelohde app. **Reactivity test.**—From a self-filling buret take 15 ml. of CCl_4 soln. contg. 0.16 g. of Br, add 20 ml. of 10% KI soln. and 40 ml. of water. Shake well, allow to stand 1 min. and titrate with 0.1 *N* thiosulfate soln., adding starch indicator toward the last. Melt 1 g. of jelly on the water bath and add 10 ml. of CCl_4 , stirring and heating till the jelly is all dissolved. Transfer to a tap tube to which has been added 1 ml. of CCl_4 to fill the capillary at the bottom of the tube. Rinse the contents of the beaker contg. the jelly into the tap tube using small quantities of CCl_4 to effect the transfer. The final vol. should be about 50 ml. Heat the contents of the tap tube for 15 mins. in a water bath at 20°, remove the tube from the bath and add Br-CCl_4 as in the preliminary expt. Shake gently, replace stopper in the tube, and in the covered water bath allow the tube to remain 1 hr. in the dark. Add 20 ml. of KI soln. and 40 ml. of water. After 1 min. titrate with thiosulfate. Express the reactivity in terms of mg. of Br per g. of jelly. **Flash point.**—The Pensky-Martens app. should be used as recommended by the Institution of Petroleum Technologists. **Sp. gr. at 100° F.**—Weigh a dry bob in air, then in water, then in air with a mineral jelly coating and then in water again with this coating. **Detn. of Pb.**—Ignite 20 g. of jelly and, if the ash is greater than the permitted Pb content, digest it with aqua regia, add HCl, evap., dil. with hot water, neutralize with NH_4OH , make acid with AcOH , dil. to 150 ml. and add some K_2CrO_4 soln. Filter and wash with hot water. Dissolve the Pb-CrO_4 ppt. in hot, dil. NaOH soln., dil. to 100 ml., neutralize with 6 *N* H_2SO_4 and add 25 ml. in excess. Add 0.5 g. of KI, allow to stand 15 min. in the dark and titrate with $\text{Na}_2\text{S}_2\text{O}_3$. W. T. H.

Determination of iron carbonyl. R. H. GRIFFITH AND G. C. HOLLIDAY. *J. Soc. Chem. Ind.* 47, 311–12T (1928).—In the manuf. of methanol from CO and H_2 in the presence of Fe, there is the possibility of some Fe carbonyl being formed, the ultimate decompn. of which may affect the catalyst. It was, therefore, desirable to develop a method for the detn. of Fe carbonyl in gases. By washing the gas with dil. H_2SO_4 , the carbonyl is decompd. and by evapn. of the acid to dryness a sulfate of Fe is obtained. By dissolving the residue in water, this Fe can be detd. by a color density method based on the Prussian blue reaction. The method is so sensitive that it will serve to detect very small quantities of carbonyl and will show the presence of Fe in most reagents. W. T. H.

Determining total solids of certain liquids. H. H. KRAUSE. *Chemist-Analyst* 17, No. 4, 14 (1928).—The method described is that used in a rubber lab. for the detn. of total solids in latex. W. T. H.

The Jaffe picric acid reaction. W. WEISE AND C. TROPP. *Inst. Schiff. u. Tropen-*

krankheiten, Hamburg. *Z. physiol. Chem.* 178, 125-38(1928).—The Jaffe picric acid reaction for creatinine (red color in alk. soln.) is the special case of a general reaction for substances with active methylene or methine groups. It differs from the Braun reaction for glucose and other reducing substances which partially reduce picric to picramic acid in that heat is not required to bring about the color change. To perform the reaction under standard conditions, prep. the reagent by adding 5 cc. of 10% NaOH to 10 cc. of a satd. aq. picric acid soln. and dilg. to 25 cc. To 5 cc. of this reagent add 20-50 mg. of the substance to be tested, shake the mixt. and compare the color with that of the reagent itself. If a distinct red color develops in 3 min. the reaction is considered pos. When the reaction is neg., on account of insoly. of the substance, add an equal vol. of EtOH and observe the color again after 3 min. Some 75 substances were subjected to this color test. The following typical examples illustrate the structures required for a positive reaction:

Positive reaction	Negative reaction
Acetaldehyde	Benzaldehyde
Acetone	Benzophenone
Diacetyl	Benzoin
Cyclohexanone	<i>d</i> -Camphor
Phenylacetamide	Acetamide
Malonamide	Oxamide
Hydantoin	5,5-Ethylphenylhydantoin
Barbituric acid	Parabanic acid
Ethyl phenylacetate	Ethyl acetate
Ethyl malonate	Ethyl oxalate
<i>p</i> -Allylanisole	Styrene
Indene	Diphenylmethane
Benzyl cyanide	Acetonitrile
Nitromethane	
Diazomethane	

The activation of methylene or methine by other groups occurs in the order: diazo, nitro > carbonyl > cyano > vinylene > carbaminyll > carbethoxyl. A. W. DOX

Some recent determinations of aspartic and glutamic acids in various proteins. D. BREESE JONES AND OTTO MOELLER. Bureau of Chem. and Soils, Wash. *J. Biol. Chem.* 79, 429-41(1928).—The aspartic and glutamic acid contents of a no. of typical proteins were detd. and compared with the values obtained by the older ester method. The older results are too low in almost all cases recorded in the literature, particularly those recorded for aspartic acid.

ARTHUR GROLLMAN

Micro-identification of isomers and homologs in their mixture. I. Three isomeric xylenes. MASAO MIGITA. Tokyo Imperial Univ. *Bull. Chem. Soc. Japan* 3, 191-9(1928).—*m*-Xylene and *p*-xylene, even in minute quantity, are successfully identified as their trinitro derivs., by their color reaction toward alkali in alc. or Me₂CO soln., or by the optical properties of their crystals. *o*-Xylene is identified microscopically as Na sulfonate, but in a mixt. very poor in *o*-xylene, a result of high sensitivity cannot be expected of this method. The technical method of sepg. *p*-xylene from its isomers by means of concd. H₂SO₄ is of little value.

A. L. HENNE

Lehmann's method of determining aniline. A. V. PAMFILOV AND V. F. KISSELEVA. *Z. anal. Chem.* 75, 87-92(1928).—L.'s method consists in absorbing aniline from air by passing it through 10% H₂SO₄, subsequently neutralizing the greater part of the excess acid and titrating with standard NaBrO soln. Apparently L., in his study of the method, added an excess of NaBrO and detd. the excess by adding KI and titrating with Na₂S₂O₃. It is here shown that direct titration of the aniline with Br in KBr soln. or with KBrO₃ soln. using indigocarmine as indicator is much more convenient. Or, better still, the end point can be detd. potentiometrically. L.'s method in its original form can be used for the detn. of small quantities of aniline if 1-2 g. of KBr is added together with the NaBrO and the soln. is allowed to stand a little while after the addition of iodide. The analysis should also be carried out in a flask with glass stopper and preferably a liquid seal.

W. T. H.

Rapid volumetric determination of glucose. CHESTER A. AMICK. *Chemist-Analyst* 17, No. 4, 10-11(1928).—Dil. 30 cc. of 2 N CuSO₄ soln. with 50 cc. of water and heat to boiling in a 250-cc. Erlenmeyer flask. Add 10 cc. of the glucose soln. and 10 cc. of 6 N NaOH soln. (free from carbonate). Heat on the water bath for 15 min., then cool in ice water to room temp. Add to the cooled soln. 50 cc. of phosphomolybdate soln. prepd. by adding dissolving 100 g. of Na₂MoO₄ in 500 cc. of water and adding

75 cc. of 85% H_3PO_4 , 275 cc. of concd. H_2SO_4 , and enough water to make 1750 cc. The clear phosphomolybdate soln. is reduced to green Mo^{+++} by the glucose and the Mo^{+++} which can be titrated back to MoO_4^{--} by KMnO_4 standardized against pure glucose which has been subjected to the above treatment. W. T. H.

Detection and estimation of sucrose by the ammonium molybdate method. NORRIS W. MATTHEWS. *Chemist-Analyst* 17, No. 4, 8(1928).—See C. A. 22, 3312.

The determination of sucrose by the use of alkaline iodine solution. G. BORRIES. German Board of Health Lab., Berlin. *Z. Untersuch. Lebensm.* 5, 405-15(1928).—By KI , soln. in the presence of OH^- glucose and other aldoses are oxidized to glycolic acid. By back-titration of the unused I , the aldoses can be detd. Methods of estn. of sucrose after inversion and also for the detn. of sucrose in the presence of invert sugar are given. Numerous data show a remarkable concordance of the results. C. R. FELLERS

Detection of traces of lead in organic substances. RAGNAR BERG. Stadtkrankenhaus Friedrichstadt, Dresden. *Biochem. Z.* 198, 420-3(1928).—After digestion with H_2SO_4 as in the Kjeldahl method, transfer the soln. to a Pt dish, evap. off the excess acid, add 4% HNO_3 and electrolyze in a small Pt crucible. Dissolve the deposited PbO_2 in 4-5 cc. of 20% HCl , rinsing off the cathode with 3 cc. portions of 4% NaOAc . Conc. the soln. and test for Pb by Fairhall's method. S. MORGULIS

Reactions of dyestuffs with nitrous acid. J. V. DUBSKÝ AND A. OKÁC. *Z. anal. Chem.* 75, 92-111(1928); cf. C. A. 22, 1929.—Studies with over 100 dyestuffs from 13 different mfrs. show that the sp. diazotization and coupling reaction can be used for the identification of HNO_2 with many dyes which are capable of undergoing further diazotization. These dyes serve to detect HNO_2 in concs. of 10^{-4} - 10^{-7} . On diazotizing the color, except in the case of the safranines, becomes lighter but on coupling a darker shade develops. In the coupling reaction, the α -compds. with free p -positions are more favorable from the analytical point of view than the p -compds. with free o -positions because the former react more rapidly and give much deeper shades. W. T. H.

Standard methods of analysis of flux soldering (commercial oleic acid). A. E. LEIGHTON. Australia Dept. of Defence Munitions Supply Board, May 1926, 1 p.—*Detn. of free fatty acids*.—Dissolve 5 g. in 50 ml. of alc., add a few drops of phenolphthalein and titrate hot with N NaOH . *Detn. of mineral acidity*.—Shake 20 g. of sample with 100 ml. of water at 60-70°. Sep. the 2 layers and shake again with a further 50 ml. of water. Titrate the combined aq. exts. with 0.1 N NaOH , using methyl orange as indicator. *Detn. of water-soluble organic acidity*.—Prep. an aq. ext. as above, filter and titrate with phenolphthalein as indicator. From the vol. used, deduct a vol. that corresponds to the mineral acid content. W. T. H.

Experiments on Fe (KNOWLTON) 9.

8—MINERALOGICAL AND GEOLOGICAL CHEMISTRY

EDGAR T. WHERRY AND J. F. SCHAIRER

Eleventh list of new mineral names. L. J. SPENCER. *Mineralog. Mag.* 21, 556-82(1928); cf. C. A. 20, 161.—The first list of new mineral names by S. appeared in 1897 and subsequent lists about every 3 years. In the first 10 lists, 1500 names are included, in the 11th, 190. W. F. HUNT

Determination of the optic angle and crystal forms from observations by the Becke method in thin sections. HARVEY COLLINGRIDGE. *Mineralog. Mag.* 21, 552-5(1928).—Observations on different sections showing the trace of the optic axial plane, the position of one optic axis, the extinction direction, and the traces of cleavage are brought together in one stereographic diagram. From the data thus collected the crystal is reconstructed. Olivine is used as an illustration. W. F. HUNT

Studies on the solubilities of carbonate minerals and carbonates in carbonic acid solutions. RAGNAR LYDÉN. *Finska Kemistsamfundets Medd.* 34, 72-9(1925).—Solubilities were detd. by passing CO_2 through H_2O in contact with the solid for 24-36 hrs. Five hundred cc. of the clear soln. were then evapd. on a tared watch glass and the residue was analyzed. Dolomite (Soanlaks Kintsinniemi) with the compn. insol. 0.66, Fe_2O_3 + Al_2O_3 0.18, MnO 0.45, CaO 30.83, MgO 20.68, and CO_2 47.34% gave 0.362 g. dry matter per 500 cc. soln. The ratio $\text{CaCO}_3:\text{MgCO}_3$ in the original was 1:0.7859.

and in the soln. 1:0.7696. Siderite (unknown origin) of the compn. insol. 3.74, FeO 46.40, MnO 7.94, CaO 1.98, MgO 2.83, and CO₂ 87.54% gave 0.0632 g. per 500 cc. The ratio FeCO₃:MnCO₃:CaCO₃:MgCO₃ in the original was 1:0.172:0.047:0.079 and in the soln. 1:0.148:0.239:0.172. Magnesite (Baumgarten, Silesia) of the compn. insol. 3.26, CaO 15.92, MgO 31.11, and CO₂ + H₂O 50.57% was mixed with 52% of its wt. of calcite (unknown origin) of the compn. insol. 1.28, Fe₂O₃ + Al₂O₃ 0.46, CaO 54.06, MgO 1.02, and CO₂ 43.90%. The soln. contained 0.4872 g. dry matter per 500 cc. The ratio CaCO₃:MgCO₃ in the original was 1:0.8416 and in the soln. 1:0.0396. Rhodochrosite (unknown origin) of the compn. MnO 61.57 and CO₂ 38.19% gave 0.0127 g. Mn₂O₄ per 500 cc. soln., a value 6 times smaller than usually given in the literature. Magnesite (Snarum, Norway) of the compn. insol. 4.51, Fe₂O₃ 1.63, CaO 4.78, MgO 41.35, and CO₂ 48.03 gave 0.0338 g. per 500 cc. The ratio CaCO₃:MgCO₃ in the original was 1:10.14 and in the soln. 1:4.03. A mixt. of 3 g. dolomite and 1 g. basic MgCO₃ (Kahlbaum) gave 0.3609 g. dry matter per 500 cc. HANS C. DUUS

The optical orientation of labradorite from County Down, Ireland, determined by the Fedorov method. W. CAMPBELL SMITH. *Mineralog. Mag.* 21, 543-51 (1928).—Labradorite of exceptional purity occurring in basaltic dikes was studied. Chem. analysis and *ns.* had previously been detd. It is + with 2 V = 82°, and the max. extinction angle in zone perpendicular to (010) averaged 36° for 5 crystals, corresponding to 61½% An. Of the 15 crystals examd. one shows albite, Carlsbad and pericline twinning; 4 show albite and pericline; 4 albite-Carlsbad; and 6 albite alone.

W. F. HUNT

Genesis of Burman jadeite. A. LACROIX. *Compt. rend.* 187, 489-93 (1928).—A study of the genesis of jadeite, or more properly *jadeitite*, was made from material collected among the lapidaries and jade merchants of China and Upper Burma. Ten analyses are reported including albitite, albitic jadeitite, jadeitite (theoretical), jadeitite with nepheline, amphibolic jadeitite, amphibolite with tawmawite, lamellar szechenyite, acicular szechenyite and tawmawite. This series shows a general loss in SiO₂, Na₂O and K₂O, and a gain in Fe₂O₃, FeO, MgO, CaO and H₂O. The compn. of jadeitite (3rd in above list) is: SiO₂ 58.48, Al₂O₃ 23.57, Fe₂O₃ 1.68, MgO 1.33, CaO 1.62, Na₂O 10.33, K₂O 3.09, H₂O + 0.16, sum 100.26%. L. W. RIGGS

Moldavites or vltavines from Bohemia and Moravia. FRANTIŠEK HANUŠ. *Rozpravy České Akad. Class 2*, 37, No. 24, 83 pp. (1928); *Mineralog. Abstracts* 3, 537.—It is suggested that moldavites were derived from a single meteoric mass. The air pressure opposing a velocity of 1.5-2 km. per second would be sufficient to cause the sepn. of molten drops (m. 1300-1500°). Two unpublished analyses of moldavites are given.

J. F. SCHAIERER

Italian mines. CARLO PARNISARI. *Notiz. chim. ind.* 3, 275-7, 352-4 (1928); cf. *Notiz. chim. ind.* 3, 134 (1928).—An illustrated description of deposits of various minerals on the Island of Elba, in Tuscany, Sicily, Emilia and central and southern Italy.

C. C. DAVIS

Microscopic examination of the magnesite deposit of Kraubath in Steiermark. E. CLAR. *Z. prakt. Geol.* 36, 97-102 (1928).—A description of the crystn. of the magnesite and its assocd. minerals is given, with a discussion of genesis. The part played by colloidal solns. is noted.

W. H. NEWHOUSE

The gold occurrence of the Pitanguy district in eastern Minas Geraes, Brazil. T. KNECHT. *Z. prakt. Geol.* 36, 7-11 (1928).—The Au occurs in quartz veins in pre-Cambrian schists. Free Au in a finely divided state is found particularly in the oxidation zone with Fe oxides, while the unoxidized ore shows pyrite and arsenopyrite, with Au content.

W. H. NEWHOUSE

Bornite occurrence of Saint-Veran. C. E. WEGMANN. *Z. prakt. Geol.* 36, 19-28 (1928).—The ore masses occur at the contact of serpentine-gabbro masses and schists. Glaucophane is assocd. with the ore, which is composed of bornite, chalcocite and chalcopyrite, with hematite and magnetite also present.

W. H. NEWHOUSE

The zinc vein of Gidrevet, south of Batum, Caucasus. C. KUZNIAR. *Z. prakt. Geol.* 36, 65-7 (1928).—The minerals present are sphalerite, chalcopyrite, galena, and pyrite, with much quartz and some siderite. Adjacent andesite is impregnated by pyrite and strongly propylitized.

W. H. NEWHOUSE

The platinum deposits of the Republic of Colombia. G. J. KELLNER. *Z. prakt. Geol.* 36, 1-7 (1928).—The history and geography are described. These alluvial deposits show many of the common black sand minerals.

W. H. NEWHOUSE

Manitoba as a mining province. A. H. A. ROBINSON. *Can. Dept. Mines, Mines Branch No.* 687, 31-5 (1928).—An extensive plant is being constructed at Flin Flon for

the handling of low-grade Cu ores carrying small quantities of Au and Ag. If this is successful, other extensive deposits in Manitoba will be exploited. L. W. RIGGS

Quicksilver occurrences in Canada. V. L. EARDLEY-WILMOT. *Can. Dept. Mines, Mines Branch No. 687*, 53-7(1928).—The Kamloops Lake deposits of Hg in British Columbia are of too low grade to be profitably mined, the output shipped in 1926-1927 being only 6 flasks. Other occurrences are reported in B. C. and in Ont. but the production is as yet unimportant. Occurrences, metallurgy and uses of mercury. *Ibid* 58-63.—At present the world demand for Hg is steadily increasing, while several of the largest known deposits are approaching exhaustion. L. W. RIGGS

Sodium carbonate at Soap Lake, B. C. L. H. COLE. *Can. Dept. Mines, Mines Branch No. 687*, 25-7(1928).—Soap Lake is situated about 7 miles by pack trail to the south of Spence's Bridge on the Can. Pacific Railway and 2000 ft. above the railway. This lake is about 1 mile long and 1300 ft. wide in its widest part, but varies in size with the dryness of the season. When low, the shore is covered with white salts about 1 in. in depth. Analysis of the brine gave in p. p. m.: K none, Na 60018, Mg 169, Cl 2439, SO₄ 5900, HCO₃ 10697, CO₃ 67700, sum 146923. The profitable recovery of these salts depends on overcoming the difficulties in transportation to the railway. L. W. R.

Lithium minerals in southeastern Manitoba. HUGH S. SPENCE. *Can. Dept. Mines, Mines Branch No. 687*, 12-8(1928).—Li-bearing minerals were found in several localities 80 to 90 miles northeast of Winnipeg. A deposit near Pointe du Bois, in which the *spodumene* and *lepidolite* contained about 4% of Li₂O, has been slightly developed and shows favorable possibilities. In the samples tested, the *spodumene* appears to be sufficiently free from Fe and Mn to allow its use in glass manuf. The *lepidolite*, on the other hand, contained too much Fe and Mn for such use. Sufficient work has not been done to warrant an est. of the size of this deposit. In Township 16, R. 15, east of the Principal Meridian a deposit of *fuchsite* or Cr-mica was found. Analyses of 2 samples gave widely varying quantities of Cr, Si, Al and K. This mineral has been used for decorative purposes as stucco dash. L. W. RIGGS

Recent developments in the gypsum industry in British Columbia. L. H. COLE. *Can. Dept. Mines, Mines Branch No. 687*, 28-30(1928).—During 1926 the production of gypsum at Falkland and Mayook, B. C. was over 20,000 tons as compared with a yearly av. of about 150 tons for the preceding 5 years. The gypsum is used in making wall plaster, wall board and in the cement industry. An export market to Australia, New Zealand and Japan is rapidly developing. L. W. RIGGS

Proposed nomenclature and graphic representation of limestones according to their chemical composition. HERMANN HEINRICHS. *Glaserh. Ber.* 5, 597-601(1928).—H. divides limestones into 5 classes according to the CaCO₃, MgCO₃, and Al₂O₃ content. E. VALDEN

Limestones of Nova Scotia and New Brunswick. M. F. GOUDGE. *Can. Dept. Mines, Mines Branch No. 687*, 36-47(1928).—Analyses of samples collected in this survey will be given in a final report. The limestones of com. importance are of Precambrian or Carboniferous age. The George River Precambrian limestones of Nova Scotia are variable in their Ca-Mg ratio, the Mg ranging from 9 to 44%. The deposits of Carboniferous limestone in a dozen counties are briefly described. In 4 out of 5 analyses the Ca-Mg ratios were quite close. The Precambrian limestones of New Brunswick show varying Ca-Mg ratios similar to those of Nova Scotia. These limestones are burned for CaO and are ground for agricultural purposes. The Carboniferous limestones of New Brunswick are used only for agricultural purposes. **Limestones of the Gaspé Peninsula.** *Ibid* 48-9.—These are high Ca limestones and are used in agriculture and in the wood pulp industry. **Limestones of the Timiskaming District.** *Ibid* 50-2.—The Ordovician and Silurian limestones of this region are described. They are suitable for building stone and for the production of CaO. L. W. R.

An unusual fluor spar deposit. MARTIN SCHWERIN. *Eng. Mining J.* 126, 335-9 (1928).—A description of a bedded deposit of fluor spar at Elizabethtown, Ill. Fluor spar commonly occurs in vertical veins, and this horizontal deposit affords an unusually economical production. A. L. HENNE

The Canadian soapstone industry. HUGH S. SPENCE. *Can. Dept. Mines, Mines Branch No. 687*, 19-24(1928).—Canadian production of soapstone has increased from 167 tons in 1922 to 1411 tons in 1927, the remaining Canadian requirements of soapstone being imported from the U. S. and Scandinavia. There appears no reason why the entire market in eastern Canada should not be supplied with Canadian soapstone. L. W. RIGGS

Feldspar in the Sudbury region, Ontario. HUGH S. SPENCE. *Can. Dept. Mines, Mines Branch No. 687*, 7(1928).—The ore consists of a somewhat intimate mixt. of

quartz, feldspar and mica, so the mine product after sorting is crushed and passed on a picking belt. L. W. RIGGS

Asbestos industry in Canada. E. H. FREEMAN. *Can. Dept. Mines, Mines Branch No. 687, 69-79(1928)*.—In 1925 Canada produced 80.6% of the world supply of asbestos. The occurrences and methods of mining and milling are described. Of Canada's asbestos export, the U. S. takes 66%. In the production of spinning varieties Rhodesia leads with an output about double that of Canada. The poorer grades of asbestos rock, which in Africa or Russia are discarded, in Canada are manufactured into a non-spinning fiber for use in shingles, mill boards and cement. L. W. RIGGS

Asbestos in northern Ontario. HUGH S. SPENCE. *Can. Dept. Mines, Mines Branch No. 687, 6(1928)*.—A mine in Deloro township has been worked at intervals during the past 5 years. It yields a high quality of asbestos of similar compn. to that of the Quebec product, but the returns were not sufficient to warrant continuance of working. L. W. RIGGS

Graphite in Ontario and Quebec. HUGH S. SPENCE. *Can. Dept. Mines, Mines Branch No. 687, 8-11(1928)*.—Only 2 graphite mines and mills were in operation in 1926, one near Calabogie, Ont. and the other near Guenette, Que. Flow sheets of both mills are shown. Milling methods have recently been improved by the introduction of flotation methods. L. W. RIGGS

Anthraxolite near Sudbury, Ontario. HUGH S. SPENCE. *Can. Dept. Mines, Mines Branch No. 687, 5(1928)*.—The run of mine material contained 35% ash. The quantity of anthraxolite in sight is limited. L. W. RIGGS

Geology and lignite resources of the Marmarth field, southwestern North Dakota. C. J. HARES. U. S. Geol. Survey, *Bull. 775, 110 pp.(1928)*.—The geography, stratigraphy and structure are described. Analyses of 12 samples from this and 4 from adjoining fields are tabulated. These lignites are quite uniform in heating value, the B.t.u. of air-dried samples ranging from 8600 to 9970. This field also contains large quantities of fused or baked rocks formed during the burning of lignite beds. This porcellanite makes good track ballast, but is rather soft for highways carrying a heavy traffic. L. W. RIGGS

The Pumpkin Buttes Coal Field, Wyoming. C. H. WEGEMANN, R. W. HOWELL AND C. E. DOBBIN. U. S. Geol. Survey, *Bull. 806-A, 1-14(1928)*.—Extensive deposits of bituminous coal occur in this region, but will not be developed at present because of other deposits nearer the railroad. L. W. RIGGS

Supplementary observations on fossil rubber bark in ancient brown coal. W. F. OTHAN. *Centr. Min. Geol. 1927A, 209-11; Chem. Zentr. 1927, 11, 800; cf. C. A. 22, 933*.—From the Leonhardt mine at Frankleben, Germany, large pieces of fossil rubber bark were obtained, which showed clearly the paths of larvae of beetles. G. SCHWACH

Lavas of the Volcano Sumaco, Eastern Ecuador, South America. R. J. COLONY AND JOSEPH H. SINCLAIR. Columbia Univ. *Am. J. Sci. 16, 209-312(1928)*.—Lavas from different parts of the crater and slopes of the volcano are described petrographically with the aid of 3 photomicrographs of thin sections. Chem. analyses by Ledoux and Co. of 3 andesitic tephrites and 1 vitrophyric tephrite are reported. One of the andesitic tephrites from the rim of the crater gave: SiO_2 52.88, Al_2O_3 18.96, Fe_2O_3 2.92, FeO 2.88, MgO 2.22, CaO 6.40, Na_2O 5.09, K_2O 4.05, H_2O^+ 1.33, H_2O^- 0.85, TiO_2 0.68, P_2O_5 0.42, SO_3 0.01, MnO 0.13, BaO 0.42, sum 99.24%. The vitrophyric tephrite from the slope of the volcano differed from the other 3 samples in having lower SiO_2 and higher CaO , MgO and combined Fe oxides. L. W. RIGGS

The age and composition of the Whin Sill and the related dikes of the north of England. ARTHUR HOLMES AND H. F. HARWOOD. *Mineralog. Mag. 21, 493-542(1928)*.—The age of the Whin Sill and its assocd. dikes is post-Westphalian and the rocks may be divided into 2 sharply defined types. The Whin Sill proper and dikes running north of east are quartz dolerites. Chem. analyses reveal quite similar compns. Dikes of another series running north of west consist of tholeiites. The calcd. mineral compn. of the Whin Sill showed: quartz 6.76, alk. feldspars, Al_{10}O_3 4.45, plagioclase, $\text{An}_{46}\text{Ab}_{54}\text{Or}_{10}$ 40.40, pyroxenes 36.76, ores 8.90, apatite 0.67, calcite 0.70%. W. F. H.

Production of trachyte and phonolite from pyroxene andesitic magma associated with limestone. H. A. BROUWER. *J. Geol. 36, 545-8(1928)*.—Trachyte and phonolite were formed from andesitic magma in contact with a large xenolith of limestone. This observation is believed significant because of its bearing on the question of assimilation in the production of alk. magmas. W. F. HUNT

Halite and glauberite cavities in the Triassic rocks of central New Jersey. ALFRED C. HAWKINS. Rutgers Univ. *Am. J. Sci. 16, 361-2(1928)*.—These cavities were

observed in the red shales of the lower part of the Triassic near New Brunswick, N. J. Hopper-shaped halites had not previously been observed in the Triassic. The glauberites are more or less filled with calcite and barite. L. W. RIGGS

Oolites of artificial origin. W. H. TWENHOVEL. *J. Geol.* 36, 564-8(1928).—The calcite oolites described were formed in a hot water coil of a furnace. Each grain possesses a concentric structure and a nucleus of Fe oxide. The pptn. was brought about by liberation of CO₂ due to the heating of the water. W. F. HUNT

Bibliography of North American geology for 1925 and 1926. JOHN M. NICKLES. U. S. Geol. Survey Bull. 802, 286 pp.(1928). L. W. RIGGS

A new heating centrifugal [for separating minerals] (HÜTTER) 1. Ground water carriers of the lower Elbe region (KOCH) 14. A new rock and a new rhythmic process in rock. Rhythmic ring formation (STORZ) 2.

SCRIVENOR, J. B.: *The Geology of Malayan Ore Deposits*. London: Macmillan & Co. 216 pp.; 16 s. Reviewed in *Bull. Imp. Inst.* 26, 404-5(1928).

9—METALLURGY AND METALLOGRAPHY

D. J. DEMOREST, R. H. ABORN

Report of investigations: hydrometallurgical laboratory. R. J. TRAILL. *Can. Dept. Mines, Mines Branch No. 688*, 95-6(1928); cf. *C. A.* 21, 724.—The tests on ilmenite were completed and show that by obtaining a high metallization in the sponge process a very high-grade TiO₂ concentrate can be made, which is low in Fe and therefore better for pigment or other purposes. Further studies were made on the electrodeposition of Fe and on the recovery of Cu from chalcopyrite leach liquors. L. W. RIGGS

Aircraft metallurgy. HORACE C. KNERR. *Trans. Am. Soc. Steel Treating* 13, 723-52(1928).—An outline of the metallurgy of aircraft manuf. including specifications, mech. properties and processes for machining, forming, riveting, welding, brazing, foundry practise and corrosion prevention. W. A. MUDGE

Metallurgy and the aircraft engine. HENRY FISHBECK. Pratt & Whitney Aircraft Co. *Heat Treating and Forging*, 14, 1023-5(1928).—A brief review of the functioning of a metallurgical lab. in the operations of an aircraft motor company, the material inspection, heat treatment, and the ferrous and non-ferrous alloys used being discussed. J. BALOZIAN

Copper in 1926 (general report). C. E. JULIHN AND HELENA M. MEYER. U. S. Bur. Mines, *Mineral Resources of the U. S.* 1926, Pt. I, 559-615(preprint No. 23, published October 8, 1928). E. H.

Gold, silver, copper, lead and zinc in the eastern states in 1927. J. P. DUNLOP. U. S. Bur. Mines, *Mineral Resources of the U. S.* 1927, Pt. I, 1-6(preprint No. 1, published Oct. 2, 1928). E. H.

Consumption of primary or virgin tin in the United States, 1927. J. B. UMHAU. *Bur. Mines, Circ.* 6084, 2 pp.(1928). E. H.

The mining and smelting industry of Peru and its future. AD. DITTMANN. *Metal. Ers* 25, 225-38(1928).—A brief description of the metal resources and mining developments in Peru, especially the Cerro de Pasco Mining Corp. and Northern Peruvian Mining and Smelting Co. J. BALOZIAN

Ore from the J and L mine near Revelstoke, B. C. J. S. GODARD. *Can. Dept. Mines, Mines Branch No. 688*, 13-5(1928).—The ore is complex and consists principally of As, Zn, Pb and Fe sulfides with smaller quantities of Cu and Sb sulfides. The Au is assoc. chiefly with arsenopyrite and pyrite, and the Ag with galena. The gang is siliceous. Extn. by cyanidation was unsuccessful. A rough sepn. was obtained by selective flotation. Tabling of the flotation tailing was effective largely on account of the poor results in the flotation of the As. With improvement in the flotation of As, this step might be omitted. Arsenical gold ore from Mount Evelyn mines, Hudson Bay mountains, D. C. *Ibid* 16-27.—The sample was an oxidized arsenical gold ore in siliceous gang. Tests by concn., amalgamation, and cyanidation with or without roasting were unsatisfactory. Sizing, tabling, flotation and tabling; or sizing, tabling, flotation and cyanidation, or flotation, tabling and cyanidation gave the best recoveries. Concentration of the zinc and copper-zinc ores of the Alderson and Mackay mine, Rouyn, Quebec. *Ibid* 41-4.—The first type of ore consisted of Zn blende disseminated in a siliceous gang. By flotation this ore gave a concentrate with more than 45% Zn

and a recovery of over 90%. The second type was a heavy sulfide ore contg. 7.36% Cu and 6.53% Zn with small quantities of Au and Ag mainly associated with chalcopyrite. Good recoveries of the Zn, Cu, Au and Ag were obtained by selective flotation. Gold ore from the Gold Hill mines, Boston Creek, Ontario. *Ibid* 46-9.—A combination of 2 samples gave an ore contg. 2.3 oz. Au per ton in a siliceous gang with small quantities of Pb and Cu. Cyanidation was not practical because of high cyanide consumption and fouling of the soln. Amalgamation was satisfactory and should be inserted in the flow sheet. Flotation and cyanidation of the flotation tailing was satisfactory. Long Lake arsenical-gold tailings. *Ibid* 53-7.—Tailings from an old cyanide plant contained about 0.2 oz. Au and 0.06 oz. Ag to the ton and 2.0% As. The tests on a composite sample indicate that fine grinding and cyanidation is the better method of recovering the Au from these tailings. Water washing previous to cyanidation is recommended. The As in the ore is not worth attention at present prices. Concentration of a silver-lead-copper-zinc ore from La Rose mine, Kitsault River section, B. C. *Ibid* 57-9.—Selective flotation followed by tabling the flotation tailing is recommended for this ore. Ore from the Argonaut mine, Larder Lake, Ontario. *Ibid* 66-72; cf. C. A. 21, 725.—Flotation tests gave good results with each of the 3 samples and on mixts. of the samples. It is recommended that the diln. of the ball and tube mills be decreased to about 60% solids; that not more than 1.5 lbs. of lime per ton be added to the ball mill, and that a sol. reagent, such as xanthate, be used in place of coal-tar creosote and pine oil mixt. Gold ore from the Kitchener mine, East Central Manitoba. *Ibid* 72-9.—The ore contained about 0.75 oz. Au per ton, 90% of which was free and the remainder was assocd. with sulfides of Fe, Cu and Ni. Good recoveries were made by flotation and tabling, also by amalgamation, or amalgamation followed by tabling. Cyanidation was less satisfactory. Concentration of a gold-copper ore from English Brook district, East Central Manitoba. *Ibid* 84-6.—The gold was free and assocd. with small quantities of chalcopyrite, pyrite and arsenopyrite in a siliceous gang. This ore is low grade with Au 0.14 oz. and Ag 0.34 oz. to the ton and Cu 0.49%. Amalgamation followed by flotation and tabling appears to be the best treatment. Special sample of cyanide tailings from Dome Mines, Ltd., South Porcupine, Ontario. *Ibid* 93-4.—The sample carried about 10% of sulfides as pyrite and assayed 0.027 oz. Au per ton. The flotation of these tailings was successful. In continuous operation with return of the middling to the regrinding circuit, a recovery of 65% should be obtained. The addn. of Na_2CO_3 is considered essential in the flotation of a cyanide tailing. It ppts. the lime and brightens the sulfides. L. W. RIGGS

Contribution to the knowledge of silver carriers in the ores of lead-zinc veins. HANS EISELDER. *Metall Erz* 25, 350-1(1928).—In the Pb-Zn veins in the Harz and Rhine districts, the Ag occurs invisibly and principally in an isomorphous mixt. of Ag_2S and galena, and visibly in Sb-fahlerz. Galena is present in the primary layers, and fahlerz between this and chalcopyrite. Galena may displace fahlerz in the upper layers, and this may displace other minerals, thus causing Ag to be present in non-Pb products. Also, argentite is found as a secondary formation in the upper layers. The results of Seiler's investigations have been confirmed microscopically. J. B.

The advances in dressing technic in the year 1927. H. MADEL. *Metall Erz* 25, 428-37(1928).—A review. J. BALOZIAN

Copper ore dressing at the mine "Crosse Burg" in Neunkirchen (Siegerland). H. MIHSSNER. *Metall Erz* 25, 248-56(1928).—The Cu occurs raw, as the spar, and as CuFeS_2 (in mixt. with varying amts. of FeCO_3 and FeS_2). Pb, Zn and Mn ores also being present. Wet-mech. dressing is suited for the Cu and Pb-Zn ores, and flotation for the Cu spar. Development of the processes used is described, flow sheets being given. The most economical dressing of the Cu ore is made, in spite of variations in its compn. A brief description of the selective flotation of Cu and spar, and the units used is given. It is found to give economical yields of Cu, Fe and Mn. J. BALOZIAN

Sampling in the dressing of lead and zinc ores. KARL KOWARSCHICK. *Montan. Rundschau* 20, 546-9(1928).—A short description is given of the way sampling should be done to obtain a true av. A. L. HENNE

Early efforts in flotation of dry minerals. Historical. HENRY F. WOOD. *Eng. Mining J.* 126, 571-3(1928). E. H.

Flotation reagents manufactured in Canada. C. S. PARSONS. *Can. Dept. Mines, Mines Branch* No. 687, 1-4(1928).—Reagents used in flotation are described, and a list of Canadian mfg. firms is given. L. W. RIGGS

Concentration of the ores from the Dunwell Mines, Ltd., Stewart, B. C. C. S. PARSONS. *Can. Dept. Mines, Mines Branch* No. 688, 3-6(1928).—Samples from 8 veins were treated separately and compositely by flotation and tabling, the results showing

that by tabling the flotation tailing the Au recovery was increased from 11 to 20% with an addn. of less than 5% by wt. to the concentrate, that each ore can be concd. into marketable products, and that only the Zn concentrate would need previous cleaning. Concentration of lead-zinc tailings from the dump at the Notre Dame (Tetreault) Mine Notre-Dame des Anges, Quebec. *Ibid* 28-30.—The Zn could readily be recovered by flotation. It was possible to obtain a Pb concentrate contg. over 30 oz. of Ag and 3 to 4% Cu but low in Pb, the best grade being 22.8%. A quantity of gang floated with the Pb and prevented the formation of a richer concentrate. Concentration of a complex gold and silver ore from Alberni, B. C. *Ibid* 32-4.—The sample was an oxidized ore contg. Au, Ag, Cu, Pb and Zn. On account of the oxidized condition of the ore, selective sepn. by flotation between Cu, Pb and Zn was not practicable. The recoveries of Au and Ag were not high but were fairly satisfactory considering the oxidized condition of the ore. Concentration of the zinc ore from the John Bull and Florence claims, Powell River section, Nanaimo Mining Division, B. C. *Ibid* 49-53.—The samples were similar and consisted of Zn blende, chalcopryrite and pyrite in a limestone gang. The John Bull ore could not be concd. by gravity methods but gave good results with flotation as did the Florence ore. Less than 1% of Cu is in the latter ore. Concentration of a lead ore from the Forbes galena mine, Perth Road, Ontario. *Ibid* 60-5.—The ore contained galena in a calcite gang assocd. with pyrite and Zn blende. Pb present, 2.03%. From a mill test, a flow sheet was worked out which is recommended for use with these ores. Concentration and separation of the values in a lead-zinc-gold-silver ore from Bunker Hill claims, Alice Arm, B. C. *Ibid* 79-82.—The sample was a heavy sulfide ore contg. galena, Zn blende, Au and Ag. Five flotation tests were run, a table test and a cyanide test. The production of Pb concentrate high in Fe sulfides is recommended in order to recover as much Au as possible. A grade of 50% Pb works well. The tests indicate that 90% of the Pb may be recovered from a concentrate contg. 50% Pb. and 85% of the Zn from a 45% Zn concentrate. Approx. 50% of the Au and 80% of the Ag can be recovered in the Pb concentrate. The Ag in the Zn concentrate can be considered as recovered. Concentration tests on ore from the Giant Mine, Spillamacheen, B. C. *Ibid* 82-3.—The sample consisted of galena assocd. with a barite gang contg. Pb 10.1%, BaSO₄ 47.1, other insol. material 36.1, Ag 1.36 oz. per ton. The Pb was easily concd. by flotation. Barite was tailed from the flotation tailing which runs high in BaSO₄. Whitewater lead-zinc tailings from Retallack, B. C. *Ibid* 87-93.—The tailings were from a gravity concn. mill and contained Pb 1.46%, Zn 6.65% and Ag 7.31 oz. per ton. Selective flotation was not feasible with these tailings. It is not possible to make definite recommendations for the treatment of this material. Selective flotation as applied to Canadian ores. *Ibid* 112-34.—A general description is given of recent flotation practice. Twelve typical examples, illustrating the treatment of a variety of ores, are worked out experimentally. Four full page photographs of modern flotation machinery are shown. L. W. R.

Concentration of the copper-gold ore ("F" ore-body) of the Noranda mines, Ltd. Rouyn, Quebec. C. S. PARSONS AND J. S. GODARD. *Can. Dept. Mines, Mines Branch* No. 688, 6-13(1928).—The samples consisted of heavy sulfide ore contg. chalcopryrite, pyrrhotite, pyrite and Au. The object of the work was to learn if this type of ore could be concd. into a body which would contain the Au and Cu, the greater portion of the pyrite and pyrrhotite to be eliminated in the tailing product. The results of the magnetic sepn. test show that pyrrhotite does not carry the Au. Flotation tests prove that the Au is not entirely assocd. with the Cu. Freshly mined ore gave higher results than aged ore, therefore oxidation should be guarded against. Good results were obtained by using NaCN with Na₂CO₃. L. W. RIGGS

The heat content and the specific heat of some slags at high temperatures. SAKURU UMINO. *Science Repts. Tohoku Imp. Univ.* 17, No. 5, 985-96(1928).—The heat content and the mean sp. heat were obtained for 2 kinds of slags, from a blast furnace and a basic open-hearth furnace, at temps. ranging from 100° to 1500° by the calorimetric method of mixts. In general both the heat content and the mean sp. heat of the slags are very large as compared with those of metals, and increase with the rise of temp. DOWNS SCHAAF

Note on the roasting of Rand refinery sweepings containing silver chloride. J. HENDERSON. *J. Chem. Met. Mining Soc., S. Africa* 29, 31-2(1928).—Exptl. results on Rand refinery sweepings and pyrite concentrates from the West Rand Consolidated Au mine show that Ag losses are reduced from 12.7% to 1.1% by roasting a mixt. contg. 60% sweepings and 40% pyrite. W. H. BOYNTON

Working up wastes in industries dealing with precious metals. FRITZ MICHEL. *Chem.-Ztg.* 52, 733-4(1928).—Solns. contg. precious metals are pptd. with sulfides,

Zn, Al, etc., or are evapd. and treated as waste matter. Solid wastes high in metal values are either smelted directly into a crude bullion, or are first ignited, then treated with a magnet for the removal of Fe compds., and finally melted down with suitable fluxes. Small scale refining by the metal worker himself is rarely successful. Most industrial waste is first roasted, mixed thoroughly, ground, treated with a magnet, and then melted with soda and borax. Wet methods for extg. precious metals from waste have not been profitable. Often the wastes are briquetted (with a binder like $\text{Ca}(\text{OH})_2$) and sold to a Pb-smelter, where they are used as part of a regular furnace charge.

W. C. BRAUGH

Copper Queen smelter. P. G. BECKETT. *Eng. Mining J.* 126, 682-3(1928).—The expansion of this smelter since its erection in 1904 is outlined and the new roaster reverberatory plant installed in 1927 is briefly described. "Pioneer" troubles are still being eliminated. For March, April and May, 1928 the reverberatory furnaces treated 998 tons (907,182 kg.) solid charge per furnace day with a gross fuel ratio of 0.405 bbl. oil per ton (equiv. to 2,562,000 B.t.u. per ton (909 kg.)). Waste-heat steam production was 7.35 lb. (3.35 kg.) steam from and at 100° per lb. of oil burnt in the reverberatories. Roasters averaged 237 tons (215,433 kg.) per day solid charge, per furnace day, from 23.7% S to 12.9% S. Fuel consumption was 0.001 bbl. of oil per ton of charge. The combined direct gross cost of roasting, reverberatory smelting, and dust recovery was about \$1.27 per ton; fuel credit is 41c per ton.

W. H. BOYNTON

Selective flotation. WM. T. MACDONALD. *Eng. Mining J.* 126, 678-82(1928).—Selective flotation of all mill heads at Copper Queen and Nacozari mines differs in 3 practical ways: (1) fines grinding is required at Copper Queen because of a closer inter-association of sulfides; (2) the Copper Queen uses Forrester cells, and Nacozari uses MacIntoch cells; and (3) sep. addnl. steps of concentrate cleaning were added at Nacozari because no new construction was necessary. Lime protects xanthate by impeding its pptn. by sol. Fe, though permitting the corresponding reaction with sol. Cu. Close control is essential to the maintenance of the best av. results in all the plants. The original mill flow sheet is compared with present practice at Nacozari and at Copper Queen; and a typical flow-sheet for Nacozari for 1927, with metallurgical results is given.

W. H. BOYNTON

Colorimetric copper method proves valuable control tool. ANON. *Eng. Mining J.* 126, 683(1928).—Samples of feed, concentrate, and tailing are taken, de-watered in a pressure filter and dried on a hot plate. This sample is cut down, weighed and given a standard HNO_3 digestion. Fe is removed by NH_4OH and the Cu detd. in the soln. by comparing with a soln. derived from a standard pulp of known Cu content in a colorimeter. Results are obtained in 30 min. and check standard KI assays within 5% of the Cu content.

W. H. BOYNTON

Concentration trends. W. B. CRAMER. *Eng. Mining J.* 126, 675-7(1928).—This and the 3 preceding abstrs. deal with operations at the plants of the Phelps Dodge Corp. Pilot plant operations at Bisbee and Nacozari between 1918 and 1920 led to concentrator changes. Two-stage grinder circuits reduced the material to 14-mesh, and then to 48-mesh. The removal of more pyrite and insol. produced a higher grade concentrate, reduced smelting costs, and smelter and slag losses, because of the partial removal of slag-forming constituents. These steps involved: elimination of all gravity processes and making flotation the sole major process; sufficiently fine grinding to sep. mineral from gang and to sep. the Cu minerals from pyrite; changes in the flotation flow sheet and arrangement of roughers, cleaners, and re-cleaners; and changes in the character and amts. of flotation reagents, including lime. The trends are for a continuation of simplicity of flow sheet, finer grinding, improved classification, and improved flotation work. Grinding equipment at individual mines is noted and 8 tables show the improvements in costs of operations. Future progress in costs and improved metallurgy is largely assocd. with crushing, grinding, and classification problems.

W. H. BOYNTON

Handling problems in the open-hearth. J. RICHARDSON. *Blast Furnace & Steel Plant* 16, 1326-8(1928).—Suggestions to the material-handling engineer from the operations of the open-hearth show a broad field for constructive planning.

E. H.

A tilting regenerative reverberatory furnace for foundry use. HESS AND H. PINSL. *Giesserei* 15, 281-9(1928).—The construction of a 25 ton tilting (by an hydraulic cylinder operating at 30-40 atm.), reverberatory, oil-fired furnace employing a preheated blast is outlined. Between the movable upper and the stationary lower portions of the furnace is a water seal, which is equally effective in either the tilted or the rested positions. One man can take care of the dampers, and for handling the oil and regulating its flow to the burners. The usual charge consists of about 80%

liquid blast furnace Fe and 50% cupola Fe scrap. The intended compn. of the cast Fe can be obtained, exactly in this type furnace, there being very small loss during the fusion. To det. the effect of progressive overheating (in this and a similar 5 ton furnace) on P-rich cast Fe, tensile tests are made. Thus, the bending strength increases about 40%, the breaking strength from 14 to 20 kg., the Brinell hardness from 187 to 217, and the sp. gr. from 7.08 to 7.17. For good tensile properties, normally overheated Fe must be poured immediately on drawing. During the fusion the temp. increase is apparently rapid, the Fe being overheated to 1375–1400° for some time before drawing. There is no change in the Si, Mn, P and S content of the Fe during fusion. The loss in C during overheating is 0.1–0.15%, that in the remainder being 0.3%. The graphite, also, decreases from 2.85% to 2.42%, or from 83% of the total C to 81.5%. The influence of overheating on the graphite formation is shown clearly by photomicrographs.

J. BALOZIAN

The zone formation in the cupola furnace and its influence on the smelting process. K. MÜHLBRADT. *Giesserei* 15, 335–9 (1928).—Previous results being used, an explanation of the combustion and smelting processes in the cupola furnace is attempted. From the gas-current lines in the ideal gas producer, the zone formation in an ideal present-day cupola furnace is developed. Here, the oxidation zone extends up from slightly below the tuyère level to the funnel-shaped neutral zone (I); the lowest point of this lies on the furnace axis, and develops upward to the sides. In the smaller furnaces the funnel-shape of I is the least apparent, in middle-sized furnaces the lower end of the funnel is about on the tuyère level, while in the larger (also smaller ones with insufficient blast) the funnel is open and I bends back below the tuyère level to the furnace walls. From a consideration of the effects of various types of I and the oxidation zones on the course of combustion and smelting in the ideal gas producer, it is seen that these processes must be so coupled that the smelting terminates directly above I. As the temp. is highest here, the most economical combustion takes place, the total heat being utilized in smelting and overheating the Fe. These conditions are not entirely fulfilled in the cupola furnace because of differences in the form of I and the charged Fe. When the coke-bed is so filled that I is raised to the top edge of the funnel, the size of the reduction zone and therefore the heat consumption increases, a considerable amt. of CO appearing in the waste gases. This disadvantage may be eliminated by keeping the coke-bed low, the Fe charge thus sinking into the oxidation zone and cutting through the hottest part of I. In the first case relatively hot Fe is produced with high fuel consumption and unsatisfactory compn. of the waste gases, while in the second there is more satisfactory combustion with lower Fe temps.

J. B. •

Points for the construction of small converters. E. PIWOWARSKY. *Tech. Hochschule Aachen. Giesserei* 15, 314–5 (1928).—The importance of correct proportions of the vol., interior height and diam. of the body of a converter are briefly stressed. The dimensions, from expt., for a 2-ton converter are given. The method of sepg. the blast-lead from the body in the Zenzen converter, the most widely used small unit in Germany, is briefly described.

J. BALOZIAN

New theory of the blast-furnace process. F. WÜST. *Stahl u. Eisen* 48, 505–6 (1928).—The theories advanced to explain the great fuel-saving effect of the hot blast introduced by James Beaumont Neilson are reviewed. An outline of a new theory is given in 14 points; the exptl. evidence of this theory will be published later. In front of each tuyère, there is an oxidizing zone, which reduces the efficiency of the blast furnace; methods to reduce the oxidizing zone increase the efficiency. Such methods are: the use of charcoal instead of coke, hot blast, Linde-air, oil-injection and the enlargement of the furnace at the oxidizing zone. Because of this re-oxidation at the tuyères the incorporation of foreign (alloying) elements must take place above the tuyères. The reaction $2\text{CO} \rightleftharpoons \text{CO}_2 + \text{C}$ improves the reducing work of the furnace; this reaction is increased by the use of hot blast. Scaffolding is not only regulated by the type of ores (porosity) but also by the temp. of the throat. The so-called direct reduction of Fe, Si and P occurs almost entirely above the tuyères and is caused by the C liberated according to the equation above. Pig Fe takes up most of the impurities in the shaft by a cementation process. Only a small part of the impurities is taken up by direct reduction from the slag. Analysis of the flue gas or of the gas from any part of the furnace does not give sufficient evidence for the evaluation of the working of the furnace.

J. A. SZILARD

Slag types for lead blast furnaces. FELIX VON SCHLIPPENBACH. *Metall Erz* 25, 343–50 (1928).—The rules, that in Pb slags an increase in ZnO is accompanied with an increase in the FeO and a decrease in the CaO and SiO₂, and an increase in Al₂O₃ with an increase in the CaO and a decrease in the FeO and SiO₂, are shown to be in-

correct. From 6000 slag analyses, obtained during 30 years, it is concluded that: (1) ZnO and Al_2O_3 are not slagged, but are, independent of the ratio to one another, completely dissolved by silicates; (2) all slags contg. $FeO \cdot SiO_2$, $2CaO \cdot 3SiO_2$ and $CaO \cdot 2SiO_2$ are uniformly good; (3) corresponding to the $ZnO + Al_2O_3$ taken up by the slag, SiO_2 , CaO and FeO are changed, without alteration in their relationships, proportionally to one another. By calcg. the slag compn. for $FeO \cdot SiO_2$ and $CaO \cdot 2SiO_2$ and using the ratio of $FeO:CaO = 2:0.5 - 2:2$, 14 types of slags are obtained. In the first table are listed acid slags and in the sec. basic slags. On the assumption that 0-20% $ZnO + Al_2O_3$ is present, the SiO_2 , CaO and FeO in slags are calcd. and given in Table 1. The min. and max. amt. of SiO_2 is 28-38%, of FeO is 24-50%, and of CaO is 12-30%, resp. When one is working with $FeO \cdot SiO_2$ and $CaO \cdot 2SiO_2$, the slag should contain not over 40% and below 26% FeO , and not over 22-23% CaO . In Table 2 are given the results of similar calcns. made for slags high in $ZnO + Al_2O_3$ and low in SiO_2 , the latter being present in sufficient quantity to form $FeO \cdot SiO_2$ and $2CaO \cdot 3SiO_2$. Limiting values assumed for FeO are 26-40% and for CaO are 12-24%, the min. for SiO_2 27%. The calcd. slag compns. compare well with the values given in the literature. J. B.

Slag types for lead blast furnaces. P. TAFEL. *Metall Erz* 25, 430-40 (1928).—The paper of von Schlippenbach (preceding abstr.) is discussed. T. considers that the relationships existing in Pb slags are not as simple as von S. supposes. Aluminates and silicates, other than those assumed by von S., are present under the conditions. A fixed rule, doubtlessly, cannot be given for producing good slags from gang of varying compn., using a min. of flux. The tables given by von S. serve for empirically detg. slag compns. J. BALOZIAN

The metallurgical aspects of cast iron. P. W. BLACKWOOD. *Trans. Am. Soc. Steel Treating* 13, 1023-38 (1928).—A discussion of the effect of addns. of Ni, Cr, W, Mo, V, Ti, Cu, and Al. W. A. MUDGE

The manufacture of pig iron in Natal. J. E. HOLGATE. *J. Chem. Met. Mining Soc. S. Africa* 29, 32-6 (1928); cf. C. A. 22, 1937.—A discussion by G. H. Stanley. A certain amt. of coke or other fuel must be burnt in the hearth. The amt. of coke consumed by soln. depends upon its "reactivity" and on the compn. and temp. of the gas to which it is subjected, increasing with CO_2 content and temp. Natal coke showed % of cell vol. of 51-7% for beehive coke, while oven coke was lower—in one case about 31%. The savings claimed when smelting raw carbonate may be due chiefly to most of the original 5% C reaching the hearth, functioning there as fuel. The 5% C is shown by calcn. to be sufficient to reduce nearly 97% $FeCO_3$. The gas evolved from the lumps will have much less solvent activity for coke in its vicinity, than that from a straight carbonate. Only half the oxide will be left to be reduced by the rest of the gas, which should not become so oxidized nor in consequence dissolve as much coke. Calcns. are shown which bear out the assumptions. "It is diminished soln. loss when smelting black band ores that enables a higher % of the coke charged to get down to the hearth and function there as fuel. W. H. BOYNTON

Report of research committee on yield point of structural steel. M. O. WITHER. *Proc. Am. Soc. Testing Materials*, Reprint from Vol. 28, Part 1, 28 pp. (1928).—Two series of tests were conducted by 3 mill labs. and 2 college labs., to ascertain the effect of speed of loading and method of detecting the yield point of C, Ni and Si structural steels. Increasing the speed of loading from 0.05 to 2.0 in. per min. caused a 7% increase in the yield point in tension for Ni steels, 9% for C steels and 12% for Si steels. At a speed of 0.2 in. per min. the yield point, by drop of beam, was 600 to 1000 lbs. per sq. in. higher than at a speed of 0.05 in. per min. The max. range in drop of beam yield points, considering all speeds, was 10% for C steels, 6% for Ni steels, and 11% for the Si steels. Of the 4 methods used in detecting the yield point the multiplying divider method was the most reliable, and gave values slightly less variable than the drop of beam method, which is the simplest and quickest, and in most cases sufficiently reliable. DOWNS SCHAAP

Recrystallization of metals. ENRICO CREPAZ. *Ann. scuola ing. Padova* 4, 43-52 (1928).—It is well known that the mech. properties of metals or alloys depend on their mech. and thermal treatment. The dimensions of the crystals can be represented according to strain and to annealing temps. and thus diagrams of recrystn. obtained. Various theories are discussed to explain the relation between the mech. properties and the structure of the metal or alloy: i. e., Tammann's theory (properties depend on the strain necessary to produce the change in structure as well as orientation of the crystals; the theory of an amorphous modification; and the theory which considers the changes in elastic forces. None explains all phenomena completely. A. W. C.

The plastic deformation and fracture of metals. WALTER ROSENHAIN. *Natl.*

Phys. Lab., Teddington, England. *Intern. Congress Testing Materials 1927, I, 50-80.*—The problems considered are, the mechanism by which cold-worked metals are rendered harder and stronger, and the mechanism by which rupture occurs. Slip starts along a few favored planes of a crystal, but those planes become hardened, and other slip planes then come into use. A breaking down of the lattice structure, like local melting, gives disturbed or amorphous layers along the slip planes, and these layers prevent the recovery of the intervening lattice from the elastic distortion in the same way as solute atoms of a different metal cause lattice distortion. General straining of the lattice is not the cause of hardening by cold working, because even after heavy plastic distortion of a crystal there is some elastic recovery, and because increasing cold work gives a progressive increase of hardness. Beilby's theory of hardening from amorphous layers along slip planes is thus modified. From a study of d. changes it is deduced that the disturbed layers may be very thin, or less than 100 atoms in thickness. The temporary semi-plastic condition of mild steel after straining just beyond the yield point, and the failure to form Neumann bands by impact in freshly strained steel, indicate a temporary mobility of the disturbed layers; this is due probably to the presence of irregular or potential but non-effective at. linkages. The time required for recovery is less at higher temp. because of the increased mobility of the atoms. In fatigue tests, elastic agitation has about the same effect as increased mobility due to heating. In corrosion-fatigue, chem. attack occurs along the disturbed layers formed by slip. When slip is no longer possible, fracture occurs by a tearing action due to concn. of stress at irregularities of structure or surface. When a crystal aggregate is strained there is movement at the boundaries and rotation of the lattices toward a preferred orientation, involving a break-down of the lattice structure near the boundary. The change of orientation at the boundary between 2 crystals is too sudden to be accounted for by a bending of the 2 lattices, and must be effected by an irregularly arranged practically amorphous layer of atoms. The strength of boundaries shows that they cannot be merely loose points of contact of different lattices, but are regions of strong cohesion. The strength of x-ray reflections from cold-worked metal shows that they are obtained not from only a few crystals that happened to be favorably oriented, but that the orientation of many crystals must have changed to the favorable direction. This is due to mass-rotation rather than a rotation of the crystal axes which would be practically the same as recrystn. The rotation of atoms within the crystals must cause a much greater amt. of disturbed arrangement than mere slip, and near the boundaries a thicker region of crystal fragments embedded in a mass of irregularly arranged atoms must exist. Truly rational testing depends on the development of a complete explanation of the mechanism of deformation and rupture. G. F. C.

The fatigue of metals. H. F. MOORE. Univ. of Ill., Urbana, Ill. *Intern. Congress Testing Materials 1927, I, 297-303.*—Most engineering formulas for the strength of materials were developed by civil and not mech. engineers, and are accurate only for static stresses of large structural members. Experience with axles, and Wohler's rotating beam tests, showed that failures might take place under alternating stresses at lower loads than called for by the accepted engineering formulas. The concept of a perfect elastic limit as a stress below which Hooke's law holds and repeated loadings are harmless depended on the postulate that material is continuous and homogeneous. Metallography has shown that this postulate is not true, except statistically on a large scale. Basquin in 1910 showed that the fatigue tests then reported did not indicate a definite endurance limit for materials. Later more extensive endurance testing resulted in reestablishing the existence of a limit of stress below which a metal will withstand an indefinite no. of reversals without fracture. There is a fairly good correlation between the endurance limit and tensile strength, the former in ferrous metals being about half the latter. Fatigue failure, as studied with the microscope, seems to be the spreading of localized fracture, rather than merely a slip. Irregularities in stress distribution weaken metal in fatigue, but not as much as the mathematical theory of elasticity would predict. Slip under repeated stress may occur without the development of a fatigue crack. The exact cause of origin of a fatigue crack is not known, but it is not known to occur without slip. Clean metal, smooth surfaces and avoiding sudden changes in section will improve fatigue strength. Rosenhain in discussion stated that fatigue failure has been known to occur without slip; failure in fatigue occurs by the exhaustion of ductility as in tension, but at a lower stress because the slip is in both directions.

GEO. F. COMSTOCK

The development and application of high-power metallography and the ultra-violet microscope. FRANCIS F. LUCAS. Bell Telephone Lab., N. Y. *Intern. Congress Testing Materials 1927, I, 123-56.*—The resolution obtainable in microscopy can be

increased by using objectives of higher numerical aperture, and light of shorter wave length. A detailed description, with illustrations, is given of the Bell Telephone metallographic lab. in N. Y. city. The microscopes and cameras are supported on sponge rubber disks, 6 in. in diam. and 1 in. thick, to eliminate vibrations. A rigid metal clamp for mounting specimens is also described, requiring no plasticine. The Zeiss lenses are raised. The ultra-violet equipment should give, theoretically, twice as high resolution as the ordinary equipment. Cd electrodes were better than Mg. Focussing, which requires a fluorescent screen, or trial exposures, is difficult and rather uncertain. Some interesting and valuable results have been obtained with ultra-violet light, but this development seems to be still in progress. The monobromonaphthalene objective of 1.6 numerical aperture was applied to metallography with good results. A suitable immersion fluid of n higher than 1.65 should be found. Specimens of soft metals were difficult to prep. properly for microscopic examn., but by the use of a Jung microtome, with the knife ground to cut a section 2 microns thick, surfaces of Pb free from defects were prepd. L.'s investigation of a fatigue crack in Armco Iron is described, showing that this metal was full of inclusions, some of which were found, by observation at high magnification, to lie in the path of the crack. His work on the structure of hardened steel is also described. Martensite needles were found to be aggregates, probably of α Fe and Fe₃C, and marked a decompn. along the octahedral planes of austenite. These investigations are still in progress. White needles found in hardened steel are probably austenite, perhaps in a sub-microscopic stage of decompn. The progressive formation of troostite and pearlite on tempering is described, and the structure of troostite was resolved, in part, into α Fe and carbide in fine particles, by high magnification. C. Benedicks in discussion shows that useful magnification may be as high as 1500 diam. in spite of the former theory.

GEO. F. COMSTOCK

Microscopic metallography in relation to impact and endurance tests. P. FORCELLA Royal Exptl. Inst. of Communications, Italy. *Intern. Congress Testing Materials 1927*, J, 229-52.—Impact tests were made with a Charpy machine made by Amsler, using specimens 10 by 10 by 55 mm. with semi-circular notch according to Mesnager. The endurance tests were made with an Amsler machine giving alternate bending by repeated shock, these specimens being rods of 11 mm. diam. They were notched to avoid working, by blows of the machine, the surface where fracture started. Tensile tests were misleading as they often showed good results for material which was weak in impact, and did not explain failures in service. Impact tests agreed with service results and microstructures, and samples giving good impact results always were satisfactory in the tensile test. Illustrations of a tire, a rail, a boiler plate, and a locomotive draw-bar are given, all having failed in service, and giving good results in the tensile test, but poor impact results and microstructures. Two rails that stood severe treatment in service gave good impact results and microstructures. Impact test specimens should be notched perpendicular to the surface of hot-working, to avoid unreliable and discordant results, and splitting or deformation of the specimen. The reasons for this are explained in detail and illustrated by photographs and by tabulated results. Notching of the endurance test specimens was considered advantageous, to localize the fracture at a measurable cross-section. Two series of tensile or hardness, impact and endurance tests of steels are reported, with corresponding microstructures, showing the superior properties attainable by heat-treatment. Specimens from a good rail endured 5000 to 6000 blows, while those from a bad one that broke in service showed about $\frac{1}{4}$ as much endurance. The endurance results agreed with the microstructure and service results, and varied with the impact results. Great hardness tended to give poor endurance, and high tensile results tended to give good endurance. Expts. are needed to det. for each metallic product the impact and tensile values assocd. with the max. endurance in service.

GEO. F. COMSTOCK

Hardness testing. H. M. GERMAN. *Trans. Am. Soc. Steel Treating 14*, 343-54 (1928).—A comparison of Brinell, Rockwell, scleroscope, Vickers and monotron methods.

W. A. MUDOK

Fundamentals in the art of heat treatment. D. K. BULLENS. *Fuels & Furnaces 6*, 1359-62(1928).

The use of the microscope in heat treatment. H. M. BOYLSTON. *Fuels & Furnaces 6*, 1377-86(1928).

Heat treatment of die blocks. J. W. URQUHART. *Heat Treating and Forging 14*, 852-5(1928).—Methods used in the U. S. and in England are compared.

Heat treatment of forgings and castings for selective directional adjustment of residual stresses. W. J. MERTEN. *Trans. Am. Soc. Steel Treating 14*, 193-7(1928).—

A discussion of selective cooling by directed quenching for producing favorable directional internal stresses in forged turbochargers. W. A. MUDGE

High-temperature treatments of castings and forgings as evidenced by core drill tests from heavy sections. W. J. MERRIN. *Trans. Am. Soc. Steel Treating* 13, 1-21 (1928).—Considerably higher temps. and extended soaking periods are necessary to give proper grain structure to permit the use of higher service stresses in design of large size elec. machinery (10,000-15,000 lbs.). A recommended practice of heat treatment is given. W. A. MUDGE

Influence of thermal and mechanical treatment on the resistance of steel to repeated stress. H. RABOZÉE. Ecole Militaire, Brussels, Belgium. *Intern. Congress Testing Materials* 1927, I, 291-6.—Resistance to repeated stress is an important property of a material and should be considered in design. Heat treatment and mech. working affect fatigue resistance, but may affect other properties, especially impact resistance, in the opposite manner. Tensile, impact and hardness test results are compared with the fatigue resistance of several steels of 0.25 to 0.29% C. The repeated shock machines of the Amsler and Cambridge types were used; they gave results of the same order as the rotating beam fatigue machine. The results after various heat treatments are tabulated and plotted as curves; and another series of tests of similar steels annealed and cold-worked is also reported. The endurance results were regular and consistent and gave smooth curves. The resistance to fatigue by repeated shock varied with the tensile strength and elastic limit, and inversely to the impact resistance. The relation to the elastic limit was more regular than to the tensile strength. Annealing at 550° gave a fatigue resistance much greater than annealing at 650°, without involving an excessive reduction in impact resistance. Cold-working led to an increase in the fatigue resistance, but with a decided fall in impact resistance. GEO. F. COMSTOCK

Slag (solid non-metallic) inclusions in iron and steel. C. BENEDICKS AND H. LÖFQVIST. *Intern. Congress Testing Materials* 1927, I, 265-90.—All solid non-metallic inclusions are called "slag," and they are classified as indigenous, due to reactions occurring in the molten metal, and exogenous or mechanically admixed foreign particles. The former are more important, and their complete study requires a knowledge of the slag-metal equil. diagrams. The Fe-S equil. diagram is shown, the soly. of S in solid Fe being estd. as 0.015 to 0.020%. The diagrams of the Fe-S-C and Fe-Mn-S systems are also illustrated. Fe₃C probably dissolves considerable FeS at high temp. C assists the sepn. of MnS from the melt. A complete Fe-O equil. diagram is given. Fe dissolves 0.21% O at the m. p. (1520°) and 0.05% at atm. temp. FeO forms a eutectic with Fe₂O₃ at 1200° and is unstable below 570°. Diagrams of the following systems are also given: FeO₂-MnO; FeO-SiO₂; MnO-SiO₂; FeO-MnO-SiO₂; Fe-FeS-Fe₂O₃; and FeO-MnO-MnS. The last would not be much affected by Fe or FeS. Systems including P are also considered briefly. Microscopic methods for identifying inclusions are mentioned, but not given in detail, and the gravimetric detn. of residues after soln. of the metal by Br or other reagents is briefly discussed. Slag particles rise out of molten metal quicker if larger and of lower d. Lowering of the m. p., as by Mn, facilitates coalescence into larger particles. Slag inclusions may slightly decrease the grain size of metal by retarding recrystn. Irregularities of structure, due for instance to pearlite particles or slag inclusions, are shown to cause banded structure on working because of the retarding influence of the harder particles on flow. Conc'n. of ferrite around inclusions is probably due to soly. of the non-metallic matter in the Fe, as explained by Mahin. Flakes are due to a combination of causes, originating at segregated spots of slag or other defects, and being developed later as "shearing fissures" by thermal or possibly mech. strains. Inclusions in general are detrimental to corrosion resistance. Basic Bessemer steel is usually dirtier than open-hearth, but high-C acid Bessemer steel should be cleaner. The addn. of CaO to acid slag helps to make cleaner steel. To prevent the formation of inclusions, the oxidation products of the deoxidizers used in the steel should have a low O pressure and must be easily rejected from the melt. In discussion, J. Bartel described a boiler plate contg. only 0.06% C which was brittle and showed much included oxide slag, and H. Fowler stated that the elongation, and the life in service, of locomotive crank-axes depended on their freedom from slag inclusions. An extensive bibliography is given. GEO. F. COMSTOCK

Inclusions in iron. C. R. WOHMAN. *Trans. Am. Soc. Steel Treating* 14, 81-125, 255-99, 385-414, 539-75 (1928).—An exhaustive photomicrographic study of FeO, MnO, FeS, MnS, and silicates and their combinations. W. A. MUDGE.

Notes on tempered cast iron: shrinkage. RUDOLF STOTZ. *Giesserei* 15, 297 (1928).—The unrestricted shrinkage of crude cast Fe is 2%, and, for similar methods of fusion, is practically independent of the chem. compn. However, the lower the C

content of the casting, the greater are the shrinkage and the danger of pipe. The change in length during annealing is dependent on the method used and on the chem. compn. The greater the temper C formation, the greater is the expansion due to annealing. The greater the thickness of the wall the less will be the shrinkage.

Notes on tempered cast iron. Differences between "white" and "black" tempered cast iron. RUDOLF STOTZ. *Giesserei* 15, 315-6(1928).—The properties and uses of tempered white and black, black-heart, and boring cast irons are briefly noted.

J. BALOZIAN

The economic value of nickel and chromium in gray iron castings. D. M. HOUSTON. *Trans. Am. Soc. Steel Treating* 13, 105-20(1928).—A discussion of the elements and conditions which influence the form of graphite and the constitution of combined C, with practical applications in heavy sections and pressure work, Diesel engine liners, forming dies and automobile cylinders. Si is a graphitizer and softener; Cr forms carbide and hardens; Ni destroys carbide and hardens the matrix. One point of C is equiv. to 3 points of Si, 3 of Cr, and 6 of Ni in reducing chill.

W. A. MUDGE

Some experiments on iron. LAWRENCE G. KNOWLTON. Cornell Univ. *J. Phys. Chem.* 32, 1572-95(1928).—Total C in Fe was detd. electrolytically by placing Fe turnings in a Pt dish serving as the anode, adding 10% Na_2SO_4 soln. and using a strip of Cu as the cathode. After a short time the $\text{Fe}(\text{OH})_3$ formed is poured off the fresh Na_2SO_4 added; this is repeated several times until all of the Fe is dissolved. The combined Na_2SO_4 solns. are treated with HCl and the insol. C is collected on a Gooch crucible. 2.27% C is obtained for a sample having 2.19% C. With sheet iron as a cathode in an ammoniacal NH_4NO_3 soln. the corrosion is exceedingly slow and more C than the graphitic C remained undissolved. If KMnO_4 soln. is added to the Fe prior to the addn. of acid, with white Fe the C remaining undissolved can be brought up to total C. With gray Fe the C values are low because of the oxidation of the graphitic C. Sn was added to molten gray Fe in an induction furnace; on pouring into sand only a part of the graphitic C is thrown out. Increasing to 16% the % of Sn added increases slightly the amt. of graphite pptd. Two layers form at this point and addn. of more Sn has little effect. It seems probable that the C is present in molten Fe either as dissolved C alone or in equil. with Fe_3C . Addn. of PhNH_2 to 10% H_2SO_4 at 50-60° cuts the amt. of H_2 evolved from a strip of Fe from 40 cc. to 5 cc. In the presence of PhNH_2 the H over-voltage rises at the cathode and the decompn. voltage is 0.05 v. higher. It was found that gray Fe boiled with either NaCl or Na_2SO_4 will reduce PhNO_2 to the same extent. Tests indicate that the Fe did not become passive during the heating with NaCl. Sn is not made passive in concd. HNO_3 by the formation of a film of $\text{Sn}(\text{NO}_3)_2$, since washing with H_2O does not remove its passivity. A Pt electrode connected to a bar of Sn in HNO_3 (sp. gr. 1.442) renders it passive. Sn also becomes passive when made the anode in HNO_3 (as low as sp. gr. 1.344) with a Pt cathode. Passivity is brought about by the discharge of H_2 at the cathode and the effect of nascent O at the anode.

D. H. POWERS

The question of the carburization of steel scrap in the cupola furnace. PAUL LORINSER. *Giesserei* 15, 366(1928).—Fusions, with addn. of 40% and 60% steel, are made in 4 cupolas of different construction and size to det. if they show the same tendency to carburize. It is seen that the C content varies not only in the same furnace with similar charges, due partly to changes in the exptl. conditions, but that also different furnaces carburize differently. By careful supervision of the furnace processes, however, the C content may be kept within narrow limits. The estd. carburization values tend to decrease with increase in the amt. of added steel and, also, with increasing Fe temps. A high Fe temp. is a criterion for a min. carburization of steel in the cupola. In L.'s opinion, the ratio of $\text{CO}_2:\text{CO}$ influences the equil. in the absorption processes during carburization.

J. BALOZIAN

The melting or molten stage of steel manufacture with particular reference to the deoxidizing, refining and contamination phases. G. A. DORNIN. *Trans. Am. Soc. Steel Treating* 13, 29-34(1928).—A discussion of the bad effects of oxides in steel and methods for their removal.

W. A. MUDGE

The tensile properties of iron-silicon alloys. TH. MEIERLING AND W. DENECKE. *Giesserei* 15, 381-4(1928).—The tensile properties of Fe-Si alloys contg. up to 5% Si, as given in the literature, are summarized. As no values could be found for alloys contg. up to 22.5% Si, results from old observations are given. In the present work an attempt is made to find the dependency of the tensile properties on the Si content in Fe-Si alloys with high Si. Melts of 100 kg. were prepd. in a graphite crucible from a special mild Fe and a "Si metal," the castings being made in green and dry sand molds. It was found that generally the bending strength decreases with increasing Si content, being max. at about 16% Si. Here Fe_3Si_2 also appears, accompanied with the formation of

eutectic graphite. The eutectic C content is max. in alloys contg. 16–17% Si. Castings made in green sand molds usually give smaller shrinkage than corresponding ones in dry sand. No differences in the tensile properties of castings made in the 2 types of molds could be detd. In the systems Fe–Si–P and Fe–Si–Cr the thermal effect of the Fe_3Si_2 formation is most evident around the eutectic compn. This is explained by a slight shifting of the atoms of the crystallites of the solid soln. and FeSi in the eutectic arrangement, making possible the formation of Fe_3Si_2 . J. BALOZIAN

Creep tests as made on Armco iron. H. J. TAPSELL. Eng. Research, Westminster, S.W.I., England. *Heat Treating and Forging* 14, 746–50 (1928).—Creep tests are made on Armco Fe (I) at 136° and 150° using a load of 25.7 tons/in.², and at 237°, 325° and 390° with loads of 20, 12 and 7 tons/in.², resp. These show a progressive decrease in plasticity and, under prolonged stress at temps. below the limiting creep values, it is replaced by apparent perfect plasticity. The new limit of proportionality, at all temps. and of all specimens, is much greater than the original value. The effect of temp. on I, strain-hardened at room temps., is studied at 150°, 240°, 290°, 340° and 390°. Under these conditions, an increase of temp. produces a further increase in the hardness, a long time being required for complete softening (if it occurs at all). Both strain and temp. hardening occur during a creep test. The removal of plasticity is accounted for by the strain and temp. hardening under const. stress, and at temps. below certain limiting values. It is shown that at 240° (also to be expected at higher temps.) the hardening of I is progressive throughout a creep test in which failure occurs. J. BALOZIAN

Armco ingot iron. REID L. KENYON. *Trans. Am. Soc. Steel Treating* 13, 240–60, 435–62 (1928).—A description of the material with chem. and phys. properties and microstructures. Data are given for hot- and cold-rolled bars and shapes, plates, sheets and wire. Tests included tension, compression, shearing, fatigue, impact and hardness. W. A. MUDGE

Procedure for simplified testing. G. D. JOHNSON. *Heat Treating and Forging* 14, 870–4 (1928).—Brief description of the spark test for differentiating between various types of steel, the shear and deep etching methods for detg. defects, and tests for decarburization and the effects of heat treatment are given. J. BALOZIAN

Expansion characteristics of low-expansion nickel steels. HOWARD SCOTT. *Trans. Am. Soc. Steel Treating* 13, 829–46 (1928).—Expansion curves on low expansion Ni steels and synthetic Fe–Ni alloys show the detrimental effect of Mn and Si. The advantage of cold working to reduce coeff. of expansion was confirmed. W. A. MUDGE

The significance of the proportional limit of steel at elevated temperatures. FRANCIS B. FOLEY. *Trans. Am. Soc. Steel Treating* 13, 813–22 (1928).—A discussion of methods for accurately detg. the proportional limit at elevated temps. W. A. MUDGE

The brittleness of metals used in aeronautical structures at high and low temperatures. M. CORELLI. Lab. du Génie Aéronautique, Rome, Italy. *Intern. Congress Testing Materials* 1927, I, 479–88.—Shock resistance is an important property of materials for use in aircraft. Since some of these materials are subjected to high temps. in use, or may be used in a cold atm., impact tests at various temps. were made. A Charpy machine was used, with specimens 1 cm. square. The specimens, either heated or cooled, were placed in the machine with a thermometer attached at one end by a Cu sheath packed with insulating cord. When the temp. reached the desired point, the thermometer was withdrawn and the test made at once. The results of a test made at temps. from –40 to 400° are tabulated. The impact resistance of a heat-treated Cr–Ni steel increased at the higher temp. to half its normal value. That of an annealed 0.6% C steel increased with rising temp. to 200°, but decreased at higher temp., and also at temp. below normal. Duralumin and electron showed better shock resistance as the temp. rose, but at low temp. showed little change. A special high-strength brass known as “delta metal” became very brittle at the higher temps., and showed little change at low temp. Expts. of this kind will be continued on other alloys. G. F. C.

Viscosity at high temperature, as applied to various metals and alloys. ANDRÉ MICHEL AND JEAN COURNOT. École Polytechnique, France. *Intern. Congress Testing Materials* 1927, I, 397–430.—When a specimen of steel is subjected to tension at elevated temp., several kinds of elongation occur, both elastic and permanent. A viscous deformation is said to occur when the rate of permanent elongation is const. or increasing. In practical use at a given temp., steel must resist the applied stress a very long time either without permanent deformation or with only slight deformation which does not increase. In the former case, the stress must be below the elastic limit for the given temp., and in the latter case below the limit of viscosity. The previous literature on elastic and plastic deformation under stress at high temp. is reviewed in considerable

detail. The great diversity of results is explained by differences in methods of testing. It is necessary to be able to define a practical limit of viscosity. This is a very complex problem because practical test results are indefinitely related to the conditions of service. Above the temp. of recrystn. the limit of viscosity may be nil or equal to the elastic limit; below that temp. the effect of coldworking is a factor in the problem. The definitions of this limit proposed by Pomp and Dahmen, and by Henry, resp., are discussed and their limitations shown. The former defined it as the stress producing an elongation of 0.001% per hr. between the 3rd and 6th hrs. of stressing; the latter gave a logarithmic formula applying only to steels between 500 and 800°. The logarithmic formula was not suitable for defining a practical viscosity limit. Measurements of the rate of deformation are first required in testing, and expts. with wires of various alloys at high temp. are described. The app. is illustrated, and the rates of flow at various loads and temps. are tabulated. For each temp., the rate of flow indicated by the straight portion of the elongation-time curve was plotted against the stress, and the curve extrapolated to intersect the axis of zero stress, this intercept being taken as the limit of viscosity. The breaking stress was also detd. in several tests. Various C and alloy steels, Cu, brass, Al-bronze, Ni, Al, duralumin, and alpac were tested. The practical viscosity limits of Al and duralumin, resp., increased a const. amt., independent of the temp., as the diam. of the test specimen was enlarged. The time required to reach the viscous state varied greatly with different alloys and at different temps.; it probably followed an exponential relation to the temp., being much shorter at higher temp. Although the results show approx. the relative viscosities of the alloys tested, they constitute only a simple contribution to the fundamental study required by the problem. Suggestions for further work are given in conclusion.

GEO. F. COMSTOCK

Testing of hardened steel. AXEL LUNDGREN. Govt. Testing Inst., Stockholm, Sweden. *Intern. Congress Testing Materials 1927*, I, 177-90.—Hardened tools are generally tested only by practical use, and a more systematic method was sought. A machine is described for repeated bending of 1.5 by 5 mm. bars of hardened steel under increasing loads, the results being plotted automatically as broken curves. The elastic and proportional limits and tensile strength were detd. with this machine; the Charpy machine was used to measure resistance to shock, and the Rockwell machine with diamond cone to measure hardness. Plain steels contg. 0.59 to 1.30% C were used for the expts.; specimens were heated for hardening in an elec. furnace, quenched in oil and tempered in oil up to 300° or in lead at higher temp. The results are shown in the form of curves. The high-C steels as rolled showed a cementite network, and when annealed the cementite was spheroidized. Both kinds were hardened and tested. When quenched from 765°, the eutectoid steel was weaker than the others at all tempering temps. below 300°. Raising the quenching temp. lowered the strength; the decrease was less after tempering at 200° than after tempering at 150°. Under nearly all conditions the eutectoid steel showed the lowest impact resistance, and the lower-C steel a better impact resistance than the others. The impact resistance was reduced as the quenching temp. was raised above 765°; the decrease was greater after tempering at 200° or 280° than at 150°, but at higher tempering temps. the effect of differences in quenching temp. decreased. The unannealed samples of the high-C steels showed greater hardness after quenching than the annealed samples. At about 55 Rockwell, all the steels showed about the same strength. At the highest hardness, the highest-C steel showed the best impact resistance, but at reduced hardness, the lowest-C steel was the toughest. Longer tempering at 150° or 200° gave reduced hardness but higher strength. Tempering a 1.24% C steel 60 min. at 150° gave greater strength and hardness than tempering 2 min. at 200°. After tempering at 300°, rapid cooling in water gave a lower bending strength than slow cooling, with the same hardness. Other interesting details of the results of tests are also given.

GEO. F. COMSTOCK

A note on the hardness and impact resistance of chromium-nickel steel. B. F. SHEPHERD. *Trans. Am. Soc. Steel Treating* 14, 67-71(1928).—Izod impact, hardness and tensile properties of Cr-Ni steels (S.A.E. 3250) with varying Ni and C contents are given. Higher C reduces impact resistance without increasing hardness. Tempering to 300° F. increases impact without materially affecting hardness.

W. A. MUNDAY

Hardening by reheating after cold working. M. A. GROSSMAN AND C. C. SNYDER. *Trans. Am. Soc. Steel Treating* 13, 201-15(1928).—The decrease in ductility in cold-worked steel, on heating at 600° F., originates in the amorphous metal produced by cold work. Metal grains deform by "block slip." Reheating at low temps. causes growth of thin, amorphous layers which obstruct deformation; reheating at higher temps. causes sufficient growth resultant ductility to be ineffective in obstructing slip. The brittle range (600° F.) observed in reheating quenched steels is due to non-ductile

transformed austenite in a matrix of tempered martensite; the non-ductile regions obstruct deformation of the softer matrix.

W. A. MUDGE

The transverse testing of cast iron. A. L. NORBURY. British Cast Iron Research Assn., Birmingham, England. *Intern. Congress Testing Materials* 1927, I, 385-8.—The transverse test is cheap and useful for cast Fe, but too many different sized bars are in use. The modulus of rupture formulas may be correct for a uniform material, but cast Fe bars are not homogeneous. Actually round bars give higher moduli than rectangular bars of similar cross section, and variations in length between 12 and 24 in. do not have as much effect as is called for by the formulas. For comparable results the square of the distance between supports divided by the modulus of section should be kept const. When bars cast in different sections are tested, lower moduli are obtained from white Fe and coarse gray Fe than from fine gray Fe in the intermediate sections. Most gray Fe bars are stronger at the outside than inside, but not if the outside is white. Gas cavities sometimes cause a weak zone at the outside or upper side of a cast bar. Methods of molding and pouring affect the properties of cast Fe bars by causing differences in soundness and in rate of cooling. The Brit. Eng. Standard Assn. are recommending 3 round bars of different sizes, from 0.875 in. to 2.2 in. in diam., each to be used in connection with castings of corresponding thickness.

GEO. F. COMSTOCK

The Neumann bands in ferrite. C. H. MATHEWSON AND G. H. EDMUNDS. Yale Univ., New Haven, Conn. *Am. Inst. Mining Met. Eng. Tech. Publication* No. 139, 22 pp. (1928).—The previous literature on the nature of Neumann bands is critically reviewed, the evidence presented being not incompatible with the view that they are mech. twins. They are readily formed in coarse-grained ferrite, which is brittle under shock. The mechanism of twinning in the body-centered cubic lattice is described and illustrated, as occurring around a diagonal of the unit cube, by photographs of a model. The same effect may be produced by translation, instead of rotation, of the atoms as is illustrated by diagrams. The Neumann bands are parallel to (211) planes, and a twin structure is obtained by sliding some of the atoms on these planes past others for a distance equal to $\frac{1}{2}$ the distance between planes. There are 9 twinning planes of form (211) in this lattice, and twinning around some of these are represented by stereographic projections, which are described. The work of Mugge in 1899 is reported, illustrating how the effect of twinning can be accomplished by sliding parallel planes past each other, and his measurements of the angles between Neumann lamellae and cleavage planes in soft Fe showed approx. the changes in the directions of the lattice planes produced by such movement. Neumann bands were produced by the authors in thin strips of coarse-grained ferrite contg. 3.78% Si, but not readily. Edgewise hammering between clamps was most effective in securing enough of the bands for x-ray analysis. By a study of the Laue pattern from this specimen, spots due to Neumann bands were identified that could not have come from planes in the original crystal. The cleavage planes of the crystal were found and their directions compared with the directions of the planes in twin position in Neumann bands. The relations of these various planes are discussed, but no conclusions are expressed.

GEO. F. COMSTOCK

A study of the structure of martensite. ARCHIBALD ALLISON. *Heat Treating and Forging* 14, 624-6 (1928).—The occurrence of martensite in steels is briefly discussed, examples and photomicrographs being given.

J. BALOZIAN

The conditions required for formation of cementite. G. CHARPY AND P. PINGAULT. *Compt. rend.* 187, 554-6 (1928).—Previous expts. are reviewed, showing that Fe could be carburized at 600° to 650° with the formation of a layer of cementite sepd. from the original metal by a narrow transition zone, and that cementite could decomp. at 700°. Pure electrolytic Fe filings, free from H, were carburized by cyanide or hydrocarbons, and the phys. properties were studied. The d. decreased gradually with absorption of C to a limit of 7.40 at 0°. The magnetic attraction of 1 g. of Fe filings decreased, on carburizing, from 7 g. to a const. value of about 4 g. The filings carburized to const. d. and magnetic attraction contained 6.75% C and left no trace of insol. C when dissolved in HNO₃. This product did not suffer any change in properties after gradual heating to 1000° during 10 hrs. Slight sepn. of graphite in previous expts. of this nature may be attributed to oxidation. Fine Fe wire was transformed entirely into cementite, with no trace of graphite, after heating to 850° in cyanide. Pyrometer protection tubes of Fe 1 mm. thick from cementation furnaces were also found to be completely transformed into cementite. Carburization of solid Fe below 1000° tends therefore to form cementite, and the distribution of the C beneath the surface is detd. only by the rate of soln. and diffusion of cementite in solid Fe.

GEO. F. COMSTOCK

Making and treating various steels. L. C. MILLER. *Heat Treating and Forging*

14, 1029-31(1928).—A discussion of the factors taken into account for the production of steel parts to be used in the manuf. of automobiles. J. BALOZIAN

Principles of the heat treatment of steel. U. S. BUREAU OF STANDARDS. *Trans. Am. Soc. Steel Treating* 14, 502-38(1928).—An outline prepd by the Metallurgical staff of the Bur. of Standards. W. A. MUDGE

A note on the effect of heat treatment on abnormal case carburizing steels. B. M. LARSEN AND A. W. SIKES. *Trans. Am. Soc. Steel Treating* 14, 355-62(1928).—Abnormal grain structures may be changed or modified by heat treatments. Structural abnormalities are not appreciably affected by heat treatments up to 2000-2050° F. W. A. MUDGE

New method of quenching steels in a high temperature bath. KOTARO HONDA AND KANZI TAMURA. *Trans. Am. Soc. Steel Treating* 13, 95-104(1928).—Quenching in fused salt mixts. reduces the no. of quenching cracks and produces a troostitic or sorbitic structure directly. Mech. properties are not inferior to those of a steel quenched in water and tempered. W. A. MUDGE

Effect of quenching temperature change on the properties of quenched steel. O. W. McMULLAN. *Trans. Am. Soc. Steel Treating* 14, 477-50(1928).—Max. surface hardness on high C steels is obtained at low quenching temp.; max. center hardness occurs at higher temps. along with increase in grain size. W. A. MUDGE

Engineering developments in steel. B. D. SAKLATWALLA. *Heat Treating and Forging* 14, 863-9(1928); cf. C. A. 22, 3122.—A review. J. BALOZIAN

Manufacture and use of high strength structural steel for bridges. L. S. MOISEWITZ, H. C. BOYNTON, A. V. DEFOREST AND H. T. MORRIS. *Trans. Am. Soc. Steel Treating* 13, 941-60(1928).—A symposium. W. A. MUDGE

Alloy steel for boiler construction. CHARLES MCKNIGHT. *Trans. Am. Soc. Steel Treating* 13, 617-56(1928).—A compilation of recent applications of Ni steel for boilers. Ni steel offers 25-40% increase in strength toughness and impact, is immune to aging embrittlement and more resistant to corrosion. It is suitable for use as boiler tubes and staybolts and can be made to develop higher strengths than are now demanded. W. A. MUDGE

Alloy steel castings annealed in car type electric furnaces. MARTIN ROCK. *Fuels and Furnaces* 6, 1405-8(1928). E. H.

Locomotive forging steels. O. V. GREENE. *Trans. Am. Soc. Steel Treating* 13, 573-87(1928).—Normalized forging steel eliminates internal fissures and cracks, internal strains and ferritic segregation due to non-metallic inclusions. V steel gave better results than Mn steel. W. A. MUDGE

Influence of the structure "as cast" upon manufacturing and qualities of some alloyed (especially high speed) steels. F. RAPATZ. *Trans. Am. Soc. Steel Treating* 13, 1009-22(1928).—Manufacturing success necessitates the use of small ingots with fine grain size and less forging, or larger ingots, with larger grain size and more forging. W. A. MUDGE

Medium carbon pearlitic manganese steels. JEROME STRAUSS. *Trans. Am. Soc. Steel Treating* 14, 1-24(1928).—A discussion of the metallurgical and mech. characteristics of steels contg. 0.30-0.50% C and 1-2% Mn, with particular reference to the limitations of heavy sections and low tempering temps. and advantages in machinability, resistance to corrosion and strength at moderate temps. W. A. MUDGE

Physical properties of several chromium-aluminum and chromium-nickel-aluminum steels. V. O. HOMERBERG AND I. N. ZAVARINE. *Trans. Am. Soc. Steel Treating* 13, 297-301(1928).—The affinity of Al for N in the NH₃ case hardening process has resulted in the manuf. of special alloy steels contg. Al, Cr and Ni. NH₃ at low temps. produces a very hard surface without deformation of the material and without any subsequent heat treatment. Mech. properties are given for 3 steels contg. 0.84, 1.01 and 1.30% of Al, resp. W. A. MUDGE

Effects of antimony, arsenic, copper and tin in high-speed tool steel. H. J. FRENCH AND T. G. DIGGES. *Trans. Am. Soc. Steel Treating* 13, 919-40(1928).—Sb, As, Cu and Sn adversely affect hot malleability and tool life but do not appreciably affect hardness or grain size on oil quenching. W. A. MUDGE

Development of high-speed steel hack saws or cutting off saws. HENRY B. ALLEN. *Trans. Am. Soc. Steel Treating* 13, 603-13(1928).—A comparison of relative performances of high-speed steel and low-W steel saws. High-speed steel saws are plastic for some time after hardening even with 62-64-C Rockwell hardness. W. A. MUDGE

The double carbide of high speed steel. ARNE WESTGREN AND GOSTA PHRAGMEN. *Trans. Am. Soc. Steel Treating* 13, 539-52(1928).—X-ray, microscopic and chem. analyses show the high-speed steel carbide to be Fe₄W₂C; its crystal lattice is face-centered cubic

and its elementary cube is occupied by 112 atoms. An analogous Fe-Mo carbide exists. Attempts to make $\text{Fe}_3\text{W}_2\text{C}$ synthetically were unsuccessful. W. A. MUDGE

Evaluating quality in heat-treated high-speed steel by means of the milling cutter. J. B. MUDGE and F. E. COONEY. *Trans. Am. Soc. Steel Treating* 13, 221-36(1928).—The dulling point of cutting edges of tools, detd. by a recording wattmeter in the circuit of the motor, gives a rapid and accurate test of heat-treated high-speed steel. Cast cutters are inferior. Open-fire hardening gave superior results to salt-bath hardening. W. A. MUDGE

Steels for case nitriding. A. B. KINZEL. *Trans. Am. Soc. Steel Treating* 14, 248-53(1928).—A study of the effect of Al and V on the case resulting from low-temp. nitriding. A steel contg. 0.4% V is particularly suited for industrial application. W. A. MUDGE

X-rays and the constituents of stainless steel. EDGAR C. BAIN. *Trans. Am. Soc. Steel Treating* 14, 27-50(1928).—One steel was used contg. C 0.77, Ni 0.24 and Cr 17.40%. Resistance to corrosion and hardness resulting from heat treatment depend upon carbide behavior. W. A. MUDGE

Furnace for treating stainless cutlery. GREGORY J. COMSTOCK. Firth Sterling Steel Co., McKeesport, Pa. *Heat Treating and Forging*, 14, 661-2(1928).—A furnace is described, which meets the necessary requirements and is capable of handling 5000-6000 blades in 8 hrs., for heat treating stainless steel cutlery. It is constructed on the semi-muffle principle and has a long, narrow, rectangular heating chamber, closed by doors raised with a treadle. Oil firing is used, the burner being movable horizontally to give even heating. Temps. are measured with a thermocouple introduced through the back of the chamber, and is provided with lights to aid in obtaining the temp. desired. J. BALOZIAN

A few steel cementations with special alloys containing manganese. JEAN COURNOT. *Compt. rend.* 187, 298-300(1928).—C. studies the cementation of soft, semi-hard and hard steel with: (a) ordinary Spiegel (15.42% Mn and 4.16% C), (b) ferromanganese (76.19% Mn and 6.52% C), (c) ferromangano-silico-aluminum (19.25% Mn, 20.64% Si and 10.34% Al). The best results are obtained when 2.5% NH_4Cl and 2.5% Al_2O_3 are mixed with the cementation agent. a gives the customary penetration structure; b gives a slow diffusion and produces an outside white constituent about 5/100 mm. thick after 4 hours at 1150°; this outside coat is very hard to attack; a high C content favors the formation of this coat; c gives an outside white layer, sharply outlined and no transition constituent. The hardness is about the same as in the case of C cementation but the results are more consistent. Corrosion tests in acids are also reported. J. BALOZIAN

Die-casting alloys of low melting point. T. F. RUSSELL, W. E. GOODRICH, W. CROSS and N. P. ALLEN. *Engineering* 126, 475-6(1928).—See C. A. 22, 4095. E. H.

The dependency of the breaking strength on the cross section of crude castings of German aluminum cast alloys (88 Al, 10% Zn, 2% Cu). WILLI CLAUS and JU-SZE TSAI. *Giesserei* 15, 342-3(1928).—Detn. of the breaking strengths of the cast "German" alloy (88% Al, 10% Zn, 2% Cu) for various cross sections shows that with increasing area of the section the breaking strength decreases. This is in agreement with the results of Souther (*Metallurgie* 1911, p. 719) for the 81.42% Al, 16.10% Zn, 2.48% Cu cast Al alloy. J. BALOZIAN

Stability of aluminum and magnesium casting alloys. A. J. LYON. U. S. A., Dayton, O. *Am. Inst. Mining Met. Eng. Tech. Pub.* No. 133, 15 pp.(1928).—Tension test specimens of various Al-base alloys and of 2 Mg-base alloys were cast in sand at carefully controlled temps., and tested for proportional limit, tensile strength, elongation, and Brinell hardness after aging at various temps. for different periods of time. The proportional limit of the Al alloy with 8% Cu was doubled by aging 2 years at room temp. The Al alloy contg. 5% Cu, 0.6% Fe, and 0.8% Si showed a similar increase in proportional limit, and a marked drop in ductility after atm. aging for 30 months, or aging at 300° F. for 20 hrs. Quenched duralumin also stiffened slowly at room temp., and should not be held too long before fabrication for use. Al-Cu-Mg alloys and the "Y" alloy contg. also Ni changed similarly when aged for a year, but reached a stable condition at 300° F. in 16 hrs. The properties of the Al-Si alloys did not change materially on aging, but their proportional limits were very low, being around 4000 lbs. per sq. in. as compared to 13000 lbs. per sq. in. for the aged alloys mentioned above. The Al-Zn alloys lost too much ductility on aging to be useful for air-craft. Their hardening is due to a phase-change rather than to a change in solid soly. of a constituent. These alloys are subject to weakness at high temp., and corrosion. The Mg alloy contg.

4.6% Al and 0.3% Mn did not harden or lose ductility on aging, but Mg alloys contg. Al and Zn increased in both strength and ductility. The properties of all these alloys aged different times are tabulated in detail. GEO. F. COMSTOCK

The constitution of the alloys of aluminum with copper, silicon, and iron. A. G. C. GWYER, H. W. L. PHILLIPS AND L. MANN. British Al Co., Ltd., Warrington, England. *J. Inst. Metals* (advance copy) No. 468, 52 pp. (1928).—Alloys of Al contg. up to 40% Cu, 20% Si, or 10% Fe, or combinations of 2 or 3 of these elements, were studied in regard to constitution and microstructure as ordinarily prepd. rather than under true equil. conditions. Previous work on the binary and ternary systems is reviewed. The soly. of Cu in Al was found to be over 5% at the eutectic temp. and under 0.5% at room temp. The soly. of Si in Al was found to be 0.35% at 450° and 0.15% at 300°. The ternary system Al-Si-CuAl₂ was simple at the Al corner, with not over 0.25% solid soly. of Cu or Si at room temp., and a eutectic contg. 26% Cu and 6.5% Si at 525°. CuAl₂ is etched deep brown by NaOH soln. while FeAl₃ is etched blue-green, and the needle or "N" constituent due to Fe is etched bronze. "N" is formed by a peritectic reaction at 590° between FeAl₃ and liquid, but this reaction was seldom complete. The FeAl₃ was often protected by a sheath of Al or of "N" constituent. The latter usually formed on other crystals rather than from its own nuclei. A ternary eutectic is formed at 540° in the Al-Cu-Fe system, and contains 32.5% Cu and 0.3% Fe, the components being Al, CuAl₂, and "N" constituent. A model of the quaternary system was constructed in the form of a tetrahedron and sections through it are illustrated and discussed. No new quaternary constituent was found within the range of compn. studied. The "X" of the Al-Si-Fe system and the "N" of the Al-Cu-Fe system were end members of a continuous series of solid solns., and in the quaternary system this was called "X." A quaternary eutectic freezes at 520° and contains 26% Cu, 6.5% Si, and 0.5% Fe, the components being Al, Si, CuAl₂, and "X." Numerous sectional diagrams are explained, and typical microstructures illustrated and described. Complete structural equil. was seldom attained, on account of the slowness of reactions and the formation of protective sheaths around reacting constituents. The structure of com. Al alloys is discussed; Fe in them generally occurs as "X," Cu as CuAl₂ and Si as the element or in "X." Diagrams are presented to show how the occurrence of these constituents is related to differences in purity of com. Al alloys. The appearance and etching characteristics of the various constituents are described. GEO. F. COMSTOCK

The reversed block liquation in aluminum bronze (4.5% Al, 95.5% Cu). WILLI CAUS AND FRITZ GOEDERITZ. *Giesserei* 15, 398 (1928).—A study of reversed block liquation in the 95.5% Cu, 4.5% Al alloy, the castings being made in cast Fe, and green and dry sand molds. If the alloy showed liquation, then differences in the chem. compn. of the exterior and interior of the castings, and of its top, middle and bottom, must be apparent. Duplicate analyses give the Cu content of the castings, independent of the type of mold used, as 95.5% and the Al as 4.4%. Thus, reversed block liquation is not shown by this Al bronze, apparently because of the small solidification interval of this alloy. J. BALOZIAN

Smoothing and etching cupronickel, bronze, brass and steel. H. B. PULSIFER. Ferry Cap & Set Screw Co., Cleveland, O. *Am. Inst. Mining Met. Eng. Tech. Publication* No. 137, 18 pp. (1928).—A rapid method of prepn. of metallographic specimens is described, involving hand-rubbing on emery papers first, and finally on chamois-skin carrying tripoli powder. Etching is relied on to remove the final scratches. CrO₂ added to HNO₃ for etching gave good results with this method. Sometimes repolishing and re-etching after a preliminary etch were advantageous. A large no. of photomicrographs are presented to show P.'s results with Ni and Cu alloys and steels. The specimens were claimed to have been prepd. in 2 min. each. CrO₂ was useful in acid FeCl₃ for etching bronze. The addn. of 5% Be raised the Brinell hardness of cupronickel from 126 to 302. It was difficult to remove the final scratches from steel by etching, and a final polish with rouge, Al₂O₃ or MgO was often worth while, especially after a preliminary etch. An active etching reagent for steel was 0.5 cc. H₂SO₄ in 100 cc. satd. KClO₃ soln., but it was liable to give promiscuous corrosion. Steel wire contg. 0.12% C when quenched from 1500° F. was brittle because the hardening constituents were not thoroughly diffused at that temp. Light etching with HCl and high magnification served to reveal the cause of brittleness. The segregated martensitic nodules reverted to cementite on annealing. GEO. F. COMSTOCK

The constitution of the copper-silicon system. CYRIL S. SMITH. Am. Brass Co., Waterbury, Conn. *Am. Inst. Mining Met. Eng. Tech. Publication* No. 142, 25 pp. (1928).—The Cu-Si equil. diagrams proposed by Rudolphi, Sanfourche, Corson, and Matuyama are shown and criticized, the last one more favorably than the others. The

exptl. alloys examd. by S. were made of electrolytic Cu and Si contg. 0.44% Fe. The compn. was checked in most cases by a detn. of Cu only. The methods of chem. and thermal analyses are given, the chromel-alumel thermocouple being protected from contact with the melt by a C sheath 1/16 in. thick. To det. the compn. ranges over which the various phases existed, the structures of annealed and quenched samples were studied with the microscope. Oxidation of Si from the high-Si samples during the annealing was worse in the CO-N₂ atm. obtained by the use of charcoal than in illuminating gas, but allowance was made by reducing the time of annealing below 4 hrs. and discarding the outer layer of the samples. A new equil. diagram is given, with the exptl. points shown in detail, up to 20% Si. The limits of the α phase were given in a previous paper (*C. A.* 22, 3873). β is formed at 852° by a peritectic reaction of α with liquid contg. 7.7% Si. It may contain 6.8–8.4% Si, but at 782° with 7.75% Si it decomposes into the α plus Δ eutectoid. The decompn. was not prevented by the most rapid quenching. At 824° satd. β reacts with liquid to form Δ contg. 8.60% Si, and the Δ phase extends to 9.7% Si at 820°. At 710° Δ with 8.95% Si decomposes into the γ plus epsilon eutectoid. This decompn. could be retarded by quenching, giving martensitic or sorbitic structures, γ contg. 8.35% Si is formed at 726° by a reaction between Δ and α , and may contain over 9% Si at lower temp. Epsilon, causing a max. in the liquidus at 12.3% Si and 859°, forms eutectics with Δ at 820° and 9.9% Si, and with 802° and 16% Si. It may contain from 11.2 to 13% Si, and changes, at 620° on the γ side and at 558° on the Si side, to another form called epsilon prime with slight pptn. of Si. These alloys did not disintegrate when exposed to air. The soly. of Cu in Si was detd. to be less than 4.4%, if any. The existence of definite compds. was not indicated, and all the phases were considered as solid solns. The microstructures are illustrated by 30 excellent photomicrographs, which are fully discussed. The β eutectoid was well etched with a satd. soln. of K₂Cr₂O₇ in 10% H₂SO₄ with the addn. of 2% of a satd. soln. of NaCl. The Δ alloys were etched very well with a 20% soln. of FeCl₃ in 1–4 HCl. Both solns. served well for the γ alloys. Epsilon was well etched by atm. tarnishing, or by FeCl₃ which developed striae in epsilon grains but not in epsilon prime. G. F. C.

The chemical destruction of cast iron. W. DENCKE. *Giesserei* 15, 307–12 (1928).—Corrosion of cast Fe (I) is ascribed to chem. causes, local elements and erosion. To study the dissolving action of alkalis and acids on I (contg. besides graphite, less than 1% Si, Mn, P, S and perhaps Cu or Ni) specimens are suspended in: (1) molten KOH and NaOH for 18 and 20 hrs. and (2) 10% HCl for 46 hrs. In the molten alkalis, specimens contg. Ni show the least, and those with Si, P and S the greatest, soly., while no decidedly unfavorable influence of Mn could be detected. In the acids, the Si-rich specimens behave the best and those contg. Ni, P and S the poorest, while Mn acts favorably. The suspension of I contg. Cu in 10% HCl for 24 and 43 hrs. at room temps. shows that stability toward this acid is increased by Cu (optimum at 0.5%). The effect of Si on the soly. of I contg. varying amts. of Si up to 17% is detd. in boiling 15% and 10% H₂SO₄, and 5% HCl. The superiority of I with high Si content is clearly seen. The Guertler-Tammann Fe-Si diagram as modified by Körber, and the solidification fields of the Fe-Si-C alloys are discussed. The disadvantages of high Si content and the importance of the graphite distribution on the corrosion of I are briefly stressed. J. B.

The corrosion of iron. WILHELM VAN WÜLLEN SCHOLTEN. *Gas u. Wasserfach* 71, 872–80 (1928).—The electrolytic theory of corrosion is reviewed in a comprehensive manner and an extensive and up-to-date bibliography given. R. W. RYAN

The corrosion of metals. WM. M. GUERTLER. *Trans. Am. Soc. Steel Treating* 13, 759–94 (1928).—The first Edward DeMille Campbell lecture. All com., acid-resisting alloys must be the group of elements Fe, Cu and Ni. Addnl. elements should be those which will enter into solid soln. W. A. MUDON

Durability tests of nickel chrome resistor materials. F. E. BASH, Driver-Harris Co., Morristown, N. J., and J. W. HARSCH, Leeds & Northrup Co., Phila., Pa. *Intern. Congress Testing Materials* 1927, I, 463–78.—The service of elec. heating elements depends on the quality of the materials as well as on the design. The Ni-Cr alloys oxidize readily, but the oxide constitutes an efficient protective coating. Failure of such heating elements occurs by development of a hot spot where the coating has cracked off, and the life is much shorter in intermittent than in continuous heating. The variables affecting a life test are temp., size and condition of wire, voltage, atm., and mounting. Vertical suspension was the best mounting method, and draughts of air must be avoided. Some previous methods of test are reviewed; heating from an external source is not desirable in testing. Tests may be made at const. temp., or at const. voltage, and both intermittent and continuous tests are desirable. The lengths of both heating and cooling periods have important influences on the results. Changes in resistance, in

temp., and in length and ductility of the sample after testing should be noted. The trial specifications adopted by a comm. of the Am. Soc. Testing Materials are given in detail. Tests made under these specifications are being conducted in 10 labs. to evolve a standard method of testing. Specimens 12 in. long are suspended vertically from a binding post, the bottom contact being in a Hg cup. Temps. are measured with a disappearing-filament optical pyrometer having a short-focus objective lens. A standard procedure, and records, are also given in detail. Before testing, the uniformity of a given coil of wire should be established. The salts of alkali metals injure hot Ni-Cr wires, and must be avoided. The results of tests so far made with this method are encouraging.

GEO. F. COMSTOCK

The corrosion-resistant ferrous alloys. JOHN A. MATHEWS. *Intern. Congress Testing Materials 1927*, I, 103-10.—Non-corrosive steels are an important new development and their value to industry is not widely realized. Austenitic Cr-Ni steels are 2 or 3 times as strong as ordinary metals above 600°. Non-corrosive steels that harden by quenching are Cr alloys; those with less than 0.12% C and 12 to 14% Cr are known as "Stainless Iron," and when normalized have 140,000 lbs. per sq. in. yield point, 160,000 lbs. per sq. in. tensile strength, 12% elongation in 2 in., 35% reduction of area, and 300 Brinell hardness. When heat-treated the properties are slightly improved. This steel is unaffected by atm. or salt-water corrosion, HNO₃, or alkalis. "Stainless Steel" with 0.3 to 0.4% C must be hardened and polished for max. corrosion resistance. Unhardenable non-corrosive steels may be Ni, Cr, or Cr-Ni alloys. Those contg. 25 to 35% Ni have been longest known, and resist HCl better than Cr steels. Those contg. 16 to 30% Cr are soft and ductile, but weak in shock resistance. Those contg. high Ni and Cr, with 2 to 3% Si, originated by C. M. Johnson, are very interesting and resistant. At 700° where the strength of ordinary steel is negligible, austenitic Cr-Ni steel may show 65,000 lbs. per sq. in. tensile strength. Full cooperation between the user and maker is very important for the most useful development of these alloys. In discussion, E. C. Bain and M. A. Grossman showed that steels with 17 to 25% Cr are non-hardenable because they always remain as α Fe; they are readily fabricated, cheaper, but less rust-resistant than the austenitic steels, which harden by cold-work. A. Michel described the Parkerizing method of protecting from rust by coating with a penetrating layer of complex phosphates, and its effects.

GEO. F. COMSTOCK

Arc welding. D. C. COOPER. *Facts about Sugar* 23, 977 (1924).—It is suggested that internal-combustion engines driving welding generators be arranged to be idle when the load is removed and maintain the working speed only when the arc is struck. The welding arc should be maintained about $\frac{1}{8}$ in. long. A table is given indicating the chem. and phys. characteristics of mild steel welding metal before and after welding. Important work should not be undertaken except by skillful operators.

M. J. P.

The effect of coal segregation, mixing and heating upon the quality of metallurgical coke (MARQUARD) 21. Occurrences, metallurgy and uses of Hg (EARDLEY-WILMOT) 8. Production of Cu castings having high electrical conductivity (MASING, HAASE) 4. Furnaces suitable for heating metal sheets in annealing boxes, etc. (U. S. pat. 1,688,393) 1. Plant for treating graphite and other ores (Fr. pat. 638,088) 18. Regenerative channel oven for heating steel billets (U. S. pat. 1,687,774) 19.

KAUTNY: *Leitfaden für Acetylschweisser*. 9th ed. Halle: Carl Marhold. 252 pp.; M. 4. Reviewed in *Chimie et industrie* 20, 600 (1928).

Apparatus for froth-flotation concentration of ores. FREDERICK SWINNEY. U. S. 1,688,998, Oct. 23.

Flotation separation of mixed sulfides in ores. KOJIRO KAWAMURA (one-half to Yoshimatsu Yokoyama). U. S. 1,688,277, Oct. 16. Ores such as those contg. sulfides of Cu, Fe and Zn are treated with crude com. anhyd. chromic acid together with alkali to neutralize any H₂SO₄ present in the crude chromic acid. This addn. to the ore pulp serves to inhibit flotation of Cu and Fe sulfides without affecting ZnS, when flotation is effected with the usual flotation agents.

Separating minerals or other materials by flotation. COOPER SHAPLEY. U. S. 1,689,693, Oct. 30. Finely divided particles such as those of fluorite, rutile or corundum are contacted with a soap soln. which does not react chemically with the particles and the particles are then brought to the surface of a body of water free from any reagent which would decomp. the soap.

Flotation oil. ROYER LUCKENBACH. U. S. 1,688,975, Oct. 23. An oil for mineral flotation comprises a heavy petroleum residuum, a petroleum diluent such as a light petroleum distillate and a frother contg. cotton-seed foots, pine creosote and a soap.

Reduction of ores and conversion of hydrocarbons. WM. H. SMITH. Fr. 638,251, July 26, 1927. Metallic oxides, particularly ores, are reduced by adding heavy hydrocarbons which are converted into light hydrocarbons, the oxides acting as catalysts. The process can be made continuous.

Direct reduction of iron ores. TOUSSAINT LEVOZ (to Naamlooze Vennootschappij Handelsmaatschappij Feriron). U. S. 1,689,734, Oct. 30. A charge comprising Fe ore, reducing carbon, oxides of alloy metals such as Si and Mn, and a low m.p. aluminous flux is subjected to a comparatively low temp. (suitably about 1700°) to produce a low-C ferro alloy and a covering slag; the temp. is raised to reduce the C content of the alloy by interaction of the C with the oxidized Al in the slag, and components other than Fe of the alloy are then reduced by use of an oxidizing agent such as Fe oxide. An app. is described.

Removing arsenic from ores, etc. NORDDEUTSCHE AFFINERIE. Brit. 286,285, March 3, 1927. As is removed from ores and metallurgical products such as mats, speiss and Cu-As compds. by the addn. of S-bearing material and carbonaceous fuel and by the combustion of the mixt. in a restricted supply of air without the application of external heat. A superposed hearth furnace with rabble arms is preferably used, but a rotary drum furnace may be employed.

Briquetting coal, ores or other materials. R. LESSING. Brit. 286,336, Nov. 3, 1926. For briquetting coal, ores, metal scrap, etc., or for treating "rod metal," the material is coated with coal tar or other liquid contg. pitchy and oily fractions. An oil solvent contg. little or no aromatic constituents such as a petroleum distillate is then used to ext. the oily portion and ppt. the pitch in a homogeneous coating on the solid particles to be briquetted. Extn. of the tar oil is facilitated by addn. of H₂SO₄, an acid soln. of Fe sulfate or chloride or spent liquor from pickling steel. Numerous details and modifications of the process are given.

Core material for use in metal founding. WILLIAM B. RUNYAN (to Dayton Malleable Iron Co.). U. S. 1,688,661, Oct. 23. Core material such as sand is treated with definitely proportioned quantities of oil and water and the materials are intimately mixed. An app. is described.

Magnet cores. FELTEN & GUILLEAUME CARLSWERK A.-G. Brit. 286,202, Feb. 26, 1927. Magnet cores for Pupin coils, etc., are formed from ball-shaped Fe particles having a diam. of less than 10 μ which are coated with an insulating layer such as cellulose acetate and then subjected to pressure less than the elastic limit of the Fe powder. Powder formed by reduction of Fe carbonyl with H is suitable. Cf. C. A. 22, 2350.

Magnetic cores. I. G. FARBENIND. A.-G. Brit. 286,167, Sept. 5, 1927. In making metallic powders for compression into cores for electromagnets, Pupin coils, etc., by decomp. the corresponding metal carbonyl, instead of treating the resulting powders in an inert atm., as described in Brit. 269,770 (C. A. 22, 1286) the powder is heat treated in a reducing atm. and is then ground (preferably in a ball mill), generally in the absence of O. An example is given of the prepn. of Fe powder from Fe carbonyl.

Separable hot top for ingot molds. JOHN E. PERRY (to Valley Mould & Iron Corp.). U. S. 1,689,174, Oct. 23. Structural features.

Hot top for ingot molds. WILLIAM H. RAMAGE (to Valley Mould & Iron Corp.). U. S. 1,689,175, Oct. 23.

Magnetic control of ingots and steel bars. FORGES ET ACIÉRIES DE LA BERARDIÈRE BÉDEL ET C^{ie}. Fr. 636,133, Oct. 8, 1926. Irregularities in ingots or steel bars are detected by placing the ingot in a magnetic field created by a solenoid and measuring either the induction produced or the residual magnetism.

Molds for casting metals. CLIFTON D. PETTIS. U. S. 1,688,350, Oct. 23. A molding surface such as a "permanent" mold is treated with a mixt. of fire clay with silica and Na silicate and then treated with an oil, e. g., crude oil or tar which serves to leave a graphitic pore-filling residue.

Device for supplying stereotype metal or other molten metals to a movable casting box. ISIDOR TORNBERG (to Wood Newspaper Machinery Corp.). U. S. 1,689,698, Oct. 30.

Stationary apparatus for filling molds in casting metals. N. LITTELL. Brit. 286,109, April 4, 1927.

Joining metals by casting. W. SMITH. Brit. 285,995, Nov. 25, 1926. Before casting molten metal to be joined with pieces of solid metal the latter is amalgamated at the surface to be joined or an amalgamated metal strip is placed adjacent the surface. The method is suitable for Pb, Cu and Al. Fe and steel may be galvanized before amalgamating and castings to receive bearing metal may be similarly treated.

Casting ferrous metals. PORTER W. SHIMER and EDWARD B. SHIMER. U. S.

1,687,799, Oct. 16. A chaplet for use in ferro metal founding is provided with a coating of a ferro-alloy such as spiegeleisen and ferro-P which melts at or below the casting temp.

Malleable iron castings. HARRY A. SCHWARTZ (to National Malleable and Steel Castings Co.). U. S. 1,688,438, Oct. 23. See Brit. 282,671 (C. A. 22, 3622).

Apparatus for centrifugal casting of pipes or like metal articles. J. HOLTHAUS (to International Delavaud Mfg. Corp., Ltd.). Brit. 285,821, Feb. 21, 1927.

Forming cast iron pipe or like articles. JAMES R. MCWANE. U. S. 1,688,727-8, Oct. 23. Mech. features.

Centrifugal casting of cast iron cylinders for internal-combustion engines, etc. NEWTON, CHAMBERS & Co., LTD., and J. E. HURST. Brit. 285,721, July 15, 1927. The Si content of the metal is adjusted and the casting is rapidly cooled from a temp. almost immediately below its solidification point (by means of an air blast which may be moistened) to obtain a sorbitic structure in order to render the article more resistant to wear, impact and vol. changes on heating and to increase its tensile strength. The proportion in Si is low and depends on the av. thickness of the casting and on the thermal cond. and temp. of the mold material. Examples are given with Si varying from 0.5% to 2.25%.

Plate mill for rolling hot metal. JOHN B. TYTUS (to American Rolling Mill Co.). U. S. 1,688,252, Oct. 16.

Apparatus for rolling metal tubes from hollow blocks. M. ROECKNER. Brit. 285,894-5-6-7, Feb. 25, 1927.

Finishing metal bars or other rolled metal shapes. SAMUEL G. WORTON. U. S. 1,689,544, Oct. 30. Articles such as bars are subjected to grinding after completion of the rolling operation and while still at a temp. approx. that at which the rolling is completed.

Thermal treatment of metals. WM. EWART WATKINS. Fr. 638,206, July 25, 1927. Metals which are passed through a furnace in the form of a band, e. g., for annealing, hang freely between rollers one at each end of the furnace.

Refining lead, etc. AMERICAN SMELTING AND REFINING CO. Brit. 285,630, Jan. 21, 1927. A molten metal such as Pb is treated for the removal of impurities such as Zn by introducing a gaseous reagent such as Cl in a reaction chamber through which the molten metal is repeatedly passed. An app. is described in which dross of $ZnCl_2$ may be confined by an iron ring dipping into Pb, whence the dross may be removed by skimming.

Recovering copper, zinc, etc., from liquors containing them. C. F. SCHANTZ. Brit. 285,662, March 12, 1927. Solns. contg. Cu and Zn in the form of chlorides or mixed chlorides and sulfates, such as solns. obtained by lixiviation of pyrites roasted under chlorination, are tested for Cu, Cl and free acid and there is added to the liquor such a quantity of H_2SO_4 as will suffice for converting to HCl the Cl present (other than that already in the form of free acid) and the Cl in the form of $CuCl_2$. There are also added a quantity of finely divided Cu slightly in excess of the Cu content, and a quantity of Cu_2O (or CuO and Cu) sufficient to convert into Cu_2Cl_2 the total Cl content less the quantity of Cl combined with the Cu content reckoned as $CuCl_2$ so that all the Cu and Cl are pptd. as Cu_2Cl_2 , Ag and Au are pptd. as metals and Pb as sulfate, while a sulfate liquor contg. Zn, Na, Fe, As, Ni and Co remains. Numerous details for the recovery of values from this soln. are given.

Aluminum. ZAIDAN HOJIN RIKAGAKU KENKYUJO. Fr. 637,879, July 18, 1927. Pure Al is obtained from Al contg. one or more impurities of Si, Fe, ferrosilicon and oxides of Fe, by Cl or gaseous HCl at a temp. above 200° with or without one or more reducing agents.

Zinc dust. FRANKLIN P. LANNON, JR. (to American Smelting & Refining Co.) U. S. 1,688,426, Oct. 23. Zinc fumes are circulated vigorously and rapidly quickly to cool them to a point considerably below the vaporizing temp. so that the Zn particles are solidified as they are incipiently condensed and formed. An app. is described.

Porous metallic bodies. GENERAL MOTORS RESEARCH CORP. Fr. 636,124, June 17, 1927. Parts of machinery such as bearings are made of porous metallic substances composed of metals which do not alloy even partially so that they will absorb lubricant. An example given contains Cu 68, Pb 25, graphite 5 and Sn phosphide 2 parts. The powd. constituents are mixed and heated with a volatile substance such as salicylic acid. Cf. C. A. 22, 4452.

Open-hearth furnace and tuyère construction. RICHARD H. STRYVENA (to Bethlehem Steel Co.). U. S. 1,689,563, Oct. 30.

Cupola furnace. L. F. C. Girardet. Brit. 286,295, March 4, 1927. The fore-

hearth of a cupola furnace is a plate or table which forms a parallel motion connecting-rod between 2 similar crank arms, so that the fore-hearth can be moved in a gyratory manner to mix the metal.

Fusion furnace for metals or alloys. E. CHABOCHE ET CIE. Fr. 637,979, Nov. 29, 1926.

Rotatable metallurgical furnace suitable for producing wrought iron. ARTHUR J. BRIGGS (to Onondaga Steel Co.). U. S. 1,687,925, Oct. 16.

Blast furnaces. FRIED. KRUPP AKTIENGESSELLSCHAFT FRIEDRICH ALFRED HÜTTE. Fr. 638,264, July 26, 1927. In blast furnaces wherein part of the gas from the mouth of the furnace is reused, the charge of coke is calcd. exactly, the blast is introduced at the highest possible temp., and modifications are compensated for by adjusting the amt. of gas to be used from the mouth.

Blast furnace for the continuous treatment of ores, etc., with cooled hearth. GOTTFRIED VERVUERT and GEORGE RIEBER. Fr. 637,998, May 5, 1927.

Blast pipes for blast furnaces. CLAUDIUS DUCHASSIN. Fr. 636,426, June 22, 1927.

Apparatus for tapping blast furnaces. EDGAR E. BROSIUS. U. S. 1,688,327, Oct. 23.

Furnace for heating steel blanks for cutter bits, etc. HARRY C. JOHANSEN (to Sullivan Machinery Co.). U. S. 1,688,814, Oct. 23.

Furnace for annealing brass, copper, etc. ALBERT N. OTIS and LOUIS F. WOOLSTON (to General Electric Co.). U. S. 1,688,745, Oct. 23. A preheating chamber is provided with a vertically movable device acting as a common support for a cold charge being preheated and a hot charge being cooled.

Induction electric melting furnace construction. JAMES R. WYATT (to Ajax Metal Co.). U. S. 1,688,220, Oct. 16.

Reversing furnace construction. WALTER DE FRIES (to Blaw-Knox Co.). U. S. 1,687,710, Oct. 16. A furnace is described which is suitable for refining steel.

System of fuel and air supply, etc., for operating metallurgical open-hearth furnaces. FRANK B. MCKUNE (to Open-Hearth Combustion Co.). U. S. 1,687,682, Oct. 16.

Checkerwork for regenerative chambers. FRANK R. MCGEE. U. S. 1,689,041, Oct. 23. Structural features. U. S. 1,689,042 relates to a hot-blast stove construction.

Checkerwork construction for regenerators. ALBERT E. PETERSON. U. S. 1,687,786, Oct. 16.

Gray iron. EMIL SCHÜZ (to the firm of Meier & Weickelt). U. S. 1,689,456, Oct. 30. Fe having a high Si content is melted to form gray Fe; the Si content is chosen in proportion with the chosen rate of cooling, and may be about 3.5% for rapid cooling in an Fe mold.

Steel. H. J. VAN ROYEN. Brit. 285,814, Feb. 21, 1927. In producing steel resistant to deformation by cold and aging, the steel is deformed during the molding or working process at a temp. below the A^1 point and then annealed by heating to a temp. above the A^1 but below the A^1 point and cooled in still air. The process may be repeated.

Rolled steel articles. SAMUEL G. WORTON. U. S. 1,689,512, Oct. 30. In order to remove surface defects from rolled steel articles such as blooms and billets before final rolling, the side surfaces of the articles having these defects are ground off while the articles are heated to approx. a rolling temp.

Hardening steel. SOCIÉTÉ AUBERT ET DUVAL FRÈRES. Fr. 638,322, July 27, 1927. During the hardening of steel by N parts are protected against the N by a coating of Sn or Sn alloy which may be made resistant to the temp. used by a layer of Na_2SiO_3 and powd. Al.

Alloy steel. CHARLES MCKNIGHT, JR. (to International Nickel Co.). U. S. 1,689,043, Oct. 23. In order to stabilize the solidification of an alloy steel casting formed from scrap initially having a high Si content, the metal is melted under oxidizing conditions until the Si content is below a crit. point, not exceeding 0.1%, and the metal is then subjected to reducing conditions and alloying materials are added.

Steel alloy. FRIED. KRUPP AKTIENGESSELLSCHAFT. Fr. 638,263, July 26, 1927. An alloy of steel resistant to heat and chem. action contains Cr 15-25, Ni 15 to 25 and C less than 0.2%. Typical alloys are Cr 25, Ni 20, C 0.1% and Cr 20, Ni 25 and C 0.1%. Cf. C. A. 22, 4455.

Alloys. THOMAS DANIEL KELLY. Fr. 638,455, July 29, 1927. See Brit. 264,414 (C. A. 22, 55).

Alloys. THOMAS DANIEL KELLY. Fr. 638,456, July 29, 1927. See Brit. 277,170 (C. A. 22, 2351).

Alloys. THOMAS DANIEL KELLY. Fr. 638,457, July 29, 1927. See Brit. 270,553 (C. A. 22, 1569).

Alloy. ELECTROLYTIC ZINC Co. OF AUSTRALIA, LTD. (S. W. Ross; R. T. D. Williams, R. S. Russell, inventors). Australia 8993, Aug. 22, 1927. A bearing alloy contains Cd 95-97, Cu 3-5, with or without up to 0.5% of Mg.

Bearing alloy. CHRISTOPHER H. BIERBAUM (to Lumen Bearing Co.). U. S. 1,687,924, Oct. 16. An alloy of Cu 84.5, Sn 10.5 and Ni 5% is cast in the absence of Zn against a chill so that the α -crystal is not hardened but left soft and a large amt. of hard delta crystal is formed upon the chilled surfaces; a wide range of hardness is provided between the hardest delta crystal and the softest α -crystal.

Alloys for turbine blades, etc. HERAEUS VACUUMSCHMELZE A.-G. AND W. ROHN. Brit. 286,367, Dec. 3, 1926. Alloys are formed contg. Cr 10-40, Ni 40-85 and Fe 1-40%, practically free from C, and may contain also W up to 15%, Mo up to 12%, Al up to 6% and Co 2-20%. The alloys may be made by the vacuum smelting process.

Alloy suitable for use in submarine cables, etc. WILLOUGHBY S. SMITH, HENRY J. GARNETT and JOHN A. HOLDEN. U. S. 1,688,247, Oct. 16. An alloy formed largely of Ni contains also Fe 6-17 and Al 1-5% and 1-5% of a fourth metal for increasing the elec. resistance such as Cr, Mo, W, V or Si.

Apparatus for magnetic tests of alloys, etc. C. KINSLEY (to Federated Engineers Development Corp.). Brit. 285,860, Feb. 23, 1927.

Refining metals and alloys. FRIEDRICH WILHELM CORSALLI. Fr. 638,486, June 24, 1927. App is described for obtaining a homogeneous mixt. of molten metal or alloy after its exit from the cupola furnace, after the addn. if necessary of refining or reducing substances such as C, Al or Na_2CO_3 .

Increasing the hardness of metals and alloys. SIEMENS & HALSKE AKTIEN-GESELLSCHAFT. Fr. 636,519, June 24, 1927. Metals and their alloys, particularly Ni, Co and Pb, have their hardness increased by alloying them with small quantities of Be. Other elements such as Sn, Zn, Sb, Al, Cd, Fe, C, Si or P may also be added. An addn., e. g., of about 0.2% of Be to Pb increases the hardness by about 100%. An addn. of 3% of Be to Co gives an alloy of about 270 Brinell. Ni contg. 13.4% Be will scratch glass.

Aluminum alloys. T. S. FULLER (to British Thomson-Houston Co., Ltd.). Brit. 285,908, Feb. 25, 1927. An alloy suitable for use in elec. motor rotors comprises Al with Mn 4-10 and Zn 2-8%.

Aluminum alloys. JEAN HANCO. Fr. 638,159, July 23, 1927. In making light Al alloys of high resistance a mixt. of 2 parts of BaCl_2 and 1 of crystd. KCl finely ground is added to the melted alloys. The mixt. corresponds to about 5% of the weight of the melt. If the alloy contains 5% or more of Si, the KCl is replaced by MnCl_2 or SnCl_2 , or a mixt. of CaCl_2 and MnCl_2 or a mixt. of metallic Sn and SnCl_2 is used.

Iron alloy. PERCY A. E. ARMSTRONG. U. S. 1,687,486, Oct. 16. An alloy resistant to scaling at elevated temps. contains Cr 9, C 0.50, Si 3.5 and Ta 3%; the remainder is principally Fe. This alloy is suitable for valves of internal-combustion engines.

Zirconium-treated iron-chromium alloy. FREDERICK M. BECKETT (to Electro Metallurgical Co.). U. S. 1,689,276, Oct. 30. Wrought articles such as tubing are formed of a ferrous alloy contg. Zr 0.008% or somewhat more and Cr 10-60%. This alloy has working properties superior to those of an alloy free from Zr but otherwise of similar compn.

Magnesium alloys. ZAV JEFFRIES and ROBERT S. ARCHER (to American Magnesium Corp.). U. S. 1,689,630, Oct. 30. In working Mg base alloys such as those contg. Al and Zn, Cd, Cu or Mn, the solid metal is subjected to heat treatment at a high temp. (suitably about 400-440°) for several hrs., below the melting temp. of the most fusible constituent of the alloy, to increase the plasticity of the alloy, and the latter is then subjected to mech. deformation.

Alloy of magnesium, aluminum and copper. JOHN A. GANN (to Dow Chemical Co.). U. S. 1,688,043, Oct. 16. An alloy which may be used for pistons of internal-combustion engines comprises Mg 90, Al 9 and Cu less than 1.5 parts. Cf. C. A. 22, 3624.

Closing the pores of metal layers deposited one upon another. NIKOLAUS MEURER (to Metallogen G.m.b.H.). U. S. 1,688,127, Oct. 16. A metal article which may be formed of iron is coated by spraying with another metal such as Zn and after this metal layer is applied it is successively treated with different substances such as BaCl_2 and a sol. sulfate which react together to form a ppt. which serves to close the pores of the metal. Addnl. layers of metal may also be applied, each of them being also subjected immediately to the pore-closing treatment.

Renewing worn surfaces of metal articles. E. H. JONES and S. WILLIAMS. Brit. 286,089, March 2, 1927. Shafts or other articles which have become worn are wound or covered with metal wire or strip which may be welded or brazed to the surface and hardened or machined.

Plating metal. WM. EWART WATKINS. Fr. 638,207, July 25, 1927. See Brit. 282,624 (C. A. 22, 3621).

Metal articles with irregular plated surfaces. EDMUND M. WISE (to Wadsworth Watch Case Co.). U. S. 1,689,810, Oct. 30. Watch case bows or other articles are formed of base metal shaped with substantially the surface form finally desired, are then coated, e. g., with Au or Ag, and subjected to a final shaping to bring out the surface irregularities desired.

Retort suitable for heat treating metal articles. EDWARD P. VAN STONE (to General Alloys Co.). U. S. 1,689,808, Oct. 30. Structural features.

Apparatus for removing carbon and gases from tantalum wire. MINER M. AUSTIN and CLARENCE W. BALKE (to Fansteel Products Co.). U. S. 1,688,481, Oct. 23.

Wire for uninsulated electric conductors. COMPAGNIE DE PRODUITS CHIMIQUES ET ELECTRO-METALLURGIQUES ALAIS, FROGES, ET CAMARGUE. Brit. 286,264, March 2, 1927. Light Al alloys such as Al-Cu, Al-Li, Al-Mg silicide, Al-Be or ternary or quaternary alloys of these metals with addns. of Ni, Cd or Mn are subjected to mech. and heat treatment, e. g., a billet of the alloy is first rolled or drawn to a diam. greater than that finally required and the coiled wire thus formed is tempered and then reheated for several hrs. at a temp. usually of 125–175° but which may be up to 250°, and the wire then cold-drawn to size and annealed at 125–250°.

Blowpipe apparatus for cutting metals by fusion. T. R. HANCOCK and J. CUTHBERTSON. Brit. 285,959–60, Nov. 22, 1926. Structural features.

Annealing metal bonds. MANSFELD AKTIENGESSELLSCHAFT FÜR BERGBAU UND HÜTTENBETRIEB and OTTO BUSSE. Fr. 635,876, June 11, 1927. The bands are passed through a furnace contg. a layer of asbestos or the like between the lower surface of the band and the base of the furnace.

Welding rod. FREDERICK M. BECKET (to Oxweld Acetylene Co.). U. S. 1,689,577, Oct. 30. See Can. 275,681 (C. A. 22, 1131).

Electrodes for arc welding. ALLOY WELDING PROCESSES, LTD. and E. J. CLARKE. Brit. 285,674, March 29, 1927. Electrodes for arc welding of Al and its alloys (other than Al bronze) are made with a core of Al or Al alloy coated with a flux contg. a reducing agent such as C, charcoal or sawdust, to form a reducing atm. around the arc. The core may be coated with other metals such as Cu or Ni for alloying with the Al or assisting in preventing formation of Al oxide, and metals such as Cu, Ni or Si may be added to the coating compn. for the same purpose. Numerous details and compns. of different fluxes are given.

Automatic electric arc welding apparatus. ALLIS M. MACFARLAND (to Westinghouse Elec. & Mfg. Co.). U. S. 1,689,882, Oct. 30.

Apparatus for making sheet-metal pipe by electric resistance welding. FREDERICK L. WILLIAMS. U. S. 1,689,374, Oct. 30.

Welding ferrous metals. GEORGE N. STEIGERWALD (to Union Trust Co. of Cleveland, Ohio). U. S. 1,688,360, Oct. 23. A seam is welded along points of contact of pieces to be united and after the seam has been allowed to solidify it is retraced with a C arc to melt the surface of the seam, relieve internal stresses and improve the characteristics of the metal along the seam.

Soldering mixture. HENRY C. P. WEBER (to Westinghouse Elec. & Mfg. Co.). U. S. 1,689,899, Oct. 30. NH_4Cl is mixed with a plurality of metal halides such as SnCl_2 and $(\text{NH}_4)_2\text{SnCl}_4$ which fuse below the melting temp. of Al or other metal to be soldered and are reduced to the metallic state by the latter.

10—ORGANIC CHEMISTRY

CHAS. A. ROULLER and CLARENCE J. WEST

Structure symbols. INGO W. D. HACKH. *Chemist and Druggist*, 108, 208(1928); cf. C. A. 13, 2197.—The symbols are explained, with illustrations. S. WALDBOTT

Application of Röntgen analysis to problems of stereochemistry. JARL A. WASASTJERNA. *Finska Kemistsamfundets Medd.* 34, 59–67(1925). HANS C. DUUS

The number of possible isomers of the saturated hydrocarbons. LEON DAVID. *Rev. gén. Sci.* 39, 142–3(1928).—Mathematical formulas are given for calcg. the possible isomers of the satd. hydrocarbon series up to $\text{C}_{11}\text{H}_{24}$. Starting with CH_4 and ending

with $C_{14}H_{30}$, the no. of isomers given is, resp., 1, 1, 2, 3, 5, 9, 18, 35, 75, 159, 355 and 1858. R. C. ROBERTS

The action of nitrosyl chloride on 2,2,4-trimethylpentane. P. A. FOOTE AND EDWARD KREMERS. *Am. J. Pharm.* 100, 599(1928).—Because of the tertiary H atom, the secondary reactions in this case will naturally be different from those involved in the action of this reagent on the normal hydrocarbons. The hydrolysis, in small part, of this heterocyclic isonitroso compd. is indicated by the formation of a small quantity of a volatile substance with a camphor-like odor and of NH_4OH . W. G. GAESSLER

The action of nitrosyl chloride on pentadecane. P. A. FOOTE AND EDWARD KREMERS. *Am. J. Pharm.* 100, 600(1928).—The presence of pentadecane in *Kaempferia galanga* L. was established by Van Romburgh. On account of its biochem. significance it seemed desirable to prove its normal character by chem. means. For this purpose the $NOCl$ reaction seemed best suited. The preliminary work in this direction, however, has shown that the reaction is not as one-sided as hoped for. The isolated hydrocarbon revealed the same phys. consts. as those recorded by Van Romburgh. The reaction with $NOCl$, however, yielded appreciable quantities of chlorination products. Their formation is explained. Because of the expense of pentadecane the further study of these reactions with heptane is contemplated. W. G. GAESSLER

Polymerization of olefins. R. VAN WINKLE. E. R. Squibb & Sons. *J. Am. Pharm. Assoc.* 17, 544-7(1928).—Propylene was mixed with activated floridin and the mixt. allowed to stand for two months under pressure to remove impurities. Contrary to expectations large amounts of polymerized olefins were obtained. By fractional distn. and mol.-wt. detns. it was concluded that the product formed is a mixt. of several polymers of propylene higher than a pentamer. Isobutylene was treated with activated floridin in a 24-inch column without pressure. Polymerization takes place but the reaction was increased if pressure be employed. Several polymers of isobutylene higher than a tetramer were found. L. E. WARREN

The monomagnesium derivative of acetylene. V. GRIGNARD, L. LAPAYRE AND TCHOU FAKI. *Compt. rend.* 187, 517-20(1928).—Passing C_2H_2 through $PhMgBr$ in Et_2O gave a soln. from which CO_2 released 28% $CH : CCO_2H$ and 13% ($: CCO_2H$). If the reaction mixt. above is heated slightly and well stirred the yields are increased to 62% and 10%, resp. Passing C_2H_2 through $EtMgBr$ under 0.5 atm. pressure gave a di-Mg deriv. of C_2H_2 . Replacing part of the Et_2O with 50 g. of C_6H_6 and heating this soln. to 65° gave 80-81% of the mono-Mg deriv. Adding $PhCH_2Br$ to this product and heating for several hrs. gave 70% $PhCH_2C : CH$, b_{17} 71-3°, n_D^{23} 1.53481, d_4^{25} 0.931; 8% ($: CCH_2Ph$)₂ and 12% C_2H_2 liberated by hydrolysis. This same reaction carried out in Et_2O at 45° gave on carbonation 78% $CH : CCO_2H$ and 8% ($: CCO_2H$)₂. This reaction was repeated at -10° and allyl bromide was added, giving 75% allylacetylene, $b.$ 41-2°, n_D^{22} 1.3653, d_4^{22} 0.777, and a small quantity of a compd., $b.$ 120-5°, which is probably allyl-3-allylacetylene. By using $BuBr$ similarly, 72% hexine, $b.$ 71-2°, d_4^{17} 0.720, n_D^{19} 1.402, is produced. The authors predict that by increasing the pressure to 1 atm. a complete transformation of the di- to the mono-Mg deriv. can be made and that this method of prepn. will be more practical and economical than those starting with aldehydes or ketones. R. C. ROBERTS

Decomposition of organic compounds at high temperatures and pressures. LEE R. HERNDON AND E. EMMET REID. Johns Hopkins Univ. *J. Am. Chem. Soc.* 50, 3066-73(1928).—A study is reported of the decompn. of org. compds. at const. vol., const. temp. (between the limits of 300-525°), at const. pressure and for periods of time ranging from 2 to 48 hrs., the temp. and duration of heating depending upon the stability of the compd. under investigation. In the decompn. of alcs., there seem to be 2 simultaneous reactions: Dehydration and subsequent polymerization of the hydrocarbon residues and dehydrogenation followed by the splitting off of CO and then polymerization. Three distinct types of compds. were derived from these decompns.: Gaseous, H_2O -insol. portion and H_2O -sol. portion. Results are given for $MeOH$, $EtOH$, $PrOH$, Me_2CHOH , $BuOH$, Me_2CHCH_2OH , Me_3COH , $AmOH$, $PhCH_2OH$, $PhCH_2CH_2OH$ and fenchyl alc. The following compds. were also studied: $AcOH$, $BzOH$, adipic, citric and stearic acids, AcH , BzH , C_7H_{16} , C_8H_{18} , $PhMe$, $PhEt$, $PhCHMe_2$, $PhCMe_3$, $MeCHPh_2$, $CHCl_3$, $AcOEt$, Et_2O , $(CH_3OH)_2$, $[CH_2(OH)CH_2]_2O$, Me_2CO , Ph_2CO , $PhOH$, $C_6H_4O_2$ and sucrose. The original should be consulted for details of the products formed. C. J. WEST

Addenda to "Syntheses with diazomethane." F. ARNDT, B. EISTERT AND J. AMENDE. *Ber.* 61B, 1949-53(1928).—A brief discussion of a no. of papers on the subject which have appeared since the last one of the authors (*C. A.* 22, 2930). C. A. R.

β -Chloro-substituted arsenic compounds. VISSEVOLOD V. NEKRASOV AND ALEXANDER S. NEKRASOV. *Ber.* 61B, 1116-21(1928).— C_2H_4 and $AsCl_3$ in the presence of $AlCl_3$ give mixts. of β -chlorovinylarsines which with alkalis again split off the C_2H_4 ; with the primary arsine, $ClCH:CHAsCl_2$, this cleavage is rapid and quant., even in the cold. It remained to be detd. whether the β -chloroethylarsines undergo a similar reaction. $ClCH_2CH_2AsCl_2$ (I) is obtained only in quite unsatisfactory yield from C_2H_4 , $AsCl_3$ and $AlCl_3$; $HOCH_2CH_2Cl$ was accordingly converted with Na_2AsO_3 into $HOCH_2CH_2AsO_3H_2$ (II), which, without being isolated, was reduced with SO_2 to $HOCH_2CH_2AsO$ (III); this with HCl gas evolves heat and forms $HOCH_2CH_2AsCl_2$ (IV), while with PCl_5 the HO group is also replaced by Cl and I is obtained in good yield; without doubt other β -substituted primary and secondary arsines and their derivs. can also be prepd. in this way (cf. following abstr.). Aq. alkalis decomp. I, even in the cold, quant. into C_2H_4 and the alkali arsenite and chloride. The mechanism of the decompn. is undoubtedly the same as that of the decompn. of the vinyl compds.; there is probably first formed an addn. product, $ClCH:CHAsCl_2(OH)K$, which very readily decomps. into $KCl + ClCH:CHAsCl_2(OH)$ and the latter by addn. of another mol. of KOH and splitting off of KCl gives $ClCH:CHAs(OH)_2$, which then adds a 3rd mol. of KOH to form $ClCH:CHAs(OH)_3K$; when this last substance again loses KCl it forms a very unstable compd. with a 3-membered heterocyclic ring, $CH:CH.As(OH)_3$, which

at once decomps. into C_2H_4 and H_3AsO_3 . Oxidizing agents convert I into β -chloroethylarsonic acid (V), which titrates, not very sharply, with Me orange as a monobasic and with phenolphthalein as a dibasic acid. The formation of the β -chloroethylarsines cannot be explained on the assumption, adopted by Lewis and Stiegler for the vinyl compds., of a primary addn. of $AlCl_3$ to the unsatd. hydrocarbon, for the assumed addn. product would have the structure $Al(CH_2CH_2Cl)_3$ and, having no double bonds, would be unable to add $AsCl_3$. It may be assumed with great probability, however, that the formation of both $ClCH:CHAsCl_2$ and I is merely a special case of the Friedel-Crafts reaction: $C_2H_4 + AsCl_3 = HCl + CH_2:CHAsCl_2$ and $CH_2:CHAsCl_2 + HCl = I$. I (17 g. from 318 g. $AsCl_3$ and 60 g. $AlCl_3$ satd. at 0° with dry C_2H_4 (about 70 l.), or 14 g. from 30 g. III with 30 g. PCl_5 in $CHCl_3$), is a mobile, almost odorless liquid, b_D^{20} 89–90°, b_D^{25} 93–4°, d_4^{20} 1.573. III (65 g. from 100 g. $HOCH_2CH_2Cl$ slowly added to 500 cc. Na_2AsO_3 soln. (100 g. As_2O_3) at 100° , followed after 1–1.5 hrs. by the addn. of 30 g. $NaOH$ and 60 g. more $HOCH_2CH_2Cl$ and reduction of the resulting II with SO_2 and a little I), thick odorless oil, d. about 2, decomps. on distn. V, from I and H_2O_2 , m. 133° .

C. A. R.

β -Substituted alkylarsonic acids and their derivatives. S. M. SCHERLIN AND G. EPSTEIN. Techn. Hochschule Moscow. *Ber.* 61B, 1821–5(1928).—Fr. patents 569,541, 556,366 and 585,970 and Engl. patents 191,028 and 191,029 purport to give methods of prepg. $HOCH_2CH_2AsO_3H_2$ from Na_2AsO_3 and $HOCH_2CH_2Cl$, ethylene oxide and $(CH_2Br)_2$ but no properties or const. of the acid are given and Quick and Adams (C. A. 16, 1560) were able by these methods to obtain only thick, non-crystallizable sirups. S. and E. have also obtained only a thick sirup from $HOCH_2CH_2Cl$ with Na_2AsO_3 . Reduction with SO_2 likewise gave no product which could be isolated, and although satn. of the reduction product with HCl yielded a rather difficultly sol. substance, it sepd. as an oil and decompd. rapidly on attempted distn. *in vacuo*; acetylation of this oil with Ac_2O gave a compd. (I), which distd. *in vacuo* without decompn. and had the compn. of β -acetoxyethylchloroarsine, also obtained very easily even with 80% $AcOH$ if the reaction mixt. is at the same time satd. with HCl . When sapond. with alkali or boiling H_2O , I splits off C_2H_4 quant. With PCl_5 or, better, with excess of $POCl_3$, $HOCH_2CH_2AsCl_2$ yields $ClCH_2CH_2AsCl_2$ (II), which behaves toward sapon. agents very much like I and on cautious oxidation yields $ClCH_2CH_2AsO_3H_2$ (III). With $COCl_2$ $HOCH_2CH_2AsCl_2$ gives an oil having the pronounced odor of $CICO_2Et$, which on vacuum distn. loses CO_2 and yields II. With Ph_2NH II gives (as found with N. A. DZBANOVSKY) phenarsazine chloride. I, b_{p-10} $120-1^\circ$, d_{20}^{20} 1.6766. II, b_D 80.6°, b_D^{25} 87°, b_D^{30} 90.8°, d_{20}^{20} 1.8401, has a faint but somewhat penetrating odor. III, m. 134° .

C. A. R.

Trypanocidal action and chemical constitution. VIII. Derivatives of β -aminoethyl- and γ -aminopropylarsonic acids. GEORGE A. C. GOUGH AND HAROLD KING. National Inst. for Medical Research, Hampstead. *J. Chem. Soc.* 1928, 2426–47; cf. C. A. 22, 959.—Although many aromatic compds. contg. As have been synthesized and tested pharmacologically, our knowledge of the aliphatic series is still unsatisfactory, since the aliphatic compds. which have been hitherto examd. for trypanocidal action

are without the amphoteric characteristics which so often accompany activity in the aromatic series. Any new investigation in this field should include the synthesis of a series of aminoaliphatic arsonic acids, which, by reason of their small mol. wt. and their similarity to the NH_2 acids derived from the tissues, should possess a greater power of penetration and a more favorable distribution. For this purpose a series of compds. of the general type $\text{RR}'\text{N}(\text{CH}_2)_n\text{AsO}_3\text{H}_2$, where R and R' are H or aliphatic or alicyclic radicals, was prep'd. Two methods of synthesis are possible: The action of NaH_2AsO_3 on $\text{RR}'\text{N}(\text{CH}_2)_n\text{Cl}$ (Meyer's reaction) and the action of amines on $\text{Cl}(\text{CH}_2)_n\text{AsO}_3\text{H}_2$. The 1st method was unsuccessful. $\text{ClCH}_2\text{CH}_2\text{NEt}_2$ (Brit. Pat. 167,781(1921)), b_p 51-2° (HCl salt, m. 210-1°; picrate, m. 116-7°; chlorbaurate, m. 68-71°), was largely unattacked when treated with NaH_2AsO_3 , though small quantities of alc. and unsat'd. amine were detected. MeI gives Me β -chloroethyldiethylammonium iodide, m. 219-20°, turns yellow or red on exposure to air, when wet with solvent; the chloride, highly deliquescent needles (chloroaurate, m. 202-4°), does not react with NaH_2AsO_3 . It was then found that $p\text{-MeC}_6\text{H}_4\text{SO}_3\text{Me}$ and NaH_2AsO_3 give a small yield of MeAsO_3H_2 , isolated as the Ca salt. However, the only product obtained from $\text{Et}_2\text{NCH}_2\text{CH}_2\text{OH}$ and $p\text{-MeC}_6\text{H}_4\text{SO}_3\text{Cl}$ was tetraethylpiperazinium di- p -toluenesulfonate, m. 300-1°; diiodide, needles, does not m. 300°; dichloroaurate, plates; both of these products were also obtained by the polymerization of free $\text{Et}_2\text{NCH}_2\text{CH}_2\text{Cl}$. $\text{HOCH}_2\text{CH}_2\text{AsO}_3\text{H}_2$ (Brit. Pat. 191,028(1922)) forms a Ca salt, crystg. with 1 H_2O ; reduction of the crude acid from 100 g. $\text{ClCH}_2\text{CH}_2\text{OH}$ in conc'd. HCl contg. a little KI with SO_2 (sat'd. at 50° and allowed to stand 48 hrs.), followed by the action of SOCl_2 in petrol. ether, gives 60 g. $\text{ClCH}_2\text{CH}_2\text{AsCl}_2$, b_p 92-3°; the synthesis of Renshaw and Ware (C. A. 20, 364) is discussed and an improved method of isolating the product of the reaction is given. Oxidation of 57 g. of the arsine with Cl_2 and H_2O gives 35 g. of β -chloroethylarsonic acid (I), m. 134-5°; the max. tolerated dose per g. of mouse (MTD) is 0.2 mg. I (5 g.) and 3.3 g. $\text{CO}(\text{NH}_2)_2$ in H_2O (H_2O is added from time to time to liberate NH_3 by hydrolysis) give 4.1 g. of triethylamine- β,β',β'' -triarsonic acid, m. 184-5° (AcNH_2 or AcONH_2 may also be used as sources of NH_3); the Ca and Ba salts are cryst., the Mg salt amorphous. I (3 g.) and 2 cc. H_2O , heated at 100° and 33% MeNH_2 added to keep the whole neutral, give after 15 hrs. 1.9 g. methyl-diethylamine- β,β' -diarsonic acid, m. 192-4°, crystg. with 1 H_2O ; MTD 1.5 mg. I and Me_2NH give a mixt. of dimethyldiethylammonium chloride β,β' -diarsonic acid, m. 178°, MTD 3 mg., and, as the principal product, β -dimethylaminoethylarsonic acid, analyzed as the HCl salt, m. 138-40°. I and Me_3N give β -dimethylaminoethylarsonic acid-MeCl, m. 187-8° (decompn.). I (7 g.) and piperidine in EtOH give 7.5 g. β -piperidininoethylarsonic acid-HCl, m. 155-7°; reduction with SO_2 in HCl contg. KI gives β -piperidininoethyldichloroarsine-HCl, m. 126-7° (decompn.); the HI salt, bright yellow, m. 158-9°, gives a colorless soln. in H_2O or EtOH. $\text{Cl}(\text{CH}_2)_3\text{OH}$ and NaH_2AsO_3 at 50-60° give γ -hydroxypropylarsonic acid (II), analyzed as the Ca salt; reduction with SO_2 gives γ -chloropropyldichloroarsine (III), b_p 120-2°; oxidation with Cl_2 and H_2O give γ -chloropropylarsonic acid (IV), m. 146-8°, MTD 0.1 mg.; the Ba and Ca salts are cryst. The reaction of II and SO_2 also gives a di-ester of II and III, $(\text{AsCl}_2\text{C}_3\text{H}_6\text{O})_2\text{AsC}_3\text{H}_6\text{OH}$, b_p 35°, which gives III with SOCl_2 ; the residue contains still higher condensation products, with 41-42% As. IV and NH_4OH (d. 0.88), heated 8 hrs. at 110°, give γ -aminopropylarsonic acid, m. 212-4°, MTD 0.4 mg. Me_2NH gives the γ -dimethylamino deriv., analyzed as the HCl salt, slightly deliquescent, m. 108-10°, MTD 0.4 mg. Me_3N gives γ -dimethylaminopropylarsonic acid-MeCl, m. 174-6°, MTD 0.3 mg. γ -Propylaminopropylarsonic acid, m. 222-4°; HCl salt, m. 210-2°, MTD 0.5 mg.; m -nitrobenzoyl deriv., m. 132-4°; the Bz deriv. is an oil. γ -Propylaminopropyldichloroarsine-HCl, m. 195-6°, MTD 0.0075 mg.; it renders trypanosomes non-infective at a diln. of 1:40,000 in horse serum after 4.5 hrs. contact. γ -Hexylaminopropylarsonic acid-HCl, m. 221-3°, MTD 0.025 mg.; m -nitrobenzoyl deriv., m. 118-20°, MTD less than 0.025 mg.; carbethoxy deriv., m. 58-60°, MTD 0.005 mg.; phenylcarbamyl deriv., m. 118-24°, MTD 0.01 mg. γ -Hexylaminopropyldichloroarsine-HCl, m. 190-2°. l - α -Phenylethylaminopropyldichloroarsine-HCl, m. 194-6°, MTD 0.005 mg. γ -Piperidinopropylarsonic acid-HCl, m. 162-4°; reduction gives γ -piperidinopropyldichloroarsine-HCl, m. 194-6°, MTD 0.01 mg. IV and vinylacetonealkamine in EtOH give γ -4-hydroxy-2,2,6-trimethylpiperidinopropylarsonic acid, deliquescent, m. 162°, MTD 0.2 mg. Reduction of the 4-bromo-2,2,6-trimethylpiperidine with AcOH and Zn gives 2,2,6-trimethylpiperidine, b_p 138-9°; HCl salt, m. 236-7°; chloroaurate, m. 127-9°; picrate, m. 195-6°; with IV this gives γ -2,2,6-trimethylpiperidinopropylarsonic acid, m. 150-60°, MTD 2 mg. IV and piperazine hydrate, heated 20 hrs. at 100°, give γ -piperazinopropylarsonic acid di-HCl, MTD 2 mg.; Bz deriv., m. 204-6° (decompn.), MTD 0.2 mg. IV and Et-

nepicotate give γ -3-carbethoxypiperidinopropylarsonic acid, amorphous, deliquescent, MTD 1.5 mg. $\text{CH}_3(\text{CH}_2\text{OH})_2$ and $\text{p-MeC}_6\text{H}_4\text{SO}_3\text{Cl}$ with $\text{C}_4\text{H}_5\text{N}$ at 0° give trimethylene-glycol di-*p*-toluenesulfonate, m. $93-4^\circ$; if the $\text{p-MeC}_6\text{H}_4\text{SO}_3\text{Cl}$ is added in 1 lot and the reaction allowed to proceed without cooling, there results propane- α,γ -dipyridinium di-*p*-toluenesulfonate, m. $118-20^\circ$; aq. HgCl_2 gives the mercurichloride, $\text{C}_{12}\text{H}_{12}\text{N}_2\text{Cl}_2 \cdot 4\text{HgCl}_2$, from which, with H_2S , there is formed the dichloride; dichloroaurate, light yellow, does not m. 300° ; *dipicrate*, m. 176° . Possible reasons for the lack of therapeutic activity of most of these compds. are advanced. C. J. WEST

Alkyl orthosilicates. A. W. DEARING AND E. EMMET REID. Johns Hopkins Univ. J. Am. Chem. Soc. 50, 3058-62(1928).— $\text{Si}(\text{OEt})_4$ is obtained in 70% yield by adding SiCl_4 dropwise to abs. EtOH cooled in a freezing mixt., removing the HCl by dry air and fractionating in a vacuum with careful exclusion of moisture. Bu ester, b_p $160-5^\circ$, d_4^{25} 0.9353, d_4^{25} 0.9194; Am ester, b_p $145-50^\circ$, d_4^{25} 0.9117, d_4^{25} 0.8933; heptyl ester, b_p $200-15^\circ$, d_4^{25} 0.9097, d_4^{25} 0.8958; octyl ester, b_p 240° . $\text{PhCH}_2\text{CH}_2\text{OH}$ gave a product which could not be purified by distn. in vacuum; the product was 88% pure. $\text{ClCH}_2\text{CH}_2\text{OH}$ gave a product 94% pure; with PhNH_2 , HCl this gives an amorphous product, apparently $\text{Si}(\text{C}_6\text{H}_5\text{NHPH})_4$. SiCl_4 and iso-PrOH give iso-PrCl and C_6H_6 . EtSH does not react under the usual conditions; even at 200° the reaction is slow. $\text{Si}(\text{OEt})_4$ and $\text{C}_6\text{H}_5(\text{CO})_2\text{O}$ give $\text{C}_6\text{H}_5(\text{CO}_2\text{Et})_2$ and $\text{SiO}(\text{OEt})_2$. Ac_2O likewise gives AcOEt . BzOH reacts slowly, giving BzOEt but $p\text{-O}_2\text{NC}_6\text{H}_4\text{CO}_2\text{H}$ does not react; neither does PhOH , $\beta\text{-C}_{10}\text{H}_7\text{OH}$ or PhSH . With AlCl_3 , C_6H_6 and $\text{Si}(\text{OEt})_4$ give Et derivs. even up to C_8Et_4 . When $\text{Si}(\text{OEt})_4$ or $\text{Si}(\text{OMe})_4$ reacts with H_2O or AcOH , the acid seps. as a gel, which is free of strong electrolytes. A non-aq. gel may be obtained by using AcOH and removing the excess AcOH by washing with C_6H_6 ; this is an excellent catalyst for vapor-phase esterification but its absorption from H_2O soln. is practically identical with that of the regular gel. C. J. WEST

Autoxidation of Grignard magnesium compounds. JAKOB MEISENHEIMER AND WALTER SCHLICHENMAIER. Univ. Tübingen. Ber. 61B, 2029-43(1928); cf. C. A. 22, 2365.—It had been found that when an Et_2O Grignard soln. is decompd. with H_2O and the $\text{Mg}(\text{OH})_2$ and Mg halide, MgX_2 , are titrated with HNO_3 and AgNO_3 , the ratio $\text{OH}^-:\text{X}^-$ the more nearly approaches 1:1 the more smoothly the reaction has proceeded, i. e., the less a Wurtz synthesis has come into play as a side reaction. With iodides, however, the method gives entirely erroneous results if, before the decompn. with H_2O , the soln. is greatly dild. with Et_2O . This influence of dildn. has now been more thoroughly studied and found to be due to O. The effect of dildn. is always such as to increase the ratio $\text{OH}^-:\text{I}^-$, e. g., from 1:1 to 1.5:1, although the sum $\text{OH}^- + \text{I}^-$ undergoes no change. If dry CO_2 -free air is passed through or over the Et_2O soln. without dildg. it, the ratio is greatly shifted, whereas with N there is no change. After the decompn. with H_2O the I which cannot be detd. by titration with AgNO_3 can be quant. distd. over and pptd. as AgI in alc. AgNO_3 , and by means of PhNMe_2 it was found that with MeMgI solns. this volatile I is in the form of MeI , not EtI , thus excluding the Et_2O as playing any role in the formation of the volatile I compd. In the absence of O, dildn. alone has no influence on the ratio $\text{OH}^-:\text{I}^-$. PhMgI behaves like MeMgI , although the effect of dildn. (in the presence of O) is less than with MeMgI . From the work of earlier investigators on the action of O on Grignard solns. there can be no doubt that MeMgI and EtMgI give as chief products MeOH and EtOH along with MeI and EtI . The reaction of aromatic Mg compds. is more complicated and the results obtained with the bromides (with which all previous work had been done) cannot be applied directly to iodides. Accordingly an expt. was carried out with the PhMgI prepd. from 25.5 g. PhI ; there were obtained 10% Ph_3 , 19.5% PhI , 18% Me-PhCHOH and 8.5% PhOH . Detn. of the limiting value of the dildn. effect afforded an important insight into the mechanism of the oxidation process. At first the effect of dildn. is very large but becomes almost undetectable when the ratio $\text{OH}^-:\text{I}^-$ has reached the value of about 1.8:1, and even correcting for the fact that the original Grignard solns. used always contained a little MgI_2 whose I naturally plays no part in the shifting of the ratio, the value of the latter never exceeds 2:1 even at the greatest dildn., indicating that MeI is split off from only 1 out of every 3 mols. of MeMgI , the other 2 giving MeOH : $3\text{MeMgI} + 3\text{O} = \text{MeI} + \text{MgO} + 2\text{MeOMgI}$. Am $_2\text{O}$ solns. behave just like those in Et_2O . The effect of dildn. is the same at -20° , room temp. and the temp. of boiling Et_2O ; so it cannot be ascribed to a greater heating, during the oxidation in the more concd. solns. EtMgI behaves like MeMgI . With PhMgI , however, the highest value for the ratio $\text{OH}^-:\text{I}^-$ attained is 1.67:1 (cor.), corresponding to the formation of 1 mol. PhI out of every 4 mols. PhMgI ; in view of the products actually

isolated (see above) the reaction may be represented thus: $4\text{PhMgI} + 3\text{O} + \text{Et}_2\text{O} = \text{PhI} + \text{MgO} + \text{PhCH(OMgMe)}_2 + \text{C}_2\text{H}_6 + \text{HOMgI} + \text{PhOMgI}$. The ratio of mols. Grignard compd. to atoms O actually absorbed was found to be about 1:0.95 for the aliphatic, 1:0.66 for the aromatic derivs.; as the true value in the 1st case is undoubtedly 1:1, it is quite likely in the 2nd to be 1:0.75, as demanded by the above equation. With the aliphatic compds. no, or almost no CH_4 or C_2H_6 is formed. Alkyl- and arylmagnesium bromides show the shifting in the ratio HO^-Br^- on oxidation with air to a much less marked degree but it also increases with increasing diln.; the ratio of mols. PhMgBr to atoms O actually absorbed is 1:0.69. Apparently in concd. solns. there are 2 concurrent series of successive reactions, the 1st of which leads to the splitting off of alkyl or aryl iodide. As the 2nd is slowed up extraordinarily by diln. it may be assumed to be of a higher order (say dimol.) than the 1st (monomol.). The results given above can hardly be explained otherwise than by assuming that there is first formed with immeasurable velocity a complex contg. 3 atoms O and 1 or, more probably, 2 atoms Mg (e. g., $\text{MeMgI} \dots 3\text{O} \dots \text{MgIme} \cdot \text{Et}_2\text{O}$). This complex reacts with still great (although lesser) velocity in 2 ways: (a) monomol., whereby the two I atoms are expelled by the O, with formation of $[\text{MeMg} \dots 3\text{O} \dots \text{MgMe} \cdot \text{Et}_2\text{O}] + \text{I}_2$, the new complex changing to $\text{MgO} + \text{Mg(OMe)}_2$ and the I_2 reacting instantly with unchanged MeMgI to form MeI and MgI_2 ; (b) dimol., oxidizing another mol. MeMgI to MeOMgI ; in the resulting complex $\text{MeMgI} \dots 2\text{O} \dots \text{MgIme}$ the oxidation potential is so diminished that it can no longer expel the I atoms, so that the two Me groups are merely oxidized to MeO . In dil. solns. (b) disappears; with the bromides, because of the greater firmness of the union of the Br to the Mg (b) predominates under all conditions. The difference between aliphatic and aromatic compds. is essentially that with the latter the Et_2O is oxidized. C. A. R.

Action of metallic tin on methylene halides. K. A. KOZESHKOV. I. Univ. Moscow. *Ber.* 61B, 1659-63(1928).— CH_2Br_2 and CH_2I_2 heated with Sn in sealed tubes at $180-90^\circ$ and then at $215-20^\circ$ give compds. of the type MeSnX_3 . The reaction can probably be represented as follows: $\text{CH}_2\text{X}_2 + \text{Sn} = \text{CH}_2\text{SnX}_2$; $2\text{CH}_2\text{SnX}_2 + \text{CH}_2\text{X}_2 = 2\text{MeSnX}_3 + \text{C}$. Along with the CH_3SnX_3 was obtained a black powder with all the properties of C, and no gaseous products were formed. With CH_2I_2 it is difficult to avoid the direct action between Sn and I and the main product is SnI_4 . For the prepn. of CH_2Br_2 the Klinger-Auger method for the prepn. of CH_2I_2 from CHI_3 was applied to CHBr_3 ; yield, about 80% CH_2Br_2 , $b_{754} 97.5^\circ$, $d_4^{20} 2.4953$, $n_D^{20} 1.5420$. The MeSnBr_3 , m. 51° , $b_{746} 210-1^\circ$; yield, 90% from 7.93 g. Sn and 18 g. CH_2Br_2 ; when 19.5 g. CH_2Br_2 is used to 5 g. Sn, considerable HBr is liberated and 14 g. SnBr_4 is formed. C. A. R.

Chemical constitution of aldehyde and ketone bisulfites. II. G. SCHROETER, WITH M. SULZBACHER. Tierärztl. Hochschule, Berlin. *Ber.* 61B, 1616 27(1928); cf. C. A. 21, 386.—In the 1st paper it was shown that $\text{Me}_2\text{C(SO}_3\text{Ph)}_2$ (I) heated with alkalis in excess decomps. into PhOH and salts of $\text{HOCMe}_2\text{SO}_3\text{H}$ (II) and H_2SO_3 . Raschig and Prah! have recently (C. A. 22, 1571) confirmed the quant. course of this decompn. as far as the H_2SO_3 is concerned but cast doubt on it as regards the salts of II, which they were able to obtain pure only with difficulty. S. and S.'s expts., however, carried out repeatedly on both a large and a small scale, have shown that the decompn. proceeds practically quant. in the way indicated above, and the failure of R. and P. to obtain the Ba salt, e. g., of II in pure form directly may have been due to their using com. instead of pure Ba(OH)_2 for the decompn. The com. product, as is known, contains impurities, especially BaCl_2 , and the latter, because of the high soly. of the Ba salt of II, accumulates with this salt in the mother liquors and naturally greatly influences the analytical results. Their method of purification through the Cu salt by double decompn. of the Ba salt with CuSO_4 is impracticable; it is better to ppt. the Ba quant. with H_2SO_4 (i. e., in acid soln.) and neutralize with freshly pptd. CuO . In this way the pure Ba salt quant. gives the green Cu salt $(\text{HOCMe}_2\text{SO}_3)_2\text{Cu} \cdot 3\text{H}_2\text{O}$, which, like the Ba salt, can be recrystd. from aq. Me_2CO or alc. R. and P. tried to recryst. their Cu salt from AcOH , but it is very difficultly sol. in AcOH and although it dissolves completely on long boiling the tertiary HO group is acetylated at the same time and there is obtained the colorless Cu α -acetoxyisopropylsulfonate, which can be recrystd. from Me_2CO . This affords a new proof of the correctness of S.'s formulation, and the unsatisfactory results of R. and P.'s attempts to purify the salts of II are explained, but as the decompn. reaction is important enough to merit a more thorough study, S. and S. have taken it up again. The formation of II is the result of an abnormal sapon. of the I, not of a primary normal sapon. to $\text{Me}_2\text{C(SO}_3\text{Na)}_2$, followed by a splitting off of

one SO_2H group as sulfite, comparable to the formation of a phenol by alkali fusion of a SO_2H acid. For only 2 mols. alkali are used to decomp. $\text{RR}'\text{C}(\text{SO}_2\text{Ph})_2$ ($\text{R} = \text{Me}$, $\text{R}' = \text{Me}$, Et or CH_2CHCH_3), there are obtained, along with the salt of $\text{HOCCR}'\text{SO}_2\text{H}$ (III), sometimes almost exclusively, the salt of the dialkylmethionic acid $\text{RR}'\text{C}(\text{SO}_2\text{H})_2$. These acids are as stable towards excess of hot alkali as $\text{CH}_2(\text{SO}_2\text{H})_2$ itself and its mono-alkyl derivs. but the corresponding methionides with excess of alkali decomp. chiefly, like II, into the salt of III. Such a reaction is termed an abnormal sapon. because aryl esters and alkylanilides of SO_2H acids may be formulated as neutral esters and alkylanilides, $\text{RadS}(\text{O}_2)\text{OR}$, $\text{RadS}(\text{O}_2)\text{NR}_2$, of asym. $\text{HS}(\text{O}_2)\text{OH}$, in which, in general, the O- and N-contg. groups are held more loosely than the radical (Rad) attached to the S through a C union; on sapon., therefore, the former groups are usually split off. But under certain conditions these relations may be reversed; the group Rad is held more loosely than OR or NR_2 and is "sapond." first, with formation of the salt of HSO_2R or HSO_2NR , which then undergoes complete sapon. to the sulfite and phenol or amine: $\text{PhO}_2\text{SCMe}_2\text{SO}_2\text{Ph} + \text{NaOH} = \text{NaSO}_2\text{Ph} + \text{PhO}_2\text{SCMe}_2\text{OH}$ or $\text{EtPhNSO}_2\text{CMeEtSO}_2\text{NEtPh} + \text{NaOH} = \text{NaSO}_2\text{NEtPh} + \text{EtPhNSO}_2\text{CMeEtOH}$. Further evidence of the presence of a HO group in II is afforded by the action of PCl_5 . It had already been shown that when II is treated hot with an excess of PCl_5 it yields $\text{MeC}(\text{CH}_2)\text{SO}_2\text{Cl}$ (IV), probably by replacement of the HO group by Cl and subsequent elimination of HCl. IV with PhNHMe gives *isopropenylsulfonmethylanilide* (V), identical with the compd. obtained by Autenrieth (*Ber.* 34, 3467(1901)) from $\text{MeCH}(\text{SO}_2\text{Cl})\text{CH}_2\text{SO}_2\text{Cl}$ and PhNHMe , to which he assigned the structure $\text{MeCH}:\text{CHSO}_2\text{NMePh}$. On gentle treatment with only 1 mol. PCl_5 , however, II gives α -hydroxyisopropylsulfonyl chloride (VI), converted by PhNHEt into the *ethylanilide* (VII), in which the alc. HO group was detd. quant. by the Zerevitinov method. There remains no doubt, therefore, that the salts of the III are entirely different from the bisulfite compds. of the corresponding ketones. As to the structure of the latter, S. and S. agree with R. and P. that they are not O-esters, $\text{R}_2\text{C}(\text{OH})\text{OSO}_2\text{Na}$, of H_2SO_3 . A unitary formulation for these compds. is therefore no longer possible and they must be considered as being "polymols." Since aldehydes and ketones are known to form mol. compds. with SO_2 , it may be assumed that these very labile dimol. compds. combine with H_2O to form more stable trimols., $(\text{R}_2\text{CO})_2(\text{SO}_2) \cdot (\text{HOH})$, functioning as strong monobasic acids. As long as they are not dissociated, the properties of their individual components are masked because the mol. valences which chiefly condition their chem. properties mutually sat. each other in the polymol. V, m. 58–9°. VI, light yellow, viscous, lachrymatory oil. VII, m. 44.5–45°. C. A. R.

Citronellal and rhodinal. A. VERLEY. *Bull. soc. chim.* 43, 845–54(1928).—To det. whether citronellal (I) has the α or ethylene ($\text{CH}_2:\text{CMe} \cdot \text{CH}_2$ -) linkage ascribed to it by Barbier and others (*Compt. rend.* 118, (1893); 119, (1894); 112, (1896); 122, 737 (1896); 157, 1114) or whether it is a mixt. of α - and the β - or propylene ($\text{Me}_2\text{C}:\text{CH}-$) (assigned by B. to rhodinal), as stated by Harries and Himmelmann (*C. A.* 2, 2807) and Grignard and Dœuvre (*Bull. soc. chim.* 40, 428(1928); cf. *C. A.* 22, 4104), V. prepd. very pure I (b_p 82°, d_{20}^{20} 0.8682, d_4^{20} 0.8668; refractive indices and sp. rotations also tabulated) through its NaHSO_3 compd. The dispersion curve of I was an equilateral hyperbola and its semicarbazone always m. 82° as obtained (83.5° upon recrystn.). Pure rhodinal (II) (b_p 83°, d_0^0 0.8752, d_4^0 0.8751, d_{20}^{20} 0.8709, d_4^{20} 0.8694, α_D^{20} 1°10'; refractive indices also tabulated) was prepd. by vacuum distn. of hydroxycitronellal (III) (b_p 116°, d_{16} 0.931, n_D^{20} 1.456, α_D^{20} (10 cm.) 8°30') in presence of kieselguhr and treatment of the distillate with neutral NaHSO_3 . The dispersion curve of II is rectilinear and its semicarbazone, m. 75° (75.5° after several recrystns.). From the phys. data and because the mixed m. ps. of the semicarbazones were always depressed, I and II must be chem. individuals. The history of III is given. It may be prepd. by the action of H_2SO_4 followed by Na_2CO_3 on the NaHSO_3 compd. of I at low temp.; by forming the cyanohydrin of I, hydrating, and eliminating HCN by vacuum distn.; by acetylating the enol of I with Ac_2O and NaOAc at relatively low temp., hydrating, and sapon. with a weak alkali. III oxidizes easily but may be stabilized by hydroquinone. An attempt to oxidize rhodinol with $\text{Na}_2\text{Cr}_2\text{O}_7$ to II yielded pulegol (β -isopulegol) (b_p 90°, d_0^0 0.9407, d_4^0 0.9406, d_{20}^{20} 0.9275, d_4^{20} 0.9260). V. offers an explanation for the predominance of the α -form among the terpenes and for the development of the β -form. C. H. PRET.

The autoxidation of citronellal (preliminary communication). J. ZIMMERMANN. Buitenzorg Dept. Agr. *Rec. trav. chim.* 47, 940–1(1928).—If Zn is added to citronella oil which is exposed to the action of air and of sunlight, a ppt. of Zn formate begins

to form after a few hrs., the HCO_2H being formed by the oxidation of citronellal, the quantity of which decreases with increasing formation of the $(\text{HCO}_2)_2\text{Zn}$. Moreover, the same phenomenon was observed with pure citronellal, prep'd. by means of the NaHSO_3 comp'd. The HCO_2H can be formed either by the oxidation of the terminal methylene group or by the oxidation of the enolized aldehyde group, the latter conception being preferred by Z. On keeping citronella oil contg. a trace of phenolphthalein, for 1 year, the % of citronellal had only decreased 4%. C. F. VAN DUIN

Chemistry of the three-carbon system. XVIII. Quantitative investigations on the influence of alkyl substituents on the α, β, γ change in unsaturated acids; observations on the reduction of sorbic acid and a new synthesis of pyroterebic acid. ALAN A. GOLDBERG AND REGINALD P. LINSTAD. Imp. College Sci. Tech., South Kensington. *J. Chem. Soc.* 1928, 2343-60; cf. *C. A.* 22, 329.—The position of equil. in the reversible change between α, β - and β, γ -olefinic acids in the presence of alkali appears to be independent of the phys. conditions under which the interconversion proceeds. From a survey of results obtained with the simple mono-olefinic acids contg. no 2nd unsat'd. group, the following generalizations may be drawn: Butenoic acids without γ -substituents (alkyl substituents are meant) show no stability of the β, γ -form even when substituted on the β -C atom. The acids with 1 γ -substituent show a small but definite stability of the β, γ -form, which is not appreciably affected by the nature of the substituent or by the presence of α -substituents. γ -Substituted butenoic acids having a 2nd alkyl group on the γ -C atom show great stability of the β, γ -form and a similar but weaker effect is produced if the 2nd substituent is on the β -C atom. The max. effect in the β -position is given by an Et group. These principles are still valid if the substituting groups form part of a polymethylene ring. Details are given for the prep'n., purification and characterization of $\Delta\alpha$ - and $\Delta\beta$ -pentenoic acids, $\Delta\alpha$ -hexenoic acid (*anilide*, m. 109-10°), $\Delta\beta$ -hexenoic acid (various methods of reducing sorbic acid are discussed), γ -methyl- $\Delta\alpha$ -pentenoic acid (*acid chloride*, b_{20} 67°; *anilide*, m. 119°), γ -methyl- $\Delta\beta$ -pentenoic acid (*acid chloride*, b_{18} 60°; *anilide*, m. 106°; *di-bromide*, m. 99°), α -methyl- $\Delta\alpha$ -pentenoic acid (*acid chloride*, b_{18} 63°; *amide*, m. 80°; *anilide*, m. 84°); α -methyl- $\Delta\beta$ -pentenoic acid (*acid chloride*, b_{17} 47°; *amide*, m. 74°; *anilide*, m. 76°). The % of α, β -acid at equil. was found to be: $\Delta\alpha$ -pentenoic, 75.4; α -methyl- $\Delta\alpha$ -pentenoic, 80.7; γ -Me deriv., 5.6; cyclopentylideneacetic, 13.7. **XIX.** The homomesitones. AILEEN EDITH ABBOTT, GEORGE A. R. KON AND RALPH D. SATCHELL. *Ibid* 2514-24.—In the intermol. condensation of MeEtCO , alk. condensing agents lead to a mixt. of $\text{MeCH}_2\text{CMe:CHCOEt}$ (I), and $\text{MeCH:CMcCH}_2\text{COEt}$ (II), the former predominating especially in the ketone obtained by Bodroux and Taboury's method; acid condensing agents lead to ketones with a branched chain ($\text{MeCH}_2\text{CMe:CMcCOMe}$ (III) and MeCH:CMcCHMeCOMe (IV)), H_2SO_4 giving a ketone of low d., consisting mainly of IV, while HCl yields a ketone of high d. and n , consisting mainly of III; by far the best method is that of Descude (*Ann. chim. phys.* 29, 486 (1903)), which gives III only. The structures of I, III and IV were confirmed by synthesis from the corresponding acids. Details of the condensations are reported. MeEtCO and $\text{MeCHBrCO}_2\text{Et}$ with Zn give *Et* β -hydroxy- α, β -dimethylvalerate (V), b_{13} 89-90°, $d_4^{19.5}$ 0.96457, $n_D^{19.5}$ 1.4319 (75% yield); the liquid acid was dehydrated by Ac_2O , giving a poor yield of α, β -dimethyl- $\Delta\alpha$ -pentenoic acid, b_{18} 116°, $d_4^{17.5}$ 0.97497, $n_D^{17.5}$ 1.45952; *acid chloride*, b_{17} 66°; *p-toluidide*, m. 123°. With MeZnI there results III, b_{20} 65°, $d_4^{17.4}$ 0.86856, $n_D^{17.4}$ 1.45283. *Et* α, β -dimethyl- $\Delta\beta$ -pentenoate, by dehydrating V with POCl_3 in C_6H_6 , b_{13} 69°, $d_4^{21.1}$ 0.92379, $n_D^{21.1}$ 1.43628; the corresponding acid, b_{20} 116°; *acid chloride*, b_{13} 52°; *p-toluidide*, m. 56°. MeZnI gives IV, b_{13} 48°, b_{750} 154°, $d_4^{19.2}$ 0.85385, $n_D^{19.2}$ 1.43768; semicarbazone, m. 203-4°; an isomeric semicarbazone, m. 163°. III also forms 2 semicarbazones, m. 166-7° and 186°. This indicates *cis-trans* isomerism. In the equil. mixt. of III and IV there is $17 \pm 0.25\%$ α, β -ketone. I was synthesized from MeEtC:CHCOCl and EtZnI ; it b_{18} 66°, b_8 53-4°, $d_4^{1.5}$ 0.85516, $n_D^{21.5}$ 1.45073. Attempts to synthesize II failed, only I being formed. II was finally isolated by treating the equil. mixt. from the EtONa condensation with Al-Hg , which reduces I to a high-boiling bimol. condensation product; the II, b_{19} 63°, $d_4^{21.2}$ 0.85244, $n_D^{21.2}$ 1.43668; semicarbazone, m. 134°. The equil. mixt. of I and II contains 67.5% α, β -ketone. C. J. WEST

Superheating of phenyl β, β -dimethylacrylate. SIEGFRIED SKRAUP. Univ. Würzburg. *Ber.* 61B, 1665-6(1928).—Doubt having been cast by v. Auwers (*C. A.* 22, 1762) on the existence of the comp'd., m. 88°, which S. and Beng described as having

obtained by superheating $\text{Me}_2\text{C}:\text{CH}:\text{C}(\text{O}-\text{Me})_2$, the substance of a series of expts. and a sample sent to us were unable to obtain it is that they were unable to obtain it is that they of doing which is emphasized in the first 2 papers of the series (cf. especially C. A. 20, 1228).

and to which they assigned the structure seen prepd. anew in 2 entirely independent series. Possibly the reason he and his collaborators did not strictly control the temp., the necessity of doing which is emphasized in the first 2 papers of the series (cf. especially C. A. 20, 1228).

Preparation of organic esters. MUNIO KOTAKE AND YASUJI FUJITA. *Bull. Inst. Phys. Chem. Research (Tokyo)* 7, 734-9; English Ed. 1, 65(1928).—Good yields are claimed when esters are prepd. by heating a mixt. of alc., acid, H_2SO_4 and anhyd. $\text{Al}_2(\text{SO}_4)_3$ at 100° . Stearic, succinic, benzoic, malonic, maleic, cinnamic, pyromucic, salicylic esters, AmOAc and oxalic acid ester have been successfully prepd. A. I. H.

Organic cyclic polysulfides: condensation of ethylene mercaptan with di- and trichloroacetic acid. GOPAL CHANDRA CHAKRAVARTI AND JOGENDRA MOHAN SAHA. Univ. Science Technol., Calcutta, and Indian Inst. Science, Bangalore. *J. Indian Chem. Soc.* 5, 453-8(1928).—This study is a continuation of the investigations of Rây (cf. C. A. 16, 3065; 18, 2332). A mixt. of 6 g. of $(\text{HSCH}_2)_2$ (I) and 9 g. of $\text{Cl}_3\text{HCCO}_2\text{H}$ (II) was heated for several hrs. on a sand or water bath. CO_2 , H_2S , and HCl were evolved. The reaction product, which was solid after cooling, was washed with dil. caustic alkali and H_2O . The residue was extd. with EtOH , and the ext. concd. Thus *pentamethylene tetrasulfide*, $\text{CH}_2.\text{S}.\text{C}_2\text{H}_4.\text{S}_2.\text{C}_2\text{H}_4.\text{S}$ (III), white, m. 96° , was obtained instead of the

expected *ethylenedisulfido-acetic acid*, $\text{CH}_2.\text{S}.\text{CH}(\text{CO}_2\text{H}).\text{S}.\text{CH}_2$ (IV). Besides III,

the reaction yielded polymers of Et_2S_2 . When I and II were heated together with C_6H_6 as a solvent, no reaction took place, while in xylene *trimethylene disulfide*, $\text{CH}_2.\text{S}.\text{CH}_2.\text{S}.\text{CH}_2$ (V), yellow, m. $192-4^\circ$, and 2 polymers of V were obtained; 1st

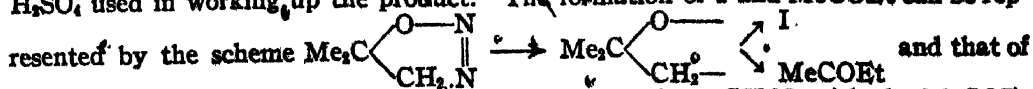
polymer, brownish, heavy oil of sweet odor; 2nd polymer, white, m. $83-4^\circ$. Nine g. of $\text{HSCH}_2\text{CH}_2\text{SK}$ and 5.5 g. of the Et ester of II in 50 cc. abs. EtOH gave *Et diethylene tetrasulfido-acetate*, $\text{C}_2\text{H}_4.\text{S}.\text{CH}(\text{CO}_2\text{Et}).\text{S}.\text{C}_2\text{H}_4.\text{S}_2$, thick oil, and *Et ethylenedisulfido-*

acetate, $\text{CH}_2.\text{S}.\text{CH}(\text{CO}_2\text{Et}).\text{S}.\text{CH}_2$ (VI), thick, transparent oil of pleasant odor. The

boiling of VI with KOH in EtOH resulted in formation of a *compd.*, which probably was IV. Interaction of $\text{Cl}_3\text{HCCO}_2\text{K}$ and $\text{HSCH}_2\text{CH}_2\text{SK}$ gave IV, oil of pungent odor, strongly acid to litmus, decomp. carbonates and bicarbonates; *K salt*, colorless crystals. Ten g. $\text{Cl}_3\text{CCO}_2\text{Et}$ (VII) and 10 g. of I gave amorphous *compds.* identified as polymers of Et_2S_2 . The same *compds.* were obtained by interaction of $\text{HSCH}_2\text{CH}_2\text{SK}$ and VII, and of $(\text{NaSCH}_2)_2$ and VII. The reaction between 10 g. of I and 9 g. $\text{Cl}_3\text{CO}_2\text{H}$ in 40 cc. xylene (no reaction occurred in C_6H_6) yielded III and polymers of ethylene disulfide. G. S.

Action of diazomethane on ketones in the presence of catalysts. HANS MEERWEIN AND WILLY BURNELEIT, WITH TH. BERSIN. Univ. Königsberg. *Ber.* 61B, 1840-7(1928); cf. C. A. 22, 1717.—In a continuation of the study of the increase in the ionizing ability of weak electrolytes by complex formation and its significance for catalytic processes, M. and B. have taken up the question of the possibility of activating purely homopolar *compds.* or at. groups (e. g., $\text{C}:\text{O}$) by complex formation, their guiding thought being that by the addn. of suitable complex formers to the O of the CO group there can be brought about a distortion of the electronic paths in the sense that the dipolar moment of the CO group is increased or a spatially enclosed or electrostatically screened dipole is set free, thus increasing the additive power of the CO group. As suitable complex formers may be considered acids, H_2O , alcs. and metallic salts, for the halochromic phenomena of aldehydes and ketones indicate that these substances can add to the O of the CO group. As a reaction to test the additive power of the CO group was chosen that with CH_3N_2 . According to observations hitherto made, ketones do not react with CH_3N_2 and in agreement with this, M. and B. found that an $\text{Me}_3\text{CO}.\text{CH}_3\text{N}_2$ soln. at 0° undergoes only barely perceptible decomp. but if 10-5% H_2O is added to the Me_3CO there sets in a vigorous evolution of N which continues as more CH_3N_2 is passed in. When about 80% of the quantity of CH_3N_2 equiv. to that of the Me_3CO has been used up the mixt. seps. into 2 layers, and the action of the CH_3N_2 becomes slower and finally ceases completely. The lower layer consists of H_2O (approx. the quantity added) and the upper layer contains chiefly *asym*-dimethylethylene oxide (I) (approx. 40% of the calcd.), together with homologs of Me_3CO (MeCOEt , isolated as the semicarbazone, and Et_3CO and MeCOPr , formed in too small quantities to permit

of their sepn. from each other); the small quantity of Me_2CHCHO , detected by its odor and fuchsin- SO_2 reaction, was probably formed secondarily from the I by the dil. H_2SO_4 used in working up the product. The formation of I and MeCOEt can be represented by the scheme



the higher ketones by an entirely analogous reaction of the CH_2N_2 with the MeCOEt formed primarily. The H_2O added is not methylated, or only in traces; no MeOH could be detected with $p\text{-O}_2\text{NC}_6\text{H}_4\text{COCl}$. The H_2O therefore acts purely catalytically, and that it is the non-dissociated H_2O , not H ions, which has this catalytic action is indicated by the fact that 0.1 N NaOH has approx. the same effect. The alcs. act like H_2O , although apparently not quite so energetically, their action decreasing with increasing mol. wt. The products are the same as with H_2O . Metallic salts also catalyze the methylation of ketones by CH_2N_2 . ZnCl_2 , SnCl_4 and SbCl_5 are excluded by their condensing action and HgCl_2 is reduced by CH_2N_2 , but a 0.1 N soln. of LiCl in Me_2CO behaves towards CH_2N_2 about like Me_2CO contg. 10% H_2O , although the reaction stops when about 70% of the Me_2CO has reacted; the yield of I is 31%, based on the quantity of CH_2N_2 used. Whether acids catalyze the reaction could not be detd. experimentally because they are almost instantly methylated by CH_2N_2 , but when CH_2N_2 in Et_2O was titrated with HCl and $(\text{CO}_2\text{H})_2$ in Et_2O on the 1 hand and in Me_2CO in the other, about 10% less acid was required with the Me_2CO than with the Et_2O solns. The effectiveness of these catalysts is not limited to the methylation of ketones; acid esters, amides and even CO react more or less energetically with CH_2N_2 under the above conditions. These reactions have as yet not been carried beyond the qual. stage and the results so far obtained are published now only because of the appearance of Mosettig's paper (*C. A.* 22, 4512); according to M. and B.'s views, the ethylene oxide which he obtained from piperonal and CH_2N_2 in MeOH is β -piperonylpropylene oxide. C. A. R.

Nitramines of methionic acid. H. J. BACKER. Univ. Groningen. *Rec. trav. chim.* 47, 942-9(1928).—The action of abs. HNO_3 at 0° on mono-alkylated amides $\text{CH}_2(\text{SO}_2\text{NHR})_2$ of methionic acid, gives rise to the formation of dinitramines, provided R be an aliphatic radical. These nitramines can also be obtained from the acetylated mono-alkylated amides if the nitration is carried out at higher temp. When R is an aryl group, the NO_2 group enters the C_6H_5 nucleus, but nitramines are not formed. *Methionbismethylamide*, m. $172-5^\circ$, was obtained on heating the $\text{CH}_2(\text{SO}_2\text{Ph})_2$ + ("methionol," according to Schroeter, *C. A.* 13, 3161) with an excess of MeNH_2 in C_6H_6 in a sealed tube at 140° for 3 hrs. With abs. HNO_3 at 0° , *methionbismethylnitramine*, (I), m. 118.5° , is produced. On titrating this compd. with alkali, 4 equivs. are consumed, the nitramine being converted into $\text{CH}_2(\text{SO}_2\text{H})_2$ and MeNHNO_2 , according to the equation: $\text{CH}_2[\text{SO}_2\text{N}(\text{NO}_2)\text{Me}]_2 + 4\text{KOH} = \text{CH}_2(\text{SO}_2\text{K})_2 + 2\text{MeN}\cdot\text{NO}_2\text{K} + 2\text{H}_2\text{O}$. With liquid NH_3 I reacts instantly with the formation of methionamide, m. 234° , and MeNHNO_2 . *Methionbismethylacetamide*, m. $174-5.5^\circ$, prepd. from $\text{CH}_2(\text{SO}_2\text{NHMe})_2$, Ac_2O and a drop of concd. H_2SO_4 , does not react with abs. HNO_3 at 0° , but at 70° is converted into I. In the same way as described above for the Me compd., the following compds. were prepd.: *methionbisethylamide*, m. $144-5^\circ$; *bisethylacetamide*, m. 78° ; *bisethylnitramine*, m. $61-1.5^\circ$; *bispropylamide*, m. 171.5° ; *bispropylnitramine*, m. $47-8^\circ$; *bisbutylamide*, m. $181-1.5^\circ$; *bisbutylnitramine*, m. $41-1.5^\circ$; *bisamylamide*, m. $179.5-80^\circ$; *bisamylnitramine*, m. 21° . *Methiondipiperidide*, m. $117-7.5^\circ$, is converted into nitropiperidine by abs. HNO_3 . The nitration of *methionbisethylanilide*, m. $112-4^\circ$, gives *methionbisethyl-2,4-dinitroanilide*, m. 219° , which is split up by concd. HCl at 175° into $\text{CH}_2(\text{SO}_2\text{H})_2$ and $2,4\text{-(O}_2\text{N)}_2\text{C}_6\text{H}_3\text{NH}_2$, m. 114.5° (cf. *Rec. trav. chim.* 2, 104(1883)). The nitration of $\text{CH}_2(\text{SO}_2\text{Ph})_2$ yields *di-p-nitrophenyl methionate*, m. 169° , treatment with benzene satd. with NH_3 at 150° giving methionamide, m. 234° , and *p*-nitrophenol, m. 113.5° . C. F. VAN DUIN

Reactions relating to carbohydrates and polysaccharides. XVII. Structure of the isomeric methyleneglycerols. HAROLD HIBBERT AND NEAL M. CARTER. McGill Univ. *J. Am. Chem. Soc.* 50, 3120-7(1928); cf. *C. A.* 22, 3132.—The possibility of both optical and geometrical isomerism in the structurally isomeric cyclic acetals of $\text{C}_3\text{H}_5(\text{OH})_3$ is pointed out. Advantage is taken of the absence of geometrical isomerism in the methyleneglycerols (I) in order to isolate and det. the structure of the 2 isomers formed by partition of HCHO between the 1,2- and 1,1'-HO groups of $\text{C}_3\text{H}_5(\text{OH})_3$ during cyclic acetal formation. Details are given for the prepn. of the mixed I (63% yield), b. $80-90^\circ$, n_D^{20} 1.4497 (indicating 60% of the 1,2-deriv.). In the formation of the benzoates, advantage was taken of the action of dry HCl in bringing about a large conversion of the 1,2- into the 1,1'-acetal. Fifty g. I were treated with 0.01%

by wt. of dry HCl and allowed to stand 15 hr. at 100°, then cooled and added to 40 g. dry C₂H₅N; finally 68 g. BzCl was slowly run in so that the temp. was maintained below 60°; after 48 hrs. at 20°, a practically quant. yield of mixed benzoates was obtained; crystn. from Et₂O gives 50% of the 1,1'-benzoate, m. 72°; from the mother liquor, there was isolated the 1,2-isomer, m. 26°. Hydrolysis of these derivs. gave 1,2-methyleneglycerol (II), b₁₁ 64-5°, b₂₈ 104°, b₇₈₀ 195°, d₄²⁰ 1.2113, n_D²⁰ 1.4477, and the 1,1'-isomer (III), b₁₁ 82°, b₂₈ 100°, b₇₈₀ 191°, d₄²⁰ 1.2256, n_D²⁰ 1.4433. The 1'-Me ether of II, b₇₈₀ 147°, d₄²⁰ 1.0788, n_D²⁰ 1.4213; the 2-Me ether of III, b₇₈₀ 152°, n_D²⁰ 1.4295. Hydrolysis of these ethers gives the known α- and β-Me ethers of C₃H₅(OH)₃. The interconversion of the ring systems of the 2 isomeric acetals is studied. C. J. W.

Polymerization and condensation. IV. Experiments on glycidol acetate. P. A. LEVENE AND A. WALT. Rockefeller Inst. *J. Biol. Chem.* 79, 363-76(1928); cf. *C. A.* 22, 59.—Glycidol acetate was allowed to stand for 5 days at 135-40° and for several weeks at 12-3° and the polymerization product fractionated. Among the products obtained were: the dimeric form of glycidol acetate, mol. wt., 226, which on standing was further polymerized; incompletely acetylated glycerol; monoaceticin; triaceticin; and polymers of glycidol acetate. *Conclusion.*—Glycidol acetate has a greater tendency to polymerize than propylene oxide, glycidol or CO(CH₂OH)₂, but a lesser tendency to form condensation products than these substances. MeCOCH₂OAc showed no tendency to polymerize or form condensation products. A. G.

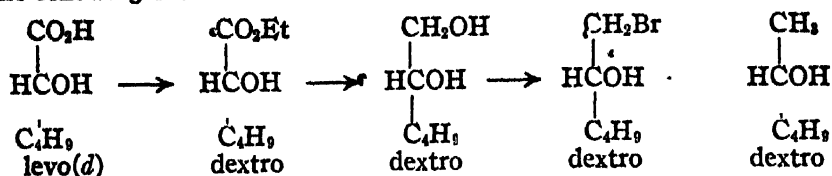
Synthesis of glyceric acid-monophosphoric acid. CARL NEUBERG, FRITZ WEINMANN AND MARTHE VOGT. Kaiser Wilhelm-Institut für Biochemie, Berlin-Dahlem. *Biochem. Z.* 199, 248-52(1928).—When EtPO₃ acts on water-free *D*-glyceric acid a mol. of the ester adds on to the latter. Equal quantities of each substance are mixed and the reaction which sets in spontaneously is completed on the water bath. The unused EtPO₃ is extd. with CHCl₃. After soln. in water various by-products are removed or destroyed by sapon. with acid and later with NH₃. The inorg. phosphoric acid is pptd. with MgCl₂. The liquid is condensed and pptd. with alc., which removes NH₄Cl and MgCl₂ remaining in soln. The sirupy material is dild. with H₂O and is heated with BaCl₂ (reaction alk. to phenolphthalein); the neutral Ba salt of glyceric acid-monophosphoric acid seps. out pure. This can be further purified as the brucine salt. S. M.

Configuration of pentaerythritol. II. The optically active dipyruvic acid-pentaerythritols. J. BÖESKEN AND B. B. C. FELIX. Techn. Hochschule Delft. *Ber.* 61B, 1855-7(1928); cf. *C. A.* 22, 2367.—It was concluded, in the 1st paper, that if it were possible to resolve condensation products of pentaerythritol (I) with ketones of aldehydes of the type C(C₂H₅O₂:CRR')₂ into optically active components, the tetrahedral structure of I, at least in the liquid state, would be proved. The dipyruvic acid deriv. briefly mentioned in that paper has since been prepd. in larger quantity and resolved by means of strychnine. AcCO₂H (190 g.) is esterified practically completely by boiling 8 hrs. with 1 l. abs. alc. + 20 cc. alc. 2 N HCl, adding 500 cc. C₆H₆ and slowly distg. off about 1 l. of EtOH-C₆H₆-H₂O through a long fractionating column. The ester is then boiled 3 hrs. with 1.5 l. abs. alc., 65 g. I and 30 cc. alc. 2 N HCl, 0.5 l. C₆H₆ added, the ternary mixt. distd. off as above and the process repeated, giving 94 g. b.-cathode vac. 130-5°, 12 g. b. 135-40° and 36 g. b. 140-65°. The 1st fraction (mol. wt. detd. by sapon. 331.6) is *di-Et dipyruvate-pentaerythritol*, C(C₂H₅O₂:CMeCO₂Et)₂, m. 46°, 50 g. of which with 1.10 N alc. NaOH at 80° gives 25 g. of the free acid (II), m. 238°, mol. wt. (by titration) 275. The 140-65° fraction above consists chiefly of the monopyruvate ether, m. 95°, mol. wt. 222. II (11 g.) with 12.5 g. strychnine in alc. suspension heated to 70° (which quickly gave a clear soln.) and poured into petroleum ether gave 23.5 g. of a salt of which 11 g. did not dissolve in 40 cc. alc.; 10 g. of this insol. salt, decompd. in H₂O with KOH, filtered from the strychnine, shaken with CHCl₃, acidified to Congo at 0° with H₂SO₄ and extd. with Et₂O yielded 2.5 g. of an active II, [α]_D -3.98° (Me₂CO). From the sol. strychnine salt was obtained in the same way 2.5 g. of a II with [α]_D 3.72° (Me₂CO), 6.87° (H₂O); in H₂O and even in the presence of a little HCl the rotation remains const. for 24 hrs. but on the H₂O bath rapidly decreases (22% racemization in 2, 100% in 45 min.). C. A. R.

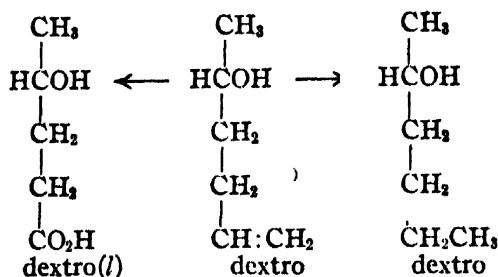
The formation from β-alanine ester of a high-molecular product composed of β-alanyl groups in acid-amide linkage. EMIL ABDERHALDEN AND FRITZ REICH. Univ. Halle. *Z. physiol. Chem.* 178, 169-72(1928).—In attempting to prep. β-alanine anhydride it was found that β-alanine ester on standing deposits a white amorphous substance and completely solidifies in 6-7 days. The product is sol. in H₂O and in AcOH, and is pptd. from H₂O as a gelatinous mass by addn. of EtOH. When dried it decomps. 310° without melting. It could not be obtained cryst. The ratio of amipo N

to total N is 1:10 and an ester group is still present. Hydrolysis with 25% H_2SO_4 gives β -alanine quant. without splitting off NH_3 . The substance is, probably the ester of a β -alanine polypeptide. A. W. DOX

Configurational relationship of methylbutylcarbinol and of 2-hydroxycaproic acid to lactic acid. With a note on the relationship of chemical structure to optical activity. P. A. LEVENE AND H. L. HALLER. Rockefeller Inst. J. Biol. Chem. 79, 475-88(1928).—By the following set of reactions:



the configurational relationship of 2-hydroxycaproic acid (I), to hexanol (II), was detd. The relation of the latter to 4-hydroxyvaleric acid (III), was detd. by the following set of reactions.



Since the relationship of III to lactic acid is known, the relationship of the latter to I and II was thus detd. A summary of the observations on the configurational relationship of the carbinols is given and the law enunciated by Guye [*Compt. rend.* 110, 714 (1890); 116, 1378, 1451(1893)] is found to hold for these substances. The relative effects of the mass and polarity of a group on the direction of rotation is discussed. In addn. to the compds. listed above, hexylenebis- α -naphthyl carbamate, hexan-1-ol-2-one and hexyl- α -naphthyl carbamate were also prepd. ARTHUR GROLLMAN

Catalytic studies on acetoacetic ester. F. O. RICE AND JOSEPH J. SULLIVAN. Johns Hopkins Univ. J. Am. Chem. Soc. 50, 3048-55(1928).—By the distn. of $\text{AcCH}_2\text{CO}_2\text{Et}$ in high vacuum and with special precautions to prevent contamination of the ester, samples were obtained in which the rate of change of the enolic form was over 10 times slower than the (calcd.) best values previously reported; with a sample contg. 38.4% enol (initial) the value of k_1 was 0.0014. Attempts to add substances to the ester which would stabilize it met with no success; the ratio k_2/k_1 (k_2 , rate after addn. of catalyst, k_1 , rate before addn.) was detd. for the following substances in the concn. (concn. $\times 10^{-3}$) given: piperidine, 4, 11,400; NH_3 , 4, 4000; $\text{C}_6\text{H}_5\text{N}$, 4, 264; quinoline, 4, 17; Br, >1300; AcCl , 4, 157; $\text{C}_6\text{H}_5(\text{CO})_2\text{O}$, 40, 6; $(\text{CO}_2\text{H})_2$, 1, 3.2; H_2O , 100, 1; dehydracetic acid, 4, 36; residue, 4, 3. The mean temp. coeff. of the rate of change of the liquid ester, k_{35}/k_{25} was found to be 5.6, from which the heat of activation is calcd. to be 31,200. C. J. WEST

Attempts to synthesize norpinic acid. GEORGE R. CLEMO AND KENNETH N. WELCH. Armstrong College. J. Chem. Soc. 1928, 2621-8.—The 1st attempt consisted in the reaction of $\text{Me}_2\text{C:CO}$ with maleic or fumaric ester, which gave only polymerized $\text{Me}_2\text{C:CO}$ and unchanged ester; likewise condensation could not be effected between $\text{Me}_2\text{CBrCOBr}$ and $(\text{HO}_2\text{C})_2\text{CNaCH}(\text{CO}_2\text{H})_2$. The prepn. of $(\text{EtO}_2\text{C})\text{CMe}_2\text{CH}(\text{CO}_2\text{Et})\text{CH}_2\text{CO}_2\text{Et}$ was then investigated with a view of carrying out the Dieckmann reaction on it to give $\text{Me}_2\text{C.CO.CH}(\text{CO}_2\text{Et}).\text{CHCO}_2\text{Et}$; $\text{Me}_2\text{C}(\text{OH})\text{CN}$ was con-

densed with $\text{CNCHNaCO}_2\text{Et}$ and the resulting product refluxed with $\text{BrCH}_2\text{CO}_2\text{Et}$, but the yield of the ester and acid was so poor that the expt. was discontinued. Heating $\text{CH}_2(\text{CO}_2\text{Et})_2$ (130 g.), 120 g. Ac_2O and 8 g. ZnCl_2 in 110 g. Me_2CO in sealed tubes 80 hrs. in the H_2O bath gives 90 g. $\text{Me}_2\text{CCH}(\text{CO}_2\text{Et})_2$, b_{14} 116-20°; with $\text{CHNa}(\text{CO}_2\text{Et})_2$, there results 10% of $\text{Me}_2\text{C}[\text{CH}(\text{CO}_2\text{Et})_2]_2$, b_1 155°; however, the Na deriv. with CH_2I_2 did not yield the expected cyclobutane deriv. The attempt to condense $\text{MeOCH}_2\text{CH}(\text{CO}_2\text{Et})_2$ with $\text{Me}_2\text{CCH}(\text{CO}_2\text{Et})_2$ to form $(\text{EtO}_2\text{C})_2\text{CHCMe}_2\text{C}(\text{CO}_2\text{Et})_2\text{CH}_3\text{OMe}$ failed. Condensation of $(\text{EtO}_2\text{C})_2\text{CNaCH:C}(\text{CO}_2\text{Et})_2$ with AcCl gave an *O*-Ac deriv., which,

on distn., gives Et ethoxy- α -pyrone dicarboxylate. In the action of Me_2CHI there results, in addn. to the trimesic ester, a considerable quantity of $\text{CH}_2(\text{CO}_2\text{Et})_2$. Et α -acetylglutarate (I) is obtained in 70% yields by refluxing 6 g. Na in 150 cc. EtOH, 33 g. $\text{AcCH}_2\text{CO}_2\text{Et}$ and 35 g. $\text{BrCH}_2\text{CH}_2\text{CO}_2\text{Et}$ for 3 hrs. I does not react with MeMgI . I (11.5 g.), shaken with 15 cc. H_2O and 2.5 g. CaCO_3 and treated dropwise with Br (2.7 cc. during 1 week) gives 13 g. α -Br deriv. (II), b_p 162–5°, which gives no color with FeCl_3 . With MeMgI II is reduced to I. The α -Me deriv. of I reacts with MeMgI to give Et α -methylglutarate. I contg. a little I, treated with NH_3 for 4 days, gives Et α -[α' -aminoethylidene]glutarate, m. 37°; heating at 190–220° splits off EtOH, giving the lactam, $\text{C}_8\text{H}_{11}\text{O}_3\text{N}$, m. 156°. Heating I with PhNH_2 and a trace of I gives CO-(NHPh) $_2$. I (4.7 g.) in 2.4 g. KOH and 9 cc. H_2O , kept 24 hrs., then treated with 30 cc. H_2O , 3 cc. AcOH and ice and then PhN_2Cl from 2 g. PhNH_2 , gives 80% of α -carboxypentane- γ,δ -dione γ -phenylhydrazone (γ,δ -diketohexoic acid γ -phenylhydrazone), pale yellow, m. 178°. I and PhNHNH_2 in AcOH give Et 1-phenyl-3-methyl-5-pyrazolone-4- β -propionate, pale yellow oil, b_p 215°.

C. J. WEST

The structural formula of bixin. I. J. RINKES. Chem. Lab., Amstelveensche Weg 1090, Amsterdam. *Rec. trav. chim.* 47, 934 (1928).—Kuhn and Winterstein have put forward the formula $\text{MeO}_2\text{CCH:CHCMe:CHCH:CHCMe:CHCH:CHCMe:CHCH:CHCMe:CHCO}_2\text{H}$ for bixin (*C. A.* 22, 2950). This formula is in accordance with the formation of AcCHO and $\text{AcCH:CHCO}_2\text{Me}$ on ozonization. In the same way R. previously had obtained from methylbixin the Me ester of an aldehydic acid, which on oxidation, sapon. and hydrogenation gave β -methyladipic acid (*C. A.* 12, 472), while according to the formula of K. and W. α -methyladipic acid was to be expected.

C. F. VAN DUIN

Bromination of tetraethyldicarboxylglutaconate and the constitution of the glutamic acids. YOSHIYUKI URUSHIBARA. Tokyo Imperial Univ. *Bull. Chem. Soc. Japan* 3, 200–7 (1928).—In the action of Br on tetra-Et dicarboxylglutaconate, tetra-Et α -bromodicarboxylglutaconate is obtained as final product. When the latter is saponified in the presence of HCl, the reaction product is α -chloroglutaconic acid. It is concluded that in the sapon. of a deriv. of glutamic acid, the constitution of the reaction product cannot be deduced from that of the starting substance. Uncertainty in Thorpe's theory of the normal form (*J. Chem. Soc.* 87, 1669 (1905)) is pointed out. A. L. H.

Walden inversion. HANS N. K. RØRDAM. Polytechnic Inst., Copenhagen. *J. Chem. Soc.* 1928, 2447–53.—A theory to account for the Walden inversion is proposed in which it is assumed that whether inversion takes place or not depends upon whether the atom, ion or radical X which enters the mol. instead of the atom or radical which is split off, is able to do so while another radical is oscillating from 1 position to another in reference to the plane formed by the other radicals and the C atom. A quant. theory may be derived based on the time of oscillation θ of the mol., the concns. and the activity conditions in the soln. Of these factors nothing is known of the time of oscillation and very little about the activity coeffs. in such high concns. as are usually employed in researches on this subject. However, a formula is developed for n , the fraction of the reaction product which retains its original configuration, and applied to certain data reported by Holmberg.

C. J. WEST

Thiocyanoacetone, its isomers and polymers. A. HANTZSCH, WITH H. SCHWANE-BERG. *Ber.* 61B, 1776–88 (1928).—Reply to Tcherniac (*C. A.* 22, 2146). The following expts. further confirm H.'s observations or disprove T.'s statements. On testing Arapides' statement that "the oily thiocyanacetone (I) even in H_2O slowly changes into the cryst. hydroxythiazole, but most rapidly when it is heated in H_2O with a little dil. HCl on the H_2O bath," it was found that in pure H_2O , I is not appreciably changed in several days but on addn. of HCl and heating quickly isomerizes. The $\text{MeCOCH}_2\text{Cl-Ba(SCN)}_2$ method of prepg. I gives, when the crude product is allowed to stand about 5 days in *vacuo* over H_2SO_4 , a 95% prepn. still contg. a little Cl but sufficiently pure for practical purposes. I and MeNH_2 in cold Et_2O react without resinification, giving first about 80% of the addn. product MeCOCHSC(NHMe):NH , yellow, m. 77°, whose anhydridization to methylaminomethylthiazole (II) takes place even at room temp. in a few hrs., at once on fusing, although pure II can hardly be obtained in this way because of resinification; the II is obtained perfectly smoothly, however, by boiling the addn. product about 20 min. in dil. HCl; it is faintly yellow and non-hygroscopic and m. 70°. I and NH_3 do not react as smoothly to form aminomethylthiazole (III), which is obtained as a brown oil solidifying in *vacuo* over H_2SO_4 ; its Ac deriv., m. 134°. III with AgNO_3 in H_2O yields an addn. product $2\text{C}_4\text{H}_6\text{N}_2\text{S}\cdot\text{AgNO}_3$, which can be recrystd. from alc. but is completely decompd. with sepn. of Ag_2S , by boiling H_2O . The two N-Me compds. derived from the tautomeric iminothiazoline form of III give both NH_3

and MeNH_2 with fuming HCl at 220° , and not, as stated by their discoverer, Traumann, only NH_3 in the 1 case and only MeNH_2 in the other. T.'s alleged "tetramol. "isomethyl-rhodime" is in fact trimol. (mol. wt. in freezing PhOH 329-35) and is really triacetylthiocyanuric acid, $(\text{MeCOCH}_2)_3(\text{SCN})_3$, for it forms a bisphenylhydrazone, turns brown in the air, a bis-*p*-tolylhydrazone, a semicarbazone and a dioxime: C. A. R.

Bromophosgene. II. Its preparation and properties. HANS-JOACHIM SCHUMACHER AND SAM LENHER. Univ. Berlin. *Ber.* 61B, 1671-5(1928); cf. C. A. 22, 3566.— COBr_2 was prep'd. essentially according to v. Barta (*Ann.* 345, 335(1906)). It has d_{15} 252 and a characteristic sweetish unpleasant odor by which traces of COBr_2 can be detected. Its physiol. effects (studied by Kraja) are the same as those of COCl_2 ; (no direct comparison with COCl_2 was made but judging from the literature on COCl_2 the action of COBr_2 is of the same order of magnitude). H_2O and steam hydrolyze COBr_2 to CO_2 and HBr but considerably more slowly than COCl_2 ; with alkalis, however, it rapidly reacts to form the carbonate and bromide. The vapor-pressure curve of pure COBr_2 , from -50° to 25° , was det'd. with a sensitive Bodenstein quartz manometer. Calcd. from this curve, $Q_m = 7200$ cal. The Trouton rule holds well ($Q_m/T_m = 21.6$). The thermal equil. lies far towards the side of decompn. even at room temp. (about 10% COBr_2 calcd. on the basis of the Br present, at 0.25 atm. Br_2 and 0.75 atm. CO). The velocity of formation from CO and Br_2 is very small at room temp. and weeks are required for the establishment of equil. Pure COBr_2 is stable towards thermal influences; up to 200° the decompn. is hardly measurable; at higher temps. it proceeds on the wall of the vessel as a reaction of the 1st order. Impurities, especially org. substances, may catalyze the decompn. extraordinarily. C. A. R.

Iminodicarboxylic acids and nitrilotricarboxylic acids. G. L. STADNIKOV AND N. TROV. Torf-Institut Moscow. *Ber.* 61B, 1788-9(1928).—It had already been shown that the stability of derivs. of iminodicarboxylic acids decreases with increasing mol. wt.; further to test this point, $\text{PhCH}(\text{CO}_2\text{H})\text{N}(\text{CHMeCO}_2\text{H})\text{CHMeCO}_2\text{H}$ (I) and $\text{PhCH}.\text{CO}.\text{O}.\text{CO}.\text{CMe}_2.\text{NCMe}_2\text{CO}_2\text{H}$ (II) were heated with conc'd. HCl at 160° ;

both break down to $\text{PhNHCH}_2\text{CO}_2\text{H}$, showing that not only the original I and II but the intermediate $\text{PhCH}(\text{CO}_2\text{H})\text{NHCHMeCO}_2\text{H}$ and $\text{PhCH}(\text{CO}_2\text{H})\text{NHCMe}_2\text{CO}_2\text{H}$ are unstable under these conditions. I m. 201° (decompn.). II m. 187° (decompn.). C. A. R.

Acetylmonoses. V. The rates of hydrolysis of tetraacetylmethylmannosides and of triacetylmethylxylosides. P. A. LEVENE AND M. L. WOLFROM. Rockefeller Inst. *J. Biol. Chem.* 79, 471-4(1928); cf. C. A. 22, 3633.—The rates of hydrolysis of the α -, β - and γ -forms of tetraacetylmethyl-*d*-mannosides and the α - and β -forms of the triacetate of Me *d*-lyxoside were det'd. The γ -forms of these compds. were hydrolyzed to sugars while the others underwent little hydrolysis. The equality in the rate of hydrolysis of the α - and β -forms of the tetraacetylmethylmannoside shows that they both possess the $\langle 1, 5 \rangle$ structure. Whether the γ -form has the $\langle 1, 3 \rangle$ or the $\langle 1, 4 \rangle$ lactal structure, cannot be concluded from these results. ARTHUR GROLLMAN

Monoacetone- γ -methylglucoside. P. A. LEVENE AND G. M. MEYER. Rockefeller Inst. *J. Biol. Chem.* 79, 357-62(1928).—The acetonization of α -Me $\langle 1, 5 \rangle$ glucoside was attempted by the previously described method (C. A. 22, 3634). The reaction lead to the elimination of the Me group with the formation of diacetoneglucose. When γ -Me glucoside was treated with acetone in the presence of anhyd. CuSO_4 , 5,6-acetone-methyl- $\langle 1, 4 \rangle$ glucoside was formed. It $b_{0.1}$ 148° , is sol. in H_2O , alc., ether and acetone and is hydrolyzed by 0.1 *N* HCl ; $[\alpha]_D^{25}$ 36.4° (MeOH). By methylation with Ag_2O and MeI, 2,3-dimethyl-5,6-acetonemethyl- $\langle 1, 4 \rangle$ glucoside was formed. It $b_{0.1}$ 105° , $[\alpha]_D^{25}$ 3.76° (MeOH). By following the procedure of Macdonald (C. A. 8, 907) a less pure and uniform product was obtained. ARTHUR GROLLMAN

Preparation of acetone cyanohydrin. KENNETH N. WELCH AND GEORGE R. CLEMO. Armstrong College. *J. Chem. Soc.* 1928, 2629.— Me_2CO (29 g.) added to 31 g. KCN in 100 cc. H_2O and slowly treated with 167 g. 30% H_2SO_4 by wt., the temp. being kept below 20° by the addn. of ice, which also, by dilg. the soln., prevents it from becoming unstirrable on account of the sepn. of KHSO_4 , gives 32 g. $\text{Me}_2\text{C}(\text{OH})\text{CN}$, b_{15} 81° . C. J. WEST

Acetone compounds of the sugars and their transformation products. XII. Shifting of the oxygen bridge by the action of hydrogen bromide-acetic acid on acyl derivatives of monoacetoneglucose. HEINZ OHLE AND HEINZ ERLBACH. Univ. Berlin. *Ber.* 61B, 1870-5(1928); cf. C. A. 22, 3140.—It had been found that when 6-benzoyl-

monoacetoneglucose is treated with HBr-AcOH the O bridge is shifted, a pyroid 6-benzoyltriacyl- β -methylglucoside being obtained from the original furoid deriv. The conclusion that this ring isomerization is general for all monoacetoneglucose derivs. in which the 5-HO group is free has been further tested on 3-*p*-toluenesulfonylmonoacetoneglucose (I), which with HBr-AcOH gives a 3-toluenesulfonyltriacylglucosyl 1-bromide (II) identical with a product obtained by Freudenberg and Ivers from 3-*p*-toluenesulfonyldiacetoneglucose. II must therefore have a 1,5-O bridge. On the other hand, 3-*p*-toluenesulfonyl-5,6-diacetylmonoacetoneglucose (III), with an Ac residue on the 5-HO group, would be expected to yield an isomer (IV) of II still contg. the same furoid structure as the original III and as a matter of fact the product obtained differs from II in m. p. and rotation and the corresponding 3-*p*-toluenesulfonyltriacyl- β -methylglucoside (V) and -glucose (VI) also differ from the analogous compds. obtained from I. These results further show that in the treatment of I with HBr-AcOH acetylation of the free HO groups proceeds much more slowly than the formation of the new type of glucose, and as the Me_2CO residue is split off very rapidly it must be assumed that 3-*p*-toluenesulfonylglucose <1,4> or the corresponding glucosyl 1-bromide is the 1st intermediate product and establishes an equil. with the other forms possible under the conditions of the expt., these various forms then undergoing acetylation insofar as they do not take part in other side reactions. This equil. will depend on (1) the concn. of the sugar components, (2) their configuration and (3) the nature, no. and position of the characteristic substituents on the HO groups, the reaction thus affording a method of comparing the relative stability of the different ring structures of a sugar and its derivs. If a Br deriv. crystals out from the HBr-AcOH , no conclusion can be drawn as to the relative stability of its ring structure, of course, but if nothing crystals out all the components of the equil. mixt. can be pptd. out by a liquid in which they are all insol. (H_2O has hitherto always been used) and their relative stabilities detd. by measuring the relative proportions in which they are present in the ppt. In most cases it will hardly be possible to do more than isolate the compd. present in largest quantity and even this is sometimes impracticable because of the instability of the Br compds., which greatly limits the choice of possible solvents. It is advisable, therefore, immediately to convert the reaction mixt. into the corresponding Me glucosides. A special advantage of this method is that only the α -glucosyl bromides are formed and these yield exclusively the β -Me glucosides, thus greatly facilitating the sepn. of the ring isomers. As thus far developed, however, the method has one great drawback—the removal of the HBr and AcOH with H_2O . The Br derivs. as a rule tenaciously retain traces of moisture, which vigorously catalyzes their decompn. A method of working up the HBr-AcOH solns. without using H_2O is being sought. III, from I and Ac_2O in $\text{C}_6\text{H}_5\text{N}$ at 36° , m. $85-6^\circ$, $[\alpha]_D^{20} -19.96^\circ$ (CHCl_3 , c 5.60) (in the 1st prepn. there was obtained a form m. 78.5° , $[\alpha]_D^{20} -16.17^\circ$ (CHCl_3 , c 4.886), which in a desiccator slowly changed into the $85-6^\circ$ form and could not again be obtained in subsequent preps.); boiling alc. KOH sapon. it to monoacetoneglucose. 3-*p*-Toluenesulfonyl-2,5,6-triacyl- β -glucosyl 1-bromide (IV) (1.3 g. from 10 g. III), begins to darken 115° , sinters about 135° , m. 140° to a black liquid, $[\alpha]_D^{20} 198.9^\circ$ (CHCl_3 , c 4.056). V (0.35 g. from 0.7 g. IV with Ag_2CO_3 in MeOH), m. 128° (mixed m. p. with Freudenberg and Ivers' compd. (m. 134°) $115-26^\circ$), $[\alpha]_D^{20} -64.25^\circ$ (CHCl_3 , c 1.323). VI, from IV recrystd. from too much Me_2CO , m. 129.5° , $[\alpha]_D^{20}$ (CHCl_3 , c 4.748) 62.97° (initial), 40.65° (at equil.). The isomeric 3-*p*-toluene-2,4,6-triacylglucose <1,5>, from II with moist Ag_2CO_3 in Me_2CO , m. $178.5-9^\circ$, $[\alpha]_D^{20}$ (CHCl_3 , c 4.662) 40.11° (initial), 51.48° (final). XIII. Behavior of completely acylated derivatives of monoacetoneglucose towards hydrogen bromide-acetic acid. HEINZ OHLE, HEINZ ERLBACH AND KURT VOGL. *Ibid* 1875-85.—As had already been pointed out, the reaction of monoacetoneglucose derivs. with HBr-AcOH is not limited to the formation of acyl derivs. of ring-isomeric glucosyl 1-bromides but is complicated by a side reaction giving compds. with more firmly bound Br (probably on C atom 4); parallel with this firmer binding of the Br there appears the characteristic color reaction, which is doubtless a halochromism phenomenon and can be ascribed only to further transformation products of these 4-Br compds. It had not been found possible hitherto to isolate any of these Br compds., probably because of their instability, but it was hoped that this might be accomplished by using the completely acylated monoacetoneglucoses where, because of the absence of free HO groups, the O bridge cannot be shifted and the reaction is by that much simplified. This hope too has thus far not been fulfilled but there was observed another effect which apparently depends on the nature and the position of the acyl groups. Triacylmonoacetoneglucose, as already shown, behaves towards

HBr-AcOH entirely like the partially acylated it shows the characteristic play of colors from yellow through red and violet and gives large quantities of products with firmly bound Br. S. The same is true of the tri-Bz deriv. As soon, however, as a p -MeC₆H₄SO₂ group is introduced, the picture changes. 3- p -Toluenesulfonyl-5,6-diacetylmonoacetoneglucose (above) no longer shows the characteristic play of colors although the color of the soln. darkens to brown-red. The HBr-AcOH soln. of the 5,6-di-Bz analog remains light yellow for days, and the resulting 2-acetyl-3- p -toluenesulfonyl-5,6-dibenzoylglucosyl 1-bromide (I) crystals out directly; it is so sensitive, however, that it has not yet been possible to purify it and when it is converted into the Me glucoside it may easily give mixts. of different glucosides. The solns. of 3,5-di- p -toluenesulfonyl-6-benzoyl- and tri- p -toluenesulfonylmonoacetoneglucose in HBr-AcOH likewise remain light yellow, and of the products, which crystal out, the 2-acetyl-3,5-di- p -toluenesulfonyl-6-benzoylglucosyl 1-bromide<1,4> (II) is the more stable. The 2-acetyl-3,5,6-tri- p -toluenesulfonylglucosyl 1-bromide<1,4> (III) forms a stable mol. compd. with 1 mol. C₆H₆. The conversion of these compds. into the corresponding β -Me glucosides and tetraacylglucoses offers no difficulties. On the other hand the 5- p -toluenesulfonyl-6-benzoyl- and 5,6-di- p -toluenesulfonylmonoacetoneglucoses give an intense red color and large quantities of products with firmly bound Br which, however, could not be isolated in crystal form. The acyl derivs. of monoacetoneglucose can therefore be classified in 2 groups as regards their reaction with HBr-AcOH, i. e., by suitable esterification the furoid structure of glucose derivs. can be so stabilized that it remains completely unaltered under conditions under which normally it is decomposed. As a no. of corresponding pairs of furoid sugars were obtained in the course of this investigation the point was tested whether the principle of optical superposition can be applied to them. Below are the values for $[M]_{Br} - [M]_{Me}$ (difference between the mol. rotations of the α -glucosyl 1-bromide and β -Me glucoside) for the various glucoses: 2,3,4,6-tetraacetyl, 88,500; 2,3,4-triacetyl-6-bromo, 88,600; 2,3,4,6-tetra-benzoyl, 45,000; 3- p -toluenesulfonyl-2,4,6-triacetyl, 95,200; 3- p -toluenesulfonyl-2,5,6-triacetyl, 134,500; 2-acetyl-3,5-di- p -toluenesulfonyl-6-benzoyl, 112,000; 2-acetyl-3,5,6-tri- p -toluenesulfonyl, 100,700. It is evident that the law of optical superposition, in the form here developed, does not hold. This is to be ascribed in the 1st place to the fact that the values for A_{Br} and A_{Me} in the equations $M_{Br} = A_{Br} + C$ and $M_{Me} = -A_{Me} + C$ are not const. in the different acylated glucosyl bromides and Me glucosides, and, in the 2nd place, that the value of C is not the same for the bromide and glucoside of any given pair. The applicability of the law is therefore limited to compds. of the same constitution, i. e., those differing only sterically. Another noteworthy regularity observed in the tetraacyl derivs. of glucose contg. a free 1-HO group is that whereas in the pyroid forms the β -derivs. have the greater crystal. power and the lesser soly., in the furoid forms it is the α -derivs. which have these properties. Tri- p -toluenesulfonylmonoacetone- d -glucose (2.4 g. from 9 g. monoacetoneglucose in C₆H₅N with 3 mols. MeC₆H₄SO₂Cl in CHCl₃ at 36°, m. 95-6°, $[\alpha]_D^{19} -5.15^\circ$ (CHCl₃, c 12.12). III (yield, 77%), crystals with 1 mol. C₆H₆, m. 106.5-8° (decompn.), $[\alpha]_D^{20} 114.5^\circ$ (CHCl₃, c 4.928); by pptn. from C₆H₆ with much petroleum ether is obtained an almost pure solvent-free product, m. 124-5°, $[\alpha]_D^{19} 124.5^\circ$ (c 3.020). β -Methylglucoside, from III in MeOH with freshly pptd., dried Ag₂CO₃ at room temp., m. 129.5°, $[\alpha]_D^{20} -8.9^\circ$ (CHCl₃, c 6.210). Glucose (1.15 g. from 3 g. of the tritoluenesulfonylmonoacetoneglucose treated with HBr-AcOH, stirred into ice water, filtered, pressed out and shaken, while still moist, in Me₂CO with Ag₂CO₃), m. 117-8°, $[\alpha]_D^{20}$ (CHCl₃, c 4.972) 51.09° (initial), 37.2° (final). II (4.8 g. from 6 g. di- p -toluenesulfonylbenzoylmonoacetoneglucose), m. 159-60°, $[\alpha]_D^{20} 156.6^\circ$ (CHCl₃, c 3.996); 2 g. yields 0.75 g. of the β -methylglucoside, m. 105°, $[\alpha]_D^{20} 4.16$ (CHCl₃, c 3.850); of this 3 g. gives 1.4 g. of the glucose, m. 139°, $[\alpha]_D^{20}$ (CHCl₃, c 4.986) 69.2° (initial), 46.33° (final). 2-Acetyl-3- p -toluenesulfonyl-5,6-dibenzoyl- β -methyl- d -glucoside<1,4> (yield, 21%), m. 132.5°, $[\alpha]_D^{20} -74.3^\circ$ (CHCl₃, c 4.266), does not reduce Fehling soln. after sapon. with aq. alc. NaOH. Glucose (1.2 g. from 2.6 g. toluenesulfonyldibenzoylmonoacetoneglucose), m. 122°, $[\alpha]_D^{20}$ (CHCl₃, c 3.118) 3.55° (initial), -20.52° (final).

C. A. R.

A new unsaturated anhydroglucose. B. HELFERICH AND E. HIMMEN. Univ. Greifswald. Ber. 61B, 1825-35(1928).—The acetylated glucose or Me glucoside 6-halohydrins react with certain Ag salts under definite conditions in an unexpected manner. With Ag₂SO₄ or com. AgI in MeOH, in MeCN, in C₆H₅N more or less rapidly, the bromides and iodides split off the halogen acid more or less completely at room or

higher temp. The best yields, after several hrs.' shaking at room temp., are obtained from the 6-iodohydrin, in abs. C_6H_5N with dried "Ag fluoride" which, however, still always contains considerable quantities of the subfluoride and probably also of Ag_2O . The fact that H_2O in relatively small quantities, without pptg. out the iodide, interferes markedly with the reaction indicates that C_6H_5N complexes play an important role as intermediate products. The resulting substances have a double bond, qual. detected by the decolorization of Br in AcOH or $CHCl_3$. Assuming that there is no shifting of the double bond in the reaction or in the isolation of the products, the double bond can be only between C atoms 5 and 6 and the products must have the structure $CH_2:C.CH(OAc).CH(OAc).CH(OAc).CH(OR).Q$ (I, R = Ac or Me). The name

glucoseenes, glucoseenides, is suggested for them. To establish with certainty the position of the double bond, β -triacetylmethylglucoseenide (II) was satd. with Cl, which gave a cryst. *dichloride* (III). Furthermore, the α -isomer (IV) of II with O_3 and reduction of the ozonide with Zn dust gives in good yield a methyl-*d*-xyluronic acid triacetate (V). The double bond in the I is also readily satd. with H and Pt sponge in AcOH. Sapon. of the II and IV to the free β - and α -Me glucoseenides (VI and VII) was effected by a modification of the Zemplén method. Neither VI nor VII reduces Fehling soln. Towards acids they are very sensitive. Soln. in 2 N HCl, folw. by addn. of alkali in excess in a few sec., suffices to split off the MeO group with formation of the free *glucoseene* (VIII), which reduces Fehling soln. at room temp. All reactions of VI and VII in acid soln. are therefore really reactions of the free VIII. VIII has thus far been obtained only in amorphous form and in soln. It is very reactive. Opening of the O ring yields a hydroxyenol aldehyde, $CH_2:C(OH)CH(OH)CH(OH)CH(OH)CHO$, which changes by ketone rearrangement into a methylketoaldopentose, $MeCOCH(OH)CH(OH)CH(OH)CHO$. It forms difficultly sol. compds. with $PhNHNH_2$ and is turned yellow by NaOH. With phloroglucinol-HCl VI gives rapidly a red color and, after a time, a dark voluminous ppt., evidently a condensation product of the VIII with the phenol. Other phenols (orcinol, pyrogallol) likewise give colors and condensation products; $PhNH_2$ in H_2SO_4 gives a yellow color, $m-O_2NC_6H_4NH_2$ in HCl a yellow color gradually changing to orange-red. These colors are very similar to those ascribed to certain wood constituents and in part to lignin itself. α -Tetraacetyl-*d*-glucose 6-bromohydrin (4.6 g. from 10 g. acetodibromoglucose with Ac_2O and concd. H_2SO_4 at 125°), m. $172-3^\circ$ (all m. ps. cor.), $[\alpha]_D^{25}$ 108.5° ($AcOEt$), $[\alpha]_D^{24}$ 110.6° ($CHCl_3$). 6-Iodohydrin (4.5 g. from 4.6 g. of the Br compd. with NaI in Me_2CO at 100°), m. 182° , $[\alpha]_D^{22}$ 101.8° ($CHCl_3$), slowly reduces boiling Fehling soln. α -Tetraacetyl-*d*-glucoseene (0.3 g. from 1.2 g. of the iodohydrin), m. $115-6^\circ$, $[\alpha]_D^{23}$ $108.7-110.9^\circ$ ($CHCl_3$). β -Isomer, m. 119° , $[\alpha]_D^{22}$ -35.0° ($CHCl_3$). Triacetyl- α -methyl-*d*-glucoside 6-*p*-toluenesulfonate (41 g. from 30 g. 2,3,4-triacetyl- α -methyl-*d*-glucoside in C_6H_5N with $p-MeC_6H_4SO_2Cl$ at room temp.), m. $77-8.5^\circ$, $[\alpha]_D^{24}$ 126.3° ($CHCl_3$), does not reduce Fehling soln. even on boiling; 40 g. with NaI in Me_2CO at 130° gives 29.6 g. of the 6-iodohydrin, m. $150-1^\circ$, $[\alpha]_D^{24}$ $116.1-116.3^\circ$ ($CHCl_3$) IV, seps. with MeOH of crystn., m. $100-1^\circ$, $[\alpha]_D^{23}$ (solvated) 116.9° , $[\alpha]_D^{18}$ (solvent-free) 123.8° ($CHCl_3$); from these values, the content of MeOH is calcd. to be 0.5 mol. IV does not reduce Fehling soln. even on boiling. VII is very hygroscopic and no good solvent for it has yet been found. V, m. turbid $83-4^\circ$, clear 85° , $[\alpha]_D^{18}$ 92.0° ($CHCl_3$), slowly sol. in concd. NaOH, apparently with complete alteration, for the soln. does not reduce Fehling soln.; with dil. NaOH (about 2 N) it first becomes red and then dissolves to a yellow liquid which strongly reduces boiling Fehling soln. II (29 g. from 47 g. triacetyl- β -methyl-*d*-glucoside 6-iodohydrin, m. $115-6^\circ$, $[\alpha]_D$ 13.4° , obtained quant. from the Br compd. with NaI in Me_2CO), m. $92-3^\circ$, $[\alpha]_D^{20}$ -34.8° ($CHCl_3$). III, m. $129.5-32^\circ$, reduces hot Fehling soln., loses HCl in boiling H_2O . VI (6.25 g. from 10 g. II in $CHCl_3$ at -20° with Na in MeOH), m. $109-10^\circ$, $[\alpha]_D^{15}$ -115.5° (H_2O), has an insipid, very faintly sweetish taste with somewhat bitter after-taste, is easily reacylated with $Ac_2O-C_6H_5N$ at 0° .

C. A. R.

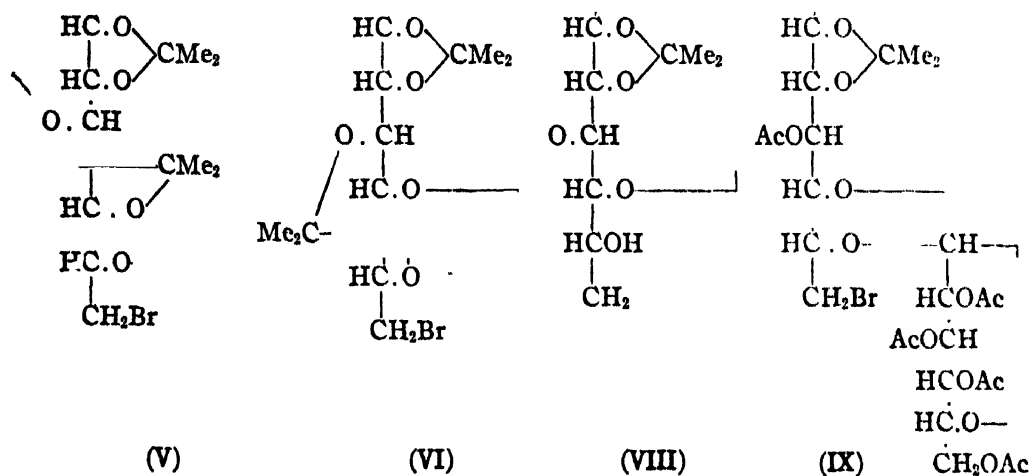
Halohydrins of gentiobiose and glucose. BURCKHARDT HELFERICH AND HERBERT COLLATZ. Univ. Greifswald. *Ber.* 61B, 1640-6(1928).—Outside of acetohalogen-sugars of the reducing saccharides which have the halogen on the 1-C atom, only few halohydrins of disaccharides were known. A gentiobiose 6'-bromohydrin (I) and its derivs. have now been made available by the synthesis of gentiobiose. If 1,2,3,4- β -tetraacetyl-*d*-glucose is coupled with acetodibromoglucose (instead of acetobromo-

glucose) there is readily obtained and in good yield a *heptaacetylgentiobiose 6'-bromohydrin* (II) which can be saponified to the free I, although the Zemplén sapon. method must be somewhat modified, as the presence of NaOAc prevents the crystn. of the I even from org. solvents. But if titrated NaOMe is used and after the reaction is complete a quantity of H_2SO_4 equiv. to the NaOMe (or a trace less) is added, the resulting Na_2SO_4 , being insol. in org. solvents, is more easily and completely removed than NaOAc from the sugar. From II is easily obtained an *acetodibromogentiobiose* (III) and from this, in turn, a *β -hexaacetylgentiobiose 6'-bromohydrin* (IV). For purposes of comparison and to study the properties of these compds. on cheaper material, several glucose halohydrins have also been prepd. II (9.5 g. from 27 g. acetodibromoglucose and 81 g. tetraacetylglucose in CHCl_3 with 22 g. Ag_2O ; almost 75% of the tetraacetylglucose used can be recovered), m. 240° (cor.), $[\alpha]_D^{10} 2.15^\circ$, $[\alpha]_D^{17} 2.38^\circ$ (CHCl_3), practically does not reduce Fehling soln. because of its slight soly. in H_2O . I (yield, 78%), sinters about 100° , m. $125-30^\circ$ (decompn.), carbonizes about 150° , slowly loses in wt. over P_2O_5 under 12 mm., has no measurable rotation in H_2O unless borax is added ($[\alpha]_D^{18} -12.8^\circ$ for 0.1278 g. I with 0.1012 g. anhyd. borax in 3.0296 g. H_2O), deliquesces in the air, reduces hot Fehling soln. III (0.55 g. from 1 g. II in cold abs. CHCl_3 with HBr in AcOH), m. about 193° (decompn.), $[\alpha]_D^{18} 108.1^\circ$, $[\alpha]_D^{21} 109.5^\circ$ (CHCl_3), does not reduce boiling Fehling soln. IV (0.6 g. from 0.7 g. III and Ag_2CO_3 in Me_2CO contg. a little H_2O), m. 264° (cor.), $[\alpha]_D^{18} 9.99^\circ$ after 20 min., 41.45° after 24 hrs. ($\text{C}_6\text{H}_5\text{N}$) (by extrapolation, the initial rotation is negative), reduces hot Fehling soln. *β -Tetraacetylglucose 6-iodohydrin* (V) (87% from the bromohydrin and NaI in Me_2CO at 100°), m. 152° (cor.), $[\alpha]_D^{23} 9.12-9.34^\circ$ (CHCl_3), gives no AgBr with AgNO_3 in Me_2CO even on short boiling, reduces hot Fehling soln., yields in CHCl_3 with HBr in cold AcOH 60% of *triacylglucose 1-bromo-6-iodohydrin*, m. $168-77^\circ$ (decompn.), depending on the rate of heating, $[\alpha]_D^{23} 177.7-8.9^\circ$ (CHCl_3), faintly reduces Fehling soln. only after long boiling, gives with Ag_2CO_3 in Me_2CO 79% of the *6-iodohydrin*, m. $159-60^\circ$ (cor.), $[\alpha]_D^{21} 31.25-32.23^\circ$ (CHCl_3), slowly increasing (81.25° and not yet const. after 6 days), reduces boiling Fehling soln. *Aceto-1,6-diiodoglucose* (65% from V in alc. with HI in AcOH), darkens around 130° , decomp. about 150° , $[\alpha]_D^{22} 205.0^\circ$ (CHCl_3), does not reduce Fehling soln., gives AgI with AgNO_3 . C. A. R.

Acetone-sugars. XIII. Hydrolysis of some disaccharides, glucosides and acetone-sugars. KARL FREUDENBERG, WALTER DÜRR AND HEINRICH VON HOCHSTETTER, IN PART WITH H. VON HOVE, W. JACOBI, A. NÖE AND E. GÄRTNER. Univ. Heidelberg. *Ber.* 61B, 1735-43(1928); cf. C. A. 22, 226.—A disaccharide from glucose and galactose was successfully synthesized thanks to the fact that in the intermediate glucosidodi-acetonegalactose HCl splits off the Me_2CO residue much more rapidly than it ruptures the disaccharide union. For the continuation of expts. along this line accurate knowledge of the 2 concurrent reactions was necessary; even for disaccharides and simple glucosides no uniform measurements were available. 1. *Inversion consts. of disaccharides and glucosides.*—Equal vols. of 0.2 N sugar soln. and N H_2SO_4 at 70° ($\pm 0.1^\circ$) were used. The rotations were read at 18° . To det. the end rotation a corresponding mixt. of the monosaccharides resulting from the cleavage was heated under the same conditions. Difficulties were encountered only with turanose because of the instability of the fructose. The trisaccharide melezitose in the same mol. concn. was first inverted at 18° to split off the glucose present in sucrose union and when the rotation, which fell from 4.55° to 3.40° , became const. after 18 hrs., the last value was taken as the initial rotation and the hydrolysis continued at 70° . For comparison was taken a mixt. of 2 mols. glucose and 1 mol. fructose. With monoacetoneglucose, because of the velocity of the reaction, the sugar and acid had to be preheated to 70° before mixing. Below are the av. values for $K \cdot 10^4$: glucosido- β -6-galactose 2.2, cellobiose (glucosido- β -4-glucose) 3.4, turanose (glucosido- α -6-fructose) 4.2, maltose (glucosido- α -4-glucose) 6.0, lactose (galactosido- β -4-glucose) 7.2, galactosido- β -6-galactose 10.2, melibiose (galactosido- α -6-glucose) 5.6, β -Me glucoside 1.7, α -Me glucoside 0.70, β -benzyl glucoside 1.9, β -Ph glucoside 13.7, α -Ph glucoside 37.0, β -Me galactoside 7.5, α -Me galactoside 4.6, 1,2-monoacetoneglucose 3100.0. The hydrolysis of the other acetone-sugars is so rapid that another method had to be used to measure it. 2. *Cleavage of acetone-sugars.*—The acetone-sugar (0.001 mol.) was boiled in 100 cc. of a buffer soln. (pH 3.6-4.4 at 20°) and the Me_2CO distd. into ice-cold H_2O and detd. by Kolthoff's method (Die Massanalyse, Berlin, 1928, p. 431). The boiling soln. was kept at a const. level by dropping in H_2O . Monoacetoneglucose has the smallest const. That of diacetonegalactose is of about the same magnitude; although 2 mols. Me_2CO are split off, the

const. between 15 and 90% cleavage decrease to only $1/2$, i. e. the reaction velocity is very similar for both Me_2CO residues. Monoacetone- α -mannose is hydrolyzed about 10 times more rapidly than the glucose compd. and so is diacetone- α -mannose but here the const. shows a much greater drift than for diacetonegalactose, falling to 0.5 between 20 and 60% cleavage, and it was therefore possible to obtain a monoacetone- α -mannose (as the Ac deriv.); it does not reduce Fehling soln. Diacetoneglucose shows the greatest fall in the const.; the 5,6- Me_2CO residue is split off roughly 40 times more rapidly than the 1,2-residue. At p_H 3.0 (measured in the cold) the most stable acetone-sugars are hydrolyzed in 2 hrs. at 100° and for the others much milder conditions suffice, while the disaccharides and glucosides studied are stable under these conditions. A no. of miscellaneous observations made in connection with the prepn. of the above compds. are reported. Monoacetone-3-benzylglucose diacetate, from the diacetone compd. in AcOH on the H_2O bath or from monoacetoneglucose in boiling dioxan treated with Na, allowed to stand 2 days at 20° , heated 6 hrs. at 70° with PhCH_2Cl , evapd. *in vacuo*, extd. with Et_2O and acetylated in $\text{C}_6\text{H}_5\text{N}$ with Ac_2O , m. $119-9.5^\circ$, $[\alpha]_D -53^\circ$ in $(\text{CH}_2\text{Cl})_2$. Monoacetone-3-methylglucose, from the diacetone compd. allowed to stand 2 days at 20° in AcOH- H_2O (4:1), b₁ $173-5^\circ$; dibenzoate, m. $81-2^\circ$. Triacetylmonoacetone- α -mannose, from diacetone- α -mannose boiled 1.25 hrs. in a biphtalate buffer soln. (p_H 4.4), m. 59° , $[\alpha]_D 49.9^\circ$ in $(\text{CHCl}_3)_2$. The old observation that the formation of diacetoneglucose depends to a large extent on the quality of the Me_2CO is explained by the fact that AcH and acetals accelerate the reaction extraordinarily. For the splitting off of the 5,6- Me_2CO residue in diacetoneglucose AcOH is best. Benzyl ethers of the sugars seem to be very stable towards acids and alkalis but are easily hydrolyzed on hydrogenation with Pt metals and with Na-Hg. A renewed study of F. and Hixon's partly cryst. diacetone- α -mannoside showed that it contains, besides the cryst. part, m. $40-1^\circ$, $[\alpha]_D -42^\circ$ in $(\text{CHCl}_3)_2$, a *d*-rotatory liquid part which, however, could not be freed from the solid form; the highest rotation obtained was 11° . Methylation of diacetone- α -mannose according to Levene and Meyer did not give their product with $[\alpha]_D 23^\circ$ but a mixt. from which were obtained fractions, b₁ $111-5^\circ$, $115-7^\circ$, $117-8^\circ$, $[\alpha]_D 32^\circ$, 19° , 3° , resp. XIV. Syntheses of further di- and trisaccharides from galactose, glucose and mannose. KARL FREUDENBERG, ANTON WOLF, ERICH KNOPF AND SYED H. ZAHEER. *Ibid* 1743-50.—New detns. of the rotation of 6- β -glucosido- β -galactose gave values lower than those obtained before and which are believed to be more nearly correct: $[\alpha]_D^{18} (\text{H}_2\text{O}) 1.6^\circ (\pm 0.5^\circ)$ 10 min. after soln., 13.9° (const.) after 2 days. Heptaacetylcellobiosidodiacetonegalactose (2 g. from 5 g. acetobromocellobiose and diacetonegalactose with Ag_2O in CHCl_3), m. 227° , $[\alpha]_D^{18} -47.1^\circ$ in $(\text{CHCl}_3)_2$ converted by boiling $\text{Ba}(\text{OH})_2$ into the sirupy cellobiosidodiacetonegalactose which with boiling 0.02 *N* H_2SO_4 gives 6- β -cellobiosido- β -galactose, crystals with $2\text{H}_2\text{O}$, $[\alpha]_D^{19} 22.9^\circ$ (H_2O) 10 min. after soln., 9.25° (const.) after 3 hrs. (calcd. for anhyd. form, 24.6° , 9.9° , resp.); osazone, m. 207° (decompn.). Heptaacetylactosidodiacetonegalactose (12 g. from 17 g. acetobromolactose), amorphous; lactosidodiacetonegalactose (4 g. from 12 g. of the Ac compd.), hydrated crystals, m. 117° , $[\alpha]_D^{18} -39.8^\circ$ (H_2O); 6- β -lactosido-galactose (1.5 g. from 3 g. of the Me_2CO compd.), amorphous, $[\alpha]_D^{18} 22.2^\circ$ (H_2O) (osazone, m. 211° (decompn.)). Tetraacetylgalactosidodiacetonegalactose (10 g. from 31 g. acetobromogalactose), m. $101-2^\circ$, $[\alpha]_D^{19} -44.7^\circ$ in $(\text{CHCl}_3)_2$; 6- β -galactosido- β -galactose, $[\alpha]_D^{17} (\text{H}_2\text{O}) 25.1^\circ$ 8 min. after soln., 34.1° (const.) after 48 hrs. (osazone, m. 207° (decompn.)). Diacetone- α -mannose 1-chlorohydrin (9-10 g. from 12 g. diacetone- α -mannose with SOCl_2 in CHCl_3 - $\text{C}_6\text{H}_5\text{N}$), b₁ $112-5^\circ$; 10 g. with diacetonegalactose and Ag_2CO_3 in CCl_4 gives 3 g. diacetone- α -mannosidodiacetonegalactose, oil solidifying to a glassy mass, b₁ $205-10^\circ$, mol. wt. in camphor 505, $[\alpha]_D^{18} -44.6^\circ$ in $(\text{CHCl}_3)_2$; 6- α -mannosido- α -galactose (the configuration of the 1-C atom of the mannose component is unknown), crystals with MeOH of crystn., $[\alpha]_D^{20} (\text{H}_2\text{O}) 142^\circ$ 5 min. after soln., 134° (const.) after 3 hrs. Diacetone- α -mannosidodiacetone- α -mannose (2 g. from 15 g. diacetone- α -mannose 1-chlorohydrin), m. $180-1^\circ$, $[\alpha]_D^{18} 84^\circ$ in $(\text{CHCl}_3)_2$; mannosido-1-mannose, sirup, does not reduce Fehling soln., $[\alpha]_D^{17} 53^\circ$ (H_2O). XV. Attempts to synthesize disaccharides. KARL FREUDENBERG, HANS TORPFFER AND CARL CHR. ANDERSEN. *Ibid* 1750-60.—In all syntheses of disaccharides hitherto carried out, the C:O of the 1 sugar reacts with the end HO group (1 or 6) of the other. Union through a secondary HO group seems to be more difficult. Diacetoneglucose, whose 3-HO group is free, apparently will in no wise react with the halogen deriv. of the monose. Believing this might be because this HO group is in a ring and between two Me_2CO residues, the authors undertook some expts. with

glucose derivs. more loosely constructed but the 1- and 6-HO groups protected, viz. 1,2-monoacetoneglucose 6-bromohydrin (I) and 4,6-benzal- β -methylglucoside (II). Both form disaccharide derivs. with acetobromoglucose (III) and there is no doubt that the method, suitably modified, will lead to the formation of the disaccharides themselves. But it is not an unambiguous, decisive synthesis, for there are 2 secondary HO groups with which the III can react. α -Glucose 6-bromohydrin (IV) was prepd. from its tri-Ac deriv. In its diacetone compd. (V or VI) the Br atom is unusually unreactive and the same is true of the I in the I compd. (VII). If the Br is removed with NaOEt, there is formed, with loss of HBr and Me₂CO, a monoacetoneanhydroglucose which would be expected to have the structure VIII, already adopted, with good reasons, for a different compd. obtained in another way with Ohle, v. Vargha and Erlbach (C. A. 22, 3141). There is no explanation as yet of this fact, nor is one afforded by the observation that I yields the same VIII with Ag₂O. With TIOAc in AcOH-Ac₂O, on the other hand, I gives the known monoacetone-triacetylglucose. I, however, does not react with Ag₂CO₃ in the cold and can therefore be treated with III in the presence of Ag₂CO₃ in indifferent solvents, giving a non-cryst. intermediate product which, however, on the introduction of another Ac group with Ac₂O-C₂H₅N yields a cryst. tetraacetylglucosidomonoacetone-monoacetylglucose 6-bromohydrin, for which the structure IX is given the preference. The hope that the Br atom in this could be replaced by AcO with TIOAc was not fulfilled. Neither in this or in any other way could a cryst., Br-free product be obtained. The corresponding I compd. (X), obtained with KI, yielded with TIOAc in MeOH a cryst. product (XI), which, however, proved to be a tetraacetylglucosidomonoacetone-anhydroglucose. According to Irvine and Scott II, because of the asym. C atom of the



PhCH = residue, exists in 2 forms, m. 161–2° and 148–9°, resp. By a modified method of prepn. the authors obtained 57% of the 161–2° form with only traces of the other. I. and S. have already made it probable that the 2-HO group in II is free. The authors applied their expts. to 3-methylglucose, which is converted by HCl in MeOH into a sirupy mixt. of its α - and β -Me glucosides and this with BzH gives 2 benzal derivs. which on methylation yield 2 benzaldimethylmethylglucosides identical with the methylation product of the 161–2° II and its β -Me isomer, resp., showing that in II and the β -Me compd. the 3-HO group must be free and leaving, as possibilities for III the 5,6- and 4,6-benzal structures; in favor of the latter it might be advanced that the union has the firmness of the original α -Me glucoside<1,5>. The ease with which the PhCH group can be split off by hydrogen is worthy of note. With III, II gives a cryst. tetraacetylglucosidobenzal-[α -methyl]glucoside (XII), yielding successively a cryst. glucosidobenzal-[α -methyl]glucoside (XIII) and a 2- or 3- β -glucosido-[α -methyl]glucoside (XIV), different from Helferich and Becker's synthetic α -Me gentiobioside; it has not been possible to split off the Me group. IV (55% from the tri-Ac deriv. and 5% HBr at room temp.), m. 134° (decompn.), [α]_D¹⁷ (H₂O) 88.9° 10 min. after soln., 48.95° (const.) after 18 hrs. or immediately on addn. of a drop of NH₄OH, gives in C₂H₅N with Ac₂O the tetra-Ac deriv., m. 171°. V (1 g. from 2.5 g. IV in Me₂CO with concd. H₂SO₄), faintly yellow, b₁₋₂ 146°, [α]_D¹⁹ 32.0° (alc.). I, obtained in 1.3 g. yield along with the V, m. 87°, [α]_D²⁰ –13.1° (H₂O), yields with cold Ac₂O-C₂H₅N a diacetate, m.

115°, $[\alpha]_D^{20}$ -7.11° in $(\text{CHCl}_3)_2$. VII, m. 126°, $[\alpha]_D^{18}$ -27.1° (H_2O). IX, m. 161°, $[\alpha]_D^{17}$ -63.6° in $(\text{CHCl}_3)_2$. VII, from V and NaI in Me_2CCl_2 at 100°, b₁₁ 110-20°, m. 58°, $[\alpha]_D^{18}$ 30.9° (alc.). X, m. 136°, $[\alpha]_D^{18}$ -80.8° in $(\text{CHCl}_3)_2$. XI, m. 106°. II was obtained in 23 g. yield from 28 g. α -Me glucoside, anhyd. ZnCl_2 and BzH , the β -Me compd., m. 205°, in 2 g. yield from 4 g. β -Me glucoside. Dimethylbenzal- $[\beta$ -methyl]-glucoside, m. 134°, $[\alpha]_D^{23}$ -61.0° (alc.). Benzal- β -methyl- $[\alpha$ -methyl]glucoside, m. 133°, $[\alpha]_D^{22}$ 49.1° in $(\text{CHCl}_3)_2$; β -compd., m. 164°, $[\alpha]_D^{22}$ -39.1° in $(\text{CHCl}_3)_2$. XII (4.7 g. from 20 g. II), m. 232°, $[\alpha]_D^{21}$ 47° (CHCl_3). XIII, m. 245°, does not reduce Fehling soln. XIV, m. 252° (decompn.), $[\alpha]_D^{18}$ 62.1-62.7° (H_2O), forms no reducing sugar with yeast.

C. A. R.

Nomenclature of parent ring systems. AUSTIN M. PATTERSON. Antioch College. *J. Am. Chem. Soc.* 50, 3074-87(1928).—Several general principles are formulated for the correct naming of parent ring systems. The individual classes of ring systems are then considered. The present state of their nomenclature is presented, the more promising methods for forming their names are discussed and some new proposals are submitted.

C. J. WEST

Possibility of ring-chain valency tautomerism and of a type of mobile-hydrogen tautomerism analogous to the Wagner-Meerwein re-arrangement. IV. Substitution reactions of some cyclic derivatives of phorone. CHARLES WM. SHOPPÉE. Univ. of Leeds. *J. Chem. Soc.* 1928, 2360-5; cf. *C. A.* 22, 3636.—Since numerous observations have been made which indicate that the 5-C nucleus possesses remarkable stability such as is sometimes found to be associated with tautomeric complexes, it was decided to study the action of substituting agents on hydroxyphorone and its derivs. in order to det. the conditions under which the nuclear type is preserved. The action of Br in CHCl_3 upon the 5-Ac (I), 5-MeO and 5- $\text{BrC}_6\text{H}_4\text{CH}_2\text{O}$ (II) derivs. of 2,2,3,3-tetramethyl- Δ^4 -cyclopentenone gives bromohydroxyphorone (III), m. 116°. 3,3,4,4-Tetramethylcyclopentenone and Br give a *di*-Br deriv., m. 93°; the 5-MeO deriv. also gives a *di*-Br deriv., m. 99-100°, which gives no color with FeCl_3 and is stable to Br in AcOH and alk. KMnO_4 ; on standing it decomp. with evolution of Br. Quinolinium perbromide (IV) and I give III, but in the presence of 1 mol. quinoline there results the 4-Br deriv. of I, m. 73°. II and IV give the 4-Br deriv. of II, m. 64°, with or without quinoline. Hydroxyphorone and 2,4,6- $\text{Br}_3\text{C}_6\text{H}_2\text{N}_2\text{HSO}_4$ give the crimson 4-[2',4',6'-tribromobenzeneazo]-5-hydroxy-2,2,3,3-tetramethyl- Δ^4 -cyclopentenone, sol. in cold 2 *N* NaOH; the corresponding 4-*p*-carbethoxybenzeneazo deriv., crimson, m. 160° (decompn.), sol. in cold 2 *N* NaOH and upon reduction and hydrolysis yields 2,2,3,3-tetramethylcyclopentylamine.

C. J. WEST

Some 1,2-dialkylcyclopentane derivatives. FRANCIS H. CASE AND E. EMMET REID. Johns Hopkins Univ. *J. Am. Chem. Soc.* 50, 3062-5(1928).—The Na salt from 20.7 g. Na and 140 g. α -carbethoxycyclopentanone in 400 cc. C_6H_6 , treated with 131 g. MeI and refluxed 3 hrs., gives 82% of the α -Me deriv., b₁₇ 106-7°; the α -iso-Pr deriv. is obtained in 59% yield. α -Ethyl- α -carbethoxycyclopentenone (I), b₇ 100°, d₄²⁰ 1.0531, d₄²⁵ 1.0310 (74% yield). Heating 100 g. I, 100 cc. H_2SO_4 and 200 cc. H_2O 5 hrs. gives 39 g. α -ethylcyclopentanone (II), b₇₈₈ 160-1°, d₄²⁰ 0.9469, d₄²⁵ 0.9260. With EtMgBr II gives 27% of 1,2-diethylcyclopentan-1-ol (III), b₄₈ 101-2°, d₄²⁰ 0.9250, d₄²⁵ 0.9041. II and PrMgBr give 8.5% of 1-propyl-2-ethylcyclopentan-1-ol, b₄₂ 115-6°, d₄²⁰ 0.9156, d₄²⁵ 0.8949. In the attempted reduction of III by satg. in the cold with HI and then refluxing with Zn, EtOH and HI, there results a 1,2-diethylcyclopentene, b₇₀₁ 148-9°, d₄²⁰ 0.9331, d₄²⁵ 0.8136.

C. J. WEST

Synthesis of certain γ -ketonic acids closely allied to Balbiano's acid. I. Synthesis of α -methylcyclopentane-1,1-diacetic acid, of the lactone of α -hydroxy- α -methylcyclopentane-1,1-diacetic acid and of 1-acetylcyclopentane-1-acetic acid. JOGENDRA CHANDRA BARDHAN. Imp. College Sci. Tech., London. *J. Chem. Soc.* 1928, 2591-604.—Previous work has shown that there is a kind of tautomerism (keto-enol type) in certain β,β -disubstituted ketoglutaric acids and that in the case of acids contg. an additional α -substituent, other factors come into play which considerably reduce the tendency to cyclopropane-ring formation. These conditions are well illustrated in the case of Balbiano's acid (*C. A.* 19, 2329; 18, 379; 16, 2141), where the usual ketocyclol change is completely suspended, the acid exhibiting a marked tendency to pass into the lactol form. It would be expected that the acid $(\text{CH}_2)_4\text{C}(\text{COCO}_2\text{H})\text{CHMeCO}_2\text{H}$ would simulate the characteristic properties of Balbiano's acid; it was assumed

that this acid could be obtained by the oxidation of the lactonic acid $(\text{CH}_3)_4\text{C} \cdot \text{CH}(\text{CO}_2\text{H}) \cdot \text{O} \cdot \text{CO} \cdot (\text{HMe})$ of the spiro compd. $(\text{CH}_3)_4\text{C} \cdot \text{CH}(\text{CO}_2\text{H}) \cdot \text{CH}_2 \cdot \text{CH}_2 \cdot \text{CMe} \cdot \text{CO}_2\text{H}$ by alk. KMnO_4 ; these results were unsuccessful. $(\text{CH}_3)_4\text{C}(\text{CH} \cdot \text{CH} \cdot \text{CO})_2\text{NH}$

(108 g.) in 300-cc. abs. EtOH was gradually added to 35 g. Na in 500 cc. EtOH, cooled, cautiously mixed with 100 cc. MeI and allowed to come to room temp. and after 12 hrs. heated on the steam bath until neutral; distg. off the EtOH, adding 2 l. H_2O and acidifying gives 90 g. of α, α -dicyano- α -methylcyclopentane-1,1-diacetic acid *N*-methyl- ω -imide (I), m. 136-7°. Hydrolysis with H_2SO_4 or HCl gives α -methylcyclopentane-1,1-diacetic acid (II), m. 90-1°; the NH_4 salt gives a bluish green ppt. with $\text{Cu}(\text{OAc})_2$; Ag salt. Excess of Ac_2O gives the anhydride (III), b_{21} 193°, m. 48°; the β -naphthylamic acid, m. 133-4°; heating at 180° gives the β -naphthylimide, m. 179°; heating the dried NH_4 salt at 150° for 4 hrs. gives the imide, m. 123-4°. III (6 g.) and 5.3 g. Br, heated in a boiling H_2O bath for 5 hrs., give the Br anhydride, m. 95°; hydrolysis with 2 *N* Na_2CO_3 for 10 hrs. gives α -hydroxy- α -methylcyclopentane-1,1-diacetic acid lactone (IV), m. 140°; Ag salt; Ba salt; Et ester, b_{30} 197°. The di-Et ester of II, b_{31} 165°, was partially sapond. (Ag salt), treated with SOCl_2 and then with Br at 55°, giving Et α -bromo- α' -methylcyclopentane-1,1-diacetate; the hydrolysis product could not be purified; the oil, oxidized with alk. KMnO_4 and treated with $o\text{-C}_6\text{H}_4(\text{NH}_2)_2$, gave no quinoxaline deriv. I gives an α -Br deriv., m. 180° (decompn.), which is hydrolyzed to II. Cyclopentane-1-acetic-1-carboxylic acid, m. 156-6.5°, gives an anhydride, b_{20} 154°, m. 30°; anilic acid, m. 167-7.5°; anil., m. 127-8°; mono-Me ester, m. 80-1°; acid chloride, b_{18} 132°; *p*-toluidide, m. 111°. The acid chloride and MeZnI give 1-acetylcyclopentane-1-acetic acid (V), m. 83-4°; oxime, m. 124-5°; semicarbazone, m. 197°; Me ester (VI), b_{18} 131° (semicarbazone, m. 152-3°). Reduction with Na and EtOH gives the lactone, $(\text{CH}_2)_4\text{C} \cdot \text{CH}_2 \cdot \text{CO} \cdot \text{O} \cdot \text{CHMe}$, b_{15} 132°, $d_4^{15.8}$ 1.057645, $n_D^{15.8}$ 1.4742; with KCN,

followed by acid hydrolysis, this gives II, thus establishing its constitution. Oxidation of VI with alk. KMnO_4 probably gives α -ketocyclopentane-1,1-diacetic acid, isolated as the quinoxaline, m. 221°. The action of HCN upon V gives, after hydrolysis, IV. Cyclopentanone, $\text{MeCHBrCO}_2\text{Et}$ and Mg give 50% of Et 1-hydroxy- α -methylcyclopentane-1-acetate (VII), b_{30} 130-40°; the acid showed no tendency to solidify and was therefore boiled with Ac_2O , giving α -methylcyclopentylideneacetic acid, m. 108-9°; acid chloride, b_{30} 123°; the action of MeZnI gives α -methylcyclopentylideneacetone, b_{27} 108°, $d_4^{19.2}$ 0.960808, $n_D^{19.2}$ 1.49642, which yields 2 semicarbazones, m. 189° and 169°, the latter being more sol.; both yield the same ketone. Dehydration of VII with POCl_3 in C_6H_6 gives the Et ester, b_{30} 108-10°, $d_4^{17.7}$ 0.96668, $n_D^{17.7}$ 1.4583, of α -methyl- Δ^1 -cyclopentenylacetic acid, b_{28} 150°, $d_4^{19.7}$ 1.050988, $n_D^{19.7}$ 1.4792; the acid chloride, b_{20} 86-8°, gives with MeZnI α -methyl- Δ^1 -cyclopentenylacetone, b_{17} 82°, d_4^{20} 0.921922, n_D^{20} 1.4632; semicarbazone, m. 144°. II. Syntheses of α, β, β - and α, α, β -trimethyllevulic acids, of the lactone of α' -hydroxy- α, α, β -trimethylglutaric acid and of γ -keto- α, α, β -trimethylpropane- α, γ -dicarboxylic acid (Balbiano's acid). *Ibid* 2604-21.—The keto structure for Balbiano's acid, $\text{HO}_2\text{CCOCMe}_2\text{CHMeCO}_2\text{H}$, is proved by the synthesis of the acid of this structure. The prepn. of trimethylsuccinic acid is described; the anhydride, with EtONa, gives the half ester, which gives an acid chloride with SOCl_2 ; with MeZnI this gives a mixt. of α, β, β -trimethyllevulic acid (I), m. 65-6° (semicarbazone, m. 155°; Et ester, b_{14} 110°, d_4^{19} 0.981537, n_D^{19} 1.43638), and α, α, β -trimethyllevulic acid (II), m. 77-8° (semicarbazone, m. 174°); I and II are sepd. by crystg. the semicarbazones at least 20 times from MeOH, that of II being the less sol. Oxidation of I with NaOBr gives trimethylsuccinic acid. The first attempt to synthesize II was by the reaction of $\text{EtCHBrCO}_2\text{Et}$ and $\text{AcCHMeCO}_2\text{Et}$, but this did not proceed in the expected manner. $\text{Me}_2\text{C}:\text{CMeAc}$ (semicarbazone, m. 186°) and HCN give a small quantity of an oil, from which the semicarbazone of II is obtained, but the main reaction product was the compd. $\text{Me}_2\text{C}(\text{CN})\text{CHMeCMe}(\text{OH})\text{CN}$, hydrolyzed to the compd. $\text{HN} \cdot \text{CO} \cdot \text{CMe}_2 \cdot \text{CHMe} \cdot \text{CMeCO}_2\text{H}$, m. 238° (decompn.), which resembles mesitylic

acid in its general properties. The synthesis of II was finally carried out as follows: MeEtCO and $\text{Me}_2\text{CHBrCO}_2\text{Et}$ with Zn in C_6H_6 give 55% of Et β -hydroxy- α, α, β -trimethylvalerate, b_{11} 92°; dehydration with P_2O_5 in C_6H_6 gives α, α, β -trimethyl- Δ^2 -pentenoic acid, b_{10} 113°, $d_4^{19.2}$ 0.963434, $n_D^{19.2}$ 1.45283, as the Et ester, b_{14} 100-2°, $d_4^{18.8}$ 0.906942, $n_D^{18.8}$ 1.43878; Ag salt; *p*-toluidide, m. 71°. The action of Br gives a dibromide, which loses HBr, giving a bromolactone; distn. of the latter at the ordinary

pressure gives the unsatd. lactone, $\text{Me}_2\text{C}(\text{Me}:\text{CMe}:\text{O}:\text{CO})$; b_p 10°; with 20% MeOH-

KOH this gives II; the *p*-nitrophenylhydrazone of II, yellow, m. 207°; the piperonylidene deriv. lemon-yellow, m. 115°. Oxidat. of I with alk. KMnO_4 gives Balbiano's acid, m. 119°; the synthesis of this acid is consistent only with the keto formula and the solid acid probably exists in this form. $\text{AcCMe}_2\text{CO}_2\text{Et}$ and $\text{ClCH}_2\text{CO}_2\text{Et}$ with EtONa give the oxidic ester, $\text{EtO}_2\text{CCMe}_2\text{CMeCHCO}_2\text{Et}$; b_p 162°; hydrolysis gives an

extremely viscous oil, which did not give a semicarbazone. $\text{OHCCHMeCMe}_2\text{CO}_2\text{H}$ and HCN give a cyanolactone, which is hydrolyzed to the α' -hydroxy- α,α,β -trimethylglutaric acid lactone, m. 110°; oxidation with alk. KMnO_4 gives trimethylsuccinic acid. Oxidation of β,β -dimethyllevulic acid gives α,α -dihydroxy- β,β -dimethylglutaric acid, m. 82-3°.

C. J. WEST

Base formation from carbonyl compounds. II. A. SKITA AND F. KEIL, IN PART WITH E. BAESLER AND L. BOENTE. Techn. Hochschule Hannover. *Ber.* 61B, 1682-92 (1928); cf. *C. A.* 22, 4502.—Anilines can also react like aliphatic bases with ketones to form secondary amines; cyclohexanone (I) and PhNH_2 on catalytic reduction with colloidal Pt give *N*-phenylcyclohexylamine (II) in excellent yield. II. HCl , m. 204-5°, is stable in the air and not easily sol. in H_2O , while according to Sabatier and Senderens (*Compt. rend.* 138, 459(1904)) the base obtained by them by the hydrogenation of PhNH_2 and Ph_2NH forms an easily sol. HCl salt unstable in the air. Moreover as the color reactions described by them for their base on oxidation differ entirely from those of II it is not at all certain that they had II. Me_2CO and Et_2CO react like MeCOEt and I with primary amines to form secondary bases, indicating that ketones quite generally react with aliphatic amines and anilines, even in H_2O suspension, to form intermediate *N*-substituted imines, which are then reduced to secondary amines: $\text{RR}'\text{CO} + \text{R}''\text{NH}_2 \rightarrow \text{RR}'\text{C}:\text{NR}''(+\text{H}_2) \rightarrow \text{RR}'\text{CHNHR}''$. On the other hand control expts. have fully confirmed Mignonac's claim (*Fr. pat.* 529,139, July 3, 1920) that I and NH_4OH reduced under the most varied conditions with Ni give the primary cyclohexylamine (III) exclusively; Me_2CO , MeCOEt and Et_2CO behave in the same way, and as aldehydes likewise give chiefly primary amines, the reaction of $\text{C}:\text{O}$ compds. on reduction with Ni may be quite generally represented by the scheme $\text{RCHO} + \text{NH}_3 \rightarrow \text{RCH}:\text{NH}(+\text{H}_2) \rightarrow \text{RCH}_2\text{NH}_2$, while the formation of secondary amines with colloidal Pt can take place only through the further reaction $\text{RCH}_2\text{NH}_2 + \text{RCHO} \rightarrow \text{RCH}_2\text{N}:\text{CHR}(+\text{H}_2) \rightarrow \text{RCH}_2\text{NHCH}_2\text{R}$. By progressively decreasing the quantity of catalyst in the reduction of I with Pt, increasingly large quantities of II (although never as large as those of dicyclohexylamine (IV)) are formed if the reduction is carried out at the same temp. (90°) as with Ni, but at room temp. even the smallest quantities of Pt give IV exclusively. At 90°, therefore, the intermediate compd. $\text{RCH}_2\text{N}:\text{CHR}$ is present in smaller concn. than at room temp. but since the stronger Pt catalyst can still reduce it to IV even when it is present in this smaller concn., the temp. cannot be the only factor in the difference between Pt and Ni; the Ni must have no power (or a markedly lesser power than Pt) to reduce the $\text{RCH}_2\text{N}:\text{CHR}$ so that the reduction practically stops at the 1st stage (RCH_2NH_2). In agreement with this is the fact that equimol. quantities of Me_2CO , MeCOEt , Et_2CO or I on the one hand and III on the other hand form no secondary amine with Ni, while with Pt more than 50% of the secondary amine is formed both at room temp. and at 90°. BzH and MeCOPh can likewise be converted into the secondary amines in NH_4OH suspension with Pt. That Knoop and Oesterlin with Pd sponge obtained secondary amines only with BzH and $\text{PhCH}_2\text{CHCHO}$ and not with Ph_2CO shows that Pd sponge is a weaker catalyst than Pt and stands between Pt and Ni. The formation of tertiary amines probably proceeds according to the scheme $\text{RCH}_2\text{NHCH}_2\text{R} + \text{RCHO} \rightarrow (\text{RCH}_2)_2\text{N}:\text{CH}(\text{OH})\text{R}(+\text{H}_2) \rightarrow (\text{RCH}_2)_3\text{N}$; AcH and PhCH_2NHEt with colloidal Pt in both acid and alk. soln. gave $\text{PhCH}_2\text{NEt}_3$ (V). NH_3 alcs. can be prepd. in this way from dicarbonyl and hydroxycarbonyl compds. Thus CH_3Ac_2 and III gave 2-cyclohexylamino-4-pentanol (VI) through the intermediate compd. $\text{MeC}(\text{NC}_6\text{H}_{11})\text{CH}_2\text{Ac}$, HOCH_2Ac yielded 2-cyclohexylaminopropanol (VII) and from arabinose and mannose were obtained *N*-cyclohexylarabinamine (VIII) and -mannamine (IX), resp. II, b_p 146-8°, gives no blue and purple color with CrO_3 and HNO_3 , resp. but with HIO_3 instantly gives a deep violet color. *N*-Isopropylcyclohexylamine (79% from Me_2CO , III and colloidal Pt with H_2 under 3 atm. overpressure at room temp.), b_p 169-71°; HCl salt, m. 204-5°; picrate, m. 142°. *N*-sec-Butylcyclohexylamine (yield, 60%), b_p 193°; HCl salt, m. 211°; picrate, m. 118°. *N*- α -Ethylpropylcyclohexylamine (31%), b_p 208-9°; HCl salt, m. 178°; picrate, m. 124°. BzH and alc. NH_3 with colloidal Pt gave $(\text{PhCH}_2)_3\text{N}$.

NH; 20 g. MeCOPh gave 3 g. each of (Me₂CHPh)₂NH, b. 145-8°, and MeCHPhNH₂, b. 185-90°; from Et₂CO were obtained Et₂CHNH₂ (HCl salt, m. 216°), and bis- α -ethylpropylamine, b. 172-4°; HCl salt, m. 115-7°. Me₂CO (15 g.) with NH₄OH and a Ni catalyst at 90° under 20 atm. gave Me₂CHNH₂ (8 g. of the deliquescent HCl salt, m. 148-50°); MeCOEt (17 g.) yielded 5 g. EtMeCHNH₂, b. 62-3° (HCl salt, m. 144-5°); Et₂CO gave Et₂CHNH₂, b. 90-4°. AcH (22 g.) and aq. EtNH₂ with colloidal Pt gave about 4 g. each of NHEt₂ and NEt₃. V was obtained in 9 g. yield from BzH, AcH and NH₂Et with colloidal Pt and in over 50% yield from PhCH₂NHEt and AcH (in acid soln. the yield was reduced to 15%). VI (10 g. from 20 g. CH₃Ac), b. 123-5°; HCl salt, m. 157-8°; di-Ac deriv., b. 183° (in H₂). VII, b. 116-7°, begins to cryst. after some days; HCl salt, m. 148-9°. VIII, m. 135-7°; HCl salt, m. 167°. IX, HCl, m. 165-7°.

C. A. R.

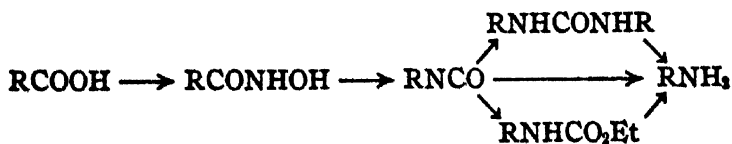
Chaulmoogric oils. The oil of Gorli. EMILÉ ANDRÉ AND DANIEL JOUATTE. Hospice de la Salpêtrière, Paris. *Bull. soc. chim.* 43, 347-60(1928); cf. C. A. 20, 1130.—Oils from seeds of the *Flacourtiaceae* have long been used by tropical peoples for the treatment of skin diseases, including leprosy. These oils are strongly d-rotatory because of the presence of glycerides of acids of the cyclopentene series, chaulmoogric (I) and hydnocarpic acids having been identified; they have not been found in the oil from any other family. *Oncoba echinata*, Oliver, called Gorli or Katoupo, is important because it is the only member of the *Flacourtiaceae* in Africa, where there is much leprosy, and the oil of Gorli contains 87.5% of I. A pure product can be obtained because there are no other chaulmoogric seeds in Africa to become mixed with Gorli seeds. The seeds yield 39-52% of oil of Gorli upon extn. with ether; the solidified oil m. 40-2°, d₂₀²⁵ 0.9286, n_D²⁰ 1.4740, α 56° 10', sapon. no. 184.5, I no. (Hanus) 98. *Trichaulmoogrin*, whose presence in oil of Gorli is certain, could not be sepd. by crystn. with Me₂CO and petroleum ether, but 3 glyceride fractions were obtained, (a) (40%) m. 51°, (b) (40%) pasty, and (c) (20%) oil. (a), sapon. no. 194, I no. 72.5, α 49° 20'; (c), sapon. no. 194, I no. 108, α 46° 25', d₂₀²⁵ 0.9482, n 1.4828. From (a), (b) and (c) the fatty acids were obtained and sepd. by fractional crystn., fractional distn. of the Et esters at reduced pressure, or fractional pptn. of the acids in alc. by Mg(OAc)₂ or Ba(OAc)₂ (method of Heintz). (a) contained 85% of I and 15% of palmitic acid (II); (b), 80% of I, about 10% of II, and about 10% of gorlic acid (III); (c), 70% of I, 10% of II, and 20% of III. *Trichaulmoogrin* (IV), prepd. by the method of Scheij (1899), m. 45°; it is noteworthy that this m. p. is lower than that of I, whereas usually the glycerides of solid, straight-chain fatty acids melt higher than do the acids. The presence of II in oil of Gorli was established for the first time. III was definitely characterized, although it was not obtained in a rigorously pure state; it is C₁₅H₂₆O₂, of the same family as I and hydnocarpic acid, with one more double bond. Its I no. (170) is low because of the presence of I and because the nature of its double bonds does not permit adding the theoretical quantity of I. Perhaps one double bond is in the 5-atom ring and the other in the side chain. Li salt of III m. 163° (decompn.) on the Maquenne block. Gorlic amide m. 95°. Dean and Wrenshall (C. A. 19, 2476) obtained from com. chaulmoogra oil an acid which may be identical with III. To prep. I from oil of Gorli, 100 g. of oil was refluxed 0.5 hr. with 100 g. 90% alc. and 50 g. NaOH. H₂O and excess HCl were added and I was extd. with Et₂O. The ext. was washed with H₂O and dried, and the Et₂O removed. I (95 g.) solidified upon cooling, was recrystd. from 95% alc. several times, then converted into Et chaulmoograte (V) with an equal wt. of 96% EtOH and concd. H₂SO₄ (0.01 wt.); V b. 218-20°; it was sapond. and the resulting I was recrystd. I m. 68°, sapon. no. 198.6, I no. 90.7, α 61.504°. I b. 235° and can be purified by distn., but A. and J. prefer to distil it in the form of V. IV was prepd. from pure C₃H₅(OH)₂ and a slight excess of pure I at 100° under 20-25 mm., CO₂ being introduced meanwhile; the heating was continued for 8 days, 6-7 hrs. per day. Excess I was removed with hot EtOH and IV was recrystd. from Me₂CO. IV m. 45°, n_D²⁰ 1.4764, d₂₀²⁵ 0.9437, α 54° 50', sapon. no. 190.6, I no. 87.3. The presence of a solid, straight-chain fatty acid in oil of Gorli is indicated by the fact that, from the alc. mother liquors obtained in the purification of I were obtained by concn., products whose sp. rotations, m. ps. and I nos. became progressively lower. II was obtained as follows: the acids from the mother liquors of I were esterified with EtOH and H₂SO₄, the esters being distd. under reduced pressure in a current of CO₂. A low-boiling portion was redistd., and certain low-boiling fractions thus resulting were sapond. and the acid recrystd. from EtOH. II is not assocd. with any homologous fatty acid in oil of Gorli. III is prepd. from (c), the liquid glycerides of oil of Gorli, as follows: (c) is sapond. with an equal wt. of 95% EtOH and 0.5 the wt. of pure 36% NaOH. HCl

is added, the acids are extd. with H_2O , the ext. is washed with H_2O , and dried and the Et_2O removed by evapn. The acids are treated with 90% EtOH to sep. the liquid acids from most of the solid acids present, the mother liquors being concd. and then filtered. The liquid acids are esterified with EtOH and H_2SO_4 , and the esters in Et_2O are washed with salt H_2O , and then with H_2O ; the Et_2O is removed by evapn. The residue is distd. under reduced pressure in CO_2 . Fractions rich in Et gorlate, as detd. by the I no., are redistd. The product is sapond., and the acids sepd. The solid acids, contaminated with oil, had an I no. of 120–30; recrystn. from EtOH gave I and II, with III in the mother liquor. The liquid acids, mostly III, had an I no. of 150–70, the theoretical for $\text{C}_{18}\text{H}_{30}\text{O}_2$ with 2 double bonds being 181. Further purification was abandoned for lack of material. III is a colorless liquid becoming slightly yellow upon contact with air, d^{20}_4 0.9364, n 1.4783, α 50° $18'$, sapon. no. 199.5, I no. (Hanus) 169.6. Li gorlate was prepd. as follows: III was refluxed 2 hrs. with 70% EtOH and 2 times the theoretical quantity of Li_2CO_3 . The excess Li_2CO_3 was removed by filtration, the alc. soln. was concd. by distn. and left in *vacuo* over H_2SO_4 . It solidified but could not be purified. Other gorlates gave less satisfactory results. The amide (VI) of III was prepd. as follows: 60 g. SOCl_2 (VII) and 20 g. III were refluxed 2 hrs. on the water bath. The excess of VII was removed by cautious distn. and the residue was dropped into satd. aq. NH_3 at -15° . VI was washed with H_2O , dried and crystd. several times from Me_2CO ; VI m. 95° .

MARGARET W. MCPHERSON

Isomerization of dicyclohexylacetaldehyde to a ketone. E. VENUS-DANILOVA. Staats-Univ. Leningrad. *Ber.* 61B, 1954–66(1928).—The study of the isomerization of aldehydes into ketones (C. A. 21, 2465, and earlier papers) has been extended to dicyclohexylacetaldehyde (I). Dicyclohexyl(ethoxymethyl)carbinol (α , α -dicyclohexylethyleneglycol β -Et ether) is obtained in 136.5 g. yield, together with Et cyclohexylacetate, cyclohexyl(ethoxymethyl)carbinol (the still impure product (C 69.83–70.19, H 11.85–11.90, EtO 25.27%, mol. wt. in freezing C_6H_{12} 166.1) b_{25} 108°), and dicyclohexyl, from 385 g. cyclohexyl bromide, 55.2 g. Mg and 152 g. $\text{EtOCH}_2\text{CO}_2\text{Et}$; it b_{18} 181° , m. 53° , mol. wt. in freezing C_6H_{12} 257.5–272.5. With crystd. $(\text{CO}_2\text{H})_2$ in CO_2 at $112-8^\circ$ it gives 75% I, b_{11} $153-3.5^\circ$, mol. wt. in freezing C_6H_{12} 191.6–7.5, d^{20}_4 0.9808, d^{20}_{20} 0.9676, d^{20}_4 0.9621, reacts only faintly with fuchsin- SO_2 , NH_3 - Ag_2O and NaHSO_3 ; semicarbazone, m. $184-4.5^\circ$; oxime, m. $108-9^\circ$. With freshly pptd. Ag_2O in alc. at 100° I yields 48.8% of the acid, m. $134-5^\circ$, mol. wt. in freezing C_6H_{12} 214.3–222.1, also obtained from I allowed to stand in the air or, most conveniently, by passing O through I in 96% alc. (77.4% yield); Ca salt, scales with 1 H_2O ; Ag salt, decomps. on evapn. of its solns. Anilide, through the chloride (prepd. with SOCl_2), m. 203° . Amide, m. $188-9^\circ$. From 86 g. cyclohexylcarbinol iodohydrin, 8.5 g. Mg and 35 g. hexahydrobenzaldehyde are obtained cyclohexylcarbinol, b_{14} 83° , 8.1 g. α , β -dicyclohexylethane, b_{11} 136° , mol. wt. in freezing C_6H_{12} 192.2, and 20.6 g. 1,2-dicyclohexylethanol (α , β -dicyclohexylethyl alc.) (II), b_{14} $162-4^\circ$, m. $64-5^\circ$, mol. wt. in freezing C_6H_{12} 213.7. With $\text{K}_2\text{Cr}_2\text{O}_7$ - H_2SO_4 II gives 65–75% of the 1-ethanone (dodecahydrodesoxybenzoin) (III), b_{16} $164-5^\circ$, b_{28} 172.3° , mol. wt. in freezing C_6H_{12} 194.3–198, d^{20}_4 0.9666, d^{20}_{20} 0.9527, d^{20}_4 0.9511; semicarbazone, m. $190-1^\circ$; oxime, m. $112-3^\circ$. Alc. KOH at $145-8^\circ$ decomps. III into cyclohexane and cyclohexylacetic acid. Unlike desoxybenzoin, III cannot be methylated with NaOEt and MeI . When I is treated with cold concd., or hot dil. H_2SO_4 , or with alc. HgCl_2 , it gives III, which is also formed from the semicarbazone of I with hot, moderately concd. H_2SO_4 . C. A. R.

Degradation studies of unsaturated acids of high molecular weight. The degradation of chaulmoogric acid to homohydnocarpylamine. A modified Curtius degradation. C. NÄGELI AND G. STEFANOVITSCH. *Helv. Chim. Acta* 11, 609–56(1928).—A critical review of the many methods which may be employed for the degradation of acids is given and it is pointed out that the method of Lossen (cf. *Ann.* 161, 357(1872)) is not given in the standard reference handbooks; this method (cf. C. A. 21, 3900) is based on the reactions of hydroxamic acids as follows:



Attempts were made to degrade chaulmoogric acid (I) by means of Hoffman's method as employed by Weerman and Rinkes (cf. C. A. 3, 64; 21, 2874), but with little success since it was not certain that a pure urethan was isolated from the reaction mixt.

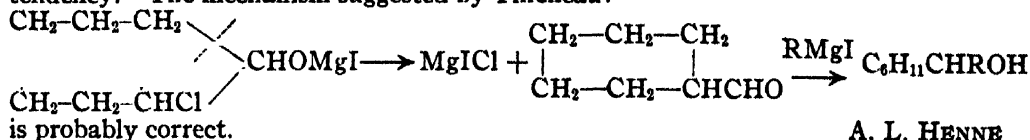
This part of the work will be repeated the starting material is available. The starting material was a com. sample of "Ol. *Gynocardiae*" (cf. Power and Barrow-cliff, *J. Chem. Soc.* 87, 896(1905); *C. A.* 18, 1155), d_4^{20} 0.9521, $m.$ 29–31°, $[\alpha]_D^{17}$ 55.16 (CHCl_3), n_D^{20} 1.4779, acid no. 14.76, sapon. no. 197.2, I no. 98.11, $m.$ p. of fatty acids 42°. The sapon. of 2 kg. of the oil was done in a H_2 atm. by the method of Grün and Schönfeld (cf. *C. A.* 10, 2210) and gave 1900 g. fatty acids having a yellow color when solid, deep red when melted and free from unsaponifiable matter. The moisture-free acids (500 g.) were fractionated at 0.5 mm. from a Claisen flask in a H_2 atm. and gave (a) 180 cc. $m.$ 43–6°, (b) 140 cc. $m.$ 40–1°, (c) 180 cc. $m.$ 46–52°, residue, 50–75 g. (cf. *C. A.* 19, 2980); a and b (640 g.) were united, dissolved in 2 l. of hot 96% EtOH, allowed to stand undisturbed until about 150 g. of acids had sepd. at room temp., and filtered; the operation was repeated with the filtrate until no more acids sepd. (total about 350 g., $m.$ 59–66°); the sepd. acids were redissolved in hot 96% EtOH and the fractional sepn. was repeated, giving pure I (152 g.). The degradation of I to homohydnocarpylamine (II) was accomplished by the method of Curtius; the yields of some of the products were quite low. Chaulmoogryl chloride (III), $\text{C}_4\text{H}_5\text{CH}(\text{CH}_2)_{12}\text{COCl}$, was prepd. by heating equal parts of I and SOCl_2 for 1.5 hrs. at 55°, removing excess SOCl_2 with a stream of dry air in *vacuo* at 60°, treating 3–5 times with CCl_4 and removing the latter each time in *vacuo* at 60°; distn. at 2 mm. gave decompn.; prepn. with I and PCl_3 or PCl_5 gave an impure product. *N,N'*-Dichaulmoogryl hydrazide (IV), $[\text{C}_4\text{H}_5\text{CH}(\text{CH}_2)_{12}\text{CONH}]_2$, was obtained in 86% yield by adding slowly 5 g. III to 2.5 g. $\text{N}_2\text{H}_4\cdot\text{H}_2\text{O}$, warming, washing the ppt. with H_2O and 70% EtOH-Et₂O and recrystg. from EtOH; in a similar manner, 2.5 g. III added to 2.5 g. $\text{N}_2\text{H}_4\cdot\text{H}_2\text{O}$ in 50 cc. cold H_2O gave a 94.8% yield; an emulsion of 5 g. $\text{N}_2\text{H}_4\cdot\text{H}_2\text{O}$ in 120 cc. PhH added to 10 g. III in cold PhH gave a 77.4% yield. When III (20 g.) in 150 cc. abs. Et₂O was added during 3 hrs. with stirring to 10 g. $\text{N}_2\text{H}_4\cdot\text{H}_2\text{O}$ in 300 cc. EtOH at –2°, stirred and kept cold for 2 hrs. more, the EtOH and Et₂O removed in *vacuo*, the residue washed with H_2O , dried, washed with Et₂O and recrystd. from EtOH, it gave 7.8 g. IV and 9.5 g. chaulmoogryl hydrazide (V), $\text{C}_4\text{H}_5\text{CH}(\text{CH}_2)_{12}\text{CONHNH}_2$, which is more sol. than IV and is converted to IV when treated with III in PhH. In a similar manner BzNHNH_2 can be obtained almost quant. from BzCl in Et₂O and $\text{N}_2\text{H}_4\cdot\text{H}_2\text{O}$ in EtOH. A 79% yield of V was obtained when 50 g. Et chaulmoograte (cf. Power and Gornall, *J. Chem. Soc.* 85, 855(1904)) was added slowly during 3 hrs. to 32 g. $\text{N}_2\text{H}_4\cdot\text{H}_2\text{O}$ at 100°, heated 2 hrs. longer at 100° (the EtOH formed in the reaction escapes through a reflux condenser kept hot with steam), then 30 min. at 120°, cooled, the 18 g. of solid residue treated with EtOH and Et₂O to remove the unchanged starting products, which were recovered from soln. and heated 18 hrs. at 140°, giving 26 g. more; the product thus obtained contains an impurity of unknown constitution (VI), $m.$ 132–3°, from which V was sepd. by dissolving in 500 cc. dry CHCl_3 , cooling to 6°, passing dry HCl into the CHCl_3 soln. during 1 hr., filtering and washing the HCl salt of V with cold CHCl_3 and then converting to the base with the calcd. quantity of alc. KOH; V forms colorless crystals, $m.$ 92°, $[\alpha]_D^{22}$ 28.34° (CHCl_3); the HCl salt, $m.$ 115–20°, decomp. 130°; BzCl and V in hot PhH gave *N*-benzoyl-*N'*-chaulmoogryl hydrazide, $\text{C}_4\text{H}_5\text{CH}(\text{CH}_2)_{12}\text{CONHNHBz}$, which was recrystd. from EtOH and $m.$ 114°; benzalchaulmoogryl hydrazide, $\text{C}_4\text{H}_5\text{CH}(\text{CH}_2)_{12}\text{CONHN}:\text{CHPh}$, from BzH and V in EtOH, $m.$ 89.5–91°; *o*-hydroxybenzalchaulmoogryl hydrazide, from $\text{C}_6\text{H}_4(\text{OH})\text{CHO}$ and V, $m.$ 109°. When V was heated to 160° for 5 hrs. it gave quant. VI, C 77.89%, H 12.24%, N 9.11%, mol. wt. 585, $[\alpha]_D^{22}$ 21.54°; no definite conclusion was reached as to the nature of this compd. but it is suggested that it might be 3,5-dihomohydnocarpyl-4-amino-1,2,4-triazole, $\text{C}_{17}\text{H}_{31}\text{C}:\text{N}:\text{N}:\text{C}(\text{C}_{17}\text{H}_{31})\cdot\text{NNH}_2$ (cf. *C. A.* 8, 3042). Chaulmoogryl azide (VII),

$\text{C}_4\text{H}_5\text{CH}(\text{CH}_2)_{12}\text{CON}_3$, was prepd. by slowly adding 5–6 cc. concd. HCl to a cold mixt. of 12.2 g. V in 200 cc. 90% EtOH and 2.6 g. NaNO_2 in a little H_2O , pptg. with 800 cc. ice water, filtering after 0.5 hr., washing with cold H_2O , 0.2% Na_2CO_3 , then H_2O , dissolving in Et₂O and drying over Na_2SO_4 or CaCl_2 ; it is unstable, gradually decompg. with evolution of N_2 , but does not explode on heating or by percussion; VII in dry Et₂O on boiling with abs. EtOH for 1 hr. gave 50% of Et homohydnocarpylcarbamate (VIII), $\text{C}_4\text{H}_5\text{CH}(\text{CH}_2)_{12}\text{CH}_2\text{NHCO}_2\text{Et}$, $m.$ 48.5°, $[\alpha]_D^{22}$ 47.62° (CHCl_3); 50% of sym-homohydnocarpylurea (IX), $[\text{C}_4\text{H}_5\text{CH}(\text{CH}_2)_{12}\text{CH}_2\text{NH}]_2\text{CO}$, $m.$ 113.5°, was obtained when VII in Et₂O was added slowly to a large vol. of boiling H_2O . A 26% yield of II $\text{C}_4\text{H}_5\text{CH}(\text{CH}_2)_{12}\text{CH}_2\text{NH}_2$, was obtained by heating 2 g. VIII and 20 g. 35% HCl in a sealed tube for 8 hrs. at 100°, adding KOH until alk., extg. with Et₂O, drying with KOH and distg. off the Et₂O; 40% was obtained when 10 parts IX and 40 parts $\text{Ca}(\text{OH})_2$ (from

70 parts CaO and 30 of H₂O) were mixed and distd. into HCl, treated with KOH and extd. with Et₂O; it forms a light yellow liquid with a disagreeable odor, decomp. on distn. *in vacuo* and changing in air to the carbamate; the HCl salt, m. 160°; the aq. soln. decomp. on evapn., $[\alpha]_D^{25}$ 54.90° (abs. EtOH); the picrate, m. 112°; the chloroplatinate is slightly sol. in 96% EtOH and insol. in Et₂O or H₂O. When 10 g. NaN₃ (X) (cf. C. A. 2, 3315) was added to 32 g. III in 150 cc. abs. Et₂O, boiled 3 hrs., then 170 cc. abs. EtOH added, the Et₂O removed by distn., boiled 1 hr., 70 cc. EtOH removed by distn., cooled, 500 cc. ice H₂O added, the ppt. filtered, washed with H₂O, recrystd. from 96% EtOH with charcoal, 89–91% VIII and 10–9% IX were obtained; similarly when aq. Et₂O was used the yields were 84–7% and 15–13%, resp.; VIII and IX were sepd. by fractional crystn. from EtOH in which VIII is very sol. and IX is very slightly sol.; IX was also prepd. in 96% yield when 5 g. III in 50 cc. Et₂O and 5 g. X were boiled for 3 hrs. and then treated with H₂O. The yields of the products obtained by inter-action with X depend upon some unknown quality of X and in some cases only traces of VIII and IX were obtained.

N. A. LANGE

Molecular transposition in the cycloheptane series. MARCEL GODCHOT AND GERMAINE CAUQUIL. *Compt. rend.* 186, 955–7 (1928); cf. C. A. 22, 8.—PhMgBr and 2-chlorocycloheptanol yield phenylcyclohexylcarbinol, m. 48–9° (whose phthalate m. 163°, phenylurethan m. 146°), and an ethylenic hydrocarbon, C₁₃H₁₆, b₁₅ 140–1°. The formation, by this reaction, of a ring contg. 1 less C atom thus appears to be the general tendency. The mechanism suggested by Tiffeneau:



A. L. HENNE

Alternating reactive positions in the nucleus of *tert*-butylbenzene. JOHN B. SHOESMITH AND ALEXANDER MACKIE. *Edinburgh Univ. J. Chem. Soc.* 1928, 2334–40.—When a substituent enters the nucleus of PhCMe₃ it does so almost exclusively in the *p*-position; the isolation of the *o*-NO₂ deriv. reported by Senkowski (*Ber.* 23, 2414 (1890)) has been confirmed and a further example of the alternating influence of the CMe₃ group has been found in that, when treated with HI, the isomeric IC₆H₄-CMe₃ only react if the I is in the *o*- or *p*-position. Nitration of PhCMe₃ with HNO₃ of d. 1.52 gave only the *p*-NO₂ deriv., b₁₀ 125–30°; nitration with a mixt. of HNO₃ and H₂SO₄ gives the 2,4-di-NO₂ deriv., m. 61–2°, reduced by NH₄OH and H₂S to 2-nitro-4-amino-*tert*-butylbenzene, yellow, m. 55° (*Ac deriv.*, m. 112°); removal of the NH₂ group gives the *o*-O₂NC₆H₄CMe₃, yellow oil, b₁₀ 114–5°, b₇₆₅ 250.5°; the *o*-NH₂ deriv., b₁₀ 102°; Me₃CC₆H₄N₂HSO₄ is very unstable and appears to decomp. at about –8°; KI gives *o*-iodo-*tert*-butylbenzene, b₁₀ 116–8°; the *m*-I deriv., b₁₀ 106–8°. Heating *p*-O₂NC₆H₄CMe₃, Br and Fe at 90° gives the 2-Br deriv., m. 94.5°; reduction with Fe and concd. HCl gives 2-bromo-4-amino-*tert*-butylbenzene, pale yellow, b₁₁ 153–5° (*HCl salt*, m. 235° (decompn.); *Ac deriv.*, m. 142–3°); elimination of the NH₂ group gives *o*-bromo-*tert*-butylbenzene, b₁₂ 96–8°. The *o*-I or Br deriv. with Mg and then with CO₂ gives *o*-*tert*-butylbenzoic acid, m. 68.5°. The following figures give the % of the *o*- and *p*-IC₆H₄CMe₃ reduced by HI in AcOH at 25°: 2 days, 61, 11; 4 days, 76, 19; 14 days, 86, 35; the *m*-isomer is unchanged. The order of reduction was unchanged even at 100° and 110°.

C. J. WEST

***p*-Cymene studies. XI. *p*-Cymyl-2-carbithioic acid.** ALVIN S. WHEELER AND CHARLES L. THOMAS. *Univ. of North Carolina. J. Am. Chem. Soc.* 50, 3106–9 (1928); cf. C. A. 22, 3147–8.—The Grignard reagent from 2-bromo-*p*-cymene and CS₂ at –10° give *p*-cymyl-2-carbithioic acid, MePrC₆H₄CS₂H, a viscid, red oil, which does not solidify at –15° and when heated at 2 mm. decomp. long before there is any evidence of boiling; the Et₂O solns. range from purple-red (concd.) to orange (dil.); the acid is fairly stable in this soln.; the Zn salt, yellow-ccher, amorphous powder, m. 92°; the Me ester, b₈ 167–8°; Et ester, b₈ 141–2°. Addn. of a metallic salt in dil. AcOH soln. to the Na salt of the above acid in H₂O gives complex salts of the type MePrC₆H₄CS₂-M-OAc: Zn, yellow, m. 196° (decompn.); Cu, red-yellow, m. 75° (decompn.); Hg, yellow, m. above 300°; Cd, m. 125° (decompn.); all are amorphous; the Pb salt is brown, m. 65°; the Ag salt is orange but turns black in 15 min. The acid and Ph-NHNH₂ give a compd., m. 112°, contg. 6.79% N and 16.18% S. PCl₅ gives a compd. b₈ 141°, which gives no typical reaction with NH₃ or PhNH₂.

C. J. WEST

The action of nitric acid on derivatives of ethylene. II. Nitration of some styrene derivatives. J. VAN DER LEE. *Cell. of Tropical Agr., Deventer, (Holland). Rec. trav. chim.* 47, 920–33 (1928); cf. C. A. 21, 399.—Previously the action of abs. HNO₃

on Et nitrocinnamates and nitrocinnamic acid has been investigated and it was shown that the HNO_3 adds to the ethylenic linkage, Et α -nitro- β -hydroxynitrate- β -nitrophenylpropionates being formed from the esters, and ω -dinitrostyrenes from the acids, in the latter case CO_2 being split off from the primary product of the reaction. The present communication deals with the action of abs. HNO_3 on 4,4'- and 3,3'-dinitrodibenzalacetone, 3- and 4-nitrobenzalacetone, 3,3'- and 4,3'-dinitrochalcone, 4,4'-Dinitrodibenzalacetone, prepd. from $p\text{-O}_2\text{NC}_6\text{H}_4\text{CHO}$ and acetone (J. prakt. Chem. [2] 60, 154(1899)) and from $\text{HO}(4\text{-O}_2\text{NC}_6\text{H}_4)\text{CHCH}_2\text{COMe}$ by adding strong potash to the boiling solution of 2 g. of the ketone in 400 cc. boiling water, m. 247° . In the latter case the ketone is partly split into acetone and $p\text{-O}_2\text{NC}_6\text{H}_4\text{CHO}$, which acts upon the starting product with the formation of $(p\text{-O}_2\text{NC}_6\text{H}_4\text{CH:CH})_2\text{CO}$. With abs. HNO_3 this compd. is converted into ω ,4-dinitrostyrene, m. $200\text{--}2^\circ$, CO_2 being evolved. 3,3'-Dinitrodibenzalacetone, m. 237° , was obtained by both the methods described above for the 4,4'-compd., HNO_3 giving ω ,3-dinitrostyrene, m. $122\text{--}3^\circ$. 4-Nitrobenzalacetone (Ber. 16, 1968(1883)) also was converted by means of HNO_3 into ω ,4-dinitrostyrene, and 3-nitrobenzalacetone (Ann. 294, 293(1897)) into ω ,3-dinitrostyrene. 3,3'-Dinitrochalcone was prepd. from $3\text{-O}_2\text{NC}_6\text{H}_4\text{COMe}$ and $m\text{-O}_2\text{NC}_6\text{H}_4\text{CHO}$ in alc. with a small quantity of alkali; with abs. HNO_3 alone or mixed with AcOH or Ac_2O , α ,3,3'-trinitrochalcone (I), $\text{O}_2\text{NC}_6\text{H}_4\text{CH:C}(\text{NO})_2\text{COC}_6\text{H}_4\text{NO}_2$, m. $152.5\text{--}4^\circ$, was obtained. The structure of the reaction product was proved by the action of KOH in MeOH , the soln. thus obtained being treated afterwards with Br water, 1,1'-dibromo-3,1'-dinitro-1'-methoxy-1-ethylbenzene (II), $3\text{-O}_2\text{NC}_6\text{H}_4\text{CH}(\text{OMe})\text{C}(\text{NO}_2)\text{Br}_2$, m. 154° (cf. Ann. 229, 237(1885)) being obtained. On recrystg. I from MeOH or EtOH the alc. adds to the double bond with the formation of β -nitro- γ -methoxy- α -keto- α , γ -di-[3-nitrophenyl]propane (III), m. 128.5° , and the γ -EtO homolog, (IV), m. $120.5\text{--}1^\circ$. The structure of III and IV was proved by the formation of II and V, m. 97° (Ann. 229, 237(1885)) by the action of alkali and Br water. From $4\text{-O}_2\text{NC}_6\text{H}_4\text{CHO}$ and $3\text{-O}_2\text{NC}_6\text{H}_4\text{COMe}$ 4,3'-dinitrochalcone, m. 205.5° , was obtained by the action of dil. alkali on the alc. soln. of the components. With abs. HNO_3 this compd. is converted into α ,4,3'-trinitrochalcone (VI), m. 135° . On recrystn. from MeOH VI was converted into β -nitro- γ -methoxy- α -keto- α -[3-nitrophenyl]- γ -[4-nitrophenyl]propane (VII), m. 122.5° , which with alkali and Br was converted into 1,1'-dibromo-4,1'-dinitro-1'-methoxy-1-ethylbenzene (VIII), m. $159\text{--}60^\circ$ (cf. Ann. 325, 16(1902)), thus proving the constitution of VI.

C. F. VAN DUIN

Intermolecular condensation of styryl ketones. II. Styryl nonyl ketone and the formation of dimerides. ISIDOR M. HEILBRON and FRANCIS IRVING. Univ. of Liverpool. J. Chem. Soc. 1928, 2323-6; cf. C. A. 21, 3611.—Bis[styryl nonyl ketone] (Carette, Compt. rend. 131, 1225(1900)) yields a monoxime, m. $125\text{--}6^\circ$. $p\text{-MeOC}_6\text{H}_4\text{CHO}$ (3.2 g.) and 4 g. Me nonyl ketone(I), refluxed 6 hrs. with 30 cc. 1% EtOH-KOH , give bis-[4-methoxystyryl nonyl ketone], m. 120° . Veratraldehyde (4 g.) and 4 g. I in 10 cc. EtOH and 2 cc. 8% NaOH give, after 12 hrs., 5.5 g. 3,4-dimethoxystyryl nonyl ketone, pale yellow, m. 61° ; if the 2 components are refluxed with 25 g. 1% EtOH-KOH , there results bis-[3,4-dimethoxystyryl nonyl ketone], m. 135° . Piperonal and I with EtOH-KOH give bis-[3,4-methylenedioxy-styryl nonyl ketone], m. 128° . $p\text{-MeC}_6\text{H}_4\text{CHO}$ and I and bis-[4-methylstyryl nonyl ketone], m. $134\text{--}5^\circ$; Scholtz and Meyer (C. A. 4, 2806) describe this compd. as 4-methylstyryl nonyl ketone, m. 129° . Cumin-aldehyde and I in EtOH and NaOH give 4-isopropylstyryl nonyl ketone (II), m. 40° ; the use of 15% NaOH gives the dimeride, m. 150° , described by S. and M. as II, m. 144° . $p\text{-ClC}_6\text{H}_4\text{CHO}$ and I with 8% NaOH give 4-chlorostyryl nonyl ketone, m. $62\text{--}3^\circ$; refluxing with 1% EtOH-KOH gives the dimeride, m. $126\text{--}7^\circ$. The 3-Cl deriv., m. 57° ; the 2-Cl deriv. could not be crystd. and was identified as the semicarbazone, m. $123\text{--}4^\circ$. 2-Hydroxystyryl nonyl ketone, m. 79° . It would appear that dimeric forms are more readily produced when the aldehyde is substituted in the p -position.

C. J. WEST

Chloro- o -xlenols. II. 3-Chloro- o -4-xlenol, the dichloro- o -4-xlenols and 4,5-dichloro- o -3-xlenol. LEONARD E. HINKEL, ERNEST E. AYLING and LILIAN COLLIER BEVAN. Univ. College, Swansea. J. Chem. Soc. 1928, 2529-33; cf. C. A. 18, 384; 22, 3638.—Reduction of 3,4,2-Me₂(PhN₂)₂C₆H₂OH in EtOH with NaHSO_3 gives 3-amino- o -4-xlenol, m. 128° ; through the diazo reaction with CuCl , there results the 3-Cl deriv., m. 27° (Bz deriv., m. 87°). 5-Chloro-3-nitro- o -4-xlenol, by nitrating the Cl deriv., yellow, m. 127.5° ; reduction gives the 3-amino deriv., m. 175° ; through the diazo reaction there results 3,5-dichloro- o -4-xlenol, m. 52° . 6-Chloro-5-benzeneazo- o -4-xlenol, red, m. 143° ; reduction gives 6-chloro-5-amino- o -4-xlenol, m. 144.5° . 5,6-Dichloro- o -4-xlenol, m. 102.5° (Bz deriv., m. 97.5°). 3,6-Dichloro- o -4-xlenol,

m. 84° (*Bz* deriv., m. 124°). 4,5-Dichloro-*o*-3-xylene, m. 90° (*Bz* deriv., m. 133°).

C. J. WEST

Chlorine addition products of toluene. WALTER QVIST. Åbo akademis Institut för Kemisk Teknologi. *Finska Kemistsamfundets Medd.* 37, 45-52(1928).—In the chlorination of PhMe it was found that the HCl liberated was considerably less than the quantity of Cl taken up by the PhMe. Two steam-distn. fractions were removed, 1 with 150 cc. water and the other with 500 cc. The 1st consisted of well-known monochlorotoluenes with pure PhMe. The 2nd fraction was distd. again under a vacuum and on analysis appeared to be a mixt. of tetra- and hexa-Cl compds. with a possible admixt. of a penta-Cl compd. About 47-9% of the Cl was removed by alc. KOH as HCl with the formation of di- and tri-chlorotoluene. Attempts were made to nitrate the di- and tri-Cl compds. in ice with concd. H_2SO_4 and HNO_3 , and analysis showed the presence of trichloronitrotoluene, but no NO_2 compds. of dichlorotoluene were obtained.

HANS C. DUUS

Properties and transformation of *o*-dichloro-4-nitrobenzene. L. McMASTER AND A. C. MAGILL. Washington Univ. *J. Am. Chem. Soc.* 50, 3038-41(1928).—In the nitration of *o*- $C_6H_4Cl_2$ a mixt. of the liquid and solid forms of the 4- NO_2 deriv. (I) is obtained; at 15° the liquid form changes entirely into the solid form, m. 43° ; at 22° about equal quantities of the 2 forms are present. KOH-EtOH and I give mainly 3,3',4,4'-tetrachloroazoxybenzene and small quantities of 3,4- $Cl_2C_6H_3NH_2$ and 2,4- $Cl(O_2N)C_6H_3OH$. With Na alcoholates the corresponding ethers are formed: *Et*, dark brown, m. 142° ; *iso-Pr*, light brown, m. 128° ; *Bu*, brown, m. 136° ; with β - $C_{10}H_7OH$ the diazo solns. from the last 2 compds. give dark red and purple-red dyes, resp.

C. J. WEST

Fluosilicates of some organic bases. C. A. JACOBSON AND H. A. H. PRAY. West Va. Univ. *J. Am. Chem. Soc.* 50, 3055-8(1928).—Fluosilicates of $PhNH_2$, $PhNHMe$, *o*-, *m*- and *p*- $MeC_6H_4NH_2$, consisting of 2 mols. base with 1 of acid have been prepd. The phys. properties of these salts are described and photomicrographs are shown which depict a wholly different cryst. form for each one. The salts crystallize easily from hot EtOH. The $PhNH_2$ salt sublimes unchanged at 230° .

C. J. WEST

Nitration of substituted tertiary aromatic amines. GEO. R. CLEMO AND JAMES M. SMITH. Univ. of Durham, Armstrong College. *J. Chem. Soc.* 1928, 2414-22.—Nitration of 4- $ClC_6H_4NMe_2$ in H_2SO_4 of various concns. gave the following results (the concn. by wt. of the H_2SO_4 and the ratio of 2- to 3- NO_2 compd. in the product are given): 50, 95:5; 70, 85:15; 74.5 to 83.9, 100:0; 86.0, 92:8; 88.3 and 90, an oily product results: 92, 9:91; 93.8 and 98.0, 6:94; 98 (with $CO(NH_2)_2$), 3.5:96.5. $BrC_6H_4NMe_2$ gave the following results: 70, 88:12; 75, 92:8; 79.4, 97:3; 83.9, 92:8; 90, indefinite; 98($CO(NH_2)_2$ present), 4:96. The nature of the *p*-substituent plays an important part in *o*-nitration, since *p*- $MeC_6H_4NMe_2$ gives a good yield of *o*- NO_2 product in dil. H_2SO_4 in the presence of $CO(NH_2)_2$, while nitration in concd. H_2SO_4 gives the *m*- NO_2 deriv. The best explanation of the *o*-nitration is the one which involves the prior addn. of HNO_2 , followed by ionization to give the NH_4^+ ion and the oxidation of the NO to the NO_2 group, which then migrates into an unoccupied *o*-position. The fact that $CO(NH_2)_2$ prevents the reaction when the *p*-substituent is Cl or Br but not when it is Me, CH_2OH , $CH_2C_6H_4NMe_2$ or $C_6H_4NMe_2$ may be ascribed to the more acid character of the 1st 2 bases. 4- $ClC_6H_4NMe_2$ (6.2 g.) in 20 cc. H_2SO_4 , cooled in ice and stirred while a mixt. of 2.9 cc. 66% HNO_3 and 10 cc. 75% H_2SO_4 is run in during 0.5 hr. (temp. $3-5^{\circ}$), the mixt. then allowed to warm to 21° (after 4.5 hrs. a rapid rise to 35° took place), gives 6.5 g. crude 2- NO_2 deriv., m. 56° ; if $CO(NH_2)_2$ is added, 5.8 g. unchanged amine is recovered. 4-Chloro-2-aminodimethylaniline, b₂₅ 158° (*Ac* deriv., m. 90°). Substitution of concd. H_2SO_4 for the 75% H_2SO_4 of the above expt. gives the 3- NO_2 deriv. (7 g.); the same yield of a purer product is obtained in the presence of $CO(NH_2)_2$. The 3-amino deriv., m. 54° (*Ac* deriv., m. 97°). The m. p. curve of the two NO_2 derivs. is given; there is an eutectic at 35° and about 60% of the 2- NO_2 deriv. A similar curve is given for the two NO_2 derivs. of 4- $BrC_6H_4NMe_2$, with an eutectic at about 46° and 67% of the 2- NO_2 deriv. 4-Bromo-2-aminodimethylaniline, b₂₅ 165° (*Ac* deriv., m. 111°). 4-Bromo-3-nitrodimehtylaniline, orange, m. 93.5° . ($Me_2NC_6H_4$)₂CH₂, nitrated in the presence of $CO(NH_2)_2$ in 70% H_2SO_4 , gives the 3,3'-di- NO_2 deriv.; ($C_6H_4NMe_2$)₂ also gives the 3,3'-di- NO_2 deriv. 4,2- $Br(O_2N)C_6H_3NMe_2$ (3 g.) and 52% HNO_3 , first at 10° and then at 35° for 0.5 hr., gives 1 g. of 4-bromo-2,6-dinitrodimehtylaniline, orange, m. 118° . 4- $BrC_6H_4NMe_2$ (1 g.) in 56 cc. 50% H_2SO_4 and 48 cc. H_2O , cooled to 12° and nitrated with 80 cc. 66% HNO_3 and 120 cc. 96% H_2SO_4 , gives 18 g. 4-bromo-2,6-dinitrophenylmethylnitrosoamine, pale yellow, m. 124° ; refluxing with MeOH-HCl for 6 hrs. gives 4-bromo-2,6-dinitromonomethylaniline, orange,

m. 104-5°; heating with fuming HNO_3 10 min. on a water bath gives 4-bromo-2,6-dinitrophenylmethylnitroamine, pale yellow, m. 113-4°; boiling with fuming HNO_3 for 5.5 hrs. gives tetryl. 4- $\text{BrC}_6\text{H}_4\text{NMe}_2$ with 66% HNO_3 and contd. H_2SO_4 gives 4,3,6- $\text{Br}(\text{O}_2\text{N})_2\text{C}_6\text{H}_2\text{NMe}_2$.
C. J. WEST

The oxidation of several tertiary hydrazines. M. GIUA. *Atti accad. sci. Torino* 63, 259-64(1928).—The action of HgO , N_2O_4 and PbO_2 on 2 tertiary hydrazines has been studied. Five g. of 5,2,4- $\text{Me}(\text{O}_2\text{N})_2\text{C}_6\text{H}_2\text{NNMePh}$ (I) in CHCl_3 is boiled with 15 g. HgO for 15 min. The resultant filtrate, a dark red liquid, is treated with petroleum ether and the ppt. recrystd. from EtOH , m. 117-8°; analysis shows it to be 5,2,4- $\text{Me}(\text{O}_2\text{N})_2\text{C}_6\text{H}_2\text{N}_2\text{Ph}$. When treated with N_2O_4 in Et_2O , I gives the same azo compd. as above. The 2,6-dinitro isomer (II) of I with HgO gives a corresponding 5,2,6- $\text{Me}(\text{O}_2\text{N})_2\text{C}_6\text{H}_2\text{N}_2\text{Ph}$, m. 147°, the same product also resulting by the action of N_2O_4 . When II is boiled in CHCl_3 with PbO_2 and the product recrystd. from EtOH the same product is again obtained. Similarly 5,2,4- $\text{Cl}(\text{O}_2\text{N})_2\text{C}_6\text{H}_2\text{NNMePh}$ gives with PbO_2 the corresponding 5,2,4- $\text{Cl}(\text{O}_2\text{N})_2\text{C}_6\text{H}_2\text{N}_2\text{Ph}$, recrystallizable from EtOH , m. 149-50°.
A. W. CONTIERI

The isomers of *p*-hydroxyphenylarsonic acid. GASTON GILTA. Univ. Brussels. *Bull. soc. chim. Belg.* 37, 253-62(1928).—A complete crystallographic examn. of *p*-hydroxyphenylarsonic acid crystals shows that 2 different isomers are obtainable: one is obtained by diazotization of *p*-arsanilic acid, the other by an arsenical fusion of phenol. The formulas proposed are: *p*- $\text{HOC}_6\text{H}_4\text{AsO}_3\text{H}_2$ and $\text{O}:\text{C}_6\text{H}_4:\text{As}(\text{OH})_3$. The crystallographic consts. are recorded, together with those of (*p*- HOC_6H_4) $_2\text{AsO}_2\text{H}$, obtained as by-product. The nitration with HNO_3 (d. 1.4) of the 2 isomers gives 2 forms of 3-nitro-4-hydroxyphenylarsonic acid, differing only crystallographically; no di- NO_2 compd. is obtained. The nitration with HNO_3 (d. 1.5) of either isomer gives only one form of 3,5-dinitro-4-hydroxyphenylarsonic acid.
A. L. KENNE

Attempt to prepare optically active derivatives of quadrivalent tin. FREDERIC B. KIPPING. Univ. of Cambridge. *J. Chem. Soc.* 1928, 2365-72.—As a preliminary to a study of optically active derivs. of Sn, mixed Sn aryls were prepd. and the action of I studied in order to det. the order in which the various groups must be introduced into the mol. so that the desired iodides may be obtained. The ease with which the various groups are removed by I from a mol. contg. 2 or 3 different radicals decreases in the order: *o*- $\text{C}_6\text{H}_4\text{Me}$, *p*- $\text{C}_6\text{H}_4\text{Me}$, Ph, PhCH_2 . (PhCH_2) $_3\text{SnCl}$ and PhMgBr give phenyltribenzylstannane, b_p 290°, does not solidify at 0°; boiling concd. HCl gives C_6H_5 and (PhCH_2) $_2\text{SnCl}$. Tribenzylstannic iodide, from the hydroxide and dil. HI , m. 102-3°; this was also obtained from (PhCH_2) $_3\text{SnPh}$ and I in CCl_4 . Treatment of (PhCH_2) $_3\text{SnCl}$ with 2 mols. I gives (PhCH_2) $_2\text{SnI}$. Triphenylbenzylstannane, b_p 250°, m. 90°; treatment with I in CHCl_3 gives an oil, which could not be crystd.; further treatment with NH_4OH and then with dil. HCl gives phenylbenzylstannic chloride, m. 83-4°, also obtained from $\text{Ph}_2\text{SnCH}_2\text{Ph}$ and concd. HCl . (PhCH_2) $_3$ (*p*- MeC_6H_4)Sn does not solidify at 0°; I gives (PhCH_2) $_2\text{SnI}$; HCl gives (PhCH_2) $_2\text{SnCl}$. Triphenyl-*o*-tolylstannane, m. 165°; I or HCl splits off the *o*- $\text{C}_6\text{H}_4\text{Me}$ group. (*p*- MeC_6H_4) $_2\text{Sn}$ and I in CHCl_3 give (*p*- MeC_6H_4) $_2\text{SnI}$. Tri-*p*-tolyl-*o*-tolylstannane, m. 168°; I splits off the *o*- $\text{C}_6\text{H}_4\text{Me}$ group. Tri-*m*-tolylstannic chloride, m. 108-9°, from the tetra deriv. and I, followed by NH_4OH and HCl . Tri-*m*-tolyl-*p*-tolylstannane, m. 103°; I gives a mixt. of products which could not be purified. Phenyl-di-*p*-tolylbenzylstannane, from PhSnCH_2Ph and *p*- $\text{MeC}_6\text{H}_4\text{MgBr}$, b_p 265-70°; HCl splits off both *p*- MeC_6H_4 groups; I in CHCl_3 gives the oily $\text{Ph}(\text{p}-\text{MeC}_6\text{H}_4)\text{PhCH}_2\text{SnI}$, whose hydroxide m. 136-7°; attempts at resolution gave only oily or amorphous compds. (*d*-camphorsulfonate, *d*-tartrate). Triphenylbutylstannane, b_p 222°, m. 61-2°; boiling HCl gives phenylbutylstannic chloride, m. 50°. Diphenylbenzylbutylstannane, b_p 215°; I in CHCl_3 , followed by NH_4OH , gives phenylbenzylbutylstannic hydroxide, m. 135-7°; fluoride, m. 218°; again the attempts to obtain optically active derivs. resulted in oily or amorphous substances. Dibenzylethylbutylstannane, b_p 195-200°.
C. J. WEST

Organic bismuth derivatives. FR. FABRYKANT. *Bull. pharm. Inst. Poland*, No. 2, 1-15(1927); cf. *C. A.* 20, 4063, 1984; 21, 2466.—In the search after pharmacol. active compds. the synthesis of trithymylbismuthine and ω -tristyrilbismuthine, $(\text{PhCH}:\text{CH})_3\text{Bi}$, was tried by the Grignard and Marquardt-Michaelis method according to the scheme: $\text{PhCH}:\text{CHCO}_2\text{H} \rightarrow \text{PhCHBrCHBrCO}_2\text{H} \rightarrow \text{PhCH}:\text{CHBr} \rightarrow \text{PhCH}:\text{CHMgBr} \rightarrow (\text{PhCH}:\text{CH})_3\text{Bi}$. ($\text{PhCH}:\text{CH})_3\text{Bi}$ was obtained but in a quantity which did not allow the measurement of phys. consts.
JAROSLAV KUČERA

Unsymmetrical arseno-compounds derived from *p*-arsonophenylaminoethanol and *p*-arsonophenylglycine amide. CHARLES S. PALMER AND ERNEST B. KESTER. North-

western Univ. *J. Am. Chem. Soc.* **50**, 3169–19 (1928).—A series of alkali-sol. unsym. arseno compds. has been prepd. by simultaneous reduction of equimol. proportions of $p\text{-H}_2\text{O}_2\text{AsC}_6\text{H}_4\text{NHCH}_2\text{CONH}_2$ and an arsonic acid contg. a solubilizing group or in which solubilizing groups can be easily substituted. A soln. of 0.02 mol. each of $p\text{-H}_2\text{O}_2\text{AsC}_6\text{H}_4\text{NHCH}_2\text{CH}_2\text{OH}$ (I) and $p\text{-H}_2\text{O}_2\text{AsC}_6\text{H}_4\text{NH}_2$ in 30 cc. H_2O and 10 cc. of 12 N HCl was treated with 0.5 mol. of 50% H_3PO_2 and kept below 15° for 3 days; addn. of 100 cc. cold N HCl ppts. 78% of 4-amino-4'- β -hydroxyethylaminoarsenobenzene-di- HCl , which turns red and gum-like in H_2O but on addn. of a little HCl dissolves readily. The N -methylenesulfoxylic acid results from the di- HCl and NaHSO_3 . I and $\text{H}_2\text{O}_2\text{-AsC}_6\text{H}_4\text{OH}$ give 60% of 4-hydroxy-4'- β -hydroxyethylaminoarsenobenzene- HCl , sparingly sol. in dil. HCl ; the free base is pptd. from alk. soln. by CO_2 . 3-Amino-4-hydroxy-4'- β -hydroxyethylaminoarsenobenzene-di- HCl (53% yield), readily sol. in H_2O or dil. alkali; the N -methylenesulfoxylic acid is formed quant. 4- β -Hydroxyethylaminoarsenobenzene-4'- N -glycine; di- HCl salt, yellow, sol. in NaHCO_3 . 4- β -Hydroxyethylaminoarsenobenzene-4'-oxyacetic acid, yellow, results in 92% yield by first reducing I and then adding $p\text{-H}_2\text{O}_2\text{AsC}_6\text{H}_4\text{OCH}_2\text{CO}_2\text{H}$ and further H_3PO_2 . Reduction of a mixt. of $p\text{-H}_2\text{O}_2\text{AsC}_6\text{H}_4\text{NHCH}_2\text{CONH}_2$ and $p\text{-H}_2\text{O}_2\text{AsC}_6\text{H}_4\text{NH}_2$ by SnCl_2 gives 86% of 4-aminoarsenobenzene-4'- N -glycine amide-di- HCl , not appreciably sol. in H_2O and difficultly sol. in warm dil. HCl , which seems to promote decompn. Reduction of the mixt. with NaHSO_3 gives the corresponding N -dimethylenesulfoxylic acid, yellow (18% yield). 4-Hydroxyarsenobenzene-4'- N -glycine amide- HCl , contains 1 H_2O (67% yield); the free base was also prepd. 3-Amino-4-hydroxyarsenobenzene-4'-glycine amide and di- HCl salt (73% yield); the N -methylenesulfoxylic acid was also prepd. Arsenobenzene-4- N -glycine-4'- N -glycine amide-di- HCl , bright yellow (48% yield), sol. in NaHCO_3 . Tetraarsenobenzene-4- N -glycine-4'- N -glycine amide. Arsenobenzene-4-glycine amide-4'-oxyacetic acid, 67% yield. 4-Hydroxyarsenobenzene-4'-glycine- HCl , sepg. with 1 H_2O (56% yield); 3-amino-4-hydroxyarsenobenzene-4'-oxyacetic acid, 73% yield. 3,4'-Diamino-4-hydroxyarsenobenzene-di- HCl and 4-amino-4'-hydroxyarsenobenzene- HCl were also prepd.

C. J. WEST

Certain aryl arsenoxides and the corresponding dichloro- and diiodo-arsines. GEORGE NEWBERY AND MONTAGUE A. PHILLIPS. May and Baker, Ltd., Wandsworth, Eng. *J. Chem. Soc.* 1928, 2375–81.—5,2-AcNH(HO) $\text{C}_6\text{H}_3\text{AsO}_3\text{H}_2$ (C. A. 22, 1337), nitrated in H_2SO_4 at $10\text{--}20^\circ$, gives 80% of 3-nitro-5-acetamido-2-hydroxyphenylarsonic acid, yellow prisms, giving red solns. in alkalis. Reduction of the corresponding NO_2 derivs. gives 60% of the 3-amino-5-acetamido-4- and -2-hydroxyphenylarsonic acids, the former of which is readily sol. in dil. mineral acids and in alkalis, while the latter is sol. only in excess of dil. mineral acids. The 3,5-di-Ac deriv. of the 2-HO acid forms needles, readily sol. in alkali; boiling with 5 parts 15% HCl gives 2,4-(H_2N) $_2\text{-C}_6\text{H}_3\text{OH}$. 3-Amino-5-acetamido-4-hydroxyphenyldichloroarsine- HCl (I), prepd. by SO_2 reduction of the arsonic acid in HCl at room temp., prisms, sol. in dil. alkali; stirring a suspension of 5 g. in 30 cc. H_2O for 30 min. and crystg. the amorphous solid by adding concd. HCl to the NaOH soln., gives the arsenoxide- HCl , prisms, sol. in H_2O after a few secs.' shaking and readily sol. in dil. alkali. The amorphous oxide with HI (d. 1.7) gives the diiodoarsine- HI , prisms, which gives with H_2O the arsenoxide- HI , prisms. Boiling 30 g. I with 120 cc. 5 N HCl and H_2O gives 50% of 3,5-diamino-4-hydroxyphenyldichloroarsine-2 HCl (II), plates, readily sol. in H_2O ; HI transforms this into the diiodoarsine-2 HI , yellow prisms. 3-Amino-5-acetamido-2-hydroxyphenyldiiodoarsine- HI , yellow; the yellow aq. soln. slowly deposits the arsenoxide- HI , prisms. 3,5-Diacetamido-4-hydroxyphenylarsinous acid results by hydrolysis of the dichloroarsine and by acetylation of I or II, plates or needles, sol. in aq. NaOH , Na_2CO_3 or dil. NH_4OH ; it does not lose H_2O at 100° . 3,5-Diacetamido-2-hydroxyphenylarsenoxide, amorphous. 3-Amino-4-hydroxyphenyldiiodoarsine- HI , yellow prisms; about 33% of the I attached to the As atom is removed by hot 8 N HNO_3 ; 25 g. of this compd. in 80 cc. H_2O , treated with 37.5 cc. Ac_2O , gives 3-acetamido-4-hydroxyphenylarsenoxide, prisms, contg. 4 mols. H_2O lost at 100° ; the oxide is sol. in excess of caustic alkalis and in a large excess of NH_4OH . 5-Amino-2-hydroxyphenyldichloroarsine- HCl , prisms, sol. in 4 parts H_2O ; the aq. soln. deposits the arsenoxide- HCl , prisms, which, with HI , gives the diiodoarsine- HI , yellow prisms, giving with H_2O the arsenoxide- HI , prisms. 5-Acetamido-2-hydroxyphenylarsenoxide, anhyd. prisms. 3-Acetamido-4-hydroxyphenyldichloroarsine, needles; the 2-HO deriv., needles, is slowly hydrolyzed to the arsenoxide. 3-Nitro-4-hydroxy-5-aminophenyldiiodoarsine- HI , yellow prisms, giving a yellow soln. in H_2O and red in alkalis; acetylation gives 3-nitro-4-hydroxy-5-acetamidophenylarsenoxide, amorphous, giving deep red solns. in caustic alkalis. 3-Acetamido-4-hydroxyphenylmethoxychloroarsine, in 70% yield from the corresponding arsenoxide

and MeOH-HCl, prisms; the 2-HO deriv. is similarly prepd.; both are readily converted by warm H₂O to the corresponding arsenoxide. 3-Acetamido-4-hydroxyphenylarsine, plates, sol. in excess caustic alkalis, by reduction of the diarseno deriv. with Zn and concd. HCl (90% yield). 5-Acetamido-2-hydroxyphenylarsine, plates; both compds. are readily oxidized by air to the corresponding arseno deriv. C. J. W.

Organic arsenic compounds. XIII. *cycl*-Pentapropylpentaarsine and the thermal decomposition of arseno compounds. WILHELM STEINKOPF* AND HERMANN DUDEK. Techn. Hochschule Dresden. Ber. 61B, 1906-11(1928); cf. C. A. 22, 2373.—It has been shown that, contrary to Auger's statement, the so-called arsenomethane has the mol. formula (MeAs)₅ and it was accordingly formulated as *cycl*-pentamethylpentaarsine (I). I readily polymerizes to a red solid, a property which the Et homolog shows less markedly and it was therefore expected that higher homologs would be still less polymerizable. *cycl*-Pentapropylpentaarsine (II) was accordingly synthesized by prepg. PrAsO₃H₂ according to Quick and Adams and, without isolating the acid, pptg. it as the Mg salt and reducing it directly with NaH₂PO₂; there seps. a viscous yellow oil having the same oxidizability and solubilities as I but, unlike I, showing no tendency to polymerization in the presence of HCl. In a high vacuum it b. 177-9° almost without decompn., but that there is some decompn. is shown by the fact that the distillate, unlike the crude product, shows an oxidizability by atm. air unusual for arseno compds. The impurity (about 5%) is propylcacodyl (III). The mol. wt. of II in freezing PhNO₂ is 563.1-584.1; calcd. for a mixt. with 5% of the cacodyl, 573.5. The formulation as *cycl*-pentaalkylpentaarsines therefore seems to be general for the aliphatic arseno compds. This cannot be tested exptly. on still higher homologs as they cannot be purified by distn. because their decompn. ps. lie below their b. ps. even in a high vacuum. On distn. in a H₂O vacuum the crude II yields metallic As and III, b₁₃ 165-7°, identified by its conversion with I and MeI into dimethyldipropylarsonium triiodide (IV). II therefore decompn. according to the scheme 4II → 5III + 10As, and as its b. p. in a H₂O vacuum must be about 250° the decompn. must already occur at this temp. I at 270° under atm. pressure likewise decompn. into As and cacodyl, b. 155-64°. Finally, arsenobenzene undergoes the same decompn. into As and phenylcacodyl when slowly heated above its m. p. up to 255°. No attempt was made to isolate the cacodyl, but the resulting dark cake, which oxidizes in the air with evolution of heat, was dissolved in dil. HNO₃ and the As detd. with magnesia mixt. as H₃AsO₄; the filtrate on acidification yielded Ph₂AsO₂H. The equation 3(PhAs)₂ = 2Ph₃As + 4As given by Michaelis and Schäfer must therefore be corrected; the tertiary arsine is formed only secondarily from the cacodyl. XIV. Firmness of attachment of hydrocarbon residues to arsenic. WILHELM STEINKOPF, HERMANN DUDEK AND SIEGFRIED SCHMIDT. Ibid 1911-8.—It was found in a series of earlier investigations that tertiary arsines form with BrCN solid addn. products which, unlike those of tertiary amines, decomp. only at high temps. into alkyl bromides and secondary arsine cyanides. From the relative ease with which this decompn. occurs it was found that Me is less firmly attached to As than Et, Pr and Ph, Et less than iso-Bu and Ph, and Et and Pr about equally firmly. The iso-Am and cyclohexyl groups have now been studied; the former is held with about the same firmness as Me, the latter more firmly than Me or Pr and less than Ph. Methyl-diisoamylarsine (116 g. from 250 g. iso-AmCl and 57 g. Mg in Et₂O with 125 g. MeAsCl₂), b₁₁ 95-9°. With Cl in petroleum ether 93 g. gave an oily dichloride, which on distn. in CO₂ began to decomp. 186°; it was finally heated to 210°, giving 24.5 g. iso-AmCl, while from the residue were isolated methylisoamylchloroarsine, b₁₁ 68-72°, and 24 g. of diisoamylchloroarsine, b₁₁ 114-22° (the supposed 6(C₆H₁₁)₂AsCl[(C₆H₁₁)₂As]₂O, b₁₃ 148°, of Dehn and Wilcox (Am. Chem. J. 35, 49(1906)), was probably the above (iso-Am)₂AsCl contaminated with (C₆H₁₁)₃As. Tricyclohexylarsine (45 g. from 118.5 g. C₆H₁₁Cl and Mg with 35 g. AsCl₃), b₁₁ 208-15°, solidifies 41-0°. When it is satd. in CCl₄ with Cl and the cryst. perchloride is heated in vacuo it gives 70% dicyclohexylchloroarsine, b₁₀ 168-71°, converted by 10% Na₂CO₃ into the oxide, faintly yellowish, very viscous mass. Cyclohexyldichloroarsine (12 g. from 21 g. of the (C₆H₁₁)₂AsCl with Cl in petroleum ether), b₁₃ 122-5°. (C₆H₁₁)₂AsPh is obtained in 93% yield from C₆H₁₁MgCl and PhAsCl₂; with Cl in petroleum ether it gives 73% cyclohexylphenylchloroarsine, b₁₃ 183-4°; oxide, viscous, faintly yellowish oil, cannot be distd. without decompn. even in a high vacuum. Cyclohexylphenylarsine cyanide (4 g. from 10 g. Me(C₆H₁₁)AsPh and BrCN in petroleum ether at -20° and subsequent heating to 150°, or 14 g. from 22 g. Ph(C₆H₁₁)AsCl and KCN in H₂O at 60°), b₂ 156.5°, b₁ 190-2°; the intermediate bromocyanide, allowed to stand in moist ether in the air, gives methylcyclohexylphenylarsine oxybromide, thick oil (picrate, yellow, m. 132.5-3°). Propyldijodoarsine (55% from 145 g. PrAsO₃Mg and KI in HCl with SO₃), red-yellow oil,

b_{11} 136–7°, has a fainter odor than the lower homologs but is strongly irritating; oxide, faintly yellowish, b_{11} 142–5°, does not solidify at -20° . *Dipropylidoarsine* (63.4 g. from 187 g. PrAsI_2 and 75 g. PrBr in NaOH), $b_{12.5}$ 103.5–6°, yellow oil, very irritating to the mucous membranes. *Dipropylcyclohexylarsine* (60% from $\text{C}_6\text{H}_{11}\text{MgCl}$ and Pr_2AsI), b_{11} 126.5–9.5°. *Propylcyclohexylarsine cyanide* (3.9 g. from 8 g. $\text{Pr}_2\text{AsC}_6\text{H}_{11}$ and BrCN at 20° , with subsequent heating to 150°), b_1 108.5–10°. *Dipropylcyclohexylarsine oxybromide*, m. 64–7°. *Propylcyclohexylchloroarsine* (2.2 g. from 8 g. $\text{Pr}_2\text{AsC}_6\text{H}_{11}$ and Cl in petroleum ether), b_{16} 131–2°; the intermediate *dipropylcyclohexylarsine dichloride*, m. about 40° and decmps. only at a bath temp. of about 200° .

C. A. R.

Influence of solvents on the rotation of optically active compounds. XXV. Bornyl benzene- and naphthalenesulfonates in various solvents. THOMAS S. PATTERSON AND IRENE MARY MCALPINE. Univ. of Glasgow. *J. Chem. Soc.* 1928, 2472–4; cf. *C. A.* 21, 1642.—The sp. rotations of *l*-bornyl naphthalene- β -(I) and α -sulfonates (II) and of the benzenesulfonate (III) are given for λ 5790, 5461 and 4358 in EtOH , C_6H_6 , $\text{C}_6\text{H}_5\text{N}$, $\text{C}_2\text{H}_5\text{Br}_2$, PhNO_2 and quinoline. The rotations vary considerably in each case with change of solvent. * I has the lowest rotation values except for the soln. in $\text{C}_2\text{H}_5\text{Br}_2$, which overlaps some of the values for other esters. The rotations of the other 2 esters in the different solvents overlap each other completely, the range of variation being greater, however, with II than with III. The different solvents do not influence the rotations in the same way, although there are resemblances. Quinoline produces the highest rotation in II and in III and the 2nd highest in I. In $\text{C}_2\text{H}_5\text{Br}_2$, I shows the highest rotation and II and III the 2nd highest. PhNO_2 produces the lowest rotation in I and III and the 2nd lowest in II. The dispersion coeffs. for these compds. are practically the same.

C. J. WEST

Mobility of symmetrical triad(prototropic) systems. III. Three-carbon prototropy in an α,γ -diphenylallyl ether. CHARLES WM. SHOPPEE. Univ. of Leeds. *J. Chem. Soc.* 1928, 2567–71.— $\text{PhCH}(\text{OH})\text{CH}:\text{CHPh}$ (15 g.) in glacial AcOH , treated with 75 g. of 30% HBr-AcOH and stirred 2 hrs., gives 13 g. *bis- α,γ -diphenylallyl ether*, m. 98–9°; *tetra-Br deriv.*, pale yellow oil. With O_3 the ether yields BzH and BzOH . Refluxing the ether with EtONa for 2 hrs. gives *bis- α,γ -diphenylpropenyl ether*, yellow oil, decomp. on distn. *in vacuo*; Br in CHCl_3 gives a *di-Br deriv.*, which quickly decolorizes KMnO_4 ; the structure of the ether was confirmed by the action of O_3 , $\text{PhCH}_2\text{-CHO}$ and BzOH being formed. The position of equil. in hot EtOH-EtONa favors the 2nd ether very largely and it thus appears that the combined electronic affinities

(inductive effect) represented in $\begin{array}{c} \text{Ph} \\ \diagup \\ \text{C(H)C:C} \\ \diagdown \\ \text{RO} \end{array}$ are sufficient to produce (under

the catalytic conditions mentioned) tautomeric mobility in a 3-C system which is of a particularly simple type, since it is not implicated in a "developed" keto-enol complex. *Ph β -phenylethyl ketone semicarbazone*, m. 144° .

C. J. WEST

Reduction of hydroxyazo compounds to aminophenols by means of phenylhydrazine. II. 5-Aminosaligenin and its oxidation by means of phenylhydrazine. GRUSEPPE ODDO AND ANTONINO GIACALONE. R. Univ. Palermo. *Gazz. chim. ital.* 58, 290–7(1928).—In all previous work on the reduction of hydroxyazo compds. to aminophenols (cf. *Gazz. chim. ital.* 35, ii, 598(1905); 36, ii, 87, 305(1906); Puxeddu, *C. A.* 2, 1444; 10, 2882); the reaction is so energetic that the aminophenols are formed immediately. In the present work, attempts were made to control the reactions with the object of isolating intermediate products. A new method for the prepn. of benzeneazosaligenin (I) (cf. *Ann.* 251, 184) is described; PhN_2Cl (from 4.65 g. PhNH_2 , 3.45 g. NaNO_2 and 5 g. of 36% HCl) is added with agitation to ice-cold saligenin (5.4 g.) and the mixt. acidified with dil. HCl , which ppts. a good yield. It m. 145° , and gives a brown-red color in concd. H_2SO_4 , a red resinous powder being pptd. when this soln. is poured in water. I refluxed 10 hrs. with excess Ac_2O and a little NaOAc , cooled, poured into water, the pptd. oil neutralized with soda, let stand overnight, and the cryst. mass recrystd. from ligroin, yields the *di-Ac deriv.* (II) of I, orange-yellow, m. 54° . I (1 g.) in $\text{C}_6\text{H}_5\text{N}$ let stand 6 hrs. with AcCl (0.7 g.), poured into dil. H_2SO_4 , the pptd. oil made alk. with NaOH , let stand, and the cryst. mass recrystd. from ligroin, yields II. Cold I in $\text{C}_6\text{H}_5\text{N}$ let stand 8–10 hrs. with BzCl , poured into dil. H_2SO_4 , neutralized with soda, let stand 24 hrs. and the mass recrystd. from ligroin, yields the *di-Bz deriv.* (III) of I, orange-red, m. 120° . III (0.5 g.) let stand 2 days with cold alc. KOH , dild. with water, filtered, a current of CO_2 passed through the filtrate, the mixt. let stand overnight and the cryst. mass recrystd. from C_6H_6 , yields I. I (1 g.) heated slowly up to $140\text{--}5^\circ$ with PhHNNH_2 (1.5 g.), a little

C_6H_6 added while the mixt. is still warm, filtered and washed with C_6H_6 , yields 0.25–0.30 g. of *aminosaligenin* 2,5- $HO(H_2N)C_6H_3CH_2OH$ (IV), grayish white, m. 139° , dissolves in acids and alkalis, in the latter case the solns. turning brown on exposure to air, can be diazotized. IV (1 g.) in C_6H_5N (6 g.) let stand 20 hrs. with $BzCl$ (3 g.), poured into dil. H_2SO_4 , filtered and the residue recrystd. repeatedly from $CHCl_3$ or $EtOH$, yields the *tri-Bz deriv.* of IV, $BzC_6H_4(OBz)CH_2OBz$, m. 187° . When let stand overnight, the C_6H_6 mother and wash liquors from the prepn. of IV deposit a product which, boiled with water and recrystd. from C_6H_6 , yields 0.1–0.15 g. of 5-aminosalicylic aldehyde phenylhydrazone, 2,5- $HO(H_2N)C_6H_3CH:NNHPh$ (VI), light yellow, m. 165° . Its compn. was established by various phys. and chem. properties (cf. Puxeddu, *C. A.* 10, 2882). PhN_2Cl (from 4.7 g. $\bullet PhNH_2$, 3.5 g. $NaNO_2$ and concd. HCl) added slowly to ice-cold $o-HOC_6H_4CHO$ (6.1 g.) in water (300 cc.) contg. $NaOH$ (6 g.), added to water (1 l.), let stand, acidified with dil. HCl , filtered, the mother liquor let stand overnight and the ppt. recrystd. from dil. $EtOH$, yields benzeneazosalicylic aldehyde (VI), m. 128° (cf. *Ann.* 251, 182; *Ber.* 33, 1325(1900); \bullet Puxeddu, *C. A.* 10, 2882). VI (1 g.) heated with $PhHNNH_2$ (3 g.), an equal vol. of C_6H_6 added to the oil which is formed, let stand, filtered, the residue washed with C_6H_6 and recrystd. from hot C_6H_6 , yields V. $BzCl$ (3.5 g.) added to VI (1 g.) in C_6H_5N , let stand 8 hrs., poured into dil. H_2SO_4 , and after the oil is crystd., the cryst. mass purified with $CHCl_3$, yields the *Bz deriv.* of VI, $C_{24}H_{23}O_4N_3$, m. 265° . The expts. show that by the action of $PhHNNH_2$ on I, IV and VI are formed. A study of various conditions shows that by limiting the proportion of $PhHNNH_2$ and making the reaction proceed rapidly up to $140-50^\circ$, the formation of VI is favored, while by increasing the proportion of $PhHNNH_2$ and maintaining the temp. below 100° , IV is obtained almost exclusively. The best conditions for obtaining IV are to heat I (1 g.) with $PhHNNH_2$ (2 g.) slowly, keeping the temp. below 100° . Since the reaction of I and $PhHNNH_2$ is so rapid and energetic, and N is evolved, atm. O plays no part. The oxidation is attributed to the $PhHNNH_2$, which acts simultaneously as an oxidizing agent and reducing agent, the $-N:N-$ group being reduced and the CH_2OH oxidized.

C. C. DAVIS

Oxidation of alcohols by means of phenylhydrazine. GIUSEPPE ODDO AND ANTONINO GIACALONE. Reale Univ. Palermo. *Gazz. chim. ital.* 58, 298–300(1928) — In previous expts. (cf. preceding abstr.) an instance is shown where $PhHNNH_2$ is an oxidizing agent. Aside from this, only one other case is known, viz., the formation of osazones from monosaccharides (cf. *Ber.* 17, 519(1884); 20, 82(1887); 23, 2117(1890)). In the present paper it is shown that $PhHNNH_2$ oxidizes other aromatic alcs., forming the phenylhydrazone of the corresponding aldehydes. 2,5- $HO(H_2N)-C_6H_3CH_2OH$ (0.5 g.) heated up to 150° with $PhHNNH_2$ (0.7 g.), C_6H_6 added while still hot, the C_6H_6 layer decanted from uncombined 2,5- $HO(H_2N)C_6H_3CH_2OH$, let stand overnight, the cryst. mass washed with cold C_6H_6 , purified with boiling water and recrystd. from hot C_6H_6 , yields 2,5- $HO(H_2N)C_6H_3CH:NNHPh$. $o-HOC_6H_4CH_2OH$ (0.5 g.), heated 5–10 min. at 160° with $PhHNNH_2$ (1 g.), cooled, and the cryst. mass recrystd. several times from dil. $EtOH$, yields $o-HOC_6H_4CH:NNHPh$, m. 142° . With $PhCH_2OH$ the reaction is much slower. $PhCH_2OH$ (1 g.) heated 1 hr. at $180-90^\circ$ with $PhHNNH_2$ (1 g.) and dil. $EtOH$ added, gives only a trace of ppt. Heated at $180-90^\circ$ for 3 hrs. and let stand overnight and dil. $EtOH$ added, it yields 0.15 g. of $PhCH:NNHPh$, m. 155° . $PhCH:CHCH_2OH$ (1 g.) heated 15–20 min. at $180-200^\circ$ with $PhHNNH_2$ (1.6 g.), let stand overnight at room temp., dil. $EtOH$ added and the cryst. mass recrystd. from ligroin, gives a very small yield of $PhCH:CHCH:NNHPh$, m. $167-8^\circ$. Longer heating does not increase the yield; in fact heating for 2–3 hrs. gives almost no yield. The best yields were therefore obtained with HO alcs., and the very low yield from $PhCH:CHCH_2OH$ perhaps depends upon the presence of the double bond in the lateral chain.

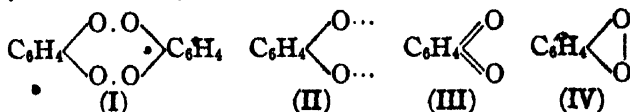
C. C. DAVIS

Equilibrium in the binary systems: cresols-amines. NIKOLAI ANTONOVITCH PUSHIN AND LJUBEVIT SLADOVIĆ. Univ. of Zagreb. *J. Chem. Soc.* 1928, 2474–83. — The following data are given for each mixt. studied: the temp. of complete melting of the crystd. mixt.; the complete cooling curve; the duration of the eutectic crystn. $o-MeC_6H_4OH$ (I)- $PhNMe_2$ (II) forms an equimol. compd. m. -6° ; the 2 eutectics correspond to 40 mols. % II (at -9°) and 70% II (at -14°). $p-MeC_6H_4OH$ (III)-II gives 1 eutectic at 50 mols. % and -35° . $I-p-MeC_6H_4NH_2$ (IV) and II-IV each form equimol. compds. m. 38° and 20.5° , resp.; in the 1st system the eutectics are at 22 and 72 mols. % of IV and 14° and 25.6° and in the other system at 32 and 65 mols. % and 12.1° and 16.4° . $m-MeC_6H_4OH$ (V)-IV gives 2 eutectics at 22 and 56 mols. % IV and -14° and 12° . I-quinoline (VI) forms 2 compds., VI.2I, m. 34.5° , and VI.I, m. 34.2° ; 2 eutectics are at 15 and 88 mols. % VI and 20° and -24° , resp. III-VI

also gives 2 compds., III.VI, m. 31.8°, and 2III.VI, m. 24.5°; 2 eutectics are at 20 and 90 mols. % VI and 16° and -23°, resp. III-piperidine forms a compd. $C_8H_{11}N \cdot 2C_7H_7OH$, m. 42.1°; the eutectics are at 15.5 and 72 mols. % of piperidine (14° and -34°). III-1,5- $C_{10}H_8(NH_2)_2$ shows a eutectic point at 10 mols. % $C_{10}H_8(NH_2)_2$ and 29° and a transition point at 33 mols. % and 118°.

C. J. WEST

Optical investigations on quinones and free radicals. STEFAN GOLDSCHMIDT AND FRITZ GRAEF. *Techn. Hochschule, Karlsruhe. Ber. 61B, 1858-69(1928).*—The ordinary formulation of quinones as unsatd. diketones is no complete expression of their properties and other structures have been suggested for them, as, e. g., that of isomeric aroxyls. It was hoped that new light might be thrown on this question by optical investigation. The properties of quinones, especially *o*-quinones, suggest that in solns. they may be present in tautomeric or polymeric forms in equil. with each other: $I \rightleftharpoons 2II$; $I \rightleftharpoons 2III$; $IV \rightleftharpoons III$; $IV \rightleftharpoons II$; $II \rightleftharpoons III$. Beer's law was found,



both colorimetrically and spectroscopically, to hold for solns. of *o*-quinone (V), so that equil. of the 1st two types (between dimeric and monomeric forms) is excluded. Spectrophotometric comparison of V with *p*-quinone (VI) showed that the only similarity which can be established with any certainty is the max. for VI at 4700 Å. U. and for V at 5800; these bands may therefore be ascribed to the 2 keto groups. The absorption curves for homo-*o*-quinone (VII) and *o*-naphthoquinone (VIII), on the other hand, show the close relationship of these substances to V; below are, resp., the position (λ) and height ($\log \epsilon$) of 2 bands for these compds.: V, 5800, 1.4; 3650, 3.35. VII, 5750, 1.35; 3750, 3.25. VIII, 5350, 1.50; 3900, 3.35. The solvent has a pronounced influence on the absorption of all the *o*-quinones studied. The positions and heights of the 2 max. in different solvents are as follows: In hexane: V —, —; 3630, 3.45; VII —, —; 3655, 3.31; VIII, soly. too small to permit of measurements. In Et_2O : V, 5790, 1.40; 3660, 3.37; VI, 5750, 1.35; 3760, 3.28; VIII, 5350, 1.50; 3900, 3.35. In CHCl_3 : V, 5685, 1.48; 3750, 3.23; VI, 5650, 1.50; 3820, 3.24; VIII, 5200, 1.80; 4050, 3.35. If the quinones were true aroxyls it would be expected, on the basis of the results obtained with other radicals contg. univalent O (see below), that at least a part of their ultra-violet spectrum would be similar to that of the corresponding hydroquinone, but such was not found to be the case with VI and homopyrocatechol. On the other hand, the considerable influence of the solvent on the absorption of the *o*-quinones, especially as compared with the hydroquinones, makes probable the existence of equil. of the type mentioned above, but comparison of the height of the quinone bands in the visible spectrum with that of the chlorophenanthroxyl bands makes it appear quite certain that even in the *o*-quinones the part present in the aroxyl form can be only very small and is even smaller in the *p*-quinones. Like VI, V decolorizes Ph_3C with formation of the ether $\text{C}_6\text{H}_4(\text{OCPh}_3)_2$, which, because of its instability, does not cryst. but on long treatment with air splits off all the Ph_3C again as the peroxide. The ultra-violet spectra of 2,4,6- $(\text{O}_2\text{N})_3\text{C}_6\text{H}_2\text{NHNPh}_2$ and the corresponding stable, wholly monomol. hydrazyl $(\text{O}_2\text{N})_3\text{C}_6\text{H}_2\text{NPh}_2$ differ from

each other hardly more than those of V in 2 different solvents; only in the visible region does there appear in the spectrum of the hydrazyl an extraordinarily high ($\log \epsilon$ 3.81) flat band; the change of N from the ter- to the bivalent state therefore affects the absorption only in the visible region. The slow dissociation of 9-chloro-10-phenanthryl peroxide (IX) in solvents into the anthroxyl permits of measuring the spectrum of the peroxide by working rapidly, and that of the equil. soln. can be detd. after adding $\text{C}_6\text{H}_5\text{N}$ (although only in the visible region, because of the considerable absorption of $\text{C}_6\text{H}_5\text{N}$ in the ultra-violet). Like the hydrazyl, the anthroxyl shows a broad, very high band throughout a large part of the visible region. At the concns. used ($M/4600$ and $M/13,650$) there were still equil. between the peroxide and aroxyl, measured by titration with $(\text{PhNH})_2$ (α_{4600} 0.655, α_{13650} 0.898), and Beer's law consequently does not hold; that it does not is shown by the powerful influence of the concn. on the height of the extinction curves. IX in CHCl_3 contg. a few % of $\text{C}_6\text{H}_5\text{N}$ allowed to stand with an excess of VI in CHCl_3 yields a substance, $\text{C}_{14}\text{H}_{18}\text{O}_4\text{NCl}$, yellow, m. 195°.

C. A. R.

Reduction of *p*-dimethylaminobenzaldehyde and the preparation of *p*-dimethylaminobenzyl alcohol. GEORGE R. CLEMO AND JAMES M. SMITH. Univ. of Durham,

Newcastle-upon-Tyne. *J. Chem. Soc.* 1928, 2423-6.—*p*-Me₂NC₆H₄CHO (10 g.) in 50 cc. EtOH, treated with 150 g. 4% Na-Hg and refluxed 4 hrs., gives, on diln. with 250 cc. H₂O, filtration, and extr. with Et₂O, 1.6-1.8 g. *p*-dimethylaminobenzyl alc., b₁ 123°; Bz deriv., m. 91°; *m*-nitrobenzate, pale yellow, m. 76°; methiodide, m. 232° (decompn.); chloroplatinate, pale brown, crystg. with 2 EtOH, m. 100° (decompn.). I is a mixt. of 2 stereoisomeric sym-bis[*p*-dimethylaminophenyl]ethylene glycols; 23.4 g. I, extd. with Et₂O, gives 8 g. of a solid, C₁₈H₂₄O₂N₄, m. 178°; methiodide, m. 232° (decompn.); the Et₂O filtrate gives 15 g. of a compd. m. 113°, whose dimethiodide, crystals with 1 EtOH, m. 97° (decompn.). Electrolytic reduction of *p*-Me₂NC₆H₄CHO gives a mixt. of at least the 4 following compds.: *p*-Me₂NC₆H₄Me, 15%; *p*-Me₂NC₆H₄CH₂OH, 20%; CH₂(C₆H₄NMe₂)₂, and the above glycol, m. 178°; it has not been possible to isolate the glycol, m. 113°, although it is probably formed. C. J. WEST

Dependence of rotatory power on chemical constitution. XXXII. Resolution of phenylbenzylcarbinol. WM. GERRARD AND JOSEPH KENYON. Battersea Polytechnic. *J. Chem. Soc.* 1928, 2564-7; cf. C. A. 21, 1253.—Phenylbenzylcarbinyl H phthalate (I) and quinine in Me₂CO give the insol. *d*-salt, m. 205° (decompn.); decompn. with HCl gives the *d*-I, m. 131°, [α]_D²⁵ 32.75°, [α]_D²⁵₅₄₆₁ 38.75° (EtOH, c 5). The more sol. fractions of the quinine salt, decompd. with HCl and the ester treated with cinchonine, give a *l*-salt, m. 110° [α]_D²⁵₅₄₆₁ 82.3° (EtOH, c 4.90); decompn. gives the *l*-I, m. 131°, [α]_D²⁵₅₄₆₁ -38.80° (EtOH, c 5). Alk. sapon. gives the *d*- and *l*-phenylbenzylcarbinols, m. 67°. The *d*-compd. has d_D¹ 1.0358, 1.0251, 1.0210, 1.0152, 1.0095 and 1.0031 at 70, 86, 92, 100, 110 and 120°, resp., and α_D¹₅₄₆₁ 6.51, 8.68, 12.92, 16.57, 20.40, 25.40, 31.82 and 67.1° at 125, 115, 100, 90, 80, 70, 60 and 20°, resp. Values are also given for 4358, 5780, 5893, 6708 and for solns. in C₆H₅N, CHCl₃, CS₂, C₆H₆, CCl₄, Me₂CO, EtOH at 25° and for EtOH at 17° and for *d*-I in Me₂CO, C₆H₆, CHCl₃ and EtOH at 25°. *l*-Phenylbenzylcarbinyl acetate, b₁₈ 182°, d_D¹ 1.0831, 1.0723, 1.0552, 1.0380, 1.0214, 1.0041, 0.9958 and 0.9870 at 17, 30, 50, 70, 90, 110, 120 and 130° resp., [α]_D¹₅₄₆₁ 43.81, 43.09, 42.02, 40.33, 38.06, 35.15, 31.09 and 28.00° at 130, 120, 110, 90, 80, 50, 30 and 17°, resp.; values are also given for 4358, 5780, 5893, 6708 at the same temps. The effect of temp. on the *d*-alc. is very great, there being a 10-fold increase on cooling from 125° to 20°; at the same time the rotatory dispersion ratio α₄₃₅₈/α₅₄₆₁ changes from 2.57 at 125° to 1.79 at 20°. The effect of solvents on the rotatory power is also very pronounced, the value of [α]_D²⁵₅₄₆₁ changing from -11° in C₆H₅N to 64.1° in EtOH, while in C₆H₆ the rotatory dispersion is anomalous. C. J. WEST

Certain mixed esters of alcohols used in perfumes. P. SCHVING AND S. SABETAY. *Bull. soc. chim.* 43, 857-9 (1928).—The following mixed carbonates were prepd. almost quant. by the reaction in CHCl₃ between alkyl chlorocarbonates and other alcs. in the presence of pyridine: rhodinyll Me, b₁₉ 137-8°, n_D¹⁸ 1.4510; cinnamyl Me, b₁₉ 158-61°, n_D¹⁸ 1.5356; phenylethyl Me, b₁₉ 133-4°, n_D¹⁹ 1.4940; phenylethyl Et, b₁₇ 140-1°, n_D²² 1.4889, d₂₂ 1.063; benzyl Et, b₂₀ 122-4°, n_D²⁴ 1.4899, d₂₄ 1.084; cinnamyl Et, b₁₈ 164-6°, n_D²⁴ 1.5214; anisyl Et, b₁₆ 166-7°, n_D²³ 1.5010; geranyl Et, b₁₇ 145-8°, n_D²¹ 1.4530; citronellyl Et, b₁₈ 141-2°, n_D^{20.5} 1.4426, n_D²² 1.4420; phenylethyl allyl, b₁₇ 152-152.5°, n_D²⁰ 1.4936, d₂₀ 1.060; cinnamyl allyl, b₁₈ 176-8°; geranyl allyl, b₁₈ 157.5-158°; diphenylethyl, b₂ 190°, m. 56°; rhodinyll phenylethyl, b₂ 191°, n_D²¹ 1.5010; cyclohexyl phenylethyl, b₁₉ 194°, n_D¹⁸ 1.5070. Allyl chlorocarbonate, b₇₆ 110-1.5°, and phenylethyl chlorocarbonate, b₁₈ 120°, n_D²¹ 1.5110, were obtained in yields of 63 and 86%, resp., by the action of COCl₂ in a freezing mixt. The linalyl Et ester, b₁₈ 127-8°, n_D²² 1.4508, could not be obtained as above but was obtained by the action of EtOCOCl on Na linalylate in Et₂O. C. H. PEET

Aldehyde synthesis with the aid of iron pentacarbonyl (preliminary communication). HANS WOLF. Univ. Frankfurt a. M. *Ber.* 61B, 1765-6 (1928).—In the Gattermann aldehyde synthesis HCOCl is an intermediate product but its formation from HCl and CO occurs only in the presence of substances, such as CuCl, which render possible the intermediate formation of a complex of CO. It seemed logical to start with a preformed CO complex such as Fe(CO)₅, and as a matter of fact 13-6 g. pure *p*-MeC₆H₄CHO, b. 204°, is obtained from 17.5 g. Fe(CO)₅, 30 g. PhMe and 45 g. AlCl₃ at 40-5° treated 3 hrs. with a rapid current of carefully dried HCl gas. C. A. R.

Conditions determining the thermodynamic stability of cyanohydrins of carbonyl compounds. I. Some effects (a) substitution in aromatic aldehydes and (b) ring

formation. ARTHUR LAPWORTH AND RICHARD H. P. MANSKE. Univ. of Manchester. *J. Chem. Soc.* 1928, 2533-49.—The consts. for the dissociation $\text{RC(OH)(CN)R}' \rightleftharpoons \text{RCOR}' + \text{HCN}$ of a no. of cyanohydrins (I) derived from aldehydes and ketones have been detd. in 96% EtOH at $20 \pm 0.5^\circ$. The dissociation consts. of I derived from BzH and its substitution derivs. appear to be affected by the same factors which influence the ionization consts. of BzOH and its substitution derivs., although the "electropolar" factor appears to be of relatively less importance in the *p*-substituted I and the "quant." factor has little if any influence in the *m*-substituted I. The effects of *o*-substituents examd. (other than HO) are such as to depress the dissociation consts. of the I and this in direct contrast to the result to be anticipated from the classical "space-occupation" hypothesis so frequently used to account for other effects associated with *o*-substitution. Ring closure (with elimination of 2 atoms of H) in a chain comprising a CO-C atom leads sometimes to a large increase and sometimes to a large decrease in the dissociation const. of the derived I. The results obtained are discussed from the point of view of the electronic theory and it is suggested that possibly the additive capacity of a CO-C and $\text{C}_2\text{H}_4\text{-C}$, considered from the standpoint of entropy, does not increase continuously with the restraint on its electrons but reaches a max. and then declines, just as in the series B, C, N, O, the capacity to form stable compds., in which the element exercises a coördination no. of 4, attains a max. at C.

C. J. WEST

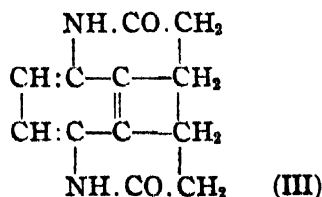
Syntheses starting from isopropyl phenyl ketone. JOSEPH BLONDEAU. *Bull. soc. chim.* 43, 343-6 (1928).—BzCHMe₂ boiled in dry C₆H₆ with NaNH₂ followed by BuI gave 81% of 1-phenyl-2,2-dimethyl-1-hexanone, b. 268° , b₃₃ 160° , split by NaNH₂ in boiling PhMe (followed by treatment with H₂O) to give 72% of α, α' -dimethylcaproic amide (I), m. 92° . Reduction of I with Na in abs. alc. gave 15% 2,2-dimethyl-1-hexylamine, b₂₄ $63-5^\circ$ (chloroplatinate); and 31% 2,2-dimethyl-1-hexanol, b₂₉ 95° ; acetate, liquid; phenylurethan, m. 52° . Similarly, BzCMe₂C₈H₁₇ yielded 50% of α, α' -dimethylcapric amide, b₁₈ 205° , m. 92° , from which 30% of 2,2-dimethyl-1-decanol, b₁₉ 134° , was obtained.

B. H. NICOLET

Absorption spectra of derivatives of acetophenone. TOMOKICHI TASAKI. *Acta Phytochim.* 3, 259-315 (1927); cf. *C. A.* 20, 1030.—Curves are given for spectra of 65 substances related to AcPh, and conclusions summarized in 3 pp. which cannot be abstracted. The following new compds. are described: reduction with Pt black in AcOH of the corresponding chalcones gave the following benzylacetophenones: 2',4',5'-tri-Me (from Me₃C₆H₂COCH:CHPh), m. $37-8^\circ$; 4-Me, m. $48-50^\circ$; 2'-HO, m. $36-7^\circ$; 3'-HO, m. $40-2^\circ$; 4'-HO, m. $62-4^\circ$; 3-HO, m. $73-4^\circ$; 3-methoxy-4-ethoxy, m. $654-5^\circ$; 2-hydroxy-4'-methoxy, m. $59-60^\circ$; 3-methoxy-4,4'-diethoxy, m. $70-1^\circ$; 4,3',4'-tri-MeO, m. $65-6^\circ$; 3-methoxy-4,4'-diethoxy-2'-hydroxy, m. $77-9^\circ$; 3,4-methylenedioxy-2'-hydroxy-4'-ethoxy, m. 117° . Claisen condensations yielded ω -acetyl-3,4-dimethoxyacetophenone, m. $71-2^\circ$; 4,4'-dimethoxydibenzoylmethane, m. 114° ; 2-ethoxy-4'-methoxydibenzoylmethane, m. $90-1^\circ$; *p*-MeOC₆H₄COCH₂COCH₂Ph, m. $75-6^\circ$.

B. H. NICOLET

Cleavage of hydrocarbostyryl and its derivatives to [2-aminophenyl] propionic and -butyric acids. FRITZ MAYER, H. PHILIPPS, F. W. RUPPERT AND A. TH. SCHMITT. *Ber.* 61B, 1966-75 (1928); D. R. P. Anmld. d. I.-G. Farbenindustrie in Frankfurt a. M. F 58,556 IV/12q of Apr. 6, 1925.—Aminophenylpropionic and -butyric acids are obtained with relative ease by heating hydrocarbostyryl (I) and its carbo- and heterocyclic substituted derivs. with aq. Ba(OH)₂ at about 150° under pressure. The stability of the Na salts, which were isolated in all cases, varies. Many are stable only in alk. solns., others can be readily recrystd. and obtained in pure form. When the Na salt of *o*-H₂NC₆H₄CH₂CH₂CO₂H (II) is treated with exactly the calcd. quantity of mineral acid, the soln. becomes turbid and after a short time I crysts. out. If the turbid soln. is at once extd. with Et₂O, some II can be recovered from the Et₂O as the Na salt with Na₂CO₃, but the free II itself cannot be isolated. Of the diketoöctahydrophenanthrolines, the cleavage of only the one having the structure



was effected with certainty; it yielded 3,6-diaminophenylene-1,2- β, β' -dipropionic acid (IV), obtained in pure form only as the Bz deriv. The *N*-alkyl derivs. of I likewise

yield the *N*-substituted acids. The following compds. were prep'd.: β -[2-Aminophenyl]propionic acids: unsubstituted (I) (Bz deriv., m. 155-8°), 3-Cl; 5-Cl (Bz deriv., m. 189-92°); 3,5-di-Cl; 3-Me; 5-Me (Bz deriv., m. 170-2°); IV (Bz deriv., m. 274°); 5-MeO (Bz deriv., m. 183-4°). β -[2-Aminophenyl]butyric acid and the 5- and 3-Cl and 3,5-di-Cl derivs. The yields were 50-100%. Cautious acidification of the Na salt of β -[2-methylaminophenyl]propionic acid (V) gave the free V, which, however, changed in 12 hrs. into *N*-methylhydrocarbostyryl (VI). From the Na salts of the corresponding acids were obtained with Me_2SO_4 the esters *o*- $\text{Me}_2\text{NC}_6\text{H}_4\text{CH}_2\text{CH}_2\text{CO}_2\text{Me}$ (VII), *o*- $\text{EtMeNC}_6\text{H}_4\text{CH}_2\text{CH}_2\text{CO}_2\text{Me}$ (VIII) and $\text{PhMeNC}_6\text{H}_4\text{CH}_2\text{CH}_2\text{CO}_2\text{Me}$ (IX). VII and VIII can be sapond. with acids while IX with HCl gives *N*-phenylhydrocarbostyryl (X). The free acids (from the HCl salts with NaOAc) are oily; on distn. *in vacuo* that obtained from VII partially changes into VI, with loss of MeOH, while the one from VIII can be obtained pure. The β -[2-aminophenyl]propionic acids can be indirectly diazotized and the NH_2 group replaced by halogens, CN, H, SH and SO_2H ; boiling of the diazo compd. gives the α -chromanone. Finally, indanones can be obtained by intramol. ring formation with AlCl_3 from the chlorides of the halogen acids obtained by replacing the NH_2 group by halogens. Me β -[2-dimethylaminophenyl]propionate (VII), b_{20} 140°; HCl salt of free acid, m. 183-4°. Me β -[2-methylethylaminophenyl]propionate (VIII), b_{20} 145°; free acid, b_{20} 190° (HCl salt, m. 130-3°). Me β -[2-methylphenylaminophenyl]propionate (IX), b_{18} 200°. The following acids were prep'd. by the Sandmeyer method from the corresponding NH_2 acid; the b. p. and yield of the chloride are given in parentheses: β -Phenylpropionic acids: 2-Cl, m. 97°, 65-70% (b_{20} 135-58°, 90%); 2-Br, m. 98°, 60-5% (b_{18} 160-5°, 75%); 2,3-di-Cl, m. 114°, 55% (b_{28} 178-82°, 60%); 2,5-di-Cl, m. 118°, 50% (b_{18} 154-8°, 95%); 2,3,5-tri-Cl, m. 113°, 50% (b_{12} 201-3°, 90%); 2-chloro-3-methyl, m. 118°, 45% (b_{18} 140-6°, 90%); 2-chloro-5-methyl, m. 93°, 45-50% (b_{18} 160-8° (solidifying in the receiver), 75-80%); 2-chloro-5-methoxy, b_{18} 200°, m. 72-3°, 30% (chloride not isolated). β -Phenylbutyric acids: 2-Cl, b_{18} 150°, m. 60°, 70% (b_{28} 140°, 90%); 2,5-di-Cl, b_{18} 180°, m. 71°, 64% (b_{18} 160°, 85%); 2-bromo-5-chloro, b_{18} 200°, m. 87°, 87% (—); 2,3-di-Cl, m. 115°, 64% (b_{18} 180°, 80%); 2,3,5-tri-Cl, b_{18} 190°, m. 115-6°, 52% (b_{18} 160°, 80%). 1-Keto-2,3-dichloroindenes: 4-Cl, m. 92°, 90%; 4-Br, m. 98-9°; 4,5-di-Cl, m. 88°; 4,7-di-Cl, m. 124°, 85%; 4,5,7-tri-Cl, m. 114°, 75%; 4-chloro-5-methyl, m. 82°, 90-5%; 4-chloro-7-methyl, b_{18} 168-73° (anal. values too high) (oxime, m. 138°); 4-chloro-7-hydroxy (Me split off from the MeO group in its prepn.), m. 122°, 65%; 3-methyl-4-chloro, m. 55°, 76%; 3-methyl-4,7-dichloro, m. 103°, 70%; 3-methyl-4,5-dichloro, b_{18} 170°, m. 44°, 66%; 3-methyl-4,5,7-trichloro, m. 88-9°, 54%. β -[2-Cyanophenyl]propionic acid, m. 136° (50% yield), hydrolyzed by H_2O_2 -NaOH to the 2- CO_2H deriv., m. 165.5°. β -[2-Cyano-5-chlorophenyl]butyric acid, b_{18} 160°, m. 120° (40%); 2-carboxy deriv., m. 185°. 4-Methyl-6-chloro- α -chromanone, b_{18} 145-50°, m. 66°, gives 4-methyl-6-chlorocoumarin at 250° with Br vapor in CO_2 . $\text{PhCH}_2\text{CH}_2\text{CO}_2\text{H}$, m. 49°, is obtained in 70% yield from diazotized II added to Cu powder in boiling alc. β -Phenylpropionic-2-sulfinic acid, from diazotized II satd. in the cold with SO_2 and then treated with Cu powder. β -[2-Mercaptophenyl]propionic acid, from diazotized II added to EtOCS_2K at 70°, then boiled with alc. KOH, freed from the alc. by distn., acidified with dil. H_2SO_4 and distd. with steam in the presence of Zn dust, m. 118° (55%). The acid obtained in the same way from 5,2-Cl(H_2N) $\text{C}_6\text{H}_3\text{CHMeCH}_2\text{CO}_2\text{H}$ loses H_2O on distn. *in vacuo*, giving 50% 4-methyl-6-chlorohydrothiocoloumarin, m. 56°, which with boiling 10% NaOH yields β -[2-mercapto-5-chlorophenyl]butyric acid, m. 81-2°.

C. A. R.

Alkali sulfonates of coumarin and nitrocoumarin. RAJENDRA NATH SEN and DUHKHAHARAN CHAKRAVARTI. Presidency College, Calcutta. *J. Indian Chem. Soc.* 5, 433-7(1928).—The positions of the SO_3H groups in coumarinmono- (I) and -disulfonic acid (II) prep'd. by Perkin (*J. Chem. Soc.* 24, 37), and of the 6-nitrocoumarinsulfonic acid (III) were detd. For this purpose, the ordinary methods were not applicable; alkali fusion, *e. g.*, leading to a rupture in the lactonic ring of the coumarin mol. Therefore the lactonic ring was oxidized with KMnO_4 and known derivs. of *o*- $\text{HOC}_6\text{H}_4\text{CO}_2\text{H}$ (IV) obtained. Thus I was shown to be coumarin-6-sulfonic acid. In III, the SO_3H group occupies a position in the lactone ring and is probably 6-nitrocoumarin-3-sulfonic acid in analogy with 3,6-dinitrocoumarin (*J. Chem. Soc.* 97, 1397), and similarly, II is probably coumarin-3,6-disulfonic acid. Some new derivs. of I, II and III were prep'd. The process of prepg. I, II and III was improved by pptg. the SO_3H acids as the Na salts, and in the case of II, by substituting the ordinary fuming H_2SO_4 by 50% fuming H_2SO_4 . Ten g. coumarin heated with 50 g. fuming H_2SO_4 for 2 hrs. on the water bath, cooled, filtered into satd. NaCl soln. and kept for 1-2 days, gave 85% of the Na salt (V) of I; this salt gave with PCl_5 or POCl_3 the sulfonyl chloride (VI), m. 115°;

from VI were prepd. the *amide*, m. 188°, and the *anilide*, m. 132°. For the oxidation, V was dissolved in 2% KOH and 4% KMnO₄ was slowly added at 0–10°. When the oxidation was complete, the soln. was heated for 1 hr. on the water bath, filtered, concd., and concd. HCl added. The resulting acid K salt of 5,2-HO₂S(HO)C₆H₃CO₂H (VII) was filtered off, recrystd., and converted to the free acid. *Na salt* (VIII) of III, from 10 g. coumarin and 70 g. 50% fuming H₂SO₄ by heating for 3–4 hrs. to 150° on the oil bath, cooling and pptg. with NaCl soln. Recrystn. gives VIII in 70% yield; *disulfonyl chloride*, m. 170–3°; *diamide*, m. above 240°; *dianilide*, yellow. Oxidation of VIII, carried out as in the case of V, leads to formation of VII. *Na salt* (IX) of III, (80% from 10 g. 6-nitrocoumarin and 60 g. 50% fuming H₂SO₄ by heating to 150° for 3–4 hrs. and pptg. with NaCl soln.), yellowish; *sulfonyl chloride*, m. 205°; *amide*, does not m. 260°; *anilide*, m. 130°. The product of oxidation of IX was identified as 5,2-O₂N(HO)C₆H₃CO₂H.

G. SCHWOCH

Thiophthalic acids. I. GOPAL CHANDRA CHAKRAVARTI. *J. Indian Chem. Soc.* 5, 405–10 (1928).—KOH, 12 g., in 125 cc. abs. EtOH, satd. with H₂S in the cold, was added to phthalyl chloride, 15 g. in 75 cc. EtOH. The mixt., after standing overnight in the cold after the initial vigorous reaction, was poured on to ice and the aq. mixt. extd. with Et₂O. The Et₂O ext., washed with H₂O, was extd. with cold Na₂CO₃ soln. A yellow solid, crystals from pyridine, not decompd. at 320°, insol. in Et₂O, EtOH, C₆H₆ and in alkalis, seps. This is supposed to be *diphthalyl disulfide*. The ether ext. is (B). The alk. ext. with HCl gave *dithiodibenzoyl-o,o'-dicarboxylic acid* (I), decomp. about 242°. This gave K and Pb salts. The alk. ext. gave another Pb salt which with H₂S gave *monothiophthalic acid*, decomp. about 198°, sol. in EtOH and Et₂O, oxidized by air to I. The ether ext. (B) on evapn. gave *thiophthalic anhydride*, m. 114° and an oil of undetd. constitution. I was also obtained from the reaction product of *ditolyl dithiophthalate* and KSH in EtOH in a sealed tube at 120°. P. J. C.

Ring formation. II. The constitution of monophthalylbenzidines. ANUKUL CHANDRA SIRCAR AND PREM RANJAN SEN GUPTA. *J. Indian Chem. Soc.* 5, 397–9 (1928); cf. *C. A.* 21, 80, 402.—Monophthalylbenzidine (I) and BzH in PhNO₂ give the *benzylidene deriv.*, m. above 300°, insol. in EtOH, C₆H₆, AcOH or pyridine, but sol. in PhNO₂. With *o*-HOC₆H₄CHO the *salicylidene deriv.*, m. 297°, and with *m*-O₂NC₆H₄CHO the *m*-nitrobenzylidene deriv. m. 280°, are obtained. With β-C₁₀H₇ONa a red dye *phthalyl-4-aminodiphenyl-4'-azo-β-naphthol*, m. 273–5°, was obtained from diazotized I. *Di-p-diphthalylbenzidine*, m. above 300°, was obtained from I and C₆H₄(CO)₂O in boiling PhNO₂. III. The condensation of benzidine with dibasic acid anhydrides. *Ibid* 401–4.—Naphthalic anhydride (I) and benzidine (II) in water under reflux gave naphthalylbenzidine (III), m. above 300°, insol. in C₆H₆, EtOH, sparingly sol. in AcOH, sol. in hot pyridine or PhNO₂, insol. in dil. acids or alkalis, diazotizable and can be coupled with phenols; *benzylidene deriv.*, m. 297°, insol. in C₆H₆, EtOH, AcOH, sol. in pyridine and PhNO₂, easily hydrolyzed; *salicylidene deriv.*, greenish yellow plates, m. 283°, insol. in alkalis; *m*-nitrobenzylidene deriv. yellow hexagonal prisms, m. 299°. I and II at 250° gave *dinaphthalylbenzidine*, m. above 300°, insol. in EtOH, C₆H₆, AcOH, sol. in pyridine and PhNO₂. Camphoric anhydride and II gave *camphorylbenzidine*, m. 190°, sol. in EtOH, sparingly sol. in hot H₂O, dil. acids and alkalis, insol. in Na₂CO₃, condensing with aldehydes, diazotizable and can be coupled with phenols. Quinolinic anhydride (IV) and II gave *p*-aminodiphenylquinolinamic acid, HO₂CC₆H₃CONHC₆H₄C₆H₄NH₂, sol. in dil. acids and alkalis, losing 1 H₂O on crystn. from PhNO₂ to form *quinolinylbenzidine*, m. above 300°. Tolidine with IV gave *p*-aminoditolylquinolinamic acid, m. 231°, which did not give quinolinyltolidine on crystn. from PhNO₂. Diphenic acid with II gave *p*-aminodiphenyldiphenaminic acid, m. 199°, which could not be made to form a 7-membered ring by loss of water. P. J. C.

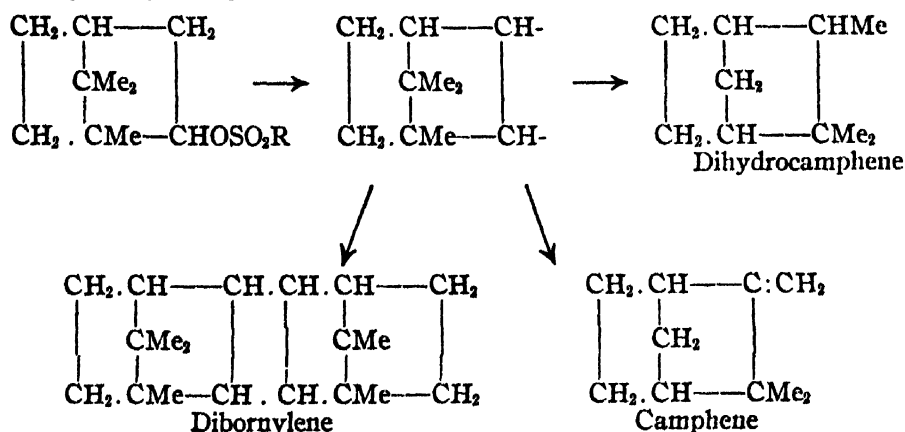
Further observations on the structure of the terpenes. Pinonene and isodiprene. OSSIAN ASCHAN. *Finska Kemistsamfundets Medd.* 36, 82–9 (1927).—Extensive researches have shown that a large part of the Finnish turpentine b. 160–174°. The portion b. 162–6° is a new compd. hitherto not isolated, which splits into sylvestrene and dipentene after the addn. of HCl. This terpene, which A. called "pinonene," appears to be identical with Simonsen's Δ⁴-carene (cf. *C. A.* 16, 419; 17, 91), while the remainder, b. 168–71°, is Simonsen's Δ³-carene. The fact that S.'s products are found in East Indian trees under conditions quite different from those of Finland, is regarded as of considerable interest from a biochem. standpoint. HANS C. DUUS

Finnish turpentine. VII. Isodiprene, a new terpene of the sylvestrene group. OSSIAN ASCHAN. *Bidrag Till Kännedom af Finlands Natur och Folk.* H.80, No. 6, 18 pp. (1926).—About 60% of the Finnish turpentine b. 160–70°. In the fraction b. 163–7° is an as yet unidentified terpene, tentatively named pinonene. The fraction

b. 167–70° contains a new terpene, isodiprene, closely related to the synthetic product, diprene; it has d_4^{20} 0.8561, n_D 1.47536, M. R. 44.84. It is unsatd. and has a mandelic odor. When distd. with Ac_2O and concd. H_2SO_4 a characteristic reddish violet color is noted. It takes up HCl to give a mono-HCl salt, d_4^{20} 0.9775, n_D 1.48175, mol. refraction 50.57, showing the presence of a double bond. The position of the double bonds in isodiprene has not been established. When the HCl is split off, sylvestrene is formed. Attempts to make a di-HCl salt of isodiprene were not wholly successful. As a result of various theoretical considerations, the terpenes of the sylvestrene group are classified in 3 groups: (1) terpenes which give an intense blue color with Ac_2O and a small quantity of concd. H_2SO_4 ; (2) terpenes which are *m*-menthadienes but give a violet color, which group is characterized by taking up more than 1 mol. HCl only with difficulty; (3) terpenes which are bicyclic and contain the same double ring as carone, consisting of a cyclohexane and cyclopropane ring. These should be intermediate between the sylvestrene and dipentene groups. HANS C. DUUS

The ultra-violet absorption curves of the terpene alcohols in comparison with their constitution. JEAN SAVARD. *Compt. rend.* 187, 540–3(1928).—The absorption curves of butylpulegol, butylisopulegol, dihydrocarveol, α -, β -, γ - and 4-terpineol were studied. All the curves present (a) a max., or a level stretch or a singular point in the range of 2260–2380 A. U.; (b) the 1st part ascends regularly from a band whose max. located in the extreme ultra-violet is not obtained. The (a) portion of the curve corresponds to the existence of a double bond and (b) to an alc. function. R. C. ROBERTS

Decomposition of bornyl benzene- and naphthalenesulfonates by heat. The products of hydrolysis of bornyl and menthyl benzene- and naphthalenesulfonates. The influence of solvents on the temperature of decomposition of these bornyl and menthyl sulfonates. THOMAS S. PATTERSON AND IRENE MARY McALPINE. Univ. of Glasgow. *J. Chem. Soc.* 1928, 2464–72.—Continuing the work reported in C. A. 21, 1642, the authors studied the *l*-bornyl derivs. Menthyl esters of benzene-, naphthalene- α - and - β -sulfonic acids, when distd. under reduced pressure, yield menthene and the corresponding SO_3H acid; but if they are heated for some time before distn., dimenthene and more complex substances are produced, but no menthene. The corresponding bornyl esters, when directly distd., yield camphene, dibornylene, a more complex gelatinous material and SO_3H acid. When heated 2–3 hrs., and then distd., they yield dihydrocamphene, dibornylene, a gelatinous material and SO_3H acid. These esters, heated to boiling in PhMe, yield dibornylene and the corresponding SO_3H acid. These changes may be represented as follows:



The menthyl and bornyl esters of these acids do not hydrolyze to yield menthol and borneol but, on the contrary, decomp. in somewhat the same way as when heated alone. The rate at which these esters decomp. in soln. depends markedly on the nature of the solvent; in the alcs. the velocity increases rapidly as the mol. wt. diminishes. Tables are given showing this behavior. *l*-Bornyl benzenesulfonate, m. 52°, $[\alpha]_{5461}^{17}$ –22.40° (C_6H_6 , *c* 2.5), –22.00° (EtOH, *c* 2.5) (yield 25%); the *d*-bornyl ester, m. 52°, $[\alpha]_{5461}^{17}$ 21.30°; *l*-bornyl naphthalene- β -sulfonate, m. 76°, $[\alpha]_{5461}^{17.5}$ –16.50° (C_6H_6 , *c* 3), –16.00° (EtOH, *c* 2.5) (yield, 60%); the *d*-bornyl ester also m. 76° and has the same rotation (opposite in sign); *l*-bornyl naphthalene- α -sulfonate, m. 90°, $[\alpha]_{5461}^{17.5}$ –23.20° (C_6H_6 , *c* 2.5), –26.4° (EtOH, *c* 2.5); the *d*-bornyl ester could not be completely purified.

C. J. WEST

Action of substituted aromatic amines on camphoric anhydride. Bromo- and iodocamphoranilic acids and camphorobromo- and iodophenylimides. MAHAN SINGH, RAM SINGH AHUJA AND KISHEN LAL, Punjab Univ. *J. Chem. Soc.* 1928, 2410-4.—When a substituted PhNH_2 is condensed with camphoric anhydride, a camphoranilic acid and the corresponding imide are formed, the relative quantities depending upon the nature of the substituent R and its position in the amine; the following % yield of the imides are reported (the 3 values are for p , m and o , resp.): CO_2H , 0 for all 3; Me, trace of p ; Cl, 15-20, 6, 5; I, 25-30, 31, —; Br, 40, 25, 5-10. • The ratio acid/imide is also dependent upon the temp. at which the reaction is carried out, though the order in which the substituents affect the ratio is the same as that given above. All the condensations except that of $o\text{-IC}_6\text{H}_4\text{NH}_2$ were carried out at $145\text{--}50^\circ$ by heating 3-4 hrs. 4'-Bromocamphoranilic acid, m. $206\text{--}7^\circ$; camphoro- p -bromophenylimide, m. 182.5° . The condensation with $o\text{-IC}_6\text{H}_4\text{NH}_2$ was carried out at 115° , since at higher temps. a viscous oil was obtained and the yield of acid was seriously diminished. 2'-Iodocamphoranilic acid, m. $147\text{--}9^\circ$; 3'-I deriv., m. $226\text{--}7^\circ$; 4'-I deriv., m. 221° ; camphoro- m -iodophenylimide, m. 172° ; p -I deriv., m. 197° . The following values are reported for $[\text{M}]_D$ for camphoranilic acid and its 2'-substituted derivs. (the 4 values are for solns. in MeOH, EtOH, Me_2CO and MeEtCO): H, 150, 131, 101, —; CO_2H , —584, —574, —551, —390°; Me, 146, 144, 98, 90.75°; I, 50.9, —, —82.8, —70.17°; Br, 36, 21.9, —61.1, —31.96°; Cl, 57.8, 35.6, —40.3, —28.5°; OMe, 29.6, 27.6, —16.3, —9.55°. Values of $[\alpha]_D$ are also given for the 2'-Br and I, 3'-Br and I and 4'-Br and I derivs. of the acid and for the o -, m - and p -Br and the m - and p -I derivs. of the imide in the same 4 solvents. The p -isomer has in all cases the max. rotation; the o -Br and o -I acids give negative values in Me_2CO and MeEtCO . As regards their effect in diminishing the mol. rotatory power in Me_2CO and EtMeCO , the order of substituents is that of their effect on the optical activity of menthyl and *sec*- β -octyl esters of mono-substituted AcOH and BzOH; this also corresponds to the relative polarity of the groups as deduced from mol. inductive capacities. For MeOH and EtOH there is a small displacement in the order of the substituents.

C. J. WEST

The synthesis of camphor. Concentration of bornyl acetate. M. TOMEO. *Anales soc. españ. fís. quím. (técnica)* 1, 30-55(1928).—A critical study of fractional distn. of bornyl acetate, controlling the operation by d and n . Replete with tables and graphs.

E. M. SYMMES

Molecular configuration of polynuclear aromatic compounds. VIII. 6,6'-Dimethoxydiphenic acid. JAMES KENNER AND HAROLD A. TURNER. Univs. of Sheffield and Sydney. *J. Chem. Soc.* 1928, 2340-3.—2,3- $\text{H}_2\text{N}(\text{MeO})\text{C}_6\text{H}_3\text{CO}_2\text{H}$ is converted by the ordinary procedure into 2-iodo-3-methoxybenzoic acid, yellow, m. $150\text{--}1^\circ$; Me ester, m. 57° ; Cu at $205\text{--}10^\circ$ converts the latter into di-Me 6,6'-dimethoxydiphenate, m. $137\text{--}8^\circ$; hydrolysis gives the free acid, m. $288\text{--}90^\circ$ (decompn.). The brucine H salt m. 268° . The acid was resolved by quinine; quinine l -acid, the less sol. of the 2 salts, m. $172\text{--}3^\circ$, $[\alpha]_D -291^\circ$ (H_2O , c 0.59); the free l -acid, m. $294\text{--}5^\circ$, has $[\alpha]_D -115^\circ$ (Me_2CO , c 0.56). Quinine d -acid, obtained as an oil which could not be crystd.; $[\alpha]_D -68^\circ$ (CHCl_3 , c 1.27); the NH_4 in H_2O salt had $[\alpha]_D 254^\circ$. Complete sepn. could not be obtained by the use of quinidine.

C. J. WEST

A note on an attempt to prepare p -diphenylene. ANUKUL CHANDRA SIRCAR AND JNANENDRA NARAYAN MAJUMDAR. *J. Indian. Chem. Soc.* 5, 417-8(1928); cf. C. A. 21, 402.—In an attempt to prep. p -diphenylene by the action of Cu on p,p' -diiododiphenyl, tetraphenylene, $(\text{C}_6\text{H}_4)_4$, white plates from C_6H_6 , m. $304\text{--}5^\circ$ were obtained. When H_2O was present Ph_2 was obtained.

PAUL J. CULHANE

Nitration and bromination of 4-methylbenzophenone. WM. BLAKEY AND HAROLD A. SCARBOROUGH. Univ. of Cambridge. *J. Chem. Soc.* 1928, 2489-96.—4- $\text{MeC}_6\text{H}_4\text{Bz(I)}$, m. 56° ; HNO_3 (d. 1.5) gives the 3- NO_2 deriv.(II), pale yellow, m. 129° , also obtained from 4,3- $\text{Me}(\text{O}_2\text{N})\text{C}_6\text{H}_3\text{COCl}$ and C_6H_6 with AlCl_3 . Reduction of II with Sn and HCl gives the 3- NH_2 deriv.(III), m. 109° (HBr salt, m. 130° ; Ac deriv., m. 108°). The 3-Br deriv.(IV), m. 107° , results from I in dry Br after standing in the sunlight for 2 days, from III through the diazo compd. with CuBr and from 3,4-Br- $\text{MeC}_6\text{H}_3\text{COCl}$ and C_6H_6 with AlCl_3 . 3,3'-Di- NO_2 deriv., pale yellow, m. 135° , results from II in $\text{H}_2\text{SO}_4\text{-AcOH}$ and HNO_3 or from 4,3'- $\text{Me}(\text{O}_2\text{N})\text{C}_6\text{H}_3\text{Bz}$ and HNO_3 . 4,3,5- $\text{Me}(\text{O}_2\text{N})_3\text{C}_6\text{H}_2\text{COCl}$, C_6H_6 and AlCl_3 give the 3,5-di- NO_2 deriv., yellow, m. 109° ; reduction gives the 3- NH_2 deriv., deep orange, m. 157° . 3,3',5-Tri- NO_2 deriv., pale yellow, m. 173° , results by the action of an excess of HNO_3 upon any NO_2 deriv. 4,4'- $\text{Me}(\text{O}_2\text{N})\text{C}_6\text{H}_3\text{Bz}$ and excess of HNO_3 give the 3,4'-di- NO_2 deriv., m. 130° , reduced by H_2S and NH_4OH to the 4'- NH_2 deriv., yellow, m. 164° ; removal of the NH_2 deriv. gives III. 4,4'- $\text{Me}(\text{O}_2\text{N})\text{C}_6\text{H}_3\text{Bz}$, H_2SO_4 and HNO_3 give the 3,4',5-tri- NO_2 deriv., pale

yellow, m. 160°; this does not react with piperidine but $p\text{-ONC}_6\text{H}_4\text{NMe}_2$ gives a light brown amorphous powder; reduction gives the 4',5-di-NH₂ deriv., orange, m. 202°, which yields II on removal of the NH₂ groups. Further nitration of the tri-NO₂ deriv. by heating with H₂SO₄ and HNO₃ 6 hrs. on the H₂O bath gives the 3,3',4',5-tetra-NO₂ deriv., yellow, m. 187°; piperidine, HOH-NH₂, and MeONa each give a light brown amorphous product. 4,3'-Me(O₂N)₂C₆H₃Bz and excess dry Br give the 3-Br deriv., pale yellow, m. 124°; 3'-NH₂ deriv., yellow, m. 94°; deamination gives IV. 3,5-(O₂N)₂C₆H₃COCl and PhMe with AlCl₃ give 3',5'-dinitro-4-methylbenzophenone, pale yellow, m. 134°, whose 3-Br deriv., pale yellow, m. 173°. 3-Bromo-4'-nitro-4-methylbenzophenone, pale yellow, m. 119°; 4'-NH₂ deriv., pale yellow, m. 162°, and on deamination yields IV. 4'-Chloro-3-nitro-4-methylbenzophenone, m. 98°, from $p\text{-ClC}_6\text{H}_4\text{COCl}$, PhMe and AlCl₃, followed by nitration, or 4,4',3-Me(H₂N)(O₂N)₂C₆H₃Bz through the diazo reaction; reduction gives the 3-NH₂ deriv., pale yellow, m. 142°. 4,3-Cl-(O₂N)₂C₆H₃COCl and PhMe give 4'-chloro-3'-nitro-4-methylbenzophenone, yellow, m. 121°; HNO₃ gives the 3,3'-di-NO₂ deriv., yellow, m. 181°. 4'-Chloro-3,5-dinitro-4-methylbenzophenone, yellow, m. 118°; the 3,3',5-tri-NO₂ deriv., yellow, m. 182°. 4'-Chloro-3-bromo-4-methylbenzophenone, m. 122°. A comparison of the behavior of the Me and the MeO groups show that they are alike in that the sequence in which substituents enter is the same, with 1 exception, and the methods by which these substituents are introduced are similar. They differ in that on di- and tri-substitution the Me groups lead to only 1 isolable isomer, whereas with the MeO group at least 2 isomers are obtained.

C. J. WEST

Autoxidation of organic compounds. VI. Autoxidation of thiobenzophenone.

H. STAUDINGER AND H. FREUDENBERGER. *Ber.* 61B, 1836-9(1928); cf. *C. A.* 19, 2658.—In the description of a simple method of prepg. Ph₂CS (*C. A.* 22, 4510) it was stated that the autoxidation of Ph₂CS does not proceed according to the scheme $2\text{Ph}_2\text{CS} + 2\text{O}_2 \longrightarrow (2\text{Ph}_2\text{C.S.O.O}) \longrightarrow 2\text{Ph}_2\text{CO} + \text{SO}_2 + \text{S}$, but that only a little SO₂

is liberated and that along with Ph₂CO is formed a trisulfide, decomps. about 124°, which decomps. quant. into Ph₂CS and S. Only 1/8 mol. SO₂ is formed and there is an increase in wt. of about 3%. The Ph₂CS and O must therefore react primarily according to the scheme $2\text{Ph}_2\text{CS} + \text{O}_2 \longrightarrow (\text{Ph}_2\text{C.S.S.CPh}_2\text{O.O}) \longrightarrow 2\text{Ph}_2\text{CO} + 2\text{S}$,

and the nascent S yields in part the trisulfide, in part polymerizes to amorphous S and, in very small part, is autoxidized. The Ph₂CS autoxidation therefore proceeds according to the scheme $6\text{Ph}_2\text{CS} + \text{O}_2 \longrightarrow 2\text{Ph}_2\text{CO} + 2(\text{Ph}_2\text{C})_2\text{S}_3$, for which the calcd. increase in wt. is 2.69%. As a part of the S polymerizes the actual increase in wt. is somewhat greater and the yield of Ph₂CO greater, that of trisulfide smaller than the calcd., and this is the more pronounced the more rapid the autoxidation, *e. g.*, when very finely divided Ph₂CS autoxidizes. The best yields of trisulfide are therefore obtained when the autoxidation is effected very slowly in the cold. At 120°, at which temp. the trisulfide decomps., only Ph₂CO, crystd. S and very little SO₂ are formed. Ph₂CS and ordinary rhombic S₈ do not give the trisulfide in CS₂.

C. A. R.

Acylation and alkylation of some compounds of the aromatic series in the presence of tin tetrachloride. G. I. STADNIKOV AND A. BARYSHEVA. *Tor.-Inst., Moscow. Ber.* 61B, 1996-9(1928).—The reaction of alkyl halides and aromatic chlorides with aromatic compds. in the presence of SnCl₄ is more or less peculiar and permits of making an interesting distinction between different classes of aromatic compds. and between C₆H₆ and thiophene (cf. *C. A.* 22, 3981). Thus, while C₆H₆ and its homologs react readily with PhCH₂Cl in the presence of SnCl₄, they do not react with acid chlorides, and BzOEt does not react with BzCl, AcCl or PhCH₂Cl. Thiophene and its homologs, on the other hand, react readily with AcCl. The behavior of cresol ethers is described in this paper. They react with acid chlorides with extraordinary ease, forming deeply colored complex compds. which with H₂O give the corresponding ketones in good yield. With PhCH₂Cl in boiling solvents (benzine, b. 80-100°) they give mono- and disubstituted phenol ethers. Thus, from 24.4 g. *o*-MeC₆H₄OMe and 15.6 g. AcCl allowed to stand overnight with 52 g. SnCl₄ is obtained 28 g. 5,2-Ac(MeO)₂C₆H₃Me, b₂₃ 171-2°, d₄²⁰ 1.0812, n_D²⁰ 1.5538; semicarbazone, m. 206-7°. The Bz analog, b₄₈ 240-54°, is obtained in 76% yield. 2,4-Me(MeO)₂C₆H₃COMe, similarly obtained in 84% yield from *m*-MeC₆H₄OMe, b₂₃ 163-4°, b₇₃ 267-8°; semicarbazone, m. 179-80°. 2-Methyl-4-methoxybenzophenone (73%), b₂₃ 219-21°, d₄²⁰ 1.1250, n_D²⁰ 1.6016. 3,4-Ac(MeO)₂C₆H₃Me (88%), b₂₃ 143-6°, d₄¹⁷ 1.0636, n_D¹⁷ 1.5375. 5-Methyl-2-methoxybenzophenone (77%), b₂₀ 210-1°, m. 37-8°. *m*-MeC₆H₄OMe (24.4 g.) with 25.3 g. PhCH₂Cl

and 52 g. SnCl_4 gives 40% of a *methylmethoxydiphenylmethane*, b_p 181–7°, and 10% of a *methylmethoxydibenzylbenzene*, m . 75–6° C. A. R.

Hydrogenation of fluorene under pressure in the presence of nickel or osmium with the addition of cerium and thorium. V. S. SADIKOV AND A. K. MICHAILOV. *Staats-Inst. angew. Chem., Leningrad. Ber.* 61B, 1792–6(1928).—Ipat'ev had found that the hydrogenation of fluorene (I) with Ni under pressure is very difficult; 20 g. I with 3 g. NiO must be heated 24 hrs. at about 300° under 120 atm. H_2 to give decahydrofluorene (II) and the latter must be heated again a long time with fresh or reactivated NiO to give perhydrofluorene (III). S. and M. have now found that when 40 g. I and 1.6 g. Os on 27.4 g. asbestos under 105 atm. H_2 (at 25°) is heated to 300° (the pressure rises to 165 atm.) hydrogenation is complete in 6.5 hrs., the pressure decreasing 105 atm. (77 atm. at room temp.), or 29, 25, 15, 13, 11 and 5 atm., resp., in each succeeding hr., and the product consists of about 78% II and 22% III. With 3.18 g. Os and 0.16 g. CeO_2 on 12.56 g. asbestos, the max. pressure attained at 300° is 153 atm., 0.5 of the H_2 is absorbed in the first 15 min. and reduction is practically complete in 4.5 hrs. (decrease in pressure each hr. 81, 15, 6, 5, 2, 2 atm.), giving about 93% III. With 26 g. I and 1.2 g. Os-asbestos in the presence of 1% ThO_2 the max. pressure is attained at 280° and decreases 48, 34, 17, 7, 8 and 6 atm., resp., in each succeeding hr., the product consisting of III exclusively. With 18 g. NiO-asbestos (14.25% Ni) and 113 atm. H_2 at 25° the pressure decreased at 300° from 193 atm. at the rate of 16, 8, 7, 6, 6, 8, 6 atm. per hr. and the product consisted of 24.15% unchanged I and 73.2% II. With 15 g. of the NiO-asbestos and 1% CeO_2 , the pressure decrease is 64, 13, 7, 4, 4, 6, 5, 4 atm. per hr. (40 atm. in the first 15 min.) and the product contains 98.2% III. With 30 g. I, 15 g. of the NiO-asbestos, 1% ThO_2 and 130 atm. H_2 at 20° the pressure increases to 256 atm. at 300° and decreases 0, 3, 4, 0, 2, 3, 2, 0, 0 atm. each succeeding hr.; all the I is recovered unchanged. Os is therefore a much more active catalyst for I than NiO, but in the presence of CeO_2 NiO is as effective as Os. C. A. R.

Catalytic hydrogenation processes: interrupted hydrogenation of quinoline under pressure in the presence of osmium and cerium. V. S. SADIKOV AND A. K. MICHAILOV. *Staats-Inst. angew. Chem., Leningrad. Ber.* 61B, 1797–1800(1928).—It was found in the work described in the preceding abstr. that the hydrogenation of cyclic compds. follows a wave-like course, which may be explained by periodically changing states of temporary stimulation and paralysis of the catalyst. To obtain as rapid and complete a hydrogenation as possible of a given substance, the following exptl. conditions must be controlled: (1) Definite optimum temp. of the substance to be hydrogenated; (2) suitable compn. and a corresponding state of the catalytic system; (3) certain mutual relations between the catalyst and the substance to be hydrogenated. An active catalytic mass can exert its hydrogenating power only when both the catalyst and the substance to be hydrogenated are within certain temp. limits (e. g., for quinoline and asbestos- OsO_2 - CeO_2 , about 340°). The following questions suggested themselves: (1) May not this permanently high temp. acting a long time injure the activity of the catalyst? (2) Is a permanent increase in the initial temp. really necessary to keep the catalyst active? (3) May not the catalyst, stimulated by the initial rise in temp., thereafter effect hydrogenation independently of the optimum temp. (e. g., at room temp.)? A series of expts. was therefore run in which quinoline was hydrogenated at the initial optimum temp. and another in which the temp. was repeatedly raised for short intervals to this point. An Ipat'ev autoclave, contg. 60 g. quinoline and 10 g. catalyst (asbestos with 20% OsO_2 and 1% CeO_2) under 100 atm. of H_2 , was placed in an elec. oven at 320–40°. The autoclave attained the oven temp. in 30–75 min. and the pressure rose to a max., remained const. for some min. and then began to fall; 20–50 min. after the max. pressure had been reached, the autoclave was removed from the oven and quickly cooled and the pressure again recorded after 24 hrs. at room temp. In a typical expt., the autoclave was filled at 15° under 102 atm., the pressure reached a max. (187 atm.) at 336° in 40 min., remained const. 3 min., fell 13 atm. in the next 17 min. (fall per min. 2, 3, 4, 1, 2, 1, 0, 0...) at 336° and another 17 atm. in the next 24 hrs. after cooling to 15°. Thus the catalyst which was paralyzed in 7 min. at the high temp. recovered its activity at room temp. and was able to effect hydrogenation outside the optimum temp. limits; this same catalyst was unable to hydrogenate quinoline before it had been subjected to a preliminary short heating at the definite initial temp. The results of 17 such interrupted hydrogenations indicate that in the hydrogenation of most cyclic compds. it is not necessary to maintain permanently the high optimum temps.; they merely start up the process, which then continues independently of the temp.; in fact, long continuance of the high temp. may have an unfavorable influence on the activity of the catalyst. C. A. R.

Hydrogenation products of quinoline under pressure in the presence of osmium and cerium. V. S. SADIKOV AND A. K. MICHAJLOV. Staats-Inst. angew. Chem., Lenin-grad. Ber. 61B, 1801-6(1928).—The object of this investigation was the elucidation of the nature of the by-products formed in the hydrogenation of quinoline (cf. C. A. 22, 1924). From the fractions boiling above 250° was isolated a thick, light yellow, oily base, $C_{15}H_{26}N_2$, of peculiar odor, b_{15} 275–90°, forms no picrate, changed to orange-red by HCl, yielding the brick-red *di-HCl salt*, from which can be obtained a H_2O -sol. ferrocyanide. The base forms a MeI addn. product and is probably 7-methyl-bis-1,2,3,4,7,8-hexahydro-1,1'-quinolyl. The 165–200° products obtained in the hydrogenation of quinoline with 20% CeO_2 + 1% OsO_2 yielded fractions b_{15} 70–85°, d_{15} 0.8705, and b_{15} 85–90°, d_{15} 0.8814, which gave a salt $C_{17}H_{26}N_2 \cdot 2HCl$, m. 276°; the base is probably a 1-[2'-methyl-3'-ethyl-1'-piperidino]-1,2,3,4,5,6,7,8-octahydroquinoline. Interrupted hydrogenation of quinoline (see preceding abstr.) with 20% OsO_2 + 1% CeO_2 gave the following fractions: 75–100°, 5.0%; 100–50°, 11.8%; 150–75°, 17.7%; 175–90°, 27.5%; 190–200°, 7.5%; above 200°, 30.0%. The 150–75° fraction gave the salts $C_{16}H_{26}N_2 \cdot HCl$, m. 226°, and $C_{17}H_{27}N \cdot HCl$, m. 156°; the bases are probably [3-methyldecahydro-2-quinolyl]amine and 2-methyl-3-ethylpiperidine, resp. From the 175–90° fraction were obtained a salt $C_{19}H_{38}N_2 \cdot 2HCl$, m. 172° (probably of 2-methyl-3-aminobisdecahydro-1,1'-quinolyl), a base $C_{14}H_{26}N_2$, possibly *N*-piperidinodecahydroquinoline, and a ferrocyanide which from its compn., $C_{14}H_{27}N \cdot H_4Fe(CN)_6$, may be a salt of 2,3-diethyl-1-methyldecahydroquinoline. If the 175–90° and 190–200° fractions are treated in alc. with CO_2 or are distd. in CO_2 they yield solid compds., $C_{18}H_{38}N_2O_2$ and $C_{27}H_{46}N_2O_2$, resp., which form no picrates nor ferrocyanides and evolve CO_2 with acids; the 2nd probably has the structure $\underline{CH_2 \cdot CH_2 \cdot CH(CH_2CH_2) \cdot CH(CH_2CH_2) \cdot NNMe}$.

$CH(CH_2CH_2)CH_2CH_2CH(CH_2CH_2)CH_2CH_2NHCO_2H$. The hydrogenation of quinoline is therefore quite a complex process and is accompanied by numerous side reactions which are strongly influenced by the nature of the catalyst and by the thermal conditions. The following stages in the hydrogenation have been established: (1) With CeO_2 tetrahydroquinoline is formed almost exclusively; (2) with Os there is a very greatly accelerated formation of the higher hydrogenation products, up to the decahydro deriv.; (3) at the same time is formed a relatively insignificant quantity of a condensation product of 2 hexahydroquinoline mols., accompanied by alkylation, which may be considered an indication of incipient decompn. of the hydrogenation products; (4) with both CeO_2 and OsO_2 are formed considerable quantities of products of the further transformation of the decahydroquinoline in 3 directions, viz., condensation or linking together of individual hydrogenated quinoline rings, rupture of individual rings with formation of piperidine derivs., and secondary syntheses with formation of alkyl derivs. and amines from the individual fragments of the decompd. hexahydroquinoline rings. The formation of these secondary condensation and decompn. products can be ascribed only to the high temp. and to avoid it the primary hydrogenation products must be at once removed from the influence of the high temp. by the use of an autoclave with a cooled side arm (cf. C. A. 22, 1336).

C. A. R.

Preparation of compounds of the type of malachite green and of phenolphthalein by means of the Grignard reaction. JOSEPH S. CHAMBERLAIN AND MALCOLM F. DULL. Mass. Agr. College. J. Am. Chem. Soc. 50, 3088–92(1928).—Details are given of the prepn. of $Me_2NC_6H_4MgBr$ and its reaction with $(Me_2NC_6H_4)_2CO$ to give Me violet. *p*- $BrC_6H_4CO_2H$ does not readily yield a Grignard reagent; the reaction with $(Me_2NC_6H_4)_2CO$ gives only traces of chrome green. Two mols. $PhMgBr$ and 1 mol. *o*- $BzC_6H_4CO_2H$ give phthalophenone.

C. J. WEST

Preparation of crystal violet from oxalyl chloride and dimethylaniline. I. YA. POSTOVSKII. Ann. Inst. Polytech. Oural 6, 347–50(1927); cf. C. A. 22, 957(1928).

G. B. KISTIAKOWSKY

Resolution of benzoïn. ISAAC V. HOPPER AND FORSYTH J. WILSON. Royal Tech. College, Glasgow. J. Chem. Soc. 1928, 2483–9.—Benzoïn and *dl*- $PhMeCHNHCONH_2$ in C_6H_5N give 3 of the 4 possible racemic modifications of benzoïn δ -[α -phenylethyl]-semicarbazone; the least sol. is the β -modification, m. 154°; then follows the α -modification, m. 174°, and finally the γ -modification, m. 187°; the yields from 8 g. benzoïn are 4, 3 and 0.4 g., resp. In EtOH there are obtained the α - and β -modifications. *d*-Benzoïn δ -[α -phenylethyl]semicarbazone, from the 2 active components, m. 181–2°, $[\alpha]_D^{14}$ –140.7° (EtOH, *c* 0.4274); the same product was obtained from *dl*-benzoïn and the active *d*-semicarbazide, using C_6H_5N as the solvent; the other 3 forms were oily and very sol.; hydrolysis gave the *d*-benzoïn, identical with the synthetic product. By

means of *l*-δ-[α-phenylethyl]semicarbazide-HCl, m. 183°, $[\alpha]_D^{12.2} -66.06^\circ$ (H₂O, *c* 3.027), there was obtained the corresponding *l*-deriv., m. 181–2°, $[\alpha]_D^{14} 140.9^\circ$ (EtOH, *c* 0.7808), which yields *l*-benzoin on hydrolysis. A by-product of the resolution is benzil di-*d*-δ-[α-phenylethyl]semicarbazone, m. 233°, $[\alpha]_D^{17} 178.2^\circ$ (AcOH, *c* 0.4320).

C. J. WEST

Dioximes. XLIX. A. VIANELLO. Reale Univ., Torino. *Gazz. chim. ital.* 58, 326–8(1928); cf. de Paolini and Imberti, *C. A.* 22, 2750.—Ph(C₂N₂O₂)NH₂, which is of interest in explaining the structure of peroxides of glyoximes, has not been prepd. because of inability to dehydrogenate α-PhC(:NOH)C(:NOH)NH₂ (I) (cf. *C. A.* 17, 2268). Since BzC(:NOH)C(:NOH)NH₂ has now been transformed by Br water into Bz(C₂N₂O₂)NH₂, it seemed possible to carry out a similar reaction with I. Br water (theoretical proportion) added to ice-cold I in 10% H₂SO₄, and the ppt. recrystd. several times from C₆H₆ (with the use of animal charcoal) yields the phenylamino-glyoxime peroxide, Ph(C₂N₂O₂)NH₂ (II), m. 142°. II heated at 100° with Sn and concd. HCl, made strongly alk. with NaOH, extd. with Et₂O and crystd. from water, yields Ph(C₂N₂O)NH₂ (cf. *C. A.* 17, 2268). Wieland has already described a phenylamino-glyoxime peroxide (cf. *Ann.* 328, 252(1903)) which m. 135–6°, and which may have been the same as II. II may have any one of 3 formulas: (1) PhC:N.O.N(:O):CNH₂;

(2) PhC:N(:O).O.N:CNH₂, or (3) PhC:N.O.O.N:CNH₂, of which the first 2 are

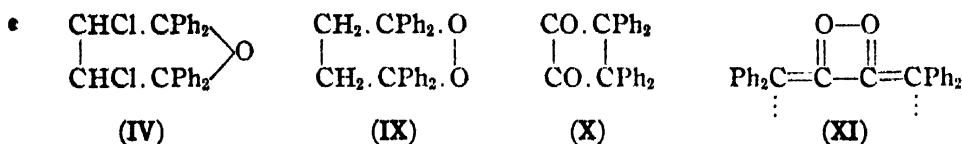
phenylaminoximes and the 3rd is a true peroxide. II cannot be hydrogenated to PhC(:NOH)C(:NOH)NH₂ by the method of Angeli (Zn and AcOH), nor can it be reduced by SnCl₂, so the choice of formula remains in doubt. Unlike I, β-PhC(:NOH)C(:NOH)NH₂ (III) (cf. *C. A.* 17, 3875) in dil. H₂SO₄ is decompd., with evolution of gases, by Br water. The yield of III can be increased almost to the theoretical, and by a simpler method, by agitating PhC(:NOH)C(:NOH)Cl (10 g.) in Et₂O with 6 *N* NH₄OH (30 cc.), sepg. the aq. layer and eliminating the solvent. Br water (theoretical quantity) added to α-*p*-MeC₆H₄C(:NOH)C(:NOH)NH₂ (IV) (cf. *C. A.* 18, 1491) in 10% H₂SO₄, and the ppt. recrystd. from PhMe, yields *p*-tolylaminoglyoxime peroxide, *p*-MeC₆H₄(C₂N₂O₂)NH₂, m. 178°. Treated with Sn and boiling concd. HCl, as above, it is transformed to *p*-tolylaminofurazan, *p*-MeC₆H₄(C₂N₂O)NH₂ (V), m. 142°. IV treated with cold Ac₂O yields on recrystn. from dil. EtOH the *di*-Ac deriv., *p*-MeC₆H₄C(:NOAc)C(:NOH)NHAc, m. 168°. Heated briefly with 20% NaOH it forms V, which establishes the constitution of the latter. With Br water the β-form of IV and BzC(:NOH)C(:NOH)NH₂ behave like III. Since treatment with Br water of HC(:NOH)C(:NOH)NH₂, H₂NC(:NOH)C(:NOH)NH₂ or MeC(:NOH)C(:NOH)NH₂, all of which have but 1 form (β), completely destroys the compd., it is concluded that only the α-forms of aminoglyoximes can be dehydrogenated by Br to the corresponding peroxides.

C. C. DAVIS

Ring tension and radical formation. II. GEORG WITTIG AND FREIHERR VON LUPIN. Marburg, Chem. Inst. *Ber.* 61B, 1627–34(1928); cf. *C. A.* 22, 3878.—The results reported in the 1st paper gave certain indications that ring tension may assist the dissociating tendency of a C.C. union. Thus, the intense color of the biradicals

Ph₂CC₆H₄(CH₂)₂C₆H₄CPh₂, would seem to show that the 2 free ends have not satd. each other within the mol. and mol.-wt. detns. show that intermol. neutralization of valence occurs to but a small extent, evidently because of the opposing ring tension. It seemed possible that certain biradicals might be prepd. which might be converted intramol. into rings with less tension. Attempts were accordingly made to synthesize 1,1,2,2-tetraphenylcyclobutene (I) and -cyclobutane (II). As the vinyl group is comparable, in its radical-forming properties, to aryl groups it was to be expected that I would show a strong tendency to dissociate, while the satd. II, standing at the limits of ability to dissociate, might show weak radical formation because of the ring tension. In trying to synthesize I all attempts to obtain (:CHCXPh)₂, by halogenation of (CH:CPh)₂ failed; Br did not react and Cl at once gave (CHClCPh₂)₂, which, when rubbed with MeOH, yielded 2,3-dichloro-1,1,4,4-tetraphenylbutane-1,4-diol di-Me ether (III). III under suitable conditions readily forms the hydrofuran IV; on fusion, it does not yield IV but, for the most part, the acyclic 2-chloro-1,1,4,4-tetraphenyl-1,3-butadiene (V). The (CH:CPh)₂ was next treated with Na-K under N, yielding the violet addn. compd. (:CHCKPh)₂ (VI), whose structure was established by conversion with alc. into (:CHCHPh)₂ and with CO₂ into (:CHCPhCO₂H)₂. The K in VI was removed with O, S, I, CH₃I, and (CMe₃Br)₂. In all cases the suspension was in-

stantly decolorized and $(\text{CH}:\text{CPh}_2)_2$ was obtained exclusively; no intermediate color, pointing to the primary formation of the diradical, was observed, even when the reaction was carried out at -100° with $(\text{CMe}_2\text{Br})_2$. The rapidity of the formation of the $(\text{CH}:\text{CPh}_2)_2$ is also shown by the fact that when the K is removed with O no trace of a cyclic peroxide is formed. The prepn. of $(\text{CH}_2\text{CPh}_2\text{Cl})_2$ for the synthesis of II was also found impossible; all attempts to make it by replacing, by the usual means, the HO groups in $(\text{CH}_2\text{CPh}_2\text{OH})_2$ by Cl resulted in the elimination of H_2O or HCl and the formation of $(\text{CH}:\text{CPh}_2)_2$. Again, when the compds. $(\text{Ph}_2\text{CNaCH}_2)_2$ (VII) and $((\text{PhC}_6\text{H}_4)_2\text{CNaCH}_2)_2$ (VIII), formed by addn. of Na to $\text{Ph}_2\text{C}:\text{CH}_2$ and $(\text{PhC}_6\text{H}_4)_2\text{C}:\text{CH}_2$, resp., are treated with I or $(\text{CMe}_2\text{Br})_2$, the metal is at once removed and there are formed, with astonishing smoothness, not the cyclobutanes but the original $\text{R}_2\text{C}:\text{CH}_2$. That these are not merely the original substances which have remained unaltered is shown by the fact that the VII and VIII with alc. always yield the homogeneous $(\text{R}_2\text{CHCH}_2)_2$. That the hydrocarbon residue freed of the metal has a radical-like character, however, is shown by the fact that VII with O gives a cyclic peroxide (IX) which liberates I from HI-AcOH . As the above results indicate that tetraaryl cyclobutanes of the type I and II are not capable of existence, W. and L. doubt the correctness of the structure X assigned by Langenbeck (*C. A.* 22, 2746) to his dimeric ketenes; their deep color, the sluggishness of the radical C atoms toward O and the lack of reactivity of the C:O groups toward ketone reagents are all readily explained by the structure XI. The $(\text{CH}:\text{CPh}_2)_2$, obtained from $(\text{CH}_2\text{CPh}_2\text{OH})_2$ in boiling HCl-AcOH , forms colorless crystals with bluish fluorescence, m. 201° ; rubbing with concd. H_2SO_4 increases the fluorescence and gives a pink soln. gradually changing through light green to dirty brown. III (3 g. from 8 g. $(\text{CH}:\text{CPh}_2)_2$ in CCl_4 suspension with Cl, m. 183° (decompn.), reduced by Na and AmOH to $(\text{CH}_2\text{CHPh}_2)_2$, m. $118-9.5^\circ$. V, faintly yellow, m. $246-7^\circ$. 2,2,5,5-Tetraphenyl-3,4-dichlorofuran tetrahydride (IV), from III in boiling AcOH with CrO_3 or from the tetraphenylfuran 2,5-dihydride in CCl_4 with Cl, m. $280-1^\circ$, reduced by Na and AmOH to $(\text{CH}_2\text{CHPh}_2)_2$, gives with excess of NaOAm in AmOH the 3-chloro 2,5-dihydride, m. $168-9^\circ$. 1,1,4,4-Tetraphenyl-2-butene, m. $132-3^\circ$. 1,1,4,4-Tetraphenylbutene-1,4-dicarboxylic acid, m. $260-1^\circ$. 3,3,6,6-Tetraphenyl-1,2-dioxane (IX), m. $171-80^\circ$, forms in Et_2O (under N) a green soln. *asym-Dibiphenylethylene*, from $(\text{PhC}_6\text{H}_4)_2\text{CO}$ and MeMgI and elimination of H_2O from the resulting alc. by boiling in AcOH, m. $204-5.5^\circ$. 1,1,4,4-Tetraphenylbutane, m. $234-5^\circ$, mol. wt. in camphor 609.



C. A. R.

Constitution of the active principle of chita. I. AMARESH CHANDRA RAY AND SIKHIBHUSHAN DUTT. *J. Indian Chem. Soc.* 5, 419-24 (1928).—*Plumbagin* is the active principle of chitraka or chita, the root of *Plumbago rosea*, *P. zeylanica* and *P. europaea*. By extg. the roots with petr. ether, b. $70-90^\circ$, and several recrystns. from dil. EtOH , plumbagin is obtained in golden yellow needles, m. $77-8^\circ$, mol. wt. in freezing C_6H_6 296, sol. in Et_2O , CHCl_3 , Me_2CO , C_6H_6 , AcOH, insol. in cold H_2O , volatile in steam gives a blood-red color with FeCl_3 , a dirty-green ppt. with alc. $\text{Cu}(\text{OAc})_2$, no ppt. with AgNO_3 , $\text{Pb}(\text{OAc})_2$ or CaCl_2 ; *mono-Ac deriv.* m. 138° ; *mono-Bz deriv.* m. 147° ; *mono-carbethoxy deriv.*, m. 109° ; *dioxime*, m. 220° ; *monophenylhydrazone*, m. 198° ; *monosemicarbazone*, m. above 280° . Alk. KMnO_4 soln. gave *cinnamic acid* and traces of HCO_2H . Fuming HNO_3 gave a *tetranitro deriv.* Br gave a *dibromide*. Distn. with Zn dust gave a solid and a liquid smelling of C_{10}H_8 . From the liquid the picrate of *methyl-naphthalene* was obtained.

PAUL J. CULHANE

Nitroid and quinoid secondary valence combination. EDUARD HERTEL AND HEINZ KURTH. *Univ. Bonn. Ber.* 61B, 1650-3 (1928).—Two NO_2 groups in different C_6H_4 nuclei do not form a common field of residual affinity, since attempts to prep. mol. compds. of aromatic hydrocarbons with the following di- NO_2 compds. were unsuccessful: 1,8- and 1,5- $\text{C}_{10}\text{H}_8(\text{NO}_2)_2$, $(m\text{-O}_2\text{NC}_6\text{H}_4)_2\text{CH}_2$, 2,7-dinitrofluorene. The grouping *m*-nitro-carbonyl-*m*'-nitro likewise does not give rise to a common field of residual affinity since the following systems showed no evidence of compd. formation: $(m\text{-O}_2\text{NC}_6\text{H}_4)_2\text{CO-C}_{10}\text{H}_8$, 2,7-dinitrofluorenone-stilbene. H. and K. conclude that the mol. compds. formed by 2,7-dinitroanthraquinone are not due to a nitroid field of residual affinity but to a quinoid field. This is supported by the fact that although

anthraquinone does not form mol. compds. with aromatic hydrocarbons, 2,7-dichloro-, 1,2,3,5,6,7,8-heptachloro- and 1-nitroanthraquinone give deeply colored melts with $C_{10}H_8$, fluorene, acenaphthene and anthracene. The resolidified melts are colorless (cf. Pfeiffer, *C. A. B.* 1742; 11, 1410). The following systems form eutectics: anthraquinone-stilbene, 2,7-dichloroanthraquinone (I)-stilbene, I-hexamethylbenzene, I-anthracene, I- α -naphthol, heptachloroanthraquinone- β - $C_{10}H_7NH_2$. Although phenanthraquinone forms a compd. with hexamethylbenzene (Pfeiffer, *C. A.* 11, 1410), it does not form compds. with other hydrocarbons. Melts of 2,7-dibromophenanthraquinone with aromatic hydrocarbons are deeply colored but the resolidified melts are colorless. The following mol. compds. are described: 4,5-dinitrophenanthraquinone + acenaphthene (1:1), red, m. 165°; 2,7-dinitrophenanthraquinone (II) + acenaphthene (1:1), dark red, m. 255°; II + anthracene (1:2), dark violet, m. 250°; II + fluorene (1:2), red-yellow, m. 270°; 2,6,7-trinitrofluorene + stilbene (1:1), red, m. 148°. 2,3,6,7-Tetranitrofluorene gives deeply colored cryst. compds. with stilbene and anthracene.

DAVID DAVIDSON

Manufacture of β -naphthol. A. I. ZAKHAROV. *J. Chem. Ind. (Moscow)* 5, 720-1 (1928).—On melting dry neutral β - $C_{10}H_7SO_3Na$ contg. 4-8% mineral salts (chlorides and sulfates) at 295-300° with an excess of alkali (1-1.5 mols.), the fluctuations of the temp. of fusion are sharp. In the crude product obtained after decompn. with acids and washing, the β -naphthol content is usually not above 75-80% of the pure β -salt. It is generally thought that Na_2CO_3 , if added, interferes with the normal course of the fusion and contributes to resinification. In reality, if the fusion of the β -salt (contg. the same quantity of mineral salts) is effected under the same external conditions, but in presence of an excess of 1-2% Na_2CO_3 , the thermic bends of the fusion curve of the product are softened. The influence of Na_2CO_3 is even more noticeable in the external course of the fusion: the melt does not thicken, as it usually does in presence of ordinary salt in the course of addn. of the last portions of β -salt, and the phenomenon of local overheating and charring is completely absent. The reason is that, when the last portions of the sulfonate are added, the acid or even the neutral sulfonate tends to decomp. because of the decrease of total alkalinity in the kettle; the presence of Na_2CO_3 preserves the salt crystal from decompn. by the temp. at a moment when, for some reason, it did not yet have time to be influenced by $NaOH$. Thus the fusion runs fairly smoothly and without formation of decompn. products. The melt is lighter in color and preserves its liquidity even if fusions are effected with 0.5 mole excess of alkalinity. The β -naphthol content in the decompd. and washed melt is increased on the av. to 93-6%. A higher Na_2CO_3 content in the sulfonate has the inconvenience of causing the melt to froth, but this phenomenon does not harmfully affect either the quant. yield of β -naphthol or the total quantity of the melt. The frothing is observed toward the end of the fusion when the melt is usually heated to 310-5°.

BERNARD NELSON

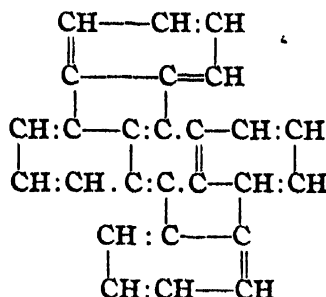
Naphthylene 1,8-disulfide. WM. BENNETT PRICE AND SAMUEL SMILES. King's College, London. *J. Chem. Soc.* 1928, 2372-4.—The diazosulfonate from 1,8- $C_{10}H_6(NH_2)SO_3H$ in H_2O , satd. with SO_2 and treated with Cu powder, then satd. with $NaCl$ gives 1-sulfonaphthalene-8-sulfonic acid, isolated as the Na salt; reduction in H_2O with SO_2 and dil. HCl gives 1,1'-dithiodinaphthalene-8,8'-disulfonic acid, isolated as the Na salt; transformed into the chloride with PCl_5 and treated with Na_2SO_3 , this gives the corresponding disulfinic acid (I), m. 144°; reduction with Zn dust in EtOH-concd. HCl gives 1,8-dithiolnaphthalene (II), m. 113-4°, which could not be purified because of the ease with which it is transformed into naphthylene 1,8-disulfide, orange, m. 116°. Me_2SO_4 and II give 1,8-dimethyldithiolnaphthalene, m. 84°; $Ni(AcO)_2$ and II give a brownish purple Ni deriv., $C_{10}H_6S_2Ni$. Reduction of I with Zn dust and EtOH into which dry HCl is passed gives 2-phenylperinaphtha-1,3-dithiane, m. 116°.

C. J. WEST

Rubiadin. II. Synthesis of 2-methyl-1,3-dihydroxyanthraquinone. PRAFULLA CHANDRA MITTER AND PRIYALAL GUPTA. *J. Indian Chem. Soc.* 5, 25-8 (1928); cf. *C. A.* 22, 587, 2562.— p - $MeC_6H_4CO_2H$ mixed with P_2O_5 was sulfonated 3-4 hrs. at 210-20° and 1 hr. at 250° in a sealed tube (*Ber.* 20, 982 (1887)), cooled, poured on to ice and neutralized with $BaCO_3$. On boiling, addn. of K_2CO_3 , filtration and evapn. the K 2,6-disulfonate is obtained. This fused with KOH at 210-20°, rising slowly to 260°, gave 4,3,5- $Me(OH)_2C_6H_2COOH$ (I) and 2,1,4- $HOC_6H_3(COOH)_2$ (II). Isolate I by H_2O extn., acidifying, Et_2O extn., evapn. of Et_2O and extn. of the residue with small quantities of hot $PhMe$, m. 175-6°. From the residue from I isolate II by boiling with $PhMe$, then with $BaCO_3$ in H_2O and filter. The soln. of the Ba salt was acidified and extd. with Et_2O and the ext. dried and esterified with $MeOH$ and H_2SO_4 . Washed

with Na_2CO_3 and crystd. from MeOH . The di-Me ester of **II** was obtained, m. 93° (Burkhardt, *Ber.* 10, 146(1887), gives 94°). It was heated with 8 parts BzOH in H_2SO_4 at 120° for 15 hrs. and poured on to ice. Steamedistd. and recrystd. from C_6H_6 it gave 1,3-dihydroxy-2-methylantranthraquinone (**III**), m. 290° . Acetylation of **III** with Ac_2O ($\text{C}_6\text{H}_5\text{N}$ as catalyst) 6 hrs. and crystn. from EtOH gave the *Ac deriv.* (**IV**), m. 225° . By the large excess of BzOH the yield of **III** is better and formation of anthrachrysone almost prevented (cf. Schlunck and Marchlewski, *J. Chem. Soc.* 63, 969(1893)). **III** and **IV** correspond in properties with rubiadin and acetylrubiadin. •FOSTER DEE SNELL

Constitution and synthesis of rubicene. W. SCHLENK AND MARGARETE KARPLUS. Univ. Berlin. *Ber.* 61B, 1675-80(1928).—In the course of a study of the behavior of aromatic ketones towards CaH_2 was discovered a simple method of synthesizing rubicene (**I**) which has proved to be an anthracene deriv.



The synthesis is based on the observation that Ph_2CO and *p*- $\text{PhC}_6\text{H}_4\text{COPh}$ heated with CaH_2 condense intermol. to 9,10-diarylanthracenes, giving 9,10-diphenyl- (**II**) and 9,10-dibiphenylylanthracene (**III**), resp. Possibly the Ph_2CO adds CaH_2 in the heat as it does an alkali metal in the cold, the $(\text{Ph}_2\text{CHO})_2\text{Ca}$ thus formed loses $\text{Ca}(\text{OH})_2$ and the resulting dihydrodiphenylanthracene stabilizes itself to **II** with elimination of H_2 . Fluorenone in the same way gives **I**, the identity of which was established not only by its compn. and appearance but also by the characteristic color change through green to violet-black when the PhNO_2 soln. is heated with anhyd. AlCl_3 . The condensation reaction is apparently not applicable to all diaryl ketones; with neither Michler's ketone nor *p*- $\text{MeOC}_6\text{H}_4\text{CO}$ could an anthracene deriv. be isolated. With MeCOPh CaH_2 behaves differently, producing, like HCl , *sym*- $\text{C}_6\text{H}_5\text{Ph}_3$; at the same time is formed a *compd.* $\text{C}_{24}\text{H}_{20}\text{O}$, m. $165\text{--}6.5^\circ$, which, it was thought, might be an intermediate product between the MeCOPh and $\text{C}_6\text{H}_5\text{Ph}_3$ but all efforts to convert it into the latter have failed. **III**, yellow, m. considerably above 300° , is strikingly fluorescent in soln., minimal traces imparting to solvents a magnificent fluorescence (blue to red); its structure was established by its prepn., with boiling HCO_2H , from 9,10-dibiphenylyl-9,10-dihydroxydihydroanthracene (**IV**), m. 290° , gives a dark olive-green color with concd. H_2SO_4 ; the **IV**, in turn, was made from anthraquinone and *p*- $\text{PhC}_6\text{H}_4\text{MgI}$. C. A. R.

Chemistry of aromadendrene. I. LINDSAY H. BRIGGS AND WALLACE F. SHORT. Univ. College, Auckland. *J. Chem. Soc.* 1928, 2524-9.—The sesquiterpene fraction of the oil of *Eucalyptus nova-angelica*, after repeatedly fractionating in a vacuum over Na-K , finally was collected in 2 main fractions (representing about 20% of the original oil), which had the following properties: b_{10} 121° , $[\alpha]_{577}^{20} -6.1^\circ$, d_4^{20} 0.9116, n_D^{20} 1.4978; b_{10} $121\text{--}1.4^\circ$, $[\alpha]_{577}^{20} \approx 0^\circ$, d_4^{17} 0.9157, n_D^{17} 1.4993. These values indicate that the bulk of the sesquiterpene fraction consists of a single tricyclic sesquiterpene (aromadendrene (**I**)) exhibiting an exaltation of approx. 1 unit in its mol. refractive power. Exhaustive hydrogenation by the methods of Skita and Paal gives the *dihydro deriv.*, b_{10} $121\text{--}2^\circ$, d_4^{17} 0.9014, n_D^{17} 1.4871. Attempts to prep. solid addn. products from **I** have not been successful; the HCl deriv. cannot be distd. in a vacuum without considerable decompn. Dehydrogenation of **I** with S yielded a deep blue oil (b_{10} $122\text{--}65^\circ$), from which no C_{10}H_8 deriv. could be isolated, although a small quantity of a black picrate (azulene picrate?) was isolated from it. **I** and O_3 in AcOH give 61% of *aromadendrone* (**II**), m. $80\text{--}1^\circ$; *oxime*, m. 103° ; *semicarbazone*, m. $189.5\text{--}90.5^\circ$ (decompn.); dehydration of the oxime does not yield a nitrile. **II**, boiled with Ac_2O and AcONa , does not give an enol-acetate, indicating that the CO group is either situated in a side chain or attached to 2 quaternary C atoms in the nucleus. The result of the action of O_3 clearly shows the presence of the group $\text{CC}(\text{:CH}_2)\text{C}$. C. J. WEST

• The constitution of diprene. OSSIAN ASCHAN AND ILMARI KROHN. *Finska*

Kemistsamfundets Medd. 34, 68–71 (1925).—Diprene formed in isoprene on standing 10 yrs. at room temp., in a sealed glass container. The m. ps. of the di-HCl and the di-HBr salts of diprene are 51.5–52° and 46–7°, of which the 1st is identical and the 2nd almost with the m. ps. of the corresponding derivs. of carvestrene prep'd. by Baeyer (*Ber.* 27, 3485(1894)). The relation of diprene and carvestrene was established by the synthesis of the latter and conversion to the di-HBr salt which gave identical m. ps. This shows that diprene contains a *m*-cymene ring, but does not establish complete identity of carvestrene and diprene, since they may not have the same position for the double bond.

HANS C. DUUS

Synthesis of 1-phenanthrol. JOHN B. SHOESMITH AND ALEXANDER GUTHRIE. Edinburgh Univ. *J. Chem. Soc.* 1928, 2332–4. — α -C₁₀H₇CHO (*p*-nitrophenylhydrazone, scarlet, m. 233–5°), succinic anhydride and AcONa, heated 6 hrs. at 122°, give α -naphthylparaconic acid, m. 169°, which, heated at 180–200° for 30 min., loses CO₂ and gives 5% of 1-phenanthrol, m. 156°; this is stable in air, in contrast to the 9-isomer, which is very unstable; warming with CHCl₃ in alk. soln. gives a deep blue color; concd. H₂SO₄ gives a yellow soln., slowly becoming red and then colorless on heating; picrate, orange-red, m. 182°; the Me ether, m. 105°.

C. J. WEST

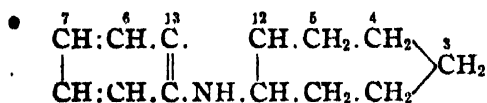
Improved method of preparing selenophene. HENRY V. A. BRISCOE, JOHN B. PEEL AND PERCY L. ROBINSON. *J. Chem. Soc.* 1928, 2628–9; cf. *C. A.* 22, 3657.—Se, in portions of 5 g., is heated in an inclined Pyrex tube, closed at the lower end and provided with an axial inlet tube delivering C₂H₂ some in. above the Se and well below a side tube leading to a condenser; the middle of the tube is heated to redness and the Se is slowly vaporized by heating it from the surface downward; a liquid condensate is formed at the rate of 3–4 cc. in 4 hrs. The reaction proceeds more smoothly if the Se is mixed with the C residue from previous runs. From 135 cc. of such a distillate there were obtained 20 cc. C₆H₆, 80 cc. selenophene, 10 cc. liquid hydrocarbon, b. 110–20°, and 10 cc. b. 150–80°, 10 g. C₁₀H₈ and 4 cc. of a green liquid contg. Se.

C. J. WEST

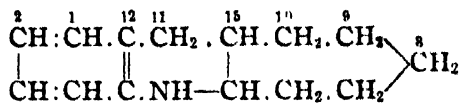
Conditions of formation of rings attached to the *o*-, *m*- and *p*- positions of the benzene nucleus. III. ALAN F. TITLEY. Dyson Perrins Lab., Oxford. *J. Chem. Soc.* 1928, 2571–83; cf. *C. A.* 20, 1794.—Et *o*-carboxyphenylpropionate, b₁₄ 182–3°, gives with Na in PhMe at 100° the Na deriv. of Et 1-hydrindone-2-carboxylate; the latter with PhNHNH₂.HCl and a little concd. HCl, heated on the H₂O bath and then 2 min. at 150°, gives 2,3-indeno(1,2)-indole, brownish red, m. 251°. Hydrolysis of Et 2-methyl-1-hydrindone-2-carboxylate, b₁₄ 156°, m. 31°, with 20% MeOH-KOH gives 60% of 2-methyl-1-hydrindone and 40% of β -*o*-carboxyphenylisobutyric acid, m. 141°. Et γ -*o*-carbethoxyphenylbutyrate, b₁₄ 188–9°, with Na in PhMe gives after 6–7 hrs. at 100° Et 1-keto-1,2,3,4-tetrahydronaphthalene-2-carboxylate (I), b₁₄ 183°, m. 33°; with PhNHNH₂.HCl and HCl I gives 1,2-indole(2,3)-3,4-dihydronaphthalene, dark red, m. 161°. I, Na and MeI give the 2-Me deriv., b₁₈ 183–4°; steam distn. with 20% H₂SO₄ gives 1-keto-2-methyltetrahydronaphthalene, b₂₀ 143°, while alk. hydrolysis with 10% MeOH-KOH gives a mixt. of the ketone and γ -*o*-carboxyphenyl- α -methylbutyric acid, m. 173°. The decrease in stability of the satd. ring on the addn. of the Me group is very strikingly exemplified in this instance, since the unmethylated ester is hydrolyzed to *o*-HO₂CC₆H₄(CH₂)₃CO₂H only by Na and boiling cyclohexanol and then to an extent of not more than 20%. Et *o*-phenylenedipropionate, b₁₂ 200–2°; 11.5 g. of the ester with 1.8 g. Na and 75 g. PhMe give 9 g. of the free acid and about 0.5 g. of a brown oil, b₁₈ 190°, which could not be purified but yields a phenylhydrazone, straw-yellow, m. 198° (decompn.), probably derived from Et 3-ketophenheptamethylene-2-carboxylate. Me *m*-phenylenediacetate (II), b₁₆ 185–7°; Et ester (III), b₁₈ 188–9°; Me *p*-phenylenediacetate (IV), b₁₈ 189–90°; Et ester (V), m. 59°. III and Na in PhMe give the free acid and a solid, sticky mass, softens and m. 30–40° and decomps. above 100°; attempts at distn. under 0.3 mm. led to complete decompn. with the formation of a horny, shellac-like mass. EtOH solns. give a deep purple color with FeCl₃ and a deep green Cu salt but no cryst. compd. is formed with PhNHNH₂; hydrolysis with EtOH-KOH gives yellow insol. resins. V gives almost precisely similar results but the sirupy mass yields an amorphous, red, glassy mass with PhNHNH₂, from which was obtained a small quantity of yellow needles, C₁₈H₁₈O₂N₂, m. 194–5°. II and Na in PhMe give 3 fractions, b₁ 131–5° (the free acid and phenylene-1-acetic-3- α -propionic acid, m. 132°); b₁ 217–22°, contg. the compd. C₂₄H₂₄O₆, with a bridged-ring structure and yielding on hydrolysis a lactone or acid anhydride, C₂₂H₁₈O₆, m. 345–6°; and b₂ 270° and upwards, contg. highly complex compds. IV behaves similarly and gave phenylene-1-acetic-4- α -propionic acid, m. 189°, and the compd. C₂₄H₂₄O₆, b₁ 225–8° *m*-Carboxyphenylpropionic acid, m. 177°; Me ester (VI), b₁₈ 184–5°. The *p*-isomer (VII

was synthesized in 2 ways: $p\text{-MeC}_6\text{H}_4\text{COCl}$ and Br give a mixt. of $p\text{-BrCH}_2\text{COCl}$ and $\omega\text{-bromo-}p\text{-toluyl bromide}$, b_{10} 170–1°, m. 58°, and also a high boiling product which yields with EtOH $\text{Et } \omega\text{-bromo-}p\text{-toluate}$, m. 103°. $\text{Et } \omega\text{-bromo-}p\text{-toluate}$, b_{10} 165°, m. 35–6°; with $\text{ClCH}(\text{CO}_2\text{Et})_2$ the results a fair yield of $\text{Et chloro-}p\text{-carbethoxybenzylmalonate}$, b_{10} 235°, m. 54–5°; reduction with Zn and AcOH gives $\text{Et } p\text{-carbethoxybenzylmalonate}$, b_{10} 218–9°, hydrolyzed to $p\text{-carboxybenzylmalonic acid}$, m. 186–8°; heating the latter to 240° gives VII, m. 294°. $p\text{-HO}_2\text{CC}_6\text{H}_4\text{CH}_2\text{CH:CHCO}_2\text{H}$ (Et ester , m. 52°), on reduction with Na-Hg and Na_2CO_3 , gives VII (Me ester , m. 33°). VI with Na and PhMe gives a product b_{10} 183–7°, which, on hydrolysis, yields the free acid and $\beta\text{-}m\text{-carboxyphenylisobutyric acid}$ (VIII), m. 137–8° (cor.), the constitution being established by the following synthesis: $m\text{-MeC}_6\text{H}_4\text{COCl}$ and 1 atom Cl give 90% of $\omega\text{-chloro-}m\text{-toluyl chloride}$, b_{10} 149–50°; EtOH gives $\text{Et } \omega\text{-chloro-}m\text{-toluate}$, b_{10} 168–9°; $\text{CHMe}(\text{CO}_2\text{Et})_2$ gives $\text{Et } m\text{-carbethoxybenzylmethylmalonate}$, b_{10} 234°; the free acid, m. 182–3° (decompn.), on heating at 185° gives VIII (Me ester , b_{10} 182°). $\text{Et } m\text{-phenylenedipropionate}$, b_{10} 197–8°; $p\text{-isomer}$, m. 69°. These reacted very slowly with Na , with the gradual formation of the Na salt of the acid. C. J. WEST

Stereoisomerism in polycyclic systems. V. WM. HENRY PARKIN, JR., AND SYDNEY G. P. PLANT. Dyson Perrins Lab., Oxford. *J. Chem. Soc.* 1928, 2583–90; cf. C. A. 22, 1978.—Suberone phenylhydrazone (18 g.), 360 cc. H_2O and 36 cc. concd. H_2SO_4 , heated on the H_2O bath for 25 min., give 11 g. 2,3,4,5-tetrahydroheptindole (I), m. 144° (*picrate*, dark crimson, m. 142°); reduction with Sn and HCl gives 2,3,4,5,11,12-hexahydroheptindole (II), m. 77°; *picrate*, yellow, m. 176° (decompn.); HCl salt, sparingly sol.; 10-Ac deriv., m. 87°; 10-Bz deriv., m. 116°; a 2nd isomer could not be isolated, and probably not more than 5% is formed. Suberone $p\text{-bromophenylhydrazone}$, m. 57°, quickly decomp. in the air; with H_2SO_4 , this gives the 7-Br deriv. of I, m. 129–30°; it is not basic; partial debromination occurs during attempted reduction. Reduction of 7,8,9,10-tetrahydroheptaquinoline gives the 5,7,8,9,10,11,14,15-octahydro deriv. (III), b_{24} 203°, isolated through the 5-Bz deriv., m. 145°; *picrate*, orange-red, m. 196°; no appreciable quantity of an isomer was formed. Suberone and $o\text{-H}_2\text{NC}_6\text{H}_4\text{CO}_2\text{H}$, heated 1 hr. at 120° and 15 min. at 210°, give 11-keto-5,7,8,9,10,11-hexahydroheptaquinoline, m. 344–5°; reduction with Na-Hg gives only III. A quant. study of the reduction of tetrahydroacridine with Sn and $\text{EtOH-H}_2\text{O-HCl}$ shows that octahydroacridine B and A are obtained in the ratio 17.3:4.7. Tetrahydroacridone is reduced by Sn and HCl to hexahydroacridone, yellow, m. 180°; *oxime*, pale yellow, m. 215–6°.



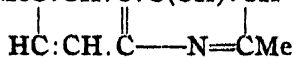
(II)



(III)

C. J. WEST

Metabolism of tryptophan. II. Synthesis of 6-methyl- and 8-methylkynurenic acid. WILLIAM ROBSON. King's College, Univ. London. *Biochem. J.* 22, 1157–64 (1928).—The starting points for 6-(I) and 8-methylkynurenic acid (II) were p - and o -toluidine, resp. p -Toluidine and $\text{AcCH}_2\text{CO}_2\text{Et}$ yielded p -methyl- γ -hydroxyquinaldine, MeC:CH.C.C(OH):CH (III) which gave the corresponding $\gamma\text{-Cl}$ compd. (IV)



and this reacted with NaOMe to form p -methyl- γ -methoxyquinaldine (V). Condensation of V with BzH gave benzylidene- p -methyl- γ -methoxyquinaldine (VI); with KMnO_4 in acetone, VI was converted to p -methyl- γ -methoxyquinoline-2-carboxylic acid (VII). HBr converted VII to p -methyl- γ -hydroxyquinoline-2-carboxylic acid (I). The synthesis of II followed along similar lines. III. The mode of formation of kynurenic acid from tryptophan. *Ibid* 1165–8.—In the formation of kynurenic acid from tryptophan, the pyrrole N of the latter compd. is eliminated and the side chain with its amino N forms the new pyridine ring.

BENJAMIN HARROW

Pure carbazole. T. V. ARISTOV. *J. Chem. Ind. (Moscow)* 5, 721 (1928).—Most manuals give 238° as the m. p. of carbazole; only 1 gives 247° on the basis of Kirby's work (cf. C. A. 14, 2936; 16, 1240). Kahlbaum's "pure" carbazole, m. 238–41°, was repeatedly recrystd. from several solvents (alc., glacial AcOH , C_6H_6 , PhMe , xylene, etc.). After the 1st recrystn. the m. p. rises to 239–42°; on further purification it reaches 246° and then remains unchanged. The purified substance appears in the form of brilliant fluorescent tablets which give the color reactions characteristic of

carbazole. *N detms.* Kahlbaum's carbazole 8.17%, purified carbazole 8.29%, theoretical 8.38%. The *picrate* obtained from purified carbazole m. 185.5°. It has been recommended to purify carbazole by H_2SO_4 , but A. advises against it, as it lowers the m. p. of the substance obtained after recrystn.; apparently partial sulfonation takes place.

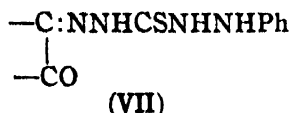
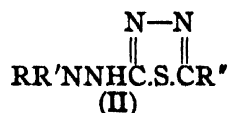
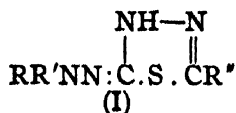
BERNARD NELSON

Derivatives of tetrahydrocarbazole. VII. Reactions of 3-methyltetrahydrocarbazole, 6-chlorotetrahydrocarbazole and their acyl derivatives. SYDNEY G. P. PLANT AND REGINALD J. ROSSER. Univ. of Oxford. *J. Chem. Soc.* 1928, 2454-64; cf. C. A. 21, 91.—Crude 4-methylcyclohexanone (I) phenylhydrazone (7 g.) warmed with 120 cc. 17% H_2SO_4 for 15 min. gives 3-methyltetrahydrocarbazole (II), m. 109-10°. I *p*-nitrophenylhydrazone, yellow, m. 128.5°; with boiling 25% H_2SO_4 this gives the 6- NO_2 deriv. of II, brown, m. 165-6°. I *o*-nitrophenylhydrazone, crimson, m. 59°; this gives the 8- NO_2 deriv. of II, bright red, m. 188°. I *m*-nitrophenylhydrazone, orange-red, m. 80-1°; 27% H_2SO_4 gives a mixt. of the 5(or 7)- NO_2 deriv. (III) of II, yellow, m. 188°, and the more sol. 7(or 5)- NO_2 deriv., orange-red, m. 175°, in about equal quantities. Nitration of II in concd. H_2SO_4 at -10° with KNO_3 gives the 6- NO_2 deriv. II, boiled with 2.5 parts Ac_2O for 3 hrs., gives the 9-*Ac* deriv. (IV), m. 108.5°. Nitration with HNO_3 (d. 1.42) gives the 5(or 7)- NO_2 deriv., yellow, m. 134°, hydrolyzed to III. When IV was treated with HNO_3 (d. 1.42) at 50° and the NO_2 deriv. filtered off, the filtrate, on neutralizing with NaOH, gives the 10,11-di-*HO* deriv. of IV, m. 189-90°, which, boiled with Ac_2O for 2 hrs., yields 6-acetyl-3-methyl- ψ -indoxylspirocyclopentane, m. 93.5°. II, treated with $EtMgI$ and then with $BzCl$, gives the 9-*Bz* deriv., b₁₁ 255-65°, m. 99°; HNO_3 at 30° gives the 11,10-nitrohydroxy deriv., pale yellow, m. 123° (decompn.), while from the AcOH mother liquors there is isolated the 5(or 7)- NO_2 deriv., yellow, m. 142.5°, yielding III on hydrolysis. II, $EtMgI$ and $ClCO_2Et$ give *Et* 3-methyltetrahydrocarbazole-9-carboxylate, m. 66-7°; HNO_3 gives the 5(or 7)- NO_2 deriv., yellow, m. 104° and, from the AcOH mother liquor, the 10,11-di-*HO* deriv., m. 135°. Reduction of II with Sn and HCl gives a mixt. of 3-methylhexahydrocarbazole A (V), m. 58.5°, and a small quantity of the isomer B, m. 128°; electrolytic reduction gives only V. The 9-*Bz* deriv. of V m. 81.5°; the 9-*Ac* deriv., m. 101°; the *picrate*, yellow, m. 115-6°. Nitration of 6-chlorotetrahydrocarbazole (VI) in concd. H_2SO_4 at -10° with KNO_3 gives the 5(or 7)- NO_2 deriv. (VII), yellow, m. 183.5°. 4-Chloro-3-nitrophenylhydrazine, orange, m. 109°. Cyclohexanone 4-chloro-3-nitrophenylhydrazone, red, m. 106-7°; with boiling 25% H_2SO_4 there results a mixt. of VII and the 7(or 5)- NO_2 deriv. of VI, orange, m. 162°, in about equal quantities. 4-Chloro-2-nitrophenylhydrazine, red, m. 134°. Cyclohexanone 4-chloro-2-nitrophenylhydrazone, red, m. 101°. H_2SO_4 converts this into the 8- NO_2 deriv. of VI, orange-red, m. 213°. VI, on boiling with 4 parts Ac_2O 24 hrs., yields the 9-*Ac* deriv., m. 136°; nitration at 90° gives the 10,11-di-*HO* deriv., m. 222°; if the temp. is maintained at 80°, there is also obtained a small quantity of the 5(or 7)- NO_2 deriv., yellow, m. 184.5-5.5°, more easily obtained by treating the 9-*Ac* deriv. in AcOH at 55° with HNO_3 of d. 1.5; hydrolysis gives VII. The 9-*Bz* deriv. of VI, m. 122-3°, nitrated in AcOH at 80° with HNO_3 of d. 1.42, gives the 5(or 7)- NO_2 deriv., yellow, m. 148° and a small quantity of the 11,10-nitrohydroxy deriv., m. 147° (decompn.), more easily obtained with HNO_3 of d. 1.5 in AcOH at 40-50°. *Et* 6-chlorotetrahydrocarbazole-9-carboxylate, m. 111-2°; the 5(or 7)- NO_2 deriv., yellow, m. 126°. Fuming HNO_3 gives the 11,10-nitrohydroxy deriv., m. 136-7°; boiling EtOH transforms it into the 11,10-di-*HO* deriv., m. 132°.

C. J. WEST

Hetero-ring formations with thiocarbohydrazide. III. Reactions of substituted thiocarbohydrazides. PRAPHULLA CHANDRA GUHA AND SATYENDRA KUMAR ROY-CHOUDHURY. Univ. Dacca. *J. Indian Chem. Soc.* 5, 149-61(1928); cf. C. A. 20, 1810.—Aryl-substituted thiocarbohydrazides, $RR'NNHCSNHNH_2$ ($R = Ph$ or $Me-C_6H_4$, $R' = H$ or Me) have been prepd. by the action of $N_2H_4 \cdot H_2O$ on $RR'NNHCS_2Me$. The ring closure in the corresponding aldehyde thiocarbohydrazones, $RR'NNHCSNHN:CHR$, was effected with $FeCl_3$; for the resulting thiobiazoles the formula I is rejected because the thiobiazoles could not be hydrolyzed by boiling concd. HCl and no $RR'NNH_2$ could be detected in the soln. thus treated. Formula II thus appears to be correct. *o*- ClC_6H_4CHO with $PhNHNHCSNHNH_2$ (III) does not only yield a thiocarbohydrazone but the reaction proceeds a step further, with loss of HCl and formation of 2-phenylhydrazino-6,7-benzo-1,3,4-thioheptadiazine (IV), which cannot be desulfurized with HgO . With phenanthraquinone and acenaphthaquinone III gives 2,3-phenanthra- (V) and 2,3-acenaphtho-6-keto-1,4,5-oxdiazine phenylhydrazone (VI), the normal thiocarbazone first formed rearranging, by migration of a H atom, into the azo form (VII \rightarrow VIII), which changes, with loss of H_2S , into the oxdiazine.

With 1 mol. phenanthraquinone oxo-oxime **III** gives an oxheptatriazine (**IX**), with isatin a thiodiazine (**X**). With $\text{AcCH}_2\text{CO}_2\text{Et}$ **III** forms the thiocarbohydrazone (**XI**), which with NaOEt loses EtOH and yields 1-carbothiophenylhydrazido-3-methyl-5-pyrazolone (**XII**); with $\text{MeC(OH):CHCH}_2\text{Ac}$ is obtained 2-phenylhydrazino-5,8-dimethyl-1,3,4-thiooctadiazine (**XIII**), insol. in alkali and not desulfurized by HgO . The reaction of **III** with ω -Br ketones is analogous to that of thiosemicarbazides (Bose, C. A. 20, 415) except that it proceeds in only 1 direction (formation only of the thiodiazine), PhCOCH_2Br giving a compd. (**XIV**) which does not react with aldehydes. $\text{ClCH}_2\text{CO}_2\text{Et}$, on the other hand, gives a compd. (**XV**) contg. a $\text{NH}_2\text{N}=\text{}$ group, as it reacts readily with BzH . This difference can be explained by assuming that the C:O group of PhCOCH_2Br reacts with the hydrazino side of the **III** to form the thiocarbazone, which then yields **XIV** by loss of HBr , while with $\text{ClCH}_2\text{CO}_2\text{Et}$, HCl is eliminated first with formation of $\text{PhNHNHC(:NNH}_2\text{)SCH}_2\text{CO}_2\text{Et}$, which then loses EtOH to give **XV**. The PhNHNHCSNHN:CHR' with $\text{ClCH}_2\text{CO}_2\text{Et}$ or PhCOCH_2Br lose EtOH or H_2O , resp., forming thiodiazines (**XVI** or **XVII**), which on hydrolysis yield compds. reacting very readily with aldehydes and mustard oils and which must therefore contain a reactive $\text{NH}_2\text{N}=\text{}$ group. Phenylthiocarbohydrazone (**III**) (2.5 g. from 10 g. PhNHNHCSMe), m. $149-50^\circ$, sol. in alkalies, sparingly in HCl ; HCl salt, m. 181° , becomes light brown in the air. Et m-tolylthiocarbazinate (2 g. from 24 g. m- $\text{MeC}_6\text{H}_4\text{NHNH}_2$, EtBr and CS_2 with KOH in aq. alc.), m. 99° , sol. in alkali and reprecipitated by acids. m-Tolylthiocarbohydrazone, brownish white, m. $163-4^\circ$ (decompn.). Et 1-phenyl-1-methyldithiocarbazinate, oil; 1-methyl-1-phenylthiocarbohydrazone, m. $228-9^\circ$ (decompn.). 1-Phenylthiocarbohydrazones: benzaldehyde, m. 185° ; p-nitrobenzaldehyde, m. 192° ; cinnamic aldehyde, light yellow, m. $167-98^\circ$ (probably should be $167-68^\circ$ or $197-98^\circ$.—ABSTR.); salicylaldehyde, m. 206° (decompn.); acetone, m. 162° . p-Nitrobenzaldehyde 1-m-tolylthiocarbohydrazone, light yellow, m. $165-6^\circ$. 2-Phenyl-5-phenylhydrazino-1,3,4-thiodiazole (**II**, R and $\text{R}' = \text{Ph}$, $\text{R}'' = \text{H}$), orange, m. 172° , insol. in acids and alkalies. 2-Cinnamyl analog, dark red, shrinks 168° , m. 173° . 2-p-Nitrophenyl compd., golden yellow, m. $263-4^\circ$. **IV**, pale yellow, m. 195° . **VI**, reddish green, m. above 300° , insol. in acids and alkalies, gives a deep blue color with concd. H_2SO_4 ; m-tolylhydrazone, reddish green, m. above 295° . **VI**, black, m. above 300° . 3,4-Phenanthra-7-keto-1,2,5,6-heptaotriazine phenylhydrazone (**IX**), reddish green, m. above 300° . 2,3-Isatino-6-keto-1,4,5-thiodiazine phenylhydrazone (**X**), red, becomes brownish about 260° , brown at 300° . Et acetoacetate phenylthiocarbohydrazone (**XI**), m. $115-6^\circ$, sol. in alkali and reprecipitated by acids. **XII**, m. 142° (decompn.). **XIII**, m. 230° (decompn.). 2-Phenylhydrazino-5-phenyl-1,3,4-thiodiazine (**XIV**), m. 199° . 2,5-Diketo-4-phenyltetrahydro-1,3,4-thiodiazine hydrazone (**XV**), light brown, m. $152-3^\circ$, readily sol. in HCl ; benzal deriv., yellow, m. 158° . 2,5-Diketo-4-phenyltetrahydro-1,3,4-thiodiazine 2-salicylaldehydehydrazone (**XVI**), m. 220° , hydrolyzed by boiling, moderately concd. HCl to **XV**, which seps. as the HCl salt, m. $247-8^\circ$ (decompn.). Benzal analog of **XVI**, m. 189° (decompn.) (it is difficult to see why this compd. should be different from the benzal deriv. (above) of **XV**.—ABSTR.). 2-Keto-4,5-diphenyl-dihydro-1,3,4-thiodiazine salicylaldehydehydrazone (**XVII**), chocolate-colored, m. 221° .



C. A. R.

The constitution of compral. P. PREIFFER AND R. SEYDEL. Univ. Bonn. Z. physiol. Chem. 178, 81-96(1928).—On the basis of thawing point curves "compral" is a definite chem. compd. of 1 pyrimidone with 1 voluntal ($\text{CCl}_3\text{CH}_2\text{OCONH}_2$). Both components also have the property of forming similar compds. with other related substances. The following have been obtained in cryst. form: 1 sarcosine anhydride + 1 voluntal, m. 73° , 1 antipyrine + 1 phenylvoluntal, m. 70° , 1 sarcosine anhydride + 2 phenylvoluntal, m. 121° , 1 sarcosine anhydride + 2 urethan, m. 70° , 1 sarcosine anhydride + 2 phenylurethan, m. $95-7^\circ$. The following compds. were indicated by thawing point curves but could not be isolated: 1 acetylaminopantipyrine + 1 voluntal, and 1 antipyrine + 1 voluntal. The residual affinity of pyrimidone emanates from the acid amide grouping and not from the Me_2N group, since antipyrine itself shows this affinity. Substitution of 1 alkyl or aryl in the CONH_2 of voluntal weakens the

affinity and substitution of 1 alkyl and 1 aryl or 2 alkyls destroys it. The Cl atoms in voluntal contribute toward the affinity since neither urethan nor phenylurethan combines with pyrimidone, although both combine with sarcosine anhydride.

A. W. DOX

The constitution of hypnal and trigemih. P. PFEDER AND R. SEYDEL. Univ. Bonn. *Z. physiol. Chem.* **178**, 97-108(1928).—Hypnal (1 antipyrine + 1 chloral hydrate), bihypnal (1 antipyrine + 2 chloral hydrate), and trigemih (1 pyrimidone + 1 butylchloral hydrate) are definite mol. complexes as shown by thawing-point curves. Similar complexes now described are: 1 sarcosine anhydride + 1 chloral hydrate, m. 92-5°, crystd. from H₂O, and 1 sarcosine anhydride + 2 chloral hydrate, m. 83-86.5°, crystd. from C₆H₆. Neither cholesterol nor mannitol forms a compd. with CCl₃CH(OH)₂, MeCHClCCl₂CH(OH)₂ or sarcosine anhydride. To form such complexes an alc. must have 2 OH on the same C. The union between the 2 components is, however, unstable and a sepn. can usually be effected by means of a suitable solvent. This is not so with "anhydrohypnal," where an actual condensation between antipyrine and chloral has occurred with loss of H₂O.

A. W. DOX

More on α,β -benzisothiazolone. ARNOLD REISSERT. Univ. Marburg. *Ber.* **61B**, 1680-2(1928).—McClelland has called R.'s attention to the fact that he and his co-workers had already prepd. (*C. A.* **20**, 2327 and earlier papers) some of the compds. described by R. and Manns (*C. A.* **22**, 4114). Stollé obtained from HNO₂ and 3-aminobenzisothiazole a substance which should be 3-benzisothiazolone but its identity with R.'s and McC.'s compd. (I) has not been proved. R. has tried in vain (with HEINRICH DÜSTERDIEK) to prep. Stollé's benzisothiazole from I in 3 ways: (1) Zn dust distn. of I; (2) conversion of I with PCl₅ into 3-chlorothiazole (II), m. 40° and reduction of the II; and (3) reduction of I with HI. Distn. of I with Zn dust removes not only the O but also the ring S and PhCN is formed; II with Zn dust in boiling HCl gives the dimol. 3,3'-bisbenzisothiazolyl, m. 100°; reduction of I with fuming HI at 230° results in complete decompn.

C. A. R.

Formation of 2-substituted benzimidazoles. MONTAGUE A. PHILLIPS. May and Baker, Ltd., Wandsworth, Eng. *J. Chem. Soc.* **1928**, 2393-9; cf. *C. A.* **22**, 1356.—2-Methylbenzimidazoles are readily formed by the action of boiling dil. HCl on mono- or diacetyl-o-diamines and by the action of Ac₂O and HCl on o-C₆H₄(NH₂)₂; it has been suggested that the hydrolysis of the di-Ac to the mono-Ac compd. constituted a stage in the formation of the ring compd. from the former. The reaction has been extended and in view of its general nature it is now suggested that an alternative mechanism may be the hydrolysis of the diamine with subsequent ring formation. o-C₆H₄(NH₂)₂ (0.02 mol.), 0.03 mol. of the requisite acid and 20 cc. 4 N HCl were boiled 30-40 min. and the filtered soln. neutralized with NH₄OH; the following compds. were thus prepd.: HCO₂H, benzimidazole (I), 60% yield, m. 170°; AcOH, 2-Me deriv., 60%, m. 176°; EtCO₂H, 2-Et deriv., 70%, m. 177°; HOCH₂CO₂H, 2-hydroxymethyl deriv., 65%, m. 171-2°; MeCH(OH)CO₂H, 2- α -hydroxyethyl deriv., 70%, m. 178-9°; PhCH(OH)CO₂H, 2- α -hydroxybenzyl, 50%, m. 202-3°; BzOH, traces of 2-Ph deriv. I was also obtained by reduction of o-O₂NC₆H₄NHOCH and by the action of boiling 4 N HCl on o-H₂NC₆H₄NHOCH. 3-Nitro-4-lactaminophenetole, m. 115°, is reduced with Fe and dil. AcOH to the NH₂ compd., m. 135-6° (60% yield); 4 N HCl gives 5-ethoxy-2-[α -hydroxyethyl]benzimidazole, m. 170-1°. 3-Amino-4-formamidobenzyl cyanide, m. 124°, results in 50% yield by reducing the 3-NO₂ compd.; heating with HCO₂H for 20 min. gives 3,4-diformamidobenzyl cyanide, m. 92-5°; either deriv. with 4 N HCl gives 5-cyanomethylbenzimidazole, m. 158-9°. o-C₆H₄(NH₂)₂ and (CO₂H)₂ with 4 N HCl give 2,3-dihydroxyquinoxaline, does not m. 350° (Na salt, prisms). CH₂(CO₂H)₂ gives a mixt. of C₆H₄(NHCO)₂CH₂ (Na salt, cubes), and 2-aminomalonanilic acid, m. 175-6°; boiling with dil. HCl for 0.5 hr. gives C₆H₄(NHCO)₂CH₂. (CH₂CO₂H)₂ and o-C₆H₄(NH₂)₂ (1 mol. of each) give 2,2'-diaminosuccinanilide and benzimidazole-2-propionic acid; using 2 mols. o-C₆H₄(NH₂)₂ gives α,β -dibenzimidazolylethane and traces of the acid. That these reactions are not confined to the aromatic diamines is suggested by the ready conversion of C₂H₄(NHAc)₂ into 2-methyl-4,5-dihydroglyoxaline by boiling with dil. HCl.

C. J. WEST

Pseudo bases and their salts in the isoxazole series. II. E. P. KOHLER AND N. K. RICHTMYER. Harvard Univ. *J. Am. Chem. Soc.* **50**, 3092-106(1928); cf. *C. A.* **22**, 1973.—Triphenylisoxazole (25 g.) and 100 g. Et₂SO₄, heated at 120° for 5 hrs., the product digested with 50 cc. concd. HCl and 50 cc. H₂O on the H₂O bath for 1 hr., the cooled product extd. with Et₂O and then treated with excess of 1:1 aq. FeCl₃, give 42 g. of the FeCl₃ salt of the Et deriv. (I), pale yellow, m. 165-7°. I does not react with O₂, but KMnO₄ gives BzOH, a trace of AcOH and benzil. I and MeMgI give ethyl-1,2-

diphenyl-2-benzoylvinylamine, yellow, m. 118-9°, also obtained by the action of MeMgI upon $\text{PhBzC:C(N:CH}_3\text{)Ph}$; hydrolysis with MeOH-HCl gives $\text{Ph(BzO)}_2\text{CH}$ and $\text{Et-NH}_2\cdot\text{HCl}$. With NaOH I gives the pseudo base, *2-ethyl-3,4,5-triphenyl-5-hydroxyisoxazoline* (II), m. 120° (decompn.); the oxidation products are the same as I. II in Et_2O , shaken with an inadequate quantity of acid, gives an aq. soln. of the salt; by using HCl and FeCl_3 , I is regenerated; KBr and Br give a perbromide; KMnO_4 a violet permanganate, which ultimately decomps. Na added to II in Et_2O gives the lemon-yellow Na salt. II reacts with 3 mols. MeMgI and liberates 2 mols. CH_4 . With MeOH and NaOH there results the *Me ether* of II, m. 100°, decomps. 150°, giving IV. Treated with HCl, the chloride ppts. which reacts with NaCN to give *2-ethyl-3,4,5-triphenyl-5-cyanoisoxazoline* (III), m. 89°, losing HCN and giving IV. *Ethylidene- α,β -diphenyl- β -benzoylvinylamine* (IV), BzCPh:CPhN:CHMe , results from II by the loss of H_2O , from the Me ether by the loss of MeOH and from IV by the loss of HCN; because of the ease of hydrolysis it is difficult to obtain pure by any process; it is best prepd. by heating II at 120° and 3 mm. for 10 min., and finally crystg. from MeOH, when it m. 112°; boiling MeOH contg. a trace of alkali gives the *α -methoxyethyl deriv.*, $\text{BzCPh:CPhNHCH(OMe)Me}$, yellow, m. 140°. When a satd. Et_2O soln. of III is kept at room temp., there slowly deposits the *α -cyanoethyl deriv.*, pale yellow, m. 130°. Both of these derivs. decomp. above the m. p., giving IV. MeMgI and IV give the *iso-Pr deriv.*, yellow, m. 115°, whose structure was established by hydrolysis. Hydrolysis of IV gives *α,β -diphenyl- β -benzoylvinylamine*, bright yellow, m. 162°. In 1 expt., there was obtained an isomeric amine, $\text{C}_{21}\text{H}_{17}\text{ON}$, yellow, m. 208°. Synthetic expts. gave only the lower-melting amine. The mixt. of isoxazoles obtained by condensing nitrostilbene and *p*- $\text{BrC}_6\text{H}_4\text{CH}_2\text{NO}_2$, on ethylation and treatment with FeCl_3 , gives, on fractionation from EtBr, a salt, $\text{C}_{22}\text{H}_{16}\text{ONBrCl}_4\text{Fe}$, yellow needles from cold solns., brown plates from boiling solns., m. 172-4°. The yellow form slowly turns into the brown in contact with the mother liquor; on shaking with NaOH, there results *3,4-diphenyl-5-bromophenylisoxazole*, m. 172-3°. The product of ozonization is *β -benzilmonoxime-*p*-bromobenzoate*, $\text{C}_{21}\text{H}_{14}\text{O}_3\text{NBr}$, m. 145-6°, which is also obtained synthetically. The pseudo base, *2-ethyl-3,4-diphenyl-5-bromophenyl-5-hydroxyisoxazoline*, m. 105° (decompn.). The anhydro compd., *ethylidene- α,β -diphenyl- β -bromobenzoylvinylamine*, pale yellow, m. 102°; hydrolysis gives *α,β -diphenyl- β -bromobenzoylvinylamine*, deep yellow, m. 172°.

C. J. WEST

Methylene bases from 1-methylbenzothiazole and 1-methylbenzoselenazole methiodides; with a note on the preparation of 1-substituted benzothiazoles. L. E. S. LIE M. CLARK. Univ. College, Swansea. *J. Chem. Soc.* 1928, 2313-20.—1-Methylbenzothiazole-MeI (4 g.), suspended in Me_2CO and shaken with 50% NaOH, gives, among other products, 0.81 g. 2-methyl-1-methylenbenzothiazoline (I), m. 170°. *o*- $\text{HSC}_6\text{H}_4\text{NMeAc}$ (as the Na salt) and BzCl give the *Bz deriv.*, m. 87°. 1-Methylbenzothiazole methopicate, yellow, m. 94°; *II sulfate*, m. 177-8°; *methochloroplatinate*, deep yellow, m. 224° (decompn.); *perchlorate*, m. 149°. 1-Phenylbenzothiazole-MeI and AgOH give the Ag salt of *o*- $\text{HSC}_6\text{H}_4\text{NMeBz}$, whose *Bz deriv.*, m. 130-1°. 1-Phenylbenzothiazole methochloroplatinate, m. 243° (decompn.); *methopicate*, orange-yellow, m. 125-6°; *methoperchlorate*, m. 220°. The Zn salt of *o*- $\text{H}_2\text{NC}_6\text{H}_4\text{SeH}$ and AcCl in C_6H_6 give 1-methylbenzoselenazole, b₆₁ 140°; *chloroplatinate*, yellow needles; *methiodide* (II), m. 221° (decompn.); *ethiodide*, m. 212° (decompn.); *methochloroplatinate*, m. 214° (decompn.). The action of NaOH upon II gives 2-methyl-1-methylenebenzoselenazoline (III), pale yellow, m. 157-8°; the alk. soln., after removal of III is oxidized by $\text{K}_3\text{Fe(CN)}_6$ to 2,2'-diacetmethylamidodiphenyl diselenide, m. 141°. The methylene base formation is reversible, since heating I with EtOH-HCl gives 1-methylbenzothiazole, and III gives the corresponding Se compd. I and *p*- $\text{Me}_2\text{NC}_6\text{H}_4\text{CHO}$ heated in EtOH and then treated with HI give *p*-dimethylaminostyrylbenzothiazole-MeI, m. 244-5°. II and HC(OEt)_3 in $\text{C}_6\text{H}_6\text{N}$ give 2,2'-dimethylselenocarbocyanine iodide, bronze, m. 267-8° (decompn.); in EtOH, the absorption max. are at $\lambda 4500$ and $\lambda 6400$, while it confers sensitivity on a bathed plate up to $\lambda 7020$. The corresponding 2,2'-di-Et deriv., dark green, m. 270-1° (decompn.); the absorption max. in EtOH are at $\lambda 4500$ and $\lambda 6420$; the sensitivity band of a bathed plate has a slight max. at $\lambda 6200$, falling off steeply to the red at $\lambda 6940$. 2,2'-Diacetamidodiphenyl disulfide, m. 165-6°, is reduced to 1-methylbenzothiazole. The 2,2'-dipropionamidodiphenyl disulfide, m. 138°, is reduced to 1-ethylbenzothiazole, whose *picrate* m. 138°. 2,2'-Dibenzamidodiphenyl disulfide, pale yellow, m. 143-4.5°; reduction gives 1-phenylbenzothiazole.

C. J. WEST

Derivatives of 2-phenyl-6-methyl-4-pyrone. The non-resolution of 2-phenyl-6-methyl-4-pyrone *d*- α -bromocamphor- π -sulfonate. CHARLES S. GIBSON AND JOHN L.

Simonsen. Univ. of London. *J. Chem. Soc.* 1928, 2307-12; cf. Levy, Holmyard and Ruhemann, *C. A.* 9, 663.—The various views regarding the constitution of the 4-pyrone salts are discussed; the failure to resolve 2-phenyl-6-methyl-4-pyrone(I) would appear to support the coordination formulation. *I.HCl*, softens 105°, m. 165° (red oil); *perchlorate*, softens 135-7°, m. 145-7°; *sulfate*, m. 168-9°; *methylmethosulfate*, m. 140-3°, could not be purified by recrystn.; the 1st fraction sepg. from Me_2CO consists of a mixt. of the methylmethosulfate and the sulfate. *Methiodide*, decomps. 105°; this cannot be obtained directly from I and MeI; heated in a vacuum it decomps. into MeI and I; I also results by the action of Ag_2O or PbO ; HClO_4 gives the perchlorate, m. 145-7°. No indication of the resolution of *I d- α -bromocamphor- π -sulfonate* is obtained after 17 crystns.; the salt m. 157-8° [α]₅₄₁ 83.05°. I and piperonal in EtOH contg. a little KOH give 2-phenyl-6-piperonylidene-methyl-4-pyrone, m. 194°; concd. HCl gives a deep red soln., decompd. by the addn. of H_2O ; *perchlorate*, terra cotta, decomps. 143°; *d- α -bromocamphor- π -sulfonate*, orange, m. 205-6°; Br in CHCl_3 gives a bright red solid, which goes into soln. and then gives a yellow solid, m. 155-7°; on crystn. from Me_2CO , it apparently loses HBr and gives a mono-Br deriv., $\text{C}_{20}\text{H}_{19}\text{O}_4\text{Br}$, m. 222°.

C. J. WEST

Reactivity of atoms and groups in organic compounds. VII. The influence of certain solvents on reaction velocity—adjuvance. JAMES F. NORRIS and SPENCER W. PRENTISS. Mass. Inst. Tech. *J. Am. Chem. Soc.* 50, 3042-8(1928); cf. *C. A.* 22, 2378.—The results of the detn. of the velocity consts. of reactions in which an alc. serves simultaneously as a reactant and as a solvent cannot be correctly interpreted without a knowledge of the effect of the solvent on the rate at which the reaction takes place. *Adjuvance* is suggested as a convenient word to be used in expressing the property possessed by liquids of affecting the rate at which reactions proceed when the liquids are present as solvents. The velocity consts. of the reaction between $\text{C}_6\text{H}_5\text{N}$ and EtI in a no. of solvents have been detd.; the relative values of the consts. are as follows: C_6H_6 1, PhNO_2 25, Me_2CO 12.8, MeOH 2.5, EtOH 1.4, PrOH 1.11, BuOH 1.11, *iso-PrOH* 1.07, *sec-BuOH* 1.00, *tert-BuOH* 0.93. Values for d_4^{25} are given for the solvents.

C. J. WEST

A diphenylpyridylmethane dyestuff. E. PLÁZEK and E. SUCHARDA. Techn. Hochschule Lwów. *Ber.* 61B, 1811-3(1928).—In a continuation of the expts. on the prepn. of dyestuffs contg. a C_6H_5 instead of a C_6H_4 residue P. and S. attempted, but without success, to condense Michler's ketone with $\alpha\text{-C}_6\text{H}_4\text{NNH}_2$ with the aid of POCl_3 . Michler's hydrol, however, condenses with the $\text{C}_6\text{H}_4\text{NNH}_2$ in dil. H_2SO_4 , giving a tetramethyltriaminodiphenylpyridylmethane (I), which with PbO_2 or MnO_2 yields the corresponding dye (II) only at 120°. Attempts to prep. similar dyes from *p*- $\text{MeC}_6\text{H}_4\text{NH}_2$ and $\text{C}_6\text{H}_4\text{NNH}_2$ with H_3AsO_4 or HgCl_2 failed. I, almost colorless, m. 163-5°, is distinctly basic, dissolves in mineral acids, seps. from C_6H_6 with 0.5 mol. solvent of crystn. II, which was not obtained pure and in very unsatisfactory yield, dyes wool directly from a neutral bath and tannated cotton a deep blue.

C. A. R.

2-Acetylaminopyridine. E. PLÁZEK and E. SUCHARDA. Techn. Hochschule Lwów. *Ber.* 61B, 1813-6(1928).—Chichibabin and his co-workers have found that nitration of 2- $\text{C}_6\text{H}_4\text{NNH}_2$ always gives the 5- and 3- NO_2 derivs., the former usually predominating largely. Needing large quantities of the 3- NO_2 compd. P. and S. attempted to nitrate 2- $\text{C}_6\text{H}_4\text{NNHAc}$ (I) in $\text{Ac}_2\text{O-AcOH}$ but found that no nitration takes place, the only product being I.HNO_3 which is exceedingly resistant to nitration, being unchanged by boiling fuming HNO_3 or $\text{HNO}_3\text{-Ac}_2\text{O}$. If it is treated with concd. H_2SO_4 , however, heat is evolved and 2,5- and 2,3- $\text{C}_6\text{H}_3\text{N}(\text{NH}_2)\text{NO}_2$ are formed in a violent reaction, but the nitration takes place only after the Ac group has been split off, for if the reaction is moderated by cooling, 2- $\text{C}_6\text{H}_4\text{NNHNO}_2$ can be detected as an intermediate product. With Br I behaves like PhNHAc , giving exclusively 2,5- $\text{C}_6\text{H}_3\text{N}(\text{NHAc})\text{Br}$ (II). 2-Acetylaminopyridine nitrate, m. 190°. 5-Bromo-2-acetylaminopyridine (II), m. 175°.

C. A. R.

A new method for the preparation of α,α' -dipyridyl. FR. HEIN and W. RETTER. Univ. Leipzig. *Ber.* 61B, 1790-1(1928).—The simplest conceivable way of prepg. α,α' -dipyridyl (I) is by the oxidation of $\text{C}_6\text{H}_5\text{N}$, and reasoning from the stability of the Fe^{II} complex $[\text{FeR}_3]\text{X}_2$ ($\text{R} = \text{I}$) that the tendency to the formation of this complex would under the proper conditions greatly facilitate any reaction whereby I can be prepd. H. and R. heated dry $\text{C}_6\text{H}_5\text{N}$ with anhyd. FeCl_3 , which ought to answer the double purpose of furnishing both the oxidizing agent and the Fe necessary for the formation of the complex. From 70 g. $\text{C}_6\text{H}_5\text{N}$ and 13 g. FeCl_3 heated about 35 hrs. around 300° they obtained 3.2 g. or 52% of practically pure I, m. 66-8° (apparently

the figure given for the quantity of C_6H_4N started with is a misprint.—ABSTR.). $FeCl_3 \cdot 6H_2O$ and anhyd. $CuCl_2$ (but not hydrated $CuCl_2$) can be used instead of anhyd. $FeCl_3$. C. A. R.

Deazahydroquinoline derivatives. IV. The Hofmann degradation of octahydro- α -methylindole. SHIN-ICHIRO FUJISE. *Sci. Papers Inst. Phys. Chem. Res. (Tokyo)* 9, 91-8(1928); cf. C. A. 22, 3663.— α -Methylindole was hydrogenated in AcOH at 40-50° in the presence of Pt black. Most of the AcOH was vacuum-distd., H_2O added and incompletely reduced material extd. with Et_2O . The soln. was then made strongly alk. and the base extd. with Et_2O . This ext. was dried with KOH, distd. and octahydro- α -methylindole (I) isolated. Neutralized with HBr and evapd. to dryness the residue was dissolved in Me_2CO and Et_2O added to give long needles of I.HBr, m. 148-9°; yield 70%. A further yield was obtained from the mother liquor. I from I.HBr, b. 187.5-8°, d_4^{25} 0.9103, n_D^{25} 1.47432, M. R. 42.66 (calcd. 42.96). I.HCl is hygroscopic. I.MeI, m. 233-4° (decompn.). Picrate, m. 178-9° (decompn.). Benzene-sulfonyl deriv., m. 125°. Chloroaurate, m. 118°. I.HBr in 60% EtOH was treated with MeI, then with Ag_2O and filtered. After distn. of EtOH and H_2O the base b. 180-213°. This was extd. with Et_2O , dried with KOH and the Et_2O distd. The residue (II) b. 211-3° (yield 70%), d_4^{25} 0.8670, n_D^{25} 1.47196, M. R. 55.25 (calcd. 54.27). II.MeI, m. 212° (decompn.). Picrate, m. 146°. This is not identical with Braun's product (cf. Ber. 57, 399; 58, 385). Reduction of II with Pt black and 2 atoms H gave *cis-o*-dimethylaminopropylcyclohexane (III), b. 214°, d_4^{20} 0.8604, n_D^{20} 1.46386, n_D^{25} 1.4629, d_4^{25} 0.8564. Chloroaurate, m. 132°. Picrate, m. 173°. Methiodide, m. 186-7°. Mixed m. ps. on the picrate and chloroaurate confirm the compn. of III.

FOSTER DEE SNELL

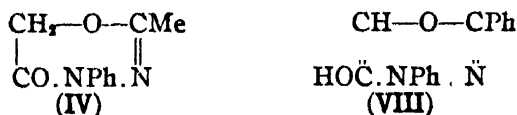
Some *ms*-acridine derivatives. KURT LEHMSTEDT AND ERNST WIRTH. *Techn. Hochschule, Hannover. Ber.* 61B, 2044-9(1928); D. R. P. 440,771, 440,772.—Whereas most org. bases give with SO_2 unstable acid sulfites which decomp. again on drying or heating and with alkali bisulfites either do not react or undergo deep-seated changes when boiled a long time, acridines behave entirely differently. From the HCl salt of acridine (I) with SO_2 or with Na_2SO_3 or from I in alc. with SO_2 , Graebe obtained a very difficultly sol. red compd. (II), $(C_{13}H_9N)_2 \cdot H_2SO_3$, while from I.HCl and Na_2SO_3 or I and $NaHSO_3$ he obtained an easily sol. colorless compd. (III), $C_{13}H_9N \cdot NaHSO_3$, which is stable in the air and can be recrystd. from hot H_2O . The behavior of III indicates that it is not a simple salt but an addn. product, the Na salt of 9,10-dihydro-acridine-9-sulfonic acid (*acridan-*ms*-sulfonic acid*) (IV), $C_8H_4 \cdot CH(SO_3H) \cdot C_6H_4 \cdot NH$.

III slowly oxidizes in the air when it is moist or its solns. are evapd., changing into II, which with the calcd. quantity of alkali regenerates III and I. II is therefore the acridine salt of IV and can be also obtained from IV and the calcd. quantity of I.HCl. With Na_2SO_3 it is completely converted into III. III is very reactive; with alkalis it smoothly regenerates I and it can be used to isolate I from mixts. with other bases. With KCN in boiling alc. suspension it gives 9,10-dihydro-9-cyanoacridine (V), which with hydrolytic agents yields acridanol, the latter at once decomp. into H_2O and I. V forms with mineral acids salts, which, however, are strongly hydrolyzed. It is readily dehydrogenated to 9-cyanoacridine (VI), in which the CN group is held very firmly so that the VI can easily be sapond. to the amide and acid. Its HCl salt can be isolated in anal. pure form. The alc. soln. of VI smells faintly of $(CN)_2$ and when refluxed a long time yields a compd. $C_{20}H_{20}N_2$ (VII), apparently 9,10,9',10'-tetrahydro-9,9'-diacridyl, which at its m. p. decomp. into an equimol. mixt. of I and 9,10-dihydroacridine. VI (76% from 28.3 g. III refluxed in alc. with KCN, freed from the alc. by distn. and of a red impurity by rubbing with very dil. NaOH, washed with H_2O and allowed to stand 1 day in the air), light yellow, m. 180.5° (186°, cor.); HCl salt, brownish; picrate, yellow, m. 229°. Acridine-9-carboxamide (prepd. by H. MAURER) (1.4 g. from 1.5 g. VI with 10 cc. 90% H_2SO_4 heated 2 hrs. on the H_2O bath), yellow, m. 283-4°. Acid (1.3 g. from 1.5 g. VI and 15 cc. 90% H_2SO_4 heated 2 hrs. on the H_2O bath, then treated with 4.0 g. solid $NaNO_2$ and heated another 2 hrs.), decomp. 289-90°. Acridine-9-thioamide (84% from VI in boiling alc. with excess of colorless alc. $(NH_4)_2S$), yellow, m. 240°. V is prepd. like VI except that after refluxing the hot alc. soln. is filtered from the Na_2SO_3 , quickly cooled and filtered from the reddish leaflets which sep.; the residue is then shaken in C_6H_6 with 5% NaOH to remove the red impurity and evapd. The V seps. in leaflets, m. 146°, forms colorless solns. in alc., Et_2O , C_6H_6 and Me_2CO and a yellow soln. in AcOH, is quite stable toward light and toward the air when dry but when moist (also in alc.) it is dehydrogenated, free alkalis greatly accelerating

the oxidation. Its salts are green. *Picrate*, olive, m. 222° . VII, m. completely 214° if kept at this temp. long enough, changes completely into I in boiling PhNO_2 .

C. A. R.

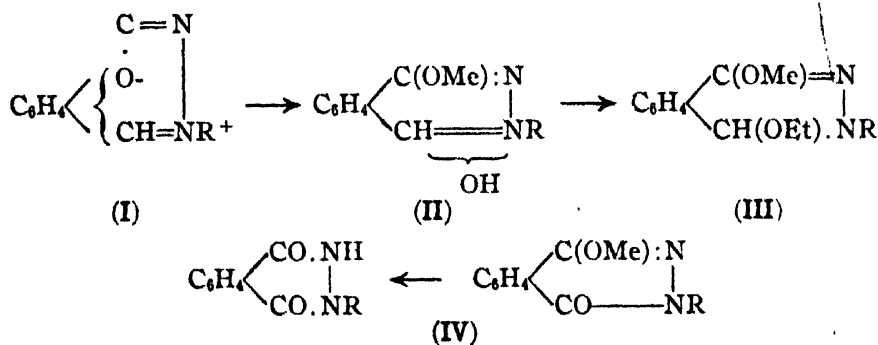
1,3,4-Oxiazines. II. J. VAN ALPHEN, Univ. Leiden. *Rec. trav. chim.* 47, 909–19 (1928); cf. C. A. 22, 2566.—Mogoketo-oxiazines with the keto group in the 5-position may be prep'd. by the action of ClCH_2COCl on β -acylphenylhydrazines: $\text{PhNHNHCOR} + \text{ClCOCH}_2\text{Cl} \rightarrow \text{PhN}(\text{COCH}_2\text{Cl})\text{NHCOR} + \text{HCl}$ and removal of a mol. of HCl from the product. α -Chloroacetyl- β -acetylphenylhydrazine (I), prep'd. by boiling 10 g. ClCH_2COCl and 13.5 g. PhNHNHAc in 50 cc. C_6H_6 for 1 hr., m. 131° . On boiling I with an excess of PhNH_2 for 5 min. was obtained α -N-phenylaminoacetyl- β -acetylphenylhydrazine (II), m. 140° , which is converted into α -N-phenylaminoacetyl-phenylhydrazine (III), m. 157° , on hydrolysis with 20% H_2SO_4 and alc. With BzH III gives α -N-phenylaminoacetyl- β -benzylidenephylhydrazine, m. 194.5° . I was converted into Δ^1 -2-methyl-4-phenyl-5-keto-1,3,4-oxiazine (IV), m. 65° , on heating 25 g. with 50 cc. dry acetone and 15 g. K_2CO_3 in a sealed tube for 4 hrs. at 100° . In a way analogous to the prep'n. of I, α -bromoacetyl- β -isobutyrylphenylhydrazine was prep'd. from PhNHNHCOCHMe_2 and BrCH_2COCl ; the substance could not be induced to cryst. and was converted into Δ^1 -2-isopropyl-4-phenyl-5-keto-1,3,4-oxiazine, (V) m. 40° , in the way described for the prep'n. of IV from I. By means of the methods already described, the following compds. were prep'd.: α -chloroacetyl- β -benzoylphenylhydrazine (VI), m. 198° , from ClCH_2COCl and PhNHNHBz ; α -N-phenylamino-acetyl- β -benzoylphenylhydrazine, m. 159° , from VI and PhNH_2 ; Δ^1 -2,4-diphenyl-5-keto-1,3,4-oxiazine (VII), m. 96° , from VI and K_2CO_3 in acetone or on heating with NH_3 in a sealed tube. The oxiazine VII slowly dissolves in alkalis, passing into the enolic form VIII.



C. F. VAN DUIN

New reaction of certain diazosulfonates derived from β -naphthol-1-sulfonic acid. **II. Constitution of nitro- and aminophenylphthalazones.** FREDERICK M. ROWE AND ESTHER LEVIN. Leeds Univ. *J. Chem. Soc.* 1928, 2550–5; cf. C. A. 20, 1802.—Heating 10 g. 1-hydroxy-3-[4'-nitrophenyl]-1,3-dihydrophthalazine-4-acetic acid (see Part I), 50 cc. concd. H_2SO_4 and 60 cc. H_2O for 2 hrs. causes the elimination of AcOH and gives 4'-nitro-3-phenylphthalaz-1-one (I) ($\text{R} = \text{C}_6\text{H}_4\text{NO}_2$) yellow, m. 333° ; NaOH gives a bluish red color, changing to orange-brown on keeping; mineral acids form salts which are readily decomp'd. by H_2O ; *picrate*, bright yellow, m. 218° , appears to be decomp'd. progressively by recrystn. from EtOH . Reduction with Na_2S gives 4'-amino-3-phenylphthalaz-1-one, m. 259° (previously described as the 4-one), while reduction with Zn and HCl gives 4'-amino-N-phenylphthalimidine, m. 198° . I and Me_2SO_4 in PhNO_2 give an orange-yellow ppt. (II), which gives a HCl salt and is unaltered by prolonged boiling with HCl ; crystn. of II from EtOH gives orange prisms (III), m. $138-41^{\circ}$, while crystn. from MeOH gives orange leaflets, m. $173-5^{\circ}$; heating III at 100° and then at 140° gives 4-keto-1-methoxy-3-[4'-nitrophenyl]-3,4-dihydrophthalazine (IV), pale yellow needles from EtOH , colorless needles from AcOH , m. 199° ; HBr-AcOH at 100° for 10 min. gives 1,4-diketo-3-[4'-nitrophenyl] tetrahydrophthalazine, m. 307° . $o\text{-HO}_2\text{CC}_6\text{H}_4\text{CHO}$ and $p\text{-O}_2\text{NC}_6\text{H}_4\text{NHNH}_2$ in EtOH give the lactone form of o-carboxybenzaldehyde p-nitrophenylhydrazone, orange, m. 254° (Seekles, C. A. 18, 2506, describes this as a nitrophenylphthalazone); this is sol. in Na_2CO_3 , from which soln. acid ppts. the free acid, red, decompg. 218° and then m. 249° , which, on attempted crystn. from EtOH or $\text{C}_6\text{H}_6\text{N}$, gives 4'-nitro-3-phenylphthalaz-4-one, m. 258° ; it neither forms a *picrate* nor reacts with Me_2SO_4 . Reduction with Na_2S gives the 4'-amino deriv., pale yellow, m. 184° (HCl salt, needles; *Ac deriv.*, m. 233°). **III. Preparation of phthalazine, phthalazone and phthalimidine derivatives from m-nitroaniline.** F. M. ROWE, MAHMED AHEND HEMMAT AND E. LEVIN. *Ibid* 2556–63.—A filtered soln. of com. 1,2- $\text{C}_{10}\text{H}_6(\text{SO}_3\text{Na})\text{OH}$ in 220 cc. H_2O , stirred into the diazo soln. from 24 g. $m\text{-O}_2\text{NC}_6\text{H}_4\text{NH}_2$ and 14 g. NaNO_2 in 60 cc. concd. HCl and 180 cc. H_2O , gives quant. the 3'-nitrobenzene-2-naphthol-1-diazosulfonate; this is washed free of acid with brine and dissolved in 600 cc. cold H_2O and 50 g. Na_2CO_3 in 250 cc. H_2O ; the yellowish brown soln. is added to 60 g. NaOH in 120 cc. cold H_2O and after standing overnight, the mixt. is rendered faintly acid with HCl , then neutralized with Na_2CO_3 , filtered, the filtrate rendered slightly acid and NaCl added, pptg. $\text{Na H 3-[3'-nitrophenyl]-1,3-dihydrophthalazine-4-acetate-1-sulfonate}$, orange-yellow prisms; the aq. soln. is de-

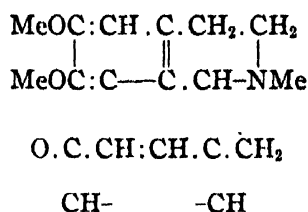
colored by Zn and NH_4OH ; ⁶boiling with concd. HCl or aq. H_2SO_4 gives 1-hydroxy-3-[3'-nitrophenyl]-1,3-dihydrophthalazine-4-acetic acid (V), pale yellow, m. 234° ; Me ester, pale yellow, m. 184° ; Et ester, pale yellow, m. 195° ; anilide, yellow, m. 239° (decompn.). Reduction of V with SnCl_2 and HCl gives the 3'-aminophenyl deriv. (VI), m. 252° (Ac deriv., m. 167°). Boiling VI with H_2SO_4 gives 91% of 3'-amino-3-phenylphthalaz-1-one, golden yellow, m. 210° (Ac deriv., m. 204°); reduction with Zn and HCl gives 3'-amino-N-phenylphthalimidine, m. 175° (Ac deriv., m. 204°); through the diazo reaction there results the 3'-HO deriv., m. 268° (Me ether, m. 122° ; Et ether, m. 115°). Heating V with H_2SO_4 gives 3'-nitro-3-phenylphthalaz-1-one, pale yellow, m. 324° (picrate, bright yellow, m. 234°); reduction gives VI. The action of Me_2SO_4 gives an orange-yellow ppt., which, crystd. from MeOH , gives golden yellow needles, m. $114-7^\circ$, or, from EtOH , golden prisms, m. $116-20^\circ$; heating these compds. at 100° , and then at 140° gives 4-keto-1-methoxy-3-[3'-nitrophenyl]-3,4-dihydrophthalazine, m. 182° ; demethylation with $\text{HBr}\cdot\text{AcOH}$ gives 1,4-diketo-3-[3'-nitrophenyl]tetrahydrophthalazine, m. 280° . $o\text{-HO}_2\text{CC}_6\text{H}_4\text{CHO}$ and $m\text{-O}_2\text{NC}_6\text{H}_4\text{NHNH}_2$ give the lactone form of the phenylhydrazone, m. 240° ; boiling in PhNO_2 gives 3'-nitro-3-phenylphthalaz-4-one, m. 240° ; reduction with NaHSO_3 gives the 3'-amino deriv., m. 156° .



C. J. WEST

Curare alkaloids. I. Constitution of curine. ERNST SPÄTH, WOLFGANG LEITHE AND FRITZ LADECK. Univ. Wien. Ber. 61B, 1698-1709 (1928).—The 1st object of this work was to convert the cryst. curine (I), m. 212° , into the amorphous tubocurarine. The investigation was begun with samples of I provided by Böhm, but a welcome source of the material was discovered in *Radix pareirae bravae*, since it has been established with certainty that Scholtz's *d*-bebeerine (II), m. 214° , is the *d*-form of I. Of 3 samples of the root obtained from different firms, 1 yielded only small quantities of cryst. II, from another about 10% of the crude alkaloid was obtained as cryst. II and in the 3rd 30% of the crude base consisted of cryst. II. All the preps. of II were *d*-rotatory, however ($[\alpha]_D^{300^\circ}$). S. has found that mixing equal parts of *d*- and *l*-II raises the m. p. to 300° , and a mixt. of equal parts of I and II, recrystd. from CHCl_3 , likewise m. $299-300^\circ$. Crystallographic examn. also showed that I and II are identical in morphological and optical properties. When subjected to the Emden degradation, I and II yield in the 1st stage optically inactive bases (III) whose difficultly sol. HCl salts are identical in m. and mixed m. p., and the 2nd stage of the degradation gives in good yield satd. N-free compds. (IV) likewise identical in m. and mixed m. p. Böhm gave $\text{C}_{18}\text{H}_{19}\text{O}_3\text{N}$ as the compn. of I while II has at various times been assigned the formulas $\text{C}_{17}\text{H}_{19}\text{O}_3\text{N}$, $\text{C}_{18}\text{H}_{19}\text{O}_3\text{N}$, $\text{C}_{18}\text{H}_{21}\text{O}_3\text{N}$ and $\text{C}_{21}\text{H}_{23}\text{O}_4\text{N}$. A series of microanalyses gave values agreeing well with the formula $\text{C}_{18}\text{H}_{19}\text{O}_3\text{N}$ except for the C values, which were generally a little low. This formula was also confirmed by the compn. of the IV, by MeO detns. on I and II and by the Cl contents of their HCl salts. Mol. wt. detns. on I in camphor gave values about 20% higher than calcd. for the simple formula, indicating some association. To det. whether II would yield a basic salt it was treated with 0.5 the quantity of HCl calcd. for complete neutralization but only 0.5 of the II formed a salt. As to the constitution of I, Böhm had found that it contains a phenolic HO and a MeO group, gives on distn. with Zn dust a substance which he believed to be a methoxyquinoline, and on fusion with alkali yields $3,4\text{-(HO)}_2\text{C}_6\text{H}_3\text{CO}_2\text{H}$. Scholtz in II found a MeO , a HO and a *N*-Me group, and on distn. with Zn dust obtained *o*-cresol. S., L. and L. on distn. with Zn dust (after sapon. of the MeO group to facilitate the reaction) obtained 1-methylisoquinoline, identified as the picrate. Böhm's product therefore was evidently not a methoxyquinoline. In view of the difficult racemizability of isoquinoline alkaloids the formation of III in the Emden degradation must be the result not of racemization but of the disappearance of the asym. structure.

The 2nd stage of the degradation gives NMe_3 along with IV, showing that the N atom in I carries a Me group and is present in a ring. Neither I, III nor IV gives mellophanic acid with HNO_3 , indicating the absence of a phenanthrene complex. Fusion with KOH of II, both before and after sapon. of the MeO group, and methylation of the product gave a mixt. of sublimable, difficultly H_2O -sol. acids consisting chiefly of veratricum and anisic acids. If, however, the HO group in II is methylated, oxidation with KMnO_4 gives neither of these acids and it may therefore be concluded that the $p\text{-HOC}_6\text{H}_4\text{CH}_2$ and $3,4\text{-(HO)}_2\text{C}_6\text{H}_3\text{CH}_2$ complexes are not present as such or as Me ethers in II or its Me ether. Although phenolcarboxylic acids do not withstand KMnO_4 oxidation, it seemed probable that by carefully controlling the quantity of KMnO_4 , any such acid formed in the oxidation of II could be isolated, at least in small quantities, and as a matter of fact $p\text{-HOC}_6\text{H}_4\text{CO}_2\text{H}$ was identified among the products by conversion into anisic acid. As all heating was avoided it may be assumed that the HO acid was originally present as such and not, perhaps, as a hydroxyphthalic acid. II must therefore contain a $p\text{-HOC}_6\text{H}_4\text{CH}_2$ complex whose HO group, however, is not free or methylated but in ether-like combination with the phenolic HO group of a 2nd C_6H_5 nucleus. No deriv. of $3,4\text{-(HO)}_2\text{C}_6\text{H}_3\text{CO}_2\text{H}$ could be obtained by oxidative degradation. The results thus far obtained indicate that I has the structure

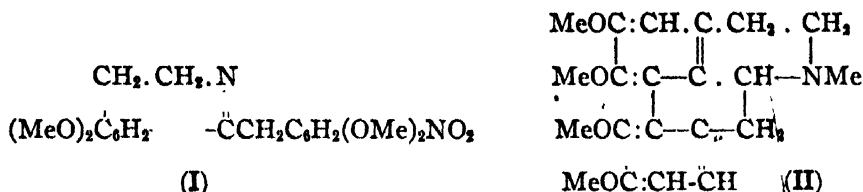


The positions of the MeO groups and of the O bridge will have to be detd. with greater certainty when more material is available. The Böhm I, recrystd. from $\text{CHCl}_3\text{-MeOH}$, m. $221\text{--}1.5^\circ$ (evacuated tubes); the crystals obtained from MeOH contain solvent of crystn., which is lost in the air or, more quickly, on heating. Pure II has the same m. p. and likewise seps. with MeOH of crystn.; the solvate with C_6H_6 of crystn., m. 161° , is more stable than the MeOH compd. $[\alpha]_D^{20}$ for I ($\text{C}_6\text{H}_5\text{N}$, c 5.04) -328° , for II (c 4.70) 332° . II.HCl, m. $271\text{--}2^\circ$ (evacuated tubes) with gas evolution. Me ether of II, prepd. with CH_2N_2 , amorphous. III.HCl, $\text{C}_{20}\text{H}_{28}\text{O}_3\text{NCl}$, m. $238\text{--}41^\circ$ (evacuated tubes) with gas evolution. IV, $\text{C}_{18}\text{H}_{26}\text{O}_3$, m. $186\text{--}7^\circ$, is unchanged by Pd-charcoal and H. C. A. R.

The alkaloids of kurchee bark (*Holarrhena antidysenteria*). I. Two new alkaloids discovered in Indian *Holarrhena*. SUDHAMOY GHOSH AND NAGENDRA NATH GHOSH. School of Tropical Med. and Hyg., Calcutta. *J. Indian Chem. Soc.* 5, 477–82 (1928); cf. C. A. 21, 1850.—The analysis of kurchee bark for total alkaloids yielded about 1.2%, though by extn. on a com. scale only about 0.7% were obtained. In sepg. the ext., G. and G. succeeded in isolating 2 new alkaloids, *kurchicine* (I) and *kurchine* (II), besides the already known conessine (III). The sepn. was based on the 3 following facts: The tartrates of I and III are very slightly sol. in 95% alc., while II tartrate is freely sol. In petroleum ether, I is almost insol., III is fairly sol. and II very sol. I sulfate is almost insol., III sulfate rather sol. in cold H_2O . I, m. 175° , N content 8.53%; tartrate, amorphous; sulfate; HBr salt, $[\alpha] -18.75$ (in H_2O). II, m. 75° , N content 9.84%; sulfate, micro needles. The prepn. of II was very difficult because besides the sulfate, no cryst. salts could be obtained; the nitrate, hydrochloride, hydrobromide, tartrate, oxalate and phosphate, all failed to crystallize. The yield of I was 0.12% of the wt. of the bark. II was not obtained quant. on account of the difficulties mentioned, but it is supposed to form the largest part of the ext. The possibility of prepg. the alkaloids on a com. scale is briefly discussed. G. SCHWOCH

Alkaloids of *Corydalis cava*. XIII. Synthesis of *d*-corytuberine dimethyl ether. ERNST SPATH AND OTTO HROMATKA. Univ. Wien. *Ber.* 61, 1692–8 (1928); cf. C. A. 22, 4126.—[2-Nitrohomoveratroyl]homoveratrylamine (92% from $2,3,4\text{-O}_2\text{N(MeO)}_2\text{-C}_6\text{H}_2\text{CH}_2\text{CO}_2\text{H}$ converted with SOCl_2 at 60° into the chloride, m. 56° , which was then added to $3,4\text{-(MeO)}_2\text{C}_6\text{H}_3\text{CH}_2\text{NH}_2$ in C_6H_6), sinters 69° , m. 72° (evacuated tube); treated in 1.5–3-g. portions in 60 parts gently boiling PhMe with about 5 parts P_2O_5 , it gives 72% of the *dihydroisoquinoline deriv.* (I), m. $165\text{--}6^\circ$ (evacuated tube), sol. in about 25 parts hot MeOH, easily in very dil. HCl; methiodide, obtained in 95% yield by heating I with MeI 20 min. at 100° , crystals with 1.5 H_2O , m. $100\text{--}4^\circ$ and, anhyd., $179\text{--}82^\circ$ (decompn.), gives with freshly pptd. AgCl on the H_2O bath the metho-

chloride, crystals with 3 H₂O, m. 100–3°; this, refluxed in EtOH-HCl with Sn, gives 67% of the aminotetrahydroisoquinoline deriv., brown oil, 7.0 g. of which, diazotized in 2 N H₂SO₄ with titrated NaNO₂, then treated with "Naturkupper C" and reduced with Zn dust and HCl, yielded 2.58 g. corytuberine di-Me ether (II), b_{0.6} 200–40°. With *l*-tartaric acid, II yielded a *l*-bitartrate, m. 213–5° (mixed m. p. with II prepd. from corydine, 212–4°), $[\alpha]_D^{25} +147^\circ$ (H₂O); examn. under the microscope by LETTMER also revealed no difference in the cryst. form of the synthetic product and that obtained from corydine; methiodide, m. 238° (decompn.), the m. p. depending on the rate of heating. II was obtained in 0.23 g. yield from 0.3 g. corydine in MeOH with CH₃N₂. This synthesis confirms the correctness of the formula assigned to II by Gadamer. Cf.



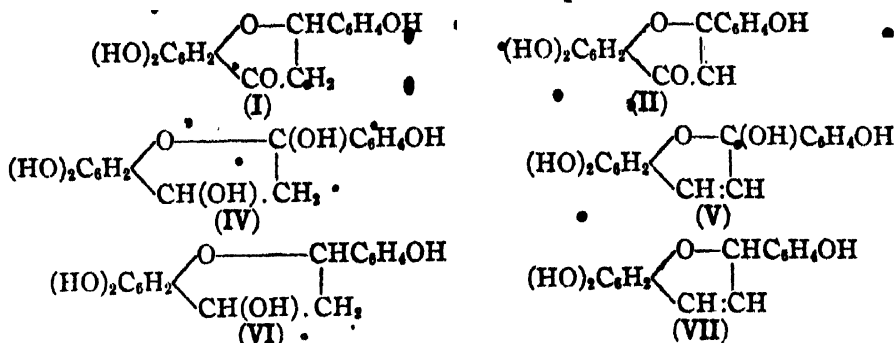
C. A. 22, 4126.

The catalytic dehydrogenation of nicotine. A suitable method for the preparation of *N*-methyl-(3-pyridyl)-2-pyrrole (3,2'-nicotyrine). J. P. WIBAUT AND J. OVERHOFF. Univ. Amsterdam. *Rec. trav. chim.* 47, 935–9(1928).—3,2'-Nicotyrine has already been prepd. from nicotine by oxidation with alk. K₃Fe(CN)₆ (*Bull. soc. chim.* [2], 34, 449(1880)) and by oxidation with Ag₂O (*Ber.* 27, 2535(1894)); both these methods, however, give unsatisfactory yields. The researches of Zelinskii have shown that it is an easy matter to dehydrogenate catalytically a cyclohexane ring, but that a cyclopentane ring cannot be dehydrogenated in this way. In the present paper the catalytic dehydrogenation of nicotine is described. On distg. nicotine slowly through a tube contg. 2 g. 30% platinized asbestos, prepd. according to Löw-Zelinskii, and heated at 290–350°, the nicotine is largely dehydrogenated to 3,2'-nicotyrine. The most favorable temp. is 320° and isomerization does not occur, only unchanged nicotine and 3,2'-nicotyrine being obtained. After 1 passage of the nicotine through the tube, 73% is transformed into 3,2'-nicotyrine on repeating the dehydrogenation with the reaction product and with fresh platinized asbestos, an almost theoretical yield of 3,2'-nicotyrine is obtained. The m. p. of the 3,2'-nicotyrine picrate was found to be 168–9°. It thus appears that the 5-membered pyrrolidine ring can be dehydrogenated catalytically.

C. F. VAN DUIN

Flavanone glucosides. III. Reduction of flavone and flavanone derivatives. YASUHIKO ASAHINA AND MOTOTARO INUBUSE. Univ. Tokyo. *Ber.* 61B, 1646–50 (1928); cf. C. A. 22, 4526.—It was shown recently that naringenin (I), hesperitin and sakuranetin are flavanone derivs. and that the formation of red dyes on reduction is a characteristic property of the hydroxy- and methoxyflavanones. These dyes contain Cl and behave very much like the anthocyanidin salts. An attempt was therefore made to det. whether a flavone deriv. can be converted into a benzopyrylium compd. by reduction. Apigenin (II) with Mg and HCl gives at most an orange soln. but on gentle warming in alk. soln. with Na-Hg there is obtained a dirty orange-red soln. from which HCl ppts. a deep red dye, probably the flavylium salt, apigenidine chloride (III), although its properties do not agree entirely with those of Pratt and Robinson's synthetic product. A. and I. assume that the II is first simultaneously hydrated and reduced to IV, which by loss of H₂O forms the carbinol base V and this under the influence of the HCl rearranges into III. By analysis and spectrochem. investigation III is found to be identical with the dye obtained from I. This is explained by assuming that I is reduced to VI, which by loss of H₂O gives VII; VII is probably easily oxidizable and is converted by atm. O into V. Since quercetin gives with Na-Hg no substance converted into the red dye by HCl the 3 groups of substances—flavanones, flavones and flavanols—can be sharply distinguished from each other by their behavior on reduction; the hydroxyflavanols give red dyes only with Mg and HCl, the hydroxyflavones only with Na-Hg and the hydroxyflavanones both with acid and alk. reducing agents. III, dark red, does not m. 300°, sol. in alc. with yellowish red color changing to wine-red on addn. of NaOAc, alkali or NH₄OH, shows no fluorescence on diln. of the alc. soln. with much H₂O and addn. of a drop of concd. H₂SO₄. Dye, C₁₅H₁₁O₄Cl.H₂O, from sakuranetin, dark red, decomp. 236–7°, sol. in alc. with purple color, changed by NaOAc to dark wine-red and by alkalis to dark violet-blue. Dye, C₁₆H₁₃O₄Cl.2H₂O, from hesperitin, dark red, m. 231–2° (decompn.), sol. in alc. with yellowish red color,

changed by NaOAc or alkalis to orange-yellow, while NH_4OH produces no marked effect. The absorption spectra (measured by Y. SHIBATA) of the dyes are given.



C. A. R.

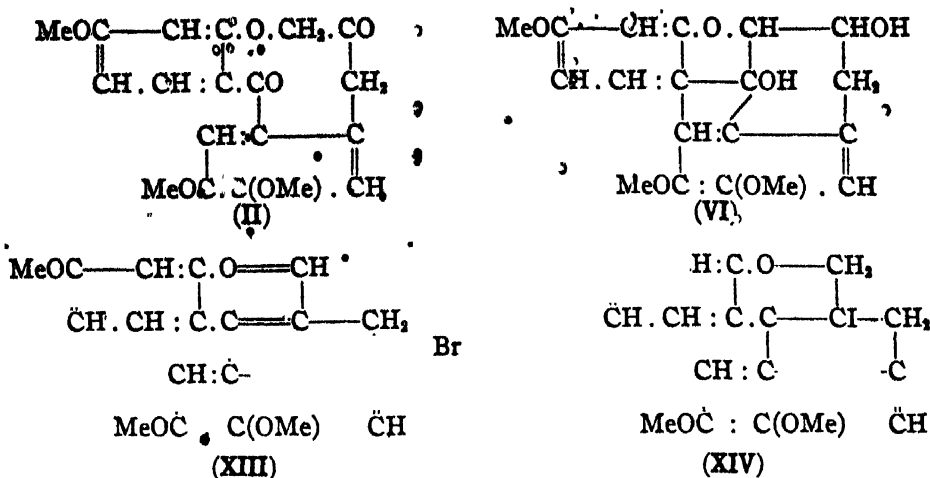
The digitalis glucosides. I. Digitoxigenin and isodigitoxigenin. WALTER A. JACOBS AND E. L. GUSTUS. Rockefeller Inst. *J. Biol. Chem.* 78, 573-81(1928).—The methods previously described (*C. A.* 21, 3902) in the investigation of the isostrophanthidin series were applied to digitoxigenin (I) and isodigitoxigenin (II). I dissolved in KOH in MeOH gives II, lustrous, sparingly sol. crystals, m. 271°. I and II have the same empirical formula, $\text{C}_{23}\text{H}_{34}\text{O}_6$, but II does not give the Legal test and does not react with nitroprusside. II reacts with 1 equiv. of alkali and when acidified with AcOH gives isodigitoxigeninic acid (III), identical with the *dixgenic acid* of Kiliani (*Arch. Pharm.* 1899, 237, 452) and Cloetta (*C. A.* 15, 707). III forms a Me hydroxyaldehyde acid ester (m. 128°) with CH_2N_2 . This ester exists in either the free aldehydic or lactol form. It forms a semicarbazone. With CrO_3 the ester forms a neutral substance $\text{C}_{24}\text{H}_{34}\text{O}_6$ which is a lactone ester. On sapon. and reacidification it gives isodigitoxigenic acid (IV). III treated with HBrO gives isodigitoxigenic acid, $\text{C}_{23}\text{H}_{34}\text{O}_6$, which differs from IV by the retention of the secondary OH group. The results are analogous to those found with isostrophanthidin and give evidence of the $\Delta^{\beta,\gamma}$ -character of the lactone ring of I. II. Gitoxigenin and isogitoxigenin. *Ibid* 79, 553-62.—Gitoxigenin is considered from its behavior to be a tri-HO tetracyclic hydroaromatic $\Delta^{\beta,\gamma}$ -lactone, $\text{C}_{24}\text{H}_{34}\text{O}_6$. The following compds. were prepd.: gitoxigenin, m. 231-2°; gitoxigenon, m. 206-7°; dihydrogitoxigenin, m. 205-7°, isogitoxigenin, $\text{C}_{23}\text{H}_{34}\text{O}_6$, m. 249-50°; isogitoxigeninic acid, m. 152-3°; its Me ester, m. 145°; Me isogitoxigenonate, m. 170-2°; the acid, $\text{C}_{21}\text{H}_{30}\text{O}_6$, m. 252-3°; and its Me ester, m. 180°. A. G.

Constitution of some Indian essential oils. XXV. *l*- α - and *l*- β -Curcumenes. B. SANJIVA RAO AND JOHN L. SIMONSEN. Indian Inst. of Science, Bangalore. *J. Chem. Soc.* 1928, 2496-505; cf. *C. A.* 22, 2028.—Rao, Shintre and Simonsen (*C. A.* 21, 798) isolated from the essential oil occurring in the rhizomes of *Curcuma aromatica*, Salish., a sesquiterpene to which they gave the name *l*-curcumene; a further study shows that this is a mixt. of at least 2 hydrocarbons, which cannot be sepd. by fractional distn. through a 4-pear Young still head but when treated with AmNO_2 and HNO_3 the *l*- α -curcumene (I) seps. as the nitrosate (II), the yield varying from 2.3 to 4.5 g. from 10 g. of the mixt., depending upon the sample used. I is also obtained by satg. the mixt. with HCl, filtering off the tri-HCl deriv. (see below) and fractionating the I HCl, b_8 150-5°; heating with AcOH and AcONa gives an impure I. II and PhCH_2NH_2 in EtOH, boiled 1 hr., give *l*- α -curcumenenitrolbenzylamine, m. 102-4°, $[\alpha]_D^{30}$ -19.5° (MeOH, c 2.46). II, heated with an equiv. quantity of EtOH-KOH for 20 min., gives *l*-oximino- α -curcumene, b_7 182-5°, d_{30}^{30} 0.9817, n_D^{30} 1.5134, $[\alpha]_D^{30}$ -27.2°; titration with Br indicates 1 double bond; Bz deriv., m. 84-5°; HCl salt, m. 135-6°, is not acted on by cold alkali; reduction with Na and EtOH gives *l*-dihydro- α -curcumenylamine, b_{17} 151-2°, d_{30}^{30} 0.9026, n_D^{30} 1.4983, isolated as the H oxalate, m. 143-4°, crystg. with $1\text{H}_2\text{O}$, lost at 100°; Ac deriv., m. 109-10°. MeI gives *l*-dihydro- α -curcumenyltrimethylammonium iodide, m. 163-4° (poor yield); the hydroxide could not be purified, but distn. at 400° gave a mixt. of very pure I, b_7 128-30°, d_{30}^{30} 0.8633, n_D^{30} 1.4944, $[\alpha]_D^{30}$ -22.9°, and *l*-dimethyldihydro- α -curcumenylamine, b_{18} 130-40°, d_{30}^{30} 0.8824, n_D^{30} 1.4913, $[\alpha]_D^{30}$ -23.0°. I is not reduced by Na and EtOH and is not isomerized by heating at 380° in an inert atm. It does not yield a C_{10}H_8 deriv. when heated with S or Se at 270°; in AcOH a drop of H_2SO_4 gives a yellow color, gradually changing to pink. Catalytic reduction of I gives the hexahydro deriv., b_7 128°, d_{30}^{30} 0.8283, n_D^{30}

1.4592, $[\alpha]_D^{30}$ 0°. The original mixt., on treatment with HCl, ppt. *l*- β -curcumene (III) as the tri-HCl deriv., from which III is regenerated by heating with AcONa in AcOH at 140° for 8 hrs.; III b₇ 128–30°, d_{30}^{30} 0.8810, n_D^{30} 1.4940, $[\alpha]_D^{30}$ –27.9°; titration with Br indicates the presence of 3 double bonds; in AcOH H₂SO₄ gives a deep brown color. III, heated with 10% H₂SO₄, yields a dicyclic terpene (?), b₇ 115–7°, d_{30}^{30} 0.8932, n_D^{30} 1.4936, $[\alpha]_D^{30}$ –11.9°. III is not reduced by Na and AmOH but is isomerized, giving a compd. b₇ 129–30°, d_{30}^{30} 0.8780, n_D^{30} 1.4936; isomerization was also observed on heating at 380° in an inert atm. No C₁₀H₈ deriv. was formed with S or Se at 270°. Catalytic reduction of III gives the *hexahydro deriv.*, b₇ 128°, d_{30}^{30} 0.8283, n_D^{30} 1.4552, $[\alpha]_D^{30}$ 6.3°. Oxidation of I or III with Bz₂O₂ confirms the presence of 3 double bonds. Dihydro- α -curcumenylamine has no characteristic physiol. action beyond a general toxic action.

C. J. WEST

Brasilin and hematoxylin question. VIII. Reduction of trimethylbrasilone and tetramethylhematoxylone. P. PFEIFFER, O. ANGERN, E. HAACK AND J. WILLEMS. Univ. Bonn. *Ber.* 61B, 1923–32(1928); cf. C. A. 22, 2360.—In earlier papers was described the synthesis of trimethylanhydrobrasilin (I), its reduction to trimethyldeoxygenbrasilin and the oxidation of the latter to trimethylbrasilone (II), the known oxidation product of trimethylbrasilin (III). The corresponding products of the tetramethylhematoxylin (IV) series, which differ from those of the III series only in having another OMe group on the C atom, were likewise synthesized. By these syntheses the structure of the natural brasilin and hematoxylin was established except for the position of the alc. HO group. To complete the synthesis of the natural products it remained to reduce II to III. This has not as yet been successfully effected, substances isomeric but not identical with the III and IV having been obtained. The results so far obtained are published now because of the appearance of the paper of Perkin, Ray and Robinson on the same subject (C. A. 22, 3414). II in AcOH with H and Pt sponge at room temp. gives quite smoothly a compd. C₁₆H₂₀O(OMe)₃(OH)₂·H₂O (V), m. 151–2°, probably identical with that obtained by P., R. and R. with amalgamated Al and to which they assigned the formula C₁₆H₂₀O₆·0.5H₂O. To be sure, their compd. m. 129° but its color reactions agree completely with those of V; both substances dissolve in concd. H₂SO₄ with deep bluish red color, changing to brown on heating and assuming an intense green fluorescence. V is also obtained in good yield in AcOH–C₆H₆ with Mg. It is thought not to belong to the true brasilin series but to be derived from the tautomeric form of II and to have the structure VI; it cannot be converted back into II with CrO₃ but gives instead a *carboxylic acid* (VII), m. 225°. With Na–Hg in AcOH–EtOH it gives a compd. C₁₆H₁₈O(OMe)₃OH (VIII), isomeric with natural III. Tetramethylhematoxylone (IX) behaves on reduction much like II; with H and Pt sponge it gives in good yield a compd. C₁₆H₂₀O(OMe)₄(OH)₂ (X), also obtained with Mg in AcOH–C₆H₆; in the latter reaction are formed a no. of other products, 2 of which have been isolated: C₂₀H₂₀O₇ (XI) and C₁₆H₁₈O(OMe)₄OH (XII), isomeric with natural IV. I cautiously treated with Br gives, through a red intermediate product which could not be isolated, by primary addn. of Br at the double bond and secondary cleavage of HBr, the *pyrylium salt* XIII, while with I is smoothly obtained the *diiodide* XIV, almost insol. in H₂O, which, when shaken in H₂O suspension with AgNO₃, forms at first a red soln., presumably of the corresponding iodonitrate, but in a short time it splits off HI and forms a pyrylium salt with green fluorescence. XIII, orange, darkens above 170° and gradually carbonizes, dissolves in H₂O with orange color and green fluorescence. XIV, dark red-brown, m. 175° (decompn.), sol. in MeCN with yellow-red color gradually changing to greenish brown-yellow. V (2 g. from 3 g. II with H and Pt sponge) after standing 1–2 days over CaCl₂ begins to sinter and evolve gas at 125° and m. clear 150–1°, but if kept over the CaCl₂ 14 days, when it has the compn. of the monohydrate, it m. 151–2° sharply without previously sintering; *p*-nitrobenzoate, light yellow, softens 98°, m. 103–5°. In the prepn. of V with Mg there are also formed a compd., m. 267° (decompn.), sol. in concd. H₂SO₄ with dark green color, and another compd., m. 285°, sol. in H₂SO₄ with pure yellow color soon becoming brown. VIII (2.6 g. from 3 g. II), m. 133–4°, gives a blood-red color with concd. H₂SO₄ and with Br vapor a violet-black color, which soon disappears; *acetate*, m. 123–4°. X (1.8 g. from 3 g. IX with Pt sponge and H), m. 185–8°, sol. in concd. H₂SO₄ with deep violet-blue color, gives in the solid state no color with Br; *acetate*, m. 150–2°; *p*-nitrobenzoate, yellow, m. 177–8°. XI, m. 283° (effervescence), sol. in concd. H₂SO₄ with green-yellow color soon changing to green-brown. XII, crystals with 1 H₂O, m. 188–92°, sol. in concd. H₂SO₄ with purple color, unchanged by Br vapors.



C. A. R.

Strophanthin. XV. Hispidus strophanthin. WALTER A. JACOBS AND ALEXANDER HOFFMANN. Rockefeller Inst. *J. Biol. Chem.* 76, 531-7(1928).—The strophanthins of *Strophanthus hispidus* seeds were investigated by the methods previously applied (C. A. 20, 3013; 22, 1131) to *Strophanthus kombe*. The aglucone of hispidus strophanthin was found to be identical with the strophanthidin of the *kombe* variety. Cymarín occurred both free and combined with glucose. The cleavage of the cymarín glucoside was accomplished only slowly and incompletely by the special enzymes in the hispidus seeds. Where cleavage did occur only glucose and cymarín were identified. Hispidus strophanthin is thus chemically different from *K*-strophanthin. **XVI. Degradation in the isostrophanthidin series.** WALTER A. JACOBS AND EDWIN L. GUSTUS. *Ibid* 539-52.—Di-Me anhydro- α -isostrophanthonate was oxidized with KMnO_4 . From the reaction mixt., undephanthotriacid di-Me ester, $\text{C}_{24}\text{H}_{32}\text{O}_9$, m. 179-80°, and the corresponding tri-Me ester, m. 154.5°-5.5°, were obtained. From the latter the ester oxime, m. 188-9°, the phenylhydrazone, m. 196.5-7.5°, and the phenyl- γ -lactazam, m. 155-7°, solidifies and remelts at 240-2°, were obtained. The following compds. were also prepd.: undephanthotriacid mono-Me ester, m. 237-40°; duodephanthondiacid, $\text{C}_{21}\text{H}_{28}\text{O}_7$, m. 253-4°: its di-Me ester, m. 166-7°: its tri-Me ester oxime, 187-9°: the lactone triacid di-Me ester, $\text{C}_{26}\text{H}_{32}\text{O}_{10}$, m. 188-90°; the lactone triacid tri-Me ester, $\text{C}_{26}\text{H}_{34}\text{O}_{10}$, m. 236-7°; and the lactone triacid, $\text{C}_{28}\text{H}_{28}\text{O}_{10}$, m. 193-5°. The bearing of these findings on the structure of the strophanthidin mol. is discussed.

ARTHUR GROLLMAN

Periplocymarin and periplogenin. WALTER A. JACOBS AND ALEXANDER HOFFMANN. *J. Biol. Chem.* 79, 519-30(1928).—Periplocymarin, $\text{C}_{30}\text{H}_{40}\text{O}_8$, was prepd. from the stems and branches of *Periploca graeca* obtained from various sources. It crystd. from MeOH as lustrous needles contg. approx. 1 mol. MeOH which was lost on drying at 100° under reduced pressure. It sintered at 138° and m. 148°. By treating periplocymarin with HCl was obtained periplogenin, small prisms, m. 135-40° with effervescence. Analyses of this material were in best agreement with the formula $\text{C}_{23}\text{H}_{34}\text{O}_6$. By hydrogenation with Pt black, periplogenin was converted to dihydroperiplogenin, $\text{C}_{23}\text{H}_{36}\text{O}_6$, m. 204°. By sapon. with NaOH in MeOH isoperiplogenin was formed. The lactone acid of the latter compd., isoperiplogenic acid, $\text{C}_{23}\text{H}_{34}\text{O}_6$, was obtained as lustrous 6-sided leaflets, with 0.5 mol. H_2O , m. 215° with effervescence. With CH_3N_3 in acetone, the Me isoperiplogenate, $\text{C}_{24}\text{H}_{36}\text{O}_6$, m. 252°, was obtained.

ARTHUR GROLLMAN

Gitoxin. A. WINDAUS, K. WESTPHAL AND G. STEIN. Univ. Göttingen. *Ber.* 61B, 1847-55(1928).—Cloetta (C. A. 20, 2724) describes his digitalin as m. 282° (cor.) on rapid heating, remaining unchanged up to 265°, then beginning to become somewhat yellowish and effervescing 282°, while W. and Schwarte reported for their gitoxin (I) that it m. 266-9° (uncor.) and that this m. p., being a decompn. point, is not very characteristic, and it has been found that this decompn. point can be raised above or brought below 282°, depending on the rate of heating; to the differences in the m. ps. of the 2 substances no great significance can, therefore, be attached. The gitoxigenin (II) obtained, along with digitoxose, by the cleavage of I, readily loses 2 mols. of H_2O to form a dianhydro deriv. identical with the digitaligenin (III) prepd. from the seed glucoside of *Digitalium verum*, to which the formula $\text{C}_{44}\text{H}_{62}\text{O}_8$ had been assigned by

W. and Bandte. II was therefore given the C_{24} formula $C_{24}H_{36}O_6$, while Cloetta assigns to his bigitaligenin the formula $C_{23}H_{34}O_6$. Schwarte's and Cloetta's analyses for II and its derivs. do not agree well and the authors have accordingly prepd. all the known derivs. anew and have had them analyzed in A. Schoeller's micro-anal. lab. and Karrer (Zürich) and Pregl (Graz) have also made many control analyses for them; they believe that the compns. of II and its derivs. may now be considered as definitely established, as follows: I, $C_{41}H_{64}O_{12}$; II, $C_{23}H_{34}O_6$ (the Ac derivs. are apparently not suitable for detg. the compn. of II, for in their prepn. mixts. of mono-, di- and tri-Ac derivs. may be formed). III, $C_{23}H_{34}O_6$. A repetition of Cloetta's hydrogenation of II with Pt black has led the authors to believe that his supposed di- and tetrahydro derivs., m. 212° and 241°, resp., are really stereoisomeric dihydro derivs., $C_{23}H_{36}O_6$; not only can the 212° compd. be converted into the 241° compd. but both yield the same *di-anhydrodihydrogitoxigenin* (IV), $C_{23}H_{32}O_6$. The 241° compd. shows $[\alpha]_D^{20} -48.74^\circ$ (MeOH). IV, readily obtained with HCl, m. 166°, is converted in alc. by H_2 and Pt black with extraordinary rapidity into a mixt. of stereoisomeric *tetrahydrodianhydrodihydrogitoxigenins*, $C_{23}H_{36}O_6$, the less sol. of which (V) m. 214°, $[\alpha]_D^{20} 75.7^\circ$ (alc.), and on cautious oxidation in AcOH with Beckmann's mixt. gives *tetrahydrodianhydrogitoxigenone* (VI), $C_{23}H_{34}O_6$, m. 207°, $[\alpha]_D^{20} 85.9^\circ$ ($CHCl_3$), probably identical with Bandte's hexahydrodigitaligenone, m. 205-7°; *oxime*, m. 215° (B., 205.6°). Reduction of the ketone by Clemmensen's method gives the *lactone* $C_{23}H_{36}O_6$, m. 173° (B., 168-9°), $[\alpha]_D^{18} 71^\circ$ ($CHCl_3$). The ketone in AcOH with excess of CrO_3 mixt. at 70° gives the *dicarboxylic acid* $C_{23}H_{34}O_8$ (VII), m. 282°, $[\alpha]_D^{20} 100^\circ$ (AcOH), whose *di-Me ester*, prepd. with CH_3N_3 , m. 163°, $[\alpha]_D^{20} 82.3^\circ$ ($CHCl_3$). Bandte and Schwarte by addn. of 6 atoms of H to III had obtained products, m. 186-7°, which they believed to be homogeneous, but it has been found that on careful fractional crystn. they can be sepd. into V and more sol., lower-melting isomers with $[\alpha]_D$ 40-50°; the 186° mixts. yield an *Ac deriv.*, m. 156° and a *Pr deriv.*, m. 163-4° (also probably mixts. of stereoisomers); oxidation with CrO_3 gives, together with some VI, chiefly a more sol. product, m. 150-85°, yielding on reduction a lactone m. around 145° and on oxidation an *isomer* (believed to be homogeneous) of VII, m. 278°, $[\alpha]_D^{18} 71^\circ$ (AcOH), whose *di-Me ester*, m. 171-2°, $[\alpha]_D^{22} 40^\circ$ ($CHCl_3$). Distd. at 280° under 1 mm. the acid gives a *ketone* $C_{22}H_{32}O_6$, m. 206°; *oxime*, m. 248°. The above results indicate that II is a singly unsatd. trihydroxy-lactone and the alc. group remaining in III and IV is secondary and adjacent to a CH_2 group in a hydroaromatic 6- (or 7-) membered ring. C. A. R.

Xanthophyll. I. Catalytic hydrogenation. L. ZECHMEISTER AND P. TUZSON. Univ. Pécs. Ber. 61B, 2003-9(1928).—After the no. of double bonds in carotin, $C_{40}H_{56}$ (I), had been established by catalytic hydrogenation and its decolorization during the reduction had been followed colorimetrically (C. A. 22, 4533), it became of interest to study in the same way the 2nd carotenoid of the green leaf, xanthophyll, $C_{40}H_{56}O_2$ (II). It behaves almost exactly like I, taking up 22 atoms H_2 and its color decreasing almost exactly proportionally to the quantity of H_2 absorbed up to 16 atoms, when it becomes colorless. I and II therefore seem to have the same unsatd. skeleton with 8 conjugated, rapidly satd. double bonds and 3 more slowly reacting double bonds which play no role in the production of the color. On the basis of the data at present available, the simplest view as to the relationship between the 2 pigments is that I contains 2 alkyl, II 2 alkoxy groups at corresponding positions in their mols. As perhydrocarotene is optically inactive while *perhydroxanthophyll* (III) is active, the O atoms must occupy a position which produces asymmetry or, if it should happen that perhydrocarotene has some activity, even though immeasurably small, they increase this activity extraordinarily. III is a colorless or very faintly yellowish, thick oil, mol. wt. in freezing C_4H_6 564-90, $[\alpha]_D^{24} -9.2^\circ$ (Et_2O), -9.8° (C_6H_6). C. A. R.

Remark on my address before the German Chemical Society (porphyrins and their synthesis). HANS FISCHER. Techn. Hochschule München. Ber. 61B, 1596 (1928); cf. C. A. 22, 1163.—F. does not feel called upon to make any reply to Schumm (C. A. 22, 2381). C. A. R.

The modifications of hydroxyhemin. A. HAMSÍK. Univ. Brünn. Z. physiol. Chem. 178, 67-74(1928).—Three modifications are distinguished, α - and β -hydroxyhemins and pseudohemin. α -Hydroxyhemin (α -hematin) is the original unaltered form. β -Hydroxyhemins (β -hematins) are products obtained from the above by mild treatment with acids and bases, while pseudohemins are obtained from either of the foregoing by more drastic treatment and are therefore more profoundly altered. The β -derivs. differ from the α -form in their greater soly. in AcOH and pyridine, their

cryst. form, inability to form anhydrides and greater difficulty of crystn. They combine with Cl less readily and the products give up Cl more easily. They can be recrystd. from AcOH-NaCl after dissolving in pyridine-CHCl₃. When deferrated by MeAc-SnCl₂-HCl they yield less protoporphyrin and more of a porphyrin characterized by its sol. Na salt and its alk. spectrum. The pseudohemins are still more sol. and more difficult to ppt., they give up Cl very readily and cannot be crystd. from AcOH-NaCl after dissolving in pyridine-CHCl₃. They yield less protoporphyrin and mainly a brown-green-red porphyrin. Some of the cryst. hemins are probably chem. individuals, but after dissolving in bases and pptg. by acid the products are mixts.

A. W. DOX

The constitution of the bile acids. XIV. The condensation of dehydrocholic acid with itself and with aromatic aldehydes. W. BORSCHÉ AND E. FESKE. Univ. Frankfurt. *Z. physiol. Chem.* 178, 148-55(1928); cf. *C. A.* 22, 3169.—When dehydrocholic acid, C₂₄H₃₄O₈ (I), is heated 3-4 hrs. in a bomb tube at 250°, 2 mols. condense with splitting out of H₂O to form a *didehydrocholic acid*, C₄₈H₆₆O₈, m. 309-10°, in 50% yield. The same product was obtained in 30% yield by heating I 4 hrs. in an open vessel in a current of CO₂, and in 50% yield by satg. I in AcOH with dry HCl and allowing to stand for 1 week. The *di-Me ester*, m. 265°, was prepd. by suspending the acid in Et₂O and treating with CH₃N₃, and the *di-Me ester pentoxime*, m. 229°, by boiling the ester in MeOH with NH₂OH.HCl and NaOAc. Oxidation of the acid with alk. KMnO₄ gave no characteristic product, but hydrogenation in AcOH with Pt catalyst at 2.5 atm. and 100° yielded *pentahydroxydicholanic acid*, m. 245-6°. I condenses also with 2 mols. of BzH when the mixt. is heated 4 hrs. at 250-5°, or allowed to stand at room temp. with AcOH-HCl, yielding *β-dibenzaldehydcholic acid*, m. 219-20°. This is isomeric with a dibenzal deriv. previously prepd. by condensation in the presence of NaOH. Although at least 2 more CH₂ groups are present in I, these do not react even with an excess of BzH. *Di-p-chlorobenzaldehydcholic acid*, m. 249°, was prepd. by a similar condensation between I and *p*-ClC₆H₄CHO in the presence of AcOH satd. with HCl.

A. W. DOX

Preparation of hemin derivatives by pyro reactions. II. 1. Préparation of pyratin from hemin by the resorcinol fusion. 2. Preparation and properties of pyroporphyrin. 3. Deferration of porphyrins in the "iron-phenol fusion" and transformation of iron porphyrins by phenols and phenol-sulfuric acid. O. SCHUMM. Hamburg Univ. *Z. physiol. Chem.* 178, 1-18(1928); cf. *C. A.* 22, 3168.—By heating hemin with molten resorcinol at 180-90° an almost quant. yield of *pyratin* is obtained, a substance probably identical with copratin. It may be converted into the cryst. *chloride* by dissolving in boiling AcOH and adding a little HCl, or by dissolving in pyridine, dilg. with CHCl₃ and pouring into boiling AcOH contg. HCl. It crystals in 3 different forms. Unlike hemin, hematin, hematohematin and their Me derivs., it dissolves in concd. H₂SO₄ with a violet color. Treatment with AcOH-N₂H₄ by removal of Fe converts it into *pyroporphyrin*, which is probably identical with copratoporphyrin. When pyratin is heated in paraffin to 360° and then after cooling treated with AcOH-N₂H₄ it yields a substance differing from pyroporphyrin only in its insoly. in alkali. The product is probably a decarboxylated pyroporphyrin. Conversion of pyratin into pyroporphyrin may be effected also by dissolving in PhOH and treating with (CO₂H)₂. Pyroporphyrin, like copratoporphyrin, contains 2 CO₂H groups and forms a Me ester, m. 218-23°. Pyratin may be obtained also from hemoglobin, though less readily than from hemin, but not from mesohemin or mesoporphyrin by the resorcinol fusion. Other phenols, *e. g.*, *o*- and *p*-C₆H₄(OH)₂, 1,2,3- and 1,3,5-C₆H₃(OH)₃ and the HO-free compds. C₁₀H₈, anthracene and camphor are not suited to this reaction. When pyroporphyrin is boiled with PhOH and Fe powder or FeO an Fe complex is formed. Other metals, as Cu and Mn, may be introduced in the same way. Treatment of hemin with a mixt. of PhOH and H₂SO₄ yields Fe-contg. or Fe-free hemin derivs. according to the proportions of the reaction mixt. At higher temps. the Fe thus removed tends to recombine with the porphyrin.

A. W. DOX

Organic addition compounds of CaCl₂ and CaI₂ (GREENBAUM) 6. The applicability of Fresnel's law in deducing evidence in favor of surface structure from surface reflectivity (BHATNAGER, *et al*) 2. A tar obtained from brown coal by steam distillation. II. Comparative experiments on the neutral constituents of a steam tar and of a tar produced by external heating (FISCHER) 21. The composition of the cell wall in the leaves of the white cabbage (PRINGSHEIM, *et al*) 11D. Reduction of ores and conversion of hydrocarbons (Fr. pat. 638,251) 9. Photooxidation of anthraquinone (Pfeilsticker) 3.

VITORIA, P. E.: *Química del carbono (teórica y práctica)*. Barcelona: Casals. 894 pp. Reviewed in *Chimie et industrie* 20, 402(1928).

Oxygenated organic compounds. I. G. FARBENIND. A.-G. -Brit. 286,010, Aug. 18, 1926. In producing alcs. and other oxygenated org. compds. by interaction of CO with vaporized aliphatic alcs. or esters as described, in Brit. 254,819 (C. A. 21, 2703), the presence of free Fe, Ni or Co or volatile compds. of these metals is excluded from the inner parts of the app., the catalysts and the reaction gases.

Organic acids. ÉTABLISSEMENTS TENCÉ ET COMPAGNIE FRANÇAISE D'APPLICATIONS CHIMIQUES RÉUNIS. (Émile Dubosc, inventor.) Fr. 638,567, Dec. 13, 1926. Org. acids are prepd. by making gaseous HCl, dry or damp, act on solid salts of org. acids either in the presence of water or a solvent in which the acid is more sol. than in water so as to obtain finally 2 liquid layers, one an aq. soln. of a chloride, the other the acid or a soln. thereof.

Sulfamic acids. I. G. FARBENIND. A.-G. Fr. 638,175, July 23, 1927. Sulfamic acids of secondary bases are prepd. by acting on the latter with chlorosulfonic acid or its salts or esters, SO₂, pyrosulfuric acid or analogous reagents, in the presence of an agent capable of fixing the acids and with (or without) a solvent or indifferent diluent. The bases are reformed by heating with an acid, so that the process may be used for the purification of the bases, e. g., carbazole may be sepd. from anthracene, and monosepd. from di-methylaniline.

Hydrogenating esters of aromatic carboxylic acids. I. G. FARBENIND. A.-G. Brit. 286,201, Feb. 26, 1927. Esters of aromatic carboxylic acids are hydrogenated in the nucleus by treatment with H at moderate pressure (suitably 25-40 atm.) in the presence of a Ni catalyst and with or without use of a solvent. With acids derived from C₁₀H₈ the addn. of H takes place only in the unsubstituted part of the nucleus. The resulting esters may be sapond. to produce acids. Co may be used with Ni in the catalyst. Examples are given of the hydrogenation of benzoic acid ethyl ester (to produce hexahydrobenzoic acid ethyl ester), phenylacetic acid ethyl ester (to produce hexahydrophenylacetic acid ethyl ester), salicylic acid methyl ester (to produce hexahydrosalicylic acid methyl ester), phthalic acid diethyl ester (to produce hexahydrophthalic acid diethyl ester), terephthalic acid dimethyl ester (to produce hexahydroterephthalic acid dimethyl ester), α -naphthoic acid ethyl ester (to produce 5,6,7,8-tetrahydro-1-naphthoic acid ethyl ester), and 2,3-aminonaphthoic acid ethyl ester (to produce 5,6,7,8-tetrahydro-2,3-aminonaphthoic acid ethyl ester).

Amines. GEORGES MIGNONAC. Fr. 638,550, Dec. 9, 1926. Primary amines are prepd. by catalytic hydrogenation of N compds. such as oximes or nitriles in the presence of NH₃. In examples, a mixt. of H, NH₃ and acetonitrile is passed over reduced Ni at 180° and EtNH₂ is collected. Similarly benzonitrile with reduced Cu at 250° gives benzylamine. A mixt. of benzyl cyanide, alc. and NH₃ is agitated in an atm. of H, and β -phenylethylamine is produced.

Alkylguanidines. SCHERING-KAHLBAUM A.-G. (formerly Chemische Fabrik auf Actien, vorm. E. Schering). Brit. 285,873, Feb. 24, 1927. A salt of a higher alkylamine is treated with cyanamide or a deriv. in the presence of a quantity of solvent which is insufficient to dissolve all the material. Thus diisoamylamine is converted into diisoamylguanidine, decamethylenediamine into diguanyldecamethylenediamine, δ -guanidinobutyl- γ -guanidinopropylamine into the corresponding triguanidine, methylaminoacetopyrocatechol into 2-amino-3-methyl-4(5)-dihydroxyphenyl(3,4)-glyoxaline and methylaminoacetophenol into 2-amino-3-methyl-4(5)-hydroxyphenyl(4)-glyoxaline.

Aromatic amino thiocyno derivatives. OSKAR SPENGLER and WERNER MÜLLER (to Grasselli Dyestuff Corp.). U. S. 1,687,596, Oct. 16. A soln. contg. the reaction product of a halide of sulfuric acid and a thiocyanate, e. g., a soln. formed from sulfuryl chloride and Pb(CNS)₂ in CCl₄, is caused to react with an aromatic amino compd., e. g., with diphenylamine in CHCl₃ to form 4,4'-dithiocyanodiphenylamine, m. 120°.

Coumarone derivatives. CHEMISCHE FABRIK AUF ACTIEN (formerly E. Schering). Fr. 638,483, Jun. 21, 1927. Alkylcoumarones are prepd. by heating to 280-320° the products of condensation of alkylphenols and ketones. In examples, the condensation product of *m*-cresol and acetone is heated to 300°. The distillate is fractionated, giving besides 3-methyl-6-isopropylphenol a dimethylcoumarone b. 98°. Similarly the condensation product of *p*-cresol and acetone gives besides 4-methyl-6-isopropylphenol a dimethylcoumarone b. 102°.

Mercaptans, etc. INTERNATIONALE NAHRUNGS- UND GENUSSMITTEL A.-G. Brit.

286,152, July 25, 1927. Furfuryl disulfides and mercaptans are made by treating furfural or a deriv. with sulfides or sulphydrates of the alkalis, earth alkalis or NH_3 , and reducing. Examples are given of the prepn. of furfuryl mercaptan and its nitrobenzoic ester, α -methylfurfuryl mercaptan and its *p*-nitrobenzoic ester, α -hydroxy-methyl-furfuryl mercaptan and methoxymethylfurfuryl mercaptan. Cf. C. A. 22, 4537.

Dinitro derivatives of perylene, etc. KARL STIEGER (to Felice Bensa). U. S. 1,688,837, Oct. 23.* Perylene or a deriv. such as a halide is suspended in glacial HOAc, the suspension is heated to about 100° and is treated with HNO_3 (produced *in situ* by reaction of KNO_3 and H_2SO_4) in the proportion of 2 mols. for each mol. of the compd. treated.

Isomeric thymols and menthols. SCHERING-KAHLBAUM A.-G. (formerly Chemische Fabrik auf Actien, vorm. E. Schering). Brit. 285,833, Feb. 22, 1927. The hydrogenated condensation products of crude cresol with acetone are sepd. into their components by fractional distn. (preferably *in vacuo*, which may be accompanied by freezing). Examples and details are given.

Derivatives of starch, cellulose and other carbohydrates. W. HARRISON. Brit. 286,331, Oct. 30, 1926. Stable and permanent derivs. are produced by oxidizing a carbohydrate compd. contg. a CSS group, in the presence of NH_3 or an NH_3 deriv. not contg. org. constituents such as hydroxylamine. Oxidizing agents which oxidize H_2S may be used such as ferricyanides, dichromates, peroxides, HNO_3 , SO_3 , ferric salts and air or O with or without O carriers. O may be used in the nascent state as generated by electrolysis. Examples are given of the use as starting materials of cellulose and starch xanthogenates and cellulose dixanthogenate. Brit. 286,332 specifies generally similar oxidations of like starting materials in the presence of an org. deriv. of NH_3 in which at least one atom of H is reactive and in which one or both of the other H atoms may be replaced by an alkyl, aryl or aralkyl group, e. g., alkylamines, arylamines such as aniline, aralkylamines, acid amides such as acetamide, benzamide or phthalamide, amino acids such as aminoacetic acid, amidines, urea and its derivs., cyanamide, dicyanodiamide, dicyanamide, guanidine and its derivs. and thiourea and its derivs. Products are obtained which may be used for making films, filaments, etc. Cf. C. A. 22, 4536.

Reducing aromatic nitro compounds. PAUL DIETERLE (to National Aniline & Chemical Co.). U. S. 1,689,014, Oct. 23. In reactions such as the production of aniline from PhNO_2 , FeS is used as a reducing agent.

Dehydration of alcohol. OVIDIO LEONORI. Fr. 636,551, June 24, 1927. Alc. for use as a fuel or in solvent mixts. is dehydrated by treating it with a mixt. of carbides of Ca, Ba, Mn, etc., which are decompd. by H_2O . Hydride of Ca or Al may also be added, and the H_2O may be first satd. with NH_3 .

Catalysts for the production of methanol. COMMERCIAL SOLVENTS CORP. Fr. 636,337, May 12, 1927. A catalyst for the production of methanol is made by reducing a Ni compd., e. g., $\text{Ni}(\text{NO}_3)_2$, with H at a temp. between 300 and 950° , preferably 500 – 600° .

Catalysts for methanol production, etc. I. G. FARBENIND. A.-G. Brit. 286,284 March 3, 1927. Catalysts of high mech. stability, especially those of the metal oxide type, are obtained by the addn. of water-sol. Mg salts such as the sulfate, chloride or nitrate to the other components. Examples are given of the use of ZnO with MgCl_2 together to form a mass which after heating is treated with chromic acid or alkali metal dichromate, to form a catalyst suitable for MeOH production from CO and H at temps. of 400 – 450° under 200 atm. pressure.

Dehydrating secondary alcohols. SYLVAN R. MERLEY (to Doherty Research Co.) U. S. 1,688,731, Oct. 23. Crude amyl alc. from petroleum products or other similar heavy secondary alc. liquids contg. small quantities of low-boiling "off-odor" compds. are rectified with a substantially dry alc. such as secondary BuOH of lower b. p. than that of the alc. to be dehydrated and forming a const.-b. p. mixt. with water and causing the temp. of initial distn. of the mixt. to be higher than the b. p. of the liquid to be dehydrated.

Olefin alcohols. FRED W. LOMMEN (to Carbide & Carbon Chemicals Corp.). U. S. 1,688,083, Oct. 16. Al butoxide is used as a catalyst in producing olefin alcs. from the corresponding aldehydes, e. g., producing cinnamyl alc. from cinnamyl aldehyde at a temp. of 100° .

Guanidino alcohols. CHEMISCHE FABRIK AUF ACTIEN, VORM. E. SCHERING. Brit. 286,196, Oct. 15, 1926. Guanidino-alcs. are prepd. by treating an amino alc. salt or deriv. with cyanamide, e. g., methylguanidinoethanol-HBr is made by heating methylaminoethanol-HBr with cyanamide in an autoclave for several hrs.

Complex metal alcoholates. HANS MEERWEIN (to Chemische Fabrik auf Actien (vorm. E. Schering)). U. S. 1,689,356, Oct. 30. Alcoholates of different metals such as Mg and Al ethylates or Mg or Al and Na ethylates are caused to react together to form complex alcoholates.

Alkylisopropylenephenols. CHEMISCHE FABRIK AUF ACTIEN (vorm E. Schering). Fr. 636,228, June 18, 1927. Alkylisopropylenephenols are prepd. by heating to between 300 and 310° condensation products of alkylphenols and ketones and distg. E. g., 3-methyl-6-isopropylphenol is obtained from the condensation product of *m*-cresol and acetone, and 4-methyl-6-isopropylenephenol from the condensation product of *p*-cresol and acetone.

Alkylisopropylphenols and their hydrogenation products. CHEMISCHE FABRIK AUF ACTIEN (vorm. E. Schering). Fr. 636,267, June 20, 1927. The alkylisopropylenephenols described in Fr. 636,228 (preceding pat.) are treated with H in the presence of catalysts till 2-8 atoms of H are fixed. Thymol, *p*-thymol, menthol and *p*-menthol are thus obtained.

Naphthisatins. I. G. FARBENIND. A.-G. Brit. 286,358, Dec. 1, 1926. Naphthyl-oxaminic acid halides derived from primary naphthylamines are treated with acid condensing agents such as AlCl₃ or FeCl₃. Several examples are given.

Thiocarbanilide. CARL N. HAND and HAROLD P. ROBERTS (to Rubber Service Laboratories Co.). U. S. 1,688,707, Oct. 23. Aniline and CS₂ are caused to react at a temp. of 46-46.2° in the presence of a small quantity of NH₃. An app. is described.

Hydrolysis of methyl chloride. RALPH H. MCKEE. U. S. 1,688,726, Oct. 23. MeCl mixed with steam is passed at an elevated temp. (suitably about 350-375°) over a hydrolyzing agent comprising Ca(OH)₂ or other alk. earth hydroxide, in order to form MeOH. AmOH may be similarly formed from AmCl.

Phthalic anhydride. FRANK A. CANON and CHESTER E. ANDREWS (to Selden Co.). U. S. 1,689,860, Oct. 30. A mixt. of naphthalene vapor and an O-contg. gas such as air is subjected to the action of a catalyst such as V oxide at a temp. of 400-450° and this temp. is maintained by transmitting the excess heat generated to a compn. of Cd and Hg which will boil at the desired temp.

2-Amino-4-nitro-1-benzoic acid. I. G. FARBENIND. A.-G. Brit. 285,877, Feb. 24, 1927. 2-Amino-, alkylamino-, arylamino- or aralkylamino-4-nitro-1-benzoic acid is made by treating 2-chloro-4-nitro-1-benzoic acid with NH₃, alkylamine, arylamine or aralkylamine in the presence of a catalyst such as finely divided Cu.

Monodiaz compounds of 1,4-diaminoanthraquinone-2-sulfonic acid. GEORG KRÄNZLEIN and FRITZ ROEMER (to Grasselli Dyestuff Corp.). U. S. 1,690,021, Oct. 30. Monodiaz compds. of 1,4-diaminoanthraquinone-2-sulfonic acid compds. are obtained by treating 1,4-diaminoanthraquinone-2-sulfonic acid compds. such as 1,4-diaminoanthraquinone-2-sulfonate (or 2,6- or 2,7-disulfonate), suitably in the form of their Na salts, with NaNO₂ and H₂SO₄.

Styrene. OMAR H. SMITH (to Naugatuck Chemical Co.). U. S. 1,687,903, Oct. 16. A halogen-contg. alkylbenzene such as chloroethylbenzene is heated to a decompn. temp. (which may be about 600-725°) to split off H and halogen and styrene is recovered from the collected liquid reaction products, e. g., by steam distn.

Anthracene condensation products. I. G. FARBENINDUSTRIE AKTIENGESellschaft. Fr. 32,803, Nov. 10, 1926. Addn. to 607,181. Anthranols, oxanthranols, anthrones or their homologs or substitution products are condensed by means of H₂SO₄ without using an oxidizing agent. An example is given of the prepn. of bz-3-methyl-benzanthrone from anthrone and crotonaldehyde.

11—BIOLOGICAL CHEMISTRY

PAUL E. HOWE

A—GENERAL

FRANK P. UNDERHILL

The place of biochemistry in medicine. A. GARROD. *Brit. Med. J.* No. 3521, 1099-1101(1928).—An address, mostly historical. J. B. BROWN

The equilibrium of chemical composition in living cells. J. MAURICE JAVILLIER. *Can. Med. Assoc. J.* 19, 1-7(1928).—An address. A. T. CAMERON

The study of the effect of various agents, chiefly sunlight, upon the susceptibility of rachitic rats to infection. ELIZABETH CHANT ROBERTSON. Connaught Lab., Univ.

Toronto. *Can. Med. Assoc. J.* 19, 154-7(1928); cf. *C. A.* 22, 103.—Exposure to the sun for 2 hrs. around noon markedly raises the resistance of young rachitic rats to infection. A. T. CAMERON

The halogen content of animal tissues. A. T. CAMERON AND C. H. A. WALTON. Univ. Manitoba, Winnipeg. *Trans. Roy. Soc. Can.* 22, Sect. V, 1-11(1928).—The results obtained by Magnus Levy (normal man, *C. A.* 4, 1765), Damiens (dog, *C. A.* 15, 1163), Vladesco (cow, *C. A.* 19, 3101) and C. and W. (rat, dog), using different procedures, show relatively comparable figures. No evidence was obtained of the presence of org. Cl in any of the tissues examd. The actual values found for any tissue seem to be largely dependent on the vascularity of such tissue and the amt. of blood and lymph present within it. Values for fresh tissue, rather than for desiccated tissue, should be used for comparison. The av. values for 6 rats were in mg. per 100 g. (fresh tissue 1st, then desiccated tissue), bone, 125, 205; brain, 108, 499; heart, 111, 484; intestinal mucosa, 84, 398; kidneys, 178, 871; liver, 132, 498; lungs, 196, 909; lymph glands, 156, 575; muscle, 60, 233; ovaries, 290, 1126; salivary glands, 125, 523; spleen, 134, 586; stomach mucosa, 136, 626; testes, 222, 1792. Corresponding results for 6 dogs were adrenals, 124, 351; bone, 103, 133; brain, 148, 692; cartilage, 190, 470; duodenal mucosa, 132, 695; heart, 119, 487; kidneys, 251, 1147; liver, 136, 501; lungs, 230, 1009; muscle, 67, 259; ovaries, 190, 750; pancreas, 138, 544; salivary glands, 152, 640; spinal cord, 118, 392; spleen, 171, 726; stomach mucosa, 160, 1119; tendon, 261, 549; testes, 187, 1076; thyroid, 161, 567; uterus, 201, 993. Van Slyke's method was used. Some results for pathol. man are also given. A. T. CAMERON

The action of ultra-violet rays on the skin. ALBERT EIDINOW. *Brit. J. Tuberculosis* 22, 136-9(1928).—The present conception of the action of ultra-violet rays on the skin supports the theory of the production of local photo-biochem. substances which have bactericidal or vitamin properties, local hyperemia of the skin, and stimulation of a leucocytic infiltration of the epidermal tissues. H. J. CORPER

Urease. MARTIN JACOBY. *Fermentforschung* 10, 1-11(1928).—A review, including bibliography of 102 references. A. W. DOX

Comparative studies on the breakdown of casein, serum globulin and serum albumin by dilute alkali, dilute acid, pepsin hydrochloric acid and pancreatic enzymes. EMIL ABDERHALDEN AND WALDEMAR KRÖNER. Univ. Halle. *Fermentforschung* 10, 12-25(1928).—Serum globulin, serum albumin and casein behave somewhat differently when treated for a no. of hrs. with *N* NaOH at 37°. The globulin shows an immediate and rapid increase in amino N; with the albumin this increase is less rapid, and with casein there is a noticeable lag before any increase occurs but the increase eventually exceeds that obtained with either of the other proteins. It is significant that globulin contains glycine while albumin does not, since it was previously shown that polypeptides contg. this amino acid are more susceptible to alkali hydrolysis. With all 3 proteins the hydrolysis is accompanied by a decrease in optical rotation. The cleavage increases also with the temp. and with the alkali concn. Not only polypeptides but also free amino acids are liberated and can be identified by the ester method. Amino and carboxyl groups are set free in equal proportions, but this does not necessarily indicate that they were originally present in acid amide linkage. Treatment with *N* HCl at 37° liberates amino N from albumin but not from globulin or casein. However, an alteration of the last 2 proteins occurs notwithstanding the absence of increase in amino groups. Casein undergoes a partial hydrolysis when treated with pepsin-0.1 *N* HCl, but albumin and globulin are quite resistant. On the other hand, both casein and albumin are hydrolyzed readily by pancreatic ext., while globulin remains unaltered after 30 hrs. and is not hydrolyzed even by trypsin-kinase. A preliminary treatment of globulin with pepsin-HCl, although causing no noticeable cleavage, renders it more susceptible to hydrolysis by *N* NaOH. The HCl evidently plays a part in this reaction by increasing the swelling of the protein, but does not account for the entire effect. The pepsin-HCl treatment renders casein and globulin, but not albumin, capable of further hydrolysis by *N* HCl. Similarly, casein, but not albumin, after digestion with pancreatic ext. undergoes further cleavage when treated with *N* NaOH, but neither one is affected by *N* HCl. All 3 proteins are strongly hydrolyzed by pancreatic ext. if given a preliminary treatment with pepsin-HCl. This is particularly significant in the case of globulin which is not noticeably attacked by either enzyme alone. Pepsin-HCl causes no further cleavage of any of the 3 proteins after pancreatic digestion. After the *N* alkali treatment, pancreatic digestion brings about a further cleavage of globulin but not of casein or albumin. A. W. DOX

The breakdown of *D*- and *L*-alanine and of glycyl-*D*-alanine and *D*-alanylglycine by the organism of the dog. EMIL ABDERHALDEN AND KURT FRANKE. Univ. Halle.

Fermentforschung 10, 39-49(1928).—Enzyme preps. from animal organs have thus given an asymmetric cleavage of racemic dipeptides. It remained to be detd. whether the living organism would show the same selective behavior. A comparison first made of the utilization of *d*- and *l*-alanine by the dog. The amino acid was administered both orally and intraperitoneally. *d*-Alanine gave an increase in total urea N in the urine corresponding approx. to the N of the amino acid administered. There was, however, no increase in amino N, thus indicating that the substance was completely utilized. *l*-Alanine, on the other hand, gave an increase not only in urea N but also in amino N. The increase in urea was much smaller than in *d*-alanine expts. *l*-Alanine was actually recovered from the urine by means of its H_2SO_4 deriv. and by the ester method, but the recovery was not quant. In some cases it seemed probable that the *l*-acid was partially acetylated since a substance responding in properties to acetylalanine was isolated in an impure state, and since amino N content of the urine was greater after than before hydrolysis. The results with *l*-alanine were, however, not uniform. In some expts. the amino N of the urine showed an increase corresponding to 85% of the substance administered and no increase in urea, while in others the increase in urea accounted for 25% of the amino N. Whether the *l*-isomer is in such cases utilized directly, or first rearranged to the *d*-form is not known. Similar feeding expts. with glycyl-*dl*-alanine and with *dl*-alanyl-glycine gave an increase in both amino N and urea. Apparently only a small proportion of the component contg. *l*-alanine is broken down, and it is possible that some interchange occurs in the intestinal tract through the action of bacteria. Glycyl-*l*-alanine was recovered from the urine by converting it into the corresponding anhydride and identified as such. An important observation is the fact that the Pb salts of amino acids (*d*-alanine, *l*-alanine, *d*-valine, *d*-glutamic acid) have a higher optical rotation than the free acids, but in the opposite direction. The Pb salts of dipeptides (*l*-leucyl-glycine, glycyl-*d*-leucine, glycyl-*l*-leucine), on the other hand, show increased rotation in the same direction. This behavior may be useful in distinguishing between amino acids and polypeptides.

A. W. Dox

A parallelism in the behavior of pancreatic secretin and of enterokinase at boiling temperature. I. P. RASENKOV. Obuch Inst. Moscow. *Fermentforschung* 10, 72-78(1928).—Secretin preps. were obtained (1) by introducing 0.5% HCl into an isolated intestinal loop of a dog for 10-5 min., (2) by boiling the mucosa ext. with HCl and neutralizing, and (3) by rinsing with HCl the isolated intestinal loop of a dog on which a Thiry-Vella operation had been performed. When these preps. were adjusted to different degrees of acidity and alk. and then boiled, all showed a complete and quantitative parallelism in the rates at which their secretin and enterokinase activities were destroyed. The possibility is suggested that secretin and enterokinase may be one and the same substance which under certain conditions functions as secretin and under others as enterokinase.

A. W. Dox

Influence of boiling temperature on pancreatic secretin. I. P. RASENKOV. Obuch Inst., Moscow. *Fermentforschung* 10, 78-82(1928); cf. preceding abstr.—The apparent lack of uniformity of secretin in its stability toward boiling in acid or alk. soln. due to the conditions under which the reaction is adjusted. By boiling the prep. in acid soln., or after neutralizing until a ppt. forms, or after adding alkali until the ppt. redissolves, the activity is not destroyed. But if the acid soln. is partially neutralized without formation of a ppt., or if it is so rapidly made alk. as to avoid pptn. boiling alone destroys the activity.

A. W. Dox

The influence of chymosin on the proteins of milk. IV. Enzymes in the stomach contents of calves at different ages. I. ZAYKOVSKII, O. FEDOROVA AND V. IVANKIN. gr. Inst., Leningrad. *Fermentforschung* 10, 83-7(1928); cf. C. A. 20, 3300.—By comparing the rate of fibrin digestion with the rate of milk coagulation, the relative contents of pepsin and chymosin were detd. in exts. of calf stomach at various stages of fetal development and after birth and feeding. Both enzymes are present in the embryo and in approx. const. proportions on the basis of stomach wt. After birth and feeding there is a considerable increase in both enzymes, but the peptic activity increases much more rapidly than the milk-curdling power. Conclusion: Pepsin and chymosin are sep. and distinct enzymes.

A. W. Dox

The question of the occurrence of polypeptides in blood plasma and serum. The use of erepsin and of trypsin-kinase for their detection. EMIL ABDERHALDEN AND ERNST ROSSNER. Univ. Halle. *Fermentforschung* 10, 102-10(1928).—If polypeptides are present in the serum they should be diffusible through a parchment membrane and make their presence known by an increase in amino N when the dialyzate is subjected to the action of erepsin or trypsin-kinase. The amt. of dialyzable N increases

somewhat when the serum is kept for a considerable time, but the possibility of bacterial action could not be definitely excluded, notwithstanding precautions for asepsis. For shorter periods up to 7 days the increase in dialyzable N is so small as to be negligible. In the presence of trypsin-kinase, but not of erepsin, an actual increase does occur. This is probably due to digestion of serum albumin, since the globulin has previously been shown to be resistant to trypsin-kinase. When erepsin or trypsin-kinase is added to the dialyzate obtained from serum no increase in amino N is observed. Evidently no substances are present which are attacked by these enzymes, or else the amt. is extremely small. The dialyzate does, however, show an increase in amino N after acid or alkali hydrolysis, but this may be due to the breaking of other than peptide linkages. No satisfactory evidence was obtained of the presence of polypeptides in serum.

A. W. DOX

Proof of the enzymic nature of the phenomena on which the Abderhalden reaction is based. EMIL ABDERHALDEN AND SEVERIAN BUADZE. Univ. Halle. *Fermentforschung* 10, 111-44(1928).—The Abderhalden reaction, in which the blood serum of pregnant women acts upon placenta protein with formation of dialyzable cleavage products, is definitely shown to be of enzymic nature. When the serum is dried *in vacuo* over H_2SO_4 and P_2O_5 under strictly aseptic conditions and the residue extd. with 87% glycerol, this ext. gives the same reaction. A concd. aq. ext. may be prepd. from dried serum and a positive reaction obtained therewith in cases where the activity of the fresh serum is too slight to be demonstrated by the ordinary procedure. Dried serum has been preserved for one month in sealed tubes without loss of its activity or specificity, while control tests show that a neg. serum does not acquire activity through this treatment. Furthermore, Willstätter's enzyme adsorption method may be applied to the glycerol ext. after diln. with H_2O and adjusting the p_H to 4.7 with acetate buffer. Kaolin and $Al(OH)_3$ thus yield an adsorbate from which the enzyme may again be liberated by elution with $(NH_4)_2HPO_4$. Of the elutions obtained in this manner from gravid sera 76% gave a positive Abderhalden reaction with placenta protein, whereas similar elutions from sera of men and non-pregnant women invariably gave a neg. reaction. The enzymic nature of the Abderhalden reaction was further demonstrated by the fact that the activity of gravid serum and of the eluate prepd. therefrom is destroyed by heating 1 hr. at 60° . By the use of dried preps. it is shown also that cerebrospinal fluid, which was previously thought to have no sp. action on proteins, may give the Abderhalden reaction if a sufficiently concd. ext. is used. In several cases of progressive paralysis positive reactions were obtained between cerebrospinal fluid and brain tissue.

A. W. DOX

Enzymes and biocatalysts in adaptation and inheritance. I. Influence on yeast of preliminary treatment in iron-containing media. HANS V. EULER AND ESTER ERIKSSON. Univ. Stockholm. *Z. physiol. Chem.* 178, 39-51(1928).—Cultivation of yeast in a medium contg. 1 g. $FePO_4$ or 2 g. $FeSO_4$ per l. results in a greatly increased Fe content of the yeast. This represents not only assimilated but also adsorbed Fe. An increase occurs also in the total and especially in the cyclic N, whereas the amino and peptide N show little change. With increasing Fe content the yeast's capacity for decolorizing methylene blue diminishes. Wide variations occur in the compn. of the yeast proteins and in the ratio of protein to nucleic acid according to the treatment accorded even in the absence of Fe. With Fe present a transition from aliphatic N to porphyrin derivs. contg. pyrrole rings is probable. In this process the porphyrin derivs. would tend to form Fe complexes and on the other hand the Fe would tend to stimulate porphyrin formation. With increasing Fe content the O consumption by the yeast diminishes. If it is assumed that the respiration pigment is an Fe complex, then it would appear that some other substance which also functions in the respiration process is destroyed or inactivated by the excess Fe. At any rate this is an instance in which an alteration in biol. activity is brought about by varying the chem. compn. Further study of this phenomenon may afford exptl. evidence as to whether dominance of a character can be traced to the quant. distribution of the corresponding gene substance, and thus throw some light on problems in genetics.

A. W. DOX

The solubility of cystine in urine. GUNNAR BLIX. Univ. Uppsala. *Z. physiol. Chem.* 178, 109-24(1928).—Although 1 l. of H_2O at room temp. dissolves only 0.1 g. cystine, the same vol. of urine can contain 5 times as much cystine in soln. The possible factors considered in attempting to account for this increased soly. are p_H , mineral constituents, diffusible org. constituents, and colloids. The min. soly. of cystine in H_2O is at p_H 3. At p_H 6 the increase in soly. is negligible, at p_H 6.5 it is 10%, at p_H 7 it is 15-20% and from there on the soly. increases rapidly up to 1300-1400% at p_H 9. However, the p_H of urine rarely exceeds 7.5; hence it is a comparatively unimportant

factor. Of greater importance is the influence of mineral constituents. In 0.25 *N* solns. of the various salts present in urine the increased soly. of cystine varied from 11% with NH_4Cl to 59% with CaCl_2 . In a soln. cong. the same salts in the same concns. as in urine the soly. of cystine was 0.149 and 0.143 g per l. The org. constituents of urine, viz., urea, creatinine and glucose, had no influence on the soly. The urinary colloids, e. g., dialyzed urine, dissolved 0.149 and 0.144 g. cystine per l. as compared with 0.078 g. per l. H_2O at the same temp. and p_{H} . There seems to be no true soly. equil. since more cystine remains in the urine after adding a solid in NaOH than can be dissolved by shaking with solid cystine. The colloids evidently stop the crystn. of cystine before an equil. can be established. A. W. Dox

Further studies on yeast amylase. ALFRED GOTTSCHALK. Städtisches Krankenhaus, Stettin. *Z. physiol. Chem.* 178, 139-47(1928); cf. *C. A.* 20, 3018.—The fermentation of glycogen by yeast which has become impoverished in cozymase by long storage is less complete than that of glucose under the same conditions. Glycogen thus requires more cozymase for its fermentation than does glucose. The extent of the fermentation depends also on the concn. of glycogen. With an abundance of cozymase supplied by addn. of boiled yeast ext., a 2% soln. of glycogen is fermented to a little more than half the extent of the parallel fermentation of 2% glucose. The difference is very much smaller with 1% solns. The induction period of glycogen fermentation is considerably longer, probably because of the complex process of glycogen saccharification which precedes the fermentation. The addn. of boiled ext. not only supplies the addnl. requirement of cozymase but also furnishes an activator which facilitates the glycogen saccharification by the yeast amylase. Glycogen is more completely fermented after treatment with Taka-diastrase than after treatment with salivary or yeast amylase. The initial fermentation velocity is in this case almost equal to that of glucose. Yeast does not contain an excess of amylase adsorptively bound to the structural constituents of the cell as is the case with frog liver, since plasmolysis, grinding with quartz sand or treatment with adrenaline gives no increase in autolytic fermentation. A. W. Dox

The preparation of a substance which participates in the enzymic breakdown of glucose to lactic acid (Meyerhof's activator). EDVARD BRUNICUS AND STIG PROFFER. Univ. Stockholm. *Z. physiol. Chem.* 178, 164-8(1928).—In prepg. Meyerhof's activator (MX) from a top yeast it was found that no activator could be obtained unless glucose was added during the autolysis. The following procedure gave an active product: Suspend 500 g. yeast in 500 cc. H_2O , add 10 g. glucose and allow the mixt. to stand 1 hr. at 30-5°. Add 10 g. glucose and some PhMe and centrifuge after 36 hrs. autolysis at 30-5°. Ppt. the clear yellow soln. with an equal vol. 96% EtOH , suspend the ppt. in H_2O and remove the undissolved matter by centrifuging. In the presence of this activator a dried muscle prepn., to which has been added phosphate buffer of p_{H} 7.0 and cozymase, converts glucose into lactic acid. Bottom brewery yeast, on the other hand, yielded an activator by the same treatment without addn. of glucose during the autolysis. This is probably because the bottom yeast itself contains sufficient carbohydrate while the top yeast does not. By subjecting the activator soln. to dialysis through collodion its activity was somewhat increased, probably by removal of inactive material. A. W. Dox

The distribution of creatinephosphoric acid in various muscles and organs of the animal organism. D. FERDMANN AND O. FEINSCHMIDT. Biochem. Inst. Charkow. *Z. physiol. Chem.* 178, 173-8(1928).—Detns. of creatinephosphoric acid in white muscle (*M. biceps femoris*), in red muscle (*M. semitendinosus*), and in the mixed type (*M. adductor longus*) of rabbits, also in the white breast muscles and red leg muscles of roosters showed that the greatest amt. is present in white and the least in red muscle. In white muscle it comprises about 30% of the total creatine, while in red muscle the proportion is much less. The smooth muscles of the viscera also contain creatinephosphoric acid but only in small quantity as compared to the voluntary muscles. It was found in pigeon stomach and heart, rooster stomach, heart and testes, rabbit heart, spleen and uterus, but not in rabbit or rooster kidney. In general the muscles with the highest lactacidogen content run highest in creatinephosphoric acid and it is probable that a relationship exists between the metabolism of these 2 substances. A. W. D.

The creatinephosphoric acid, creatine and lactacidogen content of white and red muscles. ALEXANDER PALLADIN AND S. EPELBAUM. Biochem. Inst. Charkow. *Z. physiol. Chem.* 178, 179-85(1928).—Creatinephosphoric acid detns. on the biceps femoris, the semitendinosus and the heart muscles of the guinea pig confirm the findings of Ferdmann and Feinschmidt (cf. preceding abstr.) with respect to the variation between white, red and smooth muscle of rabbits and roosters, and in the parallelism

between creatinephosphoric acid and lactacidogen content. White muscles are capable of more rapid contraction, and their content of creatinephosphoric acid as well as of lactacidogen evidently contributes to their greater capacity for quick performance.

A. W. DOX

Studies on porphyrin. A. A. HYMANS V. D. BERGH AND A. J. HYMAN. *Dcut. med. Wochschr.* 54, 1492-4(1928).—A discussion of recent work on the clinical and physiological significance of porphyrin.

ARTHUR GROLLMAN

A comparison of the titration curves of coagulated and uncoagulated egg albumin. B. M. HENDRIX AND VELMA WILSON. Univ. of Texas. *J. Biol. Chem.* 79, 389-403 (1928).—Uncoagulated egg albumin combined with more 0.01 N acid or base in the range pH 2.8 to 7.7 than an equal wt. of coagulated albumin. The unfiltered coagulated albumin showed a greater combining power than the dried material. It is, therefore, suggested that heat coagulation involves a decrease in the free $COOH$ and NH_2 groups in the protein mol.

ARTHUR GROLLMAN

The time of absorption and excretion of boric acid in man. LOUIS KAHLENBERG AND N. BARWASSER. Univ. of Wisconsin. *J. Biol. Chem.* 79, 405-8(1928).—Fifty seconds after the immersion of the feet in satd. boric acid, the latter could be detected in the urine.

ARTHUR GROLLMAN

The oxidation of disulfide acids in the animal organism. BEULAH D. WESTERMAN AND WM. C. ROSE. Univ. of Ill. *J. Biol. Chem.* 79, 423-8(1928).—Although dithiodiglycollic acid, β -dithiodipropionic acid and α -dihydroxy- β -dithiodipropionic acid cannot replace cystine for the growth of rats, these compds. are readily oxidized when administered orally or subcutaneously to rabbits.

ARTHUR GROLLMAN

Crystalline urease. III. Variations in jack-bean meal as affecting the yield of crystals. JAMES B. SUMNER AND RACHEL G. HOLLOWAY. Cornell Univ., Ithaca. *J. Biol. Chem.* 79, 489-92(1928).—Minor changes are introduced for prepg. cryst. urease as described in C. A. 22, 1989. Certain samples of jackbean meal were encountered whose urease was only partly sol. in 31.6% acetone and in 30% alc.

ARTHUR GROLLMAN

Determination of the tyrosine content of proteins. MILTON T. HANKE. Univ. of Chicago. *J. Biol. Chem.* 79, 587-609(1928).—The low results previously reported (C. A. 20, 1090) by H. for the tyrosine content of proteins is attributed to the inclusion of this material in the histidine fraction obtained by pptn. with Ag_2O . Tyrosine was quantitatively pptd. from a crude protein hydrolyzate as *tyrosino-HgCl₂*. The tyrosine content of a given protein was varied and hence the figures quoted are not considered as an accurate index of their compn.

ARTHUR GROLLMAN

Hexose phosphates and alcoholic fermentation. ALBERT L. RAYMOND AND P. A. LEVENE. Rockefeller Inst. *J. Biol. Chem.* 79, 621-35(1928).—The effect of a no. of phospho esters on the induction period of glucose with zymn was detd. The hexose diphosphate was most potent in abolishing the induction and this property could not be removed by repeated recrystns. of the ester as the strychnine salt. The rate of hydrolysis of the esters during the induction period exceeded the CO_2 production observed when the induction period was removed with added diphosphate. Rate of hydrolysis and hence of fermentation was dependent upon the configuration of the ester. Addn. of arsenate or increased concn. increased the fermentation rate of the Neuberg, Robison and Harden esters. Addn. of arsenate produced but little increase in the rate of hydrolysis or fermentation of the synthetic esters.

A. G.

Cozymase. Its relation to phosphatase activity. ALBERT L. RAYMOND. Rockefeller Inst. *J. Biol. Chem.* 79, 637-48(1928).—The removal of cozymase from zymn decreased the hydrolysis of hexose diphosphate both in the presence and absence of arsenate. This effect was one of complement enzyme action since neither washed zymn nor cozymase produced dephosphorylation of hexose diphosphate while the mixt. of the two was active in this respect. Cozymase was extd. in large amts. from live yeast by H_2O when toluene was added.

ARTHUR GROLLMAN

Effect of Röntgen radiation on solutions of tyrosine and cystine. WILHELM STENSTRÖM AND ANNE LOHMANN. Univ. of Minnesota. *J. Biol. Chem.* 79, 673-8 (1928).—Tyrosine in weak aq. soln. is changed as regards its phenol group when exposed to x-rays. The amt. changed is proportional to the radiation absorbed. About 0.01 mg. of tyrosine in a 0.002% soln. is changed by 186 kg. Röntgens. Cystine was unaffected by the rays.

ARTHUR GROLLMAN

Oxidation-reduction systems of biological significance. I. The reduction potential of cysteine: its measurement and significance. L. MICHAELIS AND LOUIS B. FLEXNER. Johns Hopkins Univ. *J. Biol. Chem.* 79, 689-722(1928).—A soln. of cysteine in absence of O established a definite potential at indifferent blank Pt, gold-plated Pt,

and Hg electrodes. The potential, reproducible within 0.005 v., was independent of the cystine concn. and was a logarithmic function of the cysteine and H-ion concns. Slight traces of O displaced the potential to the pos. side. Hg was less sensitive to O than the Pt electrodes and gave final values in a relatively short time. The anaerobic potential was neg. enough to account for reduction of all indicator dyes by cells under anaerobic conditions. The potential E , referred to the normal H electrode, could be expressed by the relation $E = -0.001 - RT/F \ln [\text{cysteine}] + RT/F \ln [\text{H}^+]$. Methods for prepg. and testing O-free N are described. ARTHUR GROLLMAN

Hemocyanin. V. The oxygen dissociation curve of hemocyanin from the snail (*Helix pomatia*) in dialyzed solution. ELLEN STEDMAN AND EDGAR STEDMAN. Dept. of Medical Chemistry, Univ. of Edinburgh. *Biochem. J.* 22, 889-901(1928); cf. *C. A.* 21, 3064.—No change in the O dissocn. curve with change in p_{H} was observed. The combination between hemocyanin and O takes place thus: $\text{Hcy} + \text{O}_2 = \text{HcyO}_2$. Each mol. of hemocyanin contains 2 atoms of Cu. BENJAMIN HARROW

Action of carbon monoxide on the autoxidation of sulfhydryl compounds. MALCOLM DIXON. Biochem. Lab., Cambridge. *Biochem. J.* 22, 902-3(1928).—CO has no effect on the rate of the autoxidation of cysteine or reduced glutathione induced by the addn. of Fe or Cu salts or by freshly dissolved hematin. Upon standing hematin breaks down into a mixt. of simpler Fe compds. This mixt. has the same catalytic power as the original hematin, but now CO markedly inhibits the reaction. B. H.

Action of ultra-violet rays on complement. JOHN GORDON AND ARTHUR WORMALL. Dept. Physiology, Univ. Leeds. *Biochem. J.* 22, 909-19(1928).—Ultra-violet rays destroy the complement of guinea-pig serum. This is due to the inactivation of the heat-labile protein components. The heat-stable components are more resistive. Irradiation of guinea pigs does not increase the complement activity of the serum. BENJAMIN HARROW

Creatine-creatinine equilibrium. The apparent dissociation constants of creatine and creatinine. ROBERT KEITH CANNAN AND AGNES SHORE. Dept. Biochemistry, University College, London. *Biochem. J.* 22, 920-9(1928).—Detns. of the apparent dissocn. const. of creatinine at 15°, 25° and 30° and of the first dissocn. const. of creatine at 17°, 25° and 30°, have been made. The velocity consts. of the reversible system creatinine-creatinine have been detd. at 30° over the p_{H} range 2 to 10, and have been related to $[\text{H}^+]$, the dissocn. consts. of the reactants and certain empirical consts. BENJAMIN HARROW

Tyramine oxidase. I. A new enzyme system in liver. MARY LILLIAS CHRISTIAN HARE. Biochem. Lab., Cambridge. *Biochem. J.* 22, 968-79(1928).—Exts. of liver oxidize tyramine, 1 atom of O being used for 1 mol. of tyramine. Deamination also occurs with oxidation. 0.002 M KCN does not affect the oxidation. H_2O_2 is produced during the reaction. The optimum p_{H} for this liver enzyme is 10.0. It is destroyed at p_{H} 11.5 and is inactivated, but not destroyed, at p_{H} 4.4. Tyrosine is not attached and the enzyme produces no pigment. Phenylethylamine is also oxidized. B. H.

Uricase and its action. I. Preparation. STANISLAUS J. PRZYLECKI. Univ. Warsaw. *Biochem. J.* 22, 1026-34(1928).—The enzyme (from the glycerol ext.) was purified by pptn. with acetone, alc. or NH_4 sulfate or by dialysis. B. H.

Pancreatic extracts in relation to lactic acid formation in muscle. EDWIN M. CASE AND DOUGLAS R. MCCULLAGH. Biochem. Lab., Cambridge. *Biochem. J.* 22, 1060-70(1928).—The pancreatic factor which inhibits lactic acid production by muscle enzymes is amylase. BENJAMIN HARROW

Isolation of pure L-proline. BERNARD WM. TOWN. Imperial College of Science and Technology, London. *Biochem. J.* 22, 1083-6(1928).—The Cu salts of protein hydrolysis are sepd. into 3 fractions; the fraction sol. in CH_3OH contains the proline, which can be sepd. as a picrate. BENJAMIN HARROW

Effect of arsenic upon some oxidation-reduction systems. GERALDINE BARRY, ELIZABETH BUNBURY AND ERNEST L. KENNAWAY. Cancer Hospital Research Inst., London. *Biochem. J.* 22, 1102-11(1928).—Arsenites retard the oxidation-reduction systems of (a) hypoxanthine and xanthine oxidases; (b) AcH and colloidal Pt.; and (3) AcH , glycolol and phosphate. Arsenates are inactive. BENJAMIN HARROW

Liberation from yeast of substances giving the nitroprusside reaction. YVONNE POURBAIX AND ERNEST L. KENNAWAY. Cancer Hospital Research Institute, London. *Biochem. J.* 22, 1112-27(1928).—The factors producing the nitroprusside test are one of 2 classes; in the one class the liberation is chiefly intracellular; in the other it is extracellular also. Many of the pos. agents are known to be hemolytic. B. H.

Effect of fluorides and iodides on the clotting of milk by pepsin. WINFRED MARY CLIFFORD. King's Coll. for Women, London. *Biochem. J.* 22, 1128-32(1928);

cf. *C. A.* 21, 3064.—The clotting of milk is inhibited by the addn. of fluorides of Na, K, and NH₄ and the iodides of Li, Na, K and NH₄. BENJAMIN HARROW

Iodine values of some sterols by Dam's method. ALICE MARY COPPING. University Coll., London. *Biochem. J.* 22, 1142-4(1928).—Ergosterol by Dam's method (*C. A.* 19, 3280) shows a high I value. A low I value is obtained in the presence of a ketonic group in the mol. BENJAMIN HARROW

A review of recent work on micro-dissection and micro-injection of living protoplasm. JOAN LATTER. *J. Roy. Micros. Soc.* [3], 48, 300-13(1928).—Some 30 references are given to work since 1924, together with brief summaries of each investigation.

C. W. MASON

The action of nascent hydrochloric acid gas on tricalcium phosphate and other insoluble salts. D. LO MONACO. *Arch. sci. biol.* (Italy) 12, 605-9(1928).—The author's method of converting insol. phosphates into sol. phosphates by passing a current of Cl gas into a mixt. of ground tricalcium phosphate and wet org. matter (hay, straw, sawdust) has been extended to the study of other insol. salts. Fe phosphate and leucite yield sol. phosphates and silicates with formation of the corresponding chlorides when treated by this method. This behavior led the author to study the formation of HCl in the dog's stomach on the assumption that nascent Cl is formed which reacts instantaneously with H to form HCl. He was unable to prove this directly *in vivo*. If, however, a mixt. of insol. phosphates and hydrocarbons is added to the gastric juice of a dog and placed in an incubator at 37° the amt. of monocalcium phosphate formed is almost 2-3 times that formed by the simple addn. of HCl equal in quantity to that of the gastric juice.

PETER MASUCCI

The analysis of the curve of respiratory exchange of minced tissues as a function of p_H . M. COMEL. *Boll. soc. ital. biol. sper.* 3, 550-3(1928).—The respiratory exchange (y) of tissue pulp may be expressed: $y = f(p_H)$. By plotting y against p_H , $y = 0$ at p_H 5.3. If $x = p_H$ at 5.3 a curve may be constructed showing the absorption of O₂ which is approx. represented by the equation: $y = ax + bx^2 + cx^3 + dx^4$, in which a and c are pos. and b and d are neg. A mathematical analysis of the curve is given in detail showing values for $x_1 = 1.92$, $x_2 = 0.44$, $x_3 = 0.80$, $x_4 = 1.6$, $x_5 = 0.67$. Tissue pulp suspended in buffered solns. of varying p_H shows a high respiratory exchange at p_H close to neutrality; the O₂ absorbed diminishes as a function of p_H , becoming zero near the isoelec. point.

PETER MASUCCI

Colloids and crystalloids of urine as factors influencing the solubility of uric acid. R. ASCOLI. *Boll. soc. ital. biol. sper.* 3, 547-9(1928).—Expts. were made to det. whether the colloidal substances in urine favored the soly. of uric acid. Dialyzed urine dissolved less uric acid than undialyzed urine; the dialyzate favored the soly. of uric acid almost as much as the whole urine. Conclusion: The solvent action of urine for uric acid must be attributed to crystalloids and not the colloids in the urine. P. M.

Combined peptic-tryptic digestion in vitro. A. RONCATO. *Boll. soc. ital. biol. sper.* 3, 558-61(1928).—The action of pepsin and that of trypsin were studied on the same substratum—corn meal, corn bread, soy bean flour with and without defatting, raw bean flour, cooked bean flour and lean flesh. The action of trypsin alone on these substrata was also studied. After the action of pepsin, tryptic digestion is regular whether the protein is vegetable or animal, cooked or uncooked. The final proteolysis depends upon the degree of hydrolysis by peptic action. Uncooked vegetable proteins resist tryptic digestion if not preceded by peptic action. Tryptic digestion not preceded by peptic digestion yields a digestate which is quantitatively and qualitatively different from that obtained by peptic-tryptic digestion. Soy bean flour defatted by benzene vapors at 100-110° does not denature the proteins and render them indigestible.

PETER MASUCCI

Nephelometric studies on enzymic proteolysis. VII. Effect of ions on the stability of trypsin. P. RONA AND H. KLEINMANN. *Pathol. Inst. Charité, Universität Berlin. Biochem. Z.* 196, 177-96(1928); cf. *C. A.* 20, 3303; 22, 792.—The effect of electrolytes on the stability of aq. trypsin solns. has been investigated within a p_H range of 5 to 6. NaCl in a 2 *N* concn. has about the same stabilizing effect as Na₂SO₄. MgCl₂ and MgSO₄ have a stabilizing effect in concns. of 0.1 to 0.02 *N*, while Al₂(SO₄)₃ is effective in a 0.01 *N* concn. The stabilization is therefore attributed to cations, and the higher the valence the less the concn. required to insure stability. The action of the cations is generally the same as that of the H ion. The addn. of cations is unfavorable at the H-ion concn. (p_H 1.7) corresponding to the opt. stability. The instability of unpurified trypsin solns. is thus attributed to its cation content. Likewise, the injurious action on trypsin of boiled stomach juice is attributed to the electrolyte content.

S. MORGULIS

Studies on the enzymic proteolysis. P. RONA AND E. MISLOWITZER. Pathol. Inst. Charité, Universität Berlin. *Biochem. Z.* 196, 197-222(1928).—Although casein is easily adsorbable it is not or very nearly not adsorbed by a collodion membrane. On the contrary, hydrolyzed casein is adsorbed. The adsorption on the collodion membrane indicates a fragmentation of the casein mol. If the increase in adsorbability is correlated to the increase in the amino acid N it appears that the fragmentation of the casein by the enzyme does not involve dissolution of the CONH grouping. S. M.

Ultra-violet illumination of cells in relation to the cancer problem. A. AND L. GURVICH. Histol. Inst., Univ., Moscow. *Biochem. Z.* 196, 257-75(1928). S. M.

Is sea water a physiologically balanced solution for isolated organs of warm-blooded animals? S. V. ZIGANOV. Pharm. Lab., Medizinisches Staatsinstitut, Odessa. *Biochem. Z.* 196, 333-9(1928).—Water from the Black Sea, warmed to body temp., can be injected in amts. of 40 cc. per kg. into warm-blooded animals without causing injury. It may serve to replace part of the blood in cases of poisoning or following hemorrhage. It can, therefore, be regarded as physiologically balanced when made isotonic by proper diln. The heart of warm-blooded animals can be preserved for a long time in this sea water, but it cannot sustain its work. S. MORGULIS

Permeability of surviving animal membranes. R. AMMON. Städtische Krankenanstalt, Mannheim. *Biochem. Z.* 196, 441-64(1928).—Killed animal membranes are 3-5.5 times more permeable to glucose than live membranes. The diffusion consts. for sep. membranes are very small as compared to the consts. for glucose and water. Expts. with insulin permit no definite explanation as to its effect on the permeability of surviving membranes or its effect on the oxidation of glucose. S. MORGULIS

The absorption of bromine by casein as well as casein and keratin hydrolyzates. FRITZ LIEBEN AND ROBERT MÜLLER. Physiol. Inst., Univ. Wien. *Biochem. Z.* 197, 119-35(1928).—When casein is treated with very large excesses of Br₂, either free or in alk. soln., compds. are formed contg. 5-6% Br₂. No stoichiometric relationship is apparent and an adsorption on the casein mol. surface must be assumed. In protein hydrolyzates the amt. of Br₂ found is dependent upon the tyrosine, histidine and cystine. Tyrosine absorbs 4 atoms Br₂, histidine 4, cystine 10 per mol though these quantities are modified by various factors such as amt. of excess, length of action, etc. Histidine which has reacted with Br₂ is no longer precipitable by phosphotungstic acid and appears quantitatively in the filtrate. S. MORGULIS

Effect of illumination on the proteins of the eye lens. FRITZ LIEBEN AND PETER KRONFELD. Physiol. Inst., Univ. Wien. *Biochem. Z.* 197, 136-40(1928).—A loss of tryptophan in the proteins of the pigs lens which was exposed to diffuse daylight in the presence of rose-bengal or in the absence of this to a quartz lamp was not demonstrated. Normal and cataract lenses from human subjects show no difference in the tryptophan content of their proteins. It is said that the high protein content of the lens protects it from loss of the tryptophan. S. MORGULIS

The complement of amylase. VI. HANS PRINGSHEIM, JONAS BONDI AND EDUARD THILO. Chem. Inst., Univ., Berlin. *Biochem. Z.* 197, 143-51(1928). Tryptic digestion of protein is a necessary condition to convert it into an energetic activator of amylase. S. MORGULIS

Physico-chemical studies on radiated proteins. IV. Influence of short wave radiations on the absorption capacity of serum and serum proteins in the ultra-violet. MONA SPIEGEL-ADOLF. Physiol. Inst., Univ. Wien. *Biochem. Z.* 197, 197-209(1928).—The increased absorption capacity of radiated serum albumin is not due in large measure to the atm. O₂. Likewise radiated pseudoglobulin shows such an increase which, however, is not found in euglobulin. S. MORGULIS

Metaphosphatase. TORAO KITASATO. Kaiser Wilhelm-Inst. Biologie, Berlin-Dahlem. *Biochem. Z.* 197, 257-8(1928).—Liver and kidney of rabbits, and yeast can convert enzymically metaphosphate to orthophosphate, but their action is weaker than that of Taka-phosphatase. S. MORGULIS

The effectiveness of alkaloids and the degree of their dissociation in buffered solutions as a function of the hydrogen-ion concentration of the medium. SEIBUN MAYEDA. Inst. für Schiffs- und Tropenkrankheiten, Hamburg. *Biochem. Z.* 197, 410-17(1928).—The dissocn. degree of a hydrolyzable salt is detd. as a function of the p_H of the medium. The degree of dissocn. of a salt of strong acid and a weak base with a dissocn. const. of K_b is given by the equation $\gamma_b = K_b/K_a + K_b[H^+]$. With the aid of this equation it was shown for the quinine alkaloid that the dependence of the biological effect on the p_H is entirely a matter of the alkaloid base set free through hydrolytic dissocn.; that the biological action is due only to the free base; and that the effect on living microorganisms represents an adsorption process. S. MORGULIS

Salt hydrolysis of starch. E. GLIMM AND R. GRIMM. Lab. Nahrungsmittelchemie and landwirtschaftliche Gewerbe, Tech. Hochschule, Danzig. *Biochem. Z.* 197, 445-59(1928).—Expts. in which the attempt was made to hydrolyze starch with salt solns., amino acid or peptone solns. were unsuccessful, hydrolysis occurring only very rarely. Under strictly sterile conditions no hydrolysis took place. From peptone (Witte) a species of sarcina was isolated together with an unknown pediococcus which hydrolyzes starch to dextrin. S. MORGULIS

Further studies on the stereochemical specificity of the lipases. P. RONA AND R. STELSOHN-SCHRECHTER. Pathol. Inst., Univ. Berlin. *Biochem. Z.* 197, 482-90 (1928).—A study of the hydrolysis of *d*- and *l*-mandelic acid and of its esters by esterase from pig liver and pancreatic lipase. S. MORGULIS

The composition of the non-protein carbon and non-protein nitrogen compounds, especially the oxyproteic acids of the blood. OTTO DEUTSCHBERGER. Physiol. Inst., Univ. Wien. *Biochem. Z.* 198, 268-95(1928).—The non-protein C was detd. by the wet combustion method. In 100 cc. horse blood 182.5 mg. C were found, which agrees with Stepp's results for human blood. The same protein-free blood contains 96 mg. glucose, 16.4 mg. lactic acid, 23.5 mg. urea, 7.5 mg. creatine and creatinine and 11 mg. amino acid. The oxyproteic acids were isolated as Ba salts from blood deproteinized with phosphotungstic acid. The Ba salts are insol. in alc. The C, H and N of this baryta fraction, obtained from 3 samples of 2 l. each of defibrinated horse blood, contained 66 mg. C, 8 mg. H and 19 mg. N per 100 cc. blood. The non-protein N of the same blood was 44 mg. Thus, 43% of the non-protein N and 36% of the C belongs to the oxyproteic acid fraction, which gives an at. relationship: $C_{100}H_{144}N_{24}$. This baryta fraction from the blood like that from the urine gives Ehrlich's diazo and Weiss' urochromogen reaction. The 44 mg. of non-protein N of 100 cc. of horse blood are made up of 19 mg. oxyproteic acid N; 11 mg. amino acid N; 11 mg. urea N and 3 mg. creatine-creatinine N. This accounts fully for all the nitrogenous compds. Of the total non-protein C in 100 cc. horse blood 165.6 mg. C are accounted for in the compn. given above. The total non-protein C, however, directly detd. is 182.5 mg. This leads to the conclusion that a small quantity of some unknown C compd. is probable. S. M.

Studies on the physiological and pathological chemistry of the brain. II. The phosphatides of the petroleum ether fraction from normal human brains. KARL SINGER AND OTTO DEUTSCHBERGER. Physiol. Inst., Univ. Wien. *Biochem. Z.* 198, 328-39 (1928); cf. *C. A.* 21, 2306.—The total amt. of the petroleum ether fraction per 1 g. fresh brain is const. for normal persons. The compn., however, varied in different sections of the brain. The N partition in the petroleum ether fraction is the same in the human and horse brain; only the galactoside N is decidedly lower. The fetal and infant brains contain small quantities of petroleum ether extractives, but the N content is $1\frac{1}{2}$ -2 times as great as in adult brains. In the course of development the petroleum ether fraction increases and its N decreases. In the first 3 years this fraction increases rapidly in the next 3 years more slowly and only in the third decade reaches a const. value. S. MORGULIS

The general occurrence of gold in food stuffs and organs. RAGNAR BERG. I. innere Abteilung des Stadtkrankenhauses Freidrichstadt, Dresden. *Biochem. Z.* 198, 424-7(1928).—In expts. on the Pb in various org. substances it was found that the CuS formed in the pptn. with H_2S does not go fully in soln. in HCl after heating but leaves a black residue. This residue was discovered to be Au. This observation has led to an examn. of a variety of org. materials, both vegetable and animal, with the result that appreciable amts. of Au were found in nearly all of them. In cows' brain as much as 1.4 mg. Au per 100 g. dry substance is present. S. MORGULIS

Studies on the reaction of tissues. A. B. CARLSTRÖM, R. EGE AND V. HENRIQUES. Physiologisches Lab., Universität, Kopenhagen. *Biochem. Z.* 198, 442-62(1928).—A colorimetric method for detg. the reaction of tissues is described. This has a systematic error because of the protein, for which, however, a correction has been worked out. Studies of the postmortem reaction change due to lactic acid occurs only in muscle tissue but not in the tissue ext. Even at 0° lactic acid is formed and influences the reaction of ground muscle tissue. The lactic acid production is much more rapid when the muscle has been previously treated with liquid air. The buffering value of rabbit muscle for the shift from p_H 7 to 6 is equal to 0.055 mol. acid, corresponding to 525 mg. lactic acid per 100 g. The temp. correction for the muscle p_H is 0.007 p_H per degree rise in temp. In resting muscle at 37° the p_H = 6.80-6.95, or even 7.0 when formation of lactic acid is prevented. The p_H of muscle tissue absolutely free from lactic acid is calcd. as 7.1. During activity the reaction shifts toward the acid side, even as low as p_H = 6.34, while in a condition of rigor to p_H = 5.90. The much higher H-

ion concn. of even resting muscle as compared with that of the blood is attributed to a Donnan equil. S. MORGULIS

Studies on the reducing power of fructose in the Bertrand procedure. BÉLA RÓHNÉ. Physiol.-chem. Inst. kgl. ungar. Univ. Budapest. *Biochem. Z.* 199, 53-9 (1928).—The reducing power of hydrolyzed sucrose and lactose is practically the same, and both are the same as that of glucose. However, although pure fructose is equiv. to glucose, galactose has only 95% of the reducing capacity of glucose. These results show that in the presence of glucose both fructose and galactose reduce as if they were glucose. S. MORGULIS

Studies on the new enzyme glucoseoxidase. I. D. MÖLLER. Pflanzenphysiol. Lab., Univ. Kopenhagen. *Biochem. Z.* 199, 136-70 (1928).—Definite strains of *Aspergillus niger* and *Penicillium glaucum* were cultured on a special nutritive medium. 100 g. dry mold are rubbed with 100 g. pure sand and 35 g. kieselguhr, and pressed under 300 atms., yielding 35-50 cc. press juice. This is poured into 12 vols. of either 96% alc., alc. + ether mixt. or acetone; the ppt. is at once filtered off and dehydrated with abs. alc., then dried over H_2SO_4 in a vacuum. From 100 cc. press juice 3-6 g. of dry prepn. is obtained. Studies of the O_2 consumption and acid production in a glucose soln. in the presence of this enzyme prepn. show that the enzyme catalyzes the oxidation of glucose to acid which does not reduce Fehling's soln. This catalyzer is an enzyme because it is specific in action, depends upon proper H-ion concn. and is destroyed at about 73°. From the quant. results showing that 11.5 cc. O_2 is taken up for each 1 cc. N acid formed and each 0.18 g. glucose disappearing it is concluded that this acid is probably gluconic, $C_6H_{12}O_7$. By isolation and analysis it was actually demonstrated that at least 20% of the acid produced under the influence of the glucose-oxidase is gluconic acid. The acid is not pptd. by neutral Pb acetate; therefore it is concluded that all the acid formed in this reaction must be *d*-gluconic acid. S. M.

Contribution to the study of the oxidative destruction of glucose. III. B. BLEYER AND W. BRAUN. Tech. Hochschule, München. *Biochem. Z.* 199, 186-94 (1928); cf. C. A. 21, 2462.—Oxidation of glucose with chloramine proceeds over pyruvic acid to AcOH and finally CO_2 , which is similar to the fermentative changes. But in fermentation the first alteration of the glucose is the formation of the biologically active γ -glucose with a low rotation, the esterification with H_3PO_4 and finally the hydrolysis of methylglyoxal. It is very certain that these preliminary steps in the fermentative oxidation of glucose are the action of the OH ions in the chloramine oxidation. The next step is the oxidation of the triose to pyruvic acid. In fermentation this is ascribable to a special enzyme, but in the oxidation expt., it is the specific effect of the chloramine, other oxidative agents having another influence. The OH ions so essential in the preliminary process of hydrolysis are of no use in the further reactions, and in fact are detrimental insofar as they promote the transformation of methylglyoxal into a difficultly oxidizable hydrate, lactic acid. The third step in the reaction is the splitting of the pyruvic action into AcH and CO_2 with subsequent oxidation of the former to AcOH. The splitting off of CO_2 from keto acids is a normal occurrence in all biological oxidation processes. Chloramine, therefore, shows analogies to the biological oxidants. Willstätter and Schudel found that glucose is oxidized to gluconic acid by an alk. soln. of I_2 . This, of course, would contain NaOI just as the chloramine soln. unquestionably contains NaOCl. It might be expected from this that the two reactions would show similarities. In the oxidation by alk. I_2 , however, the reaction stops at gluconic acid. But if the concn. of OH ions or of I_2 is increased the reaction proceeds further. It is, therefore, concluded that in the oxidation by chloramine likewise the first product is the gluconic acid. S. MORGULIS

Biochemical splitting of sugar according to the second form of fermentation under the influence of carbaminic acid hydrazide and thiocarbaminic hydrazide. Isolation of acetaldehyde and glycerol. MARIA KOBEL AND ALEXANDER TYCHOWSKI. Kaiser Wilhelm-Inst. Biochemie, Berlin-Dahlem. *Biochem. Z.* 199, 218-29 (1928).—The acid hydrazides combine easily with AcH, and they can be employed in order to promote the second form of fermentation. Glycerol appears in quantities corresponding to the amt. of formed aldehyde. S. MORGULIS

Comments on the preceding paper and on our earlier contribution to the fixation of methylglyoxal in alcoholic fermentation. CARL NEUBERG AND MARIA KOBEL. Kaiser Wilhelm-Inst. Biochemie, Berlin-Dahlem. *Biochem. Z.* 199, 230-1 (1928). S. MORGULIS

The hemolysis effect of radiated ergosterol and cholesterol. R. FISCHER. Pharmakol. Inst., Univ. Innsbruck. *Biochem. Z.* 199, 294-7 (1928).—The products formed

when ergosterol and cholesterol are exposed to the action of sunlight or to ultra-violet radiation have a hemolytic effect.

S. MORGULIS

Studies of the chemical properties of secretin substances in food stuffs. A. BICKEL AND A. KORCHOW. *Pathol. Inst., Univ. Berlin. Biochem. Z.* 199, 434-44 (1928).—Subcutaneous injection of the original Maggi bouillon cubes, or of its carnitine fraction or of the carnosine fractions I and II, (isolated by the same method as is used in meat ext. analysis) produces a distinct secretoexcitatory effect on the mucous membrane of fundus in Pavlov's stomach pouch, and the same results were found after oral administration.

S. MORGULIS

Albumin-metal salts. H. BECHHOLD. *Inst. für Kolloidforschung, Frankfurt-a.-M. Biochem. Z.* 199, 451-8(1928).—When a soln. of electrolyte-free albumin is mixed with heavy metal salts it is found that with the very low salt concn. (0.0001 *N*) there is formed a ppt. which, however, disappears on further addn. of salt; then, when the concn. becomes still greater a new ppt. is formed. If a mixt. of albumin and earthy alk. soln. (BaCl_2 , SrCl_2 , CaCl_2) is subjected to ultrafiltration with washing, all the salt soln. passes into the ultrafiltrate and the washed albumin is salt-free, so that apparently the protein-salt complex breaks up in the washing process. This holds also for salts of Ni or Co. The behavior is different with the chlorides of Zn, Al, Cr and Fe, and in this case the washed protein contains both anions and cations. With the first 3 a const. relationship was found of 1 g.-equiv. of cation for each 5100-5200 g. albumin. The situation was different for Fe salts. The *Liquor ferri albuminati* is a well-known pharmacopeal prepn. with 0.175% Fe and about 6% albumin. This soln. is in reality a very fine dispersion (possibly, a mol.) of Fe hydrosol in albumin. This shows distinctly different behavior from the plain Fe hydrosol. Thus, neither is pptd. at the p_H corresponding to that of the gastric contents (1.2-2.0) but at the p_H of the small intestine, corresponding to 0.02-0.04% Na_2CO_3 , the colloidal Fe ppts. while the albumin Fe soln. is unchanged. It is not possible to prep. *Liquor ferri albuminati* by mixing directly colloidal $\text{Fe}(\text{OH})_3$ and albumin. The Ag and Au albumin combinations are also important. The former furnish the therapeutically non-irritant disinfectants, while the latter is being made use of in demonstrating the presence of particles of submicron size and of microorganisms. This is brought about by the deposition of AuCl_3 on the surface which is fixed and cannot be washed out in the ultrafilter. On subsequent ignition Au skeletons are left behind.

S. MORGULIS

Equilibria between albumin and metal salts (silver nitrate, ferric chloride, gold chloride). ERICH HEYMAN AND FRIEDRICH OPPENHEIMER. *Inst. Kolloidforschung, Frankfurt-a.-M. Biochem. Z.* 199, 468-97(1928).—A method is described for the purification of protein by electroultrafiltration. The combination of highly purified isoelec. albumin with AgNO_3 , FeCl_3 and HAuCl_4 was studied for various proportions of the salt and protein by detg. the uncombined salt in the intermicellar space. For analysis only a small portion of this intermicellar fluid was obtained by ultrafiltration so that the equil. conditions of the system were not disturbed. The max. quantity of combined AgNO_3 and FeCl_3 is almost independent of the abs. concn. of albumin and salt; but more FeCl_3 is found (8.5×10^{-4} g.-equiv. per g. albumin) than of AgNO_3 (4.5×10^{-4} g.-equiv.). The theory of the nature of the albumin salt combination is discussed and it is pointed out that an assumption of an adsorption phenomenon is not incompatible with the facts though the view of Pauli and Pfeiffer of combination through extra valencies is accepted. It is suggested that the AgNO_3 -albumin compd. may

have this formula: $\left[\text{Alb} \begin{matrix} \text{(NH}_3\text{)}_n \\ \text{(COOH)}_n \end{matrix} \right] \begin{matrix} (\text{NO}_3)_m \\ \text{Ag}_m \end{matrix}$ which is analogous with the type of albumin- FeCl_3 compd. where the proportions are high. On the contrary, in mixt. with a low FeCl_3 concn. the mol. is supposed to correspond to $\left[x\text{Fe}(\text{OH})_3 \cdot \right.$

$\left. \text{Alb} \begin{matrix} \text{(NH}_3\text{)}_n \\ \text{(COOH)}_n \end{matrix} \right] \begin{matrix} \text{Cl}_3(m-x) \\ \text{Fe}_{(m-x)} \end{matrix}$. The combination with AuCl_3 is believed to be of the type as that of the FeCl_3 .

S. MORGULIS

Further studies on the extent of action of phosphatase. CARL NEUBERG AND RT P. JACOBSON. *Kaiser Wilhelm-Inst. Biochemie, Berlin-Dahlem. Biochem.* 498-517(1928).—It was shown that the di-potassium salt of the diphenyl ester pyrophosphoric acid, $\text{K}_2(\text{C}_6\text{H}_5)_2\text{P}_2\text{O}_7$, is hydrolyzable by phosphatase, and this is true for the inorg. $\text{K}_2\text{P}_2\text{O}_7$ which is hydrolyzed to an orthophosphate by muscle

pulp; lastly even NaPO_3 is changed by an enzyme in Takadiastase, yeast or animal organs to orthophosphate, which is thus the end product of enzymic hydrolysis of all 3 types of phosphoric acid. The following compds.: monomethyl- and trimethyl-phosphate, phosphoric acid ester of methylpropylcarbinol and cetylmonophosphate; borneol-phosphate and cholesterol-monophosphate; also di-*o*-cresol-pyrophosphoric ester, di-*m*-cresol-pyrophosphate ester and di- α -naphthol-pyrophosphate ester were all hydrolyzable by the phosphatase enzyme. Trimethyl- and triphenyl-phosphates are the only compds. which so far failed to be hydrolyzed by phosphatase. S. M.

The presence of lipase in polymorphonuclear leucocytes. WALTER FLEISCHMANN. Physiol. Inst., Univ. Wien. *Biochem. Z.* 200, 25-8(1928).—In polymorphonuclear leucocytes obtained from the sterile peritoneal exudate in rabbits the presence of lipase could be demonstrated by the manometric procedure of Rona-Lasnitzki. S. M.

An activator of malt amylase. S. NISHIMURA. Lab. of Kawaguchi-Machi Brewery, Tokyo. *Biochem. Z.* 200, 81-9(1928).—The malt amylase complex is not made up of 2 enzymes but of the enzyme amylase and another substance which has the ability to promote the liquefaction and hydrolysis of starch. The enzyme amylase by itself hydrolyzes the starch but very slowly, this effect being greatly stimulated by the activator the same as trypsin is by enterokinase. The activator loses its effect at p_H 3.0 and is reactivated at p_H 7.4. The idea that there are 2 enzymes, a starch-splitting and a saccharifying enzyme, the former being slightly injured at 70° , the latter on the contrary being completely destroyed, is false. At 70° the enzyme amylase is much inactivated while the activator component is still fairly intact. S. MORGULIS

Urine colloids and crystalloids as solvents for uric acid. RUGGERO ASCOLI. Inst. allgem. Pathol., Kgl. Univ. Mailand. *Biochem. Z.* 200, 95-107(1928).—Removing the colloids from urine either by shaking with benzene or through ultra-filtration has no effect on the soly. of the uric acid. Further expts., however, showed that complete urine is a perfect uric acid solvent because when it is satd. with warm uric acid it prevents its pptn. on cooling. Dialyzed urine is scarcely a solvent for uric acid, but the dialyzate possesses definite and perfect solvent power. The reaction of the dialyzed portion is not the essential factor since there may be acid urines with good, and alk. urines with poor, solvent properties. It is not denied that the urinary reaction is important but the presence of substances with a uric acid stabilizing action is even more essential. Conclusion: The crystalloid substances have the uric acid solvent effect while the urine colloids are of no importance in this respect. S. MORGULIS

Effect of ultra-violet rays on the passing out of pigment in the blood of normal and splenectomized dogs. G. FARKAS AND H. TANGL. Physiol. Inst., Univ. Budapest. *Biochem. Z.* 200, 184-9(1928).—Ultra-violet radiation inhibits the passing out of the blood pigment in normal dogs. In splenectomized dogs this effect does not appear because the inhibition due to the operation is apparently already maximal. S. M.

Biochemical studies on the equilibrium of halogen ions. I. The combination of egg albumin with halogen ions. KINSHIRO ITO. Inst. Anatomy, Kyoto Medical College. *J. Biochem. (Japan)*, 9, 17-43(1928).—The halogen-ion activity in KCl, NaCl, LiCl, NaBr or NaI measured with the Ag halide electrode was shown to diminish through the addn. of egg albumin, this effect being attributed to the adsorption of the halogen ions. S. MORGULIS

Biochemical studies on uric acid. TOKUSABURO SHIMODA. Biochem. Dept. Jikei-Kwai Med. Coll., Tokyo. *J. Biochem. (Japan)* 9, 117-85(1928).—Uric acid dissolved in 0.01 *N* NaOH (20 mg. per 100 cc.) is completely destroyed within 14 days at room temp. ($18-20^\circ$). The uric acid on oxidation yielded urea and NH_3 , but allantoin could not be demonstrated. The total amt. of N before and after the destruction did not differ materially. The velocity of the destruction of uric acid in alk. soln. was parallel to the concn. of the alk. soln. In neutral or acid solns. there was no evidence of destruction even at 37° and within 72 hrs. O_2 hastened the uric acid destruction in alk. soln. while N_2 delayed the process. The velocity of the destruction increased progressively with rising temp. and was inversely proportional to the uric acid concn. Uric acid seemed to be protected from destruction by adsorption. The blood intestinal contents and various organ exts. have been tested but only liver exts. promoted greatly the destruction of uric acid in soln. while the duodenal contents had a slight stimulating effect. The results with organ exts. from various animals (dog, cat, guinea pig, rat, rabbit) were practically the same. The opt. p_H for the destruction of uric acid by the liver ext. was 7.3. The uric acid introduced *per os* into rabbits is practically all absorbed by the alimentary tract, and is excreted in the urine chiefly as urea and NH_3 , only a small fraction appearing as uric acid. The destruction of intravenously injected uric acid proceeds in the rabbit in the liver alone and not in any other organ. S. M.

The significance of iron in biological oxidation. I. The role of ferrous salts as aldehydase. KUNIO ANDO. Biochem. Lab., Aichi Med. Coll. *J. Biochem. (Japan)* 9, 187-99(1928).—Exptl. evidence is presented of the many similarities in the action of Schardinger's enzyme and of ferrous salts. It is thought that possibly some org. Fe compd. is really the Schardinger enzyme. In the kinetics of reduction of FeSO_4 it is assumed that the splitting of the H_2O mol. is the first step. There is thus activation of the H which becomes attached to the aldehyde. It is supposed that the enzyme, like the FeSO_4 , attacks the H_2O mol. near it, and transfers the activated H to the acceptor and the O to the donator. His view differs from that of Wieland that the oxidation of the donator is initiated by the activation of the H followed by its transfer to a reduceable substance, in the assumption of the direct action of activated O on the donator with the resulting oxidation or reduction depending on the chem. constitution of the donator. This view, however, also differs from Warburg's regarding O activation by Fe catalysis in that it assumes that the O of the H_2O mol. is activated as a result of the H activation for which the atm. O_2 serves as acceptor. These views are based on expts. with the methylene blue technic which shows that inorg. ferrous salts act as aldehydases. Various colloidal substances, such as protein or lipids, promote the discoloration, which is not inhibited by KCN in less than 0.05 M concn. On the contrary, HgCl_2 has been found to be very toxic. The temp. coeff. of the reaction is 1.86. II. The role of ferrous salts as oxido-reductases for various organic substances. *Ibid* 201-14.—The oxido-reductase activity of ferrous salts towards a variety of org. substances is described. Org. substances which are also easily oxidized *in vivo* proved to be good donators for ferrous salts or for the methylene blue system. Lecithin and the higher fatty acids are extremely powerful accelerators. The view is developed of the surface action in these reactions.

S. MORGULIS

Hemolysis and glucolysis. KATSUMASA NOSHI. II. Med. Klinik, Med. Akad., Osaka. *J. Biochem.* 9, 243-9(1928).—An erythrocyte ext., obtained by ether hemolysis and completely freed from microscopic structures, still possesses distinct hemolytic power in a phosphate mixt. whereas in a citrate medium no appreciable glucolytic activity could be found.

S. MORGULIS

The significance of some auxosubstances in the urease reaction. MATSUNOSUKE KITAGAWA. Biochem. Lab., Kyushu Imperial Univ. *J. Biochem. (Japan)* 9, 347-52(1928).—Urease free from auxosubstance never loses its activity provided the inhibitor is in some way removed from the system. However, the pressure of inhibitor substance from any source and even in mere traces as may be found in the distd. water or in the urea causes a diminution of activity by formation of an inactive compd. If an auxosubstance is added it combines, forming an undissociable compd. with the inhibitor and sets free active urease. Therefore the urease activity is detd. by the relative amt. of auxosubstance and inhibitor in the reaction system.

S. MORGULIS

The effect of the addition of protein on the surface tension of a sodium glycocholate solution. RYUZO SUGINO. Biochem. Inst., Tokyo Imperial Univ. *J. Biochem. (Japan)* 9, 353-81(1928).—The influence of a protein on the surface tension of a glycocholate soln. depends upon the pH . Only at H-ion concns. of the soln. where the protein exists as the cation does it affect the surface activity of the glycocholate soln. probably through some combination of the protein and glycocholic acid. This combination has been found to be stoichiometric. Further, an explanation is offered of the mechanism whereby the addn. of the protein to a very weak glycocholate soln. increases the surface tension while the addn. to a more concd. soln. causes a diminution of the surface tension.

S. MORGULIS

The effect of proteolytic enzymes on the benzoyl and phthalyl derivatives of polypeptides. I. The action of intestinal erepsin and of yeast protease on phthalylglycylglycine and phthalylidiglycylglycine. SENJI URZINO. Med. chem. Inst., K. Univ., Tokyo. *J. Biochem. (Japan)* 9, 453-63(1928).—Intestinal erepsin hydrolyzes phthalylidiglycylglycine but not phthalylglycylglycine, but both are more or less split by yeast protease. II. The action of tissue proteases on the benzoyl- and phthalylglycylglycine. *Ibid* 465-81.—Neither beef muscle press juice nor rabbit muscle maceration juice has any effect on benzoylglycylglycine and phthalylglycylglycine. Rabbit liver pulp or maceration juice and pig liver press juice do not hydrolyze these dipeptides. Maceration juice hydrolyzes considerably glycylglycine and leucylglycine. Pig kidney maceration juice can hydrolyze benzoylglycine, benzoylglycylglycine and glycylglycine. The digestion mixt. with benzoylglycylglycine contained benzoic acid. With phthalylglycylglycine or phthalylglycine no evidence was found of hydrolysis. III. The action of pancreatic proteases on benzoyl- and phthalylglycylglycine. *Ibid* 483-97.—Pancreatin, pig pancreas pulp, pancreas press juice and glycerol exts. of dry pancreas preps.

definitely hydrolyze benzoyl- and phthalylglycylglycine. By activating the pancreas preps. much more extensive hydrolysis was obtained. Further expts. show that the trypsin fraction which definitely hydrolyzes edestin but not glycylglycine attacks the benzoyl and phthalylglycylglycine. S. MORGULIS

Effect of some alkaloids on an alcoholic extract of pepsin-fibrin peptone. M. A. RAKUZIN AND T. A. GENKE. Central State Sci.-Tech. Inst., Leningrad. *Zhurnal expl. Biol. Med.* 9, 221-3(1928).—Strychnine, brucine, quinine, codeine, morphine and theobromine behave like the amphoteric $Al(OH)_3$, which takes up only certain fragments of the protein in an alc. ext. of proteins. An alc. ext. of pepsin-fibrin peptone gives the same reaction after the addn. of an alc. soln. of these alkaloids as before, except the Millon reaction, showing that the tyrosine has been removed by the alkaloids. This suggests that the alkaloid acts the same way as enzymes and can also be compared to toxins. In fact the conclusion is drawn that alkaloids are cryst. toxins. Furthermore, some alkaloids with a mol. wt. above a certain limit are actually in colloidal state. S. MORGULIS

The characterization of the proteins of blood, muscles and internal organs of healthy rabbits and chickens by means of color reactions. M. A. RAKUZIN AND T. A. GENKE. Central State Sci.-Tech. Inst., Leningrad. *Zhurnal expl. Biol. Med.* 9, 225-9(1928).—The biuret, Millon, Liebermann, Adamekiewitz, xanthoproteic, Molisch and Pettenkofer reactions were carried out on the alc. extrn. of various organs and blood of rabbits and chickens. The Ostromyslensky reaction for free NH_2 groups is given in few instances and is very weak; the Liebermann, Molisch and Pettenkofer reactions were absent. S. MORGULIS

The effect of x-rays on the process of enzyme formation in the isolated cells of the pancreas. A. I. BOGAYEVSKII AND B. GOLDSTEIN. Med. Inst. Kiev. *Zhurnal expl. Biol. Med.* 9, 328-34(1928).—Through the action of x-rays on the perfused pancreas a greater concn. of amylase and lipase was found in the fluid. The effect is really one of stimulation of the gland cells, as it is possible to cause also a diminution of activity by further increase of the dose. Prolonged action of the x-rays can produce a depressing effect which however passes off. S. MORGULIS

Oxidase in the blood leucocytes and the stability of the enzyme in various types of leucocytes. J. B. GOLDMAN. Dept. Gen. Pathol., N. C. Univ., Rostov a. D. *Zhurnal expl. Biol. Med.* 9, 552-8(1928).—The α -naphthol-Li-toluidine blue staining method of Epstein was used. All myelocytes and monocytes are pos. for oxidase. "Stammzellen" of the myeloid group only gradually develop the oxidase granules. Basophiles are generally oxidase neg. Atypical monocytes are similar to neutrophile leucocytes as regards the oxidase, and some monocytes do not show the oxidase because of the instability of the enzyme complex. The stability of the enzyme under the influence of heat, sunlight, etc., is greatest in eosinophiles, least in monocytes, while it is intermediate in the neutrophiles; x-rays acting directly on the blood preps. have no effect. The greatest enzyme stability of the eosinophiles corresponds to their greatest viability. S. MORGULIS

Thermostability and regeneration of inactivated enzymes. V. KULIKOV AND M. BOBKON. Microbiol. Inst. Narkomzdrav, Moscow. *Zhurnal expl. Biol. Med.* 10, 147-52(1928).—If the heat inactivation of enzymes is assocd. with a coagulation of other substances present in the mixt. the enzyme must become adsorbed on the coagulated particles and its regeneration is probably a slow elution process. In proteolytic enzymes the regeneration takes place only when the inactivation is carried out at a pH 7.9. At more acid or alk. pH the inactivation is either irreversible or the inactivation is not complete. S. MORGULIS

Changes in the activity of the intestinal juice enzymes depending upon the kind of food. I. Amylolytic enzyme. S. V. ANDREYEV AND S. I. GEORGIEVSKII. Inst. pathol. Physiol. I State Univ., Moscow. *Zhurnal expl. Biol. Med.* 10, 169-79(1928).—The amylolytic action of the intestinal juice varies according to the content of starch in the food. Thus it is greatly increased on a milk-bread diet, diminishes with a reduction of the carbohydrates and is least on a meat diet. S. MORGULIS

Non-cystine sulfur of proteins. G. BARGER AND F. P. COYNE. Univ. Edinburgh. *Arch. sci. biol. (Italy)* 12, 141-4(1928).—Ergothioneine occurs in ergot and in mammalian blood corpuscles. It contains a S deriv. which Berger and Ewins showed to be a thiol-betaine of histidine (cf. C. A. 6, 1154). Attempts to synthesize thiobistidine and related compds. are described. L. W. RIGGS

The carotiproteins, protein pigments derived from the carotinoides in animals. J. VERNE. *Arch. sci. biol. (Italy)* 12, 203-10(1928).—A review with 23 references to the literature is given. L. W. RIGGS

Terms used in radiology. HENRY K. PANCOAST, GIOACCHINO FAILLA AND W. WARNER WATKINS. **J. Am. Med. Assoc.* 91, 960-1(1928).—The recommendations of the Subcommittee on Nomenclature of the Section on Radiology of the Am. Med. Assoc. are reported in 18 paragraphs. Sensible reasons are given for the retention or discard of terms in use. A general adoption of the recommendations of this comm. would avoid much confusion. L. W. RIGGS

Radiated vitamin B and automatin action. H. ZWAARDEMAKER. *Proc. Acad. Sci. Amsterdam* 31, 258-60(1928); cf. *C. A.* 21, 3059, 3389, 3628.—An eel's heart arrested by deprival of K resumes its beats through the addn. of the automatin derived from another radiated heart after a latency of 3.5 hrs. The frequency augments gradually and reaches a max. in 15 min. This pulsation continues for 16 hrs. The effect of non-radiated vitamin is to produce sep. beats with no quick rhythm. After the test-heart has been latent for 1 hr., the addn. to the circulation of radiated vitamin B causes intense contractions which reach a max. in 20 min. The regular beats continue 13 hrs. The pulsations engendered by automatin are similar to those caused by radiated vitamin B. The latency depends on the time required for the preceding washing out of K and automatin. The frequency depends on the concn. of the stimulating substance whether this be automatin or radiated vitamin B. The duration of radiation should not be less than 4 hrs. and preferably should be over 12 hrs L. W. RIGGS

Similarity between physicochemical and biological reactions. C. P. SIDERIS. Assoc. of Hawaiian Pineapple Cannerys, Honolulu, Hawaii. *Plant Physiology* 3, 79-83(1928).—Two proteins (designated A and B) were isolated from the stem of the pineapple. Protein A has an isoelec. point at p_H 6.4 and protein B at p_H 4.8. Protein A was used in the present study. The protein purified by dialysis was further dild. with distd. water and after thorough stirring, 100 cc. was distributed into a no. of Erlenmeyer flasks. To each of these flasks different vols. of either 0.1 N HNO_3 or NaOH were added, giving a range of p_H 2.63-11.05. Aliquot portions of these solns. were innoculated with the spores and mycelium of *Fusarium martii*, *Verticillium* sp., *Penicillium* sp., and the cultures incubated at 27°. None of these organisms was able to grow in isoelec. protein A. *Fusarium* grew in solns. of this protein having a p_H value above that of the isoelec. point of the protein; but *Verticillium* grew only in solns. of the protein having p_H values below that of the isoelec. point, and *Penicillium* sp. grew in solns. of the protein having p_H values either above or below the isoelec. point. The probable operative mechanism of the enzymes effective in making the proteins available is discussed. It is suggested that the condition of the protein at the isoelec. point, and above or below this point, is: At isoelec. point, $HOOC - R - NH_2 + H^+ \rightarrow (HOOC - R - NH_2)^+$. Above the isoelec. point, $HOOC - R - NH_2 + OH^- \rightarrow (OOC - R - NH_2)^- + H_2O$. WALTER THOMAS

Lipides and their estimation in vegetable tissues. CHARLES E. SANDO. Bur. of Plant Ind., Washington, D. C. *Plant Physiology* 3, 155-84(1928).—The numerous classifications of the fats and "fat-like" compds. are listed in detail under each authority's name. S. urges that in accordance with the recommendations of the Comm. on the Reform of the Nomenclature of Biological Chemistry (*C. A.* 17, 3433; 19, 3278) that the term "lipides" and not "lipoids" or "lipins" be used as the generic term for those plant and animal substances that are insol. in water but sol. in fat solvents such as ether, alc., chloroform and benzene and are, either actually or potentially, related to the fatty acids as esters and that yield fatty acids on hydrolysis. S. suggests that considerable confusion would be avoided if Bloor's scheme (*C. A.* 19, 3278) of classification were adopted. The importance of the solvent in the estn. and extn. of lipides from vegetable tissues is pointed out and general data dealing with the common fat solvents together with a table of phys. constants are given. Three methods for the detn. of lipids are given in detail and critically examd.: (1) official method of the Assocn. of Official Agr. Chemists (*A. O. A. C. Methods of Analysis*, 1925), (2) the modified Koch method (*C. A.* 4, 1756), (3) the Kumagawa-Suto method (*C. A.* 2, 2560; 19, 3278). WALTER THOMAS

The proteins of Indian foodstuffs. II. The proteins of ragi. Eleusin, the alcohol-soluble protein (NARAYANA, NORRIS) 12. The constitution of the bile acids. XIV. The condensation of dehydrocholic acid with itself and with aromatic aldehydes (BORSCHKE, FESKE) 10.

HAUPT, ARTHUR W.: *Fundamentals of Biology*. London: McGraw-Hill Publishing Co. 358 pp.; 15 s. Reviewed in *Bull. Imp. Inst.* 26, 403(1928).

B—METHODS AND APPARATUS

STANLEY R. BENEDICT

Practical considerations in the selection of blood-sugar methods for clinical use in diabetes. I. M. RABINOWITCH. General Hospital, Montreal. *Can. Med. Assoc. J.* 19, 49-51(1928).—R. considers that for routine clinical work the picric acid method is ideal. A. T. CAMERON

Detection of veronal, adaline and bromural in urine. E. A. VAN RIJN. Univ. Amsterdam. *Pharm. Weekblad* 65, 1030-2(1928).—To 100 cc. of urine in a tall cylinder add 10 cc. 0.5 N Pb(OAc)₂, allow the ppt. to settle and then filter. Shake twice with 2 vols. of Et₂O, adding a little EtOH if an emulsion forms. Filter the Et₂O layer through a dry filter and evap. in a glass dish. Dissolve the residue in 10 cc. boiling H₂O, add 5 cc. dil. H₂SO₄, boil and add 0.1 N KMnO₄ until a permanent pink color appears. Boil again, cool and treat with H₂O₂ to reduce the MnO₂ and excess KMnO₄. Heat to boiling, shake the warm soln. twice with 2 vols. Et₂O, filter the Et₂O ext., evap. in a glass dish and dry 24 hrs. in a vacuum desiccator. The residue of veronal gives the correct m. p. With bromural, Me₂CHCHBrCONHCONH₂, and adaline, Et₂CBBrCONHCO-NH₂, recrystn. from boiling H₂O is necessary before the correct m. p. is obtained. Veronal does not react with Nessler reagent, bromural gives a yellow to dirty green ppt., and adaline gives a brown ppt. A. W. DOX

Creatinephosphoric acid and its determination. D. FERDMANN. Biochem. Inst. Charkow. *Z. physiol. Chem.* 178, 52-61(1928).—In traumatic injury of muscle an extraordinarily rapid cleavage of the creatinephosphoric acid occurs. This enzymic cleavage can be suppressed by quickly making alk. while the muscle is being comminuted. By grinding the muscle in a mortar with quartz sand in the presence of Na₂B₄O₇ of pH 9.15 the detn. of creatinephosphoric acid is made possible. The method then consists in the colorimetric detn. of H₂PO₄ before and after acidifying the alk. ext. For the synthesis of lactacidogen *in vitro* at the expense of the inorg. H₂PO₄ in the muscle pulp the presence of creatinephosphoric acid is not absolutely necessary. A. W. D.

New contrivances for the respirometer. SVEN STEFFENBURG. Univ. Stockholm. *Z. physiol. Chem.* 178, 75-80(1928).—For measurement of fermentation velocity by yeast it is preferable to read gas vol. at const. pressure rather than gas pressure at const. vol. as in the Barcroft manometer. The app. devised for this purpose consists of a respiration chamber or reaction vessel connected by a capillary tube bearing a 3-way stopcock to a capillary gas buret graduated in cu. mm. The gas in the buret is adjusted to atm. pressure by a leveling bulb. The respiration chamber, which is immersed in a thermostat, may be agitated by a motor-driven shaking device attached to the capillary connection, the buret remaining stationary so that the reading can be taken during the shaking. A. W. DOX

Rapid methods for the chemical analysis of the gastro-duodenal contents and the differential diagnosis between hemorrhagic ulcer duodeni and ventriculi. MOSES EINHORN. *Deut. med. Wochschr.* 54, 1379-80(1928).—The gastro-duodenal contents are tested with Töpfer's soln., phenolphthalein, blue litmus, benzidine and H₂O₂, and HNO₃. The findings permit of a differential diagnosis. A. G.

The basic amino acids of horse hemoglobin. HUBERT B. VICKEY AND CHARLES S. LEAVENWORTH. Conn. Agr. Expt. Sta., New Haven. *J. Biol. Chem.* 79, 377-88 (1928).—Analysis of the basic amino acids of horse hemoglobin by direct isolation methods showed histidine 7.64%, arginine 3.32%, and lysine 8.10%. These results are in agreement with the assumption that the hemoglobin mol., weighing 66,800, consists of 33 mols. histidine, 13 of arginine, and 37 of lysine. The Ag compd. of histidine was best sepd. from arginine at pH 7.4. Complete seps. were only effected by repeated pptns. and the N contents of the different fractions could not be relied upon to give a measure of the proportions of base in them. The wts. of the dinitronaphtholsulfonates gave the best evidence regarding the actual compn. of the histidine and arginine fractions, and the wt. of the picrate regarding the lysine fraction. Practically complete pptn. of histidine from a relatively pure soln. was obtained by using Hopkin's reagent. ARTHUR GROLLMAN

A colorimetric method for the determination of inorganic phosphate in blood serum. S. L. LEIBOFF. Lebanon Hospital, N. Y. *J. Biol. Chem.* 79, 611-19(1928); cf. following abstr.—A method is described for detg. the inorg. P of blood serum. After deproteinization with trichloroacetic acid, the filtrate is alkalinized with NH₄OH, reacidified with AcOH and the P pptd. with UO₂AcO. The ppt. is dissolved in trichloroacetic acid, converted into (UO₂)₂Fe(CN)₆ and compared colorimetrically with a similar soln. contg. a known amt. of P. ARTHUR GROLLMAN

A colorimetric microdetermination of phosphate. K. HINSBERG AND K. LANG. Chem. Lab. med. Univ. Klinik, Freiburg i. Br. *Biochem. Z.* 196, 465-70(1928); cf. preceding abstr.—The principle of the method depends upon the quant. pptn. of inorg. phosphates by U acetate in an AcOH medium and in the presence of an NH_4 salt: $\text{H}_2\text{PO}_4 + \text{UO}_2(\text{CH}_3\text{COO})_2 + \text{CH}_3\text{COO.NH}_4 = 3\text{CH}_3\text{COOH} + \text{UO}_2\text{NH}_4\text{PO}_4$. An excess of $\text{UO}_2(\text{COOCH}_3)_2$ is added and the excess detd. colorimetrically by the addn. of $\text{K}_4\text{Fe}(\text{CN})_6$. The following solns. are needed: (1) 0.01 N $\text{UO}_2(\text{CH}_3\text{COO})_2$, contg. 2.1215 g. of the salt in a l., (2) 0.5% $\text{K}_4\text{Fe}(\text{CN})_6$ soln. and (3) a soln. contg. 105 g. $\text{NH}_4\text{COO.CH}_3$ and 100 cc. glacial acetic acid in a l. Procedure: to 2 cc. protein-free urine (dild. 1:10 previously) are added 2 cc. of the $\text{UO}_2(\text{COOCH}_3)_2$ soln., 1 cc. of the acetate mixt. and made up to 10 cc. with H_2O . The ppt. is centrifuged off and 5 cc. of the clear supernatant fluid is transferred to a test tube contg. 2 cc. of the $\text{K}_4\text{Fe}(\text{CN})_6$ soln. and after 30 min. the color is compared with that of a blank run exactly as before except that the urine is omitted. Example of calcn.: reading of blank 10.0, that of unknown 13.77. Excess of $\text{UO}_2(\text{COOCH}_3)_2$ present is obtained thus: $4.2430 \text{ mg.} \times 10/13.77 = 3.0814 \text{ mg.}$ Therefore, $1.1616 \text{ mg. UO}_2(\text{COOCH}_3)_2$ used in pptn. of P. $1.1616 \times 0.073 = 0.0848 \text{ mg. P,}$ or $1.1616 \times 0.167 = 0.194 \text{ mg. P}_2\text{O}_5$, or $1.1616 \times 0.224 = 0.2602 \text{ mg. PO}_4$.

S. MORGULIS

Blood-sugar determination and separation of sugars with live yeast. ALBERT L. RAYMOND AND J. G. BLANCO. Rockefeller Inst. *J. Biol. Chem.* 79, 649-55(1928).—The observations of Somogyi (*C. A.* 21, 752) on the adsorption of glucose and non-adsorption of unfermentable sugars by yeast cells were confirmed. A technic is described using 0.3 cc. blood or aq. soln. Dihydroxyacetone, xylose, ribose, arabinose, galactose, lactose and maltose in aq. soln. were recovered quantitatively in the filtrate after yeast treatment. Fructose, mannose and sucrose were partially adsorbed. Glucose was quantitatively adsorbed at concns. of 500 mg. per 100 cc. Maltose was adsorbed to the extent of 40% in the presence of blood. The action of the yeast is selective, only glucose being removed when mixed with sugars of the non-adsorbed group.

ARTHUR GROLLMAN

Sugar metabolism. Lactose, galactose and xylose. J. G. BLANCO. Rockefeller Inst. *J. Biol. Chem.* 79, 667-72(1928).—The method of Somogyi (*C. A.* 21, 752) was applied to the detn. of lactose, galactose and xylose in the blood after their administration to rabbits, orally, subcutaneously and intravenously. The results differ from those obtained by Corley (*C. A.* 21, 763, 2921, 3958) using fermentation methods.

ARTHUR GROLLMAN

Characterization of very small quantities of proteins by Van Slyke's method. NUGGIBALLI NARAYANA AND MOTHNAHALLI SREENIVASAYA. Indian Institute of Science, Bangalore. *Biochem. J.* 22, 1135-7(1928).—An extension of Thimann's method (*C. A.* 21, 2486) for the detn. of Hausmann nos. in small quantities of proteins. B. H.

Micro-determinations of lead (a contribution to the diagnosis of lead poisoning). A. SEISER, A. NECKE AND H. MÜLLER. *Arch. Hyg.* 99, 158-64(1928).—The dried material from blood, feces, or urine is first decompd. with HNO_3 and H_2SO_4 . The soln. is neutralized with NH_3 ; with blood the pptn. of FeCl_3 serves as indicator; with urine and feces, *p*-nitrophenol is used. The mixt. is made just alk., and satd. with H_2S . The ppt. is removed by filtration through asbestos, and then the Fe and Mn are sepd. from the Pb by treatment with a mixt. contg. 50% alc. and 3% H_2SO_4 , satd. with H_2S . Traces of Cu are removed by 3% KCN. The residue is extd. with hot dil. HNO_3 and the soln. evapd. to dryness on the water bath; this extn. is repeated with Pb acetate soln. The solid residue is taken up with water and neutralized with very dil. alkali; 2 cc. satd. boric acid is added, and 0.5-1 cc. NaOCl soln., contg. 15% active Cl; and the mixt. warmed to 90-95° for 2 hrs. The mixt. is cooled and filtered; the Pb is treated with crystals of tetramethyldiaminodiphenylmethane and glacial AcOH ; and filtered. The blue color of the filtrate is proportional to the Pb content, and may be compared colorimetrically with a standard Pb soln. of approx. the same concn. Analysis of the blood of normal persons shows a variation in Pb content from 0 to 0.02 mg. per 100 cc. Higher concns. than 0.02 mg. suggest Pb poisoning from some source. The concns. found in the blood of patients with Pb poisoning varied from 0.06 to 0.17 mg. in 100 cc. blood; from 0.65 to 3.6 mg. in 100 g. dried feces; and from 0.05 to 0.17 mg. in 1 l. urine.

P. Y. JACKSON

Determination of urobilinogen in feces and urine by means of a new extraction method. A. ADLER AND M. BRESSER. *Deut. Arch. klin. Med.* 155, 326-41(1927).—That the extraction method previously described gives exact quant. results is shown by the following expt.: to 30 cc. colorless urine was added 1.4 mg. mesobilirubinogen dissolved in 20 cc. alc.; 0.2 mg. MnSO_4 and 0.5 cc. glacial HAcO was added, and the

mixt. extd. with CHCl_3 for 6 hrs. 1.3 mg. was recovered and detd. colorimetrically. Normally about 1 mg. urobilinogen is eliminated daily in the urine, and about 100 mg. in the feces. In hemolytic icterus values as high as 35 mg. (urine) and 4600 mg. (feces) were detd.; in anemia, leucemia, etc., high values were found. In pernicious anemia lower and even normal values were found. Following splenectomy the urobilinogen in the feces may fall as low as 25-30 mg. daily, while in the urine the amt. may exceed 100 mg.

P. Y. JACKSON

The technic and theory of ultrafiltration. ALEX AUGSPERGER. *Physiol.-chem. Anstalt, Basel. Biochem. Z.* 196, 276-88(1928).—The effect of the membrane and of volatilization on the quant. results of ultrafiltration are discussed, and a special form of app. to avoid these errors is described. The requirement that an ultrafiltrate of const. compn. be furnished has been tested with gelatin + NaCl or serum + NaCl .

S. MORGULIS

Colorimetric determination of lactic acid according to Mendel and Goldscheider. Physiological application. ANNELIESE HANSEN, OTTO RIESER AND IAKUJI NAGAYA. *Pharmakol. Inst., Univ. Greifswald. Biochem. Z.* 196, 301-8(1928).—A report of lactic acid detns. in muscles and brain.

S. MORGULIS

Methods for quantitative chemical analysis of skin. I. General principles. ERICH URBACH AND PAUL FANTL. *Universitätsklinik und Universitätsinstitut für med. Chemie, Wien. Biochem. Z.* 196, 471-3(1928).—A study of the dry residue, fat, protein and ash content of the skin leads to the conclusion that in a tissue lacking in homogeneity chemically and also so difficult to differentiate exactly anatomically, the results of analyses should be given in relation to its ash content (preferably on a fat-free basis) of the examd. skin fragment, this being the variable component. II. Sugar content of the normal skin. *Ibid* 474-7.—The skin fragment chosen for the study is clean shaven 24 hrs. before it is removed by the bloodless method of Kromayer using the elec. cautery. After sepg. the subcutaneous fat the skin tissue is at once placed in 2.5 cc. of 0.45% ZnSO_4 in a weighing bottle. After detg. its wt. the skin fragment (about 120 mg.) is comminuted by means of scissors which are also rinsed with 2.5 cc. 0.45% ZnSO_4 . To the 5 cc. ZnSO_4 is now added 1 cc. 0.1 N NaOH and heated 3 min. in the boiling water bath. The further technic is the usual Hagedorn-Jensen method for detg. sugar. In a no. of rabbits from which a no. of skin fragments were removed there has been found 89-144 mg. reducing substance per 100 mg. tissue (av. 112 mg. %), which corresponds closely to the similar values obtained for blood.

S. MORGULIS

Double color colorimetry. E. KAUFMANN. *Biochem. Z.* 197, 141-2(1928).

S. MORGULIS

Lactic acid determination in uterus umbilical blood vessels. F. WIND AND K. V. OETTINGEN. *Kaiser Wilhelm-Inst. Biologie, Berlin-Dahlem. Biochem. Z.* 197, 170-4(1928).—No difference was found in the lactic acid content of the arterial and venous bloods.

S. MORGULIS

Preparation of ultrafilters with large pores. H. BECHHOLD AND K. SILBEREISEN. *Inst. Kolloidforschung, Frankfurt-a.M. Biochem. Z.* 199, 1-7(1928).—A method is described for the prepn. of permeable ultrafilters which depends upon the coagulation of the layer of acetic acid-collodion in acetic acid instead of water. The acetic acid must contain 18% water or more, the permeability diminishing with the increasing H_2O content. Ultrafilters of any desired porosity can be made by varying the concn. of the acetic acid-collodion and of the water in the coagulation mixt.

S. M.

Determination of small quantities of bismuth in urine and in organs. J. BODNAR AND ANTON KARELL. *Med.-Chem. Inst. Univ., Debreczen. Biochem. Z.* 199, 29-40(1928).—Method of ashing: *Urine*.—Urine is evapd. to dryness in a flat, porcelain dish. This is then supported about 10 cm. above an asbestos plate which is heated to such a degree that the contents of the dish smoke. When the smoking has ceased, the dish is gradually lowered and the contents are carbonized. The dish is heated for a few min. with the open flame which is constantly moved about. After cooling, the carbonized mass is finely powd. and completely moistened with 10% H_2O_2 . This is dried over the asbestos plate and heated with an open flame until most of the C is oxidized. If the ash is still grayish, the treatment with H_2O_2 is repeated. Finally the ash is moistened with concd. HNO_3 and heated once more when a snow-white residue remains. *Tissue*.—For the ashing of muscles and other organs a different procedure is advised. About 20-100 g. of the finely divided tissue is evapd. to dryness in a flat, porcelain or quartz dish. Enough $\text{Ca}(\text{NO}_3)_2$ soln. is added to give 1 cc. for each 10 g. tissue (the soln. is prepd. by dissolving 30 g. CaCO_3 in HNO_3 and dilg. with 20% HNO_3 to 100 cc.), then 1-2 cc. concd. HNO_3 . The dish is placed on the water bath and HNO_3 is added with const. stirring until a yellow pasty mass is produced, which is then evapd.

to dryness. The ignition is now carried out as before omitting, however, the H_2O_2 . The reaction of Bi with KI producing a yellow color is utilized for the colorimetric detn., the reaction being still pos. with 0.0016% Bi. The ash is boiled with 5 cc. 10% HNO_3 and the hot soln. is filtered through a small paper into a test tube marked at 20 cc. The dish and the filtrate are rinsed twice with 5 cc. 10% HNO_3 . The filtrate should be crystal clear and colorless; otherwise it is decolorized with a little Merck animal charcoal. Add to the soln. 6 drops of 1% $NaHSO_3$, 3 drops 1% starch soln., 2 cc. 20% KI and dil. to 20 cc. with water. For comparison a standard soln. contg. 0.1 mg. Bi per cc. is prepd. in HNO_3 . The comparison in the colorimeter should be made at once.

S. MORGULIS

Behavior of different sugars in the Bang microdetermination. BÉLA RÓHNYI. *Physiol.-chem. Inst. Königl. ungar. Univ. Budapest. Biochem. Z.* 199, 48-52(1928).—With the reduction of glucose as a basis of comparison, the reduction by xylose, fructose, galactose, lactose and maltose diminishes gradually to only 50%. In this respect the Bang procedure gives much lower results than the method of Bertrand. By the latter the reduction of glucose, xylose and fructose is the same. The paper contains a table of the factors for calcg. from the cc. 0.01 $N Na_2S_2O_3$ the mg. of resp. sugar.

S. MORGULIS

A microchemical demonstration of some barbituric acid derivatives in the urine. O. EHRLSMANN AND G. JOACHIMOGLU. *Pharmacol. Inst. Univ. Berlin. Biochem. Z.* 199, 272-5(1928).—The method depends upon the sublimation of veronal and other barbituric acid derivs. upon microscope slides. The sublimation is carried out by means of a specially constructed heater described and pictured in the text. This is provided with a thermoregulator. A quantity of urine suspected to contain veronal in amts. of 1-5 mg. per 100 cc. is evapd. to small vol., treated with tartaric acid and extd. with 30 cc. ether. The ether is carefully driven off at 30°, the residue taken up in 1-2 cc. $CHCl_3$ and transferred drop by drop to the sublimation app. For veronal the sublimation is continued for 12 hrs. at 70-80°, and even 0.5 mg. can still be detected by an examn. of the sublimated crystals.

S. MORGULIS

The applicability of the Schiff fuchsin-sulfurous acid reaction to the determination of thymonucleic acid. GASTA WIDSTRÖM. *Karolinisches Inst., Stockholm. Biochem. Z.* 199, 298-306(1928).—The reagent is prepd. by passing SO_2 through a 0.35% aq. fuchsin soln. until a permanent straw yellow color is obtained. The excess of SO_2 must be removed *in vacuo*. The test is carried out by one of the following procedures: (1) The sample is hydrolyzed in a boiling water bath with 6-8 cc. 0.05 $N HCl$ and cooled. It is then neutralized with 0.1 $N NaOH$, 2 drops of dinitrophenol being used until the first yellow color appears. An equal vol. of buffer is added. 1-3 cc. of this hydrolyzate are mixed with 10 cc. buffer soln. and 0.5-1.0 cc. of the fuchsin reagent. (2) The alternative method is to add about 8 cc. buffer to the sample previously acidified to Congo red with HCl ; the total vol. should not exceed 10 cc. The hydrolysis is performed as before. To the hydrolyzate are added 3 cc. of a mixt. of 1 part fuchsin reagent and 2 vols. buffer. The buffer was prepd. from 30.5 citrate soln. and 69.5 cc. 0.1 $N HCl$ to have a $p_H = 2$. (Michaelis.) The thymonucleic acid prepn. was made from a biuret-free Na salt contg. the correct N:P ratio. The thymonucleic acid content was detd. from the N. By this colorimetric procedure it is possible to measure the thymonucleic acid in a protein-free mixt. or in the presence of very little protein with an accuracy of about 2%, provided the hydrolysis of both the known and the unknown sample is carried out for the same length of time and at the same degree of acidity. The most suitable amts. of thymonucleic acid for analysis are 0.5 to 2 mg. S. M.

Determination of silver in biological fluids and tissues. EMMANUEL STERKIN. *Lab. pathol. Physiology, State Med. Inst., Charkow, U. S. S. R. Biochem. Z.* 199, 392-8(1928).—The detn. of Ag in biological materials depends on the ashing with concd. H_2SO_4 . The following reactions take place: $2 Ag + H_2SO_4 = Ag_2SO_4 + H_2$; $Ag_2SO_4 + 2 NaCl = 2 AgCl + Na_2SO_4$; $2 AgCl + H_2SO_4 = Ag_2SO_4 + 2 HCl$. In this way all Cl ions are converted to HCl which is boiled off. However, the complete freeing of the soln. from chlorides is not attained even after 105 hrs. of heating. This has been attained by means of nascent H_2 . The mixt. is dild. with 3-4 vols. of distd. water and 0.5-1 g. metallic Zn is added. The H_2 reacts with the $2 AgCl + H_2 = 2 Ag + 2 HCl$, and the chlorides are completely removed in 15-16 hrs., and Ag_2SO_4 is once more formed. When a solargentum soln. is injected intravenously the Ag disappears at once from the dog's blood and cannot be found by analysis. If enough Ag was administered to produce symptoms of poisoning or even death, the Ag can be always demonstrated in the blood. The time when Ag can be shown to be present in the blood corresponds exactly to the appearance of poisoning effects in the animals. If death,

regardless of the symptoms of poisoning, does not occur the Ag disappears from the blood.

S. MORGULIS

Studies on metal salt albumin solutions by means of the washing out method. HELMUT SCHORN. Inst. für Kolloidforschung, Frankfurt-a.M. *Biochem. Z.* 199, 459-67(1928).—A method is detailed for the prepn. of absolutely electrolyte-free egg albumin by a process of electroultrafiltration. The lowest pptn. zone of albumin by heavy metal salts is due to the presence of Ca, albumin free from Ca not showing this behavior. Water-sol. combinations were prepd. of albumin with Ag, Zn, Cr, Al, 1 g. equiv. of the metal combining with 5100-5200 g. of the albumin. Only combinations with FeCl₃ deviate from this behavior, probably because of the hydrolysis which takes place.

S. MORGULIS

Determination of chlorides in blood and urine by means of the conductivity titration. L. BUDAY. Pathol. Inst. Univ. Berlin. *Biochem. Z.* 200, 166-75(1928).—The cond. titration is carried out with the aid of a Kohlrausch wire bridge and telephone arrangement. One cc. of either urine or blood dild. to a vol. of 45 cc. is titrated with 0.1 N AgNO₃, a 2.0 cc. microburet being used. The material must first be acidified with dil. HNO₃. The curve is constructed by plotting the cc. 0.1 N AgNO₃ as abscissae and the readings on the bridge as ordinates, and presents a very characteristic course (different, however, for whole blood than for either urine or plasma). The results obtained by this method for plasma are identical with the Cl detn. by the Korányi method so that all the plasma Cl must be ionized or at any rate easily dissociable.

S. MORGULIS

A micromethod for the determination of phosphorus in tissue. YASUSHI NAITO. Biochem. Lab. Tokyo Imperial Univ. *J. Biochem. (Japan)* 9, 45-69(1928).—The method depends upon Neumann's reaction in which a ppt. of NH₄ phosphomolybdate of definite compn. is formed at 80° when a phosphate soln. contg. a certain amt. of NH₄NO₃ is treated with NH₄ molybdate at a definite acidity. The resulting ppt. is decompd. by NaOH: $2(\text{NH}_4)_3\text{PO}_4 \cdot 24\text{MoO}_3 \cdot 4\text{HMO}_3 + 56\text{NaOH} = 24\text{Na}_2\text{MoO}_4 + 4\text{NaNO}_3 + 2\text{Na}_2\text{HPO}_4 + 32\text{H}_2\text{O} + 6\text{NH}_3$, from which it is obvious that a minute quantity of P can be detd. by titration since 1 mol. P corresponds to 28 mol. NaOH. This method is suitable for the detn. of 0.1-0.005 mg. P in tissues, and for this amt. 3 cc. 20% H₂SO₄ gives the opt. acidity. The tissue and the acid are digested in a hard glass tube until the contents become black, the digestion being completed either with HNO₃ or H₂O₂. The H₂O₂ must be redistd. The heating must be carried out very carefully. To the digest (for instance, of muscle tissue) 3 cc. NH₄NO₃ soln. (30 g. in 100 cc.) are added and enough water to bring the vol. up to 9 cc. The mixt. is warmed to 80° and 1 cc. 10% NH₄ molybdate reagent is added. It is best to have the ppt. settle overnight. The ppt. is washed with 20% alc. An excess of 0.04 N NaOH is added and the NH₃ is removed by boiling. The excess alkali is titrated back with 0.04 N H₂SO₄ in CO₂-free air. Accurate results can still be obtained with 0.03 mg. P.

S. MORGULIS

The micromethod for the determination of blood phosphate. A. E. BRAUNSTEIN. Biochem. Inst. Commissariat of Public Health, Moscow. *Zhurnal ekspl. Biol. Med.* 9, 277-84(1928).—The reagents used are 2.5% NH₄ molybdate; 5 N H₂SO₄; a reducing soln. contg. per 100 cc. 15 g. NaHSO₃, 0.5 g. Na₂SO₃, and 0.25 g. "Eikonogen" (photographic developer of the Agfa); 22% trichloroacetic acid; 0.85% NaCl; and a standard P soln. contg. 0.3833 g. KH₂PO₄ and 20 cc. 0.1 N HCl in the l.

S. MORGULIS

A new micro-apparatus for the erythrocyte sedimentation reaction. V. I. KAMINSKII. Therap. Klinik, Med. Inst., Odessa. *Zhurnal ekspl. Biol. Med.* 10, 19-20(1928).—A description of a portable instrument which, when folded, can be carried in the vest pocket. The capillary tubes can also serve to det. the relative cell vol. if the blood is left 24 hrs.

S. MORGULIS

Certified biological stains. W. C. HOLMES. Color Lab. Bureau of Chemistry. *Am. Dyestuff Rept.* 17, 626-8(1928).—The progress in the manuf. and standardization of biological stains in America since 1920 is reviewed.

L. W. RIGGS

A rapid quantitative method for the determination of acetone and diacetic acid in urine. JEANETTE ALLEN BEHRE. *J. Lab. Clin. Med.* 13, 1155-9(1928).—A method is described for the detn. of urinary acetone and AcCH₃CO₂H, suitable for use in clinical labs. where a rapid and standardized procedure is necessary. The method is based upon the color reaction between salicylaldehyde and acetone in an alk. soln. Permanent standard solns. are described.

R. W. WICKWIRE

Improvements in Czapek's apparatus for determining surface tension (KAMINSKII)

C—BACTERIOLOGY

CHARLES B. MORREY

The bactericidal activity of hexylresorcinol (Solution S. T. 37) on wound surfaces. W. A. FEIRER AND V. LEONARD. *Surgery, Gynecol. and Obstet.* 47, 488-92(1928).—A simplified technic for the detn. of bactericidal activity is described. Solution S. T. 37 killed several types of bacteria, which usually infect wounds, in one minute in the presence of 3% peptone-gelatin, horse serum and rabbit blood and, disinfected wound surfaces freshly inoculated with these organisms. J. B. BROWN

The metabolism of amino acids by *Paramecium caudatum*. FREDERICK E. EMERY. Univ. Wis. *J. Morph. Physiol.* 43, 555-77(1928).—Expts. are made with *Paramecium caudatum* in 0.1% amino acids solns. and in aminoids. The decrease in the formol titration after 12 hrs. was taken as an index of activity. Bacterial action under these conditions was slight. In the aminoid soln. 8% was utilized at 5°, 21% at 17°, 40% at 22° and 46% at 32°. The *Paramecium caudatum* was not killed at the temp. of 5° since 31% of the aminoid was utilized when it was exposed to a temp. of 22° for 12 to 24 hrs. subsequently. The rate of utilization of the aminoid was reduced by anesthetics as follows: normal (6 hrs.), 25%, ethylene 19%, CHCl_3 17%, Et_2O 8% and nitroglycerin (1:50,000 soln.) 1.5%. The rate of metabolism of the amino acids was as follows: phenylalanine 7.7, tryptophan 9.6, glycine 9.6, leucine 12.0, glutamic acid 13.2, alanine 15.5, arginine 15.9, tyrosine 17.7, aspartic acid 25.1, cysteine-HCl 26.3, glutamic acid-HCl 45.6 and a mixt. of all except arginine 48.3%. The greater the rate of utilization the greater the rate of NH_3 production. *Paramecium* could not use cystine nor change it to cysteine but apparently uses the others as a source of energy. The results with histidine and lysine were inaccurate but probably amount to between 10 and 15% for the former and 5% for the latter. H. J. DEUEL, JR.

The poisonous action of some metals and metallic alloys on bacteria. G. TAMMANN AND W. RIENÄCKER. Univ. Göttingen. *Z. anorg. allgem. Chem.* 170, 288-300 (1928); *Nach. ges. Wiss. Göttingen math.-physik. Klasse* 1927, 158-71.—The growth of *B. brassicae* and *B. aceti* was not prevented at a definite concn. of Ag but a retardation occurred over a broad range from 1.10^{-5} to 1.10^{-3} g. Ag per l. In this range complete cessation of growth and no effect were both noted. The $[\text{Ag}^+]$ in the nutrient broth was about 1.10^{-5} . The Ag was in an org. complex but is toxic. A toxic action was exerted also by pieces of purified metal 6 to 8 mm. long and wide when these were introduced into the Petri dishes contg. bacterial cultures in nutrient media (*B. coli communis* in gelatin at 20° and *B. brassicae*, *Sarcina agilis*, *B. gossypii* or *Penicillium glaucum* in agar-agar medium at 35°). The strongest toxicity was caused by Hg, Cu (except on *B. coli communis*), Ni, Co and Sb. A medium effect was noted from Zn (slight effect on *B. gossypii*), Cd and Ag. The following metals exerted only a very weak toxic action: Al, Cr, Mn, Fe, Bi, Au and Pt. The toxic action of Al, Cr and Mn could be traced to impurities in the metals. With Hg and Ag, there were sharply differentiated zones around the metal, first one 3-5 mm. broad in which there is no growth detectable with the naked eye; a second zone 10-12 mm. wide in which there is retarded growth; then a small zone in which the growth is greater than normal while the area further distant from the metal shows normal growth. The lack of growth in the inner area is caused by the immediate soln. in the medium of the layer of oxidized metal on the surface of the piece of metal introduced. This results in the death of the bacteria in this area. After the soln. of this layer the dissolved O_2 in the medium slowly dissolves the metal and this diffuses out, causing a decreased growth of the bacteria in the second zone. The geometrical site of the zone limit depends on the concn. at the metal surface, the diffusion rate and the rapidity of bacterial growth. Cu is toxic in greater concn. than 5.10^{-3} g. Cu per l. but with smaller quantity growth is not prevented with *B. gossypii*. *B. coli* is insensitive to the Cu plates. The Ag-Au alloy was found less toxic than the Cu-Au alloy. H. J. DEUEL, JR.

Studies in the metabolism of *Aspergillus oryzae*. II. HIROSHI TAMURA. Imperial Univ. of Tokyo. *Acta Phytochim. (Japan)* 4, No. 1, 77-213(1928); cf. C. A. 22, 1990.—The effect of metals on the growth and metabolism of *A. oryzae* was investigated with different acidities of the nutrient media. Large addns. of the alkali metals did not modify the p_H growth curves. Alk. earth metals in high acidity aided growth; in low acidity they produced inhibition. Similar, although varying, results were obtained with Al, Fe, Co, Ni and Mn. With a p_H of 4 or 5, even small addns. of Zn, Cu Hg and Ag accelerate growth but in a higher or lower p_H an inhibition was noted. The alc. fermentation during growth is greater in young mycelium and when the reaction is near p_H 5-6. At this acidity autolysis of the fungous body is insignificant and the

quant. relationship of the alc. formed to the CO_2 produced is approx. 1:1. At other acidities the quantity of CO_2 drops. Alc. is also formed in smaller quantity in aerobic conditions but is increased with the depth of the fungous film in the soln. Aerobic metabolism is more vigorous in the early stages of growth. Its optimum pH lies at 6 or 7. Eliminating any of the nutrient salt components from the media in aerobic cultures produces a slight drop in growth; the opposite holds for anaerobic cultures. Aerobic cultures are influenced in various ways upon the addn. of ZnSO_4 , FeCl_3 , CaCO_3 , lactic acid and oxalic acid while no apparent change is noted in anaerobic cultures with the exception of CaCO_3 . A culture kept for a long time under anaerobic conditions will regain normal growth when placed under aerobic conditions. Thirty-six tables of data are appended.

RUSSELL C. ERB

The cytochrome in mold fungus cells. HIROSHI TAMIYA. Tokugawa Biol. Inst. *Acta Phytochim. (Japan)* 4, No. 1, 215-8(1928).—Expts. lead to the conclusion that the hemochromogen reaction that can be shown with a pyridine ext. of the fungus does not necessarily arise from the cytochrome found therein.

RUSSELL C. ERB

Oxidative changes produced in the iron-containing component of hemoglobin. Recognition of the oxidative faculty of living bacteria. K. BINGOLD. *Klin. Wochschr.* 7, 928-31(1928).—Oxyhemoglobin and methemoglobin are not decolorized by H_2O_2 . Hematin is decolorized. Dihn. of blood with H_2O leads to a loosening of the union between hematin and globin. Hematin does not actually sep.—the spectroscope shows nothing but oxyhemoglobin—but it is now held loosely enough so that H_2O_2 can produce oxidative changes. By varying the amt. of water it is possible to obtain all degrees of oxidation from none, through partial (green coloration) to complete (colorless). A limited no. of bacteria are able to produce similar changes in the blood pigments. The active agent is a peroxide which is produced by the bacteria.

MILTON HANKE

Differentiation of true paratyphoid B from the Breslau-enteritis bacteria on ammonium chloride-rhamnose agar. K. HOFMEIER. *Klin. Wochschr.* 7, 1692(1928).— NH_4Cl -rhamnose agar is not suitable for the certain differentiation of paratyphoid B from the Breslau-enteritis bacteria because certain strains of paratyphoid B and of Gärtner bacilli will grow readily on this medium.

MILTON HANKE

The binding of the bacteriophage. K. V. ANGERER AND H. RUPP. *Arch. Hyg.* 99, 118-29(1928).—A culture of Flexner bacteria grown upon agar or bouillon, and killed by exposure to a temp. of 60° for $\frac{1}{4}$ -1 hr., quickly binds a corresponding bacteriophage. The rates of the reaction at different concns. of bacteria and of bacteriophage did not fit exactly the equation for a mono-, di- or tri-mol. reaction; but the final equil. of bacteria and bacteriophage can be expressed by the adsorption isotherm in which the adsorption exponent = 0.8. The rate of binding was increased by temps. between 37° and 60° ; but was decreased by the addn. of gelatin.

P. Y. JACKSON

The minimal "chlorine death points" of bacteria. I. Vegetative forms. FRED O. TONNEY, FRANK E. GREER AND T. F. DANFORTH. *Am. J. Pub. Health* 18, 1259-63(1928).—The results of expts. appear to furnish a satisfactory theoretical basis for the current practice of relying on the destruction of *B. coli* in water as a criterion of effective chlorination and may also justify a more general application to other phases of Cl disinfection such as washing of milk bottles, eating utensils, etc. Among the various organisms studied (viz., *B. typhosus*, *B. paratyphosus* A and B, *B. dysenteriae*, *B. enteritidis*, *B. proteus*, *Cl. welchii*, *Bruc. melitensis*, *Staph. albus*, *Pneumococcus*, *C. diphtheriae*, *Strep. scarlatinae*, *Strep. fecalis*, *Staph. aureus*, *Strep. hemolyticus*, *B. pyocyaneus*, *Achromobacterium viscosum*, *B. suispestifer*, *B. prodigiosus*, *Bruc. abortus*, *Strep. morbilli* and *B. coli*) *B. coli* proved on the whole to be more resistant to free Cl than any of the others. Being readily available, having a rapid growth and readily detectable is therefore most suitable for use as an index of effectiveness of Cl sterilization. The amt. of Cl required to kill most of the intestinal pathogens was 0.1 p.p.m. with the greatest destruction of organisms occurring during the first 15 seconds exposure. A table giving the dosage of Cl required to kill the vegetative cells of the bacteria mentioned above is given.

N. A. LANGRISH

The enzyme metabolism of bacteria. V. Experiments on *Staphylococcus*. H. W. NICOLAI AND N. KAGEURA. *Pathol. Inst. Charité, Univ. Berlin. Biochem. Z.* 196, 246-56(1928).—*Staphylococcus* splits anaerobically glucose and levulose into 2 mols., and maltose and sucrose into 4 mols. of fixed acid. The rate of hydrolysis like the respiration is proportional to the cell concn. The staphylococci are very sensitive to changes in pH . The pH of the blood offers an opt. The temp. coeff. for the respiration and glucolysis is 2.27-2.60. Glucolysis and respiration are easily affected by changes in osmotic pressure. In isotonic solns. the earthy alkalies, especially Mg-

Cl_2 have an inhibitory action; the enzyme activity in KCl is better than in NaCl.

S. MORGULIS

Quantitative enzyme determinations on microorganisms. II. The effect of certain factors on the catalase content of bacteria. ARTURRI I. VIRTANEN AND A. O. WINNIE. *Biochem. Z.* 107, 210-21 (1938).—The production of catalase by *B. coli* is independent of the H-ion contn. of the nutritive medium. In bacteria grown at pH 4.8 to 8.5 the coeff. of catalytic activity was practically the same. The very low catalase content observed in media contg. glucose is attributed to the strong acid production which caused the death of many organisms. The catalase production is independent of the nature of the N or C source, and the same catalase coeff. was found either in a peptone soln. or in a sugar $(\text{NH}_4)_2\text{SO}_4$ soln. Milk and pyruvic acid had no effect on the catalase content. *B. coli* grown in strongly oxygenated media contain perhaps somewhat more catalase than those grown in O_2 -free media, but at any rate the difference is not large. S. M.

S. M.

Alcoholic sugar hydrolysis through acetic acid bacteria. CARL NEUBERG AND ERNST SIMON. Kaiser Wilhelm-Inst. Biochemie, Berlin-Dahlem. *Biochem. Z.* 197, 250-60(1928).—Acetic acid bacteria (*B. ascensens* and *pasteurianum*) under anaerobic conditions produce typical alc. fermentation in a 1.2% glucose soln. S. M.

S. M.

Characterization of *Aspergillus niger* strains on the basis of their biochemical behavior. I. Comparative studies on the acid formation of different strains of molds. K. BERNHAUER. Chem. Lab., deut. Univ. Prag. *Biochem. Z.* 197, 278-86 (1928).—Strains I and V are gluconic acid producers and do not form under any circumstances appreciable amts. of citric acid. Strain II is a good citric acid producer, while III and IV are intermediate types producing equal amts. of gluconic and citric acids under proper conditions. Much gluconic acid is produced by all molds in the absence of N salts and in the presence of CaCO_3 or CaO in the culture fluid; on the contrary, the max. citric acid production occurs only in the presence of N salts, and even molds which do not form citric acid show a tendency to produce some citric acid while the gluconic acid production is inhibited. S. MORGULIS

S. MORGULIS

Acid formation by *Aspergillus niger*. IV. Significance of the mycelium development on the acid production. K. BERNHAUER. Chem. Lab., deut. Univ., Prag. *Biochem. Z.* 197, 287-308(1928); cf. *C. A.* 22, 3187.—The quantity and quality of the N are essential in detg. the acid formation by mold developing in a N-poor medium produce gluconic acid almost entirely in the CaCO_3 when transferred to another culture medium. The acid is completely independent of the N source, and the opt. is at a concn. of 0.01-0.1%. Citric acid formation was found only in molds which had been grown on a N-rich medium. For development of these strains of molds $\text{NH}_4\text{H}_2\text{PO}_4$ and NH_4NO_3 are the best N sources, next KNO_3 and $(\text{NH}_4)_2\text{SO}_4$ while peptone is not suitable. S. MORGULIS

S. MORGULI

* Chemistry of citric acid production by molds. I. Acid formation from various carbon compounds. K. BERNHAUER. Chem. Lab., deut. Univ., Prag. *Biochem. Z.* 197, 309-28(1928).—The citric acid production from a variety of org. compds. is given. II. Citric acid production from gluconic acid. *Ibid* 327-42.—During the sojourn of mold in a soln. contg. 10% glucose and CaCO_3 there seem to be formed enzymes which facilitate the conversion of Ca gluconate into Ca citrate. This is obvious from the fact that such molds can produce more citrate from Ca gluconate than those taken directly from the culture medium. Another point of favorable evidence for the assumption of an enzyme formation is the greater production of citrate in the fluid which has not been heated as compared to the fluid which was heated for an hr. at 100° , indicating the presence of a thermolabile agent.

Loss of capacity to form acid and change in the acid in the case of Gluconic acid in place of fumaric acid fermentation.) C. WEHMER. *Microbiol.-chem. Lab. Technische Hochschule, Hanover. Biochem. Z.* 197, 418-32(1928). S. M.

The biochemistry of paratyphoid B. Schottmüller and Bac. enterit. Breislau as well as a new differential medium for these. M. N. FISCHER AND A. J. BUNTE. Botkin-Barackenkrankenhaus, Leningrad. *Biochem. Z.* 198, 428-41 (1928).—In autoclaved milk there is a condensation of amide N with sugar, a humin-like substance resulting where N is not easily assimilated by microorganisms. Paratyphoid B. Schottmüller can be differentiated from Bac. Breislau because the former does not, whereas the latter does, assimilate the N of this condensation product. The same condensation product can also be formed from aldehydes and amide N under ordinary temps. and pressure. In practice the bacteriological differentiation is carried out with an autoclaved mixt. made up as follows: lactose 2, $(\text{NH}_4)_2\text{SO}_4$ 0.02, Na citrate 0.2, NaH_2PO_4 0.05 and H_2O 50, which is mixed with 50 cc. 4% agar contg. 0.5% NaCl. This is autoclaved at 125-

127° for 40-60 min. The other mixt., not to be autoclaved, is made up as follows: AcH 0.1, urea 0.02, Na citrate 0.2, NaHPO₄ 0.05, water 50, and mixed with 50 cc. agar soln. contg. 0.5% NaCl.

Effect of temperature on the growth process of molds. RUDOLF MEYER. Inst. landwirtschaftliche Bakteriologie, Univ. Göttingen. *Biochem. Z.* 198, 463-77(1928).—M. concludes from his exptl. studies that it is not permissible to speak of an "opt. temp." except in this sense that it is the temp. which permits the greatest rate of growth under strictly specified other conditions.

The relation between the tangent of the nitrogen production curve and the supply of phosphoric acid in *Aspergillus niger*. An objection to Mitscherlich's law of action of growth factors. RUDOLF MEYER. Inst. landwirtschaftliche Bakteriologie, Göttingen. *Biochem. Z.* 199, 171-4(1928).—A criticism.

The different processes involved in alcoholic sugar hydrolysis and the acetaldehyde-dismutation. CARL NEUBERG AND ERNST SIMON. Kaiser Wilhelm-Institut für Biochemie, Berlin-Dahlem. *Biochem. Z.* 199, 232-47(1928).—The 2 acetic acid bacteria, *B. ascendens* and *B. pasteurianum*, which produce with utmost ease the quant. dismutation of simple aldehydes and keto-aldehydes give no evidence of the presence of apozymase or cozymase.

The role of oxygen in the oligodynamic action of metals. G. M. VAINDRACH. Sanitary-Bacteriol. Inst., Vjatka. *Zhurnal exptl. Biol. Med.* 10, 206-11(1928).—The oligodynamic action of Ag powders on staphylococci has been studied in a H₂ atm. The oligodynamic effect could be completely suppressed by displacing the air with H₂. Oligodynamy is regarded as a catalytic oxidative action caused by the traces of metal adsorbed by the living organism.

A sporulated thermophil bacillus functioning as a lactic enzyme. G. GUITTONNEAU. *Compt. rend.* 187, 69-72(1928).—The bacillus in question was isolated first from the sludge of Dax, previously maintained at 68° to 70° for several days. It multiplies readily in manure or fertile soil. The name *Thermobacillus tarbellicus* is proposed for this organism. It grows well in a medium consisting of K₂HPO₄ 1, MgSO₄ 0.2, FeSO₄ 0.01, ZnCl₂ 0.005, MnCl₂ 0.005, Defresne peptone 15, sucrose 40, tap water 1000 g. This soln. is neutralized by NaOH to phenolphthalein and there was added a large excess of CaCO₃. Growth in this medium was completely prevented by a temp. of 40° or 75°. A max. growth occurred at about 68°. The organism is not killed at 100° for 1 hr. It appears indifferent to the presence or absence of O, and develops within a pH range of 6.0 to 9.0. It causes the nutritive liquid to become acid with a pH of 5.5 by the production of lactic acid at the expense of the sucrose. It remains perfectly colored by the method of Claudius but not by the method of Gram.

Respiratory pigment, cytochrome, in bacteria. HIDEAKI YAOI AND HIROSHI TAMIYA. *Proc. Imp. Acad. Tokyo* 4, 436-9(1928).—A close parallelism between the cytochrome content and the intensity of aerobic respiration holds in all of the bacteria examd. The general aspect of the spectrum, however, varies much with the strains examd. In most of the aerobic bacteria studied, cytochrome was always found with its 4 characteristic bands (a, b, c, and d). In all strains of *B. dysenteriae*, excluding Shiga bacilli, and of *B. coli* there was an extra band in the spectrum at 623-637μ besides the known bands of cytochrome.

Bacterial filters. S. P. KRAMER. *Science* 68, 88(1928); cf. C. A. 20, 3481.—A filter which could remove both pos. and neg. colloids was prepd. by adding to the siliceous material in the filter compd., a basic material carrying a pos. elec. charge. Such a basic material is MgO calcined at 1300°. Equal parts of this calcined MgO with Florida kaolin and fired at a temp. not above 900° give a filter which will remove both acid and basic colloid dyes. It will also remove bacteria. The bacteriophage and the virus of mosaic disease of tobacco do not pass through these filters.

Sterilizing flask for bacteria cultures. MARIAN W. HEILMAN. U. S. 1,688,144, Oct. 16.

D—BOTANY

THOMAS G. PHILLIPS

The conduction of tropic excitation. ADOLF BEYER. *Z. Botan.* 20, 321-417 (1928).—The question is investigated as to whether the process of the conduction of stimulation in phototropism and geotropism is dependent upon an unlike distribution of normally present growth-promoting materials (Cholodny-Went hypothesis) or whether one must assume the production of special "trophohormones" (Stark hypothesis), that is, — simply cause a redistribution of substances already present

or does it induce the formation of new specific materials. It is shown that phototropic stimulation is conducted equally well by either the posterior or anterior flank of the plant material and that therefore the idea on which the Cholony-Went hypothesis is based, namely that the conduction of stimulation is limited to particular localities, must be abandoned. In the second place it was detd. that from the quant. standpoint the parallel to be expected between regeneration of growth-promoting material in decapitated plants and their ability to respond to phototropic stimulation does not exist. Both observations are in favor of the Stark hypothesis. R. C. BURRELL

A study of the grand period of growth in bamboo. WM. M. PORTERFIELD, JR. Columbia Univ. *Bull. Torrey Bot. Club* 55, 327-405(1928).—*Phyllostachys quadrangularis*, an autumn-growing species, and *P. nigra*, a spring-growing form, were measured daily during the growing periods in 1924-1926 at Shanghai, 10 shoots of each species being used in each year. All individual shoots of the same species have a grand period of similar extent in time and a growth curve of similar form, always much steeper in *P. nigra*, which completes its growth in the warm, rainy spring in about half the time required by the other species in the dry, cooler autumn. Comparison of individual growth curves show synchronous oscillations without regard to species or stage of growth, obviously induced by external conditions, and agreeing exactly with concurrent depressions in mean daily temp. As the day length was practically equatorial throughout the working period, no attempt was made to det. the effect of light intensity or length of day on growth rate. There was no correlation between rainfall or humidity and growth rate, which appears to follow strictly the rise and fall of temp. The actual growth curves agree very closely with those calcd. from Robertson's formula and support the conception that growth is an autocatalyzed monomol. reaction. The bibliography contains 59 titles. JOSEPH S. CALDWELL

The effect of a manganese deficiency on the sugar cane plant and its relationship to Pahala blight of sugar cane. H. ATHERTON LEE AND J. S. MCHARGUE. *Phytopath.* 18, 775-86(1928).—The name Pahala blight is applied in Hawaii to a disease of cane characterized by partial chlorosis and stunted growth, heretofore regarded as resulting from attack by *Mycosphaerella striatiformans*. In field expts. in Hawaii affected plants dusted with $MnSO_4$ made partial to complete recovery and any soil treatment which tended to increase the Mn content of the soil or to increase its availability was also beneficial. Plants grown in a greenhouse at Lexington, Kentucky, in Mn-free sand cultures developed the typical chlorotic conditions; checks with Mn remained healthy. Chlorotic leaves showed much lower content of Mn than normal green leaves. The condition should be renamed Mn deficiency chlorosis. JOSEPH S. CALDWELL

Application of the Donnan equilibrium to the ionic relations of plant tissues. GEO. E. BRIGGS AND ARTHUR H. K. PETRIE. St. John's College, Cambridge. *Biochem. J.* 22, 1071-82(1928).—The conception of a simple Donnan membrane equil. operating between 2 homogeneous phases is inadequate to explain the phenomena of ionic intake by plants. BENJAMIN HARROW

Biological investigations on radiation. I. Action of Röntgen rays on the development of germs. EGON BERSA. *Anz. Akad. Wiss. Wien* 63, 200-1(1926).—All studies connected with Röntgen rays and a material as variable as germs should use a statistical method. In only a few cases did a weak Röntgen treatment favor the development of the germs of *Vicia faba* and *Sinapis alba*. Such treatment never was favorable to the root system. *Sinapis* showed a very apparent depression in the root development. The depression is temporary and, within certain limits, inversely proportional to the treatment intensity. With very resistant plants (*Zea mays*), the development of the roots could be totally stopped. The phenomenon was temporary. A. L. HENNE

Is the retarded growth of germinated seeds subjected to x-rays due to an influence exerted on reserve food materials? SUZANNE ANCEL. *Bul. soc. bot. (France)* 74, 12-17(1927).—Cotyledons, stem, and root of germinated seeds of *Lentilla lens* were subjected simultaneously and separately to x-rays to det. what part of the young seedling was actually injured by such treatment. When the roots alone were irradiated, approx. the same marked retardation of growth of the main root resulted as when the entire seedling was exposed to the x-rays. Under similar treatment the stem and secondary roots showed only a slightly retarded growth. Irradiation of the stem alone retarded stem and secondary root growth but failed to affect the development of the main root. When only the cotyledons were irradiated, stem and secondary root growth were usually retarded to a much greater degree than growth of the main root. Injury resulting from irradiation of the cotyledon alone was regarded as being due primarily to stem injury since part of the stem was enclosed by the cotyledon in the youngest seedlings. Variation in degree of injury was dependent to some extent upon the stem

length of the seedlings used, a stem length of 1 cm. being retarded in development more noticeably than a stem length of 2 cm. A stronger dose (80 H.) was more injurious than a weaker (10 H.) one. Conclusion: The reserve food materials are not specifically influenced by x-ray treatment, but the adverse effects are due to direct injury of stem and root cells. The seedlings, on moist cotton, were placed 28 cm. from the anticathode of a Coolidge tube. The spark equiv. was 23 cm. and the current 2.5 milliamp. Filters were not used. Intensity measurements were made with Solomon's ionometer.

A. E. HITCHCOCK

Cumulative effects determined by the successive action of two injurious factors on legume seedlings. SUZANNE ANCEL. *Bul. soc. bot. (France)* 74, 348-9(1927).—Young seedlings of *Lentilla lens* were exposed to x-rays (450 to 700 R.) and then mutilated by severing the stem from its root. The amt. of stem elongation after this treatment was compared with that of seedlings similarly mutilated but not irradiated. Mutilation of irradiated seedlings reduced stem growth by a value 25% greater than that for seedlings which were mutilated but not irradiated. These results do not substantiate the conclusions of Jungling (1924) and Nadson and Zolkevie (*C. A.* 20, 1649), namely, that 2 or more unfavorable growth factors (e. g., low temp. and desiccation) operate in a simple additive manner. The operation of growth-retarding factors is therefore not believed to be merely a simple addn. of each injurious effect as it is produced separately. There is, instead, an accumulative effect resulting from one adverse factor which causes a second adverse factor to operate in a more injurious manner than the latter would if acting alone.

A. E. HITCHCOCK

Photosynthesis. E. C. C. BALY. *Science* 68, 364-7(1928).—See *C. A.* 22, 3682.

E. H.

The latest development in the stock-poisoning plant situation in Indiana. ALBERT A. HANSEN. Purdue Univ. *J. Am. Vet. Med. Assoc.* 73, 471-4(1928).—The tremetol content varies in white snakeroot of different areas. To test for this constituent the suspicious material is extd. with petr. ether, ether or pure gasoline by agitating gently. The mixt. is allowed to stand $\frac{1}{2}$ hr. and then a few cc. of the supernatant ext. are layered over 2 cc. of concd. H_2SO_4 . The appearance of a red color at the junction of the 2 fluids indicates tremetol.

FRANCES KRASNOW

The composition of the cell wall in the leaves of the white cabbage. HANS PRINGSHEIM, KLARA WEINREB and ERICH KASTEN. *Ber.* 61B, 2025-8(1928).—To remove substances other than the cell walls, the leaves of the white cabbage were treated with 6-8% alkali for 14 days and then washed with water followed by 2% AcOH. Incrustations were still present so the material was treated with 0.2 N ClO_2 soln., then with 6% alkali and washed. The residue gave a pentose reaction and extg. with 18% alkali did not remove it. The product was remarkably resistant to acids, being insol. in 41% HCl or 80% H_2SO_4 . It was only slightly sol. in Schweitzer's reagent. It was converted

into a triacetyl hexosan (44.8% acetyl) which gave $\alpha \left[\begin{array}{c} 2 \\ 1 \end{array} \right] + 1^\circ$ in $CHCl_3$. On sapon. a polysaccharide was obtained which was not hydrolyzed by 2% HCl and had a pentosan content of only 4%. A 4% $CHCl_3$ soln. of the acetate was refluxed for 3 days with 0.1% anhyd. $PhSO_3H$ when a swollen mass having 25.5% acetyl content pptd. This substance was water sol. and was hydrolyzed by boiling with 2% HCl for 7 days. The hydrolyzed soln. was optically inactive and an osazone prepd. agreed in m. p. with galactosazone. Other membrane walls in the cabbage plant are composed of cellulose so it appears that a plant may build cell walls of different polysaccharides for different organs.

J. G. McNALLY

The formation of enzymes in ripening seeds. A. OPARIN and N. DYACHKOV. Karpow Inst. Chemie, Moscow. *Biochem. Z.* 196, 289-93(1928).—From the time the seed leaves the mother-plant there is no more amylase formed. Apparently, during ripening, amylase passes into the seeds from the vegetative portions of the plant. The peroxidase and catalase content increases in the early stages of ripening even when the seeds are detached from the mother plant, so that these enzymes must be produced in the metabolic process.

S. MORGULIS

Orthophosphoric acid as a stimulator of germinating energy and activator of germinating capacity of seeds. MIHOVIL GRAČANIN. Inst. Pflanzenbau, Kgl. Universität Zagreb. *Biochem. Z.* 195, 457-68(1928).—Treatment of seeds of *Beta vulgaris*, *Secale cereale*, *Vicia sativa*, *Helianthus annuus*, *Lulium perenne*, *Festuca arundinacea*, etc. with P_2O_5 resulted in a definite stimulation of the germination rate. For different seeds the opt. stimulating concn. of orthophosphoric acid varies from 0.05 to 1.0% P_2O_5 for a period of 15 hrs. But this is not the opt. concn. for the development of young

plants. Seeds of *Hordeum vulgare* which after 10 days' treatment in water showed only 2% germinating ability had 61% ability after 72 hrs. treatment with 1% P_2O_5 . On the other hand, in seeds of *Polygonum fagopyrum* with high germinating power no stimulating effect could be observed under treatment with P_2O_5 . The stimulating effect is ascribed to the H_2PO_4 ions. These expts. further demonstrate that, since the germinating power can be reawakened in otherwise non-germinating seeds, inability to germinate should not be confused with the dead condition. S. MORGULIS

The nourishment of plants with aldehydes. VIII. TH. SABALITSCHKA. Pharm. Inst. Univ. Berlin. *Biochem. Z.* 197, 193-6(1928).—Discussion. S. MORGULIS

Continued studies on the chemistry of angiosperm seeds and the natural and artificial external germination factors. I. Effect of frost on germinating capacity. ANNELESE NIETHAMMER. Inst. Botanik und Warenkunde, deut. techn. Hochschule Prag I. *Biochem. Z.* 197, 241-4(1928).—The effect of frost is in some respects similar to that of light, but neither is able to wake the resting seeds from their state of rest. II. Acetaldehyde. *Ibid* 245-56.—AcH can be found in variable quantities in many air-dried seeds. Following swelling the AcH content of germinating seeds is increased, but resting seeds (i.e., not germinating) contain no AcH. Seeds incapable of germinating show in some cases the presence of AcH but this is no longer increased as a result of swelling. Frost may cause an increase in the AcH content and at the same time there is an improvement in germination. Keeping in a warm bath causes a large increase in the AcH content and the germinating power is improved. III. Surface tension active substances. *Ibid* 199, 175-85.—A variety of seeds contain saponin. The effect of saponin substances has been studied on seeds contg. and seeds lacking saponin in the germination bed, but no marked differences were noted between them. A no. of other alkaloids were tested with the general outcome that the stimulation of the seed germination is thought probably to be due to influences on their respiration. S. MORGULIS

The role of phosphate formation in the intermediate carbohydrate metabolism of plants. H. K. BARENSCHEEN AND WALTER ALBERS. Inst. med. Chemie, Univ. Wien. *Biochem. Z.* 197, 261-77(1928).—During the process of assimilation and dissimilation in plants there is an increase in the org.-acid-sol. fraction of P which is due to the formation of carbohydrate phosphoric acid esters. S. MORGULIS

Formation of methanol in the autolysis of fresh tobacco leaves. CARL NEUBERG AND BERTA OTTENSTEIN. Kaiser Wilhelm-Inst. Biochemie, Berlin-Dahlem. *Biochem. Z.* 197, 490-501(1928); cf. C. A. 22, 666.—In the leaf portion 0.816-0.986% MeOH was found; in the ribs the total MeOH content was considerably higher, 1.225 to 1.288%. S. MORGULIS

Paspalum conjugatum grass from British Honduras. ANON. *Bull. Imp. Inst.* 26, 206-7(1928).—The sample contained: H_2O 8.8, crude proteins 6.6, fat 1.5, N-free ext. 45.8, crude fiber 27.7, ash 9.6%, nutrient ratio 1:7.5, food units 66, alkaloids none, which is very similar to the compn. of *P. conjugatum* from Java. A. P.-C.

The poisonous properties of "kiligi" tuber from Tanganyika. ANON. *Bull. Imp. Inst.* 26, 322-3(1928).—The plant, which is considered to be a species of *Courbonia*, contained no alkaloids, but on autolysis yielded 0.04% HCN, equiv. to 0.22% on the dry basis (H_2O 82.1%). The skin of the tuber, examd. separately, yielded no HCN. A. PAPINEAU-COUTURE

Hypostase—its presence and function in the ovule of the Onagraceae. DONALD A. JOHANSEN. Stanford Univ. *Proc. Natl. Acad. Sci.* 14, 710-3(1928).—The hypostase consists of a well-defined but irregularly outlined group of thick-walled cells at the chalazal end of the anatropous ovule. It appears to be a flexible adaptation to the environment and makes its appearance only when nature requires it. The hypostase and epistase, when either or both are present, serve to stabilize the water balance of the resting seed over the long period of dormancy during the hot dry season. L. W. R.

Spike disease of sandal (*Santalum album*). II. Analysis of leaves from healthy and spiked trees. A. V. VARADARAJA IYENGAR. *J. Indian Inst. Sci.* 11A, Pt. 9, 97-102(1928).—Sandal leaves affected with spike contain more free reducing sugars, total carbohydrates, starch, total N and dry matter than the healthy leaves. Leaves from diseased samples were deficient in Ca, K, H_2O and ash. III. Physico-chemical study of the leaf sap. *Ibid* 102-9.—The pH of healthy sandal leaf sap was 5.15 to 5.71; that of spiked trees was 4.69 to 4.99. The titratable acidity and osmotic pressure were higher in diseased samples. The sp. cond. of sap was always lower in the spiked samples, as was also the ratio of sp. cond. to f.-p. depression. L. W. RIGGS

Cress grown on adrenaline. J. H. THOMPSON. Middlesex Hospital Med. School. *Nature* 122, 401(1928).—Cress seeds grown on cotton pads soaked in a 1 to 10,000 soln.

of adrenaline and afterwards kept moistened with distd. water showed the following marked differences from control crops grown on distd. water: (1) The seeds germinated about 24 hrs. later. (2) After the preliminary retardation, growth advanced rapidly and in 3 days the plants were taller than the controls. (3) When maturity was reached the plants were much taller and the leaves were larger than the controls. Also, the plants were a paler shade of green. (4) The most striking feature was the presence of adrenaline or adrenaline-like compds. which gave the positive oxidizing tests for adrenaline. The controls gave none of these reactions. The cross was extd. with normal saline and injected into decerebrate cats, whereupon the pharmacodynamical reactions for adrenaline were observed.

L. W. RIGGS

Anthocyanin pigments of morning glory. II. TAKEO KATAOKA. *Proc. Imp. Acad. Tokyo* 4, 389-92(1928); cf. *C. A.* 21, 1652.—Further study has proved the identity of the aglycon of the anthocyanin pigment of the red flowers of the morning glory (*Pharbitis Nil* Chois.) and pelargonidin.

L. W. RIGGS

A stable colorimetric standard for chlorophyll determinations. JOHN D. GUTHRIE. Ohio State Univ. *Am. J. Botany* 15, 86-7(1928).—The usual standard for the detn. of chlorophyll, a soln. resulting from the sapon. of the pigment itself, has several disadvantages. Because of the ease of exact duplication and its stability the standard described does not have these disadvantages. A soln. consisting of a mixt. of $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$, $\text{K}_2\text{Cr}_2\text{O}_7$, and NH_4OH is used as the standard. A table is given showing the % of chlorophyll detd. with the usual chlorophyll standard and the new standard.

E. F. SNYDER

Nitrogen metabolism in the soy bean. J. E. WEBSTER. Oklahoma Agr. and Mech. College. *Plant Physiology* 3, 31-43(1928).—Five series of pot culture greenhouse expts. were carried out using soy beans (*Glycine max.* var. Peking). In the 1st series, high-N plants were obtained by growing the plants in a soil rich in humus that received a supplemental application of dil. KNO_3 . The high-N plants of the 2nd series and the low-N plants of the 3rd series were obtained by growing the plants in sand cultures. High-N plants were obtained by using a stock nutrient soln. of 2% $\text{MgSO}_4 \cdot 2\text{H}_2\text{O}$, 2% KNO_3 , 10% $\text{Ca}(\text{NO}_3)_2 \cdot 4\text{H}_2\text{O}$ and 2% K_2HPO_4 . Fe was added as the citrate. The nutrient soln. used to obtain low-N plants was similar to that for high-N plants, except that only $\frac{1}{4}$ of the amt. of $\text{Ca}(\text{NO}_3)_2 \cdot 4\text{H}_2\text{O}$ was used. In the 4th series, low-N plants were obtained by the use of a stock nutrient soln. consisting of 2% $\text{MgSO}_4 \cdot 7\text{H}_2\text{O}$, 2% KCl , 4% $\text{CaCl}_2 \cdot 2\text{H}_2\text{O}$ and 2% K_2HPO_4 and in the 5th series low-N plants were obtained by growing them in quartz sand without the addn. of any nutrient soln. In the 1st 3 series, moisture, total N, sol. N, insol. N, ammonia N, amide N, amino N, nitrate and nitrite N detns. were made weekly for 10 weeks, on the leaves, stems and roots. In the 4th and 5th series the above detns. were made at bi-weekly intervals. The analytical data given are calcd. in terms of percentage of fresh wt. of material. Conclusions: (1) In general, the variations of the various types of N compds. in the roots, leaves and stems of any particular series are quite similar. (2) There is little or no evidence to support the idea that the leaves, stems, or if present, the seeds, draw upon the N reserves of the roots. (3) Amino acids having amide groupings, on the basis of the amt. present, are of no more importance in protein metabolism in plants than other amino acids, although there is some evidence to show that amide N may be one of the most sol. storage forms. (4) Addnl. proof has been found for the idea that NH_3 is the first and last product of N metabolism in plants. (5) There is considerable daily fluctuation of the various forms of N in no uniform direction. (6) Within a wide range, when the external N supply is the only variable, only the general appearance and not the physiol. cycle of the soy bean is changed.

WALTER THOMAS

The development of chlorophyll in seedlings in different ranges of wave lengths of light. J. D. SAYRE. Ohio State Univ. *Plant Physiology* 3, 71-7(1928).—Seedlings of corn, wheat, oats, sunflower, radish, mustard and bean were grown in daylight and also in the artificial light from a Mazda C. 400-watt lamp under colored glass $6\frac{1}{2}$ in. square ray filters manufactured by the Corning Glass Works. The same series as used by Popp (*C. A.* 22, 3191) was employed with a few addns. The chlorophyll content of the tissues was not directly detd., instead the relative greenness of the plants as compared with the controls grown under all wave lengths of light was used as the measure of the amt. of chlorophyll present. All plants were grown under similar temp., humidity and soil conditions, the variable being the different wave lengths of light. The transmission data for the colored plates used were obtained according to the methods of the Bur. of Standards (*C. A.* 13, 1136; 15, 2908) and the limits of transmission of each plate checked by a wave-length spectrometer. The plants were grown under ventilated light-proof tin boxes which held 4 glass plates. The boxes were painted white (MgO

paint) on the inside and with Al paint on the outside. The seeds were planted directly in the soil when the expts. were conducted out of doors and the tin boxes were sunk several in. in the soil to make a light-tight seal. For expts. under artificial light in the greenhouse, flats of soil were used and the tin boxes were sunk for several in. into a large tray of soil. The plants were placed 1 m. from the light. Relative to chlorophyll formation under these conditions, the following conclusions are drawn: Wave lengths of radiant energy longer than 680m μ are not effective in the formation of chlorophyll in seedlings of corn, wheat, oats, barley, beans, sunflowers and radish. All other regions of the remaining visible and ultra-violet spectrum (to 300m μ) are effective provided the energy value is sufficient. For approx. equal energy values in these regions, the red rays are more effective than the green, and the green more than the blue. The effectiveness of radiant energy appears to increase with wave length to about 680m μ and then to end abruptly.

WALTER THOMAS

Photosynthesis in absence of oxygen. E. NEWTON HARVEY. Princeton Univ. *Plant Physiology* 3, 85-9(1928).—Fourteen species of marine algae, including members of the green, red and brown groups, are able to produce O from CO₂ when illuminated in complete absence of O. The O appears within a second after illumination, showing the ready permeability of the plasma and cellulose membranes to this gas. Luminous bacteria are recommended as a test for O under all conditions where they will survive.

WALTER THOMAS

A study of the effect of hydrogen-ion concentration on the growth of *Agaricus campestris*. DONALD FREAR, J. F. STYER AND D. E. HALEY. Penna. State Coll. *Plant Physiology* 3, 91-4(1928).—Sterilized culture media consisting of black filter paper (Whatman's No. 29) 10.0 g., casein 0.6 g. and 20 cc. of the following soln.: MgSO₄·7H₂O 0.02 M., KH₂PO₄ 0.04 M., K₂SO₄ 0.01 M., FeSO₄·7H₂O trace, CaCl₂ trace, at various H-ion concns. were inoculated with a small piece of mycelium of the common mushrooms, obtained from a pure culture growing in manure. The culture flasks were placed in pans contg. moist sphagnum moss and incubated in the dark at 27°. Growth records, as detd. by the diam. of the colony, were made each week. The best growth was obtained in the cultures at or near pH 6.0. A decrease of as much as pH 2.0 occurred in the media in which the best growth was made. WALTER THOMAS

Effects of light upon nitrate assimilation in wheat. W. E. TOTTINGHAM AND HENRY LOWSMA. Univ. of Wisconsin. *J. Am. Chem. Soc.* 50, 2436-45(1928).—Data are presented from the growth of maize in H₂O cultures during late summer which indicate that the absorption of nitrate and synthesis of protein are promoted by light rays which are absorbed by greenhouse glass under the conditions here effective. Data are also presented from the growth of wheat in sand and H₂O cultures which were irradiated by elec. lamps for periods of 10-21 days; with total intensities of 200-1200 foot candles and upwards, the long ultra-violet region was increased about 50-400% by use of C arcs. The concomitant increase in red-orange rays was about 0.5-4%, with unmeasured increases in the shorter wave lengths of the visible spectrum. In the early growth phases of wheat, relatively limited increases in the proportion of shorter visible light rays greatly enhance the absorption of nitrate and significantly increase the synthesis of protein. These effects are accompanied by small increments of the % of H₂O₂ in the tissue and declines in the yields of sugar and total dry matter. Long ultra-violet rays seem to be effective in the absorption of nitrate, but the present results do not establish any further role. The proportion of blue-violet rays in the artificial light used was considerably smaller than in sunlight. Further study is desirable with sunlight or a similarly balanced spectrum.

C. J. WEST

SWINGLE, DEANE B.: *A Textbook of Systematic Botany*. London: McGraw-Hill Publishing Co. 254 pp.; 10s. Reviewed in *Bull. Imp. Inst.* 26, 403-4(1928).

CaCO₃ as a factor in the distribution of plants in Finland (PESOLA) 15.

E—NUTRITION

PHILIP B. HAWK

Intarvin in diabetes. A critique of the work of Lundin and Modern. MAX KAHN. Columbia Univ. *J. Metabolic Research* 7-8, 81-6(1925-6); cf. *C. A.* 19, 3516, 3517.—A polemic.

H. J. DEUEL, JR.

The specific dynamic action of foods. A. BORNSTEIN. Univ. Hamburg and Krankenhaus St. Georg. *Deut. med. Wochschr.* 54, 1535-6(1928).—A review and discussion of the modern views regarding the specific dynamic action of foods. A. G.

Can ultra-violet rays increase the growth-promoting effect of iron? P. M. SUSKI. Pathol. Inst. Univ. Berlin. *Biochem. Z.* 199, 69-71(1928).—Measured by its influence

on the growth of young rats, ultra-violet radiation of FeSO_4 has no significant effect upon its biological activity. S. MORGULIS

F—PHYSIOLOGY

E. K. MARSHALL, JR.

The mechanism of intestinal secretion. M. P. BRESTKIN AND V. V. SAVICH. State Inst. Exptl. Med., Leningrad. *Arkhh. Biol. Nauk* 27, 37-44(1927).—Observations were made on 3 dogs with Thiry-Vella loops of the duodenum and jejunum. Accidentally in the first dog the constrictions at the ends of the loop were incompletely closed, and consequently the uninterrupted secretion of the juice could be observed. Feeding diminished the quantity of and the concn. of erepsin and kinase in the secretion. Soaps, fats and bread had the most marked effect. Liebig's ext. and acids had a feeble inhibitory effect. The inhibition of intestinal secretion by food at a distance is believed to be regulated by a nervous mechanism. The role of local impulses, humoral stimuli, and of inhibitory nerve stimuli in the function of the intestinal glands are discussed at length. W. A. PERLZWEIG

The role of the nervous system and adrenaline in the spontaneous contraction of the blood vessels. F. N. SPERANSKA-STEPANOVA. State Inst. Exptl. Med., Leningrad. *Arkhh. Biol. Nauk* 27, 45-54(1927).—In normal frogs the spontaneous contraction of denervated blood vessels is conditioned by the adrenaline of the blood which is capable of replacing the tonic effect of the sympathetic system. W. A. PERLZWEIG

The connection between the liver and the parathyroid glands. M. M. GORBUNOVA. State Inst. Exptl. Med., Leningrad. *Arkhh. Biol. Nauk* 27, 55-60(1927).—From perfusion expts. on the isolated livers of parathyroidectomized cats it is deduced that the parathyroids regulate the Ca metabolism in general and the Ca level in the blood. The removal of these glands and the consequent diminution of the blood Ca lead to a disturbance in the function of the endocrine glands, particularly of the liver, in which the capacity to retain NH_3 is greatly reduced. This latter impairment is partially overcome by means of administering Ca salts. W. A. PERLZWEIG

The influence of relative parathyroid deficiency on gastric secretion. S. I. LEBE-DINSKA. State Inst. Exptl. Med., Leningrad. *Arkhh. Biol. Nauk* 27, 61-75(1927).—Observations were made on dogs with Pavlov stomachs in whom 2 of the external parathyroids were extirpated and 1 internal gland was crushed. The deficiency so produced led rapidly to disorders in gastric secretion, notably to a hypersecretion and diminished enzyme content in the reflex phase. Later alterations appear in the chem. phase during which secretion is prolonged, then pass to an inert type, and finally culminate in severe hypersecretion. The combined administration of NaHCO_3 by rectum and of CaCl_2 by mouth tends to reestablish the normal reflex phase, to reduce spontaneous secretion and hypersecretion, and to bring the secretion time curve closer to the normal type. W. A. PERLZWEIG

Gastric secretion in relative parathyroid deficiency. L. I. PRAVDINA. State Inst. Exptl. Med., Leningrad. *Arkhh. Biol. Nauk* 27, 77-87(1927).—The results in the preceding abstr. are confirmed and extended. The transplantation of parathyroid glands into parathyroidectomized dogs restores the reflex phase and diminishes hypersecretion. The Ca of the blood rises. The dependence of the mechanism of gastric secretion upon the blood Ca level is discussed. The injection of testicular exts. (prepd. by Kravkov's method) induced favorable results in respect to gastric secretion in parathyroidectomized dogs. W. A. PERLZWEIG

Phosphorus metabolism. A. V. KHARIT AND A. I. LIVSHITZ. State Inst. Exptl. Med., Leningrad. *Arkhh. Biol. Nauk* 27, 89-99(1927).—Inorg. and total P were detd. in the serum and whole blood taken from different blood vessels of dogs under various metabolic conditions. The highest inorg. and total P were found in the portal vein, the lowest in the renal vein. The liver retains part of the inorg. and total P of the serum as well as of the whole blood. There is likewise a similar loss in the passage of the blood through the kidneys. The following ranges of serum P in the various vessels are given:

	Inorg. P	mg. % Total as P_2O_5
Portal vein	3.8-7.2	29.0-35.0
Hepatic vein	3.4-6.9	31.1
Renal vein	4.6-6.5	28.0
Femoral artery	3.1-6.8	27.0-6.8

The range of the whole blood P is analogous but somewhat higher. Evidence is presented that the constancy of the blood P level is maintained not only by the food, but

also in the absence of food, by the digestive secretions and by the products of tissue catabolism. The ingestion of P-rich food raises the level of P metabolism. W. A. P.

The influence of testicular preparations on the regressive changes in the secondary sexual characters in castrated cocks. A. I. KUZNETZOV. *Arkhh. Biol. Nauk* 28, 33-6(1928).—A report of neg. results. W. A. PERLZWEIG

The influence of gastroenterotomy upon the function of the gastric glands. M. P. BRESTEIN. State Inst. Exptl. Med., Leningrad. *Arkhh. Biol. Nauk* 28, 211-7 (1928).—Gastroenterotomy in dogs produces an uninterrupted secretory activity of the gastric glands. In this secretion the reflex phase is almost completely lacking, and in many cases a lowering of secretion results from the act of eating. Chem. stimulants exert their action, raising the secretion materially. Eats do not inhibit secretion while soaps do, behaving in the usual manner. W. A. PERLZWEIG

The suprarenal fluid and its properties. A. I. KUZNETZOV. State Inst. Exptl. Med., Leningrad. *Arkhh. Biol. Nauk* 28, 265-8(1928).—The fluid was obtained by Kravkov's method from the isolated suprarenal glands. It contains 2 groups of substances: those of the one resemble adrenaline and those of the other resemble muscarine. The fluid is distinguished from adrenaline by its greater stability and the duration of its effects. It was utilized in the treatment of Addison's disease. W. A. PERLZWEIG

The testicular fluid and its properties. A. I. KUZNETZOV. *Arkhh. Biol. Nauk* 28, 269-73(1928).—The fluid was obtained from isolated beef testes by Kravkov's method. It is claimed to possess a tonic effect upon cardiac muscle, the blood vessels, blood pressure and upon metabolic processes. Favorable results are reported after its therapeutic use in various sexual disorders. W. A. PERLZWEIG

The change in the vascular reactivity of the kidney after adrenalectomy. A. I. KUZNETZOV AND S. I. LEBEDINSKA. State Inst. Exptl. Med., Leningrad. *Arkhh. Biol. Nauk* 28, 261-4(1928).—The renal vessels in the isolated dog kidney after adrenalectomy react much weaker to vasoconstrictor poisons (adrenaline and BaCl_2) as well as to vasodilator drugs (caffeine). This is explained by the lowering of the tonus of the vessels because of the loss of irritability in the endings of the vasomotor nerves. W. A. P.

G—PATHOLOGY

H. GIDEON WELLS

Newer aspects of liver disease. E. ANDREWS, W. A. THOMAS AND K. SCHLEGEL. *Surgery, Gynecol. and Obstet.* 47, 178-82(1928).—In certain diseases of the liver it is shown by serological methods that liver protein is excreted in the urine, accompanied by a disturbance of the mineral salt balance, especially Ca and Na. J. B. BROWN

The insulin requirement on various diets. N. R. BLATHERWICK, W. D. SANSUM, MARION BELL AND ELSIE HILL. Potter Metabolic Clinic, Santa Barbara. *J. Metabolic Research* 7-8, 39-49(1925-6).—The insulin requirement is not entirely dependent on the potential glucose of the food but upon all the foodstuffs comprising the diet as detd. by a prolonged expt. on a diabetic patient. H. J. DEUEL, JR.

Anomalous fat metabolism in a case of diabetes mellitus. I. M. RABINOWITCH AND E. S. MILLS. Montreal Gen. Hosp. *J. Metabolic Research* 7-8, 87-90(1925-6).—A report of a case in which on admission to hospital the blood fat showed an abnormally high value of 18.6%. After the administration of 50 units and later 20 units of insulin, the blood fat fell to 9.4% which would indicate the disappearance of about 460 g. of fat from the blood by storage in the tissues. Four hrs. later the blood fat had fallen to the value of 2.1%. It is suggested that insulin may cause an increased permeability of the tissues for fat. The importance of insulin in fat metabolism is emphasized. H. J. DEUEL, JR.

The glucose tolerance in arthritis. E. F. TRAUT. *J. Metabolic Research* 7-8, 187-93(1925-6).—There is a lowered glucose tolerance in some cases of arthritis, and in such generalized infections as rheumatic fever, tuberculosis and bronchopneumonia. In patients with localized freely draining infections the carbohydrate metabolism was normal. The lowered glucose tolerance in rheumatic fever continues over into early convalescence. H. J. DEUEL, JR.

The examination of the gastric contents as an aid to the diagnosis of carcinoma of the stomach. DERRICK M. DUNLOP. Chalmers Hosp., Edinburgh. *Edinburgh Med. J.* 35, 497-532(1928).—The results of gastric analyses by the fractional method in 93 cases are given. The important factors in the diagnosis of carcinoma are (1) achlorhydria, (2) lactic acid, (3) blood and (4) evidences of stagnation. The absence of free acid and the presence of lactic acid occur in the great majority of patients suffering from gastric carcinoma, these dual findings not occurring in any other condition

except carcinoma of the esophagus. The absence of lactic acid in stomach contents which show no free acidity or the discovery of large amts. of free HCl makes a diagnosis of gastric carcinoma highly improbable. Lactic acid found in the stomach contents is not always an indication of the stagnation of the gastric juice since sarcocollactic acid may be produced by the tissues involved in growth. This constituent may be found in the gastric juice in the absence of pyloric stenosis. The Congo red and the dimethyl tests for free HCl in gastric juice were found untrustworthy since they were not sensitive for small quantities of the HCl and they react with large quantities of lactic acid in the same way as with free HCl. Gunzberg's test when freshly prepd. reagent was used was found entirely reliable for free HCl. Uffelmann's test for lactic acid was found to be non-specific while MacLean's test proved satisfactory. H. J. DEUEL, JR.

An abnormality in the composition of human fat. S. V. TELFER. Western Inf., Glasgow. *Glasgow Med. J.* 110, 137-41(1928).—The fat obtained on autopsy from a diabetic had an I no. of 59.4 for the whole fat (normal value = 71.0). The insol. fatty acids had a m. p. of 36-37° (normally 32-33°), a solidifying point of 35° instead of the normal value of 30°, an I no. of 62.8 compared with the usual one of 78.6 and the percentage of sated fatty acids of 38.6 instead of 25.8. H. J. DEUEL, JR.

The changes in the ash constituents of the blood during experimental nephritis with special reference to the potassium and calcium value of the serum. ADOLF BOLLIGER AND FRITZ BREH. Henry Ford Hosp., Detroit. *Zentr. inn. Med.* 49, 825-31(1928).—The administration of urea in 30 or 40 g. doses to normal dogs did not change the normal level of serum K or Ca. Similar results were obtained on an animal with a kidney insufficiency produced by removal of one kidney and partial ligation of the renal artery to the other. These results support the view that urea has a non-poisonous property and are in contradiction to the work of Mark and Kohl-Egger (cf. *C. A.* 22, 812). In dogs in which a chronic interstitial nephritis was induced by exposure of the kidneys to the x-ray, the serum K value was somewhat raised 1 month prior to death (25 to 30 mg.) while values above 40 mg. (42-117 mg.) were characteristic of the last days of life. The rise in phosphate somewhat precedes that of K although the late rise in the K is paralleled by that of the phosphate. Because of the greater simplicity in the detn. of phosphate and its somewhat earlier rise, it is suggested that this substance is more satisfactory for the prognosis of a nearing death. The serum Ca may be raised, lowered, or remain unchanged in the uremic dog. The detn. of the alkali reserve in uremia showed that the acidosis is one of the most important factors and may be responsible for the death. The acidosis appeared a considerable time before the uremic state is pronounced. It is probably not to be traced to phosphate retention as assumed by Howland, since there is no parallelism with phosphate retention. H. J. DEUEL, JR.

The Müller-Ballungs reaction with special reference to results obtained with spinal fluid. GOTTFRIED ENGERTH. Psychiatrisch Neurologischen Klinik, Wien. *Deut. med. Wochschr.* 54, 1374-5(1928).—The Müller-Ballungs reaction is more sensitive than the Wassermann or colloidal Au reactions. It is neg. in non-syphilitic tumors, meningitic disease and multiple sclerosis. ARTHUR GROLLMAN

Blood-sugar changes during cures for morphinism by removal of the drug. Contribution to the etiology of psychomotor abstention phenomena. ARNOLD HIRSCH. Kuranstalten Westend, Berlin. *Deut. med. Wochschr.* 54, 1462(1928).—During the cure of the morphine habit, the blood sugar was abnormally low. Injection of sugar ameliorated the psychopathic manifestations usually accompanying sudden removal of the drug from addicts. ARTHUR GROLLMAN

Blood regeneration in severe anemia. XII. Potent influence of inorganic ash of apricots, liver, kidney and pineapple. FRIEDA S. ROBSCHT ROBBINS, C. A. ELDER, WARREN M. SPERRY AND G. H. WHIPPLE. Univ. of Rochester. *J. Biol. Chem.* 70, 563-76(1928).—Apricot feeding was highly potent in producing blood regeneration in anemic dogs. The inorg. ash of dried apricots retains this potency. Inorg. ash of beef liver and pig kidney are only half as potent as whole cooked organs. The ash of pineapple was only slightly potent. Analysis of the ash samples showed the apricot ash to be the richest in Cu. XIII. Influence of certain copper salts upon hemoglobin output. C. A. ELDER, WARREN M. SPERRY, FRIEDA S. ROBSCHT-ROBBINS AND G. H. WHIPPLE. *Ibid* 577-86(1928).—The effect of Fe, Cu and Zn salts when added to the diet of anemic dogs was studied. Cu salts had a positive effect on blood regeneration but FeCl₃ had a more notable effect. The effect of combined Fe and Cu feeding was variable. ARTHUR GROLLMAN

The protein content of the cerebrospinal fluid in myxedema. WILLARD O. THOMPSON, PHEBE K. THOMPSON, ESTER SILVEUS AND MARY E. DAILEY. Mass. General

Hospital, Boston. *J. Clin. Investigation* 6, 251-5(1928).—The protein content of spinal fluid was high in cases of myxedema and dropped under thyroid ext. therapy. A. G.

Chemical changes occurring in the body as the result of certain diseases. III. The composition of the plasma in severe diabetic acidosis and the changes taking place during recovery. ALEXIS F. HARTMANN AND DAN C. DARROW. Washington Univ. and Childrens Hospital, St. Louis. *J. Clin. Investigation* 6, 257-76(1928).—In severe acidosis marked concn. of the plasma occurs with slight diminution of total base. $[HCO_3^-]$ and $[Cl^-]$ are diminished relatively more than ketone acid and protein. "When therapy consists only of administration of H_2O and insulin, with or without carbohydrate, $BHCO_3$ and p_H are at first restored relatively very slowly because, as the base is released by oxidation of the salts of the ketone acids, it is claimed in large part by acids other than H_2CO_3 . Later, secretion of chloride, bound to NH_3 into the urine adds in the restoration of plasma $[BHCO_3^-]$. Salt administration adds little if any towards the early recovery of plasma $[HCO_3^-]$. $NaHCO_3$ administration with H_2O , insulin, carbohydrate and salt may provide a very rapid, safe and complete relief from acidosis.

ARTHUR GROLLMAN

Experimental modification of callus formation in bone fractures. K. GLASSNER AND J. HASS. Univ. Wien. *Klin. Wochschr.* 7, 1633-5(1928).—Exptl. evidence is presented that indicates that callus formation is greatly hastened by administration of thymus ext.

MILTON HANKE

Role of the hypophysis and the hypothalamus in experimental diabetes insipidus. PAUL TRENDLENBURG. *Klin. Wochschr.* 7, 1679-80(1928).—Diabetes insipidus may be due to a deficiency in 2 hormones. Removal of the hypophysis leads to diuresis and to the increased appearance, in the tuber cinereum, of a substance that acts as an antidiuretic. The tuber cinereum will, in time, assume the responsibilities of the hypophysis as an antidiuretic. Removal of the tuber cinereum at this time leads to a reestablishment of profound diuresis which is permanent.

MILTON HANKE

Activation of pancreas lipase in serum with leucylglycylglycine. A modification of the Rona test. ALFRED ROSEN. *Klin. Wochschr.* 7, 1693-4(1928).—The Rona serological method for diagnosing disease of the pancreas has been improved by adding leucylglycylglycine to the atoxyl-treated serum. The tripeptide activates the lipase and leads to a rapid hydrolysis of tributyrin. The 2-hr. reaction period of the Rona procedure is reduced to 7 min.

MILTON HANKE

Lactic acid content of the blood in hepatopathics. HERTHA SCHUMACHER. Med. Univ. Clinic, Frankfurt. *Klin. Wochschr.* 7, 1733-7(1928).—The lactic acid content of the blood is increased in severe, but not in mild, cases of liver injury. The injection of 4 g. Na lactate into hepatopathics leads to a more protracted rise in the blood lactic acid than is the case in normal individuals.

MILTON HANKE

The coagulation time and sedimentation time of blood after the parenteral administration of irritants. J. KNOSP. *Klin. Wochschr.* 7, 1909-11(1928).—Administration of the irritant, Clauden, leads to a decrease in the coagulation time and a parallel decrease in the sedimentation time. Injection of defibrinated blood has a similar, though a much less intense, effect.

MILTON HANKE

Action of various forms of iron on hemoglobin regeneration. GEORG STIEGER. *Klin. Wochschr.* 7, 1914(1928).—Iron as ferrum reductum, ferri chlorati, ferrum oxydatum saccharatum, dried blood or hematophan is equally valuable for blood regeneration in dogs after severe hemorrhage.

MILTON HANKE

Bile pigment content of human traumatic hemorrhagic exudates. KURISHITA. *Klin. Wochschr.* 7, 1914(1928).—Hemorrhagic exudates contain considerably more bile pigment than does the circulating blood. This indicates that the pigments are produced locally.

MILTON HANKE

Guanidine studies. II. Distribution of guanidines in acute guanidine and parathyropriva tetanics. MAX MAPES ELLIS. Physiol. Inst., Univ. Glasgow. *Biochem. J.* 22, 930-6(1928); cf. *C. A.* 22, 2413.—The guanidine contents of the livers, kidneys and brains of animals in acute guanidine tetany (A) were high. Neither high blood guanidine nor high muscle guanidine is required to maintain (A). No storage of guanidine even equalling the av. tissue guanidine was observed. III. Water content of certain tissues during acute guanidine and parathyropriva tetanics (B). *Ibid* 937-40.—Brain, kidney and striated muscle from animals in (B) had higher water contents than the same tissues from normal control animals. Blood from rats in (A) had a lower water content than normal rat blood. IV. Changes in guanidine action and in parathyropriva tetany produced by dextrose. *Ibid* 22, 941-6.—Dextrose guanidine was less active than its equiv. of guanidine base. Combined injections of dextrose and guanidine carbonate were less toxic than injections of guanidine carbonate

alone. Dextrose and adrenaline injections relieved parathyroparivria tetany in cats.

BENJAMIN HARROW

The testing of sheep erythrocytes; observations upon lead poisoning in animals. HANS RUPP. *Arch. Hyg.* 99, 165-80(1928).—In sheep suffering from chronic poisoning, induced by the subcutaneous injection twice weekly of 5 mg. Pb (as $\text{Pb}(\text{NO}_3)_2$ soln.) per kg. body wt., there was noted an increase in the resistance of the erythrocytes to hypotonic salt solns., while specific hemolysis occurred more readily. The condition of the erythrocytes as well as their total no. is of significance in the Wassermann reaction.

P. Y. JACKSON

The formation of basophile granulated erythrocytes by exposure of animals to warmth and moisture; the significance of the granulated erythrocytes in the early diagnosis of lead poisoning. HANS LEHMANN. *Arch. Hyg.* 99, 181-95(1928).—Guinea pigs were kept in a specially designed app. at a temp. of 28° and a relative humidity of 97° for 8 hrs. daily on 6 or 7 consecutive days. Microscopic examn. of the blood showed that basophile granulated erythrocytes appeared, as in Pb poisoning. No toxic foreign substance was administered to the animals during the expt. Exposure to moisture and high temps. of subjects suspected of Pb poisoning may lead to errors in early diagnosis. A photographic method is described for the more accurate detn. of the no. of erythrocytes in a blood smear.

P. Y. JACKSON

Studies of experimentally induced infectious diseases. IV. Changes in serum proteins in experimental trypanosome-infection in rabbits; and the effect of "Bayer 205." ERNST WIECHMANN AND HERMANN HORSTER. *Deut. Arch. klin. Med.* 155, 177-85(1927).—Injection of trypanosome-infected blood into a rabbit is followed by an increase in blood globulin and a slight decrease in blood albumin. Twenty min. after the subcutaneous injection of 5 g. "Bayer 205" the blood was found to be no longer capable of infecting healthy mice; during the next few weeks the albumin rapidly but at an irregular rate approached its normal concn.; the globulin somewhat more slowly. No effect upon the blood proteins was observed when "Bayer 205" was injected into healthy rabbits.

P. Y. JACKSON

An investigation of the pepsin content of the gastric juice. FRANZ DELHOUGNE. *Deut. Arch. klin. Med.* 157, 299-308(1927).—Little pepsin is found in the juice secreted by a healthy stomach, unless food is given to stimulate secretion. The subcutaneous injection of histamine especially stimulates the secretion of pepsin, as well as production of HCl. The pepsin concn. varies widely during a secretion period, reaching its max. after about 40 min. The max. concn. of acid is usually reached after the pepsin concn. has begun to fall off. With ulcus ventriculi the pepsin content is usually considerably higher, and with ulcus duodeni slightly higher, but a sharp distinction could not be based upon this detn. alone. In ulcus duodeni, however, the pepsin concn. during a single secretion period varied widely. In some cases where the gastric juice contained a subnormal amt. of acid (gastritis, achylia, carcinoma, pernicious anemia) the pepsin concn. was very low; the extent of degenerative change in the mucous membrane of the stomach is indicated by the decreased secretion of pepsin. Cases which did not respond to histamine injection showed the lowest pepsin concn.; the pepsin was present in normal amts. in other cases, though it may have been without activity because of lack of acid. The pepsin detn., with the histamine and neutral red tests, is recommended for the differentiation of achylia.

P. Y. JACKSON

Metabolic investigations in tuberculosis. I. Tuberculosis and the acidity of the urine. P. MÜLLER AND H. QUINCKE. *Deut. Arch. klin. Med.* 158, 42-53(1928); cf. *C. A.* 22, 4166.—The majority of tuberculous patients when kept upon a normal diet had an acid urine, and a high phosphate index (mono-di-phosphate ratio); and the acidity was higher where the wasting of tissues had progressed further. Apparently the acidity was due to the decompn. of the protein of the tissues. The excretion of NH_3 averaged about 0.4 g per day, a normal value. When a salt-free diet was given the acidity of the urine increased; both p_{H} and the phosphate index are changed, but not the NH_3 excretion. (With a diet rich in minerals the urine reacted more acid in 3 cases, less acid in 3, and was unchanged in 1.) That the increased acidity observed upon a salt-free diet was not due to a more concd. urine was shown by the following expt.: for a 3-day period little water was given, and for the next 3 days much water, the diet being the same during both periods. The p_{H} and NH_3 content were the same, but the phosphate index was higher during the second period. II. Tuberculosis and the buffers of the blood. P. MÜLLER AND H. ANTHES. *Ibid* 54-61.—The alk. reserve was detd. for about 25 patients with tuberculosis of the lungs; and was found to lie within normal limits (53-72 vol. %) in all but 2 cases. These cases showed values of 49.4 and 43.3 vol. %, resp.; they were in the last stages of the disease. A decrease

in alk. reserve accompanies the progress of the disease, and is attributable to the acid decompn. products of body proteins. The CO_2 -binding power of the blood at different CO_2 pressures was found to be normal in 33 of 35 detns. The p_{H} of the blood was normal, 7.31–7.34. The alveolar CO_2 pressure was about 40 mm. Hg. The diet seemed to be without influence upon the acid-base equil. of the blood. III. Tuberculosis and chlorine metabolism. P. MÜLLER AND H. QUINCKE. *Ibid* 62–8.—There is little agreement in the results of previous investigators of the quantities of NaCl in the blood and tissues of tuberculous patients. Usually the NaCl of the serum is less than normal, and may fall below 0.5% even in light cases. Only 9 out of 30 cases showed a normal concn. of 0.560–0.600%. This points to a decreased NaCl content in the entire organism and suggests that NaCl should not be withdrawn from the diet of tuberculous patients.

P. Y. JACKSON

The influence of fat in the diet upon acetonuria and acidosis in diabetes; an investigation of diafat. K. HOESCH. *Deut. Arch. klin. Med.* 160, 128–58(1928).—Diafat is a triglyceride contg. 11–13 C atoms in the fatty acid chain; its characteristic taste is due to free acid. It was almost completely utilized in man; none appeared in the feces and only traces in the urine. The basal metabolic rate was increased by about 22% after a test meal contg. 50 g. diafat. No ketonuria or acidosis was observed, and there was a beneficial effect upon carbohydrate toleration in diabetes. Following a carbohydrate-free test meal contg. fat or diafat the blood sugar concn. was slightly lower when diafat was used. The addn. of butter to a meal contg. diafat caused acetonuria; addn. of protein did not.

P. Y. JACKSON

Paroxysmal hemoglobinuria from cold. FERDINAND HOFF AND RICHARD KELS. *Deut. Arch. klin. Med.* 160, 177–95(1928).—Clinical observations upon paroxysmal hemoglobinuria show a parallel rise and fall (constituting 2 distinct phases) in the curves for leucocyte no., body temp., blood pressure, alkali reserve, blood sugar and hemoglobin content of plasma and urine. The cholesterol and NaCl content of the blood show irregular variations but no subnormal values. A high hemoglobin content of the urine is accompanied by a smaller vol., and by smaller content of NaCl and of H ions.

P. Y. JACKSON

Observations in the function test of the island apparatus according to Depisch-Hasenöhr. E. KYLIN. *Deut. Arch. klin. Med.* 160, 348–60(1928).—To obtain consistent results it was necessary that the subjects be fed a standard diet for several days before the test. In normal persons the ingestion of 75–100 g. sugar in 750–1000 cc. H_2O caused a hyperglucemia of 120–182 mg. % (av. 143), the max. being reached in 30–75 min. (av. 52). In all cases this was followed by a hypoglucemia of 5–25 mg. % (av. 13). Diabetic subjects with hypertonia in most cases showed a hyperglucemia followed by a decrease to sub-initial values; in non-hypertonic diabetics, however, the blood sugar concn. remained in most cases above its former value. In some respects the concn. curve for normal persons lies between the curves for hypertonic and non-hypertonic diabetics. The max. increase is reached more rapidly in hypertonic than in normal subjects; more slowly in non-hypertonics. The decrease to subinitial values is more marked in hypertonic subjects, while sub-initial values are not reached in non-hypertonics. Usually the most severe cases showed the least decrease in the excess blood sugar.

P. Y. JACKSON

The lactic acid content of the blood. MAX HOCHREIN AND ROLF MEIER. *Deut. Arch. klin. Med.* 161, 59–83(1928).—In functional disease of the liver there was usually an increase in the blood lactic acid of the resting subject. Circulatory insufficiency also increased the resting concn. of lactic acid; this might be a secondary effect due to functional changes in the liver. A rise in lactic acid was frequently observed in endocarditis with fever, angina, nephritis and in convalescence from pneumonia and articular rheumatism. This may be due to a disturbance in the rate of metabolic exchange between the tissues and the blood.

P. Y. JACKSON

Hypertension and blood sugar. ERNST WIECHMANN. *Deut. Arch. klin. Med.* 161, 92–110(1928).—The whole blood of 19 hypertonic subjects showed an av. sugar content of 114 mg. %, the extreme concns. being 91 and 143 mg. %. However, there is no parallel between high-blood pressure and high-blood sugar. The ratio of erythrocyte-sugar to plasma-sugar is slightly lower (av. 92:100) in hypertonic than in normal subjects. Peroral administration of 100 g. glucose is followed, after 40–50 min., by an av. difference of only 21 mg. between the total quantities of sugar in 100 cc. of arterial and of venous blood; the permeability of the tissues to glucose may be greater in hypertonic subjects. The administration, at intervals, of glucose, or starchy food, upon an empty stomach, produces in hypertonics a step-wise increase in blood sugar. This reaction resembles that in diabetics.

P. Y. JACKSON

The role of the reticulo-endothelial system in iron metabolism. (The pathogenesis of chlorosis.) SAMUEL LEITES AND A. RIABOW. *Krankheitsforsch.* 4, 249-62 (1927).—A blockade of the reticulo-endothelial system of rabbits brings about a decrease in the Fe content of the blood, with little change in the no. of erythrocytes. Chronic blockade leads to a decrease in the erythrocyte no. In exptl. phenylhydrazine-anemia, however, the blockade with collargol not only does not increase the effect of the phenylhydrazine, but lessens that effect. Splenectomy has the same effect as collargol in checking the action of the phenylhydrazine. This effect of the blockade upon the development of anemia after treatment with phenylhydrazine can be ascribed to a lowering of the hemolytic function of the reticulo-endothelial elements of the spleen. The decrease in Fe content of the blood is due to a functional weakening of the Kupffer cells of the liver. Exptl. chlorosis could be brought about by means of the blockade; this is due especially to the effect upon the Kupffer cells. P. V. JACKSON

The titration of the antimeningococcic serums. ANDRZEJ BIERNACKI. *Med. Doswiadczenia i Społeczna* 7, 394-405 (Polish), 405-6 (French) (1927).—The titration of antimeningococci serums by flocculation with the alc. meningococcic exts. gives good results only with benzoic antigen. The exts. without addn. of lipoids and with addn. of cholesterol give inferior results. The flocculating antibodies and agglutinin are sep. antibodies. The flocculation reaction is specific for the genus of the microbe, not for the meningococcus group. JAROSLAV KUČERA

The antigenic properties of lipoids. Z. YERMOLYEVA. *Mikrobiol. Inst. des Kommissariats für Volksgesundheit, Moskau.* *Z. Immunitäts.* 57, 102-6 (1928). See C. A. 22, 2982. JULIAN H. LEWIS

Experimental and theoretical studies on the role of magnesium and calcium in the acidification or in fatiguing of muscles. Behavior of earthy phosphates of the muscle in acid or alkaline death rigor. LEONHARD WACKER. *Pathol. Inst. Univ. München, Biochem. Z.* 196, 426-40 (1928).—The ash content of intact muscles diminishes with the onset of death rigor. The decrease is greater in acid than in alc. rigor. The soln. components of the total ash actually increase during postmortem acid formation, and this involves chiefly the Mg and Ca phosphates. The conversion of the insol Mg into the sol. electrolyte state during the work of the muscle is supposed to be of physiol. significance: (1) The ionized Mg introduced parenterally produces a curare like paralysis, the amt. necessary for causing this narcotic effect being equal to the total amt. of Mg present in ionized and unionized form in the muscle. (2) Pathol. irritability and convulsive responses of muscles in tetanus and in tetany can be controlled with Mg. (3) This holds true also in exptl. tetany due to parathyroidectomy. (4) Tetany can be remedied by artificially produced acidosis (NH_4Cl or CaCl_2) which induces a rise in the Ca and Mg ions. The effect of fatigue is likewise thought to be due to the increase of Mg ions in muscles which have become acid due to exertion. S. MORGULIS

The quantitative distribution of gold in the organs of healthy and of tuberculous rabbits following treatment with gold preparations. I. Experiments on non-tuberculous rabbits. B. BRAHN AND G. WEILER. *Chem. Abt. städtisches Krankenhaus in Friedrichshain, Biochem. Z.* 197, 343-52 (1928).—The max. amt. of Au was either in the liver or in the kidneys depending on the particular prepn. used in the expt. The results for the other organs are very variable. S. MORGULIS

Alimentary glucemia in phlorhizin diabetes; a contribution to the phlorhizin effect on the liver. CARL SCHWARZ AND HELMUTH SASSLER. *Physiol. Inst. Tierärztliche Hochschule, Wien. Biochem. Z.* 198, 250-8 (1928).—Strong hypoglucemia occurs after prolonged phlorhizin action or starvation. On fasting days following phlorhizin days the blood sugar rises and in spite of fasting may attain normal values. The glycogen-forming and glycogen-storing function of the liver is disturbed even on days after the administration of phlorhizin, as can be judged from the 100% increase in the hyperglucemia resulting from carbohydrate rich food as compared to the similar reaction in normal dogs not treated with phlorhizin. S. MORGULIS

Studies on the physiological and pathological chemistry of the brain. III. The

lecithin of the brain. The phosphorus ether extractives of the brain from 6 cases of progressive paralysis were found to be increased per g. of substance; the N, expressed in percent of the dry substance, diminished. Furthermore, the choline N fraction, corresponding to the lecithin, was reduced to about $\frac{1}{3}$ of its normal value, while in other cases there was also a reduction in the NH_4N (the cephalin portion). Galactoside N could be demonstrated only in traces. The total N/choline N ratio changed from the normal value 1.4:1 to 3.1:1. This diminution in the lecithin, however, is not

pathognomonic for paralysis since it is also found in cachetic individuals, and should be considered rather a symptom of marasmus in general. S. M.

The clotting of fibrin as a process of micellar crystallization and agglutination. E. HEKMA. *Biochem. Z.* 199, 333-65(1928).—Thanks to the precipitin nature of thrombin the fibrinogen or the fibrinogen micellae are transformed into the labile pptd. condition, and the labile micellae place themselves end to end and form needle or thread-like crystals. This process would go on indefinitely if it were not opposed by the agglutinin action of the thrombin which imparts a stickiness to these crystals whether they are visible or invisible microscopically, so that they begin to form agglutinated masses. The thrombin is reversibly adsorbed by the micellar crystals. The agglutinin effect of the thrombin which acts to cement together these crystals is decidedly increased by Ca. The Ca is evidently transferred to the fibrinogen by the thrombin. Fibrin is thus an adsorption compd. of fibrinogen and thrombin. The nature of the fibrin is variable, from the point of view of its structure, compn. and properties, which depends upon the agglutinin action of the thrombin and upon the participation of the Ca. To the agglutinin component of the thrombin is attributable the contractility and the elasticity of the fibrin-gel, and to the Ca the degree of its irreversibility. The Ca must be removed from the compd. before the fibrinogen and the thrombin can return to the sol. state and sep. This also explains why the fibrin-gel is much more easily solvated reversibly in the presence of acid than of alk. This also makes it possible to interpret why thrombin had been regarded as an enzyme since this has so many points of similarity to the precipitins and agglutinins: no stoichiometric relation between the agent and the substrate; better progress of the reaction at body temp.; certain amt. of thermolability; influence of the milieu and especially of electrolytes; activating effect of Ca salts; the presence of antibodies and, last but not least, the property of the agent to become attached by adsorption to the substrate. Assuming that the secretion of an antithrombin by the living blood vessel lining is a firmly established fact, the fluidity of the circulating blood may be regarded as secured by 2 factors. First, the flowing blood is protected from evapn. and contact with rough surfaces and has a const. alkali reserve and OH-ion concn.; secondly, the inactivation of thrombin by the secreted antithrombin. In view of the established precipitin and agglutinin property of the thrombin the conception of an antithrombin as an anti-agglutinin and anti-precipitin finds confirmation in modern immunology. When blood flows outside the vessels all these factors at once disappear. The blood comes in contact with rough surfaces; this promotes the agglutination and destruction of platelets and also, to a certain extent, of leucocytes and even erythrocytes, and at the same time agglutinin and precipitin (*i. e.*, thrombin) becomes very active. Without a const. alk. reserve and without the antithrombin present the fibrinogen falls under the action of the thrombin. This is also the mechanism of the coagulation as it takes place in an isolated segment of a blood vessel; but where the blood flows over a cut surface there is the added effect of the evapn. which tends to form the firm crust and of the tissue coagulins. S. MORGULIS

Specific hemolysis. I. Specific adsorption of hemolysin and complement. KENICHI HORINO. *Med.-chem. Inst. Chiba. J. Biochem. (Japan)* 9, 407-21(1928).—Hemolysin is not adsorbed either by kaolin or by infusorial earth in a phosphate mixt., but at the acidity of a citrate buffer there seems to be some adsorption by kaolin, while infusorial earth completely adsorbs the hemolysins in a citrate-HCl mixt. of a proportion of 1:1 or 1:2. The adsorbed substance can be leached out with a mixt. of 16 cc. $M/7$ NaCl + 4 cc. $M/7$ K_2HPO_4 , showing that the adsorption is reversible. The complement is adsorbed by kaolin in a weakly alk. mixt. while at a slightly acid reaction by infusorial earth. The adsorption by kaolin is not reversible as in the case of the hemolysin. Likewise the leaching out of the infusorial earth adsorbate is not complete as the soln. obtained must be completed through the addn. of inactivated serum. It is assumed that the complement consists of 3 portions of which one is irreversibly adsorbed. II. Enzymes of the guinea-pig serum. *Ibid* 423-33.—Hemolysis is the result of the destruction of the colloidal structure of red cells and hence a study has been undertaken of the enzymes which might be instrumental in the hydrolysis of these complex mols., both the albumin and the globulin fractions of the serum being used. Expts. demonstrate that the enzymes found in guinea-pig serum, namely, protease, peptase, butyrase, lipase, lecithinase, amylase and nuclease are all present only in the albumin fraction. It is remarkable, however, that thrombin is largely in the globulin fraction, and in mere traces in the albumin. It was further found that a thrombin soln. possesses the properties of the mid piece of complement which it can replace. The albumin fraction, which can be obtained from a complement soln. to which lecithin has been added, has the same complement action as native serum. The adsorption and elution behavior

of this lecithin-albumin fraction is also similar to that of native complement. The thrombin distribution between the albumin and globulin fractions treated with lecithin follows the distribution of the complement middle piece. This is interpreted to mean that the lecithin so affects this substance that it can no longer be pptd. with CO_2 . This hypothesis was further corroborated by the exp^t where lecithin was added to the previously isolated globulin fraction when it is found that the complement mid piece could no longer be pptd. with CO_2 . Thrombin and the complement mid piece are thus mutually replaceable, and both are inactivated by heating 30 min. at 56° . In the globulin fraction of complement there is present a substance which takes part as mid piece in the process of hemolysis and as thrombin in the process of blood coagulation. III. Gysinogen of erythrocytes and its new reactions. *Ibid* 435-44.—A water ext. of goat red blood cells freed from stromata becomes turbid when treated to $1/2$ satn. with NaCl, or on passing CO_2 . The fibrinogen-like substance was prepd. free from hemoglobin by pptg. first with a current of CO_2 and, after centrifuging, dissolving the residue in physiol. NaCl soln. Repeating this process several times yielded a colorless substance. The NaCl must be Ca-free or else the fibrinogen yield is greatly diminished. This soln. is pptd. by $1/2$ satn. with NaCl but not by complement or by its globulin fraction. If this soln. is treated first with hemolysin and complement it no longer gives a turbidity upon the $1/2$ satn. with NaCl. The soln. did not remain clear if any one component (hemolysin, albumin or globulin fraction of complement) was omitted. In other words, the substance extd. from the red cells was rendered unprecipitable with NaCl by hemolysin + complement, so that it must have undergone a change in the direction of increased dispersion. Similar results were obtained when the complement was adsorbed by alumina and then leached out. As with fibrinogen the lecithin-albumin fraction acts as the complement for the specific hemolysin in the fibrinogen-like substance of the red cells. Likewise, the thrombin soln. could replace the globulin fraction of the complement. Rabbits were immunized with this fibrinogen-like substance obtained from goat red cells. An immune serum was prepd. as usual and this was heated 30 min. at 56° . This had a very high hemolytic titer, 1:40000 diln. producing extensive hemolysis. It was entirely non-hemolytic with rabbit cells, but did have some effect on sheep and beef cells. Conclusion: the erythrocyte fibrinogen-like substance is a lysinogen.

S. MORGULIS

The problem of anaphylaxis in cold-blooded animals. Z. MICHAILOVA AND F. KAVENOKII. Chem. Lab., State Polytech. Museum, Moskow. *Zhurnal exp^t. Biol. Med.* 9, 361(1928).—Frogs cannot be used for the study of anaphylaxis S. M.

Anaphylaxis in frogs. I. F. LEONTYEV. Chem. Lab., State Polytechnic Museum, Moscow. *Zhurnal exp^t. Biol. Med.* 9, 367-8(1928).—It is not possible to call forth an anaphylactic reaction in frogs. S. MORGULIS

Glucemia in experimental hydrophobia. BORIS KOLDAYEV. Bact. Inst. Kiev. *Zhurnal exp^t. Biol. Med.* 9, 370-4(1928).—Hydrophobia caused by means of injections of the fixed virus is not accompanied by any definite changes in the blood sugar. The blood obtained after death from the heart showed in most cases a distinct rise in sugar content (about 66%) accompanied by an increased amt. of reducing substance in the urine. S. MORGULIS

Hydrogen-ion concentration of the blood in diseases of myeloid and lymphoid tissues. V. VARSHAVSKII AND V. KRAINSKA-IGNATOVA. Ukraina Röntgen and Radium Inst., Charkow. *Zhurnal exp^t. Biol. Med.* 9, 432-6(1928).—There was no change in the blood p_H . Considerable variations were noted in the titratable alkali. S. MORGULIS

The catalase content of erythrocytes in experimental anemia. V. S. SUMBAYEV. Lab. pathol. Physiol. State Univ., Saratow. *Zhurnal exp^t. Biol. Med.* 10, 9-17(1928).—When oxalated rabbit blood is centrifuged it is possible to sep. 2 layers of erythrocytes with different catalase indices. Generally, the upper layer is richer in polychromatophiles and also has a higher catalase content than the lower layer. In anemia produced by means of phenylhydrazine the upper layer is much richer in polychromatophiles and also its catalase is decidedly greater than that of the lower layer. In the period, however, of the rapid increase in the erythrocytes the lower layer is as active as the upper layer catalytically, but the no. of polychromatophile cells at that time is actually much reduced. The normal catalase distribution is restored when the morphological make up of the blood has become normal again. In post-hemorrhagic exp^t. anemia the upper layer of cells has more polychromatophile cells and more catalase than the lower layer as long as the anemia lasts. The young polychromatophile cells have a lower sp. gr. than old cells. The increase in the catalase index of anemia blood is ascribed to the fact that the blood is younger. S. MORGULIS

Calcium and sympathetic nerve activities. E. GLEY. *Arch. sci. biol.* (Italy) 12, 39-49(1928).—The diminution of Ca in the blood and the immobilization of the Ca ions det. not only the suspension of the cardio-inhibitory action of the pneumogastric, but also the suspension or enfeeblement of the cardio-accelerator action of the sympathetic and vaso-constrictor, vaso-dilator and secretory actions of the secretory nerves. Whether these nerves belong to the para-sympathetic or proper sympathetic system is not important. The activity of the nerves in each system depends on the same chem. condition, since they are equally affected by a lack of Ca. L. W. RIGGS

Action of acridine derivatives on blood sugar. O. J. NIELSEN. *Bibliotek for Laeger* 120, 481(1928); *J. Am. Med. Assoc.* 91, 1000.—Following the injections of an acridine deriv., no particular fall in blood-sugar values was noted in nondiabetics. In fasting diabetics more or less marked decrease in the blood sugar values occurred, but often no greater than in fasting diabetics without injection. No definite conclusion was reached in diabetics with simultaneous intake of food. Further work is in progress. L. W. RIGGS

Nature of pernicious anemia in light of the newer knowledge. J. H. MEANS AND WYMAN RICHARDSON. *J. Am. Med. Assoc.* 91, 923-5(1928); cf. following abstr.—Pernicious anemia is a chronic disease of unknown etiology, the chief manifestations of which can be held in abeyance so long as adequate amts. of a sp. substance contained abundantly in liver and kidney are received. Shortage of the sp. substance is responsible for the abnormalities in the marrow and the blood. The cause of the shortage is not completely known. Castel's work suggests that the gastric defect may play an important role. Whether the normal human requires any extraneous supply of the sp. substance or can synthesize what he needs is not yet known. Whether the active substance now found is in the state that the body needs or is merely a necessary building stone has not been detd. L. W. RIGGS

Treatment of pernicious anemia with liver and liver extract. THOMAS ORDWAY AND L. W. GORHAM. *J. Am. Med. Assoc.* 91, 925-8(1928); cf. following abstr.—This study adds 25 cases to the 553 carefully detailed in the literature. Strict adherence to the original Minot and Murphy diet is not essential. A balanced, liberal, general diet plus sufficient liver is equally effective. The administration of dil. HCl is unnecessary. Liver appears to exert a sp. influence on the development of faulty red blood cells. It has no effect on the underlying pathologic process and hence cannot be called a cure. The quantity of liver eaten should be from 0.25 to 0.5 lb. daily. It may be given raw, cooked or as a potent ext. The amt. of liver administered varies with the patient and the progress of the disease as detd. by periodical blood counts. Accurate diagnosis is vitally necessary before the use of the liver diet. Transfusion is of value in desperate cases in which the blood count is below a million. It should be used to tide over a desperately ill patient, so that he may later take the liver diet. L. W. R.

Pernicious anemia treated with liver diet and liver extract. ELMER H. HEATH. *J. Am. Med. Assoc.* 91, 928-32(1928); cf. preceding abstracts.—Careful reports of 19 cases of pernicious anemia treated by liver diet and of 5 cases treated by liver ext. are given. Excellent results were obtained in all of the cases. L. W. RIGGS

The erythropoietic response of the various anemias to liver therapy. WM. S. MIDDLETON. Univ. Wisconsin. *J. Am. Med. Assoc.* 91, 857-63(1928); cf. following abstr.—A study of 32 cases gave addnl. confirmation of the sp. value of liver and liver ext. in pernicious anemia. Of 40 patients with secondary anemia, 14 responded favorably to the dietary regimen of Minot and Murphy. This response was apparently not to the sp. maturing factor in liver, since no reticulocyte showers comparable to those in the remission of pernicious anemia occurred on the diet. The use of liver treatment in secondary anemia is still an exptl. problem. The indiscriminate use of liver in all types of anemia should be discouraged, since it creates an economic burden for patients with pernicious anemia. Cu does not appear to be the active agent in remissions in pernicious anemia. L. W. RIGGS

Experimental anemias, diet factors and related pathologic changes of human anemias. G. H. WHIPPLE. Univ. Rochester. *J. Am. Med. Assoc.* 91, 863-7(1928); cf. following abstr.—Diet factors are listed as to their potency to cause new blood hemoglobin regeneration in severe long-continued anemia due to bleeding in dogs. Liver stands first. Representing liver by 100, kidney is about 90, apricots 40, peaches 40, prunes 35 and apples 35. Tests of liver exts. point to a group of active substances rather than a single active principle. Fe may be inactive in some anemias and potent in others. Inorg. elements are potent in anemia. Some elements are potent in one type and not in another. The ashes of apricots, liver and kidney are potent in secondary anemias due to bleeding. Conservation of injected hemoglobin was about 90%,

while by mouth 10%. Pernicious anemia is a deficiency disease and not the result of an obscure poison. L. W. RIGGS

Liver fractions in pernicious anemia. RANDOLPH WEST AND EMILY G. NICHOLS. Columbia Univ. *J. Am. Med. Assoc.* 91, 867-8(1928); cf. following abstr.—Various fractions were made from liver ext. 343 of Eli Lilly Co., and these exts. were tested for their efficiency in increasing the erythrocyte and reticulocyte counts in pernicious anemia. The best fractions prepd. from 343 contained N 12 to 14%, and amino N 20% of the total N. This amino N increases to about 40% after acid hydrolysis. S was present in traces. P and Fe were absent. The fractions gave + reactions in the biuret, diazo and naphthol tests, a weak + Hopkins-Cole reaction and a slight levorotation. L. W. RIGGS

Influence of fever on the tissue sugar metabolism in the liver. HARUYOSHI IWA-SAWA. *Proc. Imp. Acad. Tokyo* 4, 425-6(1928).—Sugar metabolism, particularly the glycogen synthesis of the liver, in spite of increased O consumption undergoes in fever a certain disturbance, in that the anaerobic splitting of glucose into lactic acid is diminished. L. W. RIGGS

Cytochrome in tumor tissues. HIDETAKE YAOI, HIROSHI TAMURA AND WARO NAKAHARA. *Proc. Imp. Acad. Tokyo* 4, 433-5(1928).—Fujinawa rat sarcoma contains a large amt. of cytochrome; Flexner-Jobling rat sarcoma and Bashford mouse carcinoma contains a medium amt.; and Rous chicken sarcoma contains either little or none of this respiratory pigment. It is probable that these facts can be correlated with the difference in the ability of different types of tumors to withstand the deprivation of O. L. W. R.

Effect of anoxymbiosis upon the phosphate excretion of surviving tumor tissues. HERMANN LANGE AND NORBERT HENNING. Univ. Leipzig. *Arch. exp. Path. Pharm.* 134, 105-8(1928).—Because tumor tissues undergo an increased cell permeability under anoxymbiotic conditions the yield in phosphate is increased. G. H. S.

Postmortem increase in the lactic acid of the brain in experimental animals. M. E. MAYER. Univ. Frankfurt a. M. *Arch. exp. Path. Pharm.* 134, 218-24(1928).—The increase in acid in the gray matter of the brains of dogs and calves was definitely greater than in the white substance, e. g., during the period of 1 hr. the increase was 38% in the gray, and 18.4% in the white substance. A postmortem increase in lactic acid could be observed in the brain of cats, even though through operative procedure an anemia of the brain had been previously established. G. H. S.

Blood cholesterol studies in cancer. II. With investigation as to possible diagnostic relations. W. L. MATTICK AND KENNETH BUCHWALD. State Inst. Malig. Dis., Buffalo, N. Y. *J. Cancer Res.* 12, 236-45(1928); cf. following abstract.—The cholesterol content is higher in plasma blood than in whole blood in 85% of cancer patients, and also in cancerous mice. In 80% of normal individuals, and in normal mice, the cholesterol content is higher than in the whole blood. Diagnostic possibilities are suggested. H. G. WELLS

Blood cholesterol studies in cancer. III. Relation to nonmalignant conditions. WALTER L. MATTICK AND KENNETH BUCHWALD. *J. Am. Med. Assoc.* 91, 1087-90(1928); cf. preceding abstract.—Blood cholesterol values and ratios of the relation of plasma and whole blood cholesterol are reported in 20 healthy, 101 cancerous and 75 non-cancerous patients ill with various diseases. A plasma whole blood cholesterol ratio greater than 1 was found in 86% of the cancer cases. This disturbed ratio is probably a fairly const. finding in cancer. A plasma whole blood cholesterol ratio of less than 1 was the usual finding in 80% or more of the healthy. In noncancerous diseases this ratio was in accordance with that in health in 67%, whereas in 33% it was reversed and was as in cancer. This reversal may be accounted for on the basis of a temporary derangement of this ratio by some noncancerous disease. L. W. RIGGS

The physical chemistry of cancer. N. WATKMAN. *Z. Krebsforsch.* 27, 228-40(1928).—In part a review of some expts. with normal and cancerous tissues in which W. discusses the effects of various ions, especially Ca, on the polarization resistance const. of the cell membrane. The method is illustrated and described. The H-ion concn. of the medium affects the preservation and suspension of normal and cancerous tissue cultures. While cancerous tissue cultures *in vitro* have been found to be preserved satisfactorily at a pH 7.0-7.8, W. finds that isolated and washed cancerous cells can be kept best at pH 5.4. X-rays produce a pos. effect upon the polarization resistance const. of normal tissue but a neg. effect upon cancerous tissues because of the presence and counteracting influence of lymphocytes. Ca ions increase the const. Other data given are similar to those of other workers such as Gaspari, Centanni and Fibiger. H. G. WELLS

Cholates and tumor growth. V. E. MERTENS. *Chirurg. Klin. Munich. Z. Krebsforsch.* 27, 295-307(1928).—The theory that reduction in surface tension is a factor in producing tumor growth could not be established as a general principle. Treatment with cholates did not stimulate the growth of tar cancers and spontaneous tumors in mice. In rabbits, Na cholate inhibited tumor growth. Sometimes Na cholate causes formation of dense fibrous tissue. H. G. WELLS

Investigation of agents that produce cancer. C. C. TWORT AND H. R. ING. *Lab. of Cancer Com., Manchester, Eng. Z. Krebsforsch.* 27, 308-51(1928).—An extensive investigation of various substances that produce cancer in man and exptl. animals. Of several oils tried, whale oil was harmless, petroleums are slightly dangerous, while shale oil ranks with gas tars as likely to produce cancer. The cancer-producing activity of shale oil is about 12 times as great as that for petroleum. Two petroleum oils used in cotton spinning mills were tested, and the high-boiling fractions were about 31 times more active than the lower fractions. On the contrary, with shale oil the low-boiling fractions were most active. Some oils lose their activity if treated with H_2SO_4 , and some inactivation was obtained by oxidation and reduction. An especially active tar was obtained from pinene and turpentine by dry distn., most of the toxic components distg. over at 3 mm. pressure between 200 and 300°, and being extractable with cold C_2H_5OH . An artificial mixt. of aromatic derivs. was cancerogenic. All the tumors obtained were of epithelial origin, although some looked somewhat like sarcomas. Probably the cancer-producing substance is an unsatd. hydrocarbon or an aromatic compd. H. G. WELLS

Surface tension of sera as affected by the precipitin reaction. SUSAN GRIFFITH RAMSDELL. *Research Inst. Cutaneous Medicine, Philadelphia. J. Exptl. Med.* 48, 615-7(1928).—An attempt to find evidence, through the study of surface tension, using the du Nouy tensiometer, of a denaturing effect of the precipitin reaction upon either the antigen or the immune serum, yielded entirely neg. results. C. J. WEST

II—PHARMACOLOGY

A. N. RICHARDS

Report on the results of examination of nine cases after the oral ingestion of 1000 grams of glucose. W. J. MAY. *Brit. Med. J.* No. 3522, 7-8(1928).—Oral ingestion of 1000 g. of glucose caused hyperglucemia and glucosuria in 5 cases, but in 4 cases normal blood sugar was accompanied by glucosuria varying from a trace to 2%. J. B. BROWN

Some observations on the effect of blueberry-leaf extract in diabetes mellitus. E. M. WATSON. *Univ. Western Ont., London, Ont. Can. Med. Assoc. J.* 19, 166-71(1928).—This ext. appears to exert a beneficial effect in certain cases but its action is not consistent. Its utility is most apparent in middle-aged or elderly patients and in mild cases; it is of no avail in the emergencies of the condition. It does not give rise to serious hypogluccemia. It may become an adjunct but cannot be regarded as a substitute for insulin. A. T. CAMERON

The use of thiocyanate of soda in high-blood pressure. ARTHUR G. SMITH AND R. D. RUDOLF. *Can. Med. Assoc. J.* 19, 288-92(1928).—Sodium thiocyanate produces a fall in blood pressure, with usually no change in heart rate, the best results being obtained in cases of "essential hyperpiesis." A. T. CAMERON

The pre-operative treatment of Graves' disease by a combination of iodized fatty acid and vitamins A and D. GILBERT I. ADAMSON AND A. T. CAMERON. *Univ. Manitoba, Winnipeg. Can. Med. Assoc. J.* 19, 420-6(1928).—"Vitiodum," a combination of vitamins A and D and iodized jecoleic acid, is as effective as Lugol's soln. when administered in Graves' disease, its beneficial action, and the limits of that action, closely resembling those of Lugol's soln. It is probable that neither the vitamins nor the iodo-fatty acid alone are effective, though tests on a larger no. of cases are necessary to settle this point. The results suggest the desirability of investigating as widely as possible the relation between these vitamins and thyroid and I metabolism. A. T. CAMERON

The action on nerve and muscle of pyridine compounds. L. DE CARO. *Arch. intern. physiol.* 29, 163-74(1927); *Physiol. Abstracts* 13, 117-8.—The effect of the administration of pyridine compds. in Ringer soln. by the dorsal lymph sac on the chronaxie of the gastrocnemius muscle and the sciatic nerve of the frog was studied. The hydrogenation of the pyridine mol. caused an increase in the toxicity for muscle and for nerve. When the benzene nucleus was added, the compd. was much more toxic for nerve. The methylated compd. had greater toxicity for muscle and a decreased toxicity for nerve. H. J. DEUEL, JR.

Insulin reactions. HENRY J. JOHN. Cleveland Clinic Foundation. *J. Metabolic Research* 7-8, 51-8(1925-6).—The blood sugar apparently is not the prime cause for the insulin reaction since this occurs sometimes at relatively high levels of the blood sugar while no reaction may be obtained when insulin is injected into the same individual with the original blood sugar at a considerably lower level. H. J. DRUEL, JR.

The action of sodium chloride on normal, pregnant and partially nephrectomized animals. I. Chlorine and water metabolism. HARRY LUNDIN AND RUDOLPH SCHARF. Physiatrie Inst. Morristown, N. J. *J. Metabolic Research* 7-8, 259-326(1925-6).—Expts. on a normal (A), 2 partially nephrectomized (B), and a pregnant sheep (C). The administration of large amts. of NaCl to A resulted in a comparatively low retention of this salt, while a greater amt. was retained by B and a still larger amt. by C. Following partial nephrectomy (B) there was an inability of the kidney to conc. the urine after the administration of huge doses of NaCl (40 g.). However, these animals still possessed the ability to excrete large amts. of H₂O as well as a large quantity of the NaCl, the lower urine concn. being compensated by the largely increased vol. With A, a max. concn. of 2.76% of NaCl occurred in the urine, while in C the av. and max. NaCl concn. was less than in the normal non-pregnant animal. The H₂O retention per g. NaCl retained was much higher in C than in A or B. Under the same conditions the H₂O excretion through the lungs averaged the same in the 4 animals. With an increase in H₂O metabolism a greater excretion through the lungs occurred. After the administration of NaCl to B, a decreased H₂O elimination through the lungs occurred because of the need of increased H₂O for formation of urine. In uremia due to partial nephrectomy an increased ventilation occurred with an increased H₂O elimination through the lungs. Overventilation may act as one of the compensatory mechanisms in water metabolism. Immediately following the high salt diet there is a fall in urine vol. The sp. gr. of the urine in B for the 2 days following the omission of the salt was unusually low, suggesting that the kidney remnant cannot adapt itself for concn. of the nitrogenous products. after the sudden cessation of the functional overstrain. II. Influence of sodium chloride on the inorganic constituents of the blood. RUDOLPH SCHARF AND HARRY LUNDIN. *Ibid* 327-55.—The exptl. conditions were the same as in the previous paper. The daily administration of large amts. of NaCl resulted in a considerable increase (18.9-43.9%) in the concn. of the cations (Na, K, Ca and Mg) while there was only a slight rise (1.0-5.8%) in the anion concn. (Cl, HCO₃, HPO₄, H₂PO₄). The blood was drawn 24 hrs. after the last salt feeding. The increase in the cations must therefore be compensated by other anions, presumably the neg. radicals of org. acids. An increase in the lactic acid and pyruvic acid excretion to a max. per day of 1.3 g. for the former and 3.7 g. for the latter during the salt feedings suggests this. The K ion shows the largest increase in the blood after the NaCl feeding although there was a greater concn. of all cations. The $\text{Na}^+ + \text{K}^+/\text{Ca}^{++} + \text{Mg}^{++}$ ratio, which normally is 28, varied only slightly; the increase in the Na and K is balanced by a parallel rise in Ca and Mg. The Cl⁻ showed a remarkable constancy after NaCl feeding with a max. increase of only 9%. No change in the HCO₃⁻ concn. occurred while the phosphate was almost doubled in some cases. After the partial nephrectomy with uremia in one of the animals different results were obtained. There is therefore an independence in the excretion of Na and Cl. In the normal, as well as one of the nephrectomized and the pregnant, animals, the rise in Na occurred without an increase in the blood Cl while in the uremic animal the rise in Cl occurred first while an increase in the Na occurred later.

H. J. DRUEL, JR.

Collected references in the field of pharmacology. July Sept. 1927. CARL BACHEM. *Zentr. inn. Med.* 49, 1-9, 17-42(1928); cf. *C. A.* 22, 811.—A discussion of the papers dealing with pharmacology published in the 3 month period. A bibliography of 223 papers. Oct.-Dec. 1927. *Ibid* 298-313, 329-37, 393-400.—A bibliography of 218 papers. Jan. March 1928. *Ibid* 681-9, 697-720.—A discussion of the work in this period with a bibliography of 188 papers.

H. J. DRUEL, JR.

Plant extracts with an insulin action. II. The effect of bean husks on diabetes. E. KAUFMANN. Univ. Köln. *Z. ges. expil. Med.* 55, 1-12(1927).—In fasting rabbits water and alc. exts. lowered the blood sugar, as well as diminished the hyperglucemia following glucose injections. Similar results were obtained in diabetics though the results were not as marked as with insulin.

F. L. DUNN

Can a form of slow potassium cyanide poisoning result from a massive per oral dose? WALTER ERNST. Landesanstalt für epileptische Hochweitzschen, Saxony. *Deut. med. Wochschr.* 54, 1373-4(1928).—A case is reported in which a patient's death occurred 2 weeks after a massive dose of KCN.

ARTHUR GROLLMAN

The resorption of mercury after the application of precipitated white mercury

salve to the skin. G. MALOFF. Univ. of Berlin. *Deut. med. Wochschr.* 54, 1381 (1928).—Only small quantities of Hg were absorbed after the application of a 5% salve to the skin. ARTHUR GROLLMAN

The phosgene poisoning catastrophe in Hamburg. I. Clinical observations. C. HEGLER. Krankenhaus St. Georg, Hamburg. *Deut. med. Wochschr.* 54, 1551-3 (1928).—A description of the clinical manifestations shown by the victims of the explosion of a tank contg. 11 tons of phosgene, in Hamburg on May 20, 1928. II. Pathological anatomy of the phosgene poisoning. FRIEDRICH WOHLWIEL. *Ibid* 1553-7.—The chief pathological effects of phosgene poisoning are manifested in the upper respiratory tract, the bronchi, pulmonary tissues and the blood-vessel walls. Edema, interstitial inflammation, stasis, thrombosis with embolus formation, and degenerative changes in the nerves were the predominant sequelae. III. The formation of blood pigments by phosgene. HERMAN MAYER. Univ. of Hamburg. *Ibid* 1557-8.—The formation of hematin in the blood after phosgene poisoning is attributed to the action of the HCl which is liberated by the hydrolysis of the phosgene. ARTHUR GROLLMAN

The physiological response of rabbits to insulin. MELVILLE SAHYUN AND N. R. BLATHERWICK. Santa Barbara Cottage Hospital. *J. Biol. Chem.* 79, 443-60(1928).—The convulsive dose of insulin was higher when administered intravenously than when administered subcutaneously or intraperitoneally while the time necessary to produce convulsions was less in the former case than in the latter. Adrenaline injected 24 hrs. before insulin administration increased the sensitivity of the animals to the latter substance. Splenectomized rabbits were very sensitive to insulin and such animals are suggested for use in the assay of insulin. Immunity to insulin was developed to a marked degree in rabbits maintained on a high carbohydrate diet. Blood sugar curves of such animals after the injection of large doses of insulin are given. A. G.

Dihydroxyacetone and insulin hypoglycemia. P. A. LEVENE AND J. G. BLANCO. Rockefeller Inst. *J. Biol. Chem.* 79, 637-66(1928).—The effect of pure monomeric dihydroxyacetone on insulin hypoglycemia in rabbits was studied by following the concn. of dihydroxyacetone and sugar in the blood during the exptl. period. Both subcutaneous and intravenous administrations of dihydroxyacetone were often followed by temporary recovery from the symptoms of hypoglycemia. In such cases there was a rise in the concn. of glucose in the blood and in all cases, but one, hydroxyacetone was also present in the blood. The expts. indicated that in the presence of an excess of insulin, dihydroxyacetone is not converted into glucose to a very large extent. ARTHUR GROLLMAN

The effect of atropine upon the output of the hearts of normal men. W. CARTER SMITH, C. S. BURWELL AND M. G. DEVITO. Vanderbilt Univ. *J. Clin. Investigation* 6, 237-45(1928).—Atropine administered intravenously to normal men produced a marked rise in pulse rate, a relatively small rise in cardiac output and no change in pulse pressure or metabolic rate. ARTHUR GROLLMAN

The gaseous exchange following the administration of dihydroxyacetone. WALTER R. CAMPBELL AND S. SOSKIN. Univ. of Toronto. *J. Clin. Investigation* 6, 291-302 (1928).—Differences in R. Q., O intake, and CO₂ elimination occur when a normal animal is fed with dihydroxyacetone, as compared to the same animal given glucose. While depancreatized animals also show a rise in O and CO₂ elimination, the R. Q. remains low and the animal excretes the triose as glucose. These changes are temporary and are inconsistent with the explanation that fat is being produced or that large quantities of triose are being burned. Hyperventilation is suggested as a cause of the results obtained. ARTHUR GROLLMAN

The significance of respiratory quotients after administration of certain carbohydrates. WALTER R. CAMPBELL AND E. J. MALTBY. Univ. of Toronto. *J. Clin. Investigation* 6, 303-17(1928).—Dihydroxyacetone, fructose and cane sugar cause a lowering of the CO₂-combining power and a rise in the blood lactic acid, while glucose, maltose, lactose, galactose and glycerol do not. These changes take place at the proper time to cause stimulation of respiration. The increased elimination of CO₂ noted when such substances are fed explains the extraordinarily high CO₂-O₂ ratios found. Such ratios cannot be used as an index of food transformation, combustion, or storage of the first substances mentioned. These factors do not, however, interfere in the use of the ratios, as R. Q., in the other sugars examd. In view of the addnl. energy required, because of the stimulation of respiration and that lost by conversion of glycogen to lactic acid, the first-named sugars are not regarded as being more valuable in the treatment of diabetes than glucose itself. ARTHUR GROLLMAN

Tolysin in subacute rheumatic carditis. F. D. W. LUKENS. Penn. and Children's Heart Hospitals, Phil. *J. Clin. Investigation* 6, 319-24(1928).—Tolysin (Et p-tolyl-

cinchoninate) has no effect on the infectious process, in subacute rheumatic heart disease in children, as measured by the fever, wt. and leucocytosis. No toxic action was noted in any of the cases studied.

ARTHUR GROLLMAN

The influence of heavy metals on the growth of mouse tumors with particular reference to lead preparations. M. KOCHMANN WITH ILSE PARTAU. Friedrichs Univ., Halle-Wittenberg. *Klin. Wochschr.* 7, 1646(1928).—The action of a no. of Pb preps., $\text{Hg}(\text{CN})_2$, As_2O_3 and colloidal gold was tried on tumor mice. The results were not very encouraging.

MILTON HANKE

The mechanism of the action of synthalin. FERDINAND BERTRAM. *Deut. Arch. klin. Med.* 158, 76-97(1928).—Synthalin was used in the treatment of 21 diabetics with varying results. In light cases there was in most cases at first a marked effect upon hyperglucemia and glucosuria; but after continued use the substance lost its efficiency and there appeared such symptoms as loss of appetite, loss of wt., sleeplessness, fatigue, profuse sweat, etc. In some cases there were serious metabolic effects; and the usual amts. of insulin were not sufficient to restore the original equil. Some cases of medium intensity were transformed into serious cases by the loss of tolerance through the effect of synthalin. In more serious cases not even a temporary favorable effect was observed. A severe hyperglucemia in some cases followed the administration of moderately small doses and in 3 cases a precomatose condition resulted. Very large doses of insulin were required in the more serious cases to restore equil. The action of synthalin in lowering the concn. of blood sugar may be overcome by the administration of a sufficient quantity of atropine. Insulin, by producing a condition of rest, allows a diseased pancreas, at least in some cases and temporarily, to recover. On the other hand synthalin excites the pancreas to give up its last insulin reserve; and the more advanced the disease the sooner is the pancreas exhausted.

P. Y. JACKSON

Clinical studies on high arterial pressure and its response to therapeutic influences. E. FIRNBACHER. *Deut. Arch. klin. Med.* 161, 1-17(1928).—Br and I derivs., rhodapurine, diuretin, desencin, nitro derivs., grape sugar, etc., brought about only a temporary decrease in the blood pressure of resting patients. Desencin in doses of 0.5 g. 3 or 4 times daily produced the best results, without any accompanying dyspeptic or general toxic disturbances. A 0.5 g. dose was without any particular effect upon the blood pressure of a normal individual.

P. Y. JACKSON

Observations upon rabbits treated with cholesterol. OTTO DECKE. *Krankheitsforsch.* 3, 399-418(1926).—Cholesterol dissolved in olive oil, or in dry horse liver, was fed to a group of 88 rabbits; 56 of them showed a rise in blood pressure and in the cholesterol content of the blood; after several months the blood pressure returned to normal and there were no objectionable symptoms. A second group, 17 animals, suffered from cholesterol sickness. There was little or no increase in blood pressure, but a very sharp rise in cholesterol in the blood serum. The blood pressure gradually fell without any decrease in cholesterol concn., and with general symptoms of illness. The third group (13 animals) was scarcely affected with either increase in blood pressure, or with any change in cholesterol concn. All 3 groups showed after a time a cholesteatosis of the internal organs; this condition must be distinguished from hypercholesterolemia since it occurred with no increase in blood cholesterol. After a single intravenous injection of cholesterol there was a temporary increase in blood cholesterol; repeated injections caused irregular increases in the concn. of cholesterol in the blood; and sometimes the concn. returned to normal only some time after the end of the expt. Parenteral administration of cholesterol has less effect in raising the blood pressure and causes less cholesteatosis than enteral administration, even though a noticeable hypercholesterolemia is produced.

P. Y. JACKSON

Experiences with intarvin in diabetes mellitus. MAX EINHORN AND W. BRAUNSTEIN. Lenox Hill Hospital. *Arch. Verdauungs-Krankh.* 43, 120-7(1928).—In 7 of 10 cases of mild acidosis, the urine was freed of acetone bodies by feeding intarvin in amts. equiv. to the natural fat usually added to the diet. Intarvin is not injurious and produces no ill effects.

FRANCES KRASNOW

Intradermal sensitization for ipecac powder. PAWEŁ BAUMRITTER. *Med. Doswiadczenia i Społeczna* 7, 415-9(Polish), 419(French)(1927).—A sensitization of an individual insensitive to ipecac was obtained by the simultaneous intradermal injection of infusion of ipecac and of serum of the pig. The sep. injection of either of these substances alone did not lead to sensitization. Thus provoked sensibility is limited only to the skin.

JAROSLAV KUČERA

Toxic action of alkyl compounds of mercury. J. V. SUPNIEWSKI. *Med. Doswiadczenia i Społeczna* 8, 348-52(Polish), 353 (French)(1928).—The alkyl compds. of Hg such as $\text{Hg}(\text{CH}_3)_2$, $\text{Hg}(\text{C}_2\text{H}_5)_2$, $\text{Hg}(\text{C}_4\text{H}_9)_2$ have strong narcotic and diuretic proper-

ties because of their alkyl groups. Their late toxicity depending on the free Hg is shown as Hg encephalopathy accompanied by renal and intestinal lesions. The function of cardiac, voluntary and involuntary muscles and the respiration is depressed. J. K.

Studies on the pharmacological action of sea water. I. The toxicity of sea water introduced intravenously. ANGELO RABBENO. *Arch. sci. biol.* (Italy) 12, 469-77(1928).—Sea water from Trieste was filtered and injected into the jugular veins of rabbits until the animals died. The rate of injection varied from 0.5 to 5.0 cc. per min. By plotting the rate as abscissas and the dose as ordinates a curve was obtained which showed an initial peak with low rate of injection (0.5); then the curve dropped until it reached a primary min. at 1.5 rose and reached a secondary max. at 2.15, dropped to a secondary min. at 3.2, and again rose to a third and greatest peak at 5.0. The shape of the curve indicates that the factors of toxicity are of a different order and of opposite action. PETER MASUCCI

Experimental studies on the influence of peroral and intravenous administration of radium bromide on the urinary carbon:nitrogen quotient. A. ALLEN GOLDBLOOM. Patholog. Inst. Univ., Berlin. *Biochem. Z.* 197, 14-9(1928).—Repeated daily peroral administration of RaBr₂ in 400 M.-E. doses per kg. causes in rabbits a very definite rise in the urinary C:N quotient due to the limitation of the N excretion. A single intravenous injection of a 1100 M.-E. dose causes a gradual rise in the quotient which likewise depends upon the diminution in N elimination. Like radiothorium, the RaBr₂ therefore also produces a reduction in the metabolic process. S. MORGULIS

Studies on tissue respiration. IV. Influence of thyroxine, adrenaline and insulin on the oxygen consumption of liver cells. HELMUTH REINWEIN AND WALTER SINGER. Med. Klin. Würzburg and Physiol. Inst., Zürich. *Biochem. Z.* 197, 52-9(1928).—Pure thyroxine like the thyroid ext. causes an increase in the O₂ consumption of surviving liver cells. The addn. of adrenaline, when its concn. exceeds 10⁻⁴, causes an inhibition of O₂ consumption. No increase in the O₂ consumption resulted from insulin, which in higher concns. injures the tissue respiration. S. MORGULIS

The influence of different quinine groups on the enzymic functions of the organism. IX. Effect of quinine on the dynamics of hydrolysis of carbohydrate and fat. I. A. SMORODINTZEV. Tropeninstitut des Volkskommissariats für Gesundheitswesen, Moscow. *Biochem. Z.* 197, 160-9(1928).—The hydrolysis of carbohydrate is generally increased in the presence of quinine. In most instances it causes an increased hydrolysis of fat though that of maltose and sucrose is unaffected. The tributyrase of the digestive fluid and serum is sensitive to quinine but the organtributyrase is resistant. In other words, quinine inhibits the fat assimilation in the intestine but has no effect on the fat metabolism in the organism. However, the inhibition of digestion of fat in the intestine is found at p_H 8.0 or above, whereas on the acid side the process is accelerated. In the upper intestine fat assimilation must therefore be improved by the quinine. Cf. C. A. 22, 4546. S. MORGULIS

Effect of carbon monoxide on the metabolism of white blood cells. AKIJI FUJITA. Kaiser Wilhelm-Inst. Biologie, Berlin-Dahlem. *Biochem. Z.* 197, 189-92(1928).—The glucolysis of white blood cells in O₂ is small but in CO under similar conditions in the dark it is large (70% of the anerobic value). Under the influence of illumination this glucolysis drops from 70 to 10%, but rises once more when returned to the dark. S. MORGULIS

Animal poisons in chemistry. ANGELO CONTARDI AND TIA LATZER. Serotherapeutisches Institute, Mailand. *Biochem. Z.* 197, 222-36(1928).—The wasp poison, unlike bee, snake or scorpion poisons, has the addnl. property of sapon. salts of glycerophosphoric acid at low temps. (50°). These poisons have no effect on ordinary fats or on plant phosphatides. S. MORGULIS

Effect of glycocoll on the blood sugar. G. PAASCH. Med. Klinik, Würzburg. *Biochem. Z.* 197, 460-6(1928).—Glycocoll has no definite hyperglucemic effect in dogs or rabbits. S. MORGULIS

Experimental studies on the influence of narcotics on the blood-sugar concentration. K. STEINMETZER AND F. SWOBODA. Physiol. Inst. Tierärztliche Hochschule, Wien. *Biochem. Z.* 198, 259-67(1928).—Various narcotics (ether, morphine, chloral hydrate, hedonal) cause hyperglucemia which generally lasts on the av. 6 hrs. and always continues longer than the narcosis. The blood sugar increased 30-50% over the normal blood-sugar values. Even non-effective doses of hedonal or chloral hydrate produced hyperglucemia which lasted a long time. This hyperglucemic reaction is regarded as due to the removal of inhibition from the sugar center in the brain. S. MORGULIS

Effect of naturally occurring iron compounds on the metabolism. A contribution to the problem of active iron. M. KOCHMANN AND H. SEEL. Pharmacol. Inst., Fried-

rich-Univ., Halle-Wittenberg. *Biochem. Z.* 199, 362-78(1928).—The administration of water contg. Fe bicarbonate giving the benzidine reaction to young rats increases their growth greatly. To a lesser degree the body wt. is increased by adding similar quantities of FeSO_4 to the food. The rats receiving the mineral water show an increased O_2 consumption, also per g. of body wt., and show the same higher metabolic rate as young actively growing rats. FeSO_4 has a similar though much weaker effect.

S. MORGULIS

Thyroid gland and mineral metabolism. Influence of disodium phosphate and of calcium salts on the effect of thyroid substances. I. ABELIN. *Physiol. Inst., Univ. Bern. Biochem. Z.* 199, 72-106(1928).—The effect of thyroid gland substances on the basal metabolism is greatly increased by inorg. salts. Administration of Na_2HPO_4 increases, and of Ca salts diminishes the metabolic influence. The Ca salts produce a particularly striking inhibitory effect on the overexcitability symptoms. Neither Na_2HPO_4 nor Ca salts have any direct effect upon basal metabolism. The glycogen-forming capacity of the liver, in spite of the feeding of thyroid, can be retained unimpaired in many instances through the administration of CaCO_3 . The CaCl_2 salt is not suitable to use because of its hydrolysis. The Ca theory of goiter receives certain support from this observation of the actual antagonism between the thyroid function and excess of Ca. Continued Ca-rich food, like a predominantly milk diet, may at last create conditions which are unfavorable for the activity of the thyroid hormone. The action of adrenaline on the basal metabolism is not noticeably affected by repeated administration of Ca salts.

S. MORGULIS

The effect of hypertonic glucose solutions on the excretion of water and chlorides through the kidney. I. I. M. GOLDBERG, S. M. GAMEROV AND M. L. PINCHASSIK. *Lab. pathol. Physiol., Institute of Medicine, Leningrad. Biochem. Z.* 199, 107-14(1928).—Intravenous injection of hypertonic glucose solns. affects the H_2O distribution in that the muscle water content diminishes and that of blood and liver increases. The Cl content of blood, muscle and liver remains unchanged. The urinary excretion generally diminishes but sometimes it is unaffected, the Cl varying with the total urine quantity. II. Experiments on thyroidectomized animals. I. M. GOLDBERG, M. L. PINCHASSIK AND S. U. GAMEROV. *Ibid* 115-20.—The influence of injected hypertonic glucose solns. on the water distribution in the organism is not nearly as prominent in thyroidectomized animals as was found to be the case in normal animals. On the other hand, the reduction in the quantity of urine excreted is much greater in the operated animals.

S. MORGULIS

Influence of arsenic on the carbon and oxygen coefficient of the urine. L. KOROWSKY. *Pathol. Inst. Univ., Berlin. Biochem. Z.* 199, 366-76(1928).—The effect on metabolism produced by As depends on whether it is given perorally or subcutaneously and the metabolic changes disappear quickly if the As treatment lasted only a few days. The same effect was produced with inorg. and org. As compds; generally treatment with As causes a rise in both the C and O coeffs. of the urine, and the same is true for therapeutic or toxic doses, and this indicates a lowering of the oxidation. Exceptionally there is a lowering of the coeff. following a toxic dose of As. The quotient is unchanged under the influence of therapeutic dose. The variations in both C/N and O/N coeffs. under the influence of As are generally parallel.

S. MORGULIS

The blood-sugar level in nicotine poisoning. A. I. BURSTEIN AND I. D. GOLDENBERG. *All-Ukraine Inst. for Hygiene and Pathol. of Labor, Odessa. Biochem. Z.* 200, 115-25(1928).—Poisoning with small, medium or large doses of nicotine is accompanied by a rise in the blood-sugar concn. This occurs within 15-30 min. after the nicotine injection into the blood followed by a fall in concn. so that there is a return to the normal level after 3-3½ hrs. In chronic nicotine poisoning no lasting effect on the blood-sugar level is found. The rise in sugar following an injection of nicotine is ascribed to an adrenalinemia. There is no depression of glycolysis in nicotine poisoning.

S. MORGULIS

The origin of the alkaline reaction in the intestinal juice. KENSA OYAMA. *Med.-chem. Inst. Univ. Kanazawa. J. Biochem. (Japan)* 9, 1-16(1928).—Aq. solns. of NaCl or neutral salts or sucrose, when introduced into the intestinal canal, cause an increase in alky. If these solns. are introduced into an excised segment of the intestine and after a certain time the remaining fluid is investigated, it is found that the anions have been better adsorbed than the cations, especially the Na^+ . When aq. isotonic solns. of glucose, or such neutral salts like KCl, NH_4Cl or NaI, are injected into the intestine, NaCl passes from the blood into the canal.

S. MORGULIS

Pentosuria in experimental stasis icterus and following subcutaneous injection of bile acids in rabbits. TODI KOBAYASHI. *Physiol.-chemisches Inst., Okayama.*

J. Biochem. 9, 251-60(1928).—Bile acids provoke pentosuria, the pentose apparently arising from the body nucleins. S. MORGULIS

Effect of ergotamine on experimental hyperglucemia. GENICHIRO ODA. Med. Klinik, Kaiserliche Univ., Tokyo. *J. Biochem. (Japan)* 9, 285-97(1928).—Hyperglucemia due to diuretin, caffeine, pilocarpine, quinine, antipyrine, pyramidone, picrotoxin or salt can be more or less definitely reduced by subcutaneous injection of 0.5 mg. ergotamine. Frequently, this will even result in a hypoglucemia. This is thought to indicate that the above-named hyperglucemias are caused by sympathetic excitation. S. MORGULIS

Effect of hormones, parasympathetic drugs, alkaloids and various salts on the hypoglucemic action of bile acids. AIJIRO TAKU. Physiol.-chem. Inst., Okayama. *J. Biochem. (Japan)* 9, 299-319(1928).—Insulin promotes and adrenaline inhibits the hypoglucemic action of cholic acid. Pituirrin is apparently without any effect. The parasympathetic poisons, atropine and pilocarpine, inhibit the hypoglucemic action, as do also the alkaloids morphine, cocaine and caffeine. Morphine has a stronger antagonistic action to the bile acids than either cocaine or caffeine. CaCl₂ and MgCl₂ inhibit the hypoglucemic effect of the bile acids while KCl increased this. S. M.

Parenteral administration of sucrose and invertase. TOSIO ODA. Med.-chem. Inst., Universität Chiba. *J. Biochem. (Japan)* 9, 383-405(1928).—Intravenously injected sucrose disappears in rabbits in about 5.5 hrs. In rabbits receiving several injections of sucrose at 7-day intervals, one week after the last injection it was found that the liver, spleen, kidney, muscle and blood contained neither invertase nor lactase. Similar expts. with raffinose injection led to the same conclusion as to the absence of raffinase or lactase. Injections of yeast sucrase preps. intravenously cause a rise of the invertase action of the blood for only a short time (1-1½ hrs.) even when the enzyme is injected repeatedly into the same rabbit. Most of the invertase is found in the liver, some in the spleen and occasionally in the bone marrow, but in none of the other organs. An injection of sucrose 10 min. to 6 hrs. after an injection of invertase gave invariably neg. results. When the two are injected as nearly simultaneously as possible there is evidence than an inversion of the sucrose does take place *in vivo*. S. M.

The pharmacology of mistletoe (*Viscum album*). J. NOLLE. Chímico-farmacéutical Inst., Moscow. *Zhurnal expil. Biol. Med.* 9, 266-75(1928).—Exts. of mistletoe produce depression of the nervous system of cold-blooded animals without a preliminary excitatory stage. It causes gradual slowing of their heart beat, probably through weakening its nervous mechanism, but in warm-blooded animals the slowing of the heart is not marked. In all doses, the mistletoe ext. lowers blood pressure because of its injurious action on the vasomotor centers. On the isolated heart the ext. acts by increasing the amplitude of the beat but slowing its rhythm somewhat. On the vessels of the isolated ear, liver or kidney it acts as a dilator. In both cold- and warm-blooded animals the ext. slows up the respiration without a preliminary excitatory phase. It is pointed out that the therapeutic effect of this ext. in hypertony should be investigated. S. M.

Effect of some poisons on the corpora cavernosa and on the vessels of the dog's penis. A. NIKULIN. Pharmacol. Lab., Univ. Saratow. *Zhurnal expil. Biol. Med.* 9, 335-51(1928).—Both the blood vessels and the corpora cavernosa of the penis are very sensitive to various poisons. Adrenaline in diln. of 1:500,000-1:25,000,000 contracts the vessels and stimulates the plain muscles of the corpora cavernosa. Atropine, pilocarpine, arecoline and physostigmine have no marked effect on the vessels. Nicotine, BaCl₂, cocaine, digitalis and strophanthin constrict the vessels, while caffeine, quinine, chloral hydrate and NaNO₂ cause dilatation. "Tenosin-Bayer" in a diln. of several billions still produces vascular dilatation. Conclusion: the vascular innervation of the penis is predominantly if not exclusively of the sympathetic nervous system. S. M.

Studies on the pharmacology of *d*- and *l*-camphor. Comparative action on frogs of Japanese camphor and its *l*-isomer. K. A. SHMELEV AND N. V. GOLYAKHOVSKII. Pharmacol. Lab., Saratow State Univ. *Zhurnal expil. Biol. Med.* 9, 384-92(1928).—*l*-Camphor from *Artemisia maritima astrachanica*, which is the optical antipode of the ordinary camphor, causes typical paralysis of the central nervous system of *Rana esculenta* in no sense different from that produced by the Japanese *d*-camphor. The 2 forms, the *l*- and *d*-camphor, do not vary in the degree of their activity, both equally producing fibrillary contractions in the skeletal musculature in the stage of deep poisoning. Both equally lower the indirect elec. irritability of muscles without, however, giving the picture of a typical curare effect. Neither of these isomers affects noticeably the direct irritability of the striated muscles when injected subcutaneously even in lethal doses. S. MORGULIS

Effect of insulin and adrenaline on the distribution of glucose in the blood. S. I.

VINOKUROV. Ukraina Biochem. Inst., Charkow. *Zhurnal ekspt. Biol. Med.* 9, 394-407(1928).—The red cells of pigeons contain glucose but in smaller concn. than the plasma, but the cells contain by far the largest portion of the substance responsible for the residual reduction of the blood. Only 50% of the reduction obtained by the pigeon cells is due to glucose. In hyperglucemia, this proportion of residual reduction increases, and a proper correction for this must be made where hyperglucemia is studied. Under the influence of large insulin doses the difference between the cells and the plasma in the matter of the uneven distribution of glucose and residual reduction is wiped out: in plasma the glucose decreases and the residual reduction in the red cells increases. Under the influence of adrenaline the cells lose the glucose so that the difference in glucose concn. between cells and plasma becomes very great. There are also instances of hyperglucemia not caused by adrenaline accompanied by a rise in the cell glucose content. S. MORGULIS

Effect of poisoning with illuminating gas on the placental barrier. E. LOKSHIN AND R. R. FLAK. Metschnikoff Inst., Moscow. *Zhurnal ekspt. Biol. Med.* 9, 455-62(1928).—Poisoning with illuminating gas increases the permeability of the placenta to I or Bi, but not to $\text{Na}_4\text{Fe}(\text{CN})_6$, trypan blue or Congo red in rabbits. In mice there were no changes at all. S. MORGULIS

Charcoal as an antidote in poisoning with poisons of various pharmacological groups. E. A. LEIBENSON. State Med. Inst., Odessa. *Zhurnal ekspt. Biol. Med.* 10, 58-63 (1928).—Activated charcoal from linden is a valuable antidote for poisoning. The charcoal must be used very quickly while the poison is still in the stomach. Even with poisons of the morphine group which are administered subcutaneously charcoal is effective because the poison is excreted through the gastrointestinal tract. The charcoal antidote must be given in accordance with the following rules: the stomach is first washed out with a 15% charcoal mixt., whereupon 15 g. charcoal in 100 g. of 1% NaHCO_3 is introduced. The last is necessary because the adsorption of the coal begins at pH 3.9. After $1\frac{1}{2}$ hrs. it is necessary to administer 100-150 cc. 35% Na_2SO_4 which aids the gastrointestinal secretion of the last traces of poison and also induces the evacuation of the adsorbed poison. Even in poisoning with substances which are not adsorbed by charcoal, the latter by spreading in a thin layer over the mucous membrane effectively prevents further absorption of poison as well as the corrosion of the membrane. The neutralization of acids or alkalies by proper antidotes is more easily accomplished following preliminary treatment with charcoal. S. MORGULIS

Materials for the study of the pharmacology of *d*- and *l*-camphor. II. Effect of the *d*- and *l*-isomers of camphor and their colloidal preparations on the normal frog heart and on the heart poisoned with chloral hydrate. K. A. SHMELEV AND N. V. GOLYAKHOVSKI. Pharmacol. Lab. State Univ., Saratow. *Zhurnal ekspt. Biol. Med.* 10, 83-95(1928).—Both isomers produce the same effect on the frog heart whether in Ringer's sol. (diln. 1:5000-30000) or as an external application in a colloidal soln. Likewise, both isomers equally restore the beat to the heart which has stopped under the influence of chloral hydrate. S. MORGULIS

The influence of caseosan on the animal organism. C. A. LEVENE. Pharmacol. Lab. State Med. Inst., Odessa. *Zhurnal ekspt. Biol. Med.* 10, 102-8(1928).—Subcutaneous injections of 1 cc. caseosan once or twice a week for a period of 2-4 weeks produces no anaphylactic phenomena. The injection is accompanied by a rise of rectal temp. of $0.4-0.5^\circ$ the first 2 hrs. Given intravenously to dogs in doses of 1.25-2 cc. per kg. it has no great effect on the blood pressure nor on the frequency of the heart beat. In rabbits subcutaneous injections of caseosan causes only a slight slowing of the respiration. In 75% of the rabbits caseosan does not alter the sensitivity of the respiratory center to morphine but increases the rabbits sensitivity to the general action of morphine. Caseosan diminishes very considerably the effect of alc. on the rabbit. S. MORGULIS

Further experimental data on *Bulbus scillae maritimae* and its glucoside scillaren. B. N. DUBINSKII. Pharmacol. Inst. Med. Inst., Charkow. *Zhurnal ekspt. Biol. Med.* 10, 122-32(1928).—*Bulbus scillae maritimae* and its glucoside scillaren slows the rhythm and increases the systolic cardiac power, increases the amplitude of the pulse wave and raises the blood pressure. This action is regarded as its therapeutic effect and is opposed to its second action, the toxic due to considerable resorption, which manifests itself in an acceleration of the heart rhythm, shortening of the diastole, increased cardiac tonus leading even to a state of contracture, the blood pressure remaining for a long time high but finally falling even below the normal level. The secondary, toxic acceleration of the heart is due to an irritation of the neuro-muscular mechanism of the heart. Expts. on isolated organs show that small doses of scillaren dilate the vessels and large

doses constrict them, so that the raising of the blood pressure is due to the increased heart action and to a certain extent also to the peripheral effect: In the first 3-4 mins. of the therapeutic phase of its action the blood pressure rise is purely a haemodynamic action; the peripheral effect does not occur until later. In the toxic phase the increased heart rhythm compensates for the diminished systolic strength and with the increased vasoconstriction present, the blood pressure is maintained high. The kidney vessels are more sensitive to the vasodilating effect while the ear vessels are more sensitive to the vasoconstricting effect of scillaren.

S. MORGULIS

Action of adrenaline and of dihydroxybenzene on the heart and vessels. A. SANGAJLO. Pharmacol. Lab. II Univ., Moscow. *Zhurnal expil. Biol. Med.* 10, 212-8 (1928).—Adrenaline as well as dihydroxybenzene (pyrocatechol, hydroquinone, resorcinol) acts upon the heart not only at the time of penetration but also at the subsequent stage of leaving the tissue. The absence of side chains in the dihydroxybenzene compds is thought to be responsible for their weaker action as compared to adrenaline. S. M.

The anti-coagulant action of the venom of the rattlesnake, *Crotalus adamanteus*. ALBERT P. MATHEWS. Univ. Cincinnati. *Arch. sci. biol.* (Italy) 12, 145-52 (1928); cf. Houssay and Sordelli, *C. A.* 13, 2377; 14, 947, 2030; 15, 899.—The anti-coagulant action of rattlesnake venom is in part, but not wholly, due to its destruction of cephalin. Another very important part of the action is due to the intense, rapid and sp. destruction of fibrinogen. The venom does not appear to destroy tissue fibrinogen, one of the 2 important constituents of thrombokinase. It does not appear to destroy cephalin when the venom is in union with protein. Its destruction of blood fibrinogen has many points of resemblance to the similar destruction brought about by illuminated hematoporphyrin.

L. W. RIGGS

Reciprocal influence of folliculin and insulin on the glucemia of ovariectomized dogs. F. RATHERY, R. KOURILSKY AND Mlle Y. LAURENT. *Compt. rend.* 187, 467-70 (1928).—In 3 ovariectomized dogs folliculin exercised upon insulin an effect opposite to that which occurs in the normal animal, in the sense that it exaggerated the hypoglucemic effect of the pancreatic hormone. In 2 other dogs folliculin had the same effect toward the action of insulin as in the normal dog, in that it restrained the action of insulin.

L. W. RIGGS

Hemodynamic action of epinephrine. CARL A. DRAGSTEDT. Northwestern Univ. *J. Am. Med. Assocn.* 91, 1035-6 (1928).—The min. effective dose of epinephrine in the unanesthetized dog is less than from 0.2 to 0.4 cc. of a 1 to 1 million soln. of epinephrine per kg. per min. This produces pressor effects. The vascular (pressor) response to epinephrine is more sensitive than the intestinal inhibition both in the unanesthetized dog and in man. Compatible suprarenal vein blood collected from one dog and re-injected into a second unanesthetized dog at the rate at which it was collected has a slight pressor effect absent in the systemic blood. From these expts. there is no reason to suppose that the suprarenals are not normally and continually secreting epinephrine in amts. sufficient to modify the vascular bed, and there is reason to believe that an augmentation of secretion will have hemodynamic effects.

L. W. RIGGS

Toleration of the diuretic action of caffeine. GYOKUJO KIHARA. *Proc. Imp. Acad. Tokyo* 4, 418-20 (1928).—Rabbits acquire a moderate degree of tolerance toward caffeine following upon repeated administration of gradually increasing doses of the drug. It requires from 4 to 6 months for the full development of the toleration. The development of a decreased susceptibility to the diuretic action of caffeine is shown at first in the cessation of the extra-renal response (hydremia), and next in that of renal response. But the renal vaso-dilation to be seen immediately after the injection of caffeine appears in a caffeine-tolerant as well as in a control animal. An animal tolerant toward caffeine, theobromine and theophylline manifests a decreased susceptibility to each of these. In caffeine-tolerant rabbits, as in a control animal, no increase in the O consumption of the kidney was produced by caffeine injection.

L. W. RIGGS

Edema formation. III. Influence of potassium and calcium on edema production during disturbed thyroid functioning. CHROMATSU SATO. *Tôhoku J. Expil. Med.* 11, 232-45 (1928); cf. *C. A.* 22, 4171.—In the perfusion of thigh preps. of healthy animals with Ringer soln., an increased quantity of KCl or CaCl₂ in the Ringer soln. at first arrests but later promotes edema formation. These 2 actions adjust themselves gradually according to the concn. of the salts. Perfusion of thigh preps. from animals with disturbed thyroid functioning with Ringer soln. contg. an increased quantity of KCl or CaCl₂ caused, in hyperthyroidism, a reduction of the edema, and in athyroidism an increase of the edema formation. The action of K and Ca salts thus introduced varies with their concn. K salts have a stronger tendency to reduce the edema in hyperthyroidism and Ca salts a stronger tendency to increase the edema of athyroidism.

Action of novasurol and theocin (theophylline) on edema formation by perfusion experiments with normal and experimentally abnormal animals. *Ibid* 246-64.—Novasurol added to Ringer soln. in thigh prep. perfusion expts. accelerates the formation of tissue edema in animals poisoned with cantharidin or $\text{UO}_2(\text{NO}_3)_2$. Theocin increases edema formation in perfusion expts. with normal animals, but in animals poisoned with cantharidin or $\text{UO}_2(\text{NO}_3)_2$ it diminished the edema formation. L. W. RIGGS

Pharmacological action of soaps. IV. Toxic and anticoagulating effects of oleic acid. ANGELO RABBENO. • Univ. Pavia. *Arch. expil. Path. Pharmacol.* 134, 17-28(1928).—Stable, homogenized emulsions of oleic acid in water were tested for toxicity by intravenous injections in rabbits and for coagulation-inhibiting properties both *in vivo* and *in vitro*. Compared with Na oleinate and Ca oleinate, oleic acid is half as toxic as the Na compd., and is more toxic than the Ca compd., the minimal lethal doses being oleic acid 0.000920, Na oleinate 0.000455, Ca oleinate 0.001280. Injected intravenously oleic acid interferes with coagulation, while *in vitro* if added to a concn. of 0.016 g. per l. coagulation is prevented. In this respect, oleic acid retards coagulation to about the same degree as does Na oleinate and somewhat more effectively than does Ca oleinate. G. H. S.

Thyroid function and the effect of adrenaline upon blood pressure. WILLY KÖNIG. Westf. Wilhelms-Univ. Münster i. W. *Arch. expil. Path. Pharmacol.* 134, 36-43(1928).—In neither normal rabbits nor those deprived of thyroid is the action of adrenaline augmented by a simultaneous administration of thyroxine. Prolonged preliminary treatment of normal animals with thyroxine does not definitely increase adrenaline sensitivity. When deprived of thyroid, animals respond less vigorously to adrenaline, but a preliminary treatment with thyroxine enables them to respond in an almost normal fashion. G. H. S.

Experiments upon the amnion of the hen and goose. Pharmacological study with nerve-free smooth muscle. MAX BAUR. Univ. Kiel. *Arch. expil. Path. Pharmacol.* 134, 49-65(1928).—Automatic myogenic motility was increased, or in inactive preps. instituted, by Ba, gynergen, physostigmine, acetylcholine, choline, strophanthin, muscarine, tenosine, pituitrin and hypophysin. Papaverine, pantopon, tincture of opium, adrenaline, cocaine, morphine, dihydromorphinone and cardiazole exerted a paralyzing action. G. H. S.

Effect of extracts of the posterior lobe of the hypophysis on choleresis and cholekinesis. Influence of narcotics. D. ADLERSBERG AND J. M. NOOTHOVEN VAN GOOR. Univ. Wien. *Arch. expil. Path. Pharmacol.* 134, 88-104(1928).—Pituitrin does not modify cholekinesis in rabbits although it does exert an inhibitory action as regards choleresis, and this latter effect is not influenced by section of the vagus, or by the simultaneous administration of urethan. Chloretone, and to a lesser extent luminal, weaken or completely prevent the action of pituitrin. Clinical studies in man show that under normal conditions pituitrin regularly modifies cholekinesis but no conclusive proof of an inhibition of choleresis can be obtained. The cholekinetic action is not removed by the administration of paraldehyde, while it is diminished or abolished by chloretone and luminal. G. H. S.

Do fractional doses of poisons exhibit a greater effect than does a single dose of the same amount? L. LENDLE. Univ. Leipzig. *Arch. expil. Path. Pharmacol.* 134, 113-28(1928).—Fractional injections of some narcotics—avertin, urethan, amylene hydrate and isoamyl alc.—cause no increased narcosis in rats as compared with a single injection of the same total amt. Similarly, amylene hydrate given rabbits intravenously in fractional doses is not more effective than is a single dose. When given subcutaneously, however, amylene hydrate and urethan by divided dosage show some increased effect; this is due solely to the distribution of the agent in several injection areas with a resultant accelerated absorption. G. H. S.

Studies on alcohol. VII. Effect of alcohol on gastric digestion. G. FRANZEN. Univ. Jena. *Arch. expil. Path. Pharmacol.* 134, 129-41(1928).—As has been observed under exptl. conditions, certain concns. of alc. stimulate peptic digestion under natural conditions. When the concn. in the stomach goes above 5-7% gastric activity is retarded, but lower concns. are either without effect or are stimulating. G. H. S.

Mobilization of mercury by halogen salts from deposits in which it is difficultly soluble. FAUSTINO GARCIA. Univ. München. *Arch. expil. Path. Pharmacol.* 134, 142-8(1928).—When compds. of Hg which are insol. in water, such as calomel and the oxide, biniodid and salicylate of Hg, are deposited in the subcutaneous tissues no symptoms of intoxication become manifest unless the quantity injected exceeds a certain value. If, however, such a Hg injection is given in conjunction with the administration of

halogen salts (iodide, chloride, bromide) a typical fatal intoxication ensues. In Hg mobilizing effect KI is more potent than NaCl, and KBr is least active. G. H. S.

Quantitative pharmacological differentiation of solanaceae alkaloids. FAUSTINO GARCIA. Univ. München. *Arch. expil. Path. Pharmacol.* 134, 149-54(1928).—Sublethal doses of atropine, hyoscyamine and scopolamine do not cause narcosis in mice, but if mice injected with such doses of these substances are subsequently exposed to a non-narcotizing amt. of ether (0.25 cc. in 5 l. of air) a deep narcosis will sooner or later develop. The interval elapsing between injection of alkaloid and exposure to ether is of considerable importance, a max. effect being observed when the interval was between 30 and 60 min. With all 3 alkaloids the time required for the narcotizing effect to become manifest diminishes as the amt. of alkaloid injected is increased. Of the 3 alkaloids atropine was the most active; scopolamine required the largest doses. Upon the basis of these observations the activity of alkaloid preps. can be detd. G. H. S.

Effect of the continued administration of insulin upon the adrenal of rabbits. HEDWIG LANGECKER. Univ. Prag. *Arch. expil. Path. Pharmacol.* 134, 155-67(1928).—From the standpoint of both abs. and relative wt. the adrenals of rabbits which have been continuously treated with insulin are heavier than those of normal rabbits. While the hypertrophy of the organ involves the cortex primarily, the medullary portion is also increased somewhat since the content in adrenaline is greater than normal. Comparative values as to the adrenaline content of hypertrophied and normal organs are valid when a period of at least 7 days has elapsed after the last injection. Immediately after the insulin injection the adrenaline is largely without pressor effect. Although upon the basis of biological detn. the adrenaline is diminished by the injections, colorimetrically the adrenaline content is unchanged. G. H. S.

Toxicology of some chlorine derivatives of methane and ethane. G. A. MALOFF. Univ. Berlin. *Arch. expil. Path. Pharmacol.* 134, 168-72(1928).—The effects were detd. upon the basis of the fat content of the liver, which was increased by CHCl_3 and by tetrachloromethane. Dichloromethane, ethylene dichloride, ethylidene chloride and hexachloroethane were without effect. G. H. S.

Effect of adrenaline upon the formation of sugar. E. GEIGER AND EUGEN SCHMIDT. Univ. Pécs. *Arch. expil. Path. Pharmacol.* 134, 173-84(1928).—In the dog with phlorhizin diabetes the administration of adrenaline causes but once an increase in carbohydrate, and this is referable to a mobilization of muscle glycogen. The fat content of the liver is unchanged. G. H. S.

Constipating effect of charcoal. HELLMUT BAUER. Univ. München. *Arch. expil. Path. Pharmacol.* 134, 185-90(1928).—The administration of charcoal doubles the period required for material to pass through the intestinal canal of rats. Charcoal likewise inhibits the increased peristalsis induced by castor oil. The choline of the feces is markedly increased by the administration of charcoal, and if both charcoal and castor oil are given the increase in choline is still greater. G. H. S.

Effects of continued saponin administration. Significance of the distribution of cholesterol and the possibility of a reversal of metabolism in the mammalian body. II. HANS HANDOVSKY. Univ. Göttingen. *Arch. expil. Path. Pharmacol.* 134, 191-202(1928).—The continued intravenous administration of saponin offers a method of effecting changes in the distribution of cholesterol within the body. Cholesterol detns. of the skeletal muscle and liver of rabbits which had received 0.6 mg. per kg. of saponin every other day were supplemented by detns. of the carbohydrate and lactic acid values for the muscle, and in some instances of blood sugar. Since earlier studies had indicated that the nature of the effects were to some degree related to the sex of the animal, the results herein reported are considered upon that basis. During the first 9 days of treatment male animals show a marked increase in muscle carbohydrate and no change in the lactic acid or cholesterol of the muscle or in cholesterol of the serum. During this same period female animals show rather a tendency toward a hypoglycemia; muscle carbohydrate diminishes as does lactic acid and cholesterol. As the saponin administration is continued up to the 18th day the situation as regards metabolism changes in that both males and females show much the same picture. In both, the muscle carbohydrate is reduced and lactic acid is increased. The cholesterol of muscle is reduced in females more than in males, and the water content of the muscle is reduced. Study of the liver shows that the glycogen content is high as is the cholesterol. Carbohydrate consumption, O_2 utilization and CO_2 production are higher in the saponin animals than is normal. Apparently the increases in metabolism due to saponin are referable to an increased permeability of the cells. In animals treated for more than 18 days the respiration of liver cells approaches normal, but there is an excess of lactic acid production. These later changes in the liver occur in both sexes, but the changes which

develops in muscle at this time differ with sex. Subsequent changes, i. e., those occurring after the 23rd day, likewise differ according to sex. Apparently the differential effects based upon sex are referable to the action of saponin upon the adrenals and the germinal glands, particularly the testes. G. H. S.

Explanation of the stimulating effect of saponins upon resorption. LUDWIG PETSCHACHER AND PAUL FELDER. Univ. Innsbruck. *Arch. expul. Path. Pharmacol.* 134, 212-7(1928).—Saponin increases secretion and diastatic action. G. H. S.

Theory of the identity of action of calcium and adrenaline. O. EHRLMANN. Univ. Berlin. *Arch. expul. Path. Pharmacol.* 134, 247-51(1928).—Upon the isolated intestine prepn. of rabbits, rats and cats Ca is sometimes stimulating and sometimes exerts a paralyzing action, while adrenaline is always inhibitory. Upon infantile uteri of rats and cats Ca is always stimulating, adrenaline always inhibitory, while with isolated uterus of rabbits Ca at times causes paralysis, adrenaline at times exerts a stimulation. All of these facts contradict the theory that assumes an identity of action for Ca and adrenaline. G. H. S.

Effect of section of the vagus and of morphine upon the respiratory gas exchange. HANS MELTZER AND M. STREUBER. Landwirtsch. Hochschule, Berlin. *Arch. expul. Path. Pharm.* 134, 259-73(1928).—Respiration in dogs is modified by section of the vagus, the effects being dependent upon whether both vagi or but one vagus is cut. With unilateral vagotomy the sole effect is a considerable reduction in respiratory rate, a change which is but transitory. When both vagi are sectioned respiration is permanently retarded. Death occurring in animals so treated is not due to a disturbance in pulmonary gas exchange. Morphine stimulates respiration but diminishes the abs. respiratory vol. and the O_2 utilization while the alveolar CO_2 tension is greatly increased. G. H. S.

Fate of inorganic iron in the body after the administration of simple inorganic ferro- and ferri-compounds. E. STARKENSTEIN AND H. WEDEN. Univ. Prag. *Arch. expul. Path. Pharm.* 134, 300-16(1928).—The living body behaves as regards simple inorg. Fe compds. just as do surviving organs. Pharmacol. active ferro salts, as the chloride, are oxidized to the ferri form and as such in soln. remain in the body fluids and plasma for a long time. Inorg. ferri compds. can be introduced into the body only in the colloidal form, such as Fe albuminate. They are reduced, but the compds. which form differ from the ferro chloride, since they are insol. in water and undergo little, if any, oxidation. Further, these compds. lack all pharmacol. action. Inactive ferri compds., such as sugar of Fe, are quickly removed from the blood by the spleen and liver. G. H. S.

Hormonal effect of glucose for insulin production. E. GEIGER. Univ. Pécs. *Arch. expul. Path. Pharm.* 134, 317-23(1928).—The effect of sugar upon insulin production is not a sp. action, as suggested by Grafe and Meythaler. Apparently the effect is due simply to a stimulation assocd. with hypertonicity. G. H. S.

Theory of insulin action. I. HANS HANDOVSKY. Univ. Göttingen. *Arch. expul. Path. Pharm.* 134, 324-38(1928).—Insulin administration caused a reduction in the carbohydrate and glycogen of muscle, a change which takes place very quickly. II. *Ibid* 339-46.—Apparently the prompt reduction in the sugar of the blood following the administration of insulin is assocd. with the presence of S in the substance. S likewise sensitizes the muscle to the action of insulin. G. H. S.

Behavior of plexus-containing and plexus-free preparations of intestinal muscle. L. W. VAN ESVELD. Univ. Utrecht. *Arch. expul. Path. Pharm.* 134, 347-86(1928).—Prepns., both with or without plexus, react to elec. stimulation with a refractory period, but this is less marked with plexus-free prepns. In any case the refractory state is but relative, for with either type of prepn. a sufficiently strong stimulus is effective. Both plexus-free and plexus-contg. prepns. react to atropine, pilocarpine, physostigmine, choline, acetylcholine, muscarine, histamine, adrenaline, nicotine, strophanthin and $BaCl_2$. To these agents, in suitable concns., some plexus-free prepns. react; others do not. This behavior is not connected with the presence or absence of scattered ganglion cells. Differences in action due to the presence or absence of plexus can, however, be detected, since of the two, plexus-free prepns. are from 100 to 1000 times less sensitive to pilocarpine, physostigmine, choline, acetylcholine, muscarine and histamine, from 10 to 50 times less susceptible to adrenaline and nicotine. To strophanthin both prepns. are almost equally sensitive; and to $BaCl_2$ they react in exactly the same manner. The presence of Auerbach's plexus is responsible for the increased activity of the plexus-contg. prepn. Poisons tend to favor rhythmic motion of the prepns. with plexus, but not of those which are plexus-free. For the latter atropine is never stimulating. G. H. S.

Etiology of oroxy fever. XIII. Chemotherapy in experimental Bartonella bacilliformis infection. HIRAYO NOGUCHI. Rockefeller Inst. Medical Research, New York. *J. Exptl. Med.* 48, 619-25(1928).—The therapeutic effect of several antiparasitic chemicals (Bi albuminate, tatar emetic, neoarsphenamine, tryparsamide, HgCl_2 , novasurol, merurochrome, neutroflavine, optochin, Na tetrocholate, PhOH , HCHO , and lugol's soln.) on exptl. *Verruca peruviana* is described. The drugs were administered by intravenous injection according as the nodules were already developed to an approx. max. or were still in the active period of growth. The effect of the drugs was different under the 2 circumstances of their administration. When they were given after maturity of the nodules they hastened the regressive process but when given during active growth of the lesions no action whatever was detected. *Bartonella bacilliformis* in culture is acted upon injuriously by a no. of the chemicals employed in the therapeutic tests, the most active being HCHO and neutraflavine. C. J. WEST

Effect of sodium chloride on the chemical changes in the blood of the dog after obstruction of the cardiac end of the stomach. RUSSELL L. HADEN AND THOMAS G. ORR. Univ. of Kansas. *J. Exptl. Med.* 48, 627-38(1928).—The effect of different treatments on the toxemia of cardiac obstruction is reported. The av. duration of life of untreated dogs is 3 days; 3 dogs treated with 1% NaCl soln. subcutaneously lived 32, 36 and 45 days, resp., without developing a toxemia; 2% glucose similarly given does not alter the course of the toxemia. Concd. salt soln. in small quantities given directly into the jejunum prevents the marked rise in non-protein N but does not materially prolong life. Release of the obstruction does not change the course of the toxemia in untreated animals. The subcutaneous injection of 1% NaCl soln. after release of the obstruction causes a rapid return of the blood to normal and allows the animal to recover. A similar amt. of fluid given as 2% glucose does not alter the course of the toxemia after release of the obstruction. C. J. WEST

Blood chlorides in proteose intoxication. RUSSELL L. HADEN AND THOMAS G. ORR. Univ. Kansas. *J. Exptl. Med.* 48, 639-45(1928).—Dogs injected with proteose recovered from the intestinal contents of animals with obstruction at different levels show no significant changes in the blood chlorides even with a fatal intoxication. After the intravenous injection of lethal and sublethal doses of Witte's peptone there is little change in the chlorides. Autolyzing liver in the abdominal cavity produces no change in the blood chlorides even with a very great increase in the urea and non-protein N. Proteose intoxication is probably not a factor in the characteristic fall in chlorides seen after intestinal and pyloric obstruction. C. J. WEST

The value of phosphorus and calcium in asthma, hay fever and allied diseases. ALEXANDER STERLING. *J. Lab. Clin. Med.* 13, 997-1005(1928).—Ca and P were of great benefit in the treatment of allergic diseases. This mineral deficiency in asthmatics, hay fever, and allied diseases, whether sensitivity can be proved or not, may be the missing link which makes the allergic differ from the normal. The addn. of Ca, P, and other minerals, e. g., Fe, Na and K salts, is possibly responsible for the favorable results in this series of cases. ETHEL W. WICKWIRE

A synthetic substitute for ephedrine. The chemistry, pharmacology and clinical application of phenylethanolamine sulfate (MILLER, PINESS) 17. The minimum lethal dose in pharmacy (SIMON) 17. Organic Bi derivatives (FABRYKANT) 10. Chaulmoogric oils. The oil of Gorli (ANDRÉ, JOUATTE) 10.

I—ZOOLOGY

R. A. GORTNER

Erythrocytaphagic capacity of the hepatic peritoneum in the splenectomized horned toad, *Phrynosoma solare*. H. E. JORDAN AND C. C. SPEIDEL. Univ. of Virginia. *Proc. Soc. Exptl. Biol. Med.* 25, 491-4(1928).—Examn. of the tissues of a splenectomized horned toad, 74 days after operation, revealed no splenic regeneration or compensatory myeloid metaplasia in any of the tissues examd. A striking change in the liver capsule had occurred, both serosal cells and subserous fibroblasts assuming intense phagocytic properties. The method by which the fragmenting erythrocytes are handled by the cells of the hepatic peritoneum is described. C. V. B.

The energy metabolism of *Paramecium caudatum*. A study of the function of the contractile vacuoles. WILHELM LUDWIG. Leipzig Univ. *Arch. Protistenk.* 62, 12-40(1928).—The metabolism of *Paramecium* is a function of the cell size. Figures for *Paramecium* of different sizes are given. FRANCES KRASNOW

Soil. A regulating factor of the medium for the cultivation of *Paramecium aurelia*. E. ANDREYEV. Pasteur Institute, Leningrad. *Arch. Protistenk.* 63, 94-104(1928).—

Soil, as well as other absorbants, adsorbs substances injurious to *Paramecium*. The soil that is added should be of a p_H comparable with the needs of the organism.

FRANCES KRASNOW

The occurrence of arsenic in fish. ERIK SADOLIN. *Dansk. Tids. Farm.* II, No. 7, 186-95(1928).—The method of Bang (*C. A.* 20, 1041) was used for quant. estn. of As. In codfish 2 analyses gave 0.4 and 0.8 mg. As per kg., muscular tissue; but 0.7 and 3.2 mg. As per kg. liver, in cod liver oil between 3.0 and 4.5 mg. As per kg. Olive oil and fat did not yield As. These results indicated that the As content of the liver is largely in the oil. Attempts were made to conc. the oil-sol. As compds. Oil was extd. with cold abs. alc. The ext. was shaken for 24 hrs. with a cold Na_2CO_3 soln. and the fatty acids obtained were partially crystd. by cooling. The liquid fatty acids were steam distd. under reduced pressure and the residue was extd. with alc. From 700 cc. cod-liver oil contg. 26 mg. As there was obtained 2 cc. contg. 2.0 mg. As. The oil-contg. muscular tissue from the cel was extd. with ether, whereby all As was removed from tissue, while in the oil 0.6 mg. As per kg. was found. Expts. with herring showed a content of 2.0 mg. As per kg. muscular tissue and 9.0 mg. As per kg. oil. When these results are compared with the expts. which have been carried out to det. the As compds. present in poisoned mammals (*Arch. intern. pharmacodynamic* 15, 399 (1905)), the conclusion must be that the compds. are different in the 2 cases. O. A. NELSON

Comparative pharmacological and physiological studies with muscle of marine animals. OTTO RIESSER AND ANNELIESE HANSEN. *Zoöl. Sta. Neapel. Arch. expil. Path. Pharm.* 134, 1-16(1928).—Analyses of the muscles of some invertebrate marine forms for phosphoric and lactic acids showed that the values characteristic for different species cover a wide range. Thus as regards phosphoric acid decapods gave values varying between 0.7795 and 0.912%, while octopods gave percentages between 0.456 and 0.5694. In the different species these values show far more constancy than did the lactic acid percentages. The latter ranged between 0.0205 and 0.1597% in decapods and between 0.0767 and 0.267% in octopods. Percentages for *Sipunculus* and muscles were: *Sipunculus*, phosphoric acid 0.425-0.4799, lactic 0.416; *Pinna*, phosphoric 0.171-0.3115, lactic 0.066-0.112; *Psammobia*, phosphoric 0.359; *Pecten*, phosphoric 0.4066, lactic 0.0491. Detns. of phosphoric acid in the foot-muscle of different species of snail showed that the amt. could be correlated with their phylogenetic arrangement; thus *Helix* gave 0.308%, *Trochus* 0.280%, *Natica* 0.256%, *Murex* 0.232%, *Helix* 0.193% and *Bulla* 0.144%. The lactic acid values showed no such regularity, nor did it prove to be more reliable in fish as differentiating different species of teleosts and elasmobranchs. Phosphoric acid, on the contrary, was more consistent. The muscles of various species of snail and mussel exhibited rather distinctive reactions to contracting agents, particularly to HCl. Teleost and elasmobranch muscles could be contrasted upon the basis of their behavior to acetylcholine and HCl. All fish muscles reacted in much the same fashion to veratrine and ammonia. G. H. S.

12—FOODS

F. C. BLANCK AND H. A. LEPPER

Report on (the determination of) coloring matters in foods: (quantitative separation of amaranth from tartrazine). C. F. JABLONSKI. U. S. Food, Drug and Insecticide Administration, New York. *J. Assoc. Official Agr. Chem.* 11, 434 8(1928); cf. *C. A.* 22, 121.—Attempts to sep. amaranth (I) from tartrazine (II) by a no. of different immiscible solvents and acid solns. proved unsuccessful. A no. of salts of org. bases ppt. I but have no effect on II, pseudocumidine sulfate being apparently the most effective; but complete pptn. of I could not be obtained, and moreover no pptn. could be obtained with concns. lower than 50 mg. of I in 20 cc. of soln. Attempts to split I into its components (naphthionic acid and "R" salt) by reducing with $SnCl_2$, and then isolating the less sol. component and weighing, showed that it is essential to have at least 50 mg. of I present, and the quant. yield was by no means satisfactory. Encouraging results were obtained by reducing with $SnCl_2$ (I gives naphthionic acid and "R" salt; II gives sulfanilic acid and phenylhydrazinesulfonic acid, which in turn is converted into sulfanilic acid by activated reducing agents, as well as into other org. compds. which do not enter into a subsequent dye combination), and then diazotizing and coupling the reduced product with a component that forms dyes of a soly. ratio different from those of I and II. On coupling with β -naphthol, naphthionic acid gives Fast Red A (S. & J. No. 102, Chem. Index No. 176), and sulfanilic acid gives Orange

II (S. & J. No. 86, Chem. Index No. 151), which can readily be sepd. by extg. their AmOH soln. with $1/512\text{ }N$ HCl. The exptl. procedure followed with a no. of different mixts. of I and II is described. When only small quantities of I are present, the Fast Red A produced should be detd. colorimetrically, and larger amts. can be titrated with $TiCl_3$.

A. PAPINEAU-COUTURE

A new procedure for determining tryptophan and tyrosine in proteins through the xanthoprotein reaction and its application to the most important proteins of our foodstuffs. J. TILLMANS, P. HIRSCH AND F. STOPPEL. Universitätsinstitut für Nahrungsmittel chemie Frankfurt a. M. *Biochem. Z.* 198, 379-401(1928).—This colorimetric detn. of tyrosine and tryptophan depends upon the xanthoproteic reaction specific for these amino acids. The reaction can be carried out even when these amino acids are components of the protein mol. without any preliminary hydrolysis. The color at 2 definite pH values is matched against that of a standard soln. contg. 50 mg. of *m*-nitrophenol (m. 96°) in 500 cc. $0.1\text{ }N$ NaOH. The color produced by 1 mg. *m*-nitrophenol in alk. media is taken as the unit of color intensity. The albumin + globulin of milk (human, cow, goat) show no differences but human milk contains more tryptophan and less tyrosine than the proteins of the other milks. Myosins from various meat sources show no appreciable difference in their tyrosine-tryptophan content. The proteins of wheat flour which are sol. in salt soln. have a high tryptophan content, while zein is lacking in tryptophan, thus confirming results obtained by earlier investigators. The tryptophan and tyrosine content of rye flour is so very different from that of the wheat flour that the two must not be regarded as similar. The tryptophan-tyrosine content of globulins from beans, peas and lentils varies between 1 and 2%. The water-sol. proteins (albumins) of important foodstuffs, with the exception of egg and blood albumins, have all a low tyrosine content (0.7-2.0%). Egg and blood albumin contain 4-5% tyrosine. The proteins of both animal and vegetable origin sol. in salt solns. have a low tyrosine content (0.7-2.0%). The important seed proteins (gliadins and glutenins) have a high tyrosine content (5-8%). S. MORGULIS

Studies in the proteins of Indian foodstuffs. II. The proteins of ragi (*Eleusine coracana*): Eleusinin, the alcohol-soluble protein. NUGGEHALI NARAYANA AND ROLAND V. NORRIS. Dept. Biochemistry, Indian Inst. Sci., Bangalore. *J. Indian Inst. Sci.* 11A, pt. 8, 91-5(1928).—Ragi is the staple cereal crop of the Mysore State and forms the greater part of the diet of the lower classes. Its food value is supposed to be approx. equal to that of wheat. The compn. is approx. ash 2.7, ether ext. 1.7, crude protein 8.4, crude fiber 3.4 and carbohydrates by difference 83.8%. The protein consists largely of a *prolamine* or EtOH-sol. protein named *eleusinin*. Eleusinin is sepd. by concn. of the EtOH ext. under reduced pressure until the first signs of pptn. are observed, filtered and poured with const. stirring into 10 times its vol. of distd. H_2O . An electrolyte such as NaCl ppts. the protein in flakes, sol. in 70% EtOH. Repeated soln. and repptn. are used to purify the protein. The dried, purified powder was defatted by the Soxhlet method. A light gray powder contg. about 15.9% N results. Eleusinin is insol. in dil. EtOH, gives pos. reactions for tyrosine and tryptophan, and neg. tests for P. Cystine is probably absent. The mean of 4 combustions gave C 53.29, H 7.35, N 15.91 and O 23.34. By using Plimmer's modification of the Van Slyke method for detg. N distribution in eleusinin, an av. of 3 detns. gave insol. humin 0.87, sol. humin 0.28, amide 20.52, basic (total) 5.93, arginine 2.60, histidine 2.69, lysine 0.64, total non-basic 71.16, amino 69.03 and non-amino 2.13. The totals make 98.76% of the N accounted for. The essential difference in N distribution between eleusinin and other prolamines is the lower content of basic N including the possible absence of cystine and a correspondingly high % of amino N. The work is being extended. C. R. FELLERS

Report on (the determination of) food preservatives. WYATT W. RANDALL. State of Maryland, Department of Health, Baltimore, Md. *J. Assoc. Official Agr. Chem.* 11, 429-33(1928); cf. C. A. 22, 121.—Results are given of a collaborative comparison of the present official A. O. A. C. method for Na benzoate in tomato ketchup, orange-juice concentrate, cider and crab-apple jelly, and of the proposed method previously described, which was modified by extg. with Et_2O instead of $CHCl_3$. A higher crude ext. was obtained with Et_2O than with $CHCl_3$, but this does not militate against the use of Et_2O if thorough drying and sublimation are used for purification. With the modified method (and probably also with the official method) the crude ext. contains material other than benzoic acid, sometimes in relatively large amt. When pains are taken to dry this residue thoroughly, the loss of wt. resulting from sublimation and the direct wt. of the sublimate itself will each serve as a detn. of benzoic acid, showing that sublimation serves an excellent purpose. Titration of a properly dried

and sublimed product should be the most accurate method for detg. benzoic acid. The official method usually yields results that appear better than they actually are, because acids other than benzoic are extd. by CHCl_3 , while the benzoic acid is not extd. completely, and when the quantity of such other acids is small the 2 errors may counter-balance each other.

A. PAPINEAU-COUTURE

Report on metals in foods: (determination of arsenic). W. F. CLARKE. U. S. Food, Drug and Insecticide Administration, Washington, D. C. *J. Assoc. Official Agr. Chem.* 11, 438-42(1928); cf. *C. A.* 22, 121.—Collaborative study of 4 modifications of the Gutzeit method, though it gave very good results in some instances, showed that not one of the various modifications of the Gutzeit method can be used by the av. analyst with the assurance or even probability that his results will be accurate, unless he attains considerable experience in its use. A volumetric method capable of detecting small quantities of As, subject to better control and simpler than the Gutzeit method, is highly desirable.

A. PAPINEAU-COUTURE

Report on (the determination of) glutenin in flour. M. J. BLISH. Agr. Expt. Station, Lincoln, Nebr. *J. Assoc. Official Agr. Chem.* 11, 475-8(1928); cf. *C. A.* 22, 122.—A collaborative comparison of the Blish-Sandstedt (*C. A.* 19, 1914), $\text{Ba}(\text{OH})_2$ (Blish, *C. A.* 22, 122) and Sharp-Gortner (*C. A.* 18, 3655) methods, directed by Coleman (*C. A.* 21, 3092), showed that the results are not as concordant as might be desired, which was partially due to a surprising variation in the figures for total protein. No preference is indicated for either method from the standpoint of probable accuracy, but the $\text{Ba}(\text{OH})_2$ is preferable from the standpoint of simplicity. A collaborative study of the $\text{Ba}(\text{OH})_2$ method, conducted by B., gave somewhat widely varying results (3.79-5.03, av. 4.31%), which may be partly due to the use of MeOH from different sources, as, if an appreciable quantity of ketones or aldehydes is present in the MeOH, they might react with certain chem. groups in proteins in such a manner as to alter their solubilities. In view of the findings of Csonka and Jones (*C. A.* 21, 2718) on the constituents of glutenin, the possibility of the variation of the relative proportions of α - and β -glutelins in glutenins should be investigated.

A. PAPINEAU-COUTURE

Report on (the determination of the) diastatic value of flour. F. L. TAGUE. Kansas State Agr. College, Manhattan, Kansas. *J. Assoc. Official Agr. Chem.* 11, 483-4 (1928).—Considerable work was done (details not given) on the detpn. of a uniform product from wheat starch which could be used as a substrate in detg. diastatic value, but the resultant products showed no improvement over the raw starch. Only 2 starches from other sources (not mentioned) showed improvement in uniformity of quality. Seven substances other than starches were investigated for substrates, and details are being worked out for 3 of these that give special promise.

A. P.-C.

Chemical enzymic studies of wheat flours. NELLY NEUENSCHWANDER. Biochem. Lab. Univ. Stockholm. *Biochem. Z.* 199, 445-50(1928).—In expts. with the methylene blue method it was found that flour by itself produces only slight decoloration. If either cozymase, *i. e.*, the activator of the mutase, or zymophosphate, *i. e.*, the H_2 donator, alone is added there is little change but if the 2 are added together the enzyme activity is greatly increased. The enzyme is apparently in the cells and is poorly dialyzable. The degree of decoloration or the amt. of oxido reduction enzyme present in flour depends upon the degree of milling. Likewise the enzyme activity differs in various flour samples, the Manitoba wheat flour having the greatest and the Swedish the least activity, while the other species of wheat show variable amts. in the order: Rosa Fé > Northern Spring > Australian. Respiration expts. with the same wheat flours do not yield results as regular as the methylene blue method and the variations by the 2 methods do not agree.

S. MORGULIS

Report on (the analysis of) cereal foods. F. C. BLANCK. Bur. of Chemistry and Soils, Washington, D. C. *J. Assoc. Official Agr. Chem.* 11, 458-64(1928); cf. *C. A.* 22, 122.—Discussion of the reports of the associate referees (see following abstrs.), with a selected bibliography of 31 references to articles published in 1926 and 1927.

A. PAPINEAU-COUTURE

Report on the sampling of flour. H. RUNKEL. U. S. Food, Drug and Insecticide Administration, Chicago, Ill. *J. Assoc. Official Agr. Chem.* 11, 464-70(1928); cf. *C. A.* 22, 122.—The method previously proposed was studied collaboratively by making H_2O detns. on samples taken by the same operator in different sacks in the same pile and taken by different operators in the same sacks. In sampling a single sack of flour, the method gave av. variations from the probable true moisture content approx. only 1.5 times the av. analytical variations, and in the majority of instances the sampling variations and analytical variations were practically the same. When sampling a

pile of sacks, the method gives reasonably close checks on 2 samples from the same pile taken by different operators.

A. PAPINEAU-COUTURE

Report on (the determination of) ash in flour. D. A. COLEMAN. Bur. of Agr. Economics, Washington, D. C. *J. Assoc. Official Agr. Chem.* 11, 470-5(1928); cf. *C. A.* 22, 122.—The use of alundum should be eliminated as a factor in the rapid ashing of flour because of the difficulty of obtaining const. wt. after ignition. Addn. of glycerol-alc. to flour to hasten ashing and prevent the formation of a hard carbonaceous mass with certain classes and grades of flour should be permitted. The use of 5% H_2O_2 , as proposed by Sullivan and Near (*C. A.* 21, 969) as an aid to rapid and satisfactory ashing, has no advantage over glycerol-alc., and the temp. (615°) to be used with this method is too high as it causes the ash to fuse. An av. difference of 0.072% was found in the ash content of straight-grade flour when ashed by the official A. O. A. C. method and the Dutch Govt. method (adding H_2SO_4 before ashing and multiplying the sulfated ash by 8/9).

A. PAPINEAU-COUTURE

Report on (the determination of) hydrogen-ion concentration of flour. C. H. BAILEY. Agr. Expt. Station, St. Paul, Minn. *J. Assoc. Official Agr. Chem.* 11, 478-81(1928); cf. *C. A.* 22, 123.—Collaborative study of the method using a H electrode gave more concordant results than the previous study, the coeff. of variation being 1.63%, as compared with 5.00% previously observed. Varying results were reported with heavily buffered solns., and B. considers that errors that arise in the detn. of the p_H value of flour are not attributable to difficulties inherent in the prepn. of the ext., but arise subsequently in the manipulation of the electrodes and the potentiometer. Fair agreement was obtained by 4 collaborators using the quinhydrone electrode; but in an extensive study using different types of electrodes B. and J. A. Dunn found substantially greater differences in duplicate detns. with the quinhydrone electrode than with the H electrode.

A. PAPINEAU-COUTURE

Report on (the determination of) gluten in flour. RAYMOND HERTWIG. Hecker H-O Co., Inc., Buffalo, N. Y. *J. Assoc. Official Agr. Chem.* 11, 481-3(1928); cf. Dill and Alsberg, *C. A.* 18, 3655; Coleman, *et al.*, *C. A.* 21, 2036.—Inquiries among competent cereal chemists and reference to the literature indicated that: (1) the gluten method is still used, but not as extensively as formerly; (2) it may give an idea of gluten quality, judged by an experienced and observing operator; (3) the quantities of the gluten ascertained by washing cannot be expressed in definite mathematical terms; (4) the quant. results are only approx. The general consensus of opinion seems to be that the chem. protein detn. is the best single test for gluten quality. A. P.-C.

Report on (the determination of) starch in flour. J. C. PALMER. U. S. Food, Drug and Insecticide Administration, Seattle, Wash. *J. Assoc. Official Agr. Chem.* 11, 484-7(1928); cf. Rask, *C. A.* 22, 123.—In the Rask method (*C. A.* 21, 1425), preliminary peptic digestion, as suggested by Hartmann and Hillig (*C. A.* 21, 287), considerably slowed up filtration and is liable to cause loss of starch since peptic activity and diastatic activity take place under the same conditions. Starch residues from whole wheat flours contained 0.102% N, equiv. to 0.58% protein. The drying time of 1.5 hrs. at 130° is ample to remove all H_2O . Because of the extreme hygroscopicity of the starch, the crucible contg. it should be well covered immediately on removal from the oven and kept covered while in the desiccator and during weighing. Contrary to common belief, the diastatic activity of flour is not destroyed by the preliminary washings with Et_2O and 70% $EtOH$, and delay during the H_2O washing may cause loss of starch through diastatic inversion. No appreciable hydrolysis occurs when the washed sample is allowed to stand 4 hrs. in contact with a few drops of 20.5% HCl ; and should it be necessary to introduce any delay during the operation, it should preferably be done at this point.

A. PAPINEAU-COUTURE

Report on (the determination of) fats, lipoids and lipid phosphoric acid (P_2O_5), water-soluble protein-nitrogen precipitable by 40% alcohol, and unsaponifiable matter in alimentary pastes, and unsaponifiable matter in flour. SAMUEL ALFEND. U. S. Food, Drug and Insecticide Administration, St. Louis, Mo. *J. Assoc. Official Agr. Chem.* 11, 490-7(1928); cf. *C. A.* 22, 123.—Results obtained by and comments on different methods for these several detns. as reported by collaborators are given. The acid hydrolysis method for fat again gave consistently higher results than direct extn.; the technic might advantageously be modified to allow weighing the sample directly into the extn. tube. Though the agreement between different collaborators with the present tentative A. O. A. C. method for lipoids and lipid P_2O_5 was not as close as might be desired, the method is believed to be the best available, and is recommended for adoption as official. In the official method for detn. of H_2O -sol. protein-N precipitable by 40% alc., filtration and washing of the pptd. protein are difficult and time-

consuming; this can be eliminated by detg. the precipitable N indirectly as the difference between total H_2O -sol. and non-precipitable H_2O -sol. N. In spite of the double chance of error introduced by making 2 N detns., practically the same results were obtained by the direct and indirect methods. 1.2% NaCl soln. is a better protein solvent than H_2O and exts. considerably more alc-insol. protein than the former; but since all authentic data bearing on the differentiation of egg yolk products from whole egg products (for which such methods were devised) are based on H_2O -sol. N, the NaCl soln. may be used for flour, but not for alimentary pastes. Comparison of the modified Kerr-Sorber and F. A. C. methods for unsaponifiable showed that the latter gave slightly higher results on the whole, the variation between different collaborators being about the same in both cases and too great to be satisfactory. A. P.-C.

Report on (the determination of) flour-bleaching chemicals. G. C. SPENCER. Bur. of Chemistry and Soils, Washington, D. C. *J. Assoc. Official Agr. Chem.* 11, 487-8(1928).—In the Seidenberg method (C. A. 20, 74) for the detn. of Cl in flour direct titration in presence of K_2CrO_4 indicator was not as satisfactory as the Volhard method. In the latter: (1) the pptd. AgCl was removed more satisfactorily by boiling and filtering than by using Et_2O for its coagulation; (2) better results were obtained with KCNS than with NH_4CNS ; (3) the HNO_3 used was rendered free from N oxides by adding $1/4$ its vol. of H_2O and boiling until colorless, which condition was preserved when the acid was kept in the dark; (4) 3 cc. of 1% $Fe_2(SO_4)_3 \cdot 9H_2O$ is most satisfactory as indicator. Ashing the extd. fat can be carried out in a porcelain crucible as well as in Pt dishes. The Rask method generally gives results about 20% lower than the Seidenberg method. In detg. total Cl in flour, ashing is best carried out by mixing with a mixt. of CaO, MgO and $Mg(NO_3)_2$, as in the Eschka method for S, but difficulty may be experienced in procuring CaO and MgO that are sufficiently free from Cl

A. PAPINEAU-COUTURE

Report on experimental baking tests (of flour). M. J. BLISH. Agr. Expt. Sta., Lincoln, Nebr. *J. Assoc. Official Agr. Chem.* 11, 488-90(1928); cf. C. A. 22, 2007. A brief and general account of the present status of the project. A. P.-C.

Studies on butter salts. O. F. HUNZIKER, W. A. CORDES AND B. H. NISSEN. *J. Dairy Sci.* 11, 333-51(1928).—Results of chem. and bacteriol. analysis of 10 leading butter salts are given, as well as the methods used. The usual small quantity of impurities found in high-grade salt had no effect on the quality of butter used. Even the addn. of relatively large amts. of impurities, such as 2% $CaSO_4$, 3% KCl, 1% $CaCl_2$, and 1% $MgCl_2$, failed to have any noticeable effect on the flavor of the butter.

J. C. JURRJENS

The approximate determination of butter and coconut fat in fat mixtures. THURE SUNDBERG. Lab. Stockholm Bd. Health. *Z. Untersuch. Lebensm.* 55, 397-404(1928). In Sweden not only pure margarine is sold but also margarines contg. 10-20% butter fat. Lab. methods for detg. butter fat in such products are presented. Tables and charts based on Reichert-Meissl and Polenske numbers made on exptl. mixts. of butter and coconut fat enable S. correctly to det. the % of these ingredients present in any given sample with very slight error. Cf. C. A. 22, 3793. C. R. FELLERS

The fatty acids of Egyptian butter fats. H. ATKINSON. *Analyst* 53, 520-30(1928).—The usual analytical methods involving the iodine no., Reichert-Meissl, Polenske, sapon., and refractive index values are not sufficient for the characterization of the purity of a sample of butter when it is not known whether the fat was obtained from the gamoos, cow, sheep or goat. Analyses based on the soly. of the water-insol. acids or of the nonvolatile acids also give results which leave much to be desired. It has been found, however, that when 1 g. of sapond fat is distd. with 210 cc. of water, the titration value of the non-volatile acids obtained by subtracting that of the volatile acids, expressed in mg. of KOH, from the sapon. no. is in general lower in butter fats of the sheep and goat than in those of the cow and gamoos. If the sum of the 2 values, oleic acid and acids insol. in 62% aq. alc., is subtracted from the non-volatile acids, a no. is obtained representing the *residual acids*, which is fairly const. for the butter fat of all these animals. Addn. of coconut oil or palm kernel oil has little effect on the non-volatile acids but decreases the sum of the 2 values referred to in this last sentence to an extent practically in proportion to the amt. added and the *residual acids* are increased by about 12 units for every 10% of added oil. Addn. of beef fat decreases the *residual acids* by about 2 units for every 10% of added fat but as this effect is comparatively small, the increase due to the presence of coconut or palm kernel oil is perceptible in a mixt. of the 2 with butter fat. The purity of the fat being established in this manner, the origin can be deduced from the Polenski and Reichert-Meissl ratio or the insol. Ag value.

W. T. H.

The detection of margarine in butter. H. P. STÄDLER. Public Research Board, Pforzheim. *Z. Untersuch. Lebensm.* 55, 404-5(1928).—The use of a *Litterscheid polarization microscope* is advocated as a rapid approx. method for the detection of starch and foreign fats. C. R. FELLERS

The Duclaux method* for the estimation of volatile fatty acids and its application to the estimation of butter fat in margarine. A. KNETEMANN. *Rec. trav. chim.* 47, 950-70 (1928).—The object of this investigation was to study the theoretical basis of Duclaux' method, and its applications in analytical work. It was found that the distn. curves of Duclaux are fully detd. by a special const., which has been called the "distn. value," C. A. formula was deduced theoretically in which the "distn. value" is expressed as a function of the quantity of acid obtained in a distn. fraction and the vol. of this fraction. Distn. values of formic, acetic, propionic, and valeric acids were calcd. from Duclaux' results, while those of pure butyric, caproic, caprylic, benzoic, and salicylic acids were experimentally detd. Figures given by Duclaux, Boekhout and de Vries for butyric acid are incorrect, as they used impure acid. A method was worked out for the estn. of butter fat in margarine based on the principle of Duclaux. On account of practical considerations it is to be preferred to make use of the empirical distn. figures found for butter fat and coconut oil instead of the distn. curves for pure butyric and caproic acids. Particulars in regard to practical operation are given in detail. It is shown that during sapon. at high temp. (180°), acids are formed which cause too high results: for this reason another sapon. method at lower temp. is suggested. The results of this method of analysis are more exact than those obtained by van der Laan's method, especially if abnormal coconut oils are used in manuf. J. C. JURRIJENS

Margarine indicators. G. PILAUDEAU, Société des Experts-Chimistes de France, AND E. VITOUX, Laboratoire Central du Ministère de l'Agriculture. *Ann. fals.* 21, 416-24(1928).—As a result of a competition, 2 suggestions were considered: addn. of 0.02% furfural and addn. of 0.05% of Fe or Ni stearate. It was found, however, that in both cases the addn. gave a disagreeable taste to the margarine. The Swedish Govt. having obtained satisfactory results with 0.2% starch, a study was made of the most suitable starch, its incorporation with the margarine, and its detn. so as to detect with certainty the addn. of 5% margarine in butter. Potato, maize and rice starches are equally suitable for the purpose. The starch is best added to the oil used in the margarine, the oil being stirred just before use to distribute the starch evenly. For the detn. of the starch, remove the fat by means of petr. ether, invert the starch with 2.5% H₂SO₄ by heating 3 hrs. on the water bath or 30 mins. at 110°, defecate, det. reducing sugars by Fehling's soln., and correct for the lactose present by detg. the latter separately. The technic is described in detail. To identify the starch, melt 50 g. at as low a temp. as possible on the water bath, remove the fat by repeated decantation with petroleic ether, centrifuge the aq. liquid strongly to throw down the starch and casein, decant, dehydrate with 5 cc. alc., remove the last traces of fat with Et₂O, dissolve the casein with warm 1% NH₃ and exam. the residue under the microscope. Addn. to butter of 1% of margarine contg. 0.2% starch can be detected with certainty. A. PAPINEAU-COUTURE

The simplified molecular constant (S. M. C.) and the freezing point of ewe's milk. R. MARTIN. Station Agronomique de Rodez. *Ann. fals.* 21, 390-7(1928).—The d., total solids, fat, non-fat solids, ash, casein, lactose, acidity, chlorides, S. M. C. and f. p. of the morning and evening milk of 48 individual ewes are tabulated. The results confirm those of Sajous (C. A. 19, 1300) and Andouard (Pharm. Thesis, Toulouse, 1922). The S. M. C. found (73-84.6, av. 80.5) is appreciably higher than that of cow's milk (70-9, av. 73-4). Since, except under pathological conditions, the milk serum and blood serum of a given individual animal are isotonic, the f. p. of ewe's milk (-0.58 to -0.63°, av. -0.61°) is lower than that of cow's milk (-0.55 to -0.56°) as expected. The original acidity is higher than that of cow's milk, as was to be expected from the higher casein content (cf. Bordas and Touplain, C. A. 5, 2873). A. P.-C.

Milks of the department of Orne (region of Sées): true and apparent simplified molecular constant (S. M. C.) L. BLEUQ. *Ann. fals.* 21, 398-410(1928).—The d., acidity, total solids, lactose, fat, casein, ash, chlorides and true and apparent S. M. C. of 169 milks are tabulated and show that the compn. of the milks of this region is normal. A. PAPINEAU-COUTURE

Methylene blue for the milk reductase test. D. W. STEWART. *Analyst* 53, 532(1928).—One Blauenfeldt and Tvede methylene blue tablet dissolved in 200 cc. of water gives a soln. such that 1 cc. is suitable for 40 cc. of milk. Slight differences in the strength of the dye soln. do not have much effect on the test. W. T. H.

The influence of the *p*_H of agar media upon the bacterial counts of raw and pas-

teurized milk. JACK FABER. *J. Dairy Sci.* **11**, 401-3(1928).—Expts. were conducted on 100 samples each of raw and pasteurized milk, and 5 of each plated in dilns. of 1:100, 1:1000, and 1:10,000 each week. Agar of p_H values of 6.2, 6.4, 6.6, 6.8 and 7.0 were prepd. every 2 weeks for plating. The results obtained by plating 99 samples of raw milk showed but little variation in counts. The medium having a H-ion concn. of 6.8 gave the highest av. bacterial count. The other media ranged as follows: 6.6, 6.4, 6.2 and 7.0. The results obtained by comparing the results of 100 samples of pasteurized milk plated on beef ext. agar showed but little variation. The medium having a H-ion concn. of 6.4 gave the highest av. bacterial count; the others ranged in the following order: 6.6, 6.8, 7.0 and 6.2. Conclusion: If the bacterial counts of raw and pasteurized milk, plated on beef ext. agar, are significantly affected by the H-ion concn. of the media, when ranging between 6.2 and 7.0, the 100 samples are not sufficient to show this significance. J. C. JUURJENS

Preservative tablets and preserved milk samples. L. M. LAMPERT. *Monthly Bull. Dept. Agr. California* **17**, 449-53(1928).—Analyses of 11 tablets representing the product of 4 manufacturers showed $HgCl_2$ to be the effective preserving agent in each case. Milk samples were not always completely sterilized by these tablets. Milk preserved with $HCHO$ in the diln. used showed much greater bacterial growth than milk preserved with $HgCl_2$ tablets. A finely divided ppt. or curd was present in all of the samples which had been preserved with $HgCl_2$. This appeared to be of consequence in one case only, in which citric acid was a constituent of the tablet. There was a slight decrease in the percentage of fat when detd. on preserved samples, from that found when detd. on fresh samples. This decrease was greater when $HgCl_2$ was used as the preservative. L. W. RIGGS

Some observations on the consistency of cream and ice cream mixtures. GEORGE M. BATEMAN AND PAUL F. SHARP. *J. Dairy Sci.* **11**, 380-96(1928). The yield value and consistency of cream increased with fat content, aging and homogenization, while it decreased by heating. Ice cream mixts. of av. compn. vary considerably in yield value and consistency. Some of the difficulties are shown, which may arise if plastic substances are treated as viscous. Attention is called to some of the difficulties in relating the "viscosity" of ice cream mixt. to their freezing properties. J. C. J.

Report on (the analysis of) eggs and egg products. J. C. PALMER. U. S. Food Drug and Insecticide Administration, Seattle, Wash. *J. Assoc. Official Agr. Chem.* **11**, 421-3(1928); cf. *C. A.* **22**, 282; Lepper, *C. A.* **22**, 121. Detn. of H_2O in dried eggs by heating in vacuum at 100° gives consistently higher results than by heating in vacuum at 55° . Comparative detns. of N and lipoids in the product after drying at 55° and at 100° showed that little, if any, loss of N or lipoids occurs at the higher temp. As the xylene-distn. method gives results quite comparable to those obtained by the 100° vacuum method, it would seem that drying in vacuum at 55° fails to remove all the H_2O present. A. PAPINEAU-COUTURE

Report on (the determination of) water-soluble protein, unsaponifiable matter and ash in eggs. SAMUEL ALFEND. U. S. Food, Drug and Insecticide Administration, St. Louis, Mo. *J. Assocn. Official Agr. Chem.* **11**, 424-7(1928). Work was done only on the development of a satisfactory method for the detn. of ash, and the following conclusions were reached: (1) Ashing of solid or liquid eggs without any previous treatment is impracticable and yields low results. (2) Addn. of 60-mesh alundum reduces the ashing time by 75%. (3) Addn. of $Mg(OAc)_2$ soln. gives higher ash, indicating that in the absence of an excess of basic material some inorg. matter is lost by volatilization. (4) Addn. of $Mg(OAc)_2$ soln. prevents the creeping of the material up the sides of the ashing dish during the charring. (5) SiO_2 dishes are markedly corroded by MgO , and particularly by granulated Al_2O_3 , during ashing. (6) Pt dishes do not appear to be attacked by egg ash in presence of Al_2O_3 and an excess of MgO . (7) Porcelain crucibles are not attacked by MgO or Al_2O_3 on ignition at low red heat. A. PAPINEAU-COUTURE

Report on the detection of decomposition in eggs. H. I. MACOMBER. U. S. Food, Drug and Insecticide Administration, New York. *J. Assocn. Official Agr. Chem.* **11**, 427-8(1928); cf. *C. A.* **22**, 121.—Further collaborative results on the detn. of acidity in the fat of dried eggs gave excellent results. A. PAPINEAU-COUTURE

Comparative acidimetric investigations on seven meat extracts, seasonings and similar products. PAUL HIRSCH AND JOSEPH KIESGEN. Food Chem. Inst., Frankfurt-on-Main. *Z. Untersuch. Lebensm.* **5**, 415-23(1928).—The p_H , acidity and formol titration curves were detd. on various samples of meat and soup exts. and also peptone. In soup flavorings the protein was greatly broken down by deep-seated hydrolysis. Between p_H 7 and 11.6, there were 11 atoms of N to each 7 acid groups. Though

there is a general similarity in the titration curves for the several products examd., those for peptone and ext. were much smoother and more uniform than those developed from the soup-flavoring substances.

C. R. FELLERS

Report on (the determination of protein in) meats and meat products. R. H. KERR. Bur. of Animal Industry, Washington, D. C. *J. Assocn. Official Agr. Chem.* 11, 507-13(1928); cf. *C. A.* 22, 125.—Results of numerous tests show that digestion of 2-4 hrs. with an elec. heater (Gilmer), and to a less extent with a Bunsen burner, frequently gives rise to a considerable loss of N. With the elec. heater, highest results were obtained when an asbestos guard was used to prevent contact of the flask with the curved inner surface of the bowl-like depression in the upper brick of the heater and leave the flask about 1 in. above the coils.

A. PAPINEAU-COUTURE

Report on (the determination of) crude fiber in cacao products. MARIE L. OFFUTT. U. S. Food, Drug and Insecticide Administration, New York. *J. Assocn. Official Agr. Chem.* 11, 514-6(1928).—The present A. O. A. C. method for crude fiber in cacao products is somewhat defective because the quantity of sample used varies according to the amt. of sugar and other substances added during manuf. It has been modified by operating on a 2-g. sample consisting of the Et_2O -, H_2O - and alc.-insol. material, and the technic of the modified method is given in detail. The results obtained by the modified method seem to show greater variations for shell material and nib material than those obtained by the usual method. The modified method is applicable to cocoa, bitter liquors and sweet liquors; but in its present form it is not applicable to milk chocolates.

A. PAPINEAU-COUTURE

Report on (the detection of adulteration of) cacao butter (and milk chocolate). WALTER F. BAUGHMAN. Bur. of Chemistry and Soils, Washington, D. C. *J. Assocn. Official Agr. Chem.* 11, 517-20(1928); cf. *C. A.* 20, 118.—The test previously described for the detection of coconut oil and palm kernel oil in cacao butter is not suitable in the presence of milk fat, as the latter contains caproic, caprylic and capric acid glycerides. A collaborative study showed that the test can be made satisfactory for milk chocolate fat by using as a blank a mixt. of cacao butter and milk fat in the proportions in which they occur in the fat sepd. from the milk chocolate product under examn., the milk fat content being calcd. approx. either from the lactose or casein contents.

A. PAPINEAU-COUTURE

Report on (the analysis of) fruits and fruit products. H. J. WICHMANN. U. S. Food, Drug and Insecticide Administration, San Francisco, Calif. *J. Assocn. Official Agr. Chem.* 11, 442-4(1928); cf. *C. A.* 22, 121.—A brief discussion of the work done by members of the Assocn. during 1927 (cf. next abst.; also Hartmann and Hillig, *C. A.* 21, 2451).

A. PAPINEAU-COUTURE

Report on (the determination of) ash (constituents) in fruit products. DORIS H. TILDEN. U. S. Food, Drug and Insecticide Administration, San Francisco, Calif. *J. Assocn. Official Agr. Chem.* 11, 445-8(1928); cf. *C. A.* 22, 122.—In the scheme of analysis previously suggested, the MnO_2 pptd. by AcONa-Br in the detn. of CaO and MgO can be used for the detn. of Mn, both the gravimetric and the colorimetric periodate methods giving satisfactory results for such small quantities as are usually found in the ash of plant material. The present official A. O. A. C. procedure in the Lindo-Gladding method of washing K_2PtCl_6 with 80% alc. causes a slight error (which may be quite appreciable with the small quantities of K_2O that may be encountered in plant material) due to the soly. of the ppt.; but this error is eliminated by using exclusively a 90% alc. wash soln.

A. PAPINEAU-COUTURE

The available carbohydrate content of some fruits and vegetables. MARION BELL, M. LOUISA LONG AND ELSIE HILL. Potter Metabolic Clinic, Santa Barbara. *J. Metabolic Research* 7-8, 195-7(1925-6).—The percentage of available carbohydrate in canned vegetables was as follows: asparagus 1.8, lima beans 7.5, string beans 0.57, stringless beans 0.67, corn 9.7-14.8, peas 5.4, pumpkin 3.0-5.0, rhubarb 1.3, spinach 2.4, and tomatoes 2.6-3.0. In canned fruits the following values were obtained: apricots 5.5-7.0, blackberries 4.2-5.5, raspberries and strawberries 5.0, cherries 4.8-5.5, grapefruit 6.1, peaches 4.0-5.8, pears 4.1-5.1, pineapple 8.0-10.7 (20.0% in one variety); and quince 4.3. In the edible portion of fresh fruits and vegetables the available carbohydrate was: artichokes 4.1, avocado 1.5, barle-de-capucin 0.6, cassaba melon 8.3, cauliflower stalk 3.0, chard 1.0, chenopodium 0.2, chiote 1.9, cucumber 1.7, grapefruit 5.3, guavas 6.4, kale 2.0, loquats 5.6, honeydew melon 7.0, mustard greens 0.0, dark red osach 0.2, patience 0.6, phytin 0.6, purslane 0.3, *Scolymus Hispanicus* 0.3, banana squash 6.2, yellow squash 2.2, winter squash 2.5, summer squash 8.0, zucchini 2.1, and witloof, 0.5. Unwashed bran contained 27.3% available carbohydrates, cacao

13.9, cacao shells 0.14, coffee (dry) 11.0, ginger ale 10.0, Roman meal 41.9 and rye meal 56.3.

H. J. DEUEL, JR.

Changes in composition during ripening and storage of melons. J. T. ROSA. University of California. *Hilgardia* 3, 421-43(1928).—The late stages of development and the ripening process in cantaloupes, Honey Dews, Casabas, and watermelons are characterized by the following changes when the fruits remain attached to the plant: progressive increase in per cent of total solids, in total sugar content, in sol. solids, and in sp. gr. of the juice. Reducing sugars, which consist of approx. equal proportions of levulose and dextrose, decrease in amt. during ripening, being partly used in respiration, and partly changed to sucrose. Sucrose increases more rapidly than reducing sugars decrease, showing that sugars are moving into the fruit until the full-ripe stage is reached. The total amt. of pectic substances remains about the same, but the amt. of protopectin, high in unripe melons, decreases rapidly during ripening, with a corresponding increase of pectic substances in sol. form, suggesting that partial disintegration of cell walls is an important part of the ripening process. The flesh becomes progressively sweeter and softer, and the rind turns from green to yellow. Fruits which are picked from the plants in the immature condition show the following changes during the storage at ordinary temps. (70°-75°): little or no increase in sugar content, in the early part of the storage period, and generally a small decrease in sugars, during the latter part of storage, due to the losses occasioned by respiration. Honey Dews and Casabas during storage show the same change in form of sugars as do fruits attached to the plant, *i. e.*, decrease in reducing sugar and increase in sucrose. The total content of pectic substances decreases slightly, and protopectin is changed to pectin, just as in fruit attached to the plant. The flesh becomes softer, but does not gain appreciably in sweetness; hence melons picked very immature, while the sugar content is low, upon artificial ripening become soft and to some extent juicy, but do not attain good flavor because of the lack of sugar. Fruits of Honey Dew and Casaba picked slightly unripe and exposed to ethylene at the rate of 1 pt. to 2000 of air, or 1 pt. to 4000 of air, for 2 to 5 days, show no increase in sugar content, but do show a marked acceleration in the rate of softening, in change from green to yellow color of the rind, and in conversion of reducing sugars to sucrose, compared to similar fruit stored without ethylene treatment. The effects of ethylene upon the ripening process are believed to be due to activation of enzymic reactions, and bring about changes in a short time that would ordinarily require a longer period.

J. J. SKINNER

The iodine content of Cape Cod cranberries. FRED. W. MORSE. Mass. Agr. Expt. Sta., Amherst Univ. *J. Biol. Chem.* 79, 409-11(1928). The I content of cranberries from crates, Sandy Neck and Nantucket were 26, 35 and 27 parts per billion, resp.

ARTHUR GROLLMAN

Artichokes. FRANK T. SHUTT. Dept. Agr. Canada, *Rept. Dominion Chemist.* Year Ending March 31, 1927, 53-4(1928).—Analyses of the combined stalks and leaves and of the tubers of artichokes (*Helianthus tuberosus*) gave H₂O 74.26, 73.23; crude protein 2.61, 2.33; crude fat 0.65, 0.13; carbohydrates 13.19, 21.46; fiber 5.70, 1.23; and ash 3.59, 1.62%, resp. The compn. of the stalks and leaves is very similar to that of the sunflower plant cut at an early stage of growth. The nutritive value of the artichoke as a stock food has not been definitely detd.

K. D. JACOB

The iodine number of Spanish paprika oil. LLOYD C. MITCHELL AND SAMUEL ALFEND. U. S. Food, Drug and Insecticide Administration, St. Louis, Mo. *J. Assocn. Official Agr. Chem.* 11, 523-7(1928); cf. *C. A.* 21, 289. —The I no. of 11 authentic samples of Spanish paprika grown in various districts in Spain in 1927, detd. by the previously described method, varied from 133.0 to 139.7, the lowest I nos. being obtained in the samples with the largest proportion of seeds, and therefore of oil. The I no. range (125-36) for paprika oil specified in the U. S. food standards is therefore not applicable when the CHCl₃-extn. method is used.

A. PAPINEAU-COUTURE

Examination of three caffeine-reduced (so-called decaffeinated) coffees. P. N. LEECH. Am. Med. Assoc. Lab. *J. Am. Med. Assocn.* 91, 880-3(1928).—The amt. of caffeine removal in com. samples of Kaffee Hag and Sanka was well over 90% if it is assumed that 1.2% of caffeine by wt. was originally present. The statement that 90 or 97% of the caffeine has been removed is meaningless unless the amt. originally present is declared. Routine checking of each batch of material is necessary and has been adopted by the Kaffee Hag and Sanka corporations. Blanke's Refined Health Coffee contains a relatively large amt. of caffeine notwithstanding the claim that 90% of the caffeine has been removed.

L. W. RIGGS

Report on (the analysis of) flavors and non-alcoholic beverages. J. W. SALE. U. S. Food, Drug and Insecticide Administration, Washington, D. C. *J. Assocn. Official*

Agr. Chem. 11, 503-7(1928); cf. *C. A.* 22, 124.—The steam distn. method gave acceptable results with oils of orange, lemon and limes dissolved in corn and cottonseed oils; with nutmeg and peppermint oils the errors were -3% to $+3\%$, and -7 to $+4\%$, resp. Collaborative results obtained in the colorimetric and gravimetric detn. of methyl-anthranilate showed rather wide deviations from the av., which may be due to the fact that with both methods experience is required to obtain acceptable results. S. considers the results reported sufficiently satisfactory to warrant adoption of both methods as official. The precautions required in the colorimetric method are briefly given.

A. PAPINEAU-COUTURE

Effects of atmospheric germs on household beverages. (Miss) R. DUFLOS. *Chimie et industrie Special No.*, 834-41(April, 1928).—A brief general discussion of the good and bad effects of atm. germs on water, milk, wine, cider and beer. A. P.-C.

The question of alcohol. JULES AMAR. *Compt. rend.* 187, 511-2(1928).—The alc. of wine or beer in very moderate doses is a thermogenic food which may constitute a certain fraction of the diet in winter. Alc. furnishes no muscular or nervous energy.

L. W. RIGGS

Industrial applications of p_H : cure for the blackening of canned Crustaceae. R. LEGENDRE. Office National des Recherches et Inventions. *Chimie et industrie Special No.*, 842(April, 1928); cf. *C. A.* 20, 3199.—Blackening can be prevented, and at the same time the flavor preserved or improved, by adjusting the p_H of the finished product to approx. 6, e. g., by addn. of AcOH, CO_2 , citric, lactic or tartaric acids, or acid condiments.

A. PAPINEAU-COUTURE

Curious case of antimony poisoning. J. T. DUNN. *Analyst* 53, 532-3(1928).—A lemonade powder contg. sugar, tartaric acid and $NaHCO_3$ was dild. with water and kept overnight in enameled buckets. Next day some 50-60 people who drank the lemonade were made sick. The enamel contained 2.88% of Sb_2O_3 , 19.6% Na_2O , 20.43% B_2O_3 and 39.48% SiO_2 . Other Sb_2O_3 enamels were not attacked by the same lemonade.

W. T. H.

The iron and manganese content of feeding stuffs. J. T. SKINNER AND W. H. PETERSON. Univ. of Wisconsin. *J. Biol. Chem.* 79, 679-87(1928).—The Fe and Mn contents of a no. of feeding stuffs were detd. The Mn content ranged from 5.4 mg. per kg. (yellow corn) to 712.4 mg. (field sugar beet tops). The Fe content ranged from 8.9 (polished rice) to 750 mg. per kg. (coconut oil meal).

ARTHUR GROLLMAN

The sunflower. C. D. TIMSON. Rhodesian Ministry of Agr. & Lands. *Rhodesia Agr. J.* 25, 281-96(1928).—Ash of sunflower heads, stems and leaves contained P_2O_5 0.98, K_2O 28.90 and CaO 12.00%. Air-dried leaves gave the following analysis: H_2O 14.87, fat 2.82, protein 16.50, carbohydrates 42.15, crude fiber 7.87, and ash 15.79%. The nutritive ratio is 1:2.9. Sunflower heads without seeds and sunflower meal made from heads contg. about 8% ripe seeds contained H_2O 11.73, 14.00; ether ext. 3.18, 5.86; protein 8.86, 8.84; carbohydrates 46.42, 29.70; crude fiber 18.19, 31.70; and ash 11.62 and 9.90%, resp. The nutritive ratios are 1:6.04 and 1:8.5, resp. Silage made from sunflowers was richer in protein and fat but poorer in carbohydrates than maize silage. The starch equiv. is lower and it is less palatable than corn silage.

A. L. MEHRING

Wild sunflower. FRANK T. SHUTT. Dept. Agr. Canada, *Rept. Dominion Chemist*, Year Ending March 31, 1927, p. 53(1928).—Two samples of wild sunflower from Saskatchewan contained H_2O 81.30, 81.30; crude protein 2.92, 2.88; crude fat 0.77, 0.75; carbohydrates 9.09, 8.83; fiber 3.47, 3.85; and ash 2.45, 2.39%. The samples were taken as the seeds were just beginning to form. The protein content is higher and the fiber content lower than in the cultivated sunflower. If this plant is found to be satisfactory from the standpoint of palatability and yield it may develop into a useful forage crop in semi-arid areas.

K. D. JACOB

The curing of hay with salt. FRANK T. SHUTT. Dept. Agr. Canada, *Rept. Dominion Chemist*, Year Ending March 31, 1927, p. 55(1928).—Expts. were carried out on the curing of hay with salt from the deposits at Malagash, N. S., to det. whether the preservative action of the salt would permit of damp hay being stored without molding and whether the presence of the salt would prevent spontaneous combustion of the hay. Analyses of the salted hays did not reveal any outstanding chem. characteristics but the salted hay had a better color and aroma, and a higher % of attached leaves and was less dusty than the unsalted material. Addn. of as much as 20 lb. salt per ton of hay had no bad effect on the health of the cattle, but 30 lb. per ton had a slight purgative action. The expts. are being continued.

K. D. JACOB

The "Sugar Jack" process. FRANK T. SHUTT. Dept. Agr. Canada, *Rept. Dominion Chemist*, Year Ending March 31, 1927, pp. 51-2(1928).—By use of a "con-

verter" it is claimed that an excellent silage may be prepd. from such roughages as stalks, vines, straw, clover threshings, etc. Expts. showed that, although by means of this process a hard, coarse roughage may be presented to the animal in a moist, soft and warm condition, with its palatability enhanced by a slight saltiness, the food value of the original material is not improved by the treatment. An analysis of the "converter" used in the process gave NaCl 75, hydrated dolomitic lime 23 and vegetable matter 2%. K. D. JACOB

Occurrence of As in fish (SADOLIN) 11I. Farm or field roots [nutritive value of mangels] (SHUTT) 28. The general occurrence of Au in foodstuffs (BERG) 11A. Treatment of organic wastes (WEAVER) 14. Apparatus for drying or cooling flour (U. S. pat. 1,690,013) 1. Phosphate in small spherical particles [for use in baking powder] (U. S. pat. 1,689,697) 18. Specific gravity registers for milk flowing through dispensing apparatus (U. S. pat. 1,689,658-9) 1. Cellulose from straw, cornstalks, etc. (Brit. pat. 286,211) 23. Glass-coated pipe coil suitable for heat exchange between foods, etc., and heating agents (U. S. pat. 1,689,435) 1.

Food product. IRVING S. MERRELL (to Merrell-Soule Co.). U. S. 1,689,357, Oct. 30. The manuf. of self-sustaining pieces or blocks of compressed baked milk powder is described.

Bleaching foods. WM. B. STODDARD and VAMAN R. KOKATNUR (to Pilot Laboratory, Inc.). U. S. 1,687,803, Oct. 16. Food materials such as flour are bleached with peroxidized products of acids such as occur in natural fats and oils, e. g., fatty acid peroxides made from coconut oil. U. S. 1,687,804 specifies treating flour or other material to be bleached with an org. peroxide compd. such as acetyl, fumaryl and succinyl peroxides and with fatty acid peroxides or other suitable activating per-compd. which increases the effectiveness of the bleaching agent. U. S. 1,687,805 specifies treating flour or other material to be bleached with a peroxidized compd. of a fatty acid or ester or other peroxidized compd. constitutionally similar to the vehicle of the coloring matter in the material to be bleached.

Preserving foods. G. VAN DER VEEN and G. J. P. H. A. DEBEUS. Brit. 286,006, March 14, 1927. Fruit, meat, vegetables or other foods are preserved by coating with a mixt. of paraffin and colophony in such proportions as to have a m. p. of about 25-30°. Powd. charcoal or other suitable form of C may be added, as may also MgO, MgCO₃, MgCl₂ and soda. The articles of food may be treated with an acid permanganate soln. before being coated.

Dried milk and other preparations. CARL KNOCH and FRITZ GROSS. Fr. 638,341, July 28, 1927. See Brit. 285,313 (C. A. 22, 4670).

Chocolate milk composition. WILBERT A. HEYMAN. U. S. 1,689,028, Oct. 23. Cocoa powder of low fat content is mixed with water and the mixt. is heated to a temp. sufficiently high to break up the starch cells of the cocoa, homogenized, mixed with NaHCO₃ and milk and the mixt. is sterilized or pasteurized and dehydrated to obtain a powd. product. U. S. 1,689,029 also relates to similar products.

Apparatus for extracting juice and pulp from fruit and vegetables. SOLER ET SAUNIER. Fr. 637,954, Nov. 25, 1926.

Albuminous compounds from waste liquors obtained in meat treatment. LABORATORIUM TASCH A.-G. Brit. 286,208, Feb. 28, 1927. Albuminous compds. are obtained from the waste liquors produced in salting processes for preserving meat, by adding guaiacolsulfonic acid or other suitable org. sulfonic acid or H₂SO₄ as long as a ppt. is formed.

Invertase preparation from yeast. LEONARD WICKENDEN (to John J. Naugle). U. S. 1,689,607, Oct. 30. Yeast is heated with a sugar sirup having a pH of about 4 to about 5 at a temp. of about 55-65° to obtain a prepn. which is suitable for use in making edible products.

Treating grain, seeds, fruits, nuts, etc. NAAMLÖÖZE VENNOOTSCHAP INTERNATIONALE OXYGENIUM MAATSCHAPPIJ NOVADÉL. Brit. 285,850, Feb. 23, 1927. Acid solns. of SO₂ or its derivs. such as sulfites are used and subsequently neutralized or oxidized.

Animal food. TOWARZYSTWO HANDLOWO-PRZEMYSŁOWE "ALBUMINA." Fr. 638,187, July 25, 1927. Lupine seeds are crushed and treated to remove their bitterness, mixed with molasses and dried at 35-45°. The product is suitable for feeding animals.

Preserving fodder. M. FLUBACHER. Brit. 285,939, Oct. 22, 1926. A 3% soln. of a mixt. formed of NaCl 50, CaCl₂ 10, Na phosphate 10 and ferrous lactate 30 parts

is used for spraying materials such as clover, vetches or maize when fresh cut and before packing down in an air-tight container. The material may be packed in successive layers.

13—GENERAL INDUSTRIAL CHEMISTRY

HARLAN S. MINER

International understandings and the chemical industry. DONAT AGACHE AND J. H. LUCAS. *Chimie et industrie* Special No., 926-30 (April, 1928). A. P. C.

Statistics and their function in modern chemical industry. EMILE LAMBERT. *Chimie et industrie* Special No., 917-9 (April, 1928). A. PAPINEAU-COUTURE

Contributions of chemistry to industry. I. WALTER A. SCHMIDT. *J. Chemical Education* 5, 1224-34 (1928).—Historical. E. H.

Scientific organization in chemical manufacturing plants. CHRISTO CASACOF. *Chimie et industrie* Special No., 924-5 (April, 1928).—A brief discussion of economic, technical and commercial organization of the prepn., manuf. and sales organization of chem. plants. A. PAPINEAU-COUTURE

Heat economy processes in the technical chemical industry. HANS BRANDT. *Kautschuk* 4, 149-51 (1928).—A review and discussion. C. C. DAVIS

Economic aspects of industrial research and development. L. V. REDMAN. Bakelite Corporation, Bloomfield, N. J. *Ind. Eng. Chem.* 20, 1242-4 (1928).—By 2 series of graphs the probable course of earnings on a conservative investment (5% per annum), from a competitive industry ($12\frac{1}{8}\%$ per annum), and from a noncompetitive industry ($33\frac{1}{8}\%$ per annum), all on a (a) simple interest or without-reinvestment basis, and a (b) annual reinvestment of income or earnings basis, is shown. Similarly the probable liquidation bases of the projects are shown, and the optimum conditions for success and failure discussed. W. C. EBAUGH

Certain aspects of occupational arsenicism in the chemical industry. E. AGASSE-LAFONT, A. FEIL AND F. HEIM DE BALSAC. *Chimie et industrie* Special No., 945-6 (April, 1928).—A brief summary of the results of an as yet unpublished investigation into occupational arsenicism. In the manuf. of As_2O_3 by oxidation of As_2O_3 by HNO_3 , there is little or no infection, or at most only slight manifestations. The handling of Na_3AsO_4 in its recovery from the manuf. of anilarsinic acid, however, was found to be much more dangerous. The clinical symptoms of the intoxication are described. The difference in hazard between these 2 mfg. processes is attributed to the fact that the liquors handled in the recovery of Na_3AsO_4 are alk. and easily penetrate through the fats protecting the teguments, while the acid liquors of the oxidation of As_2O_3 are repelled by these fats. A. PAPINEAU-COUTURE

Factors in modern methods of pulverizing. HARLOW HARDINGE. *Ceramic Industry* 11, 166-9 (1928).—Comments are made on the advantages and disadvantages of various types of mills. Mill capacity and economy can be greatly increased if operated so as to allow about 25% of the unfinished product to be discharged with the finished product. A new type of pebble mill is described in which the finished product is continuously removed together with a small quantity of unfinished product by means of air circulating in a closed system. The oversize product is automatically sepd. and returned to the mill. By proper control of the air current the degree of fineness may be controlled. Another advantage claimed is the removal of moisture by the air, thus preventing packing. Operating data are given. W. H. RISING

Wetting agents and emulsifiers. A. NOLL TILSIT. *Chem. Techn. Fabrikant* 25, 95-7, 99-100 (1928).—A discussion of the properties and constitution of 22 trade prepsns. P. ESCHER

Factory floors. F. HERON ROGERS. *Chemistry and Industry* 47, 1011-21 (1928). E. H.

Gaging; a neglected chemical hazard. J. H. SHAPLEIGH. *Chem. Markets* 23, 359-62 (1928).—Instead of being merely a routine operation in chem. plants, gaging calls for care and thought, not only for the sake of accuracy but also to prevent accidents to property and persons. Proper equipment, procedure, personnel, thorough schooling in the operations involved, etc., are necessary. Illustrations of hazards and methods for guarding against them are given. W. C. EBAUGH

Automatic control through temperature or pressure. C. J. SWAN. Am. Radiator Co., 40 West 40th St., New York, N. Y. *Ind. Eng. Chem.* 20, 1152-5 (1928).—The "Mercoïd Control" is described. Its essential element is the design of an elec. switch which makes and breaks contacts, depending upon changes in temp., vacuum or pressure.

It consists of a glass tube in which are sealed leads of a special material. The circuit is made or broken by a small quantity of Hg when the tube is tilted. Arcing is instantly stifled or dampened by inert gases which are sealed hermetically within the tube. Operation with safety is thus possible, where there are fumes or other hazardous conditions. Since there is no corrosion or oxidation the contact is instantaneous in operation, and the contact points remain clean. The control will carry 110 or 220 v. with sufficient amperage in most cases to operate elec. motors up to a capacity of 1 h. p. By proper connection with suitable standard devices temps. and pressures can be controlled at will. Many illustrations of applications to chem. industries are cited.

W. C. EBAUGH

Washing by decantation. G. EVERETT MARSH. *Ind. Eng. Chem.* 20, 1241(1928)
—A chart is presented from which can be detd. the no. of decantations necessary to reduce the impurities in a ppt. to a given amt., the no. of washings required, the quantity of wash-water needed, etc. It is based upon the relation $C_n = (V_1/V_0)^n C_0$, where C_0 = the initial concn. of the impurity, C_n = its concn. after the n th washing, V_0 = vol. of vessel in which the washing is carried out, and V_1 = vol. of the settled ppt.

W. C. EBAUGH

Isotherms and isobars for air separation studies. BARNETT F. DODGE. Dept. Chem. Eng., Yale Univ., New Haven, Conn. *Chem. Met. Eng.* 35, 622(1928). Studies of processes for air sepn. by liquefaction methods must be based upon pressure-temp.-compn. data for solns. of O and N. From Dodge's paper (cf. *C. A.* 21, 1732) certain data have been compiled in order that greater use may be made of them in engineering calcns. Table I gives vapor compn. and pressure as a function of liquid compn. at various const. temps., and Table II gives the vapor compn. and temp. as a function of liquid compn. at various const. pressures.

W. C. EBAUGH

The work of the exceptionally gifted student in chemical engineering (OLSEN) 2. Micro-determination of lead (diagnosis of Pb poisoning) (SEISER, *et al.*) 11B. Plastic moldable composition containing rubber [suitable for electric insulation] (U. S. pat. 1,658,500) 30. Separation of gases by liquefaction [H from coke oven gas or lighting gas] (Fr. pat. 638,382) 13.

PAUER, W.: **Energiespeicherung.** Dresden and Leipzig: Th. Steinkopff 176 pp. M. 12 (paper), M. 13.50 (bound). Reviewed in *Chimie et industrie* 20, 599 (1928).

Exothermic reactions. I. G. FARBENINDUSTRIE AKTIENGESELLSCHAFT. Fr. 636,338, May 13, 1927. To prevent excessive heating in exothermic reactions an indifferent solid substance is added to the reagents. The size of the granules of the added substance is sufficiently different from that of the reaction product to allow of sepn. by sifting.

Colloidal solutions. M. POLANYI and S. VON BOGDANDY. Brit. 286,316, March 4, 1927. Finely distributed substances insol. in one another are obtained by vaporizing one substance and condensing it *in vacuo* on the surface of a liquid body of the other substance. An app. is described.

Emulsions. F. BRÄUNLICH. Brit. 285,880, Feb. 24, 1927. Mono- or di glycerides of the higher fatty acids or their mixts. with tri-glycerides or compds. of polyglycerides with fatty acids are stated to be suitable for prepg. aq. emulsions and may be used with fats, fatty alcs., higher ketones, wool grease resins, ethereal oils, satd. or unsatd. hydrocarbons or naphthenes. Glycerol and milk may also be used in the emulsions. Several examples are given.

Air or gas purification. ELEONORE RUDIL (NÉE MEIXNER). Fr. 638,313, July 27, 1927. An air or gas filter working on the turbo principle has flanges turned back to different angles to form eddies which help the deposition of dust in the angles and on the striking surfaces. The dust which is not caught in the angles tends to fall out of the filtering zone.

Purifying gases. I. G. FARBENIND. A.-G. Brit. 285,900, Nov. 26, 1926. H_2S and NH_3 are absorbed from industrial gases by washing with an aq. NH_4 sulfite-bisulfite mixt. having a ratio of SO_2 to NH_3 of 1:1.2-1.75. Washing liquors having an NH_3 content near the lower limit absorb H_2S most readily but evolve small quantities of SO_2 which must be removed from the gas by a further washing with water contg. more NH_3 . More than 2 stages may be used and the first stage may be conducted above or below the dew point. The NH_4 thiosulfate liquor produced during the process may

be converted into NH_4 sulfate and S and the S may be burned to produce SO_2 for further use in the process.

Purification of gases. SOCIÉTÉ D'ELECTROCHIMIE, D'ELECTROMÉTALLURGIE ET DES ACIÈRES ÉLECTRIQUES D'UGINE. Fr. 638,520, Dec. 6, 1926. Gases, particularly N and H for the production of NH_3 , are purified by passing them through molten Na or a molten mixt. of Na and NK.

Purification of gases. SOCIÉTÉ ANON. DES ENGRAIS ET NOIR ANIMAL. Fr. 636,162, Oct. 12, 1926. The absorbent material such as active C is placed in movable containers, e. g., on springs, which indicate by their position when the material is satd. Several containers are used in series.

Separation of gases by liquefaction. L'AIR LIQUIDE (SOC. ANON. POUR L'ÉTUDE ET L'EXPLOITATION DES PROCÉDÉS GEORGES CLAUDE). Fr. 638,382, Dec. 4, 1926. In the sepn. of gases such as H from coke oven gas or lighting gas or O and N from air by liquefaction, the gases are heated to a high temp. to decomp. any O compds. of N, or their occurrence in the gases is prevented.

Purifying liquids. CONSTRUCTION FRANÇAISE D'APPAREILS DE LAITERIE. Fr. 638,298, July 27, 1927. Liquids are passed through 2 concentric centrifuges, the inner of which travels at a much higher speed and is adapted to sep. only the larger particles, the smaller particles being sepd. in the outer one.

Clarifying liquids. ROBERT JOSEPH MARX. Fr. 636,252, June 20, 1927. The sepn. of solid particles from liquid is promoted by causing the liquid to fall in a thin film on to a hard surface to detach air bubbles prior to entry into the settling tank. The process has general application.

Extracting a liquid from easily fusible products. THE NAUGATUCK CHEMICAL COMPANY. Fr. 636,435, June 22, 1927. A liquid is extd. from easily fusible products, e. g., water is extd. from the condensation product of AcH and aniline prepd. in acid soln. by making the products fusible, e. g., with a fatty acid such as stearic acid, and heating and agitating the mixt.

Separation of solids or semi-solids from liquids. JAMES ARTHUR REAVELL. Fr. 638,255, July 26, 1927. Liquids are sprayed radially into a current of gas having a downward helical motion to sep. solids therefrom, the gas being filtered afterwards.

Separation of salts from sugar and other liquids. TROFILO GASPARY ARNAL. Fr. 636,112, June 17, 1927. The salts preventing crystn. of sugar from sugar liquids are removed by adding sol. ferrocyanides which will form insol. double ferrocyanides with the salts. Thus KCl is removed by adding $\text{Ca}_2\text{Fe}(\text{CN})_6$ or by adding CaCl_2 and $\text{Na}_4\text{Fe}(\text{CN})_6$. The invention may also be applied to other industries where it is desired to remove or modify the contents of a salt in a liquid. Thus CaCl_2 may be removed by adding $\text{K}_4\text{Fe}(\text{CN})_6$.

Clarifying turbid brines or similar liquids. ARTHUR W. ALLEN. U. S. 1,687,703, Oct. 16. A sufficiency of small crystals of a water-sol. compd. such as NaCl which is insol. in the liquor under the conditions of temp. and concn. prevailing is added to or formed in solns. or brines such as concd. natural brines to act as a mech. filter aid and the liquid is then filtered.

Refrigerating system of the absorption type. BALTZAR C. VON PLATEN and CARL G. MUNTHERS (to Electrolux Servel Corp.). U. S. 1,687,957, Oct. 16.

Refrigerating system of the absorption type. D. G. SMELLIE (to Hoover, Ltd.). Brit. 285,817, Feb. 21, 1927. An app. is described in which NH_3 or other refrigerant may be used.

Refrigerating system of the absorption type. W. B. NORMELLI. Brit. 285,798, Feb. 18, 1927. An app. working on the reversing system is described.

Evaporator for absorption refrigerating apparatus. LAWRENCE BRUEHL (to Gas Refrigeration Corp.). U. S. 1,688,377, Oct. 23.

Refrigerating apparatus of the compression type. AKT.-GES. BROWN, BOVERI ET CO. Brit. 286,229, Feb. 28, 1927.

Apparatus for vulcanizing insulation on wire with heat and pressure. LESLIE J. LAMPLUGH (to Western Electric Co.). U. S. 1,689,206, Oct. 30.

Insulators. ANDRÉ ALBERT SAMUEL. Fr. 638,525, Dec. 7, 1926. An insulating material with feeble dielec. losses at high frequency is made by the addn. to the insulating material such as "Thiolite" described in Fr. 549,811, of powd. quartz, SiO_2 , glass, mica or ebonite.

Insulated wire. EDMUND B. WHEELER (to Western Electric Co.). U. S. 1,689,311, Oct. 30. Cellulose acetate and finely divided Se are used together as a "flame-proofing" coating.

Insulating electric conductors such as wire with a single continuous layer of pre-

vulcanized hard rubber. ROBERT R. WILLIAMS (to Western Electric Co.). U. S. 1,689,312, Oct. 30. An app. is described, for hot extrusion.

Heat insulating material for safes. DAVID H. BELLAMORE and CARL P. BARTELS (to Mosler Safe Co.). U. S. 1,688,849, Oct. 23. A core of material such as diatomaceous earth embedded in heat insulating material contains moisture and is provided with a surface coating of material such as a cement compn. serving to prevent loss of moisture at ordinary temps.

Insulating plates. JOSEF WEISS. Fr. 638,422, July 29, 1927. Insulating plates are made by soaking wood fiber, straw, etc., in a lye of K_2SiO mixed with hydrous Mg silicate.

Electric insulation. A. JOFFE. Brit. 286,320, Sept. 8, 1926. A multi-layer insulating material comprises alternating layers of greater and less dielec. strength such as paper, wood, fabric or metal treated with linseed oil, resin varnishes, enamel or other suitable materials. The thickness of the better insulating layers is less than 0.01 mm. and preferably about 0.001 mm.

Flameproof electric insulation. EARL G. STURDEVANT (to Western Electric Co.). U. S. 1,687,525, Oct. 16. Insulation suitable for use on elec. conductors in strand form comprises rubber 20, chlorinated naphthalene 25, a vulcanizing agent such as S 2, a vulcanization accelerator such as PbO 10 and powdered silica, 33 parts.

Insulated electrical conductor. EDMUND B. WHEELER (to Western Electric Co.). U. S. 1,687,912, Oct. 16. A conductor such as wire is provided with a thin inner coating of baked enamel and a thin outer coating of vulcanized rubber; the enamel alone is too thin to serve as an insulation but serves to protect the conductor from the deleterious action of the ingredients of the rubber, and the rubber coating is too thin to serve alone as sufficient protection against moisture, but the 2 coatings together are highly flexible and efficient for both purposes.

14—WATER, SEWAGE AND SANITATION

EDWARD BARTOW

Latest development in water purification. GEORGE W. FULLER. *Proc. 9th Texas Water Wks. School* 182-6(1927); *Public Health Eng. Abstracts* E-518C, 44(1928).

The newer developments in water purification have not been along the line of new processes but in the modification of the previous methods. Superchlorination and dechlorination, split chlorination and prechlorination, double coagulation, double filtration, water softening, effluent aeration, mechanically cleaned settling basin, new methods of water coagulation, boiler-feed water, new purification plants and exptl studies on filter loading are briefly discussed. Little new data are presented.

C. R. FELLERS

Water supply problems of a desert region. W. E. RUDOLPH. *Proc. Am. Soc. Civil Eng.* 54, 2287-2302(1928).—The water supply problems of the Atacama Desert of North Chile are described. Hydrological data are given for the Rio Loa and its tributaries, with descriptions of the variations in flow, evapn., seepage, salt absorption, pipe line corrosion and potability. Some cities derive their supply from melted snow while another, Tocopilla, obtains its supply by distn. of ocean water at a cost of \$0.00 per ton. Use of the waters for irrigation and hydroelec. power are discussed.

W. D. H.

Hamburg water supply. Ground water supply from Curslack. W. HOLTHUSEN. *Gas u. Wasserfach* 71, 913-24(1928).—The methods adopted for avoiding ground water contamination by seepage into wells and other details of the plant are described and illustrated.

R. W. RYAN

Water supply of Los Angeles. WM. MULHOLLAND. *J. Am. Water Works Assoc.* 20, 463-6(1928).—The Owens Valley supply not being sufficient in view of the rapid growth of the city, plans are now under way to go to the Colorado River and only await approval of the Boulder Dam project.

D. K. FRENCH

Investigation of the impurities in the water of the Kiel Inlet. KARL KISSKALT. *Arch. Hyg.* 99, 99-110(1928).—Analyses are given of water taken from various parts of the harbor.

P. Y. JACKSON

Results of the investigation of the impurities in the water of Kiel Inlet in the years 1926-27. W. LIESE. *Arch. Hyg.* 99, 111-7(1928).—Cf. preceding abstr. P. Y. J.

Manganese in the water supplies of the Rhine province. KARL KISSKALT. *Arch. Hyg.* 99, 96-8(1928).—In 2 regions of the lower Rhine province Mn has been found in appreciable quantities in drinking water.

P. Y. JACKSON

Eliminating tastes and odors by algae in water. CHESTER COHEN. *The American City* 38, No. 4, 129-30(1928); *Public Health Eng. Abstracts* E-518C, 42(1928).—Algae in southern states where climatic conditions are favorable to their growth are partly responsible for discoloring the water, for imparting tastes and odors to the water and for clogging filter beds and filling the pores of the filter material. Their presence is also quite common in swimming pools. Living algae produce oils which give the water a fishy, oily or grassy taste. When the food supply becomes exhausted or if destroyed by chem. treatment, decompn. occurs, producing a strong medicinal taste when Cl is used for purification. Algae may be controlled by covering the reservoir to cut off sunlight or by treatment of the water with CuSO_4 or Cl. The dosage of either required must be detd. according to the type of algae growth. Water weeds in large reservoirs are usually destroyed by cutting the tops below the water line or by pulling the weeds.

C. R. FELLERS

Chlorophenol tastes from creosoted wood stave pipe. DANA E. KEPNER. *J. Am. Water Works Asscn.* 20, 473-8(1928).—Several cases are cited to show that the characteristic chlorophenol taste is developed when chlorinated water comes in contact with relatively new creosoted wood pipe.

D. K. FRENCH

Water hardness, its effects and its removal. RUDOLPH E. THOMPSON. *J. Am. Water Works Asscn.* 20, 479-80(1928); cf. *C. A.* 22, 1639.—A summary of various methods of water softening.

D. K. FRENCH

The chlorine number and chlorine requirement of water. The estimation of ability to combine with chlorine. HANS WETTE. *Arch. Hyg.* 99, 143-57(1928).—Since some decompn. products of proteins are not oxidized by the usual method of Kubel-Tiemann, the values so detd. may fail to show some impurities of hygienic importance. The Cl no. is of value in such cases. Since some Cl is taken up by org. material and can then no longer exert its bactericidal properties the amt. so removed by combination must apparently be detd. in order that just sufficient excess may be present to sterilize the water. However, when a single drop of Cl water (contg. 0.01 mg. Cl_2) was added to distd. water, cond. water, or to urea solns. of varying concn., no test for Cl could be obtained with the benzidine test after 5 min. A second drop of Cl water gave a pos. test for all solns. This test is not sufficient to det. the amt. of extra Cl required by the urea in the soln. NaHCO_3 in soln. unites with Cl, and the amt. so taken up is not affected by the presence of dissolved urea.

P. Y. JACKSON

Chlorinated copperas—a new coagulant. L. L. HEDGPETH, N. C. OLSEN AND WM. C. OLSEN. *J. Am. Water Works Asscn.* 20, 467-72(1928).— FeSO_4 was found unsatisfactory as a coagulant. When oxidized with Cl water, 1 pt. Cl to 7.8 pts. FeSO_4 , it was most effective. It is followed by alum and lime or Na aluminate. Two applications are essential, the first between pH 4.2 and 4.7, the second between pH 5.5 and 6.5.

D. K. FRENCH

Electrolytic corrosion prevention of condenser tube corrosives. F. G. PHILO. *J. Am. Water Works Asscn.* 20, 505-34(1928).—Conditions at the Long Beach plant of the Southern California Edison Co. are described. The electrolytic protective system consists of 16 cast-iron anodes properly placed and insulated. The article is very complete and detailed. The cost is low and the results are considered satisfactory.

D. K. FRENCH

Succinchlorimide for the treatment of small quantities of potable water. CYRUS B. WOOD. *J. Am. Water Works Asscn.* 20, 535-49; *Military Surgeon* 63, 493-506(1928).—This compd. can be prepd. in many ways, which are described. It is very sol. and stable. It imparts a slight saline taste to water. In water it liberates HOCl . It is considered satisfactory in sterilizing small quantities of water down to the capacity of the soldier's canteen.

D. K. FRENCH

British and American practice in rapid sand filtration. S. W. FARRINGTON. *Munic. Eng. Sanit. Record* 81, 546-7(1928); cf. *C. A.* 22, 4683.—T. discusses the different practices in automatic control of chem. feeding in accordance with water flow, the times of reaction and flocculation, and the washing of filters. In Cork there is no quiescent subsidence period. The influent to the filters therefore contains no floc but a finely divided ppt. There are no troughs used for washing the sand filters, but instead a low weir at the end of the bed a few in. above the sand is used. Consequently the vertical velocity is at a min.: 6.25 gal. per sq. ft. per min.

C. H. BADGER

Ground water carriers of the lower Elbe region. E. KOCH. *Mineral. Geol. Staat. inst. Hamburg. Gas u. Wasserfach* 71, 889-95(1928).—The geological structure of the water-bearing strata of the Hamburg region is illustrated and discussed.

R. W. RYAN

River pollution. C. C. DUNCAN. *Munic. Eng. Sanit. Record* 81, 501-2(1928).—

The river Severn is on the whole not seriously polluted. It is often turbid which necessitates frequent cleaning of the filters. After purification, it supplies the towns of Worcester and Tewkesbury. The river Stour, contaminated by a sugar factory, and the Salwarpe, a small stream too salty because of springs, are not used for water supplies.

C. H. BADGER

The sewage disposal works of Decatur, Illinois. S. A. GREERLEY AND W. D. HATFIELD. *Proc. Am. Soc. Civil Eng.* **54**, 2237-86(1928).—Since 1917 the Sanitary District of Decatur, Ill., has completed intercepting sewers, pumping station and sewage treatment works including grit chambers, Imhoff tanks, digestion gas collectors, odor burning oven, sludge drying beds, preaeration units, sprinkling filters and secondary settling tanks at a total construction cost of \$1,700,000. The treatment of the sewage has been complicated by wastes from a large corn products factory which have had a population equiv. to 300,000, but which have been reduced to 225,000 and are expected to be reduced to less than 100,000 in the near future. Two testing stations have been operated in connection with the design and construction of the plant. The engineering and chem. data on design, construction, operation and aeration testing station are quite complete.

W. D. H.

The oxidation of sulfur in suspensions of activated sludge and its influence on the solubilization of mineral phosphates. C. V. RAMASWAMI AYYAR, T. S. S. PERUMAL AND ROLAND V. NORRIS. Dept. Biochem. Indian Inst. Sci., Bangalore. *J. Indian Inst. Sci.* **11A**, pt. 8, 85-90(1928).—In an attempt economically to utilize the large natural deposits of rock phosphate in India by treatment with activated sludge suspensions, preliminary lab. and field expts. were carried out. The rock used contained 44 and 26% of insol. P_2O_5 , resp. With the rapid oxidation of elemental S there was an accumulation of H_2O -sol. sulfate. Generally the amt. of S oxidized in relation to the H_2O -sol. phosphate produced was in the ratio of 4 of S to 1 of mineral phosphate. The introduction of catalysts reduced the ratio to 1:1. In the S series without a neutralization agent the pH fell to 1.6 and there was a rapid production of titratable acidity. When phosphate was added, although there was a greater production of acid, this was utilized for the production of sol. phosphate, the pH remaining at about 4.6. In the absence of catalysts ($MnSO_4$, $Al_2(SO_4)_3$ or $FeSO_4$), even though there was increased S oxidation as indicated by the sulfate figures, there was not a corresponding increase in the production of H_2O -sol. phosphate; but with $MnSO_4$ or $Al_2(SO_4)_3$, the soly. rapidly increased.

C. R. FRILLERS

The Worcester (England) activated sludge plant. THOMAS CAINK. *Munic. Eng. Sanit. Record* **81**, 502(1928).—C. ests. £15,000 as the cost of covering 2 acres of land to air-dry sludge from an activated sludge plant, a small part of £750,000 estd. as cost of sewage works for 50,000 population.

C. H. BADGER

Municipal administration at Thornaby-on-Tees (England). G. H. CONNOR. *Munic. Eng. Sanit. Record* **81**, 490(1928).—C. gives brief statements regarding high ways, sewerage and sewage disposal, public lighting and refuse disposal. Sewage gravitates to the tidal waters of the river Tees without any treatment.

C. H. B.

Some municipal works at Totnes (England). JOHN L. DAVIES. *Munic. Eng. Sanit. Record* **81**, 517(1928).—Brief statements are made regarding highways, sewerage system, disposal of house refuse, water supply and public lighting.

C. H. B.

Health in industry. C. L. FERGUSON. *J. Am. Med. Assoc.* **91**, 868-70(1928).—A general survey.

L. W. RIGGS

Recent municipal work in Stafford (England). W. PLANT. *Munic. Eng. Sanit. Record* **81**, 462-3(1928).—The water supply is pumped from a well and bore hole. An inadequate storage reservoir of 577,000 gal. will be replaced by a million gal. concrete storage reservoir (2-day normal supply). Every house is provided with duplicate drains. The surface water finally discharges into stream courses. The sewage gravitates to a reception tank, passes through mech. coarse screens, is pumped to the disposal works, where it is treated by chemicals and settled in a pptn. tank. The tank effluent is distributed over 50 acres of land, underdrained at 6 ft. depth, the subsoil being sand and gravel. Since a stable effluent cannot always be obtained because of the small land area, 6 activated sludge units will be built. A unit, now completed, has produced a stable effluent with spent liquor from a $(NH_4)_2SO_4$ plant of a gas works. Sewage with abnormal Cl content, due to salt works, is amenable to this treatment. House refuse is burnt to provide steam at the sewage disposal plant. A description of the roads and baths is also given.

C. H. BADGER

Cleansing activities in Blackburn (England). J. RECLESTON. *Munic. Eng. Sanit. Record* **81**, 470-1(1928).—House refuse is chiefly collected by light wt. carts. It is now screened by a $1/2$ in. mesh rotary screen. Dust averages 35% of the refuse.

and is hauled away. The screenings are sorted for saleable articles and the remainder together with cinders burnt for steam purposes. Formerly burning the unscreened refuse caused troublesome dust emission in the thickly populated neighborhood.

C. H. BADGER

The treatment of organic wastes. W. WEAVER. *Surveyor* 74, 83(1928).—Slaughter house, fish market and vegetable wastes are treated by the Iwel dry-rendering process. Dried vegetable matter on analysis gave NH_3 3, phosphates 4, K_2SO_4 2.6, org. matter 60 and mineral matter 13%. Combined vegetable and foreign matter averaged on analysis: NH_3 1.5, phosphates 2.5, K_2SO_4 1.8 and org. matter 75%. The use of these materials as fertilizers was considered.

A. L. ELDER

Fumigation with cyanogen products. C. V. AKIN AND G. C. SHERRARD. U. S. Public Health Service. *Public Health Reports* 43, 2847-70(1928).—This paper is a report of expts. conducted with cyanogen products used in the fumigation of vessels for quarantine purposes at the New York Quarantine Station. The products carried were (1) liquid HCN 96 to 98%, (2) a mixt. of 80% liquid HCN and 20% CNCl , (3) HCN generated from mixts. of NaCN , NaClO_3 and HCl or NaCN , H_2SO_4 66 Bé. and H_2O , (4) Zyklon-B, a product of German manuf. contg. liquid HCN and 4 to 10% of chloropicrin, (5) $\text{Ca}(\text{CN})_2 \cdot 2\text{HCN}$ in the form of a fine dust which evolved HCN in the presence of even traces of moisture. Two adjoining rooms of equal size in a vacant building were prepd. by covering the floors, ceilings and sides with cement mortar, and were painted to prevent leakage. The partition wall between the rooms carried a no. of 2-in. holes at different heights to test gas circulation. These holes could be opened or stoppered gas-tight at will. Two or more adult white rats were used in all of the more delicate tests. The following are some of the results: (1) Within a single nearly air-tight room and in the absence of air currents HCN or $\text{HCN} + \text{tear gas}$ tend to rise. Rats in cages near the ceiling were killed before those on the floor when the 2 lots of animals were equally distant from the source of gas generation. With one room contg. 2 oz. of HCN per 1000 cu. ft. and 2 or 3 2-in. holes open in the partition wall, the HCN showed little tendency to pass to the other room regardless of temp. changes or the operation of an elec. fan in either room. In ridding ships of rats by means of HCN , the complete opening up or elimination of dead spaces is of equal importance to gas dosage, exposure time or fumigant used. (2) HCN was found in dangerous concn. in the residues after fumigation by the $\text{NaCN} + \text{acid}$ and the $\text{Ca}(\text{CN})_2 \cdot 2\text{HCN} + \text{H}_2\text{O}$ reactions, and in much smaller quantities in the residues of Zyklon-B. (3) Residues of $\text{Ca}(\text{CN})_2$ absorb lethal amts. of HCN ; those from Zyklon-B absorb much less. (4) Brief exposures to HCN of high concn. is more uniformly fatal than prolonged exposure to doses approaching the threshold concn. (5) Moisture, even that in materials dry to touch, will take up lethal quantities of HCN and hold it longer than perfectly dry materials. (6) Bedding, clothing and floor coverings should be removed from rooms during fumigation. This is particularly necessary in the crew's quarters. Rats were protected from the standard dose of HCN by 80 layers of dry gunny sacks, 40 layers of wet gunny sacks or 16 to 20 layers of blankets. (7) Mixts. of HCN and tear gas are used with the idea that the absence of tear gas after fumigation indicates the absence of HCN . This test is unsafe. The presence or absence of HCN should be detd. by test animals. In comparative applicability, usefulness, public safety and cost, Zyklon-B is superior to the other methods of producing HCN for fumigating purposes. It is practical for use in small units as well as large.

L. W. RIGGS

H-ion control of boiler feed waters (ANON.) 28. The purification and disposal of waste waters (ROSS, DE FROBERVILLE) 28.

Filter for water, etc. BENJAMIN J. PIERSON (to D. H. P. Mfg. Co.). U. S. 1,688,152, Oct. 16.

Sterilizing water. O. ADLER and R. ADLER. Brit. 286,338, Nov. 4, 1926. Water which has been sterilized by treatment with free Cl , hypochlorite or "chloride of lime" is passed through or over coarse pieces of carbonaceous material, to convert the excess Cl into HCl or chloride. To secure more effective sterilization, the water, before contact with the carbon, may be passed through clay, sand, quartz powder, glass powder, asbestos, spun glass, kieselguhr or other porous material unaffected by Cl or Cl compds. HCl in the treated water may be neutralized with limestone.

Meter and flow-control device for proportionate feeding of chlorine to water, etc. PAUL LANHAM. U. S. 1,689,491, Oct. 30.

Softening water. PAUL E. LEISS. U. S. 1,689,036, Oct. 23. BaCO_3 and Ca(OH)_2 are preliminarily mixed with water and the mixt. is added to water to be softened.

Apparatus for softening water. J. MILLS & Co. (ENGINEERS), LTD. AND W. H. PORTER. Brit. 285,629, Jan. 20, 1927. Water to be softened passes through an injector device which draws NaOH soln. from a boiler and the water then passes through a specially constructed settling and filtering app. Cf. C. A. 22, 3941.

Apparatus for softening water by treatment with zeolites. JOSEPH J. TOMKINSON. U. S. 1,688,366, Oct. 23.

Softening and purifying water. A. ROSENHEIM. Brit. 286,307, March 4, 1927. In order to soften it and remove Fe and Mn, water is treated with a gel of an acid or amphoteric substance such as silicic acid, titanin acid, alumina, chromic oxide or ferrous or ferric oxide, in the presence of basic substances such as alkalis, alkali carbonates, lime, baryta or strontia or alk. reacting salts such as borates, phosphates, cyanides, silicates, aluminates, stannates, titanates or the like. AlCl_3 or FeCl_3 may be added to the sol and a mixed gel pptd. with alkali.

Apparatus for softening water with base-exchange material. JOHN ASTROM (one-half to Deister Machine Co.). U. S. 1,688,915, Oct. 23.

Tank and connections, etc., for use in softening water with zeolites. CHARLES A. STICKNEY (to Stickney Hydraulic Co.). U. S. 1,689,308, Oct. 30.

Apparatus for treating sea water with reagent solutions to precipitate salts. R. J. WOOD. Brit. 285,954, Nov. 19, 1926.

Two-stage activated-sludge process of treating sewage. ACTIVATED SEWAGE, LTD. AND J. A. COOMBS. Brit. 285,944, Oct. 27, 1926. Each of 2 stages of treatment comprises addn. of sludge and aeration and the sludge used for the different stages is separately revived. The first stage leads to the sepn. of carbonaceous material and the second to the conversion of the NH_3 compds. present into nitrites and nitrates by the action of bacteria cultivated in sludge which has not been in contact with sewage contg. large quantities of carbonaceous material. An app. and numerous details of procedure are described.

15—SOILS, FERTILIZERS AND AGRICULTURAL POISONS

J. J. SKINNER

Soil surveys. F. S. EARLE. *Facts about Sugar* 23, 978(1928).—E. questions Arrhenius' and Willcox's apparent rejection of the idea of "soil type" and believes that the term may be defined so as to be of great agricultural value if based upon "natural" characteristics. A single character such as particle size (as in Bennett and Allison's work (C. A. 22, 2804)) or soil reaction (as in Arrhenius' work, (C. A. 21, 1830, 2569, 3411)) is inadequate as a basis of classification. The geological origin and natural vegetation are factors of prime importance. In Cuba at least, permeability is also important because permeable soils respond to treatment with chem. fertilizers and impermeable ones do not. Lines representing soil reaction and nitrifying power will not be found crossing indiscriminately the areas of definite soil types in Cuba. The degree of acidity is not a dependable index of the need of phosphates; the older "red lands" of Cuba are notably deficient in phosphates and only slightly acid. The question of cane varieties cannot be ignored in pH surveys. Comparing the sugar yields of different varieties grown on acid soils with the yields of the same varieties grown on alk. soils, Alfaro finds that *Uba* gives consistently lower yields on acid soils, while *Cristalina* usually gives as good or better yields on moderately acid soils. E. has observed that *Co. 213* and other *Saccharum barberi* hybrids endure strongly alk. soils better than *Cristalina* and much better than *Badila*. Reply. O. W. WILLCOX. *Ibid* 978-9.—W. disclaims any doubt that soil types are real, but he believes that lines representing soil reaction will be found to cross them. Not enough work has been done in Cuba to prove that Arrhenius' method is not as applicable there as elsewhere. A.'s work in Europe and Java has been carried out on a scale wholly without precedent and yields have been correlated with soil reaction in vast numbers of fields. This is the distinctive feature of A.'s method. E.'s suggestion that cane varieties differ in their preferences as to soil reaction is important.

M. J. PROFFITT

New colorimetric determination of the phosphoric acid requirement of soils. ANTONÍN NĚMEC. Staatlichen Versuchsanstalten für Pflanzenproduktion, Prag *Biochem. Z.* 198, 112-27(1928); cf. C. A. 22, 2427.—It appears probable, on the basis of further exact field investigations, to set up definite limits of the silicic acid content of soils, which det. beforehand the plausible phosphoric acid action of the fertilizer for

different plants, on the basis of a quick colorimetric silicic acid-phosphoric acid detn. in soil exts. The mutual relationship of the phosphoric acid and silicic acid compds. of soil in plant nutrition deserve therefore a further exhaustive study, especially from the physiol. standpoint. The investigations show in general, that also the hitherto neglected, useful elements fulfill their important role in plant biochemistry, at least in combination with the nutritive substances which today are regarded as the principal ones.

E. F. SNYDER

Measuring the acidity (p_H) of soils by the inversion of sucrose. V. VINCENT. Station Agronomique du Finistère. *Chimie et industrie* Special No., 843-8 (April, 1928); cf. *C. A.* 21, 1580.—The results are given in detail of an investigation on the possibility of detg. the p_H value of soils by sucrose inversion, from which, contrary to Parker and Bryan (*C. A.* 17, 3068), V. concludes that the method is incapable of giving reliable results. It was found that soils having practically the same initial p_H value but different chem. compn. inverted sugar differently and that soils that were almost neutral had an appreciable inverting action; moreover the p_H value calcd. from sucrose inversion is lower than that obtained by direct detn., and is lower at high than at low temp., irrespective of whether the soil is acid, neutral or alk. Study of the action of heat on various buffers indicated that the results obtained with soils are due to the phosphate buffers which they contain, the degree of hydrolysis being increased on raising the temp. and reduced on lowering it, but not always to its original value.

A. PAPINEAU-COUTURE

Asbestos waste: An inquiry as to its value for the correction of soil acidity. FRANK T. SHUTT. *Dept. Agr. Canada, Rept. Dominion Chemist, Year Ending March 31, 1927, 1928*, 13-6.—Asbestos waste is essentially hydrated Mg silicate from which the fibrous asbestos has been removed as far as possible by milling processes. Expts. with this material, ground to a fairly fine powder, showed that it has no value for reducing the lime requirement and the p_H of acid soils.

K. D. JACOB

The lime requirements of acid soils. CH. BRIOUX. Station agronomique de la Seine-Inférieure. *Chimie et industrie* Special No., 899-903 (April, 1928); cf. *C. A.* 22, 1004.—A comparison of the p_H value and CaO requirements of a no. of soils detd. by both the Hutchinson-MacLennan method (shaking 15 g. of soil with 300 cc. 0.02 N $\text{CaH}_2(\text{CO}_3)_2$ and detg. CaO in the soln. before and after) and the electrometric method (plotting p_H values against increasing amts. of lime water) showed that the 2 methods give results of the same order (generally within 0.01-0.02%) except with soils having a high humus content, in which case the Hutchinson-McLennan method gives results up to 50% lower than the electrometric. The initial p_H value of itself gives no indication of the CaO requirements. B. suggests expressing the CaO requirements by means of the "saln. no." of the soil, which he defines as the no. of mg. of CaO required per kg. of soil to increase the p_H by 0.1. It is generally considered that in practice the amt. of CaO found by lab. tests should be increased by about 50%. B. found that even on adding up to thrice the theoretical CaO requirement the p_H of the soil gradually decreased to slightly less than 7.0 in a few months; while if exactly the theoretical amt. was added the p_H might even fall below its original value. Nitric N detns. showed that in no case could nitrification account for the neutralization of the whole of the CaO. The mechanism of the re-acidification has not been elucidated, but B. suggests it may be due to the presence of certain unneutralized silicates having an extremely low soly., the acid radicals of which do not act appreciably at the original p_H values of the soils, but which are very slowly neutralized by the added CaO. There may also be formed org. acid compds. by oxidation of the humus.

A. P.-C.

The purchase of agricultural lime. LENGLEN AND DURIER. *Chimie et industrie* Special No., 880-3 (April, 1928).—A plea for the sale of agricultural lime on the basis of available CaO content, showing the serious disadvantages of the present system of sale without control of the CaO content.

A. PAPINEAU-COUTURE

The chemical effect of gypsum, sulfur, iron sulfate, and alum on alkali soil. W. P. KELLY AND ALEXANDER ARANY. Univ. of Calif. *Hilgardia* 3, 393-420 (1928).—The application of gypsum, S, FeSO_4 , and alum produced important chem. changes in black-alkali soil near Fresno, California. With each of these materials the chem. reactions involved the sol. carbonate and the exchange complex of the soil. Gypsum pptd. the sol. carbonate as CaCO_3 while the other materials either decompd. carbonate or else converted it into bicarbonate. Simultaneously with the effect on sol. carbonate, the exchange complex has been acted upon. The effect of gypsum is dependent on its sol. Ca, while S, FeSO_4 , and alum are effective because of the H ions that are formed. The acid formed by the oxidation of S, or the hydrolysis of FeSO_4 and alum, dissolves CaCO_3 , and possibly other minerals, and thus brings Ca into soln. As a result the Na

content of the exchange complex is decreased and the Ca content is increased. Resulting from these chem. transformations the phys. conditions of the soil have been markedly improved and the growth of crops was stimulated. The theoretical and practical aspects of the black-alkali soil problem is discussed. J. J. SKINNER

The microorganisms of cultivated and bush soils in Victoria. DOROTHY DIXON. Melbourne Univ. *Australian J. Exptl. Biol. Med. Sci.* **5**, [3], 223-32(1928).—When the mean nos. of fungi and actinomycetes are plotted from month to month the curves follow the rainfall more or less closely. The temp. exerts a slight influence in the coldest month by hindering growth and reproduction. The max. counts in the majority of cases occurred in the early autumn and early spring months. The difference between the curves for the organisms present in orchard soil as compared with bush soil can be ascribed to the soil structural differences. The balance between the types of organisms in the soils appears to change from month to month. The genera isolated appear to be the same as those found in northern regions. Types such as the *Mucors* seem to show fluctuations in their nos. during the year. L. W. RIGGS

Technical control of small farms. JACQUES DE VILMORIN. *Chimie et industrie Special No.*, 912-3(April, 1928).—A brief discussion of the advantages of carrying out simple control tests on small farms. A. PAPINEAU-COUTURE

Mixed and complete fertilizers. A. MITTASCH. *Z. angew. Chem.* **41**, 902-16(1928).—A discussion of the chem., technical and agricultural side of mixed and complete fertilizers. E. F. SNYDER

The manufacture of fertilizers and its relation to the agriculture of Hawaii. C. G. OWEN. *Facts about Sugar* **23**, 975-6(1928).—Fertilizers should be selected with respect to their ability to stimulate plant growth, their cost, their mech. suitability and the adequacy of their supply. The newer types of fertilizer are more coned. than the old. A table of typical analyses is given. M. J. PROFFITT

Determination of nitrogen in artificial fertilizers. E. THOREL. *Chimie et industrie Special No.*, 887-9(April, 1928).—See C. A. **22**, 3947. A. PAPINEAU-COUTURE

The present status of the nitrogen problem. J. GALLAND. *Chimie et industrie Special No.*, 872-8(April, 1928).—A review of the status of the effects of N from an agronomic standpoint. A. PAPINEAU-COUTURE

A new aspect of the agricultural nitrogen problem. E. BURBAN. *Chimie et industrie Special No.*, 898(April, 1928).—A plea for the utilization of weak HNO_3 (30° Bé.) directly as it comes from the absorption towers of synthetic HNO_3 plants for the production of fertilizers such as nitrophosphates (obtained by action of HNO_3 on natural phosphates) which could be carried out directly in the field. A. PAPINEAU-COUTURE

Influence of certain fertilizers and chemical agents on the weight of the crop and the alkaloidal content in the culture of the lupine legume. ALBERT GUILLAUME. *Bull. sci. pharmacol.* **35**, 347-53, 495-9(1928).—The plant, *Lupinus mutabilis* var. Cruiskanks, was grown in poor soil as control, also in the same soil to which was added fertilizers as follows: (a) complete fertilizer consisting of $(\text{NH}_4)_2\text{HPO}_4$, K_2SO_4 , FeSO_4 , MnSO_4 , MgCO_3 and colloidal MgSiO_3 ; (b) this complete fertilizer without the MgCO_3 ; (c) each constituent of the complete fertilizer singly, also KCl , NH_4NO_3 and $(\text{NH}_4)_2\text{SO}_4$ singly. In every case there was an increased yield of entire plant over the control. MgCO_3 at the rate of 20 g. per sq. m. produced the largest yield of plant tissue of any fertilizer taken singly, but caused no increase in the alkaloidal content. Both KCl and K_2SO_4 caused abs. and relative decreases in the alkaloidal content. The largest increase in alkaloidal content followed the use of a complete fertilizer. Under the action of CO_2 , addnl. to that of the atm., there was an increase in the yield of plant tissue but not in the alkaloidal content. L. W. RIGGS

Fertilization of the soils of the Landes of Gascony. RENÉ MARCARD. *Chimie et industrie Special No.*, 868-71(April, 1928).—These soils have a very poor phys. and chem. constitution, consisting of about 93-4% SiO_2 and having very poor H_2O -retaining properties. Large applications of fertilizers are of very little value, as they are rapidly washed away; but satisfactory results can be obtained to some extent by repeated application of small quantities of fertilizers at the times when they are most needed by the plants. A. PAPINEAU-COUTURE

Results obtained from collective field experiments with fertilizers in Tula district. A. V. KAZAKOV. *Trans. Sci. Inst. Fertilizers (Moscow)* No. **35**, 9-42(1928).—K. summarizes the results of fertilizer expts. carried out in the district of Tula on the podzolized loams, sandy loam, gray forest soils, dark forest soils, degraded and leached chernozem for the period of 1903 to 1925. With rye, the podzolized loams responded to the treatment of phosphates from Thomas slag, superphosphate and bone meal equally well. These soils also responded to K treatment. The gray forest soils re-

sponded to the fertilizer treatment in the same way as the podzolized soils. Stable manure has proven to be more effective than phosphates on the soils mentioned. The dark forest soils responded primarily to phosphates, this element thus being the minimum factor in this soil. Rock phosphate was just as effective as Thomas slag or bone meal. On degraded chernozem, phosphates and manure gave the best results. There was no response to N and K. The same was true for leached chernozem. The oats did not respond as well as the rye to phosphate applications on either of the soils. On the other hand, oats responded better than rye to N fertilization. With potatoes the data were meager, but there is indication that N and K are the limiting factors on the soils mentioned. The results of expts. on spring wheat, fodder beets, winter wheat, barley and flax did not warrant any definite conclusions. Clover responded to superphosphate and K. The other hay grasses did not show any striking differences due to fertilizers. The hay fields which became flooded responded to phosphate and K fertilizers.

J. S. JOFFE

Fertilizer experiments in the Tver district. A. V. KAZAKOV AND S. L. SHAPIRO. *Trans. Sci. Inst. Fertilizers* (Moscow) No. 37, 61-91(1926).—The sandy and loam soils respond primarily to P; without it N and K have no effect. For grain Thomas slag was just as good as acid phosphate; clover responded best to acid phosphate. Additions of iron sulfate gave a very slight increase. The experiments were conducted with rye, wheat, barley, potatoes, clover, meadow hay and flax.

J. S. JOFFE

Fertilizer experiments in the Vladimir district. L. L. BALASHEV. *Trans. Sci. Inst. Fertilizers* (Moscow) No. 37, 5-60(1926).—Loam soils respond best to P while light soils respond to N and N-K fertilizers. A complete fertilizer is effective on rye and oats in sandy soils and on flax in loam soil. Barnyard manure (1000-1500 poods per desiatin) on light soils was more effective than com. fertilizers. Phosphates are very effective on crops following grasses or sod. K_2SO_4 was more effective on clover than any other K salt; the reverse was true for potatoes and flax. Addns. of Mn in the form of the oxides gave neg. results. The starch content of potatoes was lowered because of the K fertilizers, especially with the KCl; no such diminution was caused by the P fertilizers.

J. S. JOFFE

Experiments with fertilizers in Moscow district. L. L. BALASHEV. *Trans. Sci. Inst. Fertilizers* (Moscow) No. 35, 83-153(1926).—The numerous expts. conducted with the effect of fertilizers on various crops are summarized as follows: grain crops respond to the 3 important fertilizer ingredients in the following order: $N > P > K$. Whenever a grain crop is introduced in the rotation P comes as the first minimum. With potatoes, flax and clover the order of the effects of the fertilizer ingredients is: $K > P > N$. Meadow hay responds primarily to K. Liming of soils increased the yield of clover and grain crop. NaCl was effective on flax.

J. S. JOFFE

Summary of fertilizer experiments by the agricultural experiment stations of Tula district. A. V. KAZAKOV. *Trans. Sci. Inst. Fertilizers* (Moscow) No. 35, 43-83 (1926).—On the northern degraded chernozem P is in the first minimum. Ground rock phosphate, bone meal, Thomas slag and superphosphate were equally effective on rye, although the ratio of quantities applied had to be: 6:4:4:3 for the resp. sources of P. N and K had no effect. Winter wheat responded even better than rye to P applications, irrespective of the source of the P. No response was obtained with N or K. Oats behaved in the same way as rye and wheat, although the effect of the P was less marked. Hemp and flax were very sensitive to P applications. The legumes responded to P and showed decreased yields (especially lupines) with N fertilizers. Similar results on the effects of soil phosphates were obtained on the gray podzolized and slightly podzolized loams.

J. S. JOFFE

Measuring the assimilability of various phosphates by means of their action on the bacterial fixation of nitrogen. GEORGES TRUFFAUT. *Chimie et industrie Special No.*, 890-4(April, 1928); cf. C. A. 21, 943.—The method of Stoklas and Waksman (C. A. 19, 3342) has been improved as follows: (1) the glucose medium is inoculated not only with *Azotobacter*, but with 4 different N-fixing bacteria, *Clostridium pastorianum*, *B. triffauti*, *A. chroococcum* and *A. agile*; (2) the culture medium contains no source of P other than that in the sample examd., and to this end H_2O redistd. over $KMnO_4$ is used in its prepn.; (3) a uniform phosphoric acid content of 0.4 g. per l. is used; (4) addn. of 2 mg. N per l. (in the form of egg albumin) practically eliminates differences which might take place in the rate at which development of the cultures sets in with the different phosphates. The technic of the method is described. The expts. on the effects of the presence of F on the assimilability of various phosphates are described (cf. C. A. 21, 2953). In the presence of excess $CaCO_3$, Gafsa phosphate and phosphated chalk cause very slight fixation of N, neutral phosphate (natural phosphate

treated with the theoretical amt. of H_2SO_4 to decomp. fluophosphates and combine with Al_2O_3 and Fe_2O_3) was the most efficient, closely followed by superphosphate, and basic slag showed the same activity as $CaHPO_4$ and $Ca_3(PO_4)_2$. Optimum N fixation is obtained only with the combination of the 4 organisms and cannot be obtained with *Azotobacter* alone. The presence of 2 mg. N per l. very greatly increases the N fixation. The p_H value greatly influences N fixation: in absence of $CaCO_3$, superphosphate (p_H 1.4) causes no fixation of N, and neutral phosphate (p_H 3.1) very little, while Moroccan phosphate (which contains $CaCO_3$) causes some fixation; subsequent addn. of $CaCO_3$ increases N fixation, but not to the same pt. as when the medium originally contained $CaCO_3$. A. PAPINEAU-COUTURE

The pretended acidity of superphosphates. M. DURIER AND M. LENGLEN. *Chimie et industrie Special No.*, 879 (April, 1928).—Examn. of 21 samples of com. superphosphates made in different plants and contg. 13–7% of citrate-sol. P_2O_5 showed that 7 contained not even a trace of H_2SO_4 and the others all contained less than 0.024%. The free H_3PO_4 content was 1–5.56%. A. PAPINEAU-COUTURE

Phosphoric acid and lime (in agriculture). E. BURBAN. *Chimie et industrie Special No.*, 897 (April, 1928).—In the soil, the acidity of superphosphate is neutralized: in the presence of $CaCO_3$ it forms insol. $Ca_3(PO_4)_2$ in a fine state of subdivision, which can be rapidly assimilated by the plants; in the absence of $CaCO_3$ it gives insol. Fe and Al phosphates which can also be assimilated, but only much more slowly. When added to soils which are poor, but not entirely deficient, in $CaCO_3$, CaO by combining with superphosphate helps to prevent further decalcification and indirect acidification. A. PAPINEAU-COUTURE

Importance of adsorption phenomena in agronomy. G. BARBIER. *Chimie et industrie Special No.*, 895–6 (April, 1928).—A brief discussion of the practical consequences of the law of adsorption $y = kx^{1/p}$. A. PAPINEAU-COUTURE

The toxicity of certain fertilizing materials and their utilization in agriculture. A. BRUNO. *Chimie et industrie Special No.*, 909–11 (April, 1928).—A brief discussion of the possibility of utilizing products such as crude ammonia, cyanamide, borax-contg. potash, etc., in such a manner as to utilize their toxic properties for cleaning the ground and their fertilizing properties for increasing the crops. A. PAPINEAU-COUTURE

Three years' experience on the fertilization of wheat lands. LENGLEN. *Chimie et industrie Special No.*, 884–6 (April, 1928).—Results of field tests carried out in 1922–26 showed that with increase in the amt. of fertilizer the yield of grain and straw increases to a max., which is reached with 55–70 kg. of N per ha., whereas it was heretofore considered that the max. amt. used should be about 35 kg. The fertilizer is utilized to the best advantage in fertile and well-cultivated soils. A. PAPINEAU-COUTURE

Field problems on an unirrigated plantation. A. T. SPALDING. *Facts about Sugar* 23, 1025 (1928).—The cost of material and labor for fertilization and the cost of weeding and cultivation, which is almost wholly labor expense, are the principal costs of growing cane in Hawaii. On 5 plantations in the Hilo district, the av. cost of weeding and cultivation was 36.78% of the total cost of bringing the crop of cane to maturity. An investment in research on the problem would seem to be amply justified. M. J. PROFFITT

Loss of valuable plant foods through the ground water. M. GERLACH. *Z. Ver deut. Zuckerind.* No. 863, 175–86 (1928).—A description of the lysimeters at the Kaiser-Wilhelm-Inst. is given. The quantity of ground water is influenced by (1) The porosity of the soil; its fertilization. Fertilized fields lost 15–137% of the precipitation; unfertilized 24–41%. (2) The till of the soil, fallow fields losing more ground water than planted fields. (3) The type of precipitation. (4) Temp. A discussion of the residual effect of various manures is given. The plant food balance for 11 years of the lysimeter expts. is given, showing large losses of N and K and a small loss of $CaCO_3$ in spite of fertilization and liming. Phosphate losses were overcome by fertilizing. E. A. FINGER

Calcium carbonate as a factor in the distribution of plants in Finland. V. A. PESOLA. *Ann. Soc. Zoolog.-Bot. Fenn. Vanamo* 9, No. 1, 2466 pp. (1928).—Finnish with English summary. About 900 plant assocns. in both high and low lime areas were studied, the presence of $CaCO_3$ in the rocks being detd. by HCl or by using certain lime-loving mosses as indicators. The plants prove divisible into: obligate calciphiles, always on high-lime soils; calciphiles, often on high, sometimes on low; subcalciphiles, often on low, sometimes high; indifferents, growing on all soils; subcalciphobes, usually avoiding lime; and calciphobes always avoiding lime. Most rock plants proved to belong to the first 3 classes, those in dry forests to the last 3. Moist forests and other wet places supported, however, more calciphilous plants, and in general the influence

of lime in the underlying rock increases with the soil moisture. In addn., plants near the borders of their ranges prove more dependent on lime than near the centers. Many species have a different relation to lime in different habitats, and in general a plant growing under relatively unfavorable environmental conditions shows a more positive response toward lime than when growing under normal conditions. At the same time indifferent species which under optimal conditions prefer poorer habitats may become more negative toward lime in less favorable places. Analytical data as to the CaO and pH values of soils from several of the localities studied are given, and from comparison with the results of other investigators it is concluded that calciphilous as applied to a plant is to be regarded as a geographical term, and alk.-soil-preferring as an ecological one.

E. T. WHERRY

Studies on the carbon nourishment of the forest. II. D. FEHÉR AND G. SOMMER. *Botan. Inst., kgl. ungar. Hochschule Bergund Forstingenieur.* *Biochem. Z.* 199, 253-71(1928); cf. *C. A.* 22, 3946.—The CO_2 production of the forest soil affects the forest air directly. This CO_2 production of the soil which is so essential for the assimilation by the trees is due to the activity of microorganisms, bacteria, protozoa and molds, which inhabit it. The CO_2 production of the soil becomes greater when the aerobic forms of bacteria predominate, and therefore care must be taken to insure good aeration of the soil. During the fall and winter, when the temp. of the soil is subjected to large variations, the effect of temp. on the CO_2 production becomes important, and when the soil temp. falls to 0° or below the respiration and the activity of the microcosmos comes to a standstill. The diminished CO_2 production is chiefly due to a rapid diminution in the no. of bacteria, the min. no. occurring in December and January. In the summer because of the greatly enhanced assimilative processes the CO_2 content of the forest air, in spite of the max. soil production, is relatively lower than in the fall, while in the winter when soil respiration is at a standstill the CO_2 content is the same as that of the ocean air. The importance of these physiol. observations is discussed in relation to the economic problem of reforestation. The N content of the forest soil depends chiefly upon the no. of nitrifying and N-fixing bacteria. The pH of the soil becomes of importance only when it falls below 5.0, as it then limits the growth of bacteria and their activity.

S. MORGULIS

Insecticidal pyrethrum: its cultivation and future possibilities. CH. CORNU. *Chimie et industrie Special No.*, 849-58(April, 1928).—A general discussion of the merits of pyrethrum as an insecticide, of the factors which militate in its favor and against it, with a description of the results obtained by C. in the course of an attempt to produce it on a com. scale in France.

A. PAPINEAU-COUTURE

Codling moth control. Experiments at Harcourt. G. T. LEVICK. *J. Dept. Agr. Victoria* 26, 459-62(1928).—Continuous use of Pb arsenate as a spray for the control of codling moth in apples seems to have led to the evolution of a moth which is partially immune to arsenical poisoning. This, together with the question of As poisoning from apples sprayed with Pb arsenate, has resulted in concn. of attention on sprays other than the arsenicals. A series of expts. was carried out to det. the effect of combined sprays of Pb arsenate and ovicidal materials, such as nicotine sulfate, lime-S and spraying oils, for codling moth control. Combined sprays of Pb arsenate with nicotine sulfate and with lime S were no more effective than Pb arsenate alone. Very good control was obtained with 2 sprayings of Pb arsenate, 5 lb. in 80 gallons H_2O , followed by 3 sprayings with a proprietary spraying oil, 1 part in 32 parts H_2O . Increasing the strength of straight Pb arsenate sprays from 4 lb. to 8 lb. in 80 gallons H_2O did not give better control. Analyses of fruit from trees receiving the different sprays indicated that spraying with oil after initial spraying with Pb arsenate tends to prevent the Pb arsenate from washing off and results in the fruit having an undesirably high As content.

K. D. JACOB

Bunt or stinking smut. The evolution of efficient control methods. D. H. ROBINSON. *Fertilizer, Feeding Stuffs and Farm Supplies J.* 13, 599-600(1928).—This is an interesting account of early attempts to control stinking smut of wheat by chem. treatments.

K. D. JACOB

Report on meetings of technical advisers in the Java sugar industry, Feb. 21 to 23, 1928 (ANON.) 28. Limestones of Nova Scotia and New Brunswick (GANDGE) 8. Limestones of the Gaspe Peninsula (Goudge) 8. S in highly dispersed form [for fungicides] (U. S. pat. 1,688,357) 18. Antiseptic, antifouling, germicidal waterproof coating composition (U. S. pat. 1,689,008) 18.

atm. of usual lead chambers from nozzles attached to the roof or side walls or below the surface of the acid which collects at the base, in such proportion that the acid collecting at the base still contains nitrous products and the acid in the last chambers contains more than that in the first chambers. An acid circulating system is described.

Sulfuric acid. CHARLES WM. FIELDING. Fr. 638,143, July 22, 1927. H_2SO_4 is produced from SO_2 gas and nitrous vitriol by introducing a mixt. of SO_2 and free O with or without oxides of N and water vapor into the bottom of a tube or series of tubes provided with mixing devices, where it comes in contact with nitrous vitriol, or H_2SO_4 strong enough to absorb oxides of N to form nitrous vitriol, which is circulated and cooled so that oxidation proceeds in the liquid phase, the nitrous vitriol acting as a true surface catalyst. Fr. 638,144 describes an app. for the production of H_2SO_4 by which SO_2 gas is forced into a vessel contg. nitrous vitriol so as to raise the vitriol in intimate contact therewith as in an air lift and continuing this intimate mixt. partly as a foam and partly as spray.

Apparatus for catalytic ammonia synthesis. FORREST C. REED. U. S. 1,689,684, Oct. 30. A pressure-sustaining vessel has connected to its cover a plurality of concentric members forming a catalytic chamber and an annular heating chamber located above the catalytic chamber. A heat exchanger is positioned in the upper portion of the heating chamber with a heater in its lower portion. Incoming gases are admitted into the heating chamber and are conducted into the catalytic chamber at points midway of the wall of the chamber and an annular baffle is positioned within the catalytic chamber for directing the flow of gases in an axial direction. Gases from the center of the catalytic chamber are conducted to the heat exchanger, and a circulating line is attached to the app. through its cover which includes a condenser and a conduit connected with the bottom of the app.

Salts of alkaline earth metals. I. G. FARBENINDUSTRIE AKTIENGESellschaft. Fr. 636,331, May 6, 1927. Salts of alk. earth metals are prep'd. from their sulfides by grinding with corresponding ammoniacal salts, preferably with the addn. of a small quantity of H_2O and final heating. Examples are given of the prepn. of $\text{Ba}(\text{NO}_3)_2$, SrCl_2 and $\text{Ca}(\text{NO}_3)_2$.

Continuous calcining of alkaline earth carbonates. REED W. HYDE (to Dwight & Lloyd Metallurgical Co.). U. S. 1,688,422, Oct. 23. Material such as lime rock, dolomite or magnesite is arranged on a traveling grate with coarser particles of the material superposed on the finer particles and heated gases are continuously passed downwardly through the material. An app. is described. Cf. C. A. 22, 2246, 4737.

Mixtures containing alkali metal hypochlorite. ALFRED OPPE. U. S. 1,689,748, Oct. 30. In order to prep. a solid mixt. of alkali metal hypochlorite and chloride, Cl is caused to react upon a suspension of alkali metal hydroxide in a neutral liquid such as CCl_4 in which neither alkali metal hypochlorite nor alkali metal chloride is materially sol.

Chlorides and bromides of silicon and titanium. I. G. FARBENIND. A.-G. Fr. 638,051, July 20, 1927. The reactions are carried out in vessels of Fe of the usual form surrounded by a casing through which water flows.

Bromides. J. H. VAN DER MEULEN. Brit. 285,015, Feb. 25, 1927. Bromides free from hypobromites are made by reacting metallic oxides, hydroxides, carbonates or bicarbonates with Br in the presence of water and of reducing agents, the decompn. of which produces only water and gases. Reducing agents suitable for this purpose are: urea, cyanamide, NH_3 , NH_4 , carbonate or bicarbonate, formamide, $(\text{CH}_2)_6\text{N}_4$, carbonates, NH_4CN , and easily decompd. org. acids such as formic or oxalic acid or their NH_4 or metal compds. or Ca nitride. Examples are given of the production of NaBr and CaBr_2 .

Anhydrous metallic chlorides. I. G. FARBENINDUSTRIE AKTIENGESellschaft. Fr. 636,339, Apr. 13, 1927. Anhyd. chlorides such as BaCl_2 , AlCl_3 , FeCl_3 , TiCl_4 are made from oxides of these metals mixed with peat or sawdust or the like, by heating and passing Cl through in the manner described in Fr. 615,772 for the production of MgCl_2 . Cf. C. A. 22, 2244.

Nitrates. ERNEST EUGÈNE NAEF. Fr. 638,551, Dec. 9, 1926. Alkali, alk. earth nitrates, NH_4NO_3 and MgNO_3 are prep'd. by the action of fuming HNO_3 with or without MnO_2 or H_2SO_4 at temps. of $50-80^\circ$ on the corresponding chlorides.

Phosphate in small spherical particles. ERNEST W. THORNTON (to R. B. Davis Co.). U. S. 1,689,697, Oct. 30. A phosphate such as a Ca or Na phosphate suitable for use in baking powder is obtained in the form of small spherical particles by spray desiccation of a soln. or suspension. Starch may be added.

Anhydrous aluminum halides. CLAUDE G. MINER. U. S. 1,688,504, Oct. 23

An acid halide gas such as HCl is passed over Al nitride and carbonaceous material at an elevated temp. (suitably about 1300°).

Ammonium sulfate. SOCIÉTÉ DE FOURN. À COKE ET D'ENTREPRISES INDUSTRIELLES. Fr. 687,977, Nov. 29, 1926. To obtain large crystals of $(\text{NH}_4)_2\text{SO}_4$ when synthetic NH_3 is passed into H_2SO_4 , any Cu or As impurities in the H_2SO_4 are pptd. and any ferric salts are reduced to the ferrous state.

Solidification of calcium nitrate. APPAREILS ET ÉVAPORATEURS KESTNER. Fr. 636,402, Jun. 21, 1927. To diminish the adherence of the layer of $\text{Ca}(\text{NO}_3)_2$ solidified by cooling on the surface of interiorly cooled rotating drums, a layer of supersatd. soln. free from crystals is interposed between the surface of the cylinder and the layer of nitrate partially crystd.

Tribarium aluminate. GEORGE W. MOREY. U. S. 1,688,054, Oct. 16. A product adapted for *pptn. of saccharates from molasses* and which comprises chiefly tri-Ba aluminate with a small proportion of BaO is obtained by heating BaCO_3 and alumina at 1150–1400° or higher.

Ferric oxide. I. G. FARBERIND. A.-G. Fr. 638,200, July 25, 1927. A finely divided Fe_2O_3 is prepd. by heating hydroxides of Fe to high temps. in the presence of water or aq. solns. of alkali salts or hydroxides.

Ferrous hydroxide. EMIL M. LOFLAND. U. S. 1,689,951, Oct. 30. Wetted Fe fragments are subjected to the action of O for a time sufficient to permit formation of $\text{Fe}(\text{OH})_2$ coatings on the fragments and these coatings are removed and recovered before they become oxidized to ferric form. An app. is described. The $\text{Fe}(\text{OH})_2$ may be preserved by an acid soln. contg. also a sol. salt of Fe.

Pure lead hydroxide. RENE DALOZE. Fr. 636,163, Oct. 12, 1926. PbSO_4 obtained, e. g., from lead chamber mud is treated with more than one equiv. of alk. earth acetate, e. g., Ca acetate. The CaSO_4 is removed and $\text{Ca}(\text{OH})_2$ added whereby $\text{Pb}(\text{OH})_2$ is formed and also Ca acetate, which is used again.

Phosphorus chloride. CLAUDE G. MINER. U. S. 1,688,503, Oct. 23. Phosphate rock is caused to react (suitably at a temp. of about 1100–1400°) with NaCl or other suitable halogen salt of an alkali metal in the presence of SiO_2 .

Potassium carbonate from chloride. J. H. BREGAT. Brit. 286,172, Sept. 22, 1927. KCl is converted into K silicate with liberation of HCl by heating with silica; the silicate is dissolved in water and treated with CO_2 to produce K carbonate and ppt. silica, which is used again. The carbonate may be used to form other salts, e. g., to form KNO_3 by reaction with $\text{Ca}(\text{NO}_3)_2$.

Sodium carbonate-sulfate. ALFRED W. GAUGER and HENRY H. STORCH (to Burnham Chemical Co.). U. S. 1,689,526, Oct. 30. Brines such as found at Searles Lake, Calif., are heated out of contact with the atm. and above a temp. (suitably about 30° or higher) beyond which the salt to be produced has a decreasing soly., in order to effect crystn. of Na carbonate-sulfate.

Trisodium phosphate. JOHN N. CAROTHERS (to Federal Phosphorus Co.). U. S. 1,689,547, Oct. 30. Na_2CO_3 is subjected to the action of H_3PO_4 of over 50% strength to form di-Na phosphate and sufficient NaOH is then added to produce Na_3PO_4 .

"Calculated iodine." WALLACE L. CHANDLER. U. S. 1,689,775, Oct. 30. A stable aq. soln. of "calculated iodine" contg. an excess of I and capable of yielding, under the action of a strong acid such as H_2SO_4 , a cryst. form of I, is prepd. by agitating an excess of I with a satd. aq. $\text{Ca}(\text{OH})_2$ soln.

Alkylating lead. CHARLES A. KRAUS and CONRAD C. CALLIS (to Standard Oil Development Co.). U. S. 1,690,075, Oct. 30. PbCl_2 is subjected to the action of Mg and EtCl in ether, without preliminary formation of ethyl Mg chloride; the temp. is maintained at about 40°, and the PbEt_2 produced is finally removed by steam.

Preventing decomposition of bicarbonates in solution. JOSEPH A. SHAW (to Koppers Co.). U. S. 1,689,059, Oct. 23. The soln. is covered with mineral oil or other suitable substantially immiscible liquid of low vapor pressure.

Hydrogen peroxide. PAUL ASKENASY. Fr. 638,090, July 21, 1927. In the formation of H_2O_2 by the action of CO_2 under pressure on BaO_2 , to the reaction mixt. are added acids, the Ba salts of which are converted into BaCO_3 by heat, or Ba salts which are converted into BaO and which are easily sol. An example is given in which 1% of AcOH or HCl is added.

Liberation of oxygen from persalts. GEORG LESCHIK. Fr. 636,106, June 17, 1927. All the O contained in persalts, such as perborate, used for washing, bleaching, etc., is liberated by adding catalysts such as MnSO_4 , K_2SO_4 , Mn lactate or tyrosinase.

Liquefying and transporting oxygen, nitrogen, etc. STUDIEN-GES. FÜR GAS-INDUSTRIE. Brit. 285,881, Feb. 24, 1927. O, N or other industrial gases of low b. p.

obtained from electrolytic or other chem. processes are liquefied and then transported in tanks to the place of use where they are gasified.

Carbon formed from hydrocarbons. A. L. MILLER (to Ault & Wiborg Co.). Brit. 286,207, Feb. 28, 1927. C is produced by the incomplete combustion of a liquid or gaseous hydrocarbon, the C-laden gases are rapidly removed from the combustion zone (suitably at a velocity of 500–6000 ft. per min.) and after cooling somewhat are treated while still traveling at high velocity to effect sepn. of the C particles, *e. g.*, by collection in an ink vehicle such as a heavy petroleum oil. An app. is described and numerous details of the process are given.

Regeneration of absorbent carbon and the like. SOCIÉTÉ ANON. DES ENGRAIS ET NOIR ANIMAL. Fr. 636,165, Oct. 12, 1926. An app. is described for the economic use of steam for regenerating C, etc., used for absorbing benzene, gasoline, etc. The boiler simply furnished the heat necessary for heating the mass and for evapg. the absorbed substance, the heat for evapg. the condensed steam being furnished by a super-heater.

Hydrogen. ARTHUR W. BURWELL (to Alox Chemical Corp.). U. S. 1,680,858, Oct. 30. In order to produce H of high purity, hydrocarbon material such as natural gas or other hydrocarbon gas is decompd. by heat, elemental C is sepd. from the mixt. of decompn. products and aromatic hydrocarbons present also are sepd. simultaneously by treatment of the mixt. with water and the methane-type hydrocarbons are converted into CO by subjecting the mixt. to a thermal decompn. at 1230–1280°, the resulting mixt. is dried, mixed with O in some excess over that theoretically required to convert the CO to CO₂ and brought into contact with a MnO₂ catalyst at a temp. below 100°, unchanged O is removed by action of glowing Cu and CO₂ is removed with NaOH soln.

Hydrogen. MARIA CASALE (née SACCHI). Fr. 638,323, July 27, 1927. H is prepd. catalytically from CO and water at such a temp. and pressure that the water remains in the liquid state, *e. g.*, at a temp. of 250° a pressure above 40.5 kg. per sq. cm. is used.

Hydrogen. COMPAGNIE NATIONALE DE MATIÈRES COLORANTES ET MANUFACTURES' DE PRODUITS CHIMIQUES DU NORD RÉUNIS (ÉTABLISSEMENTS KUHLMANN). Brit. 286,291, March 3, 1927. Coke-oven gas or other suitable hydrocarbon-contg. gas is heated at a temp. above 1200° for a sufficient time to decomp. the hydrocarbons substantially completely with production of H. The decompn. is preferably effected in the presence of coke or refractory material which may be rendered more active by impregnation with suitable substances. An app. and various details and modifications are described.

Phosphorus. COMPAGNIE NATIONALE DE MATIÈRES COLORANTES ET MANUFACTURES' DE PRODUITS CHIMIQUES DU NORD RÉUNIS (ÉTABLISSEMENTS KUHLMANN.) Brit. 286,290, March 3, 1927. White P is obtained by distg. in superheated steam the condensate obtained by heating phosphates, silica and coal in an elec. or other suitable furnace, or the P vapor may be reacted on to form H₃PO₄ and H.

Oxidation of phosphorus. COMPAGNIE NATIONALE DE MATIÈRES COLORANTES ET MANUFACTURES' DE PRODUITS CHIMIQUES DU NORD RÉUNIS (ÉTABLISSEMENTS KUHLMANN). Fr. 635,432, June 2, 1927. P is oxidized by steam mixed or not with air, in the presence of binary, tertiary or quaternary metallic compds. of Si such as silicides of Cu, double silicides of Ni and Cu, or triple silicides of Fe, Cu and Ni. Cf. C. A. 22, 4738.

Sulfur. KENNETH M. BAUM. U. S. 1,689,545, Oct. 30. Ore or like material contg. elemental S is heated with an aq. soln. of ZnCl₂ of such strength that its sp. gr. is greater than the sp. gr. of molten S when at the same temp. and less than the sp. gr. of the main portion of the extraneous matter assocd. with the S, to a temp. above the m. p. of S and the floating S is sepd.

Sulfur in highly dispersed form. HANS SCHRADER and HAROLD SCHOELLER. U. S. 1,688,357, Oct. 23. S vapors are dispersed by NH₃ or NH₄ and N or other gas contg. NH₃ and the S is sepd. from the resulting fume, *e. g.*, by elec. deposition. The product is suitable for prepg. fungicides or rubber compds.

Lead product. J. D. McLACHLAN (S. J. Warren, inventor). Australia 7532, May 28, 1927. The solid materials in the flues of Pb treatment plants are treated with free O to obtain a Pb sulfate-like material.

Silica gel. MAX YABLICK. U. S. 1,687,919, Oct. 16. A soln. of a sol. silicate is treated with a sufficient quantity of an NH₄ salt such as (NH₄)₂CO₃ to form a colloidal soln. of free silicic acid and gelling in the presence of the alk. liquor resulting from the reaction is permitted and the gel is washed and dried.

"Finishing lime." VICTOR M. FREY. U. S. 1,689,237, Oct. 30. Impure dolomite is ground and decarbonated without admixture of other solid substances while agitated

at a temp. below that necessary to produce sintered or hardened particles, and the product thus obtained is hydrated.

Refining graphite and other minerals. HENRI GUYARD. Fr. 636,502, Apr. 13, 1927. Minerals are caused to travel through a conduit by means of an Archimedian screw, and jets of water-carrying air bubbles are directed through the mineral carrying the graphite particles to the top.

Plant for treating graphite and other ores. PAUL ALEXANDRE DÉSIRÉ THÉODORE. Fr. 638,088, July 21, 1927.

Active "carbomineral" absorptive material. EDOUARD URBAIN (to Urbain Corp.). U. S. 1,689,647, Oct. 30. Carbofizable vegetable material is mixed with mineral material comprising a sufficient quantity of tri-Ca phosphate to constitute at least 25% of the wt. of the finished product and H_3PO_4 , and the mixt. is agglomerated, dried and calcined at a temp. sufficiently high to eliminate most of the P other than that combined as a tri-basic phosphate. The product is suitable for absorbing gases.

Catalysts. M. LATSHAW and W. L. JUDEFIND (to Silica Gel Corp.). Brit. 286,309, March 3, 1927. Porous gels such as silica, stannic oxide, W oxide or Al_2O_3 are impregnated with a catalytic metal or compd. by charging the gel with a gaseous compd. having a reducing action (such as SO_2 , CO or H_2S) and then treating it with a soln. of a compd. of the catalytic metal such as a compd. of Pt, Ag, Ni, Cu, Pd or Fe. Further reduction may be effected with H in some cases.

Catalysts for hydrogenation and reduction, etc. I. G. FARBENIND. A.-G. Brit. 286,123, May 6, 1927. The process described in Brit. 281,218 (C. A. 22, 3500) in which catalysts are prepd. by sepg. the metal in finely subdivided form from aq. solns. of salts by action of a more electropositive metal is modified by effecting the sepn. in the presence of an org. base or an acid amide, e. g., urea or pyridine, which may be used with inert carriers on which the sepd. Ni or other catalytic metal is deposited.

Base-exchanging materials, catalysts, etc. A. O. JAEGER (to Selden Co.). Brit. 286,212, Feb. 28, 1927. Non-siliceous base exchange compds. are formed by reaction of at least one compd. such as a metallate, contg. a non-siliceous anion capable of forming the acidic portion of the nucleus of a non-siliceous base exchange compd., with at least one compd. such as a metal salt, contg. a metal element which is amphoteric in at least one stage of oxidation, to give a product alk. to litmus and preferably neutral or alk. to phenolphthalein (one at least of the reacting materials being catalytically active). An extremely large no. of examples, details and modifications are given among which are the following. Metallates derived from Al, Cr, Zn, V, Be, Sn, Pd, Ru, Rh, Os, Pt, Ti, Zr, Pb, U, Ta, Mo and W or complexes such as NH_3 or CH derivs. of these metals may be used with metal salts such as neutral or acid salts of Cu, Ag, Bi, Au, Be, Zn, Cd, the rare earths, Ti, Zr, Sn, Pb, Th, Cr, U, V, Mn, Fe, Ni, Co, Pt and Pd; borates may be used and alkali in the product may be replaced by base exchange, by NH_4 , Cu, Ag, Au, Be, Mg, Cs, Zn, Sr, Cd, Ba, Hg, Al, Tl, Ti, Zr, Sn, Sb, Th, V, Bi, Cr, Mo, U, Mn, Fe, Co, Ni, Pt or Pd and salt-like compds. may be formed by introducing anions into the product as by treatment with acids of the elements V, W, U, Cr, Mo, Mn, Ta, Cb, Sb, Se, Te, As, P, Ti, Bi, Al, Pb, Sn, Zn, S, Cl, Pt, B, Zr or Th or with complex ions such as ferro- or ferri-cyanogen, thiocyanogen or NH_3 complexes. The components may be fused together but the reaction is preferably effected between relatively dil. solns. of the components and preferably the relatively acid components are added to the relatively alk. components to maintain the reaction mixt. alk. throughout the reaction. Diluents which themselves have a catalytic action may be used and pptn. of the gels formed may be hastened by heat, pressure, agitation, or acidifying or salting-out such as with alkali or NH_4 salts, alc. or other org. compds. and the porosity of the products may be increased by addn. of substances which can subsequently be removed by leaching, combustion or volatilization. Details are given for prep. catalyst for a wide variety of specified purposes. Cf. C. A. 22, 2818.

Gaseous catalytic reactions. I. G. FARBENIND. A.-G. Fr. 638,109, July 22, 1927. In catalytic reactions such as the synthesis of NH_3 , the production of MeOH, and particularly the treatment of C by H for the production of hydrocarbons, an irregular whirling movement is given to the contact materials by a current of gas entering the contact chamber.

Condensation products of ketones and alkylated phenols. CHEMISCHE FABRIK AUF ACTIEN (VORM. E. SCHERING). Fr. 636,119, June 17, 1927. Ketones and alkylated phenols are condensed in the presence of a condensing agent such as HCl at temps. below 100° .

Condensation products of urea and formaldehyde. FRITZ SCHMIDT. Fr. 636,219, June 18, 1927. Urea or its deriva. is condensed with formaldehyde and dehydrated

in the presence of supports such as casein, cellulose or its derivs. mixed or not with softening agents, natural or artificial resins, or polymerized vinyl ethers, to obtain a spongy porous product free from bubbles.

Condensation products of formaldehyde and thiourea or thiourea and urea. SOCIÉTÉ ANON. POUR L'INDUSTRIE CHIMIQUE À BALE. Fr. 638,082, July 21, 1927. See Brit. 275,995 (C. A. 22, 2446).

Impregnating articles with phenol-aldehyde condensation products. MANUFACTURE DE MACHINES AUXILIAIRES POUR L'ELECTRICITE ET L'INDUSTRIE SOC. ANON. Brit. 286,305, March 3, 1927. The operations of drying and polymerization are effected in a heated receptacle, and impregnation and evapn. of solvents are effected in a receptacle through which a current of air or other suitable gas is passed which is supplied by a fan and heated or cooled as required. Various details of app. are described.

Sheet material comprising condensation products of urea with formaldehyde. SOC. ANON. POUR L'IND. CHIM. À BALE. Brit. 286,250, March 1, 1927. Sheets for wind shields of automobiles, flying machines, etc., are formed by uniting sheets of CH_2O -urea condensation product. Sheets of somewhat different character (details of the prepn. of which are given) may be united under the action of heat and pressure.

Artificial horn. I. G. FARBENIND. A.-G. Fr. 638,023, July 20, 1927. Artificial horn is made from casein contg. solid or liquid bases of the aliphatic, aromatic or aliphatic-aromatic series or their salts or derivs. Bases contg. OH groups such as cyclohexylethanolamine, or their homologs or acyl derivs. are particularly suitable. An example is given of a horn prepd. from casein and cyclohexylethanolamine. The aliphatic-hydroaromatic amines are prepd. by joining hydroaromatic radicals with aliphatic radicals, one or the other of which contains an OH group. Examples are given of the prepn. of cyclohexylethanolamine from cyclohexylamine and ethylene oxide, or from ethanolamine and cyclohexanone or from glycol chlorohydrin and cyclohexylamine.

Molded cork products. WM. F. GRUPE (to Boucher Cork Co.). U. S. 1,689,584, Oct. 30. In forming molded articles, granules of cork are subjected to an elevated temp. (suitably about 175°) in a partial vacuum to render the cork and the resins present in it plastic and the material is molded *in vacuo* while plastic. An app. is described.

"Catgut substitute" (for use in tennis rackets, etc.). JOHNSON & JOHNSON (Gt BRITAIN), LTD. Brit. 285,752, Sept. 9, 1927. Silk strands deprived of sericin are impregnated with glue and a softening agent such as glycerol or a glycol and a lubricant such as lard or castor oil is added to counteract any deleterious action of the softening agent. The strands may be twisted and the impregnated cord may be water-proofed by exposure to vapors of CH_2O or by treatment with other tanning agent.

Vegetable glue. IRVING F. LAUCKS and GLENN DAVIDSON (to I. F. Laucks, Inc.) U. S. 1,689,732, Oct. 30. A glue is formed by reaction of a vegetable seed flour high in protein such as soy-bean flour and an alkali metal hydroxide in an aq. medium. NaOH and Ca(OH)_2 may be used together.

Molds for plastic materials. SOCIÉTÉ INDUSTRIELLE DE CAOUTCHOUC D'ARGENTEUIL. Fr. 638,010, June 30, 1927. Molds for rubber, celluloid, etc., are made of steel surrounded with a casting of Al for lightness and rapid absorption of heat.

Molds for plastic materials. "SICA" (SOCIÉTÉ INDUSTRIELLE DE CAOUTCHOUC D'ARGENTEUIL). Fr. 638,008, June 25, 1927. The interior of molds for rubber, celluloid, etc., has a coating of metallic regulus, e. g., an alloy of Sb and Pb.

Waterproofing and coating paper, leather, wood, fabrics, etc. A. JEREMIAS. Brit. 286,396, Dec. 20, 1926. An emulsion of rubber, collodion or other suitable material insol. in water is applied as a coating and the material in the coating is then converted into insol. form by a fixing agent, e. g., a metal salt such as alum, Al acetate or chrome alum. Numerous details, examples and modifications are described.

Protective coatings on wood, metal or other materials. PERRY W. TURNER. U. S. 1,689,567, Oct. 30. After applying a protective coating such as an adhesive varnish contg. kieselguhr, kaolin and ZnO or Ti oxide, a moist fabric is applied over the coating before the latter is dry, is allowed to dry and shrink on the article, and the fabric is impregnated with the coating compn.

Antiseptic, antifouling, germicidal, waterproof coating composition. ARTHUR BIDDLE (to United Products Corp. of America). U. S. 1,689,008, Oct. 23. A compn. suitable for use on plants or walls, etc., comprises a poisonous As compd. such as Ca arsenate 20, casein 3 and rubber latex 10 parts. This mixt. may be dild. with water up to 4000 parts for use as a spray.

Acoustic diaphragms of thin porous metal. NEWMAN H. HOLLAND (to Bell Telephone Laboratories). U. S. 1,689,030, Oct. 23.

Sound records. W. T. SMITH, W. A. SMITH and S. H. WOOD. Brit. 285,965, Nov.

23, 1926. In recording for the manuf. of records in tape form, the sound grooves are first made in wax in the usual way, Cu is then deposited on the wax to form a matrix and from this the record is impressed on a strip of celluloid or like material.

Use of radioactive material for making time records, etc., on sensitive strips of various recording apparatus. J. A. TIEDEMAN (to British Thomson-Houston Co., Ltd.). Brit. 286,299, March 3, 1927.

Polish for metal, leather, furniture, etc. GEORGE W. DARLINGTON. U. S. 1,689,864, Oct. 30. Gasoline 6, eucalyptus oil 1, an aq. soap soln. (contg. 1.25 lbs. soap per 3 gals. water) 1 and infusorial earth 1 part.

Stencil sheets. H. SIMON. Brit. 286,466, March 15, 1927. In making stencils comprising Yoshino paper coated with a compn. which includes oily softening agents, a protective coating impervious to the oily material (such as protein or resinous material or cellulose esters or ethers) is applied to the sheet to protect the typewriter platen, etc., from action of the oily substance. Examples are given of protective compns. formed of an alk. casein soln. with glycerol or sugar, an alc. soln. contg. varnish and Na oleate, and an alc. soln. of palmitic acid and Na oleate.

Decolorizing substances. SOCIÉTÉ ANON. DES ENGRAIS ET DE NOIR ANIMAL. Fr. 636,204, Oct. 15, 1926. Non- or slightly volatile acids, *e. g.*, H_2SO_4 or H_3PO_4 , are incorporated in active C such as animal black to prevent shrinking when the C is dried.

Activation of gases. ALEXANDRE FOLLIET. Fr. 637,891, July 19, 1927. Gases, such as CO and H, are heated to 500–1000° under a pressure of 5–100 kg. in a suitable app. having inert walls, and cooled if necessary before entering the catalyst chambers.

Emulsions. I. G. FARBENIND. A.-G. Brit. 286,252, March 1, 1927. Semi-solid or friable masses sol. in or emulsifiable with water are obtained by sulfonating wool fat (which may be mixed with wool fat fatty acids) in the presence of a phenol, and suitably in the presence also of solvents such as tetrachloroethane or other chlorohydrocarbon, a hydroaromatic compd. or CS_2 .

Detergent. STEPHEN D. FRANKO (one-half to Harry E. Dyer). U. S. 1,688,540, Oct. 23. A compn. suitable for cleaning hats or leather goods is formed from water 1 gal., S 4 oz., oxalic acid 3 oz., Pb acetate 2 oz., Na_2CO_3 4 oz., NaHCO_3 2 oz., Na_2SO_3 8 oz., rock alum 2 oz., H_2O_2 3 oz. and a perfume.

Detergents. BRITISH DVESTUFFS CORP., LTD., J. BADDILEY AND E. CHAPMAN. Brit. 286,197, Sept. 21, 1926. Compns. for cleaning and polishing walls, tiles, stone-ware, glass, metal and painted and polished surfaces are formed of the sulfonic acids described in Brit. 274,611 (C. A. 22, 2268) and Brit. 279,990 (C. A. 22, 3042) or their sol. salts in the form of aq. solns. or pastes which may be mixed with an org. solvent such as benzene, naphtha, petroleum spirit, chlorinated hydrocarbons, etc. Thickeners, coloring agents, abrasives or soap also may be added. Cf. C. A. 22, 4741.

Cleaning and degreasing metals. DR. ALEXANDER WACKER GES. FÜR ELEKTROCHEM. INDUSTRIE G. M. B. H. Fr. 636,405, June 21, 1927. An app. for cleaning metals by a liquid such as trichloroethylene or benzene comprises 2 closed vessels, one above the other and provided with an arrangement to establish a difference of pressure to bring the cleaning liquid from the lower to the upper vessel contg. the metals and to the lower again without coming in contact with circulating or closing parts.

Lining for metallic vessels. TAKANOSHIN DOMOTO. U. S. 1,688,857, Oct. 23. A compn. suitable for lining cans for holding soy or "miso" is formed of rubber 10, C_6H_6 100 and Al soap 5 parts.

Apparatus (with a rotating horizontal drum carrying an internal spiral) for oxidizing ground lead, etc. FREDERICK W. ECKFELDT (to John T. Lewis & Bros. Co.). U. S. 1,690,068, Oct. 30.

Composition for transferring designs. OLIVER L. DAVIS (to Joseph Walker Co.). U. S. 1,688,117, Oct. 16. Cumar gum, rosin, carnauba wax and stearic acid are used with a coloring matter comprising ultramarine blue and a special white ink contg. litho varnish and "Titanox" (contg. TiO_2 and pptd. BaSO_4).

"Antifreeze composition." JAMES R. PAUL. U. S. 1,689,153, Oct. 23. A compn. suitable for use in automobile radiator systems comprises substantially equal quantities of $\text{Na}_2\text{S}_2\text{O}_4$ and CaCl_2 , a smaller quantity of tartaric acid, and water.

Pigmented exfoliated shell. SIDNEY RAUSCHENBERG. U. S. 1,689,842, Oct. 30. Exfoliated natural shell in flaked form is immersed in a chem. soln. such as an aq. soln. of AgNO_3 and NH_3 and the mixt. is boiled and stirred, a precipitant such as $\text{K}_2\text{Cr}_2\text{O}_7$ soln. is added and the admixture is further boiled and stirred. The product is suitable for decorative purposes.

Improving frictional surfaces. BRITISH DVESTUFFS CORP., LTD., CECIL JOHN

TURRELL, CRONSHAW, JAMES BADDILEY AND ERNEST CHAPMAN. Fr. 637,850, July 18, 1927. See Brit. 278,495 (C. A. 22, 2645).

19- GLASS, CLAY PRODUCTS, REFRACTORIES AND ENAMELED METALS

G. E. BARTON, C. H. KERR

The manufacture and properties of glass and their application in illuminating engineering. S. ENGLISH. *Glass* 5, 212-4, 262-9, 310 3(1928).—A review. Transparency and color are discussed together with methods of decolorizing. The various types of daylight glasses are described. Diffusing glasses are divided into 3 groups, (1) opal glasses, (2) etched or sand-blasted glasses and (3) glass with a prismatic or irregular surface. Efficiency of diffusion is equal to scattering power divided by absorption and in opal depends upon amt. of material sepd. from soln., size of particles and difference in n of the glass and the particles. The min. diam. of the particles should be that of the wave length of the light considered. Brittleness in opal glass is due to formation of dendritic crystals in the glass from working at too low a temp. Etched or frosted glass has a smaller absorption than opal and diffuses all wave lengths equally. Better transmission is obtained when the etched surface is faced toward the source of light. Thus inside frosted bulbs are more efficient than outside frosted. A detailed diagram and description of the bulb-frosting process are given. W. H. RISING

The relationship between the water-solubility and composition of glasses. JOHANN ENSZ. *Glastech. Ber.* 5, 449-76, 509-19(1928).—Exptl. glasses were crushed and graded between circular sieves to 1-5 mm. diam. The grains were washed with abs. alc. dried at 100-120°, and 18 g. quantities boiled with a salt soln. boiling at 107°, in a 500 cc flask with a reflux condenser for 7 hrs. After cooling the soln. was filtered through silk bolting cloth of 0.085 mm. mesh, the finely pptd. silica being allowed to pass through. The grains were washed with distd. water at 100° and the filtrate was evapd. and analyzed. A summary of various theories is given. When SiO_2 is replaced by MgO , CaO , ZnO , BaO , PbO , B_2O_3 , or Al_2O_3 in a glass having the compn. 82 SiO_2 , 18 Na_2O the most resisting glass is obtained with Al_2O_3 , the other oxides following in the order of ZnO , CaO , B_2O_3 , MgO , BaO , PbO . Contrary to previous beliefs MgO glasses contg. less than 5% MgO are less stable than the corresponding CaO glasses. The belief that B_2O_3 increases resistance up to about 12% and above this point causes a decrease in resistance is confirmed. The marked max. in the soly. curves which Peddle (C. A. 16, 3180) found for K_2O - Na_2O in lead and lime glasses was not verified in this series, only a very slight max. being noted. The absence of maxima in glasses in which the oxides of bivalent and trivalent alkali elements were present in varied proportions was definitely established. E. VALDEN

The Fourcault process of drawing sheet-glass. K. LOSSEN. *Glastech. Ber.* 6, 121-34(1928).—A complete description of the Fourcault process with details of the construction of the float and drawing tower. The relations between the thickness of the sheet and (1) the drawing speed, (2) the viscosity of the glass, (3) the depth of immersion of the float are discussed. The way in which devitrification limits the temp. range of the molten glass and its compn. is explained with reference to the phase diagrams of Morey and Bowen. Raising the temp. of the molten glass is beneficial for many reasons and gives a flatter surface but the temp. variation is limited to 25° because of the cooling conditions above the float. Different dispositions of 6 machines at the working end of a tank are illustrated and the dimensions for most efficient working are given. E. VALDEN

The coloring of glass by metallic sulfides. HERMAN HEINRICHS. *Glastech. Ber.* 6, 51-4(1928).—The sulfates of Fe, Cd, Ni and Mn were reduced to sulfides by heating with powd. Al, Zn, Mg and Fe. CdSO_4 is easily and quantitatively reduced to CdS by Mg. H. attempts to obtain glasses with dissolved sulfides by reducing the sulfates with powd. metals during melting. FeS was obtained in glasses contg. 67-77½ SiO_2 , 7½-10 CaO , 14½-19 Na_2O through reduction of FeSO_4 by Al, Mg and Fe. Zn gave no sulfide. Batches high in water content gave lighter colored glasses through loss of sulfide as H_2S . As much as 1% FeS could be dissolved in these glasses. The reduction of CdSO_4 in glasses was accomplished by Al but not with Zn or Mg. The glass was colored a light brown which changed to yellow on reheating. CdS is much less sol. than FeS in the glasses examd., though its soly. increases with increasing alk. of the glass. The soly. of CuS and NiS is less than that of CdS . E. VALDEN

Wollastonite crystals in devitrified glass. M. BELLIERE. *Glass* 5, 159-60(1928).—In tearing down a glass furnace glass was found to have penetrated the floor cracks and there devitrified. The uncrystd. liquid has flowed away, leaving a skeleton-like mass of crystals. These on measurement proved to be wollastonite. Measurements are given together with several drawings of the crystals. W. H. RISING

Measuring temperatures in the glass industry.* H. MIETHING. *Sprechsaal* 61, 526-8, 546-8(1928).—The necessity and advantages of keeping a close and accurate record of temps. in glass-melting tanks are stressed. The use of the thermocouple in tanks has decided disadvantages. The Ardometer, a radiation pyrometer, is especially adapted for recording continuous temp. for long periods; the optical pyrometer is suitable for intermittent temp. measurements. The Ardometer is a combined radiation pyrometer with the thermocouple principle. The methods of attaching the Ardometer, controls, and measuring and recording the temps. in a glass tank are described and illustrated. A discussion on the use of base metal thermocouples in annealing furnaces is included. R. A. HEINDL

Glass tank operation improved by use of preheated air. W. DYRSSEN. *Glass* 5, 10(1928).—A brief description of a continuous regenerative type air heater for a glass tank fired with natural gas. H. P. HOOD

Effect of combustion conditions in glass-furnace operation. D. J. MCSWINEY. *Glass* 5, 155-6(1928).—A brief discussion of the maintenance of balanced combustion conditions. The condition of the combustion atm. largely detcs. the degree of glass decolorization by Mn. A smoky flame is a common cause of low or dirty colored glass and may be a cause for seed. The use of a soft flame is said to give glass of better working properties, probably influenced by the amt. of salt cake, As or other reducible materials in the glass. H. P. HOOD

The electric heating of glass annealing furnaces. K. TAMELE. *Glastech. Ber.* 6, 225-42(1928).—A review of the various forms of glass elec. annealing furnaces used in the U. S. with descriptions of the various methods of temp. control and the construction of the heating units. E. VALDEN

Water cooling as applied to glass tanks and furnaces. F. F. CARTY. *Glass* 5, 54-9(1928).—A description of the development of a method of water cooling glass tank walls and throat. Buckstays are cooled to prevent bending. The effect of wall cooling becomes most noticeable when the wall thickness has been reduced to 4 in. It is possible to continue the operation of a furnace even after portions of the tank walls are gone. The coolers are made of rolled steel plates about $\frac{5}{16}$ " or $\frac{3}{8}$ " thick pressed into shape and the joints welded. Water flow is adjusted to maintain an outlet temp. about 180° F. Reduced costs and increased production are claimed upon larger refractory life, lower building, operative and maintenance costs, and continuous operation for much longer times. Lower fuel costs are based on the walls retaining their thickness for a longer period and thus maintaining the original furnace design and efficiency. H. P. HOOD

Electric firing and stained glass. B. M. PEARSON. *Ceramic Age* 11, 214-7(1928).—The old gas-fired type of furnace for firing stained glass has been replaced by elec. furnaces heated by nichrome elements. By this means better temp. control is claimed as well as better atm. conditions in the furnace, resulting in less spoiled ware. An historical account is given of the stained glass industry in England from medieval times. W. H. RISING

Short course on refractories for glass makers. K. ENDELL. *Glastech. Ber.* 5, 601-2(1928). E. VALDEN

Some measurements of the depolarization effect in colloidal colored and opal glasses. B. LANGE. *Glastech. Ber.* 5, 477-86(1928).—The degree of polarization of the light scattered at right angles to the incident beam depends on the size of the colloidal particles. By measuring this degree of polarization L. obtains an indication of the size of the particles present in the glass. For CdS glasses and for a glass colored by x-rays the values obtained were so low that L. concluded that the coloring is not of a colloidal nature. A comparison between gold sols and gold sapphire glass showed the method to be valid. E. VALDEN

Stresses and strains in glass. FRIEDRICH RINNE. *Glastech. Ber.* 6, 65-76(1928).—R. discusses the at. and mol. stresses in substances and then considers the internal stresses resulting from external forces. The stress ellipsoid with its slip-planes, stress diagrams with linear and curved coordinates, and isoclinic and isodynamic stress figures for glass are defined and explained. The method of realizing these experimentally by means of polarized light is mentioned and the case of a glass disk heated by a point source at the center worked out. R. discusses the stresses set up in glass under mech.

strain, the progress of a crack and the disappearance of the stresses in the glass, the optical phenomena resulting from a scratch on the surface with stress figures, and the conchoidal fracture of glass by the impact of a steel ball. E. VALDEN

Some results on the behavior of glass under concentrated loads. OTTO GRAF. *Glastech. Ber.* 6, 183-6(1928).—The cone-shaped fracture which occurs when a sphere is in contact with a glass surface and a load applied is investigated. It was found that the surface of the cone was smooth when the load was applied smoothly and that steps were formed when the load was increased by jerks. The angle of the cone varied with the time taken to apply the load, being greatest when the load was applied suddenly and decreasing to a const. value. E. VALDEN

The durability of sheet glass. G. KEPPELER AND F. HOFFMEISTER. *Glastech. Ber.* 6, 76-89(1928).—Two methods were used: (1) A trough made of 2 glass plates sepd. by a Para-rubber band and suitably clamped was filled with water and kept at 80° for 3 hrs. in a thermostat. Fifty cc. was withdrawn and titrated with 0.01 N H₂SO₄, methyl red being used as indicator. The surface of the water was covered with paraffin. (2) A powder method in which the glass was sifted between sieves 30 and 50 per cm., washed with alc., dried, placed in 100 cc. water at 100° for 5 hrs. The water was filtered and evapd. in a Pt dish and the residue obtained. The results of these methods were compared with the values obtained from the chem. compn. While the values obtained by the powder method and the values obtained from the ternary diagram generally agreed, the results obtained by the cell method varied. The first 2 methods put most of the glasses in class III. The cell method put them in classes II, III and IV according to the classification of Mylius. The glass surface seems to be affected by methods of manuf. and previous treatment. Polishing increases its susceptibility to attack, probably because of the removal of the surface layer. Old window glass had a very high resistance on account of the removal of the soda in the surface layer. For this glass the powder method gave a rating in class III, the cell method class I. Sheet glass manufactured by the Fourcault process was the worst from the point of view of weathering. Blown sheet glass and cast plate glass were of equal quality or on the boundary of classes II and III on the Mylius scale. E. VALDEN

Gases in glass. HERMANN SALMANG AND ALFRED BECKER. *Glastech. Ber.* 5, 520-37(1928); cf. C. A. 22, 1661.—The exptl. details in connection with the detn. of gases in glass are described. Glasses which have been degasified at a high temp. in an evacuated furnace gave no gases after having been held at somewhat lower temps. in various gases at atm. pressure. S. and B. believe the gases in glass to be held in chem. combination rather than in merely phys. soln. Glasses contg. Na₂SO₄ yield SO₂ and O₂ in the ratio of 2:1 as required by the decompn. of SO₃. Water was found in all the glasses tested, varying in the carbonate glasses from 0.02 to 0.053% by wt. H. P. H.

An improved hot-wire glass cutter. J. ALLEN BAKER AND HARRY H. HALDEMAN. *J. Chem. Education* 5, 1289-91(1928). E. H.

Chemical and thermal resistance of laboratory glassware. ARNALDO MAURI. *Le verre* 7, 143(1927).—A review of previous work. E. VALDEN

Chemical and thermal resistance of laboratory glassware. ARNALDO MAURI. *Le verre* 7, 151-4(1927).—The glasses examd. were Jena (green line), Jena 20, Murano 22, Murano 23, Pyrex Labo Boromica. Analyses of the glasses are given. The effects of 0.1 N solns. of H₂O, HCl, NH₄OH, NH₄Cl, (NH₄)₂CO₃, NaOH, Na₃PO₄, Na₂CO₃ and Na₂S on the glasses were detd. at 120° in the autoclave. The glass was ground to a mesh of 8 per cm. and the loss in wt. detd. A series of expts. was made by boiling the following solns. in flasks for 2 hrs.: HCl (N and 0.1 N), HNO₃ (0.1 N), H₂SO₄ (0.1 N), (COOH)₂ (0.1 N), H₂S (0.1 N), SO₂, NH₃ (0.1 N and N), NH₄Cl (N), (NH₄)₂CO₃ (N), NaOH (0.1 N), Na₃PO₄ (0.1 N), Na₂CO₃ (0.1 N), Na₂S (0.1 N), (NH₄)₂S (0.1 N). The loss in wt. was detd. The thermal resistance was measured by chilling lab. ware from 150° to 15°. E. VALDEN

Window glasses transmitting ultra-violet rays. S. ENGLISH. *Glass* 5, 338-40 (1928).—A description of exptl. glasses leading to the development of Holviglass. Spectrograms are given for alkali silicates; the best quality of Fontainbleau sand melted in unglazed porcelain crucibles is used. The admixt. of either soda, potash or boric oxide with silica seriously reduces its power of transmitting ultra-violet. Addns. of CaO, MgO, Al₂O₃, B₂O₃, ZrO₂, ZrO and BaO were tried. Na₂O, B₂O₃ and SiO₂ glass gave the highest transmission limit, 262 μ in 2 mm. thickness. No relationship between silica content and transparency was found. Fe oxide causes reduced transparency. Alkali added as the carbonate proved to be much better than either the sulfate or nitrate. Spectrograms and curves showing the effect of solarization by sunlight and the Hg arc on various ultra-violet transmitting glasses are included. H. P. H.

Physical and chemical properties in the five-component system sodium, potassium, calcium, aluminum, silicates. (The glassy state.) E. BERGER. *Glastech. Ber.* 5, 569, 597(1928).—The investigation of this five-component system was conducted by making kg. melts in sets of forty. The density, expansion, n , dispersion and water and alkali soly. were detd. The furnace was cooled down slowly after each run and the glass examd. under a magnification of 10 X to 20 X. The various melts were divided into 3 classes: (1) glassy, (2) partially crystd., (3) totally crystd. or infusible at 1500°. The various const. were plotted according to Zschimmer's system of projection. A few typical projections are given as well as the address from which a complete set may be obtained.

E. VALDEN

Silicate analysis. ALFRED THURMER. *Glastech. Ber.* 5, 537-8(1928).—T. presents notes on silicate analysis gathered from the literature. References are given.

J. A. GRANT

Manufacture of gray brick. L. P. COLLIN. Can. Dept. Mines, *Mines Branch* No. 690, 8(1928).—A description of the process of mfg. gray brick in Pennsylvania is given. About 26 lbs. of MnO_2 is added to the clays for 1000 bricks to give the color to the burned bricks. The burning temp. is from cone 8 to cone 10. By using a strong reducing atm. at the end of the burn, various shades of gray are obtained.

L. W. RIGGS

Efflorescence on brickwork. W. ANGUS MCINTYRE. Building Research Sta. *Brit. Clayworker* 37, 252-5(1928).—The Building Research Sta. at Watford has commenced an investigation into certain aspects of the problem of efflorescence. M. discusses the value of the work of previous investigators and states that all efflorescences consist of salts which are sol. in H_2O , although the degree of soly. may vary enormously. The fact that these substances are all sol. in H_2O indicates that the best way of removing them when they appear on brick walls is washing in plain water. Salts of Na, K, Mg and Ca are present in raw brick clays and are not fully decompd. in the kiln. Sulfates meet with little or no decompn. during the firing. $BaCO_3$ is at present used to overcome the bad effects of the sulfates. M. also discusses other sources of sol. salts and how these sources may be eliminated.

R. A. HEINDL

After diaspore—what? A. F. GREAVES-WALKER. *Ceram. Age* 12, 92-3(1928).—The present reserves of diaspore are about 1 million tons. Within a few years there will be a shortage. Possible substitutes are (1) cyanite, (2) bauxite, (3) Georgia kaolins. A practically inexhaustible deposit of cyanite is located in western N. Carolina. Since it occurs in a siliceous schist it would have to be washed and also calcined before using which would increase its cost over that of diaspore. Bauxite requires much higher burning than cyanite but has been used in refractories with success. Georgia kaolins are plentiful and have been used for a long time. They also require calcining if substituted for diaspore.

W. H. RISINO

Notes on production of cream-colored bodies. GEORGE H. BROWN. *Ceramic Age* 11, 77-9(1928).—Several series of clay mixts. of rutile and TiO_2 with clays contg. various Fe contents were prepd. and burned. With low Fe_2O_3 contents a light cream color was obtained but with increasing Fe_2O_3 the color ranged from tan to greenish gray. Conclusion: (1) Rutile is satisfactory for use in the development of cream-colored vitreous floor tile bodies. (2) Better colors are secured in bodies which are free from ball clay and low in Fe_2O_3 , as the color secured from TiO_2 or rutile is largely dependent upon the proportions of rutile and Fe_2O_3 . (3) The use of TiO_2 as a coloring agent in place of rutile has great possibilities, and satisfactory colors can be secured in vitreous bodies using ball clay if TiO_2 is utilized instead of rutile. TiO_2 is very hard to grind, has a tendency to crystallize on a clay body, and has an uncertain effect on the body. Rutile gives variable color effects owing entirely to variations and irregularities in the burning.

W. H. RISINO

Lignin extract. A dry body strengthener makes a cheap organic binder. ROBERT M. KING. *Ceram. Ind.* 11, 43-5(1928).—Lignin ext., obtained in either the liquid or powder form, was tried out on representative clay bodies as a dry body strengthener. In all types it produced a marked increase in dry strength with no increase in shrinkage. Advantages of this cheap binder are: (1) body strength may be increased without increase of plastic clay content; (2) excessive shrinkage may be reduced by substituting lignin ext. for some of the plastic clay, thus saving an expensive material as well as reducing shrinkage; (3) drying and aging processes are shortened, thus cutting expense on these operations. Curves are given.

W. H. RISINO

Notes on the English and German refractories industry. STUART M. PHELPS. *Am. Refractories Inst., Tech. Bull.*, No. 25, 4 pp.(1928).

E. H.

Kaolinic refractories and their properties. MARK J. TERMAN. *Heat Treating and Forging*, 14, 642-3(1928).—Processing a kaolinic material by a new method, a re-

crystd. refractory brick is obtained having a max. uniformity of quality and size. Its ratio of $\text{SiO}_2\text{-Al}_2\text{O}_3$ is the same as that of other clays; its m. p. is 3200°F. in an oxidizing and 3165°F. in a reducing atm.; up to 2900°F. it has no permanent vol. change and only a slight shrinkage up to 3000°F. ; its av. coeff. of expansion is 242×10^{-6} ; it shows unusual resistance to spalling, does not "grow" under continued exposure to heat, and has unusual load-bearing capacity. Some applications are outlined. J. BALOZIAN

Refractoriness of molding sand. J. F. McMAHON. *Can. Dept. Mines, Mines Branch No. 690*, 9-24(1928).—The procedures for detg. the softening point of the entire sand and the clay substance are described, also the draw-trial and Sagger tests.

L. W. RIGGS

X-rays in ceramics. T. N. McVAY. *Ceram. Ind.* 10, 629(1928).—Although x-rays have not been widely applied to ceramics there are some possible applications such as: examn. of at. structure to det. directional properties or fibering, study of the fine structure to det. mineralogical character, detn. of internal strain of porcelain insulators and detn. of difference in expansion between glaze and body. M. found kaolinite as the principal mineral in an English residual china clay and a Georgia secondary clay. Mullite appeared with both clays fired at 950° and the amt. of mullite increased with an increase of temp. An x-ray photograph of unannealed glass showed lines characteristic of materials having internal strain, while a sample of a spark plug did not give a strain diagram.

W. H. RISING

The porcelain of Denmark. F. DALGAS. *Ceram. Age* 11, 80 4(1928).—Historical

W. H. RISING

Fusing porcelain enamel on iron and steel. F. W. MANKER. *Ceram. Ind.* 11, 131-3(1928).—A description of equipment in a modern plant

W. H. RISING

Some suggestions for enamellers on the control of opacity. A. I. ANDREWS. *Ceram. Industry* 11, 266-7(1928).—Ten enamel compns. were studied. No definite relation could be traced to any particular constituent nor to the total amt. of flux. Increase of SnO_2 up to 20% increases opacity, though the effect decreases for the larger % SnO . Over 10% adds but little to the opacity. If less than 10% is used, auxiliary opacifiers aid in opacity. SnO_2 used in the mill is of a good white with a slight tendency toward a blue.

H. P. HOOD

Wall tiles from sheet steel. ANON. *Ceram. Age* 11, 117 8(1928). "Porcelain" is a new type of enameled sheet steel wall tile.

W. H. RISING

They purposely produced defective enamel ware to study defects and remedies. K. B. STRONG AND E. R. BRAUNER. *Ceram. Ind.* 11, 59 61(1928).—A series of expts. was made in which the mech. operations such as spraying and burning were varied to observe the effect and det. the cause of the many faults which occur in enamel ware. Conclusions: (1) An underfired ground coat causes fish scaling not only in the ground coat but in all cover coats. (2) An overfired ground coat develops another type of fish scale in the ground coat which is smaller than that of the first case and which, if it appears in the first cover coat, is only a small dark speck. (3) Prolonged grinding of the enamel tends to produce pimples. (4) Too long aging of the enamel slip tends to develop pimples. (5) An underfired cover produces pimples while pinholes appear in succeeding coats. (6) Hairlines are produced by uneven heating which is due to uneven spraying, uneven thickness and cold spots or shadows on the ware. (7) A decidedly overfired ground coat causes pimples and blisters in succeeding coats.

W. H. RISING

Factors in modern methods of pulverizing (HARDINGE) 13. Electric conduction in Pyrex and fused and crystalline quartz (RACE) 4. Heating reacting or other liquid by electric current [ceramic material] (U. S. pat. 1,688,679) 4. Glass coated pipe coil suitable for heat exchange between foods, etc., and heating agents (U. S. pat. 1,689,435) 1. X-ray analysis [application to glass technology] (GOTTFRIED) 3.

ROUSSET, E. J.: *Le travail du verre*. Paris: Ch. Béranger. 196 pp. Reviewed in *Chimie et industrie* 20, 598(1928).

Imitating frosted or stained glass, etc. R. GOLDSCHIEDER and I. TUSCHINSKY. *Brit.* 286,012, Nov. 29, 1926. A wire gauze or other suitable fabric is impregnated with a lacquer (which may comprise a condensation product of urea and CH_2O) and granulated glass or the like is applied to the surfaces. Pattern effects may be produced on the surfaces if desired.

Apparatus for forming and cooling sheet glass. JOHN L. DRAKE (to Libby-Owens Sheet Glass Co.). U. S. 1,688,528-9-30, Oct. 23.

Apparatus for making tumblers, bulbs or other glass articles. THEODORE H. SLOAN (to Macbeth-Evans Glass Co.). U. S. 1,689,975, Oct. 30.

Apparatus for and method of handling sheet glass during annealing. FRANK W. PRESTON. U. S. 1,689,048, Oct. 23. Structural features.

Annealing kilns for plate glass. PITTSBURGH PLATE GLASS COMPANY. Fr. 636,342, May 25, 1927. Constructional features.

Uniting porcelain and glass. R. THILENIUS. Brit. 285,919, Feb. 25, 1927. In making Hg rectifiers, vacuum tubes, Röntgen ray tubes and similar app., porcelain and glass parts are united by melting, the glass being selected to have a coeff. of expansion of not more than 0.000005 and to have about the same m. p. as the porcelain. Gas or acetylene burners may be used for the fusion. Similarly, glass inspection surfaces may be fused into porcelain tubes.

Refractory material. HARTFORD-EMPIRE COMPANY. Fr. 636,308, Feb. 28, 1927. A refractory material contg. principally Al_2O_3 and SiO_2 is described. An example contains 4 parts of crude diaspore or equiv. aluminous earth, 4 parts calcined diaspore or equiv., 2 parts calcined Al_2O_3 , 3 parts siliceous plastic clay and 5 parts addnl. clay.

Apparatus for measuring the shrinkage of bricks, etc., during their drying or burning in kilns. FRANKLIN W. GUNTHER and GEORGE P. FISHER (to National Fire Proofing Co.). U. S. 1,688,330, Oct. 23.

Regenerative channel oven for burning bricks, heating steel billets, etc. HEINRICH KOPPERS (to Koppers Development Corp.). U. S. 1,687,774, Oct. 16. Structural features.

Tunnel for drying brick, etc. CLAUDE E. FULLER (to New York Brick Handling Corp.). U. S. 1,688,306, Oct. 16. Structural features.

Apparatus and air current system for drying ceramic ware. THOMAS H. RHOADS (to Proctor & Schwartz). U. S. 1,689,082, Oct. 23.

Muffle kiln for firing pottery, etc. T. SIMPSON. Brit. 285,935, Oct. 21, 1926. Structural features.

Porcelain. PORZELLANFABRIK PH. ROSENTHAL & Co., A. G. Fr. 638,438, July 29, 1927. The constituents for making hard porcelains, particularly for elec. insulators, are so chosen that the compds. of SiO_2 have the same form when the porcelain is baked as that of the clay used.

Enameling small bath room fixtures or other articles. PAUL F. TITCHENER (to E. H. Titchener & Co.). U. S. 1,689,062, Oct. 23. The articles are dipped in an enameling soln. and before drying are dipped in a thinning soln. of the enameling soln. and then dried while in motion. An app. is described.

Enameling oven suitable for treating wire. CHARLES L. HEISLER (to General Electric Co.). U. S. 1,688,710, Oct. 23. Structural features.

20—CEMENT AND OTHER BUILDING MATERIALS

J. C. WITT

Improving the quality of cement. H. RICHARZ. *Pit and Quarry* 17, No. 2, 45-8 (1928).—A general discussion of the effects of incorporating puzzolanas and water-repellent materials into cement.

Fuel economy in burning portland cement clinker. ROBERT D. PIKE. *Ind. Eng. Chem.* 20, 1155-63 (1928).—The present-day rotary kiln has a thermal efficiency of about 25%. The theoretical requirements for increasing thermal efficiency are pointed out and improvement along those lines is suggested as preferable to the use of waste heat boilers.

Modern concrete construction. Piled foundations. J. W. STEWART. *Munic. Eng. Sanit. Record* 81, 530-1 (1928).—S. describes the Raymond piling system (tapered) and gives a formula for working loads.

Reinforced concrete roads. The lack of reliable data. P. G. N. WORKMAN. *Munic. Eng. Sanit. Record* 81, 485 (1928).—A discussion as to whether some reinforced concrete roads were suitable.

Road surfacing materials. W. J. A. BUTTERFIELD. *J. Soc. Chem. Ind.* 47, 293-9T (1928).—Road surfaces today must be studied principally with respect to driven heels, not hauled wheels. Rubber has a high coeff. of friction on polished or smooth surfaces, even on snow and ice, in the absence of a lubricant (water). The surface

must also give a good foothold to iron, leather, hoofs, etc. It must offer little resistance to the roll of wheels, must be durable, and be unaffected by deposits of leaves, horse-droppings, oil, etc. The water-bound macadam road disintegrated under motor traffic because the tires sucked out the dust binder. As a result various kinds of tar were tried. Finally refined or dehydrated coal tars were found to be the most satisfactory. Specifications in Britain for successive years 1911 to 1928 are given. The viscosity is important (modified Engler, modified Redwood). Results obtained with these 2 instruments are tabulated and compared. Tar when applied to a road surface undergoes more or less rapid changes because of the oxidation or polymerization of some of its compds., and these changes are responsible for the "drying" or "setting" of the coating. Tar carries, or should carry, in itself a natural vehicle functioning like the drying oils and turpentine in paint and, like paint, its effects and durability cannot be properly judged by observation of it while "wet." In this respect tar differs from asphaltic bitumen which has no constituents to bring about this drying or setting. The best tars should contain enough, but not too much, "free carbon" to function as a "filler" in asphalt; not enough phenolic substances to indicate any extent of water sol. constituents or constituents very readily subject to polymerization and oxidation; a sufficiency of high-boiling oils of a highly viscous character; enough naphthalene to indicate that a large proportion of its assoc. liquid hydrocarbons are of a chemically stable nature, but not enough to indicate attendant destruction of other valuable hydrocarbons; enough naphthalene to effect a sensible reduction in the consistency of the tar, and a consequent increase in consistency as the naphthalene evaps., but not so much that its rapid volatilization impairs the soundness of the coating. The rock and lake asphalts are usually restricted to urban roads and fall outside the scope of the paper. Their characteristics and analysis are, however, discussed. Asphaltic bitumens from petroleum, unlike tar, do not dry or set. They must, therefore, be heated till sufficiently fluid to flow over the road surface, or be squeegeed into it to form a coat of uniform thickness, and to penetrate sufficiently to form a good bond. A better plan is to mix the hot asphaltic bitumen with the proper proportion of suitable aggregate before laying. Portland cements should not be used for mixing with the asphaltic bitumen. Good results are often secured by mixing tar and asphaltic bitumen. The surface after laying must always be covered with grit to improve traction and to prevent tires from picking up the tar while still "wet." The effects of dirt and washings from tar- and asphalt-surfaced roads on vegetation and fish are discussed. All bituminous road surfacings involve a certain danger to fish life. Concrete surfaces are discussed briefly. There is a wide scope for the better grading of road tars, for modification to render tar more nearly asphaltic and for the application of greater quantities in the use of tar in order to secure the best results with it. The common defects of asphaltic bitumen surfacing may possibly be remedied by blending with tar. The causes of all kinds of slipperiness should be studied.

E. G. R. ARDAGH

Commercial crushed stone. R. H. PIERCE. *Can. Dept. Mines, Mines Branch* No. 690, 36-58(1928).—Crushed stone quarries and their products from 64 Ontario and 7 Quebec localities are described, and the results of the usual tests of these products for road building material are tabulated. This paper informs the road builders of the 2 provinces of the location of suitable material. **Stone and its use in road construction.** *Ibid* 59-66.—The qualities which a road stone should possess and the interpretation of lab. tests are discussed. Trap rock, granites, quartzite, limestone and sand are described with reference to their utilization for road building.

L. W. R.

Road tar and its uses in Great Britain. W. E. COLE. *Chemistry and Industry* 47, 1048-54(1928).—Statistics for tar production in Britain, expenditures on highways, motor vehicles in operation and for mileage of tar macadam and surface tarring of existing roads are given. Criticisms of the application of tar to roads are dealt with. The following methods of using tar on roads are described: (1) tar spraying (hot surface dressing); (2) tar-macadam (surfacing); (3) grouted macadam (surfacing by penetration method); (4) tar emulsions (cold surface dressing and patching). Failures have been invariably due to one or more of the following causes: (1) inadequacy of foundation; (2) imperfections in the aggregates and poor grading; (3) inferior tar; (4) faulty construction. The advantages of tar are: (1) low initial cost; (2) minimum maintenance charges; (3) ease of application; (4) durability; (5) resilience; (6) permanent non-skid surface; (7) dustless and waterproof. These advantages are elaborated. British Road Tar Association's Specifications and the existing specifications of the Roads Department of the Ministry of Transport are given under the following heads: (1) general; (2) sp. gr.; (3) distn.; (4) detn. of tar acids; (5) detn. of naphthalene; (6) detn. of free C; (7) detn. of viscosity.

E. G. R. ARDAGH

Notes on road construction in Cork City. S. W. FARRINGTON. *Munic. Eng. Sanit. Record* 81, 545-6(1928).—F. discusses the different road-building materials. Steel tires and shoes constitute a high proportion of the traffic. Hills will be the most difficult problem in the future. C. H. BADGER

Slippery street paving. E. KINDSCHER AND O. SCHÖNEBERG. *Staatliches Materialprüfungsamt, Berlin-Dahlem. • Z. angew. Chem.* 41, 1048-52(1928).—Paving that has been washed thoroughly, as by prolonged rains, gives about the same friction to rubber tires as does dry paving, and the accidents that occur when a street becomes damp, or at the beginning of a gentle rain, are to be ascribed not to moisture as such, but to the slimy, slippery mass formed by the dirt already present on the street mixing with the water. The coeff. of friction on dry macadam (0.67) and asphalt (0.715) sinks to 0.17 or even 0.06 on such slippery paving. Samples of paving dirt were collected from 9 Berlin streets, and then examd. by phys. and chem. means. In 8 cases the total material collected varied from 0.7 to 3.2 g./sq. m. (on asphalt and wood-paved streets), and the 9th showed 15.8 g./sq. m. (on a stone-paved street). H_2O -sol. portions of the above amount to 10-20% of the total dirt. Seven of the residues had the odor of automobile exhaust gases, and the remaining 2 of fecal matter. H_2O -insol. dirt from asphalt streets showed about 30-40% content of material that came from the paving itself, i. e., worn out from it by traffic; it included 20-25% Fe-oxide, sand and clay, and the remainder contained the most varied materials, such as wool and leather residues, mineral oils and bitumen. The last 2 mentioned evidently hold the exhaust gases in soln. The H_2O -sol. materials resemble animal glues, and are high in N. No rubber was found in any of the samples. Evidently the intimate mixt. of H_2O and mineral oil, dust and org. matter forms a kind of emulsion that acts as a lubricant. With the addn. of H_2O the emulsion thins out and is more easily forced aside by the tires, until at last it can be washed from the streets by the rain, or soft water, much more readily than it can by the relatively hard city water. This fact has been established by expt. also. Distd. H_2O cleansed the streets even better than rain, and a 3% soap soln. best of all. One and 0.5% solns. of soda gave good results, and 1% NaOH and Na silicate solns. also proved useful. W. C. EBAUGH

The Irish Free State road outlook. R. T. KERWAN. *Munic. Eng. Sanit. Record* 81, 544-5(1928).—K. discusses the past, present and future conditions of roads and the uses and amts. of funds (grants) for road building. C. H. BADGER

Acid-proof containers and concrete paint for chemical factories. CONSTANTIN REDZICH. *Apparatebau* 40, 243-4(1928).—Concrete painted with "Sika," a colloid soln. of light and heavy metals, is made proof against acids, oils, etc. It costs 0.8-1.0 M. per kg., and 10 kg. will mix 1 cu. m. of acid-proof concrete, or 6 sacks of cement. J. H. MOORE

Coal residues in concrete. Effect on steelwork (ANON.) 21. **The manufacture of rubber road blocks** (FOL, VAN HEURN) 30. **Rubber as a floor covering** (KIRKWOOD) 10. **Developments in the gypsum industry in British Columbia** (COLE) 8. **Asbestos industry in Canada [for use in shingles, mill boards and cement]** (FREEMAN) 8. **Limestones of the Timiskaming District** (GOUDGE) 8. **Electrical dust precipitation** (LEWIS) 1. **Waterproofing and coating wood** (Brit. 286,396) 18.

Cement product. RICHARD V. MATTISON (to Asbestos Shingle, Slate & Sheathing Co.). U. S. 1,687,681, Oct. 16. Film-like layers of hydraulic cement-like material hydrated with an excess of water are assocd. with intermediate film-like layers of hydraulic cement material hydrated with water taken up from the layers first mentioned; the layers are pressed and permitted to set together to form an integral rigid product. An app. is described.

Portland cement. WALTER A. SCHMIDT (to International Precipitation Co.). U. S. 1,688,882, Oct. 23. In the wet process of manuf. of portland cement, dust is recovered from the kiln gases, mixed separately with water and some time after the mixture introduced into the raw mix slurry.

Aluminous cement. FIRM OF G. POLYSIUS. Brit. 286,122, May 6, 1927. The raw materials are fed to a rotary kiln without preliminary grinding.

Calcium aluminate cement. EMILE M. ROCHE (to Urbain Bellony Voisin). U. S. 1,689,891, Oct. 30. A cement is formed by burning a mixt. comprising bauxite and one or other suitable calcareous material at a temp. of about 900-1000° for a long period (suitably about 9-12 hrs.).

Rotary kiln and furnace construction for burning cement, etc. JOHN H. BENTLEY. U. S. 1,690,048, Oct. 30.

Potassium chloride from cement kiln flue dust or similar materials. NORMAN M. McGRANE (to International Precipitation Co.). U. S. 1,688,873, Oct. 23. Dust from portland cement manuf. or like material contg. sulfates and chlorides of Na and K is leached with an aq. solvent at super-atm. temp. and the leaching operation is continued until the concn. of Na and of sulfate reach a max. and then decrease while the concns. of K and Cl continue to increase; the soln. formed is sepd. from solid material and is cooled to effect sepn. of KCl.

Concrete paving block with surface layers of rubber. EDWIN C. WALLACE. U. S. 1,689,415, Oct. 30. Structural features.

Pavement for tennis courts, etc., comprising graded sizes of blast-furnace slag and a binder of brick dust. GERARD J. EILERS. U. S. 1,690,059, Oct. 30.

Pavement. LESTER KIRSCHBRAUN. U. S. 1,690,020, Oct. 30. A concrete foundation is covered with an emulsified mixt. of bitumen in water contg. an inert emulsifying ingredient such as colloidal clay while the concrete base is still plastic, so that a unitary structure is formed.

Road-surfacing material. FREDERICK W. VALLE-JONES (to Box, Stockell & Co.). U. S. 1,688,511, Oct. 23. A coarse aggregate such as stone is heated and cleaned by use of steam and the heated aggregate is then mixed with a colloidal mixt. of bituminous material.

Material for road surfaces. SAM E. FINLEY. U. S. 1,689,123, Oct. 23. A road is covered with bituminous material of suitable consistency and mineral aggregate is added and kneaded with the bituminous material to effect thorough admixture and to unite the coating with the underlying material of the road.

Artificial stone, bricks, briquets, etc. A. R. DAVIES, W. K. HUGHES and A. G. MORGAN. Brit. 286,334, Nov. 1, 1926. In making bricks, fuel briquets, etc., lime is used as a binder with gravel, sand, coal or other materials and is treated with CO₂ during slaking and the material or molded product is subjected to steam heat. An app. is described.

Material resembling marble. VINCENT MOLINARI. Fr. 636,140, Oct. 8, 1926. A material resembling marble is obtained by drying stone such as gypsum or alabaster in a furnace, plunging it successively into a bath of alum, a bath of K₂SO₄ and a coloring bath. The product is dried and polished.

Roofing. HENRY R. WARDELL (to Johns-Manville, Inc.). U. S. 1,689,985, Oct. 30. A sheet formed of cattle hair and asbestos fiber mixed and impregnated with asphaltic compn. is covered with a layer of adhesive asphalt and with an adherent surface layer of grit.

Laminated sheet roofing. WILLIAM R. SEIGLE (to Johns-Manville, Inc.). U. S. 1,690,079, Oct. 30. Felt sheets are used contg. a large proportion of asbestos and a smaller proportion of stiff hair-like material such as hair of cattle interspersed with the asbestos, impregnated with asphalt.

Expansion joint. ALBERT C. FISCHER. U. S. 1,689,945, Oct. 30. An expansion joint for use with concrete construction comprises over 60% of a ductile, compressible binder such as asphalt together with long animal hair and vegetable fiber such as excelsior, hemp and roofing scrap.

Bituminous mastic. CHARLES N. FORREST, JOHN S. MILLER, JR., and CHARLES S. BABB (to Barber Asphalt Co.). U. S. 1,688,041, Oct. 16. A compn. suitable for floors, walks or light driveways comprises mineral aggregate (the grains of which are between the limits of 8- and 60-mesh screens) 84-85, bitumen 14-16 and fibrous flock 0.6-0.7%.

Articles such as plaster board formed of calcined gypsum and fibrous material. WILLIAM H. KOBBE (to Texas Gulf Sulphur Co.). U. S. 1,689,394, Oct. 30. A sheet formed of cotton flannel, felt, jute or other suitable fibrous material and wet calcined gypsum is shaped before setting occurs and after setting the material is dried at a temp. above that at which calcination of the gypsum beings; the dried article is impregnated with S.

Treating waste carbide sludge from acetylene plants. DOUGLAS M. HARRISON (to McKenzie Mortar Co.). U. S. 1,688,542, Oct. 23. CaCl₂ is added to the sludge and the mixt. is heated and allowed to sep. into strata, the upper of which when sepd. is suitable for use as a plaster or stucco material.

Seasoning wood. FORREST S. SHINN. U. S. 1,687,000, Oct. 18. Wood is first subjected to steam and vacuum treatments, then to air pressure considerably higher than atm. pressure, followed by quick release to atm. pressure, and is then again subjected to steam and vacuum treatments.

Impregnating wood. J. T. HUGHES-JONES. Brit. 285,699, May 18, 1927. Oils

naturally contg. S such as shale oils are used for impregnating timber, with or without a polymerizations-accelerator such as resinate of Mn, Ni or Co or an oxide of Pb. The oil may be emulsified with glue from marine animals.

System for drying lumber, etc., in circulating heated air. HENRY C. BABEL (to Myrtle L. Babel). U. S. 1,687,822, Oct. 16. A drying kiln construction is described.

Substitute for lumber. WM. H. DROEGE. U. S. 1,688,138, Oct. 16. Artificial planks suitable for use at railroad and highway crossings are formed of bitumen 8-11, stone dust 16-25, finely divided gravel 54-71 and powd. Fe 5-10%.

21—FUELS, GAS, TAR AND COKE

A. C. FIELDNER

The training of fuel technologists. J. W. COBB. *Gas J.* 184, 135-7(1928).—A general discussion. F. S. GRANGER

Analyses of solid fuels. J. H. H. NICOLLS. *Can. Dept. Mines, Mines Branch No. 689*, 61-85(1928); cf. *C. A.* 22, 310.—The results of analyses of 155 samples of Canadian coals and of 51 samples including coke, U. S. coals, peat briquets, etc., are tabulated.

L. W. RIGGS

The examination of motor fuels by determining the boiling range. WAWRZINIOK. *Auto-Technik* 16, No. 19, 21 6; *Chem. Zentr.* 1927, II, 2254.—For detg. the boiling curve of motor fuels, W. uses a fractionating flask of 750 cc. vol. The width of the outlet tube of the flask is 0.75 of that of the neck. This arrangement helps to avoid any resistance in flowing. The flask, filled with 250 cc. of the fuel, sits in a sector 11 cm. in diameter of an asbestos ring, which is fastened to the top of a Babo plate and heated by a multiple burner. The boiling starts at a lower temp. with this equipment than with the Engler or Spilker-Kramer flask. The "dew point," where mist begins to form, is to be noted, because from this information, conclusions concerning the easy start of the motor may be drawn.

G. SCHWOCH

Commercial motor vehicles and their fuels. E. S. S. SMITH. *Petroleum Times* 20, 20(1928).—Low-temp. carbonization oils would find a ready use in the motor fuel field if they could be fractionated so that uniform fuels were obtained. If fuels with low "spirit" content, having 15-20% over at 100° and a 230-240° E. P., could be used in engines, such fuels could be had in plenty and might serve to stabilize the price of motor fuel.

M. B. HART

Recent developments in motor fuels from coal. A. C. FIELDNER. *Chem. Markets* 23, 375-8(1928); cf. *C. A.* 22, 3513. E. H.

Lockwood's Clean Coal Process, Ltd. ANON. *Mining Journal* 163, 832-3(1928).—The Lockwood is a dry-cleaning process for coal less than 1½ in. in size. Coal passes from bunkers to a deck inclined at an angle to suit the particular coal. An oscillating motion throws the material against and between converging buffers, which forces the particles into narrower but deeper masses which are aerated. The mass is then divided by an adjustable horizontal diaphragm, the clean coal passing over the top and the part of higher gravity dropping to a second stage of treatment. This treatment depends on the difference in resiliency between the coal and foreign particles. The tails from the first treatment fall on a quickly oscillating inclined surface and are impelled against an obstruction or barrier in such a manner as to cause them to rebound rapidly. The magnitude of the rebound varies with the density and allows the sepn. of the coal from the bone. The standard deck is 16 in. by 7 ft.; a unit consists of 8 or more decks for coarse and an equal no. for fines. Each deck has a capacity of 12-13 cwt. per hr. Power costs are low (1 h. p./unit). Five units (200 tons/day) can be run by a man and boy.

ALDEN H. EMERY

Nature of sulfur in Canadian coal and coke. J. H. H. NICOLLS. *Can. Dept. Mines, Mines Branch No. 689*, 34-50(1928); cf. *C. A.* 19, 1936.—Typical western Canadian coking coals generally contained but little S. Cokes from the Maritime Provinces coals, with the exception of that from Springhill coal, were too high in their S content to be used for metallurgical work. Cokes from Minto coal contained 4 or 5% of S, but much of this S could be washed out with steam. The analytical results of this study are assembled in 9 tables.

L. W. RIGGS

Instructions for burning coal, coke and peat. E. S. MALLOCH AND C. E. BALTZER. *Can. Dept. Mines, Mines Branch No. 689*, 6-11(1928); cf. *C. A.* 22, 310.—Detailed directions for burning American anthracite, Welsh and Scotch anthracite, semi-bituminous, bituminous, and Alberta coals, coke, mixts. of coal and coke and peat in hot air or hot water heaters are given.

L. W. RIGGS

The technic and economy of coal-dust firing. WM. GUMZ. *Brennstoff u. Wärme-wirtschaft* 10, 337-50(1928).—A discourse with numerous illustrations. F. S. G.

Machine for charging retorts with aspiration of dust. M. H. DÜTSCH. *J. usines gaz* 52, 414-5; *Monats. Bull. Schweiz. Ver. Gas. u. Wasserfach*, 8, (July, 1928).—The machine described is in operation in the gas-works of Flawil, Switz., and was built by the firm of Louis Giroud of Olten. One machine, mounted for vertical, forward and lateral movement on a traveling crane, serves a battery of retorts in charging and discharging. It is operated by motors but the charging hopper is fed by hand. The machine consists essentially of a rotary blower connected with 2 horizontal concentric tubes. In charging, the powd. coal is blown through the inner tube into the retort, while the gases escaping from the retort are sucked through the annular space, between the tubes, into the blower and cycled back with the charge. In discharging, the pair of tubes is thrust forward, by the movement of the whole machine, through the retort, to which it is fitted with a tight joint, pushing the coke out of the other end. Rapid service and complete suppression of fumes, flame and dust in the furnace room during charging are thus realized. F. S. GRANGER

Low-temperature carbonization. DAVID MUIR. *Gas J.* 184, 30-4; *Gas World* 89, 322-5(1928).—The performance of the *Illingsworth Process* at the Treforest Gas-Works is described. The special feature is in the construction of the vertical retorts of a no. of heavy cast-iron sections, functioning as heat conductors, permitting rapid and uniform carbonization at 600-620° with an outside temp. of 650-700°. Swelling is prevented by mixing coking coal with non-coking coal, coke breeze, etc., and by preheating. The finished semi-coke is dropped into a drum where it is mixed, by rotation, with wet-washed raw-coal smalls. The coke quenching is thus attained without addn. of water and utilized in drying the raw coal. This results in a satisfactory blended domestic fuel, 8% volatile, called *Ricoal*, for which a ready market has been found, and only 7% of breeze. A ton of dry coal yields 5900 cu. ft. of 680 B. t. u. gas, 8 lbs. $(\text{NH}_4)_2\text{SO}_4$, 4 gals. "benzole," and 17.5 gals. of crude tar contg. 30% phenols and leaving only 20% pitch on distn. The complete balance sheet shows a net profit of 6s. 2d. under existing economic conditions, per ton of wet coal. F. S. G.

Low-temperature carbonization—continuation of tests on Canadian bituminous coals. R. A. STRONG. *Can. Dept. Mines, Mines Branch No. 689*, 12 33(1928), cf. *C. A.* 20, 2405; 22, 311.—In the 10 coals tested, which were all of the coking variety, the volatile matter was 19 to 37%, coke 1500 to 1700 lbs. per ton, gas 3300 to 4000 cu. ft. and tar oil 7.5 to 22.5 Imp. gal. The numerical results are shown in 24 tables. Each of these coals proved good coke producers, but with one exception they are not suitable for low-temp. carbonization on account of low tar-oil and gas yields. L. W. R.

Combined low-temperature carbonization and combustion. D. BROWNIE. *World Power* 8, 301-9(1927).—With condensing steam turbine, the thermal efficiency from coal to switchboard is between 27½ and 32½%. The serious defects in present power station practice are (1) loss in cooling water of condenser (55-60% of total heat in coal) and (2) failure to adapt scientific methods of combining combustion with low-temp. carbonization. Two methods of low-temp. carbonization in the boiler house of the power station are discussed. With av. bituminous coal the yield per ton is 3500-4000 cu. ft. gas (750-850 B. t. u.) and 3500-3800 cu. ft. of combustion products. The final mixed gas of 7000-7800 cu. ft. per ton yields about 400 B. t. u. per cu. ft. Various processes of low-temp. carbonization are discussed in detail. A. D. S.

Coal residues in concrete. Effect on steelwork. ANON. *Gas J.* 184, 183(1928).—The joint committee of societies connected with the building industry attributes the detrimental effects, frequently observed following the use of cinders, etc., as aggregates in concrete in contact with steel, to expansion, high permeability to air and moisture, and the corrosive action of S compds. F. S. GRANGER

A disability of the ascension pipe. Its effect on undesirable fluctuations of calorific value. H. J. TOOGOOD. *Gas J.* 184, 407(1928).—In the early stages of carbonization, the ascension pipe is comparatively cool and is fed by a large supply of heavy gas. Hence its chimney effect is at a min. when it should be at a max. in order to avoid prolonged exposure of the rich gases to destructive heat, leakage, etc. In the later stages, the reverse is true and the calorific value is reduced by leakage inward. The remedy is suggested of mixing the gases before instead of after ascension, by connecting retorts horizontally in pairs with 1 ascension pipe, and charging the 2 retorts alternately. F. S. GRANGER

Recent methods for calculating on a technical basis the firing in steam boiler operation. KARL D'HUART. *Kautschuk* 4, 151-6(1928).—A review and discussion, with original references and representative data and calcns. C. C. DAVIS

Waste heat recovery. F. J. BAILEY, W. GREGSON AND J. W. REBER. *Gas J.* 184, 130-1; *Gas World* 89, 319-20(1928).—A general discussion covering *recuperators, regenerators, methods of air preheating, carbonizing plants, gas engines and waste heat boiler practice.* F. S. GRANGER

Air drying of Canadian lignite, and the reabsorption of moisture by the same. J. H. H. NICOLLS. *Can. Dept. Mines, Mines Branch* No. 689, 51-60(1928).—Dried lignite will not in any case reabsorb as much moisture as is contained in the corresponding air-dried coal. The less severe the method of drying employed, the more moisture the lignite will reabsorb; conversely the more severe the drying, the less moisture the lignite will reabsorb. Of 2 samples dried rapidly under similar conditions, the one with the lower moisture content will reabsorb moisture the more rapidly at first. The addn. of water to lignite, either raw or dried, previous to exposure to the air-drying atm., does not alter the relation between the air-drying and moisture reabsorption curves. The most satisfactory relative humidity for air drying was 60%. Analysis of ground coals should not be delayed, particularly in winter. L. W. RIGGS

The behavior of the sulfur in brown coal on dry distillation. HORST BRÜCKNER. *Braunkohle* 27, 891-3(1928).—The percentages of each of the different forms of S, before and after carbonization, were compared in 9 specimens. Sulfate, sulfide and pyrite S were detd. directly and org. S was detd. by difference. Generally more than half of the total S was lost on carbonization, presumably as H_2S . This seems to take place at a lower temp. than with ordinary bituminous coal. All forms lost more or less. Pyrite S suffered the heaviest loss, apparently being converted into org. S in the coke, the reverse of the geological process. The sulfates were believed to be converted into sulfides which were in turn converted into H_2S by the action of CO_2 , etc. F. S. GRANGER

The chemical analysis and evaluation of gasoline and benzene motor fuels. ROBT. KATTWINKEL. *Teer u. Bitumen* 26, 481-5, 501-4(1928).—A comprehensive review and literature survey covering phys. properties and hydrocarbon groups. F. S. G.

Annual statistics of the manufactured gas industry. PAUL RYAN. *Am. Gas Assoc. Statistical Bull.* No. 6, 17 pp.(1928). E. H.

Gas distribution systems for high pressures. GROSSMANN. *Gas u. Wasserfach* 71, 924-30(1928).—An analysis of the factors involved in the selection of main sizes, and distribution pressures. R. W. RYAN

Construction details of the long gas mains of the A. G. für Kohleverwertung. PETERSON. *Gas u. Wasserfach* 71, 847-52(1928).—Details are given of the couplings, expansion joints, protection against corrosion, methods of laying, welding and testing of the mains being laid in the German super-gas project. R. W. RYAN

Graphic computation of long gas mains. K. BAYERLEIN. *Gas u. Wasserfach* 71, 901-8(1928).—Graphic charts are given for pipe diam. for different pressures, power cost for compression for various pressures (in atm.) and cost of the pipe lines for various diams. R. W. RYAN

Industrial gas in the United States. Growth and trends. Coöperative paper by the AM. GAS ASSOCN. *Gas J.* 184, 48-9(1928). F. S. GRANGER

A brief history of the gas industry in Japan. SAKURA OKAMOTO. *Gas J.* 184, 41-4(1928). F. S. GRANGER

The Hamburg gas works and the present problems of the German gas industry. H. MÜLLER. *Gas u. Wasserfach* 71, 841-7, 868-72(1928).—Rates, transmission, by-products, super-gas system competition and other problems of the German gas industry are discussed. R. W. RYAN

Manufacture of producer gas. J. V. POSTLES. *Ceramic Age* 11, 135-7(1928).—A description of the manuf. and use of producer gas. W. H. RISING

Blue and carburetted blue gas. CARL A. SCHLEGEL. *Ceramic Age* 11, 85-8(1928).—A discussion of the principles involved and app. used, as well as characteristics of these types of fuels. W. H. RISING

Coal and coke-oven gas. F. C. WEBER. *Ceramic Age* 11, 20-1(1928).—Coal and coke-oven gas are essentially the same and are made by destructive distn. of coal. Gas-coal should have good coking properties and low ash content although sometimes good results are obtained with ash as high as 15%. By-products are 1400 lb. of coke, 10-12 gal. of tar, and 20-30 lb. of $(NH_4)_2SO_4$ per ton. Distn. is carried out in a refractory chamber heated to 2000-2500° F. and yields about 11,000 cu. ft. of 550 B. t. u. gas per short ton. Silica brick lasts 3-4 times as long as clay brick for lining. The coking chambers or slots are arranged in batteries and are charged and emptied mechanically. The batteries are fired from below, usually with the gas manufactured. The gas collects in a main above the batteries and is conducted through a scrubber to a

storage tank. Coke ovens are usually owned by steel mills which use the coke but are coming more into domestic use both for the gas and coke. W. H. RISING

The chemico-physical fundamentals of tar gas purification. G. JUNGE. *Teer u. Bitumen* 26, 465-9(1928).—A review of the difficulties existing in the removal of tar from coal gas, their causes and the possible means available for overcoming them.

F. S. GRANGER

Fluid-tight ferroconcrete gas purifiers. P. N. ROY. *Gas J.* 184, 274; *Structural Engineer* (Oct., 1928).—B. N. Dey has shown the importance of correct incorporation of reinforcements, grading of aggregate and proportions of concrete mixt. and of the use of large panels of thick slab, as opposed to surface dressings which are merely palliatives. Such tanks are proving satisfactory in use.

F. S. GRANGER

Aspirating gas producer. Otto system. ANON. *J. usines gaz* 52, 415-6; *Génie Civil* (Aug. 4, 1928).—Among the outstanding features is the generation of the steam required, partly by a boiler incorporated in the dome and utilizing the waste heat in the generated gas, and partly by a trough around the rim of the circular grate into which water is introduced. The introduction of the steam from the boiler into the space below the grate is regulated, to meet requirements, by an automatic valve, any excess being allowed to blow away. The air is preheated by being drawn in through an annular space between the outer sheet iron shell of the body of the generator and the refractory lining. The feed hopper is provided with gas-tight top and bottom covers to permit introduction of charge without admission of air. The arrangement of the hearth permits the continuous flow of coal and ashes without clogging.

F. S. G.

The influence of temperature on the flame velocity of gases. K. BUNTE AND A. STRÖDING. *Gas J.* 183, 596-8, 650-2; 184, 31-5(1928).—Translation of an article appearing in *C. A.* 22, 3977.

F. S. GRANGER

Technical control in the retort house. RONALD B. GLOVER. *Gas J.* 184, 203-5 (1928).—A general discussion relating mainly to control of gas quality and the recording of materials charged and other details in gas plant operation.

F. S. GRANGER

Some aspects of ammonia recovery from steamed vertical retort gas. C. SINGLETON AND J. E. STANIER. *Gas J.* 184, 405-7(1928).—The full utilization of the water contained in the retort gases, for the NH_3 absorption, by efficient counter-current recirculation under pressure, to cut down the vol. and increase the concn. of the virgin liquor, is suggested. Less virgin liquor would also mean less phenols in the effluent liquor, but this should be further avoided by sepg. the tar above the dew point of the gas, since NH_3 increases the soly. of phenols in water. Only 7.7% of the H₂S in the gas is removed during condensation and washing. The quantity of chlorides found in the virgin liquor exceeds that of the sol. chlorides found in the coal carbonized. This is attributed not to org. chlorides but to inaccuracy of the hot-water washing method of detg. sol. chlorides in coals. The recovery of NH_4Cl and other questions are discussed. The practice at the Stockport Gas Works is described.

F. S. G.

A tar obtained from brown coal by steam distillation. II. Comparative experiments on the neutral constituents of a steam tar and of a tar produced by external heating. W. FISCHER. *Inst. Ges. Braunkohlen u. Mineraloelforschung Tech. Hochschule, Berlin. Braunkohle* 27, 925-9, 951-6(1928); cf. *C. A.* 21, 4051. —Since bitumen distils largely undecompd., it was first extd. by benzene + alc. Two samples of the debittumenized coal were then distd. (1) heating internally with superheated steam to 460°, in about 10 hrs., holding at various temps. until no more tar came over and (2) heating externally to 500° in about 5 hrs. The extd. bitumen was also dry distd., like (2), to 525°, furnishing a 3rd tar (3). The tars obtained were vacuum distd., freed from paraffin wax, tar acids and bases by the usual methods, and from O compds. by shaking with acid ferrocyanide soln., and finally fractionated in vacuum over Na. This last treatment was found necessary for the subsequent crystn. of picrates. Fractions 120-130°, 130-140° and 160-170°, at 10 mm., were investigated. The *picrates* of the *naphthalene-type aromatics* were obtained by treatment with hot satd. alc. picric acid soln. and allowing to crystallize, and analyzed, etc. A second sample of each fraction was *dehydrogenated*, by heating under reflux for 6 hrs. with 0.4 part of S, according to Ruzicka, to a gradually approached oil bath temp. of 240°, and then distd. in vacuum over Na and treated with picric acid, as above, to obtain the *hydroaromatics* by difference. The 120-130° fractions from tars (1), (2) and (3) yielded, resp., 0, 3.6 and 1.78% *naphthalene-type aromatics* and 5.25, 5.47 and 1.94% *hydroaromatics*, the 130-140° fractions, 0, 4.26 and 2.13% and 3.33, 14.22 and 7.44% and the 160-170° fractions 0.2, 8.91 and 1.35% and 1.51, 8.02 and 4.65%, after correcting for the usual assumed loss of 25% of these hydrocarbons during dehydrogenation. These results are attributed to secondary decompn. due to local overheating in the

externally heated cases. The picrates gave sharp m. ps., and those from corresponding fractions were found identical, by the mixed m. p. method, from the 3 tars and before and after dehydrogenation, except that from the highest fraction of the steam tar, m. 152° and corresponding to a hydrocarbon, $C_{14}H_{18}$. The quantity was too small for further identification. The same fraction from the other tars also yielded a $C_{14}H_{18}$ picrate but it m. 138-9°, corresponding to a hydrocarbon isolated by Tammann from Russian petroleum, which he characterized as a tetramethylnaphthalene. The others were $C_{14}H_{18}$ picrate, m. 112°, from the first fraction, and $C_{13}H_{14}$ picrate, m. 123°, from the second, corresponding to Herzenberg and Ruhemann's 1,3 or 2,4 methylisopropyl-naphthalene and α -isopropyl-naphthalene, resp. Cf. C. A. 21, 2122. F. S. G.

The Kraemer-Sarnow method and the toxicity of mercury. LUDWIG MILLBRADT. Büsscher & Hoffmann A. G., Eberswalde. *Teer u. Bitumen* 26, 485-6(1928).—The following method is employed in the lab. of the above company to minimize the now well-recognized danger of Hg poisoning from continual exposure to minute quantities of Hg vapor in the manipulation of the Kraemer-Sarnow method for detg. the softening point of pitches, which it is not desirable to abandon because of certain advantages over other methods. The stem of a funnel is cut off at right angles and attached to another glass tube by means of a rubber tube contg. a glass bead, flush with both tubes. The stem is marked to indicate the level of 5 g. of Hg. It is then inserted into a bottle, by means of a stopper above the rubber tube, and Hg is poured in to above the mark and then run out to the mark, lifting the funnel out of the bottle just far enough to manipulate the rubber tube. The 5 g. dose is then run into the melting tube for the test. The funnel is kept covered by an etched glass plate sealed with grease.

F. S. GRANGER

The effect of coal segregation, mixing and heating upon the quality of metallurgical coke. F. F. MARQUARD. *Blast Furnace & Steel Plant* 16, 754-7, 914-6(1928).—The Clairton, Pa., plant of the Carnegie Steel Co., employs 100% high-volatile Pittsburgh coals in making by-product coke. The coal is coarsely prep'd.; a typical sieve test is 7.1% on 2 in., 19.6% on 1 in., 19.5% on $\frac{1}{2}$ in., 16.8% on $\frac{1}{4}$ in., 14.0% on $\frac{1}{8}$ in. and 23.0% through $\frac{1}{8}$ in. Coal of this size weighs about 51 lbs. per cu. ft. while coal crushed so that 80% passes through $\frac{1}{8}$ in. screen weighs only 48 lbs. per cu. ft. Slate is removed from coal to improve its coking quality and lower the ash content of coke. Compartment-type bunkers prevent segregation of coarse and fines in travel of coal. Each bunker has a capacity of 5000 tons and contains 24 compartments. Coking temps. of 2075° F. and more are always maintained.

D. GORDON

The reactivity of coke. F. J. DENT. Leeds Univ. *Gas J.* 184, 199-200(1928).—Expts. by the Gas Investigating Comm. are reviewed. A max. reactivity with steam at 1100° was shown by coke prep'd. at 800° as against 500° and 1100°. Coke prep'd. in the lab. from coal + 8.5% Na_2CO_3 showed, with steam, about double and, with CO_2 , about 10 times the reactivity of com. cokes. Reactivity with dil. O_2 showed a decided variation between different cokes up to 700° above which all burned at the same rate, supporting the view of Haslam that, at high temps., combustion is so rapid that its rate depends only on the rate at which O_2 is brought into contact with the C. In deep beds, however, it was shown that more reactive cokes developed lower temps. because of the endothermic reduction of CO_2 to CO. The *ignition temps. of cokes* decreased with the temps. at which they were prep'd. Considering the results reviewed, the relation of reactivity to practical application was then discussed. Because of the high temp. required, it follows that a less reactive coke is more suitable for the *foundry cupola*. In the *blast furnace* a coke of low reactivity furnishes sufficient CO for the reduction of the ore and is therefore preferred because of the high temp. required for melting down the metal. In the *gas producer*, high reactivity is obviously preferable, especially as the lower temp. decreases clinkering. In the *water-gas plant*, high reactivity would be advantageous in the run period and low reactivity in the blow period. In the *Dellwicks-Fleischer method*, in which it is sought to solve this dilemma by a thin bed of highly reactive coke, it is found that the saving is more than counterbalanced by increased sensible heat losses in the blow gases, less steam decompd., increased power consumption and lower output. The CO burns to a large extent above instead of in the fuel bed. This heat is therefore not available for the run period. It is therefore found better to use a deeper bed and utilize the CO, produced during the blow, by burning it to heat the waste-heat boilers, etc. Hodsman and Dyde, at Leeds, Univ., measured the heat radiated by various cokes in *domestic grates*. More reactive cokes showed less efficiency, since CO burned above the fire, giving lower heat concn. Low-temp. cokes are superior because of ease of ignition and less attention required. Also in *Gas World* 89, 435-6(1928).

F. S. GRANGER

Economics of coke manufacture in the coking industry. M. MACKENZIE. *Gas J.* 184, 45-8; *Gas World* 89, Coking Sect., Oct. 13-5(1928). F. S. GRANGER
Problems in atmospheric cooling. G. J. GREENFIELD. *Gas J.* 184, 273-4(1928).—
Various practical difficulties met with at the Fell Coke Wks., Consett, England, and the methods adopted to overcome them are discussed. F. S. GRANGER

Developments of natural gas in Canada (HUME) 22. Natural and artificial mineral oils in Germany, 1914 to 1927 (FABER) 22. Applied gas analysis (BURKS) 22. The manufacture of pig iron in Natal (HOLGATE) 9. New Orsat absorption tube (MOODY, STEVENS) 1. Progress of naphthology during 1927 (THOMPSON, *et al.*) 22. Electrical precipitator for brown coal dust (ANON.) 4. Briquetting coal (Brit. pat. 286,336) 9. Artificial stone, bricks, briquets, etc. (Brit. pat. 286,334) 20. Hydrogenating coal products (Brit. pat. 286,206) 22. Dehydration of alcohol [for use as fuel] (Fr. pat. 636,551) 10. Washing apparatus for coal (Fr. pat. 636,341) 1. Feeding bituminous materials such as brown coal into distillation apparatus (U. S. pat. 1,687,760) 22. Converting lower-boiling into higher-boiling hydrocarbons (U. S. pat. 1,687,890) 22. Cooling and straining device for separating oil or other vapors from gases (Brit. pat. 285,928) 1.

BEAUFAX, G. *Bilans thermiques.* Charleroi: Librairie de la Bourse J. Wattiaux. 300 pp.; F. 37.20. Reviewed in *Chimie et industrie* 20, 403(1928).

Fuel. HERBERT E. WETHERBEE (one-third each to Richard F. Grant and Howard M. Hanna). U. S. 1,687,815, Oct. 16. Before coalescing particles of fuel such as coal or lignite the material is preliminarily treated while in moistened condition with a filming carrier such as linseed oil and a binding material such as dextrin so that the latter is evenly applied to the fuel particles. An app. is described.

Motor fuel. SOCIÉTÉ DES BREVETS ÉTRANGERS LEFRANC ET CIE. Fr. 637,993, Nov. 30, 1926. A motor fuel consists of equal parts of complex ketones from the dry distn. of aliphatic Ca salts such as Ca butyrate, and MeOH or benzene. To increase the calorific value heavy hydrocarbons such as naphthalene may be added. The ketones are preferably those which distil between 60 and 140°. Cf. C. A. 22, 1461.

Atomization of liquid fuel. RUDOLF AUERBACH. Fr. 638,314, July 27, 1927. Liquid fuel for Diesel or other motors is atomized by a direct or induced elec. charge, either alone or with mech. atomization.

Electric control system for liquid fuel burners. ROBERT F. METCALFE (to Socony Burner Corp.). U. S. 1,688,126, Oct. 16.

Carbonizing fuel. H. M. RIDGE. Brit. 286,104, Aug. 23, 1926. Fuel is distd in passing through a superposed hearth oven (which is described) and the coke residue passes over a cooling hearth and after discharge from this is immediately briquetted.

Distilling powdered fuel. KOHLENVEREDLUNG A.-G. Brit. 286,404, Dec. 31, 1926. In low-temp. distn. of powd. or granular fuel which passes through the distn. chamber in suspension in a gas, hot producer or water gas is used immediately after leaving the gas producer and is fed into the distg. chamber together with the powd. fuel through a common nozzle. An app. is described.

Low-temperature distillation [of solid fuels]. COMPAGNIE DES MINES DE BRUAY. Fr. 638,335, July 27, 1927. A furnace for the continuous low-temp. distn. of all solid fuels consists in several vertical cells which are heated by gases circulating in their walls.

Vertical furnace for distillation and gasification of solid fuel. PIERRE EUGÈNE HENRI FORSANS. Fr. 637,906, Nov. 20, 1926.

Fuel mixture comprising coal dispersed in oil, etc. A. W. BURWELL (to Alox Chemical Corp.). Brit. 286,260, March 2, 1927. Finely divided coal or other solid fuel is dispersed in a gel produced by dissolving in petroleum fuel oil an alkali metal salt of a saponifiable acidic material obtained by the controlled oxidation of a liquid aliphatic hydrocarbon. Details are given for producing products which may be pumped.

Destructive hydrogenation. M. MELAMID. Brit. 285,879, Feb. 24, 1927. Liquid products are prepd. from carbonaceous material, oils, tars, etc., by spraying the material intimately mixed with a catalyst (which may be a finely divided metal, alloy or metal oxide) into a heated retort under pressure by a current of H or gases contg. H.

Destructive hydrogenation. I. G. FARBENIND. A.-G. Brit. 285,923, Sept. 10, 1925. Destructive hydrogenation of carbonaceous materials is effected under pressures of at least 50 atm. in the presence of catalysts such as alumina, thoria or other rare earths or oxides or carbonates of V, alone or mixed or with the addn. of Fe or

other metals of the 8th group or compds. of such metals. H itself may be used or H_2S , or other reducing gas contg. H, such as water gas or mixts. of H with N, H_2O vapor or CH_4 , etc., may be used. An example is given of the treatment of brown coal producer tar to obtain a yield of 50% of "petrol."

Hydrogenation of coal, etc. I. G. FARBENIND., A.-G. Fr. 638,325, July 27, 1927. In the hydrogenation of coal, tar, mineral oils, etc., the heat necessary for the reaction is obtained by passing a heated gas, taking part in the reaction or not, through the contact chamber. Preferably the H itself is heated.

Flotation separation of coal from clay or other impurities. CHEMISCHE FABRIK IN BILLWÄRDER VORM. HELL & STRAMER A.-G. AND F. L. KÜHLWEIN. Brit. 286,456, March 5, 1927. Impure coal, coal sludge or coal-contg. residues are purified by use of weak alk. or alk. earth solns. of xanthates as frothing or flotation agents. An app. is described.

Treating coal with coloring matter. GUSTAVUS J. ESSELEN, JR. and MARK W. WEISS (to Delaware, Lackawanna & Western Coal Co.). U. S. 1,688,695, Oct. 23. Coal, the pieces of which have an irregular surface with crests and valleys, is provided with coloring material such as ultramarine which is deposited in the valleys of the surface and serves as an identification of the brand or source of the coal.

Apparatus (with vertical retort) for distilling coal and similar materials. CHARLES H. PARKER. U. S. 1,689,152, Oct. 23.

Collecting pipes for coal distillation retorts. LOW TEMPERATURE CARBONISATION, LTD. Fr. 636,459, June 22, 1927.

Retort (formed with connected tubular sections set in downward inclination) for distillation of coal, etc. CHARLES H. PARKER. U. S. 1,687,990, Oct. 16. U. S. 1,687,991 also relates to somewhat similar app. for the same purpose.

Retort construction (with a battery of vertical retorts) for coal distillation, etc. CHARLES H. PARKER. U. S. 1,687,989, Oct. 16.

Apparatus for evacuating residues from retorts in the distillation of coal, etc. LOW TEMPERATURE CARBONISATION, LTD. Fr. 636,458, June 22, 1927.

Fuel gas. ALFRED H. WHITE. U. S. 1,689,940, Oct. 30. In a continuous process of manuf. of gas with a heating value of over 200 B. t. u. per cu. ft., a charge of solid fuel such as coke or coal within a gas generator is continuously blown with a gas mixt., the main reactive constituents of which are O and steam, in such proportions and quantity that the fuel bed is maintained at a temp. of at least redness and the hot gases form gaseous hydrocarbons with enriching carbonaceous material such as petroleum oil which is introduced and reacts with the gases while also undergoing destructive distn. out of contact with metal surfaces and at slowly decreasing temps. maintained principally by the reactions in the generator. Deposition of free C is largely avoided. An app. is described.

Drying fuel gases. C. COOPER AND W. C. HOLMES & Co., LTD. Brit. 285,936, Oct. 21, 1926. Fuel gases passing through a main are by-passed through brush-washers in which they are treated with hygroscopic liquid and the liquid is cooled and regenerated by circulation through independent circuits connected to the washers. The app. is described in detail.

Treating gas liquors. FÉLIX SCHÖNFELD. Fr. 638,035, July 20, 1927. Gas liquors are treated with S or sulfides, in the presence of catalysts such as active C, silicic acid or wood charcoal, to convert the cyanides into non-volatile thiocyanates and distd.

Gas producer. PAUL BEAUDEQUIN. Fr. 638,529, Dec. 7, 1926. The hearth of a gas producer terminates in a conical-shaped ring which can be rotated to empty the cinders or ashes.

Gas-producing apparatus and screw device for feeding fuel to same. WILBUR L. SHEPARD (one-half to Edward A. Beals). U. S. 1,689,159, Oct. 23.

Gas retort and regenerator construction. R. W. BROADHEAD. Brit. 286,418, Jan. 17, 1927.

Gas burner for tangential feed tubes. BADER & SALAU. Fr. 636,455, June 22, 1927.

Rich gas and semi-coke from bituminous fuel. METALLBANK UND METALLURGISCHES GES. A.-G. Brit. 285,664, March 15, 1927. In producing rich gas, semi-coke and NH_3 from bituminous fuel, by use of O or gases rich in O, with or without steam or CO_2 , the upper zone of the fuel column is distd. by gas obtained by gasification of fuel in the lower zone and the lower zone is divided into 2 parts, one of which is subjected to gasification by the O or gases rich in O while the charge in the other portion of the lower zone is withdrawn as semi-coke. Tar residues or similar material may be

injected into the hot zone and the steam may be admitted preferably through the hot semi-coke to serve for quenching the latter.

Control system for valves of water-gas plants, etc. POWER-GAS CORPORATION, LTD., N. E. RAMBUSH AND C. S. D. HARPER. Brit. 285,996, Nov. 25, 1926. Various details of an elec. control system are described.

Extraction of phenols. F. RASCHIG. Fr. 636,301, Feb. 7, 1927. Phenols are extd. from ammoniacal liquors by means of benzene or its homologs in a column washer contg. Raschig rings having a diam. of 15 mm.

Distilling tar. S. P. MILLER (to Barrett Co.). Brit. 286,278, March 2, 1927. In distg. tar by contact with the hot gases from coal carbonization retorts, coke ovens or the like, the uptake pipes of a plurality of retorts are connected to one or more stills into which the tar is sprayed through nozzles. Various features of construction of the app. are described. Cf. C. A. 22, 4779.

Distilling tar. F. OSBORNE (to Barrett Co.). Brit. 285,907, Feb. 26, 1927. Gases and vapors produced by distg. tar by contact with part of the hot gases from a battery of coke ovens are mixed with the remaining gases which have been previously cooled to remove the heavy tar constituents, and the mixt. obtained is cooled to recover condensable constituents. An app. and various details are described.

Separating constituents of aqueous tar emulsions. BIGGER JOHNSON. U. S. 1,689,728, Oct. 30. An emulsion such as an aq. tar emulsion from gas works is mixed with a carboxy acid such as oleic acid which is substantially insol. in water but is sol. in the tar constituent of the emulsion and the emulsion is allowed to stand at an elevated temp. (suitably about 60-70°) until the water is sepd. from the tar.

Apparatus and circulation system for dehydrating tar. ARTHUR W. WARNER. U. S. 1,689,309, Oct. 30.

Coke-oven construction. DR. C. OTTO & Co., Ges. (to Naamlooze Vennootschap Silica en Ovenbouw Maatschappij). Brit. 286,234, Feb. 28, 1927. Rich gas is supplied to the heating flues through horizontal distributing conduits beneath the oven sole, in the operation of an oven such as that described in Brit. 240,167 (C. A. 20, 2244).

Removing graphite from coke furnaces. GEORGES CAPLAU, MICHEL GAUQUER and LOUIS LAHAUT. Fr. 638,439, July 29, 1927. Incrustations of graphite are removed from furnaces while still warm by a jet of compressed air carrying hard or granulated material.

Tank and associated apparatus for separating coke from clinkers or other granular materials of different specific gravities by use of liquids such as water. ANTHONY R. SILVERSTON (to Coke Reclamation Corp.). U. S. 1,689,536, Oct. 30.

22—PETROLEUM, LUBRICANTS, ASPHALT AND WOOD PRODUCTS

F. M. ROGERS

Reports on the progress of naphthology during 1927. Chemistry. H. B. THOMPSON. *J. Inst. Petroleum Tech.* 14, 505-10 (1928). **Refining and refineries.** J. MCCONNELL SANDERS. *Ibid* 510-26. **Refining in Europe.** H. I. WATERMAN AND J. N. J. PERQUIN. *ibid* 526-36. **American refinery technology.** BENJAMIN T. BROOKS. *Ibid* 537-58. **Cracking.** GUSTAV EGLOFF AND C. D. LOWRY, JR. *Ibid* 558-611. **Cracking.** R. PITKETHLY. *Ibid* 611-21.—In these reviews the authors have discussed the current progress in plant equipment, treating methods and products as revealed by the literature. **The principle of the Koenigsfeld system of high vacuum distillation and two-phase evaporation.** M. L. STEINSCHNEIDER. *Ibid* 621-32.—Recent improvements include a modified firing system to prevent cracking, whereby heating is carried out in a tube still at high velocity of circulation and pressure sufficient to prevent vaporization, the product being subsequently distd. at lower pressure in the cylindrical still at relatively low temp. Unsatsd. products are removed in a gas separator after leaving the tube still, by proper pressure adjustment of this unit. Mech. circulation gives better vaporization and prevents decompn. Working plans indicate increased ease and decreased labor in handling the system. **Heavy distillates, fuel oils, asphalts and residues.** F. H. GARNER. *Ibid* 632-7. **Special products.** W. J. WILSON. *Ibid* 637-40. **Analyses and testing of petroleum products.** J. S. JACKSON. *Ibid* 640-3. **Synthetic fuels.** ALFRED W. NASH AND ARTHUR R. BOWEN. *Ibid* 643-50.—Synthetic fuels from coal (berginization), CO and CH₄, or natural gas are reviewed briefly, indicating the hydrogeneration of coal as most promising. **Engine knock and anti-knock.** A. EGBERTON.

Ibid 656-69; cf. C. A. 22, 3521.—Review with bibliography of 75 references.

World's production of crude petroleum. GEO. SELL. *J. Inst. Petroleum Tech.* 14, 679-80(1928). A. S. CARTER

Developments of petroleum and natural gas in Canada. G. S. HUME. *J. Inst. Petroleum Tech.* 14, 669-76(1928). E. H.

Roumanian petroleum and its chemical composition. G. CANE. *Anales soc. espan. fis. quim. (tecnica)* 1, 5-29(1928).—A summary and review, particularly of the possibilities of the manuf. of chem. products from petroleum. E. M. SYMMES

Progress in petroleum distillation. L. SINGER. *Petroleum Z.* 24, 531-48, 603 (1928).—A review of the literature and patents regarding dehydration, heat economy, distn. method and app., rectification, lubrication, oil distn., coking, gas treatment, and corrosion published in 1927. M. B. HART

[Petroleum production in] British West Indies. A. P. CATHERALL. *J. Inst. Petroleum Tech.* 14, 676-9(1928). E. H.

Development of the cracking process in the petroleum industry. E. OWEN. *Chem. Met. Eng.* 35, 610-3(1928).—The historical development of cracking is discussed briefly and the present tendency in cracking outlined under the following headings: (1) elec. processes, (2) chem. processes, (3) thermal processes, (a) strictly vapor phase, (b) semi-liquid-phase or distn. processes, (c) liquid phase digestion processes without distn. in the cracking zone. Problems in vapor phase cracking are C deposition, excessive formation of fixed gases, mech. difficulties in superheating the vapors uniformly and economically to a high temp., high fuel consumption, difficulties in accurate temp. control and difficulties in treating the distillate. The three vapor phase processes most discussed at present are the Gyro, the Gulf-Texas and the Leamon processes. Each is discussed briefly. D. F. BROWN

Natural and artificial mineral oils in Germany, 1914 to 1917. A. FABER. *Naturforschenden Gesellschaft Görlitz. Petroleum Z.* 24, 644-52(1928).—German oil production, consumption and import statistics are given. A general discussion of the possible future supply from coal points to the most economical production by coal distn. to produce tar oil and coke, the coke being gasified with steam to produce water gas which may be used in the production of synthetic motor fuel. The coal tar serves as a basis for Diesel and fuel oils. M. B. HART

The use of bleaching earth in the mineral oil industry. TYPKE. A. E. G. Transformatorfabrik. *Petroleum Z.* 24, 673-92(1928).—The present knowledge of the nature and use of bleaching earths is presented with a review of a greater part of the recent literature on the use of bleaching earths in the petroleum industry, contg. 237 references. M. B. HART

Gasoline survey for 1926. P. V. ROSEWARNE AND A. F. GILL. *Can. Dept. Mines, Mines Branch No.* 689, 86-96(1928); cf. C. A. 19, 1936.—Analyses of 76 samples of gasoline collected in 13 widely sepd. cities show that the gasoline sold during Aug. 1926 was superior to the U. S. Federal specifications for government motor gasoline. L. W. RIGGS

Clay treatment of refinery gasoline. C. O. WILLSON. *Oil & Gas J.* 27, No. 13, 130-1(1928).—At the Simms Oil Co.'s Dallas, Texas, refinery, cracked gasoline from Cross units is treated with 1 gal. of 21 gravity NaOH soln. for each 3 gals. gasoline, followed by an acid treat with a 50-50 mixt. of acid sludge and fresh acid through a centrifugal pump and centrifuge from which sludge is removed into an accumulator tank. The gasoline contg. some acid is treated with clay (3 lbs. per bbl.) in an agitator from which the gasoline-clay mixt. is withdrawn to a Sweetland filter for the removal of the clay. M. B. HART

The recovery of gasoline from field and refinery gases with special reference to the Bayer activated charcoal process. ION EDELEANU. *Chimie et industrie* 20, 429-40 (1928).—See C. A. 22, 3039. A. PAPINEAU-COUTURE

Applied gas and gasoline analyses. J. C. BURKS. O. C. Field Gasoline Co. *Oil & Gas J.* 27, No. 16, 142, 144, 146(1928).—The results of the cold fractionation of various samples of gasoline and gas to det. the hydrocarbon components are reported. From an analysis of various samples the efficiency of the fractionating column may be detd. by comparing the sum of the constituents with the constituents entering the plant. By plotting the analyses on a three-dimensional graph, the distn. recovery of a gasoline of a given percentage compn. of C_3H_8 , total C_4H_{10} , and C_5H_{12} plus, may be detd. if the distn. recovery lies between 78 and 95%. M. B. HART

Miscibility of castor oil with gasoline hydrocarbons. GEO. H. TABER AND DONALD R. STEVENS. *Ind. Eng. Chem.* 20, 1185-6(1928).—Expts. to det. the miscibility of

castor oil with petroleum naphtha indicate that the miscibility depends upon the character of the petroleum product used. The paraffin hydrocarbons used have a limited, though high, soly. in castor oil, while the olefins, naphthenes and aromatic hydrocarbons seem to be miscible in all proportions. D. F. BROWN

Gasoline capture by adsole. HAJIME ISOBE AND SHUTCHI MORI. *Bull. Inst. Phys. Chem. Research (Tokyo)* 7, 683-730; English Ed, 1, 63-4(1928).—Wet gas is run through 3 towers contg. adsole [acid earth], and gasoline is recovered from the adsole by heating. Complete data are given for a set of runs. A. L. HENNE

Critical temperatures and oil cracking. RALPH H. MCKEE AND HAROLD H. PARKER. *Ind. Eng. Chem.* 20, 1169-72(1928).—Cracking stocks, such as gas oil, have definite critical temps. which may be calcd. from the av. boiling points by formulas given. These critical temps. are below the av. temp. of the oil leaving the heating tubes in some of the more important so-called liquid-phase cracking processes such as the Cross process and the "Tube and Tank" process. These processes are, therefore, really vapor phase processes. Asphaltic substances, the non-volatile in the ordinary sense of the word, are sol. in highly compressed vapors. D. F. BROWN

Cracking or hydrogenation. M. NAPHTALI. *Petroleum Z.* 24, 611-4, 658(1928).—A review of recent literature on the theory of cracking, with a brief description of various cracking and hydrogenation processes. Recent patents are also reviewed. M. B. HART

Catalysts in oil cracking. H. PINCASS. *Petroleum Times* 10, 1020 1(1928).—The outstanding patents relating to the use of catalysts in cracking are reviewed. M. B. HART

Volumetric and A. P. I. gravity changes due to the solution of gas in crude oils. R. VAN A. MILLS AND R. E. HEITHECKER. *Bur. Mines, Repts. of Investigations* No 2893, 15 pp.(1928).—The soly. of city gas (in Bartlesville, Okla.) in 3 different crude oils was detd. at 70° F. and at pressures from 200 to 1000 lbs. The crude oils ranged in gravity from 20.5 A. P. I. (60° F.) to 40.6. The results are presented in tabular and chart form and show that decided increases in vol. and in A. P. I. gravity of the oil are caused by the soln. of gas in oil under pressure. Decided decreases in vol. and gravity were noted with the liberation of gas from soln. and the diminution of gas pressures. D. F. BROWN

Storage and transportation of mineral oil. L. SINGER. *Petroleum Z.* 24, 373 6 (1928).—An amplified bibliography of articles on storage and transportation of oil during 1927. M. B. HART

Distillate as its own induction pump in continuous treating system. PAUL TRUESDELL. *Natl. Petroleum News* 20, No. 34, 65-6, 68(1928). A continuous treating system in which cracked distillate is treated with caustic, hypochlorite soln. and H₂O in turn. Vertical treating tanks are used and all mixing is done with Venturi mixers. M. B. HART

Analysis of Russian mineral oil products. JOHANN DIESTENFELD. *Kommerzial rat, Wien. Petroleum Z.* 24, 763-8(1928).—Analyses are given of benzine, ligroin, illuminating oils, spindle oil, machine oils, lubricating oils, miscellaneous oils, fuel oils, etc., having various trade names, as given by the "Grosneft, Asneft and Embanest". M. B. HART

Quick action reduces loss and coking when pipe-still tube fails. J. C. CHATFIELD. *Natl. Petroleum News* 20, No. 40, 61, 63(1928).—At the Okmulgee plant of the Barnsdall Refineries, Inc., the system of handling ruptured tubes in pipe stills consists in isolating a tube still from its crude supply and tower system and purging the tubes of oil under steam pressure. The distn. system designed by G. T. Granger flashes out the light fractions of crude in a sep. tower section before entering the pipe still. In the distn. system light vapors from the top tray of the 1st tower pass through the reflux condenser surmounting the tower and are charged into the 2nd tower over about the 7th tray. Gas oil withdrawn from the 3rd tray of the 1st column is pumped through the reboiler coil in the 2nd tower and through a cooler to storage. The temp. of the 2nd tower is maintained about 50° below the desired 90% point. Kerosene is withdrawn from the bottom of the 2nd tower, the outlet being extended down to a point below the reboiler coil through which hot gas oil is pumped. M. B. HART

Low humidity hastens bright stocks settling. L. C. JAMIESON. *Viking Oil Co. Natl. Petroleum News* 20, No. 39, 89-91(1928).—At the Viking Oil Co.'s wax plant 3000 barrel settlers size 25 by 30 ft. are most used, the cooling coils being placed in 2 planes, 1, 2 or 3 ft. from the top level, the second a few feet below the first. The use of steam pumps equipped with Mason governors for the filtered soln. and the benzine

provide for the regulation of gravity.* Low humidity hastens bright stocks settling.

M. B. HART

Modern distillation methods revealing remarkable strides. D. W. Hovey, Waverly Oil Works. *Oil & Gas J.* 27, No. 18, 145(1928).

M. B. HART

New dehydration process and low-gravity oil topping unit. ANON. *Oil Age* 25, No. 6, 49, 54(1928).—The Merrill dehydration process is described.

M. B. H.

Three types of compression plants. C. O. WILLSON. *Oil & Gas J.* 27, No. 18, 130-1(1928).—Three main types of compression plant hook-ups are described. In the first, wet gas passes through a low-stage compressor and water condenser where heavy gasoline ends are condensed out and then to a high-stage compressor under 300 lbs. where the remaining gasoline is removed. The gasoline from both stages is combined and fractionated. In the second type, the gas is scrubbed before and after the low-stage compression, the gas from the high-compression stage being fractionated. The low-stage gasoline is ready for the market without further fractionation. C_2H_6 from the fractionator is recycled to the wells. In the third type, gas from the low-stage compressor is cooled and passed to the fractionator. Uncondensed gas from the latter is released to the high stage of the compressor from which it is passed to a condenser and accumulator tanks. Residue gas is released for well operation.

M. B. HART

Corrosion in refineries menaces profits, health and life; some suggestions. E. R. LEDERER. Texas Pacific Coal and Oil Co. *Natl. Petroleum News* 20, No. 40, 22-5 (1928).—The principal types of corrosion found in the refinery are (1) atm., (2) H_2O corrosion, (3) soil corrosion, (4) chem. corrosion. The palliatives suggested include for (1) the use of special paint and metal coatings, for (2) proper treatment of boiler feed water and the use of proper metal tubes, for (3) analyses of the soil and proper coatings for pipe, for (4) neutralizing charging stock with NH_3 , lime or soda, and inspection of materials.

M. B. HART

The solidifying point of paraffin-containing mineral oils and residues. A. N. SAKHANOV. *Petroleum Z.* 24, 654-5(1928).—The solidification points of various samples of Grosny crude and masut have been detd. The method used consisted in heating the sample in a tube having a diam. of 15-20 cm. for an hr. at various temps., and cooling to room temp. or below until solidification occurred. In cooling the tube was placed within a second tube about 4 mm. greater in diam. and the thermometer inserted in the space between. The following conclusions were drawn from the results: (1) The solidification point of paraffin-contg. crude oil and masut varies with the temp. to which it is heated; (2) the highest solidification point corresponds to a preheating temp. which varies with the oil but lies between 40 and 60° and increases with the paraffin content; (3) higher preheating temps. cause a depression of the solidification point, the depression disappearing on standing.

M. B. HART

Adopts Reid vapor pressure test. ANON. *Oil & Gas J.* 27, No. 15, 328(1928).—The Natural Gasoline Asscn. announces the adoption of the Reid vapor pressure testing method as a tentative standard effective Sept. 1, 1928.

M. B. HART

Various designs in pipe stills. D. G. BRANDT. Henry L. Doherty & Co. *Oil & Gas J.* 27, No. 19, 128(1928).—The present bubble cap tower is inefficient from a heat standpoint. The use of heat exchangers between each tray for the maintenance of the proper thermal gradient is more satisfactory. Side streams may be taken out and handled as in other towers except that kerosene is made as an overhead distd. product. At the H. L. Doherty Co. all tubes work at a moderate rate, the fire box temp. being regulated by the quantity of flue gas recirculated.

M. B. HART

Improved production of cracked benzene. ALFRED KARSTEN-SALMONY. *Petroleum Z.* 24, 423-6(1928).—The Blümner cracking process is described with yields from various feed stocks.

M. B. HART

Improvements in cracked benzene production developed by German engineer. ALFRED KARSTEN-SALMONY. *Oil Age* 25, No. 5, 40-1(1928).—The Blümner cracking process is described.

M. B. HART

Friction electricity in benzene as cause of fire. HEINZ VON FALSER. *Tiroler Oelwerke Reutle, Tirol. Petroleum Z.* 24, 656-7(1928).—While spent bleaching earth was being removed from a filter press, an explosion occurred which apparently was caused by the discharge of friction electricity generated in an insulated app. The use of hard wood or Al alloys instead of Fe in the app. is suggested as a precaution against such discharge.

M. B. HART

History and development of antidetonating agents for motor fuel. H. S. TEGNER. *Petroleum Times* 19, 749-51(1928).—A review.

M. B. HART

One method of extinguishing fires. C. A. THOMAS AND C. A. HOCHWALT. *Oil & Gas J.* 27, No. 14, 142(1928).—Alkali metal compds. have been shown to have a

catalytic effect in extinguishing oil fires. This effect increases with the increase in at. wt. of the metal and varies with the radical to which the metal is joined, O_2 -bearing radicals being most effective. Tables are given to show relative efficiency of various compds. of the alkali metals, and test methods are described. M. B. HART

Trend in antiknock motor fuels. GRAHAM EDGAR. Ethyl Gasoline Corp. *Oil & Gas J.* 27, No. 17, 97, 162, 164(1928).—The present status of knowledge of knocking characteristics of fuels and the elimination of knock is discussed. M. B. HART

Estimation of a possible coke formation in petroleum products. N. I. CHERNOZHUKOV. *Neftyanoe Khozyaistvo* 15, 69-72(1928).—C. compares the C detn. by Conradson with Butkov's method of testing oil under heat and pressure. The 2 tests give quite different results. An oil low in Conradson C can be high in C when both heat and pressure are applied, particularly when in the presence of O_2 . White oils and paraffin wax do not form coke. The detn. of excise resins and the color do not indicate a possible formation of coke. A. A. BOEHLINGK

Dehydration of bitumen emulsion from Alberta bituminous sands. P. V. ROSEWARNE and G. P. CONNELL. *Can. Dept. Mines, Mines Branch* No 689, 96-103(1928).—Water cannot be sepd. from bitumen by ordinary distn. methods because of excessive frothing. A special still is described whereby the wet bitumen is fed into a cylindrical retort, the bottom of which is covered with melted Pb, at a rate such that the water was entirely removed by the time the bitumen reached the outlet at the bottom of the still. The water vapor and some light oil passed from the top of the still to a condenser. Data of typical runs are given. L. W. RIGGS

Neutralization of naphthenic oils and a new dry refining method. E. T. LEBMANS. *Petroleum Z.* 24, 548-9(1928).—The use of powd. lime or lime soln. in the neutralization of naphthenic acids in oil produces an oil which does not emulsify, but has a darker color, high cold test, and bad odor even though treated with bleaching earth. The asphalt obtained contains Ca naphthenates which prevent emulsion formation. Acid-treated oil is first treated with water glass soln. (30 l. for 6000 l. oil) and the acid tar removed by gravity, after which it is neutralized with 1-2% dissolved lime powder at 100°. The oil is orange yellow in color and requires no bleaching earth to complete the refining. M. B. HART

Breaking crude oil emulsions by the use of chemicals. TADEUZ KUCZYŃSKI. *Petroleum Z.* 24, 398-403(1928).—The literature on the formation of, and the various chemicals used for breaking, crude oil emulsions is reviewed. The demulsifying property of various oil-insol. substances with respect to their elec. charge has been studied. The H_2O drops in Boryslav-Tustanowic emulsions are positively charged as contrasted to the negatively charged drops in Texas and California emulsions. H_2O and H_2O solns. are charged positively in highly refined oil, but in unrefined oil acid solns. are pos. and alk. solns. neg. Spent acid, loam and sand are charged negative with respect to crude oil. These facts seem to explain the action of alkali soap solns. as well as sand filtration in natural emulsions. M. B. HART

Shale oils and their cracked products. R. CROSS. *Petroleum Times* 19, 920(1928).—A study of the character of crude shale oils has shown that they vary greatly among themselves, the differences being mainly due to difference in origin. The sp. gr. varies between 12 and 28° A. P. I. Shale oils contain a considerable amt. of wax, 30-70% unsatd., high proportions of nitrogenous compds. and a very low proportion of light hydrocarbons boiling up to 437°. A 52-60% yield of excellent motor fuel may be produced by cracking shale oil by any of the ordinary processes and refining the cracked product in the ordinary way. M. B. HART

Low-temperature shale carbonization in Esthonia. D. BROWNLIE. *Petroleum Times* 19, 1133-6(1928).—The carbonization of "kukkersite" by the Pintsch, Fusion Retort, Grondal-Carlson, Meguin, Dvorkovitz and Crozier processes is reviewed. M. B. HART

Canadian shale oil and bitumen from bituminous sands, as sources of gasoline and fuel oil by pressure cracking. R. E. GILMORE, P. V. ROSEWARNE and A. A. SWINNERTON. *Can. Dept. Mines, Mines Branch* No. 689, 121-32(1928).—Pressure cracking tests on Canadian crude shale oil, and on bitumen from bituminous sands, according to the Dubbs and Cross processes, resp., show that these raw materials are important sources of motor fuel. Gasoline yields of 60 to 65% by vol. of the crude shale oil and about 40% by vol. of the dehydrated bitumen are reported. Other products from these oil and bitumen raw materials are coke and uncondensed gas of high calorific value. The quality of the gasoline from the shale oil is good and that from the bitumen exceptionally good. L. W. RIGGS

Oil shale from Rosevale, New Brunswick. A. A. SWINNERTON. *Can. Dept.*

Mines, Mines Branch No. 689, 104-5(1928).—A composite sample of a 26-ton shipment gave on analysis shale oil 15.4, water 3.2, gas 8.9, spent shale 72.5%. The gas was at the rate of 2330 cu. ft. per ton of shale. The shale oil was at the rate of 34.7 Imp. gal. per ton.

L. W. RIGGS

Pritchard process for the distillation of oil shale. R. E. GILMORE AND A. A. SWINNERTON. *Can. Dept. Mines, Mines Branch No. 689, 106-20(1928).*—The main feature of the Pritchard process is the recirculation of the uncondensed gases through the charge. The app. is illustrated by 2 photographs and 2 diagrammatic sketches, its operation is described in detail and data sheets of 3 tests are shown.

L. W. RIGGS

Contribution to the study of turbine oils, transformer oils and automobile oils. A. R. MATTHIS. Ateliers Construction Electriques Charleroi Belgium. *Intern. Congress Testing Materials 1927, II, 469-78.*—M. reviews factors which influence the quality of turbine, transformer and automobile oils. In order to have good aging qualities the oils must be well refined, i. e., as free as possible from unsatd. hydrocarbons. It is proposed to test the oils for their aging quality by heating in air at 200°, and noting the time necessary for the incipient pptn. of sludge.

G. C.

Basic viewpoint on the determination of resistance of insulating oils. G. WEIZ. *Petroleum Z. 24, 404-7(1928).*—The various conditions under which oxidation tests of oils are made in various countries are described.

M. B. HART

The action of light on transformer oils. GEORG INCZE. Ganzschen Elektrizitäts A. G. *Petroleum Z. 24, 743-4(1928).*—Fifteen samples of American, Russian and Galician transformer oils have been subjected to the light for 3 years, and samples tested at intervals for sludge value, tar no. with Cu, tar-forming no. and acid no. The data obtained indicate that the 3 oils are affected by the light to a measurable degree in 3 months. The Russian oil is least effected, the American and Galician in increasing order. The tar value with Cu shows the greatest change. Oil stored in tin cans in the dark shows no change provided the cans are filled completely and are clean and filled with as little access to air as possible.

M. B. HART

Testing the stability of mineral oils, particularly of transformer oils toward oxidation by air. EVERT NORLIN. Schwedische Materialprüfungsamt, Stockholm. *Intern. Congress Testing Materials 1927, II, 428-36.*—A review covering the description of the oxidizable hydrocarbons present in oil, and the methods of testing now in use. N. advocates the use of pure O₂, around 110-120°, in the presence of pure Cu, and the detn. of sludge acid in the oil and acid in the sludge.

G. CALINGAERT

The testing of lubricating oils in Germany. HILLIGER. *Intern. Congress Testing Materials 1927, II, 437-46.*—H. enumerates the routine tests applied in Germany to lubricating oils. It is pointed out in the discussion that the viscosity as detd. in a viscometer is a poor indication of the lubricating quality of the oil on account of the lack of pressure.

G. CALINGAERT

Injurious properties of lubricating oils on use. FRITZ FRANK AND HANS SELBERG. *Petroleum Z. 24, 641-4(1928).*—A series of 12 Russian and American lubricating oils have been tested by treating 10 g. samples in 50 cc. containers at 100° with O₂ for 9 hrs. The O₂ was regulated to pass through at the rate of 1 bubble per sec. The sample was titrated for the acid content. A comparison of the acid no., sapon. no., sludge content of the oils with the Hackford values for the same oils shows that Russian oils are less apt to form saponifiable products than American oils having a lower Hackford value. Paraffin base oils are more easily oxidized than naphthenic base oils, according to the results. The analyses of the oil and the results of tests are tabulated.

M. B. HART

Viscosity most important property. H. C. MOUGEY. General Motors Corp. *Oil & Gas J. 27, No. 18, 149-50, 155(1928).*—Of the various properties of lubricating oil, the viscosity is of greatest importance.

M. B. HART

Observations on the measurements of the friction coefficient of lubricating oils. PAUL WOOD. Université de Strasbourg. *Intern. Congress Testing Materials 1927, II, 409-14.*—Friction between solid surfaces belongs to 1 of 3 types: A, dry, without any lubricant, liquid, solid or gas between the surfaces; B, oily or imperfect, in which a lubricant is present in thin layers, and C, hydrodynamic or perfect, in which a continuous thick layer of lubricant is present. In practice only B and C are encountered. B is affected by the solid surfaces, and depends mostly upon the oiliness of the lubricant. In C, the surfaces play no part; the friction takes place only within the lubricant, and viscosity is the only factor. The results obtained on the current types of friction machines are of little value because the operating conditions are not well known. In measuring the wear of different metals, W. suggests the use of a standard, reproducible

lubricant, composed of 99 pts. of pure cyclohexanol and 1 pt. of pure stearic acid, which has the following characteristics: d_4^{15} 0.95318; coeff. of expansion 0.000651; abs. viscosity: 0.1743 at 34.8°, 0.0824 at 50.8°.

G. CALINGAERT

The viscometry of lubricating oils.* I. WOLFGANG OSTWALD AND ARTHUR FÖHRE. *Kolloid Z.* 45, 166-78(1928).—The decisive hydrodynamic criterion for the suitability of lubricating oils is viscosity and there is a simple relation between viscosity and lubricating power. Adhesion may be disregarded as it is approx. the same with all liquids. At the same time many investigators dissent from the view that viscosity and lubricating power are related and consider "oiliness" at least as important as viscosity. The detn. of viscosity involves friction resistance to flow. Osborne-Reynolds showed there was laminar and turbulent flow. The Hagen-Poiseuille law holds for the first and Osborne-Reynolds-Blasius law holds for the second flow. These are (1) $w = \eta(dv/dx)$, where w = resistance, v = velocity at distance x from the wall of the capillary, dv/dx = rate of fall in velocity and η = viscosity and (2) $w = \eta \bar{v}^{-1.76}$, where \bar{v} = av. velocity per cross section of the tube. There is a third law for colloidal

systems $w = \eta \bar{v}^{-\frac{1}{n}}$. For the evaluation of such oils it is advisable to use the simplest possible conditions. Accordingly, laminar flow is used, but for research, conditions are different. Turbulent flow is of interest in oils for high-speed machinery, and it is clear under these conditions a different kind of lubrication takes place. Mineral oils have long been considered as sols. With these considerations in view O. and F. used the more modern methods of pressure viscometry for some typical lubricating oils to investigate how far the Hagen-Poiseuille's law holds, the effect of temp., of mech. treatment and of solids and liquids addns. The app. consisted of a capillary viscometer joined to a manometer, of dimensions and details described. Seventeen kinds of oil available in commerce were used as investigation material to which could be added com. graphite, talc, lanolin, Marseilles soap, oleic acid, Ac(OH or alc. potash. With the velocities and tubes used at 25° and without any addns., all but 2 of the 17 obey Hagen-Poiseuille's law just as well as glycerol but values of abs. viscosity are either much above or much below that of glycerol. Temp. has a large effect on the ratio of the viscosity of the oils at 10° and at 100° being 360/1 and this suggests the behavior of a colloidal system. A mathematical expression is given for the temp. function of viscosity and its implications are discussed. II. *Ibid* 206 79.—It is well known that previous mech. treatment affects the viscosity of many colloids. Hence the oils, both free and with addns., were automatically rubbed in a motor for 120 hrs. After 20 hrs. 3 out of the 4 oils tested showed a considerable increase in viscosity. The variations over the period of the 120 hrs. treatment are discussed in relation to clay suspensions, NH_4 oleate and cellulose esters. It seems that in lubricating oils rod-shaped micelles occur as in oleate sols and that mech. treatment modifies the formation. There may be an oxidation effect, too, but oxidation alone cannot account for the total effect, though under actual technical lubricating process the chem. influence must be great. Addn. of acids causes a depression in the abs. viscosity. Addn. of alkali has the opposite effect of acids, i. e., a general increase in viscosity. Addn. of soap in most cases increased the depression of viscosity. Lanolin slowly augments the viscosity. Graphite augments viscosity as does talc.

S. L. B. ETHERTON

Asphalt manufacture. M. WILLIAMS. *Oil & Gas J.* 27, No. 13, 150, 162, 164 (1928).—The asphalt topping plant at the Norco refinery of the New Orleans Refining Co. uses the Trumble process in which crude is passed through residuum heat exchangers and a pipe still to the vaporizing tower in which the hardness of the asphalt is controlled by temp. regulation, unvaporized crude being removed from the bottom of the tower. The temp. of the tower is maintained by the circulation of flue gases through the annular space between it and an outer shell. The product is steam refined.

M. B. HART

Asphalt determination in paraffin-containing oils. J. MZOUREK. *Petroleum Z.* 24, 403-4(1928).—See C. A. 22, 4786.

M. B. HART

Importance of standard thermometers in the testing of materials [petroleum] (FULWEILER) 1. Chemical analysis and evaluation of gasoline and benzene motor fuels (KATTWINKEL) 21. Apparatus for laboratory study of fractionation [of petroleum products] (ESPACIR) 1. Theory of the bleaching action of bleaching earths (KOBEL) 18. Glycerol and its substitutes [in petroleum industry] (DARKE, LEWIS) 27. Storage tank for gasoline (U. S. pat. 1,690,072) 1. Heat exchange apparatus suitable for use with petroleum oils (U. S. pat. 1,689,910) 1. Specific gravity registers for gasoline flowing through dispensing apparatus (U. S. pat. 1,689,058-9) 1. Hydrogenation of

coal, etc. [mineral oils] (Fr. pat. 638,325) 21. Destructive hydrogenation (Brit. pat. 285,879) 21. Cooling and straining device for separating oil or other vapors from gases (Brit. pat. 285,928) 1. Alkylating lead (U. S. pat. 1,690,075) 18.

Cracking petroleum. JOHN J. JAKOSKY. U. S. 1,689,590, Oct. 30. Material to be cracked is passed under pressure through a retort heated to a cracking temp. and sufficient pressure is maintained to cause the uncracked material to remain substantially in liquid phase while permitting vaporization of cracked products, the latter are removed at a plurality of points distributed along the retort and are subjected to elec. pptn. to remove liquid particles from them and the liquid particles are returned to substantially the point in the retort where they escaped from the latter. An app. is described.

Cracking petroleum oil. GUSTAV EGLOFF (to Universal Oil Products Co.). U. S. 1,688,861, Oct. 23. Residuum accumulating in the reaction zone of a pressure cracking app. is withdrawn and passed through a cooling zone and then delivered to a tank filled to at least 50% its capacity with liquid SO_2 and is violently agitated with the SO_2 ; after the agitation is discontinued the materials are allowed to stratify into 2 layers which are separately drawn off and treated to obtain lubricating oil from the upper stratum and cylinder stock from the lower stratum. An app. is described.

Converting petroleum oils. AUBREY D. DAVID (to Universal Oil Products Co.). U. S. 1,688,855, Oct. 23. Oil is heated to a cracking temp. while passing as a stream through a heating coil or the like and the highly heated oil is transferred to an enlarged reaction chamber in which a substantial body of oil accumulates and in which no additional rise in temp. occurs. Vapors are taken off from the enlarged chamber for condensation and collection and residual oil is continuously withdrawn from the enlarged chamber without recirculating any portion of the oil through the heating zone. A swirling motion is maintained in the oil in the enlarged chamber to hold the C in suspension, by continuous withdrawal of some of the oil from the chamber and returning the oil tangentially. An app. is described.

Distilling petroleum oils. GEORGE W. WATTS (to Standard Oil Co. of Ind.). U. S. 1,689,606, Oct. 30. A stream of oil is introduced into a mixing device into which superheated steam also is introduced while reducing its pressure so that expansion of the steam is effected simultaneously with the introduction of the oil and the steam supplies at least such heat as is required for vaporization of the desired fraction of the oil; the mixt. of steam and oil is conveyed in const. flow through an externally unheated passage until substantially equil. conditions are attained at a predetermined temp. and pressure without sepn. and the resulting liquids and vapors are led to a sepg. chamber. An app. is described.

Refining petroleum distillates. ERNEST B. PHILLIPS and JAMES G. STAFFORD (to The Gray Processes Corp.). U. S. 1,687,992, Oct. 16. In order to remove "sour" constituents, a liquid stream of the oil is caused to flow, substantially free from water, first through a body of finely divided CuCl_2 and then through a body of finely divided fuller's earth. An app. is described.

Cracking hydrocarbon oils. JOHN E. BELL (to Sinclair Refining Co.) U. S. 1,688,325, Oct. 23. Oil is circulated from a bulk supply drum to the lower end of a vertically arranged heating tube and upwardly through heating tubes and back to the bulk supply drum from the upper end of the heating tubes. In the heating tubes it is heated to cracking temp. by hot combustion products which pass first into contact with the upper portion of the tubes and thence downwardly along the latter. Direct radiation from the fire-box to the heating tubes is prevented. The app. is described in detail.

Cracking hydrocarbon oils. GUSTAV EGLOFF and HARRY P. BENNER (to Universal Oil Products Co.). U. S. 1,688,859, Oct. 23. At least 10% of a solid bitumen such as bituminous coal is dispersed in colloidal form in an oil such as fuel, Mexican or Calif. oil and the mixt. is subjected to a cracking temp. under pressure.

Cracking hydrocarbon oils. GUSTAV EGLOFF (to Universal Oil Products Co.). U. S. 1,688,860, Oct. 23. The oil is heated to a cracking temp. under pressure in an initial stage, the vapors formed are dephlegmated and condensed and the unvaporized oil is passed to a top-fired secondary heating zone and subjected to higher temp. and pressure. Vapors thus formed are dephlegmated and collected separately from those produced in the first stage. An app. is described.

Cracking hydrocarbon oils. ROBERT T. POLLOCK (to Universal Oil Products Co.). U. S. 1,688,830, Oct. 23. In a continuous cracking process, the oil is subjected to cracking conditions of heat and pressure in a cracking zone and evolved vapors are passed through a dephlegmating zone in which they are caused to commingle with

incoming charging oil and a supply of water. The charging oil together with reflux condensate sep'd. from the vapors in the dephlegmator and with the unvaporized water is passed to a separator from which the water is withdrawn, and mixed reflux condensate and charging oil are passed from the separator to the heating zone. Dephlegmated vapors from the dephlegmator are passed to a condenser. An app. is described.

Apparatus for cracking hydrocarbon oils under pressure. JOHN PERL (to Sinclair Refining Co.). U. S. 1,689,362, Oct. 30. Connections are provided for circulating and recirculating a liquid body of oil in a still and through a tubular heater and for circulating heating gases around the tubes of the heater. The inner surface of the tubes of the heater is coated with Sn. U. S. 1,689,363 specifies the use of a generally similar app. in which, however, the surface of heater tubes which is in contact with the oil is coated with Fe sulfide which serves to prevent deposition of carbonaceous solids.

"Cracking" mineral oil. PAUL GRENE. Fr. 638,517, Dec. 6, 1926. To avoid the formation of compact deposits of coke or graphite in "cracking" mineral oils, catalysts having a basis of C are used, such as wood charcoal, coke, animal black or decolorizing C.

Cracking and hydrogenating oils. P. GRENE. Brit. 285,668, March 21, 1927. An app. is described in which heavy oils such as those obtained by distg. coal are cracked and hydrogenated by passing them (preferably mixed with neutral gases) through heated tubes contg. superposed layers of (a) non-metallic porous catalyst such as activated C, (b) oxides of Mn or Sn, (c) porous catalyst similar to layer "a," and, (d) a hydrogenating catalyst such as Ni. Blast-furnace gases contg. oxides of C may be used for the neutral gases and the H used may be derived from decompn. of H₂S formed from S compds. in the oil or may be derived by reaction of the oxides of C of the neutral gases with H₂O vapor.

Hydrogenating oil and coal products. G. HUGEL, M. PAUL and M. BOISHEL. Brit. 286,206, Feb. 28, 1927. Hydrogenation of org. substances such as products of distn. of coal and petroleum is effected by use of hydrides of alkali or alk. earth metals either previously formed or produced *in situ* during the process. Pitch from coal tar may be hydrogenated at a temp. of about 300° and a pressure not exceeding about 100 kg., about 10% of Na hydride being used. An app. is described.

Hydrogenating and purifying liquid and gaseous hydrocarbons. H. ROSTIN. Brit. 286,255, March 1, 1927. Oils from cracking or destructive distn., coal gas, water gas or other liquid or gaseous hydrocarbon products are hydrogenated and purified by passage with H₂S over iron which is preferably finely divided and freshly reduced. A temp. of 200-300° is suitable for treating coal gas or water gas and when the iron is converted into sulfide the flow is stopped and H or gases contg. H are passed through the material to reform Fe and H₂S.

"Constructive conversion" of heavy hydrocarbons to lighter products. WM. E. SHORE. U. S. 1,687,595, Oct. 16. Oil such as crude petroleum is directed through the jacket of a compressor, then introduced together with H-bearing gases to a mechanically operating atomizer and the vapor produced is passed to the compressor cylinder and heated by compression; the highly heated vapor is then passed to expansion condensers. An app. is described.

Converting lower-boiling into higher-boiling hydrocarbons. ALEXANDER S. RAMAGE (to Gyro Process Corp.). U. S. 1,687,890, Oct. 16. A hydrocarbon vapor similar to the lighter fractions of casing head gasoline is mixed with steam and the mixt. is brought into contact with ferrous oxide at a temp. of 600° or higher, in order to form a fuel for *internal-combustion engines*. An app. is described.

Purification of aromatic hydrocarbons. THE SELDEN COMPANY. Fr. 636,485, June 23, 1927. Hydrocarbons from different fractions of coal tar or petroleum tar distn., or oils from washing gas rich in benzene, are submitted to a differential halogenation to convert the impurities into easily separable substances. Gaseous or liquid Cl may be used, or substances yielding Cl, such as aqua regia, COCl₂, SO₂Cl₂, etc., for the chlorination. A limited treatment with H₂SO₄ before or after halogenation may be employed.

Manufacture of oil in distillation using a sweeping gas. JOSEPH TRAUTMANN. Fr. 636,329, May 5, 1927. The gas formed in slow or low temp. distn. is itself used as the sweeping gas and is sent to the furnace after being heated, a quantity of gas equal to that produced being continually withdrawn and sent to the oil extn. plant. The extd. gas is burned and used to heat the circulating gas.

Purification of mineral oils and fatty materials. GEORGES MICHOT-DUPONT. Fr. 32,762, Dec. 21, 1926. Addn. to 553,338. After deglycerination of oils and fats in the known manner, the fatty acids thus obtained are submitted to an acid treatment.

e. g., H_2SO_4 , in the presence of substances capable of liberating O such as persalts, and distd.

Preservation of oils. I. G. FARBERINDUSTRIE A.-G. Fr. 636,332, May 6, 1927. Lubricating and transformer oils are preserved from oxidation and polymerization by the addn. of small quantities of org. compds. such as hexamethylenetetramine, trioxymethylene, urea, biuret, piperidine, aldehyde ammonia, aminoguanidine, diphenylguanidine, diethylaniline, hydroquinone, aminophenol, hydroxyquinoline, phenylenediamine, toluhydroquinone, melamine, phloroglucinol.

Apparatus for decanting and filtering used oils. JEAN FRANCOIS JOSEPH FLEPH. Fr. 636,428, June 22, 1927.

Oil extraction retort. GRODZENSKI MENELL. Fr. 638,598, July 30, 1927. Vertical retorts for the extn. of oil from bituminous materials such as shale, coal or peat comprises narrow chambers with sloping plates down which the material slides in zig-zag manner. The retorts may be externally or internally heated.

Digesting shale with oil and cracking evolved products. WM. H. HAMPTON. U. S. 1,687,763, Oct. 16. Material such as bituminous shale is digested with a heavy mineral oil at temps. of 260–370°, steam is mixed with the evolved vapors and the mixt. is subjected to cracking at higher temps., products formed are fractionally condensed, and the residual digestion mixt. is treated with a lighter oil, solid matter is sepd. from the dild. mixt. and a heavy oil fraction is obtained from the residual oil which together with a heavy fraction from the products of cracking is used for digestion of addnl. quantities of raw bituminous material. An app. is described.

Ozonizing mixed liquid hydrocarbons such as those obtained in cracking petroleum oils. ALEXANDER S. RAMAGE. U. S. 1,689,599, Oct. 30. A method is described for producing products which are suitable for *varnish manuf.* Cf. C. A. 22, 2755.

"Cutting oil." MYRON P. DAVIS (to Otis Elevator Co.). U. S. 1,689,011, Oct. 23. Lard oil is heated to about 230–245° while agitated, the heating is discontinued and 20 lbs. finely divided flowers of S are added for each 10 gals. of the oil and after a few min. paraffin oil of a viscosity of about 100 sec. at 37° Saybolt is added in the proportion of 4–7 gals. for each 10 gals. of the lard oil and after all reaction is completed addnl. paraffin oil is added to dil. the mixt.

Stream divided for oil distillation apparatus. CLAUDE F. TEARS (to Universal Oil Products Co.). U. S. 1,688,839, Oct. 23.

Feeding bituminous materials such as schists or brown coal into distillation apparatus, etc. JOHAN G. GRÖNDAL. U. S. 1,687,760, Oct. 16. Mech. features.

Mixing device (with an adjustable Venturi tube) for oil-gas apparatus. ALVIN J. BASSETT (to Bruce Macbeth Engine Co.). U. S. 1,688,320, Oct. 23.

Tank and pipe system, etc., for gathering gas from refinery oil tanks or the like. HARRY R. MAXON. U. S. 1,689,352, Oct. 30. A device is provided which permits the passage of gas from a gathering line to a closed tank when the pressure in the tank falls below atm. pressure but prevents such passage as long as the pressure is maintained at atm. pressure in the tank.

Tower with superposed shelves for contacting solids with liquids. PHILANDER R. GRAY (to Gray Processes Corp.). U. S. 1,688,012, Oct. 16. An app. is specified which is suitable for *purifying hydrocarbon oil vapors* with different reagents.

Apparatus for gravity separation of liquids such as oil and water. W. A. WHITE and WHITE OIL SEPARATORS, LTD. Brit. 285,707, June 7, 1927.

Lubricating oils and fats. SOCIÉTÉ MARITIME ET INDUSTRIELLE. Fr. 636,242, June 20, 1927. Dissolved or liquified rubber is incorporated in lubricating oils or fats to increase their viscosity and adherence. Graphite and plumbago may also be added.

Tetraethyl lead. WM. STANSFIELD CALCOTT, ALFRED EDWIN PARMELEE and FREDERICK REGINALD LORRIMAN. Fr. 638,103, July 22, 1927. See U. S. 1,664,021 (C. A. 22, 1677).

Emulsions of asphalt, etc. LA TRINIDAD. Fr. 636,207, Oct. 15, 1926. Asphalt, bitumen or tar, fluxed with residual oil from gasoline, is emulsified with 3 to 12% of ordinary soap to which 1 to 8% of com. olein has been added.

Carbonizing wood, etc. JEAN SIMON JACQUES SOULIÉ. Fr. 638,232, July 26, 1927. The wood, etc., is placed in a circular container around a circular furnace, and combustion gases pass from the furnace up through the wood while air is drawn up from the atm.

23—CELLULOSE AND PAPER

CARLETON E. CURRAN

Lignin and cellulose. VII. Remarks on the chemistry of lignin. KARL FREUDENBERG, MAX HARMER AND LAURA MARKERT, IN PART WITH MISS E. SPIESS. Univ. Heidelberg. *Ber.* 61B, 1760-5(1928); cf. *C. A.* 22, 3292.—The literature contains contradictory data on the results of fusing lignin with KOH; 20-30% yields of 3,4-(HO)₂C₆H₃CO₂H (I) are frequently reported. As the purification of the I, especially the removal of the (CO₂H)₂, is difficult and the colorimetric estimation readily leads into error, a series of expts. have been made in which the I was detd. spectrophotometrically in FeCl₃ and gravimetrically as veratric acid. Only about 5% I was found; allowing for unavoidable and detectable losses, it may be asserted that 9-10% I, together with traces of *o*-C₆H₄(OH)₂, are formed. The errors in the earlier investigations were due to the fact that the substance weighed or measured colorimetrically was never pure I. The corrected result indicates that at least 8% of the Willstätter lignin consists of the 3,4-(HO)₂C₆H₃C skeleton; whether the C₆H₅ nucleus is present as such or in a hydrogenated form (quinic acid) is not established by these expts. Eugenol under the same conditions gives a similar low yield of I, and the possibility must be reckoned with that the true content in *o*-C₆H₄(OH)₂ derivs. may be many times more than the 8% found. After many series of expts. with and without Zn dust or Fe powder, it was found that the best results are obtained by adding 7 g. of the lignin to 30 g. KOH and 7 g. H₂O at 100°, raising the temp. to 260° in the course of 45 min. and then to 270° in 15 min. and heating another 15-30 min. at 270°. It was recently found that lignin distd. with 12% HCl gives a little HCHO (0.7% as detd. with barbituric acid). Attempts to increase the yield, dimedon being used to measure the quantity formed, have not, thus far, given more than 1%, and it is still believed that the quantity really present is about 2%. Aliphatically bound HCHO, as in triformal mannitol, is at once split off on the 1st distn. while lignin must be distd. up to as many as 12 times (28% H₂SO₄ can be used instead of 12% HCl); piperonylic acid and narceine yield 60-70% of their HCHO (best with 43% H₂SO₄), narcotine not much more than 20%. From these results it is concluded that the HCHO in lignin is present as a CH₂O group bound to an *o*-C₆H₄(OH)₂ residue. Wood distd. under the same conditions gives HCHO in a yield corresponding to about 1/3 of the lignin; no appreciable quantities have been found in other than the lignin components of the wood. In connection with Kalb and Lieser's paper (*C. A.* 22, 2925) the present authors state that in their earlier expts. the preliminary removal of the wood constituents sol. in alkalis and easily hydrolyzed by acids before treatment with CuO-NH₃ was taken for granted. W. Dürr has now found that after boiling out the pentosans, etc., with 1% H₂SO₄, cellulose dissolves in CuO-NH₃ and yields very light lignins with 16% MeO. Especially advisable is repeated alternating treatment of the wood with hot 1% H₂SO₄ and CuO-NH₃; even 0.1% H₂SO₄ can be used. The compn. of such lignin preps. is about the same as that of the earlier preps. It would seem as if the union between the lignin and cellulose is dissolved by removal of the "wood gum," the pentosans and hemicellulose. A wood so treated and then methylated gives up considerable methyl cellulose to CHCl₃ or AcOH.

C. A. R.

Recent developments in nitrocellulose. J. B. WEISEL. *Chemicals* 30, 31-2(1928)

R. H.

Experiments in producing cellulose ethers and esters with special reference to cellulose nitroacetate. HENRY A. GARDNER AND CALVIN A. KNAUSS. *Am. Paint & Varnish Manufs. Assoc. Circ.* No. 388, 657-72(1928).—The use of cellulose nitrate and acetate in protective coatings is briefly reviewed. Besides these the authors have prepd. the borate, phosphate, formate, propionate, butyrate and benzoate of cellulose. These compds. were usually dark in color or lacking in certain other phys. properties for use in lacquers and are not of com. importance at present. The advantages of cellulose ethers are described, especially that of being sol. in C₆H₆ and homologs, and EtOH. Methods are given for the prepn. of cellulose nitroacetate which appears to have very desirable properties for use in lacquers. It is much less inflammable than the nitrate and films showed higher tensile strength than those made with either acetate or nitrate.

R. J. MOORE

Note on the cymoles formed in the sulfite pulping process. OSSIAN ASCHAN. *Finska Kemistsamfundels Medd.* 36, 123-5(1928).—SO₂ and sulfites at high temp. and pressure tend to split off H from terpenes like pinene and dipentene. The resulting

cymoles may consequently be related as position isomers and A. points out that this may explain some obscure problems in the substitution reactions of these cymoles.

HANS C. DUBUS

Preparation of rayon for weaving. L. A. PALINA. *Cotton* 92, 335-9, 435-40, 665-7, 909-11(1928).

RUBY K. WORTNER

Determining the coating on casein-coated paper. GUSTAVE A. STRICHT. *Chemist-Analyst* 17, No. 4, 7(1928).—The method depends upon weighing shredded paper, digesting it with dil. NH_4OH , passing the liquid through a 100-mesh screen, evapg. and weighing.

W. T. H.

Limestones of the Gaspé Peninsula [for use in the wood pulp industry] (Goudge) 8. Paper pulp from cane (U. S. pat. 1,688,904) 28. Waterproofing and coating paper (Brit. pat. 286,396) 18. Derivatives of starch, cellulose and other carbohydrates (Brit. pat. 286,331) 10.

Extraction of cellulose from vegetable substances. CARL ALFRED BRAUN. Fr. 638,011, July 4, 1927. Cellulose is extd. from vegetable substances by boiling under pressure with lyes contg. alkali sulfite, caustic alkali and alkali salts of resins, fatty acids, silicates, borates, aluminates or zincates, with a slight excess of alkali carbonate.

Cellulose from straw, cornstalks, etc. B. DORNER (to Euromerican Cellulose Products Corp.). Brit. 286,211, Feb. 28, 1927. Chopped and shredded material is sieved to sep. material which may serve as fodder for animals, sol. substances are leached out with water and the material is disintegrated and repeatedly cooked with NaOH solns. of increasing strength. Cf. C. A. 22, 4247.

Treating cellulose derivatives. CAMILLE DREYFUS. Fr. 636,272, June 20, 1927. To lower the viscosity of concd. cellulose ester solns., particularly cellulose acetate, they are treated with H_2O_2 in the presence of Fe or Fe salts. Ferrous salts, specially ferrous acetate, are preferred, and they may be added during esterification while the H_2O_2 is added after esterification.

Cellulose esters. I. G. FARBENIND. A.-G. Brit. 285,858, Feb. 23, 1927. Esters of cellulose or of its conversion products with butyric, propionic and other higher aliphatic acids are prepd. by reacting on the cellulosic material with a halogenated acetic acid anhydride and butyric acid or other acid corresponding to the ester to be formed in the presence of a catalyst such as monochloroacetic acid or H_2SO_4 . The esters first formed may be modified by hydrolyzing.

Films of cellulose esters and ethers. ARTHUR EICHENGRÜN (to Celanese Corp. of America). U. S. 1,688,457, Oct. 23. In forming thin films, a soln. of the cellulose deriv. is spread in a very thin layer upon a base comprising a cellulose deriv. other than that used for the production of the film (e. g., a soln. of alc.-sol. ethyl cellulose may be spread upon a base of cellulose acetate) to which has been added a substance (suitably glycerol or paraffin with a base of cellulose acetate) which diminishes the adhesiveness of the dried film formed on evapn. of the solvent even if the film be extremely thin. The soln. used for making the film contains no substance acting as a solvent for the base. The film may be formed, stripped and rolled as a continuous band.

Decorating surfaces with cellulose esters. M. SMITH. Brit. 286,006, Nov. 29, 1926. Tennis racket handles, elec. lamps or other articles to be decorated are overlaid with a yarn or fabric such as cellulose acetate which is then treated with a solvent such as EtOAc which at least partly dissolves the material applied and causes it to adhere to the surface. Various details and modifications are described.

Saccharification of cellulose. JOHN PERL (to M. M. Cory). U. S. 1,687,785, Oct. 16. Cellulosic material such as ground wood fiber is subjected, before saccharification by hydrolysis, to a pretreatment comprising neutralizing the natural bases and any alkali present in the material with H_2SO_4 . Cf. C. A. 22, 3300.

Treating soda-cellulose liquors. B. DORNER (to Euromerican Cellulose Products Corp.). Brit. 286,210. Waste liquors resulting from the soda process of making cellulose from "maize or other straw," wood, etc., are treated to obtain substances for use as animal foods or for fermentation to produce alc. by use of CO_2 or purified flue gases which are supplied to the liquor until it is no longer alk. to litmus followed by boiling to effect concn. and pptn. The liquor may be further treated with CO_2 after cooling to effect addnl. pptn.

Use of chromium-surfaced rollers or other implements in finishing films of cellulose nitrate or other cellulosic materials. KEVIN W. SCHWARTZ (to United Chromium, Inc.). U. S. 1,688,060, Oct. 16.

Cellulose formates. EGON ELÖD. Fr. 638,431, July 29, 1927. See Brit. 275,641 (C. A. 22, 2273).

Cellulose xanthate. PIERRE MORO. U. S. 1,689,958, Oct. 30. Alkali cellulose is compressed to obtain less than 300 parts for each 100 parts of cellulose, the material is reduced to very small particles and is mixed with a high-grade soln. of S in CS_2 while heating to 30–40°. An app. is described.

Cellulose for artificial silk. HERMANN SUIDA and HANS SADLER. Fr. 636,381, June 21, 1927. Cellulose is prep'd. for artificial silk manuf. by disintegrating beech wood by a mixt. of dil. HNO_3 , and H_2SO_4 , contg. 15–25% HNO_3 and less than 10% H_2SO_4 , at a temp. not above 85°, removing excess acid and treating with alk. lye.

Artificial silk. G. BONWIR. Brit. 285,863, Feb. 24, 1927. The process for prep'g. a "viscose silk" of reduced luster, described in Brit. 285,066 (C. A. 22, 4816), is applied to artificial silk made from other cellulose derivs. such as that from cellulose, cellulose hydrate, nitrate or acetate or cellulose ethers or mixed cellulose derivs. Added substances at least relatively immiscible with the soln. of the cellulose deriv. are used such as PhCl , xylene, hydrogenated naphthalenes or mineral oils of high b. p.

Artificial silk. SAHICHI OHSAKA. Fr. 636,396, June 21, 1927. To the spinning soln. of viscose, cellulose acetate, denitrated nitrocellulose, or copper-oxide-ammonia cellulose, etc., for artificial silk threads or films, is added a vegetable or animal protein and the fatty oils occurring naturally therewith. The resistance and elasticity of the thread are thereby increased.

Artificial silk. I. G. FARBEININD. A.-G. Fr. 638,181, July 23, 1927. An artificial silk which is uniformly wettable is made by acting on the artificial silk during its manuf., e. g., before spinning, with wetting agents, such as naphthalenesulfonic acid, or the sulfonic acids obtained by the action of chlorosulfonic acid on solar oil or solvent naphtha.

Artificial silk. SOCIÉTÉ CHIMIQUE DES USINES DU RHÔNE. Fr. 638,448, July 29, 1927. To obtain a mat surface on cellulose acetate silk, BaSO_4 is ppt'd. in the acetate after its formation by the addn. of H_2SO_4 and then BaCl_2 in dil. AcOH . The whole is ppt'd. by diln. and washed and treated as usual.

Artificial silk, etc. HENRY DREYFUS. U. S. 1,688,531, Oct. 23. Artificial filaments are dry spun from conc'd. solns. of cellulose derivs. such as cellulose acetate contg. not less than 25% of the cellulose deriv. U. S. 1,688,532 specifies the use of less than 15% (calcd. on the wt. of the cellulose deriv.) of a high b. p. liquid such as triacetin or diacetin which is not completely removed during the spinning operation.

Artificial silk from viscose. H. J. J. JANSSEN and HARBENS (Viscose Silk Manufacturers), Ltd. Brit. 285,958, Nov. 20, 1926. A soln. of salts or acids such as HCl , H_2SO_4 , HOAc and Na_2SO_3 is intimately mixed with the viscose as it passes to the spinning nozzles and the material may be heated and then spun into a coagulating bath of the usual compn. An app. is described. The yarn produced has a dull luster.

Viscose artificial silk. DEUTSCHE ZELLSTOFF TEXTILWERKE G.M.B.H. Fr. 636,264, June 20, 1927. Silk obtained by spinning viscose is submitted on a perforated bobbin to all the necessary baths for its final treatment, the baths being projected through the body of silk and the bobbin. In order to use Na_2S as desulfurizing agent bobbins of inoxidizable steel or of ceramic material or bobbins covered with rubber, gum lac, etc., are used.

Viscose artificial silk. DEUTSCHE ZELLSTOFF TEXTILWERKE G.M.B.H. Fr. 636,265, June 20, 1927. Silk obtained by spinning viscose is submitted on a perforated Al bobbin to all the necessary baths for its final treatment, the desulfurizing bath consisting of a warm dil. soln. of salts of feeble acids, having an alk. reaction, e. g., a soln. of Na_2SO_3 .

Apparatus for making "viscose silk." NAAMLÖÖZE VENNOOTSCHAP NEDERLANDSCHE KUNSTZIJDEFABRIEK. Brit. 285,890, Feb. 25, 1927. The thread is subjected to a gradually increasing tension during its passage from the spinning nozzle to the winding device. A normal viscose is used and it is spun into a normal spinning bath at a temp. above 18°.

Apparatus for producing artificial silk. K. HAGIWARA. Brit. 286,086, March 1, 1927. To assist the passage of the filament-forming soln. through spinning nozzles or through a filtering surface, an electrode is placed in the soln. in advance of the nozzle or filtering surface and a second electrode is placed in the coagulating bath or in contact with the winding bobbin or behind the filtering surface, to assist in the desired migration of the material to be spun. With viscose, gases produced during the spinning operation are decomp'd. and rendered innocuous by the elec. discharge.

Apparatus for making artificial silk and winding it under regulated tension. I. G. FARBEININD. A.-G. Brit. 286,292, March 4, 1927.

Metallic bobbin for artificial silk. ÉTABLISSEMENTS J. CHUIT. Fr. 32,841, July 20, 1926. Addn. to 629,455. The body of the bobbin is in 2 pieces obtained by stamping.

Bobbins for artificial silk. THE MANHATTAN RUBBER MANUFACTURING COMPANY. Fr. 636,553, June 24, 1927. The bobbins are made hollow with a large no. of perforations, the interior and exterior being entirely covered with a thin layer of rubber vulcanized to a degree between softness and extreme hardness.

Artificial silk from cuprammonium cellulose solutions. HERMANN SCHMIDT and EMIL HUBERT (to I. G. Farbenind. A.-G.). U. S. 1,689,895, Oct. 30. The soln. is spun into an aq. pptg. bath contg. dissolved CO_2 which serves to give the product improved elasticity and tensile strength. Cf. C. A. 22, 2840.

Artificial filaments. RUDOLF SAJITZ and FRIEDRICH POSPIECH (to Chemische Fabrik Pott & Co.). U. S. 1,689,894, Oct. 30. The spinning qualities of solns. such as those of cellulose acetate, viscose or cellulose are improving by treating the solns. with pptg. agents such as H_2SO_4 and Na_2SO_4 soln. in the presence of Na β -isopropyl-naphthalenedisulfonate or other suitable naphthalenesulfonic compds. contg. substituted alkyl radicals and several sulfo substitution groups in the ring.

Kraft pulp. GEORGE A. RICHTER (to Brown Co.). U. S. 1,689,534, Oct. 30. Wood chips or other raw cellulosic material is digested in a liquor contg. Na sulfide, the pulp is sepd. from the spent liquor and the latter is concd. and evapd. and its inorg. content is smelted, and substantially all the Na and S values are recovered in the form of sublimed solids and SO_2 which are formed in the smelting and are absorbed in alk. aq. liquor, for further recovery in the smelting.

Beater for paper pulp. LEONARD E. RANDECKER (to Hammermill Paper Co.). U. S. 1,689,932, Oct. 30.

Caustic alkali from "black liquor" of paper pulp manufacture. W. BARRS and E. BARRS. Brit. 285,933, Oct. 18, 1926. The liquor is concd. by direct contact with hot gases such as hot waste flue gases used in incinerating the alkali or air heated by them. Ash derived by burning the concd. liquor is lixiviated with weak alk. liquors and the Na_2CO_3 thus obtained is treated with an aq. soln. of spent lime. An app. and various details of operation are described.

Beating "engine" for paper pulp. J. WHITE. Brit. 286,461, March 9, 1927.

Rotary refiner for paper stock or pulp. EDMUND P. ARPIN, JR. U. S. 1,689,190, Oct. 30.

Paper-making apparatus. ROBERT E. READ (to International Paper Co.). U. S. 1,687,847, Oct. 16.

Apparatus for making paper, cardboard or pasteboard. OTTO LEONHARDT. U. S. 1,689,553, Oct. 30.

Suction apparatus for paper-making apparatus. MAX WENZEL. U. S. 1,688,216, Oct. 16.

Stock-regulating apparatus for paper-making machines. JOHN R. SPOOR. U. S. 1,689,755, Oct. 30.

Apparatus for calendering paper. A. L. DAWE. Brit. 286,020, Dec. 8, 1926.

System of marking "safety paper" with substances which will disclose use of ink "eradicators." BURGESS W. SMITH (to Todd Co.). U. S. 1,689,302, Oct. 30.

Multi-ply fiber board. FREDERICK P. WOOD (to Simplex Paper Corp.). U. S. 1,689,812, Oct. 30. Outer plies are united with an intermediate ply which has been treated with water to expand the fibers and with a deliquescent substance such as glycerol serving to fix the fibers in expanded condition. A soap soln. also may be used.

Fire-resisting fiber board. CHARLES A. UPSON (one-half to W. Harrison Upson). U. S. 1,687,599, Oct. 16. Webs of vegetable fiber pulp of relatively high tensile strength and of mineral fiber pulp of lower tensile strength are united immediately after their formation and while satd. to form a composite board, the fibers of which are interlaced with each other.

24—EXPLOSIVES AND EXPLOSIONS

CHARLES E. MUNROE

Blasting explosives. B. A. GILLIE. *J. Chem. Education* 5, 1213-23(1928).—A view. E. H.

The Safety in Mines Research Laboratories, Sheffield: a description. ANON. Safety Mines Research Board (London), *Paper No. 44*, 3-19(1928). E. H.

Glycerol and its substitutes [in dynamite industry] (DARKE, LEWIS) 27.

Explosives for blasting. RALPH A. LONG (to Atlas Powder Co.). U. S. 1,689,674, Oct. 30. Explosives are formed contg. nitroglycerin up to 8%, NH_4NO_3 , trinitrotoluene and a non-explosive combustible material such as ground wood. The nitroglycerin and trinitrotoluene together constitute a sensitizer not in excess of 12% of the compn. and the quantity of nitroglycerin is greater than that of the trinitrotoluene.

Cartridge wad composition. S. C. BOND (to Bond Mfg. Corp.). Brit. 286,238, March 1, 1927. Wads are made from cork powder impregnated with a larger quantity of a binder formed of paraffin or wax 2 and asphalt 8 parts.

25—DYES AND TEXTILE CHEMISTRY

L. A. OLNEY

A history of dyestuffs. II. ALBERT P. SACHS. *Textile Colorist* 50, 244-6(1928); cf. C. A. 22, 2059. RUBY K. WORNER

The Durand and Huguenin plant at Basle. CHAS. F. MULLIN. *Clemson Coll. Am. Dyestuff Rept.* 17, 671(1928).—A description of the work at this plant, especially with reference to the Indigosols, is given. L. W. RIGGS

Light shades on silk. JAMES STAPLE. *Textile Colorist* 50, 180-1(1928).—Bleaching and drying with the basic dyestuffs. CHAS. F. MULLIN

Extracts of osage orange and "yellow wood." GABRIEL DESMURS. *J. Intern. Soc. Leather Trades Chem.* 12, 424-9(1928).—Osage orange ext. ("aurantine") was compared as to tinctorial properties with yellow wood ext. ("Cuba ext."). The former may often be used in place of the latter, but differences in the shades produced with different mordants require that the substitution be done with caution. Tests for distinguishing aurantine from Cuba ext. are described. On unmordanted wool the aurantine gives colors more yellow and less orange than does Cuba ext. With variously mordanted wools the colors produced are as follows: (A = aurantine, C = Cuba ext.): Sn salts—dull golden yellow (C), bright golden yellow (A); Al salts—brownish yellow (C), dull yellow (A); Sn and Al salts—orange yellow (C), golden yellow (A). On cotton mordanted with 1% $\text{UO}_2(\text{NO}_3)_2$ aurantine gives a yellow-orange and Cuba ext. a red-orange shade. H. B. MERRILL

The A B C of dyeing. NOEL D. WHITE. *Cotton* 91, 835-7, 943-5, 1049-51, 1147-9, 1299-300; 92, 75-9, 187-9(1927); 92, 306-10, 407, 410, 513, 515, 629-30, 761-3(1928).—A series of practical articles based chiefly on personal experience. The following subjects are discussed: Boil-off and dyeing in 1 and 2 baths and the use of CH_3COOH in dyeing and finishing hosiery; matching a sample in the lab. and adaptation of the formula in the dyehouse; repairing damaged shades from known and unknown causes; uneven dyeing and spotted work, causes, prevention and remedies; difficulties in matching colors in and out of the dyehouse; importance of light, location of the dyehouse, and knowledge of the properties of dyestuffs; stripping and redyeing, occasion, stripping agents and procedure; bleaching with KMnO_4 , H_2O_2 and Na_2O_2 ; bleaching with Cl; experiences using chloride of lime and soda ash on cotton. RUBY K. WORNER

Practical hints in the production of bright colors on textile fabrics. XXXIX. RAFFAELE SANSONE. *Am. Dyestuff Rept.* 17, 561-4, 578, 592-4, 629-30, 639-40(1928); cf. C. A. 22, 3780.—Rotary drum drying by circulating hot air in place of steam is described. Details are given for the prepn. of color pastes. Methods of producing color contrast effects are described. Ombre effects in 2 colors and in 3 or more colors are considered. L. W. RIGGS

Effect of light on colored fabric. II. EVA HIBBERT. *J. Soc. Dyers Colourists* 44, 300-1(1928); cf. C. A. 21, 4075.—When placed in aq. solns of isatin, cotton showed no affinity, silk a little and wool considerable affinity for the dye. The wool and silk were colored a dull yellow and cellulose acetate silk a golden yellow. When cotton dyed with indigo had slightly faded the isatin extd. from it dyed cellulose acetate silk yellow. The action of ordinary light on cotton dyed with *o*-toluene-azo-*o*-naphthol caused a fading of the orange color at a slow rate, but when exposed to the light of a quartz-Hg vapor lamp, crystals formed on the surface of the cloth within 3 min. The crystals appeared to be a phys. modification of the dye which could be restored to the original form by soln. in CHCl_3 and evapg. L. W. RIGGS

Palatine-fast colors in wood dyeing. CHARLES GEORGE. *Textile J. Australia* 3, 283-4(1928).—Properties and application are discussed. CHAS. F. MULLIN

Preparatory processes influencing dyeing. L. L. LAOYD. *Wool Record* 34, 917 (1928).—General, dealing with the effect of scouring, moisture content in the spinning and weaving processes, assisting agents and mildew on the dyeing properties of animal fibers. To prevent mildew, wool stock should be scoured and chromed before storing.

RUBY K. WORNER

Vat dyeing piece goods. ORMOND W. CLARK. *Am. Dyestuff Rept.* 17, 617–22 (1928).—The 3 fundamental methods of vat dyeing piece goods are jig dyeing, padding with reduced vat dyestuff, and padding with unreduced vat dyestuff with a subsequent passage of the cloth through a reducing process. These processes are described in detail.

L. W. RIGGS

Capillarity in connection with dyeing. RICHARD CAMERON. *Textile Colorist* 50, 183–4 (1928).—The importance of capillarity in connection with the penetration and level dyeing properties of dyestuffs is pointed out.

CHAS. E. MULLIN

Dyeing of mixed fibers and fabrics. WM. BENNETT. *Silk J.* 4, No. 44, 60 (1928); cf. *C. A.* 22, 872.—Resist effects on cotton-celane goods with S dyestuffs are described.

CHAS. E. MULLIN

Treatment and dyeing of natural silk and viscose mixtures. WM. BENNETT. *Silk J.* 4, No. 45, 51 (1928).—A general discussion with suggestions.

C. E. M.

Capillarity test and the dyeing of rayon. ALAN A. CLAFLIN. *Am. Dyestuff Rept.* 17, 650, 677 (1928).—The test, as given by Whittaker in his book on textile dyeing, is checked and discussed. The capillary crawl of dyestuffs is retarded by raising the p_H of the dye bath, and it is not a function of the surface tension of the soln. It appears to be a phenomenon of soly. and is equalized by the addn. of glycerol to the dye bath.

L. W. RIGGS

Rayon dyeing precautions. A. E. HANSON. *Rayon J.* 3, No. 1, 26–9, 44–5 (1928).—Monel metal is suggested. When stripping with Ti compds. it is necessary to use a short bath in order to avoid discoloration of the monel metal.

CHAS. E. MULLIN

Dyeing furs with ursols. E. HANSEN. *Textile Colorist* 50, 162–4 (1928).—Methods and formulas are given.

CHAS. E. MULLIN

The absorption of leuco dyes by cellulose. KURT BRASS AND GUSTAV TORINUS. *Kolloid Z.* 45, 256–66 (1928).—When viscose is treated with indigo in the presence of CaO in a Zn-lime vat both are absorbed but not in equiv. proportions. Shaking the material increases the absorption of indigo greatly but only slightly that of CaO. The latter is absorbed reversibly and is not influenced by the presence of indigo. The distribution coeff. is independent of the alkali content in the hyposulfite vat. The nature of the dyes does not influence the distribution of $\text{Ca}(\text{OH})_2$ between cellulose and vat soln. Dyes studied were: thioindigo, algol yellow, helidone yellow, indanthrenes orange, red golden orange, blue and yellow. The variation in distribution coeff. is closely related to the chem. constitution and is most pronounced in complex condensed cyclic group dyes such as indanthrene and flavanthrene. It is not certain that chem. combination occurs between cellulose and leuco dye.

R. H. LAMBERT

Jute bleaching and dyeing. FRED. GROVE-PALMER. *Dyer, Calico Printer* 60, 124–5, 140–1 (1928).—Methods are described for bleaching jute with hypochlorite, peroxide and permanganate. Practically all classes of dyes can be used without difficulty. Lists of basic, acid, direct and S dyes especially suited, and suggestions with regard to precautions and variations from the ordinary cotton process are given. A general discussion of the growing of jute, its uses, retting and chem. compn. is included.

RUBY K. WORNER

Peroxides for textile bleaching. Their past, present and probable future. H. G. SMOLENS. *Am. Dyestuff Rept.* 17, 672–4, 678 (1928).—Bleaching with Cl and with peroxides are compared especially with reference to the recently developed electrolytic 100 vol. H_2O_2 soln. Although the chem. cost of peroxide is higher than that of Cl, the use of the 100 vol. peroxide is easier, safer and healthier to apply to cotton as compared with any form of Cl. Also, the 100 vol. peroxide bleach is followed by less shrinkage and less loss of wt. Its advantages tend to overcome the greater chem. cost. The Na_2O_2 bleach is not recommended.

L. W. RIGGS

Textile research—its aims and application in industry. J. H. LESTER. *Wool Record* 33, 458–61 (1928).

RUBY K. WORNER

The American Association of Textile Chemists and Colorists. E. H. KILLHEFFER. *Proc. Am. Assoc. Textile Chem. Colorists* 1928, 243–5; *Am. Dyestuff Rept.* 17, 663–5.—An address on the objects, scope and accomplishments of the Assoc., with suggestions for future work, was given by the President.

L. W. RIGGS

The spectroscope in the textile industry. RICHARD CAMERON. *Textile Colorist* 50, 182–3 (1928).—The spectroscope may be used to detect traces of impurities too

small to be detected by the usual chem. tests, for qual. tests for mordants, to trace the source of fabric samples (from traces of elements present), etc. CHAS. E. MULLIN

Single texture proofing. E. P. RYDINGS. *Trans. Inst. Rubber Industry* 4, 161-9 (1928).—A review and discussion of the methods of manuf., including the general process, wet and dry mixing, spreading, chalking, cold curing, sweetening and the influence of the quality of fabric. A general discussion follows the paper. C. C. DAVIS

Paints and their uses in the textile industry. J. J. GLICK. *Textile Colorist* 50, 693-5(1928).—The surfaces to which paints and varnishes are applied and the selection and application of the different types of finishes are considered. RUBY K. WORNER

The testing of yarns for count. H. MALDWYN WILLIAMS. *Wool Record* 33, 516-9 (1928).—A discussion of the limitations of the methods for accurate results. The measurement of a definite length of yarn is affected chiefly by the tension and also by the twist. Methods are described for the detn. of yarn no. for short lengths, as in pattern analysis and for longer lengths when several yards of material are available. RUBY K. WORNER

Recent and coming developments in machines for testing fibers, yarns and fabrics. DAVID C. SCOTT. Henry L. Scott Co., Providence, R. I. *Textile World* 74, 2623-7 (1928).—Tensile strength testing machines designed for tire cord, rubber and wire are described and their possible application to textile investigations is discussed. A new cord testing machine has a double capacity head and a recorder so arranged as to magnify the chart line in the stretch direction. A rubber testing machine has a compensating device for variations in thickness, so that the results are obtained as of one standard dimension. A machine with a compensating device for moisture variations is about to be marketed. The "flexing machine" developed by the U. S. Rubber Co. is described and is recommended for studying the effect of weave of fabric. RUBY K. WORNER

The distribution of twist. Its effect upon testing methods. H. MALDWYN WILLIAMS. *Wool Record* 33, 706-9(1928).—The degree of twist in any yarn is governed by the length of the fiber, the diam. of the thread, and the purpose for which the yarn is intended. Small lengths, however, show great variation. Although the variation of twist is largely conditioned by the spinning process, a rubbing action by the guides in many other processes, particularly those of winding, will cause an irregular distribution of twist. Methods of measuring twist are described. RUBY K. WORNER

Some recent advances in the control of plain, Chase and Schreiner calenders. JAMES A. CAMPBELL. *Textile World* 74, 2499-501(1928).—The principles, design and methods of operating the machines and their production at the present time are compared with those in 1910. The survey shows that the fundamental principles are the same, but there is a definite advance in design; that calendering is a science, not an "art," that facts are being substituted for beliefs; that continuous processes are replacing intermittent ones; and that scientific control makes possible definite schedules, increased wages, and decreased cost of production. RUBY K. WORNER

A new reagent for the detection of oxycellulose. W. F. A. ERMEN. *J. Soc. Dyers Colourists* 44, 303-5(1928).—Soln. (A) contains $\text{Fe}_2(\text{SO}_4)_3$ 20 g., $(\text{NH}_4)_2\text{SO}_4$ 25 g. and H_2O up to 100 cc. Soln. (B) contains $\text{K}_3\text{Fe}(\text{CN})_6$ 33 g. in H_2O up to 100 cc. These solns. are quite stable in the dark. To perform the test, add 5 cc. of each soln. (A) and (B) to 250 cc. of water, bring to the boil, remove the flame and immerse the cotton to be examd. for 1 min. Remove the sample and rinse, first in dil. H_2SO_4 and then in water. Any oxycellulose present will be stained a deep blue. All bleached cotton appears to react to a slight extent with this reagent, so that the ground is never quite white. The coloring matter of unbleached cotton also exerts a certain amt. of reduction on the ferric ferriyanide and raw cotton is consequently tinted a much deeper shade than well-bleached cotton, but not enough to destroy the value of the test. This reagent stains wood pulp or papers a dark blue, while pure cotton or linen papers are almost unaffected. Tannins should be fixed or removed before applying the test. L. W. RIGGS

Natural impurities in wool. "TEX." *Wool Record* 33, 575, 590(1928).—Modern methods of treatment are reviewed. RUBY K. WORNER

The practice and science of wool scouring. JOHN R. HIND. *Wool Record* 34, 921-5, 987, 993(1928).—A general article on wool scouring, dealing with the kinds of impurities to be removed, the mech. operations involved and the compn. of the scouring solns. RUBY K. WORNER

Wool drying on an entirely new principle. ANON. *Textile J. Australia* 2, 664-6(1928).—Describing the "Turblex" conveyor type of drying tunnel for wool. CHAS. E. MULLIN

Leonils in the wool industry. CHARLES GEORGE. *Textile J. Australia* 3, 254-6

(1928).—The uses of Leonil LE, S, SB and SBS in washing slubbing and piece goods, in milling and carbonizing, and in prepreg. softeners are discussed. C. E. M.

Greasy wool to yarn. WILMAB. *Textile J. Australia* 3, 205-6(1928).—Wool scouring in Australia is described. CHAS. E. MULLIN

Paint-free noils and wool. CHAS. E. MULLIN. *Textile J. Australia* 3, 14-6 (1928).—Discussing the origin and removal of paint, tar and pitch from wool and noils, and the uses and advantages of "defect-free" stocks. CHAS. E. MULLIN

Action of the alkalis upon wool. CHAS. E. MULLIN. *Am. Dyestuff Rept.* 17, 109-14, 209-14, 228, 345-8(1928).—A review and discussion of the action of various alkalis on the wool fiber. L. W. RIGGS

The valuation of protective agents. H. BLACKSHAW. *J. Soc. Dyers Colourists* 44, 297-300 (1928).—The term protective agent is generally used to define those products which protect animal fibers against the action of alkali. The most important application of such agents is in the protection of wool when dyeing with vat colors by means of the caustic soda hyposulfite vat. Sulfite cellulose liquors, synthetic tannins and formaldehyde-urea compds. are claimed to possess this protective property (cf. Edge, C. A. 16, 3213). Directions are given for making tests of protective agents, the results being checked by detns. of tensile strength, elasticity of the fiber and its microscopical appearance. Since wool treated with alkali has a greatly increased affinity for acid dyestuffs, its readiness to stain with Acid Scarlet 4R Extra (B. D. C.) affords a qual. indication of alkali treatment. L. W. RIGGS

The processing of Schappe. FRED GROVE-PALMER. *Am. Dyestuff Rept.* 17, 623-6(1928).—Schappe or "spun silk" is obtained from imperfect cocoons from which on account of some damage, the fiber cannot be reeled in a continuous thread. The work of collecting, degumming and washing Schappe is described. L. W. RIGGS

Advances in reclaiming tin from silk weighting washings. GIBSON BUTTFIELD. *Chem. Met. Eng.* 35, 607(1928).—In the customary processes for recovering Sn from silk weighted by the SnCl_4 method, the Sn losses have been as high as 16 to 75 mg. of Sn/l. of wash water, in addn. to other losses. By the Buttfeld process the Sn-bearing soln. leaving the washing machines is neutralized by automatic and continuous addn. of $\text{Ca}(\text{OH})_2$ slurry, and the solids are then settled in a Dorr thickener. The sludge is pumped to an overhead storage tank, flows thence by gravity to a spray drier where it is dried instantaneously, and then is delivered to bags or barrels. Sn losses have been reduced to approx. 4 mg./l. of wash water, drying cost is reduced 50%, and total operating costs to about $\frac{1}{3}$ of the original. W. C. EBAUGH

Artificial silk hat fibers. JAMES SCOTT. *Silk J.* 4, No. 45, 57-9(1928).—A discussion of the microscopic characteristics of visca and monofil of the Courtaulds Company. CHAS. E. MULLIN

Fine cupra-ammonium filaments. FRED GROVE-PALMER. *Rayon J.* 3, No. 1, 16-7 (1928).—A general description of the development of fine filaments. C. E. M.

Delustering rayon. CHAS. E. MULLIN AND ROSS M. STRIBLING. *Textile Colorist* 50, 377-80(1928).—The various methods of delustering, such as in the process of manuf., by pptn. in the fiber, and by alteration of the fiber surface, are discussed and the literature is reviewed. CHAS. E. MULLIN

Better sizing of rayon warps is done with new equipment and materials. HERBERT C. ROBERTS. *Textile World* 74, 1973-5(1928).—General, dealing with the materials used for sizing rayon and with the methods of application. RUBY K. WORNER

The rayon spinning process. KEMPF. *Rayon J.* 3, No. 1, 20-24(1928); cf. C. A. 22, 1690.—A discussion of the micelle structure of rayon. CHAS. E. MULLIN

Making rayon yarn hollow for stockings. FRED GROVE-PALMER. *Textile Colorist* 50, 666-7(1928).—The new hollow yarn, "Celta," is lighter in weight and has greater covering power than ordinary rayon. It resembles wool in softness, as well as possessing a comparable feeling of warmth and comfort. It is a French product, but is also being made in England. RUBY K. WORNER

Mercerizing from the gray. THOMAS F. HUGHES. *Textile Colorist* 50, 682-3 (1928); cf. C. A. 22, 1856.—A procedure is described for removing the extraneous matter and leaving the cotton piece goods in a good absorbent state to receive the mercerizing from the gray. RUBY K. WORNER

Mercerization of cotton with sulfuric acid. W. B. SELLARS AND F. C. VILBRANDT. *Am. Dyestuff Rept.* 17, 645-9, 685-95(1928).—The theory and the practice of mercerization are reviewed with more than 40 references to the literature. Concns. of H_2SO_4 below 60% cannot be used for obtaining an improved luster in cotton yarn. A mercerized product may be obtained by using concns. of 60 to 65% H_2SO_4 if tension is applied during immersion in the acid; no improvement results without tension. The

acid concn. should be kept const. to obtain uniform results. 'Concns. above 65% show less mercerization than 60 to 65%; concns. above 70% immediately attack and dissolve the cotton. The time of immersion in the acid should be from 0.5 to 2 min. Longer periods of immersion give a harsh feeling or a parchimentized product. Temps. of 0° to 30° can be used to secure improved luster. Temps. above 30° tend to weaken the cotton and decrease its luster. It is possible that temps. of -10° to -20° would give even better results. In this study the max. effect was obtained at 0° to 20°. Tensile strength and extensibility were increased only with concns. of 62.5 to 65% of H₂SO₄. Lower concns. affect the strength only slightly at ordinary temps.; at higher concns. the cotton is much weakened. Concns. of 60 to 70% H₂SO₄ increase the affinity of cotton for direct dyes. It should be possible to increase both affinity for dyes and strength by using temps. below 0° with these concns. of acid. Increase of strength and dye affinity result either with or without tension, but use of tension gives a slightly stronger product. The affinity of the dye is independent of the use of tension in the mercerization. With concns. of 60 to 70% H₂SO₄ and without tension, a shrinkage in length occurs which increases rapidly with increasing time of immersion. If treated with tension an increase of about 4% results, as compared with 30% shrinkage without tension. H₂SO₄ of 62.5% concn. shows a max. activity with cotton, affecting all its properties more at this concn. than at any other. L. W. RIGGS

Preparation for and bleaching of cotton piece goods. JAMES FITZGERALD. *Textile Colorist* 50, 685-7(1928).—A description of the procedures for singeing, steeping, boiling-off and bleaching. Recipes are given for kier liquors. RUBY K. WORNER

Novel method of increasing the affinity of cotton and other fibers for coloring matters. G. E. HOLDEN. *J. Soc. Dyers Colourists* 44, 305-7(1928); cf. C. A. 21, 2803.—The application of gelatin for increasing the affinity of cotton and other fibers for coloring material consists in immersing or padding the fiber with a hot 5 to 20% aq. soln. of gelatin, steaming for 1 hr. at 5 lbs. pressure and washing. The effects of the gelatin treatment in particular cases are described. L. W. RIGGS

Influence of heat on the affinity of cotton for dyestuffs. C. K. PATEL. *J. Soc. Dyers Colourists* 44, 301-3(1928); cf. Knecht and Muller, C. A. 19, 1315.—Cotton on heating at 150° for a long time or at higher temps. for a short time possesses a lower affinity for dyestuffs of the direct and basic classes. Tests with the direct colors Chlorazol Sky Blue FF and Benzopurpurine 4B indicated that the loss of affinity for the dyestuffs was progressive. The longer the time of heating, the less the affinity of the cotton for dyestuffs. With the basic dyestuff Methylene Blue, the loss of affinity of cotton for the color on heating was very marked up to a certain stage of time and temp., after which the effect was comparatively small. L. W. RIGGS

Finishing mohair plush. W. KEGEL. *Wollen und Leinen Industrie; Wool Record* 34, 919(1928); cf. C. A. 22, 4830.—Descriptive. RUBY K. WORNER

Rubber-proofing of fabrics. A. M. MUNRO. *Textile J. Australia* 3, 96-8, 162-4(1928).—Materials and processes are discussed. CHAS. E. MULLIN

A machine for laboratory washing tests. WM. D. APPEL, WM. C. SMITH AND HUGH CHRISTISON. Bureau of Standards and Arlington Mills. *Am. Dyestuff Rept.* 17, 679-83(1928).—The authors present the following abstract: Coöperative work by the Am. Assoc. Textile Chem. Colorists and the Bureau of Standards has resulted in a practical machine for testing the fastness to washing of dyed textiles. With it one man may test up to 20 samples simultaneously and in a brief run obtain results similar to those obtained in com. laundry practice. It is also suitable for testing detergents, for dry-cleaning tests and for lab. dyeing. The machine is described and general specifications for it and for a standard washing procedure are given. The machine is being manufactured and may be obtained through the Assoc. L. W. RIGGS

Damage caused by mildew. Effects of temperature and moisture. FOSTER PICKLES. *Wool Record* 33, 1085-7(1928).—Instances of stain and defects in yarn and cloth traced to mildew are cited. These observations and further expts. indicate that mildew is a result of a combination of conditions of air, warmth and moisture. To prevent its development, material should be stored unconditioned in a fairly dry atm. Yarn to be exported should be shipped unconditioned in as dry a state as possible and with a frank understanding between buyer and seller. RUBY K. WORNER

Dyes from *Pistachio* trees (MELL) 29. Examination of oleins by thiocyanate (KAUFMANN) 27. Soaps in modern textile processing (DANN) 27. A diphenylpyridyl-methane dyestuff (PLAZEK, SUCHARDA) 10. Waterproofing and coating fabrics (Brit. 286,396) 18.

Dye. CARL METTLER (to J. R. Geigy A.-G.). U. S. 1,689,739, Oct. 30. A mordant dye is made by diazotizing aniline-methylene-*o*-cresotinic acid and coupling with 1(2-chloro-5-sulphophenyl)-3-methyl-5-pyrazolone, which in the form of its Na salt is a yellow powder easily sol. in hot water and which dyes wool from an HOAc bath greenish yellow tints which by chroming change more to yellow. Similar dyes also may be formed from closely related starting materials.

Dyes. CARL METTLER (to J. R. Geigy A.-G.). U. S. 1,689,740, Oct. 30. A mordant dyes is made by diazotizing *o*-toluidine-methylene-*o*-cresotinic acid and coupling with 1-naphthol-3, 6-disulfonic acid, which produces red tints on wool from an HOAc bath and also gives red tints when printed on cotton with a Cr salt. Similar dyes are obtained from other similar starting materials.

Dyes. R. F. THOMSON, J. THOMAS and SCOTTISH DYES, LTD. Brit. 286,323, Sept. 24, 1926. The halogenated dibenzanthrones prep'd. as described in Brit. 278,834 (C. A. 22, 2845) and halogenated to at least the dichloro stage are condensed with glycols. Dyes are thus formed which dye cotton blue or reddish blue shades from the vat.

Dyes. I. G. FARBENIND. A.-G. Brit. 286,005, Nov. 27, 1926. Indophenols are made by the simultaneous oxidation of 2,3-dihydroindole or a substitution deriv. and *p*-aminophenol or by condensing the former with quinone chlorimide or with *p*-nitrosophenol. Several examples are given. Sulfuretted dyes are made by subjecting the indophenols or leuco-indophenols, thus obtained, to polysulfide fusion.

Dyes. I. G. FARBENIND. A.-G. Brit. 286,226, Feb. 28, 1927. Disazo dyes yielding fast yellow shades on cotton, "viscose silk" or "cuprammonia silk" are made by coupling a sulfonic acid of tetrazotized 4, 4'-diaminodiphenylurea or a deriv. with a sulfonic acid of an acetoacetic arylide and sulfonating the product by treating with phosgene a sulfonic acid of a *p*-aminosulphophenyl-azo-acetoacetic arylide. Several examples are given.

Dyes. I. G. FARBENIND. A.-G. Brit. 286,359, Dec. 1, 1926. Indigoid dyes are made by condensing 8-halogen-1,2-naphthhisatins, which may contain further substituents such as Cl, Br or NO₂, or their α -derivs., with the usual indigoid dye components such as hydroxythionaphthene, oxindole, indoxyl, acenaphthene, α -anthrol, α -hydroxyanthranol, α -naphthol or carbazole. The products, which may be further halogenated, dye from the vat in blue-gray, violet, olive and other shades. Several examples are given.

Dyes. I. G. FARBENIND. A. G. Fr. 638,138, July 22, 1927. Yellow shades are produced on esters or ethers of cellulose, by dyeing the fibers with mono-sulfonated arylazodiarylamines, contg. at least 1 nitro group in the diarylamine complex. Examples of dyes are 4-benzeneazo-2',6'-dinitro-4'-sulfodiphenylamine and 4-benzeneazo-4'-nitro-2'-sulfodiphenylamine.

Dyes. I. G. FARBENIND. A.-G. Fr. 638,190, July 25, 1927. New vat dyes of the anthraquinone series which contain one or more oxazolic groups substituted in the μ C by an anthraquinone group are prep'd. by heating *o*-aminohydroxyanthraquinones in the presence or absence of solvents with anthraquinone-aldehydes or substances capable of yielding them during the reaction, or other anthraquinone derivs. having aldehyde character, or by condensing by heating the anthraquinonecarbonylaminoanthraquinones negatively substituted or contg. an OH group *o*- to the amino group. In examples, (1) 2, 3-aminohydroxyanthraquinone is heated to 250° with anthraquinone-2-aldehyde. The product dyes cotton clear yellow from the vat. (2) 3-Aminoalizarin is boiled with 1-aminoanthraquinone-2-aldehyde in PhNO₂. The product dyes cotton a full red. Several other examples are given.

Azo dyes. I. G. FARBENIND. A.-G. Brit. 286,227, Feb. 28, 1927. Disazo dyes are made by diazotizing an aminoazo dye derived from an arylene diamine carboxylic acid and coupling with a component, and trisazo dyes are made by tetrazotizing a di-aminoazo dye and coupling with a component; the coupling is preferably effected in the presence of a tertiary base, and the dyes formed may be aftertreated with metallic salts in substance or on the fiber. Those contg. free NH₂ groups may be diazotized and coupled on the fiber. Several examples are given of the production of dyes giving black, violet and blue shades, and of aftertreatment with Cu and Cr salts.

Azo dyes. I. G. FARBENIND. A.-G. Brit. 286,274, March 2, 1927. Monoazo dyes giving blue to violet shades are obtained by coupling a diazotized 4-amino-diphenylamine contg. one or more alkyl, alkyloxy or halogen groups with an arylide of 2,3-hydroxynaphthoic acid. Several examples are given, and the dye may be formed on the fiber.

Azo dyes. I. G. FARBENIND. A.-G. Brit. 285,812, Feb. 21, 1927. Disazo dyes are made either by coupling 1 mol. of a tetrazotized diamine contg. carboxyl groups in

o-position to the amino groups (e. g., tetrazotized 4,4'-diaminodiphenylurea-3,3'-dicarboxylic acid) with 2 mols. of acetoacet-*o*-chloranilidesulfonic acid or other suitable acetacetarylidesulfonic acid, or by coupling 1 mol. of a diazotized amine contg. a carboxyl group in *o*-position to the amino group with 1 mol. of an acetoacetarylidesulfonic acid and converting the resulting monoazo dye into a disazo dye, e. g., by treatment with phosgene, thiophosgene or CS₂. The products dye cotton or "viscose silk" clear yellow, orange and brown shades fast to light and may be aftertreated with metallic salts. Several examples are given.

Azo dyes. I. G. FARBENIND. A.-G. Fr. 638,408, July 28, 1927. Any diazo

compd. is coupled with aminonaphthols of the formula HO-R-N⁺-YX, in which Y represents a carboxylic acid ester, R a naphthalene ring substituted or not, X a H atom or alkyl, aryl or aralkyl group. In examples, the compd. obtained by the action of chloroformic ethyl ester on Na 2-amino-8-naphthol-6-sulfonate is coupled with diazotized *p*-aminomethylacetanilide, and the compd. obtained by the action of chloroformic ethyl ester on Na 1-amino-8-naphthol-3,6-disulfonate is coupled with *m*-xylydine, giving a dye which dyes wool reddish blue fast to light. The products may be used to manuf. dis- and poly-azo dyes.

Azo dyes. I. G. FARBENIND. A.-G. Fr. 32,804, Nov. 19, 1926. Addn. to 606,519.

Azo dyes are prepd. from coupling components, one or both of which contain one or more carboxylic acid ester groups, not including as coupling components esters of pyrazolonesulfocarboxylic acid or the prepn. of dyes starting with esters of 4-nitro-2-diazobenzoic acid and arylides of 2-hydroxynaphthalene-3-carboxylic acid. Several examples are given.

Azo dyes and intermediates. J. R. GEIGY, SOC. ANON. Fr. 637,867, July 18, 1927. Mono azo dyes are obtained by diazotizing an aminosulfobenzoic acid having the sulfo group in the *o*-position to the amino group, and coupling with a usual coupling component. In examples, 2-chloro-5-amino-4-sulfobenzoic acid is diazotized and coupled (1) with β -naphthol, the product giving a Ca or Ba lake of bright red tint faster to light than lake red C and (2) with 2,8,6-aminonaphtholsulfonic acid, giving a product which dyes wool in a H₂SO₄ bath vivid bluish red tints fast to light. The fastness can be increased by after-chroming. By using pyrazolones as coupling components, dye-stuffs giving greenish or yellow tints, very fast to light, are obtained. 2-Chloro-5-amino-4-sulfobenzoic acid is made by oxidizing *o*-chloro-*p*-toluenesulfonic acid, nitrating and reducing. 2-Chloro-4-amino-5-sulfobenzoic acid is made by sulfonating *o*-chloro-*p*-nitrotoluene, oxidizing to the carboxylic acid and reducing the nitro group.

Monoazo dyes from pyrazolones and aminobenzenepolysulfonic acids. LEON W. GELLER (to National Aniline & Chemical Co.). U. S. 1,688,044, Oct. 16. Azo dyes are prepd. by coupling a diazotized aniline poly-(preferably di-)sulfonic acid with a 1-aryl-5-pyrazolone compd. of the benzene or naphthalene or other aromatic series which may contain substituents in the aryl radical. The dyes thus formed dye wool yellow to red to brown shades. Examples are given.

Monoazo dyes from disulfonaphthylpyrazolones and *o*-aminohydroxybenzenes. LEON W. GELLER (to National Aniline & Chemical Co.). U. S. 1,688,045, Oct. 16. A 1-(4',8'-disulfo-2'-naphthyl)-5-pyrazolone compd. (e. g., the 3-methyl deriv.) is coupled with a diazotized *o*-amino-phenol compd. or a homologue or nuclear substitution product which contains an acid group such as a carboxyl or sulfonic acid group or both. The dyes thus formed dye wool in an acid bath yellow to red to brown shades which change on after-chroming to yellow-red to blue-red tints. Examples are given.

Azine dyes. SOC. ANON. DES MATIÈRES COLORANTES ET PRODUITS CHIMIQUES DE ST.-DENNIS, R. LANTZ and A. WAHL. Brit. 285,840, Feb. 22, 1927. Oxazine dyes are converted into *meso*-arylazine dyes by treatment with arylamines, e. g., phenylimino- β -, α , β' , α' -symmetrical dinaphthoxazine is treated with aniline, *p*- or *o*-toluidine, anisidine or *p*-phenylenediamine. Other examples also are given.

Dibenzanthrone dyes. I. G. FARBENIND. A.-G. Fr. 32,811, Dec. 29, 1926. Addn. to 581,915. Vat dyes are prepd. by treating ethers of hydroxybenzanthronyls with alk. condensing agents. E. g., a dye of greater purity than that in the 1st. example of 581,915 is obtained from Bz2-Bz2'-dimethoxy-Bz1-Bz1'-dibenzanthronyl which is prepd. from Bz1-iodo-Bz2-methoxybenzanthrone.

Vat dye. BRITISH DYESTUFFS CORPORATION, LTD., and ANTHONY JAMES HAILWOOD. Fr. 638,387, July 28, 1927. The dye prepd. by fusing naphthalimide in NaOH at a temp. of 280-300° is made sol. by treating it with oleum, SO₃ or chlorosulfonic acid and pouring the mixt. into water or ice.

Vat dyes. I. G. FARBENIND. A.-G. Fr. 636,345, May 28, 1925. Vat dyes

are prep'd. by converting into the corresponding hydroxynaphthenes the 3,5-dimethyl-4-halogenphenyl-, or the 3,4-dimethyl-5-halogenphenyl-1-thioglycollic acids or their derivs. substituted in the 2 position by a nitrile, CONH_2 or carboxyl group, and by transforming the hydroxythionaphthenes by oxidation into symmetrical dyes of the thioindigo series or by condensing the hydroxythionaphthenes or their 2-derivs. with compds. capable of coupling therewith. Examples are given of dyes giving reddish blue, violet-red and violet shades on cotton.

Vat dyes. I. G. FARBENIND. A.-G. Fr. 636,370, June 21, 1927. New vat dyes are prep'd. by treating with acid condensing agents, the 2-benzanthronyl-1-aminoanthraquinones, which are obtained by condensing 1-aminoanthraquinones with 2-halogenbenzanthrone. Examples are given of dyes which give brown and browning-red shades on all vegetable fibers.

Vat dyes. I. G. FARBENIND. A.-G. Fr. 32,810, Dec. 18, 1926. Addn. to 584,237. New vat dyes contg. S are prep'd. by combining hydroxythionaphthenes acylated in the OH group of the thionaphthene ring (prep'd. by condensing arylthioglycolcarboxylic acids by means of Ac_2O) with cyclic diketones in general, *e. g.*, with isatins or 2,3-diketodihydrothionaphthene or their derivs. capable of reacting in the same sense. Examples are given.

Vat dyes. I. G. FARBENIND. A.-G. Fr. 32,850, July 31, 1926. Addn. to 625,272. Further examples of violet vat dyes of the 2-thionaphthene-2-indolindigo series prep'd. according to 625,272 are given. Thus, a dye giving bluish violet colors on cotton from the vat is prep'd. by suspending 4-methyl-5,7-dichlorohydroxythionaphthene in chlorobenzene and adding 5,7-dichloro- α -isatin chloride (from 5,7-dichloroisatin and P_2Cl_5 in chlorobenzene) or 5,7-dichloro- α -isatinyride. 4-Methyl-5,6,7-trichloro-, 4-ethyl-5,7-dichloro-, or 4,7-dimethyl-5-chlorohydroxythionaphthene may also be used as starting materials.

Vat dyes. I. G. FARBENIND. A.-G. Fr. 638,022, July 20, 1927. Vat dyes are prep'd. by heating acylated 2-halogenpyrazolanthrone or other cyclic *meso*anthrone derivs. from 1-aminoanthraquinone substituted in the 2 positions by halogen, with metals or agents having a similar action or treating, if necessary, the resulting products with saponif. agents. *E. g.*, (1) acetyl-2-bromopyrazolanthrone is heated in naphthalene in the presence of Cu to 230–250°, and the product saponif., giving the dye described in Fr. 451,093; (2) the Me ether of 2-bromoanthrapyrimidine similarly heated gives a product which dyes cotton brownish red from the vat; (3) 2-iodomethylanthrapyrimidine (by decompn. of 2-diazomethylanthrapyrimidine with KI) forms a product which gives a clear citron yellow; and (4) 2-iodoceramidonine (by treating 1-anilino-2-iodoanthraquinone with H_2SO_4) gives a product which gives a brown-red.

Reduction of vat dyes and like compounds. I. G. FARBENIND. A.-G. Fr. 636,223, June 18, 1927. Vat dyes and compds. contg. groups reducible in like manner are reduced by a mixt. of SO_2 and formic acid in the presence of org. bases but in the absence of any appreciable quantity of water, and with or without diluents. The products may be acylated during or after reduction. Examples are given of the reduction of indigo, thioindigo, tetrabromindigo and dimethoxydibenzanthrone.

Fixing dyes. I. G. FARBENIND. A.-G. Fr. 636,548, June 24, 1927. Acid or basic dyes are fixed on the fiber by treating the fiber before dyeing with reduction products of complex compds. of either tungstic or molybdic acid or both. The reduction may be effected with bisulfite, hyposulfite or formaldehyde. *E. g.*, cotton is sat'd. with a 10% soln. of phosphotungstic acid, phosphomolybdic acid or the two, and treated with NaHSO_3 and H_2SO_4 . The fiber may then be dyed, *e. g.*, with Chinese green.

Dye composition. ALBERT DAVID (to Dip-It, Inc.). U. S. 1,687,751, Oct. 16. A dye is used with a pure neutral soap, a liquid carrier such as water and sufficient of a hygroscopic substance such as glycerol substantially to prevent caking of the mixt. on exposure to the air. The compn. is suitable for use on mixing with addnl. water.

1-Amino-4-pentamethyleneamineanthraquinone-2-sulfonic acid. KLAUS WEIN-AND (to Grasselli Dyestuff Corp.). U. S. 1,688,256, Oct. 16. This compd. may be made by heating an aq. soln. of 1-amino-4-bromo-2-anthraquinonesulfonic acid with pentamethyleneamine and CuSO_4 . It crystallizes in blue needles, sol. in water with a blue coloration and dyes wool pure fast blue shades. Bornylamine yields a corresponding deriv.

Condensation products of the benzanthrone series. I. G. FARBENIND. A.-G. Fr. 32,788, Dec. 30, 1926. Addn. to 612,367. Bz-2-aroylhydroxybenzanthrone is treated with acid condensing agents to obtain hydroxydibenzpyrenequinones which are then alkylated. Thus, by condensing Bz-2-benzoylhydroxybenzanthrone with AlCl_3 and NaCl, a product, 1-hydroxy-3,4,8,9-dibenzpyrenequinone, is obtained which

dyes cotton a brown-red from the vat. If the product is alkylated dyes are obtained which dye cotton yellow shades from the vat.

Condensation products of the benzanthrone series. I. G. FARBENIND. A.-G. Fr. 636,268, June 20, 1927. New condensation products are obtained by treating Bz-1-nitro-2-methylbenzanthrone with acid condensing agents such as fuming H_2SO_4 , chlorosulfonic acid or $AlCl_3$ with or without a solvent or indifferent diluent. The products give vat dyes which dye cotton from green to grayish blue or black, and they form intermediates for other dyes. A dye product can be obtained by treating the crude product with org. solvents and is probably an inner anhydride of Bz-1-aminobenzanthrone-2-carboxylic acid, or the free acid may be obtained by treating the crude product with dil. alkali carbonate and acidifying.

Transformation products of cyannaphthalenesulfonic acid. I. G. FARBENIND. A.-G. Fr. 636,489, June 23, 1927. Cyannaphthalenesulfonic acids having at least one sulfonic group *o*- or *p*- to the CN group are converted by means of alkali with or without mineral or org. diluents into compds. having the general formula $OY-C_8X-Z$, where the OY group is *o*- or *p*- with respect to the Z group, X represents H, one or more of which may be replaced by a univalent substituent, Y represents H or an alkyl group, and Z denotes CN, $CONH_2$ or $COOH$. Compds. contg. the CN group are obtained by a moderate treatment, such as by NaOH with an inert diluent. Compds. contg. the $COOH$ group are obtained by a treatment with caustic alkalies at a temp. of $150-250^\circ$ or by sapon. of compds. contg. the CN group. Compds. contg. the $CONH_2$ group are obtained by a treatment with caustic alkalies in the presence of an alc. at a temp. of $80-150^\circ$. The compds. are used for the prepn. of dyes.

Dyeing cellulose derivatives. HENRY DREYFUS. Fr. 32,813, Jan. 4, 1927. Addn. to 627,071. Materials contg. cellulose acetate or other org. deriv. of cellulose are dyed, printed or stenciled by compds. contg. an aryl dye nucleus coupled by one or more O or S atoms with one or more aliphatic side chains contg. one or more hydroxyl groups. The dyes may be applied in soln. if sol. or they may be brought into colloidal soln. in known manner. Several examples of dyes and the method of obtaining them are given.

Dyeing cellulose esters. BRITISH CELANESE, LTD., and H. C. OLPIN. Brit. 285,641, Feb. 9, 1927. Materials contg. cellulose acetate, formate, propionate, butyrate or the products obtained by treating alkylized cellulose with sulfochlorides such as *p*-toluene sulfochloride, or ethers such as methyl, ethyl or benzyl cellulose, or condensation products of cellulose and glycols or other polyhydric alcs. are dyed, printed or stenciled by use of sulfuric esters of anthraquinonylamino alcs. or of substituted anthraquinonylamino alcs. or alkali metal salts or other suitable salts of such esters. Numerous examples are given.

Dyeing cellulose esters and ethers. H. DREYFUS. Brit. 285,942, Oct. 23, 1926. Material comprising cellulose acetate, formate, propionate, butyrate or other cellulose ester or ether is dyed, printed or stenciled by treatment with a swelling agent for the cellulose deriv. and then dyeing or coloring with an aq. dispersion of an insol. or relatively insol. org. coloring matter dispersed by various specified dispersing agents. A large no. of examples of substances suitable for use as swelling and dispersing agents are given.

Dyeing cellulose esters and ethers. H. DREYFUS. Brit. 285,948, Nov. 12, 1926. Yarns, threads or fabrics contg. cellulose acetate or other cellulose esters or ethers are rendered amenable to mordanting by preliminary treatment with swelling agents such as formic, lactic, acetic or glycolic acids, EtOH, acetone, diacetone alc., diacetin, phenolic compds., thiocyanates, cyanates, isocyanates, isothiocyanates, urea, urethans, thiourea, thiourethans, guanidine and their alkyl and aryl substitution products. Mordant salts such as Fe chloride or nitrate or $SnCl_2$ or Cr or Al compds. may be used and if temps. above $75-80^\circ$ are used protective salts or agents must be added to avoid delustering. Several examples are given for dyeing cellulose acetate.

Dyeing cellulose esters and ethers. H. DREYFUS. Brit. 285,968, Nov. 23, 1926. Org. substitution products of cellulose such as the formate, acetate, propionate, or butyrate, "immunized cotton," or cellulose ethers, are dyed, printed, stenciled or otherwise colored with compds. in which an aryl dye nucleus (other than an azo dye nucleus) contains either in the nucleus or as a substituent an amino or imino group one or more H atoms of which are replaced by an aliphatic side chain contg. OH but not $COOH$. The use of 1-(β -hydroxyethyl)-aminoanthraquinone (solubilized with turkey red oil) with a soap bath, and many other specific examples are given. Brit. 285,969 specifies the use of dyes in which the aliphatic side chain is linked to the aryl nucleus through O

or S, e. g., anthraquinone-1- β -hydroxyethylmercaptan obtained from anthraquinone-1-mercaptan and ethylene chlorohydrin, and also gives several other examples.

Dyeing cellulose acetate or similar cellulose derivatives. HENRY C. OLSEN (to Celanese Corp. of America). U. S. 1,688,553, Oct. 23. 1- β -Hydroxyethylaminoanthraquinone sulfuric ester or other suitable sulfuric ester of an anthraquinonylamine alc. is used for dyeing. Scarlet, violet, blue-violet, pure blue and bluish red shades are obtained with different specified compds.

Dyeing artificial silk. HENRY DREYFUS. Fr. 638,249, July 26, 1927. Cellulose acetate or other artificial silk is treated before mordanting and dyeing with warm or boiling water or damp steam, protecting agents such as NaCl or Na₂SO₄ being added to the water or applied to the silk to prevent delustering.

Production of aniline black on cloth. THE CALICO PRINTERS' ASSOCIATION, LTD., LOUIS AMÉDÉE LANTZ and RONALD WATSON. Fr. 637,884, July 18, 1927. Fibers which have been impregnated or printed in the usual way with an aniline salt, an alkali chlorate and an alkali ferrocyanide are heated for a short time to a temp. of 110–180° in the absence of steam, and then to a steam treatment.

Stripping colors from fabrics. G. F. LLOYD. Australia 11,686, Feb. 11, 1928. The color of a fabric is lightened to any desired point by a treatment with water contg. the products of reaction of Na bisulfite, with Zn and a soln. obtained by treating crude coal-tar naphtha with H₂SO₄. The temp. and concn. det. the amt. of color removed.

Discharge printing on cellulose acetate. SOC. ANON POUR L'IND. CHIM. À BAËL. Brit. 285,973, Nov. 23, 1926. White or colored discharges on dyed "acetate silk" are produced by printing the material with a paste comprising a Zn sulfoxylatealdehyde compd. which may be used with an acid or alkali as required. Several examples are given.

Pattern effects on fabrics. ALBERT BODMER (to Heberlein & Co. A.-G.). U. S. 1,688,798, Oct. 23. A fabric is woven with nitrated and unnitrated threads and portions of the nitrated threads are decompd. with alkali according to a definite pattern. U. S. 1,688,799 specifies applying to a similar fabric a reserve (according to a definite design) which is resistant to the action of a reagent such as NaOH which will serve to decomp. the nitrated threads and then subjecting the unreserved portions of the fabric to the action of such reagent.

Preparing fibers for spinning. I. G. FARBENIND. A.-G. Brit. 286,302, March 4, 1927. An app. is described, for softening and kneading a continuous band of fibers.

Preparing fibers for spinning from agave, yucca, pineapples, etc. M. M. LLORENS, S. GÜELL, BARON DE GÜELL and F. BASTOS. Brit. 286,337, Nov. 3, 1926. Mech. features.

Metallizing fabrics. R. HÖLDRICH, F. NEUBER and S. LAM (to O. Trebitsch). Brit. 285,921, Feb. 26, 1927. Solns. such as those of salts of precious metals are applied to and reduced on the fabric and the coated fabric is then subjected to treatments such as pressure or friction. The fabric may be preliminarily treated with solvents such as NH₃, KCN or acid such as formic acid or dil. H₂SO₄ and colloids such as gelatin or gluten may be added to the solvent or metal salt solns.

Cellulose designs on fabrics of other material. CAMILLE DREYFUS and HERBERT PLATT (to Celanese Corp. of America). U. S. 1,689,426, Oct. 30. A design of cellulosic material such as viscose or cellulose soln. is imprinted on fabrics of other material such as those formed of silk, wool, cotton or cellulose esters or ethers.

Apparatus (with successive U-shaped compartments) for bleaching fabrics in rope form and in continuous manner. JACKSON & BRO., LTD., and C. TAYLOR. Brit. 285,689, April 23, 1927.

Preparing artificial fibers for washing, etc. ERNEST K. GLADDING (to DuPont Rayon Co.). U. S. 1,688,702, Oct. 23. A cake of artificial fibers is provided with a covering of fabric such as cheese cloth.

Nozzles for forming artificial filaments. C. L. WALKER. Brit. 286,342, Nov. 19, 1926. The method of forming nozzles described in Brit. 253,209 is modified by using (instead of capillary tubes of noble metal), flattened disks or the like which may be formed of Pt, are provided with spinning apertures, and are secured in a spinning nozzle body of other material such as porcelain or glazed Ni.

Yarn of mixed natural and artificial silk. I. G. FARBENIND. A.-G. Brit. 286,275, March 2, 1927. Mech. features of producing yarn exhibiting cross dye effects.

Weighting artificial silk. BRITISH CELANESE, LTD., H. DREYFUS and G. H. ELLIS. Brit. 285,941, Oct. 23, 1926. Yarns, threads, fabrics, films, etc., formed in whole or in part of cellulose acetate or other cellulose esters or ethers are loaded with metals such as Sn, Zn, Al, Bi and W by a modification of the process described in Brit.

281,084 (C. A. 22, 3528) in which there is employed for the loading a soln. contg. a loading metal and a thiocyanate in which the thiocyanate is in a proportion not exceeding that of the loading metal. The loading metal may be fixed with tannic acid, a phosphate or silicate or by washing with water. Examples are given.

Treating artificial silk. HENRY DREYFUS. Fr. 638,248, July 26, 1927. Cellulose acetate or other artificial silk to be weighted with insol. metallic substances is first treated with warm or boiling water or damp steam, protecting agents such as NaCl or Na_2SO_4 being added to the water or applied to the silk to prevent delustering.

Waterproofing artificial silk. J. P. BEMBERG, A.-G. Brit. 286,257, March 1, 1927. An Al soap (suitably a soap made from tallow) dissolved in an org. solvent such as trichloroethylene is used as a waterproofing agent, with or without addn. of other substances such as solid or liquid hydrocarbons, fats, fatty acids or waxes which are sol. in the solvent used.

Sodium chloride and tri-sodium phosphate composition. CHARLES F. BOOTH, ARTHUR B. GERBER and PAUL LOGUE. U. S. 1,688,112, Oct. 16. H_3PO_4 , Na_2CO_3 and NaOH combined with NaCl and water yield a compd. of NaCl and Na_3PO_4 which is suitable for use in fabric treatments.

Cottonization of textile fibers. ALBERT CHARBONNEAU. Fr. 636,184, Oct. 14, 1926. Textile fibers other than cotton such as linen, agave, and esparto are transformed into fibers resembling cotton by a succession of mech. and chem. operations to give a fiber which can be worked with the existing cotton looms. The chem. treatment consists in submitting the fibers to baths of NaOH, Na_2CO_3 and soft soap, bleaching baths, and neutralization.

Conditioning cotton. ARTHUR COBB. U. S. 1,688,524, Oct. 23. Cotton is conditioned for spinning, etc., by heating it to above 80° while being worked, in a substantially dry atm. An app. is described.

Mercerized cotton. ÉMILE LANG. Fr. 637,921, Nov. 23, 1926. Cotton is given a silky feel and look by lixiviation with soda and soap and a treatment with colloids, such as starch, flour, dextrin, glue or gelatin, and then mercerizing.

Cotton cloth with a wool finish. MORTIMER J. MACK. U. S. 1,689,208, Oct. 30. A cotton fabric is successively subjected to bleaching, dyeing, napping, mercerizing, sizing and re-brushing.

Felt. HYMAN STEIN, WILLIAM E. AUSTIN and IRVING LIEBOWITZ (to Stein Fur Dyeing Co.). U. S. 1,687,801, Oct. 16. Fibers such as those of rabbit skins are treated with a carotting agent such as Hg nitrate and with FeSO_4 or other ferrous salt which serves as a protective agent against excessive action by a bleaching agent such as H_2O_2 . U. S. 1,687,802 also relates to use of Hg and Fe compds.

Treating fabrics with sulfur to repel insects. WILLIS E. RAGAN. U. S. 1,688,597, Oct. 23. Clothing or other fabrics are treated with powd. S and heated to convert the S into thin liquid form so that it will penetrate the pores of the fabric, and the material is then cooled to convert the liquid to a fine powder.

Mothproofing fabrics. HILTON I. JONES. U. S. 1,688,717, Oct. 23. Fabrics are first treated with an aq. soln. of casein and then with an aq. soln. of a salt of a rare earth metal such as Ce, Th or La.

Moth-proofing articles. I. G. FARBENIND. AKT.-GES. Fr. 636,434, June 22, 1927. Articles are treated with moth-proofing substances in the form of a fine powder with or without the addns. of other substances such as kieselguhr, talc or sawdust.

Mothproofing upholstery, etc. I. G. FARBENIND. AKT.-GES. Brit. 285,825, Feb. 21, 1927. Wetting agents such as sulfonated fatty acids, aromatic sulfonic acids or their salts are used with mothproofing compns. such as those described in Brit. 173,536, e. g., a soln. of 4 grains per l. of Na fluosilicate and 1 grain of Na isopropyl-naphthalene-sulfonate may be used to spray furniture. Partially hydrogenated aromatic sulfonic acids (which may contain alkyl, aryl or aralkyl residues) also may be used as wetting agents.

26—PAINTS, VARNISHES AND RESINS

A. H. SABIN

Survey of the literature on paints and their raw material in 1927. H. WOLFF. *Chem. Umschau Fette, Oele, Wachse u. Harze* 35, 218-21, 228-32, 256-8(1928).—A review of the journal and patent literature, arranged under the following headings: (1) resins, (2) drying and driers, (3) paints, (4) nitrocellulose varnish and pigments, (5) solvents, (6) Methods of examn.

P. ESCHER

Analysis of paint materials. F. W. SMITHER, *et al.* *Proc. Am. Soc. Testing Materials* 27, Pt. 1, 410-23(1927).—This is a report of sub-committee VIII on methods of analysis of paint materials. It gives detailed descriptions of a highest accuracy sp. gr. method for pigments and a rapid method for single samples. A no. of corrections and addns. are made to the original report. Cf. *C. A.* 18, 1207. R. J. MOORE

Unreliability of visual inspection of exposure tests of paint. PERCY H. WALKER AND E. F. HICKSON. *Ind. Eng. Chem.* 20, 997(1928).—The writers have long been convinced that the rating of exposure tests on the basis of visual inspection of painting test panels or structures, with or without photographs, is very unreliable and have urged the development of quant. methods for evaluating such tests. Recently they noted a case which they quote in substantiating their view. A steel panel, painted and exposed for about 3½ yrs., appeared in an advanced state of decay and needed recoating. On vigorously washing, however, with soap and water, the panel was found in excellent condition. The panel would have been rated sound by the elec. cond. method. Cf. *C. A.* 22, 2669. R. J. MOORE

Tinting strength of pigments. H. D. BRUCE. *Bur. Standards J. of Research* 1, 125-45(1928).—A graphic method is described by which the purity and dominant wave length of a sample color are given numerical values by comparison with a block of $MgCO_3$. H. C. HAMILTON

The testing of paint films for weatherability and rust preventiveness. W. VAN WÜLLEN-SCHOLTEN. *Farbe Lack* 1928, 446-7.—Reports of exposure tests should give complete details such as the kind of metal used, manner of cleaning, time of drying of each coat, location, season of the year, abnormalities in the weather, direction of exposure, etc. The author gives a recommended scheme for prep. and conducting exposure and accelerated tests, resistance to water and smoke. G. G. SWARD

Analysis of white linseed-oil paints. R. L. HALLETT, *et al.* *Proc. Am. Soc. Testing Materials*, 27, Pt. 1, 873-94(1927).—Tentative methods are offered for the analysis of the oil and pigment. R. J. MOORE

Anti-fouling paints. A. M. MUCKENFUSS, *et al.* *Proc. Am. Soc. Testing Materials* 27, Pt. 1, 430-7(1927).—A series of tests on ships was run to det. the importance of fineness of particles using Cu oxide and Hg oxide. Conclusion: Scale Cu oxide (contg. both cuprous and cupric oxide) is about as satisfactory as the electrolytic or cuprous oxide, when both are ground to a very fine mesh. The same is true of the 2 varieties of Hg oxide. Another series of tests was run to det. the comparative value of cuprous and cupric oxides as toxics and of other chem. compds. present in the common com. toxics in use. These compds. were obtained in as pure a form as possible, analyzed, ground to 325 mesh and placed in a series of paints, all with the same vehicle and with the same % of actual Cu and Hg. The tests were confined to compds. of these 2 metals. The order of resistance to fouling was as follows, beginning with the best: (1) CuO + yellow HgO , (2) Cu_2O , (3) red HgO , (4) yellow HgO , (5) Cu cyanide + yellow HgO , (6) Cu resinate (Cu_2O) + yellow HgO , (7) Cu cyanide, (8) CuO + yellow HgO , (9) Cu_2O + yellow HgO , (10) Cu carbonate + yellow HgO , (11) Paris green + yellow HgO , (12) Cu oleate (Cu_2O) + yellow HgO , (13) Cu carbonate, (14) Cu resinate + Cu_2O , (15) Paris green, (16) Cu oleate + Cu_2O , (17) CuO . R. J. MOORE

Paint chemist and his job. DONALD DAVIDSON. *Paint, Oil, Chem. Rev.* 86, No. 16, 12-3, 25(1928).—A review of the duties that might be performed by the chemist in a paint and varnish plant. R. J. MOORE

Modern painting methods. Nitrocellulose lacquers. R. LUYA. *La Vie technique et industrielle (Paris)* 10, 529-37(1928).—The com. use in France is described. E. M. SYMMES

Some advantages of spray painting. R. C. SHEELER. *Ind. Power* 15, 56-7, 132, 135-6(1928). E. J. C.

Chinese wood oil. IV. Wood oil as a crystalloid; the autoxy-polymerization during drying. A. EIBNER AND E. ROSSMANN. *Techn. Hochsch., Munich. Chem. Umschau Fette, Oele, Wachse u. Harze* 35, 241-50(1928); cf. *C. A.* 22, 4839.—Sunlight and ultra-violet light change part of the α -eleostearin, the principal constituent of Chinese wood oil, rapidly into the cryst. β -eleostearin, m. 61°; dispersed daylight changes it slowly and no change or a very slow change occurs in the dark. These β crystals can be seen under the microscope in polarized light at 0°, but at room temp. the crystals redissolve in the oil up to 10%. The change from the α to the β form is the first step in the drying process of Chinese wood oil. The next step is the conversion of the crystals into a film under the influence of light, heat and O_2 . The opt. conditions for rapid drying are: intense light (sunlight), high temp. (70°) and presence of O_2 . The crystals absorb O_2 up to 12%, become insol., disperse, do not melt, and their acids have mol. wts.

of 380-400, indicating polymerization. The polymerized insol. product forms with the still unchanged oil an apparently finished film, and its final unexplored phase is the gradual filming of α -eleostearin. P. ESCHER

Insulating varnishes and drying of varnishes. R. SCHWARZ AND FR. SCHRÖDER. *Farbe Lack* 1928, 425, 436, 451-2.—The principal materials used in the prepn. of insulating coatings are oil varnishes, asphalt varnishes and cellulose lacquers. A few typical formulas are given. "Zellon" (cellulose acetate) lacquers contg. one or more of the following, oils, resins, tar, wax, etc., yield films which have a resistance of 21,000-26,000 megohms per cm. and a breakdown voltage of 13,000 v. at 0.2 mm. thickness. G. G. SWARD

Sampling and testing lacquer solvents and diluents. WAYNE R. FULLER, *et al.* *Proc. Am. Soc. Testing Materials* 27, Pt. 1, 870-2(1927).—Tentative methods are offered for sampling, sp. gr., color, distn., residue, non-volatile, residual odor, H_2O , acidity, alky., ester value, and Cu corrosion test. R. J. MOORE

Lacquer finishing small articles by the tumbling process. W. W. BENNETT. *Ind. Finishing* 4, 34, 39-40(1928). E. J. C.

Luster of lacquer finish depends on dispersion of pigments. M. J. CALLAHAN. *Automotive Industries* 59, 413-5 (1928).—Cf. C. A. 22, 3999. E. M. SYMMES

Shellac making in India. R. K. S. *Indian Textile J.* 38, 412-3(1928).—An illustrated description of the primitive but interesting methods still used in the lac industry in India. RUBY K. WORNER

Finishes. P. S. KENNEDY. *Ry. Mech. Engr.* 102, 591-3(1928).—A discussion of the defects of modern finishes and the finish of the future. E. M. SYMMES

New and unusual baked finishes for metal parts. W. J. MISKELEA. *Fuels and Furnaces* 6, 1409-12(1928).—A discussion of the use, application and baking of unique finishes such as crystallizing lacquer, crinkle japan, flake finish, plastic finish and others to wood and metal parts. E. H.

Finishing modern airplanes in color. D. O'BRIEN. *Ind. Finishing* 4, 27, 29-30 (1928). H. G.

Vinyl resins. HENRY A. GARDNER. *Am. Paint Varnish Manufs. Assoc. Circ.* No. 337, 637-65(1928).—The prepn. and certain properties of the condensation resins of vinyl alc. and chloride are reviewed with regard to their use in protective coatings. Many patents covering these resins are reprinted, showing the specific claims. R. J. M.

Specification disclosures on oil-soluble phthalic and phenolic type synthetic resins with the results of some recent exposure tests on the latter. HENRY A. GARDNER. *Am. Paint Varnish Manufs. Assoc. Circ.* No. 399, 673-709(1928).—Recent synthetic resins contg. phenol-formaldehyde and glyceryl phthalate are briefly referred to. The results of accelerated roof tests are given of 7 varnishes made from tung oil—soy oil mixts. with 2 different synthetic resins compared with like varnishes made with ester gum and with rosin. The synthetic resin varnishes gave better durability. Photomicrographs illustrate the various types of perishing shown by different varnishes. Patent references and specifications are given for many phenolic and phthalic type, condensation resins. R. J. MOORE

Paints and their uses in the textile industry (GLICK) 25. Importance of standard thermometer in the testing of materials [tung oil] (FULWEILER) 1. Hydrometallurgical laboratory [TiO_2 for pigment] (TRAILL) 9. Glycerol and its substitutes [in ink industry] (DARKE, LEWIS) 27. Finnish turpentine. VII. Isodiprene, a new terpene of the sylvestene group (ASCHAN) 10. Ozonizing mixed liquid hydrocarbons such as those obtained in cracking petroleum oils [suitable for varnish manufacture] (U. S. pat. 1,689,599) 22. Device for separating coarse particles and aggregates from finely divided pigments (U. S. pat. 1,688,307) 1. Experiments in producing cellulose ethers and esters with special reference to cellulose nitroacetate (GARDNER, KNAUSS) 23.

Water paints. BRITISH DYESTUFFS CORP., LTD., A. SHEPHERDSON and F. CHAPMAN. *Brit.* 285,929, Aug. 26, 1926. Water paints, distempers, etc., have added to them a wetting-out or dispersing agent consisting of sulfonic acids derived from CH_3O -naphthalene or CH_3O -phenol condensation products, the alkylnaphthalenesulfonic acids, the substances prepd. from mineral oils and isopropyl alc. sulfonated according to the method described in *Brit.* 274,611 (C. A. 22, 2268), ligninsulfonic acid, sulfonated naphthenic acids and sulfonated higher aliphatic acids. These substances may be used in the proportion of 0.1-1.0%.

Paint remover. S. HYNES. *Australia* 10,894, Dec. 14, 1927. A compn. for re-

moving paint consists of a mixt. of a soln. of wyandotte yellow hoop alkali in water with quicklime and casein.

Printing ink. KARL STEPHAN (to Chemische Fabrik auf Actien vorm. E. Schering). U. S. 1,689,868, Oct. 30. A form of MnO_2 is used, 100 cc. of which, when loosely heaped, do not weigh more than 100 g. This MnO_2 may be prepd. by pptg. a Mn compd. with Na_2CO_3 and adding Cl, and the ink may also contain a blue dye sol. in fat and varnish.

Compositions for removing paint, varnish, etc. J. G. DAVIDSON (to Carbide & Carbon Chemicals Corp.). Brit. 285,887, Feb. 26, 1927. Compds. such as di- and tri-ethylene glycols and their monoethyl ethers and the monobutyl ether of diethylene glycol are used as solvents. Brit. 285,888 refers to the use of the esters of glycol or polyglycol ethers, the acetates of the ethyl ethers of di- and tri-ethylene glycols and of ethylene-propylene glycol and similar compds. More volatile solvents may be added also.

Insulating varnish. THE ASAHI GLASS CO., LTD. Fr. 638,197, July 25, 1927. An elec. insulating varnish is made by heating glycerol and a S or Se compd. with a mixt. of resin and oil of China wood in the presence of a catalyst such as Al.

Varnish or enamel for "wrinkling finishes." FRANK B. ROOT (to Flood & Conklin). U. S. 1,689,892, Oct. 30. China wood oil 7-17 gals. is mixed with a "wrinkle finish resin" 100 lbs., using oil at least most of which has been preoxidized by blowing, and with a drier and thinner.

Composition for softening lacquered or similar surfaces. FREDERICK J. PILGRIM. U. S. 1,687,787, Oct. 16. Water 15, kerosene 30, soap 3, oil of mirbane 1, dye 1 and tripoli 50%.

Floor covering material. CHARLES O. KARPF. U. S. 1,688,239, Oct. 16. A waterproof flexible felt base is given a sealing coat of paint which is smooth and flat and on this there is applied a decorative design in ink from an etched plate having a wide-mesh screen, and before the ink is dry the flexible body is reversely bent so as to blend out the effects of the screen; a transparent wear-resistant surface coating is then applied.

Artificial resins. BAKELITE CORP. Fr. 638,084, July 21, 1927. Phthalic anhydride is caused to react on a polyhydric alc. at a temp. below 175° . The product is poured into molds and the heating continued at $90-125^\circ$ till hardening takes place. A brilliant hard resin without inherent color is obtained.

Artificial resin. BAKELITE CORP. Fr. 638,121, July 22, 1927. A resin suitable for varnishes, enamels, etc., is made by heating 100 parts of glycerol with 200 of phthalic anhydride till gelatinization begins, then 100-200 parts of a solvent of high b.p. such as diethyl oxalate or glycol diacetate is added and the heating is continued till gelatinization begins again, and then a medium b.p. solvent such as Et lactate, diethyl carbonate, or the Et ether of ethyleneglycol is added to give the desired consistency.

Artificial resins. COMPAGNIE FRANÇAISE POUR L'EXPLOITATION DES PROCÉDÉS THOMSON-HOUSTON. Fr. 638,275, June 24, 1927. Artificial resins particularly for varnishes such as phenol and glycerol resins are made sol. in org. solvents by dispersing them in esters of the aliphatic series such as a glyceride of a polybasic acid.

27—FATS, FATTY OILS, WAXES AND SOAPS

E. SCHERUBEL

Total fat determination in sulfonated oils. K. RIETZ. Wiss. Zentr. Oct. Fett Forschung, Berlin. *Chem. Umschau Fette, Oele, Wachse u. Harze* 35, 270-4 (1928).—The German Commission for Fat Analysis is standardizing the methods for the analysis of Turkish Red Oil, and is broadcasting some questions for public discussion on the methods for such sulfonated oils that can be split quant. with concd. HCl. It also discusses A. H. Grimshaw's work (*C. A.* 22, 1690) and the German "Krefeld" specifications and analytical methods for Turkish red oils.

P. ESCHER

Determination of the saturated constituents of fats by the thiocyanate number. H. P. KAUFMANN. *Z. angew. Chem.* 41, 1046-8 (1928).—The thiocyanate no. for triolein is 86.08 and for trilinolin 86.65, mean 86.36; then the satd. constituents $X = 100/86.36$ (86.36—thiocyanate no. found) or: $100 - 1.158 X$ thiocyanate no. found. For the free acids (oleic and linolic) the equation becomes $X = 100 - 1.108 X$ thiocyanate no. The following values were calcd. In the first formula the figures representing the thiocyanate no. and the % satd. glycerides are, resp.: coconut oil 8.24, 90.5; palm kernel 12.97, 85.0; babassu fat 15.17, 82.4; milk fat 21.7, 74.9; cacao butter 34.5, 60.1; mutton tallow 38.5, 55.4; beef tallow 39.4, 54.4; lard 44.21, 48.8; peanut 72.38, 16.2; sesame 75.7, 12.0; olive 76.5, 11.4; corn 77.10, 10.7; wood oil 78.0, 9.7; poppyseed 78.7, 8.9;

sunflower 79.50, 7.9; almond 81.66, 5.4. A graph is shown which eliminates calcn.

P. ESCHER

The fatty acids of olive oil. K. H. BAUER AND J. MITSOTAKIS. Univ. Leipzig. *Chem. Umschau Fette, Oele, Wachse u. Harze* 35, 275-7(1928).—Analytical data of 5 olive oils from Crete are, resp.: (1) cold-pressed oil from fresh olives, no fuller's earth used, (2) fresh olives, hot hydraulic pressing, filtered through hydrosilicate and cotton, (3) oil from stored, twice hot pressed, olives filtered as in no. 2, (4) oil from black olives, twice pressed, not filtered, (5) oil extd. from press cakes by CS_2 , so-called "sulfur oil," acid no. 2.18, 7.40, 8.21, 21.12, 81.90; sapon no. 179.7, 191.83, 191.98, 195.12, 189.60; % unsapon. 5.00, 1.03, 0.87, 0.84, 1.02; I no. 84.34, 80.21, 77.61, 81.30, 80.21; % total fatty acids 94.5, 97.9, 98.8, 98.9, 98.5; % solid fatty acids 6.07, 5.72, 5.81, 5.88, 5.99; % glycerol 9.47, 9.90, 9.70, 10.18, 5.47; n_D^{50} 1.4493, 1.4502, 1.4503, 1.4503, 1.4484. The extd. oil differs considerably from the pressed oils. Its solid fatty acids were fractionally pptd. as Li salts in 10 fractions and from the m. p. and sapon no. the presence of *lignoceric acid* was detected, and confirmed from the properties of its Ag, Cu and Ph salts.

P. ESCHER

Examination of oleins by thiocyanate. H. P. KAUFMANN. Univ. Jena. *Z. angew. Chem.* 41, 19-22(1928).—K. traces the phys. and chem. properties of oleins as required for textiles and gives analytical data obtained with com. oleins by his method of detg. linolic acid by means of thiocyanogen. The oleic acid content varied between 72.41 and 81.76%; linolic acid between 8.85 and 10.89% and the satd. acids plus unsapon. matter between 9.39 and 18.48%. Since for pure oleic acid the thiocyanate no. and the I no. are alike, viz., 89.9, it follows that the grade of oleins is the higher the nearer the value reaches 89.9.

P. ESCHER

Preparation of erucic acid from rape-seed oil. K. TAUFEL AND CL. BAUSCHINGER. Deutsche Forsch. Anstalt Lebensmittelchem. München. *Z. angew. Chem.* 41, 157-9(1928).—The methods known so far for isolating erucic acid from rapeseed oil (cf. C. A. 16, 3064; 20, 1724) are unsatisfactory, because they are either bothersome, or give a poor yield, or furnish a product not strictly pure. The authors succeeded in prepg. pure erucic acid with a good yield. The sepn. from the satd. fatty acids was based on the observation that by adding small quantities of Pb acetate to the alc. soln. of the total fatty acids obtained from the oil, the satd. acids are pptd. first. The other unsatd. fatty acids were sepd. by means of Mg acetate. Twenty-five g. of cold-pressed, unrefined German rape-seed oil (sapon. no. 176.9, I no. 100.3) are sapond. hot. The alc. is removed, CO_2 being passed through the soln., the alkali soaps are decompd. by dil HCl, and the fatty acids dissolved in Et_2O . This soln. is washed with H_2O , dried with Na_2SO_4 , and the ether distd. off, while CO_2 is passed through the soln. The fatty acids obtained (23-4 g.) are dissolved in 200 cc. 96% alc. and pptd. hot with 0.4-0.5 g. Pb acetate and 200 cc. 96% alc. After filling the flask with CO_2 , and closing the flask tightly, this mixt. is allowed to stand overnight at 10-5°. Then the soln. is sepd. from the pptd. crystals, and 0.5 N KOH added, till phenolphthalein gives a slightly red color. Warm distd. H_2O is added to give a vol. of $\text{KOH} + \text{H}_2\text{O} = 200$ cc., and 65 g. Mg acetate in 100 cc. $\text{H}_2\text{O} + 200$ cc. 96% alc. are added with stirring. After standing overnight at about 15° in a closed flask, the ppt. is filtered off and washed 3 or 4 times with 50 cc. 80% alc. Decompn. of this Mg salt gives erucic acid, which after repeated crystn. appears as white crystals, m. 33.8-34.1°, and I no. 74.9. The yield is 7-8 g. i. e., about 30% of the oil.

G. SCHWOCH

Glycerol—survey and prospects. H. STADLINGER. *Chem.-Ztg.* 52, 700-1(1928).—S. attributes the economic depression in the glycerol market to the superior phys. properties and the low cost of ethylene glycol as an anti-freezing agent and as a raw material for explosives. Fermentation glycerol may become an important rival if purity and low cost are developed.

P. ESCHER

Glycerol and its substitutes in industry. W. F. DARKE AND E. LEWIS. *Chemistry and Industry* 47, 1073-92(1928).—This general descriptive account is divided into the following sections: (1) historical; (2) manuf. (including a flowsheet); (3) addnl. methods suggested or employed in war time for its manuf.; (4) specifications; (5) applications of c. p. glycerol; (6) applications of industrial glycerol including tables and graphs of (a) viscosity of aq. glycerol solns., (b) b. p. of aq. solns., (c) f. p. of aq. solns., (d) vapor pressure of aq. solns., (e) b. p. of aq. solns. at various pressures, (f) cooling properties of aq. solns. for steels compared with water and with oil, (g) compn. of low f. p. dynamites; (7) glycerol as a constituent of adhesive compds. and inks; (8) other processes employing glycerol (photography, leather, petroleum); (9) glycerol substitutes; (10) glycerol in synthetic chemistry; (11) conclusions. A lengthy classified bibliography is included.

E. G. R. ARDAGH

Chemical studies on coconut products. II. Utilization of the coconut. N. GALVEZ, R. MORENO AND V. G. LAVA. *Philippine Agr. Expt. Sta., Los Baños. Philippine Agr.* 17, 163-8(1928); cf. *C. A.* 22, 1246.—The ashes of the pinnae and petioles contain K_2O 9.67, 18.71; Na_2O 2.77, 10.67; and P_2O_5 1.93, 7.27%, resp. Coconut oil in glass containers hydrolyzes only very slightly. Samples of pure coconut oil which contained 0.15-0.23% at the beginning increased in oleic acid content to 0.31-0.60% after standing 4 months as emulsions with 0.1-39.0% H_2O . None of the samples gave a positive test for rancidity. The ashes of coconut shells and husks contain Na_2O 5.80, 2.29; K_2O 23.5, 30.2; and P_2O_5 4.96, 5.94%, resp. A general review of the subject and 23 references are given.

A. L. MEHRING

Soaps in modern textile processing. M. DANN. *Soap* 4, No. 2, 29-31, 79(1928).—The types and characteristics of soap products for scouring, bleaching and dyeing operations are discussed.

E. SCHERUBEL

Standard methods of analysis of soap. A. E. LEIGHTON. *Australia Dept. of Defence Munitions Supply Board* May, 1926, 4 pp.—The following detns. are described: moisture, insol. matter, total fatty and resin acids, resin acids, free alkali and alc. insol., alkali carbonate, alk. silicate, both in the absence and presence of mineral matter insol. in H_2O .

E. SCHERUBEL

Cold cream soaps. W. A. POUCHER. *Am. Perfumer* 23, 464(1928).—A suitable base for these soaps is white tallow, coconut and bleached palm kernel oil. No free alkali is left in the soap and the super-fatting agent is either lanolin or soft white paraffin or a mixt. of beeswax in liquid paraffin together with spermaceti or hard paraffin. The mixt. is treated with hot $Na_2B_4O_7$ soln. which partially saponifies the beeswax and forms an emulsion.

E. SCHERUBEL

✓ **Salt content in soap base and curd soaps.** J. T. *Seifensieder-Ztg.* 55, 345-6 (1928).—Soap base and curd soaps with 30% coconut oil can hardly contain less than 0.5% $NaCl$; soaps with 10% coconut oil contain not less than 0.3% $NaCl$. P. E.

Occurrence of As in fish (S'ADOLIN) 11I. Theory of the bleaching action of bleaching earths (KOBEL) 18. Lipides and their estimation in vegetable tissues (SANDO) 11A. Chaulmoogric oils. The oil of Gorli (ANDRÉ, JOUATTE) 10. Purification of fatty materials (Fr. pat. 32,762) 22.

BERLIN, E. V. *Einheitliche Untersuchungsmethoden für die Fett-Industrie. Part I.* Stuttgart: Wissenschaftliche Verlagsgesellschaft m.b.H. 105 pp. Reviewed in *J. Assoc. Official Agr. Chem.* 11, 528(1928).

Purification of waters from wool, etc., washing. CARL VAN OVERSTRAETEN. *Fr.* 637,912, Nov. 22, 1926.—The waters from wool, etc., washing are sepd. from deposits by decantation and treated with acids, $CaCl_2$ or Al_2SO_4 , the ppts. being boiled with alkali and concd. to sep. neutral fats. The residual waters are reused after neutralization, or the soaps therein are pptd. by acid and the water is rejected.

28—SUGAR, STARCH AND GUMS

F. W. ZERBAN

Report on meetings of technical advisers in the Java sugar industry, Feb. 21 to 23, 1928. ANON. *Arch. Suikerind.* 36, IV(1928); cf. *C. A.* 22, 2480.—**Joint meeting of the three sections.** *Ibid* 3-37.—A round table discussion on deterioration of cane after cutting; weighing of cane and of bagasse; detn. of the yield of individual fields by the Djombang and other methods; behavior of different varieties in factory operation; relation between ash constituents in cane juice and those in soil and irrigation water; introduction of the metric system. **Joint meeting of chemical and technical sections.** *Ibid* 37-160.—Similar discussion on crushers and shredders; hot maceration; weighing of bagasse; loss of juice in bagasse; bagasse analysis; fuel economy and control; new filter presses; returning press mud to the mills; incrustation, and cleaning of evaporators; pressure evapn.; protection of metal surfaces against attack by SO_2 ; Lafeuille crystallizers; improving the quality of white sugars by remelting low-grade sugars; self-discharging centrifugals; use of steam in centrifugals; centrifugal capacity; dila. of run-offs with sirup or thin juice; sugar driers; fracturing of sugar crystals. **Meeting of chemical section.** *Ibid* 161-82.—Discussion on quantity of lime used in defecation; hot liming; use of centrifugals to remove suspended matter in juices, sirups,

and molasses; use of Hyflo-Supercel in filtering sirups and molasses; quality of massacuites and molasses where Lafeuille crystallizers are used; purity of final molasses; factory control. Meeting of agricultural section. *Ibid* 183-285.—Discussion on distance between cane plants; cultivation and time of planting; ripening and optimum time for cutting; production of seed cane (bibit); pokkahboeng and its effect; optimum quantity of $(\text{NH}_4)_2\text{SO}_4$; use of lime as a soil ameliorant; phosphate fertilization; reservoirs for irrigation water. Meeting of technical section. *Ibid* 287-318.—Discussion on boilers; furnaces; air preheaters; economizers; elec. mill drive; electrification of sugar factories; turbines; condensers; miscellaneous. Index. *Ibid* 319-25.

P. R. PEKELHARING

Report of the Technical Committee of the Chemists' Society (of Mauritius) on the combined production of white sugar, and of raw sugar, 99° polarization. ANON. *Rev. agr. Maurice* 5, 194-205(1928).—The sulfitation process is recommended; for the production of raw sugar the juice should be sulfured to an acidity of 0.6 g. SO_2 per l., and limed to the highest pH compatible with the defecator capacity. For the manuf. of white sugar the usual methods are to be employed. The 3-massecuites system is to be used, and 6 different boiling schemes for such a system are appended to the article. The 1st massecuite is to yield white sugar, the other two sugar of 98 to 99° polarization. All app. used for the 2nd and 3rd massecuite must be well washed and steamed before being used for 1st massecuite. Sugar conveyors must also be cleaned before being used for white sugar. It may not be absolutely necessary to use granulators for drying the sugars; superheated steam may be used for drying the raw sugars in the centrifugals. A max. deterioration factor of 0.333 is recommended, to prevent deterioration of the finished sugars. The official English methods are to be used for the analysis of the sugars.

F. W. ZERBAN

Decrease in operating costs in sugar factories by the use of the Kiesselbach storage-feeder. CONRAD. *Centr. Zuckerind.* 35, 805-8(1927).—The Kiesselbach app. is a large insulated pressure vessel connected to a boiler. A circulating pump continuously withdraws water from the boiler, sends it to this storage-feeder, and back to the boiler again. Thus, there is provided a reserve of water, many times the wt. of the water in the boiler proper, but at boiler temp. and pressure. During periods of low load heat is stored; during periods of sudden demand this stored water gives up steam by flash. The result is the same as that with a steam accumulator, and the savings are due to more even loads on the boiler with consequent more regular firing. W. L. B.

Which kind of current for electrification of sugar mills? Q. A. D. EMMEN. *Arch. Suikerind.* 36, II, 648-52(1928). The opinion is generally held that a. c. should be used in sugar factories, except for driving the mills. The only advantage of d. c. for the latter purpose is that it is easier to regulate the speed of the sep. mill units, and that it causes less loss than a. c. As in the near future only cane of the variety POJ 2878 will be ground, such regulation of the mill speed will not be required, and a. c. will be preferable for the mills also.

P. R. PEKELHARING

New methods of operation in mixed factories. A. KÜHNEL. *Z. Zuckerind. czechoslov. Rep.* 51, 551-4, 563-6, 612 4, 694-6(1927). Over 1800 expts. were carried out by heating 400 cc. of various sugar solns. with 0.1% active C, for 5 min. at 85°. The results are given in 12 graphs. Both carboraffin and polycarbon do 80-90% of their work in the 1st minute. The amt. of decolorization is relatively greater for smaller quantities of C. The rate of decolorization is faster with larger amts. Removal of some Ca from juice by adding H_3PO_4 improved the action of the carbons. Without this action the C became coated with colloids and lost its activity, and the $\text{Ca}_3(\text{PO}_4)_2$ ppt. adsorbed some of the colloids. An addn. of 0.7% gum arabic lowered the color removal from 67 to 46%. Pepsin had a similar effect, and so did an increase in alk., though the effect of the latter was most marked between 0.016 and 0.021. Addn. of CaCl_2 up to 0.7% considerably increased the activity of the C. Addn. of gum up to 0.5%, pepsin up to 0.5%, and alkali up to 0.015%, all lowered the decolorization from 67% to about 50%. Gum + pepsin had about the same effect. Gum + pepsin + alkali lowered it to 24%. Microscopic examn. showed pulp cells in the juice which not only added gums and proteins but color also. Removing these in a super-centrifuge of 30,000 r. p. m. gave a juice which after carbonation had only half the usual color. This has not yet been adopted on the factory scale. W. L. BADGER

The use of superheated steam in the sugar factory. JOSEF JASKÓLSKI. *Centr. Zuckerind.* 35, 559-62(1927).—The mill at Vyskov (Czechoslovakia) has available steam at 225 lb. gage and 190 to 360° F. superheat, steam at 100 lb. gage and 125° F. superheat, and satd. exhaust at 19 lb. gage. The av. steam consumption of the triple effect under pressure is 31% steam on the wt. of the beets. This is made up of

20% turbine exhaust with some superheat, 8% pump exhaust (satd.), and 3% high-pressure steam from the boilers. These are mixed and desuperheated with water sprays just before the evaporator throttle valve. Three expts. were run as follows: (1) no water sprays and max. superheat at the evaporators, (2) partial spraying with moderate superheat, and (3) no superheat at the evaporators. The steam to the 1st effect was at 19–20 lb. gage in all cases. (Satn. temp. 125°.) Temp. of steam as admitted to 1st effect: (1) 151°, (2) 120°, (3) 129°; temp. in steam space of 1st effect, (1) 122.1°, (2) 122.2°, (3) 122.3°; increase in color of juice, (1) 12%, (2) 10%, (3) none; coal per 100 kg. beets, (1) 4.79 kg., (2) 4.69 kg., (3) 4.63 kg. The figures on coal consumption are not considered conclusive, as the possible errors are greater than the differences observed. Use of superheat in the evaporators resulted in considerable difficulty in collecting and handling condensate. Since the use of superheated steam causes complications, is harmful to the color of the juice, and does not save coal, it is considered undesirable.

W. L. BADGER

Experiences with purification of sugar factory pulp-press water by fermentation. OTTO UNGNADE. *Centr. Zuckerind.* 35, 1097–8(1927).—The press water was collected separately and allowed to undergo lactic acid fermentation. This removed all sugar, and apparently modified the rest of the org. matter somewhat. It was then limed, and this pptd. not only Ca lactate, but also most of the albuminous substances. The result was a clear effluent, which was mixed with condenser and beet-flume water and sent to settling basins. There were enough bacteria in the effluent to effect considerable further purification in the settling basins. Previously this mill had to return the press-water to the battery. Eliminating this necessity made possible a lower draft in the battery, which relieved all subsequent stations. No effect was noticed on sugar losses. There was a slight loss of dry substance in the pulp. Suspended matter was lowered from 8560 to 2300 mg. per l., total N from 112.0 to 28.0, org. N from 88.2 to 15.4 and permanganate consumption from 19,435 to 1140. Lactic acid in effluent averaged 864 mg. per l.

W. L. BADGER

Determination of the composition of sugars. P. HONIG. *Arch. Suikerind.* 36, II, 639–47(1928).—During the crop of 1928 the sugars from a large no. of Java mills were analyzed. Monthly or fortnightly samples were sent to the expt. station and tested for polarization, H_2O , reducing sugars, ash, p_H , grain size and color. A better insight into the quality of the different grades, and their chem. and phys. compn. is thus obtained. The analytical methods used are described in detail. P. R. PEKELHARING

Determining suspended solids. S. S. PECK. *Facts About Sugar* 23, 1017(1928).—For routine control in Hawaii P. proposes to replace the present laborious method of direct estn. by an indirect one based on the relationship between the suspended matter in the juice and the dry non-sucrose in the press cake, in which the working factor representing this relationship would be redetd. periodically. M. J. P.

The conductometric determination of ash in sugar house products. K. ŠANDERA. Research Inst. of the Czechoslov. Sugar Ind. *Z. Zuckerind. czechoslov. Rep.* 51, 603–12(1927); *Listy Cukrovar* 45, 459 ff(1926–7); cf. *C. A.* 21, 3480, 3481.—The app. previously described has been made more compact. A case about the size of a microscope case carries the lamps and resistances in a back compartment, and the cell is attached to the door. A thermometer dips into the soln., and the correcting resistance is controlled by a dial graduated directly in degrees. The elec. method does not show insol. ash; but this is an advantage since insol. ash should not be considered in calcg. rendement. The sp. cond. of the various salts which might be present varies widely, but the variations in compn. of ash in sugar house products will not ordinarily cause an error of over 1% of the total (i. e., ± 0.01 – 0.02% ash on average materials). W. L. B.

New instrument for determining the specific gravity of refined sugar. V. YANOVSKII. Lab of Leningrad Inst. of Technology. *Bull. Sakharotrest (Bull. of the Sugar Trust)* No. 1, 53 60(1928).—The sp. gr. of a weighed piece of refined sugar can be detd. by displacing a certain vol. of kerosene in a volumometer designed by Y. The temp. has no effect on the instrument. The testing is rapid and accurate, with an abs. error of not over 0.5%. The method of using the app. and calcg. the result is given and a drawing of the instrument is shown. V. E. BAIKOW

Decline in the quality of sugars in connection with circulation of run-offs. J. E. ROEM. *Arch. Suikerind.* 36, II, 652–6(1928).—The quality of plantation white sugar in Java is inferior to that of whites produced in Europe. During the course of the campaign the Java white sugar gradually goes off in color. It is pointed out that the circulation of run-offs, causing higher viscosity and color, is partly responsible for this decline. Expts. at Tandjong Tiro during the 1927 crop have shown that when at the double purging C sugar is mixed with A and B sugars, the wash is lower in purity and

higher in color and viscosity than when the A and B sugars are double purged separately. When the double purged A, B and C sugars are worked up together much more water must be used to get the right color. Expts. with the de Laval centrifuge have shown that the wash has a bad effect on the quality of the sugar. When the C sugar is double purged separately, the quantity of the wash is smaller, and the quality of the product is better.

P. R. PEKELHARING

Inversion losses in gur sugar manufacture in North Behar. JOHN H. HALDANE. *Intern. Sugar J.* 30, 363-5(1928).—The compn. of "Gur" varies within the following limits: polarization, 65-74%; invert sugar, 8-14%; ash, 2.5-5.5%; purity, 70-78. Formerly the procedure in "Gur" refining was to melt it to approx. 50-55 Brix at a temp. of 50-60° and lime until slightly acid to litmus. The major portion of the "Gur" sirup is stored over a period of 12-16 hrs. It was noticed that the p_H would be lowered from 5.4 to 4.4 accompanied by a decrease in purity of 1.2-2.5. The abnormal losses of sucrose reported by "Gur" refiners may be attributed to (1) the method of liming the melt to "slight acidity towards litmus" and the subsequent development of acidity when the sirup is stored for any length of time, (2) the concn. of acid sirups to massecuites, when the light and heavy acid molasses are reboiled to produce a low-grade massecuite. By correcting these faulty practices the unknown loss of sugar in "Gur" refining has been reduced to 2.2%.

W. L. OWEN

Methods of sugar boiling. HERBERT WALKER. *Intern. Sugar J.* 30, 372-6(1928).—The importance of raw sugar manufacturers turning out a product of "good refining value" is universally recognized. The "filtration rate" of sugars is in inverse ratio to the proportion of finely divided insol. impurities in the sugar, and this will depend upon the method of sugar boiling used. Three methods of sugar boiling are described, two being of very general practice, viz., the two massecuites system and the Pioneer; and the third a combination system, recommended by W. The advantages and disadvantages of the 3 systems are discussed.

W. L. OWEN

Cane sugar industry of Rio de Janeiro. RICARDO AZZI. *Facts About Sugar* 23, 974-5(1928).—The soil and climate conditions are very promising. The only cane disease of importance is mosaic, to which all the varieties now generally grown in this district are susceptible. The few insect pests do not seem to do much damage. The methods of prepng the land, the planting, cultivation and harvesting and the basis of cane buying are briefly described. The cane is not bought by analysis and there is no chem. control of the manuf. A table is given, showing the names, ownership and production (in unstated units) for the 3 years of 1925-6-7.

M. J. PROFFITT

Cane root studies in tile-drained soil. W. P. ALEXANDER. *Facts About Sugar* 23, 1050-1(1928).—Estn. (by excavation and hand sepn) of the root development of a crop of H-109 cane grown in a heavy adobe soil with and without tile drainage confirmed the general observation that poor drainage prevents normal root development. The proportion of root growth occurring in the strata 24 to 40 in. below the surface in the drained area was comparable with that often obtained in sandy loam. Large root development was correlated with better yield. Drainage not only allows better aeration of the soil, but it also reduces the concn. of sol. salts in the soil at all levels from the kuakua to the fifth 8-in. stratum, as shown by a table included.

M. J. PROFFITT

The beet campaign of 1926-7 in Moravia. JAROSLAV FIŠER. *Z. Zuckerind. czechoslov. Rep.* 51, 689-96(1927).—The av. for Moravia, Silesia and Slovakia was: wt. of leaves, 348 g. per beet; wt. of root, 485 g.; sugar content, 17.89%. The av. for 24 mills in Moravia (56% of the total) was: kg. chips per hl. in cells, 55.2; cells per 24 hrs., 232; draft, 115; pressed pulp, 63%; lime consumption, 4.7%; raw sugar yield, 17.2%; molasses yield, 1.76%; coal consumption, 6.79% for mills with vacuum evaporators, 5.23%.

W. L. BADGER

2nd fillmass, 93.3%; in molasses, 82.1%. Purities: diffusion juice, 90.1; thin juice, 94.3; thick juice, 94.8; 1st fillmass, 92.2; high green, 76.8; 2nd fillmass, 81.0; molasses, 64.6. In general, all stations operated normally. Filtration of thin juice through a layer of partly exhausted active C accomplished some decolorizations, but by complete removal of suspended matter greatly improved the operation, and decreased the C consumption, in later decolorizing operations. Losses were: known, 0.45%; unknown, 0.55%.

W. L. BADGER

Automatic control of the carbonation process in beet-sugar manufacture. R. T. BALCH AND J. C. KEANE. *Ind. Eng. Chem.* 20, 1148-51(1928).—Equipment similar to that previously described as used for automatic control of cane juice defecation (*C. A.* 22, 1698) was tried in a beet house. The app. and installation are described

and illustrated, and a facsimile of p_H records is shown. "Automatic control of the 2nd carbonation has been shown to be practicable. If SO_2 could be delivered to the sulfitation station under as const. conditions as the CO_2 is delivered to the carbonation station, an automatic control employing similar equipment would be as successful. The control functions on electrometric principles whereby the e. m. f. produced between the W and HgCl electrodes immersed in the juice causes the elec. motor that is connected to the gas valve to operate indirectly through a system of relays. The supervision required, principally for changing and caring for the electrodes, is believed to be more than compensated by the advantages of the control." F. W. ZERBAN

Drying of sugar beet and extracting the sugar from it in a diffusion battery. N. L. KARAVAEV AND A. P. PALKIN. Lab. of Central Asia Univ. *Bull. Sakharotrest (Bull. of the Sugar Trust)* No. 5, 40-4(1928).—Sugar beets sliced and dried to 8-10% H_2O in the sun can be stored for an indefinite time without spoiling or increase of invert sugar. The exptl. run was made on 3 samples (4 yrs., 1 yr., and 5 months old) in a lab. diffusion battery. The results indicate that % sugar in diffusion juice is about double that from fresh beets if the time of diffusion is increased 50%. The purity of diffusion and limed juice is about the same. CaO used is much less if calcd. on sugar extd.

V. E. BAIKOW

The Oxford beet dehydration process. ANON. *Intern. Sugar J.* 30, 426-7(1928); cf. *C. A.* 21, 202, 1368, 2198.—The Oxford process has been in operation at the Eynsham exptl. factory for over a month, and the results have shown the following advantages: (1) a saving of 8 £ per ton of sugar made; (2) the production of an innocuous effluent; (3) the production of a superior pulp for cattle food due to its albuminoid content which usually passes into the juice. A still further advantage will result from the drying of the slices at local stations, with a saving of transport charges. One of these drying stations is now under construction at Taunton.

W. L. OWEN

Determination of solubility of sucrose in beet-house sirup. R. J. BROWN, J. E. SHARP AND H. W. DAHLBERG. *Ind. Eng. Chem.* 20, 1130-2(1928).—Soly. data of this nature are known only for European conditions. In the present study American products have been examd. Solns. of known impurity-water ratio were prepd. from a low purity molasses. Sucrose was added to these solns., the mixts. were agitated in a thermostat, and the sucrose concn. at equil. was detd. at 40°, 50°, 60°, 70° and 80°, approaching equil. from both undersatn. and supersatn. The excess sucrose was removed by filtration through metal cloth, the dry substance detd. by a method previously described (*C. A.* 22, 4267) and the sucrose found by difference. The results are shown in a table and 3 graphs. The values read from the graphs are accurate within 0.2% except at 80° where the error is slightly greater. The investigation will be continued with other low grade products as a basis.

F. W. ZERBAN

Farm or field roots. FRANK T. SHUTT. Dept. Agr., Canada. *Rept. Dominion Chemist, Year Ending March 31, 1927*, pp. 31-4(1928).—Expts. were carried out with 15 varieties of mangels to det. the relation between type, based on the length-width ratio of the root, and nutritive value as measured by dry matter and sugar content. The results, thus far obtained, indicate that in general the "long" and "half-long" types contain the highest percentages of sugar in juice and of dry matter. Limed soils produced much higher yields of mangels than unlimed soils but mangels from unlimed soils contained higher percentages of dry matter and sugar in juice. The sugar in juice content of 5 varieties of carrots varied from 1.04% in the Champion variety to 2.67% in the Improved Danver's Half-Long

K. D. JACOB

The diseases of the beet. FR. RAMBOUSEK. Research Institute of the Czechoslovakian Sugar Industry. *Z. Zuckerind. czechoslov. Rep.* 51, 559-63(1927).—A systematic table based on visible symptoms.

W. L. BADGER

Boiling of massecuites with the aid of the electric current by the method of Gränz-dörffer. YU. ZHVIRBYANASKII. *Bull. Sakharotrest (Bull. of the Sugar Trust)* No. 3, 56-9; No. 4, 20-34(1928).—In the method of Gränz-dörffer electrodes are placed in the vacuum pan, and a cs. of varying intensity are passed through the massecuite during boiling. A definite quantity of sugar powder is introduced to start crystn., and thick juice is drawn in continuously. The process is being used in a German factory, but it offers no noticeable advantage in the time of boiling, shape of crystals, or steam economy. Comparative tables, pictures of crystals, and various diagrams and drawings are shown.

V. E. BAIKOW

Control of massecuite boiling. ROJ. *Bull. Sakharotrest (Bull. of the Sugar Trust)* No. 2, 38-9(1928).—The "Brasmoscope" of R. is composed of a U tube attached to a board. The tube is filled with Hg. One end of the tube is connected with the vacuum pan; the other one is open. On the surface of the Hg in the open end floats a small

bottle (filled with Hg) which is connected, by a silk thread running over a pulley, with an eccentric and a scale which indicates % H₂O. Depending on the pressure in the vacuum pan, the scale indicates to the sugar boiler the % H₂O in the massecuite. A very simple table, by Dokhlenko, is attached to the app., by which the sugar boiler can easily calc. when and how much thick juice must be added to the massecuite. This instrument permits const. control of the massecuite. A full description and a drawing of the instrument are given. V. E. BAIKOW

The importance of proper juice screening. J. W. STEENBLIK. *Facts About Sugar* 23, 1022-3(1928).—The use of elec. vibrating screens in place of the old type of screens in 5 Cuban mills, 2 of which used the Petreé-Dorr process and 3 of which used filter presses, has resulted in increased efficiency and improved product. M. J. P.

Filter for juice of first and second carbonatation with mechanical cleaning. YU. D. LYUBCHENKO. *Bull. Sakharotrest (Bull. of the Sugar Trust)* No. 3, 33-6(1928).—The new filter consists of a rectangular tank with a horizontal plate at the top. A no. of vertical plates are attached to the top plate and are covered with filter cloths. The juice enters at the bottom and is pumped out through a pipe at the top, forming between the plates filter cakes which are washed and blown down by compressed air or steam. The cloths are scraped by a set of scrapers of special construction. The sludge is mixed by a propeller at the bottom of the filter and finally sucked out. The advantages of the filter are small space occupied by it (2.25 m.), reduced labor, and continuous work. The filter cloths can be changed by taking out the entire block of plates at one time and replacing with new ones. V. E. BAIKOW

Rationalization of mechanical filters. YU. D. LYUBCHENKO. *Bull. Sakharotrest (Bull. of the Sugar Trust)* No. 1, 37-8(1928).—Greater economy of labor and filter cloths, also perfect filtration of thick juice and sirups, can be obtained in a filter designed by L. The filter, in which are suspended filter plates covered by a small-mesh screen, is filled with a mixt. of cellulose and water. The cellulose is deposited on the screen and becomes a perfect filtering material. After filtration of the sirup the cellulose can be washed out by reversing the current of water. V. E. BAIKOW

Memorandum on burlap as a supplement to filter press cloths. D. C. BOLIN. *Intern. Sugar J.* 30, 486(1928).—The occasion often arises when it is necessary to increase the capacity of the filter press station. This can be done by increasing the existing equipment or by increasing the efficiency of the equipment. In British Guiana, because of the nature of the soil, the filtration of scums and settlings and clarified juice is comparatively slow. A large filtering area is necessary to avoid discharging soft cake. Although treating the scums with phosphoric acid and "Filter Cel" aided filtration, this proved an added expense without commensurate benefits. Burlap was tried as a covering for the filter cloths and very striking benefits were obtained. The material used was D. W. Twilled Burlap sacking; an increased rate of filtration was immediately noticeable. W. L. OWEN

Hydrogen-ion control of boiler feed waters. ANON. *Intern. Sugar J.* 30, 475-6(1928).—In sugar factories condensed water from the evaporators may contain varying amts. of sugar, which is decompd. in the boilers with the formation of org. acids, which injure the boiler plate. This can be avoided by maintaining the alky. of the water at the optimum p_H which is between 9.5 and 10.0. Recently there has been introduced the Rees colorimeter for the control of the reaction of condenser and boiler feed waters. The instrument measures out a small quantity of indicator (phenolphthalein is recommended) and mixes it with another large quantity of liquid, *i. e.*, the water under examn. After transferring the mixt. to an observation tube, it is compared with a sliding color wedge. The p_H of the boiler water being known one reads from a table prepd. for the purpose the necessary vol. of NaOH soln. of suitable concn. to be added. Feed or boiler water must never become more acid than p_H 4.5 since at this value H begins to be evolved from Fe at ordinary concns. of O. W. L. OWEN

An enquiry into methods for the purification and disposal of waste waters. PARK ROSS AND L. F. DE FROBERVILLE. *Intern. Sugar J.* 30, 376-82(1928); cf. *C. A.* 22, 2677.—The nuisance from waste waters in South Africa having attained serious proportions it was decided to investigate European methods for the disposal of such effluents. The standards for the effluents discharged in fishing rivers are: (1) they should not contain more than 3 pts. per 100,000 suspended matter; (2) they should be non-putrescible on incubation for 5 days at 18°; (3) they should not absorb more than 1.5 pts. by wt. per 100,000 of dissolved or atm. O in 5 days. In Natal the waste waters are principally from 2 sources: (1) molasses distilleries and (2) sugar factories. The waste waters from the former are from 2 sources, *viz.*, the residues from the stills, and the bottoms from the fermenters. The stills are supplied with decanted wort from the fer-

menters, and therefore contain a min. of suspended matter, but some fermentable sugars which have to be eliminated. By pptn. of the wort with lime before concn., the wort remaining in the bottom of the tubs is much more solid and easier to handle. The possible methods of disposing of these wastes are (1) application to the land; (2) evapn.; (3) biological purification. Of the 3 methods the last seems best adapted to South African conditions. In this method all of the pot ale (450,000 gals.) is collected in one tank (a), and the other polluting waters in another (b). A mixt. of 1 part of (a) and 7 of (b) is made and to each 300 gal. 1 lb. of lime is added during the mixing. After settling 24 hrs. the supernatant liquor is drawn off and sent to the biological filter. After leaving this filter with its ammoniacal and albuminoid N reduced to a safe minimum, the effluent is sent over sand filters to remove the suspended matter. Purified effluent was entirely uninjurious to fish. Of the various methods considered for the treatment of cane factory waste waters, the chem. pptn. method, and the recovery and reuse of the water in the factory is the best for the conditions in South Africa.

W. L. OWEN

How must saturation with sulfur dioxide be carried out? LUDWIG KAYSER. *Centr. Zuckerind.* 35, 722-5(1927).—The p_H of the entering juice is fixed at some value a by conditions of carbonation and filtration, and the final p_H desired is fixed at e by conditions in evapn. and boiling. These are both assumed to be on the alk. side. Sulfuring may be carried out (I) by simply sulfuring from a to e ; (II-1) by adding CaO to give the juice a p_H of Z , higher than a , and then sulfuring from Z to e ; (II-2) by sulfuring to e , adding CaO to give a p_H less than a , sulfuring to e , and repeating till the desired amt. of CaO has been used; (II-3) sulfuring with continuous addn. of CaO so that the whole process takes place practically at e ; (III-1) sulfuring from a to a p_H of y on the acid side, and then adding CaO to come back to e ; (III-2) sulfuring to y , adding CaO to give a p_H greater than y but less than e , sulfuring to y , repeating till the desired amt. of CaO has been used, ending at e ; and (III-3) sulfuring at y with continuous CaO addn., ending at e . Expts. are cited showing that up to a p_H of 5.5 there is no inversion in pure sugar solns.; and since all factory juices contain buffer substances, this limit is amply safe in practice. A no. of expts. were made at different concns. and different purities by methods II and III, and the following conclusions reached: The decolorizing effect is better, the lower the av. p_H during sulfuring. This is true both for bleaching the coloring substances, and for the adsorption of color on the $CaSO_3$ ppt. formed. A p_H of 5.5 is safe up to 85°. If juices of varying d. and purity are sulfured without addns. of CaO, the decolorizing effect is better with the thinner and less viscous juices. When there are small addns. of CaO, the results are better as the d. or purity of the juice is higher, but this effect is far overshadowed by the effect of changes in the amt. of CaO used. If 0.05% of CaO is added in sulfuring thick juice, twice as much color is removed as when sulfuring without CaO.

W. L. BADGER

Is it advantageous or not to cover the diffusion battery with insulation? B. HEINEMANN AND P. HOPPE. *Centr. Zuckerind.* 35, 1044-6(1927).—Four parallel tests were made on 2 batteries of 8 cells each. In one battery the cells were insulated and in the other they were bare. The 2 batteries were run under as nearly identical conditions as possible. The wt. of steam condensed was exactly the same for the covered battery as for the bare one, in each test.

W. L. BADGER

Fitting shells to roller shafts. R. B. KAY. *Facts About Sugar* 23, 1023-4(1928).—The replies submitted to a questionnaire sent to various equipment manufacturers and sugar factories indicates that the trend of modern practice is toward a simple shrink fit.

M. J. PROFFITT

Tube plates for multi-pass heaters. P. H. PARR. *Intern. Sugar J.* 30, 473-5 (1928).—Under modern conditions the multi-pass heater or heat exchanger is becoming of great importance, not only for juice heaters in sugar factories but also in chem. engineering. The "setting out" of the tube plates for these heaters often gives considerable amt. of trouble, much of which can be avoided by the following method. First a rough est. is made of the diam. of the heater, and then a rough drawing is made showing this divided up into a no. of equal areas corresponding to the no. of passes (traverse flows, etc.) as required. The circles may be divided into the required no. of sections by radial lines, but circular sectors are not of good shape for holding the tubes, and a rectangular system is to be preferred.

W. L. OWEN

Comparative results obtained in viscosity tests on starches used by North Carolina mills. A. H. GRIMSHAW. N. C. State College. *Textile World* 74, 1963-5(1928).—See C. A. 22, 4256.—A further report of tests on the 63 starches submitted by N. C. mills. A description of tests used by several starch firms for detg. viscosity is included.

RUBY K. WORNER

Potato starch. I. K. HESS, HERMANN FRIESE AND FRANKLIN 'ARTELL' SMITH. *Ber.* 61B, 1975-82(1928).—*I. Acetylation.* Air-dried potato starch (I) contg. 18% water was pretreated by shaking for 24 hrs. with pyridine and then acetylated at 50-70° on the addn. of Ac_2O . After 4 days a triacetate was formed which was completely insol. in all customary solvents. The yield is almost theoretical. Alc. NaOH regenerated (I) unchanged. The triacetate of amylopectin is insol. but amylose triacetate is readily sol. in Me_2CO , CHCl_3 , etc. Expts. were then planned to show whether amylose pre-exists in starch or is formed by the process of sepn. *II. Action of warm water on potato starch.* Agitating (I) with water at 50-55° sepd. it into a sol. fraction (II) which composed 69% of (I) and an insol. residue (III). At 80° 31.8% of (III) dissolved to give fraction (IV). The material insol. at 80° (V) is amylopectin and contained 0.209% P_2O_5 . (II) and (IV) are amyloses. Microscopic examn. revealed that the outer shell of the starch granule was made up of (II) and (IV) exclusively and that the nucleus of the granule was composed of (V). The water-sol. fractions (II) and (IV) were shown to be heterogeneous by fractional pptn. The more sol. fractions contained up to 11.8% of reducing sugar and the product of acetylation gave higher acetyl values than did the acetate of (I). Fraction (II), however, did not reduce Fehling's soln. and complete acetylation gave an acetate with the same acetyl content as the acetate of (I). Conclusion: Although water at 80° partially hydrolyzes potato starch, at least a part of the amylose preëxisted in the original starch. J. G. McNALLY

Soil surveys (EARLE) 15. Field problems on an unirrigated plantation (SPALDING) 15. Apparatus for drying or cooling starch (U. S. pat. 1,690,013) 1. Annular radiator for vacuum evaporating, particularly sugar solutions (Fr. pat. 638,584) 1. Separation of salts from sugar (Fr. pat. 636,112) 13. Tribarium aluminate [for precipitation of saccharates from molasses] (U. S. pat. 1,688,054) 18. Derivatives of starch, cellulose and other carbohydrates (Brit. pat. 286,331) 10.

Sugar crystals. AUGUST GRANTZDÖRFFER. Fr. 638,328, July 27, 1927. In concg. sugar solns. to obtain crystals an a. c. is passed through the soln., whereby a more rapid formation of uniform crystals is obtained and org. material is prevented from entering the crystals. Fr. 638,327 describes electrodes used for sepg. crystals, particularly from sugar solns., in which the sides facing one another are cut to a point or chisel-shaped and have perforations terminating at the points of exit of the current. The electrodes may be hollow and used for leading in superheated steam.

Sugar and paper pulp from cane. EUGENIO A. VAZQUEZ (to Vazcane Process, Inc.). U. S. 1,688,904, Oct. 23. The material is sepd. into fibers and these are leached and sepd. from the liquid and sugar is recovered from the latter. U. S. 1,688,905 relates to app. for use in processes of this character.

Cyclic processes of using barium compounds in sugar production. HENRY W. DAHLBERG. U. S. 1,688,071, Oct. 16. Insol. Ba material such as BaCO_3 is converted into a sol. Ba compd. by heating with alumina to form a Ba aluminate compd. contg. water-sol. barytic material, this sol. material is used to treat molasses and form a Ba saccharate, Ba is sepd. from the latter by CO_2 and the insol. Ba compd. thus obtained is used for the production of more Ba aluminate material.

Diffusion battery and press-worm system for extracting sugar on the counter-current principle. A. RAK. Brit. 286,125, May 7, 1927. An app. is described.

Preparing cane molasses for use in manufacture of yeast by the aeration process. FRED RANSOHOFF. U. S. 1,688,831, Oct. 23. The molasses is treated with sufficient NH_3 to render it alk., and NH_4 phosphate is added and undissolved substances are sepd.

Clarifying cane molasses for the growing of yeast. CHARLES HOFFMAN, CHARLES N. FREY AND FRANK M. HILDEBRANDT (to The Fleischmann Co.). U. S. 1,687,561, Oct. 16. A dil. soln. of the molasses is treated with a quantity of Na silicate sufficient to render the resulting mixt. alk. within the limits represented by a pH value of from 7.7 to 12, and the mass is then heated and filtered while hot.

Starch. G. M. MOFFETT (to Corn Products Refining Co.). Brit. 286,289, March 3, 1927. See U. S. 1,655,395 (C. A. 22, 1054).

Starch compositions. O. MEYER. Brit. 286,377, Dec. 6, 1926. Readily pulverizable starch adapted to swell in cold water is prepd. by mixing starch (e. g., potato starch) with a small proportion of cyclohexanone or methylcyclohexanone (suitably about 3% the wt. of the starch), adding caustic alkali soln. and adding an acid such as oxalic acid to obtain a neutral product before drying. When mixed with cold water the product makes a good adhesive.

Apparatus for manufacture of dextrin from starch, etc. WM. A. DARRAH. U. S. 1,689,379, Oct. 30.

29—LEATHER AND GLUE

ALLEN ROGERS

Tanning materials of the British Empire. ANON. *Bull. Imp. Inst.* 26, 311-22 (1928); cf. *C. A.* 22, 2289.—A review of the distribution and uses in the British Empire of the following lesser-known tanning materials, which are not at present in commerce but which appear to be worthy of consideration: *Anaphrenium argenteum* E. Mey (= *Rhus Thunbergii* Hook.), *Anogeissus latifolia* Wall, *Callitris* spp. (Australian pine barks, cypress pines, Coniferae), *Carissa spinarum* A. DC., *Colpoon compressum* Berg. (= *Osyris compressa* A. DC.), *Elephantorrhiza Burchellii* Benth., *Eucalyptus alba* Reinw., *E. calophylla* R. Br. (red gum), *E. diversicolor* F. Muell (karri), *E. gomphocephala* DC., *Phyllanthus emblica* Linn., *Pinus halepensis* Mill (Aleppo pine), *P. longifolia* Roxb., *P. khasya* Royle (Burma hill pine), *Shorea robusta* Gaertn., *Terminalia arjuna* Bedd.

A. PAPINEAU-COUTURE

Measuring the color of tanning materials. A. DE LA BRUERE. *Halle aux cuirs* 1928, 265-71; cf. *C. A.* 22, 4866.—The detn. of the color of tanning exts. by the Lovibond tintometer is inaccurate. Data are presented showing (1) that different operators get different results with the same soln. under the same lighting conditions; (2) that the same operator gets different results with the same soln. under different lighting conditions; and (3) that the practice of detg. color in a soln. of analytical strength and calcg. results to a soln. contg. 0.5% tannin is not justified. The portions of the spectrum transmitted by the yellow and red glasses of the tintometer overlap widely. The spectrophotometer is too costly and its manipulation too delicate for use in control work. The detn. of color by the Toussaint photoelec. colorimeter is advocated. This instrument consists of a photoelec. cell, galvanometer, and 7 color filters transmitting nearly monochromatic light. White light from an Fe arc is rendered monochromatic by passing through 1 filter. The light passes through the soln. and impinges on the photo-sensitive element. The amt. of light of any particular color that is transmitted is measured by the galvanometer deflection, divided by the galvanometer deflection obtained when the same light is passed through H₂O. The ratio, deflection with tannin soln.: deflection with H₂O is plotted as a function of wave length, giving a curve characteristic of the quality and intensity of the color of the soln.

H. B. MERRILL

Standard methods of analysis of dubbing. A. E. LEIGHTON. *Australia Dept. of Defence, Munitions Supply Board* May, 1926. 3 pp.—Dubbing consists of any or all of the following: cod oil, mutton tallow, mineral oil and oil of wintergreen. The mineral oil is detd. as the unsapon.; the cod and tallow are detd. from the I. no. of the dubbing by calcn. The oil of wintergreen is detd. by conversion into salicylic acid which is estd. colorimetrically.

E. SCHERUBEL

Dyes and tannin from Pistachio trees. C. D. MELL. *Textile Colorist* 50, 683-4 (1928). *Pistachio terebinthus*, the so-called Cyprus turpentine tree, is the most widely distributed species and produces most of the galls of commerce. The amt. of tannin varies from 60 to 75%.

RUBY K. WORNER

Manufacture and dyeing of artificial leather. A. J. HANLEY. *Proc. Am. Assoc. Textile Chem. Colorists* 1928, 236-43; *Am. Dyestuff Rept.* 17, 656-63.—This lecture was followed by a long discussion with many questions and answers. L. W. R.

Glycerol and its substitutes [in leather industry] (DARKE, LEWIS) 27. Polish for leather (U. S. pat. 1,689,864) 18. Waterproofing and coating leather (Brit. pat. 286,396) 18.

The Leather Trades' Year Book, 1928. London: The United Tanners' Federation. 220 pp.; 7s. 6d. Reviewed in *Bull. Imp. Inst.* 26, 401(1928).

Treating leather. CARL FREUDENBERG G.m.b.H. Fr. 638,257, July 26, 1927. In mineral tanning skins or leather, the leather while damp is impregnated with an emulsion of wax to save or replace the usual dressing.

30—RUBBER AND ALLIED SUBSTANCES

C. C. DAVIS

The constitution of rubber. HEINRICH LOEWEN. *Kautschuk* 4, 163-4(1928).—It is considered that colloid-chem. research will not in itself solve the problem of the constitution and unique properties of rubber. Fundamental research on the org. chemistry of the rubber mol. is just as necessary, for it is unlikely that rubber is the only substance whose properties depend upon chem. constitution. The great difficulty in ascertaining the chem. constitution of rubber has been the fact that most of its derivs. are also amorphous and of mol. wts. of the same order of magnitude as rubber. The ozonides are about the only derivs. which can be converted into relatively simple compds. The present paper is a preliminary report on a scheme of research, the object of which is to obtain derivs. of rubber which will throw light on the structure of the latter. As a reagent, HCl was considered preferable to Br, because rubber-HCl is more stable than rubber bromide, and because a higher halogen content (with Br) involves more complicated decomps. Assuming rubber to contain the group— $\text{CH}_2\text{CH}:\text{CMe.CH}_2$, it is shown that with HCl, several addn. reactions are possible, with formation of various known compds., depending upon whether partial or complete satn. occurs, upon the part of the mol. where partial satn. occurs, and upon the subsequent character of the cleavage. Crepe (extd. with AcMe) in CHCl_3 was first treated with 0.5 the quantity of HCl gas calcd. for complete satn., after which it was ozonized. The ozonide soln. was then warmed to 70° with water, the HCl neutralized with CaCO_3 , the CHCl_3 evapd., more water added and distd. at 125-35° to 0.5 its vol. The distillate contained probably levulinic aldehyde, while the red-yellow aq. residue contained a light yellow *semi-solid*, which was sol. in EtOH and was not a rubber-HCl. This EtOH soln., after filtration, gave a *ppt.* partially sol. in dil. NaOH, the latter soln. giving in turn *ppts.* with acids, Ba salts and Pb salts. Ext'd. with Et_2O and evapd., the red-yellow aq. soln. (*loc. cit.*) yielded a light yellow *oil*, while the residual soln. from the extn. gave on evapn. a dark *oil*. This latter oil crystd. to a mixt. of 2 substances, which were sol. in EtOH, insol. in Et_2O and gave *ppts.* with sol. Pb or Ba salts. These various compds. have not been identified, but the expts. show that volatile and crystallizable derivs. can be obtained from rubber without subjecting the latter to very energetic reactions. C. C. D.

Improvement of the properties of rubber by a technical change in its microstructure. H. POHLÉ. *Gummi-Ztg.* 42, 2687-8(1928).—A large no. of photomicrographs in natural colors shows the relation between the stress-strain curves of vulcanizates and their microstructures, the curves depending upon the particle size and the state of dispersion of the "active" fillers. The particles which play a predominant role in the quality are of microscopic dimensions, and microscopic analysis will therefore show in what way particles of different sizes influence the stress-strain curves. The influence of particle size on the stress-strain curve can, however, be detd. only when the same substance is under consideration. Under these conditions it is possible to change the shape of a stress-strain curve from convex to concave or *vice versa* by the addn. of a small proportion of particles of a different size to a filler, e. g., by the addn. of a small proportion of colloidal graphite to gas black. Sb_2S_3 , Sb_2S_5 , factice, mineral rubber and different grades of ZnO and C black can be identified by photomicrographic analysis. In the colloidal form, fillers usually show microscopically a granulation of a characteristic color, which enables the particles to be identified and their fineness estd. Thus under a magnification of 2000, C black shows a fine red-brown granulation, while lamp black and "Thermax" appear different enough to be distinguishable both with respect to their identify and their fineness. A uniform appearance of this granulation would suggest uniform dispersion, but microscopic analysis shows that frequently this is not so. By alternate pressing and warming thin sections, it is possible to obtain microsections which split in a way similar to mica, giving lamellas less than 0.001 mm. thick which appear to have been under different tensions. Such a structure may be obtained in a particularly effective way by mixing on a mill pale crepe and crepe contg. gas black, under which conditions the laminated structure becomes finer with the time of milling, but regardless of the time of milling, the mixt. fails to become homogeneous, alternate lamellas of the 2 components remaining visible. C. C. DAVIS

Coagulation phenomena in Hevea latex. VII. Phenomena in alkaline latex. OTTO DE VRIES AND N. BEUMÉE-NIEUWLAND. *Arch. Rubbercultuur* 12, 454-64(1928). (In English 465-71); cf. C. A. 22, 698.—The power of coalse to coalesce flocks in B-mixt. is destroyed not only by heating, by disinfectants and by acidifying to the 2nd liquid zone (cf. C. A. 18, 482; 19, 419) but also by making the

latex alk. Fresh undild. latex loses its coalescing power immediately by the addn. of 0.4 *N* NH_4OH or 0.04 *N* NaOH , and the addn. of 0.1 *N* NH_4OH or 0.35 *N* NaOH destroys its coalescing power in approx. 1 hr. Acidification of the mixts. shortly after addn. of the alkali only partly restores the coalescing power. Accordingly latex preserved in the ordinary way with NH_3 has lost its coalescing power. With the aq. ext. from coagulum obtained with EtOH , the limits at which the coalesce is destroyed are at 0.15 *N* NH_4OH and 0.015 *N* NaOH . The coalesce in exts. is destroyed at a limit of p_{H} 8, both with NH_4OH and with NaOH . Around this limit the coalescing power is lost gradually, and the larger the dose the more rapid is this loss. The acidity of latex, its content of NH_4MgPO_4 , and other factors also influence these phenomena. Addn. of AcONa up to 10 g. per 100 cc. to dild. or undild. latex does not decrease the coalescing power, while the alky. increases only from p_{H} 6.4 to 7, i. e., fails to reach the limit of p_{H} 8 mentioned above. C. C. DAVIS

Preserving latex with borax. N. BEUMER-NIEUWLAND. *Arch. Rubbercultuur* 12, 441-52(1928). (Summarized in English 453).—Borax may be used as an anticoagulant, for which purpose 1.2-1.5 g. per l. of latex is recommended. As a preservative, at least 30 g. per l. must be used. With an addn. of 20-25 g. per l., decompn. of the latex is inhibited, but a layer of rubber seps. on the top and a marked odor of glue becomes evident, indicating that the latex has not been rendered completely stable. Latex contg. borax has a lower viscosity than the corresponding latex without borax. Rubber prepd. from latex preserved with borax dries more slowly than rubber made under the same conditions but without borax. When latex is treated with borax and then kept for different times before coagulation, the rate of vulcanization of the rubber is slower than the corresponding rubber without borax up to about 2 weeks of preservation before coagulating. After allowing latex to stand over 2 weeks before coagulation, the rate of vulcanization of the rubber increases again until it eventually approaches the normal rate. In a similar way, the viscosity of rubber from latex contg. borax is lower than rubber from latex without borax, provided that the rubber is coagulated within a few days after addn. of the borax. If the latex is kept a long time with borax before coagulation, the viscosity of the resulting rubber increases until it reaches that of rubber from latex contg. no borax. Rubber prepd. from latex contg. borax is more plastic than the corresponding rubber from latex without borax. C. C. DAVIS

Chemical analysis applied to the selection of Hevea. A. W. K. DE JONG. *Arch. Rubbercultuur* 12, 472-501(1928). (Summarized in English 502-3).—The expts. represent the beginning of a systematic attempt to develop a method for foreseeing the yield and the quality of rubber from a given *Hevea* tree. Extn. of the blades of leaves with C_6H_6 and detn. of the rubber content showed very little difference between trees with a high yield and those with a low yield. Rubber extd. in this way from the stalks contained only about 80% hydrocarbons and the product oxidized easily, in fact accelerated the oxidation of crepe rubber, resembling the product obtained by exposing rubber solns. in quartz vessels. From the acetone and alc. exts. of the leaves a cryst. substance which m. 278-80° was obtained. Antioxidants are also present in the leaves. C. C. DAVIS

Extraction of gutta-percha leaf. A. W. K. DE JONG. *Arch. Rubbercultuur* 12, 540-55(1928). (Summarized in English 556-7).—Gutta-percha cannot be obtained by mech. methods from fallen leaves. The latter have the highest content of gutta-percha, and so expts. were started to det. whether a relatively pure product can be obtained by extn. of the fallen leaves. In preliminary expts., the addn. of the antioxidant of rubber to trunk gutta and to leaf gutta increased the resistance of the former to heating up to 90-100° but not that of the latter. By extn. with EtOH and then with acetone (to which leaf antioxidant had been added), or by extn. with C_6H_6 to which leaf antioxidant was added, a product was obtained which was extremely durable when heated up to 90-100°. When the powd. leaf was first boiled in AcOEt , and then extd. with C_6H_6 , a product was obtained which even without the addn. of an antioxidant was extremely durable when heated up to 90-100°. This indicates that the antioxidant is not extd. by AcOEt , though upon purification of the antioxidant ext. of the leaf by AcOEt , the greater part dissolved. When purified with acetone or EtOH , the C_6H_6 and benzine exts. of fallen leaves showed antioxidant power. Purification with AcOEt at normal temp. gave a product with little durability, and dry heating of the benzene ext., if already purified, gave a readily oxidizable product. For extn. on a large scale this method cannot therefore be used, but it is possible that a successful method would comprise purification of the powd. leaf with EtOH with addn. of antioxidant, and subsequent extn. with C_6H_6 or benzine contg. antioxidant. C. C. DAVIS

Sodium fluosilicate [in the production of raw rubber]. N. H. VAN HARPEN. *Arch.*

Rubbercultuur 12, 423-31(1928). (In English, 432-40); cf. van Dillen, Knaus, Kraay and Riebl, *C. A.* 22, 2682; van Harpen, *C. A.* 22, 1928.—A comparison of crepes made with the use of HCO_2H and Na_2SiF_6 , resp., as coagulants showed that Na_2SiF_6 gives the better colored crepe. Where the differences were small and close comparisons had to be made, it was found that the Lovibond tintometer was especially good, 0.5 g. of rubber being dissolved in 10 cc. of xylene. The quality of the crepe made with Na_2SiF_6 was as satisfactory as that with HCO_2H , for though the viscosity was lower and the tackiness greater, these were not abnormal. The rate of vulcanization, tensile strength and slope were normal. Na_2SiF_6 can be used as a coagulant for rubber for sole crepe, the properties of the latter being fully as satisfactory as sole crepe made under similar conditions but with HCO_2H . Further expts. show that an appreciable loss of rubber is not to be feared when Na_2SiF_6 is used as a coagulant, in fact with latex with a 20% rubber content a higher final wt. may be obtained because of greater absorption of smoke. This greater absorption probably depends upon the greater softness of the coagulum obtained by coagulation with Na_2SiF_6 . The low susceptibility to molds of sheet rubber prep'd. with Na_2SiF_6 , attributed by certain investigators to the influence of the Na_2SiF_6 , is probably a result of the greater absorption of disinfectant components in the smoke.

C. C. DAVIS

A new rubber dough and solution mixer. ANON. *India Rubber J.* 76, 536(1928).—A new mixer (made by Baker, Perkins, Ltd., Peterborough, England) is described and illustrated, the most novel features of which are a pair of horizontal blades sufficiently powerful to allow the use of unmilled rubber and a special feed pump which controls the quantity of solvent and its rate of addn. It is made in capacities of 22, 44 and 110 gals.

C. C. DAVIS

Proportion of sulfur to be added to diphenylguanidine mixtures. W. B. WIEGAND. *Kautschuk* 4, 156(1928).—Comments on a paper by Esch (cf. *C. A.* 22, 2492). The optimum proportion of S to be used in mixts. with diphenylguanidine as accelerator depends not only upon the general character of the mixt. but depends specifically upon the proportion of diphenylguanidine.

C. C. DAVIS

Proportion of sulfur to be added to diphenylguanidine mixtures. WERNER ESCH. *Kautschuk* 4, 157(1928).—A reply to Wiegand (cf. preceding abstr.).

C. C. DAVIS

Important observations on rubber mixtures containing gas and lamp blacks. WERNER ESCH. *Gummi-Ztg.* 43, 75 8(1928).—Various expts. are described which show the difference between gas blacks and lamp blacks in rubber mixts. The superiority of the gas blacks was so marked that it was possible to replace a considerable proportion of new rubber by reclaimed rubber and still have the quality of the mixts. contg. the reclaimed rubber and gas black as good as the corresponding mixts. with new rubber and lamp black. In a series of mixts. where new rubber was replaced progressively by reclaimed rubber and the other ingredients, including the gas black, altered so that theoretically the same formula was maintained, the quality of the vulcanized mixts. became progressively poorer as the reclaimed rubber content increased.

C. C. DAVIS

The two accelerator effect. F. ANDERSON. *Trans. Inst. Rubber Industry* 4, 194-7 (1928).—A review and discussion of papers by Naunton (*C. A.* 20, 3098), Martin and Davey (*C. A.* 17, 2203), Dinsmore and Zimmermann (*C. A.* 20, 1004) and Whithy and Cambron (*C. A.* 17, 3808), and patents of Weiss (U. S. Patents 1,521,739 and 1,546,876; cf. *C. A.* 19, 909, 2886) and Murrill (U. S. Patents 1,436,894 and 1,453,515; cf. *C. A.* 17, 652, 2204).

C. C. DAVIS

The manufacture of reclaimed rubber. N. BAN. *Kautschuk* 4, 193-4(1928).—A review, dealing with the present economic situation and methods of judging the quality of reclaimed rubber.

C. C. DAVIS

The development of rubber reclaiming since the war and its importance in the economics of rubber. II. PAUL ALEXANDER. *Gummi-Ztg.* 42, 2847-8(1928); cf. *C. A.* 22, 4870.—A general discussion, dealing chiefly with production.

C. C. DAVIS

Heat transmission. COLIN MACBETH. *Trans. Inst. Rubber Industry* 4, 137-47 (1928).—A review and discussion dealing with the importance of heat transmission in the rubber industry, including the part it plays in softening rubber preparatory to washing, washing rubber, drying washed rubber, masticating rubber, mixing, calendering, spreading and vulcanization by various methods. A general discussion follows the paper.

C. C. DAVIS

The absorption of light by stretched and by unstretched rubber and by isoprene. M. KRÖGER AND H. STAUBE. *Univ. Leipzig. Gummi-Ztg.* 43, 22, 24(1928); cf. *C. A.* 22, 3066.—The absorption of ultra-violet light by isoprene, isoprene rubber, unstretched and stretched raw and vulcanized rubber was measured by means of a quartz spectro-

graph to ascertain in what way the absorption of light is dependent upon the state of tension. In all cases the transparency of the stretched rubber samples was greater than that of the unstretched samples, especially with stretched membranes. The transparency of artificial rubber was greater than that of isoprene of the same thickness. Vulcanized rubber had very little transparency. The transparency was judged by the beginning of continuous absorption, not by individual absorption bands. The transparency of stretched raw or slightly vulcanized rubber membranes to ultra-violet light makes possible the manuf. of rubber lenses for ultra-violet radiation, in which case the lenses could be made as a cell contg. water or alc. C. C. DAVIS

Standard methods of analysis of rubber goods. A. E. LEIGHTON. *Australia Dept. of Defence Munitions Supply Board*, May 1926, 11 pp.—A procedure which involves standard methods is outlined for the analysis of rubber goods, including the prepn. of the sample, and detn. of the AcMe, CHCl_3 and alc. KOH exts., free S, total S (inclusive and exclusive of BaSO_4), ash, insol. ash, Pb, Sb, Sb in ash, Fe and Al, Zn, Ca and Mg, Mg, S in ash, BaSO_4 , BaCO_3 and rubber hydrocarbons. C. C. DAVIS

The manufacture of hard rubber dust. MAX RATHKE. *Gummi-Ztg.* 42, 2688-9 (1928).—A description of present developments. C. C. DAVIS

Process for rubberizing fabrics containing copper and manganese. ERICH WURM. *Gummi-Ztg.* 42, 2476-7 (1928).—The patented process of Esch (cf. German Patent 461,134) has no practical importance, and may lead to disastrous results in manuf. C. C. DAVIS

Process for rubberizing fabrics containing copper and manganese. WERNER ESCH. *Gummi-Ztg.* 42, 2477-8 (1928).—An answer to Wurm (cf. preceding abstr.). C. C. DAVIS

Process for rubberizing fabrics containing copper and manganese. ERICH WURM. *Gummi-Ztg.* 42, 2580-1 (1928).—Answer (cf. preceding abstr.). As judged by tests in air at 70° , rubber vulcanized with tetramethylthiuramdisulfide deteriorates rapidly if treated with Cu salts before vulcanization, but if treated after vulcanization their deterioration is normal. C. C. DAVIS

Molded rubber goods. R. CLARK. *Trans. Inst. Rubber Industry* 4, 186-9 (1928).—A discussion of current problems. C. C. DAVIS

Rubber as a floor covering. J. KIRKWOOD. *Trans. Inst. Rubber Industry* 4, 148-60 (1928).—A general review and discussion of present developments, including the various ingredients used and their characteristic effects, and the methods of manuf. of different types of flooring. A general discussion follows the paper. C. C. D.

Some experiments on the manufacture of rubber road blocks. J. G. FOL AND F. C. VAN HEURN. Gov. Rubber Inst., Lab. Building Materials and Lab. Tech. Botany, Delft. *Bull. Rubber Grower's Assoc.* 10, 608-20 (1928).—A new type of paving block is described which consists of a base of hard rubber, which may contain stone or sand, on which is superposed a resilient cap for the wearing surface. This cap may be vulcanized on the hard base by an intermediate semi-hard layer. The base material can be made by addn. of the stone to the uncured mixt. or by the Cresson method, using latex (cf. Brit. Pat. 191,474; C. A. 17, 3084). Various phys. tests of blocks made by different methods and of different compns. are described. The use of ordinary rubber mixts. instead of latex is preferable because (1) the drying operation is avoided; (2) more nearly homogeneous mixts. are obtained; (3) ingredients impossible to use in latex can be used, and (4) low-grade rubbers can be used. Typical formulas for the base, intermediate and surface layers which have given particularly good results are shown, and the technic for the construction and vulcanizing is described. C. C. D.

Rubber solvents, varnishes and coatings. R. ASSMAN. *Farbe u. Lack* 1928, 396, 411, 426-7.—Among the newer solvents for rubber are ethylene dichloride and tetrachloroethane. When 100 g. rubber are treated with 2.5 l. solvent, ethylene dichloride, tetrachloroethane and chloroform dissolve 99.5, 75.6 and 74.9%, resp. Hydrogenated naphthalenes are relatively cheap and several formulas using them are given. Their chief advantage are favorable evapn. rates. A typical formula is 1 kg. of rubber fused in 2 kg. of rosin, to which are added 1 kg. of linseed oil and 1 kg. of tetralin or hydroterpin. A short review of English and German patents of products similar to "Thermoprene" is given. G. G. SWARD

The question of priority for the discovery of thermoplastic products from rubber, which resemble gutta-percha, balata and shellac, and their systematization. F. KIRCHHOFF. *Kautschuk* 4, 142-9 (1928).—A crit. review of the literature shows that the gutta-percha or shellac-like products obtained by Fisher from raw rubber by treatment with H_2SO_4 and sulfonic acids (cf. C. A. 21, 195; 22, 887, 2291) are essentially the same products which have previously been described by Harries (cf. C. A. 14, 1908)

and by K. (cf. C. A. 15, 960; 16, 1885; *Kautschuk* Jan. 1926; Austrian Patents 90,775 (1921) and 93,480 (1922)). Priority for the discovery of sulfo-rubbers is therefore with the German investigators. From the technical point of view the application of these substances (cf. Canadian Patent 256,567 (1925); U. S. Patent 1,805,180 (1926)) represents important progress, since the use of solvents is avoided. Thermoplastic substances in general are discussed, an attempt being made to classify these substances in 4 groups, according to their method of prep'n. and the reagent used: (1) *sulfo-cyclorubbers*, comprising the H_2SO_4 -rubbers of Harries and of Kirchhof and the sulfonic acid-rubbers (thermoprenes) of Fisher; (2) *thermocyclorubbers*, comprising the mono-cyclorubber of Harries and the hydro-cyclorubber and the poly-cyclorubbers of Staudinger; (3) *photo-cyclorubbers* of Porritt and of Asano, and (4) *contact-polymer rubbers*, comprising the metallic halide-rubbers of Bruson and the Cl_2CCO_2H -rubber of the B. F. Goodrich Co. The methods of prep'n., phys. and chem. properties and probable chem. constitution of these substances are tabulated. C. C. DAVIS

Pressure vulcanization. F. H. AMENDE. *Trans. Inst. Rubber Industry* 4, 170-80 (1928).—A general review and discussion dealing with the historical aspects and with different types of vulcanizers. Diagrams and graphs are included. A general discussion follows the paper. C. C. DAVIS

Vulcanization problems. ALFRED A. PERKS. *Trans. Inst. Rubber Industry* 4, 123-36 (1928).—A review and discussion dealing with the dispersion of S in rubber, temps. used for vulcanizing, thermal characteristics of vulcanization, operation of vulcanizers, conditions to be satisfied during vulcanization, curing in different types of vulcanizers, varying degrees of cure depending upon the size of the product, and times of vulcanization. A general discussion follows the paper. C. C. DAVIS

The vulcanization of rubber. NICHOLAS BACON. *India Rubber J.* 76, 459-64, 504-7, 542-5 (1928).—See C. A. 22, 3804. C. C. DAVIS

The vulcanization of rubber with metallic sulfides and an ultra-accelerator. TAKEJI YAMAZAKI. *J. Soc. Chem. Ind. Japan* 31, 165B (1928); *Gummi-Ztg.* 43, 190.—The expts. deal with the influence of ZnS , $(NH_4)_2S$, PbS , CdS , Al_2S_3 and As_2S_3 on the vulcanization of mixts. contg. an ultra-accelerator. It was assumed that the presence of an ultra-accelerator would, in conjunction with the small proportion of free S in the sulfide, be capable of inducing vulcanization. Seven mixts., contg. besides smoked sheets 100, and diethylaminodiethylthiocarbamate 2, the following quantities of ZnO and sulfide, were prep'd.: (1) ZnO 30; (2) ZnO 10, ZnS 20; (3) ZnO 20, $(NH_4)_2S$ 10; (4) ZnO 10, PbS 20; (5) ZnO 10, CdS 20; (6) ZnO 10, Al_2S_3 20; (7) ZnO 10, As_2S_3 20. The mixts. were heated 30 and 110 min. at 3 atm. Mixts. (1), (3) and (6) were not cured at all, mixts. (2) and (4) were partly cured, and mixt. (5) was definitely cured. Of the sulfides which had led to a certain degree of cure, the ZnS contained 2.33% free S, PbS 0.02% free S and CdS 1.60% free S. When the CdS was first extd. with acetone, the vulcanizate had extremely poor phys. properties. Conclusion: The phys. properties of the 6 vulcanizates depended chiefly upon the proportion of free S in the metallic sulfides and only to a small extent on the metallic sulfide itself. The samples of mixts. contg. a sulfide which were thoroughly cured contained about the same proportion of free S as mixt. (1) contg. no sulfide, though their phys. properties were different. C. C. DAVIS

The discoloration of zinc oxide during vulcanization. J. A. ROBERTSON. *Trans. Inst. Rubber Industry* 4, 190-3 (1928).—Experience has shown that when ZnO is darkened by H_2S it also darkens during vulcanization, but no systematic expts. on this problem are on record. This induced a closer examn. of the problem. Samples of ZnO contg. 0.16, 0.20 and 0.013% PbO , resp., all darkened to the same extent when exposed to H_2S or when heated in a rubber-S mixt. After extn. with water and drying, the first 2 samples darkened still more, whereas the 3rd sample was unaffected. Pure $PbSO_4$ was, when dry, unaffected by H_2S , but when moist it was darkened, probably because of the equil. reaction: $PbSO_4 + H_2S \rightleftharpoons PbS + H_2SO_4$, in which case removal of the H_2SO_4 would result in complete conversion of the $PbSO_4$. Two intimate mixts. of ZnO and $PbSO_4$: (1) a thin paste dried, and (2) a dry-ground mixt., were each treated with H_2SO_4 . Only mixt. (1) darkened, probably because while wet the following reaction takes place: $PbSO_4 + Zn(OH)_2 \rightleftharpoons 2ZnSO_4 + PbO \cdot H_2O$. The same relative effects were obtained after the mixts. had been ignited. Samples of basic Pb sulfate were darkened by H_2S . $ZnSO_4$ is very difficult to ext. from ZnO , suggesting that it is not present as such, but is formed by the water from $Zn(OH)_2$ and $PbSO_4$. Mixts. of ZnO and $PbSO_4$ and of ZnO and PbO (in the same proportions) were brought to equil. in water. The filtrate from the ZnO - PbO mixt. contained considerable Pb , whereas that from the ZnO - $PbSO_4$ mixt. contained almost

none. Absence of Pb in filtrates from samples of com. ZnO depends therefore upon the fact that after treatment with water it is present as basic Pb sulfate and not as PbO. The expts. indicate that darkening of ZnO by H₂S results from the actions of the latter on basic Pb sulfate, and that in com. ZnO the Pb is present chiefly as PbSO₄ with traces of basic Pb sulfate and PbO. By treatment of com. ZnO with water, PbSO₄ is converted into basic Pb sulfate, which is darkened by H₂S. This change is so easily brought about that exposure of com. ZnO to air soon makes it susceptible to darkening by H₂S in virtue of the atm. moisture. C. C. DAVIS.

The effect of flour in rubber mixtures vulcanized with sulfur. RUDOLF DITMAR. Kautschuklaboratorium Graz. *Gummi-Ztg.* 43, 191(1928).—Expts. show that various flours, including wheat, rye, barley, oat, corn, buckwheat, rice, bean, pea and potato flour, are excellent plasticizing agents, their plasticizing power depending upon the particular flour and its fineness. As a result, flours facilitate the mixing of fillers, particularly high proportions of gas black. They are suitable for various mixts. provided they are not vulcanized at too high a temp., decompn. of the flour occurring above a certain range. This renders ultra-accelerators particularly useful when flour is used. The unfavorable effect of flours on the aging of vulcanized mixts. can be completely overcome with preservative agents (antioxidants). Flour is unsuitable for use in mixts. vulcanized with S₂Cl₂. C. C. DAVIS

Rubber-proofing of fabrics (MUNRO) 25. Determining total solids [in latex] (KRAUSE) 7. Developments in machines for testing fibers, yarns and fabrics [rubber] (SCOTT) 25. Single texture proofing (RYDINGS) 25. Fossil rubber bark in ancient brown coal (GOTHAN) 8. Electric conduction in hard rubber (RACE) 4. S in highly dispersed form [for rubber compositions] (U. S. pat. 1,688,357) 18. Molds for plastic materials [rubber] (Fr. pats. 638,010 and 638,008) 18.

Stabilized latex containing blood protein. MORGAN R. DAY (to Rubber Latex Research Corp.). U. S. 1,689,581, Oct. 30.

Softening and preventing aging of rubber. G. FESSLE and TECHNISCHE CHEMIE-KALIEN Co. GRS. Brit. 286,171, Sept. 21, 1927. A softening and "anti-aging" ingredient for use in the manuf. of rubber goods is prepd. by extg. the phenolic constituents and aromatic bases contained in tar produced by the distn. of coal, lignite, shale or peat, or in distillates from such tars, and subsequently removing any undesirable light oils. "Methylated spirits," MeOH, EtOH, acetone or EtOAc or their mixts. which may be dild. with water are suitable solvents and soda lye and C₂H₅ may also be used in some cases. The oils obtained are preferably heated to 135–50°, allowed to cool and then added to rubber mixings or scrap rubber in the proportion of 5–10%.

Roller apparatus for mixing and sheeting rubber. L. GRAFFE. Brit. 285,712, June 22, 1927.

Rubber-mixing apparatus. FERNLEY H. BANBURY (to Farrel-Birmingham Co.). U. S. 1,689,990, Oct. 30.

Preserving rubber. L. B. SEBRELL (to Goodyear Tire & Rubber Co.). Brit. 286,288, March 3, 1927. The aging qualities of rubber are improved by adding to the mixt. before vulcanization, a reaction product of an aldehyde and an amine (such as the product from aniline and acetaldehyde) which is formed in a cold reaction mixt. and is not an active vulcanization accelerator. Cf. C. A. 22, 3551.

Preserving rubber articles during storage. THOMAS M. RECTOR (to Vitapack Corp.). U. S. 1,688,355, Oct. 23. Inner tubes for tires or other closed rubber articles are filled with N, CO₂ or other inert gas and also surrounded by inert gas within a sealed container which may be made of sheet metal.

Deposition of rubber. SOCIÉTÉ DU CAOUTCHOUC "ANODEX." Fr. 638,504, Nov. 27, 1926. A partition of glass or ceramic material or cloth is placed between the cathode and the support for the electrophoretic deposition of rubber to keep the rubber free from gas bubbles formed at the cathode. Cf. C. A. 22, 3551.

Reinforced hard rubber. WM. B. WESCOTT (to Rubber Latex Research Corp.). U. S. 1,689,570, Oct. 30. In forming a material suitable for battery jars, insulation, etc., comminuted hard rubber is admixed with disintegrated partially cured rubber, S, fiber such as reclaimed cotton, and with rubber latex, and the mixt. is dried, molded and vulcanized.

Bonding rubber to metal. HAROLD GRAY (to B. F. Goodrich Co.). U. S. 1,689,628, Oct. 30. A vulcanizable rubber compn. is superposed on steel or other metal with an interposed film comprising S chloride in direct contact with the metal and vulcanizing is effected by heating at a usual vulcanizing temp. Cf. C. A. 22, 3318.

Rubber articles. "COGEDEX" COMPAGNIE GÉNÉRALE D'EXPLOITATION. Fr. 638,304, July 27, 1927. The rubber gum, after incorporation of the S and fillers, is put directly into the mold for vulcanization.

Rubber articles formed by dipping. DUNLOP RUBBER CO., LTD., and D. F. TWISS. Brit. 285,938, Oct. 22, 1926. Before dipping a mold in latex compn. or the like, the mold is first coated with gelatin or the like contg. a coagulant such as Na fluosilicate, HOAc, or a salt of Ca, Mg, Zn or Al. The mold or bath is agitated to make the deposit more uniform.

Molded rubber articles formed by dipping. ANODE RUBBER CO., LTD. Brit. 285,844, Feb. 23, 1927. The mold is heated during the intervals between successive dippings in a dispersion of rubber, and may also be heated during the dippings, *e. g.*, by a circulating heating fluid or by elec. current.

Molded articles of cork and rubber composition. RAOUL GRIMOIN-SANSON and HERMAN DANIEL. U. S. 1,688,491, Oct. 23. Tires, tire treads or other molded vulcanized articles are formed of a mixt. comprising rubber, powd. cork, emery and a vulcanizing agent.

Rubber threads, tapes and strips. INDIA RUBBER, GUTTA PERCHA & TELEGRAPH WORKS CO., LTD., AND E. J. SMITH (known as E. J. Edgar). Brit. 286,066, Feb. 10, 1927. A sheet of unvulcanized rubber is applied to a supporting surface such as tin-foil to which it will lightly adhere after vulcanization, is vulcanized, cut into threads or strips, and then stripped from the supporting surface. An app. is described.

Plastic moldable composition containing rubber. CARL KULAS. U. S. 1,688,500, Oct. 23. A mixt. of comminuted rubber and dissolved "resol" (an initial condensation product of CH_2O and phenol) is rapidly calendered to expel volatile constituents and render the mass homogeneous, the latter is seasoned at a moderate temp. (suitably about $30-40^\circ$) which is maintained const. during the seasoning and the material is dried. It is suitable for *elec. insulation*, etc.

Treating waste rubber. RHEINISCHE GUMMI- UND CELLULOÏD-FABRIK. Fr. 638,396, July 28, 1927. Waste rubber is powdered and added to a non-volatile nitro-cellulose solvent such as triphenolphosphate, palatinol, acetanilide, ethylacetanilide or plastol, which lowers the m. p. of the camphor contained in the rubber, after which the mass is submitted to heat and pressure.

Composition for sealing punctures in pneumatic tires. ERNEST E. BOARD. U. S. 1,690,051, Oct. 30. A mixt. is formed from bran 1, flaxseed meal 1, corn sirup 2 parts, and 2 parts of an anti-freeze soln. contg. CaCl_2 27.5%, and K chromate 1 part, with water to make a pasty compn. suitable for introducing into a tire.

Rubber substitute. LOUIS LAURIN. Fr. 638,559, Dec. 11, 1926. An elastic compd. which may be used for pneumatic tubes, etc., is made from chrome-tanned colloids with which a double sulfate of Al and K, glycerol and, if necessary, formol are combined. In an example 100 parts of gelatin, 5 of $\text{K}_2\text{Cr}_2\text{O}_7$, 2 of the double sulfate, 80 of water, 90 of glycerol and 3 of formol are used.

Synthetic rubber. I. G. FARBENIND. A.-G. Brit. 286,272, March 2, 1927. Polymerization of hydrocarbons such as isoprene, butadiene and dimethylbutadiene is effected in an aq. colloidal soln. soln. or suspension contg. one or more electrolytes (which may in general be acids, bases or salts, either inorg. or org., with good elec. conductivity), either in the presence of O, ozone or substances which produce them or in an inert atm. such as N or CO_2 ; *e. g.*, dimethylbutadiene is agitated with egg albumin and Na phosphate in water at a temp. of 80° . Numerous other examples are given. Cf. C. A. 22, 4274.

Vulcanizing rubber. CECIL J. T. CROMSHAW and W. J. S. NAUNTON (to British Dyestuffs Corp., Ltd.). U. S. 1,687,861, Oct. 16. Di-xylylguanidine is used as an accelerator.

Vulcanizing rubber. WINFIELD SCOTT (to Rubber Service Laboratories Co.). U. S. 1,688,755, Oct. 23. A vulcanized product of good "age resisting" properties is obtained by heating rubber and S together in the presence of a reaction product of guanidine or a diaryl-substituted guanidine and hydroquinol or other hydroxy deriv. of benzene. U. S. 1,688,756 specifies the use of *p*-dimethylaminophenyl-*p*-phenetidyl guanidine as a vulcanization accelerator. U. S. 1,688,757 specifies the use of *p*-dimethylaminodiphenylguanidine and U. S. 1,688,758 specifies *p*-dimethylaminophenyl-*o*-tolylguanidine.

CHEMICAL ABSTRACTS

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No. 2

1—APPARATUS AND PLANT EQUIPMENT

W. L. BADGER

A laboratory apparatus with a conductometric indicator for studying saturation and filtration. VL. STANĚK AND K. SANDERA. *Listy Cukrovar.* 47, 33-7(1928).—A description. FRANK MARESH

Vacuum tubes as oscillation generators. D. C. PRINCE AND F. B. VOGDES. *Gen. Elec. Rev.* 31, 678(1928). C. G. F.

A new iodosobenzene (iodoso-iodoxybenzene) electrode for the determination of p_{OH} and of p_{H} . FELIX GROSSMAN. *Bull. soc. chim.* 43, 1063-72(1928).—See C. A. 22, 4111. E. H.

A new electrical instrument for marking various objects, notably of rubber, and its application to vulcanization. L. GRAND. *Caoutchouc & gutta-percha* 25, 14195(1928).—The marker is of special alloy and can be heated electrically and const. temps. from 40° to 800° can be obtained. C. C. DAVIS

Electric water heating. H. C. WILDER, *et al.* *Elec. World* 92, 1039-41(1928).—Results are recorded of 2 yrs.' study of American and European low-wattage, high-storage-capacity elec. heaters. C. G. F.

Control of the moisture content of air in industrial driers. ANON. *Apparatebau* 40, 233-4(1928).—Description of the "Ranarex" app. J. H. MOORE

Improvements in the method of Hempel-Drehschmidt. H. VAN DAM. *Ing. chim.* 16, 124-7(1928).—A description of an apparatus permitting the use of numerous absorbents for gas analysis. P. THOMASSET

Method for heating liquids containing ether. BIRYUKOV AND PODSHIVALIN. *Masloboino Zhirovoe Delo.* *Oil & Fat Ind.* (Russia) 1928, No. 1, 19-20.—Elec. resistance elements calcd. to produce a temp. of 100° to 105° are used for drying ovens and elements calcd. for 45-50° for extractors. The elements are completely enclosed. Air is circulated and heated to about 100-105° in drying ovens and a water bath is provided for extrn. flasks. All fire hazards are eliminated by this arrangement. A. A. B.

The classification of acetylene generators. ALFRED SCHROEDER. *Acetylen in Wissenschaft u. Ind.* 31, 49-54, 68-9, 115-6(1928).—A discussion and improved scheme of classification of the various types, based on operating principles. F. S. GRANGER

Simple and low-cost gas-pressure regulator. L. MULLER. *Compt. rend. soc. biol.* 99, 1065-8(1928).—The construction and operation of the app. are illustrated and described. L. W. RIGGS

The significance of the surface for the escape of steam in evaporators. HANS MELHARDT. *Chem. App.* 15, 181-3, 210(1928).—Several types of evaporators are shown with tables showing the surface area of the soln., the amt. of steam, the vol. per unit of surface area and the speed of escape at given pressures. J. H. MOORE

Calculation of the allowable stresses in the walls of vessels manufactured from plates of wrought iron, steel, copper and aluminum. HANS MELHARDT. *Chem. App.* 14, 249-51, 263-5(1927); 15, 4-6, 15-8, 37-9, 63-6, 87-9, 110-3, 136-9, 147-50, 171-3, 207-10, 243-6(1928).—Summary of the regulations on materials and construction of stationary boilers by the German steam boiler committee, with 10 cuts, 2 charts, 15 tables and many mathematical formulas. J. H. MOORE

The fodder value of dried grass [drying apparatus] (SUTTON) 12.

Thermometers. FRITZ HÖRNIG. Ger. 466,474, Apr. 23, 1926. A max. thermometer has a rigidly fixed ball at the top of the reservoir, just below the base of the capillary tube, to retain the column in its highest position until shaken.

Thermometers. FIRMA DR. HEINRICH GLOCKEL AND CURT BUNGE. Ger. 466,473, Apr. 13, 1927. An addnl. column of liquid with a special scale is provided on top of

the usual expanding column so that the readings can be taken without removing the expansion liquid from the medium under observation.

Distance type thermometer and corrugated capillary tubing suitable for use with same. HERMAN SCHLAICH. U. S. 1,691,133-4, Nov. 13. U. S. 1,691,135-6 also relate to structural features of thermometers.

Pyrometer construction. REPUBLIC FLOW METERS CO. (Electroflo Meters Co., Ltd.). Brit. 288,105, Nov. 4, 1927.

Pyrometers. HARTMANN & BRAUN A.-G. Ger. 466,476, Dec. 25, 1926. A heat radiation pyrometer is provided with a compensating arrangement to enable it to be adjusted for the temp. of the room.

Refractometer for oils or ether liquids. W. EVERITT. Brit. 286,753, Nov. 9, 1926.

X-ray apparatus. MONTFORD MORRISON. U. S. 1,690,906, Nov. 6.

X-ray spectrograph. ALEXANDRE DAUVILLIER. Fr. 637,650, Nov. 17, 1926. An x-ray spectrograph is described which can be used for the spectral analysis of x-rays of short wave length, and of medium wave length and cryst. analysis.

Electron-discharge device. HARVEY C. RENTSCHLER (to Westinghouse Lamp Co.). U. S. 1,691,446, Nov. 13. An electron-emitting cathode is coated with an alk. earth metal carbonate, the plate and cathode are sealed in an envelope which is then evacuated, and the filament is then heated to decomp. the coating to oxide and while the filament is still heated a metallic "clean-up agent" such as "misch metal" is vaporized within the envelope.

Household filter. HENRY A. VALLEZ (to Vallez Rotary Filters Co.). U. S. 1,690,958, Nov. 6.

Tap filter for liquids. A. HALES. Brit. 287,351, May 17, 1927.

Continuous pressure filter. CHARLES ST. C. BURNS (one-half to Foist Kay). U. S. 1,691,867, Nov. 13.

Rotary vacuum drum filter with associated pressure rolls. RECKITT & SONS, LTD., AND E. H. HALL. Brit. 287,725, April 7, 1927.

Air filter with a rotatable drum. HANS E. BIRKHOLZ (to National Air Filter Co.). U. S. 1,690,813, Nov. 6.

Filter (of nested metal sleeves) for preventing backfiring in oxy-acetylene burners, etc. W. LITZ. Brit. 287,530, March 23, 1927.

Spiral filter for oil, etc. MARSHALL H. WARD (to Motor Improvements, Inc.). U. S. 1,690,564, Nov. 6.

Rotary filter for slurry, etc. R. A. ELTON. Brit. 287,694, Feb. 25, 1927.

Rake gear for sand and similar filters. C. R. B. BROWN. Brit. 287,692, Feb. 23, 1927.

Device for separating suspended particles from gases. OTTO HUBMANN (to Metallbank & Metallurgische Ges. A.-G.). U. S. 1,690,635, Nov. 6.

Apparatus for separating suspended particles from steam or other flowing gases by whirling or centrifugal action. HAGAN CORP. (J. Gordon & Co., Ltd.). Brit. 286,853, Feb. 9, 1927.

Device for separating dust from air currents by deflection. CHARLES A. WINSLOW AND ELBERT J. HALL. U. S. 1,691,536, Nov. 13.

Apparatus for separating suspended particles from a fluid stream. TIRAGE & VENTILATION MECANIQUE. Ger. 466,753, May 23, 1926. The stream is acted on by 2 oppositely directed vanes, the first forcing it against a sepg. wall arranged between the vanes.

Centrifugal apparatus for separating and washing solid substances. L. P. SHARPLES (to Sharples Specialty Co.). Brit. 287,056, March 12, 1927.

Centrifugal strainer for removing solids from various sludges. E. C. ELSMORE, H. J. HOLFORD and A. BISHOP. Brit. 286,855, Feb. 10, 1927.

Apparatus for separating solvents such as gasoline from sludges by treatment with water and sedimentation. BENJAMIN L. HARRISON. U. S. 1,691,000, Nov. 13.

Centrifugal apparatus for separating coal and "slime water" or other materials. A. KITTNAR (to Maschinenbau-Anstalt Humboldt). Brit. 287,442, March 18, 1927.

Apparatus for separating and classifying coal, pigments or other powdered or granular substances by action of air currents. R. LESSING. Brit. 287,262, Jan. 11, 1927.

Reciprocating table and air supply system for separating materials of different densities. R. PEALE, W. S. DAVIES and W. S. WALLACE. Brit. 287,184, Sept. 13, 1926. Air is forced up through material on a pervious reciprocating table.

Apparatus for gravity separation of oil and water or other liquids of different specific

gravities. WILLIAM G. G. P. LUMSDEN (to Rodway Stephens, *Liquidator*) U. S. 1,690,741, Nov. 6.

Apparatus for gravity separation of oil and water or other mixed liquids of different specific gravities. HENRY S. HELB-SHAW and ALBERT BEALE. U. S. 1,690,537, Nov. 6.

Apparatus for separating mixtures of water with benzene, benzine, etc. PASSAVANT-WERKE G. M. B. H. Ger. 466,988, Nov. 22, 1924. The float and the valve of the float-valve regulating the admission of the mixt. to a sepg. vessel are arranged at opposite ends of a double-arm lever.

Apparatus for automatically discharging liquid from a chamber to air-purifying or other devices. G. MURRAY and V. O. SIMPKINS. Brit. 287,244, Dec. 18, 1926. Gas supplied from a pressure cylinder, by chem. action or by electrolysis, may be used to cause continuous or intermittent discharge of liquid.

Apparatus for evaporating salt solutions, cellulose waste lye or other liquids. AKTIEBOLAGET SVENSKA MASKINVERKEN and E. G. ERIKSSON. Brit. 286,982, Sept. 6, 1927. A heating medium such as steam is passed through a hollow device carrying disk-like members, the lower part of which dips in the liquid to be evapd. and which may be rotated.

Apparatus for revaporizing liquefied gases. STUDIEN-GES. FÜR GAS-INDUSTRIE. Brit. 287,909, March 29, 1927.

Apparatus for testing the damping capacity of materials. O. FÖPPL and E. PERTZ. Brit. 287,500, March 22, 1927.

Apparatus for determining the moisture content of paper webs or other materials. SAMUEL S. AMDURSKY. U. S. 1,690,155, Nov. 6. Air is passed over the material being tested after adjustment of the air to a definite humidity and the humidity of the air is detd. after the passage.

Apparatus for mixing food materials or other dry and liquid materials. LIONEL TRUE. U. S. 1,691,535, Nov. 13.

Apparatus for mixing fluids in definite proportions. H. GROECK and F. JORDAN. Brit. 287,070, March 11, 1927. A pump controlling the supply of one fluid is electrically controlled by the flow of the other fluid. Numerous details of construction are described.

Apparatus for pasteurizing liquids in bottles. F. C. HIPWELL and W. B. AUSTIN. Brit. 287,605, Nov. 29, 1926.

Pump for acids, milk, "petrol" or other liquids. R. C. CROSS. Brit. 287,267, Jan. 18, 1927.

Cooling mercury pumps. ALLGEMEINE ELEKTRICITÄTS-GESELLSCHAFT. Fr. 637,739, Jul. 16, 1927. The cooling fluid does not come in direct contact with the walls of the pump.

Colloid mills and method of operation. FREDERICK J. E. CHINA. U. S. 1,690,667-8-9, Nov. 6. A film of material is subjected to the disrupting action of closely spaced surfaces of the app., one of which at least rotates relative to the other.

Rotary drum mill for pulverizing coal or other materials. LOUIS C. BONNOT (to Bonnot Co.). U. S. 1,690,712, Nov. 6.

Apparatus for testing hardness of materials by impact. W. E. BROWN. Brit. 288,009, March 3, 1927.

Charging device for vertical kilns, etc. E. SOBEX. Brit. 286,956, July 15, 1927.

Charging means for shaft retorts, especially for gas producers. Soc. ANON. J. ET A. MOUSSIAUX ET FRÈRES. Ger. 466,963, Apr. 29, 1925. Constructional details are given.

Gas producers and similar apparatus portably mounted. STUDIEN-GES. FÜR GAS-INDUSTRIE. Brit. 287,486, March 21, 1927.

Rotary gas washer. ZSCHOCKE-WERKE KAISERLAUTERN A.-G. Ger. 466,754, June 8, 1926. Small, freely movable fillers are arranged within larger, movable and perforated fillers.

Coating and lining metal pipes with concrete and bitumen. W. R. HUME and HUME STEEL, LTD. Brit. 287,656, Jan. 10, 1926. Mech. features.

Drying apparatus. SIEMENS-SCHUCKERTWERKE A.-G. (Fritz Müller, inventor). Ger. 466,256, Sept. 15, 1925. A steam-heated drier for lignite and like substances has a safety valve in the steam inlet pipe.

Apparatus for drying or "smoldering" loose material. OTTO DOBBELSTEIN. U. S. 1,690,444, Nov. 6.

Apparatus for drying granular materials by passing upwardly through a heater suspended in a gas. O. SÖDERLUND, T. GRAM and TECHNO-CHEMICAL LABORATORIES, LTD. Brit. 286,743, Oct. 7, 1926.

Electric conductor for sealing in hard glass. WM. BENJAMIN GERO (to Westinghouse Lamp Co.). U. S. 1,691,426, Nov. 13. An alloy of W 80 and Mo 20% is used.
 Device for pressure and temperature control. J. H. REINEKE. Brit. 286,742, March 11, 1927.

Steam tube heating system for digesters. H. KOCK and R. QUITT. Brit. 286,955, July 15, 1927.

Heat-exchange apparatus. W. H. ARMACOST (to Superheater Co.). Brit. 286,682, March 9, 1927.

Heat-exchange apparatus for liquids. C. W. STANCLIFFE. Brit. 286,757, Nov. 12, 1926.

Heat-exchange apparatus suitable for use with liquids or gases. GEORGE T. JACOBS (to Whitlock Coil Pipe Co.). U. S. 1,691,012, Nov. 6.

Heat-exchange apparatus suitable for use with oil or other liquids or gases. CHARLES B. GRADY. U. S. 1,690,108, Nov. 6.

Heat-exchange apparatus suitable for use with oil or other liquids. CHARLES H. POTTS (to Vickers, Ltd.). U. S. 1,690,501, Nov. 6.

Heat regenerator. GAS RESEARCH CO. Ger. 466,830, Jan. 20, 1926. Constructional details.

Blast heater. ASKANAI-WERKE A. G. (formerly Centralwerkstatt-Dessau) and CARL BAMBERG-FRIEDENAU. Ger. 466,628, June 1, 1924. In a gas blast-heating app. the combustion air is forced through an injector nozzle, thus drawing addnl. air with it into the gas.

Continuous tunnel oven of the direct flame type. J. WILLIAMSON. Brit. 287,623, Dec. 22, 1926.

Rotary annular plate oven. TROCKNUNGS-VERSCHWELUNGS UND VERGASUNGS. Ger. 466,342, June 3, 1925. Details of construction.

Furnace. J. S. CROSSLEY. Australia 8160, July 7, 1927. A furnace has a rotary grate composed of upstanding circular flanged bars of successively increasing diams. and a further series of equal diam. The fuel is fed in at the end having the smallest bar.

Gas furnace. FIRMA WILHELM RUPPMANN. Ger. 466,586, May 30, 1926; addn. to 464,692. The construction of the burner is improved.

Gas furnace. SOCIÉTÉ POUR L'UTILISATION RATIONNELLE DU GAZ (Surgaz). Fr. 638,945, Dec. 31, 1926. Construction of combustion chamber.

Gas furnaces. VEREINIGTE STAHLWERKE, A. G. Fr. 637,821, July 16, 1927. The gas and air used in gas-heated furnaces of the rotating type, having a flame parallel to the longitudinal axis of the furnace, are heated in regenerators heated by fresh air and gas.

Regenerative continuous-current gas furnace. FRIEDRICH SIEMENS A.-G. Ger. 466,693, Mar. 11, 1927. Addn. to 418,799. Constructional improvements.

Burner for gas furnace. REGNIER EICKWORTH. Fr. 638,801, Aug. 3, 1927. The air is propelled by a paddle wheel operated by the gas under pressure.

Shaft furnace. EMANUEL SOBEK. Fr. 637,437, June 28, 1927. The furnace is enlarged at one side for the descent of fresh charges.

Distillation furnace. JACK ARNOUL DE GREY. Fr. 639,059, Jan. 12, 1927. A vertical distn. furnace in which the matter to be distd. descends between the walls of a casing provided with gratings for evacuation of the distn. gas has vertically disposed heating bodies in the form of parallelepiped-shaped boxes easily accessible from the exterior.

Furnace of regenerative type. POETTER G. in b. H. Fr. 637,307, Mar. 21, 1927.

Rotary furnace. GEWERKSCHAFT SACHTLEBEN AND J. KÜPPERS. Brit. 286,590, March 5, 1927. The walls of an inner muffle are formed of a material of good heat cond. such as SiC, Cr silicide or Mo carbide, while the outer lining is of material of poor cond.

Annular rotary-hearth furnace. JOHN F. BAKER (to Westinghouse Elec. & Mfg. Co.). U. S. 1,691,367, Nov. 13.

"Car-bottom furnace." JOHN F. BAKER (to Westinghouse Elec. & Mfg. Co.). U. S. 1,691,368, Nov. 13.

Furnace for coal dust. JACQUES PIEDBOEUF. Ger. 466,464, Jan. 31, 1926. The coal dust is blown into the fire chamber by an air current.

Catalytic apparatus. PAUL GRENÉ. Fr. 637,648, Nov. 17, 1926. In app. for catalytic reactions where several heated catalysts work in series, such as in hydrogenation, the series of catalysts are used in duplicate and each series is placed end to end in a single vessel and is regenerated as a whole.

Atomizing liquids. ALBERT CHARBONNEAU. Fr. 638,992, Jan. 4, 1927. A

turbine atomizer for liquids having arms of unequal distribution of drops of the liquid on the arms is and means for a regular

Protector for the taps of cylinders containing li- gas. SOC. L'AIR
LIQUIDE (SOC. ANON. POUR L'ÉTUDE ET L'EXPLOITATION DES PR GEORGES CLAUDE).
Fr. 637,667, Nov. 19, 1926.

Apparatus for liquid treatment of bands or strips, particularly cinematograph films.
JOHANN J. F. STROCK. Ger. 466,979, Jan. 15, 1928.

Copper plate, thermocouple and voltmeter for indicating temperatures of articles in contact with the plate. HOWARD D. MATTHEWS (to Westinghouse Elec. & Mfg. Co.).
U. S. 1,691,247, Nov. 13.

Thermionic valve. SIEMENS & HALSKE A.-G. Brit. 288,180, April 2, 1927. A cathode core may be coated with an intermediate coating of BaO and then further coated with an alk. earth metal such as Ba or with an alloy of such metals. The valves may be highly exhausted or may contain a rare gas such as A.

Thermionic valves. RADIOTECHNIQUE. Brit. 287,867, March 28, 1927. Oxide cathodes have cores such as W or Pt not volatilizable at their working temp., coated with a more volatile metal such as Cu which may be applied in a thin layer electrolytically. Ni, Cr and Si also may be used in making the filament as an intermediate layer.

Thermionic valves and similar devices. NAAMLÖÖZE VENNOOTSCHAP PHILIPS' GLOEILAMPENFABRIEKEN. Brit. 286,970, May 7, 1927. One or more of the surfaces which space electrodes or other parts of the device which are maintained at different potentials are coated with enamel. A suitable enamel, m. 450°, may be formed of Pb oxide 72, B₂O₃ 15, silicic acid 7, ZnO 3, Sn oxide 2 and Al₂O₃ 1%. Various structural details are described.

Coating thermionic valve cathodes, etc. ALLGEMEINE ELEKTRICITÄTS-GEZ. Brit. 286,650, March 7, 1927. The process of Brit. 268,815 (C. A. 23, 1256) for producing metal coatings on oxide bases is modified by using metallic oxide, instead of, or in addn. to, powd. metal in the coating paste.

Thermostats. OTTO SCHINKEL. Ger. 466,477, Mar. 16, 1926. A tube has a long lever pivoted to this base. A long rod of small coeff. of expansion is adjustably fitted into a socket in the base of the lever so that when the tube reaches a min. temp. its contraction causes the end of the rod to tilt the lever to "make" the heating circuit.

Thermostatic switch. IRA E. MCCABE and RAYMOND W. ARMSTRONG (Armstrong to Arcless Contact Co.). U. S. 1,691,016, Nov. 6.

Thermostatic electric switch adapted for giving warnings of sudden rises in temperature. EDMOND HALF. U. S. 1,690,486, Nov. 6.

Thermostatic valve. H. J. YATES, M. HOWLETT & Co., LTD., and J. DOLPHIN. Brit. 286,831, Jan. 6, 1927.

Thermostatic valve for controlling flow of heating fluids. JAMES J. LAWLER (to Direct-Control Valve Co.). U. S. reissue 17,135, Nov. 13. A reissue of original pat. 1,555,592, dated Sept. 29, 1925.

Thermostatic valve for controlling the supply of gas or other materials. ADOLF BELER. U. S. 1,691,008, Nov. 13.

Thermostatic control for electric circuits of refrigerating apparatus, etc. JOSEPH F. SEIDEL. U. S. 1,691,448, Nov. 13.

Thermostatic apparatus for regulating dampers, etc. DANTE V. MAZZOCCO (to Surface Combustion Co.). U. S. 1,690,829, Nov. 6.

Thermostatic apparatus for regulating dampers of combustion apparatus, etc. WM. M. HEPBURN (to Surface Combustion Co.). U. S. 1,690,819, Nov. 6.

Thermostatic and time control device for electric circuits governing heating apparatus. GEORGE H. HART. U. S. 1,690,898, Nov. 6.

2—GENERAL AND PHYSICAL CHEMISTRY

GEORGE L. CLARK AND J. H. REEDY

American contemporaries—Arthur D. Little. JAMES F. NORRIS. *Ind. Eng. Chem.* 20, 1395-6(1928). E. H.

Jan Zawadzki. ANON. *Przemysl Chem.* 12, 553-60(1928).—An obituary with a bibliography of over a hundred publications by Z. A. C. Z.

Present and proposed activities of the Franklin Institute. HOWARD MCCLENNAN. *J. Franklin Inst.* 206, 735-70(1928). E. H.

Institute of physical and chemical research at Tokyo. JAN ZAWADZKI. *Przemysl*

Chem. 11, 289-94(1927).—This is largely a comparison of support to chemical and physical research and technology given in Japan and in Poland. A. C. Z.

Simple experiment on equivalent-weight determination. JOHN E. S. HAM. *Chemist-Analyst* 17, No. 4, 6(1928).—An expt. is described suitable for beginners, in which the vol. of H_2 evolved from a weighed quantity of Zn is detd. W. T. H.

System of volume chemistry of homogenous liquids. F. WRATSCHKO. *Pharm. Presse* 33, 321-4(1928).—An address. W. O. E.

Method of calculating constitution in volume chemistry. F. WRATSCHKO. *Pharm. Presse* 33, 341-4(1928). W. O. E.

The variation of viscosity with temperature. I. C. WALTHER. *Erdöl u. Teer* 4, 510-11(1928).—From the generalized observation that double logarithms of the viscosities of a given liquid, plotted against the corresponding temps., give a straight line, is derived the formula: $\log \log V = - (M(t - 50)/100) + \log \log V_{50}^\circ$. $V = 100$ (abs. viscosity/sp. gr.). M is the change in $\log \log V$ per degree for the material in question, found from viscosity detns. at any two temps. Thus, for a given oil, the relation of viscosity to temp., without which viscosity is of little significance with reference to lubricating value, is completely defined from 2 viscosity detns. instead of 3, as heretofore. F. S. GRANGER

The stoichiometric law of the constant and multiple proportions as a limit law. GUSTAV F. HÜTTIG. *Hochschulwissen* 4, 261-6, 317-22, 365-70; *Chem. Zentr.* 1927, II, 1925.—The conception that in chemistry the law of the const. and multiple proportions is valid, and that the chem. science is not concerned with facts that do not agree with this law, had to be maintained as long as the at. structure of the matter was based on it. Now since the existence of the atoms has been established by other means, this strict differentiation between chemistry and physics is no longer necessary. In considering solid substances in the first line, it can be demonstrated that the law of the const. and multiple proportions is only a limit law, which would be fulfilled, if only the directing forces in the crystals were acting without the heat motion disturbing the order and causing a no. of atoms to stray around among the atoms arranged in a lattice-like manner. The no. of these atoms is different for each kind of substance. An equil. results that at very low temps. comes very close to the ideal law, while at very high temps., the limit laws of physics free of chemistry may exist. Chem. stoichiometry and osmosis show many phenomena that favor the strict validity of the law of proportions; much neglected up to the present time are, however, the homogeneous phases of which it certainly cannot be asserted that one or the other principle prevails (cf. e. g., the mineral pandermite or an aq. LiBr soln.). Speculations concerning the equil. cannot be extended to the org. substances, which for the larger part do not represent stable systems. At first they may be strictly stoichiometrically constituted; sooner or later, however, an irreversible decompn. occurs. Finally, is considered the "active" state of the matter, which often continuously changes to a stable one and thus cannot claim a fundamental special position inside the conceptions given. G. SCHWOCH

The reflectivity of carbon between room temperature and 1500°. KURT WARMUTH. *Wiss. Veröffentlich. Siemens-Konz.* 7, 307-20(1928).—The reflectivity at room temp. for wave lengths 0.538 μ and 0.663 μ is 0.034 plus or minus 5%. At 1740° K. the value is 0.028. W. concludes that between these temps. the reflectivity of C is independent of the temp., and assumes that this independence continues at higher temps. With R equal to 0.028 the true temp. of the positive crater of the C arc is found to be 3740° K. It is probable that the reflectivity in the infra-red is higher. A new vapor-pressure curve is given for C, based on the temp. of 3740° K. for atm. pressure. The molar heat of sublimation for the pressure range 1-5 atms. and the mean temp. 3900° K. is calcd. to be 125.54 kg. cal. B. MILLER

The influence of the strength of molecular attraction on the internal friction and the conductivity of gas mixtures. HANS SCHMICK. *Physik. Z.* 29, 633-40(1928).—On account of the difference between homo- and hetero-polar mols. a deviation of about a 7% max. from the simple rule of mixts. should be expected. MARIE FARNSWORTH

A study of crystal structure and its applications. T. A. WILSON. *Gen. Elec. Rev.* 31, 612-21(1928).—An exhaustive review. C. G. F.

Space lattice analysis of potassium sulfate and potassium selenate. ELSA KOCH-HOLM AND NICHOLAS SCHÖNFELDT. *Wiss. Veröffentlich. Siemens-Konz.* 6, 177-87(1927).— K_2SO_4 and K_2SeO_4 are isomorphous with K_2CrO_4 (*Wiss. Veröffentlich. Siemens-Konz.* 5, No. 1). The space group is probably B_2^{13} . The unit cell contains 4 mols. The axial lengths, in A. U., are: K_2SO_4 — $a = 7.50$, $b = 10.25$, $c = 5.28$; K_2SeO_4 — $a = 7.60$, $b = 10.40$, $c = 6.02$; K_2CrO_4 — $a = 7.45$, $b = 10.30$, $c = 5.88$. BENJAMIN MILLER

Properties of large iron crystals. J. SEIGLE. *Tech. moderne* 20, 665-70(1928); cf. *C. A.* 21, 356, 2203.—The line of demarcation of the different crystals is visible with the naked eye although it remains a very thin line even under strong magnification. A rod, the cross section of which is formed of single crystals, does not possess an elastic limit. Permanent deformation is produced from the beginning; the resistance to traction is reduced by more than half. The striction is different from that in a rod made of normal crystals. Under torsion the elastic limit has also disappeared, the resistance to rupture is decreased and the rod is deformed along its axis. Fe made of large crystals is very sensitive to shock after a few minutes' immersion in liquid air but at normal temp. it is not thus sensitive and is also very ductile. In rupture by torsion, traction or shock, the line of rupture is never between two crystals but through one of them. Slip-bands and Neumann's lines are easily formed. Hardening by exposure to NH_3 fumes at 600° forms shorter lines than in fine crystal steel.

P. THOMASSET

Crystallographic orientation of metallic precipitates. G. TAMMANN AND M. STRAUMANIS. Univ. of Göttingen. *Z. anorg. allgem. Chem.* 175, 131-40(1928).—When Cu is electrolytically deposited upon Cu surfaces, the crystallite orientation of the deposit depends upon the character of the surface. On a polished surface the deposit is very fine and its orientation bears no relation to that of the cathode. If the surface of the cathode has been previously etched, the crystallite orientation of the deposit is identical with that of the electrode, if the c. d. is not too high. A satisfactory c. d. is 5-10 milliamp./sq. cm. with satd. CuSO_4 soln. as electrolyte. At high c. d. (above 30 milliamp./sq. cm.) the deposit tends to form new crystn. centers and as a result its orientation bears no relation to that of the cathode. If the metal is deposited from complex-salt solns., the formation of new crystn. centers is also favored. When Ni is deposited upon Cu from a NiSO_4 soln., the deposit at first follows the Cu in orientation, but this is only true for a very thin layer, after which the Ni is deposited in very fine crystals with irregular orientation. Cu deposited upon Ni at 2 milliamp./sq. cm. takes the Ni orientation. When Cu is deposited upon a single crystal ball of Cu, upon the surface of which all possible crystal planes are found, the deposit favors the plane with densest packing, the octahedral plane, the altitudes of the octahedra being arranged parallel to the lines of current flow.

H. STORITZ

Light figures of copper and iron. G. TAMMANN AND A. A. BOTSCHWAR. Univ. of Göttingen. *Z. anorg. allgem. Chem.* 175, 121-30(1928).—If a beam of parallel light falls upon an etched metal surface, it is reflected in the form of a definite figure, depending upon the crystallite orientation. The reflected light figure can be picked up on light-sensitive paper and studied. Cu is etched with 20% $(\text{NH}_4)_2\text{S}_2\text{O}_8$, Fe with 10% $(\text{NH}_4)_2\text{S}_2\text{O}_8$. With Al and Ag satisfactory etch figures are not obtained. If the light rays strike the crystallite planes at an angle, the figure obtained is different from that produced when the incident ray is perpendicular. An incident ray perpendicular to an octahedral plane gives a light figure with 3 equal branches with an angle of 120° between them. If the crystallite planes in question belong to the octahedral group, their angle of inclination with respect to the octahedral plane can be detd. by measuring the angle through which the incident ray must be moved to give a figure with 3 equal branches. The light figures obtained from a ball consisting of a single crystal of Cu are studied. This method is much more time-consuming than the detn. of crystallite orientation by the method of max. reflection, but the detn. of the angle of inclination of the various planes is an advantage.

H. STORITZ

The structure of crystalline carbons. ELSA KOCH-HOLM. *Wiss. Veröffentlich. Siemens-Konz.* 6, 188-201(1927).—A series of cryst. carbons was prepd. by the decompn. of hydrocarbons at temps. of 1200 – 2700° . Anthracite coal and retort carbon (made at 900 – 1000°) were taken as the first two members of the series. X-ray analysis showed the graphite space lattice in every case. The particle size increased with the temp. of formation, particularly the length in the 111 direction. The hardness increased to a max. at a 111 length of 90 A. U., corresponding to about 1300° , and then decreased. Porcelain is attacked by carbon and hydrocarbons above 1400° with the formation of aluminum carbide, which was detected by x-ray analysis.

BENJAMIN MILLER

Electric dipole moments of organic molecules. J. ESTERMANN. *Physik. Inst. Hamburg. Z. physik. Chem. Aht. B*, 1, 139-60(1928).—Dil. benzene solns. of three groups of substances, various ethers, compds. contg. two sepd. phenyl rings, and org. compds. contg. both strongly electropositive and electronegative constituents, chiefly esters of amino acids, have been investigated and the variation of their dielec. consts. with temp. have been detd. From these measurements are calcd. the dipole moments. E. discusses the relationship of elec. dipole moments and chem. structure, and also considers in some detail the sources of errors of such measurements, such as the diffi-

culties involved in the behavior of the solvents and errors thereunto attributable. Much exptl. detail, data and sketches are given. **WILLIAM E. VAUGHN**

Molecular light-scattering, dielectric constants and dispersion of several organic compounds. WERNER LAUTSCH. Physik. Inst., Königsberg. *Z. physik. Chem. Abt. B*, 1, 115-33(1928).—The degree of depolarization of 15 compds. in the liquid state is detd. They are acetophenone, benzophenone, *p*-methoxybenzophenone, propylbenzene, biphenyl, bibenzyl, triphenylmethane, naphthalene, decalin, ethyl stearate, ethyl palmitate, ethyl laurate, ethyl oleate, stearic acid and palmitic acid. There exists a parallelism between degree of depolarization and chem. constitution. The changes in dielec. const. with temp. for nine of the substances were measured. The work offers some confirmation to the dipole theory of Debye. Many detailed data are given.

WILLIAM E. VAUGHN

The electrical symmetry of the molecular structure of methane derivatives. L. EBERT, R. EISENSCHITZ AND H. v. HARTEL. Kaiser Wilhelm Inst., Berlin. *Z. physik. Chem. Abt. B*, 1, 94-114(1928).—The methods for the detn. of symmetry of mols. are discussed. The mol. polarization of many compds. of type Ca_4 in dil. soln. in C_6H_6 or CCl_4 have been detd. by use of 2.4-m. waves, and are found to behave as derivs. of three substances, $C(OH)_4$, $C(CH_2OH)_4$, or $C(COOH)_4$. Comparisons with mol. polarization of the same substances in the solid state tend toward the conclusion that a no. of these compds. have definite dipole moments. This decision supports the theory of Weissenbert, according to which there exists a multiplicity of structures of the mol. Ca_4 , as is illustrated by the models of classical stereochemistry.

WILLIAM E. VAUGHN

Determination of electrical dipole moments of organic molecules by the molecular beam method. J. ESTERMANN. Physik. Inst., Hamburg. *Z. physik. Chem. Abt. B*, 1, 161-9(1928).—Mol. beams of biphenyl, diphenylmethane, benzophenone, diphenyl ether and the methyl esters of *o*, *m*- and *p*-aminobenzoic acids were deflected in a non-homogeneous elec. field, and the dipole moments were detd. A detailed description of the app. and technic are given. The values obtained for the dipole moments are in accord with those obtained from dielec.-const. measurements.

W. E. V.

Relation between dipole moment and constitution. J. ERRERA. *Physik. Z.* 29, 689-90(1928).—E. had previously verified Debye's theory of permanent dipoles for the dihalo derivatives of C_2H_4 and C_6H_6 by showing that if the sign of the charges of the atoms of a mol. be known, the position of the atoms within the mol. can be detd. Hence chem. arguments which support assumed constitutional formulas can be directly verified. Van de Walle and Henne have established the position of the atoms in both stereoisomeric chloriodoethylenes (c. i. e.), $ClHC = CHI$, by chem. methods and E. now desires to investigate the reverse problem, *viz.*: Given the configuration, to det. the sign of the charge of some of the constituent atoms. Several chemists have already established the existence of derivs. of c. i. e. in which I is tervalent. For example, when c. i. e. is treated with Cl with simultaneous cooling, a cryst. compd. $ClHC : CHI Cl_2$ is obtained. If I is positively charged relatively to Cl then it follows that the *cis* deriv. in which both halogen atoms are nearest must have a smaller dipole moment than the *trans* deriv. Both *cis* and *trans* c. i. e. configurations have been detd. by the work of W., which is based on the existence of azeotropic mixts. with $PrOH$. E. finds that in the above compds. the hypothesis that I is relatively positively charged to Cl is established because the dipole moment of the *trans* is more than twice that of the *cis* deriv.

S. L. B. E.

The heat conductance of gas mixtures. H. GRUSS AND H. SCHMICK. *Wiss. Veröffentlich. Siemens-Konz.* 7, 202-24(1928).—The heat conductance of gas mixts. shows astonishing deviations from the simple law of mixts. In many cases there is a linear relation between the partial pressure of one of the gases of a binary mixt. and the conductance, while in other gases the mixt. may have higher conductance than either pure gas. The abs. values of the heat conductances of mixts. of air with H_2O , NH_3 and C_2H_2 , and of CO with NH_3 have been detd. at atm. pressure and at temps. between 20° and 80°. Improved app. and methods are described. The results, which are given in tables and graphs, show max. conductances for certain ratios. The departure from the simple law of mixts. is said to be due to the lowered attractive forces caused by the meeting of mols. having diff. orders of symmetry. This leads to fewer impacts, longer mean free paths and consequently higher thermal conductance.

BENJAMIN MILLER

Gas computation chart. FRITZ SCHUSTER. *Gas u. Wasserfach* 71, 1070-1(1928).—A chart gives factors for converting volumes of dry or saturated gas measured at 700-800 mm. Hg and at 0-30° to 0° and 760 mm. pressure, dry.

R. W. R.

Highly dilute flames. I. General. H. BEUTLER AND M. POLANYI. Kaiser Wilhelm Inst. *Z. physik. Chem. Abt. B*, 1, 3 20(1928); cf. *C. A.* 22, 1898.—The interaction of alkali metal vapors with halogens and certain halogen compds. at low pressure (10^{-6} mm.)

is accompanied by a non-thermal emission of the resonance line of the metal. The procedure is to allow the reactants to diffuse from opposite ends of a long tube and to investigate the distribution of d. in the pptn. formed in the region of reaction along with the distribution of intensity of the luminescence. Full details are given of the calcn. of the reaction velocity from an analysis of the pptn. curve. As the max. of the luminescence curve is always displaced toward the side of the entering alkali vapor with respect to the pptn. curve, the conclusion is drawn that the primary reaction, $\text{Cl}_2 + \text{Na} = \text{NaCl} + \text{Cl}$, is not the cause of the luminescence; it must originate in secondary reactions between some of the halogen atoms liberated in the primary reaction and the oncoming alkali vapor. The salt mol. resulting carries over its energy of formation to a Na atom in a collision of the 2nd kind. On the basis of this mechanism, the max. light yield is 0.03 to 0.5% of this value. With respect to the primary reaction it is shown that every collision is effective, with a collision area 10 times greater than the gas kinetic value. II. "Jet flames." ST. V. BOGANDY AND M. POLANYI. *Ibid* 21-9.—The light yield is much increased when the halogen is introduced through a jet into an excess of Na vapor. The influence of the alkali vapor concn. on the intensity of the luminescence was studied. For the reaction between Cl_2 and Na, the yield increased approx. linearly from 1% of theoretical at a Na pressure of 0.5×10^{-3} to 35% at 10^{-2} mm. The curve showed a tendency to bend over toward the pressure axis at higher pressures. The behavior with Br_2 was similar but with HgCl_2 the luminescence curve rapidly reached a limiting value of 7% of the theoretical, beyond which increase of the Na concn. caused no further increase in intensity of luminescence. III. The sodium-chlorine flame. M. POLANYI AND G. SCHAY. *Ibid* 30-61.—The flame reactions belong to two classes, with the following empirical characteristics: Class I (Na or K with Cl_2 , Br_2 , I_2 , ClCN , BrCN). (a) The luminescence curve of the jet flame is much broader than the pptn. curve. (b) Increase in temp. of the reaction zone diminishes the luminescence. (c) The light yield increases with Na concn. more rapidly than the concn. (d) If the reaction between Na and Cl_2 is performed in the presence of H_2 , HCl is formed. Class II (Na or K with HgCl_2 , HgBr_2 , SO_2Cl_2). (a) Luminescence curve of the jet flame coincides with the pptn. curve. (b) Increase in temp. of reaction zone does not affect brightness of luminescence. (c) The light yield increases with Na concn. more slowly than the concn. (d) In presence of H_2 , no HCl is formed in the reaction between Na and HgCl_2 . The following mechanisms account for the observed facts. Type I. (1) Primary reaction, in gas phase without luminescence, $\text{Na} + \text{Cl}_2 = \text{NaCl} + \text{Cl} + 35 \text{ Cal.}$ (2) Secondary reactions (a) $\text{Na} + \text{Cl} = \text{NaCl}$, at wall, without luminescence. (b) $\text{Na}_2 + \text{Cl} = \text{NaCl} + \text{Na} + 75 \text{ Cal.}$ (about) in gas phase. The light is produced by reaction (b), in the collision of an energy-rich NaCl mol. with a Na atom which has not participated in the reaction. Type II. Primary reaction $\text{Na} + \text{HgCl}_2 = \text{NaCl} + \text{HgCl} + 25 \text{ Cal.}$ Secondary, $\text{Na} + \text{HgCl} = \text{NaCl} + \text{Hg} + 53 \text{ Cal.}$ The energy-rich NaCl mol. excites a Na atom as before. The essential difference between the 2 types is that the first requires the production of free halogen atoms and the presence of diatomic Na_2 mols., while the second requires neither. The intensity of luminescence of the $\text{Na} + \text{Cl}_2$ flame falls off exponentially with increasing temp. and leads to a value of the heat of dissocn. of Na_2 mols. of 18 Cal. ± 2 . (Cf. Loomis' spectroscopic value of $23 \pm 2.3 \text{ Cal.}$) A calcn. is made which shows that in the flame reactions, the reaction between free atoms and mols. as $\text{Na} + \text{Cl}_2 \rightarrow \text{NaCl} + \text{Cl}$, takes place at every collision, and in fact with a collision area greater than the gas-kinetic, while the fraction of collisions between Na and Cl atoms in the gas space which lead to formation of a NaCl mol. is not more than 1/10,000. IV. The sodium-iodine flame. H. OOTUKA AND G. SCHAY. *Ibid* 62-7.—A detailed investigation of the Na I flame, with results in accordance with the hypotheses advanced above. V. The sodium-mercuric chloride flame. *Ibid* 68-73. Wm. West

The equation of state of a mixture determined from the equations of state of its constituents, and its application in determining the physical and chemical properties of a mixture in terms of those of the constituents. R. D. KLEEMAN. *J. Franklin Inst.* 206, 511-24 (1928).—The equation of state of a mixt. may be expressed in its general form by $p = \psi(T, v, M_a, M_b, \dots)$. From this the equation $p = \psi((A_1 M_a + B_1 M_b + \dots)/v, (A_2 M_a + B_2 M_b + \dots)/v, \dots)$ is derived, which directly leads to the equations of state of the constituents e. g., $p_a = \psi(A_1(M_a/v), A_2(M_a/v), \dots)$, $p_b = \psi(B_1(M_b/v), B_2(M_b/v), \dots)$, etc. This general formulation can be combined with van der Waals' equation of state. The nature of the phases into which a mixt. seps. can be detd. from the equation of state of the mixt. Other applications of this principle are the detn. of the equation of state of an interacting gaseous mixt. from the equations of state of the constituents, the detn. of the sp. heat of the internal energy and the magnetic and elec. energies of the mixt. at infinite vol. from the energies of the iso-

lated constituents. It should also be possible to express the properties of complex compds. in terms of the same properties of the constituents, *e. g.*, the phys. properties of HCl in terms of those of H₂ and Cl₂. The subject is to be amplified in a subsequent paper.

EMIL KLARMANN

Gaseous mixtures. NELLO CARRARA. *Nuovo cimento* [N. S.] 5, 224-33(1928).—A math. interpretation of the final conditions which would be established in a mixt. of several gases that could not react together chemically. The final conditions of the mixt. were compared with that corresponding to the equation characteristic for a perfect gas.

L. T. FAIRHALL

The specific heat of carbon dioxide. A correction. W. H. MCCREA. *Proc. Cambridge Phil. Soc.* 24, 290(1928); cf. *C. A.* 22, 718.—In his previous paper, McC. suggested the possibility of a transition from one mol. form to another in CO₂. The suggestion was embodied in an equation and the resulting sp. heats for low temps. were given. Now it has been found that this assumption gives a high and altogether impossible max. in the sp.-heat curve for higher temps. before it returns to the neighborhood of the unmodified curve C_p. The effect of assuming a difference of potential energy between the two positions about which the system is considered to vibrate has been tried. A curve was obtained for a value of this energy difference corresponding to a frequency ν_2 , and a fundamental frequency $2\nu_2$ (to give bands ν_2 , $3\nu_2$. . . since Schaefer and Philipps did not find $2\nu_2$), and a moment of inertia 0.5×10^{-40} g./sq. cm. While this curve agrees with observation for low temps. and almost coincides with C_p for high temps. and does give a max. in between, there is still a good deal of discrepancy there. Though the question is not yet cleared up, McC. still holds that a triangular form of the mol. with some anomalous behavior at low temps. is demanded by the facts.

A. L. HENNE

The decomposition pressure of sulfuric acid containing nitro compounds. A. SANFOURCHE AND L. RONDIER. *Bull. soc. chim.* 43, 815-26(1928).—The importance of thorough knowledge of the equil. reactions involved in the chamber process for H₂SO₄ led S. and R. to extend the work of Sorel. The pressures developed by HNO₂, HNO₃, and HNO₂-HNO₃ mixts. in H₂SO₄ of the usual chamber strengths were detd. by a dynamic method, colorimetric analyses being used. Tables are given showing that the decompn. pressure of nitrosylsulfuric acid increases with increase in nitrous content, with increase in temp., and with decrease in H₂SO₄ concn., that the decompn. pressure of nitric-sulfuric acids increases with decreasing concn., passing through a max. about 60° Bé. and then decreasing as diln. continues; that small amts. of HNO₃ in nitrosylsulfuric acid increase the pressure of the latter disproportionately, the increase being more marked as the H₂SO₄ becomes more concd. The effect of HNO₃ on the pressure of SO₂-(OH)(ONO) is due to the formation of N₂O₄.

C. H. PEET

The intensive drying of liquids. SAM LENHER AND FARRINGTON DANIELS. Univ. of Wisconsin. *Proc. Nat. Acad. Sci.* 14, 606-9(1928).—Tubes contg. P₂O₅ and org. liquids were sealed. It was proposed to keep them at room temp. for 9 yrs. and then to det. the b. p., mol. wt., surface tension, refractive index, etc., of the dried liquids. At the end of 4.5 years 3 of the tubes were opened and the B. ps. detd. in a modified Mathews app. (cf. *C. A.* 5, 3529). Two samples of dried C₆H₆ and 1 of CCl₄ showed no abnormal rise in b. p.

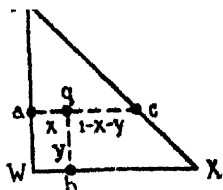
R. L. DONGE

The thermal coefficient of expansion of binary mixtures. K. M. STAKHORSEKII. *Ukrainskii Khim. Zhurnal* 3, No. 2, Pt. sci. 219-22(1928).—S. derives an equation for the thermal coeff. of expansion, α , of binary mixts. of the non-assocd. liquids $\alpha = (M_1v_1\alpha_1X + M_2v_2\alpha_2(1-x))/(M_1v_1X + M_2v_2(1-x))$ where M_1v_1 and M_2v_2 are the molar vols. of the pure components, α_1 and α_2 their coeffs. of expansion and x is the molar fraction of the first component of the mixt. This equation is compared with some known data on mixts. of CCl₄ and C₆H₆, CCl₄ and PhCl, CCl₄ and PhBr, C₆H₆ and PhMe, C₆H₁₄ and Et butyrate, PhEt and EtOAc. Fairly good agreement is obtained.

G. B. KISTIAKOWSKY

Osmosis of liquids. General considerations. F. A. SCHREINEMAKERS. Univ. Leiden. *J. Gen. Physiol.* 11, 701-13(1928); cf. Schreinemakers (*C. A.* 19, 1805; 22, 1713).—Ternary liquids may be represented as consisting of substances X, Y and W. If 1 g. of this liquid contains x g. of X, and y g. of Y, it will then contain $(1-x-y)$ g. of W and its compn. is represented by s g. X + y g. Y + $(1-x-y)$ g. W. The compn. of this liquid may also be represented by a right angle triangle, X, Y, W (Fig.), in which $WX = WY = 1$. $Wb = x$ and $Wa = y$. The point q then represents X and Y quantities of the liquid and $qa = x$ and $qb = y$. From the Fig. $qb = Wa$ and $qa + qc = ac = aY$. As $Wa + aY = 1$, we have: $qa + qb = qc = 1$, or $x + y + qc = 1$. $qc = 1 - x - y$, or $qc =$ the W amt. of the liquid. Consequently the point q represents a liquid which

contains $qa = x$ quantities of X, $qb = y$ quantities of Y and $qc = (1 - x - y)$ quantities of W. If q is on WX then $y = 0$ and the liquid contains only W and X; if q is on WY then $x = 0$ and the liquid contains only W and Y; if q is on XY then $(1 - x - y) = 0$ and the liquid contains only X and Y. If q coincides with angular point W then $x = 0$, $y = 0$ and $(1 - x - y) = 1$, the liquid consisting of W only. Also point X represents pure X, and point Y pure Y. Therefore the angular points of the triangle represent the 3 pure substances W, X and Y, the sides the binary liquids contg. either W + X, W + Y or X + Y, and the points within the triangle ternary liquids contg. X + Y + W. Similarly, the relations are developed for an osmotic system in which two liquids are sep'd. by a membrane permeable only for W. W diffuses in one of two directions or does not diffuse at all; in the latter case the liquids are isotonic. Certain points within the triangle may be connected by lines to form isotonic curves, having the following properties: (1) Two isotonic curves never intersect or touch one another; (2) every straight line passing through W intersects a curve in one point only; (3) the osmotic water attraction of the liquids of an isotonic curve is greater the farther this curve lies from W; (4) the isotonic curves are straight lines in the vicinity of W, but are curved at greater distances. The many cases which may occur with the osmosis of one or more substances are shown by a system of signs. Positive and negative osmosis are pictured in this way



C. H. RICHARDSON

Effect of molecular form and association on light-scattering in liquids. I. Fatty acids and alcohols. S. RAMACHANDRA RAO. Sri Minakshi College, Chidambaram. *Indian J. Physics* 3, 1-19(1928).—The variations of intensity and depolarization factor of the transversely scattered light have been studied for MeOH, EtOH, PrOH, BuOH, AcOH, EtCO₂H and PrCO₂H. Graphs show the changes in the values of the depolarization factor with temp. A regular gradation, in shape is noticeable for the alcohols, in ascending the series, MeOH behaving in the usual manner. AcOH shows a rapid fall up to 120° and then a gradual diminution. EtCO₂H and PrCO₂H show an initial fall in the value of r , then a horizontal part and at higher temps., a steady fall. On the basis of Ramanathan's recent expression for the intensity of the transversely scattered light (C. A. 22, 3782) the intensities at different temps., compared to that at 30° in the case of EtOH and to that at 120° in the case of AcOH, have been calcd. It is found that the calcd. and observed values show a closer agreement in the case of EtOH than in the case of AcOH. On drawing curves between Δ , the optical anisotropy, and temp. it is noticed that MeOH shows a high value at ordinary temps., the rise becoming very slow at high temps. The higher alcohols show almost steady values at ordinary temp. The fatty acids behave very peculiarly. AcOH shows a rapid fall in the value of Δ at first, and then a gradual rise. EtCO₂H and PrCO₂H show an initial rise and fall in the value of Δ and later a gradual rise. **II. Some aromatics.** *Ibid* 21-30.—The depolarization factor and intensity of the transversely scattered light and the optical mol. anisotropy have been det'd. for 4 typical polar aromatic compds.: PhNO₂, PhNH₂, PhEt and PhBr. The calcd. and observed values of the intensity of the transversely scattered light at different temps., if that at 30° is unity, do not agree, the difference becoming smaller at higher temps. This was found to be the case with PhNO₂ predominantly and to a small measure with PhNH₂. In the cases of PhNO₂ and PhNH₂, again, the value of the optical anisotropy diminished as the liquids were heated up to a certain temp. and then rose with increase of temp. This behavior as well as the anomaly in the case of intensity are suggested to be due to mol. assocn.

G. CALINGAERT

Volatility with steam of water-soluble organic substances. ARTTURI I. VIRTANEN AND L. PULKKI. *J. Am. Chem. Soc.* 50, 3138-51(1928).—See C. A. 22, 4351. E. H.

The vapor pressures of the heptahydrate and the saturated solution of sodium sulfite. KIMIO ARII. *Bull. Inst. Phys. Chem. Research (Tokyo)* 7, 891-904, Eng. Ed. 1, 83-4(1928).—The vapor pressure of the systems: (a) Na₂SO₃·7H₂O-Na₂SO₃; (b) Na₂SO₃·7H₂O-satd. soln.; (c) Na₂SO₃-satd. soln., were measured at various temps. by means of the static method; a modified Bremer-Frowein differential tensimeter was used: the values were: (a) (temp. in °C., pressure in mm. Hg): 15, 8.76; 20, 12.99; 25, 18.59; 30, 26.33; 33, 32.78; (b): 20, 16.24; 25, 21.61; 30, 28.38; 33, 32.99; (c): 35, 37.01; 40, 48.88; 45, 63.74; 50, 82.39. These values agree with those calcd. by means of the following equation: (a): $\log p = 10.65647 - 2797.12/T$; (b): $\log P = 8.50733 - 2138.23/T$; (c): $\log p = 9.04857 - 2304.20/T$. At the transition point between the heptahydrate and the anhydride, the vapor tensions of the 3 systems should be the same and the 3 vapor-pressure curves should intersect. The transition point was actually found at 33.6°, while it was calcd. at 33.49° by solving pairs of the above equations and

taking the av. Recent results obtained by Tarassenkows (*C. A.* 22, 1890), are criticized and held as erroneous.

A. L. HENNE

The vapor pressure of water over sulfuric acid-water mixtures at 25°, and its measurement by an improved dew-point apparatus. J. R. I. HEPBURN. *Proc. Phys. Soc. (London)* 40, 249-50 (1928).—A modified method of compilation has been adopted in this paper, by means of which a series of most probable values for the vapor pressure of water over sulfuric acid-water mixts. at 25° has been obtained. An improved dew-point app. was used, with the methods originated by Lescoeur and improved by Cummings. An examn. of data previously used by Wilson showed that serious divergencies exist in the results of the investigators from which his data were drawn. F. V. J. JR.

The reaction velocity between trichloroacetic acid and amylene in different solvents. L. M. ANDREASOV. *Ukrainskii Khim. Zhurnal* 3, No. 2, Pt. sci. 209-18 (1928).—A. describes preliminary measurements of the rate of reaction of amylene and $\text{CCl}_3\text{CO}_2\text{H}$ at 25° in 5 different solvents: C_6H_6 , $\text{C}_6\text{H}_5\text{NO}_2$, CHCl_3 , CS_2 and CCl_4 . The reaction rate decreases in the order of the solvents given above. The velocity consts., calcd. for a bimol. reaction, decrease with progress of reaction, indicating the presence of some secondary processes.

G. B. KISTIAKOWSKY

Catalytic acceleration of the oxidation-reduction of formic acid-methylene blue. J. V. EULER AND ARNE ÖLANDER. *Z. physik. Chem. Abt. A*, 137, 29-44 (1928).—With Bredig's Pt-sol the max. reaction velocity was found at p_{H} 2-3. The reaction velocity is detd. by the existence of a mol. species HCOOH-Pt catalyst, the concn. of which varies with p_{H} . A certain threshold value of the Pt-sol concn. is necessary as the methylene blue consumes a certain quantity of catalytically effective Pt compd. With rising methylene blue concn. velocity of decolorization diminishes. Only mol. HCOOH participates in the formation of the intermediate active mols. A. P. SACHS

Catalysis of reactions of solids by solids. S. ROGINSKII AND E. SHULTZ. *Ukrainskii Khim. Zhurnal* 3, No. 2 Pt. sci. 177-207 (1928).—In continuation of some earlier expts. (cf. *C. A.* 21, 2415) R. and S. have studied the rates of decompn. of KMnO_4 and of $(\text{NH}_4)_2\text{Cr}_2\text{O}_7$ and the effect on these of several powdered oxides. The rate of evolution of O in decompn. of KMnO_4 was found to show a period of induction and to be autocatalytically accelerated. Similar results were obtained with crystals and with the finely powdered substance, although the latter decomposes much faster. The products of decompn. (K_2MnO_4 , K_2MnO_3 and MnO_2) accelerate the decompn. Present in large quantities, they change the character of the reaction, no autocatalysis or induction being observed. Similar results were obtained with $(\text{NH}_4)_2\text{Cr}_2\text{O}_7$. R. and S. reject the theory of the reaction mechanism postulated by Hinshelwood and Bowen (cf. *C. A.* 15, 618) and suggest that the decompn. starts at definite reaction centers on the surface and spreads throughout the crystal. They distinguish two phases of the reaction: the initial stage of the increasing velocity when the reaction zones are small and can grow unhampered in all directions in the crystal and the final stage of decreasing velocity when the whole surface layer of the crystal is decomposed and the reaction can progress towards the center only. For both cases they derive kinetic equations which agree well with their exptl. data. They apply the equations to the exptl. results of Tzentnershver and Bruzs (cf. *C. A.* 20, 3623) and of Tzentnershver and Awerbuch (cf. *C. A.* 20, 3623) on the rates of thermal dissocn. of carbonates of Cd and Pb, obtaining also good agreement. A no. of powdered oxides have been tried for their effect on the rate of decompn. of KMnO_4 . The following were found to be active catalysts: NiO , MnO_2 , CuO , Fe_2O_3 , Co_3O_4 . Their activity depends on the mode of prepn. and can be destroyed by superheating. Promoter action has also been observed in case of Al_2O_3 , which itself is only a poor catalyst but when added to Fe_2O_3 increases the latter's activity very markedly. The effect of catalysts is more pronounced with powd. KMnO_4 than with the cryst. substance. It has been found that when KMnO_4 is rapidly heated to temps. at which the decompn. is fast, in absence of catalysts, the latter act retardingly on the rate. R. and S. call the effect "inversed catalysis" and interpret it in terms of the superheating of the reacting substance due to the heat evolved in the decompn. and of the influence of admixed foreign substances on such superheating. G. B. KISTIAKOWSKY

Autoxidation and antioxygen action. XXX. The autoxidation and polymerization of chloral: the action of light. CHARLES MOUREU, CHARLES DUFRASSE AND GERARD BERCHET. *College de France, Paris. Bull. soc. chim.* 43, 942-57 (1928).—The oxidation of CCl_3CHO (I), is studied. I is purified by converting it to metachloral (II), with the aid of 5-6 pts. H_2SO_4 . II is repeatedly washed, dried *in vacuo* and converted to I by heating to 180-200°. The hydrate of I, m. 57°, was prepd. by the addn. of the calcd. distd. H_2O . The oxidation of I is given as: $\text{CCl}_3\text{CHO} + \text{O}_2 \rightarrow \text{HCl} + \text{CO}_2 + \text{COCl}_2$. The calcd. amt. of O_2 is added to I and the mixt. is allowed to stand 30 days.

A marked increase in pressure is noted after 8-10 days. In every oxidation HCl , CO_2 , COCl_2 , $\text{CCl}_2\text{CO}_2\text{H}$ and Cl_2 are liberated. In sunlight, more than the calcd. HCl and CO_2 are obtained but only 24% of the calcd. COCl_2 . In electric light there is polymerization and much less than the calcd. amt. of gas formed. Pure I in the dark with O_2 showed no oxidation after 83 days. However, I heated in the light forms a product which catalyzes its interaction with O_2 in the dark. The hydrate of I does not appear to be autoxidizable, but if dehydration occurs through the formation of HCl , it will proceed. Exptly., there was induction of 52 days before the formation of I and its oxidation. There appears to be disocn. of $\text{I} \rightleftharpoons \text{CCl}_2 + \text{HCICO}$ or of the type $\text{I} \rightleftharpoons \text{CCl}_2\text{CO} + \text{HCl}$. The idea of a preliminary disocn. is strengthened by the observation of a spontaneous production of gas in I without any oxidation. XXXI. The action of different catalysts. *Ibid* 957-62.—It has been possible to protect I against autoxidation by the addn. of 0.1 to 1.0% antioxygen for the period studied up to 100 days. The following compds. decreased the rate of oxidation very greatly when 0.1% was used: hydroquinone, pyrocatechol, α -naphthol, β -naphthol, pyrogallol, resorcinol, phloroglucinol, hydroxyhydroquinone and gallic acid. 1% PhOH gave similar protection. Complete protection is given by 0.1% PhNH_2 , p - $\text{ONC}_6\text{H}_4\text{NMe}_2$, Ph_2NH or α -naphthylamine and distn. after 3 yrs. showed no evidence of polymerization. H_2NCSSEt was found to have no effect, while S and I_2 were fair and PhNHMe III afforded complete protection. D. H. P.

Oxidation of hexane. MAX BRUNNER. *Techn. Hochschule, Zürich. Helv. Chim. Acta* 11, 881-97(1928); cf. *C. A.* 22, 3130.—The slow oxidation at 210° of a gas mixt. contg. 42% C_6H_{14} , 57% O and 1% N was studied, the vol. and temp. being kept const. At first the reaction proceeds with only a slight change in the pressure, although the reaction velocities are high, as shown by analyses of the reaction products at different states. Later there is an increase in the pressure, which is smaller, less sudden and less rapid if the glass surface has been increased, e. g., by the addn. of powd. Pyrex or quartz glass. During the reaction, moloxides (*i. e.*, unstable intermediate oxidation products) and peroxides are probably formed first; they then undergo secondary reactions, resulting in the formation of H_2O , unsatd. compds., fatty acids, CO_2 , CO and other gases. Quant. investigations of the reaction products show that in addn. to the (assumed) formation of moloxides and of peroxides, the manner of oxidation of H atoms is of importance. The unsatd. intermediate products thus formed will take up O, forming new (secondary) peroxides. The decompn. and reaction of both primary and secondary peroxides results in a series of further changes, which may lead to the formation of aldehydes, peracids and other products. Soon after the peroxides have reached their max., no more free O is present; a further formation of moloxides, peroxides, H_2O and fatty acids cannot occur, but the decompn. of the peroxides present into CO_2 , CO and other gases continues. It is this decompn. which causes the marked increase in pressure toward the end of the reaction.

LOUISE KELLEY

Unilateral and non-unilateral reaching of equilibrium in the literature. EMIL BAUR. *Z. physik. Chem. Abt. A*, 137, 63-71(1928).—In certain cases of inversion or transformation a true equil. exists, but it can be reached only from one side as the reaction const., contrary to Guldberg's classical law, is not the same in both directions. This conception of unilateral equil. differs from Duhem's principle of false equil. which postulated relatively reactionless zones near the equil. point while maintaining the principle of equal velocities at equal distances from the equil. point. B. gives as examples the isomerization of BuBr , the transformation of hexachloro- α -keto- β -R-pentene into hexachloro- α -keto- γ -R-pentene, and the isomerization of the tolane dibromides. A. P. S.

A theory of partial osmotic pressures and membrane equilibria, with special reference to the application of Dalton's law to hemoglobin solutions in the presence of salts. G. S. ADAIR. *Proc. Roy. Soc. (London)* A 120, 573-603(1928).—The osmotic pressures of hemoglobin solns. in equil. with solns. of diffusible salts have been measured and correlated with detns. of the membrane potentials, and the distribution of diffusible ions. Although the relationships between the activities of diffusible ions and the membrane potentials are in accordance with Donnan's theory, his assumptions concerning osmotic pressures are not applicable to the protein solns. of finite concn. which have been studied in this work. (Cf. F. Donnan, *C. A.* 6, 1559; F. Donnan and A. J. Allmand, *C. A.* 9, 171.) Within certain ranges of hydron, salt and protein concn., a modified form of Dalton's law of partial pressures appears to be applicable for the purpose of analyzing the observed osmotic pressures in terms of p_i , the diffusible ion pressure difference, and p_p , the partial osmotic pressure of the protein ions. Systematic exptl. investigations of the partial pressures indicated that certain variations formerly attributed to changes in aggregation are due to the existence of great deviations from the law of van't Hoff. In solns. with H-ion concns. from 10^{-4} to 10^{-9} , and with NaCl

concs. from 0.01 to 4 mols. per l., and in solns. with different species of ions, including K, Na, NH₄, Mg, Cl, HCO₃, SO₄, H₃PO₄, HPO₄, the degree of aggregation of hemoglobin appears to be const. Methods for detg. the mol. wt. of proteins in non-ideal solns. contg. salts have been developed. The value 67,000 obtained for hemoglobin in physiol. salt solns. agrees with that previously detd. for hemoglobin in distd. water. G. C.

The pore size of compressed carbon and silica membranes. F. E. BARTELL AND H. J. OSTERHOF. Univ. of Michigan. *J. Phys. Chem.* 32, 1553-71 (1928).—A discussion and extensive review is given of the literature referring to the methods for the detn. of capillary radius by means of (1) decrease in vapor pressure with increasing curvature of meniscus, (2) height of rise in a capillary and (3) application of Poiseuille's law to the rate of flow through a capillary. The pore sizes of compressed C and SiO₂ membranes are measured by capillary rise and by Poiseuille's formulations and a comparison made between the results obtained. With C membranes C₆H₆, McPh and CHCl₃ were used, since they have zero contact angles. Similarly with SiO₂, H₂O and C₆H₆ were used. The equation used is: $R = 2S/Pg$ where S = surface tension at 25°, P = the equil. pressure in g. per sq. cm. and g is 981 dynes per g. The values of the pore radius of C for the different solvents were 9.29, 9.26 and 9.36×10^{-6} cm., resp., and for SiO₂ were 210.6 and 210. Poiseuille's formulation is cor. for this study and used in the following condition: $R = \pi/2 \cdot l \cdot \sqrt{8\eta Q/PVgt}$, where l = interior length of the displacement cell, η is a const. in dyne secs. per cm., Q is the vol. in cc. of liquid forced through the cell, and V = total pore vol. The value for R obtained by this method is 8.83 for C and 168 for SiO₂. By extrapolating these values to zero time the values 9.23×10^{-6} cm.² and 205×10^{-6} cm.² are obtained, which are in astonishingly close agreement with the values given above. The C was packed under 2500 lb. pressure and the SiO₂ under 3000 lb. pressure. The no. of pores per sq. cm. of membrane surface was calcd. for C as 20.8×10^8 and for SiO₂ as 30.9×10^8 and it is clear that the mean effective pore radius decreases as the no. of pores in unit cross section increases. The velocity of the liquid through a C pore is given as 4.08×10^{-4} cm. per sec. D. H. POWERS

Studies in periodic precipitation. F. E. LLOYD AND V. MORAVEK. McGill Univ. *Plant Physiology* 3, 101-30 (1928).—The expts. were conducted in glass or vitreous tubes of various bores (15 mm.–0.5 mm.) and also in the capillary spaces between the glass slides and square cover-glasses used in microscopy. These were filled with "Gold label" or "Difco" gelatin contg. the "reacting material"—either Co Na hexanitrite or Co-(NO₂)₂·6H₂O. After the mixt. had set the "entering reagent," either (NH₄)₂S or NH₄OH, was added. The details of the technic adopted are given. Photographic records of all expts. made are recorded in the 74 figures accompanying the paper. The ppt. is laid down as fine or coarser granulations or droplets in a metastable condition. Because of the proximity of surfaces favoring local absorption of the ppt., these granulations become distinctly visible when there is a structural basis, such as minute tubercles, etc. Localization of ppt. is due to the role played by the surface of the inclosing vessel (the gelatin or water-glass-wall interface) whereby a ring-and-disk structure arises. In minute glass tubes, having a diam. greater than a certain crit. value, the ppt. occurs attached as a ring to the walls, without the disk. This crit. diam. is related to the rate of movement of the ions concerned, i. e., periodic pptn. does not depend for its occurrence on a capillary space, but its fixation depends on the presence of appropriate surfaces. Thus, in a wide enough tube, and in the case for example of Co(OH)₂ pptd. in gelatin, the ppt. is adsorbed on the glass wall as a ring, and within or upon the gelatin itself as a disk. In the absence of a glass (or other) wall only diffusion-shell patterns will arise. It is urged, however, that some surfaces ("nuclei") are further required. L. and M. consider that the evidence derived from their expts. support Bradford's ideas (*Sci. Progress* 10, 369, 1916) that the ppt. furnishes surfaces toward which the surrounding solute moves, adding to each particle more material. The more surfaces that are provided and the more irregular they are, the more diverse the patterns are which arise from periodic pptn. The heterogeneity of the medium, such as that which the living cell or body presents, furnishes conditions in which extreme irregularity of pattern would arise from periodic pptns. Biol. material should be examn. free from prejudice from the conditions producing "Liesegang rings." Differences of temp. affect the results in a large degree. Low temps. did not favor regularity, or even the obvious occurrence of periodic pptn. WALTER THOMAS

The alcosol of silicic acid. KENKYO INABA. *Bull. Inst. Phys. Chem. Research (Tokyo)* 7, 948-56; English Ed. 1, 92-3 (1928).—The alcosol of SiO₂ is easily prepd. from Si(OEt)₄ by hydrolyzing it with the calcd. amt. of H₂O in the presence of small quantities of HCl or H₂SO₄. To attain the best results Si(OEt)₄ is first dild. with EtOH to keep the acid concn. from exceeding 0.02-0.06 N. The mineral acid present in the alcosol is

removed either by means of a metallic oxide such as Ag_2O or PbO which is itself insol. in EtOH and forms a salt also insol. in EtOH , or by electrodialysis, with a parchment paper or collodion film as a diaphragm. The SiO_2 -alcosol thus prep'd. is a colorless, transparent, viscous liquid. The sp. cond. of an alcocol contg. 16–18% SiO_2 at 25° is $2.5\text{--}3.0 \times 10^{-5}$ and the sp. viscosity is 3–3.5 at the same temp. The stability of the alcocol is greater than that of the hydrosol. Sols contg. about 20% SiO_2 remain unaltered for 90 days; those at 10% keep over years. The relation $C = C_0/1 + \alpha T^n$ (where $C = \text{SiO}_2$ concn. T = time required for coagulation, $C_0 = C$ at a time $T = 0$, α and n = consts. depending on the nature of the sols) exists between the stability and the concn. Though the addn. of an electrolyte decreases the stability, the sensitivity of the alcocol toward electrolytes is only trifling. The influence of inorg. acids is greater than that of org. ones. The action of neutral substances is comparatively slight. Ethyl phosphate, camphor and naphthalene increase the stability of the sols. A. L. HENNE

Some further experiences with the production of colloidal lead or salts of lead. M. C. REINHARD, K. W. BUCKWALD AND K. L. TUCKER. *J. Cancer Research* 2, 160–5 (1928).—A method is described for the production of colloidal solns. of Pb and Pb salts, from Pb acetate in gelatin and 10% Na orthophosphate. The influence of pH and of the protective colloids was studied, and also the microscopic characters of such colloidal solns. H. G. WELLS

Colloidal solution of composite (high-molecular) compounds by means of substances which possess true solubility in abundance and which are inclined to a great solvation. P. P. V. VEIMARN. Imp. Univ. of Kyoto. *Japan. J. Chem.* 3, 71–87 (1928); cf. *C. A.* 21, 3514.—Ten g. casein was easily dispergated within 15 min. in 100 cc. of a concd. aq. soln. of pyrogallol (I) at 108° , and also, but more slowly, in a concd. aq. soln. of resorcinol (II) at $108\text{--}10^\circ$. Japanese silk (15 g.) was rapidly dispergated in 100 cc. of I at $115\text{--}25^\circ$, and in II at $135\text{--}40^\circ$. When cellulose in the form of very pure filter paper was heated with a concd. aq. soln. of I at $145\text{--}55^\circ$ (0.70 g. in 30 cc.) only a part of it was dispergated after 10–15 min. Aq. solns. of thiourea and guanidine thiocyanate also dispergate composite compds., e. g. silk. LOUISE KELLEY

Breaking up of emulsions by high-voltage alternating current. STEFAN PAWLKOWSKI. Lwow Polytech. *Przemysl Chem.* 12, 501–25 (1928).—The effect of outside influences on the stability of H_2SO_4 in crude-oil emulsions was studied. The emulsions were prep'd. according to a standardized elec. dispersion method and their breaking up was studied under the influence of a 50-cycle a. c. up to 17,000 volts. Cottrell's theory of the action of elec. forces dependent on potentials and dielec. consts. of the substances has been amplified and confirmed. A condition of rapid coagulation of an emulsion is inequality of the elec. field. Droplets of the dispersed liquid are drawn into places where the lines of elec. field are the densest and are there coagulated. Only in certain simplified cases was it possible to find the optimum conditions for deformation of the field whether by the application of slits or the use of holes of definitely varied diams. in the electrodes. Several types of app. used are described. The result of coagulation is a function of the potential employed; this phenomenon is explained by further proving that a secondary dispersion of the coagulated phase may take place at the electrodes on increasing the potential sufficiently. A. C. ZACHLIN

Rhythmic precipitation in gels. D. AVDALIAN. *Ukrainskii Khim. Zhurnal* 3, No. 2, Pt. sci. 223–30 (1928).—A. has studied the formation of Liesegang rings in gelatin caused by the reaction of $\text{K}_2\text{Cr}_2\text{O}_7$ and AgNO_3 . An addn. to the gel of indifferent electrolytes, as for instance KNO_3 , progressively diminishes the distance between the rings. The effect is interpreted on the basis of Ostwald's theory as due to a decrease of the metastable limit of the supersatd. solns. by added electrolytes. Phenomena occurring when AgNO_3 diffuses into a gelatin gel contg. $\text{K}_2\text{Cr}_2\text{O}_7$ and NaCl in varying concns. have also been studied. Various types of ppts. are interpreted as the combined effect of a continuous pptn. of AgCl and a rhythmic pptn. of $\text{Ag}_2\text{Cr}_2\text{O}_7$. G. B. KISTIAKOWSKY

The degree of dispersion in solutions of metals in fused salts (pyrosols). ERICH HEYMANN. *Z. anorg. allgem. Chem.* 175, 241–4 (1928).—Eitel and Lange have demonstrated experimentally (cf. *C. A.* 23, 16) that solns. of Pb in fused PbCl_2 or of Cd in fused CdCl_2 do not contain colloidal metal particles; the dispersion is rather a mol. one. By applying March's equation, which defines the conditions of stability of disperse systems (cf. *C. A.* 22, 3088), the mean diam. of a metal particle can be calcd. from the surface tension at the boundary of metal and salt. At 1000° abs. the mean diam. of a Pb particle is not more than 3×10^{-8} to 8×10^{-8} cm., i. e., the individual particle consists of a few atoms, possible of one atom only. For Cd a mean diam. of 10^{-7} to 3×10^{-7} is obtained. This would indicate that the Cd particle occurs in an extremely fine colloid subdivision comparable with that of the very finely dispersed amicrotic Au

particles. The latter finding, which also represents an upper limit of particle size, requires exptl. corroboration.

Solubilities of some inorganic fluorides in water at 25°. R. H. CARTER. *Ind. Eng. Chem.* 20, 1195(1928).—A comparison of the values given in the literature with those obtained by C. Literature references to solubilities are also given. C. H. PEET

Eutectic. DAVID W. HORN. *Am. J. Pharm.* 100, 558-61(1928).—A discussion and defense of the original definition of the scientific term *eutectic* as introduced by Frederick Guthrie (*Phil. Mag.* [5], 17, 426(1884)). W. G. GABSSLER

Enantiotropy and monotropy. II. NOBORU NAGASAKO. *Bull. Chem. Soc. Japan* 3, 209-17(1928).—The affinity of transition (Z) and the heat of transition (X) from diamond to graphite and from white to red P have been evaluated on the basis of the Nernst theory. Under atmospheric pressure, they are monotropic changes. The former case will probably be enantiotropic under high pressure, whereas the latter case will remain monotropic. For diamond to graphite, if T (in °K.) is 0, 100, 200, 300, 400, 500, 600, 700, 800, 900, 1000, 1100; X (in cal. gr. atom) is 277, 264, 212, 150, 11, 62, 35, 1, 890, 377,

formula for the heat of transition of transition the dimorphism in Fe_2O_3 , ICl , benzophenone, phthalide, bromonitrobenzene, acetamide, chloroacetic acid, nitro-*p*-toluidine and erythritol have been estd. to be monotropic.

A. I. HENNE

Thermal study of a few mixtures of incompatible components. ANTONIO ANGEL-ETTI. *Giorn. farm. chim.* 77, 97-113(1928).—Incompatible means here forming eutectics at room temp. The expts. were carried out with 10 g. substance in a Beckmann tube. Readings were made every 10 sec. *Acetanilide* (I) - *resorcinol* forms a eutectic with 53.9% I at 24°. The sepn. of the eutectic is assocd. with supersatn. phenomena. All mixts. with 20-90% I are liquid or pasty above 24°. *I-phenol*: eutectic at -14° with 38.6% I. The other eutectics were not detd. because of the high viscosity. *I-thymol*: eutectic with 33.3% I at 24.5°. Mixts. with 60-40% I show marked undercooling on solidification of the eutectics. Solid solns. are formed with 100-70% I. *I-chloral hydrate* shows for 35-42.5% I a gap in the miscibility. Mixts. with 100-70% I had to be heated above the decompn. point of chloral hydrate. There is a eutectic with 42.7% I at 25° and another with 31.5% I at 18°. Above this temp. only pasty or liquid mixts. are obtained. *Salol-methylacetanilide* forms a eutectic with 79% salol at 29°. At 20.0% salol solid white cryst. solns. are obtained. *Salol-naphthalene*: eutectic with 21.2% naphthalene at 24.5°. *Salol-terpinol hydrate*: Only mixts. up to 30% terpinol hydrate could be prepd., since temp. over 100° must be avoided. Eutectic: 97% salol, 39°. *Antipyrine-menthol*: eutectic at 33° with 18.9% antipyrine. *Antipyrine-methylacetanilide*: eutectic at 73.5° with 51% methylacetanilide. Above 80 and below 30% antipyrine solid mixts. are formed. All mixts. with a hygroscopic component gradually liquefy below the eutectic point.

MARY JACOBSEN

The precise determination of thermal capacities with particular reference to that of molybdenum. T. E. STERN. Princeton Univ. *Phys. Rev.* 32, 298-301(1928).—A Bunsen ice calorimeter modified by the addn. of a silvered vacuum jacket yielded precise values of the total heats of substances. The falling body was contained in a metal capsule to eliminate errors due to radiation and convection during fall. Thermal contact was established in the calorimeter by a Cu cup, contg. H_2O or Hg, and surrounded by H_2O . The probable error of a single observation of the motion of the Hg thread caused by a hot body was about 1 part in 1000. By this method the sp. heat of Mo was found to be $C_p = 0.05973 + 0.00001619t$ mean cal. between the temps. of 0° and 444.5°.

BERNARD LEWIS

A simple relation between thermal conductivity, specific heat and absolute temperature. C. C. BIDWELL. Lehigh Univ. *Phys. Rev.* 32, 311-4(1928).—A relation of the form $k/aC = K_1/T + K_2$ between thermal cond. k , at. heat (aC) and abs. temp. T , is shown to hold for Zn, Na, Li, Cu, Pb, Al and Hg. The possibility is indicated of an equation of this sort based on the assumption of a double mechanism of heat conduction—an at. lattice along with energy is transmitted as elastic waves (Debye) and a structure of atoms (cryst. or amorphous), through which energy is transferred by impacts. The lattice and at. contributions to the thermal cond. may be obtained from the slopes and intercepts of the lines. The values at 0° C. are as follows (lattice part being given first): Li 0.150, 0.006; Na 0.092, 0.169; Zn 0.084, 0.192; Cu 0.920, 0.171; Pb 0.018, 0.068; Al 0.127, 0.358; Hg 0.031, 0.033. The line for Hg suggests that the at. part is at least approx. the cond. in the liquid state. The single and polycryst. Zn lines have

the same intercept but different slopes, indicating that the increased thermal cond. of the single-crystal specimen is in the elastic wave contribution. **BERNARD LEWIS**

Entropy and oscillation number of solid inorganic compounds. W. HERZ. Bröslau. *Z. anorg. allgem. Chem.* 175, 245-8(1928).—The product of entropy and square root of the oscillation no. ($S\sqrt{\nu}$) is a const. for a no. of binary and ternary inorg. salts. The entropy was calcd. from Latimer's formula $S = \frac{1}{2}R \log A - 0.94$ (cf. C. A. 15, 1842).

EMIL KLARMANN

Calculation of the heat of dilution in accordance with the Debye-Hückel theory. G. B. BONINO AND V. VAGLIO. *Nuovo cimento* [N. S.] 5, 115-26(1928).—Evidence is presented to show the value of the Debye-Hückel theory as a means of calcg. heat of diln. The math. expression of the theory is interpreted as considering the heat of diln. not as proportional only to the square root of the concn., but as the sum of two terms one of which is proportional to the square root and the other to the first power of the concn. itself. The calcd. values for heat of diln. on this basis of KNO_3 , NaCl and LiCl compare as a satisfactory approximation with observed values reported in the literature.

L. T. FAIRHALL

Contribution to the thermodynamics of mixtures. V. FISCHER. *Z. Physik* 50, 419-24(1928); cf. C. A. 22, 1892.—Temp. and vol. are taken as the independent variables in equations for mixts. Free energy, internal energy and heat content are introduced into the equil. conditions for a mixt. of two components. Equations with pressure and vol. as the independent variables are also given.

E. R. SMITH

Use of the quinhydrone electrode. R. R. MCKIBBIN AND L. I. PUGSLEY. *Can. Chem. Met.* 12, 283-6(1928).—The history of this method for detg. H-ion concn., comparison with the hydrogen-electrode method, construction of the gold electrode devised by Cullen, and some of the conditions to be taken into account in using the hydroquinone \rightleftharpoons quinone method are given together with a cut of the set-up. The p_H obtained by both the above methods for a number of colored fruit juices, animal body fluids, one moistened soil and one buffered soln. are tabulated. Where the liquid was not too deeply colored, the p_H as shown by selected indicators is also given. The general principles of the quinhydrone method are given and the procedure followed by McK. and P. in detail. For plant fluids the quinhydrone method gave slightly higher figures than the hydrogen electrode. The quinhydrone method was much more rapid. With undil. human saliva the agreement was very poor. With the moist soil and the buffer the agreement was good. A short list of references is included.

E. G. R. ARDAGH

The electromotive force between copper and its amalgam and the reproducibility of the copper electrode. MITSUGU OKU. *Bull. Inst. Phys. Chem. Research (Tokyo)* 7, 905-14, English Ed. 1, 84-6(1928).—Previous detns. of the e. m. f. between Cu and its amalgam lack accuracy, because the Cu electrode could never be reproduced. O. succeeded in preparing a reliable Cu electrode. A soln. of CuSO_4 (about 0.1 M) acidified with H_2SO_4 was electrolyzed with a Pt cathode and a Cu anode, the c. d. being kept at 0.5-1.0 amp./sq. cm.; the electrolytic Cu thus produced was in a very spongy form and was further kept in the acidified CuSO_4 soln. for some days, during which the adhering H was removed by occasional shaking. The e. m. f. of the combination $\text{Cu}|\text{CuSO}_4 \text{ soln.}|\text{Cu amalgam}$ (heterogeneous) was measured at 25°, with great precaution against the oxidation of the electrodes by air. The mean value was 0.00513 ± 0.00005 v. when the electrolyte contained 1.0 mol. and 0.00511 ± 0.00003 v. when it contained only 0.5 mol. The temp. coeff. was detd. by measuring the e. m. f. at various temps. between 0° and 40°; the e. m. f. is strictly a linear function of the temp.; $dE/dT = -0.0000737$ v./degree; so that for Cu-Cu amalgam (heterogeneous), $\Delta F_{298} = -236.3$ cal. and $\Delta H_{298} = -1250$ cal. The reproducibility of the Cu electrode is perfect. The electrolytic Cu produced by the electrolysis of a neutral soln. (Lewis and Lacey, C. A. 8, 2839) lacks in reproducibility, but after being kept in an acidified CuSO_4 soln. it gave the same e. m. f. as mentioned above. Cu powder obtained by the reduction of CuO with H shows a high and consistent e. m. f., but this defect may be removed by treating with acidified CuSO_4 . Many previous detns. of the e. m. f., were defective because the electrodes were not properly protected against oxidation.

A. L. HENNE

The Hall effect in very intense magnetic fields. ALESSANDRO MAZZARI. *Nuovo cimento* [N. S.] 5, 215-23(1928).—M. has measured the Hall coeff. of Bi in magnetic fields varying from 11,900 to 36,500 gauss. The value of the coeff. R beginning at -3.44 at 11,900 gauss changes more or less regularly to -2.64 at 29,800 gauss, from which point it remains more or less const. Its value at 36,500 gauss is -2.63 . **L. T. F.**

Eliminating eye estimates from color measurements. L. BLIN DUBARDET. *J. Soc. Dyers Colourists* 44, 327-35(1928).—Curves were drawn with wave lengths as abscissas and intensity of tone as ordinates, a white plaster surface being taken as a standard

at 100 and abs. black as zero. The "Toussaint Photoelectric Photocolorimeter" for detg. the values to be used in the construction of the curves is illustrated and described. The results are shown in 12 charts of curves. L. W. RIGGS

The preparation of thin sections of friable rock. MAX LÉGETTE. *J. Geol.* 36, 549-57(1928).—A friable rock when impregnated with bakelite varnish and then heated in an oven produces a sound rock chip from which sections can easily be made. MeOH and a few drops of acetone are used as a solvent for the varnish. The n of the bakelite varies from 1.60 to 1.64. The technic is described in detail. W. F. H.

The sun's outer atmosphere. EDWARD A. MILNE. *Proc. Roy. Inst. Gr. Britain* 25, 404-12(1928); cf. *C. A.* 22, 2887.—The depth of the photosphere is estd. as tens of km.; that of the reversing layer as hundreds of km., that of the chromosphere as thousands of km.; that of the corona as hundreds of thousands of km. The limits of the photosphere are defined by pressures from 10^{-6} to 10^{-8} atm. Conditions governing radiation in the strata are discussed. A. E. BADGER

Wolfram, not tungsten. Vanadium or erythronium. F. MOLES. *Anales soc. españ. fis. quim.* 26, 234-52(1928).—Original literature shows that the name tungsten for element 74 is not justified. V was discovered by Del Rio, who called it erythronium because of the red color of its oxide. E. M. SYMMES

Milliliter or cubic centimeter? W. H. LINNELL. *Pharm. J.* 121, 423(1928).—The non-identity of the two terms is explained. The best recently detd. equiv. is 1 l. = 1000.028 cc. "Although the difference between cc. and ml. is negligible for general purposes, the use of the ml. should be encouraged because it will tend to concentrate attention on the true meaning of the terms." The term ml. for unit of vol. became official in Brit. Pharm. 1914. S. WALDBOTT

Constitution of hydroxides and hydrates (NATTA) 6.

Congrès international pour l'essai des matériaux. 2 vols. La Haye. MARTINUS NIJHOFF. Fl 30. Reviewed in *Rev. métal.* 25, 540(1928) A. P.-C.

3—SUBATOMIC PHENOMENA AND RADIOCHEMISTRY

S. C. LIND

Packing effect and characteristic nuclear size. L. STRUM. *Z. Physik* 50, 555-8 (1928).—H is chosen as the unit and upon this basis the "packing effect" is calcd. for a no. of elements. The relationship of the effect is not linearly proportional to the no. of protons in the nucleus, but nearly so. A mode of calcn. of the packing effect and

energy involved upon the basis of Frenkel's formula, $U = \frac{1}{2} \sum_{\alpha=1}^n \sum_{\beta=1}^n \frac{e_{\alpha} e_{\beta}}{r_{\alpha\beta}}$, for the total potential energy of the particles composing the nucleus, and of the Virial theorem, is derived. WILLIAM E. VAUGHAN

Jollivet-Castelot's process of transmutation. An attempt to explain. A. LÉLEVÉ. *Ann. chim. anal. chim. appl.* 10, 285-7(1928).—Jollivet-Castelot claims to be able to form Au from Ag, Sn and sulfides of As and Sb (*C. A.* 22, 3619). This is noteworthy because it represents the formation of an element with at. no. 79 from elements having at. nos. 16, 33, 47, 50 and 51. Methods of Rutherford and his followers have resulted in at. disintegration, whereas this appears to be a case of at. synthesis. It is easy to see how it would be possible to obtain the requisite protons and electrons from As and either Sb or Sn. If the nucleus of the atom is once opened there is probably enough energy available to accomplish the regrouping of electrons and protons, which is assumably a reaction of endothermic nature. In some way not yet clear, Ag seems to catalyze the reaction. W. T. H.

Helium studies. II. Application of the sensitive helium determination to the problem of the transformation of elements. FRITZ PANETH AND KURT PETERS. Univ. Berlin. *Z. physik. Chem., Abt. B*, 1, 170-91(1928); cf. *C. A.* 22, 3110.—P. and P. utilize their sensitive He-detection app. in attempts to identify He as a product of decompn. of elements. Several methods were tried: bombardment of KCl, KI and KBr with cathode rays for long periods of time; elec. discharges through H₂ at various pressures by use of metal electrodes, H₂ electrodes and ozonizers; application of β and γ rays upon H₂ and Hg in various ways, such as by the decompn. of Th B and Th C. The results obtained are considered as decidedly neg., only such amts. as are indicated by

vols. of 10^{-3} cc. being detected, this probably being occluded gases. The exptl. detail and data are given, with a rather complete bibliography of the field. W. E. V.

The separation of isotopes and a further separation of mercury by evaporative diffusion. WILLIAM D. HARKINS AND BERNARD MORTIMER. Univ. of Chicago. *Phil. Mag.* 6, [7], 601-31(1928).—A comprehensive survey of the sepp. of isotopes actually achieved has been made, and the possibilities of any larger sepps. have been discussed. The difference of at. wt. between samples of Hg as obtained in this work is 0.189 unit, the largest difference in at. wt. yet achieved by artificial means. The app. developed by Harkins and Mulliken (*C. A.* 16, 1359) was modified by the introduction of a ground joint between the flask and condenser, which greatly reduced the time of repair and replacement of the filter-paper membrane. *The theory of isotopic resolution by evapn. and diffusion is briefly reviewed. It is shown that the change in at. wt., ΔM , depends largely on the sepn. coeff., the cut and the efficiency. The details of the method of systematic fractionation, with cuts of 2, used in this work, are given in detail. The time required for the production of any extreme fraction, allowing for the time necessary to build up the intermediate fractions, is given by $t = K(\Delta M)^2 Q_0 / DE^2 B^2$, in which K is a const., B the sepn. coeff., E the efficiency, and D the rate of production of the light fraction. Study of this equation shows the difficulty of obtaining large values of ΔM , especially if B is small, as it is with Hg. The completion of nine full rows of the fractionation scheme applied to the heavy fraction yielded 101.96 g., 0.0962 unit of at. wt. heavier than ordinary Hg, and a set of 23 fractions each 0.004 unit heavier progressively than ordinary Hg. The completion of 13 full rows of the fractionation scheme applied to the light fraction yielded 108.76 g. of Hg 0.0931 unit lighter than the ordinary element; in addn. there is the corresponding set of 23 fractions, each progressively 0.004 unit lighter than ordinary Hg. The existence of this isotopic Hg affords an opportunity for the investigation of the variation of properties with isotopic compn.

GEORGE CLOCKLER

The first separation of chlorine isotopes. WM. D. HARKINS AND CLARENCE E. BROEGER. Univ. of Chicago. *Z. Physik* 50, 537-47(1928); cf. *C. A.* 14, 1480, 2123; 16, 196; 20, 8.—This constitutes a comprehensive description of H.'s work on the sepn. of Cl isotopes, a research initiated in 1916-17. The essential method consists in passing a continuous stream of pure HCl gas through 12.2 m. of porous porcelain pipe-stems; $10/20$ of the gas diffused through the pores of the clay, while $1/10$ passed out of the end over water where it dissolves. The so-called "cut" in this case is 20 and the portion ($1/20$) which passed through the tubes is designated "the heavy fraction." The "fractionation" of the "heavy fraction" was continued 3 times, the total cut being 8000. The increase of at. wt. of the Cl in the heavy fraction was detd. for 5 sepps. and found to be 0.052, 0.059, 0.057, 0.055 and 0.053 (av. 0.055). This increase amounts to 60% of the theoretical as predicted by Rayleigh's theory of diffusion, which does not necessarily apply to the method used. A plot of the extent of the sepn. according to theory and a complete diagrammatic sketch of the app. are given. The increase in the at. wt. was detd. very accurately by comparison of the ds. of solns. of equal molar strength of the "isotopic" HCl and of ordinary HCl. The accuracy of these detns. is estd. as 0.001 or 0.002 units of at. wt. ΔA , the increase, is given by $36.468 \Delta W / W_e$, where ΔW is the difference in wt. of the equal vols. of the 2 HCl solns. and W_e is the wt. of the soln. of ordinary HCl; or by $[T_e / (T_e - 1)] (d_{HCl} - d_{H_2O}) / d_{HCl}$, where T_e and T_i are the strengths of the ordinary and "isotopic" solns. and d_{HCl} and d_{H_2O} the wts. of HCl and water in the soln. of ordinary HCl.

WILLIAM E. VAUGHAN

The isotopic system. II. GUIDO BRÜCK. Univ. Wien. *Z. Physik* 50, 548-54 (1928), cf. *C. A.* 22, 2314.—B. attempts to develop a picture of the structure of isotopes, especially of the nuclei, utilizing as "building blocks" protons, electrons and α -particles, employing the latter as discrete units. Particular attention is given to those isotopes of at. wt. $4n$, n being any no. By using quantum considerations, such as the Pauli principle of limitation of not more than 2 electrons in 1 quantum state, and utilizing reasoning to allow for the inaccuracy of the Coulomb law in the near vicinity of the nucleus, there are developed conditions for the stability of various new orbital states. The no. of stable orbits is a function of P , the no. of effective charges in the kernel. Shift in outer-shell electrons to stable positions nearer the nucleus is exemplified with Ca of wt. 40, which by motion of 2 electrons toward the kernel into a stable state, would result in its isobar, A of wt. 40. The no. of these isobaric states, B , is given by $1/2$ of the no. of electrons added to the nucleus, since the shift of each pair results in but one new orbit, in which the electrons rotate in opposite directions. A plot of B vs. P gives a parabolic curve for 18 isotopes of wt. $4n$.

WILLIAM E. VAUGHAN

Wave mechanics and radioactive disintegration. RONALD W. GURNEY AND

EDW. U. CONDON. Princeton Univ. *Nature* 122, 439(1928).—To explain radioactive decay it has hitherto been necessary to postulate some instability of the nucleus. It is pointed out that disintegration is a natural consequence of the laws of quantum mechanics without any special hypothesis. In the classical mechanics the orbit of a moving particle is entirely confined to those parts of space for which its potential energy is less than its total energy. If a ball be moving in a valley of potential energy and have not enough energy to get over a mountain on one side of the valley, it must certainly stay in the valley for all time, unless it acquires the deficiency in energy somehow. But this is not so in quantum mechanics. It will have a small but finite chance of slipping through the mountain and escaping from the valley. According to this view the α -particle is not hurled from a nucleus with explosive violence, but rather slips away almost unnoticed.

JAMES M. BELL

The constancy of the activity of radioactive preparations. HANS J. VOGLER. *Physik. Z.* 29, 678-81(1928).—The ionization of the air from the action of radioactive substances is not const. but undergoes considerable fluctuations during the course of a day. The results vary with different ionizers and with the kind of exptl. arrangement. The course of the curve is analogous to that of the cond. of the atm. at the same time. There is no theoretical discussion.

MARIE FARNSWORTH

An attempt to accelerate the rate of radioactive transformation. H. HERSZFINKIEL AND L. WERTENSTEIN. *Nature* 122, 504(1928).—The expt. of Danysz and Wertenstein was repeated. Three similar sources, each contg. 1 mg. of ThO_2 , were prepd. Two were irradiated with 28 millicuries of Rn. On comparing activity of three sources no change of activity within 2% could be detected.

L. D. ROBERTS

Condition of radium salts after storage in sealed glass tubes. A. G. FRANCIS AND A. T. PARSONS. *Nature* 122, 571(1928).—No pressure was developed in glass tubes contg. RaCl_2 and RaBr_2 which had been sealed for 7 years. The salts had been dried at 240° before sealing. A fine Pt wire was fused into the tube. The cotton-wool packing and the labels were disintegrated.

L. D. ROBERTS

Experimental evidence of the existence of aggregates of active-deposit atoms in gases containing radon. E. L. HARRINGTON. Univ. of Saskatchewan. *Phil. Mag.* 6, [7], 685-95(1928).—Exptl. evidence is given of the existence of aggregates of atoms of active deposit in mixts. of Rn and air, also of Rn and A, including in either case more or less water-vapor. The evidence is both direct and indirect. Photographic evidence as to the nature and variety of these aggregates is included. Suggestions as to the possible origin of these aggregates seem to account for the facts exptly. obtained by various observers.

GEORGE GLOCKLER

The formation of a gaseous helide of radium active deposit. D. M. MORRISON. *Proc. Cambridge Phil. Soc.* 24, 268-75(1928).—In the light of the hypothesis that the He atom can exist in a H-like form in which one electron is relatively far removed from the nucleus with respect to the other, a series of expts. has been carried out with a view to det. whether or not He could be obtained in the form of a compd. similar to certain known hydrides. The mass of evidence points to a positive result. A gaseous compd. was shown to form when excited He was passed over a strong source of the active Ra deposit. Compd. formation was proved by counting scintillations caused by the transportation of the radioactive material from the discharge tube into a bulb contg. a ZnS screen. It has been proved that the effect observed in the bulb was due to the presence of a gaseous radioactive helide and not to Rn or solid particles in suspension. It was shown to be very unlikely that the effect was due to H impurities in He. The compd. in H was more efficiently condensed by a CO_2 -ether mixt. than that in He. The catalytic effects of tap grease and Hg vapor on the reaction were noted.

A. L. HENNE

Electrolysis of radioactive B- and C-products and of polonium. HARRY RAUDNITZ. Inst. für Radiumforschung, Vienna. *Sitzb. Akad. Wiss. Wien Abt. II*, 136, 447-51(1928).—In order to obtain a view on the colloidal properties of Ra C and Po, the electrolytic isolation of these two elements has been studied, as a function of the acid concn. in the soln. Ra C nearly free of Ra B is obtained at the cathode when a 0.5 N HCl soln. is used as electrolyte. The electrolysis of radioactive $\text{Pb}(\text{NO}_3)_2$ solns. gives also an optimum Po deposit at the cathode when the acidity of the electrolyte is 0.5 N HCl.

A. L. HENNE

The photographic action of H-rays. MARIETTA BLAU. Inst. für Radiumforschung, Wien. *Sitzb. Akad. Wiss. Wien Abt. II*, 136, 460-80(1928); cf. *C. A.* 21, 2612; 22, 3841.—An app. is described for the photography of natural H particles. It easily gives a great no. of definite point series. It is shown that the AgBr particles of the point series lie closer when they are caused by H radiation than when they are caused by α -rays. The length of the point series is a measure of the remaining range of the active

H particles, although only a small point series. H rays from _____ating atoms could be _____ly detected by means of the retrograde method. Even numerically, the results were in accordance with the results obtained previously in Vienna by the scintillation method and give addnl. support to the assumption that the C atom can also be disintegrated.

A. L. HENNE

Action of the Geiger α -particle counter. JAMES TAYLOR. *Proc. Cambridge Phil. Soc.* 24, 251-8(1928).—The action of the counter is developed from 3 bases: the threshold current hypothesis; the shape and significance of the volt-ampere characteristic; and the photoelec. theory of sparking potentials. The theory explains the following points: the action of the gas, and the electrode shape; the fact that the counter can be used for radiation intensity as well as for α - and β -particle detection, and the fact that the counters are much more efficient for α -particle counting than for β -particle counting (provided that the counter is not too critically adjusted); the fact that plane parallel electrode tubes can be used as counters; the partial reversibility of the counters; the self-restoring property of the system.

A. L. HENNE

Relation between mean stopping power and mean range of β -rays. E. J. WILLIAMS. *Proc. Cambridge Phil. Soc.* 24, 315-9(1928).—Mathematical.

A. L. HENNE

The velocity and distribution of β -particles after passing through thin foils. P. WHITE AND G. MILLINGTON. Clara College, Cambridge. *Proc. Roy. Soc. (London)* A120, 701-26.—The velocity distribution of β -rays ($H\beta$ 1410 to 1938) which have passed through sheets of mica (2 to 6 mg. per sq. cm.) has been found by photometry of a magnetic spectrum and the results expressed in terms of a fundamental straggling curve. The relation between most probable loss of velocity and thickness of stopping material has been investigated for $H\beta$ 1410 to 5904, and surface density 2 to 14 mg. per sq. cm., and has been found to show a small systematic divergence from Bohr's theory, which is beyond the limits of exptl. error. The same has been found of the relation between initial velocity and most probable loss of velocity.

G. CALINGAERT

Color change of pressed salt. KARL PRZIBRAM. *Inst. für Radiumforschung, Wien Sitzb. Akad. Wiss. Wien Abt. II*, 136, 345-6(1927); cf. *C. A.* 22, 1532.—A blue NaCl crystal becomes yellow after having been powdered, then pressed again; after exposure to light it recovers its blue color. Natural blue salt, or crystals which became blue after Ra irradiation and heating, turn violet by compression, without becoming first yellow. Fluorite becomes blue by irradiation, and calcite yellow; when they have been compressed, irradiation makes them purple. Many commercial salts have been examd. When they are first compressed, irradiation develops a color slightly different from the color obtained without compression, but the color is always purple or turquoise-blue. K_2SO_4 is hardly colored if not submitted to pressure; it becomes green when it has been melted, allowed to solidify, then irradiated; if it is compressed instead of melted, it becomes purple. NaF, Na_2CO_3 , K_2CO_3 , $CaCO_3$, $BaCO_3$, Na_2SO_4 , $SrSO_4$, and $BaSO_4$ are not colored by irradiation alone, but become blue or purple after compression followed by irradiation.

A. L. HENNE

Artificial blue coloration of rock salt at room temperature. KARL PRZIBRAM. *Anz. Akad. Wiss. Wien* 63, 150-1(1926); cf. *C. A.* 18, 1781; 22, 28.—An artificial blue coloration of NaCl crystals is obtained when the salt is compressed to its limit before or after being treated with Ra rays, and is then exposed for a few hrs. to daylight. Heating the salt to 150° before exposing it to the Ra rays inhibits the phenomenon.

A. L. HENNE

Relation between the scintillations and the structure of zinc sulfide. The cause of the scintillation process. BERTA KARLIK. *Sitzb. Akad. Wiss. Wien Abt. II*, 136, 331-61(1927).—K. describes a photometric method by means of which the relation between the residual range of the α -particles and the brightness of the scintillations can be detd. by differently prepd. ZnS-Cu phosphors. The influence of size of grain has been studied and curves have been obtained showing the relation between the residual range and the brightness on a no. of different specimens. It is shown that the form of the curves can be explained by assuming that the brightness of the scintillations is proportional to the total no. of ions produced in the passage of the α -particle through the ZnS crystal. This confirms the view that a scintillation depends on an action on the Lenard centers in the phosphore, which in each element of the path is proportional to the ionization produced. The effect of optical absorption and reflection in the crystal was studied and found to be small. The differences of brightness of the scintillations in the same prepn. was studied.

A. L. HENNE

Theory of the color change of rock salt by Becquerel rays. K. PRZIBRAM. *Inst. für Radiumforschung, Wien Sitzb. Akad. Wiss. Wien Abt. IIa*, 136, 679-84(1927);

cf. C. A. 21, 1411.—The observed relation between the coloration of NaCl and the irradiation intensity is further explained by the assumption of the simultaneous presence of 2 kinds of color centers of different stabilities, of which the more stable is more easily decolorized by the dark reaction than by irradiation. A theory is developed, based on the existence of color centers which can be destroyed and regenerated; this theory also gives an explanation of the luminescence phenomena. A. L. HENNE

Natural blue rock salt. KARL PRZIBRAM. Inst. für Radiumforschung, Wien. *Sitzb. Akad. Wiss. Wien Abt. IIa*, 136, 685-8(1927); cf. C. A. 22, 28.—The examn. of the macroscopic colorless halos on certain faces of naturally blue rock salt crystals sustains the assumption that the pressure has an important role in the coloration. A. L. HENNE

The dynamics of an electron. D. MEKSYN. King's College, London. *Phil. Mag.* [7], 6, 977-91(1928).—Mathematical. GEORGE GLOCKLER

The number of impacts associated with the diffusion of slow electrons in an electric field. W. HARRIES AND G. HERTZ. *Z. Physik* 46, 177-87(1928).—The no. of impacts of slow electrons in a rare gas calcd. with reference to the no. of electrons captured by the collecting plate is shown to be dependent only very slightly upon the strength of the field employed, although the no. of these electrons depends very largely upon the strength of the elec. field. Diffusion in a field-free cylindrical condenser and the Ramsauer effect are also discussed. A. L. HENNE

Collision of two-point charges according to wave mechanics. W. GORDON. *Z. Physik* 48, 180-91(1928).—The Rutherford scattering expt. is considered, by means of wave mechanics, on the line of Born's work. The Rutherford formula for the distribution of scattered α -particles is shown to hold good for arbitrary velocities. A. L. H.

Dissociation energy of nitrogen. GERHARD HERZBERG. *Nature* 122, 505-6(1928).—Gaviola's value of 9.8 v. (C. A. 22, 4370) for the dissocn. energy of N_2 is confirmed. It is suggested that Spomer's interpretation of the afterglow be altered. L. D. ROBERTS

Entropy of electron-gas calculated upon the basis of Fermi's statistics. ALLAN C. G. MITCHELL. Inst. Physik, München. *Z. Physik* 50, 570-6(1928).—Basing his calcs. upon Fermi's statistics, M. detrs. the entropy of electron-gas at various temps., considering the material to be a dissocd. gas; this condition increases with rise of temp. A value of 5.43 cal./mol./deg. for S_{298} is obtained. The detn. and value of A , which is the deg. of dissocn. of the material, is a factor upon which the entire derivation is highly dependent. The Sackur-Tetrode formula, $S = 5/2 R \log T + 3/2 R \log M - R \log P + R \log ((2\pi)^{3/2} K^{3/2} e^{5/2}) / (\lambda^3 N^{3/2})$, gives 3.28 cal./mol./deg. This "classical" expression is corrected by M. through addn. of a term $+R \log G$, where G is the "quantum wt." given the electron; in this case $G = 2$. This factor G is independent of the mode of derivation, whether by classical, Bose-Einstein, or Fermi's statistics. The corrected value of the S.-T. equation is 4.98 cal./mol./deg. However, the entropy of the gas is 0 at 109.2° K. according to this amended formula and is, obviously, of a neg. value at temps. lower than 109.2° K. Fermi's statistics give an entropy of 0 at 0° K., in accord with the "Third Law." Much more exptl. work is necessary for strict and rigorous proof of this problem. W. E. V.

Theory of the diffraction of electrons in crystals. H. BETHE. *Ann. Physik* 87, 55-129(1928); cf. C. A. 21, 1927; 22, 538, 2511.—A mathematical explanation, from the Schrödinger equation, of the expts. by Davisson and Germer and others on the selective reflection of electrons from crystal faces. B. reconciles the discrepancy between the de Broglie wave length within the crystal, Δ , and that calcd. from the Bragg equation, λ , by postulating an index of refraction $\mu = \Delta/\lambda$, which is greater than 1. The diffraction potential for Ni is calcd. from D. and G.'s results as 14.8 v. The theoretical development of the Richardson work function, the diffraction potential, the Fourier coeff. of the potential, and in calcd. examples the numerical values of the reflecting and resolving power of crystals agree satisfactorily with expt. G. M. E.

Degradation of gaseous electrons within stars. WILHELM ANDERSON. *Z. Physik* 50, 874-7(1928).—If p = pressure, n = no. of mols./cc., R = Boltzmann's const., T = abs. temp., m = mass of the mol., h = Planck's const., then for ideal gases, $p = nkT$ (i). For weak degradation the equation is $p = nKT (1 + 1/16(h^2 n)/(\pi m K^{3/2})) + \dots$ (ii) and for strong degradation $p = 1/20(6/\pi)^{3/2} h^2 n^{3/2}/m + 2^{3/2} \pi^{3/2} / 3^{3/2} m^{3/2} k^2 T^2/h^2 + \dots$ (iii). In shooting stars the central density is 5425 times as great as the av. density. In many denser dwarf stars the law cannot hold because such gases can only be compressed to a definite limiting density. Within dense stars like Sirius B it must be assumed that practically all the atoms are ionized and the real vol. of such strongly ionized gases is relatively very small; hence even with very dense stars the gas

can be still treated as ideal. Assuming the inside of stars to be Fe, one has $32,468 \times 10^4$ atoms/cc. On complete ionization 26 free electrons per Fe atom are lost, i. e., 844×10^{10} electrons/cc. Putting this for n in (ii) and $T = 7 \times 10^7$, $p = 9 \times 10^{-10}$, $h = 6.55 \times 10^{-27}$, $av k = 1.372 \times 10^{-16}$, then $p = 8.172 \times 10^{17}$ dynes/sq. cm., while from (i) $p = 8.107 \times 10^{17}$ dynes/sq. cm., or a difference of 1%. With less complete ionization the difference is even smaller and hence the degradation of gaseous electrons must be small. The degradation is found to be small in the chief star of Sirius. Similar calcs. for Krüger B show that the degradation p is about 2.05 larger than the classical p . If the 2 electrons in the K shell of Fe remain, then degraded p : classical $p = 1.97$. If in addn., the 8 electrons in the L shell remain, the ratio becomes 1.64. From (iii), p for Sirius B is less than h from (ii). Equation (iii) shows that a degraded gas must have a finite pressure even at zero abs. The degradation of gaseous electrons within our sun and many other stars is so small that it may be neglected. In stars of unusual density, e. g., Sirius B, the degradation cannot be neglected or serious error may be committed. Eddington's theory makes the center of the star be 50 times the mean density. Kerr Grant makes it nearer 50×10^6 times as great and according to this, the pressure and energy at zero abs. of gaseous electrons in the sun must be very large.

S. L. B. ETHERTON

A determination of a limit of the number of free electrons in a metal. F. EVELYN COLPITTS. *J. Franklin Inst.* 206, 489-50 (1928).—The existence of free electrons plays an important role in a no. of theories of metallic conduction. C. detd. the no. of free electrons on the basis of a suggestion in J. J. Thomson's Corpuscular Theory of Matter. The lower limit of the no. of free electrons in Au was found to be of the order of magnitude of 2×10^{17} /cc. and in W 9×10^{16} /cc. For details of app. consult the original.

EMIL KLARMANN

The high-frequency electric discharge at low pressures. JAMES TAYLOR AND WILFRID TAYLOR. *Proc. Cambridge Phil. Soc.* 24, 259-67 (1928).—Expts. have been conducted upon elec. discharges through gases under the influence of oscillations of the order of 10^7 cycles per sec. The following points are especially considered, in connection with the character of the discharge: effect of the wall material; general nature of the phenomenon; appearance of the discharge in narrow tubes; conduction of the luminosity along the tubes and round corners; elec. effect due to the wall; effect of injecting electrons into the glow; discharges in a bulb; effect of magnetic fields; clear-up effects and spectra.

A. L. HENNE

Reflection of electrons by insulators. A. WEHNELT. *Z. Physik* 48, 165-73 (1928).—W. publishes two dissertations written in 1922 in connection with his discovery of the reflection of electrons by insulators, which has recently been theoretically deduced by Klemperer. The number of secondary electrons emitted by glass and by other insulators increases with the angle of incidence. At potentials of 1300 to 3000 v. a well-marked diminution of the reflected current occurs at a certain angle. This is well accounted for on the wave theory of electrons.

A. L. HENNE

The reflection of electrons from an aluminum crystal. D. C. ROSE. *Phil. Mag.* [7], 6, 712-29 (1928).—Expts. have been performed in which electrons have been reflected by the planes of an Al crystal in the manner suggested by the wave theory. The app. was similar to a Bragg x-ray spectroscope, having the beam of x-rays replaced by a beam of electrons. It would be expected that a beam of electrons would be reflected in a manner analogous to x-rays when the accelerating potential, spacing const. of the crystal, and angle of reflection were connected by the usual relations $\lambda = h/mv$ and $n\lambda = 2d \sin \theta$. Four different orders of reflected beams were found whose position agreed with that predicted by theory within the accuracy of the expt. Two orders of another set of beams were found, which are attributed to Al_2O_3 or some other contamination of the surface of the crystal. A comparison is made between these expts. and those of Davisson and Gernier (*C. A.* 22, 350) who obtained different results with a Ni crystal. Their results differed from those predicted, but could be explained by the assumption of a refractive index.

GEORGE GLOCKLER

Equipment for routine spectral transmission and reflection measurements. H. J. McNICHOLAS. *Bur. Standards J. Res.* 1, 793-857 (1928).

E. H.

Theoretical diagram of the stationary and transitory phases of electrical discharge in gases. GIORGIO VALLE. *Nuovo cimento* [N. S.] 5, 195-203 (1928).—A general discussion of recent investigations and theories of elec. discharge in gases illustrated diagrammatically. The diagram constitutes a means of synthetic representation of the phases of elec. discharge and of attendant phenomena.

L. T. FAIRHALL

The effective cross section of gas molecules against alkali ions of 1-30 volts velocity. CARL RAMSAUER AND OTTO BEECK. *Techn. Hochschule, Danzig-Langfuhr. Ann.*

Physik 87, 1-20(1928); cf. *C. A.* 15, 3933; 22, 1273.—The exptl. methods are those used in R.'s detn. of the cross section of gas mols., against slow-moving electrons. The results have been given previously. GREGG M. EVANS

New method for the determination of ionization potentials of elements. SENHAMOY DATTA AND SURESHCHANDRA SEN. Calcutta. *Z. Physik* 50, 849-60(1928).—Detns. of the ionization potentials of K, Na, Li, Mg, Ca, Sr, Ba and Hg were carried out by the new method and the results agreed with values from other methods. The new method of D. and S. combines thermal and elec. excitation; it measures the cond. of a flame colored with metal. An even flame is necessary and D. and S. found the atomizer of Bancroft and Weiser most convenient. Both Pt anode and cathode are in the flame; the anode about 1 cm. above the cathode is connected with the positive of a potentiometer. The cathode is connected with a rheostat through a high-resistance galvanometer. The best electron source was found to be a piece of Th gas mantle. It was placed upon the cathode and a concd. soln. of the desired metallic salt was then introduced. The reading (A) was taken on the galvanometer when the potential was varied from zero to a max, when no salt was present in the flame. This is the cond. due to the electrons. The salt was added and reading (B) obtained. This gave the increased cond. due to dissoed. metallic atoms and electronic collision of ionized atoms. The Th gauze was then removed and the reading (C) obtained; the cond. due to the thermal dissoen. of the metallic atoms, $B - C - A$, corresponds to the increase in cond. due to electronic collision of ionized atoms. The results agreed within the limits of exptl. error. The possibility of a free electron obtaining energy depends only on the partial pressure of the metallic vapor in the flame. This is small, of the order 10^{-6} , so that the actual free path will suffice for the purpose. Moreover, near the cathode, the potential gradient of the flame is large; hence the fall in potential per mean free path is much greater in this region. Therefore, in the applied field, the electrons attain the full velocity earlier before they collide for the first time with an atom. However, the degree of ionization must needs be small. Mg, Ca, Sr, Ba and Hg have 2 resonance lines corresponding to $1s-2p_1$, and $1s-2p_2$, in the old notation. Conclusion: In the flame, Mg may exist in the $2p_1$ and $2p$ states, Ca, Sr, Ba in the $2p_1$ state and Hg only in the $2p_2$ state; these views are confirmed by the flame spectra. S. L. B. ETHERTON

The ionization accompanying the oxidation of nitrogen dioxide. A. PINKUS AND L. HENRY. Univ. Brussels. *Bull. soc. chim. Belg.* 37, 285-303(1928).—The ionization accompanying the reversible oxidation of NO has been studied in an app. capable of indicating 10^{-15} amps. At room temp., and at 100° , replacing O by mixts. of NO + O or NO₂ + O in the ionizing chamber causes only temporary elec. effects, which are attributed to the different dielec. consts. of NO₂ and O₂. The same effect is obtained with HCl, but not with air or N, whose dielec. consts. are very similar to that of O. At about 300° , the reacting mixts. NO + O₂ are conductive, and give an ionization current of 10^{-14} — 5×10^{-13} amps. This is independent of the sign of the elec. field. The current intensity increases with the potential gradient and the proportion of NO or NO₂ (O₂ being always in excess). The phenomenon is not a thermionic effect. Conclusion: The reversible reaction $2NO + O_2 \rightleftharpoons 2NO_2$ is accompanied by the formation of pos. and neg. ions at 300° . The fact that the ionization cannot be detected at room temp., or even at 100° , seems to prove that the effect is due entirely to the dissoen. of NO₂. But it is possible that the neg. results at low temp. are due to adsorption of the NO₂ mols. by the electrodes; this would build an isolating pellicle; the ionization would then be detectable only at a temp. where the adsorption phenomenon becomes negligible. As a whole, the results agree with A. K. Brewer and F. Daniels (*J. Am. Electroch. Soc.* 44, 171(1923); cf. *C. A.* 17, 3458; 18, 2104).

A. L. HENNE

The ionization accompanying the thermic decomposition of ozone. A. PINKUS AND R. RUYSEN. Univ. Brussels. *Bull. soc. chim. Belg.* 37, 304-25(1928).—The thermic decompn. of O₃ is accompanied by the formation of pos. and neg. ions, causing the reacting gases to become appreciably conductive. It has been shown by expts. carried out below 250° that this cond. is to be attributed exclusively to the chem. reaction in the gaseous phase, and not to a thermionic effect. Ionization is also to be observed when the decompn. of O₃ is catalyzed by Cl at low temp. In a 845-v./cm. field, the ionization current increased from 1.2×10^{-12} to 1.1×10^{-11} amp. when the no. of O₃ mols. decomposed per sec. increased from 8.9×10^{16} to 7×10^{17} . The ratio n/m = no. of captured ions/no. of dissoed. mols., remained practically const. (close to 10^{-11}). The results were nearly the same in a positive and a negative field. A study of the variation of the ionization chamber shows that satn. currents are yet far from being reached in fields of about 3000 v./cm. A theory is proposed which explains

the mechanism of the thermic dissocn. of O_3 . This theory admits two consecutive steps: (a) ionization step, resulting from the impacts between the mols. of O_3 , yielding positive and negative ions of O; (b) recombination step, the ions yielding neutral mols. of O_2 . This interpretation explains the proportionality of the current and the no. of transformed mols., the low value of the ratio n/m and the difficulty of reaching satn. currents.

A. L. HENNE

Total actinometry with the photoelectric cell. IVO RANZI. *Nuovo cimento* [N. S.] 5, 234-8(1928).—R. describes an actinometer consisting of a photoelec. cell of K hydride in which the cathode is connected to the neg. pole of an accumulator and the anode in series with a Ag coulometer. The amt. of Ag transported by the current is used as an index of mean light intensity during a certain period of time. It furnishes a means of detg. the mean value for illumination and the value for the so-called light sum.

L. T. FAIRHALL

The photoelectric threshold and the heat of dissociation of the potassium molecule. R. W. DITCHBURN. *Proc. Cambridge Phil. Soc.* 24, 320-7(1928).—The absorption curves and the photo-ionization expts. agree to give a value for the mol. photoelec. threshold of $\lambda 2555 \pm 20$ A. U. If D.'s view of the ionization process is correct, the dissocn. energy is 0.505 ± 0.01 v. If the picture of the ionization is wrong, the dissocn. energy may be a little lower (a few hundredths of a v.). The corresponding heat of dissocn. is 11,400 cal. In the range of temp. 200-500° generally used in expts. on K vapor, the fraction assocd. varies from 10^{-4} to 10^{-2} . An equation for calcg. the fraction assocd. at any temp. was given in a previous paper (*C. A.* 22, 1278).

A. L. HENNE

The photoelectric properties of thin films of the alkali metals. N. R. CAMPBELL. *Phil. Mag.* [7], 6, 633-48(1928).—The thin films mainly studied are those produced by depositing an alkali metal on some other material, driving it off by heat, and subjecting the remaining film to a discharge in H_2 . By this process photoelec. cathodes can be produced that have very remarkable and stable sensitivity to red light; photoelec. currents can be obtained with light of $\lambda 8000$ A. U. of the same order as those obtained in normal K cells with light of $\lambda 4500$ A. U. The sensitivity depends very greatly on the material on which the film is deposited. The observations are closely related to those of Ives on the photoelec. properties of thin films and to those of the many workers who have investigated the effects of gas films on photoelec. emission. The surfaces concerned almost certainly consist of a succession of monomol. layers, similar to those of Cs and O_2 on W (Langmuir and Kingdon) or of Ba and O_2 or other gases (Ryde). But the conditions of their formation are exceedingly complex, and little progress has been made toward an analysis of their constitution. The observations seem to have an important bearing upon attempts to correlate thermionic and photoelec. emission.

GEORGE GLOCKLER

Spatial distribution of the electrons produced by polarized Röntgen rays. FRITZ KIRCHNER. *Ann. Physik* 84, 899-906(1928); cf. *C. A.* 21, 2604, 3309.—A continuance of the work previously described. The observed spatial distribution in a Wilson chamber cannot, as was thought by Watson, be explained in terms of scattering from the gas. The latest measurements by Loughridge for unpolarized rays shows that the form of the distribution is independent of the nature of the gas as was proved previously by K. for polarized radiation.

A. L. HENNE

The intensity distribution of the general and characteristic x-radiation from molybdenum. L. R. G. TRELOAR. Univ. of Reading. *Phil. Mag.* [7], 6, 1008-19(1928).—Measurements are given of the intensity distribution of the general radiation at various voltages, the corresponding intensities of the $K\alpha$ and $K\beta$ line radiation and the ratio of the homogeneous to the general radiation.

GEORGE GLOCKLER

Secondary normals for x-ray wave lengths. MANNE SIEGBAHN. Upsala. *Z. Physik* 50, 443-7(1928); cf. *C. A.* 22, 3352.—This is a criticism of Iwata's work on secondary normals. The previous detns. of the Mo $K\alpha_1$ wave length are reviewed. Iwata's results are not in good agreement. In particular, the data of Larsson (cf. *C. A.* 21, 2606) are very much more consistent and presumably therefore more reliable than those of Iwata. Iwata's value for the W $L\alpha_1$ line agrees very well with previous more accurate work by Friman though it is suggested that the Fe $K\alpha_1$ line would be a better standard in this region. In general, it is not important in wave-length measurements whether the rotating-crystal method or the wedge method is used. The important point is not how the spectrum is produced but how the measurements are made. The whole idea of secondary normals in x-ray spectroscopy is, however, a mistaken one based on the erroneous assumption that relative measurements can be made with greater accuracy than abs. ones.

A. W. KENNEY

Thermal degeneration of the x-ray halos in liquids and amorphous solids. S. S.

RAMASUBRAMANYAM. *Indian J. Physics* 3, 137-49(1928).—X-ray diffraction in a no. of liquids, *vis.*, cyclohexane, pentane and glycerol, as well as that of an amorphous substance (a synthetic hydrocarbon resin) at different temps. has been studied. As predicted by Raman and Ramanathan in 1923, 3 definite effects were observed on raising the temp.: (1) a visible contraction of the ring, (2) broadening of the ring and diffuseness of the edges, (3) a large amt. of internal scattering. It is pointed out that the first effect is due to thermal expansion of the liquid, since the distance between the mols. is increased thereby. The second effect is due to increased displacements of the mols. from their mean positions. The third effect is explained as due to local fluctuations of density of scattering electrons arising from the varying positions and orientations of the mols. within the liquid. On raising the temp., the compressibility increases and the fluctuations of electron density become larger and hence give rise to an increased scattering at small angles. In spherical or nearly spherical mols., this effect is limited, whereas in long-chain compds. it reaches its max. The case of the amorphous solid is similar to that of the liquid, once it passes the transition interval and melts completely, in conformity with the expectation of Raman and Ramanathan.

G. CALINGAERT

Relation between chemical constitution and x-ray K-absorption spectra. VII. General review of the results obtained. ORTO STELLING. *Z. Physik* 50, 506-30 (1928).—Different methods of measuring absorption edges lead to different recorded results by different workers, more particularly since some of the corrections are not made uniformly. The results obtained, particularly with P, S and Cl, by attempting to correlate absorption spectra and chem. compn. are reviewed at some length. Of all the P compds. investigated, none gives a longer wave length for the absorption limit than elementary P, and of the 3 allotropic forms, white P gives the softest edge. All those compds. in which the absorbing atom is in the same radical give the same absorption edge, regardless of the structure of the rest of the compd., *i. e.*, only those atoms immediately adjacent to the P atom influence the results. In general, the shift of the absorption edge is greater the larger the no. of inserted atoms or groups. As for the direction of the shift, the phosphate group has the hardest edge of all compds. investigated. N compds., where the N is attached to the P, come next; so that the substituting elements may be arranged in the order of decreasing hardness as follows. $O \rightarrow N \rightarrow H \rightarrow C \rightarrow (Cl^?)$. The results of S. and of Lindh on the S compds. are in excellent agreement. As the valence of S increases the absorption edge becomes harder. The wave length of the edge depends also on the nature of the group attached to the S; but it is not possible to generalize with certainty on the character of these effects. The sulfates give the edge of shortest wave length independently of the cation. The absorption edge of Cl has been studied in a large no. of compds. All Cl compds. give harder edges than the gaseous element. With increasing valence the absorption edge is shifted toward shorter wave lengths. For univalent Cl the wave length of the edge is dependent on the atom attached to the Cl. When Cl enters non-ionogenically into a complex ion, it gives 2 distinct absorption edges, of which the softer lies near the soft edge of the element itself, and the harder edge corresponds to that of ionic Cl. In org. compds. the absorption edge of the Cl is not appreciably influenced on the long-wave-length side by the radical attached to the Cl, but it is on the short-wave-length side. The absorption edges of the chlorates and perchlorates are independent of the metals. The explanation of the change of the absorption edge with constitution must be related to the structure of the atom, specifically to changes in the energy levels, which may be described as distortions or deformations of the atom. A comparison of ionic distances in lattices of the same type shows that greater ionic distances are usually assocd. with longer-wave-length absorption edges, for the same element. In general, those factors (ionic distances, lattice type, electron configuration, etc.) which influence "deformation" have the predicted effect on absorption edges.

A. W. KENNEY

The change of x-ray absorption spectra in crystal lattices. K. FAJANS. Chem. Lab. Bayer, Akad. Wiss., Munchen. *Z. Physik* 50, 531-6(1928).—A quant. investigation has been made of the analogy suggested by Stelling between the changes which take place in the wave lengths of the x-ray absorption edges on the one hand, and the mol. refraction of ions in the crystal lattice on the other. As a matter of fact, the inverse proportionality to the fourth power of the ionic distances in the lattice, which according to Fajans holds for the changes of the mol. refraction of an anion seem to hold also for the x-ray spectra. If this high exponent is established by measurements of increased precision, it will be evidence that the x-ray spectrum is also influenced by the polarization (deformation) of the ions in the lattice.

A. W. KENNEY

Excitation of mercury fluorescence with the mercury line 2536 A. U. S. PIENKOWSKI. Inst. for Exper. Physics, Warsaw Univ. *Z. Physik* 50, 787-92(1928).—The green fluorescence of Hg vapor can be obtained by illumination with many short-wave ultra-violet sparks, particularly from Al or Zn. The absorbing centers are Hg₂ mols. which, upon excitation, emit fluorescence by an intermediate process. Since the line 2536 A. U. can only excite Hg atoms, it must be assumed that the intermediate process begins with atom excitation. Since the luminescence spectra in the 2 cases are identical, the end conditions in both processes must be the same. Upon illuminating streaming Hg vapor an after-glow lasting up to 10⁻³ sec. is noticed in both excitation processes. P. investigates the period of darkness lasting from the moment of excitation to the moment of the emission of the luminescence using the Al spark and the Hg line method and showed the identity of the time of induction for both methods. Apparently, absorption in the band 2540 A. U. is responsible for the production of the green fluorescence with the Hg line 2536 A. U. A diagram and a description of the app. are given.

S. L. B. ETHERTON

The spectrum of potassium excited during its spontaneous combination with chlorine. L. A. RAMDAS. *Indian J. Physics* 3, 31-6(1928).—The paper gives data concerning the spectrum of K excited while it burns spontaneously in an atm. of Cl₂. The arc lines, an intense broad band in the red region (due to mols. of K) and a few feeble lines which appear to be the enhanced lines in the violet region are emitted. The explanation of these results has been attempted in a general way and the possibility of thermal excitation has been considered.

G. CALINGAERT

The absorption spectra and constitution of diazotates. L. CAMBI AND L. SZEGÖ. Univ. di Milano. *Ber.* 61, 2081-6(1928).—A continuation of the discussion between Hantzsch (C. A. 21, 1970) and Angeli (C. A. 21, 3603) on the constitution of diazo compds. C. and S. present data on the absorption spectra of the normal and isodiazotates and the corresponding nitrosophenylhydroxylamine and phenylnitroamine. Data are also presented on the absorption spectra of the *p*-Cl and *p*-Br derivs. of the above. All of the curves obtained are similar in character; the normal diazotate and aryl-nitrosophydroxylamine have less absorption than the isodiazotate and phenylnitroamine. The data agree with the theory of Angeli that these compds. are structural isomers and not stereoisomers as Hantzsch describes them.

WALLACE R. BRODE

The absorption spectra and constitution of azoxy compounds. L. SZEGÖ. Univ. di Milano. *Ber.* 61, 2087-91(1928).—The theories described in the preceding abstract are applied to Br, NO₂ and OH derivatives of azoxy benzene. S. assumes the presence of a tervalent and a quinquivalent N in the compd. The α and β forms give nearly identical absorption spectra, only the di-substituted derivatives in the α form showing an additional band in the far ultra-violet. S. explains the failure of the mono-substituted isomers to show different absorption on the basis that the mono-substituted halogen or nitro on the benzene nucleus is without influence on the optical properties of the compd.

WALLACE R. BRODE

Ultra-violet absorption spectra of several benzene derivatives. F. W. KLINGSTEDT. *Z. physik. Chem., Abt. B*, 1, 74-93(1928).—The absorption spectra of acetanilide in pentane, in hexane, and in EtOH and of aniline in hexane, and of benzene in hexane were detd. Acetanilide in hydrocarbons shows 2 regions of selective absorption between 2900 and 2630 A. U. as do several other benzene derivs. The phenyl radical seems to be characteristic of such behavior, since other mono-substitution products behave likewise. In alc. soln. a different activity is revealed in the disappearance of the minor absorption regions. Aniline has a very different spectrum from that of acetanilide, the presence of the acetyl group causing a change in selective absorption toward shorter wave lengths.

WILLIAM E. VAUGHAN

The ultra-violet absorption bands of oxygen. A. S. GANESAN. *Indian J. Physics* 3, 95-104(1928).—The paper deals with the structure of the 5 ultra-violet absorption bands of O₂, $\lambda\lambda = 1946-1953, 1923-1934, 1902-1920, 1882-1897$ and $1864-1878$. The lines in the bands are given by the well-known relation of the type $\nu = A + 2Bm + Cm^2$. The band-heads are given by $\nu_0 = 49,350 + 708n - 13n^2$, where n has values from 3 to 7.

G. CALINGAERT

Kinetics of the action of iodine on potassium nitrite in the dark and in the light. A. BERTHOUD AND W. E. BERGER. *J. chim. phys.* 25, 542-61(1928).—See C. A. 22, 2112.

E. H.

A study of the Raman effect in glycerol and glycerol-water mixtures. S. VENKATESWARAN. Government Test House, Alipur. *Indian J. Physics* 3, 105-22(1928); cf. C. V. Raman, C. A. 22, 2707, 2884.—The paper gives the results of investigations on the modified radiations produced in glycerol when light from a

quartz Hg lamp is diffused through the liquid. The spectrogram of the scattered light contains a bright continuous spectrum and a no. of modified lines including one of enhanced frequency. The modified lines present in the scattered spectrum have been measured and analyzed, and the frequency differences between the modified and unmodified lines have been calcd. The shift of frequency of the modified lines corresponds to certain characteristic infra-red frequencies of the mol. The wave lengths corresponding to these have been compared with the values of the maxima obtained by Pfund in his reflection measurements of glycerol. It is shown that the method of detg. these natural frequencies from the spectrum of the modified radiations is far more convenient and accurate than reflection measurements. The values for the depolarization of glycerol scattering with white sun light as the incident radiation and with different filters in the path of the incident light are given. The depolarization factor is found to be practically independent of the wave length of the incident light. With the help of suitable filters the modified and unmodified parts of the scattered light were isolated and their polarization was measured. It is shown that the scattered light consists mainly of the continuous spectrum and that the degree of polarization of the modified and unmodified parts are of the same order. These have been confirmed by spectroscopic observations. The origin of the continuous spectrum is discussed. The effect is observed in many liquids even after the most careful purification, suggesting that it is characteristic of the chem. nature of the liquid. The strong continuous spectrum observed in glycerol is definitely shown to be characteristic of the pure liquid. Expts. are described to find the relation between the continuous spectrum and the viscosity of glycerol. The intensity of the continuous spectrum falls off rapidly at high temps. although the classical scattering increases with temp. There is a slight diminution of the intensity of the modified lines with increase in temp., suggesting that these are incoherent. The effect of diln. has also been studied and it is shown that the intensity of the continuous spectrum diminishes on diln. These suggest that the presence of the continuous spectrum in glycerol is intimately connected with its high viscosity. There appears to be some interrelation between the continuous spectrum and the modified lines. The intensity of the former shows a discontinuity, brightening up on the longer-wave-length side after every modified line. A similar relation exists between the characteristic frequency of the mol. and the continuous spectrum in liquids where the latter effect is due to impurities. The importance of this relation to fluorescence is indicated.

G. CALINGAERT

Raman effect in gases and vapors. L. A. RAMDAS. *Indian J. Physics* 3, 131-6 (1928); cf. C. V. Raman, *C. A.* 22, 2707, 2884.—By means of a specially constructed spectrograph of very large light-gathering power, the Raman effect was successfully photographed with Et_2O , vapor and liquid, at room temp. The change of wave length in scattering is found to be the same in the vapor and the liquid, within the limits of exptl. error. The intensity of the radiations of modified frequency in relation to that of original frequency is smaller in vapors than in liquids. This is accounted for by measurements of the intensity of the modified radiation, which show it to be roughly proportional to the density of the fluid while that of the radiations scattered without change of frequency is much less in liquids than in proportion to the density. Some observations on the modified scattering in CO_2 liquid and vapor at and near the crit. temp. are also described.

G. CALINGAERT

The Raman spectra of scattered radiation. R. W. WOOD. *Johns Hopkins Univ. Phil. Mag.* [7], 6, 729-43 (1928).—W. obtains Raman spectra with CCl_4 , CHCl_3 , C_6H_6 , quartz and calcite and compares them with the near infra-red spectra of these substances.

GEORGE GLOCKLER

The Raman effect in crystals. I. RAMAKRISHNA RAO. Bihar National College, Bankipore. *Indian J. Physics* 3, 123-9 (1928).—In this paper, the effect discovered and explained by C. V. Raman of the change of wave length which occurs when light is scattered in fluid and solid media has been studied in cryst. ice and quartz. The difference between the incident and scattered frequencies corresponds to the characteristic infra-red frequencies of the crystals. Compared with the case of water, the bands observed with ice are sharper and of shorter wave length. This agrees with the infra-red absorption data.

G. CALINGAERT

Dispersion of light in crystals. G. LANDSBERG AND L. MANDELSTAM. *Inst. for Theor. Physics, Moscow Univ. Z. Physik* 50, 769-80 (1928).—L. and M. permit light from a Hg lamp to fall upon quartz and calcspar and find that every spectral line of the incident light corresponds not only to a line of the same frequency in the dispersed light which they term the fundamental line, but it also corresponds to a no. of satellites. The wave lengths and intensities of the satellites have a definite regular

relation to the fundamental lines. L. and M. used a 110-v. Heraeus Hg lamp consuming 70 v. and 3 amp. and a Fuess, Model B, quartz spectrograph with Ilford, Iso-Zenith and Monarch plates. The image was developed with hydroquinone for 6 mins. in total darkness. A Hilger comparator was used to measure the spectrogram and Hartmann's interpolation formulas were used to calc. the wave length. Five systems of satellites were found for quartz and 2 for calcspar. For every system of satellites the difference, $\Delta\nu_i$, between the frequency of the satellites and the corresponding fundamental line is a const. for all fundamental lines. This indicates that for every satellite system $\Delta\nu_i$ corresponds to a definite crystal frequency. For corresponding wave lengths the values found are, for quartz, $\lambda_1 = 21.5\mu$; $\lambda_2 = 48\mu$; $\lambda_3 = 81\mu$; $\lambda_4 = 13.5\mu$, $\lambda_5 = 9\mu$ for calcspar, $\lambda_1 = 9.1\mu$; $\lambda_2 = 34\mu$. The connection between the characteristic frequency detd. and the infra-red frequency of the crystals is discussed. The intensity of the violet satellites increases with rising temp. as compared with the intensities of the red satellites.

S. L. B. ETHEKTON

The scattering of light by particles of metallic oxides dispersed in dry air. T. C. NUGENT AND H. P. WALMSLEY. *Proc. Phys. Soc. (London)* **40**, 269-80(1928).—An examn. has been made of the time changes in the brightness of the Tyndall-light from ZnO, CuO CdO and As₂O₃ clouds. These changes indicate a gradual decrease in the no. of particles per unit vol. which must be due to loss by aggregation or sedimentation. A series of clouds vaporized from various masses (m) of As₂O₃ were obtained in which the brightness of the Tyndall-beam was approx. proportional to $m^{3/2}$. The actual fluctuations in brightness occur in groups, the times of occurrence of a large no. of the minima being represented by the formula $T = Ar^n$, where n is an integer and A and r are consts.

FRANK V. JOHNSON, JR.

Variations in the fine structure of H α . G. H. HARRISON. *Proc. Phys. Soc. (London)* **40**, 300-6(1928).—A study was made of the intensity changes in the fine-structure components of the Balmer lines of H, taking place at fixed pressures and current densities, with alteration of the bore of the discharge tube. Variations in the intensity ratio taking place with tube bore or gas pressure, which in the present expts. reach 100%, may be attributed to the changes of the elec. field surrounding an emitting particle. The mean value of 0.304 cm.⁻¹ for the doublet sepn, remained practically const. throughout the expt.

FRANK V. JOHNSON, JR.

A method for determining the Kerr constant of a poorly insulating substance with the help of an electric alternating field. WALDEMAR ILBERG. *Univ. Leipzig. Physik. Z.* **29**, 670-6(1928).—The Kerr const. of nitrobenzene is detd. The value varies from 31.1×10^{-6} for a wave length of 467 to 20.2×10^{-6} for a wave length of 639. The measured values are in good agreement with those calcd. from the Havelock formula.

MARIE FARNSWORTH

The falling off of the after-glow in air. MARIA MAJEWSKA. *Z. Physik* **50**, 372-84(1928).—After stopping the elec. discharge in a vacuum tube contg. air at about 1 mm. pressure a yellowish green luminescence persists and extends beyond the region of discharge. This after-glow was obtained in a glass tube connected to the discharge tube and photographed up to a distance of 1.5 m. The logarithm of the intensity of the luminescence decreased linearly with the distance from the discharge line, showing that the relation is exponential. On the assumption that a definite chem. reaction is responsible for the excitation of the after-glow in air, the observed results can be explained only by a monomolecular reaction.

E. R. SMITH

Life period of excited mercury atoms. T. ASADA. Kaiser Wilhelm Inst. *Physik. Z.* **29**, 708-10(1928); cf. *C. A.* **22**, 4369. —A. has shown that the "stepwise" fluorescence of Hg vapor, discovered by Fuchbauer, can also be obtained in a resonance vessel contg. N which is far away from the stimulating Hg lamp. The long life period of the metastable Hg atoms in the $3P_0$ state which are obtained by the collision of the previously excited $3P_1$ atoms with N mols. may be easily demonstrated by the app. indicated. The brightness of the visible fluorescence is not induced by the momentary illumination with the Hg lamp but grows with illumination. From photographic-photometric measurements of the brightness of fluorescence as a function of the speed of rotation of the disk in the app. described, the dependence can be quantitatively followed and it is found that at a pressure of several mm. the av. life period of the $3P_0$ atoms is about 10^{-3} sec. The length of life depends on the purity and the freshness of the N, for H, etc., destroy the excited atoms. The above value was obtained with N freshly made from Na azide. Excited violet light also annihilates the $3P_0$ state. A brief description and use of the app. is given together with errata and explanations of work published previously.

S. L. B. ETHEKTON

X-ray phosphorescent and thermophosphorescent radiations of kunzite. OTTO

STUHLMAN, JR., AND A. F. DANIEL. *J. Opticql Soc. Am.* 17, 289-94(1928).—The spectral distribution of the phosphorescence excited in kunzite crystals by general x-radiation was detd. The color of the light led to the suspicion that the emission possessed the same spectral distribution as the cathode phosphorescence of kunzite described by Nichols and Howes and Ra-excited phosphorescence described by Lind and Bardwell. A Coolidge tube operated at 50,000 v. and 20 milliamp. was used to radiate samples of kunzite. Visual examn. showed a strong orange-red and a blue-green band. A pale lilac crystal radiated gave the usual shades. At 168° a rose-colored light was emitted. The bands widened up to 400°, at which temp. the phosphorescence ceased. At room temp. the blue-green color had disappeared. Radiation built up the color again. Heating does not drive off water of crystn. Luminescent radiations of kunzite are independent of the method by which they are produced and depend only on the reaction between the solvent and solute taking part in the chem. reaction with the emission of chemiluminescent radiations. L. D. ROBERTS

Spectra of calcium sulfide-strontium sulfide samarium mixed phosphors. Remark on the work by M. Travnicek. ERICH RUMPF. *Ann. Physik* 84, 840(1928); cf. *C. A.* 22, 728.—The actual compn. of the CaS-SrS-Sm phosphorescent grains in a sample was detd. from the grating const. taken by the Debye-Scherrer method. According to the percentage concn. the wave length of the red band should have been, on Travnicek curve, 6056.0 A. U. It was actually 6057.8. This confirms the possibility suggested by Travnicek of estg. the actual compn. of mixed phosphors from the position of the phosphorescence bands. A. L. HENNE

Luminous carborundum detector and detection effect and oscillations with crystals. O. V. LOSSEV. Nijny-Novgorod. *Phil. Mag.* [7], 6, 1024-44(1928).—Observations are described of the phenomenon of luminescence produced at the contact of a carborundum detector. The view is held that the luminescence is the consequence of a process at the contact which is very similar to cold electronic discharge. G. G.

Ultra-violet fluorescence of iodine bromide vapor. A. FILIPPOV. Optical State Inst., Leningrad. *Z. Physik* 50, 861-73(1928).—F. investigates the ultra-violet fluorescence of the vapors of Br₂, IBr, ICl and also the mixts. I₂ + N₂, IBr + N₂ and ICl + N₂. The gases were activated by light from the sparks of a large induction coil in an arrangement described. Br gave neg. results but IBr gas gave a violet light on activation with sparks from Al. The following bands were found: 2890, 2915, 2935, 2960, 2995, 3015, 3050, 3125, 3160, 3205, 3265, 3325, 3400, 3500, 3650, 3705, 3770, 3855, 4055, 4160, 4210, 4364, 4495, 4675 and 4850 A. U. Bands between 1850 and 2200 A. U. were found by photographing on oil-sensitized plates but no values were obtained in this region. N₂ added to IBr or I₂ vapor has a considerable effect on the fluorescence, changing the violet of IBr to blue and the violet of I to deep green. Bands are obtained which split into a no. of single bands and remain up to atm. pressure. Conclusion: The ultra-violet emission of IBr vapor is due to activation of the IBr mol. The Br₂ band at the edge of 2930 A. U. splits like the 3460 of I₂ into a no. of single bands. S. L. B. ETHERTON

Fluorescence and photochemical changes. KRISHNA GOPAL MATHUR AND S. S. BHATTNAGAR. Univ. of the Punjab, Lahore. *Indian J. Physics* 3, 37-51(1928).—Solns. of quinine sulfate eosin, uranine, acriflavine and erythrosin were exposed to sunlight (a) and their fluorescences, absorption spectra and n_D measured accurately before and after exposure. The expts. were repeated (b) with gelatin present in the soln., (c) with NaOH present and (d) in sealed tube in the absence of air. Sunlight exposure in (a), (b) and (c) decomposes these substances as evidenced by a decrease in fluorescence and a change in absorption spectrum and index of refraction. The decompn. is less in (b) and (c) than in (a). In (d) no decompn. takes place. The photo-decompn. of fluorescent dyes and their subsequent transformation into non-fluorescent compds. are probably an oxidation phenomenon, which may have nothing to do with fluorescence. G. CALINGAERT

Influence of variation of the incident energy upon the velocity of several photochemical reactions. A. K. BHATTACHARYA AND N. R. DHAR. Allahabad Univ., India. *Z. anorg. allgem. Chem.* 175, 357-66(1928); cf. *C. A.* 22, 2111.—Several new photochemical reactions, (1) decompn. of aq. solns. of Na₂Co(NO₃)₆, (2) decompn. of aq. solns. of K₂S₂O₈, (3) K₂S₂O₈ + KI, (4) Br₂ + CH₃OH, (5) Br₂ + C₂H₅OH, (6) oxalic and chromic acids, (7) acetone and I₂ in aq. HCl solns., (8) lactic acid and KMnO₄ in presence of MnSO₄, and (9) tartaric acid and KMnO₄ in presence of MnSO₄, have been studied under the radiation both from a 1000-w. lamp and from the sun. The intensity of the incident energy was assumed to be proportional to the size of the opening into the reaction cell. Corrections for thermal effects are made. With the exceptions

of reactions (6) and (3) which had reaction rates proportional to the light intensity, all of the observed velocities were fairly comparable to the square root of the incident radiation d . Comprehensive exptl. data and theoretical explanations are given.

W. E. VAUGHAN

Action of the electric effluvia on the gaseous mixture sulfur dioxide and oxygen. J. MAISIN. Univ. Louvain. *Bull. soc. chim. Belg.* 37, 326-33(1928).—Berthelot's expts. on the effect of the non-disruptive electric discharge on a mixt. of SO_2 and O_2 have been repeated and completed. Contrary to Berthelot's results, but in accordance with Meyer (*C. A.* 17, 35) S_2O_7 is not formed. S_2O_{11} was found, which seems to be a definite compd., in contradistinction with Meyer who regards it as a mixt. of 2 different anhydrides.

A. L. HENNE

Emanations of ultra-violet rays from some organic phosphatides after their irradiation (SERONO, CRUTO) 11A. Spectrochemistry of rufin and its derivatives (DHÈRE, *et al.*) 11I. Autoxidation and antioxygen action. XXX. The autoxidation and polymerization of chloral: the action of light (MOUREU, *et al.*) 2.

COPPEL, TH., FOURNIER, GEORGES AND YOVANOVITCH, D. K.: Quelques suggestions concernant la matière et la rayonnement. Paris: Librairie Albert Blanchard. 48 pp.; F. 4.50. Reviewed in *Rev. métal.* 25, 591(1928).

KANTNER AND HERR: Die Verwendbarkeit der Roentgenverfahren in der Technik. Berlin V. D. I. Verlag G. m. b. H. 78 pp. Reviewed in *Rev. métal.* 25, 540(1928).

PROCA, AL.: Sur la théorie des quanta de lumière. Paris: Librairie Albert Blanchard. 96 pp; F. 9. Reviewed in *Rev. métal.* 25, 591(1928).

4—ELECTROCHEMISTRY

COLIN G. FINK

Electrochemical and electrometallurgical industries of Switzerland during 1927. ANON. *J. four. élec.* 37, 329-32(1928).—A review. Power, Al, ferrous alloys and carbide are discussed.

C. G. F.

Electrical research and progress (hydrogen). W. R. WHITNEY. *Gen. Elec. Rev.* 31, 629-34(1928).—An address. Particular stress is laid on H, its production and new applications.

C. G. F.

Industrial electric heating. The resistor furnace. U. R. STANSEL. *Gen. Elec. Rev.* 31, 662(1928); cf. *C. A.* 22, 4383.—A review.

C. G. F.

Advances in the electrolytic production of hydrogen and oxygen. A. SANDER. *Z. kompr. flüss. Gase Pressluft-Ind.* 27, 45-8(1928).—A review.

R. L. DODGE

Process for the treatment of ilmenite for the recovery of electrolytic iron and titanium oxide concentrate for pigment and other purposes. R. J. TRAILL AND W. R. McCLELLAND. *Can. Dept. Mines, Mines Branch No.* 688, 96-101(1928); cf. *C. A.* 21, 724.—In this preliminary study the results indicate the practicability of operating a plate cell at about 35 amp. per sq. ft., without causing undue Cl evolution at the anode, by arranging a rapid flow of electrolyte through the catholytic compartment of the cell. Process for the hydrometallurgical treatment of high iron-copper sulfide concentrates. Recovery of iron by electrolysis, copper as cement copper, and sulfur by distillation. *Ibid.* 101 9.—The main topics are leaching with residue retreatment, leaching with excess FeCl_3 and leaching with roast residue, single roast and single leach method. Roasting must be had at some stage in the process. This applies particularly to chalcopyrite-pyrite mixts. Further work is in progress.

L. W. RIGGS

The electrolytic zinc plant of the Sullivan Mining Co. ELLERY R. FOSDICK. *J. Am. Inst. Elec. Eng.* 77, 808-11(1928); *Elec. West* 61, 315(1928).—The present capacity is 50 tons per day. Provision has been made for additional units to increase the capacity to 150 tons per day. The Tainton-Pring process is used (*C. A.* 12, 253). The electrolyte enters the cells with 20% Zn and 22% H_2SO_4 and leaves for use in leaching with 2% Zn and 28% H_2SO_4 . Each cell contains 10 cathodes and 20 anodes. A unit consists of 150 cells in series. The cathode c. d. is about 11.1 amps. per sq. dm. This is automatically adjusted to keep the power input const. The current efficiency averages 85% and the energy efficiency 60%. Motor-generator sets supply electrolysis energy; their efficiency is 91%, including transformer losses.

B. M.

The anodic behavior of copper-antimony alloys. HANS NEUMARK. *Metall u. Erz* 24, 305-11; *Chem. Zentr.* 1927, 11, 1394.—The expts. were carried out to find a

way of working up Cu ores contg. Sb. In the electrolytical sepn., a current-impermeable film of Sb oxides soon appeared at the anode, which was the main obstacle in this process. In tartaric acid soln., this formation did not take place; but at a c. d. of 0.006 amp./sq. cm., a disturbance occurred on account of formation of an impermeable film of Cu tartrate. In the expts. with H_2SO_4 solns. of different concns., Sb oxide was formed at 0.08 amp./sq. cm., independent of the H_2SO_4 concn. Expts. with H_2SO_4 -tartaric acid mixts. showed that with 0.1 N H_2SO_4 + 0.1 N tartaric acid (1:1), only 0.05 amp./sq. cm. were attainable; with N H_2SO_4 + N tartaric acid (1:1), it was found that up to 0.15 amp./sq. cm., the voltage and current intensity increase continuously, then they decrease on account of the film formed. In these expts., Cu was deposited at the cathode as a spongy ppt. In a soln. of 0.5 N CuSO_4 + 0.5 N H_2SO_4 (1:1) at 0.054 amp./sq. cm., the potential started to rise and the c. d. to decrease on account of the anodic layer. The expts. showed that at 0.06 amp./sq. cm., a continuous electrolysis with well adhering Cu deposit at the cathode and without Sb entering the bath liquid, is possible. In 10% $\text{Cu}(\text{NO}_3)_2$ soln., the reaction takes its normal course up to 0.49 amp./sq. cm.; the oxide formed drops from the cathode as a dark gray ppt. Contrary to the sulfate electrolyte, not the least decline of the current or of the difference of potential could be observed. No Sb or nitrite was found in the electrolyte. Continuous tests at 0.09 amp./sq. cm. confirmed the favorable result with the nitrate electrolyte. In mixts. of N CuSO_4 + N $\text{Cu}(\text{NO}_3)_2$ up to 0.08 amp./sq. cm., the same result was obtained as in pure nitrate soln., but an increase of potential occurred. Expts. in HClO_4 soln. has a result similar to those in H_2SO_4 soln. Examn. of the polished surface of the alloy employed in these tests showed besides mixed crystals also free Cu dendrites. Expts. were made with an alloy of 57.3% Cu and 42.6% Sb. Examn. of the polished surface showed mixed crystals only. N. examd. the conditions in N and 0.5 N tartaric acid, N H_2SO_4 + tartaric acid soln., and CuSO_4 soln. In the tests with CuSO_4 - $\text{Cu}(\text{NO}_3)_2$ mixts., the optimum mixt. was 1:1; the current efficiency was 76% for Cu and 22% for Sb, together 98%. Further expts. with $\text{Cu}(\text{ClO}_4)_2$, N HClO_4 and $\text{Cu}(\text{ClO}_3)_2$ showed that a continuous electrolysis at any c. d. is only possible in nitrate, chlorate and nitrate-sulfate soln. For the technical use, only the nitrate and nitrate-sulfate soln. can be considered; the tartaric acid- H_2SO_4 method, which is feasible at low c. d., has to be eliminated because of Sb being deposited together with the Cu at the cathode. In expts. with a technical alloy contg. 63.3% Cu, 13% Sb, 9.6% Pb, 4.7% Sn, 1.8% As, 2.7% S, 0.34% Fe, 0.03% Ag, in $\text{Cu}(\text{NO}_3)_2$ soln., pure Cu was deposited at the cathode, and the potential stayed const. up to 0.21 amp./sq. cm. Pb, but not Sb or Sn, could be detected in the electrolyte. In expts. with mixts. of $\text{Cu}(\text{NO}_3)_2$ and CuSO_4 , out of 50 cc. N $\text{Cu}(\text{NO}_3)_2$ + 40 cc. N CuSO_4 + 10 cc. N H_2SO_4 , within 72 hrs. at an anodic c. d. of 0.01 amp./sq. cm. and a cathodic c. d. of 0.004 amp./sq. cm., a firmly adhering deposit of cryst. Cu was obtained; the current efficiency was 97% of the Cu value given by the coulometer. The Cu loss of the electrolyte was 11% of the Cu deposited. The anodic current efficiency for Cu was 86%. Therefore, the nitrate-sulfate electrolyte is the most suitable one for obtaining a technically pure Cu with good current efficiency. G. SCHWOCH

Studies on electroplating. (Second series.) Electrodeposition on aluminum. III. The non-adhesion of electrodeposits. W. F. HUGHES. *Metal Ind.* (London) 33, 293-6(1928).—See C. A. 22, 4384. BENJAMIN MILLER

Protective effects of metal deposits on iron. S. WERNICK. *Metal Ind.* (London) 30, 507, 523, 528, 555(1927).—A popular lecture and discussion on the protection against corrosion obtainable by electroplating. The establishment of a *standard accelerated corrosion test* is recommended. BENJAMIN MILLER

High-voltage arcing and alternating current electrolysis. J. W. SHIPLEY AND CHAS. F. GOODEVE. Chem. Dept. Univ. of Manitoba. *Trans. Roy. Soc.* III [3], 22, 87-102(1928); cf. C. A. 21, 860, 1597.—The decompn. of water into H_2 and O_2 by high-voltage arcing on Fe electrodes was investigated for a. c. at voltages between 110 and 4200. The max. rate of gas evolution for electrodes of 0.203 cm. diam. was 266 cc. per min., representing a value of 826% of that calcd. for the same current from Faraday's law. The gas contained 65% H_2 and 30.6% O_2 by vol. For electrodes of 0.062 cm. diam. the rate of gas evolution of the same approx. compn. represents a value 1350% of that calcd. for the same current by Faraday's law. The cond. of the water was raised by adding NaOH. At const. c. d. the rate of decompn. of the H_2O due to arcing increased as the surface of the electrode increased. The current at which arcing commenced increased as the diam. of the electrodes increased, while the c. d. at which arcing commenced decreased as the surface of the electrodes increased. At high voltages arcing commenced at a definite point, varying inversely as the potential between

the electrodes. The rate of gas evolution was found to depend primarily on the rate of consumption of elec. energy and the decompn. is mainly due to thermal decompn. of the H_2O at the high temps. produced in the arc. Application of external pressure suppressed the arc; 3 lb. pressure above atm. suppressed the arcing at 700 v. whereas 31 lbs. was required to suppress it at 2200 v. Because of the explosion hazard connected with accumulations of H_2 and O_2 , elec. boilers should operate under sufficient external pressure to prevent arcing in the electrode chamber. The hot water would be conducted into a second lower pressure chamber and there permitted to boil.

J. W. SHIPLEY

Ballistic galvanometer method of potentiometric measurement for high resistance cells. H. T. BEANS AND GEORGE H. WALDEN, JR. Columbia Univ., New York City. *J. Am. Chem. Soc.* 50, 2673-8(1928).—A semi-deflection method of potentiometric measurement for cells having internal resistances as high as 50 megohms is described and the necessary precautions are pointed out. With cell resistances as high as 10 megohms, a precision of ± 0.1 mv is possible when all precautions are taken, and with cell resistance of 50 megohms a precision of ± 0.5 mv is possible. JAMES M. BELL

Wood separators for lead storage batteries. C. A. ROBAK. *Ind. Eng. Chem.* 20, 1151-2(1928).—The mechanical strength of smooth wood separators in contact with positive plates of lead storage batteries deteriorates more than that of separators in contact with negative plates, but the difference is not great enough to be a controlling factor in design. BENJAMIN MILLER

Effect of hydrogen-ion concentration on the voltage of the Leclanche dry cell. BERTHEL M. THOMPSON. *Ind. Eng. Chem.* 20, 1176-8(1928).—The voltage of a mixt. of MnO_2 and graphite is a linear function of the p_H of the soln. with which it is in contact. The p_H of the soln. must be measured after it has come to equil., since it is changed by contact with the electrode. The slope is -0.07 rather than -0.059 (the theoretical value) in the case of natural MnO_2 . With artificial MnO_2 the slope is -0.10 . The discrepancies are attributed to impurities. The method of prepg. the artificial MnO_2 is not given. No explanation is offered for the greater discrepancy in the case of the artificial material. BENJAMIN MILLER

The electrochemical reduction of azo dyes to their respective amino compounds. LEO P. HURBUCH WITH ALEXANDER LOWY. *Trans. Am. Electrochem. Soc.* 55, (preprint) 13 pp.(1929).—Six azo dyes, methyl orange, Metanil Yellow, Acid Scarlet, Crimson, Congo red and Fast Brown O, representing 6 different types, were reduced electrochemically to their resp. amino compds. in a Na_2CO_3 soln., at a Hg cathode. In general, the conditions found favorable for this reduction were a temp. of 95° , a c. d. of 0.885 amp./sq. dm., and a concn. of 7.5 g. of dye per 200 cc. of soln. It is shown that azo dyes, without an amino or a hydroxyl group in the *ortho* or *para* position to the azo group, can be reduced electrochemically in an alk. soln. to their corresponding amines. C. G. F.

The inventor of the Swan electric lamp. KENNETH SWAN. *Pharm. J.* 121, 425 6(1928).—The circumstances of the invention of the C filament lamp by Sir Joseph Swan and its demonstration, Dec. 1878, are recounted by his son. S. WALDBOTT

Surge voltages produced by direct-current, air, circuit interrupters. LEON R. LUDWIG. *Elec. J.* 25, 604-7(1928). C. G. F.

Electric water heating (WILDER, *et al.*) 1. Some non-ferrous metals used in the electrical industry (ANON.) 9. Iron, steel and ferrous alloys in the electrical industry (PEARCE) 9. Aluminum and the problem of its production (WASILEWSKI) 9. Electro-osmotic water purification process (ILLIG) 14. The production of MgO and SiO_2 crucibles in the induction furnace (SCHUETTE) 19. Apparatus for purifying water by electric treatment (U. S. pat. 1,691,731) 14. Waterproof and adhesive composition [for use on electric coils] (U. S. pat. 1,691,543) 26. Iron smelting (U. S. pat. 1,691,401) 9. Deposition of rubber (Fr. pat. 638,630) 30. Protecting ferrous metals from corrosion (Brit. pat. 287,194) 9.

Dry battery. JACQUES COURTECUISSE and VICTOR COURTECUISSE. Ger. 466,887, Mar. 30, 1927. The battery elements rest on supports of insulating material of such a height that the electrolytes which accumulate at the bottom of the casing cannot cause short-circuiting.

Electric batteries. CHARLES J. V. FÉRY. Fr. 638,844, Dec. 21, 1926. In MnO_2 batteries the depolarizing graphite is replaced by porous C from the calcination at high temp. of cellulose products such as wood or peat, and may be "active."

Electric battery with tubular electrodes. A. FRAASS. Brit. 287,358, June 7, 1927. Structural features.

Multi-cell electric battery. G. H. TROTTER. Brit. 286,863, Feb. 19, 1927. Structural features.

Storage battery. E. BAUMER. Brit. 287,750, June 13, 1927. Structural features.

Storage battery. BRUCE FORD. U. S. 1,691,800, Nov. 13. Structural features.

Storage battery and associated hydrometer device for indicating the density of the electrolyte. FRANK SCHWARTZ. U. S. 1,691,084, Nov. 13.

Storage battery with electrodes separated by glass wool. D. P. BATTERY CO., Ltd., B. M. DRAKE and J. WADDELL. Brit. 287,666, Jan. 19, 1927. Various structural features are specified. Cf. C. A. 22, 4389.

Storage battery electrodes. JOSEPH L. WOODBRIDGE. U. S. 1,691,794, Nov. 13. Two electrodes of sheet Pb with a thin wood veneer spacer between them are rolled into cylindrical form with the grain of the veneer substantially parallel with the axis of the cylinder.

Storage battery separators. NATHAN FALLEK. U. S. 1,690,573, Nov. 6. In forming separator plate elements, a pulp formed of wood fiber or other suitable vegetable fiber and water is boiled and washed to remove dirt and impurities, subjected to the direct action of steam, washed with a soda soln., rewashed to remove all traces of soda and then mixed with a small quantity of pulverized rubber and Na silicate and dried.

Controlling the level of electrolyte in storage batteries. SOCIÉTÉ DES ACCUMULATEURS ÉLECTRIQUES (Anciens établissements Alfred Dinin). Fr. 637,575, July 13, 1927. The covers of storage batteries are made of Pb contg. Sb and have projections on the lower face which form contact with the electrolyte and thereby close an elec. circuit which gives an audible or visible signal.

Apparatus for continuous casting of molten metal to form storage battery plates. JASPER N. DAVIS. U. S. 1,690,887, Nov. 6.

Apparatus (with an electric heater for the electrolyte) for electrodeposition of metals. W. Y. NEWLAND. Brit. 286,563, May 2, 1927.

Electrodeposition of chromium. FROHWALD WALTER WÜRKE. Ger. 467,025, June 28, 1925. Pure chromic acid to which a small quantity of the salts of the alk. earth or heavy metals, excepting Cr, has been added, is used as the electrolyte.

Electrodeposition of tin. SIEMENS & HALSKE A.-G. Brit. 286,673, March 8, 1927. Coherent Sn deposits are obtained from an alk. soln. which has been treated with an oxidizing agent (such as ozone, or H_2O_2 or an alkali metal or alk. earth metal peroxide) until practically all the Sn is present as stannate. Gelatin or other suitable colloid 1.5-10 g. per l. is added.

Electrodeposition of zinc. URLYN C. TANTON. Ger. 466,279, May 5, 1927. Manganiferous $ZnSO_4$ soln. is electrolyzed. A Pb anode, preferably free from Ag, Sn or As, is used and its surface is coated with a Pb-Ag alloy contg. at least $1/10$ Ag. Cf. C. A. 22, 2890.

Beryllium. KEMET LABORATORIES CO. Brit. 287,734, April 20, 1927. See Fr. 633,360 (C. A. 22, 3359).

Obtaining beryllium and other metals by electrolysis. KEMET LABORATORIES CO. Brit. 287,762, April 20, 1927. Metals are obtained by electrolysis of their halogen compds. in a fused halide electrolyte in a cell serving as cathode, the material of which contains at least 5% Cr. Nichrome or a Cr-Fe alloy contg. about 20% Cr is suitable.

Foraminius cathodes for electrolysis of alkali metal chloride solutions. A. ERGANG. Brit. 287,760, July 11, 1927. Structural features.

Electrolytic coatings of varying thickness. BERNDORFER METALLWARENFABRIK A. KRUPP A.-G. Brit. 287,402, Sept. 14, 1927. The electrolyte is applied to the un-submerged surface of the article being coated with metal, in the form of a jet, and the thickness of the deposited metal coating at different portions of the article is controlled by the strength, size and speed of the jet and the duration of its impingement.

Rotary apparatus for electroplating small articles. F. KIRSCHNER and J. HESS. Brit. 287,350, May 16, 1927.

Coppering. HJALMAR E. SUNDBERG. Fr. 637,525, July 12, 1927. In the electrodeposition of Cu from a bath contg. a halogen salt of univalent Cu, such as $CuCl$, one or more substances which increase the cathode potential by increasing the viscosity or forming diaphragms or by exercising an adsorbent or oscillating action on the cathode are added to the bath. Suitable compds. are compds. of other metals, carbohydrates, gelatin, peptone, org. amino compds., quinones, alkaloids or coloring substances; these substances may be added in the colloidal state. Cf. C. A. 22, 2116.

Nickel plating. AUGUSTO PASSALACQUA. Fr. 638,987, June 3, 1927. Metals,

particularly Al or its alloys, to be nickel plated are cleaned chemically and then immersed in a cold aq. bath contg. H_2SO_4 , NaHSO_4 , AlCl_3 , NH_4Cl , H_3BO_3 , alum and $\text{Al}_2(\text{SO}_4)_3$, then into a bath contg. CuCl_2 , H_2SO_4 and HCl and finally into a bath contg. NiSO_4 and NH_4Cl .

Coating articles with platinum and other metals. E. G. Bæk. Brit. 287,641, Dec. 24, 1926. In coating material of low m. p. with Pt as described in Brit. 244,487 (C. A. 21, 211), a Cd or Zn coating is first applied, a Pt coating is then applied and the materials are heated. Two or more layers of Pt may be applied with a heating after each application to produce a product of the desired color or an underlying coating of Au may be used. Red gold is made white by a deposit of Ni or green by a deposit of Cd or Ag with suitable heating. Yellow gold is made white by a deposit of Cr. Green gold is made red by suspending for a half min. in a warm alkali Cu bath, applying borax and heating to 500–550°.

Covering cable wires. FÉLIX KIRSCHNER and JOSEF HESS. Fr. 637,445, July 1, 1927. Metal cables and the like of Cu are protected against the action of S by a galvanic deposition of Sn, or a deposition of Sn followed by Zn and then Sn again, or a deposition of Ni or Cr followed by Zn.

Metal production in electric furnaces. EMIL G. T. GUSTAFSSON (to Hampus Gustaf Emrik Cornelius). U. S. 1,691,439, Nov. 13. In production of metals such as Fe or Fe alloys by practically continuous operation in an elec. furnace, a charge is smelted by elec. heat while forming metal and slag, the furnace is emptied to bare its bottom, a quantity of the slag is reintroduced in practically its original tapped condition for protection of the furnace bottom against the elec. arc, and charging for the next heat is then started.

Forming points or edges on metal blanks by electrolytic removal of metal. S. O. COWPER-COLES. Brit. 287,588, Sept. 27, 1927. An app. is described.

Iron and iron alloys by reduction of oxide ore. HENNING G. FLODIN and EMIL G. T. GUSTAFSSON (to Hampus Gustaf Emrik Cornelius). U. S. 1,691,274, Nov. 13. In order directly to produce dense Fe or Fe alloys from oxide ore contg. a metal such as V or Ti capable of deoxidizing and degasifying iron, from a charge of such ore, in finely divided condition, lime and charcoal or other suitable carbonaceous material, mixed and solidified, the charge is fed successively into an elec. furnace and smelted while floating on a slag bath in the furnace, iron and slag are sepd., an oxidizing slag is formed on the iron, the slag contg. the main part of the V or Ti is removed, and after slagging off, the slag from the oxidizing period is reduced in the presence of the refined Fe or Fe alloy in an elec. furnace and the Fe alloy is tapped.

Removing oxide or gases from metals. J. VON BOSSE. Brit. 286,632, March 7, 1927. Occluded gas is removed from metal deposited electrolytically on an object by mounting the latter as an electrode in an evacuated vessel and passing a discharge. Al may be thus deoxidized and it is also stated that a like process may be used for disintegrating waste rolled gold.

Non-magnetic alloy of high electric resistance. W. S. SMITH, H. J. GARNETT and J. A. HOLDEN. Brit. 287,236, Dec. 17, 1926. Fe 67–71, Ni 23–7, Cr 1.5–4 and Al or Si 1.5–4%, free from or low in C, with or without Mn about 1% or less.

Iron and iron alloys low in carbon. HENNING G. FLODIN and EMIL G. T. GUSTAFSSON (to Hampus Gustaf Emrik Cornelius). U. S. 1,691,273, Nov. 13. A charge of mixed and solidified Fe oxide ore and finely divided charcoal or other suitable carbonaceous material is reduced and melted in an elec. furnace in a non-oxidizing atm. Less reducing agent is used than that theoretically required for reduction of the ore, and the elec. cond. of the slag formed is decreased and metal of the metal oxides in the slag is liberated by adding a thermal reducing agent such as ferro-Si to the slag bath.

Metals and alloys low in carbon. GUSTAV H. FLODIN. U. S. 1,691,272, Nov. 13. Ore such as Fe and Cr ore is mixed with such a quantity of carbonaceous material such as charcoal as will substantially all be consumed on reduction, the mixt. is briquetted and the briquets are smelted in an elec. electrode furnace in which heat is developed by elec. resistance in the slag bath with the charge swimming on the slag. An app. is described. Lime may also be used in making the ore briquets.

Fused silica. QUARTZ ET SILICE. Fr. 639,006, Jan. 5, 1927. In the production of fused SiO_2 from sand packed round a C rod raised to a high temp. by an elec. current, an oxidizing atm. is maintained in the furnace by circulating air or O in the furnace, or preferably by adding a small quantity of water to the sand before it is introduced into the furnace.

Dielectric materials. A. JORRE. Brit. 286,747, Sept. 8, 1926. In producing dielectric layers of high resistance to leakage, as described in Brit. 257,060 an elec.

current is passed through the dielectric at a high temp. (suitably about 500°). Glass, mica, calcite, mother-of-pearl, Al₂O₃ and Al phosphate may be thus treated.

• **Dielectric materials.** A. JOFFE. Brit. 287,039, Sept. 8, 1926. In producing thin insulating layers of the type described in Brit. 257,080, having a high resistance to leakage and of a thickness less than 0.01 mm., a dielectric which reacts with O is suitably treated with air, O or ozone and Cl, e. g., linseed oil may be polymerized at 250° with a Co or Mn siccative.

Dielectric materials. S. BOYER (to British Thomson-Houston Co., Ltd.). Brit. 287,140, March 16, 1927. Materials (suitable for use in condensers or like app.) of high dielectric const., specific resistance and dielectric strength, such as PhNO₂, are mixed with another dielectric material such as nitrotoluene, to lower the f. p. and prevent any change in the dielectric character of the compn. when used at low temps. Other substances such as dinitrobenzene and PhCl may be added. Impurities in PhNO₂ such as water, acids or salts are removed by mixing Al₂O₃ with either ingredient, heating to 100° and distg. Structural features of a condenser made with the specified dielectrics are described.

Electrolytic rectifier. WALTER E. HOLLAND (to Philadelphia Storage Battery Co.). U. S. 1,691,806, Nov. 13. A non-film-forming electrode of an asymmetric cell is formed of Fe contg. at least 10% Si. This may be used with an electrolyte comprising H₃PO₄ or a phosphate, borate or carbonate and another electrode formed of Al. Various structural features are described.

Electrolytic rectifier. L. LEVY. Brit. 287,778, Aug. 24, 1927. In a device such as described in Brit. 265,652 comprising an Al-Cu contact with an intermediate layer of Cu sulfide, the latter is kept moist by liquid NH₄ hydrosulfide supplied by capillary action through a wick. Various structural details are described. Cf. C. I. 22, 2721.

Rectifier for alternating currents. J. SLEPIAN (to Metropolitan Vickers Electrical Co., Ltd.). Brit. 288,174, April 2, 1927. An effective elec. connection to a surface of poor cond. material such as the oxide coating in Cu oxide rectifiers is obtained by cementing to the surface a layer of finely divided cond. material such as graphite, by means of a solidified insulating material such as paraffin or a phenol condensation product. A Pb plate may be pressed onto the graphite coating and the condensation product may be solidified by heating.

Materials for rectifying alternating currents. SIEMENS SCHUCKERTWERKE A.-G. Brit. 288,151, March 31, 1927. Various means are specified for cooling the inner surfaces of annular elements of the Cu-Cu oxide type, by circulating liquid or gaseous cooling media through the app.

Electric discharge devices. ALLGEMEINE ELEKTRICITÄTS GES. (to International General Electric Co.). Brit. 287,138, March 16, 1927. Anodes or other parts are formed of an alloy of W or Mo, or both, with 0.5-1.0% of metals such as Al, Cr, Hf, Mn, Th, Ti, Zr, Ce or other rare earth metal, or Si, which are as readily or more readily vaporized than Mo.

Electric discharge devices. H. SUNDBERG. Brit. 287,883, March 28, 1927. A general method and app. are described relating to emission of electrons from metals or their compds. by heat and transmission of energy.

Electrode material of electric discharge devices. E. HARSANYI. Brit. 287,098, March 14, 1927. Refractory metals such as W, Mo or Ta, oxides such as alk. earths, Th or Ce oxides, or a mixt. of W and Ti, are deposited on a metal core connected as cathode, by electrophoresis from a colloidal dispersion. Electrolytic action is avoided by using a low voltage (suitably 2 v.), by using a depolarizer at the cathode, or by using an electrolyte which does not yield gaseous ions at the cathode. Numerous details are given.

Electrodes. PÖRSCKE ELEKTRICITÄTS-GESELLSCHAFT M. B. H. Fr. 637,746, July 15, 1927. Electrodes are made from metallic oxide or spongy metals, the surface of which is multiplied several times by artificially formed spaces through the mass.

Electrodes. METALLBANK UND METALLURGISCHE GES. Ger. 466,357, June 4, 1920. Deposits on emission electrodes are removed by scraping or rubbing.

Electrode holder and mantle for electric furnace electrodes which are baked while in use. MARTIN WALTHER (to Det. Norske Aktieselskab for Elektrokemisk Industri). U. S. 1,691,505, Nov. 13. Structural features.

Glowing cathodes. SIEMENS & HALSKE. A.-G. (Albert Lotz, inventor). Ger. 466,462, Dec. 18, 1924. A glowing filament of high m. p. is provided with a coating of Hf. The filament may be coated with a Hf compd., e. g., the oxide and reduced by an alkali metal.

Electric furnace. SIEMENS ELEKTROWARME-GESELLSCHAFT M. B. H. (Stephan

Schneider, inventor). *Ger. 466,502, May 24, 1925. In a salt-bath furnace 2 crucibles are used one inside the other, and the salt-bath-heating-substance is placed between them.

Electric furnaces. RENÉ DUFOUR. Fr. 638,801, Aug. 3, 1927. High-frequency induction furnaces are so constructed that the induction elements dip into or are surrounded by the material to be heated.

Electric furnaces. COMPAGNIE GÉNÉRALE D'ÉLECTRICITÉ. Fr. 637,601, Nov. 10, 1926. In an elec. resistance furnace the metallic heating wires or bands are placed directly in the atm. of the heated chamber.

Electric furnace for light metals. ALUMINIUM-INDUSTRIE AKT.-GES. Ger. 166,551, Jan. 6, 1926. Addn. to 456,806.

Electric furnace construction. GUIDO SAGRAMOŠO. U. S. 1,690,795, Nov. 6.

Electric arc furnace. JAMES C. WOODSON (to Westinghouse Elec. & Mfg. Co.). U. S. 1,691,365, Nov. 13.

High-frequency electric induction furnace for heat treatment of metal disks or other articles. GEORGE F. HARRINGTON and PORTER H. BRACE (to Westinghouse Elec. and Mfg. Co.). U. S. 1,691,349, Nov. 13.

Bright-annealing furnace heated by electric resistances. KARL TAMELE (to Westinghouse Elec. & Mfg. Co.). U. S. 1,691,259, Nov. 13.

Electric resistance furnace. ALBERT J. HANSON (to American Metallurgical Corp.). U. S. 1,690,678, Nov. 6. Structural features.

Electric resistance furnace. FRANK T. COPE (to Electric Furnace Co.). U. S. 1,690,273, Nov. 6. Structural features.

Electric resistance furnace adapted for bright-annealing. KARL TAMELE (to Westinghouse Elec. & Mfg. Co.). U. S. 1,691,258, Nov. 13.

Electric resistance materials. A HEKROWSKY (to Elektro-Heiz und Warme Ges.). Brit. 287,458, March 19, 1927. Resistances are formed from C such as graphite or gas coke, mixed with materials necessary for the formation of an oxide of Si, Ca or Al or the like, formed into a plastic material with a binder and pressed into filament form. The filaments are dried and elec. heated until the desired resistance is attained and may then be surrounded by a body of cast metal. Oxides of Zr, Th or U may be employed in the case of resistances which are to be used at high temps.

Oven heated by electric resistances. SOC. ÉTABLISSEMENTS SABLYET (to F. W. Tabby). Brit. 287,173, March 18, 1927. Structural features.

Apparatus for electrically heating metal articles. RICHARD E. BISSELL (to Thompson Products, Inc.). U. S. 1,691,562, Nov. 13.

Electrical conductor. FRANK F. FOWLE. U. S. 1,691,869, Nov. 13. Metal of high cond. such as a Cu wire is substantially enclosed in an Fe base metal such as surrounding steel wires which have relatively great mech. strength and contain at least 0.30% C. Cf. C. A. 22, 3592.

Loaded electrical conductor. ADOLPH F. BANDUR (to Western Electric Co.). U. S. 1,691,029, Nov. 13. A central conductor such as wrapped wire is provided with a coating of material such as mica which will act as a separator and which will not be consumed by heat treatment, a magnetic loading material such as a suitable alloy is wrapped around the conductor and the loading material is given the proper elec. characteristic by heat treatment.

Loaded electric conductor. WILLOUGHBY S. SMITH, HENRY J. GARNETT and JOHN A. HOLDEN. U. S. 1,691,309, Nov. 13. A metal spacer such as Ag-Cu alloy which is fusible at a temp. not exceeding the temp. for annealing the loading is laid upon a conductor such as Cu and loading material is wound over the spacing material; the assembled materials are then subjected to heat treatment which causes the metal spacer to melt. Cf. C. A. 22, 3592.

Electrical device for indicating the electrolyte specific gravity or condition in electric battery cells. EDGAR G. PETERS. U. S. 1,690,500, Nov. 6.

Electric accumulator with alkaline electrolyte. AXEL ESTELLE and PAUL HAGSPILL. Ger. 466,801, Apr. 8, 1926. An alk.-electrolyte accumulator of the type having O compds. of Ni and Co as the active mass of the pos. electrodes and twice as many pos. electrodes as neg. electrodes is constructed so that each pos. plate is resiliently supported against the neighboring pos. plate or against the wall of the accumulator.

Preventing and removing incrustation in boilers. G. S. NEELEY and G. WATKINS. Brit. 287,196, Nov. 12, 1926. An a. c. is applied to the feed water before it enters the boiler and another current of different phase and voltage to the shell of the boiler and water in the boiler. Various details of elec. connections are described. Cf. C. A. 22, 32.

Ozone. SIEMENS & HALSKE AKTIEN-GESELLSCHAFT. Fr. 637,503, July 12, 1927. In an app. for the production of ozone by high frequency, wherein the generator circuit is tuned to the frequency of the source of supply, a coreless transformer is used to produce the high tension necessary for the discharge. Cf. C. A. 22, 2518.

Ozone generators. ALBERT CHARBONNEAU. Fr. 638,991, Jan. 4, 1927. Two forms of generators are described: in one the electrodes are disks with metallic brushes and the connection between the oscillating circuit and the electrode circuit is made by induction by means of coils surrounding the discharge elements; in the other the discharge elements are made of metallic boxes forming one electrode and contg. the other.

Treating various materials with ozone. S. ACZEL. Brit. 287,904, March 29, 1927. Fibrous substances, fabrics, waxes, drugs, foods, candles, oils, etc., are treated with ozone by direct exposure to elec. discharges, by being placed between or around the electrodes. Cellulose may be converted into oxycellulose. An app. is described.

Pressure-actuated control for electric circuits. IRA E. McCABE. U. S. 1,690,689, Nov. 6.

Heat-exchange apparatus for electric transformer tanks, etc. BRITISH THOMSON-HOUSTON CO., LTD., AND R. DUMAS. Brit. 287,624, Dec. 22, 1926.

Pressure-responsive device for control of electric circuits. GLENN MUFFLY. U. S. 1,691,666, Nov. 13.

Apparatus for separating constituents of emulsified oils such as petroleum by electric treatment. CHARLES W. McKIBBEN. U. S. 1,691,578, Nov. 13.

Electric system for measuring the rate of flow and temperature of steam, gas, water or other fluids. CHARLES F. BRUSH, JR. and RICHARD D. FAY (to Brush Laboratories Co.). U. S. 1,691,600, Nov. 13.

Electric arc. ALLGEMEINE ELEKTRIZITÄTS-GESELLSCHAFT. Ger. 466,380, Oct. 10, 1925. An arrangement for regulating an elec. arc furnace is described.

Mercury vapor lamps. HANOVIA CHEMICAL & MANUFACTURING COMPANY. Fr. 638,802, Aug. 3, 1927. The arc tube is surrounded by an envelope of quartz contg. any desired gas, the whole being placed in a cooling vessel contg. water.

Mercury vapor lamp for the production of light or ultra-violet rays. HENRI GEORGE. Fr. 637,657, Nov. 18, 1926. A deformable body contg. gas or air under pressure is placed in the bulb filled by the Hg, and by its action on the level of the Hg in the bulb causes lighting of the arc.

Maintaining vacuums in vacuum tubes. CLARENCE W. BALKE (to Fansteel Products Co.). U. S. 1,691,177, Nov. 13. A piece of Cb is placed adjacent a filament so as to be heated by the filament and to absorb gases present in the tube.

Apparatus for evacuating electric bulbs and like vacuum vessels. NAAMLÖÖZE VENNOOTSCHAP PHILIPS' GLOEILAMPENFABRIEKEN (Johannes Marinus van der Poel, inventor). Ger. 466,639, May 8, 1926. Addn. to 427,354.

Electric arc lamp with connections for directing gas currents along the electrodes. Y. A. ROCARD and P. DE ROTHSCHILD. Brit. 287,160, March 17, 1927.

Electric incandescent lamps. NAAMLÖÖZE VENNOOTSCHAP PHILIPS' GLOEILAMPENFABRIEKEN. Brit. 287,563, March 25, 1927. A filling of substantially pure A may be used without risk of discharge occurring by placement of a screen of quartz, mica or glass between conductors or parts of the filament.

Electric incandescent lamps. B. ERBER. Brit. 286,687, March 9, 1927. Bulbs with filaments of Ta carbide or the like have a filling of inert gas to prevent decompn. of the carbide. The filaments may have a metal core and may be helical in form.

Double incandescent electric lamps. YUKITOSHI SAKAKURA. Ger. 466,638, Nov. 5, 1926. The inner lamp is made readily replaceable.

Apparatus for degassing incandescent lamp filaments and applying gettering material, etc. PATENT-TREUHAND-GES. FÜR ELEKTRISCHE GLÜHLAMPEN (to General Electric Co., Ltd.). Brit. 286,718, March 10, 1927.

5—PHOTOGRAPHY

C. E. K. MEES

Apparatus for liquid treatment of bands or strips, particularly cinematograph films (Ger. pat. 466,979) 1.

Photography. I. G. FARBENIND. A.-G. (Bruno Wendt, inventor). Ger. 467,179,

Jan. 8, 1927. The Ag salt is carried by an emulsion which does not form a compd. which increases sensitiveness when treated with S.

Photography. KALLÉ & Co. A.-G. (Maximilian Paul Schmidt and Wilhelm Krieger, inventors). Ger. 467,090, Sept. 7, 1927. Light-sensitive layers are prepd. by a mixt. of at least 2 diazo compds. having the same base. Thus, a film contg. a mixt. of the CdCl_2 double salt of 5-diethylamine-2-diazo-1-phenol and 4-chloro-2-diazophenol-6-sulfonic acid is used and gives an orange picture. Other examples are given.

Photography. G. KÖGEL. Ger. 467,089, July 8, 1926. The film contains a ketone sensitive to light and is developed with Ag salts or org. substances such as methyl-*p*-aminophenolsulfite.

Color photography. J. H. POWRIE. Brit. 287,388, Oct. 11, 1926. Mech. and optical features.

Color photography. RICHARD GSCHÖPF. Fr. 637,423, June 2, 1927. Ger. 467,091, May 21, 1927. See Brit. 279,381 (C. A. 22, 2891).

Optical system for color photography. SOC. CIVILE POUR L'ETUDE DE LA PHOTOGRAPHIE ET DE LA CINEMATOGRAPHIE EN COULEURS. Brit. 287,488, March 21, 1927.

Film for color cinematography. J. E. THORNTON. Brit. 286,568, Oct. 12, 1927. Mech. features.

Multi-color screen system for color photography. J. H. POWRIE. Brit. 287,188, Oct. 11, 1926.

Color absorption screen for use in photography. ADELBERT AMES, JR. U. S. 1,691,366, Nov. 13.

Color photographs. WERNER LANGGUTH and CHARLES HUMMEL. Fr. 637,392, July 9, 1927. See Brit. 274,129 (C. A. 22, 1918).

Photographic films. PAUL SCHLOCHOFF. Fr. 637,675, June 8, 1927. Photographic and like films are made resistant to heat or variations of temp. by treating them with a soln. contg. 250 parts of a transparent plastic substance dissolved in acetone, 150 of glacial AcOH , 300 of acetoacetic ester, 75 of oil of turpentine or benzine, 200 of dissolved gum lac and 25 of crude camphor.

Inscriptions on photographic film. I. G. FARBENIND. A.-G. Brit. 287,124, March 16, 1927. The rear of raw film is impressed with spacing markings by use of a soln. of coloring matter in a slowly evapg. solvent such as glycol acetate which penetrates into the film support. The soly. of the coloring substance may be increased by mixing solvents of different rapidities of evapn.

Cinematographic films. AUGUSTIN ALONSO and JEAN VALLET. Fr. 637,330, June 21, 1927. Films have their clarity improved and are rendered unflammable by applying thereto 4 layers. The first layer is composed of Spanish white, fish glue and boric acid; the second HF, glass powder and gelatin; the third Ag powder and Hg; the fourth Ag powder, Al powder and gelatin. The layers are deposited in the order indicated, each layer being allowed to dry. Water is used as solvent for the first, second and fourth layer, the third forming an amalgam is used as it is.

Photographic sensitive material. I. G. FARBENIND. A.-G. Brit. 286,736, March 10, 1927. A light-sensitive layer contg. a salt of 1,2-naphthoquinone-4-sulfonic acid, as described in Brit. 286,233 (C. A. 23, 49), is developed after exposure by use of an alk. soln. of a substance which contains an acid methylene or methyl group such as trinitrotoluene, acetoacetic ester, cyanacetamide, methyl-phenylpyrazolone and resorcinol. The developer may be incorporated in the sensitive material and the image produced by the action of NH_3 vapor. Different developers permit production of images in different colors.

Photographic diazotype process. KALLÉ & Co. A.-G. Brit. 287,063, March 11, 1927. In the process described in Brit. 280,593 (C. A. 22, 3361) the tone of the developed print is modified by treating it with a small quantity of moisture which may be applied as vapor or by use of a damp sponge. Examples are given for producing dark brown prints.

Photographic reversal process. I. G. FARBENIND. A.-G. Brit. 287,542, March 20, 1927. After exposure the film is subjected to a short development not exceeding a duration fixed for the particular film material, the image is then reversed by dissolving out the Ag image, clearing, exposing to light and redeveloping, and the density of the resulting positive image is reduced by use of a bath having a uniform action which may be prepd. from I, KI and an aq. soln. of thiocarbamide. This reducing bath may also be used for dissolving out the Ag image produced by the first development.

Composition for joining strips of motion-picture films. ORRO W. COOK (to Eastman Kodak Co.). U. S. 1,690,622, Nov. 6. In order to render the compn. visible under

light of wave lengths in the red and orange wave lengths of the spectrum (In dark room use), there is added to it a dye such as xylene blue or alphasaurine G which is absorptive of such wave lengths.

6—INORGANIC CHEMISTRY.

A. R. MIDDLETON

Report on the revision of the nomenclature in inorganic chemistry. M. DELAPINE. *Chimie et industrie* 20, 603-9(1928); cf. *C. A.* 22, 2117.—An account of the decisions reached to date by the French sub-committee of the committee appointed by the International Union of Pure and Applied Chemistry. A. PAPINEAU-COUTURE

Constitution of hydroxides and of hydrates. I. G. NATTA. Reale Politecnico di Milano. *Gazz. chim. ital.* 58, 344-58(1928).—X-ray examn. was chosen as the method for studying the constitution of compds. contg. combined water. A review of the literature shows that previous expts. on hydrates have been limited to the geometry of the cryst. structure and have not shown the coordination of the H_2O mols, their position in the lattice and their dimensions. With hydroxides, the dimensions of the OH ion and its behavior from the point of view of isomorphism and morphotropy have not been ascertained. The expts., complete data of which are tabulated and discussed, lead to certain general conclusions. Metallic oxides, the metals of which in the state of bivalent ions have a radius between 0.77 and 1.10 A. U., belong to the isomorphic class of rhombohedral hydroxides. $Zn(OH)_2$ does not belong to this class because the bivalent Zn ion has a radius less than 0.77 A. U. $Ca(OH)_2$, $Cd(OH)_2$, $Ni(OH)_2$, $Mg(OH)_2$, $Mn(OH)_2$, $Fe(OH)_2$ and $Co(OH)_2$ do, however, belong to this class. All these hydroxides belong to the holohedral class of the rhombohedral system (3 Di-3) and have an elementary orthorhombic cell defined by the coordinates of the atoms: $M^{++} = (0\ 0\ 0)$; $O^{--} = (\frac{1}{3}\ \frac{2}{3}\ u)$, $(\frac{2}{3}\ \frac{1}{3}\ -u)$. The parameter u depends upon the size of the metal ion, and increases from 0.25 to 0.28 with an increase in the latter from 0.77 to 1.06 A. U. The base of the elementary cell of the rhombohedral hydroxides increases regularly with increase in the radius of the metal ion, while there is only an ill-defined relation between c/a of crystals of the compn. MX_2 and the ratio R_z/R_m of the component ions. From the distance O-M can be calcd. for O a radius between 1.33 and 1.38 A. U., a value which conforms to that detd. in another way for the bivalent O ion. The half distance O-O is about 10% greater than this value. Since the O ion is but slightly deformable, it may be assumed that the H ions which would occupy the positions $(\frac{1}{3}\ \frac{2}{3}\ v)$ and $(\frac{2}{3}\ \frac{1}{3}\ -v)$ impede the tangency of the O atoms. By assuming the spherical form of the O and H ions, calcs. show a radius of action of 0.3-0.4 A. U. If the OH is considered as an individual entity in the lattice, it should be limited by a non-spherical surface and should have a radius varying from 1.35 to 1.50 in 2 opposite directions. The OH would therefore have the form of a highly deformable ion similar to that of polarizable ions, such as I, and accordingly would form "stratified" lattices typical of compds. of polarized ions. C. C. D.

The crystalline alumina hydrate of v. Bonsdorff. R. FRICKE. *Z. anorg. allgem. Chem.* 175, 249-56(1928).—Alumina which ppts from solns of alkali aluminates by hydrolysis or slow interaction with CO_2 gives an x-ray spectrogram which is identical with that of the mineral hydrargillit (gibbsit) provided the sepn. takes place very slowly. Otherwise a different crystalline hydrate of the compn. $Al_2O_3 \cdot 3H_2O$ results, which is identical in its structure with that obtained in the prepn. of pure alumina from bauxite according to the method of Bayer. The designation Bayerite is proposed for the latter type of alumina. EMIL KLARMANN

Action of ammonia on alkali chromic chlorides. Chromamines which contain more than six molecules of ammonia. FRITZ EPHRAIM AND WILFRIED RITTER. Univ. Bern. *Helv. Chim. Acta* 11, 848-64(1928); cf. *C. A.* 19, 3070.—Several chromamines

	Mols. NH_3 added			Mols. NH_3 added	
	at room temp.	at temp. of freezing mixt.		at room temp.	at temp. of freezing mixt.
$[Cr(NH_3)_6]Br_3$	0	3	$[Cr(NH_3)_6NO_2](NO_2)_2$	0	2
$[Cr(NH_3)_6](NO_3)_3$	2	3.5	$[Cr(NH_3)_6CNS]I_3$	0	3
$[Cr(NH_3)_6H_2O](NO_3)_3$	1	6	$[Cr(NH_3)_6CNS](CNS)_2$	—	2
	(max. not reached)		$[Cr(Co(NH_3)_2)_6]Cl_3$	0	8
$[Cr(NH_3)_6H_2O]Cl_3$	1	7.5	$[Cr(Co(NH_3)_2)_6]Br_3$	—	12
$[Cr(NH_3)_6H_2O]Br_3$	3	12	$[Cr(Co(NH_3)_2)_6]I_3$	—	12

were tested as to their behavior toward NH_3 at low temps. (ice-NaCl freezing mixt.). The loss of NH_3 by these compds. when heated was studied. The following compds. added no NH_3 either at room temp. or at low temps.: $[\text{Cr}(\text{NH}_3)_5\text{Cl}]\text{Cl}_2$, $[\text{Cr}(\text{NH}_3)_5\text{Br}]\text{Br}_2$, $[\text{Cr}(\text{NH}_3)_5\text{CNS}](\text{NO}_3)_2$, $[\text{Cr}(\text{NH}_3)_5\text{CNS}]\text{Br}_2$, $[\text{Cr}(\text{NH}_3)_5\text{C}_2\text{O}_4]\text{NO}_3$, $[\text{Cr}(\text{NH}_3)_5\text{OH}]\text{Cl}_2$. A new method for the prepn. of roseo and purpureo chromammines is given.

LOUISE KELLEY

The action of mercury salts on iron pentacarbonyl. H. HOCK AND H. STUHLMANN. *Ber.* 61B, 2097-2101(1928).—The action of nitrate, sulfate, acetate, cyanide and halides of mercury on iron pentacarbonyl has been studied. HgCl_2 is reduced to Hg_2Cl_2 with the simultaneous formation of CO_2 and HCl . A momentary formation of $\text{Hg}_2\text{Cl}_2\text{Fe}(\text{CO})_4$ is also noted. In acetone solns., an unstable mol. compd., $\text{Fe}(\text{CO})_5\cdot\text{HgCl}_2$, is formed. This reacts with HgCl_2 to give the tetracarbonyl compd. noted in water and COCl_2 . In EtOH solns. the reaction seems to proceed as in water. The compd., $\text{Hg}_2\text{Cl}_2\text{Fe}(\text{CO})_4$, crystallizes in small monoclinic forms. It is insol. in most solvents, and is decomposed rapidly by HNO_3 , the carbonyl dissolving first, followed by the evolution of NO_2 . Alkalies slowly decompose it. At 100° the material begins to darken; at 140° CO is given off, and at 300° Fe and HgCl_2 are formed. The compd. may lend itself to *detns. of pentacarbonyl*.

H. C. DUUS

Oxidation of sulfur vapor at low pressures. N. SEMENOV AND G. RJABININ. Physics Lab. Leningrad. *Z. physik. Chem. Abt. B* 1, 192-204(1928).—The oxidation by O of S vapor at temps. of 80 - 120° and pressures of approx. 4 mm. has been studied. SO seems to be the principal product, although varying from 20 to 60% of the total amt. of SO and SO_2 . With passage of time the total pressure curve asymptotically reaches a mm. as in the oxidation of P vapor. There is a short induction period dependent upon temp. The min. pressure is independent of the size of reaction chamber and of the presence of foreign gas. There also exists a max. pressure of the S (dependent upon temp.) above which the oxidation cannot occur. Above the max. and below the min. pressures the reaction velocity is immeasurably slow. S and R . believe that either O_3 mols. or an active S atom initiates a chain reaction by inducing the formation of centers.

WILLIAM E. VAUGHAN

Disintegration of calcium carbide in the air. W. SCHERUHN. Untersuchungs u. Prüfstelle deut. Acetylenvereins. *Acetylen in Wissenschaft u. Ind.* 31, 129-31(1928).—Discussion and exptl. data on the influence of atm. humidity, state of division of the carbide, C_2H_2 yield, etc. More finely divided carbides and carbides of lower yield disintegrate more rapidly. The influence of atm. temp. variations is negligible, but in carbide lying in a generator, sufficient heat accumulates to show the accelerating effect of temp.

F. S. GRANGER

Calcium carbide reduction of oxides. ROBERT SAXON. *Chem. News* 137, 216 (1928). To reduce certain difficultly reducible oxides to metal (e. g., those of Mn , Cr , Al , Mg , W and Zr) on a very small scale for class-room demonstration, S . places a mixt. of the oxide with CaC_2 and CaO or $\text{Ca}(\text{OH})_2$ in a tiny crucible or a "straw" clay pipe. The latter is placed inside the tube of a gas burner (bent over and downwards) which is then lighted, and then a blast flame is placed beneath the crucible or pipe.

E. G. R. ARDAGH

Basic carbonates of beryllium. TSUNEKICHI NISHIMURA AND TAKEMARO YAMAMOTO. *Bull. Inst. Phys. Chem. Research* (Tokyo) 7, 920-33(1928); English Ed. 1, 89-90. A double decompn. between a BeCl_2 soln. satd. with CO_2 at 0° , and a satd. soln. of NH_4Cl gives a Be carbonate contg. more than 0.4 mol. CO_2 to 1 mol. BeO . If the initial solns. are more dild. than 1 N , the carbonate pptd. is generally of the form $3\text{Be}(\text{OH})_2\cdot\text{CO}_2\cdot n\text{H}_2\text{O}$, (A). The carbonate obtained by double decompn. at room temp. in the absence of CO_2 is always of high basicity; its compn. is variable. At 100° , the ppt. is practically pure $\text{Be}(\text{OH})_2$. If a deposit of Be carbonate poor in CO_2 be exposed for a long time in a wet or dry CO_2 atm., the final product acquires generally formula A , except in some rare cases where compds. very rich in CO_2 are obtained; the latter are not believed to be stable. If CO_2 is passed for a long time through a suspension of basic carbonate at 25° , a compd. similar to A forms first; after a while, it will decompose, finally yielding a salt contg. only 0.284 mol. CO_2 per mol. BeO . This corresponds to a formula: $7\text{Be}(\text{OH})_2\cdot 2\text{CO}_2\cdot m\text{H}_2\text{O}$. If a suspension of $\text{Be}(\text{OH})_2$ is treated in the same manner, the same carbonate is finally obtained. Be carbonate is unstable in air but decomposes slowly when dry. When a suspension of A in a large quantity of H_2O is treated with air for a long time, decompn. occurs rapidly; two intermediate products are detectable; the final product contains only 0.01 mol. CO_2 per mol. BeO . The same product is obtained from $\text{Be}(\text{OH})_2$ suspensions treated with air.

A. L. HENNE

The chlorides of ruthenium. (Remarks on the work of Gall and Lehmann.) E. ZINTL AND PH. ZAIMIS. *Ber.* 61B, 2110-11(1928); cf. *C. A.* 21, 2081; 22, 3595.—Polemical. HANS C. DUUS

The chlorides of ruthenium. (Reply to remarks by H. Gall and G. Lehmann.) H. REMY. *Ber.* 61B, 2109-10(1928); cf. *C. A.* 22, 3595, 2521.—Polemical. HANS C. DUUS

The induction by sodium thiosulfate of the oxidation of potassium nitrite by iodine. A. BORTHOUD AND W. E. BERGER. *J. chim. phys.* 25, 562-7(1928).—See *C. A.* 22, 1923. E. H.

Decomposition of sodium thiosulfate in acid solution. F. H. RIESENFELD AND G. SYDOW. Univ. Berlin. *Z. anorg. allgem. Chem.* 175, 49-73(1928).—R. and S. have developed the following new method of analysis for the mixt. of products produced by the reaction between HCl and $\text{Na}_2\text{S}_2\text{O}_3$. (1) The sum of SO_3 and S_2O_3 is detd. by titration with I. (2) SO_3 is detd. by conducting a rapid stream of air through the mixt. for about 10 min., collecting the SO_2 in a standard I soln. and titrating the excess of I with $\text{Na}_2\text{S}_2\text{O}_3$. (3) The sum of S_2O_3 , S_3O_6 , S_4O_6 and S_5O_6 is detd. by treatment with HgCl_2 , all of these reacting to form $\text{Hg}_3\text{S}_2\text{Cl}_2$, followed by addn. of NH_4Cl soln. and titration with 0.1 N KOH with Me orange. (4 and 5) The sum of S_4O_6 and S_5O_6 is detd. by neutralization of the soln. followed by addn. of an excess of SO_3 , the polythionates being converted into S_3O_6 and S_2O_3 , the excess of SO_3 being taken care of with CH_2O and the S_2O_3 formed detd. by titration with I. Another method is by reduction with KCN and detn. of the S_2O_3 produced (6) SO_4 is pptd. with benzidine and titrated with KOH. (7) S is filtered off, oxidized to H_2SO_4 and pptd. as BaSO_4 . The reactions between 2.5 N $\text{Na}_2\text{S}_2\text{O}_3$ and 2.5 N HCl, with and without the addition of 0.05 mols. As_2O_3 per mol. of S_2O_3 and the reactions between 2.0 N $\text{Na}_2\text{S}_2\text{O}_3$ and 9.7 N HCl with and without addition of As_2O_3 are studied. Based upon the use of 16.787 millimols of S_2O_3 in every case and a reaction time of 2 days, the following results are obtained expressed in millimols. For 2.5 N $\text{Na}_2\text{S}_2\text{O}_3$ + 2.5 N HCl, without As_2O_3 : S = 7.85, SO_3 = 0.52, SO_2 = 1.64, S_2O_3 = 2.53, S_3O_6 = 2.79, S_4O_6 = 2.17, S_5O_6 = 0.37. The same mixt. + As_2O_3 : S = 8.62, SO_4 = 0.48, SO_3 = 0.09, S_2O_3 = 2.95, S_3O_6 = 3.78, S_4O_6 = 1.34, S_5O_6 = 0.20. For 2.0 N $\text{Na}_2\text{S}_2\text{O}_3$ + 9.7 N HCl, without As_2O_3 : S = 16.13, SO_3 = 0.27, SO_2 = 11.64, S_2O_3 = 0.0, S_3O_6 = 0.0, S_4O_6 = 1.66, S_5O_6 = 0.11. The same mixt. + As_2O_3 : S = 2.10, SO_4 = 0.27, SO_3 = 2.35, S_2O_3 = 3.65, S_3O_6 = 0.0, S_4O_6 = 0.0, S_5O_6 = 4.60. The following reaction mechanism is given. S is formed primarily according to the equation $\text{S}_2\text{O}_3 + \text{H} \rightarrow \text{HSO}_3 + \text{S}$ (1), with some slight reaction as follows: $\text{S}_3\text{O}_6 \rightarrow \text{S} + \text{SO}_3 + \text{SO}_4$. Trithionic acid is the principal product among the polythionic acids when dil. HCl is used in the absence of As_2O_3 . The S_3O_6 first formed as follows $5\text{S}_2\text{O}_3 + 6\text{H} \rightarrow 2\text{S}_3\text{O}_6 + 3\text{H}_2\text{O}$ (2) is decomposed according to the equations: $\text{S}_3\text{O}_6 + \text{SO}_3 \rightarrow \text{S}_4\text{O}_6 + \text{S}_2\text{O}_3$ (3) and $\text{S}_3\text{O}_6 + \text{SO}_3 \rightarrow \text{S}_4\text{O}_6 + \text{S}_2\text{O}_3$ (4). The last of these takes place very slowly, however, and the chief source of S_3O_6 is probably as follows: $\text{S}_2\text{O}_3 + 4\text{HSO}_3 + 2\text{H} \rightarrow 2\text{S}_3\text{O}_6 + 3\text{H}_2\text{O}$ (5). In strong acid solns. without As_2O_3 , tetrathionic acid predominates and all the $\text{Na}_2\text{S}_2\text{O}_3$ has been destroyed. The final end products of the reaction $4\text{S}_2\text{O}_3 \rightarrow 3\text{SO}_4 + 5\text{S}$ are attained only after about 6 months' time. The presence of As_2O_3 in strong acid soln. causes pentathionate to be the chief product and the only polythionate produced. Reaction (1) above is prevented, which likewise prevents (3), (4) and (5) and the pentathionate formed therefore in reaction (2) is not decomposed.

H. STOERTZ

A compound of sulfur and sulfurous acid. A. KURTENACKER AND A. CZERNOTZKY. Tech. Hochschule, Brunn. *Z. anorg. allgem. Chem.* 175, 231-40(1928).—If when H_2SO_3 reacts with $\text{Na}_2\text{S}_2\text{O}_3$, the mixt. is allowed to stand for a few days, the complex ion $[\text{S}_2\text{O}_3\text{SO}_2]$ is partly converted into a loose compd. between S and SO_2 as follows: $[\text{S}_2\text{O}_3\text{SO}_2] + \text{H}_2\text{O} \rightleftharpoons [\text{S}_2\text{O}_3\text{SO}_2\text{H}_2]$; $[\text{S}_2\text{O}_3\text{SO}_2\text{H}_2] \rightleftharpoons [\text{S}(\text{SO}_2\text{H})_2]$. By treatment with CH_2O and NaOH this complex is decompd. with the pptn. of S: $[\text{S}(\text{SO}_2\text{H})_2] \rightleftharpoons \text{S} + 2\text{SO}_2\text{H}'$. Lowering acidity in the absence of CH_2O , as produced by neutralization with AcONa, leads to the formation of S_2O_3 : $[\text{S}(\text{SO}_2\text{H})_2] + \text{OH}' \rightleftharpoons \text{S}_2\text{O}_3 + \text{SO}_3\text{H}' + \text{H}_2\text{O}$. Expts. show that the reaction with CH_2O and NaOH proceeds more rapidly than the decompn. with AcONa. As an excess of SO_2 is always present, only traces of polythionates are formed. In the reaction between $\text{Na}_2\text{S}_2\text{O}_3$ and HCl (dil. or concd.) this compd. between S and SO_2 is also formed. H. S.

Preparation of a tungsten carbonyl by the intermediary of magnesium derivative. ANDRÉ JOB AND JEAN ROUVILLOIS. *Compt. rend.* 187, 504-5(1928).—By methods which had been used for the prepn. of chromium carbonyl (cf. *C. A.* 20, 3404) tungsten

carbonyl, $W(CO)_6$, was prepd. from WCl_6 . The colorless cryst. carbonyl is slightly sol. in C_2H_5O , $C_4H_{10}O$ and C_6H_6 . It sublimes at 50° . The same method is given for the prepn. of $Mo(CO)_6$, but it has already been prepd. by direct action of CO on Mo by L. Mond, H. Hirtz and M. Cowap.

L. D. ROBERTS

Complex compounds of bivalent silver. (A study on the relation between ring closure and "specific affinity.") W. HIEBER AND F. MÜHLBAUER. *Univ. Heidelberg. Ber.* 61B, 2149-53(1928); cf. *C. A.* 22, 1920, 1957.—A soln. of $AgNO_3$ interacts with a soln. of *o*-phenanthryline to give a colorless gelatinous ppt. which may subsequently be oxidized with $(NH_4)_2S_2O_8$ to give a reddish brown substance, $Ag_2O \cdot 2C_{12}H_8N_2$, in quant. yield. It is sol. in cold 64% HNO_3 and the perchlorate is prepd. by adding $NaClO_4$. The chlorate is prepd. by adding $KClO_3$. Both the chlorate and perchlorate are explosive. The salts are capable of oxidizing H_2O_2 , alkali halides and NH_3 . The state of oxidation was detd. with standardized oxalic acid, by measuring the CO_2 evolved. The formation of these compds. of bivalent Ag is explained by the theory that phenanthroline forms a complex ion with the Ag, and the resulting ring is stable. H. C. D.

Reactions and derivatives of iron carbonyl. II. A new type of carbon monoxide compound of the iron halides. WALTER HIEBER AND GEORG BADER. *Universitt Heidelberg. Ber.* 61B, 1717-22(1928); cf. *C. A.* 22, 1957.—Tetracarbonyl-ferrous iodide, $Fe(CO)_4I_2$ (I), is obtained in red, dichroic crystals by evapg. an Et_2O soln. of $Fe(CO)_5$ and I_2 . $Fe(CO)_4Br_2$ (II), red-brown powder from petroleum ether in the cold. $Fe(CO)_4Cl_2$ (III), is prepd. similarly but at -20° as a yellow powder which loses CO at room temp. II and III are instantly decompd. by H_2O , III only on heating. NH_3 eliminates CO from these compds. producing hexamine-ferrous halides. Amines, alcs., esters, aldehydes and ketones cause decompn. of these salts although III is stable toward certain agents that decomp. I and II. Pyridine converts I and II into $FeX_2 \cdot (C_5H_5N)_2$, while III yields $Fe(CO)_2(C_5H_5N)_2I_2$ (IV), green needles, and $Fe(C_5H_5N)_4I_2$. IV spontaneously loses CO, yielding monocarbonyldipyridine-ferrous iodide, $Fe(CO)(C_5H_5N)_2I_2$. Excess of C_5H_5N produces $[Fe(CO)(C_5H_5N)_3]I_2$. Light causes the complete elimination of CO from I, II and III, their stability decreasing from I to III.

DAVID DAVIDSON

7—ANALYTICAL CHEMISTRY

W. T. HALL

Centrifugal analysis as a rapid analytical method. CARL HÜTTER. *Metall u. Erz* 25, 273-5(1928).—A centrifuge for the sepn. of mineral or ore mixts. (0.5-3 g.) is described, in which 4 small tube furnaces are suspended from a body rotated at 2000 r. p. m. by a small motor. The furnace temp. is controlled by a rheostat, up to 900° being obtainable. The power consumption is 2 amp. at 220 v. at the max. The centrifuging medium may consist of salts (or their mixts.), or light metallic alloys. If the sepn. is not complete after the first centrifuging, fractional centrifuging may be resorted to.

J. BALOZIAN

Centrifugal analysis as a rapid analytical method. The correct situation. v. WOLFF. *Metall u. Erz* 25, 327-8(1928).—W. claims that the app. indicated by Hütter (cf. preceding abstract) was first described by him (v. W.). H. replies to the claim.

J. BALOZIAN

Gravimetric titration and its application to microchemical determinations. B. ORMONT. *Z. anal. Chem.* 75, 209-28(1928).—The term "gravimetric titration" signifies the titration of a weighed quantity of soln. by means of a soln. contg. a known weight of active reagent per kg. of soln. Just as there is *N*, 0.1 *N*, 0.01 *N*, etc., solns. it is now proposed to have *P*, 0.1 *P* and 0.01 *P* solns. in which the concn. is expressed in equiv. per kg. instead of equiv. per l. According to O., the methods of quant. analysis embody methods of (1). Weight Analysis, or what has formerly been called "gravimetric" methods and (2). Titration Analysis which includes gravimetric and volumetric titrations. The advantages of carrying out the titrations gravimetrically are discussed with careful consideration of the various sources of error. In particular the method is applied to the titration of HCl solns. with Na_2CO_3 solns. and of arsenite with iodine solns. contg. $0.6-2.6 \times 10^{-4}$ mg. of HCl and $0.7-3.5 \times 10^{-4}$ mg. of As_2O_3 .

W. T. H.

Macro- and micro-iodometric determination of copper in salts of organic acids and enols. M. USHAKOV. *Univ. Moscow. Z. anal. Chem.* 75, 228-35(1928).—The method consists merely in dissolving a weighed quantity of substance in 20 cc. of water, or alc., adding 10 cc. of 10% H_2SO_4 and 10 cc. of 10% KI soln. The liberated I_2 is

titrated with $\text{Na}_2\text{S}_2\text{O}_3$. This method succeeds in the presence of enols, aliphatic and aliphatic-cyclical amino acids, cyclical aminosulfonic acids, aliphatic and aliphatic-cyclical acids with a double bond and cyclical nitro acids. It cannot be used in the presence of sulfonic acids.

W. T. H.

Simplified method for potentiometric titrations. ERICH MÜLLER AND HERBERT KOGERT. Sachs. Tech. Hochschule Dresden. *Z. anal. Chem.* 75, 235-9(1928).—Further details are given concerning the usefulness of the very simple titration electrode which was described recently (*C. A.* 23, 52).

W. T. H.

The application of Emich's filtering tubes in potentiometric titrations. THEODOR HEČZKO. *Z. anal. Chem.* 75, 183-90(1928).—One of the reasons why potentiometric methods have been adopted more generally in industrial labs. is on account of the fact that the app. usually recommended is expensive. In this paper, a method of titrating is described which is inexpensive. As comparison electrode, a quartz filtering tube with porous bottom is used. The tube is about 4.8 cm. long, the diameter of the filtering plate about 1 cm., that of the inside of the tube is 1 mm. and the tube will hold 0.25 cc. of liquid. For the titration of Fe^{++} , the tube is filled with a mixt. of acid 0.05 *N* FeSO_4 and 0.05 *N* $\text{Fe}_2(\text{SO}_4)_3$ solns. For the titration of VO_3^{++} the tube is filled with VO_3^{++} soln. to which enough MnO_4 has been added to provide some quinquevalent V. For the Zn titration, the tube is filled with $\text{K}_4\text{Fe}(\text{CN})_6$ soln. contg. a little ferricyanide, and for the titration of Ag, a dil. AgNO_3 soln. is used. Inside this tube is a wire of suitable metal. A variable resistance can be made from a 50-cc. measuring cylinder filled with 0.1 *N* CuSO_4 soln. The cylinder is provided with a stopper through which a capillary tube is inserted carrying a wire electrode and another wire reaching to the bottom of the soln. serves as the other electrode. The resistance of a CuSO_4 soln. in the measuring cylinder is detd. by the distance between the 2 electrodes. The only other app. needed are a stirrer and a galvanometer. The prepn. and use of this simple arrangement are described in detail and a no. of typical analyses given to show the accuracy of the results obtainable.

W. T. H.

The Prussian blue and Turnbull's blue test. L. SZEBELLÉDY. Univ. Budapest. *Z. anal. Chem.* 75, 165-7(1928).—The blue test for Fe^{+++} with 5 cc. of 0.02 *N* FeCl_3 is completely obscured by 0.5 g. of NH_4F in the presence of which a white ppt. is formed. Smaller quantities of NH_4F make the test paler and pinker in appearance. The test for Fe^{++} with $\text{K}_3\text{Fe}(\text{CN})_6$ is weakened similarly. With corresponding concns. the ppt. is white when 0.3 g. of NH_4F is present. A ppt. of Prussian blue is not whitened readily by adding NH_4F but this is the case with a ppt. of Turnbull's blue.

W. T. H.

Detection of cadmium by microchemical method. P. G. POPOV. *Ukrainskii Khim. Zhurnal* 3, No. 2, Pt. sci., 157-60(1928).—The following procedure is suggested for the detection of Cd in acid soln. in the presence of Hg, Ag, Pb, Cu and Bi. Evap. a few drops of the soln. contg. the above metals with H_2SO_4 to remove all HNO_3 . To the soln. of the sulfates add powd. Fe, stir and immediately filter. Treat the filtrate on a watch glass with a soln. of H_2S . The same method can be applied for the detection of Zn if Cd has been shown to be absent. After the addn. of Fe heat the soln. until all free acid has been removed, filter, add AcOH and treat the soln. as before with H_2S .

G. B. KISTIAKOWSKY

Rapid method for the simultaneous determination of silver and cadmium by the potentiometric method. ERICH MÜLLER AND HERBERT HENTSCHEL. Sachs. Tech. Hochschule Dresden. *Z. anal. Chem.* 75, 240-4(1928).—The titration takes place in much the same way as has been described for the detn. of Ag and Zn (*C. A.* 22, 1929) but NaBr should be used instead of NaCl and $\text{Na}_4\text{Fe}(\text{CN})_6$ instead of $\text{K}_4\text{Fe}(\text{CN})_6$. It is possible to titrate Ag, Pb and Cd, when present together. Titrate first the Ag with NaBr using an electrode of Ag for comparison, then replace this electrode with a Pt one and titrate the Pb and Cd with $\text{Na}_4\text{Fe}(\text{CN})_6$. In another sample, remove the Ag with NaBr and the Pb with Na_2SO_4 and titrate the Cd with $\text{K}_4\text{Fe}(\text{CN})_6$.

W. T. H.

Separation of cadmium from copper in qualitative analysis. P. G. POPOV. *Ukrainskii Khim. Zhurnal* 3, No. 2, Pt. sci. 153-5(1928).—A modification of Castle's method (*Am. Chem. J.* 2, 503(1889)) of sepg. Cd from Cu in acid soln. by Fe. The new feature is the use of powd. Fe which speeds up the procedure and obviates the otherwise necessary heating. After adding Fe powder stir the soln. for 10-20 secs. and immediately filter. Det. Cd in the acid filtrate by pptg. with H_2S . Powd. Zn can be used instead of Fe, but the soln. must remain acid during filtration, as otherwise not only Cu but also Cd will be pptd.

G. B. KISTIAKOWSKY

Detection of copper in the presence of iron. L. SZEBELLÉDY. Univ. Budapest. *Z. anal. Chem.* 75, 167-8(1928).—In the presence of 1 g. of NH_4F the test for Cu is more sensitive than otherwise. As little as 0.013 mg. of Cu can be detected in 5 cc. by the

addn. of a few drops of 1% $K_4Fe(CN)_6$ soln. If, at the same time, 0.1 g. of Fe^{+++} is present, the test is not obscured. W. T. H.

Determination of sulfur in copper alloys containing tin. H. LEYSAHT. Materialprüfungsamt Berlin. *Z. anal. Chem.* 75, 169–82(1928).—The gravimetric detn. of S in bronze after treatment of the alloy with HNO_3 is a tedious procedure and one likely to give inaccurate results. It is possible to avoid the trouble caused by Sn by distg. off the Sn as $SnBr_4$ and, similarly, by decomposing the alloy with $KClO_3$ and Br_2 it is possible to get good results although considerable skill and patience are required. It is much more convenient to carry out the detn. by an evolution method similar to that used for the detn. of S in steel but treating 5 g. of material with 50 cc. of HBr soln. d 1.49 contg. sufficient $SnCl_2$ to remove any free Br_2 . The H_2S evolved can be absorbed in Br-HCl and detd. as $BaSO_4$ as recommended by Bauer and Deiss or the H_2S can be absorbed by $Cd(OAc)_2$ soln. as in steel analysis, taking care first to wash the gas free from the greater part of the HBr in the vapors by bubbling through a little water. Toward the end of the distn. this water is heated nearly to boiling so that it does not retain H_2S . Expts. with HBr and steel samples showed that either HCl or HBr can be used for the analysis of steel by the evolution method but the attempt to substitute HCl for HBr in the analysis of bronze gave values much too low, as might be expected. W. T. H.

Detection of arsenic. DAUVÉ. *Ann. chim. anal. chim. appl.* 10, 320–1(1928).—In Wurtz' dictionary, a test for As is given which consists in treating the substance with a little NaOH soln. and a piece of Al and allowing the liberated gas to come into contact with paper impregnated with $AgNO_3$. Unfortunately Al foil almost always contains sufficient Si to give the blackening of the $AgNO_3$ paper by SiH_4 . The test can be modified to avoid this difficulty by using a paper which has been impregnated with a drop of $HgCl_2$ soln. The $HgCl_2$ gives a yellowish color by contact with a little AsH_3 , whereas it is not acted upon by SiH_4 . A simple app. is depicted for carrying out the test. The test proceeds in dil. and in dil. alk. soln. W. T. H.

Determination of chlorine in benzaldehyde by the so-called combustion method. R. D. HENDRIKSZ AND A. RECLAIRE. Polak and Schwarz, Hilversum, Holland. *Parfums de France* 6, 273–4(1928).—The disadvantages of the Rubke method for the detn. of Cl in benzaldehyde are eliminated without interfering with its accuracy by mixing the benzaldehyde with an equal vol. of alc. before burning. A. PAPINEAU-COUTURE

Method for the determination of halogen or sulfur present in small quantities in organic substances, especially those containing chromium. FR. HEIN, K. HOVER AND K. KLAR. Univ. Leipsic. *Z. anal. Chem.* 75, 161–4(1928).—For the detn. of halogen, mix 0.02 g. of the substance with 0.18 g. of pure sugar and 2–2.5 g. of Na_2O_2 in a Pringsheim crucible (*C. A.* 3, 647) (taking care not to heat by grinding) and finally adding 2 g. more of the peroxide as a cover. Place the crucible in a porcelain dish contg. sufficient water to half cover the crucible. Start the reaction by means of a glowing nail and cover the crucible quickly. After 15 min., turn over the crucible so that water enters and cover the dish with a watch glass. Heat to about 95° for 15 min., make acid with HNO_3 and add 1–2 cc. of SO_2 soln. Heat 2 hrs. on the water bath and then add H_2O_2 till the excess SO_2 is removed. Add 3 cc. of concd. HNO_3 , cool to 20° and add a measured vol. of standard $AgNO_3$ soln. Titrate the excess with NH_4CNS soln. using ferric alum as indicator. For the detn. of S, use HCl instead of HNO_3 and reduce the CrO_4^{--} by alc. and a crystal of $NaNO_2$. Then allow the cold soln. to flow slowly into a hot, ammoniacal soln. of $BaCl_2$, make acid with HCl and filter off the $BaSO_4$ ppt. W. T. H.

Hypophosphoric acid. W. D. TREADWELL AND GEROLD SCHWARZENBACH. *Helv. Chim. Acta* 11, 405–16(1928). (A correction.)—For the titration of $H_4P_2O_6$, $U(SO_4)_2$ and not UO_2SO_4 must be used (*cf. C. A.* 22, 3109). W. T. H.

The volumetric determination of sulfuric acid. G. TESTONI. *Ann. chim. applicata* 18, 408–14(1928).—A modification of the method of Raschig (*Z. angew. Chem.* 617–8(1903)) based on the insoly. of benzidine sulfate. The end point is detd. by testing with filter paper moistened with PbO_2 which will give a purple color with 1 part in 200,000 of benzidine. The standard benzidine soln. is made by dissolving 10 g. of this in 100 cc. AcOH (glacial) and dilg. to 1 l. Let stand one day, then filter and titrate with 0.1 N H_2SO_4 . For the greatest accuracy the soln. contg. SO_4 is titrated, filtered, and the filtrate tested for excess benzidine with PbO_2 . When 2 titrations are made using amts. of benzidine differing by 0.1 cc. in which the filtrate of one has excess benzidine while the other has none, then the av. of these 2 is taken. Chromates and other oxidizing agents present must be reduced, while ferric salts must be removed. The sulfate soln. must be slightly acid with AcOH, as free mineral acids interfere with

the end point. This is a rapid method giving results within 1% or better. The use of AcOH also prevents occlusion of benzidine in the ppt. as is the case when the hydrochloride is used.

A. W. CONTIERI

The determination of nitrogen peroxide vapors in air and its usefulness in industrial hygiene. E. KOHN-ABREST. *Chimie et industrie Special No.*, 947-9 (April, 1928).—After a criticism of various methods, the following is recommended: exhaust a 4 l. glass-stoppered bottle carrying 2 glass tubes with stopcocks, fill it with the air to be examd. until the pressure is slightly less than atm., add 10 cc. 0.1 N NaOH and 50 cc. H₂O (2NO₂ + 2NaOH = NaNO₂ + NaNO₃ + H₂O), shake 5 min., to 30 cc. add 3 cc. of 20% H₂SO₄ (by vol.) and 25 cc. H₂O, and titrate with KMnO₄ till the color persists for 3 min. One cc. 0.1 N KMnO₄ = 0.0046 g. NO₂. The results can be confirmed by detn. of nitrates in the oxidized soln. by the method of K.-A. and Kawakibi (*C. A.* 21, 367). Examn. of the air in the neighborhood of a George 1500-c. p. quartz lamp operated in an 18-cu. m. room gave neg. results, even after 30 mins.' operation, the odor being due exclusively to the production of O₃. The work of Dadlez on the production of NO₂ in clinical elec. treatments is briefly reviewed (see *C. A.* 21, 3973). A. P.-C.

Report on chemical reagents. (Determination of sulfates in ammonium nitrate.) G. C. SPENCER. Bureau of Chemistry and Soils, Washington, D. C. *J. Assocn. Official Agr. Chem.* 11, 421(1928).—The following procedure is recommended: digest 5 g. of sample with 20 cc. concd. HCl in a 500-cc. Kjeldahl flask (not previously used for H₂SO₄ digestions) on a steam bath or over a low flame, renewing the HCl lost by evapn., until a piece of starch-KI paper is only slightly colored by the fumes, transfer to a 100-cc. beaker, evap. to dryness on a steam bath, take up in a little H₂O and 2 cc. concd. HCl, filter if necessary, and ppt. SO₄ as usual.

A. PAPINEAU-COUTURE

Colorimetric estimation of turbidity of silver chloride and of barium sulfate. S. AOYAMA AND T. DAIGO. Tokyo Imp. Hyg. Lab. *J. Pharm. Soc. Japan* 48, 702-12 (1928).—To det. the amt. of HCl and its salts present as impurities in various substances, the turbidity caused by AgCl ppt. was measured by a colorimeter. By using the "Opalsierende Trübung" of the German Pharm. as units, the relative turbidity of the standard solns. in both the German and American Pharm. was measured and numerically expressed. The turbidity does not necessarily correspond with the increase in acidity although it is greater in an acid medium than in a neutral medium. It is recommended to use the standard in HNO₃ medium, also the use of Walpole's comparator when the soln. is colored. AgCl standard cannot be used for BaSO₄ ppt. Time for the pptn. of BaSO₄ should be 15 min. instead of 10 min. in making measurement. NAO UYGI

Toxicology of lead and its compounds. VI. Distribution of lead in the organism, especially in the bones, and the toxicity of lead solutions to fish. P. W. DANCKWORTT AND E. JÜRGENS. *Arch. Pharm.* 266, 492-501(1928); cf. *C. A.* 22, 3373.—A procedure has been developed for the detn. of Pb in the bones. The chem. examn. of dogs poisoned by Pb afforded a survey of the distribution of that element in the organism. The relatively low content of Pb in the organs leads to the conclusion that this element is carried by the blood to the bones. The flattened bones carry a higher Pb content than those of tubular structure. The Pb content of H₂O exercises an influence on the life of fish.

W. O. E.

Determination of pyruvic acid. BASETTIHALLI HANUMANTHA, RAO KRISHNA AND MOTNAHALLI SREENIVASAYA. Indian Institute of Science, Bangalore. *Biochem. J.* 22, 1169-77(1928).—The method is a modification of Lieben's technic (*C. A.* 17, 2740) and is based upon the following reactions: CH₃CO.COOH + 2H → CH₃CHOH.COOH; and CH₃CHOH.COOH + O → CH₃CHO + CO₂ + H₂O. B. H.

Rapid method for the determination of the dry picric acid content of a moist sample and its application to the calculation of the yield in nitration experiments of phenol. LOUIS DESVERGNES. *Ann. chim. anal. chim. appl.* 10, 317-20(1928).—The moisture content of picric acid cannot be detd. satisfactorily by oven drying. From the d. of dry picric acid (0.9060) and the d. of a satd. soln. of picric acid in water (1.005) it is possible to compute the moisture content by introducing a weighed quantity of the sample (say 33 kg.) into a measuring vessel together with some water (say 12 kg.) and then measuring the vol. and detg. the wt. of the mixt.

W. T. H.

A new colorimetric test for tannic acid. J. RAE. *Pharm. J.* 120, 539(1928).—A 10% aq. NH₄ molybdate soln. (A) produces with soln. of tannic acid at once a reddish brown permanent color, varying in intensity with the concn. of tannic acid. The test is positive also with gallic acid, pyrogallol and tincture of catechu, *Brit. Pharm.*, neg. with dextrose, resorcinol, glycerol, PhOH or EtOH. Hydroquinone and phloroglucinol produce a very pale yellow, in concd. solns. only. To det. tannic acid in *glycerinum acidi tannici*, *Brit. Pharm.* (B) (20%), dil. 5 cc. of B with H₂O to 100 cc.; to 1 cc. thereof

add 2 cc. of *A* and dilⁿ to 50 cc. in a Nessler tube, compare the color with that obtained from a standard 1% aq. soln. of tannic acid. To *det. tannin in tea*, exhaust the tea with boiling H_2O and treat 1 cc. as stated. To eliminate the influence of the color produced by the infusion itself, 1 cc. was dild. with H_2O to 50 cc., and sufficient burnt sugar was added to 50 cc. H_2O to match the color. This colored H_2O was then used in making up the standard in the Nessler tube. A tentative detn. of tannin in *tea*, not verified by another method, gave 10%. Powd. drugs *e. g.*, galls, catechu, etc., when mixed with 1 drop of the reagent gave at once a reddish color. S. WALDBOTT

A microanalytical method of estimation of sulfur in organic compounds. SADAHIKO HANAI. *Bull. Inst. Phys. Chem. Research* (Tokyo) 7, 915-9(1928); English Ed. 1, 86-8.—The method is based on the decompn. of S compds. at 200-500° by Ni catalyst in an H atm. Place a few mg. of substance in a Ptⁿ boat and introduce into a small decompn. tube contg. Ni catalyst. The catalyst is made from NiO (obtained from NiO_4C_2) reduced with H in the tube itself. Pass pure H through the tube, and after the air has been expelled, carefully volatilize the substance so that it passes over the catalyst in the H_2 . Finally, cool the tube, add HCl to the contents and pass the evolved H_2S together with H_2 through an ammoniacal Cd soln. Det. the S content of the pptd. CdS iodometrically as in the detn. of S in steel. A. L. HENNE

Reaction accelerators in the determination of organic nitrogen by Kjeldahl's method. FOSCO PROVVEDI. *Atti accad. fisiocrit. Siena* [10], 3, 423-5(1928).—After expt. with accelerators, reducers and oxidizers under identical conditions on a sample of flour, it was found that decoloration took place with H_3PO_4 - H_2SO_4 in 6 hr. 30 min., reducing agents in 6 hr. 30 min., H_3PO_4 - H_2SO_4 and K_2SO_4 in 5 hr. 30 min., $KMnO_4$ in 3 hr. 30 min., BaO_2 in 3 hr., $(NH_4)_2S_2O_8$ in 3 hr., H_2O_2 in 45 min. the % of N remaining const. at 1.5%. The greater activity of H_2O_2 was due to the other agents reacting with SO_2 originated in the reduction of H_2SO_4 . Other expts. confirmed the errors of considering decoloration as indicator of the end reaction. This is caused by the destruction of C liberated in the principal reaction. After boiling for about 45 min. the result concords with that obtained by boiling until complete decoloration. The N detn. with Kjeldahl's method can therefore be conducted sooner than usually. R. SANBONE

The action of Hg salts on $Fe(CO)_5$, (HOCK, STUHLMANN) 6. Fatal case of acute lead poisoning (BRÜNING, KRAFT) 11H.

8—MINERALOGICAL AND GEOLOGICAL CHEMISTRY

EDGAR T. WHERRY AND J. F. SCHAIRER

Gypsum in the European part of U. S. S. R. and Caucasus. L. I. SEMIKHATOVA. *Trans. Sci. Inst. Fertilizers* (Moscow) No. 36, 3-51(1926).—S. deals with the gypsum areas in the various parts of European Russia and Caucasus, indicating the geological, petrographic and mineralogical relationships of the deposits. An English summary and a map indicating the extent of the deposits are appended, and a large no. of references to the literature is given. J. S. JOFFE

Remarks on the theory of formation of petroleum and anthracite. A. F. VON STAHL. *Montan. Rundschau* 20, 550-1(1928).—Petroleum and anthracite are both formed by an analogous process: decompn. of org. matter. In the first case, the materials are chiefly of animal origin, in the second, vegetable. Fe and S play an important role. Both are present in living organisms. They are actually found as pyrite and Fe oxide. It is to be noted that in the industrial coal liquefaction process, these elements have an enormous catalytical importance. The decompn. of org. matter yields always oily materials first; these materials may be hardened by oxidation, due to Fe oxide, forming thus anthracite. The presence of oily inclusions in pitch-coal is regarded as a support to the theory advanced. A. L. HENNE

The geological basis for the formation of oil deposits. W. WUNSTORF. *Petroleum Z.* 24, 761-2(1928).—The same conditions were necessary for the formation of oil reservoirs as for the formation of coal deposits, *i. e.*, sediments and both pervious and impervious rock formation. M. B. HART

Earth temperatures in Hannover oil fields. R. HERRMANN. *Petroleum Z.* 24, 241-3(1928).—The development of heat in the region of oil deposits is attributed to the chem. reactions such as depolymerization and subsequent polymerization which take place. Evidences of these reactions such as the presence of lighter oils at lower horizons are observed in the Hannover fields. M. B. HART

Origin of Japanese petroleum. KIUCHEI KOBAYASHI. *Chem. News* 137, 46-7 (1928).—There is a very close geological relation between the oil fields (Echigo, Akita and Aomori) and the outcrops of Japanese acid clay. In Japan, petroleum is almost always accompanied with salt water. By dry distn. of acid clay and NaCl, HCl is obtained. NaCl, AlCl_3 and HCl will affect the formation of petroleum from fish oil in the earth's crust. The origin of Japanese petroleum and natural gas is due to marine animals; putrefaction takes place first, eliminating albumin; fish oils decomp. to fatty acids and glycerol by hydrolysis; petroleum and gas are obtained by distg. a mixt. of these acids and glycerol with acid clay; hydrocarbons of the naphthane series are derived from low unsatd. fatty acids; hydrocarbons of the $\text{C}_n\text{H}_{2n-2}$, $\text{C}_n\text{H}_{2n-4}$, etc., series are derived from highly unsatd. fatty acids. A 62% yield of oil has been obtained exptly. by distg. sardine oil with acid clay. A. L. HENNE

Changes of certain clays into acidic ones through weathering. Preliminary. TSURUJI OKAZAWA. *Bull. Inst. Phys. Chem. Research (Tokyo)* 7, 776-84 (1928); English Ed. 1, 69-70.—O. examd. a no. of mountains producing acidic clays in Japan; he found that acidity is limited to the upper surface and decreases toward the interior, becoming neutral or alk. at last. The appearance of the clay remained the same throughout, the clay being derived from igneous formations. The strength of the acidity differs for individual mountains but is generally stronger for those which lie closer to the sea coast. The depth to which the acidity subsists is nearly proportional to the strength shown in the upper surface. In the mountains with the strongest acidity, a feeble acidity is traceable to a vertical depth of 12 m.; in mountains with weak acidity the clay is already neutral at a depth of 2 m. In Japan the acidic mountains are generally located in the provinces facing the Sea of Japan. Wind is generally severe there during autumn and winter, and snow rich in NaCl falls abundantly even to a depth of 4-5 m. The salinity is so intense that maple trees cannot grow fully near the coast. O. believes that the acidity is due to a chem. decompn., and not to mech. adsorption. Acidic clay is formed from the original substance by weathering by saline wind, rain and snow. This explains the rarity of this phenomenon near the Pacific coast, and inland. A. L. HENNE

Adsorption of acid and acidic salt (acidity of acidic earth and alkaline earth). HAJIME ISOBE AND YOSHIOMI YENDO. *Bull. Inst. Phys. Chem. Research (Tokyo)* 7, 805-20 (1928); English Ed. 1, 72-4.—The acidity of acidic earth is caused by small quantities of acid and acidic salts strongly adsorbed by the earth. A portion of the acid and the acidic salts is combined as a complex salt and retained in the earth by residual affinity; the other portion is simply adsorbed. The acidity may be reduced by treating with boiling H_2O . The origin of the acid and acidic salts is due to weathering. In the upper layer of the earth, AlCl_3 is produced by sea water and active Al present in the earth; CO_2 is produced by org. matter and also comes from the air. In the lower layer, $\text{Al}_2(\text{SO}_4)_3$ is produced by oxidation of sulfides present in the earth. A. L. HENNE

Occurrence of iodine and the iodine cycle. A. E. ALFTHAN. *Finska Kemist-samfundets Medd.* 37, 8-19 (1928).—Review of von Fellenberg's work on I in Switzerland (*C. A.* 21, 3910 and earlier references). HANS C. DUUS

African gold and silver quartz ore (SPORCQ) 9. Biochemistry and geochemistry of iodine (LUNDE) 11A. Industrial results of the experimental works for silicate materials (SMIRNOV, *et al.*) 20. X-ray phosphorescent and thermophosphorescent radiations of kunzite (STUHLMAN, DANIEL) 3. Natural blue rock salt (PRZIBRAM) 3. The preparation of thin sections of friable rock (LEGGETTE) 2.

9—METALLURGY AND METALLOGRAPHY

D. J. DEMOREST, R. H. ABORN

Russia's non-ferrous metal industry in 1926. L. VON MÜHLEN. *Metall u. Erz* 25, 270-3 (1928).—A brief survey. J. BALOZIAN

The separation and concentration of ores by flotation. CH. BERTHELOT. *Rev. métal.* 25, 372-96, 411-26, 496-508 (1928).—A general review of the principles of the process as applied to various types of ores, with a description of its applications, particularly in the United States, Canada and Australia. A. PAPINEAU-COUTURE

African gold and silver quartz ore. P. SPORCQ. *Ing. chim.* 16, 121-3 (1928).—Ag and Au are not alloyed but are included in the pyrites. The extn. of each varies

with the ρ_H of the flotation agent. The silver is much more finely divided than the gold.

P. THOMASSET

Attempts to utilize pyrites ashes as an iron ore. C. FICAI. *Giorn. chim. ind. applicata* 9, 450-9(1928).—As Italy has no large domestic source of iron, the product remaining from roasting of pyrites is being studied as a possible source of iron, copper is already being recovered commercially from this source.

A. W. CONTIERI

The production of high-quality cast irons, their metallurgical principles and the practical performance. B. OSANN. Bergakademie, Clausthal. *Giesserei* 15, 648-55 (1928).—A theoretical paper. It is shown that the aim of all processes for improving cast Fe is to produce a eutectic compn. The diminishing in the size of graphite is not due to overheating, but to purely mech. processes taking place in the cast Fe. Means of producing C-poor eutectic cast Fe in reverberatory and cupola furnaces are described.

J. BALOZIAN

A survey of the present methods for obtaining high-quality cast iron and views on some furnace questions. LANGENOHL. *Giesserei* 15, 566-71(1928).—A brief description of the methods, theory and furnaces used in the production of high-quality cast Fe.

J. BALOZIAN

The Burgers system of blast furnace with water-cooled metal shaft and without inner brick lining. E. DE LOISY. *Rev. métal.* 25, 557-62(1928).—At the Makiewka plant 2 furnaces were of the same shape and size, one having a Burgers water-cooled, unlined shaft while the second had the ordinary brick-lined shaft, and the same ores were supplied to both. A comparison of operations over a period of 2 yrs. showed that the coke consumption was the same in both (for the same grade of Fe), and that the Burgers furnace had a lower Fe ore and Mn ore consumption and was easier to handle.

A. PAPINEAU-COUTURE

Improved Siemens-Martin furnace with Moll-head. KARL HERMANN MOLL. *Stahl u. Eisen* 48, 1160-5(1928).—The following improvements are described: (1) air chambers placed over the stage; (2) a general easy accessibility to all parts of the furnace; (3) new brickwork built of Moll-Rhenania hollow bricks; (4) gas mains with quadratic cross-sections and the use of the new Moll-Demag valve for air and gas.

J. A. SZILARD

The cupola furnace according to Poumay. C. GEIGER. *Giesserei* 15, 816-9 (1928).—A brief description of the construction and operation of the Poumay furnace, with some exptl. results.

J. BALOZIAN

Accurate temperature measurement in cupola furnace practice. P. RHEINLÄNDER. *Giesserei* 15, 911-7(1928).—A lecture in which the most important methods of measuring the temps. of Fe, in the furnace and in the ladle, and the waste gases are described.

J. BALOZIAN

The quiet pouring of metals and alloys. P. G. DURVILLE. *Rev. métal.* 25, 563-71 (1928).—In the usual methods for the pouring of metals and alloys, the contact of the liquid metal with the atm. undoes the work accomplished in the purification prior to pouring, the extent to which this occurs depending on the conditions of pouring. When Al is present it forms a thin film of Al_2O_3 which protects the metal from oxidation; but this film is not reduced by C under the conditions ordinarily prevailing in the pouring or casting of metals, and the agitation produced by pouring results in a considerable amt. of inclusions which weakens the metal and considerably impairs its quality. These disadvantages can be overcome by die casting; but this is not economically practical except for the production of small and medium-sized pieces in large numbers. The best method available at the present time consists in open-side pouring, which entails a certain complication of the pouring equipment; but this is more than compensated by its advantages.

A. PAPINEAU-COUTURE

Investigations on slag inclusions in steel castings from small Bessemer converters with consideration to the pouring method. L. TREUHEIT. *Giesserei* 15, 585-91(1928).—A chem. and microscopic study is made of the effect on slag inclusions (I) in steels of pouring from a plugged (II) and a tilting (III) ladle, and the influence on pipe formation and the tensile properties. Three fusions (2500 kg. each) are prepd. by blasting a mixt. of 45% crude hematite Fe and 55% scrap steel, and pouring one into a II ladle, a sec. into a III, and a half of the third into a II and the rest into a III ladle. The % I, using only unannealed specimens, is detd. chemically by Eggertz's I_2 -method. The max. amt. of I is found to be 0.18%, the min. 0.1%, specimens poured from the III ladle showing the highest content of I. Microscopically, no difference in I could be detd. in etched and unetched specimens, annealed (5 hrs. at 900°) and unannealed, from the 2 methods of pouring. Steels poured from the II ladle are less inclined to pipe formation than when poured from the III. The tensile strengths of steels are not

affected by the method of pouring or by I. The notch hardness of steel increases with increasing I content, and is greater in those poured from III ladles than from the II.

J. BALOZIAN

Position of the metallurgy of copper at the present time. MARCEL FOURMENT. *Rev. métal.* 25, 481-95(1928).

A. PAPINEAU-COUTURE

Aluminum and the problem of its production. LUDWIK WASILEWSKI. *Przemysł Chem.* 11, 277-89(1927).—The conditions in Poland are favorable for eventual production of Al to supply the home market of 500-1000 tons yearly. Economical power and good electrode material may now be made available. The manufacturing may have to be begun with imported Al_2O_3 but eventually can be made to use the domestic kaolin and clay. A review of several most widely used methods for producing Al constitutes the first part of this article.

A. C. ZACHLIN

The manufacture of pig iron in Natal. J. E. HOLGATE. *J. Chem. Met. Mining Soc. S. Africa* 29, 2-5(1928); cf. *C. A.* 22, 1937; 23, 72.—The prepn. of dry FeO is a difficult matter not easily obtainable under blast-furnace condition. For every ton (909 kg.) of pig iron produced from the raw ore about 2,000,000 thermal units of heat are permanently lost to the furnace by the endothermic decompn. of the carbonate. When a furnace on normal charge is so driven that some reduction in the gas temps. is obtained, it is due to the increased speed of descent of the charge carrying down an increased amount of sensible heat, resulting in conservation of heat rather than loss. Raw ore lessens the output, discounting somewhat the economy indicated. W. H. B.

The manufacture of ferromanganese at the Makiewka plant (Southern Russia). V. G. KOTELNIKOV. *Rev. métal.* 25, 541-56(1928); *J. Russ. Met. Soc.* 1927, No. 4, Mem. 405-33.—A detailed description and discussion are given of the manuf. of Fe-Mn during a period of 17 months, which showed that the requirements for most advantageous production are: an acid slag (e. g., CaO 32-4, SiO_2 30, MnO 18-20, MgO 2, Al_2O_3 9-10%), rich ore (not less than 45% Mn, not more than 10-4% SiO_2), a blast temp. of 750-830°, rapid operation so that the ore does not remain more than 14 hrs. in the furnace. All these conclusions, with the exception of the one as regards the acidity of the slag, confirm those of Royster (*C. A.* 13, 699). The difference in conclusion as regards the compn. of the slag is due to the fact that Royster rendered his slag basic by means of dolomite, which would not be economical at Makiewka; in the latter place basicity would have to be obtained by means of limestone, and the resulting slag gives rise to greater drawbacks than acid slag.

A. PAPINEAU-COUTURE

Some non-ferrous metals used in the electrical industry. ANON. *Electrician* 101, 611 (1928).—A review.

C. G. F.

Iron, steel and ferrous alloys in the electrical industry. J. G. PEARCE. *Electrician* 101, 604-6(1928).—A review.

C. G. F.

Definite procedure required in etching iron and steel. H. H. SHEPHERD. *Foundry* 56, 785-8(1928).—The various etching agent and etching procedures used on iron and steel are discussed, with some critical notes on recommended practice. Seven photomicrographs are given in illustration.

ROBERT F. MEHL

Application of metallography in improving the quality of iron and steel. H. MEYER. *Stahl u. Eisen* 48, 506-15(1928).—The use of metallographic methods in the detection of segregations, blow holes and recrystn. in Fe and steel is described and numerous practical examples are given.

J. A. SZILARD

The mechanism of crystal growth by annealing. TOMIYA SUTOKI. *Science Repts. Tôhoku Imp. Univ.* 17, 857-76(1928).—Crystal growth in metals by annealing after plastic deformation and by annealing only was studied. In the first case, single crystals of Al were shown to grow at the expense of minute grains, but between crystals of macroscopic size no union was observed, even after very long annealing. In the second case, the concave side of the grains of a Sn-Sb alloy (1.5% Sb) absorbed, in most cases, the adjacent convex grains, the curvature of the boundary gradually diminishing. The crystal growth which takes place in the boundary of neighboring crystals is according detd. by the conditions of the atoms in the boundary layer; i. e., when the mobility of atoms is promoted by heating, an atom in the boundary layer may be attracted from those of the adjacent crystal and enter into it to form the lattice, then a new atom from the other crystal will occupy the position of the former atom and will again be attracted by the adjacent crystal and so on, and thus by a repetition of this process the former crystal will grow at the expense of the latter. The chief function of plastic strain is to produce nuclei of crystal growth, the no. being dependent on the amt. of strain. The no. of nuclei must be as small as possible, and the strain must be the critical value to obtain large single crystals.

DOWNES SCHAAF

Mixing, fusing and annealing costs of high-quality tempered cast iron. RUDOLF SRORZ. *Giesserei* 15, 905-11(1928).—A lecture. J. BALOZIAN

The behavior of cast iron under dynamic and static compression strains. BERNWARD GARRE. Tech. Hochschule, Danzig-Langfuhr. *Giesserei* 15, 792-3(1928).—Expts. were made to det. the vol. changes of cast Fe on rapid and on slow compression. A "quality Fe" (mostly pearlite), machine casting (more ferrite and graphite than in the previous), and ordinary cast Fe (with much more of these two constituents) was used. The tests show in each case that, up to the appearance of cracks, the force used is greater with rapid than with slow compression. The cracks are clearly visible on the exterior of the specimen when it is slowly compressed, while with rapid compression they are less distinct. The ratio of rapid to slow compression (dynamic/static) is greatest with pearlitic Fe, and decreases with decreasing content of pearlite. J. BALOZIAN

The gray nucleus of malleable cast iron. II. OT. QUADRAT AND J. KORITTA. *Chemický Obzor* 2, 178-82; *Chem. Zentr.* 1927, II, 971.—The object of the study was to det. the chem. compn. and the phys. properties of the material examd., and the effect of heat treatment. Compn. of the starting material: 2.5-2.95% C, about 0.8% Si, 0.08-0.18% Mn, 0.064-0.096% P and 0.049-0.078% S. After the tempering, at the surface a layer 1-2 mm. thick was found to be free from C. The gray nucleus contained 0.73-0.2% combined C as pearlite. Of the total C content, 98.5-96% was temper carbon. With decreasing C content of the gray nucleus of malleable cast iron, strength, ductility and reduction of area increased. With decreasing total C content, the strength of the gray nucleus increased. The Brinell hardness of the gray nucleus varied between 68 and 86. On cooling below 0° or heating to 100-300°, the mech. qualities deteriorated by 8-18%. The dissolving of the temper carbon and the deterioration of the mech. qualities connected with this began between 700° and 750°. Above 750°, an appreciable deterioration of the mech. qualities occurred, so that at 950° the strength was 50% of the original. Heating to 750° and cooling gave a pearlitic structure. On annealing 4 hrs. between a temp. of 900° and 600°, no decompn. of the pearlite occurred. G. SCHWOCH

The equilibrium diagram of the iron and iron sulfide system. KOZO MIYAZAKI. *Science Repts. Tôhoku Imp. Univ.* 17, 877-82(1928).—The equil. diagram of the Fe-FeS system was detd. by means of thermal analysis and elec. resistance measurements. The FeS was prepd. free from O by repeated melting of Merck's FeS with elementary S and subsequent solidification in a vacuum chamber. Samples weighing approx. 40 g each were put in a tubular crucible and melted under a cover of molten CaCl₂. The liquidus consists of two branches intersecting at the eutectic point of 83% FeS and at a temp. of 985°. DOWNS SCHAAR

Steel for casehardening—normal and abnormal steel. S. EPSTEIN AND H. S. RAWDON. Bur. of Standards. *Bur. Standards J. Research* 1, 423-66(1928).—That soft spots in casehardened articles may owe their origin to the kind of steel used, as claimed by McQuaid and Ehn (*C. A.* 16, 1730, 2291, 3460, 3850), has been exptly. confirmed. The characteristics of the so-called normal and abnormal microstructures of the extreme types and of the intermediate gradations are described. Normal steel carburizes somewhat more deeply than abnormal steel. Segregations of abnormality may occur. The mech. treatment seems to have no noticeable effect on the degree of normality. After certain heat treatments, especially annealing in H, abnormal steel assumes a more normal structure. On water-quenching abnormal steel is more prone to give soft spots. However, on quenching in brine or NaOH soln. abnormal steel, as well as normal steel, hardens without soft spots. Air or other gases ordinarily dissolved in quenching water may cause soft spots. After carburizing, the core of the abnormal steel, probably because of its finer grain, shows higher impact strength than the corresponding normal steel. High-carbon (tool) steels show features of normality and abnormality similar to those met in carburizing steels. Most cases of abnormality in com. steel seem to be associated with the use of Al for deoxidizing. Nothing arose in this work to controvert Ehn's theory that abnormality is due to dissolved oxides or, more probably, undissolved submicroscopic particles of oxide. The results of the spectrographic analyses for Al, deoxidation tests of com. steel with Al and ferrovanadium exams. of small test ingots taken during the progress of open-hearth heats, O and Al₂O₃ analyses, surveys for inclusions and thermal analysis—made in the study of the causes of abnormality—are described and discussed. ROBERT F. MEHL

The energizing action of carbonates contained in carburizing mixture. GENSKY TAKAHASHI. *Science Repts. Tôhoku Imp. Univ.* 17, 883-926(1928).—The mechanism of the action of the alkali and the alkaline earth carbonates when used with C in increasing the velocity of carburization of Fe and steel is shown by a series of expts. to be the

liberation of C from CO, the nascent C easily diffusing into Fe or steel, rather than by the reaction upon Fe and steel of CO formed by the reduction of the carbonates. The new theory is based on the following facts: (a) the carbonate seps. C from CO; (b) the velocity of carburization increases as the amt. of the nascent C coming into contact with the surface of Fe or steel increases; (c) the presence of any substance acting to produce free C from CO increases the velocity of carburization; (d) under the condition that the C liberated from CO easily recombines with CO₂, the energizing action of carbonate is not marked; (e) the energizing action of carbonate does not exist in an atm. contg. no CO; (f) active C easily diffuses into Fe and steel; (g) when Fe or steel is heated with C, the carburization is more energetic in the presence of the carbonate than in a brisk current of CO; (h) the carbonate increases the carburization velocity even when there is no disson. of it; (i) when the carburization is carried out in a current of CO, the presence of the carbonate remarkably accelerates the velocity of carburization, even in the absence of solid C; (j) the formation of CO by the direct reaction between the carbonate and solid C does not constitute the main factor of the energizing action of carbonate.

DOWNES SCHAAP

Causes of brittleness in carburized parts. STANLEY P. ROCKWELL. *Heat Treating and Forging* 14, 1026-8(1928).—An investigation was made of the causes of brittleness in case-hardened bolts and pins, and of the effect of a heavy blow as compared with numerous slight shocks in producing fracture. The carburized case is found to be the principal factor in creating core brittleness, this being present with a full case depth at carburizing temps. as low as 1500° F. Heat treatments, after carburizing, to give a core not showing brittleness, proved unsuccessful. Temps. at which the specimen is tested has great influence on brittleness. As little a difference as 30° F. (depending on the heat treatment and the compn. of the steel) between the annealing and fracturing temps. was a controlling factor between brittle and fibrous cores. Fracture tests show that bolts and pins, etc., broken after proper heat treatment, have either purely fibrous, or granular cryst. structures. Pieces having the first type of core break with an initial fracture of the case, followed by a bending of the core; those having the latter types break with a sudden snap, causing complete fracture. When frequent slight blows cause breakage of a bolt, granular cryst. and fibrous cores are in the same fractures.

J. BALOZIAN

The manufacture of steel pipes. EWALD RÖBER. *Stahl u. Eisen* 48, 1113-20 (1928).—The various methods for the manuf. of steel pipes are described and illustrated with graphs. The smallest and largest diams. obtainable with the various methods are given in form of tables. The methods are compared and their future is discussed.

J. A. SZILARD

The equilibrium diagram of the molybdenum-carbon system. TAKESHI TAKEI. *Science Repts. Tôhoku Imp. Univ.* 17, 939-44(1928).—An equil. diagram of the Mo-C system is proposed from data obtained by the microscopic examn. of melts made in an elec. furnace of sintered mixts. of Mo and C powders. The eutectic compn. is estd. to contain about 4% of C. The carbide sepd. by electrolysis from one of the specimens contained 5.5% C with a trace of Fe, and when examd. by the Debye-Scherrer x-ray method showed a hexagonal close-packed structure, its lattice const. varying with the C content.

DOWNES SCHAAP

The magnetostriction of a single crystal of nickel. YOSHIO MASHIYAMA. *Science Repts. Tôhoku Imp. Univ.* 17, 945-61(1928).—The longitudinal and transverse effects of magnetic elongation of a single crystal of Ni were observed for different orientations and different strength of fields of three oblate ellipsoids, whose flat planes coincided with planes (100), (110) and (111). The longitudinal effect is always contraction for all fields in all directions; the abs. amt. of contraction is largest in the direction (100), the next in the direction (110) and the last in the direction (111). The transverse effect is just the reverse of the longitudinal one. The variation of these effects with respect to the orientation of the ellipsoids is periodical under a constant field, the period being 90°, 180° and 60° for the planes (100), (110) and (111), resp.

D. S.

Etching phenomena on single crystals of copper. G. TAMMANN AND F. SARTORIUS. *Univ. Göttingen. Z. anorg. allgem. Chem.* 175, 97-120(1928).—The detn. of crystallite orientation by means of etching is studied and discussed, with particular reference to the etch figures obtained upon a ball consisting of a single crystal of Cu and having a diam. of 5.1 cm. Four types of etching were used: bright etching obtained with a 40-67% HNO₃ soln. contg. 20 g. CuCl₂ or 3 g. FeCl₃ per l. or a hot 100% KCN soln. and a 5% CuCl₂ soln.; acid etch such as that obtained with (NH₄)₂S₂O₈, 40% AcOH + 30 g. NaNO₃ per l., 1 part 37% HCl + 1 part 67% HNO₃ or 37% HCl + 40 g. CuCl₂ per l.; alkaline etch such as that obtained with 10% (NH₄)₂S₂O₈ + 10% NH₄OH,

or 1 mol. $\text{CuCl}_2 + 2.5$ mol NH_3 per l.; and finally etching with pptn. of another metal such as that produced by treatment with HNO_3 contg. HgNO_3 or AgNO_3 . The velocity of soln. of a crystal depends upon its orientation as well as upon the nature of the solvent and this leads to the production of etch figures, from which the no. and arrangement of crystallites can be detd.

H. STOERTZ

Wear and mechanical properties of railroad bearing bronzes at different temperatures. H. J. FRENCH, S. J. ROSENBERG, W. LEC. HARBAUGH AND H. C. CROSS. *Bur. of Standards. Bur. Standards J. Research* 1, 343-421(1928).—An account more detailed and complete of the Bureau of Standards research on this subject than that recently published in another journal (*C. A.* 22, 2914).

ROBERT F. MEHL

The hardness values of standard cast tin bronzes, red brass alloys and lead-tin bronzes. WILLI CLAUS, HANNS GOEKE AND FRITZ GOEDERITZ. *Giesserei* 15, 763-72 (1928).

J. BALOZIAN

Development of a new high-temperature solder. JAMES SILBERSTEIN. *Elec. J.* 25, 543-6(1928).—A solder was required for railway and mine motors to resist high temp. and severe service. The formula developed is Ag 2.5%, Cu 0.25%, remainder Pb. It has all the desirable properties of the usual Sn-Pb solders, and will not fail below 295°.

BENJAMIN MILLER

A supplement to "the equilibrium diagram of the copper-tin system." TOMIMATU ISIHARA. *Science Repts. Tôhoku Imp. Univ.* 17, 927-37(1928).—As a result of new expts. the author modifies his equil. diagram of the Cu-Sn system, which was published in 1924 (cf. *C. A.* 19, 926), so that the boundary line between the α and the ($\alpha + \delta$) phases lies at 14% Sn, and the triple point (H) is at 12% Sn.

DOWNES SCHAAF

Tin plate for cans for preserved goods. HERMANN SERGER. *Brunswick Res. Sta. for the Preserving Ind. Food Manuf.* 3, 481-2, 512, 513(1928).—The author discusses perforations, lacquer tests, pitting, graining and gassing. There is included a table giving the compn. of the iron for the manuf. of white plate so far recognized as optimum. The test for porosity in white plate is also given.

J. A. KENNEDY

Present position of the Röntgen technic and its practical application to cast materials. M. VON SCHWARZ. *Giesserei* 15, 883 9, 921-5(1928).—Numerous photographs of cast parts are given.

J. BALOZIAN

X-ray analysis of the silver-cadmium alloys. HALVDAN ÅSTRAND AND ARNE WESTGREN. *Metallog. Inst., Stockholm. Z. anorg. allgem. Chem.* 175, 90-6(1928).—The results of the recent x-ray study of the Cd-Ag alloys by Natta and Freri (*C. A.* 22, 1315) have been confirmed by the authors. These alloys are analogous in their structure to the Ag-Zn series. The following solid soln. phases have been identified in the order of increasing Cd content: α - has a face-centered cubic lattice, a_0 varying from 4.078 Å U. to 4.175 Å U.; β - crystallizes with a body-centered cubic structure, a_0 increasing from 3.323 Å U. to 3.327 Å U.; γ - has a complex body-centered lattice with 52 atoms in the unit cube, where a_0 changes from 9.935 Å U. to 9.982 Å U.; ϵ - exhibits a close-packed hexagonal structure, a_0 varying from 3.040 Å U. to 3.095 Å U. and c_0 remaining nearly const. at 4.810 Å U.; and η with the hexagonal structure of Cd- a_0 decreasing from 2.99 Å U. to 2.973 Å U.— c_0 increasing from 5.43 Å U. to 5.606 Å U. The alloy whose compn. has the formula AgCd undergoes a transition between 400° and 500°. The high-temp. form has a close-packed hexagonal structure, while the form stable at the low temp. shows the CsCl type structure. X-ray data do not indicate the appearance of a new phase at 200° as shown by thermal analysis.

A. J. KING

High-strength gold alloys for jewelry, and age-hardening phenomena in gold alloys. E. M. WISE. *Am. Inst. Mining Met. Eng., Tech. Publication No.* 147, 20 pp. (1928).—Phys. properties of a no. of modified Au-Cu-Ag alloys are given; the strength in the annealed and quenched states ranges between 59,100 and 82,600 lb. per sq. in. and the elongation varies between 32 and 61%. The yield point is greatly increased by age-hardening (an alloy composed of 38.5% Au, 12.3% Ag, 31.98% Cu, 1.84% Ni, and 15.38% Zn showed an increase in yield point from 34,100 to 99,400 lb. per sq. in. on aging at 325° for 30 mins. while the elongation in 2 in. dropped from 61½% to 55% in the same process). Tables and curves are included showing the Brinell hardness figures after annealing and aging for a series of Au-Ni alloys, 9.2-kt. green gold, 10 kt. yellow gold, 14-kt. white gold, and 18-kt. white gold alloys. Shot practice of alloying, melting and annealing and methods of controlling fire cracks in these alloys are described.

DOWNES SCHAAF

Alloys of calcium and aluminum. G. BOZZA AND C. SONNINO. *Giorn. chim. ind. applicata* 9, 443-50(1928).—The equil. of the system Al-Ca has been completed in the region of Ca = 0 to 5%. Low tensile and rapid increase in brittleness with even small

amts. of Ca seem to preclude the possibility of industrial uses for Al-Ca alloys.

A. W. CONTIERI

* Aluminum stock tanks compared with steel in corrosion tests. P. WAGNER. *Natl. Petroleum News* 20, No. 36, 50(1928).—Tests are being conducted by the Aluminum Co. of America and the Parkersburg Rig and Reel Co., to det. the relative corrosion of steel tanks and Al tanks.

M. B. HART

The production of cast rods of aluminum alloys which are dense and free of gas pores. WILLI CLAUS AND E. KALAEHNE. *Giesserei* 15, 996-1000(1928).—The influence of the method of fusion on the gas porosity of "Y" (1.5% Mg, 2.0% Ni, 4.0% Cu, 92.5% Al) and "American" (8% Cu, 92% Al) alloy castings was studied. The fusions were made by: (I) m. at 950°, holding at this temp. for 3 min. and pouring; (II) m. at 950°, holding for 3 min., cooling in air to 700° and pouring at this temp.; (III) m. at 950°, cooling in an elec. furnace to 680°, holding for 45 min., and pouring at 700°. In the molten condition, the alloys studied tended to form true solns. with the more easily diffusible gases. If the fused specimen was held at the m. p. for some time, degasification was complete. Fusing by III was found to give dense castings free of gas pores. Expts. with the "Y" alloy showed that: (1) with increasing velocity of solidification the d. of the metal increases; (2) with increasing velocity of cooling, the diams. of the gas pores increase, while their no. decreases. In chill castings the pores are microscopic, but evenly distributed throughout. Castings of the "American" alloy obtained by II, when retreated by III, were found to be dense and without pores, those obtained by III, when retreated by II, were again porous.

J. BALOZIAN

The properties of scleron metal. O. BAUER AND O. VOLLENBRUCK. *Mitt. Materialprüfungsamt Berlin-Dahlem*, Sonderheft 3, 78-88; *Chem. Zentr.* 1927, II, 2346. —Ingots (casting temp. 750°, mold temp. 280°) were examd. shaken and unshaken. Metallographically, no difference could be observed. From the analyses the conclusion may be drawn that scleron has a tendency to "inverse" ingot liquation. The metals added to the Al (Zn, Cu, Mn) are coned. mainly in the marginal layers and decrease towards the center. This liquation is generally not very important; it is most pronounced with Zn, Cu and Mn in the upper part of the ingot. The av. analysis of the pressed and refined bars was Si 0.35, Cu 3.14, Fe 0.49, Mn 0.72, Li 0.077, Zn 13.20%; the rest was Al. In the ground-mass consisting of mixed crystals of Al and Zn, small rounded crystals of a Cu-Al compd. (probably CuAl_2) were embedded. In 1% NaCl soln., scleron metal stands near to Al in the electromotive series; thus, in NaCl soln., it will behave similarly to Al. Scleron has high strength with good ductility. The modulus of elasticity is 722,000-755,000, the limit of stretching 3800-3814 kg./sq. cm., the limit of breaking 4842-4890 kg./sq. cm. The tensile strength is 10.98-11.1%, and the reduction of area 14.5-17.6%. It is easily worked by edge-tools and it also can be very highly polished.

G. SCHWOCH

New ways of using gases for soldering and welding. J. BRONN. *Chem. Fabrik* 1928, 569-70, 584-5. —With the spread of the practice of cooling and compressing coke oven gases, giving H-N mixts. on the one hand and CH_4 on the other, it is necessary to find ways of utilizing the CH_4 to better advantage. CH_4 has too low a velocity of combustion to give satisfactory results when used in soldering and welding app. By adding to it H_2 , with its high velocity of combustion, mixts. are obtained that yield very much better results. Comparative tests were run with H only, a mixt. of 73% H and 27% crude CH_4 , and a second mixt. contg. 37% crude CH_4 and 63% H. The first mixt. showed a saving of 46% in fuel, and the second of 67%, as compared with H only. About 25% of O also was saved, and 10% less time required for the operations. Such mixts. of CH_4 and H are superior to city gas for the purposes mentioned because they do not carry the inert N and low-value CO, and are free from the danger to workmen due to the CO. Nor do they cause injury because of S or tar content; the fact that they are cooled to -150 to -200° during sepn. insures against these and other impurities remaining in the gas. By adjusting the proportions of H and CH_4 , wide variations of temp., oxidizing and reducing properties, etc., can be secured; the flexibility is much better than with the oxy-acetylene flame. W. C. F.

The Jirotko dip process. A new process for improving light metals, especially aluminum. MARTIN MEIER. *Korrosion* 3, 33(1928).—*Cf. C. A.* 21, 222, 888.

J. H. MOORE

Rusting and protection of iron. M. SCHULZ-KIRCHMÖSER. *Intern. Congress Testing Materials* 2, 592-602(1927).—After discussing theories of corrosion and the methods of protecting iron against rust, S. takes up oil paints. Unpigmented oil films do not prevent corrosion. Red lead is the most effective pigment in preventing corrosion, being superior to red ochre and other substitute pigments. So-called "dispersion"

red lead is better than the ordinary variety in accelerated tests, in resistance to caking and settling and in brushing. Caking is less noticeable with pigments contg. a minimum amount of excess PbO. To prevent lead poisoning the removal of old paint coats is accomplished by means of a wet sand blast.

PAUL J. CULHANE

Suitable protection, against acids and alkalies. E. STAEMMLER. *Korrosion Metallschutz* 4, 204-5(1928).—A discussion of the factors detg. the applicability of certain materials as containers for alkalies and acids.

B. E. RÖRTHELI

The use of cadmium, according to the Udylyte process, as a corrosion preventative. KARL GEBAUER. *Korrosion Metallschutz* 4, 201-4(1928).—A discussion of the method of obtaining Cd deposits on Fe according to the Udylyte process. In comparative tests Ni-plated Fe rusted after 316 hrs.; hot-dip galvanized Fe after 650 hrs. and sherardized Fe after 367 hrs.; Cd-plated Fe remained rust-free after 1860 hrs.

B. E. RÖRTHELI

Accelerated laboratory corrosion test methods for zinc-coated steel. EDWARD C. GROESBECK AND WM. A. TUCKER. *Bur. Standards J. Research* 1, 255-95(1928).—The simulated atm. and the salt-spray methods of testing the corrosion resistance of hot-dip galvanized steel sheet were compared. The atm. test consisted in exposing sheet test pieces in a chamber contg. a moist mixt. of SO₂ (1%), CO₂ (5%) and air (94%) for 5 hrs., 1 hr. under a water spray and 18 hrs. drying. This cycle was repeated until failure occurred as evidenced by rust. The salt spray test used a spray of NaCl or NH₄Cl. A consistent relationship between wt. of coating and life was found, the life being shorter in the atm. test. The atm. test gave uniform corrosion while the spray gave a localized type. No attempt was made to correlate the test life with actual results from exposure tests. The presence of 0.2% Cu in the base metal showed no appreciable effect on the life. The atm. test was concluded to be the more promising.

J. K. ROBERTS

Corrosion tests with copper steel under natural conditions. KARL DAEVES. *Stahl u. Eisen* 48, 1170-1(1928).—Corrosion tests conducted for 2½ yrs. near a dyeing plant, where the acid content of the air is high, with ordinary and Cu steel showed the superiority of the latter. After an exposure of 21 months, ordinary steel (0.03% Cu) showed a loss of wt. of 23%; Cu-alloyed steel (0.23% Cu) lost only 16%. The corresponding figures for galvanized steel and galvanized Cu steel are 12 and 7%, resp. For test pieces exposed for 18 months, the loss for galvanized steel was 28.1%, for galvanized Cu steel (0.15% Cu) 19.3%.

J. A. SZILARD

Lessons of the last explosions in blast-furnace plants (WAGNER) 24. Insect poisoning from As in smoke (POPP) 111. Temperature of welding flames (WEHRMANN) 21. Process for the hydrometallurgical treatment of high iron-copper sulfide concentrates (TRAILL, McCLELLAND) 4. Light figures of copper and iron (TAMMANN, BOTSCHWAR) 2. Properties of large iron crystals (SEIGLE) 2. Treating solids [ores] with liquid reagents (U. S. pat. 1,690,363) 13.

GUILLET, LÉON: *Trempe, recuit, revenu*. Vol. II. Paris: Dunod. 296 pp.; bound, F. 85; paper, F. 75. Reviewed in *Rev. métal.* 25, 590(1928); cf. *C. A.* 22, 1318.

Metallurgy. HENNING G. FLODIN AND ÉMIL G. TORVALD. *Ger.* 467,146, Apr. 25, 1924. Metals, especially Zn and Pb, are extd. from their sulfide ores by metallic Fe. The ore and the Fe are finely divided, mixed, and inserted as a briquet into an elec. furnace.

Treating ores containing volatilizable metals. F. KRUPP GRUSONWERK A.-G. Brit. 287,745, May 24, 1927. In a process of treating ores such as described in Brit. 252,679 (*C. A.* 21, 2246), material such as lime, limestone, sand or KNO₃ is introduced into the reaction zone of the furnace for stiffening the charge or for its treatment; this permits increase of temp. in the reaction zone without fusing the charge.

Apparatus (with an endless track) for sintering ores. BETHUNE G. KLUGH (to American Ore Reclamation Co.). U. S. 1,690,231, Nov. 6.

Froth flotation. ALBERT W. HAHN. U. S. 1,690,225, Nov. 6. A pulp contg. ore such as Cu ore contg. Fe and Mn is subjected to the oxidizing action of bleaching powder in the presence of an alk. substance and oxides such as those of Fe and Mn are thus pptd. assocd. with values to be recovered, by changing them into higher oxides; a flotation agent such as xanthate and pine oil is then added and the material is subjected to froth flotation.

Froth flotation concentration. ROBERT E. PHELAN and SHERWIN P. LOWE (to R. H. Channing, Jr., agent). U. S. 1,690,907, Nov. 6. In sepg. micaceous and talcky

minerals from concentrates such as those of Cu ores starch is added to the ore pulp and the pulp is made non-alk. to prevent the minerals from entering the froth, and the pulp is then subjected to flotation.

Concentrating ores. EDWARD H. SNYDER and WM. D. GREEN (to Combined Metals Reduction Co.). U. S. 1,691,310, Nov. 13. Ores contg. at least one of the metals Ag, Pb or Cu are subjected to the dissolving action of an alk. thiosulfate and any of the metals dissolved are pptd. as sulfide from the resulting alk. soln.; the pptd. sulfide, any natural sulfides of the ore and any mineral particles to which a pptd. sulfide adheres are then sepd. from gang of the ore by froth flotation while regenerating the solvent by the action of the precipitant upon the ore soln.

Sluice-box for concentrating ores. J. F. DAY. Brit. 287,824, Dec. 8, 1927.

Thiocarbanilide solution. HAROLD GRAY (to B. F. Goodrich Co.). U. S. 1,690,166, Nov. 6. A soln. suitable for use as an *ore flotation reagent* comprises thiocarbanilide together with a plurality of amines including aniline, xyldine and dimethyl-*p*-phenylene-diamine.

Reducing oxide or oxide ores to metals. SIGURD WESTBERG. U. S. 1,690,916, Nov. 6. Oxides or oxide ores are heated with suitable carbonaceous material to a temp. sufficient to effect reaction and the CO formed during the reaction is used for the production of H by reaction with steam and the H is introduced into the reaction zone.

Smelting. ANTON SCHAUER and HERMAN FRITZ. Ger. 466,467, Dec. 12, 1926. A crucible is mounted on a circular rotary dish-shaped pan which catches the contents if the crucible cracks or overflows.

Iron smelting. RICHARD MOLDENKE (to New Process Multi-Castings Co.). U. S. 1,691,401, Nov. 13. In prepg. iron for pouring into molds, a charge is melted in a blast furnace, and the melt is poured into an elec. furnace and mixed with molten iron whose compn. has been regulated in accord with the finished compn. of the melt. An app. is described.

Reducing iron ores. STAALSYNDICAAT DR. LEDEBOER. Brit. 287,925, March 30, 1927. In reducing Fe ore and melting the Fe formed by the combustion of a gaseous fuel, a combustion gas is used which contains practically no O and is produced by the complete or practically complete combustion of the fuel by a surface combustion burner.

Apparatus (with rotating inclined horizontal cylinders) for solid reduction of metals such as iron from ores. JOHN W. HORNSEY (to Granular Iron Co.). U. S. 1,690,820, Nov. 6.

Magnetic apparatus for separating iron from slurry. MAGNET-WERK G.M.B.H. Eisenach, Spezialfabrik für Elektromagnet—Apparate. Ger. 465,620, Sep. 3, 1925.

Iron from oxide ores. GRANULAR IRON CO. Ger. 466,756, Feb. 27, 1925. The ore is first preheated in an inclined rotary drum and then reduced in a second similar drum, reducing agents contg. non-gaseous hydrocarbon being added to the ore entering the second drum and the temp. in both drums being maintained, suitably at 850–950°, so that a granular non-spongy product is obtained.

Reduction of oxides. JACQUES CHABANNAIS. Fr. 637,403, July 11, 1927. Oxides of metals or of metalloids such as As, Bi or Sb are reduced in an extremely fine state of division, such as the colloidal state.

Recovery of metals. ANACONDA COPPER MINING COMPANY. Fr. 638,638, July 21, 1927. Metals are recovered from slags and scoriae by injecting air and finely divided fuel in quantity greater than that which could be burnt by the air, and collecting the smoke. Metals such as Pb and Zn may be deposited from the smoke in sep. chambers.

Tin from ores. H. L. SULMAN and H. F. K. PICARD. Brit. 286,795, Dec. 13, 1926. In extg. Sn from ores contg. also other metals such as Fe, by chloridization and selective distn. of SnCl_2 , steam is admitted to the charge after the chloridizing step to decomp. unvolatilized chlorides and recover HCl. Numerous details are given and an app. is described.

Leaching of copper values in place. RICHARD F. GRANT, FRANKLIN B. RICHARDS and HERBERT E. WETHERBEI (one-fourth to Howard M. Hanna). U. S. 1,690,446, Nov. 6. A shaft and connecting drifts are driven to widen operations at a level below that of the surface water and localized trenches or containers are provided appurtenant to the underground workings; a soln. of $\text{Fe}_2(\text{SO}_4)_3$ of approx. 4% diln. is supplied above the drifted area of Cu ore and is permitted to percolate through the ore body, and surface water and precolating leaching soln. are pumped from the level of the drifts.

Chromium ores. I. G. FARBENIND. A.-G. (Paul Weise and Franz Specht, inventors) Ger. 467,212, Apr. 17, 1927. Cr ores are concd. by heating to over 100° with

kali hydroxide or carbonate in the absence of acid. The treatment may take place under pressure and the lye afterwards treated with dil. acid.

Zinc ores. SOCIÉTÉ GÉNÉRALE MÉTALLURGIQUE DE HOBOKEN. Fr. 638,922, cc. 30, 1926. Blende is heated with ZnSO_4 whereby ZnO and SO_2 are obtained. Cf. A. 22, 3965.

Reducing the cadmium content of zinc ore. OSCAR GERLACH and NILS OSTMAN (Matthiessen & Hegeler Zinc Co.). U. S. 1,691,714, Nov. 13. In order to remove Cd from O-contg. Zn ore, the ore is subjected to steam and to a quantity of reducing agent such as petroleum oil sufficient to reduce the Cd but not a material part of the Zn present in the ore, at a temp. (suitably about 980°) at which both Cd and Zn reduce.

Refining argentiferous metal. ALADAR PACZ. U. S. 1,691,207, Nov. 13. Molten metals such as Ag, Cu or their alloys are stirred with NaF or other alkali fluoride, to void blowholes when the metal solidifies.

Metallurgical furnaces. BENJAMIN TALBOT. Fr. 637,460, July 8, 1927. Improvements in the type of furnace of Brit. 235,346 are described (cf. C. A. 20, 807).

Cupola furnace construction. A. H. COPLAN. Brit. 288,072, July 18, 1927. The usual refractory lining is wholly or in part replaced by an inner steel wall spaced from the outer casing so as to form an air-heating chamber to the lower end of which air is admitted tangentially and from the upper end of which the heated air passes to the cylinders. Various details of the construction are described.

Ore-roasting furnace with superposed hearths. J. HARRIS. Brit. 287,356, June 1927.

Roasting-furnace with alternate rotary and fixed hearths. X. DE SPIRLET. Brit. 287,130, March 16, 1927.

Shaft furnace. HEINRICH RÜSENER. Ger. 466,627, Feb. 22, 1927. The casing at the top of a shaft furnace, specially a blast furnace, is protected by exchangeable riveted plates.

Furnace for melting and refining metals. WILHELM BUESS. Fr. 637,398, July 9, 1927. A gas or oil heated furnace suitable for melting and refining metals is capable of rotating through 360° and has its longitudinal axis at an angle to the axis of rotation.

Hearth furnace suitable for annealing. JOHN F. BAKER (to Westinghouse Elec. Mfg. Co.). U. S. 1,691,369, Nov. 13. Structural features of liquid and sand seals between the hearth and furnace walls are specified. The liquid seals are provided with cooling devices such as pipes carrying cooling fluid.

Furnace for annealing metals, etc. GEORGE F. BEACH (to F. J. Ryan & Co.). U. S. 1,690,710, Nov. 6.

Furnace for heat treatment of metals, etc. WM. L. SCHULENBERG. U. S. 1,690,555, Nov. 6.

Furnace for heating metal blanks. CHARLES F. OSGOOD (to Sullivan Machinery Co.). U. S. 1,690,428, Nov. 6.

Converters. RICHARD HELMS. Ger. 466,620, Sept. 5, 1926. In acid or basic converter beds some of the air channels are filled with iron rods or tubes to prevent remature destruction.

Apparatus for charging blast furnaces. P. B. HARWOOD. Brit. 287,865, March 8, 1927.

Apparatus for automatically shaping and grinding stones for blast furnaces. WILHELM KOSFELD. U. S. 1,691,898, Nov. 13.

Operating furnaces with powdered fuel. K. HUFSCHMIDT. Brit. 286,940, June 8, 1927. Primary air is injected in a direction tending to project the flame onto those parts of the furnace wall on which slag collects, and secondary air is normally injected at a lower level in a substantially opposite direction so as to repel the flame from these parts; the slag is melted at intervals by interrupting the secondary air supply and simultaneously introducing an addnl. supply at a higher level so as to allow the flame to act on the slag. Various details of construction are described.

Pickling metals. J. H. GRAVELL. Brit. 287,911, March 29, 1927. When foam-producing agents such as saponin, rye-meal liquor or cellulose pulp waste are added to acid pickling baths to prevent action of the acid on the cleaned metal, CH_2O or substances such as thioamides or substituted thioamides capable of generating CH_2O in the bath are used to protect the foam. Brit. 287,912 specifies the addn. of substances such as NH_4CNS which combine with nascent H and inhibit action of the acid bath on the cleansed metal.

Apparatus for centrifugal casting of metal articles. DAVID BROWN (to David Brown & Sons, Ltd.). U. S. 1,691,464, Nov. 13.

Molds for centrifugal casting of metal pipe. C. E. WILDER. Brit. 287,317, March 12, 1927.

Centrifugal casting apparatus for making articles such as bushings. JOHN O. WISHART. U. S. 1,690,354, Nov. 6.

Casting metal. VEREINIGTE STAHLWERKE AKTIENGESSELLSCHAFT. Fr. 637,578, July 13, 1927. A casting of superior quality is obtained by freeing the metal of gas or other non-metallic impurities in a rotating hearth or casting ladle.

Casting magnesium or similar metals. BRITISH MAXIUM, LTD. Brit. 287,164, March 18, 1927. Salts of NH_4 such as the borate or fluoride (suitably 2%) are mixed with or applied to the inner surface of sand molds to protect easily oxidizable metals such as Mg or its alloys which are cast in the molds. Agglomerants, solns. of resins in oils or other substances more readily oxidizable than Mg may also be added to the sand in prep. the mold.

Chilled iron rolls. H. E. WALTERS (to United Engineering & Foundry Co.). Brit. 287,396, March 23, 1927. Rolls are made by casting high-C iron contg. Cr and Mo and having a low S and P content in a chill mold. The metal contains C 2.75-4.0, preferably 3.0-3.75%, Si 0.50-2.50, preferably over 0.75%, Mn 0.15-1.50, preferably 0.20-0.80%, P under 0.20, preferably under 0.10%, S under 0.20, preferably under 0.10%, Cr 0.50-1.75, preferably 0.90-1.25%, Mo 0.05-2.00, preferably 0.15-0.80%. The Si should be sufficient to give the unchilled portion of the roll a gray or mottled iron structure. A roll thus made has a surface almost as hard as a cold roll contg. large quantities of C and S and there is no clear line of demarkation between the core and chilled surface.

Slag and gas eliminating apparatus for use in association with steel furnaces. FREDELLIA H. MOYER. U. S. 1,690,748, Nov. 6.

Apparatus for pouring molten steel. FREDELLIA H. MOYER. U. S. 1,690,749, Nov. 6.

Pouring molten steel. FREDELLIA H. MOYER. U. S. 1,690,750, Nov. 6. The metal is poured and received in an oxidizing atm., degasified in a nonoxidizing atm., and then teemed in an oxidizing atm.

Bessemer process for making steel. S. G. ALLEN. Brit. 286,745, Aug. 30, 1926. Especially in use of "non-Bessemer pig iron," the net blow heat required to bessemerize a charge of given characteristics is detd. and the O in the oxygenated blast is so proportioned that the required net blow heat is furnished. In treating an iron contg. 1% of P, the blast may contain 38% O.

Surface hardening of steel. GEORGES CHARPY. Fr. 638,913, Dec. 29, 1926. The surface of steel is hardened by heating to a temp. detd. for each steel (*e. g.*, between 600° and 675° for C steel) in the presence of solid, liquid or gaseous C compds., preferably not contg. O, such as cyanides or ferrocyanides.

Tempering of iron or steel. DEUTSCHE GOLD- UND SILBER SCHEIDE-ANSTALT. (vorm. Roessler.) Fr. 637,527, July 12, 1927. A tempering bath contg. cyanides with or without other salts, such as NaCl, soda, alkali or alk. earth cyanamides, is heated to temps. above 900°, and the production of foam is prevented by finely divided wood- or animal-charcoal. The surface of the bath is protected from the air by a layer of substances such as graphite which can react with the air. Cf. C. A. 22, 2351.

Plastic copper. GEBR. SIEMENS & CO. (Erich Birnbräuer, inventor). Ger. 466,515, Aug. 3, 1922. Addn. to 454,804. A finely divided Cu of high plasticity is prep. by pptn. of an oxidic ppt. from a Cu soln., and after washing with water, reducing with H at a temp. not above a dull glow, *e. g.*, 570°.

Condensation of zinc vapors. THE NEW JERSEY ZINC CO. Fr. 638,619, Aug. 1, 1927. Vapors of Zn are caused to travel through a no. of relatively long and narrow tubes so sloped that the condensed metal flows in the opposite direction to the vapor and a graduation of temp. is obtained along the tubes.

Zinc. THE NEW JERSEY ZINC CO. Fr. 638,960, Aug. 4, 1927. A vertical furnace for the reduction of zinciferous material is described in which the mass of material and reducing agent are heated through the metallic walls to a temp. not above 1150°.

Zinc. THE NEW JERSEY ZINC CO. Fr. 638,620, Aug. 1, 1927. Zinciferous materials are reduced by passing them, mixed with a reducing agent, through a reducing chamber heated sufficiently to volatilize the Zn but without scorification or fusion, the mass remaining porous throughout.

Protective oxide coating on ferrous metals. FRANKLIN B. RINCK (to Western Elec. Co.). U. S. 1,690,378, Nov. 6. Ferrous metal articles are subjected to an oxidizing atm. at a temp. (suitably about 760°) which is not materially lowered during

the process and the oxidizing character of the treating atm. is increased, *e. g.*, by supply of steam in increasing quantities.

Protecting ferrous metals from corrosion. T. E. MURRAY. Brit. 287,194, Nov. 8, 1926. The metal is coated with Ni, preferably electrolytically, and then heated to cause the Ni to alloy with the ferrous metal and form on the outside an adherent oxide coating. Before the heating, an addnl. coating of Cr may be applied and coatings of other metals such as Fe, Ni and Cr may be further applied and an adherent oxide coating produced in each case by heating.

Protecting magnesium and its alloys from corrosion. I. G. FARBERIND. A.-G. Brit. 287,450, March 19, 1927. The metal is treated with an acid soln. of a dichromate, and may then be coated with lacquer.

Protecting magnesium and its alloys from oxidation. G. MICHEL. Brit. 287,046, March 12, 1927. A modification of the process described in Brit. 249,484 (*C. A.* 21, 888) consists in coating the metal with a varnish mixt. having a base of synthetic resin and contg. free phenol. Cf. *C. A.* 22, 2917.

Apparatus for coating wire, bands, etc. WERNER & MERTZ A.-G. Ger. 466,842, Aug. 4, 1926. An endless loop of the material is reciprocated through a coating bath and through a plate made of material susceptible to warmth and friction. The size of the opening in the plate increases as the coating proceeds, and coating is continued until the size of the opening corresponds to the attainment of the desired depth of coating.

Coating articles of aluminum or its alloys. BOHUMIL JIROTKA. Ger. 466,843, Nov. 24, 1926. Mixts. of salts of Sn, Pb, Zn or other suitable metals with concd. solns. of alkali metal salts, preferably carbonates, are brushed on the articles at a raised temp., whereafter the coating is flame-treated. A suitable soln. contains K_2CO_3 (40 parts) and $SnSO_4$ (1 part).

Coating aluminum with zinc. B. JIROTKA. Brit. 286,729, March 10, 1927. Articles of Al or Al alloy are treated with solns. of Zn salts contg. also an alkali borate, *e. g.*, mixts. prepd. from NaCN, $ZnCO_3$ and borax or from $NaHCO_3$, $KHCO_3$, $ZnCO_3$ and borax.

Coating steel with lead and zinc. E. A. ATKINS and RYLANDS BROS., LTD. Brit. 287,201, Nov. 19, 1926. Steel wire or other steel articles to be coated after being immersed in molten Pb or a Pb alloy at 600-800° to effect annealing are then immersed in molten spelter or Zn without coming into contact with the atm.

Tin plates. AMERICAN SHEET and TIN PLATE CO. Brit. 287,436, Sept. 13, 1926. Tinned plates pass through a grease pot and thence by a conveyor to a washing vessel contg. hot Na_2CO_3 or other suitable alkali soln. An app. is described. Brit. 287,437 also relates to similar and assocd. app.

Tinned plates. H. WILLIAMS. Brit. 287,288, Feb. 9, 1927. Plates after passing through a tinning bath are passed through a water bath which may contain Ba phosphate, heated to about 100° so that any water adhering to the plates is rapidly evapd. The bath may be heated by tubes carrying superheated steam.

Apparatus for molding aluminum, bronze, etc. FIRMA CARL FELDHAUS. Ger. 466,835, Apr. 1, 1926. The mouthpiece of the mold extends through a bell-shape casing connected to a vacuum pump by which the molten metal is drawn from a bath into the mold.

Alloys. STANDARD TELEPHONES and CABLES LTD. & CO. Ger. 467,107, May 25, 1924. Alloys of phosphor-bronze and lead are used for making elec. contacts. The proportions may be 4-5½% Sn, 1-4% Pb, 0.5-0.25% P and the rest Cu.

Heat-resistant alloy. HARRY M. WILLIAMS. U. S. 1,690,352, Nov. 6. An alloy which is suitable for engine valve heads or valve guides comprises Fe together with C 2.5-3.0, Si 3.0-3.5 and P 1.90-2.25%.

Alloys of aluminum and beryllium. COMPAGNIE DE PRODUITS CHIMIQUES ET ELECTROMETALLURGIQUES ALIAS, FROGES ET CAMARGUE. Fr. 638,646, July 26, 1927. Alloys of Al contg. Be are improved mechanically by heating them to a temp. just below the fusion point of the most fusible constituent and afterwards tempering at this temp. With alloys contg. only Al and Bé they are heated to just below the eutectic point which varies from 550° to 645°. The alloys are afterwards aged at a temp. below 200°.

Copper alloys for coating iron or steel or use in welding or hard soldering. METALLBANK UND METALLURGISCHE Ges. A.-G. Brit. 286,616, March 5, 1927. Cu is alloyed with Ni 0.5-10 and Fe and Si (preferably as ferro-Si) 0.5-3%, with or without Mn 0.05-6%.

Alloys of copper and zinc. A. CORRADINI and SOC. METALLURGICA G. CORRADINI.

Brit. 287,369, July 1, 1927. Alloys suitable for use as a "substitute for bronzes" comprise Cu 50-60, Zn 30-40, Pb 0.25-1.5, Fe 0.25-1.5, Mn 2-6 and Ni 2-6%.

***Refractory iron alloys.** F. O. VOGEL and C. F. C. WEICHELT (trading as Meier & Weichelt). Brit. 287,876, March 28, 1927. Alloys free from self-hardening properties contain Ni 12-20, Cr 16-20, Si 0.3-3.0 and up to 1% of C and may also contain about 1% Mn.

Hardening iron containing alloying metals. F. KRUPP A.-G. Brit. 287,156, March 17, 1927. Articles of cast iron contg. one or more of the elements Al, Si, Mn, Cr, Ni, Co, V, Mo, W, Ti or Zr (e. g., about 1% of Al) are hardened on their marginal layers by heating at about 500° with substances liberating N.

Treating wire or strips of aluminum or aluminum alloys. SPEZIALFABRIK FÜR ALUMINIUM-SPULEN UND-LEITUNGEN GES. Brit. 287,503, March 22, 1927. Articles such as wires, plates or bands of Al or Al alloys are provided with an elastic insulating covering of oxide by treatment with oxidizing liquids or gases such as by an electrolytic bath and subjecting the articles during the treatment to mech. treatment such as hammering, beating, rubbing or bending. A bath may be used comprising org. acids such as oxalic acid or inorg. acids such as HNO₃ or chromic acid.

Recovering aluminum and magnesium and their alloys from scrap. I. G. FARBEN-IND. A.-G. Brit. 287,360, June 13, 1927. A modification of the process described in Brit. 182,948 (C. A. 16, 4180) and Brit. 219,287 (C. A. 19, 461) consists in using as the salt bath a mixt. of CaCl₂ and CaF₂ in such proportions that under the conditions of working a quantity of one or the other of the salts sufficient to act as an inspissating agent seps. out from the remaining eutectic mixt. which consists of CaCl₂ with about 18% of CaF₂.

Removing copper from alloys. H. HARRIS. Brit. 288,004, Feb. 21, 1927. Cu is removed from white metals and alloys such as silver lead, antimonial lead and tinny lead (which may or may not contain As), by treating the molten metal or alloy with S or a S-liberating material or gas such as H₂S in the absence of air or other oxidizing agents. Resin, pitch or other carbonaceous materials may be mixed with the metal during or after the treatment with S. The Cu sulfide dross formed is removed under non-oxidizing conditions.

Separating tin from alloys or mixtures. F. BISCHITZKY. Brit. 288,049, May 23, 1927. Sn is dissolved from its alloys or mech. mixts. such as lathe turnings, dross or the like by treatment with HCl contg. (as catalysts) dissolved salts which have no oxidizing action such as chlorides, sulfates, phosphates or borates, preferably salts which have a high ionization constant such as CaCl₂, Na₂SO₄ or MgCl₂. Fresh quantities of metal are treated with the used soln., effecting pptn. of Cu and Sb. The soln. is cooled to sep. Pb chloride and Sn oxide is pptd. from it by lime or chalk. The CaCl₂ thus formed may be further used in the process as a catalyst with HCl. Undissolved metallic residues may be exposed to air for oxidation which may be accelerated by adding alkali sulfides, Cu sulfide or V chloride, or by passing warm air, O or ozone over them. The residue is then dissolved in HCl which may contain CaCl₂ and the soln. is used to treat fresh quantities of metal. Co-pptd. Cu and Sb are washed from the undissolved granules, slightly calcined to form oxides and the Cu oxide may be selectively dissolved with HCl. Cf. C. A. 22, 3877.

Detinning tin scrap. TH. GOLDSCHMIDT A.-G. Ger. 466,904, Sept. 4, 1924. The scrap is passed through a series of chambers through each of which a current of Cl passes in a direction transverse to that of the scrap. The Cl current traverses the chambers in turn, and on leaving a chamber may be treated in known manner to regulate its temp. and concn. The scrap traverses the chambers in turn in the opposite order to the gas, and may be conveyed in trucks so constructed that their rear walls serve as partitions between the chambers.

Detinning. L. U. LA CORSA. Brit. 287,892, March 29, 1927. In detinning tinned scrap with a soln. of a ferric or stannic salt, the ferrous or stannous salt formed is regenerated by adding the anion of the used salt to the liquor to prep. it for reuse; e. g., when FeCl₃ or SnCl₄ is used Cl may be employed for the regeneration either as such or by use of a hypochlorite and HCl. When Fe₂(SO₄)₃ is used, SO₂ and O may be used for regeneration together with a catalyst such as N peroxide. Sn may be recovered from the soln. formed by electrolysis or pptn.

Punching and extruding process for producing tubes from metal billets. JOHN W. LEIGHTON. U. S. 1,691,725, Nov. 13. Mech. features.

Untarnishable metals. PETER PINKUS. Fr. 637,366, July 9, 1927. To render metals and alloys untarnishable and improve their color, specific addns. are made and in the order given. Thus, for soft Cu alloys, the Cu is melted and the following as

percentages are added: (A) 0.25 powd. CuSO_4 , (B) 2. calcined magnesite, (C) 1 powd. NH_4Cl , (D) 0.5 quick lime, (E) 1.25 tartaric acid, (F) 0.5 NaHCO_3 , (G) 1.25 tartaric acid. The other metals are added afterwards. For hard Cu alloys, the following percentages are used: (A) 0.5, (B) 4, (C) 3, (D) 1.5, (E) 2, (F) 1, (G) 1. The ingots are afterwards tempered in alum in water. For white metals and alloys the CuSO_4 is substituted by borax.

Apparatus for cutting metals by fusion with an oxyacetylene jet. A. GODFREY. Brit. 286,809, Dec. 21, 1926.

Annealing and tempering metal wire or strip. E. STRADA. Brit. 287,387, Aug. 10, 1927. Mech. features.

Uniting different metals. N. R. DAVIS and METROPOLITAN-VICKERS ELECTRICAL CO., LTD. Brit. 286,823, Jan. 1, 1927. In joining metals such as Fe, steel, W or Mo to (or by means of) a metal of lower m. p. such as Cu, Ag or Au, the parts to be joined are heated by elec. currents induced peripherally in and adjacent their abutting surfaces by a high-frequency magnetic field. Numerous details and modifications are given.

Composition for use in welding. IRA FREEMAN U. S. 1,691,388, Nov. 13. A compn. suitable for use as a flux in welding cast iron is formed from a dry mixt. of equal parts by vol. of borax, powd. charcoal and plaster of Paris and Na silicate soln. as a binder.

Welding metals. C. L. IPSEN (to British Thomson-Houston Co., Ltd.). Brit. 287,528, March 23, 1927. Fusible electrodes or welding rods for arc or gas torch welding or C or W electrodes are wet with a liquid such as MeOH which is subsequently vaporized and may be dissoed, to improve the weld or assist in maintaining the arc. An app. is described.

Solder for aluminum. OSKAR SPENGLER (to I. G. Farbenind. A. G.). U. S. 1,691,532, Nov. 13. An alloy is used comprising Al 85-95 and Si 5-15%.

Solder for aluminum. VICTOR NICOLAS PROSPER-POI, RENARD. Fr. 637,633, Nov. 16, 1926. A solder for Al and its alloys contains 90 parts of Zn, 4 of Cu and 6 of Al.

Soldering aluminum. MAX DE ZERBONI DI SPOSETTI, LÉON WOLF and HENRI MARTINEK. Fr. 637,319, May 23, 1927. A compn. for soldering Al alone or to other metals such as Fe, Cu, brass, Zn, Sn or Pb is made by melting together brass 0.075 to 0.125 g., Al 0.15 to 0.2 g., Pb 0.5 to 0.6 g., Zn 0.05 to 0.095 g., Sn 1 kg., the metals being added to the melt in this order.

Soldering nickel or its alloys. PAUL ODAM. Fr. 638,873, Dec. 23, 1926. A flux composed of a mixt. of H_3BO_3 and alk. earth borates (borocalcite, voracite, etc.) and finally alkali borates is used.

Flux-cored solder tube. JOHN P. ERICH (to Chicago Solder Co.). U. S. 1,690,534, Nov. 6. Structural features.

10—ORGANIC CHEMISTRY

CHAS. A. ROUILLER AND CLARENCE J. WEST

Chemical synthesis one hundred years after that of urea. F. CARELLI. *Notiz chim. ind.* 3, 633-7(1928).—A review of the progress of organic synthesis from the production of urea by heating NH_4CNO to the latest syntheses by catalytic processes.

A. W. CONTIERI

Steric hindrance. LUDWIG ANSCHUTZ. *Z. angew. Chem.* 41, 691-6(1928).—A. gives a survey of the investigations on steric hindrance and discusses the different theories thereon. Numerous references are given.

G. SCHWOCH

Generalities on the derivatives of semi-saturation of the erythrene derivatives. CHARLES PREVOST. *Bull. soc. chim.* 43, 996-1018(1928); cf. *C. A.* 22, 2737.—P. suggests that in the semi bromination of erythrene only the 1,2- (racemic) and *trans*-1,1 dibromides are formed. There is no evidence of *cis-trans* isomerism of the γ -form. With decreasing mobility of the added radical the α - and γ -isomers are either desmotopes or mesomers. They show abnormal double decompn. and yield 3 isomers. Desmotropy is reached by the dibromides but the equil. between the α - and γ -forms is attained only very slowly. At low temp. the desmotropy of the dibromides corresponds to a pseudomer, since the *trans*-form predominates. The α -forms can be stable only when they are solids. The diacetins, diethylenes and glycols are mesomers at room temp. 200 g. of *trans*- $\text{MeCHBrCH:CHCH}_2\text{Br}$ is heated for 30 hrs. at 80° in 1 l. of H_2O contg. 100 g. of Na_2CO_3 . The resulting product after 500 cc. had been distd. off, contains 15% $\text{MeCH:CHCH(OH)CH}_2\text{OH}$ (I), b_{12} 107° , 70% $\text{MeCH(OH)CH:CHCH}_2\text{OH}$ (II), b_{12} 126° , and 15% of the *dl*-forms of $\text{MeCH(OH)CH(OH)CH:CH}_2$ (III), b_{12}

88-90° and 93-5°. Heating 200 g. of a mixt. of 1,2-, 1,4- and 3,4-methylethyrene dibromides (IV) with H₂O gives 20% I, 55% II and 25% III. The first distillate obtained contained MeCH₂CH:CHCHO as detd. by its semicarbazone. A small quantity of what may be a mixt. of MeCH:CHCH:CHBr and CH₂:CHCH:CHCH₂Br (V), b₁₀ 33-4°, n_D 1.5205, d₄ 1.335, is obtained from the original distillate. To IV refluxed under 20 mm. an equiv. quantity of quinoline is added dropwise. A mixt. of a mono- and a dibromide is collected. The monobromides consist of V and possibly a small quantity of MeCH:CHCH:CHBr. V with Br₂ gives CHBr(CHBrCH₂Br)₂, m. 150°.

D. H. POWERS

Method for the preparation of nitro- and chloronitroolefins. ERICH SCHMIDT AND GUSTAV RUTZ. Bayer. Akad. Wissenschaften München. Ber. 61B, 2142-8 (1928).—For the prepn. of nitro- and nitrochloroolefins were chosen the easily available acyl derivs. of the corresponding alcs., prepd. by condensation of MeNO₂ with aldehydes; these esters, heated several hrs. in Et₂O with KHCO₃, decomp. with remarkable ease according to the following equations (R = acyl): RCH(OR)CH₂NO₂ = RCH:CHNO₂ + ROH; RCH(OR)CHClNO₂ = RCH:CClNO₂ + ROH. To be sure the yields of the propylenes are considerably reduced because of their tendency to polymerize but with the higher homologs the yields are uniformly satisfactory. The 1st member of each series is characterized by its penetrating odor and its especially violent irritating action on the eyes; all the homologs are yellow. The decrease in the tendency to polymerize with increasing mol. wt. is less marked in the nitrochloro than in the nitro series. Since the nitroallyl of Askenasy and Meyer and of Henry is described as a colorless liquid and none of the characteristics of S. and R.'s isomeric compd. are mentioned, the *nitropropylene* (I) structure assigned by S. and R. to their own product is confirmed. All the other compds. prepd. by this method are likewise assigned the $\Delta^{1,2}$ -structure, which agrees well with their properties (color, irritant action, tendency to polymerize, mol. refraction of the olefins themselves (marked exaltation) and of their dibromides (normal values)). Substitution of the H in the C:CHNO₂ group by Cl apparently results in a depression of the exaltation of the refraction. *1-Nitro-2-propanol acetate* (28.2 g. from 24 g. of the alc. with AcCl in CHCl₃), b₈ 94-5°, n_D²⁰ 1.4242, d₄²⁰ 1.1588. *1-Chloro-1-nitro-2-propanol acetate* (92% yield), b₉ 90-1°, n_D²⁰ 1.4391, d₄²⁰ 1.2773. *1-Nitro-2-butanol acetate* (95%), b₁₁ 105-6°, n_D²⁰ 1.4285, d₄²⁰ 1.1224. *1-Chloro-1-nitro-2-butanol* (82% from the Na salt of the nitro alc. in Et₂O suspension with Cl), b₈ 97-8°, n_D²⁰ 1.4548, d₄²⁰ 1.2827; *acetate* (85%), b₁₂ 98-9°, n_D²⁰ 1.4429, d₄²⁰ 1.2376. *1-Nitro-2-pentanol acetate* (80%), b₁₀ 111-3°, n_D²⁰ 1.4339, d₄²⁰ 1.0898. *1-Nitro-2-octanol acetate* (94%), was at once worked up into the octylene. *1-Chloro-1-nitro-2-octanol* (70%), b₉ 140°, n_D²⁰ 1.4570, d₄²⁰ 1.1174; *acetate* (87%), at once worked up into the octylene. *1-Nitro-1-propylene* (44%), stable when pure but shows a great tendency to polymerize, especially in the presence of alkalis, b₁₀ 37°, n_D²⁰ 1.4527, d₄²⁰ 1.0661; *polymer*, yellow-brown odorless solid, almost insol. in H₂O and most org. solvents but sol. in NaOH; *dibromide* (70%), b₁₅ 97-9°, n_D²⁰ 1.5228, d₄²⁰ 2.0303. *1-Chloro-1-nitropropylene* (57%), b₁₂ 51-2°, n_D²⁰ 1.4759, d₄²⁰ 1.2840. *1-Nitro-1-butylene* (70%), b₁₂ 55°, n_D²⁰ 1.4532, d₄²⁰ 1.0251; *dibromide* (75%), b₁₂ 99-100°, n_D²⁰ 1.5181, d₄²⁰ 1.8857. *1-Chloro-1-nitrobutylene* (73%), b₁₀ 57-8°, n_D²⁰ 1.4728, d₄²⁰ 1.2143. *1-Nitro-1-amylene* (76%), b₁₂ 69-70°, n_D²⁰ 1.4550, d₄²⁰ 0.9952. *1-Nitro-1-octylene* (83%), b₉ 112°, n_D²⁰ 1.4596, d₄²⁰ 0.9476. *1-Chloro-1-nitro-1-octylene*, b₉ 110-1°, n_D²⁰ 1.4700, d₄²⁰ 1.0685.

C. A. R.

The preparation of hexamethylenetetramine on a factory scale. F. CHEMNITZ. Chem.-Ztg. 52, 735(1928).—The reaction 6HCHO + 4NH₄OH = (CH₂)₆N₄ + 10H₂O takes place almost quant. under proper exptl. conditions. An excess of NH₄OH must be maintained; otherwise NMC₃ will be formed, rendering the product unfit for use. The reaction is conducted in absorption flasks of 250 l. capacity. Into each flask is charged 180 kg. of 30% HCHO contg. 1-2% of MeOH, and then gaseous NH₃ is led in slowly for about 12 hrs. Approx. 22 kg. of NH₃ is used per flask. The temp. must be held below 20° by regulating the speed of NH₃ feed and by using cooling water around the reaction flasks. Flasks are arranged in parallel (usually 10 at a time) so that they can be charged and emptied in regular sequence. The product is filtered with animal charcoal, evapd. in vacuum pans, with addn. of fat to prevent foaming, and allowed to cryst. in enamel vessels overnight. Each 100-kg. lot of damp crystals is treated with 300-400 g. of 25% NH₃, centrifuged, washed with distd. H₂O, dried at 50° and sieved. The yield is about 96% of the theoretical, based upon the HCHO used.

W. C. E.

New organic salts of telluric acid. FREDERICK R. GREENBAUM. Dermatological Res. Lab., Phila., Pa. *Am. J. Pharm.* 100, 630-5(1928).— H_2TeO_4 combines readily with org. bases forming org. salts of H_2TeO_4 as follows: *Hexamethyleneamine tellurate*.—4 g. of H_2TeO_4 (1 mol.) is dissolved in 25 cc. of H_2O , 2.8 g. of hexamethyleneamine dissolved in as little H_2O as possible, and the latter added to the first soln. The resulting ppt. was filtered and redissolved in H_2O , acetone was added, then filtered, washed with alc., and acetone and dried in a vacuum desiccator. The compd. obtained represents a white powder, slightly sol. in H_2O and insol. in all org. solvents. On reduction with $\text{Na}_2\text{S}_2\text{O}_4$ or with NaHSO_3 black metallic Te is pptd. *Urea tellurate*.—3 g. of urea was dissolved in a small quantity of H_2O and added to a soln. of 6.6 g. of H_2TeO_4 dissolved in hot H_2O . After cooling, EtOH and ether were added and beautiful, shining crystals were obtained, which were filtered and washed with alc. and ether and dried in a vacuum desiccator. Urea tellurate forms white, shining needles, easily sol. in cold and warm H_2O , insol. in alc., ether and CHCl_3 and all other org. solvents. The aq. soln. has a slight acid reaction, showing that only 1 of the two hydrogens of the H_2TeO_4 is in combination with the urea. Reducing substances ppt. metallic Te. *Thiourea tellurate*.—7.6 g. of thiourea was dissolved in warm MeOH, allowed to cool and 13.5 g. of H_2TeO_4 in H_2O was added to the soln. After several hrs. of standing, a white ppt. was formed, filtered off, washed with cold H_2O and dried in a vacuum desiccator. Thiourea tellurate is a white powder, which is entirely insol. in acids, in cold and hot H_2O , sol., however, in alkalies, such as warm NaOH or KOH. Its soly. in alkalies makes this compd. available for therapeutic use. *Piperazine hydrate tellurate*.—1.6 g. of piperazine hydrate and 5.3 g. of H_2TeO_4 , each in hot H_2O , were combined. MeOH and acetone were added, which pptd. out the insol. piperazine tellurate. This was filtered, washed with H_2O , alc., acetone and ether and dried. The compd. is insol. in cold H_2O and in org. solvents, somewhat sol. in hot H_2O and is sol. in dil. alkalies. The soly. in alkalies indicates the presence of free uncombined H of H_2TeO_4 . W. G. GAESSLER

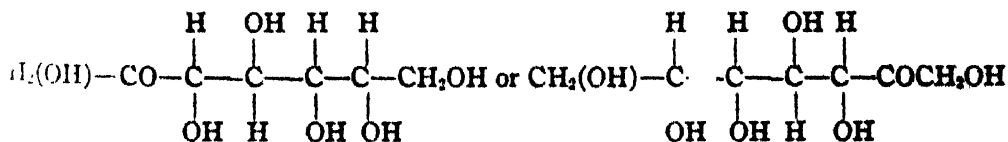
Synthesis of acetoin and its two homologs and their odor. TUNETO HIGASHI AND SUEKICHI MARUYAMA. *Bull. Inst. Phys. Chem. Research (Tokyo)* 7, 940-7; *Eng. Ed.* 1, 91-2(1928).—Acetoin, $\text{MeCOCH}(\text{OH})\text{Me}$, has been synthesized (1) from MeCOEt through $\text{MeCOC}(\cdot\text{NOH})\text{Me}$ and MeCOCOMe ; (2) by direct hydrolysis of MeCOCHBrMe , and (3) from MeCOCHBrMe through the acetate. In the 3 cases the odor of the acetoin is a very faint agreeable one, which does not resemble that of Japanese "saké." This shows that acetoin, though present in the fermentation products, has not much influence on the saké flavor. Two homologs of acetoin, viz., acetol and acetylethylcarbinol, were prepd.; their odor was substantially the same as that of acetoin.

A. L. HENNE

Vaccenic acid, a new fatty acid in beef, sheep and butter fat. S. H. BERTRAM. Tech. Hochschule, Delft. *Biochem. Z.* 197, 433-41(1928).—A method for prepn. is described in detail. It is a $\Delta^{11,12}$ -elaidic acid, $d_{20} 0.85601$, $n_D 1.43834$, $n_D 1.44071$, $n_D 1.44674$. The m. p., solidification point, I_2 no., etc., vary somewhat depending upon the source of the fatty acid. Consult original for details.

S. MORGULIS

The α -glucoheptulose and the α -glucoheptulitol. GABRIEL BERTRAND AND GEORGES NITZBERG. *Bull. soc. chim.* 43, 1019-23(1928); cf. *C. A.* 22, 2740, 3633.—B. and N. study the chem. properties of α -glucoheptulose (I), prepd. by the action of a culture of the bacteria from sorbose with yeast added to α -glucoheptitol. I gives the color changes with orcinol, phloroglucinol and resorcinol in the presence of dil. HCl, indicating the presence of a ketone group, and shows no oxidation with Br_2 . I with Na-Hg in H_2O gives the α -glucoheptulitol previously described. It is suggested that I has either the formula



D. H. POWERS

Hydroxyamino compounds which show the biuret reaction. IV. Anhydride formation by γ -amino- β -hydroxybutyric acid. MASAJI TOMITA AND TOMOKICHI FUKAGAWA. *Med. Acad. Nagasaki. Z. physiol. Chem.* 178, 302-5(1928); cf. *C. A.* 21, 3892.—When $\text{H}_2\text{NCH}_2\text{CH}(\text{OH})\text{CH}_2\text{CO}_2\text{H}$ is esterified with MeOH or EtOH and the ester HCl salt treated with NaOMe to liberate the free base, a ring closure to 70% γ -hydroxy- α -pyrrolidone occurs. The product is isomeric with the β -hydroxy- α -pyrrolidone obtained by Fischer and Göddertz (*C. A.* 5, 700) from the isomeric H_2 -

$\text{NCH}_2\text{CH}_2\text{CH}(\text{OH})\text{CO}_2\text{H}$. When refluxed with $\text{Ba}(\text{OH})_2$ it reverts to the hydroxy-amino acid. The latter gives the biuret reaction but the pyrrolidone does not.

A. W. DOX

Remarks on the paper by A. Weissberger: "Dipolar momentum of symmetrical compounds and *cis-trans*-isomerism with simple linkages." R. ENGELAND. Biochem. Inst. Mittelasiatischen Staatsuniversität. *Physik. Z.* **29**, 626(1928).—W.'s hypothesis (C. A. **22**, 3089) explains the existence of 2 Cu salts of bis- α -imino acids and the similarity between the Cu salts of *dl*- and optically active α -amino acids. A. L. HENNE

Action of anhydrous chloral on the amino alcohols and the hydroxyamino esters with a tertiary amine grouping. E. FOURNEAU AND M. L. E. W. BRYDOWNA. Pasteur Institute. *Bull. soc. chim.* **43**, 1023-7(1928).— CCl_3CHO (I), mixed with $\text{Me}_2\text{NCH}_2\text{-CMeEtOH}$ evolves a large quantity of heat. The product decomps. on vacuum distn. and recombines in the receiver to form $\text{Me}_2\text{NCH}_2\text{CMeEtOCH}(\text{OEt})\text{CCl}_3$; *HCl salt*, m. 128-30° (decompn.); *Bz deriv. of HCl salt*, m. 196-8° (decompn.); *Ac deriv. of HCl salt*, m. 193°; *Ac deriv.*, b. 158 60°. I with $\text{Me}_2\text{NCH}_2\text{CMe}(\text{OH})\text{CO}_2\text{Et}$ gives the ring compd. $\text{Me}_2\text{NCH}_2\text{CMe.O.CH}(\text{CCl}_3)\text{O.CO}$, (II), b₂₂ 140-2°, m. 66-7°; *HCl salt*,

m. 180-6°. The Pr ester with I gives II.

D. H. POWERS

The action of erepsin and of trypsin-kinase on *l*-leucylpentaglycyl-*l*-tryptophan. EMIL ABDERHALDEN AND HANS SICKEL. *Fermentforschung* **10**, 91-4(1928); cf. C. A. **22**, 2576.—*d*- α -Bromoisocapronyltetraglycylglycine (I), decomps 210°, $[\alpha]_D^{20}$ 12.21°, was prep'd. by Fischer's method (*Ber.* **39**, 2893) and chlorinated by treatment with PCl_5 . The reaction was incomplete, since the product contained only 41% of the calcd value for Cl. An attempt to couple the crude chloride with *l*-tryptophan Me ester in CHCl_3 , then to sapon. and replace the Br by NH_2 and finally isolate the desired heptapeptide through the Hg compd. entailed so great a loss of material that the prep'n. was abandoned in favor of the Schotten-Baumann procedure. The chloride was therefore shaken with *l*-tryptophan and *N* NaOH and the reaction product ppt'd. along with non-chlorinated I by addn. of *N* HCl. The crude product was sealed in a tube with liquid NH_3 and kept 6 days at 20-2°. From the residue after evapn. of the NH_3 the NH_4Br was ext'd. by abs. EtOH and the heptapeptide dissolved in H_2SO_4 and ppt'd. by HgSO_4 . The pptd. was decomp'd. by H_2S , the filtrate treated with $\text{Ba}(\text{OH})_2$ to remove H_2SO_4 , and evap'd. *in vacuo* at 40°. The residual *l*-leucylpentaglycyl-*l*-tryptophan is sol. in H_2O , AcOH and dil. EtOH, insol. in other org. solvents, sol. in acids and alkalies, ppt'd. by HgSO_4 and by phosphotungstic acid, and salted out of H_2O by $(\text{NH}_4)_2\text{SO}_4$. It gives a strong red biuret reaction, decomps. 175°, $[\alpha]_D^{18}$ 12.3°. Both erepsin and trypsin-kinase hydrolyze this heptapeptide, the former without and the latter with liberation of tryptophan. If, as Euler and Waldschmidt-Leitz have suggested, erepsin attaches itself to the free NH_2 group and trypsin to the carboxyl of polypeptides, the above observation would indicate that the 1st amino acid to be broken off from a polypeptide chain is the one to which the enzyme complex attaches itself. A. W. DOX

The influence of pepsin and of trypsin-kinase on polypeptides containing *d*-glutamic acid. EMIL ABDERHALDEN AND ERNST ROSSNER. Univ. Halle. *Fermentforschung* **10**, 95-101(1928).—*d*- α -Bromoisovaleryl-*l*-leucylglycyl-*d*-glutamic acid, $[\alpha]_D^{20}$ 16°, was prep'd. in 78% yield by coupling *l*-leucylglycyl-*d*-glutamic acid with *d*- $\text{Me}_2\text{CHCHBrCOCl}$ in the presence of *N* NaOH. It sep'd. as an oil when the reaction mixt. was acidified but was finally obtained in solid form by rubbing with petroleum ether and Et₂O and evap'd. *in vacuo*. It was converted into *d*-valyl-*l*-leucylglycyl-*d*-glutamic acid (I), $[\alpha]_D^{20}$ 11.4°, in 60% yield by 5 days' contact with 25% NH_4OH . The Br was removed by Ag_2SO_4 , the H_2SO_4 by $\text{Ba}(\text{OH})_2$, the NH_3 by evapn. and the excess Ba by H_2SO_4 , and the final product obtained by pptg. the MeOH soln. with Et₂O. It is amorphous and hygroscopic and may be salted out of H_2O by $(\text{NH}_4)_2\text{SO}_4$. *d*- α -Bromopropionyl-*d*-valyl-*l*-leucylglycyl-*d*-glutamic acid, $[\alpha]_D^{20}$ -18.2°, was prep'd. in 50% yield by coupling I in NaOH with *d*- MeCHBrCOCl , and the oily product purified by stirring with sat'd NaCl soln., extg. with EtOH, pptg. with Et₂O and drying *in vacuo*. By the same treatment as used for I, this was converted into *d*-alanyl-*d*-valyl-*l*-leucylglycyl-*d*-glutamic acid (II), $[\alpha]_D^{19}$ -10.7°, in 85% yield. Its properties are similar to those of I. By coupling II with *d*- $\text{Me}_2\text{CHCH}_2\text{CHBrCOCl}$, 65%, *d*- α -bromoisocapronyl-*d*-alanyl-*d*-valyl-*l*-leucylglycyl-*d*-glutamic acid, $[\alpha]_D^{21}$ 12.6°, was obtained, and the substance purified by stirring with H_2O , dissolving in a small vol. Et₂O and pptg. by adding more Et₂O. Amination and purification as with I and II yielded 75% *l*-leucyl-*d*-alanyl-*d*-valyl-*l*-leucylglycyl-*d*-glutamic acid (III), $[\alpha]_D^{20}$ -9.5°. The hexapeptide resembles I and II in its solubilities,

but is not hygroscopic, is salted out of H_2O by $NaCl$, and the ppt. obtained with phosphotungstic acid is less sol. in excess of reagent. It gives a carmine-red biuret reaction. Its $PhNCO$ deriv. (IV) is an amorphous powder sol. in $MeOH$, $EtOH$ and alkali, almost insol. in H_2O , Et_2O and C_6H_6 . Erepsin hydrolyzes III but not I and II, and trypsin-kinase attacks all 3 polypeptides. IV is attacked by trypsin-kinase but not by erepsin.

A. W. DOX

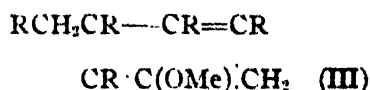
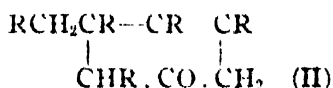
Dioximes. L. G. PONZIO. Reale Politecnico, Torino. *Gazz. chim. ital.* 58, 329-44(1928).—See C. A. 22, 4120.

C. C. DAVIS

Supplementary studies on the nitrile esters of the dicarboxyglutaconic acid. YOSHIVUKI URUSHIBARA. *Bull. Chem. Soc. Japan* 3, 219-26(1928).—The condensation of $EtOCOC(CN):CHOEt + HCNa(CN)CO_2Me$ (reaction A) should give $EtOCOC(CN):CHCNa(CN)CO_2Me$, while the condensation of $MeOCOC(CN):CHOEt + HCNa(CN)CO_2Et$ (reaction B) should give $MeOCOC(CN):CHCNa(CN)CO_2Et$, but (A) carried out in $EtOH$ gives exclusively di-Et dicyanoglutaconate semihydrate, m. 184° ; (A) carried out in $MeOH$ gives Me Et dicyanoglutaconate semihydrate, m. 197° , with the position of the Me and Et unknown, since (B) in $EtOH$ gives the same product. (B) in $MeOH$ gives only di-Me dicyanoglutaconate semihydrate, m. 224° . $CH_2(CO_2Me)_2$ condenses with di-Et ethoxymethylenemalonate: the Na deriv. is treated with dil. HCl , yielding the free ester; when the condensation occurs in $EtOH$, the final product is the Me tri Et ester, while it is the di-Me di-Et ester in $MeOH$. The constitution of the Na derivs. of the nitrile esters of dicarboxyglutaconic acid, and the mechanism of the condensation of an ethoxymethylene compd. $EtOCH:CHXY$ with a methylene compd. CH_2XY in the presence of $NaOEt$ are discussed.

A. L. HENNE

Ethyl 1,2,3,6-tetracarboethoxy-5-methoxy- $\Delta^{2,5}$ -cyclohexadiene-1-acetate, a derivative of triethyl aconitate. YOSHIVUKI URUSHIBARA. Tokyo Univ. *Bull. Chem. Soc. Japan* 3, 217-9(1928).—U. tried to methylate tri-Et aconitate (I) by refluxing it with 1 mol. of $EtONa$ and an excess of MeI in abs. alc., then heating under pressure at $115-20^\circ$. An oil was obtained b.p. $225-30^\circ$; a combustion and a mol.-wt. detn. indicated the formula $C_{22}H_{32}O_{11}$. To explain the reaction, it is assumed that 2 mols. of I split 1 mol. alc. and that 1 H is substituted by Me. Thus, I gives II, ($R = CO_2Et$), or its Na deriv., II is methylated to III (for which the name appearing in the title is proposed). III does not dissolve in aq. KOH , gives no color with $FeCl_3$, and does not condense with $PhNHNH_2$; these facts suggest that the Me group in III is in a MeO group and that II reacted in the enolic form to give III.



A. L. HENNE

The chemistry of the Jaffe's reaction for creatinine. V. The isolation of the red compound. ISIDOR GREENWALD. Harriman Research Lab., Roosevelt Hosp., N. Y. *J. Biol. Chem.* 80, 103-6(1928); cf. C. A. 22, 2925.—The compd. responsible for the red color in Jaffe's reaction for creatinine is made up of 1 mol. of creatinine, 1 of picric acid, and 2 of $NaOH$. It may be regarded as a compd. of the red tautomer of creatinine puerate with 2 mols. of $NaOH$. The red tautomer is pptd. from a fairly concd. soln. of the new compd. by HCl .

A. P. LOTHROP

Ureides of the bromovaleric acids. III. Influences on the physiological properties of the migration of the halogen in the acid chain. E. FOURNEAU AND G. FLORENCE. *Bull. soc. chim.* 43, 1027-40(1928); cf. C. A. 22, 3227.—The ureides of the isomeric bromovaleric acids are prepd. and their partition coeffs. and hypnotic actions studied and compared. $PrCHBrCOCl$ with $CO(NH_2)_2$ (I), gives $PrCHBrCONHCONH_2$ (II). $EtCHBrCH_2COCl$ with I gives $EtCHBrCH_2CONHCONH_2$ (III), m. 184° . $MeCHBrCH_2CH_2COCl$ with I gives $MeCHBrCH_2CH_2CONHCONH_2$ (IV), m. $160-1^\circ$. The uride could not be isolated from $CH_2Br(CH_2)_3COCl$ and I. $MeCEtBrCOCl$ with I gives $MeCEtBrCONHCONH_2$ (V). $MeCH:MeCO_2H$ with HBr at 0° gives $MeCHBrCMeHCO_2H$, m. $66-7^\circ$. Converting to the acid chlorides with 5 moles of $SOCl_2$ and treating with I gives $MeCHBrCMeHCONHCONH_2$ (VI), m. $125-6^\circ$. $CH_2BrCEtHCOCl$ with I gives $CH_2BrCEtHCONHCONH_2$ (VII), m. 108° .

$CH_3CH_2CHMe.CO.O$ with PCl_5 gives a good yield of $CH_2BrCH_2CMeHCOCl$, b.p. 128° . This acid chloride with I gives 30% $CH_2BrCH_2CMeHCONHCONH_2$ (VIII), m. 117.5° . The partition coeffs. between oil and water for the ureides II, III and IV are 0.44, 0.35 and 0.29, resp. The corresponding coeffs. for V, VI, VII and VIII are 1.99, 1.7, 0.84 and 0.90. Studying the narcotic action of these ureides shows that

the straight-chain Br-substituted valeric acids have no narcotic action, but the branched-chain ureides show a marked activity paralleling their partition coeffs. The ureides showed decreasing narcotic activity in the order VI, VII and VIII. D. H. POWERS

Saccharose B. AMÉ PICTET AND HANS VOGEL. Univ. of Geneva. *Helv. Chim. Acta* 11, 901-5(1928).—It has been claimed that saccharose (I) recrystd. from EtOH m. 179-80°, while from MeOH it m. 169-70°. The d_{20}^{20} of I from these 2 solns. has recently been found to be 1.5840 and 1.5737, resp. The higher-melting or A form is the common form, and the lower-melting the B form. No other solvents could be found which would convert A into B, but 10% MeOH in EtOH will bring it about. Chem. analysis shows no difference between A and B and on long standing B is quite stable if dry. The octaacetates of the 2 forms have identical m. ps. and all attempts to observe any evidence of a chem. difference give neg. results. Saccharose C and D. *Ibid* 905-9.—5 g. of β -glucose tetraacetate and 5 g. of fructose tetraacetate in CHCl_3 are mixed with P_2O_5 for 14 hrs. The resulting sirup is neutralized, extd. with H_2O and recrystd. from alc. to give 15% of the octaacetate of saccharose C (II), m. 113-4°, $[\alpha]_D^{21} -60.8^\circ$ in CHCl_3 . II gives 74% saccharose C (III), m. 104°, $[\alpha]_D^{22} -24.6^\circ$. III is hydrolyzed only after boiling 1 hr. with 10% HCl to give the invert sugar soln. $[\alpha]_D^{21} -20.4^\circ$. The probable formula for III is $\text{CH}_2(\text{OH})$ -

$$\begin{array}{c} \text{O} \qquad \qquad \qquad \text{O} \\ \text{CH}.\text{CH}(\text{OH}).\text{CH}(\text{OH}).\text{CH}(\text{OH}).\text{CH} - \text{O} - \text{C}(\text{CH}_2\text{OH}).\text{CH}(\text{OH}).\text{CH}(\text{OH}).\text{CH}(\text{OH}).\text{CH}_2 \\ \text{Octaacetylsaccharose with HCl at room temp. for 3 hrs. gives a sirup which probably is} \\ \text{a mixt. of tetraacetylglucose and -fructose but which could not be sepd. Recondensing} \\ \text{this mixt. by heating for 15 hrs. with } \text{P}_2\text{O}_5 \text{ in } \text{CHCl}_3 \text{ gives what is believed to be the} \\ \text{octaacetate of saccharose D, m. } 125^\circ, [\alpha]_D^{21} 20.3 \text{ in } \text{CHCl}_3. \text{ Sapon. gives saccharose D,} \\ \text{m. } 127^\circ, [\alpha]_D^{21} 19.0. \text{ It is suggested that this disaccharide has the structure: } \text{CH}_2(\text{OH})- \end{array}$$

$$\begin{array}{c} \text{O} \qquad \qquad \qquad \text{O} \\ \text{CH}.\text{CH}(\text{OH}).\text{CH}(\text{OH}).\text{CH}(\text{OH}).\text{CH} - \text{O} - \text{C}(\text{CH}_2\text{OH}).\text{CH}(\text{OH}).\text{CH}(\text{OH}).\text{CHCH}_2\text{OH}. \end{array}$$

D. H. POWERS

Analogies in the catalytic action of enzymes and definite organic substances. WOLFGANG LANGENBECK. *Z. angew. Chem.* 41, 740-5(1928).—While the catalytic effects similar to those of enzymes are well investigated in inorg. chemistry, studies on this subject are scarce in org. chemistry. A summary on the present knowledge of org. catalysts acting similarly to enzymes is given in this article. These org. compds. have a much weaker effect than have enzymes; therefore a relation between the action of the former and the latter is perhaps possible. In esterification, apart from the H^+ ions, weak, undissociated, org. acids have a catalytic effect. In amide formation, the reaction velocity is increased by addn. of org. catalysts. Similarly, in the hydrolysis of the carbohydrates, cyanohydrin and acyloin formation, decarboxylation, and dehydrogenation, the reaction is often hastened. Some hemoglobin derivs. have a peroxidative or catalytic action. Some org. catalysts even possess "stereochem. specificity," i. e., the property of attacking the 2 antipodes of an asym. substance with different velocities.

G. SCHWOCH

Chemistry of starch. XXI. The constitution of glycogen. HANS PRINGSHEIM AND GERTI WILL. Chem. Inst., Univ. Berlin. *Ber.* 61B, 2011-7(1928).—No successful degradation of starch to the building constituents has as yet been accomplished. Heating the plant or the animal carbohydrate in $\text{C}_2\text{H}_5(\text{OH})_2$ yields a trihexose, which amylase changes to maltose. The glycogen used was prepd. from edible mussel, purified by many washings in water and pptd. with alc. $[\alpha]_D^{20} 194^\circ$ (H_2O). The degradation product was acetylated completely by heating for 65 hrs., at 65° one part glycogen, 4 cc. Ac_2O and 6 cc. $\text{C}_6\text{H}_5\text{N}$; $[\alpha]_D^{20} 177.9-175.5^\circ$ (CHCl_3). The mol. wt. in AcOH corresponded to a triacetate hexosan in 0.3% concn.; a higher concn. resulted in assocn. To secure the necessary soln. in CHCl_3 , the glycogen acetate was refluxed 20 min. in boiling C_{10}H_8 . The degradation of glycogen acetate with PhSO_3H was accomplished by dissolving in a 4% soln. of CHCl_3 , cong. to 0.2 of original vol. over P_2O_5 under 14 mm. at 78° and then adding PhSO_3H . Two solns. were refluxed (A) 24 hrs., (B) 72 hrs., the PhSO_3H removed by shaking with NaHCO_3 , the CHCl_3 soln. purified with animal charcoal, concd. to a small vol. and pptd. with Et_2O . (A) 0.1006 g. neutralized by 8.02 cc. 0.1N NaOH yielded 34.3% Ac ; (B) 0.0762 g. neutralized by 4.40 cc. 0.1N NaOH yielded 24.8% Ac . The sapon. of the glycosan was effected with alc. KOH or with $\text{Ba}(\text{OH})_2$; the pptn. by alc. The product was ash-free, sol. in H_2O without opalescence, gave the characteristic brown color with I_2 in KI . The f.-p. method gave the mol. wt. of 3 samples as 473, 476, 452, Mol. wt. detns. by the b.-p. method varied. The hydrolysis

of glycogen and glycogen at 37° was effected (1) with pancreas-amylase alone; (2) pancreas and yeast alone; (3) dil. soln. of pancreas-amylase. Approx. the same yield of maltose was obtained for the same period of time from each carbohydrate, but hydrolysis was most rapid in (3).

GEO. W. MUHLEMAN

The constitution of inulin. HANS PRINGSHEIM AND JOSEPH REILLY. *Chem. Inst. Univ. Berlin. Ber.* 61B, 2018-9(1928).—Recently H. Pringsheim and I. Fellner (*Ann.* 462, 231) prepared inulin acetate from tetraulin acetate, which, saponified, yields a disaccharide anhydride. Another more rapid degradation method (preceding abstract) involves the use of CHCl_3 and PhSO_3H (0.2%). A mol. wt. of 400 was obtained for the disintegration product after 5 hrs. boiling; after 7 hrs. the f. p. mol. wt. detn. gave $(\text{C}_6\text{H}_{10}\text{O}_5)_2$ as the formula. The inulin used was first prepd. by Karrer and is now manufd. by Siegfried, a Swiss firm. Before acetylating the sample was dissolved 3 times in water and pptd. with EtOH ; $[\alpha]_D^{20}$ —33.9°. Two samples by the f.-p. method gave mol. wts. of 1056 and 1088. The acetate after purifying with MeOH gave $[\alpha]_D^{20}$ —41.6°. To sapon. the acetate 5 g. was dissolved in 125 cc. dry CHCl_3 and 0.25 g. dehydrated PhSO_3H added and refluxed 7 hrs. The PhSO_3H was washed out with dil. NaHCO_3 and the CHCl_3 removed by steam distn. Before detg. $[\alpha]$ and the mol. wt. the samples were dried *in vacuo* over P_2O_5 at 78°. Three analyses and 3 mol. wt. detns. averaged (1) C 39.64%, H 6.55%; (2) 348. The computed formula is $\text{C}_6\text{H}_{10}\text{O}_5 \cdot \text{H}_2\text{O} = 39.99\% \text{ C}, 6.71\% \text{ H}$. The optical rotation = —32.1°. G. W. M.

Synthesis of raffinose. HANS VOGEL AND AMÉ PICTET. The Univ. of Geneva. *Helv. Chim. Acta* 11, 898-900(1928).—Raffinose (I) may be considered as a galactosyl-saccharose or a fructosylmelibiose. 7 g. of saccharose (II) and 3.5 g. of galactose (III) are heated at 160-5° under 13-15 mm. for 1.25 hrs. The resulting sirup is extd. with MeOH several times. Slow evapn. of the ext. gives a white solid, which on crystn. from H_2O gives 1% of I. I is identified by m. p., hydrate formation, decompn. p., soly., osazones formed after hydrolysis with 10% HOAc , action with NaOAc , and rotation. It seems probable that III first loses H_2O to form galactosan, which in turn reacts with II to form I.

D. H. POWERS

Some new sugars of the trehalose type. HANS VOGEL AND HALINA DEBOWSKA-KURNICKA. The Univ. of Geneva. *Helv. Chim. Acta* 11, 910-15(1918).—The authors study the action of ZnCl_2 on solns. of monoses to give disaccharides. β -Tetracetylglucose in PhMe is boiled with ZnCl_2 for 2.5 hrs. to reach equil. between the α - and β -forms; P_2O_5 is then added and the boiling continued 6 hrs. There is obtained 15% yield of an octaacetate of a disaccharide which is an α, β -trehalose deriv., m. 68-70°. Sapon. converts it to the corresponding sugar, m. 85°, decompn. 97°, which reduces neither Fehling soln. nor neutral KMnO_4 and is believed to have the structure, $\text{CH}_2(\text{OH})$ -

$\text{CH}(\text{OH})\text{CH}(\text{OH})\text{CH}(\text{OH})\text{CHOCH}(\text{OH})\text{CH}(\text{OH})\text{CH}(\text{OH})\text{CH}(\text{OH})\text{CH}_2\text{OH}$. β -Tetracetylglucose in CHCl_3 , boiled with ZnCl_2 and P_2O_5 gives 18% of a non-reducing sugar, m. 82-3°. Sapon. gives a galactobiose, m. 122°. The rotation of this compd. indicates it may be the α, β -form. Heptaacetylmaltose in CHCl_3 with ZnCl_2 and P_2O_5 for 18 hrs. gives a tetradecaacetylmaltotetrose, m. 105°. Sapon. gives a maltotetrose, m. 120-2°. It does not reduce Fehling soln. and does not form an osazone. It is easily hydrolyzed to glucose.

D. H. POWERS

A benzene model on the basis of the electron theory, and the substitution regularities. M. ULMANN. *Z. angew. Chem.* 41, 674-80(1928).—Speculations based on the electron theory induced U. to advance a space model of PhH , which allows of explaining satisfactorily the aromatic character of PhH and its derivs., and the phenomena observed in the chemistry of PhH , as well as the vanishing of the aromatic character on hydrogenation, the regularities of substitution and the displacement reactions. A similar model was devised for pyridine.

G. SCHWACH

Production of benzene and of toluene from technical xylene and from solvent naphtha. G. L. YUKHNOVSKIY. *Ukrainskii Khim. Zhurnal* 3, No. 2, Pt. techn., 65-87(1928).—A study has been made of the yields of benzene and of toluene on passing the raw materials mixed with H through heated tubes filled with various materials. At 750-75° the best results on passing xylene were obtained with Fe tubes covered with a layer of sulfide and filled with pieces of FeS or with NiS . Cu tubes filled with Cu filings gave similar results, about 60% of the theoretical yield being obtained in each case. CoS was found to be less efficient. Fe and particularly Ni promote decompn. of hydrocarbons with deposition of C. Al and Mg oxides are reduced by the reactants under the conditions of the expts. and the yields of liquid hydrocarbons are very small initially. Later, when reduced, these contact substances give very high yields, 60-75%

of the theoretical. With solvent naphtha b. 145–70°, Al_2O_3 and FeS gave, resp., 75 and 61% yields of fractions boiling below 135°. The reaction with xylene, by using a reduced Al_2O_3 contact mass, begins at 670°, the yield of the desired hydrocarbons increasing up to 770°. At still higher temp. the yield begins to fall off. The ratio $\text{C}_6\text{H}_6:\text{PhMe}$ increases with the temp. over the whole temp. range investigated. At 730° practically no benzene is formed, at 815° its yield is about 43% of the total yield. The effect of temp. on the yields is somewhat similar when FeS or Cu is used as contact. With Ni the favorable temps. are lower. Attempts to prep. benzene and toluene by using, instead of H , either illuminating gas contg. 3% H , or Ni , gave tarry products with only small yields, not exceeding 30%, of lower-boiling hydrocarbons. G. B. KISTIAKOWSKY

Nitro derivatives of dibenzylaniline. RANCHHODJI DAJBHAI DESAI. College of Baroda. *J. Indian Chem. Soc.* 5, 425–31 (1928).—Ten g. of $\text{PhN}(\text{CH}_2\text{Ph})_2$ and 3 cc. HNO_3 (d. 1.48) in 125 cc. AcOH at 5–10° gave 9.5 g. *p*- $\text{O}_2\text{NC}_6\text{H}_4\text{N}(\text{CH}_2\text{Ph})_2$ (I), and 1 g. *o*-nitrodibenzylaniline, which is an oil. The isomers were sepd. by EtOH , in which the *o*-compd., but not the *p*-compd., was sol. I was also obtained from *p*- $\text{O}_2\text{NC}_6\text{H}_4\text{NH}_2$ and PhCH_2Cl . From I with Zn and HCl in alc., was prepd. the Zn salt of *p*-aminodibenzylaniline, white, m. 200–2°, which by decompn. with alkali gave the free base (II); *Ac deriv.* (III), m. 137–8°; *Bz deriv.*, m. 166°. From II (1.5 g.) and BzH (1.5 g.) at 0° is formed, benzylidene-*p*-dibenzylaminoaniline (IV), yellow, m. 166–7°, and not $\text{PhCH}(\text{OH})\text{NHC}_6\text{H}_4\text{N}(\text{CH}_2\text{Ph})_2$, m. 130°, which Matzudaira (*Ber.* 20, 1611) claims to have obtained by the same reaction. IV gives III, when heated with Ac_2O ; *HCl salt* of IV; *dibromide*, m. 220–5° (decompn.). *p*-Nitrodibenzylaniline (V) (from 14 g. *p*- $\text{O}_2\text{NC}_6\text{H}_4\text{NH}_2$, 13 g. PhCH_2Cl , 9 g. anhyd. AcONa and 0.2 g. I at 125–30° for 8 hrs.), golden yellow, m. 147°. With Zn and HCl in alc., V gives an oil (VI). *Ac deriv.* of VI, m. 141–2°; *Bz deriv.*, m. 182–3°. Benzylidene-*p*-benzylaminoaniline, from 2 g. VI and 2 g. BzH at 0°, pale yellow, m. 92–3°; *HCl salt*, m. 170–2°; *dibromide*, yellow, m. 210° (decompn.). *o*-Nitrodibenzylaniline (20 g. from 13.8 g. *o*- $\text{O}_2\text{NC}_6\text{H}_4\text{NH}_2$, 40 g. PhCH_2Cl , 17 g. anhyd. AcONa and 0.2 g. I heated on a sand bath for 15 hrs.), yellow, m. 32–3°; reduced to an oil by Zn and HCl ; *Ac deriv.*, m. 121–2°; *Bz deriv.*, m. 155–6°. *m*-Nitrodibenzylaniline (VII) (25 g. from 14 g. *m*- $\text{O}_2\text{NC}_6\text{H}_4\text{NH}_2$, 26 g. PhCH_2Cl , 18 g. anhyd. AcONa and 0.2 g. I heated to 125–30° for 5 hrs.), golden yellow, m. 73–4°; *HCl salt*, m. 140–2°. *m*-Aminodibenzylaniline (from VII with Zn and HCl) is an oil, oxidized by air; *Ac deriv.*, m. 143–4°; *Bz deriv.*, m. 171–2°. Benzylidene-*m*-dibenzylaminoaniline (from 1.5 g. VII and 1.5 g. BzH at 0°), yellow, m. 156–8°; *HCl salt*, m. 195° (decompn.). *dibromide*, yellow, m. 196–8° (decompn.). Ten g. $\text{PhN}(\text{CH}_2\text{Ph})_2$ with 10 g. HNO_3 (d. 1.48) in AcOH at 15–20° gave 2,4-(O_2N) $_2\text{C}_6\text{H}_3\text{N}(\text{CH}_2\text{Ph})_2$ (VIII), m. 103–4°, and not 106° (Pinnow and Wiskow, *Ber.* 32, 913). Besides VIII, 0.5 g. of 2,6-dinitrophenyldibenzylamine (IX), m. 107°, orange-yellow, was obtained. VIII (1 g.) refluxed with 5 cc. Ac_2O and 1 cc. HCl for 2 hrs. is decompd. to 2,4-(O_2N) $_2\text{C}_6\text{H}_3\text{NHC}_6\text{H}_4\text{Ph}$ and PhCH_2Cl . When the same mixt. is heated at 145–50° for 8 hrs., a heavy oil is formed, which by acetylating gave pale white needles of 2,4-(O_2N) $_2\text{C}_6\text{H}_3\text{NHAc}$. Refluxing 0.3 g. of IX with 1 cc. HCl and 3 cc. Ac_2O for 2 hrs. gave 2,6-(O_2N) $_2\text{C}_6\text{H}_3\text{NH}_2$. G. S.

Action of nitrosodimethylaniline on unsaturated compounds. A. QUILICO. Reale Politecnico, Milano. *Gazz. chim. ital.* 58, 317–25 (1928).—Researches of Angeli, Alessandri and Pegna (*C. A.* 4, 2457), of Alessandri (*C. A.* 9, 2240; 16, 558), of Bruni and Geiger (*C. A.* 21, 4092) and of Meyer, Irschick and Schlosser (*C. A.* 8, 2878) which show that various types of unsatd. compds. react through their double bonds with NO compds. induced Q . to expt. with $\text{ONC}_6\text{H}_4\text{NMe}_2$ (I). When I and safrole (equimol. parts) are maintained at ordinary temp., there is no reaction, but on heating gradually to 120–30° a violent reaction begins, the temp. increasing spontaneously to 200°. On a water bath the reaction can be controlled. I (7.5 g.) added slowly, with warming, to safrole (8.1 g.), heated 5–6 hrs. on a water bath, let stand several days in darkness, EtOH (a few cc.) added, filtered, the residue washed with a little cold EtOH , then treated with boiling EtOH and filtered hot, leaves azodimethylaniline and a filtrate from which on cooling sep. brown-yellow crystals, which after recrystn. from xylene and then from EtOH , yield a golden yellow compd. $\text{C}_{15}\text{H}_{15}\text{O}_2\text{N}_2$ (II), m. 159–60°. It is stable in air and direct sunlight, is insol. in alkalis, gives intense red solns. in dil. acids (including AcOH) which reppt. when alkalis are added, and with alk. KMnO_4 forms piperonylic acid. Dissolved (2 g.) in 25% H_2SO_4 (100 cc.), II gives an intense red soln. which, filtered rapidly to remove floating oily drops and the latter (which eventually crystallize) recrystd. from EtOH yield $\text{CH}_2\text{O}_2\text{C}_6\text{H}_4\text{CH}=\text{CHCHO}$ (III) (cf. *Ber.* 27, 2958 (1894)); *C. A.* 4, 2457). The filtrate contains the sulfate of II, $\text{C}_{15}\text{H}_{15}\text{O}_2\text{N}_2\cdot 2\text{H}_2\text{SO}_4$ (IV), red, m. 195–8°, from which by the action of alkalis II is liberated. Excess 10% NaOH added to aq. IV, then a little BzCl added, first ppts. II, but with agitation this changes its character,

and filtered, the residue washed with EtOH, dissolved in AcMe, pptd. with water and recrystd. from xylene and then EtOH, yields the *B₂ deriv.* of *p*-H₂NC₆H₄NMe₂, C₁₀H₁₆ON₂, (V), m. 216–7°. This can also be prepd. from *p*-H₂NC₆H₄NMe₂ and BzCl, with recrystn. from EtOH and xylene, in which case it m. 217–8°. HONH₃Cl (0.35 g.) and Na₂CO₃ (0.30 g.) in a little water added to II (1 g.) in EtOH (50 cc.), refluxed 1 hr., all EtOH evapd., pptd. with water and recrystd. from C₆H₆, yields the oxime of II, CH₂O₂:C₆H₅CH:CHCH:NOH, m. 155°, which is the compd. called the γ -form by Angeli, Alessandri and Pegna (*loc. cit.*). In AcOH medium, there is obtained besides a large yield of the γ -form, a small proportion of the α -isomer (cf. A., A. and P.). Thus HONH₃Cl (1.5 g.) and Na₂CO₃ (1 g.) in a little water added to II (2.5 g.) in glacial AcOH (50 cc.), heated on the water bath, dild. with water and filtered, yield 1.7 g. of crude product. The mother liquor heated to remove AcOH, made alk. with Na₂CO₃, steam distd., the residue filtered, a little NaOH and BzCl added, the ppt. boiled with EtOH and recrystd. from boiling xylene, yields V. When the mixt. of oximes is treated with boiling EtOH, the γ -form dissolves, leaving the α -form. *p*-H₂NC₆H₄NMe₂ warmed with III (the calcd. quantity) in a little EtOH, filtered and the residue recrystd. from EtOH and xylene, yields II. The reactions indicate that II is a Schiff base of the compn.: CH₂O₂:C₆H₅CH:CHCH:NC₆H₄NMe₂. The possible mechanism of the reactions is discussed.

C. C. DAVIS

Organic sulfur compounds. X. Remarks on the action of air on thiobenzophenone. A. SCHÖNBERG, O. SCHÜTZ AND S. NICKEL. *Techn. Hochschule Charlottenburg Ber* 61B, 2175 7(1928), cf. C. A. 22, 4510.—Since the compd. C₂₆H₂₆S₃ (I) obtained along with Ph₂CO by the action of air on Ph₂CS and briefly described, with reservations as to its possible structure, in the earlier paper, has been obtained independently by Standinger and Freudenberger (C. A. 23, 130), the authors hasten to publish the results they have thus far obtained in order not to keep other workers out of the field. On soln. and fusion it decomps. into Ph₂CS and S and is therefore a trisulfide, either 3,3,5,5-tetraphenyldimethylene 1,2,4-trisulfide, Ph₂C:S:S:CPh₂:S (I) or

1,4,5,5-tetraphenyldimethylene 1,2,3-trisulfide, Ph₂C:S:S:S:CPh₂ Structure I is given the

preference. I is a deriv. of the hitherto unknown benzohydril thioether, (Ph₂CH)₂S (II), which can readily be obtained from Ph₂CHBr and Ph₂CHSH and, like I, decomps. into Ph₂CS on heating. I, from Ph₂CS allowed to stand 4 weeks in the air, boiled 1 min. in benzene and filtered hot (max. yield, 15%), colorless crystals, forms in cold C₆H₆, CHCl₃, (CH₂Br)₂ or CS₂ almost colorless solns. which, however, soon become light blue, dissolves in concd. H₂SO₄ with yellow color changing to red-brown, m. about 124° (decompn.), mol. wt. in freezing C₆H₆ 405. II (with J. PETER) (4 g. from 5 g. Ph₂CHSH and 7 g. Ph₂CHBr refluxed in C₆H₆ in CO₂), m. 66.5°, forms a blue melt (Ph₂CS) when heated 30 sec. at 275°, dissolves in concd. H₂SO₄ with somewhat greenish yellow color.

C. A. R.

***o*-Aminophenylhydrazine and some interesting heterocyclic compounds derived from it. IV. Lengthened *o*-derivatives of benzene and their ring-closure.** PRAPHULLA CHANDRA GUHA AND TEJENDRA NATH GHOSH. *Univ. Dacca. J. Indian Chem. Soc.* 5, 439 51(1928). In continuation of their studies (cf. C. A. 22, 2506), G. and G. investigated the interaction of aminophenylsemicarbazides with various compds. In some of the substances prepd. by these reactions, a ring closure could be attained. A ring closure was also found to occur on reduction of some derivs. of *o*-O₂NC₆H₄NHNH₂ (I). *o*-Nitrophenyl 4-phenylsemicarbazide (II) (from 3.5 g. OC:NPh and 5 g. HCl salt of I in H₂O), yellow, m. 202°. 5 g. II was heated with 15 g. Sn and 100 cc. concd. HCl on the water bath for several hrs. From the resulting colorless soln. after cooling and dilg. with 150 cc. H₂O, 0.7 g. of 1-phenyl 2,3-benzo-6-keto 1,4,5-triazine (III) seps. out, m. 170–1°, sol. in dil. alkali. From the mother liquor was isolated 1-*o*-aminophenyl-4-phenylsemicarbazide-HCl (IV), m. 250–1° (decompn.), which gives a red azo dye on diazotization and coupling with β -naphthol. The free base, brownish, m. 145°. 1 g. IV refluxed with 3 cc. Ac₂O on the sand bath for 20 min., gives a compd., m. 170–1°, identical with III. 1-Phenylcarbamido-2-phenylsemicarbazidobenzene (from 0.5 g. OC:NPh and 1 g. IV), m. above 290°. 1-Carbamido-2-phenylsemicarbazidobenzene (V) (from 2 g. IV and 0.6 g. KOCN in H₂O), did not m. 290°, sol. in alkali. By heating 2 g. of V with 100 cc. concd. HCl for 1 hr., 1.2 g. of 2,3-benzo-6-phenylamino-8-keto-1,4,5,7-octatetrazine, m. 145–6°, was obtained. 1-Phenylthiocarbamido-2-phenylsemicarbazidobenzene (from 0.5 g. SC:NPh and 1 g. IV by heating on the water bath for 2–3 hrs.), brownish white, m. above 290°. 1 g. HCl salt of IV and 0.5 g. *o*-O₂NC₆H₄CHO gave 1-*o*-nitrobenzalanilido-2-phenylsemicarbazidobenzene, m. 245–6°. With FeCl₃

acting on IV, there results *3,4-benzo-7-phenylamino-1,2,5,6-oxheptatriazine-HCl*, reddish brown, does not m. 290° . Reaction of 2 g. IV with 0.4 g. $(\text{NH}_4)_2\text{H}_2\text{O}$ yielded *1-N-phenyl-3,4-benzo-7-hydroxy-1,4,5,6-heptatetrazine*, m. $90-1^{\circ}$, sol. in dil. alkali. By dropping 1 g. KOCN in H_2O into a concd. soln. of 2 g. HCl salt of I, *o-nitrophenylsemicarbazide* (VI), yellow, m. 225° (decompn.), was prepd. The HCl salt of *2,3-benzo-5-imino-1,4,6-triazine* (VII), brownish white, m. $248-9^{\circ}$ (decompn.), was obtained by refluxing 5 g. VI with 10 g. Sn in 60 cc. concd. HCl for 1 hr.; the free base m. 85° , whose brownish white *Ac deriv.* m. $182-3^{\circ}$. 5 g. HCl salt of I and 3 g. KSCN in H_2O yielded 5 g. of *1-o-nitrophenylthiosemicarbazide* (VIII), light yellow, m. 200° (decompn.). Reduction of VIII, carried out similarly as described for VI, resulted in formation of VII. *o-Chlorobenzaldehyde-o-nitrophenylhydrazone* (IX) (from 2 g. I and 2 g. *o*- $\text{ClC}_6\text{H}_4\text{CHO}$ by refluxing in alc. for 20 min.), orange-yellow, m. 171° . Reduction of IX with Sn and HCl gave rise to the formation of *2,3,7,8-dibenzo-1,4,5-octatriazine-HCl*, m. 285° ; the free base m. $217-8^{\circ}$. Glyoxal *o-nitrophenylosazone* (X) (from 3 g. HCl salt of I and 2.5 g. glyoxal- NaHSO_3 under reflux), red, m. $279-80^{\circ}$ (decompn.). *Bisbenzimidazole-HCl* was obtained by reduction of X with Sn and HCl, m. 253° (decompn.); its free base, brown, m. above 300° ; *di-Ac deriv.*, m. $183-4^{\circ}$. 10 g. CS_2 and 5.5 g. KOH were dissolved in a little H_2O and dropped into 10 g. I in 80 cc. EtOH at 0° . The resulting blue soln. is treated with 13 g. MeI. Pptn. of red *Me o-nitrophenyldithiocarbazinate* (XI) occurs, m. $113-4^{\circ}$ after recrystn. Reduction of XI results in formation of *2,3-benzo-6-methylthiol-1,4,5-triazine-HCl*, whose free base m. $199-200^{\circ}$. *Di-o-nitrophenylcarbohydrazide* (XII) (by refluxing 5 g. I in PhH with 7.5 g. of 20% OCCl_2 soln. in MePh), yellow, m. $260-1^{\circ}$. *2,3,9,10-Dibenzo-6-keto-1,4,5,7,8-decapentazine-HCl*, brownish white, m. $251-2^{\circ}$, was prepd. in the usual manner by reduction of XII. The free base was too unstable to be isolated. *Et o-nitrophenylcarbazinate* (from I and $\text{ClCO}_2\text{C}_2\text{H}_5$), brownish white, m. 185° .

G. SCHWOCH

Addition compounds between phenols and ammonia. III. The phenolammonia-system. E. BRINER AND O. AGATHON. Univ. of Geneva. *Helv. Chim. Acta* 11, 922-5(1928); cf. C. A. 22, 63.—It has been previously shown that the m. p. curve shows a flattening indicating the formation of a compd. $\text{PhOH}\cdot\text{NH}_3$. The vapor-pressure method is applied to this system and the results are plotted. At the 1st introduction of NH_3 to the PhOH, small drops of a liquid appear which increase in size until the entire mass is liquid. This liquid is a mixt. of the $\text{PhOH}\cdot\text{NH}_3$ compd. and PhOH. IV. Ammoniations of naphthols, diphenols, hydroxybenzoic acids, hydroxyanthraquinones and *o*-nitrophenols; heats of ammoniation. E. BRINER AND A. MORF. *Ibid* 926-44.—Working at 0° it is established that α -naphthol immediately takes up 1 mol. of NH_3 . Its disson. pressure is 16 mm. at 0° and 56 mm. at 20° . β -Naphthol (I), at 20° rapidly takes up NH_3 without liquefying. The compd. first formed is β -naphthol-0.5 NH_3 (II). The compd. β -naphthol- NH_3 (III), forms much more slowly. I in liquid NH_3 at -50° ppts. a solid which is probably II, but on evapn. of the NH_3 , only III is obtained. The heats of ammoniation of II and III are detd. as 5 and 9 cal, resp. *o*- $\text{C}_6\text{H}_4(\text{OH})_2$ at 20° shows clearly the formation of *o*- $\text{C}_6\text{H}_4(\text{OH})_2\cdot\text{NH}_3$ (IV), but only at 0° is there evidence of the compd. *o*- $\text{C}_6\text{H}_4(\text{OH})_2\cdot 2\text{NH}_3$ (V). The heats of ammoniation for IV and V are detd. as 13 and 18 cal. No evidence of any change of cryst. structure is noted with the formation of these compds. *m*- $\text{C}_6\text{H}_4(\text{OH})_2$ also forms the mono- and diammoniates; *p*- $\text{C}_6\text{H}_4(\text{OH})_2$ gives the mono- and diammoniates and this is the only case where they are both cryst. compds. *o*- $\text{HOC}_6\text{H}_4\text{CO}_2\text{H}$ rapidly forms a monoammoniate and there is also a flattening of the curve indicating a compd. with 2NH_3 . *m*- and *p*- $\text{HOC}_6\text{H}_4\text{CO}_2\text{H}$ both react rapidly to form the monoammoniate and very slowly to form the diammoniate. α -Hydroxyanthraquinone at 78° or 110° slowly forms a deep red monoammoniate. β -Hydroxyanthraquinone takes up the first 0.5 mol. of NH_3 very rapidly and the second 0.5 mol. slowly, but there is no evidence for a compd. of lower NH_3 content than the light red β - $\text{C}_{14}\text{H}_9\text{O}_2\text{OH}\cdot\text{NH}_3$. 2,3-Dihydroxyanthraquinone reacts rapidly with one NH_3 ; the 1,2-deriv. reacts slowly and the 1,4-deriv. very slowly. *o*- $\text{O}_2\text{NC}_6\text{H}_4\text{OH}$ forms a mono- and a triammoniate with heats of ammoniation of 17.6 and 33.6 cal.

D. H. POWERS

The cleavage of eugenol ethylene ether on reduction. ALEXANDER ST. PFAU. Givaudan et Cie, Genf-Vernier. *Helv. Chim. Acta* 11, 877-81(1928).—Thoms and Heynen (C. A. 22, 3153) have stated that when eugenol ethylene ether is reduced with EtOH and Na one of the products is the β -hydroxyethyl ether of dihydroeugenol (I), b_p 144° , orange-like odor. Since neither the b. p. nor the odor of I corresponded to its constitution, P. repeated the expt. His results verified for the most part those of T. and H. However, the odor of the reaction product was found to be due exclusively to *m*- $\text{PrC}_6\text{H}_4\text{OMe}$, and I when pure m. 50.5° , b_p 170° .

LOUISE KELLEY

Vinylene homologs of *p*-dimethylaminobenzaldehyde. W. KÖNIG, W. SCHRAMMEK AND G. RÖSCH, in part with H. ARNOLD. *Sächs. Techn. Hochschule Dresden. Ber.* 61B, 2074-80(1928).—In order to synthesize various "vinylene-homologous" series of colored substances to study the influence of successive lengthening of the conjugated C chain on the light absorption, it was especially desirable to obtain the compds. of the general type $p\text{-Me}_2\text{NC}_6\text{H}_4(\text{CH}:\text{CH})_n\text{CHO}$ (I) ($n = 0, 1$, etc.). The 2nd member (II) ($n = 1$) had been prep'd. by Feder and by Möhlau and Adam from $\text{Me}_2\text{NC}_6\text{H}_4\text{CHO}$ (III) and paraldehyde with concd. H_2SO_4 . M. and A. describe it as yellow leaflets, m. 133° and state it can be obtained in better yield from AcH than from paraldehyde. On repeating their work systematically the present authors were never able to obtain the high yield (about 70%) reported by M. and A. and they found, moreover, that pure II is obtained much more satisfactorily in about 40% yield from paraldehyde provided the reaction is not allowed to proceed beyond a certain time limit; otherwise there are formed together with much AcH resins, various higher vinylene homologs of II, resulting from continued aldol condensation and subsequent elimination of H_2O . F.'s and M. and A.'s product was probably contaminated with these substances or with unchanged III, for pure II is orange-yellow and m. 141° . The presence of higher homologs is easily detected by the color reactions in alc. with aromatic amines and mineral acids; the "azomethine dye salts" so obtained from II are red, those from the higher homologs violet to green-blue. By fractional alkali pptn. of the product of a condensation which had been allowed to proceed a long time there was obtained 6% of the 4th member ($n = 3$) of the series, viz. *1-p-dimethylaminophenyl-1,3,5-heptatrien-7-al* (IV). Once, in attempting to purify IV by soln. in about 60% H_2SO_4 there remained a very small quantity of a difficultly sol. yellow sulfate which was hydrolyzed by H_2O with brown color and could then be recrystd. from AcOEt. The substance (V) could never be obtained again, but its crimson onium-halochromism in concd. H_2SO_4 , its compn. and its absorption curve indicate that it is the pentavinylene compd. *1-p-dimethylaminophenyl-1,3,5,7,9-undecapentaen-11-al* (I, $n = 5$). The absorption curves of II, III, IV and V are all very similar in form; each additional $\text{CH}:\text{CH}$ shifts the absorption max. further towards the longer wave lengths (max. in EtOH for the 4 compds., 340, 390, 440, 470μ , resp.). The missing members ($n = 2$ and 4) cannot be obtained directly by the paraldehyde- H_2SO_4 process (even with $\text{MeCH}:\text{CHCHO}$ instead of paraldehyde or II instead of III), but from II and AcCO_2H with H_2SO_4 at 40° was obtained, along with a blue acid (to be described later) as chief product, a small quantity of an orange-yellow substance (VII), which from its red-yellow halochromism in concd. H_2SO_4 , the violet color of its PhNHMe condensation product and its absorption in alc. (max. at 420μ) is undoubtedly *1-p-dimethylaminophenyl-1,3-pentadien-5-al*. *Phenylhydrazone* of II, light yellow phototropic needles, m. 169° ; *oxime*, yellow, m. 151° . *Streptotriavinylene-p-dimethylaminobenzaldehyde* (IV), red needles from benzine, m. 184° , Cu-red leaflets from AcOEt, m. 176° ; *phenylhydrazone*, m. 217° . V, deep brown needles with Cu luster, m. 209° , forms a pure blue condensation product with HClO_4 and PhNHMe . VII m. around 155° . C. A. R.

The Nierenstein reaction. W. BRADLEY AND R. ROBINSON. *Nature* 122, No. 3065, 130-1(1928).—A correspondence declaring the inability of corroborating the results of the Nierenstein reaction. The reaction in question is: (A) $\text{BzCl} + \text{CH}_2\text{N}_2 = \text{BzCH}_2\text{Cl} + \text{N}_2$. B. and R. believe it takes place as: (B) $\text{BzCl} + \text{CH}_2\text{N}_2 = \text{BzCHN}_2 + \text{HCl}$; (C) $\text{HCl} + \text{CH}_2\text{N}_2 = \text{CH}_3\text{Cl} + \text{N}_2$; (D) $\text{BzCHN}_2 + \text{HCl} = \text{BzCH}_2\text{Cl} + \text{N}_2$; (E) $\text{BzCl} + 2\text{CH}_2\text{N}_2 = \text{BzCHN}_2 + \text{CH}_3\text{Cl} + \text{N}_2$. Expts. showed that (C) occurred more rapidly than (D). Equations (B) and (C) represent the reaction when BzCl is added to CH_2N_2 , (E) when the chloride is added slowly to the CH_2N_2 and when 2 or more mols. of CH_2N_2 are added to 1 of BzCl . A diazoketone will be formed when an excess of CH_2N_2 is used. When equal parts of CH_2N_2 are added to BzCl the products are mainly N_2CHBz , a little BzCl and small amounts of ClCH_2Bz . This indicates that (D) is not the primary reaction and that (B) and (C) are more rapid than (D). (B) will be followed eventually by (D). A higher yield of N_2CHBz will occur if the product is worked up after a short time and a high yield of ClCH_2Bz will occur if the reagents are mixed rapidly and the mixt. is kept many hours. JOHN T. WOLF

Isomerism of the chalcones. JOSE PASCUAL-VILA. *Anales soc. españ. fis. quim.* 26, 222(1928).—The phenomena of isomerism of *cis*- $\text{PhCH}:\text{CHCO}_2\text{H}$ is found in various other substances with the chalcone group $\text{CPhC}:\text{C}(\text{O})-$, as can be seen in recent articles by Dufraisse (*C. A.* 21, 575) and others by Weygand (*C. A.* 22, 953). In the α -phenylnitrochalcones Stobbe, however, encountered examples of analogous isomerism. Accidentally P. found one in the true α -phenylchalcone and benzaldehydobenzoin. Bromobenzyldehydobenzoin, $\text{PhCOCBr}(\text{CH}_2\text{Ph})\text{Ph}$, which with AgOAc at ordinary

temp. gives isobenzaldesoxybenzoin in excellent yields (J. Pascual-Vila, *C. A.* **19**, 826), gives when boiled with KOAc in AcOH , dild. with water, extd. by ether, concd., dild. with petroleum ether and recrystd., white needles, m. $78-9^\circ$ and with the same halochromism with H_2SO_4 as isobenzaldesoxybenzoin. The latter substance is yellow. The new isomer was converted then into isobenzaldesoxybenzoin. The m. p. differs perhaps from the true m. p. by $1-2^\circ$ because of the thermometer error; it was not of sufficient interest for a redetn.

E. M. SYMMES

Chemical constituents of the fruit of *Ginkgo biloba*. I. JIPPEI KAWAMURA. Forstversuchsanstalt, Meguro bei Tokyo. *Japan. J. Chem.* **3**, 89 108(1928).—Gingkoic acid, $\text{C}_{24}\text{H}_{48}\text{O}_2$, which Schwarzenbach (*Fortschritte Chem.* **1857**, 529) stated was present in the Et_2O ext. of *Ginkgo biloba* (I), was not obtained from I by K., who believes that S.'s product was probably a mixt. of several substances. The air-dried fruit of I was extd. with Et_2O , and the Et_2O layer shaken with 5-10% Na_2CO_3 . The Et_2O soln. was then shaken with an excess of dil. NaOH, and the mixt. sepd. into an Et_2O layer (II) and an aq. alk. layer (III). II was evapd. to small vol. and cooled, whereupon there sepd. crystals of ginnol (IV), $\text{C}_{27}\text{H}_{46}\text{O}$, m. 82.5° . Ac deriv., m. $43.3.5^\circ$. IV with $\text{K}_2\text{Cr}_2\text{O}_7$ in glacial AcOH gave ginnone, m. $74-5^\circ$. Semicarbazone, m. 45.6° ; oxime, m. $49-50^\circ$. III was acidified with dil. HCl and extd. with Et_2O . After evapn. of the Et_2O , the residue was dissolved in EtOH, treated with $(\text{AcO})_2\text{Pb}$ and neutralized with NaOH. The Pb salt (V) pptd. was filtered off and washed with dil. EtOH and Et_2O . These solns. were shaken with dil. HCl, washed, dried and the Et_2O evapd. A brown sirup remained, from which crystd. bilobol, $\text{C}_{21}\text{H}_{40}\text{O}_2$, m. 36.7° . Reduced with H and Pt black it gave hydrobilobol, m. $89-90^\circ$. Acetylhydrobilobol, $\text{C}_{21}\text{H}_{38}\text{O}_2\text{Ac}$, m. 56° . Dinitrohydrobilobol, $\text{C}_{21}\text{H}_{34}\text{O}_2(\text{NO}_2)_2 \cdot \text{H}_2\text{O}$, reddish yellow, m. 68.71° . V was suspended in Et_2O and shaken with dil. HCl. Evapn. of the Et_2O layer gave a cryst. mass which was sepd. into 2 portions by means of petroleum ether. The less sol. portion was apparently hydrogingkolic (cyclogallipharic) acid (VI). The other portion was gingkolic acid (VII), $\text{C}_{21}\text{H}_{38}\text{O}_3$, m. $42-3^\circ$. VII, heated quickly to 240° in a H atm., gave CO and gingkol (VIII), b. $221-3^\circ$, d_4^{20} 0.9148, n_D^{20} 1.50217. Reduced in abs. EtOH with H and Pt black, VII gave VI, m. $86-8^\circ$. VI in glacial AcOH with concd. HNO_3 at room temp. gave $\text{C}_{21}\text{H}_{33}\text{O}_4\text{NO}_2$, yellow, m. 66.8° , with fuming HNO_3 on the water bath another NO_2 deriv., yellow, m. 55.6° . Me ester, from VI and CH_3N_3 in abs. EtOH, m. $41-2.5^\circ$. VIII reduced with H and Pt black gave hydrogingkol, m. $50.5.1^\circ$ (the mixt. with cyclogallipharol melts at the same temp.). p Nitrobenzoylhydrogingkol, m. $60.1.5^\circ$. VIII with Na and MeI in abs. EtOH gave the Me ether (IX), b. 200.3° , d_4^{20} 0.8996, n_D^{20} 1.49454. IX oxidized with KMnO_4 in Me_2CO gave a di-HO deriv., $\text{C}_{21}\text{H}_{34}(\text{OH})_2\text{OMe}$, m. $98-8.5^\circ$. The juice of the fruit of I contained 73.08% H_2O and 26.92% dry material, chiefly reducing sugar. The P in the juice was present chiefly as phosphate, the N as asparagine.

LOUISE KELLEY

Constituents of derris root. III. Tubaic acid. T. KARIYONE, K. KONDO AND K. MAKABE. *J. Pharm. Soc. Japan* **48**, 674 8(1928).—In paper II (*C. A.* **19**, 1708) it was reported that tubaic acid (I) $\text{C}_{17}\text{H}_{12}\text{O}_6$ is a monohydroxymonocarboxylic acid contg. 1 double bond. In order to det. the exact position of the double bond the ozonide reaction of I was studied. I, MeI and Ag_2O and subsequent sapon. with EtOH-KOH gave tubaic acid methyl ether (II), $\text{C}_{17}\text{H}_{14}\text{O}_6$, m. 78° . II, H_2 and Pd BaSO_4 gave the dihydro deriv. (III), m. 101° , which was also obtained by methylation of hydrotubaic acid. Trinitro deriv. of III, m. 133° . II and O_3 and subsequent decompn. of the ozonide with H_2O gave an aldehyde acid (IV), $\text{C}_{12}\text{H}_{12}\text{O}_6$, m. 98.5° . This reaction shows that I should have a $\text{CH}_2\text{:CH-}$ group attached at the end of a side chain so that the reaction can be expressed by $\text{CH}_2\text{:CHC(H}_2\text{O(OMe)CO}_2\text{H)} \rightarrow \text{OHCC(H}_2\text{O(OMe)CO}_2\text{H)}$. Of 4 O atoms, 2 belong to the CO_2H group while 1 belongs to the OH group. The remaining O atom probably forms an ether linkage. An attempt to obtain a compd. devoid of OH and CO_2H groups in order to study the nature of the remaining O atom was unsuccessful. Boiling of hydrotubaic acid (V) with HBr gave hydrotubanol, m. 121° . Mono-Ac deriv., m. 63° . V and PCl_5 and subsequent decompn. with H_2O gave chlorohydrotubaic acid (VI), m. 201° . Reduction of IV with H_2 and Pd gave desoxyhydrotubaic acid (VII), $\text{C}_{10}\text{H}_{10}\text{OC(O}_2\text{H)}$, m. 192° . Boiling of VI with HI gave chlorohydrotubanol (VIII), b. 111.2° . The mol. refraction (54.34) of VIII indicates the presence of at least 3 double bonds. The above reactions show that I has the structure $\text{C}_5\text{H}_7(\text{---CH:CH}_2)(\text{---OH})(\text{---CO}_2\text{H})(\text{>O})$.

NAO UYEI

Modern tannin chemistry. J. DEKKER. *Gerber* **54**, 113-5, 122-3, 130-2, 150-1, 155-6(1928).—A critical review. D. distinguishes 3 types of tannin, which are derivs. of gallic acid, ellagic acid and catechol, resp. Fischer's pentagalloylglucose and

pentadigalloylglucose have many properties in common with Turkish and Chinese gallotannin, resp., but are not identical with these natural products. Most natural tannins are extremely complex mixts. of related substances. In addn. to glucose other carbohydrates may be present, and other aromatic substances may replace gallic or digallic acid. Ellagic acid plays the role of gallic acid in some tannins, e. g., in myrobalam, and is present in many others, possibly combined with gallic acid in a mixed depside. The catechol tannins, e. g., gambier and acacia, are considered to be polymerization products of catechol. Recent work on the structure of catechol is discussed. Several distinct catechols probably exist. In addn. to true tannins D. distinguishes a group of substances having all the tannin reactions except the property of pptg. gelatin. These substances are derivs. of chlorogenic acid. • H. B. MERRILL.

Formation of heterocyclic compounds. III. Interaction of cyclohexanol-2-carboxylates with phenols. HERMENDRA KUMAR SEN AND UMAPRASANNA BASU. Univ. College Science Technol., Calcutta. *J. Indian Chem. Soc.* 5, 467-76 (1928); cf. *C. A.* 21, 2696.—The reaction between cyclohexanol-2-carboxylates and phenols yields benzo- α -pyrones, though according to the theory of Jacobson and Ghosh (*C. A.* 9, 2222, 2762), γ -pyrones should be expected to form. The evidence that in these reactions α -pyrones are formed, is based on the observation that keto nitriles of the type

—COCCN, when condensing with phenols, give rise to formation of imino compds.,

which yield α -pyrones on hydrolysis (*C. A.* 13, 582, 1473). By hydrolysis of the condensation product prepd. from 2-cyanocyclohexanone (I) and *m*-(HO)₂C₆H₄ (II), a compd. identical with that prepd. by condensation of II with Et cyclohexanone-2-carboxylate (III) was obtained. The behavior of the condensation products toward alkali, however, did not support the α -formula. No benzo- γ -pyrones could be prepd. in these expts., though even P₂O₅ was used as a condensing agent in some expts. 3,4-Tetrahydrobenzo-7-hydroxycoumarin (IV) (from a mixt. of II, III, and concd. H₂SO₄ at 0°, or with better yield, at room temp.), m. 202° (Dieckmann, *Ann.* 317, 27, reported m. p. 203-4°), sol. in alkali and alkali carbonates, gives no color with FeCl₃, sol. in concd. H₂SO₄ with violet fluorescence; *Ac deriv.*, m. 186-7°; *Me ether*, m. 121-2°; *Bz deriv.*, m. 157°; all 3 derivs. are insol. in alkali or alkali carbonate. Condensation of a mixt. of II and III with P₂O₅ yields tarry or resinous substances only. Dissolving IV in strong KOH soln. and refluxing on a sand bath for 5 hrs. leaves the major part of IV unchanged; only a small quantity was decompd., yielding a faintly yellow, liquid compd., whose semicarbazone m. 175-6°. By fusion of IV with KOH at 190-200° for 10 min., after dissolving in H₂O and acidifying with HCl, a compd. (V), m. 230°, was obtained, which probably is a dehydrogenated coumarin deriv. It dissolves in alkali and alkali carbonate with yellow color, gives a light green fluorescence in concd. H₂SO₄, but no color with FeCl₃; its *Bz deriv.*, m. 195°, gives a grass-green fluorescence with concd. H₂SO₄. Besides V, BzOH was isolated from the KOH fusion product. Concd. H₂SO₄ was added to a mixt. of I and II with cooling; after 36 hrs. a N-contg. compd. was isolated, m. 290°, insol. in org. solvents, sol. in concd. H₂SO₄ and alkali. Sapon. of this with 15% KOH yielded IV, identified by its m. p. and its *Ac deriv.* 3,4-Tetrahydrobenzo-7-methylcoumarin (50% from 4 g. *m*-MeC₆H₄OH, 6.5 g. III, and 25 cc. concd. H₂SO₄ with cooling), m. 119°, sol. in H₂SO₄, insol. in strong, boiling NaOH. 3.2 g. α -naphthol, 4.2 g. II¹, and 6 cc. concd. H₂SO₄ gave 3,4-tetrahydrobenzonaphthocoumarin (VI) in 100% yield, m. 190°, sol. in H₂SO₄ with yellow color and sea-green fluorescence, insol. in alkali, gives no color with FeCl₃; *NO₂ deriv.* (from 1 g. VI and 1 cc. HNO₃ in AcOH), yellow, m. 244°. By heating a mixt. of 4 g. 1,3,5-(HO)₃C₆H₃, 6 g. Et 5-methylcyclohexanone-2-carboxylate (VII), 4 cc. AcOH and 27 g. fused ZnCl₂ at 115° for 5 hrs., 75-80% of 3,4-tetrahydro-4'-methylbenzo-5,7-dihydroxycoumarin was obtained, m. 264-6°, sol. in warm alkali, gives a yellow color without fluorescence in H₂SO₄, and no color with FeCl₃. 3,4-Tetrahydro-4'-methylbenzo-5-methyl-7-hydroxycoumarin (75% from 3 g. VII, 2 g. 1,3,5-(HO)₃C₆H₃Me, and 10 cc. concd. H₂SO₄), m. 249°, sol. in NaOH and concd. H₂SO₄ with yellow color, gives no color with FeCl₃. 2.5 g. 1,2,3-(HO)₃C₆H₃ and 3.7 g. VII treated with 10 cc. concd. H₂SO₄ gave 4.8 g. of 3,4-tetrahydro-4'-methylbenzo-7,8-dihydroxycoumarin, m. 231°, sol. in alkali, gives no color with FeCl₃, sol. in H₂SO₄ with yellow color and emerald-green fluorescence. G. S.

Color and chemical constitution. XXIV. A complete investigation of the triphenylcarbinol or "aniline" dyes. JAMES MORR. *Trans. Roy. Soc. S. Africa* 17, No. 1, 51-60; cf. *C. A.* 22, 3164.—A complete series of 23 diphenyl- and triphenylcarbinol dyes has been prepd. and their absorption bands measured. They give in all 75 bands which M. explains in terms of chem. constitution as modified by varying H-ion concns. The

reference compd. is $(p\text{-HOC}_6\text{H}_4)_2\text{CHOH}$. By use of factors, 1.008 for NH_2 , when it replaces a ring OH, 1.058 for NMe_2 , and 1.025 for Ph for H of CHOH , calcd. results agree with the observed within 0.25% with 11 compds., all that can exist in a particular group; *i. e.*, aminohydroxy-, diamino-, dimethylaminohydroxy-, aminodimethylamino-, tetramethyldiaminobenzohydrols, benzaurin, aminofuchson, Doebner's violet, dimethylaminofuchson, dimethylaminofuchsonium chloride and malachite green. Ten, *i. e.*, all the possible triauxochrome triphenylcarbinols of this series were compared with the diauxochrome diphenylcarbinols and all have one of their bands almost coincident with the band of the corresponding di-Ph compd. The tri-Ph compds. employed were aurin, parafuchsin, crystal violet, aminobenzaurin, diaminofuchson, dimethylaminobenzaurin, tetramethyldiaminofuchson, dimethylparafuchsin, tetramethylparafuchsin, dimethyldiaminofuchson. M. maintains the close relationships in absorption spectra are due to the fact that electron movements causing color are (1) the same for 3-ringed sym. compds. as for 2-ringed substances with the same auxochromes, (2) nearly the same in 3-ringed substances with only 2 sym. auxochromes, (3) similar but perturbed when inactive auxochromes have different effects, (4) still more dissimilar when active auxochromes are different, *i. e.*, unsym. When 3 rings contg. the same auxochromes are present, the effect is due to only 2 of them, the other remaining almost inactive. Electronic movements causing high color cannot take place unless there is a balance or competition between 2 or more positive centers for a single electron. When 1 of the amino groups is fully ionized by mineral acid it behaves almost as if it were totally absent.

G. ALBERT HILL

Chloro derivatives of acetylene. MARTHE VINCENS. *Rev. chim. ind.* 37, 224-7, 258-60, 291-3(1928).—A review of the manuf., properties and uses of these products.

P. THOMASSET

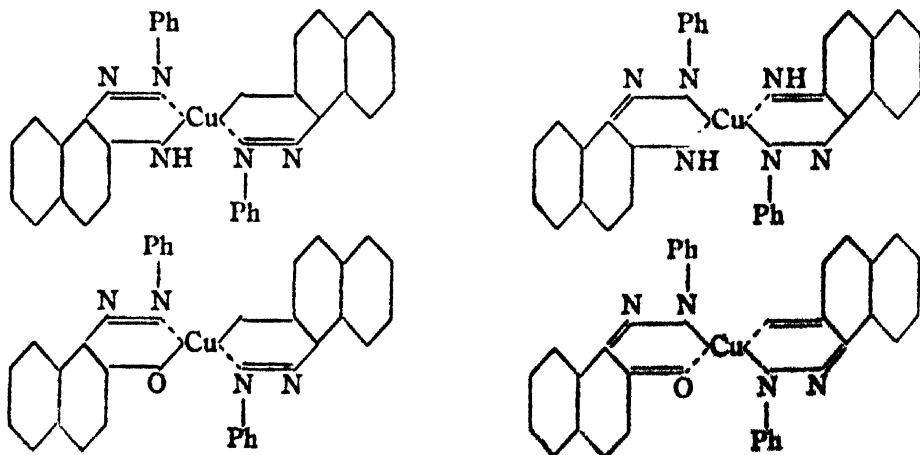
Addenda to the investigation of the half-hydrogenation of the acetylene union and the dependence of the geometrical configuration of the resulting ethylene compounds on the reaction velocity. ERWIN OTT, WITH FERDINAND SCHURMANN. *Univ. Münster i. W.* *Ber.* 61B, 2119-23(1928); cf. *C. A.* 21, 2000.—It had repeatedly been observed that in the half-hydrogenation of C_2H_2 derivs. under conditions leading to the highest possible reaction velocity the course of the reaction becomes non-uniform, a part of the C_2H_2 compd. remains unchanged and a part of the C_2H_4 deriv. formed is further hydrogenated to an C_2H_6 compd.; with a slower reaction velocity this phenomenon almost completely disappears and there is a continuously increasing sharper delimitation between the rapid hydrogenation of the acetylenes to the ethylenes and the much slower further hydrogenation of the ethylenes to the ethanes. These observations are explained by the Le Chatelier principle, much more heat being evolved in the 1st than in the 2nd reaction. Conversely the appearance of non uniformity in the course of the reaction may be taken as a direct measure of an increase in reaction velocity. If the hydrogenation of tetramethylbutinediol (I) is considered from this point of view the order given in the earlier paper for the velocities obtained with different catalysts is convincingly confirmed: (1) The non-uniformity appears with Pd only when the catalyst, after the pptn. of the metal on the carrier, has not come into contact with air; (2) with colloidal Pd there is no non-uniformity, nor with Ni animal charcoal; (3) non-uniformity is especially marked with Pt sponge (cf. Salkind, *C. A.* 21, 2459). Since the appearance of this earlier paper, Roth and Muller have repeated the detn. of the sp. heats of combustion of the most important compds. used as examples, with the following results: diphenyldiacetylene 9769 ± 2 , *trans-trans*-diphenylbutadiene 9841 ± 3 , *cis-cis*-diphenylbutadiene 9864 ± 2 , *cis-trans*-diphenylbutadiene (liquid) 9970 ± 4 cal./g.; these values confirm the order of their heats of formation which had been drawn up on the basis of the hydrogenation expts. and of the Stohmann rule. With an isostilbene from Ott's lab. they obtained a value (9800 kg. cal./g.) 15 kg. cal. lower than with a sample prepd. by Stoermer by the rearrangement of stilbene in ultra-violet light. Three fractions of another sample prepd. by catalytic half-reduction of tolan, which showed practically the same light absorption (Ley) and refraction (v. Auwers) nevertheless gave different heats of combustion (Verkade), the thermochem. method in this case proving more sensitive than the optical methods in detecting lack of homogeneity in the prepn. This again shows that with high reaction velocities, such as are necessary to obtain isostilbene and not stilbene from tolan, the course of the reaction is non-uniform. Salkind's detn. of the configuration of the butenediols obtained by half-reduction of tetraphenylbutinediol are not in harmony with Werner's rule, which has again been found to hold for the tetra-Me compds. and whose range of applicability may perhaps be extended even further than has been done by W. himself. For a comparison of m. p. relationships between *cis-trans*-isomers of the aliphatic and the corresponding *o-* and

p-substituted C_6H_4 derivs. were prep'd. ω, ω' -tetramethyl-*p*- (II) and *o*-xylyleneglycol (III). II (80% from 3 mols. $MeMgBr$ with *p*- $C_6H_4Ac_2$), m. 140° . III (10 g. from 15 g. *o*- $C_6H_4(CO_2Me)_2$ and $MeMgBr$ in C_6H_6), m. 166° . The *p*- and *o*-tetraphenylxylyleneglycols, m. 169° and 198° , resp., the *trans*- and *cis*-tetramethylbutenediols $68-9^\circ$ and $76-7^\circ$, and the *trans*- and *cis*-dihenzoylethylenes 111° and 134° . C. A. R.

Addition reactions of the ethylene double bond with the formation of ethane compounds with two asymmetric carbon atoms produced by the addition process and the influence of the reaction velocity on the course of the reaction. ERWIN ORT, WITH A. BEHR AND R. SCHRÖTER. Univ. Münster i. W. Ber. 61B, 2124-42(1928).—For a detailed study of the relations between reaction velocity and the course of the reaction in addns. to an C_2H_4 double bond was chosen the hydrogenation of dimethylfumaric (I) and dimethylmaleic acids (II) in the form of their Na salts in H_2O and of the 2 stereoisomeric dimethylstilbenes (III) in various solvents. The results, as a whole, show an undoubted analogy, in the course of the reaction, with the addn. of halogens and HO groups, but with H the picture is much less disturbed by side reactions. They indicate quite clearly that reaction in a single direction is not the rule but the exception which can be attained only by the use of reaction velocities exactly defined by the rule of reaction stages. Furthermore, the ratio of the resulting *meso*- and *dl*-products can with the fumaroid compds. be widely varied by changing the reaction velocities but with the maleinoid compds. so far studied only very little. As had already been observed with the C_2H_2 compds. (preceding abstr.) it is much easier to increase the reaction velocity than to lower it below a certain limit which is soon reached. The appearance of non-uniformity of the course of the reaction opposes, in the sense of the Le Chatelier principle, the increase in velocity only very late, while a decrease in velocity is very soon entirely offset by the complete cessation of any addn. at all. Of *cis*- and *trans*-isomers the former are usually the lower melting, more sol. and more labile, *i. e.*, richer in free energy, and addns. to them proceed with the greater velocity; it is not possible sufficiently to lower this velocity without passing below the sharply defined limit of non-reaction. Whereas with I the ratio of *meso*- to *dl*-product varies widely according as Ni or Pd is used as catalyst, with II there is practically no difference. Contrary to the Stohmann rule, of the dimethylsuccinic acids (IV) the higher-melting *meso*-form is the one richer in energy (Verkade and Coops, Jr., C. A. 22, 2871). As all the present expts. were carried out in solns. in which no racemates but only equal quantities of the optical antipodes can be present the energy contents of the active antipodes must be used in comparisons with the *meso*-forms. Verkade found for the heat of combustion of /rotatory IV 4599.2-9.7 cal./g. (*dl* form, 4597.5), *i. e.*, considerably lower than the value (4607.7 at 15°) for the *meso* form. The latter is therefore formed in preponderating amount (86-14) from the rapidly reduced II and this ratio cannot be changed by altering the conditions. I under the conditions of most rapid hydrogenation (acid salt with the most highly active Pd-charcoal) at room temp. gives 61% *meso*- and 39% *dl*-IV; by using a neutral soln. the addn. velocity is considerably diminished and the ratio becomes 30-70. By raising the temp. to 80° a ratio of 58:42 can be attained with Zn dust-AcOH also. With Ni-animal charcoal the lowest limit of decrease in reaction velocity can be attained and the *dl*-IV made the sole product. With the 1 exception above, recourse was not had to raising the temp. because the two IV can be rearranged into each other by HCl at high temps. Such a rearrangement probably also occurs in neutral solns., not only has it been proved to occur with I-II but this observation has been made use of for the most advantageous method of prep'g. I from pyrocinchonic acid. With the III it was also possible to increase the reaction velocity by raising the temp. That the liquid diphenylbutane (V) is really the *dl*-form has been definitely proved for the 1st time by its prep'n. in optically active form. The heat of combustion of the *dl*-V was found by Verkade to be 10,106-10,098 cal./g., that of the *meso*-form (by Roth) 10,064-10,085 (to which must be added 24 cal. for the heat of fusion). Thermochem. investigation of the active V has not yet been possible and moreover the sample obtained ($[\alpha]_D^{19} 20.24^\circ$) was quite certainly still contaminated with the *dl* form. *cis*-III is hydrogenated with Pd-charcoal in Et_2O at 20° with extraordinary rapidity; that the prep'n. still contained about 10% of the *trans*-form was indicated very clearly by the unmistakable decrease in the velocity of absorption of the H when about 90% had been hydrogenated; the product contained 90% *meso*- and 10% *dl*-V. In the prep'n. of the active V from the α -chloroethylbenzenes (VI) by the Wurtz-Fittig synthesis, the *dl*-VI reacts more slowly than the active form and yields relatively more *dl*-V. *trans*-III with Pd- and Ni-charcoals at 20° yields *dl*-V almost exclusively. In boiling AcOH with Pd-BaSO₄ Schlenk and Bergmann (C. A. 22, 4495) obtained only *meso*-V, but as they give no yields and O. on repeating their work obtained 35% *dl*-V and moreover

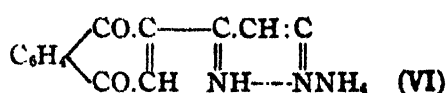
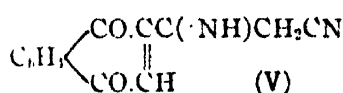
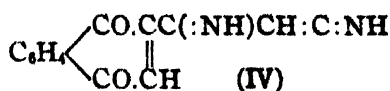
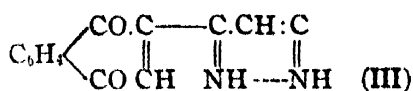
found that the catalyst was completely poisoned after the hydrogenation the results are not wholly convincing; at 180° under 40 atm. the hydrogenation was quite incomplete (with *dl*-V as the sole product) although electrolytic H in a perfectly new steel tank was used. Similarly, although S. and B. obtained only *meso*-V (yield not given) by addn. of Na to *trans*-III and subsequent decompn. with alc., O. obtained 30% *dl*-V and the addn. was incomplete. With Na and alc. at $80-5^{\circ}$ the reduction of *trans*-III was rapid and complete and gave about equal parts of *meso*- and *dl*-V; at 4° there was practically no reaction. I decomp. $244-5^{\circ}$ on rapid heating in a preheated bath. Steinhilber has found that *dl*-IV crystallizes in the monoclinic, not rhombic system, the active acids in the rhombic, very probably holohedric system; *l*-IV, $a:b:c = 0.5332:1:0.4784$. *cis*-III, obtained along with the *trans*-isomer and PhCHMeCPh:CH_2 from $\text{MeCPh}_2\text{CH(OH)Me}$ by Meerwein's method, monoclinic holohedral crystals, m. 66° .
C. A. R.

Cupric compounds of some aminoazo and hydroxyazo derivatives. A. CREMONINI, Reale Univ. Bari. *Gazz. chim. ital.* 58, 372-9(1928).—When the N derivs. of $\beta\text{-C}_{10}\text{H}_7\text{-NHCH}_2\text{Ph}$ already described (cf. Ciusa and C., *C. A.* 22, 2565) are boiled in EtOH for some hrs. with $\text{NH}_3\text{-CuSO}_4$ Cu derivs. are pptd. Thus $\alpha,\beta\text{-C}_{10}\text{H}_6(\text{N:NPh})\text{NHCH}_2\text{Ph}$ (5 g.) in 95% EtOH (500 cc.) refluxed 6 hrs. with excess $\text{NH}_3\text{-CuSO}_4$ (21 g. CuSO_4 and 240 cc. of 25% NH_4OH), filtered, washed successively with boiling EtOH, dil. NH_4OH , water and EtOH, yields a brown Cu deriv. contg. 65.78% C, 3.59% H, 10.54–10.63% N and 19.87% Cu, which is insol. in ordinary solvents, is electrified by rubbing, takes fire with cold concd. HNO_3 and does not m. up to 320° . Treated in a similar way, $\beta,\alpha\text{-C}_{10}\text{H}_6(\text{NHCH}_2\text{Ph})\text{N:N}\text{C}_6\text{H}_4\text{NO}_2\text{-}p$ ppts. a rose-violet Cu deriv. contg. 65.72% C, 3.72% H, 1.34% O, 9.69% N and 19.53% Cu. A Cu salt of phenylazo- β -naphthylamine (I) was found to differ from that prepd. by Charrier and Beretta (*C. A.* 21, 1456) $\text{CuSO}_4\cdot 10\text{H}_2\text{O}$ (5.56 g.) in 25% NH_4OH (35 cc.) boiled 1 hr. with I (10 g.) in 95% EtOH (150 cc.), filtered hot, washed successively with boiling EtOH, 10% NH_4OH , water and EtOH, and the residue recrystd. from AcMe, yields *cupridiphenylazo- β -naphthylamine*, $\text{C}_{22}\text{H}_{14}\text{N}_6\text{Cu}$ (II), greenish black with metallic reflection, when pulverized is violet-red, m. 174° , gives a violet soln. in concd. H_2SO_4 , takes fire with concd. HNO_3 , decompd. into I and CuCl_2 by dil. HCl . II is decompd. by heating 4 hrs. at $250-60^{\circ}$, yielding PhNH_2 , NH_3 , CuO , specular Cu and a brown mass. The latter extd. with water yields $\alpha,\beta\text{-C}_{10}\text{H}_6(\text{NH}_2)_2$, and then extd. with EtOH yields 2-*N*-phenyl- α,β -naphthothiazole (III). The residue from these 2 extns when extd. with C_6H_6 , $\text{C}_6\text{H}_5\text{N}$, AcOH, AcMe, etc., gives fluorescent solns., characteristic of dinaphthazines, which give blue, red or brown colors with concd. H_2SO_4 , but from which no definite compds. could be isolated. When a soln. of II in any of the solvents is left exposed to air, the violet-red soln. becomes light yellow and deposits a greenish yellow substance contg. Cu. This transformation is most rapid in Et_2O and in any of the solvents it is accelerated by heating. The soln. contains III. Phenylazo- β -naphthol (10 g.) in EtOH (800 cc.) and $\text{NH}_3\text{-CuSO}_4$ (5 g. in 35 cc. NH_4OH) form *cupriphenylazo- β -naphthol* (IV), brown, m. 288° , can be crystd. from xylene, has chem. properties similar to those of II, *e. g.* with concd. HNO_3 , dil. acids and on standing in an org. solvent. A crit. discussion of the results in conjunction with the work of other investigators leads to the conclusion that the formulas of II and IV are:



in which the Cu with secondary valences forms a hexacyclic nucleus. Photomicrographs of crystals of II and IV are reproduced.
C. C. DAVIS

The reaction of malononitrile with α -naphthoquinone. W. KASTING. ARTI-A. G. BARMEN. *Z. angew. Chem.* 41, 745-8(1928).—When $\text{H}_2\text{C}(\text{CN})_2$ (I) is allowed to act on α -naphthoquinone (II) in H_2O , a deep blue color develops (*C. A.* 22, 4315). The nature of the resulting dye is investigated in this study. The blue color also appears when the reaction takes place in alc. In Et_2O , reaction only occurs in the presence of H_2O . No reaction occurs in acid soln., while in alk. soln. a green color is formed. By acidifying the blue, neutral soln., a red, amorphous substance is pptd. By adding alkali to the blue soln., the color changes to green. Neither the blue nor the green compd. could be isolated from these solns. without decompn. The structure (III) is attributed to the blue dye, because its strong color, its soly. in H_2O , and the stability of its NH_4 salt and metallic salts are supposedly best explained by assuming that, with the aid of partial valencies, an inner complex salt is formed by the interaction of the 2 NH groups of IV. This latter is an intermediate product in the reaction and originated from V, the primary reaction product. Accordingly, the formula VI is given to the NH_4 salt



of β - α' -naphthoquinonyl- β -iminopropionitrile, prepd. by dissolving equimol. quantities of I and II in Et_2O and introducing dry NH_3 gas. The violet ppt. is pure after washing with Et_2O , sol. in H_2O and EtOH with a deep blue color, sparingly sol. in Et_2O , decolorized by H_2S , NaHSO_3 or $\text{K}_2\text{Cr}_2\text{O}_7$. It dyes wool in a neutral soln. or a soln. slightly acidified with AcOH , but the color is not stable. *HCl addn. product* (VII), from VI by dissolving it in cold H_2O and adding HCl . The red ppt. is dissolved in Et_2O , and the ether evapd. in a desiccator contg. HCl . It forms rust-brown scales, stable in a dry state. β - α' -Naphthoquinonyl- β -iminopropionitrile (III), from pulverized VII by allowing it to lie in humid air till it has a pure, blue color, washed with Et_2O , m. above 250° (decompn.). *Ag salt*, brownish black powder of metallic glitter, sparingly sol. in H_2O with blue color, sol. in NH_4OH . G. SCHWOCH

Fission of the furan ring. III. R. TAKAMOTO. Tokyo Imp. Univ. *J. Pharm. Soc. Japan* 48, 686-92(1928).—In papers I (*C. A.* 21, 3362) and II (*C. A.* 22, 3162), T. has shown that furan derivs. with a basic side chain give primary alcs. by fission of the ring by catalytic reduction and the resulting alcs. after conversion into mono-Br substitution products can be converted into higher-membered cyclic compds. by means of an alkali. Thus, $\text{C}_4\text{H}_5\text{OCH}_2\text{NH}_2$ was converted into $\text{HO}(\text{CH}_2)_4\text{NH}_2$ and then into piperidine, and $\text{C}_4\text{H}_5\text{O}(\text{CH}_2)_2\text{NH}_2$ was changed into $\text{HO}(\text{CH}_2)_6\text{NH}_2$ and then into $(\text{CH}_2)_6\text{NH}$. In this paper a new compd. *furylpropylamine* (I) (b_{20} , $34-5^\circ$, b_{714} $172.5-30^\circ$, *picrate*, m. $165-6^\circ$; *picrolonate*, m. $231-2^\circ$) was found to give the same series of reactions. Reduction of $\text{C}_4\text{H}_5\text{OCH}:\text{CHCH}:\text{NOH}$ with Na-Hg gave I, which on reduction with H_2 and PtO_2 , with FeCl_2 as a promoter, gave almost quant. *tetrahydrofurylpropylamine* (II), b_{20} $39-40^\circ$, b_{714} $186-7^\circ$. *Picrate*, m. $136-7^\circ$. *Picrolonate*, m. $176-7^\circ$. Further reduction of II with PtO_2 and a H_2 pressure of 1.5-2.0 atms. resulted in the fission of the ring and gave η -hydroxyheptylamine (III) $\text{HO}(\text{CH}_2)_7\text{NH}_2$, b_{15} $130-1^\circ$. *Chloroplatinate*, m. $165-6^\circ$. III and PBr_3 gave η -bromoheptylamine- HBr , m. $84-5^\circ$, which with an alkali gave the free base (IV), b_{100} $161-2^\circ$, b_{25} $29-30^\circ$. *Picrate*, m. $102-3^\circ$. Heating of IV, with satd. aq. KOH gave heptamethylenimine (V), $(\text{CH}_2)_7\text{NH}$, b_{25} $43-4^\circ$, b_{714} $174-5^\circ$. *Chloroplatinate*, m. $218-9^\circ$; *guaiacolate*, m. $138-9^\circ$; *N-Bz deriv.* b_{25} $162-25^\circ$; *NO deriv.* (VI), b_{25} $108-9^\circ$. Reduction of VI with PtO_2 and H_2 gave *N-aminoheptamethylenimine* $b_{15.5}$ $54-5^\circ$. *Chloroplatinate*, m. $207-8^\circ$. NAO UYEH

Condensation of pyrrole with aliphatic ketones. TH. SABALITSCHKA AND H. HAASE. *Arch. Pharm.* 266, 484-92(1928).—By the more or less modified procedures of v. Baeyer, more particularly of Dennstedt and Zimmermann, the following compds. of pyrrole with various aliphatic ketones have been prepd. and characterized. Thus, with AcMe the compd.: tetraacetone-tetrapyrrole, $\text{C}_{28}\text{H}_{24}\text{N}_4$, m. 296° (darkening); with AcEt : tetraethylethylketone-tetrapyrrole, $\text{C}_{28}\text{H}_{24}\text{N}_4$, m. 149° (Dennstedt and Zimmermann, 142°); *tetradieethylketone-tetrapyrrole*, m. 208° ; *tetra-*

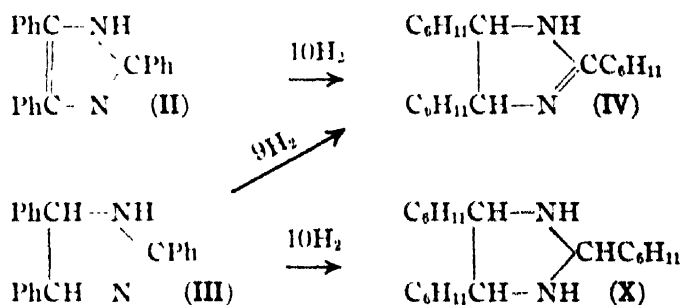
methylpropylketone-tetrapyrrole, m. 226°; *tetraethylpropylketone-tetrapyrrole*, m. 219°; *tetramethylbutylketone-tetrapyrrole*, m. 193-4°; *tetraethylisobutylketone-tetrapyrrole*, m. 199°; *tetraethylbutylketone-tetrapyrrole*, m. 205-6°; *tetramethylhexylketone-tetrapyrrole*, m. 178°. The compd. with AcEt yields with CrO_3 in aq. AcOH maleinimide. Distd. with Zn dust the AcMe compd. gave a substance volatile with steam, b. about 175°, reddening on standing, and having the compn. $\text{C}_7\text{H}_{11}\text{N}$. W. O. E.

d-Borneol and cis-terpinol from the distillation residues of turpentine oil-sulfate. WALTER QVIST. *Chemisch-tech. Inst. Akad. Abo, Finland. Biochem. Z.* **197**, 476-81(1928). S. MORGULIS

Synthesis in the pyrazolone series. Action of thiosemicarbazide and semicarbazide on ketonic esters. II. SATIS, CHANDRA DE AND NIRODE CHANDRA DUTT. *Dacca Univ. J. Indian Chem. Soc.* **5**, 459-65(1928).—Continuing their expts. on condensation of carbazides with ketonic esters (*C. A.* **21**, 2128), D. and D. studied the interaction of $\text{OC}(\text{NH}_2)\text{NHNH}_2$ (I), $\text{SC}(\text{NH}_2)\text{NHNH}_2$ (II), and their 4-substituted derivs. with $\text{BzCH}_2\text{CO}_2\text{Et}$ (III), and $(\text{EtO}_2\text{CCAcH})_2$ (IV), resp.; further on, the reaction between 4-substituted carbazides and $\text{AcCH}_2\text{CO}_2\text{Et}$ (V). In none of these reactions could the intermediate hydrazone be isolated. The condensation of IV with carbazides yielded bispyrazolones exclusively. To III in alc. was added 1 mol HCl salt of II in H_2O . The mixt. was shaken, 1 mol. AcONa added, and allowed to stand for 2 days. Solid 3-phenylpyrazolone-1-thiocarbamide (VI) seps out, m. 161° after recrystn. By heating III in alc. with 1 mol. of the HCl salt of II in a small quantity of AcONa, VI was obtained in an easier way. 4,4-Dibromo-3-phenylpyrazolone-1-thiocarbamide (from VI and an excess of Br in AcOH), light orange-red, shrinks at 130° with slow liberation of Br. NaNO_2 with VI in AcOH gives 4-isontroso-3-phenylpyrazolone 1 thiocarbamide, yellow, m. 174°, of acid reaction, sol in alkali. 3-Phenylpyrazolone-1-thiocarbophenylamide (from $\text{PhNHCS}(\text{NHNH}_2)$ and 1 mol III in EtOH), m. 127°. 3-Phenylpyrazolone-1-thiocarbo-p-tolylamide (from *p*- $\text{MeC}_6\text{H}_4\text{NHCS}(\text{NHNH}_2)$ and 1 mol III in EtOH), m. 106°. 3-Phenylpyrazolone-1-thiocarboethylamide (from $\text{EtNHCS}(\text{NHNH}_2)$ and III in EtOH), m. 136°. 3-Phenylpyrazolone-1-carbamide (VII), m. 179°, was prepd. similarly to VI. When heated in a sealed tube with HCl and EtOH at 120-30° for several hrs., VII is transformed to 3-phenylpyrazolone. From VII and Br in AcOH, there results the 4,4-di-Br deriv., m. 144°. 4-Isonitroso deriv. (from VII and NaNO_2 in AcOH), yellow, m. 204°. By condensation of IV with 2 mols I in aq. alc. AcONa, 4-bis-3-methylpyrazolone-1-carbamide, m. 128°, was prepd. At its m. p., it is at once converted into bis-3-methylpyrazolone, m. 290°. II heated with 1 mol IV in EtOH yielded 4-bis-3-methylpyrazolone-1-thiocarbamide, m. 197°. 4-Bis-3-methylpyrazolone-1-thiocarbophenylamide (from $\text{PhNHCS}(\text{NHNH}_2)$ and 0.5 mol IV), m. 191°. 4-Bis-3-methylpyrazolone-1-thiocarbo-p-tolylamide (from *p*- $\text{MeC}_6\text{H}_4\text{NHCS}(\text{NHNH}_2)$ and 0.5 mol IV), m. 201.2°. 4-Bis-3-methylpyrazolone-1-thiocarboethylamide (from $\text{EtNHCS}(\text{NHNH}_2)$ and 0.5 mol IV in EtOH), m. 191°. 3-Methylpyrazolone-1-thiocarbophenylamide, m. 117°, was prepd. from $\text{PhNHCS}(\text{NHNH}_2)$ and V by heating in EtOH. Similarly were obtained 3-methylpyrazolone-1-thiocarbo-p-tolylamide (from *p*- $\text{MeC}_6\text{H}_4\text{NHCS}(\text{NHNH}_2)$ and V), m. 121°; and 3-methylpyrazolone-1-thiocarbomethylamide (from $\text{MeNHCS}(\text{NHNH}_2)$ and IV), m. 84°. G. SCHWOCH

Hydrogenation of the imidazole ring. E. WASER AND A. GRATSOS. *Univ. of Zürich. Helv. Chim. Acta* **11**, 944-64(1928).—Up to the present, attempts to reduce imidazole (I) and its derivs. directly to compds. richer in H have not been successful. W. and G. were unable to reduce catalytically I, histidine, 2,4,5-trimethylimidazole, benzimidazole or lysidine, but did reduce lophine (II) and amarine (III). In the prepn. of I they found that the use of $\text{C}_{15}\text{H}_{16}$ as heat carrier in the decarboxylation of imidazoledicarboxylic acid increased the yield from 50 to 80% (cf. *C. A.* **20**, 1067). The time required for the hydrogenation of II was shortened (1) by careful purification of II, (2) by frequent activation of the catalyst by shaking with air for a few min., and (3) by the addn. of a little hydrolophine (IV). In the presence of a few mg. of IV, 23 g. II could be hydrogenated in about 190 hrs. To 1.028 g. II dissolved in 30 cc. very pure glacial AcOH was added 0.758 g. Pt black. The mixt. was shaken in an atm. of H at room temp. and under a slight excess pressure (50 cm. H_2O column). During the 14 hrs. of hydrogenation the catalyst was activated 3 times. The H taken up corresponded to 10 mols. H_2 per mol. of II. The product was the acetate (V) of IV, m. 162.3° (cor.). When left in a vacuum at 100-20° for several hrs. V was converted into IV. IV may also be obtained from the AcOH soln. of V by cooling, adding KOH until alk., and filtering off the pptd. IV. IV, m. 211.3° (cor.), can be distd. without decomposition. Its alc. soln. was strongly alk. to litmus. The following derivs. were prepd.: HCl salt, m. 208-70°; HBr salt, m. 290.2°, chloroplatinate, yellowish red, m. 251-2°; pic-

rate and picrolonate did not crystallize well; *styphnate*, yellow, m. 201–2°; *nitroso deriv.*, m. 175° (decompn.), when warmed with alc. HCl on water bath gave the HCl salt. IV on careful oxidation with CrO₃ gave C₆H₁₁CONH₂. From the product of the reaction of 14 g. V with 150 cc. HNO₃ (d. 1.4) was obtained 2 g. adipic acid, 0.5 g. of a yellow solid, m. 249.5–51° and contg. 2 NO₂ groups, and a red oil which did not crystallize and decompd. on distn. IV when ozonized gave products of undetd. constitution. When IV in CCl₄ was titrated with Br-CCl₄, 1 mol. Br was added, giving the HBr salt (VI) of IV, yellow, m. 287°. With a large excess (3 mols.) of Br, the product was *hydrolophine perbromide-HBr* (VII), orange, m. 162°. VII was very labile. On addn. of petroleum ether contg. unsatd. compds., the orange color disappeared at once and VI was pptd. Heated at 70–220°, VII lost Br, giving VI. *Warmed on the water bath with alc. KOH, VII was converted into IV. By the action of Br on II no well-characterized Br addn. or substitution product could be obtained. III in CHCl₃ added 3 atoms Br per mol., giving *amarine perbromide-HBr* (VIII), dark red, m. 122° (decompn.). VIII when treated with impure petroleum ether gave the HBr salt (IX) of III, m. 264° (uncor.). Heated slowly at about 220°, VIII gave IX and 2 mols. HBr. VIII when warmed with 10% alc. KOH on the water bath was converted into II (86% yield). This affords a new method for prep. II. When 35 g. III was reduced with H and Pt black in the presence of a small quantity of already hydrogenated material, 1 mol. III took up 9.72 mols. H₂ in about 320 hrs. The product (m. 150–80°) was a mixt. which could be easily sepd. into its components by Me₂CO. From the hot soln. in Me₂CO crystd. hydroamarine (X), m. 171–2° (cor.). Its alc. soln. gave a strongly alk. reaction. X did not react with KMnO₄ or Br. The other product, obtained by evapn. of the Me₂CO mother liquor from X, was IV. The following derivs. of X were prepd.: *HCl salt*, sinters 292°, m. 302° (decompn.); *HBr salt*, m. 296° (decompn.); *acetate*, m. 152–3°; *chloroplatinate*, yellow, m. 216.5–7°, loses 4H₂O at 110°; *styphnate*, yellow, m. 168.5–9.5°.

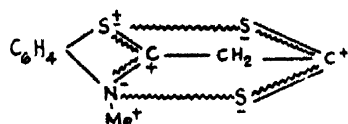


LOUISE KELLEY

Oximes of *N*-methyl-2-benzothiazolone and of *N*-methyl-2-quinolone. KARL FUCHS AND EGON GRAU AUG. Univ. Wien. *Ber.* 61B, 2194–7(1928).—The oximes of a no. of heterocyclic ketones cannot be prepd. by the usual methods (treatment of the ketone or thioketone with NH₂OH). Recently F. and G. showed that hydrazones of *N*-methyl-2-quinolone (I) are readily obtained from 2-iodoquinoline-MeI (II) (C. A. 22, 1358) and they now find that with NH₂OH it readily yields the *oxime* (III) of I. 2-Iodobenzothiazole-MeI (IV) likewise yields *N*-methyl-2-benzothiazolone *oxime* (V). III dissolves in dil. acids, without color, forming *N*-methyl-2-quinolyldihydroxylamine salts, and is reprecipitated by alkalis. It is hardly attacked by long boiling with concd. HCl and dissolves without change in cold concd. H₂SO₄; on long heating at 90° in concd. H₂SO₄ it is apparently sulfonated in the C₆H₄ nucleus, diln. with H₂O giving after a time white crystals sol. in alkalis with yellow color. III dissolves in hot alkalis with reddish yellow color and seps. unchanged on cooling. It can be reduced to 2-aminoquinoline-MeI with SnCl₂ in concd. HCl. IV (about 85% from 2-chlorobenzothiazole and MeI at 80°), Cu-colored. V (yield, 70%), faintly yellow, m. 202–3° *in vacuo* (effervescence) sol. in C₆H₅N with yellow color. III, intensely yellow, m. 180.5–1.5° *in vacuo* (effervescence); *HCl salt*, m. 230–2° (decompn.) *in vacuo*; *perchlorate*; *Na salt*, orange-yellow, immediately decompd. into the free III and NaOH by H₂O. C. A. R.

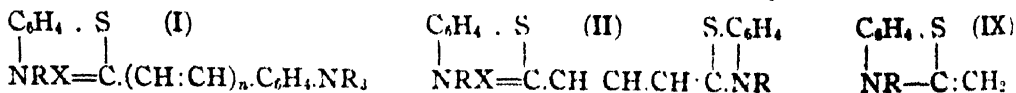
A simplified method for preparing substituted μ -methylbenzothiazoles and their conversion into new heterocyclopolyimethine dyes. W. KÖNIG, with P. SEIDEL AND G. STÜMMER. Sächs. Techn. Hochschule Dresden. *Ber.* 61B, 2065–74(1928).—In connection with certain investigations on color and constitution it was desired to have dyes of the types I and II in which the C₆H₅ ring of the benzothiazolyl residue is substituted. The starting materials were the salts (perchlorates, iodides, bromides, etc.) of the hypothetical bases 5-chloro- (III), 6-chloro- (IV), 6-bromo- (V), 6-methoxy- (VI),

6-methoxy-5(?)-chloro- (VII) and 6-chloro-4-methyl-[1,2-dimethylbenzothiazolium hydroxide] (VIII). The parent tertiary cyclamines of these quaternary salts were prepd. by the usual methods (for IV, V and VI by oxidation of the corresponding thioacetanilides by Jacobson's method, for III by acetylating reduction of [4,2-Cl(O₂N)C₆H₃]₂S₂).



(XI)

Later it was found that a no. of these γ -methylbenzothiazoles can be prepd. much more conveniently from the aq. alk. solns. of *o*-aminophenyl mercaptans obtained by treating salts of aromatic primary amines with S₂Cl₂. These solns. with Ac₂O give the thiazoles directly. The bases are in all cases smoothly converted into the quaternary salts by Me halides or Me₂SO₄; the products obtained with the latter are converted into the well-crystd. perchlorates with NaClO₄. In some cases the corresponding methylene bases (IX) were isolated in pure cryst. form and in part converted into the characteristic CS₂ derivs. (X) whose fine structure is best represented by XI, which represents them as betaine-like salts with a colored benzothiazolium cation and a likewise colored dithioacetate anion, mutually combined intramol. As regards the change in color produced by C₆H₅ ring substituents in I and II, it was found that halogen atoms in the *p*-position to the N produce a quite distinct positive shift in the color tone of the sym. I. Cl in the 6-position (*m* to N, *p* to S) is somewhat more weakly bathochromic. MeO groups in the *p*-position to the N produce a still more marked positive shifting. Me groups in the 7- or 7'-position (adjacent to the N) are weakly hypsochromic. The absorption curves of all these new thiocyanines greatly resemble those of thiazole purple; they show in the visible spectrum a strong band which in thin layers has 2 sharp max., the more persistent lying towards the longer wave lengths. The simplest *strepto*-monovinylene-thioflavines (II) are influenced in the same sense, although not so markedly, by substituents on the C₆H₅ ring. These dyes all color tannated cotton more or less violet-red; their absorption curves have in the visible region only a single, relatively broad, non-resolvable band. 5-Chloro-2-methylbenzothiazole (40% from [4,2-Cl(O₂N)C₆H₃]₂S₂ slowly treated under a reflux with Ac₂O and Zn dust), m. 62°, methiodide, light gray, m. 212°; perchlorate, m. 192°; methylene base, from the methiodide in Me₂CO suspension with concd. NaOH, yellow, m. 158°. 6-Chloro-2-methylbenzothiazole (30% from *p*-ClC₆H₄CSNHAc in NaOH with K₃Fe(CN)₆ or 20% from the product obtained from PhNH₂·HCl with S₂Cl₂ slowly heated to 70° in aq. alc. NaOH (in the presence of Na₂S₂O₃), rapidly filtered from the Na₂SO₃ and allowed to stand overnight with Ac₂O), m. 81°; methiodide, pale green, m. 222°, methobromide, m. above 270° (decompn.), perchlorate, m. 198°; methylene base, yellowish, m. 145°; CS₂ addn. product, orange, decomp. above 275°. 6-Bromo-2-methylbenzothiazole (25% from *p*-BrC₆H₄CSNHAc) methiodide, m. 208°; perchlorate, m. 216°; methylene base, yellowish, m. 148°. 6-Methoxy-2-methylbenzothiazole, b₂₀ 170°, b₂₅ 176°, b. 284° (slight decompn., assuming an unpleasant odor and strong green fluorescence); picrate, m. 176°; methobromide, m. 248° (decompn.); methiodide, m. 228°; perchlorate, m. 196°; methylene base, yellowish, m. 135°; CS₂ addn. product, yellow, m. 239° (decompn.). On distg. the above benzothiazole there remained a small quantity of cryst. 6-methoxy-5(?) -chloro-2-methylbenzothiazole, m. 69°; methiodide, m. 215°. 6-Chloro-2,4-dimethylbenzothiazole (12 g.



from 30 g. of the product obtained from *o*-MeC₆H₄NH₂·HCl and S₂Cl₂), m. 79°; methiodide (obtained in only 20% yield), m. 244°. 3-Methyl-2-*p*-dimethylaminobenzylidene methyl-6-chlorobenzothiazolium bromide, from *p*-chlorodimethylbenzothiazole-MeBr refluxed with 1 mol *p*-Me₂NC₆H₄CHO and the least possible quantity of Ac₂O, violet, m. 249°, shows in the bluish red alc. soln. an absorption band at 537μ, dissolves in concd. H₂SO₄ with yellow color, is decolorized by concd. alkalis. 6-MeO analog, violet, m. 255°, has an absorption max. in alc. at 521μ. 5(?) -Chloro-6-methoxy iodide, dark red, m. 214°, with an absorption max. in EtOH at 534μ. 3,4-Dimethyl-2-*p*-dimethylaminobenzylidenemethyl 6-chlorobenzothiazolium iodide, red-violet, m. 234°, with an absorption max. at 534μ. 1,1'-Dimethyl-6,6'-dichloro-*strepto*-monovinylene-2,2'-thiocyanine iodide, from 5-chloro-2-methylbenzothiazole-MeI refluxed with 1 mol HC(OEt)₃ in a sufficient quantity of Ac₂O for soln., needles with blue luster, decomp. above 270°, has a chief absorption band at 563μ and a secondary band at 526μ, is decolorized by excess of mineral acids and decompd. by much boiling NaOH. 5,5'-

Di-Cl analog, decomps. 286° , has absorption max. at 575 and 541μ . *6,6'-Dimethoxy perchlorate*, needles with steel-blue luster, decomps. about 290° , forms a deep blue alc. soln., shows a sharp main band at 628μ and a secondary band at 574μ . *5,5'-Dibromo iodide*, needles with steel-blue luster, decomps. 280° , with mag. in alc. at 574 (chief band) and 540μ . *1,1',7,7'-Tetramethyl-5,5'-dichloro iodide*, dark red needles with metallic luster, m. 243° , shows in alc. sharp bands at 562 and 529μ . C. A. R.

Sesamin. S. H. BERTRAM, J. P. K. VAN DER STEUR AND H. I. WATERMAN. Techn. Hochschule, Delft. *Biochem. Z.* 197, 1-7(1928).—Sesamin, according to its properties,

reactions and analyses, has the structure $3,4\text{-CH}_2\text{O}_2\text{C}_6\text{H}_3\text{CH}_2\text{OCH}(\text{CH}_3)_2\text{CH}(\text{CH}_3)_2\text{O}_2\text{CH}_2$. Its

$$\begin{array}{c} \alpha' \qquad \alpha \\ | \qquad | \\ \text{CH}_3-\text{CH}_2 \end{array}$$

 mol wt., $\text{C}_{18}\text{H}_{16}\text{O}_6$, is 312, m. 122.7° ; $[\alpha]_D^{25} 72.77^{\circ}$, heat of combustion 6565 cal./g., d. 1.307, soly. in alc. 0.27 g. at $20-3^{\circ}$ or 8.07 g. per 100 cc. at the boiling temp.

S. MORGULIS

Basic nitrogen compounds from Fushun shale tar. II. TAKASHI EGUCHI. *Bull. Chem. Soc. Japan* 3, 227-34(1928); cf. C. A. 21, 3197.—The light fractions from the Fushun shale tar consist chiefly of basic compds. of the pyridine series rich in α - and γ -alkyl derivs. By fractional distn., followed by a fractional crystn. of the picrates in alc., the following compds. were isolated: 4-Methylpyridine, completely miscible with H_2O , $b_{760} 145.45-547^{\circ}$, $d_4^{25} 0.9502$, $n 1.5029$, 1.4986, 1.5143, 1.5240 for D, C, F and G' at 25° , picrate, m. 167° . Oxidation with KMnO_4 gives isonicotinic acid. 3-Methylpyridine $b_{760} 144.17-4.18^{\circ}$, $d_4^{25} 0.9518$, $n 1.5038$, 1.4994, 1.5155, 1.5256 (picrate, m. 149°), gives the double salts. $(\text{C}_6\text{H}_7\text{N.HCl})_2\text{PtCl}_6$, m. 208° , $\text{C}_6\text{H}_7\text{N.HCl.AuCl}_4$, m. 187° , $\text{C}_6\text{H}_7\text{N.HCl.HgCl}_2$, m. 145.6° , $\text{C}_6\text{H}_7\text{N.HCl.2HgCl}_2$, m. 146° , $\text{C}_6\text{H}_7\text{N.HCl.3HgCl}_2$, m. 170° , oxidizes to nicotinic acid. 2,3-Dimethylpyridine, sol. in 10 parts H_2O at 23° , $b_{760} 160.7^{\circ}$, $d_4^{25} 0.9419$, $n 1.5057$, 1.5014, 1.5172, 1.5272 (picrate, m. 188°), oxidizes to quino-
 line acid. 2,5-Dimethylpyridine, sol. in 12 parts H_2O at 23° , $b_{760} 156.82-88^{\circ}$, $d_4^{25} 0.9261$, $n 1.4982$, 1.4939, 1.5095, 1.5194 (picrate, m. 167° ; $(\text{C}_7\text{H}_9\text{N.HCl})_2\text{PtCl}_6$, m. 211° , $\text{C}_7\text{H}_9\text{N.HCl.6HgCl}_2\cdot\text{H}_2\text{O}$, m. 203°), oxidizes to isonicotinic acid. 3,5-Dimethylpyridine, $b_{60} 171.6^{\circ}$, $d_4^{25} 0.9385$, $n 1.5032$, 1.4988, 1.5146, 1.5244 (picrate, m. $170-2^{\circ}$), oxidizes to nicotinic acid. 3,4-Dimethylpyridine, sol. in 20 parts H_2O at 22° , $b_{760} 178.82^{\circ}$, $d_4^{25} 0.9537$, $n 1.5099$, 1.5055, 1.5209, 1.5305 (picrate, m. 163° ; $(\text{C}_7\text{H}_9\text{N.HCl})_2\text{PtCl}_6$, m. 276° ; $\text{C}_7\text{H}_9\text{N.HCl.3HgCl}_2\cdot 2\text{H}_2\text{O}$, easily sol. in hot, slightly in cold H_2O , m. $150.5-131^{\circ}$; $\text{C}_7\text{H}_9\text{N.HCl.AuCl}_4$, m. 187°), oxidizes to cinchomeronic acid. 2,4-Methylpyridine, slightly sol. in H_2O , $b_{760} 179.80^{\circ}$, $d_4^{25} 0.9130$, $n_D^{25} 1.4953$ (picrate, m. 178.80°), oxidizes to lutidinic acid. 2,3,6-Trimethylpyridine, sol. in 32 parts H_2O at 26° , $b_{760} 172.88-290^{\circ}$, $d_4^{25} 0.9220$, $n 1.5018$, 1.4976, 1.5133, 1.5232 (picrate, m. $147-8^{\circ}$; $\text{C}_8\text{H}_{11}\text{N.HCl.AuCl}_4$, m. 139° , $(\text{C}_8\text{H}_{11}\text{N.HCl})_2\text{PtCl}_6$, blackens at 220° ; $\text{C}_8\text{H}_{11}\text{N.HCl.6HgCl}_2$, m. 165°), oxidizes to 2,3,6-pyridinetricarboxylic acid.

A. L. HENNE

The Döbner reaction. GINO CARRARA. Lab. Lepetit Farmaceutici, Garressio (Italy). *Gazz. chim. ital.* 58, 309-17(1928).—The explanation given by Döbner (cf. *Ann.* 240, 270; 249, 98; *Ber.* 25, 2864; 29, 59; 32, 2276), for the reaction between aromatic aldehydes, amines and AcCO_2H is unsatisfactory in several ways, particularly since it does not explain the low yields of quinoline- γ -carboxylic acids or the high yields of resins. Expts. on the analysis of such a resin are described, the results leading to a hypothesis of the reaction which takes place. AcCO_2H (40 g.) added dropwise to a boiling mixt. of PhNH_2 (67 g.), pure BzH (76 g.) and 95% EtOH (1.2 l.), refluxed 5 hrs., the EtOH distd. off, filtered, the residual resin washed with 95% EtOH (500 g.), yields approx. 100 g. of a viscous, brown resin. This resin boiled for 1 hr. with aq. Na_2CO_3 (40 g. in 700 cc. water), cooled, decanted, the decanted liquor clarified with animal charcoal, made acid with HCl , filtered, the residue dissolved in boiling dil. HCl (50 cc. concd. HCl + 100 cc. water), again purified with animal charcoal, filtered, let stand 24 hrs., the ppt. boiled with aq. Na_2CO_3 (7 g. in 100 cc. water), the soln. purified with animal charcoal, filtered, the filtrate acidified with dil. HCl , and the ppt. recrystd. from EtOH , yields about 3 g. of phenylquinolinecarboxylic acid. Fresh resin (*loc. cit.*) (500 g.) (after treatment with alkali as described above) boiled 1 hr. with concd. HCl (1.25 kg.) and water (2 kg.), decanted, the liquid boiled with animal charcoal (30 g.), filtered, the residue treated with HCl (500 g.), dild. with water (1 l.), the filtrates united, let stand 24 hrs., the ppt. (approx. 700 g.) suspended in water (1 l.), warmed, made alk. with 10% NaOH , the crude base (100-120 g.) sepd., dried, distd. *in vacuo* (204° at 65 mm.), and the crystd. distillate recrystd. from boiling 80% EtOH , yields 80-90 g. of

PhCH_2NHPh . The latter (20 g. in 50 cc. CHCl_3) treated with cold Br in CHCl_3 (21 vol.-% Br) until an orange color, absorbs 18 g. of Br, and by distn. of the CHCl_3 and recrystn. of the residue from AcOH yields bromobenzylaniline, m. 168° (the same as reported in the literature). With dil. alkalis it eliminates HBr, with formation of a compd., which m. 53° , and which is to be investigated. PhCH_2NHPh (20 g.) in AcOH (200 cc.) treated during 1 hr. with NaNO_2 (15 g.), water (200 cc.) added dropwise and the ppt. recrystd. from AcOH, yields 23 g. of the NO deriv., m. 59° (the same as reported in the literature). AcCO_2H and PhCH:NPh (equimol. parts) let stand 24 hrs. in cold EtOH give a ppt. which, washed with EtOH and recrystd. by soln. in a min. of CHCl_3 , and addn. of MeOH or EtOH, yields $\text{CO.CO.NPh.CHPh.CH}_2$, m. 160° (cf. Skita and

Wulff, C. A. 21, 2882; Bodforss, C. A. 21, 2902). The latter (25 g.) boiled 12 hrs. with BzH (11 g.), PhNH_2 (9 g.), EtOH (300 cc.) and AcOH (50 cc.), the EtOH distd. off, dild. with water, let stand 24 hrs., decanted, the residue extd. several times with Na_2CO_3 , the ext. decolorized with animal charcoal, filtered, HCl (1:5) added, the ppt. washed with EtOH and purified by soln. in Na_2CO_3 , decolorization and pptn. with HCl, yields 6-7 g. of α -phenylquinoline- γ -carboxylic acid, m. $209-10^\circ$ (the same as reported in the literature). The formation of PhCH_2NHPh from Bz, PhNH_2 and AcCO_2H suggests a hypothesis to explain the reaction. AcCO_2H first combines with PhCH:NPh , in a way similar to an aldol condensation, to form $\text{HO}_2\text{C.COCH}_2\text{CHPhNHPh}$, the latter then forming the corresponding lactam, viz., $\text{CO.CO.NPh.CHPh.CH}_2$ (*loc. cit.*). The

lactam should then be converted into $\text{HO}_2\text{CCH(OH)CH.CPhNHPh}$, which in turn with PhCH:NPh would undergo double cyclic aldol condensation, thus: $\text{PhCH:NPh} + \text{HO}_2\text{CCH(OH)CH.CPhNHPh} \rightarrow \text{PhN:CPhCH[CH(OH)CO}_2\text{H]CHPhNHPh} \rightarrow$
 $\text{C}_6\text{H}_4 \begin{matrix} \text{CH(CO}_2\text{H)} \\ \diagup \quad \diagdown \\ \text{N} : \text{CPh} \end{matrix} \text{CHCHPhNHPh}$. The latter is unstable and decomp. to $\text{PhCH}_2\text{-NHPh}$ and $\text{C}_6\text{H}_4\text{C(CO}_2\text{H).CH.CPh:N}$. C. C. DAVIS

Atophan derivatives. II. Reduction of 2-anisyl- and 2-phenylquinolines. T. KAKU. Keijo Imp. Univ., Seoul, Korea. *J. Pharm. Soc. Japan* 48, 693-702(1928).—The derivs. of 2-anisyl- or 2-phenyl-quinoline previously obtained by K. (C. A. 21, 3622) were reduced by (a) Sn and HCl, (b) PtO_2 or Pt black and H_2 and (c) Na and EtOH. The 1st method gave only a small yield of tetrahydro compds. and the 2nd method gave only 60-70% in 20 hrs., whereas the 3rd method gave the reduction products almost quant. The statement of Bamberger (*Ber.* 23, 1142) and Yamaguchi (C. A. 21, 2696) that the reduction of quinoline compds. by Na and EtOH gives only py-tetrahydro compds. without reduction in the C_6H_4 ring has been confirmed. The reduction products obtained are colorless crystals or oils, insol. in H_2O , sol. in EtOH, Et_2O and other org. solvents. Their m. p. is about $25-6^\circ$ and their b. p. about $10-19^\circ$, lower than those of the unreduced mother substances. Their basicity is slightly stronger than that of the original compds. All salts of halogen acids m. above 200° (decompn). The following new compds. were prepd: 2-anisyl-py-tetrahydroquinoline, m. $68-9^\circ$, b_{18} $242-3^\circ$. HCl salt, m. $225-6^\circ$. HBr salt, m. $230-1^\circ$. HI salt, m. $210-1^\circ$. 6-Methyl-2-phenyl-py-tetrahydroquinoline, m. 44.5° , b_{17} 220° . HCl salt, m. $228-9^\circ$. HBr salt, m. 253° . HI salt, m. $254-5^\circ$. 6-Methyl-2-anisyl-py-tetrahydroquinoline, m. 85° , b_{18} 246.5° . HCl salt, m. 249° . HBr salt, m. $249-50^\circ$. HI salt, m. $239-40^\circ$. 7-Methyl-2-phenyl-py-tetrahydroquinoline, m. 57° , b_{18} $220-1^\circ$. HCl salt, m. 220° . HBr salt, m. 234° . HI salt, m. 217° . 7-Methyl-2-anisyl-py-tetrahydroquinoline, m. $87-8^\circ$, $b_{17.5}$ $246-7^\circ$. HCl salt, m. 216° . HBr salt m. $222-3^\circ$. HI salt, m. 205° . 8-Methyl-2-phenyl-py-tetrahydroquinoline, b_{18} 212° . HCl salt, m. $209-10^\circ$. HBr salt, m. $213-4^\circ$. HI salt, m. $229-30^\circ$. 8-Methyl-2-anisyl-py-tetrahydroquinoline, m. 55° , b_{18} 242.5° . HCl salt, m. 232° . HBr salt, m. 237° . HI salt, m. 226° . 6,8-Dimethyl-2-phenyl-py-tetrahydroquinoline, b_{17} 223° . HCl salt, m. 224° . HBr salt, $235-6^\circ$. HI salt, $235-6^\circ$. 6,8-Dimethyl-2-anisyl-py-tetrahydroquinoline, m. 59° , b_{10} 248° . HCl salt, m. $218-9^\circ$. HBr salt, m. 219° . HI salt, m. $219-20^\circ$. NAO UYEI

Alkaloids of Sinomenium and Cocculus. XXI. Constitution of trilobine and homotrilobine. H. KONDO AND M. TOMITA. Tokyo Imp. Univ. *J. Pharm. Soc. Japan* 48, 659-73(1928); cf. C. A. 19, 1708; 21, 2699. —Previously (C. A. 21, 2699) it was reported that trilobine (I) and 2 other bases were isolated from *Cocculus sarmentosus*. One of the latter has now been proved to be homotrilobine (II), $\text{C}_{20}\text{H}_{21}\text{NO}_2$ (m. 215° , $[\alpha]_D^{25}$ 314.8°). It contains one MeO group. In contrast to I, the HBr salt of II is more sol. in H_2O and Me_2CO . II and MeI gave the methylodide (III), m. $262-5^\circ$. Heating of III with

20% KOH-MeOH gave α -homotrilobinemethylmethine (IV), $C_{21}H_{23}NO_3$, (m. 115–7°, $[\alpha]_D^{25}$ 61.3°) and a small quantity of β -homotrilobinemethylmethine, m. 222°. IV and MeI gave α -homotrilobinemethylmethine-MeI (V), m. 264°, which on boiling with KOH-MeOH gave beside NMe_3 , a non-N compd. $C_{18}H_{13}O_2(OMe)$, m. 185°. II and Ac_2O gave, as a result of the rupture of the N-ring, a non-basic substance m. 285–7°. Heating of II with HBr in glacial AcOH in a closed tube resulted in the opening of the O-ring and gave a substance m. 270°. The above reactions show that contrary to the previous statement, II contains one N-Me group instead of a NMe_2 group and its structure can be expressed by $C_{18}H_{15}O(OMe)(NMe)(\geq O)$. It was previously suggested that 2 O atoms in I form either an ether linkage or a special ($-CO-$) group. The action of Ac_2O or $ClCOEt$ on I resulted only in the decompn. of the N-ring, but without any change in the groups contg. O atoms. The action of HBr in glacial AcOH on I, however, resulted in the rupture of the O-ring and gave a compd. contg. a newly formed OH group and a double bond originated as a result of the sepn. of another OH group in the form of H_2O . The compd. is named *desmethyltrilobinol* (VI), $C_{18}H_{17}NO_3$, m. 290°, $[\alpha]_D^{18}$ 229.3°. HBr salt decomp. 315°. With EtOH, VI forms an addn. compd. (VII) which loses EtOH on heating above 130°. It has no MeO group. The no. of OH groups as detd. by Zarevitinov's method on VII was 3, while VI contained only 2. VI and Ac_2O gave the *diacetyl deriv.*, m. 210°, $[\alpha]_D^{29}$ 302.1°. KOH fusion of VI gave 3,4-(HO) $_2$ C $_6$ H $_3$ CO $_2$ H and 1,2-(HO) $_2$ C $_6$ H $_4$. Oxidation of I with dil. $KMnO_4$ gave a glycol, $C_{19}H_{21}NO_3$, m. 265°. Further oxidation gave an intermediate dicarboxylic acid, decomp. 210–20°, and finally *des-N-trilobinedicarboxylic acid* (VIII), $C_{15}H_{15}O_7$, m. 288°. Action of HBr in glacial AcOH on VIII gave *desmethyl-des-N-trilobinedicarboxylic acid* (IX), $C_{17}H_{19}O_7$, m. 278.9° (decompn.). Heating of VIII with HI gave *desmethyl-des-N-trilobinedicarboxylic acid*, m. 267°, which with HBr in glacial AcOH gave also IX. The above reactions can be explained in a similar way as in the production of VI by the action of HBr on I. From the oxidation reactions and also from the fact that VIII gave a phthalim reaction, it is concluded that the position of double bond in I is like that of naphthamidine or acenaphthylene.

NAO UYEI

Chloroarsinosoquinine. III. FRANZ X. ERBEN. Rudolf-Spital Wien. *Ber.* 61B, 2106 8(1928); cf. *C. A.* 21, 1462.—In the earlier paper it was shown that the synthesis of chloroarsinosoquinine (I) from dehydroquinine and $AsCl_3$ requires 1 hr's. heating at 130.5°. At room temp., but after a much longer time (6 months in the dark), there is also obtained a solid compd., *chloroarsinosodiquinine* (II), $ReCl CHAs CH'CR$ ($R = C_{15}H_{21}(O_2N_2)$); the thin sirupy reaction product is taken up

in hot H_2O , filtered from the small dark insol. residue, pptd. with NH_4OH , washed with much H_2O , repeatedly repptd. from very dil. HCl or H_2SO_4 , dried and freed from unchanged dehydroquinine by extr. with $CHCl_3$. The II, unlike I, is sol. in hot $PhNO_2$. It begins to turn brown 170°, m. 202° (cor.), is sol. in MeOH, EtOH, C_6H_5N , aniline oil, CS_2 (unlike I), difficultly in Me_2CO and $CHCl_3$, almost insol. in $AcOEt$, insol. in EtO , C_6H_6 , PhMe and xylene. The pure preps. of I described in the earlier paper are unchanged in As content and m. p. by treatment with $PhNO_2$; a small dark impurity can be removed by prepg. the *mono-sulfate* (As 15.14, Cl 6.60%) which is sol. in H_2O while the impurity is insol.; with Na_2SO_3 the sulfate gives a thick white ppt. of the *mono sulfite* (As 15.32%).

C. A. R.

Glucoside of Aucuba japonica Thunb. T. KARIYONE AND K. KONDO. *J. Pharm. Soc. Japan* 48, 679–84(1928).—*Aucubin* (I), a glucoside, was obtained from the fruits of *Aucuba japonica* in 1.7% yield. Analysis gave as its compn. $C_{16}H_{24}O_9$. It m. 181°, b $_p$ 167.7°. Hydrolysis of I with emulsin or dil. acid gave a black ppt. which could not be purified. On reduction with H_2 and colloidal Pt, I absorbed 4 mols. H_2 and gave 1 mol. glucose and an aromatic oil, *tetrahydrodesoxyaucubigenin*, $C_9H_{16}O_2$, b $_p$ 154–60°, d $_4^{20}$ 0.942, $[\alpha]_D^{26}$ –4.5°, n_D^{24} 1.48524. The reaction can be expressed by $C_9H_{16}O_2 \cdot O \cdot C_7H_{12}O_6 + 4H_2 \rightarrow C_9H_{12}O_5 + C_7H_{12}O_6 + H_2O$. Reduction of I with H_2 and PtO at 1.5 atm. pressure gave a sirupy substance after absorption of 3 mols. H_2 . It is probably hydroaucubin.

NAO UYEI

Catalytic reduction of glucosides. T. KARIYONE AND K. KONDO. *J. Pharm. Soc. Japan* 48, 684–6(1928).—Since catalytic reduction of *aucubin* (I) gave a mol. of glucose and an already reduced aglycone (cf. preceding abstr.) the reaction was studied on a few other glucosides. Reduction of *salicin* (II) with H_2 and colloidal Pt gave a *crystal glucoside* (III), 1,2-MeC $_6$ H $_4$ OC $_6$ H $_4$ O $_6$, m. 164°, $[\alpha]_D^{31}$ –61.75°. III and emulsin or dil. acid gave 1,2-MeC $_6$ H $_4$ OH and glucose. Therefore the reduction of II, unlike

that of I, gives the product, reduced only on the OH group. The reduction of *arbutin*, however, is like that of I, and gave, after absorption of 4 mols. H_2 , hexahydrophenol and glucose.

NAO UYEH

Glucosides of digitalis leaves. A. WINDAUS. *Univ. Göttingen. Arch. expt. Path. Pharmacol.* 135, 253-8(1928).—In the active glucosides the genins are found in combination with different sugars, and they seem to be very closely related; thus, with the addn. of water digitoxin yields digitoxigenin and digitoxose, gitoxin yields gitoxigenin and digitoxose, digitalinum verum yields gitoxigenin, glucose and digitalose, oleandrin yields gitoxigenin and probably digitalose, gitalin yields gitoxigenin hydrate and digitoxose, cymarine yields strophanthidin and cymarose, and k-strophanthin yields strophanthidin, glucose and cymarose. All of the well-known aglycones of the active glucosides are hydroxylactones, which contain in their C framework a complex of 4 hydrated rings. In structure they approximate the sterols and the bile acids and possibly they are genetically connected with the sterols. The aglycones of the scilla glucosides appear to be of another type.

G. H. S.

Complex compounds of bivalent silver. Relation between ring closure and "specific affinity" (HIEBER, MÜHLBAUER) 6. Preparation and constitution of hydrargyrum salicylicum (RUPP) 17. The electrochemical reduction of azo dyes (HUBBUCH, LOWY) 4. The absorption spectra and constitution of diazotates (CAMBI, SZEGÖ) 3. The absorption spectra and constitution of azoxy compounds (SZEGÖ) 3. Spectrochemistry of rufin and its derivatives (DHÉRE, *et al.*) 11I. Oxidation of phenanthrene by bacteria (TAUSSON) 11C. Relation between dipole moment and constitution (ERRERA) 2. The electrical symmetry of the molecular structure of methane derivatives (EBERT, *et al.*) 2.

Unsaturated aliphatic hydrocarbons. I. G. FARBENIND. A.-G. Fr. 637,410, July 11, 1927. Unsaturated aliphatic hydrocarbons are prepd. by treating hydrocarbons or mixts. of hydrocarbons boiling at low or medium temps. with substances having large surface development such as active C or SiO_2 . The hydrogenation products of coal, mineral oils, etc., or components thereof are particularly suitable. In an example pentane is passed over active C at a temp. of 450-500°, amylene being the chief product. The products may be polymerized to produce rubber, or be combined with other elements such as halogens. Cf. C. A. 22, 1364.

Organic acid anhydrides. FRITZ DOERINCKEL and MARTIN SCHLIEPMANN (to I. G. FARBENIND. A.-G.). U. S. 1,691,647, Nov. 13. A mixt. comprising an org. acid salt such as NaOAc, a free org. acid such as glacial HOAc, and a chloride of Si, Ti or Sn is caused to react (suitably at room temp.) with $SiCl_4$ and the anhydride produced is sepd.

Gels produced from water-soluble salts of organic acids. EUGENE E. AYRES, JR., and ERLING H. HAABESTAD (to B. A. S. Co.). U. S. 1,691,424, Nov. 13. A stable colloidal gel is formed of AmCl and common soap or from similar materials among which are mentioned chlorides, mercaptans and nitrates of hydrocarbons generally and sulfonated fatty acids of high mol. wt., e. g., $EtNO_3$ with ethyl benzenesulfonate or ethyl nitrate and Mg abietate. U. S. 1,691,425 relates to production of esters by heating a gel produced in a similar manner from a liquid halide deriv. of a hydrocarbon such as AmCl or C_2H_5Cl and Na stearate or "common soap." A temp. of about 150° may be used for decomp. the gel and producing the ester. U. S. 1,691,426 related to the hydrolysis of AmCl or substance of similar reactivity, suitably by heating with soap or soap-forming substances at 150° followed by further heating with aq. alkali. A substance such as Am oleate may be added as a catalyst.

Aliphatic acids. W. J. HALE and W. S. HALDEMAN. Brit. 287,064, March 12, 1927. Formic, acetic, propionic, butyric and other aliphatic acids are produced from the corresponding primary alcs. b. below 350° by treating the vapor (which may be dild. with N_2 , H_2O vapor or air) with a reduced metal to effect dehydrogenation and immediately after with the unreduced metal oxide to oxidize the aldehyde to acid. Cu, Ag, Au and Hg are mentioned as suitable catalysts. Various details are given.

Aminoarylarsonic acids. ÉTABLISSEMENTS POULENC FRÈRES and CARL ORCHSLIN. Fr. 637,159, Nov. 22, 1926. Nitroarylarsonic acids are reduced by Zn in alk. soln. In examples, *p*-hydroxy-*m*-nitrobenzenearsonic acid and *p*-amino-*m*-nitrobenzenearsonic acid are reduced.

Anthraquinonesulfonic acids. JOHN THOMAS (to Scottish Dyes, Ltd.). U. S. 1,691,679, Nov. 13. Anthraquinone 100 is sulfonated with about 210 parts oleum contg. 40% free SO_3 and the strength of the acid is brought down to about 80% by

adding about 500 parts of concd. H_2SO_4 of 94–98% strength and about 90 parts H_2O ; the α -disulfonic acids which crystallize are filtered out and there is added to the filtrates a Hg compd. such as about 3.5% of Hg_2SO_4 and the material is heated at about 180° for about 10 hrs. to obtain β -monosulfonic acid. Cf. C. A. 22, 2572.

Oxidation of alkylaryldithiocarbamic acids. SILESIA VEREIN¹ CHEMISCHER FABRIKEN. Fr. 637,694, July 18, 1927. Alkylaryldithiocarbamic acids are oxidized to the corresponding disulfides by means of oxides of N and air in an alk. soln. In an example an alkali metal salt of methylphenyldithiocarbamic acid in an aq. soln. of Na_2CO_3 is oxidized to dimethyldiphenylthiuram disulfide.

Sulfuric esters of aliphatic acids. FARB- & GERBSTOFF-WERKE C. FLESCHE (to H. Flesch). Brit. 287,076, March 14, 1927. Sulfuric esters of dihydroxy-, trihydroxy- and poly-hydroxy fatty acids are produced from hydroxy fatty acids by introducing a fine spray or mist of H_2SO_4 contg. 5–10% of SO_2 into the cooled and actively agitated hydroxy fatty acids. Ricinoleic acid is converted into sulfodihydroxystearic acid, and dihydroxy stearic acids may be converted into their sulfuric esters without the use of solvents. The sativic acid prepd. from linoleic acid by use of permanganate may be similarly esterified.

Esters of cholesterol with unsaturated acids. WALTER MINNICH (to Soc. anon. pour l'ind. chim. à Bâle. U. S. 1,690,647, Nov. 6. Esters suitable for use as *therapeutic agents* are formed by the combination of cholesterol with phenylpropionic acid chloride or other unsatd. acids of the general formula $\text{R}-\text{COOH}$, in which R represents an aliphatic or aliphatic-aromatic hydrocarbon radical contg. at least one treble linkage. Cf. C. A. 22, 3668.

Catalytic production of esters, etc., from alcohols. F. C. ZEISBERG (to E. I. duPont de Nemours & Co.). Brit. 287,846, March 26, 1927. Vapors of EtOH or of a higher primary alc. are passed over a heated dehydrogenating catalyst under pressure to obtain an ester of the acid corresponding to the alc. used together with an alc. with twice the number of C atoms present in the starting material and a diminished production of acid and aldehyde. As catalyst there may be used Cu reduced in the presence of small quantities of Mn and Mg oxides, or Ni, Co or Fe in admixt. with other oxides such as those of Cr or Ca or oxides such as those of Zn, Mg, Cr or Mn or their mixts. and, in treating EtOH, a pressure of 270 atm. and a temp. of about 350° is suitable for conversion of about half the alc. to a mixt. of EtOAc, BuOH and AcH.

Halogenated alcohols. I. G. FARBENIND. A.-G. AND J. CALLSEN. Brit. 286,797, Dec. 13, 1926. The primary alc. employed as solvent in the process described in Brit. 284,000 (C. A. 20, 917) is replaced by a secondary alc., e. g., a soln. of bromal in isopropyl alc. heated with Al ethylate while II is continuously passed through the materials; after distg. off the alc. and acidifying, tribromoethyl alc. seps. Chloral may be similarly treated, and the use of H is not absolutely necessary.

Alkylation of aromatic compounds. A. VERLEY. Brit. 288,122, March 31, 1927. In effecting alkylations such as that of toluene to obtain *p*-cymene or of benzoic acid to obtain *m*-toluic acid, a mixt. of an alc., H_2SO_4 and an alkali metal pyrosulfate is used.

Acyl and alkyl phenols. W. J. POPE. Brit. 287,967, Dec. 31, 1926. Derivs. of resorcinol and hydroquinone such as the monopropionate, monoisobutyrate, monocaprate or monolaurate are heated with condensing agents such as ZnCl_2 , AlCl_3 , FeCl_3 , SnCl_4 , H_2SO_4 or H_3PO_4 to obtain other derivs. such as propionylhydroquinone, isobutyryl resorcinol, laurylresorcinol or stearylresorcinol, and the corresponding alkyl hydroquinones and resorcinols may be obtained by reduction of these products with Zn amalgam and HCl.

Sulfurized derivatives of naphthols. EMIL KRAUS (to Fabrik van chemische Producten). U. S. 1,690,641, Nov. 6. A mixt. formed of a naphtholic compd. such as β -naphthol together with S and an alkali is heated to the b. p. in an aq. medium and the resulting sulfurized derivs. are treated with a lower aliphatic aldehyde and a sol. sulfite, e. g. with CH_3O and Na_2SO_3 to obtain a product which may be used in *tanning*.

Chloroperylenes. F. BENSA. Brit. 288,171, April 2, 1927. Hepta- to dodecachloroperylenes are made by passing dry Cl through a soln. or suspension of perylene or a low-chlorinated perylene contg. a metallic chloride such as AlCl_3 or SbCl_5 . The degree of chlorination effected depends on the temp. and quantity of Cl used. Several examples are given.

Aminoanthraquinones. HERMANN BERTHOLD (to Grasselli Dyestuff Corp.). U. S. 1,691,428, Nov. 13. In forming compds. such as 1-amino-5-nitroanthraquinone an α -nitroanthraquinone such as 1,5-dinitroanthraquinone is treated with a hydrogenated base of the quinoline series such as 1,2,3,4-tetrahydro-2-methylquinoline in the presence of 2-methylquinoline.

Benzodiazines. I. G. FARBENIND. A.-G. Brit. 288,159, March 31, 1927. Benzodiazines are prepd. by condensing a homolog, analog or substitution product of a 2,4-dihaloquinazoline with 2 similar or dissimilar mols. of a compd. which contains a reactive H atom attached to a N, O or S atom. H halide is eliminated and residues of the amino or other compd. used replace the halogens in the quinazoline nucleus. The products may be used as *intermediates for making dyes and pharmaceutical compds.* Several examples are given.

Dichlorotoluidines. I. G. FARBENIND. A.-G. Brit. 287,110, March 15, 1927. 1-Methyl-2,5-dichloro-4-aminobenzene is made by nitrating 1-methyl-2-amino-5-chlorobenzene in H_2SO_4 , diazotizing the amino group, replacing it by Cl by use of Cu_2Cl_2 and reducing the nitro group.

Tetrazoles. A. BOEHRINGER. Brit. 287,924, March 30, 1927. Tetrazoles are prepd. by the action of hydrazoic acid or azides on amido- or imido-chlorides such as those produced by the action of org. or inorg. acid chlorides on mono-substituted acid amides or those presumably obtained as intermediate products in the treatment of oximes with acid chlorides. Examples are given of the production of α,β -cyclopentamethylene-tetrazole, and diphenyltetrazole; the acid amides obtained as by-products in the process described in Brit. 280,529 (C. A. 22, 3170) may be utilized for the production of tetrazoles. Cf. C. A. 22, 4538.

Tertiary nitriles. MAX BOCKMÜHL and GUSTAV EHRHART (to Winthrop Chemical Co.). U. S. 1,690,325, Nov. 6. A secondary nitrile of the general formula $R_2-CH-CN$, in which R stands for an alkyl residuc, such as diethylacetonitrile is treated with an alkali metal and the resulting compd. is then treated with allyl bromide or other alkylating agent.

Di- ω -haloacyldiphenyl ethers. SCHERING-KAHLBAUM A.-G. (formerly Chemische Fabrik auf Actien, vorm. E. Schering). Brit. 286,688, March 9, 1927. Diphenyl ether or a deriv. is treated with a halogenated acyl halide. Examples are given of the production of dichloroacetyl- or dibromoacetyl-diphenyl ether, dichloroacetyl-*o*-methoxydiphenyl ether and dichloroacetyl-*p*-hydroxydiphenyl ether.

Quaternary ammonium compounds. I. G. FARBENIND. A.-G. Brit. 286,984, Dec. 10, 1926. Quaternary NH_4 compds. are obtained by the action of sulfuric or aryl-sulfonic alkyl esters on halogen-substituted tertiary amines of the benzene or naphthalene series (suitably in a solvent such as toluene or $PhCl$). Examples are given of the treatment of 3-chloro-4-dimethylaminotoluene with *p*-toluenesulfonic methyl ester, 1-chloro-2-dimethylaminonaphthalene with Me_2SO_4 , *o*-chlorodimethylaniline with Me_2SO_4 , and 3,3'-dichloro(or dibromo)-4,4'-tetramethyldiaminodiphenylmethane with Me_2SO_4 or Et_2SO_4 .

Benzodiazine condensation products. I. G. FARBENIND. A.-G. Brit. 287,179, March 18, 1927. Quinazoline or a homolog, analog or substitution product, which is halogen-substituted in the diazine ring, is condensed with one or more org. components so that the halogen or halogens are replaced by 1 or 2 direct C-to-C linkages. The process is particularly applicable to the treatment of 2,4-dihaloquinazolines, and products thus obtained may be used as intermediates in the manuf. of *dyes and of pharmaceutical compds.* Several examples are given.

Benzanthrone derivatives. I. G. FARBENIND. A.-G. Fr. 638,710, Aug. 1, 1927. Amino and sulfurized derivs. of benzanthrone are prepd. by the action of NH_4OH in H_2SO_4 on benzanthranyl sulfides, disulfides, mercaptans or other derivs., adding, if necessary, a metallic compd. such as a sulfate of Fe or Cu to accelerate the reaction. In this way a monoaminobenzanthranyl disulfide is prepd. from benzanthranyl disulfide. Diamino compds. are obtained under more energetic conditions.

Thiomorpholines of the anthraquinone series. I. G. FARBENIND. A.-G. (Georg Kränzlein and Martin Corell, inventors). Ger. 466,894, Dec. 30, 1925. See Brit. 263,843 (C. A. 22, 170).

Pyridine derivatives. SCHERING-KAHLBAUM A.-G. Brit. 288,133, March 31, 1927. Halogenated 2-pyridone and its derivs. are prepd. by direct halogenation of 2-pyridone and its derivs. in the presence of a solvent such as $CHCl_3$ or dil. HCl . Examples are given, using Cl and ICl as halogenating agents to form a mixt. of 2-hydroxy-5-chloro- and 2-hydroxy-3,5-dichloropyridine, and 2-hydroxy-3,5-diiodopyridine, resp., from 2-pyridone. Cf. C. A. 22, 4131.

Acetic acid. J. KARPATI and M. G. HUBSCH. Brit. 287,135, March 16, 1927. C_2H_2 and O are passed into glacial $HOAc$ contg. a Hg salt such as the sulfate and cellulose fibers or other vegetable fibrous materials such as sawdust, straw or shavings which have been heated in a stream of N and activated with high-pressure steam. Preferably such a quantity of dil. $HOAc$ is added as to supply just sufficient H_2O for the hydration

of the C_2H_2 . A temp. of 35–40° is suitable, and the C_2H_2 and O may be supplied together or alternately.

Acetic and other acids. HENRY DREYFUS. Fr. 637,763, July 16, 1927. AcOH is obtained free or as the Me ester by heating MeOH with CO in the presence of an inorg. acid or an inorg. acid contg. an org. group, *e. g.*, a sulfonic acid or its salt. Me_2O or Me formate or acetate may replace MeOH. A pressure up to 300 atm. may be used and the temp. is preferably 300–400°. The phosphoric acids or mixts. of them are particularly useful as catalysts; boric, arsenic and phosphomolybdic acids and acid Al phosphate may also be used. The MeOH may be produced from mixts. of CO and H₂. The presence of water favors the production of free AcOH, while excess MeOH gives MeOAc. Acetone may be produced by leading the AcOH directly over MnO at 400–500°. The process may be extended to higher alcs., *e. g.*, EtOH, or their ethers or derivs. to produce PrOH, etc., or their esters. Cf. C. A. 22, 1365.

Concentration of acetic and formic acids. SOCIÉTÉ JAMES NELSON, LIMITED. Fr. 637,389, July 9, 1927. AcOH and HCOOH are concd. by adding to the aq. soln. a sol. acetate or formate, preferably the Na or K salt, and distg. under reduced pressure first at a low temp. till all the water is removed, and then at a higher temp.

Benzoic acid. MONSANTO CHEMICAL WORKS. Fr. 638,763, Aug. 2, 1927. A mixt. of phthalic anhydride vapor and steam is passed over a catalyst such as ZnO at a temp. between 200° and 600°.

2-Aminonaphthalene-3-carboxylic acid. ERNST HOTZ and VALENTIN LANZ (to Grasselli Dyestuff Corp.). U. S. 1,690,785, Nov. 6. 2-Aminonaphthalene-3-carboxylic acid is obtained in about 90% theoretical yield from 2-hydroxynaphthalene-3-carboxylic acid and NH_3 by subjecting the products of reaction to the action of a bivalent Fe compd. (which may, *e. g.*, be added as $FeCl_2$ or $FeSO_4$ or directly as $Fe(OH)_2$) and thereafter decompg. the complex Fe compd. which is formed and liberating the free 2-aminonaphthalene-3-carboxylic acid (suitably by the action of HCl). Compds. of Co and Ni may be used similarly to those of Fe, but compds. of Zn, Ca, Mg and Cu produce no corresponding salts similar to that of Fe. Numerous details are given.

Citric acid. DISTILLERS CO., LTD. and A. M. PRAKE. Brit. 287,604, Nov. 27, 1926. Citric acid is obtained by treatment of pectinous materials such as fruit pulp mixts. with enzymes naturally present in citrous fruits; catalysts such as Mn or Ti salts may be added.

6-Aminoacenaphthene-5-carboxylic acid. I. G. FARBENIND. A.-G. Fr. 637,406, July 11, 1927. 6-Aminoacenaphthene-5-carboxylic acid is prepd. by treating 5-acetylacenaphthene or 5-chloroacetylacenaphthene by an alk. hypochlorite soln., nitrating the 5-acenaphthenecarboxylic acid obtained, and reducing the 6-nitro-5-acenaphthene-carboxylic acid.

Naphthalene-1,4,5,8-tetracarboxylic acid. I. G. FARBENIND. A.-G. Fr. 637,212, July 7, 1927. See Brit. 274,103 (C. A. 22, 1981).

Dehydrating alcohol by distillation with added substances. U. S. INDUSTRIAL ALCOHOL CO. Brit. 287,607, Nov. 29, 1926. A substance such as C_6H_6 is added, forming a ternary azeotropic mixt. which on condensation seps. into 2 layers; the process is applicable to sepn. of alcs. such as MeOH, PrOH or BuOH, esters such as MeOAc or EtOAc or Me or Et propionates, aldehydes such as AcH or ketones such as acetone, Me Et ketone or di-Et ketone from admixture with water. Among other liquids which may be added to effect similar sepns. are: CCl_4 , ethylene dichloride, EtCl or EtBr and slightly sol. esters. An app. is described. Cf. C. A. 22, 4200.

Crotonaldehyde and its homologs. SOCIÉTÉ ANON. DES DISTILLERIES DES DEUX SEVRES. Fr. 637,517, July 12, 1927. See Brit. 274,488 (C. A. 22, 2171).

Ethylene glycol. BRITISH DYE STUFFS CORP., LTD., K. H. SAUNDERS and H. WIGNALL. Brit. 286,850, Feb. 8, 1927. Ethylene chlorohydrin is carried off by a current of steam, from a crude soln., and continuously hydrolyzed in vapor phase, *e. g.*, in a tower to the top of which there is continuously supplied a soln. of Na_2CO_3 or a strong soln. of NaOH for the production of glycol or ethylene oxide, resp. An app. is described.

Cinchophen. RICHARD PASTERNAK (to Charles Pfizer & Co.). U. S. 1,690,128, Nov. 6. Substantially mol. proportions of aniline, 30% aq. soln. of pyruvic acid, and benzaldehyde are added to boiling alc. at about 100°.

Hexamethylenetetramine. SCHIEFERWERKE AUSDAUER A.-G. Brit. 286,730. March 10, 1927. Formalin is permitted slowly to run into a soln. of NH_4Cl which is supersatd. with $NaHCO_3$ or into a soln. of NaCl and NH_4HCO_3 . The mixt. obtained can be used in the artificial resin industry, or the $(CH_2)_6N_4$ can be sepd. by extn. with alc.

11—BIOLOGICAL CHEMISTRY

PAUL E. HOWE

A—GENERAL

FRANK P. UNDERHILL

The Donnan theory of "membrane equilibrium." K. SHIGI. *Acta Schol. Med. Univ. Imp. Kioto* 9, 511-42(1927).—Studies of Donnan equil. were made on various pathol. human serums. They could be divided into three main classes. These classes exhibited characteristic properties of the Donnan equil. and might be due to a characteristic change of the protein. The Donnan equil. was noticed to exist when the concn. of a neutral salt added to a human serum did not exceed a certain limit. Isolated protein did not exhibit this characteristic but did form an electrolyte with an acid or base and then exhibited the Donnan equil. When a neutral salt is present in addn. to an acid or base the equil. is retarded but the final e. m. f. is attained as when a neutral salt is present. Isolated proteins when heated above 60° or exposed to ultra-violet ray for 15-16 hrs. are incapable of forming electrolytes with an acid or base. JOHN T. WOLF

Emanations of ultra-violet rays from some organic phosphatides after their irradiation. CESARE SERONO AND ALFONSO CRUTO. *Istituto Sersono, Roma. Gazz. chim. ital.* 58, 402-4(1928).—See C. A. 22, 4361. C. C. DAVIS

The effects of x-rays on the adrenal glands. N. F. FISHER, E. LARSON AND A. BACHEM. *Univ. of Ill. Endocrinology* 12, 335-41(1928).—Adrenal deficiency was produced in dogs by radiation of the left adrenal after right adrenalectomy with 3 to 5 erythema doses. The histological changes were in proportion to the no. of doses administered. No change in blood cholesterol occurred in the adrenal deficiency.

H. J. DEUEL, JR.

The biocatalyst content of normal and pathological tissues. HANS V. EULER AND HUGO JOHANSSON. *Univ. Stockholm. Z. physiol. Chem.* 178, 209-16(1928).—Human placenta contains considerable cozymase, since an ext. prepd. therefrom activates the fermentation of glucose by washed dried yeast and decolorizes methylene blue. The cozymase content is less than that of kidney and liver of smaller mammals, and it evidently does not constitute a reserve substance for the embryo but belongs rather to an active enzyme system. The fact that zymophosphate serves here as an excellent H-donor in the methylene blue reduction indicates that mutase is also present. This activation by zymophosphate is much greater with placenta than with muscle. Direct respiration of the tissue, however, as measured by O consumption, is diminished by addn. of cozymase + zymophosphate. Biocatalyst Z, which activates fresh yeast fermentation, is present in practically all organs, but to a less extent in cancerous than in normal liver.

A. W. DOX

The structure of silk fibroin. EMIL ABDERHALDEN AND HERBERT MAHN. *Univ. Halle. Z. physiol. Chem.* 178, 253-75(1928).—If fibroin is a mixt. of 2 substances, one cryst. and the other amorphous, as indicated by Herzog's Röntgen diagrams, it should be possible to effect a sepn. into 2 fractions after treatment with certain reagents which do not bring about too deep-seated changes. When a CHCl₃ soln. of Br was added to fibroin dispersed in 50% LiBr, a flocculent ppt. was formed leaving a part of the proteinoid still in the dispersed form. The yield (75-80%) and the analysis of the ppt. were quite const. Hydrolysis of the ppt. yielded glycine, alanine, serine and 2,5-dibromotyrosine. The sol. portion after the Br treatment yielded glycine, and alanine and serine were also probably present, but the identification of other amino acids was extremely difficult on account of the LiBr which could not be completely removed. The small amt. of sol. residue may perhaps be due to impurities of silk glue adhering to the fibroin. The results afford no confirmation of Herzog's view that fibroin is a mixt., but point rather to the homogeneity of fibroin. If N alkali is added to the LiBr dispersion of fibroin, the amt. of ppt. obtained by addn. of Br decreases with the duration of the alkali treatment, until a min. is reached after which no noteworthy change occurs. If the dispersion contg. alkali is heated for a short time on the water bath, the amt. of Br ppt. is practically the same as with the untreated dispersion. Alkali treatment at 37° gives an increase in amino N which is greater than with elastin or gelatin, and a decrease in rotation. The amt. of diffusible products also increases. On the other hand, a brief alkali treatment renders the fibroin less and a prolonged treatment more amenable to hydrolysis by a mixt. of trypsin-kinase and erepsin. Dispersion in 50% LiBr is evidently not a purely phys. phenomenon but probably involves mol. changes of a cleavage nature. The fact that the fibroin dispersion is attacked by pancreatic

enzymes does not exclude the possibility that this proteinoid is composed largely of 2,5-diketopiperazines or related structures, but points rather to the simultaneous presence of polypeptide linkages. Attempts to benzoylate the partially hydrolyzed mixt. obtained by treating the dispersed fibroin with *N* alkali 71 hrs. at 38° were unsuccessful, although 70% of the total N was present as amino N. Most of the BzCl was recovered as BzOH.

A. W. DOX

The geo-chemistry of life.* E. HERLINGER. *Z. angew. Chem.* 41, 812-5(1928).—A discussion of the origin and spread of life processes as related to the division and distribution of the chem. elements and ions of the earth's crust.

C. R. F.

The behavior of casein in partial solution in calcium hydroxide. VLADIMIR PERTZOFF. Harvard Medical School. *J. Biol. Chem.* 79, 799-813(1928).—The soly. and amt. of base in soln. in the system casein-Ca(OH)₂-H₂O depend upon the amt. of Ca(OH)₂ added and the casein concn. The exptl. results were described by the relation

$$S = \frac{K_2}{(1/Ca(OH)_2) - [(K_1 - K_2)/C]}$$
 where *S* is the amt. of casein dissolved, Ca(OH)₂ the base added, *C* the total amt. of casein in the system, and *K*₁ and *K*₂ are consts. whose values in terms of g. of casein per equiv. of base are 2180 and 545, resp. The relation between *S* and the amt. of Ca(OH)₂ bound by it, Ca(OH)₂_S, is expressed by $S = K_2/[Ca(OH)_2]_S$, where *K*₂ = 1440. The consts. of the above equations and the behavior of casein toward Ca(OH)₂ are interpreted in terms of known physicochem. consts. NaOH at 5° behaves toward casein like Ca(OH)₂ at 25° and the same equations are applicable.

ARTHUR GROLLMAN

The presence in peptone of a blood anticoagulant. BOTHO E. BRÜDA. Univ. in Graz. *Klin. Wochschr.* 7, 1742(1928).—By a process identical with that employed by Howell for the prepn. of heparin, it is possible to obtain from Witte peptone a substance that is similar to, if not identical with, heparin, both pharmacologically and chemically. The possible identity of the two products becomes more probable in view of the fact that heparin is not a specific liver substance but can be obtained from other body tissues.

MILTON HANKE

The separation of the citric acid dehydrase from liver and of the lactic acid dehydrase from yeast. FREDERICK BERNHEIM. Biochem. Lab., Cambridge. *Biochem. J.* 22, 1178-92(1928).—An enzyme has been sepd. from liver which will reduce methylene blue in the presence of sodium citrate but will not take up oxygen in a Barcroft app. This is also true of the lactic acid dehydrase sepd. from yeast. The product which citric acid yields has not been identified, but in the case of the lactic acid enzyme, pyruvic acid is formed. The specificity of the enzymes is upheld, since their sepn. depends on differences in the physical properties of the enzymes.

BENJAMIN HARROW

The duration of the effect of ultra-violet radiation on chickens. WALTER C. RUSSELL, O. N. MASSENGALE AND C. H. HOWARD. N. J. Agr. Expt. Station. *J. Biol. Chem.* 80, 155-62(1928).—The % bone ash, and the Ca and inorg. P of the blood were selected as criteria to measure the duration of the effect of ultra-violet radiation from a quartz mercury lamp. As measured by the bone ash % the effect on bone formation of a single exposure of 45 min. to the filtered radiation (equiv. to 15 min. of direct exposure) at a distance of 3 ft. lasted 1 week. The duration of the effect was 2 weeks for single exposures of 90, 180 and 270 min. The amts. of blood Ca and inorg. P vary directly with the length of exposure. The values of blood Ca and inorg. P fluctuate with the curve of the % of bone ash in such a manner as to suggest a relationship to the process of mineral deposition in the bones. The results suggest the possibility of the use of single exposures at intervals of several days rather than daily exposures in the practical applications of ultra-violet radiations.

A. P. LOTHROP

The isoelectric precipitation of pepsin. II. FREDERIC FENGER, ROBERT H. ANDREW AND A. WHEELER RALSTON. Armour and Co., Chicago. *J. Biol. Chem.* 80, 187-90(1928); cf. *C. A.* 21, 2706.—An ash-free pepsin with an isoelec. point of *p*_H 2.5 was obtained by repeated washing with HCl of *p*_H 2.5. It has the highest proteolytic activity reported by any investigator when assayed by an official method and it is believed that it represents the form of the enzyme naturally occurring in the glandular mucosa of the stomach. It has the following % compn.: C 53.15, H 7.2, N 14.43, S 0.88, P 0.13. Fractions pptd. at higher *p*_H values show progressively decreasing proteolytic activity and evidently represent early stages of peptic decompn. The decrease in activity is paralleled by loss of the complex protein characteristics of the enzyme pptd. at *p*_H 2.5.

A. P. LOTHROP

The influence of quinine salts on pancreatic lipase. ZUMMO CATALDO. *Boll. soc. ital. biol. sper.* 3, 455-9(1928).—The object of this study was to det. whether quinine

salts added to the pancreatic juice would modify its lipase activity, not only when tested against tributyrin, but also against higher glycerides, *e. g.*, triolein. To 6 cc. of pancreatic juice was added one cc. of a 5% soln. of quinine-HCl and the mixt. was allowed to stand at room temp. for 12 hrs. To one cc. of this mixt. was added 2 cc. of oil of almond. It was incubated for 1-3-6 hrs. and neutralized with 0.1 N NaOH. The results show that the addn. of quinine salts to pancreatic juice in some cases leads to the entire disappearance of its lipase activity; in the majority of cases the activity is only slightly affected; and in a few cases it is not changed at all. C. is unable to interpret these results.

PETER MASUCCI

Industrial biochemistry. II. Chemistry of the proteins. EDWIN R. THREIS. Lehigh Univ., Bethlehem, Pa. *J. Am. Leather Chem. Assoc.* 23, 526-51, *et seq.* (1928).—A review.

H. B. MERRILL

Female hormone in yeast. E. GLIMM AND F. WADEHN. Tech. Hochschule, Danzig-Langfuhr. *Biochem. Z.* 197, 442-4 (1928).—Killed yeast is extd. several times with boiling alc., then chloroform. The residues after evapn. are combined and purified. They are dissolved in dil. MeOH, which is then evapd. and the residue is emulsified in dil. MeOH. On shaking with ether most impurities remain in the ammoniacal soln. The ether soln. is colored yellow and leaves on evapn. a little residue which is partly sol. in H₂O. From 1 kg. beer yeast 1 g. oily residue was obtained, of which 25 mg. was sufficient to initiate rut in a mouse.

S. MORGULIS

The significance of the lipoids in cell permeability. N. OKUNEV. Acad. Sci., Leningrad. *Biochem. Z.* 198, 296-310 (1928).—Lecithin and cholesterol are definitely surface-tension-active substances accumulating in the water-benzene or water-olive oil interface when they are dissolved in the lipid solvent or emulsified in the water. Generally, their surface-tension-lowering ability was greater in the water-benzene system, and lecithin is more active than cholesterol. In a water-benzene interface lecithin still produces a marked lowering of surface tension in a concn. of 1:400000. In lipid solvents the surface-tension activity of both lecithin and cholesterol is generally greater than in water emulsion. When lipid in a lipid solvent and trypan blue in aq. soln. are both present in either of the above systems the effect on the interfacial tension is such as if only one was present, the one which in the given concn. is the more effective. It is believed that lecithin can regulate the permeability of the protoplasm surface through changes in concn.

S. MORGULIS

Conservation of the properties of almond emulsin. M. BRIDEL AND (MLLE.) M. DESMAREST. *Bull. soc. chim. biol.* 10, 1050-5 (1928).—A sample of acetonetic emulsin, 8 yrs. after its prepn., conserved intact its β -glucosidase properties; its lactase had lost $\frac{1}{2}$ of its activity and sucrase was practically absent. Thus by simple aging a product is obtained which is active on β -glucosides but free of sucrase. **Properties of an emulsin twenty-three years old.** *Ibid* 1056-60.—Samples of emulsin prepd. in 1905 possessed glucosidase and lactase with about 50% of their original activities but no sucrase.

L. W. RIGGS

Action of trypsin. Influence of the products of digestion on the process. YVONNE SCHAEFFER. *Compt. rend. soc. biol.* 99, 669 (1928); *cf. C. A.* 22, 4551.—The diln. of the products of tryptic digestion after attaining equil., by the addn. of water, involves an acceleration of the process. The concn. of the products of peptic digestion by the addn. of peptone and amino acids retards the process. **Influence of the concentration of the enzyme and of the substrate.** *Ibid* 670-1.—For the same quantity of substrate the activity of the enzyme diminishes rapidly at first, then more slowly while its concn. increases. For the same concn. of enzyme there is an optimal concn. of substrate in which the p_H is lowered 5.5 to 6.5% of its initial value.

L. W. RIGGS

Nature of pyocyanase. SEIGO HOSOYA. *Compt. rend. soc. biol.* 99, 771-3 (1928).—A lengthy procedure is described whereby it is believed that the active substance of pyocyanase is isolated in a state of chem. purity. This substance has hemolytic properties.

L. W. RIGGS

Absorption of glucose by normal erythrocytes. F. RATHERY, R. KOULSKY AND (MLLE) S. GIBERT. *Compt. rend. soc. biol.* 99, 683-5 (1928).—By the methods of Bertrand and of Baudoin for estg. glucose, it was found that washed erythrocytes did not absorb sugar from the plasma in any const. or regular way. Absorption of glucose from the plasma by unwashed erythrocytes was insignificant either for plasmatic or added glucose. With added glucose the percentage of sugar absorbed from the plasma by erythrocytes in 9 cases of washed erythrocytes ranged from 5 to 23%, with a possible error of 4%.

L. W. RIGGS

Influence of mineralization on the osmotic pressure of the albumin of the blood in vitro. P. GRABAR AND J. WEILL. *Compt. rend. soc. biol.* 99, 868 (1928); *cf. C. A.* 22,

2000.—By the addn. of 11 mg. of NaCl and 9 mg. of NaHCO₃ to 20 cc. of serum, the Cl content was increased from 3.75 to 4.03 g. per l., while the osmotic pressure fell from 27 to 21 cm. Other tests gave similar results.

L. W. RIGGS

Influence of the quartz lamp irradiation (Hanau system) on the cholesterol content of blood of man and animals. ST. MALCZYNSKI. *Compt. rend. sol. biol.* 99, 922-5 (1928).—Irradiation by the quartz lamp for periods of 10 min. was always followed by a temporary increase in the cholesterol of the blood. The reason for this action is unknown.

L. W. RIGGS

Chemical equilibria in diastatic systems. Theoretical discussion. ERNST SYM. *Compt. rend. soc. biol.* 99, 1011-3 (1928); cf. Dietz, C. A. 1, 2903. **Experimental results.** *Ibid* 1013-5.—The system used in these expts. was the same as that employed by Dietz, except for lipase prepd. by the method of Rosenheim. The results with lipase confirmed those obtained by Dietz. Four expts. are described from which it is concluded that in a diastase-catalyzer system the equil. is the result of 2 actions, and that it depends on the difference of the activities of these 2 agents. Lipase forms a sep. phase. There is a current of diffusion of butyric acid, alc. and ester between the lipase and the solvent contg. the catalyzer. The ester formed by the catalyzer is hydrolyzed by the diastase and inversely. The equil. attained is not dynamic; it is suddenly caused by the macro-heterogeneity of chem. reactions or by phases.

L. W. RIGGS

Oxidation of uric acid under the influence of acceptors of hydrogen. S. DOBROWLSKA. *Compt. rend. soc. biol.* 99, 1022-3 (1928); cf. Przylecki, C. A. 22, 245, 248, 439, 2178.—The object of this study was to det. the behavior of uric acid under the influence of acceptors of H, and particularly of substances contg. the S-S group, in the absence of diastase. Methylene blue was inactive toward uric acid with a p_H below 8.0, but with a p_H above 8.0, a temp. of 37° and a concn. of 1 in 5000, it degrades 50% of the uric acid in 6 days, CO₂ being evolved. The action of the S-S group was studied by means of thioglycolic acid which oxidizes uric acid on passing from S-S to S-H. Anaerobiosis retards strongly the oxidation of uric acid. The presence of 0.2 mg. Cu in 100 cc. of a mixt. of uric and thioglycolic acids accelerates the oxidation of uric acid to 65% in 24 hrs. and 85% in 48 hrs. The presence of methylene blue increases the action of thioglycolic acid. The addn. of KCN 1 to 1000 causes a pronounced diminution in the oxidation of uric acid. During the action of thioglycolic acid on uric acid CO₂ is formed. The resemblance of thioglycolic acid to glutathione suggests that the latter may take part in the uricolysis in the animal body.

L. W. RIGGS

Biochemistry and geochemistry of iodine. Etiology and prophylaxis of endemic goiter. G. LUNDE. *Northwest Med.* 27, 412, 479 (1928); *J. Am. Med. Assoc.* 91, 1467, 1662; cf. C. A. 22, 1370.—The I that is released from weathered rocks is carried by rivers to the sea, where it is absorbed by the plankton, like other nutritive salts from the land, especially P and Ca compds. The production of plankton is periodic and depends, on the Norwegian coast, chiefly on the supply of nutrients from the land. These nutrients are most plentiful during the melting of snow in the spring, when large quantities of I which have been released by the erosion of rocks are carried to the sea. During and immediately after the flowering of plankton in the upper layers of the ocean, only a small quantity of the plankton is utilized for food of marine animals. The great mass sinks to the bottom and is partly consumed by bottom fauna. The bottom fishes obtain their I mostly from these animals. On the decay of various plants and animals a part of the I is again set free and can be absorbed anew by plants; much however remains in bottom sediments. I is also set free at the surface into the atm. and is carried back by pptn. Sea air is much richer in I than inland air. Fish products and especially those of easily transportable canned goods have a high content of I in org. combination and offer a simple means of supplementing iodized salt prophylaxis.

L. W. RIGGS

Action of various enzymes on calcium and sodium glycerophosphates. ANGELO CECARDI AND PIA LATZER. *Rend. ist. lombardo sci.* 1927, 856.—Ca glycerophosphate in physiol. soln. (1:100) was added to samples of cobra, bee and wasp poisons. After 10 min. in the thermostat at 50° the solns. of cobra and bee poisons were limpid; that of the wasp poison was turbid. After 1 hr. the 3 solns. were turbid. The ppt. from the soln. of wasp poison, dissolved in cold dil. HNO₃, gave an immediate ppt. with NH₄ molybdate. The ppt. from the cobra and bee poisons remained limpid for 12 hrs. when treated as above. A filtrate with the wasp enzyme gave with HNO₃ and NH₄ molybdate a yellow ppt. of NH₄ phosphomolybdate; nothing results with that from cobra poison, even after 12 hrs. The first ppt. was caused by Ca glycerophosphate. Wasps' enzyme acted also on Na glycerophosphate with and without Ca salt.

R. SANSONE

Action of Hydrapid (octahydroanthracensulfonic acid) on glycerophosphate of calcium and sodium. ANGELO CONTARDI AND PIA LATZER. *Rend. ist. lombardo sci.* 1927, 858.—Ca or Na glycerophosphate soln. added to a 5% Hydrapid soln. and heated for some time at 100° seps. phosphoric acid. The phosphate soln. with cold dil. HNO₃ and NH₄ molybdate gives no ppt., even after 12 hrs.; the hydrated soln. gives a ppt. of NH₄ phosphomolybdate after a short time. R. SANSONE

Action of octahydroanthracensulfonic (Hydrapid) on lecithin and lysocithin. ANGELO CONTARDI AND PIA LATZER. *Rend. ist. lombardo* 1927, 858.—By adding to a 1% Cd lecithin soln. $\frac{1}{10}$ its wt. of Hydrapid as a 5% soln., and warming to 100°, the opalescent soln. becomes limpid, giving an abundant ppt. in 1–10 hrs. according to the amount of Hydrapid used. * The soln. agglutinates blood, and the ppt. is slightly hemolytic. The ppt. dissolved in EtOH and repptd. with excess, filtered and washed with EtOH, is strongly hemolytic (1:4000). It contains fatty acids, P and choline, and dissolves in alc., repptg. a double salt with a cold satd. CdCl₂ soln. If the reaction is not completed, and the catalyst acts for 12–20 hrs., the ppt. rises slowly to the surface of the soln. Total decompn. is sometimes difficult, the soln. and ppt. losing all hemolytic power. The soln. contains CdCl₂, H₃PO₄, and choline. The ppt. only contains fatty acids sol. in EtOH. The I no. is 70 with a partial decompn. and 38 with a total. R. SANSONE

Buffering as a biological principle. VICTOR BERMAN. *Z. angew. Chem.* 41, 153–7(1928); cf. *C. A.* 22, 2761.—B. emphasizes the importance of buffering in relation to biological, nutritional and agricultural problems. He mentions the advantage of proper buffering in yeast manuf. where insufficient buffering of the nutrition medium causes degeneration of the yeast cells, and in the beer industry, where malt is used with better results than unmalted barley which has lesser buffering action and thus causes degeneration of the yeast cells. Also in the nutrition of humans, the buffered foods seem to have qualities superior to non-buffered ones. Concerning the action of buffers in agriculture, B. points out that the non-buffered artificial fertilizers are very often unfit on the non-buffered mineral soils, while they may be used in any amt. on humus soils, which are rich in buffer substances. Manure, which is strongly buffered, is therefore to be preferred for mineral soils. G. SCHWOCH

The influence of pepsin and of trypsin-kinase on polypeptides containing *d*-glutamic acid (ABDERHALDEN, ROSSNER) 10. Analogies in the catalytic action of enzymes and definite organic substances (LANGENBECK) 10. Chemistry of starch. XXI. The constitution of glycogen (PRINGSHEIM, WILL) 10. The action of crepsin and of trypsin-kinase on *l*-leucylpentaglycyl-*l*-tryptophan (ABDERHALDEN, SICKEL) 10. A theory of partial osmotic pressures and membrane equilibria (ADAIR) 2.

B—METHODS AND APPARATUS

STANLEY R. BENEDICT

A direct method for making total white blood counts on avian blood. DANIEL BLAIN. Vanderbilt Univ. *Proc. Soc. Exptl. Biol. Med.* 25, 594 6(1928).—A method for counting white blood cells by using neutral red staining soln. and formalin as dil. fluids was found to be accurate and applicable to avian blood in which the nuclei of the red blood cells are invariably present. C. V. B.

A body plethysmograph for the study of respiratory movements in human beings. CARL A. L. BINGER AND JOHN S. DAVIS, JR. Rockefeller Inst. *Proc. Soc. Exptl. Biol. Med.* 25, 607–10(1928).—An app. is described which was designed to eliminate errors in recording graphically the rate and depth of respiration. C. V. B.

Improved methods for the extraction of melanin from human urine. GRACE MEDES AND HILDING BERGLUND. University Hospital, Minneapolis. *Proc. Soc. Exptl. Biol. Med.* 25, 535–7(1928).—A method is described for extrn. of melanin from urine. Properties are listed for the melanin obtained. C. V. B.

A rubber-opposed hemodromograph used to measure reflux in aortic insufficiency. W. DOCK AND J. J. O'HARA. Stanford Univ. *Proc. Soc. Exptl. Biol. Med.* 25, 706–9(1928).—A simple instrument for use in studying reflux is described. C. V. B.

A modification of the Congo red method for the determination of pepsin. E. BEER AND O. PECZENIK. Univ. Wien. *Fermentforschung* 10, 88–90(1928).—Kawahara's Congo red method (*C. A.* 19, 838) is based on the fact that the dye adsorbed by albumin in dil. soln. does not undergo a color change in the presence of $\frac{1}{10}$ N HCl until the adsorption power is diminished by enzymic breakdown of the protein into simpler products. A change of color to blue or violet then indicates digestion. The reagent may be improved by staining a 1:1000 albumin soln. with "rose bengale B" (tetrachlorotetraiodo-

fluorescein) instead of Congo red and acidifying to 0.05 *N* by adding an equal vol. of 0.1 *N* HCl. Sep. portions of 3 cc. are then mixed with 1 cc. of 1:250, 500, 1000 and 2000 pepsin solns., and a boiled 1:250 soln. for control, and placed in a thermostat at 40°. The peptic activity may be expressed as the diln. of enzyme at which decolorization occurs in a given time, or the diminution in color intensity may be measured in a colorimeter. In 2-4 hrs. this reagent will detect peptic activity which would require 16 hrs. with the Congo red reagent.

A. W. DOX

The occurrence and identification of a hemochromogen-like pigment in animal suprarenals. A. ROSENBOHM. Cancer Inst., Hamburg-Eppendorf. *Z. physiol. Chem.* 178, 250 1(1928).—In a spectroscopic examn. of various animal organs the suprarenals of the pig showed uniformly 2 absorption bands, the location of which coincided with those of hemochromogen or reduced hematin. The same phenomenon was observed with the suprarenals of freshly killed steers and white rats. Apparently the hemochromogen occurs only in the medullary and not the cortical part of the gland. It was not found in other normal tissues. To det. whether any relationship exists between adrenaline and hematin formation, blood corpuscles were suspended in 1:2500 adrenaline solns. and kept 12 hrs. at 37°. Under these conditions neither hematin nor hemochromogen could be detected, but occasionally acid methemoglobin was found.

A. W. D.

The formation of hexone and purine bases in the development of the hen egg. JEN-ICHIRO SAGARA. Med. Acad., Nagasaki. *Z. physiol. Chem.* 178, 298-301 (1928).—Large quantities of chicken embryos (517-3327 g.) after 9, 14, 17 and 19 days' incubation were analyzed for purines and hexone bases. Purines were found but were not sepd. and identified. Of the hexone bases, arginine and lysine were isolated as picrates and histidine was isolated as picrolonate. With the exception of histidine the max. values were obtained on the 14th day, after which a slight decrease was noted. These values in % of embryo were: purines 0.0162, arginine 0.0149, histidine 0.0005 and lysine 0.1696. A storage of lysine is apparent.

A. W. DOX

Refractometric determination of fibrinogen. SIGISMUND SOMOGYI. Univ. Budapest. *Z. ges. expit. Med.* 53, 851-4 (1927).—The refractive index for 1% fibrinogen soln. = 0.00202. In Pulfrich units the factor is 0.187 (cf. *Arch. expit. Path. Pharmacol.* 94, 120). The method consists in detg. the *n* of blood in Ca citrate plasma and in Ca citrate serum, the difference being fibrinogen. The plasma is made up: 1 part Na citrate to 15 parts blood, and then 1 part CaCl₂ to 30 parts citrated plasma.

F. L. D.

A new syringe electrode for the direct measurement of *p*_H. C. H. LASCH. Univ. Potock. *Z. ges. expit. Med.* 56, 157-9 (1927).—The syringe is of the Luer type with a glass stopcock at the end instead of the ground tip, and a three-way stopcock fused to the barrel. The Pt electrode is attached to the tip of the plunger, the lead going through the plunger. Biological fluids can be collected easily and the *p*_H detd. without any exposure to the air. The side stopcock is for introducing H₂.

F. L. DUNN

Progress in the standardization of stains. Five years of stain standardization. H. J. CONN. N. Y. Agr. Expt. Sta., Geneva. *Stain Tech.* 3, 105-9 (1928).—Since the inception of the work of the Commission on Standardization of Biological Stains in 1923, 41 stains have been certified. Rose bengal was the only stain added to the list in 1928. The % rejects on stain samples submitted by manufs. for certification by yrs. is 1923, 45; 1924, 30; 1925, 13; 1926, 7; 1927, 12, and in the first 6 months of 1928, 3. These certified stains may now be purchased from all leading manufs.

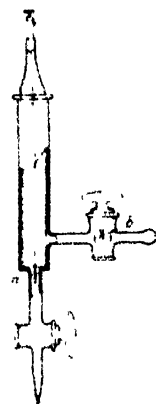
C. R. F.

The history of staining. The cochineal dyes. H. J. CONN, N. Y. Agr. Expt. Sta., Geneva, AND S. I. HORNHAUSER, Univ. of Louisville Med. School. *Stain Tech.* 3, 110-21 (1928).—The history of the use of

cochineal dyes in biol. and histological work is carefully reviewed. Carmin is derived from cochineal by boiling with some salt such as alum which causes a ppt. of a partially purified product. Carmin is more variable in compn. than cochineal itself and for good results, the use of either carefully purified carmin or carminic acid is desirable. Numerous formulas are given. The bibliography includes 25 references.

C. R. F.

Reactions of basic dyes with cyclic derivatives of an acid character. WALTER C. HOLMES AND RAYMOND M. MANN. U. S. Dept. Agr., Bur. Chem. and Soils, Wash., D. C. *Stain Tech.* 3, 122-30 (1928).—The recent discovery of French (*C. A.* 21, 1129) that the actual staining agent in the Ziehl-Neelson technic is an addn. product of the CaH₂OH and the dye employed led the authors to investigate the character of the reaction products of the various basic dyes with a considerable variety of cyclic derivs. of phenolic or acid character. Analytical data reported for the first time indicate



that basic dyes form addn. products with typical phenols. With more definitely acid cyclic derivs., the reaction is primarily metathetical, resulting in the formation of org. salts of the dyes. In some instances both metathesis and addn. result. The general method of prepn. of reaction products employed was that of adding to a concd. aq. soln. of the dye, a concd. aq. soln. contg. twice the amt. of the acid component. The reactions occurred at room temp. but hot, nearly satd. solns. were employed to insure max. yields. Cryst. ppts. were obtained on cooling. Among the addn. products prepd. were *rosanilin phenolate*, $C_{20}H_{20}N_3 \cdot OC_6H_5$; *phenol rosanilin hydrochloride*, $C_{20}H_{20}N_3Cl \cdot 2C_6H_5OH$; *resorcin new fuchsin hydrochloride*, $C_{22}H_{24}N_3Cl \cdot 2C_6H_4(OH)_2$; *hydroquinone new fuchsin hydrochloride*, $C_{22}H_{24}N_3Cl \cdot 2C_6H_4(OH)_2$; *resorcin crystal violet hydrochloride*, $C_{25}H_{30}N_3Cl \cdot 2C_6H_4(OH)_2$; *hydroquinone crystal violet hydrochloride*, $C_{25}H_{30}N_3Cl \cdot 2C_6H_4(OH)_2$; *chlorohydroquinone crystal violet hydrochloride*, $C_{25}H_{30}N_3Cl \cdot 2C_6H_3Cl(OH)_2$; *pyrogallol crystal violet hydrochloride*, $C_{25}H_{30}N_3Cl \cdot 2C_6H_3(OH)_3$; *phloroglucin crystal violet hydrochloride*, $C_{25}H_{30}N_3Cl \cdot 2(C_6H_3(OH)_3 + H_2O)$; β -*naphthol crystal violet* (formula not given); *crystal violet picrate*, $C_{25}H_{30}N_3 \cdot OC_6H_2(NO_2)_3$; *crystal violet acid phthalate*, $C_{25}H_{30}N_3 \cdot O_4C_8H_5$; *crystal violet 1-naphthol-4-sulfonate*, $C_{25}H_{30}N_3 \cdot SO_3 \cdot C_{10}H_6(OH)$; *crystal violet 1-naphthol-8-amino-3,6-disulfonate*, $(C_{25}H_{30}N_3)_2 \cdot (SO_3)_2 \cdot C_{10}H_6NH_2$; *resorcin methylene blue hydrochloride* (formula not given); *methylene blue salicylate*, $C_{16}H_{18}N_3 \cdot CO_2 \cdot C_6H_4 \cdot OH + 2H_2O$; *methylene blue acetyl salicylate*, $C_{16}H_{18}N_3 \cdot SO_2 \cdot C_6H_4 \cdot O_2C_2H_3$; *tetraethyl thionin acetyl salicylate*, $C_{20}H_{28}N_4 \cdot S \cdot CO_2 \cdot C_6H_4 \cdot O_2C_2H_3$; *azure C acetyl salicylate*, $C_{17}H_{22}N_4 \cdot S \cdot CO_2 \cdot C_6H_4 \cdot O_2C_2H_3$; and *methylene blue o-toluate*, $C_{16}H_{18}N_3 \cdot S \cdot CO_2 \cdot C_7H_7$. These new dyes may serve as valuable biol. stains.

C. R. FELLERS

Notes on stain application. R. W. FRENCH. Army Med. School. Wash., D. C. *Stain Tech.* 3, 130(1928).—Limited application has been made of the new cyclic derivs. of basic dyes described in the preceding abstr. to certain staining technics. Some of them have given very satisfactory results. In general, all act similarly to the usual phenol mixts. used in staining. When sufficiently sol. they gave very intense stains which, however, were difficult to differentiate. No definite conclusions may be drawn from this preliminary work.

C. R. F.

Investigation of thiazine dyes as biological stains. II. Influence of buffered solutions on staining properties. RACHEL HAYNES. Commission on Standardization of Biol. Stains, Geneva, N. Y. *Stain Tech.* 3, 131-9(1928); cf. C. A. 21, 1283.—The effect of buffer solns. of varying reaction upon staining fixed sections with thionine, azures A, B and C, and methylene blue was studied. The buffer solns. were employed as (1) a pre-treatment of the sections, (2) as a post-treatment and (3) as a dye solvent. Regardless of the method of employing the buffer solns. the intensity of staining increased with increasing p_H values, thus resembling the action of most basic dyes. It is uncertain whether this reaction is due to varying the p_H or to altering the salt content of the soln. or both. The staining intensity was greatest between the points p_H 5 and 6 or between p_H 6 and 7, its position varying with the method of fixation and of applying the buffer solns. It was further observed that between p_H 5 and p_H 7 there were always more pronounced metachromatic effects than with either more acid or more alk. buffer solns.

C. R. F.

Wright's as a differential spore stain. L. O. DUTTON. Methodist Hospital, Memphis, Tenn. *Stain Tech.* 3, 140-2(1928).—A method is outlined of differential spore staining utilizing Wright's stain dild. 1 to 5 in a phosphate buffer soln. of p_H 7.6 and following the general technic of the Dorner method. Spores are stained a deep blue while the cytoplasm of the sporangium is stained a pinkish red.

C. R. F.

A gasometric method for determination of reducing sugars, and its application to analysis of blood and urine. DONALD D. VAN SLYKE AND JAMES A. HAWKINS. Rockefeller Inst. *J. Biol. Chem.* 79, 739-87(1928).—The *Van Slyke-Neill* manometric app. was applied to the detn. of reducing sugars in blood or urine. The sugars are permitted to react with ferricyanide and the amt. of the latter reduced is detd. by treating with hydrazine and measuring the N_2 liberated. Highly accurate results are obtainable.

ARTHUR GROLLMAN

Note on the calibration of Barcroft manometers. MAURICE JOWETT. Univ. Liverpool. *Biochem. J.* 22, 717-9(1928).—A revised method of calibrating the Barcroft app.

BENJAMIN HARROW

Determination of succinic acid in blood. PERCIVAL W. CLUTTERBUCK. Manchester Univ. *Biochem. J.* 22, 745-8(1928).—A modification of Moyle's method (C. A. 18, 2198).

BENJAMIN HARROW

Determination of chloride in body fluids. JOCELYN PATTERSON. Charing Cross Hospital Med. School, London. *Biochem. J.* 22, 758-61(1928).—In plasma or serum: 0.1 cc. of the fluid is added to 1 cc. distd. water contained in a wide test tube. Add

3 cc. concd. HNO_3 , shake until the protein redissolves, then 0.5 cc. AgNO_3 (5.812 g. per l.) and shake again. Add 3–4 cc. acetone, mix, cool, add 8 drops (0.3 cc.) of satd. iron alum (indicator) and titrate from a microburet with alc. NH_4SCN of about $1/8$ strength of AgNO_3 and which had been standardized against the latter. B. H.

Some notes on the preparation of gold sols for the Lange test, with an account of a new method. F. S. FOWWEATHER. *Brit. J. Exptl. Path.* 9, 161–3(1928).—The success of the Lange test depends on the prepn. of a correct Au soln. Unless alk. adjusters are used the acid Au chloride salt cannot be used with success although the product commonly known as "gold chloride" is the acid salt, $\text{AuCl}_3 \cdot 2\text{HCl}$. Either the double salt with NaCl, viz. $\text{AuCl}_3 \cdot \text{NaCl} \cdot 2\text{H}_2\text{O}$ or the corresponding K salt may be used. F. prefers the K salt and avoids reduction at or near the p. p. The details of his method are as follows: Into a 200 cc. conical flask (from which any pptd. Au must be removed) are poured 100 cc. of freshly redistd. H_2O . One cc. of a 1% soln. of neutral K oxalate is added. Then 1.5 cc. of a 1% soln. of the Au K bromide is added. The whole is thoroughly shaken, the mouth of the flask protected from dust by a watchglass and the flask placed in a window where bright daylight reaches it. Direct sunlight should be avoided. The whole process from mixing and exposing the solns. to complete formation of the sol should occupy from 1 to 2 hrs. The final sol should have a faint sheen, giving the appearance of oiliness. Sols prepd. in direct sunlight may develop in half an hr. (depending somewhat on the temp.) but they are entirely without sheen and generally rather too stable. Sols taking more than 2 hrs. to develop are cloudy and unsuitable. In winter it is advisable to warm the H_2O to 25–30° before adding the reagents. In summer it is necessary that the H_2O after redistn. should be cooled thoroughly to room temp. before attempting the prepn. of the sol. On very dull or foggy days the method cannot be used. HARRIET F. HOLMES

The estimation of hydrochloric acid and enzymes in the stomach contents. FRANZ FRIEDHOFF. *Deut. Arch. klin. Med.* 160, 267–70(1928).—To est. the quantities of acid and enzyme bound to the solid stomach contents after various test meals, the residue after filtration of the stomach contents was washed with water till the washings were neutral; they were dried, and the adsorbed liquids were expressed by subjection to 250–300 atm. pressure. The concns. of acid and enzyme in the expressed liquid were roughly proportional to the concn. in the filtrate. P. Y. JACKSON

Is the finding of occult blood in small particles of feces conclusive? PAUL HIRSCH-MAMROTH. Polyclinic for Internal Diseases, Berlin. *Arch. Verdauungs-Krankh.* 43, 247–11(1928).—The presence of blood in small particles of feces was verified in 70 cases. FRANCES KRASNOW

The practical value of the determination of gastric pepsin. FRITZ HIRSCHBERG. *Arch. Verdauungs-Krankh.* 43, 211–9(1928).—The Boas method makes the detn. of pepsin very simple. It is especially valuable in cases of nervous influences on the gastric secretion. FRANCES KRASNOW

Microchemical identification of chitin. WILHELM KÜHNELT. *Biol. Zentr.* 48, 371–82(1928).—Deeply incrustated and pigmented objects are heated at 300° with glycerol or bleached with HCl and KClO_4 . For slight incrustation this treatment may be omitted. 50% KOH is added and the mixt. in a sealed tube is digested at 160° to 180°, cooled, centrifuged and washed with alc. and water. The chitin, thus obtained, is heated with KI soln. (I_2 —2 g., KI—1 g., water—200 cc.) and then with 10% H_2SO_4 . A dark violet color indicates the presence of chitin. If the prepn. is heated until the chitosan is completely dissolved and then cooled at 70° there appear spherical crystals of chitosan sulfate which turn violet in the presence of I and show the Brewster lines between crossed Nicol prisms. FRANCES KRASNOW

A normal sheep urinalysis. DANIEL J. HEALY, JOHN F. BULLARD AND HOWELL D. SPEARS. Kentucky Agr. Expt. Sta. *J. Am. Vet. Med. Assocn.* 73, 87–91(1928).—There was found urea 2.5, NH_3 0.01 and N 1.4%; no sugar, albumin, or acetone; some amorphous urates and Ca oxalate crystals. FRANCES KRASNOW

The estimation of silica in tissues. EARL J. KING. Univ. of Toronto. *J. Biol. Chem.* 80, 25–31(1928).—A colorimetric micro-method for the estn. of SiO_2 in tissue ash is described which makes use of the intense yellow color of silicomolybdic acid. Phosphoric acid is used as an artificial standard. Phosphate is removed by magnesia mixt. The following max. values were obtained for the silica content of some animal tissues (mg. per g. of fresh tissue: guinea-pig lung 0.12, rabbit lung 0.30, dog lung 0.39, rabbit kidney 0.34, dog kidney 0.21, rabbit liver 0.46, dog liver 0.34, dog spleen 0.16. In normal human lung 1.4 mg. of SiO_2 per g. of dried tissue was found; in silicotic lung 12–15 mg. A. P. LOTHEROP

Chemical and biological analysis of *digitalis lutea*. G. M. PICCININI. *Boll. soc.*

ital. biol. sper. 3, 509-11(1928).—The Keller-Kiliani reaction took place with the same rapidity and intensity for lutea as for purpurea (+++). The percent digitalin using the "Farmacopea Militare" 1916 method was 0.321 for lutea and 0.338 for purpurea. The injection of 1 cc. of a 10% infusion into the dorsal lymph sacs of frogs caused systolic arrest in 30-29-32 min. with lutea, and 25-28-35 min. with purpurea. The lutea leaves were collected in various regions of Northern Italy. The recommendation is made that *D. lutea* be used as a substitute for *D. purpurea* in Italy on account of its greater diffusion in this country.

PETER MASUCCI

The determination of phosphagen in various organs. G. MARTINO. *Boll. soc. ital. biol. sper.* 3, 622-23(1928).—The presence of phosphagen was detd. by Briggs' method, modified by Eggleton, in brain, kidneys, liver, spleen, lung, thyroid, suprarenal capsules, pancreas, ovaries and salivary glands. In none of these organs was there even a trace of phosphagen found. Blood also gave neg. results. Phosphagen is, therefore, found only in muscular tissue.

PETER MASUCCI

Comparative protein determinations in horse serum. D. VON DESHÖ. *Physiol. Inst. ungar. K. tierärztliche Hochschule, Budapest. Biochem. Z.* 200, 126-34(1928).—The micro-method of Howe for the pptn. of the serum proteins with Na_2SO_4 gives results in good agreement with the protein detns. made by the gravimetric method in the fractional salting out of the proteins with $(\text{NH}_4)_2\text{SO}_4$. The micro-method was also compared with Robertson's refractometric procedure, and while the results check so far as the total protein content is concerned, the globulin and albumin ratios are not the same by the refractometric and by the chem. method of detn. The n for horse serum globulin was 0.00169 and for albumin 0.00248, and is not the same as that given by Robertson. For total protein detn. the refractometric method is applicable with an av. error of $\pm 3\%$ if the const. 0.00199 is used.

S. MORGULIS

Gold and platinum electrodes and the acid error in the determination of p_H of yeast and blood. L. P. ROSANOV. *Physiol. Inst., Belorusskij Univ., Munich. Zhurnal exptl. Biol. Med.* 10, 141-6(1928).—Kahlbaum quinhydrone, if not recrystd., causes serious errors in the p_H detn. with yeast and blood. With yeast both Au or Pt electrodes give equally good results.

S. MORGULIS

Estimation of amino acids in urine. L. TIXIER. *Bull. sci. pharmacol.* 35, 570-1(1928).—The method is based upon the assumption that amino acids are sensitive to phenolphthalein but not to litmus.

L. W. RIGGS

The estimation of reducing substances in the blood. A. BAUDOUIN. *Bull. soc. chim. biol.* 10, 977-1049(1928).—The first part of this long paper reports a review and crit. exptl. analysis of the principal methods for detg. sugar in body fluids, which have been proposed during the past 15 years. Methods are judged on the basis of exactness, simplicity of manipulation and sensitiveness to permit the use of small quantities of body fluids. The objections to Cu reduction methods are (1) the readiness of the Cu to be reoxidized, and (2) the sensitiveness of cuprometry to slight changes in exptl. conditions, such as concn., alky. and time of boiling. The ferricyanide-permanganate and ferricyanide-iodine methods have an advantage over Cu-reduction methods in that the reagents used are "purely mineral" and the ferrocyanide produced by the reaction has no tendency to be reoxidized by the air. Very slight changes in the technic, however, may lead to an error of 50%. The Hg method of Baudouin and Lewin is described with minute detail and is preferred to the other methods. The second part of this paper is a report on the detn. of sugar in the blood. For diagnostic or prognostic purposes it is recommended to use the total blood and the mercurial method of deproteinization. The chemist engaged in research will use the method best adapted to the problem in hand.

L. W. RIGGS

Precipitation of phosphorus as strychnine phosphomolybdate. Application to microestimation of the different forms of phosphorus in the blood and of phosphorus combined with organic substances, either dry or in solution. JEAN ROCHE. *Bull. soc. chim. biol.* 10, 1061-78(1928); cf. Embden, *C. A.* 16, 267; Myrbäck, *C. A.* 20, 61.—The quant. pptn. of P as strychnine phosphomolybdate for quantities of P of the order 0.1 mg. is only to be realized in solns. less acid than 0.5 N HCl and less alk. than 2 N NaOH. The technic described allows the detn. of 0.02 to 1 mg. of combined P. The estn. of free P, total P and acid-sol. P of the blood is possible by this method, the 3 detns. requiring 1, 0.5 and 1.5 cc., resp., of blood. The error of this method is not more than 2%.

L. W. RIGGS

Relation of the mitochondria-Golgi complex to secretion. Intra-vital staining with neutral red and Sudan III. WEN-CHAO MA AND HEI-CHUN CHANG. *Peking Union Med. Coll. Chinese J. Physiol.* 2, 381-8(1928).—The staining technic is described. The use of Sudan III for staining the Golgi material is new. The mixt. of neutral red

and Sudan III promises to be as useful for Golgi as Janus green is for mitochondria. This action is dependent on the soly. of Sudan III in neutral red soln. L. W. R.

Colorimetric determination of serum proteins by means of phenol reagent. HSIEN WU AND SCHMORL M. LING. Pekin Union Med. Coll. *Chinese J. Physiol.* 2, 399-402(1928); cf. *C. A.* 22, 606.—An alk. soln. of egg albumin in 40% alc. is proposed for the standard in the colorimetric detn. of serum proteins by the authors' method. The relation between the amt. of serum protein and the color reading was detd., and by using this relation instead of Beer's law in the calcn., more accurate results are obtained.

L. W. RIGGS

Sensitive method for the detection of uranium and the localization of uranium in the body during intoxication. HERMANN EITEL. Univ. München. *Arch. exptl. Path. Pharm.* 135, 188-93(1928).—The presence of very minute amts. of U in tissues is revealed by ashing the organs and transforming the U compds. into uranyl compds. which can be detected by their fluorescence under ultra-violet illumination. After fatal U intoxication U can be found in the renal cortex. The medullary portion of the kidney and all other organs are free.

G. H. S.

Method for the perfusion of isolated surviving organs. I. A new apparatus. C JACOB. Pharmacol. Inst. Tübingen. *Arch. exptl. Path. Pharm.* 136, 203-23(1928).—A detailed description of the app., with illustrations, is given. II. **Technic.** *Ibid* 224-38.

G. H. S.

A modified Kjeldahl method for the determination of the nitrogen content of yeast. LEO M. CHRISTENSEN AND ELLIS I. FULMER. *Plant Physiology* 2, 455-60(1927).—Previous studies of N fixation by yeast (*C. A.* 20, 613) indicated that in the earlier stages of growth of yeast the N may be transformed into certain ring compds. not amenable to analysis by the usual Kjeldahl method. The following modified Kjeldahl method for the analysis of the N of yeast is now proposed:—The sample is suspended in 20-30 cc. of a soln. contg. 15% H_2O_2 by wt. to which are added 10 g. of K_2SO_4 , 0.4 g. of $CuSO_4$ crystals and 1 cc. of concd. H_2SO_4 . The mixt. is evapd. almost to dryness over a low flame. After the residue is cool it is digested according to the regular Kjeldahl method. This method gives 96-100% of the N in yeast according to the Dumas method. This method is not necessarily advantageous for all materials but the optimum concn. of peroxide may need to be detd. in each case.

WALTER THOMAS

Determination of hemoglobin by means of the silver iodide photogalvanic cell. KOICHI UCHİYAMA. *Sci. Papers Inst. Phys. Chem. Research* 8, 173-84(1928).—The concn. of hemoglobin (Hb) in human blood is easily detd. by means of the AgI cell of Imori and Takebe (*C. A.* 22, 4069). Three methods of use are given. (1) The decrease of photoelec. potential (x) due to absorption is first detd. for solns. of known Hb concn. and then the Hb concn. of an unknown soln. can be obtained by comparison. (2) There is a linear relation between c , the concn. of the soln., and x given by $c = kx$, where k is the cell const. obtained by using a standard soln. (3) By first detg. x for an unknown soln. and then substituting glass plates of known Hb equiv. until the same value of x is reached.

E. G. VANDEN BOSCHE

The chemistry of Jaffe's reaction for creatinine (GREENWALD) 10.

C—BACTERIOLOGY

C. B. MORREY

A note on the carbohydrate content of the alcohol-soluble antigen of tubercle bacilli. KATHRYN KNOWLTON AND MAX PINNER. Detroit Municipal Sanatorium, Northville, Mich. *Am. Rev. Tuberculosis* 18, 502-4(1928).—The antigenic strength of the alc sol antigen of tubercle bacilli is apparently independent of both proteins and the sp. carbohydrate which leaves but little doubt that it is of lipid nature.

H. J. CORPER

The chemical study of bacteria. XXIII. Comparative yields of water-soluble protein and carbohydrate from tubercle bacilli from various sources. TREAT B. JOHNSON AND ALICE G. RENFREW. Yale Univ., New Haven, Conn. *Am. Rev. Tuberculosis* 18, 505-12(1928).—Four specimens of tubercle bacilli from different sources have been examined for their content in the active protein no. 304 and carbohydrate, resp. While the yield of the protein is very low when autoclaved cells are used, the carbohydrate is still obtainable, but in reduced amts. Both combinations apparently undergo change by heating the cells at 100° or higher. A technic is described for sepg. both fractions from a single unit of cells, and a modified technique is given for extg. the sugar fraction alone.

H. J. CORPER

Stimulation experiments with the sucrase of *Penicillium glaucum*. II. Z. I. KÉRTÉSZ. Univ. Budapest. *Fermentforschung* 10, 36-8(1928); cf. C. A. 22, 2381-2.—The formation of sucrase by *Penicillium glaucum* is dependent upon the presence in the culture medium of a nutrient substance contg. an α -fructoside grouping. When the organism is grown for 5 days on a 5% glucose soln. contg. the necessary inorg. salts the mycelium develops normally but contains practically no sucrase. If the glucose soln. is replaced by 5% sucrose and the organism allowed to develop 2 more days an abundance of sucrase is rapidly formed. If this sucrose medium is then replaced by glucose, the sucrase content of the mycelium rapidly diminishes until on the 14th day it has fallen to less than 5% of the max. reached on the 8th day when the sucrose was removed.

A. W. DOX

Oxidation of phenanthrene by bacteria. W. O. TAUSSON. *Planta Abt. E., Z. wiss. Biol.* 5, 239-73(1928).—Three species of bacteria (*Bacillus phenanthrenicus bakien-sis*, *Bacillus phenanthrenicus guricus*, and *Bacillus phenanthrenicus*) were grown on culture media contg. various hydrocarbon derivs. to det. which ones could be utilized and what the steps were in the decompn. of phenanthrene. No appreciable amts. of naphthalene, paraffin, resorcin, phloroglucinol, pyrogallol and anthracene were utilized by the bacteria. Pyrochatecol, salicylic acid, saligenin and quinic acid were used to good advantage. These results indicate that the utilization of hydrocarbons will depend upon whether the compd. has an open or closed chain, and according to the position occupied by the OH group. The following steps are suggested for the decompn. of phenanthrene: phenanthrene \rightarrow saligenin \rightarrow *o*-hydroxybenzaldehyde \rightarrow salicylic acid \rightarrow pyrochatecol.

A. E. HITCHCOCK

Filtration experiment with tubercle bacilli. GOROKU NAKAJO. Kitasato Inst., Tokio. *Jap. Med. World* 8, 120-5(1928).—After cultural and animal expts. it is concluded that tubercle bacilli are not filterable through Chamberland's L₂ or L₃ with the strains and technic employed.

N. KOPELOFF

Constancy and variability of the properties of the diphtheria bacillus. S. BOHDANOWICZ AND A. LAWRYNOWICZ. *Med. Doswiadczalna i Spoleczna* 9, 51-76 (Polish), 76-7 (French)(1928).—The systematic study of the diphtheria bacilli leads to no sharp characterization. Most of them ferment the carbohydrates and polyatomic alcs. Levulose, galactose, glucose, mannose and maltose were fermented to the amt. of 100-86%, dextrin, starch, salicin, xylose 37.8-9.1%, glycerol and amygdalin 2.7-1.4%. Arabinose, erythritol, dulcitol, sorbitol, mannitol, inositol, lactose, saccharose, inulin, phlorhizin and arbutin were not fermented.

JAROSLAV KUČERA

The bactericidal power of tissues. BRUNO BORGH. *Boll. soc. ital. biol. sper.* 3, 545-6(1928).—Using the Saxl and Donath technic, B. failed to detect any bactericidal activity in minced organs of rabbits and guinea pigs against pneumococcus, streptococcus, staphylococcus, meningococcus, and typhosus. He, therefore, was unable to confirm Saxl and Donath's results.

PETER MASUCCI

Reactivation of culture media by means of sugars. V. CIANCI. *Boll. soc. ital. biol. sper.* 3, 644-8(1928).—Slant agar tubes were inoculated with the organism in question and incubated for 5-7 days at 37°. The tubes were then melted, sterilized and cooled. To some of the tubes was added a sugar utilized by the organism; to some of the tubes nothing was added. These acted as controls. The tubes were again inoculated with the same organism and incubated. On examn., the control tubes showed scant growth, but the sugared tubes showed luxuriant growth. The organisms used at first were *Staph. pyogenes aureus* and *B. coli*. The sugar was glucose. Similar results were obtained with *B. paratyphosus*, *B. lactis aerogenes*, *B. morgani*, and for the sugars, maltose, lactose and sucrose. *B. paratyphosus* was seeded on plain agar and lactose agar and the tubes were incubated. After growth took place, the agar was melted, sterilized and planted with *B. coli*. There was scant growth on the plain medium but luxuriant growth on the sugared medium. Other organisms and other sugars were used with identical results. This enabled C. to make a generalized statement covering the behavior of 2 organisms growing under the conditions described above.

PETER MASUCCI

Studies on the proteolytic bacteria of milk. IV. Action of proteolytic milk bacteria on amino acids and other simple nitrogenous compounds. WM. C. FRAZIER AND PHILIP RUPP. U. S. Dept. of Agr. *J. Bact.* 16, 231-45(1928); cf. C. A. 22, 4571.—Synthetic media contg. simple N compds. as a sole source of N were inoculated with 229 strains of proteolytic bacteria from milk. The growth, increase in NH₃, and change in p_H were noted. The N compds. included: Na₂(NH₄)PO₄, NH₄ succinate, urea, asparagine and the following amino acids: glycine, alanine, leucine, aspartic acid, glutamic acid, tryptophan and tyrosine. The basic medium was: K₂HPO₄ 3.1 g.; KH₂PO₄

0.8 g.; KCl, 0.2 g.; $\text{MgSO}_4 \cdot 7\text{H}_2\text{O}$, 0.2 g.; water 1000 cc. Some of the organisms which can use urea as a sole source of N cause an alk. reaction by the liberation of NH_3 , whereas others liberate no NH_3 and cause an acid reaction. Organisms which can use NH_3 as a sole source of N can apparently use any of the simpler amino acids if the medium contains fermentable sugar as a source of C. In media which contain no sugar or similar C compd., in which the amino acid must furnish both N and C, differences in utilization occur which may be useful in grouping the organisms.

JOHN T. MYERS

Some chemical studies of commercial bacteriological peptones. JAMES G. MCALPINE AND GEORGE D. BRIGHAM, Storrs Agr. Expt. Sta., Storrs, Conn. *J. Bact.* 16, 251-6(1928).—"Difco-Bacto, Difco-Proteose, Fairchild, and Witte peptones, all contained about the same amt. of total N. Witte and Difco-Proteose peptones contained the largest amts. of so-called "protein" N, which is probably proteose in nature. The non-protein N of Witte peptone was small and was equally divided between polypeptide and amino N. There was very little free NH_3 . In Difco-Proteose peptone the total N was about half non-protein. The non-protein N was about $\frac{1}{3}$ polypeptide and $\frac{2}{3}$ amino acid. Free NH_3 was negligible. Fairchild peptone contained a small quantity of protein and the non-protein fraction was about half polypeptide and half amino N. Free NH_3 was high. The total N of Difco-Bacto peptone was largely non-protein. There was little free NH_3 .

JOHN T. MYERS

Chemical constitution and germicidal activity of amines, ketones and aldehydes. F. W. TILLEY AND J. M. SCHAFER. U. S. Dept. of Agr. *J. Bact.* 16, 279-85(1928).—The phenol coeffs. of a no. of alkyl and aryl amines and alkyl ketones and aldehydes were detd. The results obtained with primary alkamines indicate that with *B. typhosus* as a test organism, the av. ratios between successive mol. coeffs. vary somewhat with different strains but the general av. was 2.0. With *Staphylococcus aureus* the general av. was 3.3. With alkyl ketones and *B. typhosus* the av. ratio between successive mol. coeffs. was 3.25. Results with aldehydes were unsatisfactory, but the ratio seems to be 2.5 or more.

JOHN T. MYERS

Nature of bacterial toxins. The tetanic toxin. SEIGO HOSoya AND SHIGEO MIYATA. *Compt. rend. soc. biol.* 99, 773-6(1928).

L. W. RIGGS

D—BOTANY

THOMAS G. PHILLIPS

Some experiments on the action of aluminum on plants. YOSHIJI YOSHII. Lab. of Hans Molisch, Univ. of Vienna. *Science Repts. Tôhoku Imp. Univ.* [4], 3, 547-59 (1928).—*Aspergillus niger* withstands concns. of $\text{Al}_2(\text{SO}_4)_3$ up to 0.005 M, *Penicillium* up to 1 M. In dil. solns. the formation of conidia is hastened. *Elodea canadensis* damaged by a 0.001 M soln. while in more dil. soln. new sprouts and roots are formed. Expts. with branches of many higher plants show that a 0.002 M soln. is toxic to them, but more dil. solns. are stimulating. There are many algae in the soil which can withstand high concns. of the Al salt; thus *Chlamydomonas* grows well in a 0.25 M soln.

DAVID DAVIDSON

Importance of phytochemistry in systematic botany. R. JARETZKY. *Arch. Pharm.* 266, 602-13(1928).—The importance of phytochemistry is discussed and emphasized in systematic botany, as also the recognition of the evolution of chem. substances in detg. the phylogenetic relationship of the plants examd.

W. O. E.

Method for the estimation of the salt content from the p_H value of apple juice, and some comparative analysis of the mineral content of the juice and whole apple. DOROTHY HAYNES AND JANET W. BROWN. Imperial College of Science and Technology, London. *Biochem. J.* 22, 947-63(1928).—If the p_H and titratable acidity of the juice of acid apples are measured, it is possible to obtain a fairly reliable idea of its salt content by comparison with the acidity and p_H of mixts. of malic acid and potassium malate of known concn. The same percentage of potash was found in the expressed juice as in the whole apple. Larger percentages of magnesia and lime were found in the juice than in the whole apple.

BENJAMIN HARROW

Effect of sunlight on sap concentration of citrus leaves. F. F. HALMA AND A. R. C. HAA. *Bot. Gaz.* 86, 102-6(1928).—Increases in sap concn. due to the action of the sunlight on the leaves are due to photosynthetic products; the ash remains the same.

BENJAMIN HARROW

Chemistry of growth as represented by carbon nitrogen ratio. Regeneration of willow cuttings. PHILLIS A. HICKS. Univ. Coll. of South Wales. *Bot. Gaz.* 86, 193-200(1928).—Expts. on the regeneration of cuttings of *Salix viminalis* have been carried out with normal cuttings, and with cuttings injected with KNO_3 and various sugars.

The initiation of growth is due to stimulated respiration, giving energy for the withdrawal of N into the bast, and its consequent upward translocation, particularly to the buds. The injected sugars hasten this process. KNO_3 in excess prevents the commencement of growth.

BENJAMIN HARROW

Effect of alcohol on cells of *Nitella flexilis*. P. A. DAVIES. Univ. Louisville. *Bot. Gaz.* 86, 235-9(1928).—Twenty % (by vol.) of alc. caused the highest initial rise of CO_2 production, followed by 10, 30, 40, 60 and 95% solns., resp. The drop in the initial rises below the normal rates was most rapid in the 95% soln., followed by 60, 40, 30, 20 and 10% solns., resp. The highest initial rise is produced by a rapid penetration of the alc. without a rapid change in the cell structure, allowing a rapid outflow of CO_2 .

BENJAMIN HARROW

Free albumin crystals in the endosperm of *Loranthus Europaeus* seeds. SOROR IMELDA MAYR. *Anz. Akad. Wiss. Wien* 63, 167(1926).—Long crystals of albumin were found in the endosperm of *Loranthus Europaeus* seeds kept in alc. for a long time. These crystals are not found in fresh seeds. Conclusion: When albumin crystals are found in materials kept in alc., one should investigate whether they are formed in the cells or in the alc.

A. L. HENNE

Analytic studies in plant respiration. I. The respiration of a population of senescent ripening apples. F. F. BLACKMAN AND P. PARIJA. *Proc. Roy. Soc. (London)* B103, 412-45(1928).—Apples, stored at a temp. of 2.5° for a period of 8 months, slowly ripen, passing through the senescent stage, which lies between the adolescent and the mature stages and is characterized by a lowered organization-resistance, fundamental changes in the organization of the tissues, and hydrolysis of reserve and semi-reserve compds. more rapidly than during the mature stage. The output of CO_2 is increased during the senescent stage, and is decreased when that stage has been completed. During senescence, 2 independent and opposite processes occur: (a) the starvation drift, which tends to lower respiration, and (b) increased hydrolysis, which tends to accelerate respiration. II. The respiration of apples in nitrogen and its relation to respiration in air. P. PARIJA. Ravenshaw College, Cuttack, India. *Ibid* 446-523.—Glucolysis, which is a measure of respiration, is itself measured by the production of CO_2 . Probably the direct substrate for glucolysis or oxidation is not a normal hexose, but some specialized hexose deriv. which is subject to marked changes of concn., production, and consumption. Glucolysis proceeds more rapidly in air than in N_2 , and is accelerated by an increased O_2 concn. This acceleration is attributed to increased production of the substrate for glucolysis rather than to oxidation.

JOSEPH S. HEPBURN

Properties and reactions of a flavonol-like pigment isolated from the red leaves of *Prunus pissardi*. ST. JONESCO. *Bull. soc. bot. (France)* 74, 460-72(1927).—This pigment is similar to the flavonol, *quercetin*, and is apparently the same substance which Willstätter and Mallison (1915) obtained as a result of reducing quercetin by means of Na amalgam in the presence of HCl. The resulting red color was assumed by these 2 investigators to be due to the reducing effect of nascent H_2 . J. shows, however, that nascent H_2 , generated from Zn will not produce a red color in the presence of HCl. Likewise no red color is produced when metallic Na alone, or HCl alone is used. Both metallic Na and HCl appear to be necessary for the production of the red color. It is suggested that this coloration occurs in 2 distinct steps. The pigment mol. is first transformed by the action of metallic Na into a greatly modified form which renders it susceptible to the subsequent coloration by HCl. H_2SO_4 may be substituted for HCl, but neither HNO_3 nor CH_3COOH was able to produce a permanent red color. Chem. tests showed that this pigment was not an anthocyan, but that its alc. soln. gave the following color reactions which are characteristic for quercetin: green-olive with FeCl_3 ; deep yellow with NaOH and KOH; brownish yellow with NH_4OH ; yellow with $\text{Ba}(\text{OH})_2$; greenish yellow with Na_2CO_3 . Other reactions: it reduces ammoniacal AgNO_3 in the cold; does not reduce Fehling's soln.; amyl alc.- H_2O suspension gives no red color when heated with HCl; pptd. by H_2O and Pb acetate. The salt itself is insol. in H_2O and dil. acids; it is very sol. in dil. alk., EtOH, MeOH, acetone and Et_2O . Isolation of the pigment was accomplished as follows: after being dried and powdered the leaves were extd. with benzene and petroleum ether, the chlorophyll pigments removed, the remaining fraction was extd. with Et_2O , distd. H_2O added to the residue and filtered. The non- H_2O -sol. residue contained the pigment in question. Purification was accomplished by repeated dissolving in EtOH and pptn. by H_2O and finally adding dil. NH_4OH and pptg. by neutralizing with H_2SO_4 . The residue was washed with hot H_2O , dissolved in EtOH, evapd., H_2O added, and then filtered. When dried the pure pigment was a brilliant yellow amorphous powder.

A. E. HITCHCOCK

Importance of nitrogen and phosphorus in the growth of *Oedogonium pluviale*.

HANS FREUND. *Planta abt. E., Z. wiss. Biol.* 5, 520-48(1928).—Zoöspores and filaments of *Oedogonium pluviale* were placed in a complete nutrient soln. and in nutrient solns. lacking various combinations of ions to det. the effect upon dimentional growth relations of the cell. Opt. growth was obtained in a complete Knop's soln. (0.4%). Cell division was practically inhibited when both nitrate and phosphate were omitted. Lack of nitrate alone was more detrimental than lack of phosphate. In solns. lacking either sulfate or Mg the rate of cell division and the length and breadth of the cells were only slightly less than those which occurred in a complete Knop's soln. When both Mg and sulfate were omitted in addn. to phosphate, the relative decrease in cell division was much greater than that for a soln. lacking Mg, sulfate and nitrate. Decreased cell division was correlated with increased cell length and decreased breadth. In light, protoplasmic growth was dependent upon nutrients but the rate of growth was dependent upon light intensity. No growth occurred in the dark, even in a complete nutrient soln. It is believed that the part which nitrate plays in increasing protoplasmic vol. and decreasing cell elongation may be due to viscosity relations. A. E. HITCHCOCK

Nicotine in the metabolism of the tobacco plant. KURT MÖRDES. *Planta abt. E., Z. wiss. Biol.* 5, 563-615(1928).—Analyses were run on the leaves of Bavarian and Maryland Broadleaf tobacco in order to det. what part nicotine plays in the metabolism of the tobacco plant. Nicotine was present in increasing amts. from the youngest to the oldest leaves, but no correlation existed between rate of growth and abs. amts. of nicotine. Conditions unfavorable for growth of the plant did not prevent nicotine from being synthesized. Even when protein N reserves were being used up, nicotine synthesis continued. Decompn. of the nicotine mol. occurred only in the dying parts of old leaves. An abundance of inorg. N was the only factor which inhibited or retarded nicotine synthesis. From these results there appears to be no correlation between nicotine synthesis and protein N metabolism. With the use of silicotungstic acid according to Rasmussen's method, the error in detg. nicotine N was estd. to be less than 1%. A. E. HITCHCOCK

The proportions of potassium and sodium contained in marine algae. GABRIEL BERTRAND AND MME. M. ROSENBLATT. *Bull. soc. chim.* 43, 1133-7(1928).—See C. A. 22, 4151. E. H.

An inheritance study of the distribution of vitamin A in maize. SIGFRED M. HAUGE AND JOHN F. TROST. Purdue Univ. and Bur. of Plant Ind., U. S. Dept. of Agr. *J. Biol. Chem.* 80, 107-14(1928).—Vitamin A was transmitted exclusively with yellow endosperm through the process of crossing and segregation of Reid Yellow Dent and Johnson County White Dent corn. No measurable transfer of vitamin A to white endosperm grains selected from the F_2 segregating ears was obtained. Any genetic relationship must be one of close linkage between vitamin A and yellow endosperm kernel character in dent corn. The 3 classes possessing yellow endosperm, heterozygous F_2 , homozygous F_2 , and homozygous parent, were equally effective in preventing ophthalmia in rats. A. P. LOTHROP

Effects upon rice plants of changing the moisture content of soil. FELECIANO T. PANTALEON. Univ. of the Philippines. *Philippine Agr.* 17, 173-85(1928).—Rice plants deprived of sufficient H_2O for a period of 15 days after attaining an age of 30 to 40 days gave better yields than those continuously well supplied. Plants deprived of H_2O from 17 to 25 days survived but gave increasingly less yields of straw and grain. When deprived of H_2O for 35 days the plants died. Withholding H_2O for periods of 5 to 10 days had no effect upon the time required to attain maturity as compared with controls which were watered daily. A. L. MEHRING

The catalase reaction and the biology of pollen. G. LOPRIORE. *Ber. deut. botan. Ges.* 46, 413-23(1928).—The sex organs of plants are especially active in liberating O_2 from H_2O_2 . This reaction is more intense when these parts are mature, and may therefore be used as an indication of the degree of ripeness. In proterandrous flowers the pollen does not react at the same time as the stigma, nor does it react as vigorously; in proterogynous flowers the pollen is more active than the stigma. Pollen germinates in the presence of dil. H_2O_2 (1 part in 1000). LAWRENCE P. MILLER

Further investigations on Rasdorsky bodies. GEORG BORISSOV. Botan. Lab. Landw. Hochsch. Wladikawkas. *Ber. deut. botan. Ges.* 46, 463-80 (1928); cf. *Ibid* 42, 366; 43, 178.—Rasdorsky bodies is the name given by B. to silica contg. cystoliths found in the root endodermis of plants. The form and development of these bodies in *Andropogon argenteus* Ell., *A. halepensis* Brot., *Sorghum vulgare* Pers. var. *sudanensis*, *A. formosus* Klotzsch., and *Eulalia japonica* Trin. are described and illustrated. LAWRENCE P. MILLER

The intermicellar space in cell membranes. ALB FREY. Pflanzenphysiol. Inst.

d. E. T. H., Zürich. *Ber. deut. botan. Ges.* 46, 444-56(1928).—By a method based on the double refraction of anisotropic layers the intermicellar space of ramie fibers was measured. When air-dry or in abs. alc. this space comprises only about 1% of the membrane thickness; after swelling in H_2O this is increased to 12%. When swelling in H_2O the micellae suffer a slight desorientation from the parallel alignment in the dry state; when $ZnCl_2$ is employed this is considerably greater. Measurements made on lignified and non-lignified cells show that lignification is without influence on the anisotropy of the membrane, and must therefore be regarded as a type of swelling.

LAWRENCE P. MILLER

Germination of *Phacelia tanacetifolia* Benth. JOHANNES STEPHAN. Staatl. Botan. Garten, Dresden. *Ber. deut. botan. Ges.* 46, 499-508(1928).—The % germination of the seed of *P. tanacetifolia* when subjected to light from different portions of the spectrum of about the same intensity decreases with respect to the quality of the light in the following order: darkness, λ 460-540, λ 500-580, λ 420-500, white light, λ 600, infra-red.

LAWRENCE P. MILLER

Color change, variegation and color variation in molds. ADALBERT BLOCHWITZ. *Ber. deut. botan. Ges.* 46, 516-24(1928).—A general discussion with special reference to the effect of p_H .

LAWRENCE P. MILLER

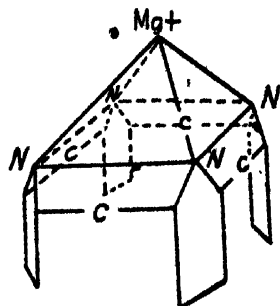
Researches on the pigments of the plastids and on photosynthesis. III. The biology of photosynthesis. V. LYUBIMENKO. Jardin botan., Leningrad. *Rev. gen. botan.* 40, 415-47, 486-512(1928); cf. *C. A.* 22, 3906.—This is a general discussion of the subject with the presentation of much data from the work of L. and his students. Some of the conclusions are: (1) The chem. reactions of photosynthesis are intimately connected with the phys. state of the plastids and with the enzymic equipment of the protoplasm; this is why it has been impossible to obtain photosynthesis in the absence of the living organism. (2) The max. quantity of chlorophyll elaborated by the plastids of various plants is an hereditary character which is transmitted by 2 series of factors, of which only 1 is subject to the Mendelian law. (3) From the detn. of the chlorophyll content of over 600 species of plants from various latitudes, it is seen that the av. content of chlorophyll increases from the poles toward the equator the higher temp. at the equator favoring the development of species adapted to shade, which contain more chlorophyll. (4) In a given plant the quantity of chlorophyll varies with the different leaves according to the intensity of the light to which they are exposed. (5) The energy of photosynthesis is influenced by the presence of carbohydrates in the tissue, and the direct absorption of sugars by the leaves often acts as a stimulant to photosynthetic activity. It is not improbable that the plant obtains part of the energy for the beginning of photosynthetic activity from the enzymic oxidation of substances previously accumulated. (6) Photoperiodic studies from the point of view of dry wt. production show that certain plants require a longer day than others. This may be due to differences in the activity of oxidizing enzymes, plants which oxidize their carbohydrates but slowly not requiring such a long period for photosynthetic work. (7) With pure lines of a given species, differing in chlorophyll content, the greatest dry wt. per unit of chlorophyll is produced by those in which the concn. of pigment is relatively low. (8) Natural chlorophyll is not a mixt. of green and yellow pigments, as is generally believed, but a colored albuminoid giving an aq. colloidal soln. which breaks up on coagulation to the colorless protein and the pigments. (9) The accumulation of chlorophyll in the plastids is not a simple photochem. reaction, but is complicated by the transformation of albuminoid substances, in which enzymes play an important role. L. P. M.

The occurrence and detection of oxidases in wood-destroying fungi. W. BAVENDAMM. *Z. Pflanzenkrankh. Pflanzenschutz* 38, 257-76(1928).—When fungi are grown in solid culture media contg. tannin, a dark zone results if oxidizing enzymes are present. Other substances besides tannin may be used but investigation showed that tannin or gallic acid in a concn. of 0.5% gives best results. By this test oxidases are absent from fungi which attack only cellulose—*Merulius lacrymans*, *Contiophora cerebella*, *Polyporus sulfureus*, *Nectria cinnabarina* and *Nectria galligena*. LAWRENCE P. MILLER

Cotton wilt. DAVID C. NEAL. *Annals Mo. Bot. Garden* 14, 359(1927).—A botanical and nutritional study of the fungus *Fusarium vasinfectum* is described. The fungus either on potato-dextrose agar or on a synthetic nutrient soln. shows optimum growth at a temp. of 28-30°. In the synthetic nutrient soln. (Duggars') the best growth was obtained in cultures started at p_H 3.5, but becomes more acid during growth. Filtrates and exts. of mycelium possess toxic properties. Addn. of Fe or Al salts to media shows no consistent effect upon infection of cotton seedlings by fungus; results indicate that K salts reduce infection. Proper fertilization of soil and the use of wilt-resistant varieties of cotton are recommended as remedial measures.

N. M. NAYLOR

A theory of photosynthesis. KARL FREILICKER. *Biochem. Z.* 199, 12-20 (1928).—"If one thinks of the chlorophyll mol. in its spatial relations the following picture presents itself. The Mg forms the highest point of a pyramid over the 4 N atoms and is the most positively charged point. Should the 4 pyrrole nuclei be placed parallel to the axis of the pyramid, the mol. assumes a resemblance to the magnet with a point sharpened to intensify its action." Indeed, the energy absorbed by the chlorophyll in different positions is concd. at the peak, on the Mg, whereas at the strongest pos. pole the 4 OH ions, corresponding to the 4 H atoms which are added to the chlorophyll mol., become discharged. The further occurrences are the same as are possible in any electrolysis." S. M.



Seaweed from Seychelles. ANON. *Bull. Imp. Inst.* 26, 297-9(1928).—Seaweed identified as *Gracilaria Wrightii* J. Ag., var. *ceylanica* Grun., contains: H_2O 15.8, crude protein 9.4, Et_2O ext. 1.1, fiber 10.6, ash 5.8 (contg. 0.6% SiO_2 on the wt. of the seaweed), N-free ext. 57.3%. It was of good quality, comparable with the best grades of Irish moss.

A. PAPINEAU-COUTURE

Evolution of iodine in Laminaria. P. FREUNDLER. *Bull. soc. chim. biol.* 10, 1123-8(1928).—This paper is mainly a criticism of the work of Dangeard; cf. C. A. 22, 1993, 3193.

L. W. RIGGS

Glycogen as a means of ciliary reversal. G. H. PARKER. Harvard Univ. *Proc. Nat. Acad. Sci.* 14, 713-4(1928).—Small fragments of filter paper soaked in sea water when placed on the ridged lips of the sea anemone were moved outward over the lips to the bases of the innermost tentacles where they were taken up by the tentacular cilia and discharged from the disk of the animal. If, however, before the bits of paper were discharged they were picked up with the forceps, and in their wet condition were worked full of powd. glycogen, and were replaced in the exact spot from which they had been removed, they moved inward. A similar bending inward of the cilia was noted on feeding with foods rich in glycogen. Starch and glucose did not produce this reversal.

L. W. RIGGS

Assimilation problems. PAUL MAYER. Kaiser Wilhelm Inst., Berlin-Dahlem. *Z. angew. Chem.* 41, 672-4(1928).—Survey of the recent investigations concerned with the detection of intermediate substances formed by the plant in assimilating C and N. $HCHO$ is considered to be the intermediate product in the synthesis of carbohydrates, especially on account of the fact that by the so-called "dimedon process," in which 5,5-dimethylcyclohexane-1,3-dione acts as a recipient for $HCHO$, its accumulation in plant cells could be shown. As to the assimilation of N, H_2NOH is likely to be the intermediate product in nitrification as well as denitrification. The importance of this fact is emphasized that H_2NOH itself has been recently shown to be formed in the metabolism of soil bacteria cultivated on nitrates by allowing $AcMe$ to act as the recipient and identifying the formed $HON:CMc_2$ as such.

G. SCHWOCH

The effect of accumulated carbon dioxide on plant respiration. J. J. WILLAMAN AND J. H. BRAUMONT. Univ. of Minnesota. *Plant Physiology* 3, 45-59(1928).—In former investigations on winter hardiness in apple trees, the authors used the continuous aspiration method (*Proc. Am. Soc. Hort. Sci.* 1924, 99-104); but, because of certain mechanical difficulties in this method over long periods, the discontinuance method of allowing the CO_2 to accumulate in the chamber until the end of the period was resorted to. The app. previously described (C. A. 22, 4583) was used. Respiration data are given for one year old apple twigs at 0° , small potato tubers at 22° , and wheat grain at 40° . It was found that when the CO_2 is allowed to accumulate, the rate of production of the CO_2 diminishes in a logarithmic ratio and with apple twigs the amt. of CO_2 produced is proportional to the logarithm of the time and is expressed, after the first 30 or 40 min., by the formula $CO_2/\log t - 0.566 = k$. When accumulated CO_2 is removed, the rate of its production immediately becomes much greater, the increase being proportional to the amt. of CO_2 previously accumulated. It is a matter of several hrs. before the rate attains a const. value. The results are in agreement with the conclusions of Spoehr and McGee (*Carnegie Inst. Washington Year Book* 22, 51-66 (1923)). The explanation of these results favored by the authors is that the accumulation of CO_2 in the tissues increases the H-ion concn. in the latter, which, by bringing the proteins of the protoplasm nearer their isoelec. points, increases the permeability of the protoplasm, resulting in an actual increase of the rate of CO_2 production. The necessity of taking cognizance in all plant respiration studies of the history of the material during the period immediately preceding respiration measurements is pointed out. W. T.

Changes in the buffer system of the wheat plant during its development. ANNIE M. HURD-KARRER. Bur. of Plant Ind., Washington, D. C. *Plant Physiology* 3, 131-53(1928); cf. *C. A.* 20, 2542; 17, 2127.—The expts. were conducted on White Odessa, a common winter wheat, and Jenkin, a spring club wheat; necessary different environmental conditions were secured by growing the plants in different greenhouses at different times of the year. At predetd. intervals some of the plants were cut and 10 cc. of the undiluted expressed juice titrated electrometrically as rapidly as possible (*C. A.* 17, 2127). The p. ds. measured after the addn. of each successive cc. of alkali or acid to the juice were translated into p_H values and plotted against the quantities of alkali or acid producing them. The "blank" corrections (*C. A.* 14, 751) were small enough to be ignored. It was found that the electrometric titration curves change progressively during the seedling stage and during the maturation period, although only minor changes, correlated with environmental factors, occur during the tillering stage and most of the shooting stage. Differences in the form of the titration curve for juice of seedlings in successive stages of development indicate differences in compn. assocd. with increasing photosynthetic activity. The end of this period of change in the curve indicates the end of the seedling stage. The progressive increase in buffer capacity during the maturation period is due to increasing concn. of the juice. The sp. gr. increases regularly during this period, and is closely correlated with the corresponding "titratable acid" values. The initiation of these changes marks the beginning of the maturation period. Heat-coagulable proteins play a very small part in the buffer system of the wheat plant. The buffers remaining in boiled and filtered juice are sol. in either hot or cold 75% alc., but practically insol. in cold 95% alc. W. T.

Further evidence of the essential nature of zinc for the growth of higher green plants. ANNA L. SOMMER. Univ. of Minn. *Plant Physiology* 3, 217-21(1928).—It has previously been shown that Zn as well as B is essential for the growth of barley and sunflowers (*C. A.* 21, 3700). Plants of 2 other families, viz., the Polygonaceae, represented by buckwheat, and the Leguminosae, represented by Windsor beans (*Vicia faba*) and red kidney beans, were studied by the technic previously reported (*C. A.* 21, 3700). All salts were especially purified. The plants were grown in Pyrex containers. Precautions were taken to prevent contamination by dust. The solns. had the following compn.: KNO_3 0.80 g., KH_2PO_4 0.15 g., $MgSO_4 \cdot 7H_2O$ 0.50 g., $CaSO_4$ (satd. soln.) 500 cc., B (as H_3BO_3) 0.0005 g., Mn (as $MnSO_4$) 0.0015 g., Al (as $Al_2(SO_4)_3$) 0.0005 g., NaCl 0.0127 g., Cu (as $CuSO_4$) 0.000125 g., I (as KI) 0.00025 g., F (as KF) 0.00025 g. Iron as $FeSO_4$ was added when needed. An excess of silicon as SiO_2 was added to the solns. The control cultures received in addn. 0.0005 g. per l. of Zn as $ZnSO_4$. Buckwheat plants without Zn grew more slowly than those receiving Zn even during the early stage of development, but none died before reaching the flowering stage. With Windsor beans there was no visible difference between the plants grown with and without Zn until the flowering stage was reached. At this stage there was a rapid abscission of leaves and most of the flower buds fell off. The av. dry wt. at maturity of the Windsor bean plants was (1) without zinc 13.3 g.; (2) with zinc 27 g. The Windsor bean plants receiving addns. of Zn grew well, bloomed freely and produced seeds. The results with red kidney beans were similar to those with the Windsor beans. The paper is illustrated with 2 plates.

WALTER THOMAS

Mineral constituents of Spanish moss and ball moss. EDGAR T. WHERRY AND RUTH G. CAPEN. *Ecology* 9, 501-4(1928); cf. W. and Buchanan, *C. A.* 20, 3179. Two new analyses of Spanish moss and 3 of ball moss are presented. The compn. of material supported by wires proved to be closely similar to that of the same plant supported by nearby trees. Ball moss from an arid region in Texas had 3 times as much ash as that from humid Florida. Contrary to the view of Schorger (*C. A.* 21, 1551) the presence of dust could not be demonstrated, and the results are believed to indicate the marked ability of these plants to ext. inorg. matter from rain water. E. T. W.

The coloring matter of cottonseed hulls (GILL, GREENUP) 27.

E—NUTRITION

PHILIP B. HAWK

Metabolism and vitamin A. C. M. MCCAY AND V. E. NELSON. Iowa State Coll. *J. Metabolic Research* 7-8, 199-204(1925-6). There were no appreciable differences in the vol., sp. gr., acidity, or N partition in the urine of rats fed on complete diets from those of rats fed on a vitamin-A-deficient diet. Albumin was found as a normal constituent in the urine of the rat, its amt. varying directly with the protein intake. H. J. D., Jr.

The chemical and nutritive properties of the grain sorghums. V. G. HELLER AND

ROBERT GREEN. Okla. Agr. Coll. *J. Metabolic Research* 7-8, 205-15(1925-6).—The nutritive value of 20 various sorghums (kafir, milo, shalu, feterita, kaoliang, hegari, yolo, and maize) was found to be comparable to that of corn as detd. by expts. on rats. "The vitamin content was sufficient for all practical purposes but the vitamin A, although sufficient for growth and reproduction, was insufficient for continued rearing of the young." The protein is deficient in some of the essential amino acids which makes it necessary to supplement it with a source of the missing amino acids. H. J. D., Jr.

Feeding of protein to partially nephrectomized animals. HARRY LUNDIN AND ROBERT MARK. Physiatrie Inst., Morristown, N. J. *J. Metabolic Research* 7-8, 221-57 (1925-6).—When about 75% of the total kidney parenchyma was removed in 3 dogs and 80 to 90% in a goat there was a decrease in the N-concg. mechanism but none of the other functions was disturbed. With a removal of greater than 75% of the total kidney tissue, there was in addn. to the impairment in the N-concg. power, a loss in ability to vary the p_H of the urine and a disturbance in the excretion of PO_4 and Cl as well as org. acids. Acidosis occurred and there was a gradual accumulation of urea in the blood; albuminuria and hematuria were present; the blood pressure rose and the animals died in uremia. When a high-protein diet was administered to the animals in which 25% of the kidney tissue remained intact, no further impairment of the kidney functions occurred. The blood urea rose as did the blood pressure, N and H_2O were retained in the tissues but no visible edema occurred. On changing the animals to a low-protein diet, these factors returned to normal. The pulmonary excretion of H_2O was increased in order to counteract the large retention of H_2O when N was stored in the tissues. Administered H_2O was more slowly excreted by the partially nephrectomized animals than by the normal. On the change from a low- to a high-protein diet, there was a preferential retention of S in comparison with that of N, while when the reverse occurred, S was excreted at first more rapidly than N. The Cl excretion was decreased in high-protein feeding. After a high-meat feeding there was a greatly increased excretion of PO_4 , SO_4 and org. acids but a decrease in Cl. The excretion of fixed base was kept low by the high NH_3 excretion and by the excretion of a urine of high acidity. Creatinuria did not occur in the adult dog when fed on a creatine-free diet although it occurred after the high-meat feeding. The creatinine excretion likewise increased in this period as did that of uric acid and amino acids. The blood pressure was increased after removal of 75% of the kidney but returned to normal with the hypertrophy of the kidney remnant. It again rose on high-protein feeding but returned to normal on resumption of the low-protein régime. The removal of 50% of one kidney caused a doubling of the size of the other kidney without being hypertrophied itself.

H. J. DEUEL, JR.

The relationship of bile acids to alimentary cholesterol. K. LOEFFLER. Univ. Freiburg. *Z. physiol. Chem.* 178, 186-91(1928).—From the fact that bile acids are the most potent cholagoges known, it might be expected that these substances would accelerate not only the absorption but also the elimination of cholesterol with the bile. If, however, the absorption but not the simultaneous elimination is accelerated there would be an accumulation in the liver and perhaps also in the entire organism. Cholesterol alone, cholesterol + desoxycholic acid, and cholesterol + cholic acid were fed to mice in daily doses of 20-50 mg. over periods of 84, 74 and 46 days, resp. The diet was well tolerated and no symptoms of sickness appeared. The animals receiving the bile acids developed greatly enlarged gall bladders. Detns. of cholesterol in the liver showed a fairly regular increase throughout the feeding periods. With cholesterol alone the value increased from 0.52 to 2.53 mg. in 80 days, with cholesterol + desoxycholic acid it rose from 0.58 to 3.74 in 74 days, while with cholesterol + cholic acid the increase was from 0.67 to 9.13 mg. in 46 days. It is thus demonstrated that a greater storage in the liver occurs when bile acids are fed along with the cholesterol. It is noteworthy that cholic acid has a greater effect than desoxycholic acid, despite the fact that it forms no addn. product with cholesterol. Whether this difference is due to greater absorption in the 1st instance or to different rates of elimination of the cholesterol remains to be detd.

A. W. DOX

Calcium metabolism with mineral-poor and vitamin-rich diets. HEINRICH ZIMMER. Univ. Berlin. *Z. ges. exper. Med.* 58, 362-9(1928).—Quant. diets rich in vitamins and with known mineral content were fed to dogs and the Ca balance was detd. In both dogs during the 7 and 6 weeks, resp., they were on the Ca-poor and vitamin-rich diets. There was a neg. Ca balance of about 0.47 and 0.18 g. weekly. No relationship was found between the loss of Ca and the C:N ratio.

F. L. DUNN

Note on the effect of ingesting large amounts of pineapple juice upon the p_H of the urine. CAREY D. MILLER. U. of Hawaii. *J. Home Econ.* 20, 498-501

(1928).—The discomfort experienced by new arrivals to Hawaii caused by ingesting large quantities of pineapple juice is not due to acidosis inasmuch as drinking a large amt. of juice by 4 women subjects resulted in an increase in the p_H of the urine, decreased the titratable acid and NH_3 output. A plausible explanation is offered in the presence of the large amt. of CaC_2O_4 crystals in pineapple juice. L. D. ELLIOTT

The adequacy of some New Zealand dietaries. LILLIAN B. STORMS AND E. NEIGE TODHUNTER. U. of Otago, N. Z. *J. Home Econ.* 20, 817-24(1928).—A study of the food consumed by 12 families for 1 week showed that all diets but 1 met Atwater's energy requirements for the resp. occupations. Protein furnished more than 10% of the total calories. The low amt. of Ca, P and Fe together with the high proportion of sugar and fats found in these diets may have a bearing on the poor teeth and high incidence of dental caries existing in New Zealand. L. D. ELLIOTT

Vital economy in human food production. J. R. MURLIN. Univ. of Rochester, N. Y. *J. Nutrition* 1, 91-104(1928).—A review of nutrition investigations particularly with reference to the Penna. Inst. of Animal Nutrition and the work of Armsby.

C. R. F.

Old and new problems of practical nutritional physiology. A. SCHEUNERT. Leipzig. *Z. angew. Chem.* 41, 780-4(1928).—A review of problems and research on nutrition and diet. It requires 600 g. of white or 900 g. of whole rye bread daily to supply sufficient vitamin B for a man. Rye bread lacks vitamins A, C and D and is deficient in minerals. The deficiency is not apparent in a proper mixed diet. C. R. F.

Vitamins. WILHELM STEPP. *Z. angew. Chem.* 41, 788-92(1928); cf. C. A. 21, 761.—A review. No original data are presented. C. R. F.

The effect of sterilization upon the antiscorbutic vitamin. E. REMY. Hyg. Inst., Univ. Freiburg. *Z. Untersuch. Lebensm.* 55, 385-93(1928).—Cauliflower, green beans, spinach, green peas and carrots were cooked in slightly salt water and then put into glass jars and sterilized for 60 min. at 98°. Tomatoes were washed, cut, covered with weak NaCl soln. and cooked 20 min. at 80°. Fifty g. of vitamin C-free basal ration and 70 g. of sterilized food material was fed as daily ration to guinea pigs to det. vitamin C content. Cauliflower, green beans and carrots did not contain enough vitamin after cooking to prevent scurvy. Cooked tomatoes and spinach contained sufficient vitamin to protect the animals. The Bezssonov test of a blue color following the addn. of a phosphomolybdic tungstic acid, $17WO_3(MoO_3)(P_2O_5)25H_2O$, was not as reliable as animal expts. for the estn. of vitamin C. A table of the chem. compn. of the vegetables used in the expts. is given. C. R. FELLERS

The vitamin A content of the liver (particularly that of man). E. LAQUEUR, L. K. WOLFF AND E. DINGEMANSE. Univ. Amsterdam. *Deut. med. Wochschr.* 54, 1495-7(1928).—The vitamin A content of livers was detd. by the $SbCl_3$ reaction of Rosenheim with Lovibond's logarithmic colorimeter. Cod-liver oils varied in their vitamin contents. Hog livers contained less than cattle livers and varied with the season. Human livers obtained at autopsy varied greatly in their vitamin content. ARTHUR GROLLMAN

The availability of disulfide acids as supplementing agents in diets deficient in cystine. II. α -Dihydroxy- β -dithiodipropionic acid. BEULAH D. WESTERMAN AND WM. C. ROSE. Univ. of Ill. *J. Biol. Chem.* 79, 413-21(1928).—Synthetic α -dihydroxy- β -dithiodipropionic acid was incapable of replacing cystine in the diet of rats for purposes of growth. ARTHUR GROLLMAN

Vitamin A deficiency and calcification of the epithelium of the kidney. E. C. VAN LEERSUM. Netherlands Inst. of Nutrition, Amsterdam. *J. Biol. Chem.* 79, 461-4(1928).—The kidneys of rats maintained on a diet deficient in vitamin A showed calcification of the tubular epithelium. Photomicrographs are appended. A. G.

The concentration of vitamin B. IV. The concentration and the separation of the two components of vitamin B. P. A. LEVENE. Rockefeller Inst. *J. Biol. Chem.* 79, 465-70(1928).—Vitamin B, concd. by the method of Levene and van der Hoeven (C. A. 20, 936), was further concd. and sep'd. into its components by means of silica gel. This substance adsorbs the heat-unstable fraction preferentially. In this way a fraction contg. both factors (in the ratio of 1:30) in high concn. was obtained. Daily doses of 2.2 mg. of this material maintained normal growth in rats while 0.07 mg. contained an effective daily dose of the heat-unstable component. HNO_3 destroys the activity of the heat-stable factor. After deaminization, extn. with silica gave a product contg. only the heat-unstable factor. ARTHUR GROLLMAN

Some biochemical relations of phenols. II. The effect of hydroquinone on the vitamin A content of stored oils. RALPH C. HUSTON, HOWARD D. LIGHTBODY AND CHARLES D. BALL, JR. Mich. State College. *J. Biol. Chem.* 79, 507-18(1928).—Feeding expts. on rats indicated a definite *antioxygenic* effect of hydroquinone on vitamin

A of milk fat and of cod-liver oil. There was a correlation between the preservative activity of hydroquinone on vitamin A and its protection of milk fat from decompn.

ARTHUR GROLLMAN

Further evidence of the complex nature of vitamin B. I. Evidence that a third factor exists. CHARLES H. HUNT. Ohio Agr. Expt. Station, Wooster. *J. Biol. Chem.* 79, 723-31(1928).—Vitamin B from yeast was sepd. into (1) the antineuritic, vitamin F, (2) the antipellagic, vitamin G and (3) a fraction left in the yeast residue. All 3 components are essential to growth in rats.

ARTHUR GROLLMAN

The relative antineuritic and antipellagic potency of cow milk. CHARLES H. HUNT AND W. E. KRAUSS. Ohio Agr. Expt. Station, Wooster. *J. Biol. Chem.* 79, 733-8(1928).—Milk from cows under winter feeding conditions was potent in the antipellagic vitamin and relatively poor in the antineuritic vitamin.

A. G.

The importance of bananas in the diet. WALTER H. EDDY AND MINERVA KELVAGG. Columbia Univ. *Wiener med. Wochschr.* 78, 1148-50(1928).—A review of past work on the food value of the banana.

ARTHUR GROLLMAN

Examination of irradiated zymosterol for the presence of vitamin D. ELEANOR M. HUME, HANNAH H. SMITH AND IDA SMEDLEY-MACLEAN. Lister Inst., London. *Biochem. J.* 22, 980-6(1928).—Zymosterol, a sterol obtained from yeast (cf. *C. A.* 22, 1985), is not activated by ultra-violet irradiation.

BENJAMIN HARROW

Absorption spectrum of vitamin A. RICHARD A. MORTON AND ISIDOR M. HEILBRON. Liverpool Univ. *Biochem. J.* 22, 988-96(1928).—Vitamin A gives an absorption band with a max. at 328 μ .

B. H.

Studies on color tests for sterols and for vitamin A. II. A spectroscopic study of the coloration attributed to vitamin A. FRANK WOKES. Univ. Liverpool. *Biochem. J.* 22, 997-1006(1928).—The color produced with AsCl_3 gave bands at about 587 and 475 μ , and that with SbCl_3 gave bands at about 614 and 530 μ . A "second" band is observed on standing, corresponding with the change from a blue to a red color.

BENJAMIN HARROW

The assay of vitamin A. KATHARINE HOPE COWARD AND KATHLEEN MARY KEY. *Biochem. J.* 22, 1019-25(1928).—The test is to keep the animal steady in weight on the deficiency factor and then to det. the resumption of growth, the dose being graded and "without premature slackening."

BENJAMIN HARROW

Vitamin A formation. The feeding of etiolated wheat shoots to rats in darkness. THOMAS MOORE. Nutritional Lab., Cambridge. *Biochem. J.* 22, 1097-1101(1928).—Etiolated wheat shoots are effective as a source of vitamin A. Light, therefore, is not essential.

BENJAMIN HARROW

Color reactions of substances containing vitamin D. WILFRED A. SEXTON. Liverpool Univ. *Biochem. J.* 22, 1133-4(1928).—Shear's claim (*C. A.* 21, 3932) that vitamin D may be recognized by the red color produced when the substance is boiled with aniline hydrochloride in excess of aniline is disputed.

BENJAMIN HARROW

Action of x-radiation upon vitamin D in activated ergosterol. ROBERT R. MORRISON, PHILIP R. PEACOCK AND SAMSON WRIGHT. Middlesex Hospital, London. *Biochem. J.* 22, 1138-41(1928).—0.0002 mg. of activated ergosterol will partially protect against, and cure, exptl. rickets. X-rays exert a destructive effect on vitamin D.

B. H.

Experimental findings in nutrition studies and their relation to clinical practice. JOHN A. MARSHALL. Univ. California. *Dental Cosmos* 70, 1080-4(1928).—An address with bibliography. Dietary deficiencies during the period of tooth formation, from the lower deciduous central incisor to the upper third molar, are very important predisposing causes, but probably are not exciting causes of dental diseases.

J. S. H.

The soy bean and its utilization in the organism. Metabolic investigations upon human subjects. R. O. NEUMANN. *Arch. Hyg.* 99, 1-51(1928).—Analysis of soy beans showed an av. compn. of water 10.93, protein 33.58, fat 17.06, carbohydrate 28.76, roughage 4.85 and ash 4.81%. If the oil is removed (this can be removed to 41%) the protein content increases to 48.50%. Soy-bean flour contains in addn. 1.5% lecithin, and vitamins A and B. The addn. of 10% soy-bean flour to wheat flour raises the protein content from 6 to 8%. The max. which may be added is about 20%; above this the bread is dry and crumbly. The taste does not differ materially from that of ordinary bread, and there is no unpleasant sensation in the stomach. Upon a diet of bread made of soy-bean flour (to 20%), added to a mixed rye-wheat flour, when nothing else was taken except water, the N balance was found to be well preserved; but after seven diet periods of 4 days each there was a slight minus balance and a loss of 1.6 kg. of body wt. The total and dry wt. of the feces was much higher with the addition of soy bean than when the diet consisted of rye-wheat bread alone. The N content of the feces was higher, but this was due to the ingestion of more N. Very

little carbohydrate was found in the feces; but of the ash contained in the diet from $\frac{1}{3}$ to $\frac{1}{4}$ was lost in the feces. In comparison with the rye-wheat bread the soy-bean bread was less well utilized. The av. differences on dry wt. basis were 6.79-20.69%; N, 2.19-3.98%; carbohydrate, 10.40%; ash, 16.31%; calories, 3.52-19.44%.

P. Y. JACKSON

Studies on the mechanism of the specific dynamic action of proteins. HELMUTH REINWEIN. *Deut. Arch. klin. Med.* 160, 268-99(1928).— NH_3 , NH_4 salts and amines cause no increase in the O consumption of surviving liver tissue beyond that caused by the OH ions. The effect is observed with amino acids only when NH_3 is liberated; in high concns. all amino acids exert a neg. action. Expts. with alanine, asparagine and perhaps glutaminic acid show that increased O consumption in the tissue may be accompanied by a decreased consumption of carbohydrate, suggesting the synthesis of sugar from the amino acid residue; but ketogenic amino acids exert a sp. dynamic action upon an entire organism. Histidine caused no increase in O consumption in surviving tissue, although it was largely broken down, yielding NH_3 . Histidine has, however, a noticeable sp. dynamic effect when fed to a dog; apparently this acid is not utilized directly by the liver tissue, or else other factors are concerned in the sp. dynamic effect.

P. Y. JACKSON

Preventing live-stock losses with iodine. GEORGE B. ROTHWELL. *Fertilizer, Feeding Stuffs and Farm Supplies J.* 13, 510, 540-1(1928).—The value of I in the growth, health and nutrition of live-stock is discussed.

K. D. JACOB

The concentrated water-soluble fraction of milk as a source of vitamin B. G. C. SUPPLEE, ODESSA D. DOW AND G. E. FLANIGAN. *J. Dairy Sci.* 11, 420-5(1928).—Numerous feeding expts. were conducted in parallel with variable quantities of dry yeast. The following basal ration was fed: casein purified by AcOH , 18 parts; salt mixt. no. 40, 4 parts; powd. agar agar, 2 parts; butter fat, 5 parts; dextrin, 71%. Several charts, showing growth curves plotted, are given. The evidence is fairly consistent in indicating a vitamin B content of the milk concentrate substantially equiv. to that of dried yeast.

J. C. JURKENS

The influence of vitamin-rich foods on the body weight in old age. ADOLF BICKEL. Berlin Univ. *Arch. Verdauungs-Krankh.* 43, 70-81(1928).—The addn. of vitamin effects increase in body wt. within certain limits.

FRANCES KRASNOW

The nutritional value of the whole potato. STANISLAW K. KON AND ANIELA KLEIN. *Med. Doswiadczalna i Spoleczna* 9, 92-9(Polish), 100(English)(1928).—In a nutritional expt. an adult man and woman lived over a period of 167 days in nitrogen equil. on a diet in which N was practically derived from the potato; the av. daily nitrogen intake was 5.7 and 3.8 g., resp.

JAROSLAV KUČERA

The hypercholesterolemia of fasting as influenced by the separate administration of fats, carbohydrates and proteins. RICHARD E. SHOPE. Rockefeller Inst., Princeton, N. J. *J. Biol. Chem.* 80, 133-40(1928).—A decrease in hypercholesterolemia similar to that observed following feeding with a mixed diet is produced in a fasting animal by the sep. administration of either fat, carbohydrate or protein. No significant increase in blood cholesterol results from a diet of fat alone for 48 hrs. This exptl. evidence adds no weight to the assumption so often made that cholesterol has a function in fat metabolism.

A. P. LOTHROP

Feeding experiments with a diet low in tyrosine. HOWARD D. LIGHTBODY AND MARJORIE B. KENYON. Mich. State Coll. *J. Biol. Chem.* 80, 149-53(1928).—Rats were fed for 12 weeks on diets that differed only in their tyrosine content. The N of the exptl. diets was supplied by gelatin which had been digested with pancreatin and by acid-hydrolyzed human hair supplemented by amino acids. The diets contained 39.7 mg. of tyrosine per 100 g. of food; to one was added an extra 0.2% of tyrosine. Under the exptl. conditions employed the growth of the rats was independent of the tyrosine content of the food.

A. P. LOTHROP

The nutritive properties of gelatin. RICHARD W. JACKSON, BEATRICE E. SOMMER AND WILLIAM C. ROSE. Univ. of Ill. *J. Biol. Chem.* 80, 167-86(1928).—Diets contg 15-55% of gelatin as the sole protein are not suitable sources of N even when supplemented with the amino acids known to be missing or present in relatively small amts. About half the rats placed upon a 35% gelatin diet, to which had been added appropriate quantities of cystine, tyrosine and tryptophan, successfully weathered the change and, after periods of more or less profound "adjustment," maintained body wt. or even grew at varying rates. The diet was not rendered more satisfactory for growth when 15% of gelatin was supplemented by the addn. of the 11 amino acids which seem to be the most likely sources of deficiency. Valine and isoleucine which are absent from gelatin are not limiting factors in the nutritive properties of this protein. Increased pro-

portions of phenylalanine, aspartic acid, glutamic acid and histidine in the supplemented 15% gelatin ration had no beneficial effect. Attempts to improve the quality of gelatin are complicated by what appears to be a deleterious action exerted by the protein when fed at a 35% level, which is shown by the early fatal outcome of many of the expts. and the frequent incidence of severe renal injury. A temporary inhibition of growth of rats upon casein diets can be brought about by substituting gelatin for 35% of the carbohydrate. The peculiar inadequacies of gelatin for growth are not due to the presence in the mol. of linkages which cannot be severed by the digestive processes as hydrolyzed gelatin supplemented with amino acids did not support growth any more successfully than unhydrolyzed gelatin.

A. P. LOTHROP

Synthesis of vitamin B in the rumen of the cow. S. I. BECHDEL, HANNAH E. HONEYWELL, R. ADAMS DUTCHER AND M. H. KNUTSEN. Penn. State Coll. *J. Biol. Chem.* 80, 231-8(1928). See *C. A.* 22, 3914.

A. P. LOTHROP

The availability of ergothioneine in supplementing rations deficient in histidine. BLYTHE A. EAGLES AND GERALD J. COX. Yale Univ. and Univ. of Ill. *J. Biol. Chem.* 80, 249-54(1928). -No evidence was found to indicate that ergothioneine (2-thiolhistidine) can be converted into histidine by the young rat or can diminish the histidine requirement of the growing animal.

A. P. LOTHROP

Dietary requirements for fertility and lactation. XIX. Does copper supplement vitamin B for lactation? BARNETT SURE. Univ. of Ark. *J. Biol. Chem.* 80, 289-95 (1928). cf. *C. A.* 22, 4584. -Expts. were conducted to det. whether Cu might be a limiting factor in synthetic rations used in studying vitamin B requirements for lactation. Addnl. increments of growth could not be secured by Cu administration in dosages which Hart and coworkers found effectual in the synthesis of hemoglobin and also for growth in rats that have become anemic on an exclusively whole milk diet. Increased dosage of vitamin concentrate, on the other hand, never failed to produce a response in the growth of nursing young within 24 hrs. XX. **A differentiation of the vitamin B complex in rice polishings as evidenced in studies of lactation.** *Ibid* 297-307. Rice polishings contain in addn. to large amts. of the thermolabile antiberiberi vitamin an appreciable amt. of the thermostable, antipellagra vitamin for growth. From the standpoint of lactation the polishings are abundant in the former vitamin but deficient in the latter. The lactating animal is inefficient in secreting both the stable and labile factors in the milk.

A. P. LOTHROP

The metabolism of fats. III. PIERA LOCATELLI. *Arch. sci. biol.* (Italy) 12, 40, 11(1928). -Neutral homogenized emulsions of beef fat (8%) were injected into the circulation of dogs. The animals were killed 1/2 hr. later and the liver, lungs, spleen and kidneys were fixed in formalin and stained by Daddi's method. No histological changes indicating the accumulation of fat in the organs, in the parenchyma or in the capillaries of the organs were noted. Neutral and alk. soaps of beef fat and cholesterol dissolved in bile were also injected intravenously. Each organ reacted differently; the animals which received alk. soaps showed deposits of fat in the "capillarihülsen" of the spleen.

PETER MASUCCI

Activation of the antirachitic factors in dry yeast. W. KIRSCH. Univ. Königsberg. *Biochem. Z.* 196, 294-300(1928). -Dry yeast irradiated with ultra-violet rays has potent antirachitic effects and is also effective in curing rickets. These properties were greatly diminished in the prepn. which was preserved for 7 months. Rats which have been directly radiated 1 mm. daily without receiving dry yeast were prevented from developing rickets but their growth was hindered as compared to that of irradiated control rats. Direct radiation of dry yeast for 1 hr. had no influence in reducing its growth promoting action.

S. MORGULIS

Studies on fat and lipid metabolism. VIII. The fat catabolism in the animal organism under excessive fat feeding. S. LETTES. Inst. of Medicine, Kharkov. *Biochem. Z.* 197, 357-62(1928); cf. *C. A.* 22, 1797. -Overfeeding with oleic acid causes a rise in the acetone bodies in the arterial blood and in the blood of the right ventricle of the dog. If olive oil or olive oil together with cholesterol is fed there is a rise in the acetone bodies of the blood of the right ventricle and of the femoral vein. In the latter the rise is accompanied by a loss in neutral fat. Overfeeding with fat leads to a formation of acetone bodies in the liver, lung and in the periphery. The retention of neutral fat in the lungs in normal dogs is not accompanied by a formation of acetone bodies which are formed apparently only from the free higher fatty acids. The anti-ketogenic effect of glucose manifests itself in the liver and in the periphery but not in the lung. The administration of glucose + oleic acid causes a much stronger hypercholesterolemia than oleic acid alone.

S. MORGULIS

Overnutrition and the blood-sugar content. CARL SCHWARZ AND JOSEPH SMUTNEY.

Tierärztliche Hochschule, Wien. *Biochem. Z.* 198, 243-9(1928).—The fasting blood-sugar concn. can be increased within narrow limits by continued overfeeding. But even after increasing the nutrition 200% over the normal requirement the sugar level did not exceed 0.120%, which must, therefore, be considered as the highest concn. for the normal dog.

S. MORGULIS

The effect of hypophysis preparations on the phosphorous and calcium metabolism. A contribution to the method of investigation of mineral metabolism. FUSAKICHI NAKAZAWA. Univ. Wien. *Biochem. Z.* 198, 350-61(1928).—In dogs on a diet consisting of sugar, starch, bacon and salt, which is practically free from N, Ca and P, there was a regular excretion of P and Ca (through the urine and feces) which per kg. wt. and 24 hrs. varied from 14 to 26 mg. P. and from 2 to 6 mg. Ca. The P excretion was invariably several times as large as the excretion of Ca. This observation is opposed to the general assumption of a destruction of bone tissue under the influence of fasting, or of P and Ca starvation. It is much more probable that the excreted Ca and P are derived from destroyed soft tissue. No effect was noted on either the Ca or P excretion through the injection of anterior or posterior hypophysis extract.

S. M.

The biochemistry of avitaminosis. VIII. Effect of avitaminosis of normal and thyroidectomized rabbits on the nitrogen creatinine and creatine excretion and on blood sugar. ALEXANDER PALLADIN, A. UTEVKII AND D. FERDMANN. Ukrainisches Biochem. Inst., Charkow. *Biochem. Z.* 198, 402-19(1928).—Avitaminosis develops as usual in thyroidectomized rabbits on a vitamin-free diet, and the survival of these animals is on the av. the same as in non-operated. In the thyroidectomized animals the excretion of N in the urine is generally less than in non-operated, and creatine, which in the latter appears $1\frac{1}{2}$ -2 weeks before death, does not appear until about 2-3 days before death. The blood-sugar curve, with the characteristic initial hyperglucemia and subsequent hypoglucemia, is the same in operated and non-operated avitaminosis animals.

S. MORGULIS

Studies on the growth-promoting influence of various inorganic iron compounds and of the accumulation of iron in the body on feeding the active magnetic ferric oxide "siderac." A. BICKEL. Univ. Berlin. *Biochem. Z.* 199, 60-8(1928).—Feeding Baudisch's ferric oxide had a marked effect in improving the growth of otherwise well-fed rats and permitted a considerable enrichment of the organism with Fe which was not accomplished with another Fe compd., also prepd. from magnetite and chemically practically undistinguishable from the former.

S. MORGULIS

The relation between the carbon and oxygen urinary coefficients in rabbits fed calcium. E. GOLDSCHMIDT. Univ. Berlin. *Biochem. Z.* 199, 207-11(1928).—The exptl. results of the study of C/N and O/N ratios in urine lead to the conclusion that during the period of Ca feeding there was an increased oxidation of C and a diminished oxidation of H; also an increase in the excretion of C-, N- and O-poor and of H- and also possibly S-rich compds.

S. MORGULIS

The position of the carbon and oxygen urinary coefficient in rabbits following peroral glucose feeding. THEODORE TASLAKOWA. Forschungsinst. Hygiene and Immunitätslehre, Berlin-Dahlem. *Biochem. Z.* 199, 212-5(1928).—No regularity was found in the variation of the urinary C/N and O/N ratios.

S. MORGULIS

Vitamin effects of steryl phosphates and of sterols from erythrocytes. HANS V. EULER, BETT V. EULER AND MARGARETA RYDBON. Univ. Stockholm. *Biochem. Z.* 199, 276-93(1928).—This investigation was inspired by the belief that antirachitic factors may perhaps affect bone formation by activating the enzymic hydrolysis and formation of water-sol. phosphoric acid esters. Diergosteryl phosphate has been studied from the point of view of its action on growth and antirachitic effect. On a basic diet free from vitamins A and D growth often remains normal for 10 weeks with a supply of 0.0002 mg. irradiated ergosteryl phosphate per day. The antirachitic action of 0.1 g. ergosteryl phosphate irradiated in hydrogen or air is thus as great as that of irradiated ergosterol. Recrystd. sterol isolated from red cells m. 147° , $[\alpha] -36^{\circ}$. With daily doses of 0.01 mg. of this prepn. there was found a body wt. increase of 15 g. with the irradiated, and of 7 g. with the unirradiated prepn. for 30 days. Histologically also there was no evidence of rachitis, though the antirachitic effect like the growth-promoting action of the unirradiated prepn. is weaker than that of the irradiated material. Even after many recrystns. the blood cell cholesterol prepn. still contained 1% of ergosterol or some closely related active sterol.

S. MORGULIS

The feeding of foals with acid whey. I. ZAIKOVSKII AND V. IVANKIN. Zootechnische Versuchsstation Detskoje Selo, Leningrad. *Biochem. Z.* 199, 326-32(1928).—The acid whey obtained in the cultivation of kefir organisms retards the growth of foals. Furthermore the sediment of the acid whey contg. fine masses of kefir organisms

has no positive influence on the growth of foals in spite of its protein and vitamin content.

S. MORGULIS

The biochemistry of avitaminosis. IX. Effect of the character of the food on the blood-sugar curve in experimental scurvy and on the sensitivity of guinea pigs to insulin. ALEXANDER PALLADIN AND A. UTEVSKII. Ukrainian Biochem. Inst., Kharkov. *Biochem. Z.* 199, 377-86(1928).—A characteristic blood-sugar curve is observed under the influence of a lack of vitamin C as well as of A, B and C in guinea pigs, which presents an alteration of an initial hyperglucemic and a later hypoglucemic phase. The reaction of the food does not alter this curve in scurvy; it affects the amplitude of the curve. (On an alk. food the hyperglucemia comes on somewhat sooner than on an acid food. Changing guinea pigs suffering from scurvy from an acid to an alk. food produces a second hyperglucemic reaction. Furthermore, guinea pigs on a basic diet manifest a greater sensitivity to insulin than animals on an acid food. X. Acetaldehyde formation in the muscle tissue of normal, avitaminosed and starved pigeons. *Ibid* 200, 108-14(1928).—In the pectoral muscle of normal pigeons during 18 hrs. of autolysis 4.9 mg. of AcH is produced per 100 g. tissue. In the muscle tissue from avitaminosed pigeons there is less AcH formed, and the diminution is greater the more advanced the avitaminosis. Likewise, during fasting there is a diminution in the AcH production which is parallel to the degree of starvation. When normal pigeon muscle tissue is added to previously boiled muscle from starved or avitaminosed pigeons the AcH production is practically normal.

S. MORGULIS

Studies on experimental rickets. I. The antirachitic property of crude "Biosterin," the cholesterol-free unsaponifiable fraction of cod-liver oil. SEIICHI IZUME AND ISAO KONATSUBABA. Central Lab. South Manchuria Railway Co., Dairen. *J. Biochem. (Japan)* 9, 233-41(1928).—The antirachitic factor in cod-liver oil was proved to be resistant to alk. sapon. and non-precipitable by digetinin. This could be properly concd. The cholesterol-free, unsaponifiable fraction of the cod-liver oil, or the crude "Biosterin," has an exceedingly strong antirachitic activity, a daily dose of 0.05 mg. being sufficient to produce healing in the rat.

S. MORGULIS

The formation of bile acids. II. Avitaminosis and bile acid excretion in the bile. KANAF MURAKAMI. Physiol.-Chem. Inst., Okayama. *J. Biochem. (Japan)* 9, 321-31(1928).—In the absence of vitamin A in the food the bile acid excretion of guinea pigs diminishes. The normal excretion is reestablished upon injecting subcutaneously vitamin A.

S. MORGULIS

Nitrogenous metabolism in avitaminosis of chickens. B. A. LAVROV AND S. N. NAT'KO. Inst. Physiol. of Nutrition Narkomzdrav, Moscow. *Zhurnal expil. Biol. Med.* 9, 515-27(1928); cf. *C. A.* 22, 4591.—The N metabolism was studied on 2 chickens fed daily 50-60 g. polished rice. The first physiol. manifestation of the avitaminosis is the lowered crop activity as a result of which the avitaminosis becomes complicated by starvation. Another chicken was fed on oats which furnished the same amt. of N and N-free substances as the 60 g. polished rice (33 g. oats + 16 g. starch), and it was found that the body wt. increased and the N balance was even pos. On changing over to the rice diet there was no further increase in wt. but this remained stationary and the N balance was also pos. but after 7 days the N balance became neg. and the body wt. commenced to decrease. The urinary N elimination shows a sharp rise (280%), but the N in forms other than the uric acid remains unchanged. This is taken as evidence that the neg. balance due to increased uric acid elimination is an expression of the increased decompn. of nitrogenous substances in the organism in the initial avitaminosis stages. A week later these birds developed the classical β -avitaminosis symptoms, and at autopsy showed the presence of an abundance of fat. Death was therefore not caused by exhaustion.

S. MORGULIS

Vitamin A content of the subcutaneous fat of the dolphin (*Delphinus delphis*). S. N. NAT'KO. Inst. Physiol. of Nutrition, Narkomzdrav, Moscow. *Zhurnal expil. Biol. Med.* 10, 163-6(1928).—Young rats were fed a basic diet of 20% casein, 56% purified starch, 4% salt mixt. (Osborn-Mendel) and 5% dry yeast. This basic diet was mixed with fat (1) from the subcutaneous tissue of a young dolphin; (2) from an old dolphin; (3) cod-liver oil; (4) ordinary bacon fat. The dolphin fat gave as good results as the cod-liver oil.

S. MORGULIS

Physical and biological properties of irradiated sterols. R. FABRE AND H. SIMONNET. *Bull. soc. chim. biol.* 10, 1100-10(1928); cf. *C. A.* 22, 3438.—A spectrographic study of cholesterol and ergosterol before and after ultra-violet irradiation is reported. The photochem. transformation of the sterol, which is detectable by optical methods, is not arrested at the biologically active stage of the product. Beginning with certain doses of irradiation the activity does not increase with further irradiation, while the

optical density gradually diminishes in the zone of 2700–3000 A. U. **Biological tests** should be made parallel with the optical tests. **L. W. RIGGS**

The antiscorbutic vitamin in cabbage soup, cabbage puree and turnip juice. ERNEST TSO. Peking Union Med. Coll. *Chinese J. Physiol.* 2, 403–8(1928).—A daily ration of 30 cc. cabbage soup, 5 to 10 g. of cabbage puree or 20 cc. of turnip juice suffices not only to protect young guinea pigs against scurvy but also to promote normal growth during an exptl. period of 5 months. Cabbage or turnip soup, puree or juice can be digested by young infants in quantities sufficient to afford considerable antiscorbutic vitamin. This is fortunate for the inhabitants of North China where inexpensive antiscorbutic foods for infants are scarce. **L. W. RIGGS**

Nitrogen, calcium and phosphorus metabolism in infants fed on soybean "milk." ERNEST TSO, MARTIN YEE AND TUNG-TOU CHEN. Peking Union Med. Coll. *Chinese J. Physiol.* 2, 409–14(1928).—This study with 2 young infants showed that the N absorption may approach 90% of the intake. The Ca content of soy bean "milk" is inadequate. The addn. of cod-liver oil and a small quantity of Ca salt markedly enhanced not only Ca retention but also the P storage. The P content of soy bean "milk" is apparently adequate but its utilization may be restricted by the limited Ca intake. **L. W. RIGGS**

Nutritive value of Chinese foods. HSIEN WU. Peking Union Med. Coll. *Chinese J. Physiol., Report Series* 1928, No. 1, 153–86.—Analyses of over 200 kinds of vegetable and 30 of animal foods are reported, also the compn. of 7 kinds of Chinese wine. In addn. to the usual detns. of food analyses the Ca, P and Fe were detd. and the vitamins were indicated approx. The methods of the Assoc. Off. Agr. Chem. were used. Animal food such as beef and pork which are not peculiar to China were not studied. **L. W. RIGGS**

Influence of the basic ration in the determination of the vitamin content of various sources. C. KUCERA. *Compt. rend. soc. biol.* 99, 988–90(1928).—The importance of a correct basic ration in test animals used for estg. the vitamin B content of foods is emphasized. **L. W. RIGGS**

Photochemistry of ergosterol. STANISLAW K. KON. Univ. Wisconsin. *Nature* 122, 276–7(1928).—The flat Pt surface of a Pt-Te thermopile was coated with a layer of solid ergosterol cemented with ether and was then exposed to monochromatic radiation from an intense quartz-Hg arc using a Hilger quartz monochromator. The results showed the production of vitamin D sufficient to cause a demonstrable deposition of Ca in the bones of a rachitic rat. **L. W. RIGGS**

Vitamins and vital elements suggesting a possible chemical basis for vitamin activity. JOHN E. RUTZLER, JR. *Oil and Fat Industries* 5, 267–72, 295–301(1928).—A review of the origin and characteristics of vitamins A, B, C, D and E is given with 19 references to the literature. A theory is proposed which makes Fe the active factor in nutritional regulation by vitamin A, Mn in vitamin B, probably Zn in vitamin C, P in vitamin D and I in vitamin E. It is suggested that the theory can be substantiated or disproved by spectrographic examn. of foods with an instrument capable of photographing spectra in the ultra-violet region. **L. W. RIGGS**

Vitamins and tumor growth. I. Deficient vitamin B content of chicken sarcoma tissue. WARO NAKAHARA AND EIICHI SOMEKAWA. *Proc. Imp. Acad. Tokyo* 4, 440–3(1928).—Pigeons fed on polished rice and dried chicken sarcoma manifest symptoms and die of polyneuritis at about the same rate as control pigeons fed on polished rice alone. Also, while the daily intake of only 0.1 g. of dried chicken liver protects rats from the reduction of body wt. on vitamin B-deficient diet, 10 times that amt. of dried sarcoma tissue fails to give similar protection. **L. W. RIGGS**

Sparing action of fat on the antineuritic vitamin. HERBERT M. EVANS AND SAMUEL LEPROVSKY. *Science* 68, 208(1928).—If fat be added to an almost fat-free diet, the amt. of antineuritic vitamin required to establish any definite level of growth or frequency of ovulation is always less than is required when fat is absent. Animals on inadequate levels of the vitamin are not only more gravely impaired in stature and ovulation when fat is absent than when present, but they invariably develop beriberi sooner. In these expts. the other vitamins were present in sufficient amts. and the presence of antineuritic vitamin could not be established in the fats used. It would appear that the fats mediate in those unknown metabolic processes for which antineuritic vitamin is essential. These results go far to explain the beneficial effects of fats in highly purified diets. **L. W. RIGGS**

Manganese as a factor in hemoglobin building. R. W. TITUS AND H. W. CAGE. Kansas State Agr. Coll. *Science* 68, 410(1928).—Rats and rabbits were kept on an exclusively whole milk diet when the hemoglobin decreased. The addn. of 5 mg. of

Fe as FeCl_3 per day to the diet had but slight effect in the building of hemoglobin as compared with the addn. of 5 mg. of Mn as MnCl_2 , along with the FeCl_3 . L. W. R.

The photosynthesis of the antirachitic vitamin by ultra-violet radiation of short wave length. HARRY D. GRIFFITH and KATHERINE C. SPENCE. *Brit. J. Actinotherapy* 3, No. 4, 69-72(1928).—Ergosterol was dissolved in xylene. This material was irradiated in 3 regions of the spectrum: longer than 313 mm., 313 to 265 mm. and shorter than 265 mm. Rats were used to ascertain the antirachitic value of the irradiated ergosterol. Controls were run on diet and irradiation. Ergosterol irradiated longer than 313 mm. produced rickets, 313-265 mm. normal ossification and shorter than 265 mm. slight tendency to rickets but later complete ossification. J. T. W.

Mineral content of pastures. Malnutrition disease in sheep (ASTON) 15.

F-- PHYSIOLOGY

E. K. MARSHALL, JR.

A biometrical study of the size inter-relationships of the glands of internal secretion. FREDERICK S. HAMMETT. Wistar Inst. *J. Metabolic Research* 7-8, 91-163(1925-6).—A study of the wt. relations of the thyroid, gonads, adrenals, hypophysis, thymus and pancreas in 121 rats. An extensive bibliography is included. H. J. DEUEL, JR.

My theory of urine formation. K. BUENEWITSCH. Kaunas Univ., Lithuania. *Zentr. inn. Med.* 49, 410-5(1928).— H_2O and NaCl are believed to be eliminated through the tubules while other urine constituents such as urea and uric acid are excreted in the glomeruli. The H_2O and NaCl may pass into the glomeruli from the tubules, where they assist in washing out the constituents there. The urine also is coned in the glomeruli. By this theory the azotemia, the N retention and the uremia of the retention caused by glomerular injury in glomerular nephritis are explained as well as the failure of edema in this condition on account of the elimination of H_2O and NaCl through the intact tubular cells. This also gives an explanation for the edema and the retention of NaCl in tubular injury and the lack of an azotemia and uremia since these latter constituents are eliminated through the intact glomeruli. There may be many complicated conditions with diffuse injuries in which the function of the glomeruli as well as that of the tubules is disturbed. H. J. DEUEL, JR.

Further observation on the simultaneous fractional gastric and duodenal juice investigation. The importance of the curves of duodenal contents and the chloride. II. M. MARKOFF. Univ. Woronesh. *Zentr. inn. Med.* 49, 442-4(1928); cf. C. A. 22, 5418.—A considerable decrease in the acidity of the stomach contents can occur in some cases without regurgitations of duodenal contents. This is brought about through the neutralization of the acidity by mucus, through the alk. secretion of the pyloric part of the stomach, and by the evacuation of a part of the acid gastric juice into the duodenum. The surface tension of gastric juice is 78-86% in comparison with H_2O while a decrease in value below 72% indicates a mixt. of bile. The surface tension of duodenal juice is 52 to 62% of that of H_2O and is raised at the moment of entrance of the gastric juice. In the differentiation of spurious and real achylia, the character of the Cl curves in the duodenum and the stomach is useful. With a duodenal ulcer the concn. of the Cl in the stomach and the duodenum is higher than in gastric ulcer while these values are low in gastric carcinoma. H. J. DEUEL, JR.

The detoxication process in the fetal organism. MASAO TAKAHASHI. *Med. A. I. Nagasaki Z. physiol. Chem.* 178, 291-3(1928).—Total and conjugated sulfates were detd. in the white, yolk, embryo, amniotic and allantoic fluids of hen eggs at 3 day intervals during incubation. None was found in the white, yolk and amniotic fluid, although more than 50 g. of material was used in each detn. In the embryo and allantoic fluid, however, both inorg. and org. H_2SO_4 were definitely present on the 13th day, after which the amt. of each remained practically const. in the embryo but increased rapidly in the allantoic fluid. The excretion of conjugated sulfates into the allantoic fluid evidently represents a detoxication process. II. Synthesis of ornithuric acid in the incubated hen egg after injection of benzoic acid. *Ibid* 294-7.—After injection of BzONa into a large no. of hen eggs (0.005 g. per egg), those that developed normally during incubation were examd. for ornithuric acid. Within 14 days the BzOH had disappeared entirely. After 14 and 18 day incubation periods considerable ornithuric acid was isolated from the allantoic fluid but none was found in the yolk, white, embryo amniotic fluid. The recovery was 0.4541 and 0.5964 g. ornithuric acid from 5.029 and 3.108 g. BzOH after 14 and 18 days, resp. Control expts. without BzOH gave no trace of either BzOH or ornithuric acid. It is obvious that the fetal chicken can detoxify BzOH

by conversion into ornithuric acid and excretion of the latter into the allantioic fluid.

A. W. DOX

Endocrinology. HERMANN BERNHARDT. Universitäts-Klinik der Charité, Berlin. *Deut. med. Wochschr.* 54, 1382-4, 1423-5(1928).—A review of the advances in endocrinology during 1927 and 1928, with 152 references to the literature. A. G.

Lactic acid metabolism during exercise. I. SNAPPER AND A. GRÜNBAUM. *Deut. med. Wochschr.* 54, 1494-5(1928).—In a series of football players, only traces of lactic acid were found in the urine before entering a game. On hot days, while playing, it appeared in the urine in high concn. less frequently than on cold days. Several g. of lactic acid were excreted in the sweat, in which it occurs in a concn. 10 times as great as that of the blood. The phenomenon of "second wind" can be correlated with the secretion of lactic acid in the sweat.

ARTHUR GROLLMAN

The inorganic phosphate content of resting mammalian muscle. JACOB SACKS AND H. A. DAVENPORT. Northwestern Univ. *J. Biol. Chem.* 79, 493-8(1928).—The inorg. P content of the resting muscle of the cat, rat and guinea pig is slightly over 20 mg. % and of the rabbit and dog, slightly under this figure. There is a rapid *post-mortem* increase in the inorg. P content of these muscles.

ARTHUR GROLLMAN

Chemical studies of muscle contracture. I. The lactic acid content. H. A. DAVENPORT, HELEN K. DAVENPORT AND S. W. RANSON. Northwestern Univ. *J. Biol. Chem.* 79, 499-505(1928).—The lactic acid content of muscles which have undergone permanent shortening from treatment with tetanus toxin is of the same order of magnitude as that of normal flaccid muscle.

ARTHUR GROLLMAN

Studies of gas and electrolyte equilibria in blood. XIV. The amounts of alkali bound by serum albumin and globulin. DONALD D. VAN SLYKE, A. BAIRD HASTINGS, ALMA HILLER AND JULIUS SENDROY, JR. Rockefeller Inst. *J. Biol. Chem.* 79, 769-79(1928); cf. *C. A.* 22, 3917.—The relation between p_H and the amt. of alkali bound by purified albumin and globulin of horse serum was detd. over the range p_H 6.8 and 7.8. At 38° the milli-equivs. of base bound per g. of albumin $N = 0.78$ (p_H 5.16) and per g. of globulin $N = 0.48$ (p_H 4.89). The base bound by the proteins of human serum agreed within 6% with the amts. calcd. from its albumin and globulin contents, by assuming the titration curves as in horse serum. XV. Line charts for graphic calculations by the Henderson-Hasselbach equation, and for calculating plasma carbon dioxide content from whole blood content. DONALD D. VAN SLYKE AND JULIUS SENDROY, JR. *Ibid* 781-98.—The values of the consts. α_{CO_2} and p_K' for human serum are applied to the construction of a d'Ocagne-Henderson nomogram for calcs. by the Henderson-Hasselbach equation. Of the 12 calcs. possible, 10 are of sufficient exactitude to be of practical value. A nomogram is also given for graphic estn. of the CO_2 content of plasma or serum from the CO_2 content observed in whole blood of any hemoglobin or cell content and degree of oxygenation.

ARTHUR GROLLMAN

The energy exchange in obesity. M. STRANG AND FRANK A. EVANS. Western Penn. Hospital. *J. Clin. Investigation* 6, 277-89(1928).—The increase in the energy exchange of the obese is of the same magnitude as their increase in surface area. When reduced by dietary measures alone, the energy exchange diminishes proportionally much more than the wt. or surface area but the metabolism never goes below limits normal for proper wt. "There is, therefore, no evidence of an energy economy in the obese."

ARTHUR GROLLMAN

The routes of central water control and hypophysis antidiuresis. S. JANSSEN. Univ. Freiburg. *Klin. Wochschr.* 7, 1680-1(1928).—The hypophysis appears to produce an antidiuretic hormone that acts directly upon the kidney. An indirect action *via* the central nervous system is rendered rather improbable by the exptl. data presented.

MILTON HANKE

The female sexual hormone, menformone. X. Action after oral administration. ERNST LAQUEUR AND S. E. DEJONGH. Univ. Amsterdam. *Klin. Wochschr.* 7, 1851-3(1928); cf. *C. A.* 22, 2194.—The oral administration of menformone leads to changes that are identical with those obtained after subcutaneous administration, namely: (1) estrual crisis in castrated infantile or senile females, (2) growth of the female genitalia in infant animals, (3) retardation of growth in the male genitalia, and (4) proliferation of the mammary glands in females and in castrated males. It has been possible to obtain a secretion of milk from castrated males after feeding menformone. M. H.

Glucose metabolism of kidney tissue in vitro. II. JAMES T. IRVING. Oxford Univ. *Biochem. J.* 22, 964-7(1928); cf. *C. A.* 22, 618.—Most of the glucose is changed to lactic acid by kidney tissue *in vitro*. A small amount combines with phosphoric acid. These processes are inhibited by HCN.

BENJAMIN HARROW

Studies on the cholesterol content of normal human plasma. III. The so-called

alimentary hypercholesterolemia. JOHN A. GARDNER AND HUGH GAINSBOROUGH. St. George's Hospital, London. *Biochem. J.* 22, 1048-56(1928); cf. *C. A.* 21, 2278.—The level of the cholesterol content of human plasma, taken while fasting, can be raised or lowered by sufficiently prolonged feeding with diets of high or low sterol content.

BENJAMIN HARROW

The pigments of the fat of certain rabbits. STANLEY G. WILLIMOTT. School of Agr., Cambridge. *Biochem. J.* 22, 1057-9(1928).—The coloring matter present in adipose tissue of certain rabbits is xanthophyll.

BENJAMIN HARROW

Influence of the state of nourishment, the amount of customary exercise, of work, and of age upon basal metabolism. HERM. V. HOESSLIN. *Arch. Hyg.* 99, 83-90 (1928).—The influence of the state of nourishment and of moderate exercise, etc., upon the magnitude of basal metabolism indicates that not the area of body surface, but internal conditions regulate the basal metabolism.

P. Y. JACKSON

Oxidases in the glands of the crop of *Columba livia* Bonnat. F. DULZETTO. *Arch. sci. biol.* 11, 341-9(1928).—The technic used was that of Graeff and Gierke. Sections of fresh tissue 10-15 μ were immersed in a mixt. of equal pts. of α -naphthol and dimethyl-*p*-phenylenediamine. After a few min. they assumed a violet and then a dark blue color. The sections were washed in physiol. salt soln. and placed in dild. Gram's soln. for 10 min. and then again washed in physiol. salt soln. contg. a drop of satd. LiCO_3 . The sections were then examd. Glands fixed in 10% formalin were tested by the Schultz and the Graeff-Gierke methods. By means of the indophenol-blue reaction numerous granules of oxidases were demonstrated in the cells of the glands of the pigeon's crop. They were distributed in all the protoplasm especially along the margin of the cells and in the part close to the glandular lumen. There was no nucleus. The absence of fat and lipoidal granules eliminated the hypothesis that the color was due to the latter substances absorbing the color and not to the presence of oxidases. P. M.

The routes of elimination of hormones. I. Lymph and insulin. EMILIO GHIRARDI. *Boll. soc. ital. biol. sper.* 3, 387-8(1928).—The effect of lymph on the glucemic titer was investigated as a possible means of detecting insulin. The lymph was obtained from a temporary fistula in the thoracic duct of normal dogs, and injected intravenously or subcutaneously into starved rabbits. The blood sugar did not decrease but rather increased an av. of 0.037%. Lymph injected into depancreatized dogs had no effect on blood sugar. The conclusion is that lymph has no hypoglucemic action and the hypothesis that lymph contains insulin cannot be supported. P. M.

The relation between alimentary glucemia and pancreatic function. G. MARTINO. *Boll. soc. ital. biol. sper.* 3, 403-7(1928); cf. *C. A.* 22, 2188.—Dogs with a Pavlov pancreatic fistula were given a soln. of peptone (15 g. in 50 cc. H_2O). Blood sugar was detd. at various intervals of time. The results obtained were compared with those from the administration *per os* to the same animal of pancreatic juice eliminated by that animal. Also, pancreatic juice was injected into an intestinal loop and its effect on glucemic titer noted. The results were compared with those obtained by injecting peptone soln. into the same loop. Results: (1) the administration of peptone to dogs with a pancreatic fistula did not increase but rather diminished the blood sugar; (2) the administration *per os* of pancreatic juice eliminated by the same animal produced an increase in blood sugar 15 min. after administration; (3) the injection of pancreatic juice into a Vella intestinal loop was followed by a slight hyperglucemia; (4) the injection of peptone soln. into the same loop did not produce any variation in blood sugar.

PETER MASUCCI

Chemical coördination and nervous coördination. UGO LOMBROSO. *Scientia* 44, 247-58(1928).—The conception of chem. coördination by means of hormones as against that of nervous coördination by reflex action does not appear to be in harmony with anatomical facts. The organs whose physiol. action e. g., the pancreatic and enteric secretion, the development of the mammary gland, etc., is attributed to the direct action of chem. stimuli are abundantly provided with a complex sympathetic nervous system. There is no other function known for this system, except that of directing and coordinating the function of the organs to which it is attached, and its presence, therefore, is an argument in favor of the conception of nervous coördination. The expl. arguments upon which the doctrine of chem. coördination is based are considered, analyzed and interpreted. The stimuli which influence the external secretion of the pancreas are discussed. The vagus contains fibers which inhibit and fibers which stimulate pancreatic secretion, the former predominating. Secretion may be inhibited by stimulating the entire vagus because of the prevalence of inhibiting fibers; secretion takes place by stimulating the degenerate vagus after cutting, on account of the greater resistance to degeneration of the secreting fibers. Secretion has no specific

action; it has properties that are more pharmacol. than physiol. The arguments based on the development of the mammary gland and milk secretion are enumerated, critically analyzed and interpreted. L.'s results from working with artificial "Siamese twins" are against the conception that the development of the mammary gland during pregnancy is due to chem. stimuli. The expts. on the development of the mammary gland, and the external secretion of the pancreas, indicate that there is a correlation between chem. substances (hormones) and nervous function. The nervous tissue stimulated by the hormones in turn causes the development of other chem. substances. To state that an organ can elaborate a chem. substance which, without the intervention of the nervous system, can act directly on another organ, is an assumption that has no exptl. proof.

PETER MASUCCI

The decomposition of sugar in the human placenta and the influence of hormones. S. HAYASHI. Chem. Abteilung, Rudolf Virchow-Krankenhaus, Berlin. *Biochem. Z.* 196, 323-32(1928).—The anaerobic sugar destruction in the human placenta is greatest at p_H 10. Levulose yields the greatest amt. of lactic acid; glucose is next in importance; galactose has no effect. Sucrose gives the largest amt. of lactic acid among disaccharides, and of polysaccharides glycogen gives the max. result. Various hormones promote the anaerobic sugar decompn. by placenta in the following order of decreasing effectiveness: insulin, folliculin, thyroxine, adrenaline, thymoglandol and hypophysin. The human placenta, like muscle or liver tissue, contains a keto-aldehyde-mutase because it can convert methylglyoxal to lactic acid.

S. MORGULIS

Studies on the carbon dioxide combination with hemoglobin. BILLA GROÁK. Univ. Budapest. *Biochem. Z.* 196, 478-87(1928).—Evidence is presented showing that hemoglobin combines with H_2CO_3 or CO_2 not only as an acid, but that between the two there is a specific affinity.

S. MORGULIS

Contributions to the problem of blood sugar. IX. The influence on blood glucolysis of the Hofmeister series. H. K. BARENSCHIEEN AND KARL HÜBNER. Univ. Wien. *Biochem. Z.* 196, 488-94(1928).—The SO_4 and PO_4 ions have a specific accelerating effect on glucolysis of human erythrocytes. All the other anions and cations of the Hofmeister series are without influence on glucolysis.

S. MORGULIS

Behavior of the carbon nitrogen urinary quotient under the influence of parenteral administration of extracts of anterior lobe of the hypophysis. A. ALLEN GOLDBLOOM. Pathol. Inst. Univ. Berlin. *Biochem. Z.* 197, 20-30(1928).—Exts. of the anterior lobe of hypophysis reduce the oxidative processes in the organism. Almost invariably and independently of the dose it causes an increase in the dysoxidizable urinary C. The N is generally increased by small doses but decreases with large doses.

S. M.

Further experiments on the formation of sugar from fat. YUZURA KOJIMA. Physiol. Inst. Univ., Berlin. *Biochem. Z.* 197, 31-71(1928).—In carbohydrate-free rats the formation of sugar from lactic acid was demonstrated, and appreciable quantities of sugar could be shown to originate from protein. The carbohydrate-free rats could not endure feeding with pure fatty acids even when these were carefully neutralized. The addn. of butter or bacon to the basic diet likewise inhibited the sugar formation, as less sugar was excreted than would correspond to the glycerol of the administered fat. Cf. C. A. 22, 1797.

S. MORGULIS

Studies on the physiology of glands. CXIV. Experiments on the exchange of matter between blood and tissues in normal and denervated thyroids. LEON ASHER AND TATEYOSHI HONDA. Univ. Bern. *Biochem. Z.* 197, 72-83(1928); cf. C. A. 22, 1798.—The change in Cl content of the blood has been studied following the simultaneous injection of a specific diuretic (cuphyllin) and 100 cc. sugar soln. into the peritoneal cavity of rabbits. The blood Cl content undergoes quicker and more extensive changes after the denervation of the thyroid gland. Complete thyroidectomy caused only insignificant alterations in the blood Cl. CXV. **The lack of overcompensation of the loss of iron after splenectomy due to blocking of the reticulo endothelial system.** LEON ASHER AND YUZURA KOJIMA. *Ibid* 84-104.—The reticulo-endothelial system was blocked to det. if the diminished excretion of iron following splenectomy in guinea pigs is due to an overcompensation of the liver or reticulo endothelial system. In normal guinea pigs the blocking of the system with India ink had a very slight effect in raising the daily Fe excretion. After splenectomy, the blocking causes a very marked increase in Fe excretion. The increase may be so great that the excretion may be returned to the level existing before the operation.

S. MORGULIS

Potassium, calcium and choline content of blood and its variations following the extirpation of the thyroid in dogs. MARIA MAXIM AND C. VASILIU. Lab. med. Analyses und Biochemie, Bukarest. *Biochem. Z.* 197, 236-40(1928).—In the first 4 to 7 days following thyroidectomy there was a lowering of the K content. The Ca remains un-

changed for a while but rises later. The choline increases immediately after the extirpation, and attains very high values during the tetanic convulsions and the respiratory crisis. The K at that time is also greatly increased. S. MORGULIS

Human fat. A. HEIDUSCHKA AND C. HANDRITSCHK. Tech. Hochschule, Dresden. *Biochem. Z.* 197, 404-9(1928).—Analytica data. S. MORGULIS

Transformation of blood pigments into bile pigments. ELSE PÖLLAK. Organchem. Inst. Tech. Hochschule, München. *Biochem. Z.* 198, 311-6(1928).—Under the action of pyrocatechol hemin gives rise to a pigment of the probable mol. compn., $C_{16}H_{16}N_2O_4$, which spectroscopically has an extinction point at 534.5, and gives no test for pyrrole. S. MORGULIS

Behavior of aldol in the animal organism and in fresh organ pulp. FRITZ LIEBEN AND GABRIELE EHRLICH. Univ. Wien. *Biochem. Z.* 198, 317-27(1928).—In normal as well as in phlorhizin dogs subcutaneously injected aldol does not appear in the urine in appreciable amts. provided the bisulfite-binding capacity of the urine during the preliminary period is taken into consideration. The transformation into sugar in phlorhizinized dogs is possible but cannot be established with certainty when one considers the small doses of aldol that can safely be employed. The D/N quotient is not affected by the aldol, nor is there any change in the β -hydroxybutyric acid excretion. Aldol is therefore thought to be changed to glycogen or to fat, or is perhaps largely oxidized. No evidence was found that aldol is detoxicated by combination with glucuronic acid and as such excreted. Organ pulp destroys more or less added aldol, and β -hydroxybutyric acid appears partly as an intermediate substance. The most effective is liver pulp, the least effective the cold-blooded muscle pulp. In perfusion expts. through living turtles aldol was very largely destroyed. S. MORGULIS

Effect of the sympathicus nerve on the ammonia content of the muscle. HANS-EDWINE BUTTNER. Med. Univ.-Poliklinik, Würzburg. *Biochem. Z.* 198, 478-86(1928).—The traumatic NH_3 formation is about 50% greater in frog muscles on the side where the sympathicus nerve has been sectioned. The same is also true with elec. stimulation, the NH_3 production being 60% higher on the side devoid of the sympathetic supply. The resting value of the NH_3 content, however, is not affected in any regular manner. S. MORGULIS

Nitrogen metabolism of man after total resection of the stomach. L. SOLOVIEV. Inst. of Exptl. Med., Leningrad. *Biochem. Z.* 199, 121-35(1928).—Removal of the stomach has no noticeable influence on the assimilation of animal or vegetable protein in the food. About 6 months after the operation there has been N retention and progressive increase in wt. in the patient. No essential difference was found from the normal N partition, though the proportion of combined S to total S was twice as large as normal. S. MORGULIS

Glycogen formation in the intestinal wall. KONRAD LANG. Lab. Med. Klinik Erlang. *Biochem. Z.* 200, 90-4(1928).—The intestinal wall can form glycogen from glucose, and to a smaller extent from fructose. In depancreatized dogs the intestinal wall still forms glycogen from glucose but in smaller amts. The glycogen formation is increased by insulin. S. MORGULIS

Metabolism of mammalian tissues in various media. I. Respiration of rat-heart explants cultured in plasma of normal and of avitaminosis animals. KAETHE BORNSTEIN. Univ. Inst. für Krebsforschung, Charité, Berlin. *Biochem. Z.* 200, 176-83(1928).—Tissue cultures were made from the heart of rats which were grown in the plasma of normally fed rats and from rats on a vitamin-B free diet. It was found that in the plasma of the avitaminosis rats the respiratory activity of the explanted tissue cultures was about 50% less. S. MORGULIS

Conditions which influence the colloidal osmotic pressure of the (serum blood). I. KORO HIROTA. Kyoto Imp. Univ. *J. Biochem. (Japan)* 9, 71-85(1928).—When a dialyzer is used as the outer liquid the colloidal osmotic pressure of the serum is reduced the more, the greater the concn. of the salt soln. In isotonic solns. KCl and NH_4Cl give a higher osmotic pressure than NaCl, while Na_2HPO_4 , K_2SO_4 , $MgCl_2$, $CaCl_2$ and KH_2PO_4 give a lower pressure. It is impossible to make measurements with the collodion membrane when the outer fluid contains Na_2CO_3 . Acidity of the outer soln. reduces, while alk. increases, the osmotic pressure, so that the reaction of the outer fluid should be the same as that of the inner. The colloidal osmotic pressure of the serum is lowered by diln. with H_2O . The blood serum shows the same colloidal osmotic pressure as the plasma. S. MORGULIS

The significance of the bile acids in the carbohydrate metabolism. IV. Antagonistic effect of bile acids against adrenaline. KANAË MURAKAMI. *Physiol.-chem.*

Inst. Okayama. *J. Biochem.* 9, 261-70(1928).—The administration of bile acids to normal rabbits or to rabbits with the adrenals extirpated causes a lowering of the fasting blood sugar, or of the hyperglucemia produced with glucose. One-sided removal of the adrenal body in rabbits produces an increase in the bile excretion and in the excretion of the bile acids. It is argued that the diminished adrenaline content of the blood following adrenal extirpation is responsible for the increased bile acid excretion and that the resulting hyperglucemia is caused by the increase in bile acid concn. of the blood. V. The effect of diminished bile acid and of excess of bile acid on the sugar content of the blood. TEIJI OKAMURA. *Physiol.-chem. Inst., Okayama. Ibid* 271-83.—The exptl. removal of bile by means of a gall-bladder fistula causes a gradually increasing hyperglucemia, which can be offset by administration of bile acids. In cases of stasis icterus there is evidence of a lowering of the blood-sugar level. Loss of bile acids thus induces hyperglucemia and excessive administration of bile acids induces hypoglucemia. S. MORGULIS

The influence of sectioning the splanchnics upon the sugar excretion threshold. SHIN-ICHI KAWASHIMA. Univ. Tokyo. *J. Biochem. (Japan)* 9, 337-45(1928).—Acetylcholine causes a rise in the sugar excretion threshold as well as in the alimentary hyperglucemia of the normal dog. Sectioning of both splanchnics raises the threshold for the alimentary glucosuria. The sugar assimilation is impaired so that with the same supply of sugar the alimentary hyperglucemia is higher than before the operation. After splanchnicectomy it is no longer possible to demonstrate the effect of acetylcholine in raising the alimentary hyperglucemia. S. MORGULIS

Significance of the bile acids in the carbohydrate metabolism. VI. Effect of the loss of bile acids and of excessive bile acid administration on the adrenaline content of the suprarenals. TEIJI OKAMURA. *Physiol. Chem.-Inst., Okayama. J. Biochem. (Japan)* 9, 445-52(1928).—Removal of bile through a bile fistula causes an increased adrenaline content of the rabbit suprarenal gland. The adrenaline content of the suprarenals is generally lowered in cases of stasis icterus. Similarly, the adrenaline content decreases when bile acids are administered by mouth. S. MORGULIS

Effect of hyperthyroidization on the egg laying of chickens. B. ZAVADOVSKII, L. LIPCHINA AND E. RADSVON. Univ. Moscow. *Zhurnal expil. Biol. Med.* 9, 464-75(1928).—Massive doses of thyroid gland sharply interfere with the egg-laying process, which ceases for variable periods depending upon the dose. A dose of 1-2 g. at one time or doses of 0.01-0.05 g. given repeatedly will just suffice to manifest this influence. With such min. doses the stimulation of the process has been observed, the activation being especially marked in chickens with poor laying ability. S. MORGULIS

Further data on the question of mutual relationship between the sex and thyroid glands. B. ZAVADOVSKII AND L. LIPCHINA. *Communist Univ., Moscow. Zhurnal expil. Biol. Med.* 9, 477-90(1928); cf. *C. A.* 33, 981.—Expts. were made on hyperthyroidized chickens which at the same time were overfed on fresh sexual glands of the same sex. Under these conditions the fading out of the feathers and depression of sex gland activity were less marked than in chicken which were only hyperthyroidized. S. MORGULIS

Presence of acetaldehyde in the surviving heart. M. V. KORCHAGIN. Univ. Moscow. *Zhurnal expil. Biol. Med.* 9, 501-13(1928).—Dimedon was used successfully to find AcH in warm-blooded muscle tissue, but its concn. must not be greater than 0.1%. The dimedon acts injuriously on the surviving heart even in minute doses, and a concn. of 0.025% disturbs seriously the heart action and lowers the sugar consumption by 50%. Nevertheless it was possible to demonstrate, by adding 0.05% dimedon to the nutritive fluid, that the working heart produces AcH. Better results are obtained with the use of $\text{Ca}(\text{SO}_3)_2$, which is less toxic for the heart. The AcH was detected according to Rimin and detd. with $\text{NH}_2\text{OH} \cdot \text{H}_2\text{SO}_4$; also as the aldomedon (m. 139°). About 6 mg. per 100 g. heart tissue is formed per hr. S. MORGULIS

Variations in the dry residue in the superior vena cava blood. L. EIDLIN. State Univ., Saratow. *Zhurnal expil. Biol. Med.* 10, 64-70(1928).—Lymph is discharged into the venous flow for several minutes even after the stopping of the blood flow. During life there is no essential difference between the dry residues of the blood from the superior or from the inferior vena cava. Following death, however, the dry residue of the superior vena cava blood diminishes and varies from 9 to 16%. The amt. of dry residue is related to the mode of death, the lowest dry content being found in cases of mechanical asphyxiation. S. MORGULIS

Alteration of the structure of feathers in hyperiodized chickens. N. A. RASPOPOV. *Communist Univ., Moscow. Zhurnal expil. Biol. Med.* 10, 154-62(1928).—Striking changes in the structure of feathers have been noted. S. MORGULIS

The relation between continuous bioelectric currents and cell respiration. II. E. J. LUND. Univ. Texas. *J. Exptl. Zool.* 51, 265-90(1928); cf. *C. A.* 22, 1381.—Continuous bioelec. currents produced by cells and tissues result from oxidation-reduction potentials developed by the respiratory mechanism of the cell. The p. d. in polar organs, such as *Obelia* stem, and frog skin equals the algebraic sum of the p. ds. of the individual cells. Therefore, cells of an elec. polar tissue have series and parallel arrangements in respect of the summation of their e. m. fs. Isoelec. cells may exist in an otherwise polar tissue. The elec. energy of such polar tissue is derived from the respiratory process of the cell and may occur under both anaerobic and aerobic conditions. The magnitude of the single p. d. at any time and in any locus of the cell is largely detd. by the ratio of concns. of oxidant and reductant. The value of this ratio is detd. by a flux equil. which depends upon the relative velocities of the reactions constituting the oxidative mechanism of the cell. The flux equil. and therefore the elec. potential at a locus may or may not be quant. related to the abs. velocity of respiration, depending upon whether or not the relative velocities of the reaction producing the reductant and removing the oxidant are changed. Wieland's theory of oxidation (*Ergebnisse d. Physiol.* 20, 477 (1922); cf. *C. A.* 16, 1245) in conjunction with this theory of continuous elec. currents explains the reduction of methylene blue and the distribution of elec. potential in the root tip and *Obelia* stem. Oxidation-reduction potentials are probably developed at all cell surfaces and result in polarization. They form the basis for the summation of continuously maintained p. ds. The elec. polarity of the cell is due to the difference in local ratios of concn. of oxidant and reductant in apical and basal ends of the cell. Changes in these ratios at the two ends of the cell account for the observed change in magnitude of elec. polarity, absence of polarity, and reversal of polarity. The theory assumes that stimulation changes the elec. potential and therefore the polarity of the cell because it temporarily accelerates the reaction, reductant oxidant (= respiration), and likewise the ratio, oxidant/reductant. It predicts the existence of a quant. relation between O_2 concn. and the magnitude of the elec. p. d. It may, therefore, be possible to distinguish between the different types of p. ds. which det bio-elec. phenomena. This theory explains how continuous currents may serve as a mechanism of continuous cell correlation and how one cell or a cell group may control the rate and direction of physiol. processes in adjacent cells. **III. Effects of concentration of oxygen on cell polarity in the frog skin.** *Ibid* 291-307.—The velocity of O_2 consumption of frog skin is approx. proportional to the concn. of free O_2 in the medium. The magnitude of elec. polarity in the skin may be increased or decreased by changing the concn. of dissolved O_2 in Ringer soln. applied to both sides of the skin. Complete removal of dissolved O_2 from the medium does not at once remove all elec. polarity, showing that the ratio, oxidant/reductant, in the cell can maintain a p. d. under anaerobic conditions and that elec. energy can be produced anaerobically by the mechanism. When the polarity finally disappears it is associated with the onset of death in the cells due to absence of O_2 . The velocity of oxidation in frog skin is about 10 times as sensitive to the same change in O_2 concn. as is its elec. polarity. An app. is described for detg. the relation between O_2 concn. and elec. polarity in frog skin or other suitable membrane. **IV. The origin of electric polarity in the onion root.** G. MAYOR. *Ibid* 309-25.—The e. m. f. of a given length of onion root is the algebraic sum of the e. m. fs. of the cells of such portion of the root. The slope of the curves of distribution of p. d. are an index of the direction of fall of potential over the root. The elec. polarity of the root fluctuates and may increase, diminish, or be reversed by changes in environment and in the internal processes of the cells. **V. The quantitative relation between E_p and cell oxidation as shown by the effects of cyanide and oxygen.** E. J. LUND. *Ibid* 327-37.—The rate of O_2 consumption and CO_2 production per unit length of *Obelia* stem is greater in the growing, apical, electropositive region than in the older basal, electronegative region. The % depression of elec. polarity by KCN across the ecto-endoderm layer in the apical region is greater than in the basal region. The same is true of the depression of cell oxidation by KCN. The % depression of elec. polarity by KCN in frog skin depends upon the concn. of KCN. The polarity can be reversibly depressed by KCN to about 40% of the normal value. Equal concns. of KCN depress both elec. polarity and velocity of cell oxidation in the same frog skin to the same % values of the normal. High concns. of O_2 in Ringer soln. antagonize the effect of KCN upon the elec. polarity of frog skin. Unequal velocities of reaction in the underlying chem. system probably det. the unequal effects of equal change in O_2 concn. on the polarity of apical and basal cells of the epidermis. C. H. R.

The properties of the gonads as controllers of somatic and psychical characteristics.
 X. **Spermatozoön activity and the testis hormone.** C. R. MOORE. Univ. Chicago.

J. Exptl. Zool. **50**, 455-94(1928).—Largely physiol. The testis hormone is responsible for prolonging the life of the spermatozoa within the epididymis. C. H. R.

General physiology of the heart. XI. Properties of "active substances," differences in their resistance to heat. JEAN DEMOOR. *Arch. sci. biol.* (Italy) **12**, 77-93 (1928); cf. *C. A.* **22**, 2594.—A review with 27 references to the literature is given. Further study is necessary before definite conclusions can be drawn as to the functions of the "active substances." These substances as isolated by different workers do not appear to be abs. equiv. The effect of heat on these substances is not the same in batrachians as in mammals. L. W. RIGGS

The blood pressure of Chinese in China and in the U. S. A. CHEN-LANG TUNG. Peking Union Med. Coll. *Chinese J. Physiol. Report Series* **1928**, No. 1, 93-6.

L. W. RIGGS

Pulse rates and ratios in Chinese students. H. S. D. GARVEN. Mukden Med. Coll. *Chinese J. Physiol. Report Series* **1928**, No. 1, 97-106.—The av. resting pulse rate in 60 Chinese students aged 19 to 29 years was 67.5 (range 50 to 101). The individual difference between the max. and min. of resting pulse rates varied between 21 and 31. Increase in atm. temp. increased the pulse rate in some but not in others. The pulse ratio test for phys. fitness showed a low av. efficiency among Chinese students. Some improvement in the pulse ratio occurred with an increase in atm. temp. L. W. RIGGS

Castration in the pigeon. ALEXANDRE LIPSCHÜTZ AND OTTMAR WILHELM. *Compt. rend. soc. biol.* **99**, 691-2(1928).—The plumage of pigeons remained normal 15 months after complete extirpation of the testicles. Accordingly the characteristic plumage of the male pigeon is not conditioned upon the testicular hormones. L. W. RIGGS

The cardiac hormones. G. KATZ AND E. A. LEIBENSON. *Compt. rend. soc. biol.* **99**, 695-6(1928). L. W. RIGGS

Composition of blood and the menstrual cycle. A study of sugar and phosphorus. CH. O. GUILLAUMIN AND H. VIGNES. *Compt. rend. soc. biol.* **99**, 749-52(1928); cf. *C. A.* **22**, 4637. **Calcium and potassium.** *Ibid.* 753-5. —No particular relations appear to be established between the sugar, P, Ca and K contents of the blood and the menstrual cycle. L. W. RIGGS

Evolution of potential in the fasting stomach. J. SWINGEDAUF. *Compt. rend. soc. biol.* **99**, 796-7(1928); cf. *C. A.* **22**, 2972. L. W. RIGGS

Starvation and glycogen in thyroidectomized dogs. I. I. NITZESCU AND MARIE BENETATO. *Compt. rend. soc. biol.* **99**, 896-7(1928).—Thyroidectomized dogs endured fasting longer and lost less liver and muscle glycogen than controls. L. W. RIGGS

Hemoglobin and its biologic role. JOSEPH BARCROFT. *Compt. rend. soc. biol.* **99**, Appendix to No. 25, 3-28(1928); cf. *C. A.* **22**, 2953. —B. gives a review and discussion with 65 references to the literature. L. W. RIGGS

Pancreatic secretion in disturbed gastric secretion. SEIZABURO OKADA, TSUNAMOTO IMAZU, KWANICHI KURAMACHI, MASAKA MATSUBARA AND TOSHIIO TSUKAHARA. *Proc. Imp. Acad. Tokyo* **4**, 423-4(1928).—The pancreatic secretion is not necessarily disturbed by disturbed gastric secretion. In some cases it is increased. The presence of HCl is not necessary to stimulate normal pancreatic secretory activity. It is probable that some powerful stimulating mechanism for this secretion other than secretin exists. L. W. RIGGS

Heart action in absence of oxygen. IV. Importance of the thyroid for the action of agents active upon the heart. WILLY KÖNIG. Westf. Wilhelms-Univ., Münster i. W. *Arch. exptl. Path. Pharm.* **134**, 29-35(1928).—The tests were made upon the hearts of guinea pigs from which the thyroid had been removed 18-35 days previously. The hearts of animals deprived of thyroid react to stimulating agents in the absence of O much as do the hearts of normal animals when O is lacking. Substances of the caffeine-adrenaline group which exhibit their action on the anoxidative phase of the metabolic process improve heart action but little if at all. Digitalis substances, whose action is assocd. with oxidative processes, cause as great or an even stronger effect than on normal hearts. These facts suggest that the thyroid is of particular importance in connection with anoxybiotic processes. G. H. S.

Fate of heterologous fats in the body. L. SCHIEFFER. Univ. Pécs. *Arch. exptl. Path. Pharm.* **134**, 66-73(1928).—Apparently under physiol. conditions heterologous fats are not deposited as such in the tissues. G. H. S.

Influence of a lipoid hypophyseal hormone upon deamination processes in the organs. RENZO AGNOLI. Kgl. Univ. Genua. *Arch. exptl. Path. Pharm.* **134**, 74-87(1928).—Exts. of the posterior lobe of the ox hypophysis exert no effect upon deamination of glycocoll when it is injected intravenously. Com. hypophysis prepns. are also

inert. Freshly prepd. exts. of the gland stimulate the processes, and lipoid exts. of either dried ox hypophysis or the fresh gland of swine are far more active. Conclusion: The anterior lobe of the hypophysis contains a hormone which stimulates processes of intermediary metabolism. G. H. S.

A particular function of the adrenals in male and female animals and of the testes in the male. HANS HANDOVSKY AND HEINRICH TAMMANN. Univ. Göttingen. *Arch. expil. Path. Pharm.* **134**, 203-11(1928).—Rabbits were subjected to bilateral adrenalectomy and detns. were later made of the carbohydrate, lactic acid and cholesterol of the muscle and of the cholesterol content of the liver. Particular attention was paid to the changes induced in relation to sex. The values for muscle carbohydrate were definitely above normal in the males and below normal in the females, and adrenalectomy somewhat increased the lactic acid of the muscle, particularly in male animals. Removal of testes or of ovaries did not modify the muscle carbohydrate. When, however, the animals were first castrated and later subjected to adrenalectomy data were obtained which indicate, that influenced by the germinal glands, the adrenals produce substances which are involved in the mechanism of carbohydrate metabolism. Apparently the active principles act in opposite directions, depending upon sex. G. H. S.

Physiology and pharmacology of the uterine musculature during the puerperium. HERMANN KNAUS. Univ. Graz. *Arch. expil. Path. Pharm.* **134**, 225-46(1928).—During the first day post partum the uterus begins to lose the properties developed during pregnancy and the altered response of the puerperal uterus to such substances as adrenaline, quinine, pituitrin and ergotamine is referable to the changed physiol. conditions obtaining at this time. G. H. S.

Humoral physiology of the frog heart. I. FRITZ KÜLZ. Univ. Kiel. *Arch. expil. Path. Pharm.* **134**, 252-6(1928). When the frog heart is perfused (in the early part of the year) some substance, inhibitory to the action of the frog intestine, is yielded up to the perfusion fluid. G. H. S.

Perfusion of isolated surviving organs. III. Mechanics of the secretion of urine in the surviving artificially perfused kidney. C. JACOBI AND LOTHAR LOEFFLER. Pharmacol. Inst. Tübingen. *Arch. expil. Path. Pharm.* **136**, 300-30. G. H. S.

G -PATHOLOGY

H. GIDEON WELLS

Immunological studies on various fractions of tubercle bacilli. MAX PINNER. Detroit Municipal Sanatorium, Northville, Mich. *Am. Rev. Tuberculosis* **18**, 497-501(1928). Various protein, phosphatide and fat fractions have been investigated as to their immunological behavior. The results with these chemically well-defined fractions confirm essentially previous similar work done with less pure materials. Probably the most important result is the fact that a phosphatide fraction was found to be a true antigen. H. J. CORPER

The Vernes flocculation test for tuberculosis. Results of 250 cases. ADELAIDE B. BAYLIS. Columbia Univ., New York. *Am. Rev. Tuberculosis* **18**, 513-9(1928); cf. *C. A.* **22**, 4612.—The Vernes flocculation test is of value in the detection of active tuberculosis. The test is of even greater value as a guide in treatment, especially in regulating the mode of life of relatively quiescent cases. It is not sp. for tuberculosis in a bacteriological sense, but is an extremely precise and delicate test, superior to other serological tests which have been employed in tuberculosis. H. J. CORPER

The treatment of pulmonary tuberculosis with a residual antigen: method of preparation and clinical results obtained. C. E. JENKINS. *British J. Tuberculosis* **22**, 126-36(1928).—By an elaborate method of ether extn., NaOH and pepsin digestion and H₂O₂ treatment, J. preps. a "residual antigen" from cultures of human and bovine tubercle bacilli grown on broth agar contg. 2% serum. The antigen is reported not to produce inoculation abscesses and the clinical results approach those with the residual antigens of other organisms. Approx. 1/3 of all cases of pulmonary tuberculosis can obtain appreciable benefit from this antigen. The original paper should be consulted for details. H. J. CORPER

The isoelectric point of the blood with especial reference to syphilis. RICHARD LUCHSINGER. Univ. Klinik Lausanne. *Z. ges. expil. Med.* **59**, 393-420(1928).—A study of the variations in sedimentation time of erythrocytes, cataphoresis and flocculation in various stages of syphilis. Bibliography. F. L. DUNN

A hypoglycemic symptom complex in rabbits. V. V. OPPEL. Militar-Medizinischen Akad. zu Leningrad. *Z. ges. expil. Med.* **60**, 86-101(1928).—An unknown

disease in rabbits which appeared in epidemic form and was characterized by marked prostration and death. The animals were hypoglycemic and the prostration was not relieved by injections of adrenaline. Petroleum ether exts. of the blood showed lowered values. F. L. DUNN

Physicochemical behavior of protein groups of pathological human blood and exudates purified by electrodialysis and studied as the sodium salt. I. The problem, characteristics of the proteinates, isoelectric point, specific viscosity, refraction and Tyndall effect. KARL HARTL AND WILHELM STARLINGER. Univsklinik in Freiburg. *Z. ges. expil. Med.* 60, 288-314(1928). II. Combination with bases, dissociation, mobility, conclusions. *Ibid* 315-35. F. L. DUNN

Theory of diabetes and the action of insulin. CARL OPPENHEIMER. *Pharm. Ztg.* 73, 1327-30(1928).—A discussion. W. O. E.

The blood sugar in tabes dorsalis. FANNY HALPERN AND H. KOGERER. Universitäts Klinik, Wien. *Wiener med. Wochschr.* 78, 910-11(1928).—Tabetic pains accompany high blood sugar values. The occurrence of painful crises in tabetics is, therefore, attributed to some faulty mechanism in carbohydrate metabolism.

Epilepsy after benzene poisoning. GEORG STIEFLER. Spital der Barmherzigen Brüder, Linz, Austria. *Wiener med. Wochschr.* 78, 938-40(1928).—A case is reported in which epilepsy followed benzene poisoning. ARTHUR GROLLMAN

The keeping qualities of specific anti-sera for the precipitin test. FRANK BAMPFORD. *Analyst* 53, 531-2(1928).—Anti-sera prepd. by the Lister Inst. and sent to Cairo in 1923 have been kept for 5 yrs. in an old-fashioned ice-chest with the temp. up to 15° during some days in the summer. On the other hand, recent samples from another manufacturer were useless when they reached Egypt. In still another case, samples were kept by mistake in a temp. of 30-35° for 12 days and were still potent. It appears, therefore, that temp. variations are not in themselves sufficient to account for the variations noted. Probably the trouble is caused by imperfect sterilization. W. T. H.

Fat, lipid and cholesterol constituents of adrenals and gonads in cases of mental disease. DENNIS L. WOODHOUSE. *Biochem. J.* 22, 1087-96(1928).—The percentage of fatty extractives from gonads showed less variation than that from the adrenals. The lowest adrenal content was found in dementia precox and the highest in senile dementia. BENJAMIN HARROW

Hemolysis by brilliant green and serum. ERIC PONDER. New York Univ. *Proc. Roy. Soc. (London)* B 103, 556-74(1928).—The mechanism of hemolysis in systems of this type is explained: "In the sensitization process, a compd. is formed between a protein component of the red cell membrane and either the brilliant green itself or its leuco base. On the subsequent addn. of serum, the serum proteins react with the combined dye in the system to form a hemolysin, which can react with the protein component referred to, and which thus brings about lysis. It will be observed that this hypothesis contains 2 essentials, the first being that the hemolytic reaction is really composed of 2 consecutive reactions, and the second being that the new lysin formed by the combination of the serum proteins and the dye acts upon the same cell component as that to which the dye is united. The dye thus acts as an 'amboceptor' in an unusually strict sense of the term, for it brings together the cell component and the serum proteins by first uniting with the former and then uniting with the latter" JOSEPH S. HEPBURN

Elimination of the normal ring at the boundary of a plant antigen and normal serum by the precipitin ring method. E. HANNIG AND W. SLATMANN. *Planta abt. F., Z. wiss. Biol.* 5, 135-58(1928).—If a phosphate mixt. is added to a plant antigen, the formation of a non-specific ring at the boundary of normal serum and antigen is prevented without at the same time destroying the immune reaction. The success of the reaction depends upon the proper p_H of the phosphate mixt. and also upon the amt. of mixt. added to a given antigen. These values must be detd. for each antigen. For the particular expts. reported p_H 6.5 gave the best results (5 cc. $M/1H_2PO_4$: 6.8 cc. 1.5 M KOH). By the phosphate ring method it is possible to obtain the immune reaction at a greater concn. and in a shorter time than with Mez's modified ring method. It is believed that the normal antigen rings are not caused by normal precipitins as has been supposed, because these rings may be eliminated by a phosphate mixt. without injury to the immune ring. The phosphate procedure is applicable to the capillary method. A. E. HIRCHCOCK

Tapeworm anemia. Therapeutic observations. RAPHAEL ISAACS, CYRUS C. STURGIS AND MILLARD SMITH. Thomas Henry Simpson Memorial Inst. for Medical

Research, Univ. of Michigan. *Arch. Internal Med.* 42, 313-21(1928).—"A case of *Dibothryocephalus latus* (*diphyllobothrium latum*) anemia is described in which the blood picture, increase in bilirubin, achlorhydria, fever, neurologic and other clinical symptoms were indistinguishable from those of pernicious anemia. The patient's mother had died of pernicious anemia. It was found possible to cause a hematopoietic remission with disappearance of symptoms by feeding *liver* daily even though the parasite was not removed. Removal of the parasite which was effected later by the administration of oleoresin of aspidium accompanied the continuance of the convalescence. Evidence for the presence of sol. toxins was not obtainable from intradermal tests with saline suspensions of the tapeworm."

MARY JACOBSEN

Pancreatogenous fatty diarrhea. Report of a case. T. E. HESS THAYSEN. St. Elizabeth Hospital, Copenhagen. *Arch. Internal Med.* 42, 352-67(1928).—A man of 43 presented azotorrhea and steatorrhea without permanent or alimentary glucosuria. The hemoglobin content was 70%. The lipolytic and tryptic activity of the duodenal juice at pH 7 was very slight; the diastatic activity was normal. The pancreas showed rows of shadows in the ducts. The patient improved on a diet contg. 124 g. albumin, 136 g. fat and 268 g. carbohydrates daily. He lost 77.3 g. fat and 54.3 g. albumin daily, showing a balance of 265 calories over his basal metabolic requirements. When contrasted with the extreme waste of protein and fat in pancreatectomized dogs this utilization suggests that the pancreas regulates metabolism by means of an internal secretion. Fatty diarrhea is difficult to explain on the basis of incomplete hydrolysis, sapon, or emulsification of fats. Possibly the pancreas controls the absorptive power of the intestine by a secretion circulating in the blood. In another patient with fatty diarrhea and diabetes who was cured of the former a year before death, autopsy revealed an almost complete atrophy of the pancreas.

MARY JACOBSEN

Chemical analysis of blood in patients having senile cataract. CECIL S. O'BRIEN AND VICTOR C. MYERS. State Univ. of Iowa. *Arch. Internal Med.* 42, 376-8(1928).—The blood of 54 patients was normal except for a slightly increased cholesterol content in 54% cases.

MARY JACOBSEN

Functional insufficiency of the suprarenal glands. C. A. MILLS. Peking Union Med Coll. *Arch. Internal Med.* 42, 390-408(1928).—A report of 40 cases of a disease common in the tropics and in the Orient, especially among foreigners and directly traceable to the heat and humidity. It is characterized by marked vascular hypotension, moderate anemia, hypo- or achlorhydria and gastric hypermotility with symptoms often simulating chronic appendicitis, peptic ulcer or tuberculous meningitis. Hypoglycemia with high sugar tolerance, edema, urticaria, pigmentation of the skin, weakness, loss of wt. and menorrhagia were also observed. It is promptly and completely relieved by the oral administration of *adrenaline*. Autopsy in 1 case revealed changes in the adrenals similar to those seen in animals exposed to moist heat. Hypoadrenalism is a distinct disease entity as is hypo- or hyperthyroidism. Many cases of so-called *sprue* are probably adrenal insufficiency.

MARY JACOBSEN

Pernicious anemia. Edema and reduction in excretion of water. E. MEULENGRACHT, POUL IVERSEN AND F. NAKAZAWA. Bispebjerg Hospital, Copenhagen. *Arch. Internal Med.* 42, 425-39(1928).—"In pernicious anemia edema frequently occurs and the water test often shows a reduction in the excretion of water. These symptoms are present during a relapse and disappear during a remission. It does not seem probable that the symptoms are caused by impairment of the function of the kidneys or by the low amt. of hemoglobin. In many instances a decrease in the total protein with a lowering of the colloidal osmotic pressure in the plasma was found. The latter often occurs in the critical zone of the origin of the edema and may therefore be a contributing factor in the production of edema and probably as well of the reduction in the excretion of water in pernicious anemia. One or more addnl. factors must also be present, however, possibly dilatation of the heart or an increased permeability of the capillary walls."

MARY JACOBSEN

The dextrose tolerance test. Its use in the determination of the severity of diabetes mellitus. MAX. WISHNORSKY. Jewish Hospital, Brooklyn, N. Y. *Arch. Internal Med.* 42, 443-52(1928).—"Various methods for detg. the severity of diabetes are discussed. Classification which takes into account only the amt. of glucosuria is fallacious, for insulin is concerned with the metabolism of all foods—carbohydrates, proteins and fats. Such classifications are also vitiated by the fact that the renal threshold of dextrose is different for each person. A high renal threshold which acts as a compensating mechanism would mask a severe case. The dextrose tolerance test as a method of detg. the severity of diabetes is considered. It is shown that the amt. of glucosuria occurring during the test cannot be taken as an index of the severity

because of differences in renal threshold in different individuals. The height of blood-sugar curve in such tests may be accepted as a criterion of the gravity of diabetes.

MARY JACOBSEN

The intracellular hemagglutinins. TADAO KUBO. Hokkaido Imp. Univ. *Jap. Med. World* 8, 148-53(1928).—The hemagglutinative substance in the ext. of red cells is a sort of hemagglutinin because it can be absorbed by erythrocytes and taken out in physiol. saline soln. Agglutination occurs at room or lower temp. and shows thermoreversibility. Intracellular agglutinin is found in the red corpuscles of rabbit and guinea pig but not in those of man, fowl, pig or cattle blood.

N. KOPELOFF

The calcium and potassium content of blood serum and experimental epilepsy in dogs. V. ZAGAMI. *Arch. sci. biol.* 11, 301-32(1928).—Healthy dogs were used and epilepsy by afferent stimuli was detd. by Amantea's technic. Ca and K were detd. by the Kramer-Tisdall method. The relation between epilepsy and thyroid-parathyroidectomy was also studied. The results are reported in 8 tables from which Z. derives the following facts. (1) In predisposed dogs the Ca content of blood serum is only slightly less than that of the non-susceptible animals, while K is noticeably less in the former than in the latter. The ratio $\frac{Ca \times 100}{K}$ is larger in the predisposed than in the nonsusceptible animals. (2) Epileptic fits whether by afferent stimuli in the susceptible animals, or by faradization of the sigmoid centers in the non-susceptible, cause an increase of Ca and, therefore, a diminution of the ratio $\frac{Ca \times 100}{K}$. (3) Similar but more definite increases of Ca and K are caused by strychnine. (4) Thyroid-parathyroidectomy produces definite variations; there is a very marked diminution of Ca and an increase of K. The importance of the ratio $\frac{Ca \times 100}{K}$ is stressed as being an excellent means of detecting small differences which would be less evident if the values of Ca and K alone were compared. The results indicate that this ratio is higher in dogs susceptible to epilepsy by afferent stimuli. The values of the ratio $\frac{Ca \times 100}{K}$ are schematically given as:

dogs not predisposed :			: dogs predisposed		
min.	med.	max.	min.	med.	max.
27.82	38.10	48.38	42.48	49.97	61.19

PETER MASUCCI

Cholesterol in malaria patients. P. SEV. *Boll. so. ital. biol. sper.* 3, 371 (1928).—Cholesterol was detd. in 36 cases of malaria. The results indicate that in malaria there is a hypocholesterolemia. The intensity is proportional to the vol. of the spleen.

PETER MASUCCI

Certain modifications of the plasma in hepatic necrosis. G. PELLEGGRI. *Boll. soc. ital. biol. sper.* 3, 417-8(1928).—Data are given for total protein, fibrin, serum-globulin, serum albumin and protein osmotic pressure in cases of cirrhosis of the liver. There was a diminution of the total protein in the plasma.

PETER MASUCCI

The lactic acid content of cerebrospinal fluid. G. MARGRETH. *Boll. soc. ital. biol. sper.* 3, 518-9(1928).—The lactic acid content in normal and pathological cerebrospinal fluid was detd. by the Mendel-Goldscheider method. The normal contained 16-18; tubercular spinal fluids 41-60; one myelitic meningitis 24.5; one tabes 25.75 and one luetic 16.25 mg. %.

PETER MASUCCI

The so-called renal diabetes from phlorhizin. MARIO CAPOCACCIA. *Boll. soc. ital. biol. sper.* 3, 597-601(1928).—Intramuscular injections of phlorhizin were made into guinea pigs. The animals were sacrificed at various intervals and a histological examn. was made of the various organs. The urine was examd. for glucose, acetone and β -hydroxybutyric acid. Besides the usual typical renal lesions, 20% of the animals showed lesions in the pancreas. A detailed histological description of this organ is given. The anatomo-pathological picture was somewhat similar to that in diabetes mellitus. The conception that phlorhizin glucosuria is of renal origin is questioned.

PETER MASUCCI

Experimental hemolysis studies. II. K. KLINKE. Univ. Basel. *Biochem. Z.* 197, 381-403(1928).—The hemolysin is adsorbed on the red blood cells where it somehow acts upon the lipid and affects the structure of the membrane, this making the lysis possible. This consists in the adsorption of the loosened fragments of the membrane on the euglobin fraction of the serum.

S. MORGULIS

Preparation of active protein from a precipitating anthrax serum. G. ROSENHOLZ. Inst. exptl. Veterinary, Moskow. *Zhurnal exptl. Biol. Med.* 10, 109-11(1928).—Globulin obtained from a pptg. anthrax serum has specific pptg. properties. The globulin is pptd. through diln. of the serum with distd. water, and the ppt. has quantitatively the pptg. activity of the genuine serum. Because of the ease with which the globulin can be obtained and kept in the dry state, its diagnostic use will undoubtedly supercede that of the anthrax serum.

S. MORGULIS

Death by hypoglycemia in acute trypanosomiasis. A. DUBOIS. *Compt. rend. soc. biol.* 99, 656-7(1928).—Expts. with mice and guinea pigs subjected to exptl. acute trypanosomiasis indicated hypoglycemia as the immediate cause of death.

L. W. RIGGS

Action of ultra-violet rays on the elaboration of bacterial agglutinins. Reduction and suppression of the latent phase. A. BESSEMANS AND A. SELDESCHLACHT. *Compt. rend. soc. biol.* 99, 628-30(1928).—Rabbits injected with an emulsion of typhoid bacilli and subjected to ultra-violet irradiation showed a larger titer of agglutinins than non-irradiated animals.

L. W. RIGGS

Schick reaction applied to the production of serums in horses. J. CELAREK AND W. PORĘBSKI. *Compt. rend. soc. biol.* 99, 1017-8(1928). Sensitivity of horses to streptococcic toxins. *Ibid.* 1019-20 Titration of antiscarlatinous serum. *Ibid.* 1020-1.

L. W. RIGGS

Lesions of the spleen produced in the rabbit by painting with tar. A. BABES AND (MME.) LAZĂRESCO-PĂNĂZU. *Compt. rend. soc. biol.* 99, 1077-9(1928).—A histological study.

L. W. RIGGS

Action of intravenous injections of biliary salts on the rhythm of the normal human pulse. DUMITRESCO MARTE AND D. HAGIUSCO. *Compt. rend. soc. biol.* 99, 1087-8(1928). While intravenous injections of mixts. more of taurocholate and glycocholate 1 to 7 cause only a slight bradycardia, a mixt. more concd. in taurocholate (1 to 2) causes a more pronounced and persistent bradycardia.

L. W. RIGGS

Identity of the urinary proteins of nephritis. WILLIAM H. WELKER, EDMUND ANDREWS AND WILLIAM THOMAS. *J. Am. Med. Assoc.* 91, 1514-4(1928).—Blood serum proteins, albumin, pseudoglobulin and euglobulin constitute an important part of the urinary proteins in nephritis. Peptones are eliminated either in chem. combination or adsorbed by these blood proteins. Some blood protein, the dispersion of which has been increased, is eliminated and this protein is toxic. Possibly the elimination of blood proteins can be explained on the basis that the body uses this means for detoxifying the split protein products and then the kidney removes them from the blood because they now resemble in part foreign proteins.

L. W. RIGGS

Chemical factors in the toxemias of intestinal obstruction. THOMAS G. ORR AND RUSSELL L. HADEN. *J. Am. Med. Assoc.* 91, 1529-30(1928).—The characteristic chem. changes in the blood in acute pyloric and upper intestinal tract obstruction are an increase in the nonprotein N, a decrease in the chlorides and a rise in the CO₂ combining power of the plasma. The relations of these and other changes to the clinical conditions are discussed. These studies have led directly to the recognition that a sufficient quantity of water and NaCl is imperative to combat the dehydration and toxemia incident to such obstruction.

L. W. RIGGS

Filterability of hydatid antigens. C. H. KELLAWAY, N. HAMILTON FAIRLEY AND I. ELEANOR WILLIAMS. Walter and Eliza Hall Inst. *Australian J. Exptl. Biol. Med. Sci.* [3], 5, 189-204(1928).—Ultra-filtrates from hydatid fluid in pyroxylin membranes hardened in 50 and 60% alc. do not contain any antigenic substances detectable by complement fixation, anaphylactic or intradermal tests, nor do they give chem. reactions indicative of the presence of protein. With more permeable membranes hardened in 70 and 80% alc. the ultra-filtrates give positive Spiegler and hemochromogen reactions, react well in anaphylactic expts. and give positive intradermal tests in patients infested with hydatid. They yield only feeble complement fixation reactions with pos. hydatid sera. Though these last membranes do not permit the passage of protein when sheep serum is filtered through them, traces of sheep serum protein are present in ultra-filtrates from hydatid fluid.

L. W. RIGGS

Chemotherapy of tuberculosis. I. ERICH HESSE, GERTRUD MEISSNER AND GERHARD QUAST. Univ. Breslau. *Arch. exptl. Path. Pharm.* 135, 82-110(1928).—From among a very large no. of dyestuffs tested for their capacity to stain tubercle bacilli under a variety of conditions, the basic derivs. of the triphenylmethane, azine and thiazine series were found to be possessed of a definite affinity for the organisms. These dyestuffs are capable of effecting a staining of the bacilli *in vivo*; hence it might be assumed that such a union with the organisms would damage the bacteria and thus

be of therapeutic value. No direct therapeutic expts. were performed, but *in vitro* bactericidal tests with the dyestuffs indicated that certain of the stains were effective, both in inhibiting growth and in actually destroying viability. G. H. S.

Experimental study of the death resulting from burns. G. RIEHL, JR. Univ. Wien. *Arch. expil. Path. Pharm.* 135, 369-84(1928).—Guinea pigs subjected to burning, while under ether narcosis or lumbar anesthesia, exhibit a gradual outpouring of adrenaline from the adrenals and a simultaneous increased appearance of free choline derivs. These facts account for the histological changes observed in the adrenal. This outpouring of adrenaline is not great during the first hr. after the injury, and in decerebrate cats a like injury shows the adrenaline content of the glands decreases but slowly during a period of from 2 to 9 hrs. But although an abundance of adrenaline can be detected in the glands by biol. methods, choline derivs. can also be found in exts. of the adrenals. Changes in the adrenals could in no case be assumed to be the primary cause of death. The vascular system of burned animals, sooner or later, lost its characteristic response to substances such as adrenaline and cholazyl, as well as to cardiazole. The gradually falling blood pressure could be increased only by such agents as hypertonic sugar solns., and, in some instances, by ext. of the posterior lobe of the hypophysis. There is no obvious connection between the behavior of the vascular system and the changes observed in the adrenals. G. H. S.

Relationship between the formation of antibodies and various experimental forms of anemia. AKINOSUKE IWATA. *Acta Schol. Med. Univ. Imp. Kyoto* 9, 485-510 (1927).—Immunization was achieved by repeated injections of typhoid bacteria. Three months were allowed for the agglutinin to attain constancy. Anemia was then induced by blood poisons and bleeding. In rabbits exhaustion resulted but the agglutinin value increased. Leucocytes increased and paralleled the agglutinin. Young blood cells increased in no. The stimulation of the hemapoietic tissue by blood poisons or bleeding favors the formation of agglutinin. Agglutinin formation did not change from the normal when typhoid bacteria were injected in anemias caused by blood poisons but in bleeding anemias it decreased. Agglutinin value once increased after injection of typhoid bacteria was unaffected by blood poison injection and bleeding. From this it is assumed that the hemapoietic tissue was stimulated. J. T. W.

The Donnan theory of membrane equilibrium (SHIGI) 2.

II—PHARMACOLOGY

A. N. RICHARDS

The effects of thyroxine injections on the suprarenal glands of the mouse. MARY I. PRESTON. Stanford Univ. *Endocrinology* 12, 323-4(1928). H. J. DEUEL, JR.

Plant extracts with an insulin action. III. Bean-pod extracts. (Phaseolin.) E. KAUFMANN. *Z. ges. expil. Med.* 60, 285-8(1928); cf. C. A. 23, 198.—Material obtained in 1926 showed a definite lowering of the blood sugar in rabbits while material obtained in 1927 showed it only very slightly. K. suggests that this may be due to variations in ripening, season, etc. F. L. DUNN

Fatal case of acute lead poisoning. A. BRÜNING AND B. KRAFT. *Arch. Pharm.* 266, 501-4(1928).—Acute Pb poisoning cannot be detd. by sectional examn. alone, but must be accompanied by a chem. examn. of portions of the cadaver. When introduced orally into the body, the Pb is found chiefly in the stomach and intestines, less so in the large glands. Fühner's procedure and destruction of cadaver material with nitrosulfuric acid (and slight addn. of KMnO_4) shortens the detection of Pb materially, and yields sufficiently dependable results provided the quantities of Pb are not too minute. W. O. F.

The action of certain narcotics on the saponification of fatty acids. M. CHIO AND M. PIRAS. *Boll. soc. ital. biol. sper.* 3, 359-62(1928).—Twenty-five cc. 0.004 N NaOH was placed in each of 5 separatory funnels. One tube served as control; to the other 4 were added, resp., 5 drops EtOH , Et_2O , CHCl_3 and chloral hydrate in aq. soln. 20%. The tubes were shaken and then 3 drops of olive oil was added to each at an interval of 10 min. between each tube. The tubes were then shaken at definite intervals and samples taken for nephelometric measurements. The turbidity was taken as an index of the quantity of soap formed. The 4 narcotics have the property in common of accelerating the action between NaOH, or Na_2CO_3 and fatty acids. P. M.

The position of the carbon and oxygen coefficients of rabbit urine following injections of "präphysonin." A. ALLEN GOLDBLOOM. Univ. Berlin. *Biochem. Z.* 199, 202-6(1928).—Injections of a prepn. of the anterior lobe of the hypophysis produced

alterations in metabolism which are not invariably shown by a parallel change in the C/N and O/N urinary ratios. Both should be detd. S. MORGULIS

Distribution of India ink in the organs of the guinea pig after intraperitoneal injections. C. CRISAN. *Compt. rend. soc. biol.* 99, 1074-6(1928).—A histological study. L. W. RIGGS

Action of strychnine on the absolute strength of the frog heart. ITARO KIKUCHI. *Tôhoku Univ. Tôhoku J. Exptl. Med.* 11, 407-9(1928).—Strychnine perfused in Ringer soln. in concns. of 1:100,000 to 1:50,000 increased the abs. strength of the frog heart as compared with the heart pressures under perfused Ringer soln. alone. L. W. RIGGS

Toxicology of lead and its compounds (DANCKWORT, JÜRGENS) 7. Production of colloidal lead or salts of lead (REINHARD, *et al.*) 2.

I—ZOÖLOGY

R. A. GORTNER

Oxygen capacity of the blood of certain invertebrates which contain hemoglobin. NAOKYUKI KAWAMOTO. *Marine Biol. Sta., Asamushi, Aomori-Ken. Science Repts. Tôhoku Imp. Univ.* [4], 3, 561-75(1928).—The values of t_h (O tension at which half satn. occurs) of the blood of *anadara* and the perivisceral fluid of *caudina* are 10 mm. and 8 mm., resp., and such small values show an adaptation of the animals to their habitats. The O capacity of the blood of *anadara* does not increase proportionally to the increase of the O capacity of the serum within the range between 50 and 150 mm. of O pressure. This fact may mean probable influence of electrolyte in the blood. The irregular forms of red corpuscles found in the perivisceral cavity in the water vascular system can be considered as the result of degeneration of round biconvex corpuscles found in the blood vessels. The perivisceral fluid of *caudina* plays an important role in the respiratory function of the animal as a whole. The O capacity of the serum of *anadara* and of *caudina* is greater than that of sea water. The dissociation curves of the blood of *anadara* and *caudina* are satisfactorily represented by Hill's equation (*C. A.* 5, 1622). The value of n given by the perivisceral fluid of *caudina is less than one and the writer suggests that the degenerative state of the blood corpuscles might be partly responsible for such an anomaly. The hemoglobin content of the blood of *caudina* increases according to the size (age?) of the shell. D. D.*

Effect of halogen compounds on the growth of the tadpole of *Bufo vulgaris formosus*. E. SHINRYO OHSUCHI. *Biol. Inst. Tôhoku Imp. Univ. Science Repts. Tôhoku Imp. Univ.* [4], 3, 625-46(1928).—Fifty tadpoles each were cultured in pond-water 0.0001 M in NaCl, KCl, NaBr, KBr, NaI and KI with the following results: "The compds. of the same anion show close resemblance in influencing the body weight and dimension in comparison with those of other anions. In the earlier part of the expt., before entering the metamorphosis, the body weight and dimensions are always larger in the chlorides than in the other compds., except the depth of the tail axis; but in the later part Br > Cl > I is the definite order, except in the cases of the tail and total length which are always Cl > Br > I. The above orders become more or less irregular after entering the metamorphosis. NaCl accelerates the growth of the hind limb. In general, the chlorides tend to accelerate, but later to retard the growth of the body. The bromides generally tend to retard at first and then to accelerate the growth of body and of the hind limb, though KBr acts suddenly in decreasing the depth of tail and the width of the trunk after entering the metamorphosis. In general, the chlorides retard the growth of the trunk and of the hind limb, but tend rather to increase the tail dimensions, indicating a prolongation of the period of tail atrophy. The acceleration of metamorphosis is not obvious in KI, while it is very acute in the expt. feeding *Thyroides siccum*." DAVID DAVIDSON

Effect of inorganic salts on photic orientation in *Alloleobophora foetida* (Sav.). IV. Iodides and bromides—NaI, KI, NaBr and KBr. IKITARO NOMURA AND SHINRYO OHSUCHI. *Biol. Inst., Tôhoku Imp. Univ. Science Repts. Tôhoku Imp. Univ.* [4], 3, 647-53(1928); cf. *C. A.* 22, 2997.—The animals were submerged in 1/1.9 N solns. of NaI, KI, NaBr and KBr as well as in mixts. of these solns. and the effect on the positively orienting functioning of the ventral nerve cord or the negatively orienting functioning of the brain was noted. "In the ventral nerve cord, NaI and NaBr cause a weakening of positively orienting functioning, while KI and KBr cause a strengthening at first and then a weakening. In the brain, NaI and NaBr cause a weakening of negatively orienting functioning, while KI and KBr cause a strengthening at first and then a weakening. In NaI + KI, the general tendency of change in positive

orientation appears mainly to follow that of the worms placed in KI, while the change in negative orientation follows mainly that in NaI. In NaBr + KBr, the general tendency of change in orientation appears mainly to follow that occurring in NaBr. In all the cases, the backward crawling is caused mainly by a relative weakening of forward crawling functioning in the ventral nerve cord. The returning movement is caused by a functioning of the brain. In NaI, KI and KBr the movement becomes frequent at the beginning of submergence, while in NaI + KI, NaBr and NaBr + KBr it becomes less. In all the cases except that of NaBr, the winding movement becomes frequent after the submergence."

DAVID DAVIDSON

The influence of fasting on the chemical composition of Anguilla. T. VIEWEGER. Univ. Libre de Pologne, Varsovie. *Arch. intern. physiol.* 30, 133-45(1928).

H. J. DEUEL, JR.

The chronaxie of the nerves and muscles in the insulinized frog. J. M. D. OLMSTED. Liege. *Arch. intern. physiol.* 30, 202-4(1928).—No change in the chronaxie of the heart or the gastrocnemius muscle of an insulinized frog was found even at the height of convulsions. The excitability of the motor nerve did not change before the convulsions but it may be more excitable during the convulsions since the chronaxie is slightly higher immediately following them.

H. J. DEUEL, JR.

Further investigations concerning the specific action of salts in the extraction of urease from amebocytes of *Limulus*. LEE LOEB, I. LORBERBLATT AND MADELEINE E. FIELD. Washington Univ., St. Louis, and Marine Biol. Lab., Woods Hole. *J. Biol. Chem.* 78, 417-31(1928); cf. *C. A.* 21, 2337. —The efficiency coeffs. (cc. 0.04 M HCl neutralized by NH_3 formed when 25 cc. urease ext. is allowed to stand with 25 cc. 1% urea soln. for 22 hrs.) differed with the salt soln. employed for extn. of urease from the amebocyte tissue of *Limulus*. H_2O was least efficient, the efficiency coeff. (e. c.) = 0.48, while the salts of alkali metals in low concn. (0.50 M) were slightly better (NaCl, 2; KCl, 2). The bivalent salts of the alk. earth metals in 0.38 M concn. were far superior (CaCl_2 , e. c. = 130; SrCl_2 , 102; BaCl_2 , 80; MgCl_2 , 37; MnCl_2 , 10) although Cu and Zn were almost ineffective (CuCl_2 , 2; ZnCl_2 , 0.66). The trivalent anions or cations were very inefficient in the extn. of urease (FeCl_3 , 2; AlCl_3 , 0.00; $\text{La}(\text{NO}_3)_3$, 0.44). Sea water was somewhat effective (e. c. = 4) while 0.5 M NaCl with 1% gelatin gave an e. c. of 4, with 2% gum arabic soln., 5, and with 2% boiled starch soln., 1. Values for 0.38 M Na_2SO_4 and K_2SO_4 were 2 and for Na citrate 1. In higher concn. the salts of the alk. earth metals were more toxic and less efficient in the extn. of urease. The salts of the alkali metals become more effective at higher concns. (up to 2.0 M). It appears that one is dealing with an osmotic effect rather than a specific chem. effect because solns. of nonelectrolytes as glycerol become more effective in higher concns. The higher osmotic pressure probably retards the deleterious reaction of the H_2O on the enzyme. The extn. of urease by 0.5 M NaCl soln. was influenced by the addn. of HCl or NaOH as follows: 0.5 M NaCl alone, 1; in 0.001 N NaOH, 9; in 0.005 N NaOH, 52; in 0.0125 N NaOH, 20; in 0.05 N NaOH, 1; in 0.00033 N HCl, 36; in 0.001 N HCl, 30; and in 0.002 N HCl, 6. The addn. of optimal amts. of CaCl_2 to NaCl exts. or the addn. of sufficient NaCl to produce an optimal concn. of NaCl does not increase the activity of the ext. On the other hand, the addn. of CaCl_2 to MgCl_2 exts. increases the activity of the prepn. in proportion to the CaCl_2 added. When mixts. of NaCl and CaCl_2 or of MgCl_2 and CaCl_2 are used for extn., the results are intermediate between those of the individual constituents of the extn. medium, being higher with greater proportions of CaCl_2 and lower the greater the ratio of MgCl_2 and especially of NaCl in the medium. When NaCl is added to CaCl_2 exts., there is a lowered efficiency in proportion to the NaCl added. Addn. of salts of heavy metals decreases the efficiency coeffs. of CaCl_2 as follows: 0.38 M CaCl_2 alone, 131; with 0.5 M NaCl, 56; with 2.0 M NaCl, 29; with 0.38 M CuCl_2 , 0.72; with 0.30 M FeCl_3 , 0.48; 0.285 M CaCl_2 alone, 164; with 0.095 M MgCl_2 , 108. With 0.38 M BaCl_2 soln. the results were as follows: BaCl_2 alone, 119; with 0.5 M NaCl, 69; with 0.38 M ZnCl_2 , 0.40; with 0.38 M CuCl_2 , 2 and with 0.38 M FeCl_3 , 0.64. Similar results were obtained with 0.38 M SrCl_2 soln., the efficiency coeff. of this ext. alone being 127 and with 0.5 M NaCl 94. It is assumed that urease, a substance closely allied to it, or a substance markedly influencing its activity, unites with the various cations and that the efficiency coeffs. of urease when in these combinations vary. Ca, Sr or Ba is more potent than the Mg compd. but the latter preserves the urease in such condition that the Ca may subsequently replace the Mg and activate it further. In combinations with the alkali metals the enzyme is so bound that a reversible reaction is not possible when CaCl_2 or MgCl_2 is added. The addn. of MgCl_2 or CaCl_2 to a NaCl soln. must precede the extn. if it is to be effective. The specific effect of the salts depends on their interaction

with the enzyme or with a specifically assocd. substance after it has been liberated from the tissue rather than on a difference in extn. There are 3 different modes of salt effects on the interaction of salt and urease: (1) combinations of actions with enzyme or closely assocd. substance in which alk. earth metals are the best cations; (2) injurious salt effects of non-specific character in which the salts of heavy metals are most potent followed by alk. earth and alkali metal salts and (3) the osmotic effects of the salts. Increased osmotic effects of salts and nonelectrolytes act favorably on the enzyme. The results may not apply to other enzymes extd. from the amebocyte tissue nor to urease extd. from other sources.

H. J. DEUEL, JR.

The effect of insulin, thyroxine and temperature on the sugar metabolism of *Paramecium*. W. E. BURGE AND A. M. ESTES. Univ. Ill. *J. Metabolic Research* 7-8, 183-6(1925-6).—The glucose metabolism of the unicellular organism, *Paramecium caudatum*, was increased by excessive doses of insulin while thyroxine exerted no effect on the carbohydrate metabolism in moderate amts. With large concns. of this hormone the carbohydrate oxidation was decreased, presumably because of the toxic effect of this substance. The carbohydrate utilization was decreased by low temp. and increased by higher temp. in the same way as the general metabolism of the cold-blooded animals is influenced.

H. J. DEUEL, JR.

The action of amines upon the smooth muscle of leeches. JULIUS ORIENT. Univ. Cluj (Klausenburg) Rumänien. *Z. ges. expl. Med.* 59, 540-7(1928).—The NH_4 ion has an irritating action upon smooth muscle followed by paralysis. The effect is least marked in $(\text{NH}_4)_2\text{SO}_4$ and most marked in NH_4CNS . In leeches the toxicity of the amines increases as alkyl radicals are substituted, when the free base is used. The salts were inactive. Guanidine was strongly toxic.

F. L. DUNN

Insect poisoning from arsenic in smoke. H. POPP. *Z. angew. Chem.* 41, 805-6(1928).—Bees in the neighborhood of metal works were thought to be poisoned by As settling from the smoke. Examn. of 5 g. of bees showed over 0.1 mg. As. The lethal dose for bees was detd. as about 0.002 mg. per bee or 27 mg. As per kg.

C. R. F.

The physiology of ciliary movement in actinians. I. The action of hydrochloric and acetic acids. CARLO IUCCI. *Arch. sci. biol.* (Italy) 12, 623-39(1928).—The acoutium of *Sagartia bellis* was used; the duration of the time of resistance of ciliary movement was taken as an index of the action of the acid. The movements were observed microscopically from the time of immersion to the arrest of ciliary motion. For HCl at p_H 2.5 the results may be approx. expressed by the formula: $T = K - 1/\text{CH}^+$; the time of resistance is inversely proportional to H-ion concn. For acetic acid the activity of the solns. is greater than that of HCl of the same p_H ; it increases with increasing concn. At p_H 4.5 the time of resistance in HCl is more than 3 hrs. and that in 0.01 N AcOH is 7-8 min. and in 0.1 N it is less than 10 seconds. This behavior is explained by the fact that besides the H ions there are also undissocd. AcOH and Na^+Ac^- mols. penetrating into the cell, although at a lower velocity.

The effect of oxidation potentials and of hydrogen-ion concentration on the multiplication of protozoa and alteration of their species. V. V. EFIMOV, N. I. NEKRASSOV AND A. V. EFIMOV. Timirjasev Research Inst., Moscow. *Biochem. Z.* 197, 105-18(1928). A hay infusion undergoes definite physicochem. changes on standing. The conductivity of the fluid increases very rapidly in the first 2-3 days but much more slowly afterward. There is at first an acid reaction which changes to a more alk. reaction, depending on how long the infusion has been standing and may even become $p_H = 8.0$. The oxidation potential shows at first a high reducing power but the fluid becomes more and more oxidizing and attains an $r_H = 35$. These physicochem. changes of the infusion are accompanied by an alteration in the rate of multiplication of various infusoria. *Paramecium caud.* multiplies until its population attains a max. of 1000-2000 per cc., then they diminish in number until only a few are present. In their place *Spirostonium ambig.* appear in constantly increasing numbers to give place to *Bursaria tr.* It is thus apparent that each species must have its own opt. physicochem. conditions.

S. MORGULIS

Observations on the gases of the blood of carp. HELENE WASTL. Univ. Wien. *Biochem. Z.* 197, 362-80(1928).—The O_2 and CO_2 dissocn. curve of defibrinated and oxalated carp blood was detd., the gas analyses being made with Van Slyke's const.-vol. app. The O_2 content of normal arterial blood varied between 7.98 and 11.80 vol. % (av. 9.51%), the CO_2 av. 44.86%. The O_2 capacity is very variable. The O_2 -dissocn. curve, especially under low O_2 tension, is much steeper than in the corresponding curves for warm-blooded organisms, and the effect of CO_2 on the O_2 dissocn. is very marked. The CO_2 -dissocn. curve for carp blood is much flatter and lower

than that of warm-blooded animals or frogs. No difference was observed between defibrinated and oxalated bloods. The CO_2 -dissocn. curve is distinctly different for the reduced or fully oxygenated carp blood. The carp blood has a much lower buffer value than warm blood.

S. MORGULIS

Studies on fish bile. III. The bile of *Cyprinus carpis*, *Carassius auratus*, *Au-guilla japonica* and *Anago anago*. TAKUICHI HATAKEYAMA AND TAKEJI OKAMURA. *Physiol.-Chem. Inst., Okayama. J. Biochem. (Japan)* 9, 333-5(1928).—The bile of the enumerated fish contains taurocholic acid.

S. MORGULIS

Response and adaptation of insects to external stimuli. WILLIAM ROBINSON. *Univ. Minn. Ann. Entomol. Soc. Am.* 21, 407-17(1928).—When water is adsorbed on tissue colloids its properties are changed with a consequent change in the physiology of the organism. Colloid-bound water differs from free water as a solvent for certain compds. in its f. p., compressibility, elec. conductance, and probably in its effect upon enzyme activity. Any condition which changes the amt. of bound water in an organism may have considerable effect upon response and adaptation. The elec. charge on the colloidal particles greatly influences the thickness of the layer of adsorbed water. This charge is affected by the H-ion concn. When the temperature commences to fall some kinds of colloids adsorb more water whereas others lose water. The possession of one or the other type of colloid by an organism determines, in some cases, whether the species can endure winter temps. Three types of insects were used in the expts.: the Promethea moth (*Callosamia promethea*), white grubs (*Phyllophaga* sp.) and the granary weevil (*Calendra granaria*). The first species is exposed to low winter temps. in northern U. S.; the second descends into the soil in winter below or near the frost line; the third is a non-hardy species probably of tropical origin. In a temp. fall from 5.6° to -15.6° the quantity of bound water in *Callosamia* increased from about 70 mg. to 300 mg. per 1000 mg. of total weight or 429%. *Phyllophaga* made practically no gain and died when frozen, whereas the non-hardy *Calendra* actually lost bound H_2O and died without having been frozen. It is believed that the water-binding response of these insects is directly proportional to their winter hardiness. Factors other than colloid activity may be involved. One cause of death from freezing is the loss of water due to the flow of free water from the cells to the intercellular spaces where ice crystals are forming. Water is continually being removed from the cells by this process. Colloidally bound water, however, is held with a force much greater than the osmotic pressure and this force may largely counteract the loss of water from the cells due to freezing. A correlation was found between the water content of the food of certain insects and their body water content. The food of the granary weevil contains 9-11% water, whereas the body moisture equals 46%; the food of the rice weevil (*Calendra oryzae*) about 16%, the body moisture 48%; the food of the locust borer (*Cytlene robiniae*) about 30%, the body moisture 58%. Another group including the Colorado potato beetle (*Leptinotarsa decemlineata*), white grub (*Phyllophaga* sp.), mourning-cloak butterfly (*Aglais antiopa*), willow sawfly (*Crabro americanus*) and imported cabbage worm (*Pieris rapae*) have a food moisture content of 65% to 86% and body moisture content of 65% to 90%. Those species which live upon food low in water obtain body water by metabolic processes within the organism. There is also a correlation between the amt. of bound water and the total water in the insect, those species which live on food with low water content showing the greatest per cent of bound water, those species living on food high in moisture showing the smallest per cent of bound water.

C. H. RICHARDSON

Digestive enzymes of the oriental fruit moth. H. S. SWINGLE. *Ann. Entomol. Soc. Am.* 21, 469-75(1928).—The fore intestine of the oriental fruit moth or "oriental peach moth" (*Laspeyresia molesta*) varies from p_H 6.8 to 7.2, approaching 7.2 as a const.; mid intestine nearly const. at p_H 7.2-7.3; hind intestine 7.2 in anterior portion to 6.8 to 7.4 in posterior part. A colorimetric method for detg. the p_H of the intestine is described. Invertase, lipase, trypsin and erepsin were found in the tissues of the mid intestine and in the contents of the digestive tract. Invertase and trypsin were especially active. Tests for pepsin, cellulase, lactase, maltase and amylase were neg. The adult moth contained only one digestive enzyme, invertase, secreted by the cells of the mid intestine. This suggests that moths should be fed sucrose but expts. showed that they lived about as long on water alone as upon dild. sucrose soln. and laid a normal no. of eggs. With neither water nor sucrose they died in a few days. Methods are given.

C. H. RICHARDSON

The physiology of insects—Metabolism. PAUL S. WELCH. *Univ. Mich. Ann. Entomol. Soc. Am.* 21, 476-88(1928).—A symposium article which discusses the following: circulation—blood compn., blood pigments, blood p_H , blood sugar, histological

elements, function of organs of circulation; respiration—gas exchange and related phenomena, differential respiration, functions of air stores, respiration during metamorphosis and the effects of anesthetics, As compds. and other internal influences upon respiration; nutrition—transformations of foodstuffs, insect foods and their sources, vitamins and other nutritional features. Bibliography. C. H. RICHARDSON

Carbon dioxide, a chemical accelerating the penetration of respiratory insecticides into the tracheal system by keeping open the tracheal valves. E. H. HAZELHOFF. Sugar Cane Expt. Station, Paseroean, Java. *J. Econ. Entomol.* 21, 790(1928).—CO₂ has a marked influence on the ordinary respiratory movements of insects and, in lower concns., on the tracheal valves. (cf. Hazelhoff, *Diss. Utrecht* 1926, *Proc. K. Acad. von Wetenschappen Amsterdam* 29, 492(1926); *Z. für vergl. Physiol.* Abt. C, 5, 179 (1927)). When at rest at room temp., the American cockroach (*Periplaneta americana*) displays no respiratory movements and its tracheal valves are nearly closed. If the insect is brought into an atm. contg. 2 or 3% CO₂, the valves open immediately, allowing a more rapid diffusion of respiratory gases. When the CO₂ pressure is raised 7 or 10% more, respiratory movements of the abdomen appear. The width of the spiracle opening is therefore regulated by the concn. of CO₂ in the vicinity of the spiracle. It is also increased when metabolism is increased by raising the temp. The same relations were found in some other insects. A small quantity of CO₂ will probably accelerate the penetration of HCN, CS₂ and other respiratory insecticides into the tracheal system of insects, thereby increasing insecticidal action. C. H. R.

Color changes in crustaceans, especially in Palaemonetes. E. B. PERKINS. Harvard Univ. *J. Exptl. Zool.* 50, 71-105(1928).—The color changes of *Palaemonetes vulgaris* were studied largely from the physiol. standpoint. Anesthetics cause an expansion of the chromatophores probably due to temporary blindness of the animal. Exptl. evidence tends to show that the eyes are endocrine organs which produce a substance that is carried by the blood to the chromatophores, bringing about their contraction. The mechanism of chromatophore expansion was not ascertained.

C. H. RICHARDSON

Factors involved in changes in form in ameba. S. O. MAST. Johns Hopkins Univ. and Marine Biol. Lab., Woods Hole, Mass. *J. Exptl. Zool.* 51, 97-120(1928).—If *Ameba proteus* is transferred from a culture medium to specially purified water it becomes inactive and strongly radiate in a few mins. The change probably depends upon the H-ion concn. of the culture medium. If left in pure water the ameba usually attaches and then successively becomes lobose, monopodal, slightly radiate and globular. The % of individuals which attach themselves to common glass is considerably higher than that of individuals which attach themselves to Pyrex glass, quartz or petalim. The time necessary to attach and become lobose is 10 times as long for these substances as for common glass. If amebas which have become radiate in purified water are transferred to a soln. of proper concn. of any one of 14 salts, they attach themselves at once and become lobose in a few mins. and assume the other forms mentioned. The time for these changes is greatly reduced as compared with water. Bases bring about similar changes of form. In general, acids inhibit attachment whereas bases facilitate it. Lactose solns. (0.05-0.001 M or weaker) gave the same results as water. Change of form is therefore not definitely correlated with the osmotic concn. of the medium. Any given form may occur in an endless no. of different environmental conditions. Form in ameba is probably directly dependent upon the water content of the organism.

C. H. RICHARDSON

The relations of dietary insufficiency to vitality in the ciliate, *Didinium nasutum*. C. D. BERRS. Univ. N. Carolina. *J. Exptl. Zool.* 51, 121-33(1928).—Individuals of *Didinium*, which were fed upon food-starved *Paramecium*, showed a decrease in fission rate, increase in death rate, decrease in encystment rate, loss of ability to encyst and other abnormalities. Those cultured upon well-fed *Paramecium* were normal. The decline of the former individuals is attributed to an inadequate diet. The symptoms of degeneration induced by this diet closely resemble changes observed by Maupas in various ciliates and attributed by him to senescence.

C. H. RICHARDSON

Studies on chemical changes during the life cycle of the tent caterpillar (*Mala-cosoma americana* Fab). III. Soluble ash and sulfates. WILHEM RUDOLFS. N. J. Agr. Expt. Sta. *J. N. Y. Ent. Soc.* 35, 219-29(1927); cf. *C. A.* 21, 3237.—The sol. ash (chiefly carbonates and sulfates) of the egg mass, larva and pupa of the eastern tent caterpillar is lowest at the beginning of each stage in the life cycle, increasing with its duration. In the egg mass, it is nearly const. during the winter dormant period, but increases shortly before hatching. The egg mass also contains an insol. ash which behaves like a Na silicate (glass). It does not increase with the age of the

egg mass but it is present and increases rapidly in the growing larva. The sol. ash of the egg mass is 0.41% at deposition and 5.46% at the time of hatching. The sol. ash of the larva drops to 3.52% 5 days after hatching and reaches a max. of 7.37% when the growth rate is most rapid, dropping somewhat just before pupation. In the 12 days of pupal life, the remarkable increase of 58.6% in sol. ash is attained. Only 10% of fat is used in this stage of tissue reconstruction. The problem of the source of sol. ash will be considered in a later paper in which glycogen will be discussed. The freshly laid egg mass contains 1600 p. p. m. of sulfates. The sulfate content rises rapidly during the formative period of the embryo, remains nearly const. for a time, and increases again before hatching to nearly 5000 p. p. m. Sulfates fluctuate during the larval stage but reach a lower level than that in the egg mass when it contains the developing embryo. The sulfate content of pupa and adult is relatively low. It is assumed that the sulfates derived from protein are deposited in the egg cases. The ratios, $N:SO_4$, with $N = 10$, were calcd. and plotted for the entire life cycle. During the active growing period the larva produces sulfates more rapidly than N accumulates, but just before pupation, the relation is reversed. In the second part of the egg stage, N decreases but slightly faster than sulfates are formed; in the first part of this stage, when active tissue building takes place, sulfates increase much more rapidly than N substances disappear. This indicates that during the first part of the egg stage, N substances are not used in metabolic processes but for tissue reconstruction whereas in the second part of this stage the N substances are used for maintenance. In the pupal stage sulfates did not increase in relation to the N content, indicating that if N substance was utilized it was not oxidized but transformed into tissue without waste. The ratios, carbonates:sulfates ($CO_3 = 100$), for the egg masses change very rapidly after egg deposition and while the embryonic larva is forming. During the larval feeding period and the pupal period, however, these ratios remain nearly const. The ratios, N :carbonates ($N = 10$), rise after egg deposition and when the embryo is forming, rise abruptly during the growth period of the larva and the first part of the pupal period. The ratios, moisture:sulfates (moisture = 100), increase rapidly when the larvae are forming within the egg after which they remain nearly const. until the eggs hatch. As soon as the larva starts feeding the ratios drop rapidly because body moisture increases more rapidly than sulfates are formed; when it is $\frac{1}{3}$ grown this relation is reversed. In the prepupal stage another fall in the ratio is observed. In the pupal stage it remains const. The ratios, moisture:carbonates (moisture = 100), follow the course of the ratios, moisture:sulfates, until the larvae are $\frac{1}{3}$ grown. This shows that nearly all the food consumed up to this time is utilized to build new tissue and maintain life and almost none is stored. Although the ratios, moisture:sulfates, decreased when the larvae were nearly full grown, the ratio, moisture:carbonates, continued to increase and also increased (51.8%) during the pupal stage. This increase is explained by the decrease in glycogen during this stage. The ratios, fat:sulfates (fat = 100) and fat:carbonates (fat = 100), follow a similar course throughout the egg and larval stages. Fat:carbonate ratios increase during the pupal stage because of the change in glycogen content at this time. Conclusion: N plays an important part at the 3 critical stages, *i. e.*, (1) formation of embryo; (2) prep. for pupation; (3) when the pupae transform to the adult. Fats are used and stored for energy and do not appear to be important at any critical stage for tissue building. The moisture content during the different stages is directly related to the rate of activities during these stages.

C. H. RICHARDSON

Sericin and fibroin. E. W. PIERCE. *Am. Dyestuff Rept.* **17**, 684 (1928); cf. Grove-Palmer, *C. A.* **22**, 4255.—The dissection of the silkworm reveals 2 sacs, one on each side, discharging into the spinning app. The contents of these sacs are liquid and the material is neither fiber nor gum, but a colloidal protein dispersion. There is no sep. supply of sericin to coat the spun fiber. The contents of the sacs will not form silk fiber either by evapn. or oxidation. There are, however, 2 tiny glands, whose function has never been detd., that are also connected with the spinning tubes. These glands are so small that their contents could not yield enough gum to coat an inch of fiber. The hypothesis advanced is that the content of the main sacs is a liquid which, as it exudes into the air, receives a very small quantity of a coagulant or clotting material from the small glands.

L. W. RIGGS

Photodynamic effects of eosin on the eggs of the sea urchin, *Strongylocentrotus purpuratus*. A. R. MOORE. Univ. Oregon. *Arch. sci. biol. (Italy)* **12**, 231-4 (1928).—The photodynamic action of eosin on the unfertilized eggs of the sea urchin kills the eggs and cytolyzes them. Sunlight changes the eosin to a toxic form capable of killing the eggs in the dark, but not cytolyzing them. Cytolysis is the result of the action of

light upon the toxic eosin-protoplasm complex, and is not fundamentally an oxidation. The photodynamic action occurs in 2 phases: (1) A long incubation phase concerned with penetration of the toxic eosin into the egg and accumulation in critical concns., and (2) a short period in which toxic eosin combines with some constituent of the protoplasm resulting in the death of the egg. Fertilized eggs when not killed by exposure to light in eosin soln. develop only to the gastrula stage, where they remain. The stomodaeum does not develop, nor does the primary mesenchyme deposit a skeleton; but when these abnormal larvae are transferred to sea water the skeleton is deposited. Hence toxic eosin acts as a block to the secretion of the calcareous skeleton.

L. W. RIGGS

Glandula uropygialis of birds. HSIANG-CH'UAN HOU. McGill Univ. *Chinese J. Physiol.* 2, 345-80(1928).—This paper contains 51 references to the literature. The statement of previous workers that elastic fibers are present in the capsule and the septa of the oil gland has not been confirmed. Ablation expts. with careful isolation and comparison with normal controls show that birds (pigeons, hens, ducks and geese) without the oil gland suffer a progressive impairment of general health with gradual loss of wt. Discoloration of the plumage and deterioration of the individual feathers occurred with loss of their efficiency in protecting against cold or wetting. Some birds without the gland eventually die with symptoms suggestive of rickets. Removal of the gland results in a depletion of the oil droplets on the feathers. This seems to account for the changes in color of the plumage, the behavior of the feathers toward CHCl_3 and MeOH treatment, and in the smooth contour of the feathers. Ablated birds remove the oil droplets from the feathers and eat them. Feathers absorb water whether there is oil in them or not. Graphs of the rate of intake and output of moisture by feathers when they are exposed to wet and dry atms., resp., are of the exponential type. The oil gland and feathers of birds contain cholesterol. Chicks with the oil gland intact, after developing rickets on a rachitic diet, improved rapidly on daily irradiation with a Hg vapor lamp. Chicks with the oil gland removed, when treated in the same way, showed little or no improvement.

L. W. RIGGS

Spectrochemistry of rufin and of its derivatives. CH. DHÉRE, CHR. BAUMELER AND A. SCHNEIDER. *Compt. rend. soc. biol.* 99, 722-5(1928); cf. *C. A.* 22, 4179.—The visible and ultra-violet absorption spectra of the orange-red pigment of *Arion rufus* and of some of its derivs. are illustrated and described.

L. W. RIGGS

Tegumentary porphyrin of *Arion empiricorum*. CH. DHÉRE AND CHR. BAUMELER. *Compt. rend. soc. biol.* 99, 726-8(1928).—Four expts. are described which appear to establish the presence of tegumentary porphyrin in *A. empiricorum*.

L. W. RIGGS

Pigmentation in *Glossosiphonia paludosa*. VICTORIA VOINOV. *Compt. rend. soc. biol.* 99, 1081-3(1928).—In *G. paludosa* the green and yellow pigments are of alimentary origin and arise from ingested hemoglobin. These are biliary pigments which are eliminated by the tegumentary route after oxidation.

L. W. RIGGS

12—FOODS

F. C. BLANCK AND H. A. LEPPER

Conception of a food. ALEXANDER JANKE. Tech. Hochschule Wien. *Pharm. Zentralhalle* 69, 694-9(1928).—The conception of a food as a natural product should be governed solely by its biochem. formation through the activity of the living cell. Such natural products are characterized by the presence of certain essential substances (vitamins, enzymes), as also by a specific odor and taste of harmonious character, and eventually also by a definite microscopically demonstrable structure. The characterization of a food must be such that the consumer is in no doubt as to its source and cannot therefore be defrauded. This demand constitutes a fundamental pillar of modern food legislation. Under the term "vinegar" (Essig) is to be understood the natural product resulting from the fermentation of alc. liquids, as distinguished from dild. acetic acid.

W. O. E.

The development of food laws. J. KAUPER. *Z. angew. Chem.* 41, 786-8(1928).—A history.

C. R. F.

Recent developments in chemical technology of foods at the exhibit of nutrition in Berlin. EUGEN FISCHER. *Z. angew. Chem.* 41, 784-6(1928).—For the rapid detection of milk from cows having chronic mastitis of the udder measurements of the Cl content were made by adding to 10-cc. samples of milk 5 cc. of a AgNO_3 soln. and 5 cc. of a soln. of NH_4CNS . The concn. of the soln. is so adjusted that good milk remains

white and infected milk turns orange or red. For quant. results, the excess AgNO_3 is titrated against NH_4CNS soln., a special buret being used on which the amt. of NH_4CNS soln. used equals the mg. of Cl present. A simple bacteriol. examn. of milk is made by filling the test tubes $\frac{1}{2}$ full of a sugar bouillon soln. contg. bromocresol purple and inserting a smaller inverted tube within the larger. The tube is yellow if only *Streptococcus lactis* is present. A trace of gas indicates a proportional no. of *B. coli*. A blue color with or without gas shows an alk. reaction and indicates spore-forming bacteria. In the examn. of sausage for horse flesh adulteration the sausage was defatted with C_6H_6 , shaken with 0.85% NaCl soln., filtered and 1 cc. of the ext. placed in each of 2 tubes. Tubes 3, 4, 5 and 6 contained 1 cc., resp., of ext. of horse flesh, beef, pork and NaCl soln. To tubes 1, 3, 4, 5 and 6 is added 0.1 cc. of horse antiserum. To tube 2 is added 0.1 cc. canine-antiserum. Horse protein is indicated by pptn. in tubes 1 and 3. C. R. F.

Criteria of the validity of analytical methods used by cereal chemists. ALAN E. TRELOAR AND J. ARTHUR HARRIS. Univ. of Minnesota. *Cereal Chemistry* 5, 333-51(1928).—The 2 criteria of fundamental importance for detg. the validity of analytical methods when these are based solely on samples of unknown compn. seem to be: (1) Av. yields and differences of av. yields of the same constituent of wheat or flour as detd. by 2 or more methods. (2) Consistency of the results obtainable by any method of detg. a constituent when applied by various workers. In both cases the significance of differences in results due to various methods must be tested by comparison with their probable errors. Formulas bearing on these points are submitted and illustration of their application is given. Computations made on data given in the reports of the Comm. on Methods of Analysis of the Am. Assoc. of Cereal Chemists have brought out the following main points concerning these data: (a) Protein detns.—more consistent results are obtained in the protein detn. than in either moisture or ash detns. When adequate digestion is given, no one method of detg. protein is shown to yield more consistent results than the others. It has not been shown that higher protein results are obtained by digesting more than 60 min. (b) Ash detns.—the glycerol-alc. method of detg. ash in flour gives significantly higher av. yields than the straight muffle method and tends to give more variable results. (c) Systematic errors—personal or lab. equation among analysts. The demonstration of the existence of this "systematic error" is important for 2 reasons: (1) It shows that the concordance of results obtained by the same worker, using 2 different methods of making the same detn., furnishes no real proof that he is really reporting the true value for his sample: (2) This "systematic error" must be taken into account in detg. the significance of the difference in the av. yields obtained by 2 methods, differences always having a lower probable error (and a higher probability of significance) when correction for this factor is made. L. H. BAILEY

Refrigeration in the food industries. A. WALTER. *Z. angew. Chem.* 41, 797-801 (1928).—A brief discussion of the types of machines and the use of refrigeration in the brewing, meat packing, cold storage, milk and ice cream industries. C. R. F.

Mold food of the Far East. G. MALCOLM DYSON. *Pharm. J.* 121, 375-7(1928).—The methods of manuf. of 3 types of mold food products of China, Japan and Java are succinctly described. They are: (1) *Shoyu* or soy bean sauce (C. A. 2, 555, 1846; 7, 3187), a deep brown salty liquid of meat-like flavor, prepd. in 3 stages: (a) *Shoyu-koji*, the soaked, steam-cooked, cooled soy beans are mixed with nearly an equal wt. of crushed roasted wheat to provide aeration and prevent subsequent overheating; (b) *tane-koji* or growing of the mold (chiefly *Aspergillus flavus*, Link and *A. oryzae*, Ahlb.) propagated on semi-softened rice. The mass is mixed with (a); the mixt. in 1.5 to 2 inch layers is spread on wooden trays and kept for 18 hrs. at 24-25°. The grains now covered with silky mycelium are stirred and again left for 8 hrs. at 30°, finally for 40 hrs. at 35-6°. (c) *Shoyu-moromi* or mashing (C. A. 6, 3106; 12, 1811; 19, 3286); stir the greenish yellow ripened beans into tubs filled with brine and inoculate with a shoyu yeast culture, a strain of *Zygosaccharomyces*; allow to stand for about 6 months, then draw off the sauce, part at a time; after 2 years the sauce is ready for bottling. The meat-like flavor is caused by *Na glutamate* (cf. Ikeda, C. A. 6, 3134) resulting from the splitting of proteins (i. e., edestin) by enzymes. Shoyu may be evapd. to a thick ext. having the flavor of meat; (2) *Miso*, white and red (C. A. 7, 3168) are solid, mold-fermented soy-bean products, used as porridge in Japan. The cooked soy bean is mixed with crushed rice or barley, then ripened by means of the shoyu mold. The ripened cereal is matured in weak brine for 10 days, then removed and salted. (3) *To-fu* (C. A. 3, 2182) is a mold-ripened soy bean curd cheese. *Natto* (C. A. 7, 3168) is a similar but inferior product. Modern technical uses of proteolytic enzymes generated by molds are the clearing of jellies and fruit exts., and the degumming of silk. S. WALDBOTT

Technical control of flour milling. I. O. JOVRUD. Portland, Ore. *Food Indus-*

tries 1, 57-9(1928).—In order to secure uniformity of compn. in flour blends it is necessary to make detns. of moisture, color, protein, ash and baking test. In order to produce a short patent flour of the proper strength and quality, a wheat blend contg. the necessary quantity and quality of gluten must be selected.

C. R. F.

Some oxidizing effects of flour bleaching. EARL B. WORKING. *Kans. Agr. Expt. Sta., Manhattan, Kans. Cereal Chemistry* 5, 431-5(1928).—The bleaching of flour has developed along such lines that the actual destruction of color is scarcely more important than the accompanying effects generally known as "maturing." Theoretically, this maturing should be similar to the development obtained in dough by the use of oxidizing agents. The use of lactic acid and a heavily over-bleached flour will give the same results in developing a dough for a no-dough-time baking method as will the use of acid with Na chlorate or other oxidizing agents. The quality of normal flour improves for some time after milling, reaches a max. and then begins to deteriorate. Preliminary expts. and general observation indicate that this deterioration begins sooner in bleached flour than in unbleached. Thus it seems possible that large bakeries could prolong the period of max. quality in their flour by buying unbleached flour and bleaching shortly before use. In this way the severity of the oxidation could be accurately adjusted to the needs of the flour at the time and to the fermentation schedule desired. L. H. B.

A critical study of some methods used in flour colorimetry. F. VISSER-T HOOFT AND F. J. G. DELEEUW. Novadel Process Corporation, Buffalo, N. Y. *Cereal Chemistry* 5, 351-65(1928).—The rapid gasoline extn. method described by Coleman and Christie (*C. A.* 20, 2547) can easily be carried out by using a shaking machine. This permits the use of tightly closed glass-stoppered bottles and eliminates all evapn. The colorimeter designed by Kent-Jones and Herd (1927) is less tiring to the eye than the Duboscq colorimeter and having a const. source of light makes the worker independent of the daylight. However, the Kent-Jones instrument requires more time to make a reading and it is no more accurate. The Kent-Jones colorimeter involves the use of standard solns. of different concns. This principle is only permissible if the unknown soln. has the same components as the standard soln. The error does not appear in sep. gasoline value tests of the same sample of flour because in each instance the same error is made. But results are very misleading when a flour is compared with another flour that has twice the amt. of carotinoid pigments. The last flour will give a gasoline value that is between 2 and 3 times as high. It has been shown that this error is probably due to differences in H-ion concn. of the standard soln., because it could be largely corrected by the use of buffer solns. instead of distd. water. The use of a standard soln. made of org. dyes, as used by Sprague (*C. A.* 22, 1176), also avoids this error. An objection to the org. dye standard soln. is that not all samples of org. dyes have the same purity and therefore not the same color value. Jørgensen (*C. A.* 21, 3848) pointed out that it is advisable to use buffer solns. of known H-ion concn. for the prepn. of the official standard solns. of $KCrO_4$. The extn. with alk. MeOH does not, in the 16 hrs. specified by Kent-Jones, give a complete extn. of all the coloring matter sol. in this solvent. Approx. 40 hrs. are required to obtain const. results. It was found necessary to shake the ext. thoroughly at the end of the extn. period. Shaking for 16 hrs. gives the same result as standing for 16 hrs. and shaking at the end of the extn. period. Extg. for 16 hrs. at 30° gives the same results as extg. for 40 hrs. at room temp. Tests in which different amts. of bran were added to a sample of flour showed that there is a direct relation between the bran content of the flour and the MeOH value.

L. H. BAILEY

Wheat and flour. FRANK T. SHUTT. Dept. Agr., Canada. *Rept. Dominion Council, Year Ending March 31, 1927*, pp. 34-40(1928).—The compns. of the Marquis and Vermilion varieties of wheat and of the flours made from them are compared. In general, the Vermilion variety is lower in protein. The flours contained approx. the same percentages of gluten but that from Vermilion wheat was soft, sticky, weak and not resilient while the gluten from Marquis wheat was firm and resilient. Differences in the compn. of Marquis and Garnet wheats grown in 11 localities from the same seed stock indicate that environmental factors such as soil and season largely affect the protein content of the same variety of wheat. Flour made from Marquis wheat was slightly superior to that of Garnet wheat in point of protein content but there was slight difference in the pH values of the flours. In general Garnet flour had the higher diastatic value.

K. D. JACOB

Effect of stage of maturity on composition and baking quality of Marquis wheat. C. P. MANGELS AND T. E. SROA. N. D. Agr. Expt. Sta., Fargo, N. D. *Cereal Chemistry* 5, 385-94(1928).—Marquis wheat harvested in the dough and hard dough stages averaged lower in yield and test weight per bushel than that cut at a more mature stage. There was no increase in yield after the crop reached normal maturity. Protein content

of wheat showed no consistent variation at different stages of maturity for different seasons. Variation in prevailing climatic conditions during the maturing period is probably responsible for lack of consistency in protein content variation for different stages of maturity. The protein content of patent flour from 1927 crop samples varied as did protein in wheat. The ash decreased as wheat matured, but the sugar content remained const. from the dough to the extra late stage. Diastatic activity showed a tendency to decrease as wheat matured. Baking tests with straight-grade flours from wheat harvested at different stages of maturity showed slightly better quality for the mature wheats. Baking tests with patent flours from wheat of the 1927 crop, harvested at different stages of maturity, show no significant difference in loaf vol. or color, but those from the dough and hard dough stages were lower in texture. N distribution in flour from wheat harvested at different stages of maturity showed some variation, but less than would be expected. Glutenin remained practically const., but tended to decrease in dead ripe and extra-late stages. N sol. in 70% alc showed consistent increase with maturity, while N sol. in 5% K_2SO_4 showed consistent decrease. N not pptd. by tungstic acid and amino N was highest in the dough stage, but was at practically a const. level after the glazed stage.

L. H. BAILEY

New developments in the technic of flour and bread production. M. P. NEUMANN. *Z. angew. Chem.* **41**, 792-4(1928).—Mech. advances in the technic of baking are discussed. The addn. of 0.2-0.5% of acid salts, especially $NH_4H_2PO_4$, gives a more plastic, porous and better baking dough. The treatment of meal with Cl gas contg. $NOCl_2$ whitens and increases the baking quality of the meal.

C. R. F.

The mechanical method of modification of dough. C. O. SWANSON. Kansas Agr. Expt. Sta., Manhattan, Kansas. *Cereal Chemistry* **5**, 375-85(1928).—Swanson points out the advantages of testing flours by the effect of mech. treatment of the dough.

L. H. BAILEY

Experimental bread making with soft wheat flour. MARGARET C. SMITH. Ariz. Expt. Sta. *J. Home Econ.* **20**, 662-74(1928).—From the results of phys. and chem. tests and baking expts. wherein control was exercised over the many factors involved, it is concluded that Arizona Early Baart flour possesses qualities conducive to good bread production.

L. O. ELLIOTT

How the experimental baking test has developed. C. L. BROOKE AND R. C. SHERWOOD. State Testing Mills, Minneapolis, Minn. *Cereal Chemistry* **5**, 366-74(1928).—A historical sketch of the development of exptl. baking.

L. H. BAILEY

Factors influencing checking in biscuits. J. A. DUNN AND C. H. BAILEY. Agr. Expt. Sta., St. Paul, Minn. *Cereal Chemistry* **5**, 395-430(1928).—When a biscuit is removed from the oven there is an appreciable difference in the moisture content of the inner, more moist, portion and the outer, dried portion. This moisture gradient can be regulated by the baking procedure. During the curing period this moisture gradient tends to diminish. All portions of the biscuit tend to come into hygroscopic equil. with the relative humidity of the curing chamber. The portions of the biscuit that absorb moisture in order to reach this equil. increase in size, or swell. Those that lose moisture shrink. When the relative humidity is low (20%) and the biscuit is not thoroughly baked, the center shrinks and the rim expands. If this change in size goes on after the biscuit has become rigid, checking will occur whenever the strain developed exceeds the elastic limit of the section under strain. Conditions that will prevent checking are (in order of their importance) thorough baking, curing in a humid atm., keeping the biscuit warm as long as possible, thorough mixing and inclusion of some invert sugar in the formula. During baking the swelling power of a hard-sweet biscuit increases, particularly during the last stages. This is probably due to the gelatinization of the starch. Biscuits contg. sugar and whose shortening content varies from approx. 5 to 20% are most susceptible to checking. This includes snaps, hard-sweet biscuits and sugar cookies.

L. H. BAILEY

Progress in the field of milk hygiene. M. SEELEMANN. *Z. angew. Chem.* **41**, 794-6.—A review of German methods of milk control and hygiene since the war.

C. R. F.

The significance of the undetermined constituents of milk. O. LAXA. *Lait* **8**, 1-4(1928).—The difference between total solids, and sum of constituents detd. directly—fat, protein, ash and lactose—varies between 0.1% and 0.4% with an av. of 0.2%, total solids being always the higher. By analyzing dried milk, this difference was increased almost tenfold, showing that the discrepancy is due to constituents undetd., citric acid etc., and not to any inadequacy in analytical methods.

H. F. ZOLLER

The variation in per cent of chlorides and the presence of nitrates. (Sundgan milks). C. LOBSTEIN AND J. WALLART. *Lait* **7**, 835-43(1927).—The administration

of NaCl to healthy cows up to 200 g. mixed with the ration during a 4-5 day period results in no increase of this salt in the milk. Nitrates are normally not present in milk and cannot be found after having been fed experimentally. Positive nitrate reactions are due to lesions or to extreme doses during veterinary treatment. H. F. ZOLLER

Gerber or Babcock? G. ROEDER. *Lait* 7, 354-63(1927).—A detailed exposition of the two tests, favoring the Gerber, and answering the arguments set forth by Possi-Escot (*Lait* 6, 601-5(1926)). H. F. ZOLLER

The Høyberg method. B. SPUR. *Kemisk Maanedshlad* 9, 2(1928); cf. C. A. 21, 1501; 22, 3934.—In the Høyberg method for the detn. of fat in milk and cream no centrifuge and no H_2SO_4 are used. A special butyrometer is used, into which milk and reagents are pipetted, and mixed by shaking. The butyrometer is immersed in a water bath at 50° for 15 min. and the height of the oil-layer read. The reagents consist mainly of amyl alc., ethyl alc., NaOH and water. Hydrolyzed fats go into the alc.-water layer. The method can be used on conserved milk samples, and is used in several Danish dairies. It is being tried in the Danish Government Research Dairy.

KRISTIAN HØJENDAHL

Høyberg method of fat determination in milk. J. VAN WOERDEN. *Lait* 8, 678-83 (1928).—Results of the fat test by Høyberg (*Lait* 6, 518-33, 639-55(1926); cf. C. A. 21, 970) and Gerber methods are given. Use of freshly prepd. liquid in the Høyberg test is advocated. The Høyberg test gives an av. value slightly higher than the Gerber test but the difference is generally less than 0.05%. There is a tendency to wider fluctuations in per cent of individual samples than in the Gerber method, but not sufficient to condemn the test. The Høyberg method is efficient, accurate and is performed without a centrifuge. H. F. ZOLLER

Study of per cent of butterfat of milk from cows of the Flemish breed. M. PAGET. *Lait* 8, 288-305(1928).—As a result of detailed study of butterfat yield, P. concludes that mixed morning and evening milk from any single cow should contain at least 2.7% and that mixed milk from small herds (2-12) and from larger herds (over 12) should contain at least 3.3-3.5%. H. F. ZOLLER

Utilization of whey and of casein serum. M. BEAU. *Lait* 8, 387-93(1928).—Lactose, lactic acid and vinegar can be made from whey or serum but not with any great commercial success. A possibility exists of concg. and then drying these liquids to make a meal which can be used for stock feeding. Typical analysis of such a product, known as lactosine, is: H_2O 6, protein 10, fat 1, carbohydrates 75, ash 8%. H. F. ZOLLER

Action of the halogens on milk and its constituents. A. J. J. VANDELVELDE. Univ. Ghent. *Lait* 8, 495-500(1928).—See C. A. 22, 2794. H. F. ZOLLER

Detection of hydrogen peroxide in pasteurized milk. A. TAPERNOUX. École Veter. Lyon. *Lait* 8, 410-1(1928).—See C. A. 22, 643. H. F. ZOLLER

Elimination of sodium and of chlorine in cow milk; adulteration by addition of sodium salts. L. BARTHE AND E. DUFILO. *Lait* 7, 817-23(1927); cf. C. A. 22, 456.—The detn. of Na and Cl by methods given by the authors reveals adulteration by the addition of NaCl, Na_2CO_3 , $NaHCO_3$ or other Na salts. H. F. ZOLLER

Enzymes and their utilization to detect heated milk. C. LIND. *Lait* 7, 935-46 (1927).—Heated milk can be detected by the destruction or weakening of enzymes, viz., catalase test, aldehyde-reductase (Schardinger), reductase-peroxidase (Storch) or by chem. methods based on coagulation of albumin. None is infallible and a combination of tests and methods must sometimes be followed, particularly with regard to low-temp. pasteurization. H. F. ZOLLER

Polarimetric determination of sucrose in mixtures of milk and sucrose. G. W. MONIER-WILLIAMS. *Analyst* 53, 569-82(1928).—In the method described, which is based on the work of Jackson, Gillis, Vosburn and Zerban, angular notation is given as more suitable than the saccharimetric notation and the correction for the vol. occupied by proteins and fat is obviated by detg. the total water present in the dild. milk and sucrose mixt., defecating with dry reagents and subsequently detg. the ratio of sucrose to water in the clear filtrate. The total solids are detd. on the milk and sucrose mixt. by the standard method and from this the % of water is computed which is represented by a in the formula below. For condensed milk, a known wt. of the condensed milk is dild. with a known wt. of water to about 3 times the original vol. Take about 350 g. of the milk sucrose mixt., treat with 1.5 g. of powdered citric acid (to coagulate the casein) and after shaking, add a mixt. of well-triturated phosphotungstic acid (9 g.) and dry sand (45 g.). Filter through a dry filter and reject the first runnings. Det. the total solids in the usual way on one portion of the filtrate, omitting the addition of NH_4OH , because the acid content is not high enough to cause much inversion of the sucrose and there is less decompn. on heating the acid soln. The total solids are repre-

sented by y in the formula. To another 50 cc. of the filtrate, add 2.675 g. of NH_4Cl , make up to exactly 100 cc. and allow to stand for 1 hr. Then polarize in a 200-cc. jacketed tube at $18-22^\circ$ (recorded to 0.2°). The mean of the polarimeter readings is given as A in the formula. To another 50-cc. portion of the filtrate, add 10 cc. of 0.5 N HCl and heat at 60° for 12 min., agitating the contents of the flask for the first 4 min. Then cool, add 10 cc. of 5 N NH_4OH slowly from a buret. Cool, make up to exactly 100 cc. and filter the soln. if it is cloudy. After an hr. polarize at the same temp. as before. A convenient device for keeping the temp. const. is shown and by which a rapid circulation of water at a const. temp. is maintained in the jacketed polarimeter tube. It is important to measure this temp. very accurately. The mean of the readings for the inverted sugar is called B in the formula and $A - B$ is the change of rotation on inversion of the filtrate as dild. for polarization. The % of sucrose present in the mixt. is given by the formula $100(A - B)x/[87.9 + 0.06c - 3(t - 20)]2y$, in which c is the % of total sugars in the inverted soln., as dild. for polarization, t is the temp. of invert polarization, B is the invert reading of the filtrate as dild. for polarization, x is the % by wt. of water in the dild. mixt. and y is the wt. of water in 50 cc. of filtrate. In the analysis of mixts. of milk with known quantities of sucrose the greatest percentage error was 0.06 on 13.50% of sucrose. W. T. H.

The chemistry of sour milk. L. L. VAN SLYKE. N. Y. Agr. Expt. Sta. *Tech. Bull.* 140, 1-14(1928).—This publication reviews work done in the Division of Chemistry of this Station on various problems associated with the souring of milk. The work was first undertaken in an effort to add to the knowledge of factors involved in the manuf., ripening and digestibility of cottage-cheese. Later studies have had to do with the chem. changes in certain constituents at different stages of souring and the detn. of the amt. of free lactic acid in sour milk. C. R. F.

Condensed milk. CHAS. E. SEARLE. *Food Manuf.* 3, 505-6(1928).—The author briefly discusses condensing, homogenization, filling, sterilization, cooling and testing. J. A. KENNEDY

Use and effect of salt in butter and margarine. WILLIAM CLAYTON. Salt Union Std. Runcorn. *Research Bull.* No. 1; *Lait* 7, 913-27(1927).—The bacteriol., physical and chemical aspects are reviewed. Bibliography. H. F. ZOLLER

Janus green and methylene blue in the reductase test (Barthel). L. SOEP. *Lait* 7, 927-35(1927). See *C. A.* 22, 1810. H. F. ZOLLER

New method for the study of cheese ripening process. C. BARTHEL, E. SANDBERG AND E. HAGLUND. *Lait* 8, 285-8(1928).—Instead of using the customary water ext. to follow hydrolysis, the authors squeeze the liquid directly out of the cheese. This liquid will form the basis for research on analytical methods and on rennet action in cheese ripening. It is obtained by putting the cheese through a small cutting mill and mixing with twice its wt. of sand. The mixt. is wrapped in a tightly woven cloth and the liquid is squeezed out in a small cylindrical iron press. Fat can be removed by the centrifuge. From one kg. cheese 62 cc. liquid was obtained. H. F. ZOLLER

The calcium of cheese. KATHARINE BLUNT AND EMMA SUMNER. Univ. of Chicago. *J. Home Economics* 20, 587-90(1928).—The av. Ca content of 32 samples of Swiss cheese was 1.05%, of 29 samples of cheddar 0.71% and 38 samples of commercial cottage cheese 0.077%, showing the latter to be not the rich source of Ca it is usually considered. L. D. ELLIOTT

Bacteriological study of frozen eggs and their sanitary control. J. VERGE AND E. GRASSET. Veterinary School, Alfort. *Rev. Hyg. Med. Prev.* 50, 748-68(1928).—Direct microscopic examn. was unsatisfactory. Samples of imported Chinese eggs, taken while frozen, gave bacterial counts on gelatin (120 hrs.) of 85,000 per g. for the yolks, 30,000 for the whole eggs and only 5000 for the whites. After standing for 48 hrs. at lab. temp. these counts were, resp., 3,600,000, 4,000,000 and 360,000. The agar counts were somewhat lower than the gelatin counts. It is recommended that frozen eggs be used immediately after thawing. Among the organisms recovered were *Sarcina alba*, *Staph. albus* and *aureus*, liquefying bacillus similar to *B. coli*, *B. coli*, enterococcus of Thiercelin, a species of *Corynebacterium*, an organism similar to *B. pseudo-tuberculosis rodenium*, *P. vulgaris*, *B. fecalis alcaligenes*, and bacilli of the paratyphoid group. The Redfield formula though difficult of application, with certain modifications, merits trial. Frozen eggs must be regarded as a highly perishable food whose wholesomeness should be strictly maintained. C. R. F.

Mechanical handling of mayonnaise dressing. L. V. BURTON. *Food Industries* 1, 60-1(1928).—Descriptions and figures of equipment are given. C. R. F.

Composition and nutritive value of Philippine food fishes. ABELARDO VALENZUELA. *Philippine J. Sci.* 36, 235-42(1928).—The nutritive values of many species

of fresh fish, preserved fish and shell fish were detd. Av. protein content of fresh fish was 21.15%; smoked or dried fish, 44.92%. Av. calorific value of fresh fish was 99.02 cal.; smoked or dried fish, 237 cal. Calorific and protein values of mollusks are tabulated.

JOHN T. WOLF

Quick freezing of filleted fish. LEICESTER H. SHERRILL. General Seafoods Corp., Gloucester, Mass. *Food Industries* 1, 33-5(1928).—CaCl₂ brine with its low f. p. is used to freeze fish very rapidly and thereby prevent distortion and the objectionable formation of ice crystals within the flesh. App. is described.

C. R. FELLERS

Concentration of fruit, vegetable and meat juices. CH. LEMALE. *Food Manuf.* 3, 515-7(1928).—A discussion of the main factors involved in the concn. of fruit, vegetable and meat juices, with particular reference to *tomatoes*; some particulars of the Lemale concg. plant are given.

J. A. KENNEDY

Specifications for California canned fruit. ANON. *Canners League of Calif.*, San Francisco, 4th Ed., 30 pp.(1928).—Canning specifications for apricots, peaches, pears, cherries, grapes, plums and fruits for salad are given together with the % sugar to be used in packing several grades. A 2 min. draining period on a 1/8 in. mesh screen is the recommended method of detg. drained wt. of canned fruit.

C. R. FELLERS

Heat transfer determinants of the bottle pasteurization of fruit juices. K. L. FORD AND A. G. OSBORNE. Glass Container Assocn. Res. Lab., New York. *Glass Container* 8, No. 1, 1-42(1928).—Heat-transfer expts. using thermocouples located at different points in glass containers show considerable temp. variations during pasteurization of fruit juices at 170° F. Agitation of the container greatly accelerated heat transfer to the contents, resulting in effective pasteurization at a lower temp. and a marked improvement in the flavor of the beverage.

C. R. F.

Effect of acid wash on the keeping qualities of apples. FERRIS M. GREEN. Colo. Agr. Expt. Sta., *Bull.* 343, 1-18(1928).—Washing apples in weak HCl or Na₂CO₃ soln. does not affect keeping qualities if properly handled. Sal soda is not as efficient as HCl in removing arsenical residues.

A. L. MEHRING

Arsenical spray residue and its removal from apples and pears. F. D. HEALD, J. R. NELLER AND F. L. OVERLEY. Washington Agr. Expt. Sta., *Bull.* 226, 1-100(1928).—Various methods of cleaning fruit that had been sprayed with arsenicals were compared. Eleven varieties of uncleaned apples contained from 0.015 to 0.075 (av. 0.032) grain As₂O₃ per lb. of fruit. The amt. remaining after wet cleaning ranged from 0.008 to 0.015 (av. 0.011) and after dry cleaning from 0.021 to 0.027 (av. 0.024) grain As₂O₃ per lb. Varying the concn. of HCl from 0.3 to 1.0% by wt. and the temp. from 48° to 98° F. had practically no effect upon cleaning efficiency. With solns. contg. less than 0.3% HCl increasing the temp. to 95-98° did increase it. Fruit held in storage 4 months was more difficult to clean than it was when first picked. Applying apple soap spray 6 days before harvest was without benefit. All of the wet-process machines cleaned pears to below the tolerance of 0.01 grain per lb. Arsenical burning around the calyx is connected with wet cleaning. Jonathan apples are very sensitive to this injury. The alkali process was as bad as the most injurious acid process in causing calyx burn.

A. L. MEHRING

Examination of sprayed apples for arsenic. FRANK T. SHUTT. Dept. Agr., Canada. *Rept. Dominion Chemist, Year Ending March 31, 1927*, p. 74(1928).—Analyses for As were made on 56 samples of apples from various parts of Canada. One-third of the samples were entirely free from As, or contained As in negligible traces. Ninety-five % of the samples contained As in amts. less than 0.01 grain per lb.

K. D. J.

Apple wraps. FRANK T. SHUTT. Dept. Agr., Canada. *Rept. Dominion Chemist, Year Ending March 31, 1927*, p. 76(1928); cf. C. A. 21, 3688.—Analyses of papers used for wrapping apples gave the following results: oiled wrappers—H₂O 5.02-6.02, petroleum ether ext. 13.53-18.18, butyro-refractometer reading at 25° 52.1-72.7, refractive index 1.460-1.474; No. 6 sulfite wrapper—H₂O 6.03, petroleum ether ext. 0.23, paraffin wax wrapper—H₂O 5.41, petroleum ether ext. 20.64; glassine wrapper—H₂O 6.77, petroleum ether ext. 0.17%.

K. D. JACOB

Composition of Philippine pineapples. A. H. WELLS, F. AGCAOILI, H. TAGUIB AO AND A. VALENZUELA. *Philippine J. Sci.* 36, 157-85(1928).—An outline of the growth of pineapple culture in the Philippines. This includes cost of production, profit and discussion of climate and soil. Smooth Cayenne and native pineapples are described and their differences in chem. compn. shown. The smooth Cayenne is the best variety for table and canning use.

JOHN T. WOLF

Determination of the state of maturity of peas in canned goods. A study of methods. Ed. LASAUSSE, B. GUERITHAULT AND PELLERIN. *Bull. sci. pharmacol.* 35, 575-9(1928); cf. C. A. 22, 1813, 3193.—It is insufficient to depend on any single detn.

to place the product in or out of the class of "Petits Pois." (Cf. Muttelet, *C. A.* 19, 1442; 20, 1674, 1675, 2546; 21, 1315. Froidevaux, *C. A.* 21, 613.) L. W. RIGGS

Relation of kernel density to table and canning quality in different varieties of maize. C. W. CULPEPPER AND C. A. MAGOON. U. S. Dept. Agr., *Tech. Bull.* 97, 1-15 (1928).—Among the factors detg. the quality of canned sweet corn are the nature, amt. and relative proportions of the different polysaccharides present in the kernel. These constituents together with the H_2O present det. the consistency of the kernel and the smoothness or creaminess of the canned corn. The *sp. gr.* was detd. by use of a pycnometer and by measuring the vol. by a weighed sample of seeds in a buret contg. light paraffin oil. The density of developing maize varied with the stage of maturity and with the type or strain, while mature seeds varied with the moisture content, variety and certain environmental conditions. The density increased constantly during development of the kernel. Developing sweet corn has the lowest density of all types of maize studied. Low density is correlated with high quality. When mature, air-dry seeds are soaked in H_2O , there is a marked difference in the behavior of varieties in regard to the rate of H_2O absorption and the total quantity imbibed. The amt. of swelling is likewise quite different. Sweet corn swells most, flint varieties only moderately, while starchy types swell but little. The seeds of sweet corn decrease in *sp. gr.* during soaking while those of flint corn increase. These data may be valuable in detg. the best types of sweet corn for canning. C. R. F.

Better flavor developed in cocoa by improved roasting methods. FRANK C. GEPHART. *Food Industries* 1, 62-4(1928).—Roasting performs 2 important functions: it renders the shell more friable and easily removable when the beans are cracked, and it develops the sensitive flavor and aroma of the finished product. Roasting causes loss in H_2O , caramelization of starch, a loss in astringency due to change in the tannin complex, and possibly loss in theobromine content. Theobromine is present in the raw nib to the extent of approx. 1%, but after roasting it is reduced to 0.75%. The fat is rendered more easily extractable because of its release from the cellular structure of the bean. Fat is volatilized during the roasting process, and in long roasting the loss may be appreciable. $AcOH$ and $AcOH$ esters present in the fermented beans are largely lost during roasting, which develops the true flavor and aroma of chocolate. The chemistry of this change is not well understood although *d*-linalool has been found in roasted beans. C. R. F.

Manufacture and composition of chocolate products. FRANK C. GEPHART. *Food Industries* 1, 100-6(1928).—Typical analyses of cacao beans, powder and butter as well as chocolate liquors, coatings and milk chocolate are tabulated. A general description with illustrations of the chocolate industry is given. C. R. F.

The cause of fermented honey and its control. F. W. FABIAN. *Fruit Products J. and Am. Vinegar Ind.* 8, No. 2, 18-9, 22(1928).—Honey contains yeasts which are capable of fermenting the honey if sufficient moisture is present. Honey, when placed in a moist atm., may absorb sufficient water to dil. it to a degree where the yeasts present are able to grow and cause fermentation. Unripe or improperly cured honey, on account of excessive moisture present, is more apt to spoil than ripe or properly cured honey. The moisture content should be reduced by evapn. with heat or by vacuum before the honey is placed in storage. Comb honey loses wt. very slowly and takes up water slowly. It is possible to prevent honey from fermenting by heating to a temp. of 145° F. for 30 min. Directions for making honey vinegar from fermented honey are given. J. A. KENNEDY

A study of the cause of honey fermentation. F. W. FABIAN AND R. I. QUINET. Mich. Agr. Expt. Sta., *Tech. Bull.* 92, 1-40(1928).—An 8-yr. study of honey spoilage showed that the critical moisture point at which fermentation occurred was approx. 21%. A study of 8 extd. honey samples showed an increase in H_2O content from 5 to 12% at 20°. Since absorption of H_2O in extd. honey occurs mainly at the surface, the sugar concn. becomes reduced, thereby allowing yeasts to grow there. On honey agar contg. 10% honey, bacteria and molds predominated, but where the honey concn. was 30% or over the organisms found were largely yeasts. Comb honey stored in a dry place loses H_2O . In a 7-yr. period over $CaCl_2$ the loss of H_2O from comb honey was 7.5%. Comb honey stored in a moist place gains from 3.5 to 5.7% H_2O . Molds grew on all concns. of honey. All honey samples, whether spoiled or not, contained yeasts capable of fermenting the honey. Twenty-five yeasts were isolated and carefully studied, 2 being new species. Honey may be pasteurized readily at 62.5° for 30 min. though care must be exercised, because of the high viscosity, that the entire mass reaches that temp. Overheating darkens the honey. C. R. FELLERS

Desiccating shredded coconut. A. E. BUCHANAN, JR. *Food Industries* 1, 9-12

(1928).—A full description of the prepn. of various coconut products at the Postum Co.'s Hoboken Plant. Sugar and NaCl are added for flavoring while glycerol is incorporated in shredded coconut to render the shreds less brittle. Careful lab. control of the water content is necessary to prevent spoilage or deterioration. In the prepn. of canned coconut, the air is exhausted from the container and product by vacuum, and replaced by CO₂ which operation is said to aid in preserving the quality of the product. Oil extd. from fresh coconut parings averages from 0.5 to 1.0% free fatty acids as against 1 to 8% in imported copra. C. R. F.

Packaging problems of confectionery. STROUD JORDAN. *Food Industries* 1, 13-6 (1928).—Chocolate-coated candies may be stored satisfactorily at temps. from 5.5° to 18.3°. To avoid serious loss due to sweating the removal from cold storage must be made in progressive steps. H₂O from outside air collects on candies and dissolves some of the surface sugar. On evapn. minute sugar crystals reform on the surface, thus accounting for the characteristic white or gray bloom on chocolates. The use of air-tight containers, vacuum seals, etc., is discussed. C. R. F.

Gas production in the making of sauerkraut. L. M. PREUSS, W. H. PETERSON AND E. B. FRED. Wisconsin Univ., Madison, Wis. *Ind. Eng. Chem.* 20, 1187-90.—Cabbage was packed in a 58-gallon metal barrel and allowed to ferment. The gas evolved was almost 100% CO₂, with a possible trace of H₂ and CH₄, and volatile org. compds. Most of the gas was given off within 40-160 hrs. Because of a correlation between gas evolution, acidity of juice, and bacterial count, it was concluded that the gas production is due to bacterial activity and not to yeast growth or plant cell respiration. Washing the cabbage improved the flavor of the sauerkraut. Cabbage at an initial temp. of 20-25° fermented more quickly, but at 25° some pink sauerkraut was formed. AMY LEVESCONTE

Nutritive value of hardened oils. II. S. UENO, M. YAMASHITA AND Y. OTA. *J. Soc. Chem. Ind. (Japan)* 31, 393-9; *Suppl. Binding* 92 3B(1928); cf. C. A. 22, 804.—The animal test showed the nutritive value of the low-temp. hardened oils (sardine oil, herring oil, finback whale oil, chrysalis oil) superior to that of their original oils. Y. TOMODA

A summary of research studies relating to casein and some of the applications. I. L. VAN SLYKE. N. Y. Agr. Expt. Sta., *Tech. Bull.* 139, 1-41(1928).—This publication reviews the work done in the Division of Chemistry of this Station for the period of 1901 to 1918 on the chemistry of milk, particularly the chemistry of the casein of cow milk, including some of the practical applications of the studies as related to the cheese industry. C. R. F.

Investigation of soda water for lead. H. W. PETHERICK. Ann. Rept. Commissioner of Health of Queensland, Australia, *Bull. Hyg.* 3, 402(1928); cf. C. A. 22, 2998.—A series of 394 samples of soda water were collected and examd. for Pb from all cld. and refreshment rooms in Brisbane and South Brisbane. In addn., a large no. of samples of tap water and water from supply cisterns were examd. Notice to discontinue sale pending action to remove sources of Pb was given in every instance in which lead was in excess of 100 gr. per pint but a large no. of soda fountains had to be dismantled. The sources of Pb were found to be the interiors of carbonators, which were potted at the seams, at the end of agitator shafts, and elsewhere with solder that contained Pb. This had to be replaced with Pb-free material and often fresh Sn lining had to be provided. In every case, this did not remove all the Pb from the soda water, and in cases in which it did not do so recourse was had to the use of harmless chem. soln. fed to the carbonator with the water. This at last reduced the lead to within the prescribed limit. C. R. F.

Mussel poisoning in California. K. F. MEYER. Calif. Dept. Health, *Weekly Bull.* 7, No. 22, 85-6(1928).—In 1927, there were 102 human cases of mussel poisoning with tetrodotoxin in Calif. All were due to eating the large mussel, *Mytilus californicus*, which had been freshly gathered from rocks near shore. The nature of the poisonous substance is not definitely known but is probably a N complex or protein. There is no known test for detg. the harmlessness of mussels. They should not be eaten during the summer. C. R. F.

Technical control of the dairy industry. W. H. E. REID. Univ. of Mo., Columbia. *Food Industries* 1, 3-8(1928).—A general discussion of lab. control methods on butter, ice cream, cheese, condensed and powd. milk and casein. No new data are presented. C. R. FELLERS

Washing powders for dairy use. A. W. PHILLIPS, M. J. MACK AND J. H. FRANDSEN. Mass. Agr. Expt. Sta., *Tech. Bull.* 13, 179-87(1928).—Analyses of 36 com. washing powder showed the 3 important ingredients to be Na₂CO₃, Na₃PO₄·12H₂O and NaOH.

Soaps were found in appreciable amts. in but 7 samples. All ingredients were usually not present in the same sample. Na_2CO_3 possessed excellent water-softening power, greatly aided washing mechanism, was a poor emulsifier, rinsed easily and neutralized odors. It had a mild corrosive action on tin-coated utensils or the hands. $\text{Na}_2\text{PO}_4 \cdot 12\text{H}_2\text{O}$ softened water readily and possessed excellent emulsifying properties but it had poor washing power. It rinsed easily, was a good casein solvent, had feeble corrosive action on metals and gave a desirable buffer effect which kept the caustic strength of the cleaning soln. uniform. NaOH was a poor water softener and emulsifier, rinsed only with difficulty, had a strong caustic action on the skin and corroded metals vigorously. However, it possessed good washing powers. The most desirable compn. for washing powders was found to be $\text{Na}_2\text{CO}_3(\text{anhyd.})$ 60%, $\text{Na}_2\text{PO}_4 \cdot 12\text{H}_2\text{O}$ 40%, with a total alkali content of 58%. By purchasing these chemicals in bulk and compounding, a very great saving in cost is effected. The washing efficiency of the powders increased up to 60°. Below 35°, the bactericidal action was greatly reduced. All powders showed disinfecting powers in 0.6% soln. by rendering the wash water sterile. C. R. FELLERS

Live stock feeding. P. DE SORNAY. *Rev. agr. Maurice* 5, 170-1(1928).—The feeding value, calcd. according to Kellner's formula, is 75.7 for peanut cake, 76.5 for copra cake and 68.6 for acacia seed; the protein-carbohydrate ratios are, resp., 1:1.5, 1:5.5, and 1:1.6. These ratios are too narrow, and the products must be supplemented by carbohydrate feeds. Acacia seed has a very hard, indigestible outer layer which amounts to 46% of the total wt. This fact must be considered in comparing its price with that of similar products. F. W. ZERBAN

The non-protein nitrogen compounds of feeding stuffs: their significance and utilization. W. L. DAVIES. Univ. of Reading. *Fertilizer, Feeding Stuffs and Farm Supplies J.* 13, 690-2(1928).—Feedingstuffs may be divided into 3 classes on the basis of the types of protein and non-protein N present: (1) those of animal origin, supplying animal protein and contg. their own special type of non-protein N compds.; (2) those of seed origin, where the protein is stored as an easily digestible and balanced protein; here, the source of protein is in the resting stage of plant life, the non-protein N being at a min., usually infinitesimally small; (3) those prepd. from the growing plant, contg. the N compds. distributed in the state and quantities required for active plant metabolism. The non-protein N is relatively high and the constitution of the compds. variable in nature. To this class belong hay, straw, roots, silages, grass and such factory residues as sugar-beet pulp. The non-protein N compds. include the protein degradation products (proteoses, polypeptides and amino acids), true amides, NH_4 salts and small quantities of nitrates. In general, the soly. in water of the N compds. of class (1) feeds increases as the content of true protein decreases. NH_3 and methylamine bases constitute a considerable portion of the non-protein N compds. present in class (1) feeds, particularly in low-grade fish meals. The latter may be dangerous to animals if more than approx. 20% of the N is sol. in H_2O . Such N compds. also contribute to the taint conferred on pork and bacon when hogs are fed on rations contg. excess fish meal. The non-protein N content of class (2) feeds is negligible. In class (3) feeds the true protein content of the dry matter of very young plants constitutes a high % of the total N and is mostly H_2O -sol. At the flowering stage of the plant the true protein becomes H_2O -insol. and decreases to a min. while the non-protein N increases to a max. On low-protein diets these non-protein N compds. have a certain protein-sparing action in the metabolism of the animal and some of them appear to possess a well-defined physiol. action in assisting N retention and protein building in the animal body. Non-protein N tends to increase the digestibility of the non-N constituents of the ration, but there is no conclusive evidence as to the exact nutritive value which can be allotted to the non-protein N of the "crude" protein. K. D. JACOB

The fodder value of dried grass. F. COLIN SUTTON. *Ind. Chemist* 4, 401-4 (1928).—The grass (cut young and short) is dried in a "Pehrson" rotary louvre drier, the hot air, driven by a fan, entering through louvres and passing through the grass as it is carried upwards on the rising side of the cylinder. The moisture in one trial was reduced from 80.3% to 19.3%. Milch cows eat the dried grass eagerly. Figures are given which show an increased yield of milk when part of the mixed strong fodder (crushed oats, crushed rape cake, crushed earth nuts, crushed soy cake and crushed sunflower cake) is replaced by dried grass. Drawings are included of the drier, which is suitable for drying coal, wood chips, bark, saw-mill refuse, peat, sugar beet slices, refuse from breweries and distilleries, sand, clay, sodium nitrate, sodium sulfate, etc.

E. G. R. ARDAGH
Silage investigations. FRANK T. SHUTT. Dept. Agr., Canada. *Rept. Dominion Chemist, Year Ending March 31, 1927*, pp. 41-5(1928).—The object of the investigations

was to det. the effect on the compn. of the silage of stage of growth, H_2O content of material as ensiled, length of ensiling period, and type of silo, e. g., glass jars as compared with small stave silos for exptl. ensiling. *Alfalfa silage*.—Alfalfa wilted for 5 hrs. before ensiling gave silage with a higher protein content than that obtained from unwilted material and the crop when cut at the full-bloom stage gave silage richer in protein than that ensiled when at the 0.1-bloom stage. Silage prepd. in the stave silo in every case contained less protein, on the H_2O -free basis, than that prepd. in tightly closed glass jars. There were indications that alfalfa cut at full-bloom stage will more frequently yield a better preserved silage than that from 0.1-bloom crop. *Sweet clover silage*.—On the H_2O -free basis, the av. protein content of 12 silages from sweet clover cut at the bud stage was 21.4%, while that of 6 samples from full-bloom clover was 19%. Silages prepd. in tightly closed glass jars in general appeared to be in better condition than those prepd. in stave silos, but the type of silo, ensiling period and wilting did not have any marked influence on the protein content of the silages. *Oats, peas and vetch silage*.—These silages were composed of a mixt. of 2 bushels Banner oats, 0.75 bushel Arthur peas and 0.25 bushel common vetch, the stage of maturity given being that of the oat crop. The silages, as a whole, were remarkably uniform in compn. The silages from the crop cut at the "dough" stage showed a slightly lower protein content, with no concomitant rise in fiber, than those from the crop ensiled at the "milk" stage. Detailed analytical data on the silages are given.

K. D. JACOB

The importance of properly balanced rations in trials to determine digestibility as shown in experiments with dried apples. C. W. HOLAWAY, W. B. ELLERT, G. F. EHEART and M. P. MILLER. Virginia Agr. Expt. Sta., *Tech. Bull.* 32, 18 pp.(1927).—Dried apple pomace, being a bulky feedstuff with a low protein and high energy content, widens the protein-energy ratio when added to a basal ration, thus causing a pronounced depression of digestibility of the protein of the whole ration. This general depression reduces the amount of digestible protein in the whole ration to such an extent that the results show that apparently none of the apple pomace protein is digested and furthermore that less of the protein in the basal ration is digested when this material is added to it. Three expts. were conducted, with a basal ration of grain and silage. (1) The dried apple pomace was added to the basal ration and coeffs. were obtained by trial. The coeffs. for the dried apple pomace constituents were computed by difference and pronounced negative results were obtained for the protein of the pomace. (2) The same basal ration was used, but when pomace was added a special corn gluten feed was used instead of the corn meal, thus balancing the lack of protein in the apple pomace and making it possible to secure basal and basal pomace rations that were comparable in amount and ratio of constituents. In making these computations, the value of the protein in apple pomace assigned by Henry and Morrison was used, and since this is altogether too high the apple pomace ration was wider than it should have been and the depression effects still persisted. In this expt. two of the four cows apparently digested 22% of the apple pomace protein, while two still gave negative results. A third expt. was conducted and in balancing the protein of the basal and basal pomace rations no value was allowed for the apple pomace protein. The results were uniform and the digestible coeff. for the protein of dried apple pomace was found to average 37% under these conditions. In these trials the quantity of protein involved in the variation due to the depression effect amounted to 130% of the total protein contained in the apple pomace. This was 0.325 lb. daily per cow or 12% of the total protein fed. The digestible coeffs. found for dried apple pomace under balanced conditions were: dry matter, 66%; crude protein, 37%; ether ext., 32%; crude fiber, 54%; nitrogen-free ext., 80%.

J. J. SKINNER

The evolution of the mineral supplement. FRANK E. CORRIE. *Fertilizer, Feeding Stuffs and Farm Supplies J.* 13, 681-4(1928).—This paper discusses the importance of mineral elements in the feeding of stock, and summarizes the results obtained by prominent research workers in this subject.

K. D. JACOB

Soy-bean meal for fattening hogs. EARL H. HOSTETLER. N. C. Agr. Expt. Sta., *Bull.* 259, 1-12(1928).—The % compn. of soy-bean meal is crude protein 39.7, carbohydrates 34.7 and fat 4.5, indicating the very high nutritive value. Four trial feeding tests with hogs indicated that soy-bean meal did not give increased returns over corn or fish meal.

C. R. F.

Tin plate for cans for preserved goods (SERGER) 9. Flaxseed (SHUTT) 27. A new metric test for tannic acid (RAE) 7. Apparatus for mixing food materials (U. S. Pat. 1,691,535) 1. Pump for milk (Brit. pat. 287,267) 1. Withdrawing yeast from vat [for use as animal feed] (Brit. pat. 287,052) 16.

Preserving milk or other beverages and foods. FRANK J. ANDRESS (to Brownie Corp.). U. S. 1,691,538, Nov. 13. The material is treated with H_2O_2 at temps. at which the H_2O_2 is active as a germicidal agent (but below the temp. at which the material would be injuriously affected) and NaOH or other suitable substance is then added to neutralize acidity.

Homogenizing ice cream mixes and reducing their viscosity. EDWARD A. SNOW. U. S. 1,690,799, Nov. 6. After being forced through a homogenizing valve under a pressure sufficient to effect homogenization, the viscosity of the material is reduced by passing it through a constricted opening under a pressure lower than that used for the homogenizing. An app. is described.

Margarine composition. JOHN C. SHERMAN (to Brown Co.). U. S. 1,691,087, Nov. 13. A substantially water-free compn. comprises hydrogenated peanut oil which is substantially solid at ordinary temps. and a dry "milk-like" product of peanuts in a state of such fine subdivision that the particles, in homogeneous mixt. with the oil, constitute the disperse phase of a colloid of which the oil is the dispersion medium.

Apparatus for drying fruit in air streams. EDWARD A. WHITE. U. S. 1,691,874, Nov. 13.

Dry powder from fruit juice and sugar. FLOYD W. ROBINSON. U. S. 1,690,131, Nov. 6. A dry powder which on addn. of water forms a liquid of palatably sweet fruit flavor and normal acid and pectin content is prepd. by drying natural fruit juice such as orange, lemon or grape juice together with sugar sufficient for preservative action, coned. acids and pectin of the fruit, and addnl. natural fruit flavor proportioned to the excess sugar content.

Pectin. R. PAUL and R. GRANDSEIGNE. Brit. 286,914, April 29, 1927. Dry, white and purified pectin is obtained from a pectous soln. by treating it in several stages with acetone, compressing the pectin jelly pptd., drying and crushing it. An app. is described.

Fish preparations containing amino acids. F. BILLON. Brit. 286,709, March 11, 1927. Fish or fish offal is chopped and reduced to a paste and mixed with 0.1-0.3% of chloropicrin, rapidly dried and the chloropicrin thus driven off, or the operation may be effected to cause autolysis and formation of amino acids. The resulting powder is de-oiled.

13—GENERAL INDUSTRIAL CHEMISTRY

HARLAN S. MINER

Our mutual interest in research and engineering. CHAS. W. APPLESON. *N. E. L. A. Bull.* 15, 713(1928).

Principles of patent law involved in the Weiss patent litigation. ANTHONY W. DELLER. *Ind. Eng. Chem.* 20, 1361-3(1928).—A review of the case in which the Weiss patent on the use of diphenylguanidine as a vulcanization accelerator was found invalid.

Some economic factors in chemical price making. WILLIAMS HAYNES. *Ind. Eng. Chem.* 20, 1348-52(1928).

Heating by oil circulation in the chemical and allied industries. L. DELESTRE. *Chimie et industrie* 20, 623-30(1928).—A discussion of the advantages of oil as a heat-transferring medium, with an outline of installations of the Merrill process in various industries.

Solvents from natural gas. HARVEY S. GARLICK. *Ind. Chemist* 4, 363-7(1928).—At Belle, W. Va., the Sharples Solvents Corp. is manufg. $C_5H_{11}OH$ from C_5H_{12} obtained from natural-gas gasoline. The carefully fractionated C_5H_{12} is chlorinated, the $C_5H_{11}Cl$ distd. to remove unchanged C_5H_{12} , and the $C_5H_{11}Cl$ hydrolyzed with NaOH obtained (like the Cl) from the neighboring electrolytic alkali plant. Pure HCl is obtained as a by-product. In addition to the pure mixt. of amyl alcohols the acetate is also manufd. (in using AcOH in the presence of H_2SO_4). The amyl alc. has a boiling range of 116-136° and has the following compn.: diethylcarbinol 8%, methylpropylcarbinol 18%, active amyl alc. 32%, isoamyl alc. 16%, normal amyl alc. 26%. The acetate is 85% ester and 15% amyl alc.; its b. p. range is 128-148°. Other com. products, e. g., amyl chloride and amylene dichloride, are also obtainable. The individual steps in the process are described, and several views of portions of the plant are included.

Chemical warfare and its medical significance. H. L. GILCHRIST. *Military Surgeon* 63, 477-92(1928).—G. gives a brief history of chem. warfare, mentioning some

of the different gases used, clinical conditions produced, a brief survey of treatments, parts of the body affected by mustard gas, some of the causes of gassing, and the after-effects of gases.

J. A. KENNEDY

Fatal poisoning probably due to arsine. M. LABORDE. *Rev. Hyg. Med. Prev.* 50, 790-1(1928).—Two laborers who were cleaning out a tank which had contained H_2SO_4 were stricken ill in about 8 min. with a severe diffuse bronchitis and gastro-intestinal symptoms. One man died; the other recovered without apparent bad effects. The H_2SO_4 contained 1000 p. p. m. of As. It is thought that AsH_3 was present in the mud in this tank and caused the fatal accident.

C. R. F.

Silicosis. E. L. COLLIS. *Trans. Ceram. Soc. (Eng.)* 27, 161-7(1928).—A study of the mortality among English men showed 12.3% deaths among the limestone masons were due to phthisis while 44.2 56.7% were similarly caused among the sandstone masons in several large towns. Among all males in England this disease causes 14.6% of the mortality. Coarser SiO_2 dust leads to bronchitis while the finer SiO_2 more frequently leads to pneumonia and silicosis. The SiO_2 dust risk is indicated by excessive mortality due to bronchitis and phthisis with the above normal mortality due to pneumonia and Bright's disease. The SiO_2 deposited on the lung tissue apparently dissolves, the adjacent cells are mummified and break down in the lymph nodes. Thereafter results the formation of the fibrous tissue, developing the actual fibrosis of the lung or silicosis. This condition is especially favorable to tuberculous infection, with generally fatal results.

H. F. K.

Insulation materials. H. WARREN. *Electrician* 101, 601-3(1928).—A brief general survey of natural and vitrified insulations, molded composites, sheet materials, varnishes, treated materials and wire coverings. There has been a marked increase in the use of synthetic molding compds.

C. G. F.

Magnesia product (U. S. pat. 1,690,771) 18.

Purifying gases. GES. FÜR LINDE'S KISMASCHINEN A.-G. Brit. 286,622, March 5, 1927. Washing for removal of readily absorbed gases such as H_2S and CO_2 by absorption in water is effected in 2 stages in which the H_2S and CO_2 are successively removed and the water contg. H_2S is regenerated separately from the remaining water. An app. and details of procedure are described.

Purifying gases. H. A. GOLLMAR (to Koppers Co.). Brit. 286,633, March 7, 1927. Fuel and other gases are freed from H_2S and other acidic constituents by washing with an alk. liquid contg. a compd. of As or metal of the "tin group of qualitative analysis" such as a soln. formed from Na_2CO_3 and As_2O_3 by heating with water. After use of the soln. to absorb H_2S it is aerated and a thioarsenate is formed. Sulfidation and limeation (with additions of fresh reagent as required) are then repeated, with recovery of free S. NaOH or Na sulfide and As sulfide or other As compds. also may be used as may also compds. of K, NH_4 , and Sb or Sn. Cf. C. I. 22, 3005.

Purification of gases. HUTH AND RÖTTGER. Ger. 466,351, Feb. 2, 1926. Gases forced under pressure into a container provided with a rotary filter cap.

Purifying gases. FREDERICK W. SPERR, JR. (to Koppers Co.). U. S. 1,690,437, Nov. 6. The greater portion of the impurities is removed from gases such as coal gas by a first washing and the gas is then subjected to a second washing with freshly regenerated or washing liquid. An app. is described. U. S. 1,690,438 specifies washing gas with a liquor such as Na_2CO_3 soln. to absorb impurities, aerating the wash liquor to regenerate it and washing the air to remove the impurities, and recirculating the air from which the impurities have been removed back to the liquid regeneration stage. An app. is described.

Gas purification. OSKI AKT.-GES. Ger. 466,356, Dec. 25, 1923. Addn. to Ger. 466,347 (Erich Oppen, inventor). The individual pieces of the wire emission electrode of a gas purifier as described in the prior patent are formed with a core of unalloyed semiconductor.

Washing gases. ERZÖST-GESELLSCHAFT M. B. H., WILHELM LINDHEIMER AND JOSEPH WALMRATH. Ger. 466,435, Jan. 7, 1926. The washing liquid is sprayed by centrifugal force round a sprinkler which has a stepped or steeply descending base.

Removing gas from molten substances. CARL BENEDICKS. U. S. 1,691,458, Nov. 13. Molten material such as glass or quartz is stirred with an electrically heated stirrer or other suitable body having a higher temp. than that of the molten mass; sep. of gas is localized on the body thus used for stirring.

Dust extraction. JAMES KEITH and BLACKMAN CO., LTD. Ger. 466,352, Aug. 14, 1926. Dust is expelled from gases by a screw fan.

Dust extraction. HERTHA MÖLLER, ARNOLD LUYKEN, GERTRUD LUYKEN, ERNST LUYKEN, NORA LAMPING, ILSE VOGG-CASTENDYK, IRMGARD FREUDE, FRITZ-KARL CASTENDYK, HEINRICH LUYKEN, GERDA LUYKEN, ELISABETH LUYKEN AND JOHANN LUYKEN. Ger. 466,343, Sept. 7, 1916. Suspended substances are extd. from gases by drying the gases and subjecting them to a high-tension current.

Separation of dust from smoke. ÉMILE PRAT. Fr. 637,272, Nov. 5, 1926. The larger particles in smoke are sepd. by a shower of water and the smaller by a metallic screen.

Separating solids or liquids from gases. GEORGES F. BRUT. Fr. 637,596, Nov. 10, 1926. The gas is caused to sweep over walls sloping in such a direction that the current assists gravity to eliminate solid or liquid particles from the gas.

Purification of liquids. PIERRE AMET. Fr. 638,948, Dec. 31, 1926. Liquids, particularly *lubricating oils*, are purified by a filter made of a metal sheet rolled into a spiral, or metal sheets partially superimposed which are continually or intermittently displaced so that the liquid is caused to pass by capillary action through the small spaces between the sheets or parts of the spiral.

Purification of chemical agents. SOCIÉTÉ HENKEL AND CIE G.M.B.H. Fr. 637,393, July 9, 1927. Chemical agents such as borax or Na_2CO_3 used for the manuf. of products contg. active O are boiled in soln. in the presence of silica gel and crystd.

Clarifying beer, vinegar and other liquids. A. J. MURPHY AND MURPHY & SON, Ltd. Brit. 286,861, Feb. 18, 1927. Finings for use in clarification are prepd. by "cutting" isinglass with lactic acid and water. H_3PO_4 or other suitable inorg. or org. acid also may be added.

Recovery of vapors. HENRI L. BARTHÉLEMY. Fr. 638,901, Dec. 28, 1926. Vapors are recovered by means of solvents made into a foam with water. An example is given of the recovery of acetone from air by a foam obtained by agitating water, NH_4 oleate and black industrial glycerol. Cf. C. A. 22, 3939.

Atomizing and mixing. A. RIEBECK'SCHE MONTANWERKE A.-G. Ger. 466,355, Mar. 23, 1926. The substances are forced under pressure through nozzles into a mixing chamber and out of this through atomizing devices.

Artificial fog. MINIMAX GES. (to Excelsior Feuerloschgerate A.-G.). Brit. 287,145, March 16, 1927. Large vols. of artificial fog are produced by bringing suitable chemicals (among which H_2SO_4 and chlorosulfonic acid and water are mentioned) into contact with air or other gas in a closed receptacle and discharging the fog thus produced into the air by suction or pressure or both. An app. is described.

Heat regulation in exothermic catalytic reactions. CHARLES W. MORTIMER. U. S. 1,691,903, Nov. 13. In regulating the temp. for catalytic reactions such as oxidation of aromatic hydrocarbons by use of a temp.-regulating liquid of const. b. p. such as Hg, the vapor of the liquid is divided and the incoming gases are also divided, a portion of the incoming gases are heated with one portion of the vapor and the other portion of the vapor is separately condensed. An app. is described.

Catalytic processes. COMPAGNIE DE BETHUNE. Fr. 639,058, Jan. 11, 1927. In exothermic synthesis such as MeOH from CO and H, a liquid is added to the reaction gases to control the temp. of the reaction. With MeOH water is a suitable liquid.

Catalytic gas reactions. SOCIÉTÉ NATIONALE DE RECHERCHES SUR LE TRAITEMENT DES COMBUSTIBLES. (André Raineau, inventor). Fr. 638,869, Dec. 23, 1926. An app. is described in which the catalytic chamber is externally cooled by the fresh gas which then becomes heated by the reaction products in a heat-exchanger and finally elec. just before entering the contact chamber. The whole is enclosed in an atm. cooled by water.

Determining gases by radiation measurements. HANS SCHMICK (to Siemens & Halske A.-G.). U. S. 1,691,138, Nov. 13. In testing gases such as those contg. CO_2 , a selective radiator (suitably a Bunsen flame with gas to be tested for CO_2) is used, the emission bands of which overlap as little as possible the absorption bands of the test gas.

Testing liquids. KARL LUDWIG. Ger. 466,653, May 20, 1927. A thin plate is provided with a no. of different sized holes and the largest hole covered by a film when the plate is dipped in a liquid gives a measure of the viscosity. By an examn. of the film the compn. of the liquid may be detd.

Treating solids with liquid reagents. JAMES E. EGGLESON (to General Chemical Co.). U. S. 1,690,363, Nov. 6. In treating *ores* with acid solns. or in other treatments of solids with liquid reagents, the solid and liquid are digested together, the solid is sepd. by settling while in a state of rest and the supernatant liquid is then withdrawn; the deposited sludge is washed with a flowing stream of wash water flowing counter-current to it under conditions providing for continuous settling of sludge from the wash water and the settled sludge is continuously withdrawn. An app. is described.

Hydraulic classification of coarse and fine granular materials. R. WUNSCH (to Erz- u. Kohle Flotation Ges.). Brit. 287,499, March 22, 1927.

Dewatering colloids, particularly peat. GES. FÜR MASCHINELLE DRUCKENTWASSERUNG M. B. H. Ger. 466,856, Dec. 28, 1919. The dewatering of colloids, particularly peat, is effected by intimate admixt. with non-porous, dry addns. of like nature in the form of granules not exceeding 1.5 mm. in diam.

System of filtering juices or other materials on rotary filters. HENRY A. VALLEZ. U. S. 1,691,001, Nov. 6. Paper pulp may be used as a filtering medium.

Emulsions and dispersions for dyeing, tanning and other purposes. I. G. FARBENIND. A.-G. Brit. 287,464, March 18, 1927. Products obtained by sulfonating, in the presence of a phenol, wool fat or fatty acids derived from it, are used in emulsifying solid and liquid hydrocarbons and derivs. such as alcs., phenols, nitro or amino compds., halogenated hydrocarbon derivs., CS_2 , bituminous substances, animal and vegetable oils, fats and fatty acids, waxes, resins, dyes and tanning substances. Several examples are given.

Preparation of emulsion. NIELS BENDIXEN. Ger. 466,353, Jan. 13, 1925. The liquid is forced through pores in a partition at an angle to the main stream.

Regulation of the temperature in exothermic reaction. SOCIÉTÉ CHIMIQUE DE LA GRANDE PAROISSE AZOTE ET PRODUITS CHIMIQUES. Fr. 32,856, Aug. 9, 1926. Addn. to 626,501. Circulation of the gaseous reaction products as well as, or instead of, the gases before reaction is used to regulate the temp. of the catalysts in exothermic reactions.

Charging vessels under pressure. I. G. FARBENIND. A.-G. Fr. 637,386, July 9, 1927. Solid materials, such as used in the manuf. of iron carbonyl or in the destructive hydrogenation of carbonaceous materials, are charged into high-pressure reaction vessels by a displacing device such as a piston located in a receptacle connected with the reaction vessel with the intervention of wide closing-means, the receptacle being capable of exposure to the pressure of the vessel or to the atm.

Respirator canisters. DEUTSCHE GASLÜHLICHT AUER-GES. and HANSEATISCHE APPARATEBAN GES. VORM. L. VON BREMEN & CO. Brit. 287,562, March 25, 1927. Exhaustion of canisters charged with material which generates O by the action of CO_2 and moisture is indicated by a substance of strong odor such as menthol which is liberated under the conditions prevailing at exhaustion of the main charge.

Refrigerating apparatus of the multiple-effect type. NICOLAI H. HILLER. U. S. 1,691,286, Nov. 13.

Refrigerating apparatus of the compression type. J. A. GRIER and J. A. WARREN. Brit. 288,138, April 22, 1927.

Compressor and condenser for refrigerating apparatus. JOHN R. REPLOGLE (to Electric Refrigeration Corp.). U. S. 1,691,305, Nov. 13.

Condenser for refrigerating apparatus. JOHN O. CARREY (to C & C Engineering Co.). U. S. 1,691,180, Nov. 13.

Filter for use with refrigerating apparatus. FRENCH E. DENNISON and WARD S. IRELAND (to National Refrigeration Corp.). U. S. 1,690,282, Nov. 6. Cylindrical screens are spaced from each other and have a decreasingly finer mesh from the outside to the inside.

Insulating material. ANDRÉ CUNY. Fr. 638,791, Aug. 3, 1927. A heat and elec. insulating material is made of superimposed layers of asbestos fibers and glass wool, sewed, glued or interlaced.

Heat-resisting and insulating material. L. F. TOOTH. Brit. 287,363, June 22, 1927. A binder of cement or fireclay, slagwool, crushed burnt brick and a small quantity of Al powder (or other material adapted when mixed with water to cause evolution of gas and produce a porous product) are used together and may be molded into bricks or blocks or used in lining or constructing furnaces.

Heat insulator. SOCIÉTÉ D'ÉTUDES POUR LE TRANSPORT ET LA MANUTENTION DE LIQUIDES ALIMENTAI: SOCIÉTÉ "TAMALA." Fr. 637,721, July 13, 1927. A heat insulator suitable for metallic walls is composed of powd. cork and bakelite.

Electrical insulating bushings. MONTFORD MORRISON. U. S. 1,691,356, Nov. 13. A heated insulating tube which may be formed of impregnated paper is placed around a conductor and is allowed to shrink in position on the conductor.

Insulating device for electric gas purification plant. SIEMENS-SCHUCKERTWERKE AKT.-GES. (Carl Hahn, inventor). Ger. 466,513, Jan. 29, 1924.

14—WATER, SEWAGE AND SANITATION

EDWARD BARTOW

Ground water of the New Haven area, Conn. JOHN S. BROWN. U. S. Geol. Survey, *Water-Supply Paper* 540, 206 pp.(1928); cf. *C. A.* 19, 2716.—The geology of the region is described. Chem. analyses of 51 samples representing ground water in 12 townships are reported for the mineral constituents of these waters. The records of wells (dug, driven and drilled) are tabulated for the different towns. L. W. RIGGS

The water supply of Concepcion, Argentina from the Uruguay River. EIGENBRODT. *Gas u. Wasserfach* 71, 943-6(1928).—The water is purified by alum coagulation and quick sand filtration. Some details of the novel filtration scheme are given. Costs of operation are given. R. W. RYAN

Dissolved and suspended mineral matter in Colorado River. W. D. COLLINS AND C. S. HOWARD. U. S. Geol. Survey. *Ind. Eng. Chem.* 20, 746-8(1928); cf. *C. A.* 21, 2947.—Typical and av. analyses of the dissolved mineral matter contained in Colorado River water regularly collected at Grand Canyon and Topock, Ariz. in 1925-7 are tabulated. The av. dissolved solids found were, resp., 768 and 827 p. p. m. for 1925-6 and 1926-7, the chief ion being SO_4 . The av. water would be satisfactory for drinking, but not for use in boilers, since even if softened it would contain excessive Na salts. It could be used for irrigation with efficient drainage. Contents in % of suspended matter are given. Insufficient data on the amt. of silt carried in suspension and by the "bed-load" now make unreliable an est. of the life of storage reservoirs. C. H. BADGER

Diurnal variation of the gaseous constituents of river waters. III. ROGER WM BUTCHER, FREDERICK T. K. PENTLOW AND JAMES WM. A. WOODLEY. Fisheries Research Station, Alresford, Hauts, England. *Biochem. J.* 22, 1035-47(1928); cf. *C. A.* 22, 1202.—A continuation of expts. from September to December. The main factors governing the oxygen content of the river Lark are (1) the quality and type of plant life present, these factors being governed by the season of the year; and (2) the prevailing actinic conditions. BENJAMIN HARROW

An apparatus for adding gypsum to irrigation water. S. C. SCOFIELD AND ELMER W. KNIGHT. U. S. Dept. Agr., *Circ.* 38, 1-5(1928).—When irrigation H_2O contains substantially more Na than Ca, an injurious effect occurs in the phys. condition of the soil. CaSO_4 added to soft waters improves this phys. condition very markedly. An automatic gypsum distributor was designed to add the proper amt. of $\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$ to the irrigation ditch. Analyses proved that most of the gypsum went into soln. where the amts. added per acre per yr. varied from 967 to 2000 lbs. C. R. FELLERS

Chlorine content as an index of the potability of water supplies. L. GILLET AND C. H. GUILLEAUME. Sanit. Service of Luxemburg. *Tech. Sanit. Munic.* 23, 177-80(1928).—If deductions are made for the Cl derived from minerals, then for each region, fairly definite limits for Cl as an indicator of pollution may be established. The mineral Cl content of waters underlying certain geological strata are given. Great credence is placed on the Cl content as a basis of detg. the potability of water. C. R. F

Chlorination of drinking water. HAYO BRUNS. *Gas u. Wasserfach* 71, 1057-64(1928).—The development of the chlorination of drinking water is reviewed and the necessity of careful control pointed out if typhoid epidemics are to be avoided. The history of numerous epidemics is given, bacterial tests are reviewed and methods of detg. free chlorine content given. The correct excess chlorine content is about 0.1 mg. l. and this can be detd. by the benzidine, *o*-tolidine or naphthoflavone tests, which are sensitive to about 0.03 mg. per l. Development of an objectionable odor and taste due to chlorination of phenols, etc., may sometimes be avoided by excess chlorine, later destroyed with Na_2SO_3 , $\text{Na}_2\text{S}_2\text{O}_3$, or KMnO_4 . This taste develops more strongly in cold weather. Many references and 3 illustrations of app. are given. R. W. RYAN

Is prechlorination worth using? J. S. WHITENER. *The American City* 38, No. 5, 123(1928); U. S. Pub. Health Eng. Abs. E-660C, 81(1928); cf. *C. A.* 22, 3472. C. R. FELLERS

Use of liquid sodium aluminate in the clarification of the Denver water supply. O. J. RIPPLE, G. J. TURKE AND C. H. CHRISTMAN. *Ind. Eng. Chem.* 20, 748-52(1928); cf. *C. A.* 21, 2344.—The use of Na aluminate-alum at the North Marston mech filter plant replacing lime-alum for coagulation has lengthened the av. filter run from 24.6 to 29.8 hrs. and reduced the av. wash water used from 2.38 to 1.88%. It forms an easily controlled, highly hydrated floc; the reaction is more rapid and complete; less alum is necessary; and it does not break up in getting to the filters. Mud balls form less rapidly. The optimum Na aluminate dosage, 2.1 p. p. m. (0.125 grain), is kept const. while the

alum dosage is varied to maintain a turbidity of not more than 0.2 p. p. m. in the filtered water. Chemicals cost \$0.092 per million gal. of raw water treated. This is offset by a corresponding saving of \$0.051 in wash water used, better efficiency of plant operation and improved water supply. Charts show the improved bacteria and microorganism removal. The filtered water is chlorinated, the residual Cl av. 0.07 p. p. m. C. H. B.

The action of permutite in softening industrial waters. I. MUTTI AND M. BASINI. *Ann. chim. applicata* 18, 387-94(1928).—When both Ca and Mg salts are present sodium permutite (NaP) reacts to a greater extent with the Mg salt. When Mg salts alone are present, CaP will react so as to transform completely the Mg salts, whereas, MgP will only react to a partial extent with Ca salts. When Ca and Mg salts react separately with NaP, then the Ca salt is transformed to a greater extent, as would be predicted from its greater mol. wt. The explanation of the apparent exception to this rule in the case when the salts are both present at the same time is clear from the above considerations, CaP being formed at first almost completely, but this in turn reacting with the Mg salts present as this reaction takes place more readily. A. W. CONTIERI

Filtering and washing process in open installations for removing iron. G. THIEM. *Gas u. Wasserfach* 71, 852-4(1928).—The method and theory of washing the filters are discussed and illustrated for fine and coarse filters. R. W. RYAN

The electroosmotic water-purification process of the Siemens-Elektro-Osmose G.m.b.H. KURT ILLIG. *Siemens-Z.* 8, 349-58(1928).—A more detailed exposition of the process and app. described in *C. A.* 22, 470. Only magnetite anodes are fully successful. The cathodes may be of almost any metal; Fe, Zn and Sn are used. Vulcanized fiber is used for all diaphragms except at the anodes in the last stages, where chrome gelatin is used. The app. is supplied in four sizes, with capacities of 2.5-250 l. per hr. 110 or 220 v. can be used. The cells are built of rubber-coated steel, with hard-rubber or hard rubber-coated steel separators. The initial cost is higher than for thermal app., but the space required and operating cost are much less. 15-40 kw. hrs. per cu. m. is the energy consumption, as against 139 for the most efficient distn. equipment. The app. is as yet too costly for the production of large quantities of pure water for boiler feed, but a comprehensive research program is under way looking to the development of higher-capacity app. built in more economical fashion. App. is also being developed for the many places in which only a few liters per day are required. At this time the yearly production of electroosmotically purified water is about 15 million liters. B. MILLER

The use of copper coils in distilling apparatus for the preparation of distilled water. H. W. VAN URK. *Pharm. Weekblad* 65, 1075 7(1928).—Unless the Cu is protected by a coating of Sn, traces of the metal are likely to be found in the distd. H₂O. A. W. DOX

Chemical disposal tanks. DANIEL FLORENTIN. Paris Municip. Chem. Lab. *Tech. Sanit. Munic.* 23, 169 72(1928).—The septic tank with its system of biol. purification does not give the desired results under all conditions. Chem. destruction of contaminated sewage is safe and easy of accomplishment. A charge consisting of 12 kg. NaOH scales in 30 l. of H₂O should last a family a yr. and the % of NaOH or Na₂CO₃ should never fall below 2 or offensive odors may result. Two installations were studied over a period of 1 yr. with inconclusive results. More data are necessary before definite recommendations can be made. C. R. FELLERS

Decomposition of cellulose. H. HEUKELEKIAN. N. J. Agr. Expt. Sta., *Ann. Rept.* 1927, 272 84; *Pub. Health Eng. Abstrs.* E-545, 32(1928).—Expts. were carried on during the past yr. in an effort to study the fundamental processes of sludge digestion, not from the standpoint of changes in bacterial life, but as measured by the decompn. of org. material. Two methods were employed: (1) following the changes in the cellulose content of digesting material and (2) adding cellulosic substance to ripe sludge and following the changes induced. The native cellulose of fresh solids as well as cellulose added to ripe sludge in the form of filter paper decompn. rapidly; the decompn. of cellulose takes place in the early part of the digestion, mainly during the first 3 weeks. The decomp. of cellulose gives rise to acidity, which retards the general course of the digestion. Cellulose decompn. takes place under acid conditions, but the addn. of CaO accelerates the rate of decompn.; the decompn. of cellulose is accompanied by the production of gas, the vol. of which is much smaller than that produced in the decompn. of an equal quantity of mixed org. matter in fresh solids. There is a lag of 5 or 6 days before the decompn. of cellulose starts while the rapidity of the decompn. of cellulosic substances is correlated with their cellulose content. The cellulose content of the solids collected from the inlet end of an Imhoff tank is higher than that from the outlet end. The digestion of the material from the inlet end was similar to the type of digestion obtained from the mixt. of solids. The material from the outlet end had a shorter period

of acid digestion, lower acidity and a higher alky. and higher ash content than the material from the inlet end. C. R. FELLERS

The determination of NO_2 in air and its usefulness in industrial hygiene (KOHNE-ARREST) 7. Preventing and removing incrustation in boilers (Brit. pat. 287,196) 4.

Apparatus for purifying water by electric treatment. WM. M. MYERS (to Earle H. Roraback). U. S. 1,691,731, Nov. 13.

Apparatus for softening or purifying water with base exchange materials. ROBERT H. THOMSON and HAROLD S. LAWRENCE (to United Water Softeners, Ltd.). U. S. 1,691,862, Nov. 13.

Automatic valve-control system for base-exchange water-softening apparatus. UNITED WATER SOFTENERS, LTD., R. H. THOMSON and H. S. LAWRENCE. Brit. 288,018, March 11, 1927.

Settling tank for separating sludge from sewage after activation treatment, etc. G. S. BINCKLEY, S. W. BINCKLEY and M. J. BINCKLEY. Brit. 287,611, Dec. 17, 1926.

Treating floating sewage sludge in digestion chambers. KARL IMHOFF and FRANZ FRIES. U. S. 1,690,682, Nov. 6, Mech. features. An app. is described.

15—SOILS, FERTILIZERS AND AGRICULTURAL POISONS

J. J. SKINNER

A new soil map of Yugoslavia. KOCH. Geol. Museum, Zagreb. *Ernähr. Pflanze* 24, 361-2(1928).—The map is reproduced and discussed. LAWRENCE P. MILLER

Timiriazev and the Timiriazev Agricultural Institute. R. B. HARVEY. Cambridge Univ., England. *Plant Physiology* 3, 227-30(1928).—A brief biographical sketch of Clement Arkadevich Timiriazev, the noted Russian plant physiologist, together with an account of the work of the Academy in Moscow named after him. The paper is illustrated with 3 plates. WALTER THOMAS

Contribution to the study of soils. III. The absorbent power of soils with respect to ammonia. J. CLARENS and PERON. *Bull. soc. chim.* 43, 962-9(1928).—The annual study of the soil from the point of view of its reaction with respect to alkalies by the hydroquinone method for example, the detn. of the bases and of the replaceable acid radicals, gives useful indications of the reserves of the soil, and, consequently of the lime, the nature and the quantity of the amendments and of the fertilizer to employ. E. F. SNYDER

Electrodialysis of soils. III. Effect of different fertilizer treatments of soils on the bases and acids extracted by electrodialysis. HARRY HUMPHELD. Iowa State Coll. *J. Am. Soc. Agron.* 20, 1141-59(1928); cf. *C. A.* 22, 836.—Advantages of electrodialysis of the soil as compared to the detn. of replaceable bases by the neutral salt method are given. The dialysis of 3 widely different soils shows that satisfactory end points were secured with each soil. Fertilizer treatments over a term of years have a measurable effect on the quantities and kinds of extractable acids and bases. The effect of treatments of rock phosphate on the P and of superphosphate on the P and S were especially striking. Applications of farm manure seemed to cause a slight decrease in the total bases extd. A change of soil type within a range of plots may have a greater effect on the amts. of extractable acids and bases than any of the treatments. E. F. S.

Electrodialysis of soil. K. N. TARANOV. *Ukrainskii Khim. Zhurnal* 3, No. 2, Pt. techn. 89-112(1928).—The electrodialysis of four different samples of soil was investigated with d. c. and a cell consisting of 3 sections sepd. by collodion membranes. By means of electrodialysis a definite amt. of bases (Ca, Mg) and of phosphoric acid can be extd. This amt. coincides with amts. obtained by usual methods applied in the study of soils. The p_H of the soils decreases very markedly as the result of dialysis. The H ions in the electrodialyzed soils should be sepd. into 2 rather distinct groups: H ions replaced by neutral salts and those replaced only by basic salts. The hygroscopicity of soils decreased on dialysis. G. B. KISTIAKOWSKY

Systems of soil survey. V. J. KONINGSBERGER. *Facts About Sugar* 23, 1166-7(1928); cf. Willcox, *C. A.* 22, 4701; Earle, *C. A.* 23, 228.—The system used by Bennett and Allison in Cuba and that used by Arrhenius in Java may be likened to taxonomy and physiology, resp., involving two different technics that cannot be compared. The Paserocean expt. station uses both and considers them equally important but independent. Arrhenius' work in Java would have been impossible if the data from the

former had not been already available. Practical aspects of soil surveys. O. W. WILLCOX. *Ibid* 1167.—W. replies to K.

M. J. PROWITT

Muck-soil reaction as related to the growth of certain leaf vegetables. E. V. HARDENBURG. Cornell Univ. *Plant Physiology* 3, 199-210(1928); cf. Rhode Island Expt. Sta., *Bull.* 160.—Lettuce, mustard, endive and parsley were grown in pot cultures on a highly fertilized low-lime muck soil (p_H 5.0). S , $Al_2(SO_4)_3$ and $CaCO_3$ were applied in varying amts. to provide a soil reaction ranging from p_H 4.0 to p_H 7.0. Because of the highly buffered nature of the muck, none of the treatments provided as wide a range of H-ion concn. as expected. Even 10 lime applications at the rate of 10 tons per acre did not give a p_H value greater than 7.0. S proved more active than $Al_2(SO_4)_3$ as an acidifying agent. No trace of Al toxicity was evident in any of the 4 vegetables from the 8000-lb. application of $Al_2(SO_4)_3$; this was due apparently to the buffer influence of the muck soil. The largest top wts. of lettuce were obtained within a p_H range of 5.0 to 6.5. The increased applications of lime to lettuce reduced the growth of both top and roots, decreased the total ash content, and the absorption of Al , Fe and Ca to a moderate extent. This influence is explained on the basis of change in permeability of the root tissues, which reduced the intake of the elements mentioned and probably of other nutrients as found also by Crist (*C. A.* 20, 3310). Parsley and endive appear to respond to decreasing acidity more consistently than either lettuce or mustard. No obvious correlation between H-ion concn. and root-and-top ratio exists for lettuce, mustard and parsley. Root development in endive appears to be favored by a culture medium which approaches neutrality. The water requirement of lettuce, mustard and parsley increased rather markedly with each increase in lime application. There was a corresponding, though much less marked, decrease in the water requirement of endive for each increment of lime. With all 4 vegetables, the max water requirement was reached in the more acid cultures. WALTER THOMAS

Soil alkalinity on recent burns. ROBERT MARSHALL AND CLARENCE AVERILL. Northern Rocky Mountain Forest Expt. Sta., Montana. *Ecology* 9, 533(1928).—Although forest soils are normally acid, the logical explanation for the alk. character of recent burns lies in the alky. of wood ashes. It is suggested that such alky. may contribute to the scarcity of reproduction in the western white pine type during the first 2 or 3 yrs following large fires, until leaching has removed the lye from the soil.

E. F. SNYDER

A type of bacteria abundant in productive soils, but apparently lacking in certain soils of low productivity. H. J. CONN. N. Y. Agr. Expt. Sta., *Tech. Bull.* 138, 1-26 (1928).—A species of bacteria, apparently not described before, has been found abundantly in good soils of this region, but is almost lacking in certain soils not so well suited for the growth of general crops, notably Volusia silt loam and Hoosick coarse sandy loam. This organism is here named *Bacterium globiformis*, n. sp. *Bact. globiformis* is unable to grow in acid soils, and the 2 soils of low productivity just named are both acid in reaction. Liming, nevertheless, is not sufficient to allow this organism to thrive in them if it is inoculated into the soil after sterilization. In addn. a suitable C and N source must be supplied. In either of these soils this organism is able to grow readily if furnished with N in the form of an NH_4 salt or an amino acid, and C in the form of a sugar, a polyhydric alc. or one of certain org. acids. Even an acid as simple as acetic is an available source of C. A further study of the physiology of this organism seems desirable in order to learn why certain soils fail to support its growth. C. R. F.

Response of oats and soy beans to manganese on some Coastal Plain soils. L. G. WILLIS. N. C. Agr. Expt. Sta., *Bull.* 257, 1-13(1928); cf. *C. A.* 22, 3013.—Unproductive spots occur in fields throughout eastern N. C. on which corn is stunted and soy beans are chlorotic. Typical cases of the chlorosis have been remedied by applications to the soil of $MnSO_4$ after the chlorosis had developed. Such treatment was without effect on corn planted with the soy beans. Soils producing this condition are approx. neutral or alk. while adjacent soils bearing normal crops are acid. Chlorosis similar to that responding to Mn treatment has long been considered evidence of K_2O deficiency, since K_2O fertilization has been found an effective remedy. The prevalence of this type of chlorosis on soils having poorly drained or impervious subsoils is taken to indicate that the comparative immunity of crops on other soil types may be due to greater root development into the more penetrable lower horizons. Results of pot expts with oats show that injury caused by applications of CaO or $Ca_3(PO_4)_2$ to a soil which was deficient in Mn for soy beans can be prevented by the addn. of $MnSO_4$.

C. R. F.

The drift in potential of the quinhydrone electrode. L. D. BAYER. Ohio Agr. Expt. Sta. *J. Am. Soc. Agron.* 20, 1125-40(1928).—The fluctuation in p_H values

measured with the satd. calomel, 0.05 *N* K H phthalate, and 0.01 *N* HCl plus 0.09 *N* KCl electrodes varied with different soils. The calomel cell is preferred because of its stability. Electrodes such as the Pt cone, Pt foil, Pt gauze and Au foil showed significant differences in results. Mech. stirring reduced the deviations in the p_H values of these soils. The lower part of the soil suspensions tended to be more acid than the upper. Recrystd. quinhydrone did not materially affect the changes in p_H when compared with a good com. product. The deviations in p_H were not influenced by passing CO₂-free air or H through the soil suspensions. Allowing the soil-water mixts. to stand overnight did not reduce the p_H fluctuations. The care of the metallic electrodes is of prime importance. A soln. of definite p_H or a control soil is used to check the accuracy of the electrodes. The more nearly correct reading is obtained at least 1 minute after the electrodes are immersed in the soil suspension. E. F. SNYDER

The actual acidity of the podzol soils and the influence of liming. NIL P. REMEZOV. *Trans. Sci. Inst. Fertilizers* (Moscow) No. 42, 5-26(1927).—With the aid of the Gemmerling-Sabanin sampling tube as described by Kachiinskii (Soil Moisture and Methods of studying it, 2nd ed. Novaya Derevhya, Moscow, 1924) soil samples were obtained in glass cylinders. The soil in these cylinders, which are a part of the sampling app., remains in natural condition. The soil is brought to its moisture-holding capacity and then forced out as the soil soln. by the Schlösing method. It is shown that in the same field the p_H varies, depending on the meteorological and biological factors. The fallow plot showed a higher acidity. In the unlimed plots the acidity increased with the increase of nitrates. The reverse was true on the limed plots. A satd. soil shows a higher acidity than a dried soil. On the podzol type of soil the acidity increases with the depth of the horizons. J. S. J.

The qualitative and quantitative determination of replaceable sodium in alkali and non-alkali soils. R. H. BRAY. Univ. of Illinois. *J. Am. Soc. Agron.* 20, 1160-6 (1928).—Barber and Kolthoff's method for the rapid detn. of Na has given satisfactory results when applied to replaceable Na in soils. A qual. test for replaceable Na is proposed which is sensitive to amts. as low as 0.02% replaceable Na. E. F. SNYDER

Mineral content of pastures. Lime-deficient areas and a hitherto unsuspected malnutrition disease in sheep. B. C. ASTON. *New Zealand J. Agr.* 37, 145-51(1928); cf. *C. A.* 22, 4182.—Bone-weakness in animals grazed on certain burned-over N. Z. soils of volcanic origin was traced to a deficiency of Ca in the soil. The soils were highly acid, having in some cases a lime requirement of 10 tons per acre, and unlimed pastures were characterized by vegetation which thrives on acid soils. K. D. JACOB

The causes of plant suffering from overliming. I. V. BOBKOV, B. A. GOLUBER AND A. F. TYULIN. *Zhurnal Oputnoi Agronomii* (Russia) 23, 165-202(1927).—Overliming may cause injury not only to peat soils, but also to mineral soils, especially on light forest virgin soils. The addn. of lime to such soils increases the alky. of them and intensifies the biological processes. The result is an increased quantity of lime, bicarbonates, ammonia, nitrites (sometime) and nitrates in the soil soln. In some of the expts. it was noted that the plant suffered because of an accumulation of NH₃. After the disappearance of the NH₃ the plants recuperated. Application of excessive amts. of lime to heavy soils did not impede the growth of plants even though the alky. increased; neither was there any accumulation of N on these soils. J. S. JOFFE

Investigational work with fertilizers. FRANK T. SHUTT. Dept. Agr., Canada. *Rept. Dominion Chemist, Year Ending March 31, 1927*, pp. 5-13(1928).—Urea gave results which compared closely with mixts. of NaNO₃ and (NH₄)₂SO₄ as a source of N for potatoes. Cyanamid gave lower results, particularly when applied at time of planting. The 13-48 and 20-20 grades of ammo-phos both gave results which were practically the same as those obtained with equiv. mixts. of NaNO₃, (NH₄)₂SO₄ and superphosphate when applied to potatoes and turnips on light sandy loam and clay loam soils. Superphosphate was more effective than Sydney fortified basic slag as a source of P₂O₅ for turnips. K. D. JACOB

Gore experimental area. Notes on operations, season 1927-28. R. MCGILLIVRAY AND J. E. DAVIES. *New Zealand J. Agr.* 37, 120-4(1928).—Superphosphate had a deleterious effect on the germination of swedes, the plants remaining yellow and their growth being uneven for some time. Superphosphate gave the lowest yield of swedes and Seychelles Island phosphate the highest, the yields with Ephos basic phosphate, Walpole Island phosphate, sulfurophosphate and Nauru Island phosphate being intermediate when all fertilizers were used at the rate of 200 lb. per acre. K. D. JACOB

Fertilizer experiments in the Jaroslav district. M. D. BAKHULIN. *Trans. Sci. Inst. Fertilizers* (Moscow) No. 40, 5-64(1927).—B. summarizes all the available information on the fertilizer expts. of the districts with rye, oats, flax, potatoes, root crops,

clover and meadow hay. It has been established that the different types of loam and sandy soils responded favorably to fertilizers. In this district P does not seem to be the min. factor, except in a few cases, especially with rye. J. S. JOFFE

The use of rock phosphate flour. A. N. LEBEDYANTZEV. *Trans. Sci. Inst. Fertilizers* (Moscow) No. 34, 18-20(1926).—L. presents a program of research on the use of rock phosphates in place of superphosphate, not only for the zone of podzol and degraded chernozem soils, but also for the chernozem zone and the southern chernozems which blend into the brown chestnut soils. The expts. at the Shotilov station are cited, whereby it is shown that raw phosphate when finely ground—0.02 mm. and lower—gave just as good results as sol. phosphates applied in the form of Na_2HPO_4 . J. S. JOFFE

The work of the Engelhardt regional agricultural experiment station with raw phosphates. V. N. POSTNIKOV. *Trans. Sci. Inst. Fertilizers* (Moscow) No. 34, 33-6 (1926).—Comparative expts. on the use of various sources of P conducted for a period of 11 years show the value of raw phosphate on podzol unsatd. soils. J. S. JOFFE

Lime and phosphoric acid in the soil. M. A. EGOROV. *Trans. Sci. Inst. Fertilizers* (Moscow) No. 34, 37-45(1926).—Data are presented to show that $\text{Ca}(\text{HCO}_3)_2$ is the form of Ca which ties up the P_2O_5 in the soil. The greater the amount of CO_2 in the soil, the smaller is the effect of acid phosphate. At the same time in certain loam soils the P_2O_5 was parallel with the Fe and not with the Ca. J. S. JOFFE

The phosphate nutrition of plants and soil acidity; a contribution to the question of rock phosphate fertilizing on chernozem soils. E. V. BOBKOV AND A. L. MASLOVA. *Trans. Sci. Inst. Fertilizers* (Moscow) No. 39, 5-38(1926).—Six types of soil were used: 3 chernozem varieties, 2 loam (dark gray forest and podzolized light) and a coarse-sandy soil. Ten g. of each soil were treated with 100 cc. solns. contg. 2, 4, 6, 9 and 12 cc. of 0.1 N HCl or 4, 7, 10 cc. 0.1 N $\text{Ca}(\text{OH})_2$, left for 24 hrs., filtered and the filtrate was analyzed for P_2O_5 , CaO, Fe_2O_3 and p_{H} . The forest loam with an original p_{H} 6.8 began to give up its P_2O_5 soon after the smallest quantities of acids were added; at p_{H} 6.2 14.3 mg. P_2O_5 were found against 8.6 mg. in the original soil; at p_{H} 5.3 the P_2O_5 content went up to 45.7 and at p_{H} 3.69 (12 cc. HCl added) 113.4 mg. Two varieties of chernozem and the podzolized loam did not show any increase in P_2O_5 until the p_{H} reached 4.0, although the original p_{H} of these were close to that of the other loam, namely, 6.81, 6.4 and 5.9. In the sandy soil the p_{H} had to go down to 2.5 to show any increase in P_2O_5 . All soils released more Ca as the acidity increased. The soil forest loam which released most of the P_2O_5 released the largest amt. of Ca. This did not release any Fe with the addn. of even 6 cc. HCl. The same was almost true for the other soils. Thus the P is apparently combined with the Ca cation. Vegetation expt. on the soils mentioned showed that the soils which released its P most readily did not respond to P fertilizers. The Neubauer method permits the detection of the influence of finely ground phosphates in the soils which respond to P fertilizers in the vegetation expts. It is suggested that the P content of a soil as shown by the titration curves may give an index of the P requirements of the soil. J. S. JOFFE

Experiments with lime and phosphates on the Kriukovo and Volokolamsk experimental plots in 1925. S. V. SHCHERBA. *Trans. Sci. Inst. Fertilizers* (Moscow) No. 41, 39-84(1927).—Applications of lime—150 to 1500 poods per desyatina—gave slight positive effects on oats with very marked residual effect on rye. The 1200 to 1500 poods of lime gave an increase of over 130% on vetch and oats as a result of the residual effect of liming the rye. Barnyard manure alone gave just as good results as lime; the addn. of both materials showed an additive effect. The residual effect of the lime was twice as large as that of manure. Phosphates (untreated) gave no increase when added with manure; by itself it did increase the yield of rye. Six poods of phosphates gave just as good results as 12 and 18 poods per desyatina (a pood equals 36 pounds; a desyatina equals about 2.7 acres). The soils of the exptl. field are of the heavy type. J. S. JOFFE

Tricalcium phosphate in phosphorites. Solubility of tricalcium phosphate in decinormal nitric acid. MASSIMO TRAMONTANO. *Atti accad. fisiocrit. Siena* 1928, 405-9.—By treating 5 g. of phosphorite with 500, 654.5 and 1.000 cc. 0.1 N HNO_3 at the ordinary temp., agitating for $\frac{1}{2}$ hr., taking the quantity of soln. equal to 1 g. of product, pptg. with molybdic reagent, dissolving the ppt. in 2.5% NH_4OH , and pptg. with magnesia mixt. it was found that pure $\text{Ca}_3(\text{PO}_4)_2$ is completely sol. if enough acid is to absorb 2 atoms of Ca (128.5 cc. = 1 g. $\text{Ca}_3(\text{PO}_4)_2$). The fact that the theoretical quantity of HNO_3 is not sufficient for a complete soln. of the phosphate is due to the soly. of the numerous salts present. 0.1 N HNO_3 must not be employed for detg. % of P_2O_5 in phosphorites assimilable by plants, because the acid affinity of the HNO_3

is greater than that of the vegetable acids more usually present in plants. 0.1 N HNO_3 can be used to det. total P_2O_5 in phosphorites. A 1% soln. gives better results. R. S.

The absorption of phosphoric acid by the soil. V. V. GEMMERLING. *Trans. Sci. Inst. Fertilizers* (Moscow) No. 34, 46-50(1926).—Gemmerling presents data which show that the main mass of mineral phosphoric acid in red and podzolized soils is bound with the sesquioxides and not with the Ca; in chernozem soils the largest portion of phosphoric acid is combined with Ca and possibly Mg. J. S. JOFFE

The application of lime. D. N. PRYANISHNIKOV. *Trans. Sci. Inst. Fertilizers* (Moscow) No. 34, 51-4(1926).—A theoretical discussion on the probable role of Ca in the various soil reactions. J. S. JOFFE

The microbiology of soils in relation to liming and phosphate applications. E. E. USPENSKII. *Trans. Sci. Inst. Fertilizers* (Moscow) No. 34, 65-71(1926).—The work conducted at the institute warrant the following theses: (1) NO_2 , NO_3 and other products of microbial metabolism detns. are not sufficient for the evaluation of the role of microbes. (2) In solving the problem of liming and P application more attention should be paid to *Azotobacter*, denitrifiers, nitrifiers and *B. mycoides*. The biol. retrogression of phosphoric acid is connected with the total number of microbes and the number of acid formers. Wherever peat is involved the urea bacteria enter the field. The protozoa are not important under field conditions. (3) An account of the number and state of the microbial flora under conditions of liming and P applications gives indications of the transformation of P and N in the soil. (4) Liming to a reaction beyond the neutral point (p_H 7.6) increases the activities of the denitrifiers. J. S. J.

The value of peat as a material for the preparation of composts and peat manure. D. N. PRYANISHNIKOV. *Trans. Sci. Inst. Fertilizers* (Moscow) No. 34, 72-5(1927).—Peat added to sand cultures with K and P_2O_5 salts efficiently supplied the nitrogen to plants. Composting peat with raw phosphates showed that the phosphorus becomes water-sol. Alk. composting of peat (4% of wood ashes or equivalents of CaO) brought 12% N into sol. state in 72 days. Inoculation of the composts with manure exts. did not increase the efficiency of the composts. J. S. JOFFE

Citrus chlorosis as affected by irrigation and fertilizer treatments. P. S. BURGESS AND G. G. POHLMAN. *Ariz. Agr. Expt. Sta., Bull.* 124, 183-232(1928).—For the past 8 or 10 yrs. many of the older citrus groves in Ariz. have been deteriorating both in yield and in quality of fruit produced. The leaves are chlorotic, the set of fruit is small and in many cases much dead and weak wood is in evidence. As the poor conditions noted have been brought about, not by org. diseases, but apparently by a general physiol. derangement of the trees, this work was done in an endeavor to find whether certain soil treatments might not be of value either in preventing a further decline, or in actually improving present conditions. The lab. work on the soils included mech., chem. and bacteriol. studies. They showed the soils to be free from toxic concns. of the alkali salts, but fairly high in CaCO_3 and alk. in reaction, p_H 8.1 to 8.5. Total N was low in all cases but its availability was high. Total P_2O_5 was fairly high but its availability was slight. The bacteriol. studies indicated a fair degree of microbiological activity. N fixation was especially high. Soil soln. studies are reported together with results from the use of various salts as clay coagulants. The mech. analyses and soil profiles of the important citrus soil types are discussed. From this lab. work it appeared that org. matter, N and sol. phosphates should be of value on the soils in question. The fertilizer and soil-amendment studies were conducted in 8 or 10 of the poorer groves, both in the Salt River Valley and on the Yuma Mesa. Both surface applications and deep treatments were included. Although a slight improvement was usually shown where both manure and double-superphosphate were applied deeply, the results of the fertilizer treatments were largely negative. Spraying the chlorotic foliage with FeSO_4 and MnSO_4 also was without permanent effect. The field moisture-control work was extremely successful. Where the irrigation program was changed to conform to the information secured from the soil-moisture studies, a remarkable recovery usually took place. After 1 or 2 yrs. of work several of the older chlorotic groves appear to be well on their way towards profitable production. It appears best to give a heavy irrigation, 5 to 6 inches in basins, and then allow the soil to approach closely the wilting point before another irrigation is given. This gradual drying-out between irrigations permits of thorough soil aeration, which is of great importance in citrus culture. Pot-culture work with grapefruit seedlings in the greenhouse showed that excessive amts. of CaCO_3 in the substratum caused chlorosis but that this condition could be alleviated to a large extent by the application of org. materials. Peat and muck gave the best results followed by alfalfa and manure. C. R. F.

Results of experiments on the Dolgoprudnoe experimental field for the year 1925.

N. G. KOSHECHKIN. *Trans. Sci. Inst. Fertilizers* (Moscow) No. 41, 5-37(1927).—Limestone at the rate of 600 poods per desyatina (1 pood equals 36 pounds; 1 desyatina equals about 2.7 acres) without barnyard manure and with 1200 poods, 2400 and 3600 on rye showed that lime alone had no effect. With the highest application of manure the increase of grain was 37.8%. With oats the lime alone gave almost as much of an increase as lime with the highest amt. of manure. Lime without and with N, K and P fertilizers showed that without lime the effect of the fertilizers was not noticeable, except with phosphates.

J. S. JOFFE

Variation in alkaloid content of the pomegranate due to certain soil treatments. E. MAURIN. *Bul. soc. bot. (France)* 75, 280-2(1928).—The alkaloid content of the pomegranate was more than doubled by the application of CaHPO_4 or a soln. of thorium X to the soil. $(\text{NH}_4)_2\text{SO}_4$ and FeSO_4 were only slightly less effective, but K_2SO_4 reduced the alkaloid content. The favorable treatments should be of commercial importance for growers who raise the pomegranate for its alkaloid content. A. E. HITCHCOCK

An interpretation of the results of fertilizer experiments carried out in N. W. Occ. Negros. ROBERT L. PENDLETON AND V. G. LAVA. *Sugar News* 9, 652-7(1928).—The conclusions were based upon data from about 50 reports by different workers, and were reached with the use of "Students" method of calcg. odds. The variety used was Negros Purple. The region was grouped into (a) the low nearly flat recent alluvial soil comprising the Silay series of brown to gray brown color of andesitic origin, the Isabela dark heavy soils, and the Pulupandan light coastal soils both of andesitic and calcareous origin; and (b) the irregular slightly to deeply eroded older uplands comprising the Guimbala-on series of brown or grayish brown soils, the Santa Rosa series of dark-colored soils, the poor Bago soil and the Guimbala-on "volcanic ash" soils. In lowland soils (1) 250 kg. of $(\text{NH}_4)_2\text{SO}_4$ per hectare produce an av. increase of about 44 piculs of sugar; (2) 500 kg. $(\text{NH}_4)_2\text{SO}_4$ per hectare produce an increase of about 57 piculs sugar; (3) 624 kg. of ammophos per hectare give an av. increase in yield of about 60 piculs sugar; (4) 2000 kg. of slaked lime gave no significant increase in yield; (5) 2000 kg. per hectare of copra coke give an av. increase in yield of about 37 piculs sugar (in mixed upland and lowland). In upland soils: (6) 500 kg. of $(\text{NH}_4)_2\text{SO}_4$ per hectare give no significant increase in yield.

V. G. LAVA

Fertilizer experiments at Binalbagan. GREGORIO B. LONTOK. *Sugar News* 9, 170-2(1928).—The object of the expt. was to find out whether or not P_2O_5 and K_2O are needed in the district. First ratoons of Negros Purple cane were used on a silt loam. The fertilizers used were ammophos (16% N, 20% P_2O_5), "Big Crop" (10% N, 6% P_2O_5 , 2% K_2O), "Filfer" (17% N, 6% P_2O_5 , 3.5% K_2O) and $(\text{NH}_4)_2\text{SO}_4$ (20% N). All of the plots were given 100 kg. of N per hectare. The yields in piculs of sugar per hectare, together with % P_2O_5 and K_2O in the juice, are as follows: $(\text{NH}_4)_2\text{SO}_4$: 96, 0.068, 0.091; ammophos: 92, 0.066, 0.081; "Filfer": 85, 0.074, 0.075; "Big Crop": 82, 0.073, 0.073; control: 26, 0.108, 0.075. It is concluded that N is the only element that should be applied to the soil as fertilizer.

V. G. LAVA

Increasing sugar yields per hectare by application of ammonium sulfate in the Laguna-Batangas District. MANUEL L. ROXAS. *Sugar News* 9, 450-9(1928).—The application of 250 kg. per hectare of $(\text{NH}_4)_2\text{SO}_4$ to different soil types in the Laguna-Batangas district produced in 1927-28, a yr. of pronounced drought, about 33% more sugar than the unfertilized fields in the spring months; the increase was 54% in the 1926-27 season when the weather was more favorable. There were more heavier stools per hectare with $(\text{NH}_4)_2\text{SO}_4$. Under Luzon conditions it is suggested that the best time to apply the fertilizer is at time of planting.

V. G. LAVA

Magnesium fertilizers and nitrogen content of the wheat grain. M. JAVILLIER AND A. CREMIER. *Compt. rend. acad. agr. France* 14, 986-90(1928).—Mg as carbonate and as the silicate of colloidal Mg has not increased the N of the wheat grain.

E. F. SNYDER

The disappearance of nitrate under timothy. L. G. JONES. *Texas A. and M. Coll. J. Am. Soc. Agron.* 20, 1167-75(1928).—A study in pots was made of the ultimate fate of NO_3 when applied to Dunkirk silty clay loam soil growing timothy of different ages, and when added to similar soil kept free of vegetation. A complete inventory was kept of the income and outgo of NO_3 and of total N. The expts. were conducted over a period of 14 months. NO_3 disappeared in a comparatively short time when added to timothy sod. This disappearance during a given time was more complete from the soil growing timothy than from the bare soil. Where the crop was growing, this disappearance, the largest application of NO_3 excepted, was accounted for by the N taken up by the crop (roots and tops). At certain stages of growth the crop contained considerably more N than was contained in the added NO_3 . Considering the N of the

crop as "conserved," there was a net gain of total N by the soil where timothy was growing. Although not entirely conclusive, the figures indicate that added NO_3 may be lost from bare soil of this type by denitrification. E. F. SNYDER

The value of hairy vetch and crimson clover for green manure. R. P. BLEDSOE. Georgia Agr. Expt. Sta., *Bull.* 146, 188-208(1927).—Vetch cut when in full bloom contained 3.8% N. When cut earlier the N content was greater. Crimson clover cut in full bloom contained 2.9% N, and larger quantities when cut earlier. Calcns. are given showing the quantity of N added to the soil with varying dates of cutting green manure crops. J. J. SKINNER

Artificial farmyard manure. V. R. GREENSTREET. *Malayan Agr. J.* 10, 194-203 (1928).—Expts. were made to study the decompn. of grass and dry padi straw alone and with addition of Adco and sugar. The work was done with materials contg. an excess of pentosan over lignin. Conditions producing most efficient decay are alk., a sufficient supply of air, and a min. moisture content of 75%. Under the conditions of the expts. in the tropics, the materials decayed equally well without the addn. of the Adco provided it was kept alkaline. J. J. SKINNER

Insecticides and fungicides. FRANK T. SHUTT. Dept. Agr., Canada. *Rept. Dominion Chemist, Year Ending March 31, 1927*, pp. 66-73(1928).—*Sol. As in Ca arsenate-lime S sprays.*—Combined sprays of Ca arsenate and lime-S, the latter contg. 24.8% total S, with and without added lime, were prepd. and allowed to stand for 40 hrs. The supernatant liquid then contained 0.69% H_2O -sol. As_2O_3 . When lime was used the sediment contained 0.49% H_2O -sol. As_2O_3 and 1.42% when lime was not added. To avoid foliage injury, due to liberation of sol. As, only freshly prepd. combined sprays should be used and care should be taken to effect thorough agitation of the mixt. before use. *Oils for mosquito control.*—Continuous oil films on water could not be obtained with straight mixts. of light and heavy petroleum oils. Addn. of 0.004% soln. of NaOH in water or alc. caused the oil to spread evenly and rapidly in a continuous film when sprayed on water. Application of the treated oil at the rate of 1 ounce to 15 sq. ft. gave a continuous film, which remained for at least a week even though subjected to occasional heavy rains. *Adherence of arsenical sprays to apple leaves.*—The Pb arsenates in admixtures with limes showed superior adhesion to Ca arsenate in the same fungicide. Arsenicals when incorporated in the Al sulfate-lime S spray persisted on foliage for a longer period than when used in the straight lime-S mixt. Ca arsenate was more adhesive to foliage when present in Bordeaux mixt. than any of the arsenicals which can be used in lime-S sprays. *Analyses are given of a number of insecticides, fungicides, spraying oils, etc.* K. D. JACOB

Chemical methods of combating plant diseases. G. HILGENDORFF. Biol. Imp. Inst., Berlin. *Z. angew. Chem.* 41, 801-5(1928).—A discussion of the use of such plant disinfectants as Bordeaux mixt., S and As compds., nicotine, phenol and coal-tar solns. C. R. F.

Composition of fluorides and fluosilicates sold as insecticides. R. H. CARTER AND R. C. ROARK. Bur. Chemistry and Soils, Washington, D. C. *J. Econ. Entomol.* 21, 762-74(1928).—Samples of fluorides and fluosilicates from 14 manufs. were analyzed chemically and microscopically. NaF was detd. gravimetrically as CaF. Fluosilicates were det. volumetrically by titration in Pt dishes with standard NaOH free from SiO_2 and CO_2 , phenolphthalein being used as indicator. Moisture was detd. by drying at 110° for 3 hrs. The following method was used to det. the bifluorides: 0.5 g. sample is weighed into a Pt dish, 1.0 g. solid KCl added and the whole dissolved in 25 cc. water. 20 cc. neutral alc. is then added. The mixt. is cooled to approx. 0° , and titrated with standard NaOH free from SiO_2 and CO_2 until the red color of the phenolphthalein persists for 1 min. CO_2 was detd. according to Hepburn (*C. A.* 21, 1076) and the results were calcd. to Na_2CO_3 . p_H was detd. colorimetrically. An arbitrary method was used to ascertain the no. cu. in. per lb. consisting of a detn. of the wt. of material occupying a known vol. Twelve samples of com. NaF had the following % compn.: total F 40.3-43.9, NaF 89.2-98.8, NaHF 0-0.04, Na_2SiF_6 0-2.17, Na_2CO_3 0-4.39, moisture 0.004-1.02, impurities by difference 0.4-0.5, p_H of 2% soln. 6.8-10.5, cu. in. per lb. 21.9-51.2. The % compns. of 11 samples of com. Na_2SiF_6 follow: total F 57.1-60.3, Na_2SiF_6 94.4-99.8, NaHF 0.02-0.14, moisture 0.04-0.21, impurities by difference 0.14-5.5, p_H of 0.5% soln. 3.1, cu. in. per lb. 22.6-28.5. Four samples of MgSiF_6 gave total F 41.7-41.9, purity 100+%, p_H 0.5% soln. 3.0-3.1. A few figures are also given for CaSiF_6 , CuF_2 , BaF_2 , and cryolite. Analyses of 10 special mixts. and dusting powders are also given. NaF and Na_2SiF_6 may be obtained commercially in a satisfactory degree of purity. Com. NaF is higher in cu. in. per lb. than Na_2SiF_6 . Solns. of all fluosilicates give an acid reaction whereas solns. of NaF are neutral or alk-

line. The acidity of fluosilicate solns. may account for the burning of foliage which sometimes follows application. The addn. of a small quantity of $\text{Ca}(\text{OH})_2$ or Na_2CO_3 to fluosilicates to decrease acidity decomposes some of the fluosilicate in soln. to the fluoride without increasing the p_{H} value of the soln. The fluorine in soln. is pptd. by Ca as insol. CaF_2 . The size of the crystals affects their rate of soln. and therefore the time between application and insecticidal action, the effectiveness of the material as a dust and the adhering qualities of the dust particles. The other fluorides and fluosilicates available in a high degree of purity are: BaF_2 , cryolite, MgSiF_6 , CuSiF_6 , CaSiF_6 . Based on cu. in. per lb. the values for these compds. are low compared to Ca arsenate and other good dusting powders. Variations in crystal size, dusting qualities, adhesiveness and rate of soln. rather than in the F content are believed to cause the observed variations in apparent toxicity to insects of com. Na_2SiF_6 . Variations in effects on plant tissue of com. Na_2SiF_6 are probably due to variation in crystal size. C. H. R.

An operation in practical control of codling moth in a heavily infested district—second report. THOMAS J. HEADLEE. N. J. Agr. Expt. Station. *J. Econ. Entomol.* 21, 774-8(1928).—A report on procedure which resulted in 82% of apples picked being free from codling moth (*Carpocapsa pomonella*) injury. The timing, compn. and methods of applying insecticides (oil emulsions, lime-sulfur soln., nicotine, PbHAsO_4) were the most important factors in producing this result, but orchard sanitation measures play an important though minor part. C. H. RICHARDSON

Some macroscopical effects resulting from the fumigation of *Plodia* larvae with carbon disulfide in relation to revival potentialities. J. C. HAMLIN and W. D. REED. Bur. of Entomology, Washington, D. C. *J. Econ. Entomol.* 21, 783-8(1928).—Grown larvae of the Indian-meal moth (*Plodia interpunctella*) revive 1-2 weeks after fumigation with CS_2 (2 lb. per 1000 cu. ft. of space). The larvae which will survive may be detected by normal color, turgidity of the body and resistance to shriveling. Reviving larvae commonly show congestion of the intestinal tract which subsequently causes the death of some of them. Some larvae which survived a 6-hr. exposure to CS_2 ultimately developed into adults. C. H. RICHARDSON

Experiments on control of *Eutettix tenellus* (Baker). E. A. SCHWING. Spreckles Sugar Co., Sacramento, Calif. *J. Econ. Entomol.* 21, 790-1(1928).—The beet leaf-hopper may be controlled by a spray consisting of "Oronite fly spray," a com. petroleum oil product, emulsified with an aq. soln. of whale oil soap. Dilns. are given. C. H. RICHARDSON

Specifications for petroleum oils to be used on plants. E. R. DEONG. *J. Econ. Entomol.* 21, 697-702(1928); cf. C. A. 22, 4708.—Flash point, fire point, pour point, color and gravity or Baumé density are of little value in evaluating petroleum lubricating oils for insecticidal purposes. The presence of S as low as 0.05% may be hazardous to plant tissue. Oil emulsion contg. free S cannot be recommended at the present time. The distn. range is of little significance in field work except as an indicator of the proportions of volatile and non-volatile oils. Volatility is an important characteristic of insecticide oils. It is detd. as follows: A weighed quantity of the oil, usually 0.5 g., is placed on a sheet of asbestos paper 3 in. square and kept at a controlled temp. ranging from 50° to 100° according to the oil fraction used. Weighings are made every 24 hrs. until 95-100% of the oil has evapd. From duplicate samples a curve of volatility is obtained. The sulfonation test (Gray and DeOng, C. A. 20, 963) has been devised to det. the proportions of the chemically inert hydrocarbons of the paraffin series and the chemically active hydrocarbons of the aromatic and olefin series contained in petroleum oils. The presence of a larger or smaller quantity of these two classes of oils has been found to offer the best basis for the grouping of tolerable and intolerable fractions. The viscosity (Saybolt at 37.8°) of an oil is an important characteristic from the standpoint of evapn. and penetration. The present trend in the use of oils on citrus in So. Calif. is toward a viscosity of 35-80 sec. Expts. show that oils of almost 100% concn. of satd hydrocarbons may on exposure to air and sunlight break down through oxidation, yielding such quantities of acid as to become decidedly injurious to plant foliage. Oils differ greatly in their resistance to oxidation, a factor that may have entered into known instances of oil injury. A method based on that of Sligh (C. A. 19, 1491) is given for the detn. of degree of oxidation in lubricating oils. The acidity of oils oxidized by this method is detd. by titration as follows: 50 cc. of the oil are added to 50 cc. 95% alc. and 50 cc. 0.1 N NaOH. The mixt. is refluxed 1 hr. and the excess NaOH titrated with 0.1 N HCl with phenolphthalein as indicator. Expts. show that for use on foliage at summer temps. in Calif. petroleum oils should have an unsulfonated residue of 88-99%, the lower % being permitted for volatile oils of 40-50 sec. viscosity (Saybolt). These oils should also be stable and not easily oxidized.

Oils for foliage use at low temps. (7.2–15.6°) may be more viscous and less volatile. Such oils are apparently more effective for California red scale (*Chrysomphalus aurantii*) and for insect and mite eggs. Oils for use on deciduous trees during the dormant season should have an unsulfonated residue of 65–75%, and a viscosity of 85–120 sec. Resistance to oxidation is not so important for these oils as for oils intended for use on foliage. The lowered insecticidal value resulting from the use of highly refined oils may be partly compensated for by incorporation with them of more toxic compds. such as nicotine. Specially refined pine oils are useful for blending with petroleum oils.

C. H. RICHARDSON

The effect of certain hard water on the stability of cold mix lubricating oil emulsions. J. R. EYER AND F. M. ROBINSON. N. M. Coll. Agr. and Mech. Arts. *J. Econ. Entomol.* 21, 702–7(1928).—Petroleum lubricating oil was emulsified with com. casein-lime mixt. and dild. with certain hard waters from New Mexico. The action of these waters on the emulsion was detd. by a modification of the Herschel demulsibility test (U. S. Bur. Standards, *Bull.* 86, (1917); cf. C. A. 11, 537). Oil emulsions dild. with water contg. MgSO_4 in amts. greater than 5 parts per 100,000 were unstable, the oil sepg. out in proportion to the amt. of MgSO_4 present. CaSO_4 and NaCl , normal constituents of New Mexico hard waters, did not affect the stability of the emulsions. C. H. R.

Studies on the resistance of certain insects to hydrocyanic acid. A. M. BOYCE. Univ. Calif. *J. Econ. Entomol.* 21, 715–20(1928).—This paper is a progress report on the tolerance of insects to HCN and the possibility that this tolerance may be inherited. The existence of areas in Calif. where the California red scale (*Chrysomphalus aurantii*) and the black scale (*Saissetia oleae*) are so resistant to HCN that former doses no longer give adequate control, are discussed. The pomace fly (*Drosophila melanogaster*) was subjected to doses of HCN which consistently killed a high % of the flies. Seven generations were reared from the original parents and fumigated. An indication of slight development of resistance to HCN is shown. Expts. were also made with the melon aphid (*Ophis gossypii*) which gave similar results. Conclusion: Tests made so far have not shown that through continued selection any marked degree of resistance to HCN is developed by these insects. The expts. are being continued with other species of insects.

C. H. RICHARDSON

Spraying of rubber. HERBERT ASHLANT. *Bull. Rubber Growers' Assocn.* 10, 677–9(1928).—It is judged that in the past season (one of the worst for leaf-fall) rubber trees would have lost nearly 90% of their leaves except for spraying. Nothing has been found to be better than Bordeaux mixt., though Burgundy mixt. is practically as effective. At least 3.5 gals. per tree is necessary, the quantity being much more important than the concn. Well applied in adequate quantity, Bordeaux mixt. prevents secondary leaf-fall almost entirely. Lower proportions of CaO (down to 1.5 lb. per 4 lb. CuSO_4 per 50 gals. of water) gave as good results as the usual proportion or abnormally high proportions (up to 6 lb.), and the only advantage of a high CaO addn. is the greater visibility of the spray. Adhesives are advantageous only when much of the foliage is immature. Resin-soda is the best adhesive, whereas Na silicate is useless. Economically better results are obtained by spending the money not on adhesives but on a larger quantity of Bordeaux mixt.

C. C. DAVIS

The bud mite (blister mite) of the pear. WILLIAM B. PARKER. *J. Econ. Entomol.* 21, 676–7(1928).—The pear leaf blister mite (*Eriophyes pyri*) was not controlled with lime-sulfur (1%), highly refined petroleum oil emulsion (1–4% oil) or S applied as a dust.

C. H. RICHARDSON

A unit system for recording the results of insecticides against the citrus black scale. R. S. WOGLUM AND J. R. LA FOLLETTE. Calif. Fruit Growers Exchange, Los Angeles. *J. Econ. Entomol.* 21, 678–82(1928).—In evaluating the results of spraying operations, 5 units of scale-bearing branch, 6 to 10 inches long, are taken per tree and the no. of scale per unit detd. by counting. Units are taken from 40 trees per 10-acre block to give the rating of an orchard.

C. H. RICHARDSON

District Argentine ant control in citrus orchards. HAROLD J. RYAN. *J. Econ. Entomol.* 21, 682–90(1928).—Although an effective poison bait contg. Na_2AsO_3 has been used for some years to control the Argentine ant (*Iridomyrmex humilis*) in citrus orchards, the individual grower has not been able to suppress it effectively, because of renewed infestation from untreated orchards. This paper gives the details of a cooperative project in which 45,000 acres of citrus orchard were treated. A new cheap paper poison container was developed. A decrease of 50% in no. of infested orchards was obtained. Costs are given.

C. H. RICHARDSON

Poisons for cutworm baits. CLAY LYLE. Miss. State Plant Board. *J. Econ. Entomol.* 21, 748–50(1928).—Paris green was compared with Na_2SiF_6 as a poison for

the black cutworm (*Agrotis ypsilon*) and the fall armyworm (*Laphygma frugiperda*). The compds. were administered in a bait consisting of 50 lb. wheat bran, 1 lb. of the poison compd. and enough water to moisten. Paris green is more toxic and more rapid in its action than Na_2SiF_6 . *Agrotis* is more easily killed by these compds. than *Laphygma*.

C. H. RICHARDSON

The stimulation and immunization of beet seeds against blight. V. STEHLIK AND FR. NEUWIRTH. *Listy Cukrovar.* 41, 53-66(1928); cf. C. A. 22, 181.—(A) A review of 20 papers. (B) In lab. expts. seeds from 9 sources were grown upon sterile agar-beet media; all seeds developed *Phoma Betae*. Dry Betanal, Abavit B, Germisan 225 dry, Ostan, Tillantin C, Wet Betanal and Wet Germisan retarded growth of *Phoma Betae* for a few days but had no effect after that. In a very humid atm. Germisan was quite effective; in a dry atm. the infection appears later and acts more slowly. Distd. H_2O was found as effective as solns. of germicides. (C) Field expts. In one field the beet (seeds soaked in wet Germisan) developed less blight than the field control. In another field, the incidence of blight was greater for seeds treated with Germisan than for controlled fields. The soaking of seeds in germicidal solns. has no influence upon the yield of beets, does not increase the sugar content of beets or the yield of sugar. S. and N. advise discontinuing the practice.

FRANK MARESH

Grape culture and the present fight against disease. F. STELLWAAG. *Z. angew. Chem.* 41, 806-9(1928).—From 1 to $1\frac{1}{2}\%$ Bordeaux mixt. is most used against fungus. An org. Cu compd., "Nosperat," which when mixed with $\text{Ca}(\text{OH})_2$ is used as a spray. S is used against mildew. In fighting hay and wireworm nicotine or As is used. From 1 to $1\frac{1}{2}$ kg. of an 8-10% com. nicotine soln. is added to 100 l. spray soln. From 200 to 300 g. of cotton-oil soft soap is added as a spreader. Nicotine- SO_2 acts as a corrosive poison while raw nicotine is mainly a stomach poison. A mixt. is most effective. Arsenic is mixt. with Cu and $\text{Ca}(\text{OH})_2$ and used as a combined spray against fungus and worms. Trade names of com. compds. are given.

C. R. F.

Report on control of tomato mildew. W. H. RICE. *New Zealand J. Agr.* 36, 100-2(1928).—Dry flowers of S and several proprietary S dusts did not control tomato mildew (*Cladosporium fulvum*) on plants grown in hot-houses. The mildew was greatly reduced and growth of the plants favored by application to the soil of a mineral product, contg. approx. 25% free S, obtained from White Island (C. A. 22, 838). An excess of superphosphate favored mildew attack, while a predominance of K_2O retarded the trouble and N in excess also had a retarding effect on the disease.

K. D. JACOB

Transmission of tobacco mosaic. A. MOUTIA. *Rev. agr. Maurice* 5, 179-80 (1928).—Expts. have shown that tobacco mosaic may be transmitted to sound tobacco planted in soil on which diseased plants have grown previously.

F. W. ZERBAN

Constituents of the leaf and their relation to the burning qualities of tobacco (HALEY, *et al.*) 17. Examination of sprayed apples for arsenic (SHUTT) 12. Arsenical spray residue and its removal from apples and pears (HEALD, *et al.*) 12. The protection of plants and culture of beets along the Rhine (NEUWIRTH) 28. Withdrawing yeast from vats [for use as a fertilizing material] (Brit. pat. 287,052) 16.

Spent-soil compost. RICHARD H. MORRIS, 3RD. U. S. 1,691,077, Nov. 13. A bed of soil contg. 20% of fibrous peat mixed with 80% straw and horse manure is maintained moist and at a temp. of about 15° for over 3 months, while cultivating mushrooms in the bed; the peat used is primarily alk. and is inoculated with a substance such as HgCl_2 or a phenol deriv. which is toxic to mushroom disease germs, and the mat. is shredded to break up the fibrous portions and is uniformly mixed.

Nitrate fertilizer. COMPAGNIE NATIONALE DE MATIÈRES COLORANTES ET MANUFACTURES DE PRODUITS CHIMIQUES DU NORD RÉUNIES (Établissements Kuhlmann). Fr. 637,196, July 7, 1927. A granulated fertilizer is obtained by incorporating powd. and heated KCl or NaCl or a mixt. (sylvinites) of these in a boiling soln. of $(\text{NH}_4)\text{NO}_3$ of 80% or more, and mixing the whole; the water present is vaporized during the mixing.

Superphosphate fertilizers. LUIS ADELANTADO. Fr. 637,228, July 8, 1927. See Brit. 276,297 (C. A. 22, 2434).

Insecticide. HOWARD W. AMBRUSTER. U. S. 1,691,454, Nov. 13. An insecticide suitable for use on plants comprises a finely pulverized ore contg. native Fe arsenate.

Insecticide. MARIE LUCIE PIGNODOL. Fr. 637,673, May 25, 1927. A liquid insecticide contains oil of aspic, mirbane and pennyroyal.

Insecticides. ASSOCIATED OIL CO. Brit. 287,371, July 4, 1927. Fr. 637,716, July 13, 1927. Basic nitrogenous compds. suitable for use as insecticides are obtained

from the ext. sepd. in the purification of hydrocarbon materials such as petroleum or shale oils with liquid SO_2 . The ext. is treated with dil. H_2SO_4 or other suitable acid (used repeatedly if desired to obtain a high concn.) and the acid soln. is then neutralized with NaOH or other alkali and the free bases are distd. off, preferably in steam, and dried. The material may be mixed with a suitable petroleum oil, clay, diatomaceous earth or other material, for use, and may be used in free or sulfate form (using alkali with the sulfate to liberate the bases slowly in use).

Fungicides for seed or grain. I. G. FARBENIND. A.-G. Brit. 287,246, Dec. 20, 1926. As_2O_3 or arsenic acid or a salt of these As compds. is used together with a phenol or homolog contg. Hg in its nucleus and other substances may be added such as CuCO_3 , CuSO_4 , talc, gypsum or infusorial earth. A suitable mixt. comprises nitrophenol Hg 1.5, As_2O_3 1.5 and gypsum 97%.

"Immunizing" seed grain. I. G. FARBENIND. A.-G. Brit. 287,093, March 14, 1927. Org. As compds. such as aminophenylarsine oxide, to be used for immunizing seeds by dry or wet treatment, are converted into the colloidal state, suitably by a process such as described in Brit. 243,361 (C. A. 20, 3781) as applied to Hg compds. The colloidal As compd. may be mixed with talc and with other fungicides or bactericides.

Plant treatment. I. G. FARBENIND. A.-G. (Hans Wesche and Werner Ext, inventors.) Ger. 467,213, May 20, 1927. Seedlings are cauterized by a mixt. of sol. alkali org. compds. contg. Hg and salts of HCNS or HF , such as mercurized cresol-sodium and NaF .

16—THE FERMENTATION INDUSTRIES

C. N. FREY

The recovery of carbon dioxide from fermentation in distilleries and breweries. F. LÜDDE. *Apparatchau* 40, 229-31(1928)—Notes are given on the amt produced in Germany and the cost of liquefying.

J. H. MOORE

Synthesis of 2,3-butylene glycol and its nature, especially its odor. SUTERICH MARUYAMA AND TUNEDO HIGASHI. *Bull. Inst. Phys. Chem. Research (Tokyo)* 7, 934 9(1928); English Ed. 1, 90-1.—2,3-Butylene glycol has been detected in various fermentation products, specially in Japanese Saké and Shoyu. Its odor has been reported as resembling that of Shoyu, though Kekulé reported it to be odorless. The glycol was synthesized from BuOH through the butylene (Fourneau, C. A. 16, 2495), its 2,3-dibromide and the diacetate. Its constitution was verified by oxidation to diacetyl and pptn. of Ni dimethylglyoxime. The glycol is colorless and odorless. The odor previously reported is to be attributed to an unknown substance picked up from the fermentation materials.

A. L. HENNE

A talk on vinegar. A. E. ROWSE. *Fruit Products J. and Am. Vinegar Ind.* 8, No. 3, 15(1928).

J. A. KENNEDY

Black vinegar. Its cause and cure. CLYDE H. CAMPBELL. Penna. Dept. Agr., Harrisburg. *The Glass Packer* 1, 15 6(1928).—Neither tannin nor Fe alone will cause black vinegar; the proper ratio of both is necessary. The usual sources of Fe in vinegar are Fe pipes, tanks, connections, rust from barrel or tank hoops, and accidental Fe contaminations. Black vinegar has a very objectionable metallic, astringent taste. To reclaim such discolored vinegar, the addn. of tannin at the rate of 5 g. per gal. (9 oz. to 50 gal.) is recommended. This causes a slow pptn. of Fe tannate which is insol and can be filtered off. Likewise singlass added at the rate of 1 oz. dry substance to a 47 gal. hbl. is effective if the pptn. is carried on at low temps. Unless kept cold, clouding occurs following filtration. A mixt. consisting of 5 g. tannin plus 6 g. gelatin per gal. is particularly efficacious. As little as 0.01% Fe in vinegar will produce this discoloration.

C. R. FELLERS

The "Balsam" vinegar of Modena. F. PARISI. *Ann. chim. applicata* 18, 395-408 (1928).—A famous product of Modena is its "balsam" vinegar hundreds of years old and made according to the following formula. Grapes are crushed and allowed to ferment in vats 24 hrs. until mash rises to the top when the liquor below is withdrawn, and boiled to about 70-80% of the original vol. Either chalk or soda ash is then added to neutralize excess acid, the liquid is decanted off, cooled and placed in oak barrels to age and thus turn to vinegar.

A. W. CONTIERI

Behavior of spirit vinegar and vinegar essence in ultra-violet light of the Hanau quartz lamp. H. WÜSTENFELD AND H. KREIPE. *Deut. Essigind.* 32, 345-7(1928).—The present investigation was undertaken to find a simple and certain method for the differentiation of spirit vinegar, resulting from the rapid fermentation process, from

vinegar essence and its aq. dilns. Spirit vinegar develops in ultra-violet light characteristic luminescence phenomena, while the materials from which it is produced (spirit, water, nutrient salts, carbohydrates) as also acetic acid are without such action. All observations point to the probability that the luminescent substances present in finished vinegar are formed by bacterial activity. The usual method of simple qual. observation of luminescence phenomena by means of the quartz lamp in connection with Ostwald color charts and of the chrometer has been placed on a secure footing. With this method and also the nephelometer method one is able to differentiate spirit vinegar from pure aq. acetic acid. The fact that spirit vinegar, like other natural foods and condiments, exhibits luminescence phenomena, thus indicating an entirely different compn. from dild. acetic acid obtained synthetically, would seem to forbid that two so different products should enter trade channels under the same designation "vinegar" (Essig). If spirit vinegar is to be simply termed "vinegar" then dild. acetic acid should not be given the same designation. W. O. E.

Difficulties encountered in saccharification (in the brewing industry). J. RAUX. *Brasserie et malterie* 18, 230-4, 262-8(1928).—A brief general discussion of these difficulties, their causes and remedies. A. PAPINEAU-COUTURE

Present-day malts and the brewing process. P. PETIT. *Brasserie et malterie* 18, 241-5, 257-62(1928).—A discussion of their effects on the quality of the beer. A. PAPINEAU-COUTURE

Wines produced from grapes damaged by insects "eudemis." II. J. HENRIE FABRÉ AND ERNEST BRÉMOND. *Inst. Agricole d'Algérie. Ann. fals.* 21, 323-39(1928); cf. C. A. 22, 663.—A study of the effects of partial de-acidification by means of increasing amts. of CaCO_3 , K_2CO_3 , Na_2CO_3 and $(\text{NH}_4)_2\text{CO}_3$ on the compn. of such wines. Addn. of 300 g. CaCO_3 and 500 to 600 g. of Na_2CO_3 , K_2CO_3 or $(\text{NH}_4)_2\text{CO}_3$ per hl. improved the taste of the wine, but further addn. gave it a bitter taste. In most cases the total and fixed acidities were progressively decreased, but the volatile acidity was unaffected. Total ash was increased by CaCO_3 [slightly lower with 200 than with 100 g. per hl., but otherwise increasing proportionally to the CaCO_3 addn.], K_2CO_3 and Na_2CO_3 , but was unaffected by $(\text{NH}_4)_2\text{CO}_3$. Addn. of CaCO_3 has the same effect on the alky. of total and insol. ash and on total Ca in the ash as on the total ash, but with time the total Ca and the alkalinities slowly decrease due to gradual pptn. of org. Ca salts. Addn. of K_2CO_3 and Na_2CO_3 increases the alky. of total and sol. ash, but does not affect the alky. of the insol. ash. $(\text{NH}_4)_2\text{CO}_3$ also has no effect. CaCO_3 and K_2CO_3 rapidly reduce total tartaric acid. K_2CO_3 and $(\text{NH}_4)_2\text{CO}_3$ increase total K_2O . Na_2CO_3 and $(\text{NH}_4)_2\text{CO}_3$ have but little effect on total tartaric acid but later increase NH_3 content, and total K_2O . Analysis of wines from damaged grapes of known origin and purity are given. Fraudulent de acidification of such wines should be suspected when total ash > 4 g. per l., alky. of total ash > 6 g. per l., total tartaric acid < 4 g. per l., total K_2O > 6 g. per l., total Ca > 0.3000 g. per l., and NH_3 > 0.05 g. per l. A. P.-C.

Tests on the clarification of liqueur wines by centrifuging. J. DUBAGUIÉ. *Station Oenologique de la Gironde. Ann. fals.* 21, 460-3(1928).—Supercentrifuging is efficient for removing yeast cells from relatively common wines; but in white liqueur wines exhibiting an opalescent turbidity which is normally eliminated by storing in casks for a sufficient length of time, supercentrifuging may spoil the taste, and frequently the opalescence returns to a greater extent than before supercentrifuging. A. P.-C.

(The antiseptic value of) hop resins. CAVENAILS. *Bull. assoc. élèves inst. sup. fermentations Gand* 29, 377-84(1928).—Comparative biol. tests showed that the antiseptic principles of hops are much more sol. in worts than in distd. H_2O . Max. extn. of the antiseptic constituents is obtained with 1 hr.'s boiling, and boiling for a longer period reduces the antiseptic power of the wort, the decrease being more marked the higher the d. of the wort. With worts having a very high d. the max. antiseptic power is reached at the end of 30 min.' boiling. With worts having a d. of 10° Balling or less the antiseptic power is proportional to the amt. of hops; but with 15° wort the antiseptic power increases more slowly than the amt. of hops added. The optimum ϕg value from the standpoint of antiseptic value is from 5 to 6; above 6 the antiseptic value is very considerably reduced. High N content of the wort greatly reduces the antiseptic power, probably because the lupulone is almost completely pptd. by coagulation of the proteins during boiling. Storage of hops in presence of water reduces the antiseptic power, but this action seems to affect only the H_2O -sol. antiseptic constituents and to have little or no effect on the wort-sol. constituents. When the wort was boiled in large flasks the antiseptic power was higher than when it was boiled in small flasks, probably because in the latter case there is a greater tendency to caramelization which affects the hop resins and reduces their antiseptic power. A. PAPINEAU-COUTURE

Clarifying beer, vinegar and other liquids (Brit. pat. 286,861) 13.

Fermentation. RENÉ E. TROTTER. Fr. 638,894, Dec. 28, 1926. In a continuous fermentation process the vats are provided with diaphragms through which the active yeast passes while the dead or used-up yeast is sepd. The vats are made in the form of a cone at the bottom and a truncated cone at the top.

Hops and malt. KARL S. FELIX and ERNST KLAPP. Ger. 466,433, May 15, 1925. Malt ext. and pulverized hops are mixed in a closed container and heated in boiling water.

Withdrawing yeast from vats. ZELLSTOFFFABRIK WALDHOF and O. LÜHR. Brit. 287,052, March 12, 1927. In continuous or intermittent withdrawal of yeasts from vats (e. g., for use as a *fertilising material or animal feed*), a gyratory motion is imparted to the bottom layer of material in the vats and this motion is confined to the bottom layer by an arrangement of baffles.

17—PHARMACEUTICAL CHEMISTRY

W. O. EMERY

The essential oil of *Myrtus communis* L. F. L. VODRET. *Ann. chim. applicata* 18, 421-8(1928).—The oil is green, $d_{15} 0.8961$, $[\alpha]_D^{10} = +18.4$, $n_D^{20} = 1.4702$, viscosity at $20^\circ = 1.23$; it shows no fluorescence in Wood light. Its soly. at 15° in 70% EtOH is 1.26; in 80%, 1.1; in 90%, 2.1. Acid no. is 1.36; sapon. no. 22.8; acetyl sapon. no. 53.10; I_2 no. 201.1; ethers % calcd. as $C_{10}H_{18}O$ 7.5; alcohols calcd. as $C_{10}H_{18}O$ total 31.71 (free 5.29, combined 25.82); aldehydes, traces; phenols present; it freezes below -12° .

A. W. CONTIERI

Chemical and pharmacological evaluation of belladonna leaves and the extract prepared therefrom. TH. EXLER. Univ. Leiden. *Pharm. Weekblad* 65, 1152-77 (1928).—The official methods for detn. of the alkaloid content of belladonna according to the German, U. S., Swiss and Dutch Pharmacopeias give discordant results with one and the same sample. The German method is considered unreliable, the U. S. method devious and conducive to high results, and the Swiss and Dutch methods more convenient, rapid and free from sources of error. Procedures which tend to hydrolyze or racemize the alkaloid should be avoided. In 70% EtOH atropine is stable at p_H 5 at 80° , but in aq. soln. the hydrolysis in 5 hrs. amts. to 20%. Hyoscyamine is stable in aq. soln. at p_H 5, the decrease in rotation amounting to only 3-4% after 5 hrs.' warming but in alc. soln. at the same p_H 5 hrs.' heating results in racemization equiv. to a 17.5% decrease in rotation. In the gravimetric detn. of atropine by silicotungstic acid a correction must be applied if the hydrolysis product tropine is present. In the physiol. detn. where the antagonistic action toward pilocarpine on the isolated intestine is measured, 2 parts of hyoscyamine are equiv. to 3-4 parts of atropine. Tropine here has no effect even in doses 500 times the usual hyoscyamine or atropine dose. The colloidal constituents of belladonna ext. are also without influence. Colloids which are retained by an ultrafilter impervious to Congo red have neither an activating nor an inhibiting effect on the ext.

A. W. DOX

Sproetin and spraetin. C. A. ROJAHN. Univ. Halle. *Apoth. Ztg.* 43, 1291-2 (1928).—Two proprietary salves are shown to have the following essential compn: sproetin—fats 30, vaseline 45, talc 20, salicylic acid 2%; spraetin—fats 10, vaseline and tar products 64, talc 23, salicylic acid 0.7%; both products had from 2 to 3% moisture.

W. O. E.

Alkaloids of *Hyoscyamus reticulatus* L. R. A. KONOWALOWA and O. J. MAGIDSON. *Arch. Pharm.* 266, 449-52(1928).—In addn. to a small amt. of hyoscyamine, *H. reticulatus* L. contains about 1% of a liquid, easily volatile base, tetramethyldiaminobutane, probably related in some way to the plant proteins.

W. O. E.

Estimation of the hydrochlorides of procaine and codeine. E. SCHULEX and G. VASTAGH. Hygienic Inst., Budapest. *Arch. Pharm.* 266, 452-5(1928).—The method depends on the decompn. of procaine when heated with 0.02 N NaOH under prescribed conditions. A soln. (about 50 cc.) contg. up to 40 mg. of the alkaloids is treated with 1 cc. aq. NH_3 , then extd. 5-6 times with $CHCl_3$, a few cc. of the final ext. being checked by evapn. on the H_2O bath and addn. of Mayer's reagent as to completeness of this operation. Pass the united $CHCl_3$ portions through a pledget of cotton, evap. the solvent, dissolve the residue in 5-10 cc. alc. (neutral to methyl red), add 0.02 N HCl in excess, then neutralize this excess with 0.02 N NaOH. Now add double the amt.

of 0.02 N NaOH equiv. to the acid required to neutralize the bases, then heat the mixt. 0.5 to 1 hr. on a boiling H₂O bath. To the cooled liquid add 1 cc. aq. NH₃ and ext. 5-6 times with CHCl₃ or until all extractable alk. material (codeine) is removed, evap. the solvent on the H₂O bath, and continue the heating 1 hr., eventually with an air blast. Dissolve the residue in alc. as before, add the acid in excess, this excess being later detd. by back-titration with alkali. The amt. of acid thus required to neutralize the base yields the codeine-HCl (calcd.), which subtracted from that previously detd. for the combined bases will disclose the amt. of procaine in the mixt. W. O. E.

Evaluation and aging of ergot preparations. A. PRYBIL AND K. MAURER. *Arch. Pharm.* 266, 464-79(1928).—An exptl. study showing that the fresh fluid exts. made in accordance with Am. and Ger. Pharm. specifications show the highest alkaloid content. Under the influence of aging the alkaloid content of fluid exts. of whatever specification made suffers steady diminution, from which it follows that the best method for the prepn. of an ext. with high alkaloid content is of little value unless the ext. can be stabilized. The stabilization of a fluid ext. is independent of the stabilization of the drug itself. Numerous com. brands of the ext. were examd. and the results are tabulated. W. O. E.

Parent plants of radix primulae. L. KOFLER. Univ. Innsbruck. *Arch. Pharm.* 266, 479-84(1928).—In discussing the question as to the true source of primula root the conclusion is reached that with our present knowledge no difference can be made in the use of *Primula officinalis* Hill and *P. elatior* Schreb, although the latter appears to have been involved in most cases. W. O. E.

Preparation and constitution of hydrargyrum salicylicum. E. RUPP. Univ. Breslau. *Arch. Pharm.* 266, 504-6(1928).—Finely powder equimol. quantities of HgSO₄ and Na salicylate (5% excess of the latter) mix and treat with water until a thick magma results. Heat on the steam bath 15 min. with const. stirring and add sufficient H₂O to maintain the original consistency, then every 5 min. test a small amt. (size of a pea) with a few cc. of NaOH soln. On complete soln. add several times the vol. of warm water, collect on a suction filter, wash until free of sulfates, then dry at 80° to 100°. Nitration expts. show that the Hg atom enters the benzene nucleus about equally at the *o*- and the *p*-positions. W. O. E.

Chemistry of mercury salve (unguentum hydrargyri cinereum). R. DIETZEL AND J. SEDLMEYER. Univ. Munich. *Arch. Pharm.* 266, 507-17(1928).—Expts. were undertaken covering methods for detg. the Hg contents of such salves, the nature of changes in the product on storage, and isolation of fatty acid salts of Hg eventually present, and finally the prepn. and properties of such fatty acid salts of Hg. Changes taking place in salves specially prepd. in accordance with pharmacopeial procedure are noted and discussed; certain salts of Hg also were specially prepd. and characterized, notably the stearate, palmitate and oleate. W. O. E.

Utilization of the ash picture in determining pharmacognostically used barks. WALTHER BLARENSTEINER. Univ. Wien. *Sitzb. Akad. Wiss. Wien Abt. I*, 137, 1-16(1928).—In the present study an attempt has been made to demonstrate the value of the ash picture in the diagnosis of a group of pharmaceutically important drugs (barks), notably those official in the VIII. d. of the Austrian Pharmacopeia, as *Cortex Frangulae*, *Rhamni purshiani*, *Quercus*, *Quillajae*, *Chinae*, *Cinnamomi*, *Quebracho*, *Cascarillae*, *Granati*, *Viburni*. For purposes of ashing only good sections should be taken, since the arrangement of the ash constituents in the spodogram is frequently very characteristic, not however the presence of definite crystals as such, for which reason the ash picture of powdered or otherwise comminuted barks is rarely of service. The necessity for maintaining a correct arrangement of ash constituents requires a special method, which was developed and renders possible a presentation of the ash of very thin sections unchanged. The investigation has shown that the spodogram of barks may be utilized for purposes of identification, since the mineral constituents can be made to retain their original arrangement and thus permit reconstruction of the original anatomical structure. W. O. E.

Constituents of the root of *Helleborus niger* and *viridis*; new alkaloids of *Helleborus viridis*. O. KELLER AND W. SCHÖBEL. Univ. Jena. *Arch. Pharm.* 266, 545-72 (1928).—The substance isolated by O. Keller (1910) from the root of *Helleborus niger* has been identified as the glucoside helleborin and the formula therefor, C₂₁H₃₅O₈, suggested. From the root of *Helleborus viridis* the same glucoside was isolated and in its general properties characterized as such. The root of *H. niger* is free from alkaloids; that of *H. viridis* on the other hand contains about 0.2% alkaloidal material. By means of a specially elaborated method the following alkaloids were isolated and characterized: *celliamine*, C₂₁H₃₅NO₈, a tertiary base contg. no MeO groups, but possibly a MeN group,

although proof of the latter is lacking; *sprintillamine*, $C_{21}H_{41}NO_4$, a tertiary base contg. no MeO groups. The N contains, however, a Me group. This base yields a very difficultly sol. *HCl salt*, $C_{21}H_{41}NO_4 \cdot HCl$. Exhaustive methylation *via* Nöling converts it into the quaternary iodide, *sprintillammonium iodide*, $C_{21}H_{41}NO_4 \cdot MeI$; *sprintilline*, $C_{21}H_{41}NO_3$, a tertiary base contg. no MeO groups. There are some indications of the presence of a MeN group, though proof therefor is lacking. *HCl salt*, $C_{21}H_{41}NO_3 \cdot HCl$; an alkaloid "V" of very low basicity, having the compn., $C_{22}H_{41}NO_4$. The root of *H. viridis* contains sucrose, characterized by the m. p., behavior towards Fehling's soln., $[\alpha]$, elementary analysis and crystallographic properties. It contains further 1% of a greenish fat, a perfume volatile with steam; brown dyestuff and resin. The pharmacological examn. of celliamine, sprintillamine and sprintilline shows a typical cardiac action. W. O. E.

Iron cacodylate and estimation of cacodylic acid. O. J. NOSKOWA AND V. A. TERECHINA. *Univ. Perm. Arch. Pharm.* 266, 599-602(1928).—Iron cacodylate, $(Me_2AsO_2)_2Fe$, was prepd. by treating cacodylic acid (8 mol.) with dialyzed $Fe(OH)_3$, evapg. the dialyzate in vacuum and freeing the residue of excess cacodylic acid by extr. with $CHCl_3$. Cacodylic acid was detd. in the product by mineralization *via* d'Emilio (H_2SO_4 , K_2SO_4 and $KMnO_4$), reduction of the resulting H_3AsO_4 with KCN S, followed by titration with I. Satisfactory values are reported by this method. W. O. E.

Saponification velocity of menthyl succinate, acetate and isovalerate. V. A. NEKRASOVA. *Univ. Perm. Arch. Pharm.* 266, 595-9(1928).—The sapon. medium used was 0.5 N KOH in connection with temps. obtaining in a thermostat at 33-6° and a boiling H_2O bath. After 3.5 hrs.' treatment in a thermostat about 26% of menthyl succinate remained unchanged, while at boiling- H_2O -bath temp. sapon. was almost complete (99.76%) after 1 hr. After $\frac{1}{2}$ hr. at boiling- H_2O -bath temp. 97.24% menthyl acetate was saponified, while at a temp. of 33° only 68.69% was decomposed. Menthyl isovalerate was relatively much more stable, 93.63% remaining unaffected after 3.5 hrs. at 36°, and 8.45% after 8 hrs. at 99-100°. W. O. E.

Quantitative methods of the D. A.-B. 6, and their practical application in the laboratory. KARL HERING. *Arch. Pharm.* 266, 582-95(1928).—An address. W. O. E.

Results of drug plant experimentation in the year 1927. JOHANN APPL. *Heil- und Gewürz-Pflanzen* 11, 142-55(1928).—An account of work undertaken and cultural results obtained with *A Artemisia*, *Althaea*, *Ruta*, *Melissa*, *Rheum*, *Hypericum*, *Hyssopus*, *Salvia*, *Thymus*, *Mentha* and *Majorana*. W. O. E.

Chemical composition of *Iris germanica* rhizome cultivated in Hungary. J. KABAY. *Heil und Gewürz-Pflanzen* 11, 155-61(1928).—Monthly values for the period of March to November for total ash, H_2O -sol. ext. and ash, sugars (glucose and sucrose), and starch are reported, from which it appears that the Hungarian product differs markedly from the foreign, in that the H_2O -sol. portion is considerably higher, while the starch content is much lower. Sugar is also higher and the mucilage content likewise considerable. W. O. E.

Alkaloid content of *Hyoscyamus* leaves infected with *Peronospora* and mildew. ELEMER KOPF. *Heil- und Gewürz-Pflanzen* 11, 161-3(1928).—The results of extended study of these diseases show that as they progress the alkaloid content gradually falls from 0.165 (for entirely healthy leaves) to 0.122 (partially infected), 0.045 (completely diseased), and 0.028% (after 3 months' storage of the latter). In view of such marked loss of diseased leaves during storage, their harvesting and marketing would appear to be ill-advised, since the alkaloid content would be practically nil. W. O. E.

Chemistry of western Australian sandalwood oil. I. A. R. PENFOLD. *J. Proc. Roy Soc. N. S. Wales* 62, 60-71(1928).—The object of this paper is to summarize the present state of knowledge regarding the chemistry of the com. oil and the reasons for the divergent analyses published to date. In the present investigation it was found that the Western Australian oil reacted just as readily with phthalic anhydride in CaH_2 on the H_2O bath as the santalols of the East Indian oil, and appeared to be of a primary character, contrary to the experience of Rao and Sudborough, who, however, make no reference to the presence of santalols in the oil examd. by them, whereas P. found these alcs. to be present to the extent of 40-45% in the com. samples furnished by the various West Australian manufrs. Curiously, however, the santalols were not detected in oils distd. by P. This observation is being followed up and will be dealt with in a subsequent paper. Rao and Sudborough sep'd. 2 alcs. which they designated α - and β -fusanol, which, with the exception of variation in b. p. possessed const. not far removed from each other. They appear to approximate very closely to the santalols. Apparently it is inadvisable to characterize alcs. of this nature by optical activity alone, as the values given for α - and β -fusanol are 5.7° and 2.6°, resp. A levorotatory alc. has been

isolated with $[\alpha] -70.4^\circ$, being the principal component of a sandalwood oil obtained from *Santalum lanceolatum*, which is used by the W. Australian manufs. to bring the $[\alpha]$ of their oils up to the requirements of the B. P. for the East Indian oil. Some of the various alcs. present have been characterized by means of their resp. allophanates, that of the santalols, m. $162-3^\circ$, while the other alcs., for which the term fusanol might be retained, yield similar derivs., m. $148-52^\circ$. On the other hand that from the *l*-rotatory alc. referred to above is a cryst. deriv., m. 114° . With the exception of santalol none of these other alcs. yielded santalenic acid. A *d*-rotatory alc. of apparently a secondary character was also isolated in small quantity from the W. Australian oil, but it failed to yield a cryst. allophanate. For purposes of comparison, com. samples of E. Indian oil were examd. at the same time and under similar conditions. The chem. and phys. characters of the resp. oils of the W. A. manufs. are in close agreement, and the exptl. work leaves no doubt at all that these oils differ in chem. compn. from the E. Indian oil, although the santalols are present to the extent of about 45%. No valid reason has been advanced as to why the Australian oil cannot find a market on its own intrinsic merits as the product of *Eucarya spicata*. The authorities should undoubtedly make provision for it in the B. P. under its own generic name, as it is futile to include it under the same heading as the oil of *Santalum album*, more especially as the chem. and phys. characters of the Australian oil can be made similar by the addn. of the distillate of *Santalum lanceolatum*.

W. O. E.

Occurrence of a number of varieties of Eucalyptus dives as determined by chemical analysis of the essential oils. II. With remarks on the *o*-cresol method for estimation of cineole. A. R. PENFOLD AND F. R. MORRISON. *J. Proc. Roy. Soc. N. S. Wales* 62, 72 S(1928); cf. *C. A.* 22, 604. —Numerous field and lab. expts. have shown marked differences in the character of oil obtained from various types of the same species growing closely together, notably with respect to the presence or absence of piperitone and phellandrene, which substances render the oil undesirable for pharmaceutical purposes. During this work the *o*-cresol method for detg. the cineole content of oils was tested against the older and better known H_3PO_4 process, with very satisfactory results; it is believed the B. P. authorities should adopt this method as standard. Also in *Perfumery Essential Oil Record* 19, 468-70(1928).

W. O. E.

Seeds of *Pentadesma butyraceum*. L. ROSENTHALER. Univ. Bern. *Pharm. Ztg* 73, 1307(1928). —These seeds, not infrequently used to adulterate Semen Colae, are reported in certain quarters to contain caffeine, in others to be caffeine-free. It is now shown that they contain no caffeine.

W. O. E.

Reactions of colchicine. LAD EKKERT. Univ. Budapest. *Pharm. Zentralhalle* 69, 662(1928). Certain known color reactions of colchicine are enumerated. Dissolve a few mg. pure cryst. or amorphous colchicine in about 0.5 cc. concd. H_2SO_4 , then heat carefully, whereupon a canary-yellow liquid results, passing over golden yellow, saffron, brown-red, blood-red to deep garnet. Even with only 0.5 mg. of alkaloid the soln. becomes garnet. Not only in dil. or concd. H_2SO_4 , but also in concd. or dil. HCl, dil. HNO_3 , and AcOH is a soln. of colchicine yellow. A warmed soln. of the alkaloid in H_3PO_4 or lactic acid becomes golden yellow. A yellow soln. also results with tartaric, citric or salicylic acids. On heating 0.1 g. colchicine with 0.003 to 0.005 g. tartaric acid and 1 cc. concd. H_2SO_4 , the soln. becomes green; with citric or salicylic acid instead of tartaric, the soln. becomes garnet.

W. O. E.

Evaluation of cresol-naphthenic acid soap solutions. GREGOR KOGAN. *Pharm. Zentralhalle* 69, 681-4(1928). —To 10 cc. of the sample add 20 cc. H_2O and 10 cc. dil. H_2SO_4 , and then with const. shaking Na_2SO_4 to satn. Follow with 20 cc. Et_2O , shake 3 min. and transfer the mixt. to a separatory funnel. Withdraw the aq. layer to a 2nd funnel, then wash the Et_2O again with 20 cc. dil. (5%) H_2SO_4 , and unite the aq. layer with the 1st portion withdrawn. Wash these united portions with 20 cc. of Et_2O , withdraw and set aside the aq. layer for examn. of bases (soln. A). Transfer the Et_2O to the 1st separatory funnel and wash twice with two 50-cc. portions of 10% Na_2CO_3 soln., finally collecting the latter in a flask for estn. of the naphthenic acids (soln. B). Warm the Et_2O (now contg. the cresols and hydrocarbons) by immersion in H_2O at 50° until the solvent is eliminated, add to the residue 25 cc. 15% NaOH soln. and 45 cc. H_2O (a turbidity may here result, if not add an addnl. 30 cc. H_2O). In the event that hydrocarbons are pptd., treat the mixt. with 20 cc. of Et_2O . Remove the sepd. H_2O (cresolates) to a flask (soln. C). To the Et_2O add 3 g. anhydrous Na_2SO_4 , then after some min. pass the liquid through an 8-cm. folded filter, washing both filter and funnel twice with 5 cc. anhydrous Et_2O . Evap. the Et_2O at 50° and bring the residual hydrocarbons in a desiccator to a const. wt. The amt. of hydrocarbons should not exceed 0.5%. To the cresol soln. (C) add an excess of dil. H_2SO_4 sat. with Na_2SO_4 .

and ext. with 20 cc. Et_2O , then again twice with 10 cc. Et_2O , finally uniting and drying the Et_2O portions over 2 g. Na_2SO_4 . Pass the liquid through a folded filter into a weighed flask, washing the sulfate, funnel and filter twice with 10 cc. dry Et_2O . Evap. the solvent, dry the residue 40 min. at 100° , cool in desiccator and weigh. The residue should not be less than 35%. Acidify soln. B contg. the naphthenic acids with dil. H_2SO_4 , then sat. with Na_2SO_4 and ext. with 20 cc. Et_2O , pour off the latter and again ext. with 20 cc. Et_2O . Unite the Et_2O portions, dry over 3 g. Na_2SO_4 for 1 hr., then filter into a tared flask washing the sulfate, funnel and filter 3 times with 5-cc. portions of dry Et_2O . Evap. the latter and bring the residue to a const. wt. in a desiccator. The naphthenic acids should not be less than 33%. The residue is tested for the I no. Soln. A is examd. for bases by treatment with excess NaOH soln., extn. with Et_2O , the latter dried and evapd. at room temp. There should be entire absence of odor indicating presence of bases. Further suggestions are given for the detection of fatty and resin acids.

W. O. E.

Technic and examination of hemoglobin preparations. C. MASSATSCH. *Apoth. Ztg.* 43, 1307-8(1928).—A discussion of the methods ordinarily followed in prepg. hemoglobin specialties, with some suggestions for their evaluation. The results obtained in the examn. of 7 different brands are presented in tabulated form.

W. O. E.

Stability of powdered opium. AXEL JERMSTAD. Univ. Oslo. *Pharm. Zentralhalle* 69, 693-4(1928).—Two samples of powd. opium examd. in 1920 had morphine contents of 11.26% and 16.20%, resp. Ten years later these values had fallen to 10.94% and 15.82%, resp., from which it appears that this commodity if properly handled will suffer no undue loss of morphine over a period of years.

W. O. E.

Salvia officinalis. H. WALDECK. *Pharm. Zentralh.* 69, 709-15(1928).—A discussion of the role sage has played in the popular and scientific mind, with especial reference to its large-scale culture and marketing by a leading German firm.

W. O. E.

Rapid method for the examination of ergot in the apothecary. K. HERING. *Apoth. Ztg.* 43, 1381-2(1928).—Prep. an infusion of 1 g. powdered ergot (previously defatted by repeated extn. of a 2-g. sample with petr. ether in a separatory funnel) with 20 cc. distd. H_2O and 1 drop HCl , filter and to 4 cc. of filtrate (= 0.2 g. ergot) add 1 drop aq. NH_3 , then ext. with 10 cc. of Et_2O by vigorous shaking. Pipet 5 cc. of the clear Et_2O soln. into a test tube contg. 2 cc. pure H_2SO_4 , whereupon a cornflower-blue zone should shortly appear when viewed in a moderate light. This test will indicate a drug satisfying the lowest D.A.-B. 6 provisions.

W. O. E.

Sodium phenylethylbarbiturate. HÅKAN SANDQVIST AND THORSTEN HJ'SON LINDSTRÖM. *Pharm. Inst., Stockholm. Arch. Pharm.* 266, 613-6(1928).—This substance is available in 2 com. forms, as luminal sodium and as substitutes for this. In examg. the latter, on heating at about $140-50^\circ$, or even over H_2SO_4 at the ordinary temp., it was shown to suffer loss in wt., due apparently to the presence of EtOH . The prescribed Pharm. test (Na content), or titration of the product alone, offers no unqualified assurance of purity. A better procedure is to det. the org. component, as follows: Render an aq. soln. of the salt distinctly acid (methyl orange) with HCl , evap. to dryness on the H_2O bath, then ext. the residue repeatedly with pure absolute Et_2O . Evap. the solvent in a tared container and weigh the residue after drying at $90-5^\circ$. This wt. multiplied by 0.9957 gives the amt. of org. component.

W. O. E.

Adjustment of liquids to a definite specific gravity. CARL OTTO. *Pharm. Ztg.* 73, 1307(1928).—The readjustment of Liq. Kal. acetatis (d. 1.250) and of EtOH (d. 0.8047) to lower concns. is discussed.

W. O. E.

Muscatele sage oil (Ol. Salviae sclareae). ELEMER KOPP. *Pharm. Zentralhalle* 69, 677-80(1928).—The yield of oil depends on the condition of material distd. whether fresh, wilted or dry, the variations being from 0.03 to 1.0% volatile oil. The Roumanian product is characterized by its high content of linalyl acetate (41.8 to 59.2%) and linalol (13.8 to 26.5%), whether obtained from the fresh or dry plant.

W. O. E.

Chemical changes in tincture of iodine on storage. W. KNOLL. *Apoth. Ztg.* 43, 1324-5(1928).—A summary of results obtained respecting the keeping qualities of tincture of iodine shows that the addn. of little (0.2%) or no KI to tinctures leads to their instability. The statement of Valentin that a 5% tincture prepd. with 80% alc. is stable is without foundation in fact, even in the presence of 0.2% KI. A KI content of 1.75% (army specification) or of 2.8 to 3% (D.A.B. 6) renders the prepn. stable. The use of 70 or 90% alc. has no effect on the stability of tinctures fortified by the addn. of KI. For the prepn. of such tinctures 70% alc. may be used without disadvantage. A small addn. of NaHCO_3 , similar to that made in KI tablets, is without effect on the

stability of tinctures, so that the prepn. of tincture of iodine from tablets for army purposes is justified. W. O. E.

Plant lecithin. BRUNO REWALD. *Pharm. Ztg.* 73, 1377(1928).—The differences in the nature of plant and animal lecithin, and the difficulties heretofore experienced in the prepn. of the latter are pointed out. With soy-bean cake now available as a ready source of supply it is shown to what extent plant lecithin may be advantageously substituted for egg lecithin, notably in combination with cod-liver oil, pills, malt, blood preps., etc. W. O. E.

Testing bismuth subnitrate for calcium salts. C. STELLBAUM. *Pharm. Ztg.* 73, 1363(1928).—The belief is expressed that eventual contamination of Bi subnitrate with Ca salts is due to the filter paper employed in tileir manipulation. W. O. E.

Testing bismuth subnitrate for calcium salts. J. HERZOG. *Apoth. Ztg.* 43, 1353-4(1928).—Exception is taken to S.'s suggestion (cf. preceding abstract) as to the source of Ca in the subnitrate. Rather is the error, or contamination if any, due to the German Pharm., which specifies the addn. of too little Na_2S in pptg. the Bi as the sulfide, so that the filtrate yields with aq. NH_3 a ppt. of basic Bi compds. easily confused with CaC_2O_4 . W. O. E.

Ash pictures of technically valuable barks. KARL CZAPLA. *Tech. Hochschule Brünn. Sitzb. Akad. Wiss. Wien Abt. I*, 137, 17-44(1928).—The ash pictures of all the com. important barks examd., particularly those used for tanning, possess characteristic structures well-suited to the detn. of the several barks as developed from their resp. sections. The ashes of coarsely comminuted barks, as also that of bark mixts. involving 2 different barks, may in connection with the ash pictures of single barks serve to identify each one. The ashes colored by eosin soln., "Direct Sky Blue" (greenish), or "Chlorantine Red" yield especially striking differences. The occurrence of Fe as also Mn in the bark ashes, with respect to the outer and inner layers, may serve in differentiation. By virtue of the blue color in ashes produced by ZnCl_2 (indicative of K_2CO_3 and CaCO_3) the barks (or their ashes) may be divided into 5 groups. In view of the foregoing it is now possible to formulate a scheme for the systematic identification of the several barks. W. O. E.

Notes on the spirits of the National Formulary V. RALPH E. TERRY. *Univ. of Ill. Am. J. Pharm.* 100, 625-30(1928).—A brief history as to the source, formula, changes, a phys. description of the product as made according to the present formula, identity tests, etc., of the spirit of formic acid. W. G. GAESSLER

Justus von Liebig and medicine. K. F. HOFFMANN. *Wiener med. Wochschr.* 78, 655-6(1928).—An appreciation of Liebig in commemoration of the 125th year since his birth. ARTHUR GROLLMAN

Siegesbeckia orientalis. R. ALLENDY. *Hahnemannian Monthly* 63, 765-73(1928).—A detailed account of the physiol. action and therapeutic use of the annual herbaceous plant, *Siegesbeckia orientalis*. JOSEPH S. HEPBURN

A new biological method for detecting small quantities of morphine. P. TREMONTI. *Boll. soc. ital. biol. sper.* 3, 393-6(1928).—By means of the Lâwen-Trendelenburg technic, the arteries of the posterior extremities of the frog were perfused with physiol. salt soln. The soln. inserted into the aorta was gathered from the median vein and collected into graduated tubes. The time of observation was 10 min. The no. of drops for each min. and the total no. of cc. of liquid obtained for the entire period were recorded. The drug to be tested was either injected directly into the circulation or added to the perfusing liquid. Drugs such as morphine have a marked vasoconstrictor action and modify the normal flow of the liquid. By this method it was possible to detect morphine up to a diln. of 0.0002 mg. per cc. when the drug was injected into the circulation, and in amts. of 0.002 mg. when added to 10 cc. of perfusion liquid. It was also possible to differentiate drugs that have an isoquinoline nucleus like papaverine (vasodilators), from those having a phenanthrene nucleus like morphine (vasoconstrictors). PETER MASUCCI

Determination of synthetic camphor in pharmaceutical preparations. J. BOUGAULT AND (Miss) BL. LEROY. *Faculté de Pharm. de Paris. Ann. fals.* 21, 456-60(1928).—Introduce 0.5 g. camphor dissolved in 5 cc. 90% EtOH into a test tube, add 1 g. NH_4OH -HCl dissolved in 5 cc. H_2O and then 2 cc. 20% NaOH soln., seal the tube, heat 2 hrs. in a boiling water bath, let cool, transfer the contents of the tube to a sepg. funnel washing with a little 2% NaOH, add 20 cc. H_2O and 3 cc. 20% NaOH, if the soln. is more than slightly opalescent filter, neutralize with HCl (bringing back to neutrality with Na_2CO_3 if necessary), ext. the camphor oxime with 20, 10 and 10 cc. Et_2O , washing each ext. with 5 cc. H_2O , evap. in the open atm. for 12 hrs., dry in a CaCl_2 desiccator for 12 hrs., weigh and add a 4% correction to compensate for evapn. of camphor oxime.

The corrected wt. $\times 152/167$ gives the wt. of camphor. For the analysis of camphorated oil, the camphor is first sepd. by steam distn., finishing with a little alc., and the detn. carried out on an aliquot of the distillate. Com. synthetic camphor can contain camphene, borneol and isofenchone as impurities. The first 2 are eliminated, but the 3rd is converted into an oxime and is counted as camphor; its presence can be detected by taking the m. p. of the oxime after weighing. Synthetic camphor can now be prepd., however, as pure as the natural Japanese product. The oxime of natural camphor m. 117-8°, that of synthetic camphor m. 116-7°, and a mixt. of equal parts of the two m. 110-2°.

A. PAPINEAU-COUTURE

Henning's olfactive prism and the preparation of (perfume) bases. OTTO GERHARDT. *Parfumerie moderne* 21, 415-23(1928).—The classification and evaluation of odors according to Henning's prism (based on the assumption that odors can be classified as spicy, flowery, fruity, resinous, putrid or burnt, or as mixts. of these in varying proportions) is considered to be of little or no use in the mixing of perfumes, as the bases utilized are themselves complex. The difficulty and complexity of the problem of blending perfume bases is briefly discussed. A list is given of the commoner perfume materials and their utilization.

A. PAPINEAU-COUTURE

Tuberose. ETABLISSEMENTS ANTOINE CHRIS. *Parfums de France* 6, 287-92 (1928).—A brief review of its cultivation and of the extn. and compn. of the perfume.

A. PAPINEAU-COUTURE

New constituents of the volatile oil of concrete oil of *Polianthes tuberosa* L. F. ELZE. *Riechstoffind.* 154 (Aug., 1928); *Parfums de France* 6, 308-9(1928).—Steam distn. of the ext. obtained by treating *P. tuberosa* L. flowers with low-boiling petr. ether gives a 6% yield of oil having d_{15}^{20} 1.003, n_D^{20} —3°15', acid no. 25.0, ester no. 230.0, Me anthranilate 1.4%. Eugenol, methyl benzoate, geraniol and nerol (in the free state and as acetic, and probably also propionic, esters), benzyl benzoate and farnesol were identified.

A. PAPINEAU-COUTURE

Botanical, chemical and pharmacodynamic study of common tansy. *Tanacetum vulgare* L. LÉON CROUY. *Bull. sci. pharmacol.* 35, 481-6(1928).—The essence of tansy contains β -thujone and small amts. of *l*-camphor and borneol. This essence is toxic, causing convulsions of the rabic type. It contains no alkaloid. A glucoside hydrolyzable by emulsin is present, but has not yet been obtained in the cryst. form. The Et₂O ext. of tansy is inactive toward tenia but is an effective ascaricide.

L. W. RIGGS

The opening and digestion of capsules inspected by aid of the radioscope. MAURICE-MARIE JANET. *Bull. sci. pharmacol.* 35, 486-95(1928).—The disintegrating actions of water, saliva and gastric juice on medicinal capsules were studied *in vitro*. The actions of the fluids of the mouth, esophagus and stomach were followed by the observation of a capsule contg. a Bi salt by means of the radioscope. Under certain conditions the capsule opened in the mouth or esophagus, but more frequently in the stomach in from 1 to 30 min. The passage of the intact capsule into the duodenum has been observed by Adam (*Thèse Doct. Univ. Pharmacie, Paris* 1928) but not by the author, who regards it as exceptional.

L. W. RIGGS

Report of the permanent commission for the standardization of serums, serologic reactions and biologic products. M. TIFFENEAU. *Bull. sci. pharmacol.* 35, 517-33 (1928).—The report of this commission, under the League of Nations, gives directions by biologic methods for the standardization of the following named therapeutic substances: arsenobenzenes, digitalis, squill, insulin, hypophysis and ergot. Thyroid, male fern and oil of chenopodium were considered but no biologic method was described for their standardization.

L. W. RIGGS

Seeds of *Euphorbia paralias* L. PAUL GILLOT. *Bull. sci. pharmacol.* 35, 561-4 (1928).—Analysis of the seeds gave moisture 7.08%, oil 38.05, proteins 22.43, sugars 2.58, mineral matter 5.39, cellulose 24.47. The oil obtained by pressure was golden yellow in color and showed an absorption band at 675 μ ; rotary power +4°30', d_{15}^{15} 0.9368, n_D^{15} 1.4845, Crismer index 62°, m. p. —25°. Free aliphatic acids in mg. KOH per g. of oil 3.36, insol. aliphatic acids + unsapn. matter 96.17%, sapon. index 194.0, iodine index 196.3, acetyl index 10.0, unsapon. matter 1.55%, bromoglycerides insol. in Et₂O 43.6%, degree of oxidation 19.12%. The oil gives an immediate ppt. with the Halphen Br test and the oil turns violet and the acid yellow with Bellier's resorcinol test. Oil extd. from the seeds by petr. ether has practically the same characters as oil obtained by pressure.

L. W. RIGGS

Gum arabic. L. AMY. *Bull. soc. chim. biol.* 10, 1079-90(1928).—Solns. of gum arabic are heterogeneous and contain a substance in the state of gel which was isolated and is the subject of further study. The gum acid is a strong monobasic org. acid.

Its dissocn. const. is about 2.0×10^{-4} , mol. wt. about 1600 and its solns. are unstable, changing rapidly by hydrolysis and yielding both insol. and reducing products. There is evidence of the existence of dialyzable acids, of which a thermolabile part plays an important role in the oxidizing activity of gum arabic.

L. W. RIGGS

Further assays of Chinese *Ephedra* species. CHIH-TUNG FENG AND BERNARD E. READ. Peking Union Med. Coll. *Chinese J. Physiol.* 2, 337-44(1928); cf. C. A. 22, 2031, 2243.—Assays of the sep. male and female plants of *Ephedra equisetina* and *E. sinica* show that during the flowering season there is a greater amt. of alkaloid in the male than in the female plants. Sep. monthly analyses show that this difference in the sexes amounting to 13 to 17% in May gradually lessens until after the fruiting season, when the alkaloidal content is practically the same for the 2 sexes. Assays of the various parts of the whole plant of *E. equisetina* show that the root, berries and seeds contain no alkaloid. The nodes contain only 32% of the alkaloid contained by the internodes, but they contain a greater proportion of pseudoephedrine than do the internodes. Further seasonal analyses of *E. sinica* collected in winter show a decrease in the alkaloidal content of nearly 50%.

L. W. RIGGS

Work and proposals of the international conferences on the biological standardization of therapeutic agents. E. KNAFFL-LENZ. *Arch. expil. Path. Pharm.* 135, 259-332 (1928).—A statement covering the conclusions reached at the conferences of Edinburgh, Geneva and Frankfurt. The substances considered, and concerning which recommendations are made in this report, are digitalis substances, ergot preps., *Cannabis indica*, hypophysis ext., adrenal ext., thyroid preps., insulin, silix mas preps., oil of chenopodium, vitamins and arsenobenzene preps.

G. H. S.

Plumbagin. A. MADINAVEITIA AND M. GALLEGO. *Anales soc. españ. fís. quim.* 26, 263-70(1928) —From the roots and stems of *Plumbago europea* there has been isolated a medicinal compd., yellow crystals, slightly sol. in H_2O , more sol. in boiling H_2O , very sol. in boiling alc., less so in cold alc., very sol. in ether, $CHCl_3$, C_6H_6 and acetone, sol. in alkalis, with violet color discharged by Zn reduction or by atm. oxidation, sol. in H_2SO_4 with intense red color changing to violet on heating m. 76° . Plumbagin is probably a methyljuglone, but so far the position of the CH_3 radical has not been detd. definitely.

E. M. SYMMES

The adsorbing properties of some aluminum silicates used in pharmacy. R. PORTILLO. *Anales soc. españ. fís. quim.* 26, 271-86(1928).—There are a no. of remarkable pharmaceutical compds., either natural or artificial, which can be regarded as kaolin mixed with an excess of SiO_2 and H_2O , whose activity is attributed to their adsorbing powers. SiO_2 and total H_2O were detd., and the rest was assumed to be Al_2O_3 , although in most cases there were traces of Fe and Mg oxides. Tabulation of results shows that there is no simple relation between adsorbing powers and chem. compn., but degree of dispersion and degree of hydration have a large influence. By use of methylene blue to det. adsorption many previous errors were eliminated.

E. M. SYMMES

Certain constituents of the leaf and their relation to the burning qualities of tobacco. D. E. HALEY, E. S. NASSET AND OTTO OLSON. Penna. State College. *Plant Physiology* 3, 185-97(1928).—Eighteen selected mature plants of cigar leaf tobacco (Hibshuan strain, Pennsylvania Broadleaf) grown on the expt. plots at Ephrata, Pa., under different combinations of fertilizer treatment were used in the present study. After being air-cured in a shed the plants were air-dried under lab. conditions and the leaves, stems and stalks separately finely ground for analysis. A comparison of the data on what the authors describe as "sol. and insol. alky." of the ash with the ether ext. of both the cured and fermented material indicated that the org. acids probably occur almost entirely in combination with the alkali and alkaline earth metals. The burning quality of the cigars made from these samples was related more to the alky. of the ash than to the amt. of ether-sol. org. acids. The alky. of the ash was affected by the season and the kind of K salt used. If consideration is to be paid to burning quality, fertilization with K_2SO_4 is preferable to KCl. The phenomenon of base exchange in soils and the removal of what the authors describe as certain "active" substances such as $CaCl_2$ by leaching are believed to be influential factors in the burn and compn. of tobacco; but the ability of the plant to secure sufficient K, especially in soils high in colloids, may also be a factor. The CaO content of these samples was too high and the K_2O content too low for max. burning quality.

WALTER THOMAS

Constituents of *Polypodium hastatum* Thunb. K. SUZUKI. First Junior Coll., Tokyo. *J. Pharm. Soc. Japan* 48, 712-6(1928).—From alc. ext. of dried leaves of *Polypodium hastatum* Thunb., a variety of fern used by some in treatment of gonorrhea in Japan, coumarin was isolated in 0.22% yield.

NAO UYEH

Oxymel of squill. FRANK BROWNE AND P. A. W. SELF. *Pharm. J.* 120, 442-3

(1928).—The re-heating of honey for the purpose of purifying it is one of the causes of darkening and bulky pptn. of its mixt. with vinegar of squill (oxymel). Three out of 5 samples of honey from widely different countries showed this behavior. The sepd. clear liquid had the same physiol. strength as the original unstrained liquid (J. H. Burn); the amorphous sediment contained fatty matter, pollen grains and spores of molds (T. E. Wallis). To prep. a dark oxymel which is sometimes desired, boil 500 g. com. honey with 250 cc. H_2O until nearly all the H_2O is evapd., remove the scum, again add 250 cc. H_2O , boil off the H_2O again and skim off, then add H_2O to bring the honey to d. 1.36. Finally mix 200 cc. of vinegar of squill (d. 1.070) with 500 cc. of dark purified honey. Very little contraction takes place, and d. will be 1.28–1.29. S. W.

Acidum nitrohydrochloricum dilutum. Brit. Pharm. G. J. W. FERREY. *Pharm. J.* 120, 443–4(1928).—Dil. nitrohydrochloric acid prepd. from strictly Brit. Pharm. strong acids (31.79% HCl (80 cc.), 70% HNO_3 (60 cc.), H_2O 500 cc.) requires 27.43 cc. N $NaOH$ for neutralization; hence the required 26.6 cc. is too low as an av. value. As the Brit. Pharm. strong acids are usually above the strict Brit. Pharm. strength, a range of 26.5–28.5 cc. would be more appropriate. The allowance made by the Brit. Pharm. for loss of acid strength on mixing or keeping, is unnecessary with its present method of prepn. In Brit. Pharm. 1867, the concd. acids were mixed, allowed to stand 24 hrs., then mixed with the H_2O ; this involved a slight loss of Cl , i. e., of acidity. S. WALDBOTT

Psoralea corylifolia. J. C. GHOSH. Calcutta. *Pharm. J.* 121, 54–5(1928).—The seeds of this plant (natural order Leguminosae), and of *Vernonia anthelmintica* (Compositae) have long been used in India as a remedy in leucoderma or white leprosy, but the results are contradictory, being vitiated on account of the use of the same vernacular name for both plants. The oleoresinous ext. of the seeds of *P. corylifolia* seems to have given good results (Kanny Loll Dey, *Pharm. J.* Sept. 24, 1881). The possible causes of discrepancies in later results with seeds of the same plant are set forth. Expts. with both plants named are now conducted by the Calcutta School of Tropical Medicine, with a view of detg. the remedial effect of each in leucoderma. S. WALDBOTT

A new test for the activity of medicinal charcoal. HARRY BRINDLE. *Pharm. J.* 121, 84; *Chemist and Druggist* 109, 115(1928).—Expose the powd. charcoal dried at 110–120° in a closed vessel (desiccator) and in a thin layer to air satd. with the vapors of H_2O , $CHCl_3$, $EtOH$ and turpentine separately, and det. the % of increase of wt. in each case every 24 hrs. Some charcoals adsorbed the full quantity, others seldom less than 90% during the 1st 24 hrs. Detn. of $CHCl_3$ adsorption is unsatisfactory, on account of its evapn. during weighing in air. Active charcoal adsorbs H_2O from the air rapidly, e. g., 5% during a few min. exposure. With 8 samples of charcoals, including ordinary levigated, wood charcoal, gas-mask charcoals, purified animal charcoal, medicinal, and exptl. active charcoal, adsorption of H_2O varied from 9.55 to 83.62%, that of $EtOH$ from 9.43 to 84.49, of turpentine from 7.63 to 86.89%. A charcoal adsorbing below 15% of H_2O , is classed as inactive; active charcoal adsorbs from 30 to 100% of H_2O . As a rule, a given charcoal shows the same ratio of activity towards the several vapors used. S. WALDBOTT

A comparison of the adsorptive power of medicinal charcoals. HARRY BRINDLE. *Pharm. J.* 121, 84–5; *Chemist and Druggist* 109, 116–7(1928); cf. preceding abstr.—The adsorption powers of 18 different charcoals were compared by (1) B.'s H_2O -adsorption test, (2) a modification of Miller's $BzOH$ -adsorption test (*C. A.* 20, 3615) and (3) the $HgCl_2$ test of the Germ. Pharm. In (1) the adsorptive range was 9.55–83.62%, in (2) 2.9–23.05%, in (3) 0.7–6.2%. On the basis of an empirical activity standard of 100 for the best sample (No. 18), 7 com. samples were declared inactive, while 9 were considerably active with all the tests used. The H_2O and $BzOH$ tests gave concordant results on duplicate detns. made on the same sample; with the $HgCl_2$ test, results were erratic. The chief factor governing the activity of charcoal is a slow oxidizing action during manuf., brought about by passing a slow current of air or better, steam over the charcoal during carbonization. S. WALDBOTT

Mercury ointment. J. H. FRANKLIN. *Pharm. J.* 121, 85–6; *Chemist and Druggist* 109, 117–8(1928).—Several formulas are suggested to reduce the time required for "killing" the Hg upon trituration; the Brit. Pharm. formula requires at least 1 hr. The use of hydrous lanolin with white petroleum jelly, or hydrous lanolin with pale yellow beeswax and benzoated lard as ointment bases will reduce the time to 20 min. In another formula: Hg 300, powd. resin 15, prepd. suet 50, benzoated lard sufficient to make 1000 parts, trituration will cause the Hg to disappear easily within 10 min. S. WALDBOTT

A note on suppositories. ALER RAE. *Pharm. J.* 121, 315(1928).—Detn. of the

sp. gr. of medicaments commonly prescribed in suppositories being desired in order that correct allowance may be made for their vols. in admixt. with cacao butter (A), R. found that 10 g. of medicament displaced g. of A as follows: Boric acid 6.9 g., gallic acid 6.8, tannic acid 8.3, Bi salicylate 4.0, Bi subnitrate 2.8, Ext. bellad. virid. 8.5, gallae pulv. 7.4, ichthyol 9.1, morphine-HCl 8.5, opii pulv. 7.7, plumbi acet. 4.6, Quinin. hydrochl. 8.3, resorcinol with 5 g. of H₂O for soln. 13.4, zinci oxid. 2.3 g. S. W.

The weight of the base in suppositories. F. R. C. BARNESON. *Pharm. J.* 121, 346 (1928).—An accurate method is given whereby the quantity of base required for any suppository may be easily and quickly detd. Weigh out the active medicament for 1 suppository, mix this with a little of the melted base but insufficient to fill the mold. Fill up the mold with more of the base. When set, the trial suppository is removed and weighed. Deduct the wt. of the medicament to obtain the quantity of base needed. The method not only applies to the theobroma base but also to compd. bases, e. g., theobroma-wax, coconut-stearin, or to gelatin. S. WALDBOTT

Pharmacy as a career. R. R. BENNETT. London School of Pharmacy. *Pharm. J.* 121, 316-7(1928)—An address. S. WALDBOTT

Methylated iodine preparations. WM. JOHNSTON. *Pharm. J.* 121, 374-5(1928).—The pungent odor noted by MacEwan and Gregory (*Ibid* Jan. 27, 1883) upon dissolving I in methylated spirit, which was attributed by them to an allyl compd. contained in the denaturant, J. found to be caused chiefly by the acetone present in the latter; possibly also by some of its other constituents. S. WALDBOTT

A works museum. (Thomas Morson and Son.) T. E. WALLIS. *Pharm. J.* 121, 378(1928).—A descriptive account of the collection of specimens in materia medica, portraits, relics and manuscripts illustrating the progress of the firm of manufg. pharmacists named. S. WALDBOTT

A century of pharmacy in Manchester. W. KIRKBY. *Pharm. J.* 121, 379-81 (1928).—Historic details concerning the forerunners of the Manchester Pharmaceutical Assoc. S. WALDBOTT

William Kirkby. ANON. *Pharm. J.* 121, 382(1928).—Biography, with photograph, and review of publications. S. WALDBOTT

Edmund White, 1866-1928. ANON. *Pharm. J.* 121, 441-4, 467-8(1928).—Obituary, with portrait, and memorial tributes by W. J. U. Woolcock, D. L. Howard, F. W. Gamble, E. T. Neathercoat and G. A. Mallinson; also see *Chemist and Druggist* 109, 574-5(1928). S. WALDBOTT

A discussion of the pharmacopeial specifications for cresol. HUBERT OHAVER. Parke, Davis and Co. *J. Am. Pharm. Assocn.* 17, 547-9(1928).—After the U. S. P. X. was issued there was some agitation to change the specifications of compound cresol soln. or to admit a high-boiling cresylic acid. The claims were (1) that cresylic acids b. 193-205° had greater germicidal value than the U. S. P. cresol; (2) were less corrosive to tissue; (3) were cheaper and (4) more readily available. The first claim has been shown to be true for the 2 organisms *B. typhosus* and *B. aureus*. It is not known whether the assertion holds for other organisms but since the high-boiling cresols in general have higher phenol coeffs. it seems probable that they are more efficient as disinfectants. The second argument has not been proved. The third claim is undisputably true. Authorities disagree on the 4th. Examn. of many market samples of high-boiling acids demonstrates that the products are widely variant in phys. properties. No change in the U. S. P. standards should be made without carefully considering these facts. L. E. WARREN

Facts regarding the manufacture of physical constants and keeping qualities of soap, chloroform and camphor liniments. SAMUEL SHKOLNIK. U. Ill. School Pharm. *J. Am. Pharm. Assocn.* 17, 550-3(1928).—In making U. S. P. soap liniment the directions require that the unfinished product shall be set aside in a cool place for 24 hrs. and filtered. This procedure removes most of the Na palmitate. The Brit. prepn. is made from K soap which is sol. in EtOH. This does not require filtering. If CHCl₃ liniment be made from soap liniment which has not been filtered the Na palmitate will remain in soln. permanently and the total solids will be slightly higher than normal. The following consts. were noted: soap liniment $d_{20} 0.876$; direct rotation 1.51-1.67°; solids 5.96 g. per 100 cc. CHCl₃ liniment $d_{20} 1.060$; direct rotation 1.15-1.23°; solids 4.16 g. per 100 cc. Camphor liniment $d_{20} 0.939$; camphor 19.96%. Storage produced no appreciable changes in the consts. L. E. WARREN

The standardization of digitalis preparations. E. E. SWANSON and C. C. HARGRAVES. Lilly Laboratories. *J. Am. Pharm. Assocn.* 17, 641-5(1928).—Four biological methods were studied. The biological methods were (1) the U. S. P. 1-hour frog, (2) Houghton's 12-hour frog, (3) guinea pig, and (4) Hatcher's cat. The results by the

U. S. P. methods were compared with the colorimetric methods of Knudson and Dresbach. The samples tested included fluidexts., tinctures and the trade prepn., digiglusin. In one series the 1-hour frog method was compared with the colorimetric method, with ouabain as a color standard and in another series standard digiglusin was used as a color standard. The colorimetric method assays low for digiglusin and high for tinctures and fluidexts. The colorimetric method with ouabain as a standard gave low results as compared with the biological method. The colorimetric method with digiglusin as a standard gave inconsistent results. Since digitalis is given by clinicians in repeated doses until the therapeutic effect is obtained, and the amts. given to produce this effect vary with the individual patient, a more accurate method than those now in use is not absolutely essential.

L. E. WARREN

Notes on digitalin standardization. L. W. ROWE. Parke, Davis & Co. *J. Am. Pharm. Assocn.* 17, 645-7(1928).—The U. S. P. 1-hour frog method cannot be used for the assay of digitalin since the time is so short that complete absorption cannot take place. The Houghton M. L. D. method may be used as the time (12-18 hrs.) permits of nearly complete absorption. However, some indefinite results may be expected. The guinea pig method may be employed but the expense is high. The cat method gave unpromising results. Intraperitoneal injection of the white mouse gave the most promise but not sufficient tests were made to warrant establishing a standard.

L. E. WARREN

A study of the absorption and antiseptic properties of several types of iodine ointments. W. H. ZEIGLER. Med. Coll. South Carolina. *J. Am. Pharm. Assocn.* 17, 648-50(1928).—The ointments studied were the U. S. P. iodine ointment, the stainless N. F. ointment, the N. F. iodized petroxolin, an ointment with petroleum as a base, and one from which the KI had been omitted. In dogs 6 g. were rubbed into the axilla, the animal was bandaged and the urine tested for I at intervals of 4-6 days. In human beings one application only was made. Tests on the urine were made 5 or 6 times *per diem* for 2 days. The U. S. P. ointment was readily absorbed. The same ointment made with a petrolatum base was also absorbed. The 1 petroxolin N. F. V. and the U. S. P. ointment without KI were absorbed. The tests for I in the urine of subjects treated with the "stainless iodine ointment" were neg. The U. S. P. ointment possesses antiseptic properties but the stainless ointment of the N. F. V. does not.

L. E. WARREN

Flaxseed (SHURT) 27. Variation in alkaloid content of the pomegranate due to certain soil treatments (MAURIN) 15. A new colorimetric test for tannic acid (RAE) 7. Benzodiazines (Brit. pat. 288,159) 10. Benzodiazine condensation products (Brit. pat. 287,179) 10.

HOFSTEDE, H. W.: *Mededeelingen van de Afdeeling Nijverheid No. 4 Citronell-olie*. Buitenzorg: Archipel Drukkerij. 189 pp.; Fl. 8.50. Reviewed in *Parfums de France* 6, 297(1928).

Hemostatic medicinal preparation. FREDERICK MARTINEZ and ADOLFO GOMEZ. U. S. 1,690,869, Nov. 6. An aq. ext. is formed from fibers of the outside of the fruit of the *Cocos nucifera*.

Medicinal compositions for external use to stimulate cell growth, etc. I. G. FARBERIND. A.-G. Brit. 287,465, March 18, 1927. Solns. for treating wounds or fractures are prepd. by treating expressed animal cell juices or exts. or albumins or degradation products of these with microorganisms and then removing the latter. The liquids obtained may be used directly or may be evapd. to dryness. A prepn. from peptone and an agar culture of *Bacillus coli* is described.

Medicinal composition from tannic acid, zinc oxide and glycerol. RUSSELL S. PATERSON. U. S. 1,690,175, Nov. 6. Tannic acid and ZnO are mixed and ground together, glycerol and water are successively added and the mass is allowed to harden and then redissolved in distd. water. The product is suitable for use as a urethral injection.

"Enteric" coated medicinal capsule. ERNEST H. VOLWILER (to Abbott Laboratories). U. S. 1,690,760, Nov. 6. Capsules which may be formed of gelatin are coated with nitrocellulose.

Active substances from squill. CHEMISCHE FABRIK VORM. SANDOZ. Brit. 287,147, March 16, 1927. Cardioactive substances are extd. from fresh squill (suitably after grinding with Na phosphate, $Al_2(SO_4)_3$, or $MgSO_4$ and drying) by use of $EtOAc$ or $CHCl_3$.

or other suitable org. solvents not readily sol. in water, in the presence of water and easily sol. salts. The extn. may be facilitated by the addn. of small quantities of EtOH, MeOH, acetone or benzoic or salicylic acids.

Unsymmetrically disubstituted barbituric acids. WERNER SCHULEMANN and KURT MEISENBURG (to Winthrop Chemical Co.). U. S. 1,690,796, Nov. 6. Details are given of the prepn. of hypnotic compds. among which are described Δ^2 -cyclohexenylethylbarbituric acid (m. 172°), Δ^2 -cyclohexenylallylbarbituric acid (m. 149°), Δ^1 -cyclohexenylethylbarbituric acid (m. 170°), and Δ^1 -cyclopentenylethylbarbituric acid (m. 168°).

Benzoic acid salts of aminobenzoic esters. HERMAN SEYDEL. U. S. 1,690,705, Nov. 6. Esters such as Et *p*-aminobenzoate benzoate, m. 70–71°, are produced by reaction between benzoic acid and *p*-H₂NC₆H₄CO₂Et or like compds. They are *anti-septics* and *local anesthetics*.

Theobromine. NAAMLÖÖZE VENNOOTSCHAP SOC. VOOR CHEMISCHE INDUSTRIE KATWIJK. Brit. 287,507, March 22, 1927. Theobromine is extd. from material such as cacao fruits by mixing the ground material with a large excess of an alk. earth hydroxide (including magnesia), adding only such a quantity of water that the mixt. maintains its dry appearance and then (suitably after several hrs.) adding more water to obtain a soln. of the theobromine of the desired concn. The soln. may be sepd. by filtration and the theobromine recovered from the soln. by use of CO₂ or other acid. A temp. of 70° is suitable for the process.

Glucosides. F. HOFFMANN-LA ROCHE & Co. A.-G. Brit. 288,129, April 1, 1927. In addn. to the easily sol. glucoside obtained as described in Brit. 265,941 (C. A. 22, 480) by treating exts. of *Adonis vernalis* with adsorbents, a difficultly sol. glucoside is simultaneously adsorbed. It remains as an oil when the residue obtained by evapg. to dryness the soln. of the glucosides extd. from the adsorbent is washed with ether to remove fats and with water to remove the water-sol. glucoside.

Phosphorus compound from animal proteins. SVIGEL POSTERNAK (to Soc. anon. pour l'ind. chim. à Bâle). U. S. 1,690,752, Nov. 6. In order to obtain mixts. of the nuclei contg. P and Fe contd. in egg yolk, the defatted egg yolk is subjected to pepsin digestion in the presence of an inorg. acid such as HCl and this digestion is arrested at a suitable stage by materially diminishing the acidity of the mixt., the ppt. formed is filtered out and is subjected to trypsin digestion in a feebly alk. medium, the digestion liquor is then acidified, filtered and the filtrate is treated with sol. metal compds. such as CaCl₂ or Ca(OAc)₂, which serve to isolate a mixt. of metal salts of the 3 P nuclei. The product may contain about 11% P, 1.25% Fe and 9–10% Ca and may be used as a *tonic therapeutic agent*.

Ergotoxine. WELLCOME FOUNDATION, LTD., and G. M. TIMMIS. Brit. 286,582, Dec. 23, 1926. Ergotoxine is converted into sol. salts by alkylsulfonic acids. Prepn. of the methyl- and ethylsulfonates is described. Cf. C. A. 23, 241.

Pneumonia toxin and antitoxin. E. LILLY & Co. Brit. 286,744, May 11, 1927. Pneumococcus is cultivated in beef broth prepd. from beef not more than 6 days after its slaughter, sterilized in an autoclave under pressure, free from added carbohydrate and not over a week old. After 24 hrs.' incubation, the culture is filtered and the toxin obtained is preserved with tricresol and standardized on the basis of skin-test units. It may be used for obtaining an antitoxin in the usual manner from a rabbit, sheep or horse.

Vitamins. W. MERCK, K. MERCK, L. MERCK, W. MERCK and F. MERCK (trading as the firm of E. Merck). Brit. 286,665, March 8, 1927. In order to obtain antirachitic vitamin, provitamin substances are irradiated in the presence of "photochemical stabilizers" such as erythrosin, fluorescein, eosin or similar dyes and it is stated that I and CHI₃ may be used. Irradiation of dil. solns. of ergosterol is described.

Hormones. SCHERING-KAHLBAUM A.-G. Brit. 288,132, March 31, 1927. A therapeutic substance is prepd. from the anterior lobes of the pituitary body by treating the fresh or dried glands with a physiol. extn. agent such as Ringer's soln. or with an alk. medium such as NaOH or Ba(OH)₂ soln. Details are given.

Therapeutic hormone preparations from ovaries, corpus luteum and placenta. MAX HARTMANN (to Soc. anon. pour l'ind. chim. à Bâle). U. S. 1,690,932, Nov. 6. The animal tissue is dried and treated with a volatile org. fat solvent such as ether, phosphatides are pptd. and sepd. and the filtrate is subjected to a temp. of between –50° and –70° in order to sep. active and inert substances. Cf. C. A. 22, 845.

Tubercle wax. I. G. FARBENIND. A.-G. Brit. 287,941, March 30, 1927. Wax obtained from tubercle bacilli and freed from fatty acid and from most of the bacillary substances is purified by digestion with dil. acid (suitably of 5% strength) and may

be further purified by repeated soln. in ether, drying with Na_2SO_4 and pptd. with acetone or alc.

Bactericidal and trypanocidal compounds of desoxycholic acid with safranine and acridine dyes. FRIEDRICH W. R. OSTEN and E. GRUBE. Brit. 287,965, Dec. 30, 1926. Addn. products are obtained, e. g., by adding a compd. such as tolusafranine to a soln. of desoxycholic acid in alc., ether or HOAc, and boiling under pressure for several hrs. The products are capable of effecting the soln. of water-insol. or slightly sol. therapeutic substances such as quinine.

Mucin-solvent tooth paste. CLARENCE C. VOGT (to Glenn F. Bowman). U. S. 1,691,504, Nov. 13. Na_3PO_4 1, is dissolved in glycerol 12, soap 2.5 and a powd. abrasive such as pptd. CaCO_3 6 parts are added and the substances are thoroughly mixed.

Disinfectant. KARL DAIMLER, FRITZ JUST, GERHARD BALLE and SIGISMUND FUCHS (to I. G. Farbenind. A.-G.). U. S. 1,691,228, Nov. 13. Na butylnaphthalene-sulfonate or other suitable aromatic sulfonic acid substituted by at least 1 side chain contg. at least 3 C atoms is used as a disinfectant, suitably for treating fabrics, the hands or surgical instruments.

Disinfectant and antiparasitic composition suitable for use in hats. F. HAMMOND. Brit. 286,798, Dec. 13, 1926. A compn. which may be formed into tablets comprises thymol and an absorbent of CO_2 such as ZnO , to which a perfume may be added.

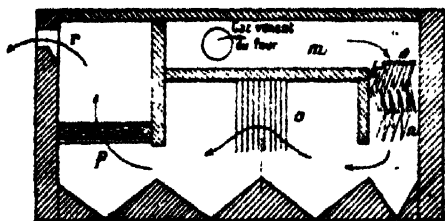
18—ACIDS, ALKALIES, SALTS AND SUNDRIES

E. M. SYMMES

Gas investigations in the Opl tower system (sulfuric acid plant). I. W. HANSEN. *Chem.-Ztg.* 52, 813-5(1928).—A detailed description of app. and analytical methods used in examg. gases from a tower acid plant. It is recommended that exit gases be drawn at a rate of 20 l./hr., with 100-150 l. as a sample, through an absorption train contg. 2 wash bottles, each holding 50 cc. 0.1 N NaOH, 2 or 3 similar bottles each holding 50 cc. 0.5 N KMnO_4 , and 1.0 cc. H_2SO_4 (sp. gr. 1.25), capillary flow-meter or indicator, trap for entrained liquid, and a large flask (to equalize pressure). By the titration of the NaOH and KMnO_4 , and the use of a nitrometer the SO_2 and NO content can be detd.

W. C. EBAUGH

Application of the MacDougall furnace to the sulfuric acid industry and elimination of the dust contained in the gases. B. PENTEGOV. *Mém. Univ. d'État d'Extrême-Orient* 73, 51-4(1927); *Chimie et industrie* 20, 468-9(1928).—The construction of the MacDougall furnace was modified as follows to adapt it to the production of SO_2 for Pb chambers: (1) A cast Fe sleeve over the central opening of each of the chambers



down which the pyrites traveled through the peripheral opening, reducing the amt. of excess air rising along the central axis without having taken part in the combustion and enabling the SO_2 content and temp. of the gases to be increased considerably. (2) The area of each of the 6 peripheral openings was doubled by decreasing the thickness of the wall of the furnace at the corresponding point. A sleeve was placed in each opening and 3 of the sleeves

were provided with a baffle which allowed the gases to pass but prevented the pyrites from falling. This reduced the velocity of the gases and also the amt. of dust entrained. Moreover, the reduction to 3 of the no. of openings allowing the pyrites to pass improved the roasting. With a 6-chamber furnace 5.9 m. high by 5.9 m. in diam., 20 tons of pyrites could be burned per 24 hrs. With the above-mentioned improvements the S content of the roasted pyrites was reduced from 12.1 to 2%, and the SO_2 content of the gases was increased from 4.8 to 70%. The dust-removing chamber is constructed as shown. The 4 following factors have been taken into consideration: (1) velocity of flow of gas as low as possible, (2) variation of this velocity, (3) change in direction of the gas, (4) shocks and friction against a solid surface. These principles follow from the laws of coagulation of colloids and suspensions of solid particles in gases. n are Fe bars fixed diagonally, provided with a cleaning device k ; in the horizontal tunnel are suspended angle-irons forming the filter o ; p is a concrete filter. This chamber is very efficient, and the Glover acid, after concn., contains only 0.1-0.06% non-volatile residue and 0.01% Fe.

A. PAPERNAU-COUTURE

Safe removal of caustic soda from drums. H. L. KAUFFMAN. *Chem. Met. Eng.* 35, 638(1928).—At the Parco, Wyo. refinery of the Producers and Refiners Corp. a sheet iron building houses four 1300 gal. and one 900 gal. iron tanks. Above these tanks a steel rail support and chain hoist permit workmen to raise NaOH drums (previously perforated with an axe) and lower them into hot water with safety. A concrete dyke 18 in. high surrounds all tanks. All connecting pipe lines are placed in the dyke. Each of the larger tanks has air, steam and water lines, and a pumping-out line.

W. C. EBAUGH

Evaporating system for salt solutions. A. MITTENBERG. *Ukrainskii Khem. Zhurnal* 3, No. 2, Pt. techn. 43-64(1928).—A detailed investigation of the efficiency of a vacuum evaporator, with steam heating, working on a technical scale.

G. B. KISTIAKOWSKY

Reduction of tricalcium phosphate by carbon. K. D. JACOB AND D. S. REYNOLDS. U. S. Dept. Agr. *Ind. Eng. Chem.* 20, 1204-10(1928).—A study was made of some of the factors affecting the volatilization of P from mixts. of pure $\text{Ca}_3(\text{PO}_4)_2$ and pure C under closely controlled conditions. Reaction begins at 1150° and under favorable conditions is complete in 1 hr. at 1325° , or in 10 min. at 1500° . At the lower temps. graphite is less efficient as a reducing agent than the amorphous forms of C. There is some evidence that a phosphate more basic than $\text{Ca}_3(\text{PO}_4)_2$ is formed to a certain extent during some stage of the reaction. Less than 0.2% of the P originally present as $\text{Ca}_3(\text{PO}_4)_2$ is converted into Ca_3P_2 at temps. up to 1500° . In the presence of an excess of C reduction of $\text{Ca}_3(\text{PO}_4)_2$ follows the course of a monomol. reaction, the velocity coeffs. being 0.0113 and 0.0639 at 1250° and 1400° , resp.

K. D. JACOB

The lime industry of the Philippine Islands. F. D. REYES. *Philippine J. Sci.* 36, 139-56(1928).—A summary of the lime industry in the Philippines, including a comparison of methods, efficiency and costs.

JOHN T. WOLF

New systematic study of the iron content of special red lead. L. SPRINGER. *Chemtech. Ber.* 6, 186-8(1928), cf. *C. A.* 22, 2898.—Results on 3 red lead samples are compared, with HCl and HNO_3 as solvents, and 2 g. and 10 g. samples, the PbO being removed both quant. and qual. The Fe was detd. colorimetrically with KCNS. If care is used in removing the PbO a 1-g. sample is sufficient to give good results, the quant. removal having slight advantages. The Fe specification for red lead is too low, as a sample under 0.010% calcd. as Fe_2O_3 , especially when analyzed in HCl soln., is seldom found.

J. A. GRANT

Fine grinding of calcite containing a small amount of graphite, from near Perth Ontario. R. K. CARNOCHAN. *Can. Dept. Mines, Mines Branch* No. 688, 31-2.—The calcite was pure white, contg. CaO 50.55, MgO 1.68, SiO_2 2.80, CaF_2 0.95, Fe 0.16, C 0.35. The purpose of the tests was to det. if products could be prepd. from the calcite suitable for use in paint, linoleum, rubber goods, etc. The treatment recommended is to remove the graphite by oil flotation, dry the cleaned calcite and grind in a pebble mill in closed circuit with an air separator. If a finer product is desired the cleaned calcite should be ground wet in a pebble mill in closed circuit with a Dorr bowl classifier.

Reconcentration of low-grade graphite concentrates from Buckingham, Quebec. *Ibid.* 35-40.—The purpose was to find an economical method of raising the grade of the concentrates. The Gayco or any similar separator is unsuitable for this work. Good results can be obtained by small-scale flotation and the longer the charge is ground before flotation the higher the grade of concentrate and the greater the recovery.

Grinding test on Rosedale bentonite. *Ibid.* 86-7.

L. W. RIGGS

The application of oxygen and hydrogen to industrial operations. Hydrogen, nitrogen and the electric furnace. F. P. WILSON, JR. *Gen. Elec. Rev.* 31, 493(1928).—A review in particular of the commercial annealing, brazing or oxide-reducing furnaces containing H or H + N atoms, the furnaces being elec. heated.

C. G. F.

Specific gravity of various kinds of carbon black. WERNER ESCH. *Kautschuk* 4, 160(1928).—In spite of opinion to the contrary (cf. Hock, *C. A.* 22, 3742), it is maintained that the d. of C black is about 1.75 and of lamp black about 1.90. Data of other investigators are given in support of these values.

C. C. DAVIS

Density and porosity of limestone and coke. K. SMOLENSKI AND W. REICHER. *Gazeta Cukrownicza* 62, 693(1928); *Listy Cukrowar. Rozhledy* 47, 8.—The authors detd. the d. of finely pulverized materials (actual d.) and materials in lump (porous form (apparent d.)). The actual d. of limestone was 2.69-2.71, the apparent d. 2.14-2.675, showing a porosity of 1.2-20.3%. The limestone contained 91.4-99.9% CaCO_3 . The coke showed an actual d. 1.72-1.76, apparent d. 0.94-1.12, porosity 36.1-45.6%.

F. MARESH

Heat losses in the lime kiln. CH. LONGENECKER. *Rev. matériaux construction*

trav. publics 1928, 333-4.—After a discussion of the heat losses in lime burning it is suggested that powdered coal can be used to good advantage in vertical kilns.

F. O. A.

The economical organization of the lime kiln. E. MASSELON. *Rev. construction trav. publics* 1928, 364-7.

Bibliography of investigations, progress and novelties in the technology from the standpoint of the theory of colloids, during the years 1923-1927. OTTO. *Rev. gén. mat. plastiques* 4, 579-87, 649-51 (1928). A. PAPINEAU

The problem of accelerated hardening in the technology of proteino MANFRED. *Rev. gén. mat. plastiques* 4, 643-9 (1928); cf. C. A. 22, 3963.—A of patented processes, bringing out that the hardening by incorporation which generate CH_2O is intimately linked with plastification if max. phys. properties are to be developed. A. PAPINEAU

Asbestos, its selection and suitability for technical uses. TH. HOFFMAN *sion* 3, 21-2, 33-4 (1928).—The occurrence, compn, resistance to heat, acid elec. insulating properties and commercial products of hornblend and s bestos are discussed. J.

Suitable protection against acids and alkalis (STAEMMLER) 9. Purn (Brit. pat. 287,267) 1. Recovery of ZnCl_2 in paper making (Ger. pat. 4 Apparatus for evaporating salt solutions (Brit. pat. 286,982) 1.

Hydrochloric acid. EDSON R. WOLCOTT (to Texas Co.). U. S. 1,691,45 NaCl and clay are intimately mixed with a carbonaceous binder such as asphalt and the mixt. is subjected to destructive distn. at a temp. of less than 1500° to form a porous cake adapted for producing HCl by contact with steam at elevated temps.

Sulfuric acid. A. P. JAEGER (to Selden Co.). Brit. 286,708, March 10, 1927. A catalyst for oxidizing SO_2 to SO_3 comprises a catalytically ineffective base-exchange material physically combined with a catalyst, e. g., a zeolite comprising silicates of 2 or more metals, one of which at least may be a heavy metal and which may contain Al, Be, Cd, Zr, Zn or Ti may be used with a catalyst such as a metal of the 5th or 6th group such as V, Mo, W, U, Cr, Mn, As, Sb, Ta, Nb or Bi, with or without the addition of activating ingredients among which are listed Mn, Be, Al, Ti, Fe, Cu, Zr, Zn, Pb, Ag, Ce, Ni, Co, B and the rare earths. Pt and V compds. are especially suitable and vanadates and vanadites of Fe, Cu, Ag, Ni, Co, Ti, Zr, Ce, Al, Ca, Cd, U, Cr or Mn may be used. Inert or "diluent" carriers also may be used and some salt solns. and acid compds. have a stabilizing effect on the material. Many details are given.

Sulfuric acid. SOC. GÉNÉRALE MÉTALLURGIQUE DE HOBOKEN. Brit. 286,980, Aug. 23, 1927. Sulfurous gases are catalytically oxidized and after removal of the SO_2 formed the remaining gases are treated in towers or chambers packed with broken flint or the like and washed with nitrosylsulfuric acid. The SO_3 produced in the first stage of the process may be absorbed in the H_2SO_4 produced in the second stage. (C. A. 23, 243.

Sulfuric acid. SOC. GÉNÉRALE MÉTALLURGIQUE DE HOBOKEN. Brit. 286,865, Feb. 19, 1927. In making H_2SO_4 in packed chamber or towers as described 249,914 (C. A. 21, 991) a substance having a high heat capacity such as is used as the packing material in order to counteract fluctuations in temp. within the chamber may be maintained almost const. by varying the temp. of the acid which is circulated through the chamber and the latter is in the cube or of a cylinder, the height and diam. of which are equal

Ammonia synthesis. KALI-INDUSTRIE A.-G. and T. THORSSELL. Br April 1, 1927. A N-H mixt. for NH_3 synthesis is obtained by passing a and steam over Fe oxides; the higher oxides produced are then treated in chamber with reducing gases, and the operations, which are carried out w heat supply, are then repeated. Details are given as to the extent of oxide Fe oxides. The reducing gases may be water gas or coke or blast furnace gas

Synthetic ammonia. WALTER H. KNISKERN (to Atmospheric Nitrogen U. S. 1,690,585, Nov. 6. In liquefying NH_3 from gases contg. it the mixt. in successive stages to a cooling action produced by evapg. portions of the liquid cooling agent at pressures which are progressively lower from one stage next, the resulting vapors of the cooling agent are recompressed to the same pressure as the compressed vapors are condensed to liquid form, and the liquid is returned to the evapg. stages. An app. is described.

Synthetic ammonia. R. S. RICHARDSON (to Nitrogen Engineering Corp.). Brit. 287,072, March 12, 1927. A mixt. of H and N is circulated in a cycle to and through a single catalytic converter, part of the NH_3 is removed at one point and a further part is removed at another point beyond the pump and the inlet for fresh gases and this portion takes with it impurities from the gases and from the lubricating oil in the pump. Various features of app. are described.

Synthetic ammonia. VEREIN FÜR CHEMISCHE UND METALLURGISCHE PRODUKTION. Fr. 637,336, July 8, 1927. A mixt. of N and H for the production of NH_3 is made by treating an industrial gas rich in CO , such as the gas formed in the prepn. of carbides in elec. furnaces, with steam, with or without catalysts, and absorbing the CO_2 formed.

Alkali nitrates. I. G. FARBENIND. A.-G. Fr. 637,393, July 7, 1927. See Brit. 283,771 (C. A. 22, 4211).

Alkali hydride. DEUTSCHE GOLD UND SILBER-SCHNEIDANSTALT, (formerly Roessler) Fr. 637,794, July 19, 1927. See Brit. 276,313 (C. A. 22, 2444).

Alkali cyanide lye. NAAMLooZE VENNOOTSCHAP NEDERLANDSCHE MIJNBOW EN HANDEL, MAATSCHAPPIJ. Ger. 467,117, Jan. 19, 1927. Alkali cyanide lye, free from K ferrocyanide, is prepd. from cyanide raw material contg. Fe by lixiviation with concd. NH_4OH , treating with alkali sulfide and then with heavy metal salts.

Decolorizing alkaline earth metal thiocyanate solutions. ROBERT R. FULTON. U. S. 1,691,345, Nov. 13. Solns. such as those of Ca thiocyanate for dissolving cellulose are treated with a deriv. of a water-sol. aliphatic acid such as CH_3O and heated at $120\text{--}130^\circ$.

Chromium compounds. ÉMILE BAUMGARTNER. Fr. 638,718, Aug. 2, 1927. Na_2CrO_4 is reduced with SO_2 , giving a soln. of $\text{Cr}_2\text{O}_3\cdot\text{SO}_2$ which is acted on by alkalies, neutral salts or acid salts of weak acids to obtain compds. such as $2(\text{Cr}_2\text{O}_3\cdot n\text{H}_2\text{O})$. $\text{Na}_2\text{Cr}_2\text{O}_7$, which are useful for *anti-rust* paints and for tanning.

Purifying vanadate solutions. SELDEN Co. Brit. 287,401, Sept. 14, 1927. A crude Vanadate soln. from which vanadic acid is to be prepd. is subjected to oxidation (suitably with a halogen or peroxide) to render impurities readily removable on subsequent treatment, as with NH_3 . Numerous details, modifications and auxiliary treatments are described.

Treating zinc solutions with ammonium carbonate. S. C. SMITH. Brit. 287,186, Sept. 18, 1926. Zn salt solns. such as those of ZnSO_4 or ZnCl_2 obtained from ores are treated with $(\text{NH}_4)_2\text{CO}_3$ in the presence of free NH_3 in a quantity suitably about half that chem. equiv. to the Zn in the soln., suitably by passing CO_2 into the cooled ammoniacal soln. under pressure. A granular ppt. is obtained which can be readily filtered and washed.

Lead, zinc, copper and silver salts. F. DIETZSCH. Brit. 287,207, Dec. 8, 1926. Oxidized, oxide or roasted ores are treated with a soln. of thiosulfate simultaneously with or after treatment with a soln. of SO_2 to ext. Cu or Pb and Zn or Ag. Solns. of cuprous sulfite and Pb sulfite or sulfate are formed and if the Pb is present almost wholly as sulfate the SO_2 may be omitted. The metals may be pptd. and the thiosulfate regenerated. Various details and modifications are given.

Aluminum chloride. ALMER M. McAFEE and GERALD I. ROBERTS (to Gulf Refining Co.). U. S. 1,690,900, Nov. 6. A mass of aluminous material such as bauxite and C is established in a reaction chamber and is graded so that it is denser at the walls of the chamber than at other points and a mixt. of Cl and combustion-supporting gas such as O or air is passed through the mass under conditions (suitably while maintaining a temp. of about $600\text{--}700^\circ$) for AlCl_3 formation, preferably so that the gases travel in a path away from the walls of the chamber.

Aluminum sulfate and alums. JEAN G. HERBOS. Fr. 638,760, Aug. 2, 1927. $\text{Al}_2(\text{SO}_4)_3$ is prepd. without heating by making a paste of bauxite and H_2SO_4 and a paste of bauxite and water and adding one to the other in a vat. The soln. of $\text{Al}_2(\text{SO}_4)_3$ is freed from Fe by pptg. it as Prussian blue or oxidizing it with dichromate. The corresponding alums may be pptd. by adding an alkali sulfate or chloride.

Ammonium chloride. CHEMISCHE FABRIK GROSS-WEISSANDT and PAUL SEIDLER. Ger. 467,184, Aug. 11, 1926. Addn. to Ger. 463,184. Larger crystals of NH_4Cl are prepd. by the crystn. of the NH_4Cl ext. of such plants as are non-ligneous, such as soy-bean wax. Cf. C. A. 22, 2444.

Ammonium sulfate. SOCIÉTÉ DES MINES DE DOURGÈS. Fr. 638,997, Jan. 4, 1927. In the prepn. of $(\text{NH}_4)_2\text{SO}_4$ from synthetic NH_3 wherein large crystals are obtained by reducing the ferric salts in the acid used to ferrous salts by the action of H_2S , H_2S used is obtained from ammoniacal vapors from ammoniacal liquors of coke-oven plants.

Calcium arsenate. CARLETON ELLIS and VERNON T. STEWART (to Chadeloid Chemical Co.). U. S. 1,690,627, Nov. 6. Powd. quicklime is reacted on with a soln. of arsenic acid contg. water in excess of that required completely to hydrate the lime and the product is desiccated by the further addn. of pulverized quicklime. U. S. 1,690,628 specifies grinding quicklime with arsenic acid while in the presence of an insufficient quantity of water to produce a pasty mass.

Calcium cyanamide. JOSEPH BRESLAUER and ÉDOUARD DE LUSERNA (to Soc. d'études chimiques pour l'industrie). U. S. 1,691,044, Nov. 13. See Can. 275,516 (C. A. 22, 1209).

Ferric hydroxide. J. WAGNER. Brit. 287,702, March 8, 1927. A strong current of air contg. up to 10% of crude dust-free CO₂ is passed through a tank contg. iron or steel shavings and filled with water to which has been added up to 3% NaCl and up to 1.5% of chloride such as those of Fe or Mn, or according to one description CaCl₂ or NH₄Cl. The aq. liquid is circulated and the product is removed by filtration.

Pure lead carbonate from crude lead sulfate. RENÉ DALOZE. U. S. 1,691,841, Nov. 13. Crude Pb sulfate (such as slime from lead chambers) is treated with a soln. of an alk. earth metal acetate such as Ca(OAc)₂ in excess to effect a double decompn. between the Pb sulfate and the alk. earth metal acetate, the resulting soln. is sepd. from insol. matter and the sepd. soln. is treated with an alk. earth metal base such as Ca(OH)₂ and the tri-basic Pb acetate formed in soln. is decompd. with CO₂ to produce Pb carbonate.

Potassium nitrate, etc. KALI-INDUSTRIE A.-G., T. THORSSELL and A. KRISTENSON. Brit. 287,133, March 16, 1927. In producing KNO₃ from KCl by use of HNO₃ of a strength up to 35%, the mother liquor, after sepn. of solid nitrate formed, is treated (suitably with FeCl₂ or Cu) to reduce its content of N compds. to NO, which is driven off and converted to HNO₃ for further use. Numerous details are given.

Zirconium oxychloride. RHENANIA-KUNHEIM VEREIN CHEMISCHER FABRIKEN A.-G. Brit. 287,424, Nov. 2, 1927. The product obtained by sintering Zr ores with lime and an alk. earth metal halide, as described in Brit. 282,023 (C. A. 22, 3621), is treated with HCl of such concn. that a soln. which when cold is almost satd. with CaCl₂ is obtained, by which a high yield of Zr oxychloride crystals is obtained. Various details are given.

Removing nitrogen oxides from gases containing hydrogen. SOC. L'AIR LIQUIDE (SOC. ANON. POUR L'ÉTUDE ET L'EXPLOITATION DES PROCÉDÉS G. CLAUDE). Brit. 287,577, March 25, 1927. Gases such as coke-oven gas freed from tar (but not necessarily from H₂S) are passed over reduced metals such as Fe or Cu which may be slightly heated. Fe may be used which has been used as a catalyst in NH₃ synthesis. The treated gas may be subjected to low temps. to effect partial liquefaction and obtain H or gas rich in H without generation of explosive products. Cf. C. A. 22, 3715.

Copper and carbon compound. GEBR. SIEMENS & Co (Erich Birnbrauer, inventor) Ger. 466,514, Nov. 9, 1921. Addn. to 454,804. In the process of 454,804 for the prepn. of a substance from Cu and C the powd. C is intimately mixed with the Cu ppt. before reduction with H.

Hydrogen. I. G. FARBENIND. A.-G. Brit. 288,056, Dec. 30, 1926. In operation of a process and app. such as described in Brit. 263,859 (C. A. 22, 32) a gas contg. 14% CH₄ and 86% H may be passed through the furnace arc to produce a gas which passes through the smaller outlet tube contg. C₂H₂ 7 and H 93%. The C₂H₂ is removed by washing to obtain pure H. In a furnace using a flat arc and producing 2% of N oxides, the gas recovered by the smaller outlet tubes contains 5% of the oxide.

Carbon. I. G. FARBENIND. A.-G. Brit. 286,845, Feb. 4, 1927. C is obtained from CO (or a gas contg. it) by decompn. the CO into C and CO₂ by heating to a high temp. with the addn. of a small quantity of an org. compd. or a carbonyl of a metal such as Fe carbonyl which serves as a catalyst to accelerate the decompn. The acetyl-acetone compds. of Fe, Ni and Co may be used, and with CO and Fe carbonyl a temp. of 400° and pressure of 100 atm. are suitable.

Carbon from carbon disulfide and other compounds. ANTON LEDERER. Fr. 637,817, July 20, 1927. In production of C by decompn. of C compds. such as CS₂, a temp. of 1100-1750°, preferably 1600-1700°, is used to obtain a hard, coherent and brittle C of about 1.8 d. A temp. of 1750-2100°, preferably 1800-1890°, gives a gray C which is lustrous, coherent and very soft, and of density about 2.3 or more and of a metallic character. The black may be converted into the gray by heating to above 2800°. The gray C can be heated in air or O to 700° without appreciable loss of weight, and can be obtained in metal-like plates by deposition on a flat core. Strips of the gray

C or filaments formed by powdering it and mixing with binders and squirting can be used for elec. incandescent lamps, working at high c. ds.

Active carbon. T. FUJISAWA. Brit. 287,982, Jan. 13, 1927. "Soot" prepd. by incomplete combustion of oils, fats, waxes, resins or gases of high C content is heated to dull redness and exposed to the atm. while stirring in a layer of 2 in. of less thickness, and is then cooled in a closed vessel.

Apparatus for distilling hydrogen peroxide. J. D. RIEDEL A.-G. Brit. 287,281, Feb. 4, 1927. Various structural details are described of an app. which may be made of ceramic materials, Ta or Cr-Ni alloys.

Magnesia product. THOMAS S. CURTIS (to Pacific-Southwest Trust & Savings Bank, trustee). U. S. 1,690,771, Nov. 6. A product suitable for use as *elec. insulation* comprises magnesia which has been heated sufficiently to convert it substantially wholly to periclase without fusion.

Molded articles of clay and magnesium cement. HARVEY E. MANNING. U. S. 1,690,305, Nov. 6. In forming articles such as bowls of tobacco pipes, kaolin clay is mixed with MgO and nitro-hydrochloric acid, to form a thin pasty mass which will set slowly upon standing in a vacuum, forming a product of low gravity; the mass is allowed to set under less than atm. pressure, and sol. materials are removed by washing.

Phosphorus and aluminous cement. I. G. FARBENIND. A.-G. Brit. 287,036, March 19, 1927. P and an aluminous cement are obtained by melting phosphates under reducing conditions in an elec. or shaft furnace with a slag formed by fusing (under reducing conditions) Al_2O_3 70-90 and lime 30-10 parts. Bauxite of high Fe content may be used in forming the slag and the Fe eliminated as a regulus.

Condensation products of urea and formaldehyde. HENRI BARTHELEMY (to Soc. industrielle des matières plastiques). U. S. 1,691,427, Nov. 13. A sirupy soln. of the initial condensation product of urea and CH_2O is treated with an org. anhydride of the aliphatic series such as Ac_2O to facilitate production of molded articles.

Condensation products of thiourea, etc., and aldehydes. K. RIPPER. Brit. 287,568, March 25, 1927. Thiourea or its derivs., which may be admixed with urea or its derivs., is condensed with an aldehyde such as CH_2O or its polymers to produce a hydrophobe resin which disintegrates on contact with water or aq. solns. into a powder which may be molded under heat and pressure. Methylolurea and methylolthiourea also may be used as starting materials. Various details and examples are given, some of which include the use of fibrous or other fillers and auxiliary ingredients.

Condensation products for making buttons, etc. SILUR TECHNISCHE UND CHEMISCHE PRODUKTE GES. and I. THORN. Brit. 287,727, April 9, 1927. Urea or thiourea is condensed with CH_2O , with or without an acid catalyst, and starch or a similar material is added "in an amount which is a multiple of the urea" and the material is dried and pressed. Other resinous substances, softening agents such as wool fat, etc., also may be added.

Plastic substances. GEORGES BIA and JEAN ÉTIENNE DOUZAL DE GRANVILLE DE BIELIZE. Fr. 638,887, Dec. 27, 1926. A dielec. nonbrittle plastic substance is made by condensing phenol with a large excess of CH_2O . A catalyst such as MgO , Na_2CO_3 or a mixt. of Na_2CO_3 and $NaBO_2$ may be used, and a little paraffin is added to render the substance elastic.

Adhesive for surgical dressings, etc. JOHNSON & JOHNSON. Brit. 286,527, June 15, 1927. A weak soln. of gum tragacanth, Irish moss, agar-agar, Indian gum or the like is added to rubber latex to cause "creaming" and the "cream" is then treated with solns. such as Na silicate or other alk. compd. such as Na phosphate, NaOH or Na_2CO_3 and with a germicide such as CH_2O , thymol, phenol or cresol and more gum soln. is added to cause further "creaming," the material is warmed to 70° , a warmed soln. of agar agar and Na silicate is stirred in and a perfume is added. The mixt sets to a jelly when cold and is squeezed through fine gauze to give it a pasty consistency.

Vegetable glue. IRVING F. LAUCKS and GLENN DAVIDSON (to I. F. Laucks, Inc.). U. S. 1,691,661, Nov. 13. Adhesives such as those prepd. from soy-bean flour contain reaction products of CS_2 with other substances present which serve to increase the resistance of the glue to water. Cf. C. A. 23, 248.

Size. GERHARD HÖNSCH. Fr. 637,476, July 11, 1927. A size powder sol. in cold water consists of a mixt. of finely divided animal glue and a liquefying agent such as Na α -naphthosulfonate, Na salicylate, NaCl, $CaCl_2$ or $Ca(NO_3)_2$. The adhesive properties may be increased by tanning agents, siccatives or casein. If for use in the making of paper, casein and an agent which will also liquefy the casein are added.

Absorbents. BRITISH DYE STUFFS CORP., LTD., JAMES BADDILEY and ERNEST CHAPMAN. Fr. 637,498, July 12, 1927. See Brit. 280,262 (C. A. 22, 3025).

Photomechanical printing surfaces. A. W. NORDLANDER (to Aktiebolaget Rapidografi). Brit. 287,460, March 18, 1927. Printing surfaces, or grain screens, are produced from gelatin films contg. one or more Ag salts, with a preliminary hardening of the film by successive treatments with an alum bath and a CH_3O bath. Various details are given.

Photomechanical printing surfaces. F. ULLMANN. Brit. 288,023, March 24, 1927. To prevent chem. action between a Zn plate and the dichromate emulsion, the cleaned and fat-free plate is treated with a metal salt such as AlCl_3 which has a tendency to form a double salt, and is then washed and dried before the application of the sensitized coating.

Impression or transfer rolls with a core of sponge rubber coated with a gum composition or other material. LLOYD V. CASTO (to Oxford Varnish Corp.). U. S. 1,691,336, Nov. 13. Rolls are specified which are suitable for use on printing app.

Embossed articles. ERNST SAUER. Ger. 466,328, Aug. 25, 1927. Gelatin reliefs are formed in celluloid by stamping. The reliefs are soaked in water and coated with AmOH or AmOAc . This is then washed off and the water removed by an aspirator.

Material for expansion joints. ALBERT C. FISCHER. U. S. 1,691,234, Nov. 13. Resilient material such as granular cork is distributed throughout a mass of ductile bituminous material so as to provide for free contraction and expansion. Cf. C. A. 23, 258.

Wetting agents. BRITISH DYE STUFFS CORP., LTD., and JAMES BADDILEY and ERNEST CHAPMAN. Fr. 637,848, July 18, 1927. Sec Brit. 279,990 (C. A. 22, 3042).

Packing material. WALTER W. EVANS (to B. F. Goodrich Co.). U. S. 1,690,161, Nov. 6. Packing material adapted for bottle seals comprises a relatively thick resilient backing layer and a relatively thin, impervious plastic facing layer adherent to the backing layer and composed of unvulcanized rubber, wax and a reinforcing pigment such as BaSO_4 . The backing layer may be formed of cardboard and is substantially free from impregnation by the material of the facing layer.

Sound record tablets. THOMAS A. EDISON (to Thomas A. Edison, Inc.). U. S. 1,690,159, Nov. 6. A blank which is to be impressed with a sound record groove is treated with a priming or sizing coating of varnish contg. a fusible condensation product such as a phenol resin and the coated blank is dried between successive coatings of varnish, and the duration of successive drying periods is progressively increased, and the coated blank is finally further cured by heating.

Projection screens. ZAIDAN HOJIN RIKAGAKU KENKYUJO. Brit. 288,135, March 31, 1927. Dark colored glass or the like is coated with a thin layer of gelatin or similar material on which crystals such as NH_4 manganous phosphate or NH_4 cobaltous phosphate, or both are deposited. The preliminary coating may contain pigments or colloidal coloring substances, and, instead of glass, metal or wood surfaces may be used. Rubber, varnishes, mica, stannic sulfide and other materials also may be used.

Modifying the physical properties of "isocolloids." L. AUER. Brit. 287,943, Sept. 30, 1926. The viscosity of "isocolloids" (defined to include colloidal substances of which the dispersed phase and the dispersion medium are both of the same chem. compn. but in a different phys. state, and which may include fatty oils, resins, mineral oil fractions of high b. p., goudron, tar, asphalt, rubber and similar substances and styrolene) and other phys. properties of the "isocolloids" are modified by adding various salts such as Co linoleate and KCNS (which on heating to 300–350° with linseed oil, rapeseed oil or mineral cylinder oil, in vacuum, yield a tacky product suitable for making linoleum), or with about 2% each of Na_2HPO_4 and MgO , and 1% of NH_4Cl , or with 5% of Na phenolate or trichloroacetic acid or with MgSO_4 and formic acid. Various products are obtained suitable for use as rubber substitutes, *manuf. of lacquers*, etc.

Synthetic gems. I. G. FARBERIND. A.-G. Ger. 466,310, Feb. 11, 1926. Gems of the spinel group are made by fusing a mixt. of MgO and Al_2O_3 in the mol. proportions 1 to 4 or 5, resp.

Polishing pad. SABURO YAMANAKA. U. S. 1,690,960, Nov. 6. A pad suitable for polishing varnished or metal surfaces comprises a body of hair felt with which is incorporated a mixt. formed of powd. horn 1, powd. squid shell 2, powd. pumice stone 7 parts and gelatin.

Bolter for carbon black or other pulverent materials. WM. S. HOSKINS (to Columbian Carbon Co.). U. S. 1,691,572, Nov. 13.

Vermin-proofing composition. CHARLES DICKENS. Ger. 466,780, Feb. 26, 1925. A vermin-proofing compn. particularly effective against toredo comprises Se or Te dissolved in a concd. aq. soln. of BaS .

Composition for fireproofing cloth, paper or other materials. CHARLES LICHTENSTADT. U. S. 1,691,726, Nov. 13. ZnNH_4 phosphate, mono- NH_4 phosphate and NH_4Cl are used together.

Apparatus for generating fire-extinguishing foam from acid and basic solutions. FRANK A. EPPS, ADDISON O. BONIFACE and WILLIS D. WITTER (to American LaFrance and Foamite Corp.). U. S. 1,691,710, Nov. 13.

Dental plate of rubber coated with metal. HENRY F. BUTTNER. U. S. 1,691,755, Nov. 13. The rubber surface is first subjected to the combined action of an ammoniacal AgNO_3 soln. and an aq. soln. contg. sugar, alc. and a small proportion of HNO_3 , and is then subjected to the combined action of a AgNO_3 soln. and gallic acid.

19—GLASS, CLAY PRODUCTS, REFRACTORIES AND ENAMELED METALS

G. E. BARTON AND C. H. KERR

An elementary laboratory method for the determination of the density of glass. A. R. PAYNE. *Glass Ind.* 9, 191-4(1928); cf. *C. A.* 22, 4215.—Samples of about 3 g. each are freed from projections and sharp edges, weighed in air and then in H_2O as usual. Temp. corrections must be made for the buoyancy of the H_2O and for the cu. expansion of the glass, which for the ordinary SiO_2 - Na_2O - CaO bottle glass is about 0.00003. Correction tables for the usual temp. ranges are given. H. F. K.

Microstructure of glass. N. N. SMIRNOV. *Trans. State Expt. Inst. Silicates* (Moscow) 1926, No. 23, 5-29.—The conditions responsible for the appearance of various cryst. products in glass as indicated by a number of mineralogical and chem. analysis are: CaSiO_3 in the form of needles of the monoclinic system of wollastonite crystallizes at 1000° and in the form of hexagonal plates at very high temps. Both of these forms are characteristic for glass of a high Ca content. Apparently Ca silicate forms supersatd. solns. in sodium silicate; at a high content of Mg and Fe in glass other pyroxenes of the augite series crystallize. SiO_2 crystallizes from glass as tridymite and cristobalite. It is possible that the concn. of Ca salts takes place in connection with the accumulation of the more heavy part of the glass in certain places of the bath. A miniature magmatic differentiation takes place and the heavier silicates of calcium crystallize. The observations of Smirnov show that these silicates belong not only to wollastonite, but apparently to the other compds. of the type $3\text{CaO} \cdot 2\text{SiO}_2$ and $2\text{CaO} \cdot \text{SiO}_2$. J. S. JOFFE

Effect of heat treatment on the physical properties of glass. A. Q. TOOL AND D. B. LLOYD. *Bur. Standards. Fuels and Furnaces* 6, 353-6, 364(1928).—Heat treatment of glass not only removes the strains introduced by rapid cooling, but also changes such physical properties as density, refractivity and thermal expansivity. Elec. cond., color, transmission, etc., are also affected by the degrees to which physicochem. reactions are advanced by heat treatment. Changes in the density of thermometric glass resulting from different heat treatments account for the major part of the error in the ice-point. If a thermometer is held for a considerable time at temps. below its previous effective treating temp. its ice-point will rise, while if held above this temp. the ice-point will fall. Slight variations in the ice-point observed after small temp. changes may be due to suppression of physicochem. processes affecting the density. Variations in refractivity lie between 2 and 5 in the fifth decimal place for each degree change in the effective annealing temp. Differences of one in the third decimal place may be obtained by varying the heat treatment of pieces of glass secured from the same melt. The end condition of the physical properties of a glass is detd. by the temp. of the heat treatment, independently in most cases of the previous history of the glass. During heat treatment the rate of approaching physicochem. equil. doubles for temp. increments lying between 5° and 15° . A knowledge of the behavior of glass following heat treatment is of especial value in manufg. optical app. J. W. SHIPLEY

The petrographic microscope as an instrument for the glass technologist. HERBERT INLEY. *Bur. of Standards. J. Am. Ceram. Soc.* 11, 812-28(1928).—It is of value in identifying crystalline defects in glass and impurities in raw materials. C. H. K.

Value of the thermal expansion factor of aluminum oxide in glass. I. KITAIGORODSKY AND S. RODIN. *J. Soc. Glass Tech.* 12, 164-9(1928).—Measurements of the thermal expansion of glasses contg. 9-14% Al_2O_3 showed the value of the coeff. for Al_2O_3 to be about 0.52×10^{-7} as found by English and Turner rather than 5.0×10^{-7} as given by Winkelmann and Schott. H. F. K.

Study of the glasses boric oxide-silica. ARNOLD COUSEN AND W. E. S. TURNER. *J. Soc. Glass Tech.* 12, 169-90(1928).—Mixts. of pure powd. quartz and purified B_2O_3 were melted, cooled, powd. and remelted until clear homogeneous glasses were obtained which contained 0-61.45% SiO_2 and their properties detd. Small clear beads contg. up to 80% SiO_2 were made, showing the probability of complete miscibility of these oxides in all proportions. The thermal expansion of B_2O_3 itself and the B_2O_3 - SiO_2 glasses shows no change points and remains const. in the range between the ordinary temp. and the lower critical temp. The straight portion of the curve in the critical range shows progressive shortening with increasing SiO_2 % while the actual critical temp. range is continuously increased. The thermal expansion coeff. decreases with increasing SiO_2 content. When plotted against compn. the coeff. graph is a smooth curve without max. or min. between the values for B_2O_3 and for SiO_2 glasses. The formation of compds. such as $B_2O_3 \cdot SiO_2$ or $3B_2O_3 \cdot 2SiO_2$ is not indicated. The density of pure, fused, well-annealed B_2O_3 is 1.8442. This is higher than the best previous values because of the later better annealing and H_2O removal. The density of B_2O_3 - SiO_2 glasses increases proportionally with the SiO_2 content. Apparently these oxides form only simple solns. when fused together. H. F. K.

Some physical properties of glass tank block refractories. A. ERNEST MACGEE. *J. Am. Ceram. Soc.* 11, 858-67(1928).—Properties depend largely upon compn. Crushing strength was 7000-12,000 lbs. sq. in.; porosity 20%; apparent sp. gr. 2.6; Young's modulus $7.5-10.0 \times 10^5$ lbs. sq. in.; transverse strength 1440-2080 lbs. sq. in.; impact strength $2.4-3.2 \times 10^6$ g. cm. per sec. expressed as momentum; coeff. of linear expansion $5-9 \times 10^{-6}$ over the interval 30-850°. High- SiO_2 tank blocks have very high coeff. of expansion, especially at about 250°, due probably to cristobalite conversion. Bodies, strong enough at first, may fail in consequence of "thermal" fatigue. Bodies resistant to spalling show low and uniform rate of expansion, high tensile and transverse strength, low Young's modulus, high thermal diffusivity and resistance to thermal fatigue. C. H. KERR

Notes on Kallauner and Seger methods of rational analysis. WILBUR F. FISCHER. Iowa State College. *J. Am. Ceram. Soc.* 11, 842-4(1928). A comparison is made of the Seger, Kallauner and calcd. rational analysis, on a Florida kaolin and a Temball clay. There seems to be no definite effect of the increased concn. of the digesting acid in the Kallauner method. The Kallauner results agree more closely than the Seger results with the calcd. compn. As a plant control method the Kallauner is preferred, largely because of the time saved. C. H. KERR

X-ray investigation of the effect of heat on china clays. T. N. MCVAY AND C. L. THOMPSON. Univ. of Illinois. *J. Am. Ceram. Soc.* 11, 829-41(1928).—X-ray diffraction patterns were obtained from an English china clay and a Georgia sedimentary kaolin, both raw and fired to various temps. The chief cryst. constituent of the raw clays was found to be kaolinite. Upon dehydration the kaolinite lattice was destroyed and the clays gave no diffraction pattern. Mullite was formed in both clays at 950° and the amt. increased with increase in firing temp. In addn. to the mullite, free Al_2O_3 was present in the Georgia clay from 950° to 1100° and cristobalite at temps. above 1200°. C. H. KERR

Florida clay in bone china bodies. C. E. JACKSON. *Trans. Ceram. Soc. (Eng.)* 27, 151-2(1928).—An English formula for bone china calls for 50% calcined bone, 20% Cornwall stone, and 30% English china clay. The china clay was replaced in 3% increments with the more plastic Florida china clay. The ware fired to cone 11 showed that the latter clay was satisfactory for this purpose. The more refractory Florida clay caused the ware to have a little less translucency and more absorption. The best ware contained a mixt. of 9-12% English and 21-18% Florida clays. H. F. K.

An investigation of the hydrometer method for determining colloid content. PAUL J. SLEGEL. Iowa State College. *J. Am. Ceram. Soc.* 11, 851-3(1928).—Two clays, bentonite and Florida kaolin, were used in the study of the George Bouyoucos hydrometer method for detg. the colloid content in a clay suspension. This hydrometer method was not found to be an accurate measure of % colloid. It checked the heat of wetting, which also is unsatisfactory. C. H. KERR

Variations in pyrometric cone equivalent of silica cements and fire clays. SANFORD S. COLE. Mellon Inst. *J. Am. Ceram. Soc.* 11, 854-7(1928).—Samples of 100 SiO_2 cements and 5 fire clays were tested, in cone form, for deformation point, in 3 ways: (1) as received, (2) ground to 65-mesh, and (3) after calcining at 1400° and grinding to 65-mesh. Tests (1) gave closer checks than tests (2) or (3). Grinding lowered the deformation point $1\frac{1}{2}$ to 2 cones. Calcining and grinding lowered it nearly 2 cones. C. H. KERR

Brick clays in the region of Moscow. N. N. SMIRNOV. *Trans. State Exptl. Inst. Silicates* (Moscow) 1926, No. 19, 5-22.—Smirnov gives a survey of the available raw materials for the manuf. of bricks in the region. J. S. JOFFE

Microstructure of silicate bricks. N. N. SMIRNOV. *Trans. State Exptl. Inst. Silicates* (Moscow) 1926, No. 20, 5-18.—Microscopic observations and chemical analyses show the presence of cryst. Ca hydrosilicate in silicate bricks. The cryst. form of the cementing substance obtained is the cause of the strength of the brick. For this reason all the operations in the manuf. of silicate bricks should be directed toward a max. formation of this cryst. cementing substances. The following might be done to attain this end: (1) The lime should be ground as fine as possible. The fineness of the material serves as centers of crystn. (2) The lime should be completely slaked. The sand and lime should be admitted into the drum simultaneously and in equal proportions. (3) Max. pressure is desirable for the close contact of the lime with the sand. (4) The steaming should be continued as long as possible in order to obtain a large, granular crystalline mass and a max. amount of soluble SiO_2 . The microscopic observations are illustrated. J. S. JOFFE

Temperature—Property characteristics of refractories. J. F. HYSLOP. *World Power* 10, 253(1928).—A review. C. G. F.

Refractory failures. HUGH E. WEIGHTMAN. *Power* 68, 624-7(1928).—Failures often may be attributed to (1) improper furnace design, (2) overloading of the refractory or (3) mechanical stresses set up in operation. Ten photographs illustrate failures due to such causes. D. B. DILL

Some effects of coal ash on refractories. T. N. MCVAY AND R. K. HURSH. Univ. of Illinois. *J. Am. Ceram. Soc.* 11, 868-73(1928).—Coal ash slagging of various refractories was studied by means of the petrographic microscope. No feldspar was noted in the slags. Diaspore brick were more deeply penetrated by the slag, because of their porosity. Varying the temp (1500-1600°) or the length of time of slagging action did not change the reactions or cause any new compds. to be formed. Compds. present, magnetite, mullite, etc., were the same as those found in refractories subjected to the same temps. in the boiler furnace. C. H. KERR

Determination of iron oxide and titania in clay refractories. W. RAYMOND KERR AND EDGAR B. READ. Mellon Inst. *J. Am. Ceram. Soc.* 11, 845-50(1928).—The usual detn. of Fe_2O_3 and TiO_2 from ignited R_2O_3 ppt. requires considerable time. Direct titration of fusions with Na_2CO_3 is impossible because of gelatinous SiO_2 . Direct titration of fusions with KHSO_4 is accurate with clays low in SiO_2 and unfired clays. By treating with HF and H_2SO_4 and dissolving with dil. HCl and pptg. the R_2O_3 by NH_4OH and then fusing with KHSO_4 , the Fe_2O_3 and TiO_2 can be titrated accurately. Details are given. C. H. KERR

Increase in refractoriness in ceramic bodies in interrupted heat treatment. H. B. HENDERSON AND J. H. CALDWELL. *J. Am. Ceram. Soc.* 11, 795-802(1928).—The study was undertaken to overcome the tendency of pyrometric cones to set (or freeze) in prolonged heat treatment, when the temp. is fluctuating. Conclusions are: (1) Fired natural bodies, as a rule, and many synthetic bodies are more refractory than the raw bodies. (2) The probable cause is the development and segregation of aluminous silicates such as mullite. (3) This development seems to be from kaolinite and not from feldspar, porphyry, etc. (4) Feldspar and possibly other aluminous minerals such as porphyry dissolve mullite, etc., and thus prevent freezing. (5) Freezing appears to be a function of the ratio of feldspathic material to the other aluminous minerals in the mixt. and not to the constitution of any one mineral. C. H. KERR

The production of magnesia and silica crucibles in the induction furnace. C. N. SCHUERTE. *Bur. Mines, Repts. of Investigations* No. 2896, 6 pp.(1928).—Magnesia crucibles are made in graphite molds, using 60-mesh periclase, a fused elec. furnace product contg. 95.1% MgO . Silica crucibles are made of 20-30 mesh crushed silica from old crucibles and of 20-30 mesh Ottawa standard sand. W. H. BOYNTON

High ratings—no erosion in boiler-furnace tests at carborundum plant. ANON. *Power* 68, 839-41(1928).—A furnace burning pulverized coal and lined with *carbofrax*, SiC refractory, stood up without erosion with a boiler rating of 500% and combustion rates as high as 50,000 B. t. u. per cu. ft. D. B. DILL

The insulator molding room and the molding of porcelain insulators. C. DORNEDINGER. *Sprechsaal* 61, 523-5, 541-4, 559-61 579-81, 597-9, 617-20(1928). R. A. H.

A test for the adhesiveness of vitreous enamels to metal. W. N. HARRISON AND G. T. THALER. *Bur. of Standards. J. Am. Ceram. Soc.* 11, 803-11(1928).—Test specimens are prepd. by clamping together 2 strips of enameled metal while they are still in the furnace and allowing them to cool slowly in another furnace from a temp.

of 500°. The test consists of detg. the force necessary to pull the pieces apart when treated as a continuous strip of metal under tensile stress. An estimate is also made of the % of contact area on each specimen within which failure occurred in the bond. A Co enamel gave a stronger bond than one without Co. The test is sufficiently reproducible to permit positive distinction where the difference is commercially considerable. C. H. KERR

The application of the cone softening point method for the determination of the relative fluidity of enamel frits. F. DEURVORST. *Tech. Hochschule, Karlsruhe Sprechsaal* 61, 561-4(1928).—A series of 12 normal enamels for sheet iron are itemized, of which the melting periods are given, using 1250° for an approx. const. working purification temp. The time of deformation of the series of 12 cones of frits with an approx. const. rate of heating is also included, which gives both the temp. at which deformation started and complete fusion of the cone. The calcd. time for reaching fusion is compared with observed time. These values are also compared with calcd. values using the so-called "refractory factors" obtained by Staley (cf. *C. A.* 20, 2901-2). R. A. HEINDL

Terra cotta in modern building (GILARDONI) 20. Iron content of special red lead (SPRINGER) 18. Removing gas from molten substances (U. S. pat. 1,691,458) 13.

Artificial glass. KUNSTHARZFABRIK F. POLLAK G.M.B.H. Fr. 637,318, May 1, 1927. A compressible powder is made by pptg. from dil. solns., either by an electrolyte or by an albumin pptg. agent, an amorphous, flocculent deposit of the condensate products of carbonic acid amides or their derivs. with formaldehyde. The powder is washed, dried and heated to 120-130° under high pressure to obtain homogeneous, transparent or translucent materials resembling glass.

Sheets of glass. SOC. ANON. DES MANUFACTURES DES GLACES ET PRODUITS CHIMIQUES DE SAINT-GOBAIN, CHAUNY-ET CIREY. Fr. 637,622, Nov. 15, 1926. In the manuf. of glass in sheets by flowing and rolling the gathering zone of the furnace is kept at a temp. above the critical point of devitrification, and the temp. of the flow of glass from the furnace is rapidly cooled to a convenient degree for rolling.

Plate glass manufacture. NAAMLooZE VENNOOTSCHAP MIJ. TOT BEHEER EN EXPLOIT. VAN OCTROOIEN. Brit. 287,111, March 15, 1927. Mech. features.

Light-diffusing glass. PATENT-TREUHAND-GES. FÜR ELEKTRISCHE GLÜHLAMPEN (to General Electric Co., Ltd.). Brit. 287,545, March 24, 1927. Clear glass is pulverized and then fused together to form a viscous mass which is blown to the desired state and forms a turbid or opalescent product. Coloring or opacifying agents may be added.

Revolving tank for molten glass. MEYER M. EPPSTEIN (to Owens Bottle Co.). U. S. 1,690,777, Nov. 6. A compartment is provided from which charges are gathered and a compartment surrounding this serves to receive portions of glass severed from the charges gathered in the inner compartment. The app. is arranged for reheating and transfer of the chilled portions from the outer to the inner compartment.

Apparatus for supplying molten glass to molds. LEONARD D. SOUBIER (to Owens Bottle Co.). U. S. 1,690,998, Nov. 6.

Apparatus for making blown glass bottles. H. HILLMANN. Brit. 287,067, Mar. 10, 1927.

Apparatus for melting off waste portion of blown glass bulbs, etc. NAAMLooZE VENNOOTSCHAP PHILIPS' GLOEILAMPENFABRIEKEN. Brit. 287,131, March 16, 1927.

Bricks from clay. G. H. HADFIELD. Brit. 286,772, Dec. 7, 1926. Clay is mixed with clinker, from boiler ash, house refuse, destructor ash or the like which has been substantially freed from carbonaceous materials.

Ornamenting and cold-glazing tiles, etc. M. POLLAK-STEGE. Brit. 286,566, May 9, 1927. In a continuous process, the roughened surface of a tile or the like is treated with a slimy mass in approx. the design to be produced and the material is then distributed on the surface by vibration to form a marbled design or other pattern and the surface is then pressed or cross-rolled and planed or scraped. Hygroscopic material may be thinly applied to absorb moisture during the rolling. The scrapings may be used for surfacing other tiles of different character.

Fuel-charging apparatus for brick kilns, etc. K. RUETZ. Brit. 286,626, March 6, 1927.

Material for furnace linings, etc. P. E. J. J. COURTURAUD (to Laboratoire de perfectionnements thermiques). Brit. 287,556, March 24, 1927. Walls or other parts

of furnaces exposed to the injurious action of slag, clinker or the like are protected by a coating having a graphite base preferably mixed with Na silicate or other sol. silicate.

Refractory materials. A. WAGEMANN. Brit. 286,677, March 8, 1927. The strength of refractory materials such as those of clay-bound quartz, sand, chamotte and similar siliceous materials is increased by adding 10% or less of artificial silicates contg. Al_2O_3 such as slag, in a very fine or colloidal state.

Heating refractory and other materials. MARCEL FOURMENT. Fr. 638,843, Dec. 21, 1926. An app. for heating refractory, insulating and abrasive materials by induction currents at high frequency is described.

Ceramics. KUNSTSTEIN-INDUSTRIE W. HENKER & Co. G.M.B.H. Ger. 466,254, Jan. 16, 1927. Light colored objects are made by pouring S mixed with gypsum or powd. marble into molds. A thin layer of the mixt. is poured in and a thicker layer of a different colored non-cracking mixt. added.

Ceramic articles. DONALD W. ROSS and JAMES M. LAMBIE. U. S. 1,690,208, Nov. 6. Grog grains of assorted sizes, deflocculatable clay to bond the grog, a deflocculating agent and water are mixed together as a paste *in vacuo* and molded to form tank blocks for use with molten glass or other articles. An app. is described.

Casting pottery. JOHN D. WIGGIN and MATHIAS M. REMMES (to H. B. Wiggin's Sons Co.) U. S. 1,690,708, Nov. 6. Articles which are afterward removed from the mold and fired are cast in a mold, using a slip contg. a sol. carbonate and a mold material comprising plaster of Paris and a substance such as $BaCl_2$, $CaCl_2$ or $MgSO_4$ which prevents reaction between the carbonate of the slip and the $CaSO_4$ of the mold.

Kiln or oven for firing pottery, etc. F. BENNION, H. J. PLANT and J. B. CLARKE. Brit. 287,693, Nov. 22, 1927.

Continuous furnace for baking porcelain. NGUYEN-BA-CHINH. Fr. 32,908, Dec. 21, 1926. Addn. to 595,009. The furnaces have 8 or 10 rectangular compartments joined to one another with a partition of refractory material between.

Fused silica. QUARTZ ET SILICE. Brit. 287,522, March 23, 1927. In making transparent fused silica from quartzites as described in Brit. 190,477 (C. A. 17, 2942), as large blocks as possible of the quartzite are melted without deformation by packing the blocks into an elec. resistance furnace with a filling of pure sand. After fusion, the cooled ingot is cut up and the flawless portions are sepd. and used for optical purposes. Other portions may be further treated.

Fused silica. QUARTZ ET SILICA. Fr. 639,016, Jan. 6, 1927. See Brit. 283,148 (C. A. 22, 3969).

Silica and other gels. E. B. MILLER (to Silica Gel Corp.). Brit. 287,066, March 12, 1927. Hard, tough, low-density gels of silica, tungstic acid, alumina, Ti oxide or their mixts. are prepd. by submitting the hydrogel to a heat treatment before drying. The hydrogel may be slowly heated to 80-160° under conditions which prevent dehydration, and slowly cooled. Heated gas or vapor satd. with H_2O may be used in the treatment. Cf. C. A. 22, 2644.

Abrasive wheels with side plates bonded to the abrasive after firing by use of vulcanized rubber. J. R. GAMMETER. Brit. 286,683, March 9, 1927. The thickness of the layer of rubber used is "comparable" with the grain size of the wheel.

20—CEMENT AND OTHER BUILDING MATERIALS

J. C. WITT

New England's only cement mill. C. H. SONNTAG. *Chem. Met. Eng.* 35, 623-6 (1928).—A description of the Thomaston, Maine, plant of the Lawrence Portland Cement Company.

RAYMOND WILSON

Volume stability of cement. A. DAHLGREN. *Rev. matériaux construction trav. publies* 1928, 331-2.—A discussion of the role of CaO in causing unsoundness in cement.

F. O. A.

The shrinkage of cements. J. COCAGNE and MME. Y. MATRAS. *Rev. matériaux construction trav. publies* 1928, 321-30; cf. C. A. 22, 4219.—Specimens were stored at const. temp. and practically const. humidity for one year, after which very little change occurred. The shrinkage varied with the cement, with the amount of mixing water, with the amt. and nature of the aggregate and with the amt. of admixtures. Angular aggregates are preferred. $CaCl_2$, Na_2CO_3 and water glass increased the shrink-

The concrete should be applied as dry as possible and after it has set it should be kept wet for a while.

F. O. A.

A new method of burning cement in a shaft kiln of high yield; the system of Andrees. KARL BIEHL. *Rev. materiaux construction trav. publics* 1928, 339-41; cf. *C. A.* 22, 3029. F. O. A.

Graphical mixing of raw cement mixtures. RICHARD GRUEN AND GUENTHER KUNZE. *Pit and Quarry* 16, No. 13, 64-70(1928); cf. *C. A.* 22, 4754. R. W.

Gypsum and anhydrite in the manufacture of portland cement. RICHARD K. MEADE. *Rock Products* 31, No. 24, 55-8, No. 25, 40-5(1928).—Gypsum and anhydrite-gypsum mixts. are equally effective as retarders and have the same effect on the strength of cement if compared on the basis of their SO_3 contents. Anhydrite alone also retards the set, if finely ground (cf. *C. A.* 22, 1836). RAYMOND WILSON

The effect of retarders on portland cement clinkers. ERNEST E. BERGER. Bur. of Mines. *Rock Products* 31, No. 25, 50-1(1928).—Anhydrite alone is less effective as a retarder for portland cement, per unit of SO_3 , than gypsum or plaster of Paris. In mixts. with gypsum or plaster it is as effective as any other form of CaSO_4 . RAYMOND WILSON

The manufacture of supercement. N. C. KYBIAOU. *Rev. materiaux construction trav. publics* 1928, 341-5.—A cement of the compn.: 20.5 0.7% SiO_2 , 3.0-0.6% Al_2O_3 , 8.0-0.5% Fe_2O_3 and 66-7% CaO has given two-day strengths greater than 380 and 36 kg./sq. cm. The logical way to build waste-heat boilers is along an extension of the axis of the rotary kiln, allowing the attainment of much higher steam pressures. F. O. A.

Aluminous cement. TRAVERS. Inst. chim., Nancy. *Ciment* 33, 363-5, 406-10(1928).—A general discussion. F. O. A.

Aluminous cement. J. KONARZEWSKI. *Przemysl Chem.* 11, 309-12(1927).—This is a review of the properties of aluminous cement. Its manuf. in Poland would be at a disadvantage because of the high cost and unavailability of domestic bauxite. A. C. ZACHLIN

Unsoundness and its control. P. FERON. *Rev. travaux construction trav. publics* 1928, 361-4.—A general discussion. Cements contg. 3 to 5% MgO showed no vol. change on boiling 3 hours but after a second 3 hrs. expansion of several mm. was noted which had reached as much as 160 mm. after 18 hrs.' boiling. F. O. A.

Design of pavement by the water-cement ratio. F. H. JACKSON. U. S. Bur. Public Roads. *Roads and Streets* 68, 479-82(1928). L. B. MILLER

Modulus of elasticity of cores from concrete roads. A. N. JOHNSON. Univ. of Md. *Public Roads* 8, 164-8(1928).—J. discusses the accuracy of various types of extensometers used for elasticity measurement of concrete cores under compression. The results on various rock cores and concrete cores are given. L. B. MILLER

Terra cotta in modern building. HENRI GILARDONI. *Ciment* 33, 342-9(1928). F. O. A.

Methods of making structures impermeable, especially by means of waterproofers. LOUIS VIENNOT. *Ciment* 33, 355-9, 389-94(1928).—In spite of a few really good waterproofers most are apt to give variable results and should be used with caution. If a cement could be developed free from shrinkage, the problem of waterproofing would be eliminated. F. O. A.

Industrial results of the experimental works for silicate materials. N. N. SMIRNOV, A. S. GRYAZNOV AND N. K. LAKHTIN. *Trans. State Exptl. Inst. Silicates* (Moscow) 1927, No. 24, 5-39.—The authors give a description of the geology, mineralogy and chem. compn. of the lime deposits and other raw building materials at Podolsk, the methods of working over these materials for the building industry, such as plaster, cement and binding sand. J. S. JOFFE

Constitution and properties of plaster of Paris. ALEXANDER PELLAT. *Rev. materiaux construction trav. publics* 1928, 335 7.—When the resistance of gypsum products to atm. conditions and to fire have been established by sufficiently profound research; when the manuf. of the plaster is carried out with sufficient technical control; and when adequate care is used in its application, then this material will occupy the chief place in modern construction. F. O. A.

The diffusion of water-soluble preservatives in wood. ROBERT NOWOTNY. *Z. angew. Chem.* 41, 46-9(1928); cf. *C. A.* 21, 4043.—In the Cobra process a paste of NaF and dinitrophenol is injected into wood by means of hollow needles (cf. *C. A.* 20, 3069). The diffusion of these salts, 1 yr. after introduction into the wood by needle injection, was studied in spruce and pine telegraph poles. Cross sections of the poles at intervals of a few cm. were made and the diffusion patterns measured to obtain longitudinal, radial and lateral penetration. The longitudinal diffusion is by far the greatest (20 to 40 cm.), sidewise spreading along the annular rings much less (1 to 2

cm.) and radial diffusion very slight. The rate of diffusion is greatly influenced by the moisture content of the wood. The diffusion therefore is considerably greater underground than above the ground line in poles. Pine shows more diffusion than spruce. The NaF is more diffusible than the dinitrophenol. From such data puncture distribution patterns can be developed. While the incisions may be a considerable distance apart longitudinally, they must be close together laterally and should be staggered in alternate rows in order to obtain a penetration ring of uniform depth. The depth of penetration will be practically equal to the length of the needle, 3 to 4 cm. in practice.

ALFRED L. KAMMERER

Testing cements [for oil wells] (ALEKSANDROV) 22. Oxidized petroleum wax products [for use in proofing brick, stone or concrete] (Brit. pat. 287,514) 22. Compositions for paints, plasters, etc. (Fr. pat. 637,370) 26. Apparatus for distilling wood (U. S. pat. 1,690,933-4-5) 21. Phosphorus and aluminous cement (Brit. pat. 287,030) 18. Vermin-proofing composition (Ger. pat. 466,780) 18.

ANSTETT: *Essai et analyse des matériaux de construction*. 2nd ed. Paris: Eyrolles. 454 pp.; F. 50. Reviewed in *Rev. métal* 25, 591-2(1928).

Cement. OTTO LELLEP. Ger. 466,298, Apr. 3, 1927. The crude powder, heated by waste furnace gases, is roasted with clinker in a rotating oven.

Rotary cement kiln and cooler construction. O. BOUZIN. Brit. 288,114, Dec. 8, 1927.

Treating concrete surfaces. NATHAN C. JOHNSON. U. S. 1,691,721, Nov. 13. Flexible sheet material such as paper or cloth has one side covered with selected concrete aggregate such as colored pebbles secured to the sheet by an adhesive which includes a substance such as $AlCl_3$, $MgCl_2$ and Mg saccharate which inhibits normal setting of the concrete to a limited depth when applied to the surface. This material is secured to the inside of the forms in which concrete is cast.

Supplying water to concrete during setting. MARVIN S. WEAVER. U. S. 1,690,467, Nov. 6. A perforated water-supply pipe is placed in the interior of a mass of concrete next placed for setting and water is supplied through the pipe under pressure in excess of the gravity pressure due to the head of the water.

Asphalt concrete. NAAMLOOZE VENNOOTSCHAP KONINKLIJKE STEARINE KAARSEN-FABRIEK GOUDA. Brit. 286,552, Aug. 2, 1927. A bituminous emulsion (which may be formed of asphalt, resin, NaOH and water) to which protein material may be added is mixed with coarse stone separately and fine stone or the like is then added with or without previous admixt. with emulsion.

Asphalt. HERMANN PLAUSON. Ger. 466,567, Nov. 18, 1925. An artificial asphalt for roads is made by subjecting factice contg. oil either alone or in combination with tar, pitch, etc., to a partial sulfonation. Filling materials may be added and the mass is ground if necessary and emulsified.

Asphalt paving. WEST PROCESS PAVEMENT CO. Brit. 287,799, Oct. 5, 1927. A paving compn. which will not set into a coherent mass during storage or transit but requires to be heated and blended before laying is prepd. by heating a mixt. of mineral aggregate and a powd. hard asphalt to a temp. below that at which the hard asphalt can blend with a soft or semi-liquid asphalt or asphaltic flux (the latter being separately heated and then blended with the other materials). An example with proportions is given.

Paving composition. F. MORTON. Brit. 286,949, July 5, 1927. Coal-tar pitch or like material with a "twisting point" between 40° and 65° 5-20% is used with granite chippings, slag or the like in sizes of 0.25-0.75 in.

Porous artificial stone or other porous solid materials. BERNARD GRANVILLE. U. S. 1,691,280, Nov. 13. Cement mixts. or other wet gas-contg. material which has the property of setting and hardening is subjected to a sub-atm. pressure to maintain the material in expanded condition during setting. An app. is described.

Apparatus for preparing bitumen emulsions for use on roads, etc. H. E. WARSOP. Brit. 287,257, Jan. 1, 1927.

Cast sulfur masses of marble-like appearance. KUNSTSTEIN-INDUSTRIE W. HENKER & CO. G. M. B. H. Ger. 466,922, Feb. 16, 1927. The mass before casting is sprinkled with readily fusible dyes, or with a finely ground mixt. of dyes and S. The drops of dye run together during the casting to produce a grained product.

Plastic product from Jerusalem artichoke. EDWIN K. O'BRIEN. U. S. 1,690,648,

Nov. 6. Parts of the Jerusalem artichoke plant such as the stems or stalks are mixed with other substances such as lime and preservatives which render the product resistant to deteriorating effects of ordinary heat and moisture. The product is suitable for use in *building construction*.

Moisture-indicating instrument for testing wood or like materials. MATTHEW E. DUNLAP (to the Government and People of the United States). U. S. 1,690,672, Nov. 6.

Floor construction. W. MICHAELIS. Brit. 288,093, Sept. 21, 1927. A concrete or brickwork base carries slabs or plates of porous burnt clay, ashes, cork or peat, with straw or peat in intermediate spaces and cement ribs between the slabs.

Sectional wood piling. EUGENE F. CONSIDINE. U. S. 1,691,704, Nov. 13. A sectional wood pile comprises an upper section which has been treated with a preservative and a lower section adapted to be completely below water level and which is not treated with preservative.

Drying, dyeing or fireproofing wood. C. GOODALL. Brit. 286,833, May 18, 1927. Mech. features of supplying treating fluids to a balk of timber supported in a cylinder.

Fireproofing and preserving wood, etc. F. S. VIVAS (to International Fireproof Products Corp.). Brit. 286,725, March 11, 1927. Wood or other material is fireproofed and preserved from decay by treatment successively with solns. of chlorides and H_3BO_3 (such as a soln. formed of $CaCl_2$, NH_4Cl , H_3BO_3 and water) and of metallic sulfates such as sulfates of Zn and Al, to ppt. insol. sulfates in the material. $NaOH$ may be used to saponify the resins of wood treated which may be recovered as a by-product.

Composition for preserving wood. CHARLES WILLIAMS and FERDINAND FRANÇOIS (one-third to Eddy Bozonier). U. S. 1,690,390, Nov. 6. A mixt. suitable for use on submerged wooden structures is formed from paraffin oil 2, naphthalene 2, benzene 3, light creosote 2.5, oil of tar 5, heavy creosote 2.5 gals., cement 5 lbs., hydrated lime 5 lbs., S 5 lbs. and Paris green 20 oz.

Preserving wood, etc. G. GUNN. Brit. 286,892, March 25, 1927. Wood or other material to be preserved, after treatment with an aq. soln. of a dichromate and a sol. Cu salt acidified with $HOAc$ as described in Brit. 273,007 (C. A. 22, 1838) and after running off the treating soln., is subjected to the direct action of steam (suitably satd. steam at atm. pressure) to form a deposit in the wood of basic Cu chromate.

21—FUELS, GAS, TAR AND COKE

A. C. FIELDNER

Pulverized fuel at the Calumet Power Station, Chicago. F. H. ROSENCRANTZ. *Engineering* 126, 389-91, 398(1928).—An installation of 2 boilers erected in 1926 to burn powd. coal contg. $14\frac{1}{2}\%$ moisture and 18% ash is described. These furnaces were first of the bin-and-feeder type, but they are now being changed to the unit or direct-fired system. The efficiency of these boilers is $86\frac{1}{2}\%$ as contrasted with 78% for the stoker-fired boilers, partly due to the fact that only 20% excess air is required as against 40% for the former installation. The final temp. of the products of combustion is $250^\circ F$. The boiler can be started from the cold in 30 min. as against 1-1 $\frac{1}{2}$ hrs. for the stoker-fired boiler. The boiler is designed to supply 200,000 lb. of steam per hr. at 375 lb. per sq. in. at $700^\circ F$.
ALDEN H. EMERY

Principles of combustion. A. A. POTTER AND H. L. SOLBERG. Purdue Univ. *Power* 68, 765-7(1928).—A discussion of the elementary principles involved in combustion calcs.
D. B. DILL

Analyzing the products of combustion. A. A. POTTER AND H. L. SOLBERG. Purdue Univ. *Power* 68, 928(1928).—Practical suggestions for collecting gas samples and for the use of the Orsat app. are given.
D. B. DILL

Solved and unsolved problems of the chemistry of combustibles. C. KIPPENBERGER. *Arch. Pharm.* 266, 519-40(1928).—An address.
W. O. E.

The relation between carbon dioxide and excess air. A. A. POTTER AND H. L. SOLBERG. Purdue Univ. *Power* 68, 837-9(1928).—The max. $\% CO_2$ in products of combustion can be calcd. by the formula, $(CO_2)_{max.} = \frac{8.81}{0.421 + ((H - O/8)/(C + 0.375))}$

the symbols H, O and C representing $\%$ by wt. in the fuel. Since $(CO_2)_{max.}$ can be detd. when the analysis of the fuel is known, the actual $\% CO_2$ in the products of combustion can be used as a measure of the $\%$ excess air supplied for combustion, provided combustion is complete.
D. B. DILL

Recovery of waste heat from internal-combustion engines. CONSTANTIN REDZICH. *Gas u. Wasserfach* 71, 1071-2(1928).—Heat may be recovered from the cooling water used in the jacket of internal combustion engines or the waste gases may be circulated through waste heat (fire tube) boilers. In this way 1 kg. of steam at 2 atm. pressure can be secured per kw. hr. and this will develop 10% additional power in a steam turbine. Care should be taken to avoid cooling the gases to the condensing point as excessive corrosion results. The power developed can be increased from 22% of the theory to 32% or if the steam is used in chemical processes the utilization of heat totals about 70% of the theory.

R. W. RYAN

Damage due to smoke. H. B. MELLER. *Power* 68, 734(1928).—A review.

D. B. DILL

Experiences and results with the continuous vertical retort plant at Salzburg. HANS DERINGER. *Städt. Gas- u. Wasserwerke, Salzburg. Monatsbull. Schweiz. Ver. Gas u. Wasserfach* 8, 219-24, 247-50, 274-9(1928).—The equipment and operation of a Koppers plant and its performance, during the two years of its existence, are described and discussed. The high gas-thermal yield peculiar to this system is attributed to protection, against pyrogenic decompn., of the rich distn. gases through prompt diln. and removal by the water gas simultaneously produced. Other special features are the ready adaptation to variation of output; the long life of the furnaces, due to reduction of mechanical requirements by the continuous movement of the charge and to the absence of very large temp. variations in the walls; the comparatively little underfiring; the possibility of increasing the yield of coke, available for sale, by about 20% by heating the retorts with their own gas; and the small power consumption. In selecting the coal, a low gas yield of high calorific value is considered preferable to the reverse.

F. S. GRANGER

Desirable fusion temperatures of coal ash and influence of sulfur. A. BEMENT. *Power* 68, 683-4(1928).—There appears to be only a slight increase in fusion temp. of ash as the S content of coal decreases. Since an efficient furnace temp. softens the ash of any coal the emphasis should be placed on the proper disposal of a fused ash rather than on avoiding fusion.

D. B. DILL

Pneumatic coal transport at the Gablonz municipal gas works. WILLY GAESSLER. *Gas u. Wasserfach* 71, 1073-5(1928).

R. W. RYAN

The fractionation of coal with solvents, and the influence of the soluble portion upon the agglutinating power of coal. HUGO NOVAK AND J. HUBAČEK. *Paliva a Topeni* 10, 9, 22-8, 28-33, 41-51(1928).—Two brown, one bituminous, and one sub-bituminous, coal from Bohemia were extd. with tetrahydronaphthalene at 18 atm. and elevated temp. Brown coals yielded 26 and 24% sol. material. The bituminous coals were further extd. with pyridine, yielding a total of 44 and 39% bituminous substances, which are considered as the portions which have the property of becoming liquid, plastic, or semisolid at elevated temp. Further extn. was carried out in petroleum ether, EtOH and C_6H_6 . The fraction extd. by petroleum ether consisted of hydrocarbons in large amts. of resinous matter. This fraction and the EtOH fraction have an av. temp. of 100°; these exts. reveal properties of fossil resins and constitute the chief sol. fraction of brown coal. Bituminous coal extracts consist chiefly of 3 fractions: (1) sol. in C_6H_6 , m. 180°, (2) insol. in C_6H_6 , m. 300°, (3) sol. in pyridine. Tables of coal comps. and ultimate analyses are given. The coking mechanism, significance of caking curves, and improper testing methods are discussed. The influence of the diff. coal constituents must be considered as well as the grinding, blending and heating of coal. Brown coal lacks caking ability; it is high in extractable matter. All substances in brown coal which can be melted show binding power when heated with inert matter. Therefore the amt. of fixed C left behind by the extd. fractions after carbonization (cementing residuum) is the first factor detg. the coking power of coal. Bituminous coals yielded 20% of cementing residuum constituting $\frac{1}{3}$ of the total coke formed, brown coals yielded 5% cementing residuum. A fraction from a coking bituminous coal (sol. in tetrahydronaphthalene, insol. in benzene) yielded 60% cementing residuum; this is considered the real binding matter in coal. Thermal stability (the range of temp. during which the binding materials remain molten) is also necessary. Both bituminous coals contained the same amt. of cementing residuum; one (a coking variety) had a thermal stability of 120°; the non-coking variety 30°. The hydrocarbons and resinous fractions act favorably or adversely upon the agglutinating power of coke formation depending upon the thermal stability. The binding power is impaired by the destructive distillation of the resinous fraction. An English translation accompanies the article.

FRANK MARESH

The determination of the specific heat of brown coal. G. BURCKHARDT AND A.

FRITZSCHE. *Braunkohlenarch.* 1927, No. 17, 20-33; *Chem. Zentr.* 1927, II, 1641.—B. and F. worked out a method in which a bomb calorimeter having certain modifications was employed. In order to det. the exact initial temp. of the coal, which is impossible, when the coal has to be transferred from the thermostat to the calorimeter, the coal was put in a basket of wire gauze attached to the stirrer, and heated in the calorimeter, by an elec. heating resistance. Thus the coal was examd. in a chemically and physically unchanged state; it was easily moistened, and therefore quick exchange of the heat was caused. The initial temp. can be measured with exactness, and the simple method accommodates serial tests in a short time. The tests made on almost all German brown coals gave for water-free coal values between 0.322 and 0.4678. The sp. heats for raw and dry coal of the samples examd., and the water, ash, and tar content are compiled in tables. It was impossible to calc. the sp. heat by Kopp's law. The figures obtained have to be regarded as av. values between 0° and 100°.

G. SCHWOCH

Low-temperature distillation of lignite. MAX TOLTZ. *Power* 68, 853(1928).—By low-temp. distn. the max. yield of liquid by-products is obtained. The *semi-coke* or char can be briquetted by the addn. of 6% by-product tar as a binder. Lignite deposits amounting to 9 billion tons in S. D., N. D., and Montana, may become available by such treatment.

D. B. DILL

Transformations of the methoxyl group during the distillation of lignite. KAREL HRDLICKA. *Pulva a Topeni* 9, 185-7(1927).—The yields of MeOH (0.25%) and AcOH (0.32%) even during careful and gradual distn. are insignificant in comparison to wood, which contains 6% MeO but yields 1.5-2% MeOH. The lignite used came from Dubnany; it contains 6.12% MeO (based on org. matter present). The coke contained no MeO; 6.9% MeO was located in the tar and 5.8% in the light oils, making 0.53% of the org. matter in lignite. During the distn. of lignite, even under careful control, the destruction is more complete than when wood is distilled, and the yield of MeOH and AcOH is insignificant.

FRANK MARESH

New methods of benzene purification. R. KATTWINKEL. *Teer u. Bitumen* 26, 536(1928).—After a brief discussion of the H₂SO₄ process, the Rostin and Stegemann processes are cited as improvements. In the former, the H₂S in the crude benzene is utilized, through the action of Cu-Al contact agents, as a source of nascent H to hydrogenate the unsatd. compds., which are thus utilized instead of lost. In one of the two Stegemann processes, HF, used to polymerize the unsatd. compds., is easily recovered by distn., leaving a marketable pitch, whereas the H₂SO₄ regeneration residue is worthless. In the other, dehydrogenation, by heating with 1% S, strangely enough, reduces the Br absorption no. 90% with very little material loss, leaving also a marketable pitch.

F. S. GRANGER

Air excess required in gas heating. HEINRICH MÜLLER. *Gas u. Wasserfach* 71, 971-5, 995-1000, 1017-20, 1042-6(1928).—Ordinary gas oven burners are adjusted in such a way as to have a very large surplus of air, as much as 10-fold when the flame is turned low. Theoretical and practical studies of the problem have indicated that satisfactory operation (with respect to CO formation) can be attained with 1.4 times the theoretical amt. of air. The air excess can be maintained const. by suitable "throttling" means operated by the gas valve, etc.

R. W. RYAN

The simultaneous elimination of ammonia and sulfur from gas. HANS BAHR. *J. usines gaz* 52, 429-35(1928).—See C. A. 22, 1841.

F. S. GRANGER

Direct firing of boilers with producer gas. WILLIAM B. CHAPMAN. *Power* 68, 733-4(1928).—The development is predicted of an underfeed, mechanically operated, gas producer designed to go directly beneath a boiler and burn low-grade fuels, such as coke breeze or slack coal, with high efficiency.

D. B. DILL

The purification of coal gas. CHARLES COOPER. *Gas World* 89, 451-4(1928).—See C. A. 22, 4772.

F. S. GRANGER

Reinforced concrete in (oxide) purifier installations (for coal gas.) ZIMPEL AND FRANK. *Augsburg. Gas u. Wasserfach* 71, 952 4(1928).—Spent purifying material in contact with reinforced concrete pillars caused rusting of the iron reinforcing material and softening and embrittling of the concrete itself, due to the presence of thiocyanates. Oxygen and moisture aided in the action of the thiocyanates on the iron. The outside of the columns was roughened and a specially dense concrete surface prepnd., which was then waterproofed with an asphalt prepnd. The purifier boxes were cleaned inside with wire brushes and coated with a tar product, closing the pores and keeping moisture from attacking the reinforcing.

R. W. RYAN

Temperature of welding flames. WEHRMANN. *Duisburg. Gas u. Wasserfach* 71, 950-2(1928).—The theoretical flame temp. of mixts. of acetylene or illuminating gas

with various vols. of oxygen and air was calcd. and the flame temps. actually obtainable were measured by means of Seger cones for low temps. and by the melting point of zirconium oxide (2750°) and thorium oxide (3000°). It is believed that the use of such materials gives a much closer approximation to the true flame temps. than the use of wires. The temps. thus detd. are shown on a drawing of the flames. Identical temps. were obtained for the usable part of the acetylene and the illuminating gas flames, when the proper burner was used in each case. On a $\frac{1}{2}$ -meter weld on 1.5-mm. material the two burners were of equal value. The superiority of the oxy-acetylene burner over the oxy-gas burner on large work appeared to be due to the greater quantity of heat supplied, 6670 kg.-cal. in the first case and 5400 kg.-cal. in the second. It is important that oxy-gas burners should be constructed so that excess oxygen is not required.

R. W. RYAN

Primary tar oils. R. WEISSGERBER. Gesellschaft f. Teerverwertung m.b.H., Duisburg-Meiderich. *Ber.* 61B, 2111-9(1928).—R. had found (C. A. 18, 3705) that the unsatd. components of the 180-235° fractions of the neutral part of primary tar oil consist in great part of homologous coumarones and indenenes but that there are also present substances less sensitive to H_2SO_4 which can be removed by the usual methods with this acid only gradually and after repeated treatment. The primary object of this work was the elucidation of the constitution of these substances. By means of H_2SO_4 under definite conditions of concn. and temp., W. has been able to show that they consist, in great part at least, of aliphatic olefins with a terminal double bond, and definitely to characterize 1 of them, undecylene. One l. of a 193-201° fraction, obtained from a 199-207° tech. primary tar oil washed with concd. H_2SO_4 and distd. to remove easily resinifiable coumarones and indenenes was vigorously stirred 0.5 hr. at 15-20° with 500 g. of 90% H_2SO_4 . Two layers were formed. The lower, deep brown red, acid layer contained about 10% of the original material in soln. and on diln. with H_2O yielded an oil (I) smelling strongly of ketones. The upper, likewise deep, dark red, oily layer (II), which contained the olefins in the form of alkylsulfuric acids, was washed with small quantities of H_2O , the dild. aq. ext. cautiously neutralized with NaOH and shaken with Et_2O and the remaining clear aq. soln. of the Na alkyl sulfates decompd. in the usual way by acidification and distn. with steam, yielding the secondary alcs. (III) (1.5-2% of the original oil). The washed II on attempted distn. *in vacuo* evolved much SO_2 and deposited large quantities of resin, because of the presence of neutral alkyl sulfates. The decompn. can be prevented by distg. with steam at 150° instead of *in vacuo*; the colorless distillate (66% of the original oil) now shows all the properties of a "washed," i. e., tech. pure hydrocarbon mixt. from which no appreciable quantities of ketone-contg. oils or olefins can be removed on further treatment with 90% H_2SO_4 , and the residue (25%) with $PhNH_2$ at 170° splits off H_2SO_4 , the quantity of which, however, corresponds to only 0.9% of olefins in the original material. This residue undoubtedly consists chiefly of polymerized olefins, which thus escape quant. detection; the presence of a small quantity of polymeric coumarones was also established. From the III, purified through the benzoates, was isolated methylchanylcarbinol, b. 234-6°, d_{20} 0.8304, identified through the semicarbazone and oxime of the ketone obtained with CrO_3 . The total yield of olefins, calcd. from that of the neutral and acid alkyl sulfates, is about 3% but the true content in the original material is undoubtedly many times that. Their presence explains why it is so difficult to purify primary tar oils, as compared with coking tar oils, by the usual tech. methods, especially that of washing with H_2SO_4 . Of I (5-7% of the original material), about $\frac{1}{2}$ consists of ketones; after removal of the latter as the hydrazones there remains an oil of nitrile-like odor sol. in 90% H_2SO_4 and unstable toward $KMnO_4$; on long boiling with concd. KOH a part dissolves and acids ppt. from the soln. a mixt. of low melting and oily CO_2H acids from which was isolated a small quantity of *o*- $MeC_6H_4C_6H_5$. The oil sol. in 90% H_2SO_4 remaining after removal of the ketones and nitriles yielded a product (IV) (0.76% of the original material), b. 190-200°, d. 0.950, having an intense, unpleasant odor and contg. 16.4-18.9% S, insol. in and unchanged by alkalis and giving none of the reactions for sulfide S. It could only be concluded that the S was aromatically bound, i. e., that the product consisted of homologous thiophenes. A systematic study (with CHR. SEIDLER) indicated that it was chiefly tetramethylthiophene. Attempts to prep. a $HgCl_2$ deriv. failed; oxidizing agents reacted with it vigorously but split off the S as H_2SO_4 ; halogens gave only uninviting substitution and addition products. With H at 650-75°, however, it gave thiophene, *o*-thiophene, 2,3-thioxene and a fraction b. 158-65° whose $HgCl_2$ compd., m. 160-1°, contained 9.03% S (calcd. for that of trimethylthiophene, 8.87%). Attempts to synthesize a tetramethylthiophene failed, but by acetylating 1,4-thioxene, reducing by

Clemmensen's method and again acetylating and reducing the resulting ethyldimethylthiophene there was obtained *dimethyldiethylthiophene*, an oil of peculiar, not unpleasant odor, d_4 0.9573, b. 214–7°, sol. without change in 80% H_2SO_4 and behaving entirely like IV towards oxidizing agents, Br and isatin- H_2SO_4 . Since coking tar results from the higher heating of the primary tar formed first at lower temp. it was of interest to det. what changes occur during this higher heating, and accordingly a fraction of coking tar oil, b. 180–200°, was put through the same process as above. Below are the yields of the different classes of substances obtained from the primary and the coking tar oil, resp.: coumarones and indenenes 33, 66; alcs. from the alkyl sulfates 1.3, 0.06; ketones from the hydrazones, 0.4, 0.13; thiophenes, 0.31, 0.01; saponifiable nitriles, 0.19, 1.59%. These values, although, of course, they do not give the true content of these substances in the original materials, show clearly that the character of the tar changes at the coking temp. The olefins, ketones and thiophenes practically disappear; the apparently considerable increase in coumarones, indenenes and nitriles is probably due to the stability of these compds. at the coking temp. The chem. group-characteristics of both tars, however, are identical; it is the quant. distribution of these groups (especially the absence of the cryst. constituents and the predominance of the homologs) which imparts to the primary tar properties materially different from those of coking tar.

C. A. R.

Coke breeze firing (in boilers). FR. ALBACH AND FR. REUTER. Berlin Municipal Gas Works. *Gas u. Wasserfach* 71, 937–43 (1928).—Progress in the development of grates for successfully burning coke breeze is reviewed and illustrations are given. Breeze can be fired successfully with at least one modern grate and appropriate design of the boiler setting.

R. W. RYAN

Disintegration of CaC_2 in air (SCHERUHN) 6. Solvents from natural gas (GARLICK) 13. Application of gas to the textile industry (DORCHESTER) 25. Density and porosity of limestone and coke (SMOLENSKI, REICHER) 18. Some effects of coal ash on refractories (McVAY, HURSH) 19. New ways of using gases for soldering and welding (BRONN) 9. Filter for liquid fuels (Brit. pat. 287,932) 22. Centrifugal apparatus for separating coal and slime water (Brit. pat. 287,442) 1. Dewatering colloids, particularly peat (Ger. pat. 466,856) 13. Purifying gases [fuel] (Brit. pat. 286,633) 13. Apparatus for separating and classifying coal (Brit. pat. 287,262) 1. Rotary drum mill for pulverizing coal (U. S. pat. 1,690,712) 1. Purifying gases (U. S. pat. 1,690,437–8) 13. Charging means for shaft retorts, especially for gas producers (Ger. pat. 466,963) 1.

Combustion of fuels. RICHARD H. ANDREWS. Fr. 638,942, Dec. 31, 1926. A mixt. of air and powd. coal or a liquid or gaseous fuel is injected into the furnace with a gyratory movement.

Burning liquid hydrocarbon fuels. JOHN M. KELLEY (to Protane Corp. (1926)). U. S. 1,690,119, Nov. 6. A liquid hydrocarbon fuel (such as a product from casing-head gas) having a dry end point not in excess of 65° and an initial b. p. of about 7° or lower and which will develop a pressure of over 50 lb. per sq. in. at a temp. of 37° is expanded into a chamber and further expanded after its discharge from the chamber and sufficient heat is applied at its point of escape from the chamber to prevent congealing of moisture at the escape aperture; the expanded fluid is mixed with air and the mixt. is burned as required. An app. is described.

Use of gaseous and liquid fuels in aircraft. J. I. BRONN and CONCORDIA BERGBAU A.-G. Brit. 287,082, March 14, 1927. In order to maintain the buoyancy substantially const., liquid and gaseous fuels are used either in mixt. together in the same engines, or in different engines. The gaseous fuel may be CH_4 or a mixt. of hydrocarbons obtained by cooling distn. gases of coal, and the gas, alone or mixed with air, may be passed in contact with liquid fuel maintained at a const. temp. or at different temps. according to the proportion of the liquid fuel which it is desired shall be taken up.

Motor fuel. RÜTGERSWERKE-AKT.-GES. and LEOPOLD KAHL. Ger. 866,573, May 29, 1926. See Fr. 632,193 (C. A. 22, 3517).

Motor fuels. SAMUEL P. MARLEY and WM. A. GRUSE (to Gulf Refining Co.). U. S. 1,690,988, Nov. 6. Gasoline or similar fuel is mixed with a plurality of detonation-preventive substances, each having a soly. in gasoline of not more than about 0.5%. Among the substances which may be used, in various mixts., are β -naphthoquinone, *p*-anisidine, phthalimide, toluylene diamine, *m*- or *p*-phenylenediamine, azobenzene, dinitro-*p*-toluidine, dimethylhydroresorcin, aminoazobenzene, formanilide, capronitrile, $(CH_3)_3N$, *p*-iodoaniline and blending solvents such as C_6H_6 .

Destructive hydrogenation. I. G. FARBENIND. A.-G. Brit. 286,578, Sept. 10,

1925. In destructive hydrogenation of coal, tars, mineral oils and the like at pressures of 50 atm. or higher to produce light hydrocarbons, a catalyst is used contg. an oxide or carbonate of Li, Mg or Zn, with or without metals or compds. of the metals of the 8th group of the periodic system. Brit. 286,679 specifies a catalyst contg. a compd. of Cd, Pb, Bi or Sn, with or without more difficultly reducible metal oxides (or carbonates forming such oxides), and with or without metals or compds. of metals of the 8th group of the periodic system. Fe and carbonates of Mg, Li, Mn, V, Zn and U may be used, and an example is given of the passage of fuel oil with H and N under 200 atm. pressure and at a temp. of 500° over porous material impregnated with Pb nitrate. Brit. 286,680 specifies a catalyst contg. U oxide or carbonate, with or without metals of the 8th group of the periodic system or their compds. Brit. 286,681 specifies a catalyst contg. Mn oxide or carbonate, with or without 8th group metals or compds. Cf. *C. A.* 23, 264.

Destructive hydrogenation of carbonaceous materials. I. G. FARBERIND. A.-G. Brit. 288,148, March 31, 1927. Residues remaining after destructive hydrogenation of coals, tars, and like materials, are heated to recover oil constituents, *e. g.*, by passing hot gases or steam through the residues in a shaft or rotary furnace, in a low-temp. producer, in a metal bath, or in a closed pipe through which the materials are conveyed by a worm, or by atomizing the residues into a heated chamber. The sepd. oils may be mixed with carbonaceous materials to form a pasty mixt. for further destructive hydrogenation, or the oils may be heated to effect cracking and production of light hydrocarbons such as "benzines" and olefins which can be further converted into alcs., "solvents," lubricating oils, etc. The solid residues still remaining after sepn. of the oils may be gasified in a producer or may be used for the production of active C.

Destructive hydrogenation of coal, oils, etc. I. G. FARBERIND. A.-G. Brit. 287,855, March 26, 1927. The temp. of the reaction is regulated partly directly by the temp. of the hydrogenating gas introduced into the reaction chamber and partly indirectly by indirect heat exchange. Various details are described.

Distilling solid carbonaceous materials with by-product recovery. H. NIELSEN and B. LAING. Brit. 287,381, Dec. 4, 1926. The time factor and temp. gradient during the distn. period are so controlled, that a temp. difference exceeding 150° is avoided between the temps. at the center and periphery of a suitably arranged fuel bed. A solid fuel, easily powd., free from deposited graphitic C and contg. 4-15% of volatiles is obtained. Numerous details are given.

Distilling coal or like carbonaceous materials. H. NIELSEN and B. LAING. Brit. 287,637, Dec. 4, 1926. In distn. with by-product recovery, by direct heating with a gas such as water gas, producer gas or combustion gas which is passed in counter-flow to the materials, the vol. of gas used is such as to lower the vapor tension of the volatiles to enable the oil vapor to be liberated at temps. not exceeding 450-500° and so that the gaseous mixt. may be cooled to 80-100° without causing the highest b. p. fraction to condense. Coking coals may be subjected to a preliminary heat treatment with gases contg. O 2-8% to reduce their coking properties, and O may be added to the heating gases to assist in polymerization of resinous substances. Lubricating oil may be obtained by treating the primary oil with NaOH to remove tar acids, refining the residue with H₂SO₄, distg. off 25% of the refined oil and passing the remainder through a filter press at -5° to sep. paraffin. Various other details are given.

Distilling powdered fuel. KOHLENVEREDLUNG A.-G. Brit. 287,627, Dec. 22, 1926. Carbonaceous or bituminous materials are carried through a retort in suspension in a stream of heating gas, suitably at a temp. of about 800°, for a time sufficiently short to effect only low-temp. distn. Cf. *C. A.* 23, 264.

Apparatus (with superposed annular carbonizing chambers) for low-temperature distillation of fuels. J. PLASSMANN. Brit. 287,313, March 9, 1927.

Coal distillation. KARL PRINZ. Ger. 466,571, Jan. 13, 1926. In a distn. plant for coal, etc., of the type in which the coal is spread in a thin layer on and removed from a rotating disk, the disk floats on a metal bath above the furnace.

Distilling coal and similar materials. LOW TEMPERATURE CARBONISATION, LTD., and C. H. PARKER. Brit. 287,586, Sept. 25, 1926. The material is distd. by being charged into receptacles which are rolled on inclined tracks through an externally heated retort. Numerous details of the app. used are described. Brit. 287,587 relates to a similar process applied to coal distn. and in which the receptacles are dried by being caused to traverse a chamber through which hot waste gases pass.

Distillation of coal, etc. JOHN H. ANDERSON. Fr. 638,755, Aug. 2, 1927. Carbonaceous material is distd. at low temp. in a rotating retort over the heating furnace. Metallic bodies which can move freely are placed in the material.

Distillation of coal, etc. GIUSEPPE SCAVIA. Fr. 637,782, July 19, 1927. In low-temp. distn. of coal, etc., the coal in small pieces is heated to 600–725° in a layer of 6–18 mm. thickness, and without movement of the coal. The heating lasts for approx. 5 min.

Distillation of coal in two stages. LOW TEMPERATURE CARBONISATION, LTD., and C. H. PARKER. Brit. 287,585, Sept. 25, 1926. In operation of an app. in which the charge from a retort in the first stage is transferred to a second retort of large vol. so that the second stage is of longer duration than the first and effects cooling of the charge, water is passed into the retort of the second stage or into a cooling receptacle adjacent to the retort.

Apparatus (with shaft-like heating or distilling chambers) for distilling coal, lignite, peat, wood or other carbonaceous materials. OTTO HUBMANN. U. S. 1,690,933-4, Nov. 6. U. S. 1,690,934 is assigned to Metalbank und Metallurgische Ges. A.-G. as is also U. S. 1,690,935 which specifies continuous distn. of high-ash solid carbonaceous materials such as oil shale or slaty coal by passing a charge of the material downwardly and in continuous flow successively through a distn. zone, a reaction zone, and a residue-cooling zone, introducing O-free gases such as combustible gases into a cooling zone and thereby heating them, introducing O-contg. gases such as air into the reaction zone to sustain reaction or combustion with the distd. material which still contains combustible material, drawing off and mixing the hot gases from both zones and passing them into the distn. zone. This pat. also describes app.

Apparatus for removing the slag from the combustion space of furnaces using coal dust. KARL HUFSCHMIDT. Fr. 637,331, June 21, 1927.

Apparatus for regulated and proportionate supply of air and powdered coal or other fuel to furnaces. ASKANIA-WERKE A.-G. VORM. CENTRALWERKSTATT DESSAU AND C. BAMBERG-FRIEDENAU. Brit. 287,132, March 16, 1927.

Unsaturated hydrocarbons. I. G. FARBENIND. A.-G. Brit. 286,825, Jan. 3, 1927. Unsatd. hydrocarbons such as C_2H_2 are obtained by subjecting coal, tars, mineral oils or the like, in vaporized or finely divided condition, to the action of an elec. arc either in the presence of water vapor or gases contg. it or, when tars and mineral oils are treated, in the presence of H_2 , N , CO_2 , CO or gas mixts. contg. these. Only 33–50% (or less) the quantity of water vapor is used as would be necessary to produce water gas. The materials are preferably preheated.

Charcoal fuel. JACK GELÉ DE FRANCONY. Fr. 637,296, Nov. 8, 1926. A fuel is made by mixing finely divided charcoal with the tar coming from the carbonization of the wood and 20–200% of coal or petroleum tar. An agglutinant such as wood gum, xylose or other product obtained by the treatment of wood or straw with caustic soda is added.

Coal briquets. HENRI LIESENS. Fr. 637,396, July 9, 1927. Coal briquets which do not smell or smoke and are non-friable are made from an intimate mixt. of coal dust, flour of manioc 3, bitumen tar 2, and chalk 1 1/5.

Peat fuel in the form of united hollow cylinders. RAYMOND E. OBER. U. S. 1,691,734, Nov. 13.

Pressure-feed apparatus for producing hard homogeneous fuel, etc., from peat, peat moss, lignite or similar materials. BOHUMIL JIROTKA (to the Firm of Dr. Otto Sprenger Patentverwertung Jirotka m. b. H.). U. S. 1,691,196, Nov. 13.

Montan wax. WILHELM PUNGS and MICHAEL JAHNSTORFER (to I. G. Farbenind. A.-G.). U. S. 1,690,876, Nov. 6. The properties of montan wax are improved by treating it with chromic acid in the presence of glacial $HOAc$ and small quantities of an acid substance such as H_2SO_4 or acid salts or polybasic acids.

Bleaching montan wax. A. RIEBECK'SCHE MONTANWERKE A.-G. Fr. 637,777, July 16, 1927. Crude montan wax is bleached by oxidizing agents such as $Na_2Cr_2O_7$ in the presence of H_2SO_4 .

Drying damp fuels. I. G. FARBENIND. A.-G. Fr. 637,838, July 18, 1927. See Brit. 274,858 (C. A. 22, 2259).

Recovering phenol from waste liquors. F. RASCHIG. Brit. 287,226, Dec. 15, 1926. Waste water of gas works or the like is treated with a hydrocarbon such as benzene in a vessel filled with Raschig rings of 15 mm. diam. and corresponding axial length. The phenol and benzene are sepd. by distn. and the waste water is heated by being utilized for condensing the benzene vapor. After distg. off the benzene, impure phenol contg. a small proportion of C_6H_6 , pyridine and pyrrole is obtained which can be purified in the usual manner.

Transforming heavy into light oils. HENRI MONY. Fr. 638,833, Dec. 20, 1926. Heavy oils from coal, etc., are heated in the presence of one or more solid or liquid

substances under atm. pressure to produce light oils. Suitable substances include metallic sulfides such as FeS , AcOK and Na_2SO_4 .

Mill adapted for grinding heavy portions of fuel oils or other oils. ROBERT C. HOPKINS. U. S. 1,690,168, Nov. 6.

Coal-tar oils. HERBERT WITTEK. Ger. 466,264, Aug. 13, 1925. Crude coal-tar oils are purified by dilg. with aliphatic hydrocarbon oils and distg. The fraction b. $100-200^\circ$ is dissolved in an equal quantity of paraffin and shaken with 2% by wt. concd. H_2SO_4 . The fraction b. $30-150^\circ$ is dissolved with an equal quantity of petroleum-benzene and shaken with 1% by wt. concd. H_2SO_4 .

Apparatus for extracting benzene from coal gas wash-oils. CHRISTIAN BUNTE and FRIEDRICH GOSSLER. Ger. 466,814, July 18, 1925. The app. comprises a distn. column, a reflux cooler and an intermediate container for sepg. the oil and water, the container having a vol. equal to that of the cooler.

Container for charging acetylene generators. AUTOGENWERK SIRIUS G.M.B.H. Ger. 466,832, May 6, 1927. The container has a displaceable bottom and is filled with carbide and inserted as a whole into the generator; the bottom is then displaced from outside the generator.

Drying fuel gases. D. M. HENSHAW, C. COOPER and W. C. HOLMES & Co., LTD. Brit. 287,678, Feb. 5, 1927. Gas is dried in 2 stages, first at about atm. temp. and then with a cooled hygroscopic liquid.

Coal or coke-oven gas. S. P. MILLER (to Barrett Co.). Brit. 287,900, March 29, 1927. Hot coal gases from a battery of coke ovens or retorts are cooled and freed from tarry impurities by spraying them with oil as they pass through the collector mains. Oils may be used which are obtained in the condensers of the carbonizing plant or the process may be used for the distn. and purification of dirty oils which are vaporized by contact with the hot gases and afterward recovered by condensation (impurities such as tar and pitch being pptd. in the collector main and washed out by the undistd. oil). An app. is described.

Controlling calorific value of coal gas. W. M. CARR. Brit. 286,758, Nov. 13, 1926. A device for controlling the supply of an admixt. of diluent gas is controlled by the flame temp. of a burner in which the mixed gases are burned.

Purifying coke oven gases or similar gases. SOC. L'AIR LIQUIDE (SOC. ANON. POUR L'ETUDE ET L'EXPLOITATION DES PROCÉDÉS G. CLAUDE). Brit. 287,558, March 25, 1927. N oxides present as impurities in gases which are subsequently to be sepd. by liquefaction are sepd. by hydrogenation in the presence of a catalyst such as reduced Cu or Fe, at a low temp. and under atm. or higher pressure. C_2H_2 present is hydrogenated at the same time. C_2H_4 remains practically unaffected and may be converted into alc. An Al sulfate soln. at high temp. also may be used for removing the oxides.

Oil gas. J. HANSFORD and J. S. HUGHES. Brit. 287,213, Dec. 13, 1926. Gas production from oil or other liquid or powd. fuel is effected in the presence of iron shavings or the like at such a temp. that the Fe is consumed. Steam may be supplied to increase the H content of the gas formed. An app. is described.

Purifying exhaust gases from internal-combustion engines. DEUTSCHE GAS-GESELLSCHAFT-AUER GES. Brit. 287,106, March 15, 1927. Exhaust gases are first passed through a layer of absorbing material such as active C or silica gel and then over an oxidizing agent such as heated Pt wire or Cu oxide.

Automatic oil control for carburetted water-gas plants. M. PARSONS (to Humphreys & Glasgow, Ltd.). Brit. 287,870, March 28, 1927. A calorimeter measures the calorific value of the carburetted water gas produced and a galvanometer system responsive to the calorimeter and balanced at the standard calorific value of the gas (but unbalanced and operative at departure from the standard calorific value) serves to vary the oil supply to the carburetter. Numerous structural details are described.

Burning gas. W. C. HOLMES & Co., LIMITED. Fr. 637,733, July 15, 1927. Corrosion of gas mains by S or CN compds. is prevented by thoroughly drying the gas by CaCl_2 which is continually regenerated.

Producer for water gas. ARTHUR BRANCART. Fr. 637,207, July 7, 1927. The fuel is emptied onto step-like plates in the masonry and water pipes are arranged above the highest for sprinkling the fuel.

Gas producer. JACQUES G. SCHULZ. Fr. 638,926, Dec. 30, 1926. Part of the waste gases from the engine are directed back into the combustion zone of the gas producer to lower the temp. thereof.

Gas producer and retort setting. R. W. BROADHEAD. Brit. 286,835, Jan. 17, 1927. The producer of a retort setting is placed externally to and independently of the setting and the space in the setting which it would otherwise occupy is devoted to

an extension of the regenerator which is arranged to preheat both the producer gas and the secondary air (or either of them).

Apparatus for washing and cooling producer gas. EDMOND WARNANT. Ger. 466,694, Aug. 26, 1926. The end of the washing column stands in water, up through which the gas bubbles, and the water which travels in a closed cycle may be drawn off at this level for cooling.

Retort and associated construction for two-stage distillation in gas production. LOW TEMPERATURE CARBONISATION, LTD. and C. H. PARKER. Brit. 287,830, Sept. 25, 1926.

Vertical gas retorts (cast in multiple). LOW TEMPERATURE CARBONISATION, LTD., and C. H. PARKER. Brit. 287,584, Sept. 25, 1926. Structural features.

Apparatus for operating the doors of gas retorts. FIRMA H. KOPPERS. Ger. 466,673, Oct. 2, 1925.

Eddy-stream gas burner. DEUTSCHE WÄRME AUSNUTZUNG G.M.B.H. "DEWAG." Ger. 466,831, Oct. 25, 1927. Constructional details are given.

Gas purification plant. SIEMENS-SCHUCKERTWERKE A.-G. (Hans Hoßler, inventor). Ger. 466,437, Feb. 4, 1926. A device for guiding and equally dividing gas currents in an elec. gas purification chamber is described.

Gas production plant. METALLBANK UND METALLURGISCHE GES. (Ernst Hüter, inventor). Ger. 466,436, Dec. 7, 1926. A method of detecting the existence of high-tension currents in the plant is described.

Gas production plant. ASKANIA-WERKE A.-G. and CARL BAMBERG. Ger. 466,465, Apr. 10, 1925. A steady input is maintained by a rotary regulating device in the exhaust chamber. The device widens the outlet in proportion to the exhaust pressure.

Hydrogenizing tar oil. RUDOLF BERNHARD and WALTER DEMANN. U. S. 1,691,221, Nov. 13. The oil is heated to near the b. p. and treated in the presence of a colloidal Ni catalyst with the dry gas resulting from the manuf. of coke, under the normal pressure prevailing in the coke oven. The catalyst is prepd. by reduction at 310° with that part of the oil which b. 375-390°.

Dehydrating tar. S. P. MILLER (to Barrett Co.). Brit. 287,084, March 14, 1927. Tar is dehydrated by direct contact with the hot gases produced in coal distn. ovens or retorts. The gases may be used at such a temp. as to effect partial distn. of the tar and light oils thus distd. may be condensed and remixed with the dehydrated tar. An app. is described.

Treating low-temperature tars, etc. F. C. BUNGE. Brit. 287,471, March 21, 1927. Low-temp. tars or their fractions are freed from acid constituents by use of H_3PO_4 or other suitable acid, preferably in the presence of a neutral diluent such as the purified oil. Water formed may be removed by evapn. or use of P_2O_5 . The acid constituents form stable aq. emulsions and may be used as disinfectants or flotation agents.

Coking apparatus. OTTO H. HERTEL. Ger. 466,996, June 21, 1925. In app. of the type comprising an externally heated retort enclosing a spiral conveyer traversed by an internally heated tube, the internal heating is effected with a no. of independent groups of burners arranged at intervals along the length of the tube.

Coke-oven construction (designed to provide unobstructed outlet for distillation products). DR. C. OTTO & CO. GES. Brit. 287,885, March 28, 1927.

Regenerative coke-oven construction. GUSTAV O. WOLTERS. U. S. 1,690,805, Nov. 6.

Coke oven and regenerator construction. FOUNDATION OVEN CORP. Brit. 286,776, Dec. 8, 1926.

Combined coking retort and gas generator construction. ALBERT BREISIG. U. S. 1,691,636, Nov. 13.

Continuous vertical distillation retort furnace. J. PIETERS. Brit. 287,934, March 30, 1927.

Vertical coking-retort construction. J. PIETERS. Brit. 287,935, March 30, 1927.

Charging truck for coke-oven chambers. C. OTTO & CO. G.M.B.H. Ger. 466,939, July 23, 1926. Constructional details are given.

Metallurgical semi-coke. KURT JAHNKE. Ger. 466,940, May 3, 1924. The subdivided fuel is mixed with $FeCO_3$ or other unstable compds. and with bituminous substances and the mixt. subjected to low-temp. coking.

22—PETROLEUM, LUBRICANTS, ASPHALT AND WOOD PRODUCTS

F. M. ROGERS

Petroleum and the filtering earths. P. G. NUTTING. *J. Wash. Acad. Sci.* 18, 409-14(1928).—Filtering materials are effective because of the open oxygen and silicon bonds. These are produced by removal of water from terminal hydroxyl radicals. They act by attacking certain less firmly bound radicals of the hydrocarbons. The result may be mere adhesion but is in many cases a surface reaction in which a film of org. silicate is formed over the surface of the filter grains. Many of the org. silicates so formed are insol. in any single known solvent. Clays of the kaolin type do not filter because they contain no hydroxyl water to be driven off leaving open bonds. Clays of the bentonite type make only poor filters even after acid treatment because they contain only a little alkali replaceable by hydroxyl. Good filters are (1) those well supplied with hydroxyl water removable by moderate heating and (2) those having originally had terminal alkali radicals subsequently converted to hydroxyl by acid treatment. The selective action of filters is readily accounted for by the varying activity of open bonds toward organic radicals retained by bonds of varying strength.

D. F. BROWN

Cracking of Boryslaw gas oil. SZAYNA. *Ann. office nat. comb. liquides* 2, 917-25 (1927).—Boryslaw gas oil of d. 0.8554 with 9.3% distg. below 225° is cracked in a flask with dephlegmator in the presence of 15% of AlCl_3 . A yield of 36.2% by vol. of colorless gasoline with 150° end point and d_{15} 0.702 is obtained. The cracking of this gas oil at atm. pressure in electrically heated tubes (cf. Gault, *C. A.* 21, 1882) of SiO_2 , Cu and Fe gives max. yields of about 28% by vol. of gasoline (225° end point with d_{15} 0.790-0.799) at 610°, 540° and 600°, resp. These gasolines are all yellow and with the exception of that produced in the Fe tube, they darken with age and deposit resins or tars. Berginization of the gas oil for 3 hrs. at a mean temp. of 480° and at a pressure of 60 to 245 atms. produces 29% by vol. of 150° end point gasoline with d. 0.7045. The total yield of 225° end point gasoline amts. to 46% by vol., has a sp. gr. of 0.7466 and contains 4% of olefins, 14.5% of aromatics and 81.5% of satd. hydrocarbons.

R. E. SCHAAD

The composition of heavy Sakhalin crude oils and their working up. A. N. SAKHANOV. *Neftyanoye Khozyaistvo*, 15, 53-4(1928).—A sample of Okhinskii crude (Sakhalin) had the following characteristics: Sp. gr. 0.931, E_{10} 3.14, excise resins 36%, f. p. below -20°, H_2O 0.3%. Distn. with a "Glinskii" dephlegmator: Below 200° 3.03%, sp. gr. 0.804; 200-220° 3.26%, 0.832; 220-240° 4.38%, 0.894; 240-260° 4.00%, 0.863; 260-270° 2.78%, 0.871; 270-280° 2.88%, 0.877; 280-300° 6.45%, 0.885. Mazout: Sp. gr. 0.964, flash (Mart.-Pens.) 149°. Cold test -18°, E_{10} 17.4, excise resins 49%. Results of vacuum distn. of this mazout are given. Three fractions between 200° and 330° are transparent when frozen and no paraffin is sepd. The residue obtained from mazout 26% had sp. gr. 1.02, m. p. (Kremer-Sarnow) 41°, penetration at 25° 20, elongation at 25° over 100. The content of lubricating oils is very high, contrary to Nametkin's investigations (cf. *C. A.* 22, 2458); it has 18.5% of machine oil distillates with sp. gr. 0.947 and 16.5% of cylinder stocks with sp. gr. 0.964. These distillates are only obtainable with a high vacuum. They must be treated with fuller's earth, since H_2SO_4 causes a loss of 30-40%. The residue left after this distn. is an asphalt of high quality, suitable for roads. The mazout cracked at 425°, 10 atm., 1 hr. or 450°, 20 atm., 10 min. gave gasoline up to 200-210° 14.9%, sp. gr. 0.727; kerosene 200-300° 15.8%, sp. gr. 0.864; bottoms 60.5%, sp. gr. 1.027, E_{10} about 30; traces of coke are present; gas and loss 7.7%. The cracking residue mixed with cracked kerosene gives a fuel oil of E_{10} about 10 and sp. gr. 0.990. A more complete cracking gives a higher yield in gasoline but also a high % of coke. The crude oil when cracked at 425°, for 2 hrs. 38 min., at 10 atm. or 450°, 30 atm. and 26 min. gives gasoline fractions up to 200-210° 25.8%, kerosene 200-300° 26.7%, residue 33.6%, gases and loss (including the distn.) 14%. The gasoline has a sp. gr. of 0.759, the kerosene 0.876 and the residue 1.1, containing about 10% coke of a high viscosity. On cracking the above kerosene and gas oil the following final yields from the Okhinskii crude oil are obtained: Gasoline 44.5%, residue 40.0% sp. gr. about 1.0, gases, loss and coke 15.5%. The residue is an inferior fuel oil. The crude oil can be worked up in three different ways, depending on the marketing conditions: (1) for kerosene and lubricating oil, yielding refined kerosene 16.5%, gas-oil unrefined 16.5%, solar oil 15.0%, machine

oil refined 12%, cylinder stock refined, E_{100} 3.0, 13%, asphalt residue 18%, loss (not including fuel for distn.) 9%; (2) for kerosene and gasoline yielding refined kerosene 23%, cracked benzine 11%, fuel oil 50%, gases and loss (not including fuel for distn.); (3) for gasoline (by complete cracking), yielding cracked gasoline 44.5%, fuel oil 40%, gases and loss 15.5%.

A. A. BOEHLINGK

Sludge formation on the addition of new to used transformer oil. H. v. D. HEYDEN AND K. TYPKE. A. E. G. Transformatorenfabrik, Berlin-Oberschöneweide. *Erdöl u. Teer* 28, 493-4 (1928).—Highly refined oil showed a greater sludge-pptg. propensity than less refined oil, and paraffin-base than naphthene-base. The proportions also were a factor. Non-sludging oil does not retain its sludge-pptg. power after oxidation.

F. S. GRANGER

Testing cements [for oil wells]. I. A. ALEKSANDROV. *Neftyanoye Khozyaistvo*, 15, 17-20 (1928); cf. *C. A.* 22, 1452.—Various methods for testing cement are discussed and special attention is paid to the expansion in the process of setting. A. recommends using the methods of Le Chatelier and Michelis, these, while not quite in accordance with the conditions existing in oil wells, are the best methods so far known.

A. A. BOEHLINGK

Vapor-pressure chart for paraffin hydrocarbons. O. G. WILSON, JR. *Ind. Eng. Chem.* 20, 1363-6 (1928).

E. H.

The action of antiknock compounds. AUBERT, DUMANOIS AND PIGNOT. *Ann. office nat. comb. liquides* 3, 705-7 (1928).—See *C. A.* 22, 2832.

R. E. SCHAAD

Tetraethyl lead. G. ICHOK. Office of the Engineer, Dept. Roads and Bridges, Paris. *Rev. hyg. med. prev.* 50, 769-79 (1928).—A review with critical comment.

C. R. F.

Semi-solid lubricating greases. E. ALTMANN. *Chem. Tech. Ind.* 29, 276-8, 289-90 (1928).—A detailed description of the manuf. of semi-solid lubricating greases, prep'd. by saponif. a mixt. of some fatty oil or fatty acid and mineral oil with $\text{Ca}(\text{OH})_2$ at 70-80°. The chem. tests of the finished product are confined to % soap, H_2O , ash, alky. and m. p. or drop point.

P. ESCHER

Basic nitrogen compounds from Fushun shale tar (EGUCHI) 10. Aluminum stock tanks compared with steel in corrosion tests (WAGNER) 9. The geological basis for the formation of oil deposits (WUNSTORF) 8. Earth temperatures in Hannover oil fields (HERRMANN) 8. Origin of Japanese petroleum (KOBAYASHI) 8. Breaking up of emulsions by high-voltage alternating current (PAWLIKOWSKI) 2. The variation of viscosity with temperature (WALTHER) 2. Apparatus for separating solvents such as gasoline from sludges by treatment with water and sedimentation (U. S. pat. 1,691,060) 1. Apparatus for separating constituents of emulsified oils such as petroleum by electric treatment (U. S. pat. 1,691,578) 4. Purification of liquids (lubricating oils) (Fr. pat. 638,948) 13. Destructive hydrogenation of carbonaceous materials (Brit. pat. 288,148) 21. Destructive hydrogenation of coal, oils, etc. (Brit. 287,855) 21. Pump for "petrol" (Brit. pat. 287,267) 1. Destructive hydrogenation (Brit. pat. 286,678) 21. Apparatus for distilling coal, lignite, peat, wood or other solid carbonaceous materials (U. S. pat. 1,690,933-4 5) 21. Heat-exchange apparatus suitable for use with oil (U. S. pat. 1,690,108) (1,690,501) 1. Apparatus for gravity separation of oil and water (U. S. pat. 1,690,741) (U. S. pat. 1,690,537) 1. Spiral filter for oil (U. S. pat. 1,690,564) 1. Unsaturated hydrocarbons (Brit. pat. 286,825) 21. Recovering oil from aqueous emulsions (Brit. 287,438) 27. Wetting agents (Fr. pat. 637,848) 18. Transforming heavy into light oils (Fr. pat. 638,833) 21.

Petroleum or bitumen from rocks, etc. PAUL VÉROLA. Fr. 637,619, Nov. 13, 1926. Petroleum or bitumen is ext'd. from rocks, sand, etc., by a liquid heavier than the petroleum but lighter than the rocks, and having a b. p. higher than the temp. at which the petroleum becomes fluid. Water, contg. CaCl_2 to raise its b. p., may be used.

Cracking oils. STANDARD DEVELOPMENT CO. Brit. 286,017, May 2, 1927. The cracking zone comprises a series of converters through which the oil is slowly passed without distn. while maintaining the temp. and pressure and which are arranged so that any chamber may be cut out without disturbing the continuity of the process. Various details of app. and operation are described.

Distilling and cracking oils. H. MAGNUS. Brit. 287,525, March 23, 1927. Mineral oils and tars are dist'd. under pressure and the products are sepd. in a condensation plant into fractions of higher and lower b. p. than gasoline; the fraction of higher b. p.

is then further treated at higher temp. and pressure in a cracking app. Two or more pressure vessels are connected in series in a closed circuit and the raw materials are distd. in the first vessel while the residues remaining after the fractionation of the lighter constituents are cracked in the following vessels. Turbines driven by the expansion of the cracked vapors serve to circulate the materials.

Cracking hydrocarbon oils. WM. C. PARRISH (to Texas Co.). U. S. 1,690,243, Nov. 6. A body of oil is maintained at a cracking temp. to cause the formation of lighter hydrocarbons and C and is agitated by a power-actuated agitating device; the power required for the operation of the agitator is measured and the cracking run is stopped when the accumulation of C is indicated to be excessive by the increasing power required for this operation. An app. is described.

Agitating and cracking hydrocarbon oils. ALFRED SCHWARZ (to Petroleum Sand Products Corp.). U. S. 1,691,085, Nov. 13. A heavy oil and the vapor produced from it while being heated to a cracking temp. are agitated by an agitator rotating at a speed of about 400–600 r. p. m. to form a vapor-oil emulsion. An app. is described.

Cracking liquid hydrocarbons. OWEN D. LUCAS and ERNEST L. LOMAX (to V. L. Oil Processes, Ltd.). U. S. 1,690,416, Nov. 6. Heavy oils are heated rapidly to a cracking temp. in a tube still and then passed to a conversion chamber in which they are maintained in bulk at the cracking temp. and under a pressure of 600–1000 lb. per sq. in.; lighter oils are drawn off in vapor form into a vapor-pressure or refluxing chamber open directly to and forming an extension of the conversion chamber and under the same pressure as the latter, and the refluxing chamber is maintained at a temp. substantially lower than that of the conversion chamber but sufficiently high to prevent (under the prevailing pressure) condensation of any oils below a predetd. density; heavier oils are condensed in the refluxing chamber and the condensed oils are passed without reheating and below the cracking temp. through a branch passage directly back into the conversion chamber for further treatment; liquid oils are simultaneously drawn off from the conversion chamber and released through a pressure-reducing valve into a lower-pressure chamber and vapor of the lighter oils is removed from the lower-pressure chamber. Various details of app. are described.

Apparatus for cracking oils. CARBON P. DUBBS (to Universal Oil Products Co.). U. S. 1,690,997, Nov. 6. Substantially straight vertical heating pipes extend through heating flues in a furnace and are connected to a supply tank. A pump is provided in the connections for forcing oil from the supply tank to the heater.

Decolorizing hydrocarbon oils. THOMAS G. DELBRIDGE and HENRY F. DURE (to Atlantic Refining Co.). U. S. 1,690,772, Nov. 6. After acid treatment and sepn. of sludge, air is passed into the acid-treated oil while heated and without neutralization, to condition the oil for subsequent clay treatment, finely divided clay is added and the mixt. of oil and clay is aerated at a temp. below 100°. An app. is described.

Purifying hydrocarbon oils. LYLE CALDWELL (to Celite Co.). U. S. 1,691,266, Nov. 13. Oils such as "sour" gasoline are brought into contact with a pulverulent treating agent obtained by chlorinating the product of reaction between diatomaceous silica and an alk. earth hydroxide and the treating agent is then sepd. from the oil. This treatment serves to "sweeten" sour oils.

Rectifying hydrocarbons. IRA B. FUNK (to Union Oil Co. of Calif.). U. S. 1,691,238, Nov. 13. Liquid hydrocarbon material is distd. with steam and the vapors are passed through a rectifying column in which certain fractions are progressively condensed together with the steam; the fractions and condensed steam are removed at a plurality of selected points and the oil fractions are then returned to the column. An app. is described.

Obtaining light hydrocarbons from distillation of solid carbonaceous materials. ZULEY PROCESSES CORP. Brit. 287,999, Feb. 14, 1927. Material such as coal is coated or impregnated with a substance such as NaCl which will break up on heating to about 1375° and which has a catalytic effect on the distn. and gasification process and production of light hydrocarbons such as C₂H₄. An app. is described.

Oxidizing hydrocarbons. ARTHUR W. BURWELL (to Alox Chemical Corp.). U. S. 1,690,768, Nov. 6. A normally liquid hydrocarbon material contg. aliphatic compds. such as a spindle oil petroleum distillate is treated, in liquid phase, with an oxidizing gas such as air at a temp. of at least 100° (it may suitably be about 120–130°) and under a pressure of about 100–320 lb. per sq. in. An app. is described. The process results in the formation of simple and hydroxy org. acids. U. S. 1,690,769 specifies contacting an oxidizing gas such as air with a normally liquid petroleum hydrocarbon mixt. such as a 42° B₄ distillate from Pennsylvania petroleum under similar conditions of temp. and pressure, to produce oxidation products including

water-insol. org. acids of solid or semisolid character which are insol. in the hydrocarbon mixt.; these insol. acids are sepd. and aq. liquid is sepd. during the further treatment of the hydrocarbon mixt. with oxidizing gas. An app. is described. Mn stearate or other catalyst may be used.

Metallic towers and electrical connections for protecting petroleum tanks, etc., from lightning. * WEST DODD. U. S. 1,691,340, Nov. 13.

Trap and pipe system for separating gas from oil at wells. FORD W. HARRIS. U. S. 1,691,350, Nov. 13.

Liquid fuel for internal-combustion engines. BRITISH DYESTUFFS CORP., LTD., and S. CORREY. Brit. 287,192, Oct. 25, 1926. Knocking of the usual hydrocarbon fuels is reduced by adding to the liquid or to the gases in the combustion chamber a heavy metal deriv. of a β -diketone such as the Fe, Ni, Co, Cr, Th, Cu, Mn, Mo, V, W, Ce, Hg, Ag, other noble metals, Al and Zn compds. of acetylacetone, benzoylacetone and their alkyl, aralkyl or aryl homologs, *e. g.*, 0.1–1.0% of ferric methylacetylacetone may be added to "petrol" or a blended fuel.

Producing gasoline from heavier hydrocarbon oils. BERNARD ORMONT (to Bernard Ormont Associates). U. S. 1,691,300, Nov. 13. Oil such as gas oil is heated to a temp. sufficient to vaporize only lighter fractions of the oil and water is independently heated to produce a region of nascent steam. The proportion of oil to water is so regulated that the product of the latent heat of vaporization of the oil and the wt. of the oil shall substantially equal the product of the latent heat of vaporization of the water and the wt. of the water, and the unvaporized oil is conveyed to the region of nascent steam, and the resulting mixt. of oil vapors and steam is then subjected to further heating. An app. is described.

Chlorinating gasoline. F. S. VIVAS (to International Fireproof Products Corp.). Brit. 286,726, March 11, 1927. An app. is described in which gasoline after treatment to remove heavy oils is brought into contact with Cl in the presence of a catalyst. NaOH may be used as a purifying agent and the purified gasoline then introduced into a vessel with perchloromethane, aq. NH_3 and a metallic chloride such as AlCl_3 or FeCl_3 acting as a catalyst and Cl then introduced. Heavy oil sapon. products are recovered; they may be used as *lubricants*.

Purifying "petrol." W. M. KNOWLING and M. KOSTEVITCH. Brit. 287,141, March 16, 1927. "Petrol" is filtered through activated charcoal which may be admixed with silica gel. A filter contg. these substances may be placed between the fuel tank and the carburetor of an automobile.

Oxidized petroleum wax products. A. W. BURWELL (to Alox Chemical Corp.). Brit. 287,514, March 23, 1927. Emulsions suitable for use in *sizing paper, dressing fabrics*, and "*proofing*" permeable materials such as *strawboard, asbestos, brick, stone or concrete*, are made from oxidized petroleum wax which may be prepd. by supplying the wax to an oxidizing cylinder having a steam coil and a pipe for admitting compressed air and effecting oxidation under pressure at 100–155° in the presence of a catalyst such as Mn oleate or other suitable Mn, Cu or Fe compd. until about 30% of the material is oxidized to acids. Numerous details are given for prepg. the coating and sizing compns., etc., from the oxidized wax derivs.

Separation of paraffin and like compounds from oil. AKTIEBOLAGET SEPARATOR-NOBEL. Fr. 637,229, July 8, 1927. See Brit. 276,658 (*C. A.* 22, 2462).

Cylindrical apparatus with superposed compartments for sweating paraffin, etc. H. L. ALLAN and J. MOORE (Burmah Oil Co., Ltd.). Brit. 287,714, March 26, 1927.

Dipolymer from pine oil. IRVIN W. HUMPHREY (to Hercules Powder Co.). U. S. 1,691,573, Nov. 13. Vapors of pine oil are passed in contact with a catalyst such as fuller's earth for such a time and at such a temp. (suitably about 8 hrs. at 160–170°) as will effect dehydration and polymerization of a substantial part of the vapors to form "dipolymer."

"Dipolymer" from pine oil. IRVIN W. HUMPHREY (to Hercules Powder Co.). U. S. 1,691,065, Nov. 13. A "dipolymer" is obtained by heating pine oil (suitably at a temp. of about 145–225°) with a neutral catalyst such as fuller's earth to effect dehydration and finally polymerization of a substantial proportion of the oil. U. S. 1,691,066 specifies the production of a "turpentine substitute" by dehydrating pine oil with a halogen, *e. g.*, by treating the pine oil with I and then distg. with steam. U. S. 1,691,067 specifies producing a "dipolymer" by vaporizing dipentene and passing the vapors in intimate contact with a catalyst such as fuller's earth, Al_2O_3 or chlorides of Zn, Sn, Al or Fe for a time and temp. (suitably about 400°) to effect substantial polymerization. U. S. 1,691,068 specifies heating dipentene with a metallic chloride such as SnCl_4 to effect production of di- and higher polymers. U. S. 1,691,069 specifies

heating pine oil with SnCl_4 or other suitable metallic chloride to effect dehydration and formation of dipentene and subsequent polymerization of the dipentene.

Thickening mineral lubricating oils. ROBERT W. HENRY and ELFORD D. STREETER (to Gulf Refining Co.). U. S. 1,691,882, Nov. 13. A thickener for "mineral castor" oils is prepd. by making a basic Al soap and a less basic Al soap, and mixing these in accord with the desired ratio of Al to fatty acid content.

Device for atomizing lubricating oil, etc., into a stream of air or other gas. E. PLAYER and PARC ENGINEERING Co., LTD. Brit. 286,812, Dec. 23, 1926.

"Mineral castor oil" for lubricating. ROBERT W. HENRY and ELFORD D. STREETER (to Gulf Refining Co.). U. S. 1,691,654, Nov. 13. An aq. soap soln. is mixed with a soln. of an Al salt, in the presence of an alkali, thus pptg. a basic Al soap and the Al soap is mixed with mineral oil.

Filter for lubricating oils, liquid fuels, etc. G. CATTANEO. Brit. 287,932, March 30, 1927.

Filter for oil in lubricating systems. ABRAHAM M. BABITCH (to A. C. Spark Plug Co.). U. S. 1,690,358, Nov. 6.

Bituminous emulsions. L. KIRSCHBRAUN. Brit. 286,844, Jan. 31, 1927. Asphalt or similar material (suitably at a temp. of about $160-175^\circ$) is added to a suspension of colloidal clay at about 65° and the materials are agitated together to effect emulsification. The process may be made continuous.

Emulsions or dispersions of pitchy substances. LESTER KIRSCHBRAUN and HAROLD L. LEVIN (Levin to Flintkote Co.). U. S. 1,691,766, Nov. 13. In producing an aq. dispersion of a pitchy substance in an aq. vehicle, the p_H of the system after dispersion is adjusted to a predetd. value (suitably about 6.0-6.5 with various asphalts and clays). U. S. 1,691,767 relates to maintaining the p_H at a definite value while forming the dispersion.

Dispersions of pitchy substances. LESTER KIRSCHBRAUN. U. S. 1,691,768, Nov. 13. In forming dispersions of pitchy substances, in an aq. vehicle, the p_H is adjusted by combining with the materials a second dispersing agent which will produce a modified dispersion medium of the desired p_H .

Agglomerating wood charcoal. SOC. O. MONNET ET CIE. Brit. 288,167, April 2, 1927. Pulverized wood charcoal is made into a homogeneous paste with a binder such as 20-40% of blood and molded under pressure at a temp. sufficient to effect coagulating without carbonizing.

23—CELLULOSE AND PAPER

CARLETON E. CURRAN

Researches on cellulose acetate and its solution. III. Stabilizer for cellulose acetate. Y. TANAKA AND K. ATSUKI. *J. Soc. Chem. Ind. (Japan)* 31, 416-20; Suppl. Binding 97B(1928).—See C. A. 22, 2473. Y. TOMODA

Development of the rayon industry. ANON. *Textile Colorist* 50, 334-8(1928).

RUBY K. WORNER

Development of the centrifugal spinner in rayon manufacture. JOHANN EGGERT. *Rayon* 6, No. 7, 18-21, 26(1928).

CHAS. E. MULLIN

The rayon spinning pot. J. EGGERT. *Rayon* 7, No. 6, 21, 33-4(1928).—See C. A. 22, 1849. CHAS. E. MULLIN

Corrosion of rayon spinning pots. J. EGGERT. *Rayon J.* 3, No. 5, 24-6, 39(1928).—The various factors and materials of construction are considered. C. E. M.

Commercial production of viscose. EARLE H. MORSE. *Rayon J.* 3, No. 2, 13-6, 39(1928).—The prepn. of the alkali cellulose is described. CHAS. E. MULLIN

Coördinating a paper-mill's demands for steam and power. J. C. HAYES AND O. C. CALLOW. *Power* 68, 664-6(1928).—Power and light are supplied by a semi-automatic water-turbine unit with a steam-turbine generator in reserve. Pulverized-coal fired boilers supply steam to this unit when required and to digesters and paper-machine engines. Exhaust steam at 25 lb. and live steam generated from wood refuse supplies the process demand. D. B. DILL

Composition for fireproofing paper (U. S. pat. 1,691,726) 18. **Size** [for use in the manufacture of paper] (Fr. pat. 637,476) 18. **Oxidized petroleum wax products** [for use in sizing paper and waterproofing strawboard] (Brit. pat. 287,514) 22. **Apparatus for determining the moisture content of paper webs** (U. S. pat. 1,690,155) 1. **Apparatus for evaporating cellulose waste lye** (Brit. pat. 286,982) 1.

Cellulose. HERMINGHAUS & Co. (Hermann Rathert, inventor). Ger. 466,383, Mar. 6, 1926. Cellulose is washed on the spools by equally distributing the washing fluid by capillary tubes and porous bodies.

Cellulose. LEON LILIENFELD. Ger. 467,003, May 20, 1924. See Brit. 231,801 (C. A. 19, 3592) and 231,806 (C. A. 19, 3593).

Cellulose. SIEMENS-SCHUCKERTWERKE A.-G. (Friedrich Schiebuhr, inventor). Ger. 466,384, May 21, 1926. A method of and app. for simultaneously spinning and twisting artificial silk filaments by rotating nozzles and rotating coagulating fluid are described.

Cellulose. SIEMENS-SCHUCKERTWERKE A.-G. (Hans Schultz, inventor). Ger. 466,386, May 8, 1927. Artificial silk spinning devices have exchangeable bottom plates for the inserted spinning heads.

Cellulose. SPINNSTOFFWERKE GLAUCHAU A.-G. and HEINRICH VOSS. Ger. 466,385, Nov. 13, 1925. The filaments are washed on the spools by forcing or sucking the washing fluid with air, gas or steam, through the layers.

Cellulose from sugar cane bagasse. E. C. H. VALET. Brit. 287,516, March 23, 1927. In a process such as that described in Brit. 277,163 (C. A. 22, 2465) the entire treatment is carried out within a single container. Numerous details are given.

Laminated fabric of cellulosic materials. ARNOLD PRINT WORKS. Brit. 287,669, Jan. 21, 1927. Two or more layers of cellulosic fabric are treated with caustic alkali and then with cuprammonium soln. and are held together during the treatment. An app. is described.

Digesting cellulosic material. EDMONDSON SPENCER. U. S. 1,690,954, Nov. 6. In prep. paper pulp, digesters are charged with cellulosic material such as bamboo, wood, reeds or grasses and digesting liquor such as caustic-sulfide liquor is introduced into one of the digesters to dissolve at least a portion of the sol. substances from the material, the resulting liquor is removed and liquor of greater concn. and higher temp. and under greater steam pressure is introduced into the digester and the process is similarly continued in successive stages and by use of the liquor in sequence in a series of digesters on the countercurrent principle. An app. is described.

Alkali cellulose. L. C. P. JARDIN. Brit. 286,619, March 4, 1927. Sheets of wood pulp or similar material, which are treated with a detd. porportion of caustic alkali soln. or the like are treated in such a manner that at the end of the operation the desired quantity of soln. remains in the sheets and they need not be subjected to pressing. An app. is described in which the sheets may be suspended on a weighing device and immersed in and sprayed with the treating soln. until they have absorbed the desired quantity of the soln. Brit. 286,620 describes an app. in which wood pulp sheets or rags or other materials may be disintegrated and moistened with a spray of caustic alkali soln. to effect the desired transformation.

Cellulose esters. HANS T. CLARKE and CARL J. MALM (to Eastman Kodak Co.) U. S. 1,690,620, Nov. 6. Esters are formed contg. a crotonate, cinnamate or other acyl group of a monocarboxylic acid having an ethylenic bond, *e. g.*, by treating cellulose (*e. g.*, tissue paper) with specified esterifying agents. Esters of this character are suitable for making highly flexible films. U. S. 1,690,621 specifies mixed esters contg. nitro groups and a halogen-substituted acyl group such as dibromobutyryl which are suitable for making films.

Cellulose ester composition for films, molded articles, etc. HARRY M. WEBER (to Ellis-Foster Co.). U. S. 1,690,515, Nov. 6. A cellulose ester such as cellulose nitrate is used together with a reaction product of a vegetable oil such as corn oil, China wood oil or blown rapeseed oil, an org. acid such as fatty acids from castor or soya bean and a polyhydric alc. such as glycerol and phthalic anhydride.

Cellulose esters of organic acids. H. T. CLARKE, C. J. MALM and R. L. STINCHFIELD (to Kodak, Ltd.). Brit. 287,880, March 28, 1927. Cellulose or a suitable cellulose conversion product or deriv. is treated with an org. acid and the corresponding anhydride, preferably in the presence of a solvent for both the acid and anhydride such as halogen acetic acid. Processes are described particularly suitable for the manuf. of mixed esters contg. acyl groups derived from aliphatic acids contg. 2, 3 or 4 C atoms and also acyl groups derived from aliphatic acids contg. more than 8 C atoms. The starting material may be undegraded cellulose, hydrocellulose, reverted cellulose and lower nitrates, acetates, formates or ethers. By use of the appropriate org. acid together with $Mg(ClO_4)_2$ the following esters may be obtained: propionates, butyrates, isobutyrate, valerates, isovalerates, caproates, heptylates, caprylates, pelargonates, caprates, laurates, myristates, palmitates, stearates, crotonates, cyclohexanecarboxylates, benzoates, *o*-methoxybenzoates, *o*-chlorobenzoates, acetylsalicylates,

phenylacetates, hydrocinnamates, cinnamates and mixed esters derived from stearic and acetic acids and from *o*-methoxybenzoic and acetic acids. Numerous details and examples are given.

Cellulose ester and ether solutions. I. G. FARBENIND. A.-G. Brit. 280,789, Dec. 10, 1926. Cellulose esters and ethers are dissolved in aq. solns. of compds. of the acetal type of polyhydric alcs., and other solvents, plastifying agents, dyes, etc., may be added. *E. g.*, cellulose acetate is dissolved in a mixt. of water 30 and glycerol monoformal 60 parts or water 20 and glycol formal 70 parts. The solns. may be used for making films, for printing or impregnating or as lacquers.

Esterification of cellulose. HENRI L. BARTHÉLEMY. Fr. 638,897, Dec. 28, 1926. Cellulose is pre-treated with warm AcOH vapors to soften the cellulose and then esterified with successive addns. in convenient quantities of the esterifying agent.

Esterification of cellulose. HENRI L. BARTHÉLEMY. Fr. 638,902, Dec. 28, 1926. Cellulose is esterified by org. acid anhydrides, particularly Ac_2O , in the presence of known catalysts such as H_2SO_4 and a compd. capable of liberating O, such as peracids or peroxides. Examples are given in which $\text{Na}_2\text{Cr}_2\text{O}_7$ and KMnO_4 are used. Fr. 638,903 describes a process of esterification in which the cellulose is previously treated with oxidizing agents such as peroxides or H_2O_2 in aq. alk. soln. Carbonates, silicates or soaps may be added to avoid the formation of alkali cellulose.

Apparatus for acetylating cellulose. HENRI L. BARTHÉLEMY. Fr. 638,900, Dec. 28, 1926. Cellulose is acetylated in a rotating vessel which presents discontinuous surfaces of contact such as a cube or parallelepiped or cylinder turning about an axis inclined to the axis of symmetry.

Cellulose acetate. HARRY LEB. GRAY and CYRIL J. STAUD (to Eastman Kodak Co.). U. S. 1,690,632, Nov. 6. Cotton or other suitable esterifiable cellulose material 100 is mixed with an esterifying catalyst such as H_2SO_4 and H_3PO_4 and with less than 250 parts of liquid Ac_2O (using at least the quantity theoretically required for fully esterifying the material) contg. less than 15% of solvent diluent, and a temp. of reaction is employed which is below the soln. point of cellulose acetate in the mixt.; the reaction is continued until the material is fully converted into CHCl_3 -sol. cellulose acetate in the undissolved state.

Apparatus for making sheets or films of cellulose acetate or similar materials. SPICERS, LTD., AND H. J. HANDS. Brit. 287,635, Dec. 23, 1926.

Cellulose ether compositions. I. G. FARBENIND. A.-G. Brit. 288,143, March 31, 1927. In working up compns. by heating, solvents are used which dissolve the cellulose ether used only when heated. On cooling, the soln. gelatinizes, or the ether seps. as flakes or grains, the hot soln. can be purified by filtering. Solvents which may be used for the higher ethyl cellulose ethers comprise benzene, ligroin and aromatic substances such as hydrotoluene or hydronaphthalenes or their mixts.

Treating (waste) sulfite cellulose liquor. BRITISH DYESTUFFS CORP., LTD., AND A. J. HAILWOOD. Brit. 286,808, Dec. 21, 1926. "Sulfite cellulose pitch" is subjected to heating under pressure with NH_3 soln. and the products obtained may be subjected to alk. reduction, as by use of NaOH and Zn . The products may be used as dispersing agents and protective colloids in making dye pastes which are to be dried to powder form and may be used also as tanning agents.

Charging pulp digesters, etc. PER A. FRESK. U. S. 1,690,192, Nov. 6. Mech. features.

Horizontal press for treating boards of alkali cellulose (used in the manufacture of artificial silk) or similar materials. WILHELM DÜTZMANN. U. S. 1,690,894, Nov. 6.

Artificial silk. B. BORZYKOWSKI (to Borvisk Syndicate, Ltd.). Brit. 287,073, March 12, 1927. In order to improve the strength and flexibility of artificial silk, the latter, after washing and while still on the winding bobbins, is treated with oil, oil emulsion, soap soln. or the like, *e. g.*, with a soln. of a "textile oil". This treatment enables the material better to withstand twisting, re-winding and similar operations without breakage of individual filaments.

Artificial silk. ERICH HEYMANN. Fr. 637,300, April 16, 1927. Artificial silk having a brilliant mat surface is made by incorporating in the spinning solns. of viscose, cuprammonia, or nitrocellulose, non-volatile or difficultly volatile substances such as mineral, animal or vegetable oils, fats or waxes, aniline, tetralin or nitrobenzene as fine emulsions or colloids, or solid substances insol. or only slightly sol. in the solns. may be used, such as oxide of Th, Mg soaps or Ca naphthenate. The added substances may be partly removed by solvents or by evapn. in vacuum.

Artificial silk. FABRIEK VAN CHEMISCHE PRODUCTEN. Brit. 287,540, March 24, 1927. In prep. cellulose esters such as the formate, acetate, propionate or aceto-

formate, the cellulose is first subjected to a partial formylizing with strong formic acid and ZnCl_2 or a salt of similar action. This treatment may be repeated and formylizing may be completed in the presence of HCl , sulfonyl chloride or P oxychloride. Ac_2O is used in making acetic or mixed esters. Various details are given.

Artificial silk, films, etc. HENRI L. BARTHÉLEMY. Fr. 638,896, Dec. 28, 1926. The coagulating liquid for cellulose ethers or esters is composed of either (1) hydrocarbons boiling higher than 80° such as toluene, xylene or the terpenes, (2) hydroaromatic compds. such as cyclohexane or tetrahydronaphthalene, (3) alcs such as EtOH , PrOH , glycol, glycerol or cyclohexanol, (4) fatty acids such as oleic or ricinoleic acid, (5) esters such as oleates, palmitates or stearates, (6) halogen compds. such as trichloroethylene pentachloroethane, or chlorotoluene, (7) nitriles such as benzonitrile or xylonitriles, (8) nitro compds. such as PhNO_2 , (9) mixts. of the above. Fr. 638,899 describes a process in which a coagulant having emulsifying properties is used, such as an ammoniacal soln. of an alkali salt of a fatty acid or sulfonated fatty acid. A hydrocarbon, mineral or vegetable oil or alc. may be added.

Artificial silk from the cellulose of sugar cane bagasse. E. C. H. VALET and O. FUNK. Brit. 287,461, March 19, 1927. Cellulose such as that obtained by the process described in Brit. 277,163 (*C. A.* 22, 2465) is used for making nitrates, acetates or xanthates or soln. in alkalies or ammoniacal Cu solns. for artificial silk manuf.

Viscose and artificial silk. I. G. FARBENIND. A.-G. Brit. 287,492, March 21, 1927. Cellulose xanthate is purified by treating with an alc. such as MeOH , dild. with a quantity of water insufficient to cause swelling of the xanthate. The treatment is rapidly effected at a low temp. and the sepd. purified material is suitable for artificial silk manuf.

Apparatus for making artificial silk. I. G. FARBENIND. A.-G. Brit. 286,603, March 5, 1927.

Apparatus for making filaments of artificial silk. H. KINDERMANN. Brit. 287,602, Nov. 23, 1926.

Apparatus suitable for making filaments of artificial silk of small "total titre." I. G. FARBENIND. A.-G. Brit. 287,862, March 24, 1927. In producing artificial silk of 120 deniers or less a pinning box is used of greater than usual diam. (over 160 mm.) and the speed of the box is adjusted in accord with its diam. so as to produce the desired twist on the thread. Various other details of operation are described.

Vertical cell construction for manufacture of artificial silk by the downward dry-spinning method. ACETA Ges. Brit. 286,608, March 3, 1927.

Apparatus for spinning artificial silk. I. G. FARBENIND. A.-G. Brit. 288,153, April 1, 1927. In producing fine threads the output of the app. is increased by providing 2 nozzles separately supplied with soln., at each spinning place. Various details of construction are described.

Centrifugal apparatus for spinning artificial silk. A. H. RAILING and H. J. ELEY. Brit. 286,927, Dec. 15, 1926.

Apparatus for spinning artificial silk by the box or "pot" spinning system. J. BRANDWOOD and T. W. HOLT. Brit. 287,183, Sept. 13, 1926.

Spinning artificial silk. RAYMOND A. J. TUÉNOZ. Fr. 638,993, Jan. 4, 1927. Between the spinning nozzles and the receiver for the finished thread are placed 2 rollers easily displaceable to be brought in contact with the thread at 2 points variable at the wish of the operator and capable of rotating in both directions. Fr. 638,994 describes rotating spinning nozzles having capillary channels for the cellulose ester or ether so inclined as to give to the threads an inclination approx. equal to that caused by rotation of the nozzles.

Apparatus for drying filaments formed from viscose or similar materials. SAMUEL A. NEIDICH. U. S. 1,691,165, Nov. 13.

Gear wheel pump for distributing viscose in artificial silk plants. ARMAND C. FREY. U. S. 1,691,713, Nov. 13.

Wood pulp. CARL B. THORNE. U. S. 1,691,682, Nov. 13. A preheated liquor such as a sulfite liquor is injected into wood chips in a digester against a substantially const. pressure derived from an external gas such as SO_2 , and circulation of the liquor in the digester is effected by pressure of the gas. An app. is described.

"Chemical pulp" manufacture. JOHN S. BATES. U. S. 1,691,511, Nov. 13. After settling kraft green liquor, the supernatant clear liquor is sepd. from the underlying dregs, and the clear liquor is causticized.

Drying device for paper or wood pulp. JOHN E. ALEXANDER. Ger. 466,409, Feb. 5, 1924. A device for drying paper or wood pulp in sheets is described.

Paper pulp. REX WM. HOVEY. Fr. 637,326, June 14, 1927. The charge in the

digester is kept at a const. temp. by continuously circulating the liquor, so that the lower sugars and part of the lignin are dissolved while almost all the cellulose and part of the lignins, the pentosans and complex sugars are preserved.

Apparatus for straining paper pulp. D. RUSSELL and J. R. HAPPER. Brit. 286,814, Dec. 28, 1926.

Beater for treating paper pulp. AMOS C. BONTELL. U. S. 1,690,661, Nov. 6.

Beater for paper stock. CHARLES R. SEABORNE. U. S. 1,691,308, Nov. 13.

Treating paper stock before compacting it. AGASOTE MILLBOARD CO. Brit. 286,948, July 2, 1927. Paper stock or like fibrous material is treated with water, tannic acid and a metallic soap (which may be prepd. from linseed oil, China wood oil or rosin) which may be formed *in situ* after beating the material, by the action of Al sulfate.

Paper. MASCHINENFABRIK A.-G. VORM. WAGNER & CO. AND EDUARD BÖHME & CO. Ger. 466,407, Mar. 15, 1927. Toothed rollers for a pulverizing and tearing machine are described.

Recovery of zinc chloride in paper making. I. G. FARBENIND. A.-G. (Udo Ehrhardt, inventor). Ger. 466,559, Sep. 16, 1926. $ZnCl_2$ is recovered from the waste liquor in the making of paper pulp by the addn. of Zn hydroxide and Cl in such a way that the liquor is alk. and the Fe is oxidized and removed. More Cl is then added to form $Zn(OCl)_2$ and finally an excess of Cl is added whereby $Zn(ClO)_2$ is formed. During the evapn. the org. compds. become oxidized.

Paper-making apparatus. JOHN C. CORCORAN (to Argy Preheating Corp.). U. S. 1,690,402, Nov. 6.

Paper-making apparatus. NICKOLAS J. NICKS. U. S. 1,690,203, Nov. 6.

Machine for making elastic paper. WM. A. LORENZ. U. S. 1,690,172, Nov. 6.

Increasing the elasticity and shrinkability of paper. DAVID GENESE (one-half to Wm. H. Orem). U. S. 1,690,631, Nov. 6. Paper is moistened with a soln. of H_2BO_3 and dried under heat and pressure.

Apparatus for washing paper after parchementizing, etc. P. ERKENS. Brit. 286,506, May 9, 1927.

"Art paper." SIEBENHIRTNER CHEM. INDUSTRIE-WERK GES. Brit. 287,559, March 24, 1927. A paper of high gloss and pure white color is obtained by adding to the pulp a paste consisting of sapond. stearin to which is added a heavy metal salt such as $ZnSO_4$. K or Na silicates also may be added.

Waterproof paper board. EDMUND BACHE (to Waldorf Paper Products Co.). U. S. 1,691,752, Nov. 13. A quantity of bitumen emulsion is prepd. in which the emulsoid particles carry an electronegative charge, paper pulp is prepd. carrying an electropositive charge on the fibers, and the emulsion and pulp are intimately mixed uniformly to distribute the bitumen upon the surfaces of the paper fibers.

Drying paper in folio. EUGEN A. ALBRECHT. Ger. 466,786, Sept. 25, 1924. The paper is carried through a drying chamber by an arrangement of bands and rollers.

Paper formed by use of kelp. A. L. KENNEDY (to Plastic, Inc.). Brit. 287,538, March 25, 1927. See Can. 280,789 (C. A. 22, 3045).

Extraction of fibers from plants. CARL LEYST-KÜCHENMEISTER. Ger. 466,276, Oct. 4, 1925. Straw, esparto grass, maize straw and similar substances are split, roasted and steamed under pressure. They are then treated with hot sulfite- or sulfate-contg. liquor and dried.

24—EXPLOSIVES AND EXPLOSIONS

CHARLES E. MUNROE

A new permissible explosive. B. L. STROOPS. *Chem. Met. Eng.* 35, 676(1928).—As high explosives were first offered for use in mining coal they were so coned. as to shatter the coal. To overcome this, bulky matter such as balsa dust or sugar-cane pulp were introduced but they were so absorbent for the nitroglycerin as to render the product insensitive to detonation. By soaking the sawdust in a soln. of NH_4NO_3 and drying, the salt crystallized on the surface of the dust and prevented the absorption of the nitroglycerin, but the drying of this nitro-soaked dust is tedious and dangerous. Success has been reached by mixing 20 pts. of $Mg(NO_3)_2 \cdot 6H_2O$ with 80 pts. NH_4NO_3 , heating so that both salts are dissolved in the water of crystn., incorporating the balsa sawdust in the melt and allowing the whole to cool, when a bulky dry mass is at once obtained which forms an admirable dope for a coal-mining explosive, and such a compn. has passed to Permissibility. Where for the older powder there were but 370 cartridges in 100 pounds, for this new permissible there are 500 or more. C. E. M.

The gaseous explosive reaction at constant pressure. The effect of inert gases. F. W. STEVENS. *J. Am. Chem. Soc.* 50, 3244-58(1928).—See C. A. 22, 2058. E. H.

The decomposition of powders and explosives and the theory of stabilizers. HENRI MURAUOUR. Ingénieur en chef des Poudres. *Chimie et industrie* 20, 610-7(1928).—The deterioration of powders and explosives is apparently due to a slow hydrolysis, taking place at atm. temp., of the nitric esters under the action of traces of HNO_3 formed in the course of manuf., the rate of the phenomenon being gradually accelerated by autocatalysis. This reaction is unaccompanied by evolution of gases, and is therefore essentially different from the decompn. reaction observed when nitric esters are raised to a high temp. as in the usual stability tests. The thermal decompn. reaction does not seem to be involved in the decompn. which takes place at atm. temp. The chief function of stabilizers is to form neutral compds. with the traces of oxygenated N compds. formed during manuf. A. PAPINEAU-COUTURE

Guncotton from cellulose. G. PANDELE. *Notiz. chim.-ind.* 3, 631-2(1928).—Because of the shortage of cotton in Italy, during the war a guncotton was produced from cellulose by using 67.2% H_2SO_4 , 24.3% HNO_3 , 8.5% H_2O and allowing nitration to proceed 90 min. It contained 12.1-12.2% N, whereas the product from cotton shows 13.36% N. A. W. CONTIERI

The origin of gunpowder. ALBERT HAUSENSTEIN. *Z. ges. Schiess-Sprengstoffw.* 23, 229-33, 276-9(1928).—A discussion of the early history of black powder and its use in warfare and in mining in various countries. Evidence is presented that Berthold Schwarz was the first to use black powder as a propellant in fire arms, in the year 1313 in Freiburg, Germany. C. G. STORM

Pentaerythritol tetranitrate-nitroglycerin mixture as a shell and detonator explosive of highest brisance. ALFRED STETTBACHES. *Z. ges. Schiess-Sprengstoffw.* 23, 345-8(1928); cf. C. A. 22, 2991.—The tendency, especially of the very fine crystals of pentaerythritol tetranitrate, to explode on pressing to high densities, is thought to be due to adiabatic compression of air held in the mass of fine crystals. This tendency is overcome by admixt. of 20-30% of nitroglycerin. Such mixts. reach their max. d. of 1.69-1.70 at 600 atm. pressure. Tests on iron plates up to 8 mm. in thickness showed that such mixts. have higher brisance, as indicated by perforations of the plates, than nitroglycerin, guhr dynamite, picric acid or TNT. Detonating fuse made with a granular mixt. of pentaerythritol tetranitrate and nitroglycerin detonates at a rate of 7000 to 8000 m./sec. C. G. STORM

Standard methods of analyses of mercury fulminate, 5 pages; Standard methods of examination of ammonium nitrate 8 pages; of trotyl (TNT), 6 pages; of amatol, 5 pages and of picric acid, 6 pages. A. E. SLEIGHTON. *Australian Dept. of Defence, Munitions Supply Board*, May, 1926.—Each of these pamphlets sets forth in minute detail the analytical and other tests which the particular explosive treated of must pass to conform with the Governmental specifications. CHARLES E. MUNROE

Photographic study of detonation in solid explosives. I. Development of a photographic method for measuring rates of detonation. ELWYN JONES. *Proc. Roy. Soc. (London)* A 120, 603-20(1928).—Photographic records give the rate of movement of the detonation zone along the surface of an explosive cartridge and differences existing between the "surface" and "axial" rates of detonation are considered. Under certain conditions, the disturbance set up in the surrounding medium may cause distortion of the photographic records of the detonation phenomenon. A method of overcoming this is described. Under certain circumstances the disturbance set up outside an explosive cartridge placed in a gaseous medium travels faster than the detonation phenomenon in the cartridge. The contour of the disturbed region surrounding a particular cartridge of explosive was approx. detd. at definite intervals from the instant at which the disturbance was first initiated. Photographic detns. of velocities of detonation agree with those obtained by the Dautriche method. Some results are tabulated to illustrate the two stable velocities of detonation peculiar to the gelatinous explosives and the effect of the nitroglycerin content of a powdered explosive on its velocity of detonation. A method is given for detg. the approx. duration of the detonation phenomenon over a transverse section of a cartridge. The stable form assumed by the detonation front inside a 7.6-cm.-diam. cartridge of a certain explosive was detd. G. CALINGAERT

The dependence of detonation velocity on initial impulse. H. HENKEL. *Z. ges. Schiess-Sprengstoffw.* 23, 354-5(1928).—A discussion of the manner of functioning of detonators, and of the influence of such factors as d., granulation, H_2O content, etc., of the detonator charge, on its efficiency. The Pb plate test for detonators is unreliable because the effect on the plate is increased if the detonator is not in direct contact

with the plate. A detonator in which the charge has the form of a cone is advocated to increase the initial impulse imparted to the explosive to be detonated. C. G. S.

Are flame safety lamps suitable for detecting petroleum vapors? A. B. HOOKER, W. P. YANT AND D. H. ZELLERS. Bur. of Mines. *Information Circular* 6083, 6 p. (1928).—The changes in the flames of safety lamps so vary with circumstances, are so slow to react and are so difficult to observe, that the flame safety lamp is deemed unsuitable for testing for small percentages of inflammable gases and vapors in and about petroleum tanks.

CHARLES E. MUNROE

Fire in the powder factory at Hasloch a. M., July 14, 1928. J. BODEWIG. *Z. ges. Schiess-Sprengstoffw.* 23, 348-50(1928).—The fire, of unknown origin, started in a dry-house of the smokeless sporting powder factory, destroyed this building and two other dryhouses, in spite of fire-walls and barricades, and then spread to numerous other factory buildings. Static electricity is suggested as a possible cause of ignition of the powder. Two men inside and 2 outside of the dryhouse where the fire originated, were killed. No others were in the immediate vicinity. This factory has suffered 2 previous fires within the 2 preceding years.

C. G. STORM

The velocity of flames in complex gaseous mixtures of low inflammability in a closed vessel. KIYOHICO YUMOTO. *Bull. Inst. Phys. Chem. Research (Tokyo)* 7, 957-73(1928); *English Ed.* 1, 93.—The flame velocity in complex gaseous mixts. of low inflammability was studied kinematographically by the Schlieren method. The expts. were carried out in a closed cylindrical vessel of 6.9 cm. diam. and 5 cm. length. For mixts. of H and air contg. an excess air, the speed of flame propagation is never const. In mixts. of CO and air with an excess of air, the speed of the flame is approx. uniform within a certain travel. Various mixts. of H and air and of CO and air had nearly the same av. speed. The mean velocity of mixts. of CO, H and air was appreciably higher.

A. L. HENNE

Lessons of the last explosions in blast-furnace plants. ALFONS WAGNER. *Stahl u. Eisen* 48, 1153-9, 1200-8(1928).—The explosion of a blast furnace at Völklingen is described in detail and the opinion of a great no. of blast-furnace experts is given as to the possible cause of the explosion. All seem to agree that it was a coal-dust explosion, probably caused by the sudden endothermic reaction between fine pyrophoric C, formed according to the equation $2\text{CO} \rightleftharpoons \text{CO}_2 + \text{C}$, and the downrushing oxidic ores, falling from a scaffold in the upper part of the shaft. A scaffold in the upper part of the shaft of a blast furnace is very dangerous. Various methods are advanced and discussed for the prevention of scaffolding and for the increase of the resistance to explosion of the shaft. The explosion of the cold-blast main at Oberhausen was caused by the presence of explosive gas mixt. in the main, during the reversal of the hot stoves, when the valve of the blast main was not closed properly. This explosion danger is eliminated if the mixed blast main is led into the hot blast main, so that the same valve will close both hot and cold blasts. Various possible installations are shown. A discussion of the paper is given.

J. A. SZILARD

Explosive charges for projectiles. O. MATTER. *Brit.* 287,906, March 29, 1927. Bullets for destroying barbed wire or other obstacles (for use with rifles or machine guns) have a thin-walled casing which is filled with high explosive such as trinitrotoluene and are provided with a detonator compn. such as Hg fulminate at the front of the projectile.

Nitroglycerin dynamite. THOMAS O'HERN (to Arthur T. O'Hern). U. S. 1,690,872, Nov. 6. A 60% nitroglycerin dynamite comprises NaNO_3 64, infusorial earth 30, wood flour 20, KNO_3 3, ground MgCO_3 3 and nitroglycerin 180 parts.

Use of lead trinitroresorcinate in priming compositions for explosives. J. E. BURNS (to Remington Arms Co.). *Brit.* 287,517, March 23, 1927. Various mixts. are described which are stated to produce no corrosion of the gun barrel.

25— DYES AND TEXTILE CHEMISTRY

L. A. OLNEY

Early documentary references on the use of dyestuffs in America. C. A. BROWNE. Bureau of Chemistry, Washington. *Am. Dyestuff Rept.* 17, 696-700, 712, 739-40(1928).—An interesting account, including quotations from Governor Winthrop's note book, is given of the prepn. and application of indigo, cochineal, galls, madder, redwood and lute as used from 1630 to 1700. During the following century black was obtained from *Alea spicata*, *Acer rubrum*, *Rumex acetosella* and logwood, copperas or alum being used

as mordants; blue from indigo; red from *Sanguinaria canadensis*, *Rhus glabra* and *Rubia tinctorum*; yellow from saffron, birch bark, apple bark, barberry and many other plants; orange from sassafras; brown from the barks of butternut, walnut, white oak and other trees; scarlet and purple from *Phytolacca decandra*. Interesting formulas for dyes as used in the first half of the 19th century are quoted. L. W. RIGGS

The choosing of dyestuffs. C. WESTGATE. *Dyer, Calico Printer* 60, 118-8, 138-9, 182-3(1928).—General. Suggestions are given for a classification of dyes with regard to light fastness, for decreasing the cost of production and for the simplification of dye nomenclature. RUBY K. WORNER

Testing the fastness properties of dyestuffs—methods adopted. J. STEPHEN HEUTHWAITE. *Textile Colorist* 50, 311-5(1928).—Fastness to laundering and to weather are considered. Methods are given. RUBY K. WORNER

Fading of dyestuffs on textile fabrics. J. J. HEDGES. *J. Soc. Dyers Colourists* 44, 341-6(1928); cf. *C. A.* 21, 3746; 22, 1478.—The results given in this and previous papers show the abs. necessity for control of humidity in the testing of all textile fabrics for fastness to light. Unless tests are carried out with some form of fading lamp in which conditions are under control, as in the Fugitometer, the results may be misleading. Temp. must be considered equally with humidity in fastness tests. With most of the lamps used for testing light-fastness of colored fabrics the exposed patterns become very hot. This alone would increase the rate of fading, but in addn. the regain is lowered and tends to decrease the rate. Accordingly in the efficient fadeometer both humidity and temp. must be under control. The exptl. data treated mathematically yield an equation connecting fading, time and regain for a given dyeing, and from this equation it is possible to calc. the amt. of fading that would take place at other regains and for other times of exposure. L. W. RIGGS

Textiles and dyes abroad. CHAS. E. MULLIN. *Clemson Coll. Proc. Am. Assoc. Textile Chem. Colorists* 1928, 253-7; *Am. Dyestuff Rept.* 17, 719-23.—An account is given of textile research abroad. The need of greater attention to textile research in America is emphasized. L. W. RIGGS

A red dye from West African Guinea corn. C. D. MELL. *Textile Colorist* 50, 268(1928).—The bright red dye, used extensively by the natives for dyeing leather, is obtained from *Sorghum guineense*, variety robustum. It is held chiefly in the leaf-sheaths, which are tinged with a deep red-purple color. RUBY K. WORNER

The ancient Kendal Green. DAVID PATERSON. *Dyer, Calico Printer* 60, 159, 184-6(1928).—This article is "the result of a little research into its history and method of dyeing." RUBY K. WORNER

Influence of the anions of the mordant on the shade of alizarin red lake. P. P. VIKTOROV. *J. Soc. Dyers Colourists* 44, 336-41(1928).—The influence of the anions of the mordants is due to a combination of varied effects, including the reducing action of the mordant itself, the reducing action resulting from the interaction of the mordant and the thickening during steaming, the rapidity of the hydrolysis of the mordant, etc. Additions, such as basic Al chloride, As_2O_3 , etc., intended to increase the brightness of the shade, owe their action to a variety of causes. They behave as reducing agents, they increase the reducing properties of thickening agents and regulate the rapidity of the hydrolysis of the mordants. Thiocyanates prevent the introduction of Fe salts into the printing paste, but if the Fe is already present, they are unable to exert any compensating action. L. W. RIGGS

Piece-dyeing machines. ANON. *Textile Colorist* 50, 333-4(1928).—An illustrated description is given of the new Monel-metal dye beck built by the Klauder-Weldon Dyeing Machine Division of H. W. Butterworth & Sons Co., Philadelphia. R. K. W.

New piece-dyeing process. THEODORE J. BACHOFEN. *Rayon* 7, No. 8, 52-3(1928).—A new type of machine on which the cloth is wound on a reel for dyeing is described. CHAS. E. MULLIN

Studies on mordanting and dyeing processes. VI. EGON ELÖD, E. PIEPER AND E. SILVA. *Z. angew. Chem.* 41, 14-6(1928); cf. *C. A.* 21, 1887.—Silk treated with $SnCl_4$ and then H_2O takes up 9-43% SnO_2 , depending on concns. The various combinations give x-ray spectrograms of both SnO_2 and silk, but no other spectrograms, indicating the absence of any cryst. compd. of Sn with protein. In combinations contg. 30% or more SnO_2 the spectrogram of the SnO_2 masks that of the silk. The treatment of unweighted silk with a ripened SnO_2 sol results in a fixation of SnO_2 , the spectrograms obtained being the same as in the foregoing cases. The SnO_2 is not removed by dil. HCl, which condition the authors attribute to the impossibility of diffusion of the large particles of SnO_2 through silk filaments, such a theory being supported by the fact that SnO_2 sols of similar dispersity are not absorbed. $Cr(OH)_3$ is fixed to silk in a similar manner.

The formation of SnO_2 occurs by 2 processes, first, by shifting of the hydrolytic equil. of SnCl_4 soln. by the protein chloride formation, and, second, by further pptn. due to hydrolysis during washing. $\text{Cr}(\text{OH})_3$ is fixed mainly according to the first step, as Cr salts are less susceptible to hydrolysis. VII. EGON ELÖD AND E. PIEPER. *Ibid.* 16-9; cf. C. A. 20, 3574; 21, 4073.—Wool and silk, being amphoteric, tend to reach their isoelec. points when warmed in alk. or acid solns. Thus, the presence of basic or acid dyes does not affect the final p_H . With wool the basic dye taken up increases with increase of p_H up to 10; above this there is a decrease due to an increase (observed ultramicroscopically) in the size of dye particles, without influencing the nature of the change in p_H value. With an acid dye the max. dye is taken up at a p_H of 2, above which there is a decrease due to increase in size of dye particles. The curve showing the relation between dye absorbed and final p_H value is continuous, there being no break at the isoelec. point; this indicates that the taking up of dye by wool or silk is due not entirely to the formation of protein salts, but also to adsorption. Weighted silk behaves similarly to unweighted silk with respect to the taking up of dye, but its isoelec. point is lower. Deaminated silk takes up more basic and less acid dye than silk, and also has a lower isoelec. point.

FREDERICK C. HAHN

Studies of mordanting and dyeing phenomena. VIII. E. ELÖD AND E. SILVA. *Z. physik. Chem. Abt. A*, 137, 142-75(1928).—E. and S. consider single-bath chrome tanning of hides, tin weighting of silk, mineral mordanting of wool and the acid dyestuff dyeing of animal fibers to be very similar phenomena. In the systems investigated the conditions were found to be suitable for existence of Donnan membrane equil. The acid-binding power of hide and wool with varying p_H values agrees with Procter and Wilson's work and with Loeb's data for swelling of gelatin. The action of acid dyestuffs on hide substance and wool depends on the taking up of dyestuff anions, which is influenced by the p_H of the bath, added electrolytes and dyestuff concn. The conditions for max. uptake of dyestuff from soln. are calcd. and agree with expt. Single-bath chrome tanning is due to the hydrolysis of the Cr salt and agrees exactly with the Donnan theory. In mineral mordanting of wool and tin weighting of silk there is a hydrolysis accelerated and increased by the membrane action of the org. materials.

A. P. SACHS

Dyeing rayons. CARL M. HERSTEIN. *Rayon* 7, No. 4, 30-2(1928).—A brief review.

CHAS. E. MULLIN

Improvements in rayon dyeing. RAFFAELLE SANSONE. *Rayon* 7, No. 3, 31-2(1928).—A yarn-dyeing machine is described.

CHAS. E. MULLIN

Problems in dyeing rayon. A. L. SNYDER. *Rayon* 7, No. 4, 7-8, 10, 12(1928).—The scouring and dyeing of rayon in various forms are discussed.

CHAS. E. MULLIN

Dyeing fine-denier rayon fabrics. B. L. HATHORNE. *Rayon* 7, No. 7, 24(1928); cf. C. A. 22, 2993.—A very brief discussion of the jig, padder and open-kettle dyeing.

CHAS. E. MULLIN

Dyeing mixed rayon fabrics. W. BENNETT. *Rayon* 7, No. 2, 28-9; No. 3, 18, 20 2(1928); cf. C. A. 23, 281.—Dyeing of wool with acetate on viscose silks is discussed.

CHAS. E. MULLIN

Dyeing and water-proofing viscose rayon. GEORGE RUDOLPH. *Rayon* 7, No. 1, 38, 40, 44(1928).—See C. A. 22, 3533.

CHAS. E. MULLIN

Discussion of oiling and dyeing fine filament rayon yarns. GEORGE GROH. *Rayon* 6, No. 8, 5-8, 33(1928).

CHAS. E. MULLIN

Treating and dyeing fine filament rayon yarns. GEORGE GROH. *Rayon* J. 3, No. 5, 20 2(1928).—Scouring, bleaching and dyeing are discussed.

CHAS. E. MULLIN

Dyeing and cross-dyeing celanese. TODD B. MEISENHEIMER. *Rayon* 6, No. 12, 16 8(1928); cf. C. A. 22, 1855.—Scouring, desizing, dyeing and printing are briefly discussed.

CHAS. E. MULLIN

The effect of printing, discharging and stripping agents on muslin. I. Rongalit groups and Decroline. H. UDAKA. *J. Soc. Chem. Ind. (Japan)* 31, 374-81; Suppl. Binding, 87-8B(1928).—The actions of Rongalit groups and of Decroline on muslin were investigated. The tensile strength and the elongation of muslin decreased with the increase of the concn. of Rongalit C and ZnO and of the time of steaming. ZnO promoted the lowering of the elongation of muslin and seemed to prevent the depression of the tensile strength. Distinct differences were observed between the effect of fresh Rongalit CW and that of an old one that had been kept for 1 year, i. e., the former showed little effect on the tensile strength and elongation of muslin, whereas the latter showed a serious effect. Decroline in AcOH soln. did not lower the tensile strength and elongation, but it did in the aq. soln. Rongalit C and Zn powder had less effect than Rongalit C and ZnO . II. Blankit, hyposulfite, sodium bisulfite and steaming pressure. *Ibid.*

382-6; Suppl. Binding, 88B.—Blankit and ZnO, hyposulfite and ZnO decreased the tensile strength and the elongation of muslin greatly, but NaHSO₃ and Zn powder had little effect. The steaming pressure of printing affected more or less the tensile strength and the elongation of muslin that had been treated with those reagents above mentioned. **III. The aging test.** *Ibid* 386-8; Suppl. Binding, 88B.—Aging damaged slightly the muslin treated with the stable hyposulfite groups, *i. e.*, Rongalit C, CW, CL and Decroline, but scarcely those treated with the unstable hyposulfite groups, *i. e.*, Blankit, hyposulfite, etc. The elongation of the treated muslin increased generally with aging. Y. TOMODA

Matching shades. JAMES STAPLE. *Textile Colorist* 50, 324-5(1928).—The effects of different sources of light, the variation in hue with different concentrations of dyestuff, and the mixing properties of various dyestuffs are discussed. RUBY K. WORNER

Visual possibilities and limitations of color as they apply to textile design. FABER BIRREN. *Textile World* 74, 2871-3(1928). RUBY K. WORNER

The physical side of textile chemistry. ALAN A. CLAFLIN. *Am. Dyestuff Rept.* 17, 709-12(1928).—A review. L. W. RIGGS

The mill laboratory. T. R. JOHNSON. *Proc. Am. Assoc. Textile Chem. Colorists* 1928, 250-3; *Am. Dyestuff Rept.* 17, 716-9.—The duties of the mill lab. should be (1) to check and analyze all raw materials coming into the plant, (2) to check and analyze new products submitted by manufacturers, and det. if these products are better values or have advantages over those being used, (3) to check materials that are to be processed and where possible to check the processes in operation, (4) to match new shades and change old ones where an advantage arises, (5) to check finished materials, (6) to keep in touch with research of others, (7) to test and analyze goods of competitors. L. W. RIGGS

Temperature regulation in the textile industry. ISMAR GINSBERG. *Textile Colorist* 50, 308-10(1928).—A general article, describing the more important applications of temperature-controlling instruments in various textile chemical processes. The value of such control is emphasized. RUBY K. WORNER

Automatic temperature control and its application to the heating requirements of the textile industry. JOHN T. TRAVIS. American Gas Furnace Co., Elizabeth, N. J. *Textile Colorist* 50, 329-32(1928).—The calendaring process is considered in particular. RUBY K. WORNER

Lubrication and care of textile-finishing machinery. J. EBERT BUTTERWORTH. *Textile Colorist* 50, 318-9(1928). RUBY K. WORNER

Application of gas to the textile industry. PAUL DORCHESTER. *Textile Colorist* 70, 261-5(1928).—The three most important applications are for singeing, tentering and calendaring. Recent improvements in gas-fired equipment are described and illustrated. RUBY K. WORNER

Centrifugals in the textile industry. L. H. CLARK. Sharples Specialty Co., Philadelphia. *Textile Colorist* 50, 257-61(1928).—Eleven present uses of solid-wall centrifugals in the textile industries are listed and discussed. Several types of centrifuge are illustrated. RUBY K. WORNER

The great textile fibers. JAMES STAPLE. *Textile Colorist* 50, 396-7(1928).—General. In the present order of importance, as measured by yearly production, the six principal textile fibers are cotton, wool, linen, rayon, silk and ramie. R. K. W.

Manufacturing stains produced on vegetable fibers. JAMES FITZGERALD. *Textile Colorist* 50, 398-9(1928).—The occurrence and removal of oil paraffin wax, iron and mildew stains are considered. RUBY K. WORNER

Lillienfeld patents and their commercial importance. CONRAD CLAESSEN. *Rayon J.* 3, No. 4, 24-5, 39-40(1928).—Translation of a paper discussing the Lillienfeld patents on ether and viscose silk. CHAS. E. MULLIN

Synthetic yarns improving in quality. E. V. PETERS. *Rayon* 6, No. 12, 7-8 (1928).—Very general. CHAS. E. MULLIN

The silk industry in the Caucasus. MABELL S. C. SMITH. *Textile Colorist* 50, 394-5(1928). RUBY K. WORNER

Taking iron spots off silk. FRED. GROVE-PALMER. *Textile Colorist* 50, 315(1928).—See C. A. 22, 872. RUBY K. WORNER

Notes on the action of tans on silk. FRED. GROVE-PALMER. *Textile Colorist* 50, 242-4(1928).—A series of expts with all the different kinds of tannin readily obtainable shows that a full velvety black is best given by a combination of two tan exts., chestnut (Best French) and divi divi. Two tables are given, one listing the tans used and describing the colors obtained, the other showing the amount of weighting put on at differ-

ent temps. with chestnut and divi divi alone and in combinations. The behavior of different varieties of silk is an important consideration. RUBY K. WORNER

Tenacity and elongation of artificial silks. P. E. KING AND E. N. JOHNSON. Leeds Univ. *J. Soc. Dyers Colourists* 44, 346-50(1928).—The corrected tenacities, both dry and wet, viscose silk vary considerably, but with the finer counts the wet tenacity is higher than with coarser counts. This is desirable as in any case the gross strength of the coarser counts is greater than that of the finer ones. With the fine filament cuprammonium silk the elongation both dry and wet is about half that of viscose silk, whereas the tenacity is somewhat greater. With cellulose acetate silk the tenacity, although less than that of viscose silk when dry, is practically the same as that of wet viscose silk. The tenacities are const. for both high and low counts. The elongation is higher than for viscose silk. The elongation of Chardonnet silk is of the same order of magnitude as that of the cuprammonium variety. L. W. RIGGS

Physical properties of rayon. CHARLES S. FOWLER. *Rayon* 7, No. 7, 7-8, 16, 33 4(1928).—A general discussion stressing the importance of research. C. E. M.

Physical properties of rayon. A. L. WYKES. *Rayon J.* 3, No. 2, 20-4, 39, 42 (1928); cf. *C. A.* 22, 2064.—A mathematical discussion. CHAS. E. MULLIN

Softening and lubricating rayon. GEO. F. ECKER, JR., AND C. IRWIN POST. *Rayon* 7, No. 7, 10-2, 18; No. 8, 20-1, 34, 51(1928).—The use of Textoyl 1477 is described. CHAS. E. MULLIN

Greater interest being shown in rayon lubricating methods. RALPH W. TAYLOR. *Rayon* 6, No. 7, 12-3, 49(1928).—General. CHAS. E. MULLIN

Effect of oil on rayon. HENRY W. NICHOLS. Bradford Durfee Textile School. *Rayon J.* 3, No. 4, 26, 40(1928).—As it is common practice to oil rayon in the mills, expts. were conducted to det. the effect of the oil upon the strength and stretch of the rayon. Four tables are given comparing the (I) "yield break" or load in lbs., at which the stretch becomes excessive, (II) % stretch at the yield point, (III) "rupture break" or tensile strength in lbs. and (IV) percentage stretch at rupture, of 7 diff. 150-denier rayon yarns at 39% relative humidity and 21°C. with 0.62, 1.47, 2.70, 3.60, and 4.95% of added oil in the yarns, as well as without added oil. While conclusions may be drawn from these tables, "it is unfortunate that there does not appear to be any general law that can be derived from these results with the exception perhaps in the case of table I." With only one exception, the "yield break" was greatest when 0.62% oil was present. These yield breaks were also in every case greater than those obtained with non-oiled samples. Most of the samples showed a greater % of stretch when oiled with 0.62% oil than in any other condition. In one case the % stretch was slightly less with 0.62% oil than without oil. In 2 cases the max. stretch was obtained with 1.47% oil. In table III, "rupture break," less favorable results were obtained with 3.6% of oil on 4 samples than with any other amt. One gave best results with 4.95% oil. Results varied widely and no law can be stated. Table IV gives even more variable results as to the % of stretch at the break, the variations extending over the entire range with the exception of 0.62% of oil, which did not give the optimum result in any case. In this table 5 samples gave the best results when oiled. CHAS. E. MULLIN

Boiling-out and bleaching rayons. THOMAS F. HUGHES. *Rayon* 7, No. 6, 12, 14(1928), cf. *C. A.* 22, 1891.—Scouring and bleaching goods containing rayon and colored yarns are discussed. CHAS. E. MULLIN

Rayon-sizing equipment. ROBERT P. MORNINGSTAR. *Rayon J.* 3, No. 2, 18-20 (1928).—General. CHAS. E. MULLIN

Scrooping rayon. FRED. GROVE-PALMER. *Rayon J.* 3, No. 5, 27-8(1928); cf. *C. A.* 22, 321. CHAS. E. MULLIN

Rayon scouring. RICHARD CAMERON. *Textile Colorist* 50, 254-5(1928).—The selection of the method is dependent upon the variety of rayon and its physical state. General methods of procedure are given. RUBY K. WORNER

Bleaching wool yarn. JAMES FITZGERALD. *Textile Colorist* 50, 255(1928).—Practical. RUBY K. WORNER

Wool carbonizing. E. B. KERST. Proctor & Schwartz, Providence, R. I. *Textile Colorist* 50, 405-7(1928).—The advantages of a continuous cloth-carbonizing system are pointed out. Such a machine is available on the market. RUBY K. WORNER

Wool oils and their removal or the scouring of wool piece goods. CHAS. E. MULLIN. Clemson College Textile School. *Textile Colorist* 50, 451-6(1928).—A discussion of the scouring properties of wool oils, the scouring of woollen and worsted pieces, the effects of soap and soda in the scour, the temp. and pH effects, solvent scouring agents, the "break" in continuous scouring, the pH and cond. of scouring soles. at the break, and the theory of detergent action. CHAS. E. MULLIN

The effect of heat on cotton. Initial changes in tensile strength of unproofed fabric. A. H. TILTMAN AND B. D. PORRITT. *India Rubber J.* 76, 245-8(1928).—There is a serious lack of published data on the effect of heat on cotton in the presence of air and moisture, and yet cotton fabrics are as important as rubber in the construction of automobile tires. For this reason expts. were begun to det. the effect of temps. comparable with those during vulcanization on the structure, strength and durability of cotton fabrics. In these initial expts., cotton fabric of a construction suitable for precise testing was heated in air and *in vacuo* at different temps. up to 240° and afterward was exposed for some hrs. to air of a humidity close enough to the original humidity to make the tests comparable on this basis. After equil. was reached, the stretch and strength (*i. e.*, the stress-strain curves) of the samples were detd. Permanent weakening of the fabric was roughly proportional to the time of heating. The effect of heating became manifest at 115-20°, and loss of strength increased with increase of temp. until complete loss of strength occurred around 240° after 4 hrs. of heating. Heating in air was far more injurious than heating *in vacuo*; *e. g.*, the losses of strength after 4 hrs. at 160° were around 17% and 7% in air and *in vacuo*, resp. Preliminary removal of air prior to vulcanization might therefore increase the durability of fabric in vulcanized rubber products. Heating did not influence materially the elastic properties of the fabric, but only its breaking strength. C. C. DAVIS

Modern methods in boiling out cotton piece goods. RICHARD CAMERON. *Textile Colorist* 50, 326-7(1928).—Descriptive. RUBY K. WORNER

A study of the boiling and bleaching of cotton. V. KACZKOWSKI AND N. KROL. Polytechn. School of Warsaw. *Tiba* 6, 1255-61(1928).—From biol. considerations, the presence of fats and waxes in raw cotton is thought to be due to contamination by the oil of the seed rather than to be due to their direct elaboration in the fibers by the plant. The other non-cellulosic so-called impurities of raw cotton consist of pectic compds. constituting intermediate stages in the elaboration of cellulose. It has been found that cotton can be subjected to the action of very strong alk. (16-60% NaOH) or acid (up to 60% H₂SO₄) solns. without impairing its strength, provided the treatment is carried out in such a way as to prevent all contact with O. With weaker alkali (below 16% NaOH) there is tendency for the cotton to dissolve and the strength is impaired. In the bleaching process as usually carried out, the acidification which generally follows treatment with an oxidizing agent is generally considered to act by liberation of HOCl, but the amt. of the latter is so small that its action is practically undetectable; on the other hand, it has repeatedly been observed that the color is improved by prolonging the acid treatment, which K. and K. attribute to more complete hydrolysis and soln. of the last traces of fats, etc., by the acid. Equiv. results are more difficult to obtain with strong NaOH solns. because it forms a slimy film on the fibers, which makes it difficult to obtain proper and uniform wetting and penetration of the goods. It is suggested that washing with soap after the acid treatment, which is not used in practice (except in the Mohr process), could be used to advantage, as in lab. tests it has always given excellent results. A. PAPINEAU-COUTURE

The control of the bleaching of cotton. S. R. TROTMAN. *Textile Recorder* 45, No. 540, 65, 67; No. 541, 57, 59; 46, No. 542, 67; No. 543, 61, 63; No. 545, 64(1928).—The methods given in the literature for detg. copper number, methylene blue number and viscosity are critically reviewed and the relation of these properties to degree of oxidation is discussed. RUBY K. WORNER

Shrinkage of cotton woven materials. GEORGE H. JOHNSON. *Proc. Am. Assoc. Textile Chem. Colorists* 1928, 259-65; *Am. Dyestuff Rept.* 17, 725-31.—The amt. of shrinkage varies with the material. Moisture is the controlling factor in shrinkage, without it there is no shrinkage. An increase in the washing temp. has little effect on the rates of shrinkage, and the presence of soap, Na₂CO₃, NaOH or NaCl has no effect on the shrinkage. The warp shrinkage is generally, but not always, greater than the filling shrinkage. Varying amts. of agitation have no effect on the shrinkage of woven cotton goods. Approx. the same shrinkage occurs during 2 20-min. as during 2 55-min. washings. About 85% of the warp shrinkage occurs during the first washing regardless of the washing method used. From 65 to 85% of the shrinkage obtained is due to the moisture or soaking factor alone. The presence of sizing lowers this percentage. Pressing with a hand iron tends to stretch the fabric slightly, but will never overcome excessive warp or filling shrinkages. Any fabric that is tailored to fit should be previously shrunk. A gain in yardage during finishing means a corresponding shrinkage during washing. If a cotton fabric is going to shrink, nothing can be done during laundering to prevent it. L. W. RIGGS

The Launder-ometer. HUGH CHRISTISON. *Proc. Am. Assoc. Textile Chem.*

Colorists 1928, 265-8; *Am. Dyestuff Rept.* 17, 731-4.—The Launder-ometer is a machine for making standard laundry tests. Its construction and uses are described. L. W. R.

What kind of soap shall we use? W. W. BRAY. Procter & Gamble. *Textile Colorist* 50, 407-10(1928).—See C. A. 22, 3303, 3783. RUBY K. WORNER

The structure of silk fibroin (ABDERHALDEN, MAHN) 11A. The p_H and detergent value of soap solutions (MULLIN) 27. Preparing substituted μ -methylbenzothiazoles and their conversion into new heterocyclopolyimethine dyes (KÖNIG, *et al.*) 10. Color and chemical constitution. XXIV. A complete investigation of the triphenylcarbinol or aniline dyes (MOIR) 10. The electrochemical reduction of azo dyes (HUBBUCH, LOWY) 4. The tizrah sumach from Morocco (MELL) 29. Sericin and fibroin (PIERCE) 11I. Composition for fireproofing cloth (U. S. pat. 1,691,726) 18. Sulfonated oils [in the textile industry] (Fr. pat. 637,335) 27. Oxidized petroleum wax products [for use in dressing fabrics] (Brit. pat. 287,514) 22. Fatty substances soluble in water [application in the textile industry] (Fr. pat. 637,274) 27. Benzodiazines [as intermediate for making dyes] (Brit. pat. 288,159) 10. Benzodiazine condensation products [as intermediate for making dyes] (Brit. pat. 287,179) 10. Treating sulfite cellulose liquor [in making dye pastes] (Brit. pat. 286,808) 23. Aralkylated fats and fatty acids [for use in dyeing] (Brit. pat. 286,796) 27.

Dyes. I. G. FARBENIND. A.-G. Brit. 286,602, Dec. 14, 1925. Halo- or methyl-dibenzanthrones are obtained by treating with alk. condensing agents Bzl, Bzl'-dibenzanthronyls contg. halogen or methyl groups but not substituted in the 2- and 2'-positions. The reaction may be effected with alc. potash at temps. slightly over 100°. Examples are given of the production of intermediates as well as the final products.

Dyes. I. G. FARBENIND. A.-G. Brit. 286,669, March 8, 1927. Vat dyes of the anthanthrone series are made by condensing a halogenated anthanthrone with an aminoanthraquinone (or a deriv. or substitution product) in the presence of an acid-binding substance and a catalyst such as Cu or a Cu compd. Examples are given for producing dyes giving on cotton from the hyposulfite vat various shades of gray, blue and brown.

Dyes. I. G. FARBENIND. A.-G. Brit. 286,717, March 10, 1927. Substantive azo dyes are made by coupling tetrazotized 4,4'-diaminobiphenyl-3,3'-dicarboxylic acid or a deriv. with an aryl naphthylaminosulfonic acid or a deriv. and with another coupling component contg. a sulfo, carboxy, OH, NH₂ or ketomethylene group which gives soly. in water. The couplings may be in different sequences and in the presence of pyridine. The dyeings may be rendered faster by after-treatment with metal salts such as those of Cu. Several examples of blue and reddish violet and green dyeings are given.

Dyes. I. G. FARBENIND. A.-G. Fr. 638,269, May 25, 1927. New vat dyes are produced by reacting the halogen or other negatively substituted derivs. of *allo-ms*-naphthodianthrones, *ms*-anthradianthrones, *ms*-benzodianthrones, *ms*-naphthodianthrones, dibenzanthrones or isodibenzanthrones with N compds. contg. at least one H atom attached to the N capable of reacting, preferably in the presence of solvents or diluents, and with or without catalysts or acid-binding agents. The N compds. belong preferably, and with the *ms*-naphthodianthrones exclusively, to the anthraquinone series. New vat dyes are also obtained by replacing some or all of the halogen atoms in polyhalopyranthrones by N radicals contg. a H atom attached to the N capable of reacting. In examples, tetrabromo-*allo-ms*-naphthodianthrone is boiled with α -aminoanthraquinone in the presence of PhNO₂ and NaOAc, giving a compd. which dyes cotton a fast blue-marine from the vat. Tribromopyranthrone is boiled with α -aminoanthraquinone in the presence of PhNO₂ and NaOAc; the product gives dark violet shades on cotton from the vat. Similarly dichlorodibenzanthrone is heated with 1,4-aminomethoxyanthraquinone with the addn. of CuCO₃, giving gray-blue to blue-black shades of great fastness on cotton. Several other examples are given.

Dyes. I. G. FARBENIND. A.-G. Fr. 638,772, Aug. 3, 1927. Very fast dyes giving violet red to violet-blue shades on wool are obtained by the action of compds. yielding Cr on α -hydroxyazo dyes from diazotized 4-chloro-2-aminophenol and naphtholmono-sulfonic acids. Valuable complex Cr compds. are also obtained from α -hydroxydiazo compds. and 2,4-dihydroxyquinoline, giving brown-red to red or violet shades. Instead of the α -hydroxyazo compds. themselves the derivs. contg. alkyloxy groups instead of OH groups may be used under such conditions that the alkyl group is eliminated. In examples, the dye from diazotized 4-chloro-2-aminophenol and 2,6-naphtholsulfonic acid is heated in aq. soln. with a paste of Cr₂O₃ and HCOOH. The dye from diazotized 4-chloro-2-aminophenol-6-sulfonic acid and 2,4-dihydroxyquinoline is similarly treated.

The dye from diazotized *o*-phenetidine and 1,5-naphtholsulfonic acid when similarly treated gives the same product as from *o*-aminophenol and 1,5-naphtholsulfonic acid but in a purer state. Other examples are given.

Dyes (halogen derivatives of anthanthrone). L. CASSELLA & Co., Ges. Brit. 287,020, Nov. 3, 1926. The process described in Brit. 260,998 (C. A. 21, 3467) is modified by carrying out the halogenation with an excess of liquid halogen or halogenating agent as diluent, or by using the halogenating agent in gaseous form without a diluent, or by employing successive chlorination and bromination or *vice versa*, or by use of sulfonyl chloride as a chlorinating agent (suitably in PhNO_2 in the presence of I or FeCl_3). Various examples are given.

Dyes. SOC. ANON. POUR L'INDUSTRIE CHIMIQUE À BAËLE. Ger. 466,535, May 23, 1923. Addn. to 453,087. Indigoid dyes are prepd by condensing 2,1-naphthohydroxythiophene with the anil or halide of cyclic ketones, except β -naphthisatin chloride and halogenating the product. In examples, 2,1-naphthohydroxythiophene is condensed with (1) the *p*-dimethylamino-2-anil of benzothiofuran-1,2-dione; the product dyes cotton a Bordeaux shade. By treating with Br a redder dye is obtained. With (2) the 2-dibromide of benzothiofuran-1,2-dione, the product dyes cotton a Bordeaux shade.

Dyes. RAYMOND VIDAL. Fr. 639,034, Jan. 8, 1927. See Brit. 283,468 (C. A. 22, 4257).

Azo dyes. I. G. FARBERIND. A.-G. Brit. 287,479, March 21, 1927. Azo dyes fast to kier-boiling, to Cl and to light are produced by coupling a diazotized dihalo-*m*-toluidine with a component capable of being taken up by the fiber such as an arylide of 2,3-hydroxynaphthoic acid or of a β -ketocarboxylic acid. Numerous examples are given.

Azo dyes. I. G. FARBERIND. A.-G. Brit. 287,651, Jan. 5, 1927. The process for dyeing cellulose acetate described in Brit. 262,537 (C. A. 21, 3751), by treating with a mixt. of a diazotizable amine, coupling component and nitrite and, after wringing, developing the dye in an acid bath, is applied to the dyeing of pelts, hairs, feathers or similar materials. In a modification of the process (applicable also to cellulose acetate) the dye is developed in the original bath by addition of acid. Numerous examples and further modifications are described.

Azo dyes. I. G. FARBERIND. A.-G. Fr. 637,383, July 9, 1927. Azo dyes are prepd. by coupling 2,5-dimethyl-4-halo-1-diazobenzene, in which either the 3- or 6-position H is substituted by a halo, with an arylamine of β -ketocarboxylic acid or of 2-hydroxynaphthalene-3-carboxylic acid. The fastness to boiling of these dyes is greater than that of any other of this class. In an example cotton fiber is treated in a bath of the 2-methyl-4-chloro-1-anilide of 2-hydroxynaphthalene-3-carboxylic acid, and the dye is developed with 2,5-dimethyl-4,6-dichloro-1-aniline. A bright red fast to Cl and boiling is obtained. Other examples of dyes giving a reddish blue and alizarin shades are given.

Azo dyes. WALTER DUISBERG, WINFRID HENTRICH and LUDWIG ZEH (to Grasselli Dyestuff Corp.). U. S. 1,690,774, Nov. 6. Diazotized *o*-aminobenzaldehyde is coupled with a component such as 2-phenylamino-8-naphthol-6-sulfonic acid, 1-ethylamino-8-naphthol-3,6-disulfonic acid, methyl-4-sulfophenylpyrazolone, 5,5'-dihydroxy-7,7'-disulfo-2,2'-dinaphthylamine or 5,5'-dihydroxy-2,2'-dinaphthylurea-7,7'-disulfonic acid and the product further coupled with hydroxylamine. The dyes produced give different colors and are suitable for treatment with Cu salts.

Azo dyes. KARL HOLZACH and RICHARD METZGER (to Grasselli Dyestuff Corp.). U. S. 1,690,900, Nov. 6. Dyes suitable for dyeing cellulose acetate are made by coupling 1,3-dihydroxyquinoline, 3-methyl-1-phenyl-5-pyrazolone or other unsulfonated compd. selected from the group consisting of hydroxyquinolines and pyrazolones with a diazo compd. of *m*-aminobenzaldehyde or other suitable unsulfonated aromatic amine contg. at least 1 aldehyde group. The dyes thus obtained give yellow shades fast to light.

Azo dyes. J. R. GEIGY A.-G. Ger. 466,381, Jan. 29, 1926. An azo dye for use with a mordant is prepd. by diazotizing the diarylmethane deriv., described in Ger. 454,460, which contains in one nucleus an amino group and in another an *o*-hydroxycarboxylic acid group, and coupling it with an azo dye component.

Azo dyes and intermediates. SOC. ANON. POUR L'INDUSTRIE CHIMIQUE À BAËLE. Ger. 466,961, Oct. 1, 1925. Azo dyes or intermediates with readily displaceable H. atoms are treated with cyanurictricarboxylic halides. Examples are given describing (1) treatment of aminoazobenzene-*p*-sulfonic acid with cyanurictricarboxylic acid trichloride; (2) treatment of toluylenediamine with cyanuric tricarboxylic acid trichloride, the condensation product being then diazotized and coupled with the Na salt of 2,5-aminonaphthol-7-sulfonic acid; (3) treatment of the Na salt of 1,4-phenylenediamine-3-

sulfonic acid with cyanurictricarboxylic acid trichloride, the condensation product being diazotized and coupled as in (2); (4) treatment of the Na salt of 2,5-aminonaphthol-7-sulfonic acid with cyanurictricarboxylic acid trichloride, the condensation product being coupled with diazobenzene. Reference is made to the use of 1,8-aminonaphthol-3,6-disulfonic acid instead of 2,5-aminonaphthol-7-sulfonic acid.

Complex copper-ammine azo dyes. WINFRIED HENTRICH and MAX HARDTMANN (to Grasselli Dyestuff Corp.). U. S. 1,690,782, Nov. 6. Diazotized *o*-aminobenzoic acid is coupled with the mono-azo dye obtained from diazotized 3-aminobenzaldehyde and 5,5'-dihydroxy-2,2'-dinaphthylurea-7,7'-disulfonic acid and the materials are simultaneously reacted on with tetrammine-cupric sulfate in the presence of Na_2CO_3 . The product dyes cotton fast brick-red shades. Similar complex Cu-ammine azo dyes may be obtained from various other similar specified starting materials.

Monoazo dye. KARL HEUSNER and MAX SIMON (to Grasselli Dyestuff Corp.). U. S. 1,690,783, Nov. 6. Dyes giving an orange color on wool are formed from *p*- or *m*-sulfanilic acid and β -naphthylsulfamic acid compds. Cf. C. A. 22, 3304.

Monoazo dyes. I. G. FARBENIND. A.-G. Brit. 287,908, March 29, 1927. Monoazo dyes dyeing fast to kier-boiling and to light are produced in substance or on the fiber by coupling diazotized 2,3- or 2,5-dichloro-4-aminotoluene with an arylide of 2,3-hydroxynaphthoic acid. Several examples are given of dyes dyeing in various shades of red.

Trisazo dyes. I. G. FARBENIND. A.-G. Brit. 287,232, Dec. 16, 1926. The process described in Brit. 248,230 (C. A. 21, 654) is further applied to the manuf. of trisazo dyes contg. 1,2-aminonaphthol ether as well as its sulfonic acid as third component and any deriv. of 2-amino-5-naphthol-7-sulfonic acid as end component. Several examples are given of dyes which give greenish blue on cotton.

Benzanthrone dyes. BRITISH DYESTUFFS CORPORATION, LTD., ARNOLD SHEPHERDSON and SIDNEY THORNLEY. Fr. 637,847, July 18, 1927. Benzanthrone and its unsulfonated derivs., except dibenzanthrones, are condensed with hydroxylamine or its salts and the products are fused with alkali. They dye cotton from the vat in gray to black shades. Examples are given of the condensation of benzanthrone and the methyl-benzanthrone from β -methylantraquinone in the presence of H_2SO_4 and FeSO_4 , the products being fused with NaOH at 240° .

Dyes. I. G. FARBENIND. A.-G. Brit. 287,050, March 12, 1927. Vat dyes which are probably 4,5,8,9-dibenzopyrene-3,10-quinones are obtained by treating 2-arylbenzanthrones with a condensing agent such as AlCl_3 , with or without use of a diluent or air or O . Several examples are given, one of which is of a dye giving intense yellowish red dyeings on cotton from the vat.

Benzanthrone dyes. I. G. FARBENIND. A.-G. Brit. 287,845, March 26, 1927. The 4,5,8,9-dibenzopyrene-3,10-quinones described in Brit. 287,050 (preceding abstract) are converted into new vat dyes by halogenation. By introducing Cl into the original dye brighter tints are obtained, while brominating gives darker tints. Examples are given.

Lissamine green. V. (Color Index No. 735.) BRITISH DYESTUFFS CORP., LTD., and T. A. SIMMONS. Brit. 287,995, Feb. 5, 1927. In the manuf. of this compd. from 4,4'-tetraethyldiaminobenzohydrol and 2,7-naphthalenedisulfonic acid, the hydrol is isolated in the form of its 2,7-naphthalenedisulfonate and to prepare the dye the naphthalene disulfonate is washed and dissolved with H_2SO_4 . The leuco dye obtained by heating and pouring into water is then oxidized with PbO_2 . Various details are given.

Anthraquinone dyes. I. G. FARBENIND. A.-G. Fr. 637,512, July 12, 1927. Vat dyes of the anthraquinone series are prepd. by condensing aminobenzamidoanthraquinones with benzamidoalkoxyanthraquinones contg. halogens or by combining benzamidoalkoxyanthraquinones contg. halogen with anthraquinone derivs. which have at least one amino or benzamido group free and alkylating the condensation products thus obtained, or by combining among themselves aminohydroxybenzamidoanthraquinones or halogenated benzamidoalkoxyanthraquinones and alkylating. In examples (1) 1-benzamido-4-hydroxy-5-chloroanthraquinone and 1-benzoylamino-4-aminoanthraquinone are heated in the presence of AcONa . The dye obtained gives a Bordeaux red on cotton, which is sensitive to alkalies on account of the OH group. Other examples are given.

Anthraquinone vat dye. WALTER MIEG (to Grasselli Dyestuff Corp.). U. S. 1,690,306, Nov. 6. 4-Benzoylamino-1,1'-dianthraquinonylamine is treated with anhyd. AlCl_3 in the presence of pyridine. The resulting dye gives fast brown shades on vegetable fibers from cold or hot vats. U. S. 1,690,307 specifies treating the dianthraquinonylamine deriv. obtained by condensing 4-bromo-1,9-anthraquinonemethylpyridone

with 1-aminoanthraquinone, with anhyd. AlCl_3 in the presence of pyridine. A dye is thus formed which gives brownish orange dyeings on cotton from a cold or a hot vat.

Vat dyes. WILHELM ECKERT (to Grasselli Dyestuff Corp.). U. S. 1,690,775, Nov. 6. The dianhydride of 1,4,5,8-naphthalenetetracarboxylic acid (or the acid itself or a substitution product) is condensed with an *o*-nitroamino compd. such as 3-nitro-4-amino-1-phenetole or 3-nitro-4-amino-1-anisole, and the condensation products thus obtained are then reduced to effect ring closure and formation of corresponding imidazole derivs. The dyes obtained (of which several examples are given) produce brown, red or reddish brown tints on cotton after exposure to the air in dyeing from the vat.

Vat dyes. ALBERT JOB (to Grasselli Dyestuff Corp.). U. S. 1,690,786, Nov. 6. By causing a benzoylamino-dipthaloylacridone to be acted upon by hydrazine, preferably in the presence of an org. solvent such as pyridine or toluene, and at an elevated temp. (suitably 90–100°), vat dyes are obtained which dye cotton from the vat fast green shades. Examples and details are given.

Vat dyes. WALTER MIEG (to Grasselli Dyestuff Corp.). U. S. 1,690,236, Nov. 6. Vat dyes are formed by reaction of anhyd. AlCl_3 upon a 1,2'-dianthraquinonylamine or other suitable anthraquinone deriv. of the general formula R-NH-R' , in which R stands for an anthraquinonyl residue and R' for H or an anthraquinonyl residue, in the presence of pyridine, quinoline or similar cyclic compd. contg. a tertiary N atom different from the anthraquinone deriv. reacted upon. The products dye various yellow and brown shades.

Vat dyes. OSKAR UNGER and GEORG BÖHNER (to Grasselli Dyestuff Corp.). U. S. 1,690,913, Nov. 6. Vat dyes of the anthraquinone series are made by heating a 1-chloroanthraquinone-2-carboxylic acid and an arylamine such as β -naphthylamine or *p*-chloroaniline in PhNO_2 or other inert org. solvent (suitably at a temp. of boiling).

Vat dye. I. G. FARBENIND. A.-G. (Paul Nawiasky, inventor). Ger. 466,990, July 12, 1923. Addn. to 398,485. The parent case describes the manuf. of a blue-green dye by ethylating oxidized dibenzanthrone with the ethyl ester of toluenesulfonic acid, the product being different from that obtained by Fr. 543,910, in which the ethylating agent is Et_2SO_4 . It is now found that the product of the parent case can be obtained by using Et_2SO_4 if the reaction is conducted in an org. medium free from NO_2 groups but contg. halogen substituents, or alternatively if the reaction is conducted in an org. medium contg. NO_2 groups and the desired product is sepd., suitably with solvents such as trichlorobenzene, from the other dye which accompanies it. Examples are given.

Vat dyes. I. G. FARBENIND. A.-G. (Paul Nawiasky, inventor). Ger. 466,585, Jan. 13, 1926. Gray to black vat dyes are prepd. by treating aminodibenzanthrone with Me esters of H_2SO_4 in the absence of agents which combine with acids. In examples pure aminodibenzanthrone is heated with MeOH and H_2SO_4 , or Me_2SO_4 and H_2SO_4 , or Me_2SO_4 . A smaller yield of dye is obtained with crude aminodibenzanthrone.

Solid preparations of vat dyestuffs. SOC. ANON POUR L'INDUSTRIE CHIMIQUE À BAËLE. Ger. 466,938, Jan. 26, 1926. The dyes are intimately mixed with a non-caustic alkali, such as Na_2CO_3 , $\text{Na}_2\text{B}_4\text{O}_7$ or Na_2HPO_4 , and with a hyposulfite; a dispersing agent such as Turkey red oil may be added if required. *E. g.*, the dye may be mixed with the dispersing agent, the alkali added, and the mixt. evapd. to dryness, the hyposulfite being incorporated after the product has been finely ground. Detailed examples are given.

Vat dyes of the 2,2'-indolethionaphthene-indigo series. CARL KRAUSS (to Grasselli Dyestuff Corp.). U. S. 1,691,660, Nov. 13. Dibromomethyl-2,2'-indolethionaphthene-indigos which dye animal and vegetable fibers from a yellow vat clear fast violet shades are produced by brominating 7-methyl-2,2'-indolethionaphthene-indigo or similar compds. by a method which is described in detail.

Aminoanthraquinone derivatives. SOC. ANON POUR L'INDUSTRIE CHIMIQUE À BAËLE. Fr. 638,732, Aug. 2, 1927. See Brit. 282,853 (*C. A.* 22, 3996).

Anthraquinone condensation products. I. G. FARBENIND. A.-G. Fr. 638,966, Aug. 4, 1927. Amino compds. of the anthraquinone series are treated with halohydrins in the presence of acid-binding agents with or without condensing agents. The products are sol. in org. solvents and dye cellulose esters in red, red-violet and blue shades and most of them dye wool from an acid bath. In examples, compds. are prepd. from: (1) 1-aminoanthraquinone and ethylene chlorohydrin in presence of Na_2CO_3 ; (2) 1-aminoanthraquinone and glycerol α -monochlorohydrin in presence of 1,2-dichlorobenzene and Na_2CO_3 ; (3) 1-amino-4-hydroxyanthraquinone and ethylene chlorohydrin in presence of disodium phosphate; (4) 1,4 or 1,5-diaminoanthraquinone and ethylene chlorohydrin in the presence of NaOAc or MgO . The compds. of (1) and (2) are 1- β -hydroxy-ethylaminoanthraquinone and 1- β - γ -dihydroxypropylaminoanthraquinone, resp.

Sulfurized derivatives of phenols. EMIL KRAUS (to Fabrick van chemische Pro-

ducten). U. S. 1,690,640, Nov. 6. Phenol, cresol or other phenol is treated with a quantity of NaOH or other suitable alkali sufficient to convert more than about 25% of the phenol into alkali phenolate but insufficient to effect such conversion of all the phenol, the mixt. is heated until free from water, 1-2 at. proportions of S is added for each mol. proportion of the total phenol present, and the mixt. is heated for a sufficient time at a reacting temp. above 100° and below the temp. which would decomp. the desired product (suitably about 160-180°) until a product is obtained whose soln. in an alkali is capable of fixing basic colors on cotton.

Dye intermediates. I. G. FARBENIND. A.-G. Brit. 287,858, March 24, 1927. Halobenzenesulfonic acids and their homologs are converted into the corresponding sulfonylchlorides by treatment with chlorosulfonic acid at temps. below 100°. On reduction of the sulfonylchloride, mercaptans are produced and by condensing the mercaptans with chloroacetic acid thioglycolic acids are obtained. Several examples are given.

Dye intermediates. I. G. FARBENIND. A.-G. Brit. 286,694, March 9, 1927. 2 Amino (and substituted amino)-6-nitro-1-benzoic acids are made from a 2-chloro-6-nitro 1-benzoic acid by treatment with NH_3 or the corresponding alkyl, aralkyl or arylamine, in the presence of a catalyst such as Cu powder.

Dye intermediates. I. G. FARBENIND. A.-G. Brit. 287,178, March 18, 1927. Trihalobenzenesulfonylchlorides or their homologs are produced by treating a trihalo-benzene or a homolog with chlorosulfonic acid. By reduction, the product yields the corresponding mercaptan which, by condensation with chloroacetic acid, gives the trihaloarylthioglycolic acid. Examples are given.

Dyes and intermediates. RAYMOND VIDAL. Fr. 639,033, Jan. 8, 1927. See Brit. 283,467 (C. A. 22, 4257).

Dyeing. CHARLES CALLEBAU AND JULIEN DE BLICQUY. Ger. 466,349. Feb. 27, 1926. Textile goods such as hose and gloves are rotated with the dye liquor in closed vats by air pressure.

Dyeing. I. G. FARBENIND. A.-G. (Paul Nawiasky and Fritz Helwert, inventors). Ger. 466,810, Dec. 8, 1926. Fast yellow shades are produced on animal, vegetable or artificial fibers by treatment in feebly alk. vats with the product obtained by fusing 1-hydroxyanthraquinone with caustic alkali.

Dyeing. I. G. FARBENIND. A.-G. (Otto Siebert und Max Raeck, inventors). Ger. 467,036, Jan. 1, 1926. A dye for cellulose ethers and esters is formed by coupling non-sulfonated aromatic diazo compds. with 2-4-diaminophenylmethanesulfonic acid. Thus, aminoazobenzene gives a straw-yellow, 4-nitroso-1-aminoazobenzene a Corinth, and 1-aminoazobenzophthalene an orange.

Dyeing. I. G. FARBENIND. A.-G. (Hermann Wagner, Heinz Eichwede und Erich Fischer, inventors.) Ger. 467,037, Mar. 23, 1926. A pyrazolone dye contg. one or more alkyl, aryl, aryloxy or aralkyloxy groups is used for dyeing mixed wool and silk. Thus, a dye bath contg. *o*-aminoanisole-1-(4'-sulfophenyl)-3-methyl-5-pyrazolone was used. Other examples are given. Cf. C. A. 22, 2536.

Dyeing. I. G. FARBENIND. A.-G. (Winfried Hentrich, Rudolf Knoche und Max Hardtmann, inventors.) Ger. 467,038, Sept. 23, 1926. A dye for acylated cellulose, cellulose esters and their transformation products is formed from the diazo compds. aminomonosulfonic acid aminomonocarboxylic acid, and their substitution products coupled with α,β -diketohydrindene and its derivs. Thus, the NH_4 salt of aniline-4-sulfonic acid-azo- α,β -diketohydrindene dyes acetate silk a fast yellow.

Dyeing. I. G. FARBENIND. A.-G. (Heinrich Clingstein and Harry Grimm, inventors.) Ger. 467,059, Aug. 20, 1926. Dyes which are insol. in water are prepd. by coupling diazo compds. with compds. formed by coupling non-sulfonated amino-fluorones with an insol. azo dye. Thus, cotton yarn immersed in a bath of 2,3-hydroxynaphthoic acid anilide, NaOH and Turkey red oil, wrung out and immersed in a diazo soln. neutralized with acetate and contg. monoaminofluorenone receives a fast red color. When 2,3-hydroxynaphthoic acid aniside is used, a red-brown dye is obtained; β -naphthol gives a red; 2,7-diaminofluorenone and 2,3-hydroxynaphthoic acid anilide give a violet. Other examples are given.

Dyeing. IWAN KOSTIN. Ger. 466,624, April 15, 1924. In an app. for dyeing, particularly with vat dyes, the cloth is led into a tank contg. the dye liquor under vapor pressure and free of air, the cloth passing several times from the liquor to the vapor and back.

Dyeing. SOCIÉTÉ PAUL NAVARRE, E. CHEREAU & CIE. Fr. 638,935, Dec. 31, 1926. Coarse fibers such as vegetable fiber, raffia or coconut fiber are dyed black by impregnation with a soln. of a Pb salt, and treatment with H_2S in the cold.

Dyeing cellulose esters and ethers. H. DREYFUS. Brit. 286,761, Dec. 3, 1926.

Material formed of or contg. cellulose acetate or other cellulose ester or ether, in mordant dyeing, is treated with a mordant metal in the form of a metal salt soln. of at least 15% concn. (suitably 20-40% or even 60% or more). As mordant salts there may be used Al sulfate, alums, Cr chloride, Cr fluoride, Cr bisulfite and SnCl_2 and assistant substances such as cream of tartar or oxalic acid may be added. A temp. of 60° or higher may be used for the mordant bath. Various examples are given. Cf. C. A. 23, 288.

Dyeing regenerated cellulose materials. BRITISH DYESTUFFS CORP., LTD., AND J. BADDILEY. Brit. 287,609, Dec. 10, 1926. Dyeing in level shades is effected with secondary disazo dyes (other than those used according to Brit. 283,319 (C. A. 22, 3997)) obtained by coupling the diazo compd. of a sulfonated or carboxylated *p*-nitro-arylamine with a usual middle component, rediazotizing, and coupling with an aminonaphtholsulfonic acid or a N deriv. (other than 2,8-aminonaphtholsulfonic acids and their derivs.). Corresponding dyes in which the nitro group has been reduced to the amino group may also be used with diazotization on the fiber and development with usual developers if desired. Several examples are given.

Dyeing regenerated cellulose "silk." BRITISH DYESTUFFS CORP., LTD., AND J. BADDILEY. Brit. 287,214, Dec. 13, 1926. Secondary disazo dyes are used which are made by coupling a diazotized nitroarylamine or a homolog or deriv. free from sulfo or carboxy groups with a middle component, rediazotizing and coupling in alk. soln. with a 1,8-aminonaphtholsulfonic acid or a N-substituted deriv. The nitro group may or may not be reduced. Several examples are given.

Dyeing cellulose acetate. GEORGE H. ELLIS and WM. O. GOLDTHORPE (to Celanese Corp. of America). U. S. 1,690,481, Nov. 6. 3-(5, 7-Dibromoindole)-2'-thionaphthen-indigo or other substances for coloring cellulose acetate, which are relatively insol in water, are solubilized by pretreating them with a solubilizing agent comprising a substance of oily or fatty characteristics such as Na sulforicinate and with at least one auxiliary solvent such as $\text{C}_2\text{H}_2\text{Cl}_4$.

Dyeing cellulose acetate and similar materials. ARMIN GOESCHKE (to Soc. anon. pour l'ind. chim. à Bâle). U. S. 1,691,517, Nov. 13. Blue to green shades fast to light and storing are produced on "acetate silk" or other cellulose esters and ethers of like character by use of indophenols such as may be produced by simultaneous oxidation of a halogenated *p*-aminophenol and an aromatic amine having a free *p*-position or by condensation of a halogenated *p*-nitrosophenol with an aromatic amine with a free *p*-position, or by simultaneous oxidation of a suitable *p*-diamine with a halogenated phenol with free *p*-position. Preferably, a dispersing agent is used such as sulfite waste liquor, condensation products from naphthalenesulfonic acids with CH_2O , salts of lignin-sulfonic acids, Turkey red oil, etc.

Dyeing artificial silk. BRITISH DYESTUFFS CORP., LTD., J. BADDILEY, P. CHORLEY and R. BRIGHTMAN. Brit. 287,010, Sept. 8, 1926. Materials such as "viscose silk" are dyed in level shades by use of secondary disazo dyes formed by coupling diazo compds. with N-substituted derivs. of 2 amino-8-naphtholsulfonic acids. A large no. of examples are given.

Dyeing cotton and artificial silk. LOUIS LIBMANN. Fr. 637,833, July 18, 1927. Cotton or artificial silk to be dyed with indigosol or its derivs. is mordanted with peroxide of Mn, Pb or other analogous metal, rinsed and dyed in an acid bath of indigosol, etc. Discharge effects may be produced by the application of reducing agents to parts of the cloth before dyeing.

Dyeing wool and silk. CECIL SHAW. U. S. 1,691,500, Nov. 13. Dyestuffs of water-sol. 1,4-dihydroxy-2,5-dihalobenzoquinones are applied from an acid bath.

Dyeing yarn. EDWIN I. CARLSON and LAWRENCE A. STEAD. U. S. 1,691,701, Nov. 13. An app. is described. U. S. 1,691,702 also specifies a yarn-plaiting app. for prepg. warp yarn for dyeing.

Mordant dyeing of cellulose acetate and similar materials. H. DREYFUS. Brit. 287,204, Dec. 3, 1926. In the mordant dyeing of yarns, fabrics and other materials made of or contg. cellulose acetates or other org. esters of cellulose or cellulose ethers, the mordant metal is applied in the form of a salt of an aliphatic acid, suitably a hydroxy aliphatic acid. Among the salts which may be used are: basic Cr lactate, Al lactate, Na Al lactate, basic Al NH_4 citrate, ferric citrates, basic Al glycolate, basic Cr glycolate and the acetates of Al, Cr, Fe and Cu, and also salts contg. other acid radicals such as Al sulfate-acetate, Al nitrate-acetate and Al chloride-acetate and the corresponding Cr salts. The mordanting bath may be heated and if temps. are used in excess of 75-80° there should be added to the bath, to prevent delustering, protective agents such as those referred to in Brit. 246,879 (C. A. 21, 502) and Brit. 200,312 (C. A. 21, 3471).

The mordant may be applied before dyeing or simultaneously with or after application of the dye.

Apparatus and liquid-circulating system for scalding or dyeing cotton in bundles. J. ANNICQ. Brit. 287,011, Oct. 27, 1927.

Dye baths. I. G. FARBENIND. A.-G. (Joseph Nusslein, inventor). Ger. 466,420, June 3, 1925. In employing soap or Turkey red oil in acid baths which also contain K and Mg salts, a substance which prevents the sepn. of fatty acids or insol. salts thereof is added. Thus, in a color bath which for 100 kg. of woolen goods contains 0.5% aniline yellow G, 0.25% superamine red B, 0.2% anthraquinone blue SR, 2 g. soap and 2 g. disopropyl naphthalenesulfonic acid, 3% H_2SO_4 is added. Instead of the above named or similar sulfo acid, 5 g. purified and thickened sulfite pulp waste liquor can be used. Other examples are given.

Dyeing apparatus. CURT FÖRSTER. Ger. 466,619, Mar. 18, 1927. In a dyeing app., particularly for hose, the holder which enters the dye liquor in piston-like manner has a perforated bottom and top and is of smaller cross-section at the top than at the bottom.

Dyeing machines. SOCIÉTÉ F. & L. CONSTANT. Ger. 466,350, Jan. 9, 1926. The vat swings on a fixed axle with stirring fins.

Hardened colloid films for dye imbibition processes, etc. J. F. KIENNINGER (to Technicolor Motion Picture Corp.). Brit. 288,146, April 1, 1927. A gelatin compn. or the like while still in liquid form is treated with a potential hardening agent such as a dichromate together with an activating agent such as an alkali sulfite and a restrainer such as NH_4OH and the restrainer is afterward rendered inactive as by its removal, in whole or in part, to permit hardening to proceed.

Treatment of textiles. OSCAR KOHORN & CO. AND ALFRED PERL. Fr. 637,779, July 16, 1927. An app. is described for the uniform wet treatment of skeins of textiles particularly artificial silk, whereby tangling is prevented.

Restoring textile fabrics. ALFRED KARSTEN-SALMONY. Ger. 467,116, April 26, 1927. Old clothing and like textile materials are restored to their original appearance by treating them with an aq. soln. of mucilage mixed with formaldehyde and alkali carbonates.

Treating vegetable fibers. JEAN JULES LAMBRECHT. Fr. 637,772, July 16, 1927. Vegetable fibers are rendered imputrescible by heating them in a bath contg. a vegetable or animal fatty substance such as oleic acid, soda lye and a mineral fatty substance such as oil of vaseline, and agitated to secure sapon. of the fatty substance.

Treatment of cotton fibers. PAUL KARRER. Ger. 466,937, Dec. 16, 1925. See Brit. 263,169.

Sizing textile fibers. COMPAGNIE FRANÇAISE DE PRODUITS CHIMIQUES ET MATIÈRES COLORANTES DE SAINT-CLAIR-DU-RHÔNE. Fr. 638,891, Dec. 28, 1926. Emulsions for sizing fibers are made in hydrocarbons or their derivs. especially in chloro derivs. In an example boiled linseed oil is dissolved in *p* dichlorobenzene and NaOH soln. is added and the mixt. is emulsified with boiling water.

Sizing threads. ÉDOUARD PINEL. Fr. 637,654, Nov. 18, 1926. Threads of wool, cotton or other textile are sized in a bath contg. carob gum with or without glycerol and then in a bath contg. starch, dextrin and wax.

Tank (with a perforated false bottom) for washing fibrous materials wound on bobbins. W. ALTHOFF. Brit. 286,512, May 16, 1927.

Apparatus for drying and stretching fabrics. M. R. JAHR MASCHINENFABRIK. Brit. 287,163, March 17, 1927.

Apparatus for calendering fabrics. C. SCHLATTER (to Slater & Sons). Brit. 287,139, March 16, 1927.

Apparatus for tentering fabrics. R. C. MATHER and MATHER & PLATT, LTD. Brit. 286,487, April 7, 1927.

Apparatus for fulling and milling fabrics. T. CROWTHER and J. A. CROWTHER. Brit. 286,839, Jan. 24, 1927. Cloth in rope form is continuously worked or compressed and opened out as it is passed through a trough by temporarily obstructing its passage by rollers the rotation of which is intermittently checked.

Bleaching textile materials. C. TAYLOR. Brit. 286,567, Oct. 12, 1927. Cotton, linen, artificial silk or other vegetable material is satd. with a liquid contg. about 1% Na_2CO_3 and about 4.4% $NaOCl$, bleaching powder or Cl_2 , the material is stored for about 12 hrs. and is then washed. The process may be repeated and the goods then soured. Temps. of about 22° are suitable and small quantities of borax or NH_3 may be added to the satg. liquid.

Apparatus for bleaching fabrics in lengths. C. TAYLOR. Brit. 287,419, Oct. 12, 1927.

Coating pervious materials. NORMAN E. OLIVER (to Hermetite Corp.). U. S. 1,690,426, Nov. 6. Pervious material such as woven fabric is first subjected to mech. treatment, e. g., by calendering under high pressure, to reduce the size of the openings or interstices, flatten the fibers and give a smoother surface, and a coating compn. is then applied such as a cellulosic deriv. or celluloid lacquer or varnish having a high degree of pliability when dried and forming on the outer surface of the treated material only one layer which does not permeate and embed the fibers. U. S. 1,690,427 relates to a similar process in which one side only may be given the preliminary treatment.

Use of compressed air from nozzles for moistening warps on looms, etc. T. WINSTANLEY and A. WINSTANLEY. Brit. 287,311, March 9, 1927. Mech. features.

Zig-zag roller apparatus for treating fabrics with liquids. J. BAILEY and W. H. WADSWORTH. Brit. 287,233, Dec. 17, 1926.

Apparatus for dressing, drying and beaming yarns in warp form. A. SUCKER. Brit. 287,345, April 30, 1927.

Apparatus for dressing textile threads with wax, oil, etc. MASCHINENFABRIK SCHWEITER A.-G. Brit. 287,923, March 30, 1927.

Delustering acetate silk. SOCIÉTÉ POUR LA FABRICATION DE LA SOIE "RHODIASÉTA." Fr. 638,795, Aug. 3, 1927. Acetate silk is delustered without being weakened by plunging the silk into an aq. soln. of CaCl_2 , LiCl or MgCl_2 of 10–30% concn. at ordinary temp. and then into a bath of boiling aq. acid not over 0.1 N strength. Naphthalene sulfonic acid gives a mat crepe effect. BzOH or salicylic acid gives a very white mat without much of the crepe effect. H_3BO_3 gives a clear pearly mat. Other acids give different effects.

Apparatus for treating skeins of artificial silk with liquids. J. BRANDWOOD. Brit. 287,731, April 19, 1927.

Apparatus for pressing artificial silk into flat cakes for washing, desulfurizing, bleaching, dyeing, etc. F. KÜTTNER A.-G. Brit. 287,097, March 14, 1927.

Viscose silk. S. TODA. Brit. 287,807, April 22, 1927. Yarns made from a viscose soln. are loosely twisted, then starched, and are woven or knitted without previous desulfurization and the resulting fabric is afterward desulfurized and bleached.

Linen-like effects on cotton. HULDRICH EGLI (to A.-G. Seeriet). U. S. 1,690,572, Nov. 6. Cotton yarns or webs the fineness of the threads of which does not exceed English yarn No. 60 are subjected to the action of 49–50.5° Bé. H_2SO_4 for not less than about 4 min. and then subjected under tension to treatment with caustic alkali of about 15° Bé. at ordinary temps.

Treating cotton cloth. LÉON LILIENFELD. Fr. 637,826, July 16, 1927. A wool-like cotton fabric is produced by treating cotton in an unstretched condition with alkali lye, or by a treatment with a mixt. or emulsion of CS_2 and alkali lye. The CS_2 may be dild. with benzine.

Apparatus for the carbonization of wool. EMILE MOLINGHEN and JULES GAVE. Ger. 466,623, Dec. 31, 1925. The wool is fed between radial arms, on a rotating drum, which dip into a half-cylinder acid container on the same axis.

Balloon fabric. WM. J. KELLY (to Goodyear Tire & Rubber Co.). U. S. 1,691,764, Nov. 13. The fabric is coated with a soln. of cellulose xanthate contg. acidified Na_2SO_4 and the cellulose is regenerated on the fabric.

26—PAINTS, VARNISHES AND RESINS

A. H. SABIN

New decorative finish and how to use it. F. B. ROOR. *Ind. Finishing* 4, 110, 112, 117 (1928).—A general description and directions for use of a new baking finish. The compn. is not given.

Chalking of paints. HANS WOLFF. *Farbe u. Lack* 1928, 472–3.—The degree of chalking of a paint film was measured by drawing a dark cloth across its surface and comparing the spot produced with a standard. By this test a paint contg. white lead and lamp black chalked least; one contg. ZnO and sublimed lead was next; and one contg. lithopone, ZnO and CaSO_4 chalked most. The last lost less wt. than the others. This may be explained by the fact that chalking is a surface phenomenon while loss in wt. may also take place along the pores of the film.

Zinc lithopones and calcium lithopones. VON STEINAU. *Chem.-Ztg.* 52, 785–6

(1928).—The physical properties of these lithopones are discussed and photomicrographs are shown. Reference made to previous papers shows the relative resistance of each to light.

RICHARD KATZ, JR.

Microscopic examination of lithopone and of zinc whites. V. ALLARD. *Société des Couleurs Zincique. Ann. fals.* 21, 445-9(1928).—Under the microscope, with ordinary light, true (or "molecular") lithopone appears as dark, agglomerated, amorphous grains; lithopone prep'd. by mixing ZnS and ground heavy spar appears as amorphous agglomerates interspersed with brilliant, translucent crystals of BaSO₄. With polarized light, pure "mol." lithopone appears as agglomerated amorphous grains on a red background, heavy spar and gypsum appear as angular, cryst. beautifully colored grains, the color changing as the Nicol prism is rotated; CaCO₃ appears as small, greenish yellow crystals, which undergo but little change in color; ZnO appears like lithopone. The detection of natural BaSO₄ can be rendered more sensitive by examg. the HCl-insol. residue.

A. PAPINEAU-COUTURE

The effect of zinc white and lime on the permanency of coal-tar dyes. GUSTAV ARNOLD. *Chem.-Ztg.* 52, 815(1928).—The permanency of several coal-tar dyes as alizarin and indanthrene is affected by ZnO when dispersed in linseed oil after 12 months' exposure to light and the elements. When dispersed in casein soln. CaO affects them similarly. In mixts. of these colors dispersed in linseed oil with white lead, lithopone and BaSO₄ their permanency was unchanged.

RICHARD KATZ, JR.

Specific gravity of linseed oil at higher temperatures. FELIX FRITZ. *Farbe u. Lack* 1928, 474.—The temp. coeffs. of the sp. gr. of linseed oil between 22.8° and 170°, 226° and 243° were 0.0006707, 0.0006857 and 0.0006877, resp.; of tung oil between 22.26 and 200°, 0.000678 and of linseed fatty acids between 23° and 160°, 0.0006806. Comparison with older data in the literature is made.

G. G. SWARD

Heat polymerization of tung oil and ethyl ester of eleostearic acid. T. MAZUME AND S. NAGAO. *J. Soc. Chem. Ind. (Japan)* 31, 473-6; Suppl. Binding 114-5B(1928).—When tung oil was heated at 200-300°, its mol. wt. was doubled, but its I value did not decrease much; therefore it was considered that the change was an extramol. polymerization. With the Et ester of eleostearic acid, the change was similar, except that it did not solidify as the tung oil did.

Y. TOMODA

Oxidation and polymerization of ethyl esters from linseed acids. G. PETROV AND N. SOKOLOV. *Masloboina Zhiravoe Delo (Oil & Fat Ind. (Russia))* 1928, No. 2, 106.—Linseed oil was split with "Kontakt," washed with water, dried with CO₂ and obtained according to Wolf. Vacuum distn. of these ethers caused decomn., but steam distn. gave satisfactory results. The 210-230° fraction had acid no. 14.0, I no. 194.7, sapon. no. 188.44 and sp. gr. 0.8921. Comparative drying expts. were made with linseed oil (a), fatty acids (b) and the steam-distd. Et ester fraction (c) from linseed fatty acids. After 100-110 hrs (a) had gained in wt. 7.8%, (b) 16.24%, (c) 24.91%. After 13 days the weight was const., but after 26 days (c) lost 3.65%. (a) Had a hard skin, (b) becoming viscous very slowly did not have any skin; (c) did not have a skin but was semisolid. With a drier such as Co linoleate (c) is oxidized in thin layers, containing a high amount of O without producing a linoxyn skin; only a thickening takes place similar to that of (b). By blowing air (c) is easily oxidized and gives a viscous oxidized oil, apparently more rapidly than does linseed oil. The formation of a linoxyn skin is due to the presence of glycerol and unsatd. acids. On heating to 180-200° (c) becomes polymerized, at reduced pressure, nearly to the same extent as (a).

A. A. BOEHLINGK

Short contribution to the history of abietic acid. PAUL LEVY. *Tech. Hochschule, Aachen. Z. angew. Chem.* 41, 233-4(1928).—Criticism on an article of H. Wislicenus (*C. A.* 22, 1070).

G. SCHWOCH

Answer to the remarks of P. Levy concerning the "history of abietic acid." H. WISLICIENUS. *Z. angew. Chem.* 41, 234-5(1928); cf. preceding abstr.

G. S.

Insulating varnishes: classification, selection and use. A. R. DUNTON AND A. W. MUIR. *Electrician* 101, 607-8(1928).—A review.

C. G. F.

Composition and properties of Albertol resins. J. H. FRYDLENDER. *Rev. prod. chim.* 31, 461-5(1928); cf. *C. A.* 18, 2611; 19, 408; 22, 3999.—The compn., uses and comparison of these products are made with other varnishes.

P. THOMASSET

Euphorbia verrucosa Jacq (GILLOT) 27. *Euphorbia paralias* L. (GILLOT) 17. Rusting and protection of iron (SCHULZ-KIRCHMÖSER) 9. Iron content of special red lead (SPRINGER) 18. Process for the treatment of ilmenite for the recovery of electrolytic iron and TiO₂ concentrate for pigment, etc. (TRAILL, McCLELLAND) 4. Fatty substances soluble in water [for cleaning paint, varnishes, etc.] (Fr. pat. 637,274) 27.

Modifying the physical properties of "isocolloids" [use in the manufacture of lacquers] (Brit. pat. 287,943) 18. Cellulose ester and ether solutions [for use as lacquers] (Brit. pat. 286,789) 23. Apparatus for separating and classifying pigments (Brit. pat. 287,262) 1. Chromium compounds [for anti-rust paints] (Fr. pat. 638,718) 18.

Aqueous emulsion paints. LESTER KIRSCHBRAUN. U. S. 1,691,765, Nov. 13. A paint base such as a pitch compn. is dispersed in an aq. medium by means of a finely divided pigment such as chrome green in an aq. paste form adjusted to a predetd. H-ion concn. (suitably p_H of about 6.5-7.0 with chrome green); the pigment chosen is of such a character as to impart a distinct color to the final product.

Compositions for paints, plasters, etc. ARCHIBALD M. SARGINT. Fr. 637,370, July 9, 1927. A compn. suitable for paints, plasters, putty, cements, etc., consists of ZnO and for MgO, a sol. silicate and a powd. metal, such as brass, bronze, Cu, Ni, Sn, Al or Zn. A basic Pb compd., e. g., a mixt. of litharge and white lead, is added to accelerate setting. The sol. silicate is preferably a Na_2SiO_3 contg. Na_2O and SiO_2 in the ratio of 1:3 and of sp. gr. of 1.29. A typical compn. is 4 kg. of Sn, 255 g. of ZnO, 28 g. of litharge and white lead mixt. (3:1), and sufficient Na_2SiO_3 to give the desired consistency.

Lithopone. FRANK G. BREYER and CLAYTON W. FARBER (to N. J. Zinc Co.). U. S. 1,690,099, Nov. 6. Solns. of ZnSO_4 and ZnCl_2 are separately prepd. and purified and crude lithopone is pptd. by mixing these purified solns. with Ba sulfide soln.; at the end point of the pptg. step there is established in the crude pulp a predetd. sulphhydrate excess, the crude pulp is dild. with water promptly after the pptn. and the crude lithopone is washed until the Cl content of the liquor in which the lithopone is suspended does not exceed 0.5 g. per l. After the washing a definite hydrate content is established in the liquor equiv. to 2.5-7.0 cc. of 0.25 N HCl per 250 cc. of filtrate, and the crude lithopone is charged into a calcining app. with an av. moisture content of about 5-8% and is calcined at 650-725°.

Coating metal or other surfaces with paints, lacquers, etc. E. I. DU PONT DE NEMOURS & Co. Brit. 287,940, March 30, 1927. A preliminary coating is first applied which is preferably formed of glycerol, phthalic acid, linseed oil acids, china wood oil acids and rosin acid or of ethylene glycol, phthalic anhydride and linseed oil, to which pigments also may be added. After this coat has dried top coats are applied which may be of the drying oil type or may be compns. of cellulose esters or ethers.

Roller mill for grinding and mixing paints, inks, etc. J. BAXENDALE and HUGHES & TRELEAVEN, LTD. Brit. 287,658, Jan. 11, 1927.

Device for testing the spread of ink. MILTON O. SCHUR (to Brown Co.). U. S. 1,691,739, Nov. 13.

Paint- and varnish-remover. BORIS N. LOUGOVY (to Chadeloid Chemical Co.). U. S. 1,691,771, Nov. 13. Alc., acetone and paraffin or ceresin wax are used together with sufficient Na lauroate (the latter being partly in pptd. condition) to serve as a thickener.

Varnishes. I. G. FARBENIND. A.-G. Brit. 287,115, Nov. 9, 1925. Varnishes of the oil resin type (such as those prepd. from linseed oil and copal resin) contain "benzine" obtained by the destructive hydrogenation of carbonaceous materials or conversion products of such a "benzine." Brit. 287,116 specifies cellulose ester lacquers contg. such a "benzine" and which also may contain various other solvents and auxiliary ingredients such as urea- CH_2O resin, blown castor oil and isobutyl alc.

Nitrocellulose varnishes. I. G. FARBENIND. A.-G. Brit. 287,137, March 16, 1927. Nitrocellulose varnishes contain oxyns such as linoxyn, with or without plasticizers, resins, dyestuffs or coloring substances, etc. and solvents such as alc., benzene, acetone, AmOAc or BuOAc .

Lacquers. F. S. VIVAS (to International Fireproof Products Corp.). Brit. 206,724, March 11, 1927. A non-inflammable chlorinated hydrocarbon such as perchloromethane is incorporated with sep. solns. of gum (e. g., gum dammar) and of "soluble cotton" and vegetable oil and the solns. are mixed. H_3BO_3 also may be used and various solvents are specified.

Grinding mill, for colors to be mixed with "cellulose lacquers," etc. L. M. FRASER. Brit. 287,318, March 12, 1927.

Waterproof and adhesive composition. CARROLL A. CRAWFORD (to Western Electric Co.). U. S. 1,691,543, Nov. 13. A compn. suitable for use on elec. coils subject to heating is formed of paracoumarone resin 50, carnauba wax 40 and raw linseed oil 20 parts.

Composition for polishing surfaces composed of cellulose ester compositions.

JOSEPH E. HIRSH AND ARTHUR D. ROBSON (to Standard Varnish Works). U. S. 1,690,680, Nov. 6. EtOAc, BuOAc or other suitable cellulose ester softening agent is mixed with an inert diluent of lubricant such as an oil and wax and with pumice, tripoli or other abrasive material.

Product containing sulfur and sulfurized xylene resin. CARLETON ELLIS. U. S. 1,690,335, Nov. 6. A material suitable for making molded articles by hot pressing comprises S and sulfurized xylene resin and may be prep'd. by reacting on raw material contg. cresol and xylene with S chloride, deodorizing and incorporating with molten S.

Artificial resin. SCHIEFERWERKE AUSDAUER A.-G. Brit. 286,731, March 10, 1927. A viscous condensation product is made by heating to boiling a mixt. of PhOH, *p*-dichlorobenzene and CH₂O in the presence of a catalyst such as NaCl and NH₄Cl and (CH₂)₆N₄. The product may be hardened by further heating at about 80° and may be used with fillers, etc. Brit. 286,732 specifies forming sheets and articles of insulating material by cold pressing under very high pressure condensation products similarly produced.

Resinous composition. CARLETON ELLIS. U. S. 1,690,160, Nov. 6. A deodorized fusible resin free from H₂S and free from other sol. sulfides is formed by heating a phenolic comp'd. such as PhOH with at least 1.6 times its wt. of S in the presence of an alk. catalyst, such as K₂CO₃.

Synthetic resinous material. CARLETON ELLIS. U. S. 1,691,271, Nov. 13. A crude xylene and a Mg formaldehyde jelly are caused to react by agitation together at room temp., and water is sep'd. The product is suitable for use in making molded articles, etc.

Condensation products of alcohols and ketones with urea. I. G. FARBERNIND. A.-G. Brit. 287,095, March 14, 1927. Examples are given of the condensation of acetylurea, diacetin and benzylamine; urea, butylene glycol and acetanilide; urea, methylcyclohexanol and toluenesulfonamide; and of urea, cyclohexanone, acetanilide and toluenesulfonamide. Oily products are obtained which on prolonged heating are transformed into resinous materials which may be used as softening agents for cellulose esters. Cf. C. A. 22, 3056.

Dicyandiamide-aldehyde condensation products. K. RIPPER. Brit. 287,177, March 18, 1927. Dicyandiamide is condensed with CH₂O with or without the presence of other substances capable of combining with CH₂O to give resins, to form hydrophobe products which are converted by cold water into fine powders which can be molded and pressed. Various details and examples are given.

27—FATS, FATTY OILS, WAXES AND SOAPS

E. SCHERUBEL

High-pressure hot-water equipment in the fat industry. EGON BOHM. *Chem. App.* 15, 193-5, 219-20 (1928).—Description of app., exclusive of steam supply and condensers, accompanied by notes based on 20 yrs.' experience. J. H. MOORE

Splitting fats. G. PETROV AND N. SOKOLOV. *Masloboino Zhirovoe, Delo* (Oil & Fat Ind. (Russia)) 1928, No. 1, 28-30.—Linseed oil, sunflower oil, animal fat and hydrogenated vegetable fat ("Salolin") were treated and agitated with steam in the presence of H₂SO₄, ZnSO₄, Al₂(SO₄)₃, Na₂SO₄. H₂SO₄ (5%) was used to the amt. of 25% of the total fat, sulfates 10% of the wt. of H₂SO₄. The fats were then sapon'd. with 2% of "Kontakt" and only 0.2% of H₂SO₄. The emulsions were broken up by adding 0.2 to 0.5% of CaSO₄ and agitating with steam for 10-15 min. (method of Russ. pat. 12,441). For linseed a preliminary treatment with dil. H₂SO₄ as well as with a mixt. of sulfates and dil. H₂SO₄ does not improve the color of the oil, but makes it transparent. The oil thus treated shows no improvement in color on sapon. Emulsions are formed when over 2.5% of Na₂SO₄ or any amount of other sulfates is present; they are broken up by adding 0.5% of CaSO₄. For sunflower oil washing with a 5% H₂SO₄ makes the oil transparent but does not improve the color. Oil treated with a 5% H₂SO₄ is not improved in color. Oil treated with a 5% H₂SO₄ does not have an improved color after sapon.; but the color is improved after sapon. when the oil is treated previously with a mixt. of 5% H₂SO₄ and Na₂SO₄. The emulsions could not be broken up with lead acetate. For animal fat (acid value of 1.46 mg. KOH) and "Salolin" (acid value of 10.18 mg. KOH) treatment with mixts. of 5% H₂SO₄ and Na₂SO₄ and ZnSO₄ improved the color. On sapon. fats washed previously with H₂SO₄ and Na₂SO₄ gave brighter fatty acids than if only H₂SO₄ was used. A. A. BOEHLINGK

Rapid determination of water in fats and glycerol. V. CHERNUISHEV. *Masloboino*

Zhirovoe, Delo (Oil & Fat Ind. (Russia)) 1928, No. 1, 17-8.—A weighed amount of water-contg. fat is pressed on a weighed filter paper either with a spatula or by rubbing it between two layers of filter paper. The water is thus absorbed by the paper and is evapd. by drying the sample and paper in a beaker at 105°. Only 20 min. is required for the whole operation instead of the customary 4-10 hrs. Glycerol is poured on to a weighed filter paper, dried at 80°, powdered Na_2SO_4 is added, the whole is placed in a thimble and extd. with dry acetone. By this method losses in glycerol due to evapn. are avoided and the drying procedure is accelerated. A. A. BOEHLINGK

The action of narcotics on the saponification of fatty acids. M. CHIO AND N. PIRAS. *Boll. soc. ital. biol. sper.* 3, 359-62(1928).—The effect of CHCl_3 , EtOH , Et_2O , and chloral hydrate on the sapon. of olive oil and oleic acid by alkalis was studied. The 4 substances had the property in common of accelerating the reaction between NaOH or Na_2CO_3 and free fatty acids. PETER MASUCCI

Hydrogenation of fatty oils. VII. Formation of isooleic acid by the hydrogenation of soy-bean oil. T. MAZUME. *J. Soc. Chem. Ind. (Japan)* 31, 467-9; Suppl. Binding, 111-2B(1928).—Formation of the isooleic acid was less when the temp. of hydrogenation was low. The greater the amt. of the catalyzer used, the greater was the formation of isooleic acid. When the Ni catalyzer contained a small quantity (0.3%) of Cu, the formation of isooleic acid was very great, but when its Cu content was large (4%), the formation of isooleic acid was very small. The Ni catalyzer which had been exposed to air at a low temp. after its reduction gave more isooleic acid than that which had been exposed to air at high temp. **VIII. Hydrogenation of the methyl ester of oleic and linolic acid.** *Ibid* 470-2; Suppl. Binding, 112-3B.—During the hydrogenation of the Me ester of oleic acid, a large amt. of isooleic acid was formed at the initial period of the hydrogenation, and the isooleic acid so formed was gradually transformed into oleic acid by further hydrogenation. When the Me ester of linolic acid was hydrogenated, the following transformation of linolic acid was observed: Linolic acid \rightarrow oleic acid \rightarrow isooleic acid \rightarrow stearic acid. Y. TOMODA

Olive oil and its substitutes. CHARLES H. LA WALL. Phila. Coll. of Pharmacy and Sci. *Am. J. Pharm.* 100, 616-25(1928).—A sp. list of the different brands and detailed description of the manner of labeling illustrating misbranding by the substitution of cottonseed oil, or other edible oil, for olive oil. W. G. GAESSLER

Emulsification of sulfonated oils. D. WOODROFFE AND F. N. CRANE. *J. Intern. Soc. Leather Trades Chem.* 12, 419-23(1928).—Samples of (1) a very acid sulfonated vegetable oil and (2) several specimens of sulfonated cod oil, giving emulsions of $p_H = 5.8-9.0$ and contg. mineral oil in unstated amt., were shaken with buffer solns. of $p_H = 1.0-12.0$ and the stabilities of the emulsions noted. Sample (1) gave stable emulsions at $p_H = 2.2-10.0$. The various specimens of (2) gave stable emulsions only at $p_H = 7.8-12.0$. Dilm. of emulsions with H_2O had little effect. Most emulsions were unstable in the presence of more than 3% NaCl . H. B. MERRILL

Flaxseed. FRANK T. SHUTT. Dept. Agr. Canada. *Rept. Dominion Chemist, Year Ending March 31, 1927*, pp. 40-1(1928).—The Argentine, Novelty, Crown and Linota varieties of flaxseed, grown in Manitoba, had the following compps., resp.: H_2O 6.57, 5.77, 6.16, 6.09; protein 25.86, 26.04, 24.54, 25.44; fat 36.91, 38.33, 38.37, 33.61; carbohydrates 20.80, 20.47, 21.16, 23.81; fiber 6.54, 6.20, 6.43, 7.26; ash 3.32, 3.19, 3.34, 3.76%. K. D. JACOB

Coloring matter of cottonseed hulls. AUGUSTUS H. GILL AND H. W. GREENUP. *Oil and Fat Ind.* 5, 288-94(1928).—The coloring matter is not extd. from cottonseed soap stock or foats by any common solvent which will not dissolve the soap stock. The extracts of cottonseed hulls were made with ether, CS_2 , alc., acetone and benzene. When the exts. were analyzed by the absorption method they failed to show carotin, xanthophyll or closely related pigments. The result was checked by the spectroscopic examn. and agreed with the work done by Gill on color tests for oils. The cottonseed-hull exts. made with the above solvents when combined showed very small amounts of gossypol as identified by the aniline and acetyl derivs. Less than a g. was found in 15 lb. of hulls; this would have little or no toxic effect. The H_2O ext. of cottonseed hulls gave a substance contg. 38.1% C, 5.4% H and 56.5% O. This substance was reddish brown and could not be decolorized by animal charcoal. It gave no class reactions and was inactive toward most reagents. It gave a compd. with $\text{Cu}(\text{NO}_3)_2$ and with NaOH gave a black tarry mass. Mol. wt. detns. by the f. p. method were not successful. The mol. wts. calcd. from the combustion and from the detn. of Cu in the $\text{Cu}(\text{NO}_3)_2$ compd. were 597 and 612, resp. E. SCHERUBEL

Euphorbia paralias L. PAUL GILLOT. *Mat. grasses* 20, 8307-8(1928).—The seeds contain water 7.08, fats 38.05, proteins 22.43, sugars 2.58, ash 5.39, cellulose 24.47%.

The expressed oil has d_{44}^{20} .9368, n_D^{20} 1.4819, n_D^{15} 1.4815, Crismer no. 62°, solidifying point -25° , free acids = 1.69 oleic acid per 100 g., sol. acids = 3.3 cc. 0.1 N KOH for 150 cc., insol. acids + unsapond. = 96.17%. Sol. volatile acids = 2.5 cc. 0.1 N KOH; insol. 0.5 cc. 0.1 N KOH, sapon. no. 194, I no. 196.3, acetyl no. (Andre) 10, unsapond. 1.55%, Hehner's no. 43.60%, oxidation 19.12%, elaidin test, Bellier aldehyde test, Halphen CS_2 test, Villavecchia and Fabris test, Blarez test and Bellier test (arachidic acid), all negative. Halphen Br test, immediate ppt.; resorcinol test, oil deep violet and acid yellow. Total acids have n_D^{20} 1.4727, I no. 203.8, neutralization value 198.2. The oil extd. with petroleum ether possesses practically the same consts., the only marked differences being an increase in the proportion of the free acids and a greater proportion of unsaponifiable matter. This oil is strongly drying.

P. THOMASSET

Halphen reaction. J. PIERAERTS AND EMILE SIMAR. *Mat. grasses* 20, 8312-6 (1928); cf. C. A. 22, 3546.—From tabulated results obtained in presence of various hydrocarbons, furfural and other substances and on different oils, it is concluded that: (a) No increase in sensitivity is obtained by dilg. the product under test; (b) pure furfural has no effect on the reaction; (c) pyridine increases the speed and sensitivity of the reaction; (d) contrary to Gastaldi, very pure amyl alc. does not give the same coloration with Halphen reaction.

P. THOMASSET

Apparatus for reducing the nickel catalyst. E. VOLPSON. *Masloboino Zhirovoe Delo (Oil & Fat Ind. (Russia))* 1928, No. 2, 8-11.—For his app. for the reduction of the Ni catalyst V. claims the advantages of mechanical charge and discharge, abs. tightness during the complete operation, a very good contact between the H_2 and the catalyst, the possibility of drawing samples during the process without cooling the apparatus, and the possibility of discharging the catalyst when hot.

A. A. BOEHTLINGK

The physicochemical evaluation of the "Physiol" soaps. A. BEYRODT AND L. ZAKARIAS. Prague. *Seifenforsch.* 1, 1-10(1928).—Some data are given on H_2O retention and lathering power of soaps which contain an addition of "Physiol" (a gum of the tragacanth class).

P. ESCHER

The bleaching of soaps. E. W. ALBRECHT. *Seifensieder-Ztg.* 55, 359(1928).—It is more economical to bleach the original fats than the finished soaps.

P. ESCHER

The p_H and detergent value of soap solutions. CHAS. E. MULLIN. Clemson College Textile School. *Textile Recorder* 46, No. 543, 65-6; No. 544, 59-61(1928).—The theory of detergents and the effect of p_H upon the cleansing action of detergent solns. are discussed. The surface tension of detergent solns. decreases with increasing p_H but the emulsifying action of the soln. has an optimum point, beyond which the emulsion of oil or dust is not as stable as at the optimum. There is no relation between the p_H of an alk. soap soln. and the remaining detergent power of the soln. These points are discussed in connection with wool scouring.

CHAS. E. MULLIN

The influence of certain narcotics on the equilibrium between soaps and alkalies and alkaline earths. M. CHIO. *Boll. soc. ital. biol. sper.* 3, 370-1(1928).— Et_2O , $EtOH$, $CHCl_3$ and chloral hydrate increase markedly the assocn. of Ca oleate mols.

PETER MASUCCI

The influence of certain narcotics on the dissociation of sodium oleate. R. SANNA-RANDACCIO. *Boll. soc. ital. biol. sper.* 3, 363-6(1928).—The effect of $CHCl_3$, $EtOH$, Et_2O and chloral hydrate on the dissocn. of sodium oleate was investigated. A 0.5% soln. of the soap was used. The turbidity formed on mixing the soap with the various reagents was detd. by means of a nephelometer and this turbidity was taken as a measure of the dissocn. or hydrolysis. The 4 substances acted as follows: (a) and (b) with and without the addn. of HCl all the reagents seem to accelerate the hydrolysis of Na oleate; (c) in the presence of CO_2 the 4 substances inhibit hydrolysis; (d) in the presence of $NaCl$, $EtOH$ and Et_2O inhibit hydrolysis, while $CHCl_3$ and chloral hydrate accelerate hydrolysis. However, if the soap soln. is dild. with distd. H_2O , $EtOH$ and Et_2O increase the turbidity. This increase is attributed to the assocn. of soap mols., which decreases dispersion, and not to increased hydrolysis. Similarly, in (a) and (b) the apparent increase of hydrolysis is due to the assocn. of the complex soap-fatty acid mol.

PETER MASUCCI

The precipitating action of chloroform on soaps. M. CHIO AND S. PORCU. *Boll. soc. ital. biol. sper.* 3, 367-9(1928).— $CHCl_3$ does not modify the dispersion of highly hydrolyzed soaps; it does decrease the dispersion of slightly hydrolyzed soaps with the formation of a coagulum. The coagulum is dehydrated by $CHCl_3$.

P. M.

for oils (Brit. pat. 286,753) 1. Heat-exchange apparatus suitable for use with oil (U. S. pat. 1,890,108) 1.

Aralkylated fats and aliphatic acids. I. G. FARBENIND. A.-G. Brit. 286,796, Dec. 13, 1926. Oleic acid or fats or other aliphatic acids are aralkylated by treating the materials, of unsatd. character, with benzyl chloride or other aralkyl halide, preferably in the presence of a catalyst such as Fe powder, ZnCl_2 or AlCl_3 . The products, when sulfonated, yield substances suitable for use as *wetting agents in dyeing* and as *substitutes for Turkey red oil*. A temp. of 150° is suitable for the aralkylation.

Extracting fats from waste liquors. CARL VAN OVERSTRAETEN. Fr. 638,739, Aug. 2, 1927. Fatty substances are recovered from the residues obtained in purifying wash waters such as wool by washing the residues in tepid water and boiling to dryness in the presence of Na_2CO_3 and afterwards heating under pressure to allow the impurities to ppt. to the bottom, then decanting and again boiling in water.

Fatty substances soluble in water. RAYMOND VIDAL. Fr. 637,274, Nov. 5, 1926. Fatty acids, such as oleic acid, acids from copra oil, peanut oil, etc., animal fats and oils, or mixts. of fatty acids and mineral oils, such as mazout, vaseline oils or paraffins, are made sol. in water by a treatment with alkali hypochlorites alone. The products find application in the *textile industry* for purifying raw fibers and for *cleaning paint, varnishes, etc.*

Bleaching fatty substances. I. G. FARBENIND. A.-G. Brit. 286,794, Dec. 11, 1926. Oils or fatty substances of vegetable or animal origin are bleached by the conjoint use of inorg. oxidizing agents such as permanganate, chlorate or hypochlorite, and inorg. substances acting by reduction or adsorption such as nascent H or bleaching earths. The material may be preliminarily treated with concd. H_2SO_4 or made into an emulsion with soap and during the bleaching an amt. of acid at least equiv. to the alkali in the oxidizing agent used is added. After bleaching, the material may be converted into soap and bleached with hypochlorite. Several examples are given.

Sulfonating fatty substances, etc. CHEMISCHE FABRIK MILCH A.-G. (to Oranienburger Chemische Fabrik A.-G.). Brit. 288,126, April 1, 1927. Mixts. of fatty substances (such as castor oil or wool olein) with mineral oils, lactones, alcs., ketones, aliphatic or aromatic acids, hydroxy acids, keto acids, acid anhydrides or acid chlorides are sulfonated by use of strong sulfonating agents such as chlorosulfonic acid to obtain products which may be used as emulsifying agents, wetting or fatting agents or in cleaning or dyeing paper, textile fabrics, leather, etc., or bleaching, mercerizing, carbonizing or finishing operations. Cf. C. A. 22, 2284.

Sulfonating aliphatic acids, etc. I. G. FARBENIND. A.-G. Brit. 288,127, April 1, 1927. Castor oil or other unsatd. aliphatic acid material or anhydrides or esters of unsatd. aliphatic acids are sulfonated by use of a mixt. of a low aliphatic acid or its anhydride (such as glacial HOAc or Ac_2O) and fuming sulfuric acid. The products obtained may be used like Turkey red oil.

Treating oils and fats. METALLBANK UND METALLURGISCHE GESELLSCHAFT AKTIENGESELLSCHAFT. Fr. 638,606, Aug. 1, 1927. See Brit. 275,536 (C. A. 22, 2284).

Recovering oil from aqueous emulsions. AMERICAN SHEET AND TIN PLATE CO. Brit. 287,438, Sept. 13, 1926. A heated aq. emulsion such as that of palm oil is agitated with steam and treated with an acid such as H_2SO_4 or other suitable acid or salt to break down the emulsion so that gravity sepn. of the oil may then be effected. An app. is described. Cf. C. A. 22, 4266.

Sulfonated oils, fats or their acids. H. TH. BÖHME A.-G. CHEMISCHE FABRIK. Fr. 637,338, July 8, 1927. Polymerized oils, fats or their acids are sulfonated by H_2SO_4 in the presence of anhyd. acids, their anhydrides, or chlorides, such as AcOH , Ac_2O or AcCl . An example is given of the sulfonation of "Floricin" (obtained by heating dry castor oil). Products with better properties than Turkey red oil are obtained. Cf. C. A. 22, 4265.

Sulfonated oils. CARL DREYFUS. Fr. 637,335, June 24, 1927. Sulfonated oils, contg. 6% or more of H_2SO_4 in org. combination are used in the treating liquids in the *textile industry*, as they are not decompd. in baths having a high content of acid, lye or salts. They can be used alone or along with hydrocarbons, alcs., esters, ketones, or chlorohydrocarbons.

Apparatus for continuous decantation of olive oil. SOCIÉTÉ CÉLESTIN COQ ET CIE. Fr. 638,881, Dec. 24, 1926.

Apparatus for extracting oil or fat from seeds, offal, fish or other vegetable material by use of solvents. J. R. STERLING. Brit. 286,752, Nov. 8, 1926.

Degreasing wool. I. G. FARBENIND. A.-G. Brit. 287,230, Dec. 16, 1926. Cyclo-

hexanone or a homolog is used for decreasing raw wool or other textile materials which may be wet or dry and may have been washed with water to ext. K salts. Cf. C. A. 22, 3789.

Centrifugal apparatus for recovering wax from honey-combs, etc. C. BOESCH. Brit. 287,094, March 14, 1927.

Soaps. I. G. FARBENIND. A.-G. Brit. 287,114, Nov. 9, 1925. Soaps suitable for cleaning textile materials contain "benzine" obtained by destructive hydrogenation of carbonaceous materials or a conversion product of such a "benzine." Other substances such as EtOH, oleic acid and benzene may also be added to soaps such as Marseilles soap.

Jacketed cauldron and soap-mixing apparatus. L. H. NELLES. Brit. 287,198, Nov. 16, 1926.

Soap-molding apparatus with an endless chain of molds. LEWIS A. PALEY. U. S. 1,691,899, Nov. 13.

Detergents. AXEL VIGGO BLOM. Ger. 466,301, Feb. 12, 1924. Alkali soaps and similar substances are treated with ethylene chlorhydrin to increase their adsorptiveness towards org. solvents and to decrease their sensitiveness toward Ca and Mg compds. Thus 40 parts of fatty acid is dissolved in 15 parts of BuOH and neutralized with concd. KOH. After cooling, 33 parts ethylene chlorhydrin is stirred in. The addn. of CCl_4 further increases the fat-dissolving action of the product.

28—SUGAR, STARCH AND GUMS

F. W. ZERBAN

Current problems in sugar plants. FRANT. NOSEK. *Listy Cukrovar.* 47, 37-9 (1928).—A discussion (non-technical). FRANK MARESH

Central Tarlac—greatest of Philippine mills. ANON. *Facts About Sugar* 23, 1112-5, 1121(1928).—This is a detailed qualitative description without engineering details. M. J. PROFFITT

The Indian sugar bowl and agricultural research in connection therewith. T. S. VENKATRAMAN. *Agr. J. India* 23, 166-76(1928).—An address dealing with the Indian sugar industry. K. D. JACOB

Production of refined sugar from gur in India in 1926-27. WYNNE SAYER. *Agr. J. India* 23, 213-6(1928).—In 1926-27, 21 factories in India produced 121,028 tons sugar as compared with 91,499 tons produced by 19 factories in 1925-26. K. D. JACOB

Some suggestions to improve the refining quality of the raw sugar. SEGUNDO D. LABAYEN. *Sugar News* 9, 464-7(1928).—To improve the refining quality of Philippine sugars, which in the 1926-27 season gave poor filtration rate, L. makes the following suggestions based upon his data obtained in Binalbagan Estate: (1) liming the cold mixed juice to 7.6-8.0 pH, (2) use of ample settling-tank capacity, preferably of the continuous type, (3) screening of the clarified juice through 100-150 mesh before sending to evaporators, (4) filtration of the sirup through some cloth (like fiji cloth), (5) making of good B massecuite and (6) using the "combination system" of sugar boiling. V. G. LAVA

Impurities of raw sugar. J. HAMOUS. *Listy Cukrovar.* 47, 90(1928).—H. concludes that in order to obtain the largest grains of sugar with a max. yield, the amt. of sirup must be at a min. This is effected by centrifuging the sugar as dry as possible. FRANK MARESH

Influence of the method of filtration of sugar solutions upon polarization. J. J. WEISS. *Listy Cukrovar.* 47, 49-50(1928).—The commission for standard methods has adopted a filtering app. which permits filtration in covered flasks. Details are lacking. FRANK MARESH

Unknown losses of sugar during saturation. L. O. ŠNAJDMAN. *Nauchnuie Zapiski* 5, 322-8; *Listy Cukrovar. Rozhledy* 47, 3(1928); cf. C. A. 22, 2286.—An aq. soln. of sugar was made alk. with CaO and some CaCl_2 was added. A Na_2CO_3 soln. was added until only a small quantity of free CaCl_2 remained in soln. The cloudy liquid was divided into 2 portions; one was filtered immediately, the second after the pptd. CaCO_3 originally amorphous became cryst. The first filtrate showed a lower alky. and polarization than the second because amorphous CaCO_3 is adsorbed more strongly than the cryst. form, which has a smaller surface, and some adsorbed products return into soln. FRANK MARESH

Losses encountered in diffusion batteries. JOSEF JASKÓLSKI. *Listy Cukrovar.*

47, 104-5(1928).—A description of an automatic device for preventing losses of diffusing liquors. FRANK MARESH

Colloids in their relation to clarification. J. J. SEIP. *Sugar News* 9, 81-6(1928); cf. C. A. 22, 2678.—The presence of colloids increases the viscosity of the soln. and this retards heat diffusion with its consequent effect on the rates of pan boiling and crystn. and on purging and centrifuging. Cane-juice defecation as now practiced, consists, essentially, in eliminating by flocculation about 15-25% of the colloids present. The elimination of colloids may be effected by elec. neutralization, by dehydration (e. g., by the use of strong alc.) or by adsorption (e. g., by use of Norit, Suchar, etc.). The use of the Gilchrist process of coagulating and clarifying sugar juices together with the Gilchrist settler is suggested. No data are given. V. G. LAVA

Elimination of the filter press in the sugar house and the possibility of obtaining granular muds. F. BERGÉ. *Sucr. Belge* 47, 444-51(1928).—B. points out the advantage to be gained by centrifuging juices through cloth. In this way a cake is obtained, the water content of which is 20% compared to the 60% water content of the regular filter press-cake. Thus sugar losses may be reduced. E. A. FIEGER

The danger of inversion in sugar-house products. O. SPENGLER AND F. TÖDT. *Z. Ver. deut. Zuckerind.* 78, 393-405(1928).—A simple method has been worked out for detg. the risk of inversion in all cases occurring in factory practice. The max. possible theoretical loss from inversion may be immediately detd. from temp.- p_H curves. These curves are based on the fact that inversion is influenced in a simple manner only by temp. and p_H . Hitherto, because of the irregular effects of salts, and because of the other inversion phenomena apparently contradictory to the law of mass action, the prevalent belief has been that inversion was a catalytic process which could not be governed by any readily derived law. The practical possibilities of the application of this direct method of detg. the danger of inversion are discussed. E. A. FIEGER

The sulfide stain method for determining small quantities of "volatile sulfur" in sugar. J. M. BRYAN. *Analyst* 53, 589-90(1928).—An app. similar to that used for the Gutzeit test is recommended. The test papers are prepd. by soaking filter paper in 25% neutral $Pb(OAc)_2$ soln. and are kept moist by placing them in a desiccator contg. wet pumice. 25 g. of Zn pellets and 50 cc. of 6 N HCl are used in the test. For the standard stains sat. air-free distd. water with SO_2 , dil. to a convenient strength and add 10 g. of sucrose per 100 cc. of soln. Prep. standards corresponding to 0.005, 0.010, 0.015, 0.020 and 0.025 mg. of SO_2 . W. T. H.

Methods of determining p_H with special reference to the quinhydrone electrode. V. G. LAVA AND A. S. HIZON. *Sugar News* 9, 16-26(1928).—The colorimetric method, the H-electrode method and the quinhydrone electrode method of detg. p_H are compared. Data on crusher juice, clarified juice and solns. of centrifugal sugar and molasses, are given, to show that the quinhydrone electrode can be used for measuring p_H of these solns. especially in the crusher juice and in solns. of molasses, where neither the H-electrode nor the color method will give satisfactory results. In solns. of centrifugal sugar the difference between the p_H detd. by the quinhydrone electrode and that detd. by the H electrode is less than 0.2 up to p_H 9, if care is taken that the quinhydrone reading is made within 2 min. after the quinhydrone powder is placed in the soln. Instead of using the calomel electrode for a half-cell, 0.01 N HCl buffered with 0.09 N KCl is suggested. V. G. L.

Gumming disease (of sugar cane). E. F. S. SHEPHERD. *Rev. agr. Maurice* 5, 173-6(1928).—Amplifying an article by Edwards (C. A. 22, 1491), S. describes in detail the symptoms of this disease and recommends various control measures. Some cane varieties are more resistant than others. Hot-water treatment of seed cane is being tried. F. W. ZERBAN

Leaf scald (of sugar cane). E. F. S. SHEPHERD. *Rev. agr. Maurice* 5, 176-8(1928).—This disease is present in Mauritius. It is similar to gumming disease caused by *B. vascularum*; the differences in the symptoms are described. The same control measures are recommended as for gumming disease (cf. preceding abstr.). F. W. Z.

The quality of milling cane: field trash. W. K. ORTH. *Facts About Sugar* 23, 1097, 1103(1928).—On the basis of direct estimates of the quantity of trash shipped in with cane at the Ewa, Hawaii, factory, 5 graphs are shown indicating an increase of trash with increase of rainfall; and with increase of trash a decrease of milling capacity, an increase of moisture in the bagasse, the ratio of bagasse to cane and sugar loss in the bagasse. It was not found that trash effected the purities deleteriously, but every effort should be made to exclude trash from the cane. M. J. PROFFITT

A summation of the comparative yields from cane variety tests conducted by the Philippine Sugar Association. H. ATHERTON LEE. *Sugar News* 9, 163-9(1928).—L.

compiled the results of variety tests in Negros and in Luzon with and without the use of fertilizers. Out of 14 expts. of 10 replications each in Negros, Badila was found to give better yields than Negros Purple in 8 instances, poorer yields in 3 instances, and results with no significant differences in 3. Out of 3 tests, H-109 was found to outyield Negros Purple in 2 and to be outyielded in 1. Badila is resistant to Fiji disease, mosaic disease and smut; it ratoons better than Negros Purple. From other data L. concludes that Cebu Purple will give greater yields than Pampanga Red and Luzon White, and be a more profitable cane to grow in Central Luzon, although H-109, M-1900 and Badila have some promise of being even more profitable. V. G. LAVA

The growth of beets in 1928. JAROSLAV SOUČEK. *Listy Cukrovar.* 47, 99-104 (1928).—A statistical study giving the yield of sugar beets in Czechoslovakia for 1928 as 61,376,800 kg.; the yield of sugar was 10,698,300 kg. FRANK MARESH

Ecology of sprouting beets with reference to disease. V. STEHLIK AND F. NEUWIRTH. *Listy Cukrovar.* 47, 77-90(1928).—A chapter for a monograph which is being prepd. FRANK MARESH

The protection of plants and culture of beets along the Rhine. F. NEUWIRTH. *Listy Cukrovar.* 47, 39-40(1928).—N. gives a survey of the work carried on by the Inst. of Plant Pathology at Bonn and describes the beet culture in the neighborhood. FRANK MARESH

The effect of removing the tops of sugar beets upon the sugar content. JAROSLAV SOUČEK. *Listy Cukrovar.* 47, 41-9(1928).—A statistical study. Exptl. plots were established throughout Czechoslovakia. About $\frac{1}{2}$ of the tops of each beet were broken off in certain rows during Aug. 15-20, and in others during Sept. 15-20. The remaining rows served as controls. Only the analyses (weights, yields, etc.) of the middle row of each plot of 3 rows are considered. Detailed instructions for collecting representative samples were given. In 1926 removal of the tops in Aug. decreased the yield of beets 17 quintals (q.) per hectare (ha.) and the sugar content 0.20%. The removal of tops in Sept. decreased the yield of beets 13 q. per ha.; the sugar content decreased 0.64%. Early removal of tops decreased the total yield; the later removal affected the sugar content. The results are not considered reliable, for the no. of plots was small, climate abnormal and distribution unrepresentative. In 1927 the control yielded 376 q. per ha. of beets. The Aug. removal of tops decreased the yield of beets 32 q./ha., the yield of tops (at harvest) 65 q./ha., the sugar content 0.38% and the yield of sugar 7.1 q./ha. The removal of tops in Sept. decreased the yield of beets 15 q./ha., tops 93 q./ha., sugar content 0.45%, yield of sugars 4.5 q./ha. The percentage of pressed juices remained the same in all cases. The effect of a late removal of tops is increased as the harvest is delayed. The decrease of sugar is not offset economically by the total growth of tops. FRANK MARESH

Increasing the capacity of the evaporator station in the beet sugar factory. M. MAXANT. *Sucr. Belge* 47, 382-91, 405-13(1928).—The Prache and Bouillon pre-evaporator-autocondenser is described in detail. The app. functions on live steam. It is autocondensing since no excess vapors but only incondensable gases and condensate water leave the app.; in this way all the energy of the live steam is utilized. The equipment facilitates the work of the evaporators by removing the incondensable gases to a large extent as well as by pptn. of various materials from the juice, this being done without fouling the app. The app. can handle 5-10-15% of the juice going to the effects, giving 3 lb. water evapn. per lb. steam in single effect. Examples are given showing where economies in juice heating and evapn. may be effected by means of the Thermo-Compressor. This is a basic part of the pre-evaporator. The vapors produced by evapn. of the juice are partly drawn off by a live-steam nozzle which forces them back into the steam chest of the pre-evaporator. This is the principle of the Thermo-Compressor. Another part of the vapors from the pre-evaporator is used for preliminary juice heating. An inclined evaporator is also described which serves to utilize part of the vapors from the vacuum pans. This evaporator resembles a juice heater, heated by vapors robbed from the pans. The juice section of the heater is in full connection with the vapor pipe going to the condenser. Full details of the principle and practice are given. E. A. FIEGER

Determination of lime salts in the beet sugar factory. O. SPENGLER AND C. BRENDL. *Z. Ver. deut. Zuckerind.* 78, 175-89(1928).—Full details of methods of prepn. of soap solns. are reviewed. Manipulation and procedure for all factory cases are described. Exptl. proof is given to show that equiv. quantities of $\text{BaCl}_2 \cdot 2\text{H}_2\text{O}$ and CaO require the same amt. of soap soln. The soln. is so standardized that for 0.04358 g. $\text{BaCl}_2 \cdot 2\text{H}_2\text{O}$, 10 cc. of soap soln. are required. As the cc. of soap soln. are not exactly proportional to the lime content a table of the relation between cc. of soap

soln. and lime content is given. The table checks the table of Faisst and Knauss (*Chem. Pharm. Centralbl.* 1852:513). Mg salts do not use the same amt. of soap soln. as the equiv. amt. of Ca salts. A mixt. of Ca and Mg salts requires very little more soap soln. than that required for the Ca salts alone. Again Mg may be changed by the $\text{Ca}(\text{OH})_2$ to the insol. $\text{Mg}(\text{OH})_2$ and so removed from the reaction. Where high-Mg lime is used for liming, the soap test gives lime contents that are too high. In this case the tedious oxalate method must be used. The oxalate method is reviewed and may be used for checking. High-Mg limes will be discussed later. E. A. FIEGER

Answer to the remarks of J. J. Willaman concerning our article: "Degree of sweetness of fructose as compared with sucrose." O. SPENGLER AND A. TRÄGEL. *Z. Ver. deut. Zucker-Ind.* 1927, 367-9; *Chem. Zentr.* 1927, II, 988; cf. *C. A.* 22, 1784.—The expts. of S. and T. deal with the relative sweetness of fructose and sucrose, while W. always (with 1 exception) refers to the relative sweetness of fructose and glucose. Thus a discussion on the degree of sweetness of fructose (108 according to S. and T., 173 according to W.) is superfluous. As far as W.'s criticism of the method used by S. and T. is concerned, S. and T. discuss it and decline it. G. SCHWOCH

Analysis of starch sugar degradation products by selective fermentation. THOMAS McLACHLAN. *Analyst* 53, 583 9(1928).—To control the manuf. of products such as malt extract or glucose, the following, fairly accurate method is suggested. Take 8 tubes, each contg. 50 cc. of 10% soln. of the substance under examn. and sterilize in the steam sterilizer for 3 successive days, heating rapidly on the first day to destroy any diastase. Inoculate 2 tubes with *S. exiguus*, 2 with *S. froberg*, 2 with *S. saaz* and keep 2 blank. Incubate the whole set at 26° for 14 days. On the 4-5th day, rotate the tubes to distribute the yeast and to introduce a fresh air supply. After the fermentation, empty out one tube from each set into a sep. 150-cc. beaker, rinse it out carefully and evap. to about 15 cc. Cool, make up to 50 cc. and det. the d. *Dextrose and levulose*. The difference in the total solids of the blank and the soln. fermented by *S. exiguus* represents the dextrose and levulose. These can be detd. approx. if desired, by the diff. in optical rotation. *Maltose*.—The difference in the total solids between *S. exiguus* and *S. froberg* is maltose. *Other fermentable sugars*.—The difference in the total solids of the *S. froberg* and *S. saaz* solns. indicates other fermentable sugars. *Dextrins*.—The optical rotation is detd. and calcd. for the 100% product. Then dextrins = $[\alpha]_D \times 100, 180\%$. W. T. H.

The newer knowledge of pressure digesters. V. SÁVAZSKÝ. *Listy Cukrovar.* 47, 115-20(1928).—A discussion. FRANK MARESH

Formulas for computing the liquid contents of horizontal tanks. R. FREUND. *Listy Cukrovar.* 47, 50-2(1928).—Derivations, formulas and tables for use in the plant are given. FRANK MARESH

Fire extinguishers in sugar refineries. JOZEF KADLEC. *Listy Cukrovar* 47, 120-2(1928).—A description of the equipment "Minimax"; it contains Na_2CO_3 and HCl . FRANK MARESH

Boilers, furnaces and control equipment. GEORGE W. CONNOR. *Facts About Sugar* 23, 1046-50(1928).—C. describes two recent installations of boiler plants for cane sugar factories, one with regenerative air preheaters, and cites recent trends in the automatic control of firing with oil burners and bagasse burners, the increasing use of tuyères placed in the side and back walls of the furnaces, flat suspended furnace arches and certain operating devices. M. J. PROFFITT

A laboratory apparatus with a conductometric indicator for studying saturation and filtration (STANĚK, SANDERA) 1. An interpretation of the results of fertilizer experiments carried out in N. W. Dec. Negros (PENDLETON, LAVA) 15. Fertilizer experiments at Binalbagan (LONTOK) 15. Increasing sugar yields per hectare by application of $(\text{NH}_4)_2\text{SO}_4$ (ROXAS) 15. Systems of soil survey (KONINGSBERGER, WILLCOX) 15. The stimulation and immunization of beet seeds against blight (STEHLIK, NEUWIRTH) 15. Cellulose from sugar cane bagasse (Brit. pat. 287,516) 23. Artificial silk from the cellulose of sugar-cane bagasse (Brit. pat. 287,461) 23.

Sugar. RAFFINERIE TIRLEMONTAISE SOC. ANON. Brit. 286,599, March 5, 1927. Centrifugal sepn. of mother liquor from sugar crystals is effected so as to avoid the circulating of extraneous air through the crystal layer; a centrifuge drum with an air-tight cover may be used. Cf. *C. A.* 22, 3005.

Corn sugar. CHARLES N. BROWN and HUBERT E. NELSON. U. S. 1,690,350, Nov. 6. In producing glucose and corn sugar from corn grits, which have been prepd

by cracking, degerminating and dehulling, the grits are treated with a dil. inorg. acid (such as 0.03% HCl soln.) of a concn. just sufficient to solubilize basic salts contained in the grits and are washed prior to further treatment.

Purifying sugar. CORN PRODUCTS REFINING COMPANY. Fr. 638,958, Aug. 4, 1927. Fatty materials, proteins, cellulose and metal compds. are eliminated from glucose solns. obtained by the conversion of starch by passing an elec. current through the soln. in which a diaphragm such as porous porcelain is placed, which is permeable to the impurities but not to the glucose.

Refining sugar. C. G. PERRÉ. Brit. 287,590, Oct. 18, 1926. The viscosity of massecuite is reduced by heating immediately prior to its delivery to centrifuges or by the addn. of hot molasses while passing to the centrifuges so that it may be charged while the app. is in rotation. An app. is described.

Purifying sugar juice. AKTIEBOLAGET SEPARATOR. Brit. 287,526, March 23, 1927. Sugar juice is settled after liming and then centrifuged to remove suspended impurities. A centrifuge is used which has a non-perforated bowl from which the deposits are periodically removed while the centrifuge is at rest.

Purifying sugar juices. J. POHLMANN and R. F. RASSERS. Brit. 287,119, March 15, 1927. Albuminous substances are removed from an acid or neutral saccharine juice by addn. of tannin, tannin compds. or derivs., MeOH, picric acid, phosphotungstic acid or phosphomolybdic acid. The treatment may be effected at normal temp. and Ca(OH)₂ is added to remove excess tannin. A second crystn. may be obtained or the molasses may be concd. for the production of treacle.

Apparatus (with an endless belt traveling in a fluid-tight conduit) for counter-current extraction of beet slices, etc. SOC. ANON. DES ÉTABLISSEMENTS A. OLIER. Brit. 286,668, March 8, 1927.

Recovering nitrogen and acetone, etc., from molasses or vinasses. NOUVELLES INDUSTRIES CHIMIQUES SOC. ANON. Brit. 287,829, June 23, 1927. In the process of recovering N and acetone from molasses or vinasses as described in Brit. 277,932 (cf. J. 22, 2636), an alk. earth carbonate such as CaCO₃ or residues from a previous distn. or a hygroscopic substance such as sawdust is added to the mixt. of molasses or the like and lime to be distd.

Crystallization of glucose. CORN PRODUCTS REFINING COMPANY. Fr. 638,955, Aug. 4, 1927. Pure dextrose crystals are obtained from a soln. contg. isomers of glucose of high purity by maintaining a state of supersatn. and such a temp. that only 1 isomer crystallizes to the exclusion of the others. Thus, under vacuum at a temp. of 49–55° the anhyd. α -glucose is obtained.

Glucose from starch. CORN PRODUCTS REFINING CO. Fr. 638,956, Aug. 4, 1927. Glucose is prepd. from starch in successive stages; the second stage being carried out in the absence of substances forming polysaccharides. Between the first and second stages, the liquor is given 2 successive neutralizing and filtering treatments. The vessels used have walls inert to the hydrolyzing acid. Fr. 638,957 describes the conversion of starch into glucose in the absence of catalysts which tend to polymerize the glucose by converting the starch in the presence of absorbents such as animal or vegetable charcoal, fuller's earth or silica gel and using vessels chemically inert to the hydrolyzing acid.

Starch and glucose. CHARLES R. BROWN and HUBERT E. NELSON. U. S. 1,690,360, Nov. 6. In order to remove Fe salts from starchy materials such as in starch or glucose manuf., they are treated with a suitable dil. acid such as dil. HCl and the solubilized Fe salts and acid are washed out.

29—LEATHER AND GLUE

ALLEN ROGERS

Materials for protecting and preserving leather. EWALD ALTMANN. *Chem.-tech.* Ind. 29, 305–6, 321–2(1928).—A discussion of waterproofing materials for work or sport shoes. For the soles, mixts. of drying oils with waxes and resins are employed. For the uppers, mixts. of mineral oil with non-drying animal or vegetable oils and limited amts. of waxes are recommended. Numerous recipes are given. H. B. MERRILL

Determination and nature of water-solubles in leather tanned with wattle-bark extract. R. O. PAGE. Woolston Tanneries, Christchurch, New Zealand. *J. Am. Leather Chem. Assoc.* 23, 495–523(1928).—Leather from the butt of a cowhide tanned 6 weeks in wattle-bark ext. was very lightly oiled, dried and prepd. for analysis by shav-

ing. From the H_2O content of leather on removal from the last liquor and concn. of sol. matter in that liquor the % of sol. matter occluded by the leather was calcd. Ten-g. samples of leather were extd. with variable amts. of distd. H_2O flowing at 600 cc. per hr. in Wilson-Kern extractors. H_2O -sol. matter was detd. (1) by weighing the dried leather after extn., and (2) by analyzing the dried leather to get the ratio between hide substance and combined vegetable materials. Both methods gave the same % H_2O -sol. matter up to extn. with 25 l. H_2O . On further extn., % H_2O -sol. matter as detd. by the wt. of residue continued to increase up to extn. with 150 l., while the % H_2O -sol. matter as detd. by analysis of the residue did not increase, indicating that the ratio of hide substance to tannin became const. after extn. with 25 l. but that the residue was slowly hydrolyzed with the loss of both tannin and hide substance. To follow the extn. process in greater detail, 10-g. samples of leather were treated repeatedly with 100 cc. of H_2O or other soln. at 25° and at 50° until equil. between leather and liquor was established (8-24 hrs.). The liquor was filtered and sol. matter detd. in an aliquot. Fresh soln. was added to bring the vol. up to 100 cc. This process was repeated 65 times with H_2O at 25°, 54 times with H_2O at 50°, and 48 times with 0.001 N H_2SO_4 at 25°. The no. g. sol. matter in each ext. was plotted against the no. of extns. The resulting curves all consisted of 4 parts: (1) a smooth curve asymptotic to the vertical axis and to a line parallel to the horizontal axis, (extns. 1 to 10 with H_2O at 25°); (2) a short horizontal portion (extns. 11-20), representing the removal of material at a const. rate of about 0.04 g. per extn.; (3) a second horizontal portion following a sharp break, representing uniform extn. at a slower rate (about 0.025 g. per extn.), (extns. 20-39); and (4) a final horizontal portion following another break, representing uniform extn. at a still slower rate (about 0.012 g. per extn.), (extn. 39 till the expt. was discontinued). With H_2O at 50° the breaks were reached sooner. The principal effect of raising the temp. or varying the p_H value of the extn. medium is to change the shape of the curve before the first break is reached. The total amt. of material extd. up to the second break agrees very well with the amt. extd. by continuous washing with 25 l. H_2O , and is independent of temp. or p_H value within limits. This is the total quantity of material that can be removed without causing the leather to hydrolyze. The exts. obtained after the second break in the curve all contained dissolved hide substance. Conclusion: Total H_2O -sol. matter is best detd. by extn. of 10 g. leather with 25 l. H_2O flowing at a rate of 600 cc. per hr. The total matter extractable by H_2O may be divided into fixed and free. The exts. obtained after the curve first becomes linear all gave the gelatin-salt test for tannin. Analysis of combined exts. 10 to 20 for tannin by A. L. C. A. and by Wilson-Kern methods showed that much of the material dissolved is tannin that can be irreversibly fixed by hide substance. Hide, therefore, combines with a certain amount of tannin to form a compd. that is very resistant to washing, but it can also combine with more tannin to form a compd. that is broken down by washing. Free H_2O -sol. matter is the material deposited in the skin by evapn. of the last tan liquor carried out of the liquor by the skin. The wt. of H_2O -sol. matter found in the first ext. agrees closely with the wt. calcd. from the vol. and concn. of the liquor occluded by the skin. This was confirmed with several leathers tanned in final liquors of varying concn. Conclusion.—Det. free H_2O -sol. matter by digesting 10 g. leather with 100 cc. H_2O for 24 hrs. Det. sol. matter in an aliquot of the filtered soln. and calc. the quantity of material dissolved in the whole soln., including H_2O in the leather when weighed for analysis. Take the difference between total and free H_2O -sol. matter as combined H_2O -sol. matter. The effect of tanning conditions on % tannin, % combined H_2O -sol. matter and % free H_2O -sol. matter was studied. Increasing the concn. of wattle liquor from 20 to 150 g. tannin per l. in the last liquor increased the free H_2O -sol. matter, and had no effect on fixed tans or combined H_2O -sol. matter. Increasing time of tonnage from 6 weeks to 6 months had no effect on any constituent. Fixed tannin and combined H_2O -sol. matter were uniform throughout the cross section of the skin, but free H_2O -sol. matter was much higher near the surfaces. Pretreatment of skin with $CaCl_2$, $Ca(OH)_2$ and $NaOH$ increases combined H_2O -sol. matter at the expense of fixed tannin. Unhairing with NH_3 instead of $Ca(OH)_2$ increases fixed tannin at the expense of combined H_2O -sol. matter. Pretannage with 37% basic $Cr(OH)SO_4$ increases fixed tannin and decreases combined H_2O -sol. matter. The p_H value of the tan liquor is without effect on either fixed tannin or combined H_2O -sol. matter over the range p_H = 4-8. Decreasing the p_H value below 4 increases both fixed tannin and combined H_2O -sol. matter. Increasing the p_H value above 8 increases fixed tannin but decreases combined H_2O -sol. matter.

H. B. MERRILL

An improved tintometer [for tanning materials]. J. GORDON PARKER. London

Leather Industries Lab., London, Eng. *J. Intern. Soc. Leather Trades Chem.* 12, 417-8(1928).—Attention is called to a modified Lovibond tintometer adapted to the detn. of the color of vegetable tanning materials. Advantages claimed over the old form are saving of time and better agreement between different observers' results. H. B. M.

The tizrah sumach from Morocco. C. D. MELL. *Textile Colorist* 50, 395(1928).—Tizrah, tezera, tisrah, or five-leaved sumach (*Rhus pentaphylla*) is used chiefly for tanning hides, dyeing skins and fabrics and making inks. The roots constitute the best grade and may contain as much as 35% tannin. RUBY K. WORNER

Mordanting and dyeing phenomena (ELÖD, SILVA) 25. A red dye [for leather] from West African Guinea corn (MELL) 25. Emulsification of sulfonated oils (WOODROFFE, CRANE) 27. Modern tannin chemistry (DEKKER) 10. Vulcanization of rubber joined to leather (Fr. pat. 637,487) 30. Treating sulfite cellulose liquor [for use as tanning agent] (Brit. pat. 286,808) 23. Sulfurized derivatives of naphthols [for use in tanning] (U. S. pat. 1,690,641) 10. Composition for filling shoe bottoms (Brit. pat. 287,206) 30. Chromium compounds [for tanning] (Fr. pat. 638,718) 18.

Treating dried hides and skins. HARRY DODGE. U. S. 1,690,969, Nov. 6. Dried hides and skins are treated with a bath formed of CH_2O , KNO_3 , NaHCO_3 and water, in order to prep. them for tanning. Cf. C. A. 22, 2855.

Treating leather to prevent mildew, etc. BRITISH DYESTUFFS CORP., LTD., T. H. FAIRBROTHER and A. RENSHAW. Brit. 287,222, Dec. 14, 1926. A small proportion of an alkali salt of a polyhalogenated phenol such as 2,4,6-trichlorophenol is added to a leather dressing compn.

Tanning. CARL DREYFUS. Fr. 637,441, June 28, 1927. Sulfonated oils or fatty acids contg. more than 6% combined H_2SO_4 are used for tanning and prepg. skins, particularly in chrome tanning, along with org. acids such as H.COOH , AcOH , PrOH , BuOH , lactic acid or oxalic acid.

Tanning. F. G. STIASNY and B. JALOWZER. Brit. 287,221, Dec. 14, 1926. Complex ferri sulfite compds. are used or substances which will form them in the bath or on the hide itself. These compds. may be formed from FeCl_3 , $\text{Fe}_2(\text{SO}_4)_3$ or ferrous salts with subsequent oxidation by reaction with alkali sulfites, bisulfites or metabisulfites or compds. of SO_2 and org. substances such as aldehydes, ketones and acids and their salts, glucose or other carbohydrates. These compds. may be used with other tanning substances such as sulfite cellulose liquors and the hides may be successively treated with the reactive reagents to form the ferri-sulfites in the hide substance itself.

Tanning fish skins. S. STRAMSKY. Brit. 287,981, March 29, 1927. Fish skins such as those from ray fish, after liming, are fastened together in pairs with their flesh side opposed and tanned in this position to avoid curling.

Dyeing leather. BARTHOLOMAËUS VOSSEN (to Grasselli Dyestuff Corp.). U. S. 1,690,518, Nov. 6. Full even brown shades are produced on leather with acid azo dyes formed with 2 end components derived from a diazotizable aromatic amine such as peramic acid and *p*-nitroaniline and middle components, one of which is a non-sulfonated resorcinol or substitution product and the other of which is an aminonaphthol mono- or di-sulfonic acid.

Gelatin. L'ULTRA-FILTRE D. M. S. Fr. 638,871, Dec. 23, 1926. Gelatin from the hydrolysis of N compds. such as ossein is clarified by passing it through an ultra-filtr made of nitrocellulose, denitrated or not, or cellulose acetate or viscose.

Apparatus for obtaining glue or gelatin in solid pellets. C. GREINER. Brit. 287,866, March 28, 1927. Drops of liquid material are allowed to fall onto a cooled impeller conveyor band formed of metal.

Glue. STOCKHOLMS BENJÖLSFABRIKS AKTIEBOLAG. Brit. 287,128, March 16, 1927. Small pieces of glue in a "glutinous" condition are introduced into or sprinkled with a powder to form a coating on them. Cf. C. A. 22, 4870.

30—RUBBER AND ALLIED SUBSTANCES

C. C. DAVIS

Dispersoidological investigation of latex. P. P. VON VEIMARN. *Kolloid-Z.* 46, 23(1928).—See C. A. 22, 4872. E. H.

Investigation on rubber prepared from primary and tertiary latex cream according to the Itermark patent. W. SPOON. *Arch. Rubberkultur* 12, 596-603(1928). (Sum-

marized in English 604.)—The prepn. and drying of crepe from ammoniated primary and tertiary latex cream were investigated. The tertiary cream was obtained by centrifuging the primary cream twice, each time after diln. with water. Samples of crepe were prepd. in Holland from the primary and from the tertiary cream to det. the changes which they might undergo during a sea voyage. Rubber from primary and tertiary cream dried very slowly, while the chem. compn. of the former indicated a low proportion of non-rubber components and the chem. compn. of the latter a still purer rubber. The rate of vulcanization of these rubbers was abnormally slow, especially with tertiary rubber, while the quality after vulcanization was abnormally poor. Centrifuging the primary cream twice purified the rubber to some extent but did not improve the phys. quality. C. C. DAVIS

Investigations on Utermark cream and on rubber prepared therefrom. Comparison with some other rubber types. W. SPOON. *Arch. Rubbercultuur* 12, 576-93(1928). (Summarized in English 594-5.)—*Hevea* latex concd. while fresh by the Utermark method (cf. British pat. 218,635) gave cream which contained 54-5 g. of dry rubber per 100 cc. of cream. Crepe rubber prepd. from fresh cream and from cream preserved with NH_3 was compared with crepe prepd. by ordinary methods from fresh latex and from latex preserved with NH_3 and with crepe from fresh underlatex. Crepe from cream was nearly white; that from underlatex was yellow. Crepe from cream preserved with NH_3 required twice as long to dry as crepe from normal latex preserved with NH_3 (cf. Stevens, *C. A.* 21, 2077). Rubber from cream contains a very low content of serum substances, whereas rubber from underlatex contains a considerable content. The phys. and chem. properties of crepe from underlatex resemble those of rubber prepd. by partial coagulation (cf. de Vries, *C. A.* 11, 2625), and the properties of crepe from cream resemble those of crepe from the residual liquid. Aging tests were carried out by heating at 70° in air, the change in wt. and in acetone ext. being detd. Rubber from cream was inferior in its aging properties to rubber prepd. in the ordinary way, which agrees with similar expts. by Stevens. Cured with S alone, rubber from cream vulcanized more slowly than did rubber prepd. in the ordinary way. Rubber from cream had a smaller capacity for water absorption than ordinary rubber. C. C. DAVIS

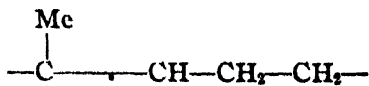
Determination of the specific gravity of rubber mixtures. ST. REINER. *Gummi Ztg.* 43, 135(1928).—A method is recommended which involves cutting out a small sample, measuring its dimensions and wt. and thence calcg. the d. C. C. DAVIS

Determination of the specific gravity of rubber mixtures. L. STOLL. *Gummi Ztg.* 43, 252(1928).—The methods for detg. d. as described by Reiner (cf. preceding abstr.) are impractical. It is best to follow standard methods, such as weighing in air and then in water, or the Mohr procedure. C. C. DAVIS

The absorption of the vapors of liquids by rubber. STEPHAN REINER. *Kautschuk* 4, 210-5(1928).—The possibility that rubber might be used in place of active powders as an absorptive agent for the recovery of volatile solvents led to expts. to det. at what rate and to what extent rubber absorbs such vapors at room temp. The app. and technic devised, which are described and illustrated in detail, allowed the measurement of the absorption of any vapor by rubber at const. temp. The rubber was purified by soln. in C_6H_6 and reprecipn. with EtOH , and was finely divided to present a large surface area, and was then exposed to the vapor under the very carefully controlled conditions described. Data are tabulated for the continuous absorption of C_6H_6 vapor at 25° by rubber over a period of 700 hrs. These results show a rate of absorption which is relatively slow and progressive, no approach to equil. being evident even after 700 hrs. This is shown by the following values drawn from the results, the data giving the hrs. of exposure and the % C_6H_6 absorbed: 1, 0.2; 5, 0.37; 25, 1.07; 50, 1.80; 75, 2.62; 100, 3.24; 200, 5.46; 300, 7.10; 400, 9.30; 500, 12.10; 600, 13.50; 700, 16.10. At the end of 700 hrs., the rubber was sticky and swollen and with all indications that absorption would have continued progressively. C. C. DAVIS

Color reactions of rubber and gutta-percha. F. KIRCHHOFF. *Kautschuk* 4, 190-2(1928).—A crit. review and discussion of a paper by Pauly (cf. *C. A.* 22, 1703), with the inclusion of new data. Like concd. H_2SO_4 , $\text{Cl}_3\text{CCO}_2\text{H}$ isomerizes rubber (cf. *C. A.* 23, 307), and since moreover $\text{Cl}_3\text{CCO}_2\text{H}$ gives characteristic color reactions with other unsatd. cyclic hydrocarbons, the Chugaev-Godoletz and allied reactions probably involve a transitory addn. of $\text{Cl}_3\text{CCOC}_2\text{H}$ (or H_2SO_4) with formation of cyclorubber, which as a result of the colloidal state shows an intense coloration. By dissolving the product in water, the rubber isomer seps. in flocculent form. The appearance of these colors is not, therefore, a proof of the original existence of a ring structure in the rubber hydrocarbon (cf. Pauly, *loc. cit.*), but only of cyclization or rearrangements within the rubber mol. The comparatively great tendency of the rubber hydrocarbon toward

cyclization is accordingly responsible for the color changes. Much more characteristic and significant is the color reaction of rubber dibromide noted by Weber (cf. *Ber.* 33, 791(1900)). Since phenolic ethers do not react with rubber dibromide, it was concluded by W. that the H atom of the OH group, and not the *p*-H of the Ph group, reacts with the Br, but this was disproved by Fisher, Gray and McCollm (cf. *C. A.* 20, 1987). It is therefore probable that hydroxyphenyl derivs. of hydorrubber of the constitution:



are formed (cf. Geiger, *C. A.* 21, 4093), which will also explain their soly. in alkalis. In the absence of catalysts, blue or red-violet fusion mixts. are formed which are stable for several days, but which change color when dissolved in org. solvents. The violet color of fusion mixts. of rubber or gutta-percha dibromide is a typical dispersive color reaction which depends upon the particle size, while the latter depends in turn upon the concn., temp. and occurrence of secondary reactions. Natural impurities in rubber therefore play a part and alter the color obtained with pure reagents. The Weber reaction can be utilized for the detection or identification of rubber or gutta-percha. Ext. a few centigrams of finely divided sample with acetone, swell or dissolve in CCl_4 , brominate in this soln., suspend a few mg. of bromide in 2-3 cc. of CCl_4 , add 1-2 cc. of very concd. PhOH (or the corresponding quantity of cryst. PhOH), warm to eliminate CCl_4 and heat until the PhOH begins to boil. If rubber or gutta-percha is present, the characteristic blue or red-violet color appears. For further identification, dissolve a few drops of the fusion mixt. in an org. solvent (CHCl_3 , Et_2O or Ac_2O) and note the color. About 6 mg. of gutta-percha bromide (from Tjipetir gutta-percha), i. e., about 2 mg. of gutta-percha hydrocarbon, in 10 cc. of CHCl_3 gave a distinct blue-violet color, so even 0.2 mg. of rubber hydrocarbon can be detd. by this method. The reaction is applicable to hot- and cold-vulcanized rubber. With hexahydrophenol and phenetole there is no definite color reaction. The following data give the color of the dibromides, of the PhOH fusion mixts. and of their solns. in CHCl_3 , CCl_4 , Ac_2O and Et_2O , resp.: pure rubber (crepe), yellowish white, blue-violet, blue-violet, blue-violet, reddish yellow, yellow, pure gutta-percha (Tjipetir), white, blue, blue, blue-violet, reddish yellow, yellow, oxidized gutta-percha, yellowish white, carmine, carmine, carmine, reddish yellow, yellow; synthetic rubber II, yellowish white, cherry-red, cherry-red, cherry-red, —, yellow, sulfolycorubber, yellow-brown, carmine, cherry-red, cherry-red, —, yellow; $\text{Cl}(\text{CO}_2\text{H})$ rubber, light yellow, reddish brown, reddish brown, reddish brown, —, yellow; rosin oil, light brown, reddish brown, reddish yellow, reddish yellow, —, brown; rosin, light brown, reddish yellow, reddish yellow, reddish yellow, —, brown. Heated with pyrogallol, rubber dibromide gives a cherry-red color, and with resorcinol a dark orange-red color. Like the PhOH mixts, these fusion mixts. give with alc. alkalis, intense yellow brown solns. (alkali salts of the corresponding hydroxyphenylhydorrubbers). None of these fusion mixts. exhibits such a characteristic color as the PhOH products of rubber, gutta-percha and balata dibromides.

C. C. DAVIS

The direct agglomeration of waste soft rubber and the manufacture of soles.

L. GRAFFE. *Caoutchouc & gutta-percha* 25, 14186-7(1928).—As ordinarily encountered, the tendency of fresh surfaces of unvulcanized rubber to adhere and the lack of such tendency in vulcanized rubber depends upon the temp. and pressure, vulcanization merely changing the limits between which adhesion may be obtained. It is possible by the use of sufficiently high pressures and suitable elevated temps. to bind finely divided vulcanized waste rubber together into a compact mass, and thus obtain useful products directly, such as soles (cf. French patents 338,945(1903); 361,300(1905); English patents 12,454(1906); 28,267(1907)). The process may be made continuous, the ground material passing to heated hydraulic presses. Soling made in this way has shown tensile strengths of 0.35-0.40 kg. per sq. mm. and elongations of 150-250%, with good resistance to abrasion.

C. C. DAVIS

The resistance of rubber to compression. RAFFAELE ARIANO. *Nuovo Cimento*, [N. S. V.] 3, 77-107(1928); cf. *C. A.* 20, 3362; 22, 2081.—A. has explored mathematically the compression curves of rubber of different degrees of vulcanization, and the relation

between variation in vol. and the Joule effect and Poisson's coeff. The Poisson coeff. for stretching is never greater than 0.5, but for compression varies from 0.5 to infinity. The expression for work of deformation has a logarithmic form. L. T. FAIRHALL

Jelutong. C. D. V. GEORGI. *Malayan Agr. J.* 16, 204-11(1928).—There are several reasons which may account for the tendency of jelutong from certain sources to oxidize to a brittle resin (cf. C. A. 22, 2078), among which are contamination with harmful metallic salts or alkalies. Expts. were therefore undertaken to det. whether the addn. of salts to jelutong latex would result in oxidation and resinification. FeSO_4 , FeCl_3 , CuSO_4 , MnSO_4 , and MnCl_2 were added in sep. expts. to latex and the latter was then coagulated with AcOH . In control tests, latex was coagulated without the addn. of a salt. The coagula were then treated in the usual way and examd. after 6 months. Fe and Cu salts induced oxidation, whereas Mn salts only favored the growth of molds. With 0.01-0.02 g. of Fe per 100 cc. of latex, the jelutong oxidized considerably during 3 months of storage. Mn compds. have consequently a far different effect on jelutong than their effect on rubber. In further expts. fresh coagulum was extd. with boiling water, was then soaked in 1% aq. FeSO_4 , FeCl_3 , CuSO_4 , $\text{Cu}(\text{OAc})_2$, MnSO_4 , MnCl_2 , NaOH and KOH and finally was pressed into blocks, dried and stored for 6 months. Under these conditions the metallic compds. had little or no effect. Jelutong latex from Kedah differs in compn. from latex from the local forest reserves of Malay, expts. with the former showing no tendency to oxidize whether or not the jelutong had been extd. with boiling water, and whether or not it had been coagulated with AcOH , HCO_2H , H_2SO_4 , K alum or Na_2SiF_6 . Addn. of FeCl_3 to the latex, however, resulted in rapid oxidation. Addn. of NaCl (0.1 g. per 100 cc. of latex) had no influence on the aging. Kedah latex coagulated with alc. gave a product with no tendency to oxidize, but when the jelutong was creped and then blocked, oxidation ensued. C. C. DAVIS

The valuation of jelutong. C. D. V. GEORGI. *Malayan Agr. J.* 16, 220-33(1928); cf. preceding abstr.—Definite standards should be established for the manner of sampling, examn. and testing jelutong. Present methods for detg. the moisture content are unsatisfactory, since the water present in a block is unevenly distributed. A crit. survey of present methods of detg. water, with expts. on the development of a better method, shows that good results can be obtained by weighing the whole block, cutting into pieces, creping the latter, drying the crepes superficially, weighing, removing a part of each sample, repeating the process of creping, drying and removing a proportionate part, creping finely, drying for 10 hrs. at 40° , cooling, weighing, removing an aliquot part and drying to const. wt. Jelutong has a tendency to gain weight when heated more than 6 hrs. at 100° . It darkens considerably, acquires an odor suggesting decompn., and probably both absorption of O and decompn. take place simultaneously, the former more rapidly than the latter. Data on moisture detns. of jelutong from various sources are given. C. C. DAVIS

Factors in the evaluation of vulcanized rubber mixtures. WERNER ESCH. *Kautschuk* 4, 215-22(1928).—A general discussion dealing with modern methods of compounding, with the object of showing the phys. quality obtained with different types of rubber mixts. The argument is supported by quant. data on the phys. quality obtained with various formulas, phys. tests before and after aging being given to show that it is impracticable to judge the phys. quality of rubber mixts. by the content of rubber and other ingredients. C. C. DAVIS

Is vulcanization a chemical phenomenon? PAUL BARY. *Rev. gén. caoutchouc* 5, No. 45, 3-7(1928).—A crit. review and discussion of recent work by Bacon (cf. C. A. 22, 3804). The expts. do not disprove the existence of "giant" mols., for the swelling of lyophilic colloids, particularly rubber, involves depolymerization and solvation (cf. Bary, C. A. 21, 670, 1911) with formation of mols. small enough to peptize. No explanation of vulcanization with very small proportions of S in the presence of an ultra-accelerator is offered. Difficulties in explaining the degree of polymerization of raw and of vulcanized rubber and the continuity in the variation of the phys. properties of compds. of the compn. $(\text{C}_6\text{H}_8)_n$ and $(\text{C}_6\text{H}_8)_n\text{S}$ are removed by assuming that raw rubber is a complex system of mols. of various degrees of polymerization (cf. Bary, C. A. 21, 670) and that the coeff. of polymerization n is only a mean value. Two types of polymers may be present, α and β , with widely different n values and transformable into each other by changes of temp., elongation, soln., light, etc. Since the higher the temp. the lower the mean degree of polymerization, vulcanization at low temps. requires less S than vulcanization at higher temps., e. g., $140-5^\circ$. Satn. of the available double bonds at vulcanizing temps. does not assure the formation of a rubber resistant to heat or to repeated mech. work, and if the temp. is raised above that of vulcanization, renewed depolymerization occurs and the rubber is again undercured. The

expts. of Bacon do not take into account the more recent theories involving colloidal properties, though there is no evidence offered which is at variance with any of the latter.

C. C. DAVIS

Specific gravity of various kinds of carbon black (ESCH) 18. A new electrical instrument for marking various objects, notably of rubber, and its application to vulcanization (GRAND) 1. Spraying of rubber [trees] (ASHPLANT) 15. The effect of heat on cotton. Initial changes in tensile strength of unproofed fabric (TILTMAN, PORRITT) 25. Principles of patent law involved in the Weiss patent litigation (DELLER) 13. Dental plate of rubber coated with metal (U. S. pat. 1,691,755) 18. Bolter for C black or other pulverulent materials (U. S. pat. 1,691,572) 18. Unsaturated aliphatic hydrocarbons [for use in the production of rubber] (Fr. pat. 637,410) 10. Modifying the physical properties of "isocolloids" [use as rubber substitutes] (Brit. pat. 287,943) 18.

Treating latex. WM. B. WESCOTT (to Rubber Latex Research Corp.). U. S. 1,690,150, Nov. 6. A reaction is effected between ZnO and hemoglobin in soln. in latex to obtain a material which may be subsequently coagulated for various purposes.

Rubber compositions. L. B. SEBRELL (to Goodyear Tire & Rubber Co.). Brit. 287,445, March 19, 1927. Reaction products of crotonaldehyde and amines such as toluidines, xylydines or naphthylamines are used as "antiagers" for rubber.

Rubber composition for sealing containers, etc. ARTHUR BIDDLE (to United Products Corp. of America). U. S. 1,691,460, Nov. 13. A compn. of adhesive properties comprises an aq. dispersion of chicle, a hydrophilic colloid such as casein, an oil solvent for the chicle such as linseed oil, rubber in dispersed phase and an alkali such as NH₃ and borax.

Composition of rubber and fibers. THE DUNLOP RUBBER CO., LTD. Fr. 637,211, July 7, 1927. Objects are made by molding and vulcanizing a material contg. 75% or more of waste tires and tubes, or other waste from the manuf. of tires, and if desired, filling materials. In an example, 29 parts of waste auto covers ground small, 28 of cloth scraps or waste cord, 28 of old rubber tires, 10 of S, 2 of mineral oil, 2 of brown substitution product, and 1 of stearic acid are mixed and vulcanized under pressure.

Deposition of rubber. WM. A. WILLIAMS. Fr. 638,630, June 22, 1927. In the electrophoretic deposition of rubber an exterior source of current is dispensed with by adding to the latex, vulcanized or not, an electrolyte such as NH₄Cl which acts as an auto-excitant, and connecting the electrodes of Zn and C directly outside the electrolyte. If the latex of commerce is used its alky. is first reduced.

Forming rubber tubes from solutions or dispersions. DUNLOP RUBBER CO., LTD., D. F. TWISS AND E. A. MURPHY. Brit. 287,592, Oct. 21, 1926. Mech. features.

Forming tires in metal molds. WALLACE H. CAMPBELL (to Goodyear Tire and Rubber Co.). U. S. 1,691,756, Nov. 13. A tire is supported in a metallic mold blank in spaced relation to the blank, the intervening space is packed with a casein compn. and the materials are subjected to heat and pressure to harden the compn. and form a tread mold for tire manuf.

Molded rubber articles formed by dipping. DUNLOP RUBBER CO., LTD., G. W. TROUBRIDGE AND E. A. MURPHY. Brit. 287,946, Oct. 20, 1926. The mold is treated, on the side which is to take the deposit, with materials which facilitate the agglomeration of the rubber from latex or other aq. dispersions, e. g., with CaCl₂, with or without fillers, S, accelerators, etc. The pressure on the inside of the mold may be reduced or that on the outside increased, or the mold may be partially glazed so that a thinner deposit is formed on the glazed than on the unglazed portions.

Utilizing waste rubber for belting, etc. I. BONTEMS. Brit. 286,652, March 7, 1927. Articles such as driving, conveyor or elevator belts are made from old tire casings (from which the beads or flanges are removed) which are partly devulcanized and then revulcanized in stretched-out position.

Composition for filling shoe bottoms. H. BROOMFIELD AND SHOE INVENTIONS, LTD. Brit. 287,206, Dec. 7, 1926. Various materials are used together, of which an example comprises ground vulcanized rubber 56, leather or cork dust 16, cotton, leather or wool fiber 2, a soln. of bitumen in light hydrocarbon with or without collodion 24, raw rubber soln. 48, S 2 and accelerator 1 part.

Molding ebonite. A. FRASER AND RISSIK, FRASER & CO., LTD. Brit. 286,915, Nov. 2, 1926. In subjecting ebonite dust to pressure and heat, molds are used, the inner surfaces of which are composed of materials such as Sn, brass, duralumin or other Al alloy, rustless steel contg. no Ni or an alloy such as described in Brit. 250,721 (C. A.

21, 1247), to which the ebonite dust does not stick and with which it does not react. Cf. *C. A.* 22, 2082.

Molded ebonite articles. HAROLD GRAY (to B. F. Goodrich Co.). U. S. 1,691,347, Nov. 13. Rubber is mixed with a vulcanizing agent such as S and accelerator and with sufficient clay, whiting, C or other suitable pigment to stiffen the compn. after momentary vulcanization, the material is partially vulcanized in a mold, then removed from the mold and subjected to further vulcanization.

Vulcanization of rubber joined to leather. LÉON B. CONANT. Fr. 637,487, July 12, 1927. See *Brit.* 275,194 (*C. A.* 22, 2292).

Vulcanized rubber. BRITISH DYESTUFFS CORP., LTD., CECIL J. T. CRONSHAW and WM. J. S. NAUNTON. Fr. 637,849, July 18, 1927. A material giving good aging properties to rubber is produced by condensing equal parts of α - and β -naphthylamine with AcH in the presence of an acid. An example of a good aging rubber is 45 parts smoked sheets, 30 floating reclaim, 3 mineral rubber, 10 ZnO, 10 gas black, 2 S, 0.3 diphenylguanidine, and 1.2 of the above described compd., vulcanized for 45 min. at 141°.

CHEMICAL ABSTRACTS

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1—APPARATUS AND PLANT EQUIPMENT

W. L. BADGER

A new microburet. ERIK M. P. WIDMARK AND SÖREN L. ÖRSKOV. *Med.-Chem. Inst., Lund. Biochem. Z.* 201, 15-21(1928).—Description of a buret graduated in cu. mm. S. MORGULIS

A new attachment for bottles used for the storage of standard solutions. A. G. LIPSCOMB. *Analyst* 53, 645(1928).—The device recommended provides for the escape of air from the container when the temp. rises and prevents contamination by CO₂ and concn. changes. In the rubber stopper is inserted a tube which runs upward into an outer glass jacket. Through the top of this jacket is introduced and sealed to the jacket, a tube which is expanded into 3 bulbs. Air drawn into the stock bottle is made to bubble through the same soln. that is contained in the stock bottle and air from the bottle is made to pass through the soln. in the opposite direction. W. T. H.

A sensitive vacuum-tube voltmeter. CHARLES B. AIKEN. *J. Optical Soc. Am.* 17, 440-50(1928). F. H.

Illuminator for Stammer's colorimeter. V. SÁZAVSKÝ. *Listy Cukrovarnické* 47, 137(1928).—S. describes a simple arrangement which allows the use of a Stammer colorimeter with artificial light at const. intensity and distance. A moving curtain removes gray shadows and permits reliable results. FRANK MARESH

Addition to the paper: A new simple automatic cryostat. A. SIMON WITH O. FISCHER, R. GLAUNER AND L. EHLING. *Tech. Hochschule, Stuttgart. Ber.* 61B, 2173-4(1928).—A new arrangement of the device described previously (cf. *C. A.* 21, 1905) permits a more convenient regulation of the pressure. A. L. HENNE

The separation of solids from liquids. A review of modern plant and appliances. ANON. *Chemistry & Industry* 47, No. 48; *Chem. Eng. Trade Literature Suppl.*, 32 pp. (1928). F. J. C.

A new rapid extrusive type of plastometer. P. M. GIESY AND S. ARZOOMANIAN. *Fifth Colloid Symposium Monograph* 1928, 253-8.—Pressure is produced by Hg in a buret, connected by canvas-lined rubber pressure tubing to a chain of ordinary cast-iron pipe fittings seriated as follows: reducing coupling, nipple, street elbow, cap. The cap is pierced to allow the insertion of a capillary into a rubber stopper, which is held in by the cap. A stopcock and side outlet tee of glass are interposed between the pressure tube and the reducing coupling. If desired, a const.-temp. bath may be used. JEROME ALEXANDER

The falling-sphere viscometer and plasticity measurements. H. E. PHIPPS. *Fifth Colloid Symposium Monograph* 1928, 259-66.—The falling-sphere viscometer may be used as a plastometer, its use being limited to the lower portion of a normal plasticity curve. JEROME ALEXANDER

New hydraulic press. HANS KLEINMANN. *Univ. Berlin. Pharm. Ztg.* 73, 1498-9(1928).—A detailed description is given in connection with an illustration, of a new micropress for small quantities of material. W. O. E.

Temperature regulator for Carius furnace. G. B. HEISIG. *Univ. of Minnesota. J. Am. Chem. Soc.* 50, 3388(1928).—Suggests the use of a thermostat used to control the temp. of ovens on gas stoves. C. J. WEST

A new type of thermostat. V. CUPR. *Masaryk Univ. Z. Elektrochem.* 34, 679-82 (1928).—The thermostat described may be used between wide temp. limits (most advantageously from -40° to +20°) with an accuracy of $\pm 0.02^\circ$, the danger of overheating being eliminated. Its temp. is kept const. by allowing some of the soln. to flow from or into a test tube. The soln. in the test tube is cooled (when used below room temps.) by immersion in a freezing mixt., or heated (for above room temps.) by surrounding with an elec. heating unit. The flow of the soln. is controlled by an elec. interrupting device and a vacuum pump, relays and strong sparking being eliminated.

Gasometric determination of H_2O_2 , nitrogenous compounds and of fermentative CO_2 by means of Paechtner's ponderovolumeter (Luy) 11B.

Scientific Instruments. London: Adam Hilger, Ltd. Reviewed in *Glass Ind.* 9, 223(1928).

Grinder for laboratory use. ETIENNE JOUKOWSKY. Swiss 126,456, May 2, 1927. Constructional details.

Pyrometers. SIEMENS & HALSKE AKT.-GES. (Alfred Schack and Mathias Wenzl, inventors). Ger. 467,953, July 9, 1926. In a pyrometer for measuring the temp. of a flowing gas, the hot junction is surrounded by substances, such as tubes of refractory material, offering a large heating surface to the gas and having high coeffs. of heat transmission.

Recording optical pyrometer. OSWALD H. BLACKWOOD. U. S. 1,692,923, Nov. 27. Wet- and dry-bulb hygrometer. SOC. ANON. DES ETABLISSEMENTS NEU. Brit. 288,604, April 13, 1927. A device suitable for use with humidity-regulating app. comprises a hygrometer the wet bulb of which is moistened with an aq. soln. having a vapor tension that is a constant determined fraction of that of pure water at all temps. Solns. of glycerol, NaCl, $NaNO_3$, and $CaCl_2$ are suitable. Various structural details are described.

Portable electrical thermometer. JÖRGEN U. A. OHLSEN. Swiss 126,229, Mar. 1, 1927. Constructional details.

Thermometer for measuring temperatures of electrical apparatus. E. D. T. NORRIS and FERRANTI, LTD. Brit. 288,735, Jan. 17, 1927.

Thermometer with dial and pointer. BLAINE H. HARRIS (to Brown & Bigelow). U. S. 1,692,551, Nov. 20. Structural features.

Thermometer stem with inner and outer tubular portions. HARRY Y. NORWOOD (to Taylor Instrument Companies). U. S. 1,692,381, Nov. 20. Structural features.

Temperature regulator. FABRIK ELEKTR. APPARATE FR. SAUTER A.-G. Swiss 126,490, June 14, 1927. Constructional improvements are described in app. of the type in which the linear expansion of an expansible body acts on an elec. contact so constructed that at a predetd. min. or max. temp. a control circuit is completed.

Automatic temperature regulator. WM. DÉRIAZ. Swiss 126,605, April 4, 1927. An elec. device is described.

Temperature-indicating devices for use on automobile radiators. JOHN W. ANDERSON. U. S. 1,694,902-3-4-5-6-7-8, Dec. 11.

Temperature indicator adapted for use on automobile radiators. CLAYTON A. DUNHAM (to C. A. Dunham Co.). U. S. 1,693,225, Nov. 27.

Temperature indicator for use with internal-combustion radiators. LOUIS M. SPENCER and JOSEPH ZUBATY (to A. C. Spark Plug Co.). U. S. 1,694,871, Dec. 11.

Thermometric device with a distance indicator operated by a rotatable shaft. WILLIAM R. HESLEWOOD (one-half to Fred A. Dana). U. S. 1,692,301, Nov. 20.

Filter. ALFRED GRONNING. Fr. 639,836, Aug. 20, 1927. A filter for liquid is described in which filtering takes place in spaces provided between the surfaces of plates or disks piled on one another or placed side by side.

Air filter. WM. M. REED and CHESTER P. HEGAN (to Reed Air Filter Co.). U. S. 1,693,585, Nov. 27. Structural features.

Filter for air or other gases. EDWARD L. JOSEPH. U. S. 1,695,237, Dec. 11. Structural features.

Apparatus for cooling and filtering milk or other liquids. ANGEL F. ORTIZ. U. S. 1,692,760, Nov. 20.

Leaf filter for wine or other liquids. J. CUENOUD. Brit. 288,920, Nov. 8, 1927. Structural features.

Apparatus for filtering and bottling effervescent liquids or other liquids under pressure. GOTTLIEB STRIFFLER. U. S. 1,692,393, Nov. 20.

Arrangement of filter cloths in a filter press. HARRY L. WALKER (to Standard Oil Co. of Ind.). U. S. 1,694,956, Dec. 11. Mech. features.

Filtration apparatus with a rotary filtering drum and compression rolls. ARTHUR WRIGHT and FRANK W. YOUNG. U. S. 1,691,950, Nov. 20.

Baffle device for separating dust from air or other gases. HARRY A. EDGAR. U. S. 1,693,479, Nov. 27.

Apparatus (with plates coated with oil) for separating dust from air, etc. G. S. DAUPHINEE (to General Air Filter Corp.). Brit. 288,992, April 18, 1927.

Apparatus for separating dust from gases by centrifugal action. E. PRAT. Brit. 288,190, April 1, 1927.

Device for removing impurities from gases by centrifugal action and entrainment in a moving liquid film. HAGAN CORP. (J. Gordon & Co., Ltd.). Brit. 289,192, Feb. 9, 1927.

Apparatus with rotating screens for separating suspended matter from gases. FRED F. PEASE (to F. F. Pease, Inc.). U. S. 1,694,666, Dec. 11.

Apparatus for separating liquids from gases or vapors by baffling and gravity. J. T. H. WARD. Brit. 288,740, Jan. 21, 1927.

Centrifuges. ÉLISÉE C. DUHAMEL and COMPAGNIE GÉNÉRALE DES INDUSTRIES TEXTILES. Fr. 636,661, Oct. 21, 1926. Improved construction to facilitate cleaning and dismantling.

Apparatus for condensing vapor in air or gas by cooling. MATHIAS FRÄNKEL. Fr. 636,707, June 21, 1927.

Atomizer for liquids with adjustable orifices. ALFRED LANSER. Fr. 636,590, June 25, 1927.

Atomizing nozzles for aerating liquids, etc. H. G. L. DE WHALLEY. Brit. 288,349, Oct. 8, 1926. Structural features.

Nozzle for mixing liquids with vapor or gases. ELEKTROWERKE A.-G. (Karl Ilgen, inventor). Ger. 468,306, Sept. 18, 1927. The nozzle has inwardly bent slits.

Evaporators. AKT.-GES. BROWN, BOVERI & CO. Ger. 467,232, Feb. 13, 1925. Lye at a certain concn. is intermittently discharged from an evaporator by an automatic valve governed by the elec. cond. of the lye at the desired concn.

Evaporation apparatus. NIRO A./S. SWISS 126,187, Mar. 30, 1927. The app. comprises a container with an atomizer in the center of the top cover, a hot-air-admission tube arranged tangentially in the upper part of the container, and an air-outlet tube centrally arranged at the bottom of the container, the inner end of this tube extending into the container.

Absorption apparatus. SIEMENS-SCHUCKERTWERKE A.-G. (Edmund Altenkirch inventor). Ger. 468,138, Aug. 13, 1926. Addn. to Ger. 453,847. The gas is introduced into the app. between an absorber and an evaporator, the latter contg. a heavier neutral gas than the former.

Gas analysis apparatus. REPUBLIC FLOW METERS CO. (Electroflo Meters Co., Ltd.). Brit. 288,510, Dec. 5, 1927. Various structural details are described, of an app. comprising measuring and absorption vessels, etc.

Electrical control for gas valves. SAMUEL G. CRANE (to F. H. Ohrmund). U. S. 1,693,070, Nov. 27.

Device for controlling the flow of gas to burners. JAMES QUINLAN. U. S. 1,692,467, Nov. 20.

Micromanometer for the continuous measurement and recording of gaseous density. UNION APPARATEBAUGESELLSCHAFT G. m. b. H. Ger. 467,755, Nov. 11, 1923.

Cell for measuring the thermal conductivity of gases. R. H. KRUEGER (to C. Engblard, Inc.). Brit. 288,908, Aug. 27, 1927. Structural features.

Apparatus for exothermic catalytic reactions of gases under pressure. A. T. LARSON (to Soc. l'air liquide, Soc. anon. pour l'étude et l'exploitation des procédés G. Claude). Brit. 288,577, April 12, 1927. An outer pressure-resisting chamber is associated with an inner chamber contg. the catalyst. Fresh entering gases pass through a space between the 2 chambers and after being mixed with recirculating gases pass into the catalyst space. A heat-exchanger may be placed within the inner chamber. Cf. C. A. 22, 3744.

Containers for compressed gases. HERMAN E. STÜRCKE. U. S. 1,692,521, Nov. 20. Containers for compressed gases are formed of comparatively soft steel substantially free from heat and mech. stresses, annealed, subjected to internal pressure corresponding to the ultimate test pressure, and the mech. stresses thus set up are then removed, e. g., by heating to 100–425°.

Tower for washing gases. H. A. BRASSERT (to H. A. Brassert & Co., Ltd.). Brit. 289,118, Dec. 24, 1926. Structural features.

Gas burner construction. MAX NUSS. U. S. 1,692,382, Nov. 20.

Determining gaseous carbon dioxide. HANS SCHMICK (to Siemens & Halske A.-G.). U. S. 1,695,031, Dec. 11. An app. is specified including a quartz filter and a holder for the gas through which rays from an elec. heated coil may act on bolometric devices.

X-ray target. JOHN W. MARDEN (to the Canadian Westinghouse Co., Ltd.). Can. 285,347, Dec. 4, 1928. X-ray targets are manufd. by heating W to about 2200° in a vacuum and bringing into contact with the W the vapor of a U compd.

Vacuum-tube filament. FREDERICK S. McCULLOUGH (to Radio Tubes, Ltd.). Can. 284,421, Oct. 30, 1928. An electron-emitting body for cathode structures is formed by applying a coating of Th oxide to a W rod having associated therewith a reducing agent, then sintering the rod in a non-oxidizing atm. and reducing a portion of the oxide coating, the reduced metal and the sintered W alloying and permanently fusing the unreduced oxide on to the core.

Discharge tubes. C. H. F. MÜLLER A.-G. (Wilhelm Daumann und Kurt Knoth, inventors). Ger. 467,293, Mar. 7, 1926. An arrangement for regulating the electron discharge by a movable electrode is described.

Electron discharge tubes. COMPAGNIE FRANCAISE POUR L'EXPLOITATION DES PROCÉDÉS THOMSON-HOUSTON. Fr. 639,106, Aug. 5, 1927. The electrode connections are constructed to take current up to 100 amps.

Electric discharge tubes. J. R. ROBERTSON. Brit. 289,326, Jan. 22, 1927. Various structural features are specified relating to compound vacuum tubes for converting elec. oscillations into light oscillations as in sound recording and for *therapeutic purposes*. The tubes have expansion chambers and contain N, or Ne, or both, mixed with H (the H passing through the electrodes as soon as its pressure in one tube falls below that in the other tube).

Electric discharge devices. SIEMENS & HALSKE A.-G. Brit. 289,381, April 25, 1927. A thermionic cathode such as that of a gas discharge rectifier comprises a W core with a surface of an alloy of the metal of the core with a high proportion of an electron-emitting metal such as Th or U. This alloy may be formed by coating the core with Th azide or hydride and heating, or a coating of Th nitrate with a material such as Mg or C may be applied. A filling of rare gas or low-pressure Hg vapor may be used.

Funnel with a measuring and recording discharge device. DANIEL G. MILLIGAN. U. S. 1,695,053, Dec. 11.

Thermionic valves. J. R. SINCLAIR. Brit. 289,509, Jan. 24, 1927. A filament is coated with electron-emitting material by the combined action of cataphoresis and electrolysis obtained by immersing the filament in a bath contg. the coating materials in suspension or in a colloidal state and connecting the filament to the pos. and the bath to the neg. terminal, and continuously moving the filament. A suspension of BaO₂ in alc. with which a 1% soln. of Ba(OH)₂ in water or C₂H₂Cl₄ is mixed may be used as may also various other similar admixtures which are described. An app. is also described.

Supports for thermionic valves or electron tubes. REDFERN'S RUBBER WORKS, LTD. Fr. 639,338, Aug. 11, 1927.

Device for detecting oxygen in hydrogen. GAYLOR W. PENNEY (to The Can Westinghouse Co.). Can. 283,911, Oct. 9, 1928.

Furnace. JULIUS HAACK. Ger. 467,933, Mar. 8, 1923. In a furnace burning coal dust the cross-sectional area of the furnace varies with the vol. of gaseous products.

Furnaces. KARL KOLLER. Ger. 468,196, Nov. 2, 1926. Oil and gas furnaces for industrial use have the flue gases kept at const. high pressure.

Annealing furnace. AKT.-GES. BROWN, BOVERI & CIE. Ger. 468,081, July 14, 1927. The chamber covers are operated by filling or emptying chambers with water by means of a pump.

Regenerative furnace. MARCEL FOURMENT and JEAN J. LADURÉE. Fr. 639,747, Jan. 29, 1927. The conduits to and from the combustion chamber are made adjustable, so that a conduit when functioning for the arrival of gas can be made as large as possible and when for the evacuation of the products of combustion is reduced in size.

Regenerative-furnace construction. HEINRICH BANGERT and GUSTAV HÜHN. U. S. 1,691,913, Nov. 20.

Rotary drum furnace for lime burning, ore roasting or coking. ÉTABLISSEMENTS POLIET & CHAUSSON. Ger. 468,288, May 4, 1926. Detail of construction.

Inclined furnace suitable for heating unit pieces such as poppet valves. RICHARD F. BISSEL (to Thompson Products, Inc.). U. S. 1,692,614, Nov. 20.

Charging means for furnaces. ANTONIN CHMELICEK. Swiss 126,370, Jan. 31, 1927. Constructional details.

Furnace grate moved on endless chain. DEUTSCHE BABCOCK & WILCOX DAMPF-KESSEL-WERKE AKT.-GES. Ger. 467,802, April 9, 1927.

Electromagnetic safety device for gas furnaces. COMPAGNIE DES FORGES DE CHATILLON-COMMENTRY ET NEUVES-MAISONS. Fr. 639,456, Aug. 12, 1927.

Gas burner. PAUL BEAUDEQUIN. Fr. 639,438, Jan. 24, 1927. The gas and air are led in parallel tubes so arranged that they do not mix till the point of combustion is reached.

Gas burners. LOUIS NECCHI. Fr. 639,540, Aug. 16, 1927. The diam. of the gas holes is approx. equal to the thickness of the walls of the burner at that point.

Gas burner. LE GAZ BLEU. Fr. 639,765, Feb. 1, 1927. The tube in which the gas and air mix is bent so that the direction of flow of the mixt. is changed sharply.

Annular tunnel kiln. JULIUS KERSTEN. Ger. 468,136, Mar. 27, 1925. The kiln is particularly suitable for the decompn. of $MgCl_2$ and has a rotary plate and side chambers for steam or generator gas.

Burner for mazout for bakery furnaces. MAURICE GASSE. Fr. 637,095, July 5, 1927.

Burner using mazout for heating bakery ovens. HENRI J. AUBRESPIN. Fr. 636,767, June 28, 1927.

Heat exchangers for fluids not in contact. COMPAGNIE DES SURCHAUFFEURS. Fr. 639,511, Aug. 13, 1927.

Heat-exchange apparatus. E. MENZEL and MENZEL A.-G. Brit. 289,677, July 14, 1927.

Heat-exchange apparatus for effecting catalytic reactions. M. CASALE-SACCHI. Brit. 289,661, June 7, 1927. Structural features.

Apparatus for heat-interchange between liquids. CHARLES L. BURDICK. U. S. 1,694,370, Dec. 11.

Bunsen burner for use with polarimeters and other optical instruments. W. Y. BUCHANAN. Brit. 289,548, Jan. 29, 1927. Finely powd. chem. salts are supplied to the gas and thence to the flame to give a desired color to the latter. Various structural details are described.

Heat recorder. WALTER SIEGNER. Ger. 468,035, Aug. 19, 1926. A heat recorder has the thermometer adjustable to allow for difference in sp. gr. of the liquid.

Acetylene generator. E. MENZ. Brit. 288,185, March 31, 1927. A device is provided for indicating the quantity of carbide remaining in the generating chamber. Various structural features are described.

Acetylene generator. BERNHARD GREIFZU. Ger. 467,352, Nov. 5, 1926. Constructional improvements are described in a generator of the type in which water is displaced from the carbide container when gas is not required.

Working acetylene generators. MESSER & Co., G. m. b. H. Ger. 467,353, June 29, 1926. Access of air to the generator during charging or removal of sludge is avoided by means of an auxiliary generator adapted to supply gas to the main generator when required.

Pressure regulator of the water-seal type for acetylene generators. BERNHARD GREIFZU. Ger. 467,351, Nov. 5, 1926. Constructional details.

Apparatus for emulsifying oils or other liquids. GEORGE L. FISH (to Raymond Salisbury, trustee). U. S. 1,694,589, Dec. 11.

Apparatus for feeding materials to emulsifiers at a constant head. A. W. EMPSON. Brit. 289,186, Feb. 1, 1927.

Apparatus for extracting oil from oil-containing materials. FREID. KRUPP GRUENWERK AKT.-GES. Ger. 467,801, Dec. 10, 1925.

Apparatus for distillation of solid and liquid materials in a closed circuit of superheated steam and gas. H. DUPUY. Brit. 289,425, April 27, 1927. The suction chamber of a steam injector is connected with the distn. chamber and is connected by a by pass with a heat economizer and condenser for the distillates. Various other structural features are specified also.

Apparatus for storing compressed air or other fluids under pressure. LOUIS J. LEMESURIER. U. S. 1,692,670, Nov. 20.

Extraction press for treating fish products or other materials. P. VOLDNES. Brit. 288,472, Aug. 18, 1927.

Apparatus (with a submerged flame burner) for evaporating ammonium chloride solutions or other liquids. C. F. HAMMOND and W. SHACKLETON. Brit. 289,159, Jan. 22, 1927.

Injectors and associated apparatus for producing foam by reacting chemicals. EXCELSIOR FEUERLÖSCHGERÄTE A.-G. Brit. 289,444, April 27, 1927.

Rubber-lined tumbling-barrel for cleaning and polishing silver articles, etc. H. C. BECKETT. Brit. 288,819, April 22, 1927. The lining is seamless and may be applied electrically or electrochemically or in a plastic state.

Casting chilled metal pipes, conveyor chutes or other articles with abrasion-resisting inserts. RALPH S. EDMONDSON and EUGENE HAHN (to American Abrasive Metals Co.). U. S. 1,692,725, Nov. 20. Mech. features.

Apparatus for heat-treatment of coils of wire for annealing, etc. GOTTLIEB KELLER (to A. G. Brown, Boveri & Cie). U. S. 1,693,388, Nov. 27. Structural features.

Apparatus for separating dredged muds or other solid materials from liquids. SAMUEL R. PURYEAR. U. S. 1,695,021, Dec. 11.

Wire helix conveyor device for feeding regulated small quantities of powdered substances. NAAMLOOZE VENNOOTSCHAP INTERNATIONALE OXYGENIUM MAATSCHAPPIJ NOVADÉL. Brit. 289,275, May 13, 1927. A small wire helix is driven by a sprocket and the helix may be formed of steel, bronze, Al, chrome Ni steel, Monel metal, or "V2A" steel, and may be coated with Sn, lacquer, varnish, etc.

Automatic reversing arrangement for the alternate filling and emptying of measuring vessels filled under pressure. PAUL BREITSCHUH. Swiss 126,384, April 21, 1927. Constructional details.

"Wear down" testing apparatus for typewriter ribbons, carbon paper and the like. WINFIELD P. PEMBROKE (to Kee Lox Mfg. Co.). U. S. 1,693,494, Nov. 27.

Rotating and dipping drums for soaking, rinsing and drying materials. GOTT-FRIED BUCHERT. Ger. 467,911, Sept. 29, 1927.

Apparatus for drying fabrics and paper in endless webs. AUBIN LAMBRETTE. U. S. 1,692,129, Nov. 20.

Thermostats. ALBERTO ALBERT. Swiss 126,690, April 6, 1927. The variation in length of metal rods due to temp. changes makes or breaks an elec. contact.

Thermostatic device for control of electric circuits. HERBERT E. RIDER (to Beaver Machine & Tool Co.). U. S. 1,694,928, Dec. 11.

Thermostatic device for control of electric circuits. OLIVER C. TRAVER (to General Electric Co.). U. S. 1,692,474, Nov. 20.

Thermostatic electric switch for controlling heater circuits. WILFORD J. WINNINGHOFF (to Cooper Hewitt Electric Co.). U. S. 1,695,261, Dec. 11.

Thermostatic electric switch. ARLEY U. HOOK. U. S. 1,695,103, Dec. 11.

Thermostatically operated electric switch. ERNEST L. BENSON. U. S. 1,692,540, Nov. 20.

Thermostatic device for control of dampers, etc. IRA E. SMITH. U. S. 1,693,060, Nov. 27.

Thermostatic valve. HARPY C. TABLER (to American Heater Corp.). U. S. 1,694,492, Dec. 11.

Thermostatic control for ovens heated by gas, etc. EMIL L. CLAUS and WALTER E. CLAUS (to Claus Mfg. Co.). U. S. 1,694,682, Dec. 11.

Device controlled by steam pressure and a thermostat for regulating atomizing burners used to heat steam boilers. LEE S. CHADWICK (to Perfection Stove Co.). U. S. 1,694,501, Dec. 11.

2—GENERAL AND PHYSICAL CHEMISTRY

GEORGE L. CLARK AND J. H. REEDY

Max Margosches. H. DIRZ. *Z. angew. Chem.* 41, 1213-4(1928).—An obituary. E. H.

Max Margosches, 1876-1928. ED. DONATH. *Chem.-Ztg.* 52, 825(1928).—An obituary. E. J. C.

Theodor Paul, 1862-1928. A. HEIDUSCHKA. *Chem.-Ztg.* 52, 841(1928).—An obituary. E. J. C.

In memory of Theodor Paul. KURT TAUFEL. *Z. angew. chem.* 41, 1253-5(1928). E. J. C.

Johannes Hendrikus Aberson. S. C. J. OLIVIER. *Chem. Weekblad* 25, 582-5(1928).—Biographical, with portrait. E. J. C.

Joseph Black. ANON. *Chem.-Ztg.* 52, 913(1928).—Biographical. E. J. C.

The one hundredth anniversary of Wöhler's discovery. OTTO OHMANN. *Chem.-Ztg.* 52, 877-8(1928).—Comment of historical interest. E. J. C.

Chemistry in the life of the nation. A. J. ALLMAND. *Chem. Age* (London) 19, 390-5(1928). E. H.

Doctorates in chemistry conferred by American Universities, 1927-1928. CALLIE HULL AND CLARENCE J. WEST. National Research Council, Washington, D. C. *J. Chem. Education* 5, 1450-2(1928). E. H.

The Australian Chemical Institute. H. G. CHAPMAN. *Chem. Eng. Mining Rev.* 21, 25-9(1928).—An address. E. H.

The teaching of chemistry in small colleges. LEO P. SHERMAN. *Chem. Bull.* (Chicago) 15, 362-3(1928). E. J. C.

Evening courses in chemistry. W. ALBERT NOYES, JR., Univ. of Chicago. *J.*

Chem. Education 4, 969-72(1927). Evening instruction for the chemist in industry. The Chicago plan. ARTHUR GUILLAUME, Swift and Co., Chicago, AND WARD V. EVANS, Northwestern Univ. *Ibid* 5, 1406-14(1928); cf. also *Chem. Met. Eng.* 33, 474 (1928). E. J. C.

Survey of chemistry teaching in Wisconsin high schools. T. A. ROGERS. Central State Teachers' Coll., Stevens Point, Wisconsin. *J. Chem. Education* 5, 1415-24(1928).

Term paper practices in teaching chemistry in the high schools of the United States. RALPH E. DUNBAR, CLARE H. HOLGATE AND J. E. HARKNESS. Dakota Wesleyan Univ., Mitchell, S. Dakota. *J. Chem. Education* 5, 1445-6(1928). E. H.

Some views on the teaching of science. W. L. BRAGG. *Mem. Proc. Manchester Lit. Phil. Soc.* 72, 119-23(1927-8).—An address. E. H.

Does laboratory work belong? RALPH E. HORTON. Seward Park High School, N. Y. City. *J. Chem. Education* 5, 1432-43(1928). E. H.

The relation of research to wealth production. HARRISON E. HOWE. *Science* 68, 495-7(1928). E. H.

Covalency, the paramagnetism of oxygen and stereochemistry. H. F. BIGGS. Oxford Univ. *Phil. Mag.* [7], 6, 659-64(1928).—Discussion and speculation of London's theory of the non-polar bond (cf. *C. A.* 22, 1531). GEORGE GLOCKLER

The metastability of elements and compounds as a result of enantiotropy or monotropy. XI. The physical-chemical constants of silver iodide. I. ERNST COHEN AND W. J. D. VAN DOBBENBURGH. Univ. of Utrecht. *Z. physik. Chem. Abt. A*, 137, 289-334 (1928).—The phys. consts. of many solid substances have been erroneously reported in the past because they were detd. for metastable mixts. of 2 or more modifications of the solid. C. and D. describe here the prepn. of "physically and chemically" pure AgI in its α - and β -forms and the detn. of the vol. change accompanying the transition from 1 form to the other. AgI was prepd. by adding a 1% soln. of KI, or NH_4I , to a soln. of AgNO_3 . After being thoroughly washed, the ppt. is no longer discolored by ordinary light. It consists, however, of both modifications of the solid. The stabilization at ordinary temps. takes place very slowly, but can be hastened either by boiling the ppt. with a CaCl_2 soln. or by melting the solid. When once obtained, the α -form is stable below the transition pt. and has d_{40}^{30} 5.683. The d . at the transition pt., 145.80° , as detd. by using a pycnometer filled with paraffin oil, was found to be unchanged with the rise in temp. The α -form is converted into the β -form on being heated above the transition pt. The $d_{46.80}^{145.80}$ of the β -form is 6.009. The change in sp. vol., -0.00948 cc., accompanying the transition from β to α was verified by direct measurement. The value obtained corresponds to the value calcd. from other data with the Clapeyron equation. H. F. JOHNSTONE

Evidence of boron in the sun. SETH B. NICHOLSON AND NICOLAS PERRAKIS. *Astrophys. J.* 68, 327-34(1928). E. H.

Crystal structure of calcium. C. D. NIVEN. Univ. of Toronto. *Phil. Mag.* [7], 6, 665-6(1928).—Some of the crystals of Ca grown by distn. definitely showed that Ca has a cubic structure. GEORGE GLOCKLER

The crystal structure of mercury, copper and copper amalgam. HENRY TERREY AND CYRIL M. WRIGHT. Univ. College London. *Phil. Mag.* [7], 6, 1055-69(1928).—The work on Hg was carried out at approx. -150° . The rhombohedral structure assigned by McKeehan and Cioffi (*C. A.* 17, 2068) was fully confirmed. For the plane spacings of Cu they obtain 3.603 A. U. In the case of amalgams they find that they are mech. mixts. of the two metals, as in every case the diffraction pattern of Cu was obtained on the film, and the intensity of the lines decreased with increasing Hg content. The appearance of a weak amalgam pattern in the freshly prepd. amalgams contg. 40 and 49% of Cu is probably due to the fact that these amalgams hardened in 3-4 hrs., and the time of exposure was also of this order. In the hardened amalgams a definite compd. is found contg. 27-40% Cu. This pattern is masked in the amalgams of high Cu content by the Cu pattern. GEORGE GLOCKLER

Crystal structure and linear coefficient of thermal expansion of tungsten carbides. K. BECKER. Osram-Konzern, Berlin. *Z. Physik* 51, 481-9(1928).—X-ray analysis and comparison of W, WC, α - W_2C and β - W_2C . GEORGE GLOCKLER

Slip in a crystal and rupture in a solid due to shear. A. T. STARR. *Proc. Cambridge Phil. Soc.* 24, Pt. 4, 489-500(1928). E. H.

Lattice constant of gypsum. J. NAGY. *Z. Physik* 51, 410-2(1928).—The distance between at. planes in gypsum crystals is not const. but differences up to 2.5 per mille are found. From the viewpoint of x-ray spectroscopy it is essential to assume a standard value for x-ray wave length rather than for the lattice const. of NaCl. GEORGE GLOCKLER

Observations on the higher fatty acids. X-ray measurements. GILBERT T. MORGAN AND EUSEBIUS HOLMES. Chem. Research Lab. Teddington, England. *J. Soc. Chem. Ind.* 47, 309-11T(1928).—X-ray pictures of a number of the fatty acids have been taken by the methods originated by Müller (cf. *C. A.* 17, 3833). The diffraction pattern of cluytinic acid gave a main spacing identical with that of the highest fraction of the satd. arachis oil acids, indicating by comparison with Müller's results that the acid was really hexacosic acid (C_{26}); later work on the higher fatty acids shows that it is probably a mixt. of the C_{24} and C_{26} acids and not a C_{21} acid as originally believed. Acids obtained by hydrogenating whale oil give main spacings agreeing with those of acids of established compn., but less concordant results were obtained with the arachis oil acids. In purifying these acids, the superiority of distn. over recrystn. as a means of sepn. of the different individuals was demonstrated. Following is a list of the main interplanar spacings observed for a number of fatty acids. Margaric (C_{17}) 36.9 A. U., stearic (C_{18}) 39.0 A. U., eicosic (C_{20}) 44.3 A. U., heneicosic (C_{21}) 45.0 A. U., cluytinic (C_{21} ?) 54.5 A. U., behenic (C_{22}) 48.3 A. U., tricosic (C_{23}) 50.3 A. U., hexacosic (C_{26}) 56.6 A. U. It is noted that all the values given for the arachis oil acids (58-54 A. U.) are much higher than are warranted by the sapon. figures, which indicate C_{20} to C_{24} acids. This may be due to the selective influence on the x-ray pattern of relatively small amts. of higher acids present. Expts. with eicosic and behenic acids showed little difference resulting from pressing the sample on to the mount instead of melting it. A. W. KENNEY

The question of liquid crystals. L. S. ORNSTEIN. Univ. Utrecht. *Physik. Z.* 29, 668-70(1928).—A further explanation of the work of O. (*C. A.* 18, 2827). There are 2 questions to be distinguished in the study of liquid crystals. The first deals with the macroscopic properties of the cloudy liquid crystal form, i. e., a discussion of their extinction, the influence of a magnetic field on the extinction and on the dielec. const., etc. The 2nd more essential question deals with mol. properties, which form the basis of the optical and chem. properties of the liquid crystals—thus the properties of the pseudo-isotropic form and the explanation of the differences between the macroscopic properties in turbid melts and in the pseudo-isotropic form in the same temp. range. In a discussion of liquid crystals both questions must be kept in mind. M. F.

The equation of state of a perfect gas. R. D. KLEEMAN. *Phil. Mag.* [7], 6, 743-4 (1928).—Mathematical. An improved form is given of proof of the equation of a perfect gas showing $PV = MRTx$, where $x = f(V)$ and other symbols have their usual meaning. GEORGE GLOCKLER

Gas flow through packed columns. S. P. BURKE AND W. B. PLUMMER. Combustion Utilities Corp., Linden, N. J. *Ind. Eng. Chem.* 20, 1196-1200(1928).—Results are reported for numerous tests on the pressure drop for air flowing at various rates through systems packed with spheres. The general expression for gas (or other fluid) flow through packed spaces is $p/l = C\rho V^2S/f^3$, where p is the pressure drop, l the length of packing, C the const. or friction factor, ρ the d., V the velocity, S surface of packing per unit of packed volume, f the packing factor or fractional free space. The variable coeff. is a function of, and is plotted against $\mu S/\rho V$, where μ is the viscosity in centipoises. L. A. PRIDGEON

Suspension of macroscopic particles in a turbulent gas stream. S. P. BURKE AND W. B. PLUMMER. Combustion Utilities Corp., Linden, N. J. *Ind. Eng. Chem.* 20, 1200-4(1928).—The const. of the equation ($R = k\rho V^2r^3$) for the resistance acting between a macroscopic spherical particle and turbulent gas stream moving past it has been detd. as $k = 0.00084$. R = grams, ρ the density of the gas, V the velocity, r the radius of the sphere, all in c. g. s. units. For irregular particles the value of k is slightly higher. The method of detg. the value of k is described. L. A. PRIDGEON

The molecular state of liquid substances. VL. KISTYAKOVSKII. *Z. physik. Chem.* Abt. A, 137, 383-92(1928).—On the basis of their phys., chem. and elec. properties, K. has classified liquids in 7 groups according to their degree of mol. assocn. The existence of the completed shell of 8 electrons is shown to be unfavorable to assocn. as well as to chem. action. For this reason the rare gases, with the exception of He, are placed along with a few satd. hydrocarbons, in Group I contg. substances which show no assocn. That liquid He shows a slight assocn. is explained by the fact that the 2 electrons in the shell are not stable enough to prevent the approach of other atoms of He. For the same reason, compds. contg. H joined either to O or N are often highly assocd. in the liquid state. The assocn. of liquid mols. is supplementary to the instability of the electronic shell. The assocn. of the elements in the liquid state is clearly periodic and agrees with the Mendelyev system. H. F. JOHNSTONE

Measurement of flow by means of orifice meters. L. ZIPPERER. *Gas. Wasser-*

fact 71, 1033-5(1928).—The derivation of the formula for flow of liquid through orifices is given, together with charts for orifice size, and calcs. for gases of given analyses.

R. W. RYAN

An exact determination of the coefficient of internal friction of fused salts. R. S. DANTUMA. *Z. anorg. allgem. Chem.* 175, 1-42(1928).—The detn. was carried out by the method of the "oscillating body." A steel ball suspended from a wire on which a mirror was fastened was allowed to move in the salt melt by the action of torsion. The movements were registered by a beam of light reflected from the mirror upon a rotating drum covered with light-sensitive paper. The internal friction of fused KNO_3 , NaNO_3 , LiNO_3 and NaCl was detd. at different temps.

EMIL KLARMANN

Jaeger's method as applied to the determination of the surface tension of mercury. R. C. BROWN. Univ. College London. *Phil. Mag.* [7], 6, 1044-55(1928).—Difficulties similar to those mentioned by Bircumshaw (*C. A.* 22, 4025) were encountered.

G. G.

The molecular nature of the adsorption of gases on glass and charcoal. HEINO ZEISE. Univ. Berlin. *Z. physik. Chem.* 136, 385-418(1928).—Adsorption of CH_4 , N , O and H on thin glass plates was measured at 90° abs. and at pressures between 2×10^{-4} and 7×10^{-2} mm., by the const.-vol. method. The total glass surface area was 12,590 sq. cm. The measurements with CH_4 , N and O were extended to 306 mm. with 3810 sq. cm. of glass surface. The isotherms obtained were studied mathematically. The Freundlich exponential equation fits the data only as a first approximation.

The data are represented quant. by the equation $a = \sqrt{(k_1 k_2 P)/(l + k_2 P)}$, where k_1 and k_2 are consts., P is the pressure and a the moles gas adsorbed per sq. cm. This equation is interpreted to show that the adsorption is monomol. There was no polymol adsorption indicated, even at the highest pressure studied. The Langmuir adsorption isotherm equation (cf. *C. A.* 12, 2152) was found to fit satisfactorily the earlier adsorption data of Tittoff, Homfray and Richardson on wood charcoal.

R. L. DODGE

Colloid types. EUGENE C. BINGHAM. *Fifth Colloid Symposium Monograph* 1928, pp. 219-28.—From the standpoint of plastic flow, colloids show 3 types: *Non-polar*, e. g., a suspension of a finely divided solid in a very viscous medium; *emulsions*, e. g., fats and greases, which when molten, behave as viscous liquids, but become plastic as solidification begins; *polar*, e. g., gelatin in water, where the increase of concn. of the dispersed phase is more marked than with the first type. The so-called "solubility" of polar colloids has long been roughly measured by the apparent viscosity of the soln. in diff. "solvents." This method is of course open to various objections, for these are not true solns. nor true viscosities, and it is not apparent that one would be an exact measure of the other. With a single crystal since the flow takes place along slip planes, it differs from the foregoing. With ordinary cryst. mixts., the situation is more complicated.

JEROME ALEXANDER

Interferometric measurements of ultramicroscopic particles. U. GERHARDT. *Ann. Physik* 87, 130-44(1928).—By means of special shields for the microscope objective, it is possible to make such particles appear as 2 sep. points of light, so that the Michelson methods for measurement of fixed and twin stars may apply. The influence of these shields and the light coherence is believed to nullify these methods for particles of less than 270 μ . A minimum of total brightness discussed by Bechmann was not observed.

GREGG M. EVANS

Study of chemical reactions in gelatin gels. S. M. KUZMENKO. *Ukrainskii Khim. Zhurnal* 3, No. 2, Pt. sci. 231-5(1928).—K. has studied the pptn. of sulfides from binary solns. of metallic sulfates in a 5% gelatin gel, spread on a glass plate, by a drop of concd. soln. of Na_2S . In 0.001 *N* solns. of $\text{Co} + \text{Mn}$; $\text{Zn} + \text{Ni}$; $\text{Co} + \text{Ni}$; $\text{Co} + \text{Zn}$; $\text{Ni} + \text{Mn}$ the less sol. sulfide is pptd. mainly. In the soln. $\text{Fe}^{++} + \text{Mn}$ the more sol. sulfide is pptd. In solns. contg. $\text{Zn} + \text{Mn}$; $\text{Zn} + \text{Ni}$; $\text{Co} + \text{Ni}$; $\text{Co} + \text{Zn}$, $\text{Ni} + \text{Mn}$, both metals are simultaneously pptd. as sulfides.

G. B. K.

Ebullioscopic determination of double and complex salts in aqueous solution. F. BOURION AND E. ROUYER. *Ann. chim.* 10, 182-262(1928).—The term ebullioscopic deviation is used to denote the difference between the observed b. p. elevation for a pair of salts in soln. and the elevation calcd. by a rule of mixts. Algebraic relations are established between the magnitude of the deviations and the compn. and dissoen. consts. of complex salts which may be formed. Two similar app. of the Beckmann type, one contg. the soln. under investigation and the other contg. pure water were used at the same time in order to eliminate corrections for the variation of atm. pressure. The following complex salts were found between CdCl_2 and KCl , NaCl and NH_4Cl , with the given dissoen. consts. $\text{K}_2(\text{CdCl}_4)$, $k = 0.625$; $\text{Na}_2(\text{CdCl}_4)$, $k = 1.12$; $2\text{Cd} \cdot 3\text{NH}_4\text{Cl}$, k not detd. CdI_2 and KI form the complex $\text{K}_2(\text{CdI}_4)$ with $k = 6.0 \times 10^{-3}$.

E. R. SMITH

The rate of solution of cadmium in hydrochloric acid. M. TZENTNERSHVER. Lettland Univ., Riga. *Z. physik. Chem. Abt. A*, 137, 352-60(1928).—When the concn. of the acid is not less than 6 *N*, Cd dissolves in HCl solns. in a manner similar to the solution of Zn and Al. A period of induction first exists during which the rate of attack steadily increases. If the metal has previously been dipped in strong acid, the induction period is eliminated. The increased action of the metal is not lost if the surface is kept covered with H₂O. Stirring the acid does not increase the velocity of the action except for the higher concns. The temp. coeff. of the velocity is about 2 for each 10° rise for the higher concns. but decreases with the concn. These results show that at the lower concns. of acid, the rate of solution of the metal depends almost entirely upon the chem. action at the surface and only slightly upon the rate of diffusion, while at the higher concns. this relation is reversed.

H. F. JOHNSTONE
The expression of free acid and alkaline ion concentration. ALB. J. J. VANDEVELDE. Inst. Supérieur des Fermentations de Gand. *Bull. assoc. élèves inst. sup. fermentations Gand* 29, 395-402(1928).—A brief crit. discussion of the various systems which have been proposed, with a table giving the equivalence of the various methods of notation varying from *N* acid to *N* alkali. V. considers that the expression C_H and C_{OH} are the simplest because they constitute an elementary translation of what is learned by experimentation without requiring any new conventional notion. Also in *Natuurw. Tijdschrift* 10, 145-51(1928).

A. PAPINEAU-COUTURE
Theory of electrical migration of ions. J. N. MUKHERJEE. Univ. College of Science, Calcutta. *Nature* 122, 608(1928).—According to Mukherjee, the theory of moving boundaries as developed by Kohlrausch and Weber overlooks the unequal transfer of the common ion at the boundary and consequently rests on a misconception of the conditions on the "indicator" side of the boundary. Consider a boundary between solns. of two salts AR and BR. When current passes there will not be any mixing of the ions A and B. However, more R ions leave the boundary on one side than enter it from the other, thus tending to violate the condition of elec. neutrality. This ion excess causes a drag and an adjustment of the potential gradient which for the steady state requires an equal no. of R ions entering and leaving the layer in the same time. A paper contg. a fuller treatment is to appear.

E. R. SMITH
Supplement to our paper, "The dielectric constants of electrolytic solutions." H. HELLMANN AND H. ZAHN. *Ann. Physik* 87, 716(1928); cf. *C. A.* 22, 4347-8.

MALCOLM DOLE
Chemical interactions corresponding to the constant of mass action being a function of the volume and masses of the constituents as well as of the temperature and catalytic action. R. D. KLERMAN. *Phil. Mag.* [7], 6, 648-59(1928).—K. has investigated (*C. A.* 22, 4040) some of the conditions under which the const. of mass action is a function of the vol. of the gaseous interacting mixt. and the masses of the constituents, as well as of the temp. This paper is a continuation of the investigation.

G. G.
Free energy of formation of fused salts. I. Cuprous and thalious halides and mercuric iodide. GIOVANNI DEVOTO. Reale Univ. Milano. *Gazz. chim. ital.* 58, 359-71(1928).—The present paper gives the initial results of expts. to establish an electrochem. series of the elements in fused salts. The method chosen as most promising was that of polarization (cf. Lorenz, *Elektrochemie geschmolzener Salze*, III (1906); Cambi and Devoto, *C. A.* 21, 2837). Polarization tensions of CuCl, CuBr, CuI, ThCl, ThBr, ThI and HgI₂ at different temps. are tabulated. With CuCl, depolarization through formation of CuCl₂ at lower temps. (i) results in the *E/t* curve remaining horizontal to approx. 520°, above which temp. the voltage diminishes fairly regularly with increase of temp. Changes in the *E* values of CuBr with changes in current strength show approx. the logarithmic relation of Jahn (cf. *Z. physik. Chem.* 34, 529 (1900)). As a result of the formation of yellow thalious thallic chloride, TiCl shows considerable depolarization, which diminishes with increase of temp. With CuBr, CuI, TlBr and TlI there is no depolarization because of the slight stability of the higher halides. The polarization tension of HgI₂ has an abnormally high temp. coeff. Calcn. in an approx. way of *F* at the abs. m. ps. gave CuCl, $F_{700} = 22,220 = 0.965$ v.; CuBr, $F_{700} = 16,750 = 0.779$ v.; CuI, $F_{800} = 9675 = 0.460$ v.; TiCl, $F_{600} = 37,880 = 1.64$ v.; TlBr, $F_{700} = 32,300 = 1.40$ v.; TlI, $F_{700} = 25,255 = 1.095$ v.; HgI₂, $F_{600} = 19,100 = 0.515$ v. Differences between the observed and calcd. values are approx. 0.05 v.

C. C. DAVIS
The resistance of cesium, cobalt and chromium at low temperatures. J. C. McLENNAN, C. D. NIVEN AND J. O. WILHELM. Univ. of Toronto. *Phil. Mag.* [7], 6, 672-7(1928).—Tables and curves show the elec. resistance of Cs, Co and Cr as a function of temp.

GEORGE GLOCKLER
Application of an electromagnetic force to the "thermobalance." ZEN-ICHI

SHIBATA AND MASAJI FUKUSHIMA. *Tech. Repts. Tôhoku Imp. Univ.* 7, 201-8 (1928).—See *C. A.* 22, 3086. E. J. C.

Electrical conductivity of arsenic and antimony at low temperatures. J. C. McLENNAN, C. D. NIVEN AND J. O. WILHELM. Univ. Toronto. *Phil. Mag.* [7], 6, 666-72 (1928).—Tables and curves show the variation of resistance of As and Sb with temp.

Molecular cohesion. G. A. TOMLINSON. *Phil. Mag.* [7], 6, 695-712 (1928).—Cohesion between quartz fibers and glass spheres is studied. From the study elec. moments of mols. of the right order of magnitude are obtained. An inverse-fourth-power law for mol. attraction is favored.

GEORGE GLOCKLER

The effect of cadmium as an impurity in lead on the conductivity of lead. J. C. McLENNAN, C. D. NIVEN AND J. O. WILHELM. Univ. of Toronto. *Phil. Mag.* [7], 6, 678-85 (1928).—The alloys show supercond. as does Pb. An aging effect was noticed.

GEORGE GLOCKLER

The electrical conductivity of metals as a function of pressure according to the Sommerfeld electron theory. A. T. WATERMAN. Yale Univ. *Phil. Mag.* [7], 6, 965-70 (1928).—For the effect of hydrostatic pressure upon the elec. cond. of metals, Houston (*Z. Physik* 48, 449 (1928)) has given an approx. formula, and has briefly pointed out that its application is qual. correct. When subjected to quant. calcn., this formula is found only to give the right order of magnitude for the pressure coeff. of resistance. The accuracy of known data for the pressure coeff. of metals, however, warrants a more exact formula, which is deduced. The agreement is fair.

GEORGE GLOCKLER

The application of the Debye dipole theory to binary liquid mixtures. JOHN W. WILLIAMS. Univ. Leipzig. *Physik. Z.* 29, 683-8 (1928); cf. *C. A.* 22, 1897.—The elec. moments of 33 mols. calcd. from the dielec. consts. and the d. of their solns. in C_6H_6 at 25° , are collected in a table and the significance of these values in reference to the structure of the mols. is sought. The mols. are divided into C_6H_6 derivs., compds. of the type Ca , biphenyl and its derivs., and inorg. mols. Every atom or every group substituted in a C_6H_6 nucleus is characterized by a larger or smaller definite moment which can be considered as a vector and has a definite bearing. When 2 or more atoms are substituted in the C_6H_6 nucleus, their reciprocal effect can in general not be neglected. A probable structure for C_6H_6 is one in which all the C atoms lie in a plane. It is not possible to express the structure of biphenyl and its derivs. by a simple spatial arrangement. No clear relation exists between the structure of the dissolved mols. and that of the crystals.

MARIE FARNSWORTH

Capillary-electric phenomena of amalgams. I. Thallium amalgam. A. FRUMKIN AND A. GORODETZKII. Karpov Inst. Moscow. *Z. physik. Chem.* 136, 451-72 (1928).—Electrocapillary curves on Tl amalgams were measured in a variety of solns. with a capillary electrometer (cf. *C. A.* 10, 3017). The max. of the curves of the Tl amalgams was displaced from the max. for Hg in the direction of stronger cathodic polarization. The displacement for a 41.5% amalgam in normal Na_2SO_4 soln. was 0.45 v. The curves for the amalgams were affected in the same way as the Hg curves, by the concn. of the electrolyte and by the presence of pyrogallol, thiourea or amyl alc. in the electrolyte. Application of Gibbs' equation to the adsorption of Tl at the soln.-amalgam interface indicated that the quantity of adsorbed Tl was a function of the potential difference between soln. and amalgam.

R. L. DODGE

The refractometric relations and state of dissolved ammonium salts and of strong acids. K. FAJANS. Akad. Wissenschaften, München. *Z. physik. Chem. Abt. A*, 137, 361-82 (1928).—The change in the refractivity of a salt soln. which accompanies an increase in the concn. has been explained by the formation of undissocd. particles and the mutual deforming action of the ions in direct contact with each other (cf. *C. A.* 21, 3539; 22, 4037). In solns. of NH_4 salts and in those of HCl the distorting action of the Cl on the NH_4 and OH ions, resp., is greater than that of the same anion on the alkali cations because of the disturbance of 1 of the H atoms in the nuclei. For these solns., therefore, the decrease in refractivity with increase in concn. is much greater than might have been expected from the similarity in the structure of these cations to that of the alkali cations. F. also shows that the change in the refractivity with increasing concn. for a series of Na salts of different acids, agrees in sign and in magnitude with the change in refractivity of the acids alone in passing from infinitely dil. solns. to the homogeneous undissocd. acids. He regards this as further proof for his explanation of the effect of concn. on refractivity.

H. F. JOHNSTONE

Magnetic hysteresis at high frequency. W. NEUMANN. Univ. Königsberg. *Z. Physik* 51, 355-73 (1928).—The magnetization of 2 samples of Fe was found smaller at higher frequencies.

GEORGE GLOCKLER

Proteins and the lyotropic series (GORTNER, *et al.*) 11A. Synthetic kidneys (BANCROFT, NUGENT) 11A.

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3—SUBATOMIC PHENOMENA AND RADIOCHEMISTRY

S. C. LIND

An upper limit of energy density. G. I. POKROVSKII. Univ. Moscow. *Z. Physik* 51, 730-6(1928).—The assumption is made that the greatest possible density of energy cannot be greater than the density of matter (considered as energy) in the heaviest atoms. As a consequence temp. and frequency also have upper limits. The max. temp. is 3×10^{12} degrees and the max. frequency is 10^{23} ($= 3 \times 10^{-15}$ A. U.). G. G.

Corpuscular theory of interference and diffraction. G. WATAGHIN. Univ. Turin. *Z. Physik* 51, 593-604(1928).—The density of quanta in a light-beam corresponds at each point to the energy density of the electromagnetic field of classical theory. The velocity of the light quanta is parallel to the Poynting vector. Mathematical. G. G.

The evolution of the quantum theory. E. PERSICO. *Scientia* [2], 44, 373-86(1928).

F. H.

Quantum theory and molecule-formation. H. LESSHEIM. Univ. Breslau. *Z. Physik* 51, 838-41(1928).—See *C. A.* 22, 3821.

GEORGE GLOCKLER

Group theory and the mutual interactions of atoms. W. HEITLER. Univ. Göttingen. *Z. Physik* 51, 805-16(1928).—Mathematical. The problem of valency is studied as a problem of modern quantum-theory. The mathematical methods of group-theory are applied.

GEORGE GLOCKLER

An interpretation of the wave-equation of a material particle. T. TAKEUCHI. *Z. Physik* 51, 887-8(1928).—The mathematical similarity of the Schroedinger wave-equation and the equation of Brownian movement leads T. to interpret the former in terms of the latter.

GEORGE GLOCKLER

Molecular spectra of diatomic molecules in modern quantum-mechanics. E. WIGNER AND E. E. WITMER. *Z. Physik* 51, 859-86(1928).—The structure of mol. spectra is studied by the math. methods of group theory. First approximations of the proper *eigenfunctionen* are derived and the selection and intensity rules and the energy-level scheme of rotational bands are given. Similarly the mode of formation of a scheme of electron energy levels of a mol. is given and this term system is thought built up out of the union of 2 atoms.

GEORGE GLOCKLER

Spectrum characteristics in the quantum mechanics of the spinning electron. J. V. NEUMANN AND E. WIGNER. Berlin and Göttingen. *Z. Physik* 51, 844-58(1928); cf. *C. A.* 22, 3584.—Starting with the math. soln. of the Schroedinger equation of an atom not having spinning electrons, a first approximation for *eigenfunctionen* with spin is derived. Results are: the Landé-equation (Zeeman-effect) and the Burgers-Dorgelo sum rule of spectral intensity.

GEORGE GLOCKLER

The spectrum of aluminum in the extreme ultra-violet. ERIK EKEFORS. Univ. Upsala. *Z. Physik* 51, 471-80(1928).—The extreme ultra-violet spectrum of Al is investigated by means of a one-meter vacuum spectrograph. The instrument is described. A few lines of Al II and Al III in the region γ 480 to 1300 Å. U. are identified and several term values for Al III are detd.

GEORGE GLOCKLER

The vector-system of atoms in the newer quantum theory. E. FUES. Univ. Stuttgart. *Z. Physik* 51, 817-27(1928).—Impulse-vectors were used in the older quantum theory to describe the state of an atom. Certain addn. laws which these vectors obeyed are translated into the newer mechanics.

GEORGE GLOCKLER

Calculation of grating energies of simple salts on the basis of the new wave mechanics. H. BRUCK. Univ. Munchen. *Z. Physik* 51, 707-27(1928).—The repulsive forces in crystals as calcd. by Born and Landé are now considered on the basis of the new quantum mechanics. The grating energies, ionic radii and compressibilities of a few salts are calcd. and discussed and good agreement is found with expts. G. G.

The decomposition constant of actinium. STEFAN MEYER. Radium Inst., Wien. *Sitzb. Akad. Wiss. Wien Abt. IIa*, 137, 235-9(1928).—The half life of Ac is found to be 13.4 years, detd. from the rise and decay of Ac activity.

M. F.

Range of atomic disintegration-products. W. BOTHE. Reichsanstalt, Charlottenburg. *Z. Physik* 51, 613-7(1928).—In the case where the α -particle causing the disintegration is captured by the disintegrated atom, is it possible to derive simple relations of energy and momentum. These relations give certain definite information concerning the range of H particles as dependent on the range of the α -particle causing the disintegration. These deductions seem to apply to the case of N, as studied by Blackett (*ibid.* 1, 19, 1657).

GEORGE GLOCKLER

Yield of atomic disintegration experiments. G. KIRSCH AND H. PETTERSSON. *Z. Physik* 51, 669-95(1928).—The factors affecting the yield in expts. on at. disintegration are noted and the differences between the values of Bothe and Franz (with the Geiger counter) and the Vienna results (with various methods) are discussed. The difference is ascribed to the failure of the Geiger counter to register H particles quantitatively. Further differences are taken up and the earlier Vienna expts. are thought to have been correctly carried out and interpreted.

GEORGE GLOCKLER

The decomposition of carbon. III. HANS PETTERSSON. Radium Inst., Wien. *Sitzb. Akad. Wiss. Wien Abt. IIa*, 137, 1-6(1928); cf. *C. A.* 22, 1271.—Expts. on the decomposability of C with the α -particles of Po of artificially degraded range are described. The no. of scintillations from α -rayed graphite observed by the retrograde method show a very appreciable decrease when the range of the α -particles falls from 3 to 2.4 cm. When the α -particles have a range of 2 cm. the no. of at. fragments is the same with or without a source of rays. The same minimal energy is required to comp. both C and Al.

MARIE FARNSWORTH

A method for the preparation of a highly concentrated polonium preparation. ELISABETH RONA AND EWALD A. W. SCHMIDT. Radium Inst., Wien. *Sitzb. Akad. Wiss. Wien Abt. IIa*, 137, 103-15(1928); cf. C. A. 22, 3827.—The method of distn. is used to prep. a highly concd. Po prep. Systematic expts. are made for obtaining a good yield. The preps. have high surface d. and the advantage that they can be strengthened at any time. Expts. to det. how the preps. are suited to expts. on at. decompn. gave satisfactory results. Further expts. concerning the importance of the metal holding the Po and the influence of a gaseous Po compd. are planned.

MARIE FARNSWORTH

The preparation of polonium from radium compounds and active lead salts. ELISABETH RONA. Radium Inst., Wien. *Sitzb. Akad. Wiss. Wien Abt. IIa*, 137, 227-34 (1928); cf. C. A. 22, 3827.—It is possible to sep. pure Ra D and Po from a strong Ra prepn. (1207 mg. Ra) by pptg. with H_2S . The Po can be concd. from the active Pb salt by shaking the soln. with Ag foil.

MARIE FARNSWORTH

Separation and purification of radium D, E and F. O. ERBACHER AND K. PHILIPP. K. W. Inst. Berlin, Dahlem. *Z. Physik* 51, 309-20(1928).—A new method for purification of Ra D by electrolysis is described. Po is pptd. on Ag foil and Ra E on Ni foil.

GEORGE GLOCKLER

Volatilization curves of radium B and radium C which are precipitated on gold by single and by double recoil. ERNA BUSSECKER. Radium Inst., Wien. *Sitzb. Akad. Wiss. Wien Abt. IIa*, 137, 117-26(1928).—The possibility of an alloy between active deposit and its substratum is studied. Ra B and Ra C are hammered into Au foil, once by a single recoil and the other time by a double recoil. The volatilization curves are studied in both cases. The Ra B and Ra C product produced by 2 recoils, which favors alloy formation, in general volatilized more readily.

MARIE FARNSWORTH

Simultaneous action of impact and radiation. O. OLDENBERG. Univ. Göttingen. *Z. Physik* 51, 605-12(1928).—From the study of a continuous spectrum of Hg with He in the discharge tube, it can be concluded that radiation and kinetic energy together can, in one elementary act, cause the excitation of an atom. More generally the simultaneous action of 2 sorts of energy in 1 excitation act is discussed. From the Smekal-Raman effect it is concluded that 2 light quanta can possibly act together and cause the excitation of one atom.

GEORGE GLOCKLER

Transparency of rare gases for slow electrons. F. KORROESY. *Z. Physik* 51, 420-8(1928).—A very slow electron will not be acted upon by a mol. for the latter will appear to be a spherical condenser (neg. shell outside of the pos. kernel) with no elec. forces acting toward the outside. Such a slow electron will therefore pass easily through a gas of such mols. An outside electron passing the mol. with a velocity comparable with the velocities of the outer electrons of the mol. will, however, be acted upon by strong elec. forces and the collision area of the mols. will appear to be large. A very much faster electron will, however, be only a very short time under the influence of the mol. fields and it will pass easily through the gas. Thus on the old Bohr model K. attempts to explain the phenomenon of transparency of the rare gases for slow electrons. (Cf. C. A. 20, 3383, and Faxén and Holtsmark, C. A. 22, 1273).

GEORGE GLOCKLER

Photoelectricity. WILLIAM BRAGG. *Sci. Monthly* 1928, 522-9; cf. C. A. 22, 4055.—An address.

E. H.

Influence of gases upon photoelectric sensitivity of carbon. O. v. AUWERS. *Z. Physik* 51, 618-37(1928).—The presence of gases has a great influence upon photoelec. sensitivity of C. However, the kind of gas (H_2 , O_2 , air) has not a marked influence. It is assumed that the active location of the photoelec. phenomenon is to be sought in gas layers within the pores of the material.

GEORGE GLOCKLER

The sudden discharge-voltage of the Geiger counter. OTTO KLEMPERER. Univ. Kiel. *Z. Physik* 51, 341-9(1928).—Independent of the dimensions of the counter, the gas pressure and the kinds of gas used, the voltage at which the current through the counter suddenly increases from about 10^{-13} to 10^{-10} amp. depends only on 2 factors: the no. of pos. ions needed to liberate another electron and the range of the electron. Deviations are found only with extremely high ion velocities. H_2 , air and CO_2 were studied.

GEORGE GLOCKLER

Sparking potential at pressures less than one atmosphere. FR. KLINGELFUSS. *Z. Physik* 52, 126-40(1920).—The sparking potential at const. electrode distance is studied as a function of pressure. The pressure-distance product ($p \times d$) is translated into equiv. wave length and the expression of the sparking potential is given in terms of this wave length.

GEORGE GLOCKLER

Optical experiments with electrons. II. L. H. GERMER. Bell Tel. Lab., N. Y. *J. Chem. Education* 5, 1255-71(1928); cf. C. A. 22, 4361.—Since electrons have a

wave length of h/mv , intensity of reflected beam is plotted vs. reciprocal of wave length. Maxima of electron reflection fall to the left of corresponding x-ray reflections, with the displacement decreasing toward the higher orders. By assuming that the displacement from x-ray positions indicates a refraction different from unity, 6 different values are obtained, corresponding to 6 electron wave lengths. These values plotted vs. reciprocal wave lengths give the dispersion curve of Ni crystal for electron waves. The break in the continuity of this curve is not understood. The loops suggest double refraction. Miller indices can now be assigned to each of the electron beams. The 54-v. diffraction beam is shown. This is a (331)—x-ray terminology. Figures for (662), (422), (844), (551), (553), (442) and (773) reflections are shown. Application is made of electron waves to the study of crystal structure. Electron waves are scattered more efficiently by the atoms of a crystal than are x-rays, and do not penetrate as deep. These waves should provide a new and useful means of studying crystal surfaces. L. D. R.

Diffraction of an electron beam on a grating. E. RUPP. A. E. G., Berlin. *Z. Physik* 52, 8-15(1928).—A metal grating having 1300 lines per cm. was used to produce spectra of 3 orders of electron beams of 70, 150 and 310-v. velocity. The method of glancing incidence used for x-rays was used here. The de Broglie relation $\lambda = h/(mv)$, λ = equiv. wave length, m = mass of electron, v = velocity of electron, is checked satisfactorily to an accuracy of $\pm 2\%$. GEORGE GLOCKLER

Wiedemann—Franz—Lorenz—law. E. GRÜNEISEN. *Z. Physik* 51, 652-68 (1928).—In order to explain certain deviations from the above law, G. assumes that in a metal there exist 2 types of electron motion, only one of which, however, can partake in thermal conduction. (Cf. C. A. 21, 3776.) GEORGE GLOCKLER

Alternating-current arcs in liquids. A. v. ENGEL. *Z. Physik* 52, 145-9(1928).—The high potential noted by Bodforss and Frölich (C. A. 16, 3593) is caused by interruption of the current and is not to be confused with the normal drop across the arc. This was shown in the case of measurements with uninterrupted arc current. G. G.

The magnetic moment of the electron. C. G. DARWIN. *Proc. Roy. Soc. (London)* A120, 621-31(1928).—By starting from the wave equations for an electron and the associated elec. density and current, it is shown how the electromagnetic fields of a moving electron can be attributed partly to the convection of electricity and partly to an intrinsic magnetization. A geometrical construction shows the relation between the wave const. and the magnetization. The formulas, first worked out for slow motion, are easily generalized by relativity for high speeds, and in this case there are elec. as well as magnetic moments, and various invariant properties are given. A comparison is made between an electron wave and a light wave, and the resemblance may be loosely expressed by saying that a light quantum is an electron without charge or mass. G. CALINGAERT

Diffraction of the magnetic electron. C. G. DARWIN. *Proc. Roy. Soc. (London)* A120, 631-42(1928).—The problem is solved of the diffraction of an electron wave by a line-grating exerting periodic elec. or magnetic forces; this represents the essential features of diffraction by a crystal. The incident wave is supposed to be magnetized in a definite direction, and it is shown that when the grating exerts only elec. forces, the effect is to rotate the direction of magnetization through a definite angle about an axis perpendicular to the incident and diffracted rays, and no polarization can be produced by the diffraction. For some magnetic forces a similar rotation occurs, but in general the simultaneous action of elec. and magnetic forces may produce a partial polarization, though the case is too remote from expt. to be worth treating in detail. G. CALINGAERT

Polarization of characteristic x radiation. H. MARK AND K. WOLF. *Z. Physik* 52, 1-7(1928).—By a photographic method it is found that the degree of polarization of the characteristic K radiation of Cu is within the limits of error of 1%. G. G.

Insulation for radiation and the economical production of light. F. SKAUPY. *Z. Physik* 51, 388-94(1928).—The amt. of energy required to overcome the radiation losses of an incandescent object can be greatly reduced if the body be surrounded by certain covers or mantles placed at distances calcd. from the laws of radiation (Stefan-Boltzman law). These mantles must be transparent to the visible but impervious to the infra-red. The proper placing and choice of these mantles would result in an economical light production. GEORGE GLOCKLER

The propagation of light through fields of force. F. J. WISNIEWSKI. *Z. Physik* 51, 443-50(1928).—The fact that the velocity of light in material media is not c (3×10^{10} cm./sec.) is explained on the assumption that electromagnetic fields exist inside of the material media. GEORGE GLOCKLER

Dispersion in air and carbon dioxide in the interval from 600 to 60 meters. M.

FORRO. Univ. Budapest. *Z. Physik* 51, 374-7(1928).—The change in dielec. const. in air and CO_2 was measured and a slight increase with decreasing wave length was found.

GEORGE GLOCKLER

Derivation of Plank's radiation law. K. SHAPOSHNIKOV. *Z. Physik* 51, 895-900 (1928).—It is assumed that black-body radiation consists of wave groups or wave packets each of energy $ih\nu$, where i = a whole no. and $h\nu$ = energy of 1 quantum. On further geometrical considerations Plank's Law is derived.

GEORGE GLOCKLER

The interpretation of the green auroral line on the basis of the Zeeman effect. L. A. SOMMER. *Z. Physik* 51, 451-70(1928).—On the basis of interferometer measurements of the Zeeman effect of the oxygen line $\lambda = 5577.350$ A. U. obtained in a discharge tube contg. A and O_2 this line is identified as the famous auroral green line with the term designation $2pD_2 - 2pS_0$. This transition violates both the selection principles for azimuthal and inner quantum no.

GEORGE GLOCKLER

Light absorption in crystals with traces of impurities. I. MASLAKOWEZ. Univ. Göttingen. *Z. Physik* 51, 696-706(1928).—The ions NO_3^- and NO_2^- can be incorporated in an alkali-halide crystal and can be identified therein by means of their ultra-violet and infra-red absorption spectra. Addn. of NO_3^- ion brings also NO_2^- absorption and *vice versa*. A sort of equil. is established. Carbonates and sulfates cannot be incorporated into alkali halide crystal without causing considerable disturbance.

GEORGE GLOCKLER

Broadening of spectral lines through self-reversal. H. C. BURGER AND P. H. VAN CITTERT. Univ. Utrecht. *Z. Physik* 51, 638-51(1928).—The broadening of spectral lines due to absorption is calcd. By the use of a Fabry-Perot interferometer the absorption coeff. is measured for the red He-line $2^1P - 3^1D$ and is found to be large as theoretically expected. With triplet-lines the measurement is more difficult on account of the multiple structure. By means of working with liquid air it has been possible to study this multiple structure.

GEORGE GLOCKLER

Molecular spectrum of hydrogen. W. FINKELNBURG. Univ. Bonn. *Z. Physik* 52, 27-118(1928).—In the region $\lambda = 4861$ (H β) to $\lambda = 3314$ there are found 3667 lines belonging to the mol. spectrum of H_2 . These were taken with the great Rowland concave grating with a dispersion of 1.98 A. U. per mm. The calcd. probable error is ± 0.0035 A. U. for the more intense lines and twice this for the lesser lines. More than 2000 lines are here measured for the first time. Because of some peculiarities in the conditions of excitation it is possible to fit these lines into 3 rough classes of which at least 2 are such that the lines behave quite differently. An alphabetical bibliography is appended.

GEORGE GLOCKLER

Molecular spectra. F. HUND. Univ. Rostock. *Z. Physik* 51, 759-95(1928).—An attempt is made to systematize the electron terms in mols. similar to the present arrangement of energy levels for atoms. With the two-center mol. there are assigned certain terms to certain electron configurations. For varying nuclear sepn. the sequence of binding of individual electron shells is discussed and a sort of principle for mol. formation is described. The spectra of the hydrides are the simplest to interpret but for other mols. the interpretation is still very arbitrary. Differences in the energy diagram of mols. with equal and unequal nuclei or kernels are noted and the alternate intensity in the N_2^+ bands is explained. The relations between ionizing and resonance potential are much more complex in mols. than they are in the atoms. A few rules for dissocn. energy are found. The shells of electrons in the many-center systems are in a certain sense simpler than in the two-center systems. The connection of this study with problems of chem. combination and valency is discussed.

GEORGE GLOCKLER

Diffuse molecular spectra. B. ROSEN. Univ. Berlin. *Z. Physik* 52, 16-20 (1928); cf. C. A. 22, 2717.—In the S_2 spectrum it is shown that dissocn. does not explain always the diffuse character of the bands. It is necessary also to consider the greater diam. or vol. of an excited mol. caused by the large amplitudes of nuclear vibrations. Wherever dissocn. is possible on energetic grounds it appears to happen

GEORGE GLOCKLER

Helium band spectrum. W. WEIZEL. Univ. Rostock. *Z. Physik* 51, 328-40 (1928).—The carrier of the band spectrum of He is a He mol. made up of 2 excited He atoms. The mol. does not consist of 1 normal and 1 excited He atom. A model for such a He mol. is proposed and an energy level (= term) diagram is worked out. Some former discrepancies in the assignment of certain bands are discussed. Three new bands are recorded.

GEORGE GLOCKLER

Band spectrum of aluminum hydride. E. BENGTSSON. Univ. Upsala. *Z. Physik* 51, 889-94(1928).—New Al-H Bands are found in the ultra-violet and the bands

λ 2229 and 2254 are studied. An energy diagram is given. Certain electron levels are found and several consts. of the mol. are given. GEORGE GLOCKLER

Raman effect of aqueous solutions and the degree of polarization of Raman lines. A. CARRELLI, P. PRINGSHEIM AND B. ROSEN. Univ. Berlin. *Z. Physik* 51, 511-19(1928).—Raman spectra of pure H_2O and solns. of HNO_3 , $NaNO_3$, $NaNO_2$, NH_4NO_3 and NH_3 obtained with the Hg arc are studied and compared with infra-red frequency spectra of the substances. The infra-red frequencies are due to vibrations within a grouping (such as NO_3 for instance) and the residual-ray frequencies have so far not been found. So for instance it is found that NaCl and HCl do not show displaced lines. It is also found that apparently optically inactive vibrations (not found in the infra-red) show up as displaced Raman lines. The degree of polarization of Raman lines is a complex function of the scattering process of the individual case. G. G.

The influence of the disaggregation upon the specific fluorescence of complex natural products. HANS PRINGSHEIM AND OTTO GERNGROSS. Tech. Hochschule, Berlin. *Ber.* 61B, 2009-11(1928).—Many inorg. materials, also cellulose and proteins and their derivs., show a strong specific rotation. In this work the visible rays were filtered out and a Hanauer Analytical Quartz lamp was used, which supplies a monochromatic light wave 360μ long. This study included 7 different polysaccharides and their disaggregation products and 7 different solns. of gelatin. The increase in fluorescence was in direct ratio to the increased disaggregation products. The % concn. of gelatin was 24, the pH 5.05 for 5 solns. The solns. were heated in sealed glass tubes from 336 to 8 hrs. and at varying temps. The fluorescence from the 10 % gelatin soln. heated 11 hrs at 120° was greatest. In both, high temp. and long boiling yielded the greatest fluorescence. The 7 polysaccharides used were lichenin, cellulose, glycogen, amylopectin, potato starch, inulin, and inulin acetate. The last three showed fluorescence; the fluorescence of the disaggregation products was intensified three-fold. G. W. M.

The cause of luminescence of phosphorus. A. PETRIKALN. Univ. Riga. *Z. Physik* 51, 395-409(1928); cf. *C. A.* 22, 1912.—In order to det. the carrier of the luminescence of P oxidation, the emission and absorption spectra of P_2O_3 and P_2O_5 were studied. P_2O_3 when excited by electron impact in the gas phase shows only the spectrum of O_2 , which gas is liberated during the decompn. of the P_2O_3 . P_2O_5 shows no absorption in the ultra-violet (to about λ 2100); its emission spectrum is located in the Schumann region. *The spectrum of P_2O_5 vapor under electron bombardment consists of a band spectrum which is completely identical with the spectrum of P luminescence.* P_2O_5 shows a continuous spectrum in the visible and a band spectrum consisting of 2 band systems called A and B. The longer-wave-length system A could be partially analyzed and the shorter-wave-length system B could be completely analyzed and a term diagram established. It is surmised that the continuous spectrum belongs to solid P_2O_5 . The conditions of excitation of P_2O_5 during luminescence of P are discussed. G. G.

Quantum yield of the action of x-rays on silver bromide. J. EGGERT AND W. NODDACK. *Z. Physik* 51, 796-804(1928).—Each absorbed x-ray quantum liberates about 1000 Ag atoms and causes thereby the development of a grain. This relation is shown for certain films and plates. A difference between their expts. and the ones of Eggert and Noddack (*C. A.* 21, 3562) and March (*C. A.* 22, 2113) is discussed.

GEORGE GLOCKLER

GROTRIAN, W.: **Graphische Darstellung der Spektren von Atomen und Ionen mit ein, zwei und drei Valenzelektronen.** Tl. II. Berlin: Julius Springer. 168 pp. R. M. 34; bound, R. M. 36.40. Cf. *C. A.* 22, 4383.

SEELIGER, RUDOLPH: **Physik der Gasentladungen.** Leipzig: Johann Ambrosius Barth 423 pp. R. M. 22; bound, R. M. 24. Reviewed in *Phys. Rev.* 32, 840(1928).

Apparatus for treating a liquid with emanations or radioactive gas. ADOLPHE LEPAPE and EUGÈNE LEVOUX. *Fr.* 637,096, July 5, 1927.

4—ELECTROCHEMISTRY

COLIN G. FINK

Industrial electric heating. ALEX DOW. *Elec. World* 92, 1189-91(1928).—An analysis. Research in mfg. processes and technic must precede application of elec. heat. C. G. F.

Design and construction of an electric furnace. A. TENIVELLA. *Met. ital.* 20, 381 8(1928).—Detailed calcns. are shown for size of electrodes, power consumption,

thermal efficiency, as well as the size of a three-phase, carbon-arc, basic furnace for handling 5 to 10 tons of pig iron per charge.

Commercial cells for fused electrolytes. P. DROSSBACH. *Metall. Ers.* 25, 437-9(1928).—In the author's equation: $E = \frac{e}{\gamma} + \frac{e}{\gamma - \frac{c}{2}} = \frac{e}{\gamma} + \frac{e}{\delta c \left(\gamma - \frac{c}{2} \right)}$, $E =$

the energy required for the electrolysis, e = the decompn. voltage, γ = the quantity of metal deposited in unit time, c = the metal which goes back into the melt during the same unit time, i = amperes, and w = the cell resistance. In this c may be detd. as a function of the current and the surface, e is known or may be calcd., and the cond. of the fused electrolyte is fixed. The heat balance is formulated mathematically. J. B.

Fundamental principles of commercial zinc electrolysis, current requirements and composition of electrolyte. P. RÖNTGEN AND H. HÖGEL. *Tech. Hochschule, Aachen. Metall. Ers.* 25, 12, 291-8, 319-27(1928).—The effects of the Zn and H_2SO_4 concns. and of the c. d. on the quality and yield of the Zn deposit were studied. The soly. of $ZnSO_4$ in varying H_2SO_4 concns. was detd. At 46.50% H_2SO_4 there is a sharp decrease in the soly. of $ZnSO_4$. H_2O of crystallization or hydration is removed and $ZnSO_4 \cdot 7H_2O$ forms $ZnSO_4 \cdot H_2O$. Sheet-Pb anodes and Al cathodes, in electrolytes contg. 0, 10, 20, or 40% H_2SO_4 and a 2, 5 or 8% Zn content at 250, 750, 1250 or 3000 amp./sq. m. were used in the electrolytic expts. Glue up to 0.005% does not affect the Zn deposit; 0.005-0.05% glue gives a metallic deposit, while with further addn. it increases in brittleness and the yield decreases until upon the addn. of 0.5% no Zn deposit is obtained. Upon electrolysis of neutral solns. treeing of the Zn occurs. Mn affects the electrolysis only when in presence of PbO_2 (anode). The bath voltage decreases with increasing H_2SO_4 to 20%, and remains const. at higher concns. In solns. contg. up to 6-7% H_2SO_4 , the voltage decreases with increasing Zn concn. and above this acid concn. increases with increasing Zn concn. The current efficiency increases rapidly in 2% Zn soln. with both acid concn. and c. d. With increasing Zn concn. the difference in the yields decreases at varying c. ds., the greatest difference between 250 and 3000 amp./sq. m. being 16% in 2% Zn soln. and 6% in 5% soln. In 8% Zn soln. the yield is nearly const. at all c. ds. except at 250 amp./sq. m., at which it decreases strongly with the higher H_2SO_4 concns. Up to 18% H_2SO_4 in solns. with 8% Zn the yield decreases with increasing c. d., above which it increases. In neutral soln. with 8% Zn the deposit is metallic at c. ds. up to 2000 amp./sq. m., with 5% Zn up to 750 amp./sq. m., and with 2% Zn up to 250 amp./sq. m. Above these c. ds. the deposit is black and spongy. As the acid content increases up to 20% the deposit becomes more metallic. Above this concn. further addn. of H_2SO_4 serves only to dissolve the deposited Zn. For a given acid concn. the metallic character of the deposit increases with increasing Zn. In 2% Zn soln. the min. power required for the electrolysis is at 13-14% H_2SO_4 , 2.9 kw. hrs. being consumed in the deposition of 1 kg. Zn at 250 amp./sq. m. and 5.5 kw. hrs. at 3000 amp./sq. m. In both 5 and 8% Zn solns. it is the same, being min. at 14-20% H_2SO_4 (depending on the c. d.); for the deposition of 1 kg. Zn the min. consumption at 250 amp./sq. m. is 2.7 kw. hrs., and at 3000 amp./sq. m. is 4.7 kw. hrs. J. BALOZIAN

Bauxite and aluminum in 1927. JAMES M. HILL. *Bur. of Mines, Mineral Resources of the U. S. 1927, Pt. I, 7-24* (preprint No. 2, published October 24, 1928).

Pyrochemical Daniell cells. RICHARD LORENZ AND FRITZ MICHAEL. *Univ. Frankfurt a. M. Z. physik. Chem. Abt. A*, 137, 1-17(1928); cf. *C. A.* 21, 2215.—The voltages of cells composed of metals in contact with their molten chlorides were measured over the temp. range 350-720°. The liquid junctions were either 1 of the molten chlorides or a molten eutectic of KCl - $LiCl$ or KCl - $NaCl$. The e. m. fs. in milliv. for 1 temp. and the temp. coeff., dE/dT , (second figure) follow: $Sn/SnCl_2/KCl + LiCl/TiCl/Tl$, $E_{100} = 367$, 0.15; $Sn/SnCl_2/TiCl/Tl$, $E_{100} = 403$, 0.45; $Pb/PbCl_2/TiCl/Tl$, $E_{100} = 365$, 0.39; $Zn/ZnCl_2/SnCl_2/Sn$, $E_{100} = 306$, 0.1; $Zn/ZnCl_2/CdCl_2/Cd$, $E_{100} = 148$, -0.13; $Zn/ZnCl_2/PbCl_2/Pb$, $E_{100} = 276$, -0.095; $Zn/ZnCl_2/TiCl/Tl$, $E_{100} = 110$, 0.48; $Mg/MgCl_2/PbCl_2/Pb$, $E_{720} = 1078$, 1.075; $Mg/MgCl_2/KCl + NaCl/CdCl_2/Cd$, $E_{720} = 964$, 1.07; $Mg/MgCl_2/TiCl/Tl$, $E_{720} = 530$, -0.43; $Mg/MgCl_2/ZnCl_2/Zn$, $E_{720} = 759$, -0.73. A method for the prepn. of pure anhyd. $ZnCl_2$ and the detn. of its melting pt. is given also. H. F. JOHNSTONE

Corrosion and residual currents (TÖDT) 9. Corrosion at discontinuities in metallic protective coatings. II. Different methods of applying a Zn coating (EVANS) 9. Electrolytic reduction of nitrosoantipyrine (GIORDANI) 10. Coking pitch [for making

electrodes for electric furnaces] (U. S. pat. 1,694,800) 21. Oil by low-temperature distillation and hydrogenation (Fr. pat. 636,609) 21. Thermometer for measuring temperatures of electrical apparatus (Brit. pat. 288,735) 1.

Electric batteries. EUGÈNE FOURNIER. Fr. 636,664, Oct. 21, 1926. The pos. electrode is hollow with its internal surface in contact with the air while its external walls are immersed in the electrolyte.

Electric batteries. M. VAN KONINGSVELD AND EVER READY CO. (GREAT BRITAIN), LTD. Brit. 289,324, Sept. 8, 1927. Structural features.

Reversible electric battery. FREDERICK W. HOCHSTETTER and WM. BROAD. U. S. 1,693,385, Nov. 27. Structural features.

High-tension electric battery assembly. BERLINER BATTERIE-FABRIK GES. Brit. 288,597, April 13, 1927. Structural features.

Dry-cell electric batteries. LESLIE G. JENNESS. U. S. 1,694,919, Dec. 11. In producing "bobbins" of dry-cell batteries, substances such as $Al_2(SO_4)_3$ and $CaCl_2$ are added which will form a ppt. giving hardness to the bobbin.

Dry batteries. GUSTAVE ENGISCHE. Fr. 639,872, Aug. 19, 1927. Polarization is prevented by placing an insulation material such as ozocerite between the C electrode and the fabric surrounding the polarizing material.

Storage battery. CLAUDIUS BAULT. Fr. 639,749, Jan. 31, 1927. The pos. electrode is of PbO_2 , the neg. of Sn, the latter being disposed at the bottom of the tank below the former. A screen partially seps. the 2 electrodes and divides the electrolyte into unequal vols. The charge is preserved indefinitely on open circuit.

Storage battery. DEAN W. DAVIS (to Albert L. New). U. S. 1,694,530, Dec. 11. A battery contg. an electrolyte such as dil. H_2SO_4 from which gases may be evolved is provided with a body of catalytic material such as Pt adapted for promoting combination of the gases and so placed that a portion of the catalyst at least will be unsubmerged in any position of the battery. Various structural details are described.

Storage batteries. CHARLES JEAN VICTOR FÉRY. Fr. 637,152, Oct. 30, 1926. The neg. plates have active C disseminated through them to render them porous and of high cond. at a sufficient temp.

Storage battery. JOHN G. JACKSON. U. S. 1,694,856, Dec. 11. Structural features.

Storage battery. THOMAS E. MCCARTY and HAROLD E. SALISBURY. U. S. 1,692,217, Nov. 20. Structural features.

Storage battery. EDWARD W. SMITH. U. S. 1,692,316, Nov. 20. Structural features.

Storage batteries. SIDNEY J. WILLIAMS. Fr. 639,513, Aug. 13, 1927. The oxide of Pb is made in hard blocks, placed in a mold and molten Pb is run in to form the plates.

Zinc-lead storage battery. KOLOMAN NÉMETH and ALBERT SZANTO. Fr. 636,806, June 29, 1927. The construction of a cathode and its support is specified.

Separators for storage batteries. SOC. ANON. DES ACCUMULATEURS MONOPLAQUE. Brit. 288,959, April 16, 1927. Structural features.

Electric system for indicating the liquid level in electric batteries. IRLAND R. WELLS. U. S. 1,694,609, Dec. 11.

Electric system for indicating the electrolyte-level in storage batteries. THOMAS MCCARTY. U. S. 1,694,687, Dec. 11.

Preventing overcharge of storage batteries connected to alternating-current chargers while supplying a load. SIEMENS-SCHUCKERTWERKE A.-G. Brit. 288,249, April 5, 1927. The resistance of a dry metallic rectifier supplying the charging current is so chosen that the rise of battery voltage reduces the charging current to a small amount at the end of the charge.

Photoelectric cells. G. R. STILWELL (to Electrical Research Products, Inc.). Brit. 288,539, April 6, 1927. Cells which may be of comparatively large size have a cathode of light-sensitive material such as K on the inner surface of a closed vessel, and an internal member (such as a reentrant tube in a vessel of Pyrex glass) which carries an anode and is adapted to be heated by external means to assist the formation of the cathode during manuf. Various details of manuf. and structure are described.

Electric resistances. H. A. JONES (to British Thomson-Houston Co., Ltd.). Brit. 289,030, April 20, 1927. A ballast resistance of the type having a wire in an enclosure contg. a gas such as H or He at a low pressure is provided with 2 or more wires of different materials such as Fe and Ni, connected in series, so that the temp. ranges over which the 2 wires have a ballast action continue each other.

Electric resistance heater units. HOWARD S. LEE (to Jasper Marsh). U. S. 1,694,600, Dec. 11. Structural features.

Electric discharge devices. A. LEDERER. Brit. 288,561, April 12, 1927. An electron-emitting wire or ribbon is formed of an alloy or compd. of more than 2% Th with one or more metals of the Pt group, preferably Os, to which highly refractory metals such as W may be added. Details are given of the manuf. of filaments by squirting an oxide-contg. mixt. and then heating and reducing the product and of coating W cores electrolytically or otherwise.

Copper oxide rectifier plates. SIEMENS-SCHUCKERTWERKE A.-G. and E. DUHME. Brit. 288,499, Oct. 28, 1927. The oxide coating of Cu plates of rectifiers is produced by heating the plates to above 1040° (suitably to 1053–1060°) and plunging them into warm water (which may be at a temp. of 40–60°).

Electrodeposition of nickel. SOC. ANON. LE NICKEL. Brit. 288,605, April 13, 1927. Ni is deposited from a Ni chloride soln. in a diaphragm cell and the spent catholyte is passed to the anode chamber which contains anodes of impure Ni. The liquid from the anode chamber is treated with Ni(OH)₂ in a sep. vessel to ppt. Fe, Co, As and other impurities and returned to the cathode chamber at a temp. above normal. The electrolyte is maintained at a d. of 1.2–1.3 corresponding to 150 kg. of Ni per cu. meter. Ni(OH)₂ and air may be used instead of Ni(OH)₂. Crude alloys before formation into anodes are refined by converting the greater part of the Fe into slag, to obtain a Ni content of 90–95%. Anodes may be produced from the oxidized ores of New Caledonia. Various details and modifications are described.

Cadmium plating. ARTHUR W. YOUNG and MAURICE E. LOUTH (to Udylyte Process Co.). U. S. 1,692,240, Nov. 20. Electroplating of Cd is effected from a cyanide bath to which is added a cereal ext. such as an ext. from whole wheat and bran and caramelized sugar, which serve to facilitate production of uniform, bright, coherent deposits.

Electrolysis of zinc sulfate solutions. URLYN C. TAINTON. Can. 285,310, Dec. 4, 1928. In the electrolysis of ZnSO₄ solns. contg. Mn, the use of an anode composed mainly of Pb and contg. substantial proportions of Ag and As improves the quality of the Zn deposited at the cathode and of the MnO₂ deposited at the anode. Cf. C. A. 22, 2890.

Electrolytic apparatus for deposition of copper, etc. GUNNAR ROSENQVIST. U. S. reissue 17,141, Nov. 20. See original pat. 1,594,509 (C. A. 20, 3136).

Electrolytic apparatus for treating anode plates in vertical position. FOSTER C. NIXON. U. S. 1,692,757, Nov. 20. Structural features.

Electrolytic manufacture of compounds containing active oxygen. I. G. FARBEN-IND. A.-G. Swiss 126,402, Mar. 21, 1927. The manuf. is conducted so that such compds. are formed simultaneously in the anode and cathode compartments. In the example, (NH₄)₂SO₄ soln. to which H₂SO₄ has been added is introduced into the anode compartment of a cell having earthenware diaphragms, and 0.5% H₂SO₄ into the cathode compartment, through which a brisk stream of O is passed. The anode is Pt, the cathode is amalgamated Au, and the c. d. is 20 amp./sq. dm. at the anode and 0.4 amp./sq. dm. at the cathode, the voltage being 3.7. (NH₄)₂S₂O₈ is obtained in the anode compartment, and H₂O₂ in the cathode compartment.

Aluminum. DEUTSCHE VERSUCHSANSTALT FÜR LUFTFAHRT E. V. Fr. 639,173, Aug. 8, 1927. See Brit. 276,911 (C. A. 22, 2331).

Beryllium. SIEMENS & HALSKE A.-G. (Hellmut Fischer, inventor). Ger. 467,247, Oct. 8, 1926. See Brit. 278,723 (C. A. 22, 2517).

Perborates. HENKEL & CIE. Swiss, 126,527, Mar. 14, 1927. Addn. to Swiss 120,794. The soln. employed in the electrolytic prepn. of NaBO₃ from soda and borax is regenerated by adding a silica soln. under excess pressure, boiling and allowing the gel to set.

Treatment of mixed sulfide ores. HORACE FREEMAN (to The Honorary Advisory Council for Scientific and Industrial Research in Canada). Can. 284,442, Oct. 30, 1928. Mixed sulfide ores are heated in a furnace with Na₂S, thereby producing a fused mixt. of sulfides and a slag; the slag is sepd. from the fused mixt., and a d. c. passed through the fused mixt. thereby sepg. the metals and the S, which is distd. from the furnace, and the metals are tapped off.

Apparatus for electric precipitation of smoke. COMPAGNIE DES MINES D'OSTRICOURT. Brit. 288,208, April 4, 1927.

Removing dust from gases. SIEMENS-SCHUCKERTWERKE AKT.-GES. (Carl Hahn, inventor). Ger. 467,975, Oct. 4, 1924. In an app. for electrodeposition of dust from gases, plates are arranged at intervals in the gas stream below the electrodes and are

combined with sloping tubes or channels arranged so that dust flows from the plates down the tubes and the gas passes without hindrance between them. Cf. C. A. 22, 2045.

Electric condenser. ROBERT BOSCH A.-G. Fr. 636,969, July 4, 1927. Condensers are protected against moisture by a layer of gum lac and a layer of "bakelite."

Device for shaking the electrodes of electrical gas purifiers. SIEMENS SCHUCKERT-WERKE A.-G. Ger. 467,410, Oct. 1, 1926. Constructional details.

Oxidized cathodes. SÜDDEUTSCHE TELEFON-APPARATE-, KABEL- UND DRAHTWERKE A.-G. Ger. 467,323, June 1, 1922. A pure metallic coating is deposited on the cathode electrolytically, and then oxidized by treatment with acid.

Device for regulating the area of the focal spot of a glowing-cathode Röntgen tube. C. H. F. MÜLLER A.-G. Ger. 468,271, Feb. 23, 1926.

Thermionic cathodes. L. DE FOREST (to de Forest Phonoflms, Ltd). Brit. 289,424, April 27, 1927. Parallel filaments are bound together by transverse elements which may be formed of Pt, Mo or nichrome and may be interwoven with the filaments to form a mesh, and a coating of electron-emitting material such as oxides of the rare earths or of alk. earth metals is used.

Coating filaments. COMPAGNIE DES LAMPES. Fr. 639,785, June 4, 1927. An app. is described for coating filaments by projecting them upwardly into a closed space by a jet of air contg. the coating substance.

Coating wax surfaces with graphite. W. McLAUGHLIN and H. KNOWLES. Brit. 288,709, Jan. 11, 1927. Wax surfaces such as those to be used in prepg. electrotypes are coated with graphite in the form of an aq. colloidal suspension which may be applied by spraying and may contain a protective colloid such as tannic acid or a deflocculating agent such as Na silicate, glycerol or eucalyptus oil. An alkali such as NaOH also may be used. "Aquadag" also is suitable. An app. is described.

Rust-resisting coatings. CHRISTIAN J. WERNLUND (to The Roessler and Hasslacher Chemical Co.). Can. 284,269, Oct. 23, 1928. Steel articles are first cleaned and then put in hot alk. cleaning soln. contg. 1 to 5% NaOH. The cleaned article is rinsed in water and suspended from the cathode rod into a Cd-Hg alloy plating soln. contg. water 1 l. (1 gal.), NaCN 60 g. (8 oz.), NaOH 15 g. (2 oz.), Cd(OH)₂ 15 g. (2 oz.), HgO 0.1 g. (0.0125 oz.). Anodes of Cd are used, the temp. is 25° (77° F.), e. m. f. 3-6 v., c. d. 15 amp. per sq. ft. An av. analysis of the coating produced is Cd 98-99% and Hg 1-2%.

Electric furnace. WESTINGHOUSE ELECTRIC & MANUF. CO. Swiss 126,670, July 9, 1927.

Electric furnace of the tilting type. CHARLES B. FOLEY (to Charles B. Foley, Inc.). U. S. 1,694,536, Dec. 11. A gas inlet extends through the side walls of the furnace and is so located that during normal operation the tapping device is above the surface of the melt while the gas inlet is below the surface of the melt. The furnace is suitable for melting and refining Cu, etc.

Electric furnace for heat or chemical operations. HENRI GEORGE. Fr. 637,024, Oct. 27, 1926. The furnace contains an intermediate mass composed of a conducting substance and liquid which receives the elec. energy either directly from electrodes or by induction or by forming one or more arcs.

Electric furnace for heating liquid steel and other metals. IVAR RENNERFELT. Fr. 636,918, July 2, 1927.

Electric furnace (with a bottom mounted for lowering and raising) for heat treatment of metal articles. HARRY O. BREAKER. U. S. 1,694,964, Dec. 11.

Electric furnace for annealing copper wire, etc. FRANK T. COPE (to Electrical Furnace Co.). U. S. 1,694,684, Dec. 11.

Induction furnace. SIEMENS & HALSKE A.-G. Fr. 636,879, July 1, 1927.

Electric induction furnace. GUSTAVE M. RIBAUD. Fr. 636,844, June 30, 1927.

Electric induction furnaces. EDWIN F. NORTHRUP (to Ajax Electrothermic Corp.). U. S. 1,694,791-2, Dec. 11. Structural features.

Electric resistance furnaces adapted for heat treatment of metal articles. JACOB WENTZ (to The Strong, Carlisle & Hammond Co.). U. S. 1,692,478-9, Nov. 20.

Electric resistance furnace suitable for heat-treating various articles. ORA A. COLBY (to Westinghouse Elec. & Mfg. Co.). U. S. 1,693,370, Nov. 27. Structural features.

Electric resistance heater. S. THOMPSON. Brit. 289,226, March 16, 1927. Structural features.

Electric heater. "I. C. E." (Industria Costruzione Elettrotermiche). Fr. 639,679, Aug. 19, 1927. An elec. heater for heating the interior of casks, etc., to be filled, emptied or sterilized by heat is described.

Automatic regulators for electric furnaces. COMPAGNIE DES FORGES ET ACIERS DE LA MARINE ET D'HOMECOURT. Fr. 639,198, Jan. 14, 1927.

System for regulating current supply to electric furnaces. D. F. CAMPBELL, G. E. TAYLOR and ELECTRIC FURNACE CO., LTD. Brit. 289,114, Dec. 20, 1926.

Electrical apparatus for regulating air and fuel supply to steam generator furnaces. SIEMENS & HALSKE A.-G. Brit. 289,079, April 23, 1927. The steam pressure serves to actuate the control devices through the action of a Wheatstone bridge.

Electric energy. NICOLAS BOGENSKY. Fr. 639,363, July 28, 1927. Liquids boiling below 100° are used when vaporized to drive a motor for the production of elec. energy and condensed again within a closed container. CHCl_3 , Me_2O , Et_2O , EtCl , liquid NH_3 and liquid CO_2 may be used.

Molded carbon articles for electrical uses. M. OSWALD. Brit. 289,680, July 27, 1927. Mech. features of producing furnace electrodes, metal-coated articles, etc.

Thermal cut-out for electric circuits. MAURITS J. SANDIN (to Westinghouse Elec. & Mfg. Co.). U. S. 1,693,404, Nov. 27.

Electric system for operating signals or control devices, etc. RAY E. HALL (to Hall Research Corp.). U. S. 1,694,653, Dec. 11. A cell contg. a polyiodide may be used.

Leading-in conductor. SAMUEL RUBEN. U. S. 1,692,998, Nov. 27. A leading-in conductor for use with glass bulbs or like devices is formed of a suitable metal such as Cu carrying a layer of Cu_2O .

Electrically heated agitating device for stirring liquids. AAGE JENSEN. U. S. 1,692,270, Nov. 20.

Metal tubing. EDWARD R. BERRY (to General Electric Co.). U. S. 1,694,962, Dec. 11. Metal such as Cu is electrodeposited on a silica support and the latter is removed after heating sufficiently to cause sepn. of the silica from the metal by differences in thermal expansion.

Mercury-vapor lamp. WILHELM ULBRICH. U. S. 1,694,836, Dec. 11. Structural features.

Mercury-vapor lamps. DEUTSCH-ENGLISCH QUARZSCHMELZE G. Swiss 126,672, Dec. 4, 1926.

Alloys for electrodes of mercury-vapor lamps, etc. COOPER HEWITT ELECTRIC CO. Brit. 288,737, Jan. 17, 1927. Hg is alloyed or combined with a metal or metalloid altering the angle of contact of the Hg with the wall of the container when cold and non-operative, to facilitate starting the lamp. So small a quantity of added material is used that it does not permanently leave the Hg nor blacken the container. Cu 0.01% or a similar mol. proportion of Ni or Cr may be added or Al 0.01 g. may be added to each oz. of Hg.

Mercury-vapor rectifiers. A.-G. BROWN, BOVERIE & CIE. Ger. 457,932, Feb. 20, 1923. The space between an annular cathode insulator and an inserted cylinder is closed at the top.

Apparatus for concentrating light from a "quartz burner," etc., for chemical or other purposes. QUARZLAMPEN-GES. Brit. 288,613, April 13, 1927.

Machines for forming and inserting into glass rods wire supports for incandescent lamp filaments. NAAMLOOZE VENNOOTSCHAP PHILIPS' GLOEILAMPENFABRIEKEN (Richard Shepherd, inventor). Ger. 467,895, June 7, 1925.

Use of getters in making incandescent lamps. C. SEVERIN (to British Thomson-Houston Co., Ltd.). Brit. 289,478, April 29, 1927. Halogen compds. such as cryolite or other suitable double fluoride are applied as "getters" to the filaments of gas-filled lamps such as are described in Brit. 10,918 of 1913 and flashing is then effected with a gradually increasing voltage, which may be increased in about 5 steps from about one-fifth of the normal to the normal voltage.

Protecting brass caps of incandescent electric lamps from oxidation. PATENT-TREUHAND-GES. FÜR ELEKTRISCHE GLÜHLAMPEN (to General Electric Co., Ltd.). Brit. 289,440, April 27, 1927. Brass caps or the like are heated in a reducing atm. between the process of cleaning by pickling and the setting of the cement, which enables the latter operation to be carried out at higher temps. Brit. 289,441 specifies pickling and then heating in an atm. comprising N 80 and H 20%. The articles may be heated for a short time to 500-600°.

Luminescent tubes. PAUL F. J. LEBRUN. Can. 248,156, Oct. 23, 1928. Luminescent tubes are evacuated and then filled with a scavenging gas (as N, a mixt. of Ne and He or Ne alone) and a high-tension current of the order of 10,000 v. is passed through the scavenging gases, for the purpose of disengaging all impurities, including gases, from the surface of the tube, and removing all traces of H and N from the interior of

the tube, the operation being observed with a spectroscope. The tube is finally exhausted and then filled with a pure gas as He, Ne or other gas of a character to produce luminescence of the desired color when a current is passed through it in the usual way.

Electric arc lamp electrodes. COMPAGNIE LORRAINE DE CHARBONS POUR L'ELECTRICITE. Brit. 289,042, April 21, 1927. Arc lamp carbons contg. rare earth metals contain also small quantities of Si or its carbides or B or other elements of the same groups such as Zr or V or their compds. These added materials may form the core of the carbon, or, in a modification, the Si or B is added to the shell of the carbon and the rare earth metal to the core.

Lamp filaments. SOC. FRANÇAISE DES LAMPES À INCANDESCENCE LUXOR. Brit. 288,557, April 11, 1927. A fine W filament may be wound on a coarser filament as a core, or helices may be wound on brass mandrels which are then dissolved out or upon permanent asbestos mandrels. Various details and modifications are described.

5—PHOTOGRAPHY

C. E. K. MEES

The processes of color photography. I. Early history. C. E. K. MEES. Eastman Kodak Co. *J. Chem. Education* 5, 1385-91(1928). E. H.

Na sulfide [for use in preparing photographic toning solution] (Brit. pat. 289,354)
18. Cleaning gelatinous surfaces (U. S. pat. 1,692,358) 18.

Photography. I. G. FARBENIND. A.-G. (Emil Mauerhoff, inventor). Ger. 468,171, Oct. 15, 1925. Addn. to Ger. 464,450. Animal or vegetable proteins, broken down by treatment with acids, are added to the Ag salt emulsion. Cf. C. A. 23, 348.

Photography. GUSTAV KÖGEL. Ger. 468,155, July 13, 1926. Addn. to Ger. 467,089. Light-sensitive layers are prepd. by using colorless light-sensitive org. substances other than ketones. Thus, a soln. of flavindulin O II is mixed with gelatin and chrome alum soln., to form the sensitive layer and is developed with phenylenediamine and CO_2H_2 . Cf. C. A. 23, 349.

Photographic films. TECHNICOLOR MOTION PICTURE CORP. Ger. 467,817, April 24, 1927. See Fr. 633,306 (C. A. 22, 3361).

Photographic films. PETER WIELFF and BRUNO WENDT (to I. G. Farbenind. A.-G.). Can. 284,234, Oct. 23, 1928. Fogging is prevented in the manuf. of light-sensitive silver halide emulsions by incorporating a compd. of the imidazole series. E. g., a sensitive Ag halide emulsion manufd. according to one of the known processes with a certain sort of gelatin showed considerable fog and little sensitivity. When there was added to the gelatin before or during the making of the emulsion or when the emulsion is poured on the support of the sensitive layer, 0.1 to 0.4% of nitrobenzimidazole a clear and highly sensitive emulsion is obtained.

Photographic films. I. G. FARBENIND A.-G. (Hermann Lummerzheim and Eduard Schnitzler, inventors). Ger. 467,780, Mar. 17, 1927. See Fr. 639,330, below.

Photographic films. I. G. FARBENIND. A.-G. Fr. 639,330, Aug. 11, 1927. Letters or figures are printed on films during their manuf. by a soln. of a dye in a non-volatile solvent such as glycol acetate and on the reverse side to the sensitive layer.

Protective layers on photographic films. MAX HAGEDORN (to I. G. Farbenind. A.-G.). Can. 284,233, Oct. 23, 1928. A protective layer on photographic films made of cellulose derivs. sol. in org. solvents contains several different radicals as substituents, particularly radicals of more than one acid or besides ether groups radicals of acids. Such compds. may be obtained from cellulose derivs. having still esterifiable hydroxyl groups, particularly from mono-esters, di-esters, mono-ethers, di-ethers or mixts. of such compds. swollen or dissolved in org. solvents by treating them, preferably in the presence of a substance promoting the esterification, with functional derivs. of inorg. or org. acids, for instance their esters, chlorides, amides, anhydrides or mixed anhydrides.

Film for color photography. ARON HAMBURGER. U. S. 1,695,045, Dec. 11. A transparent support carries on one side a single film continuous tone positive image corresponding substantially to yellow and red sensations and on the other a similar image corresponding to green and blue-green sensations.

Coloring images on photographic films. GEOFFREY WHEELER. U. S. 1,693,500, Nov. 27. The image is bleached and treated with a reducing agent such as NaHSO_3 .

and is then dyed with a dye such as basic magenta or methylene blue 2B and toned with TiCl_4 .

Colored photographic prints. E. H. FARMER. Brit. 289,411, April 26, 1927. A photographic underprint (which may be formed on paper or celluloid sensitized with a thin coating of gelatin and AgCl or AgBr and developed with metol-hydroquinone, and may be a "weak print") is painted in different parts with an excess of different colored pigments with a gelatinous vehicle, the pigmented vehicle is subjected to a tanning agent (which may be a soln. formed from KBr , $\text{K}_2\text{Cr}_2\text{O}_7$, $\text{K}_2\text{FeC}_6\text{N}_6$, HOAc , alc. and water) and the surplus unhardened vehicle is dissolved away to leave a selectively colored image. Various details are given.

Photographic developers. I. G. FARBENIND. A.-G. (Gustav Reddelien and Werner Müller, inventors). Ger. 467,818, Nov. 22, 1927. Addn. to 454,839. The *N*-mono hydroxyethyl derivs. of the homologs or substitution products of 4-amino-1-hydroxybenzenes are used as photographic developers. Examples of developing solns. contg the sulfate of 4-hydroxyethylamino-2-chloro-1-hydroxybenzene, the oxalate of 4-hydroxyethylamino-3-methyl-1-hydroxybenzene and 4-hydroxyethylamino-1-hydroxybenzene-2-carboxylic acid are given. Cf. C. A. 23, 49.

Photographic sensitive materials. I. G. FARBENIND. A.-G. Brit. 289,386, April 25, 1927. Salts of substitution products (such as those of halogen, hydroxy or sulfo substitution products) of 1,2-naphthoquinone-4-disulfonic acid are used in sensitive layers instead of salts of the unsubstituted acid as described in Brit. 286,233 (C. A. 23, 49) and Brit. 286,736 (C. A. 23, 349).

Light-sensitive materials. THE WADSWORTH WATCH CASE CO. Swiss 126,216, Feb. 10, 1926. See Brit. 265,769 (C. A. 22, 548).

Light-sensitive materials. THE WADSWORTH WATCH CASE CO. Swiss 126,217, Feb. 10, 1926. Instead of the resinous products used in Swiss 126,216 (above) there is used a resinous product derived from an aldehyde, e. g., a formaldehyde- β -naphthylamine condensation product or a benzaldehyde- β -naphthylamine condensation product.

Sensitized papers, etc. VICTOR PLANCHON. Fr. 639,189, Jan. 13, 1927. The blue images obtained on sensitized papers, etc., by Fe salts are converted into a permanent black by passing them into a bath of a Cu salt, e. g., the sulfate and, after washing, into a soln. of Na_2S or liver of S. The process may be completed by coloring with aniline dyes.

Desensitizing agent. I. G. FARBENIND. A.-G. Ger. 468,093, Dec. 12, 1925. Addn. to Ger. 396,402. Desensitizing agents are prepd. by condensing *m*-nitrobenzaldehyde with salts of *p*-alkoxyquinaldine, especially the bromide, chloride or alkylsulfate. Thus, *p*-methoxyquinaldine methobromide and nitrobenzaldehyde are dissolved in alc. Glacial CO_2H_2 and copellidine are added and the whole is heated some hours. On cooling, the condensation product crystallizes out. Other examples are given.

White sheet material for reflecting light in viewing multi-color screen-film pictures. J. H. CHRISTENSEN. Brit. 289,175, Jan. 26, 1927. The white layer used may consist of a cellulose deriv. penetrated by numerous air fissures and mixed with a white pigment such as lead white or Ti oxide, agitated with toluene and then poured upon a support.

6—INORGANIC CHEMISTRY

A. R. MIDDLETON

Preparation of tantalum pentabromide. K. R. KRISHNASWAMI. *Nature* 122, 845(1928).—Br is distd. on to powd. Ta heated to 260–300° in an atm. of N or Ar.

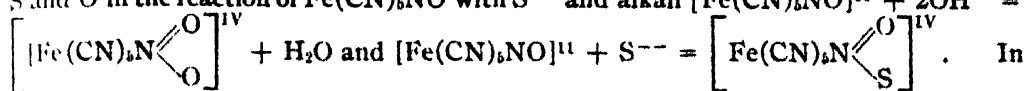
E. J. C

Ammonium polysulfides, hydrogen pentasulfide, and the thiocarbonic acids. HERBERT MILLS AND PERCY LUCOCK ROBINSON. Univ. of Durham. *J. Chem. Soc.* 1928, 2326–32.— $(\text{NH}_4)_2\text{S}_5$ (I) is prepd. by satg. with H_2S , free of O, a soln. of 40 g. of S in 100 cc. of aq. NH_3 (d. 0.88). Yellow crystals deposit on cooling. Increase in the quantity of S gives a non-homogeneous product supposed to be $(\text{NH}_4)_2\text{S}_7$ (II). CS_2 extn. of II leaves a solid with the properties of I. II is a solid soln. of S and I. I upon decompn. yields monosulfide and not the disulfide. I with anhyd. formic acid yields H_2S_5 (III); mineral acids yield products with higher S content. III is a glassy solid at -50° , is a thin, clear yellow oil, $d_{16} 1.67$, and cannot be distd. under reduced pressure. By digesting I and CS_2 and subliming a very pure $(\text{NH}_4)_2\text{CS}_3$ (IV) is obtained; incomplete refluxing leaves a yellow cryst. residue, $(\text{NH}_4)_2\text{CS}_5$ (V). IV and concd. HCl yield a bright red liquid which dried over P_2O_5 shows the following: $d_{16}^{17} 1.47$; f. p. -30.5° , surface tension 48.3 dynes/cm. at 12.5° ; it is slightly sol. in H_2O , org.

solvents, or acids giving yellow solns. which decompose rapidly; it dissolves in acetone with no decompn. even on long standing. Distn. yields H_2S and CS_2 . V and 98% formic acid yield an oil vigorously decompd. by acetone. On distn. CS_2 is obtained, then an oil at 70° , with properties of H_2S_2 . Polysulfides and thiocarbonates only slowly decomp. below -7° .

ARTHUR, FLEISCHER

The reaction between nitroprusside and sulfide of sodium. G. SCAGLIARINI AND P. PRATESI. *Atti accad. Lincei* 8, 75–82(1928).—The reaction between $\text{Na}_2\text{Fe}(\text{CN})_5\text{NO}$ and Na_2S or K_2S has been shown by various investigators to take place in equimolar proportions, giving a product $\text{Na}_2\text{Fe}(\text{CN})_5\text{NO} \cdot \text{Na}_2\text{S}$. S. and P. hold that S is combined directly through N (1) because a deep red though labile compd. has been prepd. by Tasker and Jones (*C. A.* 4, 1023) by action of NOCl_2 and a mercaptan, the formula being undoubtedly $\text{N}=\text{SR}$; (2) because neither ferri- nor ferropentacyanide which differ from nitroprusside only by absence of the NO group, combines with sulfides, so that the missing N atom must be that which holds the S; and (3) because by analogy between S and O in the reaction of $\text{Fe}(\text{CN})_5\text{NO}$ with S^{--} and alkali $[\text{Fe}(\text{CN})_5\text{NO}]^{11} + 2\text{OH}^- =$



both these reactions, electrometric titration reveals a large drop in cond. for equimol. concns. of the 2 reagents.

A. W. CONTIERI

Rotation dispersion and space configuration of complex salts of cobalt and rhodium which contain ethylenediamine and trans-1,2-diaminocyclopentane. F. M. JAEGER AND H. B. BLUMENDAL. Univ. Groningen. *Z. anorg. allgem. Chem.* 175, 161–230 (1928); cf. *C. A.* 22, 3596.—Racemic 1,2-diaminocyclopentane is prepd. according to the following scheme: $\text{CH}_2(\text{CH}_2\text{CN})_2 \rightarrow \text{CH}_2(\text{CH}_2\text{CO}_2\text{H})_2 \rightarrow \text{CH}_2(\text{CH}_2\text{CO}_2\text{Et})_2 \rightarrow$ condensation with $(\text{CO}_2\text{Et})_2$ to di-Et cyclopentanedione dicarboxylate \rightarrow cyclopentanedione dioxime \rightarrow 1,2-diaminocyclopentane. The pure base is a colorless liquid, b. 170° , has a weakly ammoniacal odor, becomes turbid in the air, taking up CO_2 to form a solid white carbonate. The hydrochloride is more sol. than the sulfate, and the picrate can be crystd. from H_2O in long, yellow needles which decompose at 210° . The diacetyl deriv. is used for a study of crystal form; it is monoclinic-prismatic. 1,2-Cyclopentanedi-amine can be split into its optically active antipodes by means of *d*- and *l*-tartaric acid; for the sulfate of the *l*-base $[\alpha]_D = -12^\circ$, for that of the *d*-base $[\alpha]_D = +14^\circ$. The rotation dispersion data are given for the *l*-base. With a wave length of 7002 Å. U. $[\alpha] = -37.67^\circ$, with 4209 Å. U. $[\alpha] = -113.44^\circ$. B. p. is 166° and sp. gr. is 0.9463 at 15° . By the action of the racemic base upon CoCl_2 solns. contg. H_2O_2 , complex Co salts of the hexammine or triethylenediamine type are formed. Thus by action of the diaminocyclopentane upon praseo-diethylenediamine-dichlorocobaltic chloride with exclusion of CO_2 , followed by neutralization with HCl and pptn. with alc., the ppt. can be dissolved in NaI or NaBr soln. to form the correspond-

ing salt, diethylenediamine-trans-diaminocyclopentane cobaltic iodide, $\left\{ \text{Co} \begin{array}{c} (\text{En})_2 \\ (\text{Cptdin}) \end{array} \right\} \text{I}_3$,

or bromide, $\left\{ \text{Co} \begin{array}{c} (\text{En})_2 \\ (\text{Cptdin}) \end{array} \right\} \text{Br}_3 + \text{H}_2\text{O}$. By transposition with Ag salts the nitrate, per-

chlorate and salts of other acids can be prepd. The iodide crystallizes in rhombic pyramidal form, brown-red in color. These can also be split into optical antipodes by *d*- and *l*-tartaric acid. Co and Rh salts of the same rotational direction have the same spatial configuration; the dextrorotatory ions contain only 3 levorotatory, the levorotatory only 3 dextrorotatory mols. of diaminocyclopentane. The entrance of 3 dextrorotatory mols. of the base is incompatible with the dextrorotatory configuration of the ion, just as the entrance of 3 levorotatory mols. of the base is incompatible with a levorotatory configuration of the complex. It is shown that all other theoretically possible substitutions of dextro- and levorotatory mols. of the base in the optically active complexes are not realized, since these unstable groupings decompose as follows: $3\{M(d-d-l)\}X_3 = 2\{M(d-d-d)\}X_3 + \{M(l-l-l)\}X_3$. On the other hand, by the action of *d*- or *l*-diamino-

cyclopentane upon praseo- or violeo- salts of the type $\left\{ \text{Co} \begin{array}{c} (\text{En})_2 \\ \text{Cl}_3 \end{array} \right\} \text{Cl}$, a partially racemic,

optically active compd. is formed which can be split into 2 optically active salts with the formulas: $\left\{ \text{Co} \begin{array}{c} (\text{En})_2 \\ (l\text{-Cptdin}) \end{array} \right\} X_3$ and $\left\{ \text{Co} \begin{array}{c} (\text{En})_2 \\ (d\text{-Cptdin}) \end{array} \right\} X_3$. These are not mirror

images. In the reaction of the original praseo- or violeo-salts, however, upon the racemic base, a racemate is formed which can be split into 2 optically active antipodes by the action of *d*- and *l*-tartaric acid. These have the formulas: $\left\{ \text{Co} \begin{matrix} (\text{En})_2 \\ (l\text{-Cptdin}) \end{matrix} \right\} \text{X}_3$ and

$\left\{ \text{Co} \begin{matrix} (\text{En})_2 \\ (d\text{-Cptdin}) \end{matrix} \right\} \text{X}_3$. It is not possible to introduce 1 mol. of ethylenediamine or 1

mol. of *d*-diaminocyclopentane in salts of the type $\left\{ \text{Co} \begin{matrix} (l\text{-Cptdin})_2 \\ \text{Cl}_2 \end{matrix} \right\} \text{Cl}$, or to substi-

tute a mol. of the *d*- or *l*-base in salts of the type $\left\{ \text{Co} \begin{matrix} (d\text{-Cptdin}) \\ (l\text{-Cptdin}) \end{matrix} \right\} \text{Cl}$ which are prepd.

from the racemic base. Such substitution products quickly decompose in soln. with formation of salts of a highly symmetrical type as follows: $3 \left\{ \text{Co} \begin{matrix} (l\text{-Cptdin})_2 \\ (\text{En}) \end{matrix} \right\} \text{X}_3$ -

$\{ \text{Co}(\text{En})_3 \} \text{X}_3 + 2 \{ \text{Co}(l\text{-Cptdin})_3 \} \text{X}_3$ and $3 \left\{ \text{Co} \begin{matrix} (d\text{-Cptdin}) \\ (l\text{-Cptdin}) \end{matrix} \right\} \text{X}_3 = \{ \text{Co}(d\text{-}d\text{-}d) \} \text{X}_3 +$

$2 \{ \text{Co}(l\text{-}l\text{-}l) \} \text{X}_3$. From the spatial standpoint the contrast between 2 mirror-image-forming mols. is much more marked than between one of these antipodes and a foreign substance such as ethylenediamine. The optically active chlorides, chlorates and perchlorates of Co and Rh salts of the type $\{ \text{Me}(\text{Cptdin})_3 \} \text{X}_3$ all crystallize in the cubic system (pentagonal icositetrahedral). Of the chlorides and nitrates there is also a hydrate with $3\text{H}_2\text{O}$ crystg. in the hexagonal system, and of the perchlorates a rhombic form with $1\text{H}_2\text{O}$. The racemic perchlorate splits into its antipodes by spontaneous crystn., in the Co salt with a min. transformation temp. of -1.6° and in the Rh salt with a min. transformation temp. of 48° . In both cases, the transition from the mixed antipodes to the racemic compd. is accompanied by a hydration or dehydration. The mol. rotation obtained with these optically active complex ions reaches very high values, that given by the tri-diaminocyclopentane salts of Co being about 3 times that given by the analogous triethylenediamine salts at low wave length. The mol. rotation obtained with $\{ \text{Co}(l\text{-Cptdin})_3 \} \text{Cl}_3 + 4\text{H}_2\text{O}$ at 7002 Å. U. is given as $[\text{M}].10^{-2} = +1794^\circ$ and at 4209 Å. U. as $[\text{M}].10^{-2} = +5148^\circ$. In general the rotation obtained with Rh salts is less. Thus for $l\text{-}[\text{Rh}(\text{Cptdin})_3] \text{Cl}_3 + 4\text{H}_2\text{O}$, $[\text{M}].10^{-2}$ at 7002 Å. U. = -1179° and at 4249 Å. U. $[\text{M}].10^{-2} = -4010^\circ$. For Rh salts these values are about 8 times those obtained with analogous triethylenediamine salts at low wave lengths and about 7 times as great at high wave lengths. As the wave length increases, the rotation dispersion falls more steeply with the diaminocyclopentane salts of Rh than with analogous triethylenediamine salts.

H. STOERTZ

Cyanosulfo compounds of molybdenum. I. F. CREPAZ. R. Scuola d'Ingegneria, Padova. *Gazz. chim. ital.* 58, 391-401 (1928).—The formation of derivs. contg. trivalent Mo from MoS_3 and KCN by the method of Heide and Hoffmann (*Z. anorg. allgem. Chem.* 12, 278 (1896)) involves the difficult prepn. of MoS_3 by the method of Péchard (*Compt. rend.* 118, 804). Expts. were therefore directed toward their formation from MoS_3 . Concd. KCN was let stand 1 week with still moist MoS_3 (e. g., 5 g. MoS_3 and 15 g. KCN in 50 cc. water) at ordinary temp., and from the intense green soln. was pptd. by EtOH an oil from which definite compds. could not be crystd. An entirely different method was therefore used. When H_2S was passed through a soln. contg. 25 g. of K_2MoO_4 and 40 g. of KCN in 120 cc. of water, the soln. became successively green-yellow, blue, green and brown-green, while heat was evolved, indicating several successive reactions. Pptn. with EtOH at the various stages yielded different-colored oils from which, however, individual compds. could not be isolated. H_2S passed into a soln. contg. 5 g. of K_2MoO_4 and 10 g. of KCN in 50 cc. of water only to the appearance of a green-blue color, the soln. then let stand 3-4 hrs. (until yellow), H_2S again passed through until green, let stand again until yellow and the process repeated, EtOH added, the oil sepd. and agitated with EtOH until crystd. yields a *K octacyanomolybdate*, $\text{K}_4[\text{Mo}(\text{CN})_8].2\text{H}_2\text{O}$, yellow, showing that the reaction involves reduction from Mo^{VI} to Mo^{IV} . If instead of restoring the yellow color, H_2S is passed in until the soln. is green and EtOH is added, a green oil is pptd. This oil crystd. by the aid of more EtOH gives a mixt. of at least 3 cryst. compds., from which no individual compd. could be isolated in the pure state. The mixt. contained K, Mo and CN, and no S, the salts probably being double cyanides

of K and Mo. A concd. aq. soln. of this mixt. treated with concd. KOH pptd. a violet-red cryst. compd. which, washed with EtOH, showed the following % compn.: K 29.85, Mo 17.94, CN 19.71, O (by oxidation) 3.00, which corresponds closely to $K_4[Mo(OH)_4(CN)_4] \cdot 6H_2O$, and was therefore the compd. described by Hoffmann and Heide (Z. anorg. allgem. Chem. 12, 277). H_2S passed into a soln. contg. 20 g. of MoO_3 and 40 g. of KCN in 200 cc. of water (contg. just sufficient KOH to dissolve the MoO_3), until the soln. is yellow-green, let stand 24 hrs., filtered, the residue washed with water and EtOH until no longer alk., the salt dissolved in water and repptd. by concd. KOH, and the purification repeated yields a compd. of the % compn.: K 30.78–30.94, Mo 24.2–24.35, S 8.03–8.18, N 14.30–14.36, which corresponds closely with $[Mo^S(CN)_4]K_3 \cdot 2H_2O$.

It is light blue, decomp. when heated, and its aq. soln. changes after 1–2 days from blue to violet. In water acidified with H_2SO_4 , it is oxidized by $Fe_2(SO_4)_3$, with sepn. of S on warming. It is also oxidized by ammoniacal AgCl, a study of which reaction confirmed the presence of Mo^{III} in the compd. Application of the method of Brintzinger and Oschatz (C. A. 21, 3577) to the detn. of Mo showed a transition from Mo^{VI} to Mo^V , then to Mo^{IV} and finally to Mo^{III} . To det. the basicity of the compd., cond. measurements were made at various concns., the results of which show that in soln. the mols. are not complex and do not contain a multiple no. of Mo atoms. Slight hydrolytic decompn. probably takes place. The salt originates from a tribasic acid.

C. C. DAVIS

Addition products of hydric acids and salts of heavy metals. III. FRITZ EPHRAIM AND AUGUST SCHÄRER. Univ. Bern. Ber. 61B, 2161–73(1928).—Hydric acids can be added by dry sulfates, phosphates, phosphites and hypophosphites. Pulverulent addition products can be isolated. The addition compds. formed with arsenates, selenates and benzoates undergo rapid or instantaneous decompn. With HBr or HI the compds. are less stable than with HCl. Heating a compd. contg. HCl liberates the majority of this hydric acid. Compds. formed from a sulfate and HBr yield Br and SO_2 on heating. MBr_2 and MSO_3 are formed. With HI compds. this type of decompn. is by far predominant. The addn. products are pulverulent. They do not show a trace of acidity. Their color resembles that of the corresponding metallic halide. They

are represented by the general formula:
$$\begin{array}{c} \diagup X-H \\ M \text{---} O_3S \\ \diagdown X-H \end{array}$$
 Phosphates are capable of

adding 3 hydric acids; sulfates, phosphites and hypophosphites only 2. The new compds. isolated were: $CdSO_4 \cdot 2HBr$; $CuSO_4 \cdot 2HBr$; $Ag_2SO_4 \cdot 2HBr$; $PbSO_4 \cdot 2HBr$; $ZnSO_4 \cdot 1.5HBr$; $HgSO_4 \cdot HBr$; $HgSO_4 \cdot 2HBr$; $Hg_2SO_4 \cdot 2HCl$; $Ag_3PO_4 \cdot 3HCl$; $Pb_3(PO_4)_2 \cdot 6HCl$; $H_3(PO_4)_2 \cdot 6HCl$; $Fe_3(PO_4)_2 \cdot 5HCl$; $Ni_3(PO_4)_2 \cdot 6HCl$; $Ni_3(PO_4)_2 \cdot 2H_2O \cdot 6HCl$; $Ag_3PO_4 \cdot 3HBr$; $Hg_3(PO_4)_2 \cdot 3HBr$; $Ni_3(PO_4)_2 \cdot 2H_2O \cdot 7HBr$; $CdHPO_3 \cdot 2HCl$; $PbHPO_3 \cdot 2HCl$. Addn. of hydric acids on numerous other salts were observed but no definite compound could be isolated.

ALBERT L. HENNE

7—ANALYTICAL CHEMISTRY

W. T. HALL

Advances in analytical chemistry in 1927. AUGUST RAUCH. Fortschrittsber. Chem. Ztg. 2, 124–30(1928).—A review with bibliography. E. J. C.

Advances in potentiometric analysis. ERICH MÜLLER. Z. angew. Chem. 41, 3–6, 1176–8(1928). E. J. C.

Reaction end point in certain analyses by saturation. L. STAPPERS. Soc. des Hautes "De Cavel et Roegiers," Ghent, Belgium. Bull. fédér. ind. chim. Belg. 7, 306–11(1928).—In order to prevent errors during the detn. of the acid index and the saponification number in mineral oils, due to the influence of CO_2 from the air on the indicator (phenolphthalein or alkaline blue VI B) a current of CO_2 -free air should be blown through the liquid during the titration. [By "saturation point" the author means the end point of a volumetric titration, and an "analysis by saturation" is really a volumetric detn. Abstractor.] A. L. HENNE

Limits of accuracy and importance of sampling in chemical analysis. L. FRESSENIUS. Metall. Erz 25, 395–400(1928).—A lecture. J. BALOZIAN

Systematic study of indicators. XIII. The solvent error. 1: The alcohol error of methyl orange and allied azo indicators. A. THIEL AND W. SPRINGEMANN. Univ.

Märburg. *Z. anorg. allgem. Chem.* 176, 64-80(1928).—The alc. error of the azo indicators is partly optical and partly electrochem. Since there is no absolutely reliable information as to the change of sensitivity to acid, the values obtained cover this displacement of the "half-value" stage. The optical bases of the alc. error were detd. for methyl orange, methyl red, monomethyl orange and methyl yellow. In carrying out the expts. 0.5 *N*, 0.4 *N*, 0.1 *N* and 0.01 *N* HCl solns. were used and 0.01 *N* (CH₃)₄-NOH. Solns. of NaOH could not be used because it was practically impossible to avoid slight absorption of CO₂ which caused pptn. of Na₂CO₃ in the presence of alc. and the ppt. interfered with the spectrophotometric work: For methyl orange the $p_{H^{1/2}}$ value changes from 3.40 in pure water to 2.51 in water which has been dild. with an equal vol. of alc. XIV. A new source of error in colorimetric measurements: the "light error" of some azo indicators in the presence of organic solvents. *Ibid* 112-20.—The yellow form of methyl orange in the vicinity of the transition point is very sensitive to light when alc. is present and this accounts for the fact that the various shades at the transformation point are not additive when studied with the spectrophotometer. The red form of the indicator is perfectly stable to light. Methanol, acetone and other org. solvents produce similar effects. Besides methyl orange, other disubstituted *p*-amino derivs. are bleached by light in the presence of org. solvents. The reaction involved, however, is monomolecular in type and in reversible, the yellow color returning after the sample has been allowed to stand in the dark for some time. It is explained on the assumption that the dye stuff is activated by light and in the active state combines with the org. solvent with the disappearance of the azo chromophor. In the dark, the compd. breaks down and the chromophor is regenerated. In colorimetric measurements this "light error" may be the cause of trouble unless precaution is taken to avoid it.

W. T. H

The salt error of indicators in the colorimetric determination of $p_{H^{1/2}}$. I. M. KOLTHOFF. Univ. of Minn. *J. Phys. Chem.* 32, 1820-33(1928).—The fact that neutral salts often causes a change in the color obtained with certain indicators at definite H ion concn. has been known for at least 20 years but the real reason for this error is not quite clear. Bjerrum, to be sure, has attempted to explain it, but the explanation meets with certain difficulties. Neither the acid nor alk. colors of dil. solns. of bromophenol blue, bromocresol green, bromothymol blue, phenol red, cresol red and thymol blue are affected by large quantities of salts but the acid colors of methyl orange, tropaeolin OO and methyl red are more intense when considerable salt is present and the alk. colors of various nitrophenols and salicyl yellow are more intense at high salt concn. Although it is hard to give a general theory to account for this salt error, an attempt is made here to calc. the error on the basis of the equation of Debye and Hückel and the results were tested by expt. It was found that when the ionic strength of the soln. is much larger than that in the ordinary buffers, the calcd. corrections are higher than the exptl. values. Moreover, indicators of the same general type do not behave alike. The av. salt correction for the different phthaleins at an ionic strength of 0.1-0.0025 was detd. and the values related to an ionic strength of 0.1 for the buffer soln. Methyl orange and methyl red show very small salt errors under different conditions and are, therefore, very suitable indicators. This is probably due to the amphoteric character of these indicators and it may be expected, in general, that amphoteric indicators will be found ideal for the colorimetric detn. of $p_{H^{1/2}}$.

W. T. H

Diphenylcarbazone as indicator in hydrargyrometry. L. ROSENTHALER. Univ. Bern. *Apoth. Ztg.* 43, 944-5(1928).—An exptl. study of the behavior of varying amts. of HgO when titrated with 0.1 *N* NH₄CNS in the presence of diphenylcarbazone (indicator in Et₂O). Satisfactory results are reported.

W. O. E

New reagent for potassium, ammonium, rubidium and cesium ions. Very sensitive reagent for the phosphate ion. Specific reaction for tin and antimony. TEOPHIL GASPAR Y. ARNAL. *Chimie et industrie* 20, 631-2(1928); cf. *C. A.* 23, 52.—A precipitant for K, Rb and Cs is prepd. by adding UO₂(NO₃)₂ in stoichiometrical proportion to a Na₂CrO₄ soln. (contg. about 5% CrO₄), taking care to avoid excess of UO₂(NO₃)₂ and presence of NaCl. The soly. of the ppt. decreases from K to Cs. The reagent can also ppt. NH₄ salts. The soln. obtained by adding excess of Na molybdate to SbCl₃ constitutes an extremely sensitive reagent for the phosphate ion. When added to solns. of various salts the reagent gave the following results: carbonates, bluish color or ppt. gradually turning darker (but always fairly light); bicarbonates, yellow; borates, yellow; arsenites, bluish yellow, the blue tinge very slowly deepening; arsenates, bluish white; phosphates, bluish white turning very deep blue (indigo); KNO₃, yellow; UO₂(NO₃)₂, yellow ppt. sol. in excess of reagent; Na₂S₂O₃, reddish brown; NiSO₄, light bluish green; (NH₄)₂C₂O₄, no ppt.; Pb(OAc)₂, yellow; MgSO₄, bluish white; Ca(OAc)₂,

yellow; $K_2Cr_2O_7$, slight ppt. at first with subsequent slow formation of a light brown ppt.; $K_2Cr_2O_4$, no ppt. at first, then slow formation of a light brown ppt.; KBr , ppt.; $FeCl_3$, no ppt.; Na_2SO_3 , whitish yellow; $(NH_4)_2SO_4$, whitish yellow. A. P. C.

Determination and separation of rare metals from other metals. XI. The quantitative analysis of gallium. Part I. LUDWIG MOSER AND ALFRED BRUKL. Tech. Hochsch. Wien. *Monatsh.* 50, 181-92(1928).—The best precipitant for Ga is the negatively charged tannin hydrosol which adsorbs the positively charged $Ga(OH)_3$ hydrosol produced by hydrolysis; 0.2 mg. of Ga_2O_3 per l. can be detected. The pptn. is best carried out as follows: To the soln. of Ga^{III} salt in dil. AcOH (about 1%) add sufficient NH_4NO_3 to bring the content to about 2%. Heat to boiling and to the boiling soln. add dropwise 10% tannin soln. until the pptn. is complete, using 0.5 g. of tannin as a minimum. The ppt. is so voluminous that not more than 0.1 g. of Ga_2O_3 can be handled easily and about 1 g. of tannin should be sufficient for this quantity. Wash the ppt. with hot water contg. some NH_4NO_3 and a few drops of AcOH. Dry, ignite and weigh as Ga_2O_3 in a quartz or porcelain crucible. In Pt there is danger of reduction and damage to the crucible. Although Ga is not pptd. by H_2S in acid soln., it is adsorbed by all sulfides and pptd. with them as $Ga(OH)_3$. For this reason, perhaps, Ga has seldom been detected in minerals although it is widely distributed in small quantities. The sepn. of Ga from Zn, Ni, Co, Mn, Cd, Be and Th is discussed in detail and although in some cases other methods will give good results the pptn. with tannin is excellent in every case. To the soln. contg. only very little free mineral acid, NH_4OAc should be added to make the content about 1% of AcOH. Then to 100 cc. of soln. add 2 g. of NH_4NO_3 , heat to boiling and ppt. as described above. W. T. H.

Determination of small quantities of antimony in the form of stibine. JULIUS GRANT. *Analyst* 53, 626-32(1928).—The app. recommended is an improved type of that commonly used for the electrolytic production of AsH_3 . The cathode is an inverted Pt cone against which a swift current of H_2 is directed so that the SbH_3 is rapidly carried away and is not decompd. by remaining in contact with the soln. As electrolyte, 40 cc. of 0.5 HCl is suitable and a current of about 5 amp. is satisfactory. The SbH_3 is passed through a glass tube heated before a restriction and the Sb detd. by comparing the mirror with standard mirrors or by dissolving the deposit in HCl and comparing colorimetrically the Sb_2S_3 produced with H_2S . W. T. H.

Determination of molybdenum. H. A. DOERNER. *Metal Ind.* (London), 33, 106(1928).—See C. A. 22, 4081. E. J. C.

Precipitation of zinc from solutions containing considerable sodium chloride. F. DEBE. Hessisch. Inst., Bad Nauheim. *Ber.* 61B, 2248-51(1928).—Former expts. have shown that the presence of salts often tends to prevent the pptn. of sulfides. One theory is that the Debye effect between the anion and the H^+ ion is diminished by the addn. of a salt of a strong acid so that the H^+ ion is more effective in preventing the ionization of H_2S . The expts. here described serve to discredit this theory because the pptn. of ZnS in neutral, in dil. AcOH and in NH_4OH solns. is made incomplete when considerable NaCl is present. W. T. H.

Determination of manganese in the presence of silica. CLIVE NEWCOMB. *Analyst* 53, 644-5(1928).—In the colorimetric detn. of Mn as MnO_4^- difficulty is encountered if SiO_2 is present, as in the examn. of plant ashes, on account of the tenacity with which SiO_2 adsorbs Mn. The difficulty can be overcome by fusing with Na_2CO_3 , dissolving the melt in water and adding it at once to an excess of HNO_3 . The resulting soln. is a colloidal one but all the Mn therein can be oxidized by persulfate and the cloudiness disappears when the oxidation to MnO_4^- is complete so that the colorimeter can be used. W. T. H.

Determination of iron in silicates. A. E. J. VICKERS. *Trans. Ceram. Soc.* (Eng.) 27, 156-60(1928).—Methods are described for the detn. of both FeO and Fe_2O_3 when present in silicates, with special directions for the use of the Reinhardt method of titrating Fe in the $KMnO_4$ in HCl soln. For total Fe fuse the silicate with Na_2CO_3 and a little $NaNO_3$, take up in HCl, remove the SiO_2 by double evapn., and pptg. R_2O_3 as usual. Filter, dissolve off the filter with hot HCl (1:1), catching the soln. in the beaker used for the R_2O_3 pptn. Make up the soln. to 200 cc., and det. Fe by the Reinhardt method in 100 cc. For acid-sol. Fe, digest 10 g. of the powd. silicate with 20 cc. of hot 1:1 HCl, heat for 2 hrs., filter, reduce and titrate. For the KSCN method, wash the R_2O_3 ppt. free from chlorides, ignite, fuse with 8-10 g. $KHSO_4$, take up with H_2O and 10 cc. H_2SO_4 and make up to 250 cc. Compare the color obtained with an aliquot treated with the KSCN soln., with the color produced by standard Fe soln. added from a buret into a KSCN soln. For FeO the sample should be crushed in a mortar (coarsely) to prevent oxidation. Treat a 5-g. sample with 12 cc. H_2SO_4 (1:1) and 10 cc. concd.

HCl in a Pt crucible and heat over a small luminous gas flame for 10 min. Plunge the crucible into a 600-cc. beaker contg. 400 cc. H_2O , 20 g. pure KHSO_4 and 10 g. pure pptd. SiO_2 and titrate at once with 0.01 N KMnO_4 . H. F. K.

Sampling methods for gray cast iron. RAYMOND H. HOBROCK. *Foundry* 56, 797-8(1928). R. F. M.

The sensitiveness of the detection of small quantities of impurities in iron. G. TAMMANN AND W. SALGE. Univ. Göttingen. *Z. anorg. allgem. Chem.* 176, 152-4 (1928).—By treating a piece of metal weighing about 0.3 g. with 15% $(\text{NH}_4)_2\text{S}_2\text{O}_8$ soln contg. a very little H_2SO_4 , it is possible to detect in the residue as little as 0.002 % of FeS, less than 0.05% Al, 0.05% Sb, 0.02% Sn and 0.001% Si. W. T. H.

Study of the hydrogen-antimony-tin method for the determination of oxygen in cast irons. BENGT KJERRMAN AND LOUIS JORDAN. *Bur. Standards J. Research* 1, 701-20(1928).—Sb and Sn are added to Fe for the purpose of reducing the m. p. and, in some way, these metals help to accomplish the reduction of SiO_2 and of MnO on heating in H_2 . Unfortunately, however, when much C is present in the material under investigation, there is danger of some CO and CO_2 being formed while heating in H_2 and to absorb these gases as well as H_2O complicates the method so that it has become the practice to recover H_2O alone with the understanding that the method is applicable only to samples low in C and not contg. much SiO_2 or Al_2O_3 . Very recently Müller and his associates have studied the limitations of this H-reduction method and concluded that the method is useful only when the metal contains very little C, Si or P. On the other hand, Oberhoffer and his collaborators have regarded the method accurate for high-C alloys. In the present work, the H-Sb-Sn method, with suitable provision for recovering CO and CO_2 as well as H_2O , was applied to a pig Fe contg. C 3.7, Mn 0.7, P 0.12, S 0.04 and Si 1.3% and the results are compared with those obtained with the graphite-crucible, vacuum-fusion method. It was found that for either method it is important to use lump samples rather than millings because of the danger of air and H_2O being adsorbed from the atm. and, to a lesser degree, the possibility of superficial oxidation. With cast Fe contg. 0.01-0.04% O, the vacuum-fusion method is to be preferred, as it is more precise. The H-Sn-Sb method, however, gives values agreeing within 0.006% of those obtained by the more sensitive vacuum-fusion method. The rather complicated nature of the blank that must be run is pointed out. The limitation of the H-reduction method to Si-free samples does not appear to hold with respect to high-C materials of the type used in this investigation. W. T. H.

The sensitiveness of the detection of small quantities of impurities in cadmium and copper. G. TAMMANN, A. HEINZEL AND F. LAASS. Univ. Göttingen. *Z. anorg. allgem. Chem.* 176, 143-6(1928).—When a metal dissolves without liberating any gas, a part of the impurities is often left behind in the form of a delicate film. For the detection of small quantities of impurity it has been recommended to dissolve all of the metal, crystallize out the major constituent and look for impurities in the mother liquor. In this way Mylius succeeded in detecting 0.005% of Pb, 0.001% of Fe (1.2 mg.) and a trace of Zn in 120 g. of Cd metal. By the method of dissolving 0.2 g. of Cd in 50% NH_4NO_3 soln. and exang. the residue, it is possible to detect 0.02-0.04 mg. of Pb, Bi, Sb and Sn. This method, therefore, besides being more rapid serves to detect quantities of impurity which are absolutely smaller, although the method of Mylius permits the detection of smaller percentages. The presence of Sb, Bi and Pb in Cu metal can also be detected by exang. the residue. The method is particularly advantageous when the impurity lies below the chief metal in the e. m. f. series. By treating Hg with HNO_3 the residue serves to indicate 0.01% of Au. W. T. H.

Metallic lead in red lead. HERMAN HEINRICHS. *Glastech. Ber.* 5, 505-8(1928).—The usual treatment of a large sample has the disadvantage that appreciable amts. of Pb are dissolved. H. agitates a 20-g. sample with water, washing away the greater portion of PbO and leaving the Pb in a 2- or 3-g. residue. This goes into soln. with HCl and hydrazine chloride so rapidly that Pb is not attacked. Results on English and German red leads are given and the effect of Pb in pot melts is discussed. J. A. GRANT

Determination of minute quantities of iodide in the presence of much chloride. A contribution to potentiometric titration. F. KIEFERLE AND E. ERBACHER. Forschungsanstalt für Milchwirtschaft, Weihenstephan. *Biochem. Z.* 201, 305-17(1928).—For potentiometric analysis of very dil. soln., a modification of the Ostwald rheostat is suggested which has besides the 100-ohm and 10-ohm, also dials for 1 and 0.1 ohm. Titration of minute quantities of iodide in the presence of much chloride, as in milk, is unsuccessful in the presence of AgNO_3 , because PdCl_2 is not sufficiently sensitive to iodide, but I can be pptd. with $\text{Hg}(\text{ClO}_4)_2$ on a Ag electrode if the titration is performed carefully. The method fails, however, when it is applied to milk. S. MOROULIS

Detection of traces of carbonate. J. RAE. *Pharm. J.* 121, 315(1928).—The app. used is similar to that of A. E. Parker for the detection of sulfites (*C. A.* 21, 1155). Place in the flask 25 cc. of air-free water, 2 cc. of CHCl_3 and 1 g. of the substance. Add 10 cc. of dil. H_2SO_4 , quickly insert the stopper, which carries a thistle tube with 2–3 cc. of $\text{Ca}(\text{OH})_2$ soln., and heat on the water bath. The CHCl_3 vapor sweeps the CO_2 into the tube, causing milkiness. With 1 mg. Na_2CO_3 a distinct reaction is seen when viewed against black paper, with 2 mg. a decided turbidity; hence, if 1 g. of substance is employed, 0.1% Na_2CO_3 is readily detected. If no reaction is noted after 2–3 min., less than 0.1% or no carbonate is present. Any turbidity caused by CHCl_3 through unduly long boiling is differentiated by dil. HCl . If sulfites, nitrites or sulfides are also present, add excess of a 1% KMnO_4 soln. and H_2SO_4 . S. WALDBOTT

A very sensitive reagent for phosphate ions. Distinction between antimony and tin. T. GASPAR Y ARNAL. *Anales soc. españ. fís. quim.* 26, 181–3(1928).— $(\text{NH}_4)_2\text{MoO}_4$ gives a blue coloration when treated with an acid soln. of SnCl_2 . With SbCl_3 and Na_2MoO_4 the reaction is quite different; a yellow ppt. is obtained which is sol. in excess SbCl_3 . In the presence of PO_4^{---} and without using an excess of SbCl_3 , the original ppt. soon turns an intense blue and the color is more permanent than the blue characteristic of the SnCl_2 reaction. Possibly this can be used not only as a test for PO_4^{---} but also for its differentiation from HPO_3 and $\text{H}_4\text{P}_2\text{O}_7$. The Na_2MoO_4 soln. used in the test should be concd. E. M. SYMMES

Use of potassium iodate in back titration for the determination of the hypochlorite content of solutions. JOHN R. LEWIS AND R. F. KLOCKOW. Univ. Wisconsin. *J. Am. Chem. Soc.* 50, 3243–4(1928).— NaOCl solns. can be reduced to NaCl by NaH_2AsO_3 , $\text{Na}_2\text{S}_2\text{O}_3$ or KI and the excess reductant detd. by titration with KIO_3 . In the last 2 cases, the presence of chlorate interferes seriously. W. T. H.

Highly accurate method for the analysis of urea. MILLICENT TAYLOR. Univ. of Bristol, Eng. *J. Am. Chem. Soc.* 50, 3261–5(1928).—By adding a slight excess of HCl to an aq. soln. of urea and heating in an autoclave for 30 min. under 2 atm. and for 4 hrs. under 4 atm., it is possible to convert all of the urea to NH_4Cl and CO_2 and the urea can be detd. with great accuracy by a back titration with Na_2CO_3 , using methyl orange as indicator. W. T. H.

The occurrence and detection of hydrogen in mines. L. WEIN. *Z. ges. Schiess-Sprengstoffw.* 23, 265–6(1928).—The Fleissner method, proposed, by Heyer (*C. A.* 22, 3047) for detg. H in mine gases, was found to detect not less than 0.8 cc. of H, and is, therefore, not sufficiently sensitive for samples of the usual size. The method is also not satisfactory because color standards prepd. from gases of known compn. are not permanent. W. prefers the combustion method. C. G. STORM

Method for determining carbon and hydrogen in organic substances in the dry way. D. BUTESCU. Univ. Bucarest. *Ber.* 61B, 2336–40(1928).—Details are given for carrying out combustions in a 50-cm. tube heated by 3 Teclu burners; CuO and platinized asbestos are used for filling the tube. W. T. H.

Detection of isopropyl alcohol. JOHN RAE. *Analyst* 53, 646(1928).—The method described by Henville (*C. A.* 22, 3864) is almost identical with that of R. (*C. A.* 20, 3665). W. T. H.

The identification of coloring matters by stratification of mixed solvents. J. J. HOFMAN. *Pharm. Weekblad* 65, 1190–8(1928).—If 5 cc. of H_2O is added to any of the following mixts. at room temp. the soln. remains homogeneous: $\text{EtOH} + \text{PhCH}_2\text{OH}$ 1:1, $\text{EtOH} + \text{AmOH}$ 1:1, $\text{MeAc} + \text{C}_6\text{H}_6$ 10:1. Further addn. of 5 cc. of H_2O then causes the mixt. to sep. into 2 layers. If the first 5 cc. of H_2O added contains a dye or other coloring matter the color becomes uniformly distributed throughout the mixt., but when the mixt. is sepd. into 2 layers by the second addn. of H_2O the color tends to accumulate in one or the other of the 2 phases. The distribution of the color, and the change in color produced in one or the other layer by addn. of acid (5 drops HCl), alkali (5 drops KOH soln.), reducing agents (6% SO_2 or NaHSO_3), or oxidizing agents (5 drops 30% H_2O_2), is more or less characteristic for individual dyes and coloring matters. The test is useful in the identification of aniline dyes and vegetable colors, especially if a control test is made with a known soln. of the suspected substance. These color reactions are tabulated for 34 coal-tar dyes and 12 vegetable colors. A. W. DOX

Determination of acidity of industrial casein. A. CHOLLET. *Ecole Lait Surgeres. Lait* 8, 21–2(1928).—Grind casein as fine as possible; weigh 2 g. of rennet origin or 1 g. lactic origin into a 50-cc. conical flask. Add 10 cc. H_2O and a few drops of phenolphthalein. Titrate with standard NaOH , $N/10$ or $N/9$ to a pink coloration and alternately add more NaOH and heat the flask until the color persists on cooling. Calc. as percent lactic acid. H. F. ZOLLER

Determination of fat in industrial casein. A. TAPERNOUX, R. DESRANTE AND J. BINEAN. *Lait* 8, 592-4(1928).—*Laboratory method*.—Weigh 1 g. of ground casein into a 100-cc. beaker, add 10 cc. H_2O and heat to boiling. Add 15 drops NH_4OH for lactic casein, 30 drops for rennet casein. Heat gently with agitation to complete soln. Cool and transfer into a Meillere tube (Rose-Gottlieb modification. Shaw 1920). Add 20 cc. Meillere soln. ($EtOH$ 41.5%, Et_2O 50%, H_2O 8.5%). Shake briskly and let stand for 5-10 min. Withdraw 10 cc. of the aq. layer, add 10 cc. petroleum ether, shake and allow to stand for 10 min. Run off all the aq. layer, and transfer the alc.-ether layer into a tared dish, rinsing with petroleum ether. Evap. the fat solvent, cool and weigh. *Plant method*.—An application to casein of the Teichert method for milk powder (A. Schoonjans, C. A. 20, 785). Using a butyrometer graduated 0-35° B., add 10 cc. H_2SO_4 (d. 1.82), then 8 cc. H_2O and exactly 2.5 g. casein, and 1 cc. amyl alc. Place the butyrometer in the water bath at 85-90° for at least 2 hrs. Centrifuge 3 min. at 1200 r. p. m. and read at 65°.

H. F. ZOLLER

The action of basic lead acetate in the presence of alkali on dextrin and its application in the sugar determination. C. PERTUSI. *Ann. chim. applicata* 18, 414-21 (1928).—In the analysis of gummy substances for sugar content, the soln. is treated with basic lead acetate to clarify it before measuring the rotatory power, and the excess Pb is pptd. with Na_2SO_4 . Very often a clear soln. is not obtained. P. throws down the Pb by means of $NaOH$, adding only enough excess to color phenolphthalein slightly. In this way a clear soln. is always obtained. Excess OH does not affect the polarimeter readings, the pH value being held near the neutral point merely to give a more rapid coagulation.

A. W. CONTIERI

The purity of ether for analytical use. G. MIDDLETON. *Pharm. J.* 121, 82-3, *Chemist and Druggist* 109, 112-4(1928); cf. C. A. 22, 2030.—The presence of peroxide in old Et_2O , in addn. to the danger of explosion caused by it when in contact after evapn. with unsatd. org. compds., markedly affects the accuracy of the detn. of fatty acids (e. g., oleic acid) or alkaloids (e. g., those of aconite, hydrastis and ipecac) extd. by it. Tabulated results show that const. wt. is attained more slowly than with pure Et_2O , and the final wts. are generally higher. The evapn. residue is chemically altered as seen in the changed appearance, soly., I no. and titration results. Other impurities affecting detns. are: e. g., aldehydes, which on evapn. in presence of $NaOH$ leave a brown residue of aldehyde resin.

S. WALDBOTT

FAIRBANKS, ERNEST EMERSON: The Laboratory Investigation of Ores. A symposium. New York: McGraw-Hill Book Co., Inc. 262 pp. \$3.50.

FARNSWORTH, MARIE ANNA: The Theory and Technique of Quantitative Analysis. New York: J. Wiley & Sons, Inc.; London: Chapman & Hall, Ltd. 154 pp. \$2.50.

HARRIMAN, NORMAN F.: Standards and Standardization. New York: McGraw-Hill Book Co., Inc. 265 pp. \$3. Reviewed in *Ind. Eng. Chem.* 20, 1277; *Mech. Eng.* 50, 881(1928).

LUNGE, G., AND KEANE, C. A.: Technical Methods of Chemical Analysis. Vol. 11. London: Gurney and Jackson. £3, 3s., net. Reviewed in *Can. Chem. Met.* 12, No. 10, 54(1928).

Determining hydrogen in oxygen or vice versa. DEUTSCHE GLÜHPADENFABRIK RICH. KURTZ AND PAUL SCHWARZKOPF. *Swiss* 126,232, Apr. 13, 1927. App. is described in which the mixt. is brought into contact with a catalyst and the rise in temp. due to the combustion of the impurity is observed.

8—MINERALOGICAL AND GEOLOGICAL CHEMISTRY

EDGAR T. WHERRY AND J. F. SCHAIERER

The optical properties of rock-making chondrodite from Pargas. OTTO MELLIS. *Geol. Fören. Forh.* 49, 220-8(1927).—The material contd. FeO 3.19% and showed polysynthetic twinning; $\alpha = 1.597$, $\beta = 1.600$, $\gamma = 1.630$; pleochroism straw-yellow to almost colorless; $2V_D = 75^\circ 8'$.

J. F. SCHAIERER

The lead deposits in Bolivia. FRIEDRICH AHLFELD. *Metall. Erz* 25, 265-70 (1928).—The most important districts in which Pb ore is found (Lake Titicaca, Yungas, Tupiza-Villazon) are briefly described. A max. output was reached in 1925, when 36,823 tons of ore yielding 21,042 tons of metal was exported; and in March, 1927, 2192 tons of ore yielding 1398 tons of metal was produced. There are no smelteries in the country.

J. BALOZIAN

The chromium mines of northwest Macedonia. P. LEPÉZ. *Metall Erz* 25, 299-304(1928).—A description of the geography and geology of the country, the type of ore and its form. J. BALOZIAN

The structural relations of the Mourne granites (Northern Ireland). JAMES E. RICHEY. *Quart. J. Geol. Soc.* 83, 653-88(1928).—Analyses of hornblende-granite and biotite-granite are included. J. F. SCHAIRER

The geology of Snowdon, North Wales. HOWEL WILLIAMS. *Quart. J. Geol. Soc.* 83, 346-431(1927).—Analyses of quartz-tourmaline rock, rhyolites, rhyolitic tuffs, pumice tuffs, andesitic basalt, pyrrhotite, porphyritic felsite, quartz porphyry, spherulitic felsite, augite-dolerite, dolerite and amphibolite are included. J. F. SCHAIRER

The petrography of the Austral or Tubuai Islands (Southern Pacific). WALTER C. SMITH. *Quart. J. Geol. Soc.* 83, 317-41(1927).—Analyses of melanocratic olivine-theralite, kyllite, sodalite-bearing trachytoid phonolite, ultrabasic basalt, porphyritic basic andesine-andesite, and olivine-bearing ephelite-tephrite are given. J. F. S.

The serpentines and associated rocks and minerals of the Shetland Islands. FRANK C. PHILLIPS. *Quart. J. Geol. Soc.* 83, 622-52(1927).—Analyses of albite-zoisite rock, gabbro, soapstone and chlorite-magnetite schist are included. J. F. SCHAIRER

The Kateruk series and associated rocks of the northern Suk Hills, Kenya Colony. VINCENT G. GLENDAY. *Quart. J. Geol. Soc.* 83, 790-800(1928).—Analyses of hornblende and chlorite-biotite-schist are included. J. F. SCHAIRER

The trass deposits of Mount Karadag, Crimea. D. V. SOKOLOV. *Trans. State Expl. Inst. Silicates* (Moscow) 1926, No. 22, 5-18.—S. presents a report of a geological investigation on the deposits. Their extent could not be detd. J. S. JOFFE

Report of prospecting on Mount Karadag, Crimea. B. S. SHIVETZOV. *Trans. State Expl. Inst. Silicates* (Moscow) 1926, No. 22, 19-23; cf. preceding abstract.—S. reports on the prospecting for trass-deposits. At the older workings the material proved not to be genuine trass. The true trass deposits found were of indeterminate extent. J. S. JOFFE

Clays. XII. Changes of certain clays into acidic ones through weathering. ISURUGI OKAZAWA. *Bull. Inst. Phys. Chem. Research* (Tokyo) 7, 974-83(1928); *Eng. Ed.* 1, 93-4. O. explains exactly what he means by the term acidic, which he used in his previous communications (cf. C. A. 17, 3078; 22, 358) and was found misleading. An acidic clay is one which develops acidity when treated with a neutral salt. The actual amt. of free acid present in the clay before treatment is exceedingly small, whereas the amt. detectable after treatment is quite appreciable. The acidic properties are to be referred to Al compds. The constitution of acidic clays probably resembles that of zeolites. A. L. HENNE

Helium studies. IV. Helium content of natural gases. F. PANETH, H. GEILEN and K. PETERS. *Univ. Berlin. Z. anorg. allgem. Chem.* 175, 383-401(1928); cf. C. A. 22, 3110. This paper contains an extensive bibliography of work on He and other noble gas detns., with criticisms and explanations of the technic and difficulties encountered. Considerable detail is given to a description of a new app. and the technic of its operation. While previous methods of analysis required very large samples of natural gas (as much as 15 l.) for even approx. detns. of the noble gas content, this app. will conveniently utilize 5-cc. samples but can be used with portions as small as 0.01-0.001 cc., accurately measuring 10^{-5} to 10^{-6} cc. of He. Hydrocarbons, N_2 , O_2 , are removed with heated Ca and H_2 by admixture with O_2 , the gases then being passed over heated Pd. A, X and Kr are absorbed in an "activated" charcoal, the remaining gases being Ne and He. The noble-gas contents of a large no. of samples obtained from Central Europe are given and compared with analyses of American, Canadian and Japanese wells; the data indicate that apparently there can never be any European competition with the latter sources. WM. E. VAUGHAN

Remarks on the development of applied geophysics. H. REICH. *Metall Erz* 25, 315-9(1928).—A list of 17 references is appended. J. BALOZIAN

KRAUS, E. H., AND HUNT, W. F.: **Mineralogy.** 2nd ed. revised. An Introduction to the Study of Minerals and Crystals. New York: McGraw-Hill Book Co. 604 pp. \$5. Reviewed in *Eng. Mining J.* 126, 807(1928).

9—METALLURGY AND METALLOGRAPHY

D. J. DEMOREST, R. H. ABORN

Gold and silver in 1926. J. P. DUNLOP. Bur. of Mines, *Mineral Resources of the U. S. 1926*, Pt. I, 673-709(preprint No. 26, published Nov. 5, 1928). E. H.

Gold, silver, copper, lead and zinc in Utah in 1926. C. N. GERRY. Bur. of Mines, *Mineral Resources of the U. S. 1926*, Pt. I, 471-510(preprint No. 21, published Aug. 30, 1928). E. H.

Gold, silver, copper and lead in South Dakota and Wyoming in 1926. CHAS. W. HENDERSON. Bur. of Mines, *Mineral Resources of the U. S. 1926*, Pt. I, 617-25(preprint No. 24, published Oct. 17, 1928). E. H.

Gold, silver, copper, lead and zinc in Arizona in 1926. C. N. GERRY. Bur. of Mines, *Mineral Resources of the U. S. 1926*, Pt. I, 627-72(preprint No. 25, published Oct. 30, 1928). E. H.

Platinum and allied metals in 1927. JAMES M. HILL. Bur. of Mines, *Mineral Resources of the U. S. 1927*, Pt. I, 25-38(preprint No. 3, published Nov. 14, 1928). E. H.

Mercury in 1927. J. W. FURNESS. Bur. of Mines, *Mineral Resources of the U. S. 1927*, Pt. I, 51-74(preprint No. 5, published Nov. 12, 1928). E. H.

The copper industry and its progress since the war. WM. G. SCHNEIDER. *Metal Ind.* (N. Y.) 26, 522-4(1928). E. H.

World production of tungsten. BECKER-ROSE. *Chem. Fabrik* 1928, 653-4(1928). E. H.

Recent observations on some European iron and steel conditions. C. A. MEISSNER. *Blast Furnace & Steel Plant* 16, 1433-5, 1574-8(1928). E. H.

The Jamshedpur iron and steel works. ANON. *Engineer* 146, 572-4(1928).—An illustrated account of a works located 150 miles west of Calcutta. D. B. DILL

Production of white bearing metals and tin solders from scrap metals. I. II. EDMUND R. THEWS. *Metal Ind.* (N. Y.) 26, 394-6, 472-3, 513-6(1928). E. H.

Metals and alloys used in bearings. II. White metals. ANTONY SETON. *Metal Ind.* (London) 33, 489-92(1928); cf. *C. A.* 22, 4438. E. H.

Studies in mineral separation in a finely divided state. R. C. EMMONS. *Am. J. Sci.* [5], 16, 423-45(1928).—A report of progress in expts. to find a new means of affecting minerals selectively with a view to applying the selective force to the problem of sepg. minerals in the dry state and in the finely divided state. Selective action should be based very largely upon definite mineral characteristics which reflect chem. compn. or mineral species and the action should be as far as possible independent of variables which are difficult of control. A radiometer consisting of two or more vanes in vertical position supported by one or more horizontal cross arms which rotate on a vertical axis passing through the center of the cross arms causes deflection of mineral particles when under conditions of a vacuum. Radiometer deflection curves of certain minerals are illus. and the app. and the procedure described. Application to mixts. of minerals is hindered by an adhesive force between grains of different species—an influence becoming progressively stronger with reduction in grain size. The outstanding objection to the method is the necessity of working with a vacuum, which requires expensive app. and knowledge of glass blowing and vacuum technic. W. H. BOYNTON

A new process and some new principles in the metallurgy and dressing of complex sulfide ores. HARALD SKAPPEL. *Metall Erz* 25, 367-70(1928).—S.'s "Zerfall-Prozess," in which the constituents of ores are sepd. by chem. rather than mech. means, is briefly described. The application of the process to sulfide ores is investigated. Certain metal sulfides (I) (similarly to metals) form 2 sharply sepd. layers upon fusion with non-metallic compds. with which they do not react. This and other phys. properties lead to the classification of I as "metallic" (the heavy metal I), "semi-metallic" and "unmetallic" (the light metal I). By fusing together "metallic" I with metals or "unmetallic" I, all gradations of "semi-metallic" I may be obtained. Usually these 3 types of I are formed by crystn.-differentiation on cooling of I melts. The heat of formation (II) of metallic I, from S and the corresponding metal, plays a large part on the type of I produced, their metallic properties decreasing with increase in II. Thus, I with II less than 25 cal./g. at. combined S show "metallic" properties, while those with II greater than 40 Cal./g. at. combined S are markedly "unmetallic." In the series O, S, Se, Te and its neighbor N, P, As, Sb of the periodic system, there is an increase in the "metallic" properties from left to right, the compds. behaving analogously to the metallic I. *Ibid* 400-11.—To study the chem. equil. in the system metal, I, silicate (III)

an electrolytic process is described in which the O_2 and S present are gradually diminished, thereby shifting the entire equil. of the system. In this process the III phase is the electrolyte, a C anode dipping into it, and the metal and I phase form the cathode. The distribution of the elements in the system changes with its reduction degree. According to the reciprocal action between the III and I phases the FeO , CaO and Al_2S_3 stages may be distinguished. The general order of transference of metals from III to I is given as: heavy metals, Zn, (Sn), K, Na, Ba, Fe, (Cr), Mn, Ca, Mg, Al, Li, the position changing with the reduction degree of the system. The sepn. of metals from molten I is investigated. An electrolyte contg. oktavi ore (with more than 10% each of Pb, Cu, Zn, SiO_2 , less than 2% each of As, Fe, Al_2S_3 , CaO , MgO , S and 240 g./t. Ag) charged in a graphite crucible and heated to $1200-50^\circ$ in an elec. resistance furnace, is electrolyzed. The expts. are so conducted that in one group only slag, mat and crude metal are formed, while in another speiss is formed in addn. In the electrolysis, Pb seps. out until its content in the mat falls to a certain value, depending on its Fe content. Up to the sepn. of Fe, As distributes between the mat and crude Pb in the ratio of 1:8.2, but when Fe begins to sep. it absorbs the As from these to form speiss. The distribution of Ce and Zn between the mat and crude Fe metal is 14.8% Cu, 23.0% Zn and 1.59% Cu, 0.51% Zn, resp.; their distribution between FeS and Fe metal is in the ratio of 9.5:1 — 9.1 for Cu, and 1:4.14 — 1:2.8 for Ni, resp.; that of ZnS (contg. Na_2S and reduced in a thin silicate slag with Cu turnings) between the I and metal layers is 23.3% Zn, 56.2% Cu_2S and 10.12% Zn, 89% Cu, resp.; that of Ag between mat and crude Pb is 1:7; and that of Mo between the I and metallic layers is traces to 29%, resp. According to these investigations "speiss" is to be regarded as a pure metal contg. most of the As and Sb. The distinctions between speiss, mat, slag and crude metal are discussed. J. B.

Hearth and bosh investigation of a blast furnace with special regard to the combustion relations before the tuyères. WILHELM LENNINGS. *Archiv. Eisenhüttenwesen* 1, 549-64(1928).—An investigation of the combustion in the hearth and bosh of a 600-ton blast furnace (hearth diam. 3900 mm.); over 1100 gas (from the main and emergency tuyère, and C-pocket levels), Fe and slag analyses were made. The gas currents before the tuyères are studied, by spraying H_2O (0.5 l./sec. for 5 sec.) into the hot blast. In agreement with van Vloten (*Stahl. u. Eisen* 13, 26-9(1893)), it is found that most of the heat in the furnace is developed in a ring-shaped zone extending 1 m. beyond the tuyères. At the main tuyère level, O_2 decreases with increased distance from the tuyères, CO and H_2 increase, and CO_2 increases to a max. at 60 cm. from the tuyères and falls, being zero at the center. The gas compns. from the emergency tuyères, the C-pocket and the throat are uniform. It is shown that a considerable portion of the reduction in the furnace takes place in the lower bosh and hearth zones. The metal burning before the tuyères is not diminished by hearth enlargement. The output of a blast furnace is detd. by the amt. of coke consumed before the tuyères in a unit of time and the sp. coke consumption. J. BALOZIAN

Views of the Amenabar-process for the recovery of copper with iodine in a wet way. ERNST HENTZE. *Metall. Erz* 25, 370-2(1928).—A lecture dealing with the Claudet and Amenabar processes. J. BALOZIAN

Accurate sampling from unit-pulverizers. P. A. WILLIS. School of Mines and Metallurgy, Univ. of Mo. *Power* 68, 1003-4(1928).—A practical device is described and illustrated. D. B. DILL

Calculation of carbon balance on metallurgical furnaces. ROBERT D. PIKE. *Ind. Eng. Chem.* 20, 1356-61(1928).—An application of stoichiometry to the development of a complete C balance and the fuel balance of a type of metallurgical furnace in which account is taken of the possibility of leakage outward, from certain parts of the furnace, of C-bearing gases. The furnace was of the open-hearth regenerative type. The data required are outlined, also the method of calcn. and the derivation of general pilot tube formulas contg. terms for A , (wt. of air leaking into regenerators and flues in lb per min., when generators are being heated), and L (decimal portion of the hearth gases leaking out from the hearth). The leakage of air out of the regenerators during the period of heating is measured and 5 tables show: (1) a summary of drafts, (2) analyses of combustion gases, (3) mols. of gas per min. in hearth, (4) mols. per min. of gases at pilot tube, and (5) a summary of results—flow of air and gases and leakages. W. H. BOYNTON

Pig-bed dressing and molding machine. ANON. *Iron and Steel Ind.* 2, 77-80(1928); illus.—For pig iron. E. J. C.

The Ludwig-Soret effect in metallic alloys. MARCEL BALLAY. *Rev. métal.* 25, 427-54, 509-20(1928).—The Ludwig-Soret effect is the variation in concn. which takes place in unevenly heated solns. and was discovered independently by Ludwig at Vienna

in 1856 and by Soret at Geneva in 1879. The effect of different temp. gradients was studied on Pb-Sn alloys in vertical tubes and showed that the Pb always concs. at the pt. of lowest temp. The curves for a stationary anisothermic condition were drawn for the whole Pb-Sn system between temps. of 360° and 800°. The difference in the effect of temp. gradient in vertical and in horizontal tubes, which had previously been suspected, is clearly brought out: (a) in horizontal tubes of uniform bore prolonged heating causes no notable variation in concn.; (b) when the tube is contracted at one pt. to prevent convection currents, with some alloys the variation in concn. is sometimes in one direction and sometimes in the other, without any cause for these divergences having been discovered; with other alloys the results are more concordant, but, contrary to what occurs in vertical tubes, the Pb concs. at the pt. of higher temp. The differences in concn. can be expressed as a function of time by an expression such as $\Delta c = \Delta c(1 - e^{-kt})$, which is applicable not only for the expts. described in the present paper but also for the results obtained by Eilert (*C. A.* 8, 3143) on aq. solns. The preceding results make it possible to calc. the influence of the Ludwig-Soret effect on segregation in the cooling of castings under normal conditions; the resultant heterogeneity is very small, and it is only under exceptional circumstances that this phenomenon will occur to an appreciable extent, at least with Pb-Sn alloys. The effect of a temp. gradient was also detd. for a few liquid Cu-Sn, Sn-Cd and Sn-Zn alloys. With the latter, consisting of 2 metals having almost the same d., the concn. of Sn, which has a slightly higher d., increased in the upper end of the vertical tube, which was maintained at the higher temp. The effect of uneven temp. on the heterogeneity of 2 solid alloys (Pb-Th and Pt-Rh contg. 10% Rh) was also shown. In working out a theory of the Ludwig-Soret effect, the laws of thermodynamics may be applied, with the assumption that part of the phenomenon is reversible; the variations in concn. can thus be expressed as a function of the heat of diln. and of the vapor tension of one of the constituents. This theory, though not strictly true, accounts for the fact that with very dil. solns. the ratio of concns. in the hot and cold regions tends toward 1 and not toward the reciprocal of the ratio of abs. temps. as would be the case if van't Hoff's theory were true. As B.'s expts. did not readily lend themselves to calcn., in order to verify his theory he used some of the detns. carried out by Eilert on aq. solns. for which he was able to find values for vapor tension and heat of diln. The agreement can be considered fairly good in view of the facts that the data on which the calcns. are based are none too accurate and that extrapolations have to be resorted to. In any case, the results thus obtained are far better than those obtained with van't Hoff's theory. B.'s theory does not indicate in a satisfactory manner the direction of the phenomenon. In a vertical tube, it is nearly always the heavier constituent that migrates toward the bottom.

A. PAPINEAU-COUTURE

Liquation and tensile properties. G. FIEK AND G. SACHS. *Mill. Materialpruf. Amt Berlin-Dahlem, Sonderheft* 3, 88-93; *Chem. Zentr.* 1927, II, 2347.—By testing the tensile strength it becomes evident that I-beams showing strong liquation in the cross-section are of inferior mech. qualities. First of all, the reduction of the section of rupture is always smaller in the liquated material than in the purer material of the outside parts. In tests on the flange, the cross-piece, and the parts between cross-piece and flange, it was noticed that the resistance against deformation is a little greater in the liquation zone than in the purer parts, while the ability of alteration of the form is considerably smaller. Samples from the zone forming the transition between flange and cross-piece are frequently very brittle. The poor tensile properties of this part are, aside from other factors, probably due to the fact that this part is subjected to a particularly heavy strain in the rolling process.

G. SCHWOCH

X-ray investigation of the phenomena accompanying the stamping of metals. JEAN J. TRILLAT. *Chimie et industrie* 20, 618-22(1928); cf. *C. A.* 22, 3125.—A more detailed account of the investigation. **Conclusions.**—Stamping produces an alignment of the micro-crystals of the metal such that one of the directions of the cubes becomes an axis of rotation, which has been detd. as being the (110) axis, i. e., the diagonal of the face of the cube, and it is located parallel to the direction of the av. deformed fiber, as proved by tests in 3 rectangular planes. The orientation is particularly intense in regions having a small radius of curvature or in which there is a marked double curvature. The orientation effect due to stamping is accompanied by a considerable decrease in the size of the grains; comparative tests showed the av. size of the grains to be a few hundredths of a mm. in the deformed regions and about 0.02-0.1 mm. at some distance (of the order of 1-2 cm.) from the former. Stamping sets up internal tensions which are most intense as the degree of curvature increases; they are due to distortions and deformations of the reticular planes and are distributed symmetrically about the axis of orientation, so that they are felt only in certain preferred directions in the (110) planes.

In the undeformed regions, no orientation effects nor internal stresses are apparent at some distance from the deformed regions; the grain of the metal is much coarser, and these grains are placed haphazard. The cold rolling to which the sheet metal had been subjected before stamping was not apparent from the diagrams, because of the fact that it had been subjected only to relatively slight rolling. X-rays afford an accurate method for examg. the internal structure of stamped sheet metal; it is suggested that the fibrous structure and internal stresses produced by stamping might be corrected by suitable local heat treatment, the results of which could be followed by means of x-rays. The quantity of material required to carry out x-ray investigation is so small that it can be taken without serious drawback from a finished piece, and much more complete information is obtained than by micrographic examn.; no complicated prepn. of the samples is necessary, and the method could easily be adapted to current industrial control by using a spectrograph allowing of making 8, 16 or 24 diagrams simultaneously. A. P.-C.

The manufacture of case-hardened rolls. HELMUT CREYDT. *Z. ges. Mühlenwesen* 4, 4-16; *Chem. Zentr.* 1927, II, 1888.—Survey of the principles concerning the examn. of the quality of case-hardened rolls. In the elec. furnace, chill-castings may be manufd. that equal the Swedish charcoal pig-iron and even are superior to it in some respects. G. SCHWOCH

Boiler drums for the largest 1200-lb. power plant go through the shop. JOHN McQUILLAN. *Power* 68, 950-3(1928).—The process of mfg. solid-forged seamless drums is described and illustrated. The final dimensions are: length 50 $\frac{1}{4}$ ft.; inside diam. 52 in.; outside diam. 60 in. The open-hearth steel used meets the following requirements: tensile strength 75,000 lbs. per sq. in. max.; yield point one-half tensile strength; elongation in 2 in., (min.) 24%; reduction in area, (min.) 38%; test specimen to stand cold bending through 180° around a pin 1 in. in diam. without cracking on the outside of the bent portion. The compn. is C_{max.} 0.45%; Mn 0.30 to 0.45%; P_{max.} 0.04%; S_{max.} 0.04%. D. B. DILL

The effect of impurities in raw acetylene on the health of the welder. J. H. VOGEL. *Acetylen in Wissenschaft u. Ind.* 31, 54-8(1928).—The contention that danger from PH₃ poisoning in welding does not exist is supported by a literature survey and personal experience. Cases reported in the medical journals have been traced to metallic oxides from tinned or galvanized metal. F. S. GRANGER

Present status of structural-steel welding. F. T. LLEWELLYN. *Blast Furnace and Steel Plant* 16, 1430-2, 1583 6; *Engineering* 126, 664-6, 693 5(1928). E. H.

Cold and hot working of metals. I. W. ROSENHAIN. *Metallurgist* (Suppl. to *Engineer* 146, No. 17) 152-3(1928).—A review. D. B. DILL

Contribution to the study of the causes of formation of blow holes in open-hearth steel according to the manner in which deoxidation is conducted. P. Y. YVANOV. *Rev. soc. russe métal.* 1, No. 4, 459-65(1927); *Rev. métal.* 25 (Extraits), 431(1928).—Contrary to the opinion of M. M. Karnaoukhov (*C. A.* 20, 2637), who considers that this phenomenon is due to the decompn. of the Si nitrides formed during deoxidation, the presence of blow holes in steel is due to the formation of CO. A. P.-C.

Influence of cobalt, vanadium and manganese on some properties of tool steel. A. SCHERER. *Arch. Eisenhüttenwes.* 1, 325-9(1927); *Chimie et industrie* 20, 667(1928).—The tests were carried out on eutectoid C steels contg. increasing amts. of Mn, V, and Si, Co, V and Co. Co steels were least affected by variations in quenching conditions, and particularly unaffected by excessive heating. They also exhibited least change in vol. on quenching. The steels best suited for making tools are Co and V steels, which have both max. hardness and min. sensitiveness to hardening treatment. A. PAPINEAU-COUTURE

Length changes in steel produced during quenching. EDGAR C. BAIN AND WILLIS S. N. WARING. *Fuels & Furnaces* 6, 1727-34(1928). E. H.

Deformations due to quenching of case-hardened pieces. R. BARAT. *Rev. métal.* 25, 585-9(1928).—A mathematical discussion based on the change in d. before and after quenching of steels with various C contents, showing the general application of a method of calcn. of the deformation according to the Co content and relative thicknesses of the core and of the case-hardened layer. A. PAPINEAU-COUTURE

The effect of oxygen on iron and steel. II, III. ANON. *Metallurgist* (Suppl. to *Engineer*, Nos. 13 and 17) 131-2; 147-9(1928).—A review of recent literature. D. B. DILL

British refined pig irons. ANON. *Metallurgist* (Suppl. to *Engineer* 146, No. 17) 150 1(1928).—The compn. of 4 specimens of a com. brand of pig Fe refined by the modern cupola practice is C 3.0, Si 1.0-1.6, Mn 0.6-0.75, S 0.06-0.09, P 0.1-0.6%. Tensile

strength varied from 12 to 18 tons per sq. in. The principal refining methods followed are described. Causes for occasional lack of uniformity are discussed. D. B. DILL.

The growth and the contraction of cast iron and gray cast iron of high quality. E. PIWOWARSKI. *Giesserei-Ztg.* 23, 379-85, 414-21; *Chem. Zentr.* 1927, II, 2566.—P. discusses the problems concerning the quality of gray cast iron, the significance of the systematic overheating in the melting-process, and the refinement of the graphite. The density of the castings is an important factor in the problem of producing constancy of vol. The shaking and the vacuum treatment of the melt, the carbide decompn., and the process of growth are discussed in detail. G. SCHWOCH

The wear of cast iron and its relation to the structure and to the mechanical properties. KÜHNEL. *Giesserei-Ztg.* 24, 533-41; *Chem. Zentr.* 1927, II, 2566.—The wear of cast iron was examd. by plant lab. tests on brake-blocks and other instruments, and it was found that gray cast iron with pearlitic texture does not possess sufficient resistance against wear. Further on, the relation between wear and the mech. properties was investigated. The taking up of S and the change of texture caused by the mfg. process were examd. on fire bars. The results are demonstrated in the form of curves and photographs. G. SCHWOCH

Improved process for casting (cast-iron) pipe centrifugally in green sand molds. GUISEPPE GUERRINI. *Foundry* 56, 832-5(1928).—A description of the method developed and used in Italy. The process is compared with that using permanent molds. The Italian process has the usual advantages of centrifugal casting, namely, good distribution of graphite and P in the form of fine grains, a pearlitic instead of a ferritic structure apart from the thin film on the inside which may be removed by more rapid cooling. The general characteristics of the process and of the pipe produced are pearlitic matrix and great tensile strength; uniformity in the various thicknesses; less heavy than vertically cast pipe; rapid production; low installation and production costs; rejections reduced to a min.; min. quantity of slag inside the pipe because of use of a filtering feed runner. ROBERT F. MEHL

Anomalies of annealing copper and brasses after cold hardening. EUGENE. *Compt. rend.* 187, 378-80(1928); cf. *C. A.* 22, 1945.—A systematic study of the influence of annealing on the mech. properties of these metals has established: (1) this anomaly affects not only the hardness but also the fitness for stamping as characterized by the Ericksen test (depth of penetration of stamp) and to a lesser degree by the elongation in the slow traction test. (2) An anomaly, A_1 presenting the same characteristics as A_2 , manifests itself immediately before A_2 , the beginning of the "germination zone." In pure Cu A_2 is more marked than A_1 but with the addn. of Zn A_1 increases and A_2 decreases. Brass 60-40 showed for A_2 2 successive steps in the curve. H. M. McL.

Physical properties of 72 : 28 and 90 : 10 brass as a function of final reduction and previous annealing. JOSÉ M. FERNÁNDEZ-LADREDA. *Anales soc. españ. fis. quím.* 26, 81-112(1928).—The phys. properties of 72:28 and 90:10 brass depend upon the work previous to the last annealing. Differences due to different working in factories disappear at final annealing temps. between 500° and 600° for 72:28 brass and between 350° and 400° for 90:10 brass. The phys. properties of some of these alloys also depend upon the annealing previous to the last reduction. Differences due to variable temp. of annealing in factories disappear at final annealing temps. between 300° and 500° (depending upon whether great or slight reduction has been used) for 72:28 brass and between 250° and 300° for 90:10 brass. It has been found that while the hardness test can be an auxiliary aid in manuf. and receipt of material, replacing the tensile strength test, investigations on thin sheets should be continued with the baby Brinell and Rockwell machines. There has been detd. the most appropriate scale of working and annealing, starting from the ingot 32-mm. thick, for 3.35-mm. sheets, 72:28 alloy, and 1.55-mm. sheet, 90:10 alloy, which the factories should adopt when submitting this material to ammunition plants. E. M. SYMMES

X-ray spectrography of copper and of a few brasses. JOSEPH LOISEAU. *Rev. métal.* 25, 572-84(1928); cf. *C. A.* 22, 4442.—A study of Laue patterns of Cu and brasses. In rolled samples, as such or after annealing at moderate temp., the (100) planes are the reflecting planes. They constitute the faces of the cubes. They are oriented by rolling and make an angle of about 11° with one another for severe cold-working. The bisecting planes of these angles are perpendicular to one another and their intersection lies along the axis of the beam. The first effect of annealing is to orient the (100) planes about an axis perpendicular to the rolled sheet; it then produces an orientation of the reticular planes (in order of decreasing spacings) (110), (111), (200). In the α -solid soln. zone orientation due to rolling is manifested at all annealing temps. below the m. p. Passing through a transformation point modifies the form of the diagrams, giving the spots

a radial orientation and neutralizing the effects due to rolling. Examn. of the Laue diagrams enables 4 temp. zones of cryst. equil. to be detd.: (1) no effect, the properties retaining their initial values and the diagram being about the same as that of the rolled metal; (2) increasing effect, the properties varying with the temp. and the diagrams showing that the (100) planes begin to be oriented; (3) const. effect, the properties retaining the values they had at the end of the 2nd zone; at this stage the metal is entirely annealed; the zone is characterized by the orientation of the (100) planes; (4) harmful effects, the properties decreasing simultaneously; the metal is overheated; the diagrams indicate reflection from the (110), (111) and (200) planes. A. PAPINEAU-COUTURE

X-ray analysis of the copper-magnesium alloys. ANNA RUNQUIST, H. ARNFELT AND ARNE WESTGREN. *Metallog. Inst., Stockholm. Z. anorg. allgem. Chem.* 175, 43-8 (1928).—The thermal analysis of the Cu-Mg alloys, as well as the structure of the intermetallic compd. Cu_2Mg as detd. by Friauf (*C. A.* 22, 705), has been confirmed by x-ray analysis. A change in the lattice const. of Cu from 3.608 A. U. to 3.624 A. U. indicates a soly. of Mg in the Cu lattice, not to exceed 1.5 at. %. The addn. of Cu to Mg does not change the lattice dimensions of the latter, showing that the solid soly. of Cu in Mg is negligible. The dimensions of the hexagonal close-packed structure of Mg have been re-detd. for very pure metal: $a_0 = 3.203$ A. U., $c_0 = 5.196$ A. U. The structures of the intermetallic compds. Cu_2Mg and CuMg_2 have been studied by the powder method and by the rotating-crystal method. Cu_2Mg crystallizes as a face-centered cube which contains 24 atoms in the unit cell: $a_0 = 7.029$ A. U. The cube edge of Cu_2Mg varies from 7.021 A. U. when it is in equil. with the Cu phase to 7.036 A. U. when in equil. with the CuMg_2 phase. CuMg_2 has a face-centered rhombohedral lattice whose parameters are: $a = 5.273$ A. U., $b = 9.05$ A. U., $c = 18.21$ A. U.; the axial ratios, therefore are $a : b : c = 0.295 : 0.497 : 1$. The elementary parallelepiped contains 48 atoms.

A. J. KING

X-ray analysis of the copper-tin alloys. ARNE WESTGREN AND GÖSTA PHRAGMÉN. *Metallog. Inst., Stockholm. Z. anorg. allgem. Chem.* 175, 80-9 (1928).—By means of x-ray analysis it has been shown that the Cu-Sn system is a structural analog of the Cu-Zn system. The satn. concn. of α -bronze contains slightly more than 15% Sn. The lattice parameter of this increases from 3.608 A. U. to 3.698 A. U. The lattice of tetragonal Sn has the dimensions for the elementary prism: $a_0 = 5.818$ A. U., $c_0 = 3.174$ A. U. The β -phase which appears at high temps. has a body-centered cubic lattice with a parameter of 2.972 A. U. at 15 at. % Sn. The Cu and Sn atoms are distributed statistically on the lattice points. The phase which is sometimes called Cu_4Sn gives a powder diagram which resembles that of the γ -Cu-Zn and the γ -Cu-Al phases. According to this the lattice appears to be face-centered cubic with an elementary cube which contains 416 atoms and which has an edge of 17.91 A. U. The phase is homogeneous at a compn. which corresponds exactly with the formula, $\text{Cu}_{31}\text{Sn}_8$. The valence electron concn. for this is as 21:13, the same as the corresponding phases of the Cu-Zn and the Cu-Al series whose formulas are Cu_7Zn_3 and Cu_9Al_4 , resp. The ϵ -phase which is generally considered as Cu_3Sn has a close-packed hexagonal lattice. The parameters change with increasing Sn content from $a_0 = 2.747$ A. U., $c_0 = 4.319$ A. U. to $a_0 = 2.755$ A. U., $c_0 = 4.319$ A. U. The Cu and Sn atoms are statistically distributed. The η -phase which appears at about 60% Sn at lower temps. has the NiAs structure, with the following distribution of the atoms on the unit prism: Cu: 000; $00\frac{1}{2}$; Sn: $\frac{2}{3}$, $\frac{1}{3}$, $\frac{1}{3}$, $\frac{1}{3}$, $\frac{1}{3}$, $\frac{1}{3}$. The lattice parameters of the phase when satd. with Sn are: $a_0 = 4.190$ A. U., $c_0 = 5.086$, $c/a = 1.214$. The Cu atoms in excess of the formula CuSn are distributed statistically within the inner space of the lattice.

A. J. KING

Spectrographic analyses of Irish ring-money and of a metallic alloy found in commercial calcium carbide. A. G. G. LEONARD AND P. F. WHELAN. *Univ. Coll., Dublin. Sci. Proc. Roy. Dublin Soc.* 19, 55-62 (1928).—I. *Ring-money.*—The base metal forming the core of the ring is Sn with traces of Cu and Pb. The Sn was in a purer form than that in a pair of "pure" Sn electrodes used for comparison purposes. The Au sheath contains Ag and a trace of Cu. II. *Metallic alloy.*—The subject of this examn. was a metallic substance found occasionally in small quantities in a certain brand of com. CaC_2 . Its sp. gr. was between 9 and 10 and it conducted electricity like a metal. It resembled steel, but was brittle, and its hardness on Moh's scale was 5. It has a great resistance to acid attack. The presence of Fe, Ti and Si was proved and quantitated as Fe 66.2, Ti 22 and Si 11.3%. Details of measurements and identifications are given in tabular form.

J. A. KENNEDY

Laboratory experiments on high-temperature resistance alloys. C. J. SMITHILLS, S. V. WILLIAMS AND J. W. AVERY. *Engineering* 126, 629-32 (1928).—See *C. A.* 22, 4444.

E. J. C.

Rational recovery of clippings in the manufacture of aluminum alloys. P. SCHWERBER. *Metall* 1927, 165-6, 169-70; *Chem. Zentr.* 1927, II, 2566.—S. describes the various sorts of clippings of light metals, the circumstances encountered disfavoring their recovery, and finally their rational melting-down.

G. SCHWOCH
The influence of the shape of the mold on the properties of cast aluminum and its alloys. WILLI CLAUS AND FRITZ GOEDERITZ. *Giesserei-Ztg.* 24, 516-20; *Chem. Zentr.* 1927, II, 2347; cf. *C. A.* 22, 2912.—Pure Al, the "German alloy" (88% Al, 10% Zn, 2% Cu), and the "American alloy" (92% Al, 8% Cu) were cast in various kinds of molds, namely, the dry sand-mold, the green sand-mold and the Fe ingot-mold. The mech. properties of these castings were examd. The results are recorded in tables and photomicrographs.

G. SCHWOCH
Corrosion and residual currents. F. TÖDT. *Korrosion* 3, 37-8(1928).—The electrochem. explanation of corrosion is not the lowering of the overvoltage of H, but measurements have shown that the increased soln. of base metals connected to noble metals in H₂O solns. is due to residual currents caused by O, as indicated by current measurements with the following pairs: Zn-Pt, Zn-Cu, Zn-Pb, Zn-Cd, Cd-Pt, Cd-Cu, Cu-Pt, Cu-Pb, Pb-Pt, As-Pt, C-Cd. Under the same conditions of internal resistance, stirring, surface, etc., the resulting currents were nearly equal, but stirring the electrolyte increased the current tenfold; the current was nearly proportional to the surface of the noble metal, but independent of the base metal surface, of the internal resistance and the p_H value; by passing a current of O the elec. current was increased to several times that caused by passing air, but passing H decreased the current to 0.1 that caused by air, addn. of H₂O₂ raised the current to 10 times that of air; boiling the electrolyte and covering with paraffin reduced the current to about 0.25 of its former value, but on removing the paraffin the current was gradually restored. The measuring app. is described.

J. H. MOORE
Corrosion at discontinuities in metallic protective coatings. II. Different methods of applying a zinc coating. ULICK R. EVANS. *Metal Industry* 33, 281-3, 300-2(1928), cf. *C. A.* 22, 4100.—By measuring the potentials of galvanized Fe vs. pure Zn vs. time the thickness and type of Zn coating were detd. for sprayed, hot-dipped, sherardized and electrodeposited Zn. The electrodeposited and sprayed coats were pure Zn, the sherardized coating was a Zn-Fe alloy and the hot-dipped coating a mixt. of alloy and pure Zn. Sprayed and hot-dipped metals showed cracks on the convex side when bent. The electrodeposited coatings indicated the presence of cracks at bends upon subsequent immersion in 0.5 N NaCl soln. Sherardized coating showed cracks on the concave side of the bend, indicating brittleness in compression. In most cases rust first developed at the bends. Heavy sherardizing showed upon partial immersion, the presence of iron rust in 9 days, lightly sherardized coats in 4 days, while electrodeposited coats showed no attack on the Fe for 28 days. In Cambridge water all but the sherardized metal showed no yellow spots for 51 days while the sherardized coating showed slightly yellow tinges after 3 days and a heavy yellow deposit after 28 days. Thickly sherardized metal showed yellow tinges after 51 days. Bent specimens showed rust spots at the bends after 40 days. In moist air contg. SO₂ sherardized specimens darkened before sprayed and hot-dipped metal. Spraying in 0.5 N NaCl and 0.01 (NH₄)₂SO₄ showed localized attack at areas concluded to be discontinuities in coatings. A protective film of corrosion products is built up upon spraying in NaCl which prevents further corrosion. B. E. R.

Slip in a crystal and rupture in a solid due to shear (STARR) 2. Fuels, ores, etc (Ger. pat. 467,275) 21. Rotary drum furnace for ore roasting (Ger. pat. 468,288) 1. Cracking oils and reducing ores simultaneously (Brit. pat. 288,193) 22. Preventing rust formation in water systems (U. S. pat. 1,692,706) 14. Operating producers or shaft furnaces (U. S. pat. 1,692,572) 13.

KELLER, JOHN F.: *Lectures on Steel and Its Treatment*. Cleveland, Ohio: Evangelical Press, 1900 Superior Ave. 267 pp. \$3.50. Postpaid in the U. S. Reviewed in *Eng. Mining J.* 126, 720(1928).

PY, GAETAN: *Progres de la metallurgie et leur influence sur l'aeronautique*. Cleveland, Ohio: The Foundry, 40 cents. London: Penton Publishing Co., Ltd. F. 5. 90 pp. Reviewed in *Foundry* 56, 777(1928).

RAWLINSON, WILLIAM: *Modern Foundry Operations and Equipment*. LONDON: Chapman & Hall, Ltd. Cleveland, Ohio: The Foundry. 312 pp. \$5 (25s.) Reviewed in *Foundry* 56, 859(1928).

Strong Aluminum Alloys. Pittsburgh, Pa.: Aluminum Co. of America. 60 pp.

Magnetic separation of ore. ROSWELL H. STEARNS (to Magnetic Mfg. Co.). U. S. 1,692,590, Nov. 20. Finely divided material such as ore contg. magnetite is moved in a shallow stream of flowing water in opposition to the movement of the water while subjected to magnetic attraction transversely in a plane substantially parallel to the direction of flow. An app. is described.

Apparatus for separating ores by flotation. FRANK E. ELMORE. Fr. 639,476, Aug. 12, 1927.

Ore-concentrating apparatus. J. R. BROADLEY. Brit. 289,178, Jan. 28, 1927.

Reciprocating table for concentrating ores. J. R. BROADLEY. Brit. 289,371, Jan. 28, 1927. Structural features.

Centrifugal apparatus for metallurgical concentrations. F. M. COX. Brit. 289,681, Aug. 3, 1927. Structural features.

Washing minerals. ANTOINE FRANCE. Fr. 639,110, Aug. 5, 1927. A sieve for classifying minerals according to their density under the action of a sweeping current of liquid is described. Fr. 639,111 describes a method of mech. regulating the cross section of the sieve.

Agglomerating pulverulent materials for use in metallurgy. ÉMILE J. TYBERGHEIN. Fr. 636,866, June 30, 1927. Phosphatic material, which on account of its pulverulent condition cannot be used in blast furnaces, is made into briquets with Fe ore, preferably with a proportion of powd. coke.

Muffle construction for ore-sintering apparatus. JOSEPH C. DEVICK (to American Smelting & Refining Co.). U. S. 1,692,976, Nov. 27.

Roasting sulfide minerals. JOHN B. READ and MELVILLE F. COOLBAUGH. U. S. 1,694,794, Dec. 11. In subjecting sulfides such as those of Cu and Zn to an oxidizing roast, the minerals and gases are caused to travel in the same direction through the furnace; sulfates are formed and, toward the end of the roast, a predetd. quantity of sulfide mineral is added to react with sulfates already formed, so that the sulfates may be decompd. to produce oxides and retain regulated quantities of sulfates.

Roasting kiln for zinc blend. GEORG BALZ. Ger. 468,166, Oct. 23, 1924. Addn. to Ger. 419,308. The blend is scraped between vertical fixed and rotating teeth.

Vertical reduction chamber for zinciferous materials. THE NEW JERSEY ZINC COMPANY. Fr. 639,281, Aug. 10, 1927. Constructional features.

Reduction of zinciferous materials. THE NEW JERSEY ZINC COMPANY. Fr. 639,323, Aug. 11, 1927. An app. is described in which Zn ores are reduced in a chamber externally heated and combined with a condenser, the flow of gases liberated being induced by a chimney and the necessary pressure being maintained at one or more points along the chamber and condenser.

Refining metals. ALADAR PACZ. Can. 285,291, Dec. 4, 1928. Five parts of Na_2SiF_6 and 1 part of powd. Al and a quantity of one or more metallic deoxidizers such as Si, Ti or more Al are mixed together and briquetted, and the briquets are introduced below the surface of a ferrous metal bath to purify and refine it.

Compositions for refining metals. ALADAR PACZ. Can. 285,290, Dec. 4, 1928. Compos. for refining metallic baths and producing alloys consists of a double fluoride of an alkali metal and a non-alkali metal mixed with a quantity of Al powder approx. equiv. atomically to such non-alkali metal, and an addnl. quantity of metal which is to be incorporated into the bath.

Protecting the inner walls of iron melting pans. FERDINAND BUSCH and ANDREAS SCHROTER. Ger. 468,322, July 26, 1927. The inner walls are coated with asbestos.

Ferruginous blocks. SOCIÉTÉ LORRAINE DES ACIÉRIES DE ROMBAS. Fr. 639,147, Aug. 6, 1927. A mixt. of dust from the mouths of blast furnaces, coal and ferruginous flux moistened with water is pressed into blocks and afterward scorified and used in different types of metal furnaces.

Treating ores containing copper and zinc. METALLBANK UND METALLURGISCHE GES. A.-G. Brit. 288,266, April 7, 1927. Ores such as roasted pyrites contg. Cu and Zn are subjected to chloridizing roasting at a temp. above 550° with NaCl in excess (suitably about 15%) so that most of the Zn is converted into chloride and most of the Cu into sulfate. The product is then subjected to fractional lixiviation, and various treatments of the solns. to recover their values are described. Ag present passes into the Zn soln. and is pptd. with Cu present.

Treating chromium ores. BOZEL-MALETRA SOC. INDUSTRIELLE DE PRODUITS CHIMIQUES. Brit. 288,250, April 6, 1927. Decompn. of Cr ores with alkalis or alk. reagents (with or without use of diluents) is effected in a mech. furnace of the type usually employed for roasting pyrites, and through which the material may be continuously

fed while undergoing agitation in thin layers. The temp. used may be 200–300° less than usually heretofore employed and recovery of Na chromate formed is facilitated.

Treating chromium ores. I. G. FARBENIND. A.-G. Brit. 288,973, April 16, 1927. The proportion of Cr oxide in Cr ores is increased by treating the ore, at a temp. above 100°, with an alkali hydrate or carbonate, or both, in the absence of free O. The ore may be treated with a soln. under pressure or may be fused with the reagents and the products washed with water, alkali or acid and further treated.

Treatment of iron ores. JOHN W. HORNSKY (to the Granular Iron Co.). Can. 284,060, Oct. 16, 1928. Fe ore and carbonaceous material passing $\frac{1}{4}$ " mesh or finer is heated in a cylinder (the mixt. moving in counter flow to the reducing gases) at a temp. below 900° in a reducing atm. to reduce the Fe to form small particles without melting. The mixt. is transferred to a cylinder contg. a non-oxidizing atm. and cooled to below the oxidation temp. of the Fe. The mixt. is then removed into the outside air and the metallic particles are sepd. from the gang. The sepd. Fe particles are mixed and agitated with a polishing material to clean the Fe, which is finally introduced into a non-oxidizing atm. at about 1200° and therein welded to relatively large masses.

Treating platinum ores. S. C. SMITH. Brit. 289,220. Pt and other precious metals such as Pd, Rh, Ir, Au and Ag are extd. from Pt ores or concentrates contg. only small quantities of precious metals by treatment with HCl together with Cl or a substance (other than HNO₃) which evolves Cl or an oxide of Cl during the treatment such as MnO₂, a hypochlorite or a chlorate, which is preferably added gradually as the treatment proceeds. Numerous details are given.

Treating titanium ores. W. F. WASHBURN (to Titanium Pigment Co.). Brit. 288,569, April 12, 1927. A solvent such as H₂SO₄ is used for treating Ti-bearing material such as ilmenite under such conditions that gases or vapors (evolved *in situ* or introduced from an external source) are present in the interior of the reacting mass; no external heat is applied during the course of the reaction, and the latter may be controlled by agitating with a mech. device or by introducing gases such as air. A small quantity of water may be added to the mixt., contg. concd. H₂SO₄, to initiate the reaction, and water may be further added from time to time to maintain the desired temp. or steam may be injected to raise the temp., preferably to 80–120°. An aq. acid soln. obtained by leaching the product may be treated with Fe or Zn in Pb baskets to reduce ferric Fe and some quadrivalent Ti and obtain a soln. suitable for hydrolysis.

Iron and iron chlorides from ores. VEREINIGTE STAHLWERKE A.-G. Brit. 288,319, April 7, 1927. Fe ore is crushed and mixed with chlorides of alkali, alk. earth or Mg-group metals and the mixt. is heated to 150–250° to form Fe chloride. HCl may be added to the mixt. and the process may be carried out in a neutral atm. such as N. The resulting mixt. of Fe oxide and chloride is then treated with H at temps. below the b. p. of Fe chloride (suitably 150–200°) and the metallic Fe produced is sepd. magnetically or otherwise; or the Fe chloride may be volatilized at a temp. of about 250° with water and HCl, sepd. from the latter and then reduced by H at 300°. The HCl produced is used for chlorination of the ore. Cf. C. A. 22, 4450.

Recovery of tin and copper from waste bronze. HENRY GIL. Fr. 636,694, Oct. 26, 1926. Waste bronze is heated with HCl, the H being collected, and the liquid sepd. by decantation and washing. The solid residue of Cu and traces of Pb is dried and mixed with wood charcoal and heated in a reducing atm. in a foundry crucible to obtain Cu. The liquid is concd. and the Sn recovered by electrolysis.

Gold from sea water. B. CERNIK and B. STOCES. Brit. 289,638, May 3, 1927. See Fr. 633,998 (C. A. 22, 3621).

Treating metals and metalliferous material in cupola furnaces. D. H. MELOCHE (to American Radiator Co.). Brit. 289,007, April 19, 1927. Carbonaceous fuel such as powdered coal or coke is burned in a combustion chamber external to the charge-receiving chamber, and the resulting combustion products are passed upwardly through the charge. Various structural details of a furnace are specified.

Cupola. WILHELM STEFFE (to Freier Grunder Eisen- und Metallwerke G. m. b. H.). Can. 284,396, Oct. 30, 1928. Cupola provided with a particular form of front hearth is specified.

Metallurgical furnace. FRANCIS M. SIMONDS (half interest to Albert F. Hyde). Can. 284,448, Oct. 30, 1928. A furnace is specified in which the crushed ore in the form of a hollow cylindrical sheet or shell gradually thickening toward the bottom is heated while it descends to a discharge hopper.

Superposed-multiple-hearth rabble furnace for roasting ores, etc. ERZRÖSTUNG GRS. and G. BALZ. Brit. 288,823, April 25, 1927. Structural features.

Open-hearth regenerative furnace. FRANK R. MCGEE. U. S. 1,691,982, Nov. 20.

Regenerative furnace suitable for metallurgical purposes. W. MILLWARD. U. S. 1,695,199, Dec. 11.

Vertical furnace for iron reduction. CHARLES M. DAY and CHARLES J. SCULLIN. U. S. 1,694,376, Dec. 11.

Furnace for annealing metal sheets in an inert atmosphere. W. G. BEESTON. Brit. 289,121, Jan. 15, 1927.

Furnace for annealing metal articles in inert gases. ADALBERT BESTA. U. S. 1,695,224, Dec. 11.

Furnace for fusion of iron. FRITZ WÜST. Fr. 639,093, Aug. 5, 1927. For fusing Fe poor in C a cupola furnace is placed in front of a reverberatory furnace in such a way that the melt flows directly from the cupola into the reverberatory and the gases from the latter heat the former. The content of C may be regulated in the cupola.

Pot furnace for treating articles with molten cyanide, etc. ALBERT J. HANSON (to American Metallurgical Corp.). U. S. 1,694,416, Dec. 11.

Acid or basic converters. VEREINIGTE STAHLWERKE A.-G. Fr. 639,244, Aug. 9, 1927. See Ger 466,629

Utilization of blast-furnace dust. PAUL HESKAMP. Can. 284,140, Oct. 23, 1928. Blast-furnace dust recovered from the furnace gases is blown into the furnace shaft above the smelting zone with the aid of non-oxidizing gas.

Casting ingots. RHEINISCHE METALLWAAREN UND MASCHINENFABRIK. Ger. 467,361. Oct. 26, 1926. To avoid formation of hollow spaces within the ingot, the mold is provided centrally at the bottom with a pin movable within a larger pin, both pins being driven into the ingot as the metal cools.

Casting hollow ingots. J. BROWN & Co., LTD and W. H. ELLIS. Brit. 288,424, March 11, 1927. Mech. features.

Casting hollow metal articles. B. L. M. VAN DER LANDE. Brit. 288,573, April 12, 1927. A core formed of or coated with refractory material (which may be rotated during the casting) is drawn through the mold while the metal to form the hollow article is being poured.

Casting steel ingots for rolling into railway rails. VEREINIGTE STAHLWERKE A.-G. Brit. 288,271, April 8, 1927. Ingots are cast from soft steel with an insert of wear-resisting steel (which may contain Cr, Ni, Mn, Si, Ti or C) so placed as to form the wearing faces of the finished rail.

Hot top construction for ingot molds. MAXWELL G. DUMAS (to Dumas Engineering Co.). U. S. 1,692,491, Nov. 20.

Wash (containing aluminum powder and tar) for coating ingot molds. JOHN W. ALDEN (to Central Alloy Steel Corp.). U. S. 1,692,532, Nov. 20.

Invertible mold for casting metals, etc. CHARLES A. WOOD. U. S. 1,695,001, Dec. 11. Structural features

Centrifugal metal-casting machines. DAVID BROWN & SONS (HUDDERSFIELD), LTD., AND DAVID BROWN. Fr. 639,109, Aug. 5, 1927.

Apparatus for molding metals and alloys under pressure. NUMA P. R. V. J. DU DONJON. Fr. 636,575, June 25, 1927.

Apparatus for casting magnesium and its alloys while protected from oxidation. ELEKTRON-METALL GES. and K. F. WAGNER. Brit. 289,693, Sept. 7, 1927. A protective substance such as S may be so placed as to protect the metal from oxidation by compressed air used or by air in the mold.

Casting apparatus for first-quality and refined steels. FRANZ GEISSLER. U. S. 1,693,076, Nov. 27. Mech. features.

Cooling aluminum-alloy castings while clamped to prevent warping. ALLEN B. NORTON (to Aluminum Co. of America). U. S. 1,695,239, Dec. 11. Mech. features.

Molders' core materials. K. MICHAELIS (to A. Stahn). Brit. 288,587, April 12, 1927. A binder for making self-supporting cores from quartz sand comprises a water-sol agglutinant such as sulfite liquor and an oil-sol. pitch such as stearin pitch. Not more than 4 parts of this binder is required for each 100 parts of sand.

Magnetic dust cores. GUSTAF W. ELMEN (to Bell Telephone Laboratories). U. S. 1,695,041, Dec. 11. Cores such as those of elec. coils comprise particles of magnetic material such as an alloy of Ni and Fe substantially all of which have a continuous curved surface, insulated and compressed together to form a coherent structure. The particles may be prepd. by spraying the molten metal into a bath of water. Cf. C. A. 22, 2350.

Hard-surfaced engine pistons of light metal. F. FEHRENBACH. Brit. 288,467, July 28, 1927. Pistons are made by casting in a metal chill an alloy of Al with Si 18-35% with or without 5% of other metals or metalloids. Details of the operation are described.

Malleable cast iron. C. E. KLUIJTMANS and W. H. W. PROCTOR. Brit. 288,980, April 16, 1927. A charge of steel scrap and residues from previous melts is melted in a cupola with addn. of small quantities of ferro-Si and ferro-Mn to produce a white iron of the compn.: C (cementite and pearlite) not over 2.9, Si 1.1-1.5, Mn 0.42-0.75, P 0.1-0.2, S below 0.2 and Fe 98.38-94.45%. The iron is then embedded in sand or Fe ore in an annealing furnace and rapidly heated to 680°, then for 12 hrs. at 680-730° rapidly from 730° to 800°, then for 12 hrs. at 800-830°, then rapidly from 830° to 880°, then for 48 hrs. at 880-900°, cooled at the rate of 5-8° per hr. down to 700° and then rapidly cooled.

Black-heart malleable cast iron from white cast iron. TARIO KIKUTA (to Tobata Imono Kabushiki Kaisha). U. S. 1,692,842, Nov. 27. In a process not using packing material, the white cast iron is first maintained at 850-950° for 15 hrs., then cooled to and maintained at 730-650° for 20-50 hrs., then removed from the furnace and cooled rapidly.

Improving cast-iron surfaces. WILHELM KLEPSCH. Fr. 639,590, Aug. 17, 1927. Surfaces of cast iron are made more resistant to heat, acids or alkalis by forming thereon a layer of appropriate thickness of Fe contg. 1.4 to 2.6% C. Other metals may be added to the Fe.

Apparatus (with long narrow retorts arranged in a row) for reducing metallic oxides such as those of iron (to form sponge iron). WILLIAM H. SMITH (to General Reduction Corp.). U. S. 1,692,587, Nov. 20. A heating system is specified which provides for preheating between the retorts. U. S. 1,692,588 specifies continuously passing Fe oxide or the like through a reducing zone of fixed temp. and utilizing the heat from reduced Fe to preheat the incoming ore. An app. is described.

Rust-proofing iron and steel. NEAL HARRIS. U. S. 1,694,820, Dec. 11. A black rust-resisting oxide or other coating is formed on *cans for holding foods* or other articles by Parkerizing or other suitable process and the coating is then covered with a film of adherent easily fusible metal such as Sn.

Enamel-coated iron, steel or other articles. JOHN A. ANDERSON (to Central Oil and Gas Stove Co.). U. S. 1,693,130, Nov. 27. A base material such as iron or steel is coated with enamel contg. 60% silica and an anchoring material such as oxides of B, Na, Al, Ca, Co and Ni.

Steel. WELTON J. CROOK (three-fourths interest to The Pacific Coast Steel Co.). Can. 283,961, Oct. 9, 1928. C steel of high elastic limit and ductility for structural purposes is produced by heating normal steel contg. not over 0.25% C and between 5% and 1% Mn to 1300-1700° F., holding this temp. for 10 min. to 1 hr. or longer, quenching rapidly and then reheating to a temp. not above 1300° F., maintaining this temp. for 10 min. to 1 hr. or longer and thereafter cooling slowly or quickly.

Steel. DEUTSCHE EDELSTAHLWERKE A. G. Ger. 467,307. Apr. 25, 1926. Scale is removed from stainless steel during manuf. by treatment with a soln. of HF or salts of HF with alkali or alk. earth metals. E. g., an aq. soln. of HCl, HNO₃, HF and NH₄F may be used.

Hardening steel for high-speed tools, etc. WERNER STAUFFER. Swiss 126,252, Apr. 23, 1927. The pieces to be hardened are heated while packed round with a finely divided carbide, particularly a Si carbide.

Hardening articles of high-speed steel. W. STAUFFER. Brit. 289,082, April 23, 1927. The articles are packed in a carbide such as granular SiC and may be heated to about 1380°. Graphite powder may be added to the carbide.

Hollow drill steel. LESLIE PRYCE. Can. 284,179, Oct. 23, 1928. Hollow rock drill steel is manufd. with the bore through the steel formed of pure Fe, non-corroding metals as Ni, and non-corroding ferrous alloys such as Al and Cr alloys. Cf. C. A. 22, 2138.

Crucible steel. J. K. SMITH (to The Granular Iron Co.). Can. 284,059, Oct. 16, 1928. Crucible steel is produced from solid-produced Fe, i. e., Fe produced from low-grade ores by a process which does not involve the melting and in which there is present to a greater or less degree, earthy or mineral dross. The dross and oxide are completely sepd. from the metallic Fe, and thus is avoided subsequent formation of slag, and the Fe is then briquetted and used as a crucible charge. From this point on the melting process is as customarily followed in crucible practice. The quality of the steel is equal to that of crucible steel made from high-grade Swedish iron base.

Aluminum. ELEKTRIZITÄTSWERK LONZA. Fr. 639,645, Aug. 18, 1927. Al₂O₃ is divided sufficiently for the prepn. of Al electrothermally, by very rapid cooling, e. g., by pouring the molten Al₂O₃ in a thin stream into water, whereby crystals are formed with spaces between them.

Alloy. WILLOUGHBY S. SMITH, HENRY J. GARNETT and JOHN A. HOLDEN. Can. 283,831, Oct. 9, 1928. A magnetic, substantially C-free alloy contains Fe 12.90, Si 1.6, a metal selected from the group Cr, W, V, Mo 2.20, Mn 0.30% and the rest Ni.

Alloy. EUGEN VADERS. Can. 284,193, Oct. 23, 1928. An alloy comprises Al 5 to 9.5, Mn 1 to 6, Ni 0 to 3, Fe 0.1 to 3 and Sn 0.01 to 2%, the remainder being Cu.

Alloys. ALADAR PACZ. Can. 285,298, Dec. 4, 1928. The production of an alloy of a metal whose oxide is refractory consists in forming a double fluoride of the metal with Na, pulverizing such fluoride, mixing with a quantity of powd. Al necessary to replace the first-mentioned metal, agglomerating the mixt. into lumps, and adding to a molten bath of the metal with which the first metal is to be alloyed.

Alloys. MICHAEL POLYANYI and STEFAN VON BOGDANDY. Ger. 468,103, July 29, 1927. Addn. to Ger. 449,973. App. for the estn. of the compn. of a Cu, Zn alloy by distg. off the Zn *in vacuo* is described.

Fusible alloy. WILFORD J. HAWKINS (to the American Machine and Foundry Co.). Can. 285,319, Dec. 4, 1928. A fusible alloy capable of being used to unite metallic surfaces consists of pure Pb having incorporated Pb phosphide (0.1%). When a bright or lustrous appearance is desired a brightening metal (Al, Sb, Sn or Zn) may be fused with the alloy.

Alloy capable of rapid magnetization and demagnetization. SIDNEY OSSER. U. S. 1,692,690, Nov. 20. Fe is associated with Mn 0.51, P 0.10-0.15 and Si 0.3-0.5% to form a material suitable for use in electromagnets, transformers or other elec. devices or app.

Alloys for blades and nozzles of turbines. H. HOLZWARTH. Brit. 289,089, April 23, 1927. Blades and nozzles of gas turbines are formed of alloys of Ni, Cr and Fe. A suitable alloy for the nozzles and stator blades comprises Ni 60, Cr 12 and Fe 25 parts, and, for the rotor blades, Ni 65, Cr 15, Fe 10 and Mo (to increase the hardness) 1 part. Traces of P, Mn, S and Si also may be present.

Bearing-metal alloy. KARL MÜLLER and WILHELM SANDER. U. S. 1,691,931, Nov. 20. Pb 70-75, Sb 15-25, Sn 3-6, a metal of the Co type 1-3 and Cu 0.6-2.0%. U. S. 1,691,932 specifies Pb 70-75, Sb 15-25, Sn 3-6 and Cd not over 5%. Small quantities of auxiliary ingredients also may be added.

Hard alloys and carbides. S. L. HOYT (to British Thomson-Houston Co., Ltd.). Brit. 288,521, April 6, 1927. Compns. consisting of W, C and Co, and of W and Cu are referred to. W carbide may be first formed by heating W with finely divided sugar C or gas C or in CH₄ or illuminating gas. The carbide formed may be powdered and mixed with Co and the mixt. placed in a C mold and heated to about 1300-1450° between electrodes while subjected to a pressure of about 1000 lb. per sq. in. Instead of first forming W carbide, a mixt. of W, Co and C may be treated.

Magnetic alloy. OLIVER E. BUCKLEY (to Western Electric Co.). U. S. 1,695,038, Dec. 11. Alloys suitable for loading submarine cables comprise Fe together with 80-85% as much Ni as Fe (and may also contain some Cu, Cr, etc.) and have a higher permeability than Fe at magnetizing forces less than a few tenths of a c. g. s. unit. Cl. C. 122, 3128.

Deoxidizing molten metals and alloys. SIEMENS & HALSKE A.-G. Brit. 288,543, April 11, 1927. Be (usually not over 0.5%, which may be in the form of an alloy) is added (with or without other additions such as Li) to metals such as Cu and Ni, to effect deoxidation.

Increasing the electrical conductivity and flexibility of aluminum alloys. KARL HALMANN. U. S. 1,695,044, Dec. 11. Alloys of Al which may also contain Zn, Cu, Si, Cd or Be are annealed to recrystn. temps., reduced in cross-section by cold treatment and then reheated to 160-200°.

Purifying antimonial lead alloys. UNITED STATES SMELTING, REFINING AND MINING Co. Brit. 288,939, Dec. 21, 1927. A modification of the process described in Brit. 236,782 (C. A. 20, 1214) for purifying antimonial Pb alloys with NaOH, Na₂CO₃ or the like consists in carrying out the operation at temps. of 335-480° (preferably 450-460°).

Purification of copper or its alloys. COMPAGNIE FRANÇAISE POUR L'EXPLOITATION DES PROCÉDÉS THOMSON-HOUSTON. Fr. 639,596, Aug. 17, 1927. Molten Cu or Cu alloys such as bronze is purified by the addn. of an alk. earth metal such as Mg, or a Mg-Al alloy (90-85 Mg to 10-15% Al). One part of the alloy is added to about 320 of the Cu, just before casting at a temp. of about 1200°.

Copper alloys. FRIEDRICH HEUSLER. U. S. 1,692,936, Nov. 27. In order to increase the hardness and elastic limit of alloys of Cu contg. Mn 0.5-20 and Si 0.3-8%, the alloys are first annealed, after they have been cast, rolled or forged, at a temp. above 450°, then cooled, and finally hardened at a temp. of 200-350°.

Copper alloys. METALLBANK UND METALLURGISCHE GES. A.-G. Brit. 288,314, April 9, 1927. A modification of the alloys described in Brit. 286,616 (C. A. 23, 369) consists in replacing the Fe content by one or more of the metals Cd, Sn and Mn. The alloys may contain Cu 96, Ni 2, Si 1% and up to 1% of Sn or Cd or both or up to 3% of Mn; and may be heat-treated at about 750°, quenched, cold-rolled, annealed at 300–600° and further worked, or may be annealed at above 600°, cooled rapidly to 300–400° and then cooled slowly.

Copper-silicon alloys. METALLBANK UND METALLURGISCHE GES. A.-G. Brit. 288,974, April 16, 1927. Cu-Si alloys which may also contain other elements such as Ni, Fe, Mn, Sn, Cr, W, Zn, Al, Mg, As, Sb, Ca, Co, P and Ti, contain also up to 10% of Pb, Cd and Tl.

Iron alloys. B. D. SAKLATWALLA. Brit. 288,861, June 30, 1927. Can. 284,361, Oct. 30, 1928. Fe alloys contain Cr 1–8, Cu 0.5–5 and Si 1–6%. C may be present up to 3.5% and scavenging and refining agents such as Al, Ti and V may be added.

Cast iron alloys. H. L. GREENE and C. TAYLOR (to Molybdenum Corp. of America). Brit. 289,075, April 21, 1927. Cast iron alloys are formed contg. about 1–4% C, 0.5–2.5% Si, 1–4% Ni and up to 1% Mo, without other intentionally added constituents. S, P and Mn may be present as impurities and metals such as Cr, V and Cu may also be included if they are present in scrap metal used for making the alloys.

Iron-beryllium alloys. SIEMENS & HALSKE A.-G. Brit. 288,579, April 12, 1927. Alloys of Fe with less than 13% Be (which may also contain up to 40% of other elements such as Al, Ni, Cu, Sn, Zn, Co, C and Si and which may be worked mechanically before treatment) are improved by quickly cooling in air or by quenching from temps. above 550° and then heating to 250–500°.

Non-magnetic or feebly magnetic iron alloys. FRIED. KRUPP A.-G. Swiss 126,436, June 14, 1927. Typical alloys comprise (1) 6–12% Mn and 3–7% Si, and (2) 3% C, 3–8% Mn, 1–5% Si and 4% Ni.

Magnesium alloys. I. G. FARBENIND. A.-G. Fr. 639,256, Aug. 10, 1927. Alloys of Mg for pistons of internal-combustion engines contain 1 to 6% of Si and Al, Cu, Zn, Cd or Ca separately or mixed and in such proportions that the fusion point is not below 400° and in quantity not above 20%.

Alloys of sodium and potassium. LOUIS HACKSPILL and ÉMILE RINCK. Fr. 639,218, Aug. 8, 1927. Na is heated with KCl above the fusion point of KCl. The salt residue forms a sep. layer or becomes solid at ordinary temp., whereas the alloy remains liquid.

Hard alloys of tungsten, etc. E. G. GILSON (to British Thomson-Houston Co., Ltd.). Brit. 289,477, April 28, 1927. A hard metallic compn. consisting of a metal of the Cr group such as W together with C and a metal of the Fe group such as Co is prepd. by subjecting a mixt. of the powd. elements to pressure at a sintering temp. A C mold and a pressure of about 1000 lb. per sq. in. may be used.

Phonograph needles or styli made of aluminum and its alloys. E. R. LAUBER. Brit. 288,279, April 6, 1927. The Al may be hardened by rolling or drawing or by alloying with Si, Fe, Cu, Zn, Sn, Mn, Ni, Mg or other suitable metals.

Apparatus for kneading and forming amalgams. KARL ZENTNER. U. S. 1,694,524, Dec. 11.

Protecting metals. SOCIÉTÉ ANON DE PERFECTIONNEMENTS ÉLECTROLYTIQUES. Fr. 639,701, Jan. 21, 1927. Metals such as Fe which are coated with a protecting layer of another metal such as Cr are afterwards dipped into a heated bath of melted paraffin, whereby any cracks or fissures in the coating are filled up.

Coating metals. THE EXPANDED METAL CO., LTD. Fr. 639,116, Aug. 5, 1927. A metal to be impregnated with Al or an alloy is first coated with Cd electrolytically and then exposed to vapors contg. the Al or alloy.

Coating metals. SIEMENS & HALSKE A.-G. Fr. 639,841, Aug. 20, 1927. Metals of alloys are coated with Be in a fusion bath composed of an alkali halide and a compd. of Be, the metal to be coated forming the cathode, at a temp. below the fusion point of Be. An intermediate coating of a metal, such as Cu, Fe or Ni, which will alloy with Be may be given.

Coating base-metal articles to protect them from corrosion. R. NOVELLY. Brit. 288,674, Jan. 1, 1927. Articles such as malleable iron sheets are coated on one or both sides with a steel alloy contg. Cr 6–25, Ni 0.5–20 and C up to 1% (suitably Cr 16.5, Ni 10.2 and C 0.15%).

Treating metals before painting. JAMES H. GRAVELL. Fr. 636,734, June 28, 1927. See Can. 280,098 (C. A. 22, 2819).

Etching. F. ULLMANN. G. m. b. H. Ger. 468,045, July 31, 1927. Metal plates

are carried on a rotating cylinder and the etching acid is thrown upon it by a bladed wheel rotating in the acid.

Galvanizing. J. H. LAWES. Brit. 288,741, Jan. 21, 1927. Al is added to a Zn bath in the form of an alloy of Al with 40 times its quantity of Zn (preferably commercial virgin spelter) and the use of NH_4 salts as a flux may be dispensed with.

Welding rails by the thermo-aluminic method. H. SCHULTZ. Brit. 288,309, April 6, 1927. Mech. features.

Soldering tungsten and molybdenum. NAAMLÖÖZE VENNOOTSCHAP PHILIPS' GLOEILAMPENFABRIEKEN. Brit. 289,553, Jan. 31, 1927. Cu together with a deoxidizing substance such as Si or Al is used for soldering W or Mo, *e. g.*, for uniting W contact plates or rods to leading-in wires. A flux such as borax or glass may be added. Mention is also made of the similar soldering of chrome-iron.

10—ORGANIC CHEMISTRY

CHAS. A. ROUILLER AND CLARENCE J. WEST

New investigations relating to organic radicals during the years 1922–1928. F. HENRICH. *Z. angew. Chem.* **41**, 1214–8, 1239–42 (1928). E. J. C.

Recent results in the chemistry of alkaloids. ERNST SPATH. *Z. angew. Chem.* **41**, 1234–9, 1257–62 (1928).—A review. E. J. C.

Oxidation of hexane. MAX BRUNNER AND ERIC K. RIDEAL. Univ. of Zürich and Cambridge. *J. Chem. Soc.* 1928, 2824–5; *cf. C. A.* **22**, 3130. —Further investigation of the rate of O consumption, in the oxidation of C_6H_{14} , while confirming the view that the period of rapid pressure increase is associated with an oxidation process by means of peroxide mols. formed prior to the observed pressure increase, has shown that the rate of O uptake during the initial period of no pressure change, previously called the induction period, is in reality rather rapid. The rapid increase in pressure occurs when the O has almost disappeared and is to be attributed to reactions involving the decompn. or reaction of peroxide mols. The rate of O uptake appears to be a 0-order reaction over a wide range of pressure. The reactions which appear to predominate in the initial stages of combustion in glass vessels at low temps. may be summarized by the equations: $\text{C}_6\text{H}_{14} + \text{O}_2 \longrightarrow \text{C}_6\text{H}_{14}\text{O}_2$ (active mol.); $\text{C}_6\text{H}_{14} + \text{C}_6\text{H}_{14}\text{O}_2 \longrightarrow 2\text{C}_6\text{H}_{12} + 2\text{H}_2\text{O}$; $\text{C}_6\text{H}_{12} + \text{O}_2 \longrightarrow \text{C}_6\text{H}_{12}\text{O}_2 \longrightarrow$ decompn. The peroxides cannot be the reaction centers for the propagation of the chem. action through the homogeneous bulk phase. C. J. WEST

The rearrangement of ozonides. ALBERT VERLEY. *Bull. soc. chim.* **43**, 854–7 (1928). —The decompn. of ozonides cannot always be relied upon to fix the position of a double bond. Three types of ozonide formation may occur. (1) The ozonide is formed by the fixation of O_3 at a double bond occupying a special position as with isosafrole. In this case no rearrangement is possible and the ozonide decompn. at the original double bond. (2) The ozonide is formed at a double bond occupying an indifferent position. A typical case is furnished by oleic acid. The position of the double bond between 9 and 10 (numbering from the end of the chain opposite the carboxyl) is indifferent, *i. e.*, if it passes to position 8,9 or 10,11 these 2 positions are equiv. to the first. In this case rearrangement is possible and the ozonide, $-\text{CH}_2\text{CH}(\text{O}-\text{O})\text{CHCH}_2-$, can pass by

the shifting of one of the O atoms around the other to either of the positions

$$\begin{array}{ccc} \text{O}-\text{O} & & \text{O}-\text{O} \\ | & & | \\ -\text{CH}_2\text{CH}_2\text{CH}(\text{O}-\text{O})\text{CH}- & \text{or} & -\text{CH}(\text{O}-\text{O})\text{CHCH}_2\text{CH}_2- \\ | & & | \\ \text{O}-\text{O} & & \text{O}-\text{O} \end{array}$$

(3) The ozonide is formed at a double bond adjacent to a special position. In this case the rearrangement cannot be avoided and always occurs to a certain extent. An example is eugenol, which on oxidation with O_3 behaves in part like isoeugenol.

E. R. SMITH

Several compounds of α -glycols with arsenic acid and arsonacetic acid. BERTIL ENOLUND. Univ. Upsala. *J. prakt. Chem.* **120**, 179–84 (1928).— H_3AsO_4 dissolves easily in $(\text{CH}_2\text{OH})_2$ on slight warming; on cooling, diglycolarsenic acid, $\text{HOAs}(\text{C}_2\text{H}_4\text{O}_2)_2$, m. 120° , seps., which is stable in the air but is immediately hydrolyzed by H_2O ; in CHBr_3 the mol. wt. is twice the calcd. The pyridine and brucine salts are reported. Triglycolarsenic acid could not be obtained pure but an iline, pyridine and brucine salts were obtained when excess of $(\text{CH}_2\text{OH})_2$ was used. Diglycolarsonacetic acid, $(\text{C}_2\text{H}_4\text{O}_2)_2\text{AsCH}_2\text{CO}_2\text{H}$, m. 142° (60% yield), immediately hydrolyzed by H_2O ; brucine salt.

If the $(\text{CH}_3\text{OH})_2$ soln. is heated above 130° , CO_2 is split off, giving *diglycol methyl-arsenate*, b_p $135-6^\circ$. *Dipinacone arsenic acid*, $\text{HOAs}(\text{C}_2\text{Me}_4\text{O}_2)_2$, m. 131° ; *pyridine salt*. *Dipinacone arsonacetic acid*, m. 188° (decompn.). *d-Tartaric acid arsonacetic acid*, carbonizes above 250° .

C. J. WEST

Some side reactions in the preparation of alkylmagnesium halides. HENRY GILMAN AND ROBERT E. FOTHERGILL. Iowa State College. *J. Am. Chem. Soc.* 50, 3334-41(1928).—A study has been made of the gases formed during the prepn. and in the hydrolysis of some alkylmagnesium halides. A table is given showing the gases resulting in the prepn. of MeMgI , EtMgBr and $\text{C}_4\text{H}_9\text{MgBr}$. From the nature of these gases it appears that the free radicals that are probably formed prior to the formation of organomagnesium halides undergo disproportionation and coupling to varying degrees.

C. J. WEST

Synthesis of behenic acid. RAMAKANTA BHATTACHARYA, SHANKAR RAO SALETORRE AND JOHN L. SIMONSEN. Indian Inst. Sci., Bangalore, and Univ. of London. *J. Chem. Soc.* 1928, 2678-81.—An improved method is given for decane-1,10-dicarboxylic acid; the partial hydrolysis of the Me ester gives the *Me II ester*, m. 51° . Reduction with EtOH and Na gives *11-hydroxydodecoic acid*, m. $78-9^\circ$ (*Mg salt*, amorphous). *Me ester*, b_p 160° ; *anilide*, m. 87° . MeOH-HBr transforms the acid into *Me 11-bromododecoate*, m. about 50° ; condensation with $\text{C}_6\text{H}_{17}\text{C}$: CNa gives behenic acid, m. 57° .

C. J. WEST

New esters of α -bromopropionic and α -bromoisobutyric acids. VENANCIO DEULOFEU. *Anales soc. españ. fis. quim.* 26, 315-9(1928); cf. *C. A.* 22, 3881.—By the action of MeCHBrCOBr and $\text{Me}_2\text{CBrCOBr}$ on an excess of the corresponding alcs. the following new esters were prepd.: α -Bromopropionates.—*iso-Pr*, b. $163-5^\circ$ (yield, 41%), *allyl*, b. $173-7^\circ$ (47%); *Bu*, b. $192-6^\circ$ (41%). α -Bromoisobutyrate.—*Pr*, b. $92-6^\circ$ (54%); *iso-Pr*, b. $91-4^\circ$ (40%); *allyl*, b. $90-3^\circ$ (51%). All are oily liquids of peculiar odor, the allyl esters pungent, the others fruit-like.

E. M. SYMMES

Carbazylic acids, the ammonia analogs of the carboxylic acids. E. F. CORNELL. Stanford Univ. *J. Am. Chem. Soc.* 50, 3311-8(1928).—The amidines are to be regarded as the NH_2 analogs of the carboxylic acids and are termed carbazylic acids. The alkyl and aryl cyanides are anammonides of the carbazylic acids. By the action of a metallic amide and a nitrile in liquid NH_3 the following salts were prepd.: *K* and *Na ammonoacetate*, *K*, *Na* and *Ca ammonopropionate*, *K* and *Na ammonobutyrate*, *K ammonovalerate*, *K ammonoisocaproate*, *K ammonopalmitate*, *K ammonosuccinate*, *K*, *Na*, *Ag*, *Cu*, *Cu* and Cu^{++} *ammonobenzoate*, *K ammono-p-toluale* and *Na dibenzylimidamide*. The action of HCN upon KNH_2 gives KCN ; KNH_2 and CN give K_2NCN , KCN and NH_3 , PhCN and KOH in liquid NH_3 , heated 16 hrs. at 175° , give $\text{Bz}(\text{NH})\text{OK}$; EtCN gives $\text{EtC}(\text{NH})\text{OK}$. PhCN and NH_4Cl in NH_3 give $\text{PhC}(\text{:NH})\text{NH}_2$; EtCN behaves similarly. The decompn. of the salts of the carbazylic acids, when heated with a metallic amide, proceeds with the formation of a hydrocarbon and an alkali salt of H_2NCN . $\text{PhC}(\text{:NH})\text{NHK}$ and HCl in EtOH give $\text{PhC}(\text{:NH})\text{NH}_2$, HCl and KCl . $\text{Ph}_3\text{C NMgBr}$ and NH_3 give $\text{Ph}_3\text{C:NH}$ and NH_2MgBr .

C. J. WEST

Reactions relating to carbohydrates and polysaccharides. XVIII. *p*-Nitrobenzylidene glycols and glycerols. HAROLD HIBBERT AND MURRAY G. STURROCK. McGill Univ. *J. Am. Chem. Soc.* 50, 3374-6(1928); cf. *C. A.* 23, 98.— $p\text{-O}_2\text{NC}_6\text{H}_4\text{CHO}$ (20 g.), 31 g. $(\text{CH}_2\text{OH})_2$ and 0.2 cc. 40% H_2SO_4 , heated on the steam bath for 6 hrs., give 60% of *p*-nitrobenzylideneethylene glycol, m. 90.5° ; the corresponding trimethylene deriv., m. 111.5° , results in 71% yield. From $\text{C}_3\text{H}_5(\text{OH})_2$, there results a mixt. of isomeric *p*-nitrobenzylideneglycerols, 1 m. 85° , increasing to 99° on standing, the other being an oil at -15° . The corresponding benzoates, m. 198° and 178° . XIX. Structural, geometrical and optical isomerism of the *p*-nitrobenzylideneglycerols and their derivatives. H. HIBBERT AND NEAL M. CARTER. *Ibid* 3376-88.— $p\text{-O}_2\text{NC}_6\text{H}_4\text{CHO}$ (166 g.), 110 g. $\text{C}_3\text{H}_5(\text{OH})_2$ and 6 drops 40% H_2SO_4 , heated 20 min. at 120° , during the latter part of which suction is applied to remove the H_2O , give 99% of the mixt. of *p*-nitrobenzylideneglycerols; the C_3H_5 soln. at 0° deposits 48% of the 1,1'-isomer (I) and the filtrate yields 51% of the 1,2-isomer (II). Methylation of 100 g I gives 30 g. of a 2-Me ether, m. 139° , and 35 g. of a 2nd ether, m. 100° , corresponding to the 2 theoretically possible, non-resolvable, geometrically isomeric forms. These same forms are obtained by condensing glycerol β -Me ether with $p\text{-O}_2\text{NC}_6\text{H}_4\text{CHO}$, sepn. being effected by crystn. from MeOH . Hydrolysis of either ether gives the β -Me ether in approx. 90% yields. Condensation of glycerol α -Me ether with $p\text{-O}_2\text{NC}_6\text{H}_4\text{CHO}$ gives a mixt. of 1,2-*p*-nitrobenzylideneglycerol 1'-Me ether, m. 47° and 42° , also obtained by methylation of II; these correspond to the 2 theoretically possible, geometrically isomeric, racemic forms. Benzoylation of I gives a mixt. of the 2-Bz derivs.,

m. 204° and 159°; if freshly crystd. I is used, only the higher-melting isomer is obtained. $p\text{-O}_2\text{NC}_6\text{H}_4\text{COCl}$ and I with $\text{C}_6\text{H}_5\text{N}$ give 2 isomeric 2-*p*-nitrobenzoyl derivs., m. 208° and 202°. II and BzCl give 2-*Bz* deriv., m. 178° and 115° and 2-1'-*p*-nitrobenzoyl derivs., m. 117-8° and 110°. Addn. of 0.01% by wt. of dry HCl to either I or II, followed by heating to 130° for 1.5 hrs., causes an equil., the ratio of I:II being approx. 1:5.

C. J. WEST

Sesamin. J. BÖESEKEN AND W. D. COHEN. Tech. Hochschule Delft. *Biochem. Z.* 201, 454-63(1928).—Sesamin is the 3rd unsaponifiable component of sesame oil; it has the empirical compn., $\text{C}_{20}\text{H}_{18}\text{O}_6$. Several reactions of the sesamin are described.

S. MORGULIS

Synthesis of mesoxalates by interaction of nitrogen tetroxide with esters of malonic acid. ELIZABETH GILMAN AND TREAT B. JOHNSON. Yale Univ. *J. Am. Chem. Soc.* 50, 3341-8(1928).— $\text{CH}_2(\text{CO}_2\text{Et})_2$ (25 g.) and an equal wt. of liquid N_2O_4 and about 1 g. Na at -5° for 3 hrs. and at room temp. for 2 days give 90% of $\text{CO}(\text{CO}_2\text{Et})_2$; the principal gas evolved is NO. $\text{CH}_2(\text{CO}_2\text{CH}_2\text{CH}_2\text{Cl})_2$, b₄ 143-4° and N_2O_4 at -5° give 90% of di- β -chloroethyl mesoxalate, greenish yellow oil, b₂ 148°; the hydrate is an oil. Di- β -bromoethyl malonate, b₁ 153°, in 84% yield from $\text{CH}_2(\text{CO}_2\text{H})_2$ and $\text{BrCH}_2\text{CH}_2\text{OH}$, with HCl as the catalyst, gives with N_2O_4 di- β -bromoethyl mesoxalate, b_{0.8} 155°, yellow oil which is decolorized by H_2O but does not give a cryst. hydrate. $\text{Et}_2\text{NCH}_2\text{CH}_2\text{OH}$ in CHCl_3 made just acid by HCl gas, and then treated with $\text{CH}_2(\text{COCl})_2$, gives the di HCl salt, m. 154° (decompn.), of di- β -diethylaminoethyl malonate, b_{4.8} 163°. The ester reacts explosively with N_2O_4 ; with gaseous N_2O_4 at low temps., 3 equivs. were completely decolorized before a green color was imparted to the soln.; the HCl salt produces a much less vigorous reaction and only 1 equiv. is decolorized; no satisfactory method of decompn. the intermediate product formed to yield mesoxalate has been discovered.

C. J. WEST

Synthesis of lactose. A. PICTET AND H. VOGEL. Univ. Geneva. *Lait* 8, 684-5 (1928). cf. C. A. 21, 3602.— β -Galactose was heated *in vacuo* at 150° to obtain β -galactosan, hygroscopic, m. 154-5°, α_D 30.5°. β -Galactosan was mixed with an equal wt. of β glucose, a few cg. of ZnCl_2 added, and the mixt. heated *in vacuo* at 150°, where the mass fused and then resolidified on cooling: $\text{C}_6\text{H}_{12}\text{O}_6 + \text{C}_6\text{H}_{10}\text{O}_6 = \text{C}_{12}\text{H}_{22}\text{O}_{11}$. The product of this reaction was boiled in H_2O with Ag_2CO_3 to ppt. Zn, then with animal charcoal and evapd. to dryness. The residue on treating with Ac_2O resulted in lactose octaacetate, m. 85°, easily purified by crystn. The acetate was also obtained by heating β glucose with β -galactose and raising the temp. to 175°. The former remained unchanged; only β -galactose was transformed into its anhydride. Further treatment was as above. The acetate was sapond. by NaOEt , according to Zemplén. This gave a reducing sugar, $\text{C}_{12}\text{H}_{22}\text{O}_{11}$, which was completely identified as lactose.

H. F. ZOLLER

Decomposition products of benzene at high temperatures. YOSABURO KOSAKA. Tokyo Imp. Univ. *J. Fuel Soc. (Japan)* 7, 893-900(1928).—Using quartz and coke as catalysts, K. tried to decomp. benzene in a quartz tube. The sample was pure benzene which was treated with concd. H_2SO_4 , dried with CaCl_2 and distd. at 80-81°. K. employed a modified app. and the decompn. took place between 700° and 900°. The rate of decompn. was proportional to the temp. It was accomplished at the rate of 10, 20 and 50% of the original sample at 700°, 800° and 900°, resp., and both catalysts gave similar results. The results conform with those of Haffman, Meyer, Schultz, etc., the following reactions taking place: $2\text{C}_6\text{H}_6 = \text{Ph}_2 + 2\text{H}_2$; $3\text{C}_6\text{H}_6 = p\text{-C}_6\text{H}_4\text{Ph}_2 + 4\text{H}_2$; $n\text{C}_6\text{H}_6 = \text{C}_{6n}\text{H}_{4n+2} + (n-1)\text{H}_2$. Among other decompn. products K. found Ph_2 to be about 3% of the original sample at 700°, 12-3% at 800° and 17-8% at 900°, resp., and also a trace of $\text{C}_6\text{H}_5\text{Ph}_2$. No trace of C_{10}H_8 , anthracene and other similar compds. was found. K. also claims that following reactions take place at various temps.: $2\text{C}_6\text{H}_6 = 3\text{C}_2\text{H}_4 + 6\text{C}$; $2\text{C}_6\text{H}_6 = 3\text{CH}_4 + 9\text{C}$; $\text{C}_6\text{H}_6 = 3\text{H}_2 + 6\text{C}$.

F. J. NAKAMURA

Coupling of diazonium salts in lateral chains of unsaturated compounds. I. ANGELO QUILICO AND MARIA FRERRI. Reale Politecnico, Milano. *Gazz. chim. ital.* 58, 380-90(1928).—In investigations on the sulfonation of amines, phenols and phenolic ethers with $\text{H}_2\text{NSO}_3\text{H}$ (cf. Q., C. A. 21, 738; 22, 1764), a notable similarity was noticed in the behavior of these compds. when sulfonated and when coupled, which was manifest in the formation of *N*-substituted or *o*-substituted derivs., which were converted into derivs. substituted in the nucleus. Furthermore with unsatd. phenolic ethers with a propenyl chain, e. g., anethole (I) (cf. Q., C. A. 22, 1965) sulfonation occurred in the lateral chain, which can be explained by the existence of an active double bond conjugated with those of the nucleus. It was therefore to be expected that propenyl

phenolic ethers would react in the lateral chain with diazo compds. Thus as found by Meyer (C. A. 7, 2540; 8, 2878; 14, 1330) anisole reacts very slowly or not at all with $p\text{-O}_2\text{NC}_6\text{H}_4\text{N}:\text{NOH}$, whereas I reacts very readily. I (14 g.) in glacial AcOH (70 cc.) added with continuous agitation to ice-cold $p\text{-nitrobenzenediazonium sulfate}$ (II) (from 13.8 g. of $p\text{-O}_2\text{NC}_6\text{H}_4\text{NH}_2$ by the method of Hantzsch and Jochim, Ber. 34, 3337(1901)) in glacial AcOH (150 cc.), kept cold and agitated for 10–12 hrs., filtered, and washed with a little EtOH, yields (including 2 g. sepg. from the evapd. filtrate) 20 g. of $p\text{-MeOC}_6\text{H}_4\text{CH}:\text{NNHC}_6\text{H}_4\text{NO}_2$ (III) (cf. Ciusa, C. A. 5, 3405), m. 161° . It was identified by its properties, by its synthesis, and by its oxidation in alk. KMnO_4 to anisic acid. Similarly I in EtOH (50 cc.) added to ice-cold II in EtOH (150 cc.), filtered after 12 hrs., and the ppt. (combined with the residue of the evapn. of the alc. liquors) purified by soln. in boiling EtOH and cooling, yields 21–22 g. of III. The purification with EtOH leaves a small proportion of a brown-red powder, m. $223\text{--}4^\circ$ (decompn.), probably a condensation product of II. It contains approx. 28% N, gives intense blue solns. in dil. alkalis, probably because of a change of the $p\text{-HNC}_6\text{H}_4\text{NO}_2$ group to $\text{—N:C:CH:CH:C(:NOOH):CH:CH}$ (cf. Witt and Kopetschni, C. A.

6, 2600; Meyer, C. A. 8, 2878). $p\text{-O}_2\text{NC}_6\text{H}_4\text{NH}_2$ (1 g.) diazotized by the method of Hantzsch and Jochim (*loc. cit.*), the product purified as before, dissolved in AcOH (10 cc.), cooled, I (0.91 g.) in glacial AcOH (5 cc.) added with continuous agitation, kept cold 6–8 hrs., filtered and the residue recrystd. from C_6H_6 , yields 1.2 g. of *anisic aldehyde dinitrophenylhydrazone*, $p\text{-MeOC}_6\text{H}_4\text{CH}:\text{NNHC}_6\text{H}_4(\text{NO}_2)_2$ (IV), blood red, m. 243° , gives violet-red solns. in dil. alkalis, oxidized by alk. KMnO_4 to anisic acid. IV can be synthesized by heating 2,6- $(\text{O}_2\text{N})_2\text{C}_6\text{H}_3\text{NHNH}_2$ with anisaldehyde (equimol. parts) and recrystg. the product from C_6H_6 . In AcOH and under the condition described with I, the product obtained from isosafrole (IV) and $p\text{-H}_2\text{NC}_6\text{H}_4\text{NO}_2$ contains a considerable quantity of a resin, brown with a green reflection, which gives intense red solns. in AcOH and in MeAc. In EtOH, the reaction gives excellent results, IV (15 g.) and $p\text{-H}_2\text{NC}_6\text{H}_4\text{NC}_6\text{H}_4$ (13.8 g.) yielding, after purification from boiling EtOH, 21–22 g. of *piperonal p-nitrophenylhydrazone*, $\text{O:CH}_2\text{O:C}_6\text{H}_4\text{CH}:\text{NNHC}_6\text{H}_4\text{NO}_2$ (V),

dark red, m. $199\text{--}200^\circ$, oxidized by alk. KMnO_4 to piperonic acid. In the treatment with EtOH there remains a red powder, m. $222\text{--}3^\circ$, identical with that obtained with I. V can be synthesized from its constituents in AcOH, in which case after recrystn. from EtOH, it m. $201\text{--}2^\circ$. A mixt. of the 2 products, m. $199\text{--}200^\circ$ and $201\text{--}2^\circ$, resp., m. $200\text{--}1^\circ$, so it is very improbable that 2 stereoisomers are concerned. When boiled with AcOH contg. a little CrO_3 , the m. p. of the product which m. $199\text{--}200^\circ$ becomes 201° . By the same method of synthesis, IV and $\text{H}_2\text{NC}_6\text{H}_3(\text{NO}_2)_2$ in AcOH form *piperonal dinitrophenylhydrazone*, $\text{C}_{14}\text{H}_{10}\text{O}_6\text{N}_4$, purple-red, m. 265° , can also be prepd. from its components in EtOH. $p\text{-O}_2\text{NC}_6\text{H}_4\text{NH}_2$ (6.9 g.) diazotized in the same way as before, suspended in EtOH (50 cc.), cooled, isoapiole (11 g.) in EtOH (50 cc.) added, let stand 12 hrs., filtered, washed with a little EtOH, and the residue purified by recrystn. from boiling $\text{MeC}_6\text{H}_4\text{NO}_2$ or better by soln. in glacial AcOH, pptn. with water and recrystn. from EtOH, yields approx. 13 g. of *apiolic aldehyde p-nitrophenylhydrazone*, $\text{C}_{16}\text{H}_{18}\text{O}_6\text{N}_2$, orange-red, m. $228\text{--}9^\circ$. The coupled compds are very resistant to reducing agents, though dil. alc. $\text{Na}_2\text{S}_2\text{O}_4$ and SnCl_2 in HCl render their solns. colorless. The phenylhydrazones are not the primary products of the reaction, an addn. of the diazo compd. to the double bond of the lateral chain occurring, with formation of a labile compd. which by transposition and elimination of AcH leads to the phenylhydrazone of the aromatic aldehyde, e. g., $\text{MeCH:CHC}_6\text{H}_4\text{OMe} + \text{O}_2\text{NC}_6\text{H}_4\text{N}:\text{NOH} \rightarrow \text{MeCH(OH)CH(N:NC}_6\text{H}_4\text{NO}_2)\text{C}_6\text{H}_4\text{OMe} \rightarrow \text{MeCH(OH)C(:NNHC}_6\text{H}_4\text{NO}_2)\text{C}_6\text{H}_4\text{OMe} \rightarrow \text{MeCHO} + \text{CH(:NNHC}_6\text{H}_4\text{NO}_2)\text{C}_6\text{H}_4\text{OMe}$. C. C. D.

Action of alkyl chlorocarbonates on stibanilic acid. CLIFF S. HAMILTON AND R. E. EZTELMILLER. Univ. of Nebraska. J. Am. Chem. Soc. 50, 3300–3(1928).— $p\text{-H}_2\text{O}_3\text{SbC}_6\text{H}_4\text{NH}_2$, in a slight excess of $\text{N Na}_2\text{CO}_3$ treated, drop-wise, with a slight excess of alkyl chlorocarbonate, gives the following 4-carboalkoxyaminophenylstibonic acids: MeO , 73% yield; EtO , 85%; PrO , 87%; Me_2CHO , 89%; BuO , 70%; $\text{Me}_2\text{CHCH}_2\text{O}$, 85%; $\text{ClCH}_2\text{CH}_2\text{O}$, good yield; $\text{Cl}(\text{CH}_2)_3\text{O}$, good. These compds. are colorless powders, insol. in C_6H_6 , H_2O or dil. acids. Concd. HCl changes them into a tarry oil. They show but slight soly. in dil. NaOH, the soly. decreasing with an increase in their C content. By heating the Cl derivs. with 4 equivs. of 5% NaOH at $70\text{--}5^\circ$ for 30 min., there results 25% of $\beta\text{-hydroxyethyl-}$ and $\gamma\text{-hydroxypropyl-}$ *p-aminophenylstibonic acid*, colorless powders readily sol. in dil. alkali and sol. in HCl. A method of analysis for Sb is given. C. J. WEST

3-Halogeno-2-, 4- and 6-aminophenol. HERBERT H. HODGSON AND ARNOLD KERSHAW. Tech. Coll., Huddersfield. *J. Chem. Soc.* 1928, 2703-5.—3-Chloro-2-aminophenol, m. 122°, by reduction of the corresponding NO₂ deriv. (HCl salt, plates); 3-Br deriv., m. 138° (HCl salt, needles); 3-I deriv., m. 137° (decompn.) (HCl salt, plates). 3-Chloro-4-aminophenol, m. 159.5° (HCl salt, plates); 3-Br deriv., m. 151° (HCl salt, prisms); 3-I deriv., m. 145.5° (HCl salt, plates). 3-Chloro-6-aminophenol, m. 154° (HCl salt, plates); 3-Br deriv., m. 150° (HCl salt, plates); 3-I deriv., m. 141° (HCl salt, plates). Color reactions of these compds. with FeCl₃, bleaching powder soln. and Br-H₂O are given. C. J. WEST

Condensation of chloral with 2,6-dichlorohydroquinone, with anisic acid and with *p*-nitroanisole. F. D. CHATAWAY AND F. CALVET. *Anales soc. españ. fis. quim.* 26, 320-36(1928); *J. Chem. Soc.* 1928, 2913-8.—The general reaction between *p*-substituted phenols and chloral under the influence of concd. H₂SO₄, forming 1,3-benzodioxin derivs. (cf. C. A. 21, 233, 1980, 3606; 22, 1965, 2946) applies to 2,6-dichlorohydroquinone. Whereas substituents in the *o*-position to the Ph group prevent condensation, the existence of 1 substituent in the *m*-position does not interfere. 2,6-Dichlorohydroquinone, in which both *m*-positions to 1 of the Ph groups are occupied by 2 Cl atoms, reacts with chloral normally, giving 6-hydroxy-5,7-dichloro-2,4-bis(trichloromethyl)-1,3-benzodioxin. Boiling alc. KOH acting on this condensation product eliminates 2 mols. of HCl, forming 6-hydroxy-7,5-dichloro-2,4-bis(dichloromethylene)-1,3-benzodioxin. Anisic acid and *p*-nitroanisole condense with chloral somewhat differently, giving products like an aldol condensation of 1 mol. of aldehyde with 1 of the Ph ether. Anisic acid gives first 5,2-HO₂C(MeO)C₆H₃CHClCCl₃, whose constitution was proved by oxidation with alk. KMnO₄, forming 4-methoxyisophthalic acid. The condensation product of *p*-nitroanisole and chloral is 5,2-O₂N(MeO)C₆H₃CHClCCl₃, which on oxidation gives 5,2-O₂N(MeO)C₆H₃CO₂H. E. M. SYMMES

Reduction of quinones by means of phenylhydrazine. ANTONINO GIACALONE. Reale Univ. Palermo. *Gazz. chim. ital.* 58, 409-11(1928).—The literature contains no expts. on the reduction of quinones to hydroquinones by PhHNNH₂. PhHNNH₂ should be of advantage because it avoids the use of an aq. medium in which hydroquinones oxidize rapidly and because the method gives high yields. The rate of the reaction and its violence vary with different quinones. When PhHNNH₂ is added to dry quinone, the reaction is violent, even explosive. However, PhHNNH₂ in C₆H₆ added slowly to quinone in C₆H₆ until the product (at first brown) becomes light colored and no more gas is evolved, filtered, the residue washed with C₆H₆ and recrystd. from hot C₆H₆, yields hydroquinone. In the same way C₆H₆ solns. of thymoquinone and of PhHNNH₂ yield thymohydroquinone, m. 140° (cf. 139.5° in the literature). PhHNNH₂ (2 g.) stirred into naphthoquinone (1 g.) until the reaction is over, PhNH₂ and excess PhHNNH₂ extd. from the reaction mixt. with C₆H₆, the residue washed with C₆H₆ and recrystd. from hot C₆H₆ or CCl₄ yields naphthohydroquinone. Unlike true quinones, anthraquinone is not reduced by PhHNNH₂, even after heating together for 2 hrs. Reduction of quinones by PhHNNH₂ is probably a general reaction. Pure PhHNNH₂ must be used, and if its aq. salts are used instead, condensation products are formed (cf. Ber. 17, 3026(1884)). C. C. DAVIS

Catalytic reduction of nitriles and oximes. WALTER H. HARTUNG. Sharp and Dohme, Baltimore. *J. Am. Chem. Soc.* 50, 3370-4(1928).—PhCN was reduced catalytically in abs. EtOH to pure PhCH₂NH₂ by means of Pd charcoal when 1, or more, equiv. of HCl was present; without HCl a mixt. of PhCH₂NH₂, (PhCH₂)₂NH and NH₃ was formed. PhCH:NOH was similarly reduced to pure PhCH₂NH₂ when 3 or more equivs. of HCl were present; with 1 equiv., or more, of the acid a mixt. of primary and secondary bases resulted. PhCH(OH)CN was reduced in abs. EtOH contg. HCl to PhCH₂CH₂NH₂ but the yield of primary amine was poorer because a non-basic by-product was formed. PhCH(OBz)CN and PhCH(OAc)CN were also reduced; though the esters of PhCH(OH)NH₂ were not formed, good yields of PhCH₂CH₂NH₂ were obtained. C. J. WEST

Action of pyridine as a catalyst in Perkin's synthesis of cinnamic acid. GEORGE BACHARACH AND FRANCIS BROGAN. Fordham Univ. *J. Am. Chem. Soc.* 50, 3333-4(1928).—A substantially increased yield (up to 85%) of cinnamic acid in the Perkin synthesis has been produced by using pyridine as a catalyst at the rate of 8 drops for 20 g. BzH, the time of reaction being 8 hrs. Addnl. C₆H₅N and longer heating do not increase the yield. The product is obtained in a very pure condition. C. J. WEST

Enolization of homophthalic anhydride. THOMAS S. STEVENS AND JAMES L. WILSON. Univ. of Glasgow. *J. Chem. Soc.* 1928, 2827-8.—4,5-Methylenedioxyhomophthalic anhydride (I), yellow, m. 178-80°, is obtained from the acid and AcCl

after boiling several hrs.; it is not readily affected by Br but gives a dark brown ppt. with FeCl₃. Preliminary expts. on the methylation of homophthalic anhydride (II) led to no definite result. An estn. by Hieber's method indicated but a small % of enol but no great reliance is to be placed on the observation. Oxidation of II with aq. KMnO₄ gives phthalidecarboxylic acid, m. 151°; I behaves similarly, giving the methylenedioxy deriv., m. 213-5° (decompn.).

C. J. WEST

Preparation of 4-bromophthalic acid. LESLIE C. BAKER. Univ. Coll., London. *J. Chem. Soc.* 1928, 2829.—C₈H₄(CO)₂O is converted into Et 4-nitrophthalate by Miller's method (*Ann.* 208, 224(1881)) and this reduced to the 4-NH₂ ester by Baeyer's method (*Ber.* 10, 1079(1877)) at 30-40° in 71% yields; through the diazo reaction there results 66% of Et 4-bromophthalate, hydrolyzed with Ba(OH)₂ in EtOH to the free acid in 88% yield.

C. J. WEST

4-Hydroxy-5-methoxycoumarin (β -methylesculetin, scopoletin, gelseminic acid, chrysotropic acid) and its glucoside. ERHARD GLASER. Univ. Wien. *Arch. Pharm.* 266, 573-82(1928).—Methylesculetin, C₁₀H₈O₄, is readily obtained in the form of brilliant yellow needles by the action of Me₂SO₄ on esculetin; it is characterized by a fluorescence capacity exceeding that of esculetin. By virtue of its m. p. (199°), soly., and other reactions it is to be regarded as a mono-Me ether of esculetin (formerly designated β -methylesculetin) and occurring in nature under various names (scopoletin, chrysotropic acid, gelseminic acid) in the plants *Atropa belladonna*, *Gelsemium sempervirens*, *Convolvulus scammonia*, *Ipomaea oryzabensis*, *Prunus serotina*, *Fabiana imbricata*. In view of the fact that Moore by boiling aq. scopoletin with 45% KOH succeeded in splitting off the cinnamic acid side chain and so isolating a 2,4-(H)₂ C₆H₃OMe (m. 66°) differing from the 2,5-compd. (m. 84°) derived from methoxyquinone, the conclusion seems justified that the ether resulting from the above synthesis is 4-hydroxy-5-methoxycoumarin. This constitution is verified indirectly by the investigations of Bargellinis and Montis. Guided by the fact that by the action of persulfate on phenol in cold alk. soln. a new OH enters the nucleus in a very definite position, they were able to convert coumarin into the already known 5-hydroxycoumarin and in the case of 4-methoxycoumarin (Me ether of umbelliferone), which occurs in *Herniaria hirsuta* and *Matricaria chamomilla*, and prep. a 4-methoxy-5-hydroxycoumarin, identical with the α -methylesculetin of Tiemann and Will. The *tetraacetoglucoside* of 4-hydroxy-5-methoxycoumarin, C₂₄H₂₆O₁₃, m. 104-5°, was prepd., and in turn yielded the *l*-rotatory β -glucoside, C₁₆H₁₈O₈, m. 127-8°. Since methylesculetin is more strongly fluorescent than esculetin, while esculin shows no fluorescence at all, it is reasonable to conclude that in fluorescent substances of this character the introduction of the Me group tends to increase, that of sugar to diminish the fluorescent property. Furthermore, since increasing acidity also tends to inhibit fluorescence, attempts were made to measure the differences in fluorescent intensity with varying acidity. In any consideration of the mono-Me ether of esculetin, it is more practical to employ the designations 5-hydroxy-4-methoxy- and 4-hydroxy-5-methoxycoumarin, resp., rather than the terms α - and β -methylesculetin, reserving the latter for compds. like those prepd. by Pechmann and Kraft.

W. O. E.

Phenyl- and α -naphthylcarbamic hydrazones of inactive camphor. VALENTINO MORANI. Reale stazione chimico-agraria, Roma. *Gazz. chim. ital.* 58, 404-9(1928). In expts. on the essential oil of sage, camphor inactive to polarized light was obtained, a form which is considered by some not to exist in nature (cf. Semmler, *Die atherische Öle* 3, 342(1906)). The prepn. of the phenylcarbamic hydrazone gave a different result from that of Borsche and Merkwitz (*Ber.* 37, 3182(1904)) in that the compd. m. 153-4° could be obtained only from *d*-camphor, whereas the *dl*-camphor from sage oil gave a compd. m. 171.5-2.5°. This led to further expts. to det. whether the difference in the derivs. of *d*- and of *dl*-camphor was true of other compds. of similar type. *dl*-Camphor semicarbazone (1 g.) refluxed 5 min. with PhNH₂ (5 g.), cooled, EtOH added, poured into 10% AcOH (40 cc.), let stand overnight, decanted, the cryst. mass washed with water and recrystd. from boiling 95% EtOH yields almost 100% of *dl*-camphor phenylcarbamic hydrazone (phenylsemicarbazone), C₁₆H₁₈:NNHCONHPh, m. 171.5-2.5°. Prepd. from synthetic *dl*-camphor, it m. 171-2°. An intimate mixt. of PhMeC:NNHCONH₂ (1 g.) and α -C₁₀H₇NH₂ (6 g.) heated 10 min. at 200°, cooled, boiled with 95% EtOH, filtered, washed with boiling EtOH (the residue is a 30% yield of dinaphthylurea), and the filtrate allowed to crystallize, yields *acetophenone α -naphthylcarbamic hydrazone*, PhCMe:NNHCONHC₁₀H₇, violet-gray, m. 208°. The formation of dinaphthylurea can be avoided by using quinoline as solvent. PhMeC:NNHCONH₂ (1 g.), α -C₁₀H₇NH₂ (0.8 g.) and quinoline (5 g.) refluxed 5 min., cooled, poured into cold 0.5 N H₂SO₄ (80 cc.) and the product recrystd. from EtOH gives almost a

100% yield. By either of these 2 methods of prepn., *d*-camphor yields *d*-camphor α -naphthylcarbamic hydrazone, $C_{19}H_{18}:NNHCONC_{10}H_7$, violet-gray, m. 172.5°. *dl*-Camphor semicarbazone (from oil of sage) (0.9 g.), α - $C_{10}H_7NH_2$ (0.7 g.) and quinoline (5 g.) refluxed 5 min., treated with 0.5 *N* H_2SO_4 (80 cc.) and purified from 95% EtOH, yields *dl*-camphor α -naphthylcarbamic hydrazone, $C_{19}H_{18}:NNHCONHPh$, rose colored, m. 179–80°. Prepd. from synthetic *dl*-camphor, it m. 179–80°. These compds. are of importance in identifying *dl*-camphor, since other well-known derivs. have the same m ps. as those of the active forms. They may also be useful in identifying ketones, where the semicarbazones themselves give insufficient information. C. C. DAVIS

Chlorination of naphthalene in benzene solution. J. TRAUBENBERG AND E. WASSERMAN. Chem. Fabrik, Rubeschnoje, U. S. S. R. *J. prakt. Chem.* 120, 177–8 (1928).— $C_{10}H_8$ (130 g.) in 250 cc. C_6H_6 , treated with Cl with cooling, Fe being used as the catalyst, gives 85% of the α -Cl deriv. The C_6H_6 is scarcely chlorinated under these conditions. C. J. WEST

Preliminary examination of rotenone and some of its degradation products. GORDON M. WRIGHT. Univ. of Cambridge. *J. Am. Chem. Soc.* 50, 3355–60 (1928).—Extn. of the powd. root of *Derris elliptica* Benth with Et_2O gives rotenone (I), m. 163°; *oxime*, m. 252°; *phenylhydrazone*, yellow, m. 245°; *HCl salt*, m. 197°, whose *oxime*, m. 239° (decompn.); *HBr salt*, m. 190°; analyses of these compds. indicate the formula $C_{23}H_{22}O_6$ for I. Isorotenone, $C_{23}H_{22}O_6$, m. 184°, results by the action of H_2SO_4 on I; *phenylhydrazone*, yellow, m. 230°. Oxidation of I with CrO_3 gives rotenone, $C_{23}H_{18}O_6$, yellow, m. 300°. Fusion of I with KOH gives rotenic acid, $C_{12}H_{12}O_4$, m. 183°; *Me ester*, m. 39–40°; *NO₂ deriv.*, $C_{12}H_{11}NO_4$, yellow, m. 187°. The action of heat on rotenic acid gives a *compd.*, $C_{22}H_{22}O_6$, m. 104°; $FeCl_3$ gives a green color. The action of alc. KOH on I gives tubaic acid, $C_{12}H_{12}O_4$, m. 128–9°. These results confirm the work of Taker (*C. A.* 22, 2941). C. J. WEST

Electrolytic reduction of nitrosoantipyrine. MARIO GIORDANI. Lab. chim. della sanità publica, Roma. *Ann. chim. applicata* 18, 289–96 (1928).—The reduction of nitrosoantipyrine by Zn and AcOH in dil. EtOH is slow and troublesome and necessitates careful control of conditions. Expts. were therefore directed toward developing an electrolytic method. An electrolytic cell in series with a voltmeter of the Oettel type, an ammeter and a variable resistance was used, the process being followed quantitatively by the Tafel method as modified by Pomilio (cf. *Atti. accad. sci. fis. mat. Napoli*, 1914). To det. the best conditions, the influence of the nature of the cathodic deposit, the cathodic c. d., and the concn. of current were detd. Comparative tests of Ni cathodes covered with Ni, Sn and Cu sponge showed that the best results are obtained with Ni sponge, i. e., with an electrode which gives the lowest cathode supertension. Cu gave poorer results and Sn the poorest, which is the order of their supertensions. Nitrosoantipyrine probably acts as a cathodic depolarizer (cf. Dony-Hénault, Gall and Gauye, *Principles et applications de l'Electrochimie* 179; *C. A.* 8, 2531). This was confirmed by the fact that there was an almost const. yield up to the point where the current was approx. 50% of the calcd. value for total reduction. Above this value the yield diminished rapidly. When the c. d. was increased, the yield diminished during the early stages, but subsequently became greater than at the lower c. d. This is explained by the fact that with a const. vol. of liquid an increase in the intensity of the current causes not only an increase in c. d. but also in the concn. of current. The concn. of current therefore plays a part, in fact by tripling the value the depolarizing action is still appreciable when the current is higher than the theoretical value. With increase in the concn. of current, the yield also increases. In conformity with the depolarizing action mentioned above, the potential applied increased slightly from the beginning to the termination of the expts. C. C. DAVIS

So-called bisthiohydantoins of Frerichs, Förster and Höller. HERBERT W. STEPHEN AND FORSYTH J. WILSON. Royal Tech. Coll., Glasgow. *J. Chem. Soc.* 1928, 2826–7; cf. *C. A.* 4, 2294; 7, 3476.—It has been shown (*C. A.* 22, 3410) that the so-called 3,3-bis- ψ -thiohydantoin is really diketotetrahydrothiazole-2-ketazine. It is now shown that the 2 compds. described by F. and F. and by F. and H. are similar in structure. $H_2NCSNHNHCSNH_2$ and $EtCHBrCO_2H$ give 2,4-diketo-5-methyltetrahydrothiazole-2-ketazine, m. 289°; hydrolysis yields N_2H_4 and 2,4-diketo-5-methyltetrahydrothiazole, b_p 166–8°, m. 46–7°. The corresponding 5-Et deriv., m. 233°, behaves similarly on hydrolysis. C. J. WEST

Piperidine derivatives. VI. 3-Methylpiperidinoalkyl benzoates. J. R. THAYER AND S. M. McELVAIN. Univ. of Wisconsin. *J. Am. Chem. Soc.* 50, 3348–55 (1928); cf. *C. A.* 22, 81.— $ClCH_2Ac$ (10 g.) and 20 g. 3-methylpiperidine (I) in 400 cc. Et_2O give 13 g. 1 [3-methylpiperidino]-propan-2-one, b_p 101–2°, analyzed as the *HCl salt* (II),

m. 162-3°. Catalytic reduction of 15.5 g. II in EtOH with Pt oxide-Pt black gives 9 g. 1-[3-methylpiperidino]propan-2-ol, b_{18} 98-100°, analyzed as the HCl salt (III), m. 184-5°. III and BzCl give α -methyl- β -[3-methylpiperidino]ethyl benzoate-HCl, m. 165-6°. A mixt. of 13.5 g. I.HCl, 3.6 g. (HCHO)₃, 30 g. Me₂CO and 5 cc. abs. EtOH, heated 3-4 hrs., gives 12 g. 1-[3-methylpiperidino]butan-3-one-HCl, m. 151-2°; catalytic reduction and the action of BzCl give α -methyl- γ -[3-methylpiperidino]propyl benzoate-HCl (IV), m. 178-80°. (MeCHBr)₂ and PhCO₂Ag give α,β -dimethyl- β -bromoethyl benzoate, b_4 140-1° (the Br value is low, probably because of the presence of dibenzoate). CH₂Ac₂, on catalytic reduction, gives 60% of CH₂[CH(OH)Me]₂; successive reaction of BzCl and SOCl₂ gives α,γ -dimethyl- γ -chloropropyl benzoate, b_2 134-5°, n_D^{20} 1.5074, d_{20}^{20} 1.1008. These compds. do not react normally with I but apparently lose 1 mol. HCl (HBr) to form, presumably, an unsatd. compd. 2-Chloro-2-methylpentan-4-one, b_{14} 50-2° (74% yield), begins to darken immediately after distn. This, also, does not react normally with I. III and IV have higher anesthetic efficiencies and higher toxicities than the corresponding compds. in which the alkylene group between the O and N is unsubstituted.

C. J. WEST

Behavior of pyrazine compounds. I. C. GASTALDI AND E. PRINCIVALLÉ. Reale Univ. Sassari. *Gazz. chim. ital.* **58**, 412-6(1928).—The compds. used in the expts., 2,5-dimethyl-3,6-dicyanopyrazine (I), 2,5-dimethyl-6-hydroxypyrazine (II) and 2,5-diphenyl-6-hydroxypyrazine (III), were prepd. by a method already described (cf. C. A. **16**, 101). I (3.5 g.) heated 2 hrs. at 70° and 1 hr. more at 115° with concd. H₂SO₄ (14 cc.), poured into water and the ppt. recrystd. from EtOH, yields 100% of 2,5-dimethyl-3,6-pyrazinedicarboxylic diamide (IV), m. 290°. By the method of Bouveault, IV can be readily transformed into 100% of 2,5-dimethyl-3,6-pyrazinedicarboxylic acid, m. 194-5° after dehydration. This m. p. differs from the 200-1° reported by Wleügel (*Ber.* **15**, 1051(1882)), but the di-Et ester was found to have the same m. p., viz., 85-6°. III (2.8 g.), KOH (1 g.), MeI (8.2 g.) and MeOH (20 cc.) heated in a sealed tube 10 hrs. at 100° and the product crystd. from water, gives a high yield of 1-methyl-2,5-diphenyl-6-keto-1,6-dihydropyrazine-MeI, the properties of which conformed to those in the literature. It is decompd. by heating with aq. KOH to MeNH₂, the quantity of the latter corresponding to its formation from both N atoms in the pyrazine nucleus. II (1.5 g.), MeOH (15 cc.), KOH (0.75 g.) and MeI (6.7 g.) heated in a sealed tube 10 hrs. at 100°, evapd. *in vacuo*, and the residue recrystd. repeatedly from EtOH, yields 1-methyl-2,5-dimethyl-6-keto-1,6-dihydropyrazine-MeI, MeN.CO.CMe:NMeI.CH:CMe, greenish yellow, m. 215° (decompn.). When

it is decompd. by prolonged boiling with aq. KOH, the MeNH₂ evolved corresponds to its formation from both N atoms. The expts. show that the Rung-Behren-Pinner reaction (cf. *Ann.* **271**, 34(1892); *Ber.* **35**, 2444, 2457(1902)) is not, as generally believed, characteristic of imidazole compds. alone, hydroxypyrazines behaving in the same way. The similar behavior of the two series of compds. $\text{(Alk)N.C(:O).CAr:N(Alk)(Hal).CH:CAr}$ and $\text{ArC:CHN(Alk)(Hal):CAr.N(Alk)}$,

probably depends upon the equivalence of the atomic groups: $\begin{array}{c} | \\ -C-N-C- \\ || \quad || \end{array}$ and

$\begin{array}{c} \diagup \quad \diagdown \\ =C-N=C- \\ | \end{array}$, in which there should be other heterocyclic compds. which give the

Rung-Behren-Pinner reaction. Pinner (*Ber.* **38**, 1532(1905)) has erroneously attributed the structure of 2-benzoyl-5-phenylimidazole to the product of the action of NH₃ on phenylglyoxal, the product actually being III.

C. C. DAVIS

Resinic acids. GEORGES ROUIN. *Inst. du Pin. Bull. inst. pin* **1928**, 121-30, 167-72, 173-6, 197-204, 221-31.—A detailed description of the technic and results of an investigation of the acid constituents of the gum turpentine of *Pinus laricio* and their relation to abietic acid, of the acid constituents of rosin from Aleppo pine, and a verification on pure compds. of the properties investigated by previous authors on isomorphous mixts. generally designated as "abietic acid." The acid constituents of the turpentine of *P. laricio* contain about 0.7% of *d*- and *l*-pimaric acids; the remainder consists chiefly of a primary terebenthenic acid, the crystallographic characteristics, rotatory power and isomerization products (alepabietic and abietic acids) of which identify it with Dupont's α -alepic acid. By means of Darms' method (*Thesis, Paris*, 1910) and a generalization thereof worked out by R. (this method is explained theoretically and mathematically, and exptl. evidence is given to confirm its soundness)

the rosin of Aleppo pine is shown to consist of a mixt. of alepic, alepabietic and abietic acids, and 2 types of binary mixts. were sepd.: (1) isomorphous, *l*-rotatory mixts. of alepabietic and abietic acids, (2) *d*-rotatory mixts. contg. 2 kinds of crystals (alepic form and abietic form), in which alepabietic acid greatly predominates; this constitutes a confirmation of the fact that in its isomerization into abietic acid, α -alepic acid passes through a definite intermediate stage, alepabietic acid, as previously shown by Dupont and Dubourg. Pure abietic acid ($[\alpha]_D^{20}$ -100°) gives gelatinous and crystd. salts and also an acid Na salt. Elimination of CO_2 by pyrogenation, with subsequent conversion into a hydrocarbon $\text{C}_{19}\text{H}_{30}$ shows that it is a true CO_2H acid. Production of a di-HBr salt (m. $146-51^\circ$ (decompn.)) on treating with HBr and of a tetrahydroxy-abietic acid on KMnO_4 oxidation shows that the mol. must contain 1 double bond and a bridge (Grün formula) or 2 double bonds (Easterfield and Baglay-Bunbury). The following were also identified in the oxidation products obtained on treating with KMnO_4 : Me_2CO , the formation of which can be explained either by the presence of an iso-Pr group or by the presence of 2 Me groups attached to the same C atom (Grün formula); butyric (or isobutyric) acid, but no EtCO_2H as indicated by Levy, the presence of the latter being possibly due to the fact that the abietic acid studied by Levy contained *d*-pimaric acid; valeric (or isovaleric) acid. The formation of butyric and valeric acids can be explained by assuming that 1 of the rings is opened, giving rise to di- CO_2H acids which by elimination of CO_2 lead to the above-mentioned acids; though this does not definitely fix the positions of the double bonds, it makes it seem plausible either that 2 Me groups and a double bond are placed as in Grün's formula, or that in Bunbury's formulas the iso-Pr group and 1 double bond belong to the same ring and are attached to 2 neighboring C atoms. Work done on pyroabietic, hydrated and anhyd. abietic acids is described (cf. Dupont, R. and Dubourg, *C. A.* 22, 423).

A. PAPINEAU-COUTURE

Structure of proteins. EMIL ABDERHALDEN AND WALDEMAR KRÖNER. Univ. Halle. *Z. physiol. Chem.* 178, 276-90 (1928).—In the hope of developing a method for the isolation of individual polypeptides resulting from partial hydrolysis of proteins several procedures were tried but without much success. To det. whether dipeptide esters after benzylation could be distd. *in vacuo*, benzoylglutylglycine Me ester (I), m. $78-82^\circ$, benzoyl-*dl*-leucylglycine Et ester (II), m. $145-6^\circ$, and benzoylglutyl-*l*-tyrosine Me ester (III), an oil, were prepd. and examd. I and III decompd. into dark oils, but II distd. without decompn. even at ordinary pressure. When, however, the products of partial hydrolysis of casein, obtained by 14 days' treatment with *N* NaOH, were benzyolated, esterified and distd., there was strong decompn. and no individual substance could be isolated. The use of solvents was then tried, including MeOH, EtOH, BuOH, iso-BuOH, PrOH, iso-PrOH, AmOH, iso-AmOH, EtAc, EtOAc, Et_2O , CHCl_3 and MeAc. Only Et_2O and EtOAc showed a limited solvent action. The former dissolved practically nothing, while the latter extd. a cryst. product which, however, was a mixt. that defied all attempts at sepn., and on complete hydrolysis yielded benzoylleucine, alanine, serine and an unidentified benzoylamino acid. Finally, by adding a large vol. of H_2O to the BuOH ext. from the benzyolated and esterified hydrolyzate, one pure product was obtained, viz. *di-Me benzoylleucylglutamate* (IV). By the usual method of esterification with an alc. and dry HCl, the following esters were prepd. from *dl*-leucylglycine: Me ester-HCl, m. 133° (yield 42%); iso-Pr ester-HCl, hygroscopic powder (35.6%); Bu ester-HCl, hygroscopic powder (33.6%); iso-Bu ester-HCl, m. 46° ; iso-Am ester-HCl, an oil; PhCH_2 ester-HCl salt + $3\text{H}_2\text{O}$, m. 57° , anhyd., m. $64-5^\circ$. From the tripeptide *l*-leucyl-*l*-leucyl-*l*-leucine, the Me ester-HCl, m. 215° , $[\alpha]_D^{20} -40.87^\circ$, was prepd. in the same manner; free base, m. $140-5^\circ$. Heating to 190° converted the latter into *l*-leucyl-*l*-leucine anhydride. IV was also prepd. synthetically by benzylation and esterification of the dipeptide, but neither the benzoyldipeptide nor its ester could be crystd.

A. W. DOX

Preparation of cholestenone. WILFRED A. SEXTON. Univ. of Liverpool. *J. Chem. Soc.* 1928, 2825-6.—A mixt. of 20 g. of pure cholesterol and 15 g. Cu bronze, heated at 2-3 mm. pressure and the temp. raised until distn. commences, gives 80% of cholestenone.

C. J. WEST

Cerebrosides. VIII. Galacto-sphingosine, the partial cleavage product of cerebrosides. E. KLENK AND R. HÄRLE. Univ. Tübingen. *Z. physiol. Chem.* 178, 221-38 (1928); cf. *C. A.* 22, 1782.—Treatment of cerebrosides with $\text{Ba}(\text{OH})_2$ splits off the fatty acid, leaving the linkage between sugar and base intact. The cerebrosides differ among themselves merely in the nature of their fatty acid, especially with those contg. unsatd. acid; hence the residual sugar-contg. base obtained from the mixt. present in a cerebroside fraction represents an individual substance, viz., psychosine. The

linkage in psychosine between its galactose and sphingosine components was thought by Thierfelder to consist in 2 O bridges where the galactose formed either an acetal or a 1,5-glycol ether by condensation with 2 adjacent hydroxyls of the sphingosine. Another mode of linkage which is now shown to be the actual structure is a single ether linkage between galactose and sphingosine with retention of the amylene oxide structure of the galactose. Psychosine was prepd. from 2 cerebroside fractions by the method previously used for its prepn. from cerebrone, and purified by recrystn. of its sulfate from 96% EtOH. The substance was identical with the psychosine from cerebrone, as shown by the sp. rotation of -16.6° . The free base was liberated by treatment of the sulfate with $\text{Ba}(\text{OH})_2$, and obtained cryst. by addn. of petroleum ether to the CHCl_3 -EtOH soln. It was converted into *dihydropsychosine* by hydrogenation of the sulfate in H_2O with a Pd catalyst. The substance sinters at 129° , m. 215° and decomp. 240° . Neither the base nor its sulfate could be obtained definitely cryst. Exhaustive methylation by repeated refluxing with MeI and Ag_2O gave a yellow viscous sirup insol. in H_2O and the usual org. solvents. On long standing it solidified to a glassy mass, and heated in a tube it distd. without charring. The max. MeO content was 20.7%, corresponding to a methylation of 5 OH groups. From 2.9 g. of the dihydro deriv. 3.74 g. of the methylation product was obtained. The methylated deriv. was then hydrolyzed by heating 5 hrs. with 16% H_2SO_4 . A gelatinous ppt. sepd. on cooling. This was washed with ice H_2O and crystd. from MeAc. The max. yield obtained was 57%. Analysis agreed with the formula $\text{C}_{14}\text{H}_{29}\text{CH}(\text{OMe})\text{CH}(\text{OH})\text{CH}_2\text{NMe}_3\cdot\text{HSO}_4\cdot 0.5\text{H}_2\text{O}$. The substance sinters at 70° , loses H_2O at 135° and m. 184° . The chloroplatinate crystallizes from EtOH and m. 215° with previous sintering. Methylation of dihydrosphingosine gave a similar product, the chloroplatinate of which was identical with that of the cleavage product. Only 1 of the 2 hydroxyls can be methylated. A small quantity of the di-MeO deriv. obtained in the first MeI treatment is due to an impurity of methylsphingosine in the original substance, since none is obtained from the mono-MeO deriv. by repetition of the methylation treatment. The failure of the 2nd OH to react with MeI shows that its position must be adjacent to the methylated amino group as in the formula above, and also the point of attachment of the galactose group in psychosine. The other product of hydrolysis of the methylated dihydropsychosine, *viz.*, tetramethylgalactose, was not isolated. A. W. DOX

Observations on the higher fatty acids (MORGAN, HOLMES) 2. Census of synthetic organic chemicals, 1927 (ANON) 25. New formula for the constitution of cellulose (ODDO) 23. Purifying camphor (U. S. pat. 1,693,243) 13. K salts, betaine hydrochloride and glutamic acid from residues of alcohol production from beet molasses (Brit. pat. 288,390) 16.

ADAMS, ROGER AND JOHNSON, JOHN R.: *Elementary Laboratory Experiments in Organic Chemistry*. New York: The Macmillan Co. 304 pp.

BERNTSEN, A.: *Textbook of Organic Chemistry*. Revised by J. J. Sudborough. New York City: D. Van Nostrand Co. 908 pp.

PORTER, C. W.: *Molecular Rearrangements*. New York: Chemical Catalog Co. \$4. Reviewed in *Can. Chem. Met.* 12, No. 12, 56(1928).

Volatile hydrocarbons. WILHELM GESSMAN and EDUARDO WILLIAM SHALDERS. Fr. 636,568, June 25, 1927. See Can. 282,392 (*C. A.* 22, 4198).

Hydrocarbons and oxygen derivatives. SOCIÉTÉ NATIONALE DE RECHERCHES SUR LE TRAITEMENT DES COMBUSTIBLES (Étienne Audibert, inventor). Fr. 639,441, Jan. 24, 1927. Hydrocarbons and their O derivs., such as alcs., are prepd. by circulating CO and steam over a catalyst, with heat and pressure. A suitable catalyst is a mixt. of oxides of Fe and Cu.

Hydrocarbons from oxides of carbon and hydrogen. I. G. FARBENIND. A.-G. Fr. 636,882, July 1, 1927. The contact chamber is combined with a high-pressure steam generator so that heat is transmitted between the two.

Hydrogenation of oxides of carbon. RUDOLF WIETZEL and WALTER SPEER (to I. G. Farbenind. A.-G.). Can. 284,235, Oct. 23, 1928. Catalysts for the reduction of oxides of C in addn. to Fe, Ni or Co or compds. of these, contain Cd, Tl or their compds. or mixts. of these substances. Such catalysts are effective at 180° to 200° , but preferably the process is carried out between 250° and 350° ; the catalysts may be used at temps. of about 400° . Admixture of the Cd or Tl prevents deposition of soot on the catalyst. Elements of the 8th group of the periodic system also give in combination

with Cd or Tl a similar action to that given by Fe, Ni or Co. The activity of the catalysts is assisted by addition of substances such as Cu, Au, Ag, Ce, Zr, Al, V, U, Cr, Mo, W, Mn, alkali metals and alk. earth metals or compds. of these, provided the metal compds. contg. O which are difficultly reducible to the metal are absent or present in amt. not exceeding 5%, preferably less than 1% of the catalytically active material. The process may be carried out at ordinary or elevated pressure. According to the conditions of working as regards temp., pressure, compn. of the gases, catalysts and the like, solid liquid or gaseous hydrocarbons may be produced or also products contg. O or mixts. of these. *E. g.*, a soln. contg. 12 parts Fe, 2 parts of Cd and 3 parts of Cu, in the form of nitrates, is pptd. with K_2CO_3 , and the resulting ppt. washed and dried. Over the resulting catalyst placed in a Cu-lined contact tube, water gas, freed from CO_2 and S compds. in the usual manner, is passed at a rate of 60 l. per each 8 cc. of catalyst per hr. at 300–350° at about 100 atm. pressure. From the separator, which is cooled to the ordinary temp. but maintained under pressure, a liquid is drawn off composed of two layers the upper one consisting mainly of hydrocarbons, higher alcs. and esters, while the lower one consists mainly of H_2O and about 40% of lower alcs., especially EtOH and org. acids. By attaching a vessel charged with active C, in the rear of the separator, benzenes and hydrocarbons boiling below 20° also may be recovered.

Concentrated fatty acids. ORRO FUCHS (to Holzverkohlungs Industrie A.-G.). Can. 284,062, Oct. 16, 1928. Concd. fatty acids are prepd. from volatile esters by sapon. the esters and distilling the resulting mixt. of acid, alc., unchanged ester and water. *E. g.*, a mixt. of 300 parts of $AcOEt$ and 300 parts of water is heated in a pressure vessel under about 8 atm. After the sapon. equil. is practically reached the liquid is allowed to enter a low capacious Raschig column which is connected with a condenser through a pressure-reducing valve. The unsapond. ester evapd. together with alc. and a considerable portion of the water travels upward, while the $AcOH$, together with a little water flows away from the bottom of the column. About 40% of the ester is sapond. and accordingly 80 parts of $AcOH$ is obtained as 80–90% acid. To accelerate the evapn. in the column a suitable supply of heat in the region of the point of entry of the column is advantageous. On the other hand, there should be little or no dephlegmation. Sapon. is accelerated by the addn. of small quantities of mineral acids, *e. g.*, 0.1 to 0.2% concd. H_2SO_4 .

Concentrated acetic acid or anhydride and unsaturated hydrocarbons. HOLZVERKOHUNGS-INDUSTRIE A.-G. Fr. 636,781, June 28, 1927. See Brit. 274,076 (C. A. 22, 1980)

Sulfonating aliphatic acids, etc. I. G. FARBENIND. A.-G. Brit. 288,612, June 21, 1926. Stearic or oleic or palmitic acid or other aliphatic or hydroaromatic carboxylic acids contg. more than 8 C atoms in their mol. are sulfonated at ordinary or higher temps. by use of SO_3 , fuming H_2SO_4 , chlorosulfonic acid or concd. H_2SO_4 at a temp. of 100° or higher. Diluents such as $PhNO_2$ or CCl_4 and catalysts such as P_2O_5 , diatomaceous earth and active C may be present. The products may be used as wetting, emulsifying and detergent materials and may be added to acid baths for dyeing, fulling and carbonizing, and may be used as catalytic fat saponifiers.

Aliphatoaromatic acids. I. G. FARBENIND. A.-G. Fr. 639,359, July 20, 1927. Aliphatoaromatic carboxylic acids are obtained by heating unsatd. acids of the type $CX_nC CXCO_2H$, in which X represents H or any univalent substituent with aromatic hydrocarbons contg. more than 2 condensed nuclei. A condensing acid or $AlCl_3$ may be added. In examples acrylic acid is heated with anthracene in the presence of a current of HCl gas. Chloropropionic acid is heated with *meso*-dichloroanthracene. Other examples are given.

2',4'-Dichloro-2-benzoylbenzoic acid and derivatives. I. GUBELMANN, H. J. WEILAND and O. STALLMANN. Brit. 288,884, Aug. 15, 1927. Dichlorobenzene is condensed with phthalic anhydride, the resulting 2',4'-dichloro-2-benzoylbenzoic acid is nitrated and then reduced and the 2',4'-dichloro-5'-amino-2-benzoylbenzoic acid is finally treated with a dehydrating agent in order to close the ring and produce 1-amino-2,4-dichloroanthraquinone.

Aromatic amines. I. G. FARBENIND. A.-G. Fr. 639,557, Aug. 10, 1927. Nitro compds. are reduced by insufficient quantities of solns. of sulfides or polysulfides or thiosulfates for total reduction in the presence of H or CO or mixts. thereof, under pressure and at a high temp. and preferably in the presence of a catalyst such as FeO, spongy Fe or Ni. Examples are given.

Secondary and tertiary aromatic amines from a mixture of bases. BRITISH DYE-STUFFS CORP., LTD., REGINALD W. EVERATT and ERNEST H. RODD. Ger. 468,304, May 3, 1927. The bases are treated with $COCl_2$ in presence of water with sufficient

alkali to neutralize the HCl. Thus, a mixt. of mono- and diethylaniline is added to water and while COCl_2 is led in, NaOH or Na_2CO_3 is slowly stirred in. HCl is then added. The phenylethylurea chloride is filtered off and washed with dil. HCl. It is then hydrolyzed to obtain pure monoethylaniline, or condensed with a further mol. to produce β -diethyldiphenylurea.

Halogen-substituted tertiary amines. I. G. FARBENIND. A.-G. Brit. 288,665, Dec. 10, 1926. Such amines of the benzene or naphthalene series are obtained by treating the amines in aq. soln. with halogens in the presence of an inorg. acid. The halogens may be used in nascent state by adding a bromate or chlorate to the acid soln. Examples are given of the production of 1-methyl-3-chloro-(or bromo-)-4-dimethylaniline, 1-chloro-(or bromo-)-2-dimethylaminonaphthalene, *o*-chloro-(and *o,p*-dichloro-)-dimethylaniline and 3,3'-dichloro-(or dibromo-)-4,4'-tetramethyldiaminodiphenylmethane. The products are suitable for the prepn. of quaternary NH_4 compds. as described in Brit. 286,984. Cf. C. A. 22, 3668.

Higher alcohols from homologs of ethylene. COMPAGNIE DE BÉTHUNE. Fr. 636,651, Oct. 20, 1926. Ethylene from coke-oven gas or from gas cracking is passed through a tower contg. H_2SO_4 dild. to about 90% and kept at a temp. of about 18° , whereby propylene, amylene, etc. are absorbed to form propylsulfuric acid, etc., which are worked up in the usual way to form higher alcs. or ethers.

Aromatic *N*-aminoalkylamino aldehydes. I. G. FARBENIND. A.-G. Brit. 288,972, April 16, 1927. Compds. of this class are prepd. by (a) treating an aromatic aminoalkylamino compd. having a free *p*-position with CH_2O in the presence of an aromatic hydroxylamine compd. and decompg. the resulting anhydro compd. with alkali (in which case the hydroxylamine compd. may be formed *in situ*); or, (b) converting an aromatic aminoalkylamino compd. contg. (or capable of acquiring in the course of the reaction) a substituent group which can be transformed into an aldehyde group, by treatment in the usual manner as by oxidation, for producing aldehydes (suitable substituents being methyl, methylol and isoalkyl groups); or, (c) introducing the aminoalkyl group into the primary or secondary amino group of an aromatic aldehyde by a usual alkylation method. Oily products are obtained which may be used for producing therapeutic compds. Examples are given of the production of *N*-diethylaminoethyl-*p*-aminobenzaldehyde, *N*-methyldiethylaminoethyl-*p*-aminobenzaldehyde and *N*-methyl-(α -dimethylamino- γ -methylpropane)-*p*-aminobenzaldehyde.

Cyclic ketones. I. G. FARBENIND. A.-G. Brit. 288,441, April 26, 1927. Cyclic ketones are obtained by heating aromatic hydrocarbons or their homologs or substitution products with olefin-carboxylic acids or their H halide addn. products and an acid condensing agent with or without use of a solvent. Examples are given of the production of 1-indanone, from C_8H_8 , a mixt. of 4- and 6-methyl-1-indanones from toluene, 4- and 6-chloro-1-indanones from chlorobenzene and corresponding products from bromobenzene, *o*- and *m*-dichlorobenzene, *m*-dibromobenzene and *o*-chlorotoluene and of various other similar compds. Cf. C. A. 22, 4537.

Metallic derivatives of ketones. BRITISH DYESTUFFS CORP., LTD., AND S. COFFEY. Brit. 289,493, Oct. 28, 1926. Normal metallic derivs. of β -diketones are prepd. by treating a β -diketone of the type R.CO.CHR'.CO.R'' , contg. more than 5 C atoms (in which R and R'' represent hydrocarbon radicals and R' is a hydrocarbon radical or H) with Al, Fe, Ni, Co, Mn, Cr, Zn, Ti, Ce or Th or an oxide, hydroxide or salt of these metals. Examples are given of the prepn. of Al propionylacetone, γ -ethylacetylacetone, γ -butylacetylacetone, ferric propionylacetone, butyrylacetone, γ -methylacetylacetone, γ -ethylacetylacetone and γ -butylacetylacetone; nickelous propionylacetone, γ -methylacetylacetone, and acetylmesityl oxide, cobaltous propionylacetone and butyrylacetone, cobaltic propionylacetone and γ -methylacetylacetone, manganic benzoylacetone and propionylacetone, Cr propionylacetone, benzoylacetone, γ -ethylacetylacetone and γ -butylacetylacetone, Zn, Ti, Ce and Th propionylacetone, Th butyrylacetone and benzoylacetone.

Oxidizing aldoses. CHEMISCHE FABRIK VORM. SANDOZ. Brit. 289,280, June 17, 1927. In the oxidation of glucose, lactose or the like to the corresponding mono-carboxylic acids such as gluconic and similar acids, by use of hypochlorite in the presence of Br and I derivs., an alk. medium is used throughout the process and the temp. is maintained at 15° or lower. Milk of lime may be added. Examples are given of the treatment of glucose and lactose, and reference is made also to the treatment of mannose and maltose. Cf. C. A. 22, 4538.

Benzoates. WM. S. CALCOTT and HERBERT W. DAUDT (to E. I. du Pont de Nemours & Co.). U. S. 1,692,927, Nov. 27. Alkali metal permanganate is used to oxidize impurities in crude benzoic acid made from phthalic acid, in aq. soln., pre-

paratory to producing undisclored sol. white benzoates such as those of alkali metals or NH_4 .

Cyanides of the perylene series. ALFRED PONGRATZ (to Felice Bensa). U. S. 1,692,417, Nov. 20. Halogen compds. of perylene such as dichloro-, dibromo- or tetrachloro-perylene are mixed with metal cyanides such as $\text{Cu}_2(\text{CN})_2$ and the mixt. is heated to 300° to form perylene dicyanide, monochloroperylene nitrile or similar compds.

Complex vanadyl compounds of the quinoline series. BEHRINGWERKE, A.-G. (Friedrich Krollpfeiffer and Hermann Schultze, inventors). Ger. 468,300, Mar. 11, 1925. Solns. of vanadyl salts are allowed to react with alk. solns. of 7-halo-8-hydroxyquinoline-5-sulfonic acid, and the complex vanadyl compd. so formed is sepd. by addn. of acid. Thus, 7-iodo-8-hydroxyquinoline-5-sulfonic acid is dissolved in NaOH and V_2O_5 added. On acidulation, the vanadyl compd. seps. out as greenish flakes.

Pyridine derivatives. C. RATH (to Schering-Kahlbaum A.-G.). Brit. 288,628, April 14, 1927. Hydroxypyridines or their derivs. are obtained by treating a halopyridine which has no saponifiable group in the 5-position or a deriv. with an alk. or acid saponif. agent with or without a solvent or diluent; *e. g.*, 2-chloropyridine is treated with KOH to produce 2-hydroxypyridine or 2-chloro-5-nitropyridine is treated with either NaOH or HCl to produce 2-hydroxy-5-nitropyridine.

2-Arylaminoanthrahydroquinone compounds. KARL SCHIRMACHER, HANS SCHLICHENMAIER, WALTER KROSS, WILHELM SCHAICH, HANS TAMPKE and HANS NEUMANN (to I. G. Farbenind. A.-G.). Can. 283,918, Oct. 9, 1928. 2-Acetamidoanthraquinone (26.5 parts) is suspended in 200 parts of alc. and to this 2 parts of Ni catalyst is added and the whole is stirred in an autoclave under 20 atm. pressure of H_2 . The H_2 is absorbed at ordinary temp. with evolution of heat and absorption is finished after a short period. To the suspension of the easily oxidizable 2-acetamido-9,10-anthrahydroquinone thus prep'd. are added 25 parts of NaOH soln. of 40°Bé. and some water, and to this mixt. is then added at ordinary temp., with stirring and exclusion of air, 30 parts of Me_2SO_4 . Heat is evolved and the temp. should not exceed 40° . The mass is kept alk. and, if required, some further Me_2SO_4 is added until the red color of the alk. soln. has disappeared. When the reaction is finished addn. of H_2O causes the sepn. of 2-acetamido-9,10-anthrahydroquinone dimethyl ether, greenish yellow, cryst., m. $235-240^\circ$, and after a single crystn. from alc., m. 253° . It dissolves in alc., benzene and glacial AcOH with a green fluorescence.

Water-soluble santalol derivative. VEREIN FÜR CHEMISCHE INDUSTRIE A.-G. Swiss 126,303, July 13, 1926. Bromoacetic acid santalyl ester is caused to react with hexamethylenetetramine. The initial material may be obtained by reaction of santalol with bromoacetyl bromide in CHCl_3 soln. in presence of pyridine. Cf. C. A. 22, 2812.

A new basic derivative of the camphor series. HANS RUPE. Swiss 126,677, Apr. 17, 1927. The new substance, $\text{C}_8\text{H}_{14}\text{CO.NH.C:NH}$, is prep'd. by treating cam-

phoronitrile acid amide with alkali. It forms transparent crystals m. 238° . The hydrochloride, m. 230° , and the picrate, m. 293° .

Preparation of a lepidine-containing quinoline base mixture by catalytic means. ALEXEI. E. CHICHIBABIN. Ger. 468,303, Sept. 15, 1926. A vaporous mixt. of PhNH_2 , AcH or paraldehyde is led over the oxides of ter- or quadrivalent metals heated to $350-550^\circ$. Thus, vapor contg. PhNH_2 and paraldehyde is led through Cu tubes contg. granular Al_2O_3 at $480-490^\circ$. A quinoline base mixt., b. $220-270^\circ$, is obtained. By fractional pptn. and recrystn. pure lepidine picrate, m. $210-211^\circ$, is obtained.

Preparation of a compound from quinine and isobutylallylbarbituric acid. CHEMISCHE FABRIK VORM. SANDOZ. Swiss 126,680, May 10, 1927. Quinine and isobutylallylbarbituric acid are mixed in mol. proportions. The product forms colorless crystals, m. $112-115^\circ$; 0.2049 g. neutralizes 14.35 cc. 0.1 $\text{N H}_2\text{SO}_4$.

Compounds of indene and phenols. I. G. FARBENIND. A.-G. Fr. 636,606, June 27, 1927. New compds. of indene and phenols are made by treating with hydric acids (HCl , HBr , HI) or with metallic chlorides a mixt. of indene or substances contg. indene or indene derivs. and uni- or multi-valent phenols or their substitution products. Several examples are given. The products have *disinfectant and therapeutic properties* and may be used for the *manuf. of lakes and dyes*.

Addition products of acetylene and similar hydrocarbons. VEREIN FÜR CHEM. INDUSTRIE A.-G. and H. WALTER. Brit. 288,707, Jan. 11, 1927. C_2H_2 and steam are passed into a soln. formed from HgO and H_2SO_4 , and the vapors are condensed to

recover *acetaldehyde*. C_2H_2 and HOAc vapor are passed into a soln. formed from HgO and HOAc to obtain *ethylidene diacetate*. C_2H_2 and propionic acid similarly yield *ethylidene dipropionate*. C_2H_2 and CCl_3CO_2H are passed into a soln. formed of HgO and fused CCl_3CO_2H to produce a *vinyl ester of trichloroacetic acid*. C_2H_2 and iso-Bu alc. vapor passed into a suspension of mercuric phosphate in iso-Bu alc. yield *ethylidene-diisobutyl ether*. C_2H_2 and ethylene glycol vapor passed into a soln. of $HgSO_4$ in ethylene glycol yield *ethylene ethylidene ether*. Allylene and steam passed into a soln. formed from HgO and H_2SO_4 yield *acetone* (an isomer of the methylvinyl alc. probably being first formed). Allylene and HOAc vapor passed into a soln. formed from HgO and HOAc yield *acetone and Ac_2O* (probably dissocn. products of methylethylidene diacetate first formed). Allylene and iso-Bu alc. vapor passed into a suspension of mercuric phosphate in iso-Bu alc. yield a condensate contg. *methylvinylisobutyl ether*.

Sulfur compounds. WILHELM LOMMEL, THEODOR GOOST and HERMANN FRIEDRICH (to I. G. Farbenind. A.-G.). Can. 284,056, Oct. 16, 1928. New compds. contg. S are obtained by reaction of CS_2 upon secondary alicyclic bases. The reaction can take place in the presence of other org. or inorg. bases or oxides or hydroxides. The reaction mass is cooled and the process carried out with or without a diluent (e. g., $PhCl$, CCl_4 , C_6H_6 , EtOH, or water). The products are partly solids, oils and resins. Nearly all are difficultly sol. in ether and benzene, some are sol. in $CHCl_3$, benzene, or alc. and some in water. They cannot be distd. If heated at elevated temp. decompn. takes place. By slight oxidation thiuram disulfides are formed. E. g., 76 parts of CS_2 is gradually run into a stirred and cooled mixt. of 127 parts hexahydroethylaniline, 99 parts of hexahydroaniline and 400 parts of ice water. The hexahydroaniline salt of ethylhexahydrophenyldithiocarbamic acid seps., at first in form of an oil, which becomes cryst. after some time. The new compds. are valuable in *vulcanizing rubber*.

Tetraalkyl lead. WM. S. CALCOTT and HERBERT W. DAUD (to E. I. du Pont de Nemours & Co.). U. S. 1,692,926, Nov. 27. An alloy of Pb with an alkali metal such as Na is progressively added to EtCl or other alkyl chloride to effect reaction.

Acetic acid. CHEMISCHE FABRIK AUF ACTIEN (VORM. E. SCHERING). Fr. 637,129, July 6, 1927. In the production of AcOH from Ca acetate and H_2SO_4 , the Ca acetate is used in soln. in AcOH and the soln. is effected in a paste or mud of plaster of Paris and AcOH from Ca acetate and H_2SO_4 . Cf. C. A. 22, 4133.

Acetic acid. HERMANN SUIDA. Fr. 639,112, Aug. 5, 1927. AcOH is extd. from a mixt. of superheated AcOH vapor and steam by esters of mono- or poly-basic cyclic org. acids with uni- or multi-valent alcs. Examples are, the dibutyl or dihexyl ester of *o*-phthalic acid, or neutral esters of glycol or glycerol.

Carboxylic acid anhydrides; ethylidene diacetate. CONSORTIUM FÜR ELEKTRO-CHEMISCHE INDUSTRIE GES. Brit. 288,549, April 11, 1927. Reaction between a vinyl ester and a carboxylic acid, e. g., between vinyl acetate and HOAc, is effected preferably by heating together in the presence of a catalyst such as H_2SO_4 , H_3PO_4 , benzenesulfonic acid, sulfoacetic acid or other suitable acid or an acid or neutral salt such as Hg sulfate. Production of Ac_2O and ethylidene diacetate from vinyl acetate and HOAc is described. The process may be made continuous and distn. effected in a column still. Mixed anhydrides may be produced such as acetopropionic anhydride from vinyl acetate and propionic acid and butyroacetic anhydride from vinyl butyrate and HOAc. Increased or reduced pressures, inert gases, solvents or diluents may be used in effecting the reactions.

Acetic anhydride. WALTER BADER (to Celanese Corp. of America). U. S. 1,693,331, Nov. 27. Acetone is subjected to the action of CO_2 in excess under pressure (suitably 750 lb. per sq. in.) at a temp. of about 350° and in the presence of a catalyst such as Mn carbonate pptd. on pumice. Other aliphatic anhydrides also may be similarly produced from the corresponding ketones.

Citric acid. AUGUSTE FERNBACH and JOHN L. YUILL (to Rowntree and Co., Ltd.). U. S. 1,691,965, Nov. 20. In producing citric acid from solns. of sucrose contg. the necessary nutrient materials such as NH_4NO_3 , K phosphate and $MgSO_4$ by means of fungi such as *Aspergillus*, HCl is added to give a p_H of 1.2-2.5, which renders sterilization by heat unnecessary. U. S. 1,691,966 specifies a similar process in which, instead of HCl, there may be added other "strong" acids such as H_2SO_4 . Cf. C. A. 22, 663.

Phthalamic acid and its derivatives. ANTAL FODOR. Fr. 636,846, June 30, 1927. Phthalamic acid is prepd. from phthalic anhydride by adding NH_3 soln. and evapg. to dryness and treating with an alkali. Esters are prepd. from the alkali phthalamate by treating with an alc. and H_2SO_4 at 66° . Compds. of the esters with N derivs. are prepd. by heating then together with alc. under reflux on a water bath. The N derivs. may be esters or amino or benzoyl derivs. of *p*-aminobenzoyldiethylaminoethanol.

Purification of phthalic anhydride. ALPHONS O. JAEGER and FRANK A. CANON (to The Selden Co.). Can. 284,272, Oct. 23, 1928. Technical phthalic anhydride is heated for a shorter or longer time depending on the amt. of impurities with or without elevated pressure, and in some cases, even under diminished pressure, and with agitation. The heating may be about the boiling point of phthalic anhydride at the pressure chosen and causes the unsatd. impurities to condense or polymerize to non-volatile products, which can be easily sep'd. from the phthalic anhydride by distn. or sublimation. When high pressure is used, it is frequently not necessary to heat up to the boiling point of phthalic anhydride, in many cases a temp. of 150° to 280° being quite sufficient. For most grades of technical anhydride heating for 2 to 10 hrs. or longer is desirable, e. g., 1000 kg. of technical phthalic anhydride is heated for $1\frac{1}{2}$ hr. to the b. p. in a kettle surrounded by a metal bath and under 3 to 5 atm. pressure. A little superheated steam is then blown into the boiling melt, whereupon the pressure is allowed to drop and the phthalic anhydride distd. off. A colorless product of good purity is obtained. Cf. C. A. 22, 4539.

Benzimidazolone-earsonic acid. KARL STREITWOLF and ALFRED FEHRLE (to I. G. Farbenind. A.-G.). Can. 283,919, Oct. 9, 1928. N-substituted benzimidazolone-earsonic acids are obtained by the action of H_3AsO_3 on diazo compds. produced from aminobenzimidazolones, substituted at the nitrogen by an alkyl group or alkylene group.

1-Aminoanthraquinone-2-sulfonic acid. I. G. FARBENIND. A.-G. Brit. 289,097, April 23, 1927. 1-Aminoanthraquinone is sulfonated in the presence of a sulfate of an alkali or alk. earth metal (suitably by use of fuming sulfuric acid and Na_2SO_4) so that only 1-aminoanthraquinone-2-sulfonic acid is produced.

3-(4-Methoxyphenylamino)-1,8-naphthosultam-6-sulfonic acid. I. G. FARBENIND. A. G. Swiss 126,339, Aug. 31, 1926. A 1,8-naphthosultampolysulfonic acid having a sulfo group in the 3-position is treated with 4-anisidine.

3-*p*-Tolylamino-1,8-naphthosultam-6-sulfonic acid. I. G. FARBENIND. A.-G. Swiss 126,338, Aug. 31, 1926. *p*-Toluidine is treated with a 1,8-naphthosultampolysulfonic acid having a sulfo group in the 3-position.

2-Hydroxynaphthalene-6-carboxymonosulfonic acids. I. G. FARBENINDUSTRIE A. G. Fr. 636,561, June 24, 1927. A mixt. of 2-hydroxynaphthalene-6-carboxy-3- and 8-sulfonic acids is prepd. by treating 2-hydroxynaphthalene-6-carboxylic acid with conc'd H_2SO_4 . The 2 acids are sep'd. by using the difference in soly. of their alkali salts. By using fuming H_2SO_4 , 2-hydroxynaphthalene-6-carboxydisulfonic acid is obtained, one sulfonic group being split off by heating the sulfonation mass dild. with H_2O , to give 2-hydroxynaphthalene-6-carboxy-3-monosulfonic acid.

4,4'-Dichloro-1,1'-binaphthyl-8,8'-dicarboxylic acid. LEOPOLD CASSELLA & Co. G. M. B. H. Swiss 126,337, June 30, 1926. The diazo compd. from 4-chloro-1,8-aminonaphthoic acid is reduced. Reduction may be effected with ammoniacal cuprous salts. The product melts above 300° .

5,5'-Diethoxy-1,1'-binaphthyl-8,8'-dicarboxylic acid. LEOPOLD CASSELLA & Co. G. M. B. H. Swiss 126,336, June 30, 1926. The diazo compd. from 5-ethoxy-1,8-aminonaphthoic acid is reduced. Reduction may be effected with ammoniacal cuprous salts. The product decomposes at $300-310^{\circ}$.

Formamide of 2-hydroxy-4-aminobenzene-earsonic acid. ÉTABLISSEMENTS POULENC FRERES and ERNEST FOURNEAU. Fr. 637,049, Oct. 29, 1926. The formamide of 2-hydroxy-4-aminobenzene-earsonic acid is prepd. by heating CH_3O with 2-hydroxy-4-aminobenzene-earsonic acid. It crystallizes from water in fine needles which do not have well defined m. p.

Dehydrating ethyl alcohol. FIRMA E. MERCK. Swiss 126,401, Feb. 12, 1927. The alc. is heated with CaO in a closed vessel to a pressure above atm.

Isopropyl alcohol. GEORGE O. CURME, JR., and ERNEST W. REID (to Carbide and Carbon Chemicals Corp.). U. S. 1,695,249, Dec. 11. Diisopropyl sulfate is hydrolyzed suitably at 40° and lower temps.) while emulsified with water.

Furfuryl alcohol and methylfuran. SOCIÉTÉ ANON. DES DISTILLERIES DES DEUX-SEVRES. Fr. 639,756, Jan. 31, 1927. Furfural vapor is hydrogenated with a large excess of H_2 ; a catalyst is used. The proportion of methylfuran increases with increase of H_2 .

Acetaldehyde. CONSORTIUM FÜR ELEKTROCHEMISCHE INDUSTRIE GES. Brit. 288,213, April 4, 1927. AcH is produced by decomp. a vinyl ester such as vinyl acetate with H_2O , suitably with the addn. of a catalyst such as H_3PO_4 , H_2SO_4 , and org. sulfonic acids, acid salts such as NaH_2PO_4 or $NaHSO_4$, and a solvent such as $HOAc$. Alk. agents may also be used in the reacting mixt., in which case the aldehyde produced

may be converted into aldol, crotonaldehyde or aldehyde resin if desired. An excess of H_2O is used to avoid the production of ethylidene ester, which resinifies easily. The reaction may be continuously effected in a column still or similar app., from which the AcH is continuously distd.

Butyraldehyde. CHARLES BOGIN (to Commercial Solvents Corp.). U. S. reissue 17,157, Dec. 11. See original pat. 1,556,067 (C. A. 19, 3490).

Butyraldehyde from crotonaldehyde. CONSORTIUM FÜR ELEKTROCHEMISCHE INDUSTRIE G. M. B. H. Swiss 126, 197, April 30, 1927. See Brit. 271,103 (C. A. 22, 1596).

Formaldehyde, ethylene, etc., from methane. HENRI SPINDLER. Fr. 637,050, Oct. 29, 1926. Methane and O are condensed by heating them together under pressure in the presence of a catalyst such as Cu to produce CH_2O . The CH_2O may be combined with another CH_4 mol. by using as catalyst Fe, Ni, Co, Cu, Cr, etc., or their compds. and the temp. may be raised to 500° and the pressure to 1000 kg. to give ethylene, which may be used to make $EtOH$. If $ZnCl_2$ is used as catalyst higher hydrocarbons, cyclic or acyclic, may be obtained.

Metaldehyde. EMIL LÜSCHER and HEINRICH STEIGER (to the Firm: Elektrizitätswerk Lonza). U. S. 1,693,204, Nov. 27. In producing metaldehyde which burns practically free from soot and ash, acetaldehyde is treated with catalyzer salts such as NH_4Br , hydrazine chloride, or hydroxylamine chloride, which are obtained from the action of strong acids on inorg. N bases.

Acetone. KOLMAN ROKA and KARL WIESLER (to the Holzverkohlungs-Industrie A.-G.). Can. 283,954, Oct. 9, 1928. Fe shavings are coated with iron oxide and manganese oxide and filled into a reaction pipe. A mixt. of 1 part by vol. of acetylene and 10 parts by vol. water vapor is passed at 475° through the reaction pipe. The vapors which pass off are condensed. There is obtained acetone in a yield of 95% of the theoretical amt. calcd. on the acetylene which has been used.

Glycols. GEORGE O. CURME, JR. (to Carbide and Carbon Chemicals Corp.). U. S. 1,695,250, Dec. 11. A chlorohydrin such as ethylene chlorohydrin while dissolved in water is reacted on with caustic alkali until the Cl is substantially completely taken up in the reaction, and the rate of the reaction is restricted (suitably by regulation of the temp. and concn.) so that the major portion of the chlorohydrin is converted into glycol. Cf. C. A. 22, 92.

Esters of glycols. OSKAR LOEHR (to I. G. FARBENIND. A.-G.). Can. 285,356, Dec. 4, 1928. Esters of ethylene glycol and homologous glycols or derivs. thereof are manufd. by heating ethylene oxide or a homolog or deriv. thereof with at least twice the mol. proportion of a carboxylic acid in the presence of a catalyst, *e. g.*, a strong inorg. acid or an acid salt. By this means the ester of the corresponding glycol is produced in which the two hydroxyl groups of the glycol are substituted by the radical of the carboxylic acid. From ethylene oxide and $AcOH$ acid, ethylene glycol diacetate is obtained.

Polyalkylene glycols and their alkyl ethers. OSKAR LOEHR (to I. G. FARBENIND. A.-G.). Can. 285,357, Dec. 4, 1928. Polyalkylene glycols and their derivs. are manufd. by causing 2 or more mol. proportions of an olefin oxide to react upon 1 mol. proportion of a hydroxyl compd. in the presence of a catalyst. If the hydroxyl compd. used is water or a polyhydric alc., polyalkylene glycols are formed; by using monohydric alcs. the ethers of polyalkylene glycols are obtained. As catalysts small amts. of strong mineral acids, *e. g.*, H_2SO_4 or H_3PO_4 , or of acid-reacting salts, *e. g.*, $NaHSO_4$, or basic substances such as alkali alcoholates or tertiary amines can be employed.

Aryl ethers of polyalkylene glycols. OSKAR LOEHR (to I. G. Farbenind. A.-G.). Can. 285,359, Dec. 4, 1928. Aryl ethers of polyalkylene glycols are manufd. by reacting upon 1 mol. proportion of an aromatic hydroxyl compd. with 2 or more mol. proportions of an olefin oxide in the presence of suitable catalyst. As catalysts, basic substances such as alkali phenolates, alkali alcoholates and tertiary amines can be employed. *E. g.*, into 500 parts of technical cresol mixed with 10 parts of KOH , 500 parts ethylene oxide is introduced at 100° . A mixt. boiling between 170° and 200° under 12 mm. pressure and rich in diethylene glycol cresyl ether is obtained besides some monoethylene glycol cresyl ether.

Esters of polyalkylene glycols. OSKAR LOEHR (to I. G. Farbenind. A.-G.). Can. 285,358, Dec. 4, 1928. Acetates of polyalkylene glycols are manufd. by reacting upon 1 mol. proportion of $AcOH$ with 2 or more mol. proportions of an olefin oxide in the presence of H_2SO_4 .

Recovery of glycerol. JOHANNES ALTENBURG. Ger. 467,350, Mar. 12, 1927. Glycerol is recovered from albuminous or glutinous materials by treating them with

CH_2O or compds. which liberate CH_2O , heating to a high temp., with or without the addn. of a condensation medium, and extg. the glycerol from the condensation product by washing.

Camphor. SOCIÉTÉ NOBEL FRANÇAISE. Fr. 636,809, June 29, 1927. In prepg. camphor from borneol or isoborneol by catalytic dehydrogenation, the support for the catalyst is a soft CaCO_3 , e. g., crushed chalk is soaked with a soln. of nitrate or acetate of Ni and reduced by H.

Menthol. RHEINISCHE KAMPFER FABRIK GES. Brit. 289,125, Jan. 17, 1927. Crude inactive menthol obtained by the hydrogenation of thymol, menthone or isomenthone is first subjected to a preliminary freezing-out or fractional distn. or both, and the partially purified inactive menthol is then converted into its esters or ester acids, which are recrystd. and sapond. Pure inactive menthol (racemate of natural menthol) is thus obtained, while from the remaining fractions of the preliminary treatment neomenthol, m. 51° , is obtained together with small quantities of a solid inactive isomenthol, m. 52° . Brit. 289,126 specifies the conversion of solid inactive isomenthol, m. $52-3^\circ$, by heat treatment with H, with or without pressure, into inactive menthol, employing catalysts, or by use of alkali mentholates and heating. The product is subjected to freezing-out or fractional distn. and the crude inactive menthol obtained is purified by conversion into its esters or ester acids, followed by crystn. and sapon. Cf. following abstract and C. A. 22, 4540.

Menthol. RHEINISCHE KAMPFER-FABRIC. Swiss 126,585, Jan. 7, 1927. Impure inactive menthol is converted into a cryst. ester and recrystd. to form an isomeric menthol ester, m. $52-3^\circ$, from which the menthol is then regenerated. Thus, impure menthol is churned with phthalic anhydride and alc. added. The phthalic ester seps. out and is recrystd. in alc. after which the menthol is recovered by steam. Other examples are given.

Thymol and menthol. WALTER SCHOELLER, HANS JORDAN and REINHARD CLERC (to Schering-Kahlbaum A.-G.). Can. 283,943, Oct. 9, 1928. 3-Methyl-6-isopropylphenol and its products of hydrogenation are produced by heating the product of condensation of crude cresol and acetone to effect decompn. thereof, treating the decompn. product with H in the presence of a catalyst until 2 or 8 atoms of H have entered into combination, and subjecting the resulting mixt. to fractional distn. and to freezing out. Cf. C. A. 22, 2756.

Phenol. I. G. FARBENIND. A.-G. Brit. 288,308, April 6, 1927. PhCl is passed with steam over active silica gel at a temp. of about 350° .

Anthraquinone derivative. I. G. FARBENIND. A.-G. Swiss 126,579, Feb. 28, 1927. A new deriv. of anthraquinone is prepd. by the reaction between anthrone and cinnamaldehyde.

Ethylene. GEORGE F. HORSLEY (to Imperial Industries, Ltd.). Can. 284,405, Oct. 30, 1928. Gases contg. C_2H_4 are freed from their S compds. and scrubbed with an acid soln. of AgNO_3 contg. at least about 200 g. of AgNO_3 per l. and about 0.3 N with respect to HNO_3 and cooled to $0-10^\circ$ to absorb the C_2H_4 . The soln. is regenerated and C_2H_4 recovered therefrom by heating to $50-70^\circ$.

Recovery of solid polymerized styrene. WILLIAM S. JOHNSTON and ALEXIS W. KEEN (to Dominion Rubber Co., Ltd.). Can. 283,915, Oct. 9, 1928. Superheated steam at 115 lb. pressure is utilized to heat a jacketed conduit through which conduit a 60% soln. of a polymerized styrene in ethylbenzene or other org. solvent flows while under a pressure of 70 to 80 lbs. The steam when it reaches the end of the conduit intermingles with the preheated polymerized styrene soln. and the mixt. is forced through a constricted passage and on issuing therefrom the vaporized solvent and steam pass out of the dried styrene, leaving a sponge-like mass, which may be pulverized.

Xylenes. I. G. FARBENIND. A.-G. Fr. 639,252, Aug. 9, 1927. The *o*- and *p*-xylenes are obtained by the action of CH_2O on toluene in the presence of HCl , with or without condensing agents such as ZnCl_2 , AlCl_3 , SnCl_4 , the *o*- and *p*-xylyl chlorides being reduced with H. The xylenes may be sepd. by fractional distn.

Filtering xylidine or similar materials. JUSTIN F. WATT. U. S. 1,693,417, Nov. 27. In filtering and sepg. an org. material such as xylidine from inorg. material in a filter cake, the material in the filter is subjected to the pressure of vapors of a volatile substance, such as steam in which the org. component is sol., and the org. component is removed by passing the vapors through the filter cake and subsequently the materials passing through the cake are recovered. Volatile solvents such as benzene also may be used.

Cyclohexylbenzene. PAUL SCHVING. Fr. 636,686, Oct. 23, 1926. Cyclohexylbenzene and its homologs are prepd. by heating, in the presence of concd. H_2SO_4 , cyclohexanol with C_6H_5 and its homologs.

Catalytic oxidation of naphthalene. ALPHONS O. JAEGER (to Selden Co.). U. S. 1,692,126, Nov. 20. $C_{10}H_8$ vapors mixed with an oxidizing gas such as air are caused to react in the presence of a catalyst contg. a zeolite, in order to form products such as *α*-naphthoquinone or phthalic anhydride. Numerous examples are given.

1-Alkoxy- or aralkoxy-methyl-3,7-dimethylxanthines. I. G. FARBENIND. A.-G., K. SCHRANZ and C. LUTTER. Brit. 288,366, Jan. 6, 1927. These compds. are obtained by treating theobromine or its salts with a chloromethyl ether of the formula $ROCH_2Cl$, in which R represents an alkyl group higher than Me or an aralkyl group; e. g., 1-ethoxymethyl- and 1-isopropoxymethyl-3,7-dimethylxanthines are prepd. by the action of the Na or Pb salt of theobromine with chloromethyl ethyl ether and chloromethyl isopropyl ether, resp. Other products referred to are: 1-propoxymethyl-, 1-butoxymethyl-, 1-isobutoxymethyl-, 1-benzyloxymethyl-, and 1-allyloxymethyl-3,7-dimethylxanthines. Chloromethyl ethers such as the butyl chloromethyl ether, benzyl chloromethyl ether and allyl chloromethyl ether are made by reaction of the corresponding alc. with CH_3O and HCl.

Purifying nitroaniline. HAMILTON MERRILL (to Tower Mfg. Co.). U. S. 1,692,308, Nov. 20. *p*-Nitroaniline formed from *p*-nitrochlorobenzene is treated with an aq. soln. of an alkali such as NaOH or NH_3 and the soln. is filtered off from the nitroaniline while it still contains alkali. Cf. C. A. 22, 2756.

Calcium aluminum ethylate. CHEMISCHE FABRIK AUF ACTIEN (VORM. F. SCHERING). Swiss 126,335, Oct. 12, 1926. A complex Ca Al ethylate is obtained by the interaction of Ca ethylate and Al ethylate in the mol. proportions 1:2, at least one of the ethylates being in the nascent state.

Sodium aluminum ethylate. CHEMISCHE FABRIK AUF ACTIEN (VORM. F. SCHERING). Swiss 126,334, Oct. 12, 1926. A complex Na Al ethylate is obtained by the interaction of Na ethylate and Al ethylate in equimol. proportions, at least one of the ethylates being in the nascent state.

Emetine cholate. CHEMISCHE FABRIK VORM. SANDOZ. Swiss 126,503, Jan. 12, 1927. Emetine and cholic acid are caused to react in mol. proportions. Alternatively emetine-HBr and Na cholate may be used. It is an amorphous yellowish substance.

Quinine cholate. CHEMISCHE FABRIK VORM. SANDOZ. Swiss 126,502, Dec. 17, 1926. Cholic acid is caused to react on quinine. Thus, quinine methanesulfonate is stirred with Na cholate. The substance seps. out as a colorless amorphous ppt. Its soly. in water can be considerably increased by the addn. of such substances as urethan and urea.

3,6-Diamino-10-methylacridinium cholate. CHEMISCHE FABRIK VORM. SANDOZ. Swiss 126,678, Jan. 6, 1927. Cholic acid is allowed to act on 3,6-diamino-10-methylacridinium chloride.

Lupanine. E. VON AMMON and K. SZOMBATHY. Brit. 288,637, April 14, 1927. Seeds of lupins such as those of *Lupinus albus* are extd. with a soln. of a neutral salt sufficiently concd. to ppt. the conglutin so as to avoid its loss. A suitable soln. may be formed of water 100, and NaCl 18, or Na_2SO_4 32 or $MgSO_4$ 27 or $CaCl_2$ 8 parts. The soln. is treated with acid such as H_2SO_4 to ppt. the proteins dissolved by the salt soln., filtered and the filtrate is rendered alk. and extd. with C_6H_6 , from which the lupanine is recovered. The lupanine when converted into the hydrochloride can be sepd. into the *d* and *l* forms as the *d*-lupanine-HCl can be dissolved selectively in $CHCl_3$.

Pyridyl iodochloride. SCHERING-KAHLBAUM A.-G. (Curt Rath, inventor). Ger. 468,302, Nov. 12, 1924. The I substitution derivs. of pyridine having the I at the 3- or 5-position are subjected to the action of Cl. Thus, Cl is bubbled into an ice-cooled soln. of 3-iodopyridine in $CHCl_3$. The 3-pyridyliodochloride is pptd. in fine yellow needles, m. 128–130° with decompn.

Ethyl *m*-aminobenzoate methanesulfonate. CHEMISCHE FABRIK VORM. SANDOZ. Swiss 126,679, March 9, 1927. Equimol. mixts. of *m*- $H_2NC_6H_4CO_2Et$ and $MeSO_3H$ are allowed to react. The substance forms crystals m. 149–150°. 0.3185 g. neutralize 11.9 cc. 0.1 N H_2SO_4 (Kjeldahl); or 0.2940 g. neutralize 10.8 cc. 0.1 N H_2SO_4 .

Bromo derivatives of 1,1'-binaphthyl-8,8'-dicarboxylic acid. I. G. FARBENIND. A.-G. Brit. 288,957, Dec. 10, 1926. 1,1'-Binaphthyl-8,8'-dicarboxylic acid is converted into a monobromo deriv. by brominating it in glacial HOAc. A dibromo deriv. is obtained by treating the acid with excess of Br in the cold. The products may be converted into bromobenzobenzanthronecarboxylic acids as described in Brit. 288,666.

Derivatives of 2,3-hydroxynaphthoic amide. I. G. FARBENIND. A.-G. Brit. 289,037, April 22, 1927. Interaction is effected between 2,3-hydroxynaphthoic acid and a mustard oil, e. g., 2,3-hydroxynaphthoic anilide is made by heating together

equimol. proportions of 2,3-hydroxynaphthoic acid and phenyl mustard oil at a temp. of about 220° until evolution of C oxysulfide ceases.

5-Iodo-2-aminopyridine. SCHERING-KAHLBAUM A.-G. Brit. 288,571, April 12, 1927. 2-Aminopyridine is treated successively with quantities of an iodizing agent which separately would be insufficient to effect complete conversion into the addition product and after each addition the compd. is decomposed with alkali; *e. g.*, I or I chloride may be added alternately with alkali in a three-stage treatment.

3,10-Perylenequinone. GEORGES LE FLOCH. U. S. 1,604,884, Dec. 11. After reaction of a ring-forming reagent such as AlCl_3 on a substance contg. the naphthidine radical such as naphthidine base the product is subjected to energetic oxidation, *e. g.*, by use of $\text{Na}_2\text{Cr}_2\text{O}_7$ and H_2SO_4 .

Aminopentylguanidine. SCHERING-KAHLBAUM. A.-G. Swiss, 126,501, June 10, 1926. Aminopentylguanidine sulfate is prepd. by the reaction of pentamethylenediamine on an alkylisothiurea sulfate. The substance is colorless salt. Concd. alkali causes it to give off NH_3 .

1-Chloro-2-methylnaphthalene. I. G. FARBENIND. A.-G. Swiss 126,716, Dec. 27, 1926. Addn. to Swiss 125,470. Equimol. quantities of 2-methylnaphthalene and sulfuryl chloride are allowed to react. The product is a colorless, odorless oil.

A monochloro-2,6-dimethylnaphthalene. I. G. FARBENIND. A.-G. Swiss 126,717, Dec. 27, 1926. Addn. to Swiss 125,470. Equimol. quantities of 2,6-dimethylnaphthalene and sulfuryl chloride are allowed to react. The substance forms crystals m. 39°.

1,5-Dichloro-2,6-dimethylnaphthalene. I. G. FARBENIND. A.-G. Swiss 126,718, Dec. 27, 1926. Addn. to Swiss 125,470. Sulfuryl chloride and 2,6-dimethylnaphthalene are allowed to react in the mol. proportions 2:1. The product forms white crystals m. 130°.

1,8-Naphthisatin. I. G. FARBENIND. A.-G. Swiss 126,720, Jan. 27, 1927. Addn. to Swiss 125,475. The hydroxyamino acid chloride formed by the action of hydroxyallyl chloride on *p*-toluenesulfo- α -sodium naphthalide is treated with an acid condensing agent to give a *N*-toluenesulfo-1,8-naphthisatin, which is converted to 1,8-naphthisatin by sapon. The m. p. is 300°. Cf. C. A. 23, 156.

Tetranitrodianthrone. I. G. FARBENIND. A.-G. Swiss 126,196, Mar. 10, 1927. Dianthrone is nitrated. The product forms colorless crystals difficultly sol. in H_2SO_4 and gives a green soln. on heating with pyridine.

2,7-Dinitroanthraquinone. I. G. FARBENIND. A.-G. Swiss 126,403, Mar. 10, 1927. Anthrone is treated with concd. HNO_3 and HNO_2 is split off from the product.

2-Styryl-4-amino-6-ethoxyquinoline. I. G. FARBENIND. A.-G. Swiss 126,346, Sept. 7, 1926. 2-Styryl-4-halo-6-ethoxyquinoline is caused to react with hydrazines, and the 2-styryl-4-hydrazino-6-ethoxyquinolines so obtained is reduced with Zn and AcOH .

3-Phenylamino-1,8-naphthosultam. I. G. FARBENIND. A.-G. Swiss 126,340, Aug. 31, 1926. 1,8-Naphthosultam-3-sulfonic acid is treated with aniline. The product m. 165–170° and forms salts by replacement of H attached to N in the sultam ring.

α -Indanone. I. G. FARBENIND. A.-G. Swiss 126,404, Mar. 14, 1927. α -Indanone is made by the interaction of β -chloropropionic acid, benzene, and AlCl_3 at a raised temp.

α -Methylaminopropiophenone. I. G. FARBENIND. A.-G. (Friedrich Stolz, inventor). Ger. 468,305, Jan. 19, 1927. Arylsulfomethylamine or the alkali salts are allowed to react with α -bromopropiophenone and the so-formed arylsulfone- α -methylaminopropiophenone sapond. Thus, the dry K salt of *p*-toluenesulfomethylamine is stirred into a soln. of α -bromopropiophenone in acetone. The ppt. is washed with acetone and dried, and the KBr washed off with water, leaving *p*-toluenesulfo- α -methylaminopropiophenone from which the acetone is distd. off. On washing with MeOH, white crystals of *p*-toluenesulfomethylamine m. 112–113° are obtained. This is sapond. and the solvent evapd., leaving the $\text{C}_6\text{H}_5\text{CO.CH}(\text{NH.CH}_3)\text{CH}_3$ as the *p*-toluenesulfonate.

1-Phenyl-3-methyl-5-pyrazolone. I. G. FARBENIND. A.-G. Swiss 126,198, Jan. 24, 1927. See Brit. 274,366 (C. A. 22, 1983).

1-*p*-Bromophenyl-3,4-trimethylenepyrazolone. CARL MANNICH. Swiss 126,528, Sept. 30, 1926. Addn. to Swiss 123,733. This substance is prepd. by treating the product of the reaction of an ester of β -ketopentamethylenecarboxylic acid on *p*-bromophenylhydrazine with an alk. condensing agent. The substance is a slightly colored, acid-reacting cryst. powder m. 200°. It is insol. in water, but sol. in alkali.

1-*p*-Tolyl-3,4-trimethylenepyrazolone. CARL MANNICH. Swiss, 126,529, Sept. 30, 1926. Addn. to Swiss 1 — — The reaction product of an ester of β -ketopenta-

methylenecarboxylic acid and *p*-tolylhydrazine is treated with an alk. condensing agent. The substance is a slightly colored, acid-reacting, cryst. powder, m. 202°. It is insol. in water, but sol. in alkali.

Solid diazo salt. I. G. FARBENIND. A.-G. Swiss 126,405, Feb. 11, 1927. A solid diazo salt is obtained by treating a soln. of a salt of diazotized *p*-nitroaniline with free *p*-chlorobenzenesulfonic acid or one of its salts.

11—BIOLOGICAL CHEMISTRY

PAUL E. HOWE

A—GENERAL

FRANK P. UNDERHILL

Synthetic kidneys. WILDER D. BANCROFT AND R. L. NUGENT. *Fifth Colloid Symposium Monograph* 1928, 149-58.—Preliminarily, there must be developed a theory for the selective concn. or diln. of a soln. by filtration or dialysis. Selective membranes may vary from semipermeable to ultra-filtration types. Under the former type, *e. g.*, rubber membranes, are non-porous ones owing their semipermeability to selective soly. and the porous ones, *e. g.*, Cu ferrocyanide membranes, semipermeable because of practically complete negative adsorption. The kidney glomerulus is more than a simple ultra-filter, holding back colloids while allowing the passage of solutes; for changes occur in concentration of solutes. As the org. membranes involved will not stand high pressures, the changes must therefore be due to some form of dialysis or elec. endosmose, water flowing from a place of low partial pressure, to a place of high partial pressure. "If 2 solns., in which the acetone-water ratio is 0.17, are sepd. by a rubber membrane, and if MnSO_4 be added to one side until it forms 17% of that soln., the acetone-water ratio on the other side can theoretically be forced up nearly 200%. If the original acetone-water ratio is 0.06 and if MnSO_4 be added to one side to the extent of 32%, the ratio on the other side should be forced up nearly 1000%." MnSO_4 tends to ppt acetone from aq. soln. The concn. effects in *Valonia* are considered. Blood and urine are never in equil., and therefore the concn. changes in the kidney involve initial flow; "it must therefore be to some extent a problem of negative osmosis. . . . 'Salting-out' effects, negative osmose, initial osmotic flow, and the special nature of the membrane are probably important factors; but we cannot at present say to what extent they enter in. In so far as negative osmose is an elec. phenomenon, it would seem to involve the Donnan equil."

JEROME ALEXANDER

Physico-chemical studies on proteins. III. Proteins and the lyotropic series. ROSS A. GORTNER, WALTER F. HOFFMAN AND WALTON B. SINCLAIR. *Fifth Colloid Symposium Monograph* 1928, 179-98.—From a study of the peptizing effects of 21 inorg. salts on the proteins of wheat flour, concns. ranging from 0.5 to 2.0 *N*, the following conclusions are reached: Arranged in order of increasing peptizing effect, there is a pronounced lyotropic or Hofmeister series of anions $\text{F} < \text{SO}_4 < \text{Cl} < \text{tartarate} < \text{Br} < \text{I}$; with cations, a less pronounced but distinct lyotropic series $\text{Na} < \text{K} < \text{Li} < \text{Ba} < \text{Sr} < \text{Mg} < \text{Ca}$. H-ion differences do not account for these differences, for they are measurable even at const. H-ion concn. Alkali halides all cause decreasing peptization with increased salt concn. The alk. earth halides generally cause increased peptization with increasing salt concn.; this is particularly noticeable for MgCl_2 , MgBr_2 , SrCl_2 and CaBr_2 . Protein "solubility" in neutral salt solns. is, in reality, protein peptization, and as such is governed as to rate and extent by the nature and extent of the particular anions and cations present in the salt soln. Since globulins are defined as "proteins sol. in dil. solns. of salts of strong acids, with strong bases," the question is raised: What salts, what dilns., and what is a globulin? Using wheat flour proteins and *N* solns., KF exts. 13%, KCl 23%, KBr 37% and KI 64%. Obviously none of these exts. is a chem. entity "globulin." "Peptization" by neutral salt solns. is not "hydrolysis," for there is no increase in free amino or carboxyl groups. "The colloid chemical viewpoint still affords the most satisfactory explanation for many of the properties of protein systems."

JEROME ALEXANDER

The dicarboxylic amino acid fraction in gliadin. D. BRESEE JONES AND RUSSELL WILSON. Protein and Nutrition Division, Bur. of Chemistry and Soils, U. S. Dept. of Agr. *Cereal Chemistry* 5, 473-7 (1928).—Gliadin is unique in that it yields on hydrolysis over half its weight of dicarboxylic amino acids (aspartic, glutamic and hydroxy-

glutamic acids), a proportion of this class of amino acids larger than has been found in any other protein: When hydrolyzed by boiling with 20% HCl, gliadin yielded 53.6% of amino acids representing the dicarboxylic amino acid fraction as obtained by pptn. of their Ba salts with alc. Of this quantity, there were isolated the following percentages of pure amino acids: glutamic acid 43.0, hydroxyglutamic acid 7.7; aspartic 0.5. Length of time of hydrolysis of the gliadin (20 and 46 hrs.) had no significant effect on the proportions yielded of these amino acids.

L. H. BAILEY

Chemical constitution of respiration enzyme. OTTO WARBURG. *Science* 68, 437-43(1928). See *C. A.* 22, 3672.

E. J. C.

The creatinephosphoric acid of the muscles. ALEXANDER PALLADIN, A. KUDRYASHEVA AND E. SAVRON. *Biochem. Inst. Charkow. Z. physiol. Chem.* 179, 9-23(1928).—Poisoning by large doses of P results in a considerable increase in creatinephosphoric acid and creatine in the white and red muscles of rabbits, and a decrease in lactacidogen content. The increase is much more pronounced in red than in white muscle. The ratio of combined to total creatine increases in both white and red muscle, but to a greater extent in the latter. Small doses of P which cause chronic poisoning bring about an increase in phosphocreatine content and in the phosphocreatine-total creatine ratio in red muscle, while the corresponding values in white muscle remain normal. Tetrahydro- β -naphthylamine lowers the lactacidogen content of the biceps femoris and to a smaller extent that of the semitendinosus. It increases the phosphocreatine content of both white and red muscle, but especially the latter, and increases also the phosphocreatine-total creatine ratio. Muscles which differ in their functional activity thus show different responses with respect to their phosphocreatine and lactacidogen content under the influence of certain toxic agents.

A. W. DOX

Plant proteases. XIII. The proteinase and the polypeptidase of yeast. WOLFGANG GRASSMANN AND HANNS DYCKERHOFF. *Acad. Wissensch., München. Z. physiol. Chem.* 179, 41-78(1928). (XII not yet published).—Although the sepn. of 2 proteases by means of selective adsorption was eminently successful when applied to pancreatic ext., the method has thus far failed with yeast proteases. A new method has now been developed which consists in selective liberation of the enzymes by means of fractional autolysis. At faintly alk. reaction in the presence of CHCl_3 the polypeptidase is only very slowly liberated and not completely in 1 week. The proteinase, on the other hand, is not set free during the first 15 hrs., but after this interval the liberation is very rapid and reaches completion in 24 hrs. After the proteinase has thus been removed, further autolysis of the yeast residue gives a 30% yield of the total polypeptidase entirely free from any activity toward proteins. The proteinase extd. between the 15th and 24th hr. may be obtained in greater purity if the autolysis is performed at slightly acid reaction, e. g., p_H 4.8-5.0, and subsequent purification by adsorption then yields an active prepn. practically free from all activity toward polypeptides and dipeptides. Dornby's view that yeast contains 2 proteinases analogous to pepsin and trypsin, resp., is thus disproved. Yeast contains only 1 proteinase. The polypeptidase does not attack any protein of animal or vegetable source, but readily hydrolyzes peptones obtained by digestion of proteins with pepsin, papain, papain-HCN or yeast proteinase. The polypeptidase is strongly inhibited by KCN and H_2S . The proteinase, on the other hand, is activated by both of these substances. When the proteinase soln. is allowed to stand, a natural activator is formed, the action of which is analogous to that of HCN. The freshly purified enzyme prepn., however, is inactive toward all proteins tested, e. g., gelatin, casein, fibrin and histone, but the cleavage readily occurs in the presence of HCN or H_2S , or after the natural activator has been allowed to develop. As the activator develops, the activating effect of HCN decreases proportionately. The increased activity is not due merely to a destruction of inhibitory substances present in the fresh material. Spontaneously activated proteinase again becomes inactive and capable of re-activation when the elutions are kept at p_H 5.0. Under such treatment the enzyme is perfectly stable but the activator undergoes destruction. Non-activated proteinase is, however, active toward peptones but to a greater extent when HCN is present. A gelatin peptone obtained by papain-HCN digestion is a striking exception since it is not attacked by the enzyme either before or after activation. From this it is inferred that activated papain can replace yeast proteinase as far as its sp. action on gelatin is concerned. This does not apply conversely, since the peptone obtained by digestion of gelatin with yeast proteinase undergoes further hydrolysis by papain or papain-HCN. The relationship between these 2 enzymes is therefore analogous to that between 2 amylases with different limits of saccharifying power. More important, however, is the difference in specificity between the non-activated forms of papain and yeast proteinase. The former hydrolyzes proteins but not albumin peptone or

papain-gelatin peptone, while the reverse is true of the latter. This difference may possibly be due to the presence or absence of 2 sp. natural activators, one of which activates protein cleavage and the other peptone cleavage. Yeast thus contains 3 sp. proteases, viz., a proteinase, a polypeptidase and a dipeptidase, and the terms "yeast trypsin" and "yeast erepsin" should be abandoned. Carboxyl and amino groups are liberated in equal proportions, indicating a cleavage of acid amide linkages. An addnl. enzyme is also present, a sp. asparaginase, which will be the subject of a later paper.

A. W. DOX

Coproporphyrin synthesis by yeast and factors which influence it. VI. The enzymic character of coproporphyrin synthesis in yeast. Cell-free increase in coproporphyrin. R. M. MAYER. Tech. Hochschule München. *Z. physiol. Chem.* 179, 99-116(1928); cf. *C. A.* 22, 3187.—The increase in coproporphyrin obtained by autolysis of yeast is shown to be an enzymic process. Like other enzymic reactions it is suppressed by the addn. of HCN. A cell-free press juice shows the same porphyrin increase when allowed to stand 4 hrs. at 48° in the presence of CHCl₃ or PhMe with buffer solns. of p_H 4.9-9.0 but it is suppressed by 2% AcOH or by HCN. At 62°, as with other enzymes, no reaction occurs, suggesting a destruction or inactivation of enzyme, though it is possible also that enzyme or porphyrin is pptd. with coagulated protein. The enzyme passes through a coarse but not through a fine colloid filter. Whether the assumption of a sp. "porphyrase" is justified or whether the porphyrin formation is a function of some already known enzyme is left undecided.

A. W. DOX

The action of choline on the isolated suprarenal gland. N. V. PUCHKOV. Inst. für Experimentalmedizin in Leningrad. *Z. ges. expil. Med.* 61, 20-3(1928).—Perfusion expts. using Locke soln. contg. 1:1000 to 1:10,000 chlorocholine showed an increase in secretion of adrenaline. There was no choline in the perfusion fluid when only Locke soln. was used and when choline was added it appeared promptly in the perfusion fluid after passage through the gland.

F. L. DUNN

Succinoxidase. II. Influence of phosphate and other factors on the action of the succinoxidase and the fumarase of liver and muscle. PERCIVAL W. CLUTTERBUCK. Univ. Manchester. *Biochem. J.* 22, 1193-1205(1928); cf. *C. A.* 21, 3210.—Liver pulp, wt. for wt., has 8-10 times as great a fumarase activity as muscle pulp. After extg. fumarase with water or saline, steeping the residue in $M/15$ phosphate or in bicarbonate-carbonate buffer of the same p_H and expressing, liberates from the muscle residue a further large quantity of enzyme. The total activity of the water and phosphate exts. of 50 g. liver was approx. equal to the total activity of the exts. of 150 g. muscle. Phosphate not only elutes fumarase but also activates it. The temp. coeff. for the fumarase activity of liver pulp is 2-2.4 but of muscle pulp it is 1.4. NaCl inhibits the action of succinoxidase, but inhibits the fumarase for less. An active fumarase soln. is obtained by pptg. the phosphate ext. of washed muscle with (NH₄)₂SO₄, filtering and dialyzing the soln.

BENJAMIN HARROW

Notes on the irradiation of ergosterol. THOMAS A. WEBSTER AND ROBERT B. BOURDILLON. Natl. Inst. for Med. Research, London. *Biochem. J.* 22, 1223-130(1928); cf. *C. A.* 22, 3907.—Attempts to produce more concd. solns. of vitamin D by the irradiation of ergosterol by selected portions only of the ultra-violet spectrum have not given any definite results. The suspicion that temp. changes during radiation were affecting the results could not be confirmed.

BENJAMIN HARROW

Destructive action of heat on insulin solutions. AUGUST KROGH AND AXEL MARIUS HEMMINGSEN. Lab. of Zoophysiology, Copenhagen. *Biochem. J.* 22, 1231-8(1928).—The destruction of insulin at const. temp. follows the law of monomol. reactions. The relation of rate of destruction to temp. can be expressed by Arrhenius's formula.

BENJAMIN HARROW

Some factors affecting the adsorption of quinine, oxalate, and glucose by fuller's earth and norit. N. B. GUERRANT AND W. D. SALMON. Ala. Polytechnic Inst., Auburn. *J. Biol. Chem.* 80, 67-89(1928).—"The purpose of the investigation was to make a study of some of the factors affecting the adsorption of electropositive, electro-negative and nonelectrolytic substances of known compn. by different adsorbents. Different fuller's earths have different adsorptive capacities because of differences in both compn. and state of division. H-ion concn. plays an important role in the adsorption of electrolytes, and under certain conditions, it also affects the adsorption of nonelectrolytes. Degree of dispersion of adsorbent is more important in apolar adsorption than in polar adsorption. By heating fuller's earth at a red heat for 30 min., its adsorptive capacity for both oxalate and glucose is only slightly altered. The electro-dialyzing of fuller's earth slightly reduces its adsorptive capacity for quinine. Fuller's earth which has been previously digested with hot mineral acid adsorbs only $\frac{1}{2}$ as

much quinine as the untreated earth, while it adsorbs only $\frac{1}{4}$ as much oxalate as before the treatment. Such treatment has little effect upon the adsorption of glucose by this adsorbent. Electrodialysis of the acid-treated earth restores much of its quinine adsorptive capacity but has little effect upon the adsorption of either oxalate or glucose." The optimal adsorption of quinine and glucose by norit occurs at the same H-ion concn. as with fuller's earth but the effect of H-ion concn. upon the adsorption of oxalate is quite different for the 2 adsorbents, being negligible with norit in the alk. range.

A. P. LOTHROP

Inactivation of invertase and raffinase by heat. J. M. NELSON AND PHILIPPOS PAPADAKIS. Columbia Univ. *J. Biol. Chem.* 80, 163-6(1928).—After partial inactivation of some preps. of yeast invertase by heat, a greater loss in activity was observed when the activity was calcd. from the rate of hydrolysis of raffinose (75%) than when calcd. from the rate of hydrolysis of sucrose (58%). In some cases, however, the decrease in activity was the same for both sugars. These observations may have some bearing upon the question whether or not these 2 enzymes in yeast are identical as claimed by some investigators.

A. P. LOTHROP

The formation of free amino acids and peptides by the pancreatic and enteric juices. U. LOMBROSO AND A. DI FRISCO. *Boll. soc. ital. biol. sper.* 3, 460-4(1928).—A comparative study of protein digestion by pure pancreatic juice, by pancreatic juice in the presence of enterokinase, and by enteric juice. The purpose was to demonstrate whether or not there is a parallelism of action between the so-called erepsin of pure pancreatic juice and that of erepsin of enteric juice, and if activated pancreatic juice modifies the course of the digestion. 0.5 g. samples of casein and peptone plus 5 cc. of pancreatic or enteric juice were placed in an incubator. To a number of the tubes contg. casein, peptone and pancreatic juice there was also added enterokinase extd. from the intestinal mucosa. At various intervals of time the tubes were made neutral to azolitmin and divided into 2 equal pts. To one pt. was added EtOH to a concn. of 80% and then this was titrated with 0.1 N NaOH, thymolphthalein being used as an indicator (A). A few drops of methyl red were then added and the soln. was titrated with 0.1 N HCl to a tinge of red (B). The difference between A and B reveals the prevalence of dicarboxylic monoamino acids or diamino acids. To the other fraction was added EtOH to a concn. of 50% and this was titrated with 0.1 N NaOH in the presence of phenolphthalein. The carboxyl groups of the free amino acids and of the peptides were calcd. from Willstätter's formula. Results and conclusions: (1) The digestion of casein and peptone by pure pancreatic juice leads to a gradually increasing quantity of free amino acids and also of peptides. The ratio between the amino acid and peptide carboxylic groups is about 1:3. (2) The addn. of enterokinase to pancreatic juice results in a more rapid digestion. The polypeptide carboxylic groups are more prevalent but the ratio between these and the amino acid carboxylic groups is not so const. or so high. In some cases the digestion reaches a certain stage and then seems to recede; the amino acid carboxylic groups diminish. (3) The ratios between the amino acid and polypeptide groups are almost const.; there is a slight increase in the amino acid groups. (4) The digestion of casein and peptone by enteric juice produces more amino acid than polypeptide carboxylic groups—the reverse of that noted with pure pancreatic juice. The latter, therefore, has a proteolytic action which is markedly different from that of enteric juice and the end products are also distinctly different. Since activated pancreatic juice does not modify the course of the digestion; the conclusion drawn is that pancreatic juice contains its own activated tryptic enzyme.

PETER MASUCCI

Analysis of pancreatic nucleic acids. ERIC JORPES. Chem. Lab. Karolinische Inst., Stockholm. *Acta Med. Scand.* 68, 503-73(1928).—Proof is offered that a pentapentose nucleotide with 3 purine-nucleotides exists in the pancreas. It is, next the thymonucleic acid, the principal nucleic acid of the pancreas.

S. MORGULIS

The assay of digitalis substances by biological methods. MARIE KROGH. *Acta Med. Scand.* Suppl. XXVI, 512-5(1928).—The use of several biol. tests is necessary to obtain some definite idea of the qual. compn. of various therapeutic preps.

S. M.

The destruction of β -hydroxybutyric acid by liver enzymes. I. Preparation and properties of the enzyme complex; demonstration of products of destruction. JOACHIM KUHNAU. Städtisches Forschungsinst., Wiesbaden. *Biochem. Z.* 200, 29-60(1928).—A protein-free liver ext. is prepd. by pptn. at p_H 4.8, which can destroy about 40% of added β -hydroxybutyric acid. The pptn. causes a sepn. of oxidative enzymes in 2 portions: the succino-dehydrogenase and the β -hydroxybutyric acid-splitting enzyme are adsorbed on the ppt. while the aldehyde mutase and the co-reductase remain in the filtrate. The ppt. is collected by centrifuging and is extd. 5 times with about 250 cc. 0.01 N Na_2CO_3 . The ext. is freed from protein by the addn. of small quantities of col-

loidal Fe, an excess of reagent being avoided. After filtration the p_H of the filtrate is adjusted to p_H 6.8–7.1. The properties of the active principle which is made up of a several enzymes and is described as the "hydroxybutyroclastic system" are the following: without inactivation it is pptd. by 66% satn. with $(NH_4)_2SO_4$ or alc. but not with U acetate or colloidal $Fe(OH)_3$; it is inactivated by 20 min. shaking; it is inactivated by boiling or by temp. -10° to $-15^\circ C$; it is sensitive to HCN; it has an optimum activity at p_H 6.8–7.1 and a 0.01–0.024 *N* concn. of β -hydroxybutyric acid; it is neither a peroxidase nor an oxygenase. The study of the sep. products of β -hydroxybutyric acid decompn. gives a definite idea of the nature of the enzymes composing this system. The following enzymes partake in this reaction with β -hydroxybutyric acid: (1) the mol. is attacked by an oxido-reducing enzyme; (2) a hydrolytic enzyme splits aldol and acetoacetic acid; (3) several dehydrogenases of which succino-dehydrogenase was demonstrated; (4) a fumarase; (5) a β -carboxylase; (6) an aldehydemutase; (7) and its coenzyme (coreductase); and (8) probably also an alcoholoxidase. The decompn. proceeds equally well under aerobic or anaerobic conditions. Dextro-rotating hydroxybutyric acid is decompd. 3–5 times as much as the levo-rotating substance. By the addn. of dimedon the decompn. is prevented. The following products were isolated or identified in the reaction: aldol, acetoacetic acid, 1,3-butyleneglycol, CH_3CHO , succinic acid, fumaric acid, malic acid and traces of $AcOH$ and $CH_3COCOOH$. These results bear upon the problem of conversion of fats into carbohydrate. II. The oxidation intensity of the system. *Ibid* 61–80.—The oxidation intensity of the β -hydroxybutyroclastic system was detd. at $r_H = 7.0$ with Clark's indicators. Under anaerobic conditions the oxido-reduction potential of the system is not const. It forms a curve with a neg. tendency, which starting with a r_H above 22, attains after a variable length of time a value r_H 17.6. The longer the enzyme ext. was in contact with air O_2 the longer it takes to reach this const. r_H value. Aldol has a very important influence on the oxidation intensity. Methylene blue is not reduced by the enzyme- β -hydroxybutyric acid system because its potential is below that of the system, and its stimulating action on the β -hydroxybutyric acid oxidation is due to its reducing oxidizing intensity.

S. MORGULIS

Studies of the enzymic proteolysis. II. P. RONA AND E. MISLOWITZER. Univ. Berlin. *Biochem. Z.* 200, 152–65(1928); cf. *C. A.* 23, 163–4.—In the peptic digestion of casein the dispersion of particles observed during tryptic digestion already in the very earliest stage of the enzymic action does not occur. Only after very advanced cleavage the adsorption on collodion tubes characteristic for the breaking up of the mols. occurs also in the peptic digestion of casein.

S. MORGULIS

Studies on the decomposition of gelatin and gelatin peptone with acetic anhydride. Isolation of associated polypeptides. A. FODOR AND CHASUVA EPSTEIN. Hebraische Univ., Jerusalem. *Biochem. Z.* 200, 211–22(1928).—When gelatin is heated with acetic anhydride it undergoes nonhydrolytic decompn., the products being polymers of dipeptides, especially of oxypropylalanine and oxypropylglycine. About 50% of the products are polymeric depeptides of mol. wt. about 800. These are subject to enzymic cleavage. Similar results were obtained when gelatin peptone, obtained from prolonged peptic digestion of gelatin, is used. Studies with the ultramicroscope indicate that one is dealing here with colloiddally dispersed matter which is reversibly coagulated by heat.

S. MORGULIS

The decomposition of gelatin by glycerol under variable conditions. Isolation of a non-colloidal intermediate product hydrolyzable through pepsin. A FODOR AND R. SCHOENFELD. Hebraische Univ., Jerusalem. *Biochem. Z.* 200, 223–35(1928).—Heating gelatin with glycerol at 180° for 2 hrs. yields reaction products precipitable with abs. alc. By fractional pptn. of their aq. soln. by means of abs. alc. they may be sepd. in more or less purified state. These products have no free amino groups. If the heating is carried out at 130° a good yield is obtained of a reaction product which cannot be fractionated and which differs from the previous one in being of a more uniform nature. It shows a mol. wt. similar to that of gelatin peptone (about 400). This product is hydrolyzed by both pepsin and pancreatin. The product is a non-hydrolytic dissociation result of the reaction with gelatin which in spite of its anhyd. character still retains intact the conditions necessary for the pepsin or trypsin attack. The heating to a higher temp. leads to a dissocn. and anhydration to components which can be fractionated and which, on analysis, prove to be low polypeptide-anhydrides unhydrolyzable by enzymes.

S. MORGULIS

The results of combination of dipeptide or peptone with sugar, hexose-diphosphate as well as methylglyoxal. CARL NEUBERG AND MARIA VONDL. Kaiser Wilhelm Inst. für Biochem., Berlin-Dahlem. *Biochem. Z.* 200, 459–67(1928).—The combination of

dipeptide or of silk fibroin-peptone with fructose manifests itself at once in a change in rotatory power. With glucose this polarimetric reaction requires a longer time.

S. MORGULIS

Further studies on the stereometric specificity of ketone aldehydemutase. CARL NEUBERG AND ERNST SIMON. Kaiser Wilhelm-Inst. für Biochem., Berlin-Dahlem. *Biochem. Z.* 200, 468-72(1928).—The enzymic dismutation of ketoaldehyde, of which practically all plant and animal cells are capable, presents certain problems from a stereochem. standpoint. *Bacillus Delbrückii* yields *dl*-lactic acid with methylglyoxal but only *d*-mandelic acid with phenylglyoxal; *Bacterium lactis aerogenes* forms only inactive lactic acid from methylglyoxal and a predominantly *l*-mandelic acid. *Mucor javanicus* dismutates methylglyoxal to *d*-lactic while *Mucor stolonifer* to *dl*-lactic acid. S. M.

The chemical structural specificity of carboxylase. CARL NEUBERG AND FRITZ WEINMANN. Kaiser Wilhelm-Inst. für Biochem., Berlin-Dahlem. *Biochem. Z.* 200, 473-6(1928).—It has been found that decarboxylase does not affect $(\text{CH}_3)_2\text{C}.\text{CO}.\text{COOH}$, although it easily splits off CO_2 from $\text{CH}_3.\text{CO}.\text{COOH}$, $(\text{CH}_3)_2\text{CH}.\text{CO}.\text{COOH}$, $\text{CH}_3.\text{CH}_2.\text{CO}.\text{COOH}$; also from $\text{CH}_3.\text{C}_2\text{H}_5.\text{CH}.\text{CO}.\text{COOH}$ or from $\text{CH}_3.\text{CH}_2.\text{CH}_2.\text{CH}_2.\text{CO}.\text{COOH}$. The failure with $(\text{CH}_3)_2\text{C}.\text{CO}.\text{COOH}$ is attributed to a specificity of the enzyme for chem. structure which apparently allows the formation of enolate. S. M.

The nature of the protein-bound blood plasma sugar. ZACHARIAS DISCHER. Univ. Wien. *Biochem. Z.* 201, 74-86(1928).—Horse plasma was hydrolyzed with 3% H_2SO_4 at 120° in an autoclave. After dialysis the protein hydrolytic products were removed by pptn. with phosphotungstic acid and the filtrate was evapd. to a very small vol. On the addn. of Na acetate and phenylhydrazine-HCl a ppt. was formed in the cold which according to crystal structure, m. p. and elementary analysis was identified as mannose phenylhydrazone. The total mannose bound to the plasma proteins is fermentable by yeast and is thus *d*-mannose. Apart from mannose there is no appreciable amt. of fermentable sugar combined with the proteins of the plasma, which, however, contains also another but non-fermentable sugar. The latter by its reaction may be a glucosamine, but the identification of this sugar is not yet positive. It is found in about the same amt. as the mannose. The total sugar of horse blood plasma may be estd. as 0.3%, of which only 0.08 to 0.11% is in the form of the usual free blood sugar, while the sugar bound to the protein, the non-diffusible sugar, is made up of equal parts of mannose and of a non-fermentable sugar.

S. MORGULIS

The conditions necessary for the combination of brain proteins with alkaloids and animal bases. ANNA PETRUNKIN AND MICHAEL PETRUNKIN. Inst. Exptl. Med., Leningrad. *Biochem. Z.* 201, 185-9(1928).—The alkaloids, strychnine, quinine, morphine, cocaine and the animal bases, adrenaline and guanidine, were studied. The brain proteins were placed for an hr. at 15° in mixts. of H_2SO_4 and NaOH of various pH values. They were washed with ice cold water and then treated with 20 cc. 0.02 *N* soln. of the tested substance also for an hr. at 15° . The amt. of alkaloid or base taken up was detd. by analysis. Combination without exception took place only when the pH was above 4.0.

S. MORGULIS

Further studies on metaphosphatase. TORAO KITSATO. Kaiser-Wilhelm-Inst. für Biochem., Berlin-Dahlem. *Biochem. Z.* 201, 206-11(1928); cf. *C. A.* 23, 164.—An enzyme exists which transforms metaphosphate into orthophosphate by the addn. of H_2O . By increasing the strength of the enzyme and reducing the concn. of the substrate 100% transformation was accomplished. The transformation can be followed by means of the colorimetric procedures since the $(\text{NaPO}_3)_x$ yields practically no color. The formation of the orthophosphate was also checked up by forming the $\text{NH}_4\text{Mg}(\text{PO}_4)_2$ ppt.

S. MORGULIS

The so-called coenzyme of alcoholic fermentation. An attempt to form a synthetic viewpoint of the coenzyme problem on the basis of experimental studies. A. J. KLUYVER AND A. P. STRUYK. Tech. Hochschule, Delft. *Biochem. Z.* 201, 212-58(1928).—The addn. of a suitable amt. of sol. phosphate to the ultrafiltrate of yeast maceration juice does not produce fermentation. However, the residue contains the zymase in unaltered condition, because fermentation does ensue when this residue is added to the ultrafiltrate. When, however, the ultrafiltrate is replaced by a suitable quantity of phosphate and acetaldehyde variable results are obtained. In some instances fermentation occurred but it is concluded that even in the presence of K ions the complete replacement of coenzyme by acetaldehyde is out of the question. In agreement with Meyerhof's findings following continued washing of the ultrafiltrate residue it could not be regenerated with Na hexose-diphosphate but could with boiled juice. However, the hypothesis that the coenzyme of boiled juice functions as a H-acceptor and can therefore be replaced by acetaldehyde is not tenable. It follows from this observation

that the boiled juice must contain some other factor of unknown function which is indispensable for the fermentation in a cell-free medium. This factor is considered to be identical with Meyerhof's coenzyme. Further expts. show that it is possible to change a zymase washed free of coenzyme into a soln. which unquestionably contains coenzyme by the simple procedure of heating for a short time at 100° with phosphate. This surprising result is inexplicable when the cozymase is regarded as a substance of definite chem. constitution which can be sepd. from the zymase by dialysis or ultra-filtration. The exptl. evidence speaks in favor of the view that the function of the coenzyme depends upon a non-specific inhibition of the endotryptase-zymase system. This makes clear also Meyerhof's procedure for the extn. of the coenzyme from muscle by liberal extn. with boiling water which, of course, dissolves also much protein or protein-split products together with more or less proteolytic enzymes. Cold water removed relatively little and also yields a coenzyme-poor ext. However, a cold water muscle ext. which is nearly coenzyme-free can be more or less activated by subsequent boiling. Besides, Meyerhof's results showing the presence of inhibiting bodies in the ultra-filtrate residue of a cold tissue ext. coincide with the findings in this study that these inhibiting substances are tryptic in action. The antiprotease property, however, belongs probably only to Meyerhof's coenzyme which is evidently different from that of Harden-Young (different precipitability with Ph salts, also less easily ultra-filtrable). The fact that boiling of the coenzyme-free hot water ext. in the presence of a small amt. of hexose diphosphate regenerates the lost coenzyme activity suggests the identity of Buchner's coenzyme with the diphosphate ester. But Buchner also discovered the importance of the endotryptase in the alc. fermentation, because this tends to destroy the zymase, while the favorable action of the boiled juice furnished antiprotease which inhibits the action of the endotryptase. This suggested that Meyerhof's coenzyme is really an antiprotease necessary to protect the thoroughly washed zymase from proteolytic decomposition. Expts. with this idea in view yielded strong evidence in favor of this hypothesis. The concept of a coenzyme thus appears wholly superfluous, the cell-free fermentation requiring the zymase, an acceptor, a hexosephosphate ester and substances which regulate the proteolysis of the zymase system.

S. MORGULIS

Studies on D-vitasterols. II. The activation of ergosterol. A. JENDRASSIK AND A. G. KEMÉNYFI. Staatliches ungarisches hyg. Inst. *Biochem. Z.* 201, 269-80 (1928).—Ergosterol attains its max. healing effect after 30 min. irradiation. Although longer radiation causes further transformation of ergosterol it does not affect its healing action. By means of fractionation with EtOH a prepn. was made which was 5 times as active as the prepn. made directly by radiation. From radiated ergosterol one can still recover unchanged ergosterol which can be activated through renewed radiation. After irradiation for 10 hrs. the ergosterol loses its activity but no longer contains any unchanged ergosterol. This leads to the conclusion that the D-vitasterol formed through radiation is transformed into an inactive substance through further radiation. This can also be detd. by the I reaction which serves to show whether the ergosterol is in radiated or unirradiated condition.

S. MORGULIS

Studies on the optical activity of insulin-muscle-glucose-sodium chloride mixtures, together with some comments on the hydrogen-ion concentration. CHR. N. J. GRAM AND O. JUL NIELSEN. Med. Universitetsklinik A, Copenhagen. *Biochem. Z.* 201, 369-90 (1928).—In expts. with dialyzates of insulin-muscle-glucose-NaCl and muscle-glucose-NaCl mixts. no difference was noted in the rotation and reduction capacity of samples examd. every 15 min. In a series of expts. where fresh muscle was added to glucose solns. the rotation capacity indicated lower values than the reducing capacity in 27 out of 125 dialyzates, but in some of these the rotation spontaneously increased on standing where insulin was also present in the mixt. The addn. of fresh muscle to the glucose-NaCl mixt. lowers the p_H from the original 7.40 to 6.0-6.2. The use of borate buffers is not permissible because the boric acid combines with glucose, and thus the rotation yields lower results than reduction, but the full rotation capacity can be restored by the addn. of strong acid.

S. MORGULIS

Comment on E. Pollak's paper: Transformation of blood pigment to bile pigment. FRITZ SCHWERTHL. Tech. Hochschule, München. *Biochem. Z.* 201, 435-8 (1928).—E. Pollak in her expts. with a mixt. of hemin and pyrocatechol obtained a pigment to which she assigned the formula, $C_{16}H_{18}N_4O_4$, for which she claims relationship to the bile pigments. That this pigment is not a pyrrole would be indicated only if the same substance could be produced without hemin. She experimented with quinone but failed to obtain a cryst. product. S. repeated these latter expts. using 1 mol. quinine and 2 mols. pyrocatechol in 500 cc. alc. to which was added 40 cc. NH_4OH . This is stirred $1\frac{1}{2}$ hr. with a gentle current of air. After 24 hrs. an ext. with CCl_4 yields a sub-

stance with a characteristic blue color in acid which can be crystd. out from pyridine. About 4% of the quinone is yielded in the form of this cryst. compd. which according to elementary analysis has the formula, $C_{16}H_{10}N_2O_4$, and was identical in m. p., crystal form, spectroscopic properties and soly. with E. Pollak's pigment obtained from hemin.

S. MORGULIS

How many respiratory enzymes are there? OTTO WARBURG. *Biochem. J.* 201, 486-8(1928).—A reply to Dixon's critical inquiry (*C. A.* 22, 249; 23, 162). W. points out that just as there is only one process of O_2 transmission in nature but many different hemoglobins (or even other chromoproteins) so there may be a variety of respiratory enzymes although the process of oxidation is the same. S. MORGULIS

Oxidation of glucose in alkaline solution by oxygen of the atmosphere: Production of carbon monoxide. Facts and hypotheses with reference to the biologic consequences of this reaction. MAURICE NICLOUX. *Bull. soc. chim. biol.* 10, 1135-63(1928); cf. *C. A.* 22, 3633.—More than 35 references to the literature are cited. At a temp. of 85 to 87° and an alk. between $1/16$ and $1/8$ N, 1.6 to 1.7 cc. of CO are produced by 0.25 g. of glucose in 50 cc. of soln. and in the presence of 50 cc. of O_2 . At 40° CO is produced in much smaller quantities. In the absence of O_2 no formation of CO was detected. From 25 to 30% of the vol. of O_2 was consumed and recovered as CO + CO_2 , the ratio CO/ CO_2 oscillating between $1/3$ and $1/4$. The reaction appears in 2 phases, the first corresponding to the formation of several compds. by the alk. hydrolysis of the glucose, and the second an oxidation of these compds. with the formation of CO. Alk. carbonates act like alk. hydroxides but less energetically. Lactose, maltose, galactose and levulose act the same as glucose. Sucrose is not attacked until after inversion. CO has been found in the floats of the alga, *Nerocystis Luetkeana*, and in the blood of mammals, birds and fishes. Dog blood contains about 1.5 cc. of CO per l. Since CO does not exist in uncontaminated air the CO of the blood is probably a product of metabolism.

L. W. RIGGS

Synthesis and biochemical hydrolysis of glycerides. Kinetics of the reactions. LEON VELLUZ. *Bull. soc. chim. biol.* 10, 1213-26(1928); cf. *C. A.* 22, 2393.—The biochem. synthesis of glycerides from glycerol and the aliphatic acids of olive oil proceeds according to the law of mass action. The fermentive hydrolysis of di- and triglycerides corresponding to the aliphatic acids of olive oil obeys the symmetric laws of heterogeneous catalysts. In certain technical conditions there is a parallelism between catalytic action and reversible fermentive action of the active cytoplasm of ricin seeds. This paper is largely mathematical. **Role of the ethylene linkages in the biochemical synthesis and hydrolysis of nonsaturated glycerides.** *Ibid* 1227-37.—The mathematical laws which govern the biochem. hydrolysis and synthesis of the glycerides by the active cytoplasm of ricin seeds are the same whatever may be the I index of the fat used. The velocity consts. are less as the I index of the fat is greater. In the sapon. of fats, there exists an inverse relation between the velocity consts. and the I index of the fat.

L. W. RIGGS

Absorption capacity of serum proteins with respect to biliary salts. P. LÉCOMTE DE NOUY. *Compt. rend. soc. biol.* 99, 1097-9(1928).—Immunized serums (antivenin, antistreptococcic and antigonococcic) possessed less adsorptive power toward biliary salts than normal serums in the cases tried.

L. W. RIGGS

Does carbonic acid combine with protein in a solution of pure serum albumin? E. GREGORIE. *Compt. rend. soc. biol.* 99, 1227-31(1928).—The combination of the carbonic acid of the air with electrodyalyzed protein is scarcely possible. The results of this study do not support the hypothesis of Pauli (cf. *C. A.* 19, 1431).

L. W. R.

Lysozyme. MARGUERITE BORDET. *Compt. rend. soc. biol.* 99, 1252-4(1928); cf. *C. A.* 19, 1440; Fleming and Allison, *C. A.* 17, 143, 2899.—The lysozyme in white of egg passed the Chamberland filter no. 3, but human milk filtered in like manner was completely inactive. A weak acid reaction favored the lytic action, while an alk. concn. greater than 4 in 1000 inhibited it. Lytic action was not prevented by bubbling CO_2 through a bacterial emulsion previous to adding the lysozyme. Lysis was not hindered by decalcifying the active liquid. Serums of different animals had different lytic activity on the bacterial suspension used. Dog saliva had pronounced lytic activity; human saliva had little or none. **Attempt at the extraction of lysozyme.** *Ibid* 1254-6.—Lysozyme may be partially pptd. from dil. white of egg soln. by the addn. of 4 vols. of alc. If the white of egg soln. is previously acidified by AcOH or citric acid, the pptn. by alc. is complete. The prepn. made by macerating this ppt. in acidified physiol. saline did not lose its activity by boiling or desiccation.

L. W. RIGGS

Liberation of sulfur compounds in definite quantities by the alkaline hydrolysis of albumins; their colorimetric measurement by the phosphotungstic reaction. R.

GOIFFON AND R. HAUDIQUET. *Compt. rend. soc. biol.* 99, 1625-8(1928).—The object of this study was to det. the conditions of alk. hydrolysis of albumin which set free all of the substances which are chromogenic with the phenol reagent. A soln. of 0.02 g. of tyrosine in 100 cc. of 0.1 N HCl was used as a standard for measuring the tyrosine index. Heating the albumin soln. alone generally decreased slightly its tyrosine index. Heating the albumin soln. with increasing quantities of N NaOH caused a rapid increase in the tyrosine index which after oscillations became const. Prolonged heating for 30 to 60 min. on the boiling water bath slightly increased the tyrosine index. At low temps. the hydrolysis required more time, but the effect of low temp. may be compensated by greater concn. of NaOH. L. W. RIGGS

Action of ultra-violet light on the autonomous excitability of the surviving intestine and uterus. FOLKE PETERSON. Univ. Upsala. *Compt. rend. soc. biol.* 99, 1677-80 (1928).—The action of ultra-violet light was to weaken the parasympathetic excitability by a diminution of the excitability of the sympathetic inhibitor and an increase in the excitability of the sympathetic motor. These modifications of excitability are durable and persist even after the source of light has ceased to act. L. W. RIGGS

Method for the ultrafiltration of proteins. F. FALUDI. *Magyar Orvosi Arch.* 29, 435-8(1928); cf. following abstr.—The app. is illustrated and described. L. W. R.

Relation of bile secretion to the velocity of ultrafiltration of the blood. F. FALUDI. *Magyar Orvosi Arch.* 29, 439-43(1928); cf. preceding abstr.—By use of the app. described in the preceding paper, it was shown that solns. of Na salts of dehydrocholic and phenylquinolinecarboxylic acids do not influence the velocity of the ultrafiltration of blood plasma or serum when used in the max. concns. in which they occur in the body. Gelatin on the contrary lowers the velocity of ultrafiltration of blood. A mixt. of gelatin and of these cholagog materials behaves in ultrafiltration exactly like gelatin alone. It is assumed that the inhibitive effect of gelatin on the secretion is due to its property of decreasing the velocity of ultrafiltration of the serum. L. W. RIGGS

Effect of cholagog materials on the swelling of colloids. F. FALUDI. *Magyar Orvosi Arch.* 29, 444-6(1928); cf. preceding abstr.—The Na salts of dehydrocholic and phenylquinolinecarboxylic acids diminish the swelling of gelatin and that of agar-agar. Since the same effect is seen in equimolar solns. of cane sugar, it is not assumed that the cholagog activity of these materials has any connection with their action in lowering the swelling of colloids. L. W. RIGGS

A partial reaction of the enzymic degradation of carbohydrates. RAGNAR NILSSON. Univ. Stockholm. *Arkiv Kemi, Mineral. Geol.* 10B, No. 1, 6 pp. (1928). (In German.) Cf. von Euler, C. A. 22, 4552.—It is known that in expts. with muscle or yeast an increase of the phosphorylation observed can be obtained by adding a certain amt. of NaF. This increase runs parallel with an inhibition of the formation of CO_2 and $\text{Me-CHOHCO}_2\text{H}$. N. assumes that this process is connected with an inhibition of the glucose diphosphate formation, and that the phosphorylation observed is due to the action of a monophosphatase and is not influenced by the mutase or cozymase. N. proved by expt. that addn. of NaF to a fermentation mixt. caused inhibition of the glucose diphosphate formation. In a mixt. of glucose, small amts. of phosphate, and dried yeast freed of cozymase by washing, phosphorylation occurs even without addn. of NaF, but it is increased by adding NaF. Addn. of cozymase to the mixt. contg. NaF did not result in increased phosphorylation. In order to det. the compn. of the hexose phosphate formed in the reaction, a mixt. of 125 g. dried yeast freed of cozymase, 125 g. glucose, 250 cc. of 2.5% phosphate soln. of p_H 6.4, 1250 cc. of NaF soln. (2×10^{-2} mol.), and 1000 cc. H_2O was allowed to react for 3 hrs. at 30° . The ester formed was isolated from the mixt. as the Ba salt in a yield of 2.2 g.; the analysis gave values agreeing closely to the formula $\text{C}_6\text{H}_{11}\text{O}_5\text{PO}_4\text{Ba}$ or $\text{C}_6\text{H}_{11}\text{O}_4\text{PO}_4\text{Ba} + \text{H}_2\text{O}$, resp. The value for $[\alpha]_D$ was found to be 14.9° . G. SCHWOCH

Molecular weights of serum albumin and of serum globulin. THE SVEDBERG AND BERTIL SJÖGREN. Univ. of Upsala. *J. Am. Chem. Soc.* 50, 3318-32(1928).—The centrifugal sedimentation and sedimentation equil. methods have been applied to the study of the mol. wts. of serum albumin and serum globulin in buffer solns. at their isoelec. points, with various protein concns. The serum albumin had a mol. wt. of $67,500 \pm 2000$ and the serum globulin $103,800 \pm 3000$, both being independent of concn. Within the limits of exptl. error both these proteins are homogeneous with regard to mol. wt. and they therefore may represent pure chem. individuals. Both these proteins, but especially the serum albumin, are rather unstable substances, easily decompd. during the process of purification. Serum albumin is always partly, although reversibly, decompd. in dil. soln. These facts seem to afford an explanation for the discrepancies between the results of various investigators working on the proteins of the serum. The

mol. wts. of serum albumin and serum globulin are, like the mol. wts. of hemoglobin, phycocyan and phycoerythrin, very nearly simple multiples of that of egg albumin. These new mol.-wt. detns. show that there exist proteins of different chem. compn. and widely different properties but possessing very nearly the same mol. wt. Hemoglobin and serum albumin with mol. wts. near 68,000 and phycocyan and serum globulin with mol. wts. near 105,000 are 2 such pairs. C. J. WEST

I as a biogenous element (SCHARRER, SCHWAIBOLD) 15. Cerebrosides. VIII. Galactosphingosine, the partial cleavage product of cerebrosides (KLENK, HÄRLE) 10. Structure of proteins (ABDERHALDEN, KRÖNER) 10.

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B—METHODS AND APPARATUS

STANLEY R. BENEDICT

Determination of bilirubin in blood. L. JENDRASSIK AND A. CZIKE. Universität Pecs. Ungarn. *Z. ges. expth. Med.* 60, 555-62(1928).—A modification of the Hijmans v. d. Bergh method (Der Gallenfarbstoff im Blute, 1918). F. L. DUNN

Studies with secretin. LADISLAUS TAKACS. Kgl. ung. Pazmany-Peter-Univ. *Z. ges. expth. Med.* 60, 424-9(1928).—A secretin of higher potency and greater uniformity was obtained as follows: The freshly scraped mucosa of the duodenum and upper $\frac{2}{3}$ of the jejunum was ground and crushed with enough 0.4% HCl to make a pulp-like creamy consistency. This was cooked for 15 min., during which time caustic alkali was added to neutralization. The proteins were filtered out. The filtrate was boiled down and dried and dissolved in the smallest quantity of 75% alc., and then 3 vols. acetone were added, and the ppt. was transferred to warm aq. soln. and filtered. Picric acid is added until a ppt. appears and then allowed to stand for 2 days. The sediment is washed with water until the addn. of satd. picric acid to the washings shows a ppt., *i. e.*, that the active principle is being dissolved. The ppt. is dried, dissolved in 10 vols. abs. alc., 5 vols. 5% HCl in abs. alc. and finally double the quantity of acetone is added, and the mixt. filtered. The picric acid is removed from the material on the filter by acetone and ether. The material is then dissolved in alk. soln., acidified, filtered, neutralized and sterilized at 150°. The soln. had a N content of 15% and seemed to be a secondary albumose. It remained unchanged for months and the activity of trypsin and pepsin was proportional to the concn. of secretin and the time. F. L. DUNN

A micro-method for the determination of serum proteins. ERNST FRIED. Wiener Landesheilanstalt "am Steinhof." *Z. ges. expth. Med.* 60, 515-20(1928).—A gravimetric method using as little as 0.05 cc. serum and a micro-balance with a method error of not over 5% is described. F. L. DUNN

A new histochemical method for the biological determination of arspenamine and related arsenobenzene derivatives. N. VON JANKO, JR. Josef-Univ., Szeged. *Z. ges. expth. Med.* 61, 62-92(1928).—The arsenobenzene deriv. is fixed in the tissue with formalin followed by deposition of Ag. The method is as follows: fixation in 10% formalin for 1-4 days; section; distd. water; 30-35 min. immersion in a freshly prepd. soln. of 1.5% AgNO₃ to which has been added concd. NH₃ until the soln. has become again clear, followed by the same amt. of pure glycerol; then distd. water for 1 min.; 1% Na thiosulfate for 3-10 min.; distd. water; nuclear stain; dehydration and mounting in Canada balsam. The deposits of Ag were found chiefly in the cells of the reticulo-endothelial system, the epithelial cells of the renal tubules, certain mesenchymal structures, *e. g.*, stroma of spleen, and as capillary emboli. Bibliography. F. L. D.

Iodine content and the action of the thyroid gland. A biological method for determining the activity of thyroid gland preparations. H. KREITMAIR. Chem. Fabrik E. Merck, Darmstadt. *Z. ges. expth. Med.* 61, 202-10(1928).—Guinea pigs weighing 250-300 g. are used and given the material by stomach tube daily for 6 days. A guinea

pig unit is contained in the amt. required to lower the weight 10%. The animals are starved each night so that the weights are fasting. I detns. do not parallel the activity of preps. but preps. below 0.04% I are practically inactive. Bibliography.

F. L. DUNN

Types of safranine and their use. RACHEL HAYNES. *Stain Tech.* 3, 143-4(1928).—There is apparently little correlation between the staining properties of safranine samples and their dye content. A variable salt content may explain these differences. Some safranine samples are very rapid in their action; others are slow. C. R. F.

A micro-method for the determination of the fats and lipins of blood. JOHN A. MILROY. Queen's Univ., Belfast. *Biochem. J.* 22, 1206-11(1928).—The method is based on the formation of a colored salt of the isolated fatty acids of the blood with the base of Nile-blue hydrochloride (cf. Smith, *J. Path. Bact.* 15, 53 (1911)). B. H.

The measurement of chlorine-ion potentials in the presence of proteins. ROBERT S. AITKIN. Physiol. Lab., Oxford. *Biochem. J.* 22, 1239-45(1928).—The Cl-ion potentials were measured by means of Ag-AgCl electrodes. The readings obtained in pure KCl solns. were steady and reproducible. The readings obtained in KCl solns. contg. serum protein were steady but not accurately reproducible. Readings obtained in oxalated human plasma were not steady and not reproducible. B. H.

A method for fractionating lipins (free cholesterol, cholesterol esters and phosphatides) in a single suprarenal capsule of small animals. MICHELE BUFANO. *Boll. soc. ital. biol. sper.* 3, 444-7(1928).—A method for fractionating lipins is given in great detail. Briefly, it is as follows: The suprarenal capsule is extd., freed from connective tissue and weighed. It is placed in a vacuum desiccator over H_2SO_4 and allowed to dry to const. wt. Then it is triturated and divided into approx. 2 equal pts. These are introduced into 2 small extn. thimbles and extd. with acetone for 48 hrs. Cholesterol and cholesterol esters pass into the acetone. After the 1st extn. one of the thimbles is immersed in EtOH for 48 hrs. The phosphatides pass into soln. The total cholesterol is detd. in one of the acetone exts. colorimetrically by means of the Liebermann reaction without previous sapon. with NaOH; in the other extn. the free cholesterol and the cholesterol from the esters liberated by sapon. is pptd. with digitonin and also detd. colorimetrically. The difference between the 2 detns. gives the free cholesterol. The EtOH ext. is dried and its P content detd. colorimetrically by the method of Bell and Doisy. PETER MASUCCI

A method for determining the osmotic pressure of the cations in the serum and a few preliminary results obtained by it. ERIK WARBURG AND KNUD WINGE. *Acta Med. Scand.*, suppl. XXVI, 500-11(1928).—All substances in serum with the exception of the cations Na, K, Ca and Mg can permeate the cell membrane of red corpuscles, which thus alone must det. the size of the cells. The total cation concn. is 0.15 N, of which 96% is Na, 3% K and 1% Ca + Mg, so that the Na alone becomes decisive for the detn. of osmotic pressure upon which erythrocyte size depends. Blood is taken by venous puncture without stasis. One sample is transferred to a centrifuge tube under light paraffin oil; another sample is defibrinated with 2 thin rods before centrifuging. About 2 cc. of serum is introduced into 2 Hamburger hematocrit tubes while 2 other tubes receive a soln. of 21.64 g. $Na_2SO_4 \cdot H_2O$, 0.63 g. KH_2PO_4 and 2.73 g. Na_2HPO_4 in 2 l. of a p_H 7.4. The cation concn. of this soln. is 0.182 N. A suspension of 0.04 cc. erythrocytes is added to each hematocrit tube and these are rotated for about an hr. at 3500 rotations per min. The vol. of the cells is read by means of a microscope. A curve is worked out, showing the relationship between the relative erythrocyte vol. and the relative salt concn. The relative cation concn. in normal and pregnant women, also during lactation, during sweating from hot baths, in pneumonia and in a variety of other diseases was detd. by this procedure. S. MORGULIS

The technic of microdialysis, especially of microelectrodialysis. G. ERTSCH AND W. EWIG. Kaiser Wilhelm-Inst., Berlin-Dahlem. *Biochem. Z.* 200, 250-7(1928).—A glass cell for electrodialysis is described suitable to use with any membrane. The construction of the cell is such that the most favorable condition exists for the utilization of the current for quick removal of ions. The capacity of the middle chamber can be varied from 50 to 1 cc. by the simple device of inserting glass blocks, which makes it possible to use the cell even for microdialysis. S. MORGULIS

A study of the micro-iodine titration. ALEXANDER STURM. Med. Univ.-Klinik. Jena. *Biochem. Z.* 200, 273-9(1928).—Fellenberg's colorimetric detn. of I_2 is only reliable with pure solns. of KI, and for quantities above 1 γ the titration is proposed. The principle of the method is the oxidation of the I^- to iodate with Cl_2 water, evapn. of excess oxidation reagent and liberation of the I_2 by the addn. of purest KI. The I_2 is titrated with $Na_2S_2O_3$ and starch. The Cl_2 must be quantitatively removed; in the

absence of org. matter, this is accomplished when the soln. is evapd. to $1/3$, and the material analyzed must be incinerated in a Pt dish and the HCl soln. of the ash must be kept absolutely dust-free. The sharpness of the end point is very essential for a good analysis. For amts. below 10γ the optimum concn. is 0.5 cc. 1% starch soln. to a vol. of 5-6 cc. The starch must be prepd. fresh daily, by boiling 0.1 g. sol. starch in 10 cc. H_2O for 1 min., and keeping this at $6-8^\circ$, at which temp. the titration should be carried out. For quantities less than 3γ the change of the indicator is inhibited, but the delay is graphically definable. With special care as to the prepn. of reagent, etc., good results are obtained titrimetrically even with quantities of only 1γ (3% error).

S. MORGULIS

Methods of fat analysis. GEORG ROSENFELD. *Biochem. Z.* 200, 280-8(1928).—A comparative study was made of the methods of Kumagawa-Suto, in which the tissue is destroyed with KOH and the fatty acids are set free with HCl and extd. with ether, and of the Rosenfeld method, in which the tissue is first boiled 15 min. with alc. and then extd. with $CHCl_3$. In both methods the operation is repeated twice. From a large no. of analyses it is shown that assuming the value by the Kumagawa-Suto method as = 100, the results by Rosenfeld's method are 131, or almost $1/3$ higher. The original should be consulted for further details of extn.

S. MORGULIS

Methodological study of the in vitro investigation of tissue respiration. ELSA SENNHAUSER. Univ. Zurich. *Biochem. Z.* 200, 351-5(1928).—A comparison was made of the Lipschitz dinitrobenzene method and of the Barcroft gas analytical method in the study of tissue respiration. By the latter method the exptl. results fall within narrower limits. On the whole, for fresh tissue, the 2 methods give about the same variations, and the end results are more or less fortuitously detd. by factors apparently beyond the experimenter's control.

S. MORGULIS

Studies on the method for determining alveolar gas tension. HOKAN RYDIN. Univ. Bern. *Biochem. Z.* 200, 379-400(1928).—An app. together with a special valve is described for detg. the collection of alveolar air. With this automatic respiration valve the alveolar CO_2 tension can be detd. for any depth of respiration. The max. CO_2 tension is found in respiration which is natural in respect to depth and frequency.

S. MORGULIS

Comments on the determination of urotropine in the cerebrospinal fluid. ERICH BERTEL. Chem. Inst. Univ. Innsbruck. *Biochem. Z.* 201, 13-4(1928).—A quantity of cerebrospinal fluid corresponding to 1-10 mg. urotropine (*i. e.*, $9/7 \times 10^{-3}$ HCHO) is heated with 5 cc. $N H_2SO_4$ in a current of steam for 20 min. The distillate is treated with 25 cc. 0.1 $N I_2$ soln., then $N NaOH$ (free from iodate) is added until the brown color changes to yellow. This is left standing for $1/2$ hr., acidified with 10 cc. $N H_2SO_4$ and titrated with 0.1 $N Na_2S_2O_3$. One cc. 0.1 $N I$ corresponds to 1.16 mg. urotropine or 15 mg. HCHO.

S. MORGULIS

A micro-method for determining ether-soluble organic acids in the blood. SÖREN L. ÖRSKOV. Med.-chem. Inst., Lund. *Biochem. Z.* 201, 22-33(1928).—By a special modification of the Widmark shaking app. the extn. of ether-sol. org. acids present in blood is carried out with 0.2-cc. quantities. This is mixed with 0.8 cc. of a soln. of H_2SO_4 in 10% NaCl. By means of the micro-buret (Widmark 0.2 N Örskov) about 200 cu. mm. 0.05 $N NaOH$ is used in the app. to absorb the extd. acid. After shaking 90 min. the alkali is freed of ether and various volatile admixts. by passing a current of CO_2 -free air. An excess of 0.05 $N H_2SO_4$ is added from a microburet until the reaction to phenolphthalein is acid, and titrated back with the NaOH in the first micro-buret.

S. MORGULIS

Gasometric determination of hydrogen peroxide, nitrogenous compounds and of fermentative carbon dioxide by means of Paechtner's ponderovolumeter. P. LUY. Medizinische Hochschule, Hannover. *Biochem. Z.* 201, 65-84(1928).—Paechtner's ponderovolumeter is used in a series of quant. analyses. The app. measures quantities of gas by pressure changes. The utility of the app. for various chem. and biochem. detns. is emphasized. The original description of the app. is given *Z. angew. chem.* 37, 328(1924).

S. MORGULIS

Theoretical and practical consideration about apparatus in which the quantity of developed gas is measured by the height to which the sealing fluid is driven by the gas. MAX SCHLESINGER. Univ. Budapest. *Biochem. Z.* 201, 87-109(1928).—The relation between the change in level of the sealing fluid and the amt. of gas developed is formulated. From this formula the sensitivity of the app. and the deviation from proportionality between change in level and the amt. of gas are detd. With the aid of these theoretical considerations an app. is designed in which the rise of the sealing liquid and the quantity of gas are practically proportioned, or the deviations may be calcd.

S. MORGULIS

Determination of the smallest iodine quantities in organic products by means of acid hydrolysis. II. G. PREIFFER. Landwirtschaftliche Hochschule, Bonn-Poppelsdorf. *Biochem. Z.* 201, 298-304(1928).—The material to be analyzed (finely divided if a solid) is mixed with KOH until reaction is alk. and is dried *in vacuo* at low temp. The relatively dry material, whose H_2O content is detd. by wt., is broken up into pieces the size of a pea and preserved in a closed flask. About 15-20 g. is used corresponding to 60-120 g. fresh substance, but if this is insufficient to demonstrate the presence of I, the distillates from several samples are combined. The material is transferred quantitatively to a Corliss combustion flask of 1.5 l. capacity. The absorption takes place in 2 wash bottles, each with 100 cc. of 10% and 5% KOH, resp. The substance is covered with H_2SO_4 , then a little H_2O_2 is added and the combustion is carried out slowly. The I_2 is set free rapidly. Air is passed in a slow stream of bubbles. By a little practice one soon learns to regulate the aeration, heating and the continuous addn. of H_2O_2 in such a manner that the oxidation is complete for any moment. Before the end of the combustion the addn. of H_2O_2 may be stopped for a few min. when enough CO_2 and CO accumulate to reduce any possible iodate to the volatile I_2 . The most serious source of trouble is the carrying over of fatty acids, which produce soaps; the following procedure is employed to get rid of these. When the combustion has been completed the KOH from the 2 wash bottles is washed into a beaker and digested for a while on the boiling water bath, whereby all the fatty acids are changed to K soaps, and these are then pptd. with $CaCl_2$ (excess $CaCl_2$ can be removed with KOH). The clear supernatant liquid is sepd. from the bulky ppt., which is washed several times with hot water. The combined filtrates are evapd. and dried in a Pt dish. The residue is powdered and repeatedly extd. with alc. The use of a special condenser between the combustion flask and the KOH wash bottles is also recommended, which permits the quant. removal of the fatty acids. The alc. ext., freed from remaining traces of fatty acid if necessary, is now worked up according to the usual procedure. (Cf. C. A. 22, 4558.) S. MORGULIS

Two new laboratory apparatus. II. HANS J. FUCHS. "A. von Wassermann" Inst., Berlin. *Biochem. Z.* 201, 332-6(1928); cf. C. A. 22, 1253.—An app. is described for rapid evapn. at low temps. This is essentially a vacuum desiccator consisting, however, of 2 sep. flasks connected by a wide arch made of glass tubing and fitting into each flask by a ground joint. The tubular arch is also provided with 2 more ground joints for a small manometer and for a funnel, the tip of which reaches into the first flask and serves to run in the material to be evapd. This flask is kept in a water bath of desired temp. The second flask contains H_2SO_4 or other H_2O absorber, and is connected to a vacuum pump by means of a glass-stoppered arrangement. The second app. is a double distn. outfit. Both instruments are shown in figures. S. M.

The pigment analysis of urine. VI. A new spectrometer for qualitative and quantitative analysis of urine. M. WEISS. Inst. med. Chemie, Wien. *Biochem. Z.* 201, 337-40(1928); cf. C. A. 17, 1666.—Description of a spectrometer constructed from a Duboscq colorimeter and adaptable for the study of pigments with a well-defined and limited absorption. The instrument is operated like a colorimeter, but the standard may be used in sealed tubes of definite depth so that the standard pigment soln. need not be prepd. fresh each time. S. MORGULIS

The spreading of protein as a method for the determination of serum albumin and globulin. E. GORTER AND F. GRENDL. Univ. Leiden. *Biochem. Z.* 201, 391-411(1928).—A 0.1 cc. of serum together with 0.1 cc. satd. $(NH_4)_2SO_4$ is placed in a centrifuge tube 6 mm. in diam. and about 5 cm. long and well mixed with a fine rod. This is centrifuged 5 min. at 5000 revolutions or for a longer time at a slower rate. The liquid is poured off quantitatively with the aid of a glass rod and the globulin residue is washed 3 times with 0.1 cc. $1/2$ satd. $(NH_4)_2SO_4$. After the last washing the centrifuge tube is cut off just above the level of the residue and is then placed in a small stoppered weighing bottle. The residue is now weighed and taken up in 950 mg. H_2O (a correction of 50 mg. is allowed for water in the ppt.), and 0.005 cc. of the soln. is used to det. its spreading on 0.1 N HCl. By a simple calcn. the no. of sq. m. which can be spread over by the globulin from 1 cc. serum is easily found. Similarly, 0.1 cc. of the serum is mixed with 0.9 cc. H_2O , and again the spreading of 0.005 cc. of this mixt. on 0.1 N HCl is measured. The spread in sq. m. of total protein in 1 cc. serum is thus calcd., the difference between the 2 values divided by 0.1 representing the percent of albumin. S. MORGULIS

Spectrophotometric studies on oxyhemoglobin. EMERICH KEVE. Univ. Budapest. *Biochem. Z.* 201, 439-53(1928).—When A, the absorption at a definite position of the spectrum of a pigment in a specific solvent, is known, it is possible to find its concn.

C (g. of pigment in 1 cc. soln.) by detg. spectrophotometrically its extinction coeff. E , since $C = A \cdot E$. The ratio $E_{541.5-543.1}/E_{565.2-568.9}$ for once-crystd. oxyhemoglobin of the horse and of the dog is 1.62 and 1.61, resp. The value is lower for recrystd. oxyhemoglobin (1.55) and becomes less the more it is recrystd. For once-crystd. horse oxyhemoglobin the values for $A_{541.5-543.1} = 1.16$ and for $A_{565.2-568.9} = 1.88$. The spectrophotometric hemoglobin detn. in blood is accurate to within 2%. S. MORGULIS

Arterial carbon dioxide pressure in cardiac dyspnea. R. R. FRASER, C. F. HARRIS, R. HILTON AND G. C. LINDER. St. Bartholomew's Hosp., London. *Quart. J. Med.* 22, 1-20(1928).—The following method was used for detg. the CO_2 pressure of the arterial blood by means of a dissozn. curve constructed with arterial blood. A syringe was coated with liquid paraffin and loaded with sufficient Na oxalate to give a final concn. of 0.4% and enough NaF to make 0.1%. Without exposure to the air, 50 cc. of blood was drawn from the femoral artery and transferred under paraffin to a large test tube surrounded with ice. Four portions of 10 cc. each were transferred to tonometers of 400-cc. capacity which had been previously filled with mixts. of air and CO_2 at partial pressures of approx. 20, 30, 40 and 50 mm. of Hg, resp. Each was then placed in a water bath at 37° and rotated continuously for 15 min. The pressure in the tonometer was then measured while it was still in the bath by connecting it with a Hg manometer by small-bore Pb tubing. The blood was run into a small tube under paraffin and again chilled with ice. The CO_2 content of arterial blood and of the tonometer samples was detd. by the method of Van Slyke and Neill, *C. A.* 18, 3615. The pressure of CO_2 in the tonometers was detd. by the Haldane method. At the same time the p_{H} of arterial and tonometer bloods was detd. colorimetrically. Observations were made on 30 bloods from 17 cases of heart failure with dyspnea. The CO_2 pressure may be within normal limits, or above or below them. From a consideration of the O satn., CO_2 capacity, p_{H} of the arterial blood and condition of the patient at the time of observation, it appears that there must be in cardiac dyspnea, a stimulus at the respiratory center independent of the quality of blood at the center, causing increased pulmonary ventilation with a lowering of the CO_2 pressure in the arterial blood. This stimulus may be due to low O tension in the tissues of the center, the result of lowered minute vol. of the circulation. In cases of pulmonary disease in addn. to heart failure, or with pulmonary lesions seen in congestive failure, the arterial CO_2 pressure is raised because of inefficient pulmonary ventilation, or inefficient gaseous exchange in the lungs, which masks this stimulus. The raised CO_2 pressure will act as an addnl. stimulus to the respiratory center. In one case examd. shortly before death, there was evidence of retention of non-volatile acids which would increase the p_{H} and lower the CO_2 , and act as an addnl. stimulus, thus masking the stimulus mentioned above, which was always present in cardiac dyspnea. JOHN T. MYERS

Variation of the glucemic figures obtained as a function of blood dilution after mercurial defecation of the blood. GEORGES FONTES AND LUCIEN THIVOLLE. *Bull. soc. chim. biol.* 10, 1164-78(1928); cf. *C. A.* 22, 2588, 3185.—In defecating total blood, plasma or corpuscles with Hg nitrate or sulfate in increasing dilns., the glucemia values are increased with the diln. If the glucemia of the total blood is detd. for a given diln. of the Hg salt and the glucemia of the plasma and corpuscles is detd. separately at an equiv. diln., their sum equals the glucemia of the total blood. Defecation by tungstic acid gives a glucemia figure independent of diln. The phenomenon of increase of glucemia with diln. of the Hg defecator has no relation to the glucose ester in the blood, since it occurs in the absence of the ester, and, moreover, the ester is pptd. by mercurial defecation. Nor is it explained by the acidity of the Hg salt, since hyperacid tungstic defecator has no influence on the blood reducing power. The phenomenon is not observed after the action of beer yeast on the blood. Accordingly tungstic acid is preferred as a defecating agent. L. W. RIGGS

Microestimation of potassium in biologic media. ALBERT LEULIER, LÉON VELLUZ AND HENRI GRIFFON. *Bull. soc. chim. biol.* 10, 1238-47(1928); cf. *C. A.* 22, 4405.—The liquid such as serum or milk, is deproteinized by means of $\text{CCl}_3\text{CO}_2\text{H}$ and the ppt. is removed by the centrifuge. The excess of acid is neutralized by pure Li_2CO_3 added in small portions, and the undissolved Li_2CO_3 is removed by the centrifuge. The dissolved Li_2CO_3 is neutralized by a few drops of AcOH on the boiling water bath. If NH_4 compds. are present they are removed by heating the deproteinized liquid on the boiling water bath for 30 min. with NaNO_3 and AcOH . K in the liquids thus prepd. is detd. by the cobaltinitrite method. Tissues are brought into soln. by means of HNO_3 and H_2O_2 and the acid is neutralized by pure Li_2CO_3 . Tissues may be mineralized by the sulfoperchloric method. (Cf. Lematte, *C. A.* 21, 2914.) L. W. RIGGS

Estimation of sulfur and phosphorus in plant tissues. R. ECHEVIN AND A. CRÉPIN.

Bull. soc. chim. biol. 10, 1248-50(1928).—Oxidation of org. S by HNO_3 gave results within 5%. The volumetric detn. of P by $\text{UO}_2(\text{AcO})_2$ gave much more accurate results than weighing as $\text{Mg}_2\text{P}_2\text{O}_7$. L. W. RIGGS

Improvement in the Nicloux apparatus for the microestimation of carbon. MAURICE NICLOUX. *Bull. soc. chim. biol.* 10, 1271-2(1928); cf. *C. A.* 22, 202, 3185.—A semi-capillary funnel tube is described whereby the H_2SO_4 is admitted. (Cf. following abstr.) L. W. RIGGS

Modification of the apparatus for the microestimation of carbon by the method of Nicloux. N. BEZSSONOV. *Bull. soc. chim. biol.* 10, 1273-6(1928); cf. preceding abstr.—An alternative arrangement to that proposed in the preceding paper is described. L. W. RIGGS

Application of the Nicloux method to the estimation of carbon in the filtrates from deproteinization of the blood. JEAN ROCHE. *Compt. rend. soc. biol.* 99, 714-6(1928); cf. Nicloux, *C. A.* 21, 3211, 3642.—Details are given for the detn. of C in the filtrate from the deproteinization of 1 cc. of blood. The error is about 5%. **Data on the carbon of filtrates from the deproteinization of total blood, serum and corpuscles.** *Ibid* 716-8.—The figures for total C, total non-protein N, C/N ratio, glucose and C in glucose are tabulated for defibrinated total blood of hog, ox, dog, normal man, uremic man and diabetic man. The detns. were made by the method of Nicloux. The total C after defecation and the total non-protein N in serum and in corpuscles were detd. for the dog, ox and hog. L. W. RIGGS

Estimation of urobilin. M. ROYER. *Compt. rend. soc. biol.* 99, 1003-5(1928).—In the method of Elman and McMaster (cf. *C. A.* 19, 1580) it is necessary to dil. the liquid examd. to that degree which gives optimum fluorescence. R. uses as a diln. liquid a mixt. of the following compn.: $\text{Zn}(\text{AcO})_2$ 25 g., NaAcO 70, concd. HCl 4 cc., 60% alc. up to 1000 cc. This gives a soln. with a p_H of 6.0. The comparison of the fluorescence with that of a standard soln. of acriflavine was made in an app. similar to that used by Brousse, Descomps and Goiffon (cf. *C. A.* 19, 1723). Particular directions are given for the detn. of urobilin in excreta, bile blood and organs. Detns. made in duplicate did not show an error greater than 10%. L. W. RIGGS

Vital coloration of the ossification zone of long bones with p_H indicators. A. POLICARD. *Compt. rend. soc. biol.* 99, 1331-2(1928).—Fresh sections of bones of newborn guinea pigs were immersed in the color soln. for 2 min. and were immediately examd. under low power. The indicators used were bromophenol blue, bromocresol violet, neutral red and thymophenol blue. The colors noted 2 min. after immersion of the section, and the p_H of the various histologic elements are shown in a table. L. W. R.

Reactions of Bordet-Wassermann and of Vernes on the cerebrospinal fluid and blood. A. PRUNELL. *Compt. rend. soc. biol.* 99, 1451-2(1928).—In 132 serums and 90 cerebrospinal fluids the reaction of Vernes and that of Bordet-Wassermann were equally sensitive. L. W. RIGGS

A new lipase determination. L. GZÓONY, JANOS GSELL, AND F. HOFFENREICH. *Magyar Orvosi Arch.* 29, 374-84(1928).—The method depends on the pptn. of a casein soln. of p_H 5.6, on addn. to a mixt. of serum dild. in geometric series 2-4-8, etc., and a satd. monobutyryl soln., the free butyric acid causing the ppt. The results are presented in 11 tables showing the influence of serum components, enzyme poisons, activators and some on the ions on the serum lipase. L. W. RIGGS

Clinical thermometer containing gas under pressure. WM. H. JONES (to General Electric Co.). U. S. 1,693,299, Nov. 27. Structural features.

C—BACTERIOLOGY

CHARLES B. MORREY

Studies on the Coccaceae. XII. Action of the streptococci upon casein. G. J. HUCKER. N. Y. Agr. Expt. Sta. *Tech. Bull.* 141, 1-13(1928).—A series of selected strains of streptococci were grown in milk and by the detn. of the amino N present according to the Van Slyke method, it was noted that certain types had the ability to increase, after prolonged incubation, the amino N content of the milk. When furnished *chemically pure casein* as the only source of N, these strains of streptococci did not produce visible growth if washed cells were used as the inoculum. If large amts. of unwashed cells were used as an inoculum, the streptococci assocd. with milk and milk products generally produced growth. Under no conditions did the pyogenic streptococci produce growth when chemically pure casein was furnished as the only source of N. *Paracasein* and casein appeared to be equally unavailable as sources of N for the streptococci. **XIII. Production of carbon dioxide by the streptococci.** *Ibid*

142, 1-10.—A no. of representative strains of streptococci were secured and their ability to produce CO_2 from either peptone or carbohydrates was studied. Most of these strains, with the exception of *Streptococcus citrovorus* Hammer and *S. kefir* Migula, showed an increase in the amt. of CO_2 produced as the amt. of peptone in the medium was increased. *Streptococcus citrovorus* and *S. kefir* produced no CO_2 from peptone but formed relatively large amts. from glucose. This ability to produce CO_2 from glucose and not from peptone was confined to these 2 species in this study, and further indicates that they are identical or closely related. One strain of *S. ignavus* Holman apparently produced CO_2 from both peptone and glucose, while certain strains of *S. mitior* Schottmüller, *S. cremoris* Orla-Jensen, and *S. stenotrophicus* Bergey produced only small quantities from peptone, which were slightly increased upon the addn. of glucose. XIV. Certain biochemical reactions produced by the streptococci. *Ibid* 143, 1-64.—A study was made of 358 representative strains of streptococci to find const. and convenient characters by which the species of the genus may be differentiated. Only authentic and previously named strains of streptococci were studied and no effort was made to make a floral study of any particular natural habitat of this group. The streptococci can be divided into 2 groups on the basis of the type of lactic acid produced. The low-acid producers, which generally prefer levulose to glucose, attack the pentoses, form relatively large amts. of volatile acid, and many times CO_2 , all form *l*-lactic acid. The more common types of streptococci produce *d*-lactic acid. Many of the strains attacked the nitrogenous constituents in milk and produced an increasing amt. of H_2O -sol. N if the culture was allowed to incubate over a long period of time in the presence of CaCO_3 . Certain of the strains studied, particularly *Streptococcus lactis* Lohnis and related types, produced less than 10% of the total acidity as volatile acid, while *S. kefir* Migula, the aroma types, and certain hemolytic strains produced as high as 40% volatile acid. The relative amts. of non-volatile and volatile acid formed remained approx. const. regardless of the total amt. of acid produced. The non-hemolytic strains all produce AcOH and a volatile acid with a higher distg. const. than acetic, while the hemolytic types form, in addn. to AcOH, a volatile acid with a lower distg. const. than that found for AcOH. The distg. consts. obtained from the hemolytic strains indicate that varying amts. of HCO_2H are present. Const. results were obtained in qual. acid production from sugars if the conditions of growth were controlled, and it was concluded that fermentations of sugars and other C sources were valuable as routine methods in sepg. the species of streptococci. The strains producing *l*-lactic acid hydrolyzed the lactose much faster than it was converted into acid, while the remaining types produced acid as rapidly as the lactose was hydrolyzed. The need for a usable classification of the streptococci is pointed out, one which is based upon const. and easily detd. characters. Conclusion: The biochem. reactions produced by the streptococci studied may be used as a basis for differentiating the species in this genus. XV. Relationships of the various acid-proteolytic cocci. *Ibid* 144, 1-20.—A study of 25 strains of acid-proteolytic cocci showed there were 2 distinct types, micrococci and strains of streptococci which included *S. liquefaciens*. Some of these types are said to play an important part in both the normal and abnormal changes in the ripening of cheese and other dairy products. C. R. F.

Effect of cigaret smoking on the number of bacteria removable in mouth rinsings. J. L. T. APPLETON, JR., AND EARL LEHNER. Univ. Pennsylvania. *Dental Cosmos* 70, 1111-21 (1928).—The smoke from 1 cigaret bubbled through dild. saliva decreased the bacterial count of the latter by approx. 35%. Smoking 1 cigaret reduced the no. of bacteria removable by rinsing the mouth by approx. 40%; 30 min. later, the no. of such bacteria was 14% below its initial value and 26% below the value in a control group. At the end of 1 hr., no difference was found between the smokers and the controls. A bibliography is appended. JOSEPH S. HEPBURN

The importance of the hydrogen-ion concentration for the storage of starch-like substance in iodophil intestinal clostridia. NANNA SVARTZ. *Acta Med. Scand.*, suppl. XXVI, 385-9 (1928).—It is possible to regulate the storage of starch-like substance and spore formation of the iodophil clostridia. By keeping the reaction below 6.6 these bacteria will never store up any I-stainable material or form spores even if there is an abundance of carbohydrate in the medium. If the reaction of the medium is 6.6-7.0 these organisms at once begin to deposit iodophil substance. By preventing acidification of the medium by the addn. of CaCO_3 , spores will be formed. S. M.

Decomposition of olive oil under the influence of the vital activity of some microorganisms; transformation of oleic acid into ketostearic acid. G. PIGULEVSKII AND N. CHARIK. Chem. Lab., Univ. Leningrad. *Biochem. Z.* 200, 201-10 (1928).—Olive oil is utilized by microorganisms. This process is accompanied by a hydrolysis of the

oil, oxidation of the liberated oleic acid and further modification of the oxidation product. Unquestionably the oleic acid is changed to a variety of intermediate substances of which one, ketostearic acid $C_{18}H_{34}O_8$, has been actually isolated. S. M.

The demonstration of metachromatic granules in diphtheria bacilli. Microscopic diphtheria diagnosis. M. GUTSTEIN AND H. NEISSER. Univ. Berlin. *Centr. Bakt. Parasitenk. I Abt.* 108, 253-6(1928).—Heat-fixed films are covered with a 1% aq. soln. of Azure II for 2 to 5 sec., washed with water and differentiated with 3% HOAc (1 to 3 sec.). The granules are reddish violet and the body of the bacillus is light blue. Another method: Stain with 1% Azure II for 2 to 3 min., wash with water and aq. phosphine (chrysaniline extra) Kahlbaum. The granules are black and the body of the bacillus is yellow. Azure II will also demonstrate granules in living cells.

JOHN T. MYERS

Comparative studies of the reduction potential of anaerobic and aerobic bacteria. C. G. REYMAN. Staatens Serum Inst., Copenhagen. *Centr. Bakt. Parasitenk. I Abt.* 108, 401-12(1928).—The reduction potential of facultative anaerobes has usually been considered less than that of obligate anaerobes, and that of obligate aerobes still less. But facultative anaerobes possess the greatest reducing power in either complete or partial anaerobic conditions. Comparisons were made in bouillon which contained a moderate amt. of carbohydrate. This result should be expected since the reducing power is associated with the power of assimilation, which is wider with the facultative anaerobes. Obligate anaerobes have smaller amts. of reducing enzymes than do facultative organisms and are more easily poisoned by O.

JOHN T. MYERS

Limiting factors in lactic fermentation. L. O. ROGERS AND E. O. WHITTIER. U. S. Dept. of Agr. *J. Bact.* 16, 211-29(1928).—Lactic fermentation continues for a time after the bacterial cells cease multiplication, although the same factors appear to limit both. Control of p_H at 5.8 to 6.0 permits attainment of a greater bacterial population than when the accumulating acid is not neutralized. Still greater populations are attained when the culture with controlled p_H is agitated with a mech. stirrer with air, and greater populations still when N is substituted for air. The concn. of the undissocd. lactic acid is the principal factor in the limitation of growth and metabolism. Exhaustion of food factors may limit growth, but ordinarily the supply is more than sufficient. Mech. crowding is not a factor in the limits so far attained. Volatile products of metabolism, easily oxidizable products, total lactate concn., and self-induced changes in reduction potential, are not factors in limiting the numbers of *Streptococcus lacticus*. A substance which is diffusible through a collodion membrane limits the growth of *St. lacticus*.

JOHN T. MYERS

The effect of pure soaps on the bactericidal properties of phenolic germicides. BETTYLEE HAMPH. Johns Hopkins Univ. *J. Bact.* 16, 287-300(1928).—The marked inhibitory action of Na oleate, Na myristate, K palmitate and K stearate on the bactericidal properties of phenol, *m*-cresol, *sec*-butylphenol, butylresorcinol and hexylresorcinol has been demonstrated. The relationship appears to be more or less quantitative and indicates the impossibility of producing a germicidal soap by adding small quantities of a phenolic compd. The addn. of large quantities of non-irritating phenols is precluded by their cost. The germicidal activity of phenol is interfered with more extensively by the dispersed than by the gel phase of soaps. Apparently the soap removes the phenol from soln., thus interfering with its bactericidal activity. There is a good bibliography.

JOHN T. MYERS

A study of *Micrococcus zymogenes*. MARTIN FROBISHER AND E. RANKIN DENNY. Johns Hopkins Univ. *J. Bact.* 16, 301-14(1928).—The organisms studied as *M. zymogenes* may not all belong to the same species. A biochem. study was made of 5 freshly isolated strains. Some produce α , some β , and some γ types of colony on blood agar. There is no apparent relation between hemolysin and proteolytic enzyme production. The proteolytic enzymes resemble histase in their action on cooked meat but differ in their ability to digest coagulated serum, gelatin and casein. There is no direct relationship between *M. zymogenes* and any clinical or pathological entity, although it has been isolated more frequently from endocarditis. *M. zymogenes* and *Streptococcus liquefaciens* are probably identical. There is a long bibliography.

JOHN T. MYERS

Physiological studies on cellulose fermentation. J. R. SANBORN. Macdonald Coll., P. Q. *J. Bact.* 16, 315-9(1928).—China blue-aurin-cellulose soln. is very useful in the study of cellulose-decomp. organisms from soil; isolations may be made by the streak or pouring plate methods using the solid medium. Microbial associations can be studied fairly effectively, and studies can be made of accessory influences in the medium, upon cellulose fermentation. The medium gives excellent results with soil fungi for the detection of cellulose-destroying powers.

JOHN T. MYERS

The inhibiting effect of *Streptococcus lactis* on *Lactobacillus bulgaricus*. L. A. ROGERS. U. S. Dept. of Agr. *J. Bact.* 16, 321-5(1928).—A sol. and diffusible sp. substance is produced by the lactic cultures which will inhibit *Lactobacillus bulgaricus*.

JOHN T. MYERS

A study of rennin action. I. Rennin production by *Bacillus prodigiosus*. JOEL G. WAHLIN. Univ. of Kansas. *J. Bact.* 16, 355-73(1928).—Rennin production by *B. prodigiosus* occurs in media contg. complex proteins, amino acids, and NH_3 as sources of N. The accumulation as reflected by the clotting time proceeds more rapidly at 37° than at 20° . Clotting time is independent of the cell constant of the fluid. Filtrates of cultures are less rennin-active than raw cultures, perhaps because of adsorption of rennin by the filter. Prodigiosus rennin is characterized by being more thermostable, less susceptible to oxalates and apparently less susceptible to the casein concn. than is calf rennin. Both types are within limits accelerated in their action by CaCl_2 and by heat. Prodigiosus rennin coagulates heated milk more readily than does calf rennin. **II. The effect of rennin on sodium caseinate.** *Ibid* 375-86.—Rennin alters Na caseinate and milk in such a way that the protein is more readily precipitable by salts. Certain types of proteolytic bacteria when grown in Na caseinate alter the medium in a similar way.

JOHN T. MYERS

Muller's phenomenon: Distant punctate hemolysis of blood agar by staphylococci. F. M. BURNET. Walter and Eliza Hall Inst. *Australian J. Exptl. Biol. Med. Sci.* 5 [3], 205-12(1928).—Muller's findings are confirmed. Among the conditions of the medium necessary for the appearance of the characteristic discrete areas of hemolysis are the following: Of several species tested human red blood cells only are effective. A certain amt. of serum or plasma must be present. Human, rabbit and guinea-pig serum are all capable of giving the appearances. The nature of the basic nutrient medium actively influences the reaction. Huntton's hormone agar was the most satisfactory basis. Among the bacterial species tested only pyogenic staphylococci gave the reaction. Staphylococci of the *epidermidis albus* type were inactive. L. W. RIGGS

Influence of molds on the growth of luminous bacteria in relation to the hydrogen-ion concentration, together with the development of a satisfactory culture method. SAMUEL F. HILL. Princeton Univ. *Biol. Bull. Marine Biol. Lab.* 55, 143-9(1928).—The influence of molds on the length of life of cultures of luminous bacteria may be simulated by the use of buffer mixts., or by a continuous supply of fresh alkali. The max. alky. produced in these expts. by the influence of *Penicillium* species was p_H 8.6 \pm 0.2. Degeneration of cultures of luminous bacteria may be caused by growth on media insufficiently alk., or so slightly buffered that it soon becomes acid. Diffuse growth and spreading over the surface of the slant is caused by too low salt concn. Long life of cultures may be secured by growing on media sufficiently alk., and sufficiently buffered to resist rapid change by the acid production of the bacteria, which are killed by their own acid at about p_H 5.6. L. W. RIGGS

Elimination of false presumptive tests (JANZIG, MONTANK) 14.

NORTON, JOHN F., AND FALK, I. S.: **Laboratory Outlines in Bacteriology and Immunology.** Chicago: The University of Chicago Press. 114 pp. \$2. Reviewed in *J. State Med.* 36, 680(1928).

Bacteriological sterilizing and incubating apparatus. VALDEMAR CHRISTENSEN. U. S. 1,695,008, Dec. 11. Structural features are specified of an app. with a liquid bath which is elec. heated and thermostatically controlled.

D—BOTANY

THOMAS G. PHILLIPS

A comparison of some properties of normal and frosted wheats. ARNOLD H. JOHNSON AND W. O. WHITCOMB. Mont. Agr. Expt. Sta., *Bull.* 204, 1-66(1927).—The grade of wheat depends on freedom from frost-damaged kernels. This investigation has for its object the detection by chem. methods of frosted wheat. Wheat frosted when the moisture content is 44-46% or less appears to be equal in milling and baking quality to normal wheat even though the % of wrinkled or blistered kernels may be relatively high. Wheat of such moisture content is in the stiff-dough stage. When allowed to stand in the field before cutting, frosted wheat decreases in wt. per bu. and in yield. Green color in wheat which has been frosted at a very immature stage, changes to more nearly the color of normal wheat if the wheat is allowed to stand in the field some time before cutting. No further translocation of proteins or carbohydrates into the kernels occurs when wheat has been subjected to a killing frost, but such translocation does

occur in normal wheat cut young. The crude protein content of frosted wheat appears not to be significantly different from that of normal wheat. The crude gluten in wheat is lowered by frost damage only when the grain has a moisture content greater than 44-46% at time of freezing. Amino N compds. exist in greater quantity in frosted wheat and flour than in normal wheat and flour. During a given time of autodigestion greater quantities of the protein are broken down in frosted-wheat flour than in normal-wheat flour. The viscosity after acidulation of extd. flour-H₂O suspensions is greater for normal-wheat flours than for comparable frosted-wheat flours; the more severe the frost damage the greater is the difference in viscosity. The ash content of flours milled from frosted wheats is higher than that of flours milled from normal wheats of the same ash content, the differences becoming less as the wheats approach maturity. The reducing-sugar content of frosted wheat and the flour milled from it is greater than that of normal wheat and flour; the more immature the wheat when frosted, the greater is the reducing-sugar content. Reducing sugars are formed at a more rapid rate during the autodigestion of frosted-wheat flours than during similar autodigestion of comparable normal-wheat flours. A temp. of -1.8 to -2.8° will cause frost damage in immature wheat, the degree of this damage depending on the above conditions. The food value of frosted wheat is but little, if at all, inferior to that of normal wheat

C. R. F.

Calcium in lemon and orange leaves. A. R. C. HAAS AND F. F. HALMA. Calif Citrus Expt. Sta., Riverside. *Citrograph* 13, No. 3, 10(1928); cf. C. A. 22, 2390—Preliminary expts. showed that the ash contents of lemon and valencia leaves were approx. the same but that in mature lemon leaves, a much greater proportion of the ash is insol. in H₂O. For lemon leaves this ratio is 11 to 4, while in valencias, it is evenly balanced. The Ca content of the ash of both leaves is about 33%. Only 18% of the Ca in lemon leaves is sol. in H₂O against 48% of the Ca in valencia leaves. This fact may have an important bearing upon the relative sensitiveness of lemon and orange leaves to freezing, the lemon freezing at considerably higher temps. The expts. are being continued.

C. R. F.

Some phases of nitrogen metabolism in Polyanthus narcissus. G. T. NIGHTINGALE AND W. R. ROBBINS. N. J. Agr. Expt. Sta., *Bull.* 472, 1-32(1928).—The roots of the paper-white narcissus appear to be the chief organs concerned with the transformation of nitrates to org. N. Within the roots, nitrates were apparently reduced to nitrites and NH₃, accompanying which there was oxidation of reducing sugars, and a decrease in % and abs. amt. of higher carbohydrates, not only in the roots but in the storage tissues as well. As a direct or indirect result of nitrate assimilation, there was an increase in abs. amt. of total org. protein, proteose, and basic, amide and amino N in bulbs of the paper-white narcissus while in darkness. In one series of bulbs much of the N for new growth of centers and tops was newly synthesized from nitrates, whereas in another group the sole source of N for new growth was derived from the breaking down of more or less complex org. nitrogenous materials of the storage tissue; yet the quality of N in the centers and tops was about the same in both cases. The comparatively active centers or centers and tops of the paper-white narcissus are relatively high in the simpler carbohydrates and the less complex forms of org. N, whereas the storage tissue has relatively much N in the form of protein, and carbohydrates in the form of starch and dextrin. Bulbs with a low initial N content after transfer from darkness to light bloomed earlier as the result of nitrate applications, whereas other bulbs, likewise shifted from darkness to light, with a much higher initial quantity of stored N were delayed in time of blooming by addn. of nitrates to the nutrient medium. Twenty-six references are appended.

C. R. F.

Effects of ultra-violet radiation on various fungi. F. L. STEVENS. *Bol. Gaz.* 86, 210-25(1928).—Ultra-violet radiation has a profound effect upon the reproductive processes in various fungi. There occurs profuse sexual or conidial development in fungi that normally exhibit these stages very rarely.

BENJAMIN HARROW

The biological role of tannin in the plant cell. L. LUTZ. *Bull. soc. bot. (France)* 75, 9-18(1928).—Oxidation processes were noticeably retarded by the addn. of tannin to cultures of the following fungi: *Stereum hirsutum*, *S. purpureum* and *Polyporus versicolor*. Tannins may act as moderators of intracellular oxidation processes; this confirms in part the theory proposed by Moureu and Dufraisse (1922). Reference is made to the many theories concerning the possible role of tannin in the plant.

A. E. HITCHCOCK

Algae in sodium phosphate solutions. W. R. TROTTER. *Nature* 122, 729(1928); W. H. PEARSON. *Ibid.*—The occasional occurrence of green algae in bottles contg. Na phosphate solns. is discussed.

E. H.

Germination of sugar-cane pollen in artificial culture media. N. L. DUTT AND G. GANAPATHI AYYAR. Imp. Sugarcane Sta., Coimbatore. *Agr. J. India* 23, 190-202(1928).—The best germinations of sugar-cane pollen were obtained in a culture medium contg. 26% sucrose and 0.7% agar. Solns. of maltose, lactose, galactose, etc., isotonic in concn. with a 26% soln. of sucrose did not give satisfactory germinations. This indicated that the germination of cane pollen was not merely the effect of a balanced osmotic condition but was the result of a response to a definite chem. stimulus by the sucrose. The percentages of germination varied widely with different varieties of cane, a max. of 61% being obtained with M. 54,111, a seedling developed at the Coimbatore station. Germinations were obtained at temps. ranging from 22° to 33°. Pollen of Saretha Desi, a thin cane variety, was found to retain its viability for 2 hrs. when exposed to lab. atm. conditions and for 1 hr. when exposed to free air in direct sunlight. Cloudy weather was found to have no very harmful effect on ultimate germination of cane pollen.

K. D. JACOB

Intervarietal differences of a chemical nature in the mature potato tuber. T. P. McINTOSH. *Scottish J. Agr.* 11, 304-11(1928).—A preliminary study was made of the value of various chem. tests for distinguishing between different varieties of mature potato tubers. *The alkali test.*—This test is based on the development of yellow color, due to the presence of "flavones," when sections of potato are immersed for several sec. in *N* KOH solns. and then laid out on petri dishes. The colors developed varied from very faint yellow to deep yellow, and the color of each variety tested remained relatively const., no substantial variations being noted in samples grown in acid and alk. soils in widely sepd. districts and tested over a storage period of 5 months. The fertilization of the crop had no effect on the results and from a limited no. of tests it seems that the reaction holds in the case of tubers affected with virus diseases. There was no substantial variation in the test when applied to potatoes of the same variety dug at different stages of maturity. *The oxidase test.*—This test is based on the development of colors ranging from light brown to dark purplish brown when slices of potato, free from injuries and eyes, are brushed with a few drops of a 0.5% soln. of benzidine in 50% alc. and dried for 1 hr. at about 40° F. The test gave substantially const. results on the same variety of potato under various conditions. *The blackening of potato tissue.* This test is based on the oxidation of tyrosine to give finally a black coloration due to formation of melanin. The test was carried out as follows: Transverse slices were cut with a stainless-steel knife from the middle of the long axis of the tubers, and the surface of these slices was lightly scratched with a Ag wire in order to expose more tissue. The slices were immersed in a soln. of Na_2CO_3 , p_H 8.3, for about 30 sec. and then incubated in petri dishes in a moist incubator for 30 min. at 37°. The resulting shades of black were classed as faint, intermediate and dark, and, with the exception of slight differences in the intermediate group, the results were consistent for the individual varieties. Toward the end of the storage period there appeared to be a slight decrease in the amt. of melanin formed, but the individual varieties still retained their relative positions. *The tyrosinase reaction.*—This test is based on the formation of a red color, due to oxidation of tyrosine by the enzyme, tyrosinase, on the surface of cut potatoes. *p*-Cresol, which is similar to tyrosine in its structure is also oxidized by the enzyme. In carrying out the test, slices of potato were brushed with a few drops of 0.2% soln. of *p*-cresol and the red coloration was noted after 15 min. at 40° F. This test also gave useful results on the same variety of potato under different conditions. A few expts. indicated that varieties of potatoes might also be distinguished by the shades of color developed when slices are steeped for 2 min. in 20% nicotine soln. Intervarietal differences were not revealed by tests with Millon's reagent, methylene blue, oxidizing agents, reducing agents, common acids in various degrees of concn. and the H-ion concn. of the cell sap. The investigation is being continued.

K. D. JACOB

Changes produced in plants upon emasculation. V. G. TARANOVSKAYA. *Zhurnal Opuhnoi Agronomii* (Russia) 23, 127-64(1927).—Buckwheat was grown in sand cultures with the Prishnitskov medium, consisting of 0.172 g. $\text{CaHPO}_4 \cdot 2\text{H}_2\text{O}$ per kg. of sand and the other ingredients as a 1% soln. in the following quantities: 24 cc. NH_4NO_3 , 15 cc. KCl, 6 cc. $\text{MgSO}_4 \cdot 7\text{H}_2\text{O}$ and 2.5 cc. FeCl₃. The plants were grown in 4 to 6 pots, from 2 pots the plants were emasculated, the rest were left to develop normally. Similar operations were carried out with the following plants in the field: barley, lupines, corn, buckwheat, mustard, hemp, poppy, soy beans. In general the grain crops were negatively affected by the emasculation as shown by the decrease in dry matter. Chem. detns. were made on the buckwheat both grown in the pots and in the field. The flow of plastic substances not being able to feed the seed and fruit-forming organs goes to the vegetative parts of the plant. The increased concn. of cell sap increases the turgor

of the plants and the osmotic pressure in the cells, thus increasing the activities of the plant and thereby increasing the synthesis of nutrient substances. Emasculated plants show an increased intensity of CO_2 assimilation because of an increase in leaf area and a more successful utilization of mineral substances of the soil because of an intensified ability of the roots to take up these substances. The emasculated plants exercised a selective absorption for certain substances. Thus there was an increase of P_2O_5 , K_2O , Mg and Cl. The N content decreased, but the percent of protein N increased. The bulk of the Ca did not combine with the oxalate and it accumulated primarily in the cell wall. The low oxalate content is due to the increased respiration. There was an increase in carbohydrates, especially sugars and a decrease in cellulose. J. S. J.

Function of potash in the formation of carbohydrates. A. JACOB. German Potash Syndicate. *Z. angew. Chem.* 41, 298-301(1928).—Recent theories of light-energy relations in photosynthesis are briefly discussed. The theory of Stoklasa that the radioactivity of K is responsible for the emission of electrons, which he regards as the effective agent in photosynthesis, is contradicted by his expts. which indicate that light is necessary in the presence of K while Rn is effective in darkness. J. advances the theory that the photoelec. effect could afford an explanation just as satisfactorily as the radioactive theory of Stoklasa. If this could be established it would overcome difficulties met with in other theories advanced, namely, that the energy of light is not sufficient to explain the conversion of CO_2 into HCHO on the basis of the quantum theory. The process could then be explained by regarding the effect of K on plant life as due to the photoelec. effects, by assuming that the K atom stores up the light energy and by emitting electrons provides the necessary energy for the assimilation process. H. R. KRAYBILL.

The significance of the water saturation condition for the carbon dioxide assimilation of plants. (Preliminary paper.) HEINRICH WALTER. *Ber. deut. botan. Ges.* 46, 530-9(1928).—*Elodea canadensis* was grown in water from Lunz (Austria), which contains considerable bicarbonate, and the assimilation measured by changes in cond. according to the method of Ruttner. By adding varying amts. of cane sugar to the H_2O , conditions were obtained whereby some H_2O was withdrawn from the plants. There was then a strong decrease in assimilation and a lesser fall in respiration. When such plants were returned to cultures contg. only H_2O recovery took a no. of days, and if plasmolysis had been too long continued the plants died. LAWRENCE P. MILLER.

The extraction of plant sap by pressure for the determination of osmotic values by cryoscopic methods. HEINRICH WALTER. *Ber. deut. botan. Ges.* 46, 539-49(1928).—If leaves of *Helianthus annuus* are first killed by being placed in a glass cylinder which is put in boiling water for 15 min., the amt. of sap which can be expressed by hydraulic pressure is $3\frac{1}{2}$ times that which can be obtained from living leaves under the same pressure. The osmotic value of the sap thus obtained is twice that of the sap pressed from living leaves. Investigation of other plants showed that only in exceptional cases, such as where the leaf tissue is watery, as in *Rhoeo discolor*, is the proper value obtained from living leaves. That this higher value from dead leaves is not due to hydrolysis induced by the temp. of killing is shown by the fact that if the killing is done by liquid nitrogen similar values are obtained. Thus sap from living leaves of *Buxus sempervirens* gave a value of 7.16 atm., from leaves killed by heat 25.64 atm., and from leaves killed by liquid nitrogen 25.94 atm. In the case of *Prunus laurocerasus*, which stores considerable glucoside, killing of the leaves by heat does result in some hydrolysis and in osmotic values which are somewhat high. It is only in a few isolated cases, however, that killing by heat introduces such an error. LAWRENCE P. MILLER.

The influence of the anions of potassium salts on potato plants and the effect of the root activity of the plant upon the medium. W. VON BREHMER. Biol. Reichsanstalt f. Land- u. Forstw., Berlin-Dahlem. *Ernähr. Pflanze* 24, 393-7(1928); cf. *C. A.* 22, 1428.—Potato plants were grown in sand cultures with a basal nutrient content adjusted to give an initial p_{H} of 4.0. Varying quantities of KCl, K_2SO_4 , KNO_3 and K_2HPO_4 were added and measurements made of the height of the plants produced and the p_{H} of the media. In every case the p_{H} change was toward neutrality. L. P. M.

The carbohydrates of the iris. Nature, genesis and transformations. ANDRÉ AUGEM. *Rev. gén. botan.* 40, 456-73, 537-54, 591-605(1928).—The reserve carbohydrates of the rhizome of *Iris germanica* consist only of sucrose and starch. The rhizome of *Iris pseudacorus* contains a levulosan, irisin, accompanied by a little sucrose but no starch, while that of *Iris foetidissima* contains sucrose, starch and levulosans. Irisin as prepd. from the rhizome and seed of *I. pseudacorus* consists of white lumps, m. 185°, $[\alpha]_{\text{D}}$ before hydrolysis -51° , after hydrolysis -92° . Mol.-wt. detns. indicate that it contains 6 or 7 mols. of $\text{C}_4\text{H}_{12}\text{O}_8$. Two levulosans were isolated from the rhizome and leaves of *I. foetidissima*, the 2 being sepd. through difference in soly. of their Ba compts.

The one present in the larger amt. was obtained as a white, tasteless powder, very hygroscopic, m. 151° , $[\alpha]_D$ before hydrolysis -29° , after hydrolysis -80° . Mol. wt. detns. show this to be a dilevulosan. The second levulosan prepd. had a $[\alpha]_D$ -20° before hydrolysis, -78° after hydrolysis. This substance, differing from the other levulosans, which were resistant to the action of all enzymes tried except a powd. enzyme prepd. from mucedin, was slowly but completely hydrolyzed by yeast invertase. In no case was any aldehyde sugar found in hydrolysis products. Analyses of rhizomes indicates that the reserve carbohydrates are const. in amt. during the greater part of the year. The rhizomes contain no enzymes which hydrolyze the levulosans and starch except during the flowering period, when levulosan-splitting enzymes are present. The leaves contain these enzymes at all times. At the time of flower formation, especially in *I. germanica* and *I. pseudacorus*, there is a marked hydrolysis of the sol. polyoses in the rhizome. These are transported as reducing sugars to the growing seed, where they are condensed to form irisin in *I. pseudacorus*, sucrose in *I. germanica*, and levulosans and sucrose in *I. foetidissima*. As the seed ripens these substances slowly change to a horny albumen, which is the same in the 3 species, and which on hydrolysis yields 80% mannose and 20% arabinose. The leaves contain sucrose, glucose and levulose; those of *I. foetidissima* contain levulosan in addition. Starch is absent in all cases except in the guard cells of the stomata.

LAWRENCE P. MILLER

The significance of oxygen for the production of urea by molds. NICOLAI N. IVANOV AND M. I. SMIRNOVA. Univ. Leningrad. *Biochem. Z.* 201, 1-12(1928).—Molds produce urea only in the presence of the O just as green plants form asparagine. Placed in an atm. of H_2 , the molds cease to form urea but retain their urea content, and commence to produce more urea as soon as they are transferred once more to an O atm. The urea is synthesized from absorbed NH_4 salts. In the absence of O the mold fails to absorb the NH_4 , and when the conditions for this are favorable only as much NH_4 is being absorbed as is transformed to urea. The fact that both urea and asparagine require O for their synthesis suggests a comparison between these 2 substances. S. M.

The destruction of hexoses in plants. III. The problem of the plant cozymase. V. ZALESSKII AND E. SCHATALOVA-ZALESSKA. Plant physiol. Lab. Charkov. *Biochem. Z.* 201, 190-8(1928); cf. *C. A.* 22, 612.—The flour of pea seeds and germinated plantules lose their capacity to utilize AcH after dialysis. The addn. of boiled juice from dried yeast restores the ability to transform AcH. The pea flour thus requires a heat-stable substance for this transformation. This is contained in the dry yeast ext. and is provisionally designated as the coenzyme of pea aldehydase, which is identical with zymase (thus cozymase). The difference in the aldehydase activity of ungerminated and of the germinated pea seeds can be removed by an excess of cozymase; the problem of the change in the aldehydase activity during germination requires thorough reinvestigation. The coenzyme of the aldehydase is firmly bound in the unripe pea seed, and cannot be removed from its flour by dialysis. The dialyzed flour of unripe pea seeds transforms AcH to some unknown compd. S. MORGULIS

The enzymic condensation of formaldehyde to sugar. II. J. BODNÁR. Kgl. ungar. pflanzenbiochem. Inst., Budapest. *Biochem. Z.* 201, 281-5(1928); cf. *C. A.* 22, 1611.—The pulp of *Tropaeolum* leaves does not convert AcH to sugar as it does with CH_2O . Not only the pulp but also the dry leaf powder can condense CH_2O to sugar. The powder has no effect on AcH. Since neither the boiled leaf pulp nor the boiled powder can produce the condensation of CH_2O to sugar it is concluded that this is an enzymic reaction.

S. MORGULIS

Studies on nectar in relation to honey production. O. W. PARK. Iowa State Coll. *J. Econ. Entomol.* 21, 789-90(1928).—This investigation was undertaken: (1) to discover the factors which influence the quantity or the quality of nectar produced by a given species of plant; (2) to find a means of measuring the value of a plant as a honey producer; (3) to contribute information on the manner in which the honey bee (*Apis mellifera*) changes nectar into honey. About 900 samples of nectar from many species of plants, including the important honey plants of Iowa, were collected and analyzed. Nectars which are secreted abundantly have a lower sugar concn. than those secreted less abundantly. Most of the nectar samples contained 40-55% sugar, few showing less than 30% or more than 60%. Nectar from a given source varied considerably in sugar concn. Sugar concn. was found to be nearly inversely proportional to the relative humidity of the air. Light was a factor of less importance. In some species of plants, the same flower secretes nectar throughout a period of several days.

C. H. RICHARDSON

Metabolism of *Ustilina vulgaris* L. WÜNSCHENDORFF AND CH. KELLIAN. *Compt. rend.* 187, 572-4(1928).—The fungus was grown in Erlenmeyer flasks on cotton pads

covered with filter paper and satd. with the nutrient soln. contg. MgSO_4 , K_2HPO_4 , gelatin and either peptone, urea, asparagine or $(\text{NH}_4)_2\text{SO}_4$. In the cases of peptone, urea and asparagine, NH_3 was produced and the reactions for biuret, cystine, tyrosine and tryptophan disappeared. During several months of active life of the fungus NH_3 was evolved at widely varying rates. An av. of 8 detns. over a period of 23 days was 0.77 mg. NH_3 per 100 g. of dry mycelium. These cultures contained NH_4 salts, amino acids, urea and creatinine but no indole, aldehydes or acetone. In the presence of carbohydrates were produced oxalic, citric, malic and succinic acids. Glucuronic acid sometimes appeared, its amt. varying with the sugar present. L. W. RIGGS

Reducing action by fungi of the *Fusarium* and *Verticillium* genera, parasites of wood tissue. J. BORDAS AND P. H. JOESSE. *Compt. rend.* 187, 574-6(1928); cf. Lutz, C. A. 20, 3485; 21, 1290.—Several species of *Fusarium* and *Verticillium* were grown on the Richard medium to which was added one drop of a 0.125% soln. of methylene blue for each 5 cc. of the medium. The culture tubes, each contg. 10 cc. of the medium, were placed in free air at 25°, and the reduction was estd. by the change in color of the methylene blue. Two species of *Fusarium* and 3 of *Verticillium* showed stronger reducing powers than *Polyporus fulvus*, *Stereum necator* and probably of the greater part of the *Hymenomyces* studied by Lutz. L. W. RIGGS

Variations in the content of vitamins B and C of cereal grains during germination. C. KUCERA. *Compt. rend. soc. biol.* 99, 967-70(1928).—By feeding expts. with guinea pigs it was detd. that vitamin C was developed in practically equal quantities in wheat, rye and barley, and in sufficient quantities during the first 24 hrs. of germination. With oats the development of vitamin C was retarded but was present after 72 to 96 hrs. of germination. Localization of vitamins B and C in young plants. *Ibid* 971-2.—In plants 6 to 12 days old, vitamin C was found in all parts, including the germinating seed. Vitamin B, on the contrary, was found only in the germinating seed. Further work is in progress. L. W. RIGGS

Origin of camphor trees. TOMIZO YAHAGI. *Central Inst. Japanese J. Chem.* 3, 109-29(1928).—The findings of this research were obtained by extensive cytological and morphological studies of tissues from various parts of camphor trees. In the oil cells of camphor trees there exists an enzyme material of the nature of a peroxidase, and the formation of camphor products in them is due chiefly to the direct action of this enzyme material on the substance of the cells. The rate of formation of camphor and oil is closely related to the vigor of tree growth; where the vegetative force is strongest the largest amt. of camphor is found. Once the formation of the oily matter is started within the cell it proceeds rapidly until the cell is filled with camphor products. The formation of camphor and oil occurs in the very early stages of growth, contrary to formerly accepted ideas. The formation of oily matter occurs in nearly all tissues in active growth and especially in wood lying beneath the cambium layer. The sap of camphor tree contains no perceptible amt. of camphor or oil. The "resinogenous layer," which Tschirch indicated along the inside wall of oil cells in plants, probably corresponds to the layer of peroxidase above mentioned. The existence of a peroxidase lining has been found in cells of tissues from *Cinnamomum loureirii* Nees, *Laurus nobilis* L., and a few other trees. This gives addnl. support to the idea of peroxidase formation of essential oils and camphoraceous products in essence-producing plants. L. W. RIGGS

F—PHYSIOLOGY

E. K. MARSHALL, JR.

Facts about the hormone for nerve stimulation and about some nerve poisons. G. C. SANTESSON. *Caroline Inst., Stockholm. Arch. sci. biol. (Italy)* 12, 20-5(1928).

H. J. DEUEL, JR.

The importance of the conditions existing in the organism for the activity of the internal secretions. EMIL ABDERHALDEN. *Univ. Halle. Arch. sci. biol. (Italy)* 12, 26-9(1928).

H. J. DEUEL, JR.

Changes in tissue permeability. ALFRED FRÖHLICH. *Wiener klin. Wochschr.* 41, 1545-9(1928).—A review. D. B. DILL

Serum studies in high altitude by means of electrodialysis. A. TÓTH. *Inst. für Hochgebirgsphysiol., Davos. Biochem. Z.* 201, 412-23(1928).—In rats there is a lower globulin content in serum at high altitude. Acute lowering of atm. pressure produced contrary effects on the globulin fraction in different rats. In guinea pigs there was no effect noted at high altitude, and no influence produced by lowering the pressure experimentally. This also applies to the rabbit. In human beings who have been for a long

while in the mountains there is generally a high total protein content and a low globulin in the serum. However, the difference between high and low albumin is too slight to be of any significance.

G—PATHOLOGY

H. GIDEON WELLS

Variations in blood lactic acid levels in normal and liver-damaged rabbits. G. NOAH. Rudolph Virchov-Krankenhaus, Berlin. *Z. ges. expl. Med.* 61, 59-62(1928).—The blood lactic acid curve following the injection of 0.3 to 0.6 g. Na lactate was detd. in normal rabbits and in rabbits with liver damage following the injection of 0.5-1.0 cc. P. In general the blood lactic acid was lower in the normals. F. L. D.

Calcium oxalate in disorders of metabolism and its relation to salivary calculus formation. BERNARD B. BADANES. *Dental Cosmos* 70, 1122-6(1928); cf. *C. A.* 22, 4618.—A review with bibliography. JOSEPH S. HEPBURN

Further studies on the glycogen in the adeno-carcinoma of the mouse. BRUNO BORCHI. *Boll. soc. ital. biol. sper.* 3, 378-82(1928); cf. *C. A.* 22, 1399.—The aim of this investigation was to study the influence of insulin and glucose treatment on the glycogen content of neoplastic tissue and of the liver of tumor-bearing mice. The animals were injected with 2 units of insulin and $\frac{1}{4}$ hr. afterwards injected with one cc. of a 15% glucose soln. Four hrs. after the last injection the animals were killed and the glycogen was detd. Results: (1) normal mice, av. glycogen in the liver 0.0305 g. = 2.8%; (2) normal mice treated with glucose and insulin, av. glycogen in the liver 0.038 g. = 3.10%; (3) tumor-bearing mice, av. glycogen in the liver 0.0148 g. = 1.0%; av. glycogen in the tumor 0.01 g. = 0.5%. (4) tumor-bearing mice treated with insulin and glucose, av. glycogen in the liver 0.0024 g. = 0.22%; av. glycogen in the tumor 0.0019 g. = 0.1%. Conclusions: In normal animals, insulin and glucose increase the glycogen content of the liver. The liver of tumor-bearing mice shows a marked diminution of glycogen compared to the normals. In tumor-bearing mice the glycogen in the liver and neoplastic tissue is greatly reduced by insulin and glucose treatment. PETER MASUCCI

Further investigations on the metabolism of fatty substances in pathological conditions. III. The action of colloidal silver on the infiltrative liposis of arsenic. G. TRIMARCHI. *Boll. soc. ital. biol. sper.* 3, 399-400(1928); cf. *C. A.* 22, 2613.—The investigation aimed to establish whether colloidal Ag inhibited the infiltrative liposis of As. White mice were injected intraperitoneally on 4 successive days with 0.5 cg. of argyrol dissolved in one cc. H₂O and with 8 mg. As₂O₃ per kg. of body wt. This treatment was also varied by giving different amts. of As₂O₃ and on various days. In the control animals which received 8 mg. As₂O₃, whether administered all at once or in fractions, on alternate days or on successive days, a marked infiltrative liposis of the hepatic cells was observed; nuclear and plasmatic changes were noted and the Kupffer cells were free of fat. In the animals treated with As₂O₃ and colloidal Ag no trace of fat was visible in the hepatic cells. Argyrol therefore exerts an inhibiting action on the infiltrative liposis of As similar to that of P. IV. The action of colloidal silver on the liposis caused by the administration of olive oil. C. CIACCIO AND G. TRIMARCHI. *Ibid.* 401-3.—The action of colloidal Ag on liposis caused by olive oil administered either by mouth or subcutaneously was investigated. (1) The rats were treated with colloidal Ag followed by the administration of 10 cc. of olive oil; (2) alternate treatment: colloidal Ag in the morning followed by 5 cc. olive oil in the evening for 5 successive days; (3) treatment with olive oil for 5 days followed by Ag for 5 days. Results: (1) After the administration of olive oil a marked liposis was noted in the liver and kidneys; (2) such liposis was not noted, however, in animals treated with colloidal Ag. The latter exerts a marked catalytic action on fatty substances even when it has infiltrated into the cells. PETER MASUCCI

Studies on the washing out of edema. ESKIL KYLIN. Allg. Krankenhaus zu Jonkoping, Sweden. *Acta Med. Scand.* 68, 403-26(1928).—A study has been made on 5 patients with edema. The typical occurrences during the washing out of the edema were a fall in the blood Na and K and a rise in the blood Ca. When the edema was completely, or very nearly so, removed the Na and K level again increased while that of the Ca remained unaffected. S. MOROGLIS

A case of spontaneous hypoglycemic coma. ANNA S. PETTERSSON. Krankenhaus zu Umeå. *Acta Med. Scand.* 69, 232-40(1928).—A case of hypoglycemic coma is described which is regarded as spontaneous because none of the familiar causes of hypoglycemia was operative. Besides the hypoglycemia there were low blood pressure

and certain anomalies in the skin, nails and hair which indicate a marked polyglandular atrophy.

S. MORGULIS

Studies on the frequency of goiter in Finland and its relation to the occurrence of iodine in the water. ERIK ADLERCREUTZ. Univ. Helsingfors. *Acta Med. Scand.* 69, 1-45(1928).—Endemic goiter occurs not only in mountains but also in low lands. The mountain endemic goiter is characterized by its intensity and cretinism, whereas in the low lands the progress of the disease is much milder and cretinism is very rare. The endemics of low lands are localized in lake regions or occur on the shores of certain waters. It is stated that the incidence of goiter shows spontaneous diminution in certain localities where the disease has been known for a very long time. II. Etiology of goiter. *Ibid* 187-222.—Discussion of endogenous causes of goiter (disposition, heredity) and exogenous causes (relation to soil, significance of food, water and air). It is pointed out that no theory so far advanced to explain the etiology of goiter is sufficient to account for facts obtainable in territories different from that where the theory has been promulgated. It is maintained that a uniform type of endemic goiter does not exist, because goiter is the result of multiple factors, and regionally one or another factor predominates. III. The presence of iodine in various waters in Finland. *Ibid* 325-91.—An I deficiency is probably not a direct cause for goiter in Finland. As evidence it is shown that the incidence and frequency of goiter along the Finnish coast line as well as along the Bothnic Sea and inner lakes is in the inverse ratio to presence of I. In fact, in certain regions marked by a relative richness in I there is nevertheless endemic goiter present. Neither is an I lack in other regions always assocd. with the occurrence of the disease.

S. MORGULIS

Variations in the serum electrolytes in disease of renal origin with special reference to the cause of renal acidosis. HAROLD A. SALVESEN. Univ. Oslo. *Acta Med. Scand.* 69, 126-86(1928).—In 37 cases of renal disorders (chronic nephrosis without insufficiency, with contracted kidney and with amyloid degeneration, acute eclamptic nephritis, chronic glomerulonephritis in all stages of insufficiency, a case of bilateral cystic kidney and one case of bilateral kidney tumor) detns. were made of the serum Na, K, Ca, Mg, HCO_3 , Cl, P and protein, as well as of the p_{H} and CO_2 tension. These cases have been followed for many months. There was found no gross increase in these constituents except in one case of uremia. Very often a decrease was found both in cases with and without urea retention. A real alkalosis with increase in the bicarbonate was not seen, but in 2 cases a high p_{H} associated with a low CO_2 pressure was observed. Acidosis is very frequent. As a general rule, excepting acute nephritis, there is no acidosis without insufficiency. The phosphate retention was found of no significance in the production of acidosis. A pure HCl acidosis was found only in 2 cases of amyloid kidney. The most important factor is the accumulation of org. acids in the blood together with a more or less pronounced loss of base, probably caused by lack of NH_3 production. Renal acidosis shows a tendency to be uncompensated with p_{H} down to 7.05 because of the loss of ability to lower the CO_2 tension. A case of nephritis is described with amyloid kidney with severe, uncompensated acidosis, due to HCl, which lasted for 3 years. The p_{H} was down to 7.14 and the BHCO_3 13-14 mM. The acidosis is not responsible for any clinical symptoms except occasionally for the forced breathing. A common phenomenon of renal acidosis is the low Cl concn. of the serum. The Cl may act as neutrality regulators and leave the blood, giving up the base for neutralization of the org. acids. Sometimes the base of the chlorides is attacked before that of the bicarbonates, which is thus kept const. The acidosis of acute nephritis is not a true renal acidosis and is due to org. acids formed during convulsions. HCl administration may produce acidosis in the presence of kidney insufficiency. In Bright's disease there are 2 types of decrease in Ca: (1) due to low protein; (2) due to retention of P.

S. MORGULIS

The cause of rapid occurrence of coma upon sudden discontinuation of insulin administration in insulin-treated patients. MARTIN ODÉN. Krankenhaus zu Umeå. *Acta Med. Scand.* 69, 254-67(1928).—The sudden death following the abrupt cessation of insulin treatment in certain severe diabetes cases is evidently due to the failure of the organism to develop an efficient capacity for producing NH_3 . This requires a certain time, and a gradual reduction in the quantity of insulin usually gives the organism time to mobilize its NH_3 -producing capacities and the acid produced is more or less effectively taken care of, so that the insulin can even be left out for a time in such cases without bringing on coma.

S. MORGULIS

Contribution of the study of the basal metabolism in goiter at puberty. SVEN M. ELDM. Med. clinic II, Serafinerlasarettet, Stockholm. *Acta Med. Scand.* 69, 286-308 (1928).—Clinical.

S. MORGULIS

The concentration of lactic acid in blood and urine under physiological and pathological conditions. OTTO JERVELL. *Acta Med. Scand., Suppl. XXIV*, 135 pp. (1928).—Two-cc. oxalated blood was measured into a 50-cc. Erlenmeyer flask and deproteinized according to the Folin-Wu method. Of the clear filtrate 10 cc. (1 = 1 cc. blood) was transferred to a large centrifuge tube and treated with 1 cc. 10% CuSO_4 and 2 cc. 10% $\text{Ca}(\text{OH})_2$, and after $\frac{1}{2}$ hr. centrifuged off. The clear liquid was now poured through a small funnel plugged with a little well-cleaned cotton, the filtrate being collected in a 150-cc. Erlenmeyer flask. The centrifuge tube was rinsed twice with H_2O , also poured into the funnel. To the filtrate were added 5 cc. $\text{K}_2\text{Cr}_2\text{O}_7$, and drop by drop with const. stirring 4-6 cc. H_2SO_4 . The flask was stoppered and kept 30-45 min. at 60° . The contents were then dild. with 50 cc. H_2O , 2 cc. 10% KI was added together with some starch and the soln. titrated with $\text{Na}_2\text{S}_2\text{O}_3$. The mean error by analysis by this method is 5%. For the lactic acid detn. in urine Clausen's method of ether extn. was followed. The normal lactic acid concn. in the blood during rest is 20-30 mg. %. Under the same conditions the excretion through the urine is 10-20 mg. per hr. In healthy persons there was no difference noted in the blood lactic acid concn. while lying in bed or being at rest in upright position. A carbohydrate-rich meal causes no increase in the lactic acid concn. of the blood. In expts. where a measured amt. of work was performed by means of a cycle-ergometer it was found that every muscle exercise produces hyperlactacidemia. During exercise with uniform rate of work the increase in lactic acid concn. is greatest in the first minutes and least in the last minutes, which is attributed to the fact that the minute-vol. of the heart is less at the beginning of exercise. The increase in the blood lactic acid concn. depends on, but is not directly proportional to, the amt. of work per min. With an output of work less than 1000 kg.-m. per min. there is small increase, but this is considerable with greater exertion. After an initial rise variations in the intensity of work may produce alterations in the lactic acid concn. of the blood, but individual differences can be noted between exptl. subjects. After the exercise the blood lactic acid level falls, returning to the normal usually in 30 min. On continued mild muscular exertion the lactic acid concn. falls somewhat more rapidly than when the subject is entirely at rest. The hyperlactacidemia of muscular exertion is due to a relative shortage of O, the intake of which is not sufficient to meet the requirement, more lactic acid being produced in the muscles than is consumed by combustion. There is always an O debt at the conclusion of muscular work which is compensated in a few min. It is assumed that approx. $\frac{1}{2}$ the entire organism is in intimate contact with the blood, and that lactic acid concn. of the blood before and after exercise, in g. per l., multiplied by $\frac{1}{2}$ body wt. correspond roughly to the quantity of accumulated lactic acid. From the latter value the O debt can be calcd., and this agrees fairly well with the value actually detd. The lactic acid concn. in urine after physical exertion may rise to 1%, and in more severe muscular work 1-2% of the lactic acid accumulated in the organism is excreted through the urine. In milder muscular work less than 0.5% is thus excreted. Alkali administered by mouth diminishes the alkali concn. in the blood and increases the excretion through the urine. Likewise, the hyperlactacidemia following exertion is much less if the subject had been given previously alkali than otherwise. The increasing concn. of lactic acid in the muscles is the cause of fatigue and it is also probable that the hyperlactacidemia is the cause of the dyspnea during exertion. The increase in lactic acid of the blood may induce an uncompensated acidosis. An increase in blood lactic acid was found when a gas mixt. was inhaled contg. only 7.5% O, and it is suggested that certain symptoms of mountain sickness are associated with hyperlactacidemia. In case of asphyxia several min. elapse before there is a distinct rise in the blood lactic acid concn. In stasis, which is a local asphyxia, there is a rise in lactic acid concn. of the venous blood. During muscular exertion there is a small increase in the inorg. P of blood and urine but much less than the corresponding rise in lactic acid, and it is suggested that on the cleavage of lactacidogen most of the inorg. P is retained in the muscles. In compensated heart disease the blood lactic acid concn. is normal, but in cases of absolute cardiac insufficiency an increased blood lactic acid concn. is not uncommon. Patients with non-compensated heart affection are unfitted for physical exertion because of the O debt already present even in a state of repose. Hence, in cardiac insufficiency the lactic acid concn. during muscular exertion rises much more than in normal persons. On respiring pure O the hyperlactacidemia occurring in asystolia disappears in many cases. The alkali reserve in cardiac insufficiency is practically normal. In anemia the lactic acid concn. of the blood is frequently high, the hyperlactacidemia occurring only if the organism is unable to compensate the deficient O-binding capacity of the blood by an increase in minute-vol. output of blood. In pernicious anemia there is a low lactic acid concn. in the blood evidently due to a low

carbohydrate metabolism. In pneumonia, on account of the asphyxia, there is regularly a small rise in the blood lactic acid. In advanced stages of pulmonary tuberculosis there is hyperlactacidemia which may be complicated by the contributory effect of anemia. Fever does not raise the lactic acid concn. of the blood. In spastic conditions there is hyperlactacidemia; in nephritis a retention of lactic acid is observed only in the uremic condition; in carcinoma hyperlactacidemia is present only in association with anemia. No definite evidence was obtained to decide whether or not liver diseases occasion any change in the blood lactic acid concn. In general it must be concluded that an increase in the lactic acid in venous blood is a sign of deficient O_2 supply to the tissues, in consequence of which the oxidative processes are below par.

S. MORGULIS

Ketonemia of diabetes. V. BÜLOW-HANSEN. *Acta Med. Scand.*, suppl. XXVI, 77-83(1928).

S. MORGULIS

Problems in metabolism in obesity. H. C. HAGEDORN. *Acta Med. Scand.*, suppl. XXVI, 154-6(1928).—In cases of obesity there are at least 2 symptoms of metabolic disturbance, one being a low basal metabolism, the other a low respiratory quotient in the postabsorptive phase following a carbohydrate meal. The 2 symptoms are not necessarily assocd.

S. MORGULIS

A case of alimentary hypoglycemia. INGA SCHRÖDER. *Acta Med. Scand.*, suppl. XXVI, 157-63(1928).—A diet of fat and vegetables brings about a fall in the blood sugar concn. not only in diabetics but in normal individuals as well. In such diet one deals therefore with a general physiol. reaction.

S. MORGULIS

Lactation hypoglycemia. ERIK M. P. WIDMARK. *Acta Med. Scand.*, suppl. XXVI, 164-9(1928).—During milking of cows as well as during lactation by healthy women there is a fall in the blood sugar.

S. MORGULIS

A few observations on the spontaneous hypoglycemic reaction of man. THOR STENSTRÖM. *Acta Med. Scand.*, suppl. XXVI, 170-80(1928).—Description of several interesting clinical cases where the hypoglycemic phase of the sugar tolerance test was very exaggerated, the blood sugar falling below 0.05%, and was accompanied by distinct subjective complaints. It is stated that the hypoglycemic phase following the initial hyperglycemic reaction is not an uncommon phenomenon.

S. MORGULIS

Edema and the diminished water excretion in pernicious anemia. The plasma colloids and the colloidal osmotic pressure in plasma. F. MEULENGRACHT, POUL IVERSEN AND F. NAKAZAWA. *Acta Med. Scand.*, suppl. XXVI, 248-55(1928).—Hypalbuminosis is found in cases of pernicious anemia, which, however, is not of the same severity as that in nephrosis. The colloid osmotic pressure of the serum, which normally is 362 mm. H_2O on the av., is also lowered and is within the range of 240-270, which is favorable to the production of edema.

S. MORGULIS

Studies on the acidosis of nephritis. HARALD A. SALVERSEN. *Acta Med. Scand.*, suppl. XXVI, 256-7(1928).—No acidosis was found in cases of chronic nephrosis or glomerulonephritis without kidney insufficiency. Damaged kidney function seems necessary for the development of renal acidosis.

S. MORGULIS

Provisional report of investigations regarding the pathology of nephritis. CARL HOLTEN AND P. BRANDT REHBERG. *Acta Med. Scand.*, suppl. XXVI, 284-91(1928).—By using Rehberg's formula: $F = Au\% / (Ap\% \times U)$, where $Ap\%$ is the concn. in the blood plasma; $Au\%$ the concn. in the urine measured at the same time of a substance which is not reabsorbed by the tubules of the kidney, and U is the amt. of urine in the given time unit, the rate of formation of filtrate in the kidney was studied. The substance used for this purpose was creatinine. At 9 a. m. the patient gets 3 g. creatinine orally; at 10 and 11 a. m. urine is passed and a blood sample collected at the same time. The creatinine as well as the urea is detd. in the urine and blood. In nephrosis it was found that the filtration process may be normal even though the disease is of long standing.

S. MORGULIS

The content of cells and albumin plus globulin in normal and in pathologically changed spinal fluid with a schematic survey of about 6000 personally examined spinal fluids. With special regard to the importance of establishing the limits for normal spinal fluid and of demonstrating the small changes. AXEL V. NIEL. *Acta Med. Scand.*, suppl. XXVI, 406-14(1928).—A demonstration of the globulin content of a spinal fluid is of decisive importance.

S. MORGULIS

Urobilinuria in carbohydrate minimum. OLAF BANG. *Acta Med. Scand.*, suppl. XXVI, 447-54(1928).—Urobilinuria occurred when the daily carbohydrate in the form of bread and potatoes is below 1 g. per kg. of body wt.

S. MORGULIS

The occurrence of organ-specific lipases in serum and their diagnostic significance,

especially in liver diseases. EDMUND POLACK. *Acta Med. Scand.*, suppl. XXVI, 491-9 (1928).—The presence in serum of quinine-resistant lipases is ascribed to parenchyma destruction, a quant. relation apparently existing between the two. S. MORGULIS

Hyperlactacidemia in cardiac insufficiency. OTTO JERVELL. *Acta Med. Scand.*, suppl. XXVI, 527-36 (1928).—An increased amt. of lactic acid was found in the blood of patients with cardiac insufficiency. This is regarded as evidence of a permanent "oxygen debt." S. MORGULIS

A study of glucosuria with special reference to the interpretation of the incidental finding of a positive reduction test. HAQUIN MALMROS. Univ. Lund. *Acta Med. Scand.*, suppl. XXVII, 309 pp. (1928).—In an examn. of 365 normal persons only 1.1% gave pos. reduction tests, and of 9272 patients without any subjective symptoms of diabetes only 0.42% gave a pos. reduction test for urine. When these tests were made during 1-2 hrs. after a mixed meal, the pos. tests were found more frequently, on the av. in 7.7% (even 13-17% in some series of tests). In children between 6 and 15 years the pos. tests after a meal were rare (1.9%). After carbohydrate-rich meals (contg. 40-150 g. carbohydrate, half of which was sucrose) the pos. reduction tests were more frequent than after ordinary meals. The urines from a no. of healthy students, nervously upset on account of difficult examns., did not show a higher percent of pos. reactions than under usual conditions. Alimentary glucosuria is apparently the most important factor responsible for the pos. reduction reaction. Urine from healthy persons almost regularly contains a carbohydrate fermentable by common yeast as quickly as glucose, and in most cases also the phenylhydrazine test yielded osazones of the same appearance as can be obtained by the addn. of small quantities of glucose to fermented urines. This is especially true of urines secreted 1-2 hrs. after meals. The evidence indicates that glucose is present in normal urine. After ingestion of 1 g. glucose per kg. of wt., the pos. reduction test is found relatively often as well as the phenylhydrazine test, showing that true alimentary glucosuria is not uncommon. Ingestion of salicylic acid preps. is of no importance as a contributory cause in producing a pos. reaction. Also, there was no evidence found that emotional glucosuria occurs in healthy persons. A study of sugar-tolerance tests led to the following general conclusions: Bang's blood-sugar method gives reliable values for clinical use, and the tolerance can suitably be tested by the administration of 1 g. glucose per kg. when it can be considered that all the glucose will have left the stomach within 2 hrs. The preceding diet is a very essential factor for the course of the blood-sugar curve. Low-carbohydrate diets produce a hypersensitiveness for carbohydrate, resulting in a prolonged hyperglucemia and frequently in glucosuria. If the tolerance test is preceded by a longer time of fasting there is likewise a hypersensitiveness for carbohydrate, and the tolerance test should therefore be made 12 hrs. after the last meal, the patients being kept for some time previously on an ordinary mixed diet. It is denied that emotion, pain or fear causes hyperglucemia in man. In older persons (50-70 years) the blood-sugar rise in tolerance tests are frequently more marked and of longer duration than in younger persons. On an empty stomach the blood-sugar level in healthy persons is not higher than 0.11%, and in young persons during the tolerance test does not exceed 0.20%, falling to the original level in 2-3 hrs. The pos. reduction test incidentally found in wine is often due to alimentary glucosuria, the cause of this being sometimes a low threshold value but more frequently a pronounced alimentary hyperglucemia. Cases of glucosuria with low threshold value have proved to be insulin-resistant and are thus not assocd. with a pancreatic insufficiency. It is to be noted that among persons with glucosuria but no subjective symptoms of diabetes there is a large proportion of corpulent individuals. The glucosuria assocd. with low threshold values often occurs in several members of the same family and may be a congenital quality due to a hereditary predisposition. S. MORGULIS

The significance of the electrolyte composition for the organism. The biochemistry of the parturient paralysis of cows. B. SJOLLEMA. Reichsuniversität, Utrecht. *Biochem. Z.* 200, 300-8 (1928).—The mineral metabolism in milk fever of cows is seriously upset. Particularly the Ca and inorg. P of the blood serum is lowered. Although there is no tetany and no guanidine bases could be found in this disease of the cows, the facts nevertheless have a bearing upon the tetany question. The condition is undoubtedly associated with a functional disturbance of the vegetative nervous system. As soon as enough Ca is available for the organism the symptoms disappear; even a single injection of CaCl_2 brings relief to the sick animal within 1-2 hrs. S. MORGULIS

The intermediate metabolism of rats infected with trypanosomes. GEORG SCHEFF. Elisabeth-Univ., Pécs. *Biochem. Z.* 200, 309-30 (1928).—The trypanosomes as blood parasites primarily deprive the organism of carbohydrate and O, and so long as this can be satisfied there are no noticeable disturbances. But as soon as the liver as the

central regulatory organ is secondarily injured through functional overburdening so that its reserves are used up and the destruction of non-sugar substances ceases there is hypoglycemia. The simultaneous, though much less noticeable, disturbance of the protein metabolism may be due to the trypanosomes or may be due to the resulting dysfunction of the liver. With the increase in the number of trypanosomes in the blood the destruction of the red cells becomes gradually greater. The O consumption of the trypanosomes and the anemia cooperate in impairing the O supply of the organism, which leads to the development of a form of internal asphyxiation toward the end of the infection, with the usual accompaniment of an acidosis.

S. MORGULIS

Studies on the fat metabolism of cancer patients. KAREL KLAUS. Karl-Univ., Prag. *Biochem. Z.* 201, 286-91(1928).—The serum of women with cancer of the genital organs shows invariably a definite lowering of the total cholesterol. The amt. of fatty acids is usually about the upper normal level. Only in clinical cases of very malignant tumors was there an increase in the fatty acids. The proportion of cholesterol in the unsaponifiable portion is about 50%, and the lipemic cholesterol fatty acid coeff. is about 0.5. Hypocholesterolemia follows more or less the extent and malignancy of the tumors. In cases of marked malignancy there is considerable diminution in the total cholesterol, definite increase of the fatty acids and a very low lipemic coeff., but it cannot be stated that these facts are actually an indication of the degree of malignancy. Neither is it possible to decide whether the hypocholesterolemia is a sign of the organism's exhaustion in its struggle with the malignant growth or is an indication of the organism's susceptibility to cancer.

S. MORGULIS

The destruction of acetoacetic and β -hydroxybutyric acid in the organs of dogs with phlorhizin acidosis. I. SNAPPER, A. GRÜNBAUM AND CH. MENDES DE LEON. *Biochem. Z.* 201, 473-8(1928).—Both the kidney and the extremities of phlorhizin diabetic dogs can destroy ketone bodies. According to the analyses even the extent of this destruction is not affected by phlorhizin acidosis. The phlorhizin acidosis must then be due to an increased production rather than to a diminished capacity of destroying the ketone bodies. In diabetes likewise the initial acidosis must be due to an increased acetone bodies production in the organs showing fatty degeneration without any alteration in their destruction. Only in the advanced stages of diabetes, when there is coma which no longer responds to insulin and symptoms of kidney insufficiency appear, there is the possibility that the organs concerned with the destruction of ketone bodies have been injured.

S. MORGULIS

The relationship of precordial stress, blood-uric acid, and salicylate therapy. MILTON A. BRIDGES. N. Y. Post Graduate Med. School and Hosp. *Ann. Internal Med.* 2, 367-72(1928).—In 9 cases of angina pectoris the mean uric acid reading was at or above the upper physiol. limit. Therapy was directed toward the reduction of the blood uric acid by the use of salicylates. In all cases the uric acid gradually decreased and the hemoglobin increased. A transient albuminuria occurred in several cases. In no case were there any permanent untoward salicylate effects. There is no assurance that uric acid produces angina pectoris. It is barely possible that some undetd. product of faulty metabolism may be the factor which ppts. this syndrome.

JOHN T. MYERS

The use of preserved bacterial suspensions for the agglutination test. With special reference to the enteric fevers and typhus fever. A. FELIX AND L. OLITZKI. Rothschild Hosp., Jerusalem. *J. Hyg.* 28, 55-66(1928).—In *B. typhosus*, *B. paratyphosus* A and B, and *B. enteritidis*, low concns. of phenol and HCHO produce a definite inhibition of the O agglutination, while the H agglutination remains unchanged—a fact long established for *B. proteus* X 19. Alc. even in high concns. has no such effect. Such suspensions are not adequate for the qual. test in enteric fevers or the usual diagnostic test in typhus. Phenol and HCHO suspensions are responsible for the negative Widal test in cases of enteric fever which show only the O agglutinin. Such cases are common, especially in typhoid. It is suggested that both alc., and phenol or HCHO suspensions be used to detect both H and O agglutinins. The nature of the inhibition is not clear. There is a good bibliography.

JOHN T. MYERS

The clinical application of total chloride estimations in the fractional test meal; with an analysis of a series in fifty normal children. W. S. C. COPENMAN AND N. GRAY HILL. *Quart. J. Med.* 22, 33-41(1928).—The usual estns. of free HCl and total acidity are not of much clinical value, because of their variability, even in the same individual at short intervals. A total-chloride curve is of more value in detg. whether the stomach secretion is reacting within normal limits to the stimulus of foods. The emptying time of the stomach in children does not seem to be shorter than in adults as evinced by disappearance of starch. The current theory that the emptying time during achlorhydria in adults is faster than when HCl is present, is correct. However, the ptyalin of the saliva

is more active in cases of achlorhydria, which may account for the more rapid disappearance of starch from the stomach.

JOHN T. MYERS

The distribution of electrolytes in hemophilic blood. RONOLD V. CHRISTIE, J. SENDROY, JR., AND D. D. VAN SLYKE. Rockefeller Inst. for Med. Research, N. Y. *Quart. J. Med.* 22, 65-71(1928).—As a result of analyses of both serum and cells sep'd. from blood after satn. with CO_2 at tensions from 25 to 197 mm., it was found that there were entirely normal shifts of Cl and HCO_3 between the cells and serum in hemophilic blood. The serum and cell chloride contents at physiol. CO_2 tension were also quite normal.

JOHN T. MYERS

The osmotic pressure of the blood proteins in nephritis. C. L. COPE. *Quart. J. Med.* 22, 91-105(1928).—The osmotic pressure of blood-plasma proteins was det'd. by the method of Verney. The normal pressure is 30-32 cm. of water. In general disease states the pressure varies from 20 to 45 cm. In non-edematous nephritis the pressure is not reduced except slightly just before death. It may be slightly raised, but this is not assoc'd. with high blood pressure. In nephritis with edema there is a definite fall which disappears with the subsidence of the edema. In cardiac failure, the protein osmotic pressure may be unchanged in the presence of edema, or lowered in the presence of demonstrable edema. The available evidence is inadequate to prove a relation between nephritic edema and osmotic pressure, although such may exist.

J. T. M.

Addison's disease with atrophy of the cortex of the suprarenals. O. BRENNER. Queen's Hosp., Birmingham, England. *Quart. J. Med.* 22, 121-44(1928).—In 4 out of 5 cases of Addison's disease there was a peculiar and characteristic lesion of the cortex with destruction of most of it. The medulla was little or not at all deranged. In the fifth case no suprarenals were found, which may be the end stage. The process may be a necrosis of cortical cells caused by some unknown toxin with a special affinity for them. This is followed by focal regeneration with the production of hyperplastic islands of hypertrophied cells, which are then attacked by the same process. Part of the late degeneration may be due to overwork of the few remaining cortical cells. The adrenal medulla and the rest of the chromafin system may be normal. Hence symptoms must be due to loss of cortical cells. There is a bibliography of 90 titles.

JOHN T. MYERS

Further notes on the sedimentation rate of erythrocytes. H. B. NEWHAM AND P. H. MARTIN. London School of Hyg. and Tropical Med. *Quart. J. Med.* 22, 145-52 (1928).—The results of levulose-tolerance tests do not suggest that marked derangement of the liver necessarily accompanies rapid sedimentation. The sp. gr. of packed erythrocytes and that of plasma are not sufficiently great to account for observed increases in sedimentation rate. The viscosity of the plasma is not decreased; in fact it is increased in kala-azar, which has a rapid sedimentation rate. There is no change in red-cell size. Auto-agglutination seems to be a dominant factor in causing rapid sedimentation. In kala-azar there are a globulin increase, a pos. formol-gel test, very rapid sedimentation, and autoagglutination.

JOHN T. MYERS

Creatinuria as a sequel to fractures of bones, and the influence of thyroid feeding upon it and upon the creatinuria of post-encephalitic rigidity. MARION HIRST AND C. G. IMRIE. Univ. of Sheffield. *Quart. J. Med.* 22, 153-65(1928).—Creatinuria occurs after fractures of bones. The amt. excreted in 24 hrs. varies in different cases from a trace to over 500 mg. It disappears gradually as healing occurs. The rate of excretion is lowest at night. It has been observed in 4 cases of fractured femur, in some fractures of tibia and fibula, in a fracture of the pelvis, and to a less degree in some but not all fractures of the tibia alone. Administration of thyroid ext. increased the output of creatine threefold in a fracture of the femur. This increase was more marked at night. The increase in output preceded any change in the rate of metabolism, or in other nitrogenous constituents of the urine. Creatinine was not increased and uric acid only slightly. Parkinsonian rigidity was practically uninfluenced by thyroid in amts. which produced the above changes in fracture. A diuresis always followed thyroid administration. It was most marked after fracture of the femur.

JOHN T. MYERS

Action of folliculin on the glucemia of ovariectomized dogs. F. RATHERY, R. KOURILSKY AND (MLLE) GIBERT. *Compt. rend. soc. biol.* 99, 667-9(1928).—In the normal dog the injection of 10 units of folliculin with 20 g. of glucose was most frequently followed by an increase in the hyperglucemia compared with the hyperglucemia following the injection of 20 g. of glucose without the folliculin. In the ovariectomized dog the results were variable during the first 3 hrs., but in 6 out of 7 cases there was hypoglycemia after 5 hrs. It appears that the folliculin excites a more rapid secondary secretion of insulin.

L. W. RIGGS

Action of folliculin on the glucemia of depancreatized female dogs. F. RATHERY, R. KOURILSKY AND MLLE YV. LAURENT. *Compt. rend. soc. biol.* 99, 679-83(1928).—The

action of folliculin on the glucemia was not sensibly modified by partial ablation of the pancreas, but in the majority of cases of complete extirpation of the pancreas the injection of folliculin caused a more pronounced glucemia than that in the normal dog. In some cases, however, folliculin caused a transient hypoglucemia. In the same animal the action of folliculin was not the same before and after pancreatectomy, but inverse. In the absence of any insulin secretion folliculin detd. important modifications of the glucemia; therefore insulin was not necessary to the action of folliculin. But insulin when present exercised a certain influence on the reactions of folliculin. Under normal conditions there is probably an equil. between the actions of these internal secretions which intervene in the glucemic regulation.

Concentration of antitoxic serum. P. A. ACHMARINE AND A. W. PONOMAREFF. *Compt. rend. soc. biol.* 99, 694-5(1928).—By fractionating antitoxic serum with Na_2SO_4 a triple and quadruple concn. of the antitoxin may be obtained contg. 7% of Na_2SO_4 . The latter may be removed by dialysis, but with much difficulty. It is recommended to remove the greater part of the Na_2SO_4 by the addn. of CaCl_2 and the pptd. CaSO_4 by means of the centrifuge, when the resulting liquid will contain but 0.6% of Na_2SO_4 .

Role of euglobulin in the reaction of Botelho. J. LOISELEUR AND R. MOREL. *Compt. rend. soc. biol.* 99, 710-12(1928); cf. *C. A.* 22, 810.—Serum was dialyzed and brought to a pH of 4.7. The euglobulin, isolated by centrifugation, was redissolved in physiol. saline and brought to the reaction of serum by the addn. of NaOH . Botelho tests were made on the entire serum, the euglobulin and the part remaining in the serum (pseudoglobulin and serine). In 1 normal and 14 pathological subjects the Botelho test was always pos. for the euglobulin fraction, always neg. for the pseudoglobulin-serine fraction, and pos. in 8 out of 14 samples of entire serum from pathological cases. In cases of epithelioma the Botelho test was always pos. for the entire serum as well as the euglobulin fraction.

Free and protein sugar content of the blood during experimental intestinal occlusion. F. RATHERTY AND LÉON BINET. *Compt. rend. soc. biol.* 99, 739-40(1928).—Dogs were subjected to aseptic ligation of the intestine either at the duodenum, in the middle of the small intestine, or at the large intestine. The animals were fasting and were given only water. The occlusion of the intestine probably caused an inconstant elevation of free sugar in the arterial blood. The protein sugar was always increased with the upper or middle ligations.

Neutralization of highly toxic diphtheritic toxins by *B. pyocyaneus*. LOUIS DUCHON. *Compt. rend. soc. biol.* 99, 777-8(1928).

Study by microincineration of anthracotic tracheobronchial nodes. A. POLICARD, S. DOUBROW AND D. PILLET. *Compt. rend. soc. biol.* 99, 823(1928); cf. *C. A.* 22, 2982.—The pigment in this case is entirely of C.

Mineralization of fluids and muscles in experimental edema in the rabbit. A. NAU. *Compt. rend. soc. biol.* 99, 869-72(1928).—These expts. support the conclusions of Aubel and Mauriac (*Report XIX Congress of Med.* 1927), that it is not exact in hydropogenous nephritis to consider only the retention of the Cl ion, as edemas were produced by means of org. salts of Na. The ratio Na/Cl is ordinarily greater in the liquid of edema than in the blood of the same subject. The retention of water in the tissues is coincident with a complete overthrow of the mineral equil. of the organism, and it appears that this overthrow is conditioned upon the formation of edemas.

Role of the bone marrow in experimental rickets. I. I. NITZESCU, G. POPOVICU AND M. UNGUREANU. *Compt. rend. soc. biol.* 99, 894-5(1928).—Rats were subjected to the rickets-producing diet of Sherman-Pappenheimer nos. 84 and 85 for 3 to 6 days, then there was added to the ration an ext. of bone marrow equiv. to 6 or 7 g. per animal per day. All animals thus fed developed rickets more intensely than controls on the original rickets-producing diet. Rats receiving vigantol or cod-liver oil with the rickets-producing ration were protected against the disease.

Serodiagnostic value of the cytolytic reaction of Freund and Kaminer. OVID COMSIA. *Compt. rend. soc. biol.* 99, 898-9(1928).—In 46 specimens of cancer serum 63% gave a positive and 37% negative cytolytic reactions. The same serums gave 82% positive and 18% negative with the Botelho reaction. Of 104 non-cancerous serums only 3% gave positive cytolytic reactions, while the same serums gave 19% positive with the Botelho reaction.

Alkaline reserve of venous blood in local experimental venous stagnation and its relation to the appearance of edema in animals. M. FRANK. *Compt. rend. soc. biol.* 99, 925-7(1928). Experimental edema caused by intraarterial injection of solutions of various substances. *Ibid* 927-8.—The parallelism between the appearance of edema

and a lowering of the alk. reserve suggests that the state of acidification of the cellular liquids is a cause of the edema in cases of venous stagnation. Edema following the intraarterial injection of various substances depends on the nature of the substance injected. Edema in this case is a consequence of the harmful action of the injected substance on the cells and their vital functions.

L. W. RIGGS

Relations between glucemia and the temperature of the body. ALBERTO DE CARVALHO. *Compt. rend. soc. biol.* 99, 935-6(1928).—From 59 detns. on 6 subjects, it appeared that there was no hyperglucemia in the course of fever, nor any relation between variations of temp. and variations of glucemia.

L. W. RIGGS

Concentration of hemoglobin in the nucleated erythrocytes in the course of anemia in man. L. DRASTICH. *Compt. rend. soc. biol.* 99, 991-4(1928).—In pernicious anemia the concn. of hemoglobin in the erythrocytes is increased, or at least is at the upper normal limit.

L. W. RIGGS

Respiratory quotient in peripheric fever. J. DADLEZ AND W. KOSKOWSKI. *Compt. rend. soc. biol.* 99, 1032-4(1928); cf. *C. A.* 21, 2030; 22, 1392.—The increase in the quantities of O_2 absorbed and CO_2 eliminated as well as in the respiratory quotient, proves that in peripheric fever there is an increased combustion of carbohydrates which is the source of the hyperthermia. Gaseous exchange taken as criterion of the differences between thermic polypnea and polypnea of peripheric fever. *Ibid* 1034-7.—Thermic polypnea differs from the polypnea of peripheric fever in the following points: The cause of thermic polypnea is reflex; it is partly the consequence of the superheating action of the blood on the nervous center. It is independent of chem. excitants, while the cause of polypnea of peripheric fever is chem., depending on the production of lactic acid in the blood. During thermic polypnea the respiratory quotient is not raised, and the quantities of O_2 absorbed and CO_2 eliminated remain the same or are diminished. During the polypnea of peripheric fever the respiratory quotient is raised and the quantities of O_2 absorbed and CO_2 eliminated are increased. In thermic polypnea there is a tendency toward a diminished body temp., but in polypnea of peripheric fever the body temp. is raised.

L. W. RIGGS

Variation in the fibrinogen content of the blood after aseptic traumatism and surgical intervention. PAUL GOVAERTS AND J. DE HARVEN. *Compt. rend. soc. biol.* 99, 1051-3(1928).—A study of 20 cases showed that aseptic traumatism or benign surgical intervention not followed by infection, caused an increase on the following day in the fibrinogen content of the plasma. This increase reached a max. of 2 to 3 times the normal amt. by the 3rd to the 5th day and had not returned to the normal figure by the 11th day following the operation.

L. W. RIGGS

Glucosensitivity of the superior nerve centers in the course of experimental pancreatic diabetes. JEAN LABARRE. *Compt. rend. soc. biol.* 99, 1053-6(1928).—The procedure consisted of a combination of the isolated head and the pancreato-jugular anastomosis technics. Post-diabetic hyperglucemia, by the intermediary of the central and parasympathetic nerve system, caused an increase in the insulin secretion that outside of all humoral mechanism, should constitute a factor favorable to the diminution of the glucemia which abnormally increases in the course of exptl. pancreatic diabetes. Influence of hyperglucemia and hypoglucemia through the superior nerve centers on the external secretion of the pancreas. JEAN LABARRE AND PIERRE DESTREE. *Ibid* 1056-7.—Hyperglucemia of the superior nerve centers increases the quantity of pancreatic juice secreted, whereas hypoglucemia, insulinic as well as sympathetic, diminishes that secretion. With the same technic as above, when the glucemia has been lowered by synthalin and then a massive dose of dextrose is injected, there is a return to normal in the quantity of pancreatic juice excreted per hr.

L. W. RIGGS

Quantitative evolution of bilirubinemia in the course of catarrhal icterus and arsenamine treatment with or without insulin compared. Threshold of renal elimination of bilirubin. D. SMICI AND M. POPESCO. *Compt. rend. soc. biol.* 99, 1084-5(1928).

L. W. RIGGS

Digestion of lecithin by pancreatic enzymes. SIDNEY A. PORTIS. *J. Am. Med. Assoc.* 91, 1248-50(1928).—Normal duodenal contents digest lecithin; gastric contents do not. In patients with cardiac decompensation there is a definite depression of enzyme activity as far as lecithin digestion is concerned. There is no apparent alteration in pancreatic enzyme activity in normal pregnant women. The pancreatic enzyme activity is depressed in the untreated duodenal ulcer and returns to nearly normal with the administration of alkalis. Ulcer patients treated by the ordinary methods of bed rest and food and without the administration of alkalis did not show a return to normal in the 3rd week of management.

L. W. RIGGS

Relation between the hydrogen-ion concentration of the cerebrospinal fluid,

lymph and blood serum and the thermostable bactericidal action of these fluids. TAKEO SHIMIZU. *Tôhoku Univ. Tôhoku J. Exptl. Med.* 11, 344-65(1928).—Cerebrospinal fluid after being heated at 100° for 30 min. possesses strong bactericidal properties to typhoid bacilli. This action runs roughly parallel to an increase in the p_H , whereby the medium becomes too alk. for the growth of the organism. A continuous development of typhoid bacilli is observed in active or inactive fluids in which the p_H is maintained at the optimum figure by the addn. of KH_2PO_4 . The bactericidal properties of blood serum heated to 60° for 30 min. and of lymph show no relation to p_H changes. L. W. RIGGS

Edema formation. V. Reciprocal relations between the hormone of the thyroid, the hypophysis and the pancreas by the intermediary of water exchange. CHROMATSU SATO. *Tôhoku J. Exptl. Med.* 11, 468-82(1928); cf. *C. A.* 23, 205—Pituitrin in perfusion liquid promotes tissue swelling in normal animals. In athyroidic or hyperthyroidic animals, pituitrin opposes tissue swelling, the opposition being stronger in the latter condition. In perfusion expts. insulin opposes swelling of normal tissue. Under athyroidic or hyperthyroidic conditions insulin promotes tissue swelling. Thus pituitrin and insulin exert opposite actions on the water exchange of tissues. VI. Edema formation in edematous tissue. *Ibid* 482-8.—Edema formation in normal Ringer-perfused thigh preps. of normal, U-poisoned and edematous rabbits was most pronounced in the U-poisoned animals. The increased edema of normal and of edematous animals was nearly the same. L. W. RIGGS

Importance of contemporary estimation of diastase in blood, urine and excrements for the study of the pancreatic physiopathology. F. GALLI. *La diagnosi* 4 (1928); *Zymol. Chim. dei Col. e degli Zuccheri* 3, 104-5(1928).—Among the pancreatic enzymes diastase is the most easy to est. Determination in the gastro-enteric contents or in blood cannot give a sure indication of the altered functions of the pancreas, as the enzymes can be missing in the duodenum juice, or in the excrements for non-pancreatic causes without anatomic or functional alterations. For this reason the investigation has to be conducted simultaneously on the urine, blood and excrements, where the pancreatic juice is discharged. Investigations were made on sane individuals and on individuals affected by illnesses independent of pancreatic affections, affected by renal forms, affected with occlusion of the duct for non-pancreatic causes and affected by pancreatic forms. The diastase estn. in blood and urine was conducted with Wolgemut's colorimetric method as modified by Bettoni (starch digestion), taking as the unit of diastase the quantity of enzyme contained in 1 cc. of non-diluted urine, that can absorb 2 cc. of 1% sol. starch in $\frac{1}{2}$ hr. at 38°. Diastase was estd. in the excrements by Bettoni's method. After convenient diln. of the ext., obtained by centrifuging a suspension of excrements in a 1% NaCl soln., an increase in the amylolytic contents in the blood and urine, and absence or reduction in the excrements, indicate occlusion of the duct, without alteration of the gland. Low diastase values with the 3, absence of indican in the urine, absence of trypsin in the excrements, steatorrhea, are sure signs of damaged function. If to the said symptoms is added a slight increase of diastase there is a lesion of the pancreas with occlusion of the duct. R. SANSONE

Fever caused by hay infusion. ERICH HESSE AND GERT TAUBMANN. Univ. Breslau. *Arch. exptl. Path. Pharm.* 136, 239-56(1928).—A substance possessing the chem. and biol. properties of humic acid may be isolated from hay infusion. Administration of this substance leads to fever and leucopenia, the febrile reaction being central in origin and of the type assocd. with non-sp. stimuli. G. H. S.

H—PHARMACOLOGY

A. N. RICHARDS

Experimental studies of nausea and its pharmacologic control. M. H. FISCHER. Univ. Prag. *Z. ges. exptl. Med.* 61, 609-26(1928).—F. describes a method of testing the protective action of drugs against nausea produced in brief by a standard rotation of the subject. Vasano (Schering-Kahlbaum, Berlin) and Nautisan (Chemosan A.-G. Wien) had a protective effect but Navigan (Chemische Werke A.-G., Grenzbach, Baden) did not. F. L. DUNN

The oral administration of derivatives of chaulmoogra oil in leprosy. N. E. WAYSON AND L. F. BADGER. *Pub. Health Repts.* 43, 2883-4(1928). E. H.

Action of the blood on acetylcholine. G. VIALE AND J. M. SONCINI. *Compt. rend. soc. biol.* 99, 1440(1928).—Perfusion expts. with the isolated toad heart with a mixt. of blood or serum and acetylcholine showed that the acetylcholine was not rendered inactive by being mixed with blood. The technic of Galehr and Plattner, (*cf. C. A.* 22, 2624) is considered defective. L. W. RIGGS

Synergic effects of some of the alkaloids with narcotics. E. ANNAU AND I. SÁRKÁNY. *Magyar Orvosi Arch.* 29, 420-3(1928).—Strychnine, cocaine and quinine increase the narcotic effect of morphine and Mg. No synergism was found between morphine and atropine. L. W. RIGGS

I content of thyroid glands of Uruguayan cattle (GOSLINO, FERRO) 17. The dangers of certain mineral baking powders based on alum (SCHAEFFER, *et al.*) 12.

MCGUIGAN, HUGH ALISTER: A Text-Book of Pharmacology and Therapeutics. Philadelphia: W. B. Saunders Co. 660 pp. \$6.

12—FOODS

F. C. BLANCK AND H. A. LEPPER

Chemistry and food regulation. P. B. DUNBAR. U. S. Dept. Agr., Wash., D. C. *Ind. Eng. Chem.* 20, 1320-2(1928). J. A. KENNEDY

Food control. G. D. ELSDON. Analyst for Lancashire. *Food Manuf.* 3, 541-4 (1928).—The subject is critically examd. from a new angle. After giving reasons why some form of food control is desirable and necessary, E. discusses the question as to whether the present provisions are suitable or adequate. There has been so much controversy over the debatable question of Food Standards that much prejudice has been created by the words themselves. The chief fault which can be found in food-stuffs as sold today is that of misdescription. E. proposes that "Standard Definitions" shall be fixed legally for all classes of foods. J. A. KENNEDY

Chemistry and the dairy industry. GEORGE E. HOLM. Bur. Dairy Ind., Wash., D. C. *Ind. Eng. Chem.* 20, 1312-15(1928).—There is appended a bibliography of 22 references. J. A. KENNEDY

Advances in the milk industry. L. EBERLEIN. *Z. angew. Chem.* 41, 1255-7, 1279-81(1928).—A review. E. J. C.

Dried milk products. LEWIS E. PERSOFF. *Arch. Pediatrics* 45, 681-6(1928).—A concise summary is given of the manuf. of dried milk, the effect of drying upon its nutritive value, the various com. dried milks, and the chem. compn. of modified milk made from them. JOSEPH S. HEPBURN

Foods of the inhabitants of Lebanon (Syria). Lében. Lebneé. P. GUIGUES. *Bull. sci. pharmacol.* 35, 642-8(1928); cf. C. A. 21, 282, 2513.—Lében is milk curdled by a special enzyme. The milk is sterilized by boiling, which also destroys the common enzymes, leaving only the heat-resisting enzymes. After boiling the milk is cooled to 51-53°, when 20 g. of "robb," an enzyme of lében is added to each liter of milk. The probable origin of the first "robb" is discussed. Lében thus prepd. is a jelly. With slow coagulation cream rises to the surface; otherwise it is distributed through the mass. The taste of lében is agreeable and not sour. Lében with bread is the principal N food of the Lebanon mountaineers. From lében is prepd. a kind of cheese known as lebneé and a whey called petit-lait. Analysis of lében gave: d. at 15° 1.036, acidity as lactic acid 1.63%, NH₃ 0.037, solids at 100° 13.77, water 86.23, fat 3.38, casein 4.74, hydrated lactose 3.15, ash 0.69, P₂O₅ 0.25, total N 0.62. In the manuf. of lebneé, 500 g. of lében yielded 396 g. of lebneé and 596 g. of petit-lait. Analysis of lebneé gave: acidity as lactic acid 2.19%, NH₃ 0.088, solids at 100° 27.52, water 72.45, casein 11.89, hydrated lactose 2.46, ash 0.76, P₂O₅ 0.33, total N 1.76. Petit-lait on analysis gave d. 1.029, acidity as lactic acid 1.33%, NH₃ 0.026, solids at 100° 7.33, water 95.6, hydrated lactose 2.46, ash 0.81, P₂O₅ 0.18, Na 0.053, total N 0.066. L. W. RIGGS

Effect of variation in the method of manufacture on the baking quality of dry skim-milk. EMILY GREWE AND GEORGE E. HOLM. Bur. of Dairy Ind. *Cereal Chemistry* 5, 461-9(1928).—Six samples of dry skim-milk with forewarming treatments for 30 min. at 50°, 63°, 73°, 83°, 93° and 100° were used, together with a hard spring (I), a hard winter (II) and a soft winter wheat flour (III). The 3 kinds of flour differed in their reaction to dry skim-milk. The greatest improvement in baking as the result of the use of dry skim-milk was with III. The least improvement was noted with the flour made from II. The range of fermentation time in which doughs give good bread is increased by the use of dry skim-milk. This is a very important factor, as it adds to the ease with which doughs are handled in the bakery. Loaf vol., period of fermentation tolerance, grain, texture and break were used in scoring the bread. In the 3 flours the poorest results in all properties were obtained in the bread containing dry skim-milk that had been subjected to a temp. of 50° for 30 min. previous to changing to the

dry state. The forewarming temp. of 63° gave a slightly better result than that of 50°. There was a marked improvement in the baking quality when the milks had been given one of the 4 higher temps. 73°, 83°, 93° and 100°, but the variation within the latter series was only slight.

L. H. BAILEY

Dairy salt. A. A. RAMSAY. *Agr. Gaz. N. S. Wales* 39, 553-61(1928).—NaCl used in butter manuf. should have uniform particle size, preferably 0.025 to 0.0167 in. in diam., in order to obtain uniform soln. of salt in the butter. The presence of particles of 0.01 to 0.005 in. seems to be undesirable. Brands of salt showing differences in chem. compn. and in size of particle, did not differ in rate of soln., 15 g. of each brand dissolving completely in 100 cc. H₂O in 30 sec. Chem. and mech. analysis are tabulated for several brands of dairy salt sold in N. S. Wales.

K. D. JACOB

Distribution and growth of bacteria in butter. OTTO RAHN AND H. H. BOYSEN. *J. Dairy Sci.* 11, 446-70(1928).

E. H.

The composition of Irish butter. The distribution of the volatile-acid groups among the glycerides of butter fat. PAUL ARUP. *Analyst* 53, 641-4(1928).—When butter fat is allowed to crystallize slowly at 27°, it seps. into liquid and solid portions which can be sepd. by filtration. These portions can be resolved still further by allowing them to crystallize at lower and higher temps., resp. By this treatment 6 different fractions were obtained. Then, to study the distribution of the volatile fatty acid groups among the harder and softer glycerides, the Reichert-Meissl, Polenske and Kirschner values were detd. as well as the m. p. of the fractions of highest m. p. The fractions liquid at 10° yield about 1.5 times as much of sol. volatile acids as the fractions crystd. at 37°. The insol. fatty acids show a similar falling off but to a less degree. In all the fractions, the ratio of the Polenske to the Reichert-Meissl and Kirschner values falls within the range accepted for genuine butters. The various volatile-acid groups appear to be distributed fairly evenly and indicate that there is an impartial distribution of the acid groups among the different glycerides. The mono-olein type predominates in the fraction crystd. at 37° and the di-olein type in the fractions liquid at 10°.

W. T. H.

Longevity of typhoid bacilli in Cheddar cheese. E. M. WADE AND LEWIS SHERE. *Am. J. Public Health* 18, 1480-8(1928).

E. H.

Chemistry and the breakfast-food industry. WILLIS S. HILPERT. Miner Labs., Chicago. *Ind. Eng. Chem.* 20, 1318-19(1928).—The large and important field for research before the chemists today is that of utilization of the waste and by-products of this industry.

J. A. KENNEDY

Chemistry and the baking industry. G. B. MORISON. Am. Inst. Baking, Chicago. *Ind. Eng. Chem.* 20, 1292-4(1928).—Progress report.

J. A. KENNEDY

The service of chemistry to the milling industry. C. O. SWANSON. Kans. St., Agr. Coll., Manhattan. *Ind. Eng. Chem.* 20, 1322-4(1928).—The times demand that the ash, moisture, protein and baking tests shall be performed more rapidly and more accurately. Studies in surface tension are needed.

J. A. KENNEDY

The viscosity of flour suspensions. G. VAN DER LEE. The Novadel Lab., Deventer, Holland. *Cereal Chemistry* 5, 484-5(1928); cf. *C. A.* 22, 1196.—The author refers to a paper by Denham, Watts and Scott-Blair (1928) and points out variations in viscosity nos. found for flour suspensions of the same concn. with different viscometers. He maintains his objections to the applications of the laws of liquids to the flow of flour suspensions, even of low concn.

L. H. BAILEY

Correlation of ash content of wheat and of flour. R. C. SHERWOOD, MINNESOTA STATE TESTING MILL, AND C. H. BAILEY, Univ. of Minnesota. *Cereal Chemistry* 5, 437-44(1928).—Ash content of straight grade flour was found to be positively correlated with the ash content of the wheat from which the flour was milled in 148 samples of wheat representing 3 crops. Coeff. of correlation of these 2 variables, $r = +0.81 \pm 0.02$, is of sufficient magnitude to indicate that a relatively small proportion of the samples failed to correspond to the relationship that has been observed. The correlation ratio in the instance of the same variables $\eta = +0.82$, is so nearly the same as the correlation coeff. as to justify the conclusion that the ratio between the 2 variables is essentially linear. This conclusion is supported by the calcn. of Blakeman's criterion of linearity. When a selected group of wheat samples was taken that represented all the wheats weighing more than 57 and less than 61.1 lb. per bushel, the correlation coeff. of ash in wheat with ash in flour was $r = +0.76 \pm 0.03$. This differs so little from the corresponding value of r resulting from the inclusion of all the wheat samples as to indicate that variations in wt. per bushel occasioned no variations in the relation between ash content of wheat and ash content of flour. Partial correlation of ash content of all the wheat samples and ash content of flour was next computed, with wt. per

bushel held const. The resulting value $wA_{AA} = +0.78$, which again is nearly identical with the coeff. of correlation r detd. in the 2 instances detailed above, further supports the assumption that the ash content of the endosperm varies with the ash content of the entire kernel. Ash content of a highly refined middlings flour was correlated with ash content of the wheat in the same degree as was that of the straight-grade flour. It accordingly appears that the percentage of ash in a flour cannot be used as a measure of the percentage extn. of that flour unless something is known concerning the ash content of the wheat from which the flour is produced.

L. H. BAILEY

Determination of hydrogen-ion concentration of flour-water mixtures. P. HALTON AND E. A. FISHER. Research Assocn. of Brit. Flour-Millers, St. Albans, Eng. *Cereal Chemistry* 5, 445-60(1928).—The electrometric method of detg. H-ion concn. has been shown to be far more reliable than the colorimetric method. The quinhydrone electrode gives results in satisfactory agreement with those obtained by means of the H electrode provided Au or Au-plated electrodes are employed. Quinhydrone with Pt electrodes gives unreliable results, errors in p_H of the order of 0.4 or more not infrequently occurring. Concordant values for H-ion concn. can be obtained with centrifuged exts. and with decantates from suspensions. Filtered exts. generally give slightly low values and suspensions always high values. H-ion concn. of flour exts. increases as the ratio of flour to water increases. The slopes of the concn.- p_H curves are different for different flours and curves for different flours may cross. Hence the H-ion concn. of flour exts. obtained in the conventional way cannot be correlated with the H-ion concns. of the corresponding doughs. The H-ion concn. of flour exts. appears to increase very slightly with increasing time of extn. The apparent buffer action of a flour is widely different from that of a flour ext., the former value varying from $1\frac{1}{2}$ to $3\frac{1}{2}$ times the latter.

L. H. BAILEY

Volume displacement of salt-sugar solutions. EMILY GREWE. Bur. of Dairy Industry, U. S. Dept. Agr. *Cereal Chemistry* 5, 470-2(1928).—A soln. of salt and sugar offers a convenient means of adding these 2 ingredients to the dough mixts. The quantity of water used in this soln. must be known because of its presence as a factor in absorption. A table is given for the concn. ordinarily used in bread making according to the formula reported by Blish (1928). A table is also given for vol. displacement of salt and sugar when solns. for one or more doughs are prepd. at the same time.

L. H. BAILEY

Staling and hydrogen-ion concentration. L. P. KARÁCSONYI. Tech. Univ., Budapest. *Cereal Chemistry* 5, 477-81(1928).—Among the different processes that take place during the staling of bread, the change in acidity is said to play an important part. Acid reaction (Lehmann 1893) is caused by (1) free org. acid, and (2) acid K phosphate, which comes into existence by the interaction of the org. acid resulting from the fermentation of the dough and the neutral phosphates preëxistent in the flour. Other investigators have measured the titratable acidity but K. measured the H-ion concn. electrometrically. Tables are given which show the H-ion concn. of fresh and of stale wheat and rye breads. It is seen from these tables that the acidity does not increase during ordinary keeping at room temp., but either remains const. or shows some decrease. Acidity of stale bread can increase during further keeping, but this can be traced back to the activity of microorganisms.

L. H. BAILEY

The dangers of certain mineral baking powders based on alum, when used for human nutrition. GEORGES SCHAEFFER, G. PONTÈS, E. LE BRETON, CH. OBERLING AND L. THIVOLLE. Univ. of Strasbourg. *J. Hyg.* 28, 92-9(1928).—In female mice fed on alum breads, the diam. of the ovaries was hardly half that of normal controls, and there was an almost total absence of normal follicles. The insol. phosphate may be changed to sol. $AlCl_3$ in the stomach. It is suggested that certain substances not poisons in the usual sense of the word, when absorbed for months or years, can produce physiol. disorders and org. lesions, the etiology of which usually remains unnoticed. Such products are probably responsible for many illnesses.

JOHN T. MYERS

Chemistry and the shortening industry. M. B. GRAFF. *Ind. Eng. Chem.* 20, 1309-12(1928).

J. A. KENNEDY

The cause of deterioration of maize and maize meal. W. L. DAVIES. Univ. Reading. *Fertilizer, Feeding Stuffs and Farm Supplies J.* 13, 784-5(1928).—Excessive moisture is the chief cause of deterioration of maize grain. Sound, air-dry grain contg. not more than 12% H_2O can be kept in good condition for a considerable length of time. Molds, causing rapid deterioration of oil, starch and sugar in the germ of the grain, develop on grains contg. 15% H_2O at normal temps. and with poor conditions of ventilation. Under the same conditions, alcoholic and $AcOH$ fermentations occur when the grain contains 20%, or more, of H_2O . Maize meal deteriorates under the same conditions as

the grain. Meal made from sound grain contg. 12% H_2O can be stored for 4 to 6 months if the H_2O content of the atm. is kept low. K. D. JACOB

Industrial, commercial and manufacturing possibilities of fruit canning and preserving in South Dakota. LOUIS N. CRILL. *Fruit Products J. and Am. Vinegar Ind.* 8, No. 4, 22-3(1928). J. A. KENNEDY

Chemistry and the canning industry. W. D. BIGELOW. Nat. Can. Assoc., Wash., D. C. *Ind. Eng. Chem.* 20, 1286-9(1928).—To this article are appended 80 selected references. J. A. KENNEDY

The canning of peas. F. HIRST. Univ. Bristol Res. Sta., Campden, Glos. *Food Manuf.* 3, 535-40(1928).—This article gives a concise and practical account of modern methods, suitable for England, of canning peas. Ten photographs of various machinery accompany this article. J. A. KENNEDY

Relation of chemistry to the spice industry. JOHN GLASSFORD. *Ind. Eng. Chem.* 20, 1316-7(1928). J. A. KENNEDY

The extraction of apple juices in the manufacture of jelly. CARL R. FELLERS. Mass. Agr. Expt. Sta., *Research Bull.* 15, 218-51(1928).—A 3-yr. investigation showed that Baldwin apples varied but little from yr. to yr. as to chem. compn. of fruit and juice or jelly yields. Long extn. periods destroyed the jellifying power of the pectin and impaired jelly yields and quality. Two short extn. periods at 100° are recommended to obtain max. yields of juice contg. sufficient pectin and acid to give satisfactory yields of high-quality jelly. The best ratio of fruit to water was 3:2 with sliced apples, or 3:3 where chopped or grated apples were used. The yield of jelly per lb. of fruit was greatest when the ratio was 3:4 and least when it was 3:2. Tartaric acid added to the apple-water mix in concns. of 0.2 to 0.4% slightly increased the yield of solids and pectin in the ext. as well as the total jelly yield. Added acid always improved the color and often the flavor and consistency of apple jellies. In short extn. periods, the jelly strength of the jellies increased with the % of pectin present. Apples suitable for jelly should yield approx. 20 oz. of jelly per lb. of fruit. The p_H of the varieties tested was suitable for the formation of good yields of well-flavored jellies. There was a fair degree of correlation between the total titratable acidity and H-ion concn. of apples, apple juice and jelly. The sugar content of apple jellies ranged from 65 to 70% with an av. of 67.5%. Jellies contg. less than 65% sugar were often tough, while those with over 70% were uniformly soft or sirupy. In making jellies from fruit, it was found much more desirable to proportion the sugar to the original wt. of fruit than to an uncertain yield of juice of questionable compn. The detn. of jelly strength by means of the Bloom gelometer gave very concordant results. Brix hydrometer readings on extd. apple juice gave an av. of 0.18% higher than by the Abbé refractometer and 0.15% higher than by the gravimetric detn. of solids in soln. The mean sugar content of the sol. solids in heat extd. apple juice was 76.5%. C. R. FELLERS

Chemistry and the preserve, or jam and jelly industry. C. P. LATHROP. *Ind. Eng. Chem.* 20, 1298-1301(1928).—Progress report in which L. points out the major chem. problems requiring solution. J. A. KENNEDY

What should jelly standards be? JULIAN S. COHEN. *Fruit Products J. and Am. Vinegar Ind.* 8, No. 4, 15(1928). J. A. KENNEDY

Relation of chemistry to the citrus-products industry. C. P. WILSON. Cal. Fruit Growers Exchange, Ontario, Cal. *Ind. Chem. Eng.* 20, 1302-7(1928).—Of all the com. citrus products, *pectin* is the one requiring the most careful attention to every detail of production and use. Some specific problems relating to its production and use are presented. There is a bibliography of 52 references. J. A. KENNEDY

Research in the confectionery industry. H. S. PAINE. U. S. Dept. Agr., Wash., D. C. *Ind. Eng. Chem.* 20, 1325-7(1928).—The field of application of chemistry to devise new types of confections, to obtain suitable consistency and texture, to retard aging, and to design appropriate types of packages has hardly been touched. J. A. K.

Cuban honey. J. FIEBE. *Z. Untersuch. Lebensm.* 55, 460-6(1928).—Analyses of 17 samples are given, together with a list of honey-flowers of Cuba. Honey obtained from near sugar mfg. plants, was shown to contain *artificial invert sugar* by the use of the following method: Five g. of honey is triturated in a mortar with ether (stored over Na). To the ether ext. in a porcelain evapg. dish is added drop by drop a soln. consisting of 1 g. of carefully prepd. pure resorcinol in 100 g. of HCl (sp. gr. 1.19). The soln. of resorcinol must be kept in the dark. Within 1 hr., a permanent cherry-red will appear if artificial invert sugar is present. In pure, natural honeys there is only a rapidly disappearing orange to rose-red color. The latter reaction may occur only on heating. Linden-blossom honey is easily identified by a microscopic examn. for the characteristic pollen grains. C. R. F.

Chemistry and the beverage industry. F. M. BOYLES. Jack Beverages, Brooklyn, N. Y. *Ind. Eng. Chem.* 20, 1289-92(1928).—Progress of the carbonated-beverage industry is discussed. J. A. KENNEDY

Chemistry and the cocoa and chocolate industry. FRANK C. GEPHART. *Ind. Eng. Chem.* 20, 1295-7(1928).—Progress report in which G. points out some of the problems that confront this industry, the soln. of which would do much to stabilize it and further its growth. J. A. KENNEDY

Chemistry and the flavoring-extract industry. BERNARD H. SMITH. *Ind. Eng. Chem.* 20, 1307-9(1928).—Problems that suggest themselves are: (1) Classification of flavoring materials by taste and its relation to odor, (2) further studies of higher esters of anthranilic acid, (3) further studies of acetals, (4) further work on pure vanilla, etc. J. A. KENNEDY

Chemical composition of Philippine fishes. AMADO N. BALAGTAS. Univ. of Philippines. *Philippine Agr.* 17, 253-61(1928).—The compn. of the edible portion of catfish, *Clarias batrachus* Linn.; flounders, *Pseudorhombus neglectus* Bleeker; herring, *Harengula moluccensis* Bleeker; and sardines, *Sardinella longicops* Cuv. et val., resp., was as follows: moisture 76.34, 80.13, 79.36 and 75.29; ash 1.16, 1.56, 1.65 and 1.60; crude fat 4.75, 0.49, 2.45 and 2.61; protein 17.66, 17.42, 16.40 and 19.21; and carbohydrates 0.09, 0.40, 0.14 and 1.29%. Similar analyses as well as additional data for the entire series are given for 33 species of fishes. On the av. nearly 50% of the live wt. is refuse, the percentage of fat varies inversely as the moisture content, carbohydrates, when present at all, are insignificant in amount and about $\frac{1}{4}$ of the wt. of the edible portion is protein. A. L. MEHRING

Woolly finger grass in Bechuanaland. HENRICI. *Farming in South Africa* 3, 711-2(1928).—Droogland grass (*Pennisetum cenchroides*), Rhodes grass (*Chloris gayana*), Guinea grass (*Panicum maximum*), Natal grass (*Pennisetum unisetum*), woolly finger grass (*Digilaria eriantha*), golden millet grass (*Setaria aurea*) and limpopo grass (*Echinochloa pyramidalis*) were grown under the same dry land conditions near Groenkloof, Pretoria. The grasses were allowed to stand uncut and ungrazed until the middle of the winter when they were in a brown and frosted condition. They were then cut and analyzed with the following results: H₂O 7.2, 8.3, 8.0, 7.9, 8.1, 8.0 and 7.0; crude protein 2.2, 3.2, 3.4, 2.6, 4.8, 2.5 and 2.4; ether ext. 2.5, 1.3, 1.2, 1.5, 1.5, 1.2 and 0.9; fiber 30.6, 32.0, 35.1, 39.6, 26.6, 35.1 and 36.8; ash 11.3, 9.5, 10.5, 9.2, 10.7, 9.7 and 10.3; carbohydrates 40.2, 45.7, 42.8, 39.2, 48.3, 43.5 and 42.6%, resp. The figures show that in this stage woolly finger grass is much richer in protein and carbohydrates and lower in fiber than the other grasses, and is a superior grass for winter grazing. The green leaves of woolly finger grass contain 13.4-20.0% crude protein and the brown leaves, after leaching for 5 months, contain 5.4%. The grass also contains higher percentages of P than the other grasses. K. D. JACOB

Digestibility trials on Indian feeding stuffs. Some Punjab hays. P. E. LANDER AND PANDIT LAL CHAND DHARMANI. Punjab Agr. Col., Lyallpur. *Memoirs Dept. Agr. India, Chem. Ser.* 9, 235-46(1928).—This paper gives the results of an investigation on the compn. and feeding value of hays from various districts in the Punjab. The hays were not all cut at the same stages of growth and the results are, therefore, not strictly comparable, but they indicate the importance of a high content of mineral elements. K. D. JACOB

The bacterial content of raw and commercial sugars (JAMES) 28. The identification of coloring matters (HOFMAN) 7. Determination of minute quantities of iodide in the presence of much chloride (KIEFERLE, ERBACHER) 7. A comparison of some properties of normal and frosted wheats (JOHNSON, WHITCOMB) 11D. Studies on nectar in relation to honey production (PARK) 11D. Extracting vitamins from liver (Brit. pat. 289,187) 17. Centrifuging, pasteurizing and degasifying milk (U. S. pat. 1,693,034) 13. Rust-proofing iron and steel [cans for holding foods] (U. S. pat. 1,694,820) 9. Freezing organic liquids (Brit. pat. 288,310) 13. Apparatus for cooling and filtering milk or other liquids (U. S. pat. 1,692,760) 1.

Food Industries (New Journal), Vol. 1, No. 1, Oct., 1928. Published by McGraw-Hill Pub. Co., 10th Ave. at 36th St., New York. Published monthly. Subscription rates \$2.00, domestic, \$3.00 foreign.

Bread. AUGMENTINE SOC. ANON. Brit. 289,060, April 21, 1927. To increase the yield of bread from a given quantity of flour, there is added to the dough a small quantity of an emulsion comprising a neutral fat or paraffin oil, glycerol and water. Details are given of the dough prepn.

Apparatus for cooling milk immediately before entering the transport containers. OTTO M. HANSEN. Fr. 636,757, June 25, 1927.

Apparatus for pasteurizing milk. WM. SANGSTER (to DeLaval Separator Co.). U. S. 1,695,207, Dec. 11.

Apparatus for pasteurizing milk in bulk. WM. SANGSTER (to DeLaval Separator Co.). U. S. 1,694,452, Dec. 11.

Apparatus for pasteurizing and electric treatment of milk. JOHN O. TEMPLETON (to Electropure Corp.). U. S. 1,692,874, Nov. 27.

Apparatus for congealing milk and like products in thin homogeneous layers. HENRI CORBLIN. Fr. 636,692, Oct. 25, 1926.

Apparatus for treating milk by irradiation. THE DRY MILK COMPANY. Fr. 636,749, June 25, 1927.

Vat for treating milk, cheese, etc. CHARLES PAULY. U. S. 1,693,249, Nov. 27. Structural features.

Yoghurt. ALFRED ZIERER (Gustav Winkler, inventor). Ger. 467,710, June 12, 1926. See Brit. 272,468 (C. A. 22, 1814).

Homogeneous emulsified food product containing butter, honey and egg albumin. EDWARD F. BURTON AND JAY H. MONTGOMERY (to Honey-Butter Co.). U. S. 1,694,680, Dec. 11.

Cheese. HERMAN H. KAUFMANN and AUGUST H. KAUFMANN. U. S. 1,694,921, Dec. 11. In making curd cheese, 100 lb. of standard curd is ground to a fluffy mass, approx. 3 lb. of Na phosphate and 25 lb. water are added, the mixt. is heated to about 70° until thoroughly melted, ground cheese 98 lb. is added and thoroughly mixed in, the temp. is then raised to about 65° and the liquid is run into and sealed in foil-lined containers.

Preserving cheese. ELMER E. ELDREDGE (to Kraft-Phenix Cheese Co.). U. S. 1,693,025, Nov. 27. Comminuted cheese is mixed with a small proportion of water-sol. pectin at a temp. not exceeding about 52°, subdivided and introduced into shipping receptacles and then heated in the receptacles to a temp. not materially in excess of 65° while quiescent. U. S. 1,693,026 relates to a generally similar process in which gum tragacanth is added to the cheese.

Vitamin preparations. AAGE W. OWE. Ger. 468,301, Nov. 4, 1924. See Norw. 43,892 (C. A. 22, 4205).

Beverage from apple juice. H. MACKESON. Brit. 289,601, March 9, 1927. A beverage is made from apple juice as described in Brit. 267,236 (C. A. 22, 1211) but without use of malt ext. either before or after fermentation.

Preparing fresh citrus fruits for market. ERNEST M. BROGDEN and MILES L. TROWBRIDGE (to Brogdex Co.). U. S. 1,693,575, Nov. 27. The entire surface of fruits such as citrus fruits, apples or peaches is treated with soap and borax in aq. soln. and in sufficient concn. to inhibit blue mold.

Coating fruits with paraffin or similar protective and preservative agents. ERNEST M. BROGDEN (to Brogdex Co.). U. S. 1,692,286, Nov. 20. A mixt. of paraffin and white medicinal mineral oil or similar coating material is applied in a fluent condition to grapes, oranges, grapefruit or other fruits and the latter are treated with a blast of air. An app. is described. Cf. C. A. 22, 2627.

Dried marmalade. HARVEY L. HULBERT (to Murray Calif. Food Products, Inc.). U. S. 1,692,040, Nov. 20.

Preserving foods such as animal carcasses. P. C. LAVENDER and A. E. SHERMAN. Brit. 289,653, May 24, 1927. Air from a cold-storage chamber is circulated, in a cyclic system, through towers where it is treated with reagents such as a permanganate, HCl, aq. glycerol and CaCl₂. An app. is described.

Cattle food. HARAND ROBINSON (to The Piercy Co.). Can. 284,079, Oct. 16, 1928. Waste vegetable roughage is cut into particles not exceeding 1 in., and reacted on in a moist state and in an alk. medium with approx. 8% of several enzymes of animal origin acting selectively on the protein and starchy materials in the presence of NaHCO₃, 5%, chlorides, bromides or nitrates (such as NaCl) 32%, Ca salts (such as CaCO₃) 36%, malt 15%, anise or other flavoring 4%. The reaction takes several hrs. depending on the concn. of the converter compd., the character of the roughage and the temp. maintained. The reaction is completed by the fact that the starches have been substantially entirely transformed and the resulting material no longer gives evidence of the presence of any untransformed starch.

Food for poultry. B. H. BERTELS. Brit. 289,289, July 11, 1927. A granulated food is made from a mixt. of various ground grains, cereal meals, animal meal, partially expressed oleaginous seeds, nutritive salts and materials contg. vitamins such as cod-liver oil and dried yeast.

13—GENERAL INDUSTRIAL CHEMISTRY

HARLAN S. MINER

- Outlook for the chemical industry. C. C. CONCANNON. *Chemicals* 30, 11, 29 (1928).—An address. E. J. C.
- Pure science and engineering. AUGUSTUS TROWBRIDGE. *Science* 48, 575-9 (1928).—An address. E. H.
- Chemical engineering education and research. W. E. GIBBS. *Ind. Chemist* 4, 443-5(1928). E. H.
- Some engineering problems in the Chemical Warfare Service. AMOS A. FRIES. *J. Western Soc. Engineers* 33, 581-9(1928). E. H.
- The chemical industry in relation to civilization. A. CRESSY MORRISON. *Chem. Markets* 23, 601-2(1928). E. H.
- Chemistry and the railroads. L. R. POWELL, JR. *Bull. Virginia Sect. Am. Chem. Soc.* 6, No. 3, 5-8(1928).—An address. E. H.
- Budgeting expenditures of plants and equipment. J. J. BERLINER. *Chem. Markets* 23, 603-6(1928). E. H.
- The reform of the British patent system. ANON. *Engineering* 126, 622-3(1928); *Nature* 122, 757-61(1928).—A committee rept. E. J. C.
- Insurance viewpoint of health hazards in the chemical industry. WALTER S. PAINE. *Chem. Markets* 23, 598-600(1928). E. H.
- Ethics for the consulting chemist. CLARENCE H. DONOVAN. *Aromatics* 9, No. 11, 21-3(1928). E. H.
- The grinding of materials. Theoretical and experimental researches on particle-size distribution incident to the disintegration process. A. H. M. ANDREASEN. *Kolloidchem. Beihefte* 27, 349-458(1928).—It is emphasized that the character of a disintegrated product is to be considered in detg. the most satisfactory means of disintegration. A single numerical value, e. g., the particle surface-area increase per unit of material, is an insufficient criterion to measure character of product. Particle-size distribution is an essentially better basis for judgment. A critical discussion of accepted research methods is given and a method proposed to give the best results for particle-size distribution detns. consistin_g of the application of sifting, wet elutriating, and sedimentation. A series of related problems is given, the solution of which by mathematical considerations led to the development of a series of ideas in regard to particle size, shape and degree of disintegration. Later a series of functions is defined for use. The relations so derived were then applied to 2 special cases: (1) that the product is evenly graded by weight; (2) that the compound-interest law held for the frequency curve. The exptl. undertakings intended to show that for such typical substances as quartz sand, feldspar, flint, glass, brick, barite and hematite which had been disintegrated by means of such typical mills as rolls, hammer mill, ball mill, etc., the following held: (1) The amt. of material is dependent upon particle size, and not width of mesh, velocity of blow, etc. (2) The accuracy of measurement in the range used held for all sizes. (3) The practical methods would be applicable. It was shown that the usually employed method of sedimentation was excluded for the finer particles. A method consisting of suspension in glycerol contained in a counting cell was developed for the detn. of particle sizes of different fractions. For the water dispersions no electrolyte was used as peptizer for quartz sand, feldspar, glass and flint; Ca citrate was used for brick and barite; and Na arsenite for hematite. A new type of washing and settling chambers with tapered sides was designed which gave good agreement with Stoke's law. The exptl. results are given in tabular and graphic form. In conclusion it was desired to see how well results checked the fundamental considerations: (1) For disintegrated products no general law holds for the particle-size distribution method and material. (2) The particle shape is not dependent upon its size if the same method of disintegration is used. (3) The compd.-interest law did not hold for ball-mill disintegration. (4) Nothing was found that showed the particle shape varied with particle size. A bibliography of 74 references is given. L. F. MAREK

Molding phenolic condensation products [for insulating covering] (U. S. pat. 1,693,327) 18.

SADGER, WALTER LUCIUS AND BAKER, E. M.: *Inorganic Chemical Technology*. New York: McGraw-Hill Book Co., Inc. 228 pp. \$2.50. Received in *J. Western Soc. Eng.* 33, 599(1928).

BALCKE, HANS: *Die Abwärmotechnik*. Vol. II. Munich and Berlin: R. Oldenbourg. 198 pp. M. 11.50. Reviewed in *Mech. Eng.* 50, 882(1928).

CAMMERER, J. S.: *Wirtschaftlichste Isolierstärke bei Wärme- und Kälteschutzanlagen und Wärmeabgabe isolierte Rohre bei unterbrochener Betriebsweise*. Berlin: Industrieverlag von Hernhausen A. G. 90 pp. M. 6. Reviewed in *Ind. Eng. Chem.* 20, 1279(1928).

Chemical Engineering Catalog, 1928. 13th annual edition. New York: The Chemical Catalog Co., Inc. 1107 pp. Price to those technically qualified, \$3 or exchange of previous edition; to others \$10. Reviewed in *Chem. Met. Eng.* 35, 629; *Rubber Age* 24, 205(1928).

RIEGL, EMIL RAYMOND: *Industrial Chemistry. An Introduction*. New York: The Chemical Catalog Co., Inc. 650 pp. \$9. Reviewed in *Ind. Eng. Chem.* 20, 1276(1928).

RIGG, GILBERT: *The Sales Engineer. Some Commercial Aspects of Metallurgical and Chemical Engineering*. London: Mining Publications, Ltd., 10s, net. Reviewed in *Ind. Eng. Chem.* 20, 1277(1928).

THOMAS, EDWARD: *The Law of Chemical Patents*. New York: D. Van Nostrand Co. 358 pp. \$6. Reviewed in *Glass Ind.* 9, 138(1928).

Purification of gases. JEAN HENRY BRÉGEAT. Ger. 467,880, July 25, 1925. Volatile substances are recovered from natural or artificial gas mixts. by washing with terpene derivs. rich in H such as pinene or oil of turpentine or hydrogenated terpene, either alone or with other washing agents.

Purification of gases containing hydrogen sulfide. I. G. FARBENIND. A.-G. (Johann Behrens, inventor). Ger. 466,802, Apr. 30, 1925. The oxidation of H_2S with air or mol. O is effected in presence of powd. active charcoal mechanically suspended in the gas.

Removing dust from gases. LÉON L. BEURRIER. Fr. 639,090, Aug. 5, 1927. In a "cyclone" dust separator in which the gas is submitted to centrifugal action in the space between two tubes, one tube is made to touch the other and one is rotatable about the axis of the inner tube.

Desulfurizing gases. PAUL G. GRENÉ. Fr. 636,684, Aug. 31, 1926. Gaseous mixts. are desulfurized by metallic dioxides which are found sufficiently pure as ores to be used directly, such as dioxides of Mn or Sn.

Storing gases under pressure. CHRISTIAN W. P. HEYLANDT. Fr. 639,614, Aug. 17, 1927. See Brit. 271,692 (C. A. 22, 1637).

Separating constituents of air by liquefaction. ROBERT G. AUBERT. Swiss 126,482, Apr. 9, 1927. To avoid explosions in air-liquefying and N-distg. app., the combustible gases or vapors in the air are sepd. in solid state from the liquid air, suitably by filtration, at a point prior to the O-collecting zone.

Liquid air. ROBERT G. AUBERT. Fr. 639,702, Jan. 24, 1927. Explosions in liquefaction app. for liquid air are prevented, by leaving in the air until liquefaction, gases such as acetylene or its homologs which can be sepd. as solids from the liquid air before it reaches the O-collecting app.

Aerated liquids. BRITISH DVESTUFFS CORPORATION, LTD., AND CECIL HOLLINS AND ERNEST CHAPMAN. Fr. 639,558, Aug. 16, 1927. Sulfonic acids of high mol. weight having wetting or dispersing properties are added to water or beverages to be aerated with CO_2 , or to sirups to be added to beverages.

Filtering. MARCEL KOEHLER. Fr. 639,445, Jan. 24, 1927. Filtering surfaces, particularly for lubricating oil, comprise a permeable support, the pores of which are filled with a substance by adsorption and are then reduced in size.

System of magnetic separation of materials. JAMES L. HOPE (to Ding's Magnetic Separator Co.). U. S. 1,693,033, Nov. 27.

Evaporating liquids to recover crystallizable residues. HENRY W. CARR. U. S. 1,694,841, Dec. 11. Residues such as those of brines are dropped upon a hot bed of previously prepd. residues of like character to those to be recovered, maintained at a temp. sufficient to evap. liquid present. An app. is described.

Freezing organic liquids. B. TSROVITSCH. Brit. 288,310, April 8, 1927. Solns. of biocolloids such as fruit and plant juices, medicinal toxins, beer, milk and cream are rapidly frozen into amorphous condition by spraying into a freezing chamber.

Centrifuging, pasteurizing and degasifying milk or other liquids. AAGE JENSEN. U. S. 1,693,034, Nov. 27. An app. is described.

Purifying camphor and similar volatile substances. EVARTS G. LOOMIS. U. S. 1,693,243, Nov. 27. The material is reduced to a liquid form and a current of air, N,

CO₂ or other suitable gas below the b. p. of the camphor (or other material being treated) is forced upon the surface of the material so as to become satd. with the vapor and is then led to a condensing chamber where the product condenses and coalesces. An app. is described.

Product for absorbing vapors from volatile solvents. SOC. INTERNATIONALE DES PROCÉDÉS PRUDHOMME HOUDRY. Fr. 636,645, Oct. 20, 1926. The product obtained from the hydrogenation of light oils from gas-works or coke-plant tar with or without a fractionation to remove light or heavy components is used to absorb vapors of volatile solvents such as ethers, alcs., acetones or to absorb light hydrocarbons.

Crystallization. CHEMISCHE FABRIK GROSS-WEISSANDT G. M. B. H. and PAUL SEIDLER. Ger. 467,788, Nov. 15, 1927. Addn. to 463,184. Large crystals, e. g., of NH₄Cl, are obtained by adding dried exts. of wood, ligneous material or plants to the soln.

Crystallization. GES. FÜR LINDE'S EISMASCHINEN A.-G. Ger. 467,233, Dec. 4, 1923. Addn. to Ger. 413,819. Salts and like substances are sepd. by adding a super-cooled liquid to the mother liquor.

Emulsion. G. STADNIKOFF, ROBERT KLASSON and VICTOR KIRPITSCHNIKOFF. Ger. 468,135, Oct. 23, 1924. The clearing velocity of emulsions is accelerated by the stirring in of coagulated peat or like colloidal substance. Thus, pptd. CdS after treatment with H₂S water forms a colloidal suspension which settles much more rapidly after addn. of coagulated peat. Other examples are given.

Emulsions. RUDOLF AUERBACH. Fr. 639,245, Aug. 9, 1927. A liquid such as water, milk or aq. solns. of salts or acids is emulsified in an insulating liquid such as paraffin oil, linseed oil, etc., by a direct or induced elec. charge.

Colloidal substances. MINERAL A.-G. Swiss 126,190, Nov. 10, 1925. The material to be subdivided is finely ground and mech. colloidalized in presence of a liquid, the non-colloidal particles are sepd. by centrifuging, and the colloidal product is then sepd. by centrifuging at a higher speed or by ultra-filtration or osmosis. A protective colloid may be added during the first colloidalization and rendered inactive again prior to sepg. the colloid. Examples are given of the prepn. of *colloidal ocher* and of the sepn. of *colloidal CaCO₃* from siliceous limestone.

Dispersion of solids. PIERRE G. M. A. FIGACHE. Fr. 639,069, June 27, 1927. Solid bodies such as dyes, catalysts or reagents normally insol. are dispersed by grinding, malaxing, etc., with hydrosol colloids swollen or dispersed in an aq. medium.

Measuring temperature. ALFRED ROBERT MEYER, MARCELLO PIVANI and WERNER VON SIEMENS. Ger. 468,151, Apr. 22, 1926. Change of temp. in a gas-filled room is measured by variation in elec. cond.

Measuring the temperature of gases. KAISER-WILHELM-INSTITUT FÜR EISENFORSCHUNG (Hermann Schmidt, inventor). Ger. 468,128, July 17, 1926. The heat es are compensated for by elec. heating.

Effecting chemical reactions at high temperature. GOTTFRIED TRÜMLER. Swiss 126,493, May 1, 1927. The reaction mixt. is placed in a drum which is rapidly rotated so that the mixt. is spread out on the inner surface of the drum. The mixt. may be heated by passing hot gases through the drum, or the drum may be elec. heated externally or may have perforated internal walls which may act as electrodes.

Drying substances at a low temperature. MARIUS M. C. GUILBAUD. Fr. 636,610, . 16, 1926. Substances which are affected by heat are dried by steam at low pressure rising from a vacuum evaporator. The substance may be caused to travel in a cascade.

High-tension electric cables. FELTON & GUILLEAUME CARLSWERK A.-G. Brit. 3,284, April 7, 1927. To reduce transformer current losses, the Pb sheathing or noring of a high-tension cable is divided into sections insulated from each other suitably protected against moisture by a covering of tarred jute or asphalt-treated er, and are insulated from earth throughout their length by a covering of gutta sha, bitumen, rubber or the like.

Operating producers or shaft furnaces. JAMES W. REBER (to Woodall-Duckham P), Ltd.). U. S. 1,692,572, Nov. 20. In operating a producer or shaft furnace a jacket comprising 2 superposed sections with blast nozzles extending through ver section, water is supplied under high pressure to the upper section of the jacket under low pressure to the lower section of the jacket, which serves to facilitate -tion and operation.

ating apparatus of the absorption type. GUNNAR ROOS. U. S. 1,692,053,

; system of the absorption type. HERVEY S. VASSAR. U. S. 1,693,357,

Refrigerating system of the absorption type. CARL G. MUNTERS (to Electrolux Servel Corp.). U. S. 1,693,553, Nov. 27.

Refrigerating system of the reversing absorption type. A. SCHICKLER. Brit. 288,738, Jan. 17, 1927.

Refrigerating apparatus of the compression type. T. ZEMANN. Brit. 289,088, April 22, 1927.

Refrigerating apparatus of the compression type. ALFRED M. THOMSON (to Joseph Mercadante). U. S. 1,694,630, Dec. 11.

Refrigerating apparatus of the compression type. G. ZWICKY. Brit. 288,611, April 13, 1927. Structural features.

Packing material for compressors of refrigerating apparatus, etc. H. A. FRASER, W. L. PRICE and J. HETHERINGTON. Brit. 289,365, Jan. 12, 1928. A mixt. of grease, graphite and Hg.

Refrigerating apparatus precipitating sodium nitrate from solution, etc. CHARLES L. BURDICK (to Guggenheim Bros.). U. S. 1,694,369, Dec. 11.

Safety plug (fusible in case of fire) for permitting escape (without explosion) of volatile substances used in refrigerating systems. R. S. TAYLOR (to Electrolux, Ltd.). Brit. 289,064, April 21, 1927.

Heat insulator. SOCIÉTÉ DES ÉTABLISSEMENTS WANNER, S. A. Fr. 636,957, July 4, 1927. A heat-insulating material for pipes or other objects is made from powd. or granulated ashes, infusorial earth, clay and asbestos.

Electrical or heat insulation, etc. C. ZARFEL and W. D. STROEVER. Brit. 289,676, July 14, 1927. Waste tan bark or the bark of coniferae and foliage trees is boiled for 2-3 hrs. in a closed vessel contg. a 3-4% soda soln., sepd., rinsed with water, ground and molded. Pulp fibers may be added for reducing the hardness of the product.

Heat insulation for refrigerators, etc., formed of synthetic resin strips, cork and sheet metal. J. L. KNIGHT (to British Thomson-Houston Co., Ltd.). Brit. 288,576, April 12, 1927. Structural features.

Heat insulation of vacuum-walled receptacles. WM. D. COOLIDGE (to General Electric Co.). U. S. 1,694,967, Dec. 11. The evacuated jacket contains a filling of finely divided solid material such as lampblack and P_2O_5 , at least part of which has a strong affinity for water so that detrimental absorption of water by the material is prevented.

Mica insulation. J. M. COFFEY (to Mica Insulator Co.). Brit. 288,260, April 5, 1927. Mica flakes are agglomerated by a condensation product of glycerol and phenol or its homologs (which may be used in alc. soln.). Details of manuf. and use of the condensation product are given. Cf. C. A. 22, 4187.

14—WATER, SEWAGE AND SANITATION

EDWARD BARTOW

Water problems in Morocco. EDMOND BOUCHV. *L'eau* 21, 121-2(1928).—Because of the arid nature of Morocco the sanitary engineering problems are quite different from those in France. The use of large reservoirs and very long pipe lines are necessary. Great progress on water engineering projects now under way is reported.

C. R. F.

Hydrogen-ion control in water softening. JOHN R. BAYLIS. Dept. Publ. Works, Chicago. *Ind. Eng. Chem.* 20, 1191-4(1928).—Knowledge of p_H of water through the different stages of the softening process enables the most efficient results to be obtained in a plant where lime is used for softening. The approx. satn. equilibria of $CaCO_3$ and $MgCO_3$ have been established. The concn. of $MgCO_3$ at satn. equil. is much higher than $CaCO_3$ for a given p_H . Most natural waters contain some $MgCO_3$ and this throws the satn. equil. somewhat higher than the curve for $CaCO_3$. Mg begins to ppt. as the hydroxide when the p_H is increased above 10.3. When Mg occurs largely as carbonate it can be reduced to about 3 p. p. m. of Mg by increasing the p_H to about 10.8 with $Ca(OH)_2$. The max. softening possible for waters contg. both $CaCO_3$ and $MgCO_3$ is to add lime until the p_H is about 10.8 and then ppt. the Ca by converting it to carbonate. It is better to recarbonate at 2 or 3 stages of the process than to attempt to recarbonate at only 1 point.

J. A. KENNEDY

Developments in water softening. CHARLES P. HOOVER. *J. Am. Water Works Asscn.* 20, 642-54(1928); cf. C. A. 22, 3941.—An interesting résumé covering the handling of chemicals and their applications to water as well as mixing or agitating by

baffled tanks or mech. agitators. The use of clarifiers is considered. Improvement in softening procedure is discussed and in that connection re-carbonation is discussed at some length.

D. K. FRENCH

Manganese in the Croton water of New York City. FRANK E. HALE. *J. Am. Water Works Assocn.* 20, 661-70(1928).—Troubles due to Mn in water from Croton Lake are described. The use of an intervening reservoir for sedimentation is a temporary solution.

D. K. FRENCH

Zeolite softening. JAMES FITZGERALD. *Textile Colorist* 50, 759-60(1928).—General.

RUBY K. WORNER

Phototurbidimeter in the determination of water turbidity. Atilio A. Bado and Rogelio A. Trelles. *J. Am. Water Works Assocn.* 20, 674-6(1928).—This app. is described as to construction and operation. It is claimed to show directly turbidities up to 100.

D. K. FRENCH

Oxygen-consumed determination. GEORGE W. BURKE. *J. Am. Water Works Assocn.* 20, 677-83(1928).—To decrease inaccuracy it is recommended that 25 cc. KMnO_4 soln. be used. Oxalic acid is preferred to its salts.

D. K. FRENCH

Filter-plant loadings. H. W. STREETER. *Proc. 10th Texas Water Works School*, Jan., 85-8(1928); *U. S. Pub. Health Repts.* 43, 3102(1928).—A survey showed that av. well-designed and operated rapid sand filter plants in the Ohio River Basin could produce a final chlorinated water which would meet the requirements of the Treasury Department Standards, if the raw water *B. coli* index is not over 5000 per 100 cc., while in the Great Lakes region, 2000 per 100 cc. is the limit for water to be purified to meet these standards. Raw water of the Ohio River type cannot be treated consistently so as to produce an unchlorinated effluent meeting the standard if the *B. coli* content of the raw water exceeds 60 to 100 per cc., while with lake waters the limit appears to fall somewhere less than 10 per 100 cc. To increase the bacterial efficiency of the plants a no. of possibilities for plant elaboration are suggested: (a) long-time preliminary storage prior to its delivery for treatment; (b) double-stage preliminary sedimentation, aided in some instances by two-stage coagulation; (c) double filtration; and (d) double chlorination, including prechlorination of the raw water. Excess lime treatment is also suggested where feasible. Tests at 5 Ohio River plants and at Cincinnati exptl. plant indicate that plants elaborated to include (b) with a *B. coli* index ranging as high as 50,000 per 100 cc. in the raw water will produce a standard chlorinated effluent. Results from (d), although not as good as those from (b), are sufficient to increase the permissible bacterial pollution of raw water two-fold as measured in *B. coli* index. All observations were made in summer and autumn.

C. R. F.

Elimination of false presumptive tests. A. C. JANZIG AND I. A. MONTANK. *J. Am. Water Works Assocn.* 20, 684-95(1928).—By proper control of the H-ion concn. of lactose broth the no. of false presumptive tests can greatly be reduced.

D. K. F.

Cast-iron service pipe. WM. W. HURLBUT. *J. Am. Water Works Assocn.* 20, 595-607(1928).—The advantages of such pipe from the standpoint of service, durability and cost are stated and the method of connecting is outlined. A free discussion brings out many addnl. points.

D. K. FRENCH

Dead ends. S. B. MORRIS. *J. Am. Water Works Assocn.* 20, 608-14(1928).—The problem is largely of taste and odor due to bacterial action under conditions where such action is not interfered with. This action does not seem to affect the corrosiveness of a water, though corrosion from electrolysis is sometimes increased. In general, dead ends are not desirable.

D. K. FRENCH

Acid mine drainage in Western Pennsylvania. R. D. LEITCH. *Bur. Mines, Repts. of Investigations* No. 2889, 18 pp., 2 figs., 10 tables (1928).—A stream in each a low-S and a high-S district was investigated. Workings are mainly drift mines. In the low-S district an av. of 4.5 tons of H_2O is discharged per ton of coal in a normal dry season with a variation from 0 to 22 tons. In the high-S district the vol. varies from 1.7 to more than 3.5, depending on production. Data were taken for 2 wet fall seasons in each and for 1 dry summer in the low-S district. Total acidity is reported at boiling temp. In the low-S district above the mines the p_{H} is 6.4-6.8, although, the water is alk. at boiling temp. Tabulated values from the low-S district show total acidity as high as 14,484 p. p. m. with 400-500 p. p. m. common. Cold acidity is considerably less and free acidity varies up to over 500 p. p. m. Some samples were alk. The p_{H} of 17 out of 24 mines was less than 3.2 at some period during the investigation. Few values were over 5.0. In the high-S district total acidity reached 8221 p. p. m., and free acidity varied from 0 to 684 p. p. m. with 4 out of 14 samples alk. The p_{H} of 5 out of 7 mines was less than 3.2. Drippers were in general alk. with a p_{H} of 4.6-9.0. Many faces of entries in the low-S district were less than p_{H} 3.2; in the high-S district only

a few were under 5.0. Abandoned sections in the low-S district were somewhat higher than the operating mine; in the high-S district every sample was highly acid, many total acidities in the thousands with free acidities of 87-1715, every p_H less than 3.2. Typical total acidities follow:

Mine	Type	Active sections	Abandoned sections
1	Low S	..	458
2	Low S	673	840
4	Low S	217	464
7	Low S	..	595
13	Low S	..	512
15	Low S	2325	5985
17	Low S	..	6
18	Low S	55	..
21	Low S	547	1090
27	High S	..	5054
28	High S	1645	4760
29	High S	24	1400

Material outside the mine liberates the most acid and it is suggested that less damage would be done if this were sealed off in dry sections of the mine. There is no marked difference in acidity from mines having a limestone floor. Some active mines do not have acid water. Crystals of ferrous and ferric sulfate accumulate in some abandoned workings. Water from high-S coal is more acid than that from low-S coal. Abandoned mines give highly acid water for many years, some for 35 years. During flood periods mine water is negligible; during low water it may constitute almost all of the stream. Recovery of a stream rendered acid by mine drainage may be by neutralization or by dilution. As a chem. treatment neutralization with lime or limestone followed by 4-5 hrs.' sedimentation is feasible. Sludge disposal by drum drying is used in one plant. Such individual installations would be too expensive for most mines. Experience shows that if abandoned workings were sealed to keep air out, water from those mines would become pure more quickly. There is little doubt that chemically and mechanically the problem can be solved. The final problem is one of economics. F. D. S.

Modern views on the formation and prevention of incrustations in boilers. ROBERT STUMPER. *Bull. soc. chim. Belg.* 37, cv-cxii(1928).—A survey. ALBERT L. HENNE

Power-plant efficiency increased by application of chemistry. H. C. DINGER. U. S. Naval Acad., Annapolis. *Power* 68, 714-6(1928).—A general discussion of feed-water treatment, protective coatings and deaeration. D. B. DILL

The chlorination of raw sewage for odor control. JAMES L. BARRON AND R. E. LAWRENCE. Univ. Kan., *Eng. Bull.* 16, 29, No. 3, 1-28(1928); *U. S. Public Health Eng. Abs.* E-660b, 62(1928).—In sewage-treatment plants the sprinkling filters usually release the H_2S , thus causing odors. Important factors in the reduction of sulfates to H_2S are: (1) conditions of flow previous to the sprinkling operation, permitting bacterial growth; (2) the septicization of fluid and accumulation of dissolved gases. The most practical means of preventing odors is to prevent the growth of H_2S organisms. Cl does this and also combines with any H_2S that may be present. The quantity of Cl needed in various expts. was greatly reduced by making changes in the tanks which kept the sewage moving and avoided dead spaces. Taking advantage of weather conditions permitted savings in Cl to be made on days when the wind carried the odors away from the city or during rainy weather when the sewage became diluted. Excellent results could be obtained when residual Cl was present in the tank influent although none was present in the effluent. The usual quantity added to the influent for dry weather flow was 10 p. p. m. In one expt. the construction of suitable baffles made the addn. of Cl unnecessary to control odors. C. R. F.

Sewage-treatment plant at the Grand Canyon National Park. H. B. HOMMON. U. S. Pub. Health Service, Wash. *U. S. Public Health Repts.* 43, 2583-98(1928).—Water is brought to the Park by railroad from Flagstaff, Ariz., a distance of 100 miles at a cost of \$3.09 per 1000 gals. In order to conserve this water a specially designed sewage-treatment plant was built and operated for approx. a year and is still in operation. The activated-sludge process with rapid sand filters and Cl sterilization of effluent was utilized. At first laundry waste was purified separately by pptn. with 25 gr. per gal. but finally the sewage plant absorbed it without difficulty. The recovery of water as purified effluent was 99%. The effluent was used for locomotive boilers, flushing toilets, cooling engines, irrigation of lawns and for washing automobiles with excellent results,

It is economically practicable to reclaim sewage for industrial purposes and to use this sewage, after sterilization, in crop irrigation. For large sewage-disposal installation the cost per acre-ft. for sterilizing a well-oxidized effluent is approx. 60c. In small treatment plants where cylinders of Cl are used, the cost may reach \$1.20 per acre-ft. The principles involved are of great interest in arid communities. C. R. F.

Note on the composition of the air in Paris. D. FLORENTIN. *Municip. Chem. Lab., Paris. Tech. Sanit. Munic.* 23, 172-5(1928).—See C. A. 22, 1069. C. R. F.

Removing water vapor from agitation air. M. F. KNOV. *Power* 68, 923-4(1928).—Air used for agitation in the raw-water ice plant may be dried by (1) cooling to a temp. below that of the freezing tank, (2) treatment with a hygroscopic chemical, or (3) cooling under pressure nearly to tank temp. and then expanding. The last method is most commonly used. D. B. DILL

Studies on the use of deratisation gas for ships. AKIRA MOTOMURA. *J. Pub. Health Assocn. (Japan)* 4, No. 7, 1-9(1928); *U. S. Pub. Health Eng. Abs.* E-660b, 11 (1928).—The germicidal power of SO_2 was detd. by exposing both moist and dry silk threads which had been cultured with *B. coli*. Both moist and dry threads were exposed simultaneously to varying concns. of SO_2 . Two lb. of S burned per 1000 cu. ft. of area did not affect *B. coli*. Five lb. of S sterilized the moist threads only, with no effect upon the dry threads. At this concn. there was injury to cargo and metal parts of the ship. The bacteria should be destroyed by means other than S fumigation, which is recommended merely for deratisation. A summary of 6 yrs.' work on ship fumigation by S is given. C. R. F.

Present tendencies regarding disinfection. E. C. FARR. *Munic. Eng. Sanit. Record* 81, 333(1928). C. H. BADGER

Progress report on cannery waste treatment studies conducted by the Ohio Canners' Association at Canal Winchester, Ohio, Aug. 24 to Oct. 8, 1926, and Association of New York State Canners, Inc., at Albion, N. Y., Aug. 9 to Oct. 25, 1927. Under supervision of A. ELLIOTT KIMBERLEY. Ohio State Dept. Health, Columbus, Ohio. 85 pp. (cf. C. A. 22, 656).—An illustrated report with diagrams describing the test treatments given wastes from the canning of corn, lima beans, succotash, green beans and tomato products. Numerous tables show operating data, results of screening and chem. pptn. tests and compn. of the screened raw wastes and their effluents. The cannery wastes proper were sepd. from the cooling and condensing waters and domestic sewage. Screenings and silage liquors were carried away. Concd. wastes as dried bean soak and blancher liquors are probably best disposed of in this manner. Mech. operated screens having openings of about 0.010 in., with proper control of the rate of flow, seem most effective for screening. After fine screening, filtering on lath (cypress) or coarse limestone filters, inoculated with sewage bacteria, at the rate of 2 million gal. per acre per day gave effluents requiring limited diln. for corn, lima-bean, succotash and green-bean wastes. With tomato products a short sedimentation period is necessary before filtering to prevent clogging, because of the excessive finely divided matter passing the screens. This effluent requires a 4-fold diln. Sand filters were also found effective but because of costs are probably only suitable for small plants. Successful chem. pptn. methods using lime and Na aluminate (2.8 and 17.5 grains (65% CaO) per gal. resp.) for tomato-products wastes are described. The use of 15 or 20 grains $Al_2(SO_4)_3$ with or without 5 and 8 grains Na_2CO_3 per gal. produced after 2 hrs.' sedimentation clear but highly putrescible effluents with raw screened wastes from corn, lima beans and succotash. 46 p. p. m. Cl applied to screened corn, lima bean and succotash wastes did not retard fermentation although the Cl-demand figures were 31, 20 and 10 p. p. m., resp. It was recommended that the National Canners' Assocn. continue the studies on other packs. C. H. BADGER

Apparatus for purifying waters by separating solids according to their density. LUCIEN LINDEN. *Fr.* 639,481, Aug. 12, 1927.

Apparatus for softening water with base-exchange material. OSCAR W. JOHNSON (to Ward-Love Pump Corp.). *U. S.* 1,692,939, Nov. 27.

Apparatus for softening water with base-exchange substances. UNITED WATER SOFTENERS, LTD., and E. B. HIGGINS. *Brit.* 289,112, Dec. 15, 1926. Numerous structural details are described.

Apparatus for softening water by use of zeolites, etc. EDWARD T. TURNER. *U. S.* 1,694,804, Dec. 11.

Apparatus for softening water with zeolitic substances. W. NEUMANN (H. Baron). *Brit.* 288,660, Nov. 5, 1926.

Preparing natural zeolite for use in water softening. MARTIN F. NEWMAN (to

Wm. B. Scaife & Sons Co.). U. S. 1,693,284, Nov. 27. Natural silicates such as greensand marl and glauconite are washed and treated with superheated steam at a temp. of not less than about 315°. Borax or $\text{Al}_2(\text{SO}_4)_3$ also may be used.

Liquid injector or ejector nozzle suitable for use in water-softening apparatus. CHARLES A. STICKNEY (to Stickney Hydraulic Co.). U. S. 1,692,592, Nov. 20.

Water-softening agent. GEORGE L. BORROWMAN (to Wayne Co. to The Permutit Co.). Can. 284,455, Oct. 30, 1928. Glauconite is heated to 200–400° and then allowed to cool. The baked glauconite is first washed with water and then treated with salt brine. After rinsing it is ready for use as a water-softening agent. It can be regenerated by salt brine.

Water-softening agent. ARTHUR C. SPENCER (to The Permutit Co.). Can. 284,454, Oct. 30, 1928. Native greensand is washed and purified to free it from sol. matter and mechanical impurities such as clay. This greensand is then used for purifying hard water. When the activity of the material has diminished it can be revived by brine or common salt soln.

Automatic apparatus for softening water by use of zeolites, etc. HARRY A. TOULMIN, JR. (to Duro Co.). U. S. 1,694,457, Dec. 11.

Soft water. ARTHUR ROSENHEIM. Ger. 466,259, Feb. 23, 1926. Glauconite is recovered from softened water by 5% (or less) solns. of NaCl.

Neutralizing the alkalinity of water. ALFRED H. WHITE. U. S. 1,693,065, Nov. 27. In order to render alk. water suitable for use in boilers it is treated with a quantity of H_3PO_4 sufficient to adjust its final acidity after reaction and removal of its CO_2 content, to a proportion not in excess of 0.5%. U. S. 1,693,066 specifies prepg. water for use in steam boilers by adding H_3PO_4 sufficient to form insol. phosphates with the Ca, Mg and Fe carbonates in soln. and sufficient Na phosphate to form insol. phosphates with the other Ca, Mg and Fe salts in soln., the addns. being made in such proportions as to effect substantial neutralization of the water after the CO_2 has been removed from soln.

Filter for water. CHARLES P. EISENHAUER (to Duro Co.). U. S. 1,694,467, Dec. 11. Structural features.

Regeneration of a filter for softening water. PERMUTIT A.-G. Ger. 468,344, May 18, 1927. Addn. to Ger. 458,017. A funnel contg. exactly one or more times the vol. of the filter is used for introducing the purifying and washing fluids.

Regeneration of filtering material. KARL HUFSCHMIDT. Fr. 636,940, July 2, 1927. Filtering material such as *permutite for softening water* is regenerated by a soln. of NaCl, which flows through the material in a permanent cycle. Sprinklers for the NaCl soln. are arranged in tiers through the material, which also serve for introducing the water to be filtered.

Apparatus for controlling the feed of water into boilers, etc. RICHARD G. JONES. U. S. 1,694,621, Dec. 11.

Preventing scale. JOHANN BILLWILLER. Fr. 639,856, Aug. 20, 1927. Scale is removed or prevented by adding oxidized or polymerized resinic acids, such as abietic, pimaric or guaiaconic acid or resinic acid contg. water obtained by sapon. with alkalis or carbonates and pptn. with an acid, to the feed water, with or without gum arabic, glycerol or gummy substances. Cf. C. A. 22, 3010.

Electrode and associated connections for preventing incrustation in boilers, condensers, etc. J. G. BARBER. Brit. 289,586, Feb. 16, 1927. Structural features.

Apparatus for supplying disincrustants, etc., to steam boilers. J. R. BOWICK and J. M. BOWICK. Brit. 288,710, Jan. 11, 1927. A modification of the app. described in Brit. 253,194 (C. A. 21, 2403).

Preventing rust formation in water systems. RALPH A. SEALEY. U. S. 1,692,706, Nov. 20. Various structural details are specified of a water-supply system in which water is heated and to the supply line of which is connected a receptacle for material adapted to check rust formation in the system.

Protecting iron water pipes. CHRISTIAN BÜCHER. Swiss 126,205, Oct. 4, 1926. Iron water pipes are preserved from attack by treating the water with sufficient $\text{Ca}(\text{OH})_2$ to unite with all the CO_2 and to render the water neutral or alk.

Septic tank. JOHN P. THURELL. U. S. 1,695,217, Dec. 11.

Heatable sludge-digestion chamber for sewage treatment. KARL IMHOFF. U. S. 1,692,446, Nov. 20.

Apparatus for disintegrating sewage before discharge into the sea, etc. PULSOMETER ENGINEERING CO., LTD., AND J. BJÖRNSTAD. Brit. 288,814, April 11, 1927.

15—SOILS, FERTILIZERS AND AGRICULTURAL POISONS

J. J. SKINNER

Soil research activities in 1927. N. M. COMBER. Univ. Leeds. *Agr. Progress* 5, 9-20(1928).—This paper reviews some of the important work done in 1927 on soil acidity, org. matter in soils and other phases of soil research. K. D. JACOB

An acidity survey of the soils of two parishes in Berwickshire. W. G. OGG AND W. T. DOW. *Scottish J. Agr.* 11, 273-86(1928). K. D. JACOB

The soils of Shropshire. W. MORLEY DAVIES. *Agr. Progress* 5, 50-6(1928).—The different types of soil are briefly discussed and chem. and mech. analyses are tabulated. K. D. JACOB

A comparative study of the methods of preparation of the soil for mechanical analysis with a note on the pipet method. AMAR NATH PURI AND BHAILAL M. AMIN. Agr. Research Inst., Pusa, *Bull.* 175, 15 pp.(1928).—Results obtained on several types of soil indicate that treatment with dil. HCl is necessary to obtain max. dispersion. Treatment with H₂O₂ (Official English method) or hot 0.2 N HCl (Hissink's method) is not necessary. Treatment with 0.05 N HCl is less drastic and is effective in giving max. dispersion. Results obtained by other methods, with and without the use of chemicals, are tabulated. An improved form of pipetting app. for the mech. analysis of soils is described and the various sources of error are discussed. K. D. J.

The phosphoric acid requirements of Czechoslovakian soils. E. G. DOERRELL. *Superphosphate* 1, 128-32(1928).—A large no. of soil samples from estates in Czechoslovakia were examd. for acidity and lime and P₂O₅ requirements. Of these soils, 2% were below p_H 5, 12% p_H 5-6, 14% p_H 6-7, 57% p_H 7-8 and 15% p_H 8-9. There was a fairly definite relation between the p_H values of the soils and their interchange acidity as detd. by Kappen's method. Eighteen % of the soils of large estates contained sufficient readily assimilable P₂O₅, as detd. by the Neubauer and Lemmerman methods, while 82% required P₂O₅ fertilization. In general, the subsoil was more in need of P₂O₅ than the surface soil. K. D. JACOB

Studies on iodine as a biogenous element. XVII. Studies on the ability of soils to split off iodine. K. SCHARRER AND J. SCHWAIBOLD. Tech. Hochschule, München. *Biochem. Z.* 200, 258-72(1928); cf. *C. A.* 22, 4547.—An examn. was made with a variety of soils. Mineral soils with an acid reaction had great ability to split off I, while those of neutral or alk. reaction were relatively inactive in this respect. Of the former loam soils were more active than sandy soil of the same degree of acidity. Heating the soil to 100° or sterilization destroyed this ability to split off I. On the contrary, incineration of the soil to const. wt. resulted in an increased ability, several times as great as the original. Likewise an increased activity followed preliminary treatment with phenol or AlCl₃. Furthermore, an alk. soil which did not split off I did so to an appreciable degree after it has been boiled with HCl and has acquired an acid reaction. Ultra-violet radiation had only a slight influence. In a certain sense the H₂O₂-splitting property of the soil is reciprocal to the I-splitting capacity, the latter being greater the more below p_H 7.0 the soil reaction is and the greater its content in colloidal compds. of Fe and Mn. In soils rich in org. substance the split off I is secondarily bound so that in such soils the I-splitting cannot be utilized. S. MORGULIS

Experiments for the determination and explanation of the buffer action of carbonate-poor soil. K. MAIWALD. *Kolloidchem. Beihefte* 27, 251-346(1928).—The buffer action of 14 soils of known origin taken from places not used agriculturally has been studied. The soils contained 1.0-20.5% raw clay and 2.6-52.7% silt and ranged from light sandy to a heavy clay. They were classified by the triangular method of M. Whitney, U. S. Dept. Agr., Bur. of Soils, *Bull.* 78, 11(1911). Colloidal matter (cf. Robinson, *C. A.* 17, 444) ranged from 12 to 39%, indicating that the clay fraction and more or less of the silt were of colloidal nature. Colloidal matter was from 6 to 45% after strong mech. treatment or after chem. transformation of constituents reactive to strong bases. The soils were classified into 3 groups: 4 weakly alk. and neutral soils with under 0.2% carbonate, 4 intermediate soils with slightly alk. character and 6 carbonate-free, unsatd. soils. Titration curves of the reactions of the soils in water and in KCl soln. are given and possess these characteristics: (1) Conclusive figures are obtained only after more than one day of reaction. (2) In the exptl. range the curves do not show any transformation or turning point. (3) The curves taken as a whole are different from the titration curve of buffer-free quartz sand; also the soils have a good buffer action against admixed reacting compds. (4) Titration from either basic or acid side gives a continuous, symmetrical curve. In soils poor in carbonate it is probable

that colloidal complexes of humus and clay give the buffer action. The degree of buffering and the form of titration curve of a soil depend on the factors: (a) the chem. character of the colloid complex as detd. by the abs. base-binding capacity of the anion, (b) the satn. condition of the colloid complex as indicated by x in the formula $xR^+ + (100 - X) H^+$, (c) the abs. content of substances capable of reaction, i. e., colloidal content or better the sum $R^+ + H^+$ per gram, (d) the type of colloid and its change in the titration range, (e) the character and compn. of adsorbed, interchangeable bases, (f) the character of the admixed reagents. Factors (a) and (b) can be considered as material factors; (c) and (d) as concn. factors; and (e) and (f) as secondary factors. The combined effects of the 6 factors give the smooth, flat titration curve with a wide buffer-action zone. A no. of improvements for the electrometric titration are recommended. A bibliography of 118 references is given.

L. F. MAREK

Losses and gains of nitrogen in an Indian soil studied in relation to the seasonal composition of well waters, and the bearing of the results on the alleged deterioration of soil fertility. HAROLD E. ANNETT, A. R. PADMANABHA AIVAR AND RAM NARAYAN KAYASTH. *Memoirs Dept. Agr. India, Chem. Ser.* 9, 155-234(1928).—This paper gives in detail the results of an extensive investigation on the loss of N from black cotton soils in the Central Provinces of India. Accumulation of nitrates reached a max. during the early part of the rainy season and then decreased rapidly because of leaching. Cropped soils, whether fertilized or not, lost more nitrate than uncropped soils. Analyses of water from a well surrounded by an unfertilized, unirrigated field indicated an annual loss of nitrate equiv. to 165 lb. N per acre, while analyses of water from a well surrounded by an irrigated, highly fertilized field indicated an annual loss of 550 lb. NO_3 nitrogen per acre; however, the av. annual loss of nitrate was equiv. to approx. 165 lb. N per acre. Apparently, loss of N by leaching was counterbalanced by fixation of atm. N as it was found that the actual N content of the soil had not decreased during a period of 25 years.

K. D. JACOB

The determination of the electrical conductivity of the aqueous extract of soil as a rapid means of detecting its probable fertility. ASHUTOSH SEN. *Agr. Research Inst., Pusa. Memoirs Dept. Agr. India, Chem. Ser.* 9, 247-54(1928).—Samples of dry soil from fertile and non-fertile fields were shaken with cond. H_2O , and allowed to settle for 2 hrs. The elec. cond. of the mixts. of soil and H_2O was then detd. at intervals over a period of several days, the mixts. being shaken 2 hrs. before the detns. In all cases, the conductivities of the exts. from fertile soils increased progressively with time of contact with the soil while those of exts. from non-fertile soils remained approx. const. This phenomenon was independent of the initial cond. of the exts. The results indicate that fertile soils progressively supply sol. salts to the soil soln., probably through combinations of chem. and bacteriol. processes, while non-fertile soils do not have this power. The non-fertility of a soil known to be incapable of growing cinchona was readily detected by the cond. method although its chem. compn. and pH value were approx. the same as that of an adjacent soil upon which cinchona thrived.

K. D. JACOB

Bone fertilizers. FRANK E. CORRIE. *Fertilizer, Feeding Stuffs and Farm Supplies J.* 13, 753-4(1928).—The history of the use of bones as fertilizers is briefly discussed and data are given on the compn. and relative value of the various types of bone fertilizers.

K. D. JACOB

The 1927-28 fertilizer constituent tests at Western Pampanga. MANUEL L. ROXAS, RAMON ADVINCULA AND JUAN O. UNITE. *Rept. of Committee on Cane Varieties, Diseases and Fertilizers for the 6th Annual Convention, of the Philippine Sugar Assocn. Manila 1928*, 90-3.—From the results of the 7 fertilizer tests in light and heavy soils, it is concluded that although large increases (24-300%) in yield were obtained from the use of $(NH_4)_2SO_4$ alone, the addn. of K_2O and P_2O_5 to the N in the fertilizer gave no significant increase in yield over that when N alone is used. Ammonium sulfate quantity tests in Western Pampanga (Luzon). MANUEL L. ROXAS, JUAN O. UNITE AND RAMON ADVINCULA. *Ibid* 94-7.—Practically all fertilizer quantity tests indicated no additional significant increases from the use of more than 250 kg. of $(NH_4)_2SO_4$. Increasing sugar yields per hectare by application of fertilizer in Western Pampanga. MANUEL L. ROXAS. *Ibid* 97-9.—R. has compiled the data obtained by him and his co-workers for 1927-28, and finds that with use of 250 kg. $(NH_4)_2SO_4$ per hectare, (a) the number of stools per hectare is increased by 8%; (b) the weight of stools by 58%; (c) the wt. of cane by 72% and the wt. of sugar by 64%. The fertilizer had no effect on the rendement (piculs sugar per ton cane).

V. G. LAVA

The use of calcium sulfate as a soil amendment on clay loam soil in Laguna. MANUEL L. ROXAS, E. DAYTON, A. CARANDANG AND G. H. BISSINGER. *Rept. of Committee on Cane Varieties, Diseases and Fertilizers for the 6th Annual Convention of the Philippine*

Sugar Assocn., Manila 1928, 119-20.—A consistent response from the application of 2 tons of CaSO_4 per hectare has been obtained with heavy clay loam at the Laguna district, although a still better yield was obtained when this was supplemented with 250 kg. $(\text{NH}_4)_2\text{SO}_4$ per hectare. The effect of the CaSO_4 is to correct the phys. structure of the soil through base replacement.

V. G. LAVA

Formosan agriculture in 1928; some observations made during a short visit. ROBERT L. PENDLETON. *Rept. of Committee on Cane Varieties, Diseases and Fertilizers or the 6th Annual Convention, of the Philippine Sugar Assocn., Manila 1928*, 121-6.—Formosan agricultural conditions are largely similar to those of the Philippines; Formosa with $\frac{1}{10}$ the area and $\frac{1}{2}$ the population, produces nearly as much sugar as the entire Philippines. A table of sugar cane and sugar production is presented. The Formosan Govt. generously supports agricultural research.

V. G. LAVA

Comparing various quantities of mixture of ammophos and ammonium sulfate plus filler to make a 10-10 formula (10% nitrogen and 10% phosphoric acid). C. L. LOCSIN, F. TABHAN AND E. PUNZALAN. *Rept. of the Committee on Cane Varieties, Diseases and Fertilizers for the Sixth Annual Convention of the Philippine Sugar Assocn., Manila 1928*, 83-6.—The expts. were carried out in Negros red clay soil, which is rich in org. matter, high in Fe_2O_3 and Al_2O_3 , fairly well supplied with available K_2O , fairly normal in N, although deficient in available P_2O_5 . The p_H of the soil is 6.3, while the lime requirement to neutralize a foot depth is 7.3 tons of $\text{Ca}(\text{OH})_2$. Data and graphs are given to show the relation between value of fertilizer applied and yield per hectare. It is concluded that under present conditions it is not advisable to apply more than 50 kg. of N per hectare, accompanied by as much P_2O_5 , or 300 kg. of ammophos. Testing various quantities of ammophos 20-20 (or 16.5% nitrogen and 20% phosphoric acid). CARLOS L. LOCSIN. *Ibid* 86-9.—This expt. is similar to the preceding one; the P_2O_5 content of the fertilizer was made higher than the N. The soil, was similar to that in the preceding expt., but the p_H was lower (5.9), and the lime requirement was 15.1 tons. Although the total K_2O (sol. in strong acid = 0.149%) was lower than the generally recognized limit below which K_2O fertilization is necessary, the available K_2O (sol. in 1% citric acid = 0.0258%) was fairly high. This fact together with the high porosity of the soil indicates the need for K_2O fertilizer in the near future. It is concluded from the data and the graphs that it is not profitable to fertilize with over 250 to 300 kg. of ammophos per hectare. The quantity of N being the same, an increase in P_2O_5 seems to increase the yield, probably on account of the abnormally low P_2O_5 content of the soil. The cane, cut when 12 months old, gave a purity as high as that of greater age but grown in soil of less P_2O_5 content, thus showing that maturity of the cane depends upon P_2O_5 sufficiency for at least one of the factors.

V. G. LAVA

History and technic of the superphosphate industry. ANON. *Superphosphate* 1, 93-100, 109-14, 141-5, 157-66(1928).—This is an interesting account of the early manuf. and history of superphosphate, with special reference to the work of Gilbert, Lawes and Liebig.

K. D. JACOB

Comparative pot experiments with superphosphate, Reform phosphate, Plutophos, Moorphos and two Polish raw phosphates. C. DREYSPRING AND C. KRÜGEL. *Superphosphate* 1, 62-72, 77-90(1928).—Pot expts. on oats and barley were carried out with superphosphate, Reform phosphate, Plutophos, Moorphos—ground Algerian raw phosphate rock, and 2 Polish ground raw phosphates, in a slightly sandy soil and a lowland moor soil, both poor in P_2O_5 . Superphosphate was the only one of the P_2O_5 fertilizers which gave an increase in grain and straw of oats grown on lowland moor soil. With barley on sandy loam soil, the relative yields were—superphosphate 100, Polish raw phosphate (B) 35, Moorphos 25, Reform phosphate and Polish raw phosphate (A) 15, and Plutophos 10. There was a close relation between the yield and the quantity of P_2O_5 assimilated by the plants from the different phosphates. When superphosphate was used the grain contained the highest percentages of P_2O_5 , while with the other phosphates the stalks contained the largest percentages. This was apparently due to the slow rate of assimilation of the less readily sol. phosphates and to the greater time required for the dissolved phosphate to circulate through the plant to the grain. Plants receiving superphosphate ripened 15 to 20 days earlier than those fertilized with the other phosphates.

K. D. JACOB

Effect on soil reaction of nitrogenous fertilizers under the anaerobic conditions of rice production. R. P. BARTHOLOMEW. *Ark. Agr. Expt. Sta. J. Am. Soc. Agron.* 20, 1305-13(1928).—The nitrogenous fertilizers may be divided according to their effect on the H-ion concn. into 3 groups. (a) acid-producing, (b) alk.-producing, and (c) those having practically no effect on the H-ion concn. The groups arranged in order of largest to smallest change are as follows: (a) acid-producing, $(\text{NH}_4)_2\text{SO}_4$, *Leucaena* mulberry,

Ammophos, and urea; (b) *alk.-producing*, NaNO_3 , $\text{Ca}(\text{NO}_3)_2$, and Ca cyanamide; and (c) *practically no change*, cottonseed meal and blood meal. Changes in H-ion concn. due to applications of $(\text{NH}_4)_2\text{SO}_4$, Ammophos, Leuna saltpeter, $\text{Ca}(\text{NO}_3)_2$, NaNO_3 , and Ca cyanamide greatly affected plant growth. The decrease in H-ion concn. caused by the latter was more harmful than the increase caused by the first 3, even though the increases were from 2 to 3 times greater than the decreases. Failure to control changes in H-ion concn. in studies concerning the availability of nitrogenous fertilizers may lead to erroneous interpretations of the results. The changes in H-ion concn. under the conditions studied were due largely to assimilation of the N by plants and bacteria. Some of the change may have been due to the liberation of elemental N by denitrifying bacteria.

E. F. SNYDER

A method of increasing the fertilizing value of mahua cake. N. D. VYAS. Agr. Research Inst., Pusa. *Bull.* 176, 12(1928).—Mahua cake is the residue obtained in the extn. of fat from the seeds of *Bassia latifolia*, *B. longifolia*, and *B. butyracea*. The air-dry material contains approx. 8% H_2O , 2.57% N, and 0.9% P_2O_5 but has a low fertilizer value because of its resistance to the action of soil microorganisms. When a mixt. of mahua cake 100, soil 25, charcoal 5, and H_2O , 65–70 parts is composted for 3 months, with an occasional sprinkling with H_2O , the greater portion of the N is rendered susceptible to attack by nitrifying and ammonifying bacteria. About 23% of the total N is converted into NH_3 during the composting process.

K. D. JACOB

Notes on liming experiments in Berkshire, Dorset, Hampshire and Oxford. H. H. NICHOLSON. Reading Univ. *Agr. Progress* 5, 60–2(1928).— CaCO_3 applied to loamy soils at the rate of 0.5 to 3 tons per acre seemed to disappear at the av. rate of 0.5 tons per acre per year.

K. D. JACOB

Liming tests in Luzon. MANUEL L. ROXAS. *Rept. of Committee on Cane Varieties, Diseases and Fertilizers for the 6th Annual Convention of the Philippine Sugar Assocn., Manila 1928*, 114–8.—It is suggested that a possible explanation for the lack of response to liming lies in the improper way of conducting the expt. The method of liming followed should be that proposed by O. Arrhenius of the Java Sugar Expt. Sta. This consists in first detg. the lime requirement of the soil in the exptl. field, adding this quantity to the soil and allowing the soil reaction to reach equil., adding more and more lime, if necessary, until the p_H of the soil after equil. becomes about 7.

V. G. LAVA

Magnesium and calcium chlorates as substitutes for sodium chlorate for killing field bindweed. Note. W. L. LATSHAW AND J. W. ZAHNLEY. Kansas Agr. Expt. Sta. *J. Am. Soc. Agron.* 20, 1328(1928); cf. *C. A.* 22, 3014.— $\text{Mg}(\text{ClO}_3)_2$ and $\text{Ca}(\text{ClO}_3)_2$ may be used as substitutes for NaClO_3 in the control of field bindweed. Expts. conducted during the past yr. suggest that these chemicals are as effective as NaClO_3 and that they have certain advantages.

E. F. SNYDER

Spraying for woolly aphid. The addition of miscible oil to summer tobacco sprays. A. R. WOODHILL. *Agr. Gaz. N. S. Wales* 39, 613–4(1928).—The results indicated that no advantage is gained by adding small quantities of miscible oil to tobacco sprays for control of woolly aphid on fruit trees, and that if a greater quantity than 2 pints per 100 gallons of spray is added burning of the foliage may result.

K. D. JACOB

A micro-technic for observing oil penetration in citrus leaves after spraying. HUGH KNIGHT. *Science* 68, 572(1928).

E. H.

Spring and autumn spraying for red scale of citrus. A. R. WOODHILL. *Agr. Gaz. N. S. Wales* 39, 561(1928).—Autumn spraying with miscible oil gave a 95% kill of red scale on citrus trees, while spring spraying gave a kill of 65%. To avoid injury to the trees, spring spraying should be done before the young shoots appear.

K. D. J.

Feeding copper carbonate-treated wheat to poultry. E. HADLINGTON. *Agr. Gaz. N. S. Wales* 39, 660(1928).—A pen of poultry was fed for about 3 months solely on wheat which had been treated with CuCO_3 for control of bunt. No ill effects were noted.

K. D. JACOB

Some aspects of the sugar-beet problem (LING) 28. Physiological studies on cellulose fermentation (SANBORN) 11C. Emulsifiable oil (for preparing sprays for fruit trees or sheep dips) (U. S. pat. 1,695,197) 22. Disinfectants (Ger. pat. 467,265) 17. Emulsions, paints, insecticides, waterproofing compositions (Brit. pat. 289,122) 18. Double salt—fertilizers (Fr. pat. 639,648) 18. Dyes and insecticides (Brit. pat. 288,307) 25.

Method of testing the character of subsoil electromagnetically. MAX MASON. U. S. 1,692,849, Nov. 27.

Fertilizer. GEORGE BARSKY and FREDERICK W. FREISE (to American Cyanamid Co.). U. S. 1,695,081, Dec. 11. The proteins of nitrogenous org. waste such as leather scrap, fish scrap, etc., are combined with free cyanamide in the presence of H_2SO_4 .

Fertilizer. R. C. FLUCK and A. THIEL. Brit. 289,284, July 1, 1927. Fecal matter from pit or cask systems or sewers is treated with peat or lignite to remove the solid matter and the sepd. liquid is treated with lime, an Fe salt or other reagent which will ppt. nitrogenous and phosphatic matter as a mud. The fecal matter may be initially treated to drive off NH_3 , which may be recovered as $(\text{NH}_4)_2\text{SO}_4$, and the latter may be added to the fertilizer.

Fertilizers. AGRICULTURAL DEVELOPMENTS COMPANY (PYRFORD), LTD. Ger. 467,850, Apr. 20, 1924. A fermentable material such as straw and an insol. or difficultly sol. compd. of N are kept in a wet state under aerobic conditions to allow free development of NH_3 -assimilating organisms. CaCN_2 or stable refuse may be used as the N compd. and phosphates and CaCO_3 may be added.

Mushroom bed. RICHARD H. MORRIS, 3RD. U. S. 1,694,482, Dec. 11. A compost bed comprises fertilizing material together with fibrous peat and material such as HgCl_2 , CH_2O or a phenolic compd. which is toxic to mushroom-disease germs.

Insecticides. Sheep dips. JAMES BADDLEY and ERNEST CHAPMAN (to The British Dyestuffs Corporation, Ltd.), Can. 284,215, Oct. 23, 1928. The addn. either to the powd. insecticide or to its soln. of 0.1 to 1.0% by wt. of a product prepd. by the sulfonation of a mineral-oil fraction, with or without subsequent condensation with an alc., preferably isopropyl alc., will cause the aq. suspension to wet and penetrate the fleece. A similar addn. to insecticides for use in sprays results in the immediate wetting of the leaves.

Insecticides, fungicides and disinfectants. V. CASABURI. Brit. 289,498, Nov. 24, 1926. Hemicelluloses obtained from locust-tree beans are used in various mixts. for treating plants together with metal salts or other insecticides, fungicides, fertilizing ingredients, etc.

Colloidal fungicidal sulfur composition. HENRY W. BANKS, 3RD (to Loomis, Stump and Banks). Can. 284,411, Oct. 30, 1928. Finely powd. bentonite and finely powd. S are mixed and then heated to 125–140° until the mass is sintered and becomes substantially uniform in color. On cooling, a friable material results which can be ground to a powder. If it is desired to use the S in finely dispersed form in an aq. soln., water may be added to the material and used as a fungicidal spray. The proportions of bentonite and S may be varied from 25 lb. of each, or 15 lb. of S to 25 lb. of bentonite, or an excess of S 25 lbs. to 15 lb. of bentonite, depending on the final material desired.

Insect lime. ARTHUR BIDDLE (to The United Products Corp. of America). Can. 284,093, Oct. 16, 1928. Trunks of trees or shrubs may be girdled with a compn. contg. rubber latex 2 parts, cottonseed oil $\frac{1}{2}$ part and sulfonated castor oil 3 parts by wt. A compn. suitable for application to paper consists of rubber latex (approx. 35% rubber content) 1 part, fish oil $\frac{1}{2}$ part, petroleum oil 15 parts, rosin $\frac{1}{2}$ part, and molasses (or other sweetening) 1 part by wt.

Plant disinfectant containing metallic copper in a state of extremely fine subdivision. RUDOLF ZELLMANN and DIETRICH LAMMERING (to Chemische Fabrik von Heyden). U. S. 1,694,497, Dec. 11. A compn. suitable for treating seeds contains Cu in pptd. form on a carrier such as coal, charcoal, silica gel, infusorial earth or talcum.

Neutralization of hydrocyanic acid. SOCIÉTÉ FRANÇAISE D'EXPLOITATION DES PROCÉDÉS SANSONE. Fr. 639,085, Aug. 1, 1927. HCN gas used for the destruction of insects, etc. is neutralized by CH_2O gas produced by a soln. of KMnO_4 on formalin.

Parasiticide. HENRY W. BANKS (to Loomis, Stump and Banks). Can. 284,410, Oct. 30, 1928. Bentonite is utilized as a carrier for active parasitic poisons (i. e.) salts of the toxic metals such as Cu, Ni, Hg, Ag and Zn; arsenates such as those of Pb and Ca; nicotine compds. such as the sulfate; certain org. mercurials and arsenicals; hydrocarbon oils; cyanide soaps; creosote and the like. E. g., ordinary oven-dried bentonite is mixed with sufficient 10% AgNO_3 soln. to form a smooth paste and the mixt. stirred until the ingredients are uniformly mixed. An excess of concd. alk. CH_2O soln. is now stirred into the paste and allowed to stand and the mixt. dried at a temp. above 100°. The resulting friable mass is ground to form a powder or paste suitable for dusting on plants, or it may be taken up in water to form a colloidal soln. of the reduced Ag, which is suitable for a plant spray.

16—THE FERMENTATION INDUSTRIES

C. N. FREY

The mechanism of alcoholic fermentation. A. LEBEDEV. Univ. Moscow. *Biochem. Z.* 200, 149-51(1928).—Polemical. S. MORGULIS

Maderia. F. DE CASTELLA. *J. Dept. Agr. Victoria* 26, 577-87(1928).—This paper discusses the manuf. and properties of Maderia wines. K. D. JACOB

Estimation of fructose and glucose in sweet wines. F. LUCIUS. Hamburg. *Pharm. Zentralhalle* 69, 725-7(1928).—A general procedure is outlined for detg. these 2 ingredients of sweet wines in connection with the results obtained in the examn. of some 15 different brands. W. O. E.

Economical vinegar production in a plant of moderate capacity. I. B. LAWYER. *Food Products J. and A. n. Vinegar Ind.* 8, No. 2, 9-11; No. 3, 16-18; No. 4, 20-1(1928).—This article is especially prep'd. for those who are seeking authentic information regarding the establishment and operation of small vinegar plants. Complete description of the methods used in starting vinegar generators, of pasteurization and filtration of vinegar, etc., is given. J. A. KENNEDY

Leaf filter for wine (Brit. pat. 288,920) 1.

CRAWFORD, STUART L., AND WARD, J. M. The Interpretation of Cider Vinegar Analyses. With proposed method for the detection of evaporated apple-products vinegar. Rochester, N. Y.: Am. Cider Vinegar Manufacturers' Assoc. 60 pp.

SCHOEN, M.: The Problem of Fermentation. Translated by H. Lloyd Hind. London: Chapman & Hall. 211 pp. 21 s. Reviewed in *Chem. News* 137, 349(1928).

Absolute alcohol. DISTILLERIES DES DEUX-SEVRES. Brit. 289,051, April 21, 1927. In a 3-stage process including (a) distg. a fermented mash, (b) rectifying the alc. obtained, and then (c) dehydrating the alc. by the "azeotropic method," economy of steam is effected by conducting the first stage under pressure and thus raising the temp. of the alc. vapors so that they supply the heat for the remaining stages. An app. is described.

Potassium salts, betaine hydrochloride and glutamic acid from residues of alcohol production from beet molasses. Y. TAKAYAMA. Brit. 288,390, Jan. 22, 1927. The waste liquor remaining after distn. in producing alc. from beet molasses is dialyzed to remove yeast and uncrystallizable substances and, after concn., HCl or H₂SO₄ is added to obtain KCl or K₂SO₄, and by further concn. betaine-HCl seps. HCl in excess is added to the remaining liquor and it is then heated under pressure to convert glutimic acid into glutamic acid-HCl and to remove impurities in the form of a humus-like material. By cong. and cooling glutamic acid-HCl crystallizes. An app. is described in which an elec. current may be used to promote dialysis.

Fermentation of wort. ALFRED LEBBE. Fr. 639,512, Aug. 13, 1927. The height of the fermenting mass is reduced and is made proportional to the d.

Tartaric salts. SOCIÉTÉ RAYNAUD FRÈRES. Fr. 639,573, Aug. 16, 1927. Tartaric salts are recovered from wine lees by adding 2 to 5% HCl, which renders the pectins insol., and filtering.

Cooling and drying yeast. ELMER B. BROWN (to The Fleischmann Co.). U. S. 1,694,807, Dec. 11. A current of air (suitably having a temp. of about 15° and contg. approx. 1.25 grains of moisture per cu. ft.) is passed through a thick comminuted mass of moist yeast (e. g., at a rate which may approx. 2 cu. ft. per min. per lb. of yeast). An app. is described.

17—PHARMACEUTICAL CHEMISTRY

W. O. EMERY

Fluidextracts. II. Fluidextract of *Hydrastis canadensis*. A. ALBANESE AND A. PEDRONI. *Ann. chim. applicata* 18, 429-46(1928).—A review of the extn. processes as recommended by the Pharmacopeias of Italy, France, U. S., England and Germany. The following alkaloids were identified in *Hydrastis canadensis*, and their characteristic reactions are given. Hydrastine, + H₂SO₄ = violet coloration, + MnO₂ = orange, + K₂CrO₄ = red; with Fröhde reagent, green to brown; KMnO₄ added to the acid soln.

gives blue fluorescence; $(\text{NO}_3)_2\text{C}_6\text{H}_5\text{OR}$ gives distinctive ppt. Hydrastineine, $+\text{HNO}_3$ = yellow-orange coloration, $+\text{H}_2\text{SO}_4$ = maroon; solns. of the esters give slight bluish fluorescence, gives distinctive ppt. with $(\text{NO}_3)_2\text{C}_6\text{H}_5\text{OR}$. Berberine, $+\text{HNO}_3$ = olive-green to red-brown coloration; H_2SO_4 = olive green; Fröhde reagents green to brown; NH_3 = brown color; Cl water and Br water = red coloration; distinctive ppts. obtained with Bouchardat reagent, other with $\text{NO}_3\text{C}_6\text{H}_4\text{OH}$ acetone, and CHCl_3 . Canadine, $+\text{HNO}_3$ = red color with effervescence; $+\text{H}_2\text{SO}_4$ = yellow, then wine-red; Fröhde reagent, violet to greenish brown. A. W. CONTIERI

The disinfection of tuberculous excretion with Caral, T. B. Bacillol and chloramin Heyden. E. BERGIN. *Z. Tuberk.* 49, 355-60(1928).—Chloramine Heyden and T. B. Bacillol proved about equal in value as disinfecting agents for tuberculous excretions. Caral proved less valuable and is not recommended for this purpose. H. J. CORPER

Microchemical reactions of homatropine. M. WAGENAAR. *Pharm. Weekblad* 65, 1213-6(1928).—Of the 5 reactions tested, whereby cryst. salts of homatropine are pptd. the most sensitive is that with Eder's reagent (Br , KBr , H_2O , 1:2:20) which gives a positive reaction when the concn. of alkaloid is 1:1000. The reaction with $\text{KI} + \text{I}$ is about half as delicate, then in decreasing order the pptn. as chloroaurate, picrate and picrolonate. Sublimation gives fine drops of liquid which cannot be crystd. Pptn. as free base by addn. of alkali or alkali carbonate to solns. of the alkaloid salts gives a milky emulsion from which no crystals can be obtained. A. W. DOX

Microchemical reactions of scopolamine. M. WAGENAAR. *Pharm. Weekblad* 65, 1226-7(1928).—Observations are reported on the sublimation, pptn. of free base, and reactions of scopolamine with AuCl_3 and with $\text{KBr} + \text{Br}$. The last reaction is considered the most useful and characteristic for purposes of identification. A. W. DOX

The color of some recent medicinal dyes (tryptaflavine, rivanol, iodtetragnost, mercurochrome 220) at various hydrogen-ion concentration. H. W. VAN URK. *Pharm. Weekblad* 65, 1227-30(1928).—Slight variations in color shades of solns. of each of the 4 dyes at p_H values between 1 and 12 are pointed out. A. W. DOX

Inventions and patents in pharmaceutical and related fields. J. J. L. ZWIKKER. *Pharm. Weekblad* 65, 1230-4(1928); cf. *C. A.* 22, 843.—A discussion of the physiol. action of the glucosides obtained from *Adonis vernalis*, and the methods of extn. according to Dutch patents 35,689 and 39,405. A. W. DOX

Bosamin preparations. C. A. ROJAHN. *Univ. Halle. Apoth. Ztg.* 43, 1452-3(1928).—A series of 4 different preps. for the treatment of asthma was examd. with the following results: (1) Tablets (*Luft für Asthmatiker*) consisted essentially of NaHCO_3 , Na_2CO_3 and talc. (2) Radioactive salts, a sandy powder contg. S , NaCl , MgSO_4 , Na_2HPO_4 , Ca silicate and uranium ore (radioactivity in 1 g. of the sample = 5×10^{-10} g. Ra). (3) Tablets, consisting essentially of lactose with 10% talc. and possible homeopathic medication. (4) Liquid, essentially an alc. soln. or oleum valerianae. W. O. E.

Stability of morphine in aqueous solution, especially during sterilization. C. STICH. *Pharm. Ztg.* 73, 1513(1928).—From an earlier study of this question by Schäfer and Stich with reference to the behavior of morphine solns. (characteristic absorption spectra in ultra-violet light), it is concluded that for all practical purposes all such solns. fall into the thermostable category with respect to their behavior in the ultra spectrum. W. O. E.

Volume and refraction relationship in pharmaceutical tinctures. F. WRATSKO. *Pharm. Presse* 33, 369-72(1928).—An address delivered in Hamburg at the convention German natural philosophers and physicians in 1928. W. O. E.

Carvacrol. ALFRED WAGNER. *Pharm. Zentralhalle* 69, 757-63, 773-7(1928).—The history, constitution, occurrence, formation, isolation, properties, behavior, detection and estn. are discussed at some length, and the following method of estn. is outlined: Shake the sample with an equal vol. of petr. ether *via* Kremers and Schreiner, and with 5% KOH soln. until no further decrease in vol. occurs, add a slight excess of 0.1 N I soln., filter off the pptd. iodocarcacrol, and titrate the I excess with thiosulfate after acidification. One mol. carvacrol requires 4 mol. I for pptn. W. O. E.

Preparation and testing of pepsin wine. W. BRANDRUP. *Apoth. Ztg.* 43, 1471-3(1928). W. O. E.

Manufacture of argentum proteinicum, argentum colloidal and other organic silver preparations. JULIUS SCHWYZER. *Pharm. Ztg.* 73, 1549-53, 1568-70(1928).—Definitions are given and discussed, lab. expts. described, and detailed procedures for *en gros* production given. W. O. E.

Medinal and diethylbarbituric acid. WOLTER. *Pharm. Ztg.* 73, 1463(1928).—

Attention is directed to the erroneous soly. values as stated in the Ger. Pharmacopeia for these two drugs. W. O. E.

Cera flava. BOHRISCH. *Pharm. Ztg.* 73, 1478-80(1928).—A discussion of the official Ger. prepn. with especial reference to methods for its evaluation. W. O. E.

Characterization of official salves. L. ROSENTHALER. Univ. Bern. *Pharm. Ztg.* 73, 1480-1(1928).—Some 17 preps. are discussed in connection with the results obtained in the examn. of 10 different samples. W. O. E.

Tincture hemostatica. WALTER MEYER. *Pharm. Ztg.* 73, 1481-2(1928).—A commentary on the *ergot* prepn. official in the Ger. Apothecary Assoc. (D. Ap.-V. 4). W. O. E.

Mar-Ko tablets. C. A. ROJAHN AND MAX HERTER. Univ. Halle. *Apoth. Ztg.* 43, 1410(1928).—A laxative prepn. contg. per tablet 0.17 to 0.22 g. phenolphthalein and talc. 10% in addn. tr lactose and starch. W. O. E.

Two phloroglucide drugs. W. PEYER AND W. LIEBISCH. *Apoth. Ztg.* 43, 1422-4(1928).—An address dealing with the African drugs *Albizzia anthelminthica* Brongn and *Combretum raimbaultii* Heck. Examn.; of these two drugs yielded the following values, resp.: mineral constituents 10.5, 6.5; insol. in 10% HCl 2.2, 1.7%; H₂O ext. 12.0, 12.5; Et₂O ext. 0.6, 5.0; petr. ether ext. 0.1, 5.5; alc. ext. 2.5, 19.5; CHCl₃ ext. 0.8, 7.5; saponin, 8.2, 2.25; tannin, —, 6.25%. W. O. E.

Essential oil of Agathosma microphylla. JAMES L. B. SMITH AND KENNETH A. C. ELLIOTT. *Trans. Roy. Soc. S. Africa* 17, 23-7(1928).—Chief among the herbal remedies employed by the natives of S. Africa are the various plants designated as "Buchu." *Agathosma microphylla* or "Stembok buchu" is a short, stunted shrub giving off a strong aniseed-like odor. The oil content of the air-dried leaves is subject to seasonal variation, the summer product contg. 2 to 3%, while winter samples yield up to 5% of volatile oil. The latter is levorotatory and has $\alpha_D^{20} = -12' 10''$, $d_{20} 0.920$, $n_D^{20} 1.499$. Its chief constituent is methylchavicol, about 50%; it contains in addn. a terpene hydrocarbon (probably myrcene) 3%, alcs. (in part *l*-linalool), esters 4%, eugenol about 1%. W. O. E.

Labeling galenical preparations. RICHARD BRIEGER. *Pharm. Ztg.* 73, 1531-2(1928).—A critical discussion of the present methods of indicating the strength of such preps., with some suggestions for an only too apparently needed reform. W. O. E.

Biochemical studies of the North American Sarraceniaceae. The use of the genus Sarracenia in medicine: A review. JOSEPH S. HEPBURN. *Am. J. Pharm.* 100, 675-84(1928).—A review and summary of the literature on the use of these plants in medicine. A bibliography is appended. W. G. GAESSLER

The story of gum benzoin. G. H. A. MASSELMAN. *Aromatics* 9, No. 10, 32-7(1928). I. H.

Solubility of iodine in ethyl alcohol. MARCEL DELÉPINE AND MAURICE ARQUET. *Bull. sci. pharmacol.* 35, 625-31(1928).—Previous work was reviewed and a redetn. of the soly. of I in EtOH was made with great care. At 15° 100 g. of 85° alc. dissolved 6.95 g. of I, 90° alc. 9.65 g., 95° alc. 14.3 g. and 99.8° alc. 23.0 g. At 24.5° the corresponding wts. of I dissolved were 8.65, 11.3, 17.4 and 26.6 g. These results are discussed with reference to the requirements of several European pharmacopeias. L. W. RIGGS

Determination of the total alkaloids in cinchona bark. R. DUBREUIL. *Bull. sci. pharmacol.* 35, 635-42(1928).—An ext. of the bark made by a mixt. of CHCl₃ and Et₂O, after many treatments was finally titrated with standard KI-KIO₃ and Na₂S₂O₃. L. W. RIGGS

The clove; the future of its production in Madagascar. EM. PERROT. *Bull. sci. pharmacol.* 35, 667-72(1928).—The production of cloves, essence of cloves and of vanilla in Madagascar and other French dependencies is discussed from an economic point of view. L. W. RIGGS

Trioxymethylene sulfite and the preparation of diphtheria anatoxin. A. CH. HOLLAND AND (MLLE) J. PENN. *Compt. rend. soc. biol.* 99, 1196-7(1928).—In place of using HCHO or other aldehydes in the prepn. of the anatoxin, a mixt. of 10 g. of trioxymethylene in 100 cc. of water and 6 cc. of a 5% Na₂SO₃ soln. was employed. L. W. R.

Iodine content of thyroid glands of Uruguayan cattle. A. E. GOSLINO AND M. I. FERRO. *Compt. rend. soc. biol.* 99, 1446-8(1928).—The I content, detd. by the method of Fabre and Penau (cf. C. A. 17, 2032), ranged from 0.35 to 0.52% of the desiccated gland with the lipoids removed. In females the I content of the thyroid was about the same as in castrated males. No seasonal effect on the percentage of I in the thyroid was detected. It is proposed for pharmaceutical preps. of beef thyroid, that 0.40 g. of I per 100 g. of desiccated ether extd. gland be taken as a basis. L. W. RIGGS

Recent results in the chemistry of alkaloids (SPÄTH) 10. Electric discharge tubes (for therapeutic purposes) (Brit. pat. 289,326) 1. Compounds of indene and phenols (with disinfectant and therapeutic properties) (Fr. pat. 636,606) 10. Javelle water (U. S. pat. 1,694,711) 18. Freezing organic liquids (Brit. pat. 288,310) 13.

KRANTZ, JOHN C., JR.: *Treatise on Pharmaceutical Chemistry*. Embracing certain special topics of analytical organic and physical chemistry as they are related to pharmacy. St. Louis: C. V. Mosby Co. 282 pp. \$3.50. Reviewed in *J. Am. Med. Assoc.* 91, 1917(1928); *Am. J. Pharm.* 100, 713.

ZANDER, H. H.: *Weltproduktion und Welthandel von ätherischen Ölen und die wirtschaftliche Entwicklung ihrer Industrie*. Berlin: Verlag Chemie G. m. b. H. 381 pp. Unbound, M. 15. Reviewed in *Chem. Trade J.* 83, 395(1928).

Pharmaceutical products. WERNER SCHULEMANN, FRITZ SCHÖNHOFER and AUGUST WINGLER (to the Winthrop Chemical Co. Inc.). Can. 284,097, Oct. 16, 1928. Pharmaceutical products of the quinoline, di- and tri-arylmethane, azine, oxazine, thiazine acridine, and xanthene series are manufd. by converting amino derivs. of these classes of compds. into more strongly basic polyamino derivs., in which the newly introduced nitrogen atoms are in heterocyclic combination, or conversely by converting amino derivs. of suitable intermediate products for the manuf. of these classes of compds. into polyamino derivs. of the kind mentioned and subsequently transforming the latter into compds. of the desired classes. *E. g.*, 174 parts of 6-methoxy-8-aminoquinoline melted with 287 parts of 2-dimethylaminocyclohexyl bromide hydrobromide at 140–150° for 8 hrs. with stirring gives 8-(2-dimethylaminocyclohexylamino)-6-methoxyquinoline, a light yellow oil, solidifies to a glassy mass, *b*₁ 192–5°. The *hydrochloride* is easily sol. in water. 6-Methoxy-8-aminoquinoline (174 parts) melted with 305 parts of 4-bromo-1, 2, 2, 6, 6-pentamethylpiperidine-HBr at 160–70° for 12 hrs. with stirring gives 8-(1, 2, 2, 6, 6-pentamethyl-4-piperidylamino)-6-methoxyquinoline, a light yellow oil, *b*₁ 215–8°. The *hydrochloride* is easily sol. in water.

Coatings for pills and pastilles. S. HERMANN and PHARMACEUTISCHE WERKE NORGINE A.-G. Brit. 288,542, April 11, 1927. In making pills or pastilles as described in Brit. 285,091 (C. A. 22, 4725) the mixt. of stearic acid and other fatty acids is replaced by any single fatty acid or by a mixt. of fatty acids the m. p. of which is lower than that of stearic acid. Palmitic acid, mixed fatty acids from coconut oil or mixts. of palmitic acid with lauric acid or coconut oil acids may be used.

Basic therapeutic solutions of quinine. ARTHUR LIEBRECHT (to the Firm Chemisch-Pharmazeutische A.-G. Bad Homburg). U. S. 1,692,900, Nov. 27. Phenyl-dimethyl-pyrazolone is used in prepg. aq. solns. of quinine base, which also may contain quinine salts such as the hydrochloride or formate.

Therapeutic vanadium compounds. HANS HAHN and WALTER KROPP (to Winthrop Chemical Co.). U. S. 1,695,147, Dec. 11. Anti-syphilitic salts are formed of bases such as Mg or Na combined with salicylic, tartaric, thioglycolic or mandelic compds. or other suitable quadrivalent vanadyl carboxylate.

Amino aromatic esters (anesthetics). EDUARD RITSERT. U. S. 1,692,224, Nov. 20. An aromatic amino carboxylic acid ester such as Et *p*-aminobenzoate hydrochloride is combined with Na diiodo-*p*-phenolsulfonate or other suitable compd. contg. a halogenated non-aliphatic sulfo acid radical, in order to form a product of strong antiseptic and anesthetic properties.

Borates of anesthetic bases. WILLIAM J. POPE (to British Drug Houses, Ltd.). U. S. 1,692,695, Nov. 20. Compds. of anesthetic bases such as "ethocaine," butyn, cocaine or amylocaine are formed with about 5 mol. proportions of H₂BO₃, which in soln. have a high local anesthetic effect. U. S. 1,692,696 relates to benzamine borate which may be similarly formed. U. S. 1,692,697 specifies the production of benzamine borate by reaction between benzamine sulfate and Ba borate in a liquid medium. U. S. 1,692,698 specifies producing borates of anesthetic bases such as "ethocaine," amydrine, cocaine or amylocaine by reaction between their sulfates and Ba borate in a liquid vehicle.

Therapeutic phenol aminoalkyl ethers. I. G. FARBERIND. A.-G. Brit. 288,555, April 11, 1927. A phenol contg. an unsatd. alkyl group in the *p*-position to the OH group in which both *o*-positions are occupied is treated with a dialkylaminoalkyl halide in the presence of an alk. agent or may be treated with an alkylene dihalide and the monohalogenated product then combined with an alkylamine; *e. g.*, 4-allyl-2,6-dimethoxy-1-phenol is heated with diethylaminoethyl chloride in alc. to which Na has been added, to obtain the diethylaminoethyl ether of 4-allyl-2,6-dimethoxy-1-phenol.

Mercury derivatives of sulfonefluorescein. EDWIN C. WHITE. U. S. 1,692,237, Nov. 20. Compds. which are strongly germicidal are formed by the action of a Hg salt such as $\text{Hg}(\text{OAc})_2$ on a salt of a halogenated sulfonefluorescein such as the dibromo salt.

Soluble trypanocidal complex organic antimony compounds. I. G. FARBERMIND. A.-G. Brit. 288,870, Jan 7, 1927. Complex Sb compds. are made by treating an antimonyl compd. of an *o*-dihydroxyaryl compd. with a neutral salt of an *o*-dihydroxyaryl carboxylic or sulfonic acid in approx. equimol. proportions; *e. g.*, Na gallate is caused to react with antimonyl pyrocatechol- or Na pyrocatecholdisulfonate with antimonyl pyrocatechol. Compds. of galloicarboxylic acid and 2,3-dihydroxynaphthalenedisulfonic acid are also mentioned.

Pyridine derivatives. C. RÄTH (to Schering-Kahlbaum A.-G.). Brit. 288,629, April 14, 1927. Halo-pyridines contg. a further substituent such as nitro, carboxy or additional halogen are made by treating the corresponding *N*-alkyl or aryl-oxypyridine with a halogenating agent with or without a solvent. The products may be used as or in making therapeutic agents. 2-Chloro-5-nitropyridine is made by heating *N*-methyl-2-oxo-5-nitropyridine with PCl_5 or with gaseous phosgene or with phosgene dissolved in toluene. Thionyl chloride also may be used as halogenating agent in similar processes.

Vaccines. GEORG SCHRÖDER. Swiss 126,676, Nov. 10, 1926. Antituberculosis vaccines are recovered from glandular organs for use as prophylactics or medicants. The discharge from such organs is frozen, then melted and filtered.

Tuberculin. IGNAZ SCHILLER. Ger. 467,246, Feb. 13, 1925. Tubercle bacilli are introduced into water contg. living yeast cells. After the digestion of the cells, the bacilli develop as clouds on the surface of the water, and are collected and made into tuberculin in the usual way.

Tuberculosis pseudoglobulin. ELEKTRO-OSMOSE A.-G. Swiss 126,302, Jan. 7, 1926. Blood serum or exudations, etc., from tuberculous patients is treated to sep. euglobulin, etc., the soln. is electroosmotically purified and filtered, and the pseudoglobulin is pptd. from the filtrate by treatment with neutral salts. The ppt. may be dissolved in water and electroosmotically purified.

Extracting vitamins from liver. BRITISH DRUG HOUSES, LTD., and F. H. CARR. Brit. 289,187, Feb. 7, 1927. An ext. suitable for pharmaceutical or food purposes is prepd. by extg. livers such as lamb or ox livers with an animal, vegetable or mineral oil such as paraffin oil, lard, linseed oil or arachis oil.

A product containing hormones. CHEMISCHE FABRIK AUF ACTIEN VORM E. SCHERING. Swiss 126,304, Oct. 12, 1926. Comminuted and dried glands such as ovaries, corpus luteum, follicles, placenta and testicles are extd. in the usual manner, *e. g.*, with acetone, the ext. is sapond. with alc. NaOH or KOH, the unsapond. portion is extd. with a solvent such as Et_2O , and the Et_2O soln. is distd. to leave a hormone-contg. product.

Medicinal product from internal female secretory organs. WERNER MERKI (to Soc. anon. pour l'ind. chim. à Bâle). U. S. 1,692,509, Nov. 20. Fresh organs such as ovaries or placenta are cooled to such a low temp. that they become hard and are then pulverized and the powd. material is extd. with a suitable solvent such as ether.

Therapeutic dyes. CHEMISCHE FABRIK VORM. SANDOZ. Swiss 126,504, Jan. 15, 1927. Na cholate on a dye produced by an alk. coupling of tetrazotized benzidine with 1,8-aminonaphthol-3,6-disulfonic acid. The substance is gray-blue powder giving a blue-violet aq. soln. It is toxic to blood parasites.

Dental powder. FRANCIS M. LINDERSMITH. Can. 284,158, Oct. 23, 1928. A dental powder contains tobacco ash 70, NaCl 5, soda 15 and alum 10% by wt.

Disinfectants. ADOLF ABRAHAM'S LABORATORIUM. Ger. 467,245, Mar. 9, 1924. See Brit. 281,530 (C. A. 22, 3492).

Disinfectants. KÖNIGSBERGER ZELLSTOFF-FABRIKER UND CHEMISCHE WERKE KOHOLYT A.-G. UND S. HILPRET. Ger. 467,265, Oct. 22, 1922. A strong bactericide and fungicide is produced by treating spent lye from cellulose with halogen, or halogen-generating substances.

Cleaning and disinfecting. GEORGES TSCHOEPPÉ. Fr. 639,716, Jan. 26, 1927. A cleaning and disinfecting agent consists of water, CuSO_4 , NH_3 , oil of turpentine, salt and flour which are made into a paste.

18—ACIDS, ALKALIES, SALTS AND SUNDRIES

E. M. SYMMES

Barium nitrate, strontium nitrate, sodium fluoride, zirconium oxide. J. FRERE. *Rev. prod. chim.* 31, 733-8(1928); cf. *C. A.* 22, 1656.—The manuf. of these products is described. P. THOMASSET

Potassium ferrocyanide. Its manufacture. F. CHEMNITZ. *Rev. prod. chim.* 31, 697-8(1928). P. THOMASSET

Tripoli. P. B. BUTLER. *Mining and Met.* 9, 527-31(1928).—A concise statement of its properties, occurrence, history, preparation and uses. E. J. C.

Fuller's earth in 1927. JEFFERSON MIDDLETON. Bur. of Mines, *Mineral Resources U. S. 1927*, Pt. II, 39-42 (Preprint No. 5, published Sept. 5, 1928). E. H.

Antimony in 1927. J. W. FURNESS. Bur. of Mines, *Mineral Resources of the U. S. 1927*, Pt. I, 39-49 (preprint No. 4 published Nov. 10, 1928). E. H.

New high-temperature fixation reactions of nitrogen. NORMAN W. KRASE AND BILL MACKEY. Univ. of Ill. *J. Phys. Chem.* 32, 1488-94(1928).—The equilibria for several N-fixation reactions have been calcd. for high temps. by the usual thermodynamic method. They are $\frac{1}{2} \text{N}_2 + \frac{1}{2} \text{O}_2 = \text{NO}$ (1811° to 2675° abs.); $\frac{1}{2} \text{N}_2 + \text{CO}_2 = \text{NO} + \text{CO}$ (2000° to 3500° abs.); $\frac{1}{2} \text{N}_2 + \frac{1}{2} \text{H}_2 + \text{C} = \text{HCN}$ (298° to 3500° abs.); $\frac{1}{2} \text{N}_2 + \text{CH}_4 = \text{HCN} + \frac{1}{2} \text{H}_2$ (298° to 3500° abs.); $\frac{1}{2} \text{C}_2\text{H}_2 + \frac{1}{2} \text{N}_2 = \text{HCN}$ (298° to 3500° abs.). With O and N only a comparatively small increase in the concn. of NO results when stoichiometric proportions are used as compared with the result using air. The reaction of N and CO_2 in the arc should produce at equil. a concn. of NO more than double that with air. N, H and C should yield concns. of HCN greater than 15% at the usual arc furnace temp. The interaction of N and CH_4 to form HCN is complete at 2000° abs. N and C_2H_2 should form 70% HCN at arc-furnace temps. R. L. D.

Wet purification method for hydrogen. I. LARYUKOV. *Masloboino Zhirovoe Delo. (Oil and Fat Ind. (Russia))* 1928, No. 2, 6-7.—H obtained from water gas contains as a rule H_2S , which is removed by passing the gas over iron ore ($\text{Fe}_2(\text{OH})_6$). L. suggests using a cold 5-10% Na_2CO_3 or K_2CO_3 soln., the gas passing up through a coke scrubber and the soln. down. H_2S is absorbed, $\text{Na}_2\text{CO}_3 + \text{H}_2\text{S} = \text{NaHS} + \text{NaHCO}_3$; $\text{NaHCO}_3 + \text{H}_2\text{S} = \text{NaHS} + \text{CO}_2 + \text{H}_2\text{O}$; $\text{Na}_2\text{CO}_3 + \text{CO}_2 + \text{H}_2\text{O} = 2\text{NaHCO}_3$. NaHS and NaHCO_3 are regenerated by blowing hot air through the soln., forming again Na_2CO_3 and H_2S , the last being carried off by the air. This method allows the same reagent to be used indefinitely. A. A. BÖRRTLINGER

Fineness and available lime content of chemical quicklimes. J. S. ROGERS. Bur. of Standards. *Ind. Eng. Chem.* 20, 1355-6(1928).—In addn. to the chem. analysis the available alkly. is important, as well as the fineness, the latter detg. the soln. and reaction rates. F. O. A.

Carbon dioxide fire protection. ROBERT S. MOULTON. *Quarterly Nat. Fire Protection Assn.* 22, 145-60(1928).—Liquefied CO_2 is not new as a fire extinguisher, but is being applied to many special hazards. Rapid progress is being made in technic of application, but details have been worked out for only a few of the many places where it may be found applicable. Hazard to life from use of CO_2 extinguishers is not regarded as significant; a 4-lb. piece of yellow pine in burning evolves more CO_2 than is discharged from a hand CO_2 extinguisher. Its action is said to be much quicker than other fire-extinguishing methods, producing an inert atm. in spaces protected within a very few sec. The cooling effect due to vaporization of liquefied CO_2 is not regarded as having primary importance in fire extinguishing, compared with smothering action. Advantages, limitations, and suitability of CO_2 systems for special hazards in lacquers, solvents, elec. app., marine hazards, dry-cleaning machinery, fur vaults and record vaults are discussed. While much of the equipment used is patented, there are no basic patents covering the general principles of CO_2 fire protection, and development of this new method appears to be proceeding on a sound basis. Twelve illustrations. C. L. JONES

The consistency of casein glue. F. L. BROWNE AND DON BROUSE. *Fifth Colloid Symposium Monograph* 1928, pp. 229-42.—Consistency is important practically, but difficult to measure because it changes with time, seemingly identical batches differ, and it is hard to establish a satisfactory datum point for working life. A modified Herschel consistometer has drawbacks, but was used. Flow-pressure diagrams for solns. of casein contg. no $\text{Ca}(\text{OH})_2$ indicate that they have more complex flow than the lime-contg., jelly-forming glues, which from present evidence seem to be truly viscous. "The flow-pressure diagrams for jelly-forming water-resistant casein glues (contg. lime) fail to reveal any transition from viscosity to plasticity with lapse of time after mixing, at

least until the consistency has passed far beyond the condition ordinarily considered 'set.' Neither does the viscosity-time curve exhibit any sharp break. The 'setting' point must therefore continue to be defined arbitrarily, but the use of the viscosity-time curve permits cancellation of the personal factor. It is suggested that the glue be considered 'set' when the viscosity reaches 1000 poises." Illustrations are given of the changes in viscosity of water-resistant glues with time, alky. and water content, and the practical significance of these relations is discussed. J. ALEXANDER

Gasifying coal, coke or other similar fuels (for use in NH_3 synthesis) (Brit. pat. 289,080) 21. Rotary drum furnace for lime burning (Ger. pat. 468,288) 1. K salts, betaine hydrochloride and glutamic acid from residues of alcohol production from beet molasses (Brit. pat. 288,390) 16.

Hydrofluoric acid. VEREIN FÜR CHEMISCHE UND METALLURGISCHE PRODUKTION. Brit. 289,383, April 25, 1927. HF substantially free from Si compds. is obtained from vapors contg. HF and Si compds. (such as those formed from fluor spar and H_2SO_4) by first removing water vapor (suitably by fractional condensation or by use of dehydrating agents such as H_2SO_4) and then condensing the substantially anhyd. HF. The first fractions, which contain H_2SiF_6 , may be used to form AlF_3 , which is converted into cryolite by treatment with alkali fluoride obtained from the Si-free HF.

Molybdc and tungstic acids. METALLWERK PLANSEE G. M. B. H. Fr. 636,697, Feb. 14, 1927. See Brit. 269,947 (C. A. 22, 1319).

Nitric acid. MARTIN BATTEGAY. Fr. 636,637, Oct. 19, 1926. HNO_3 is prepd. by absorbing N_2O_4 in H_2SO_4 and oxidizing the product by atm. O, or pure O, or by electrolysis or by a combination of these means with or without catalysts such as NH_4 vanadate, CrO_3 , or CeO_2 .

Nitric acid. NIKODEN CARO and ALBERT R. FRANK. Fr. 639,344, June 28, 1927. See Brit. 273,718 (C. A. 22, 2035).

Nitric acid from ammonia. LUCIEN H. GREATHOUSE (to Atmospheric Nitrogen Corp.). U. S. 1,692,298, Nov. 20. A gaseous mixt. contg. NH_3 and O is compressed and subjected to catalytic action; a portion of the product is condensed to liquid form and the condensed liquid and uncondensed gases are caused to travel together in the same direction with further cooling; the liquid condensate is then sep'd. from the gases and they are again brought into contact with each other countercurrent-wise with further cooling, and the liquid HNO_3 thus obtained is finally discharged separately from the gases. The entire process is effected under super-atm. pressure. An app. is described.

Sulfuric acid. SOCIÉTÉ GÉNÉRALE MÉTALLURGIQUE DE HOBOKEN. Fr. 639,259, Aug. 10, 1927. In the production of H_2SO_4 in towers without the use of Pb chambers, almost the whole of the oxides of N necessary is liberated at the head of the system, particularly in the first production app. Cf. C. A. 23, 486.

Sulfuric acid. SOCIÉTÉ GÉNÉRALE MÉTALLURGIQUE DE HOBOKEN. Fr. 639,440, Jan. 24, 1927. H_2SO_4 prep'd. from cold sulfurous gases is denitrified at a concn. less than 60°Bé. by warm sulfurous gases in a tower contg. small packing material.

Denitrating waste acids. WILLI BÜSCHING. Fr. 639,641, Aug. 18, 1927. Nitroglycerin or other waste acids are denitrated by part of the vapors from a H_2SO_4 concg. boiler. The process is continuous. Cf. C. A. 22, 2444.

Ammonia. SOCIÉTÉ GÉNÉRALE DE FOURS À COKE (Systèmes Lecocq). Fr. 639,129, Aug. 5, 1927. To obtain a granular salt, synthetic NH_3 is mixed with dry steam before passing to the saturators.

Ammonia from its elements. FRIEDRICH UNDE. Fr. 636,874, June 30, 1927. A catalyst for the manuf. of NH_3 from N and H is made by evapg. a soln. of an Al salt (chloride or sulfate) with a soln. of $\text{K}_4\text{Fe}(\text{CN})_6$ or $\text{K}_3\text{Fe}(\text{CN})_6$ in the proportions of 1 to 1.2.

Purifying gases for use in ammonia synthesis. BIRGER F. HALVORSEN (to Norsk Hydro-Elektrisk Kvaelfstofaktieselskab). U. S. 1,694,594, Dec. 11, 1928. See Can. 282,906 (C. A. 22, 4211).

Alkaline earth metal salts. I. G. FARBENIND. A.-G. Brit. 289,196, Feb. 14, 1927. Salts such as SrCl_2 , $\text{Ba}(\text{NO}_3)_2$ or $\text{Ca}(\text{NO}_3)_2$ are obtained from alk. earth metal sulfides by triturating the latter with NH_4 salts, and, if desired, accelerating the reaction by heating or by the addition of small quantities of water. NH_4 sulfide evolved is collected.

Alkaline earth metal oxides. WILLIAM L. LAWSON. Can. 284,341, Oct. 30, 1928.

Oxides of the alk. earth metals, such as Ba, Sr and Ca, are produced by subjecting a mixt. of the carbonate of the alk. earth metal and a catalytic agent (petroleum coke, graphite, coke, bone black, lamp black, carbon black, etc., may be used) in a closed vessel to a sufficiently high temp., not exceeding 2800°F. , for effecting ready decompn. of the carbonate with the evolution of CO_2 under conditions inhibiting any substantial consumption of the catalytic agent. The evolved gases are withdrawn from the vessel as the reaction proceeds, and the resulting reaction product is cooled under conditions inhibiting any deleterious changes therein. This reaction permits lower temp. than would otherwise be possible.

Cyanides. NAAMLooZE VENNOOTSCHAP NEDERLANDSCHE MIJNBouw EN HANDEL-MAATSCHAPPIJ. Swiss 126,193, Dec. 9, 1926. N is passed at about 1000° over pieces of highly absorptive coke contg. alk. compds. and the products obtained by the action of alk. compds. on humous materials are coked; catalytically acting metals of the Fe group may be added to the humous materials before coking.

Alkali metal cyanides. SYLVAIN COULIER. U. S. 1,691,960, Nov. 20. Nitrogenous org. matter such as leather scrap, slaughterhouse offals or vinasse is distd., relatively non-volatile non-nitrogenous substances are sepd. from the rest of the distillate, as by decantation of a sepd. layer, and the elemental N liberated in the course of the distn. is caused to act at a temp. of $800\text{--}1000^{\circ}$ upon the residue of distn. to effect cyanidation. The distn. step is carried out at a temp. considerably below that of cyanidation. Cf. C. A. 22, 305.

Iodates. FRIEDRICH A. HENGLEIN (to I. G. FARBENIND. A.-G.). U. S. 1,693,441, Nov. 27. KI or other alkali metal iodide is contacted with O in the presence of alkali metal hydroxide under superatm. pressure and at temps. above 100° (suitably $180\text{--}600^{\circ}$).

Chromium salts. I. G. FARBENIND. A.-G. Ger. 467,789, Nov. 9, 1924. Basic Cr salts are obtained in a spongy state and free from Fe by submitting the soln. or suspension thereof as a spray to a warm stream of gas or air.

Chromate and alumina. I. G. FARBENIND. A.-G. Fr. 636,782, June 28, 1927. Chrome ore is heated with bauxite or other Al ore in the presence of alkali carbonate, or mixts. forming such carbonates at decompn. temp., so that on lixiviating a soln. of chromates and aluminates is obtained. Caustic alkali, particularly KOH, may replace the carbonate. Al_2O_3 may be pptd. after removal of silicic acid by CO_2 and the soda is crystd. out, leaving an alkali chromate soln. Cf. C. A. 22, 2036.

Lead salts. S. C. SMITH. Brit. 289,105, Oct. 20, 1926. See Can. 283,213 (C. A. 22, 4211).

Titanium compounds. HEINRICH PLAUT (to I. G. Farbenind. A.-G.). Can. 285,355, Dec. 4, 1928. Ti compds. are manufd. by working up ilmenite with strong or fuming H_2SO_4 acid, dissolving the strongly acid material in water with the addition of a suitable quantity of K_2SO_4 , isolating the double sulfate thus obtainable and hydrolyzing. E. g. 1000 parts of strongly acid material obtainable by working up ilmenite with H_2SO_4 , which contains $\text{Ti}(\text{SO}_4)_2$ in a quantity equiv. to about 17% TiO_2 , is quickly heated with 2500 parts of water and 400 parts of K_2SO_4 to 95° . The soln. is filtered while hot. In the cold, i. e., at about $0\text{--}5^{\circ}$, the double sulfate seps. in about 65–75% the quantity calcd. on the dissolved Ti. The greatest part of the rest of the double salt may be isolated by evapg.

Titanium compounds. TITAN CO. AKTIESELSKABET. Brit. 289,111, Nov. 17, 1926. Ti compds. sol. in org. and dil. inorg. acids are obtained by heating a hydrated oxygenated compd. of Ti such as metatitanic acid or basic Ti sulfate, in the presence of alkali, at a temp. (suitably about 150°) below the fusion point of the reaction mass. By reaction of the products with suitable acids or mixts. of acids there may be obtained double salts of Ti and alkali such as Ti Na tartrate or lactate, Ti K oxalate, or Ti Na sulfate.

Aluminum compounds. T. R. HAGLUND. Brit. 289,639, May 3, 1927. Al sulfidiferous material contg. Al_2O_3 and sulfides of Al, Ca, Ba or Mg is oxidized below its m. p. to give O-contg. products and to yield the most of the S in other form than H_2S , preferably as free S which may be volatilized or as SO_2 . With excess air, $\text{Al}_2(\text{SO}_4)_3$ may be formed. Oxidation may be effected by gases obtained by burning H, H_2S , S or C in the furnace, by air, steam, or gases contg. SO_2 or O compds. of C such as CO or CO_2 or COS by which CS compounds such as CS_2 and COS are formed. By treatment of the product first with steam and then with SO_2 , Al sulfite or hyposulfite is formed, and dissolved, and on heating *in vacuo* the basic sulfite is pptd. from which the oxide may be prepd. Various details and modifications are given.

Aluminum sulfate. LOUIS G. PATROUILLEAU (to Soc. Alumine et Derives). U. S. 1,692,692, Nov. 20. Bauxite is treated with H_2SO_4 to form a soln. of mixed sulfates

and the salts of Fe present are converted into sol. ferrous salts by adding Fe and heating, the material is dild. to ppt. basic Al sulfate and the insol. Al sulfate is recovered.

Alumina and hydrochloric acid. I. G. FARBENIND. A.-G. Fr. 639,177, Aug. 8, 1927. Aluminous material is dissolved in H_2SO_4 and NaCl is added corresponding approx. to the quantity of H_2SO_4 and the mass is heated to about 700° , the HCl being collected. The product is mixed with C and heated to 1000° to form aluminate, Na_2CO_3 , and sulfide. The soln. is treated to sep. Al_2O_3 .

Alumina, soda and hydrochloric acid. NOEH J. GAREAU. Fr. 639,844, Aug. 20, 1927; Can. 283,982, Oct. 16, 1928. Clay is calcined in the form of briquets, treated with H_2SO_4 , water, steam and air, SO_2 and SO_3 to produce a product with a high content of $Al_2(SO_4)_3$. The briquets are leached with H_2SO_4 and water, and the $Al_2(SO_4)_3$ obtained is dehydrated and partly dissocd. The resulting mass is mixed with NaCl and coal, made into briquets and heated to a bright red and treated with superheated steam. The mass is leached to obtain pure Al_2O_3 and Na_2CO_3 . A suitable plant is described.

Ammonium nitrate. AZOGENO SOCIETÀ ANON. PER LA FABBRICAZIONE DELL'AMMONIACA SINTETICA E PRODOTTI DERIVATI CARLO TONIOLO. Swiss 126,578, May 16, 1927. NH_4NO_3 is rendered less hygroscopic by continually stirring it during solidification so that it forms a powder.

Metallic and ammonium sulfates. I. G. FARBENIND. A.-G. Brit. 288,977, April 16, 1927. Metal sulfates such as $ZnSO_4$ are obtained by treatment of aq. suspensions of the corresponding sulfides with O under pressure at temps. above 120° (suitably $20-30$ atm. pressure and 180° in treating ZnS). The process may be applied to the purification of coke-oven or raw illuminating gas by treating a metal sulfate in aq. ammoniacal soln. with the gas to be purified, converting the pptd. sulfide into sulfate, and recovering $(NH_4)_2SO_4$ from the filtrate.

Barium sulfate. K. EBERS. Brit. 288,498, Oct. 25, 1927. Crude barytes free from or low in lime but contg. such impurities as silica and Fe and Mn compds. is roasted at a temp. which preferably does not exceed its sintering point, treated with water (as by quenching) and then with an acid such as HCl, to obtain a pure white product, which may then be washed and ground.

Calcium nitrate. APPAREILS ET EVAPORATEURS KESTNER. Brit. 289,370, May 6, 1927. $CaCO_3$ is reacted on with HNO_3 and the gas released is forced in the same direction as the HNO_3 moves, as in the process described in Brit. 279,037 (C. A. 22, 2815). Sandstone spheres or other suitable blocks not affected by the HNO_3 are added to the $CaCO_3$ to maintain the resistance to the passage of liquid substantially const. An app. is described.

Nickelic hydroxide. FRIEDRICH MEIDERT (to I. G. FARBENIND. A.-G.). Can. 284,237, Oct. 23, 1928. $NiCO_3$ is transformed into $Ni(OH)_2$ by suspending the carbonate, in the form of a fine powder, in water and running a hypochlorite soln. into the suspension with vigorous stirring, at ordinary temp. The reaction takes place with development of CO_2 and O. E. g., 500 parts by wt. of $NiCO_3$ is suspended in 2000 parts of water. A hypochlorite soln. contg. 150 g. of active Cl per l. and as little free alkali as possible is slowly run into the well-stirred suspension. The end of the reaction can easily be recognized by the cessation of the gas developed. The consumption of the hypochlorite soln. corresponds to about 140 parts by wt. of active Cl. The output amounts, in accordance with the theory, to 380 parts of $Ni(OH)_2$, contg. 57% of Ni and free from carbonate. The filtrate is colorless and neutral.

Cobaltic hydroxide. FRIEDRICH MEIDERT (to I. G. Farbenind. A.-G.). Can. 284,236, Oct. 23, 1928. The process is exactly similar to that for $Ni(OH)_2$ (preceding abstract).

Potassium phosphates and hydrochloric acid. SOC. ANON. DES CHARBONS ACTIFS E. URBAIN. Brit. 288,330, April 8, 1927. KPO_3 and HCl are formed by heating together KCl and ortho-, pyro- or meta-phosphoric acid. The KPO_3 may be hydrated to form di-K pyrophosphate or mono-K orthophosphate and these substances may be treated with bases such as NH_3 to obtain products suitable for use as fertilizers. The HCl formed may be used for neutralizing synthetic NH_3 . Brit. 288,331 specifies hydrating KPO_3 (prepd. as just described) to form di-K pyrophosphate or mono-K orthophosphate, and treating these substances with N bases such as NH_3 , urea or cyanamide to form complex compds. such as $PO(OK)(ONH_4)NH_2$, suitable for use as fertilizers.

Sodium carbonate. SOCIÉTÉ ANON. DES USINES DIOR. Fr. 636,560, Jan. 23, 1925. Crystals of hydrated Na_2CO_3 are obtained in a compact form by submitting a mass of crystals resulting from a first soln. of Na_2CO_3 to the action of several warm concd. solns. of Na_2CO_3 , the action of each soln. being prolonged till it deposits no more crystals.

Sodium carbonate compounds from brines. WALTER A. KUENZERT. U. S. 1,693,-

237, Nov. 27. A brine such as that of Owens Lake, Calif. is first carbonated with a CO_2 -bearing gas while maintaining the rate of supply of CO_2 to the brine sufficiently low to maintain the temp. below 45° and cause pptn. to occur principally in the form of coarsely cryst. Na sesquicarbonate, until the concn. of Na_2CO_3 in the brine has been materially reduced. Cf. C. A. 22, 2816.

Soda ash from waste liquors. J. HOLMES, H. A. COME and J. L. JARDINE. Brit. 288,699, Jan. 11, 1927. The heat of combustion of org. material in waste liquors (such as those obtained by digestion of wood, grasses or the like with soda) is utilized to effect concn. of the liquors and to generate steam for use in the digesters. The concd. liquor is injected through atomizers into a combustion space, previously heated to start combustion by oil burners. Air for the combustion is preheated. Soda ash collects and is recovered. An app. is described.

Sodium sulfate and hydrochloric acid. CHARLES S. BENJAMIN (to General Chemical Co.). U. S. 1,693,217, Nov. 27. In furnacing a mixt. of NaHSO_4 and NaCl , the moisture content of the mixt. to be treated is adjusted to between 2 and 3.5%. This serves to produce a soft porous Na_2SO_4 which is easily pulverized.

Sodium acid sulfate in globular form. OTTO H. BUSE and RUSSELL R. REID (to The Grasselli Chemical Co.). Can. 284,244, Oct. 23, 1928. Molten nitercake or NaHSO_4 is atomized or sprayed into a cooling atm. to produce globular, dense, hard, smooth, non-porous, discrete particles having a pearly appearance.

Sodium sulfide. R. BOTSON and SOC. INDUSTRIELLE DES APPLICATIONS CHIMIQUES SOC. ANON. Brit. 289,354, Nov. 14, 1927. Crude Na sulfide is purified by use of steam under pressure with the addn. of about 1% of terpinolene to ppt. impurities, dilg. with water to form a soln. of 13° Bé., filtering or centrifuging, adding 35° Bé. NaOH soln. to bring the sp. gr. to 18.5° Bé., again filtering, concg. to a 50% soln. and crystg. The product is free from Fe, Cu and hyposulfite and may be used in prepg. *photographic toning solns.* The dried crystals may be pressed into blocks or aggregated with a binder.

Zinc chloride. METALLBANK UND METALLURGISCHE GES.-A.-G. Brit. 288,253, April 9, 1927. Anhyd. ZnCl_2 is obtained by subjecting ZnO (suitably after preheating to 300 – 400°) to the action of Cl in the presence of H, with or without other reducing agents; water gas, power gas or other gas contg. both H and CO may be used, e. g., a mixt. of Cl and water gas may be used under such conditions that a temp. of 400 – 500° is maintained by the heat of the reaction, and the fused ZnCl_2 produced may be tapped off and filtered before it solidifies. If desired the process may be carried out at 700° or a higher temp. to effect volatilization and condensation of the ZnCl_2 .

Treating zinc chloride solutions containing magnesium. NILS E. LENANDER (to Orkla Grubekaktiebolag). U. S. 1,694,710, Dec. 11. A soln. such as that obtained as a waste in Cu extn. is treated with less lime than would be required to convert the Zn present into $\text{Zn}(\text{OH})_2$, pptd. basic Zn chlorides are removed and mixed with not more than an equiv. proportion of lime and the mixt. is heated at atm. pressure to not higher than about 70° to form ZnO .

Zinc oxide. THE NEW JERSEY ZINC CO. Swiss 126,621, Mar. 9, 1927. Zinciferous and carbonaceous substances are heated and the metallic Zn is volatilized and oxidized. The gas carrying the ZnO in suspension is maintained at 125° .

Purifying zinc sulfate solution. ERNEST R. CRUTCHER (to the Sullivan Mining Co.) Can. 285,390, Dec. 4, 1928. ZnSO_4 soln. to be purified is put into an agitator and a small quantity of zinc oxide is added to neutralize any acid present. MnO_2 (25 lb. per ton of Zn contained in the soln.) is added and the soln. agitated for 5 min. Zn xanthate, or one of the alkyl S derivs. of carbonic acid which has been previously mixed in a small quantity of the soln. undergoing treatment is then added to the soln. in the agitator and the soln. is agitated until approx. all the impurities are pptd. The soln. is then filtered. The temp. of the process is between 50° and 70° . The pptn. can be completed at a temp. as low as 30° , but the time required for complete sepn. is greater.

Lime. E. JEENICKÉ & Co. Ger. 468,253, Aug. 22, 1926. Lime is burned in a kiln in which O-enriched air is admitted under pressure after circulation in heating pipes in the flues.

Copper and carbon compound. GEHR. SIEMENS & Co. (Erich Birnbrauer, inventor). Ger. 467,790, Nov. 16, 1921. Addn. to 454,804. Cu pptd. as in 454,804 is mixed with graphite and heated in the absence of air to a bright red heat (900°). Cf. C. A. 23, 488.

Carbon monoxide. GUSTAV WIERZEL (to I. G. Farbenind. A.-G.). U. S. 1,695,130, Dec. 11. In order to produce pure CO and a mixt. of pure H and N from a gas such as water gas or coke-oven gas which also contains impurities including org. S compds., the impure gas is treated with steam to convert a portion of the CO to CO_2 and sub-

stantially all the S compds. to H_2S , the CO_2 and H_2S are removed (suitably by water under pressure) and the CO is then sepd. from the H and N (suitably by ammoniacal cuprous formate soln. or a similar compd.).

Carbon monoxide. JOHN C. WOODRUFF (to The Commercial Solvents Corp.). Can. 283,913, Oct. 9, 1928. CO is produced by passing granular C downward through a tilted rotating tube which is heated so that the temp. of the contained C will be $800\text{--}1500^\circ$ and passing CO_2 upward through said tube.

Carbon dioxide. PIERRE É. HAYNES. Fr. 637,000, July 5, 1927. See Brit. 277,938 (C. A. 22, 2642).

Nitrogen oxides. ELEKTRIZITÄTSWERK LONZA. Brit. 289,412, April 26, 1927. N oxides (such as those obtained by oxidation of N or of NH_3) are absorbed from gaseous mixts. by treatment in stages with HNO_3 of increasing concn. at temps. below 0° (preferably -20° to -30°). In the first stages the lower oxides of N decomp. the HNO_3 to form NO_2 , which is absorbed in concd. HNO_3 in the final stages.

Sulfur dioxide and hydrogen. CHARLES H. MACDOWELL and HERBERT H. MEYERS (to Armour Fertilizer Works). U. S. 1,693,244, Nov. 27. A mixt. of S vapor and steam is heated in the presence of Fe oxide as a catalyst (suitably at a temp. of about $900\text{--}1000^\circ$) for a time sufficient to produce a gaseous mixt. contg. SO_2 and H which are individually recovered from the mixt.

Hydrogen peroxide. I. G. FARBENIND. A.-G. Swiss 126,577, Jan. 4, 1927. Solns. of H_2O_2 are concd. by bringing the soln. to a finer state of division by a gas current.

Hydrogen sulfide and sulfides. I. G. FARBENIND. A.-G. Fr. 636,963, July 4, 1927. H_2S or sulfides are prepd. by the action of H on S or compds. yielding it, under pressure and at a high temp. and in the presence of H_2O or bases. The H may be partly or wholly replaced by CO or CH_2O or formates. Catalysts such as FeO or FeS may be used.

Minium. JEAN J. TARDAN. Swiss 126,583, Jan. 20, 1927. Minium is manufd. by oxidizing spongy or finely divided Pb in 2 stages. First, a mass contg. the monoxide is formed at a temp. which avoids melting the Pb; then the mass is roasted. The app. for carrying out the process is described.

Protecting calcium chloride or other granular substances from deterioration. BENJAMIN P. RICHARDSON. U. S. 1,692,996, Nov. 27. Active granular material such as CaCl_2 is treated with an excess of a normally inert impermeable solid such as paraffin carried by gasoline or other inert liquid vehicle, the surplus of the fluid mixt. is removed, and the deposit on the granules is caused to solidify by evapg. the solvent.

Double salt; fertilizers. "AZOGENO" (SOCIETÀ ANON PER LA FABBRICAZIONE DELL'AMMONIACA SINTETICA E PRODOTTI DERIVATI), CARLO TONIOLO and BRUNO TANZI. Fr. 639,648, Aug. 18, 1927. A double salt which is non-hygroscopic is prepd. by mixing $(\text{NH}_4)_2\text{SO}_4$ and anhyd. $\text{Ca}(\text{NO}_3)_2$ in the presence of 2 mols. of water for one of nitrate. The water may be added to either salt as moist air, steam or liquid or the hydrate $\text{Ca}(\text{NO}_3)_2 \cdot 4\text{H}_2\text{O}$ may be used. An NH_4 phosphate may be used instead of the sulfate, and K salts, NH_4NO_3 or urea may be added to obtain a mixed fertilizer.

Purifying alkali or alkaline earth metals. J. J. CONLIN (to British Thomson-Houston Co., Ltd.). Brit. 288,333, April 6, 1927. Metallic Ca or other alk. earth or alkali metal is purified by placing it in a metal container, such as a steel tube with an opening at its lower end, and immersing the container in a molten salt such as CaCl_2 which does not react with the metal to be purified. The impurities sink to the bottom of the tube and the purified metal rises to the top. Mg and Ca may be purified together and simultaneously alloyed. An app. is described.

Active carbon. SOCIÉTÉ INTERNATIONALE DES COMBUSTIBLES LIQUIDES. Fr. 639,242, Aug. 9, 1927. A very active C is obtained by treating the insol. residues from the berginization of coal with acids, washing and heating.

Activated carbon. I. G. FARBENIND. A.-G. Brit. 289,170, Jan. 24, 1927. Activation is effected by gases contg. no free O (e. g., by steam) which may be caused to diffuse through a diaphragm into the activating chamber, or may be introduced directly into the chamber. The gaseous products of the activation diffuse out through a diaphragm and after oxidation may pass back into the chamber for further use in the activation. Various details of app. are described.

Activation of carbon. SOCIÉTÉ DE RECHERCHES ET D'EXPLOITATIONS PÉTROLIFÈRES. Fr. 639,202, Jan. 14, 1927. Carbonaceous materials are impregnated with small quantities of acids, bases or salts which have a fire-proofing effect, before activation. Phosphoric acid, H_3BO_3 , Na_2BO_3 , Na_2CO_3 and alkali phosphates are suitable. Cf. C. A. 22, 4212.

Metallurgical carbon. G. DE KORFF AND G. JAKOVA-METURI (to Carbonisation

soc. générale d'exploitation des carbonés). Brit. 288,551, April 11, 1927. See Fr. 632,623 (C. A. 22, 3387).

Revivifying bone black. WM. W. KEMP. U. S. 1,692,745, Nov. 20. A preformed mixt. of fuel gas and air (contg. not more air than required for combustion of the gas) is burned in a container holding the bone char while excluding other air from the container, and the combustion products and gases and vapors produced are discharged from the container. An app. is described.

Hydrogen. FRANK C. BLAKE (to Lazote, Inc.). U. S. 1,692,811, Nov. 27. Steam and CO are together subjected to the action of a non-ferrous catalyst such as oxides of Cr, Cu, Mn, V, Mg and W in an app. the interior surfaces of which are formed of Cr, Al, Cu, Ag or other non-ferrous material. Cf. C. A. 22, 2817.

Hydrogen. I. G. FARBENIND. A.-G. Brit. 288,662, Nov. 15, 1926. Hydrocarbons or mixts. contg. them such as purified coal gas freed from S are subjected to partial combustion with a limited quantity of O or gas richer in O than air so that the resulting mixt. still contains some hydrocarbons, steam is added if not already present and the mixt. is passed over a catalyst which at least converts the hydrocarbons into CO and H and which may also effect the complete conversion of the mixt. into CO and H. Ni activated with alumina and Fe and Cr oxide are suitable catalysts. Cf. C. A. 23, 488.

Hydrogen. RUDOLF E. BATTIG. Can. 284,117, Oct. 23, 1928. Satd. or unsatd. hydrocarbons or gas mixts. contg. them are passed through a chamber heated to the temp. of decompn. and the decomposed hydrocarbons are passed through a second chamber in which the C is deposited, the H passing through a third chamber and heating the same before being passed to a gas collector. At the end of the process air is passed through the third chamber and after preheating it enters the second chamber, where combustion of the C takes place and the products of combustion heat the first chamber to a high temp., whereupon the decompn. of hydrocarbons is renewed.

Hydrogen. WILHELM GLUUD, KONRAD KELLER, ROBERT SCHONFELDER and WALTER KLEMP. Can. 284,298, Oct. 30, 1928. One hundred cu. m. of a gas mixt., contg. besides H for instance 20 cu. m. of CO, is conducted at atm. pressure together with the quantity of steam required by theory for the conversion of the CO (*i. e.*, 20 cu. m. steam) at a temp. of 300–600° over a mixt. of 15 kg. bauxite with 58 kg. CaO. During the reaction all the CO is converted into CO₂, which is completely bound by the lime, the CO being replaced in the gas mixt. by an equal vol. of H, so that the vol. of the gas mixt. is not altered. As soon as material quantities of CO or CO₂ can be detected in the H produced, the raw gas contg. CO is conducted to an app. charged with CaO and bauxite, in which the same process is carried through, while the lime in the first app. being satd. with CO₂ is regenerated by heating up to 900–1000°.

Helium from natural gas. MONTAGUE H. ROBERTS (to Air Reduction Co.). U. S. 1,693,052, Nov. 27. An app. and system for fractional liquefaction is specified by which He is obtained as a final gaseous residue.

Iodine. WALLACE L. CHANDLER. Swiss 126,576, Nov. 2, 1926. I is prepd. in a finely divided colloidal form by the action of HI on iodic acid at a low temp. in the presence of a protective colloid.

Compounds containing active oxygen. HENKEL & CIE, G. M. B. H. Swiss 126,192, Mar. 16, 1927. The reagents to be used in the manuf. are purified by treatment in soln. with silica gel.

Sulfur from sulfur dioxide. ALFRED P. THOMPSON (to General Chemical Co.). U. S. 1,695,068, Dec. 11. In reducing SO₂ by the action of carbonaceous fuel, an endothermic reaction such as that of CO, mixed with the SO₂ is simultaneously effected in the absence of H in any form, so that the temp. of the reduction process is thus controlled.

Purifying sulfur contaminated with hydrocarbons. JAMES W. SCHWAB (to Texas Gulf Sulphur Co.). U. S. 1,692,422, Nov. 20. The molten S to be purified is agitated with anhyd. AlCl₃ and then sepd.

Purifying gases containing phosphorus. GUSTAV PISTOR and ERNEST BORSBACH (to I. G. Farbenind. A.-G.). U. S. 1,692,787, Nov. 20. See Can. 279,987 (C. A. 22, 2801).

Javelle water. HARRY D. LEVINE. U. S. 1,694,711, Dec. 11. A NaOH soln. is rapidly refrigerated to about 0° and maintained at approx. this temp. while Cl gas is introduced into the soln. An app. is described.

Bleaching liquors. T. BENCKISER, A. REIMANN and A. REIMAN (trading as the Firm of J. A. Benckiser) and F. DRAISBACH. Brit. 289,156, Jan. 21, 1927. In stabilizing bleaching liquors contg. peroxides or persalts by use of alkali pyrophosphates, the *p_H* of the liquors when warm is maintained at 7.0–8.5 in the absence of soap, and at 7.0–10.0 in the presence of soap suitably by the addn. as necessary of acids or acid salts such as bisulfates, mono-Na or mono-NH₄ phosphates or an acid alkali pyrophosphate.

Granular bleaching earths. JOSEF BRUNNER and OTTO HELL. Swiss 126,189, Mar. 10, 1927. Crude bleaching earths in granular form are refined by treatment with acid of sufficient concn. to avoid disintegration of the granules, *e. g.*, with HCl of 10–11° Bé.

Regenerating metallic oxides used for desulfuration. SOCIÉTÉ INTERNATIONALE DES PROCÉDÉS PRUDHOMME-HOUDRY. Fr. 639,774, Feb. 3, 1927. Oxides used for desulfuration of gases are regenerated by passing a reducing gas in the opposite direction through the app. heated to about 350° and when a sufficient thickness has been reached, air or an oxidizing gas is passed through and the heat thereby liberated is sufficient to remove the rest of the S as SO₂, with formation of oxides.

Glazed surfaces resistant to acids, alkalies, etc. ELEKTROCHEM. FABRIK KEMPEN-RHEIN DR. BRANDENBURG & WEYLAND GES. (to R. Arnot). Brit. 288,303, April 6, 1927. Highly glazed surfaces resistant to acids, alkalies, hot and cold water and org. solvents are produced on molded articles or sheet material by applying a coating of synthetic resin by use of a highly polished mold or metal plate coated with a soln. of the resin, and heating to form a hard film which is transferred by pressure to the article to be coated. Various other substances including materials for preventing adhesion may be added.

Rotary furnace for the commercial preparation of lead oxide. SOCIÉTÉ GAMICHON, CARETTE & CIE. Ger. 468,298, July 3, 1926. The inner wall is provided with broad scoop-like projections which carry the lead granules upward and gradually decant them to the bottom.

Furnace for the decomposition of alkali metal chlorides by steam in the presence of silicates in a molten mass. JULIUS KERSTEN. U. S. 1,692,175, Nov. 20. A furnace is specified suitable for the production of HCl from NaCl, Na silicate and steam.

Furnace for producing phosphoric acid, etc. STETTINER CHAMOTTE-FABRIK. A.-G. VORM. DIDIER. Brit. 289,128, Jan. 17, 1927. In a furnace suitable for producing H₃PO₄ from phosphates mixed with coal and sand, and for other chem. and metallurgical purposes, the raw materials are fed in a thin layer to a melting chamber down an inclined neck or throat, and all of the combustible gas evolved is used for heating the furnace. Various structural details are described.

Drying nitrous gases. I. G. FARBENIND. A.-G. Fr. 636,961, July 4, 1927. See Brit. 284,839 (C. A. 22, 4677).

Resinous moldable composition. HARRY M. WEBER. U. S. 1,692,524, Nov. 20. MgO is ground with CH₂O and the resulting mixt. is caused to react with a cresol. Numerous examples are given.

Plastic compositions containing phenolic condensation products. CLARENCE A. NASH (to Cutler-Hammer Mfg. Co.). U. S. 1,692,856, Nov. 27. A condensation binder produced from a phenolic compd. and a reactive CH₂-contg. substance such as (CH₂)₆N₄ is mixed with an inert filler such as asbestos or mica, before completion of the reaction of the substances forming the binder and before molding, and such a quantity of the inert filler is added as will serve to arrest the reaction at a given stage. The product may be used for making molded articles.

Molding phenolic condensation products. SAMUEL L. ABRAHAMS (to General Electric Co.). U. S. 1,693,327, Nov. 27. In forming articles such as *insulating covering* on commutator clamping rings a wall of a mold is coated with a mixt. of mica and a binding material such as shellac which is softened by heating, and a condensation product is molded in contact with the mica and binder, by the action of heat and pressure, so as to form an insulating coating for the molded product.

Phenol-aldehyde condensation products. KUNSTHARZFABRIK DR. F. POLLAK GES. Brit. 288,228, April 6, 1927. "Dispersively acting substances" such as gum arabic, saponin, tragacanth, dextrin, gelatin, casein or other protective colloids, are added to the condensation soln. before or at the moment of condensation. The condensation product forms in finely divided condition and assumes a pulverulent character on heating, without forming a solid cake. By pouring this emulsion or suspension into water or solns. of salts or acids, or by cooling it, a pulverulent cake is formed. Various aldehydes may be used and considerable quantities of condensing agents preferably are employed. Examples are given.

Purification of phenol-aldehyde condensation products. BAKELITE G. M. B. H. Swiss 126,203, Feb. 10, 1926. See Brit. 248,726 (C. A. 21, 828).

Phenol-formaldehyde condensation products. GRIGORI PETROFF. U. S. 1,693,461, Nov. 27. A phenol is condensed with CH₂O in the presence of MeC₄H₉SO₃NCINa, which serves to facilitate the reaction.

Urea-formaldehyde condensation products. I. G. FARBENIND. A.-G. Brit. 288,-

346, Oct. 1, 1926. The condensation is effected in an acid soln. continuously maintained at a p_H between 4 and 6 and the water is then removed at a temp. not exceeding 50° while a p_H between 6 and 7 is maintained. When less than 2 mol. proportions of CH_3O is used for each mol. proportion of urea, the evapn. stage may be wholly or partly dispensed with and the condensation product may be sepd. by cooling the soln. preferably while adding salts such as Na_2SO_4 or $NaCl$. Plasticizers, cellulose esters or ethers and other substances may be admixed with the products. Na phosphates may be used as buffers. Cf. C. A. 22, 2645.

Adsorbent products from zeolitic materials. A. ROSENHEIM. Brit. 289,418, April 27, 1927. The treatment of natural or artificial zeolites or similar substances with acids to obtain adsorbents as described in Brit. 275,203 (C. A. 22, 2248) is so conducted that a sol is produced and the latter is converted into a gel without sepn. of the electrolytes, such as $AlCl_3$ or $FeCl_3$, which are obtained by the action of the acid on the zeolites. After drying, the gel may be freed from the electrolytes by use of water or acids. Numerous details and modifications are described including the use of compds. of Al, Fe, Cu, Mn, Mg and Ti. Acetates, formates or nitrates may be used as electrolytes in the process. Cf. C. A. 22, 4739.

Catalysts containing base-exchange substances. ALPHONS O. JAEGER (to Selder Research & Engineering Corp.). U. S. 1,694,620, Dec. 11. Catalysts suitable for use in producing oxidation products of aromatic hydrocarbons or in other reactions contain base-exchange substances free from chemically combined Si and having catalytically active elements such as V, W, Mo, Cu, Ni, U, Cr or Zn combined in non-exchangeable form. Many detailed examples are given.

System for supplying dried compressed air for discharge of chlorine or other liquefied gases from tank cars. WM. B. LEACH, JR. (to Mathieson Alkali Works). U. S. 1,692,847, Nov. 27.

Porous fillings for storage of gases such as acetylene. SOC. L'AIR LIQUIDE, SOC. ANON. POUR L'ÉTUDE ET L'EXPLOITATION DES PROCÉDÉS G. CLAUDE. Brit. 289,391, April 26, 1927. Large pieces of charcoal are used with pulverulent material (which may also be charcoal) which by settling assumes sufficient density to prevent propagation of explosions.

"Ethyl alcohol substitute" for use as a solvent, etc. ROBERT M. ISHAM (to Doherty Research Co.). U. S. 1,692,662, Nov. 20. A mixt. of isopropyl alc., acetaldehyde and $BuOAc$ is used, suitably in the resp. proportions of 5 gal., 3 cc. and 6 cc. (which gives an odor similar to $EtOH$).

Impervious material comprising artificial graphite and sulfur. WARREN F. BLEECKER. U. S. 1,694,730, Dec. 11. Conduits, receptacles or other articles are formed of artificial graphite, the voids of which are closed with S. Cf. C. A. 22, 4740.

Gems. LEON H. BARNETT. Can. 284,305, Oct. 30, 1928. Fe contg. C 4.5, Si 3, and P 1% and as little S as possible is melted and poured into a red-hot steel shell of great strength into which particles of opaque corundum have been previously introduced. The shell is then closed and the material permitted to cool to 1050° and is kept at this temp. for 1 hr., after which it is allowed to cool to room temp. The hardened material is cracked open or dissolved in acid to free the resulting rubies, sapphires, etc. Some small diamonds should also be present. A similar high pressure with its accompanying action on C (and corundum if present) can be produced by rapidly cooling a mass of molten cast iron to below 700° with production of cast iron in which most of its C is in the combined form. The cast iron will thereby be in a denser form, there having been no expansion during solidification and cooling. The temp. is now slowly raised to about $700-800^\circ$ and kept at this temp. until most of the C is in a free state; the shell is cooled and broken and the material dissolved as before to isolate the gems.

Organic glass. HENRI SPINDLER. Fr. 637,051, Oct. 29, 1926. An org. glass is prepd. by the action of CO on NH_3 at high pressure and at a temp. of $150-400^\circ$ in the presence of a catalyst such as Fe, Ni, Co, Cu or their compds. to produce CH_3O and urea, which are then combined in known matter.

Composite sheets of glass and cellulose acetate. H. J. MALLABAR and NONIN-FLAMMABLE FILM CO., LTD. Brit. 288,782, Feb. 24, 1927. The surfaces to be united are first coated with a layer of gelatin, which when dry is softened and the sheets are then united by pressure. A blue dye must be used to neutralize the yellow tint of the cellulose acetate. Various formulas of softening liquids, etc. are given.

Cleaning gelatinous surfaces. BERTHA SUGDEN (to Technicolor Motion Picture Corp.). U. S. 1,692,358, Nov. 20. Materials such as film matrices carrying dye residues are immersed in a dil. volatile soln. inert to the gelatinous material, such as a 2% soln. of NH_3 in $EtOH$, followed by drying.

Adhesive. ORANIENBURGER CHEMISCHE FABRIK, A.-G. KURT, LINDNER and JOHANNES ZICKERMANN. Ger. 468,026, June 24, 1926. An org. colloidal adhesive is made stronger by the addn. of a colloidal, high-mol. sulfo acid, or the sulfo salt of an alkylated or arylated aromatic hydrocarbon, sol. in water. The examples given are isobutyl- and isopropyl-naphthalenesulfonic acid.

Dichromate-glue printing plates. MAX WIELAND. U. S. 1,692,528, Nov. 20. A gelatin or glue compn. is mixed with finely ground portland cement in such proportions as to preserve the ability of the gelatin to swell, and the compn. is then spread and sensitized.

Coating composition. JOSEF TOTH. Swiss 126,258, Jan. 13, 1927. The compn. comprises $MgCl_2$ soln. (100 parts), acetone (5 parts), dextrin (10 parts) and calcined MgO (90 parts). The compn. may include also a dye and 6-10% of portland cement. The coating may be rendered impervious by treatment with a mixt. of soda cellulose and Me_2O .

Metallic coatings for loud-speakers. TELEFUNKEN GES. FÜR DRAHTLOSE TELEGRAPHIE. Brit. 288,334, April 7, 1927. The movable metallic coating of an electrostatic loud-speaker is made of a metal the oxides or sulfides of which are elec. conductors, e. g., powd. Ag is sprayed upon the dielectric of the loud-speaker to form its moving metallic coating.

Printing surfaces. LANKES & SCHWÄRZLER. Brit. 288,550, April 11, 1927. In prepg. a printing surface, one side of a sheet of paper or the like is coated with chalk or clay (preferably in a number of layers), the back of the sheet is impregnated or coated with a substance resistant to the action of a washing or etching liquid capable of removing the chalk or clay, a picture is impressed on the side coated with the chalk or clay and the chalk or clay not covered by the picture is removed, e. g., with a $CaCl_2$ soln. Glue or casein treated with CH_2O may be used as the resistant substance.

Stencil sheets. S. HORII. Brit. 289,511, Jan. 24, 1927. Esters such as cellulose nitrate or acetate or mannan acetate are used with alcs. derived from oils or waxes of marine animals such as oleyl alc., cetyl alc., or selachyl alc., and these and other suitable associated ingredients may be used as a coating on Yoshino paper or may be added to the paper pulp in a mixing hollander.

Material for core of telephone cable loading coils. SIEMENS & HALSKE A.-G. Brit. 289,385, April 25, 1927. Cores with very small hysteresis losses are formed of magnetic material in very small particles which would pass through a sieve of not less than 40,000 meshes per sq. cm., compressed under high pressure. Such particles may be obtained from suspensions or solns. which may comprise shellac or colophony and alc.

Compositions for seats, etc. J. HARRIS. Brit. 289,702, Sept. 26, 1927. The upper layer is formed of a compn. of granulated cork, fiber, sawdust or the like, rubber and glue, with coloring and vulcanizing ingredients, and the lower layer is formed of sponge rubber compn.

Brake-lining material. ROBERT LAUGHLIN (to Brand Co.). U. S. 1,693,304, Nov. 27. A compn. for use on brake linings, clutches and similar devices is formed from rubber sponge, linseed oil, crude paraffin wax, PbO , S, hard wax tailings, rosin, $Ca(OH)_2$ and soft wax tailings or petroleum tailings.

Friction material suitable for brake linings or clutch facings. ISADOR J. NOVAK (to Raybestos Co.). U. S. 1,692,136, Nov. 20. A material with an asbestos base contains a binder comprising the solid residue of waste sulfite liquor produced by drying the liquor.

Hardening casein. SOCIÉTÉ INDUSTRIELLE DES MATIÈRES PLASTIQUES. Fr. 637,157, Nov. 2, 1926. Casein is hardened in the mass to produce a homogeneous artificial horn of any thickness, by soaking softened casein in the cold with the necessary quantity of CH_2O or other substance yielding it, in the presence of a swelling agent and an agent preventing the CH_2O reacting in the cold, and then heating under pressure. In an example casein is mixed with formalin, $EtOH$ and $NaOH$ and heated under pressure to 95-100°. Cf. C. A. 22, 2446.

System for spray evaporation of brine, etc., in a circulating current of relatively cool gas. SALT UNION, LTD., D. V. PLUMBRIDGE and W. E. GIBBS. Brit. 289,116, Dec. 23, 1926.

Piezo-electric crystal. WILLIAM H. BURTIS. U. S. 1,692,074, Nov. 20. The surface of a crystal carries a silicate binder and a powd. metal forming the electrode for the crystal. A layer of metal may also be deposited electrolytically.

Metal foil. CHEMISCHE FABRIK VON HEYDEN AKT.-GES. Ger. 467,884, July 6, 1924. Metal foil used for gilding, etc., is prepd. by mixing bronze powder and dried parchment paper pulp in a mixer and treating the mixt. as for the usual prepn. of parchment paper.

"Color-binding" substances. HENKEL ET CIE, Ges. Brit. 289,053, April 21, 1927. "Color-binding" substances sol. in cold water are obtained by slightly disintegrating starch preps. which swell in cold water, such as alkali-starch, CaCl_2 -starch, NH_4CNS -starch or the like, with disintegrating agents such as H_2O_2 , per-salts, hypochlorites or chloramines. The disintegration may also be effected before or simultaneously with the prepn. of "swelling" starch. When liquid disintegrating agents are used, alc. is added to prevent local paste formation.

"Heat-responsive" material suitable for indicating temperatures. PAUL B. COCHRAN (to Westinghouse Elec. & Mfg. Co.). U. S. 1,693,869, Nov. 27. A compn. including Cu_2I_2 about 30 and HgI_2 about 70 parts is used with oil varnish free from drier or other suitable waterproof vehicle for indicating temp. by change of color at approx. 65° .

"Thermal mine" suitable for loosening ice accumulations, etc. JOHN H. DEFFELER (to Heat Research and Service Corp.). U. S. 1,695,089, Dec. 11. A thermite charge is arranged to be ignited by an internal igniting charge. Various structural features are described.

Emulsions, paints, insecticides, waterproofing compositions, etc. C. J. J. FOX. Brit. 289,122, Jan. 15, 1927. An NH_3 base such as NH_3 itself or an aliphatic amine is added to the oleic, palmitic, stearic or other soap of a metal, the hydroxide of which is solubilized by NH_3 , such as Zn, Cu or Ni. The resulting product, with or without addn. of a diluent such as water, may be used for dispersing glycerol, CS_2 , oils, rubber latex, pigments, dyes or color lakes (especially those formed from the metals mentioned), metallic salts, inert solids such as clay or kieselguhr and aq. and other solns. of substances such as salt, waxes, resins and fats. Several examples are given.

Waterproofing composition. WALLACE B. VAN ARSDEL (to The Brown Co.). Can. 284,377, Oct. 30, 1928. A waterproofing compn. which is hard, non-sticky and wax-like at ordinary temp., remains tenacious at about 100 – 140°F ., and tough at about 40 – 50°F ., is composed of a mixt. of about 40 to 70% petroleum asphalt, 15 to 40% paraffin and 10 to 30% of a finely divided filler (bentonite, fuller's earth).

Vermin-proofing compositions. SCHERING-KAHLBAUM A.-G. Swiss 126,358, Feb. 26, 1927. Powd. vermin-proofing compns. are rendered easier of application by a small addn., for instance 0.5–2%, of a water-insol. resin.

Foam for extinguishing fires. BRITISH DYESTUFFS CORP., LTD., and E. CHAPMAN. Brit. 289,630, April 25, 1927. Gas-developing reagents are used with "foaming agents" such as sulfonic derivs. of aldehyde-phenol condensation products, alkylated naphthalenesulfonic acids, sulfonic derivs. of sulfonatable mineral oil fractions b. above 200° , sulfonated alkylated mineral oil fractions, ligninsulfonic acid, naphthenic acids, taurocholic acid, sulfonated higher fatty acids or salts of any of these.

Fire extinguisher. "POLEO" FEUERLÖSCHAPPARATE G. M. B. H. Fr. 636,714, June 28, 1927. See Brit. 273,713 (C. A. 22, 2038).

Fire extinguisher. EXCELSIOR FEUERLÖSCHGERÄTE A.-G. and HANS BURMEISTER. Swiss. 126,506, Apr. 7, 1928. The extinguishing means comprises 2 or more chemicals which, with water, evolve gas and form a foam. Thus, Na_2CO_3 and $\text{Al}_2(\text{SO}_4)_3$ can be employed.

19—GLASS, CLAY PRODUCTS, REFRACTORIES AND ENAMELED METALS

G. E. BARTON, C. H. KERR

The plasticity of clay. B. S. SHVETZOV. *Trans. State Expt. Inst. Silicates* (Moscow) 1927, No. 21, 15–20.—S. analyzes the Auerbach formula (F. Auerbach, *Plasticität und Sprödigkeit*, *Ann. Phys. u. Chem.* 45, 277(1892)) for plasticity. J. S. JOFFE

The effect of thermal shock on the transverse strength of fireclay brick. C. W. PARMELEE and A. E. R. WESTMAN. Univ. of Ill. *J. Am. Ceram. Soc.* 11, 884–95 (1928).—An app. is described by which a firebrick, initially at 1100° , could be subjected to local stress by cooling the center of one face with an air blast, the remaining surface being protected. The effect on 20 com. brands of brick was thus detd. Stiff-mud brick were more affected than dry-press or handmold brick. The more porous bricks were less affected. Bricks of high transverse strength were more affected than weaker bricks. C. H. KERR

Effect of heat treatment on diatomaceous earth. HOBART M. KRANER. *J. Am. Ceram. Soc.* 11, 875–83(1928).—Samples from several com. deposits were studied. The

diatom structure may be destroyed by heating without any indication of deformation of the material. There seems to be a direct relationship between chem. purity and retention of diatom structure, the purest being least easily affected. An air-float sample which was quite pure showed little deterioration up to 1300°. C. H. KERR

Manufacture of stoneware and flower pots in a small plant. FRANK A. KIRKPATRICK. *J. Am. Ceram. Soc.* 11, 896-903(1928).—Plant descriptions and formulas are given. C. H. KERR

Economical lime burning. O. WOLCEN. *Tonind.-Ztg.* 52, 1652-5(1928).—A general discussion, with descriptions of the patents (DRP): 357,420 and 358,295, of the firm of Heinrich Koppers of Essen for the use of air under pressure; 358,587 of the Allgemeine-Vergassungs-Gesellschaft m. b. H., Berlin-Halensee covering a furnace of large cross section; 459,950, Ludwig Riedhammer of Nuremberg, for a furnace with constructed upper part; and 458,374, A. B. Helbig, Berlin, for the use of coal-dust firing. F. O. A.

Silica in 1927. ESTELLE R. PHILLIPS AND J. A. DORSEY. Bur. of Mines, *Mineral Resources of the U. S. 1927*, Pt. II, 51-5 (preprint No. 7 published 1928). E. H.

The physical structure of refractory materials. THOMAS S. CURTIS. *J. Am. Ceram. Soc.* 11, 904-16(1928).—12 color plates. Relations between phys. structure and performance characteristics, particularly of *mullite*, are pointed out. C. H. K.

Abrasive materials in 1927. A. T. COONS, B. H. STODDARD AND J. A. DORSEY. Bur. of Mines, *Mineral Resources of the U. S. 1927*, Pt. II, 91-8 (preprint No. 11, published Nov. 8, 1928). F. H.

Report of the Enamel Division, Standards Committee, of the American Ceramic Society, 1927-28. E. P. POSTE, et al. *Bull. Am. Ceram. Soc.* 7, 347-67(1928).

C. H. KERR

Determination of Fe in silicates (VICKERS) 7. Metallic lead in red lead (HEINRICKS) 7.

The Glass Packer (New Journal) Vol. I. No. 1, Oct., 1928. Published by Ogden-Watney Publishers, Inc., at 117 Liberty St., N. Y. City. Published Monthly. Subscription price, \$2.00 domestic, \$3.00 foreign.

Glass. FRANCIS J. O. HOWE and MYER MISENER. *Brit.* 290,144, Jan. 23, 1928; *Can.* 285,240, Dec. 4, 1928. Splinterless or safety glass formed with a layer of transparent colloidal material interposed between the glass layers (cellulose acetate or cellulose nitrate) is immersed in a bath contg. a solvent (AcOH, AcOMe, a mixt. of alc. and ether, or commercial acetone) which converts the colloidal substance at the edges of the glass into a gel that is readily removable. The groove left by the removal of the gel is washed and then sealed with a suitable material.

Method and apparatus for forming charges of molten glass. LEONARD D. SOUBIER (to Owens Bottle Co.). U. S. 1,692,589, Nov. 20.

Use of barium silicate as an initial ingredient of glass-forming batches. FRITZ ROTHE and HANS BRENEK (to Rhenania-Kunheim Verein Chemischer Fabriken A.-G.). U. S. 1,694,831, Dec. 11. Ba silicate (suitably in a proportion of about one-third the amt. of sand used) is incorporated in glass-forming batches which may also contain sand, Na₂CO₃ and CaCO₃.

Manufacture of glass with barium sulfide as a batch ingredient. E. E. FISHER. *Brit.* 288,273, April 6, 1927. Formulas of batches suitable for making window glass, bottle glass and the like are given; the use of barium sulfide facilitates the satisfactory use of a greater proportion of Ba in the batch than when BaSO₄ is used as a sole source of Ba in similar batches.

Manufacture of clear transparent glass with barium sulfate as a batch ingredient. E. E. FISHER. *Brit.* 288,267, April 5, 1927. Batches are described contg. up to 4% BaSO₄ (based on the wt. of sand used) which are free from carbonaceous material or other reducing agents that would interfere with the use of Se decolorizing agents. Cf. C. A. 22, 1835.

Apparatus for feeding mold charges of molten glass. RICHARD LA FRANCE (to Owens Bottle Co.). U. S. 1,692,553, Nov. 20.

Apparatus for feeding mold charges of molten glass. KARL E. PEILER (to Hartford-Empire Co.). U. S. 1,692,464, Nov. 20.

Apparatus for forming mold charges from molten glass. KARL E. PEILER (to Hartford-Empire Co.). U. S. 1,692,858, Nov. 27.

Forming mold charges and molding and blowing glassware. W. J. MILLER (to W. J. Miller, Inc.). Brit. 288,342-3-4-5, Oct. 16, 1925. Various app. and mech. features are specified.

Machine for the automatic feeding of glass to molds. ALFRED BOUCHER and JAMES BOUCHER. Fr. 639,404, Jan. 19, 1927.

Device for controlling flow of molten glass. CHARLES B. KINGSLEY. U. S. 1,692,306, Nov. 20. A flow spout gate is formed with nested conduits through which a cooling fluid may be passed.

Apparatus for forming parisons from molten glass and treating them with cooling air blasts. JOHN E. McLAUGHLIN (to Owens Bottle Co.). U. S. 1,692,680, Nov. 20.

Down-flow apparatus for making sheet glass. JAMES C. BLAIR (to Libbey-Owens Sheet Glass Co.). U. S. 1,692,615, Nov. 20.

Apparatus for drawing sheet glass. ARTHUR E. SPINASSE. U. S. 1,692,585, Nov. 20.

Apparatus for drawing sheet glass. JOSEPH A. REECE (to Libbey-Owens Sheet Glass Co.). U. S. 1,692,569, Nov. 20.

Apparatus for drawing sheet glass from a mass of molten glass. NESTOR NAMBOURG (to Libbey-Owens Sheet Glass Co.). U. S. 1,692,673, Nov. 20. Structural features.

Drawing and flattening sheet glass. ENOCH T. FERNGREN (to Libbey-Owens Sheet Glass Co.). U. S. 1,692,548, Nov. 20. Mech. features. An app. is described.

Apparatus for producing sheet glass in continuous lengths. JOSEPH A. REECE (to Libbey-Owens Sheet Glass Co.). U. S. 1,692,702, Nov. 20.

Continuous process of making plate glass. EDWARD T. BROWN (to Ford Motor Co.). U. S. 1,692,813, Nov. 27. Mech. features.

Laminated sheet glass. WILBUR F. BROWN (to Libbey-Owens Sheet Glass Co.). U. S. 1,692,619, Nov. 20. Structural features.

Tank furnace for glass manufacture. GENERAL ELECTRIC CO., LTD., W. W. WARREN and J. F. HYSLOP. Brit. 288,668, Dec. 13, 1926. Structural features.

Tunnel leer for annealing glassware. E. FRAZIER and J. SYLVESTER. Brit. 289,017, April 20, 1927.

Annealing glassware. UNITED GLASS BOTTLE MANUFACTURERS, LTD., E. A. C. PRYOR and F. A. HURLBUT. Brit. 289,501, Oct. 29, 1926. In annealing glassware in a tunnel kiln, the ware is cooled rapidly and uniformly from temps. considerably above the lower crit. annealing temp. by first subjecting the ware to the upper crit. annealing temp. and then passing it through a part of the leer where it is surrounded or enclosed at top, bottom and sides by material such as metal which permits rapid dissipation of heat. A leer construction is described.

Glass threads. CHEMISCHE FABRIK STOCKERAU DR. F. POLLAK. Brit. 288,978, April 16, 1927. Elec. resistance heaters are used for fusing the glass, which may be prepd. from cullet, and the glass may be discharged from nozzles also elec. heated.

Glass opaque to x-rays. SOCIÉTÉ ANON DES MANUFACTURES DES GLACES ET PRODUITS CHIMIQUES DE SAINT-GOBAIN, CHAUNY ET CIREY. Fr. 639,768, Feb. 8, 1927. See Brit. 284,648 (C. A. 22, 4750).

Glass surfaces. THE ASAHI GLASS CO., LTD. Fr. 639,594, Aug. 17, 1927. Glass surfaces are protected against the action of the atm. by treating them with gases contg. large quantities of acid gases such as SO_2 , SO_3 , HCl , Cl or CO_2 .

Machine for cutting glass lenses. HENRI SARRAZIN. Fr. 639,707, Jan. 24, 1927.

Forming tank blocks for glass-melting tanks or other molded clay articles. ELBRIDGE J. CASSELMAN (to Window Glass Machine Co.). U. S. 1,692,887, Nov. 27. A clay slip is confined in the desired form with one face of the material in contact with material such as a porous clay block which facilitates absorption of moisture from the contacting face while absorption from other faces is retarded by super-atm. pressure and impervious retaining walls.

Drying "sanitary pipes" or other clay goods. G. O. LAWTON, S. DOWTHWAITE and ALBION CLAY CO., LTD. Brit. 289,225, March 15, 1927. After molding, the goods are heated in front of a fire for a few min. before the usual drying on a drying floor.

Clay bricks. RICHARD BÖHLIG. Fr. 636,972, July 4, 1927. Bricks or tiles are made by mixing bituminous schist powder with a plastic mass of porous clay and baking.

Light molded bricks or similar articles. JOSEPH A. BABOR and WM. L. ESTABROOKE. U. S. 1,693,015, Nov. 27. Exfoliated zonolite is used with a binder such as Na silicate.

Sintered magnesite brick. KARL HARR. U. S. 1,694,540, Dec. 11. Relatively pure natural magnesite is mixed with aniline oil residues (which serve as a binder) and the mixt. is sintered.

Kiln for firing bricks, tiles, etc. J. Moss and J. W. Moss. Brit. 288,383, Jan. 15, 1927. Structural features.

Wall and floor tiles. A. FEIST and F. L. KOPF. Brit. 288,867, July 18, 1927. Cold-glazed tiles or slabs are formed by mixing burnt magnesite, fine sand, pulverized talc and a pigment, adding $MgCl_2$ soln. and stirring to obtain a pasty mass, then kneading with a hardening material which may contain bituminous substances and fluosilicates, and allowing the mass to set in molds which preferably have a base of glass or celluloid. An example is given with proportions of ingredients.

Refractory material. VITREFRAX Co. Brit. 289,560, Feb. 1, 1927. Mullite contg. 72% Al_2O_3 and 28% SiO_2 is prepd. in an elec. furnace from a mixt. of minerals such as cyanite, andalusite, sillimanite or pyrophyllite with a quantity of approx. pure Al_2O_3 as required to give the specified compn. of the product. Where the product is to be used as a refractory lining to resist glasses or enamels of alk. silicate character, the porosity may be reduced by the use of Al_2O_3 contg. K_2O and P_2O_5 such as the residue left as a by-product in the recovery of potash from alunite. Various details are given.

Refractory materials. LOUIS LONGCHAMON. Fr. 639,419, Jan. 20, 1927. Powd. moist siliceous material such as quartzite or sand, with or without amorphous SiO_2 , is mixed with 1 to 10% Al_2O_3 and a small quantity of an alkali salt, molded and baked.

Refractory material suitable for use in brick or other form. RUSSELL E. LOWE (to Doherty Research Co.). U. S. 1,694,924, Dec. 11. A graded refractory aggregate such as zircon or magnesite is bonded with less than 1% of a highly adherent bond formed by the chem. pptn. of a hydrate such as Fe hydroxide in intimate adhering contact with the particles of the aggregate, substantially free from other substances formed at the time of the pptn.

Making hollow stay-bolts by rolling billets on refractory core inserts. GEORGE H. MANSFIELD. U. S. 1,693,487, Nov. 27. Cores of refractory material such as C, sand or fireclay are inserted into heated billets and removed after rolling.

Ceramics. KURT SCHENKEL. Ger. 468,170, Feb. 20, 1927. Porous artificial stone is prepd. from gypsum or other water-solidified material by suspending finely divided binding material, such as starch, in the water.

Casting ceramic slip. ARTHUR O. AUSTIN (to Ohio Brass Co.). U. S. 1,693,429, Nov. 27. In casting elec. porcelain or similar articles, a mold of porous material is filled with a ceramic slip, hydraulic pressure is placed on the material in the mold to facilitate passage of water from the slip to the mold and a layer of ceramic material is permitted to be deposited on the inner wall of the mold; the slip is then removed from the mold and its interior is filled with oil, wax or other suitable fluid under pressure to compress the deposited layer and render it more nearly uniform. An app. is described.

Glazes for ceramic ware. J. W. MELLOR and CERAMIC PATENT HOLDINGS, LTD. Brit. 288,679, Jan. 4, 1927. A leadless or practically leadless glaze consists of Cornish stone and about half its quantity of borocalcite or an insol. or but very slightly sol. Ca borate. There may also be added whiting, cryolite or fluorspar, china clay or Na silicate. Ground flint or ground sand also may be introduced into the glaze together with a pigment or opacifying agent such as Sn oxide. The glaze may also contain a small quantity of a Pb compd. such as Pb silicate.

Glazed ceramic products. WILLIS O. PROWTV (to American Encaustic Tiling Co., Ltd.). U. S. 1,693,252, Nov. 27. In forming glazed ceramic products having a surface of variegated color, a coating of glaze material of selected color is applied to the bisque, and over this coating there is then applied a coating of a glaze mixt. of a different color and contg. an insol. material such as starch or sawdust which will be eliminated by the firing of the glaze; a third coating of glaze mixt. is sprayed on and the product is fired.

Ceramic articles resistant to acids and to heat. M. HAUSER. Brit. 289,031, April 28, 1926. Powd. Si or ferro-Si (which may contain 90-95% of Si) is added to usual ceramic materials and when a high proportion of Si or ferro-Si is used there are also added easily fusible compds., such as borates or H_3BO_3 . Si or ferro-Si also may be used as a coloring agent mixed with glaze to produce a blue-black color on porcelain or stoneware.

Kiln with internal shelves for firing ceramic articles. BARTHOLOMEW H. GREENE. U. S. 1,694,650, Dec. 11. Structural features.

Molding plastic ceramic material such as deflocculated clay mixtures in vibrating molds. DONALD W. ROSS and JAMES M. LAMBIE. U. S. 1,694,563, Dec. 11. Mech. features.

Valve or tap for casting china or slip. J. NEWTON and T. SIMPSON. Brit. 289,172, Jan. 25, 1927.

Pottery. ÉTABLISSEMENTS MALMA. Fr. 639,415, Jan. 20, 1927. A pottery, etc., compn. contains S 46, plaster 20, cement 14, bitumen or asphalt 6, very fine sand 6, powd. kaolin 2, and powd. asbestos 6%. The proportions which can be used are not limited.

Abrasive wheels containing chopper sponge and a binder of rubber. GILDEROY O. BURLEW. U. S. 1,692,329, Nov. 20.

Aluminous enamel. FRIED KRUPP GRUSONWERK A.-G. Ger. 467,408, Nov. 3, 1925. Addn. to 437,242. According to Ger. 437,242, clays rich in SiO_2 are treated to reduce their SiO_2 content to a permissible amt., for instance by treatment with HF, with CaF_2 and H_2SO_4 , or with silicide-forming metals and a reducing agent. This method is now applied to other materials contg. Al and SiO_2 , such as marl, kaolin, slag or coal ashes, with which materials the reduction of the SiO_2 content may also be effected by addn. of Al_2O_3 and CaF_2 . An addn. of calcareous materials may also be made.

Enameling furnace. RANDAL E. TALLEY. U. S. 1,692,060, Nov. 20.

Ornamenting cast-iron articles. L. NANQUETTE. Brit. 288,617, April 14, 1927. Coatings of enamels of different colors are applied and fired, and the successive coatings are selectively etched with acid (photographic methods being employed in some cases).

20—CEMENT AND OTHER BUILDING MATERIALS

J. C. WITT

Criticism of the standard cement specifications for the determination of strength. BERTEL GRITLIN. *Tekniska Föreningens i Finland Förhandlingar* 48, 181-7(1928).—Tests have shown that the strengths of 2 different cements according to the standard specifications do not run parallel. Greater uniformity of results is obtained with larger water content, such as corresponds to practice, provided the setting time is reduced to 2-3 days instead of 28. The same uniformity may also be obtained if the standardized stamping and mixt. consistency is retained by increasing the cement:sand ratio. The anomalies of the standard tests are explained on the supposition that the binding and hardening processes proceed at different speeds in different cements.

HANS C. DUUS

Hydrated portland cement as a colloid. ALFRED H. WHITE. *Fifth Colloid Symposium Monograph* 1928, 349-60.—Portland cement is a mixt. contg. rather indefinite cryst. compds. and amorphous slag. When hydrated, only the external surfaces of the cement particles tend to react with the water, so that when dried, the cement becomes porous, and re-wetting causes formation of some new gel at the exterior of the particles, before swelling of the old gel prevents more water from penetrating. The swelling and shrinking of cement blocks as they are alternately wet and dried have been followed for over 20 years on the same specimen. With a burned clay brick the changes were only 0.02%, which is less than 0.1 those of cement. A cement bar was immersed in benzene under treatment calcd. to replace the water, as far as possible and later on the benzene was replaced with water again. The bar swelled once more, as the still unhydrated nuclei began to hydrate. Heat effects cannot be used to det. amt. of compression of water in cement capillaries, for each immersion means renewed chem. action. From calcns. based on increase in sp. gr., the water seems to be compressed to the order of half its vol. The adsorption of water may produce high external pressures, e. g., in pavements and structures exposed to the weather. Freezing satd. cement bars shortened them a trifle; perhaps the water was solid before frozen, or else under high pressure. [Cf. work of P. W. Bridgman on water under high pressures.]

JEROME ALEXANDER

The abrasion of cement and cement raw materials during sieve tests and the proper sieving times. HAEGERMANN. *Tonind.-Ztg.* 52, 1766-72(1928).—Prolonged sieving, especially, with machine shaking, tends to produce some abrasion of the material; also many of the larger grains are apt to pass through. A procedure similar to that specified by the Am. Soc. Testing Materials is proposed for standard sieving.

F. O. A.

The limiting concentration for the formation of Sorel cement. L. JESSER. *Tonind.-Ztg.* 52, 1676-7(1928).—The concn. of the MgCl_2 soln. absorbed in the hardening magnesia cement approaches a minimum, which depends on the nature of the MgO . This limit lies between 17° and 20° Bé. for com. magnesias.

F. O. A.

Deterioration of concrete by means of aggressive carbonic acid. KARL BIEHL. *Beton Eisen* 27, 371-3(1928).—Superficial attack of the concrete lining of a canal was laid to aggressive carbonic acid. The interior of the concrete was found to be in good

shape. The p_H of the waters coming in contact with the concrete varied from 5.8 to 7.6. F. O. A.

Study of the failure of concrete under combined compressive stresses. FRANK E. RICHART, ANTON BRANDTZAEG AND REX L. BROWN. Univ. Illinois, *Bull.* 26, No. 12, 102 pp.(1928). E. H.

Retrogressions in strength. HEINRICH LUFTSCHITZ. Materialprüfung anstalt, Dresden. *Tonind.-Ztg.* 52, 1697-9(1928).—Speculations about the connection between the change in vol. and strength of concrete during drying and soaking.

F. O. A.

The chemical reaction between trass and lime. A. STROPOF. Materialprüfung-samt, Berlin-Dahlem. *Tonind.-Ztg.* 52, 1609-12(1928); cf. *C. A.* 22, 4755.—Trass and lime were ground together and mixed with a little water and molded into a suitable specimen which was stored in a satd. atm. After 7, 30 and 56 days of storage the 1-g. sample was ground up and added slowly to 60 cc. cold HCl (1.12). After 10 min. it was filtered through an acidified filter paper and the M_2O_3 and SiO_2 were detd. in the filtrate. In 4 types of trass, the bulk of the reaction was complete in the first 30 days. The M_2O_3 dissolved was not proportional to the SiO_2 brought into combination.

F. O. A.

Mechanism of the burning process in rotary kilns. ERNST RISSEL. *Pit and Quarry* 17, No. 4, 76-80(1928).—See *C. A.* 22, 3970. E. J. C.

Colloidal ferric hydrate in molding sand. CLYDE C. DEWITT AND GEORGE G. BROWN. *Fifth Colloid Symposium Monograph* 1928, 313-48.—This paper deals with the influence of a surface film of hydrated iron oxide on the bond in sand-clay-water systems. The strength is increased, and "synthetic" sands were made to prove this. The paper has much information which cannot be well abstracted. J. A.

Modern roads. F. KOUDELA. *Paliva a lopeni* 10, 103-9(1928).—A review of utilizable materials, particularly hydrocarbons, for road construction. F. M.

Asphalt emulsions and their use in road construction. INGVAR PEDERSEN. *Tekniska Föreningens i Finland Förhandlingar* 48, 199-205(1928).—Description of the use of asphalt emulsions in road construction in Copenhagen since 1925. H. C. D.

Slate in 1927. A. T. COONS. Bur. of Mines, *Mineral Resources of the U. S.* 1927, Pt. II, 81-90(preprint No. 10, published Oct. 19, 1928). E. H.

Determination of Fe in silicates (VICKERS) 7.

Anweisung für Mörtel und Beton der deutschen Reichsbahn. Berlin: Wilhelm Ernst und Sohn. RM. 4, net. Reviewed in *Tonind.-Ztg.* 52, 1713-7(1928).

Cement compositions. E. C. PALM and H. T. THORSSON. Brit. 288,003, Sept. 28, 1927. A compn. for making building blocks, tiles or other articles comprises a mixt. of portland cement and a pulverized material (other than asbestos) contg. hydrated Mg silicate such as chlorite and serpentine. Coloring substances or metal dust or fillings which give a desired coloring when oxidized may be added as may also small pieces of metal or carborundum.

Quick-setting cement. JOHN MAYES (to Mayes Bros. Tool Mfg. Co.). U. S. 1,693,488, Nov. 27. PbO is mixed with 8 times its quantity of "molding plaster" to form a compn. which makes a quick-setting cement with addn. of water, suitable for cementing "vials" in levels.

High-alumina cement. JOHAN A. BOUTHON and TURE R. HAGLUND. Can. 284,109, Oct. 23, 1928. Products contg. Ca aluminates are produced by melting together raw materials contg. CaO and Al_2O_3 , resp., removing wholly or partially the content of silicic acid in the raw material contg. Al_2O_3 by melting said raw material with reducing agents in the presence of a smaller quantity of raw material contg. CaO than is to be contained in the end product, and adding the rest of the raw material contg. CaO after the intended reduction of silicic acid has been concluded. The compn. of the charging materials is so adapted that the slag obtained in the reduction process will contain less than 20% CaO.

Slag cements. SVEN NICHOLSEN. Ger. 467,829, Mar. 14, 1926. Gypsum or other S compd. is added to slag under reducing conditions to increase its reactivity by the conversion of its MnO content into MnS. The lime content is then adjusted.

Calcining cement or burning lime. O. LELLEP. Brit. 288,192, April 2, 1927. The pulverized raw material is granulated, without addn. of fuel, and the granules are sintered to clinker in a rotary kiln after preliminary heating by waste gases from the

kiln. Granulation may be effected in a rotary drum to which water is supplied by a perforated pipe. For limestone, however, the granulating drum is unnecessary. Various app. features are described.

Curing concrete. DOZIER FINLEY and WM. L. RHOADES (to The Paraffine Companies, Inc.). U. S. 1,694,588, Dec. 11. The surface is overlaid with a porous sheet contg. water and this is covered with an impervious sheet.

Preventing leakage in concrete reservoirs. EUGENE R. ODEN. U. S. 1,693,094, Nov. 27. The walls of the reservoir are subjected to the action of a chilling agent such as ice and salt suddenly to lower the temp. of the material with resultant opening up of the weak places in the material purposely to produce cracks and the cracks are then sealed with a filling material before introduction of water into the reservoir to put it into regular com. use.

Mortar. ALBERT FLEXER. Fr. 639,637, Aug. 18, 1927. Mortar resistant to acid is made by adding a few % of org. substances such as hydrocarbons or alcs. to S, whereby the solidification of the S is made slower and its adhesion to concrete, wood or Fe is increased. Baryta or talc may be incorporated in the S.

Mortar. ALEXANDER FLEXER. Fr. 639,639, Aug. 18, 1927. Lime or cement mortar is made impermeable by the progressive decompn. of an alkali silicate in its pores with the increasing concn. of a precipitant such as alc. or phenol, the mortar acting as a dehydrant. In an example a mixt. of aq. solns. of an alkali phenol and alkali silicate are used for mixing the mortar.

Artificial stone. CAMILLE LANGLAUDE. Fr. 637,100, July 6, 1927. A light artificial stone is made from 3 parts sawdust, 1 of cement and a binder such as starch paste.

Artificial stone. KURT SCHENKEL. Fr. 639,823, Aug. 19, 1927. See Brit. 285,-470 (C. A. 22, 4757).

Artificial stone compositions. G. CONOD and F. C. F. LÉCOULTRE. Brit. 288,202, April 4, 1927. Cryst. CaCO_3 powder 30 is mixed with CaSO_4 or other binder 50 and with colloidal silica soln. 5 parts, to produce an imitation marble or the like which may be veined in the usual manner. The cryst. CaCO_3 may be produced by baking limestone fragments at 1200° in an elec. oven under 100 atm. pressure and disintegrating the hot mass by immersion in water, or by dissolving CaCO_3 in water satd. with CO_2 and reprecip. with Na_2CO_3 . The colloidal silica is obtained by dialysis of a mixt. of Na silicate and HCl solns.

Building slabs. CHARLES E. McMANUS (to Crown Cork & Seal Co.). U. S. 1,692,783, Nov. 20. A semi-fluid batch including granular material such as cork and a plaster cement is brought into a mold cavity in intimate contact with a previously formed thin sheet composed of granular cork and a binder such as a glue or albumin compn. and subjected to light pressure during setting to effect bonding with the sheet.

Paving blocks faced with rubber or other elastic material. COMPAGNIE FRANÇAISE DU CAOUTCHOUC. Brit. 289,087, April 23, 1927. Structural features.

Paving blocks comprising rubber composition layers or other materials. J. S. COWPER. Brit. 288,896, Jan. 7, 1927. Structural features.

Building material. VICTOR M. GOLDSCHMIDT, ROLF KNUDSEN and KRISTOFFER STONVIK. Can. 285,241, Dec. 4, 1928. A building material consists of a mixt. of particles of natural olivine with materials which are capable of forming Mg_2SiO_4 . E. g., a powd. or granular mixt. which consists predominantly of olivine rock and also contains talc serpentine or the like and calcined caustic magnesite in proportions which are adapted for the formation of Mg_2SiO_4 , is thoroughly wetted or made plastic by incorporating water, if necessary also organic binding agents, as sirup, and is shaped by the aid of pressure. The shaped pieces are calcined at $1300\text{--}1500^\circ$.

Wall-texture composition. EDWARD E. STAHLHUT. Can. 283,881, Oct. 2, 1928. A wall-texture compn. comprises 37 lbs. of powdered natural clay (contg. SiO_2 60.50, Fe oxide 2.14, Al_2O_3 22.58, CaO 3.75 and MgO 1.87%), 37 lbs. of plaster of Paris, 21 lbs. of powdered whiting, 5 lbs. powdered casein glue, sufficient cold water to make a thick plastic mortar and 2.5 quarts of boiled linseed oil.

Laminated flooring material comprising layers of rubber, asbestos cement, etc. VICTOR LEFEBURE. U. S. 1,694,476, Dec. 11.

Filling and polishing the surfaces of cement-bonded asbestos articles such as asbestos board. JOHN C. MACILDOVIE (to Asbestos Wood and Shingle Co.). U. S. 1,695,253, Dec. 11. The surface interstices are filled with very finely comminuted material such as polishings of the same compn. as the cement-bonded asbestos surface.

Apparatus for seasoning wood with ozone. GUSTAVE LYON. U. S. 1,698,486, Nov. 27.

Impregnating wood. COMPAGNIE FRANÇAISE DES ÉTABLISSEMENTS GAILLARD. Fr. 639,100, Aug. 5, 1927. Wood is preserved by 2 successive injections, the first of an aq. soln. of CuSO_4 or the like, and then of an antiseptic such as creosote. An energetic drying in a closed vessel by warm air is made between the 2 injections.

21—FUELS, GAS, TAR AND COKE

A. C. FIELDNER

Pulverized fuel and its various fields of application. GEO. E. K. BLYTHE. The Buell Combustion Co. *Mining Journal* 163, 975-6(1928); cf. C. A. 22, 3380.—B. reviews the principles behind combustion, especially of powd. coal. Its application to metallurgical heating has greatly increased the efficiency of certain processes. A certain furnace using 37.5 cwt. of coal and requiring 10 hrs. to complete the process by hand firing now uses only 11.5 cwt. of powd. coal and completes the process in 7 hrs. Another non-ferrous reverberatory furnace with a throughput of 9 tons of metal per 24 hrs. and consuming 4 tons of hand-fired coal now produces 15 tons per day using 3 tons of powd. coal. Installations for burning powd. coal are briefly described, particularly equipment for its transportation. Advantages of the drying of the coal are discussed.

ALDEN H. EMERY

Low-temperature carbonization at Dunston power house. R. P. SLOAN. *Engineer* 146, 411-3(1928).—Summary of a paper read before the World Fuel Conference, 1928. From 2240 lb. of coal costing 12s. can be obtained by distn. of volatile constituents 1.0 gal. (= vol. of 10 lb. H_2O) *motor spirit*, value 1s 2d.; 1.0 gal. *white spirit*, value 1s. 1d.; 1.43 gal. *paraffin*, value 5.36d.; 6.88 gal. *creosote*, value 4s. 8.76d.; 5.0 gal. *pitch*, value 2s. 2.90d.; 0.507 gal. *cresylic acid*, value 10.14d. *Semi-coke* and *gas* have a value of 9s. 1.44d. so that if the cash value of the raw coal is 100, the volatile constituents have a value of 87 and the non-volatile, 76. Also in *Engineering* 126, 787-8(1928).

D. B. DILL

Crystalline phenols of brown-coal tars. FERD. SCHULZ AND JEAN PRUNET. *Paliva a Topeni* 10, 61-7(1928).—During the study of tars and oils of coal from the mine Karel in Cukmantel, Bohemia, over 3.5% of crystallizable phenols were obtained from an oil fraction b. 200-300°. Besides pyrocatechol the fraction showed a yield of substances with a higher b. p. and lower m. p. These substances crystn. with difficulty from oil and were pptd. only by following a definite procedure. Washing with NaOH soln. is to be avoided. The substances were washed with dil. AcOH, and the washings were treated with $(\text{AcO})_2\text{Pb}$ and filtered. Pyrocatechol remained in soln. with the excess $\text{Pb}(\text{AcO})_2$. The ppt. was washed and redissolved in HCl. The PbCl_2 formed together with many liquid phenols which prevent crystn. are extd. The residue b. 250-60° and solidifies immediately into dendritic chalk-white forms which form a network. Fractional crystn. yielded a product m. 59° and b. 254-7°, indicating a mixt. of dihydroxybenzene and methylenedioxybenzene. Pyrocatechol crystallizes from unrefined oils into individual transparent crystals. Chemically, the residue reacts as pyrocatechol. S. considers it higher homologs of pyrocatechol.

FRANK MARESH

Present status of gas appliances and its significance for gas works. F. FREI. *Gas. u. Wasserfach* 71, 1064-70, 1084-90(1928).—Most dissatisfaction with gas is due to defective equipment. Burners must be adjusted to give the size and type of flame best adapted to the special purpose, and with a min. quantity of CO. Thin wooden plates were used to secure "pictures" of typical burner flames. Photographs of these are shown and discussed. Striking back of burners occurs when the velocity of ignition of the gas is greater than the rate at which gas leaves the burner. This velocity is especially high with water gas and the equipment should permit rather wide variations in the percentage of water gas without "striking back." Methods of testing the uniformity of baking ovens are given and curves for temp. shown. The use of gas at pressures above normal is also discussed.

R. W. RYAN

Use of gas in large industries. JEHNIGEN. *Gas u. Wasserfach* 71, 1090-5(1928).—The use of gas in the manuf. of wrought iron, hardening and tempering sheet steel and small parts is discussed and illustrated, with especial respect to continuous operation.

R. W. RYAN

Liquid purification (removal of sulfur from gas). FERBERS. *Gas u. Wasserfach* 71, 1133-7(1928).—Dry methods of removing sulfur from gas are comparatively expensive and require excessive ground space. The method described by Glauud and Schönfelder (C. A. 21, 3264) for purifying coal gas contg. ammonia depends on an Fe

hydroxide suspension in a weak NH_3 soln. In a plant erected at Waldenburg, Germany, purifying gas substantially free from NH_3 , this method, modified by the use of a Na carbonate suspension of Fe hydroxide has been used to purify daily about 2,500,000 cu. ft. of gas contg. about 0.2 g. H_2S per cu. ft. to a content of less than 0.0002 g. per cu. ft. In a 14-day trial the av. removal of H_2S was 99.97%, and the cost about 1¢ per 1000 cu. ft. of gas treated, without credit for the S produced in this way. This is about twice the cost of purifying gases contg. NH_3 , as previously estd. Itemized costs are given.

R. W. RYAN

Leakage from high-pressure natural-gas transmission lines. E. L. RAWLINS AND L. D. WOSK. Bur. of Mines, *Bull.* 265, 106 pp. (1928).

E. H.

Recent advances in the distillation of tar. C. CHAPMAN. *Ind. Chemist* 4, 478-81 (1928).

E. H.

Coke and by-products in 1926. F. G. TRYON, H. O. ROGERS AND H. L. BENNIT. Bur. of Mines, *Mineral Resources of the U. S. 1926*, Pt. II, 587-675 (Preprint No. 30, published Nov. 15, 1928).

E. H.

Electrical apparatus for regulating air and fuel supply to steam generator furnaces (Brit. pat. 289,079) 4. Rotary drum furnace for coking (Ger. pat. 468,288) 1. Operating producers or shaft furnaces (U. S. 1,692,572) 13. Device for controlling the flow of gas to burners (U. S. pat. 1,692,467) 1.

AVALLE, EDOARDO: I combustibili liquidi per i motori endotermici. Processo della combustione—Combustibili liquidi derivati dalle sostanze vegetali—Gli alcoli come carburanti—Combustibili liquidi dai carboni fossili, dalle ligniti, torbe, asfalti, bitumi e schisti—Il processo Bergius—Processo di cracking. Milan: C. Tamburini fu Camillo. 407 pp.

CHAPMAN, W. R., AND MOTT, R. A.: The Cleaning of Coal. London: Chapman and Hall. 680 pp. 42s, net. Reviewed in *Fuel Economist* 4, No. 37, 59; *Gas. J.* 184, 536 (1928).

Technical data on fuel. Edited by H. W. Spiers. London: World Power Conference. Reviewed in *Fuel Economist* 4, No. 37, 59 (1928).

Fuel. EDOUARD GOUTAL and HENRI HENNEBUTTE. Ger. 468,019, April 22, 1925. Briquets of a greater solidity are made from shrunken and crude lignite by mixing with pyroligneous acid and tar and heating to under 700°.

Fuel. WILHELM GROTH. Ger. 467,274, Jan. 1, 1925. Damp crude lignite is prepd. for fuel by treating it with colloidal mucilage, pressing and drying.

Fuel. SOC. ANON LE CARBONE. Swiss 126,647, April 22, 1927. Heavy liquid fuel is rendered more suitable for motors using light fuel by passing the liquid over a catalyzer such as C to decomp. it.

Fuels, ores, etc. EMIL KLEINSCHMIDT. Ger. 467,275, Nov. 7, 1926. The powd. materials are formed into briquets by causing a current of the powder to meet a stronger current of binding material, which carries the powder along to be subsequently dried and pressed.

Gaseous fuel. KENNETH GORDON (to the Imperial Chemical Industries, Ltd.). Can. 284,248, Oct. 23, 1928. Finely divided coke of good quality (i. e., low in ash and volatile matter) is blown together with steam through a "Staybrite" tube 30 ft. long and 1/4" diam. heated externally to about 1000°. The rate of flow of gas through the tube is about 30 ft. per sec. giving a time contact of about 1 sec. A slight excess of steam to coke is employed. A high-grade water gas is produced, contg. H 51, CO 48, and CO_2 1%. It contains no hydrocarbons.

"Smokeless fuel." CHEMISCH-TECHNISCHE-GES. Brit. 288,235, April 7, 1927. Small pieces or fine particles of anthracite or lean coals are mixed with bituminous fuel (such as a "swelling coal" contg. 30% of volatiles) and the mixt. is heated (at various temps. between 500° and 1200°) to form "smokeless fuel" in coarse lumps. Gas and tar may be recovered.

Liquid fuel for internal-combustion engines. P. G. SOMERVILLE and W. H. HOFFERT. Brit. 289,347, Oct. 27, 1926. Fuels such as "motor-benzole," benzine, gasoline, "petrol," "cracked petrol," heavy oils, "spirits obtained by low-temp. carbonization" and "synthol," contg. resin-forming constituents, have their resin-forming tendency inhibited by the addn. of a small proportion of substances such as phenols, cresols, aminophenols, PhNO_2 or RhNH_3 . About 0.05% of the added substance may

be effective. The fuel may be tested for stability by exposure to ultra-violet rays and the latter may be standardized and their effect estd. by their action on a KI soln.

Motor fuel. LESTER KIRSCHBAUM. U. S. 1,692,176, Nov. 20. A homogenized emulsion comprises gasoline or similar fuel, an org. acid NH_4 product such as NH_4 naphthenate as an emulsifying agent and water (the latter being in the dispersed phase). This fuel is stated to "reduce" deposition of C in the engine cylinders.

Hydrocarbon motor fuel. JOHN W. ORELUP and O. IVAN LEE (to Boyce-Itte Products, Inc.). U. S. 1,692,784, Nov. 20. About 0.1% of ethyl laurate, oleate, palmitate or stearate or other suitable ethyl esters of higher aliphatic acids are added as a C-removing agent.

Fuel briquets. JEAN M. P. SILVE. Fr. 639,792, May 27, 1927. Lime is slaked with water mixed with sawdust and small coal and powdered, molded and dried.

Filters especially for benzene or other fuels. SOCIÉTÉ DU CARBURATEUR ZÉNITH. Fr. 636,680, Oct. 23, 1926.

Thermostatic fuel supply device for "constant temperature" internal-combustion engines. ALEX TAUB (to General Motors Corp.). U. S. 1,694,759, Dec. 11.

Igniting composition for starting internal-combustion engines of the injection type. MOTORENFABRIK DEUTZ A.-G. Brit. 289,400, April 26, 1927. An igniting mixt. may be formed from KClO_3 , 6, S 1, and C 1 part, mixed with a glutinous soln. and dried on wood, paper or other slow-burning fibrous material which may be impregnated with KNO_3 or KClO_3 .

Carbonizing low-grade fuel such as peat, wood or shale. M. MIGEON. Brit. 288,335, April 8, 1927. The material is predried by the waste heat of the plant, distd. externally or internally or by both methods at low temps. while undergoing a mixing or kneading movement, and then distd. at a high temp. in vertical retorts, and the distillates of the different zones are collected separately. An app. and numerous details are described.

Conversion of carbonaceous substances into liquid products. MATHIAS PIER, MAX WILDHAGEN and WALTER SCHUNCK (to I. G. Farbenind. A.-G.). Can. 283,921, Oct. 9, 1928. Coal, tars and mineral oils are hydrogenated by preheating H to about 400° and then circulating it through the jacket of a reaction chamber, and elec. heating the H to a temp. above the reaction temp. before admitting it to the reaction chamber, admitting the carbonaceous material heated to a temp. approaching the reaction temp. and under pressure of 200 atm. into the reaction chamber to react with the H.

Combustible liquids. LES CARBURANTS ÉCONOMIQUE SOC. ANON. Swiss 126,586, Nov. 15, 1926. The combustibility of such liquids as animal, vegetable and mineral oils is increased by the addn. of a small quantity of such org. compds. as are contained in the essential oils. Thus, essence of terebenthine and cymene may be added to gasoline. Other examples are given.

Hydrocarbons by hydrogenation. STANDARD DEVELOPMENT CO. Fr. 639,681, Aug. 19, 1927. Carbonaceous materials contg. a large proportion of ash are very finely ground and mixed with a hydrocarbon oil and water, whereby the ash is sepd. with the water. The resulting material impregnated with oil is hydrogenated in the usual manner with a catalyst.

Apparatus for damping fuel before it enters heating furnaces. ERICH ROUCKA. Fr. 639,120, Aug. 5, 1927.

Burner for heavy fuels such as mazout. ALBERT FÈVRE and WILLIAM-ALEXANDRE SAINT-MARTIN. Fr. 639,417, Jan. 20, 1927.

Burner for heavy liquid fuels, particularly naphtha oils. RENÉ ZANTIOLI. Fr. 639,131, Aug. 5, 1927.

Fuel from pulverized coal. WALTER E. TRENT (to Trent Process Corp.). U. S. 1,693,356, Nov. 27. Pulverized coal having a substantial volatile content is heated to remove volatiles in sufficient quantity to entrain and carry in suspension fine carbonaceous particles.

Apparatus for powdering coal. WALTHER & CIE A.-G. Fr. 639,127, Aug. 5, 1927.

Apparatus for drying fuel, particularly coal dust. ROMAN TERDICH. Ger. 467,949, May 6, 1925.

Inclined rotary kiln and drier suitable for treating coal, slack, etc. FRED A. JONES. U. S. 1,694,708, Dec. 11.

Apparatus for drying coal or similar materials. REGINALD F. KRALL (to Woodall-Duckham (1920), Ltd.). U. S. 1,695,193, Dec. 11.

Berginization of coal. SOCIÉTÉ INTERNATIONALE DES COMBUSTIBLES LIQUIDES. Fr. 639,240, Aug. 9, 1927. The insol. substances are sepd. from the crude oil obtained

from the berginization of coal by adding naphthalene or like hydrocarbon. An absorbent such as fuller's earth may also be added.

Berginization of coal. SOCIÉTÉ INTERNATIONALE DES COMBUSTIBLES LIQUIDES. Fr. 639,241, Aug. 9, 1927. A higher yield of oils is obtained by berginizing different kinds of coal together.

Carbonization of coal. WALTER RUNGE (to The International Combustion Engineering Corp., to The International Coal Carbonizing Co.). Can. 284,065, Oct. 16, 1928. Pulverized coal is preheated for a period not exceeding 60 sec. by a gaseous medium of temp. between 500° and 700° F.; the preheated coal is then mixed with raw pulverized coal and the mixt. subjected for a period not exceeding 60 sec. to the carbonizing action of a hot gaseous medium the temp. of which is approx. 1000° F. Cf. C. A. 22, 2259.

Liquid products from coal, tar, etc. MATHIAS PIER and WILHELM RUMPF (to I. G. Farbenind. A.-G.). Can. 283,916, Oct. 9, 1928. Coals, tars, mineral oils, etc. are converted into liquid products by treatment with reducing gases contg. CO under elevated pressure and at high temp. in app. the surfaces of which coming in contact with the high-pressure gases are made of Al or alloy thereof, Cr, Mn, V or U or of special steels contg. a considerable percentage of Mn, Ti, Cr, W, V or Mo or of alloys corresponding to special steels contg. Ni or Co instead of Fe. For the moderately heated parts Cu, Ag or even low-melting metals as Sn, Zn, Pb or their alloys may be used. Since the app. is heated to temp. of at least 150° the metals used should be resistant to S.

Removing hydrogen sulfide from coal or water gases. WM. E. LEUCHTENBERG. U. S. reissue 17,162, Dec. 11. See original pat. 1,629,396 (C. A. 21, 2181).

Absorption of hydrogen sulfide and ammonia from gases. CHRISTIAN HANSEN (to I. G. Farbenind. A.-G.). Can. 284,390, Oct. 30, 1928. H₂S and NH₃ are absorbed from gases by washing in a first stage either with a thiosulfate soln. with the addition of SO₂ or gases contg. SO₂ or a polythionate soln. to remove the greater part of the H₂S and NH₃, and in removing the remainder of the H₂S in a second stage by washing with a neutral or weakly alk. NH₄ polythionate soln. or by washing with (NH₄)₂SO₄-NH₄HSO₄ soln. Cf. C. A. 22, 2830.

Gasifying coal, coke or other similar fuels. O. GROSS. Brit. 289,080, April 28, 1927. In order to produce a gas suitable for use in NH₃ synthesis, a mixt. of air, O and water vapor is used and a gas mixt. is obtained contg. H, CO, N and hydrocarbons. This mixt. is purified and its H content is increased by treatment with O, the hydrocarbons are converted into CO and H and the CO is removed. For treating the gases with O, a chamber is used filled with materials such as refractory substances carrying oxides of alk. earth metals, oxides of Fe, Cr or Mn, Pt or coke.

Oil by low-temperature distillation and hydrogenation. RICHARD FRIGE. Fr. 636,609, June 27, 1927. In a process for the production of oils by the distn. of coal and hydrogenation, part of the coke is used to produce an elec. current which is used for the electrolysis of H₂O, the other part is gasified by the electrolytic O, and the gas thus produced, with the tar and distn. gas, is hydrogenated by the electrolytic H.

Vertical retort and associated apparatus for obtaining gas and oil from waste. ALEXIS NAERT. U. S. 1,693,456, Nov. 27. An app. is specified suitable for treating wood shavings or waste paper.

Distillation apparatus. JOSEF PLASSMANN (to Chemisch-Technische Gesellschaft m. b. H.). Can. 285,352, Dec. 4, 1928. App. for the low-temp. distn. or coking of fuel is specified.

Apparatus for distilling carbonaceous material. EDOARDO M. SALERNI (to E. M. S. Industrial Processes, Ltd.). Can. 284,406, Oct. 30, 1928.

Distilling ammoniacal liquor. SOUTH METROPOLITAN GAS CO., P. PARRISH, F. C. SNELLING AND O. W. WEIGHT. Brit. 288,436, April 13, 1927. The waste gases from coal-carbonizing retorts are used for recovering the NH₃ from the ammoniacal liquor by passing them through a setting contg. a waste-heat boiler and a tubular heater. The ammoniacal liquor is preheated in the tubular heater and then passed through a still, where the NH₃ is distd. off by steam generated in the boiler with addition of milk of lime. The app. is described.

Recovery of ammonium salts and phenols from waste liquors. WALTER R. KNAPP (to The Semet-Solvay Co.). Can. 284,086, Oct. 16, 1928. Waste liquors from a coal-carbonization plant are treated to recover products therefrom by scrubbing the products of distn. evolved in the carbonization of coal with liquor, removing the tar from the scrubbing liquor, treating the tar-free liquor with benzene to ext. benzene-sol. material, distg. the phenol-free liquor to remove free NH₃, successively evapg. the aq.

condensate freed of volatile NH_3 from the aforesaid step to recover NH_4Cl , $(\text{NH}_4)_2\text{S}_2\text{O}_8$ and NH_4CNS , and returning any residual liquor after evapn. to a former step.

Montan wax from lignite. A. RIEBECK MONTANWERKE A.-G. Brit. 288,197, April 4, 1927. Moist or dried lignite is treated with a solvent such as benzene (suitably at a temp. of 90° and under 1.5 atm. pressure).

Montan wax from lignite. A. RIEBECK MONTANWERKE A.-G. Brit. 288,258, April 8, 1927. In extg. montan wax from lignite by a solvent, the preliminary drying of the material is assisted by treating it with the steam and solvent vapors obtained when the ext. is distd. and the residual solvent recovered from the lignite. The steam and vapors may be passed through a dust separator before they enter the dryer.

Vertical retort for distilling lignite or other carbonaceous material. R. W. EASTON. Brit. 288,700, Jan. 11, 1927. The retort is divided into chambers by longitudinal partitions which act as conductors of heat into the charge. Steam is withdrawn from outlets at the top and distillates are withdrawn at a lower level.

Purification of gases. FRIEDRICH SIEMENS A.-G. Fr. 639,693, Aug. 19, 1927. Gases such as coke-oven or producer gas are purified by passing them over metals which combine with S such as Fe, Ni, Co, Cu, Pb, Ag, or Mn, whereby the H_2S is converted into SO_2 and cyanogen compds. are converted into NH_3 . Cf. C. A. 22, 2457.

Thiocyanate of the alkaline earth metals. ROBERT R. FULTON (to The Koppers Co.). Can. 284,068, Oct. 16, 1928. Alk. earth metal thiocyanate from gas-purification liquor is obtained by treating the liquor with a sol. alk. earth metal salt, heating the liquor, cooling, and filtering, treating the filtrate with a reagent capable of pptg. colloidal and coloring matter, re-filtering the liquor to remove the ppt. thus formed, evapg. the filtrate to a sp. gr. of approx. 1.4, allowing it to cool, filtering and evapg. the filtrate.

Gas generator. JACQUES G. SCHULZ. Fr. 636,690, Oct. 25, 1926. A gas generator with reverse draft has an air feed coming into the center of the fuel and open toward the bottom.

Gas producer with solid fuel such as wood charcoal. ERNEST BOUCHER. Fr. 636,746, June 23, 1927.

Gas producer using wood, wood shavings or sawdust. JEAN LERAT. Fr. 637,140, Oct. 29, 1926. Constructional details to prevent formation of tar and to restrict the area of combustion are given.

Gas producer for finely divided fuels. PAUL JAWORSKI (to the Firm Bismarck-hütte). U. S. 1,693,483, Nov. 27. Structural features.

Gas producer construction. FREDERICK L. DUFFIELD. U. S. 1,692,724, Nov. 20.

Gas-producer construction and operation. W. M. CROSS. Brit. 289,491, April 28, 1927. Producer gas is generated by subjecting powd. carbonaceous material to a mixt. of air and steam-heated to above the reaction temp. (suitably to about 1100°). An app. is described.

Apparatus for use as a gas producer, burner, or for low-temperature carbonization or drying dust or granular materials. I. G. FARBENIND. A.-G. Brit. 288,491, Oct. 8, 1927. The app. comprises a narrow cylindrical chamber, to which, when operated as a gas producer a gas such as air is supplied tangentially through nozzles. A steam nozzle is also provided and powdered fuel may be fed into the chamber tangentially. When used as a burner, secondary air is supplied through other pipes. Solid residue and distillates may be passed successively to a cyclone separator, dust extractor, condenser and tar separator.

Apparatus for smoothing or leveling charges in gas producers or like apparatus. L. VAN GULCK and A. M. FOURLINNIE. Brit. 288,281, April 9, 1927.

Residual berginization gases. SOCIÉTÉ INTERNATIONALE DES COMBUSTIBLES LIQUIDES. Fr. 639,243, Aug. 9, 1927. The gases absorbed by the washing oils used to sep. H are evacuated from the oil and heated in the presence of catalysts to a temp. between 450° and 1000° to obtain valuable liquid hydrocarbons. Water gas, producer gas or NH_3 may be added to the gases.

Water gas. N. J. BOWATER. Brit. 288,797, March 17, 1927. In a continuous process, pulverized fuel such as coal or coke is showered from the top of an app. counter-current to steam introduced at the bottom and heat for the reaction may be supplied through a hollow heating cylinder extending vertically through the central portion of the gasifying chamber. Various details are described and an app. is illustrated.

Water gas. O. MISCH. Brit. 288,426, March 21, 1927. In generating water gas from bituminous fuel, the lower end of the preliminary distn. retort is heated externally by a compressed air-water gas burner with baffles or by oil or coal-dust burners or other means so as to effect an intensive local heating of the contents of the lower portion of

the retort to above 700° with the temp. decreasing to about 250° toward the charging hopper. An app. and various other details of operation are described.

Water gas; ammonia. IMPERIAL CHEMICAL INDUSTRIES LIMITED. Fr. 639,683, Aug. 19, 1927. Water gas is prepd. by treating carbonaceous material with steam, with or without air or O, the heat necessary being supplied externally through a heat-resisting metal such as "Staybrite," "Era/A. T. V." or V2A. If air is mixed with the steam a gas contg. CO, H and N is obtained, which after elimination of CO may be used for producing NH₃.

Water-gas apparatus. J. PINTSCH & DR. OTTO GKS. (to Chamber Ovens, Ltd.). Brit. 289,058, April 21, 1927. In operation of a vertical gas-producing chamber, steam is introduced through pipes and flexible connections which are described and thence through jets to a space between the bottom door and a protective hood provided with slots for even distribution of the steam to the charge.

Water-gas plant. POWER-GAS CORP., LTD., and N. E. RAMBUSH. Brit. 288,463, July 6, 1927. A tubular steam superheater is employed having its tubes covered with non-metallic protective material of high heat-storage capacity such as fire clay or terra cotta. During the "blow," gases from a generator are burned with air in the superheater and the combustion gases are used to heat a waste-heat boiler. During the "run" water gas passes through the superheater and waste-heat boiler to an outlet pipe and steam passes to the superheater and thence to the generator. Various details of construction of the app. are described.

Apparatus for the production of water gas from bituminous substances. HAROLD NIELSON and BRYAN LAING. Fr. 636,750, June 25, 1927.

Producing mixed coal gas and water gas. W. SCHWEDER. Brit. 288,336, April 6, 1927. Glowing coke from a coke oven is transferred to a water-gas generator in which it is gasified and the water gas thus produced is then mixed with the coal-distn. gas. An app. and details of procedure are described.

Purifying oil gas. C. CHILOWSKY. Brit. 288,305, April 8, 1927. The cloudy product or gas formed by partial combustion of heavy oils for supplying internal-combustion engines is suddenly cooled at the generator outlet to temps. below that of condensation of the tars. Cooling and purifying agents such as water or gas oil may be used to sep. condensed products and may be circulated through a cooler and returned to the washing app. An app. and various details of procedure are described. Cf. C. A. 22, 3523.

Removing acetylene from gases by catalytic treatment. GKS. FÜR LINDE'S EISMACHINEN A.-G. Brit. 288,216, April 4, 1927. Gases such as air or coke-oven gases are passed over catalysts such as Ni, Cu, Fe or Al or their oxides or partially dehydrated hydroxides of Fe or Al at temps. of 100–400°. In the presence of H, the C₂H₂ is hydrogenated mainly to C₂H₄ or may be polymerized into higher hydrocarbons, and in the absence of H the C₂H₂ may be decompd. into C and H. An app. with regenerative heat-exchange system is described.

Use of catalysts in carburetors. SOC. ANON. LE CARBONE. Brit. 288,588, April 13, 1927. A chem. decompn. of "volatile spirit" is effected by the action of a catalyst, such as tubes of active C exposed to exhaust heat or Cu wire or metal shavings, heated to 300–400°. An app. is described.

Benzene from coke-oven gas. GESELLSCHAFT FÜR LINDE'S EISMASCHINEN A.-G. Fr. 639,615, Aug. 17, 1927. In the recovery of benzene from gas by compression followed by expansion, glycol or isopropyl alc. is used as lubricant for the expansion app. to dissolve the solids which sep. Cf. C. A. 22, 2662.

Purifying benzene fractions. FIRM OF C. STILL. Brit. 288,591, April 13, 1927. Benzene fractions, directly after their production and before any oxidation can occur, are treated with caustic alkali to free them from S. An app. is described.

Horizontal gas-retort setting, etc. R. W. BROADHEAD. Brit. 289,123, Jan. 17, 1927. Structural features.

Distilling tar. S. P. MILLER (to Barrett Co.). Brit. 288,270, April 6, 1927. Tar to be distd. is sprayed into contact with hot coal gases as they pass from the retorts to a collector main and the resulting gases and vapors while still hot are purified by elec. pptn. and the oils are then condensed by cooling. An app. and various details of procedure are described. Cf. C. A. 22, 4779; 23, 266.

Distilling tar. S. P. MILLER (to Barrett Co.). Brit. 289,023, April 20, 1927. Tar is distd. by spraying it into contact with hot gases produced from a battery of coal ovens or retorts, and the gaseous products are scrubbed with tar or pitch to give clean gases from which the oils are subsequently condensed, while pitch is obtained from the scrubbing operation. An app. is described. Cf. C. A. 22, 4779; 23, 266.

Apparatus for dehydrating tar by steam-jet atomization. ROGER CRILLY. U. S. 1,693,549, Nov. 27.

Pitches from coal distillation. G. E. McCLOSKEY and W. B. WINGERT (to Barrett Co.). Brit. 289,378, April 25, 1927. Pitches with high and low free C content are separately obtained from coal-distn. gases by separately collecting the lean and rich gases leaving the retorts during the later and earlier stages, resp., and cleaning them as by elec. pptn. at a sufficiently high temp. to sep. the pitch while leaving a considerable part of the oils in vapor state for subsequent condensation. An app. is described.

Coking pitch. FREDERICK W. SPERR, JR. (to Koppers Co.). U. S. 1,694,800, Dec. 11. A mixt. of pitch, bauxite and coke breeze derived for the carbonization of coal is subjected to a coking temp. The resulting coke is suitable for making *electrodes for elec. furnaces*.

Coke. ALUMINUM COMPANY OF AMERICA. Swiss 126,574, Jan. 29, 1927. See U. S. 1,671,673 (C. A. 22, 2657).

Semi-coke. S. STERNBERG (to Chemisch-Technische Ges.). Brit. 288,264, April 6, 1927. In order to produce semi-coke with ash of a desired compn., the fuel is mixed with fluxes of such character that during heating no reaction takes place between them and the original ash constituents. Oxides of Fe, Al or Mn may be added and various types of fuels such as siliceous and calcareous coals may be mixed with each other. Fluxes used favorably affect the yield of tar, and distn. is effected at about 500–700°.

Vertical coke-oven construction. J. VAN ACKEREN (to Koppers Co.). Brit. 288,558, April 12, 1927.

Vertical-chamber coke-oven construction. CARL OTTO. U. S. 1,695,204, Dec. 11.

Coke-oven and gas-retort operation. J. PINTSCH & DR. OTTO GES. Brit. 288,337, April 7, 1927. The excess gas pressure in the lower part of freshly charged coke ovens or vertical retorts is relieved by connecting the ovens through pipes provided with valves so that the high gas pressure in one oven is relieved by the passage of gas through the pipes to another oven in which the charge has been nearly completely coked. When the coking in a retort has sufficiently proceeded, the valve from this retort is closed so that the retort then operates independently. Various structural features are described.

Coke-oven and regenerator construction. KOKSOFFENBAU UND GASVERWERTUNG A.-G. Brit. 288,538, April 11, 1927.

Coke-oven discharging apparatus. J. A. B. LOVETT (to Koppers Co.). Brit. 288,566, April 12, 1927.

Apparatus for leveling charges in horizontal coke ovens. J. I. THOMPSON (to Koppers Co.). Brit. 288,622, April 15, 1927.

Removing graphite incrustation from coke ovens and similar apparatus. G. CAPIAU, M. GAUQUIER AND L. LAHAUT. Brit. 289,308, Aug. 10, 1927. See Fr. 638,439 (C. A. 23, 266). The hot incrustation is subjected to a jet of compressed air carrying a hard powd. or granular material such as plumbago or crushed slag, and the incrustation is cut into blocks which can be readily loosened and knocked off.

Automatic control system for coke-quenching apparatus. CHARLES HYMAN. U. S. 1,695,105, Dec. 11.

Method of charging coke furnaces to avoid the escape of gas and smoke into the air. THE KOPPERS COMPANY. Fr. 636,604, June 27, 1927.

Vented storage receptacle for hot coke. J. S. HAUG (to Humphreys & Glasgow, Ltd.). Brit. 288,599, April 13, 1927.

22—PETROLEUM, LUBRICANTS, ASPHALT AND WOOD PRODUCTS

F. M. ROGERS

The petroleum industry in 1927. RICHARD KISSLING. *Fortschrittsber. Chem. Ztg.* 2, 118–24(1928); cf. C. A. 22, 4780.—A review with bibliography. E. J. C.

Oil analysis. B. HLAVICA AND E. TRČA. *Paliva a lopeni* 10, 101–3(1928).—Oil from a drilling 247 m. deep at Lurrooka, Czechoslovakia, shows a paraffin base and a large content of gasoline. The findings agree with earlier borings in this region. Oil from Hodonin drillings 338.8 m. deep shows a higher paraffin content but lower gasoline yield. H. predicts a higher gasoline content with deeper drilling. F. M.

The production of gasoline by cracking. F. KOUDELÁK. *Paliva a lopeni* 10, 67–75, 89–95, 109–13(1928); cf. C. A. 22, 4781.—A review of the Burton, Dubba, Cross, Fleming, tube and tank, Holmes-Manley, Emerson, etc. processes for cracking oils together with operating data and European installations. FRANK MARSH

Changes in the regulations proposed for tetraethyl lead gasoline. HUGH S. CUMMING, *et al.* U. S. Pub. Health Service, *Pub. Health Repts.* 43, 3147-9 (1928). E. H.

Manufacturing bituminous coal from petroleum. W. F. RITTMAN. *Mining J.* 163, 1016 (1928).—R. briefly describes the manuf. of petroleum coke of the compn. volatile matter 45, fixed C 51 and ash (lime) 5% as a final step in oil refining by pumping refuse oil through a pipe still. Also in *Ind. Eng. Chem. News Ed.* 6, No. 24, 1-2 (1928).

A. H. EMERY

Asphalt and related bitumens in 1927. G. R. HOPKINS AND A. B. COONS. Bur. of Mines, *Mineral Resources of the U. S. 1927*, Pt. II, 67-80 (preprint No. 9, published Oct. 20, 1928). E. H.

The dry distillation of gums from Beechwood. KAREL HRDLÍČKA. *Paliva a lopeni* 10, 81-9 (1928).—Using the unpublished method of Jedlička-Mašt to prepare 1 kg. of xylan, H. exts. beechwood sawdust with 2% NH_4OH and follows with water. This cleaned sawdust is extd. with 5% Na_2CO_3 , and the alk. ext. is pptd. under vigorous stirring with an aq. 30% CaCl_2 soln. The pptd. mass is spread upon linen cloth and pressed. The dry mass is ground with 85.90% alc., boiled, chilled in a salt-ice mixt. and decompd. by HCl with vigorous stirring. Xylan is extd. in a Soxhlet app. and dried at 80° . The product is a white powder contg. 17-20% H_2O . On a dry basis, the gum contains 1.6-2.4% ash with some Cl, 92-96.8% pentosans and 2.5% ethoxyl groups. These constituents represent 6% of a wood contg. 8.8% H_2O . The gum is distd. in a glass retort connected to an analytical train. The distn. began at 150° , most distd. over at 220° , and it ended at $300-310^\circ$. The products show a yield of gas 20%, liquid 48.5%, coal 31.5%. The gas contains 12.5% CO_2 , 7.5% $\text{CH}_4 + \text{CO}$; the liquid: 0.9% formic acid, 0.8% AcOH , 13.8% furfurole, 6.0% tar, 27.0% H_2O . Moist gums yielded less oily products than dry ones for some oils dissolve in H_2O . The acids were neutralized with BaCO_3 and identified by the reaction of arsenic anhydride upon the K salts of the above acids. The cacodyls were formed by reducing with HgCl_2 and HgCl . The Ca salts of the acids were distd. and also identified by acetone, HCHO , etc. In the oil, 63.4% furfurole, small amts. of furan, pyromucic acid, a mixt. of phenols, HCOOH and AcOH were found. The results verify those of Bergström. F. M.

Bleaching vegetable and mineral oils with clay (ELAKOV) 27. Swelling of aluminum soaps in various solvents (MARKOWICZ) 27. Apparatus for emulsifying oils (U. S. pat. 1,694,589) 1. Treating natural and synthetic oils and resins (Brit. pat. 289,414) 27. Apparatus for extracting oil from oil-containing materials (Ger. pat. 467,801) 1. Combustible liquids (Swiss pat. 126,586) 21.

Device for cleaning oil of internal-combustion engines by filtration and use of a cleaning liquid. LOWELL C. WEINBERG. U. S. 1,693,471, Nov. 27. Structural features.

Refining petroleum oils. F. B. THOLE, S. F. BIRCH and W. S. G. P. NORMAN. Brit. 288,931, Oct. 13, 1926. In refining kerosene, benzene or other hydrocarbon oils by alk. solns. of alkali or alk. earth hypochlorite, the concn. of free alkali is not substantially less than 1.5% so that "evil-smelling" S compds. are converted into other compds. which are less offensive and which can be removed by subsequent refining. The material may also be redistd. and treated with H_2SO_4 , caustic alkali and water. Details are given.

Fractional distillation of petroleum oils, etc. T. E. PERKS. Brit. 289,394, April 26, 1927. The liquid is caused to flow in a continuous passage which is progressively heated, and vapors produced at sep. points are separately collected and condensed. An app. is described.

Cracking oils and reducing ores simultaneously. W. H. SMITH. Brit. 288,193, April 4, 1927. The oil is passed through a series of heated closed chambers or retorts through which a stream of ore is continuously fed. The retorts are preferably heated by elec. resistances, and with Fe ore the ore acts as a catalytic agent but the retort walls may also be lined with catalytic material or a catalyst may be mixed with the ore; Cr, Ni, magnetite or reduced Fe sponge are suitable catalysts. A temp. of about $1000-1100^\circ$ at the hottest part of the app. is suitable. CH_4 and CO are formed in the process by union of C, H and O set free during the reaction. An app. is described.

Cracking and rectifying petroleum oils. JAMES M. WADSWORTH. U. S. 1,692,476, Nov. 20. Oils are cracked under pressure by heating, to produce a mixt. of gasoline hydrocarbons, lighter and heavier hydrocarbons than those of gasoline, and residuum, the mixt. is rectified to sep. sharply the gasoline hydrocarbons and lighter hydrocar-

bons from heavier hydrocarbons and residuum, and the gasoline hydrocarbons and lighter hydrocarbons are then further rectified and the gasoline is sepd. from uncondensed gases. The pressure developed in the cracking stage is used for effecting the second rectification under super-atm. pressure, at temps. of about atm. temp. or higher. An arrangement of app. is described.

Apparatus (with a top-heated still having agitators) for simultaneously dehydrating and distilling emulsified petroleum oils. GUSTAV EGLOFF and HARRY P. BENNER (to Universal Oil Products Co.). U. S. 1,694,643, Dec. 11.

Fatty acid mixture derived from petroleum. GELLERT ALLEMAN (to Sun Oil Co.). U. S. 1,694,461, Dec. 11. Fatty acids of a m. p. range below -30° and substantially free from mineral oil and petroleum resins, which are suitable for making soaps, are obtained by treating an aq. mixt. contg. soap, petroleum resins and oil with gasoline and alkali metal sulfate or chloride, followed by sepn. and acid treatment.

Petroleum jelly. FRANÇOIS LAVIROTTE. Swiss 126,409, Sept. 19, 1925. Pure petroleum jelly is obtained by treating suitable hydrocarbon mixts., with H_2SO_4 at a sufficiently high temp. and for a sufficient time to convert the impurities into insol. carbonaceous substances, with evolution of gas. The initial material, which may be crude petroleum jelly, petroleum residues, etc., may be treated with oleum at 70° for 24 hrs. and then at $160-70^{\circ}$ for 48 hrs., the product being then sepd. and worked up as usual.

Cracking hydrocarbons. M. B. SCHUSTER. Brit. 289,556, Jan. 31, 1927. Cracking of materials such as black asphalt crude oil, kerosene, gas oil, lubricating oil or tar residuum is promoted by adding a colloidal substance such as bentonite or hydrated lime. The bentonite may be preliminarily treated with acid. A distn. residue similar to natural asphalt is obtained.

Cracking hydrocarbons. HENRI CARROLL. Fr. 639,740, Jan. 28, 1927. Hydrocarbon oils are continuously cracked to obtain products of lower b. p. by heating the oil in coils to slightly less than cracking temp., sepg. the vapor produced from the liquid portion in a dephlegmator, passing the liquid portion to a converter and delivering the cracked vapors up through the dephlegmator from which the mixed vapors are passed to the usual rectifiers, dephlegmators and condensers. An app. is described in detail. Cf. C. A. 22, 4788.

Cracking heavy hydrocarbons. PAUL GRENFÉ. Fr. 639,436, Jan. 22, 1927. C compds. such as coke, activated charcoal or lignite are used as catalysts. The app. used has no joints, cocks or valves in the heated region.

Cracking hydrocarbon oils. R. T. POLLOCK. Brit. 287,344, April 29, 1927. See U. S. 1,688,830 (C. A. 23, 273).

Fractionating hydrocarbon oils. JOHN C. BLACK. U. S. 1,692,072, Nov. 20. Oil such as crude petroleum or crude naphtha is distd. and fresh oil is supplied to the still to replace the vaporized portions; the condensate is passed to a sep. still, a portion of the condensate is redistd. and the vapors are partially condensed by heat exchange with the fresh oil supply and residual vapors are subjected to a further final condensation. An app. is described. Cf. C. A. 22, 865.

Oil-distillation apparatus. WARREN K. LEWIS (to the Standard Oil Development Co.). Can. 285,385, Dec. 4, 1928.

Desulfurizing hydrocarbon oils. ROBERT C. MORAN (to Vacuum Oil Co.). U. S. 1,692,756, Nov. 20. The oil is subjected to the action of Hg and the latter is simultaneously treated with an aq. soln. of an alkali sulfide. An app. is described.

Treating hydrocarbon oils with aluminum chloride. GUSTAV EGLOFF. U. S. 1,692,203, Nov. 20. Oil such as petroleum residue, "spruce turpentine" or a high-b. p. coal-tar oil is heated in a substantial liquid body in the presence of $AlCl_3$, while maintaining a temp. within the body above the m. p. of $AlCl_3$ and sufficient to vaporize portions of the oil; the unvaporized oil and $AlCl_3$ are withdrawn from the lower portion of the liquid body and are reintroduced into the upper portion of the liquid body in an atomized condition. An app. is described. (Note: The application on which this pat. was granted was filed July 19, 1918.)

Pump and valve system for pumping heavy hydrocarbon oils. IRA E. SMITH. U. S. 1,693,061, Nov. 27.

Bridge-wall furnace containing heating tubes, and associated apparatus for continuously refining hydrocarbon oils. JOHN PRIMROSE (to Foster Wheeler Corp.). U. S. 1,693,156, Nov. 27.

Apparatus for filtering liquid hydrocarbon materials and revivifying the filtering material (such as fuller's earth) by use of benzene, etc. LESLIE W. NAYLOR (to Continental Oil Co.). U. S. 1,693,207, Nov. 27.

Cracking oils. A. D. SMITH and J. PERL. Brit. 289,673, July 12, 1927. An app. is described in which oil heated in liquid phase while passing through pipes in a furnace is allowed to expand in a still whence unvaporized residue passes to a heat-exchanger, where it is cooled by heat exchange with the raw oil to cause pptn. of the heavy polymerized products and the latter are sepd. by gravity in a settling chamber. The lighter fractions are further treated and cracked in cracking tubes and mixed with cracked products from the heating pipes first mentioned.

Cracking and hydrogenating oils. P. HAHN. Brit. 289,482, April 28, 1927. The method described in Brit. 235,625 (C. A. 20, 987) is applied to the conversion of heavy hydrocarbon oils into light hydrocarbons by passing the gaseous mixt. obtained through condensers where the light hydrocarbons are condensed.

Distillation of oils. LEO STEINSCHNEIDER. Fr. 639,081, July 26, 1927. See Brit. 264,476 (C. A. 22, 163).

Purifying oils. G. PETROFF. Brit. 289,561, Feb. 1, 1927. Naphtha distillates, petroleum, cracked oils and oils obtained by the dry distn. of bituminous fossils are decolorized by passing air or other gas contg. free O through a series of vessels contg. the oil; heavy-metal salts of fatty, naphthenic or resin acids are dissolved in the oil in the first vessel and metal turnings or powder are placed in the other vessels. Salts of Pb, Mn, Co, Cu, Zn, Fe, Ca or Cr may be used, and an example is given of the purification of acid- and alkali-treated petroleum oil by use of Mn stearate and Cu turnings and Pb turnings. The oil may subsequently be further treated with acid and alkali.

Decolorizing and neutralizing oils. DAVID R. MERRILL (to Union Oil Co. of Calif.). U. S. 1,695,198, Dec. 11. Oils such as petroleum lubricating oil are treated with a mixt. of clay and an acid such as oxalic acid and, in a sep. treatment, are treated with clay and an alkali soln. such as NaOH and Na oxalate or NaF.

Emulsifiable oil. DAVID R. MERRILL (to Union Oil Co. of Calif.). U. S. 1,695,197, Dec. 11. An emulsifiable oil mixt. suitable for *treating wool* or *prepg. sprays for fruit trees, sheep dips, lubricants*, etc., comprises a naphthenic soap, a mineral oil and a substantially anhyd. aliphatic alc. such as BuOH.

Fuel oil. RALPH T. GOODWIN (to the Standard Oil Development Co.). Can. 285,386, Dec. 4, 1928. Fuel oil is prepd. by mixing pressure tar with acid oil and allowing the mixt. to stand to ppt. the carbonaceous sediment, and then withdrawing the clear oil. E. g., 13.3° A. P. I. pressure tar having a furfurole viscosity of 17, is treated with 20% by wt. of 32.2° A. P. I. acid oil contg. 0.4% free H₂SO₄. The mixt. is heated to 200° F. and agitated for 2 hrs. The mixt. is allowed to settle, thereby depositing C-forming material. The clear oil is sepd.; it is suitable as a fuel oil.

Treating spent clays used for oil refining. ROBERT A. DUNHAM (to Union Oil Co. of Calif.). U. S. 1,694,971, Dec. 11. In order to effect "de-oiling" of spent clay such as that which has been used for refining oil, the clay is treated with "an experimentally detd. optimum quantity" of water, which effects a greater sepn. of the oil than either a greater or a less quantity of water.

Cracking mineral oils. ARTHUR E. PEW, JR., and HENRY THOMAS (to Sun Oil Co.). U. S. 1,692,786, Nov. 20. A system is described in which Hg vapor is used as a heating medium for the oil. Various details of app. and of handling and recondensation of the Hg are specified.

Mineral oil derivatives. GELLERT ALLEMAN (to Sun Oil Co.). U. S. 1,694,463, Dec. 11. A compn. contg. mineral oil, petroleum resins and a fatty acid soap, such as the ppt. produced in the alkali treatment of acid-treated mineral oil lubricating stock, is treated to effect a substantially complete sepn. of the oil from the soap and resins, by adding water and heating under pressure, cooling under sufficient pressure to prevent substantial boiling and re-entry of the oil, resins and soap into an emulsion, and then sepg. the oil.

Water-insoluble soaps from mineral-oil derivatives. GELLERT ALLEMAN (to Sun Oil Co.). U. S. 1,694,462, Dec. 11. Salts such as CaCl₂, Pb(NO₃)₂ or CuSO₄ are used for pptg. insol. soaps from water-sol. soaps derived from mineral products substantially free from unchanged mineral oil and contg. only a reduced quantity of petroleum resins. The insol. soaps thus formed may be used for *waterproofing* or as *wood fillers, adhesives*, etc.

Oil filter suitable for use on engines. FRED C. MORRIS. U. S. 1,692,852, Nov. 27.

Separating benzene and oil. JULIUS REINHARD. Swiss 126,547, Feb. 8, 1927. A device for sepg. oil and benzene from washings of garages and chemical works has an ascending pipe with an overflow and collecting gutter.

Retort construction and associated apparatus for producing oil gas. ALVIN J. BASSETT (to Bruce MacBeth Engine Co.). U. S. 1,694,910, Dec. 11.

Gas from heavy oils. CONSTANTIN CHILOWSKY. Fr. 637,032, Oct. 27, 1926. An

app. is described in which heavy oil is submitted as a vapor to a partial combustion with air in a region in front of the catalyst, the combustion being completed in an incandescent container contg. the catalyst. Cf. *C. A.* 22, 4243.

Hydrogenation of gaseous products from heavy hydrocarbons, etc. SOCIÉTÉ INTERNATIONALE DES PROCÉDÉS PRUDHOMME-HOUDRY. *Fr.* 637,022, Oct. 26, 1926. In the hydrogenation of heavy hydrocarbons, crude petroleum or the like, after gasification and purification, vapors of a solvent are introduced continuously or from time to time into the catalyzer to remove deposits which tend to cover the catalyst. The solvent may be the first runnings from the fractional distn. of the hydrocarbons collected by condensation from the catalyzer.

"Natural gasoline." HAROLD E. THOMPSON (to Carbide & Carbon Chemicals Corp.). U. S. 1,695,162, Dec. 11. A liquid mixt. of hydrocarbons such as may be obtained from natural gas is treated by rectification to obtain a liquid gasoline and vaporous portion and the vaporous portion is brought to a temp. below the normal b. p. of the liquid gasoline and used for cooling the latter. An app. is described.

Absorption tower for obtaining gasoline from natural gas, etc. MEINHARD H. KOTZEBUE. U. S. 1,695,192, Dec. 11. Structural features.

Absorption and fractionation system for separating gasoline from gas. EDWIN R. COX AND DEXTER A. CUSHMAN. U. S. 1,695,139, Dec. 11. Part of a body of absorbent oil at atm. temp. is refrigerated to a considerably lower temp. and passed downwardly through an absorption tower through which wet gas is passed upwardly and through a portion only of which the oil at atm. temp. is also passed. An app. is described.

Laminated filter for gasoline, etc. VICTOR R. HEFTLER. U. S. 1,694,939, Dec. 11. Structural features.

Decolorizing kerosene, gasoline and similar petroleum distillates. VLADIMIR A. KALICHEVSKY (to Union Oil Co. of Calif.). U. S. 1,695,251, Dec. 11. Distillates contg. coloring substances not readily adsorbable by clay are treated with sufficient alkali, such as a 10% NaOH soln., to convert these coloring substances into more adsorbable form, and the distillate is then treated with acid and clay.

Shale retort. EDWARD B. ROTH. *Can.* 285,300, Dec. 4, 1928.

Shale retort. EDWARD B. ROTH. *Can.* 285,299, Dec. 4, 1928.

Distilling bituminous materials. TROCKNUNGS- VERSCHWELUNGS- UND VERGASUNGS GES., L. HONIGMANN AND F. BARTLING. *Brit.* 289,137, Jan. 18, 1927. In distg. fine granular coal or other bituminous material, the material is spread on a surface in a layer 1-3 mm. thick and distd. by heating in a furnace, which is described.

Bituminous emulsions. J. A. MONTGOMERIE. *Brit.* 288,821, April 23, 1927. Aq. emulsions of materials such as Mexican asphalt are prepd. by directly admixing the material in molten form with a hot dil. aq. soln. of an alkali carbonate or bicarbonate or mixt. of such salts.

Lubricants. C. BREWER. *Brit.* 288,796, March 17, 1926. A lubricating grease is formed by mixing the lubricating distillate from a paraffin or other suitable base crude oil with stearin or a stearin compd., tallow, soap or like material, distg. the mixt. in superheated steam with a current of O, thus producing a second distillate, treating the residue to sep. asphaltic substances (as by dissolving the other constituents in benzene and then distg. the benzene) and then mixing the de-asphalted residual material with the second distillate.

Reclaiming used lubricating oil. PHILIP F. MILLER (to De Laval Separator Co.). U. S. 1,694,478, Dec. 11. An app. is specified for reclaiming used oil by centrifuging and heating and treatment with reagents such as Na_2PO_4 .

Asphalt. ALEXANDRE FLEXER. *Fr.* 639,638, Aug. 18, 1927. An artificial asphalt is made by submitting coal tar to incomplete oxidation or nitration and adding an alkali material, or glue or gelatin dissolved in an oil. A degree of hardness may be given by melting with S.

Apparatus for melting bitumen or asphalt. AUGUSTE FRANÇOIS. *Fr.* 639,519, Aug. 13, 1927.

Furnace for the carbonization of wood. JEAN BONELLO and VICTOR-CONSTANT LAURENT. *Fr.* 639,385, Jan. 17, 1927.

23—CELLULOSE AND PAPER

CARLETON E. CURRAN

The determination of α -cellulose. C. G. SCHWALBE. *Papier-Fabr.* 26, 189-98 (1928); cf. *C. A.* 20, 283, 502.—A critical review of the literature on this subject, followed by a report of the results of a comparative test of the Jentgen (J) and Bubeck (B) methods, details of which are given. The 2 methods differ in the use of 5% and 9% NaOH, resp., for the first washing, and use of thermostatic temp. control in B. Mean values obtained on the same pulp sample in 7 labs. by the J. and B. methods are: 1925, 87.37, 86.63%; 1927, 86.54, 85.69%; difference of highest and lowest values, 1.92, 1.55. The slightly lower accuracy of J. does not warrant its abandonment in favor of B.

R. H. DOUGHTY

Constitution of flax cellulose. GEORGE W. RIGBY. *Mass. Inst. Tech. J. Am. Chem. Soc.* 50, 3364-70(1928).—Flax bast fibers consist of cells composed of pure cellulose and an intercellular material contg. a furfural-yielding constituent. The glucose residues in cellulose are joined together in positions 1 and 4 by glucoside linkages, as are those in cotton. Cellobiose is obtained from flax cellulose in yields equiv. to those from cotton. This assures that at least 2 glucose residues are combined in the cellulose and suggests that probably at least 3 are combined in a unit from which the cellulose mol. is constructed. Acetates of a trisaccharide and of an anhydrotrissaccharide may be obtained from flax cellulose. These results point to the chem. identity of cotton and flax cellulose, without reference to the relative states of polymerization.

C. J. WEST

Plasticity and solvation of cellulose esters. S. E. SHEPPARD, E. K. CARVER AND R. C. HOUCK. *Fifth Colloid Symposium Monograph* 1928, 243-52.—The authors discuss the nature of solvents for cellulose esters in relation to their influence on plasticity without, however, touching on their relationship between mech. structure and plasticity.

JEROME ALEXANDER

The falling-ball method for the measurement of apparent viscosity of nitrocellulose solutions. JOHN K. SPEICHER AND G. H. PFEIFFER. *Fifth Colloid Symposium Monograph* 1928, 267-72.—By the falling-ball method, and calcn. of the results by Stokes' law as modified by Ladenberg, nitrocellulose solns. yield mutually consistent results. This is true even with low-viscosity types, where the same relation obtains between the falling-ball and capillary-tube methods, as with castor oil. With higher-viscosity nitrocelluloses, a change in shearing stress leads to a divergence between the nitrocellulose and castor oil. As the capillary-tube instrument was not refined enough, the results cannot be interpreted in terms of abs. values.

JEROME ALEXANDER

The cellulose nitrates. JAMES CRAIK. *Fifth Colloid Symposium Monograph* 1928, 273-86.—Following an historical review, expts. are reported on nitrating, denitrating and "nitrating-up," with the results on the solubilities of the nitro cottons obtained. 12% cotton is sol. in ether-alc., whereas 8% and 13+% cottons are not. Nitration on the surface with a sol. or an insol. deriv. detcs. the soly. behavior of the product. The results are consistent with the view that there are 3 cellulose nitrates.

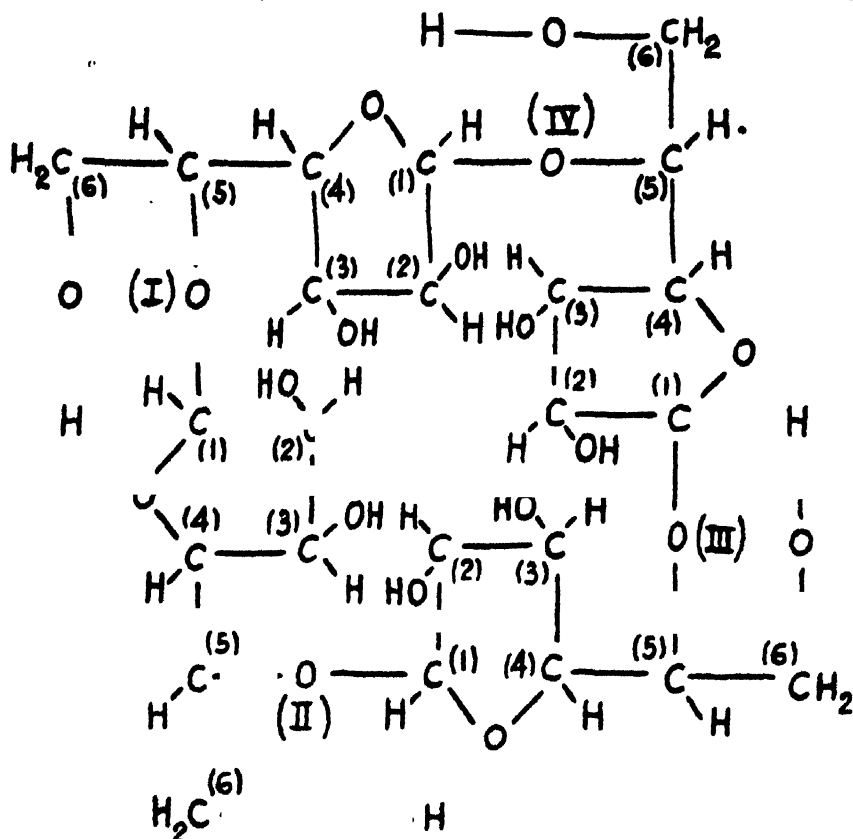
J. A.

New formula for the constitution of cellulose. GIUSEPPE ODDO. *Reale Univ., Palermo. Gazz. chim. ital.* 58, 301-9(1928).—A critical review of the literature on cellulose shows that only the following can be regarded as established facts: (1) its compn. is $C_6H_{10}O_5$; (2) its mol. is $(C_6H_{10}O_5)_n$ or a multiple of this; (3) it is very resistant to the hydrolytic action of acids and enzymes and to alkalies and other reagents; (4) it can be hydrolyzed completely to *d*-glucose by concd. HCl and to cellobiose octaacetate by concd. H_2SO_4 and Ac_2O and thence to cellobiose by alc. KOH; (5) it forms levo-glucosan by distn. *in vacuo*; (6) it forms bromomethylfurfural by the action of HBr in $CHCl_3$; (7) it contains 3 free OH groups for each $C_6H_{10}O_5$, which are in the 2-, 3- and 6-position in the glucose mol., one of these 3 OH groups being more easily attacked than the others, and (8) it forms hydrocellulose, cellulose hydrate and oxycellulose, which gives hydrazones, with no alteration of the fibrous structure. A study of the formulas proposed by Tollens (*Handbuch d. Kohlenhydrate* 2 Aufl., 565(1914)), Vignon (*Bull. soc. chim.* 21, 500(1900)), Green and Irvine (1907), shows that none

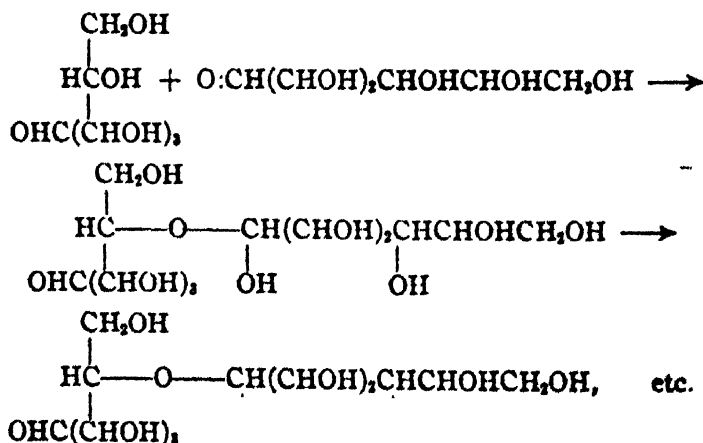
Green
Irvine

satisfies all these properties, the first 6 leaving unsettled the size of the mol., none explains the great resistance to reagents, Tollens, Vignon, Cross and Bevan and Green do not explain the formation of cellobiose, Cross and Bevan show 4 OH groups for each glucose residue, and Tollens, Vignon, Green and Euler show 3 OH groups disposed

otherwise than in the 2,3,6-positions. The following formula explains simply and completely all known phys. and chem. properties. It originates from 4 mols. of glucose



with elimination of 4 mols. of H_2O . The mechanism of this formation is that of all polysaccharides (cf. O., C. A. 9, 789), *i. e.*, by the addn. of 1 mol. of glucose through the alc. group of the C in the 5-position to the next mol. in its CHO group with formation of an alcoholate or semiacetal, and with subsequent closure of the hydrofuran nucleus in the sugar mol. (where the addn. occurs) by elimination of 1 mol. of H_2O between the OH groups of the 1,4-C atoms. This continues until the alc. OH of the C in the 5-position of the 4th glucose mol. adds similarly to the CHO group of the 1st mol., closing the nucleus:



The 4 primary alc. groups at the angles are relatively easily attacked by reagents and thus protect the 4 acetal groups, so that in the formation of tetranitrocellulose, viscose, oxycellulose, the fibrous structure is preserved. The various other features of the structural formula are explained in their relation to the phys. and chem. properties of cellulose. Thus partial hydrolysis in the I and III or in the II and IV locations divides

the mol. into 2 equal parts, giving cellobiose, while complete hydrolysis at I, II, III and IV gives 4 mols. of *d*-glucose.

C. C. DAVIS

Investigations and patents by Leon Lilienfeld. WILHELM A. DYES. *Kunstseide* 10, 401-7(1928).—A review of L.'s work on cellulose products.

FREDERICK C. HAHN

History and patents in connection with the development of the cellulose acetate industry. R. A. KÖLLIKER. *Kunstseide* 10, 409-10(1928).—A general discussion.

FREDERICK C. HAHN

Chemical engineering in the viscose process of artificial-silk manufacture. ANON. *Ind. Chemist* 4, 449-60(1928).—A description of the Branston Artificial Silk Co.'s Works, near Burton-on-Trent.

E. J. C.

Rayon. ROSS M. STRIBLING. Clemson College, S. C. *Textile Colorist* 50, 596-9(1928).—A brief discussion is given of the early history and present processes of fiber manuf., raw-product sources, and uses and applications of rayon.

R. K. W.

Most recent improvements in the rayon industry. WALTER OBST. *Kunstseide* 10, 337-8, 502-3(1928).—A review of recent patents and journal articles having a bearing on improvements in the manuf. of rayon.

FREDERICK C. HAHN

The processing of rayon. THOMAS F. HUGHES. *Textile Colorist* 50, 820, 826-7(1928).—General.

RUBY K. WORNER

Cellulose acetate rayon. WILHELM A. DYES. *Kunstseide* 10, 441-5, 484-90(1928).—Technical processes for the production of Celanese, Rhodiaseta, Aceta and other types of cellulose acetate rayon are described, and investigations and patents relating to them are discussed.

FREDERICK C. HAHN

A short survey of nitrocellulose rayon. FRED. GROVE-PALMER. *Textile Colorist* 50, 484-5(1928).

RUBY K. WORNER

Use of carbohydrates to increase durability of cuprammonium rayon. K. MELKUS. *Kunstseide* 10, 446-7(1928).—The use of carbohydrates to inhibit the oxidation of cellulose in cuprammonium soln. is described in patents. M. studied a no. of carbohydrates with the object of detg. those which were the most favorable with reference to the working up of cellulose cuprammonium solns. into rayon. Sugars showing strong reducing power in weak concns. at ordinary temp. inhibit oxidation the best. Results indicate that lactose and maltose are satisfactory for the purpose.

F. C. H.

Chemistry of sulfite pulping. XII. The use of relief liquor in pulping. ERIK HAGGLUND. Inst. für Holzchemie, Akademie Åbo (Finland). *Papier-Fabr.* 26, 657-61(1928); cf. *C. A.* 22, 3291.—A series of exptl. cooks were made on spruce in bomb tubes, using both fresh liquor and a mixt. of $\frac{2}{3}$ fresh liquor and $\frac{1}{3}$ waste liquor from a com. mill. Both liquors contained 40 g. per l. SO_2 and 10 g. per l. CaO . Good circulation was necessary to the best results with mixed liquor, and even then the pulps were not up to the usual standard of color. The lignin content of the pulps cooked with mixed liquor was noticeably higher and the cooking time longer regardless of yield. It has already been shown experimentally that aldoses in the cooking liquor accelerate change of SO_2 to SO_3 . The use of waste liquor exaggerates this effect. The increased acidity thus caused tends toward overcooking and to degradation of the pulp. Waste liquor should not be used in cooking when high-grade pulp is desired.

R. H. DOUGHTY

A rapid method for measuring pulp consistence. AUGUST NOLL. *Papier-Fabr.* 26, 673-9(1928).—The use of a small centrifuge is recommended, the damp pulp cake being weighed directly. On pulps ranging from 1 to 7% consistence, a fairly const. neg. error 5% (abs.) was found, as checked by dry wt. detns.

R. H. DOUGHTY

Methods for determining the constitution of wood. ERICH SCHMIDT. *München. Papier-Fabr.* 26, 673-9(1928).—An address. The work of S. and his associates (cf. *J.* 21, 144, 1829, 3375) is described and discussed. This work leads to the conclusion that the various components (cellulose and hemicelluloses) of the skeletal substance are present in stoichiometric proportions and in chem. rather than mech. combinations.

R. H. DOUGHTY

nical lignin determinations, wood investigations, etc. ERICH RICHTER. *Papier-Fabr.* 59, 767-71(1928).—The modified Hempel-Seidel method for lignin previously described (*C. A.* 8, 2945) has been tested in use and improved. The method are described in detail. Briefly, the sample of wood or pulp is heated with HNO_3 , the N_2O_5 formed is detd., and the lignin present calcd., standardized on material of known lignin content. Very good results are obtained. The unhydrolyzed residue, gives an approx. measure of the pulp yield obtainable from the tree, and also of pulps, are given.

R. H. DOUGHTY

Conversion of spruce wood by means of sulfites. C. G. SCHWALBE AND

WERNER LANGE. *Papier-Fabr.* 26, 641-4(1928); cf. *C. A.* 22, 3295-6.—A no. of exptl. cooks have been made with Na_2SO_3 (I) and Na (II), Ca (III) and Mg (IV) bisulfites. Using I alone at 145° gives a 56% yield of imperfectly softened chips, and requires a long cooking time (48 hrs.). Impregnating with II at 110° , blowing off free SO_2 and pulping at 145° gives a better cook (70% yield) in a shorter time (20 hrs.). Thorough penetration is important, and must be carried out at or below 110° . The beneficial effect of bisulfite is probably due to acceleration of the penetration (cf. *C. A.* 22, 3295). Impregnating 5 hrs. at 110° , draining off liquor and cooking 1 hr. at 145° with direct steam, gave the following results: pulping agent, yield of screened pulp, and yield of screenings are given: II, 75, 17%; III, 60, 11%; IV, 70, 7%. The pulps contain 23-26% lignin and about 8% pentosans; IV gave the best pulp. The steaming treatment seems to result in more phys. than chem. change of the fibers. The results are discussed in some detail.

R. H. DOUGHTY

The dependence of sizing strength upon degree of beating. ANON. *Papier-Fabr.* 26, 561-5(1928).—Report of exptl. work by Johannes Berger. Papiertechn. Inst. der Gewerbehochschule Köthen-Anh. Unsized hand sheets prepd. from pulp ranging from unbeaten to very highly beaten (10-94 Schopper-Riegler degrees) were tested for sizing strength and compared with groundwood-free printing paper ranging from unsized to fully sized. Degree of sizing was detd. by the flotation method, NaOH-phenolphthalein (I), $\text{NH}_4\text{CNS-FeCl}_3$ (II), tannin- FeCl_3 (III), and ink (IV) being used. The unbeaten pulp showed less water resistance and the highly beaten pulp much more, as measured by these methods, than the unsized and fully sized papers, resp. There seems to be no regular relation between the results of the several methods. Values given by I and IV agree fairly well; I seems best, though it is suggested that the NaOH may have an undesirable effect on the results, because of chem. action on the cellulose or sizing agents.

RANDALL H. DOUGHTY

Hydrogen-ion determinations on paper. BRUNO SCHULZE. Staatl. Material-Prüfungsamt Berlin-Dahlem. *Papier-Fabr.* 26, 625-9; *Wochbl. Papier-Fabr.* 59, 1087-93(1928).—The p_H values of a no. of papers have been detd. directly on the paper electrometrically (I) or with indicator papers (II) (cf. Behrens, *C. A.* 22, 1745); also on the aqueous ext. electrometrically (III), with Merck's universal indicator (IV), and with Wulff indicator foils (V) (*C. A.* 21, 3855). Many papers are so well buffered that the effect of atm. CO_2 during extn. is small, and all methods give equally good results. For tech. use with such papers V is recommended as most convenient. Weakly buffered (nearly neutral) papers give low values, and parchment gives high values by extn.; I gives best results with these papers, though II can be used on parchment. Details of prepn. of indicators used in II are given.

R. H. DOUGHTY

The bleaching of sulfite pulp. RAGNAR BERGQVIST. *Papier-Fabr.* 26, 593-604 (1928); cf. *C. A.* 22, 4798.

R. H. DOUGHTY

Recovering resinous products in the manufacture of wood pulp (U. S. pat. 1,693,586) 26. Denitrating waste acids (Fr. pat. 639,641) 18. Apparatus for drying fabrics and paper in endless webs (U. S. pat. 1,692,129) 1. Protective layer on photographic films (Can. pat. 284,233) 5.

Artificial silk. I. G. FARBENIND. A.-G. Brit. 287,553, March 24, 1927. The extensibility, tensile strength, dyeing properties, etc., of artificial silk are controlled by reducing the tension on the threads during the coagulation stage, and applying tension to the threads at the thread guide which is so arranged as to cause the threads to make one or more changes in direction during passage. An app. is described.

Wood pulp. GEORGE A. RICHTER (to the Brown Co.). Can. 284,216, Oct. 23, 1928. The spent cooking liquor resulting from the alk. treatment of unbleached pulp may be used as make up liquid, instead of water, in the production of a sulfite liquor for production of sulfite pulp, either by passing it and SO_2 in counter-current flow through a mass of inert interstitial material, or through a lime tower, or else by employing it for slaking the lime in case the sulfite cooking liquor is formed by passing SO_2 through milk of lime. The spent liquor contg. the sol. salts or other org. compds. of Na or Ca may be employed in the production of a sulfite cooking liquor having either Na or Ca, or Na and Ca as its basic constituent material or materials.

Elimination of silica from residual lyes of cellulose factories. ANDRÉ THIRIET (to The Papeteries Navarre), Can. 284,259, Oct. 23, 1928. Lyes are exposed to the action of CO_2 or of NaHCO_3 , or to both at a temp. of 15° so that the dissolved silica is pptd. The SiO_2 ppt. is sepd. and the CO_2 is recovered from the soln. by heating.

Cellulose. EMIL PRIFFNER. Swiss 126,658, Dec. 23, 1926. Insulating layers of acetylcellulose are formed by soaking them in oil in the absence of air, drying them, and then allowing the atm. O to oxidize the oil.

Cellulose. NAAMLOOZE VENNOOTSCHAP NEDERLANDSCHE KUNSTZIJDEFABRIK. Swiss 126,588, Nov. 27, 1926. Acetylcellulose soln. with a higher viscosity is prepd. by the reaction of Ac_2O on cellulose in the presence of a catalyzer and a diluent. The constituents must be at least partially dehydrated. Thus Ac_2O is mixed with glacial acetic acid and allowed to stand. Sulfuryl chloride is added as condensing agent and the cellulose added after some hrs.

Cellulose. SOCIÉTÉ BARBOU ET C^{IE}. Fr. 639,426, Jan. 21, 1927. The quantity of water used in cellulose manuf. is reduced by dilg. the pulp before it enters the presses, using the water pressed out for adding to the pulp coming from the bleachers and using the water from the thickening cylinders for washing the cellulose after defibering. Fr. 639,427 describes a process for leaching cellulose with sulfite lye in which CaCO_3 is added to the lye to transform the Na_2SO_4 formed into Na_2CO_3 .

Cellulose. WOLFF & CO. AND R. WEINGAND. Brit. 288,997, April 19, 1927. Cellulose which has been freed from hemicellulose, wholly or in part, by treatment with alkali, is treated with a salt soln. or other suitable liquid prior to washing with water, in order to avoid further formation of hemicellulose. NaCl , K_2SO_4 or alcs. may be used.

Hydrated cellulose. I. G. FARBENIND. A.-G. Fr. 636,803, June 29, 1927. The tendency of hydrated cellulose to expand is reduced by impregnating it, as freshly pptd. or dried, with resins sol. in water or alkalies and then treating with a substance to render the resin insol. Phenol-sulfur or phenol-formaldehyde-sulfur resins are suitable with an after-treatment with formaldehyde to render them insol. Condensation products of urea and formaldehyde may also be used.

Nitrocellulose. I. G. FARBENIND. A.-G. Brit. 289,387, April 25, 1927. Unstable nitrocelluloses which yield highly viscous solns. are converted into nitrocelluloses which yield solns. of low viscosity by heating to above 100° with water and an insol. basic compd. such as magnesia.

Cellulose derivatives. I. G. FARBENIND. A.-G. Fr. 639,150, Aug. 6, 1927. Alkali cellulose is esterified or etherified in the form of pressed sheets or boards. The sheets may be sepd. by Fe netting.

Figured or multi-colored products of cellulosic derivatives. I. G. FARBENIND. A.-G. Brit. 288,592, April 13, 1927. Products resembling cork or ivory or having other figured or multi-colored effects, suitable for making cigarette mouthpieces or other articles, are produced by applying to a supporting surface a layer of the substances producing the figured or multi-colored effect and pouring, spraying or spreading over this layer a soln. of the cellulose deriv. Examples of the use of various coloring substances, cellulose acetate, etc., are given.

Apparatus for making films of cellulose derivatives. I. G. FARBENIND. A.-G. Brit. 288,223, April 9, 1927. Supports for film manuf. are made from a soln. of a cellulose deriv. which still contains free OH groups and is therefore free from tendency to swell or dissolve in the solvent for the "dope;" e. g., the surface of a drum on to which a soln. of acetylcellulose is to be flowed may be coated with nitrocellulose of 8% N content by evapg. a soln. of the nitrocellulose in a mixt. of acetone, ethylene chlorohydrin and water.

Support for making films. I. G. FARBENIND. A.-G. Fr. 637,012, July 5, 1927. A support for making films by causing substances such as cellulose acetate dissolved in org. solvents to flow upon them is made of cellulose derivs. modified on the surface by sapon., reduction, etc., to such a point that it neither swells nor is sol. in the solvent used, or the support may be made of a cellulose deriv. contg. free hydroxyl groups which, without further treatment, neither swells or dissolves in the solvent.

Cellulose esters. BRITISH CELANESE, LTD., H. DREYFUS and C. I. HANEY. Brit. 288,657, Oct. 8, 1926. Cellulosic materials such as unmercerized cotton or alkali-treated wood pulp are rendered more easily esterifiable by treatment with small quantities of liquid formic acid preferably of 70-90% strength and by using 10-20% of the acid it is not necessary to remove residual acid before acetylation or other similar esterification.

Cellulose esters. I. G. FARBENIND. A.-G. Fr. 639,119, Aug. 5, 1927. Cellulose before acetylation is given a preliminary treatment by passing it in the form of endless bands of paper, into glacial AcOH .

Products from cellulose esters, etc. I. G. FARBENIND. A.-G. Brit. 289,068, April 22, 1927. Cellulose esters of the higher aliphatic acids which are insol. in the

usual org. solvents, and the sol. cellulose esters of such acids which may be prep'd. as described in Brit. 283,181 (C. A. 22, 3988) and also the mixed esters and ether-esters are formed into molded articles, coatings or the like without use of solvents by subjection to mech. pressure while heated (suitably at 100–150°) to plastify the material. Fillers and other substances may be added for making floor coverings and various other articles.

Films and other products from cellulose esters and ethers. I. G. FARBENIND. A.-G. Brit. 289,523, Jan. 26, 1927. Glycerol monoformal or other acetal type comp'd. of a polyhydric alc. is used as a solvent and other suitable solvents and modifying ingredients also may be added.

Coating objects with cellulose esters or ethers. CAMILLE DREYFUS. Fr. 637,113, July 6, 1927. Threads, cloth, films or other objects made of or contg. cellulose acetate or other ethers or esters of cellulose or having a surface of cellulose acetate, etc., are coated with a soln. of cellulose acetate or other ether or ester of cellulose in a solvent which is not a solvent for the ester or ether in the object to be coated. Substances such as metallic powders, paints or dyes may be added to the soln. A metallic effect is obtained by rubbing polished surfaces with oxychloride of Bi or Sb, etc., and covering with a transparent layer of cellulose acetate, etc., with different soly. characteristics from that of the base. Cf. C. A. 22, 3788.

Cellulose acetate. JAMES W. BULMER. U. S. 1,692,622, Nov. 20. Cellulose is prep'd. for acetylation by mixing it with HOAc of such strength that the acid crystallizes when cooled and then cooling the mixt. until crystn. of the acid is effected throughout the mass.

Cellulose acetate. SOCIÉTÉ CHIMIQUE DES USINES DU RHÔNE. Swiss 126,204, Mar. 9, 1927. See Brit. 274,814 (C. A. 22, 2272).

Treatment of cellulose acetate. VEREIN FÜR CHEMISCHE INDUSTRIE A.-G. Swiss 126,410, Apr. 12, 1927. Pptd. cellulose acetate is pressed to remove AcOH and then washed and pressed to remove wash water. An app. is described in which the material is treated in band form and washed in countercurrent.

Articles of cellulose nitrate or other cellulose ester or similar material. ALFRED S. DONALDSON (to Du Pont Viscoloid Co.). U. S. 1,694,847, Dec. 11. Mirror backs or other decorated machinable articles are formed of united sheets of material, one of which carries decorative material on an interior surface.

Coating composition. ARTHUR W. BURWELL (to The Alox Chemical Corp.) Can. 283,892, Oct. 2, 1928. A coating compn. suitable for use in the production of *artificial leather* comprising 50–5 parts by wt. of nitrocellulose and 50–95 parts by wt. of a softening agent consisting essentially of the water-insol. carboxylic acids substantially identical with those obtainable by contacting an O-contg. gas with a petroleum hydrocarbon mixt. consisting of a 48–43° Bé. petroleum distillate in liquid state at reacting temp. and at a pressure greater than atm., producing thereby water-insol., saponifiable carboxylic acids which are sol. in the hydrocarbon mixt., sapong. the acids, sepg. the resulting soaps from the hydrocarbon mixt., decomp. the soaps by treatment with H₂SO₄, and sepg. the free acids thus obtained from the reaction mixt.

Artificial masses from cellulose esters. OSKAR LOEHR (to I. G. Farbenind. A.-G.). Can. 285,360, Dec. 4, 1928. Soft and pliable masses are manuf'd. from cellulose esters, in particular nitro- and acetylcellulose, by incorporating with the cellulose ester an ester of a polyglycol or of a monoalkyl or aralkyl ether thereof or a mixt. of such compds. E. g., 100 parts of nitrocellulose together with 50 parts of a mixt. of the BzOH esters of polyethylene glycol monoethyl ethers (boiling between 315 and 355°) is dissolved in 300 parts of AcOBu, 150 parts of alc. and 150 parts of benzene. The soln. on pouring out and evapg. the solvent yields a film of excellent properties. The product is suited to the manuf. of artificial masses, *lacquers*, *artificial leather* and the like.

Sized xanthated cellulose fiber. WM. W. CARTER (one-half to Henry T. Nelson). U. S. 1,693,573, Nov. 27. Fiber such as ordinary paper stock is permeated with a rosin size or other suitable sizing material prior to xanthation and subsequently xanthated. The product is suitable for use in making a waterproof paper.

Saccharification of lignocellulose. JEAN ARCHIMANDRITI and JACQUES A. É. CARRIÈRE. Fr. 639,075, July 8, 1927. Lignocelluloses, particularly vine shoots, are saccharified by very dil. acids and the sugar solns. are concd. by using the same acid soln. for several charges of cellulose.

Saccharification of wood. LES DISTILLERIES D'ALSACE. Fr. 637,107, July 6, 1927. Wood is saccharified by a treatment with concd. (40%) HCl and HCl gas in quantities insufficient to complete the saccharification which is completed by a less concd. (30%) acid. The less concd. acid serves to sep. the sugar soln. from the solid residue.

Precipitation of viscose solutions. I. G. FARBENIND. A.-G. Fr. 636,725, June 28, 1927. Pptg. baths for viscose, particularly for the manuf. of artificial silk, are satd. with respect to Na_2SO_4 (33–50%) and contain a high % of H_2SO_4 so that on crystn. trisodium H sulfate first separates. Examples give 16% H_2SO_4 at 20°, 18% at 46° and 19% at 60°.

Desulfuration of viscose silk. I. G. FARBENIND. A.-G. Fr. 636,848, June 30, 1927. Viscose silk is desulfurized in a bath comprising a soln. of an alkali salt which is more or less hydrolytically dissocd. Solid soap, Marseilles soap or Turkey red oil or a 2–4% soln. of Na_2CO_3 may be used.

Artificial silk. MAX J. THEUMANN (to Société pour la fabrication de la soie "Rhodi-aseta"). Can. 284,275, Oct. 23, 1928. To 100 l. of a soln. contg. cellulose acetate 1, AcOH 9, and water 5 parts and H_2SO_4 is added gradually 8.5 l. of a soln. contg. $\text{BaCl}_2 \cdot 2\text{H}_2\text{O}$ 20, AcOH 20 and water 60 parts. The mixing takes 5 min. The whole is then pptd. into a large quantity of water, the pptd. product is washed, dried and from the product so obtained, a cellulose acetate collodion for spinning is prepd., filtered and spun by the usual methods. The silk obtained contains approx. 20% BaSO_4 and 80% cellulose acetate. It has a very matt white appearance and is supple to the touch. This silk can be subjected to repeated washing in water, cold or hot, without any loss of BaSO_4 . The silk can be dyed by any of the processes currently used for cellulose acetate silk.

Artificial silk. HENRY DREYFUS. Fr. 637,468, July 11, 1927. Threads, cloth, etc., of acetate silk are composed of fibers or threads of lustrous cellulose acetate and fibers or threads of cellulose acetate partly or entirely delustered. The silk may be dyed by the usual solubilized dyes for acetate silk, or dyes such as basic dyes which dye the lustrous threads differently from the delustered may be used.

Artificial silk. ANTONIO BERIA. Ger. 468,315, July 5, 1926. A method and device for drawing out an unbroken thread from a bundle of silk fibers on a spinning-machine is described.

Artificial silk. COURTAULDS LIMITED. Fr. 637,130, July 6, 1927. The proportion of solvent vapor in a spinning chamber is maintained const. by a valve which regulates the inlet or outlet of the atm. to the chamber, and a hot-wire gas-testing app. arranged inside the chamber or connected to the outlet piping through which the evaporative atm. leaves the chamber. One testing app. may be used for two or more spinning chambers.

Artificial silk. COURTAULDS, LIMITED. Fr. 639,235, Aug. 9, 1927. In dry-spinning artificial silk a sudden increase of pressure is applied to the soln. so that the filaments form at the spinning nozzles. The increase of pressure may be obtained by an auxiliary pump between the spinning pump and the nozzles.

Artificial silk. DEUTSCHE ZELLSTOFF-TEXTILWERKE. Ger. 467,241, Dec. 22, 1925. So called air- or light-silk is produced from viscose by causing electrolytic gas, such as H_2 , to be formed in the viscose immediately in front of the spinning holes.

Artificial silk. GRUNERT & GIANNETTI. Ger. 468,272, Feb. 6, 1927. A device for spinning silk from cuprammonium-cellulose soln. is described. Cf. C. A. 22, 3777.

Artificial silk. G. BONWITT. Brit. 288,222, April 7, 1927. In producing artificial silk with reduced luster as described in Brit. 285,066 (C. A. 22, 4816) and Brit. 285,863 (C. A. 23, 278), the spinning soln. contg. the added substance is homogenized before spinning in the case of filaments of less than 6 deniers. The size of the particles of the added substance must be decreased progressively as the denier number is reduced (according to a formula which is given).

Artificial silk. T. IWASAKI and K. HAGIWARA. Brit. 288,655, Oct. 8, 1926. The dispersed particles in a soln. to be used for the spinning of artificial silk are caused to arrange themselves in chain formation by the action of an elec. field produced by a high-voltage elec. discharge. The chain formation persists during ripening and extrusion and the process is applicable to solns. of viscose, ammoniacal-Cu cellulose, nitrocellulose, cellulose acetate, gelatin, albumin and natural silk solns.

Artificial silk. INOXI (Soc. A RESPONSABILITÉ LIMITÉE). Fr. 639,197, Jan. 14, 1927. The stretching of artificial silk is prevented by sizing the silk before submitting it to torsion with sizes usually employed for wool and cotton such as animal or vegetable glue. A "crêpe" appearance is obtained on the silk.

Treating artificial silk. PIERRE JOLIOT. Fr. 639,196, Jan. 14, 1927. Artificial silk is dipped in a bath contg. albumins and gelatin and AcOH, and afterward treating with CH_2O to render the gelatin insol. The appearance of the silk is improved and it becomes more absorbent to weighing salts and more easily woven.

Spinning artificial silk. I. G. FARBENIND. A.-G. Fr. 636,976, July 4, 1927. The

silk thread issuing from the spinning nozzle is bent either not at all or only slightly. The method may be employed for spinning viscoses of high viscosity and low cellulose content and it may be used for the spinning of fine filaments, i. e., below 3 deniers. The bath is preferable H_2SO_4 and the length of immersion may be reduced to a few cm. and in a vertical direction.

Spinning artificial silk. SCIENTIFIL (Charles Sandoz, inventor). Fr. 639,289, Aug. 10, 1927. In dry-spinning acetone-sol. acetate silk the filament coming from the spinning nozzle is sucked down through an appropriate tube such as a constriction between 2 inverted cones by the current of air used for recovering the solvents and guided toward the winding spools. The spools are arranged to be replaced when full without altering the speed of spinning.

Receiver for artificial silk spinning. I. G. FARBERIND. A.-G. Fr. 636,893, July 1, 1927. Receivers which are resistant to acids, particularly HNO_3 , are made from an alloy of Fe 70, Cr 19, Ni 6.6 and Mo 3.6%.

Apparatus for making rayon filaments by the dry-spinning method. SOC. POUR LA FABRICATION DE LA SOIE "RHODIASETA." Brit. 288,618, April 14, 1927.

"Spinning pump" and other apparatus for making artificial silk. H. KINDERMANN. Brit. 289,497, Nov. 23, 1926. Structural features.

Apparatus for making artificial silk by the "dry-spinning" method. NICOLAS B. GRILLET (to Société pour la fabrication de la soie "Rhodiaseta"). U. S. 1,695,094, Dec. 11. Devices for control of temp. and pressure are specified.

Apparatus for manufacture of artificial silk from cellulose derivatives. JOSEPH E. G. LAHOUSSE (to Société pour la fabrication de la soie "Rhodiaseta"). U. S. 1,695,111, Dec. 11.

Filtering or straining material for use in making artificial silk, etc. WILLIAM H. FURNESS (to Cellocilk Co.). U. S. 1,692,824, Nov. 27. Thin metallic sheets which may be formed of Sn are embedded in a wax-like block, which may comprise paraffin or material of similar properties, the block is shaved, and the wax-like material is removed from the metallic shavings and the clean shavings are balled.

Apparatus (with a liquid seal at the outlet) for dry or semi-dry spinning of "acetate silk," etc. O. SILBERRAD. Brit. 289,233, March 23, 1927.

Paper-making apparatus. E. A. OHLIN and F. O. CARLSSON. Brit. 288,286, April 9, 1927. Structural features.

Control system for paper-making apparatus. HAROLD F. DUNBAR. U. S. 1,694,704, Dec. 11.

Suction roll for paper-making apparatus. EARLE E. BERRY (to Beloit Iron Works) U. S. 1,694,698, Dec. 11. Structural features.

Paper stock from straw. LEWIS GRAFFLIN (to Ball Bros. Co.). U. S. 1,692,774, Nov. 20. Paper is formed contg. straw fibers and the residue of a weak Na_2SO_4 liquor in which the straw has been disintegrated.

Strainer for paper-stock. JOHN D. HASKELL and MORTIMER R. RUST (to Dilts Machine Works, Inc.). U. S. 1,693,560, Nov. 27.

Paper. ERIK L. RINMAN. Can. 284,182, Oct. 23, 1928. Straw, esparto, reed and similar raw material is boiled with NaOH at a temp. not exceeding 140° , whereby glutinous substances present in the raw material are not destroyed; the waste liquor is sepd. from the cellulose after the boiling is completed at a temp. not exceeding 50° , whereby the glutinous substances are not dissolved from the cellulose; the cellulose is ground in beaters so that the fibers are not cut or torn and a pulp is obtained having a degree of grinding of 65 to 80 degrees Schopper-Riegler, from which parchment paper or grease proof paper can be produced in a suitable machine. If it is desired to produce thicker paper the cellulose is heated to about 30° but not above 40° before it is transferred to the wire apron of the paper machine.

Centrifugal pulp strainer. P. ERKENS. Brit. 289,397, April 26, 1927. Structural features.

Beating engine for paper pulp. GEORGE S. WITHAM, JR. U. S. 1,692,602, Nov. 20.

Paper and pulp making cylinder mold. TOM HARVEY. U. S. 1,692,733, Nov. 20. Structural features.

Rotary apparatus for screening paper pulp, etc. ERNEST W. LINDQUIST. U. S. 1,694,622, Dec. 11.

Indicating moisture condition of paper webs during manufacture. T. KÄLLÉ. Brit. 288,598, April 13, 1927. An app. is described by which the variation in plasticity or resistance to bending of paper or the like, varying with the moisture content, is used to indicate the latter.

Apparatus for drying paper. ALVIN E. MONTGOMERY. U. S. 1,691,930, Nov. 20.

Refining paper. AUGUSTE AVOR. Fr. 639,713, Jan. 25, 1927. In conical refiners for paper pulp an agitator is placed at the entry to keep the pulp stirred while facilitating the deposition of heavy substances.

Material for bottle closures, etc. HENRY P. SHOPNECK (to John J. Daly). U. S. 1,694,399, Dec. 11. Long and short fibers such as are suitable for paper making are felted together and impregnated with a thermo-plastic stiffener such as a mixt. of rosin and montan wax.

Safety paper with a dye coloring coating and compressed portions serving as identification marks. LOUIS GAILER (to E. E. Lloyd Paper Co.). U. S. 1,692,645, Nov. 20.

Newsprint paper. W. H. MILLSPAUGH. Brit. 288,212, April 4, 1927. See C. A. 22, 3045.

Liberation of fiber from bagasse or like fibrous stalks. GEORGE A. RICHTER (to Brown Co.). Can. 284,219, Oct. 23, 1928. Bagasse or like fibrous stalks are steeped at about room temp. in a highly concd. alk. liquor until such liquor has diffused into and penetrated the stalks, then the liquor is dild. to an alky. equiv. to about 7-12% NaOH, and the stalks are cooked in such dild. liquor at atm. pressure.

24—EXPLOSIVES AND EXPLOSIONS

C. E. MUNROE

Production of explosives in the United States during the calendar year 1927. WILLIAM W. ADAMS. Bur. of Mines. *Tech. Paper* 435, 49 pp (1928). E. H.

Safety of liquid-air explosives in coal dust. MATTHIAS. *Z. ges. Schiess-Sprengstoffw.* 23, 297-302 (1928).—Tests were made to det. the length and duration of flame from charges of approx. 120 g. each of 2 coal-mining explosives, 1 rock-mining explosive and 5 explosives comprising liquid air absorbed in various mixts. of wood meal, chalk, kieselguhr, and NH_4 salts. The charges, both unstemmed and stemmed with 200 g. coal dust, were fired from a mortar, and the flames photographed on both stationary and moving films. The photographs show that all of the liquid-air explosives ignited the coal-dust stemming, producing flames several m. high. Without stemming, the coal-mining powders gave flames of 0.5 to 0.7 millisecc. duration and 0.37 to 0.6 m. height; the liquid-air explosives, 1.2 to 3.24 millisecc. duration and 0.86 to 1.08 m. height. The liquid-air explosives are regarded as unsafe for use in coal mines. C. G. STORM

Determination of velocity of detonation of explosives. H. HENKEL. *Z. ges. Schiess-Sprengstoffw.* 23, 314-5 (1928).—A theoretical discussion is given of the possible sources of error in the detn. of rate of detonation by the *Dautriche method* (with TNT fuse) and by the *spark chronograph method*. C. G. STORM

Initial impulse and detonation. H. HENKEL. *Z. ges. Schiess-Sprengstoffw.* 23, 296-8 (1928).—The total quantity of heat liberated is the same, whether the explosive burns or is detonated. The mech. equiv. of heat calcd. from detn. of min. height of fall of a 2-kg. wt. required to produce explosion (impact test), is always much less than the heat capacity calcd. from the sp. heat and ignition temp. of the explosive. This demonstrates that shock energy is more effective than heat energy in producing detonation. The sensitiveness of molecular explosive compds. to shock is in inverse relation to their heat capacities. The most important factors for obtaining max. rate of detonation are intensity of initial shock wave and sensitiveness of the explosive. Increased fineness of solid ingredients is favorable to high rate, while high content of liquid ingredients is unfavorable. C. G. STORM

Laws governing the combustion of colloidal powders. HENRI MURAOUR. *Z. physik. Chem. Abt. A, Haber Bd.* 139, 163-8 (1928).—See C. A. 22, 4250. E. J. C.

Rock-dusting by hand method. D. HARRINGTON AND C. W. OWINGS. Bur. of Mines, *Information Circ.* No. 6087, 7 pp. (1928).—This is recommended. E. H.

Construction and use of hand grenades. K. REICHERT. *Z. ges. Schiess-Sprengstoffw.* 23, 224-8, 273-6, 311-4 (1928).—The article reviews the history of the development and the uses of hand grenades, classifies various types as to methods of use, function, and method of ignition, enumerates the essential requirements of satisfactory grenades, and describes and illustrates various types used during the World War with charges comprising high explosives, gas and incendiary compns. C. G. STORM

Denitrating waste acids (Fr. pat. 639,641) 18. Liquid air (Fr. pat. 639,702) 13.

Explosives. FRANK H. BERGEIM (to E. I. du Pont de Nemours & Co.). U. S. 1,691,955, Nov. 20. Explosives which are suitable for various purposes contain nitroisobutylglycol dinitrate or other suitable compd. comprising a branched-chain hydrocarbon to which is attached a nitro group and 2 nitrate groups, and may contain also other substances such as nitroglycerin, NaNO_3 , wood meal, CaCO_3 , and nitrocellulose.

Priming and igniting explosives. WILHELM ESCHBACH. Fr. 636,605, June 27, 1927. A mixt. of thermite fastened in a sleeve and provided or not with a fuse is used for priming and igniting explosives such as dynamite.

Storing explosive gases. AUTOGEN GASACCUMULATOR, A.-G. (Edmund Steil, inventor). Ger. 467,881, May 23, 1924. Silica gel is used as filling material for containers for explosive gases, particularly C_2H_2 .

Priming mixture for small-arms ammunition. HARLEY T. PECK (to Peters Cartridge Co.). U. S. 1,694,890, Dec. 11. A priming mixt. comprises Hg fulminate, $\text{Ba}(\text{NO}_3)_2$, Ph chromate and $\text{Ph}(\text{CNS})_2$.

Erythritol tetranitrate. FRANK H. BERGEIM (to E. I. du Pont de Nemours & Co.). U. S. 1,691,954, Nov. 20. Erythritol is dissolved in H_2SO_4 and HNO_3 is then added.

25—DYES AND TEXTILE CHEMISTRY

L. A. OLNEY

Census of dyes and of other synthetic organic chemicals, 1927. U. S. Tariff Commission, *Tariff Information Series No. 37*, 191 pp. (1928). E. J. C.

Interesting sources of natural dyestuffs. C. D. MELL. *Textile Colorist* 50, 602-4 (1928).—The fruit of the genipap (*Genipa americana*) of tropical America furnishes a dye, considered absolutely indelible on cotton and linen, which is being used industrially for marking laundry. A red dye used chiefly for dyeing the sticks used in the manuf. of mats in the Far East is obtained from rang (*Peristrophe tinctoria*). Raicilla (*Calliandra anomala*), a Mexican shrub, furnishes tannin and dye. Dyeing woods the color of mahogany with a mixt. contg. powd. alkanet root, aloes and dragon's blood is described.

RUBY K. WORNER

Color specification—physical, physiological and psychological. WALTER M. SCOTT. *Am. Dyestuff Rept.* 17, 773-8 (1928).—In this paper color "is the general name for all sensations arising from the activity of the retina of the eye and its attached nervous mechanisms." Accordingly black, gray and white are considered colors as well as the spectrum tints. By the physical factors are meant the stimuli which are transmitted by the colored pigments to the eye, physiological factors are the excitations in the eye which result from the color stimuli and the psychological factors are the visual sensations produced by such color excitations. A review of the more important contributions to the science of color is given; these contributions are classified according to the factors mentioned above.

L. W. RIGGS

Sulfur and the dye industry. H. C. MEAGHER. *Textile Colorist* 50, 769-71 (1928).—General.

RUBY K. WORNER

The use of substantive colors in printing. J. STEPHEN HEUTHWAITE. *Textile Colorist* 50, 809-12 (1928).—A general article, dealing with the different methods at the disposal of the calico printer, use and prepn. of thickenings for the mordant or mixt. of mordant and dyestuff, formation of the color lake, steaming process, applicability and use of substantive colors, cross dyeing and discharge agents.

RUBY K. WORNER

Some points as to the use of the basic dyes on silk. J. F. TELFER. *Textile Colorist* 50, 470 (1928).—If 2 or more basic dyes are to be used, sep. dyeing operations are advisable. Such dyeings show the shade of the combination in transmitted light, but chiefly that of the topping color in reflected light. Dyes should be chosen which dye at the same temp. Temps. higher than 149° are unnecessary for the actual dyeing, except in such a case as fuchsin, where $158-176^\circ$ is the best temp. In general, the basic dyes are rather poor light resistors. Methylene blue and Capri blue are mentioned as exceptions.

RUBY K. WORNER

A yellow dye from the English saw wart. C. D. MELL. *Textile Colorist* 50, 827 (1928).—Before the introduction of synthetic dyes, the saw wart (*Serratula tinctoria*) was used extensively as a substitute for weld. Its herbage furnished a good permanent yellow with alum mordants, and was also used for dyeing green.

RUBY K. WORNER

Pale and mode shades on wool, silk and cotton. WM. PANCROFT. *Textile Colorist* 50, 543-4 (1928).—The selection of the bleaching method is discussed from the practical viewpoint.

RUBY K. WORNER

Mesquite as a source of dyes and tans. C. D. MELL. *Textile Colorist* 50, 845-6 (1928).—Mesquite (*Prosopis juliflora*) flourishes chiefly in Mexico. Its wood, bark and pods contain tannin and a dye of khaki-yellow color. RUBY K. WORNER

The root bark of the Morinda trees. C. D. MELL. *Textile Colorist* 50, 531-2 (1928).—Morindin is obtained from the root bark of *Morinda citrifolia* and *M. tinctoria*. Practically all desired shades of colors may be obtained with it by the use of proper mordants. RUBY K. WORNER

The light that fades. WM. T. ANDERSON, JR. *Proc. Am. Assoc. Textile Chem. Colorists* 1928, 273-5; *Am. Dyestuff Rept.* 17, 753-5.—The variations in sunlight and the differences between sunlight and artificial lights are discussed. L. W. RIGGS

Progress in the standardization of tests for fastness to light. WM. D. APPEL. Bur. of Standards. *Proc. Am. Assoc. Textile Chem. Colorists* 1928, 275-81; *Am. Dyestuff Rept.* 17, 755-61; cf. *C. A.* 22, 3048.—The work of the past 4 years is reviewed. L. W. RIGGS

Dyeing in its relation to chemistry. PAUL RABE. *Textile Colorist* 50, 614-8 (1928).—"A brief outline of the great advance in dyeing made possible by the reciprocal relations between chemistry and dyeing since the historical year 1856." R. K. W.

Color chemistry and dyeing from the academic view. F. M. ROWE. Dept. Tinctorial Chemistry of Leeds Univ. *Chem. Age* (London) 19, No. 489, *Dyestuffs Monthly Supplement*, 35-6(1928).—An address. E. H.

Modern apparel dyeing industry assuming important proportions. GEORGE RICE. *Am. Dyestuff Rept.* 17, 779-81(1928).—Improved methods and results in garment dyeing together with the demand for changes in color have led to an increase in this business. L. W. RIGGS

The A B C of hosiery dyeing. XIII-XIV. NOEL D. WHITE. *Cotton* 92, 867-9, 975 7(1928).—A continuation of *C. A.* 23, 280. RUBY K. WORNER

Silk dyeing. E. W. PIERCE. *Proc. Am. Assoc. Textile Chem. Colorists* 1928, 283 9; *Am. Dyestuff Rept.* 17, 783-9.—An address with discussion. L. W. RIGGS

Silk dyeing and boiled-off liquor. JAMES FITZGERALD. *Textile Colorist* 50, 472 (1928).—The use of boiled-off liquor and H_2SO_4 in the dye-bath is described. RUBY K. WORNER

Acid and resorcinol dyeings on cotton. HORACE FLEMING. *Textile Colorist* 50, 471 2(1928).—Although acid dyestuffs are, in general, unsuited for vegetable fibers, certain selected dyes give good color effects which are fast to light but not to washing. Methods and formulas are given. RUBY K. WORNER

Snags in rayon-yarn dyeing. FRED. GROVE-PALMER. *Textile Colorist* 50, 529-31, 599 602(1928).—A general article, dealing with the bleaching and dyeing of rayon yarns. The process is "a very serious series of operations, each of which requires knowledge and judgment for its successful conclusion." "What is done cannot be undone with rayon." RUBY K. WORNER

Dyeing of piassava. FRED. GROVE-PALMER. *Am. Dyestuff Rept.* 17, 749-50 (1928).—Piassava is a fiber obtained from *Leopoldina piassaba*, a species of palm tree growing in Brazil. The fiber is used for brooms, brushes, matting and screens. The fiber may be dyed with basic colors without a mordant. L. W. RIGGS

Acid dyeings on wool developed by metallic salts. WM. PERRY. *Textile Colorist* 50, 541(1928).—Representative practice is described. RUBY K. WORNER

Some points on matching colors. JAMES STAPLE. *Textile Colorist* 50, 468(1928); cf. *C. A.* 23, 520.—Spectroscopic analysis of 2 dyestuffs will show whether or not a perfect match can be made. RUBY K. WORNER

Color matching: the drawing up of specifications and the fixing of allowances. L. BLIN DESBLED. *Textile Colorist* 50, 447-50, 538-9(1928); cf. *C. A.* 21, 2821; 22, 4822.—By means of the photoelec. photo-colorimeter, any color may be represented by a curve detd. by 6 points, each giving, resp., as a % of white, the intensity of the Violet, Blue, Green, Yellow, Orange and Red radiations constituting the color in question. By using the sample to be matched instead of the white as standard and plotting intensity of tone vs. colorations, the resulting curve becomes a "matching curve," and gives exact data defining (1) the mean tone with reference to the standard denoted by 100 and (2) the difference in each tone of each coloration. On the basis of such studies, specifications can be drawn up making allowances in color matching in *mean tone* and in *coloration tone difference*. Such an "allowance limit rule" is proposed. RUBY K. WORNER

Advances in the chemical technology of textile fibers in the years 1919-1927. RICHARD LOEWENTHAL. *Fortschrittsber. Chem. Ztg.* 2, 105-18(1928).—A review with bibliography. E. J. C.

What scientific research has done to standardize and improve the textile industry. H. D. MARTIN. *Textile Colorist* 50, 738-40(1928). RUBY K. WORNER

Progress in textile mechanical engineering reviewed by textile division of A.S.M.E. JAMES W. COX, JR. *Textile World* 74, 3126-7, 3171(1928). RUBY K. WORNER

Critical theory of the examination of textiles. ADOLF ROSENWEIG. *Kunstseide* 10, 360-1(1928).—See C. A. 22, 2276. FREDERICK C. HAHN

Lubricating textile machinery. FRED. GROVE-PALMER. *Textile Colorist* 50, 622-4(1928). RUBY K. WORNER

Care and maintenance of leather belting in the textile mill. ROY C. MOORE. Chas. A. Schieren Co. *Textile Colorist* 50, 624-6(1928). RUBY K. WORNER

Testing instrument for yarns and fibers. WM. S. DENHAM AND THOMAS LONSDALE. *J. Sci. Instruments* 5, 348-54(1928).—Descriptions of a ballistic instrument for measuring the work done in breaking a thread or bundle of filaments and of an extensometer. E. J. C.

The preparation of yarn for the knitter. B. F. MITCHELL. Am. Yarn and Processing Co., Mt. Holly, N. C. *Cotton* 92, 1011-2(1928).—An outline of the pretreatment, mercerization, and after-treatment of yarn is given. RUBY K. WORNER

The measurement of luster and sheen. L. BLIN DESBLEDS. *Cotton* 92, 1007-9(1928).—The photoelectric photometer furnishes a simple and accurate means for measuring sheen. The method is described. RUBY K. WORNER

Methods of boiling off silk. W. W. BRAY, J. B. CROWE AND S. MEEKER. *Am. Dyestuff Rept.* 17, 743-8(1928).—Various methods of boiling off silk are described. The advantages of the double bath counter-current system are presented. L. W. RIGGS

Improvement in the durability of weighted natural silk. KARL GUTOWSKY. *Kunstseide* 10, 460(1928).—Deteriorated portions, brittle edges, stains, etc., which occur frequently in highly weighted silk fabrics may be attributed to chem. and atm. influences. The detrimental action of these influences is inhibited by treating the silk with substances which act simultaneously as reducing and neutralizing agents, i. e., HCO_2NH_4 , NH_4CNO , NH_2OH . FREDERICK C. HAHN

Washing of silk materials. KARL MICKSCH. *Kunstseide* 10, 334-7(1928).—Detailed directions are given for efficient cleaning of different types of rayon, silk goods and mixts. of these with wool. FREDERICK C. HAHN

The copper number of cotton. A. KOEHLER AND M. MARQUEYROL. *Ann. chim. anal. chim. appl.* 10, 349-51(1928).—The method of Schwalbe consists in detg. the reducing power by heating 15 min. with Fehling's soln. The practice in the French munitions lab. has been to boil for 15 min. with a soln. of CuCO_3 contg. Na_2CO_3 and NaHCO_3 . The question as to whether the time of treatment should be increased was studied and it was found that higher nos. were obtained on prolonging the treatment. At first the change is quite marked but after a time, when the cellulose begins to be attacked the change is slow and becomes proportional to the time. The slow but steady increase takes place at the end of 3 hrs. It is important also to bear in mind, although the fact is not easy to explain, that the concn. of Cu and the relative quantities of Cu and cotton present affect the results. The following procedure is recommended. Dissolve 350 g. of $\text{Na}_2\text{CO}_3 \cdot 10\text{H}_2\text{O}$ and 50 g. of NaHCO_3 in water to make 1 l. Pour a boiling soln. of 95 cc. of the above reagent and 5 cc. of 10% CuSO_4 soln. upon 2.5 g. of carefully sampled cotton in a 100-cc. Erlenmeyer flask. Stir up the cotton in the liquid and heat on a steam bath for 3 hrs. with the flask covered with a watch glass. Remove the cotton and pptd. Cu_2O . To accomplish this use 2 funnels, one over the other. Place a porcelain filter plate in the upper funnel and a filter paper in the lower one. Pour the bulk of the liquid through the paper filter and then transfer the cotton to the upper funnel. Wash somewhat with dil. soda soln. Squeeze out the liquid from the cotton and transfer the latter to a 250-cc. beaker contg. 50 cc. of recently boiled, cold water. Into the original flask introduce 5 cc. of soln. prepd. by dissolving 50 g. of $\text{Fe}_2(\text{SO}_4)_3$ crystals and 250 g. of H_2SO_4 in water to make 1 l. Dil. somewhat and pour through the filter paper contg. the Cu_2O ppt., catching the filtrate in the vessel contg. the cotton. Rinse out the flask and filter the washings. Titrate the reduced Fe^{+2} with KMnO_4 soln. contg. 1.25 g. per l. Add a slight excess of the KMnO_4 , then remove the cotton, wash it and titrate the excess MnO_4^- with standard FeSO_4 soln. The values obtained in this way for some 9 samples of cotton and similar materials are between 0.075 and 2.46. It is not altogether clear how valuable this index is but if it is to be used in practice for evaluating cotton, perhaps 0.3 may be taken as the max. permissible value. W. T. H

The prevention of mildew in cotton goods. JOHN V. KILHEFFER. *Textile Colorist* 50, 519-25(1928).—A preliminary investigation is reported of the action on cultures of black mold, of various antiseptics, particularly certain brominated β -naphthols and

their derivs., Neomerpin, Neomerpin O and Hexalin. Of these, only Neomerpin and Neomerpin O inhibited fungus growth under the conditions selected, and these apparently are not effective until the mold growth has started. Except with regard to cost, both of these substances fulfil the requirements of an ideal antiseptic as set forth by L. E. Morris of the British Cotton Industry Research Assocn. The cost may be offset by their greater efficiency.

RUBY K. WORNER

Mercerizing cotton. WM. B. NANSON. *Cotton* 92, 348-51, 917-9, 1123-4, 1207-8 (1928); cf. *C. A.* 22, 1856.—A general article, dealing with the various factors affecting mercerization and describing in detail the processes and machinery for mercerizing cotton yarns and piece goods.

RUBY K. WORNER

Boiling out of cotton is unnecessary. G. S. McCARTY. *Am. Aniline and Ext. Co. Textile Colorist* 50, 483(1928).

RUBY K. WORNER

Bleaching cotton warps and yarn. RICHARD CAMERON. *Textile Colorist* 50, 469-70 (1928).—A brief discussion and description are given of the procedure.

R. K. W.

Strength of cotton fibers. F. F. CHANDLER. *Bur. Agr. Economics. Textile World* 74, 3024, 3030(1928).—The method of detg. fiber strength developed by the Cotton Division of the Bur. of Agr. Economics is described. Cf. *C. A.* 21, 4077.

R. K. W.

A continuous cold bleach for piece goods. THOMAS F. HUGHES. *Cotton* 92, 1231-2(1928).—An illustrated description of the process is given.

RUBY K. WORNER

Testing of rainproof cloths. H. MALDWYN WILLIAMS. *Wool Record* 33, 1299, 1301(1928).—The application of the "drop" test is limited. Exposure to rain is not satisfactorily imitated by allowing a sequence of drops to impinge on one spot of the fabric. Many cloths, satisfactory to the wearer, show penetration with much less treatment than that prescribed by this test.

RUBY K. WORNER

Defects in weaving piece-dye goods. ALEX. J. BENNETT. *Textile Colorist* 50, 528-9(1928).—Stains occurring during the weaving which show up on dyeing may be due to lubricating-oil splashes, tin coating from wire healds, web bobbins (when new, may cause tannic stain), mixing different qualities or counts of yarn, mildew, or over-application of size.

RUBY K. WORNER

Strength of single wool fibers. P. KRAIS. *Textile World* 74, 3139-41(1928).—See *C. A.* 22, 4254.

RUBY K. WORNER

Penetration and weight added in sizing. JOHN W. CARD. *Cotton* 92, 1112-4 (1928).—The desirability of "perfect penetration" of size is questioned. In calcg. the weight added, the moisture content of the sized and unsized yarn must be taken into account.

RUBY K. WORNER

New abrasion machine controls temperature, humidity, pressure, tension and rate of rubbing. W. R. BRACKETT, E. V. FLOYD AND A. C. DENNEN. *Kansas State Coll. Textile World* 74, 3019-20(1928).—This app. for testing the resistance of fabrics to wear is described in detail and illustrated. Tests were carried out on 3 materials commonly used for coat linings. Under the temp. and relative humidity conditions selected, the wear was found to be: rayon longest, crêpe de chine next, and satin crêpe poorest in the ratio of 1:0.7:0.5.

RUBY K. WORNER

Differentiation of rayons. OTTO ALDEN. *Kunstseide* 10, 497-8(1928).—The difficulties of identifying different types of rayon, especially in colored fabrics, are pointed out, and the need of satisfactory methods of identification is emphasized.

F. C. H.

Identification of rayons by means of ultra-violet rays. M. NOPITSCH. *Kunstseide* 10, 321-4(1928).—All types of undyed rayon exhibit characteristic lighting colors when examd. in filtered light from a quartz lamp, and can readily be identified by this means. A method of procedure is described and the various distinctions are given. The various behaviors of rayons under the quartz lamp after treatment with boiling aq. alk. solns. or after extrn. with Et₂O-petroleum ether mixt. or alc. also are described.

F. C. H.

American methods for testing rayon. ANON. *Kunstseide* 10, 361-5(1928).—American and German methods are compared with reference to defining, testing and differentiating between the different types of rayon.

FREDERICK C. HAHN

Microscopic examination of rayon in a dark field. ALOIS HERZOG. *Kunstseide* 10, 281-3(1928).—A simple app. for the microscopic examn. of rayon in a dark field is described, in which an arc light is used as the source of light. By means of this app., viscose and cuprammonium rayons may be readily distinguished from one another. These rayons show a special ultra structure, the viscose rayon having a striking no. of granular and fine split particles which show a very strong light in the ultramicroscopic field, and the cuprammonium rayon having a structure identical with that of the coarse cuprammonium rayon formerly manufd. The foregoing method, which is more advantageous than chem. methods, is not intended to replace the finer ultramicroscopic methods.

FREDERICK C. HAHN

Photomicrography of rayon. G. HEINK. *Kunstseide* 10, 378-80(1928).—A description of the arrangement of equipment for obtaining clear photomicrographs of rayon.

FREDERICK C. HAHN

The future of acetate rayon. HELLMUTH SCHUPP. *Kunstseide* 10, 283-8(1928).—Various properties of cellulose acetate rayon are discussed with the thought of detg. whether the widespread confidence which this rayon enjoys in the textile world is really justified. Although this type of rayon is more expensive than viscose rayon, its advantages over other rayons from the standpoint of appearance, feel, water-resistance, salt-water-resistance, typical dyeing properties, etc. have increased enormously the demand for acetate rayon. The patent situation on cellulose acetate rayon is discussed.

FREDERICK C. HAHN

Washing and other wet treatments of rayon. O. FAUST. *Kunstseide* 10, 324(1928).—Cellulose hydrated rayon swells less in water and alk. liquids at higher temps., on the basis of which it is recommended that these treatments be conducted hot.

FREDERICK C. HAHN

Swelling of aluminum soaps in various solvents (MARKOWICZ) 27. The identification of coloring matters (HOFMAN) 7. Emulsifiable oil (for treating wool) (U. S. pat. 1,695,197) 22. Dispersion of solids [dyes] (Fr. pat. 639,069) 13. Compounds of indene and phenols [for use in the manufacture of lakes and dyes] (Fr. pat. 636,606) 10. Printing celluloid (Swiss. pat. 126,212) 26. Apparatus for drying fabrics and paper in endless webs (U. S. pat. 1,692,129) 1.

NASMITH, FRANK: **Artificial Silk Handbook**. 2nd ed. revised. Manchester: John Heywood, Ltd. 3s. 6d., net. Reviewed in *Textile Recorder* 45, 95(1927).

Dyes. BRITISH DYESTUFFS CORP., LTD., H. M. BUNBURY, H. EVANS and A. SHEPHERDSON. Brit. 289,191, Feb. 9, 1927. Vat dyes obtained, as described in Brit. 29,352 of 1910, by treating dibenzoyl-4,4'-(or 4,5'-)-diamino-1,1'-dianthrimides with H_2SO_4 , are treated with oxidizing agents, such as $NaOCl$, Na perborate or Na persulfate.

Dyes. BRITISH DYESTUFFS CORP., LTD., J. BADDILEY, P. DOOTSON, A. SHEPHERDSON and S. THORNLEY. Brit. 289,188, Feb. 8, 1927. Flavanthrone derivs. contg. amino groups such as the products obtained from flavanthrone by nitration and reduction, or the products obtained by the reaction of hydroxylamine on flavanthrone as described in Brit. 282,852 (C. A. 22, 3994) are condensed with polynuclear aromatic halogen compds. having a ring system of 3 or more fused nuclei such as chloroanthraquinones, haloacenaphthenequinones, haloflavanthrones or halopyranthrones. The products are vat dyes, or, if they contain carboxylic or sulfonic groups, acid dyes for wool or silk. The reaction product of hydroxylamine and flavanthrone when condensed with dibromopyranthrone forms a vat dye giving brown dyeings on cotton.

Dyes. J. E. G. HARRIS, B. WYLAM, J. THOMAS and SCOTTISH DYES, LTD. Brit. 288,673, Dec. 31, 1926. Sol. products are obtained by treating vat dyes with pyrosulfuryl chloride in the presence of a metal and a tertiary org. base, e. g., by treating dimethoxydibenzanthrone with pyrosulfuryl chloride in the presence of Cu and pyridine, with or without $EtBr$, and extn. with Na_2CO_3 soln. The products are used for dyeing or printing by impregnating textiles with their solns. and developing by hydrolysis and oxidation. Pyrosulfuryl chloride may be made from CCl_4 and H_2SO_4 or chlorosulfonic acid (suitably by heating in the presence of kieselguhr and distg. under reduced pressure).

Dyes. I. G. FARBENIND. A.-G. Brit. 288,214, April 4, 1927. Dyes which have good copying properties and are suitable for use in the manuf. of copying inks and pencils, copying printing pastes and typewriter ribbons are made by the interaction of the diazo compd. of a safranin with a β -diketone. Several examples are given.

Dyes. I. G. FARBENIND. A.-G. Brit. 288,291, April 9, 1927. Dyes derived by treating haloanthrones or their derivs. with aminoanthraquinones or their derivs. as described in Brit. 286,669 (C. A. 23, 523) are converted into new vat dyes by a further condensing treatment (suitably by use of H_2SO_4 , chlorosulfonic acid or $AlCl_3$ alone or mixed with $NaCl$, or alkali hydroxides) and the products may be further subjected to the action of an oxidizing agent. Several examples are given of dyes of different colors.

Dyes. I. G. FARBENIND. A.-G. Brit. 288,788, March 2, 1927. Monoazo and polyazo dyes are made by use as diazo components of such derivs. of 2,5-diaminodiphenylsulfone as are substituted in the 5-position by acetyl or alkyl groups, and in the non-amino-substituted nucleus by a hydroxy group and a carboxylic group in α -position

to each other. (The manuf. of these derivs. is described in Brit. 267,366 (C. A. 22, 1242).) Numerous examples and details are given.

Dyes. I. G. FARBENIND. A.-G. Brit. 288,983, April 16, 1927. Azo dyes adapted for after-treatment with metal salts such as salts of Cu or Cr are formed in substance or on the fiber by coupling with an arylide of 2,3-hydroxynaphthoic acid a diazotized aminoazo compd. obtained by coupling an *o*-hydroxydiazo compd. or a substitution product with a substituted or unsubstituted amine; *e. g.*, cotton is impregnated with the 2-naphthylamide of 2,3-hydroxynaphthoic acid and developed with a diazo soln. of the dye formed from 2-aminophenol and aminohydroquinone dimethyl ether to obtain a deep black dyeing, the fastness of which is increased by after-treatment.

Dyes. I. G. FARBENIND. A.-G. Brit. 289,092, April 23, 1927. Diaminotriphenylmethane dyes are made by condensing a benzaldehydesulfonic acid such as benzaldehyde-2, 4-disulfonic acid with 2-mono-1'-methylpropylamino-1-methylbenzene or other suitable propylated or higher alkylated arylamine. The dye may be salted out after oxidizing the leuco compd. formed.

Dyes. I. G. FARBENIND. A.-G. Brit. 289,135, Jan. 18, 1927. *p*-Aminobenzene-azosalicylic acid is diazotized and coupled with salicylic acid, and the resulting diazo dye is then sulfonated by heating with oleum. The product gives a yellow-orange shade fast to soaping and to light when chrome-printed on cotton. Other *o*-hydroxycarboxylic acids of the benzene series or their substitution products may be used instead of salicylic acid for producing similar dyes.

Dyes. I. G. FARBENIND. A.-G. Brit. 289,564, Feb. 1, 1927. Triarylmethane dyes are prepd. by joint oxidation in alk. soln. of a *p*-methylated aromatic hydroxy compd. such as a *p*-hydroxydiarylmethane or the corresponding hydrol and a hydroxyaromatic compd.; *e. g.*, methylenedi-*o*-cresotinic acid and 2-hydroxynaphthalene-3,6-disulfonic acid are oxidized with air in the presence of an O carrier such as CuSO₄ (the resulting dye dyes wool with after-chroming reddish blue). Various other examples are also given.

Dyes. I. G. FARBENIND. A.-G. Brit. 289,692, Sept. 6, 1927. Naphthostyryl or a substitution product is condensed with a tertiary aromatic amine or with a phenol by use of an acid condensing agent. The products are themselves dyes and further yield acid wool dyes by sulfonation. Several examples are given of the production of dyes giving various-colored dyeings.

Dyes. I. G. FARBENIND. A.-G. Fr. 639,253, Aug. 9, 1927. Sulfuretted dyes are prepd. by heating 2-nitro- or 2-amino- or 3-nitro- or 3-amino-4-acetyltoluidines with S in the presence of 2 or more mols. of benzidine. The 2-nitro and 2-amino compds. give orange, and the 3-nitro and 3-amino yellow colors on cotton fast to boiling.

Dyes. I. G. FARBENIND. A.-G. Fr. 639,649, Aug. 18, 1927. Monoazo dyes of a pure yellow and very fast to light are prepd. by diazotizing 2,5,6-trichloro-3-amino-1-methylbenzene-4-sulfonic acid and coupling it with 1-sulfophenyl-3-methyl-5-pyrazolone, or with 1-sulfophenyl-5-pyrazolone-3-carboxylic acid or an ester thereof, or substitution products or derivs. of these compds.

Dyes. I. G. FARBENIND. A.-G. Fr. 639,818, Aug. 19, 1927. Fast dyes are obtained on cellulose acetate by forming in a neutral bath monoazo dyes which do not contain more than one acid group such as sulfonic, carboxylic or oxalic, diazotizing them on the fiber and developing with coupling components such as β -naphthol, β -hydroxynaphthoic acids, aminonaphthols, etc. Thus, *p*-aminobenzeneazosalicylic acid diazotized and coupled on the fiber with β -naphthol gives a red color. A long list of coupling components and dyes is given.

Dyes. I. G. FARBENIND. A.-G. Fr. 639,852, Aug. 20, 1927. Arylazodiarylamines

the formula, $\text{aryl-N} = \text{N-aryl-N-aryl}$ in which the aryl groups may contain

the formula, $\text{aryl-N} = \text{N-aryl-N-aryl}$ in which the aryl groups may contain sulfo, carboxyl, nitro or other groups and in which X represents a sulfo or carboxyl group, are prepd. by condensing by boiling in aq. medium monoaminoazo dyes with bidinitroaryl compds. contg. at least one replaceable H and at least one sulfo or carboxyl group. In examples, *p*-aminoazobenzene is boiled in water with 1-chloro-2,6-dinitrobenzene-4-sulfonate of K, with the addn. of NaOAc. Reddish yellow crystals are obtained which dye acetylcellulose. *p*-Aminoazobenzenesulfonic acid is condensed with K 1-chloro-2,6-dinitrobenzene-4-sulfonate giving a product which dyes wool deep shades.

Dyes. I. G. FARBENIND. A.-G. (Oswald Meyer, inventor). Ger. 468,181, July 6, 1928. A compd. is prepd. from the triarylmethane dye base by combining it with hydroxynaphthoic acid. Thus, hydroxynaphthoic acid and NaOH are dissolved in water

and stirred with methyl violet in the form of the hydrochloride. Benzal green, in the form of the oxalate, or fuchsin-HCl may also be stirred with the hydroxynaphthoic acid.

Dyes. I. G. FARBENIND. A.-G. (Fritz Günther and Otto Friedrich Jordan, inventors). Ger. 468,200, Mar. 20, 1925. Addn. to Ger. 446,495. Azo dyes obtained from unsulfonated *p*-nitroaniline or its derivs. are reduced in alk. soln., thereby linking 2 mols., and then sulfonated. Thus, an azo dye formed from *p*-nitroaniline and salicylic acid is reduced in alk. soln. and the 2 mols. so linked sulfonated with fuming H_2SO_4 .

Dyes. SOC. ANON. POUR L'IND. CHIM. À BALÉ. Ger. 467,861, April 12, 1925. Addn. to 463,800. New dyes are prepd. by treating the mordant dyes obtained by coupling hydroxynaphthalenepolysulfonamide and *o*-hydroxydiazocompds. with metal-yielding compds. They dye wool from an acid bath fast shades of reddish violet to blue and dark green. In examples, the dye obtained from diazotized 4-chloro-2-amino-1-hydroxybenzene with 1-hydroxynaphthalene-3,8-disulfonamide, and the dye from diazotized 1-hydroxynaphthalene-2-amino-8-sulfonamide-4-sulfonic acid and 1-hydroxynaphthalene-4,8-disulfonamide are treated with Cr formate or $CuSO_4$.

Dyes. R. F. THOMSON, J. THOMAS and SCOTTISH DYES, LTD. Brit. 289,103, Oct. 13, 1926. A vat dye which is probably a diaminoisodibenzanthrone, dyeing cotton reddish blue which on treatment with bleaching powder becomes bright blue, is obtained by treating with alk. condensing agents the amino-*B*₂-1-chlorobenzanthrone, m. 280-1°, described in example 7 of Brit. 256,281 (C. A. 21, 2989). The dye may be formed by fusion with alc. KOH or a mixt. of KOH, EtOH or BuOH and *p*-thiocresol (or other mercaptans such as thiophenol) or with NaOEt. Cf. C. A. 23, 285.

Dyes. B. WYLAM, J. E. G. HARRIS, J. THOMAS and SCOTTISH DYES, LTD. Brit. 288,358, Dec. 29, 1926. Substantially dry powders of dyes and their derivs. including leuco compds. and their salts and including derivs. of vat dyes which can be employed for dyeing without vatting such as the vat dye derivs. described in Brit. 186,057 (C. A. 17, 343), Brit. 202,630 (C. A. 18, 333), Brit. 202,632 (C. A. 18, 333), Brit. 203,681 (C. A. 18, 756), Brit. 212,546 (C. A. 18, 2254), Brit. 218,649 (C. A. 19, 579), Brit. 220,964 (C. A. 19, 1058), Brit. 231,889 (C. A. 19, 3597), Brit. 245,587 (C. A. 21, 328), Brit. 247,787 (C. A. 21, 654), Brit. 248,802 (C. A. 21, 825), Brit. 251,491 (C. A. 21, 1360), Brit. 258,626 (C. A. 21, 3132), Brit. 260,638 (C. A. 21, 3467), Brit. 260,647 (C. A. 21, 3467) and Brit. 261,139 (C. A. 21, 3468) are made by adding to the wet paste of the dye or deriv. a substance capable of combining with the water present to form a solid cryst. or other hydrated compd. contg. water of hydration and preferably yielding an alk. or neutral product. Anhyd. Na_2CO_3 is suitable for this purpose and buffers such as Na_2HPO_4 or NaOAc may be added. Several examples are given.

Dyes and insecticides. I. G. FARBENIND. A.-G. Brit. 288,307, April 6, 1927. Cu ammine complex azo compds. suitable for use as dyes or as insecticides are obtained by coupling a diazo, diazoazo or tetrazo compd. contg. one or more substituted or unsubstituted alkyloxy, aralkyloxy or aryloxy groups in *o*-position to one or more azo or diazo groups, with a coupling component in the presence of a water-sol. complex Cu compd. contg. N such as tetrammine Cu sulfate. Several examples are given.

Dyes and intermediates. COMPAGNIE NATIONALE DE MATIERES COLORANTES ET MANUFACTURES DE PRODUITS CHIMIQUES DU NORD REUNIES ÉTABLISSEMENTS KUHLMANN. Brit. 288,572, April 12, 1927. 4-Chlorobenzenediazo oxide is made by the action of alkalis such as an alkali metal or alk. earth metal carbonate or a salt of an org. acid such as NaOAc on diazotized 2-nitro-4-chloroaniline. By coupling it with azo components (various examples of which are given) in the absence of free alkali, dyes of purer shades are obtained than when free alkali is present. The dyes are fast and may in some instances be changed in shade by after-chroming and yield compds. with metal salts such as those of Cu and Cr.

Dyes and intermediates. I. G. FARBENIND. A.-G. Brit. 288,215, April 4, 1927. 4-Methyl-5-halohydroxythionaphthene is prepd. by ring closure of a 3-methyl-4-halo-1-thioglycolic acid substituted in the 2-position by CN, $CONH_2$ or $COOH$. Thioindigo dyes are obtained by oxidizing the resulting hydroxythionaphthene or by condensing the latter or its 2-deriv. with usual indigoid components. Similar dyes are obtained by halogenating 4,4'-dimethylthioindigo. Several examples are given.

Dyes and intermediates. I. G. FARBENIND. A.-G. Brit. 288,554, April 11, 1927. 3,5,6-Trimethylbenzene-1-thioglycolic acid or a substitution product having a carboxy, cyano or a carboxylic acid amino group in the 2-position is treated with a ring-closing agent in order to produce the corresponding hydroxythionaphthene, which, by oxidation gives 4,6,7',4',6',7',-hexamethylbisthionaphtheneindigo. The 4,6,7-trimethylhydroxythionaphthene or its active 2-derivs. also may be condensed with the usual

indigoid components to produce vat dyes. Examples are given, including the production of 3,5,8-trimethylbenzene-1-thioglycolic-2-carboxylic acid nitrile.

Dyes and intermediates. I. G. FARBENIND. A.-G. Brit. 288,985, April 16, 1927. Benzanthrone-*peri*-dicarboxylic acid, its derivs. and substitution products, are obtained by treating 4-benzoyl-1,8-naphthalic acid or its anhydride, or a deriv. or substitution product, with or without a diluent or fluxing agent, with a metal chloride such as AlCl_3 , NaAl chloride or FeCl_3 , either alone or in the presence of an oxidizing agent such as mol. O or MnO_2 . Examples are given of the production of benzanthrone-*peri*-dicarboxylic acid and its anhydride, chlorobenzanthrone-*peri*-dicarboxylic anhydride, benzanthrone-*peri*-dicarboxylic-*N*-phenylimide, an orange-red dye from 4-benzoyl-1,8-naphthylenebenzimidazole and a fast brown dye from 4-benzoyl-1,8-naphthoylene-1,2-naphthyleneimidazole.

Dyes and intermediates. I. G. FARBENIND. A.-G. Brit. 288,986, April 16, 1927. Arycarboxylic acid amide-*o*-thioglycolic acids are converted into hydroxythionaphthenes by heating with aq. alkalis; e. g., 2-carboxylic acid amide-3-methyl-5-chlorobenzene-1-thioglycolic acid is heated with aq. NaOH and Na_2CO_3 . The resulting hydroxythionaphthene and hydroxythionaphthenecarboxylic acid may be oxidized to the 4,4'-dimethyl-6,6'-dichloroindigo without first isolating them.

Dyes and intermediates derived from dibenzopyrenequinone. GEROG KRÄNZLEIN, KARL ZAHN, PAUL OCHWAT and MARTIN CORELL (to Grasselli Dyestuff Corp.). U. S. 1,693,447, Nov. 27. The *Bz*-2-aroylehydroxybenzanthrenes and their substitution products which possess free *peri*-positions in the naphthalene nucleus are converted into hydroxy compds. of dibenzopyrenequinone by treating them with acid condensing agents, e. g., *Bz*-2-benzoylhydroxybenzanthrone is melted with AlCl_3 . Some of the products are themselves useful as dyes and others may be used as intermediates for dye manuf. Several examples are given.

Dye intermediates. BRITISH DYESTUFFS CORP., LTD., W. H. CLIFFE, F. W. LINCH and E. H. RODD. Brit. 289,571, Feb. 5, 1927. Condensation products are produced by treating alkali metal derivs. of 4,4'-tetraalkyldiaminodiarlylketones (as described in Brit. 272,321 (C. A. 22, 1859)) with aromatic compds. contg. at least one methyl or methylene group, which may be present in a side chain or in a ring. On treating the resulting products with water carbinols are obtained which yield ethylenic compds. by removal of water. Examples are given of the production of tetramethyldiaminodiphenylstyrene, octamethyltetraaminotetraphenylethylene, tetramethyldiaminodiphenyldiacenaphthylcarbinol, 4,4'-tetramethyldiaminodiphenylmethylenecacenaphthene, 4,4'-tetramethyldiaminodiphenylmethylenefluorene and similar products.

Dye intermediates. I. G. FARBENIND. A.-G. Brit. 288,927, Nov. 22, 1927. 2,3-Dichloro-1,4-naphthoquinone is nitrated with a mixt. of HNO_3 and H_2SO_4 . The product crystallizes in 2 different forms when glacial HOAc and alc. are used as solvents and is probably 2,3-dichloro-8-nitro-1,4-naphthoquinone.

Dye intermediates (anthracyl and anthraquinonyl alkyl ketones). I. G. FARBENIND. A.-G. Brit. 289,585, Feb. 16, 1927. Anthracyl alkyl ketones are made by the treatment of anthracene or its derivs. with a fatty acid halide in the presence of AlCl_3 , FeCl_3 , ZnCl_2 or other agent facilitating the removal of HCl . On oxidation, the products yield the corresponding anthraquinonyl alkyl ketones. By using "mild conditions" for the condensation, the *meso* alkyl anthracyl ketones are produced, while with "stronger conditions" mixts. of α - and β -derivs. are usually obtained. Examples are given of the production of methyl and ethyl anthracyl ketones, the corresponding anthraquinonyl alkyl ketones, *meso* methyl anthracyl ketone and 2-methyl anthracyl ketone.

Phenyl- α -naphthyl ketone (a dye intermediate). H. A. E. DRECHSER, J. THOMAS and SCORRISH DYES, LTD. Brit. 289,544, Jan. 28, 1927. Ca α -naphthoyl-*o*-benzoate is heated in the presence of Ca(OH)_2 under reduced pressure; phenyl α -naphthyl ketone distils over.

1,5-Dinitro-8-chloroanthraquinone. SOC. ANON. POUR L'IND. CHIM. A BÂLE. Swiss 126,195, Feb. 10, 1927. A new product, probably 1,5-dinitro-8-chloroanthraquinone, is obtained by treating 1,8-nitrochloroanthraquinone with concd. HNO_3 . The product melts with decompn. at 357° and is useful as an intermediate for dyes.

Azo dye. I. G. FARBENIND. A.-G. Swiss 126,200, April 27, 1927. Diazotized *p*-aminoacetanilide is coupled with *p*-cresol. The product is a yellow powder suitable for dyeing cellulose esters and ethers.

Azo dye. I. G. FARBENIND. A.-G. Swiss 126,408, April 27, 1927. A yellow azo dye suitable for dyeing acetate silk is obtained by coupling diazotized *p*-nitroaniline with 1-nitro-2,4-diaminobenzene.

Azo dyes. I. G. FARBENIND. A.-G. Fr. 636,982, July 4, 1927. Azo dyes are

prepd. by uniting 2 mols. of the dyes obtained from diazotized 5-nitro-2-aminobenzoic acid and azo components by careful reduction of the nitro groups by means of the azoxy and azo group, resp. Diazo or polyazo dyes are thus obtained which may be treated on the fiber with heavy metallic salts. In an example 5-nitro-2-aminobenzene is diazotized and coupled with 2-amino-8-naphthol-6-sulfonic acid. The product is reduced by means of glucose. The diaminoazo dye is diazotized and coupled with 2,4-diaminoacetanilide giving a dye which dyes cotton black, which is rendered resistant to light and washing by treatment with metallic salts. Other examples are given.

Azo dyes. I. G. FARBENIND. A.-G. Fr. 639,283, Aug. 10, 1927. Azo dyes insol. in water and fast to light are prep'd. by coupling diazo compds. of unsulfonated aminofluorenones or their derivs. with components such as naphthols, arylides of 2,3-hydroxynaphthoic acid, hydroxynaphthocarbazoles, or diacetylacetoarylates. In examples colors are developed on cotton from the following components (1) a red from 2,3-hydroxynaphthoic anilide and monoaminofluorenone; (2) a brownish red from 2,3-hydroxynaphthoic dianisidide; (3) a red from monoaminofluorenone and β -naphthol; (4) a violet from 2,7-diaminofluorenone and 2,3-hydroxynaphthoic anilide; (5) a deep black from 2,7-diaminofluorenone and 7-hydroxynaphthocarbazole.

Azo dyes. I. G. FARBENIND. A.-G. Fr. 639,284, Aug. 10, 1927. Diazotized aminonaphthol ethers are coupled with arylamides of 2,3-hydroxynaphthoic acid. In an example a clear violet color is obtained by coupling diazotized 7-methoxy-1-aminonaphthalene with 2,3-hydroxynaphtho- β -naphthylamide.

Azo dye containing chromium. I. G. FARBENIND. A.-G. Swiss 126,407, Mar. 31, 1926. The complex compd. obtained by treating with a Cr compd. the azo dye from *p*-nitro-*o*-aminophenol-*o*-sulfonic acid and β -naphthol is reduced to the corresponding NH_2 compd. with Na_2S . The product dyes wool blue.

Basic dyes. I. G. FARBENIND. A.-G. Fr. 639,469, Aug. 12, 1927. Fastness to light of basic dyes is increased by a final treatment with reduction products of compds. of W and Mo. In an example rhodamine B extra on a mordant of Sb and tannin is treated with a reduction product of a compd. of Mo, W and P.

Anthraquinone dyes. WILFRED M. MURCH (to National Aniline & Chemical Co.). U. S. 1,692,854, Nov. 27. Ni-Fe-alloy vessels (which may be formed of Ni steel contg. 0.1-0.25% each Cr, Mn and Si and Ni 3-4%) are used in effecting reactions between caustic alkalies and aminoanthraquinone compds. such as those employed for producing dyes by fusion.

Indigoid dyes. I. G. FARBENIND. A.-G. Brit. 289,154, Jan. 21, 1927. Reactive α -derivs. of 2,3-naphthisatins halogenated in the nucleus are condensed with monoethers of 1,4-dihydroxynaphthalene, to produce dyes giving fast green shades on cotton from the vat.

Mordant dye. I. G. FARBENIND. A.-G. Swiss 126,199, April 16, 1927. The diazo compd. from 2-amino-1-phenol-4-sulfonic acid is coupled with 2,6-dihydroxynaphthalene-3-carboxylic acid. The product imparts olive-green shades to wool in a single-bath chrome process.

Sulfuretted dyes. I. G. FARBENIND. A.-G. Brit. 289,241, March 29, 1927. An amino- or hydroxyaryl-compd. is treated with free thiocyanogen or compds. yielding the latter and the resulting thiocyano deriv. is converted into the corresponding thiophenol or disulfide; e. g., 2-hydroxy-1,2-naphthophenazine is converted into its thiocyano deriv. by treatment with sulfuryl chloride and Pb thiocyanate in the presence of CCl_4 , and the leuco dye or the dye itself is then obtained by boiling with Na disulfide or NaOH and pptg. by passing in air or adding HOAc or other acid. Other examples also are given. Cf. C. A. 22, 4833.

Triarylmethane dyes. I. G. FARBENIND. A.-G. Fr. 636,600, June 27, 1927. One of the aryl groups of triarylmethane dyes is the residue of a 4-alkoxydiphenylamine. In examples, 4-methoxydiphenylamine is condensed with 4,4'-tetramethyldiaminobenzophenone by means of POCl_3 and the resulting basic dyestuff is sulfonated. 4-Amino-1-ethoxybenzene is heated with Guinea green 2G in the presence of HCl. The dyes dye wool in a feebly acid bath clear blue tints fast to light.

Vat dyes. I. G. FARBENIND. A.-G. Fr. 636,860, June 30, 1927. Vat dyes giving deep blue and clear red shades are obtained by condensing the dihalogen derivs. of alkylisatins or their α derivs. capable of reaction, with compds. contg. a ketomethylenic group in cyclic connection, such as naphthols, anthrols, hydroxythionaphthenes, hydroxynaphthothiophenes, indoxyls and naphthindoxyls. The α -derivs. mentioned give on reduction tetrahalodialkylindigos which are also valuable dyes. Thus, 6-methyl-5,7-dichloroisatin is condensed with 6-chloro-4-methyl-3-hydroxythionaphthene. Other examples are given.

Vat dyes. J. R. GEIGY AKT.-Ges. Fr. 638,964, Aug. 4, 1927. Stable leuco compds. of vat dyes are prepd. by intimately mixing the dye with a dihydric alc. or an aldehyde, reducing and drying. In an example Tinon scarlet G extra is mixed with ethylene glycol and NaOH soln. and reduced with NaHS, Na_2SO_4 is added and the mixt. evapd.

Metal compounds of dyes. HANS KRZIKALLA and WERNER MÜLLER (to Grasselli Dyestuff Corp.). U. S. 1,693,448, Nov. 27. In producing metal compds. of dyes such as various azo dyes which are difficultly sol. in water, the dye is treated with an aq. soln. of a metal compd. such as Cr formate capable of reaction with the dye in the presence of alc. or other suitable org. solvent capable of dissolving the dye and miscible with water.

Chromium compounds of dyes. SOC. ANON. POUR L'IND. CHIM. À BAËLE. Brit. 289,094, April 23, 1927. An *o*-hydroxyazo dye obtained by coupling diazotized 5-nitro-2-aminophenol with an *N*-alkyl, *N*-aryl, or *N*-alkylene or *N*-arylene deriv. of 2,5,7-acid is converted into a sol. Cr compd. by boiling with Cr fluoride or otherwise suitably treating with a chromium compd. The products dye fast blue from a neutral or slightly alk. bath. Cf. C. A. 22, 3305.

Compounds derived from triarylmethane dyes. I. G. FARBENIND. A.-G. Fr. 636,991, Jul. 4, 1927. Compds. are derived from basic dyes of the triarylmethane series by decompn. with a hydroxynaphthoic acid compd. which does not contain a sulfonic group. In examples, the hydrochloride of fuchsin or of methyl violet is treated with 1,3-hydroxynaphthoic acid or 2,3,6-naphtholdicarboxylic acid, and malachite green as the oxalate is treated with 2,6-naphtholcarboxylic acid.

Anthraquinone-1,8-dinitrile. I. G. FARBENIND. A.-G. Swiss 126,712, Nov. 8, 1926. Addn. to Swiss 125,469. CuCN is heated with 1,8-dihaloanthraquinone in the presence of a compd. in which a nitrile group is linked with an aliphatic residue, and dil. HNO_3 added. The substance dissolves in concd. H_2SO_4 with a red color and gives a green *vat dye*.

2-Chloroanthraquinone-1-nitrile. I. G. FARBENIND. A.-G. Swiss 126,713, Nov. 8, 1926. Addn. to Swiss 125,469. CuCN is heated with 1-halo-2-chloroanthraquinone in the presence of a compd. in which a nitrile group is linked with an aliphatic residue, and warmed with dil. HNO_3 . The substance gives a blue-green *vat dye*, but is red in concd. H_2SO_4 .

3-Chloroanthraquinone-1-nitrile. I. G. FARBENIND. A.-G. Swiss 126,714, Nov. 8, 1926. Addn. to Swiss 125,469. CuCN is heated with 1-halo-2-chloroanthraquinone in the presence of a compd. in which a nitrile group is linked with an aliphatic residue, and warmed with dil. HNO_3 . The substance gives a blue-green *vat dye* and is red in concd. H_2SO_4 .

2,3-Dichloroanthraquinone-1,4-dinitrile. I. G. FARBENIND. A.-G. Swiss 126,715, Nov. 8, 1926. Addn. to Swiss 125,469. CuCN is heated with 1,4-dihalo-2,3-dichloroanthraquinone in the presence of a compd. in which a nitrile group is linked with an aliphatic residue, and treated with dil. HNO_3 . The product gives a green *vat dye*, but is red in concd. H_2SO_4 .

Fixing dyes. A. HOLTSMANN & Co. Ger. 467,337, May 30, 1925. Dyes, prints, etchings and reserve-style prints, on fibers or fabrics are fixed by steam. The fabric is moistened and passed through a steamer over rollers into a vat where the neutralizing and fixing substances are applied as vapor.

Dyeing. I. G. FARBENIND. A.-G. Swiss 126,580, Feb. 16, 1927. In the prepn. of *p*-diazophenylsulfamic acid, *p*-phenylenediamine is sulfonated in the presence of a tertiary base, and the product diazotized. The substance is a colorless crystal giving a red dye sol. in water when coupled with β -naphthol.

Dyeing. I. G. FARBENIND. A.-G. Swiss 126,581, Feb. 16, 1927. In the prepn. of *p*-diazophenylsulfamic acid, *p*-nitrophenylsulfamic acid is reduced in a neutral soln., and the product diazotized.

Dyeing. I. G. FARBENIND. A.-G. Swiss 126,582, April 9, 1927. A dye contg. a naphthosultam ring is prepd. by condensing 3-phenylamino-1,8-naphthosultam-6-sulfonic acid with 4-nitrosodimethylaniline. The dye is red-violet in water.

Dyeing. I. G. FARBENIND. A.-G. Swiss 126,584, Jan. 18, 1926. Insol. and slightly sol. dyes and color lakes are given a high wetting-out quality by finely dividing them in the presence of sulfo acids or their salts. Thus, the diazotization of 2,4-dinitroaniline and β -naphthol produces an orange-red dye, which is then mixed with the Na salt of isopropynaphthalenesulfonic acid and ricinoleic acid. The strength of the dye is thus increased. The aromatic sulfo acids with side chains in the mol. are preferred.

Dyeing. I. G. FARBENIND. A.-G. (Otto Siebert and Max Raack, inventors). Ger. 468,210, Feb. 10, 1927. Addn. to Ger. 467,036. Cellulose esters and ethers are

further dyed by diazo compds. Thus, the straw-yellow color produced on acetate silk by aminobenzeneazo-2,4-diaminophenylmethanesulfonic acid is turned to yellow-brown by further treatment with 4-nitro-1-diazobenzene. The orange color produced by 1-aminonaphthaleneazo-2,4-diaminophenylmethanesulfonic acid is turned to a red-brown. Cf. C. A. 23, 527.

Dyeing. PAUL RABE, HERMANN STÖTTER, BERTHOLD WENK and WILHELM SCHEPSS (to Grasselli Dyestuff Corp.). U. S. 1,694,562, Dec. 11. In dyeing fibers such as cotton or "acetate silk," a complex acid contg. at least one metal of the group including Mo and W is pptd. on the fiber by the action of an org. fixator such as phenol or benzhidine hydrochloride to facilitate fast dyeings with acid and basic dyes.

Dyeing. SOC. ANON. POUR L'IND. CHIM. À BAËLE. Brit. 288,306, April 9, 1927. Compact vegetable fabrics, yarns, etc. are dyed throughout by use of vat dyes by treating them at high temp with a protective colloid such as glue or sulfite waste liquor and then, without washing, dyeing with a vat dye (such as Cibacone 3G or Indanthrene blue green B) in the presence of glue, sulfite cellulose lye or other suitable protective colloid.

Dyeing and printing. SOCIÉTÉ ALSACIENNE DE PRODUITS CHIMIQUES. Fr. 636,665, Oct. 21, 1926. For direct dyeing or printing, a mixt. of a sulfurized phenolic substance and an acid dye in soln. in an alkali is used, the sulfurized phenol in such a mixt. being capable of fixing in one operation the acid dye on cellulose fibers and artificial textiles.

Dyeing animal fibers, etc. S. W. WILKINSON. Brit. 289,578, Feb. 12, 1927. The absorptive capacity of animal fibers and fabrics of protein character is increased by preliminarily treating them with ozone together with compds. such as HNO_2 or HOCl which are capable of undergoing oxidation to produce other acid compds.

Dyeing cellulosic fibers. ALBERT BODMER (to Heberlein & Co. A.-G.). U. S. 1,694,526, Dec. 11. Cellulosic fibers such as cotton yarn are treated with alkali and PCl_5 or other P compd. which is capable of rendering the fibers immune to substantive dyes and relatively attractive to basic dyes.

Dyeing cellulose derivatives. HENRY DREYFUS. Fr. 639,825, Aug. 19, 1927. Cellulose acetate is dyed, printed or stenciled by nitro derivs. of compds. contg. 2 or more aryl groups joined by any means other than a single N linkage, as, e. g., nitro derivs. of the following classes: $\text{R}'\text{—R}^2$, $\text{R}'\text{—NH—CH}_2\text{—R}^2$, $\text{R}'\text{—O—R}^2$, $\text{R}'\text{—CH}_2\text{—R}^2$, $\text{R}'\text{—CO—R}^2$, $\text{R}'\text{—NH—R}^2$, in which R' and R^2 are the same or different aryl groups. The compds. may be solubilized in the manner described, e. g., in Fr. 602,603, Fr. 627,427, or Fr. 568,655. Examples among others are given of dyeing with 3,3'-dinitro-4,4'-diaminodiphenyl, 2,4-dinitrophenylbenzylamine, 3-nitro-4-aminodiphenylether and 3,3'-dinitro-4,4'-diaminodiphenylmethane. Cf. C. A. 23, 288.

Dyeing cellulose esters and ethers. HEINZ EICHWEDE, ERICH FISCHER and CARL E. MÜLLER (to Grasselli Dyestuff Corp.). U. S. 1,692,492, Nov. 20. Monoazo dyes are used such as may be formed by coupling the diazo compd. of 2-chloro-1-aminobenzene-5-sulfonic acid or other diazo compd. contg. not more than one sulfo group with an *o*-aminophenol ether such as 3-amino-4-cresol methyl ether. U. S. 1,692,493 specifies dyes similarly formed except that instead of the *o*-aminophenol ether there is used a monoacyl-*m*-phenylenediamine such as *m*-aminoacetanilide.

Dyeing cellulose acetate. GEORGE H. ELLIS (to Celanese Corp. of America). U. S. 1,694,413, Dec. 11. A Twitchell reagent is used for solubilizing azo dyes or other coloring substances. U. S. 1,694,414 specifies dyeing cellulose acetate materials with unsulfonated stilbene coloring compds. such as azo stilbene dyes. Cf. C. A. 23, 528.

Dye vat. CHARLES CLARK, ROBERT CHARLES CLARK and ARTHUR BERNARD CLARK. Ger. 468,016, Oct. 13, 1926. The vat has curved walls with compressed air and steam pipes to one side of the bottom.

Complex iron compounds forming color lakes. I. G. FARBENIND. A.-G. (Winfrid Hentrich and Ludwig Zeh, inventors). Ger. 467,423, Dec. 23, 1925. Compds. giving blue lakes are obtained by treating isonitroso compds. of acetylacetamides with ferrous salts. In an example, the Na compd. of isonitrosoacetoacetyl-2-anisidide is stirred with FeSO_4 soln., the corresponding ferrous compd. being pptd. The Na compd. of isonitroso-acetoacetyl-2-anisidide is prepd. by running a soln. of the calcd. amts. of acetoacetyl-2-anisidide, NaOH and NaNO_2 into ice-cooled 20% H_2SO_4 .

Colored compounds. I. G. FARBENIND. A.-G. Fr. 639,166, Aug. 8, 1927. Compds. for coloring paints or for the production of stable dyes are prepd. by treating mono- or poly-nuclear aromatic compds. which contain one or more amino groups and which are not basic dyes, or mixts. of such compds. with basic dyes, or dyes which contain acid as well as basic groups, with complex acids or their salts or substances forming complex acids. In examples, 4,4'-tetramethyldiaminodiphenylmethane is treated in concd. HCl

soln. with Na phosphotungstomolybdate. A deep blue ppt. is obtained with NaOH. In the same way 4,4'-tetramethyldiaminobenzophenone gives an orange-brown compd., and *p*-aminobenzaldehyde an orange compd. Other examples are given.

Designs on mixed goods of cotton and wool. J. MAHLER. Brit. 289,700, Sept. 20, 1927. A pattern is printed on the fabric with NaOH or with H_2SO_4 according to whether the wool or cotton threads are to be etched out.

Metallic effects on fabrics comprising cellulose derivatives. RENÉ CLAVEL. U. S. 1,694,466, Dec. 11. See Can. 276,359 (C. A. 22, 2068).

Immersion apparatus for bleaching, dyeing or washing cloth. JOSEPH M. CLERC-RENAUD. Fr. 639,742, Jan. 29, 1927.

Washing, bleaching or dyeing hanks or cakes of artificial silk. F. KÜTTNER A.-G. Brit. 288,990, April 16, 1927. An app. is described.

Roller apparatus for printing on hanks of yarn. W. BAMFORD. Brit. 289,576, Feb. 10, 1927.

Card grinding rollers for use in the textile industry. T. WAREING. Brit. 289,577, Feb. 12, 1927. Metal rollers are coated with a varnish or soln. of synthetic resin, then sprinkled with powdered emery or other abrasive and heated (suitably to about 105° and then gradually to about 175°) to effect hardening.

Drying drum and associated apparatus for yarn-sizing machines. PAUL GREVE. U. S. 1,692,373, Nov. 20.

Apparatus for treating silk cloth in quantity with liquids. SOCIÉTÉ CLERTIN (Société immobilière et de participations industrielles et commerciales à responsabilité limitée). Fr. 639,772, Feb. 3, 1927.

Treatment of fabric. ROBERT R. FULTON (to the Koppers Co.). Can. 285,372 Dec. 4, 1928. Cellulosic pulp is spread over fabric which is then pressed and dried and the fabric and superposed layer of cellulose is immersed in a soln. of $Ca(CNS)_2$ and CH_3O . The treated fabric is then removed and pressed to remove the excess soln. and the fabric is allowed to stand until gelatinization of the pulp occurs. When the desired degree of gelatinization is obtained the material is sprayed with water or subjected to the action of steam or otherwise treated to dil. the gelatinizing agent and the fabric is passed through squeezing rolls. The fabric is then washed and dried in the usual manner.

Treating cloth. HEBERLEIN & Co. A.-G. Fr. 639,374, Aug. 8, 1927. A woollen appearance is given to cloth of vegetable origin by treating the crude cloth still contg. its natural incrustations with swelling agents. An app. is described.

Treatment of cloth containing cellulose derivatives. CAMILLE DREYFUS. Fr. 636,608, Jun. 27, 1927. Cloth contg. fibers of cellulose derivs. and other fibers is treated with a carbonizing soln. to remove vegetable fibers. The carbonizing soln. may contain $AlCl_3$ and Glauber salts may be added to protect the luster.

Treating spun rayon yarns. JAMES J. BOYLE. U. S. 1,692,717, Nov. 20. The moistened yarn is subjected to a reverse twisting after it has been completely spun, in order to improve the luster.

"Delusterizing" artificial silk. HENRY A. GARDNER. U. S. 1,692,372, Nov. 20; Brit. 290,263, May 13, 1927. Artificial silk such as that formed from cuprammonium cellulose, nitrocellulose, viscose or cellulose acetate is treated with a dil. aq. soln. of a Ti salt such as Ti sulfate which is decomposable by heat in the presence of water and the impregnated fibers are heated to deposit in and on them a water-insol. Ti compd. The concn. of the salt soln. used is such as to cause an increase in wt. of the artificial silk of about 0.5% or somewhat more.

Silk. RENÉ CLAVEL. Ger. 468,017, Sept. 18, 1926, and Ger. 468,018, Sept. 18, 1926. Acids or acid salts are added to the baths contg. metal compds. used for making artificial or natural silk heavier. The silk, after immersion, is treated without washing, with an alk. soln. contg. a tannin dye. A suitable bath contains $Al_2(SO_4)_3$ and anhyd. $SuCl_2$ and $ZnCl_2$ or concd. H_3PO_4 . Cf. C. A. 22, 3997.

Composition for softening silk. ROBERT E. ROSE (to E. I. du Pont de Nemours & Co.). U. S. 1,691,994, Nov. 20. A guanidine salt of sulfonated castor oil such as the di-*o* tolylguanidine salt is used.

Decreasing raw wool. RUDOLF BRAUCKMEYER. U. S. 1,693,106, Nov. 27. The wool is preliminarily freed from water except for about 2-3% of moisture which is left in the wool and is then treated with a water-sol. mild grease solvent such as MeOH.

Apparatus for damping or oiling threads before weaving or knitting. PRAXERA (Société anon. pour la fabrication de la bonneterie). Fr. 639,564, Aug. 16, 1927.

Ventilating and dust-collecting system suitable for cotton mills. T. ANDREW. Brit. 288,798, March 17, 1927.

Protecting animal fibers from injury by alkaline liquids. PAUL ONNERTZ and

BENNO SCHWÄRZEL (to Grasselli Dyestuff Corp.). U. S. 1,692,950, Nov. 27. In order to protect them from the action of Na_2CO_3 solns. or similar alk. liquids, animal fibers such as woolen yarn are treated with the alk. liquid in the presence of a sulfurized phenol which does not possess dyeing properties and which is sol. in Na_2CO_3 with only a slight color.

Resists on animal fibers. I. G. FARBERIND. A.-G. Fr. 639,326, Aug. 11, 1927. To obtain resists on animal fibers or cloth contg. them, they are suitably treated with synthetic tanning agents, such as the condensation products of ketones, ethers or aldehydes with aromatic compds., the products being solubilized by sulfonation.

Preservation of colors in washing. HENKEL & CIE. G. M. B. H. Fr. 639,379, Aug. 11, 1927. To prevent running of colors during washing of cloth, urea is added to the wash-water or incorporated in the soap.

Composition for cleaning and bleaching clothes, etc. LEVER BROS., LTD., and R. THOMAS. Brit. 288,654, Oct. 4, 1926. A compn. which may be formed into powder, flakes or cakes and which is stable during storage is obtained by mixing soap, NaOCl and Na_3PO_4 (or substances which react suitably to form a mixt. of these constituents). Various details, modifications and proportions are given.

Detergents, bleaching agents, lubricants, etc. R. VIDAL. Brit. 289,001, April 19, 1927. In producing detergents, washing and bleaching agents, or lubricants for use in the textile industry as described in Brit. 280,193 (C. A. 22, 3052) and Brit. 285,473 (C. A. 22, 4854), the oleic acid is replaced by ricinoleic acid and the hypochlorite is added in stages.

Material for loom pickers. H. PERCIVAL. Brit. 289,218, March 10, 1927. To avoid necessity of steeping loom pickers in oil they are made from buffalo hide impregnated with glycerol after removal of the hair and lime and neutralization of residual lime with "spirits of salts."

Stiffening material for use in shoe manufacture. BRITISH UNITED SHOE MACHINERY CO., LTD., W. J. LUND and L. P. MELLERIO. Brit. 289,496, Oct. 30, 1926. Fibrous material is used which may be gelatinized by use of solvents such as fibers of nitrated cellulose or acetylated cellulose which are gelatinizable by acetone. A felted fabric may be formed from the fibers and sufficient solvent is applied to at least retain them in the desired formation and shape.

Waterproofing. FIRMA C. A. MÜLLER. Ger. 467,326, Nov. 4, 1925. Waterproof cords are made from degummed silk threads by steeping the threads in a soln. of silk and gelatin, drying and twisting them, and coating them with a soln. of Cr salts. The cord is then exposed to the action of steam at $110-115^\circ$, dried, and vulcanized with rubber under pressure.

Waterproofing felt hats and caps. N. VILLA. Brit. 288,431, March 30, 1927. The material is immersed for a few min. in a bath which may comprise a soln. or emulsion of lanolin, Pb acetate and alum in "petrol," then pressed in a hydraulic press, and treated in a second bath formed of Para rubber dissolved in "petrol" and mixed with NH_4 sulforicinate. Proportions are given.

Stain remover. CHARLES X. JOTHAUD. Fr. 636,618, Oct. 16, 1926. A mixt. of alc. and benzine in equal parts, with a small quantity of boric acid to facilitate their mixing, is used to remove grease and paint stains from cloth.

Clarifying soiled solvent from "dry-cleaning" plants. A. F. HATFIELD and ACHILLE SERRE, LTD. Brit. 289,581, Feb. 15, 1927. The process described in Brit. 260,850 (C. A. 22, 876) is applied to the cleaning of soiled liquid from laundry washing-machines. After filtering, the liquid is returned to the washing-machine, so that the process is cyclic.

26—PAINTS, VARNISHES AND RESINS

A. H. SABIN

Analysis of red lead. J. F. SACHER. *Farbe u. Lack* 1928, 547-8.—S. offers the following modification for the detn. of Fe in red lead. One g. is moistened with 2-3 drops of water, dissolved in 2 cc. HNO_3 (1.2), evapd. to dryness, redissolved in 15-20 drops HCl (1.19), and again evapd. to dryness on the steam bath. One cc. H_2SO_4 (1.84) is added and the beaker heated until the HCl is driven off. After cooling, the sample is dild. to 50 cc. and 2 cc. KSCN (10%) added. Comparison is made with 50 cc. water contg. 2 cc. KSCN soln. to which ferric soln. (0.00002 g. Fe per cc.) is added to match the color of the sample.

G. G. SWARD

The decomposition of oil paints by bacteria and molds. W. VAUREL. *Farben-*

Ztg. 34, 505(1928).—The free fatty acids are attacked more than the glycerides, oxidized acids sometimes more than the original, the unsatd. more than the satd. and the *cis* form more than the *trans*., e. g., oleic more than elaidic. O is necessary; moisture and metals, such as Cu, Zn and Fe promote the attacks. Many bacteria and molds will live on paints contg. red lead, white lead, iron oxide, zinc oxide and lithopone.

G. G. SWARD

Boiling wood oil. HANS HADERT. *Farbe u. Lack* 1928, 558.—Wood oil when heated below 200° for about 12 hrs. and subsequently at 250–300° with addn. of various agents, such as oxidizers, reducers, terpenes, halogen compds., acetates, phthalic compds. and aldehydes, does not gel in the usual manner and dries clear.

G. G. SWARD

Micrometer for measuring the thickness of varnish films. ANON. *J. Sci. Instruments* 5, 323–4(1928).

E. H.

Swelling of aluminum soaps in various solvents (MARKOWICZ) 27. Metallic lead in red lead (HEINRICHS) 7. Emulsions, paints, etc. (Brit. pat. 289,122) 18. Treating natural and synthetic oils and resins (Brit. pat. 289,414) 27. Colored compounds [for paints] (Fr. pat. 639,166) 25. Treating metals before painting (Fr. pat. 636,734) 9.

BROWN, BRUCE KEITH, AND CRAWFORD, FRANCIS M.: *A Survey of Nitrocellulose Lacquer*. New York: The Chemical Catalog Co., Inc. 368 pp. Reviewed in *Can. Chem. Met.* 12, No. 11, 52(1928).

Lithopone paints. I. G. FARBENIND. A.-G. Brit. 289,153, Jan. 21, 1927. White oil paints made from lithopone are prevented from thickening by adjusting the content of free fatty acid in the linseed oil used to the ZnO content of the lithopone (suitably by addition of free fatty acids derived from linseed oil, wood oil or wool fat, preferably as a colloid or in suspension or dispersion).

Binding agent for paints. JULES DREHER. Fr. 636,827, June 29, 1927. A mixt. of equal parts of a resinate lacquer and trichloroethylene with the addn. of hexalin or tetralin is used as a binding agent for paints. Sand or powd. marble may also be added.

Painting with successive coats. FIRM OF H. FRENKEL. Brit. 288,624, April 14, 1927. Each successive coat is applied before the preceding coat is dry and a fatty oil treated with S chloride is used as a binding medium. The finishing coat may contain any suitable binder such as an oil or nitrocellulose compn. The paints may contain pigments, driers, thinners such as turpentine substitute, high-b. p. hydrocarbons or esters (to prevent rapid surface drying), ethereal oils, org. amines, etc.

Rendering paint "weatherproof." DEUTSCHE GASGLÜHLICHT-AUER-GRS. Brit. 288,601, April 13, 1927; Fr. 639,905, Aug. 23, 1927. Paints such as those with an oil vehicle contain small quantities of added fungicide substances such as compds. of Cu, Zn, Cd or Hg. Fe ores contg. Ti and Cu may be used and when the paint contains ZnO or lithopone complex Cu compds. which will not react with the pigment to form colored products must be used.

Sprayers for liquids such as paint. JEAN BRIZON. Fr. 636,653, Oct. 20, 1926. A liquid is forced through a very narrow passage by the vacuum created by a jet of compressed air, the liquid and air being intimately mixed at the outlet.

"Color-binding" composition. EDUARD SCHWARZ. U. S. 1,692,389, Nov. 20. A compn. suitable for use with various pigments as a waterproof paint or varnish comprises casein 5.3, glue 0.3, flour 0.3, linseed oil 2.4, China wood oil 3.7, "ammonia" 0.1, thymol 0.03, benzene 0.1 and cobalt drier 0.01 part.

Printing celluloid. MAX ERNST. Swiss 126,212, Mar. 5, 1927. Printing compns. for celluloid comprise a pigment, camphor and an oil. A suitable compn. comprises 1000 parts of pigment mixed with 30 parts of a 20% soln. of camphor in lavender oil; a small quantity of siccativ may be included.

Coating compositions containing cellulose esters. GLASURIT-WERKE M. WINKEL-MANN A.-G. Brit. 288,221, April 9, 1927. Paints or varnishes contg. undissolved cellulose esters are prepd. by grinding or otherwise mixing cellulose esters such as acetate or nitrate (which may be moistened with alc.) with oil, varnishes, lacquers, oil or knifing colors, enamels or the like or by adding these latter to concd. solns. of the ester to effect pptn. After applying the resulting coating compns. the coating may be treated with a solvent for the ester which it contains to cause soln. or swelling.

Adhering undercoating for paint, varnish, etc. FABRICE R. HERVE, MAXIME HERVE AND ANDRE HERVE. Can. 284,196, Oct. 30, 1928. An albuminoid substance (casein) is dissolved in a soln. of an alk. salt (NaHCO₃) so as to obtain a sirupy consistency. The quantity of alk. salt soln. should be slightly in excess of that necessary to dissolve

the albuminoid substance. Powd. Al or other metal or alloy having similar properties is added to the soln., H is liberated, and there is formed caseinate of Al or a corresponding substance according to the albuminoid and metal employed. The new substance constitutes an adherent undercoating to be applied to the surface of any material to be varnished or painted.

Polymerization of oil of turpentine. ÉMILE A. L. ROUXVILLE and PAULINE A. M. CREUZILLET. Fr. 639,726, Jan. 27, 1927. Polymers of turpentine hydrocarbons of the general formula $C_{10}H_{16}$ for use in the rubber and varnish industry are prep'd. by pouring H_2SO_4 into the oil with stirring and cooling. The first portion of acid is dild. and the addn. is continued till 1 of acid to 4 of oil has been added, and the mixt. is finally heated. $K_2Cr_2O_7$ (5-10%) may be added to the acid.

Treating oils, resins, etc., for making varnishes, linoleum compositions, etc. L. AUER. Brit. 289,415, April 26, 1927. Materials contg. unsat'd. compds. such as mineral or fatty oils, resins, asphalts, "goudrons," tar-distn. residues, rubber and rubber-like products or styrene are treated to modify their properties by use of a soln. or colloidal soln. of electrolytes in an org. solvent. A sulfurizing treatment with S or S chloride may be effected at the same time or subsequent to the electrolyte treatment and accelerators may be added. A moldable product may be formed by treating Chinese wood oil with a soln. of Na in AmOH and then heating the product with Fe oxide and S to a temp. of 160° . Masticated rubber may be treated with C_6H_6 and alc., β -naphthol and $NaClO_3$. Rosin in alc. soln. may be treated with an alc. soln. of NaI. Chinese wood oil and ether are treated with a mixt. of stannic tetraphenyl and alc., the solvent is dist'd. off and the product is emulsified with water with the addn. of the reaction product of a fatty oil and Na cresylate. The emulsion thus prep'd. is suitable for use with rubber latex for various purposes. Asphalt in C_6H_6 soln. is treated with trichloroacetic acid.

Varnish. PAUL BRAUN. Ger. 468,314, July 18, 1925. Varnish is prep'd. from unrefined resin by dissolving the molten resin in a hydrocarbon, such as sangaj oil, and after cooling, an oxidizing agent, such as permanganate and HCl, together with a distributing agent such as silicic acid, is stirred in. After removal of the dirt, a softening agent, such as castor oil is added.

Collodion or nacreous varnishes. PIERRE CHESTAKOFF. Fr. 636,627, Oct. 18, 1926. Aq. "essence d'Orient" is mixed with a little alkali salt of sulforicinoleic acid, or of the sulfonic acids from naphtha refining, or sulfonated octahydroanthracene, or other dispersing agents. To the mixt. thick collodion or a varnish in a solvent not miscible with H_2O is added and mixed for a short time and H_2O is then added. By agitating very fine grains of collodion contg. brilliant particles of the essence are obtained.

Black varnish for metals. SOCIÉTÉ MARITIME ET INDUSTRIELLE. Fr. 636,759, June 27, 1927. A mixt. of bitumen, resin and wax or gum lac is heated to $80-100^\circ$, an oil from heavy coal, a refined tar, solvent naphtha or alc. is added in quantities sufficient to produce the consistency of a varnish when cooled.

Reviving colors and regenerating varnishes. FRANÇOIS E. HEPP. Fr. 639,060, Jan. 12, 1927. A compn. consisting of oleoresinous gums rich in resinic acid and resins, comp'd. tincture of benzoin and essential oils on a basis of linseed oil and turpentine is used for reviving colors and regenerating varnishes.

Brushing lacquers. STANLEY D. SHIPLEY (to Atlas Powder Co.). U. S. 1,692,584, Nov. 20. A solvent for use in making nitrocellulose brushing lacquers comprises glycol 40, "gum soln." (suitably gum and toluene) 25 and gasoline 35%.

Vehicles or thinners for pyroxylin lacquers. J. G. DAVIDSON (to Carbide & Carbon Chemicals Corp.). Brit. 289,373, April 23, 1927. A solvent of low b. p. such as EtOAc with or without EtOH is used with solvents of higher b. p. such as the monoethyl ether and the acetate of the monoethyl ether of ethylene glycol and with diluents and gum solvents such as toluene and xylene and their mixts. or petroleum naphtha.

Phenol resin. FRASIER GROFF (to Bakelite Corp.). U. S. 1,693,112, Nov. 27. A phenol such as PhOH is caused to react with furfural in proportion to yield an infusible resin, the reaction is arrested before the infusible stage is reached and the mass is heated to dehydrate the resin and further advance it and a methylene-contg. hardening agent such as $(CH_2)_6N_4$ is added.

Articles of artificial resin. ÉDUAUD REDHAMMER & SÖHNE. Fr. 639,331, Aug. 11, 1927. The resin is introduced into the molds in a semi-liquid state obtained by pressure, so as to give after hardening a brilliancy to the article. Glass or ceramic molds having a coeff. of expansion as close as possible to that of the resin are used.

Recovering resinous products in the manufacture of wood pulp. EDWARD H. FRENCH. U. S. 1,693,586, Nov. 27. In the treatment of resinous woods with alk. liquor such as Na_2S and NaOH impure rosin is liberated from the alk. liquors by passing

an acid gas such as SO_2 through the liquor, the liberated rosin is removed from the liquor and is dissolved in a hydrocarbon solvent such as C_6H_6 , toluene or gasoline, the soln. of rosin and solvent is distd. under a high vacuum and condensation and sepn. of the rosin from the solvent are effected. An app. is described.

27—FATS, FATTY OILS, WAXES AND SOAPS

E. SCHERUBEL

Liver-fat of the sperm whale. MITSUMARA TSUJIMOTO AND KANESUKE KIMURA. *Imp. Inst. Chem. Tech. Tokyo, Japan. Chem. Umschau Fette, Oele, Wachse u. Harze* 35, 317-8(1928).—The 6% oil, obtained from a portion of a 13 m. long male sperm whale, contained 69.3% acids and 16.4% unsaponifiable matter, the remainder being water-sol. substances, etc. The acids had the following consts.: m. 32-33.5°, d_4^{40} 0.8877, neutralization no. 194.1, I no. (Rosenmund-Kuhnnehn) 141.3, n_D^{40} about 1.4610; ether-insol. bromide 38.5%, Br content 70.47%, blackens at 250° without melting. The liquid acids (75.4%) had an I no. of 175.5 and a neutralization no. 188.9, while the solid acids (24.6%) showed 11.8 and 209.5, resp., and m. 52-53°. The unsaponifiable matter contained 48% cholesterol, apparently no cetyl nor olein alc. but contained an unsatd. hydrocarbon of the probable formula $\text{C}_{25}\text{H}_{48}$, probably a homolog of squalene; the unsaponifiable gives color reactions similar to vitamin A. P. ESCHER

Determination of unsaponifiable matter in oils and fats. E. LESTER SMITH. *Analyst* 53, 632-41(1928).—The following method is offered for the detn. of unsaponifiable matter. It gives results accurate to 1% of the unsaponifiable content. To 20 g. of oil in a 300-cc. flask add 40 cc. of alc. and 10 cc. of 40% NaOH soln. Heat under a reflux for 1 hr., rinse into a 1. separatory funnel with 150 cc. of water, cool and shake with 300 cc. of pure ether. Ext. the soap soln. twice more with 150 cc. of ether, wash the combined ext. into 20 cc. of water from the ext., remove most of the ether by heating in a distg. flask. Meanwhile ext. the soap soln. 3 times more with 250-cc. portions of ether. Wash these exts. with the same water that was used for the first washing, distil to small vol. and carefully rinse into a 250-cc. separatory funnel with 100-150 cc. of ether. Place 75 cc. of ether in another small sepg. funnel and use this to wash all the liquors from the first separator. This prevents loss of unsaponifiable matter in the soapy washings and in the portions of the upper layer which may be emulsified in or run off with the lower layer. Wash the ext. with 5-cc. portions of wash liquor, using water twice, then 2 N NaOH in 10% alc. followed by 2 water washes. This sequence of washing should be repeated at least once. Wash with 0.5 N HCl to decompose any remaining soap and to remove basic impurities often present in fish oils. Then wash with 100 cc. of water to remove alc. from the ether layer. Finally pour the ethereal ext. into a tared flask, rinsing the first separator with the ether from the second, distil off ether, remove water globules if necessary by evapn. with alc. or CHCl_3 and take to const. wt. in a vacuum, hot-plate desiccator. Add about 10 cc. of alc. (neutralized to phenolphthalein), heat and titrate with 0.025 N NaOH. A second method recommended is similar but with fewer extns. It is not quite as accurate but better than any method hitherto published. W. T. H.

Bleaching vegetable and mineral oils and animal fats with clay. I. S. ELAKOV. *Lehr. State Expt. Inst. Silicates (Moscow)*, 1927, No. 21, 67-72.—E. tested a number of variously treated clays for their adsorption power and concludes: (1) The presence of MgO has no relation to the adsorbing power of the clay, as claimed by some. (2) Cryst. clays have lower bleaching qualities than colloidal clays. (3) Clays suspended in water show a higher power of bleaching than the original clay. (4) A hindrance in the use of clays as a decolorizing agent is the water in the clay. (5) The finer the clay the higher is the decolorizing power. J. S. JOFFE

Development of the theories of the drying process of fatty oils. H. WOLFF. *Chem. Umschau Fette, Oele, Wachse u. Harze* 35, 313-7(1928).—A brief review followed by a record of W.'s work. The cardinal question whether a chem. reaction, oxidation or a colloidal phenomenon jellying is the primary cause of the drying of oils, and whether the latter requires preliminary oxidation is still unanswered. W. together with G. Zander spread boiled oil plus drier and raw linseed oil, and wood oil with acid without drier upon Fe and Zn plates. The boiled oil plus drier on Fe and Zn and the raw oil on Fe resembled each other in behavior, varying slightly in time and in weight-increase; but raw oil on Zn, while drying the same time, dries irregularly with liquid spots on an

otherwise dry film, these spots drying exceedingly slowly; O_2 absorption is also much retarded. Wood oil plus drier on Zn and Fe resemble each other, the greater wt. increase occurring after the film is dry. This wt. increase becomes less marked when Zn powder is added to the wood oil plus drier, either on Fe or on glass; when Fe powder is added instead of Zn, the retarding of wt. increase is so pronounced as to make the plotted curve convex instead of concave toward the abscissa denoting wt. increase. In some of the tests a distinct wt. decrease was observed at the beginning. The work leaves the question of chem. or colloidal reaction during drying still an open one.

P. ESCHER

Determination of the cold test of oils. AUG. C. ORTHMANN AND WM. J. ARNER. Pfister & Vogel Leather Co., Milwaukee, Wis. *J. Am. Leather Chem. Assocn.* **23**, 595-9(1928).—Cold tests of 6 samples of neatsfoot oil and 5 samples of other oils were measured (1) by the Tentative Method of the A. S. T. M. and (2) by a method in which cooling is accomplished by drawing dry air through Et_2O in a special 3-walled Dewar flask in which the oil tube is supported. The entire app. is transparent and readings, except the final one, are made without removing the oil tube from the cooling bath. Results obtained by the 2 methods agreed within $1^\circ F$. The temp. of the Et_2O cooling bath can be regulated more accurately and much more easily than that of ordinary mixts.

H. B. MERRILL

Chemical processes in oil mills. I. YELAKOV. *Masloboino Zhirovoe Delo (Oil and Fat Ind. (Russia))* **1928**, No. 3, 22-5.—A review.

A. A. BOEHTLINGK

A color reaction to establish the purity of olive oil. MARIO CUCCURULLO. Reale Stazione Chim.-Agraria Sperimentale, Roma. *Ann. chim. applicata* **18**, 297-9(1928).—Fifty samples of pure and mixed olive oils and other oils were used to det. whether the color reaction of Milani (cf. *C. A.* **22**, 1489) gives consistently reliable results in lab. practice. Of 20 oils, only 8 were decolorized to a yellow on heating, while the others, though pure olive oils, were not decolorized at all. Mixed oils remained red. These results were at variance with those of Milani and accordingly the cause was investigated. Eosin is pptd. by strong acids and is decolorized by weak acids and since the oils contained no strong acids, the decolorization was probably due to weak acids. The acidity (as oleic acid) of all the oils was detd. and enough oleic acid was then added to each to make the acidity 4% in each case. All these acidified oils gave a rose color which vanished on heating. Therefore some olive oils decolorize eosin not because of a reaction with a substance which is present in olive oil and not in other oils, but because of the acidity. This is further confirmed by the fact that pure *oleic acid* decolorizes the Milani reagent. Com. olive oils, particularly of inferior quality, have a much higher acidity than that of other vegetable oils, not infrequently reaching 4 or even 7-8%. There may be another minor cause of the decolorization for some oils decolorize when their acidity is only 4%, whereas other oils have this power only when their acidity is raised to 6%. The Milani test is, therefore, not a test of the genuineness or purity of olive oil.

C. C. DAVIS

Comparative oxidations in free air of cod-liver, linseed and olive oils. P. DELORE. *Compt. rend. soc. biol.* **99**, 805-7(1928).—The oils were exposed to the air and the gains in wt. were in the ratios olive oil 1 : linseed oil 13.31 : to cod-liver oil 66.75 in 50 days. It appears remarkable that linseed oil with its higher iodine index should absorb but $\frac{1}{6}$ as much O as cod-liver oil. **Influence of previous irradiation upon the oxidation in free air of cod-liver, linseed and olive oils.** *Ibid* 807-10.—Previous irradiation of the oils by means of the Hg-vapor ultra-violet rays for 30 hrs. caused the O absorption by olive oil in 50 days to increase from 1.6 to 55.6, linseed oil from 39.3 to 184 and cod-liver oil from 124 to 272.6; the figures 1.6, 39.3 and 124 representing the O absorbed by the resp. oils in 50 days *without* previous irradiation.

L. W. RIGGS

Clays as adsorbents. P. N. GRIGOR'EV. *Trans. State Expt. Inst. Silicates (Moscow)* **1927**, No. 21, 59-66.—A review of the use of clays as adsorbents in the oil industry with data on a bentonite substance found in Georgia (Caucasia), which does not, however compare favorably with the adsorption capacity of floridin.

J. S. JOFFE

Acetone as solvent in the rapid iodine number determination for factory control. B. M. MARGOSCHES, B. KRAKOWETZ AND F. SCHNABEL, assisted in expts. by F. SCHÖNATZ AND MARIA BÖHM. *Techn. Hochschule Brunn. Chem. Umschau Fette, Oele, Wachse u. Harze* **35**, 300-5(1928).—Expts. with acetone in the rapid method for I no. detn. lead to the following conclusions: Acetone can be used to advantage as a fat solvent in place of alc.; 2 cc. acetone suffice for 0.1 g. of fat; soln. occurs at room temp.; the I required by the 2 cc. acetone is negligible, but when 5-10 cc. is used it must be detd. by a blank test. Sunlight does not influence the results. For scientific investigation alc. should be used instead of acetone. Comparative I no. detns. with

alc. and acetone gave practically identical results and they were also in close agreement with results by the Hanus method. P. ESCHER

Experimental tests of fireproofing oleins by means of β -naphthol. H. POMERANZ. *Seifensieder Ztg.* 55, 370-1(1928).—Davidsohn has published (*Allg. Oel Fett Ztg.* 1928, 400 and *C. A.* 22, 1697, 4847) some expts. in which addn. of β -naphthol to oleins greatly diminished their inflammability when tested in Mackey's app. P. questions the correctness of D.'s conclusion and thinks the reagent is quite inefficient at temps. above 100° and that a longer exposure in Mackey's app. might lead to a rise in temp. P. E.

Determination of halogen numbers in aqueous solutions. ALBERT HANSEN. Polytech. Lehranstalt, Copenhagen. *Z. anal. Chem.* 75, 257-88(1928).—Winkler's method for detg. halogen nos. has distinct advantages over the procedures of V. Hübl, Hanuš, or Wijs but has been criticized by several investigators. The purpose of this paper was to det. the sources of error so that the usefulness of the method would be increased. To this end, many expts. were made with samples of olive oil (halogen no. 84.5) of linseed oil (175) and of cod-liver oil (157.5). Particular attention was paid to the effect of light upon the results and it was found that during the first stages of the reaction light has little effect but toward the end and particularly when KI is added, the photochemical effect is very marked. The addition of KI to the reaction mixt. served to diminish this effect of light but the total result was not altogether favorable. The use of 5 cc. of ether and 5 cc. of CCl_4 instead of 10 cc. of CCl_4 and a reaction mixt. of 25 cc. of 0.2 N KBrO_3 contg. 0.3 g. of KBr and 0.415 g. of KI made the method practically insensitive to light but in this case the excess of halogen must be regulated more closely than is otherwise necessary. As the final outcome of the investigation the following modification of the Winkler method is offered. Of the oil, take a wt. equal to 33/assumed halogen no. Dissolve the oil in 10 cc. of CCl_4 using a bottle such as is commonly used for detg. I nos. To the soln. add 5 g. of KI dissolved in 15 cc. of water, 25 cc. of 0.2 N KBrO_3 soln. and finally 10 cc. of 10% HCl. Quickly stopper the bottle, rotate the contents a little and place the bottle in a box which is painted black and is lined with plush in such a way that no light can enter. For a non-drying oil, allow the mixt. to stand in the dark for 2-3 hrs. but allow 20 hrs. for a drying oil. Then, before taking the bottle out of the box, quickly add 10 cc. of 10% KI soln. and after 2-3 min. add 150 cc. of water and titrate the free I_2 with 0.1 N $\text{Na}_2\text{S}_2\text{O}_3$ adding starch toward the end. W. T. H.

Specific gravity of glycerol. L. W. BOSART AND A. O. SNODDY. *Ind. Eng. Chem.* 20, 1377-9(1928).—Tables are given showing that the International Critical tables for glycerol are unsatisfactory as a working basis where accuracy in the 4th decimal place is necessary. E. SCHERUBEL

Application of castor oil in soap manufacture. N. SPASSKII. *Masloboino Zhirove Delo* (Oil and Fat Ind. (Russia)) 1928, No. 2, 34-5.—The use of castor oil increases the lathering ability of soap and improves its soly. in cold water. Castor-oil soap resembles coconut-oil soap in being but slightly hydrolyzed and giving a clear soln. with cold water; it is salted out with 27% of salt as compared to 24% for coconut-oil soap. The upper limit of lather is raised by mixing castor oil with hydrogenated vegetable-oil soap. The admixt. of castor oil soap in curd soap to replace liquid oils increases the hardness. An increase in the concn. of the salting out electrolyte gives a soap with a smaller proportion of water. S. succeeded in obtaining a soap with 62.6% instead of 59-60% of fatty acids with a concn. of 10% of salt in the caustic liquid as compared to the usual 5-6% for animal fats. When using 80% of fatty acids present in the "T. E. ZH. E." soap and 20% castor oil, 62% of curd soap with a 38° titer, 20% niger with 30% of fatty acid with a 37.4° titer and 18% caustic of 12° Bé. with 0.2% of fatty acids were obtained. This soap was of the same hardness as the original curd soap regardless of the 20% of castor oil admitted. A. A. BOEHLINGK

Swelling of aluminum soaps in various solvents. E. MARKOWICZ. *Farben-Ztg.* 34, 326-8, 414-8, 503-5(1928).—Dibasic Al palmitate contg. up to 2% Na_2SO_4 and 1-2% H_2O does not swell in water, alc., drying oils or paraffin oils to any appreciable extent. The gels in aliphatic hydrocarbons are soft opaque pastes, in chlorinated and aromatic hydrocarbons are transparent elastic gels, and in terpenes are transparent or translucent thin gels which flow readily. In the aliphatic hydrocarbons, the speed of setting and firmness of the gel pass through a minimum for fractions boiling around 100°. The viscosities of the gels decrease with age, the most with chlorinated deriva. and the least with turpentine. The presence of impurities in either the solvent or the gel increases the degree of swelling. The gels are used in mat-finish varnishes non-settling paints, thickened lubricating oils, waterproofed fabrics, etc. In order to avoid lumps etc., thorough mixing of the gel is stressed. G. G. SWARD

The distribution of soap and electrolytes in the soap body, niger and lye. E. L. LEDERER. *Seifensieder Ztg.* 55, 383-6(1928).—On account of insufficient analytical data L. uses Perrin's expt. on the distribution of sedimentary colloids as a basis to derive a formula for calcg. the soap content of a kettle charge of finished soap at different heights of the kettle, and the size and wt. change of the ultimate particles of the soap. The result confirm McBain's view on the constitution of soap solns. P. ESCHER

The significance of alcohol in the determination of the saponification number. F. POLLMANN *Seifensieder Ztg.* 55, 375-6(1928)—A clear soln. of oil in alc. KOH is not proof of complete sapon., since the oil forms an ester with the alc. which is sol. in KOH. Expts. with Et esters required 5-10 min. boiling before sapon. was complete; 50% excess of KOH is essential for rapid reaction. MeOH in place of EtOH is out of the question because sapon. is incomplete even after 1-2 hrs.' boiling. P. ESCHER

Apparatus for emulsifying oils (U. S. pat. 1,694,589) 1. Water-insoluble soaps from mineral oil derivatives (U. S. pat. 1,694,462) 22. Fatty acid mixture derived from petroleum (U. S. pat. 1,694,461) 22. Mineral oil derivatives (U. S. pat. 1,694,463) 22. Apparatus for extracting oil from oil-containing materials (Ger. pat. 467,801) 1. Preservation of colors in washing (Fr. pat. 639,379) 25.

STANISLAUS, I. V. STANLEY AND MEERBOTT, P. B.: *American Soap Maker's Guide.* 709 pp. \$10.

UBBELOHDE-GOLDSCHMIDT: *Handbuch der Chemie und Technologie der Öle und Fette.* 2nd revised edition. Edited by Hans Heller. Leipzig: Verlag S. Hirzel. 800 pp. Paper, R.M. 68; half leather, bound, R. M. 75.

Separation of fatty acids from glycerides. ALFRED EISENSTEIN. Swiss 126,202, Feb. 26, 1926. See Austrian 108,701.

Apparatus for rendering animal fats and oils by cooking with steam. ROBERT McTAVISH (to Cincinnati Butchers' Supply Co.). U. S. 1,695,254, Dec. 11.

Degreasing bones, etc. BRITISH GLUES & CHEMICALS, LTD. and R. B. DREW. Brit. 289,569, Feb. 3, 1927. Bones and other material contg. fat and water are degreased by vapors of a solvent such as benzine so that the water is vaporized and the mixed vapor formed is used for further degreasing. An app. is described.

Detergents from fatty acids, etc. R. VIDAL. Brit. 289,002, April 19, 1927. A modified acid is obtained by treating oleic acid with alk. hypochlorite or hypobromite, and decomp. the product with acid such as by dil. H_2SO_4 . When this modified acid is again treated with hypochlorite or hypobromite a thick paste is obtained which is transparent when hot and is sol. in water and may be used for solubilizing hydrocarbons, halogenated hydrocarbons, ethers, esters, animal and vegetable oils, fats and waxes, and alcs. and phenols, for prepg. compns. for use in the textile industry, tanning, perfumery, regeneration of used rubber, lubrication of machinery, washing painted or varnished surfaces or for other purposes.

Centrifugal apparatus suitable for separating fatty substances from emulsions by use of a volatile solvent. SOC. FRANCAISE DE CENTRIFUGATION AND J. A. L. ROZIERES. Brit. 289,350, Oct. 25, 1927.

Rotating extractor for dissolving fatty substances from seeds, etc. CHARLES LEMALE. Fr. 639,211, Jan. 15, 1927.

Extraction of fatty acids from dilute aqueous solutions. SOC. ANON. DES DISTILLERIES DES DEUX-SÈVRES. Fr. 636,825, June 29, 1927. Fatty acids, such as AcOH or BuOH, are extd. from aq. solns. by acetic esters, such as AcOEt, AcOBu or AcOPr, alone or mixed. The acid and ester contg. a certain quantity of H_2O are distd. The first fraction contains the H_2O and some of the ester, which form a binary mixt., and the ester and acid then distil separately.

Extracting oils, fats or waxes by solvents. L. J. SIMON and SIMON EXTRACTING MACHINE SYNDICATE, LTD. Brit. 288,670, Dec. 14, 1926. In the extn. of oils, fats and waxes from raw materials by subjecting them (in a basket rotating in a closed extractor) to successive flushings with progressively purer solvent, as described in Brit. 255,923 (C. A. 21, 2995), the flushing with each grade of solvent is repeated before the next purer grade of solvent is applied. An app. is described.

Apparatus for the continuous distillation of solvents in connection with the extraction of oils, fats, waxes, etc. LOUIS JOHN SIMON and SIMON BROS. (ENGINEERS), LIMITED. Fr. 636,703, June 13, 1927.

Refining vegetable oils. ALEXANDER SCHWARZMAN (to Spencer Kellogg and Sons). U. S. 1,692,226, Nov. 20. A body of oil such as linseed oil is agitated with an aq. caustic

alkali soln. in about the quantity corresponding to the free fatty acids present, the mixt. is allowed to stand quiescent for a time less than required to effect settling but sufficient to permit agglomeration of the solid soaps formed by the agitating action; the temp. of the oil is then raised to a point slightly below 100° and hot water is passed through it in finely subdivided form until the oil is rendered neutral and the aq. soln. is sepd. An app. is described.

Treating natural and synthetic oils and resins. L. AUGER. Brit. 289,414, April 26, 1927. Materials contg. unsatd. C compds. such as fatty or mineral oils or resins are treated with a metal, metal oxide or hydroxide or an org. base and this treatment is combined with a sulfurizing treatment which may be effected simultaneously or successively. S or S chloride may be used in CS₂ or "white spirit" and accelerators such as (CH₂)₆N₄, PhNH₂ or diphenylguanidine may be added. Fillers may be added for making plastic compns. An example is given in which castor oil is treated with Fe oxide, PhNH₂ and S, heated successively to 140° and 160° and molded under pressure. The treatment of rosin with stannic oxide and S chloride to obtain a varnish ingredient is also described.

Soap. A. E. HATFIELD and ACHILLE SERRE, LTD. Brit. 289,582, Feb. 15, 1927. In making a soap suitable for "dry cleaning," a fatty acid such as purified oleic acid, with a setting point below 2° (and preferably below 0°) is partially sapond. (suitably to the extent of 65-75%) with aq. solns. of NH₃ or of carbonates or hydroxides of Na or K, and an emulsifying agent is incorporated comprising chlorinated hydrocarbons such as perchloroethylene, trichloroethylene or C₂HCl₃ or free fatty acids and alc. Cyclohexanol may also be added.

Soap. ADOLF WELTER. Swiss 126,587, Oct. 25, 1926. Free fatty acid is intimately mixed with not more than double the necessary quantity of calcined soda for sapon. The soap is mixed with soap obtained in another way and pressed. Thus, palm oil or coconut oil is mixed with calcined soda and sapond. Before the sapon. is over, tallow or bone fat curd soap is pumped in and stirred. The homogeneous mixt. is then pressed.

Soap powders. A. LETTERMANN. Brit. 288,584, April 12, 1927. Soap masses which are to be converted into powders are obtained directly by mixing fatty oils such as a mixt. of peanut and coconut oils with caustic alkali soln. and with Na₂CO₃, potash or other water-absorbing substance and allowing the mixt. to stand. Perfumes, org. solvents such as benzine or chlorinated hydrocarbons, etc., also may be added.

Cleaning compound. BENJAMIN W. LIGHTY. Can. 285,283, Dec. 4, 1928. Soap is heated in 3.5 parts its wt. of water, and flaked ammonia is dissolved in 2.5 parts its wt. of water, and the solns. are admixed by stirring and then an essential oil is added. The resulting product is a soft, semi-plastic homogeneous demulcent detergent.

28—SUGAR, STARCH AND GUMS

F. W. ZERBAN

Saving money in the making of sugar through p_H control. R. T. BALCH. U. S. Dept. Agr., Bur. of Chemistry and Soils. *Food Industries* 1, 127-9(1928).—In the clarification of sugar-cane juice by the use of lime and heat, the degree of pptn. of Ca₃(PO₄)₂ is greatest at p_H 7.5-8.5. If these limits are exceeded, the wt. of ppt., or mud, remains practically const. For controlling the loss of sucrose by inversion the p_H must be kept at approx. 7 or slightly above because hydrolysis begins at p_H 7. The use of H ion app. instead of old titration methods is now rapidly taking place in both cane and beet sugar-mfg. plants. C. R. F.

The bacterial content of raw and commercial sugars. L. H. JAMES. U. S. Dept. Agr. *Food Industries* 1, 65-9(1928).—Bacteriological examns. of 197 samples of sugars showed the presence of aerobic saprophytes, putrefactive anaerobes and spoilage thermophiles in all types of sugars examd. *B. coli* was isolated from only 2 samples of raw sugars but the "flat sour" types were abundant. "Sulfur or hard swell" types were likewise found in many samples of raw sugar. The findings are important from the food canners' and confectioners' viewpoints inasmuch as these organisms cause certain well defined types of spoilage. C. R. F.

Some aspects of the sugar-beet problem. A. W. LING. *Agr. Progress* 5, 56-60 (1928).—NaNO₃ and superphosphate are the best forms of N and P, resp., for the sugar beet. Beets covered with earth and left for 9 months lost only 1.3% sugar without any change in the H₂O content. Loss of sugar was steady after an increase of nearly 1% during the first month in storage. K. D. JACOB

The solubility of carbon dioxide in sugar solutions and its combination with amino acids. VLADIMIR MAJER. *Listy Cukrovar.* 47, 123-36(1928).—M. describes a new app. for measuring the soly. of CO_2 in solns. at higher temps. Carbamides of aspartic and glutamic acids form in favorable media not only at 40° , but even at $80-90^\circ$. The amt. of CO_2 bound by an amino acid is a typical function of the alky. of the soln.; its course is indicated by an internal linkage between the carboxyl and NH_2 group, opening with an increase in the alky. at 40° . The soly. of CO_2 was detd. for diffused, limed and satd. liquors of various alkalinities. The absorption powers show them to act like amino acid solns. After absorption the CO_2 is bound as a bicarbonate in slightly alk. solns., in phys. soln. or as a salt bound by alkalies by non-alk. constituents of the liquors which increase with the alky. Amino acids are concrete examples which bind the CO_2 in labile forms as carbamides. The absorption of CO_2 at 80° was lowered in the presence of aspartic and glutamic acids and hydrolytic products of sucrose and pectin. The amt. of CO_2 in phys. soln. and that bound by amino groups are lower at 80° .

FRANK MARESH

Modern processing revives a long-dormant industry. Sorghum sirup now made successfully under strict technical control. J. J. WILLAMAN. Univ. of Minn. *Food Industries* 1, 107-9(1928).—A new factory at Cedar Rapids, Ia., utilizes 20,000 tons of sorghum cane annually, the products being a purified sorghum sirup, seed, ground cattle feed and bagasse. The *Pfund honey grader* is used to grade the sirup as to color. The refined sirup is of a very mild flavor and light color.

C. R. F.

The 1927-28 fertilizer constituent tests at Western Pampanga (ROXAS, *et al.*) 15. Comparing various quantities of mixture of ammophos and NH_4 sulfate plus filler (LOCSIN, *et al.*) 15. Germination of sugar-cane pollen in artificial culture media (DUTT, AYYAR) 11D. Liberation of fiber from bagasse, etc. (Can. pat. 284,219) 23.

Sugar. HENRY W. DAHLBERG. Fr. 639,581, Aug. 16, 1927. Sugar is extd. from molasses by means of a complex ferrite of Ba prep'd. by heating BaCO_3 with oxides of Fe. The sucrate of Ba is decompd. by CO_2 .

Crystalline dextrose. WM. B. NEWKIRK (to International Patents Development Co.). U. S. 1,693,118, Nov. 27. In obtaining substantially pure dextrose in granular form, 90% of which is in the form of individual crystals, the procedure is carried out in 3 stages: (a) the soln. is concd. to about the point of supersatn. at any temp. or rate of boiling; (b) formation of crystals is induced (preferably with addn. of small quantities of seed crystals), which may ordinarily require from a few min. to 45 min. or under adverse conditions possibly 2-3 hrs. (the amt. of crystals to be induced depending on the size of crystals desired in the finished batch); and (c) growth of the already formed crystals, which may require 6-12 hrs. The entire process may cover 36-48 hrs. Numerous details are described.

Preventing deterioration of sugar. HENRIK MAUTNER. Fr. 636,731, June 28, 1927. The water usually found in sugar particularly glucose is replaced by EtOH either by adding EtOH to the concd. soln. before crystn. or by recrystn. from EtOH. Fermentation on keeping is thereby prevented.

Sirup. WM. F. COLE. Fr. 639,687, Aug. 19, 1927. See U. S. 1,647,082 (C. A. 22, 329).

Purifying and clarifying corn-sirup and corn-sugar liquors. CLARENCE H. CHRISTMAN (to National Aluminate Corp.). U. S. 1,692,817, Nov. 27. The solns. are neutralized with Na aluminate, which serves to sep. nitrogenous and other impurities.

Starch. R. O. MCCOY (to Corn Products Co., Ltd.). Brit. 288,546, April 11, 1927. Disintegrated material such as maize is subjected in water to sepg. operations yielding a mixt. of starch and gluten; the mixt. is tabled and the effluent from the tabling is reused with the gluten it contains for subsequent sepn. The table effluent is used for coarse slop sepn., and water from washing the starch after tabling is used for germ and fine slop sepn. An app. and various details are described. Cf. C. A. 22, 2680.

29—LEATHER AND GLUE

ALLEN ROGERS

Extraction of solid tanning materials by the Koch and Procter apparatus under identical conditions. J. GORDON PARKER. London Leather Industries Lab., London, Eng. *J. Am. Leather Chem. Assoc.* 23, 590-5(1928).—The new international method for tannin analysis differs from the former official method in employing the closed Koch

extractor instead of the open Procter extractor for extg. raw and spent tanning materials, in employing 2 l. instead of 1 l. H_2O for extn., and in specifying 5 hrs. extn. instead of 3. Data are given showing (1) use of 2 l. H_2O gives more complete extn. with either app.; (2) under identical conditions slightly more material is extd. with the Procter than with the Koch app.; (3) as much material is extd. in 4 hrs. as in 5 hrs., with either app., and (4) the ratio of tans to non-tans in the ext. is the same with the new method as with the old.

H. B. MERRILL

Sulfite cellulose extracts (as tanning materials). A. DEFORGE. *Halle aux cuirs* 1928, 292-8.—A review of recent work.

H. B. MERRILL

Tannin from the trumpet tree. C. D. MELL. *Textile Colorist* 50, 466-7 (1928).—Many interesting uses are described for different parts of the trumpet tree (*Cecropia peltata*) which flourishes in tropical America. The strong inner bark referred to as imbauba, is generally made into rope. The bark of the older tree, which contains a high percentage of tannin, is used for tanning leather.

RUBY K. WORNER

Tizrah wood and tizrah extract (as tanning materials). WILHELM VOGEL. *Gerber* 54, 171-3 (1928).—Tizrah is a tanning material very similar to quebracho and was introduced as a substitute during the war shortage of tanning materials. The plant (*Rhus pentaphylla*), a member of the sumac family, is a thorny shrub, which grows in the dry regions of north Africa and Sicily. Growth is extremely slow; hence culture is not practicable. The wood, especially that of the trunk and upper roots contains slightly more tannin than does quebracho. The tannins are exclusively of the pyrogallol type, and give all the qual. tests of quebracho, but may be distinguished by the color of the phlobaphenes, which are dark brown instead of red-brown. Tizrah ext. is marketed as a liquid contg. either 32 or 40% tannin. Reduced to a 22% H_2O basis, the ext. contains slightly more tannin and sol. non-tannin, and considerably less insol. matter than solid quebracho ext. Sulfitation is superfluous. Color of the leather produced is practically the same as that of quebracho leather.

H. B. MERRILL

South African tanning materials. The black wattle. C. O. WILLIAMS. School of Agr. Cedara Natal. *Union S. Africa Dept. Agr. Science Bull.* 63, 68 pp. (1928).—This paper reports the results of an extensive investigation on the compn. and chem. properties of the bark of the black wattle, which is the common name usually applied in S. Africa to *Acacia mellissima*. The mature green bark of the black wattle contains approx. 53% H_2O , the greatest proportion usually being present in bark from the middle portion of the tree. No appreciable difference was noted in the yield and compn. of bark stripped from trees of the same age from the same plantation in summer and in winter. The % of tannin in the bark decreases as the tree is ascended the bottom third of the trunk usually contg. more than half the tanning matter obtainable from the entire tree. The av. % tannin content for any particular thickness of bark seems to be greatest in young trees but in general, the % tannin in bark from trees 3 to 12 years old increases with the thickness of the bark. No appreciable loss of tanning matter results from drying the bark artificially at temps. up to about 150° F. When wattle bark is ground the coarser fibrous material is lowest in sol. matter and particularly in tannins, the finest powder being the richest. The various portions of very young trees, about 1 year old, are very low in tannins, the bark contg. only about 4% while the bark of more mature trees contains about 25 to 40%. Bark from the larger branches of mature trees contains approx. as much tannin as the bark from the top portion of the main stem, i. e., about 30%, while the twigs and leaves contain only about 4%. The amts. of tannins and sol. non-tannins in areas of bark affected with the "mottle" disease are usually appreciably less than in the sound bark in the immediate vicinity, and the color of the ext. is also invariably darker. When the bark is exposed to wet weather the loss of sol. matter due to leaching is chiefly non-tannins. Growth of molds on the bark causes loss of non-tannins and results in marked deepening of the color of the ext. but does not appreciably affect the total tannin content. "Sweating" deepens the color of the ext. but does not depreciate the compn. of the bark. Wattle wood contains less than 1% tannin. Boiling the ext. under atm. pressure causes deterioration in the color and decreases the tannin and non-tannin content of the infusion. When stored in open vessels, wattle exts. gradually deposit insol. matter, chiefly non-tannins, but they may be preserved for some time, without deterioration, in clean sealed cans provided the cans are not pitted. Addn. of alum to the ext. ppts. some of the sol. matter and decreases the tannin content, but does not cause sufficient improvement in the color of the ext. to be of practical value. Good qualities of solid wattle ext. contain approx. 60% tannin. In a cycle of 8 years, the total mineral matter taken from the soil by wattle trees is approx. 430 lb. CaO , 320 lb. K_2O and 30 lb. P_2O_5 per acre, 170, 60 and 10 lb., resp., being removed by the bark. The ash of spent wattle bark contains approx.

70% CaCO_3 , 4% K_2O and 1% P_2O_5 . The original paper contains numerous tables of analytical data. K. D. JACOB

Recent investigations on fat-liquoring leather. A. DEFORGE. *Halle aux cuirs* 1928, 329-33.—A review of recent American work. H. B. MERRILL

Basicity of chrome liquors. O. DRYAIDIN. Tannery School, Liege, Belgium. *Halle aux cuirs* 1928, 301-7.—Different methods of expressing basicity are described and the quantities of acid, Na_2CO_3 and $\text{K}_2\text{Cr}_2\text{O}_7$ or $\text{K}_2\text{SO}_4 \cdot \text{Cr}_2(\text{SO}_4)_3$ required to produce liquors of different basicities are tabulated. H. B. MERRILL

Leather belting has kept step with industrial progress. H. J. PAYNE. Am. Leather Producers, Inc. *Textile Colorist* 50, 761-3(1928). RUBY K. WORNER

Water absorption and penetration tests for sole leather. L. M. WHITMORE AND G. V. DOWNING. Leas & McVitty Inc., Salem, Va. *J. Am. Leather Chem. Assocn.* 23, 603-6(1928).—The rate of satn. of sole leather blocks immersed in water is measured by detg. gain in wt. (1) after 2 hrs.' immersion and (2) after 24 hrs.' immersion, the latter value being taken as complete satn. The % satn. after 2 hrs. is a measure of the permeability of the sole to water. The relative permeability of different leathers detd. by this test is the same as that detd. by measuring the time required for complete penetration of the leather by water under the pressure of a column and the % satn. test is much easier to perform than the time-of-penetration test. H. B. M.

Mesquite as a source of tans (MELL) 25. Care and maintenance of leather belting in the textile mill (MOORE) 25. Coating composition [for artificial leather] (Can. pat. 283,892) 23.

STIASNY, E.: *Gerbereichemisches Taschenbuch*. Dresden: Theodor Steinkopff. 177 pp. R. M. 6. Reviewed in *J. Am. Leather Chem. Assocn.* 23, 554(1928).

Synthetic tanning agents. J. R. GEIGY A.-G. Fr. 639,097, Aug. 5, 1927. Tanning agents free from mineral acids are obtained by mixing the products resulting from aromatic hydroxysulfonic acids and CH_2O in the form of their salts with salts of H_2SiF_6 . In an example the tanning agent prep'd. from cresolsulfonic acid in known manner is neutralized with NaOH and dried, and 100 parts are mixed with 50 of Na_2SiF_6 .

Apparatus for making tanning extracts. BUSS A.-G. Swiss 126,188, Mar. 22, 1927. Constructional improvements are described in app. of the type comprising digesters in which the bark is packed on sieves and a pump for circulating water through the digesters.

Apparatus for treating hides or skins with tanning or other solutions. MATTHEW M. MERRITT (to United Shoe Machinery Corp.). U. S. 1,694,447, Dec. 11.

Leather-belt dressing. ALBERT KRUEGER. Can. 285,281, Dec. 4, 1928. A leather-belt dressing comprises 10 parts of linseed oil, 12 parts of chlorinated lime and 2 parts each of CaCO_3 and eucalyptus oil.

Ornamenting fish skins. H. V. ANDREW and G. BETJEMANN & SONS, LTD. Brit. 289,213, March 7, 1927. Fish skins such as those known as "shagreen" when finished are ornamented to produce the effect of the natural markings which disappear in the cleaning process, by applying color through a suitable stencil to the back of the skin and mounting it on a light-colored background and then grinding down the skin to reduce its thickness so that the pattern shows through because of the translucence of the skin.

Imitation leather. H. W. ROWSELL, W. JANVIER and SHAMMY CO., LTD. Brit. 289,592, Feb. 24, 1927. A soft absorbent fabric such as flannelette is dyed and finished and then treated with a soln. of an albumin and a tanning soln. such as tannic acid. The tanning may be repeated.

Thickener for animal glue, particularly veneering glue. LUDWIG ZINSSER. Swiss 126,201, Dec. 30, 1926. The thickener comprises an intimate mixt. of wood meal and powd. mineral substances such as chalk.

30—RUBBER AND ALLIED SUBSTANCES

C. C. DAVIS

Modern developments in the rubber testing laboratory. T. L. GARNER. *India Rubber J.* 76, 705-9(1928).—Various types of app. are described and illustrated.

C. C. DAVIS

Determination of the specific gravity of rubber mixtures. ST. REINER. *Gummi-Ztg.* 43, 371(1928).—Comments on a paper by Stoll (cf. *C. A.* 23, 544). The methods

suggested by R. are claimed to be convenient and satisfactory. Reply. L. STOLL. *Ibid* 371.

C. C. DAVIS

Determination of the specific gravity of rubber mixtures. P. ZILCHERT. *Gummi-Ztg.* 43, 310, 312(1928); cf. Stoll, C. A. 23, 544.—A convenient method for detg. the d. of small samples (e. g., 0.05–0.10 g.) is the use of a series of I-KI solns. of different concns., i. e., of different d., in which the samples can be immersed. For larger samples (e. g., 3–5 g.) the well-known method of using a Jolly balance is recommended.

C. C. DAVIS

Critical comments concerning carbon black for rubber mixtures. F. KIRCHHOFF. *Gummi-Ztg.* 43, 309–19(1928).—A discussion of the chem. compn. of com. blacks, in which recent papers of Esch (cf. C. A. 23, 306) and Beaver and Keller (cf. C. A. 22, 3802) are discussed critically.

C. C. DAVIS

Absorption of the vapors of liquids by rubber. WLČECK. *Gummi-Ztg.* 43, 310 (1928).—In view of recently published expts. of Reiner (cf. C. A. 23, 544) brief reference to similar but unpublished expts. of W. is made. In an atm. satd. with benzene or with benzine, rubber absorbed up to about 300 and 150%, resp., of its own wt. at ordinary temp.

C. C. DAVIS

Absorption of the vapors of liquids by rubber. ST. REINER. *Gummi-Ztg.* 43, 870 (1928).—Comments on a paper by Wlček (cf. preceding abstr.).

C. C. DAVIS

Vulcanization of latex. PHILIP SCHIDROWITZ. *Rubber Age* (N. Y.) 24, 263–4 (1928).—The process embodied in a recent patent of S. (cf. U. S. Patent 1,682,857, C. A. 22, 4008) is described in detail, with examples of its application.

C. C. D.

Paving blocks comprising rubber composition layers or other materials (Brit. pat. 288,896) 20. Paving blocks faced with rubber or other plastic material (Brit. pat. 289,087) 20. Polymerization of oil of turpentine [for use in the rubber industry] (Fr. pat. 639,726) 26. Waterproofing (Ger. pat. 467,326) 25. Sulfur compounds [for rubber vulcanization] (Can. pat. 284,056) 10.

SOARES, JOSE CARLOS DE MACEDO: *Le Caoutchouc: Etude Economique et Statistique*. Paris: A.-D. Cillard. 164 pp. Reviewed in *Rubber Age* 24, 205(1928).

Treating rubber latex. J. MCGAVACK and R. A. SHIVE (to Naugatuck Chemical Co.). Brit. 288,268, April 8, 1927. Latex having a p_H of 4.5 to 7 is stabilized by sulfonic alkyl aryl reaction products such as the product obtained in the presence of H_2SO_4 or chlorosulfonic acid from cinnamic acid and $BuOH$, or p -cresol and oleic acid, or anthracene or naphthalene and $PROH$ or the like. "Twitchell compds." may be used. Details are given, and the product is stated to dry more rapidly than alk. latex and to be more rubbery and more plastic on the mill.

Preserving latex. I. G. FARBERIND. A.-G. Brit. 289,022, April 20, 1927. Premature coagulation of latex is prevented by addn. of water-sol. neutral or alk. salts of ester acids such as Na dicresylphosphate, K methylsulfate or NH_4 diphenylphosphate. Other preservatives such as NH_3 , amines and alcs. also may be added. Cf. C. A. 22, 1705.

Spray-drying latex. J. E. NYROP. Brit. 289,583, Feb. 15, 1927. Latex is sprayed into a heated gaseous medium by app. such as that described in Brit. 259,922 and anti-coagulating or anti-agglutinating agents such as soap are simultaneously sprayed without being previously mixed with the latex. Softeners, fillers, vulcanizing agents, etc., may also be added by spraying.

Rendering rubber resistant to aging. ALBERT M. CLIFFORD (to Goodyear Tire & Rubber Co.). U. S. 1,694,529, Dec. 11. Rubber is incorporated with a small proportion (suitably about 1–5%) of β,β -dinaphthylamine or other suitable compd. of the general formula $RR'NH$, in which R and R' are similar naphthylene radicals.

Ornamenting sheet rubber with a printing apparatus. IOCO RUBBER & WATER-PROOFING CO., LTD., A. RYAN and J. KIRKWOOD. Brit. 288,411, Feb. 21, 1927. An unvulcanized rubber sheet is backed with a glazed or faced sheet and treated in a printing app. of the calico-printing type and then passed over steam-heated drying plates. This treatment is suitable for material used for making hot-water bottles or the like.

Thin-walled rubber articles. I. DOROGI, L. DOROGI and DOROGI ES TARSA GUMMIGYAR R.-T. Brit. 288,541, April 11, 1927. The extensibility of dolls or other toys or thin-walled rubber articles is reduced by applying to them a flexible lacquer-like coating (either on the exterior or interior of the articles) preferably contg. a cellulose deriv. which reduces the stretching capacity by at least half. Various details are described.

Puncture-filling composition. B. G. HARRINGTON and R. S. MASON. Brit. 288,917, Nov. 3, 1927. Finely powd. silica 40, alumina 40, mica 10 and soapstone

10% are uniformly mixed with water and evapd. crushed and sifted. Coarse mica, ocher or "gilt dust" may be added.

Rubber composition for sealing joints in can ends, etc. AMERICAN CAN CO. Brit. 289,270, May 28, 1927. Latex is mixed with NH_4 alginate or other suitable "alginic material" and with a "body material" such as calcined Al_2O_3 . Other substances such as sapond. beeswax and NH_3 may also be added.

Liners for use between rubberized fabrics. L. B. SEBRELL (to Goodyear Tire & Rubber Co.). Brit. 288,244, April 6, 1927. Material suitable for use between freshly prep'd. rubber coated fabric such as that used for making pneumatic tires consists of fabric coated with nitrocellulose compn. contg. a softening agent such as diethyl phthalate, dibutyl phthalate, diamyl phthalate, tricresyl phosphate or castor oil. The softening agent may be applied to the fabric after the nitrocellulose coating is applied by spraying or dipping.

Preserving the interior surfaces of air bags formed of rubber. STEWART S. KURTZ JR. (to Goodyear Tire & Rubber Co.). U. S. 1,694,879, Dec. 11. A soln. contg. glycerol and a drying oil such as rapeseed or linseed oil is introduced into the interior of bags such as those used in vulcanizing pneumatic tires.

Rubber sheet material. H. BROOMFIELD. Brit. 288,354, Dec. 7, 1926. A sheet material suitable for use in the manuf. of footwear is formed of raw rubber, fillers such as ground vulcanized rubber, lithopone, ZnO , vulcanizing agents and fibers, with a cell-producing agent such as water or $(\text{NH}_4)_2\text{CO}_3$, without use of naphtha or other softening agent which would cause rupture of the cells. A compn. is specified which may be vulcanized at atm. pressure at a temp. of 90–120°. Various details and modifications are described.

Recovery of used rubber. MAURICE DIT RENÉ GATTEFOSSÉ and SOC. FRANÇAISE DE PRODUITS AROMATIQUES (Anciens établissements Gattefossé). Fr. 636,641, Oct. 20, 1926. Used rubber is boiled with an ester such as an acetate, butyrate, or formate of an alc. such as cyclohexanol, or an ether such as benzyloxy-amyl- or -butylcineole, and filtered. The ether is recovered by washing with an alc. or other solvent in which the ether is sol. but not the rubber.

Reclaiming rubber. JOHANN TENGLER. Can. 284,014, Oct. 16, 1928. Pulverized old rubber is mixed with hydrogenated hydrocarbons, *e. g.*, hydronaphthalene, and is subjected to pressure and heat, whereby the H in the hydronaphthalene combines with the S in the vulcanized rubber deposit and is removed as H_2S . Further hydrocarbon is added, *e. g.*, benzine and high pressure and heat are applied and the complete soln. of the mass is obtained. The naphthalene formed from the hydrogenated naphthalene is removed by freezing out. Vulcanization is then effected with natural S by subjecting the mass for a long time to high pressure and heat, whereby hardening of the mass occurs. The mass recovered is suitable as a binding medium for colors, varnishes, cements, etc.

Vulcanizing rubber latex. I. G. FARRENIND. A.-G. Brit. 288,206, April 4, 1927. Latex is vulcanized by successive treatment with SO_2 and H_2S (coagulation being prevented by a medium such as a condensation product from C_{10}H_8 , CH_2O and H_2SO_4 or sulfonic acids of alkylated naphthalenes or sulfonation products of oils, naphthenic or fatty acids or the like).

Vulcanizing rubber. RUBBER SERVICE LABORATORIES CO. Brit. 286,749, Oct. 6, 1926. Accelerators are produced by combining mercaptans or mercapto compds. with org. bases other than guanidines, *e. g.*, with aldehyde-ammonia reaction products such as $(\text{CH}_2)_6\text{N}_4$, which gives a resinous product when heated with mercaptobenzothiazole. Biguanide, guanyl ureas, isoureas, thioureas, and isothioureas may be used, and various examples are given. Cf. C. A. 23, 310.

Vulcanizing rubber. RUBBER SERVICE LABORATORIES CO. Brit. 287,001, Oct. 6, 1926. Vulcanization accelerators are produced by combining the reaction product of a mercaptan or mercapto compd. and an org. base with an aldehyde, *e. g.*, mercaptobenzothiazole is heated with di-*o*-tolylguanidine and the product cooled and ground and treated in a closed vessel or under reflux with crotonaldehyde, aldol, acetaldehyde, propionaldehyde or heptaldehyde. Other examples of the manuf. and use of the accelerators also are given. Cf. C. A. 23, 310.

Apparatus for vulcanizing rubber articles. R. W. SNYDER (to Goodyear Tire & Rubber Co.). Brit. 288,248, April 7, 1927. The articles are carried by a conveyor through an approx. U-shaped chamber holding liquid heated by a steam-jacket. Various structural details are described.

Apparatus for vulcanizing rubber articles in successive procession. HARRY E. WANER (to B. F. Goodrich Co.). U. S. 1,693,264, Nov. 27.

CHEMICAL ABSTRACTS

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No. 4

1—APPARATUS AND PLANT EQUIPMENT

W. L. BADGER

Balance-stand for U-tubes. GERHARD PIATKIEWICZ. *Chem. Ztg.* 52, 842(1928).
J. H. MOORE

The shape of socket-joints and clamps. WILHELM VOLKMANN. *Chem. Fabrik* 1928, 631-3.—Proposed new forms are shown.
J. H. MOORE

Laboratory drainage. ALAN E. MUNBY. *Nature* 122, 773(1928).—Glazed ware is generally used, while research is being carried on with certain alloys of Ni, and with vulcanite.
R. J. H.

Electrofilter in the chemical industry. NACHTWEH. *Chem. Fabrik* 1928, 645.—
Cf. *C. A.* 23, 1. J. H. MOORE

The diameter of the pores and the manner of operation of the Berkefeld filter. H. HORK. *Chem. Fabrik* 1928, 645-6.—Tests were made by measuring the air and H_2O forced through at known pressures and calcg. the diams. by the formulas of Einstein (*C. A.* 18, 1) and of Bechhold (*Z. physik. Chem.* 64, 331). In 1 filter the max. diam. was 3.3μ , and the mean diam. 1.1μ . Since filters with a mean pore diam. of 2μ will safely remove bacteria below 1μ diam. it is concluded that the principal action is one of adsorption.
J. H. MOORE

Ultra-filtration. P. DICKENS. *Chem. Fabrik* 1928, 633.—D. claims Wasmuth has copied features of his filter (cf. *C. A.* 22, 4011).
J. H. MOORE

Increase in efficiency of evaporators and heat exchanging apparatus. HANS WOLLENBERG. *Chem.-Ztg.* 52, 915(1928).—When small spirals are placed in pipes used for conveying fluids, gases and vapors through boilers, condensers, feed-heaters, etc., the exchange of heat is improved. This is due to the fact that a whirling movement is imparted to the particles of the material, thus bringing them into intimate contact with the walls of the pipe. Another advantage is that on account of the whirling movement the deposition of dirt and boiler scale in the pipes is prevented.
G. SCHWOCH

The re-use of evaporator tubes that are corroded at the lower end. BERTHOLD BLOCK. *Korrosion* 3, 41-2(1928).—The corroded portion is cut off and a new piece welded on.
J. H. MOORE

A new device in glass apparatus. I. E. I. LEWIS. *Chemistry & Industry* 47, 1238-41(1928).—An app. in glass or silica devised by Max Haas is described. It is a tight, non-rigid joint made on the ball and socket principle. The advantages are the slight danger of fractures even when different glasses are used, easy erection and dismantling of app., interchangeable joints, and the easy handling of dangerous gases.
ARTHUR FLEISCHER

Titration flask with side compartment to prevent over-titration. J. LINDNER. *Chem.-Ztg.* 52, 868-9(1928).—An Erlenmeyer flask with a closed side-tube attached about half way up and inclined downward at about 45° . Part of the soln. is held in the side-tube as a precaution against over-titration.
J. H. MOORE

A cheap universal siphon. GEORG BEETZ. *Chem.-Ztg.* 52, 868(1928).—There is a cock near the bottom of the outside arm and just above this cock is a short side-arm, with a cock, to which is attached a small injector pump operated by blowing with the mouth to fill the siphon.
J. H. MOORE

New viscometer with double-row radiator system. ERNŐ LASZLÓ. *Chem.-Ztg.* 52, 869(1928).—The app. resembles the Engler app., but attached to the inner walls of the bath are vertical fins that extend inward almost to the sample cup, and under it. This cup also has fins on the outside and bottom to pass between those on the outer vessel. The fins transmit heat uniformly and eliminate stirring.
J. H. MOORE

A new electric heater for extractions, etc. ANON. *Chem.-Ztg.* 52, 869(1928).—The heating element is protected by a casing with openings for air circulation and by standing the flask in a pan to catch the contents if broken. The heat is regulated by a rheostat.
J. H. MOORE

Results of comparative tests of the Hanau ultra-violet ray analysis lamp and the one constructed by Muller. J. WERDER AND C. ZÄCH. *Mitt. Lebensm. Hyg.* 19, 339-40 (1928).—The advantages and disadvantages of both app. are given. The main drawback of the Muller lamp is a deficiency in light intensity, which makes it useless for certain work where a very strong luminescence is an abs. necessity. J. C. JURRGENS

An improved gas-analysis apparatus according to Carpenter. FR. STRIECK. Univ. Würzburg. *Biochem. Z.* 202, 1-4(1928).—An adaptation of the usual gas-analysis app. is described which permits the performance of a duplicate detn. within 15 min. S. M.

Manometers for orifice (gas) meters. M. SCHAAK. *Gas. u. Wasserfach.* 71, 1137-43(1928).—The mechanism of indicating, recording and transmitting (distant recording or indicating) manometers for use with orifice gas meters is described and illustrated. R. W. RYAN

Gas measurement by orifice and proportional meters. WÜNSCH. *Gas. u. Wasserfach* 71, 1107-12(1928).—Various German gas-flow meters are described and illustrated, especially those which depend on by-passing a proportional part of the gas around an orifice, and measuring this gas flow by means of an orifice or other gas meter. Methods of compensating for changing density are illustrated. R. W. RYAN

Apparatus for automatically measuring hydrogen-ion concentration. ARNOLD LASSIEUR. Lab. Municipal de Paris. *Chimie et industrie* 20, 819-22(1928).—An app. has been devised and is described, which is based on the method of Beans and Oakes (C. A. 15, 8). In carrying out the detn. the condenser is first charged from the cell of which the e. m. f. is to be measured, the condenser is discharged through a ballistic galvanometer, the deflection of which measures the e. m. f. of the cell, the oscillations of the galvanometer are dampened by shunting through a suitable resistance (about 7000 ohms) and the two plates of the condenser are short-circuited to remove any residual charge. A special contactor has been devised for carrying out these operations either manually or automatically. A. PAFINEAU-COUTURE

New combustion meter. ANON. *Instruments* 1, 531(1928).—The app. records CO₂ in flue gas, together with either furnace draft or flue gas temp., or both. C. Z. R.

Research air flow indicator. ANON. *Instruments* 1, 527-8(1928).—A portable orifice or Venturi meter app. is described, for use in tests of internal-combustion engines. A motor-driven blower supplies air at low pressure, and the usual water manometer indicates the flow by the pressure drop across the orifice or Venturi tube. The app. is self-contained and adaptable to widely different test conditions. C. Z. ROSECRANS

Research fuel flow indicator. ANON. *Instruments* 1, 528-9(1928).—The flow meter, used for liquid fuel measurement in engine tests, is of the float type. Ranges available are 10 and 12 gallons per hr. C. Z. ROSECRANS

Research twin buret fuel system. ANON. *Instruments* 1, 529-30(1928).—Calibrated burets are described for measurement of liquid fuels used in road or lab. tests of internal-combustion engines. C. Z. ROSECRANS

Flue ashes eliminator. MAX BERGER. *Apparatebau* 40, 270-1(1928).—The "Deuca-Räumer" is made of a special heat-resisting alloy and of such shape that when placed in the flue it gives the gases an increased velocity and spiral motion, thus preventing deposition of ashes in the flue and giving higher heat utilization. J. H. MOORE

Catalytic hydrogenation apparatus. ANON. *Instruments* 1, 537-8(1928).—A flint glass bottle in which the reaction proceeds is shaken by an elec. motor. A H₂ tank equipped with a pressure gage is mounted on the base, and supplies H₂ for the reaction during the shaking. Rates of oscillation are 200, 250, or 300 per min. C. Z. R.

Standardization of chemical heavy apparatus. A. TRAUB. *Chem. Fabrik* 1928, 629-30.—T. favors standardization of app. used in all well-established processes. J. H. MOORE

Steam apparatus. M. GRELLERT. *Apparatebau* 40, 217-8, 231-2, 241-2, 253-6, 265-6(1928).—A discussion of steam generators, engines, turbines, exhaust steam heating, pipes and heating coils, super-heating, de-watering lines, with data on generators and H₂O-heaters to operate at 0.5 at. pressure. J. H. MOORE

The steam turbine in the chemical industries. H. STRAUSS. *Chem. Fabrik* 1928, 607-9, 630-1.—A discussion of the most important differences in turbines and the principal conditions affecting a choice. J. H. MOORE

Frame dialyzers. HEIBIG. Société des Filtrés Philippe, Paris. *Russe* 3, 1291-7 (1928).—A polemical discussion of their merits, particularly for the recovery of spent alk. liquors from viscose manuf. A. PAFINEAU-COUTURE

A useful micro-electro dialysis apparatus. ERICH BAHR. *Kolloid.-Z.* 46, 176-8 (1928).—The method is given of constructing and using a micro-electro dialyzing app. having a parchment membrane at the cathode and a chrome-gelatin membrane at the

anode. Construction is simple and from common lab. material. The app. is useful for various types of colloidal materials and has been used in physiol. studies. L. F. M.

The "Drayton" differential humidity regulator. ANON. *Engineering* 126, 635 (1928).—Controlling humidity under varying conditions of temp. is the task of the "Drayton" differential humidity regulator made by the Drayton regulator and Instrument Co., Ltd., West Drayton, Middlesex, England. The regulator is constructed so that the setting of a wet-bulb control is altered in a definite relation to any variations in the dry-bulb temp. which may occur, thus maintaining const. relative humidity at all temps. (illustrated with view and diagram). W. C. EBAUGH

The influence of a dust film on the efficiency of regenerators. A. SCHACK. *Z. tech. Physik* 9, 390-8 (1928).—In an ideal regenerator (perfect heat conduction by bricks, high brick weight or sp. heat) the heat recovered per hr. is $Q = k(t - t')$ with the heat transfer value $k = 1/[(1/\alpha) + (1/\alpha')]$; α and α' are, resp., heat transfer coeffs., for waste gas-brick and brick-air, t and t' are time averages of waste gas and air temp. If the time averages of the brick temp. t_s and t'_s during gas and air periods, resp., are unequal $Q = k(t - t_s) + (t_s - t')$. This holds for an actual regenerator and can be represented by a smaller value of k : $k_s = k\{1 - [(t_s - t'_s)/(t - t')]\}$. In the original equation $Q = k_s(t - t')$. The customary assumption of sinusoid temp.-time curve in a regenerator is unreal; it would give the ideal condition $t_s = t'_s$. For the case of a dust film, covering the regenerator brick, sp. heat of the film being zero, and the brick having a conduction $\lambda = \infty$, is calcd. the influence on k_s . The expression found for the efficiency is $k_s/k =$

$$\frac{(cs\gamma/\alpha\tau_0)}{1 - e^{-\alpha\tau_0/cs\gamma(1 + \alpha\delta/\lambda)}} - 1/2$$

The two factors $\alpha\tau_0/cs\gamma$ (I) and $\alpha\delta/\lambda$ (II) (c is sp.

heat of brick in kg. cal. per kg. per degree centigrade, s thickness of brick in m., γ is sp. wt. of brick in kg. per cu. m., α heat transfer coeff. in gas period or air period, to length of full reversal cycle in hrs., δ thickness of dust film in m., λ heat cond. of film in kg. cal. per m., hr. and degree) which det. the quotient k_s/k have been used to plot a set of curves for the efficiency (I from 0 to 2.0, II from 0 to 0.5) and numerical examples are worked out. For $\delta = 0.002$ m., $\lambda = 0.1$, $\alpha = 10$, $c = 0.25$, $s = 0.06$, $\gamma = 1500$, $\tau = 1$ hr., $k_s = 0.81 k$, i. e., a drop in efficiency of 19%. For a 5-mm. film the drop would be 34%. High values of I tend to lower the quotient even if $\delta = 0$. For a value of I = 1.5 (practical for blast-furnace stoves) the quotient $k_s/k = 0.85$, because of the approach of gas and brick temp. at the end of the cycle. The values derived from the equation are in reality a little too high due to finite conductivity of the brick; for other reasons, however, they might be on the low side. For unequal gas and air reversal periods the same results can be used if ϵ is substituted for k , ϵ or ϵ_s being defined by $\epsilon = 1/[(1/\alpha\tau) + (1/\alpha'\tau')]$ and $Q = \epsilon_s(t - t')$ for an actual regenerator.

B. J. C. VAN DER HOEVEN

Apparatus for the production and mixing of solutions by electrical control. F. PETZOLD. *Chem. Fabrik* 1928, 668-9.—An automatic control for a process involving the mixt. of 2 fluids in predetd. amts. is described. J. H. P.

High-temperature automatic regulator with alternating-current relay. MARCEL ANTRUC. *Arts et métiers* 99, 463-8 (1928).—The instrument is based on expansion properties and on the properties of a. c. electromagnets, more particularly on the fact that in a. c. electromagnets with adjustable air gap the intensity of the current is a function of the air gap and within certain limits is proportional to the value of the air gap. The construction, characteristics and operation of the instrument are described.

A. PAPINEAU-COUTURE

Cylinder testing and I. C. C. regulations. H. E. STÜRCKE. *Bull. Compressed Gas Manufacturers Assoc., Tech. Series* 1928, 324-30.—This is the first of a series of articles on the general subject of cylinder testing and regulations pertaining thereto. "The principal objection to the present test methods is the lack of a scientific basis and the failure to correlate pressures, stresses and strains in a satisfactory manner." A principle overcoming these deficiencies is applied in the Linde acceptance tests. A two-fold application on this principle is summarized. (1) A cylinder of given water capacity, ratio of diams., fixed form of ends (top and bottom) must at a given pressure give a specific amt. of elastic volumetric expansion. If 4 of these factors are known together with certain consts. the fifth value can be calcd. Thus the elastic volumetric expansion is a reliable criterion for the form strength of the cylinder. The expansion tells the story and its proportionality to the pressure eliminates the need of stressing a cylinder to or near the elastic limit to get an est. of its form strength. (2) This accurate information about form strength permits detn. of the wall fiber stress that equals or ex-

ceeds the elastic limit of the material. Variations in wall thickness are a serious problem. When the water-jacket test can be conducted so as to avoid an error in excess of 1% the Linde acceptance test is practicable. The water-jacket test measures directly the elastic volumetric expansion of a cylinder. "A complete change of the regulations about the hydrostatic test seems inevitable. The inconsistencies and the hazardous character of the allowance of 10% permanent expansion, the inaccuracies of the data supplied by the water-jacket test as practiced today, and the failure to gain any real worth while information from this test, are too glaring to be tolerated indefinitely."

W. H. BOYNTON

Device for identifying colors. W. C. HOLMES. *Chemicals* 30, No. 21, 31 (Nov., 1928).—Investigations made by the Color and Farm Waste Div. of Dept. of Agr. in coöperation with the Comm. on Standardization of Biological Stains disclose the fact that the spectrophotometer gives better results than the colorimeter. Detn. of suitable spectrophotometric ratio affords an extremely convenient means for disclosing the nature of the sample when the dyes under examn. are of closely related structure; e. g., 4 homologs of basic fuchsin. Relative proportions of each homolog can be ascertained. An attempt to prep. an Al lake for quant. consideration as well as a colored B compd. was not entirely satisfactory. Spectrophotometric analysis of gases evolved in the reaction of HCl and HNO₃ furnished promising results. Detn. of p_H and dissocn. consts. of indicators have been studied by the method advocated. H. maintains that the spectrophotometer has proved more convenient and accurate than the colorimeter, even in instances when the latter is reasonably reliable. Further, it proves reliable in many cases in which the colorimeter is misleading.

FREDERICK G. GERMUTH

Oils, greases and high vacua (BURCH) 22. Apparatus for separating CH₄ from natural gas or other gases from mixtures by regulated liquefaction (U. S. pat. 1,694,308) 13. **Ultrafilter membrane (U. S. pat. 1,693,890) 23.**

STOTT, VERNEY: Volumetric Glassware. London: H. F. & G. Witherby. 20s. Reviewed in *Intern. Sugar J.* 30, 609; *Pharm. J.* 121, 454 (1928).

Thermometer tubes. ALFRED T. HESPE. U. S. 1,696,400, Dec. 25. Mech. features.

Thermocouple and electric system for indicating temperatures. FERNALD S. STICKNEY (to Westinghouse Elec. & Mfg. Co.). U. S. 1,695,867, Dec. 18.

Electric apparatus for temperature control. ALBERT W. HULL (to General Electric Co.). U. S. 1,694,264, Dec. 4. An app. is specified suitable for regulating the temp. of furnaces, ovens, etc.

Electric temperature-indicating system suitable for attachment to pipes. EDWARD A. ROLLINS. U. S. 1,695,295, Dec. 18.

Temperature-indicating device suitable for automobile radiators. STANLEY F. BARKER. U. S. 1,695,838, Dec. 18.

Heat-indicating device for indicating the temperature of internal-combustion engines, etc. HENRY C. HEBIG (to Harrison H. Boyce). U. S. 1,693,984, Dec. 4.

Thermoelectric pyrometer. J. L. ORCHARD and CAMBRIDGE INSTRUMENT CO., LTD. Brit. 290,493, Sept. 14, 1927. Structural features.

Electrical recording device suitable for use with balances, manometers, etc. WILLIBALD SIEBERS. U. S. 1,695,668, Dec. 18.

Air filter and moistener. GEORG SUPANZ. Austrian 109,250, Nov. 15, 1927. Constructional details.

Oil filter. EUGENE M. SCOVILLE (one-half to Floyd L. Swanberg). U. S. 1,696,735, Dec. 25. Structural features.

Cylindrical filtering apparatus for milk or other liquids. ANDREW WUEST. U. S. 1,693,741, Dec. 4. Structural features.

Filter for benzene, oils, etc. SVENSKA ACKUMULATOR AKTIEBOLAGET JUNGNER. Fr. 639,923, Aug. 23, 1927.

Rotating filtering drums. R. WOLF A.-G. Fr. 640,551, Aug. 27, 1927.

Filter grids. SOCIÉTÉ ANON. DES ÉTABLISSEMENTS THUILLIER-LEFRANT. Fr. 640,458, Sept. 5, 1927.

Apparatus for separating impurities such as oil and water from air. CLYDE C. FARMER (to Westinghouse Air Brakes Co.). U. S. 1,693,646-7, Dec. 4.

Apparatus for separating mineral substances by stratification on an air-pervious table. E. DAVIS (to R. Peale and W. S. Wallace). Brit. 290,276, May 12, 1927.

Extrusion press for expressing liquids from solids. H. J. L. DUNLOP and A. J. SIBBALD. Brit. 289,954, Feb. 4, 1927. A press is described which may be used for expressing oil from palm kernels.

Apparatus for separating oil, gas, sand and water by settling and scrubbing. DAVID G. LORRAINE. U. S. 1,693,849, Dec. 4.

Electric discharge devices. VEREINGTE GLÜHLAMPEN- UND ELEKTRICITÄTS A.-G. Brit. 289,762, April 30, 1927. Cathodes for discharge tubes such as radio valves, rectifiers and Röntgen-ray tubes are coated with alk. earth metals or their oxides by introducing into the tube an alloy of the alk. earth metal not oxidizing in air (*e. g.*, a Ba-Mg alloy) and decomposing the alloy *in vacuo* and vaporizing it partially or completely to form a thin deposit on the core wire of the cathode. A method of producing the alloys used from fused baths electrolytically is also described. Brit. 289,763 specifies cathode cores of Pt, Ni, Cu, Cr-Ni or the like coated with Ba or of W or Mo coated with Th. The coating may be formed from metal vaporized by elec. heating of a mixt. of oxide or hydroxide of Ba or Th with Mg in the evacuated device, or an aq. colloidal soln. of Ba(OH)₂ or Sr(OH)₂ may be coated on the anode and reduced by vaporization of a fragment of Mg positioned adjacent. If the anode cannot be heated sufficiently directly addnl. heat may be furnished by an exothermic reaction such as that of Fe oxide with Al or Mg.

Electric discharge tubes containing rare gases and suitable for use as lightning arresters, etc. DR. G. SEIBT FABRIK ELEKTRISCHER UND MECHANISCHER APPARATE and A. SALOMON. Brit. 290,561-2, May 14, 1927. Structural features.

Mercury-arc discharge device. VLADIMIR K. ZWORYKIN (to Westinghouse Elec. & Mfg. Co.). U. S. 1,696,023, Dec. 18.

Cathode for discharge tubes. ERICH F. HUTH G. M. B. H. Ger. 467,675, Sept. 1, 1921. The cathode is made from a mixt. of a refractory material with one or more oxides or chlorides of metals of the 2nd and 8th periodic groups. In an example, the cathode is made from a mixt. of SrO 60, BaO 30 and PdCl₂ 10% mixed with 19 times its wt. of a refractory such as W or Mo.

Filaments for electron discharge devices. FREDERICK HOLBORN (to De Forest Radio Telephone & Telegraph Co.). U. S. 1,695,687, Dec. 18. Cathodes are used comprising Fe and Li.

Oxide cathodes for electron tubes. RADIOWERK F. SCHRACK. Austrian 109,261, July 15, 1927. The oxide film is brought on to its support from a mist produced by atomizing a soln. or suspension of a suitable alk. earth compd., *e. g.*, an alc. suspension of SiCO₃, from which the oxide is then produced by heating *in vacuo*.

Cathodes for electron tubes. GEORG SEIBT, FRITZ SEIDEL and HELLMUTH BLEY. Ger. 466,075, Aug. 5, 1924. A metal wire or grid is coated with one or more preheated alk. earth sulfides; a mixt. of CaS and BaS with 20-50% BaS is mentioned.

Electron-emitting elements. LEON McCULLOCH (to Westinghouse Elec. & Mfg. Co.). U. S. 1,695,899, Dec. 18. Filaments are coated with an aq. soln. of at least one compd. contg. an alk. earth metal (*e. g.*, Ba or Sr nitrate) and subsequently heated to ignition temp. in CO₂. An app. is described.

Stereoscopic Röntgen-ray apparatus. F. BORNHARDT. Brit. 290,619, May 18, 1927.

X-ray shield. PHILLIP E. HARTH (to The National Pigments and Chemical Co.). Can. 284,593, Nov. 6, 1928. A compd. composed of 75 to 95% of a mixt. of powd. BiSO₄, 73% of which will pass through an 800-mesh screen and 100% through a 325-mesh screen, and 25 to 5% of powd. bakelite, 98% of which will pass through a 200-mesh screen, is heated under pressure to mold the desired articles. A temp. of 800° F. and a pressure of 25 tons per sq. inch are suitable. Boards composed of sheets of fabric impregnated with bakelite and layers of the above compound may be built up to the desired thickness and heated under pressure and such boards used to line x-ray rooms. Powd. bismuth and finely ground metallic lead may also be used and other binders such as hard rubber or China wood oil, after being boiled at 660° F., in order to polymerize it, may be used.

Thermionic valves. NAAMLÖÖZE VENNOOTSCHAP PHILIPS' GLÜHLAMPENFABRIKEN. Brit. 289,975, Feb. 9, 1927. To prevent the deposition of a "getter" such as Ca or other electropositive metal, on the electrodes, a screen is interposed between the latter and a device, such as a W helix, contg. or coated with the metal which is to be evolved when the helix is heated (the helix acting as a cathode).

Thermionically active cathodes. GEORGE W. HALLOCK (to Westinghouse Lamp Co.). U. S. 1,695,845, Dec. 18. Cathodes for thermionic discharge devices are formed with an elec. conductive core comprising an alloy of Ni and Si (suitably in the proportions of 97 and 3%, resp.). Some Mn also may be present.

Thorium-coated filaments. JOHN W. MARDEN, JOHN E. CONLEY and THOMAS P.

THOMAS (to the Canadian Westinghouse Co., Ltd.). Can. 284,951, Nov. 20, 1928. Filamentary material of W, Mo or other similar material has applied thereto a pure coating of Th. Cf. C. A. 22, 2860.

Photosensitive cell. SAMUEL RUBEN. U. S. 1,694,189, Dec. 4. An elec. discharge tube with a cathode and anode contains a control element of cuprous oxide which is used as a grid coating. U. S. 1,694,190 specifies a photoelec. cell with a control element comprising a metal body such as Ag or Mo carrying on its surface a photosensitive compd. of the O series of the sixth periodic group, such as Mo sulfide, Ag sulfide or Ag selenide.

Evaporators. AKTIEBOLAGET SVENSKA MASKINVERKEN. Fr. 640,772, Sept. 12, 1927. An evaporator for liquids, particularly waste cellulose lye and salt solns., consisting of a hollow heater turning on a horizontal axis in a vessel contg. the liquid, is described. Cf. C. A. 23, 313.

Inclined evaporator with cylindrical shell and steam-heated internal tube system. J. HOLMES and H. A. KINGCOME. Brit. 289,717, Nov. 1, 1927. Structural features.

Apparatus for crystallizing salt, etc. F. JEREMIASSEN. Brit. 290,369, Feb. 14, 1927. A circulating soln., supersatd. by evapn. or cooling, flows down through a channel passed through a collection of granules, near the bottom of which there is directed upwardly from a pipe a portion of the soln. which is not more than slightly supersatd. so that the soln. then flows in an upward direction through the granules to deposit the crystals. Various details of construction are specified.

Crystallization apparatus and the like. AUGUST GRÄNTZDÖRFFER. Fr. 640,014, Aug. 25, 1927. The leading-in pipe for liquids in crystn. or vacuum boiling pans ends in several vertical tubes under the surface of the liquid and the outlets are facing outwardly so that added liquid becomes heated to the temp. of the liquid in the pan before mixing, and is then thoroughly mixed.

Mixer for two or more substances such as coal and ore. HJALMAR ERIKSSON. Fr. 640,351, Sept. 1, 1927.

Driving means for vibrating sieves, particularly for coal and ores. WILHELM SELTNER. Austrian 109,217, Nov. 15, 1927. Constructional details.

Centrifugal grinder. FIRMA KITTAY & Co. Austrian 109,241, Nov. 15, 1927. Constructional details.

Colloid mill. ANDREW FRASER. U. S. 1,696,083, Dec. 18. Structural features.

Cooler for liquids. ANNE TIPPMAR (NÉE VOSS). Ger. 466,132, Nov. 13, 1927. An app. for air-cooling liquids comprises an arrangement of grids and riffles; the cooling of beer is mentioned.

Apparatus for pasteurizing and cooling milk or other liquids in bulk. G. ROTTGER. Brit. 290,615, May 17, 1927.

Apparatus for sterilizing milk or other liquids in containers carried in perforated baskets. NAAMLooZE VENNOOTSCHAP HUYGEN & WESSEL'S INGENIEURS-BUREAU. Brit. 290,555, May 14, 1927.

Device for delivering liquids. ALFRED HOCHSTRASSER. Austrian 109,262, Sept. 15, 1926. A device for delivering predetd. amts. of liquid at predetd. intervals of time is described, the device being operated by the pressure generated by heating the liquid in a closed container.

Apparatus for supplying boiler feed water or other liquids in regulated quantities regardless of variations in level in the supply tank. ERICH ROUCKA. U. S. 1,695,471, Dec. 18.

High and low water alarm device for boilers, etc. J. GORDON & Co., LTD., and C. H. ARMSTRONG. Brit. 290,114, Nov. 8, 1927.

Surface condenser for large quantities of vapors. ALLGEMEINE ELEKTRICITÄTS GRS. Ger. 466,029, May 12, 1926. Constructional details.

Device for immersion in liquids to take samples of the liquids. H. L. R. BELL. Brit. 290,758, Feb. 23, 1927. Structural features.

Drying apparatus. N. G. WEISBRUT. Russ. 3615, Sept. 30, 1927. A drying oven is heated by circulating hot air. The dried goods are sorted out by sieves of different mesh placed in the oven.

Inclined rotary drying apparatus for treating cotton or other materials. SHERWOOD GREEN. U. S. 1,695,652, Dec. 18.

Roller press for briquet manufacture. HUGO APFELBECK. Austrian 109,225 and 109,236, Nov. 15, 1927. Constructional details.

Roller press for briquet manufacture. MASCHINENBAU A.-G. VORM. BREITFELD, DANEK & Co. and WILLIBALD GELINER. Austrian 109,218, Nov. 15, 1927. Constructional details.

Apparatus (with a series of troughs and rotary scoops) for drying coal, cereals or other materials. J. H. RICE. Brit. 290,776, March 14, 1927.

Electric control system for regulating heating, filling and emptying of containers or similar operations. LEWIS B. SWIFT (to Taylor Instrument Companies). U. S. 1,693,877, Dec. 4.

Apparatus for testing hardness of materials. C. H. WILSON. Brit. 290,729, Feb. 18, 1927. A generally automatic app. is specified similar to that described in Brit. 277,517 (C. A. 22, 2497) but especially suitable for dealing with large or heavy objects.

Apparatus (and system of utilizing electric resistance) for determining and indicating hardness of materials. R. ESNAULT-PELTERIE. Brit. 289,960, Feb. 4, 1927.

Apparatus for casting in refractory molds. ERLE J. BYERLEIN. U. S. 1,696,670, Dec. 25.

Mold for high-temperature casting of refractory materials. KARL E. PEILER (to Hartford-Empire Co.). U. S. 1,696,688, Dec. 25. Fused silica 80-85 (of which a material portion is amorphous and which is comminuted to a fineness of at least 20 mesh) is mixed with comminuted lime 20-15 parts, sufficient water is added for dry pressing, the mixt. is molded by dry pressing and is hardened by heat in the presence of steam.

Apparatus for gas analysis. SOC. L'AIR LIQUIDE (SOC. ANON POUR L'ÉTUDE ET L'EXPLOITATION DES PROCÉDÉS G. CLAUDE). Brit. 290,259, May 11, 1927.

Cover construction (and apparatus for handling the covers) for gas purifiers. WHES-SON FOUNDRY & ENGINEERING CO., LTD. and R. L. CHAMBERS. Brit. 290,793, April 1, 1927.

Apparatus (with stirrer blades and water vapor injectors) for purifying furnace gases or other gases. D. RADULESCU. Brit. 289,825, May 2, 1927. The stirrers may comprise 3-6 pairs and may exert suction and may be oppositely disposed to produce eddy effects.

Gas burner construction. HARRY E. DICKINSON. U. S. 1,696,840, Dec. 25.

Gas burner construction. ERNEST A. HALL and GORDON E. BURNS (to Hall Mfg. Co.). U. S. 1,695,548, Dec. 18.

Gas burner construction. JOHN HARRIS (One-half to James R. Rose). U. S. 1,695,587, Dec. 18.

Automatic cut-off for gas burners. J. TUREK and W. TIROCKE. Brit. 289,738, Dec. 19, 1927. A device is described which cuts off the gas by the action of clockwork when the flame is accidentally extinguished.

Heater. THEODOR POPESCU, ALEXANDER PAIS and CONSTANTIN PAIS. Austrian 109,213, Nov. 15, 1927. Constructional improvements are described for a heater (for use in the explosives, oil and alc. industries) which comprises 2 metal blocks provided with a system of interconnected passages charged with a heated volatile liquid.

Heat-exchange apparatus. D. W. BERLIN. Brit. 290,868, Aug. 18, 1927. Structural features of an app. with interlocked corrugated walls.

Heat-exchange apparatus. J. KARMAZIN. Brit. 290,471, July 26, 1927.

Heat-exchange device. C. W. STANCLIFFE. Brit. 289,912, Jan. 6, 1927.

Heat exchanger. ALLGEMEINE ELEKTRIZITÄTS GES. Ger. 466,199, Feb. 18, 1927. Means is described for steadying the tubes of a heat exchanger of the type comprising tubes passing loosely through intermediate supports.

Heat exchangers. COMPAGNIE DES SURCHAUFFEURS. Fr. 640,090, Aug. 27, 1927.

Furnaces. AUGUSTE WINKLER & SOC. WILTON POUR L'EXPLOITATION DES PROCÉDÉS CHIMIQUES ET FOYERS BREVETÉS S. G. D. G. Ger. 467,426, Dec. 25, 1924. Constructional improvements are described in the means for admitting an air-steam mixt. to the fire chamber of a smoke-consuming furnace.

Furnace with several compartments for the distillation of coal, etc., at low temperatures. SOCIÉTÉ DE RECHERCHES ET DE PERFECTIONNEMENTS INDUSTRIELS. Fr. 640,770, Sept. 12, 1927.

Furnace for the distillation of coal, etc., by treating it with gas or superheated steam. SOCIÉTÉ DE RECHERCHES ET DE PERFECTIONNEMENTS INDUSTRIELS. Fr. 640,771, Sept. 12, 1927.

Charging furnaces. DEMAG AKT.-GES. Ger. 468,706, Mar. 1, 1927. The charging app. for tilting furnaces, particularly elec. fusion furnaces, is so arranged that it engages with the furnace opening and is tilted by tilting the furnace.

Muffle furnace. V. E. GRUM-GRZHUJMALO. Russ. 3995, Nov. 30, 1927.

Rotating furnace. MAX GENSBAUR. Fr. 639,920, Aug. 23, 1927. The charge of cement or ores mixed with fuel is introduced in pieces, preferably sausage-shaped, instead of as powder. The mouth of the furnace is suitably enlarged.

Rapidly rotating furnace and accessory plant. GOTTFRIED TRUMPLER. Swiss 126,066, May 1, 1927. Constructional details.

Continuously operating rotary furnace. LUIGI TOCCO and MICHEL LANDI. Swiss 126,067, June 12, 1926.

Rotary-hearth furnace with tiltable trays. ORA A. COLBY (to Westinghouse Elec. & Mfg. Co.). U. S. 1,695,883, Dec. 18.

Shaft furnaces. PAUL KESKAMP. Can. 285,440, Dec. 11, 1928. Charging materials are crushed and have intimately mixed therewith furnace dust, and the mixt. is blown by non-oxidizing gases into a shaft furnace above the smelting zone.

Automatic feed for shaft ovens, particularly for gas generators. RUDOLF MOLLER. Ger. 466,229, Mar. 6, 1927. Constructional details.

Burner for vaporized liquid fuel. LOKOMOTIVFABRIK KRAUSS & CO. AND OSTERREICHISCHE EISENBAHN VERKEHRANSTALT. Austrian 109,212, Nov. 15, 1927. Constructional details.

Atomizing burner for liquid fuels. GEORG MULLER. Ger. 466,227, Mar. 18, 1927. Constructional details.

Atomizing burner for heavy liquid fuels. FRANÇOIS GRANDMAGNAC. Ger. 466,226, Feb. 10, 1927. Constructional details.

Burners for heavy oils. AGNAN DURAND. Fr. 640,301, Aug. 31, 1927.

Oil burner. D. D. SOROKIN. Russ. 3694, Sept. 30, 1927.

Oil burner. G. A. BIRYUKOV. Russ. 3695, Sept. 30, 1927.

Mechanical oil burners. A. I. KOTLYARENKO, P. I. KOTLYARENKO and V. I. KOTLYARENKO. Russ. 4072, Nov. 30, 1927.

Furnace burning pulverized solid or liquid fuel. GASIFIED FUEL LIMITED. Fr. 640,555, Sept. 1, 1927.

Retort. DOUGLAS RIDER (to The Thermal Industrial Chemical Research Co., Ltd.). Can. 284,810, Nov. 13, 1928. A vertical retort having a vertical conveying screw of shallow thread to ensure approximation to film distn. conditions and allow of even heat treatment of all particles of material between the threads is specified.

Sintering apparatus. THOMAS M. ALEXOVITS (to John E. Greenawalt). Can. 285,230, Nov. 27, 1928.

Lamp for heating thermo-batteries. A. I. IOFFE. Russ. 3626, Sept. 30, 1927.

Mechanical stoker. JOSEF MUCHKA. Austrian 109,467, Dec. 15, 1927. A reciprocating trough is provided for the removal of ash.

Electric control (responsive to pressure and temperature changes) for feeding fuel to furnaces. CHARLES H. QUINN. U. S. 1,695,606, Dec. 18.

Apparatus for feeding powdered solids in predetermined amounts. I. G. FARBERIND. A.-G. (Waldemar Berger, inventor). Ger. 467,636, June 5, 1927. The app. comprises a vertical container closed at the bottom by a peripherally perforated plate adapted to slide on a disk having openings of variable size which can be made to register with the perforations in the plate.

Mechanical coal feed for annular kilns. HARRY KLOSTERMEYER and ALBERT KLOSTERMEYER. Ger. 467,458, Aug. 14, 1927. Constructional details.

Fuel-feeding means for annular kilns having an oscillating shovel under the fuel container. ANTON CHMELICEK. Ger. 466,192, Feb. 22, 1927. Constructional details.

Kilns for lime, cement, etc. LUDWIG RIEDHAMMER. Ger. 466,191, July 15, 1927. The kiln is divided into compartments by walls passing through its principal axis, and is constructed with stationary upper and lower parts and a rotary intermediate part.

Shaft kiln for lime or cement manufacture or for roasting ores. GEOFFREY MARTIN. Ger. 466,190, May 6, 1927. The materials fall in powder form through a stream of gases ascending a shaft, the shaft having a comparatively wide upper or preheating zone and a comparatively narrow lower or roasting zone built asymmetrically beneath the upper zone.

Device for the better utilization of hot gases in furnaces of all kinds. LUDWIG BORBELY. Austrian 109,473, Dec. 15, 1927. Oppositely acting vanes are arranged in the gas conduits so as to produce eddies in the gas stream.

Draft regulator for furnaces. ÖSTERREICHISCHE MASCHINENBAU A.-G. KÖRTING. Austrian 109,215, Nov. 15, 1927. Constructional details.

Interconnected system of apparatus for controlling combustion in furnaces. ERICH ROUCKA. U. S. 1,695,470, Dec. 18. U. S. 1,695,472 also relates to an app. for furnace combustion control.

Electrically controlled combustion control system for steam-boiler furnaces. FRED H. LINDLEY. U. S. 1,695,431, Dec. 18.

Supporting and sealing devices for cyanide pots used in furnaces. FREDOLF J. PETERSON. U. S. 1,695,467, Dec. 18. Structural features.

Traveling grate of the endless-chain type. L. and C. STEINMULLER. Ger. 466,076, Feb. 13, 1926. Constructional details.

Traveling grate of the endless-chain type. JOHANN PLACZEK. Ger. 466,125, June 25, 1926. Constructional details.

Traveling grate of the endless chain type. MAX BIRKNER. Ger. 467,654, Oct. 14, 1924. Constructional details.

Gas-heated sectional boiler. FRITZ DRECKMANN. Ger. 467,424, Oct. 4, 1927. Constructional details.

Sectional boiler with wrought iron tubes of oval shape. SEVERIN VORENT. Ger. 467,425, Dec. 28, 1926. Constructional details.

Insertion for the smoke conduits of furnaces. HEDWIG BALTZER (NÉE RIETH) and BERTA GOERTZEN (NÉE PFLUGMACHER). Ger. 467,427, July 21, 1926. Addn. to 430,739. An insertion for promoting combustion in the smoke conduits of furnaces comprises a plate oscillated by mech. means and resiliently attached to a ring made fast to the conduit.

Apparatus for heating by an electric arc superposed on a combustion flame. GEORGE T. SOUTHGATE. Ger. 466,102, Apr. 23, 1925. The flame and the arc have independent sources, the arc being directed in the line of the flame by a gas stream with a sufficiently great velocity to prevent the arc from striking back to the source of the flame.

Portable high-pressure acetylene generator. RICHARD MÜTSCHLE. Ger. 467,497, Oct. 13, 1925. Constructional details.

By-pass valve. M. D. BONDAREV. Russ. 4194, Dec. 31, 1927.

Apparatus for exothermic reactions at high temperatures and pressures. SOC. L'AIR LIQUIDE (SOC. ANON. POUR L'ÉTUDE ET L'EXPLOITATION DES PROCÉDÉS G. CLAUDE). Swiss 126,815, Feb. 21, 1927. A reaction chamber heated by an elec. resistance and with ducts to convey the hot gases generated to a heat absorber is provided.

Method of fusing metal caps on to vessels or tubes of glass. SIEMENS SCHUCKERT-WERKE A.-G. Ger. 466,049, Feb. 26, 1925. Manipulative details.

Chart recording apparatus suitable for use with conveyers, etc. HERBERT L. MERRICK. U. S. 1,693,701, Dec. 4.

Apparatus for ozonizing air. LOUIS GRAS and GEORGES CREPIN. Fr. 640,211, Aug. 27, 1927.

Emulsifying machine. INGEMANN LARSEN. Fr. 639,984, Aug. 26, 1927. Constructional details.

Apparatus for cleaning and reclaiming sand after use for sand-blasting, etc. HARRY W. TITGEN. U. S. 1,696,064, Dec. 18.

Sorting according to color. ARTHUR WEIGL. Fr. 640,593, June 8, 1927. In an app. for mech. sorting natural or artificial substances according to color or shade as described in Ger. 331,077 the Se cells are replaced by photoelec. elements coupled with strengthening tubes.

Misch metal as clean-up material. JOHN W. MARDEN and MALCOLM N. RICH (to The Westinghouse Lamp Co.). Can. 285,038, Nov. 20, 1928. Misch-metal wire as a clean-up material for lamps and like evacuated devices is specified.

Thermostat. PORTER H. BRACE (to The Canadian Westinghouse Co., Ltd.). Can. 284,559, Nov. 6, 1928. A bimetallic thermostat has one member formed of irreversible Ni steel (i. e., a Ni steel in which the Ni content is below 30%) heat treated above the A₁ transformation point, and a second member of reversible Ni steel (i. e., a Ni steel in which the Ni content is above 30%). Other metals such as Co, Cr, W, Mo, Si, Al, Mn, Ta, or V may be incorporated in the respective alloys and the percentage of such auxiliary elements should not exceed 15% and will usually be below this value.

Thermostat. PORTER H. BRACE (to The Canadian Westinghouse Co., Ltd.). Can. 284,560, Nov. 6, 1928. A bimetallic thermostat has one member formed of Mo and the second member formed of a Cr-Co alloy contg. approx. 80% Co and 20% Cr, the thermostat being coated with a deposit of electrolytic Cr to protect the Mo from oxidation. A second member formed from an alloy 22% Co, 22% Cr and 56% Fe may be employed.

Thermostat. HOWARD D. MATTHEWS (to The Canadian Westinghouse Co., Ltd.). Can. 284,558, Nov. 6, 1928. A bimetallic thermostat has one member composed of a Cu-Ni alloy (Monel metal), and the other member of a Cr-steel alloy contg. 10-15% Cr, with admixtures of P, Si, C and S, the latter being present in relatively small amts. only. Cf. C. A. 22, 517.

Thermostat. THEODOR KLÖTZL. Swiss 126,847, Mar. 7, 1927. A moving contact thermometer is described.

Thermostats. METALLO-CHEMISCHE FABRIK DR. LEOPOLD ROSTOSKY, Ger. 468,824, May 17, 1927. Halogen salts of metals of the Ag group, such as AgI, are used as material with allotropic transition points for elec. thermostats.

Thermostatic control devices. A. G. S. SANDISON and ELECTROFLO METERS CO., LTD. Brit. 290,402, March 17, 1927.

Thermostatic device for control of electric circuits. EARL K. CLARK (to Westinghouse Elec. & Mfg. Co.). U. S. 1,695,879, Dec. 18. Structural features.

Thermostatic device for control of electric circuits. JULIAN G. GOODHUE (to trustees of The Electric Thermostatic Control Co.). U. S. 1,695,546, Dec. 18.

Thermostatic electric switch. INTERNATIONAL GENERAL ELECTRIC CO. Brit. 290,260, May 11, 1927. Structural features.

Thermostatic (mercury) electric switch. SOC. ANON. HEWITTIC and M. DEMONT-VIGNIER. Brit. 290,597, May 16, 1927. Structural features.

Thermostatic device for controlling air-admission shutters, etc. F. W. MILLER. Brit. 290,698, Jan. 19, 1927.

Thermostatic device and mode of adjustment and operation for regulating steam supply. DAVID N. CROSTHWAITE, JR. (to C. A. Dunham Co.). U. S. 1,694,164, Dec. 4.

Thermostatic device for regulating the supply of gas to burners. A. J. THOMAS and A. A. STOW. Brit. 290,423, April 11, 1927.

Thermostatic valve for controlling fuel supply to burners of water heaters. FRANK L. O. WADSWORTH. U. S. 1,696,222, Dec. 25. Structural features.

Thermostatically controlled valve for liquids. JOHN V. O. PALM (to Bishop & Babcock Mfg. Co.). U. S. 1,696,410, Dec. 25. Structural features.

Thermostatic valve for controlling the flow of heating or other fluids. JAMES J. LAWLER (to Direct-Control Valve Co.). U. S. 1,695,809, Dec. 18. Structural features.

Thermostatic and electric system for controlling the temperature of various apparatus. ROLLO B. LINCOLN (to Westinghouse Elec. & Mfg. Co.). U. S. 1,695,853, Dec. 18.

Temperature alarm device controlled by a thermostatic electric switch. SIEMENS BROS. & CO., LTD., and E. R. GARROD. Brit. 290,024, April 19, 1927.

Bimetallic element and associated device for thermostatic devices, etc. PORTER H. BRACE (to Westinghouse Elec. & Mfg. Co.). U. S. 1,695,877, Dec. 18. Structural features.

Thermostatically controlled heating plug and liquid containers such as hot water bottles. ERNST G. K. ANDERSON (to Appleton Elec. Co.). U. S. 1,696,146, Dec. 18. Structural features.

Spark plug with thermostatic adjustment of the points. H. SCHLAICH. Brit. 289,758, April 30, 1927. The size of the spark gap reaches its max. at a temp. of about 300° by the use of terminals, one of which may be formed of Ni 36 and steel 64% ("Invar"), and the other of which may contain C 0.50, Mn 0.70, Si 0.75, Cr 8.00, Ni 22.00, Cu 2.00, Co 1.00 and Fe 64.05 parts. Structural details are described.

2—GENERAL AND PHYSICAL CHEMISTRY

FREDERICK L. BROWNE

Marcelin Berthelot. L. ILOSVAY. *Természettud. Közöny* 60, 49-57(1928).—A memorial lecture, delivered before the Hungarian Academy of Sciences, Nov. 28, 1927.

Ira Remsen, 1846-1927. JAMES F. NORRIS. *J. Am. Chem. Soc.* 50, (Proc.) 67-79 (1928).—An obituary, with portrait, followed by a bibliography of Remsen's work compiled by J. C. W. FRAZER.

Theodore William Richards, 1868-1928. H. B. D. *Proc. Roy. Soc. (London)* 121 A, xxix-xxxiv(1928).—Obituary.

Some experiences of Dr. Edgar F. Smith as a student under Wöhler. ANON. *J. Chem. Education* 5, 1554-7(1928).

The chemist and his message. W. HUBBALL. *Chemistry and Industry* 47, 1110-13 (1928).—An address.

Some random thoughts on chemical themes. HERBERT H. HODGSON. *Chemistry and Industry* 47, 1179-82(1928).—An address.

An old colonial manuscript volume relating to alchemy. C. A. BROWNE. *J. Chem. Education* 5, 1583-90(1928).

The most recent investigations of the antecedents of alchemy. EDMUND O. VON LIPPMANN. *Chem.-Ztg.* 52, 973-4(1928).

Ammonium chloride in the history of alchemy. JULIUS RUSKA. *Z. angew. Chem.* 41, 1321-4(1928). E. H.

The correlation of high-school chemistry with first-year college chemistry. LOUIS W. MATTERN. *J. Chem. Education* 5, 1627-33(1928). E. H.

The place of physics in the modern world. JOHN ZELENY. Yale Univ. *Science* 68, 629-35(1928). E. H.

The indexing of chemical compounds. A contribution to the problem of organization of the literature. H. REUMUTH. *Z. angew. Chem.* 41, 1264-7(1928).—A special form of card index is described which, by means of a series of tabs, permits the subject matter to be classified in several ways at once. In applying the system to org. arsenicals the author arranges the compds. by empirical formulas, but the tops of the cards are also so trimmed that projecting tabs show whether the compd. is aliphatic, isocyclic or heterocyclic, whether it is a deriv. of AsH_3 , an oxide, an arsenous acid, etc. A. M. P.

The undulatory mechanics of an alkali atom in the electric field. I. F. RASSETTI. *Atti. accad. Lincei* [6] 7, 839-44(1928).—Mathematical, dealing with theoretical calcns. and deductions of the perturbation of an external field on an atom of an alkali metal. C. C. DAVIS

The absorption of light and mode of linkage of molecules of gases and vapors. (MISS) H. SPONER. *Z. Elektrochem.* 34, 483-9(1928).—By detns. of absorption the energy corresponding to the beginning of the continuum or convergence of absorption bands is found. The energy of dissocn. is detd. from available chem. data or by other methods so that the degree of excitation of the dissocn. products by the light becomes known. From this the mode of chem. linkage is deduced. Mols. like H_2 , O_2 and the halogens dissociate into a normal and an excited atom. They are called *at. mols.* because in the fundamental state of these compds. atoms vibrate against each other. Since compds. like AgI , $AgBr$ and $AgCl$ have proved spectroscopically to be *at. mols.*, polar and non-polar *at. mols.* must be distinguished. Mols. in the fundamental state of which ions vibrate against each other are *ionic mols.* Ionic mols. not only dissociate into a normal and an excited atom but also, at the lowest dissociation level, into 2 normal atoms. The latter process has proved to be characteristic of ionic mols. Conversely the energy of dissocn. can be obtained from the absorption data. A comparative table of values of the energy of dissociation from available chem. data and from absorption data is given. A. P. SACHS

Transitions between various modes of linkage based on absorption of light in the dissolved condition. G. SCHEIBER. *Z. Elektrochem.* 34, 497-502(1928).—The absorption spectrum of a substance gives us information with respect to the difference in energy content of two states of the absorbing mol. In the visible and ultra-violet range the energy differences are due to change of orbit of an electron or to the complete, even if temporary, loss of an electron. The absorption spectra of gaseous substances permit in many cases the calcn. of the individual quantized states of the mol. but in soln. and in the liquid or solid condition more or less masking occurs. In solvents with a large dipolar moment, such as alcohol and water, the masking is generally considerable. The extinction in these latter solvents generally occurs in a few continuous curves, each of which probably belongs to one electron. The curves are parallel in the various solvents although displaced by an amt. which is nearly const. for a given chromophore regardless of the mol. in which it is present. There are three classes of effects: (1) The mol. contains a chromophore which does not directly participate in the changes of linkage. This occurs chiefly in complex org. compds. (2) The chromophore is directly involved in the linkage and its changes, as in the case of the alkali halides. (3) The chromophore, although not directly concerned in the change of linkage, undergoes a subsequent rearrangement as in keto-enol isomerism. A study of ZnI_2 , CdI_2 , and HgI_2 in various solvents leads to the conclusion that homopolar and heteropolar linkages exist in soln. in equal A. P. SACHS

Calculation of intermolecular forces in organic compounds. MANFRED DUNKEL. I. G. Farbenind. A.-G. *Z. physik. Chem., Abt. A* 138, 42-54(1928).—Using data from the literature, D. shows that the mol. cohesion of org. compds. is an additive property, and can be calcd. by means of a series of increments. The mol. cohesion increases with mol. wt.; many polar groups, like OH, have a very strong positive effect on the mol. cohesion. The data used to calc. the increments (heat of vaporization at $0^\circ K.$) is considered preliminary and should be replaced by data on the heat of sublimation at $0^\circ K.$ for accurate calcns. ALBERT L. HENNE

Selenium cells as colorimeters. A. MICKWITZ. Univ. Dorpat, Estland. *Z. anorg. allgem. Chem.* 176, 271-82(1928); cf. C. A. 22, 4046.—A Se cell was used to measure the absorption of light by freshly prepd. suspensions of PbS . The soly. of

amorphous PbS found in this way was $6.81 \times 10^{-8}\%$ Pb. The light-absorption curve shows a point of inflection which corresponds to the change of the PbS from the amicroscopic to the submicroscopic state. *Selenocolorimetric detns. of Pb at concns. from 1×10^{-4} to $1.89 \times 10^{-8}\%$ of Pb were made.* The mean error of each detn. was $\approx 4.5\%$.

H. F. JOHNSTONE

Dielectric constant as a function of temperature. H. A. STUART. Univ. Koenigsberg. *Z. Physik* 51, 490-510 (1928); cf. *C. A.* 22, 2863.—The dielec. consts. of gaseous Et_2O , Me_2O , AcH and Me_2CO were detd. in the temp. range from 20° to 180° . The elec. moments are, resp., 1.14, 1.29, 1.88 and 2.84×10^{-18} . A few measurements of d. are given.

GEO. GLOCKLER

An interferometer method for the determination of refraction in crystals. PETER WULFF. *Z. Elektrochem.* 34, 611-16 (1928).—An immersion method was used with crystals of 0.5-10.0 mm. length. The interferometer was the Haber-Löwe form of the Raleigh instrument and was without a compensator. The crystal is held firmly in a clamp which can be rotated about two axes at right angles to each other and to the path of the light rays. The interference bands show a sharp angle unless the liquid has the same refractivity as the crystal. When this compn. is attained the refractivity of the liquid is obtained in the cell itself (which contains the liquid and crystal) by the Pulfrich method for which the necessary auxiliaries are attached to the instrument. The manipulations necessary to det. the several indices of refraction of birefringent crystals are described. With crystals of 1 to 2 mm. in diam. n of liquid can be adjusted to within 0.00003 of n of crystal, while the Pulfrich method can be made accurate to 0.00001. Perfect crystals are quite unnecessary but internal inhomogeneities should be absent. Measurements on KCl and K_2SO_4 prove the great accuracy of the method as compared to the finest precision results recorded.

A. P. SACHS

The importance of the crystalline form in the formation of solid solutions. I. Thermal analysis of the system: anhydrous $\text{LiCl}_2\text{-CoCl}_2$. A. FERRARI AND A. BARONI. Reale Univ. Milano. *Atti accad. Lincei* [6] 7, 848-53 (1928).—The discovery that the elementary cells of MgCl_2 and LiCl have the same geometric form (cf. Bruni and F., *C. A.* 20, 1344) coupled with the fact that these salts form solid solns. raised the question whether identity of geometric form is not more important than similarity of chem. behavior in deciding the formation of solid solns. CoCl_2 and NiCl_2 have elementary cells identical in form with that of MgCl_2 and LiCl (cf. F., *C. A.* 22, 189), and therefore the possibility of forming solid solns. of CoCl_2 and LiCl was studied. In this case there is no chem. similarity. A suitable *app. and technic* had to be developed to overcome the hygroscopicity of the salts and the difficulty of fusing CoCl_2 . Contrary to Sandonnini (*C. A.* 8, 2659), CoCl_2 fuses at ordinary pressures. A fusion curve of the system: LiCl-CoCl_2 was obtained for all proportions of the 2 salts, from which several facts were evident. The solidification curve showed a max. at a compn. corresponding to 50% CoCl_2 (by mol.), indicating the probable existence of the *compd.* Li_2CoCl_4 . On each side of this max., the curve has a continuous course, with 2 min. which indicate soly. for all proportions of the *compd.* in the 2 components. This type of curve is unusual, and resembles that of Au-Mn (cf. Hahn and Kyropoulos, *C. A.* 11, 2443). In the system LiCl-CoCl_2 , all cooling curves have intervals of crystn. which are practically 0, which has also been observed in other systems of bivalent and univalent chlorides with similar elementary cells. On the other hand, as will be shown in a forthcoming note, systems of bivalent chlorides with similar cells show very great intervals of the type of solid solns. This indicates that in systems of chlorides with different valences, the liquid phase always has the same compn. as the solid phase, i. e., the curves of liquid and of solid are coincident. Another explanation of the absence of an interval of crystn. is that the solid phase is formed by entrance of the elementary cell of the univalent chloride into the lattice of the bivalent chloride, and *vice versa*, in which case the cells would keep their individuality. The *m. ps.* of CoCl_2 and of FeCl_2 are 724° and 673° , resp.

C. C. DAVIS

Mixed crystals, solutions and melts in the system $(\text{K}, \text{NH}_4)(\text{Cl}, \text{NO}_3)$. E. JÄNECKE. *Z. angew. Chem.* 41, 916-24 (1928).—The reciprocal salt pair $(\text{K}, \text{NH}_4)(\text{Cl}, \text{NO}_3)$, embracing the 4 salts given by the equation $\text{KCl} + \text{NH}_4\text{NO}_3 = \text{NH}_4\text{Cl} + \text{KNO}_3$ is studied from 0° to a condition of fusion. The absence of hydrates and double salts simplifies the system somewhat. Equil. diagrams of the binary systems $\text{KNO}_3\text{-KCl}$, $\text{NH}_4\text{NO}_3\text{-NH}_4\text{Cl}$, $\text{NH}_4\text{Cl-KCl}$, $\text{NH}_4\text{NO}_3\text{-KNO}_3$ are given and discussed. In the system $\text{NH}_4\text{NO}_3\text{-NH}_4\text{Cl}$ the complexity of NH_4NO_3 leads to mixed crystals in different ranges. In the system $\text{NH}_4\text{Cl-KCl}$ there are 2 types of mixed crystals, *crystg. in different lattices*. Those rich in NH_4Cl crystallize in the CsCl lattice and those rich in KCl crystallize in the NaCl lattice. In the system $\text{NH}_4\text{NO}_3\text{-KNO}_3$ the large zone of rhombic mixed

crystals is of interest. In these NH_4NO_3 takes up almost equimol. quantities of KNO_3 . The transformation temp. of NH_4NO_3 is raised by addition of KNO_3 , in contrast to the general rule. Soly. curves are shown in which isotherms at 0, 60, 100 and 200° are plotted in the system $\text{NH}_4\text{Cl}-\text{KCl}-\text{H}_2\text{O}$ and at 0, 20, 40 and 60° in the system $\text{NH}_4\text{NO}_3-\text{KNO}_3-\text{H}_2\text{O}$. In the entire system isotherms are plotted at 0, 20, 40 and 60°. In each case there are 4 different zones, each zone limited by 2 binary salt lines and each diagram showing 2 ternary salt points. With increasing temp. the soly. of KCl and mixed crystals contg. KCl decreases, the reverse being true of the nitrate. The stable salt pair is always NH_4Cl and KNO_3 . The soly. of the various salts and salt mixts. in relation to H_2O content and temp. is given in both tables and curves. The equil. diagram of these systems in a state of fusion is given, the existence of quaternary salt points being shown; 4 ternary salt curves run from each point.

H. STÖRRTZ

Crystallographic identity of the two forms of mercuric oxide. G. R. LEVI. Reale Univ. Milano. *Gazz. chim. ital.* 58, 417-8(1928).—In spite of expts. by L. (cf. C. A. 19, 424) showing that the red and yellow forms of HgO are identical crystallographically being confirmed by Fricke (C. A. 22, 705) and by Zachariassen (C. A. 21, 3777), Kolkmeijer (C. A. 22, 1066) has challenged the correctness of the results. The contention of K. is based on the fact that Andrews was unable to detect Ni in Fe (cf. *Phys. Rev.* 17, 261(1921)), but this is a misinterpretation of the results of A., since the absence of Ni lines results from the solid soln. with a lattice of the Fe type. There is little to support the further contention of K. that even high proportion of impurities cannot be detected by x-rays, for it has already been shown by L. (cf. *Gazz. chim. ital.* 54, 598(1924)) that x-ray analysis is more sensitive than gravimetric analysis in detecting Ag in Ag_2O . Further expts. by L. in which single crystals of red HgO were examd. by x-rays confirmed the fact that crystallographically they are identical with those of yellow HgO . Detns. of the d. of the red and yellow forms showed 11.19 and 11.24, resp., compared with a calcd. value of 11.22.

C. C. DAVIS

Symmetrical and antisymmetrical hydrogen and the third law of thermodynamics. Thermal equilibrium and the triple-point pressure. W. F. GIAUQUE and H. L. JOHNSON. Univ. Cal. *J. Am. Chem. Soc.* 50, 3221-8(1928).—The triple-point pressure of ordinary H has been found to be 5.38 ± 0.01 cm., while that of H kept at liquid air temp. for 197 days is 5.34. No source of error accounting for this difference has been found and it is concluded that this difference in values is evidence for the existence of symmetrical and antisymmetrical H_2 mols.

J. H. PERRY

The compressibility of sodium, barium and beryllium. T. W. RICHARDS, L. P. HALL and B. J. MAIR. Harvard Univ. *J. Am. Chem. Soc.* 50, 3304-11(1928).—Coefficients of compressibility were measured at 25° and between 100 and 500 megabars as follows: Na, $\beta = 15.6 \times 10^{-6}$; Ba, $\beta = 10.48 \times 10^{-6}$; Sr, $\beta = 7.22 \times 10^{-6}$; Be, $\beta = 0.93 \times 10^{-6}$. The results for Sr are only preliminary. The ds. of the specimens used were as follows: Ba, 3.66; Sr, 2.74; Be, 1.85. Special methods used in weighing and handling Ba and Sr are described. A new type of pycnometer for measuring the ds. of solids is also described.

R. E. GIBSON

The compressibility of thallium, indium and lead. THEODORE W. RICHARDS and JOSEPH D. WHITE. Harvard Univ. *J. Am. Chem. Soc.* 50, 3290-3303(1928).—Using Richards' well-known app., the authors det. the following compressibilities at 25° between 100 and 500 megabars: 2.40×10^{-6} for Pb, 2.83×10^{-6} for Tl, 2.55×10^{-6} for In and 2.51×10^{-6} for an alloy of 97% In and 3% Zn. The compressibility of the last named is less than would be expected for the rule of mixts. Special precautions were taken in prep. the metals pure—these are presented in detail. The compressibilities of the 3 elements agree with previous detns. by Richards. That of Tl differs considerably from Bridgman's. This is because Tl is anisotropic. A very useful table comparing 12 physical properties including internal pressures and lattice patterns of 15 metallic elements (Cu, Zn, Ga, Ge, As, Ag, Cd, In, Sn, Sb, Au, Hg, Tl, Pb and Bi) is given in the paper.

R. E. GIBSON

Recrystallization phenomena of aluminum. A. E. VAN ARKEL and M. G. VAN BRUGGEN. Philips' Lampworks, Eindhoven, Holland. *Z. Physik* 51, 520-33(1928).—Al subjected to a very considerable deformation recrystallizes in exceedingly small crystals. Since a system of many very small crystals has a higher potential energy than one composed of larger crystals (presenting a smaller sp. surface), a second recrystn. in larger crystals takes place subsequently. This second recrystn. varies with the previous condition of the piece of metal. Both very pure Al and ordinary technical Al show the same phenomena, but in different degrees. The behavior of pure Al is the more complex.

GEO. GLOCKLER

Dissociation of pure mercury. R. S. BRADLEY. *Nature* 122, 573(1928).—By

applying Summerfeld's expression to the conductivities of dil. amalgams κ for pure Hg can be calcd. without l . The equation obtained for Cd amalgam does not agree in the coeffs. with that of Williams. Assuming a fraction, q , of the Hg to be ionized accounts for the discrepancy. For Cd amalgams $q = 0.13$; for Zn amalgams $q = 0.12$.

L. D. ROBERTS

Definition, importance and determination of hydrogen-ion concentration. J. GRÖH. *Természettud. Közöny* 60, 194-201(1928).

S. S. DE FINÁLY

The present data on vapor pressures at high temperatures. C. ZWIKKER. *Physica* 8, 240-50(1928).—The values measured for the vapor pressures of metals at high temps. are well represented by an equation $\log p = -(A/T) + B$, in which B has a value approx. the same for many metals. From Sackurs' equation it follows that $B = 5/2 \log T - (1/2.30 R) \int (E/T^2) dT + 1.29 + 3/2 \log M$, which on applying Debye's sp. heat theory reduces to $B = -1/2 \log T + 3/2 \log T_m - \log V + 7.25$ for T_m , the m. p. temp., V the at. vol. It is shown that for 15 metals B is from 8.66 to 10.19, av. 9.33, whereas from exptl. data for 20 metals B has an av. value of 9.7. The semi-empirical rule of const. B is useful in judging the consts. of newly detd. p - T curves; faulty results on Zr (*C. A.* 20, 2785) and on alk. earth metals have been traced by it. In a graph all curves so far detd. ($\log p$ vs. $1/T$) are drawn; their common intersection point is marked. It appears that the same result ($B = 9.33$) holds for salts. A bibliography of 40 titles is attached.

B. J. C. VAN DER HOEVEN

The vapor density of formic acid. H. C. RAMSPERGER AND C. W. PORTER. *J. Am. Chem. Soc.* 50, 3036-8(1928).—A graphical comparison of the existing data on the vapor d. of formic acid is presented and briefly discussed.

DON BROUSE

Internal friction of gases and vapors. I. Air and bromine. H. BRAUNE, R. BASCH AND W. WENTZEL. *Tech. Hochschule, Hanover. Z. physik. Chem., Abt. A.*, 137, 176-92(1928).—A quartz app. is described, capable of measuring the internal friction of gases and vapors between room temp. and 650° . It is substantially a disk oscillating between 2 fixed plates. In order to test the device, the internal frictions of air and bromine were measured. The results agree with the data of previous expts. II. Mercury, cadmium and zinc. *Ibid* 447-57.—The internal friction of Hg, Cd and Zn vapors were measured with the app. described in the preceding paper. The consts. of the Sutherland equation are: Hg, 942 (between 490° and 880° K.); Cd, 1053 (between 790° and 900° K.); Zn, 876 (between 880° and 950° K.). From these values, the thermal cond. coeffs. were calcd. The at. radii ($\times 10^8$) are: Zn, 2.33; Cd, 2.46; Hg, 2.53. These radii are 0.8 times those indicated by x-ray analysis and a similar ratio holds for A. The results are discussed from the point of view of Debye's theory of mol. forces.

ALBERT L. HENNE

The expression for the refringent power. R. DE MALLEMANN. *Compt. rend.* 187, 888-90(1928); cf. *Compt. rend.* 187, 536, 720.—The internal field of a fluid is best evaluated by the direct or mol. method based on the fine discontinuous structure of the substance. This method also permits the refringent (and rotatory) power of an isotropic liquid to be expressed as a function of the refringent (and rotatory) power of the gas, of the mol. diameter and of the d. of the liquid. R. gives the mathematical analysis, which incidentally shows that the Lorentz equation is really empirical and that it is impossible for the current formulas to be rigorously exact. Improvement is to be found by adding terms of the type of $(n^2 - 1)^2$.

A. P. SACHS

Molten salts. III. W. HERZ. *Breslau Univ. Z. Elektrochem.* 34, 682-4(1928).—The capillary consts., a^2 , of the molten alkali halides at the m. p. and the b. p. are calcd. from the equation: $a^2 = 2\gamma/d$ (γ = surface tension, d = density). The ratios of a^2 at the two points are found to be approx. const., the av. for the 18 halides being 1.37. The principle of corresponding states holds. The consts. in Walden's and in Kistiakovskii's equations, which give the relations, resp., between the m. p. a^2 and the mol. wt., and the b. p. a^2 and the mol. wt., are calcd. The change in the degree of association from the m. p. to the b. p. is concluded to be the same for all the alkali halides. W.'s consts. increase with increasing at wts. of the anions and cations, and salts with about the same mol. wts. have about the same consts. It may be assumed that the lightest ions show the greatest and the heaviest ones the smallest tendency to form associated complexes. Similar relations could not be obtained from Kistiakovskii's quotients.

J. BALOZIAN

Dilatometric measurement of the thermal expansion of unstable crystalline salts. WILHELM KLEMM, WOLDEMAR TILK AND SIGELIN V. MÜLLENBERG. *Techn. Hochschule, Hanover. Z. anorg. allgem. Chem.* 176, 1-22(1928).—The thermal coeff. of cubic expansion (α) is detd. for various cryst. salts by a dilatometric method, in which the fused or sintered salt is placed in a small flask, which is highly evacuated and then

filled with clean Hg. The flask is equipped with a capillary tube, the level of the Hg in this tube being read as the app. is heated in a paraffin oil bath. The expansion of the salt can then be calcd. from the difference between the observed vol. change and that of the Hg and flask material. Quartz is used for BeCl_2 , ZnCl_2 , CdCl_2 , MgCl_2 , CaCl_2 , CaI_2 , LaCl_3 , ThCl_4 , potash glass for ZrCl_4 , and ordinary Thüringian glass in all other cases. The manipulation of the app. is described in detail. Before any measurements are made, it is heated for several hrs. at the highest temp. to be attained, traces of H_2O and gases being removed from the salt. The heating velocity used in the test is 1° in 1 to 2 mins. The results are as follows, expressed as $\alpha \times 10^3$, in most cases being the av. of several tests: naphthalene (temp. range -20 to $+70^\circ$), ~ 280 ; anthracene ($20-180^\circ$), ~ 213 ; camphor ($20-150^\circ$), ~ 484 ; benzoic acid ($20-110^\circ$), ~ 90 ; salicylic acid ($20-120^\circ$), ~ 100 ; KCl ($20-100^\circ$), ~ 113 ; BaCl_2 ($20-170^\circ$), ~ 60 ; LaCl_3 ($20-190^\circ$), ~ 48 ; CuCl ($40-140^\circ$), ~ 30 ; CuBr ($20-120^\circ$), ~ 56 ; CuI ($20-120^\circ$), ~ 67 ; TiCl ($20-120^\circ$), ~ 168 ; TiBr ($20-120^\circ$), ~ 172 ; PbCl_2 ($20-120^\circ$), ~ 93 ; PbI_2 ($20-120^\circ$), ~ 108 ; CdI_2 ($20-140^\circ$), ~ 107 ; HgCl ($20-120^\circ$), ~ 103 ; ZnF_2 ($20-120^\circ$), ~ 34 ; CdF_2 ($20-120^\circ$), ~ 80 ; MgF_2 ($20-120^\circ$), ~ 32 ; AlCl_3 ($20-170^\circ$), ~ 60 ; AlBr_3 ($20-80^\circ$), ~ 283 ; AlI_3 ($20-160^\circ$), ~ 182 ; BiCl_3 ($20-120^\circ$), ~ 167 ; SbCl_3 (-20 to $+60^\circ$), ~ 239 ; TiBr_4 (-20 to $+30^\circ$), ~ 283 ; TiI_4 (-30 to $+125^\circ$), ~ 222 ; BeCl_2 ($0-160^\circ$), ~ 113 ; ZnCl_2 ($20-120^\circ$), ~ 87 ; CdCl_2 ($20-120^\circ$), ~ 73 ; MgCl_2 ($10-190^\circ$), ~ 74 ; CaCl_2 ($20-190^\circ$), ~ 67 ; CaI_2 ($20-160^\circ$), ~ 91 ; ThCl_4 ($10-200^\circ$), ~ 30 ; ZrCl_4 ($20-100^\circ$), ≤ 90 ; LiOH ($20-120^\circ$), ~ 80 ; NaOH ($20-120^\circ$), ~ 80 ; KOH ($30-130^\circ$), ~ 190 . In prep. the samples the salts are as a rule fused in Pt crucibles in an elec. furnace. LaCl_3 is prepd. by chlorinating La_2O_3 in a Cl_2 - S_2Cl_2 stream. CuCl , CuBr , CuI , TiCl , TiBr , PbCl_2 , PbI_2 , CdI_2 , and HgCl are prepd. in the wet way, chiefly by pptn., and are dried in a vacuum and fused, except HgCl which is pressed into tablets in a hand press. ZnF_2 and CdF_2 are fused in a Pt crucible with a cover of NH_4F . MgF_2 is pptd. by action of HF upon a MgSO_4 soln., and is also fused under NH_4F . AlCl_3 , AlBr_3 , AlI_3 , BiCl_3 , and SbCl_3 are prepd. by reaction of the metal with the H halide gas or the halogen, followed by distn. TiBr_4 and TiI_4 are prepd. by the action of HBr or HI upon TiCl_4 ; BeCl_2 , ZnCl_2 and CdCl_2 by combustion of the metal in Cl_2 ; MgCl_2 , CaCl_2 , CaI_2 by slowly heating mixts. of the halide hydrate and the corresponding NH_4 salt in a H halide stream in quartz app.; ZrCl_4 by action of a stream of Cl_2 - CCl_4 upon ZrO_2 followed by sublimation. The alkali hydroxides are heated to 100° above the m. p. for 1 hr. to remove traces of H_2O . Some d. measurements are made and given as follows as d_4^{25} , H_2O being used for anthracene and camphor, Hg for TiBr_4 and TiI_4 , and petroleum for the others: anthracene 1.283, camphor 0.992, TiBr_4 3.37, TiI_4 4.40, PbI_2 6.06, MgF_2 3.13, ZnF_2 4.95, CdF_2 6.11, ZnCl_2 2.92, LiOH 1.43, NaOH 2.02, KOH 2.12. Anion vols. are calcd. from mol. vol. extrapolated to -273° , with the following results: TiBr_4 19.8, TiI_4 24.2, PbI_2 28, MgF_2 6.4, ZnF_2 5.8, CdF_2 5.7, ZnCl_2 18.4, LiOH 10.4, NaOH 8.0, KOH 3.6.

H. STOERTZ

The interferometer measurement of particles of $200\text{m}\mu$ diameter made visible in the ultramicroscope. O. VON BAEYER AND U. GERHARDT. *Landwirtschaftl. Hochschule, Berlin. Fortschritte Chem., Physik, phys. Chem.* 20, Ser. B, 1-23(1928).—The Michelson interferometer method for measuring the angular distance between the components of a double star is applied to measure the diameter of particles in the dark field of the ultramicroscope by illuminating them so that the ends of a diam. act as interfering sources of light. This is accomplished by using a Siedentopf and Szegvari azimuth diaphragm in the diaphragm holder of the Abbé illuminator.

A. P. SACHS

The determination of the agglomeration temperatures. G. TAMMANN AND A. YA. SYORVKIN. Univ. Göttingen. *Z. anorg. allgem. Chem.* 176, 46-8(1928).—The agglomeration temps. of several salts, oxides and silicates were detd. by an indirect method in which a blast of air was passed over the powdered substances, and the temp. at which the powder ceased to fly was taken as the temp. of agglomeration. For the salts and oxides, the ratio of agglomeration temp. to melting temp. on the abs. scale was about 0.5, while for the silicates the ratio was 0.88.

H. F. JOHNSTONE

The resistance to bending of easily deformable materials, especially of vulcanized rubber. R. ARIANO. Società Italiana Pirelli. *Il Politecnico* 1928, No. 7-8; *India Rubber J.* 76, 935-9(1928); cf. *C. A.* 22, 2855; 545.—By abandoning many of the restrictive assumptions usually made in the theory of flexion, and in particular by substituting a more general stress-strain relationship in place of Hooke's law, general equations for the bending of easily deformable bodies have been obtained, which accord with exptl. data. The theoretical equations are less convenient but more significant than empirical formulas.

C. C. DAVIS

Electrical conductivity of deformed crystals of rock salt. Z. GYULAI AND D. HARTLY. Univ. Szeged (Hungary). *Z. Physik* 51, 378-87(1928).—Crystals of rock

show an intermittent increase in elec. cond. The added cond. The crystals assume a permanent set in several seconds. Under can be seen that the mech. deformation takes place in sudden incre-
GEO. GLOCKLER

sion and heat of vaporization. H. SIRK. *Z. Physik* 52, 21-6(1928).—

energy $u = \gamma - T\left(\frac{d\gamma}{dT}\right)$; γ = surface tension, T = abs. temp. The mol. vol. v , the b. p. ($= V$) and the mol. heat of vaporization ($= \lambda$) are related as follows: $\lambda = uV^{2/3} \times \text{const.}$ (const. = 2.26×10^8 expt. and 2.71×10^8 theory). G. G.

Equilibrium in systems consisting of both volume and surface phases in connection with the spontaneous surface-increase of microscopic particles. N. V. RASHEVSKY. Westinghouse Co. *Z. Physik* 51, 571-83(1928).—The monomol. layer of Langmuir is treated as a sep. phase. The equil. existing between such a surface phase and a vol. phase is studied thermodynamically. The total free energy of the system, F , depends upon the surface free energy and therefore upon the total surface area. F may pass through a min. at a characteristic surface area; the equil. then depends upon the surface area. At the characteristic surface area the capillary pressure becomes zero and a free liquid may assume other than spherical shapes. The changes are studied which a system would undergo during slow variations of the total masses of its components. It is shown that, as a consequence of the relation between F and surface area, the surface may increase spontaneously, bringing about a stretching or a sepn. of the whole system.

G. G.

The ζ -potential and the lyotropic series. DAVID R. BRIGGS. Univ. of Minn. *J. Phys. Chem.* 32, 1646-62(1928).—The ζ -potential, H , of a cellulose-water boundary was measured in the presence of the chlorides of K, Na, Li, Cs, H, Ba, Sr, Al, Th^{IV}, NH₄, and of NH₄OAc at the following normal concns.: 0.0, 0.00005, 0.0001, 0.0002, 0.0004, 0.0008, and 0.0016. The method of measurement was the streaming potential (cf. C. A. 22, 3571). Chlorides of univalent cations, except HCl, increase the value of H with increasing concn. up to 0.00005 or 0.0001 N and then decrease the value of H . Bivalent ions decrease the value of H more rapidly than univalent ions, but in no case does the value reach zero. Tervalent Al reduces H to zero, and quadrivalent Th in increasing concns. first decreases the value of H , then reverses the sign of the double layer and increases the potential at an almost uniform rate. The effects of the ions of a series are in the same order as their mobilities. The mobilities are in the inverse order of the lyophilic capacities of these ions in water. It is from the relative lyophilicity of the ions for the phases of the system (cellulose and water in this case) that the ζ -potential arises and it is in this property of the ions that the lyotropic effect of the ions has its theoretical foundation. When NH₄OAc is substituted for NH₄Cl slightly greater effects on H are produced for equal concns. The effect that a salt soln. has upon H is a function not alone of the ion carrying the charge opposite to that of the colloid, but also of all ions present in the system to which the interface is accessible. When kH/P is plotted against log of concn., straight lines result in the cases of Th, Al and H. The potential varies with the concn. of the salt soln. in the same manner as the variation of the partial molal free energy of a substance dissolved in a solvent varies with its concn. in that solvent, $C = ae^{b\zeta}$; and $c = e^{\bar{P}/RT}$ being the equations defining these similar phenomena. The total surface energy is lowered by adsorption, but ions of Th continue to be adsorbed and build up a comparatively large p. d. There must be other forms of energy in the interface which are being decreased. The change of ζ -potential is, in some cases at least, secondary to other free surface energy changes.

F. E. BROWN

Capillary electrical phenomena and membrane formation on liquid gallium. A. FRUMKIN AND A. GORODETZKIL. *Z. physik. Chem.* 136, 215-27(1928).—Since Ga melts at 29.75° and exhibits passivity it is suitable for the investigation of the relation between passivity and the condition of the surface. A double U-tube electrometer was used. It consisted of a wider reference tube connected to two capillary tubes so arranged that one capillary was in contact with various acidic and basic salt solns. and the other was fitted with an elec. connection by which varying p. ds. could be produced between the Ga and a normal calomel electrode. Surface tensions were measured when the solns. were (a) N KOH, and (b) N KCl + 0.1 N KOH, (c) N KCl + 0.001 N KOH, (d) N KCl + 0.001 N HCl, and (e) N KCl + 0.1 N HCl. The highest surface tension found was 592 abs. units when the soln. was N KCl + 0.1 N HCl and the p. d. was 0.9 v. $592 - \gamma = 120 (\phi - 0.9)^2$ approximately expresses the relationship between ϕ , voltage imposed and γ , surface tension in absolute units. Strong acid or weak acid with higher voltage (0.001 HCl and 1.8 v.) reacts with the Ga, producing an evolution of H₂ and an oxide layer on

the Ga. The voltage was varied from 0.8 to 2.0 with the solns. named above. The presence of OH-ions strongly depressed the value of γ . The depression increases with time unless the voltage is above 1.4. A solid but extensible membrane forms between the salt soln. and the Ga. After long standing the Ga may form a tongue-like projection into the salt soln.

F. E. BROWN

Friction constant and surface layer. I. J. TRAUBE AND SIAR-HONG WHANG. *Techn. Hochschule, Charlottenburg. Z. physik. Chem., Abt. A*, 138, 102-22(1928).—T. and W. measure the time of flowing of H_2O through a capillary tube set at a small angle with the horizon. Then, by means of an ethereal soln. of oleic acid, they form an inside film in the capillary and measure the flowing time again. Depending on the angle at which the tube is set, the flowing velocity is increased 4 times or more. Other polar substances, as AmOH, octyl alcohol, AmOAc, tripropylamine, or polar oils have the same film effect. Films of non-polar materials (paraffin, C_6H_6 , CCl_4) have no effect or only a negligible one. Stearic acid, lacs, rubber and solid benzene derivs. have a marked effect. If the capillary tube is nearly vertical, or if the water is forced through under pressure, none of the above compds. shows any effect on the flowing time. Several equations (Einstein-Smolukowski, Helmholtz) related to the friction const. should be modified. In biology, the theories of permeability, narcosis, resorption, etc., should take this fact into account. It is desirable to det. whether these films have the same effect on boats or airplane wings. Fish-swimming or bird-flying is probably helped by similar films.

ALBERT L. HENNE

Artificial membranes selectively permeable to anions. RUDOLF MOND AND FRIEDRICH HOFFMANN. *Univ. Kiel. Arch. ges. Physiol. (Pflüger's)* 120, 194-202(1928).—Collodion membranes, impregnated with the basic dyestuff rhodamin B, were used. With these the anions exhibited the sequence $SCN^- > NO_3^- > I^- > Br^- > Cl^- > acetate, SO_4^{--}$.

G. H. S.

The influence of a second liquid upon the formation of soap gels. HARRY N. HOLMES AND RALPH N. MAXSON. *Fifth Colloid Symposium Monograph* 1928, 287-300.—Small traces of H_2O greatly aid in the dispersion of K stearate in turpentine, and the formation of a gel on cooling. The prepn. of pure anhyd. soaps is described—Na stearate, Na oleate, K stearate, K oleate and Ca stearate. The addn. of small definite quantities of H_2O increases the ability of Na stearate to hold turpentine, but the contrary is the case with Na oleate. With K stearate a max. is speedily reached. K oleate does not readily disperse in turpentine; a trace of H_2O helps, but the clear sols do not gel on cooling. Relatively small amts. of oleic acid help Na oleate or Na stearate to hold turpentine; but a max. is soon reached. If paraffin oil be substituted for turpentine, oleic acid depresses gel formation with Na stearate, but helps it with Ca stearate, as does stearic acid. With Na stearate and benzene, small quantities of oleic acid aid dispersion; with stearic acid, there is a critical zone, above which no gels are formed. But no gels are formed without stearic acid. The joint action of small quantities of H_2O and stearic acid in Na stearate dissolved in turpentine, gave better results than either separately.

JEROME ALEXANDER

The formation of Liesegang rings as a periodic coagulation phenomenon. ERNEST S. HEDGES AND ROSALIND V. HENLEY. *J. Chem. Soc.* 1928, 2714-26; cf. *C. A.* 22, 4314.

"The production of periodic structures of $Ag_2Cr_2O_7$ and of $Mg(OH)_2$ in gelatin, and also of PbI_2 in agar, was studied. In each case, by mixing equiv. quantities of the reactants in the gel, and then superimposing a strong soln. of the diffusing electrolytes, it was possible to sep. the chem. reaction from the formation of the ppt. Since the rings produced in these expts. are comparable with those produced by chem. reaction, it follows that the formation of periodic structures is a coagulation phenomenon taking place after the chem. reaction. Periodic structures are to be distinguished, therefore, from periodic reactions. The critical concn. of $AgNO_3$ required to coagulate colloidal $Ag_2Cr_2O_7$ was found to be 0.29%. A chem. anal. of a periodic structure of $Mg(OH)_2$ in gelatin showed that the ratio of $Mg(OH)_2$ contained in the bands to that in the clear spaces is about 12:1; the corresponding ratio for NH_4Cl is about 1:3. Periodic coagulation of sols of As_2S_3 was effected by diffusing solns. of $FeCl_3$ and $Al_2(SO_4)_3$ into the sol contained in 1% agar gel, and similar results were obtained in the coagulation of colloidal $Fe(OH)_3$ by Na_3AsO_4 and by $(NH_4)_2CO_3$. In these cases, there is an optimum concn. of colloid, and band formation is favored by a dil. diffusing electrolyte." F. L. BROWNE

The formation of gels. Vulcanized oils. B. C. J. G. KNIGHT AND P. STAMBERGER. *J. Chem. Soc.* 1928, 2791-8.—Previously (*C. A.* 22, 506.) S. showed that an insol., tough, elastic substance is formed by heating triolein with S and that the reaction takes place in 3 stages: (1) combination of triolein with S, (2) polymerization to double mols., and (3) polymerization to still larger mols. Examn. of the reaction products with

x-rays is now shown to give the ring pattern for amorphous structures, the diam. of the ring being const. at the different stages of the reaction, showing that no change takes place in the nature of the mol. Thin films of triolein, its vulcanization products, and the fatty acids obtained by sapon. of the products spread on water in films one mol. thick. The films are of the expanded type. The dimensions of the mols. measured in this way are changed only slightly by vulcanization. The thickness of the films remains practically const. It is concluded that in the first stage of the reaction S enters the mol. at the unsatd. linkages of the oleic acid chains. The dimer then forms by linking together of two mols. side by side, an atom of S acting as the link and attaching itself to the ends of the glyceryl groups of the mols. thus joined. On sapon. this part of the S remains with the glycerol. Higher polymers are formed in the same way, producing long chains in a definitely oriented manner. Such oriented chains are considered responsible for the elastic properties of the solid polymers.

F. L. BROWNE

General theories of rapid coagulation. The coagulation of rod- and plate-shaped colloids; the theory of any polydispersed system and of motion coagulation. HANS MÜLLER. *Kolloidchem. Beihefte* 27, 223-50(1928).—A mathematical discussion of the theories of coagulation. M. postulates that the general theory of rapid coagulation involves the following: (1) contact of the surfaces is necessary for the cohesion of two micelles; (2) the frequency of collisions depends upon the effect of temp. on the motion of the particles and on the velocity of motion of the particles; (3) only the momentary particle distribution immediately surrounding a single particle influences its coagulation. The application of these theories to monodisperse systems leads to a theory of the coagulation of plate- and rod-shaped particles. This indicates that plate-shaped particles coagulate fairly rapidly as do sols with spherical particles, whereas rod-shaped particles may coagulate much more rapidly. By investigating the influence of a polydispersed condition of a sol a relationship between the particle size distribution curve of a colloid with spherical particles and the initial rate of coagulation is established. Systems approx. monodisperse coagulate within the limit of error of Smoluchowski's measurements, while polydisperse systems coagulate more rapidly. The influence of sedimentation and stirring are discussed in the light of Stokes' law. It is shown that this effect influences the coagulation of large particles only and formulas are given for the min. particle size, below which the effect is not noticed.

L. F. MAREK

Colloidal gold. HUGH NICOL. *J. Soc. Chem. Ind.* 47, 343T-4T(1928).—Expts. are described with a new method using "hyperol" for the production of a pure red Au sol which is very sensitive to electrolytes and well adapted for use in cerebrospinal fluid examn. A modified method for the use of "hyperol," a comly. produced equimolar compd. of carbamide and hydrogen peroxide, is recommended. L. F. M.

The preparation of a lead sulfide hydrosol and its combination with phosphate ions. J. BROOKS. Univ. of Liverpool. *J. Phys. Chem.* 32, 1717-24(1928).—PbS was prepd. by bubbling an excess of H_2S into vigorously stirred solns. of $Pb(OAc)_2$ contg. 0.5% gelatin as a protective agent. Solns. contg. 0.25, 0.50, 0.75, 1.00, 1.25, 1.50 and 1.75 g. of Pb as $Pb(OAc)_2$, per 100 cc. yielded, resp., 97, 96, 88, 52, 21, 7 and 3% of the Pb as colloidal PbS. The markedly greater coagulation at the higher concns. is ascribed to a decrease in the velocity of formation of nuclei, the rate of growth remaining unchanged. PbS sol was added to an aq. phosphate soln. of such concn. that PO_4 ions were always present in excess. At intervals, the mixt. was ultrafiltered and the uncombined PO_4 --- detd. by a colorimetric method. The p_H of the soln. was about 7.2. The ions present included K^+ , Na^+ and Cl^- . The black, colloidal particles became white. The total PO_4 --- which disappeared was sufficient to form $Pb_3(PO_4)_2$. The rate of the reaction was extremely slow in comparison with the rate of diffusion of the colloidal particles, and independent of the concn. of the PO_4 --- up 0.0025 M, which was the highest concn. used. At 15° the rates of reaction were proportional to the surface of the unchanged particles. At higher temps. coagulation reduced this surface. A probable explanation of the zero order of the reaction is that combination takes place between the surface and adsorbed PO_4 ---, the number of adsorbed PO_4 ions per unit area being independent of the PO_4 --- concn. over a wide range.

F. E. BROWN

Influence of lyophilic colloids on the stability and the electric charge of lyophobic sols. I. Influence on gold sols. W. REINDERS AND W. M. BENDIEN. *Rec. trav. chim.* 47, 977-88(1928).—Lyophilic, N-contg., amphoteric colloids (albumin, for instance) react on Au sols at a p_H lower than the isoelec. point like high-valence cations. Very small quantities discharge the Au sol and cause its pptn., but larger quantities charge it positively and stabilize it. With decidedly higher concns. some substances again exhibit a flocculation zone. The explanation is probably that the added substance is not completely sol. in solns. of the given acidity, and that a part of it flocculates, bring-

ing Au along mechanically. In solns. which are a little less acid than the isoelec. point, and in which the Au sol remains negatively charged in the presence of any amt. of the added colloid, it is sometimes possible (although not easy) to demonstrate the flocculating action of small quantities of added colloid. For large amts. the protective action predominates and the sol is stabilized, in spite of the small charge of its particles. The quantities of added colloid required to change the red color of the Au sol into a purple one depends on the p_H . The smaller the p_H , the smaller are the quantities required to produce the color change. Non-amphoteric colloids, as dextrin, gum arabic and tannin, do not cause flocculation in acid or basic soln. They are able to decrease but not to reverse the charge of the Au sol.

A. L. HENNE

Deposition of carbon from carbon monoxide or benzene in the presence of iron.

II. Crystalline carbon with high adsorptive power. ULRICH HOFMANN. Univ. Berlin. *Ber.* 61B, 2183-94(1928); cf. *C. A.* 22, 4289.—C obtained from CO or benzene by the method previously described or pptd. in the presence of $Fe(CO)_5$, although cryst., is highly adsorptive. The adsorptive power cannot be attributed to the presence of amorphous C. It is due to a very loose cryst. structure, presenting an enormous surface.

ALBERT L. HENNE

Phenomena of mixing inorganic salts in ammonium hydroxide. A supplement. ERNST JANECKE. *Z. Elektrochem.* 34, 786(1928); cf. *C. A.* 22, 904. MALCOLM DOLE

The absorption capacity of clays for neutral salts. A. M. TANKHILEVICH. *Trans. State Expt. Inst. Silicates* (Moscow) 1927, No. 21, 53-7.—T. tested the adsorptive capacity of a particular type of clay for anions and cations of NaCl, $MgSO_4$ and $CaCl_2$. The strengths of soln. used were 0.2, 0.1 and 0.05 N. Adsorption of cations but not of anions occurred.

J. S. JOFFE

Adsorption and constitution. The adsorption of organic acids on animal charcoal. KENNETH M. GRIFFIN, HENRY L. RICHARDSON AND PHILIP W. ROBERTSON. Victoria Univ. College, Wellington, N. Z. *J. Chem. Soc.* 1928, 2705-9.—The adsorption by animal charcoal of 49 carboxylic acids from C_2H_5OH soln. was measured. The concn. of acid was $N/20$. The relative adsorptions ($AcOH = 1$) varied within wide limits, e. g., isovaleric acid 0.21, *p*-nitrobenzoic acid 17. The relative adsorptions tended to increase with mol. wt., but the increase was subject to marked constitutive effects. Aromatic acids were much more strongly adsorbed than aliphatic. Substitution, especially in the para position, increased the adsorption. The relative adsorption values were found to be almost independent of the activity of the charcoal.

R. L. DODGE

The adsorption of electrolytes by crystalline surfaces. A. PINKUS AND L. DE BROUCKÈRE. *J. chim. phys.* 25, 605-40(1928).—See *C. A.* 22, 2092. E. H.

Hydrolysis of tin chloride and chlorostannate. LENNART SMITH. Univ. of Lund. *Z. anorg. allgem. Chem.* 176, 155-80(1928).—The concns. of H ions and Cl ions in H_2O solns. of $SnCl_4$ were measured by colorimetric (malachite green and HCl), electrometric (quinhydrone electrode) and polarimetric methods. Cond. and f.-p. detns. were made at the same time. In dil. solns. the concn. of (H) and (Cl) is about equal, but above 0.1 mol. (Cl) concn. is slightly greater. Even the presence of NH_4Cl does not suppress the Cl ions. In old solns. cond. and f. p. as detd. agree well with the values obtained by calcn. from ion concns., if the existence of a positive Sn complex is assumed. In freshly prepd. solns. (0.10 M and 0.40 M) cond. as detd. is 15-20% lower than the calcd. values. This is attributed to the dispersion of colloidal nonelectrolytes which are present in fresh solns. To a soln. of $SnCl_4$ (0.1074 M) NaCl and KCl solns. are added and their effect upon hydrolysis is measured. Addition of N NaCl to a $SnCl_4$ soln. 2 wks. old in which (H) = 0.365, gives (H) = 0.16, while N KCl gives (H) = 0.28 and 3.5 N KCl gives (H) = 0.12. Na ions therefore suppress the hydrolysis more strongly than K ions. The effect of addn. of acids and salts in greater concn. is studied by means of soly. and distribution detns. (Et_2O and H_2O). In distribution expts. it is found that only pure $SnCl_4$ is taken up by the ether, rather than the complex compd. $SnCl_4 \cdot 2HCl + aq$. In N HCl the concn. of $SnCl_4$ as well as $SnCl_6^{--}$ is small, but even in 4.0 N HCl, a complete suppression of hydrolysis does not occur. The concn. of $SnCl_4$ and $SnCl_6^{--}$ are of the same order of magnitude. The effect upon the degree of hydrolysis by the addn. of various chlorides is much different, the suppressive action increasing in the order NH_4 , K, Ba, Na, Mg, equiv. quantities being compared. Comparative values are given by the ratios $K/NH_4 = 1.2$, $Na/NH_4 = 5$, $Mg/NH_4 = 9$.

H. STOMARZ

Solutions. T. M. LOWRY. *J. Soc. Chem. Ind.* 47, 1233-8, 1260-5(1928).—The soly. of sugar in H_2O is explained on the basis of the mutual attraction of H_2 and O_2 . The existence of hydrates of sucrose cannot be demonstrated since anhyd. sucrose crystallizes from its soln. The soly. and properties of salt solns. are discussed from the

standpoint of the theory of complete dissoen. Solns. of H_2SO_4 in H_2O are discussed chiefly on the basis of Pickering's work on the hydrates and the f.-p. curve. A. F.

Relation between the deviation of the vapor pressure of binary mixtures of normal compounds from the straight line, and the heat of mixing in the liquid state. J. J. VAN LAAR. *Z. physik. Chem., Abt. A*, 137, 421-46(1928).—Mathematical discussion of a paper by Schmidt (cf. *C. A.* 20, 3120). ALBERT L. HENNE

A new method for measuring osmotic pressure. R. V. TOWNEND. Johns Hopkins Univ. *J. Am. Chem. Soc.* 50, 2958-6(1928).—The method is applicable to dil. solns. in a non-volatile solvent. The vapor phase, which is permeable to the solvent only, is used as a diaphragm to sep. the pure solvent from the soln. A sketch of the app. and a description of its operation are included. DON BROUSE

Directions for preparing a universal indicator which gives the colors of the spectrum over a p_{H} range of 3-11.5. H. W. VAN URK. *Pharm. Weekblad* 65, 1246-9(1928).—Universal indicators previously described, e. g., those of Carz, Bujnid and Geerligs, are not recorded in sufficient detail with regard to the exact proportions of the ingredients used. The following mixt. is claimed to be a satisfactory universal indicator, the colors following the order of the spectrum from red orange at p_{H} 3 to red violet at p_{H} 11.5: methyl orange 0.1 g., methyl red 0.04 g., bromothymol blue 0.4 g., naphtholphthalein 0.32 g., phenolphthalein 0.5 g., cresolphthalein 1.6 g., 70% EtOH to make 100 cc. A. W. DOX

The ionic concentrations and activity coefficients of weak electrolytes in certain salt solutions. HERBERT S. HARNED AND ROBERT A. ROBINSON. Univ. of Pennsylvania. *J. Am. Chem. Soc.* 50, 3157-78(1928).—E. m. f. measurements were made on cells of the types: $\text{H}_2 | \text{AcOH} (m_1), \text{MCl} (m_2), \text{AgCl} | \text{Ag}; \text{H}_2 | \text{HCl} (m_0), \text{MCl} (m_3), \text{AgCl} | \text{Ag}$, where MCl represents KCl, NaCl, LiCl or BaCl_2 , and $\text{H}_2 | \text{BOH} (m_1), \text{NaCl} (m_2) | \text{NaCl} (m_2), \text{AgCl} | \text{Ag}; \text{H}_2 | \text{NaOH} (m_0), \text{NaCl} (m_2) | \text{NaCl} (m_2), \text{AgCl} | \text{Ag}$, where BOH is a weak hydroxide. Five weak bases were used: NH_4OH , mono-, di- and trimethylamines, and $\text{N}(\text{CH}_3)_3\text{OH}$. A method is given for computing the activity coeffs. and dissoen. of weak acids and bases in salt solns. from such e. m. f. measurements. The dissoen. const. of a weak electrolyte in a given solvent or in salt solns. in this solvent, is given by $K = C_{\text{C}}C_{\text{A}}/C_{\text{CA}}(\gamma_{\text{C}}\gamma_{\text{A}}/\gamma_{\text{CA}}) = K_{\text{C}}\gamma^2$, where γ represents the activity coeffs. When the electrolyte is at infinite diln. so that γ^2 equals unity, $K = K_{\text{C}}$. Thus, K is a const. which measures the dissoen. of the weak electrolyte in the pure solvent. γ^2 is a measure of the effect of the presence of the attractive and repulsive forces of the elec. field produced by the addn. of the salts on the elec. potentials of the ions of the weak electrolyte. K_{C} is an abs. measure of the dissoen. of the weak electrolyte under varying conditions of salt concn. Although the change of K_{C} upon salt addn. depends upon the variation of γ^2 , its abs. value does not. This is shown clearly by the behavior of the methyl derivs. of NH_3 . Thus, K_{C} increases in the order NH_3 , tri-, mono-, dimethyl-amine, whereas, at a given salt concn., γ^2 increases in the order tri-, di-, monomethylamine, NH_3 . The results of the sp. relative salt actions are generalized by the following rules. A.—The ionic activity coeffs. of AcOH, mono- and dichloro-acetic acids are less in the soln. of a given strength of that salt which possesses the higher activity coeff. in pure H_2O . B.—The same is true for NH_3 and NH_4CH_3 . It is probable that it would also be true for $\text{NH}(\text{CH}_3)_2$ and $\text{N}(\text{CH}_3)_3$. This order agrees with that found for the ionic activity coeffs. in H_2O , and is the reverse of the order found for the activity coeffs. of halide acids in salt solns. The results show that a 0.01 *M* soln. of $\text{N}(\text{CH}_3)_3\text{OH}$ contg. 0.1 *M* NaCl has a slightly lower OH-ion concn. than that of an identical salt soln. contg. NaOH. At higher salt concns., however, NaOH is about 6% less dissociated. The effect of the change in the solvent caused by large quantities of the undissociated mols. is discussed and computed approx. The method employed, as well as the results, should prove useful for studying salt effects in org. and biological media. It is more sound from a kinetic or a thermodynamic point of view than the usual method which employs single electrodes and salt bridges. E. R. S.

Conductivities of strong electrolytes for currents of high frequency. H. ZAHN. Univ. Kiel. *Z. Physik* 51, 350-4(1928).—KCl and MgSO_4 solns. are compared at a frequency corresponding to $\lambda = 1$ meter. In accord with theoretical calcs. of Debye and Falkenhagen (*C. A.* 22, 3573), the cond. of MgSO_4 soln. is found to be about 11% greater than it is for the low frequencies usually employed. GEO. GLOCKLER

The equilibrium of silver oxide and silver chloride with aqueous potassium chloride and potassium hydroxide. ROY F. NEWTON. Purdue Univ. *J. Am. Chem. Soc.* 50, 3258-61(1928).—The equil. of AgCl , Ag_2O , KOH, KCl and H_2O previously studied by Noyes and Kohr has been redetd. with Ag_2O prepd. in various ways; the chloride was detd. by electrometric titration. The mean activity ratio is given as 0.00893. This

result is somewhat below that of Noyes and Kohr but not beyond exptl. error. The method of prepn. of the Ag_2O has no significant effect on the equil. ratio of the chloride to hydroxide. Within exptl. error the equil. ratio is the same in 0.05 M soln. as in 0.1 M soln.

R. E. GIBSON

The determination of solubility curves of mixed crystals at small concentrations and the re-distribution of the boundary substance by heating. G. TAMMANN AND A. HEINZEL. Univ. Göttingen. *Z. anorg. allgem. Chem.* 176, 147–51(1928).—If the soly. of one metal in another decreases with falling temp. it should be possible to find for each temp. the concn. at which the grain boundaries just show no accumulation of the first metal, and below which the solid is homogeneous. The values for a series of temps. would thereby establish the soly. curve. Experimentally, it was found that the soly. of Pb in Cd at 270° is greater than 0.1% Pb but falls below this value at lower temps. The soly. of Cu in Cd at 270° is between 0.05% and 0.1% Cu and falls below the former value at lower temps. If a solid consisting of mixed crystals be recrystd. at a temp. below that of the polyeutectic, there is no change in the concn. of the grain boundaries accompanying the natural grain growth. On the other hand, if the temp. is above that of the eutectic, the grain boundaries become more concd. by drawing from the eutectic. The eutectic temps. found in this way for binary Cd systems contg. Bi, Pb, Sb and Cu, are, resp., 149° , 249° , 292° and 310° .

H. F. JOHNSTONE

The solubility and transition points of ferrous chloride hydrates in aqueous solution. FR. SCHIMMEL. *Z. anorg. allgem. Chem.* 176, 285–8(1928).—The temp.-compn. diagram for $\text{H}_2\text{O}-\text{FeCl}_2$ shows a eutectic between ice and $\text{FeCl}_2 \cdot 6\text{H}_2\text{O}$ at -36.5° corresponding to a content of 30.4% FeCl_2 . A soln. contg. 35.5% FeCl_2 may be under-cooled to -60° without the sep. of a solid phase. On warming to -50° , ice is caused to form as the metastable solid by seeding or scratching the surface of the contg. vessel. On further warming, the hexahydrate begins to sep. as the stable solid. The transition point at which the hexa- and tetrahydrates exist in equil. with soln. lies at 12.3° , while that between the tetrahydrate and dihydrate lies at 76.5° . The boiling point of the satd. soln. at atm. pressure lies at 117.5° . The liquid phase at this point has a compn. of 50.4% FeCl_2 .

H. F. JOHNSTONE

Reaction regions and their practical application. W. P. JORISSEN. Univ. de Leiden. *Chimie et industrie* 20, 807–12(1928).—A brief review of the work carried out here by J. and co-workers and reported in C. A. 21 and 22. A. PAPINEAU-COUTURE

The mechanics of the reaction between hydrogen peroxide, iodine and iodide ion. E. ABEL. *Z. physik. Chem.* 136, 161–82(1928).—The reaction involves the formation of HIO . $\text{I}_2 + \text{H}_2\text{O} \longrightarrow \text{HI} + \text{HIO}$ (1); $\text{HIO} + \text{H}_2\text{O}_2 \longrightarrow \text{HI} + \text{H}_2\text{O} + \text{O}_2$ (2). Equation (1) is catalyzed by H_2O_2 . The relationship is expressed by $[\text{H}^+]^2 [\text{I}^-]^2 / [\text{I}_2] = L + A [\text{H}^+]$. At 25° , $L = 1.4 \times 10^{-12}$ and $A = 1.3 \times 10^{-7}$ for concns. about 0.8. Theoretical equations are worked out for the speed of reaction for the evolution of O_2 and of I_2 , which are shown to agree with exptl. results.

F. E. BROWN

Revision of the kinetics of the iodic acid-hydriodic acid reaction. II. E. ABEL AND K. HILFERDING. *Z. physik. Chem.* 136, 186–94(1928); cf. C. A. 21, 3621.—The previous treatment of this reaction is modified. At very small concn. of I^- , the reaction velocity is proportional to the first rather than to the second power of the concn.

A. L. HENNE

The ethyl acetate equilibrium. R. C. CANTELO AND R. D. BILLINGER. Univ. of Cincinnati. *J. Am. Chem. Soc.* 50, 3212–6(1928).—This is part of an investigation of the change in the equil. const. of the reaction $\text{CH}_3\text{COOH} + \text{C}_2\text{H}_5\text{OH} \rightleftharpoons \text{CH}_3\text{COOC}_2\text{H}_5 + \text{H}_2\text{O}$ by alteration of the thermodynamic environment. In particular this paper deals with the effect of the salts NaCl, NaI and NaCNS on the above equil. In absence of salts the equil. const. at 78° is 3.7. The presence of the salts causes the equil. const. to rise. With NaCl the rise is a linear function of the salt concn. With the other salts the relation is more complex. There is no trace of a Hofmeister series effect. R. E. GIBSON

Decomposition of formic acid by sulfuric acid. II. ERNEST R. SCHIERZ AND T. WARD. Univ. of Wyoming. *J. Am. Chem. Soc.* 50, 3240–3(1928); cf. C. A. 17, 1422.—The velocity of decompn. of HCO_2H by means of H_2SO_4 has been measured as follows. H_2SO_4 concn. in %: 96.69, 94.40, 92.78, 91.49, 89.53, 85.52. Velocity const. ($K_s = 0.4343K \times 10^3$) at 15° : 28.5, 10.4, 5.1, 2.7, 1.2, 0.24. At 25° : 91.7, 33.5, 16.6, 8.9, 4.0, 0.78. At 35° : 312, 106, 53.5, 28.7, 13.1, 2.5. At 45° : 810, 280, 159, 86.2, 41.4, 7.8. From the above figures, the temp. coeffs. are calcd.; they decrease in magnitude as the velocity const. increases. The values for E (critical increment) have been calcd. and found to be nearly equal to 20 for all concns. at the temp. intervals: $25-15^\circ$, $35-25^\circ$, and $45-35^\circ$. For equal H_2SO_4 concns., the effect of small quantities of

H₂O becomes more marked with increase in temp. No irregularities in velocity const. or temp. coeffs. are observed in the temp. and concn. ranges studied. A. L. HENNE

Monochloramine and hydrazine. I. Decomposition of monochloramine in acid solution. MAX BODENSTEIN. Univ. Berlin. *Z. physik. Chem.*, Abt. A, 137, 131-41 (1928).—The decompn. of NH₂Cl is investigated in weakly ammoniacal solns., which become slightly acid during the expts. The reaction follows a very remarkable course: it starts as an autocatalytic reaction, nearly stops after completing the first half of the reaction, then starts again in a similar way and finally ends very slowly. Consequently, the Raschig equation $3\text{NH}_2\text{Cl} = \text{NH}_4\text{Cl} + 2\text{HCl}$ represents only the first half of the decompn. and its very end. In the second half, HCl fails to appear before the reaction is nearly finished. A qual. interpretation is proposed, calling for the formation of NHCl₂ and NCl₃, but this does not give a satisfactory explanation of the abnormal behavior of the reaction velocity. In a soln. satd. with borax and boric acid, the decompn. is a bimol. reaction. ALBERT L. HENNE

Decomposition of nitrosotriacetoneamine in the presence of hydroxyl ions. A. W. GOODAL AND W. C. M. LEWIS. Univ. of Liverpool. *Z. physik. Chem.*, Abt. A, 137, 45-62 (1928).—The decompn. of nitrosotriacetoneamine is a complex reaction, the observed velocity of decompn. in dil. KOH being detd. by the activity of the OH ion, while in concd. KOH it is detd. by the H ion. The rate of decompn. in the drift region (intermediate alkali concn.: 0.05-0.5 N) is quant. accounted for by the theory of consecutive reactions, one reaction being catalyzed by the H ion, the other by the OH ion. Each reaction has its own characteristic critical increment or energy of activation. ALBERT L. HENNE

Kinetics of the hydrolytic decomposition of α -bromopropionic acid. JAN ZAWIDZKI AND JAN G. ZAWIDZKI. Polytechnikum, Warsaw. *Z. physik. Chem.*, Abt. A, 137, 72-106 (1928).—The reaction $\text{MeCHBrCO}_2\text{H} + \text{H}_2\text{O} = \text{HBr} + \text{MeCH(OH)CO}_2\text{H}$ has been studied in aq. soln. at 90°. The reaction velocity may be represented by $dx/dt = k_{1/2}(a-x)/\sqrt{x}$ in which $(a-x)$ = concn. of MeCHBrCO₂H, and x = concn. of HBr. The av. exptl. value of $k_{1/2}$ at 90° is 0.000942. In the interval 80-90°, the temp. coeff. for $k_{1/2}$ is 2.99. The reaction is retarded by HBr and by H ions. In the presence of an excess of HBr (b), or HNO₃, the equation representing the velocity becomes: $dx/dt = k_{1/2}(a-x)/\sqrt{(b-x)}$. Expts. at 90° give av. values for $k_{1/2}$: 0.000937 (with HBr) and 0.000943 (with HNO₃) which are practically identical with the value given first. The presence of neutral salts (KBr or KNO₃) increases the velocity of the reaction by less than 4%, indicating that Br ions or metallic cations affect the hydrolysis negligibly. On the other hand, the presence of similar amts. of K₂SO₄ multiplies the velocity coeff. by 6; KCl has a decided retarding action which is to be explained by the fact that α -bromopropionic acid and KCl exchange their halogen atoms with a measurable velocity. ALBERT L. HENNE

Hydrolytic decomposition of succinimide. H. V. EULER AND ARNE OLANDER. Univ. of Stockholm. *Z. physik. Chem.*, Abt. A, 137, 393-8 (1928).—A new detn. of the dissocn. const. of succinimide gives $k_a = 2.6 \times 10^{-10}$ at 25°. The relation between the hydrolysis velocity and the alky. of the soln. was investigated for the reaction: succinimide \rightarrow iminosuccinic acid. A curve of K vs. p_{OH} was obtained, for which no satisfactory interpretation is forthcoming. In acid soln. (0.118-0.50 N HCl), the reaction const. at 90° is $k = 2.9 \times 10^{-4} h^+$. The velocity of hydrolysis of H₂NCOCH₂CH₂CO₂H gives $k_a = 2.72 \times 10^{-6}$ at 25°. ALBERT L. HENNE

Kinetics of the formation of dioximes. LII. G. B. SEMERIA AND B. SOMIGLIANA. *Atti accad. sci. Torino* 63, 325-34 (1928).—The reaction between AcCH:NOH and HONH₂ has been studied for $p_{\text{H}} = 1.2$ to 12, the rate of reaction being measured iodometrically by titrating the remaining HONH₂. Data showing results at various acid concns. are appended. The reaction rate is not that of the bimol. reaction $\text{AcCH:NOH} + \text{NH}_2\text{OH} = \text{HON:CMech:NOH} + \text{H}_2\text{O}$, but renders probable the equl. first suggested by Baly, Marsden and Stewart (*J. Chem. Soc.* 89, 966 (1906)). A. W. C.

Decomposition of carbonyl bromide. E. H. REERINK. *Rec. trav. chim.* 47, 989-99 (1928).—Previous observation by R. (Diss., Leiden, 1924) that the velocity of decompn. of COBr₂ first increases, then decreases is compatible with the observation by Lenher and Schumacher (*C. A.* 22, 3566) that the reaction is accelerated by org. impurities. The walls of the reaction vessel, covered with org. substances, act as a catalyst by adsorbing Br₂ mols. ALBERT L. HENNE

Rotatory dispersion of nicotine solutions in the ultra-violet. MAX MILWARD-LIQUIER AND ROBERT DESCAMPS. *Bull. soc. chim. belg.* 37, 345-50 (1928).—A continuation of J. Liquier's previous work in the visible range (*C. A.* 19, 620; 22, 16). From

the expts. It is concluded that aq. nicotine solns., to which HCl has been gradually added until one of the basic functions has been completely neutralized, behave like mixts. of 2 optically active constituents, whose dispersions are different and whose proportions vary with the p_H of the soln. One of the constituents is the nonelectrolytically dissoed. mol., the other being the optically active ion. These conclusions hold as well in the visible as in the ultra-violet range.

ALBERT L. HENNE

The catalytic decomposition of hydrogen peroxide in an acid chlorine-chloride solution. II. An interpretation of the rate measurements in concentrated solution. ROBERT LIVINGSTON. Univ. Minn. *J. Am. Chem. Soc.* 50, 3204-11(1928).—The Bronsted reaction velocity equation is combined with the Debye and McAuley equation for the activity of non-electrolytes to obtain the expression: $V = K (H_2O_2) (H^+) (Cl^-)^2$. 10^{-4} for the rate of decompn. of H_2O_2 in acid chlorine-chloride solns., which agrees with exptl. data. The activity of H_2O_2 in NaCl and in Na_2SO_4 solns. has been detd. by distribution measurements, and the results have been used to test a prediction based on the rate of reaction theory.

J. H. PERRY

The catalytic decomposition of gaseous acetaldehyde at the surface of various metals. P. C. ALLEN AND C. N. HINSHELWOOD. *Proc. Roy. Soc. (London)* A121, 141-55(1928); cf. *C. A.* 19, 3198.—The decompn. of acetaldehyde, the homogeneous decompn. of which is bimol., was studied at the surface of electrically heated wires of Au, Pt, W and Pt-10% Rh alloy. The surface reaction involves two mols., but at pressures above 150 mm., the surface becomes satd. with adsorbed mols. and the reaction appears unimol. The relation between reaction rate and pressure, the heat of activation and the absolute rate of reaction are markedly similar with all the metals, indicating adsorption of a loose, non-specific kind. The heat of activation is close to that of the homogeneous reaction, indicating that the wire acts merely as a source of energy without affecting the stability of the adsorbed mol. The mol. statistics indicate inelastic collisions with a duration of 10^{-6} – 10^{-8} secs.

GREGG M. EVANS

Catalytic processes in solid phase. I. Decomposition of potassium permanganate. S. ROGINSKII AND E. SHULTZ. Wissenschaftlich Institut für physikalische Chemie, Dnjepropetrowsk, Ukraine, U. R. S. S. R. *Z. physik. Chem., Abt. A*, 138, 21-41(1928).

ALBERT L. HENNE

Sixth report of the committee on contact catalysis. ROBERT E. BURK. National Research Council, Washington, D. C. *J. Phys. Chem.* 32, 1601-45(1928).—A review summarizing the principal points of the 5 previous reports (cf. *C. A.* 21, 3150), and in addn. covering important new developments of the year 1927 in catalysis. R. L. D.

Systematic affinity principle. XLVII. The relation of mercury to a few metals. WILHELM BILTZ AND FRITZ MEYER. Hannover Techn. Hochschule. *Z. anorg. allgem. Chem.* 176, 23-45(1928); cf. *C. A.* 22, 3326.—Amalgams of Au, Ce, Tl and Na are prepd. and studied, the nature and stability of the compds. and their heat of formation being detd. Au and Ce amalgams are examd. by means of vapor-tension measurements, while Tl and Na amalgams are studied calorimetrically, by means of a Bunsen ice calorimeter. Au amalgams contg. 3-15% Hg are bright yellow in color; with 18-24.6% Hg they are a bright grayish yellow, and with more than 24.8% Hg they are gray. Up to 24.6% Hg Au amalgams can be cut with a knife; above this amt. they are brittle and can be pulverized. Isotherms at 253°, 300° and 315° are given, in which vapor pressure in mm. of Hg is plotted against % Hg. Between 0 and 25% Hg several series of mixed crystals exist and one compd. $HgAu_4$. Above 25% Hg, in addition to the compd. $HgAu_5$, Hg is present. The phase of the compn. $HgAu_5$ is a satd. mixed crystal. The amalgamation of Au with liquid Hg is weakly endothermic in this zone, with an affinity of less than 0.5 cal. per g. atom of Hg. In the Hg-rich zone, the unstable compds. Hg_3Au_2 and Hg_4Au occur at lower temps. or higher pressures. Ce amalgams contg. more than 15% Ce are pyrophoric, and precautions are taken to exclude air from the app. Below 15% Ce these amalgams are gray, above this amt. they contain black specks and as Ce increases they finally become coke-like in appearance. Only one compd. is formed, $CeHg_4$, unstable in the air, stable on heating, only slightly miscible with Hg and not at all with Ce. Its heat of formation from solid Ce and 1 g. atom of liquid Hg is +5.8 cal. In Tl amalgams, the compd. Hg_2Tl_3 occurs, its heat of formation being +0.5 cal. at 0°. The d. of solid Hg_2Tl_3 at 0° is found to be 13.16; that of the liquid compd. at 25° is 12.94. The mol. vol. at $T = 0^\circ$ is calcd. from the d. to be 105, in good agreement with the sum of the constituents (104). With Na, Hg forms the following compds., their heats of formation per g. atom of Hg being also given in cal.: $NaHg_4$ (5.6 cal.), $NaHg_3$ (9.4), Na_2Hg_4 (10.6), $NaHg$ (11.3), Na_2Hg_2 (10.4), Na_3Hg (9.3). The heat in cal. necessary to split off 1 g. atom of liquid Hg from a Hg-rich compd. to give the next lower compd. is given as follows: $NaHg_4$ —1.9, $NaHg_3$ —7.8, Na_2Hg_4 —5.3, $NaHg$ —13.2, Na_2Hg_2

—11.4, Na_2Hg —9.3. These amalgams, as that of Ce, are definite chem. compds., not at all or only slightly miscible with an excess of their components. H. STOERTZ

Systematic affinity principle. XLVIII. The heats of formation of UCl_3 , UCl_4 , and UO_3 . WILHELM BILTZ AND CURT FENDIUS. *Z. anorg. allgem. Chem.* 176, 49–63 (1928).—The heats of formation of UCl_3 and UCl_4 were detd. by an indirect method from the difference in the heats of soln. of the chlorides and that of the metal in 8 N HCl. An ice calorimeter was used for the calorimetric measurements. The values found were: $\text{U} + 2 \text{Cl}_2 = \text{UCl}_4 + 251 \text{ Cal.}$ and $\text{U} + 3/2 \text{Cl}_2 = \text{UCl}_3 + 213 \text{ Cal.}$ The heat of reaction for the oxidation of UCl_3 and UCl_4 to a hexavalent U compd. by a soln. of FeCl_3 in HCl, or by a soln. of ICl_3 , was compared with the heat of soln. of UO_3 in the same soln. media. Based on the values obtained for the heats of formation of UCl_3 and UCl_4 , the heat of formation of UO_3 is 294 Cal. A comparison of these results with those obtained for other metals shows that U is less noble than Fe and has about the same affinity for Cl as has Th.

H. F. JOHNSTONE

Systematic affinity principle. XLIX. The relation of chlorine and other halogens to gold. WERNER FISCHER AND WILHELM BILTZ. *Z. anorg. allgem. Chem.* 176, 81–111 (1928).—Methods of prepn. are described. D. is detd. in paraffin oil, d_4^{25} for AuCl_3 being 4.67. The dissocn. pressure of AuCl in mm. of Hg is detd. and given as follows: at 155.7° —9.5 mm., at 183° —27.3, at 209.3° —70, at 217° —92, at 231.4° —163.5. For AuBr the dissociation pressure is given: at 111° —21.4 and 18.3 mm., at 139° —71.1 and 67.4 mm., at 156° —132 mm. App. for detg. vapor pressure of the Au halides is described. The vapor of auric chloride has the formula Au_2Cl_6 rather than AuCl_3 . Its vapor pressure is given as follows in mm. of Hg: at 200° —0.23, at 220° —0.78, at 232° —1.33, at 245° —2.82. Metallic Au is prepd. by pptn. with $\text{H}_2\text{C}_2\text{O}_4$ from a soln. of 14 g. $\text{HAuCl}_4 \cdot 4\text{H}_2\text{O}$ in 7 liters H_2O , followed by drying in a vacuum over P_2O_5 at 50° , and also by pptn. as above using 5 times greater concn., followed by ignition at a deep red glow. The heats of soln. of these 2 forms as well as Au plate are detd. and found to be identical ($18.5 \pm 0.1 \text{ cal. per g. atom}$), indicating no difference in these modifications. Heats of soln. are detd. for halogens and Au halides in I-ICl_3 soln. and are expressed in cal./g. atom or cal./mol. as follows: $\text{Cl}_2 = 7.1 \pm 0.1$, $\text{Br (liquid)} = -1.0 \pm 0.1$, $\text{I (solid)} = 2.3 \pm 0.1$, $\text{AuCl} = 17.2 \pm 0.1$, $\text{AuBr} = 14 \pm 0.1$, $\text{AuI} = 21 \pm 0.2$, $\text{AuCl}_3 = 11.5 \pm 0.2$, $\text{AuBr}_3 = 2.4 \pm 0.2$. Heats of formation for these compds. are: $\text{AuCl} = 8.4 \pm 0.2 \text{ cal.}$, $\text{AuBr} = 3.4 \pm 0.2$, $\text{AuI} = -0.2 \pm 0.3$, $\text{AuCl}_3 = 28.3 \pm 0.3$, $\text{AuBr}_3 = 12.9 \pm 0.3$, $\text{HAuCl}_4 \cdot 4\text{H}_2\text{O} = 60 \text{ cal.}$, $\text{HAuBr}_4 \cdot 5\text{H}_2\text{O} = 48 \text{ cal.}$ The authors find no evidence for the existence of mixed Au halides such as expressed by $\text{AuCl} + \text{AuCl}_3 = \text{Au}_2\text{Cl}_4$. The m. p. diagram of the system KAuCl_4 is shown. Thermal decompn. of this salt is not through such compds. as KAuCl_3 or KAuCl_2 , but metallic Au and Cl_2 are directly formed as follows: $\text{KAuCl}_4 = \text{KCl} + \text{Au} + 3/2 \text{Cl}_2$. L. **Pneumatolytic transfer of gold by means of chlorine.** WILHELM BILTZ, WERNER FISCHER AND ROBERT JUZA. *Ibid* 121–42.—The vaporization of Au in a stream of Cl_2 , the compn. of the vapor, and the thermodynamics of the reactions involved are studied. In prepn. of the reaction mixt., silica gel is mixed with a soln. of Au in aqua regia, and this is then dried and ignited at 1300 – 1400° . The expts. are conducted in an electrically heated quartz tube. With a pressure of 1 atm. of Cl_2 , the Au in the reaction mixt. is in the form of AuCl_3 at temps. up to 254° , between 254° and 282° , it has the compn. AuCl , between 282° and 1063° it is solid metallic Au, and above 1063° it is molten Au. Above 475° , the compn. of the Au compd. in the gas phase is found to be Au_2Cl_6 . The partial pressure of Au_2Cl_6 in the gas phase is detd. for varying pressures of Cl_2 at 900° and 1000° . At 900° with $p_{\text{Cl}_2} = 189 \text{ mm. of Hg}$, $p_{\text{Au}_2\text{Cl}_6} = 0.234 \text{ mm. of Hg}$; with $p_{\text{Cl}_2} = 544$, $p_{\text{Au}_2\text{Cl}_6} = 0.708$; with $p_{\text{Cl}_2} = 771$, $p_{\text{Cl}_2\text{Cl}_2} = 0.975$; and with $p_{\text{Cl}_2} = 762$, $p_{\text{Au}_2\text{Cl}_6} = 0.919$. The ratio $p_{\text{Au}_2\text{Cl}_6}/p_{\text{Cl}_2} \times 10^3$ is given as 1.25 at 900° and 2.77 at 1000° . The heat of reaction for Au_2Cl_6 is calcd. to be -19 cal. , the heat of sublimation -36 cal. , at 900° . With exptl. temps. under 475° , thermodynamic measurements seem to indicate the formula Au_2Cl_6 for the compn. of the Au compd. in the gas phase, but some indications are given of a dissociation equil. in the gas phase as follows: $\text{Au}_4\text{Cl}_{12} \rightleftharpoons 2\text{Au}_2\text{Cl}_6$. With $p_{\text{Cl}_2} = 760 \text{ mm.}$, $p_{\text{Au}_2\text{Cl}_6} = 2.00 \text{ mm.}$ at 240° , 3.41 at 258° , 2.80 at 270° , 0.740 at 311° , 0.405 at 329° , 0.190 at 350° , 0.040 at 405° , 0.012 at 450° .

H. STOERTZ

Decomposition of carbon monoxide on nickel. H. A. BAHR AND TH. BAHR. *Ber.* 61B, 2177–83 (1928).—Metallic Ni or NiO catalyzes the reaction $2\text{CO} = \text{C} + \text{CO}_2 + 38.9 \text{ cal.}$ by first forming Ni_3C . Below 270° , the decompn. of CO continues until the Ni is completely transformed into Ni_3C ; then the reaction stops. Between 270° and 380 – 420° , the CO decompn. continues after this point has been reached, the catalyst being Ni_3C free from metallic Ni. This is proved by analysis which shows that the amt. of C bound

chemically by the catalyst corresponds to Ni_3C , excess C being present as the free element. (To determine the ratio of bound C to free C, H_2 is passed over the catalyst. The amt. of methane formed indicates the quantity of bound C. Free C remains inert.) Above $380\text{--}420^\circ$, free Ni again appears in the catalyst because Ni_3C dissociates at such temps. Ni_3C is probably an intermediary step in the decompn. of Ni_3C . It is believed that Ni_3C formed in the catalysis process is identical with that isolated from fusions of Ni in the presence of C.

ALBERT L. HENNE

Equilibrium between aluminum carbide and nitrogen at high temperatures. C. H. PRESCOTT, JR., AND W. B. HINCKE. Gates Chemical Lab., Cal. Inst. Technology. *J. Am. Chem. Soc.* 50, 3228–37(1928).—Equil. in the reaction $4\text{AlN} + 3\text{C} = \text{Al}_4\text{C}_3 + 2\text{N}_2$ was observed at pressures of about 0.01 mm. and temps. between 1700° and 1900° K. App. is described in some detail. Increases in free energy and heat content which would accompany this reaction between 1775° and 1910° K. and at 1 atm. pressure are given by the equations $\Delta F^\circ = 253,630 - 90.58 T$ and $\Delta H = 253,630$ cal. At 1875° the equil pressure is 0.0100 mm. and ΔF is 83,800 cal. Calcns. were also made for the reaction $\text{Al}_2\text{O}_3 + 3\text{C} + \text{N}_2 = 2\text{AlN} + 3\text{CO}$. Here $\Delta F^\circ = 127,065 - 67.5 T$ and $\Delta H = 127,065$ cal. These agree with Fraenkel's observations.

R. E. GIBSON

The system: $\text{KNO}_3\text{--HNO}_3\text{--H}_2\text{O}$ between 25° and 60° . G. MALQUORI. Reale Univ. Roma. *Atti accad. Lincei* [6], 7, 844–6(1928).—Isotherms of the system: $\text{KNO}_3\text{--HNO}_3\text{--H}_2\text{O}$ have already been studied at lower temps. (cf. *Bull. soc. chim.* [2], 47, 677 (1887); *Z. anorg. Chem.* 40, 1(1904); M., C. A. 21, 2414.—In the present paper measurements were at 40° and at 60° . The data, which are given in graphical and tabular form, show that at 40° and 60° (as at 25°) the quantity of KNO_3 which passes into soln. diminishes for low acidities and then increases gradually with increase in the acidity. The higher the temp. the greater the decreases in soly. Thus at 25° , 10.3% HNO_3 lowers the soly. of KNO_3 from 27.31 to 25.03%, whereas at 40° 7.01% HNO_3 lowers it from 39 to 32.13%. At 60° the decrease is still greater, so that 5.25% HNO_3 reduces it from 52 to 41.12%. On the other hand, the increase of soly. with high acidity decreases with increase of temp. Thus the soly. of KNO_3 in 100% HNO_3 at 25° , 40° and 60° is 49.99, 49.21 and 52.03%, resp., whereas its soly. in H_2O at these 3 temps. is 27.31, 39 and 52%, resp. The influence which HNO_3 exerts on the soly. of KNO_3 cannot therefore be ascribed to the existence of complexes in soln., the stability of which diminishes with increase of temp.

C. C. DAVIS

The system: $\text{KNO}_3\text{--Al(NO}_3)_3\text{--H}_2\text{O}$ at 0° , 40° and 60° . G. MALQUORI. Reale Univ. Roma. *Atti accad. Lincei* [6], 7, 846–8(1928).—The same method previously used for the isotherm at 25° (cf. C. A. 21, 2108) was followed. As at 25° , the only solids in contact with solns. at 0° , 40° and 60° are the 2 salts, KNO_3 and $\text{Al(NO}_3)_3 \cdot 9\text{H}_2\text{O}$. The quantity of KNO_3 in a satd. soln. of the 2 salts increases slightly with increase in temp. At 0° the soln. contains 5.25% of KNO_3 and at 60° it contains 7.22%.

C. C. DAVIS

The thermal decomposition of alumina (Bayer). II. N. PARRAVANO AND G. MALQUORI. *Atti accad. Lincei* 7, 970–5(1928).— $\text{Al}_2\text{O}_3 \cdot 3\text{H}_2\text{O}$ when heated shows three breaks, i. e., at 190° , 270° and 450° , indicating the changes to $\text{Al}_2\text{O}_3 \cdot 2\text{H}_2\text{O}$, $\text{Al}_2\text{O}_3 \cdot \text{H}_2\text{O}$ and finally Al_2O_3 .

A. W. CONTIERI

An application of the rule of Dulong and Petit to molecules. DONALD H. ANDREWS AND ELLIS HAWORTH. *J. Am. Chem. Soc.* 50, 2998–3002(1928).—Detns. were made of the heat capacities of mono-, di-, tetra- and hexachlorobenzene and of mono- and dibromobenzene from 101° to 335° K. The heat capacity per halogen atom approaches the Dulong and Petit value of 6 cal. per degree at about room temp. The observed values agree well with those calcd. from optically observed frequencies in the infra-red.

DON BROUSE

Methods of obtaining fibrous precipitates of any substance: the structure of fibers in general and of cellulose fibers in particular. P. P. VON VEIMARN. *Russa* 3, 995–1003, 1285–9(1928).—In French and English. See C. A. 22, 4028. A. P.-C.

Approximation determination of the absolute dimensions of pores in porous materials. MARK A. RABINOVICH AND NIKOLAI S. FORTUNATOV. *Z. angew. Chem.* 41, 1222–6(1928).—Substantially the same as C. A. 22, 4297. ALBERT L. HENNE

Oils, greases and high vacua (BURCH) 22.

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3—SUBATOMIC PHENOMENA AND RADIOCHEMISTRY

S. C. LIND

The character of quantum physics. P. JORDAN. *Naturwissenschaften* 16, 765-72 (1928).—A lecture.

Quantum mechanics of homopolar valency. F. LONDON. *Z. Physik* 50, 24-51 (1928); cf. *C. A.* 22, 1531.—Mathematical.

The principle of uncertainty of Weyl's systems. G. BREIT. *Carnegie Inst. Phys. Rev.* 32, 570-9(1928).

The self-consistent field and the structure of atoms. J. C. SLATER. Harvard Univ. *Phys. Rev.* 32, 339-48(1928).—The method proposed by Hartree (*C. A.* 22, 1269) for the soln. of problems in at. structure is examd. as to its accuracy as a method of solving Schrödinger's equation.

Electron exchange and molecule building. W. HEITLER. *Nachr. Ges. Wiss. Göttingen Math.-Physik. Klasse* 1927, 368-74.—Mathematical.

ALBERT L. HENNE

Critical potentials of molecular hydrogen. E. U. CONDON AND H. D. SMYTH. Princeton Univ. *Proc. Natl. Acad. Sci.* **14**, 871-5(1928).—The effects of electrons of different speeds on the H_2 mol. are interpreted in terms of energy levels and potential energy curves.

Experimental method for measuring molecular rays. H. MAYER. *Z. Physik* **52**, 235-48(1928).—By means of a torsion balance the intensity of a mol. beam is detd. and the appropriate formula of kinetic gas-theory is checked.

Atomic systems and planet systems. F. KONEK. *Természettud. Közlöny* **60**, 2-5(1928).—A summary of the theory of S. Arrhenius, describing the similarity of planet systems to subatomic systems.

The possibility of detecting individual cosmic rays. W. F. G. SWANN. Bartol Foundation, Philadelphia. *J. Franklin Inst.* **206**, 771-8(1928).—Because of the enormous energy available for ionization in a single cosmic ray, and of the relatively small no. of ions produced per sec. by the rays in a vessel of moderate size, the ionization should occur in spurts which may be observable under suitable conditions. The element which acts unfavorably to the purpose of the expt. is that concerned with the fact that the no. of primary cosmic rays absorbed per unit vol. is so small that it is very rarely that a cosmic ray is absorbed so near to the vessel as to cause by its secondary radiation a large ionization therein. Matters could be improved in this respect by surrounding the vessel with a highly absorbing material such as Pb.

The origin of the cosmic rays. R. A. MILLIKAN AND G. H. CAMERON. Calif. Inst. of Tech. *Phys. Rev.* **32**, 533-57(1928).—From Einstein's equation $Mc^2 = E$ and Aston's curve the max. possible energy that can be released in radioactive changes can be computed. The theoretical and exptl. values are in satisfactory agreement. No step-by-step atom building process can produce rays as penetrating as the observed cosmic rays. The absence of the radiations corresponding to such step-by-step processes probably means that atom-building does not in general occur in this way. About 80% of the observed cosmic rays appear to be due to the act corresponding to the sudden union of 4 pos. and 2 neg. electrons into the nucleus of the atom of He. This process produces a cosmic ray of absorption coeff. $\mu = 0.30$ per m. of water. The observed cosmic rays of absorption coeffs $\mu = 0.08$ and $\mu = 0.04$ appear to be produced by the sudden building of positive and negative electrons into atoms of O_2 and Si, the former act giving rise to a ray of absorption coeff. $\mu = 0.08$ and the latter to $\mu = 0.04$. This last is a definitely observed ray having an energy corresponding to the fall of an electron through 250,000,000 v. The cosmic-ray indications are reconcilable with the view that Fe is produced by the union in a single act of positive and negative electrons into the atom of Fe, but the cosmic rays show no direct indications of the transformation of the whole mass of the H atom into radiation. The observed cosmic-ray curve can be built up fairly satisfactorily by the assumption that the relative intensities of the cosmic rays reaching the earth's atm. are proportional to the abundance of the common elements in meteorites and the earth's crust, 96% of these bodies being made of the four elements O, Mg, Si and Fe. Evidence is presented to show that cosmic rays do not originate in the stars, but only in the depths of space where temp. and d. are practically zero. The observed properties of cosmic rays, indicating that the creation of common elements occurs only in the interstellar or intergalactic space, suggest the possibility of avoiding the "Warmistod," and of regarding the universe as already in a steady state. B. L.

The normal state of helium. J. C. SLATER. Harvard Univ. *Phys. Rev.* **32**, 519-60(1928).—An approx. wave formation for normal He is calcd., by using theoretically detd. functions for the limiting cases of large and small r 's and interpolating between them. The charge d. computed from the wave function is in good agreement with that found independently by Hartree (*C. A.* **22**, 1269). The diamagnetism of normal He is calcd., and it agrees with observation within exptl. error. The repulsive forces between 2 He atoms are calcd. by the method of Heitler and London and the attractive van der Waals forces are roughly estd. from Wang's (*C. A.* **22**, 721) results with H_2 . The potential curve so found gives a "mol. diam." in agreement with expt., and the min. of the curve leads to approx. correct d. and b. p. for the liquid. B. L.

Energy transfer during nuclear impact. W. KUHN. Univ. Heidelberg. *Z. Physik* **52**, 151-7(1928).—K. deduces that a fast α -particle can only transfer a small portion of its energy to a nucleus with which it comes into collision. The energy so transferred is taken as a criterion of nuclear stability. It is interesting that this view leads to the possibility that a transformation of elements may be expected in the interior of stars.

Partition coefficient in the fractional crystallization of radium-barium bromide solutions. ZACHARY T. WALTER AND HERMAN SCHLUNDT. Univ. of Mo. *J. Am.*

Chem. Soc. 50, 3266-70(1928).—The Ra-Ba bromide system can be made more than twice as efficient as the Ra-Ba chloride system. The crystals are sepd. from the mother liquor by centrifuging. The av. value for the partition coeff. in the Schlundt equation is 6.66 and in the Doerner-Hoskins equation 5.6.
L. D. ROBERTS

The production of color in glass and in gems by x-rays and radium rays. M. C. REINHARD AND B. F. SCHREINER. *J. Phys. Chem.* 32, 1886-7(1928).—Glass contg. Bi was colored yellow, but the depth of color does not depend on the concn. of the Bi. Topaz, aquamarine, amethyst, garnet, white and brown diamonds were not affected by intense x-radiation nor by β and γ rays from Rn. Natural quartz is unchanged, while fused quartz is colored brown in spots. White diamond fluoresced blue when exposed to the Rn tube.
L. D. ROBERTS

Electronic waves and the electron. J. J. THOMSON. *Phil. Mag.* [7], 6, 1254-81 (1928).—It is assumed that the electron consists of a nucleus and an outer sphere. This system is studied from the point of view of electrodynamics and gives a picture in accord with modern views of the electron.
GEO. GLOCKLER

Wave mechanics of the rotating electron and the fundamental equations of the electromagnetic field. J. FRENKEL. *Z. Physik* 52, 356-63(1928); cf. *C. A.* 22, 4353.—An attempt is made to establish the fundamental equation of the electron in wave mechanics as a generalization of the Maxwell and d'Alembert equation of classical electromagnetic theory. Mathematical.
GEO. GLOCKLER

Diffraction of cathode rays by calcite. SHOJI NISHIKAWA AND SEISHI KIKUCHI. *Inst. Phys. Chem. Research, Tokyo. Nature* 122, 726(1928); cf. *C. A.* 22, 3577.—The diffraction pattern consists of a no. of bands of different widths and also many black and white lines (black and white being referred to the negative). It resembles the pattern which is produced when the cathode rays are transmitted through a mica sheet. Usually a black line makes a pair with a white line parallel to it; when the distance between the lines becomes small, the pair looks like a band. Some of the bands show satellites which may be regarded as other pairs of black and white lines parallel to the main bands. An interpretation is given of the formation of the pattern.
C. J. WEST

Polarization of an electron beam. F. WOLF. *Z. Physik* 52, 314-7(1928).—If electrons are magnetic dipoles then an electron stream should attain a certain degree of polarization while passing through a magnetic field. Exptl. attempts to show this gave a negative result.
GEO. GLOCKLER

The electrification of air by friction. AGNES W. MCDIARMID. *Univ. of Glasgow Phil. Mag.* [7], 6, 1132-40(1928).—The passage of a rapid current of air through a tube causes the current to carry with it charged particles of air and leaves the tube oppositely charged.
GEO. GLOCKLER

Diffusion of slow electrons in rare gases. H. POSE. *Z. Physik* 52, 428(1928). The theories of G. Hertz (*C. A.* 19, 2908) are tested on Ne, A and He-Ne mixt. Furthermore the assumptions made are studied to find out how far they apply in the cases under consideration. It is concluded that the process is one of diffusion of electrons as has been assumed in the theory.
GEO. GLOCKLER

Ionization by electrons in a homogeneous electrical field. M. J. DRUYVESTEIN. *Z. Physik* 52, 197-202(1928).—The probability of ionization in a rare gas in a homogeneous elec. field is calcd. A differential equation of the second order is deduced for the density of electrons. The equation can be solved for certain conditions. A few curves are given for probability of ionization in Ne.
GEO. GLOCKLER

The quantum theory of electron impacts. J. R. OPPENHEIMER. *Calif. Inst. Techn. Phys. Rev.* 32, 361-76(1928).—The previous treatment of electronic collisions has been incomplete, the error consisting in the neglect of terms which correspond to an interchange of the colliding electron with one of those in the atom. The corrected first-order cross section for elastic collisions is evaluated by Dirac's method for at. H and He. The complete soln. for H is set up by Born's method. The elastic cross section becomes infinite, for low velocities, with the reciprocal of the velocity; further the first order cross section reduces to that already obtained. For H this is a monotonically increasing function; for atoms with completely paired electrons the monotonic increase is broken by a min. at velocities corresponding to about 1 v.; the higher the azimuthal quantum no. of the paired valence electrons, the more marked is the min., and the lower the voltage at which it occurs.
BERNARD LEWIS

The recombination of argon ions and electrons. CARL KENTY. *Princeton Univ. Phys. Rev.* 32, 624-35(1928).—Afterglow spectrum in A due to recombination. The arc spectrum of A persists approx. 0.001 sec. after an arc of 0.4 amp. in pure A at 0.5 mm. pressure is cut off. Lines involving jumps from high energy levels are relatively much stronger in the afterglow than in the arc. When Na vapor is present the D lines are

strong in the arc but absent in the afterglow, showing that the electron speeds in the afterglow are too low to excite the spectrum of A by direct electron impact. The highly excited A atoms must, therefore, be produced by the recombination of ions and electrons. The presence of 0.001 mm. of H does not affect the intensity of the afterglow; so the persistence of metastable atoms is not involved in the production of the afterglow. *Effect of applied potentials on the afterglow.*—Accelerating voltages of 3–10 v. quench the afterglow during the period of application of 0.001 sec. Retarding after-voltages up to 90 v. have practically no effect. Measurements with an intermittently connected exploring electrode show that the velocities of the electrons are increased by the applied accelerating voltage but unaffected by the retarding voltage. The quenching is apparently the result of the decreased probability of recombination because of the higher velocities of the electrons. When low accelerating voltages have been applied for 0.001 sec. the intensity of the afterglow and the cond. of the arc space in the period immediately following this application are both greater than they would be had the voltage not been applied. The intensity of the afterglow is thus directly related to the concn. of positive ions and the quenching of the afterglow is shown to be connected with a saving up of ions, as it should be if the effect of the after-voltages is to prevent recombination. Ordinary arc spectra are obtained under conditions which are here most unfavorable to recombination. They are presumably primary excitation spectra. The use of intermittent discharges for obtaining recombination spectra and strong high series members is suggested. The measurements show positive-ion concns. in the afterglow of the order 10^{12} per cc. The mean energy of the electrons is 0.4 v. From the measured rate of change of the concn. of ions there results a value of 2×10^{-10} for the coeff. of recombination. This value may be in error by a factor of 5 because of several unavoidable errors.

BERNARD LEWIS

The scattering of positive ions from a platinum surface. RONALD W. GURNEY. Princeton Univ. *Phys. Rev.* 32, 467–77(1928).—The velocity and intensity of positive ions scattered at various angles from a metal surface have been measured by allowing the ions scattered from a heated Pt target to pass through slits into the elec. and magnetic analyzing fields of a positive-ray box. The source, oxide catalyst emitting K, Cs or Li ions, could be rotated around the target, so that the latter could be bombarded from any angle. When the target was brought to a red heat the intensity of scattering was markedly increased, presumably because of the removal of a layer of adsorbed gas. With a homogeneous initial beam the ions scattered at a given angle are nearly homogeneous in velocity. But the energy retained by the ions varies continuously with the angle of incidence, rising from 20% of the initial energy to over 80% as grazing incidence is approached. The velocity of ions scattered from a cold target on which an adsorbed layer has formed is much less, the energy retained rising only to 40% of the initial energy near grazing incidence. A sep. app. was used to explore the intensity of scattering in all directions, by means of a collector which could be rotated around the source. For angles of incidence near the normal the intensity is very small, or even zero, but increases with increasing angle of incidence. The most intense scattering takes place in a forward direction, the no. of particles which suffer large deflections being small. Thus for a fixed angle of incidence the no. of particles scattered in a direction normal to the target is very small or even zero, but increases steadily with increasing angle of reflection. The intensity of scattering varies greatly with the energy of the incident ions, rising to a sharp max. at about 40 v. The crit. energy for intense scattering is the same for Cs, K and Li ions.

BERNARD LEWIS

Absorption coefficient of slow electrons in mercury vapor. T. J. JONES. Univ. of Minnesota. *Phys. Rev.* 32, 459–66(1928).—An account is given of measurements by two different methods of the absorption coeff. α in Hg vapor for electrons with energies of 0.5 v. up to 400 v. The expts. described in the first part were made by Ramsauer's method, in which a homogeneous electron beam is obtained by bending the electrons through a series of slits suitably arranged in a magnetic field. The second part deals with expts. made by an arrangement which gave a fairly homogeneous beam of electrons without the use of a magnetic field. In each method the fraction of the initial electrons which traversed a given distance through the vapor without suffering collision was measured, and this enabled α to be calcd. The results obtained by the two different methods were in fair quant. agreement. The absorption coeff. increased continually as the energy of the electrons was reduced down to 0.5 v. The results are in fairly good agreement with those of former workers.

BERNARD LEWIS

The motion of electrons in pentane. J. D. MCGEE AND J. C. JABOER. Univ. of Sydney. *Phil Mag.* [7], 6, 1107–17(1928).—Bailey (*C. A.* 16, 681) has given a detailed account of a method for investigating the motion of electrons in gases, which is particu-

larly applicable to those gases in which ions are formed by attachment of electrons to mols. as a stream of electrons moves through the gas. The same app. and method have since then been used to investigate the motion of electrons in pentane. A similarity exists between the curves of C_2H_4 and C_6H_{12} .
GEO. GLOCKLER

Capture of electrons by molecules. V. A. BAILEY AND J. D. MCGEE. Univ. of Sydney. *Phil. Mag.* [7], 6, 1073-89(1928).—The method of investigating the attachment of electrons to gas mols. which was described (*C. A.* 20, 11) has now been applied to the gases HCl and NH_3 . The former conclusion that h (= probability of attachment at one collision) may vary considerably with k (mean energy of agitation) in NH_3 and in air is again reached and it is certain that the method used by Loeb and Wahlen is liable in general to give erroneous results, for it depends on the assumption that h is a const. characteristic of the gas alone. Cf. I. B. Loeb, *Kinetic theory of gases*. MacMillan Co., New York, 1928.
GEO. GLOCKLER

Mobility of ions in air. IV. Investigations by two new methods. A. M. TYNDALL, L. H. STARR AND C. F. POWELL. *Proc. Roy. Soc. (London)* A121, 172-84(1928).—Ions are generated by α -rays from Po. In the first app. described the life of these is varied by means of the potential pulling them toward a metallic screen. After passing the screen they are filtered by an arrangement of superimposed alternating and steady voltages between screens, taken by a steady voltage to a further screen, filtered as before, and then go on to an electrometer plate. Only those ions reach the electrometer whose time for the passage of the screens is close to the duration of a cycle. In the second type, the field, after pulling the ions from the generating box through a slit, is changed by a commutator so as to pull the ions onto a course at right angles to the first. After passing through a slit into a second box, a second commutation changes the field so as to pull the ions to a course parallel with the first, through another slit to the electrometer collecting rod. The following results were obtained. The mean value for pos. ions of long ages in air is 1.25 cm./v./cm., and is independent of the humidity. If any initial pos. ions (cf. *C. A.* 20, 3383) exist in dry air or pure N they are all transformed in less than $1/100$ sec. The mobility of both pos. and neg. ions in air contg. alc. vapor is independent of the age of the ions from $1/65$ to $2/3$ sec. V. Transformation of positive ions at short ages. A. M. TYNDALL, G. C. GRINDLEY AND P. A. SHEPPARD. *Ibid* 185 94.—An app. is used similar in principle to those of the preceding article, but impurities from container walls are eliminated by using air under blast. It is shown that O_3 has a marked accelerating effect on the transformation of initial to final positive ions in air. The presence of final ions in increased amt. in pure N_2 shows that O_3 is not the only factor involved. Further speculation regarding the nature of this transformation is regarded by the authors as premature.
GREGG M. EVANS

Comparison of measurements of critical potentials of mercury vapor. J. C. MORRIS, JR. Princeton Univ. *Phys. Rev.* 32, 447-55(1928).—The crit. potentials of Hg vapor were examd. with a tube constructed to permit the use of a no. of different methods. For detecting crit. potentials other than those of ionization, the *Hertz method* proved the most satisfactory. Of the 13 crit. potentials found below ionization, 10 have definite spectroscopic interpretation and the remaining 3, which are probably due to Hg mols., confirm similar values by Messenger (*C. A.* 21, 3547). The *partial current method* of Franck and Hertz showed less resolving power, but otherwise gave good agreement with the Hertz method. The *Franck and Einsporn method* gave peculiar results, suggesting that it detected only photoelec. effects and not metastable atoms; and that the failure to show the other crit. potentials was due to features of tube design which eliminated inelastic impacts in the region around the filament where space charge acts to limit emission. *Compton's method* for studying ionization proved very satisfactory since no effects of other types of inelastic impacts were detected. Three *ultra-ionizing potentials* at 10.65, 11.34 and 11.78 were found in good agreement with Lawrence (*Phys. Rev.* 28, 945(1926); *C. A.* 21, 3308), although the present results do not show the regions of max. ionization probability near these values, as reported by him. An attempt to test the mol. origin of these high ionizing potentials led to neg. results.
B. L.

Ionization potentials of methane, ethane, ethylene and acetylene. J. C. MORRIS, JR. Princeton Univ. *Phys. Rev.* 32, 456 8(1928).—After prepn. and purification by the most approved methods, the gases methane, ethane, ethylene and acetylene were introduced into an ionizing tube of the Mackay type and their ionization potentials measured. The app. was calibrated against Hg and He as standards. The values found are: CH_4 , 14.4 v.; C_2H_6 , 12.8 v.; C_2H_4 , 12.2 v.; C_2H_2 , 12.3 v. These are believed to be correct to 0.2 v.
BERNARD LEWIS

Temperature of the cathode as a factor in the sputtering process. L. R. INGERSOLL AND L. O. SORDAHL. Univ. of Wisconsin. *Phys. Rev.* 32, 649-56(1928).—Au, Pt and

Ni show an increase in the rate of sputtering in A with increase in cathode temp. The lower the sputtering voltage the more pronounced the effect. Films sputtered from a hot cathode show considerable initial aging, i. e., suffer less change in resistance on baking and show a more definite crystal structure than those from a cold cathode. While evidence is presented to show that the "explosion theory" of sputtering may have a certain basis of fact, especially as regards starting conditions, the results are, on the whole, consistent with the explanation of sputtering as essentially a vaporization process. The indications are, however, that ordinary evapd. films even when produced under the same pressure as sputtered films, contain less gas, pointing to the excitation accompanying the discharge as an important factor in the process of gas occlusion in the films. B. L.

Theory of photoelectric effect. H. TH. WOLFF. *Z. Physik* 52, 158-60(1928).—The hypothesis is made that photoelectrons are conduction-electrons which have received addnl. energy from atoms by collisions of the second kind. The atoms have been excited optically. GEO. GLOCKLER

A photoelectric phenomenon which can be detected with audions. Q. MAJORANA. *Atti accad. Lincei* [6], 7, 801-6(1928).—The phenomenon was discovered during expts. with an amplifier of low frequency with transformers having 3 thermionic or audion lamps, and in a system so arranged that it was extremely sensitive to changes of potential. When light was coned. intermittently on the audions, a telephonic sound exactly corresponding to the frequency of interruption of the light was detected. It was proved that the effect was due to a photoelec. property of oxidized Cu imbedded in the vitreous mass, and is different from phenomena already known in that a gaseous medium is lacking and in that there is no variation of elec. resistance as in the Se cell. The phenomenon is of general importance in that it shows the great sensitivity of CuO to light under conditions such as those of the expt. C. C. DAVIS

The potential of photoactive cells containing fluorescent electrolytes. H. W. RUSSELL. Cornell Univ. *Phys. Rev.* 32, 667-75(1928).—*Variation with time of illumination of the potential of a cell contg. rhodamine B dissolved in abs. alc.* A theory of the variation of potential with time has been developed for the photoactive cell. It is assumed that the exciting light produces a chem. change in the electrolyte. Allowing for the effects of diffusion the expression $E = K \log [T^{1/2} - t^{1/2} + (t/2T^{1/2}) - (t^2/8T^{3/2}) + (B/I)] - K \log (B/I)$, where E is the e. m. f., T is the time of illumination, t is the time after illumination ceases, I is the intensity of illumination, and K and B are consts., has been derived. By the use of a cell with Pt electrodes contg. Rhodamine B in abs. alc. and illuminated with monochromatic light, results in good agreement with the theory are secured. Diffusion is shown to play an important part. Goldmann's theory is shown to be inadequate. No "limiting potential," independent of the intensity of illumination, was found. No evidence was found which indicated the presence of Hollwachs' photoelec. effect. BERNARD LEWIS

Photoelectric phenomenon. B. POGÁNY. *Technika* (Budapest) 9, 1-2, 8-11 (1928). A brief exposition. S. S. DE FINÁLY

Photoelectric thresholds and fatigue. GEORGE B. WELCH. Cornell Univ. *Phys. Rev.* 32, 657-66(1928). Using elements of the highest purity, clean surfaces were prepd. in a vacuum tube of the order of 10^{-6} mm. of Hg. by means of an electromagnetic filing device. A linear relation was found between the logarithm of the photoelec. current and the logarithm of the time elapsed since polishing the specimen. The rate of fatigue depends upon the element used and the factors which produce fatigue and, for a given substance, increases numerically as the threshold is approached. Increasing the pressure increases the rate of fatigue. The action of light has a negligible effect. The values of the photoelec. threshold for Ca, Fe, Cs, Ni, Cu, Zn and Ge are, resp., 4475, 3155, 3165, 3040, 2955, 3180 and 2880 A.U. Within a period of several hrs. at least photoelec. fatigue causes no change in these values when a high vacuum is used. Evidence for a shift toward shorter wave lengths is obtained for lower vacua. A theory in which contamination takes place at discrete areas of the surface of the element is proposed to account for the exptl. facts obtained. BERNARD LEWIS

The element of time in the photoelectric effect. ERNEST O. LAWRENCE AND J. W. BEAMS. Yale Univ. *Phys. Rev.* 32, 478-85(1928).—*Time of appearance and cessation of the photoelec. effect from a K hydride surface:* A method has been devised which has made possible the study of the time variation of the photoelec. emission from a metal surface illuminated by flashes of light 10^{-8} sec. in duration. The exptl. arrangement has also yielded information on the speed of operation of the Kerr cell electro-optical shutter described in earlier work, and has made possible for the first time the observation of the steepness of wave fronts travelling along wires resulting from spark discharges. Photoelec. emission begins in less than 3×10^{-9} sec. after the beginning

of illumination of a K hydride surface. The light shutter closes less abruptly than it opens and the exptl. observations indicate that the sum of the time required for the shutter to close plus the time during which the photoelec. emission persists after cessation of irradiation is less than 10^{-8} sec. A wave traveling along a wire resulting from a sudden change in potential of one end by a spark discharge is so steep that the time necessary for about $\frac{1}{2}$ the wave-front to pass a point 6 meters along the wire is 4.5×10^{-9} sec. Theoretical considerations bearing on these results are discussed. BERNARD LEWIS

The influence of deformation on the internal photo effect of rock salt crystals. ADOLF SMEKAL. *Naturwissenschaften* 16, 760(1928).—It has been shown by Podaschewsky (*Ibid* 653) that plastic deformation of crystals, concurrent with decrease in yellow coloration, of rock salt is accompanied by a decrease in internal photo effect. It remains to be studied whether this decrease is due to a direct destruction of the photo centers or to a decrease in the stability of them. Possibly the electron sepn. energy is lowered locally by the plastic changes. B. J. C. VAN DER HOEVEN

Magnetism and nuclear structure. D. ENSKOG. *Z. Physik* 52, 203-20(1928).—Correction of a slight error in the paper abstracted in *C. A.* 22, 1271. Further discussion of nuclear structure based on magnetic forces. Packing defects calcd. appear to have the right order of magnitude. GEO. GLOCKLER

Change of magnetization intensity of iron upon stretching. J. B. SETH, CH. ANAND AND M. DAYAL. *Z. Physik* 52, 382-8(1928).—An Fe wire located in various weak magnetic fields is put under various tensions. The magnetization intensity changes. The curves showing the intensity of magnetization for various fields as a function of the stretching are similar and also resemble the curves connecting stretching and load. GEO. GLOCKLER

Magnetostriction of single crystals of iron. N. AKULOV. *Z. Physik* 52, 389-405(1928).—A general equation of the expansion energy of dipole-lattices, electro-striction and magneto-striction is given. Comparison with exptl. curves shows satisfactory agreement. Conclusion: Fe ions have no marked elec. dipole moment and they act as simple magnetic dipoles as far as their mutual magnetic inter-action is concerned. G. G.

Anomalous magnetic rotation in excited neon. R. N. JONES. Univ. of Chicago *Phys. Rev.* 32, 681-8(1928).—The anomalous magnetic rotation of the plane of polarization was observed near 20 lines belonging to the transition, $s_3 - p_k s_4 - p_k$ and $s_3 - p_k$. Quant. measurements were made of the angle of rotation for different frequencies near 16 lines. The effect is the normal effect, sym. on both sides of the line, the direction of rotation being neg. From the angle of rotation the dispersion consts. were detd., the formula derived by Kuhn being used. This formula requires a knowledge of the relative intensities in the longitudinal Zeeman effect. They were calcd. from the theoretical rules of Hönl, and were found to give good results. The relative transition probabilities, for absorption lines having the same lower state, were calcd. from the ratios of the dispersion consts., Ladenburg's formula being used. The values so found are, in general, in good agreement with those previously detd. from the anomalous dispersion. B. L.

The direction of ejection of photoelectrons by polarized x-rays. C. J. PIETENPOL. New York Univ., Univ. Heights, N. Y. *Phys. Rev.* 32, 564-9(1928).—P. has studied the lateral distribution by means of Geiger counters which could rotate about the polarized beam. The electrons were ejected from air at a low pressure in which the mean free path of the electron is many times the distance through which the electron must move to enter the counter. Allowance being made for the fact that completely polarized beams are impossible to obtain in practice, the data strongly favor the cosine squared relation of Auger and Perrin rather than the relation deduced by Bubh. BERNARD LEWIS

Are characteristic x-rays polarized? E. O. WOLLAN. Univ. of Chicago. *Proc. Natl. Acad. Sci.* 14, 864-7(1928). K_α lines of Mo are not polarized in excess of 1%. D. D.

Precision-measurement of x-rays from Zn to Ru. B. EDLEN. *Z. Physik* 52, 364-71(1928).—The K_α lines of Zn, As, Se, Br, Rb, Sr, Yt, Zr, Cb and Ru are measured in first order. GEO. GLOCKLER

Intensity distribution in the Compton effect. F. SAUTER. *Z. Physik* 52, 225-34(1928).—An attempt is made to derive equations for the intensity of the Compton lines on the basis of pure quantum theory. By means of appropriate hypotheses theory and expt. check satisfactorily. GEO. GLOCKLER

Theory of x-ray diffraction in liquids. G. W. STEWART. Univ. of Iowa. *Phys. Rev.* 32, 558-63(1928); cf. *C. A.* 23, 30.—There are numerous exptl. results in the diffraction of x-rays in liquids that seek explanation by an adequate theory of which S. enumerates 9. The conception of mol. non-cryst. groupings in the liquid makes possible the use of the crystal powder theory as an idealized one for liquids. It is found that

used as an approxn. this theory explains all the phenomena listed. The Erhenfest formula, intended for gases but which has been used to obtain the mean mol. sepn. in liquids, and which varies from Bragg's law by about 19%, cannot be so applied to liquids.

BERNARD LEWIS

Fine structure of the scattered radiation from graphite. BERGEN DAVIS AND DANA P. MITCHELL. Columbia Univ. *Phys. Rev.* 32, 331-5(1928).—The analysis of the "undisplaced" scattered radiation was made with a double x-ray spectrometer. Four lines were observed: (a) an undisplaced line at position of Mo $K\alpha_1$; (b) a line displaced $80''$ (0.0012 A. U.) from $K\alpha_1$; position: (c) a line displaced $140''$ (0.002 A. U.) from $K\alpha$; (d) a line displaced $780''$ (0.0113 A. U.) from $K\alpha_1$. These are all on the long wave-length side of Mo $K\alpha$. The undisplaced line (a) is scattered from the whole atom. The line displaced (0.0113 A. U.) agrees closely with $h\nu' = h\nu - V_e$, where V_e is the energy level (287 v.) of the C atom. The line (b) is displaced 0.0012 A.U. This is equiv. to 29 v., which does not agree with the L_{III} level of C (11.2 v.) The line (c) is displaced 0.002 A. U. This is equiv. to 50 v. which does not agree with the L_I level of C (34 v.). With these 2 lines the relation $h\nu' = h\nu - V_e$ does not hold. A search was made for scattered radiation on the short wave-length side of the Mo $K\alpha_1$ position with neg. results.

B. L.

Investigation of continuous x-radiation from thin aluminum films. HELMUTH KULENKAMPFF. Tech. Hochschule, München. *Ann. Physik* 87, 597-637(1928).—Since loss of speed and diffusion of cathode rays veil the regularity of the process of emission of continuous x-radiation more with massive anti-cathodes than with thin layers of metal, K. has used thin Al foil as an anti-cathode in his expts. The intensity of the x-radiation is too small to use a spectrometer; the compn. of the radiation was obtained by measuring the absorption in Al filters. The max. of hardness of the radiation was found to be at an angle of 67° ; the radiation showed no marked difference between the angles of 90° and 55° , but was weaker at 30° and 140° . Through application of Sn, Ag and Zr, as absorbing substances, narrow spectrum limits could be filtered out of av. parts of the spectrum. This radiation is so homogeneous that in a small-voltage interval the course of the isochromator can be estd. For angles of 90° , this radiation showed decreasing intensity with increasing voltages. The azimuthal intensity distribution was investigated in respect to wave length with const. voltage (Al, Ag, Zr filters) and in respect to voltage for the same wave length. The direction of the most important emission is independent of the wave length and coincides with the direction of the max. of hardness. It depends only on the speed of the cathode rays and changes from 73° to 64° if the voltage is raised from 16.4 to 37.8 kv.

MALCOLM DOLE

The similarity in x-ray spectrum of fluid crystals and of the liquid phase of the same substance. J. R. KATZ. Univ. Amsterdam. *Naturwissenschaften* 16, 758-9 (1928).—Previously (*C. A.* 22, 4021) K. has shown that mols. of various substances (Me and Et salicylate, methylindole, etc.) in the true liquid state show x-ray interference lines indicating stiff mols. in some lattice-like arrangement. In order to elucidate the difference between this and the liquid cryst. state K. took x-ray spectra around the transition point liquid-fluid crystal, studying in particular the fine structure of the interference rings. Quite similar diagrams were found without any characteristic differences (*p*-azoxyanisole, *p*-azoxyphenetole, *p*-azoethyl benzoate, etc.). All diagrams indicated, parallel, i. e., lattice-like order of the stretched mols. It is improbable that the fluid crystals consist of a conglomeration of true crystals; however, the mol. bundles in the fluid crystals (order of 10^4 units, Ornstein) must be considerably larger than in the true liquid.

B. J. C. VAN DER HOEVEN

Absorption spectra of liquid-crystals. D. VORLÄNDER. *Naturwissenschaften* 16, 759-60(1928).—By means of a quartz spectroscope the absorption spectra of several liquid cryst. esters were detd. It appears from the reproduced spectra that the transition from "amorphous" liquid into cryst. liquid is very little marked as compared with considerable changes in spectrum at the transition from the latter into the solid cryst. state. Conclusion: Liquid crystals are an amphibious form, not an independent intermediary one.

B. J. C. VAN DER HOEVEN

Oven for x-ray investigations at high temperatures and preliminary results with pentaerythritol and quartz. WILLI M. COHN. *Z. Physik* 50, 123-36(1928).—A camera is described in which the fine structure of the x-ray spectrum of solid, non-conducting substances may be detd., the prepn. being brought to a known high temp. for long periods. Both with pentaerythritol and quartz, the effect of rising temp. was to cause a general weakening of the intensity of the bands with equal times of exposure and a falling off of the higher interference bands. On the other hand, the broadening of the lines which was anticipated on theoretical grounds was observed only with pentaerythritol.

A. L. HENNE

Alkali-halide crystals with copper impurity. A. M. MACMAHON. *Z. Physik* **52**, 336-41(1928).—Alkali-halide crystals are not stable when contg. an impurity of Cu ions. These ions deform the crystal lattice. The emission spectra of these crystals change in the course of time (a few months). The absorption bands behave the same on cooling as do the bands of Pb and Tl contg. halides. The bands due to the Cu impurity resolved into partial smaller bands on cooling. The absorption bands become more narrow and less tall upon cooling. GEO. GLOCKLER

Note on the effect of chemical combination on the structure of the K absorption limit. BERGEN DAVIS AND HARRIS PURKS. Columbia Univ. *Phys. Rev.* **32**, 336-8 (1928).—The structure of the K absorption limits of some chem. compds. was examd. with the double x-ray spectrometer. The K absorption limits of the elements Ag, Mo and Cu, and the compds. Ag_2S , Ag_2O , MoO_3 , MoS_2 and Mo_2O_3 were examd. for increase in width or fine structure. The width for the pure element decreases with increasing at. no. The general effect of chem. combination was to broaden the absorption limit but there was little displacement; in one case, Mo_2O_3 , there was evidence of fine structure. The Ag salts appeared to be reduced by the x-rays. Expts. of Read (*Phys. Rev.* **28**, 898(1926) and *C. A.* **20**, 2616) indicate an increase of absorption of the absorbing element due to temp. The results were interpreted as due to a shift in the absorption limit. This was examd. with the double spectrometer. A strip of Mo was heated to incandescence in vacuum. The position and form of the K limit was identical with that of the cold strip. No effect of temp. was detectable. The authors believe their method would detect $1/10$ the displacement estd. by Read. BERNARD LEWIS

Mechanism of abrasion. W. D. KUZNETZOV, N. A. BESSNOV AND N. F. PITCHENIN. *Z. Physik* **25**, 420-7(1928).—The work necessary to cause abrasion of the surface of a cubic crystal is studied. NaCl, KCl and KI behave according to theoretical prediction. As a result it is stated that the method of polishing can be used to det. the relative values of the surface energy of material of similar structure. GEO. GLOCKLER

Quantum-mechanical theory of the natural optical activity of liquids and gases. L. ROSENFELD. *Z. Physik* **52**, 161-74(1928).—A general formula for the optical rotatory power is derived on the basis of modern quantum mechanics. Mathematical. G. G.

The intensities of the lines in the spectrum of mercury. E. O. HULBERT. Naval Research Lab., Washington, D. C. *Phys. Rev.* **32**, 593-9(1928).—The total radiation, measured with a thermocouple, in the spectral region 6000 to 2300 Å. U. from a small quartz Hg lamp of known size filled with Hg vapor at a known pressure was 1.85×10^{-10} ergs per atom per sec. From this and the intensities of the lines it was found that each atom on the av. emitted each sec. 11.4, 8.9, 5.0, 2.3, etc., quanta of yellow, green, blue, violet, etc., light, resp. The intensities of 24 lines of the spectrum were measured with a quartz spectrograph, a thermocouple, and a photoelec. cell, all calibrated. In some cases a photographic densitometer was used. Plotting the logarithm of the intensity against the frequency for the lines of a series gave roughly straight lines of about the same slope for the sharp series ($2^3P_n - m^3S_1$) and for the diffuse series ($2^3P_n - m^3D_{1,2,3}$). The temps. of the excited atoms derived from the slopes were 3900° and 2600° K. for the sharp and diffuse series, resp. BERNARD LEWIS

The influence of foreign gases on the optical excitation of mercury. E. GAVIOLA. Johns Hopkins Univ. *Phil. Mag.* [7], **6**, 1167-91(1928).—The increases and decreases of the intensities of the Hg lines in the optical excitation of Hg vapor when foreign gases are admitted into the fluorescence tube are readily explained, using the results of the theory on the optical excitation of Hg vapor (cf. following abstr.). The influence of diverse gases upon the absorption of the line 4046 by the metastable Hg atoms has been studied experimentally to det. the amt. of metastable atoms produced by each of the gases at different pressures. Diffusion of metastable atoms has been directly demonstrated, showing their long lifetime. The higher metastable level 2^3P_2 is very sensitive to collisions with gas mols., and its lifetime when no foreign gas is present has been calcd. to be of the order 10^{-5} sec. The mean life of the lower metastable level 2^3P_0 has been calcd. to be of the order of $1/300$ of a sec. under the present conditions, and a further calcn. shows that it can increase to about 10 secs. under ideal conditions (in stars, for instance). The efficiency of quenching collisions of N_2 with excited atoms in the resonance level is of the order of magnitude 1. The no. of metastable atoms produced by the presence of a few mm. of N_2 or H_2O vapor is estd. to be about 100 times the no. of excited atoms in the resonance level. The different changes of the intensities of the lines along the slit of the spectrograph when gases are admitted and an image of the cross-section of the tube is formed upon it are explained for every one of the lines appearing in fluorescence. GEO. GLOCKLER

The power relation of the intensities of the lines in the optical excitation of mercury.

E. GAVIOLA. Johns Hopkins Univ. *Phil. Mag.* [7], 6, 1154-67(1928).—The intensity of the different lines of Hg vapor at room temp. when excited optically by a water-cooled Hg arc has been calcd. as a function of the primary intensities, and of the position of the emitting vol. element in the tube, and the results allow one to understand the special behaviors of some lines like 3650. The absorption laws for lines like 4358 and 3650 in excited Hg vapor have been calcd.

GEO. GLOCKLER

New contribution to the spectrum of bromine in the electrodeless discharge. N. SIRACUSANO. Reale Univ., Catania. *Atti accad. Lincei* [6], 7, 835-8(1928).—The method already developed for detg. the spectra of Cl and of As in a discharge without electrodes (cf. *Atti accad. gioenia Catania*, [Mem.] III, 1926) was modified and perfected so that it could be applied to the spectrum of Br. CuBr_2 was used. With the smallest distances of explosion (1-2 mm.) for 45-60 min., the spectrum was continuous, with faint lines which formed a characteristic group. The discharge was pale blue, with little intensity. The group of lines increased in intensity with increase in the excitation, finally becoming most intense at the center. These lines are in great part new and are tabulated, the data showing a practically const. sepn. of 3685^{-1} cm., which is the value noted by Turner (cf. *C. A.* 20, 2613) in the ultra-violet region.

C. C. DAVIS

The relative intensities of the Stark effect components of the Balmer lines $H\beta$ and $H\gamma$. H. MARK AND R. WIERL. I. G. Farbenindustrie Aktiengesellschaft, Ludwigshafen. *Naturwissenschaften* 16, 725-6(1928).—The relative intensities of Stark-effect components repeatedly found, the reverse of those expected from the Schrödinger theory, were now detd. in 2 different ways, in Stark's way by canal rays parallel to the lines of force of the field; addnl. to this, fields perpendicular to the rays were used. All other conditions were left the same; the field was 200 k.v. per cm. From 2 photometer curves of $H\beta$ $\Delta = 8$ and 10 Stark's observations were confirmed for the first method (10 stronger than 8); for the second method the ratio was reversed in agreement with Schrödinger's theory. The same holds for the $H\gamma$ components $\Delta = 5$ and $\Delta = 2$, not for $\Delta = 13$ or 10.

B. J. C. VAN DER HOEVEN

Interference of corpuscular rays. W. ELSASSER. *Naturwissenschaften* 16, 720-5 (1928).—A review is given of reflection of elec. rays on metals. The work of Davisson and Germer (*C. A.* 22, 350) is described in detail. Thomson's (*C. A.* 22, 1723) and Rupp's work is briefly mentioned.

B. J. C. VAN DER HOEVEN

The spark spectrum of neon. A. S. GANESAN. Imperial Coll., London. *Phys. Rev.* 32, 580-2(1928).—A list of lines in the spark spectrum of Ne between $\lambda 2300$ and $\lambda 1850$ is given. Many of the lines seem to belong to Ne III.

BERNARD LEWIS

The 29- and 30-electron <system spectra of arsenic and selenium. R. A. SAWYER AND C. J. HUMPHREYS. Univ. of Michigan. *Phys. Rev.* 32, 583-92(1928).—New vacuum-spark data in the extreme ultra-violet have been obtained for As and Se. By aid of previous classifications in the 29- and 30-electron-system spectra of Cu, Zn, Ga and Ge, it has been possible by extrapolation of the Moseley diagram, the irregular doublet law, screening const. data and the triplet interval ratios to predict the location of and to identify the lines arising from transitions between the lowest levels in the spectra of As IV, As V, Se V and Se VI. The ionization potential of As V is detd. as 62.4 v., that of Se VI as 81.4 v. The $(4P^2)^3P$ sepn. of the 30-electron-system spectra is observed to show a rapid increase with respect to the sepn. both of $(4s4p)^3P$ term and $(4p)^3P$ term of the next ion. The theoretical significance of this effect, which is observed here for the first time, and which does not appear in the corresponding isoelectronic spectra of the lighter elements, is discussed. The effect is believed to be due to a change of coupling of the quantum vectors with increasing nuclear charge.

BERNARD LEWIS

The structure of the induction spectra of rare gases—arc spectra of argon, krypton and xenon. ADOLFO T. WILLIAMS. *Proc. Phys. Soc.* (London) 40, 312-5 (1928), cf. *C. A.* 22, 4373.—The purpose of the paper is to establish the usefulness of the excitation by induction method to sep. different orders of the spectra of rare gases. An examn. is made of the arc spectra, const. sepn. and groups of lines obtained by Bloch and Dejaridin. The probable regions occupied by different series are given. Meissner's results in the arc spectrum of A do not agree with groups of lines deduced by Bloch and Dejaridin.

FRANK V. JOHNSON, JR.

The refractive index of sodium vapor and the width of the D lines in absorption. JOHN Q. STEWART AND SERGE A. KORFF. Princeton Univ. *Phys. Rev.* 32, 676-80 (1928).—Classical methods being employed, a theoretical relation is developed between the refractivity of Na vapor near the D lines and their observed width in absorption. A preliminary exptl. test of this relation is described. The method involved observation of the wave lengths of interference fringes produced by Na vapor when a Michelson interferometer was used in conjunction with a spectroscope and a source of white light.

This is a convenient means of detg. refractivity in cases where it varies rapidly with wave length. The approx. observations verify the classical theory, and serve to give a detn. of e^2/mc^2 which is correct in order of magnitude. As regards the scattering of radiation Na atoms may be considered as behaving in a manner analogous to Hertzian oscillators.

BERNARD LEWIS

Polarization of resonance radiation in mercury. HARRY F. OLSON. Univ. of Iowa. *Phys. Rev.* 32, 443-6(1928).— $1^1S_0 - 2^3P_1$ of Hg excited by plane polarized light shows incomplete polarization both in the absence and in the presence of a weak field parallel to the elec. vector. The amt. of initial polarization depends upon the relative intensities of the hyperfine structure lines in the exciting light. The polarization with various relative orientations of field and light vector and the variation with field intensity in weak fields may be interpreted successfully by means of a semi-classical model, with proper relativ. intensities parallel and perpendicular to the light vector, rotating after excitation with an angular velocity $g\hbar/2mc$ and emitting a damped wave. From curves connecting depolarization, rotation of max. of polarization, etc., with field intensity α , the damping const. has been found to be $1.02 (\pm 0.02) \times 10^7 \text{ sec}^{-1}$.

BERNARD LEWIS

Absorption bands in the spectra of mixtures of metallic vapors. R. K. WARING. Johns Hopkins Univ., Baltimore. *Phys. Rev.* 32, 435-42(1928).—It is shown by expt. that at a given temp. the amt. of Tl in the vapor is increased by adding Hg vapor. This indicates definitely that Tl-Hg mols. are formed. In a mixt. of Tl and Hg vapors a no. of bands appear in absorption, which are to be attributed to the HgTl mol. In no case was the resolving power sufficient to show structure. Asymmetric broadening of the at. Tl lines and of the Cd line 2288 due to Hg vapor has been observed. Two possible explanations are discussed: broadening due to a superimposed mol. band, and broadening due to transfer of kinetic energy by collisions. Absorption due to InCd mols. were observed in mixts. of In and Cd vapors at temps. of 400°, 500° and 800°. Their short wave-length limits are tabulated. A few showed traces of their structure but the resolving power was not sufficient to make measurements possible.

BERNARD LEWIS

Band spectra in the extreme ultra-violet excited by active nitrogen. HAROLD P. KRAUSS. Univ. of Cal., Berkeley, Cal. *Phys. Rev.* 32, 417-26(1928).—To det. the amt. of energy available in active N_2 for the excitation of spectra, a vacuum grating spectrograph was used to observe spectra between 2500 and 1000 A.U. excited in certain gases in the afterglow. The gases were mixed with glowing N_2 obtained from a stream of N_2 , passing through a discharge tube contg. an oscillatory discharge. H_2 , O_2 , N_2 , CO and NO were studied, of which only CO and NO showed bands in the region mentioned. In addn. to the β and γ bands of NO characteristic of the afterglow, a progression was found belonging to another system with the same final levels, i. e., levels assocd. with the normal electronic state of the mol. The initial level identified from published absorption data as an electronic state with zero vibration is designated as level C, and the new system as the δ band system of NO. The O-O δ -band is at 1915.7 Å corresponding to 6.44 v. A few bands of the 4th positive group of CO were obtained in the afterglow, corresponding to the excitation of vibration states $n' = 1$ to 6 of electronic level A. The total energy of these levels is from 8.2 to 9.0 v. The results are discussed. It is assumed that atoms of N can combine to form an excited diatomic mol. if the encounter is such that the energy of formation and the relative kinetic energies of the atoms go over into electronic, vibrational and rotational energies of the mol. Such encounters will be rare, because both energy and momentum must be conserved in the recombination, therefore, the active modification will have a relatively long life. On formation, the mols. have 11.4 ± 0.3 v. of energy; part of this is lost immediately by radiation of the α bands, leaving 9 to 10 v. in a configuration which is strongly metastable with respect to the normal electronic state. This metastable mol. is considered responsible for the excitation of spectra in the afterglow.

BERNARD LEWIS

Beryllium hydride band spectra. WM. W. WATSON. Univ. of Chicago. *Phys. Rev.* 32, 600-6(1928).—Two new band systems appear in a Be arc in H_2 , one in the green from 4800 A.U. to 5120 A.U. and the other from 3700 A.U. to beyond 2200 A.U. in the ultra-violet. Measurements of the bands of both systems at high dispersion are reported and the quantum analysis is given. The green band group belongs probably to the $^3P \rightarrow ^3S$ class due to BeH mols. It consists of the 0-0, 1-1, 2-2, etc., bands, degrading to the violet but all branches exhibit a marked shift to the red for $j > 30$. The analysis gives $I_0' = 2.6833 \times 10^{-40}$ g. per sq. cm. and $I_0'' = 2.7212 \times 10^{-40}$ g. per sq. cm. for the moments of inertia, $r''_0 = 1.35 \times 10^{-8}$ cm., $\omega_0' = 2053.4$, $\omega_0'' = 2025.7$. The ultra-violet system consists of singlet P, R branch bands degrading to the red, the equation for the zero points being $v = 39,059 + 1460.5 n' - 14.5 n'^2 - 2182.0 n'' + 41.0 n''^2$.

For this system $I_0' = 3.85 \times 10^{-40}$ g. per sq. cm and $I_0'' = 2.50 \times 10^{-40}$ g. per. sq. cm., $r_0' = 1.29 \times 10^{-8}$ cm. A discussion of the probable electronic transition for the ultra-violet bands is included.

BERNARD LEWIS

The less refrangible bands in the spectrum of tin monochloride. W. F. C. FERGUSON. New York Univ. *Phys. Rev.* 32, 607-10(1928).—Four groups of bands previously obtained by Jevons (*C. A.* 20, 1561) in a discharge through SnCl_4 vapor are now found also in streaming active N_2 . Two groups α and β were previously classified as a $^2S \rightarrow ^2P$ transition in SnCl_4 ; with the help of new measurements, and from an examn. of the band structure, it is concluded that the other two groups, $\lambda 3500$ and $\lambda 3800$, are a $D^2 \rightarrow ^2P$ transition with the same 1P state as the α and β bands. The Cl_2 isotope effect confirms the identity of the emitter as SnCl_4 as also the vibrational quantum no. assignments. The vibrational intensity distribution (intensity concn. in $n = 0$ sequence) is in qual. agreement with theory, for the ratio of ω_0'' to ω_0' . An attempt was made to obtain analogous bands by introducing SnI_4 vapor into active N_2 , but no new bands were obtained.

BERNARD LEWIS

The absorption spectrum of liquid benzene. JAMES BARNES AND W. H. FULWEITER. Bryn Mawr College. *Phys. Rev.* 32, 618-23(1928); cf. *C. A.* 22, 730.—A *precision method* is described for measuring the wave lengths of radiation in the rear infra-red region of the spectrum by using a six-foot Rowland concave grating with a thalofide cell. The results obtained are believed to be accurate within 0.001μ . By this method the wave length of an outstanding absorption band of liquid benzene was detd. The frequency of this band together with those of other bands previously measured substantiates the theory that the absorber of these radiations is a linear anharmonic oscillator, whose energy states are represented by odd multiples of half quanta.

B. LEWIS

Absorption band spectrum of iodine monochloride. EARL D. WILSON. Ohio State Univ. *Phys. Rev.* 32, 611-7(1928).—The visible absorption spectrum of ICl was photographed and measured. Eight new members have been located in the two series described by Gibson and Ramsperger (*C. A.* 22, 354) as corresponding to $n'' = 1$ and $n'' = 2$. The limit of convergence of the former series is at $v. = 17,430 \pm 5$ per cm., which makes the heat of dissocn. equal to $49,650 \pm 15$ cal. per mol. Four members of a new series for which $n'' = 3$ have been found. It is thus possible to compute the fundamental vibratory frequency of the mol. as 381.9 per cm. Still another series of 5 members is recorded whose presence may be due to the existence of a close electronic doublet having a sepn. of about 36 per cm. The ratio of the two *sp. heats* of gaseous ICl has been calcd. to be 1.30, in agreement with empirical results. The fine structure of 3 consecutive bands has been measured and the corresponding values of the parabolic parameter C have been computed to be in agreement with the theory of change of moment of inertia, I , with ω , the frequency of vibration of the mol. By combining both sets of data for band heads and fine structure the following approx. values for the *moment of inertia* have been computed $I'' = 575 \pm 100 \times 10^{-40}$ g. per. sq. cm.; $I' = 995 \pm 200 \times 10^{-40}$ g. per sq. cm.

BERNARD LEWIS

Experimental test of combination rules in band spectra. E. BENGTSSON AND E. HULTHÉN. *Z. Physik* 52, 275-9(1928).—Two band systems are known in AlH : $P \rightarrow ^1S$ and $^1S' \rightarrow ^1S$. A combination system was found, $^1S' \rightarrow ^1P$. The combination rules established by Kronig are tested exptly. Cf. *C. A.* 22, 1278; 23, 32.

G. G.

Band spectrum of helium. W. WEIZEL. *Z. Physik* 52, 175-96(1928); cf. *C. A.* 23, 504. Nine new bands of He are recorded. Partly they are higher series-members of known bands. They show great anomalies which have already been known to a slight extent in previously known bands. The anomalies are explained by the assumption that rotation affects the moment of momentum vector of the electron orbit, causing a component along the axis of rotation. This leads to a doubling of the rotation terms. The electron-energy levels of He_2 are systematized completely.

GEO. GLOCKLER

Electronic states and band spectrum structure in diatomic molecules. VII. $^2P \rightarrow ^2S$ and $^2S \rightarrow ^2P$ transitions. ROBERT S. MULLIKEN. Wash. Sq. College, New York Univ. *Phys. Rev.* 32, 388-416(1928); cf. *C. A.* 22, 355.—A survey is made of the varied empirical structure-types to be expected for $^2P \rightarrow ^2S$ and $^2S \rightarrow ^2P$ bands, and examples of these types are discussed individually. In agreement with Kemble's theory, the arrangement of the rotational levels in the 2P state changes continuously with the parameter $\Delta E/B$ (ΔE = elec. doublet sepn.), and these changes are responsible for a large part of the observed variations in band structure. Figures and tables are given showing how the arrangement of the 2P levels changes with $\Delta E/B$ and also how observed branches are related to energy levels, for the MgH , OH , HgH and $\text{NO } \gamma$ bands. Data on A and B are listed for a no. of mols. The mode of variation of the arrangement of

the rotational levels in 1P states appears to be in striking agreement with the quant. formulas of Hill and Van Vleck. *E. g.*, if $\Delta E/B = +2$ their equation becomes formally identical with the Kramers and Pauli formula which holds exactly for the 3P state of CH. A consistent notation is given here for the known branches of the MgH, CaH, OH, ZnH, CdH, HgH and NO bands. A more or less detailed discussion is given of the spectra mentioned, especially MgH and OH; some term values are given for 3P and 3S states of MgH, CaH and OH. In the bands just mentioned, band structure and missing lines show good agreement with theory. In the cases where $|\Delta E/B|$ is small for the 3P state (CH, MgH) there is agreement with the case *b* intensity theory (6 main branches, 4 weak satellite branches). As $|\Delta E/B|$ increases, the satellite branches get stronger and 2 new branches become evident. This tendency first appears distinctly in OH, where the satellite branches, although very weak, are much too strong for Hund's case *b*, and where a previously unclassified very weak branch is found to be 1 of the 2 new branches just mentioned. As $|\Delta E/B|$ increases still further, the 6 weak branches finally become equal to the other 6 in intensity. The observed relations, in particular the equality of intensity of the 6 weak and 6 strong branches when $|\Delta E/B|$ is very large, appear to be in excellent agreement with the quant. intensity formulas of Hill and Van Vleck. A conclusion of interest for the empirical study of $^3P \rightarrow ^3S$ and $^3S \rightarrow ^3P$ bands is the following: in four-headed bands of these types the *first* head should always be weaker than the rest unless $|\Delta E/B|$ is large and should disappear if $|\Delta E/B|$ is near zero. Intensity relations in $^3P - ^3S$, $^3P \rightarrow ^1S$, and other types of bands are briefly discussed for the case that one electronic state falls under Hund's case *a*, the other under his case *b*; some predictions are made.

BERNARD LEWIS

Polarization of the resonance radiation from degenerate systems. FRANK C. HOYT. *Phys. Rev.* 32, 377-87(1928) —The problem of resonance between light and an atom is treated by solving the wave equation through the method of variation of consts. An initial degeneracy is removed by the action of the light and there occur fluctuations between the two states involved. Calc. of the elec. moment of the perturbed atom on the Schrödinger d. hypothesis shows that when the incident light is linearly polarized the radiation has the same degree of polarization as though the atom were in a weak magnetic field parallel to the elec. vector of the light. For circular polarization this fictitious field is perpendicular to the plane of polarization. These results confirm the Heisenberg rule and deduced from the correspondence principle.

BERNARD LEWIS

Reversals in the arc spectrum of nickel. A. C. MENZIES. Univ. College, Leicester *Phil. Mag.* [7], 6, 1210-6(1928) —The ground-term of Ni (I) empirically is a term 3F_4 . Doubt exists that this is the ground-term to be expected theoretically; it might be a 1S_0 term. Fuse-spectra in air in the ultra-violet and *in vacuo* in the Schumann region have been examd. Many reversed lines in the former region have been found, but most of them can be accounted for as transitions to low levels already known, from middle terms already known and from new middle terms. In the Schumann region no long lines occur which could be attributed to the arc, they all appear to belong to the ground-terms 3D_2 and 3D_2 of Ni (II). It is concluded that the hypothetical term 1S_0 must give rise to lines below the region examd., if the term exists at all.

GEO. GLOCKLER

Theory of the single-leaf radiometer. TH. SEHL. *Z. Physik* 52, 249-63(1928). A theory of the single-plate radiometer is derived on the view that a plate represents the limiting case of an ellipsoid of revolution. Radiation falling on the plate produces a temp. gradient on the surface, causing thermal convection currents. The problem is now a hydrodynamical one and the force upon the radiometer is now the force produced by the gas-flow. This force has the correct dependence upon intensity of radiation, gas pressure and nature of the gas.

GEO. GLOCKLER

Experimental study of the radiometer. E. BRÜCHE AND W. LITWIN. *Z. Physik* 52, 318-35(1928). —The gases He, Ne, Ar, H₂, O₂, N₂, air, CO, NO, CO₂, N₂O and CH₄ were studied. At low pressure the radiometer-effect is a surface-effect, independent of the kind of gas used and the geometry of the arrangement and depends only on the concn. of gas. At somewhat higher pressures a max. effect is reached depending on the mean free path. At high pressure, the effect becomes an edge-effect directly proportional to the square of the mean free path and inversely proportional to the pressure. Similar gases CO, NO and CO₂, NO₂ give similar radiometer effects.

GEO. GLOCKLER

Note on Raman lines under high dispersion. R. W. WOOD. Johns Hopkins Univ. *Phil. Mag.* [7], 6, 1282-3(1928). —W. photographed the spectra scattered by C₆H₆ and CCl₄ with a 6-inch plane grating combined with a lens of 3-m. focus. Small portions of the spectra are reproduced. (cf. C. A. 23, 338).

GEO. GLOCKLER

Scattering of light in water. G. I. POKROVSKII. *Z. Physik* 52, 448-50(1928). —The Raman effect found is peculiar since no narrow lines but broad bands are found.

The Raman effect corresponds to an absorption at 3.04μ , which agrees with the absorption spectrum of H_2O .

GEO. GLOCKLER

The phosphorescence of fused quartz. A. C. BAILEY AND J. W. WOODROW. *Phil. Mag.* [7], 6, 1104-7(1928).—Many samples of fused quartz possess the properties of a phosphorescent body; that is, they can be excited by ultra-violet light, they will then emit a visible phosphorescent light of considerable strength upon the application of heat, and they can be completely deactivated by bringing to a red heat in a flame. This phosphorescent activity of fused quartz is not uniform, but there is a wide variation between samples and even within the area of a single small piece. Natural quartz crystals do not possess this property of emitting a phosphorescent radiation, but they can be brought into this condition by heating slowly in an elec. furnace to 1600° . Pyrex glass, calcite and fluorite exhibit a prominent phosphorescent activity, but gypsum does not.

GEO. GLOCKLER

Diffusion of metastable atoms in mercury vapor. J. HORACE COULLIETTE. Columbia Univ. *Phys. Rev.* 32, 636-48(1928).—The diffusion of metastable atoms in Hg vapor was studied with a 4-electrode tube of special construction, and with short voltage pulses sep'd. by variable time intervals actuating and accelerating the photoelec. gauzes. The change in the rate of arrival of metastable atoms at the outer boundary of a spherical vol. of gas was det'd. as a function of the time elapsed after a no. of atoms had been formed at the center. Observations were made at vapor pressures ranging from 3×10^{-9} mm. to 0.33 mm. A comparison of the exptl. results with the theoretical values of normal Hg atoms under the same conditions shows that the assumption made by Webb and Messenger that metastable Hg atoms travel across the exptl. tube and produce a direct action on the "photoelec." plate is correct. It is found that the effective radius of the metastable atom is about 1.5 times as large as that of the normal atom and that metastable and normal Hg atoms obey the same general laws of diffusion. Evidence of the loss of energy of excitation as a result of collision between normal and metastable Hg atoms was found.

BERNARD LEWIS

Photosensitized band fluorescence of OH, HgH, NH, H_2O , and HN_2 molecules. E. GAVIOLA AND R. W. WOOD. Johns Hopkins Univ. *Phil. Mag.* [7], 6, 1191-209 (1928).—The photosensitized fluorescence of HgH, OH, NH, Hg- H_2O , and Hg- HN_2 mols. has been observed, the conditions for the appearance of each of the bands have been det'd., and the most probable chem. processes which give rise to them have been suggested. The dissocn. energy of H_2O into H and OH is probably about 5.2 v., and not less than 4.9 as assumed by Sentfleben and Rehren (*C. A.* 20, 3390). The concn. of OH and NH in the fluorescence tube is, under the best conditions, of the order of magnitude of the concn. of excited Hg atoms (10^{-6} mm. pressure). The dissocn. energy of the N_2 mol. seems to be less, or about 9.8 v., and not 11.4 as calcd. by Sponer and Birge (*C. A.* 21, 3547). Collisions of excited Hg atoms in the resonance level 2^3P_1 with normal H_2O vapor mols. may lead to different processes: in most of the cases the excited Hg atom is thrown down to the metastable 2^3P_0 level; in a few cases (about 1 in 10,000 collisions) the H_2O mol. is dissoed. into H and OH; and finally in some cases (less than 1 in 1000) a complex quasi-mol. Hg- H_2O is formed which dissociates, emitting the continuous band at 2800 Å. U. Collisions of excited Hg atoms in the resonance level with N_2 mols. bring the first ones down to the metastable level; 3-body collisions of two excited atoms with a N_2 mol. may lead to dissocn. of N_2 .

GEO. GLOCKLER

The nature of active nitrogen. H. O. KNESER. Marburg Univ. *Ann. Physik* 87, 717-36(1928).—In his investigation to det. the nature of active N, K. first calcd. the dependence of the intensity of the N afterglow or phosphorescence upon the time in relation to the different assumption as to the nature of active N and with consideration of the deactivation through the walls of the app. He then measured, by a simple photometric method, the decline of the phosphorescence with different kinds of app. walls, different pressures and different amts. of A, and found that his results agreed with the assumption of deactivation through collision of 2 active atoms with a non-active particle. He further confirmed this quantitatively by obtaining a brightening up of the phosphorescence by the introduction of non-active particles.

MALCOLM DOLÉ

The deterioration of quartz mercury-vapor lamps and the luminescence of transparent fused quartz. A. E. GILLAM AND R. A. MORTON. Univ. Liverpool. *Phil. Mag.* [7], 6, 1123-32(1928).—Two results are involved in the deterioration of quartz mercury lamps: (a) a shortening of the spectrum confined to the extreme ultra-violet, and (b) a non-selective loss in transmission. The first factor preponderates for the first 150-200 hrs. and shows itself as a rapid fall in output. After this period the effect becomes fairly const. During the subsequent history of the lamp the second factor plays an increasingly important part, but manifests itself much more slowly. The first effect

may be due to the formation of SiO vapor inside the lamp, and the second effect may arise from the gradual deposition of a film of opaque Si. The luminescent properties of fused quartz after treatment with ultra-violet rays have been studied. There is little or no connection between these properties and the deterioration of quartz mercury lamps. Three types of luminescent phenomena have been observed with transparent fused quartz: (a) a brief visible phosphorescence; (b) a phosphorescence of long duration; (c) a thermoluminescence. The balance of evidence points to the view that traces of impurity must be present in those samples of fused silica which exhibit luminescence.

GEO. GLOCKLER

The quenching of mercury resonance radiation and its relation to reactions sensitized by excited mercury atoms. ALLAN C. G. MITCHELL. Bartol Foundation, Philadelphia. *J. Franklin Inst.* 206, 817-26(1928).—Zemansky's treatment (*C. A.* 22, 2324) of the quenching of resonance radiation is reviewed with conclusions unfavorable to the theory there proposed. The activation processes of sensitized reactions are discussed; these processes most probably occur in the gas phase. The high quenching efficiency of O for Hg resonance radiation is accounted for by assuming that O can take up energy of oscillation by collision of the second kind with excited Hg atoms. M. F.

Energetics, quantic action and temperature coefficients of photo-chemical reactions in radiations of various frequencies. A. K. BHATTACHARYA AND N. R. DHAR. Univ. of Allahabad, India. *Z. anorg. allgem. Chem.* 176, 372-84(1928).—The decompn. of $\text{Na}_2\text{Co}(\text{NO}_2)_6$ is a monomolecular reaction in the light and in the dark. Between 20 and 30°, the temp. coeffs. are: 3.5 (dark), 1.64 (sunlight), 2.34 (4725 Å. U.), 2.5 (5650 Å. U.), and 2.7 (7304 Å. U.). The quantic yield is very high. The decompn. of $\text{K}_2\text{S}_2\text{O}_8$ is a reaction of the zero order in sunlight. The quantic yield is very high. The temp. coeff. in sunlight is 1.2 between 17 and 27°. The reaction between KI and $\text{K}_2\text{S}_2\text{O}_8$ is bimol. in the light. Between 20° and 30°, the temp. coeffs. for the radiations enumerated above are: 1.9, 1.25, 1.5, 1.6 and 1.64. The quantic yield is very high. The reaction between Br and MeOH is monomolecular in the dark and in the light. Between 20° and 30°, the temp. coeffs. are: 2.5, 1.99, 2.4, 2.34, 2.42. The quantic yield is abnormally high. The temp. coeffs. of the reactions between Br and EtOH are: 2.84, 1.54, 2.36, 2.04, 2.67 between 20° and 30°. The quantic yield is high. The reaction between I and Me_2CO is monomol. in the dark and in sunlight. The quantic yield is abnormally high. Between 21° and 31°, the temp. coeffs. are: 3.21, 1.77, 2.7, 2.82, 2.94. The reaction between oxalic and chromic acids gives a high quantic yield and has the following temp. coeffs. between 20° and 30°: 1.9, —, 1.7, 1.65, 1.76. Reactions between lactic or tartaric acids and KMnO_4 in the presence of MnSO_4 are bimol. in the dark and 1.5-mol. in sunlight. In both cases, the quantic yield is abnormally high. Between 19° and 29°, the temp. coeffs. are 2.5, 1.5, 2, 2.2, 2.3 for lactic acid; for tartaric acid they are: 2.46, 1.45, 2, 2.1, 2.3 between 16° and 26°. The Einstein photochem. law does not apply to the above 9 cases. The no. of reacting mols. is higher than the no. of quanta absorbed. The quantic action increases with the temp. of the reagents. The quantic yield is decidedly higher in sunlight than in any other radiation; it increases with the frequency of the incident radiation. The temp. coeffs. of photochem. reactions are always greater than 1, and smaller than the corresponding coeffs. of the thermic reactions. The greater the acceleration of the reaction by light, the smaller are the temp. coeffs. The velocities of more than 25 photo reactions are accelerated by the radiation 7304 Å. U. Chem. reactions may also be accelerated by infra-red radiations.

ALBERT L. HENNE

Band spectroscopy and flame reactions. K. F. BONHOEFFER AND F. HABER. Kaiser Wilhelm Inst. *Z. physik. Chem.* A137, 263-88(1928).—The spectrum of the H flame contains a band in the ultraviolet which has been identified as characteristic of the uncharged OH radical. The band exists at 3064 Å. U. corresponding to 92.8 cal. It cannot be obtained at ordinary temps. in the absorption spectrum of mixts. of O, H and H_2O vapor, but may be identified at 1250°. The authors discuss the origin of the hydroxyl radical and conclude that it is formed either by the endothermic reaction, $\text{H}_2 + \text{O}_2 \longrightarrow 2\text{OH}$, or by the collision of a H_2 mol. with an excited H_2O mol. Once formed, it can take part in the reaction by the formation of the chain: (a) $\text{H}_2 + \text{OH} \longrightarrow \text{H}_2\text{O} + \text{H}$, (b) $\text{H} + \text{O}_2 \longrightarrow \text{H}_2\text{O} + \text{OH}$. In the presence of H_2O vapor, the CO flame also shows the OH band, as well as other bands in the visible spectrum which cannot be identified with the CO spectrum (cf. Weston, *C. A.* 19, 3427). The interpretation of the reactions in the CO flame on the basis of these results, however, is difficult. In hydrocarbon flames the Swan bands obtained in the absorption, as well as in the emission spectra, are characteristic of the carrier C_2 . These bands appear at 5160 Å. U., corresponding to 55 cal. There are also bands at 4317 Å. U. and 3888 Å. U. which are probably due to the group CH. The high cond. of the inner cone of the Bunsen flame may be

explained by the presence of the 3 radicals, OH, CH and C₂, each of which has a relatively low ionization tensi compared to the gases in the outer cone. H. F. JOHNSTONE

The photochemical dissociation of iron carbonyl compounds (carbon monoxide-hemochromogen, iron monoxide-ferrocysteine) and the rule of photochemical equivalence. OTTO WARBURG AND ERWIN NEGELEIN. Kaiser Wilhelm Inst., Berlin-Dahlem. *Biochem. Z.* 200, 414-58(1928); cf. *C. A.* 22, 3356.—The photochem. dissocn./light absorption ratio was detd. for CO-pyridine-hemochromogen and for CO-ferrocysteine, at 6 different wave lengths. The photochem. action depends upon the no. of absorbed quanta and not upon their energy, one absorbed light quantum splitting 2 iron carbonyl groups. Consult original for details. S. MORGULIS

The time function of the light rays of active nitrogen. A. KOENIG AND G. H. KLINKMANN. *Z. physik. Chem.* A137, 335-51(1928).—The rate of decrease of the intensity of the afterglow in active N, following an elec. discharge, was photometrically detd. to correspond to a bimol. reaction. It is evident, however, from the color changes, that not 1, but several reactions take place, and that some are faster than others. In order to measure the decrease of intensity not only of the integral light but of each band, the following method was used: A stream of active N at a low pressure and const. velocity was passed through a quartz tube. By means of a condenser lens, a small image of the glowing tube was thrown on the slit of a spectrograph. From the spectrogram obtained, an estn. was made of the decrease in intensity of each band over the length of the tube, and from the velocity of the gas the rate of decrease was calcd. The results show that the rate of decrease of intensity of the red bands at 6300, 6230 and 5800 Å. U., the so-called α -group, is much faster than that of the violet bands at 4310 and 4040 Å. U., the β -group, i. e., the short wave rays have the longest life. This indicates that the reactivity and the light intensity of active N do not parallel each other. The bands of the β -group possess no equiv. in the arc spectrum of N. The very weak band in the afterglow at 5050 Å. U. was not observed. H. F. JOHNSTONE

The fluorescence and absorption of a mixture of mercury and zinc vapors. J. G. WINANS. Princeton Univ. *Phys. Rev.* 32, 427-34(1928).—Light from the Al spark of wave length below 2000 Å. U. excites vapor distg. from slightly amalgamated Zn, causes the emission of the first triplet of the sharp series of Zn, but excites neither the non-distg. vapor nor that distg. from pure Zn. The same kind of Hg-Zn mixt. shows a continuous absorption from 2500 to <1850 Å. U. in distg. but not in stagnant vapor. The stagnant vapor and pure Zn vapor show in addn. to the absorption lines of Zn, 3 new absorption bands. Two of these correspond to absorption bands in Cd. The absorption spectrum of Hg alone is different from that of Zn amalgam. The fluorescence excited by the Al spark is emitted by ²¹³S Zn atoms, which may have been produced either through absorption by HgZn mols. and dissocn. into excited Zn and normal Hg atoms or through collisions of the second kind between normal Zn atoms and excited HgZn mols. B. L.

The chemical effects of cathode rays on oxygen, air, nitric oxide and carbon dioxide. WARREN F. BUSSE AND FARRINGTON DANIELS. Univ. of Wis. *J. Am. Chem. Soc.* 50, 3271-86(1928).—A Coolidge cathode-ray tube equipped with a nickel window and actuated by an induction coil furnished the source of energy for these expts. The reaction cell was not in direct contact with the window but was sepd. from it by a 2-3 mm. air space. The energy of the cathode rays was measured with an ingenious small calorimeter and varied from 3 to 16 cal. per min. Variation in current and voltage were studied and the chem. effects are expressed as M/C, the ratio of mols. produced per electron crossing the cathode-ray tube.

Reaction	Voltage kv.	Current mil. amp.	Micromoles per min.	M/C	Cals./min.	Cals./mole
C ₂ → O ₃	185	0.4	25	100	8.6	3.4 x 10 ⁵
Air → O ₃	185	0.4	11	44	9.6	7.8 x 10 ⁵
Air → NO	185	0.4	4	14	8.6	22.0 x 10 ⁵
NO → O ₂	185	0.4	57	230	8.6	1.5 x 10 ⁵
CO ₂ → CO	200	1.0	2	3	37	180 x 10 ⁵

In the ozonization expts. it was found that the ratio of mols. to gas ions was approx. the same as for α -particles. The similarity of the chem. behavior of α -particles and cathode rays is emphasized. WILLIAM E. VAUGHAN

The formation of ozone by cathode rays. ABRAHAM L. MARSHALL. Gen. Elec. Co., Schenectady, N. Y. *J. Am. Chem. Soc.* 50, 3178-97(1928).—A Coolidge cathode-ray tube operated from a 200 kv. transformer and provided with a resistal window was employed. Electrolytic O₂ was continuously circulated through the system by a compressor and the O₃ removed by scrubbing with alk. KI soln. The reaction apparently

occurs in the gas phase, since it is relatively uninfluenced by increase in surface area. Variations in yield of O_3 with voltage, cell length, tube current, pressure and rate of flow of O_2 have been detd. in detail. Energy of the rays falls off exponentially with increase in distance from the window. Cathode rays also decompose O_3 in a far more pronounced manner than the silent discharge. A steady state is reached with a concn. of one mol. of O_3 to 1700 of O_2 , this ratio being independent of tube current. The max. yield is 825 cc. of gas (NTP), obtained with a current of 0.001 amp. at 180 kv. Many graphs are given. The temp. of the window and its influence were not investigated. W. E. V.

Combination of hydrogen and oxygen under the influence of cathode rays. ABRAHAM L. MARSHALL. Gen. Elec. Co., Schenectady, N. Y. *J. Am. Chem. Soc.* **50**, 3197-204(1928); cf. preceding abstract.—The app. described in detail in the previous paper is utilized, operating at 180 kv. and 0.80 milliamps. Dried electrolytic tank gases are used without purification. H_2O_2 and H_2O are frozen out in a CO_2 snow-ether trap and O_3 is absorbed in alk. KI soln. M. concludes that H_2O_2 is not formed via water production and that both H_2O_2 and O_3 are decomposed as well as formed by high velocity electrons. Water formation is independent of the rate of flow of H_2 and O_2 while the yield of H_2O_2 is reduced as the rate of flow is diminished, for given concns. of H_2 and O_2 , but is insensitive to changes in concn. of the reactants. Speed of formation of H_2O and O_3 seem to parallel one another very closely, probably indicating a relationship of the mechanism of production; H_2O_2 seems to be produced by a different mechanism. W. E. V.

The constitution of the boron hydrides (EPHRAIM) 6. Radium emanation and goiter (MILLIGAN, ROGERS) 11G.

LÖWE, F.: Atlas der letzten Linien der wichtigsten Elements. Dresden and Leipzig: T. Steinkopff. 44 pp. R. M. 12.

REISER, OLIVER L.: The Alchemy of Light and Colour. London: Kegan Paul, Trench, Trübner & Co. 86 pp. 2 s. 6 d. Reviewed in *Science Progress* **23**, 550(1929).

4—ELECTROCHEMISTRY

COLIN G. FINK

Advances in the electrochemical and electrometallurgical industries during 1926. W. DOMINIK. *Przemysl Chem.* **12**, 605-17(1928).—A general review with an extended bibliography. A. C. Z.

Some developments in the electrical industry in 1928. JOHN LISTON. *Gen. Elec. Rev.* **32**, 6-73(1929).—Chapters on elec. melting and refining furnaces; elec. welding; vacuum tubes, etc. C. G. F.

Electric furnace cast iron. C. E. WILLIAMS AND C. E. SIMS. Bur. of Mines, *Tech. Paper No. 418*, 48 pp.(1928).—Results are given of studies made by the North west Expt. Sta. of the Bureau of Mines, Seattle, in coöperation with the Coll. of Mines, Univ. of Washington, between 1920 and 1925. Elec. furnace cast iron made from both steel and cast iron scrap by the authors had transverse strengths of 5000 to 6000 lb. and tensile strengths up to 42,000 lb. In a basic elec. furnace desulfurization can be carried out so that in 30 min. the S will be reduced from 0.2% to a few hundredths of 1%. Production of molten cast iron in an elec. furnace is at rate of 500 to 700 kw-hr. ton. The authors discuss present and future uses of available ferrous scrap and the results of their studies of carburization. They used 2 different furnaces (50 and 100 kw) and conclusions are based on 78 melts made. Curves show the rate of absorption of C by molten Fe, different kinds of carburizers being used. Further investigations were made to study the effect of impurities in cast iron (Si, Mn, S and P). Reference is made to the production of cast iron in the elec. furnace during and after the war and to tests made in direct-arc and indirect-arc furnaces. Production cost figures are given. A. D. SPILLMAN.

Technical production of beryllium. GY. INCZE. *Természettud. Közlöny* **60**, 108-10(1928).—A review. S. S. DE FINÁLY.

Sullivan electrolytic zinc plant. U. C. TANTON. *Eng. Mining J.* **126**, 856-60(1928).—The plant was erected to treat Zn-bearing Coeur d'Alene district ores, which form large quantities of insol. Zn ferrite in roasting and yield considerable gelatinous silica in leaching. The ores contain much Co, which is most troublesome in making electrolytic Zn. The plant uses the Tainton high-acid process. The electrolyte for

leaching contains 28–30% free acid; in electrolysis a c. d. of 100 amp. per sq. ft. is used. Cu, Cd and Co are eliminated in the liquor-purification system by Zn dust. The tank house has 150 cells in a circuit, each taking 8000 amp. Each cell contains 10 cathodes, 4 sq. ft. each, of Al. Pure MnO_2 is produced as by-product. Anodes are of Pb alloy (almost 99% Pb) and other elements and oxides. The Zn produced is over 99.99% pure. The electrolytic load factor for first month was 97+%. C. E. MANTELL.

Factors affecting the relative potentials of tin and iron. E. F. KOHMAN AND N. H. SANBORN. *Ind. Eng. Chem.* 20, 1373(1928).—The single potential of Fe is but little affected by change in H-ion concn., but Sn becomes less noble as the p_H of the soln. with which it is in contact decreases. In some solns. the potentials of Sn and Fe will be equal; these equiv. points are p_H 1 for HCl, p_H 1.3 for H_2SO_4 , p_H 2.1 for citric acid, and p_H 2.9 for oxalic acid. The cathode polarization on Fe at low current densities (0.1–0.7 milliamperes per sq. dm.) is increased by the presence of stannous ion and (or) apple pomace. The corrosion of Fe is decreased by contact with Sn in solns. more acid than the equiv. point. It is also decreased by the presence of Sn or apple pomace. Gelatin and various protein-bearing products decrease the corrosion of Fe even in solns. in which Sn is more noble than Fe. B. M.

Direct electrolytic preparation of potassium permanganate. GASTON RAPIN. *Bull. soc. chim.* 43, 1174–89(1928).—See C. A. 22, 4386. E. H.

Chromium plating and its applications. F. LONGAUER. *Magyar Mernök Építészegylet Közlönye* 62, 49–50(1928).—Plating baths for Cr are described. There are two Cr-plating plants in Hungary operating successfully. S. S. DE FINÁLY

A study of chromium plating. RICHARD SCHNEIDEWIND. *Univ. Mich. Eng. Res. Bull.* No. 10, 141 pp.(1928).—The paper is divided into 4 parts: first, there is presented a non-technical account of the electrodeposition of Cr; second, a detailed description of the original research done at the Univ. of Mich. during the years 1927 and 1928, on the effects of bath compn., nature of anodes, and plating conditions; third, a review of the outstanding scientific articles and patent literature on Cr plating; fourth, a bibliography is given of 111 papers on the general subject of Cr plating. The following general conclusions are drawn from the results of the research: (1) In order to obtain smooth, bright plates these conditions must be maintained: (a) a Cr_2O_3 concn. between 150 and 600 g. per l., preferably between 250 and 300 g. per l.; (b) a sulfate concn. relative to the Cr_2O_3 concn. and expressed as the ratio by wt. Cr^{VI} : SO_4 of between 10 and 60, preferably, 50; (c) a Cr^{III} concn. under 15 g. per l., preferably as close to 0 as possible; (d) a temp. over 15° , (this is imperative for thin deposits); (e) a combination of c. d. and temp. resulting in a cathode current efficiency of 13%; (2) in order to favor a low rate of anode corrosion (a) a low sulfate concn. must be maintained, (b) too high a temp. should not be used; (c) with Fe or steel anodes too low an anode c. d., under 2 amp. per sq. dm., must not be used; (d) anodes are best of Pb and Fe. (3) Under fixed bath compn., anodes, and plating conditions the concn. of Cr^{III} of the soln. comes to equil. the factors favoring a low Cr^{III} concn. are (a) a low sulfate concn., (b) the inherent nature of the anode material, (c) a low temp., (d) a low anode c. d., (e) continuous electrolysis rather than alternate application and cessation of current.

DOWNES SCHAAP

Colloids in the electroplating of metals. WM. BLUM. *Colloid Symposium Monograph* 1928, 301–12 pp. —There is no entirely satisfactory simple definition of an addition agent; since the effects of such agents are closely associated with cathode polarization, they might be tentatively called "polarization agents." Colloids tend to decrease the growth of existing crystals, increase the formation of new crystals, and thus make the deposit "fine-grained." The action is often specific, inhibitory in some solns. and causing characteristic growths in others. In Cu refining, colloids permit the use of high current densities. Often, addition agents are found in the deposit, but not invariably. Sometimes they alter the proportions deposited, acting as brighteners in brass deposits. They tend to improve the "throwing power," i. e., the ability for the metal to deposit uniformly on a cathode of irregular shape. In acid Cu or Zn solns. small quantities of gelatin seem to produce slight, if any, effect on the static or equil. potential; but they make the dynamic potential markedly more negative; i. e., they increase cathode polarization. However, CS_2 used as a brightener in Ag cyanide baths, and $Na_2S_2O_4$ used similarly in cyanide Cu baths, both decrease polarization. Increase of the total voltage required is due, not to effects on cond. of the bath, but to cathode or anode polarization effects. Cathode efficiency may be increased or diminished, the former if the colloid increases the H polarization or overvoltage more than that of the metal polarization. It is still an open question as to what occurs at or near the cathode surface, where colloids obviously produce their effects. The views of Blum and Rawden (C. A. 17, 3841),

of Frölich, and of Fuseya and Murata, are discussed, as to the mechanism involved. Many crystalloids function favorably, and some contain inherent colloid impurities, which make them function. The inadequacy of our present knowledge is stressed.

JEROME ALEXANDER

Good and bad nickel plating. E. MOREL. *Plating* 1, No. 4, 4-7(1928).—A review. C. G. F.

The preparation of potassium ferricyanide without the use of a diaphragm with special regard to the use of alternating current superimposed on direct current. H. PAWEK AND P. HIRSCH. Tech. Hochschule, Wien. *Z. Elektrochem.* 34, 684-96 (1928).—The electrolytic oxidation of $K_3Fe(CN)_6$ to $K_2Fe(CN)_6$ without the use of a diaphragm is studied. Addn. substances ($(NH_4)_2WO_4$, $(NH_4)_2MoO_4$, and other compds.) are not permanently active in producing a cathodic diaphragm suppressing reduction. By covering the cathode with clay a diaphragm is mechanically produced which thoroughly suppresses it. The reduction is, also, diminished by superimposing a. c. on d. c., this being due principally to the ppt. formation which roughens the cathode, and also to depolarization and diaphragm action. Lab.-scale expts. with Ni sheet, bar and wire cathodes, Ni anodes, d. c. 0.8 amp., total current 1.2 amp. and effective current 0.895 amp. show that with increasing frequencies (0-300 periods) the current yield decreases when the sheet and bar cathodes are used, and increases to a max. and then decreases with the wire. The current yields increase with increasing c. d. of the a. c. Ni is found to be the best cathode material. In prepg. solid $K_3Fe(CN)_6$, the current yield using d. c. alone is 43%, is increased to 60% by using a. c. superimposed on d. c., and to 61.5% with a diaphragm and d. c.

J. BALOZIAN

Gassing and self-discharge of lead storage batteries. E. FREIGELSOHN. *Elektrichestvo* 1928, 470-3.—F. records tests on self-discharge and gassing and lays down specifications for the maintenance and operation of batteries. C. G. F.

Storage battery production in U. S. S. R. K. M. TERENTIEV. *Elektrichestvo* 1928, 467-70.—T. presents production statistics for 1927-1928 and comments upon the development of the Russian battery industry. C. G. F.

Hot cathode neon arcs. CLIFTON G. FOUND AND J. D. FORNEY. *J. Am. Inst. Elec. Eng.* 47, 855-9(1928).—The hot cathode of Hull (*Ibid* 47, 798(1928)) has been employed to construct low-voltage Ne lights. A tube of this type, 2.2 cm. in diam. and 75 cm. long, can be operated on 125 v. d. c. The potential gradient in these tubes varies with the pressure, having a flat min. between 2 and 5 mm. of Hg. The v.-ampere characteristic is neg. The product of potential gradient and tube diam. is const. An inductance must be used in series with the tube to make the over-all v.-ampere characteristic pos. Circuit diagrams are given for a. c. and d. c. tubes. The tubes are started by suddenly stopping the current in an inductance in series with the tubes, the high voltage causing ionization. The efficiency of these lights is 10-15 lumens per watt, about the same as that of the 100 watt Mazda C lamp. The efficiency is approx. const. with load. The life should be 5000 hours or more. These lights may be used for advertising and fog penetration, and in combination with Hg vapor lamps for *panchromatic photography*.

BENJAMIN MILLER

High-voltage gaseous conductor lamps. Electrical characteristics of the high-voltage neon type. F. O. McMILLAN AND E. C. STARR. *J. Am. Inst. Elec. Eng.* 47, 901-4(1928).—The neg. v.-ampere characteristic of these lamps necessitates a high series inductance to limit the current. This results in low power factor. The power factor may be improved by using parallel capacitance on the low-voltage side of the transformer or series capacitance on the high-voltage side. If the series capacitance is used, resonance is produced, leading to abnormal voltages across the reactances. The insulation on the transformers now used would not be adequate for these voltages.

B. MILLER

Corona eliminated in high-voltage generators. CHAS. F. HILL. *Elec. World* 93, 139-40(1929).—To bring the potential to the surface of the insulation a graphite, conducting paint was used over the surface of the coil.

C. G. F.

Hydrogen-cooling system increases electric machine capacity. ANON. *Power* 68, 995-6(1928).—A synchronous condenser of the New England Power Co., Pawtucket, R. I., has a capacity of 10,000 kva. when air-cooled and 12,500 kva. when H-cooled. It is enclosed in a gas-tight, explosion-proof chamber. H is supplied at a replacement cost of 7¢ per day. Heat absorbed by H is removed by 4 internal surface-type coolers. Wind resistance loss in H is reduced to 10% of the loss in air.

D. B. DILL

Sir Joseph Swan's electrical work. J. SWINBURNE. *Electrician* 101, 739(1928).—The early history of the C incandescent lamp is reviewed.

C. G. F.

Studies in chemical patent procedure. I. Hall patents for aluminum production (DOREN) 13. Treating latex (Brit. pat. 289,965) 30. Alumina (Fr. pat. 640,737) 18. Charging furnaces (Ger. 468,706) 1. Apparatus for heating by an electric arc superposed on a combustion flame (Ger. pat. 466,102) 1. Purification of brine (for use in electrolytic tanks) (Fr. pat. 640,237) 18. Litharge and minium (Fr. pat. 640,519) 18.

Electric battery. E. WOLFF. Brit. 290,047, May 23, 1927. A cell is specified having Cu and Zn electrodes. A Cu oxide depolarizer is enclosed between an outer Cu vessel and an inner perforated cylinder and the Zn electrode is supported by glass insulators. Various structural features are described.

Electric batteries. COMPAGNIE LORRAINE DE CHARBONS, LAMPES ET APPAREILLAGES ELECTRIQUES. Fr. 640,507, Feb. 16, 1927. The carbons used for battery anodes are formed with grooves on their surface while still soft into which graphite and MnO_2 are pressed.

Interconnected grouping of electric battery cells. R. SACHS GES. Brit. 290,539, Dec. 1, 1927. Structural features.

Assemblage of electric batteries with zinc cups. SIEMENS & CO., LTD., AND C. R. RIBER. Brit. 290,836, May 26, 1927. Structural features.

Magnesium primary cell. ROBERT T. WOOD (to American Magnesium Corp.). U. S. 1,696,873, Dec. 25. A Mg electrode is used with a neutral electrolyte contg. a strong sol. oxidizing agent such as $Na_2Cr_2O_7$ adapted to reduce the rate of corrosion of the Mg electrode on open circuit.

Galvanic cell with a horizontal zinc electrode below the depolarizer and spare electrolyte. N. V. OLEKHOVICH. Russ. 4434, Jan. 31, 1928. The spare electrolyte, which is placed above the cell (under the cover) and insulated, enters the cell after the insulation has been destroyed by a tool through the opening in the upper cover.

Storage battery. GEORGES DROPSY. Fr. 640,586, Dec. 11, 1926. The construction of sepg. partitions is given.

Storage battery. PAUL O. GUNKEL (to Joseph Stokes Rubber Co.). U. S. 1,696,001, Dec. 18. Structural features.

Storage battery. A. POUCHAIN. Brit. 290,665, May 19, 1927. A battery with Zn and Pb electrodes has an electrolyte contg. H_2SO_4 of such strength that the quantity of free H_2SO_4 varies from 280 g. to 80 g. per l. of electrolyte according to the state of charge of the battery. The electrolyte may be formed from H_2SO_4 80-150 g., $ZnSO_4$ 450-650 g. and water 1000 cc. and 15-30 g. of "catalytic substances" such as H_2BO_3 or sulfates of Al, Hg, Na or K also may be added. For each 75 amp. hr. capacity of the battery, at least 800 cc. of electrolyte are used.

Storage batteries. LUCIEN A. H. ARNAUD. Fr. 640,781, Sept. 12, 1927. Construction of plates.

Storage battery electrodes. A. BLAUSZTAJN. Brit. 290,623, May 18, 1927. Structural features.

Storage battery electrodes. I. G. FARBERIND. A.-G. Brit. 290,193, May 9, 1927. Porous Pb is formed in the spaces of a Pb grating made by a special method which is described and the assembly is subjected to pressure and if too thick is cut to the required thickness. The grating is prepd. by casting prisms of a Pb alloy in a mold and inserting them in the openings of a Pb skeleton which has been separately cast, followed by dissolving out the metal which is alloyed with the Pb.

Hydrometer suitable for use with storage batteries. SAMUEL P. WILBUR (to U. S. L. Battery Corp.). U. S. 1,696,618, Dec. 25. Structural features.

Hydrometer suitable for testing electrolyte of storage batteries. HERMAN NGUWIRTH (to Testrite Instrument Co.). U. S. 1,694,138, Dec. 4.

Testing the charge of storage batteries. HARRY I. SHIRE. U. S. 1,696,334, Dec. 25. Current is passed from one terminal to the other of the battery through a resistance less than the normal internal resistance of the battery and the effect of the current is noted by an ampere meter.

Float-actuated electric indicating system for showing condition of storage battery electrolytes. G. H. O'BRIEN. Brit. 289,993, March 2, 1927. Structural features.

Electrolyte for batteries. RICKARD SCHUSTER. U. S. 1,695,667, Dec. 18. Water, H_2SO_4 and a silicate such as Na or K silicate are added to a soln. of $Na_2Cr_2O_7$ and the resulting mixt. is heated to evap. sufficient water to produce a solid mass.

Drying accumulator plates. ACCUMULATOREN FABRIK A.-G. Austrian 109,412, Dec. 15, 1927. Accumulator plates having a surface of finely divided Pb are placed, immediately after their prepn., in a cold sealed container, in which the drying takes place after the small quantity of O in the container has been absorbed by the Pb.

Rendering wax-like or soap-like surfaces conductive and suitable for electro-deposition of metals. GRAMOPHONE CO., LTD., and U. BONELLI. Brit. 290,406, March 21, 1927. The surface is made elec. cond. by treating it with a gas such as H_2S and subsequently immersing in a liquid such as a soln. of $AgNO_3$ or $SnCl_2$ with which the gas reacts to form a cond. film on the surface. The method is applicable to the manuf. of sound records.

Apparatus for electrodeposition of copper or other metals on nonmetallic roofing, etc. ELMER M. WANAMAKER (to Anaconda Sales Co.). U. S. 1,693,683, Dec. 4.

Electrodeposition of tin. SIEMENS & HALSKE A.-G. Brit. 290,552, Oct. 13, 1927. Sn is deposited by the process described in Brit. 286,673 (C. A. 23, 344) on another metal such as an iron plate, with either sol. or insol. anodes. The Sn soln. used may be obtained by leaching Sn ore or scrap tin and if scrap tin is used the leaching may be effected in an open-work iron vessel which serves as anode. A temp. of 70° is suitable for the electrolysis.

Electrodes with electrolyte pads at their ends for local electroplating. J. F. BENNETT and J. HADFIELD. Brit. 290,704, Jan. 22, 1927.

Electroplating tank and associated apparatus. WM. E. BELKE. U. S. 1,695,795, Dec. 18. Structural features.

Coating steel with copper. J. M. ROTH. Brit. 290,112, Nov. 7, 1927. In forming billets suitable for use in making wire, the surface of the billet is cut away, then electroplated with Cu, fluxed, and molten metal is poured around it. An app. is described in which water-cooled electrodes may be used for heating in a mold filled with CO_2 or other inert gas.

Coating with platinum. NAAMLooZE VENNOOTSCHAP PHILIPS' GLOEILAMPENFABRIEK. Fr. 640,293, Aug. 30, 1927. See Brit. 280,697 (C. A. 22, 3128).

Coating bodies with tungsten. JOHANNES A. M. VAN LIEMPT (to N. V. Philips' Gloeilampenfabrieken). Can. 284,078, Oct. 16, 1928. In a porcelain crucible contg. Li_2WO_4 are placed a W anode and the body to be coated as cathode. A tension of 0.08 v. is supplied and a current d. of 75 milliamp. per sq. cm. A regular isolation of W occurs which rigidly adheres as a coherent layer to the cathode. If the body to be sheathed with W will not readily adhere thereto, the body should first be coated with a layer to which the W will readily adhere, for example Fe to be coated should first be coppered.

Electrolytically formed coatings on aluminum. C. H. R. GOWER and S. O'BRIEN & PARTNERS, LTD. Brit. 290,901, Oct. 20, 1927. Al or Al alloys are provided with a resistant coating by anodic treatment in a bath contg. a substantial proportion of H_2SO_4 or of a substance which forms H_2SO_4 at the anode. $K_2Cr_2O_7$, Na hyposulfite, Pb acetate, $BaSO_3$ or $KCNS$ or NH_4CNS or their mixts. may be added to color the coating formed on the Al. Many details of procedure are given. Brit. 290,903 specifies prepg. Al or Al alloys for plating by anodic treatment in a bath contg. H_2SO_4 or a substance which forms H_2SO_4 at the anode. In an example given the cathodes may be of Pb or C and the treatment may last 1-4 min. The plating baths used are preferably about 2° Bé. above the usual strength. Baths for plating with Cu and Ni are specified and some details for plating with Cd, Zn and Ag are also given.

Electrolytic cell for use as a condenser or rectifier. SAMUEL T. WOODHULL (to Amrad Corp.). U. S. 1,695,989, Dec. 18. Structural features.

Dielectric material for electrical condensers. ARTHUR MÖHRLE (to Robert Bosch A.-G.). U. S. 1,694,276, Dec. 4. See Brit. 269,874 (C. A. 22, 1287).

Per-compounds produced electrolytically. I. G. FARBENIND. A.-G. Brit. 290,750, Feb. 22, 1927. Electrolysis is so effected as to produce highly oxidized compds. in both the anode chamber and the cathode chamber of a divided cell; e. g., the anode chamber may contain satd. $(NH_4)_2SO_4$ soln. and the cathode chamber a 0.5% H_2SO_4 soln. through which O is passed, H_2O_2 being produced in the cathode chamber and NH_4 persulfate being produced in the anode chamber. The anode may be formed of Pt and the cathode of amalgamated Au. Various details are given and the production of perborate and percarbonate is also described.

Electrolytic production of zinc. SAMUEL FIELD, ELIAS F. PETERSSON and WILLIAM E. HARRIS (to the Metals Extraction Corporation, Ltd.). Can. 285,553, Dec. 11, 1928. Pb-Zn ores (finely crushed) are roasted with a current of air at 650° F. SO_2 is formed and collected for the manuf. of H_2SO_4 . When the S content of the ore is reduced to 9%, steam is admitted with the air until the Zn content of the ores is converted to oxide and sulfate. The process takes from 24 to 26 hrs. The quantity of steam is kept at a min. to avoid ferrites and manganites. The SO_2 in the outgoing gases is then not unduly dild. Ore thus treated is more amenable to extn. with acid than ore which

has been roasted without the introduction of steam to the muffle. After roasting the ore is introduced with agitation into heated H_2SO_4 and the Zn present is dissolved. The soln. is purified and electrolyzed.

Alumina. ELEKTRIZITÄTSWERK LONZA. Fr. 640,057, Aug. 26, 1927. In the electrothermal prepn. of Al_2O_3 from bauxite, etc., the ferrosilicon produced contg. Al is used for the preliminary reduction of a new charge. The ferrosilicon thus freed from Al is poured off and the reduction with C is carried out.

Salts of bismuth. RICARDO S. CARRERAS. Fr. 640,346, Sept. 1, 1927. Bi_2O_3 is prepd. electrolytically by using anodes of metallic Bi and cathodes of C, Zn, Fe or Al in an electrolyte, preferably a soln. of $NaClO_3$ through which CO_2 gas is passed. Salts of Bi are prepd. from the oxide.

Copper. CHARLES CASMAN. Fr. 640,645, Sept. 7, 1927. Cu is recovered from wash waters of cupriferous ores by inserting in the soln. electrodes of Cu and Al and short-circuiting them, the Cu being pptd. on the Cu electrode.

Light metals. PAUL L. HULIN. Fr. 640,105, Feb. 3, 1927. In the electrolytic prepn. of light metals such as Ca, Mg or Be which float on the electrolyte, the cathode is formed as several depending rods which may have a surface of Fe and a core of Cu or Cu alloy, or the upper portion may be of Cu and the part immersed of Fe. The upper portion may be cooled by water.

Thin flakes of nickel, etc. COMPAGNIE GÉNÉRALE D'ÉLECTRICITÉ. Fr. 640,601, July 5, 1927. Thin flakes of Ni used for addn. to the active mass of storage batteries are produced by depositing a layer of Ni electrolytically, the surface of which is then made passive by a treatment with concd. HNO_3 or a strong soln. of chromic acid or by polarization in an alk. bath and another layer is then deposited. The layers of Ni are sepd. by a weak acid such as 10% H_2SO_4 which penetrates between the layers and produces H. Flakes of Co and Fe may be produced similarly.

Alloys. RICHARD RÜBENACK. Swiss 126,830. May 17, 1927. Galvanic deposits of noble metal alloys and common metal alloys are formed successively in such thicknesses as to give a desired product.

Electric furnace. JOHN J. NAUGLE. Can. 285,459, Dec. 11, 1928. An elec. furnace for the production of an *activated carbon* by the treatment of leached carbonized lignin residues is specified.

Electric induction furnace. I. RENNERFELT. Brit. 290,460, June 29, 1927. Structural features.

Electric resistance heated furnace. ORA A. COLBY (to Westinghouse Elec. & Mfg. Co.). U. S. 1,695,882, Dec. 18.

Electric resistance heated furnace. JAMES C. WOODSON (to Westinghouse Elec. & Mfg. Co.). U. S. 1,695,874, Dec. 18. Structural features.

Electric resistance heated furnace for annealing or heating various articles. WILHELM ROHN (to Siemens-Schuckertwerke G.m.b.H.). U. S. 1,695,860, Dec. 18. Structural features.

Electric resistance furnace suitable for heating drills, forgings, etc. ALBERT N. OTIS and CARL L. IPSEN (to General Electric Co.). U. S. 1,696,728, Dec. 25. Structural features.

Tiltable electric resistance furnace suitable for melting metals. GEORG SCHMITT (to Westinghouse Elec. & Mfg. Co.). U. S. 1,695,863, Dec. 18.

Inclined electrically heated furnace suitable for heat treatment of metal rivets, bars, etc. CRANSTON H. CARPENTER (to Westinghouse Elec. & Mfg. Co.). U. S. 1,695,950, Dec. 18. Structural features.

Electrically heated muffle. ÖSTERREICHISCHE SIEMENS-SCHUCKERT-WERKE. Austrian 109,388, Dec. 15, 1927. Constructional details.

Electrically heated boiler for generating vapors of carbon tetrachloride or similar material under pressure. AUGUST EIMER. U. S. 1,695,803, Dec. 18.

Electric resistance heater units. WALTER E. HUDSON (to Hudson Heating Systems). U. S. 1,694,178, Dec. 4. Structural features.

Electric resistance heater unit. ERNEST E. SUTHERLAND and FRANK F. FORSHEE (to Westinghouse Elec. & Mfg. Co.). U. S. 1,695,869, Dec. 18.

Heat-resistant composition suitable for arc deflectors. WILLARD R. STEELE (to General Electric Co.). U. S. 1,696,614, Dec. 25. Zirconia 65, slaked lime 5 and asbestos 30% are used together. Cf. C. A. 22, 1663.

Electrically heating oil. MASCHINENFABRIK OERLIKON. Ger. 467,586, Sept. 6, 1927. The heat generated in elec. motor driving a circulating pump is applied.

Electrodes. SOCIÉTÉ D'ÉLECTROCHIMIE, D'ÉLECTROMETALLURGIE ET DES ACIÉRIES ÉLECTRIQUES D'UGINE (Jean Michel and Victor Makow, inventors). Fr. 640,835,

Feb. 21, 1927. Anodes are made of Al intimately combined with another metal which acts as the active anode, while the Al serves as a support and conductor for the current.

Carbon electrodes. COMPAGNIE LORRAINE DE CHARBONS, LAMPES ET APPAREILLAGES ELECTRIQUES. Fr. 640,506, Feb. 16, 1927. C electrodes for high c. d. are made from pure C incorporated with mineral substances which may be denser at the core than at the outside. An example is given which contains C 45, oxides of rare earth metals 20, fluorides of rare earth metals 30, magnesia 2, anhyd. H_3BO_3 , Al_2O_3 , or blue oxide of W 1 part.

Electrode for water-resistance steam generators. HOWARD W. MATHESON and JULIAN C. SMITH. U. S. 1,693,794, Dec. 4. Structural features.

Electric purification of gases. A. A. BULAKH and P. P. PORFIROV. Russ. 4637, Feb. 29, 1928. A condenser of a much higher capacity than the gas-purification app. is connected between the transformer and the gas purifier.

Electrical purification of gases. HERMANN ROHMANN and ELEKTRISCHE GASREINIGUNGS G. M. B. H. Ger. 467,554, Dec. 10, 1921. In an elec. gas-purifying plant having sep. electrode systems for charging and sepn., these systems being charged at relatively low and relatively high voltages, resp., the charging electrodes and the sepg. electrodes are charged with alternating e. m. f. from transformers of different secondary e. m. f., the primary currents supplied to the transformers being of either equal or diff. phase.

Electrical gas purifying plant. "FLGA" ELEKTRISCHE GASREINIGUNGS-GESELLSCHAFT M. B. H. Ger. 468,972, Feb. 26, 1924.

Recovering reaction gases from electric arc furnaces. BERTHOLD BLOCK. Ger. 466,139, May 28, 1925. The gases are withdrawn through a movable tube let into a channel in the hollow electrode. Side channels leading to the main channel may be made in the electrode.

Electrical precipitation apparatus for treating gases and vapors. LODGE-COTTRELL, LTD., and L. LODGE. Brit. 290,030, April 23, 1927. Structural features.

Removing hydrogen sulfide from gases. F. FISCHER. Brit. 289,885, May 5, 1927. In purifying gases contg. H_2S by an alk. soln. of $K_3FeC_6N_6$, with formation of S and $K_4FeC_6N_6$, the soln. freed from S is revived by electrolysis and the H liberated at the cathode is added to the purified gas. Alkali formed by the electrolytic action is mixed with the revived $K_3FeC_6N_6$.

Phosphoric acid. JACQUES SIGRIST. Fr. 640,287, Aug. 30, 1927. The energy disengaged in the production of phosphoric acid in an elec. furnace from phosphates is recovered by using a mixt. of CO_2 and air as oxidizing gas, whereby a gas rich in CO is obtained. Superheated steam is eventually added to recover the heat resulting from the combination of the phosphoric anhydride with water. An app. is described.

Pasteurizing milk. JOHN O. TEMPLETON (to Electropure Corp.). U. S. 1,695,300, Dec. 18. An app. is described in which milk is heated between electrodes by an elec. current. The electrodes may have an elec. cond. approx. the same as that of the milk.

Thermal and electric treatment, etc., of cables in telephone circuits. WERTVERKEHRSKABEL GES. Brit. 290,257, May 11, 1927. In order to equalize the differential capacities of cables in telephone circuits, an elec. current is passed, after the line has been laid, through the cable core or an auxiliary conductor arranged between the cores or in their insulation. In using the thermic heat of the current, a temp. above the normal drying temp. of the cable and below that which might damage the paper insulation (suitably about 120°) is preferred. When metal is used as a capacity equalizer, the conductor, before insulation, may be thinly coated with metal m. 120° and after the cable is finished the current is passed to soften or melt the metal so that it partly sats. a cord of paper surrounding the conductor, or a metal may be used which sublimates and is partly pptd. on the insulation when heated, or a salt such as an NH_4 salt may be distributed on the conductor or in the insulation so as to be decompd. into a metal and a gas.

Treatment of electrical conductors containing aluminum. TH. GOLDSCHMIDT A.-G. Swiss 126,012, Apr. 12, 1927. Elec. conductors made of Al alloys are heated and chilled and then, before subjection to the usual tempering process, are stored at room temp. for a day or so, with or without a preliminary cold pressing.

Electric apparatus for indicating and controlling humidity of air. WALTER R. STARKINS. U. S. 1,694,107, Dec. 4.

Electric control for remote electric apparatus. THOMAS U. WHITE and JOHN E. GARDNER (to Westinghouse Elec. & Mfg. Co.). U. S. 1,695,908, Dec. 18.

Metallic-vapor lamps. "CLARUM" GLASWAREN ERZEUGUNGS & HANDESGES. M. B. H. Austrian 109,303, Dec. 15, 1927. The inert gases in the lamp are freed from

polyatomic impurities by lining the inner surface of the lamp with a very thin layer of an adsorbent such as powdered glass or silica gel.

Glass and quartz bulbs for mercury vapor lamps. E. GOLTSTEIN. Brit. 290,682, May 18, 1927.

Mercury arc rectifier. CHRISTIAN KRÄMER (to General Electric Co.). U. S. 1,694,328, Dec. 4. An evacuated vessel is provided with an anode and cathode and also contains a vessel of porous material such as porous clay in which P_2O_5 or other hygroscopic material may be placed and through the walls of which water vapor may pass without passage of Hg vapor.

Filaments for electric vacuum tubes, etc. G. R. SHAW and B. F. TELLKAMP (to British Thomson-Houston Co.). Brit. 289,837, May 3, 1927. In treating metal filaments while incandescent with a gas contg. C or other non-metal (such as a mixt. of C_2H_6 vapor and H), the duration of the exposure is controlled by the increase in the resistance of the filaments and the app. is arranged to prevent the filaments being heated outside the gas chamber. Various details of the app. used are described.

Leading wires for evacuated electric lamps, etc. JOHN A. YUNCK. U. S. 1,695,791, Dec. 18. A composite wire having a mean coeff. of expansion approx. equal to that of the glass used in making incandescent elec. lamps comprises a core of the approx. compn. Ni 40 and Fe 60% and a welded-on sheath of an alloy mainly composed of Ag and which may also contain Cu.

Activating thoriated tungsten filaments. GEORGE D. O'NEILL (to Westinghouse Lamp Co.). U. S. 1,695,819, Dec. 18. The filaments are intermittently incandesced in a C-bearing atm. such as C_2H_6 vapor and H. An app. is described.

Applying "getter" material to filaments for incandescent lamps. GEORGE E. INMAN (to General Electric Co.). U. S. 1,694,265, Dec. 4. Mech. features. An app. is described.

5—PHOTOGRAPHY

C. E. K. MEES

Hot cathode Ne arcs (for use in panchromatic photography) (FOUND, FORNEY) 4.

Films. SOCIÉTÉ DU FILM EN COULEURS KELLER-DORIAN. Fr. 640,118, Feb. 5, 1927. To regulate the degree of hygrometry and to draw off any elec. charge which may have formed, photographic, etc., films are passed through a chamber before rolling, through which a current of warmed air is passed, and the rolling cylinders are either entirely of metal or have a thin layer of metal, or are combined with brushes rubbing against the films and earthed.

Photographic films. SPICERS, LTD. Ger. 468,743, Mar. 5, 1927. Supports for photographic emulsions, etc., are formed of derivs. of carbohydrates such as esters or ethers of cellulose mixed with finely divided pure cellulose and a white pigment. An example given contains: finely divided cellulose 10, ZnO or TiO_2 or other pigment 10, cellulose acetate 10, cedar wood oil 4, acetone 100 and plastifying agent 4 parts.

Photographic plates. PHILIPPE DAVID. Fr. 640,847, Feb. 22, 1927. A thin layer of collodion contg. $AgNO_3$ 20 g., warm water 20 g., nitrocellulose 7 to 8 g., ether 300 cc., and 95% alc. 700 cc., is spread on a glass plate and after coagulation is emulsified by dipping in a bath contg. water 11, KBr 100, gelatin 1 g. At the end of 15 min. the plate is sensitized in a bath contg. water 11, alkali bromide 40, gelatin 1 g. and AgBr 1 cg.

Photographic sensitive material. I. G. FARBENIND. A.-G. Brit. 289,895, May 6, 1927. Processes such as are described in Brit. 286,233 (C. A. 23, 49), Brit. 286,736 (C. A. 23, 349) and Brit. 289,386 (C. A. 23, 572.) are modified by employing as the sensitive medium, instead of a salt of 1,2-naphthoquinone-4-sulfonic acid or a substitution product, a salt of another sulfonic acid of 1,2-naphthoquinone such as the 6-sulfonic or 3,7-disulfonic acid or a halogen, hydroxy or other suitable substitution product; e. g., paper may be treated with a layer of Na 1,2-naphthoquinone-3,6-disulfonate and resorcinol, exposed to light, and developed with vapor contg. NH_3 to obtain a violet positive which turns bordeaux on exposure to air.

Radiophotography. FRANZ SIMON. Fr. 639,924, Aug. 23, 1927. The differences in absorption of the x-rays are utilized to increase the differences of intensity of the image or are transformed into colors or visible tints. Between the sensitive layer and the object a screen is placed which comprises elements having different absorptive powers for the rays, such as a mixt. of starch grains, some of which are satd. with a Pb salt, some

with a Cu salt and some with an Al salt. The 3 kinds of grains are colored differently such as green, blue and red.

Color photography. J. K. HERTZBERG. Brit. 289,845, May 4, 1927. Continuous-tone color-record component negatives are printed successively, through suitable color filters, in register on a multicolor screen plate or film with fine screen elements and a fine-grained emulsion.

Color photography. FREDERIC E. IVES (to Carl W. Fenninger). U. S. 1,695,284, Dec. 18. A colloid layer contg. a photographic Ag image and AgBr is prepd. for printing of a second image by converting the Ag image to AgBr and a pigment blue image by treatment in a bath contg. bromide and ingredients such as $K_3FeC_6N_6$ and $FeCl_3$ which will produce the blue image and then treating with an alkali sulfate such as Na_2SO_4 . Cf. C. A. 22, 921.

Color cinematography. R. GSCHÖPF. Brit. 289,827, May 3, 1927. Double-coloring of superposed 2-color images as described in Brit. 283,560 (C. A. 22, 4073) is produced either by first converting the Ag image into a metallic mordant such as V ferrocyanide and dyeing the mordanted image with the first color, or by dyeing the image with a loose dye of the first color, and then in either case washing to free the half-tones from dye and then applying the second dye. When the V method is used, rhodamine red and thioflavine yellow may be used for the dyeings.

Optical system for color photography. CLIFFORD L. TRELEAVEN (to Color Cinema Productions, Inc.). U. S. 1,696,739, Dec. 25.

Sensitive material for color photography. SOC. CIVILE POUR L'ETUDE DE LA PHOTOGRAPHIE ET DE LA CINEMATOGRAPHIE EN COULEURS. Brit. 289,864, May 6, 1927. A sensitized layer may comprise dichromated gelatin which after exposure is treated with a black dye to color the unexposed parts of the layer; or it may comprise "cellophane" impregnated with a mixt. of light-sensitive diazo compds. and phenols which after exposure is treated with an alk. bath or NH_3 vapor to blacken the unexposed parts. The layer may be used with or without a support such as celluloid and when a support is used a refractive network may be located at the contacting surfaces.

Reproduction of color films. SOCIÉTÉ DU FILM EN COULEURS KELLER-DORIAN. Fr. 640,139, Feb. 9, 1927. To obtain true reproduction with direct light of original cinematographic films, the original image is constituted either of a compd. of Ag, such as AgCl, AgBr or AgI or by a colored compd. of lower actinic density such as a compd. obtained by toning the image blue, these compds. permitting, after inversion of the original image, a contrast equal to the first contrast of this image.

Reproduction in colors by optical projection of images made on films with a lenticulated layer. SOC. FRANÇAISE DE CINEMATOGRAPHIE ET DE PHOTOGRAPHIE FILMS EN COULEURS KELLER-DORIAN. Ger. 466,246, Feb. 10, 1928. A copy is produced having contrasts equal to those of the original image by transforming this image, before copying, into an image having reduced contrasts. E. g., the Ag image may be toned by conversion of the Ag into chloride, bromide, iodide or ferrocyanide, or by mordanting.

Touching-up or coloring photographs. FIRMA A. W. FABER. Ger. 466,112, Feb. 9, 1928. The photograph is given a transparent layer which is overlaid with a colored coating, this coating being removed or strengthened at the required points. A suitable colored coating comprises 75% hydrogenated naphthalene, 15% linseed oil and 10% tincture.

Photographic diazotype process. ZAIDANHOJIN RIKAGAKU KENKYŪJO. Brit. 290,565, May 14, 1927. Paper is sensitized with an aq. soln. of either a tetrazo compd. of diaminodiphenylamine or a diazo compd. of aminodiphenylamine or suitable derivs. of these compds. mixed with an org. or inorg. acid and either with or without addn. of an azo-color component. Several examples are given.

Diazotype photographic processes. KALLE & Co. A.-G. Ger. 466,111, Mar. 12, 1927. The neutral brown to black tints obtained from a sensitive layer contg. a diazo compd., an azo coupling component and a Ti salt are modified by treating the developed print with a small quantity of moisture. E. g., a print from a layer contg. 1,2,4-diazonaphtholsulfonic acid, dichlororesorcinol, and Ti K oxalate, after development with gaseous NH_3 , may be toned by varying degrees of exposure to moist air to any shade from yellowish brown to brownish black. Cf. C. A. 22, 3361.

Photographic dichromated colloid process. LUXOR-FILM GRS. Brit. 289,858, May 4, 1927. Finely detailed prints are formed on dichromated colloid layers with a short exposure (suitably about 0.2 sec.) by treating the layer after printing with cold and preferably supersatd. water vapor which may contain weak volatile acid such as HOAc or CO_2 ; the prints may then be developed directly in cold water and colored in the usual way, or they may first be subjected to a uniform addnl. exposure. Various details are given.

Photographic sensitive layers. R. SCHWICKERT *Ges.* and E. BURG. *Brit.* 290,557, May 14, 1927. To layers such as are described in *Brit.* 284,253 (*C. A.* 22, 4395), which are developed by means of gases or vapors, there are added hygroscopic salts and also non-hygroscopic salts of aliphatic acids in such proportions that a colored image is produced by exposure only and development after exposure is unnecessary. Examples are given of sensitive layers contg. nitrosophenacetin, benzcatechin, KHSO_4 and NaOAc and diazotized H-acid, Na biphosphate, NaOAc and Na citrate. Na, Al or Ca salts of acetic, oxalic, citric, tartaric or other acids may be used in various mixts.

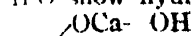
Light-sensitive silver halide emulsions. PETER WULFF and BRUNO WENDT (to I. G. Farbenind. A.-G.). U. S. 1,696,830, Dec. 25. A compd. of the iminazole series such as iminazolealanine is incorporated in the emulsion to prevent fogging.

6—INORGANIC CHEMISTRY

A. R. MIDDLETON

Calcium compounds. ED. DONATH. *Chem. Ztg.* 52, 885-7(1928).—Burnt lime made from dolomite has hydraulic properties, but whether this was due to SiO_2 or Al_2O_3 present was not certain. Therefore pure MgO was prepd. by igniting the purest Magnesia alba obtainable, and CaO by igniting pptd. CaCO_3 to const. wt. The MgO was converted into $\text{Mg}(\text{OH})_2$ by moistening and then drying at 120° . MgO and CaO were mixed in equiv. amts. and then ignited. The ignited mass was treated with H_2O ; heat developed, and in 3 to 4 hrs. the mass was hard and solid, showing true hydraulic properties. It is assumed that the compd. formed at first was HO-Ca-O-Mg-OH , and

on ignition CaMgO_2 or $\begin{array}{c} \text{Ca}-\text{O} \\ | \quad | \\ \text{Mg}-\text{O} \end{array}$ was produced. Similarly, mixts. of CaO , CaCO_3 , and H_2O show hydraulic properties. These are ascribed to the formation of the compd.



In France and Russia cements are made that owe their hydraulic properties to the formation of this substance. Expts. with pure CaO , CaCO_3 , and H_2O confirmed the above view. Another proof is offered by the fact that CaCl_2 pptd. by NaOH yields $\text{Ca}(\text{OH})_2$, and if this be redissolved in H_2O and an amt. of Na_2CO_3 insufficient for complete pptn. be added, the ppt. formed ought to contain the basic carbonate from which the excess of NaOH and $\text{Ca}(\text{OH})_2$ could be washed out. The product dried at 150° showed a compn. corresponding to the basic carbonate. W. C. E.

Hydrates of beryllium halides. V. ČUPR and H. ŠALANSKÝ. Masaryk-Univ., Brünn. *Z. anorg. allgem. Chem.* 176, 241-57(1928).—A method for the purification of large quantities of Be material is described. After conversion into sulfate, still contaminated with Fe and Al, the concd. soln. is pptd. with NH_4OH and evapd. to dryness at 100° without filtration. After further drying at 130° , the residue is washed with hot H_2O , dried again, dissolved in concd. AcOH , and pptd. as basic acetate, which is purified by sublimation in N_2 . Beryllium chloride tetrahydrate is prepd. by dissolving BeO in concd. HCl the soln. being evapd. several times with fresh addn. of HCl until a clear soln. is obtained. This is allowed to stand in a desiccator over concd. H_2SO_4 for several weeks, prismatic crystals of the tetrahydrate, $\text{Be}(\text{H}_2\text{O})_4\text{Cl}_2$, being deposited. This compd. is very unstable, deliquesces rapidly in moist air, giving off HCl gas as a result of hydrolysis. $\text{Be}(\text{H}_2\text{O})_4\text{Br}_2$ is prepd. in an analogous manner and resembles the chloride in cryst. form and properties, but does not lose HBr on deliquescing. Efforts to prep. the iodide were unsuccessful. By passing HCl gas into a suspension of $\text{Be}(\text{OH})_2$ in Et_2O and a little H_2O , delicate needle-like crystals sep., having the compn. $[\text{Be}(\text{H}_2\text{O})_4(\text{C}_2\text{H}_5\text{O})]\text{Cl}_2$. This compd. is also unstable, deliquescing in moist air with slow liberation of Et_2O and HCl . It is nearly insol. in Et_2O , easily sol. in H_2O . Because of escaping Et_2O , the crystals ignite when brought near a flame. The bromide is prepd. in a similar manner, but is even less stable. Its crystals are light yellow in color. Attempts to isolate the iodide failed, but indications were given of the existence in soln. of the compd., $[\text{Be}(\text{H}_2\text{O})_4(\text{C}_2\text{H}_5\text{O})_2]\text{I}_2$.

H. STÖERTZ

Oxides and hydroxides of cobalt. G. NATTA and M. STRADA. Reale Politecnico, Milano. *Gazz. chim. ital.* 58, 419-33(1928).—The present paper, which is an amplification of earlier ones (cf. N. and Reina, *C. A.* 20, 3399; N. and Schmid, *C. A.* 21, 214), is an attempt to det. what oxides of Co really exist and their cryst. structure, and thus to end the confusion which prevails in the literature. Three oxides of definite chem. compn. and structure were identified, viz., CoO , Co_3O_4 , and Co_2O_3 . CoO has a cubic

structure of the face centered type and an elementary cell, with $a = 4.22$ A. U., and contg. 4 mols. of the NaCl type. Co_2O_3 has a cubic structure with a lattice of the spinel type and with an elementary cell, with $a = 8.05$ A. U., and contg. 8 mols. Co_2O_3 probably has a hexagonal or a rhombohedral structure, and an elementary cell, with $a = 4.64$ and $c/a = 1.24$, contg. 2 mols. and with a calcd. d. of 5.34 (exptl. d. 5.09). All methods described in the literature for the prepn. of Co_2O_3 and all attempts to prep. it at temps. above 265° have yielded only Co_3O_4 , indicating that Co_2O_3 is unstable at the higher temps.; in fact by heating Co_2O_3 at 280° it is finally converted wholly into Co_3O_4 . A new method was therefore developed, which consists of dehydrating $\text{Co}(\text{OH})_2$ at 250° . Products described as Co_2O_3 in the literature consist of mixts. of Co and CoO . Among the hydroxides of Co, only $\text{Co}(\text{OH})_2$ has a definite chem. compn. and cryst. structure. The latter is rhombohedral, of the brucite type, with an elementary cell having $a = 3.19$ A. U. and $c/a = 1.46$, and contg. 1 mol. $\text{Co}(\text{OH})_2$ could not be obtained as a substance with a definite cryst. structure, and by x-ray examn. it showed the same lines as pure Co_2O_3 , which it forms on dehydration. The other oxides and hydroxides below Co_2O_3 and $\text{Co}(\text{OH})_2$, described in the literature could not be isolated as definite individual compds., and represent only mixts. of the oxides and hydroxides described above, with compns. which depend upon the particular conditions under which they were formed. No oxide above Co_2O_3 in the dry state could be obtained. C. C. DAVIS

The composition of crystals obtained from solutions containing sodium sulfate and iodides. III. EMMA FABRIS. Reale Univ., Pisa. *Ann. chim. applicata* 18, 326-32(1928); cf. C. A. 22, 2722.—The previous expts. were extended to include LiI, the same method being used as before. Na_2SO_4 and LiI were used in various proportions from 2.5 to 25 parts of LiI per 100 parts of $\text{Na}_2\text{SO}_4 \cdot 10\text{H}_2\text{O}$ at 13.5 – 18° . The cryst. products were transparent and sharply defined crystallographically. The results, which are recorded in graphical and in tabular form, show that with increase in the concn. of LiI, there is a progressive increase in the content of LiI in the mixed crystals. A comparison of these results with those of the earlier expts. (*loc. cit.*) shows notable differences in the behavior of various iodides. By using the particular iodide, crystals of Na_2SO_4 contg. different proportions of I can be obtained, between limits as follow: with NaI, 0–0.3893% I; with KI, 0–0.5029% I; with NH_4I , 0–0.6358% I; with LiI, 0–0.5751% I. C. C. DAVIS

Basic carbonates of zinc and cadmium. TSUNEKICHI NISHIMURA AND TAKEMARO YAMAMOTO. Tokyo Inst. of Phys. and Chem. Research. *Chem. News* 137, 307(1928).—Normal Zn carbonate ($\text{ZnCO}_3 \cdot 0.5\text{H}_2\text{O}$) prepd. at low temp. in the presence of CO_2 gas was stable when exposed to air for 183 days. When it was suspended in H_2O and a rapid air current passed through the suspension, it lost CO_2 for 19 days and then maintained the compn. $\text{ZnO} \cdot 0.421\text{CO}_2 \cdot n\text{H}_2\text{O}$ (I). $\text{Zn}(\text{OH})_2$ absorbed CO_2 from air for 73 days and then maintained the compn. $\text{ZnO} \cdot 0.363\text{CO}_2 \cdot m\text{H}_2\text{O}$. It seems doubtful whether I is identical with the basic salt $5\text{ZnO} \cdot 2\text{CO}_2 \cdot 3\text{H}_2\text{O}$. Normal Cd carbonate is stable in air and boiling H_2O ; however, when it was prepd. at low temp., suspended in H_2O and a rapid air current passed through the suspension, it lost CO_2 for 15 days, till it contained 0.93 mol. CO_2 for each mol. CdO . Then it started absorbing CO_2 , and after 235 days the original compn. was restored. $\text{Cd}(\text{OH})_2$ absorbed CO_2 from the air, the amt. taken up after 208 days corresponding to 0.88 mol. CO_2 for 1 mol. CdO . G. SCHWOCH

Bivalent and quadrivalent compounds of the rare earths. I. Samarium halides. WILHELM KLEMM AND JOACHIM ROCKSTROH. Hannover Techn. Hochschule. *Z. anorg. allgem. Chem.* 176, 181-99(1928).— SmCl_2 is prepd. by heating the oxide in a stream of Cl_2 – S_2Cl_2 , holding the temp. at 400 – 500° for 1 hr., at 500 – 600° for about 3 hrs., and at 600 – 650° for 2–3 hrs. SmBr_2 is prepd. by heating the oxide in a stream of CO – Br_2 at 500 – 650° , followed by treatment of the product with HBr gas. The dihalides are prepd. by reduction of the trihalides in H_2 at 600 – 650° , the product even after 30 hrs. reaction contg. at the most 90–92% dihalide. SmCl_2 and SmBr_2 behave like typical dihalides, closely resembling Sr and Pb dihalides, as shown by the following values for mol. vol.: SrCl_2 51.9, SmCl_2 48, PbCl_2 47.3, SrBr_2 58.9, SmBr_2 60, PbBr_2 55. M. p. of $\text{SmCl}_2 = 740^\circ$, SmBr_2 about 700° . The Sm halides are characterized by the formation of addition compds. with NH_3 . Thus SmCl_2 forms compds. with 13, 8, 5, 4, 2.66, 2 and 1 NH_3 . These ammoniates exhibit a strong tendency to form mixed crystals, particularly between 8 and 5 mols. of NH_3 . SmCl_2 forms compds. with 8 and 2NH_3 , between these 2 mixed crystals being formed. SmCl_2 also reacts with NH_3 by ammonolysis, analogous to hydrolysis. Thus: $\text{SmCl}_2 + \text{NH}_3 = \text{Sm}(\text{NH}_2)\text{Cl} + \text{H}$, and $\text{Sm}(\text{NH}_2)\text{Cl} + 2\text{NH}_3 = \text{Sm}(\text{NH}_2)_2\text{Cl} + \text{NH}_4\text{Cl}$. Density detns. in a pycnometer give for d_4^{25} : $\text{SmCl}_2 = 4.31 \pm 0.01$, $\text{SmBr}_2 = 5.40 \pm 0.02$, $\text{SmCl}_2 -$

4.5 ± 0.07 , SmBr_2 — 5.1 ± 0.05 . The m. p. of SmCl_2 is 677° and of SmBr_2 626° . *Mol. magnetic susceptibility* is detd. and expressed as $\chi \cdot 10^6$ as follows: Sm_2O_3 —9900, SmBr_2 —15,600, SmBr_3 —71,000.

H. STOKERTZ

Phosphates and arsenates of quadrivalent manganese. V. AUGER AND AL. YAKIMACH. *Compt. rend.* 187, 603–5(1928).—Analyses of compds. prepd. agree with the formulas: $\text{O:Mn}:[\text{P}_2\text{O}_4(\text{NH}_4)\text{H}]$, $\text{Mn}(\text{AsO}_4\text{H}_2)_4$, and $\text{O:Mn}:[\text{As}_2\text{O}_4(\text{NH}_4)\text{H}]_4$. The first is obtained by heating cautiously a soln. of $(\text{NH}_4)_2\text{HPO}_4$ and KMnO_4 . The brown soln. on cooling gives brilliant black plates. $\text{Mn}(\text{AsO}_4\text{H}_2)_4$ is more stable than the corresponding compd. of P.

L. D. ROBERTS

Univalent iron, cobalt and nickel. IV. The action of nitric oxide on ferrous mercaptide. W. MANCHOT AND H. GALL. *Tech. Hochschule, München. Ber.* 61B, 2393–4(1928); cf. *C. A.* 22, 2892.—In reply to Reihlen (*C. A.* 22, 4476) M. and G. find that the interaction of $\text{Fe}(\text{SC}_2\text{H}_5)_2$ and NO is so vigorous at room temp. that decomposition occurs. At -40° the reaction requires several hrs., red oily drops of $\text{NO} \cdot \text{SC}_2\text{H}_5$ appearing on the solid mercaptide according to the equation: $\text{Fe}(\text{SC}_2\text{H}_5)_2 + 3\text{NO} = \text{Fe}(\text{NO})_2 \cdot \text{SC}_2\text{H}_5 + \text{NO} \cdot \text{SC}_2\text{H}_5$. Vacuum distn. of this product was effected by evacuating, cooling the previously attached receiver with $\text{Et}_2\text{O} + \text{CO}_2$, and allowing the reaction vessel to warm up to room temp. The reaction occurs very slowly at room temp. with NO diluted with 9 pts. of N_2 .

DAVID DAVIDSON

The chemistry of rhenium. WALTER NODDACK. *Z. Elektrochem.* 34, 627–9 (1928).—Re heated in O at 300° forms volatile white Re_2O_7 , m. $26-30^\circ$ and yellow cryst. ReO_3 , m. 160° . Aq. solns. of the latter are not affected by common acids and alkalis; $\text{Ba}(\text{OH})_2$ and AgNO_3 form white ppts.; reducing agents cause a yellow color after a long time in contrast to Mo, W, Ru and Os; tartaric, oxalic and phosphoric acids do not prevent the formation of the sulfide. Five reactions distinguish Re from Mo: its yellow-red color with KSCN; K acid xanthate shows only S; NH_4 phosphate and K ferrocyanide are both neg.; ReO_3 mixed with MoO_3 sublimes before MoO_3 distills. Re is pptd. quantitatively by H_2S . Three sulfides prepd. were Re_2S_7 , ReS_3 and ReS_2 . ReCl_6 forms in Cl. The properties of the Re compds. conform to those of an element between W and Os in the periodic table. In the most stable compds., Re has a valence of 6 and 7. The ion diam. of Re^{IV} is 0.68 A. U.

MARY E. LEAR

Aluminum arsenide. G. NATTA AND L. PASSERINI. *Reale Politecnico, Milano. Gazz. chim. ital.* 58, 458–60(1928).—The system Al–As has never been carefully studied (cf. *Jahrb. prakt. Chem.* 91, 206(1864); *Pogg. Ann.* 11, 61 (1827)), and its structure has never been detd. The arsenide was prepd. by heating a mixt. of Al and a small excess of As at 800° . It was a gray mass, with a metallic luster, which could be easily pulverized. Its analysis corresponded to AlAs . It did not fuse up to 1200° . An x-ray study of its cryst. structure showed that it belongs to the monometric or cubic system, of the blende class, and is therefore isomorphous with AlSb . Its elementary cell has an a value of 5.62 A. U., and contains 4 mols. It has a non-ionic structure. Its calcd. d. was 3.81, while its exptl. d. was 3.598.

C. C. DAVIS

The constitution of the boron hydrides. FRITZ EPHRAIM. *Helv. Chim. Acta* 11, 1094–8(1928).—The constitution of BH_3 can only be explained by unusual electron distribution. By assuming that the binding of two atoms by means of an electron can result or that an electron is related to four different atoms, BH_3 constitution can easily be explained by the octet theory. BH_3 must consist of a form with 6 outer electrons, 3 from the B atom and 3 from the H atom polymerized into a mol. Through so called covalence of 4 electrons a form originates consisting of two complete octets. Accordingly, the polymerization of BH_3 to B_2H_6 can be imagined. The constitution of the tetraborons B_4H_{10} are explained on the same principle. B_4H_{10} is split into $\text{B}_2\text{H}_6 + \text{BH}_3$. It consists now of a diboron B_2H_6 united with a second diboron which has lost two hydrogen atoms. With the aid of this loss a constitutional formula is derived having 22 outer electrons. The 3B hydrides B_3H_8 , B_3H_{10} and B_3H_{12} can be split in the same way. $\text{B}_3\text{H}_8 = \text{B}_2\text{H}_6 + 3\text{BH}$; $\text{B}_3\text{H}_{10} = \text{B}_2\text{H}_6 + 4\text{BH}$; $\text{B}_3\text{H}_{12} = \text{B}_2\text{H}_6 + 5\text{BH}$. The group BH contg. 4 outer electrons $3\text{B} + 1\text{H}$ forms an edge of a cubic face. This edge with another similar one forms a complete new cube. Each new BH group then forms a new octet. Through chain ramifications there are also conceivable isomers which have not so far been found.

C. SCOTT

Chlorine fluoride. OTTO RUFF, ERNST ASCHER, JOSEPH FISCHER AND FRIEDRICH LAAS. *Tech. Hochschule, Breslau. Z. anorg. allgem. Chem.* 176, 258–70(1928).—Gaseous HCl is passed into a vessel contg. F_2 and cooled in liquid air. Green luminosity is apparent, a mist is formed and white flakes slowly sink to the bottom. After removal of HF by distn. at -50° , the contents are fractionated and each fraction is analyzed. The results indicate the presence of a chlorine fluoride in the fraction between

—80 and —110° which has been decompd. by reaction with the glass to form Cl_2O . Expts. are conducted with mixts. of F_2 and Cl_2 in various proportions in quartz, glass and Cu vessels, the most satisfactory results being obtained when Cl_2 reacts with a large excess of F_2 at 250° in a Cu vessel, no explosion occurring under these conditions. The reaction product also contains F_2 and Cl_2 ; it is liquefied and sepd. into its constituents by fractionation. ClF is an almost colorless gas with a strong odor, differing from Cl_2 or F_2 . In quartz glass it has a yellowish brown color, due probably to traces of Cl_2O . When solidified it is white, m. —161 ± 0.5°, b. —103 ± 3°. Its reactions are in general similar to those of F_2 , but are somewhat more vigorous with metals, particularly As and Sb.

H. STOERTZ

The constitution of tungsten carbide. KARL BECKER. *Z. Elektrochem.* **34**, 640–2(1928).—In the system W–C, 3 carbides were proved; WC formed below 1900°, $\alpha\text{W}_2\text{C}$ between 1900° and 2400°, and its allotropic modification $\beta\text{W}_2\text{C}$ above 2400°, which loses its stability at room temp. A curve of the concns. of CH_4 in H for the different temps. shows a break at 2400° which also occurs in the cond. curve. $\beta\text{W}_2\text{C}$, identified by its x-radiogram, was obtained in cryst. form. $\alpha\text{W}_2\text{C}$ was obtained in hexagonal crystals of the Cd iodide type with the atom coordinates, C (000), W ($\frac{2}{3}$, $\frac{1}{3}$, $\frac{1}{4} + p$) ($\frac{1}{3}$, $\frac{2}{3}$, $\frac{3}{4} - p$). The hexagonal crystal measurement of WC agreed with those of Westgren and Phragmen (*C. A.* **21**, 46). The calcd. mol. vol. of $\alpha\text{W}_2\text{C}$ is 22.1; that of WC is 12.94. The radiographic calens. of the linear coeffs. of expansion given for WC and W_2C show the latter to have greater isotropy. M. E. L.

Peroxides of titanium, zirconium, hafnium and thorium. ROBERT SCHWARZ AND HERMANN GIESE. *Chem. Inst. Frankfurt a. Main. Z. anorg. allgem. Chem.* **176**, 209–32(1928).—The elements of the Ti group, as well as Ce, are pptd. by H_2O_2 in alk. or ammoniacal soln. as *peroxide hydrates*; in every case but Th the product contains 1 peroxide O atom to 1 mol. of dioxide and 2 mol. of H_2O of constitution. The Th compd. is richer in O and contains 4 mols. of H_2O , having the formula $\text{Th}_2\text{O}_7 \cdot 4\text{H}_2\text{O}$

The others are written $\text{MeO}_3 \cdot 2\text{H}_2\text{O}$ and are considered *orthoperoxy acids*, $\begin{array}{c} \text{HO} \diagup \text{Me} \diagdown \text{OH} \\ \text{HO} \diagdown \text{Me} \diagup \text{OOH} \end{array}$.

$\text{HfO}_3 \cdot 2\text{H}_2\text{O}$, previously not isolated, is prepd. by pptn. with H_2O_2 and NH_4OH from a soln. of the sulfate. Extn. with liquid NH_3 removes H_2O from the slimy ppt., NH_3 being removed in a high vacuum at 0°. The product is a white powder, stable at room temp., and almost insol. in ice-cold alk. H_2O_2 (distinction from $\text{ZrO}_3 \cdot 2\text{H}_2\text{O}$). When heated, the active oxygen (O_A) is easily driven off. In analysis O_A is detd. by soln. in dil. H_2SO_4 and titration with KMnO_4 . In this reaction, the KMnO_4 is decolorized slowly, and the liberation of I from a cold KI soln. is also slow, indicating slight hydrolytic splitting up of an —O—O— bond. This, together with behavior in $\text{Et}_2\text{O} \cdot \text{H}_2\text{O}$ mixts. is taken to indicate that O_A is combined in the form —O—O—. Ce likewise forms the compd., $\text{CeO}_3 \cdot 2\text{H}_2\text{O}$, a dark, reddish brown, flocculent ppt. It is even less stable than the Ti group peroxides, decompg. at 0° in a few days. From acid Zr sulfate solns., an excess of H_2O_2 slowly ppts. *zirconium peroxo-sulfate*, $\text{Zr}_2\text{O}_6\text{SO}_4 \cdot 8\text{H}_2\text{O}$. It is poorly sol. in H_2O and dil. acids, easily sol. in concd. H_2SO_4 . Boiling in dil. HCl

liberates Cl_2 . The constitutional formula is written $\begin{array}{c} \text{O} \diagup \text{O} \diagdown \\ | \quad \text{O} \quad \text{O} \quad \text{O} \\ \text{SO}_4 \end{array} \text{Zr} \begin{array}{c} \text{O} \diagdown \text{O} \diagup \\ | \quad \text{O} \quad \text{O} \quad \text{O} \\ \text{SO}_4 \end{array} \text{Zr} \begin{array}{c} \text{O} \diagup \text{O} \diagdown \\ | \quad \text{O} \quad \text{O} \quad \text{O} \\ \text{SO}_4 \end{array} \cdot 8\text{H}_2\text{O}$.

Ti, Th and Hf do not form analogous compds. With Ti and Zr, if the peroxide hydrate is dissolved in an excess of a cold soln. of H_2O_2 and alkali, alc. ppts. from this soln. a *perbitanate* or *perzirconate* with the compn. $\text{K}_4\text{TiO}_8 \cdot 6\text{H}_2\text{O}$. They are regarded as salts of *tetra-orthoperoxy acids*; corresponding compds. with Hf and Th are not formed. With Ti, Zr and Hf, salts of the type $\text{K}_2[\text{TiO}_2(\text{SO}_4)_2] \cdot 3\text{H}_2\text{O}$ are formed. Thus *potassium peroxozirconyl sulfate* is prepd. by dissolving sufficient hydrate to contain 1.0 g. ZrO_2 in 18.5 cc. of 65% H_2SO_4 , and adding to this 1.4 g. K_2SO_4 and 5 cc. of 30% H_2O_2 . After standing 1 hr. at 0°, the salt is pptd. by adding cold acetone. Hydrolysis proves these to be actually complex salts rather than mixts. The Zr and Hf compds. had not been previously prepd. The colorimetric detn. of F, based upon the decolorization of the reddish yellow soln. of $\text{K}_2[\text{TiO}_2(\text{SO}_4)_2]$, is studied and found to involve the reaction: $\text{K}_2[\text{TiO}_2(\text{SO}_4)_2] + 3\text{H}_2\text{F}_2 = \text{K}_2(\text{TiF}_6) + 2\text{H}_2\text{SO}_4 + \text{H}_2\text{O}_2$, the presence of *peroxyfluorides* such as $\text{TiO}_2\text{F}_2 \cdot 2\text{NH}_4\text{F}$ and $\text{TiO}_2\text{F}_2 \cdot 3\text{NH}_4\text{F}$ being assumed as intermediate products. Cond. measurements show the latter, *ammonium peroxotitanyl fluoride*, to possess 4

ions and therefore the complex ion, $\left[\text{F}_6\text{Ti} \begin{array}{c} \text{O} \diagup \text{O} \diagdown \\ | \quad \text{O} \quad \text{O} \quad \text{O} \\ \text{O} \end{array} \right]^{111}$, is confirmed. In this the —O—O— group occupies only one of 6 coordination positions.

H. STOERTZ

Triphenyl chromium, as well as contribution to the knowledge of tetraphenyl chromium and diethyl thallium. FR. HEIN AND E. MARKERT. Univ. Leipzig. *Ber.* 61B, 2255-67(1928).— Ph_3Cr (I) is obtained as an amorphous, brownish yellow deposit by the electrolysis of Ph_3CrI in anhyd. NH_3 . I is even less stable than Ph_4Cr (II), readily splitting off Ph_2 . In air it becomes pasty and is transformed into Ph_3CrOH (III). I can be quantitatively converted into III, which can be titrated with acids. Preps. of I contain some NH_3 which disappears in moist air or EtOH . Under certain conditions amide formation appears to occur as in the case of II. I can also be prepd. by the action of NH_3 solns. of Na on Ph_3CrI . II is produced by the electrolysis of Ph_3CrOH in NH_3 , and contains $\frac{1}{3}$ of a mol of NH_3 , which disappears in moist air or EtOH . II dissolves in $\text{C}_6\text{H}_5\text{N}$, forming a red-brown soln without chem. action being apparent. In 0.062-0.086 *N* solns. II is practically monomol. II lacks the metallic nature of the tetra-alkyl NH_4 radicals and the alkali metals in that it does not form amalgams or blue solns. in NH_3 . Its reaction with H_2O is its only metallic character, since a strong base is formed; although this is unlike the behavior of the alkyl derivs. of Pb, Sn, and Hg. I and II are poor conductors and show no definite decompn. potential. Attempts to prep. Et_4Tl in an analogous way were unsuccessful, Tl being obtained.

DAVID DAVIDSON

Hydrazine selenate. JULIUS MEYER AND WILLI AULICH. *Ber.* 61, 1839-40 (1928).—By the action of $\text{H}_2\text{NNH}_2 \cdot \text{H}_2\text{O}$ on dil. aq. H_2SeO_4 , $\text{H}_2\text{NNH}_3\text{HSeO}_4$ (I) is obtained as a colorless cryst. powder which soon colors red. It is difficultly sol. in cold, but readily sol. in hot water. The addn. of HCl to this soln. causes sepn. of Se. I when rubbed with a glass rod or treated with concd. HCl explodes; this is due to an inner oxidation. It is recommended in the detns. of selenates and H_2SeO_4 first to convert these to the selenious compd. (II) by boiling with strong HCl , and then to reduce II with $\text{H}_2\text{NNH}_3\text{HSO}_4$.

FREDERICK C. HAHN

Action of carbon monoxide on metallic chlorides. L. BELLADEN, M. NOLI AND A. SOMMARIVA. Reale Univ., Genova. *Gazz. chim. ital.* 58, 443-9(1928).—CO was passed over PbCl_2 , AgCl , CuCl and NiCl_2 at different temps. and the equil. reaction: $\text{MCl}_2 + \text{CO} \rightleftharpoons \text{M} + \text{COCl}_2$, was studied. The data, recorded in tables, show that reduction appreciable, the quantities of COCl_2 formed being great enough to be detd. and therefore much greater than the theory predicts. There can, however, be no doubt of the measurements of the dissocn. of COCl_2 of Bodenstein (cf. *C. A.* 2, 1223; 18, 2848) and of Christiansen (cf. *C. A.* 17, 917), so that secondary reactions must take place under the conditions used by B., N. and S. Expts. to settle this problem showed that in the presence of the metallic chlorides, CO decomps thus: $2\text{CO} \rightleftharpoons \text{C} + \text{CO}_2$. The CO_2 formed decomps. thus: $2\text{CO}_2 \rightleftharpoons 2\text{CO} + \text{O}$, and the O reacts with the metallic chloride, thus $2\text{MCl}_2 + \text{O} \rightleftharpoons 2\text{MO} + \text{Cl}_2$. At the high temps. employed, viz., 450-750°, the yields of COCl_2 from the action of CO_2 on metallic chloride are as great as those with CO. The expts. show that the reactions which take place are complex and difficult to study quantitatively, but the expts. are conclusive in proving why the actual yields of COCl_2 differ so greatly from those calcd. from known dissocn. data. C. C. D.

The simplest silicic acids—with observations on aluminum hydroxide. XI. **Hydrates and hydrogels**. RICHARD WILSTÄTTER, HEINRICH KRAUT AND KARL LOBINGER. Bayer. Akademie Wissenschaften, München. *Ber.* 61B, 2280-93(1928).—12.5 g. SiCl_4 was maintained at 60-65° while a stream of dry air or N_2 was passed through it and into a beaker contg. 750 g. H_2O + ice which was rapidly stirred and kept at 0°. Freshly pptd. Ag_2O was introduced simultaneously to maintain the acidity at 0.01 *N*-0.04 *N* in HCl . By filtering through charcoal a clear filtrate was obtained contg. 80% of the silica introduced and having a f. p. which when corrected for the HCl present corresponded to a mol. wt. referred to SiO_2 of 72-75, indicating a monosilicic acid of 75-80% purity. If the acidity is greater or less a disilicic acid (mol. wt. 120-30) is obtained. That the latter are not mixts. of mono- and higher acids was shown by dialysis. The f. p. of these solns. rose in the course of several days until the mol. wt. was over 1000 and no longer determinable. The stability of these solns. is max. at p_H 2-3. Monosilicic acid is not pptd. by org. solvents such as MeAc. The authors assume its condensation to occur through intermol. loss of H_2O , thus: $2\text{Si}(\text{OH})_4 \longrightarrow \text{O}[\text{Si}(\text{OH})_2]_2 + \text{H}_2\text{O}$. Those acids above the hexasilicic give ppts. with solns. of egg albumin. Silica gels prepd. by the action of concd. HCl or NH_3 + NH_4Cl showed the compn. $2\text{SiO}_2 \cdot \text{H}_2\text{O}$. Potentiometric titration curves of the silicic acids show an inflection point at one equiv. of NaOH , hydrosols and gels behaving in the same way. With the aging of a soln. there is a slight displacement toward higher potentials of a portion of the curve but agreement exists from below the equiv. point onward. SiO_2 , however, does not titrate like an acid. Silica gels, therefore, are not simply hydrated silica. The formulas of

Biltz and Lehrer (*C. A.* 22, 3365) for the various forms of Al hydroxide are criticized as not being representatives of their chem. behavior. DAVID DAVIDSON

Silicophosphoric acid. ROBERT SCHWARZ. *Z. anorg. allgem. Chem.* 176, 236-40 (1928).—Silica gel with a definite H_2O content is added to a slight excess of H_3PO_4 at 200° , the reaction mixt. then being held at 125° until a small quantity gives a clear soln. in H_2O (240-300 hrs.). The product is dried over P_2O_5 and is found to have the compn. $SiO_2 \cdot 2P_2O_5 \cdot 4H_2O$. It is a *heteropoly acid*, its constitution being best represented by the formula, $H_8[Si(PO_4)_4]$ or $H_8[SiO_4(P_2O_5)_2]$. The complex is very weak, cond. detns. and electrolysis indicating instantaneous and complete dissocn. in H_2O ; the irreversibility of the reaction is due to the sepn. of SiO_2 in colloidal form: $H_8[Si(PO_4)_4] + 2H_2O = 4H_3PO_4 + SiO_2$. Alkalies, NH_4OH and concd. HCl produce the same effect. Alkali phosphates, SiO_2 and Na_2CO_3 are fused together in various proportions, a homogeneous melt with a definite crystn. temp. of 961° being obtained with the proportions $4Na_2O \cdot SiO_2 \cdot 2P_2O_5$, and this is the Na salt of *silicophosphoric acid*, $Na_8[Si(PO_4)_4]$. Attempts to prep. the analogous *silicoarsenic acid* failed. H. STOERTZ

Molybdc acid—selenic acid. ERWIN WENDEHORST. Tech. Hochschule, Braunschweig. *Z. anorg. allgem. Chem.* 176, 233-5(1928).— $MoO_3 \cdot SeO_3$ is prepd. by heating a mixt. of *molybdic acid* and *selenic acid* for several days upon a water bath. The liquid is poured off and the excess SeO_3 is driven off from it by heating below 230° . Yellow, transparent crystals are formed, which are quickly washed with acetone and Et_2O ; they agree closely with the formula, $MoO_3 \cdot SeO_3$. This compd. can also be prepd. by adding finely powd. MoO_3 to hot H_2SeO_4 until no more goes into soln. After standing about 6 hrs. the soln. is poured off, dild. with H_2O after cooling, filtered and dried to a yellow sirup in a desiccator. Analysis shows this to be a soln. of MoO_3 in H_2SeO_4 . The excess SeO_3 is driven off as above. Addn. of a few drops H_2O to $MoO_3 \cdot SeO_3$, followed by drying at 110° , forms a yellow, glassy substance with the compn. $MoO_3 \cdot SeO_3 \cdot 2H_2O$. This is extremely hygroscopic. Electrolysis shows the compd., $MoO_3 \cdot SeO_3$, to be actually a complex rather than a mixt. It is very sensitive to reducing agents, alc. and acetone, producing a blue coloration and sepn. of Se. H_2O_2 produces the orange-yellow color of *permolybdate*. With Et_2O a loosely held addn. compd. is formed, a bluish green, oily liquid, insol. in excess Et_2O . H. STOERTZ

A new compound of lithium, iron and nitrogen. W. FRANKENBERGER, L. ANDRUSOW AND F. DÜRR. *Z. Elektrochem.* 34, 632-7(1928).—Pure finely divided Fe and Li nitride of highest purity (1:1), heated in N to $280-730^\circ$ in an app. of special design, forms a complex compd., $Li_3N \cdot FeN$, proven by analysis, its Debye-Scherer absorption, thermodynamic properties and other measurements. The heat curve shows a sudden upward bend between 480° and 520° , when the reaction is most evident. Decompn. begins at 730° and the reaction reverses on cooling. Thermal measurements in a differential app. show the reaction is not univariant. A table is given showing the results of varying the mol. proportions of Fe and Li_3N . Conclusion: The opposing results of previous investigators as to the action of Fe on N is due to differences in the purity and division of the Fe. Also Fe nitride is not formed as an intermediate compd. in the *catalytic NH_3 synthesis*. MARY E. LEAR

Complex nickel ammines. E. KOCIS. *Magyar Chem. Folyóirat* 34, 33-39(1928).—Examn. of complex Ni hexammines shows that the concn. of solns. or mixts. has some relation to the structure of the complex compd. formed. A compd. contg. 2 mols. of water is formed from 10-15% solns., another contg. 1 mol. of water from a 30-40% solns. and an anhyd. compd. from a soln. of 50% or more concn. Ni hexamine chlorides, bromides, iodides, nitrates, sulfates and chromates have been examd. Anhydrous complex compds. were the most stable and those with 1 mol. of water were the least. All of these compds. are sol. in dil. acids. The water content can be characterized as water of crystallization, since it does not belong to the structure of the complex ion. The compds. have varying colors with some regularity. Water content has no influence on the crystal form of the compds. S. S. DE FINÁLY

Lithium chloride ammonia complexes. S. C. COLLINS AND F. K. CAMERON. U. of N. Carolina, Chapel Hill. *J. Phys. Chem.* 32, 1705-16(1928).—The mono-, tri- and tetraammino Li chlorides were investigated, vapor measurements on the first disagreeing with the results of Bonnefoi (*Ann. chim. phys.* [7] 23, 317(1901)), while measurements on the other 2 agree with those of B. No evidence could be found for the existence of the diammino complex described by B. At temps. $0-66^\circ$ either tetra-, tri-, or monoammino- $LiCl$ may be formed. Pressure-temp. limits for the existence of each were detd. The system $LiCl-NH_3-H_2O$ at 25° yields as a solid phase $LiCl \cdot H_2O$ in contact with solns. up to 15% NH_3 , $LiCl \cdot NH_3$ for solns. with 15-27% NH_3 , and $LiCl \cdot 3NH_3$ for solns. with 32-40% NH_3 . Vapor-pressure measurements were made

on this system. There is a steady increase in the amt. of LiCl dissolving in H_2O when NH_3 is added until there is present a mole of NH_3 per mole of LiCl , at which point $\text{LiCl}\cdot\text{NH}_3$ becomes the stable solid phase.

R. J. HAVIGHURST

Monochloramine and hydrazine. I. Decomposition of monochloramine in acid solution (BODENSTEIN) 2.

BAILEY, G. H., AND SNELGROVE, D. R.: *Inorganic Chemistry*. Vol. I. Non-Metals. London: University Tutorial Press. 488 pp. 6s. 6d. Reviewed in *Chem. News* 137, 223(1928).—Cf. *C. A.* 22, 1742.

GODDARD, A. E., AND GODDARD, D.: *A Textbook of Inorganic Chemistry*. Vol. XI. Pt. 1. Edited by J. Newton Friend. London: Charles Griffin & Co., Ltd. 353 pp. 25s., net. Reviewed in *Chem. Trade J.* 83, 536(1928).

7—ANALYTICAL CHEMISTRY

W. T. HALL

Sampling in the chemical industry. J. H. SHAPLEIGH. *Chem. Markets* 23, 485–7 (1928).—A general discussion with particular reference to the sampling of liquids.

W. T. H.

An experiment in quantitative analysis for group performance. LYMAN E. PORTER. Univ. Ark. *J. Chem. Education* 5, 1429–31(1928).—To illustrate a reaction that is progressing slowly, it is suggested to have different students in a group det. on different days some constituent in a salt that is taking up or losing H_2O .

W. T. H.

An improvement in the technic of spectroscopic analysis: application to forensic chemistry. E. BAYLE AND L. AMY. Service d'Identité Judiciaire, Paris. *Ann. méd. légale criminol. police sci.* 8, 525–31(1928); cf. *C. A.* 20, 1640; 21, 3579.—The extreme sensitiveness of the method previously described requires the use of reagents absolutely free from the metal in question; incineration and electrolysis should be carried out in closed vessels to prevent contamination with dust, and in the detection of Cu incineration should be carried out in an elec. muffle to avoid the use of burners. By this method, Cu was detected on cloths through which Cu, brass or Ni-brass bullets had been fired; Ni and Zn were detected inside the bore of a fire-arm through which a Ni-brass bullet had been fired; Cr was detected in the ink of a small portion of a letter of text and Mn on a written text which had been treated with a KMnO_4 ink eradicator and thoroughly washed; and Zn and Pb were detected on a steel bit which had been used to bore wood having a coating of BaSO_4 -ZnO-white lead paint.

A. P. C.

Simplified methods of potentiometric and conductometric analysis and their industrial application. T. CALLAN AND S. HORROBIN. *J. Soc. Chem. Ind.* 47, 329–43T (1928).—The theory of electrometric titrations is discussed and practical examples of such titrations are described. In potentiometric work, it is shown how the expensive potentiometer is often unnecessary. Thus alkali hydroxide added to an acid soln. with the quinone electrode shows the same e. m. f. at the end point as is obtained in titrating TiCl_3 with Fe^{+++} alum so that with such a cell, a tapping key and a simple reduction flask, which is shown, a great many dyes can be analyzed by TiCl_3 . In titrating aniline, toluidine, phenol, nitrophenol, dinitrophenol and sulfanilic acid with KBrO_3 , the end point is reached in every case at 0.64 v. and this e. m. f. can be obtained easily by means of a Pt wire immersed in an acid soln. of KBr contg. a trace of Br. For some reason resorcinol titrated with bromate shows 0.54 volt at the end point. For pptn. work, Treadwell has devised a simple arrangement for using alternating current and a thermionic valve for rectifying the current before measuring. Treadwell's arrangement is modified advantageously by introducing a step-down transformer so that the app. is not connected directly with a high e. m. f. A no. of conductometric titrations with this simplified app. are described.

W. T. H.

Method for evaluating analyses. II. OTTO LIESCHER. *Z. angew. Chem.* 41, 1156–9(1928); cf. *C. A.* 22, 4078.—The use of factors in indirect analysis is explained and it is shown how to interpret the accuracy of the analysis on the basis of these factors.

W. T. H.

Elementary microanalysis. R. GOUBAU. Univ. of Ghent. *Natuurw. Tijdschrift* 10, 129–36(1928); *Bull. soc. chim. belg.* 37, 335–44; cf. *C. A.* 21, 3576.—To eliminate the use of absorption trains in microanalysis, G. describes methods for the detn. of H_2O and CO_2 by direct condensation. The combustion takes place in a long quartz

tube with ground joints filled according to Pregl, the PbO_2 being heated by electricity in an Al block. The O_2 used is passed through H_2SO_4 , soda lime and CaCl_2 , a quartz tube contg. Pt heated to redness, a bubble flask, and a U tube with Ag spirals cooled with liquid O (not liquid air) before entering the combustion tube. The products of combustion go through a U tube cooled in solid CO_2 + alc. (H_2O condensed) and a second one with liquid O (CO_2 condensed). All glass work is ground, the absorption U tubes are of thin glass 3 to 4 mm. wide, 15 cm. long with constrictions at tops and bottoms; they contain Ag spirals for better cooling efficiency. After the combustion the U tubes are sealed off at the constriction nearest to the combustion tube, the tube is rapidly evacuated from the other end (1 mm. by oil pump) and the other top constriction sealed, all before the cooling bath is removed. The loss by the evacuation is negligible. The individual sealed tubes are then turned over with one leg outside the Dewar vessel to distil the H_2O or CO_2 over into the cool leg and the latter is in turn sealed off at the bottom constriction. The containers so obtained are much lighter than Pregl's and easier to weigh. The glass tare is weighed subsequently after removal of the condensate by repeated evacuation and heating; the tubes are not to be touched by hand. Examples are given showing the correction for O_2 and air in the tubes; samples of 10 mg. material are advised.

B. J. C. VAN DER HOEVEN

Quantitative microchemical analysis. J. MIKA. *Bányás Kohás Lapok* **61**, 97-101, 125-30(1928).—A treatise on the methods of modern quant. microchemical analysis.

S. S. DE FINÁLY

Quantitative chemical analysis by Röntgen emission spectra. HUGO STINTZING. Univ. Giessen. *Z. angew. Chem.* **41**, 1173-5, 1201-3(1928).—During the last few years considerable work has been done in perfecting the methods of x-ray analysis. In this paper the subject is discussed thoroughly with particular attention paid to the sources of error and the conclusion is drawn that x-ray analysis serves not only for the positive identification of many substances but is just as reliable for the detn. of constituents as the usual methods of analysis. Drawings of the necessary app. are shown. W. T. H.

Simplification for the computation of gas analyses. L. ZECHMEISTER. *Chem. Ztg* **52**, 887(1928).—When a gas is measured over H_2O at 11-21°, a rough correction for aq. tension can be made by subtracting from the barometer reading the same no. of mm. pressure as the temp. reading.

W. T. H.

Standards for titration, their significance and tests. N. SCHOORL. *Chem. Weekblad* **25**, 534-7(1928).—A lecture.

B. J. C. VAN DER HOEVEN

The electrometric titration of manganese by the Volhard method. B. F. BRANN AND M. H. CLAPP. Univ. Me. *J. Am. Chem. Soc.* **51**, 39-41(1929).—Various methods for detg. the end point of the Volhard reaction electrometrically proved unsuccessful until the "dead stop end point" described by Foulk and Bawden was tried with a short piece of Pt wire as cathode and Ag wire as anode. Then, by adding a few drops of 6 N HCl to the soln., the anode became depolarized as soon as an excess of KMnO_4 had been added. Moreover, an e. m. f. results between the 2 electrodes at the start so that the 2 electrodes can be connected directly with a galvanometer without using any outside source of current. The electrodes should be cleaned after each titration. The results are quite satisfactory, the max. error reported on some 18 titrations being about 2 drops of 0.1 N KMnO_4 .

W. T. H.

Determination of calcium in calcium glycerophosphate, calcium lactophosphate and calcium mono- and di-hydrogen phosphates. E. LETRUC. Établissements Darasse. *Ann. fals.* **21**, 534-6(1928).—In the Fr. Codex method for the detn. of Ca in $\text{CaH}_2(\text{PO}_4)_2$ (soln. in dil. AcOH and pptn. with $\text{H}_2\text{C}_2\text{O}_4$ in presence of AcONa), considerable trouble is encountered in filtering the ppt., and the latter is always contaminated with more or less P_2O_5 . These causes of error are eliminated in the following technic: for glycerophosphate and lactophosphate dry 0.5 g. at 150° for 4 hrs., incinerate carefully to a grayish white ash, take up in dil. HCl, filter, ignite the residue and filter to a white ash, take up with dil. HCl, filter, add the filtrate to the 1st filtrate, and ppt. with $\text{H}_2\text{C}_2\text{O}_4$ from AcOH + AcONa soln.; for CaHPO_4 and $\text{CaH}_2(\text{PO}_4)_2$, dissolve in dil. AcOH, ppt. with $\text{H}_2\text{C}_2\text{O}_4$ and AcONa , wash the ppt. by decantation, transfer the ppt. to the filter, dry the filter, ignite in the same manner as for glycerophosphate and ppt. as usual.

A. PAPINEAU-COUTURE

Rapid method for the determination of selenium. ERWIN BENESCH. *Chem.-Ztg.* **52**, 878-9(1928).—Amorphous Se dissolves readily in cold, satd. Na_2S , forming a red soln. which can be titrated with KCN, the end point being reached when the soln. assumes a light yellow color corresponding to the formation of KCNSe . To apply the method it is only necessary to ppt. Se by a suitable reducer, e. g., $\text{Na}_2\text{S}_2\text{O}_3$, added to an acid soln., wash the ppt., dissolve it in Na_2S and titrate.

W. T. H.

Microestimation of bismuth. P. DUMONT AND M. BOUILLENNE. *Compt. rend. soc. biol.* **99**, 1247-8(1928).—The color reaction of Bi in the presence of an excess of KI is applicable to the microestn. of Bi. L. W. RIGGS

Quantitative separation of alkali metals from calcium and magnesium by means of amyl alcohol. D. KÖSZEGI. *Acta Sci. Regiae Univ. Hung. Francisco Iosephinae* **II**, 214-25(1927).—Gooch stated that amyl alc. has a very small solvent effect on NaCl and KCl. Amyl alcohol therefore may be used for sepg. CaCl_2 and MgCl_2 from Na and K because anhyd., hot amyl alc. dissolves CaCl_2 , MgCl_2 and LiCl. The Lawrence-Smith has been much used for detg. alkalies in silicates, and the removal of Ca^{++} has been tedious. If the anhyd. chlorides of CaCl_2 , $\text{NaCl} + \text{KCl}$, etc., are extracted with anhyd. alc. much time will be saved. S. S. DEF.

Investigations on quantitative spectral analysis. I. Determination of potassium, magnesium and copper in flame spectrum. HENRIK LUNDEGÅRDH. *Arkiv. Kemi. Mineral Geol.* **10**, No. 1, 26 pp.(1928).—By using the nozzle spraying app. of Gouy, and photographing with varying concn. it is possible with 60 sec. exposure and 3 cc. of soln. to det. 0.36 mg. of K, 0.20 mg. of Mg and 0.1 mg. of Cu. The method is probably more accurate than other methods of microanalysis. This paper is published in excellent English and can be obtained from Wheldon & Wesley, Ltd., of Arthur St., London. It will be found interesting to all workers in spectral analysis. A bibliography is given. W. T. H.

Zirconium. II. Detection of potassium by zirconium sulfate in the presence of ammonium ions. RUFUS D. REED AND JAMES R. WITHROW. Ohio State Univ. *J. Am. Chem. Soc.* **50**, 2985 7(1928).—A 10% soln. of $\text{Zr}(\text{SO}_4)_2$ in dil. H_2SO_4 will serve to detect 0.48 mg. of K in 2 cc. of reaction mixt. and the test is equally reliable when considerable NH_4 salt is present, whereas other pptn. tests for K^+ also give ppts. with NH_4^+ . W. T. H.

The quantitative determination of palladium by means of 6-nitroquinoline. S. C. OGBURN, JR. AND A. H. RIESMAYER. Bucknell Univ. *J. Am. Chem. Soc.* **50**, 3018-22(1928).—By means of a satd. soln. of 6-nitroquinoline, Pd is pptd. as $\text{Pd}(\text{C}_8\text{H}_6\text{NNO}_2)_2$. The ppt. can be washed with hot water and weighed as such or it can be ignited in H_2 and the residual Pd weighed. The flocculent ppt. is yellow and insol. in dil. mineral acids. The reagent does not give ppts. with other metals of the Pt group; so it will doubtless prove of value in sepgs. W. T. H.

Ceric sulfate as a volumetric oxidizing agent. VIII. The determination of chromium in the presence of manganese, iron and vanadium. IX. Preparation and stability of ceric sulfate solutions. H. H. WILLARD AND PHILENA YOUNG. Univ. Michigan. *J. Am. Chem. Soc.* **51**, 139 49, 149-52(1929).—A high-grade hydrated CeO_3 has been obtained from the Welsbach Co. and also purchased on the market which, when heated with sufficient H_2SO_4 to form the sulfate and leave the soln. 1-2 N in H_2SO_4 , will yield a soln. of $\text{Ce}_2(\text{SO}_4)_3$ satisfactory for use as an oxidant in titrations. Such a soln. is remarkably stable, as shown by the fact that the titer does not change in 40 weeks, and the CeO_2 for 1 l. of 0.1 N soln. costs only a few cents. With such a soln. Cr can be detd. very rapidly. The expts. here described were made with 100 cc. of aq. chromic alum soln. contg. about 0.046 g. of Cr. The addition of 5 cc. of concd. HNO_3 or of 70% HClO_4 is advantageous. Three methods of continuing the analysis were tested and found satisfactory; (a) Titrate the excess of oxidant in acid soln. with standard NaNO_2 or $\text{Na}_2\text{C}_2\text{O}_4$ soln. With the proper temp. and acidity, these reagents reduce quadrivalent Ce without affecting the oxidized Cr. (b) Remove the excess Ce^{++++} with a slight excess of NaNO_2 and add urea to remove all nitrite. Then titrate the CeO_3 with standard FeSO_4 soln. (c) Remove the excess Ce^{++++} with 0.1 molar NaCN and titrate the $\text{Cr}_2\text{O}_7^{--}$ with FeSO_4 soln. These methods of detg. Cr are not only very rapid but meet with little interference. Fe does not interfere and although V will be detd. with the Cr, the soln. can be used for a subsequent detn. of V. A large quantity of Mn can be present. In method (b) diphenylbenzidine or diphenylamine can be used as indicator, otherwise it is necessary to det. the end points electrometrically. W. T. H.

Microcolorimetric estimation of uranium salts. Application to the estimation of sodium following the technic of Blanchetière. (MILLE.) MARGUERITE TISSIER AND HENRI BÉNARD. *Compt. rend. soc. biol.* **99**, 1144-6(1928).—The object was to det. the influence of the reaction of the medium, the concn. of the ferrocyanide and the concn. of the UO_2 salts on the intensity of the brown color produced by the reaction between ferrocyanide and UO_2 salts. The triple acetate of Na-Mg and UO_2 was used. In concns. of 0.04 to 5.0% of AcOH in the medium, the intensity of coloration was independent of the acidity. The coloration is not produced in an alk. medium. With

0.2% solns. of the U salt a 1% soln. of $K_4Fe(CN)_6$ is the optimum concn. With a 1% soln. of $K_4Fe(CN)_6$ and 2% AcOH acidity in the medium the intensity of coloration varied directly as the concn. of the U salt. By converting the Na to the triple acetate, this method may be used in the quant. detn. of Na according to the method of Barrenscheen and Messiner (cf. C. A. 22, 607).

L. W. RIGGS

Critical studies on the fusion of rare-metal ores. III. Determination of tantalum and columbium. GEORGE W. SEARS. U. S. Bur. Mines. *J. Am. Chem. Soc.* 51, 122-9 (1929).—When fused at about 650° with $Na_2S_2O_7$, Fe and Ti oxides are converted into sulfates sol. in hot 3 N HCl. It is best to digest the melt with cold water, filter and then treat with hot HCl. The residue insol. in dil. HCl contains all of the Ta_2O_5 and Cb_2O_5 , together with a little SiO_2 in most cases. By treatment with HF and H_2SO_4 , the pure oxides can be weighed. Then, by fusing with more $Na_2S_2O_7$ at $835-850^\circ$ for 10-15 min., leaching with water and washing the residue with hot, 3 N HCl, a residue is obtained from which $Cb(SO_4)_2$ can be removed by digesting with hot concd. H_2SO_4 ; fuming for 15 min., cooling and pouring slowly into cold water. Ta_2O_5 resists this treatment. By adding NH_4OH and filtering, a ppt. is obtained from which pure Cb_2O_5 can be obtained by ignition and treatment with H_2SO_4 and HF.

W. T. H.

Use of methyl orange for the detection of free chlorine and chloramines. BERSMANN. *Chem.-Ztg.* 52, 826(1928).—Methyl orange is sensitive to Cl_2 or $HClO$ only in acid soln. Thus if dil. Cl_2 water is made alk. with NaOH and then methyl orange is added, the indicator retains its yellow color. On making acid, the methyl orange is bleached. Similarly by adding NH_4OH or an amine to Cl_2 the bleaching effect of Cl_2 is lost but now on making the soln. acid there is no bleaching effect although other reagents for Cl_2 are affected. Conclusion: Methyl orange serves to differentiate between free Cl_2 and chloramines. Only the former is active toward methyl orange whereas KI, toluidine or benzidine is sensitive to the latter. This probably explains Grassberger's "apparently free" and "actually free" tests for Cl_2 in drinking water.

W. T. H.

The gasometric determination of carbon dioxide by the Chittick method. RAYMOND HERTWIG AND J. S. HICKS. Hecker H-O Co. Inc., Buffalo, N. Y. *Cereal Chemistry* 5, 482-4(1928).—The addn. of a measured vol. of reagent acid to the dry decomposition flask causes a greater displacement in the gas-measuring tube than the vol. of acid added. This may amount to 3 to 5 cc., depending on barometric pressure, the temp and the acid concn. The increase in vol. is attributed to the vapor tension of the reagent acid. Tables are given showing exptl. results.

L. H. BAILEY

Detection of arsenic in the ashes of corpses. A. HEIDUSCHKA. *Z. angew. Chem.* 41, 1286(1928); G. Popp. *Idem.*—A polemical discussion with respect to whether the detection of As in the ashes from a crematory has any significance. Cf. C. A. 22, 4403

W. T. H.

Scheme for systematic qualitative analysis of alloys. D. SCIUTO. *Notiz. chim. ind.* 3, 698-701(1928).—The usual methods of qual. analysis are employed.

A. W. CONTIERI

Rapid determination of alloyed constituents in iron by quantitative emission-spectral analysis. G. SCHEIBE AND A. NEUHÄUSSER. Univ. Erlangen. *Z. angew. Chem.* 41, 1218-22(1928).—The sensitivity and reproducibility of quant. emission-spectral analysis was studied with Sn-Pb, Mn-Fe and Mn-Si mixts. When the Si content lies between 0.8 and 4% a detn. of Si can be made in 20 min. with a result within about 0.1% of the true value.

W. T. H.

Rapid analysis of brass or bronze without making use of rapid electrolysis. HANS KRUG. *Chem.-Ztg.* 52, 842(1928).—Instead of starting with a single sample and detg. Pb, Cu, Fe, Mn and Zn one after the other, it is recommended to make up a soln. of the alloy in HNO_3 and use different aliquots for each sep. detn.

W. T. H.

Detection of nitrous acid. W. VAUBEL. *Chem.-Ztg.* 52, 842(1928).—Independently, V. has discovered a test for HNO_2 which was mentioned by Reigler in 1927. The test is carried out as follows: To a dil. soln. of naphthionate, add a little HCl and the soln. to be tested for HNO_2 . Then make alk. and a red color is obtained.

W. T. H.

Rapid and convenient method of analyzing Paris green. D. KÖSZEGI AND I. GERŐ. *Kísérlet Közlemények* 30, 607-0(1927).—Dissolve 1 g. of material in dil. H_2SO_4 , add an excess of KOH and boil 5 minutes. Filter off the Cu through a Gooch crucible, wash with hot water, dissolve with acid $Fe_2(SO_4)_3$ soln. and titrate the resulting Fe^{++} with 0.1 N $KMnO_4$ soln. Det. the As iodometrically taking cognizance of the fact that some of it is pptd. with the Cu.

S. S. DE FINÁLY

Modifications applied to the method of organic elementary analysis. A. WAHL. AND J. P. SISLEY. *Bull. soc. chim.* 43, 1279-87(1928).—See C. A. 22, 3113.

E. H.

Attempt to develop a titrimetric determination of the albumin content of solutions. W. D. TREADWELL AND W. EPPENBERGER. *Tech. Hochschule Zürich Helvetica Chim. Acta* 11, 1053-62 (1928).—It is improbable that there will ever be a satisfactory direct method for titrating a colloid such as egg albumin or gelatin and expts. using $K_4Fe(CN)_6$ as precipitant with electrometric detn. of the end point, confirmed this view. Egg white and gelatin have a marked tendency to adsorb colloidal Prussian blue. The amt. of colloidal Prussian blue that can be added to a tannin-albumin gel before a distinct blue is recognizable in the supernatant soln., can be taken as a measure of the albumin content provided the colloidal Prussian blue soln. has been standardized against the same protein. In the expts. here described a soln. of gelatin contg. 5-10 g. per l. was used and the white from a fresh egg was shaken for 1 hr. with 300 cc. of water and filtered through cotton and paper. It was found that 1 g. of gelatin corresponded to 23 millimol. of ferrocyanide ion and 1 g. of egg albumin to 1.1 millimol. of ferrocyanide. To a measured vol. of the protein soln. (contg. about 30 mg. of protein) add 200 mg. of tannin in 0.5-1% soln. and after the resulting ppt. has settled, add colloidal Prussian blue in small portions. The titrating soln. is prepared by mixing 25 cc. of 0.2 N $K_4Fe(CN)_6$ with 18.8 cc. of 0.2 N $FeCl_3$ and dilg. to 500 cc. Add the blue colloid at first in 2-cc. portions, then in 1-cc. portion and finally in 0.5-cc. portion. After each addn. shake 10 min. and, when near the end point, take 10 cc., centrifuge and note whether the soln. is blue.

W. T. H.

Detection of methanol in ethyl alcohol, alcoholic beverages, tinctures, etc. Y. KINUGASA, Y. HATTORI AND K. AKIYAMA. *Tokyo Imp. Hyg. Lab. J. Pharm. Soc. Japan* 48, 767-90(1928).—After studying the sensitiveness and practical usefulness of various methods for the detection of MeOH, especially the Japanese official, U. S. P., Reif's (*C. A.* 20, 2965) and Wright's (*C. A.* 21, 2240), the following procedure was adopted. If the sample contains more than 60% EtOH, use 10 cc. and dil. with 10 cc. H_2O ; if 20-60% EtOH, use 10 cc.; if less than 20%, use 20 cc. sample. Introduce the sample into a 50-cc flask provided with a small glass tube 75 cm. long, bent twice nearly at right angles, which serves as a condenser. If the sample is distinctly acid, neutralize with 0.1-0.5 g. of pptd. $CaCO_3$. By means of a small flame distil carefully 1 cc. into a small test tube cooled by ice- H_2O . The last vertical column of the condenser should not become heated. Place 0.1 cc., 0.2 cc. and 0.3 cc. of the distillate separately into 3 test tubes; fill each to 5 cc. with H_2O ; add 0.4 cc. of 50% H_2SO_4 and 5 cc. of 1% $KMnO_4$. Allow the mixt. to stand 2 min.; decolorize by adding 1 cc. of 8% $(CO_2H)_2$ followed by 1 cc. of concd. H_2SO_4 . Then add 5 cc. of fuchsin-sulfurous acid soln. and mix. If MeOH present, a violet or reddish purple color is developed in 1-2 hrs. If it is desired to distinguish a small amt. of MeOH spontaneously generated by fermentation, etc. from that intentionally added, add 2 cc. (instead of 1 cc.) concd. H_2SO_4 after decolorization with $(CO_2H)_2$. In the former case (0.05% MeOH or less), no color reaction is obtained.

NAO UYBI

Volumetric estimation of reducing sugars. R. BIAZZO. *Ann. chim. applicata* 18, 447-53(1928).—Dil. sugar solns. can be titrated, by adding Fehling soln. in excess to a measured vol. of the soln., dissolving the pptd. Cu_2O with $(NH_4)_2SO_4$ and NH_4OH excluding air, and then measuring the Cu_2O by adding $AgNO_3$ soln. according to the reaction $Ag_2O + Cu_2O = 2 Ag + 2CuO$, KCNS being used to measure the excess $AgNO_3$. To 10 cc. dil. sugar soln. add 50 cc. Fehling soln. boil 2 min., and close with a stopper carrying a separating funnel that contains a soln. of 220 g. Na_2SO_4 and 300 cc. concd. NH_4OH . Run in this soln. with stirring until Cu_2O is dissolved, then add 10 cc. $AgNO_3$ (3.5%) through the separating funnel. The soln. may now be exposed to the air during final titration with KCNS. The results are good to 3%.

A. W. CONTIERI

Studies on the polarimetric determination of small quantities of glucose. C. LUNDGAARD, CHR. N. J. GRAM, S. A. HOLBØLL AND E. RUD. *Med. Univ., København. Biochim. Z.* 201, 341-52(1928).—Even with a polariscope reading in 0.01° the error with small quantities of glucose does not exceed 0.02 mg.

S. MORGULIS

Directions for preparing a universal indicator (URK) 2. Selenium cells as colorimeters. (MICKWITZ) 2.

CUMMING, A. C., AND KAY, S. A.: *A Text Book of Quantitative Chemical Analysis*. 5th ed., revised. London: Gurney & Jackson; Edinburgh: Oliver & Boyd. 440 pp. 15s.

Reviewed in *Chemistry and Industry* 47, 1251; *Chem. Age* 19, 436(1928).

FALES, HAROLD A.: *Inorganic Quantitative Analysis*. London: G. Bell & Sons. 493 pp. 12s. 6d. Reviewed in *Chem. News* 137, 334(1928).

LONG, JAMES SCOTT, CHAMBERLIN, DALE S., AND ANDERSON, HAROLD VICTOR: **Qualitative Analysis**. New York: Prentice-Hall, Inc. 193 pp. Cf. C. A. 21, 3328.
WELLINGS, A. W.: **Volumetric Analysis**. London: Methuen & Co. 1926 pp. 5 s. Reviewed in *Chem. News* 137, 190(1928).

Analysis of liquids. THE GRASSELLI CHEM. CO. Ger. 468,912, May 13, 1926. An app. for the analysis of a liquid by measuring its heat of reaction with another liquid is described. The 2 liquids flow in unbroken streams from 2 vessels, in which their temp. is measured, to a vacuum flask, in which the temp. of the mixt. is measured, and the mixt. flows away from the top of the flask.

Moisture determinations. FRANKFURTER FORSCHUNGSINSTITUT FÜR GETREIDE-CHEMIE GES. Brit. 290,645, May 18, 1927. The moisture content of granular or pulverulent solids such as grain or flour (and also of other liquid, semi-liquid, pulpy, pasty or solid materials) is ascertained by detg. the dielec. const., *c. g.*, by capacity measurements, and comparing it with the const. of the normal material.

8—MINERALOGICAL AND GEOLOGICAL CHEMISTRY

EDGAR T. WHERRY AND J. F. SCHAIRES

The double dispersion method of mineral determination. R. C. EMMONS. *Am. Mineral.* 13, 504-15(1928).—The method described has as an objective the detn. of the *ns* of a mineral to ± 0.001 instead of the usual ± 0.005 , and an increase in speed. A set of 13 liquids chosen on a basis of both wave length and thermal dispersion covers the *n* range from 1.40 to 1.78, usually with considerable overlap. The actual procedure consists in changing the *n* of the liquid by a temp. change first, and then going back by a change in the wave length until the mineral and liquid again agree. Three detns. suffice to give the dispersion curve of the mineral, from which the *n_D* or *n* for light of other wave lengths can be easily read. The app. consists of a water heated cell for the microscope stage in series with a refractometer, with thermometers to check temps. The mineral is mounted in the appropriate liquid and the same liquid is placed in the refractometer. At a given temp. the monochromator is adjusted until the *n* of the mineral and that of the liquid agree. The temp., monochromator and refractometer readings are recorded. The temp. is then raised a few degrees and the monochromator again adjusted; and this is repeated. There are now available 3 correct *ns* on one ray, and a curve can be drawn. A description of the app. is given and also graphs of the optical properties of the liquids used.

A. M. BRANT

Dyscrasite and the silver-antimony constitution diagram. G. M. SCHWARTZ. *Am. Mineral.* 13, 495-503(1928).—The Ag-Sb constitution diagram is given and the application of the data to veins is discussed. An intergrowth of native Ag and dyscrasite is described with photomicrographs of etched surfaces. It is concluded that the formula of dyscrasite is Ag₃Sb which is also a known compd. in the system Ag-Sb. Compns. other than Ag₃Sb are due to the solid soln. of Sb and Ag, or a mixt. of Ag₃Sb and this solid soln. An intergrowth, such as is found in the ores at Cobalt, Ont., may originate by: (a) crystn. of the solid soln. Ag-Sb above 560° and of Ag₃Sb at 500°; (b) formation of solid soln. Ag-Sb in range 10-15% Sb and its breakdown into Ag-Sb solid soln. and Ag₃Sb on cooling. Mixts. of types described can be recognized only by etching the polished surfaces and examn. under the microscope.

A. M. BRANT

The occurrence of linnéite in the coal measures of South Wales. W. E. HOWARTH. *Geol. Mag.* 65, 517-8(1928).—Crystals of linnéite (Co₃S₄) as minute octahedrons or aggregates of octahedrons (sometimes twinned) averaging about 0.4 mm. were found loosely attached to dolomite or ankerite lining cracks in the clay ironstones of East Glamorgan. Associated minerals were millerite, kaolinite, chalcopyrite, quartz, barite, sphalerite, galena and a hydrocarbon (hatchettine?). The mode of occurrence indicated that its formation was subsequent to that of dolomite and millerite.

A. M. BRANT

Xanthoconite and associated minerals from the General Petite Mine, Atlanta District, Idaho. EARL V. SHANNON. *Am. Mineral.* 13, 469-75(1928).—A description of a specimen in which the rare mineral xanthoconite is assocd. with quartz, Au, arsenopyrite, argentite, proustite and polybasite. Crystallographic data for the last 3 are given.

A. M. BRANT

Calcite crystals from Vodelée. VALÉRE BILLIET. Univ. Gent. *Natuurw. Tijdschrift* 10, 158-9(1928).—On specimens from the marble quarries of Vodelée, Bel-

gium a new form $d^7 = \{71\bar{8}6\}$ was found. Several crystals were measured in detail and tabulated data are given.

B. J. C. VAN DER HOEVEN

Structural relationships in the silicates. B. GOSSNER. *Ber.* 61B, 1634-8(1928).—There are groups of silicates which have a structural type common to the group. By structural type is meant a mol. contg. a certain no. of O atoms and a certain no. of other atoms (excepting H which is too small to affect the space lattice appreciably). Silicates having a common structural type show unit cells, under x-ray analysis, which have very similar dimensions and vol., although their crystallography may be entirely different. Examples of 3 groups are given: (1) babingtonite, anorthite, epididymite; (2) beryl, cordierite; (3) diopside, tremolite.

DAVID DAVIDSON

Structural relations of rhodonite to other silicates. B. GOSSNER AND K. BRÜCKL. *Centr. Mineral. Geol.* 1928A, 316-22. The unit cell of rhodonite has $a = 7.77$, $b = 12.45$, $c = 6.74$ A. U.; $\alpha = 85^\circ 10'$, $\beta = 94^\circ 4'$, $\gamma = 111^\circ 29'$. This is not similar to diopside, but resembles babingtonite. To express this relationship, the formula is written $Mn_3CaSi_4O_{12} MnSiO_3$, that of babingtonite being written $Ca_2Fe_2Si_4O_{12} Si_2O_4$. J. E. GILL

The systematic placing of neptunite and babingtonite. B. GOSSNER AND F. MUSSGUG. *Centr. Mineral. Geol.* 1928A, 274-81. The unit cell of neptunite has $a = 16.54$, $b = 12.64$, $c = 10.04$ A. U.; $\beta = 115^\circ 38'$, with 8 mols. $Na_2FeSi_2O_6 \cdot Si_2TiO_6$. Apparently, there is no close relation in structure between aegirite and neptunite. The formula for neptunite is written as above to express this essential difference in structure. Babingtonite has a unit cell with $a = 6.73$, $b = 7.54$, $c = 12.43$ A. U.; $\alpha = 112^\circ 22'$, $\beta = 93^\circ 48'$, $\gamma = 86^\circ 9'$, and 4 mols. $CaSi_2O_6 \cdot (0.292 FeSiO_3, 0.295 MnSiO_3, 0.285 Al_2O_3, 0.127 CaSiO_3)$. It is pointed out that this resembles anorthite, the principal differences being in the angles, α , β and γ . Chem. and possibly also phys. relations between these minerals are explainable by substitution of SiFe for Al_2 . The neptunite-aegirite relationship is considered to be similar in that it is explainable on the basis of substitution with the general relation $M_2''' = M^{IV}M''$.

J. E. GILL

Analcite from Brewster County, Texas. JOHN T. LONSDALE. *Am. Mineral.* 13, 449-50(1928). The analcite was found in basalt. Many of the crystals were euhedral, of a light gray to white color and showed chiefly the trapezohedron. The $n = 1.484$. An analysis is given. There is distinct double refraction, and x-ray examn. shows this mineral to be not isometric in crystn.

A. M. BRANT

X-ray and chemical investigation of the thermal changes of serpentine. HAARON HARALDSEN. *Centr. Mineral. Geol.* 1928A, 297-315. Serpentine from Snarum, Norway, gave: SiO_2 37.39, MgO 40.77, FeO 1.96, CaO 0.62, Fe_2O_3 2.63, Al_2O_3 2.66, H_2O 14.08%. Most of the H_2O passed off between 500° and 700° , the crystal structure of serpentine being destroyed. At 700° the substance showed a structure similar to that of olivine. At higher temps., mixtures of olivine, amorphous silica and enstatite were obtained. Enstatite increased at the expense of the silica with rising temp.

J. E. GILL

Euxenite from Sabine Township, Nipissing District, Ontario. H. V. ELLSWORTH. *Am. Mineral.* 13, 484-7(1928); cf. *C. A.* 22, 2905. Euxenite, next to allanite, is the commonest rare element mineral in Canadian pegmatites, and this new area contains fine material in considerable quantities. A chem. analysis of the best obtainable is given, together with a description of its occurrence and phys. properties.

A. M. BRANT

The constitution formulas of the salts occurring in the potash salt deposits, from the standpoint of coördination studies. H. JUNG. *Centr. Mineral. Geol.* 1928A, 182-5. The formulas derived are: halite $[NaCl_6]$; $[ClNa_6]$; sylvite $[KCl_6]$; $[ClK_6]$; bischofite $[Mg(H_2O)_6]Cl_2$; carnallite $[Mg(OH)_6] \begin{smallmatrix} KCl \\ Cl_2 \end{smallmatrix}$; rinneite $[FeCl_6] \begin{smallmatrix} K_3 \\ Na_4 \end{smallmatrix}$; anhydrite $Ca[SO_4]$; langbeinite $2[SO_4]Mg \cdot [SO_4]K_2$; apthitalite (glaserite) $[SO_4]K_2 \cdot [SO_4]Na_2$; thenardite $Na_2[SO_4]$; glauberite $[SO_4]Ca \cdot [SO_4]Na_2$; vanthoffite $3 \cdot [SO_4]Na_2 \cdot [SO_4]Mg$; kieserite $Mg[SO_4]H_2$; epsomite $[Mg(OH)_6] [SO_4]H_2$; syngenite $\begin{smallmatrix} Ca \\ H_2 \end{smallmatrix} [SO_4] \cdot K_2[SO_4]$; gypsum $\begin{smallmatrix} Ca \\ H_2 \end{smallmatrix} [SO_4]$; blödite $\begin{smallmatrix} Mg \\ H_4 \end{smallmatrix} [SO_4] \cdot \begin{smallmatrix} Na_2 \\ H_4 \end{smallmatrix} [SO_4]$; and leonite $\begin{smallmatrix} Mg \\ H_4 \end{smallmatrix} [SO_4] \cdot \begin{smallmatrix} K_2 \\ H_4 \end{smallmatrix} [SO_4]$.

J. E. GILL

The chemical formula of boracite. JOHN W. GRUNER. *Am. Mineral.* 13, 481-3(1928). An x-ray examn. of the structure of boracite showed the hitherto accepted formula to be incorrect. The av. of new analyses is: $MgCl_2$ 12.35, MgO 26.39, B_2O_3 62.26%, FeO trace. The more probable formula is $Mg_3Cl_2B_{14}O_{26}$, or $Mg_3Cl_2B_7O_{13}$ if boracite is orthorhombic-holohedral instead of hemimorphic as usually claimed.

A. M. BRANT

Gypsum and anhydrite. FRANK A. WILDER. *Am. Mineral.* 13, 476-80(1928).—An inference is made that many important gypsum beds were originally anhydrite.

At least half the U. S. deposits are associated with anhydrites. A careful study of the relationship between gypsum and anhydrite is recommended. A. M. BRANT

Mineralogical contributions from Hungary. Two new minerals. JOSEF KRENNER. *Centr. Mineral. Geol.* 1928A, 265-71; cf. C. A. 22, 1303.—Tabular orthorhombic crystals with the compn. SO_4 49.27, Fe_2O_3 24.54, FeO 0.35, CuO 0.03, CaO 0.10, MgO + Na_2O 0.15, H_2O [25.54]% are named *rhomboclase*. Pyramidal monoclinic crystals with the compn.: SO_4 47.96, FeO 39.42, Fe_2O_3 1.36, CuO 1.20, CaO 0.07, MgO 0.25, $\text{Na}_2(\text{K}_2)\text{O}$ 0.31, ZnO 0.14, H_2O 10.36%, are named *szomolnokite*. Both minerals occur in the Kiesgruben in Szomolnok. *Berthierite* from Felsőbánya has sp. gr. 4.622 and compn.: S 29.28, Sb 55.96, Fe 12.61, Cu 0.06, Pb 0.94, Zn 0.24, Mn 0.31, As trace, insol. 0.05%. J. E. GILL

Thucholite, a remarkable primary carbon mineral from the vicinity of Parry Sound, Ontario. H. V. ELLSWORTH. *Am. Mineral.* 13, 419-39(1928).—A pegmatite dike in this district carries a no. of rare mineral species including uraninite, calciosamaraskite, allanite, cyrtolite and a new species. The last, a black mineral, named thucholite, occurs assocd. with both uraninite and calciosamaraskite embedded in feldspar quartz or mica or in a mixt. of all 3, and is as much of a primary mineral as are any of those mentioned. It takes the form of irregular rounded nodules or roughly globular masses 1-25 mm. in diam. Thucholite is jet black with brilliant luster and perfect conchoidal fracture, cleavage none, very brittle; hardness = 3.5-4; opaque; sp. gr. 1.777 at 17.74°. The mineral appears to vary greatly in compn. It contains about 50% carbon, about 13% H_2O , and about 28% ash of which one-half is ThO_2 . The gas content is high as is the radioactivity of the ash. The fact that it is a carbon containing 25 to 28% of rare element compds. yielding no visible evidence of their presence, and has an enormous gas content in which hydrocarbons are practically absent, may be of remarkable chem. and geological significance. Other reported occurrences of the mineral are noted. The occurrence of C as a magmatic mineral is established, and it appears that in it is absorbed a sample of the final gases of the Precambrian granite magma; with the exception of He. A. M. BRANT

Cyrtolite intergrowth with the Parry Sound thucholite. H. V. ELLSWORTH. *Am. Mineral.* 13, 439-41(1928); cf. preceding abstract.—The Parry Sound thucholite nodules almost always carry on their outer surfaces more or less imbedded or intergrown cyrtolite. An analysis of the intergrowth is given. The cyrtolite group of minerals, contg. Hf, U and the rare earths are always considerably altered. A. M. BRANT

Thucholite and uraninite from the Wallingford Mine near Buckingham, Quebec. H. V. ELLSWORTH. *Am. Mineral.* 13, 442-8(1928); cf. preceding abstract.—Thucholite, uraninite and cyrtolite occur in close assoc. as at Parry Sound. An approx. analysis is H_2O 13.53, gases 28.70, ash 19.84, fixed C 37.93%. One pseudomorph after tourmaline was found, indicating that thucholite could also be produced by late pneumatolytic action. It appears that C must be included with B, F, etc., as one of the constituents of the residual solns. of granite magmas. A. M. BRANT

Anthraxolite from the Northwest Territories of Canada. RALPH L. RUTHERFORD. *Am. Mineral.* 13, 416-8(1928).—The material found in the district of Mackenzie is strikingly similar to that of the Sudbury district in mode of occurrence, mineralogical associations and inclusion in Precambrian rocks. A. M. BRANT

Hungarian minerals. S. KOCH. *Természettud. Közöny* 60, 62-8(1928).—The minerals which have been discovered first in Hungary are: sylvanite (named later on as nagyágit), wehrlite, libethenite, euchroite, tetradymite, thombolite, petzite, hauerite, partschinite, felsőbányite, rézbányite, hörnesite, száibelyite, evansite, fauserite, allosclase, ludwigite, vészelyite, krennerite, pseudobrookite, stützite, herrengrundite, semseyite, dognácskaite, szmikite, kornelite, szomolnokite, andorite, vashegyite, warthaite (named later on as goongarrit), muthmannite, fizelyite and schafarzikite. The history of their discovery is told. S. S. DE FINÁLY

Famous mineral localities: Wodgina, North West Australia. EDWARD S. SIMPSON. *Am. Mineral.* 13, 457-68(1928); cf. C. A. 22, 46.—The recent invention of malleable Ta sheet has led to the reopening of the Wodgina mines which hold first place as sources of supply of Ta. The mines comprise an area of a 20-mile radius of coastal plain out of which rise low granite domes and hills of Archean greenstone. The granite and greenstone are seamed with pegmatite veins in which are found Sn and Ta ores, as well as many other minerals. The following species have been described as new from this district; their analyses are given: pilbarite and hydrothorite genetically related to mackintoshite; calciotantalite, a calciferous tantalite named by S.; and tanteuxenite, a titano-tantalate of Yt, also named by S. A. M. BRANT

Ore deposits of the Harz. IV. The occurrence of pyrrhotite and the origin of

the antimony, nickel and cobalt content in the Rammelsberg ores. GEORG FREBOLD. *Centr. Mineral. Geol.* 1928A, 161-7; cf. *C. A.* 22, 44.—Pyrrhotite occurs with sphalerite. Small amts. of pentlandite and cobaltite are believed to be present, though not certainly identified. J. E. GILL

Bauxite, laterite and red clay. T. KORMOS. *Bányás Kohás Lapok* 61, 32-5 (1928).—Sharp distinction should be made between genetically primary and secondary bauxite occurrences. New examns. of bauxite occurrences in the Bakony mountains, Hungary, showed that the original chem. character of primary bauxite changes during geologic transferring. When evaluating a bauxite occurrence, both chemists and geologists should be consulted. S. S. DE FINÁLY

Cellular forms in rhyolite. I. A. HERRERA. *Lab. Altí Studií Biol. Messico. Atti accad. Lincei* [6], 7, 807-11 (1928).—Rhyolite from the Contepec district, Mexico, which is profoundly silicized, contains an abundance of cellular forms visible with the naked eye. These forms are bluish, yellow, white or reddish, of circular shape, and contain nuclei of a darker and different color from the surrounding portions. In size they vary from 1 to 15 mm. Various other visible characteristics of the nucleated cells, which are described in detail, show in general similarity to various plant forms. Their formation depends upon the presence of SiO_2 , which as an antagonistic colloid also influences the character of living and pseudo-living forms. C. C. DAVIS

Petrographic notes on three rock types from the Shetland Islands. F. COLES PHILLIPS. *Geol. Mag.* 65, 500-7 (1928).—Descriptions are given of (1) an epidote granite contg. primary allanite assocd. with xenotime and later stages of grass-green epidote; (2) chloritoid-garnet-andalusite schist; and (3) secondary serpentine. A. M. BRANT

The petrography of the Triassic sandstone of northeast Ireland. DORIS L. REYNOLDS. *Geol. Mag.* 65, 448 (1928).—The purpose was to trace the origin of the Triassic in Ireland through its mineralogical constitution. A description of the minerals identified and a tabular summary of their distribution at the various localities are given. The older sediments apparently furnished some material, but the main part of the sandstone was derived directly from the metamorphic rocks, quartzite and gneiss. This was indicated by the high % of feldspar in the north of the area, microcline being the most abundant, and in the south by the richer % of heavy minerals present than in the neighboring older sediments. The Triassic sandstone forms one continuous series in which no lithological or mineralogical change was found. A. M. BRANT

Cenozoic "marl" of the Dniester bank. I. V. PUSTOVALOV AND M. F. SMIRNOV. *Centr. Mineral. Geol.* 1928A, 185-92.—Replacement of CaCO_3 by opal-like material has occurred in the upper part of the "marls." A transition from carbonate-rich to siliceous rocks was noted. Several analyses are given. J. E. GILL

Metamorphism in the upper Devonian of North Cornwall. F. COLES PHILLIPS. *Geol. Mag.* 65, 541-56 (1928).—From a petrographic study it was concluded that many of the changes in the phyllites, notably the formation of porphyroblastic white mica, chlorite and chloritoid, hitherto ascribed to the action of Bodmin Moor granite, were due to an earlier dynamic metamorphism. A. M. BRANT

Shugo: a mud volcano of the western Caucasus, with a theory of the origin of mud volcanoes and their significance with regard to oil products. FELIX OSWALD. *Geol. Mag.* 65, 494-9 (1928).—A brief description of this and other mud volcanoes is given. The gas emitted consists of 93.2% CH_4 , which likewise predominates in all gases of the mud volcanoes of the region, analyses of 9 of which are tabulated. O. advances a theory that mud volcanoes are the final stages in a process of torsional fracturing due to the mountain pressure being exerted on concave folds whose strata are no longer plastic enough to fold any more. The oil stored in the anticlinal domes escaped either along the fractures laterally into porous Pliocene and recent beds or to the surface. Mud volcanoes appeared only when gas and saline water remained in the anticlinal domes. The mud volcanoes of the Caucasus occur only at its eastern and western extremities where the Tertiary folds have been deflected from the normal direction. Their presence is not a favorable indication of oil. A. M. BRANT

The Karst water of the brown-coal area of Esztergom, Hungary. Z. SCHRÉTER. *Hydrol. Kozlöny* 1, 45-51 (1921) (publ. 1928).—Karst water occurs in lime and dolomite layers of upper Triassic age under the brown coal area surrounding Esztergom. The horizon of this water is anywhere about 132 m. above sea level, being also considerably higher than that of the neighboring Danube. The Karst water takes its origin from the rain pptd. in remote mountain ranges. S. S. DE FINÁLY

Unchangeableness of composition of spring waters. I. FELBER. *Balneol. Értésítő* 13, 5-7 (1928).—A brief summary of grouping of mineral waters made by Than. Fresenius long ago showed that those of Wiesbaden, Niederselters, Ems and Schlangenbad have

only slight changes in 36 (or 20) years. According to Ludvig and Mautner, Karlsbad water has not changed since 1770. The mineral waters of Fachingen had a const. compn. during 20 years, as found by C. Meineke. Hankó demonstrated that also the thermal waters of Szováta and Buda, Hungary have a const. compn. Mineral waters of shallow borings can have unchanging compn. only in case their enclosing rock excludes soil water and rain.

S. S. DE FINÁLY

Mineral waters of Csik county, Transylvania. S. DE SZINYEI-MERSE. *Hidrol Köz-löny* 1, 27-37 (1921) (publ. 1928).—Samples of 10 different springs have been analyzed both chemically and physically. Data of the analyses made by S. and K. Emszt show that the springs rich in MgO take their origin from phyllites, and those rich in CaO from limestones. Some of the springs contain much gypsum, formed by the S content of ore impregnations in the phyllite. It can be stated on the basis of the examn. of K. de Telegdi-Róth that the acid mineral waters of Csik county are of postvulcanic nature.

S. S. DE FINÁLY

Newest chemical analysis of the thermal springs of Harkány, Hungary. K. Emszt. *Balneol. Értesítő* 13, 7-9 (1928).—The results are given of E.'s analysis of the so-called "older" spring bored in 1866 (analyzed first in 1867 by K. Than) and that of the "new" spring bored in 1887 which has not yet been analyzed. Both borings supply a hot water of almost the same compn. belonging to the group of sulfuric thermal waters. The compd. COS is said to be present.

S. S. DE FINÁLY

The chemistry of coal. V. The maturing of coal considered from the standpoint of its benzene-pressure-extraction (BONE, *et al.*) 21. The production of color in glass and in gems by x-rays and radium rays (REINHARD, SCHREINER) 3. Classification of coal from the viewpoint of the geologist (CAMPBELL) 21.

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9—METALLURGY AND METALLOGRAPHY

D. J. DEMOREST, R. H. ABORN

Gravity concentration and flotation at Mount Morgan, 1925-1927. R. D. NEVETT. *Chem. Eng. Mining Rev.* 21, 7-13 (1928).—The concn. made throughout the concn. plant were mainly pyrite carrying varying quantities of chalcopyrite and Au. The ore from the mine 6" max. size was crushed to 4" in 1 K6 and 1 D6 Gates gyratory breakers, and then to 2 1/2" in 2 K4 Gates gyratory breakers. The gravity concn. section consisted of 4 sets of rolls 36" in diam. in closed circuit with two 9/16" hole trommels when the jigs were used, and with 8 King screens fitted with 5-mesh wire when the jigs were out of action. The jig concentrate was treated in hydraulic classifiers and the clean concentrate sent to the smelter. The overflow of the classifiers was run over Wilfley tables to remove SiO₂. From the King screens the oversize was sent back to the rolls and the undersize went to 6 primary tube mills after being dewatered by cone classifiers. The flotation section consisted of 4 regrind tube mills 16 ft. long by 5 ft. in diam. in closed circuit with 5 Dorr classifiers and 1 automatic cone classifier. The discharge from the classifiers went to the tube mill and the overflow to 4 24-ft. Dorr thickeners. The discharge from the thickeners was run to the flotation boxes and the overflow to the mill sump. Various kinds and quantities of flotation materials were used, but the best results were obtained by using a standard mixt. contg. 60% residual oil, 20% essential

C oil and 20% eucalyptus oil. Recovery of the Au amounted to 82% and that of the Cu to 88%.

DOWNES SCHAAP

Flotation and surface charges of minerals. THOMAS M. BAINS, JR. *Mining J.* (Phoenix, Ariz.) 12, No. 12, 7-9(1928).—A rept. of expts. conducted to det. the liquid-mineral contact potential. The app. consisted of a Compton electrometer suspended by wires from the ceiling, a calomel half-cell, an aeration cell, and a potential cell for the minerals under test. The app. is illus., also five arrangements of the connections. The features of each arrangement are outlined. Negative charges can be secured on the positive, and positive charges on certain negative minerals in certain other solns. Where the "metal" in the mineral has a great affinity for the negative element or radical of the salt in soln., the electrometer seems to read negative. Thus Cu in the chalcocite radical has a great affinity for the CN in the NaCN. S is negative and registers its polarity on the electrometer. In the case of H_2SO_4 , H₂ and S have greater affinity than the Cu and the SO_4 , thus the Cu being positive registers its polarity on the electrometer. Differences in detns. of the single potential have been proved due to elec. conditions in the soln. Ion adsorption may be prevented by the addn. of certain salts which are indicated for the minerals tested. Adding HNO_3 to a soln. or NaOH, or Na_2CO_3 and NaCN gives blende a negative charge, while pyrite remains positive. Tests from actual flotation practice are feasible. The extreme sensitiveness of the electrometer is its chief drawback for general use in mill practice.

W. H. BOYNTON

Preparation of ore pulps for flotation. H. S. MARTIN. *Mining J.* (Phoenix, Ariz.) 12, No. 13, 7-8(1928).—Grinding, pulp diln., reagents, iron depressors, collectors and frothers must all be considered in the flotation of ores. Each ore offers its own problem. Most changes in type of grinding tend to get the bulk of the flotation feed just below the critical mesh and as little as possible in the very fine sizes; pulp d. is made as high as possible; a pH range of 9.0-12.0 is best maintained. Reagents should be added in the following order: lime, cyanide or other depressor, the selector and last the frother.

W. H. BOYNTON

Economies and increased production achieved at the Silver King Coalition plant. H. D. KEISER. *Eng. Mining J.* 126, 748-50(1928).—A flow sheet is given of the remodeled selective flotation mill of the Silver King Coalition Co. near Park City, Utah. The ore is crushed to 2" in a No. 6 KD Allis-Chalmers gyratory and to $\frac{3}{8}$ " in a 4-ft. Symons cone crusher before passing to the grinding section, composed of 3 ball mills, each in a closed circuit with a 6 × 20-ft. duplex Dorr classifier. The circulating load on the grinding section is 2000 tons. In the flotation department there are 28 MacIntosh machines, each driven through a Foote gear reduction unit by an individual 1 h. p. 1200 r. p. m. motor. Concentrates are dewatered on Oliver filters. The ball mills are charged with 3" forged Cr-steel balls at the rate of 1 lb. for each ton of ore ground. Quantities of reagents used per ton of ore treated are: soda ash, 3 lb.; thiocarbamide, 0.25 lb.; $ZnSO_4$, 200 cc. of a 1-lb.-per-gal. soln.; cyanide, 100 cc. of a 1-lb.-per-gal. soln.; phosphoric acid, 7 cc. of a 15% Aerofloat; 15 cc. of Yarmor pine oil is added in the Pb section, and 1 lb. of $CuSO_4$ and 4 to 5 cc. of xanthate soln. in the Zn section.

DOWNES SCHAAP

Refractory patio tailing responds to leaching. P. ANDRUS BABB. *Eng. Mining J.* 126, 832-3(1928).—The Blaisdell Coscotitlan Syndicate, of Pachuca, Mexico, has benefited 750,000 tons of old patio tailings by a modification of the Russell process, the novelty of which is the use of metallic Cu as the precipitant, com. $Na_2S_2O_3$ being added to the top of the leaching charge. The idea of using metallic Cu as precipitant, instead of adding $CuSO_4$ to a $Na_2S_2O_3$ soln., is credited to Albert Delissalde, a French metallurgist. All the chem. combinations of Au, Ag and Hg, likely to be present in patio tailing deposits, are subject to solution in an aq. soln. of the so-called Delissalde salt. They combine with cuprous-Na thiosulfate through replacement with Cu or Na to make corresponding metal-sodium thiosulfate. By contacting this pregnant soln. with granulated Cu, the 3 metals, Au, Ag and Hg, are pptd. in the metallic form and replaced in the double salt by Cu. At present the Delissalde process is being used in treating Hg bearing tailings. Recovery of a kg. of Hg per ton of tailing leaves \$2.60 net to a shipper today in Mexico.

DOWNES SCHAAP

The extraction and utilization of cobalt. G. MALCOLM DYSON. *Chem. Age* 19, No. 188, Met. Sect. 33-5, and No. 492, Met. Sect., 41-2(1928).—There are 3 main types of raw materials for the manuf. of Co: (1) high-grade Co minerals (e. g., the Cloncurry deposits of Queensland averaging 20% of this element); (2) the residues from the Mond process for the extn. of Ni contg. Co, much Fe and very little Ni; (3) by-products from the extn. of Au and Cu in certain Canadian minerals, the residues contg. approx. 8% Co and 6.6% Ni, and the speiss 17.5% Co and 19% Ni. The residues or minerals are

smelted in a low-pressure blast furnace or cupola with the addn. of various slag-making materials; the As and S combine with the Fe, Ni and Co present, forming a heavy speiss. The speiss, finely ground and calcined in a mechanically stirred rabbling furnace, has much of its As volatilized as As_2O_3 . Further treatment is almost purely chem. and involves 2 stages: (1) the removal of the residual As; (2) the sepn. of Co from Ni. The ground speiss is treated with HCl and sufficient $FeCl_3$ to convert the As to ferric arsenate, which is thrown out of soln. by the addn. of milk of lime and H_2S . Sufficient $CaOCl_2$ is added to the clear soln. after the removal of the As, Fe and Cu to ppt. the Co as the hydrated oxide. Co metal may be obtained by smelting the oxide with charcoal in a small blast furnace. The elec. properties of Co steels are eminently suitable for the manuf. of magneto magnets. Co-Cr steels are much used for valves for internal-combustion engines, since they are not scored by grit and do not scale at 1000° . Tool steels of the Stellite class contain large proportions of Co. Various salts of Co (the acetate, oleate, borate, linoleate, tungstate and oleo-resinate) are added in small proportions to varnish in order to hasten the absorption of O and the formation of the dry film. In the ceramic art, Co is used as a body stain, as a glaze stain or in the form of under- or over-glaze colors.

DOWNES SCHAAF

Charging cupolas mechanically. JOHN A. MURPHY. *Foundry* 56, 1023-4(1928).—A marked tendency for direct movement from stockpile to cupola without placing on the charging floor is noted. Bucket charging permits the use of a deep-well cupola without any cumbersome paraphernalia and eliminates the necessity of heavy expensive cupola-house floors. Storage bins may be on ground level or of gravity type, depending upon the size and shape of the foundry yard.

W. H. BOYNTON

The calculation of the useful height of a foundry cupola. MICHAEL KARNAOUKLOV. *Iron Steel Ind.* 2, 83-5(1928).—The limitation of the hearth area at the tuyère level being detd. by the hourly capacity of the cupola, and for small cupolas, the area (on a ton/hr basis) varies inversely with the height in accordance with the capacity of the cupola. K. proposes a new method of calcg. the useful height of a cupola based on the nature of the heat distribution within the cupola. A formula is derived and applied in a cupola with a diam. of 1 m. and a useful height of 3.345 m. Increasing the height of the cupola saves coke but involves expense in breaking up the pig iron and scrap. In Germany it is more profitable to increase the cupola height and to break up the pig iron, while in American foundries lower cupolas are favored. Too great a cupola height in relation to its diam. has the great disadvantage of increasing the chances of the charge scaffolding.

W. H. BOYNTON

Melting practice in the foundry. HENRY M. LANE. *Iron Age* 122, 1359-62(1928).—Prime requisites for securing high-grade metal with min. fuel consumption are outlined. Points discussed include: powd. coal as a cupola fuel; development of special furnaces; the use of elec. furnaces in the foundry; melting of very low-C steel scrap at the Century Elec. Co., St. Louis, Mo.; elec. furnace advantages over cupola; advantages of indirect arc melting of borings; planning to utilize borings; and use of com. borings from the open market.

W. H. BOYNTON

Dovel type blast put on test. JAMES P. DOVEL. *Blast Furnace Steel Plant* 16, 1555-8, 1570(1928).—Ore used in the Birmingham, Ala., district is of the hard type. A 6-day run on ore crushed to 1 inch was made. The burden and mixt. were: ratio of ore to coke: 2.4:1; mixt., hard ore 76% and brown ore 24%; dolomite 600 lb. (273 kg) per charge; coke 6300 lb. (2864 kg.). Analyses of ore, flue dust, limestone and coke, and operating data are tabulated.

W. H. BOYNTON

Die casting. A. H. MUNDEY. *Metal. Ind. (London)* 33, 467-8(1928).—The general equipment used in the production of die castings and the technic involved in the actual operation of casting in a plunger machine are briefly described. A short list of the com. applications of die casting is given.

DOWNES SCHAAF

Blast furnace metal for castings. DAVID BAKER. *Iron Age* 122, 1501-2(1928).—A discussion indicating a saving of approximately \$9 per ton (909 kg.) by direct casting of pipe from a blast furnace. Combination of the blast furnace and foundry with two 10-hr. shifts in the latter, and resultant savings in foundry equipment contribute to these savings. Lower Si content also aids.

W. H. BOYNTON

Converting core ovens to gas heating. JOHN F. LANGNER. *Iron Age* 122, 1424(1928).—Conversion from coke to gas heating in one instance resulted in increased production with the attendant lower labor, fuel, time, space and equipment costs. In addn., the atm. control was attained. A sketch shows the burner assembly. Fuel cost was \$1.876 per ton (909 kg.) of dried cores. Insulation of the ovens should result in still lower cost.

W. H. BOYNTON

A theoretical consideration of the desulfurizing action of manganese. ZEN-ICHI

SHIBATA. *Tech. Repts. Tohoku Imp. Univ.* 7, 299-303(1928).—In the removal of S from Fe and steel by Mn, it is quantitatively demonstrated from theoretical considerations that the degree of desulfurization increases on decreasing the temp. and increasing the concn. of Mn.

DOWNES SCHAAP

Progress in iron and steel. G. T. SNYDER, F. C. BIGGERT, JR., C. SNELLING ROBINSON, W. W. MACON AND W. TRINKS. *Mech. Eng.* 51, 49-52(1929). E. H.

Wrought iron and the puddling process. GEORGE A. RICHARDSON. *Blast Furnace Steel Plant* 16, 1566-70(1928).—High-grade wrought iron is still manufd. for certain purposes for which it is considered superior to any other. Wrought iron is defined and specifications are given for remelted muck bar, staybolt iron (Bethlehem special muck) and engine bolt iron. Mfg. operations begin in the puddling plant. Here are found: a mill for grinding the ore used for lining the furnaces, puddling furnaces, mono-rail tracks for transferring balls of iron to the squeezer, muck bar mill, weigh scales, shears, etc. The puddling process as conducted at the Lebanon, Pa., plant of the Bethlehem Steel Co. is described.

W. H. BOYNTON

The physical chemistry of steel making: Deoxidation with silicon and the formation of ferrous silicate inclusions in steel. C. H. HERTY, JR., AND G. R. FITTERER. *Carnegie Inst. Tech. Mining Met. Investigations Bull.* 36, 1-92(1928).—This bulletin deals only with inclusions composed of iron oxide and silica—the ferrous silicates. In most steels the silicates formed are more complex than those resulting from deoxidation with silica alone, but it is necessary to have a quant. knowledge of the reactions between iron oxide and silica before quant. information on the more complex silicates may be obtained. Synthetic slags were prepd. by starting with 100% SiO_2 and finishing with 100% FeO , the compn. being varied in steps of 10%. The m. p. of these slags was detd. by means of a Burgess micropyrometer (Bur. of Standards, *Bull.* No. 3, 345(1907)) and a phase equil. diagram of the system FeO-SiO_2 was constructed. The m. p. of FeO lies between 1355° and 1377° but is probably nearer 1355° . Two eutectics were found. The first contained 22% silica, the eutectic temp. being 1240° ; the second contained 35% silica and the eutectic temp. was 1260° . Most of the samples used in the m.-p. detn. were also examd. microscopically. This served as a check on the compn. of the eutectics and the compd. The formation of silicate inclusions in steel was studied by adding ferro silicon to low-carbon steel. The mechanism of deoxidation with silicon is shown to consist of (1) the formation of silica particles by the reaction $\text{Si} + 2\text{FeO} \rightleftharpoons \text{SiO}_2 + 2\text{Fe}$ and (2) a subsequent fluxing of dissolved FeO by the silica so formed. The extent of deoxidation for a given FeO content of the steel depends upon the amt. of silicon added and the type of silicate formed. The relation $K = [\text{Si}] [\text{FeO}]^2 = 1.49 \times 10^{-4}$ holds when the metal is satd. with pure silica; but under this condition only. As the concn. of dissolved silica decreases the amt. of deoxidation will increase because the true equil. const. is $K = [\text{SiO}_2]/[\text{Si}] [\text{FeO}]^2$. From a study of the forging of steels containing various types of ferrous silicate inclusions it was concluded that: (1) Steels contg. ferrous silicates high in FeO forge readily and show no red-shortness. (2) When high silica inclusions are present in large amts. the steel is extremely red-short in consequence of the solubility of these inclusions at forging temps. Practically no Mn oxide was present in the inclusions. (3) The forged steels contained 0.033% S, but in spite of this the steels with fairly high iron oxide content forged well. A bibliography of 34 references is included.

E. G. MEYER

Value of insulation in the steel plant. L. B. McMILLAN AND J. D. VAN VALKENBURGH. *Blast Furnace Steel Plant* 16, 1560-6(1928); cf. C. A. 22, 2728.—A practical illus. review of various applications of heat insulation to furnaces and auxiliary equipment. Cost and savings compared show substantial returns on the investment.

W. H. BOYNTON

The production and uses of beryllium. KURT ILLIG. *Metal Ind.* (London) 33, 611-12(1928); cf. C. A. 22, 3843. E. H.

A general survey on cadmium. C. F. MOORE. *Metal Ind.* (London) 33, 593-5, 611-12(1928). E. H.

Summarized data of copper production. C. E. JULIEN. U. S. Bur. Mines, *Economic Paper* 1, 32 pp.(1928). E. H.

Gold, silver, copper, lead, and zinc in New Mexico and Texas in 1926. CHAS. W. HENDERSON. Bur. Mines, *Mineral Resources of the U. S. 1926*, Pt. I, 711-732(preprint No. 2, published November 14, 1928). E. H.

Nature of recrystallization nuclei. A. E. VAN ARKEL. *Intern. Congress Testing Materials* 1927, I, 157-60.—A new theory on the nature of recrystn. nuclei is presented. The fact that the no. of these centers increases with increasing mech. deformation seems to exclude the possibility that the nuclei are crystals which escaped injury by the defor-

mation. Where the deformation energy is greatest the transformation temp. is most likely to be exceeded, and strained crystals already present are most apt to be transformed into new, strain-free crystals, which act as recrystn. nuclei. H. STOERTZ

Conductivity and cold-rolling. M. MASIMA AND G. SACHS. Kaiser Wilhelm Inst. Berlin-Dahlem. *Z. Physik* 51, 321-7(1928).—The change in elec. cond. of brass crystals was studied. There is no connection between the relation of elec. cond. and cross-section and the relation of load and cross-section. Similarly there is no connection between elec. and mech. resistance as increasing annealing temps. are employed. GEO. GLOCKLER

Elasticity of metals and alloys. GEORG WELTER. Frankfurt a/Main. *Intern. Congress Testing Materials* 1927, I, 559-68.—A discussion of the significance of elastic limit detns. in testing metals and alloys. In making a no. of detns. on hardened Al alloy, 40% of all tests gave an elastic limit of 19 kg./sq. mm., while about 96% of all samples gave values between 17 and 22 kg./sq. mm., an av. value therefore of 19 ± 2.5 kg./sq. mm. A large part of this variation is probably accounted for by variation in the quality of the material itself. A close relationship is claimed between elastic limit and fatigue strength. Tests on more than 200 Fe alloys give values for fatigue strength of 40-60% of the breaking strength, most values being between 40 and 49%, while the elastic limit for these alloys varies from 30 to 50% of the ultimate strength. Discussion is included. H. STOERTZ

Theory of Heusler alloys. O. v. AUWERS AND H. WEINNOLDT. *Z. Physik* 51, 754-6(1928).—Polemical against A. Kussmann and B. Scharnow, *C. A.* 22, 2133. GEO. GLOCKLER

Theory of Heusler alloys. A. KUSSMANN AND B. SCHARNOW. *Z. Physik* 51, 757-8(1928).—Polemical against O. v. Auwers and H. Weinholdt (cf. preceding abstr.). GEO. GLOCKLER

Die-casting of copper-rich alloys. R. GENDERS, R. C. READER AND V. T. S. FOSTER. *Engineering* 126, 725-9(1928).—See *C. A.* 22, 3873. E. H.

Nickel brasses. A. C. STURNEY. *Metal Ind.* (London) 33, 485-8, 494, 521(1928).—A lecture in which the theory of the Cu-Ni-Zn system, methods of prepn., effects of impurities, etc., are discussed. J. BALOZIAN

A new method for determination of internal energy absorption of materials under load. E. VOIGT. *Z. tech. Physik* 9, 321-37(1928).—Plastic hysteresis is a common property of most metals; it may be attributed to slip in the lattice or twin formation. A test machine was built for exptl. purposes; it consists of one 150-kg. cast steel block, stationary, and a second 6.7-kg. block forming the anchor of a stationary magnet. The app. can be enclosed and worked in vacuum; the test rods fastened to both blocks are from 30 to 50 mm. long, 5 to 7 mm diam., the magnet is run on 500-cycle a. c. (i. e., in resonance with the mech. system). By photographic arrangement the longitudinal vibrations of the 6.7-kg. mass can be followed. From the decrement of the vibration amplitude registered after disconnecting the magnet current the damping of the material could be evaluated. It represents the energy absorption. Evacuation of the instrument showed negligible effect of air resistance below 37 mm. Hg pressure; careful hardening of the test rods is required for uniform results. Four steels were examd.: (I) Thomas steel, 0.33% C; (II) Siemens-Martin steel H, 0.42% C; (III) Si steel, 0.14% C, 0.68% Mn, 0.86% Si, 0.60% P, 0.04% S, 0.14% Cu, and (IV) Böhler Mn-Si steel, 0.5% C, 1.0% Mn, 2.2% Si. For small loads the damping decreased from the initial value to a const. after about 1 million load vibrations. No decrease in damping was found for Cu, little for brass, none for barium crown glass. From the measurements the dynamic elastic limit can be detd. No tabulated data are given; all results are represented in graphs. B. J. C. VAN DER HOEVEN

Non-destructive detection of flaws. ELMER A. SPERRY. *Iron Age* 122, 1214-7 (1928).—Hidden fissures in rails are located and measured by means of intense d. c. energization. The main primary energizing current is made to traverse the rail, or a section thereof, as by main brushes in contact with the track. Intermediate between these brushes are 3 searching brushes which are connected to 2 opposite primary coils constituting the primary of the transformer. These coils are oppositely wound and produce opposite magnetic excitation of the transformer. All variations in the primary current will be picked up by the 2 outer brushes and there be completely neutralized as to their influence on the secondary. In passing along the track, when a fissure occurs between one end brush and the middle brush, the first coil will become excited to a greater extent than the other. The transformer will become active and in the secondary will be induced half (e. g., the pos. side) of a sine wave curve. In the next instant the fissure passes between the middle and the rear brushes, giving an opposite excitation to

the secondary, completing the alternating wave by adding the neg. side. This wave then passes to the amplifiers and may be examd. as to both its magnitude and characteristics. By this method the size, characteristics and location of fissures or flaws are accurately detd. in rails either on the inspection bench at the mill or when in use in a track.

DOWNES SCHAAP

The use of temperature gradients in metallographic studies. O. TESCHE. *Z. tech. Physik* 9, 419-22(1928).—Expts. on the Metcalf test are described in which steel rods contg. 0.9, 0.75 and 0.65% C were heated on one end, a temp. gradient over the rod being established and the microstructure of a section parallel to the rod length studied. Results obtained confirm previous data.

B. J. C. VAN DER HOEVEN

Thermal expansion of iron alloys. ALFRED SCHULZE. *Phys. tech. Reichsanstalt, Berlin. Z. tech. Physik* 9, 338-43(1928).—For Fe-Si, Fe-Al and Fe-Mn alloys the thermal expansion was measured by the tube method (Henning) up to 500°. Four Fe-Si rods were used (0.15 to 0.32% C, little Mn) annealed at 900°. Between 20° and 100°, 100° and 300°, 300° and 500° the calcd. linear $\beta \cdot 10^6$ is for 0.08% Si, 12.37, 13.64, 15.01, resp.; for 1.03% Si, 12.22, 13.41, 15.00; for 2.40% Si, 12.03, 13.32, 14.76; for 8.37% Si, 11.31, 12.73, 14.19. The behavior is typical for mixed crystals. For four Fe-Al alloys β was found to be in the same temp. intervals for 0.52% Al, 11.60, 13.19, 14.42; for 2.17% Al, 11.74, 13.21, 14.50; for 5.66% Al, 11.96, 13.42, 14.88, for 10.52% Al, 12.20, 13.70 and 15.12. These data can be considered characteristic also for mixed crystals. On Fe-Mn rods the data found indicated up to 7.81% Mn a normal behavior; a break in the curve occurs at 200° for 10.3% Mn, for 12.3% and higher a hysteresis loop appears between 200° and 300°. The values of $\beta \cdot 10^6$ between 20°, 100°, 200°, 300°, 400° and 500° intervals are for 0.09% Mn, 12.42, 13.2, 13.55, 14.55, 15.5. For 2.76% Mn, 12.60, 13.54, 14.3, 15.1, 15.7; for 4.20% Mn, 12.88, 14.3, 15.1, 15.4, 16.0; for 7.81% Mn, 13.56, 14.4, 15.4, 17.1, 18.0, for 10.3% Mn, 15.75, 16.5, 22.9, 22.2, 21.4; for 12.34% Mn, 16.55, 18.7,—, 22.9, 22.0; for 14.41% Mn, 16.91, 19.2,—, 22.8, 23.0. It is apparent that the β -x curves below 8°C lie above the straight mixing line, the Fe-Mn alloys are abnormal like those of 2 ferromagnetic metals. To allotropic transformations (found in the magnetic qualities by Gumlich, *Wiss. Abh. Phys. tech. Reichsanstalt* 4, 377(1918)) are attributed the discontinuities around 10% Mn.

B. J. C. VAN DER HOEVEN

Armco pure ingot iron. EUGÈNE DUPUY. *Rev. métal.* 25, 637-47(1928).—A description of its manuf., properties and uses.

A. PAPINEAU-COUTURE

Connection between grain size and the magnetic properties of pure iron. G. J. SZOOS. Philips' Lampwork, Eindhoven, Holland. *Z. Physik* 51, 557-64(1928).—Vacuum-melted electrolytic Fe was studied in relation to the size of crystals and the magnetic properties. As crystal size increases coercive force and hysteresis work decrease and max. permeability increases. Retention is independent of crystal size as is elec. cond. and its temp. coeff.

GEO. GLOCKLER

The use of rubber as a core binder. FRED. GROVE-PALMER. *Foundry Trade J.* 39, 392(1928).—Rubber dissolved in naphtha or gasoline may be used as a binder for cores instead of linseed oil; such cores dry easily in air at normal temp., are stronger before use, and fall into loose sand after metal has solidified around them. Precautions must be taken against the fire hazard arising from the use of inflammable solvents. Screen tests of suitable sands for the rubber binders are given; the clay content must be very low. Fresh rubber must be used, S of course being avoided. Small cores made in this way from coarse sand may be used at once; larger cores require a few hrs. air-drying. Stronger cores resulted from the addn. of benzidine or *p*-aminophenol to the rubber binder. Balata in benzene made cores that were soft at 37° and hard when cool. Thermoprene binders used in sufficient vol. produced cores that were much stronger than those made in the usual way with linseed oil.

GEO. F. COMSTOCK

The physical chemistry of steel making: A study of the Dickenson method for the determination of non-metallic inclusions in steel. C. H. HERTY, JR., G. R. FITZGERER AND J. F. ECKEL. *Carnegie Inst. Tech. Mining Met. Investigations Bull.* 37, 1-37(1928).

The results are given of a critical study of the Dickenson method (cf. *C. A.* 20, 2643) for the detn. of non-metallic inclusions in steel. The study consisted chiefly of the detn. of the percentage recovery of the more common types of inclusions after their subjection to the procedure of the D. method and an explanation of the methods and of the types of inclusions with which it can be used successfully. Synthetic melts, each weighing 200 g., of the following binary systems (1) FeO-SiO₂, (2) MnO-SiO₂, (3) FeO-MnO, (4) FeO-Al₂O₃ were made either in a C resistor or in an induction-type furnace. The compn. of the mixts. was varied in steps of 10% from 100% of one component to 100% of the other. Each synthetic melt was then crushed to 200 mesh, and a 3-g. sample was treated by the D. method. As a result of the study the authors conclude: (1) The D.

method has been found to be satisfactory for steel killed with S or Al. It is not satisfactory for rimming steel or those steels in which the predominant inclusions are MnO or FeO. (2) In the system FeO-SiO₂, good recoveries are obtained if the inclusions analyze more than 60 or 65% SiO₂. The compd., 2FeO.SiO₂ (29.45% SiO₂), is completely dissolved by the HNO₃ treatment. (3) No recoveries are obtained on FeO or MnO alone or on combination of these 2 oxides. (4) Good recoveries are obtained in the system MnO-SiO₂ if the inclusions analyze more than 30-40% SiO₂. (5) Al₂O₃ is completely recoverable by this method. In the system FeO-Al₂O₃ the compd., 2FeO.Al₂O₃, is recoverable, but FeO existing in any other state is lost. (6) A decrease in the acid strength has no appreciable effect on recoveries of the more sol. oxides. After one week's extn., further treatment gave no extra loss of non-metallic matter. The D. method as modified by the authors is described. It is claimed that the modified method is just as reliable for most purposes and much faster. A brief review of the halogen and electrolytic extn. methods is also included.

E. G. MEITER

Steel castings from the molder's viewpoint. J. JEFFERSON. *Foundry Trade J.* 39, 393-4(1928).—Various defects in castings are discussed. Globular blowholes with bright surfaces are due to faulty steel; those with tarnished surfaces are probably due to the molds being too wet. Washing of sand from the mold, insufficient feeding of the shrinking metal, and cracks due to hindered contraction, are other causes of defects. The last two causes are the most important. Steel is very weak soon after solidification, and the contraction of thin parts of a casting tends to cause pulling away from the weak, thicker parts that solidify more slowly. The proper way to feed the shrinkage of a T-shaped casting is shown; when not properly fed, the metal showed only 15% elongation instead of 25%. The cost of proper feeding, and of the extra machining thus required, is discussed. Coöperative research on foundry engineering problems is advocated. In making round, hollow castings, the mold should have a greater chilling effect than the core. It is impossible to make a complicated casting with exactly the same properties in every part.

GEO. F. COMSTOCK

The relation between the quantity and the depth of carburization. GENSUKÉ TAKAHASHI. *Science Repts. Tohoku Imp. Univ.* 17, 1135-56(1928).—As a result of cementation tests on Fe for various intervals of time at different temps. and with several kinds of carburizing agents, the following results were obtained, the quantity of C diffused into Fe being detd. by the wt. increase and the thickness of the cemented zone being measured by a microscope: (1) the amt. and the depth of carburization differ greatly for different carburizing agents; (2) it was confirmed that, for a given depth, the amt. of carburization becomes greater with the efficiency of the carburizing agent; (3) the relation between the amt. and the depth of carburization at a given temp., different carburizing agents being used, is expressed by a single parabola; (4) the relation between the amt. and the depth of carburization is the same, whether the carburizing agent is one of the CO or hydrocarbon series, provided the carburization is carried out under the same conditions; (5) in a range of the ordinary carburizing temps. (900-1000°), the amt. of carburization for the same depth is the greater the higher the temp.; (6) when the temp. of carburization is in a range between 900° and the A₁ point, the C density in the innermost layer is the greater the lower the temp.

DOWNES SCHAAF

The mechanical characteristics of steel wires, drawn at elevated temperatures, as a function of the rate of reduction, the working temperature and the carbon content. A. POMP AND W. KNACKSTEDT. *Stahl u. Eisen* 48, 1705-12(1928); *Mitt. Kaiser-Wilhelm-Inst. Eisenforsch. Düsseldorf* 10, 117-74. Four samples of steel wire were used, (5 mm. diam.) A a low C-steel, with 0.03% C, B, C and D heat-treated C steels, with a C content of 0.35, 0.70, 0.84%, resp. A showed a perlitic, B, C and D a sorbitic structure. The drawing operation was carried out at room temp., then at 50°, 100°, 150°, 200° and 300°. The wire samples were drawn without annealing, with a 20% reduction for each drawing operation. A could be drawn to 0.20 mm. between 20 and 200°, a reduction of 99.84%; at 300° it was not possible to draw the wire below 0.78 mm., a reduction of 97.8%. The wire samples from the high-C steels were drawn as far as possible: B to 0.94-0.485 mm., 96.5-99.1% reduction, C to 1.61-1.17 mm., a reduction of 89.2-94.0%, and D to 2.33-1.82 mm., 78.2-86.7% reduction. The samples so obtained were subjected to tensile, bending and torsion tests. The limit of elasticity, yield point, modulus of elasticity, tensile strength, elongation, reduction in area and the ratio, expressed in %, of the yield point and tensile strength were also detd. and the results tabulated by plotting these various values against the no. of passes and the rate of reduction, for the various temps. No structural differences could be observed between the wires drawn at various temps. For practical steel drawing the following deductions are made: The increase of the elastic limit, yield point and tensile strength and the de-

creased tenacity of the low-C steel, at higher temp. is of no great importance in actual wire drawing, because of the limited use of this material. The fact, however, that a slight increase of the temp. of drawing, of the wire from heat-treated high-C steel, improves its yield point and tensile strength and considerably improves its elastic limit, without decreasing its tenacity, is of great importance in the manuf. of steel wires, such as used in airplane construction, which, even when subjected to unusual loads, must show only very little tendency for permanent deformation. The drawing of such wires at 200° appears to be very promising.

J. A. SZILARD

The investigation and rating of case-hardening agents. F. HEBLER. *Chem.-Ztg.* 52, 775-6(1928).—The activity of various case-hardening mixts. (contg. bars, brown or anthracite coal, charcoal, alkali or alk. earth carbonates) whose action has previously been doubtful are studied. The pieces are hardened in a Wisnegg furnace, reheated to 900-950° and quenched in tap water, and heated again to 760-780° and quenched in water. The case depth is measured microscopically on a fractured piece. The compns. and hardness obtained of 20 mixts. are tabulated. The action of barks and brown coal (or charcoal) is slight, no difference between them being detectable. For hardening in a short time, charcoal is equaled by most and surpassed by many materials. The activity of carbonates increases in the series: chalk, soda, SrCO_3 and BaCO_3 . J. B.

Steels used by the automotive industry. W. J. MACKENZIE. Interstate Iron & Steel Co., Chicago. *Blast Furnace and Steel Plant* 16, 1439-43, 1460; *Am. Metal Market* 35, 2nd Sec., 12-6(1928).—Alloy steels were developed commercially by the automotive industry, and 81% of all alloy steel is made in basic open-hearth furnaces. The care required for making a satisfactory product is described. The present uniformity and reliability of the various grades of alloy steels are essential for confidence in design and manuf. The useful S. A. E. steel specifications are quoted in a table, and the properties of the various types of steel are discussed. The detn. of cleanness is too much a matter of opinion, and a definite measure of this property is needed, as well as a good test for dynamic properties. The choice of one alloy steel rather than another for a given part is often due to the individual opinion of the designer.

G. F. C.

Steel requirements of the aircraft industry. H. J. FRENCH. Bur. of Standards. *Blast Furnace and Steel Plant* 16, 1436-8, 1445, 1579-83; *Iron Age* 122, 1161-4(1928).—Airplane production increased almost 380% in 1928, and metals, including steel, have been applied successfully to all parts of the plane. The strength per unit of wt. of heat-treated alloys steels is about the same as that of Al alloys like duralumin, but the latter are more bulky and parts made of them are therefore stiffer. Uniformity and cleanness are demanded in steels for aircraft for the sake of reliability, and these requirements will probably become more exacting as experience is gained. Microscopic examn. is used to det. cleanness, and steel is rejected if prominent inclusions are seen in it. The super-clean steels are generally made in basic elec. furnaces, and are often coarse-grained, and difficult to heat-treat so as to obtain high impact values. Corrosion-fatigue may be very damaging to airplane parts, and can be resisted most effectively by duralumin and stainless steels. Most airplane motors are 50% steel, all but the cylinders being alloy steels. The compns. of the steels used for various parts are tabulated. Better steel is needed to resist the severe service of exhaust valves. For parts of the plane itself steel, when used, is generally in the form of light seamless tubing with welded joints. Cr-Mo steel contg. 0.3% C, 0.5% Mn, 0.9% Cr and 0.2% Mo is easily cold-drawn and welded, and the welded parts have satisfactory properties. To discourage competition by non-ferrous alloys, E. C. Smith in discussion urged that only the highest quality of steel should be offered for aircraft use. Z. Jeffries believed that the greatest use of steel in this industry would be for manufg. plants and ground equipment rather than in the airplanes themselves.

GEO. F. COMSTOCK

Stainless steel. EDWIN A. BROPHY. *Chem. Eng. Mining Rev.* 21, 15(1928).—The heat treatment and the effects produced by different concns. of C, Si, Mn and Cr are described for a stainless steel of the following compn.: C 0.25-0.40%, Si less than 0.30%, Mn less than 0.35%, S less than 0.030%, P less than 0.030%, Cr 12.50-14.50%.

DOWNS SCHAAF

A study of the mechanical properties of low-manganese steel. MATSUJIRO HAMASUMI. *Tech. Repts. Tohoku Imp. Univ.* 7, 305-41(1928).—Static and dynamic tests are recorded for 21 low-Mn steels varying in compn. from 0.1 to 0.4% C and from 0.4 to 5.0% Mn. A structural diagram is advanced from a study of the microstructure as shown in 12 photographs which differs from Guillet's, in that all the samples contained troostite or martensite with or without ferrite, except those in the 0.1% C series contg. under 4% Mn, those in the 0.15-0.20% C series contg. less than 2.5% Mn, and those in the 0.35-0.37% C series contg. less than 1.5% Mn, which are pearlitic. The sorbitic

steels contg. from 0.15 to 0.2% C and from 1.5 to 2% Mn have the max. toughness according to the notched-bar impact tests at both low and high temps. The cold brittleness and the blue shortness which appear in the notched-bar impact test are explained by the idea of max. normal resistance and max. slip resistance on a slip plane of a crystal.

DOWNES SCHAAP

X-ray investigation of the changes in the alloy copper-gold. V. GORSKII. *Z. Physik* 50, 64-81(1928).—An alloy consisting of 1 atom Cu and 1 atom Au is heated to various known temps., quenched and examd. by Debye's method. A tetragonal lattice without systematic distribution of the Cu and Au atoms is the stable form below 385°. The ratio a/c changes from 1.07 at 380° to 1.08 at 300° and $\sqrt[3]{a^2c} = 3.860$ A. U. The transition from cubic into tetragonal forms and *vice versa* occurs through a process of recrystn. The gradual change in the axial ratio brought about by sudden change in temp. occurs according to an exponential equation. The observed phenomena are explained by thermodynamic and statistical methods.

A. L. HENNE

The keys to good babbitt bearings. JAMES SILBERSTEIN. *Power* 68, 1000-2 (1928).—Sn-base babbitts contain up to 2% Pb, 3 to 5% Cu and up to 1% As. Zn and Al should be absent. Pb-base babbitts may have up to 30% Sn, 1% Cu and 0.5% As. It is questionable whether increasing Sn above 10% is beneficial in a Pb-base babbitt.

D. B. DILL

Recrystallization of single crystals of aluminum. W. G. BURGERS AND J. C. M. BASART. *Z. Physik* 51, 545-56(1928).—The crystals formed from one single crystal of Al when the latter was stretched a little (10-15%) show to some extent a preferential direction in the same sense as the mother-crystal. It also appears that the direction of the deforming force has a slight influence on the situation of the crystals formed.

GEO. GLOCKLER

Recrystallization phenomena of zinc. A. E. VAN ARKEL AND J. J. A. PLOOS VAN AMSTEL. Philips' Lampworks, Eindhoven, Holland. *Z. Physik* 51, 534-44(1928).—Phenomena are noticed similar to those in Al. Cf. preceding abstract.

GEO. GLOCKLER

Cadmium coating. G. DE LATTE. *Rev. métal* 25, 630-6(1928). From a discussion of the relative advantages and disadvantages of Cd coating (by immersion in molten Cd) L. concludes that: (1) It constitutes an effective and more durable protection of Fe and its alloys than does galvanizing, the coating being very adherent, ductile, homogeneous and brilliant. (2) All the drawbacks of galvanizing are avoided. (3) Pure Cd gives very satisfactory results; but the hardness of the coating is relatively low and the m. p. of the metal is too high to permit of wiping the coating with palm oil. (4) The Cd-Zn eutectoid may be used to advantage to increase the hardness of the deposit and lower the m. p. of the bath, the quant. compn. of the bath being readily controlled by microscopic examn. of a polished section etched with FeCl_3 . (5) The consumption of metal is of the same order as that of pure Sn, and the unwiped coating has an av. thickness of 20 μ . (6) The resistance to atm. corrosion is perfect. (7) Metalization of Cu can be advantageously carried out either with pure Cd or with the Cd-Sn eutectoid.

A. PAPINEAU-COUTURE

Corrosive action of sulfur monochloride. ILLERY H. HARVEY. *Chem. Met. Eng.* 35, No. 11, 684(1928).—Compilation of an exhaustive bibliography covering S_2Cl_2 , to be published elsewhere, failed to reveal exact information on its metal-corrosive properties. H. reports the percent loss in wt. of Al, Sb, As, Bi, Cd, Cr, Co, Cu, Pb, Ni, Mn, Ag, Sn and Zn after one year in S_2Cl_2 out of contact with air. Bibliography.

E. H. H.

Watch the outside surface of your boiler. I. S. CHAMBERLAIN. *Power* 68, 998-9 (1928).—External corrosion of boilers is often overlooked.

D. B. DILL

Rust, acid and heat-resisting steels. W. H. HATFIELD. *Iron Age* 122, 1164-5; *The Nucleus* 6, 56-60; *Am. Metal Market* 35, No. 240, 2nd section, 22-6(1928).—Phys. properties of corrosion-resistant steels are tabulated for 6 grades of the following chem. analyses: (1) C 0.30, Mn 0.30, Si 0.20, Cr 13.0, Ni 0.30; (2) C 0.30, Mn 0.30, Si 0.40, Cr 14.5, Ni 0.30; (3) C 0.09, Mn 0.18, Si 0.14, Cr 13.4, Ni 0.28; (4) C 0.15, Mn 0.28, Si 0.20, Cr 14.8, Ni 10.9; (5) C 0.14, Mn 0.30, Si 0.30, Cr 18.1, Ni 7.9; (6) C 0.28, Mn 0.30, Si 0.16, Cr 21.0, Ni 5.8. The advisability of supplementing lab. tests by actual work tests is strongly advised. Correct heat treatment is necessary, since an incorrect one may destroy the homogeneity of the steel with the consequent setting up of electrolytic corrosion. The good influence of the Cr content of rust, acid and heat-resisting steels is believed to be due to its facility of producing (by oxidation through atm. corrosion and like oxidizing influences) a protective film.

DOWNES SCHAAP

The corrosion of iron. HIROZO ENDO. *Science Repts. Tohoku Imp. Univ.* 17,

1111-34(1928).—The loss in wt. of Armco Fe is tabulated for different time intervals when the Fe is exposed to water under different conditions of light and temp., to dil. acid and various salt solns. when bubbling O through them, to different concns. of HNO_3 , H_2SO_4 and HCl, and to solns. of the following salts, KCl, NaCl, MgCl_2 , BaCl_2 , KNO_3 , NaNO_3 , K_2SO_4 , Na_2SO_4 , $\text{KAl}(\text{SO}_4)_2$, Na_2HPO_4 , $\text{K}_2\text{Cr}_2\text{O}_7$, K_2CrO_4 , KClO_3 , KMnO_4 .

DOWNES SCHAAP

Influence of composition and cold-hardening on corrosion and grain growth of aluminum. LEON GUILLET AND BALLAY. *Compt. rend.* 187, 585-7(1928).—Pure Al is attacked less than ordinary Al (Fe, 0.72%; Si, 0.47%) by HNO_3 (36° Baumé), HCl (2% HCl, d. = 1.19) and 3% NaCl soln. and about the same in 5% H_2SO_4 and 5% HNO_3 . The influence of hardening on 98.81% Al is much more marked than on pure Al. Another series of tests to show corrosion as a function of hardening and mode of deformation was carried out. The corrosion passes through a max. for a certain value of cold deformation and then decreases. Pure Al shows much larger grain growth after cold-hardening and annealing than does impure Al.

L. D. ROBERTS

Microscopical studies of a passivating film on carbon steel and the resulting etched structure. CARL BENEDICKS AND PER SEDERHOLM. Univ. Stockholm. *Z. physik Chem*, Abt. A, 138, 123-34(1928). A sample of very homogeneous C steel has been etched with very dil. HNO_3 (0.1%). The etched structure is in agreement with the formation of a protective film, which renders the sample passive. ALBERT L. HENNE

Electric heat treating proves 70 percent lower in cost. H. F. SCARBROUGH. *Elec. World* 93, 154(1929).—Comparative cost figures on an elec. furnace installation for normalizing and annealing small crankshafts.

C. G. F.

Electric furnace anneals 5.4 lb. of steel per kw.-hr. ANON. *Elec. West.* 62, 10(1929)

C. G. F.

Stencil etching. JOHN R. BAYNES. *Metal Ind* (London) 33, No. 21, 495-6(1928). The process of stencil etching is described. The compn. of the bath for steel etching is given.

J. BALOZIAN

Theory and practice of autogenous copper welding. M. PALLASKE. *Apparatebau* 40, 281-4(1928). A general discussion of the technic of Cu welding, with a few references.

J. H. MOORE

Welding, cutting and soldering with fuel oils. ANON. *Apparatebau* 40, 285-6(1928). Torches for using C_6H_6 , benzine, petroleum, etc., with O are described.

J. H. MOORE

Respiratory disease in industry [brass and iron] (HUTTON) 13. The influence of a dust film on the efficiency of regenerators (SCHACK) 1. The determination of solubility curves of mixed crystals at small concentrations and the redistribution of the boundary substance by heating (TAMMANN, HEINZEL) 2. Heating briquets of ores (Brit. pat. 289,932) 21. Flotation of ores (Brit. pat. 289,848) 21. Washing ores (U. S. pat. 1,996,767) 21. Preserving metals (Brit. pat. 290,331) 20. Regenerative furnace adapted for the production of metallurgical or gas coke (Fr. pat. 640,467) 21. Mixer for two or more substances such as coal and ore (Fr. pat. 640,351) 1. Driving means for vibrating sieves, particularly for ores (Austrian pat. 109,217) 1. Shaft kiln for lime or cement manufacture or for roasting ores (Ger. 466,190) 1. Apparatus for separating mineral substances by stratification on an air-pervious table (Brit. pat. 290,276) 1. Boiler cleaning apparatus with special alloy parts (Brit. pat. 290,924) 14. Apparatus for cleaning and reclaiming sand after use for sandblasting (U. S. pat. 1,696,064) 1.

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Werkstoff-Handbuch Stahl und Eisen. Edited by Karl Daeves for the Ger. Iron Inst. Düsseldorf, Ger.: 200 loose leaves in leather binder. G. M. 18. Reviewed in *Iron Age* 122, 1640(1928).

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Treating ores. AKTIEBOLAGET FERRICONCENTRAT. Fr. 639,934, Aug. 23, 1927. See Brit. 279,797 (*C. A.* 22, 2916).

Treating ores with acid solutions of chloride. NIELS C. CHRISTENSEN. U. S. 1,696,471, Dec. 25. In effecting the treatment of ores such as oxidized ores contg. Pb and Ag with acid solns. of chloride, dissolved metal is pptd. from the soln. by use of a Ca compd. such as CaCO_3 or lime so as to leave in the soln. as CaCl_2 the Cl combined with the metals of the soln. before pptn., and thereafter the soln. contg. the CaCl_2 is mixed with comminuted ore and H_2SO_4 is added to ppt. the Ca as CaSO_4 and to form HCl in the soln. which serves to dissolve the metals from the ore.

Magnetic ore-separating drum. MASCHINENBAU-ANSTALT HUMBOLDT. Ger. 468,936, July 4, 1925.

Ore-sintering apparatus. JOHN KNOX (to Dwight and Lloyd Sintering Co., Inc.). Can. 285,168, Nov. 27, 1928.

Treating iron ores. THOMAS P. CAMPBELL. U. S. 1,696,188, Dec. 25. Comminuted Fe ore is reduced to produce Fe sponge and the latter is then partially reoxidized and the mixt. is passed over a magnetic separator.

Treatment of iron from oxide ores. GRANULAR IRON CO. Ger. 467,485, April 25, 1925. Addn. to 466,756 (*C. A.* 23, 366). Iron obtained by the method of Ger. 466,756 is charged into crucibles either immediately after production or after mech. purifying and (or) briquetting in known manner.

Jig screen, water sprays and associated apparatus for recovery of gold or other fine values from sand. EDWIN A. SPERRY. U. S. 1,695,614, Dec. 18. Structural features.

Treating impure lead containing tin and antimony. GEORGE E. DALBEY and THOMAS P. HANFORD (to Stanley Chemical Co.). U. S. 1,693,639, Dec. 4. The metal is treated in molten or finely divided condition with a Na-Sb salt such as Na antimonate or antimonite and the Sb in the salt is caused to be reduced to metallic Sb and the Sn in the metal replaces the Sb in the salt, forming Na stannate which may be reclaimed. U. S. 1,693,640 specifies treating impure Pb for the removal of As, Sn, Sb, etc. by action of PbO on the molten metal while at the same time gradually adding an aq. caustic alkali soln. and maintaining a temp. which will always allow the reacting materials on the surface of the molten metal to remain in a powdery or granular condition. U. S. 1,693,641 specifies treating mixts. contg. Na-metallic salts, by dissolving any NaOH present and sepg. it from undissolved materials, dissolving the metal salts other than Na plumbate and plumbite and any Na pyroantimonate which may be present due to action of water on Na antimonate in the original mixt., sepg. the soln. from undissolved materials and treating the latter to obtain metallic Pb and Na pyroantimonate, and treating the sepd. soln. to obtain stannic acid. U. S. 1,693,642 specifies treating metallic particles which may contain Pb, Sn and As, at temps. below the fusion point, with an aq. soln. such as NaOH in the presence of Pb oxide or other suitable oxidizing agent, in order to form Na salts such as arsenate, stannate and antimonate.

Treating zinc waste. E. BURY and F. W. WALKER. Brit. 290,035, May 3, 1927. In effecting recovery of Zn and Pb from zinc waste, it is heated with coke or coke dust contg. S in an oxidizing atm. and the S required to transform the Pb into sulfate is supplied by using coke or coke dust of a sufficiently high S content that the sep. addition of S is unnecessary. Lime, limestone or sand may be added to the mixt. treated and when lime or limestone is used a *hydraulic cement* is obtained as a by-product. ZnO and PbSO_4 pass off as a fume from which values are recovered by condensation or by scrubbing with acid to react with the ZnO selectively. Cf. *C. A.* 22, 2547.

Reduction of zinciferous substances. THE NEW JERSEY ZINC CO. Fr. 639,972, Aug. 24, 1927. Zinciferous material agglomerated with a reducing agent is heated to reduce the Zn compds. and volatilize the Zn, the charge passing progressively through a reducing chamber practically horizontal and exteriorly heated, in such a manner as to avoid any relative motion of the particles of the charge. The charge is supported on a bed of coal dust, or a layer of larger material may be interposed between the charge and the dust. The app. used is described in detail. Cf. *C. A.* 23, 569.

Zinc. JAMES A. SINGMASTER, FRANK G. BREYER and EARL H. BUNCE (to the New Jersey Zinc Co.). Can. 285,005, Nov. 20, 1928. An agglomerated or briquetted charge of zinciferous material and carbonaceous reducing agent is progressively passed through a vertically disposed retort externally heated to a sufficiently high temp. to reduce compds. of Zn and volatilize the resulting metallic zinc without fusing or sintering the charge. The metallic Zn vapor is conducted upward from the retort to a condenser and recovered, and the exhausted charge is drawn off from the bottom of the retort in a pulverulent condition. Cf. C. A. 23, 368.

Prevention of oxidation of metals. GILBERT MICHEL. Swiss 126,864, May 5, 1927. Gaseous sulfurous anhydride is employed to produce a non-oxidizing atm.

Refractory metals. ERNEST A. LEDERER (to The Canadian Westinghouse Co., Ltd.). Can. 284,952, Nov. 20, 1928. Substantially pure refractory metals as W or Mo are produced from the sulfides by pressing into slugs at moderate pressures and heating in a vacuum or in a reducing atm. such as H. The resultant slug consists of pure coherent metal. W produced in this way is entirely free from such impurities as O, C and S and when reduced in a vacuum is also free from H. In this extremely pure condition W is ductile and can be rolled, swaged or drawn into wire.

Concentric nozzle or tuyère devices for introducing crushed or powdered materials into furnaces for producing pig iron. GASTON DE BETHUNE. U. S. 1,693,916, Dec. 4.

Attachment to a crucible for melting metals and alloys. L. Y. POLUNOV and I. A. PETKEVICH. Russ. 4636, Feb. 29, 1928.

Apparatus for making foundry molds. JOHN J. LAWLOR (to New Process Multi-Castings Co.). U. S. 1,695,925, Dec. 18.

Apparatus for foundry molding. EDWARD HARMES (to New Process Multi-Castings Co.). U. S. 1,695,921, Dec. 18.

Permanent metal mold. HARRY D. RINDSBERG (to Harry J. Hater). U. S. 1,696,690, Dec. 25. Structural features.

Wash for protecting metal molds. ARTHUR J. HESS (to Earl Holley). U. S. 1,693,923, Dec. 4. A suspension of graphite and silica in kerosene is mixed with a dil. aq. soln. of Na silicate.

Shrink-head for ingot molds. EMIL GATHMANN. U. S. 1,696,395, Dec. 25. Structural features.

Shrink-head casing for ingot molds. FRED H. CHAPIN (to Bourne-Fuller Co.). U. S. 1,695,797, Dec. 18. Shrink-head casings are formed of a mixt. of cement 1 and slag 4 parts.

Mold for centrifugal pipe casting. JOHN H. UHRIG (to U. S. Iron Pipe and Foundry Co.). U. S. 1,693,703, Dec. 4. Structural features.

Centrifugal pipe-casting apparatus. SOC. D'EXPANSION TECHNIQUE. Brit. 290,671, Mar. 19, 1927. Mech. features.

Centrifugal pipe-casting. JOHN H. UHRIG (to U. S. Cast Iron Pipe & Foundry Co.). U. S. 1,695,514, Dec. 18. Mech. features. An app. is described.

Apparatus for die-casting under pressure. J. POLAK. Brit. 290,936, Jan. 2, 1928. Structural features.

Metallic castings. SIEMENS & HALSKE A.-G. Ger. 466,239, Jan. 16, 1928. Manipulative details.

Casting steel ingots. REINHOLD C. KRAUSE. Fr. 640,163, June 13, 1927. Two sides of the molds for steel ingots are protected against absorption and radiation of heat, whereas the other 2 sides favor radiation and absorption. The cover can slip as a telescopic element on the mold, and its sides are constructed in the same way as the sides of the mold.

Pump for stereotype metal or other molten metal. ISIDOR TORNBORG (to Wood Newspaper Machinery Corp.). U. S. 1,696,656, Dec. 25.

Hardening metals. HEINRICH LINDHORST. Fr. 640,681, Sept. 8, 1927. Metal objects to be hardened are placed in a sealed furnace, preferably rotating, with a powder which completely sublimes, yielding C and CO₂ when heated, these products with the aid of the pressure produced performing the necessary hardening. A suitable powder contains ground coke, BaCO₃ and an NH₃ salt or substance yielding NH₃ when heated.

Hardening metals by nitrogenizing. P. F. M. AUBERT, A. J. P. DUVAL and H. A. M. DUVAL (trading as Aubert et Duval frères). Brit. 290,214, May 10, 1927. In hardening by nitrogenization, portions of articles which are not to be treated are coated with a suitable metal such as Sn or a Sn alloy. A coating of waterglass and powd. Al also may be used. Before nitrogenization, the entire article or the tinned parts may be dipped in a bath of HNO₃ or NaNO₃ heated to about 400°.

Hardening the heads of railway rails. EISENWERK-GES. MAXIMILIANSHÜTTE.

Brit. 290,182, May 5, 1927. The hot rail is straightened and clamped and then the head is immersed in flowing water or water which is agitated.

Material for carburizing or case hardening. FREDERICK C. LANGENBERG (to E. F. Houghton & Co.). U. S. 1,695,337, Dec. 18. Ca acetate or other suitable org., O-contg. salt of a "carburizing oxide" is used together with a salt such as KNO_3 comprising a combination of a "carburizing oxide" and an acid radical contg. both N and O, and with BaCO_3 and charcoal or the like. U. S. 1,695,338 specifies carbonaceous material such as charcoal together with BaCO_3 or other "energizing material" and an org. salt of a metal, e. g., Co acetate or Fe oxalate.

Liquid for carburizing metals. GEORGE W. HEGEL and GERALD R. BROPHY (to General Electric Co.). U. S. 1,696,603, Dec. 25. Bone oil is used with kerosene and oil of mirbane.

Roll for rolling metals. FRANCIS D. CORBIN (three-eighths to Llanelly Foundry & Engineering Co., Ltd. and one-third to Richard Nevill & Co., Ltd.). U. S. 1,694,251, Dec. 4. Rolls are made with a case-hardened portion of hard structure and the remaining portion of a soft perlite or similar structure; both structures are obtained by the same slow rate of cooling from high temps. Cf. C. A. 22, 2735.

Rolling brass, etc. SUNDWIGER EISENHÜTTE MASCHINENBAU A.-G. Brit. 289,812, May 2, 1927. In hot rolling brass or other metals, a large reduction at one heat is obtained by utilizing one pass through rolls with a slow surface speed and sufficient friction to draw in the metal. An app. and various mech. details are described.

Refining aluminum or its alloys. ELEKTRIZITÄTWERK LONZA. Swiss 126,014, Jan. 28, 1927. The metal is brought into intimate contact with Al_2O_3 , e. g., by adding Al_2O_3 to the fused electrolyte from which the metal is prep'd. or to the fused metal to be alloyed.

Refining magnesium and its alloys. GUSTAV PISTOR (to I. G. Farbenind. A.-G.) Can. 384,768, Nov. 13, 1928. Mg and its alloys contg. at least 85% Mg is melted and has stirred therein MgCl_2 and a substance adapted to act as a thickening medium (MgO , CaF_2) on MgCl_2 ; Ca metal and MnCl_2 are introduced into the molten metal and the temp. is raised to 900° , the treatment being continued until the refined metal contains 0.1% of Ca at most, and up to 0.4% of Mn.

Recovery of tin. LUIGI UGHETTI LA CORSA. Fr. 640,205, Aug. 23, 1927. In the recovery of Sn from waste such as residues of tinned sheet Fe by the action of a soln. of a ferric or stannic salt with the production of ferrous or stannous salts, the ferric or stannic salt is continually reproduced by the addn. of the anion of the salt used. Thus if FeCl_3 or SnCl_4 is used, Cl is bubbled through the liquid or liquid Cl is added.

Apparatus for galvanizing iron by the lead-zinc process. RUDOLF PASSEKER Ger. 467,471, Sept. 13, 1925. Constructional details.

Platinum and other metals. ÉTABLISSEMENTS MÉTALLURGIE DE VIENNE (ISÈRE) and GEORGES A. L. R. COLLARD. Fr. 640,110, Feb. 4, 1927. In the usual treatment of goldsmith's ash with Pb, about 1% of Cu with respect to the Pb is added, whereby during cooling 2 distinct masses are obtained, one of which contains Au and Ag mixed with Pb and a small proportion of Cu, the other, which lies as a paste on top, all the Pb, most of the Cu and some Au and Ag. The mass contg. the Pt is cupelled with Pb to eliminate Cu.

Wiredrawing tungsten. LA RADIOTECHNIQUE. Fr. 640,525, Feb. 17, 1927. Rods or bars of W are made ductile for wiredrawing by immersion in a bath of molten salt in which a chem. action takes place so as to heat the metal to 1300 – 1400° , or in a bath of molten metal to 400 – 500° , or first into the metal bath and then into the salt bath, which may be an alkali nitrite.

Feeding device for metallurgical furnaces, particularly rotary furnaces. FRIED. KRUPP GRUSONWERKE A.-G. Ger. 466,134, Dec. 11, 1925. Constructional details.

Furnace for treating ores with heated gases. FRANCIS M. SIMONDS. U. S. 1,693,702, Dec. 4. The furnace hearth is formed in sections, each of which comprises a floor and a perforate confining wall at one end forming an angle with the floor.

Continuous furnace for heating metal blanks. CHARLES E. LEHR (to Bethlehem Steel Co.). U. S. 1,696,805, Dec. 25. Structural features.

Continuous furnace for heating metal articles. JOHN B. TYTUS (to American Rolling Mill Co.). U. S. 1,696,822, Dec. 25.

Inclined chamber apparatus for heat treatment of metal articles. LESLIE E. HOWARD (to Simonds Saw and Steel Co.). U. S. 1,696,801, Dec. 25.

Furnace for annealing cast-iron pipes. U. S. CAST IRON PIPE & FOUNDRY CO. Brit. 290,365, Feb. 12, 1927.

Furnace and conveying apparatus for annealing cast-iron pipes. JOHN H. UHRIG

(to U. S. Cast Iron Pipe & Foundry Co.). U. S. 1,695,515, Dec. 18. Structural features.

Packing for closing plugs of smelting furnaces. WERNER HANDELSGES. Ger. 466,236, Dec. 8, 1927. Graphite 4, kaolin 1, coke dust 1 and shredded flax 1 part are beaten to a stiff paste with undild. sulfite lye of molasses.

Blast-furnace practice. AUGUSTIN G. A. CHARPY and LÉON F. G. J. BRUN. Fr. 640,400, Feb. 14, 1927. A material having a content of Fe and Si suitable for addn. to blast furnaces working on calcareous ores is made by heating the dust from blast furnaces with a suitable proportion of siliceous material either to fritting or fusion point.

Gas-vent for blast furnaces. ALBERT DAUB. Ger. 468,760, Jan. 25, 1927.

Tuyère construction for blast furnaces. GUTHOFFENUNGS-ÜTTE OBERHAUSEN A.-G., A. WAGNER and E. POHL. Brit. 290,861, July 22, 1927.

Crucible furnace for melting metals. LUDWIG WEISS. Ger. 466,237, Jan. 21, 1928. The furnace has 2 crucibles connected by a channel passing from the upper part of one to the lower part of the other. The app. is a modification of an earlier construction (Ger. 437,170) which has the 2 crucibles connected by a channel near the bottom.

Crucible furnace for melting type metal. Soc. LE MATIN. Ger. 466,234, July 17, 1926. Constructional details.

Shaft furnace. ALBERT EBERHARD. Ger. 468,782, Dec. 25, 1926. App. for the introduction of gas and air into a shaft furnace is described.

Shaft furnace. GUTHOFFENUNGS-ÜTTE OBERHAUSEN AKTIENGESSELLSCHAFT. Fr. 640,209, Aug. 26, 1927. The blast is introduced in such a way as to have little suction effect on the gas from the hearth of the furnace and not to produce premature combustion of this gas.

Inner lining for shaft furnaces. MATTHIAS FRÄNKEL. Ger. 467,563, April 7, 1925. The lining is built up of superposed sections so constructed and connected that the lining, as it wears out, can be lowered through the shaft while fresh sections are added from above.

Preheating the charge in shaft furnaces. ALEXANDER L. FEILD (to Linde Air Products Co.). U. S. 1,695,953, Dec. 18. In operations such as smelting iron ores, a hot, non-smelting gas comprising O and N with the ratio of O to N less than in atm. air is passed into the furnace above the smelting zone.

Method of and means for spraying water into a shaft furnace. VULCAN-FEUEERUNG A. G. Ger. 466,235, Dec. 17, 1927. To prevent premature evapn., the water is supplied in excess to a nozzle in the tuyère. Alternatively, water in excess may be circulated through a jacket surrounding the tuyère and the spraying nozzle connected to the jacket.

Tier furnace for roasting and calcining ores. GUSTAVE VERNON. Fr. 640,429, Sept. 5, 1927. A drying oven for the ore is placed above the furnace and communicating tubes are placed between the tiers for regular circulation of gas and to avoid the sweeping along of dust.

Tier furnace for roasting ores, etc. VEREIN FÜR CHEMISCHE UND METALLURGISCHE PRODUKTION. Fr. 640,489, Feb. 14, 1927. Means for cooling the rotating scrapers are described.

Metallurgical operations. FRANK G. BREYER and EARL H. BUNCE (to the New Jersey Zinc Co.). Can. 285,006, Nov. 20, 1928. Briquets employed in metallurgical operations are fed directly from the briquetting machine to the furnace without drops or falls, the briquets being heated on their way to the furnace by furnace gases.

Cutting holes in iron by fusion with a blowpipe. H. HENTSCHEL and H. GREGGENSEN. Brit. 290,391, March 2, 1927.

Cleaning iron and steel. J. H. GRAVELL. Brit. 290,458, June 24, 1927. An acid, oil solvent and adhesive and "control agent" are used together, e. g., H_3PO_4 may be used with H_2O or $BuOH$ or both, an adhesive size, starch or gelatin and quinoline, pyridine, Al_2O_3 , CH_3O or thiocyanates.

Rustproofing iron and steel. W. H. COLE. Brit. 289,906, Jan. 1, 1927. Iron or steel is treated with a soln. of phosphates of Al, Zn, Fe and Cr which are used together in soln. in specified proportions and may be assoc. with $(NH_4)_2HPO_4$, Na biborate and $K_2C_2O_7$.

Cleaning and rustproofing steel. JAMES D. KLINGER. U. S. 1,695,430, Dec. 18. A soln. contg. a hydroxycarboxylic acid such as a soln. of citric acid contg. also alc., H_2SO_4 and acetone is used to prepare surfaces for painting.

Reconditioning rusted iron or steel drums. ROBERT C. HEINZMAN. U. S. 1,696,036, Dec. 18. Drums which may have been used for holding alc. or other substances and which are interiorly rusted are treated with an oxalic acid soln. and then treated with Al acetate, which serves to form a rust-resisting waterproof coating.

Steel. FREDERICK C. LANGENBERG and MARCUS A. GROSSMANN. U. S. 1,695,594, Dec. 18. A non-hot-short steel suitable for automobile bodies, fire boxes, etc., contains C less than 0.05% and O less than 0.03% and may contain Cu 0.15–0.60, Mo 0.03–0.25 and Mn over 0.15%.

Steel from iron ore. J. W. HORNSEY. Brit. 290,317, Jan. 5, 1927. Reduction of phosphatic iron ore as described in Brit. 284,040 (C. A. 22, 4101) is conducted so that a sufficient proportion of unreduced Fe oxide remains in the Fe to prevent the P from being released in elemental form during subsequent conversion of the Fe into steel.

Steel from iron ore. J. W. HORNSEY. Brit. 290,318, Jan. 5, 1927. Reduction of iron ore by a process such as is described in Brit. 284,040 (C. A. 22, 4101) is effected so as to produce iron free from S and suitable for steel manuf., by mixing with the ore before reduction a small proportion of flux (such as 5% of lime) which combines with the S. If the ore contains metallic sulfides, burnt lime is added with the coal, or limestone is added to the ore before it enters the preheater.

Steel and steel alloys. F. A. DESILVA and C. G. CARLISLE. Brit. 290,442, May 18, 1927. In producing steel and steel alloys directly from titaniferous ores, the ores are first subjected to magnetic concn. and the concentrate together with reducing material is supplied to an elec. furnace and the temp. of the bath in the furnace during the main portion of the reducing operation is controlled so that it does not exceed 1600° so that the Ti oxide passes at least mainly into the slag. After sepn. of the slag the molten metal is further refined and may be combined with alloying elements such as Cr, Ni, Si, Mn, W, Mo, V or Co.

Heat-treating steel. LEBARON W. KINNEY and GEORGE H. BIERMAN (to White Motor Co.) U. S. 1,695,922, Dec. 18. A compn. for preventing decarbonization during heat treatment comprises kieselguhr, water and borax. This compn. may be used as a coating on steel gears or other articles.

Liquid bath for quenching and tempering tool steel. JOHN F. EDWARDS. U. S. 1,696,297, Dec. 25. An aq. bath is formed with specified proportions of glycerol, sweet spirit of niter, NH_4Cl , ZnSO_4 , NH_4 alum, NaCl and CuSO_4 . Cf. C. A. 22, 377.

Annealing sheets or strips of steel or similar materials. JOHN B. TYTUS (to American Rolling Mill Co.). U. S. 1,693,800, Dec. 4. The pieces of material are rolled with excess length at the ends to allow for removal of end irregularities and are temporarily united by their excess end portions for passage through a heating chamber for annealing. After annealing the original pieces are severed from each other and cut to exact desired length.

Alloy. JOHN W. HORNSEY (to The Granular Iron Co.). Can. 284,058, Oct. 16, 1928. Granular Fe ore is heated to approx. the temp. of reduction, granular or pulverized coal is introduced to reduce the metal, and the material is cooled below the temp. of reoxidation. During the heating, the reduction and the cooling, air is excluded with the exception of such air as is required for heating, this air being under control. After cooling the metal is sepd. from the gang by magnetic or other sepn. The solid Fe produced is used as an alloying ingredient or as a base. It produces steel of high grade (attributable to the fact that there is no ferrite-dissolved nitride or because there is no occluded O or N or perhaps a combination of both factors).

Alloy. HANS G. A. VON KANTZOW. Can. 284,524, Nov. 6, 1928. A fire-resistant alloy with high elec. resistance contains as principal constituents Fe with Al 1–5%, Co 1–6% or Al 1–5%, Cr 5–22% and Co 1–4%. The addition of Co alone or together with Ti to alloys of this type, especially those contg. Cr, increases the fire resistance by several hundred percent and the elec. considerably, for instance by about 20% or more.

Alloys. F. B. COYLE (to International Nickel Co.). Brit. 290,267, May 13, 1927. White or mottled cast iron has added to it, after tapping it from the furnace, Al, Si, Ni or Mn, to induce the formation of graphite and produce a gray cast iron of high tensile strength. Al 0.5% or Si 0.75% or Si 0.25% or Ni 1.25% may be added, with an addn. in each case, of Mn about 0.5%.

Alloys. JEAN ECABERT, XAVIER ECABERT and PAUL DE STEINHEIL. Fr. 640,503, Feb. 16, 1927. An alloy of low coeff. of friction, particularly for motor cylinders, contains Zn 80–87, Cu 7–11, Al 2–3, Ni 0.5–2, Fe 0.2–3%, the total of Ni and Fe not exceeding 3.5%. Fr. 640,504 describes an alloy with similar properties, preferably contg. Zn 86–88, Cu 3–6, Al 5–7, Sn 4–6, Pb 1–2%. If more than 5% of Pb is used Ni is also added.

Alloys. I. G. FARBERIND. A.-G. Fr. 640,596, June 18, 1927. Alloys resistant to chem. agents, particularly HCl, contain up to 78% of Ag, and up to 22 of Al or Mn or 22 of a mixt. of these 2 metals. Zn, Sn, Mg, As, Sb or Si may also be added. Alloys

are also described contg. up to 70% Ag and up to 30, preferably 10-20, of Ti; about $\frac{1}{2}$ the Ti may be replaced by Al.

Low-carbon alloys. A. P. VOLKOV. Russ. 4628, Feb. 29, 1928. In the production of low-C alloys, particularly cast iron, in a cupola furnace, air or O is blown through the molten metal by a special arrangement.

Alloys resistant to corrosion. J. T. HAY. Brit. 290,487, Sept. 5, 1927. Fe alloys contain also Cu 0.2-0.5, up to about 0.2 of Mo and less than 0.2% of C and the total content of C, Mn, Si, S and P does not exceed 0.25%.

Corrosion-resisting alloy. CENTRAL ALLOY STEEL CORP. Fr. 649,679, Sept. 8, 1927. A rust- and corrosion-resisting Fe alloy contains Cu 0.2-0.5, Mo 0.1-0.2, and C 0.05-0.1%. The alloy may contain other ingredients such as Si, Mn, P and S, but the total of these including the C should not exceed 0.25%.

Magnetic alloy. BELL TELEPHONE MANUFACTURING CO. Swiss 12,601, Dec. 31, 1926. An alloy susceptible to small magnetic impulses comprises Ni 78, Fe 18-19, and Mo 4-3%.

Magnetic alloys. SIEMENS & HALSKE A.-G. Brit. 290,658, May 20, 1927. Alloys are formed of Ni 30-80, Fe 20-70 and Si 1-20% (suitably Ni 78.5, Fe 17.5 and Si 4%) and may be heated at about 900° for some time, then slowly cooled to about 625°, maintained at that temp. for some time, and finally cooled in air.

Aluminum alloys. ANDRÉ GEYER. Fr. 640,113, Feb. 4, 1927. Al alloys contg. C are protected against oxidation during fusion by a layer of carbides. Reducing gases are maintained over the bath. The C used is wetted with water. An example of an alloy contains Al 93.84, Cu 3.55, Mg 0.7, Mn 0.66, Si 0.6, Fe 0.54 and C 0.11%. Cf. C. A. 22, 4454.

Aluminum alloys. DEUTSCHE VERSUCHSANSTALT FÜR LUFTFAHRT E. V. Fr. 639,954, Aug. 24, 1927. See Brit. 282,701 (C. A. 22, 3877).

Aluminum-silicon alloy. ALFRED G. C. GROVER and HENRY W. L. PHILLIPS (to The British Aluminium Co., Ltd.). Can. 284,544, Nov. 6, 1928. The structure of Al-Si alloys is physically varied by introducing into the molten alloy at a temp. only slightly above the melting point of the alloy Na_2O_2 , preferably in small quantities at a time (as the reaction is strongly exothermic). After skimming off the dross and slag the molten alloy is cooled to the temp. desired for pouring and poured in the usual way, preferably into chill molds. In place of Na_2O may be used K_2O or other alkali metal peroxide or mixts. of these.

Nickel and its alloys, etc. P. D. MERICA and A. E. KAYES (to International Nickel Co.). Brit. 290,647, May 19, 1927. In order to produce metal free from C and from gas, Ni contg. metal is melted and, by the addn. of Ni oxide or in other suitable manner, C present is completely oxidized and the CO is boiled out of the metal. The Ni oxide is then reduced by a deoxidizer such as Si which does not form gaseous oxides, and Mn and Mg may be added before casting. Various details are given.

Steel alloys. FRIED. KRUPP AKT.-GES. (Franz P. Fischer, inventor). Ger. 468,752, Dec. 8, 1926. Steel alloys such as Ni-Mg steel and particularly austenitic steel alloys have their stretching point raised by rotating the article made from the alloy, such as a turbo rotor, at a sufficiently high speed.

Alloy steel. GREGORY J. COMSTOCK (to Firth-Sterling Steel Co.). U. S. 1,695,916, Dec. 18. An alloy steel contg. C 1.20-1.80, Cr 10-14, V 0.75-1.25, and Mo 0.50-1.25% may be air hardened even in fairly large sections and is capable of being annealed sufficiently soft for easy machining. It is suitable for making dies and punches.

Alloy steel for "high-speed" tools. REMY-STÄHLWERKE STAHL SCHMIDT & CO. GES. Brit. 280,900, Feb. 28, 1927. An alloy steel is specified contg. W 17, Cr 5, V 1.5, Ta 7, and C 0.9%, with or without Mo 2%.

Manufacture of tungsten-carbon alloys for tools. METALLABOR A.-G. Swiss 126,663, June 23, 1927. C in an amt. not exceeding 3% is supplied to the metal during its fusion at a temp. at which the metal is passing from the pasty to the liquid state. An addn. of an auxiliary metal, particularly Ta, may be made, and fusion may be effected in an atm. of N.

Tungsten carbide. STAHLWERKE RÖCHLING-BUDERUS A.-G. Swiss 126,729, Jan. 18, 1926. Hard tools and like objects are made from W carbide, by mixing a small quantity of Th carbide with W, fusing with C, and molding.

Electric testing apparatus for detecting flaws in metal bars, railway rails, etc. SPERRY DEVELOPMENT CO. Brit. 290,073, July 22, 1927.

Production of corrosion-resistant surfaces on metals. FREDERICK M. BECKET (to the Electro Metallurgical Co. of Can., Ltd.). Can. 284,705, Nov. 13, 1928. Corrodible metal (iron, steel, etc.) is treated by a cementation process with a powd. ternary alloy

of Fe, Cr and Si and a diluent consisting of an inert oxide (alumina). A binary alloy of Cr and Si may be used instead of the ternary alloy quoted.

Acid-proof linings for vessels. I. G. FARBERIND. A.-G. Brit. 290,189, May 9, 1927. Linings are formed of slabs of Si alloys having good thermal cond. such as alloys of Si with Cu, Cr, Mn or W. Cf. C. A. 22, 4016.

Apparatus for tinning metal plates. H. WILLIAMS. Brit. 290,337, Feb. 9, 1927.

Apparatus (with sheepskin rollers, etc.), for cleaning tin plates with bran, etc. L. B. FRY and B. A. THOMAS. Brit. 289,946, Feb. 3, 1927.

Tempering wires. ÉDOUARD DROUET. Fr. 639,877, Aug. 22, 1927. Wires are tempered by passing them simultaneously in opposite directions in 2 series so as to recover, by heating one series, the heat given out in tempering and cooling the other series.

Seamless metal tubes. W. KUNST. Brit. 290,334, Feb. 8, 1927. Mech. features of manuf. are specified.

Apparatus for pickling or other liquid treatments of long rods or tubes. CHARLES E. LEHR (to Bethlehem Steel Co.). U. S. 1,696,806, Dec. 25. Structural features.

Apparatus for forming pipe from lead or similar metals by extrusion through a water-cooled die. J. C. LABROSSE. Brit. 290,289, May 12, 1927.

Continuous-sheet mill and method of making finished metal sheets. FLORENCE C. BIGGERT, JR. (to United Engineering & Foundry Co.). U. S. 1,695,910, Dec. 18. Mech. features.

Apparatus for testing the effect of bending of metal strips. GEORGE B. COLLINS (to The Texas Co.). U. S. 1,695,367, Dec. 18.

Arc welding. COMPAGNIE FRANÇAISE POUR L'EXPLOITATION DES PROCÉDÉS THOMSON-HOUSTON. Fr. 32,953, Jan. 12, 1926. Addn. to 523,169. The electrodes for arc welding contain a compd. of Ti, e. g., Na titanate, with Zn and finally Sn.

Arc-welding electrode. HARRY R. PENNINGTON and CHARLES H. HOLLUP (to C. H. Hollup Corp.). U. S. 1,696,011, Dec. 18. A coating for welding rods comprises BaCO_3 and powd. C in approx. equal vols. and a dil. Na silicate soln.

Solder. H. CHAPMAN. Brit. 290,891, Sept. 27, 1927. A method is specified for prepg. solder in the form of flakes coated with flux (which for lead soldering may comprise an emulsion of a mineral hydrocarbon oil with ZnCl_2 soln.).

Solder for aluminum. ERNEST STIRNEMANN and ADRIEN PERRET. Fr. 640,676, Sept. 8, 1927. Solder for Al and its alloys is made under the following conditions: (1) It must not contain over 40% Al; (2) if it contains over 30% Al it must not contain over 40% Zn; (3) it must not contain over 45% Cu; (4) if no Pb is present the quantities of Cu and Sn are obtained for the formula $y = 2 - 0.00047x^3 + 0.00667x^2 - 0.042x$, if Pb is present, from the formula $y = 1 + 0.001x^2 + 0.08x$, where x and y represent the amts. of Sn and Cu, resp.; (5) the fusion pt. should not exceed 480° .

10—ORGANIC CHEMISTRY

CHAS. A. ROUILLER AND CLARENCE J. WEST

One hundred years of organic synthesis. JOCELYN F. THORPE. *J. Chem. Education* 5, 1591-602(1928). E. H.

Progress in the synthetic organic chemical industry in 1928. FRANK TALBOT AND W. N. WATSON. *Ind. Eng. Chem.* 21, 8-11(1928). E. H.

Contemporary reception of Wöhler's discovery of the synthesis of urea. W. H. WARREN. *J. Chem. Education* 5, 1539-53(1928); cf. C. A. 22, 2919. E. H.

The synthesis of methane from carbon dioxide and hydrogen. MERLE RANDALL AND FRANK W. GERARD. Univ. of Calif. *Ind. Eng. Chem.* 20, 1335-40(1928). The equil. for the reaction $\text{CO}_2 + 4\text{H}_2 \rightleftharpoons \text{CH}_4 + 2\text{H}_2\text{O}$ was detd. by the dynamic method at atm. pressure and at temps. between 322° and 392.5° . The catalysts used were supported Ni catalysts, both unpromoted and promoted by ceria. Space velocities from 6 to 12 were used. Equil. was approached from both sides. In studying the forward reaction ratios of H/CO_2 of 4 and 2.3 were used. The free energy equation that fits the data for this reaction is $\Delta F^\circ = -35,093 + 12.38T \ln T - 0.00415T^2 - 0.00000025T^3 - 39.91T$. This equation gives $\Delta H_{29.81}^\circ = -38,401$ cal. and $\Delta F_{29.81}^\circ = -26,339$ cal. An observed deposition of C during some of the expts. is accounted for by assuming reaction between CO_2 and CH_4 to form graphite and H_2O . Such a reaction is thermodynamically possible under the exptl. conditions prevailing. R. L. D.

Synthesis of higher hydrocarbons from water gas. II. DAVID F. SMITH, CHARLES O. HAWK AND D. A. REYNOLDS. U. S. Bur. of Mines, Pittsburgh, Pa. *Ind. Eng. Chem.* 20, 1341-8(1928); cf. C. A. 22, 1948.—A catalyst made from co-pptd. hydroxides

of Co, Mn and Cu was used to synthesize hydrocarbons from purified water gas at atm. pressure and at temps. about 250°. Space velocities between 120 and 360 were used. Extensive tabulation is made of the nature and quantities of hydrocarbons formed, the quantities of water gas converted, and their relation to the temp. and space velocity. The quantities of oxygenated products formed were comparatively small. The % of CH₄ in the hydrocarbon product was higher the higher the temp. and the more active the catalyst. The proportion of very heavy hydrocarbons was greater at the lower space velocities and the higher temps. At the higher space velocities and higher temps. relatively more unsatd. hydrocarbons were formed. At 260° and 260 space velocity the hydrocarbon product was 21% by wt. CH₄, 45% enriching hydrocarbons (German "Gasol"), 34% motor fuel. The yields of hydrocarbons, exclusive of CH₄, vary from 92 to 156 gm. per cu. m. of H₂ + CO converted. At 203° and 230 space velocity, about 18% of the water gas was converted in a single pass. R. L. DODGE

Oxidation of methane with nitrogen peroxide. PER K. FROLICH, P. J. HARRINGTON AND ALDEN H. WAITT. Mass. Inst. Tech. *J. Am. Chem. Soc.* 50, 3216-21 (1928).—The min. reaction temp. for the oxidation of CH₄ with NO₂ is about 430° in an open Pyrex tube. No MeOH could be detected. HCHO is formed, the yield being less than 25% of the CH₄ reacting. Conditions favoring lowering of the reaction temp. such as low NO₂ concn., slow rate of flow and absence of contact surfaces, also favor HCHO production. The losses of NO₂ by decompn. to free N₂ are small. Attention is called to the possible formation of AcOH by reaction in the cold, of liquid NO₂ with small quantities of higher hydrocarbons present in the CH₄. J. H. PERRY

Preparation of tetramethylethylene. J. C. EARL. *J. Proc. Roy. Soc. N. S. Wales* 61, 68-72 (1928) — EtC(OH)Me₂ was dehydrated by the method of D. R. P. 66,866, except that the vapors from the reaction flask were passed through a fractionat-

ing column, at the top of which the temp. did not exceed 45°. $\text{MeCH: CMe}_2 \xrightarrow{\text{Cl}} \text{MeC(OH)CClMe}_2 \xrightarrow{\text{MeMgI}}$

$\text{MeC(OH)CClMe}_2 \longrightarrow \text{Me}_2\text{CHC(OH)Me}_2$ which was dehydrated by adding in small portions to boiling 33% H₂C₂O₄ and distg. so that the top of the fractionating column was not above 80°. The distillate was nearly pure Me₂C: CMe₂ with a little water. L. W. RIGGS

Electron displacement in carbon compounds. V. The addition of hydrogen chloride to 3-ethyl-2-pentene. HOWARD J. LUCAS. Calif. Inst. Tech. *J. Am. Chem.*

$n_D^{20} 1.417$
70% of 3-ethyl-2-pentanol, b_{50} 82.0-2.5°, b_{743} 151-1.5°, and 8% of 4,5-dimethyl-3,6-dimethyl 4,5-octanediol, m 100.7-1.2°. 3-Ethyl-3-pentanol, b_{50} 72.5-3.5°, b_{710} 83.5-1.0°, b_{743} 140.5-1.5°, n_D^{20} 1.4305, n_D^{25} 1.4281. With HCl and ZnCl₂ the alcs. give the corresponding chlorides. 2-Chloro-3-ethylpentane, b_{50} 62-2.5°, b_{710} 77-7.5°, b_{743} 142.5-3.0°, d_4^{25} 0.8911, n_D^{20} 1.4318, n_D^{25} 1.4299. 3-Chloro-3-ethylpentane, b_{50} 78.5-0.0°, b_{710} 83.0-3.5°, b_{743} 143.0-4.0° (decompn.), d_4^{25} 0.8945, n_D^{20} 1.4334, n_D^{25} 1.4311. HCl in glacial AcOH reacting with 3-ethyl-2-pentene gives a heptyl chloride which is practically pure 3-Cl deriv. The product formed agrees with the prediction made on the assumption that the electron attractions of H, Me and Et are in the order H > Me > Et and not with the hypothesis of an alternately polarized C chain. C. J. WEST

Cadmium acetylide. KARL GEBAUER. *Z. anorg. allgem. Chem.* 176, 283-4 (1928).—When pure dry C₂H₂ is passed through CdI₂·C₆H₅NH₂ in Me₂CO, there is formed an orange ppt., the compn. of which corresponds to the formula CdC₂·C₂H₅·CdI₂. By washing with alc., or H₂O, the CdI₂ is removed and CdC₂·C₂H₅ is formed. Both compds. partially decomp. in hot H₂O with the evolution of C₂H₂, but may be heated in the air to 200° without decompn. H. F. JOHNSTONE

Action of sulfuric acid in the preparation of certain alkyl halides. ROGERS McCULLOUGH AND FRANK CORTESE. Mass. Inst. Tech. *J. Am. Chem. Soc.* 51, 225-8 (1929).—CH₃CHCH₂Cl is conveniently prepd. by mixing the alc. with 8 times its vol. concn. HCl (d. 1.19) in a well-corked bottle; after 10 days the upper layer is washed with 10% NaOH and twice with 15% NaCl; distn. gives 55-65% chloride, b. 45-7°; the bromide is obtained in 60-5% yields and the iodide in 75-80% yields. These halides do not develop objectionable odors and colors on standing; these colors are caused by the action of H₂SO₄ and halogen acid on the unsatd. materials, which are always formed, even by the Norris method. H₂SO₄ not only polymerizes these materials but attacks sensitive halides to form more unsatd. materials. H₂SO₄, therefore, is to be condemned in the prepn. of pure alkyl halides. The Norris procedure gives the purest products. C. J. WEST

Behavior of zinc oxide and zinc oxide-chromium oxide catalysts in the decomposition and synthesis of methanol. H. H. STORCH. Roessler & Hasslacher Company, Perth Amboy, N. J. *J. Phys. Chem.* 32, 1743-7(1928).—Details of prepn. of several pptd. and supported ZnO and ZnO-Cr₂O₃ catalysts are reported. Their activities for the synthesis of MeOH from 4H₂:1CO gas mixts. at 3000 l./sq. in. and about 350° are compared. The addn. of Cr₂O₃ to a ZnO catalyst in proportions of 200 g. ZnO to 22 g. Cr₂O₃ showed more activity than pure ZnO or pure Cr₂O₃. There was, however, no appreciable difference in activity between the catalysts when used to decomp. MeOH at atm. pressure. The mixed oxide catalyst was practically inactive for the synthesis of MeOH below 300°, and at 350° the yield was less than at 330°.

R. L. DODGE

Catalysts for the formation of alcohols from carbon monoxide and hydrogen. II. Synthesis of methanol with catalysts composed of copper and zinc. PER K. FROLICH, M. R. FENSKE, P. S. TAYLOR AND C. A. SOUTHWICK, JR. Mass. Inst. Tech. *Ind. Eng. Chem.* 20, 1327-30(1928); cf. *C. A.* 22, 3338.—Data on the decompn. of MeOH by CuO-ZnO catalysts at atm. pressure have been correlated with expts. on MeOH synthesis at 204 atm., the same catalysts being used. The curves for "% of decompd. MeOH appearing as CO" vs. "compn. of catalyst" are of the same shape as those representing "% of CO converted to MeOH" plotted against the same abscissas. Conclusion: The atm. pressure decompn. method of testing is eminently fitted for studies of the activity of catalysts for the MeOH synthesis from water gas at high pressure.

R. L. DODGE

History of ether. ERNST DARMSTAEDTER. *J. prakt. Chem.* 120, 74-88(1928).—Discussion of the claims of Cordus (1600) as the discoverer of Et₂O. Twenty-five references.

C. J. WEST

Relationship of the constitution of certain alkyl halides to the formation of nitro-paraffins and alkyl nitrites. ROBERT B. REYNOLDS AND HOMER ADKINS. Univ. of Wisconsin. *J. Am. Chem. Soc.* 51, 279-87(1929).—The reaction between AgNO₂ and the following alkyl halides gave the indicated total yield of mixed isomers (%) and % of NO₂ compd. in the mixt. (2nd figure): CH₃:CHCH₂Br, 74.0, 79.8; PrBr, 86.1, 77.4; *sec*-PrBr, 78.5, 40.3; BuBr, 88.2, 77.9; *iso*-BuBr, 77.2, 57.8; *sec*-BuBr, 68.3, 30.0; *tert*-BuBr 60.6, 48.3; *iso*-AmBr, 78.2, 67.5; C₇H₁₅Br, 94.3, 71.0; *sec*-C₈H₁₇Br, 82.1, 34.3; Pri 85.9, 66.9; *sec*-PriI, 71.7, 31.8; BuI, 85.1, 60.7; *iso*-BuI, 74.9, 40.0; *sec*-BuI, 70.0 31.9. A larger proportion of NO₂ compd. was produced from the bromides than from the iodides except in the case of *sec*-BuBr. *Iso*-AmBr gave over twice as large a % of NO₂ compd. as did the *iso*-AmCl. The yield of the isomers isolated was from 10-17% higher from the bromides than from the iodides, except in the case of *sec*-BuBr. Primary halides contg. a branched chain did not give as high a proportion of NO₂ compd. as did the straight chain compds. If the halogen in the alkyl halide is on a *sec.* C atom, the amt. of formation of the NO₂ compd. is materially less than it is for the corresponding primary or *tert.* alkyl halide. It cannot be said that there is in general either an increase or decrease in proportion of NO₂ compds. with increasing mol. wt. of the alkyl group. The results obtained with allyl bromide indicate that unsatn. has little or no effect on the ratio of isomers formed. The highest yields of the mixed isomers were isolated from the reaction of normal alkyl halides, the yield increasing with lengthening of the chain in the case of the bromides. The order of increasing activity of the alkyl halides is allyl, *tert*-Bu, *sec*-halides, isoalkyls and *n*-alkyls. The iodides are more reactive than the bromides. Attempts to prep. mixts. of the isomers sufficiently pure for analysis were unsuccessful with *tert*-BuI, cyclohexyl iodide, PhCH₂Br or PhCH₂-CH₂Br. The method of analysis of the reaction mixt. involved the addn. of EtOH-NaOH to a weighed sample, evapg. the soln. and analyzing the residue by a wet combustion method for C.

C. J. WEST

Chemistry of nitroso compounds. JOHN C. EARL, FRANK C. ELLSWORTH, EDWARD C. S. JONES AND JAMES KENNER. Univ. of Sydney and Coll. of Tech., Manchester. *J. Chem. Soc.* 1928, 2697-703.—*β*-Hydroxyethylnitrolic acid, m. 76-7° (decompn., cor.) results from the Na salt of HOCH₂CH₂NO₂ in EtOH and NaNO₂ and KOH in H₂O, the mixt. being acidified at -10° to 0°, then rendered alk. and again reacidified; the yield (33%) is due to the soly. of the acid in H₂O; it gradually decomp. with evolution of NO fumes. The same compd. is obtained from (HOCH₂)₂C:NO₂H, HCHO being formed. Ethylnitrolic acid is obtained in the same manner from MeCH(NO₂)CH₂OH. The original should be consulted for the discussion of the chemistry of these reactions.

C. J. WEST

Factors involved in the preparation of mercury diisobutyl by the reaction of Frankland and Duppa. HARRY F. LEWIS AND EUNICE CHAMBERLIN. Cornell College and

Univ. of Iowa. *J. Am. Chem. Soc.* 51, 291-4(1929).— $\text{Me}_2\text{CHCH}_2\text{I}$ (31 cc.) and 14.8 cc. AcOEt , cooled to 0° , are treated with 0.25% Na-Hg from 13.6 g. Na and 400 cc. Hg so that the temp. does not exceed 15° (45 min.); addn. of H_2O and distn. gives 56.6% of the Hg deriv. Between $15-20^\circ$, the yield drops to 49% and at the b. p. ($75-85^\circ$) to 45%. Using a 0.125% Na-Hg , the yield dropped to 38.3%. In the absence of AcOEt no Hg deriv. is formed; doubling the amt. of AcOEt gives a 48.7% yield. Aldehydes, ketones and anhydrides may be used as catalysts in the reaction. The principal by-product is diisobutyl. $\text{Me}_2\text{CHCH}_2\text{Br}$ cannot replace the iodide in the above expts.

C. J. WEST

Polymerides of aliphatic chloroaldehydes. FREDERICK D. CHATTAWAY AND EDWIN G. KELLET. Queen's College, Oxford. *J. Chem. Soc.* 1928, 2709-14.— $\text{Cl}_3\text{CCHO} \cdot \text{H}_2\text{O}$ (100 g.) in 1000 g. concd. H_2SO_4 , each portion of chloral being shaken until dissolved, on standing 3 days at room temp. gives a mixt. of 3 polymers with chloralide; the excess of chloral is removed with hot H_2O and the solid then extd. with boiling EtOH , from which the chloralide seps. on cooling; H_2O ppts. α - (I) and β -parachloral (II), which are sepd. by repeated crystn. from EtOH , in which II is the more sol. I, orthorhombic, m. 116° , b_{700} 223° (capillary tube); $a:b:c = 0.8801:1:1.4505$, c (001), o (111), m (110). II, m. 152° , b. 250° . The yield of I and II is not more than 1%; of chloralide, about 2%. Butylchloral hydrate (25 g.) and 150 g. concd. H_2SO_4 give about 80% of α - (III) and β -parabutylchloral (IV), sepd. by crystn. from AcOH or EtOH . III, m. 180° , b_{700} 255° , orthorhombic, $a:b:c = 0.8209:1:1.4460$, c (001), b (010), m (110), r (101) and o (111). IV, m. 157° , b_{700} 233° . Anhyd. butylchloral may be prepd. by distg. the hydrate with about half its wt. of Ac_2O ; it b. 165° ; HCl does not give the meta-polymer. $\text{C}_4\text{H}_9\text{N}$ gives a mixt. of III and IV. C. J. W.

Oxidation of lignoceric acid. F. A. TAYLOR AND P. A. LEVENE. W. H. Singer Memorial Research Lab., Pittsburgh, Pa., and The Rockefeller Inst., N. Y. *J. Biol. Chem.* 80, 609-13(1928).—Lignoceric acid was prepd. from peanut oil by recrystn. of the insol. fatty acids. It m. $80-1^\circ$ and solidifies 77° . With red P and Br, it was converted to α -bromolignoceric acid (m. $69.5-70.5^\circ$). This compd. in turn, by heating on the H_2O -bath with an excess of 10% NaOH , was converted to α -hydroxylignoceric acid (m. $94-5^\circ$) which was oxidized by KMnO_4 to isotricosanoic acid (m. $76.5-7.5^\circ$).

ARTHUR GROLLMAN

Oxidation of unsaturated compounds. I. Oxidation of crotonic and isocrotonic acids, of the lactone of 3-hydroxyisocrotonic acid and of maleic anhydride. GÉZA BRAUN. Univ. of Chicago. *J. Am. Chem. Soc.* 51, 228-48(1929).—The oxidation of crotonic acid with BzO_2H gives a *dl*-1,2-dihydroxybutyric acid (I), m. 81.5° , in 63.5% yields. isocrotonic acid gives the isomeric acid (II), m. $74-5^\circ$, in 62.5% yields. With AgClO_4 and OsO_4 crotonic acid gives 82.5% II, while isocrotonic gives 82.5% of I. Various chlorates were studied; in the chlorate oxidations, the reduction of chlorates proceeds through the lower oxides of Cl and the mechanism of these oxidations is discussed. I is considered the *erythro*-form, II the *threo*-form. Oxidation of the lactone of 3-hydroxyisocrotonic acid with AgClO_3 gives 75%, with $\text{Ba}(\text{ClO}_3)_2$ 64%, of erythronic lactone. Oxidation of maleic anhydride with $\text{Ba}(\text{ClO}_3)_2$ gave mesotartaric acid quant., while AgClO_3 gave only 70% yields.

C. J. WEST

New synthesis of 1,5-dihydropentane(pentamethyleneglycol) and 1,5-diiodopentane. ADOLF MÜLLER, ERICH RÖLZ AND ALEXANDER GERO. Univ. Wien. *Monatsh.* 50, 105-8(1928).—Glutaric acid is best prepd. by the oxidation of cyclopentanone. Reduction of the di-Et ester (b_{110} $108-10^\circ$, b_{700} $127-9^\circ$) with EtONa gives 46% of pentamethyleneglycol, b_{110} 134° (*bisphenylurethan*, m. $174-5^\circ$ (cor.)); on cooling and immediate remelting, the m. p. is $142-3^\circ$ (cor.). HBr with the glycol at $80-90^\circ$ gives 62.2% of the 1,5-di-Br deriv., b_{110} $95-8^\circ$. The glycol, I and red P give 76.3% of the 1,5-di-I-deriv., b_{110} $128-30^\circ$.

C. J. WEST

Reactions of solid azides. ALFRED BERTHO. Univ. Heidelberg. *J. prakt. Chem.* 120, 89-118(1928).—A general summary of the work on azides, much of which was done in Curtius' lab.

C. J. WEST

1,12-Dodecanediol. M. LESPIEAU. *Compt. rend.* 187, 605-7(1928).—By the action of Mg on $\text{Br}(\text{CH}_2)_n\text{Br}$ a mixt. of compds. of the general formula $(\text{CH}_2)_n(\text{MgBr})_2$ is formed in which $n = 1, 2, 3$, etc., the proportion of the compd. formed diminishing rapidly with the increase in n . Treatment of this mixt. with chloromethyl ether gives corresponding MeO derivs. $\text{MeO}(\text{CH}_2)_n\text{OMe}$ (I) (prepd. according to M. Dionneau, *C. A.* 9, 2057), b_{110} $156-6.5^\circ$, m. 11.5° , d_{20}^{25} 0.8563, n_D^{25} 1.436. I and gaseous HBr give $\text{Br}(\text{CH}_2)_n\text{Br}$ (II), m. $38.5-39^\circ$. II with AgOAc in the presence of AcOH gives $(\text{AcO})_2(\text{CH}_2)_n$ (III), m. $36.5-7.5^\circ$. Sapon. of III gives $\text{HO}(\text{CH}_2)_n\text{OH}$, m. $80-1^\circ$. $\text{Me}(\text{CH}_2)_n\text{OMe}$, b. $124-5^\circ$, d_{20}^{25} 0.7997, n_D^{25} 1.4065.

FREDERICK C. HARR

Acetylation of diethylene oxide. MORNA MACLEOD. Univ. Coll., London. *J. Chem. Soc.* 1928, 3092.—The reaction of Ac_2O with $\text{O}:(\text{CH}_2\text{CH}_2)_2:\text{O}$ gives some $(\text{CH}_3\text{OAc})_2$ and β,β' -diacetoxyethyl ether, $\text{O}(\text{CH}_2\text{CH}_2\text{OAc})_2$, sweet smelling oil, b_{16} 110–35°, d_{20}^{20} 1.123, n_D^{20} 1.4348, $(R_L)_D$ 44.12. C. J. WEST

Determination of the structure of carbohydrates. M. HAWORTH. *Bull. soc. ind. Mulhouse* 94, 662–6 (1928).—An address. A. PAPINEAU-COUTURE

Reactions relating to carbohydrates and polysaccharides. XX. Preparation, properties and identification of glycerol β -methyl ether. HAROLD HIBBERT, MYRON S. WHEELER AND NEAL M. CARTER. McGill Univ. *J. Am. Chem. Soc.* 51, 302–6 (1929); cf. *C. A.* 23, 596.—Glyceryl α -Me ether (I) gives a practically theoretical yield of a di-*p*-nitrobenzoate, yellow, m. 108°; the β -Me ether deriv., orange, m. 155° (yield, almost quant.). I gives a diphenylcarbamate, m. 118–9°; the β -Me ether deriv., m. 102°. The importance of the β -Me ether as a "type substance" in org. analyses and syntheses is indicated. C. J. WEST

The glycerides of lauric and myristic acids. A. BOMER AND K. FRACH. Münster. *Z. Untersuch. Lebensm.* 55, 501–28 (1928).—Lauric and myristic acids are found in laurel, nutmeg, coconut and palmkernel oils. The glycerides were recovered from these oils by vacuum distn. Nutmeg oil contd. about 40% trimyristin, m. 56.2°. Free stearic acid made up about 6% of the nutmeg oil. The synthesis of α -lauro- α,β -dimyristin, $\text{C}_3\text{H}_6(\text{C}_{12}\text{H}_{23}\text{O}_2)(\text{C}_{14}\text{H}_{27}\text{O}_2)_2$, m. 43.3°, and α -myristo- α,β -dilaurin, $\text{C}_3\text{H}_6(\text{C}_{14}\text{H}_{27}\text{O}_2)(\text{C}_{12}\text{H}_{23}\text{O}_2)_2$, m. 38.0°, is described. C. R. F.

Polysaccharides. II. Acetylation and methylation of starch. WALTER N. HAWORTH, EDMUND L. HIRST AND JOHN I. WEBB. Univ. of Birmingham. *J. Chem. Soc.* 1928, 2681–90.—In prepg. starch for the following expts. 20 g. prime starch was stirred into 600 cc. H_2O until it formed a paste; after 30 min. heating the starch was pptd. by the addn. of EtOH to the warm paste and the ppt. was ground in a mortar with EtOH, finally washed with EtOH and Et₂O and dried *in vacuo*. This powd. starch was treated with 6 times its wt. of glacial AcOH through which Cl had been bubbled for a few sec. and the mixt. stirred 30 min. at 20°; Ac_2O (20 parts by wt.), contg. an amt. of SO_2 equiv. to that of the Cl in the AcOH, was then added and the mixt. stirred at room temp. for 60 min. and then at 55° for about 4 hrs.; there results 96.5% of tri-Ac starch, identical with that obtained by Bergmann and Knehe (*C. A.* 21, 1448). Similar products were obtained from untreated starch, using Cl and SO_2 or $\text{C}_6\text{H}_5\text{N}$ as the catalyst but in 10–15% yields. Methylation of the triacetate with 30% NaOH and Me_2SO_4 at 50° for 1.25 hrs. and at 70° for 1.25 hrs., with final heating for 30 min. at 100°, gives 80% of a product analyzing for di-Me starch, α_D 143° (CHCl_3 , c 1.0) but giving a mixt. of mono-, di- and trimethyl methylglucosides on hydrolysis. Methylation of the triacetate (25 g.) in 250 cc. Me_2CO with 280 cc. 30% NaOH and 100 cc. Me_2SO_4 at 56° (6 methylations in all) gave 89.4% of trimethyl starch, identical with that obtained by Irvine and Macdonald, which gives 80% of trimethylmethylglucoside on hydrolysis. III. The molecular complexity of inulin. HARRY D. K. DREW AND W. N. HAWORTH. *Ibid* 2690–7.—It is considered probable that inulin consists of chains of fructose-furanose or γ -fructose rings, the mol. contg. at least 20 or 24 such rings. Degradation, by means of CO_2 or a trace of HCl, consists in the hydrolytic scission of the chains at junctions between the rings, polysaccharides of shorter chains being produced. Dehydration may in certain circumstances tend to regenerate the longer chain polysaccharides or inulin itself. Complete scission probably leads to the production of γ -fructose, which is then irreversibly changed to ordinary fructose. The migration of inulin in plant stems may possibly occur through the formation of H_2O -sol. polysaccharides which are subsequently dehydrated to inulin in the tubers. C. J. WEST

Preparation of the sodium salts of ω -hydroxybutyric, -valeric and -caproic acids. C. S. MARVEL AND E. R. BIRKHIMER. Univ. of Illinois. *J. Am. Chem. Soc.* 51, 260–2 (1929).— γ -Butyrolactone, b. 202.6°, d_4^{25} 1.1054, n_D^{25} 1.4343, and NaOH, heated 3 hrs., give 40% of Na γ -hydroxybutyrate. δ -Valerolactone, b. 215–20°, d_4^{20} 1.1130, n_D^{20} 1.4600 gives 47% of the corresponding Na salt. Na ϵ -hydroxycaproate was similarly prepd. C. J. WEST

Substituted butyrolactams. SARBHANI SAHAY GUHA SIRCAR. *J. Indian Chem. Soc.* 5, 549–54 (1928).—A no. of substituted butyrolactams (I) were prepd. by slight modification of the method used by Noyes (*Ber.* 27, 917) with camphorimide. Substituted glutaric anhydrides are treated with 2.2 equivs. of concd. aq. NH_3 (d. 0.88), giving the NH_4 salts of the amic acids which are converted to the Na salts with 10% NaOH. The resulting solns. are evapd. to half vol., treated with 1 equiv. of Br in 8 equivs. 10%

NaOH, and heated 2 hrs. at 70–5°. The cool solns. are neutralized with concd. HCl, excess NaOBr decompd. with NaHSO₃, and the solns. made strongly acid with HCl and evapd. to dryness. The residues are extd. with Et₂O to remove the glutaric acid, and then with acetone. The acetone exts. are evapd. to a pasty consistency to remove HCl, dissolved in H₂O and neutralized with NaOH. I are extd. from the resulting solns. with Et₂O. I are sol. in all usual org. solvents, neutral in reaction, and moderately stable toward dil. acids and alkalis. They are pptd. as white ppts. from H₂O by phosphotungstic and tannic acids, Hg(OAc)₂, Pb(OAc)₂, yellow with Meyer's reagent, brown with Dragendorff's reagent, and give violet color with 3,5-(NO₂)₂C₆H₃COCl. I form unstable cryst. addn. compds. with HgCl₂ in H₂O, yellow oily compds. with AuCl₃, yellow oily or cryst. nitrosamines when treated with dil. H₂SO₄ and KNO₂ in the cold which decomp. in warm H₂O. Treatment of the Na derivs. of I with alc. AgNO₃ gives unstable Ag derivs. I form oily or cryst. Bz derivs. according to the Schotten-Baumann reaction. The following compds. were prepd. *Cyclohexane-spiro-butyrolactam*, m. 98°, b₁₃ 180–1° (46% yield); *Bz deriv.*, m. 138°; *nitroso deriv.*, m. 82°; *HgCl₂ addn. compd.*, m. 158–60°. *Cyclopentane-spiro-butyrolactam*, m. 75°, b₁₀ 164° (yield, 38%); *Bz deriv.*, m. 70–1°; *nitroso deriv.*, m. 51–2°; *HgCl₂ addn. compd.*, m. 135°. *β,β-Dimethylbutyrolactam*, m. 65–6°, b₁₂ 146–7° (yield 35%); *Bz deriv.*, m. 69°; *nitroso deriv.*, m. 45°. *β,β-Methylethylbutyrolactam*, m. 74–5°, b₁₃ 150–2°; *nitroso deriv.* is an oil. *β,β-Diethylbutyrolactam*, m. 76–7°, b₁₂ 163° (yield 40%); *HgCl₂ addn. compd.* 130°. *β-Ethylbutyrolactam*, b₁₃ 117–8° (yield, 25%); *nitroso* and *Bz derivs.* are oil. *β-Methylbutyrolactam* b₁₃ 116° (yield, 15%). *Butyrolactam*, b₁₄ 114° (yield, 20%). Reaction with the foregoing lactams is difficult, 0.1 N alkali produces very little effect for 5 hrs. at 55°. Because of the stringent conditions required and the possible accompanying disturbing factors, a study of the influence of the various groups on the stability of the ring was abandoned.

FREDERICK C. HAHN

A molecular compound of glycine anhydride and silver nitrate. TEI-ICHI ASAHINA. Univ. Tokyo. *Z. physiol. Chem.* 179, 83–7(1928).—By dissolving glycine anhydride in hot concd. AgNO₃ and allowing the soln. to cool over night an 80% yield of scaly crystals with pearly luster is obtained. The substance contains 2 mols. each of AgNO₃ and glycine anhydride. It is stable to diffused light, insol. in org. solvents, and decomps. into its constituents by H₂O. At 195° it begins to decomp. and at 210° it puts with formation of NO and metallic Ag. It is probably an intermediate product in the formation of the well-known glycine anhydride Ag from which sarcosine anhydride is obtained by treatment with MeI.

A. W. DOX

Concentration of hydrazine hydrate solution. CHARLES D. HURD AND C. W. BENNETT. Northwestern Univ. *J. Am. Chem. Soc.* 51, 265–9(1929).—Dil. N₂H₄·H₂O solns. may be readily concd. to solns. of 65% strength by distg. them with an equal wt. of xylene until all the hydrocarbon is removed. By beginning with more xylene and distg. similarly, concns. up to 95–6% but apparently not higher, may be effected in a single operation. PhMe is considerably less efficient than xylene and C₆H₆ is quite unsatisfactory for this purpose. CaC₂ and Al₄C₃ do not react with N₂H₄ salts but NaNH₂ reacts violently if undild. Hydrocarbons are unsatisfactory diluents for the purpose of prep. anhyd. N₂H₄ by this method.

C. J. WEST

Photochemical decomposition of glyoxal. RONALD G. W. NORRISH AND JOHN G. A. GERRITHS. Cambridge Univ. *J. Chem. Soc.* 1928, 2829–40.—Glyoxal (I) gas decomps. in the light of the Hg vapor lamp, probably through the agency of the blue, violet and ultra-violet light at 3650 Å. U. The main reaction involves a bimol. change, 2 vol. of I giving 1 vol. of CO and a polymerized solid product. A 2nd reaction to the extent of about 1.5% of the total change probably occurs with the production of H₂ I → 2CO + H₂. The chem. properties, compn. and mol. wt. of the solid product are in accord with its representation as a polymeride of the hitherto unknown *glycerone* (II) to which it is hydrolyzed in H₂O and acids. The properties of II further suggest that in H₂O it exists in tautomeric equil. with an acidic HOCH₂ form: CHOCO-CH(OH)-CHOC(OH).CHOH, in analogy with other substances of this type. The kinetic of the photochem. reaction is discussed. The polymer decomps. 200° without melting. The mol. wt. gradually decreases from 342 (after 30 min.) to 89.5 at a. The *oxamoxaline deriv.*, yellow, m. 165°. PhNHNH₂ in cold 50% AcOH gives a bright yellow compd., C₂₁H₂₀N₄, m. 161°; heated on the H₂O bath, the reaction mixt. turns brownish red and then m. 132°.

C. J. WEST

Interaction of bromine with acetic anhydride. IV. Bromination and chlorination compared. HERBERT B. WATSON AND EMERY H. ROBERTS. Univ. Coll. of North Wales. *J. Chem. Soc.* 1928, 2779–86; cf. C. A. 22, 942.—The reactions of Cl with Ac₂O, AcCl and AcOH indicate that chlorination is in many respects similar to bromi-

nation but it nevertheless presents some striking contrasts. Chlorination of Ac_2O , like bromination, proceeds by 2 routes, involving in 1 the halogenation of the acid chloride and in the other the preliminary enolization of the anhydride. Cl, however, reacts far more slowly than Br; this difference is due entirely to a difference in the speeds of halogenation of the acyl halides, while the velocity of enolization of the anhydride is unaffected. Quinoline, pyridine and AcONa , which inhibit the bromination of Ac_2O , have no similar effect on chlorination; the 1st 2, indeed, accelerate the disappearance of Cl. AcCl reacts with Cl more slowly than with Br; the rate of disappearance of Cl has been found to increase as the reaction proceeds, which is due to side reactions. Addn. of a small quantity of I catalyzes the production of ClCH_2COCl so powerfully that the side reactions are now imperceptible and the velocity is proportional to the concn. of Cl. The reaction of AcOH with Cl is also slower than with Br. A powerful acceleration results from the introduction of a small quantity of AcCl ; the velocity is proportional to the quantity of AcCl added and different acid chlorides have identical effects. HCl also accelerates the chlorination of AcOH , probably due to the production of a trace of AcCl ; the powerful enolizing agents H_2SO_4 and FeCl_3 have very little effect, which indicates that reaction of the halogen with the enolic form of AcOH occurs only to a very small extent. These facts are supported by many exptl. measurements of reaction velocities. I does not attack Ac_2O at 25° nor does introduction of HI or of H_2SO_4 lead to reaction. On heating the Ac_2O with I at 100° for several hrs., there is little fall in I concn. No reaction takes place when AcOH is heated with I at 100° .

C. J. WEST

Influence of solvent on the rotation of optically active compounds. XXVI. The optical activity of malic acid in the presence of sodium molybdate. THOMAS S. PATTERSON AND CHARLES BUCHANAN. Univ. of Glasgow. *J. Chem. Soc.* 1928, 3006-19. The optical activity of malic acid in solns. of Na molybdate of varying concns. and with different wave lengths and temps. is recorded in tables and as curves. The original must be consulted for the discussion.

C. J. WEST

Alkylation of hexacyanochromic acid. FRANZ HÖLZL AND FRIEDRICH VIDITZ. Univ. Graz. *Monatsh.* 49, 241-64(1928). $\text{K}_2\text{Cr}(\text{CN})_6$ is treated with Me_2SO_4 in (or without) MeOH for 3 hrs. at $40-50^\circ$, the product cooled and filtered. From the filtrate KMeSO_4 is pptd. by Et_2O ; further addn. of Et_2O ppts. a red, tarry substance (I). The brown residue, the main product, is washed with H_2O and dried at 105° , yielding a grayish green product (II), $\text{Cr}_2(\text{CN})_4(\text{OH})_2 \cdot 6\text{H}_2\text{O} \cdot \text{MeNC}$, this on keeping over CaCl_2 yields a product (III), $\text{Cr}_2(\text{CN})_4(\text{OH})_3 \cdot 3\text{H}_2\text{O} \cdot 2\text{MeNC}$, which slowly absorbs H_2O from the air to give $\text{Cr}_2(\text{CN})_4(\text{OH})_3 \cdot 4\text{H}_2\text{O} \cdot \text{MeNC}$ (IV). MeI with the Ag salt yields unsatisfactory products, dry HCl with the K salt in abs. EtOH yields $\text{CrCl}_3 \cdot (\text{EtOH})_3$ and in MeCN a brown substance (V) contg. $\text{MeCN} \cdot \text{Cr}_2(\text{CN})_3(\text{OH})_3 \cdot 7\text{H}_2\text{O} \cdot \text{MeCN}$. Me_2SO_4 with the K salt in H_2O at $40-50^\circ$ yields a red liquid from which a Ag deriv. ($\text{Cr}:\text{Ag} = 1:2$) is obtained. Schemes are given for the gradual evolution of these products; thus the hypothetical $(\text{MeNC})_3\text{Cr}(\text{CN})_3$ (VI) by loss of MeNC from 2 mols. would yield the substance $(\text{MeNC})_4$; $(\text{CN})_3\text{Cr}(\text{CN})_3$ (VII); a product which probably has this constitution (contg. a triple bridge of coordinated CN ion) is obtained from Me_2SO_4 and the K salt in EtOH . VII is then considered to be hydrolyzed by H_2O , yielding ultimately the substance $(\text{H}_2\text{O})_7\text{Cr}(\text{CN})_3\text{Cr}(\text{OH})_3$ (VIII), which can be prepd. (+ $2\text{H}_2\text{O}$) with Me_2SO_4 in absence of solvent and treating the product with H_2O without removing the adhering Me_2SO_4 ; by adding AgNO_3 the substance $\text{Ag}_2[(\text{H}_2\text{O})_3\text{Cr}(\text{CN})_3\text{Cr}(\text{OH})_3]$ is obtained. From the decomposition schemes the substances II, III and IV are formulated $[(\text{MeNC})(\text{H}_2\text{O})_2\text{Cr}(\text{CN})_3\text{Cr}(\text{CN})(\text{OH})] \cdot 4\text{H}_2\text{O}$; $[(\text{MeNC})_2(\text{H}_2\text{O})\text{Cr}(\text{CN})_3\text{Cr}(\text{OH})_3] \cdot 2\text{H}_2\text{O}$ and $[(\text{MeNC})(\text{H}_2\text{O})_2\text{Cr}(\text{CN})\text{Cr}(\text{OH})_3] \cdot 2\text{H}_2\text{O}$; each of these has a triple bridge of coordinated CN ion. C. J. W.

Hydantoins. XLVII. Synthesis of polypeptide hydantoins from 2-thiohydantoin-3-acetic acid. ALICE G. RENFREW AND TREAT B. JOHNSON. Yale Univ. *J. Am. Chem. Soc.* 51, 254-9(1929).—2-Thiohydantoin-3-acetic acid (I) and $p\text{-MeOC}_6\text{H}_4\text{CHO}$ with Ac_2O , AcOH and AcONa give 80% of the 5- $p\text{-anisal deriv.}$, m. $280-2^\circ$; $\text{ClCH}_2\text{CO}_2\text{H}$ removes the S, giving 5- $p\text{-anisalhydantoin-3-acetic acid}$, m. $269-71^\circ$; this has also been obtained from hydantoin-3-acetic acid and $p\text{-MeOC}_6\text{H}_4\text{CHO}$. I and $o\text{-HOC}_6\text{H}_4\text{CHO}$ give the 5-salicylal deriv., m. $253-4^\circ$ (decompn.) in 96% yield; $\text{ClCH}_2\text{CO}_2\text{H}$ gives salicylalhydantoin-3-acetic acid, light yellow, m. $273-4^\circ$ (decompn.); *Et ester*, m. 164° (uncor.). Reduction with HI gives *o-hydroxybenzylhydantoin-3-acetic acid*, m. $189-90^\circ$ (75% yield). The 5-piperonal deriv. of I, yellow, m. 291° (decompn.). 5-Piperonalhydantoin-3-acetic acid, lemon-yellow, m. $275-6^\circ$; *Et ester*, m. $159-60^\circ$.

C. J. WEST

Aldehyde condensation with diphenylisothiohydantoin. STUART S. KINGSBURY

AND KLAIRE S. MARKLEY. George Washington Univ. and Johns Hopkins Univ. *J. Wash. Acad. Sci.* **18**, 558-61(1928); cf. *C. A.* **20**, 1980.—Diphenylisothiohydantoin (I) was prepd. by refluxing for 3 hrs. $\text{CS}(\text{NHPh})_2$ and $\text{CH}_2\text{ClCO}_2\text{H}$ in alc. The following 2,3-diphenylisothiohydantoins were prepd. by condensing I with aldehydes: 5-*o*-methoxybenzal (3.4 g. from 2.5 g. I and 1.6 g. *o*- $\text{MeOC}_6\text{H}_4\text{CHO}$), greenish yellow, m. 296-7°; 5-*anisal* (1.46 g. from 2 g. I and 1.15 g. *p*- $\text{MeOC}_6\text{H}_4\text{CHO}$), bright yellow, m. 199°; 5-*veratral* (2.34 g. from 2 g. I and 1.35 g. 3,4-(MeO) $_2\text{C}_6\text{H}_3\text{CHO}$), bright yellow, m. 177-8°; 5-*piperonal* (2.3 g. from 2 g. I and 1.2 g. piperonal), bright yellow, m. 232°; 5-*p*-tolual (from I and *p*- $\text{MeC}_6\text{H}_4\text{CHO}$), dark yellow, m. 197-8°; 5-*p*-hydroxybenzal (from I and *p*- $\text{HOC}_6\text{H}_4\text{CHO}$), greenish yellow, did not m. 300°; 5-*o*-chlorobenzal (from I and *o*- $\text{ClC}_6\text{H}_4\text{CHO}$), greenish yellow, m. 234-5°; 5-*m*-nitrobenzal (1.79 g. from 2 g. I and 1.2 g. *m*- $\text{O}_2\text{NC}_6\text{H}_4\text{CHO}$), deep orange, m. 219-20°; 5-*citral* (2 g. from 5.3 g. I and 3 g. citral), greenish yellow, m. 230°.

LOUISE KELLEY

Direct substitution on the nitrogen of 5,5-dialkylbarbituric acids. ARTHUR W. DOX AND EDWARD G. JONES. Parke, Davis and Co., Detroit. *J. Am. Chem. Soc.* **51**, 316-9(1929). The possibility of tautomeric forms of the 5,5-dialkylbarbituric acids is discussed, the question was definitely disposed of in the case of the 1-benzyl deriv. which was prepd. by 2 methods, the products being identical. Alkylation on the N apparently does not occur until both methylene H have been substituted. By reaction of PhCH_2Cl or $\text{CH}_2=\text{CHCH}_2\text{Br}$ with the Na salts there were prepd. the *N*-benzyl derivs. of the following 5,5-dialkylbarbituric acids: *di*-Et, m. 127°; *ethylisoamyl*, m. 90°; *ethylphenyl*, m. 113°; *diallyl*, m. 116°; *allyl sec butyl*, m. 90-1°, and the *N*-allyl derivs. of *di*-Et, m. 75°; *diallyl*, m. 68-9°; *di*-Pr, m. 73°. Some tetraalkyl deriv. is simultaneously formed. *Diallyldipropylbarbituric acid*, m. 62-3°. C. J. WEST

Identification of alkylbarbituric acids. EDWARD LYONS AND ARTHUR W. DOX. Parke, Davis and Co., Detroit. *J. Am. Chem. Soc.* **51**, 288-91(1929).— $p\text{-O}_2\text{NC}_6\text{H}_4\text{CHCl}$ is a useful reagent for the identification of alkylbarbituric acids. It reacts with these acids in the presence of Na_2CO_3 to form cryst. products with definite m. p.; both the imide and methylene H react to give completely substituted derivs. The following derivs. of barbituric acid were prepd. ($R = p$ nitrobenzyl). 1,3,5,5-tetra-*R*, lemon-yellow chars when heated, 1,3-*di*-*R*-5,5-diethyl, m. 192°, 1-*R*, m. 192°; 1,3-*di*-*R*-5-ethyl-5-isopropyl, m. 160°, 1,3-*di*-*R*-diallyl, m. 190°, 1,3-*di*-*R*-5-ethyl-5-butyl, m. 141°, 1,3-*di*-*R*-5-isoamyl-5-ethyl, m. 138°, 1,3-*di*-*R*-5-ethyl-5-phenyl, m. 169°, 1,3-*di*-*R*-5-ethyl-5-butyl, m. 182°, 1,3-*di*-*R*-5-ethyl-5-amyl, m. 131°, 3,5-*di*-*R*-1-methyl-5-ethyl, m. 139°, 1,3,5-tri-*R*-5-isopropyl, m. 187°, 1,3,5-tri-*R*-5-butyl, m. 180°, 5-*R*-5-phenyl-1,3-diphenyl, m. 218°, 1-*R*-3-methyl-5,5-diethyl, m. 104°, 1-*R*-3,5,5-triethyl, m. 90°, 1-*R*-3-phenyl-5,5-diethyl, m. 133°. C. J. WEST

Xylose from cottonseed bran. WARREN E. EMLEY. *Bur. Standards Ind. Eng. Chem., Anal. Ed.* **6**, No. 21, 3(1928). Brief account of exptl work on the hydrolysis of cottonseed bran or peanut shells for the production of xylose and its possible uses.

C. J. WEST

Rotation dispersion of sugars. THEODOR WAGNER-JAUREGG. *Helv. chim. Acta* **11**, No. 9(1928). Rotation dispersion data are given for α , β -glucose, α , β -galactose, α , β -fructose, α , β -arabinose, α methylglucoside, β -phenylglucoside, β -pentamethylglucose, and β -pentaacetylglucose. Dispersion coeffs. of the unsubstituted sugars are identical within exptl error. The substitution of H in position 1 by Me has no influence, while Ph increases the coeff. only slightly. Substitution of Me in all 5 OH groups causes significant increase of dispersion which is even greater with the penta Ac deriv.

FREDERICK G. HAHN

Hexose diphosphate. P. A. LEVENE AND ALBERT L. RAYMOND. Rockefeller Inst. New York. *J. Biol. Chem.* **80**, 633-8(1928). "On the basis of the rate of hydroly-

Me glucoside of the fructose diphosphate of fermentation, it is concluded that the substance has the <2,5> lactal structure." The stable phosphoric acid residue thus attached to C atom 6 and Neuberg's monophosphate is 6-fructose phosphate.

ARTHUR GROLLMAN

A new *h*-fructose anhydride. H. H. SCHLUBACH AND H. ELSNER. *Naturwissenschaften* **15**, 772(1928). The sirup prepd by Irvine and Garrett (*C. A.* **5**, 1077) from acetone and *h*-fructose contains besides a monoacetonefructose 2 acetone-free compds. in considerable amt. The first one is an anhydride of *h*-fructose, the second a di-*h*-fructose, easily to be converted into a di-*h*-fructose anhydride. The fructose anhydride was identified by methylation; it is a (1,2)(2,5) deriv., the tri-Me compd. being identical with Haworth's inulin deriv. (3,4,6-trimethylfructose). B. J. C. VAN DER HOEVEN

Review of recent papers on lignin. CLARENCE J. WEST. National Research Council, Washington, D. C. *Paper Trade J.* **87**, No. 24, 51-3(1928). A. P. C.

Genuine lignin. II. Action of bromine on acetylated pine wood. WALTER FUCHS AND OTTO HORN. Kaiser Wilhelm-Inst. f. Kohlen-Forschung in Mülheim-Ruhr. *Ber.* 61B, 2197-2202(1928); cf. *C. A.* 22, 2744.—When the dry acetylated wood prep'd. with $\text{Ac}_2\text{O-H}_2\text{SO}_4$ as described in the earlier paper is treated with Br in CCl_4 in the presence of I under the proper conditions a quite const. quantity of Br is absorbed and there is obtained, with slight loss of Ac groups and evolution of a little HBr, a 1st *perbromoacetylwood* (I) with about 6% Br, $\frac{2}{3}$ of which can be removed as HBr with alkali acetates, leaving a 1st *bromoacetylwood* (II) with unchanged wood structure which, after replacement of the AcOH split off, contains 2% Br, 38-9% Ac and 17% lignin. On acid hydrolysis both I and II yield a lignin with about 11% Br. These results indicate that acetylated wood contains a H atom replaceable by Br and a double bond capable of adding Br, and the II obtained by removing 2 mols HBr from I must contain 2 double bonds instead of the 1 present in the original acetylwood. And, in fact, on again treating II with Br there is obtained a 2nd *perbromoacetylwood* (III) with 9% Br, $\frac{2}{3}$ of which can be removed with alkali acetates, leaving a 2nd *bromoacetylwood* (IV) which, after replacement of the slight quantity of AcOH lost, contains 3.5% Br, 18% lignin and 37% Ac. When well dried and carefully acetylated wood is used, the prep'n. of these Br products offers no difficulty. I and III, however, have a tendency to decomp. by spontaneous loss of HBr and must be analyzed as rapidly as possible. The bromolignin obtained from III and IV contains about 18% Br. The firmly bound Br, at least, of all these compds. must be in the lignin part of the wood and the same is also probably true of the loosely held Br, for in all the stages of the reaction all the quantities of Br involved bear simple, whole no. relations to each other. Apparently the acetylated wood takes up one Br atom in firm union by substitution and 2 atoms in loose union by addn. The 2 new double bonds produced by the removal as HBr of the 2 loosely held Br atoms take up 4 more Br atoms, 3 of which can again be split off as HBr while the 4th remains in the lignin part. This process is analogous to that of the exhaustive bromination whereby hydrogenated C_6H_6 nuclei can be converted into purely aromatic derivs. and it may justifiably be assumed that genuine lignin acetate contains a tetrahydrobenzene ring converted by exhaustive bromination into a deriv. of PhBr. Other possibilities are that it contains a ring with more than six C atoms or a long open chain but these seem excluded by the fact that on a 3rd bromination IV takes up no more Br. The Br content of the above compds. gives for the min. mol. wt. of the lignin in acetylated wood an av. value of 690 (± 40), while recent direct detns. have given values around 800. Furthermore, in passing from wood to IV there is a loss of 12.5%, occurring chiefly in the acetylation, and as it is possible that this loss may consist in the splitting off of a building stone of the lignin mol., the concordance between the mol. wts. obtained in the 2 ways is even better. *C. A. R.*

Conversion of hydroaromatic into aromatic compounds. III. 3,5-Dichloro-1-phenyl- $\Delta^{2,4}$ -cyclohexadiene and its behavior with chlorine. LEONARD E. HINKEL AND DONALD H. HEY. Univ. Coll., Swansea. *J. Chem. Soc.* 1928, 2786-91; cf. *C. A.* 22, 2927.—Phenyldihydroresorcinol (94 g.) in 200 cc. dry CHCl_3 , gradually treated with 220 g. PCl_5 , gives 70 g. 3,5-dichloro-1-phenyl- $\Delta^{2,4}$ -cyclohexadiene (I), b_{10} 156°, and some 3,5- $\text{Cl}_2\text{C}_6\text{H}_3\text{Ph}$ (II), m. 36°. I and Cl (cooling) give mainly II; when Cl is passed into I in hot CHCl_3 there results a mixt. of II and 2,3,5- $\text{Cl}_3\text{C}_6\text{H}_2\text{Ph}$ (III). Nitration of II in AcOH gives the 4'- NO_2 deriv., pale yellow, m. 146°, and the 2'- NO_2 deriv., m. 75°. The 4'- NH_2 deriv., m. 124° (*Ac deriv.*, m. 188°); the 2'- NH_2 deriv., m. 74° (*Ac deriv.*, m. 163°). The 4'- NH_2 deriv., through the diazo reaction, gives 3,5,4'-trichlorodiphenyl, m. 88°; 3,5,2'-tri-Cl deriv., pale yellow, m. 58°. Nitration of III gives the 4'- NO_2 deriv., yellow, m. 155°. *C. J. WEST*

Use of chromium powder in organic syntheses. SACHINDRA NATH CHAKRABARTY AND SIKHIBHUSAN DUTT. *J. Indian Chem. Soc.* 5, 513-8(1928).—The use of metallic Cr in a no. of org. syntheses in which metals such as Na, Cu, Ag, Zn, Hg and Al are generally used has been studied. Cr behaves in a similar manner to Al (see *C. A.* 22, 4508) in most of the reactions studied, but its action is less vigorous and yields are lower. Cr does not react with org. Br or I compds. Successful results were obtained with org. Cl compds. in which the Cl is quite labile. Freshly powd. Cr is much more reactive than old powd. Cr. The activity of the latter however can be renewed by heating to red heat in a current of pure H. Successful reactions tried were: Zinc, Friedel-Crafts' and Ullmann's. Cr cannot be used in Reformatski's or Gattermann's synthesis, nor as a neutral reducing agent. *FREDERICK C. HAHN*

The constitution of high polymers. XIII. H. STAUDINGER. *Ber.* 61B, 2127-31 (1928).—The phys. properties of high polymers are det'd. by the length of the principal-valence chain in the mol., the chem. properties by the nature of the end-standing

groups. The length of the chain may be much greater than that deduced from the unit cell obtained by x-ray analysis.

DAVID DAVIDSON

Polymerization. I. Polymerization of styrene. NICHOLAS A. MILAS. Princeton Univ. *Proc. Natl. Acad. Sci.* **14**, 844-9(1928).—The rate of oxidation of styrene (I) at 110° falls off rapidly because of polymerization which is probably caused by the energy liberated in the oxidation. BzO_2H accelerates both oxidation and polymerization. Anthracene, while allowing the primary oxidation of I to proceed, inhibits the oxidation of the primary oxidation products (BzH and CH_2O) and also the polymerization of I. The anthracene itself suffers induced oxidation to anthraquinone. D. D.

The mobility of various halogen atoms. II. A. ANGELI AND R. POGGI. *Atti accad. Lincei* **7**, 966-9(1928).—The similarity in behavior of MeOCH_2Cl and $\text{MeO-C}_6\text{H}_4\text{CH}_2\text{Cl}$ is already known, both losing HCl readily, either in H_2O or EtOH , also neither reacts with Mg (Grignard reagent). This is probably due to the labile condition of the Cl atom; when there is a group in the *o*- or *p*-positions as in 3,4- or 3,6- $\text{O}_2\text{N}(\text{C}_6\text{H}_4)_2\text{C}_6\text{H}_3\text{CH}_2\text{Br}$, the halogen is stable. This also explains the resistance to heating of certain diazonium salts, as *o*- $\text{MeOC}_6\text{H}_4\text{N}_2\text{Cl}$. Chlorotrianiisylmethane, however, again has a labile Cl atom as its constitution, $\text{MeOC}_6\text{H}_4\text{C}(\text{C}_6\text{H}_4\text{OMe})_2\text{Cl}$, indicates. In a stoppered bottle the latter slowly changes to a red vitreous mass with liberation of HCl gas (pressure formation). The similar product $\text{MeOC}_6\text{H}_4\text{CH}_2\text{Cl}$ also resinifies, losing HCl . The analysis of the product agrees with the empirical formula $(\text{C}_{15}\text{H}_{14}\text{O}_2)_n$, i. e. $2\text{MeOC}_6\text{H}_4\text{CH}_2\text{Cl} = \text{C}_{15}\text{H}_{14}\text{O}_2 + \text{HCl} + \text{MeCl}$. The polyhydroxymethylenes and Balchite are formed similarly from HCHO and salicylic acid, HOCH_2OH and $\text{HO-C}_6\text{H}_4\text{CH}_2\text{OH}$, which have this "labile" constitution. A. W. CONTIERI

Pentanitroaniline. BERNHARD FLÜRSCHHEIM AND ERIC L. HOLMES. *J. Chem. Soc.* **1928**, 3041-6.—3,5-(O_2N) $_2\text{C}_6\text{H}_3\text{NH}_2$ (I) (1 vol.) in 20 vols. of oleum (5% SO_3) and 15 vols. of HNO_3 (d. 1.52) is heated at 70-5° for 3 hrs. without stirring and the product crystal from C_6H_6 , giving *pentanitroaniline* (II), crystg. with 1 C_6H_6 , golden yellow, m. 192°. 3 g. I gives 1.5 g. II; 4.5 g. of the Ac deriv. give only 0.6 g. II. II in Me_2CO , shaken with excess of aq. AcONa , or heated on the H_2O bath with satd. Na_2CO_3 , gives 2,4,6-trinitro-5-aminoresorcinol (III), deep yellow, m. 236.7°. II and 10% aq. KOH transform II into 2,4,6-trinitrophenol (IV), m. 167°. II, refluxed with dry MeOH for 24 hrs., gives the *di-Me ether* of III, lemon-yellow, m. 127.5°; the *di-Et ether*, yellow, m. 127.5°. II and 10% NH_4OH give 2,4,6,1,3,5- $\text{C}(\text{NO}_2)_6(\text{NH}_2)_2$, which has been reduced to a hexaminobenzene, m. 255° (decompn.), whose hexa-Ac deriv. does not m. 30°. It also forms a tripicrate and a tetra- HCl salt. II, boiled with Ac_2O and concd. H_2SO_4 gives a compd., m. 147-7.5°, which may be a tetranitrodiaacetaminophenol. Tetranitroacetanilide, yellow, m. 169° (decompn.). Approx. soly. data for II are given. C. J. WEST

Chlorination of anilides. V. The significance of velocity measurements in relation to the problem of benzene substitution. ALAN E. BRADFELD AND BRYNMOR JONES. Univ. Coll. of North Wales. *J. Chem. Soc.* **1928**, 3073-81; cf. *C. A.* **22**, 2371.—The original should be consulted for the math. discussion under the heads: critical energy measurements for the reactions of *p*-disubstituted benzenes; phase and steric factors; structure and reactivity. *p*-Isobutoxybenzoic acid, m. 136.5°. *p*-Chlorophenyl isobutyrate, b_p 95.7°, n_D^{25} 1.5000. The velocity coeff. for the chlorination of addnl. samples at 20° and for the 2 ethers are given. C. J. WEST

Nitration of *o*-bromoacetanilide. CHARLES S. GIBSON AND JOHN DOBNEY A. JONES. Univ. of London. *J. Chem. Soc.* **1928**, 3092-3. Nitration of 204 g. *o*- $\text{Br-C}_6\text{H}_4\text{NHAc}$ according to Frazer and Engel (*C. A.* **15**, 3633) gives 66 g. 2,4- $\text{Br}(\text{O}_2\text{N})_2\text{-C}_6\text{H}_3\text{NHAc}$ and 80 g. 2,6- $\text{Br}(\text{O}_2\text{N})_2\text{C}_6\text{H}_3\text{NHAc}$. C. J. WEST

Some substitution products of azobenzene. JAMES BURNS, HAMILTON MCCOMBIE AND HENRY A. SCARBOROUGH. Univ. of Cambridge. *J. Chem. Soc.* **1928**, 2928-36.—Nitration of 5 g. of 4- $\text{MeC}_6\text{H}_4\text{N}:\text{NPh}$ with HNO_3 of d. 1.5 below 5° for 2 hrs. gives 55% of *nitro deriv.*, deep red, m. 183°, also obtained from *p*- $\text{O}_2\text{NC}_6\text{H}_4\text{NH}_2$ and *p*- $\text{MeC}_6\text{H}_4\text{NO}$. *4'-Br deriv.*, orange, m. 152°. PhNO and 4,2- $\text{H}_2\text{N}(\text{O}_2\text{N})\text{C}_6\text{H}_3\text{Me}$ give 3-nitro-4-methylazobenzene, golden, m. 105°; 3-*Br deriv.*, yellow, m. 84°. 4- $\text{MeC}_6\text{H}_4\text{N}:\text{NPh}$ and 80 cc. 10% Br-AcOH contg. 4 g. AcONa , heated 8 hrs., gives 1 g. *α-Br deriv.*, red, m. 115°. Nitration of 3- $\text{MeC}_6\text{H}_4\text{N}:\text{NPh}$ with HNO_3 of d. 1.5° below 5° for 90 min. gives the 4,4'-*dinitro deriv.*, bright red, m. 183°. Br-AcOH gives the 4-*Br deriv.*, light yellow, m. 69°. 4,4'-*Dinitro-2-methylazobenzene*, dark red, m. 220°. 2- $\text{MeC}_6\text{H}_4\text{N}:\text{NPh}$ and 10% Br-AcOH give a compd. $\text{C}_{15}\text{H}_{12}\text{N}_2\text{Br}_2$, m. 210°. 4- $\text{ClC}_6\text{H}_4\text{N}:\text{NPh}$, Br and FeCl_3 give the 4'-*Br deriv.*, bright yellow, m. 195°; 4,4'-*di-Cl deriv.*, light yellow, m. 188°; oxidation with hyperol gives 4,4'-*dichloroazoxybenzene*, light straw-colored, m. 157°. 4-*Chloro-4'-nitroazobenzene*, red, m. 169°; 3-*Cl deriv.*, red,

m. 129°. 3-Chloro-4'-bromoazobenzene, deep yellow, m. 128°. 3-Bromo-4-methoxyazobenzene, yellow, m. 78°. 2-Bromo-4-nitroaniline, m. 108°. 3,4'-Dibromo-4-methoxyazobenzene, light yellow, m. 123°, from $p\text{-BrC}_6\text{H}_4\text{NO}$ and $2,4\text{-Br}(\text{H}_2\text{N})\text{C}_6\text{H}_3\text{OMe}$. $4\text{-MeOC}_6\text{H}_4\text{N:NPh}$, 30% Br-AcOH and AcONa give the 3,4',5-tri-Br deriv., yellow, m. 130°. 3,5-Di-Cl deriv., yellow, m. 98°. HBr splits off the Me group, giving 3,5-dichloro-4-hydroxyazobenzene, brown, m. 116°. 3,4'-Dinitro-4-methoxyazobenzene, bright red, m. 190°, from $4\text{-MeOC}_6\text{H}_4\text{N:NPh}$ and KNO_3 in H_2SO_4 . 3-Chloro-4-acetaminobenzene, orange, m. 134°; the 4-amino deriv., deep yellow, m. 99.5°. Reduction of 3 $\text{ClC}_6\text{H}_4\text{N:NPh}$ gives 2-chlorobenzidine, m. 113°. $4\text{-H}_2\text{NC}_6\text{H}_4\text{N:NPh}$, 10% Br in AcOH and AcONa give 3,5-dibromo-4-aminoazobenzene, light yellow, m. 168°; through the diazo reaction there results 3,5-dibromoazobenzene, dark red, m. 104°; reduction with SnCl_2 and NaOH in EtOH gives 3,5-dibromohydrazobenzene, m. 114°, while reduction in EtOH-HCl gives 2,6-dibromobenzidine, m. 185°. C. J. WEST

Interaction of chloral and 2,4,6-trihalogen-substituted phenylhydrazines. FREDERICK D. CHATTAWAY AND FRANCIS G. DALDY. Queen's College, Oxford. *J. Chem. Soc.* **1928**, 2756-62.— $\text{Cl}_3\text{CCHO} \cdot \text{H}_2\text{O}$ (9 g.) and 13.5 g. $2,4,6\text{-Cl}_3\text{C}_6\text{H}_2\text{NHNH}_2 \cdot \text{HCl}$ in 1000 cc. H_2O contg. 20 cc. HCl, heated nearly to boiling, give α, α -dichloro- β -2,4,6-trichlorobenzeneazoethylene (I), deep crimson, m. 54°; the normal hydrazone is an intermediate product but is very unstable and loses HCl rapidly at room temp., giving I; this elimination of HCl is a reversible reaction, for when I in Ac_2O is satd. with HCl at 80°, there results chloral- α -2,4,6-trichlorophenylhydrazone (II), m. 144°. I is also formed from the components in AcOH and AcONa, but if the AcONa is omitted there results glyoxylic acid 2,4,6-trichlorophenylhydrazone (III), pale yellow, m. 167°, also obtained from glyoxylic acid and $2,4,6\text{-Cl}_3\text{C}_6\text{H}_2\text{NHNH}_2 \cdot \text{HCl}$ in boiling H_2O ; the formation of III is due to the hydrolysis of the CCl_3 group, which is a much slower reaction than the elimination of HCl. The initial reaction in EtOH gives I but on further heating there results the Et ester (IV) of III, pale yellow, m. 97.5°, also obtained by the esterification of III and by boiling I with EtOH for 8 hrs. or with EtOH-HCl for 1 hr. Cl and I in AcOH (cooling) give chloral- ω -chloro-2,4,6-trichlorophenylhydrazone, yellow, m. 104°; if the soln. is boiled, HCl is evolved, giving α, α, β -trichloro- β -2,4,6-trichlorobenzeneazoethylene (V), bright red, m. 75°. Br gives the corresponding α, α -dichloro- β -bromo deriv., brick-red, m. 108.5°. IV in Ac_2O contg. a drop of H_2SO_4 gives the α -Cl deriv., m. 112.5°. Cl and IV in AcOH give the ω -Cl deriv. (VI), m. 73.5°, also obtained by boiling V in EtOH for 8 hrs. The corresponding α -Br deriv. (VII), m. 75°. III and Cl in AcOH give the ω -Cl deriv., yellow, m. 151.5°. $2,4,6\text{-Cl}_3\text{C}_6\text{H}_2\text{N}_2\text{Cl}$ and $\text{AcCH}_2\text{CO}_2\text{Et}$ in EtOH-AcONa give Et 2,4,6-trichlorobenzeneacetate, yellow, m. 94.5°, with Cl and Br this yields VI and VII, resp. With $2,4,6\text{-Br}_3\text{C}_6\text{H}_2\text{NHNH}_2$ the following compds. were prepd.: α, α -dichloro- β -2,4,6-tribromobenzeneazoethylene, crimson, m. 92°; α, α, β -tri-Cl deriv., deep red, m. 105°; α, α -dichloro- β -bromo deriv., deep red, m. 115°; glyoxylic acid 2,4,6-tribromophenylhydrazone, pale yellow, m. 170.5° (decomposes); Et ester, pale yellow, m. 126° (α -Cl deriv., m. 133.5°; ω -Cl deriv., m. 108.5°; β -Br deriv., m. 102.5°); Et 2,4,6-tribromobenzeneacetate, yellow, m. 96.5°. C. J. WEST

Dependence of rotatory power on chemical constitution. XXXIII. The resolution of *dl*-*m*-carboxyphenyl ethyl sulfoxide and of *dl*-*m*-carboxyphenylethylsulfine-*p*-toluenesulfonylimine. JOSEPH HOLLOWAY, JOSEPH KENYON AND HENRY PHILLIPS. Battersea Polytechnic. *J. Chem. Soc.* **1928**, 3000-6. *m*-Ethylmercaptobenzoic acid (I), m. 99-100°, on oxidation with HNO_3 gives *dl*-*m*-carboxyphenyl Et sulfoxide, m. 104-6°. The *d*-isomer, m. 71°, $[\alpha]_{546}^{25}$ 236° (CHCl_3 , c 2), is obtained by crystn. of the brucine salt, m. 125-6°, $[\alpha]_{546}^{25}$ 69° (CHCl_3 , c 2.145). The *l*-isomer was obtained through the quinidine salt, m. 198-9°, $[\alpha]_{546}^{25}$ 102° (CHCl_3 , c 1.25). *m*-Carboxyphenyl Et sulfone, m. 162-4°. *m*-Carboxyphenyl Et sulfide dibromide, yellowish red, m. 102°. The action of chloramine-T on I gives *dl*-*m*-carboxyphenylethylsulfine-*p*-toluenesulfonylimine, m. 149°; through the brucine salt, m. 161°, $[\alpha]_{546}^{25}$ -157°, $[\alpha]_{4359}^{25}$ -287°, there results the *l*-isomer, m. 149-50°, $[\alpha]_{546}^{25}$ 368° (EtOH, c 2.543); through the strychnine salt, m. 174°, $[\alpha]_{546}^{25}$ 152° (EtOH, c 0.9566) there results the *d*-isomer: cinchonidine salt, m. 198-9°, $[\alpha]_{546}^{25}$ 50° (CHCl_3 , c 1.050). The rotation of these 2 optically active compds. is given for several solvents and various wave lengths. C. J. WEST

Influence of sulfonic acid groups and other substituents on the color of trisazo dyes. HANS DINNER. *Z. angew. Chem.* **41**, 1078-83(1928).—The introduction of a SO_3H group in all cases gives a positive color change, the change becoming smaller the more SO_3H groups are present. Introduction of a 2nd SO_3H into the diazo component gives a very small positive change. SO_3H in the *p*-position to the azo group is more effective than in *o* or *m*, except in some cases where *m* is just as effective. The light

absorption max. of *o*-sulfanilic (I), metanilic (II) and sulfanilic acid dyes (III) lie near one another, but that for III is shoved more toward the red. The influence of the position of the SO_3H is greater than that of the no. thereof. The fastness to light increases with the introduction of SO_3H groups, I being more effective than II. Dyes from 2,4-anilinedisulfonic acid are faster than those from the 2,5-acid. Dyes contg. benzene derivs. as one component and C_{10}H_8 derivs. as the other are faster to light than dyes contg. benzene derivs. as both components. Substitution of Ph in the NH_2 of J-acid gives a positive color change, increase in light fastness and affinity for cotton, and a decrease in soly. of the dye. Introduction of Me gives a positive or negative color change depending on its position and an increase in light fastness. Alkoxy gives a positive color change, and improvements or very slight decreases in light fastness.

FREDERICK C. HAHN

Organic acids and bases in non-aqueous solutions. IV. Phenols and amines. F. HÖLZL. *Monatsh.* 50, 291-309 (1928); cf. *C. A.* 21, 3188. Compd. formation between phenols and amines was studied by elec. cond. in abs. alc. The phenols studied were PhOH , *o*-, *m*- and *p*- $\text{C}_6\text{H}_4(\text{OH})_2$; the amines were NH_3 , NH_2Et , NHEt_2 , NEt_3 , $(\text{CH}_3\text{NH}_2)_2$, PhCH_2NH_2 , PhNH_2 , *p*- $\text{MeC}_6\text{H}_4\text{NH}_2$, *o*-, *m*- and *p*- $\text{C}_6\text{H}_4(\text{NH}_2)_2$. Compds. are indicated in nearly all cases except with *o*- and *m*- $\text{C}_6\text{H}_4(\text{NH}_2)_2$. G. B. TAYLOR

Phenols from anthracite tar. HORST BRÜCKNER. *Z. angew. Chem.* 41, 1043-6 (1928). B isolates the homologs of PhOH from a 20 kg. sample of crude industrial anthracite tar by the following process. The phenols are first sulfonated, then treated with superheated steam, fractions being taken while the temp. is gradually increasing. By taking advantage of the different solubilities of the homologous phenolates in 25% NaOH , and of the Na salt of the acylglycolic acids of the phenols ($\text{RO}-\text{CH}_2\text{COONa}$) in water, the fractions obtained by steaming are reduced into their constituents.

Decomposition temp. of the phenol sulfonic acid homologs	Soly. of the Na phenolate in 25% NaOH	Soly. of the Na salt of the acylglycolic acid of the phenol	Additional sepn	Phenol.
140	Easily sol. Easily sol. Almost insol.	Almost insol. Almost insol. Almost insol.	<i>o</i> - and <i>p</i> Ethyl phenols may be sepd by means of the Ba salt of their sulfonic acids	<i>o</i> -Ethylphenol <i>p</i> -Ethylphenol 1,3,5-Xylenol,
107-111°	Easily sol.	Almost insol.		1,2,4-Xylenol
115-9	Easily sol. Almost insol.	Almost insol. Almost insol.		<i>m</i> -Cresol
			The mixt. is sulfonated, dild. with H_2O , poured into a cold KCl soln. The K salt of 1,4,2-xylenolsulfonic acid crystallizes out	1,2,3-Xylenol 1,4,2-Xylenol
120-4	Easily sol.	Easily sol.		1,3,4-Xylenol
	Easily sol.	Almost insol.		Phenol
124-8°	Easily sol.	Almost insol.		<i>m</i> -Ethylphenol
	Easily sol.	Almost insol.		1,3,2-Xylenol
132-6°	Easily sol.	Easily sol.		<i>o</i> -Cresol
	Easily sol.	Almost insol.		<i>p</i> -Cresol

A. L. HENNE

Hydroxythiophenols. I. JAKOB POLLAK AND EUGEN RIESZ. *Monatsh.* 50, 251-62 (1928). Hydroxythiophenols are of interest as intermediate products in the prepn. of S contg. dyestuffs; they can be readily obtained by the reduction of the hydro-sulfochlorides from chlorosulfonic acids. (With RUDOLF FEIKS.) Reduction of 20 g. of *o*-cresoldisulfonyl chloride in Me_2CO with Zn and H_2SO_4 gives 8 g. of *dimercapto-o-cresol*, m. 51°. FeCl_3 gives a red-violet color; $\text{Ph}(\text{OAc})_2$ ppts. a yellowish red Pb salt, *tri-Bz deriv.*, m. 96°; *dipicryl deriv.*, orange-red, decmps. explosively on heating, and with KOH in EtOH yields a phenoxthin deriv. Reduction of the sulfonyl chloride with Zn and Ac_2O in AcOH AcONa gives a pale yellow oil, probably the tri-Ac deriv. *Dimercapto m-cresol*, m. 69° (9 g. from 20 g. sulfonyl chloride); *tri-Bz deriv.*, m. 120°; *dipicryl deriv.*, orange-yellow, which yields with KOH the compd. $\text{C}_{24}\text{H}_{14}\text{O}_{10}\text{N}_4\text{S}_4$, dark red, which may be a *disulfide* of 2,4-dinitro-7-methyldibenzophenoxthin-6-mercaptan. Reduction with Zn and Ac_2O in AcOH - AcONa gives the *tri-Ac deriv.*, m. 56°. *Tri-mercapto m-cresol*, yellow, m. 35-6°; *tetra Ac deriv.*, m. 76°. (With FRANZ PILPEL.) *Dimercapto p-cresol*, m. 48°; *tri-Mc deriv.*, m. 77°; *tri-Ac deriv.*, m. 98°; *tri-Bz deriv.*,

m. 138°; *dicarboxymethyl deriv.*, m. 139°; *dipicryl deriv.*, yellow, decomp. 109°. *Dimercaptosorcinol* is oily and was analyzed as the *Pb salt*; the *tetra-Me deriv.*, m. 83-6°; the *dicarboxymethyl deriv.*, m. 174°; the *tetracarbethoxy deriv.*, m. 81°; the *dipicryl deriv.*, yellow, decomp. on heating, and with KOH gives the *tetranitrodiphenoxthin deriv.*, dark red, decomp. above 280°; *tetra-Ac deriv.*, m. 136-8°. The *trimercaptosorcinol* is also oily and was analyzed as the *Pb salt*; *penta-Ac deriv.*, m. 105-10°.

C. J. WEST

The directive action of the carbethoxy group in phenols. ERICH GEBAUER-FÜLNEGG AND JOHN SMITH-REESE. Univ. Wien. *Monatsh.* 50, 231-4(1928).—When the CO_2Et group is used to protect the phenolic group in nitrations, substitution in the *o*-position is decreased and that in the *p*-position is increased. PhOCO_2Et (9.5 g.) and AcNO_3 (5 cc.), cooled with ice-salt, and the product sapond. with NaOH , gives 0.5 g. *o*- and 1.6 g. *p*- $\text{O}_2\text{NC}_6\text{H}_4\text{OH}$. The use of BzNO_2 likewise gives a greater amt. of the *p*- than the *o*- NO_2 isomer, while with PhOMe , there results 85% of the *o*- NO_2 deriv. and PhOH gives an excess of the *o*- NO_2 deriv. Nitration with H_2SO_4 and KNO_3 is not suitable for PhOMe ; PhOCO_2Et gives only 20% of NO_2 derivs., but here, also, the *p*-isomer predominates.

C. J. WEST

Chemical examination of salyrgan. GEORGE W. COLLINS. Chem. Lab. Am. Med. Assoc. *J. Am. Med. Assoc.* 91, 1994-5(1928).—Salyrgan appears to be a $\text{Na}\{o\text{-}[\gamma\text{-(hydroxymethyl)-}\beta\text{-methoxypropylcarbamyl}]\text{phenoxy}\}\text{acetate}$, a definite chem. compd. $\text{NaO}_2\text{CCH}_2\text{OC}_6\text{H}_4\text{CONHCH}_2\text{CH}(\text{OMe})\text{CH}_2\text{HgOH}$. The presence of the MeO group and the radical HgOH , as claimed by the H. A. Metz labs., was sustained. The formula generally given in German literature contg. the acetoxymercuri group appears incorrect. While the product contains moisture, there is no evidence that the H_2O is combined as water of crystn.

L. W. RIGGS

Sulfur-containing derivatives of *p*-dichlorobenzene. ERICH GEBAUER-FÜLNEGG AND ERIKA NEUMANN. Univ. Wien. *Monatsh.* 50, 235-6(1928).—The dichloronitrobenzenesulfonyl chloride, m. 59-60°, prepd. by G.-F. and Figdor (*C. A.* 22, 1148), on heating with KOH, gives the *di-K salt* of 1-chloro-3-nitro-4-phenol-5-sulfonic acid, orange leaflets with 1 mol. H_2O (dil. H_2SO_4 in EtOH gives a *mono-K salt*, anhyd. needles) and the *K salt* of 1,4-dichloro-3-nitrobenzene-5-sulfonic acid, less deeply colored leaflets.

C. J. WEST

Acylation of diazomethane. Effects of variations in the conditions on the extent of formation of chloroacetophenone from benzoyl chloride. WM. BRADLEY AND GEROLD SCHWARZENBACH. Univ. of Manchester. *J. Chem. Soc.* 1928, 2904-12.—The reactions involved in the addn. of 1 mol. RCOCl to 2 mols. CH_2N_2 in Et_2O are: $\text{RCOCl} + \text{CH}_2\text{N}_2 = \text{RCOCHN}_2 + \text{HCl}$ (I); $\text{CH}_2\text{N}_2 + \text{HCl} = \text{MeCl} + \text{N}_2$ (II); $\text{RCOCHN}_2 + \text{HCl} = \text{RCOCH}_2\text{Cl} + \text{N}_2$ (III); reactions I and II occur almost to the exclusion of side reactions such as III. Nierenstein (*C. A.* 22, 3389) believes that RCOCH_2Cl may be obtained in high yield by adding the CH_2N_2 to the RCOCl . This suggestion cannot be confirmed and under all conditions PhCOCHN_2 is found to be the principal product of the reaction of CH_2N_2 and BzCl . Of the 3 reactions given above, II is far more rapid than III, which, however, is a facile reaction. II is also more rapid than I, but not to such an extent that BzCl in excess is unable to compete effectively with HCl for the CH_2N_2 that enters the system. When CH_2N_2 is in excess reactions I and II greatly predominate; when BzCl is in excess, I is still the primary reaction but the relatively diminished concn. of CH_2N_2 permits reaction III to occur to a small extent. Under ordinary conditions of rapid addn. or gradual addn. during a period of 25 min., the action of 1 mol. CH_2N_2 on 1 mol. BzCl gives only 10-13% of PhCOCH_2Cl , while the yield of PhCOCHN_2 is approx. 50%. This yield is maintained whether the solvent is dried by P_2O_5 or CaCl_2 and whether the product is isolated after a few min. or several hrs. Heating the product previous to isolation entails the loss of cryst. BzCH_2Cl without increasing the proportion of chloroacetophenone. PhCH_2COCl and CH_2N_2 in Et_2O at -10° give a viscous oil, which decomp. at 90-100° with evolution of N and reacts with *p*- $\text{O}_2\text{NC}_6\text{H}_4\text{CO}_2\text{H}$ to give *p*-nitrobenzoyloxymethyl benzyl ketone, m. 120°. *p*- $\text{O}_2\text{NC}_6\text{H}_4\text{COCl}$ and CH_2N_2 give *o*-diazo-*p*-nitroacetophenone, m. 116-7°; rapid loss of N occurs at 120-5°; warming in AcOH gives *p*-nitro-*o*-acetoxyacetophenone, yellow, m. 121-2°. *o*-Diazo-3,4-diacetoxyacetophenone, lemon-yellow, m. 76-7°; HCl in dry Et_2O gives *o*-chloro-3,4-diacetoxyacetophenone, m. 107.5-8°.

C. J. WEST

Some aromatic hydroxymethylene ketones and their derivatives. ERICH BENARY. *Ber.* 61B, 2252-5(1928).—In connection with the synthesis of pyridine ketones from hydroxymethylene ketones with AcONH_4 and AcOH (*C. A.* 21, 2130) some other aromatic hydroxymethylene ketones were also studied in this respect. Whereas $\text{PhCOCH}_2\text{CHOH}$ gave a mixt. of pyridine ketone and imino compd. its nucleus-substituted de-

rivs. gave only imino compds. with but traces, at most, of basic substances. The new ketones are cryst. and quite stable; the *p*-Br and *p*-Cl derivs. can be titrated as enols by the Meyer Br method. *Hydroxymethylene-p-bromoacetophenone*, from $\text{BrC}_6\text{H}_4\text{COME}$ and HCO_2Et slowly added to Na in cold abs. Et_2O , yellow, m. $71-2^\circ$, gives a red color in alc. with FeCl_3 ; *Cu salt*, green, decomp. about 268° ; *anilide*, yellow, m. 178° . *1-Phenyl-5(3)-p-bromophenylpyrazole*, from the ketone and PhNHNH_2 on the H_2O bath, silvery leaflets, m. 127° . *Iminobisformyl-p-bromoacetophenone*, from the ketone in Et_2O allowed to stand several days with a satd. soln. of AcONH_4 in glacial AcOH , yellow, m. 217° . *Hydroxymethylene-p-chloroacetophenone*, light yellow, m. $48-9^\circ$ gives an intense red color with FeCl_3 in alc.; *anilide*, greenish yellow, m. $163-4^\circ$. *Iminobisformyl-p-chloroacetophenone*, yellow, m. 204° . *1-Phenyl-5(3)-p-chlorophenylpyrazole*, m. 118° . *Hydroxymethylene-m-nitroacetophenone*, light yellow, m. 85° (yield, very small), gives a red color with FeCl_3 in alc.; *anilide*, light yellow, m. 151° ; *imino deriv.*, yellowish, m. $215-6^\circ$. *Hydroxymethylene-m-cyanoacetophenone*, light yellow, m. $103-4^\circ$, gives a deep red color with FeCl_3 in alc.; *imino deriv.*, light yellow, m. 165° . *Iminobisformylmethyl p-tolyl ketone* (with KURT CHARISIUS), m. $155-6^\circ$, shows yellow-green fluorescence in concd. H_2SO_4 ; *iminobisformyl-p-methoxyacetophenone*, m. $188-9^\circ$.

C. A. R.

"Oxidizing" actions of the alkalis. I. GUNTHER LOCK. Techn. Hochschule Wien. *Ber.* 61B, 2234-40 (1928).—Unlike BzH itself, its HO derivs. are so difficultly oxidized that often HO groups are introduced into the nucleus before the CHO group is oxidized to CO_2H , while fusion with alkalis affords a practicable method of converting aromatic HO aldehydes into the acids. This, however, is true only of the free HO aldehydes; their alkyl ethers, like BzH , undergo the Cannizzaro reaction. Earlier investigators have reported that *o*- $\text{HOC}_6\text{H}_4\text{CHO}$ can be converted into the acid only by fusion with KOH and that H is evolved in the process but they do not describe the exptl. conditions. I. has found that the KOH reacts quite rapidly even at $105-10^\circ$ (bath temp.) with $\text{KOC}_6\text{H}_4\text{CHO}$, converting it quant. into $\text{KOC}_6\text{H}_4\text{CO}_2\text{K}$ with evolution of 1 mol. H_2 (detd. as H_2O). That there is not first a Cannizzaro reaction, the $\text{KOC}_6\text{H}_4\text{CH}_2\text{OH}$ then reacting according to the equation $\text{KOC}_6\text{H}_4\text{CH}_2\text{OH} + \text{KOH} = \text{KOC}_6\text{H}_4\text{CO}_2\text{K} + 2\text{H}_2$, was indicated by the results of a control expt. under the same conditions with a mixt. of $\text{KOC}_6\text{H}_4\text{CH}_2\text{OH} + \text{KOH}$. H_2O in the KOH facilitates the reaction by making possible intimate mixing by lowering the m. p., but its presence is not essential; the oxidation also takes place when H_2O is excluded with the utmost care. NaOH and LiOH react in the same way but higher temps. are required (130° and 150° , resp.). Even Ba(OH)_2 dehydrated at 120° can effect the oxidation. NaNH_2 could not be made to react with $\text{KOC}_6\text{H}_4\text{CHO}$. Dissociation of H_2O into H_2 and O at 110° cannot explain the reaction, which is not a true oxidation but a dehydrogenation replacement of the H of the CHO group by the KO residue.

C. A. R.

The degradation of acid azides by the Curtius method. HANS LINDEMANN. *Helv. Chim. Acta* 11, 1027-8 (1928).—The expression "a modified Curtius degradation" employed by Naegeli and Stefanovitch (cf. *C. A.* 23, 113) is not justified since their modification is nothing more than the employment of a different method for the prepn. of the starting product (*viz.* the azide); N. and S. are also in error in the statement that azides prepd. from the chlorides "have never before been employed for the purpose of a Curtius degradation" (cf. *C. A.* 19, 2824; Abderhalden, *Handb. d. Biol. Arbeitsmethoden*, I, pt. 2, 1273 (1927)). The usual method (concd. HCl in sealed tubes or distn. with alk. earth oxides) of converting azides to amines with urethans and ureas as intermediates is often impossible but in some cases it is possible to accomplish the desired result by heating on the water bath with dil. acids, especially AcOH . Thus, 2,4,3,5- $\text{ClMe}(\text{ONa})\text{C}_6\text{HCON}_3$ (5 g.) (prepd. from the corresponding acid chloride and NaN_3 in aq. Me_2CO) when heated on the water bath with 100 cc. 50% AcOH until N_2 evolution ceases, then filtered and cooled, yields 3,5-dinitro-2-chloro-4-methylaniline, yellow, m. 173° ; similarly indoxazene-3-carboxylic azide yields the acetate of 3-aminoindoxazene from which the free base, $\text{C}_7\text{H}_5\text{ON}_2$, is obtained by neutralization with Na_2CO_3 ; the base crystals from H_2O in needles, m. 110° .

N. A. LANGE

o-Sulfinobenzoic acid. WM. B. PRICE AND SAMUEL SMILES. King's Coll., London. *J. Chem. Soc.* 1928, 2858-63.—*o*-Sulfinobenzoic acid (I) yields a dichloride, $\text{C}_6\text{H}_4\text{SCl}_2\text{O.CO}$, cream, m. 62° ; with *p*- $\text{O}_2\text{NC}_6\text{H}_4\text{CH}_2\text{OH}$ there results the *p*-nitro-

benzyl *o*-carboxybenzenesulfonate, m. 121° ; hydrolysis gives I and the alc. The K salt of I and *p*- $\text{O}_2\text{NC}_6\text{H}_4\text{CH}_2\text{Br}$ give *o*-carboxyphenyl *p*-nitrobenzyl sulfone, m. 226° , whose *p*-nitrobenzyl ester (II), m. 190° . *m*-Carboxyphenyl *p*-nitrobenzyl sulfone gives a *p*-nitrobenzyl ester, m. 203° . Boiling II with EtONa gives 3-keto-2-*p*-nitrophenyl-2,3-di-

hydrothionaphthene 1,1-dioxide, m. 186°. The K salt of I and $\text{ClCH}_2\text{CO}_2\text{Et}$ give the corresponding 2-carbethoxy deriv. 2-Carboxy-4'-hydroxydiphenyl sulfide, from the dichloride and PhOH , m. 193°; 2',4'-di-HO deriv., m. 190°. $m\text{-C}_6\text{H}_4(\text{OH})_2$ gives bis-2'-carboxyphenyl-2,4-dihydroxybenzene, m. 272°. $\beta\text{-C}_{10}\text{H}_7\text{OH}$ gives *o*-carboxyphenyl 2-hydroxy- α -naphthyl sulfide, m. 237°. The reactions of the dichloride confirm the structure assigned to it.

C. J. WEST

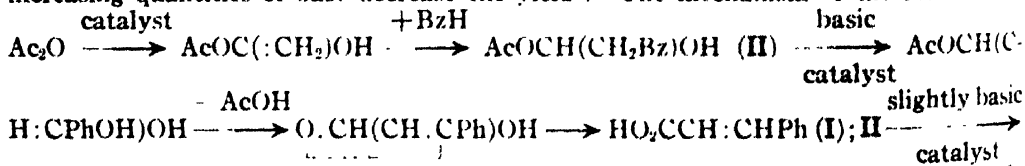
4-Chloro-2-aminobenzoic acid. GUSTAV HELLER AND LUDWIG HESSEL. Univ. Leipzig. *J. prakt. Chem.* 120, 64-73(1928).—Et 4-chloro-2-aminobenzoate, m. 41° (50% yield); Me ester, m. 68.5°; with $\text{N}_2\text{H}_4 \cdot \text{H}_2\text{O}$ the latter gives the hydrazide, m. 151° (95% yield) (*di-Ac* deriv., m. 214°). Heating 5 hrs. at 200° splits off N_2H_4 , giving, *di*-4-chloro-2-aminobenzoic acid]hydrazide, m. 272°. Chloroanthranilic acid (I) and BzCl in $\text{C}_6\text{H}_5\text{N}$ give 4-chloro-2,1-benzoylanthranil (II), m. 198°, and 4-chloro-2-benzoylaminobenzoic acid, m. 219°, changed into II by warming with concd. H_2SO_4 . II and $\text{N}_2\text{H}_4 \cdot \text{H}_2\text{O}$ in EtOH give 6-chloro-3-phenyl-3-hydrazino-2,4-dihydrobenzoxazone, m. 214°, changed by warming in AcOH to 7-chloro-2-phenyl-3-amino-4-quinazolone, m. 198°. I and Ac_2O give 4-chloro-2-acetantranilic acid, yellow, m. 145°; acidification of the alk. soln. gives 4-chloro-2-acetantranilic acid, m. 213°. $\text{N}_2\text{H}_4 \cdot \text{H}_2\text{O}$ gives 7-chloro-2-methyl-3-amino-4-quinazolone. I and KCN in AcOH give 4-chlorophenyl-2-glycinenitrile-1-carboxylic acid, yellow, m. 215° (decompn.); warming with 50% KOH gives the glycine 4,2-Cl($\text{HO}_2\text{CCH}_2\text{NH}$) $\text{C}_6\text{H}_4\text{CO}_2\text{H}$, red, m. 228° (Me ester, m. 189°); Ac_2O and AcONa give 2,2-dichloroindigo.

C. J. WEST

Salts of aromatic nitriles. II. Potassium phenylacetoneitrile. MARY M. RISING, IRVING E. MUSKAT AND EDMUND W. LOWE. Univ. of Chicago. *J. Am. Chem. Soc.* 51, 262-5(1929); cf. *C. A.* 22, 2377.—Details are given of conditions for the prepn. of *K* phenylacetoneitrile from PhCH_2CN and K in dry Et₂O in a N atm. The salt is yellow, is exceedingly sensitive to traces of H_2O and acids, which form HCN; EtI gives $\text{Ph}(\text{CN})\text{CH}_2\text{Et}$. These 2 reactions indicate a nitride structure, $[\text{PhHC}:\text{C}:\text{N}]\text{K}$ and also a carbide form, $[\text{Ph}(\text{CN})\text{HC}]\text{K}$.

C. J. WEST

The mechanism of the Perkin synthesis. PAUL KALNIN. *Helv. Chim. Acta* 11, 977-1003(1928).—The generally accepted mechanism of the Perkin synthesis as proposed by Fittig is erroneous since the condensation as a rule does not occur between the salt and the aldehyde but rather between the acid anhydride and the aldehyde, the salt acts only as a catalyst since it can be replaced entirely by other catalysts such as tertiary bases (quinoline, pyridine, $\text{Et}_3\text{NCH}_2\text{Ph}$, Et_3N , etc.). The catalytic action (a) causes enolization of the acid anhydride, making possible the addn. of the aldehyde to the enolic acid anhydride; (b) enolizes this addn. product which is formed; and (c) splits off a mol. of acid from the enolized addn. product. The effectiveness of the catalyst is directly proportional to the basicity of the catalyst and consequently the yields are adversely affected by the addn. of free acid and the yield of cinnamic acid (I) can be reduced to zero by adding sufficient free acid. Since the effectiveness of the tertiary bases is directly proportional to their basicity the yield of I can be used to det. the relative basicity of a series of bases; the yield also depends upon the quantity of basic catalyst, the quantity of base necessary decreasing with increasing basicity, increasing quantities of base decrease the yields. The mechanism of the reaction is



$\text{AcOH} + \text{OHCCH}_2\text{Bz} \longrightarrow \text{tar and resins}$. The yield of cinnamic acid depends upon the reactivity of the aldehyde H atom and for this reason aldehydes can be replaced by aldehyde-anilines, RCH NPh . Various alkali salts of weak org. acids can replace the usual AcONa and act even more advantageously as catalysts; thus when 20 g. BzH , 30 g. Ac_2O were heated to 180° for 8 hrs. the yields of I based on BzH were: with 11.95 g. AcOK , 72.5%; 8.41 g. K_2CO_3 , 58.9%; 6.46 g. Na_2CO_3 , 40.2%; 10 g. AcONa , 39.3%; 20.1 g. Na_3PO_4 , 36.4%; 10.44 g. K_2SO_3 , 32%; 26 g. K_3PO_4 , 20.4%; 6.72 g. K_2S , 8.4%; 8 g. KCN, 0%; 20.24 g. KI, 0%. The time of reaction can be decreased by a substitution of Na_2CO_3 for AcONa and when K_2CO_3 was substituted for AcONa the time of heating was decreased from 8 hrs. to 15 min.

N. A. LANGE

Addition of halogens to unsaturated acids and esters. II. The addition of "bromine chloride" to phenylpropionic acid. NORMAN WM. HANSON AND THOMAS C. JAMES. Univ. Coll. of Wales. *J. Chem. Soc.* 1928, 2979-85; cf. *C. A.* 22, 3647.

PhC : CCO₂H and a mixt. of BrCl in CCl₄ at 0° in the dark give a mixt. of *trans-chloro- α -bromocinnamic acid*, m. 129°, and the *cis-isomer*, m. 112°; the ratio is approx. 1:4. The lower-melting acid with H₂SO₄ gives *3-chloro-2-bromo-1-ketoindene*, golden yellow, m. 150°; with PhNH₂ the latter gives *2-bromo-3-anilinoindene*, m. 170° (Roser and Haselhoff, *Ann.* 247, 148(1888)); NH₂OH gives the *oxime*, yellow, m. 194° (decompn.); 2-chloro-3-bromo-1-ketoindene gives an *oxime*, m. 184° (decompn.). The *trans-acid* is not changed by H₂SO₄ and from a mixt. of the 2 acids may be recovered after H₂SO₄ treatment and removal of the indene. BrCl reacts with PhC : CCO₂H at a much more rapid rate than either Br or Cl alone, the reaction being of the bimol. type, without an inhibition period. *cis*-PhCCl:CClCO₂H and Cl in CCl₄ give $\alpha,\alpha,\beta,\beta$ -tetrachloro- β -phenylpropionic acid, m. 130°. *cis*-PhCCl:CBBrCO₂H and Cl yield α,β,β -trichloro- α -bromo- β -phenylpropionic acid, m. 127°, and some tetra-Cl deriv. C. J. WEST

Metallic derivatives of hydroxy esters. I. Copper and nickel derivatives of methyl salicylate. BRIAN W. DOAK AND JOHN PACKER. Univ. of New Zealand. *J. Chem. Soc.* 1928, 2763-9.—Cu(AcO)₂·2H₂O (36 g.) in H₂O and 16 g. concd. NH₄OH, added to 50 g. *o*-HOC₆H₄CO₂Me in 5 vols. of 94% EtOH give 67% of *Me cuprisalicylate dihydrate* (I), Cu(OC₆H₄CO₂Me)₂·2H₂O, green, begins to decomp. 115° and may be recrystd from Me₂CO. *In vacuo*, I loses H₂O and *o*-HOC₆H₄CO₂Me, slowly at room temp., more rapidly at 100°, but the hydrolysis is incomplete; when I is heated in the air at 100°, the hydrolysis is also incomplete, owing to the escape of some of the H₂O of crystn. A stream of air, satd. with H₂O, passed over I at 100-5° for 10 days, gives *Me hydroxycuprisalicylate* (II), MeO₂CC₆H₄OCuOH; when dry air is passed over this compd. for 6 days, there results the basic compd. (III), MeO₂CC₆H₄OCuOCu(OH)₂CO₂Me. I, treated with MeOH in a Soxhlet app. until the ext. is colorless, gives *Me methoxycuprisalicylate* (IV), blue, decomp. on heating, decompd. by mineral acids, completely hydrolyzed by boiling H₂O. Treated with wet air at 100° for 4 days and then with dry air for 4 days, there result successively II and III. I and EtOH give a small quantity of HOC₆H₄CO₂Me and Cu(OEt)₂. IV in anhyd. AcOMe contg. the theoretical quantity of *o*-HOC₆H₄CO₂Me gives the anhyd. *Me cuprisalicylate*, green, giving IV with MeOH. *o*-HOC₆H₄CO₂Me, NiCl₂ and NH₄OH give a smaller yield of *Me nickelosalicylate dihydrate* (V), light green. Boiling V with H₂O gives *Me hydroxynickelosalicylate* (VI), dark green. Boiling MeOH or EtOH gives the corresponding *Me methoxy(or ethoxy)nickelosalicylate*. Excess NH₄OH added to the theoretical quantities of NiCl₂ and *o*-HOC₆H₄CO₂Me gives *Me diamminenickelosalicylate*, C₁₆H₂₀O₆N₂Ni, bright purple, hydrolyzed by boiling H₂O to NH₃, HOC₆H₄CO₂Me and VI. C. J. WEST

The glucoside of methyl salicylate of Gaultheria procumbens is the monotropitoside. M. BRIDEL AND S. GRILLON. *Compt. rend.* 187, 609-11(1928).—Me salicylate (I) exists in *Gaultheria procumbens* as a glucoside (II) which is isolated by extn. with alc. in cryst. form, m. 179.5°, α_D^{20} -57.91°. It shows properties identical with monotropitoside. II with concd. H₂SO₄ gives the odor of I; with orcinol and HCl, a violet color characteristic of pentoses; with rhamnodiastase, I and glucose (reducing sugar).

FREDERICK C. HAHN

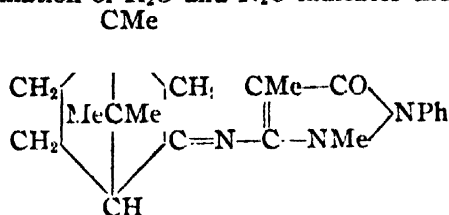
New synthesis of coumarin derivatives. RICHARD WEISS AND EMERICH MERKSAMMER. Univ. Wien. *Monatsh.* 50, 115-22(1928).—W. and Woidich (*C. A.* 21, 1265) prepd from resacetophenone and AcC(CHOEt)CO₂Et (I) a compd. to which they ascribed the formula 3-acetyl-5-resorcylyl- γ -pyrone and which is now shown to be 3,6-diacetyl-7-hydroxycoumarin (II), m. 166-8°. *Me methoxymethyleneacetate*, b. 150°, m. 56-8°, may also be used. Orcacetophenone and I give 3,6-diacetyl-5-methyl-7-hydroxycoumarin, yellow, m. 211-2°; FeCl₃ gives a wine-red color. I and 2,4-(HO)₂C₆H₃Bz give 60% of 3-acetyl-6-benzoyl-7-hydroxycoumarin, yellow, m. 215-7°; FeCl₃ gives a red color. *o*-C₆H₄(OH)₂ and I give 3-acetyl-7-hydroxycoumarin, yellow, m. 236°. The dil. EtOH soln. shows a strong fluorescence; *bromobenzoyl deriv.*, m. 212-4°. NH₄ gives resorcyldiazine, yellow, does not m. 300°, which crystals with H₂O. 1,2,3-C₆H₃(OH)₃ and I give 3-acetyl-7,8-dihydroxycoumarin, brown needles, m. 251-5°. A by-product from the prepn. of II is a compd., C₁₆H₁₄O₆, m. 192-7°. The previously described 5-Bz deriv., m. 180°, is now to be termed 3-benzoyl-6-acetyl-7-hydroxycoumarin. C. J. WEST

Ozonide of nopinene. GEORGES BRUS AND G. PEYRESBLAQUES. *Compt. rend.* 187, 984-6(1928).—The nopinene (I) used b. 162-3°, d_4^{20} 0.8712, n_D^{20} 1.4861. Ozonized O₃ was bubbled through 5 g. I in 30 cc. pure CHCl₃ at 0°. During each 30 min. 2 cc. CHCl₃ was added to keep the concn. const., since the absorption of O₃ decreased in proportion to the evapn. of the solvent. When absorption of O₃ had ceased, the CHCl₃ was evapd. *in vacuo*. The ozonide (II), C₁₆H₁₆O₈, of I was obtained as a colorless, viscous oil which crystd. partially when kept for a long time at 0°. When heated

with 5% KOH or with AcOH, or distd. with steam, II gave H_2O_2 , CH_2O , nopinone (>50% yield) and a small quantity of an unidentified cryst. substance, m. $125-6^\circ$. This is a good method for the prepn. of nopinone.

LOUISE KELLEY

New compounds of camphor with amines. F. ROMAGNOLI. *Ann. chim. applicata* 18, 465-8(1928).—Camphor-2-aminodimethylphenylisopyrazolone, prepd. by heating together pernitrosocamphor and aminoantipyrine, and recrystg. from EtOH, m. 194° . It is very sol. in org. solvents, as well as in mineral acids, insol. in H_2O and alkalis. Its formation with elimination of H_2O and N_2O indicates the formula



A. W. CONTIERI

Diphenyl series. VIII. Derivatives of 2-amino- and 4-aminodiphenyl. FRANK BELL. Wellcome Chem. Res. Labs, London. *J. Chem. Soc.* 1928, 2770-9; cf. *C. A.* 22, 70.—The attempted prepn. of *o*-diphenylene from diazotized $2\text{-H}_2\text{NC}_6\text{H}_4\text{Ph}$ gave only the 2-Cl and 2-azo derivs. $2\text{-AcNHC}_6\text{H}_4\text{Ph}$, AcOH and HNO_3 (d. 1.5) give, if the temp is kept below 30° , the 5- NO_2 deriv., orange, m. 133° ; at higher temps., more highly nitrated products are formed. Hydrolysis gives 5-nitro-2-aminodiphenyl, yellow, m. 125° , whose *p*-toluenesulfonyl deriv. (I), pale yellow, m. 169° . 2-*p*-Toluenesulfonamidodiphenyl, m. 99° (*Me* deriv. (II), m. 136°); nitration with dil. HNO_3 gives the 5- NO_2 deriv.; nitration in AcOH gives the 3,5-di- NO_2 deriv., m. 186° , hydrolyzed to 3,5-dinitro-2-aminodiphenyl, yellow, m. 182° ; an Ac deriv. could not be prepd. Nitration of II gives the 5- NO_2 deriv., m. 152° , also obtained by methylation of I. 4'-Nitro-2-*p*-toluenesulfonamidodiphenyl, very pale yellow, m. 163° ; nitration gives the 3,5,4'-tri- NO_2 deriv., m. 190° , hydrolyzed to 3,5,4'-trinitro-2-aminodiphenyl, bright yellow, m. 229° . Nitration of $5,2\text{-O}_2\text{N}(\text{AcNH})\text{C}_6\text{H}_3\text{Ph}$ gives the 5,4'-di- NO_2 deriv.; this does not react with *p*- $\text{MeC}_6\text{H}_4\text{SO}_2\text{Cl}$ under the ordinary conditions. 3,5-Dinitro-4-*p*-toluenesulfonamidodiphenyl (III), m. 189° ; hydrolysis gives 3,5-dinitro-4-aminodiphenyl, orange-red, m. 177° , whose Ac deriv., pale yellow, m. 146° . The *Me* deriv. of III, m. 144° , on hydrolysis and acetylation gives 3,5-dinitro-4-acetomethylaminodiphenyl, yellow, m. 149° . Directions are given for the prepn. of $p\text{-O}_2\text{NC}_6\text{H}_4\text{SO}_2\text{Cl}$, from which the following compds. were prepd.: Et *p*-nitrobenzenesulfonate, m. 91° ; menthyl ester, m. 72° ; Ph ester, m. 114° ; *m*-nitrophenyl ester, m. 133° ; *p*-nitrophenyl ester, m. 156° ; *p*-tolyl ester, m. 106° ; 3-nitro-*p*-tolyl ester, m. 136° ; 2-nitro-*p*-tolyl ester, m. 116° . *p*-Nitrobenzenesulfon-*p*-tolylamide, m. $179-80^\circ$; nitration gives the 3,5-dinitro-*p*-tolylamide, m. 185° . $2\text{-H}_2\text{NC}_6\text{H}_4\text{Ph}$ and $\text{Hg}(\text{OAc})_2$ in EtOH- H_2O -AcOH give an oil, which, treated with Ac_2O , yields 5-acetoxymercuri-2-acetamidodiphenyl, m. 200° ; Br gives the corresponding 5-Br deriv. $4\text{-H}_2\text{NC}_6\text{H}_4\text{Ph}$ and $\text{Hg}(\text{OAc})_2$ gives a compd., m. 167° , apparently $\text{PhC}_6\text{H}_3\text{NH.Hg}$, which crysts. from AcOH to give

3-acetoxymercuri-4-acetamidodiphenyl, m. 205° ; repeated crystn. from AcOH raises the m. p. and Hg content; excess of Br gives a compd., m. 196° , probably 3,4-Br-(AcNH) $\text{C}_6\text{H}_3\text{C}_6\text{H}_4\text{Br-4'}$. 3-Bromo-4-*p*-toluenesulfonaminodiphenyl, m. 119° . 3,4-Br-(HO) $\text{C}_6\text{H}_3\text{Ph}$ yields a mono-Hg deriv., m. 235° , but 4-HOC $\text{C}_6\text{H}_4\text{Ph}$ gives a mixt. of more highly mercurated derivs. 3-Acetoxymercuriaceto-*p*-toluide, m. 178° . C. J. W.

Hydroxycarbonyl compounds. Constitution of cotoin, isocotoin and isohydrocotoin. P. KARRER AND N. LICHTENSTEIN. *Helv. Chim. Acta* 11, 789-95(1928). The constitution of cotoin (I), $2,6,4\text{-(HO)}_2(\text{MeO})\text{C}_6\text{H}_2\text{COPh}$ and isocotoin (II), $2,4,6\text{-(HO)}_2(\text{MeO})\text{C}_6\text{H}_2\text{COPh}$, have been established in the following way. I with PhSO_2Cl (III) in pyridine gives a mono-(IV), m. 138° , and a ditoluenesulfonate (V), m. 144° . Partial sapon. of V gives IV. Methylation of IV gives the corresponding ester of hydrocotoin, m. 112° , that is also obtained by the action of III on hydrocotoin (VI). II with III in pyridine gives a mono-(VII), m. 109° , and a ditoluenesulfonate (VIII), m. 137° . VII shows a strong brown color with FeCl_3 , and therefore contains the CO group near the OH group. Partial sapon. of VIII gives a 2nd mono ester, m. 140° , that shows only a weak color with FeCl_3 . Isohydrocotoin, $2,6,4\text{-(MeO)}_2(\text{HO})\text{C}_6\text{H}_2\text{COPh}$, m. 177° , gives no color with FeCl_3 and is formed with VI (see J. Pollak, *Monatsh.* 18, 739) when $3,5\text{-(MeO)}_2\text{C}_6\text{H}_3\text{OH}$ is treated with BzCl and ZnCl_2 . F. C. HAHN

Interaction of ethyl acetoacetate with distyryl ketones. IV. Selective addition

to unsymmetrical chlorodistyryl ketones. ISIDOR M. HEILBRON AND ROWLAND HILL. Univ. of Liverpool. *J. Chem. Soc.* 1928, 2863-70; cf. *C. A.* 21, 2258.—Styryl Me ketone (20 g.) and 19 g. *o*-ClC₆H₄CHO in 150 cc. EtOH and 100 cc. H₂O, treated with 5.5 cc. 1% aq. NaOH (0.01 mol.) at 0° for several days, gives 11 g. (increased to 31 g. by liberal seeding) of 2-chloro- β -hydroxy- β -phenylethyl styryl ketone (I), m. 79-80°; by increasing the alkali concn. to 0.03 mol. or by refluxing the aldol with Ac₂O there is obtained 2-chlorodistyryl ketone (II), yellow, m. 82-3°. The 3-Cl isomer (III), m. 108-9°. The 4-Cl analog of I, from *p*-ClC₆H₄CHO, m. 108-9°; Ac₂O gives the 4-Cl analog (IV) of II, yellow, m. 134°. 2-Chlorostyryl Me ketone and *m*-ClC₆H₄CHO in Et₂O, satd. with Et₂O, give 2,3'-dichlorodistyryl ketone (V), yellow, m. 67-8°; the 2,3'-di-Cl deriv. (VI), yellow, m. 109°. *m*-ClC₆H₄CHO (20 g.) in 100 cc. Me₂CO, dild. to 2000 cc. with H₂O and treated with 100 cc. 10% NaOH, gives 17 g. 3-chlorostyryl Me ketone, yellow, m. 28-9°; *p*-ClC₆H₄CHO gives 3,4'-dichlorodistyryl ketone (VII), pale yellow, m. 134°. II (2.5 g.), 8 cc. AcCH₂CO₂Et and 12 drops piperidine, heated for 48 hrs., give Et [γ -keto- α -phenyl- ϵ -2-chlorophenyl- Δ^5 -pentenyl]acetoacetate, m. 112°; concd. H₂SO₄ gives an orange soln.; warming with EtONa or heating II, AcCH₂CO₂Et and EtONa in EtOH 15 min. gives Et 3-phenyl-5-*o*-chlorostyryl- Δ^5 -cyclohexen-1-one-2-carboxylate, m. 137°. The structure was established by oxidation with KMnO₄, giving *o*-ClC₆H₄CO₂H. Refluxing the ester with H₂SO₄-AcOH gives 3-phenyl-5-*o*-chlorostyryl- Δ^5 -cyclohexen-1-one, yellow, m. 142°. The filtrate from the above ester gives an isomer, Et 3-phenyl-5-*o*-chlorostyryl- Δ^4 -cyclohexen-1-one-2-carboxylate (?), m. 107°; H₂SO₄-AcOH gives 3-phenyl-5-*o*-chlorostyryl- Δ^4 -cyclohexen-1-one (?), golden yellow, m. 136-7°. III and AcCH₂CO₂Et give Et 3-phenyl-5-*m*-chlorostyryl- Δ^5 -cyclohexen-1-one-2-carboxylate, yellow, m. 105-6°; IV gives the corresponding 5-*p*-chlorostyryl deriv., m. 121-5°; V gives the 3-*o*-chlorophenyl-5-*m*-chlorostyryl deriv., pale yellow, m. 108-9°; VI gives the corresponding 5-*p*-chlorostyryl deriv., yellow, m. 143°; VII gives the 3-*m*-chlorophenyl-5-*p*-chlorostyryl deriv., yellow, m. 122°. A possible mechanism of the addn. is discussed.

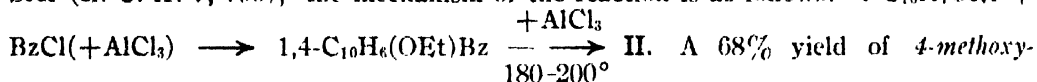
C. J. WEST

Dehydration of *o*-benzoylbenzoic acid. A. H. GLEASON AND GREGG DOUGHERTY. Princeton Univ. *J. Am. Chem. Soc.* 51, 310-5 (1929).—A series of kinetic studies of the reaction BzC₆H₄CO₂H (I) \longrightarrow C₆H₄(CO)₂C₆H₄ (II) has been undertaken to throw light on the mechanism of such processes in general. I, heated alone, yields small quantities of II; the reaction temp. is high (220°) and numerous by-products are formed. Catalysts, such as AlCl₃, the sulfates of Hg, Cu, Sn, Mg and Ag and other anhyd. salts had little or no effect. TiCl₄ had a marked influence on the reaction temp. and in the presence of traces of this salt a strong positive test for II was obtained at 180°. P₂O₅ does not give good yields of II. Solns. contg. 10 parts concd. H₂SO₄ to 1 of pure I gave II quantitatively when heated 2 hrs. at 100°; at room temp. the yield is approx. 1% in 100 hrs. At 65°, using 1 part I and 10 parts 96% H₂SO₄, the value of *K* is fairly constant at 0.076; at 75°, the values vary from 0.242 to 0.272; at 85°, *K* is 0.838; at higher temps. the reaction was so rapid that *K* could not be accurately measured. The condensing power of the H₂SO₄ is directly proportional to the concn. of the acid. The 1 mol. of H₂O produced during the reaction has little or no effect on the value of *K* and does not cause deviation from the monomol. order as the reaction proceeds; H₂O added to the H₂SO₄ does have a retarding effect but the effect is not as great as in reaction of the (CO₂H)₂ type. The esters and acyl derivs. of I form II under the same conditions as the free I. An explanation of this type of reaction is offered. C. J. W.

The so-called fluorene-oxalic ester. RICHARD KUHN AND ERNST LEVY. Eidgenöss. Tech. Hochschule Zürich. *Ber.* 61B, 2240-8 (1928).—In prepg. Wislicenus' "fluorene oxalic ester," (C₆H₄)₂CHCOCO₂R, K. and L. were struck by the similarity of its color to the yellow diphenylene-acrylic acid, (C₆H₄)₂C:CHCO₂H, which is obtained from it by reduction, sapon. and elimination of H₂O, and were led to believe that it might have the enolic structure of α -hydroxy- β -diphenylene-acrylic ester (C₆H₄)₂C(OH)C(O₂R) (I). Thorough investigation has confirmed this view and shown that I is an enol tautomer completely enolized in the cryst. state. When the finely powd. I (the Me ester was used exclusively in this work) is dissolved as quickly as possible in glacial AcOH at room temp. the yellow color greatly diminishes in intensity (about 1/10 in a few sec.), the change being too rapid to be followed colorimetrically; titrations with Br₂ show that an equil. with the ketonic form is established. If alkali is added to the equil. soln. in alc., the yellow color deepens appreciably. The enolic HO group imparts a strongly acid character to the I, which dissolves in hot NaHCO₃ and can be titrated, with sapon., as a monobasic acid with naphtholphthalein and alkalis. When it is heated with concd. aq. NaOH its originally clear yellow soln. gradually becomes completely colorless and deposits fluorene nearly quant.; from the mother liquors

(CO₂H)₂ can be isolated as the Ca salt after exhaustive sapon. Similarly, 9-iodo-fluorene is obtained with exactly 2 atoms I (as HIO). With O₃ are obtained fluorenone and (CO₂H)₂. I is readily hydrogenated catalytically to (C₆H₄)₂CHCH(OH)CO₂H. It couples with diazonium salts, with elimination of the side chain; with *p*-O₂NC₆H₄N₂-OH it gives a compd. (II) identical with that obtained from fluorenone and *p*-O₂NC₆H₄-NHNH₂ and which with alc. alkalis gives a deep blue color, evidently peculiar to the *aci*-nitro salt; this salt formation is most simply explained by assigning to II the structure of a true hydrazone rather than an azo compd. Of enol derivs. of I were obtained the *p*-nitrobenzoate (III) (with O₂NC₆H₄COCl) and the *Me* ether (IV) (with CH₂N₂); of keto derivs. the *oxime* (V) and the Br deriv. (VI). The Meyer Br titration method gives widely varying results (75-95% enol) with I because of the unusually small reaction velocity between the Br ketone and HI; after the addn. of the β -naphthol and KI the mixt. must be allowed to stand 1-2 hrs., when the enol content is 100% if the crystd. ester is covered with the Br-AcOH soln.: if, however, solns. in glacial AcOH which have stood about 20 hrs. are used, the titration gives only 58.8% enol, which is the equil. value. I (*Me* ester) (65% from 12 g. (CO₂Me)₂ and KOMe in MeOH and 13 g. fluorene in Et₂O), m. 117.5°. Fluorenone *p*-nitrophenylhydrazone (II), yellow, m. 269°. IV, m. 60°, insol. in alkalis, colorless in the solid state but yellow when fused or in soln. III, yellow, m. 255°, gives no color with concd. H₂SO₄ and with FeCl₃. *Me* β -bromo- β -diphenylenepyrivate (VI), m. 94.5°, insol. in alkalis, almost colorless in org. solvents, very slowly forms AgBr with alc. AgNO₃ at room temp. *Me* α -hydroximino- β -diphenylenepropionate (V), m. 190°. C. A. R.

The constitution of a new hydroxybenzofluorenone. HANS E. FIERZ-DAVID AND GASTON JACCARD. *Helv. Chim. Acta* 11, 1042-7 (1928).—The condensation of 2-hydroxyanthraquinone and glycerol (cf. C. A. 16, 1948) as previously reported gives a compd. which is most likely 2-hydroxybenzanthrone (I); but the condensation product of 1-ethoxy- or 1-methoxynaphthalene with BzCl and AlCl₃ when heated to 180-200° gives 6-hydroxy-7,8-benzofluorenone (II) and not I as previously reported by Scholl and Seer (cf. C. A. 7, 790); the mechanism of the reaction is as follows: 1-C₁₀H₇OEt +



naphthyl *Ph* ketone (III), yellow, m. 82.3°, was obtained when a mixt. of 48 g. α -MeO-C₁₀H₇, 200 g. CS₂ and 43 g. BzCl was treated with 60 g. AlCl₃ during the course of 0.5 hr., boiled for 2 hrs., 300 cc. of 10% HCl added, steam distd., and the residue recrystd from 95% EtOH. III (20 g.) and 120 g. AlCl₃ heated 1 hr. at 100-45°, then boiled with HCl, filtered, dissolved in hot, dil. NaOH, and acidified gave about 0.5% I and 85% of 2-hydroxychrysofluorenone (II), red, m. 305°, and gives a non-fluorescing, green soln. in concd. H₂SO₄ (benzanthrone gives fluorescent, yellow or orange solns.); distn. of II with 10 parts of Zn dust in H₂ gave chrysofluorene (IV); oxidation of IV with KMnO₄ and NaOH (cf. Graebe and Honigshberger, *Ann.* 311, 268 (1900)) gave diphthalic acid. The small quantity of I which was formed was isolated by extn. with EtOH from the residue of the Zn distn.; it is yellow and gives a fluorescent orange soln. with H₂SO₄. In a similar manner, condensation of 1,5-C₁₀H₆(OMe)₂, BzCl and AlCl₃ gave 90% of 1,5-dimethoxy-4,8-dibenzoylnaphthalene, m. 356-68°. Condensation of 2,6-C₁₀H₆(OMe)₂ with BzCl and AlCl₃ in CS₂ gave 50% of 2,6-dihydroxy-1,5-dibenzoylnaphthalene, m. 275° (cf. D. R. P. 453,280). N. A. LANGE

Optically active carbonium salts. P. KARRER AND A. HELFENSTEIN. *Helv. Chim. Acta* 11, 842-7 (1928).—Attempts are made to isolate optically active carbonium salts to throw light on the constitution of anthocyanidins (I) from natural anthogen (II) that may be viewed either as oxonium or carbonium salts. II after fission of the sugar group gives I in optically inactive form. This inactivity may be attributed to the strong tendency of the carbonium salt to racemize. Ethers are prepd. by treating Ph(*o*-MeC₆H₄)(PhC₆H₄)CCl (III) with *d*-camphylcarbinol or α -*d*-methylglucoside in the presence of pyridine. A study of the rotation of these ethers in CHCl₃ shows that the carbonium radical must exist in optically active form. Regeneration of the carbinol from the ether by treatment with HCl gas at 0° gives III which is optically inactive, from which it is concluded that the carbonium salt shows such a great tendency to racemize that it is difficult to obtain in optically active form. F. C. H.

Demethylation of 2,4'-dimethoxybenzilic acid. S. YUKAWA. *J. Pharm. Soc. Japan* 48, 816-9 (1928).—Demethylation of 2,4'-dimethoxybenzilic acid (Asahina and Terasaka, C. A. 17, 3028) with HI gave 2,4'-dihydroxydiphenylacetic lactone, m. 158°. Bz deriv. (II), m. 161. Oxidation of II in Me₂CO with KMnO₄ gave a compd., m. 207°, which is probably the mono-Bz deriv. of 2,4'-dihydroxybenzilic acid. NAO UYEI

Preparation of 2,4-dihydroxybenzil. M. URUSHIBARA. *J. Pharm. Soc. Japan* **48**, 819-25(1928).—Condensation of PhCH_2CN and $m\text{-(HO)}_2\text{C}_6\text{H}_4$ by Hoesch's reaction, using ZnCl_2 and HCl as the condensing agents, gave 2,4-dihydroxydesoxybenzoin ketimine *HCl* salt, $(\text{C}_{14}\text{H}_{13}\text{NO}_2)\text{HCl} \cdot \text{H}_2\text{O}$, m. 243° , which on decompn. with H_2O gave the free benzoin (I), m. 117° . I and Ac_2O gave the *di-Ac* deriv. (II) which m. 137° instead of 109° as given by Finzi (*Monatsh.* **26**, 1128). I and $\text{NH}_2\text{OH} \cdot \text{HCl}$ gave the *oxime*, m. 230° (decompn.) instead of 170° . By satg. the soln. of II and AmNO_2 or EtNO_2 in abs. Et_2O with dry HCl , 2,4-dihydroxybenzil monoxime (III), $\text{PhC(}:\text{NOH)-COC}_6\text{H}_3(\text{OH})_2$, m. 187° , was obtained. *Tri-Ac* deriv., m. 189° . PhNHNH_2 with the PhH -sol. portion of the mother liquor from III gave 2,4-dihydroxybenzil osazone, yellow, m. 175° .

NAO UYER

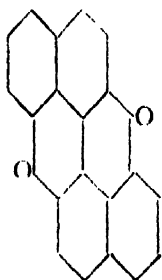
Benzoin-anil-anilide and benzoin-*p*-tolyl-*p*-toluide as ammonobenzoin acetals. HAROLD H. STRAIN. Stanford Univ. *J. Am. Chem. Soc.* **51**, 269-73(1929); cf. *C. A.* **22**, 1149.—Benzoin-anil anilide and *p*-tolyl-*p*-toluide are ammonobenzoin acetals; as ammono acetals they can be ammonolyzed and hydrolyzed; as ammonobenzoin they can be nitrified to ammonobenzils. HCl converts the ammonobenzoin into indole derivs.

C. J. WEST

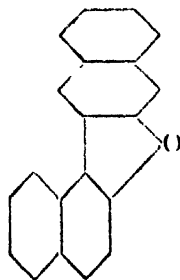
The chemistry of naphthalene and its derivatives. MARK SALONT. *Dyer, Calico Printer* **60**, 208-9, 229(1928).—A general review is given of their formation and sources, properties and constitution.

RUBY K. WORNER

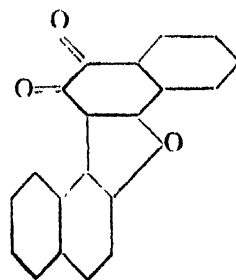
Catalytic production of polynuclear compounds. I. GEORGE R. CLEMO AND ROBERT SPENCE. Univ. of Durham *J. Chem. Soc.* **1928**, 2811-9.—Heating $1,2\text{-C}_{10}\text{H}_7\text{BrOH}$ with Cu bronze and I, 3 hrs. at 280° gives a mixt. of β -dinaphthol (I), 1,1'-dinaphthylene 2,2'-oxide (II), pale yellow, m. 156° , and 1,1'-dinaphthylene-2,8',2',8'-tetroxide (III), yellow, m. 236° . Boiling I (25 g.) and V_2O_5 (1 g.) for 7 hrs. gives almost pure II; the oxide gives a purple color in concd. H_2SO_4 , changing to red and then to dark brown on warming, the picrate, m. 164° . $\beta\text{-C}_{10}\text{H}_7\text{OH}$ (20 g.) and 0.5 g. WO_3 , heated at 270° and then at 300° , give 12.5 g. ($\beta\text{-C}_{10}\text{H}_7$) $_2\text{O}$, m. 105° . V_2O_5 (0.5 g.) at 300° gives 8 g. I, while 100 g. $\beta\text{-C}_{10}\text{H}_7\text{OH}$ and 1 g. V_2O_5 , heated at 340° , give 43 g. II. $\beta\text{-C}_{10}\text{H}_7\text{OH}$ and 1 g. CaO , heated 10 hrs. between $270\text{--}340^\circ$, give 30 g. isodinaphthylene-oxide (IV), m. $158\text{--}9^\circ$. H_2SO_4 gives an orange-red soln., changing through scarlet, purple and blue to light brown on warming, Br in CS_2 gives a di-Br deriv., m. 193° . Oxidation of II with H_2SO_4 gives $\text{C}_{10}\text{H}_4(\text{CO}_2\text{H})_2$, while CrO_3 and IV give a quinone (V), $\text{C}_{10}\text{H}_6\text{O}_2$, bronze leaflets, m. 268° , which sublimes unchanged and gives a bluish green soln. with H_2SO_4 , becoming brown on heating. Reduction of V with Zn in Ac_2O gives diacetoxyisodinaphthylene oxide, m. $245\text{--}6^\circ$; hydrolysis of V with EtOH-NaOH gives dihydroxydinaphthaquinone (VI), light red, m. 222° ; this crystals with CHCl_3 and C_6H_6 ; *di-Ac* deriv., golden yellow, m. 167° ; H_2SO_4 gives a reddish brown color, or KOH gives a red color (hydrolysis). VI, heated at 250° , loses H_2O , giving *o*-naphthaquinone oxide (VII), deep red, m. $255\text{--}6^\circ$, which condenses with *o*- $\text{C}_6\text{H}_4(\text{NH}_2)_2$ to a phenazine, $\text{C}_{26}\text{H}_{14}\text{ON}_2$, yellow, m. 240° . 2,3 $\text{C}_{10}\text{H}_6\text{ClCO}_2\text{H}$ and Cu bronze in PhNO_2 give only $\beta\text{-C}_{10}\text{H}_7\text{CO}_2\text{H}$. 2-Methoxy-3-naphthylamine, m. 109.5° (*Ac* deriv., m. $124\text{--}5^\circ$), through the diazo reaction, yields 3-bromo-2-methoxynaphthalene, m. 76° ; the 3-*I* deriv., m. 65° ; 2-bromo- β -naphthol, m. $80\text{--}1^\circ$. 2,3- $\text{C}_{10}\text{H}_6(\text{OH})\text{CO}_2\text{H}$ (6 g.) with 0.05 VO_3 or V_2O_5 give dinaphthaxanthone, yellow, m. $134\text{--}5^\circ$. $\alpha\text{-C}_{10}\text{H}_7\text{OH}$ and V_2O_5 at 40° give 2,2'-dinaphthylene-1,1'-oxide, yellow, m. 179° .



III



IV



VII

C. J. WEST

Reduction of phenyl naphthyl ketones by the binary system magnesium + magnesium iodide. W. E. BACHMANN AND R. V. SHANKLAND. Univ. of Michigan. *J. Am. Chem. Soc.* **51**, 306-9(1929).—Reduction of $\alpha\text{-C}_{10}\text{H}_7\text{Bz}$ with $\text{Mg} + \text{MgI}_2$ (cf. S. M. S. and B., *C. A.* **21**, 579) gives 46% of diphenyldi- α -naphthylpinacol (I), m. 20° (decompn.), the crude reaction product was shown to be mostly I by rearranging

it ($\text{AcOH} + \text{I}$ or AcCl) to *benzoyldi- α -naphthylphenylmethane*, m. 216–7°. Reduction of the ketone by Zn and AcOH gives a pinacol (II), m. 158° (Cohen, C. A. 13, 2504); rearrangement with AcCl or $\text{AcOH} + \text{I}$ gives a *compd.*, $\text{C}_{24}\text{H}_{24}\text{O}$, m. 232°, which is very resistant to hot EtOH-KOH . II is transformed into I by treating with EtMgI and decomp. the product with ice and NH_4Cl . Reduction of $\beta\text{-C}_{10}\text{H}_7\text{Bz}$ by $\text{Mg} + \text{MgI}$ or by Zn and AcOH gives *diphenyldi- β -naphthylpinacol*, m. 175°; dehydration gives quant. *benzoyldi- β -naphthylphenylmethane*, m. 181–2°. C. J. WEST

Production of thiophene by the interaction of acetylene and carbon disulfide. HENRY V. A. BRISCOE, JOHN B. PEEL AND PERCY L. ROBINSON. Univ. of Durham. J. Chem. Soc. 1928, 2857–8; cf. C. A. 22, 4460.—The small proportion of thiophene that is formed from C_2H_2 and S vapor is produced probably by a direct reaction of C_2H_2 and S and not by a secondary reaction between the gas and CS_2 . C_2H_2 satd. with CS_2 was passed through tubes heated to any desired temp. up to 800°; at 200° the liquid contained only unchanged CS_2 ; at 350° a trace of thiophene appeared; at 700° there was present approx. 10% by vol. of thiophene. The yield could not be increased by the use of bauxite or granular CuS as the furnace packing. C. J. WEST

Synthesis of indole derivatives. II. Synthesis of a few indolecarboxylic acids. S. KEIMATSU AND S. SUGASAWA. Tokyo Imp. Univ. J. Pharm. Soc. (Japan) 48, 755–61(1928); cf. C. A. 22, 3163.—In order to improve the method for the prepn. of 3-[β -aminoethyl indole (I) the following reactions were tried. Action of 1 mol. $\text{AcCH}_2\text{CO}_2\text{Et}$ and 1 atom Na on 1 mol. $\text{ClCH}_2\text{CH}_2\text{CN}$ gave, as a main product, *bis*-[β -cyanoethyl]acetoacetic ester, m. 83°. On the other hand, the action of 3 mols. $\text{AcCH}_2\text{CO}_2\text{Et}$ and 3 atoms Na on 1 mol. $\text{ClCH}_2\text{CH}_2\text{CN}$ gave *cyanomethylacetoacetic ester* (II), b. 156° (yield 70%). II and PhN_2Cl gave *β -cyanomethylpyrrolacetic ester phenylhydrazone* (III), $\text{C}_6\text{H}_5\text{NHN}:\text{C}(\text{CO}_2\text{Et})\text{CH}_2\text{CH}_2\text{CN}$, bright yellow, m. 155°. In an attempt to convert III into the indole deriv. by a ring closure, various condensing agents were used but without success. When EtOH-HCl or $\text{EtOH-H}_2\text{SO}_4$ were used the indole ring formation took place, but sapon. of CN group took place simultaneously and instead of the desired nitrile, *Et indole-3-acetic acid-2-carboxylate* (IV), m. 85.6°, was obtained. The free acid m. 228° (decompn.). Although the synthesis of I from III has not been accomplished, IV has been easily obtained. Therefore in order to study whether the above reaction is a general method for the prepn. of indole- α,β -carboxylic acids the synthesis of Kalb's (C. A. 21, 90) *indole-3-propionic acid* (V) was tried. The action of KCN on $\text{ClCH}_2\text{CH}_2\text{CH}_2\text{Br}$ gave $\text{ClCH}_2\text{CH}_2\text{CH}_2\text{CN}$ (V). Condensation of V with $\text{AcCH}_2\text{CO}_2\text{Et}$ and Na gave *γ -cyanopropylacetoacetic ester* (VI), b. 138–9° (yield, 48%). VI and PhN_2Cl in EtOH-NaOH gave *Et α -keto- δ -cyanovalerate phenylhydrazone* (VII), yellowish brown, m. 93°. Dry HCl on VII in abs. alc. gave an intermediate product, probably the *HCl salt of the imido ester*, which with cold H_2O gave *di-Et indole-3-propionate-2-carboxylate*, m. 95°. The free dicarboxylic acid (VIII) m. 195° (decompn.). Heating of VIII at 220–30° gave V, m. 134°. Synthesis of 2,3-dimethylindole: Heating of *o*- $\text{AcNHC}_6\text{H}_4\text{Et}$ with NaNH_2 gave 2,3-dimethylindole. It is to be noted that the reaction gave an indole instead of a quinoline deriv. III. New method for the synthesis of 3-keto-3,4,5,6-tetrahydro-4-carboline. S. KEIMATSU, S. SUGASAWA AND G. KASUYA. Ibid 762–6.—Manske, Perkin and Robinson (C. A. 21, 1269) have recently obtained harmalan and harmaline by a clever application of the Japp-Klingemann reaction. Since K., S. and K. are interested in the synthesis of 3-[β -phthalimidomethyl]indole-2-carboxylic acid (IV) and 3-keto-3,4,5,6-tetrahydro-4-carboline (V) which are the raw materials for the synthesis of rutecarpine, R., M. and P.'s method was slightly modified to obtain these compds. $\text{AcCHNaCO}_2\text{Et}$ with $\text{C}_6\text{H}_4(\text{CO})_2\text{NCH}_2\text{CH}_2\text{CH}_2\text{Br}$ gave *Et α -acetyl- δ -phthalimidovalerate* (I). The free acid, obtained by sapon. of I, was condensed with PhN_2Cl in EtOH-NaOH to *Et- α -keto δ -phthalimidovalerate phenylhydrazone* (II), yellowish brown, m. 146°. In this reaction, if aq. NaOH were used instead of EtOH-NaOH as a condensing agent, CO_2H should have been decompd. instead of Ac group, to give ζ -phthalimidohexane- β,γ -dione γ -phenylhydrazone as in the case of R., M. and P.'s synthesis of harmaline. Heating of II in abs. alc. with dry HCl gave *Et 3-[β -phthalimidomethyl]indole-2-carboxylate* (III), m. 195°. Boiling of III with EtOH and $\text{H}_2\text{NNH}_2\cdot\text{H}_2\text{O}$ and then heating again with 10% HCl gave R., M. and P.'s compd. V, which m. 188–9° instead of 173–4°. In this reaction IV has probably been formed as an intermediate product. Decompn. of V with dil. EtOH-KOH and then neutralization with AcOH gave IV, m. 257° (decompn.). Further heating of IV with 5–10% HCl gave the *HCl salt of 3-[β -aminoethyl]indole Acetate*, m. 136°. NAO UYEI

Azo dyes from acetoacetanilides. HANS E. FIERZ-DAVID AND EDWIN ZIEGLER. Tech. Hochschule, Zürich. Helv. Chim. Acta 11, 776–86(1928).—A no. of dyes from

acetoacetanilides (I) are prepd. and then reduced. In every case the intermediate unstable aminoacetoacetanilide could not be isolated, the corresponding dihydropyrazine being formed. The general method for the prepn. of I consists in heating $\text{AcCH}_2\text{CO}_2\text{Et}$ (1.2 mols.) in xylene contg. pyridine to 135° and adding thereto during 5 hrs. the aniline (1 mol.) in xylene contg. pyridine, the resulting mixt. being boiled 2 hrs. I sep. from the cool reaction mixt. and are washed with xylene. Prepd. according to this method, *acetoacetanilide*, m. 85° ; *o*-toluide, m. 104° ; *p*-toluide, m. 95° ; *m*-xylide, 89° ; *o*-aniside, 87° ; *o*-chloroanilide, 105° ; *2,5*-dichloroanilide, 96° ; *p*-nitroanilide, 119° ; *diacetoacetbenzidide*, 234° (decompn.). Coupling of the foregoing acetoacetanilides with diazosulfanilic acid and reduction of the resulting azo dyes gave the following dihydropyrazines: *2,5-dimethyldihydropyrazine-3,6-dicarboxanilide* (II), m. 218° ; *o*-toluide, m. $236-7^\circ$; *p*-toluide, m. $227-8^\circ$; *m*-xylide, m. 190° ; *o*-aniside (III), m. 231° ; *o*-chloroanilide, m. 197° ; *2,5*-dichloroanilide, m. 215° . On the basis of the foregoing information the structures of the following I. G. dyes were detd. by reduction to some of the foregoing anilides and corresponding *o*-diamines which gave the known phenanthrazines. In this way it is shown that Hansagelb R is manufd. by coupling $2,5\text{-Cl}_2\text{C}_6\text{H}_3\text{NH}_2$ with phenylmethylpyrazolone; Hansagelb G obtained by coupling *m*-nitro-*p*-toluidine with I is identical with Hansagelb GA, Monolithgelb G and Pigmentgelb HGL; Hansagelb 3G obtained from $4,2\text{-Cl(O}_2\text{N)}_2\text{C}_6\text{H}_3\text{NH}_2$ and I is identical with Pigmentgelb 3GL; Hansagelb 5G from *o*-nitroaniline and I is identical with Monolithgelb 5G, Pigment 5G, extra H 5 GL, Litholechtgelb 5G and Hansagelb 10G from $4,2\text{-Cl(O}_2\text{N)}_2\text{C}_6\text{H}_3\text{NH}_2$ and III.

FREDERICK C. HAHN

Aminobenzothiazoles. X. Mobility of the 1-amino-3-methylbenzothiazole system. ROBERT F. HUNTER AND ERIC R. STYLES. Imperial Coll. Sci. Tech. *J. Chem. Soc.*, 1928, 3019-27. —Because of certain possible criticisms, it is necessary to establish the mobility of a typical substituted 1-aminobenzothiazole (the 3-Me deriv. was chosen) by means of evidence of the symmetry type and of the substitution type, about which there can be no question. The labile acetyl-*o*-tolylthiocarbamide (I) (m. 140°) in CHCl_3 with Br at 0° gives the *tribromide*, $\text{C}_{10}\text{H}_9\text{ON}_2\text{Br}_3\text{S.HBr}$, yellow, m. 173° (decompn.); treatment with SO_2 and then NH_4OH (d. 0.880) gives *1-imino-2-acetyl-3-methyl-1,2-dihydrobenzothiazole*, pale yellow, m. 170° ; refluxing with 25% HCl for 24 hrs. gives *1-amino-3-methylbenzothiazole* (II), m. 136° . The stable form of I yields a *tetrabromide*, orange, m. 140° (decompn.); reduction gives *1-acetamido-3-methylbenzothiazole* (III), m. 285° ; this is identical with the Ac deriv. obtained from II and Ac_2O and on hydrolysis gives II. Bromination of III gives a *hexabromide*, orange, m. $255-8^\circ$ (decompn.). *o*-Tolylthiocarbamide and Br in CHCl_3 give I *tribromide-HBr* (IV), orange-yellow, m. 129° (decompn.); crystn. from 80% EtOH gives *5-bromo-1-amino-3-methylbenzothiazole-HBr*, m. $280-90^\circ$ (decompn.), which is reduced by SO_2 to II. Certain preps. of the IV are unstable in the air and give the HBr salt of II, m. $220-2^\circ$. Bromination of II gives a *tetrabromide*, yellowish brown, m. 302° . Methylation of II (MeI at 100° for 24 hrs.) gives a mixt. of *1-methylamino-3-methylbenzothiazole* (V), m. 130° , and *1-imino-2,3-dimethyl-1,2-dihydrobenzothiazole* (VI), m. 86° ; the resp. Ac derivs. m. 133° and 147° . *o*-Tolylthiocarbamide and MeNH_2 in EtOH give *s-o-tolylmethylthiocarbamide*, m. 161° ; bromination with vigorous refluxing gives a *tetrabromide*, d. m. 75° (decompn.), readily decompd. by atm. moisture; if the bromination is carried out on the steam-bath, there results a *tribromide*, yellow, m. 113° ; reduction with SO_2 gives V. *as-o-Tolylmethylthiocarbamide*, m. $107-8^\circ$, yields a Br deriv. which is reduced to VI. *5-Bromo-o-tolylthiocarbamide*, m. 194° , and Br give a *dibromide-HBr*, orange, turns white at $130-40^\circ$ but is unmelted at 250° ; SO_2 gives the 5-Br deriv. of II. *s-o-Tolylpropylthiocarbamide*, m. 66° ; *tetrabromide*, red, m. 71° (decompn. 130°); reduction gives *1-propylamino-3-methylbenzothiazole*, m. 62° ; HBr salt, m. 179° (decompn.); Ac deriv., m. 61° . The tetra-Br deriv. with EtOH gives a *bromide-HBr*, m. 259° . *s-5-Bromo-o-tolylpropylthiocarbamide*, m. 79° ; reduction of the ill-defined Br compd. gives *5-bromo-1-propylamino-3-methylbenzothiazole*, m. 82° , identical with the base liberated from the last mentioned HBr salt. *s-o-Tolylheptylthiocarbamide*, m. 98° ; *hexabromide*, orange-red, m. 53° ; *1-heptylamino-3-methylbenzothiazole*, m. 57° ; Ac deriv., m. 73° ; the hexa-Br deriv. with EtOH gives a *bromide-HBr*, m. 220° . *s-5-Bromo-o-tolylheptylthiocarbamide*, m. 71° ; *5-bromo-1-heptylamino-3-methylbenzothiazole*, m. 75° .

C. J. WEST

Transformation of quinazolones into triazole derivatives. GUSTAV HELLER, WILLI KÖNIGER, SIEGFRIED GOTTFRIED, HERBERT ARNOLD AND HELMUT HERRMANN. Univ. Leipzig. *J. prakt. Chem.* 120, 49-63 (1928). —Dibenzoyl-*o*-aminobenzohydrazide (7 g.) and 150 cc. dil. NaOH, heated 2 hrs., give 21% of *1-[carboxyphenyl]-2,5-diphenyl-3,4-triazole*, m. 310° ; it is more easily prepd. from 2-phenyl-3-benzoylamino-4-quinazoline;

the triazole is not attacked by concd. H_2SO_4 at 200° , boiling Ac_2O , KMnO_4 , or Zn dust in alk. soln., or CrO_3 in AcOH . 2-Phenyl-3-diacetyl-amino-4-quinazolone, m. 153° ; this or the mono-Ac deriv., heated with dil. alkali, gives 1-[*o*-carboxyphenyl]-2-phenyl-5-methyl-3,4-triazole (I), m. 241° (76% yield); Me ester, m. 156° ; Et ester, m. 165° ; 2-methyl-3-benzoylamino-4-quinazolone and alkali give only a trace of this triazole. Benzoyl-*o*-aminobenzoic acid *p*-chlorobenzoylhydrazide, m. 175° , yields 1-[*o*-carboxyphenyl]-2-phenyl-5-*p*-chlorophenyl-3,4-triazole, m. 204° . *p*-Chlorobenzoyl-*o*-aminobenzoic acid hydrazide, m. 225° ; the benzoylhydrazide, m. 213° ; with dil. alkali the latter yields 1-[*o*-carboxyphenyl]-2-*p*-chlorophenyl-5-phenyl-3,4-triazole, m. 212° . *p*-Chlorobenzoyl-aminobenzoic acid *p*-chlorobenzoylhydrazide, m. 227° (decompn.); alkali gives 1-*o*-carboxyphenyl-2,5-di-*p*-chlorophenyl-3,4-triazole, m. 345° . I, treated with PCl_5 in PCl_3 and then with PhNH_2 , gives the 1-*o*-benzanilide deriv., m. 253° . Attempted nitration of I gave a compd., $\text{C}_{16}\text{H}_{11}\text{O}_6\text{N}_5$, m. 273° . Oxidation of I with KMnO_4 in acid soln. gives a compd., $\text{C}_{16}\text{H}_9\text{O}_2\text{N}_5$, m. 259° . Diacetylbenzohydrazide, m. 152° ; acetylformylhydrazide, m. 96° (70% yield). BzNHNHAc , PhNH_2 and P_2O_5 , heated 45 min., give 1,5-diphenyl-2-methyl-1,3,4-triazole, m. 161° ; picrate, m. 182° ; *p*- $\text{MeC}_6\text{H}_4\text{NH}_2$ gives the 1-*p*-tolyl deriv., m. 162.5° (HCl salt, m. 205.10° ; picrate, m. $160-2^\circ$); 1-*o*-tolyl deriv., m. 177.5° (HCl salt, m. 210° ; picrate, m. 186°). 2-Phenyl-5-methyl-1,3,4-triazole, m. 164.5° , from BzNHNH_2 and AcONH_2 ; picrate, m. 158° ; HCl salt, m. 230° . 1-Phenyl-2,5-dimethyl-1,2,4-triazole, m. 236° . 1-Phenyl-1,3,4-triazole, m. 122° picrate, m. 172° . Dichloroacetylbenzohydrazide chloride, m. 143° . C. J. WEST

Synthesis of derivatives of benzotriazole. SACHINDRA NATH CHAKRABARTY AND SIKHIBHUSAN DUTT. *J. Indian Chem. Soc.* 5, 555 9(1928).—Although *o*-nitroazobenzene (I) is readily reduced to *o*-aminoazobenzene with alc. $(\text{NH}_4)_2\text{S}$, it was found that when I contained other substituents, derivs. of benzotriazole (II) were obtained. C. and D. postulate the theory that the introduction of substituents into the 2 benzene nuclei brings the latter two closer together in space with the result that the reduction takes a different course and derivs. of II are formed. The following benzotriazoles were prepd. by coupling diazotized *o*-nitroaniline with the suitable phenol or amine, and reduction of the resulting substituted *o*-nitroazobenzene with aq. or alc. $(\text{NH}_4)_2\text{S}$. 2-[4'-hydroxy] (III), m. 231° ; 2-[4'-methoxyphenyl], m. 138° , prepd. from *o*-nitrobenzeneazobenzene which was prepd. by methylating *o*-nitrobenzeneazophenol with Me_2SO_4 and NaOH ; 2-[2',4'-dihydroxyphenyl], pale brown, m. 191° ; 2-[4'-hydroxynaphthyl]; yellow, m. 201° ; 2-[2'-hydroxynaphthyl], light brown, m. 119° ; 2-[3'-carboxy-4'-hydroxyphenyl], m. 300° ; 2-[3'-carboxy-4'-hydroxynaphthyl], light gray, m. 189° ; 2-[4'-carboxy-3'-hydroxyphenyl], m. 109° ; 2-[2',3',4'-trihydroxy-6'-carboxyphenyl], yellow powder, m. 191° ; 2-[4'-hydroxy-3'-aldehydophenyl], m. 132° ; 2-[4'-aminophenyl], yellow, m. 135° , which when diazotized and boiled with water gave III; 2-[4'-dimethylaminophenyl], yellow, m. 187° ; 5-amino-2-phenyl, yellow, m. 182° ; 5-amino-2-[4'-sulfo]phenyl, yellow, 5-amino-2-naphthyl, yellow, m. 169° ; 5-amino-2-[2'-naphthyl], brown powder, m. 114° . The structure of III was detd. by oxidation with 5% KMnO_4 to triazoledicarboxylic acid. FREDERICK C. HAHN

Synthesis of polyhydroxychalcones and flavanones. I. Synthesis of 2', 4'-dihydroxychalcone; 2', 4'-dihydroxy-4-methoxyhydrochalcone and isosakuranetin. J. SHINODA AND S. SATO. Tokushima Higher Tech. School. *J. Pharm. Soc. (Japan)* 48, 791-801(1928).—The method of prepn. of polyhydroxychalcones by Kostanecki and his coworkers which consists in the condensation of methoxyacetophenone with methoxybenzaldehyde is beset with difficulty when applied to compds. with free OH groups. S. and S. have now succeeded in the synthesis of polyhydroxychalcones or polyhydroxyhydrochalcones by using Behn's reaction (D. R. P. 95901; *Chem. Zentr.* 1898, I, 1223), i. e., by condensing polyhydroxyphenols with PhCH:CHCOCl (I) or $\text{PhCH}_2\text{CH}_2\text{COCl}$ (II) in PhNO_2 , using AlCl_3 as the condensing agent. When *m*-(HO) $_2\text{C}_6\text{H}_4$ (III) is used the main products are chalcone derivs., while with 1,3,5-(HO) $_3\text{C}_6\text{H}_3$ (IV), the main products are flavanone derivs. Condensation of I and III with AlCl_3 in PhNO_2 gave 2',4'-dihydroxychalcone, m. 151° instead of $133-4^\circ$ as previously reported by Ellison (C. A. 21, 3193). By using II in place of I in the above reaction, 2',4'-dihydroxyhydrochalcone, m. 84° , was obtained, while with *p*- $\text{MeOC}_6\text{H}_4\text{CH}_2\text{CH}_2\text{COCl}$, 2',4'-dihydroxy-4-methoxyhydrochalcone, m. 83° , was obtained. Condensation of IV and I in similar way gave as a main product 5,7-dihydroxyflavanone (V), m. $203-4^\circ$ (oxime, m. 263°), and the isomeric 2',4',6'-trihydroxychalcone (VI), orange needles, m. $189-90^\circ$, together with small amts. of 3 compds., one m. 147.5° (tricinnamoylphloroglucinate), another m. 243° and still another m. 205° . The compd. VI is unstable and by heating with glacial AcOH or heating above its m. p., it changes over to V, whereas heating of V with dil. KOH gives VI. Di-Ac deriv. of V m. $141-2^\circ$. Tri-Ac deriv. (VII) m. $115-$

6.5°. Catalytic reduction of VII gave 2',4',6'-triacetoxhydrochalcone (VIII), m. 76°. CH_3N_2 with V gave the mono-Me deriv., m. 101°. II and IV gave 2',4',6'-trihydroxyhydrochalcone, m. 120–1°, which with Ac_2O gave VIII. *p*-MeOC₆H₄CH:CHCOCl and IV gave 4'-methoxy-5,7-dihydroxyflavanone (or isosakuranetin), m. 193–4°, and a small amt. of a red compd., m. 176°. Condensation of 3',4'-methylenedioxy-cinnamyl chloride and IV gave 3',4'-methylenedioxy-5,7-dihydroxyflavanone, m. 220°, and a red compd., m. 213°. *p*-MeOC₆H₄CH₂CH₂COCl and IV gave 2',4',6'-trihydroxy-4-methoxyhydrochalcone, m. 201–2°. The reason why III gives chalcone derivs., while IV gives flavanone derivs. in the above reaction is probably that the presence of OH at position 6 makes OH at 2 so reactive that the intermediate chalcone compd. formed undergoes a ring closure and changes over to the flavanone deriv. This assumption also explains why substances exist in nature as flavanones rather than trihydroxychalcones. N. U.

Chemistry of grape pigments. V. The anthocyanins in Ives grapes. R. L. SHRINER AND R. J. ANDERSON. New York Agr. Expt. Sta., Geneva. *J. Biol. Chem.* **80**, 743–52 (1928). The anthocyanin pigment in Ives grapes was isolated and found to consist of anthocyanidin, the monoglucoside of dimethoxydelphinidin (enidin), the monoglucoside of a monomethoxydelphinidin, and some deriv. of *p*-hydroxycinnamic acid. The only product obtained by oxidation of the anthocyanidin acetates was syringic acid.

ARTHUR GROLLMAN

Reactions and derivatives of iron carbonyl. III. Pyridine-containing iron carbonyls. W. HIEBER AND F. SONNEKALB. Univ. Heidelberg. *Ber.* **61B**, 2421–7 (1928); cf. *C. A.* **23**, 353. $\text{NH}_2\text{CH}_2\text{CH}_2\text{NH}_2$ (I) combines with $\text{Fe}(\text{CO})_5$ (II) at 70° to form $\text{Fe}(\text{CO})_4\text{NH}(\text{CH}_2\text{CH}_2\text{NH}_2)_2$, reddish yellow prisms, which is notably unstable toward acids, $\text{Fe}(\text{CO})_4$, Fe salts, H_2 and CO being formed. Substitution of CO by I occurs in the presence of $\text{C}_6\text{H}_5\text{N}$. At 80°, 5 mols. of $\text{C}_6\text{H}_5\text{N}$ cause the liberation of 3 mols. of CO, 2 mols. appearing in 10 hrs. and the 3rd very slowly thereafter. At 25° 2 mols. of CO are liberated in 78 hrs., when the reaction comes to a standstill. Two g. II + 4 cc. $\text{C}_6\text{H}_5\text{N}$ were allowed to stand in a loosely stoppered flask at 20–25°. The products were isolated in the absence of H_2O in a N_2 atm. In 12 hrs. the above-mentioned addn. product was obtained. After 3–4 days, monoclinic leaflets of $\text{Fe}(\text{CO})_4\text{C}_6\text{H}_5\text{N}$ separated, while at the end of 10–14 days, deep red pyramids of $\text{Fe}(\text{CO})_2\text{C}_6\text{H}_5\text{N}$ were isolated. Substitution of CO by $\text{C}_6\text{H}_5\text{N}$ occurs only when the liberated CO can escape; it does not take place in sealed tubes. The products are pyrophoric and yield Fe_2O_3 in pseudomorphs of the original crystals. D. D.

α -Methylaminopyridine and some of its derivatives. A. E. CHICHIBABIN AND I. I. KUNJANZ. *Ber.* **61B**, 2215–7 (1928); cf. *C. A.* **22**, 1975. In the earlier paper was described a method of prep. α - $\text{C}_6\text{H}_4\text{NNMe}_2$ by methylating the Na deriv. of α - $\text{C}_6\text{H}_4\text{NNH}_2$ with Me_2SO_4 , sepn. from the α - $\text{C}_6\text{H}_4\text{NNHMe}$ (I) and unchanged $\text{C}_6\text{H}_4\text{NNH}_2$ being effected by acetylating the mixt. and fractionating the acetylation product. If the methylation is carried out under conditions which give much I, the sepn. can be conveniently effected by exhaustive benzoylation, the $\text{C}_6\text{H}_4\text{NNH}_2$ yielding the di-Bz deriv. insol. in dil. acids while the $\text{C}_6\text{H}_4\text{NNMe}_2$ and $\text{C}_6\text{H}_4\text{NNMeBz}$ (II) dissolve readily and after pptn. with Na_2CO_3 or alkalis, can easily be sepd. by fractionation *in vacuo*. Sepn. of II gives I in entirely pure form, b_p 90°, m. 15°. With HNO_2 I readily forms the *nitrosamine* (III) which, unlike PhNMeNO , is not isomerized by hot H_2SO_4 with migration of the NO group to the nucleus. III is reduced to *asym.- α -pyridylmethylhydrazine* (IV). *Benzoyl- α -methylaminopyridine* (II) (50 g. from 94 g. I), b₁₁ 200°, m. 61–2°. III (yield, 93%), greenish yellowish, b₁₀ 123–4°; *picrate*, m. 186–7°. IV, from III in 80% AcOH and Zn powder in H_2O suspension at room temp., b₁₀ 105°; *picrate*, m. 153–5°, forms with BzH a *hydrazone*, m. 67–8°. C. A. R.

Action of thionyl chloride on the pyridinemonocarboxylic acids. HANS MEYER AND RODERICH GRAF. *Ber.* **61B**, 2202–15 (1928). M and others had obtained by the action of SOCl_2 on pyridinecarboxylic acids substances having the properties of acid chlorides, but which, because of their abnormally high m. ps., were thought to be polymers, while Späth and Spitzer (*C. A.* **20**, 3294) later obtained products with normally low m. ps. A renewed study of the reaction has now revealed the cause of the discrepancy. If the treatment of picolinic acid (I) with SOCl_2 is not too prolonged there is obtained almost exclusively the normal low-melting chloride (II) but if it is continued longer nucleus chlorination also takes place, especially at high temps. Nicotinic (III) and isonicotinic acids (IV) are not appreciably halogenated in the nucleus at the b. p. of SOCl_2 but do yield chlorinated derivs. when heated in sealed tubes. If the crude II, still contg. SOCl_2 , is kept *in vacuo* over KOH the originally liquid mass gradually changes into the high-melting product previously thought to be the polymer but which is really II.HCl and finally changes into I.HCl. This change into II.HCl occurs

only in the presence of traces of H_2O . The conversion of II.HCl into I.HCl is at first very rapid but gradually becomes slower and slower so that the resulting mixt. shows for many hrs. an almost const. Cl content, the presence of I.HCl being thereby masked. As in the earlier expts. fresh products were used for the prepn. of the amide and esters while the analyses were made only after they no longer gave off penetrating vapors it is easy to understand why the error as to their true nature was made. The admixed SOCl_2 can readily be removed completely *in vacuo* but the now completely S-free products still evolve for a long time penetrating vapors which, however, do not originate in an excess of SOCl_2 still present but represent the HCl set free in the change of II.HCl into I.HCl . **III** and **IV** behave in the same way but the change of the chloride HCl salts into the acid HCl salts is materially slower. Sublimed **II**, prepd. according to Späth and Spitzer, m. 46° , gives 80% of the amide with NH_3 , is stable in C_6H_6 even in the light or in sealed tubes at 100° but in the cryst. form changes in a few hrs. into a green-black mass even if protected from light and air. II.HCl , readily obtained from **II** in C_6H_6 with HCl, is a powdery ppt. which, when heated under the supernatant fluid in a sealed vessel until dissolved and allowed to cool slowly, seps. in leaflets, whereas on heating in an open dish it loses HCl and changes into I.HCl ; it is extraordinarily hygroscopic and rapidly decomp. in the air into I.HCl and HCl, but when protected from the air it can be kept for months without appreciable change; in a sealed capillary it m. $118-22^\circ$ (decompn.). Chloride of **III**, best prepd. by refluxing its HCl salt 3 days in SOCl_2 , b.₁₂ 85° , m. $15-6^\circ$. Chloride of **IV**, b. 100° in the vacuum of a H_2O pump, m. $15-6^\circ$. 4-Chloropicolinic acid (**V**) (30-40% from 10 g. I.HCl boiled in 30 cc. SOCl_2 until dissolved, and then heated 20 hrs. at 100° , the resulting HCl salt being decompd. with boiling H_2O) m. 182° (decompn.); its NH_4 salt with concd. NH_4OH at 180° gives aminopicolinic acid, m. 260° (decompn.) (isolated through the light violet Cu salt), which above its m. p. loses CO_2 and yields quant. $4\text{-C}_6\text{H}_4\text{NNH}_2$, m. $157-8^\circ$, while on diazotization it yields 4-hydroxypicolinic acid, m. $254-5^\circ$ with evolution of CO_2 and formation of $4\text{-C}_6\text{H}_4\text{NOH}$, m. $65-6^\circ$. Chloride of **V**, m. 46° , can be distd. *in vacuo* without decompn. Me ester, m. $57-8^\circ$. Ph ester, m. 68° . Amide, m. 158° . 4,6-Dichloropicolinic acid (**VI**) (35% from 5 g. **V** and 15 cc. SOCl_2 heated 50 hrs. at 180°), needles (from dil. soln.) or leaflets (from concd. soln.) with $1\text{H}_2\text{O}$, m. $96-7^\circ$, sublimes in anhyd. spears, m. $111-2^\circ$, loses HCl at $160-70^\circ$ and changes into a solid which melts very much higher with decompn. **V** refluxed in **III** (b. 127°) with red P gives a basic 4-iodopicolinic acid-**HI** (**VII**), $\text{C}_{12}\text{H}_9\text{O}_4\text{N}_2\text{I}_3$, m. $185-90^\circ$, converted in hot H_2O by an excess of freshly pptd. AgCl into the free acid (18 g. from 12 g. **V**), m. 169° (decompn.); Me ester, m. $75-6^\circ$. **VI** boiled with **HI** (d. 1.7) and red P gives **VII**. Me ester of **VI**, m. $73-4^\circ$. Amide, m. $172-4^\circ$. 3(5),4,6-Trichloropicolinic acid is obtained as a by-product in the prepn. of **VI**; its Me ester m. $122-3^\circ$. 5-Chloronicotinic acid, m. 171° , is obtained in very small yield from III.HCl with SOCl_2 at 180° , followed by sapon. with boiling H_2O ; chloride, b.₁₂ 120° , m. 53° ; Me ester, m. $88-9^\circ$; Ph ester, m. 79° ; amide, m. $205-6^\circ$. The NH_4 salt with NH_4OH and CuO at 180° yields 5-aminonicotinic acid (Me ester, m. 137°) which above its m. p. forms $3\text{-C}_6\text{H}_4\text{NNH}_2$. 5,6-Dichloronicotinic acid (30% from III.HCl heated 50 hrs. with SOCl_2 at 150°), needles with $1\text{H}_2\text{O}$, m. (anhyd.) $161-2^\circ$, resolidifies a few degrees higher and m. again about 300° (decompn.); boiled a long time in excess of KOH or with moderately concd. H_2SO_4 it gives the 5-chloro-6-hydroxy acid, m. 305° (incipient decompn.). From **IV** and SOCl_2 at $180-220^\circ$ are obtained 3-chloroisonicotinic acid (**VII**), m. 235° (sealed capillary) (Me ester, m. 32°), and 3,5-dichloroisonicotinic acid (**VIII**), m. $218-20^\circ$, sublimes without decompn. *in vacuo*. 3-Hydroxyisonicotinic acid, from **VII** in boiling 50% KOH, yellowish, m. 312° . **VIII** heated 20 hrs. at 230° yields 3,5-dichloropyridine (**IX**), m. $64-5^\circ$, has an intense odor and is extraordinarily volatile; it was also synthesized from 5-chloronicotinic acid through the Me ester, hydrazide (m. 178°), urethan and $3,5\text{-C}_6\text{H}_3\text{N}(\text{NH}_2)\text{Cl}$. 2,5-Dichloropyridine, from Me isocinchomerone through $2,5\text{-C}_6\text{H}_3\text{N}(\text{NH}_2)_2$ treated in concd. HCl with NaNO_2 and Cu_2Cl_2 , extremely volatile, m. 60° , depresses the m. p. of **IX** more than 20° . C. A. R.

A new type of arsenical derivatives of quinoline. S. BERLINGOZZI. Reale Univ. Roma. *Ann. chim. applicata* 18, 333-6(1928) — Earlier investigations (cf. C. A. 22, (1976) have shown that it is possible to couple diazo salts with quinoline derivs., of which the As derivs. are of particular interest because of their pharmacol. value. In the present paper, aminoquinolines were chosen for coupling, both because of their relation to naphthylamines and because they offered the opportunity of obtaining for pharmacol. tests more basic compds. than those of the earlier expts. In conjunction with the latter, the expts. described in the present paper show a new type of arsenical and N deriv. of quinoline. They are particularly adapted to a study of the influence of the

position of substituents in the mol. on the physiol. properties of the resulting compds., and at the same time are of special pharmacol. interest because of the characteristics of the nucleus. Aq. Na arsanilate (2.8 g. in 100 cc. of water and 18 cc. of N HCl) diazotized with 0.1 N $NaNO_2$ (90 cc.), let stand 15 min., 2-methyl-3-aminoquinoline (1.7 g. in slight excess dil. AcOH) added, gradually warmed to 30–5°, let stand several hrs., filtered, washed with water, dried *in vacuo* over H_2SO_4 , yields 2-methyl-3-amino-4-azoquinoline- p -phenylarsonic acid, p -

$(HO)_2OAsC_6H_4N:NC:C(NH_2).CMe:N.C:C.CH:CH.CH:CH$, brown, m. 150–2°

(decompn.), gives intense brown-red solns. in alk. hydroxides and carbonates, from which it is reprecipitated by dil. AcOH, gives an intense brown soln. in concd. H_2SO_4 . Na salt. Following the same procedure, 2-phenyl-3-aminoquinoline (2.2 g.) yields 2-phenyl-3-amino-4-azoquinoline- p -phenylarsonic acid, orange-red, decomps. around 100°, is a weak acid, gives a brown-green soln. in concd. H_2SO_4 . Na salt. In the same way Na arsanilate (2.8 g.) and 2- p -methoxyphenyl-3-aminoquinoline (2.5 g.) yield 2- p -methoxyphenyl-3-amino-4-azoquinoline- p -phenylarsonic acid, brilliant red, decompd. around 145°, gives brown-yellow solns. in concd. H_2SO_4 . Likewise Na arsanilate (2.8 g.) and 8-aminoquinoline (1.4 g.) yield 5-azo-8-aminoquinoline- p -phenylarsonic acid,

$p-(HO)_2OAsC_6H_4N:NC:CH.CH:C(NH_2).C:C.CH:CH.CH.N$, chocolate-colored, is

not altered by heating up to 250°, gives an intense violet-red soln. in concd. H_2SO_4 . In the same way was prepd. 5-amino-8-azoquinoline- p -phenylarsonic acid $p-(HO)_2-$

$OAsC_6H_4N:NC:CH.CH:C(NH_2).C:C.N:CH.CH:CH$, dark wine-red, is not altered

by heating to 250°, gives a brilliant red soln. in concd. H_2SO_4 .

C. C. DAVIS

Mercury compounds of quinoline. II. T. UKAI. Kumamoto Pharm. Coll. Japan. *J. Pharm. Soc. (Japan)* 48, 812 (1928); cf. *C. A.* 22, 785.—By the action of $Hg(OAc)_2$ on several Me derivs. of quinoline, products of 3 types were obtained, i. e., (a) $C_8H_7MeN(HgCl)$, (b) $C_8H_7MeN(HgOAc)_2$ and (c) $C_8H_7MeN(HgOAc)$ (?). In the following are given resp. the kinds of derivs. used, the types of products obtained and their m. p.: 2-Me, (a) 154°, (b) 158–60°; 6-Me, (a) 210–3°, (b) does not m. 300°, (c) 229–32°; 7-Me, (a) 190–2°, (b) does not m. 300°, (c) 233–5°; 8-Me, (a) 212–4°, (b) does not m. 300°, (c) 209°.

NAO UYEI

Synthesis of methyl 2,4-dihydroxy-6,7-benzo-1,8-naphthyridin-3-carboxylate.

GLOE KOLLER AND ELSE STRANG. Univ. Wien. *Monatsh.* 50, 144–8 (1928).—Acridonic acid (1 g.) and 8 cc. AcOH, heated 1 hr. at 100°, 2 hrs. at 120° and 1 hr. at 130° give the anhydride, m. 223°; with NH_3 the C_6H_6 soln. ppts. an NH_4 salt, which with SO_2 yields the half amide of acridinic acid, sinters 175°, m. 189–90°; NaOBr transforms this into 2-aminoquinoline-3-carboxylic acid, m. 290–2° (decompn.) (the position of the NH_2 group was established by heating *in vacuo*, 2-aminoquinoline being formed); Me ester, yellow, m. 140–1°; condensation with $CH_2(CO_2Et)$ by heating with NaOEt at 145–50° gives Me 2,4-dihydroxy-6,7-benzo-1,8-naphthyridine-3-carboxylate, m. 240°.

C. J. WEST

Preparation of acridone derivatives. RICHARD WEISS AND J. LUDWIG KATZ. Univ. Wien. *Monatsh.* 50, 109–14 (1928).—The following compds. were prepd. with the idea of transforming them into heterocyclic analogs of trimethylenetriphenylmethane tricarboxylic acid; as yet this has not been accomplished. 4,3-Me(O_2N) C_6H_4COCl and C_6H_5MgCl in CS_2 with $AlCl_3$ give 90% of p -methyl- m -nitrodiphenyl ketone, m. 130–2°; reduction with $SnCl_2$ in concd. HCl gives the m - NH_2 deriv., m. 108–10°; condensed with o - $ClCH_2COH$ (KOH and Cu bronze), there results 2-tolyl-5'-benzoylanthranilic acid, m. 190–2°, crystg. with 0.5 H_2O (Me ester, m. 95–100°, crystg. with 1 H_2O). 2-Methyl-5'-benzoylanthranilic acid, m. 257° (decompn.), results from 4,3-Me(H_2N) C_6H_4COCl and o - $ClCH_2CO_2H$ with K_2CO_3 and Cu. (With WALTER HANDEL AND JACOB MELZER). o - IC_6H_4Me (7 g.) and 4.7 g. of o -tolylanthranilic acid give 3.8 g. of o -tolylanthranilic acid, m. 206–9°. Heating with concd. H_2SO_4 gives N - o -tolylanthranilic acid, m. 197–9°; the EtOH soln. shows a blue fluorescence. Phenyl- o -tolylanthranilic acid, m. 166–8° (86% yield); with concd. H_2SO_4 this gives a mixt. of N - o -tolylacridone and N -phenyl-4-methylacridone, m. 180–95°.

C. J. WEST

The alkylation of 2,5-diketopiperazine and peptides. CH. GRÄNACHER, G. WOLF AND A. WEIDINGER. *Helv. Chim. Acta* 11, 1228–41 (1928).—Of the many alkylation

methods, one in particular is suited to the prepn. of *N*-alkylated acid amides and consists in evapg. to dryness at low temps. the soln. or suspension of the acid amide and MeONa in abs. MeOH and then allowing the alkyl halide to react with the residue. When 5 g. glycine anhydride (I) suspended in a soln. of 2.5 g. Na in 50 cc. MeOH was heated to boiling for 1 min., the MeOH removed *in vacuo* below 40° until the residue was completely dry, 50 cc. PhCH₂Cl previously dried over K₂CO₃ added, heated on the water bath until test portions no longer gave an alk. reaction with moist litmus paper, filtered, washed with Et₂O, the excess I and NaCl removed from the cryst. residue with hot H₂O and then recrystd. from EtOH, 6-7 g. of *N,N'*-dibenzyl-2,5-diketopiperazine (II), PhCH₂N·CH₂·CO·N(CH₂Ph)·CH₂·CO, m. 176°, was obtained. *N*-Benzyl-

glycine-HCl, m. 226°, was obtained when 1.5 g. II was boiled 3-4 hrs. with 70 cc. concd. HCl. *N,N'*-Di-*p*-methoxybenzyl-2,5-diketopiperazine, prepd. like II from I and *p*-MeO C₆H₄CH₂Cl, m. 206°. Alanine anhydride (10 g.) prepd. from *dl*-alanine was treated with MeONa, dried and treated with PhCH₂Cl (70 g.) as above until neutral, the excess PhCH₂Cl removed by distn. *in vacuo*, the residue shaken with 150 cc. Et₂O, allowed to stand 3 hrs., the sepd. NaCl filtered off, the Et₂O removed by distn., the residue heated to 100° to remove traces of PhCH₂Cl and allowed to stand several days in the cold; the *N,N'*-dibenzylalanine anhydride (III) (2 g.) which sepd. m. 144.5°; when boiled with concd. HCl for 12 hrs., the soln. decanted from the impurities, evapd. to dryness *in vacuo*, the residue treated in H₂O with NH₄OH, filtered, the filtrate evapd. to dryness and recrystd. from a very little hot H₂O, *N*-benzyl-alanine (IV), softens 265°, m. 269-70° (decompn.), was obtained. The oily mother liquors from which III sepd. were steam distd., the residue dissolved in Et₂O, the Et₂O soln. washed successively with dil. HCl, H₂O, Na₂CO₃, H₂O, dried over K₂CO₃, the Et₂O evapd., giving the isomeric *N,N'*-dibenzylalanine anhydride (V), softens 85°, m. 89°; III and V are *trans*- and *cis*-stereoisomers, resp.; V is more sol. than III in EtOH or Et₂O; hydrolysis of V with HCl gives IV. *N*-Benzylhippuric acid ethylamide (VI), BzN(CH₂Ph)CH₂CO·NH₂Et, softens 117°, m. 119°, was prepd. by treating 10 g. BzNHCH₂CONH₂Et (VII) with 4 g. Na in 60 cc. abs. MeOH, evapg. to dryness at 60°, treating the residue with excess PhCH₂Cl, heating until neutral, adding Et₂O, removing the sepd. NaCl and cooling; hydrolysis with concd. HCl gave BzOH, benzylglycine-HCl, m. 226°, and PhCH₂NH₂Et. *p*-Bromobenzyl-*N*-hippuric acid ethylamide, prepd. like VI from VII and *p*-BrC₆H₄CH₂Br, m. 134-6°. *N*-Benzyl-hippuric acid benzylethylamide (VIII) BzN(CH₂Ph)CH₂CON(CH₂Ph)Et, obtained from the oily mother liquors in the prepn. of VI by fractional distn. *in vacuo*, b₁₋₂ 230-40°, forming an oil which does not cryst., was identified by the hydrolytic products in HCl soln. (BzOH, benzylglycine and EtNHCH₂Ph).
N. A. LANGE

β-Alanine derivatives. II. Metathiazine ring formation from acyl-β-alanine ester. E. MIYAMICHI. Toyama Pharm. Coll. Japan. *J. Pharm. Soc. (Japan)* **48**, 802-7 (1928) cf. *C. A.* **21**, 2663. - P₂S₅ and PhCONHCH₂CH₂CO₂Et in C₆H₆ gave *Et*-thiobenzoyl-β-alanate (I), yellowish brown, b₁ 175-82°. Heating of I with P₂S₅ at 120-40° gave 2-phenyl-6-ethoxymetathiazine, red, b₅ 85-95°. Picrate, m. 145°. Ac₂O and NH₂CH₂CH₂CO₂Et gave *Et* acetyl-β-alanate, b₆ 142°. III. Pyrimidine ring formation from acylalanine derivatives. *Ibid* 807-11. Action of 33% EtNH₂ in EtOH on PhCONHCH₂CH₂CO₂Et gave benzoyl-β-alanine ethylamide (I), PhCONHCH₂CH₂CONH₂Et, m. 138°. I and P₂O₅ in CHCl₃ gave 1-ethyl-2-phenyl-6-ketotetrahydropyrimidine (II), PhC·N·CH₂CH₂CO·NEt, brown, b_{0.6} 143-5°, which with PCl₅ gave 1-ethyl-2-

phenyl-6-chlorodihydropyrimidine-HCl, PhC·N·CH₂CH₂CCl·NEt·HCl, bright yel-

low, m. 171.3°. The above reactions are of interest because many pyrimidine derivs. are found in the decompn. products of nucleoproteins. NAO UYEI

Synthesis of four amino-3-hydroxy-1,4-benzisoxazines. GEO. NEWBERY AND MONTAGUE A. PHILLIPS. May and Baker, Ltd., Wandsworth. *J. Chem. Soc.* 1928, 3046-50.—These derivs. were prepd. for the orientation of certain of their As derivs. An improved method is given for the prepn. of 3,2-O₂N(H₂N)C₆H₃OH, whose chloroacetyl deriv., yellow, m. 153-4°; heating the latter with NaOH for 30 min. gives 5-nitro-3-hydroxy-1,4-benzisoxazine, orange, m. 115.6°; reduction with Fe and dil. AcOH gives the 5-NH₂ deriv., m. 236°; HCl salt, rhombs; Ac deriv., m. 255°; the triazole, by the action of NaNO₂, m. 204°. 4-Nitro-2-chloroacetamidophenol, m. 245° (decompn.); 6-nitro-3-hydroxy-1,4-benzisoxazine, m. 133.4°; reduction gives the 6-NH₂ deriv., m. 255°, also obtained by reduction of 2,4-(O₂N)₂C₆H₃OCH₂CO₂H with Fe and HCl; HCl salt, m. 300° (decompn.); Ac deriv., m. 298-9°. 2-Nitro-4-acet-

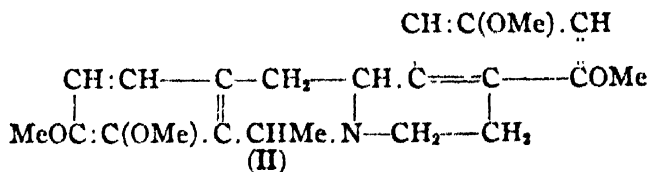
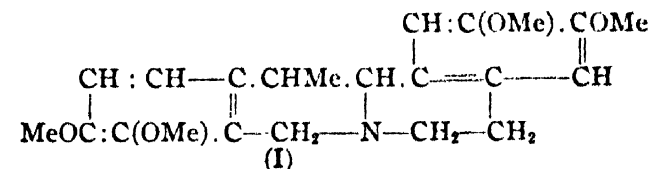
amidophenoxyacetic acid, yellow, m. 205–6°; reduction gives the 6-NH₂ deriv., m. 255°. *5-Nitro-2-chloroacetamidophenol*, light yellow, m. 233°; *7-nitro-3-hydroxy-1,4-benzisoxazine*, yellow, m. 232°; *7-NH₂ deriv.*, m. 220°; *HCl salt*, m. 275–8° (decompn.); *Ac deriv.*, m. 250°. *6-Nitro-2-chloroacetamidophenol*, yellow, m. 126°; *8-nitro-3-hydroxy-1,4-benzisoxazine*, light yellow, m. 255°; *8-NH₂ deriv.*, m. 180°; *HCl salt*, m. 272° (decompn.); *Ac deriv.*, m. 257°.

C. J. WEST

Heterocyclic compounds containing arsenic. II. Derivatives of 1,4-benzisoxazine. GEO NEWBERRY, MONTAGUE A. PHILLIPS AND RALPH WM. F. STICKINGS. May and Baker, Ltd., Wandsworth. *J. Chem. Soc.* 1928, 3051–66.—2,3-H₂N(HO)-C₆H₃AsO₃H₂ (20 g.) in 50 cc. 2 N NaOH, treated alternately with ClCH₂COCl (15 cc.) and 25% NaOH at 50°, gives 60% of *3-hydroxy-1,4-benzisoxazine-5-arsonic acid*, m. 245–8° (decompn.); the Ca, Ba and Mg salts are amorphous. 3,4-AcNH(HO)-C₆H₃AsO₃H₂ (45.5 g.) in 100 cc. H₂O, treated with 20 g. NaOH in 20 cc. H₂O and 16 g. ClCH₂CO₂H, refluxed until the mixt. is acid and again treated with 7 g. NaOH and 8 g. ClCH₂CO₂H, gives 66% of *2-acetamidophenoxyacetic acid-4-arsonic acid*, does not m. 280°. Using ClCH₂CONH₂ gives the corresponding *amide*, m. 236° (decompn.). With 5 N NaOH or 4 N HCl either the acid or amide gives 3-hydroxy-1,4-benzisoxazine 6 arsonic acid (I); I also results from 6-amino-3-hydroxy-1,4-benzisoxazine-HCl through the diazo reaction, from 3,4-ClCH₂CONH(HO)C₆H₃AsO₃H₂ and NaOH or from 3,4-H₂N(HO)C₆H₃AsO₃H₂. *2-Nitrophenoxyacetic acid 4-dichloroarsine*, plates, results from the 4-arsonic acid and HCl with KI satd. with SO₂; it is very resistant to aq. hydrolysis and is not reduced by SnCl₂ or NaHSO₂ but Fe(OH)₂ gives a small yield of *3-hydroxy 1,4-benzisoxazine 6-arsenoxide*, obtained in a 60% yield by reducing the arsenic acid. I (2.7 g.) in 20 cc. H₂O and 5 cc. satd. Na₂CO₃ soln., added to 2 g. MgCl₂·6H₂O and 10 g. NaHSO₂ in 200 cc. H₂O, gives *3,3'-dihydroxy-6,6'-arseno-1,4-benzisoxazine*, light yellow, amorphous. Nitration of I gives about 75% of total NO₂ derivs.; the proportion of 7- and 5-NO₂ compds. varies with the temp.: 0°, 29, 39%; 10°, 35, 35%; 30°, 41, 28%; there is also 1.3% of the 8-NO₂ deriv. The *5-NO₂ deriv.*, yellow, forms sol. cryst. Ca, Ba and Mg salts and a sparingly sol. mono-NH₄ salt; reduction with Fe(OH)₂ gives 70% of the *NH₂ deriv.*, plates, does not m. 300°; HNO₃ gives a *triazole*, C₈H₆O₆N₃As H₂O, m. 247° (decompn.). Refluxing with 5 N HCl for 4 hr. splits off the As, giving *5-amino-3-hydroxy-1,4-benzisoxazine-HCl*. The *7-NO₂ deriv.* of I is yellow and sparingly sol.; the Ca, Ba and Mg salts are sol. yellow solids; reduction gives 70% of the *7-NH₂ deriv.*, m. 258–60° (decompn.); *Ac deriv.*, decomp. 255°, *urethan*, needles. The *7-NO₂ deriv.* may be freed from As by boiling with Na₂SO₃. *3,7-Dihydroxy-1,4-benzisoxazine-6-arsonic acid*, plates, does not m. 300°. Ba salt, prisms; Ca and Mg salts, amorphous. *5-Acetamido-2,4-dihydroxyphenylarsonic acid*, prisms. Ca and Mg salts, amorphous. *3-Nitro-5-chloroacetamido-4-hydroxyphenylarsonic acid*, yellow, m. 200° (decompn.); NaOH gives 60% of *8-nitro-3-hydroxy 1,4-benzisoxazine-6 arsonic acid*, decomp. 320°; Ca and Mg salts, yellow needles. *2,6-Diacetamidophenoxyacetic-4-arsonic acid*, m. 212° (decompn.); Mg salt, amorphous. Boiling 5 N NaOH or 5 N HCl gives *8-amino-3-hydroxy-1,4-benzisoxazine 6 arsonic acid* (II), plates, does not m. 300°, sulfate, rhombs; Ba salt, prisms; Ca salt, needles; Mg salt, amorphous. Reduction of this in 5 N HCl by SO₂ and KI gives the *6-hydroxychloroarsine-HCl*, needles, which, with H₂O, gives the *6-arsenoxide-HCl*, plates, sol. in excess of H₂O. *8,8'-Diamino-3,3'-dihydroxy-6,6'-arseno-1,4-benzisoxazine*, pale yellow, amorphous. The *Ac deriv.* of II, m. 275–80°; reduction with SO₂ and KI gives *8-acetamido 3-hydroxy 1,4-benzisoxazine-6-dichloroarsine*, needles; H₂O gives the *arsenoxide*, needles. *8,8'-Diacetamido-3,3'-dihydroxy-6,6'-arseno-1,4-benzisoxazine*, yellow, amorphous. *3-Hydroxy-1,4-benzisoxazine-6-arsonic acid 8-glycinamide*, plates (60% yield). II and ClCH₂COCl and NaOH, followed by NH₄OH, give the *8-glycylamino deriv.*, needles. Through the diazo reaction, II gives the *8-Cl deriv.*, yellow, does not m. 280°. *3,3'-Diacetamido-4,4'-dihydroxy-5,5'-dimethylarsenobenzenamine*, yellow, amorphous. *3-Hydroxy-8-methyl-1,4-benzisoxazine-6-arsonic acid*, prism. *3,3'-Dihydroxy-8,8'-dimethyl-6,6'-arseno-1,4-benzisoxazine*, yellow, amorphous. II and ClCH₂CH₂CO₂Cl in 10 N NaOH give the *3-α-chlorocarbethoxyamino deriv.*, refluxing with 5 N NaOH gives the *8-β-hydroxyethylamino deriv.*, prisms. *3-Nitro 1-hydroxy-5-carboxyphenylarsonic acid*, rich yellow, forming a monohydrate, m. 282–4° (decompn.); Mg, Ba and Ca salts, amorphous; reduction with glucose and alkali gives the *3-NH₂ deriv.*, rhombs, not melted at 300°; Ca, Ba and Mg salts are amorphous. *Ac deriv.*, m. 250–4° (decompn.); Mg and Ca salts, amorphous. *3-Hydroxy-5-carboxy-1,4-benzisoxazine-6-arsonic acid*, m. 300–5° (decompn.). *3-Hydroxy 2-methyl 1,4-benzisoxazine-6-arsonic acid*, needles, does not m. 300°; Ca salt, needles; Mg salt, amorphous. The corresponding *2-Et deriv.*, needles, does not m.

280°. 8-Acetamido-3-hydroxy-2-methyl-1,4-benzisoxazine-6-arsonic acid, decomp. 265°, Mg salt, amorphous; the 2-Et deriv. forms needles. 3- ω -Chlorocarbethoxyamino-4-hydroxyphenylarsonic acid, m. 209° (decompn.) (63% yield); Mg salt, amorphous. With 4 N NaOH this yields 2,3-dihydro-1,4-benzisoxazine-6-arsonic acid, buff prisms, does not m. 300°. Reduction in HCl with SO₂ and HI gives the 6-arsenoxide, amorphous. 6,6'-Arseno-[2,3-dihydro-1,4-benzisoxazine], yellow, amorphous. 3- ω -Chlorocarbethoxyamido-5-acetamido-4-hydroxyphenylarsonic acid, m. 189° (decompn.); Mg salt, amorphous. Reduction gives 3,3'-di-[β -hydroxyethylamino]-5,5'-diacetamido-4,4'-dihydroxyarsenobenzene, pale yellow, amorphous. 3-Hydroxy-1,4-benzisoxazine-8-arsonic acid, m. 298° (decompn.); 6-NH₂ deriv., prisms, does not m. 300°; Ba and Ca salts, cryst.; Mg salt, amorphous; Ac deriv., needles, does not m. 300°. 6,6'-Diacetamido-3,3'-dihydroxy-8,8'-arsen-1,4-benzisoxazine, pale yellow, amorphous. III. Some derivatives of 4-amino-3-hydroxyphenylarsonic acid. ISIDORE E. BALBABAN. *Ibid* 3066-73.—3-Hydroxy-1,4-benzisoxazine-7-arsonic acid, crvsts. with 1H₂O; Mg and Ba salts, amorphous; Ca salt, spikes. Nitration gives 72.4% of a mixt. of the 8-NO₂ and the 6(?)·NO₂ derivs., both decomp. at 280°. 8-NH₂ deriv., needles with 0.75 mol. H₂O (66.6% yield); Ba and Ca salts, cryst.; Mg salt, amorphous; Ac deriv., needles. 2-Nitro-4- α -hydroxyacetamido-3-hydroxyphenylarsonic acid, golden brown, decomp. 210°. 2-NH₂ acid, prisms; Mg, Ca and Ba salts, amorphous; Ac deriv., needles. 8-Acetamido-3-hydroxy-1,4-benzisoxazine-5-arsonic acid, needles. Hydrolysis gives 8-amino-3-hydroxy-1,4-benzisoxazine, m. 180°; HCl salt, chars 270°, decomp. about 300°; it diazotizes normally; Ac deriv., m. 257°. 8-Amino-3-hydroxy-1,4-benzisoxazine-5-arsonic acid, prisms with 0.5 mol. H₂O not lost at 100°. 4,3-H₂N(HO)-C₆H₃AsO₃H₂ and COCl₂ in 2 N NaOH give benzoxazolone-5-arsonic acid, plates; nitration gives the 3-NO₂ deriv. 5-Nitro-4-amino-3-hydroxyphenylarsonic acid, bright yellow spikes with 1 mol. H₂O not lost at 100°. 6-Nitrobenzoxazolone-5-arsonic acid, pale brown plates; 6-NH₂ deriv., crystg. with 1H₂O, lost at 100°; Ac deriv., leaflets. 6-Acetamidobenzoxazolone-3-arsonic acid, leaflets. C. J. WEST

Synthesis of ketodehydrocorydaline. JOSEPH B. KOEPLI AND W. M. H. PERKIN, JR. Dyson Lab., Oxford. *J. Chem. Soc.* 1928, 2989-3000.—A brief sketch is given of the evidence which indicates that the constitution of corydaline must be I and not the II of Dobbie and Lauder; in order to establish this the synthesis of the highly characteristic deriv., ketodehydrocorydaline, was undertaken. Acetoveratrone (45 g.)



and 50 g. BrCH₂CO₂Et in 280 cc. C₆H₆ were heated with 20 g. Zn for 0.75 hr. and the resulting crude Et β -veratryl- β -hydroxybutyrate (III) distd. *in vacuo*, giving 50 g. Et β -veratrylcrotonate (IV), b₁₀ 195-6°, m. 51-2°; if the III is dehydrated with P₂O₅ there results a compd. C₂₄H₂₈O₈, m. 225-6°, which is not reduced by Na-Hg. Hydrolysis of the ester (IV) gives the free acid, m. 138-40°, which is reduced by Na-Hg to β -veratrylbutyric acid (V), m. 84-5°; the acid crvsts. with 1H₂O, m. 60-1° and loses H₂O at 100°. With concd. H₂SO₄ at 60-73°, V gives 5,6-dimethoxy-3-methyl-1-hydrindone, m. 90-1°, characterized as the oxime, m. 128-9°, and iso-NO deriv., lemon, m. 225-6° (decompn.). In order to cause the condensation to take place in position 2, the 6-position was protected by treating V with Br in AcOH-Ac₂O, giving the 6-Br deriv., m. 106-7°, which, with concd. H₂SO₄, gives the 4-bromo-6,7-dimethoxy-3-methyl-1-hydrindone, lemon, m. 82-3° (oxime, m. 187-8°). The 2-iso-NO deriv., pale yellow, m. 217° (decompn.), in NaOH undergoes a Beckmann transformation with *p*-Me-C₆H₄SO₂Cl, giving 6,3,4,2-Br(MeO)₂(HO₂C)C₆HCHMeCN, which was hydrolyzed to the corresponding acid and since this did not cryst., it was transformed into 6-bromo-3,4-dimethoxy- α -homophthalic anhydride m. 128-9°; this anhydride was hydrolyzed in alk. soln. and debrominated with Na-Hg, and the crude acid again transformed into

3,4-dimethoxy- α -methoxyhomophthalic anhydride, m. 131–3°. Boiled with β -veratrylethylamine in C_6H_6 , the acid transformed into the Me ester and the latter treated with $POCl_3$, there results **6,7,3',4'-tetramethoxy-9-methyl-2'-carbomethoxy-3,4-dihydro-protopapaverine**, m. 136–7°, which, heated at 150–70° for 10 min., gives ketodehydro-corydaline, identical with a specimen from corydaline. Preliminary expts. indicate that this is not readily reduced electrolytically to *dl*-corydaline. C. J. WEST

Constitution of laurotetanine. GEORGE BARGER AND ROBERT SILBERSCHMIDT. Edinburgh Univ. *J. Chem. Soc.* 1928, 2919–27.—Laurotetanine (I) is an alkaloid in various *Lauraceae*; Gorter (*C. A.* 22, 2470) assumed the same C skeleton in I and glaucine and termed the *N*-Me Me ether isoglaucine. The present work indicates that glaucine and isoglaucine are identical; complete methylation gives dimethyl-laurotetanine-MeI, m. 210° (G. gives 226°); with 10% EtOH-KOH this gives dimethyl-laurotetaninemethine, whose HI salt m. 265° and MeI salt m. 276°. Heating the MeI with 10% MeOH-KOH splits off Me_2N and gives **2,3,5,6-tetramethoxy-8-vinyl-phenanthrene (II)**, pale pink, m. 142°, oxidized by $KMnO_4$ in Me_2CO to **2,3,5,6-tetramethoxyphenanthrene-8-carboxylic acid**, yellow, m. 215°; CO_2 could not be removed from this acid. Similar compds. were prepd. from glaucine and found to be identical with those from the so-called isoglaucine. Reduction of II gives the *SA* deriv. (III), m. 120°. In the attempted synthesis of III, the following reactions were carried out. **3,4-(MeO) $_2$ C $_6$ H $_2$ Et**, through the Gattermann reaction, was transformed into **3,4-dimethoxy-6-ethylbenzaldehyde (?) (IV)**, b. 150–9°, m. 28–30° (*semicarbazone*, m. 197–9°); oxidation gives the corresponding *benzoic acid*, m. 138°. IV, hippuric acid, Ac_2O and $AcONa$ give 66% of the *azlactone* of **3,4-dimethoxy-6-ethylbenzylidenhippuric acid**, yellow, m. 155°; the acid, m. 212°. KOH transforms it into **3,4-dimethoxy-6-ethylphenylpyruvic acid**, pale yellow, m. 181°; oxidation with alk. H_2O_2 gives **3,4-dimethoxy-6-ethylphenylacetic acid**, pale pink, m. 67 (78% yield); condensation of the acid with **6,3,4-O $_2$ N(MeO) $_2$ C $_6$ H $_2$ CHO** by Ac_2O and $ZnCl_2$ gives 52% of **α , β -1-dimethoxy-6-ethylphenyl- β -6-nitro-3,4-dimethoxyphenylacrylic acid**, yellow, m. 203°; reduction with $FeSO_4$ and NH_4OH at 80° gives an amorphous *NH $_2$ acid*, deep yellow, m. 192°, which is transformed through the diazo reaction to **2,3,5,6-tetramethoxy-8-ethylphenanthrene-9-carboxylic acid**, which did not cryst. but was decarboxylated by heating at 230–50° and 9 mm., giving a compd. m. 118°, but the mixt. with III, m. 106°. The reason for this is as yet unexplained. **6-Nitro-3-methoxy-4-ethoxybenzaldehyde**, m. 159–60°. C. J. WEST

Strychnine and brucine. VII. The constitution of the alkaloids discussed in relation to the hypothesis that dinitrostrychnol is an isoquinoline derivative. REGINALD C. LAWCEY, WM. H. PERKIN, JR., AND ROBERT ROBINSON. Univ. of Oxford and Manchester and Univ. Coll., London. *J. Chem. Soc.* 1928, 3082–92; cf. *C. A.* 21, 3065. It is suggested that dinitrostrychnol is a dinitrodihydroxyisoquinoline and this suggestion is used as a starting point for the elaboration of new structural formulas for strychnine and brucine. The original must be consulted for the discussion. C. J. W.

Method for the technical preparation of scopolamine. F. CHEMNITZ. *J. prakt. Chem.* 120, 221–4 (1928).—Details are given for the extn. and purification of scopolamine.

C. J. WEST

Constitution of delphinin. KAORU KONDO. *Helv. Chim. Acta* 11, 919–21 (1928).—The constitution of the *p*- $HOC_6H_4CO_2H$ (I) in delphinin (II) was detd. as follows. This (from *Delphinium consolida* L.) was methylated with Me_2SO_4 and NaOH, keeping reaction as nearly neutral as possible, until a product (III) insol. in dil. alkali was obtained, showing that no free OH groups were present. Alk. hydrolysis of III gives an acid and an anthocyan (IV). Acid hydrolysis of IV gives an alkali-sol. aglucon the CO_2 content of which is nearly the same as that of the tri-Me ether of delphinidin, 3 OH groups being free (2 phenolic, apparently the same as those in the pyrylium nucle). The position of the sugar and I groups must be the same in III and II. I in II before is not combined with the sugar radical but in the aglucon of the dye mol.

FREDERICK C. HARN

Formula of the digitalis glucosides. II. *Digitalium verum*. ADOLF WINDAUS. *Nachr. Ges. Wiss. Göttingen Math.-Physik. Klasse* 1927, 422–6; cf. *C. A.* 22, 88.—Numerous analyses of very pure digitaligenin and 8 of its derivs. indicate that digitaligenin has a formula, $C_{25}H_{30}O_7$. By oxidation it never gives digitoxigenone, but a compd. m. 197°. *Digitalinum verum* has the formula, $C_{25}H_{34}O_{11}$ and contains 1 mol. of genu. $C_{25}H_{34}O_6$, 1 mol. glucose and 1 mol. digitalose. Hot HCl is required to split *digitalinum verum*. This reagent eliminates 2 mols. H_2O from the compd., $C_{25}H_{34}O_{11}$ primarily formed, so that digitaligenin, $C_{25}H_{30}O_7$, is obtained. Digitaligenin is a monohydroketone with 3 double bonds, giving cryst. formyl and Ac derivs., adding 6 H to

form satd. hexahydrodigitaligenin, $C_{23}H_{36}O_3$. A tetrahydro deriv. can be isolated as intermediary product. CrO_3 oxidizes the hexahydro deriv. to a ketone, $C_{23}H_{34}O_3$, then to a di- CO_2H acid, $C_{23}H_{34}O_6$. The secondary alc. groups of digitaligenin are located in a hydro ring. When reduced by Clemmensen's method, the ketone, $C_{23}H_{34}O_3$, gives a satd. lactone, $C_{23}H_{36}O_2$, which, like bile acid, contains 4 carbocyclic systems in its mol. This lactone differs from the one obtained from anhydrodigitoxigenin by the same method, they may be stereoisomers.

ALBERT L. HENNE

The addition of bromine to protoporphyrin dimethyl ester and to its complex zinc salt. WM. KÜSTER AND ARNO GROSSE. Tech. Hochschule Stuttgart. *Z. physiol. Chem.* 179, 117-38(1928).—The behavior of hemin toward Br or Cl and $AcOH-HBr$, whereby 2 atoms of halogen and 2 mols of HBr are added, leaves a choice of 2 structures for the unsatd. side chains, viz.



The addn. products would be the same in either case provided both side chains are attached to the same pyrrole ring. Fischer's synthesis of mesohemin, however, would indicate that the acetylene and vinyl groupings are not adjacent. But this complication disappears when hemin is regarded as a double mol. contg. a radical with a coordination position on the Fe as long as the latter is Fe^{++} , as in hemoglobin and hemochromogen, but an actual bond when the Fe becomes Fe^{+++} . There would be a distinction in this respect between the porphyrins, whose formation from hemin involves a reduction, and their complex salts, on the one hand, and the hemins on the other hand. It was therefore of interest to exam. the behavior of protoporphyrin ester and its complex Zn salt with respect to their halogen-adding capacity. In contrast to hemin ester which adds only 2 Br, the protoporphyrin ester adds 4 Br. Since the hemin ester is thought to be identical with the complex $ClFe^{+++}$ salt of protoporphyrin ester, the difference between this and the complex Zn salt as well as the porphyrin itself appeared to be established, especially since the mol. wt. of the Zn salt of tetramethyl-hematoporphyrin indicates the presence of 38 C atoms. However, a prepn. of the complex $ClFe^{+++}$ salt of protoporphyrin ester likewise had the capacity of adding 4 Br, so that it appears that in the transition from hemin to protoporphyrin a rearrangement may occur which accounts for the difference between the 2 hemin esters. The contrast between the complex $ClFe^{+++}$ and Zn salts of protoporphyrin ester would indicate that in some hemin esters, depending on their method of prepn., the $ClFe^{+++}$ group may or may not exert an influence on the acetylene and perhaps also on the vinyl grouping. Two of the 4 Br add to the acetylene group of protoporphyrin ester and the other 2 to the vinyl, a further evidence of structure I. To yield a substance of the hematoporphyrin type 2 Br should add to a secondary and 1 each to a primary and a tertiary C. The first 2 Br should then be replaceable by MeO, which is actually the case with tetrabromoporphyrin ester, while its Zn salt merely splits off 1 HBr . In the latter case the resulting side chains are $-C(OMe):CHBr$ and $-CHBrCH_2OMe$ as shown by oxidation to hemateric acid and the imide, $C_8H_{10}O_3NBr$, m. 75° . $Zn(OAc)_2$ in MeOH sapon. 1 MeO with formation of a Zn salt of the Zn complex. In tetrabromoporphyrin 2 Br are replaceable by 2 CN, viz. those on secondary carbons. Sapon. of the 2 CN to 2 CO_2H followed by esterification yields a dibromotetracarboxylic ester. Reduction by HI and P and treatment with MeOH removes a 3rd Br, leaving 5 MeO in all, showing that the tertiary Br on the unsatd. side chain had become secondary and therefore replaceable by MeO. The product is cryst. and represents an $A-\alpha$ -methoxy- $A-\beta$ -, $V-\alpha$ -dicarboxymethyl- $V-\beta$ -bromomesoporphyrin di-Me ester, where A designates the acetylene and V the vinyl side chain.

A. W. DOX

The rhodin-like compounds. HANS FISCHER, A. TREIBS AND J. HELBERGER. Tech. Hochschule, München. *Sitzb. math. naturw. Abl. bayer. Akad. Wiss. München*, 1928, No. 2, 141-2. Porphyrin is changed by treatment with H_2SO_4 and H_2O_2 , H_2SO_4 alone, or $AlCl_3$ to a cryst. compd. with the properties similar to rhodin. With compds. of the ethereal porphyrin type, methylethylmaleic acid imide is formed. When mesoporphyrin is treated with H_2SO_4 and H_2O_2 indifferent acid compds. originate which are probably lactones.

H. J. DEUEL, JR

Cerebronic acid. VI. P. A. LEVENE AND F. A. TAYLOR. Rockefeller Inst. and Allegheny General Hosp., Pittsburgh. *J. Biol. Chem.* 80, 227-9(1928).—In view of the recent emphatic refutation by Klenk (*C. A.* 22, 1782) of the accepted view of the

structure of cerebronic acid as $C_{25}H_{50}O_3$, the oxidation of cerebronic acid has been repeated under more rigorous conditions than in the expts. of Levene and Taylor (C. A. 16, 2305). The results confirm the older view of the compn. of the acid. L. and T. "have some reason to believe that the acid $C_{23}H_{46}O_2$ of Klenk was a mixt. of 2 acids, one of C_{24} and the other of C_{22} ." A. P. LOTHROP

Some derivatives of cholesterol. R. L. SHRINER AND LUTHER KO Univ. of Ill. *J. Biol. Chem.* 80, 1-8(1928) --Cholesteryl *p*-aminobenzoate was prepd. in the hope that its salts would be sol. in H_2O and because of the possibility that this deriv. might have a local anesthetic action. Neither hope was realized. The compd. was prepd. from the *p*-nitrobenzoate by catalytic reduction in $AcOEt$; the reduction requires only 25 min. and the double bond is not affected. Cholesteryl *p*-aminobenzoate, m. 237.4-8.5°, $[\alpha]_D^{25}$ 3.61° in $CHCl_3$; *HCl* salt, m. 210 1° Cholesterol can be completely reduced in $AcOEt$ catalytically to dihydrocholesterol in 4 hrs. but requires a large amt. of catalyst. The product is absolutely neg. to the Liebermann-Burchard reaction and its $[\alpha]_D^{25}$ is 26.35°, which is considerably higher than that usually given and is probably the correct value for the rotation of the completely reduced sterol. Dihydrocholesteryl benzoate, m. 135.8-6.8°, $[\alpha]_D^{25}$ 21.40°. Dihydrocholesteryl *p*-nitrobenzoate, m. 156.5-7.7°, $[\alpha]_D^{25}$ 20.05°. Dihydrocholesteryl *p*-aminobenzoate, m. 191 2°, $[\alpha]_D^{25}$ 26.55°; *HCl* salt, m. 182.5-4.5°. The values for $[\alpha]_D$ of the previously described benzoate and *p*-nitrobenzoate were found to be 13.70° and 6.48°, resp. A. P. LOTHROP

Progress of the great organic industry and technology of dyes (TURSKE) 25. Kinetics of the formation of dioximes (SEMFRIA, SOMIGLIANA) 2. Decomposition of nitrosotriacetone in the presence of hydroxyl ions (GOODAL, LEWIS) 2. Kinetics of the hydrolytic decomposition of α -bromopropionic acid (ZAWIDZKI, ZAWIDZKI) 2. Hydrolytic decomposition of succinimide (EULER, OLANDER) 2. Plant coloring material VIII. Constitution of Monardaecin (KARRER, WIDMER) 11D.

Gesammelte Abhandlungen von F. Kehrman. Vol. V. Leipzig: Georg Thieme. 46 pp. Paper cover, M. 30. Reviewed in *Chem. Trade J.* 83, 303 (1928).

LASSAR COHN **Organic Laboratory Methods.** Translated by Ralph E. Oesper; edited by Roger Adams and Hans T. Clarke. Baltimore: The Williams & Wilkins Co. 439 pp. \$6.50. Reviewed in *Chemicals* 30, No. 27, 23(1928).

MOURET, CHARLES. **Notions Fondamentales de Chimie Organique.** 6th ed., revised and enlarged. Paris: Gautier Villars. 657 pp. Reviewed in *Chem. News* 137, 433(1928).

OPPENHEIMER, CARL. **Organische Chemie.** 2nd ed., revised. Leipzig: George Thieme. 471 pp. Reviewed in *J. Am. Chem. Soc.* 51, 320(1928).

Catalytic oxidation of organic compounds. JOHANNES BRODE and ADOLF JOHANNSEN (to Grasselli Dyestuff Corpn.) U. S. 1,693,915, Dec. 4. In effecting catalytic oxidations such as that of $C_{10}H_8$ to produce phthalic anhydride the gaseous mixt. which has undergone reaction, prior to sepn. of the reaction products and at a temp. at which no deposition of the desired reaction product occurs, is brought into contact with a solid substance such as granulated pumice or bauxite the shape of which is not altered at the temp. of use and which does not cause further conversion or contamination of the product but which is capable of removing impurities such as H_2SO_4 .

Dissolving various organic compounds. I. G. FARBENIND A.-G. Brit. 290,554, Oct. 26, 1926. Ingredients of the prepn. described in Brit. 261,720 (C. A. 21, 3433), suitable for production of aq. solns. of org. compds. such as hydrocarbons, higher alcs., and ketones insol. or difficultly sol. in water, and comprising sulfonic acids having soap-like properties such as alkylated aromatic sulfonic acids or their salts and water-sol. salts, may be mixed in the solid state or the mixt. may be produced when prepg. the sulfonic acids and subsequently rendered solid. An example is given of the sulfonation of naphthalene followed by butylation, neutralizing the upper layer formed with an alkali, evapng. and mixing the salt of butylated naphthalenesulfonic acid obtained with Na_2SO_4 .

Purifying aromatic hydrocarbons. SELDON CO. Brit. 290,840, June 7, 1927. Aromatic hydrocarbons, particularly those of the benzene series, are purified by treatment with a halogen or halogen-yielding substance under conditions such that the impurities are converted into readily separable or harmless substances. Catalysts, ultra-violet rays, heat, pressure or a silent elec. discharge may in certain instances be used to facilitate the treatment. Many details and examples are given. Cf. C. A. 23, 274.

Alcohols and aldehydes from hydrocarbons. J. C. WALKER (to Empire Gas & Fuel Co). Brit. 290,613, May 17, 1927. Hydrocarbon gases such as natural gas or gases from coal, petroleum or shale distn. are treated (to produce oxidation products such as MeOH and other alcs., CH_2O , AcH and propionaldehyde) by adding to the gas a relatively small proportion of O and treating the mixt. with a catalyst under conditions favoring the production of the particular products desired. Among the catalysts which may be used are Pt, Pd, Cr, Mn, Fe, Cu, Ni, Au, Ag, oxides of Cu, Mn, Fe, Ni, V, Cr, Mo, Ce and other metals forming higher and lower oxides and their mixts. Various details and modifications are given.

Acetylene and other unsaturated hydrocarbons. I. G. FARBENIND. A.-G. Brit. 290,322, Jan. 10, 1927. Liquid hydrocarbons are sprayed into, or in admixt. with a combustible gas such as CH_4 , C_2H_6 or H and rapidly heated to a high temp. by burning part of the mixt. with O or gases rich in O, to produce C_2H_2 and other unsatd. hydrocarbons. An app. is described. Cf. C. A. 22, 243.

Polymerization of hydrocarbons. VIKTOR SZIDON. Fr. 640,534, Feb. 18, 1927. Thick, pasty polymerization products of hydrocarbons of the aliphatic series are prepd. by oxidation with a catalyst at a suitable temp. and pressure. Catalysts such as metals, oxides, oleates and stearates of metals, org. and inorg. acids may be used. In an example air under pressure is injected into American spindle oil at 180° in which finely divided Cu oxide is dispersed. A white paraffin, m. 45° , is obtained.

Depolymerization. I. G. FARBENIND. A.-G. Swiss 126,817, Jan. 28, 1927. High mol. carbohydrates are depolymerized by heating with a bivalent alc. The examples given are glycol and glycol chlorohydrin.

Amines. I. G. FARBENIND. A.-G. (Rudolf Wietzel and Otto Köhler, inventors). Ger. 468,895, July 8, 1925. In the prepn. of mono- and dimethylamine or their salts by the action of CH_2O , or substances yielding it, on NH_4 salts, alc. in the proportion of 1 mol. alc. to 2 mol. CH_2O is added to the reaction mixt. or to one of the components used.

Cyclic amines. I. G. FARBENIND. A.-G. Brit. 290,175, May 7, 1927. Homologs of PhNH_2 are hydrogenated by treatment under pressure with H, suitably at temps. of 170 – 350° and under pressures of 50–200 atm. in the presence of a catalyst such as Cu, a metal of the Pt or Fe group or oxides or salts of these metals (among which are particularly mentioned Pt, Ni, Co, oxides of Co and Ni, Co formate and Ni oxalate). Examples are given of the hydrogenation of *o*-, *m*- and *p*-toluidines and *p*-xylylidine to the corresponding hexahydro-compds. and of β -naphthylamine to a mixt. of *ar*- and *ac*-tetrahydro- β -naphthylamines.

Primary amines of the benzene series. I. G. FARBENIND. A.-G. (Paul Herold, inventor). Ger. 467,638. Jan. 1, 1927. Nitro compds. of the benzene series are reduced to the corresponding amines by treatment under pressure with solns. of water-sol. sulfides, polysulfides, or thiosulfates in the presence of a reducing gas, such as H, and in the presence or absence of a catalyst, the amt. of sulfide, etc., being so adjusted that at the end of the reaction all the S is present as sulfate only. Cf. Brit. 295,824.

Separating mono- and dialkyl derivatives of aromatic amines. WALTER FLEMING and HANS KLEIN (to Silesia Verein chemischer Fabriken Ida- und Marienhuetten). U. S. 1,695,372, Dec. 18. Mixts. such as those comprising monomethyl- and dimethylaniline are dissolved with a neutral solvent such as C_6H_6 and phthalic anhydride is added to convert the monoalkylated amine into the corresponding phthalimidic acid and the latter is then sepd. by shaking with an aq. alkali soln. such as a dil. NaOH soln.

Esters. WM. J. BANNISTER (to Commercial Solvents Corp.). U. S. 1,695,449, Dec. 18. In forming esters such as ethyl lactate an alc. and an acid such as EtOH and lactic acid are heated in the presence of a liquid, *e. g.*, C_6H_6 , which forms a const-boiling mixt. of minimum b. p. with water and the alc., and in the presence of a solid dehydrating agent, *e. g.*, anhyd. $\text{Al}_2(\text{SO}_4)_3$.

Mixtures of esters. WALTHER CLAASEN. Fr. 32,991, Feb. 4, 1927. Addn to 611,824. Crude phenols or cresols are hydrogenated and oxidized to the corresponding acids, which mixt. of acids is esterified. Before esterification individual acids, such as adipic, glutaric or succinic may be sepd. Cf. C. A. 22, 966.

Ethers of carbohydrates. I. G. FARBENIND. A.-G. Fr. 640,174, July 30, 1927. Ethers of carbohydrates of high mol. wt., $(\text{C}_6\text{H}_{10}\text{O}_5)_x$, such as cellulose or starch, are made by causing the alkylating agent to act on the semi-moist hydrates in the form of a gas or vapor under pressure or not and in the presence of an alkali. The mass is kept in motion during the reaction. Examples are given of the ethylation and methylation of starch and cellulose in various forms.

Ethylene glycol monoalkyl ethers. CHARLES O. YOUNG (to Carbide & Carbon Chemical Corp.). U. S. 1,696,874, Dec. 25. A reaction is effected between ethylene

oxide and EtOH by employment of heat and pressure, in the presence of a large excess of EtOH.

Aromatic aldehydes. J. D. RIEDEL A.-G. Brit. 290,649, May 20, 1927. *o*- and *p*-Propenylhydroxybenzenes are oxidized to the corresponding aldehydes by use of aromatic nitro compds. such as PhNO₂ or nitrotoluene in excess; e. g., a mixt. of isomeric propenylmonomethylpyrocatechol ethers can be decompd. directly by oxidation of the alkali salts into a mixt. of vanillin and isochavibetol and the vanillin subsequently extd. or after sepn. of the main quantity of isochavibetol the filtrate may be oxidized. By use of nitro compds for effecting the oxidation of the mixt. of alkali salts of the 2 propenylmonoalkyloxymethylpyrocatechol ethers produced in the decompn. of isosafrole or camphor oils, followed by methylation and heating with dil. acids, there is obtained an easily separable mixt. of isovanillin and isoeugenol.

Anhydrides. HENRY DREYFUS. Swiss 126,820, May 18, 1927. The anhydrides of monobasic fatty acids are obtained by the decompn. of the acids by heat. The hot gases resulting are led through app. which condenses the anhydride only. Alternatively the gases may be passed over a solvent for the anhydride having a higher b. p. than water.

Heterocyclic bases. MARCEL DE MONTMOLLIN. Swiss 126,821, May 9, 1927. Alk. dinitriles are reduced and the diamines so formed cyclized simultaneously in the presence of a catalyzer.

Benzanthrone derivatives. I. G. FARBENIND. A. G. (Richard K. Müller and Karl Wilke, inventors). Ger. 468,896, Oct. 27, 1925. Condensation products of the benzanthrone series are prepd. by heating *Bz*-halogenbenzanthrone or their derivs. with primary or secondary aliphatic or aromatic bases with or without diluents and acid-binding agents as well as a small quantity of Cu or a Cu salt. Examples are given of the condensation of *Bz*-1-bromobenzanthrone with MeNH₂, Me₂NH, carbazole and the Et ester of anthranilic acid, of amino-*Bz*-1-bromobenzanthrone with Me₂NH, and of pyrazoleanthrone with *Bz*-1-bromobenzanthrone giving benzanthrionylpyrazoleanthrone m. 398-400°.

7-Meso-Benzanthrenone derivatives. I. G. FARBENIND. A.-G. Fr. 640,410, Sept. 3, 1927. New condensation products are obtained by heating to a high temp. a compd. of the benzanthrenone series, having the 4-position free, with an aromatic OH compd. having an *o*- or *p*-position free, in the presence of NaOH or KOH only sufficient to form the phenolate. 7-*meso*-Benzanthrenone, β -naphthol and KOH are heated to 200°; a compd. is formed that is 4-(2-hydroxy-1-naphthyl)-7-*meso*-benzanthrenone, turns red at 200° and m. below 300°. Similar products are obtained if β -naphthol is replaced by chloro 2 naphthol or α -naphthol or if benzanthrenone is replaced by its 6-chloro deriv. only the benzobenzanthrenonecarboxylic acid described in Fr. 628,120. If β -naphthol is replaced by 2,6-xenol, the product, probably 4-(4-hydroxy-3,5-dimethylphenyl)-7-*meso*-benzanthrenone, crystallizes in yellow prisms from PhNO₂.

Monohydroxy- ω -aminoacetophenone derivatives. HELMUT LEGERLOTZ. Can. 287,650, Dec. 11, 1928. To 10 g. *p*-HOC₆H₄COCH₂Br (10 g.) in 25 cc. 96% alc. is added in small portions 40 cc. of 40% aq. MeNH₂ with cooling. After 24 hrs. at ordinary temp. the excess of MeNH₂ is partially evapd. and the cryst. deposit filtered out by suction and washed with alc. The HOC₆H₄COCH₂NHMe, purified by redissolving once or twice with alc., forms brilliant colorless leaflets, m. 147-8°. These leaflets can also be obtained by pptn. with NH₃ from the aq. soln. of the hydrochloride of the base. The hydrochloride, cryst. from alc., m. 239-240°.

Substituted guanidines. I. G. FARBENIND. A.-G. Fr. 640,017, Aug. 25, 1927. Substituted guanidines are prepd. by treating substituted thioureas with a Zn compd. and H₂ or an NH₃ deriv. in the presence of NaOH or an oxide or hydrate of an alk. earth metal. *Diphenylbenzylguanidine*, probably (Ph.NH)₂.C:N.CH₂.Ph, is prepd. from thiocarbanilide and benzylamine, m. 102-3°. *Diphenylmethylguanidine* is prepd. from thiocarbanilide and methylamine, m. 108-9°. *Diphenyldimethylguanidine* is prepd. from thiocarbanilide and dimethylamine, as an oil, the nitrate of which m. 199°.

Alkyl isoketyl cyclohexanols. WALTER SCHÖLLER and HANS JORDAN (to Chem. Fabrik auf Actien, vorm. E. Schering). U. S. 1,696,782, Dec. 25. Condensation product obtainable from alkylated phenols and ketones such as *p*-cresol and acetone are decompd. by heating and the mixt. of decompn. products thus obtained is then hydrogenated until 8 H atoms have entered into the mol. combination, and the hydrogenated alkyl isoketyl phenols are sepd. from the product by fractional distn. *in vacuo*.

Halogen derivatives of hydrocarbons. M. POLANYI and S. VON BOGDANDY. Brit. 289,795, April 29, 1927. Halogen in gas or vapor form is brought into contact with hydrocarbon mixed with a substance such as an alkali metal or As and P which readily

combines with the halogen and serves to facilitate the desired reaction. The process may be applied to the production of halogen derivs. from CH_4 and its homologs such as C_6H_{12} . The hydrocarbon, $\text{C}_{18}\text{H}_{38}$, gives chlorination products which after splitting off the Cl and oxidizing yield acids which can be used for *manuf. of soap*. Aromatic hydrocarbons can be similarly chlorinated. An app. is described in which MeCl may be made by use of CH_4 , Cl and Na vapor.

Halogen-substituted sulfonic acids. CHEMISCHE FABRIK MILCH A.-G. (to Oranienburger chemische Fabrik A.-G.). Brit 289,841, May 3, 1927. Halogen carriers are used in making halogen-substituted sulfonic acids by treating aliphatic, aromatic or hydroaromatic compds. of mixts. with sulfuric acid halohydrins. Examples are given of the treatment of castor oil, and a mixt. of ground nut fatty acid, wool fat and C_6H_6 with chlorosulfonic acid with addn. of pulverized pyrolusite.

Aromatic sulfonic acids. FRITZ GÜNTHER and ADOLF CANTZLER (to I. G. Farbenind. A.-G.). U. S. 1,696,199, Dec. 25. Sulfonic acids of high emulsifying, cleansing and wetting power and which are not dyes are derived from aromatic compds. (such as condensation products of C_{10}H_8 with alcs and aldehydes) contg. at least 2 aromatic nuclei linked together by a bridge and in which at least 1 aromatic nucleus contains at least 1 H atom substituted by a hydrocarbon residue with at least 2 C atoms.

Amino sulfonic acids. I. G. FARBENIND. A.-G. (Walther Duisberg, Winfrid Hentrich, Johann Huismann and Ludwig Zeh, inventors). Ger. 467,626, Mar. 5, 1924. ω -Aminoalkylaminonaphthalenesulfonic acids are obtained by treating hydroxy-, dihydroxy-, amino-, aminohydroxy-, or diaminonaphthalenesulfonic acids with a sulfite and an alkylendiamine, simultaneously or in the order named. In the examples (1) $1,4\text{-H}_2\text{NCH}_2\text{CH}_2\text{NHC}_{10}\text{H}_6\text{SO}_3\text{H}$ is obtained from $1,4\text{-HOC}_{10}\text{H}_6\text{SO}_3\text{H}$, NaHSO_3 and $\text{C}_2\text{H}_4(\text{NH}_2)_2$; (2) $2,7\text{-H}_2\text{NCH}_2\text{CH}_2\text{NHC}_{10}\text{H}_6\text{SO}_3\text{H}$ is obtained from $2\text{-H}_2\text{NC}_{10}\text{H}_6\text{SO}_3\text{H}$, NaHSO_3 and $\text{C}_2\text{H}_4(\text{NH}_2)_2$; (3) $2,8,6\text{-H}_2\text{NCH}_2\text{CH}_2\text{NH}(\text{OH})\text{C}_{10}\text{H}_6\text{SO}_3\text{H}$ is obtained from $2,8,6\text{-H}_2\text{N}(\text{HO})\text{C}_{10}\text{H}_6\text{SO}_3\text{H}$, NaHSO_3 and $\text{C}_2\text{H}_4(\text{NH}_2)_2$; (4) $2,8,3,6\text{-H}_2\text{NCH}_2\text{CH}_2\text{NH}(\text{OH})\text{C}_{10}\text{H}_6(\text{SO}_3\text{H})_2$ is obtained from $2,8,3,6\text{-(HO)}_2\text{C}_{10}\text{H}_6(\text{SO}_3\text{H})_2$, NaHSO_3 , and $\text{C}_2\text{H}_4(\text{NH}_2)_2$; (5) $2,7\text{-H}_2\text{N}(\text{CH}_2)_4\text{NHC}_{10}\text{H}_6\text{SO}_3\text{H}$ is obtained from $2,7\text{-H}_2\text{NC}_{10}\text{H}_6\text{SO}_3\text{H}$, NaHSO_3 and $\text{C}_4\text{H}_8(\text{NH}_2)_2 \cdot 2\text{HCl}$; (6) $5,1,3\text{-H}_2\text{NCH}_2\text{CH}_2\text{NH}(\text{H}_2\text{N})\text{C}_{10}\text{H}_6\text{SO}_3\text{H}$ is obtained from $1,5,3\text{-(H}_2\text{N)}_2\text{C}_{10}\text{H}_6\text{SO}_3\text{H}$, NaHSO_3 and $\text{C}_2\text{H}_4(\text{NH}_2)_2$. Cf. Brit. 230,457 (C. A. 19, 3272).

Cyclohexyl-substituted aliphatic acids. ROGER ADAMS and GLEN S. HIERs (to Abbott Laboratories). U. S. 1,693,801, Dec. 4. The *manuf.* of various of these acids is described, among which are: cyclohexylnonanoic acid, m. $45.5\text{--}46.5^\circ$, cyclohexyl butyric acid, m. $29\text{--}30^\circ$, δ -cyclohexylpentanoic acid, m. $6\text{--}8^\circ$, ϵ -cyclohexylhexanoic acid, ζ -cyclohexylheptanoic acid, m. $25\text{--}26^\circ$, θ -cyclohexyloctanoic acid, m. $27\text{--}28^\circ$, and the four acids of formula $\text{C}_6\text{H}_{11}(\text{CH}_2)_n\text{COOH}$ in which n is 9, 10, 11 and 12, resp., m. $52.5\text{--}53.5^\circ$, $58\text{--}59^\circ$, $61.5\text{--}62^\circ$ and $63\text{--}64^\circ$, resp. These compds. may be used as *therapeutic agents* and are effective against acid-fast bacteria such as *B. leprae* and *B. tuberculosis*. The acids with side chains larger than 8 C are prepd. by the condensation of the proper Grignard reagent with the aldehyde esters obtained by the ozonization of methyl oleate, methyl undecylenate or methyl erucate. The 9-C-side-chain acid is obtained from cyclohexyl bromide and methyl μ -aldehydooctanoate, the 10-C-side-chain acid from cyclohexyl bromide and methyl θ -aldehydononanoate, the 11-C-side-chain acid from β -cyclohexylethyl bromide and methyl μ -aldehydoctanoate, the 12-C-side-chain acid from β -cyclohexylethyl bromide and methyl θ -aldehydononanoate and the 13-C-side-chain acid from cyclohexyl bromide and methyl λ -aldehydododecanoate. Numerous details of procedure are given. Cf. C. A. 22, 3491.

Aminobenzenearsonic acids. ÉTABLISSEMENTS POULENC, FRÈRES (Robert Meyer and Gaston Sauvage, inventors) Fr. 636,660, Oct. 21, 1926. Aminobenzenearsonic acids and their derivs. are prepd. by reducing nitrobenzenearsonic acids with Fe and HCl. Examples are given of the prepn. of *p*-hydroxy-*m*-amino-, *o*-hydroxy-*p*-amino-, and *p*-aminobenzenearsonic acid.

Abietic acid esters of polyglycerol. ERNEST M. SYMMES (to Hercules Powder Co.) U. S. 1,696,337, Dec. 25. Esters are prepd. by refluxing a polyglycerol such as diglycerol with rosin and Zn dust. They are harder than "ester gum" and may be used in *varnishes*.

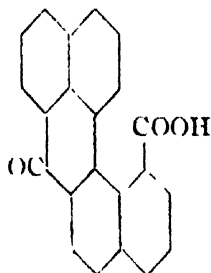
An indophenol. I. G. FARBENIND. A.-G. Swiss 126,120, Oct. 29, 1926. An indophenol is made by joint oxidation of propyl-2-monophenyldihydroindole and *p*-aminophenol.

Lead and tin alkyl compounds. STANDARD DEVELOPMENT CO. Brit. 290,444, May 21, 1927. The metal to be alkylated is alloyed with an alkali metal and the subdivided alloy is treated in a closed reaction vessel with EtCl or other suitable alkylating agent dissolved in a liquid hydrocarbon material such as naphtha, "white oil" or kero-

sene or benzenoid hydrocarbons The resulting products are sepd. by distn. or extrn. with suitable solvents.

Gold compound of the thiobenzimidazole series. I. G. FARBENIND. A.-G. Swiss 126,127. Feb. 4, 1927. 3,4-Thiobenzimidazolesulfonic acid or its salts is treated with Au salts. The initial material may be obtained as Na salt by treating the Na salt of 3,4-diaminobenzenesulfonic acid with CS_2 in alc. alkali.

Benzobenzanthronecarboxylic acid. I. G. FARBENIND. A.-G. Swiss 126,194, Jan. 13, 1927. 1,1-Dinaphthyl-8,8-dicarboxylic acid is treated with acid condensing agents until the product is sol. in glacial AcOH. The product, probably having the appended formula, m. 278° and is sol. in alkalies and in cold concd. H_2SO_4 .



1-Diazo-5-nitroanthraquinone-2-carboxylic acid. I. G. FARBENIND. A.-G. Swiss 126,965, Nov. 26, 1926. Addn. to Swiss 124,351. The N-contg. anthraquinone deriv. obtained by the action of fuming H_2SO_4 on 1,5 dinitro-2-methylantraquinone is heated with HNO_3 .

Separating benzoic and phthalic acids. ALPHONS O. JAEGER (to Selden Co.). U. S. 1,694,124, Dec. 4. The mixt. is brought into contact with vapors of C_6H_6 , ether or CCl_4 or other suitable org. solvents for benzoic acid at temps. (suitably about 125 – 150°) not substantially above the temp. at which the phthalic acids are transformed into the anhydrides, in order to sublime the benzoic acids. Cf. C. A. 22, 4539.

Condensation products of phthalic acid. FRANZ WEBEL (to I. G. Farbenind. A.-G.). Can. 284,968, Nov. 20, 1928. Water-sol. derivs. of phthalic acid are produced by action on 1 mol. proportion of phthalic acid at from 60° to 70° with at least 2 mol. proportions of ethylene oxide in the presence of a solvent and a catalyst comprising Na-late.

Lactic acid and derivatives. I. G. FARBENIND. A.-G. Brit. 290,464, July 2, 1927. Acid neutralized mash in which lactic acid has been produced by fermentation is treated with MeOH which dissolves out the lactate and the latter may be sepd. by distn. of MeOH or by pptg. as with acetone or Me formate. The free acid may be obtained by treating the lactate with inorg. acid or Me lactate may be produced by adding H_2SO_4 to the MeOH soln. of lactate and other esters of lactic acid may be similarly formed from different alcs.

Sulfonic acids. I. G. FARBENIND. A.-G. Brit. 290,229, May 10, 1927. 6-Chloro-2-amino-1-methylbenzene-3-sulfonic acid, 6-chloro-2-amino-1-methylbenzene-5-sulfonic acid and 6-chloro-2-amino-1-methylbenzene-3,5-disulfonic acid are made by sulfonating 6-chloro-2-amino-1-methylbenzene with suitably different regulation of the conditions of the process. Details are given of each of the processes.

Sulfonic acids. CHEMISCHE FABRIK MILCH A.-G. Fr. 640,617, Aug. 1, 1927. Sulfonic acids or sulfonates which are used for fat splitting and in the textile, paper and leather industries as washing, wetting, penetrating and dispersing agents and for the preservation of fibers, are obtained by treating org. substances of high mol. wt. with strong sulfonating agents. Examples are given of the treatment of castor oil, olein, waste wool fat, mineral oils of high b. p., a mixt. of oleic acid and benzene, a mixt. of mineral oils of high b. p., a mixt. of oleic acid and benzene, a mixt. of mineral oil and Freon, a mixt. of castor oil and Ac_2O , and a mixt. of lanolin and lactic acid with ClSO_3H . As sulfonating agents oleum or a mixt. of H_2SO_4 with either P_2O_5 , metaphosphoric acid, POCl_3 or anhydrous K_2SO_4 may also be used.

Aminoarylarsonic acids. LES ÉTABLISSEMENTS POULENC FRÈRES. Ger. 468,757, Oct. 22. Aminoarylarsonic acids and their derivs. are prepd. by reduction of the corresponding nitroarylarsonic acids with Fe in HCl soln. Examples are given of the prepn. of 3-amino-4-phenol-1-arsonic acid, *p*-aminophenylarsonic acid, 3,4-diaminobenzenearsonic acid, and 4-amino-2-phenol-1-arsonic acid. See Fr. 636,600.

1-Methyl-2,5,6-trichloro-3-aminobenzene-4-sulfonic acid. I. G. FARBENIND. A. G. Fr. 640,748, Sept. 10, 1927. 1-Methyl-2,5,6-trichlorobenzene-4-sulfonic acid is

treated with a nitrating agent, *e. g.*, HNO_3 , and reduced. In an example 1-methyl-2,5,6-trichlorobenzene is dissolved in H_2SO_4 and HNO_3 is run in with heating. The product is reduced in the usual manner.

1,5-Diaminoanthraquinone-2,6-dicarboxylic acid. I. G. FARBENIND. A.-G. Swiss 126,726. Mar. 7, 1927. Addn. to Swiss 125,478. Anthraquinone-1,2,5,6-diisoxazole is sapon.

1,8-Diaminoanthraquinone-2,7-dicarboxylic acid. I. G. FARBENIND. A.-G. Swiss 126,727. Mar. 7, 1927. Addn. to Swiss 125,478. The substance is prepd. by the sapon. of anthraquinone-1,2,8,7-diisoxazole.

5-Nitro-1-aminoanthraquinone-2-carboxylic acid. I. G. FARBENIND. A.-G. Swiss 126,725. Mar. 7, 1927. Addn. to Swiss 125,478. The substance is prepd. by the sapon. of 5-nitroanthraquinone-1,2-isoxazole, it m. 325° .

Concentrating lower aliphatic acids such as acetic acid. HENRY DREYFUS and CLIFFORD I. HANEY (to Celanese Corp. of America). U. S. 1,696,432, Dec. 25. Extn of aq. solns. of acids such as dil. HOAc is effected with a solvent for the acid, *e. g.*, ether or CHCl_3 , and a normally liquid hydrocarbon, *e. g.*, gasoline, both of lower b. p. than the acid, and subsequent fractional distn.

Concentrating acetic acid. HENRY DREYFUS and CLIFFORD I. HANEY (to Henry Dreyfus). Can. 285,052, Nov. 20, 1928. Aq. solns. of AcOH are concd. by extg. with a medium comprising about 70 parts by vol. of Et_2O and about 30 parts by vol. of petroleum ether b. about 40° . The aq. soln. and extg. medium are caused to pass counter-current through a column. The extracting medium is sepd. from the ext. and returned to the process.

Acetic acid. I. G. FARBENIND. A.-G. Swiss 126,819, April 29, 1927. Concd. AcOH is prepd. from dil. AcOH by extn. with an org. base, such as quinoline, which is not affected by the concd. acid.

Acetic anhydride. WM. P. SKERTCHLY (to Celanese Corp. of America). U. S. 1,696,363, Dec. 25. See Can. 283,817 (C. A. 22, 4539).

Acetic anhydride. I. G. FARBENIND. A.-G. Fr. 640,721, Sept. 9, 1927. AcOH is dissoed. into water and Ac_2O with catalyst at temps. above 500° , and the vapors formed are sepd. by diffusion in a series of porous plates and cylinders.

Acetic anhydride, etc. I. G. FARBENIND. A.-G. Brit. 289,959, Feb. 4, 1927. Ac_2O is made by mixing glacial HOAc with dry NaOAc in a closed vessel and adding SiCl_4 while stirring. SnCl_4 and TiCl_4 as well as SiCl_4 may also be used in various similar reactions for prepg. various anhydrides such as those of homologs and halogen derivs. of HOAc.

Acetic anhydride and other anhydrides. H. DREYFUS. Brit. 289,972, Feb. 8, 1927. In forming Ac_2O or similar anhydride from the corresponding acid, the vapor of the acid (which may be dil.) is treated at a high temp., with or without catalysts, and the product is then treated with water-binding substances such as a bisulfate or pyrosulfate of an alkali or alk. earth metal, ZnCl_2 , CaCl_2 or ortho-, pyro- or meta-phosphoric acid (but not using H_2SO_4). In the first stage, decompn. of the acid may be effected by passing the vapor through a Cu or fireclay tube, preferably at $700\text{--}1000^\circ$, and the second stage for water removal may be effected at a lower temp., suitably $150\text{--}350^\circ$.

Aldehydes. I. G. FARBENIND. A.-G. Brit. 290,319, Jan. 7, 1927. Carboxylic acids or their anhydrides are reacted on by reducing gases such as H, coal gas, producer gas or water gas at elevated temp. in the presence of hydrogenation catalysts such as Cr, Fe, Cu, Mn and Co and their oxides. Activating substances which also may be used include Pb, Be, Ce, U and Zn and their oxides. Examples are given of the production of benzaldehyde from phthalic anhydride and of propionaldehyde from succinic anhydride.

Acetaldehyde. CARL N. HAND (to Rubber Service Laboratories Co.). U. S. 1,696,479, Dec. 25. In order to sep. AcH from a mixt. also contg. C_2H_2 , the mixt. is passed through an aromatic org. compd. (such as aniline at $70\text{--}90^\circ$) which will chemically combine with the AcH.

Acetaldehyde and acetic acid. S. GOLDSCHMIDT. Brit. 290,523, Nov. 30, 1927. EtOH vapor and air or O are used with Ag as acatalyst at temps. of $380\text{--}440^\circ$ (preferably $400\text{--}420^\circ$). Various details are given.

Benzaldehyde and benzoic acid from toluene. ALPHONS O. JAEGER (to Selden Co.). U. S. 1,694,122, Dec. 4. Vapors of toluene mixed with O-contg. gas at an elevated temp. (suitably about $340\text{--}380^\circ$) are passed over a catalyst contg. a zeolite such as one contg. V, W and Mo which preferentially catalyzes the reaction and which has assocd. with it sulfate or other suitable non-alk. salt of an alkali-forming metal. Numerous other uses of various similar zeolitic catalysts are also described.

Crotonaldehyde. EMIL LÜSCHER (to Elektrizitätswerk Louza). U. S. 1,693,907,

Dec. 4. In forming crotonaldehyde from AcH and aldol, AcH is combined, in an atm. of N, with only such a quantity of a dil. aq. caustic alkali soln. as not to cause any pptn. on subsequent neutralization, and an inorg. acid such as H_3PO_4 or H_2SO_4 is then added to the reaction product to obtain a reaction mixt. contg. aldol, AcH and a little salt; this reaction mixt. is finally distd. fractionally without previous purification or sepn., in a circulating atm. of N. Cf. *C. A.* 22, 3670.

Synthesis of methanol, etc. SYNTHETIC AMMONIA & NITRATES, LTD. and R. G. FRANKLIN. Brit. 290,399, Nov. 15, 1926. Catalysts for the production of MeOH and other oxygenated org. compds. from CO and H are prepd. by heating a mixt. comprising $ZnCO_3$ or basic Zn carbonate and a Cr compd. such as Zn chromate or basic Zn chromate.

Synthetic methanol. JOHN C. WOODRUFF, GROVER BLOOMFIELD and WM. BANISTER (to Commercial Solvents Corp.). U. S. 1,695,447, Dec. 18. See Brit. 279,377 (*C. A.* 22, 2756).

Benzene. I. G. FARBENIND. A.-G. Swiss 126,818. Mar. 21, 1927. Naphthalene vapor is treated with acid in the presence of an acid-carrying catalyzer and the product subjected to the action of an energetic H_2CO_3 -liberating catalyzer.

Purifying crude anthracene. ALPHONS O. JAEGER (to Selden Research & Engineering Corp.). U. S. 1,693,713, Dec. 4. Impure anthracene is subjected to the action of furfural and methylfurfural or other suitable selective solvent contg. at least one liquid compd. with a furan nucleus and which serves to dissolve out phenanthrene and carbazole. Numerous details and examples are given.

Acetylene. FIRMA C. H. BOEHRINGER SOHN. Swiss 126,764, Nov. 22, 1926. C_2H_2 is purified by drying and treating with absorptive agents such as H_2CrO_4 . Cf. *C. A.* 22, 304.

6-Isopropoxy-8-aminoquinoline. I. G. FARBENIND. A.-G. Swiss 126,723. April 13, 1926. Addn. to Swiss 125,476. The substance is prepd. by isopropylating 6-hydroxy-8-aminoquinoline.

2-Styryl-4-amino-6-ethoxyquinoline. I. G. FARBENIND. A.-G. Swiss 126,074, Sept. 7, 1926. 2-Styryl-6-ethoxyquinoline-4-carboxylic acid amide is treated with hypohalogenites. The product m. 212° and forms water-sol. salts with lactic and glycolic acids. The initial material is obtained by treating 6-methoxyquinoline-4-carboxylic acid with excess of benzaldehyde in presence of $ZnCl_2$, esterifying the 2-styryl-6-ethoxyquinoline-4-carboxylic acid so obtained, and converting the ester to the amide with alc. NH_3 .

2-Styryl-4-amino-6-ethoxyquinoline. I. G. FARBENIND. A.-G. Swiss 126,075, Sept. 7, 1926. 4-Amino-6-ethoxyquinoline is condensed with benzaldehyde. The initial material (m. 195°) is made from 4-chloro-6-ethoxyquinoline by treatment with alc. NH_3 . Cf. Swiss 126,074 (above).

6-Ethoxy-8-aminoquinoline. I. G. FARBENIND. A.-G. Swiss, 126,722, April 13, 1926. Addn. to Swiss 125,476. The 6-hydroxy-8-aminoquinoline is ethylated. The product is a yellow oil which congeals at 60° .

1-Amino-2-bromoanthraquinone-4-nitrile. I. G. FARBENIND. A.-G. Swiss 126,724, Nov. 7, 1926. Addn. to Swiss 125,469. CuCN is heated with 1-amino-2-bromo-1-haloanthraquinone in the presence of a compd. in which a nitrile group is linked with an aliphatic residue, and the product treated with dil. HNO_3 . The substance m. 275° .

Diphenylaminechloroarsine. DONALD B. BRADNER. U. S. 1,696,539, Dec. 25. Crude molten diphenylaminechloroarsine is introduced into water and the mass is agitated until the diphenylaminechloroarsine has solidified, to effect purification.

Phenolphthalein. EARL B. PUTT. U. S. 1,693,666, Dec. 4. Phenolphthalein in unground particles less than 10 microns in diam. is obtained by dissolving in an aq. NaOH soln., mixing an aq. soln. of gum acacia, agar-agar or the like and adding an acid such as HCl or H_2SO_4 .

Crotonyl bromide. I. G. FARBENIND. A.-G. Brit. 289,777, April 30, 1927. An addn. reaction is effected between HBr and 1,3-butadiene (suitably by introducing butadiene into a soln. of HBr in glacial HOAc). The reaction mixt. is poured into ice water and the bromide which seps. as a heavy oil is dried and distd.

Sodium glutamate. K. OKA. Brit. 290,657, May 19, 1927. Na glutamate soln. is purified to free it from Fe by boiling with Na sulfide. When the glutamic acid is contaminated with other amino acids, such as leucine or tyrosine, the crude hydrochlorides are dissolved in water, neutralized with $Ca(OH)_2$ and the Ca salts of the other amino acids are filtered off, Na_2CO_3 is added to the filtrate to form Na glutamate and the latter is then freed from Fe.

Tribromoethanol from

I. G. FARBENIND. A.-G. Swiss 126,962,

Jan. 21, 1927. Addn. to Swiss 122,060. A soln. of bromal in secondary alc. is allowed to react with an Al alcoholate or an Al halogen alcoholate.

Trichloroethanol from chloral. I. G. FARBENIND. A.-G. Swiss 126,963, Jan. 21, 1927. Addn. to Swiss 122,061. A soln. of chloral in a secondary alc. is allowed to react with an Al alcoholate or an Al halogen alcoholate.

2,3-Hydroxynaphthoyl-2',3'-aminonaphthol methyl ether. I. G. FARBENIND. A.-G. Swiss 126,822. Mar. 25, 1927. The prepn. is carried out by heating 2,3-hydroxynaphthoic acid with 2,3-aminonaphthol methyl ether and a dehydrating agent in an indifferent medium, and crystg. from benzene. The m. p. (uncorrected) is 203-4°.

Iodobenzonitriles with a linkage of the phenol ether type. SCHERING-KAHLBAUM A.-G. (Walter Schoeller and Kurt Schmidt, inventors). Ger. 467,639, Aug. 3, 1926. Products of the type ROR'CN, in which R and R' are iodine-substituted aryl residues, are prepd. by condensing an iodophenol ether with a metal salt of a hydroxyiodobenzonitrile, or a metal salt of an iodophenol ether with an iodobenzonitrile, in either case in presence of a catalyst such as Cu. The iodobenzonitrile or iodohydroxybenzonitrile may be replaced by an idonitrobenzene or an idonitrophenol and the condensation product then reduced, diazotized and treated with Cu(CN)₂. Examples are given describing the prepn. of 4-cyano-4'-methoxy-2,6,3'-triiododiphenyl ether in 4 different ways. Cf. Brit. 275, 213 (C. A. 22, 2244).

Synthetic camphor. GABRIEL ROZIER. Fr. 640,846, Feb. 22, 1927. In the prepn. of borneols and synthetic camphor, pinene, mixed or not with secondary compds. of oil or turpentine is treated with dry HCl dild. either in a neutral solvent or dehydrating catalyst such as CCl₄, EtOH or in the mother liquors from crystn. from a preceding operation. Dehydrating catalysts such as CaCl₂, EtOH or BaCl₂ may be added to the pinene. Etherification of the pinene-HCl by an org. acid is facilitated by dildn. in a solvent such as Et formate, the losses of which are compensated by introduction of abs. alc. and recovered as alc. in the subsequent sapon. Transformation to camphene may be carried out at the same time as etherification by a metallic oxide such as ZnO.

Condensation products from crude cresol and acetone. HANS JORDAN (to Chem. Fabrik auf Actien, vorm. E. Schering). U. S. 1,696,769, Dec. 25. In order to recover separately the constituents of a mixt. produced by the condensation of crude cresol and acetone, the product is dissolved in ether and the *m*-cresol acetone condensation product which crystallizes out is sepd. from the liquid. Cf. C. A. 22, 2952.

Condensation products of alcohols and ketones with urea, etc. I. G. FARBENIND A.-G. Brit. 290,192, May 9, 1927. Examples are given of the production of condensation products from: (a) glycol, urea and *p*-toluenesulfonamide, heated together and treated with Na amalgam; (b) butylene glycol, urea, *p*-toluenesulfonamide, acetanilide and Zn dust; (c) diacetin, acetylurea, acetanilide and Ca shavings; and (d) butylene glycol, urea and *p*-toluenesulfonamide heated with Mg powder. The products may be used for keeping in soft condition casein, gelatin or artificial products which swell in water, being viscous or resinous in character and sol. in water. Cf. C. A. 23, 533.

11—BIOLOGICAL CHEMISTRY

PAUL E. HOWE

A—GENERAL

FRANK P. UNDERHILL

The composition of dental enamel. A. BERNARDI. *Ann. chim. applicata* 18, 454-60(1928).—The enamel from the teeth of bulls 2-5 yrs. old, as well as those 7-10 yrs., has been analyzed as follows: (I) 2-5 yrs., sol. ash 99.87, CaO 45.83, MgO 4.05, P as PO₄ 52.44, Cl 0.33%; (II) 7-10 yrs., sol. ash 99.63, CaO 57.25, MgO 1.49, P as PO₄ 52.05, Cl 0.25%. Change in compn. indicates that this is living matter. A. W. C.

Influence of amino acids on the action of salivary amylase. J. TEMMINCK GROLL. Univ. Amsterdam. *Pharm. Weekblad* 65, 1315-9(1928).—In contrast to the activating effect of amino acids on the cleavage of starch by salivary amylase reported by Sherman and coworkers, glycine, alanine, leucine, glutamine, asparagine and tyrosine were found by G. to have no influence whatever. With a sol. starch soln. buffered to pH 6.15-20 and dild. saliva, the time required for conversion to erythroextrin was the same with and without the addn. of various quantities of the above amino acids. Proline gave variable results, indicating possibly a slight activating effect. A. W. Dox

The dissociation constants of

acid and of inosid acid from

muscle. H. WASSERMEYER. Univ. Frankfurt. *Z. physiol. Chem.* 179, 238-42(1928).—Detns. by electrometric titration gave the values $pK_1 = 3.8$ and $pK_2 = 6.2$ for adenosine-phosphoric acid (I), and $pK_1 = 2.4$ and $pK_2 = 6.3-5$ for inosic acid (II). In the region of the 1st dissocn. stage II is more acid than I, whereas in the 2nd dissocn. stage both are about equally strong acids. During muscle contraction I is converted into II with liberation of NH_3 and the reaction is thus displaced toward the alk. side. A. W. DOX

Enzymic deamination in muscle. GERHARD SCHMIDT. Univ. Frankfurt. *Z. physiol. Chem.* 179, 243-82(1928).—Adenine in the form of adenylic acid or adenosine undergoes deamination when treated with the pulp or press juice from rabbit muscle. The free purine, on the other hand, remains practically unaltered when subjected to this treatment. Guanine, guanosine and guanosinephosphoric acid are not attacked by the enzymes present. The formation of NH_3 from adenylic acid and from adenosine is brought about by 2 distinct enzymes, each of which is sp. for the 1 substrate. The enzyme which liberates NH_3 from adenylic acid may be extd. from muscle by $NaHCO_3$ after a preliminary extn. with $NaCl$, and is adsorbed from faintly acid or alk. soln. by $Al(OH)_3$ and can then be recovered from the adsorbate by elution with $N Na_2HPO_4$. The other enzyme, which splits adenosine, is not adsorbed by $Al(OH)_3$ and the sepn. of the 2 can thus be effected. The pH optimum of the adenylic acid deaminase is at 5.9. This enzyme is inert toward a no. of amino acids, dipeptides, amides and purines. Although it readily attacks adenylic acid from muscle it has no action on that from yeast, showing that the adenylic acids from these 2 sources, despite their similarity in properties, are not identical but are isomers. Inosic acid (hypoxanthinephosphoric acid) was isolated and identified as the cleavage product of adenylic acid from muscle.

A. W. DOX

The role of the membrane in the measurement of the osmotic pressure of plasma proteins. A. NITSCHKE. Univ. Freiburg. *Z. ges. expth. Med.* 59, 298-302(1928).—The height of the osmometer when a collodion sack is used does not depend only on the proteins, but the Donnan effect between serum and collodion must be considered. For 7% protein at 20° and pH of 7.9 the rise was 20 cm. serum with a parchment membrane. With the collodion membrane the rise was 35 cm.

F. L. DUNN

Some aspects of the vibration theory of odor. G. MALCOLM DYSON. *Perfumery Essential Oil Record* 19, 456-9(1928).—Since odor perceptions take place through direct contact between the mols. of the odorous substance and the nasal perceptory app., a substance to be odorous must have a vapor pressure above a certain critical value. The odor of trichlorophenol can be detected in a diln. at which its partial pressure is 10^{-10} mm. of Hg, and for each particle of odorous substance there will be 10^{12} mols. of air. To produce the sensation of odor a succession of vibrations must be set up by the presence of a succession of mols. entering the nasal processes and impinging upon the sense organs (cf. *C. A.* 22, 1436). The wave motion is of such a nature that the mols. suffer no permanent change during its genesis. The odor mol. forms a loose absorption system with the protein mols. of the olfactory cells, and absorbs radiant heat energy. This causes displacement of one or more electrons from their normal orbit. When electrons revert to their normal positions the energy released as wave motion of a definite frequency is absorbed by the sensory app. and leaves the system as a nervous impulse. The above interpretation is in harmony with Grips's failure to find any relation between the intensity of odor and the absorptive capacity of the vapor in regard to radiant heat. Furthermore, it explains the variety of odors which exist. Any relation between gross chem. constitution and odor must be superficial, since the olfactory frequencies will not necessarily be related to the group present. Substances like vanilla, citral, aubepine, rhodinal and benzaldehyde all contain the CHO group and have a pleasant odor. The ester grouping as in Me salicylate, the ether group as in safrole, the ketone group as in Me heptenone are the seat of olfactory activity, but other groups modify or influence the odor associated with these special groups. Probably the electron pairs of the CHO group form the mechanical system for conversion of absorbed radiant heat energy into olfactory vibrations; when this system is altered, as it undoubtedly is, by attachment to a different group, then the frequency of the vibrations is altered accordingly. Respecting the fact that in extreme diln. certain unpleasant substances are found to have a pleasant odor, it seems probable that the "critical threshold concn.," or the limiting concn. at which olfactory frequency can be physiologically detected may differ with the frequency, and that the "pleasant" frequency is still observable at a diln. where the "unpleasant" frequency has ceased to be detectable.

W. O. E.

Physicochemical researches on sucrose. E. CANALS AND MELLE P. GOMBERT. Univ. de Montpellier. *Bull. soc. chim.* 43, 1137-44(1928).—By pptn. with EtOH,

sucrase loses a certain quantity of Mg; the diastasic activity is lessened, no matter whether it is detd. in neutral or acid soln. The addition of Mg ions (usually MgSO_4) causes a partial recovery of the diastase activity, at least in acid soln. Mg probably plays an important role in sucrase fermentation. A soln. of sucrase is freed of its electropositive Mg by dialysis; after electrolysis of such a soln., it is possible to detect electronegative, non-dialyzable colloidal Mg. This Mg has the same elec. sign as sucrase itself; it migrates with it by elec. transference. Mg is a constituent of the sucrase micelle.

A. L. HENNE

Russell Henry Chittenden. GRAHAM LUSK. *Ind. Eng. Chem.* 21, 91-2(1929).—Biography with portrait.

E. H.

Twenty-five years of biochemistry. HANS PRINGSHEIM. *Science* 68, 603-8(1928).

E. H.

The physical basis of electrobiology. R. FÜRTH. *Naturwissenschaften* 16, 777-81(1928).—A review on elec. phenomena in biological systems.

B. J. C. VAN DER HOEVEN

Studies on proteins. VIII. The influence of salts on the isoelectric behavior of the protein. KINSUKE KONDO AND TSUNETOMO HAYASHI. *Mem. College Agr., Kyoto Imp. Univ.* No. 5, 1-29(1928); cf. *C. A.* 22, 3420.—Expts. with solns. of the difficultly sol. proteins, rice-glutenin and casein, show that the isoelec. point of the protein is not at the point of max. flocculation, as the salt content plays a very important role. Many salts were added to protein solns. contg. about 40 mg. in 25 cc. together with calcd. amts. of 0.5 N AcOH and AcONa; and the quantities of protein pptd. and the H-ion of the solns. carefully followed. The paper contains a great many tables and graphs and a lengthy discussion of the results. IX. The isoelectric point of glutenin. *Ibid* 30-47.—The isoelec. point of glutenin from wheat flour varies according to the investigators. A glutenin carefully prepd. in this lab. showed 17.17% N. Its apparent isoelec. point was detd. at p_H 5.15 to 5.39 and was independent of the glutenin concn. in the exptl. soln. The glutenin does not denaturate after dehydration with alc. and ether. Addn. of RbCl to the buffer soln. shifts the isoelec. point of the glutenin to the acid side. Seven tables and 4 graphs are given.

G. H. W. LUCAS

The chemical composition of follicular liquid. III. G. B. TAFURI. *Boll. soc. ital. biol. sper.* 3, 641-44(1928).—The yellow substance in follicular liquid was studied spectroscopically. It showed a strong absorption band in the blue and indigo beginning at F at a wave length of 500μ and ending at G at about 430μ . Spectrophotometric measurements were also made. Two absorption bands were noted, one between $\lambda = 499.6$ and 460μ with a max. at $\lambda = 472.5$, the other between $\lambda = 459$ and 430μ with a maximum at $\lambda = 443\mu$. Probably the lipochrome in follicular liquid is identical with Escher's lutein.

PETER MASUCCI

The distribution of phosphagen in the various parts of the muscle fibers. G. MARTINO AND G. ZANGHI. *Boll. soc. ital. biol. sper.* 3, 720-3(1928).—Phosphagen was detd. in the middle portion and in the end portions of striated muscles. The animals used were the pigeon, dog and cat; the muscles tested were the sartorius of the dog and cat, the pectoral of the pigeon, and occasionally the sterno-cleidomastoideus or the abdominal muscles. The muscle fibers were cut into 3 parts; the detn. of phosphagen was made on the middle and on each of the end portions. The results are given in tabular form. The phosphagen content was greater in the middle portions. In some cases this was very marked, being 14% mg. in the middle and none in the ends, 46% mg. in the middle against 6% in the end portion, etc. These findings support the hypothesis that phosphagen is found largely in that part of the fiber next to the motor plexus.

PETER MASUCCI

The thermal effect of death. V. V. LEFESHKIN. *Ber. deut. botan. Ges.* 46, 591-3(1928).—If one considers the decompn. of unstable protein and lipid compds. as an essential feature of death, one should expect the process of death to be exothermic. Using a Dewar bottle as a calorimeter L. found that when yeast is killed by satd. sublimate or chloroform it gives off 2 g. cal. and 1.5 g. cal., resp., per g. of dry yeast. This is a preliminary report.

LAWRENCE P. MILLER

The biological significance of the radioactivity of potassium and other conclusions from a general disintegration scheme for potassium. JOSEF PENKAVA. *Radiol. Inst., Prag. Ernähr. Pflanze* 24, 429-35(1928).—A review with discussion.

L. P. M.

The adsorption ability of erythrocytes. I. Adsorption of alanine. A. KULTJUGIN AND N. IVANOVSKII. State Univ., Saratow. *Biochem. Z.* 200, 236-43(1928).—Cat, dog and cow erythrocytes thoroughly washed with physiol. salt soln. have the ability to remove alanine from soln. The removal of alanine by the erythrocytes is completed in 30 min. when no further increase in the alanine in the corpuscles is

observed. The quantity of alanine taken up by the erythrocytes depends upon the concn. of the amino acid in the soln.; absolutely less but relatively more alanine is adsorbed from dil. than from concd. solns. The removal of the alanine is an adsorption.

S. MORGULIS

Studies on the colloidal chemistry of hemoglobin. II. BR. JIRGENSONS. Lettland Univ., Riga. *Biochem. Z.* 200, 331-8(1928); cf. *C. A.* 22, 2582.—The flocculating influence of org. compds. on hemoglobin is directly related to their capillary activity. The spectral changes are similarly affected. Salts by themselves have no effect on the stability or the spectrum of the oxyhemoglobin, but when these are present together with the capillary active org. substances, the latter exert their influence generally more easily. If the concns. of both the salt and the org. substance are very high the hemoglobin may become stabilized against flocculation (e. g., isopropyl alc.), but the stabilization was only found in the cathemoglobin. In the presence of salts oxyhemoglobin is not flocculated by org. capillary active substances, and spectroscopically only the formation of methemoglobin is observed. Through heating flocculation occurs more easily; also the spectroscopic alterations proceed better in the following order: oxyhemoglobin, methemoglobin, cathemoglobin, hematin.

S. MORGULIS

The optical activity of cerebrospinal fluids. CHR. N. J. GRAM, O. JUL NIELSEN AND E. RUD. Med Universitetsklinik A, Copenhagen. *Biochem. Z.* 201, 353-68(1928).—The reducing power and the optical activity were detd. on the cerebrospinal fluid of 21 patients without disturbance of carbohydrate metabolism. The cerebrospinal fluid is dextrorotatory, corresponding to 0.026% glucose, which is invariably much lower than the value corresponding to the reduction. Administration of glucose by mouth just previous to taking the cerebrospinal fluid has no effect. In a few instances when the fluid remained for 24 hrs. its polarimetric glucose content was found to correspond to that detd. by reduction. But where the protein is pptd. with Pb acetate the rotation capacity is at once of a magnitude corresponding to the reducing capacity. It seems probable that the optical activity is the summation of the dextrorotation of the glucose and the levorotation of the protein, and is not the result of condensation of protein and glucose.

S. MORGULIS

Catalase number and catalase index of the blood of newborn kittens. F. v. KRÜGER. Univ. Rostock. *Biochem. Z.* 202, 18-20(1928).—The red-blood-cell count of kittens 6-8 weeks old is much lower than that of adult cats. Corresponding to the lower red cell count they show a smaller blood catalase no. but the catalase index is not different from that found in adult cats, the values falling within the same range of variation.

S. MORGULIS

Influence of abstention from food and water on the catalase number and catalase index of the blood. F. v. KRÜGER. Univ. Rostock. *Biochem. Z.* 202, 21-8(1928).—Abstention from food and water causes a marked rise in the no. of red cells. The catalase activity of the blood is likewise considerably increased, but since the catalase index remains still within the normal limits of variation, the increase is due to a parallel rise in the no. of red blood cells.

S. MORGULIS

Conditions for the formation of urea in the isolated liver. III. P. P. ASTANIN AND V. M. RUBEL. State Inst. of exptl. Med., Leningrad. *Biochem. Z.* 202, 70-4(1928); cf. *C. A.* 22, 2778.—In accordance with Werner's formulation of the chemistry of urea formation HNCO is the most important intermediate step. Expts. on perfused livers show that there is no formation of urea in the absence of serum; while the absence of the erythrocytes interferes with the oxidation processes also essential for the urea formation. Each is supposed to take part in one of the phases of the reaction. When serum and red cells are recombined the urea formation proceeds normally. Stimulation of the vagus nerve, which is regarded by some as favoring oxidation, also promotes the formation of urea. The addn. of NH_4 salts had no definite quant. effect on the urea formation. Conclusion: The urea formation must be dominated by the oxidation process which det. the amt. of HNCO produced, while the NH_4 salts simply favor the transformation of the HNCO to urea in alk. medium.

S. MORGULIS

The normal lipid content of some organs. II. Lipoids. BRUNO REWALD. *Biochem. Z.* 202, 99-105(1928).—The sex glands have the highest lipid content. On the basis of the dry substance, the ovaries, without the corpus luteum, contain 6.43% and the corpus luteum 21.63%, the testes 11.1% lipid material. The adrenal glands are likewise rich in lipid but the other organs contain about 6%.

S. MORGULIS

The "mitogenetic radiation" of working muscles and some other tissues. WERNER W. SIEBER. Univ. Berlin. *Biochem. Z.* 202, 115-22(1928).—It was found that pulp from muscles electrically stimulated promotes the growth of tad poles and that this effect cannot be obtained with pulp from resting muscles. Since Gurwitsch has shown

previously that germinating tissue from plants or animals can stimulate nuclear division in rootlets without any direct contact the action at a distance of the muscle pulp was likewise tested. The expts. were carried out in accordance with Gurwitsch's technic. Either 2 onion roots are employed, of which one is the "inductor" and the other the "detector" in which mitoses are induced by distant action. On the "inductor" is a culture of yeast grown on beer wort agar and the "detector" is a culture of yeast on peptone-dextrose-agar. Gurwitsch's results were corroborated, and the budding of the yeast exposed to the action of the "inductor" was found to be about 45% greater than in the control. A repetition of this expt. using the muscle pulp as "inductor" showed the same distant effect when a previously faradized muscle but not when a resting muscle was used. That the effect is really due to a radiation is sustained by the observation that it could be directed from the "inductor" tube by means of a metal mirror placed at 45° to a selected spot in the "detector" yeast culture which was marked off. Increased budding was invariably noted in the marked off spots. Other proliferating tissues were tested for their distant action; spleen and lymph nodes gave neg. results, but bone marrow was quite effective. Testes, ovary, skin and liver all gave neg. results, but fairly young Jensen sarcoma tissue was very active in inducing budding. Apparently the growth activity cannot account for the radiation which exerts its effect at a distance, because it is displayed strongly by muscle, and on the other hand, the lymph tissue was found inactive. The idea that the radiation may be assocd. with the production of special metabolic products is rejected and an hypothesis is proposed that oxidation is really the releasing cause. It is pointed out that the bone marrow and lymph tissue so unlike in their distant effects are also sharply differentiated from each other by the presence in the former and absence in the latter of oxidases. S. M.

Sugar oxidation and decomposition. I. Influence of chloramine on glucose. K. BERNHAUER AND K. SCHÖN. Chem. Lab., deut. Univ. Prague. *Biochem. Z.* 202, 159-63(1928).—Only under exceptional conditions are 8 equivs. of O_2 used up in the reaction of chloramine and glucose. The claim of Bleyer and Braun that under these conditions the glucose mol. is quantitatively changed to CO_2 and $C_2H_4O_2$ is denied. Not a trace of AcOH was found but on the contrary HCOOH which was recognized by its reaction with $HgCl_2$ and as its Pb salt. The oxidation of glucose by chloramine is thus not a simple process. The formation of methylglyoxal seems probable; on the contrary, gluconic acid is apparently not formed. S. MORGULIS

The photochemical dissociation under intermittent illumination and the absolute absorption spectrum of the respiratory enzyme. OTTO WARBURG AND ERWIN NEGELEIN. Kaiser Wilhelm-Inst. für Biologie, Berlin-Dahlem. *Biochem. Z.* 202, 202-28(1928).—The relative absorption spectrum of the respiration enzyme, i. e., the alteration of the absorption coeff. according to the wave length, can be calcd. from the stationary condition established when cells are illuminated in $CO-O_2$ mixts. The theory is developed in great detail to show that the abs. absorption spectrum of the respiration enzyme can be calcd. from the data on the velocity with which the stationary condition is established in light or dark. From the exptl. results the conclusion is drawn that the spectrum of the enzyme is not that of iron carbonyl but of iron carbonyl bound to an org. mol. as in hemin-CO, where the FeCO is carried by the tetra-pyrrole nucleus. The N of the latter forms complex salts with heavy metals and with Fe it forms hemin. Judging by its spectrum the respiration enzyme is a similar complex Fe compd. S. M.

The effect of proteins on ferric oxide sol. H. FREUNDLICH AND G. LINDAU. Kaiser Wilhelm-Inst. physik. Chem. u. Elektrochem., Berlin-Dahlem. *Biochem. Z.* 202, 236(1928). S. MORGULIS

Further studies on plant oxidoreductase. D. MICHLIN. *Biochem. Z.* 202, 329-36(1928).—A highly purified prepn. of oxidoreductase was made from potatoes. 500 g. of a finely ground potato pulp is quickly introduced into 500 cc. H_2O which prevents the formation of a brown color. After shaking for 2 hrs. it is poured through a cloth and pptd. with 3 vols. of acetone. The ppt. is collected and washed with small quantities of acetone and dried in the air. The gray powder thus obtained is rubbed up with 100 cc. 0.0025 N HCl and kept for 12 hrs. under toluene. After centrifuging, the soln. is decolorized with 2 g. charcoal and filtered, the treatment with charcoal being repeated until a colorless filtrate is obtained, which reduces nitrates to nitrites in the presence of aldehyde. Upon the addn. of 2 vols. of acetone to this soln. a fine colorless powder is formed easily sol. in H_2O , which preserved under petroleum ether retains its oxidoreductase activity. A prepn. of still greater purity is obtained when the enzyme soln. is dild. with 2 vols. of H_2O , then treated with 1 vol. of a 30% suspension of bolus alba. After thorough mixing this is centrifuged and the residue is washed twice with H_2O . The residue is now shaken for 2 hrs. with 0.05% NH_4OH equal to the original vol. of the

enzyme soln. The leached-out enzyme is then purified by the procedure previously described for the milk oxidoreductase. The activity of the enzyme is expressed per g of dry residue. The relative reaction velocity of both plant and animal oxidoreductase enzyme systems is studied and the relationship between the two enzymes discussed.

S. MORGULIS

Studies on electrolyte-free aqueous solutions of proteins. VII. Hydration and charge of protein ions. WOLFGANG PAULI. Univ. Wien. *Biochem. Z.* 202, 337-64 (1928).—The following table summarizes the results of numerous measurements which were made with highly purified proteins. The max. binding capacity of one g. protein in g. equivs. was:

	Pos. groups	Neg. group
A { Ovalbumin	110 $\times 10^{-5}$	134 $\times 10^{-5}$
{ Seralbumin	147 $\times 10^{-5}$	160 $\times 10^{-5}$
B Hemoglobin	68.5 $\times 10^{-5}$	68.5 $\times 10^{-5}$
C { Glutin	68 $\times 10^{-5}$	57 $\times 10^{-5}$
{ Pseudoglobulin	143 $\times 10^{-5}$	126 $\times 10^{-5}$

According to the highest pos. (+ mE) and neg. (− $m'E$) charge of their ions the proteins may be placed in 3 classes: (A) − $m'E$ > + mE ; (B) + mE = − $m'E$; and (C) + mE > − $m'E$. The first are predominantly acid, the third is predominantly alk. Hemoglobin with the equal no. of acid and basic groups is practically the ideally symmetrical ampholyte. The viscosity is greatest at the point of greatest elec. charge which corroborates the 2 principles, namely, that hydration increases with the charge and that under similar conditions cations become more hydrated than anions. S. M.

The sulfur content of hemoglobin in blood of pure-bred dogs and of some rarely studied animal species. ELIZABETH TIMÁR. Univ. Budapest. *Biochem. Z.* 202, 5-79 (1928). The previous reports that cat hemoglobin contains 0.97% S and beef blood hemoglobin 0.58% S are confirmed. In dogs of the usual lab. run the value of 58% in the hemoglobin is rarely found, so that a simple ratio as that of Fe:S₂ or Fe: calculated from the previous data cannot be derived. On the other hand, the hemoglobin of pure-bred dogs, as well as that of donkeys and foxes, yields very generally the due 0.57% S corresponding to a Fe:S₂ ratio. The hemoglobin of geese contains 71% S. In hemoglobin with a 0.58 or 0.97% S this must be entirely in the form of cysteine.

S. MORGULIS

The effect of age on the composition of the lipid fraction in the animal organism. S. SADIKOV AND E. S. GOLOVCHINSKII. Univ. Leningrad. *Biochem. Z.* 202, 421-54 (1928). The ether ext. of cats at different ages varies considerably, reaching a max. of 13.34% on the 21st day of age. The glycerol content of the ether ext. also varies with age, being only 0.7% of the dry residue of the ether ext. at birth but rising to 7.2% on the 7th day and again diminishing to 2.7% on the 14th day after birth. At the end of the lactating period this becomes 4.6%, and this value is retained throughout adult life. Referred to the total body wt. the glycerol content is only 0.04% in the new born cats, ranging between 0.10 and 0.55% in later stages, and in the well-nourished adult it is about 0.36%. In the state of senile exhaustion it falls to 0.08%. From these data on glycerol it follows that glycerides constitute only a small fraction of the ether ext. In the ext. of the new-born 56.86% is unsaponifiable matter, which increases gradually to 61.83% at the end of 5 days, with but a small quantity of fatty acid present. The unsaponifiable matter together with the glycerol and fatty acids accounts only for 69.52% of the total ext., but this is not thought to be due to the presence of volatile acids which are lost in the preliminary process. But from the 5th day after birth the unsaponifiable fraction falls to only 4.1-2.7%, to accumulate once more about the 30th day; the undetd. fraction so large in the newborn almost completely disappears by the 7th day. Subsequently this fraction again reappears and shows considerable variations in the course of growth. The degree of unsatn. diminishes gradually. At birth 100 parts of the ether ext. requires 80.2 parts of I₂ but this drops to 56.7 in the adult. The high I₂ value may be accounted for because the unsaponifiable lipid alcs. in the ether ext. of the new born are very greatly unsatd. This is not regarded as being of the cyclic sterols especially as it fails to give the usual cholesterol tests. It is supposed that these alcs. are oleyl alc., linolic alc., linolenic alc. and terpene alc. The ether ext. of kittens in the first postembryonic stage of development is rich in unsatd. aliphatic alc., corresponding to the unsatd. fatty acids, but the quantity of fatty acids is so small that these alcs. must be thought to be in an unesterified condition. In the second stage of postembryonal development, beginning on the 7th day, the unsaponifiable substances disappear and there is simultaneously a sudden appearance of an ex-

cess of fatty acids. This is believed to be due to a conversion of unsatd. aliphatic alcs. into the corresponding unsatd. acids which now esterify with the glycerol.

S. MORGULIS

Studies on enzymic proteolysis. III. P. RONA AND E. MISLOWITZER. Univ. Berlin. *Biochem. Z.* 202, 453-65(1928); cf. *C. A.* 23, 618.—Under the influence of trypsin on albumin solns. there is no diminution in the particle size. During peptic digestion of albumins a diminution in size of the particles can be observed corresponding more or less to the diminution observed in casein soln. The increase in amino groups during hydrolysis depends upon the cleavage of hydrolytic products of the non-protein N. In the colloidal part there is no or practically no increase in the NH_2 groups but a marked increase in the carboxyl groups.

S. MORGULIS

The occurrence and the transformation of pyrophosphate in cells. I. Demonstration and isolation of pyrophosphate. K. LOHMANN. Kaiser Wilhelm-Inst. für Biologie, Berlin-Dahlem. *Biochem. Z.* 202, 466-93(1928); cf. *C. A.* 22, 2176.—Fresh muscle contains an acid-sol. P compd. which is hydrolyzed in 7 min. by boiling at 100° in *N* HCl and which was isolated as a pyrophosphate. This substance is present in amts. of 0.0-0.9 mg. P_2O_5 per g. fresh or frog rabbit musculature, thus corresponding to 20% of the total acid-sol. P of muscle. The isolation from frog, rabbit, or crab muscle, as well as baker's yeast, is made generally by neutralizing with baryta a trichloroacetic ext. of the cells, the Ba ppt. being repptd. from an acetic acid soln. and transformed into the cryst. Na pyrophosphate from Pb and Cu salts. The identification of the compd. was by direct analysis as well as by comparison of its electrotitration curve with that of a synthetic product. The const. of the hydrolysis velocity of the pyrophosphate in 0.1 *N* HCl at 100° is 26×10^{-3} .

S. MORGULIS

Effect of irradiation on the blood chemistry in tuberculosis. KATHERINE C. SPENCE. *British J. Actinotherapy* 3, 148-9(1928).—It is known that blood Ca and P play an important part in the pathology of tuberculosis, and it is probable that cholesterol does also. For a study of the effect of ultra-violet irradiation on these constituents, 12 adults with undoubted tuberculous lesions were irradiated daily. After a month of this treatment the cholesterol had risen considerably in every case, the greatest rise occurring in patients who clinically showed the most improvement. The Ca and P figures, however, showed no significant changes. It is suggested that, although the total amt. of Ca is unchanged, the action of the radiation is to increase the percentage of the element in the ionized or active state.

E. H. QUIMBY

Influence of carbon dioxide tension on the oxygen dissociation curve. VALY MENKIN AND MIRIAM F. MENKIN. Harvard Univ. *Science* 68, 518-9(1928).—A double dissocn. process of oxyhemoglobin is assumed, thus: (1) $\text{HHbO}_2 \rightleftharpoons \text{HHb} + \text{O}_2$ and (2) $\text{HHbO}_2 \rightleftharpoons \text{H}^+ + \text{HbO}_2^-$. Equation (1) represents the absorption of O by the tissues and the production of reduced hemoglobin. Equation (2) represents the dissocn. of oxyhemoglobin, therefore $[\text{H}^+][\text{HbO}_2^-]/[\text{HHbO}_2] = K$. With the formation of CO_2 in the tissues the concn. of H is increased and hence in equation (2) the reaction would be driven back and thus tend to increase the concn. of undissocd. HHbO_2 . An increase in the concn. of HHbO_2 would involve a shift in the equil. of equation (1) to the right with an increase in the production of O. This double dissocn. of HHbO_2 offers a chem. mechanism to account for the lowering of the O dissocn. curve by an increase in the CO_2 tension.

L. W. RIGGS

Permeability of cell membranes of plants and animals to carbohydrates. WALTER FLEISCHMANN. Univ. Kiel. *Arch. ges. Physiol. (Pflüger's)* 220, 448-65(1928).—A common behavior is exhibited by the red blood cells of man, horse, cow and dog and the cells of tradescantia and hyacinth as regards permeability. Sugars penetrate more readily than do alcs. of the same no. of C atoms.

G. H. S.

Oxygen utilization of isolated organs. A. BORNSTEIN AND H. GREMELS. Pharm. Inst. Univ. Hamburg. *Arch. ges. Physiol. (Pflüger's)* 220, 466-79(1928).—The capillary supply of an organ is of great importance in detg. the O utilization.

G. H. S.

Equilibrium in the death of living systems. I. ERWIN BAUER. Lab. Obuch-Inst. Gewerbekrankh. Moskau. *Arch. ges. Physiol. (Pflüger's)* 220, 480-94(1928).—The formula derived for expressing the changes taking place in the death of living systems is applied to the death of red blood cells.

G. H. S.

Local effect of heat rays on the frog heart. M. H. FISCHER. Univ. Prag. *Arch. ges. Physiol. (Pflüger's)* 220, 539-50(1928).—The effects of heat upon heart function vary with the region—sinus, auricle, ventricle, auriculo-ventricular junction—exposed.

G. H. S.

Human blood, studied by new methods. III. Blood of the newborn with reference to the absolute hemoglobin content, number of erythrocytes, quantity per eryth-

rocyte, amount of hemoglobin per μ^2 of surface and the refraction exponent or percentage of protein in the plasma. R. BÖRNER. Univ. Giessen. *Arch. ges. Physiol.* (Pflüger's) **220**, 716-37(1928); cf. *C. A.* **23**, 861. G. H. S.

Artificial membranes selectively permeable to anions (MOND, HOFFMANN) 2.

Chemistry in Medicine. Edited by JULIUS SIEGLITZ, *et al.* New York: The Chemical Foundation, Inc. Printed on Bible paper, two vols. in one. 780 pp. \$2. Reviewed in *Chemicals* **30**, No. 27, 23(1928).

HÁRI, PÁL: *Kurzes Lehrbuch der physiologischen Chemie.* 3rd revised and enlarged ed. Berlin: J. Springer. 407 pp.

OPPENHEIMER, CARL AND PINCUSSEN, L. *Die Methodik der Fermente.* IV. Leipzig: G. Thieme. pp. 945-1264. R. M. 28. Cf. *C. A.* **22**, 3181.

WHLSTÄTTER, R.: *Untersuchungen über Enzyme.* Berlin: Julius Springer. 1200 pp. M. 124. Reviewed in *Chem. News* **137**, 415(1928).

B—METHODS AND APPARATUS

STANLEY R. BENEDICT

The histochemical detection of urea. W. LAVES. Universitäts-inst. gericht. Med. in Graz. *Wiener klin. Wochschr.* **41**, 1403-4(1928).—In urea retention its presence in tissues can be demonstrated as follows: The material, secured at autopsy, is allowed to stand 6 hrs. in a 6% soln. of xanthydrol (Kahlbaum) in AcOH. Thin sections are dehydrated during a 24-hr. period in successive portions of abs. alc., embedded and cut. Characteristic dixanthyl urea crystals are formed. Illustrations are given of brain preps. D. B. DILL

Method for determining minimal quantities of lactic acid. E. LEHNARTZ. Univ. Frankfurt. *Z. physiol. Chem.* **179**, 1-8(1928).—Certain modifications in the Hirsch-Kauffmann and Embden procedures make it possible to det. lactic acid in quantities as small as 0.02 mg. with an av. yield of 100% and a max. error of $\pm 2.7\%$. For detn. of lactic acid in muscle a 0.1 g. sample is powdered in liquid air and transferred to a centrifuge tube contg. 5 cc. of 4% HCl. Add 2-3 cc. of 5% HgCl₂ to ppt. the proteins and let stand several hrs. Add 17 cc. H₂O and let stand overnight in the icebox. Centrifuge, pass H₂S through the decanted liquid to remove Hg and expel the H₂S by a current of air. Transfer the filtrate (about 23 cc.) to a 35-cc. volumetric flask, add 2 cc. of 10% CuSO₄, neutralize with 33% NaOH and ppt. with 5 cc. milk of lime. Dil. to 1 mark, transfer to a centrifuge tube, shake repeatedly during 0.5 hr. and centrifuge 5 min. Decant, filter and transfer a large aliquot (32-3 cc.) to a 100-cc. short-neck Erlenmeyer flask. This represents 80-90% of the lactic acid originally present. Neutralize with 25% H₂SO₄, add an excess to bring the H₂SO₄ concn. to 0.5%, add 2 cc. of 1% MnSO₄ and a little talc. In case considerable lactic acid is present a smaller aliquot is taken so that the detn. does not exceed 0.5 mg. Larger amts. require a longer time for oxidation without enhancing the accuracy. Oxidation is performed by dropping in 0.002 N KMnO₄ at the rate of 40-50 or 20-30 drops per min. according to the amt. of lactic acid to be detd., until the contents of the flask become dark brown, then heating on an asbestos plate provided with a hemispherical depression to fit the bottom of the flask so as to distil the AcH formed. The latter is collected in a receiver contg. 10 cc. of 0.02 N or 0.1 N KHSO₅ cooled in ice. The distg. head should fit the flask by means of a ground-glass joint instead of a rubber stopper. The main excess of KHSO₅ is removed with 0.04 or 0.02 N I and the exact end point reached by adding 0.002 N or 0.001 N I from a micro-buret graduated in 0.01 cc. Toward the end point only fractional drops are added. Now add a few g. NaHCO₃ or better Na₂HPO₄ to decompose the aldehyde-bisulfite compd., shake thoroughly and titrate as before with I. Recognition of the end point is facilitated by addn. of a trace of talc. If, instead of the Schenck reagent for removal of protein in the 1st step of the above procedure, CCl₄-CO₂H is used the results are less satisfactory. A. W. DOX

Preparation of histidine. F. CHEMNITZ. Jena. *Pharm. Zentralhalle* **69**, 741-2(1928). The prepn. of this compd. from dried beef blood is described. W. O. E.

Estimation of sugar in urine. FELIX JÖSTEN. *Pharm. Ztg.* **73**, 1436(1928).—A criticism of a recent article by E. Meyer on this subject (direct titration of dextrose with boiling Fehling's soln.), and recommendation that the indirect iodometric method as developed by Rupp be used instead. W. O. E.

Colorimetric determination of inorganic sulfate in small amounts of urine. BEN-NARD S. KAHN AND S. L. LEIBOFF. Lebanon Hospital, New York. *J. Biol. Chem.* **80**, 623-31(1928).—A colorimetric method is described for the detn. of inorg. SO₄— in

small quantities of urine. The SO_4^{--} is pptd. as benzidine sulfate; this is diazotized and coupled with PhOH , in alk. soln., to produce a yellow color, the intensity of which is proportional to the amt. of benzidine.

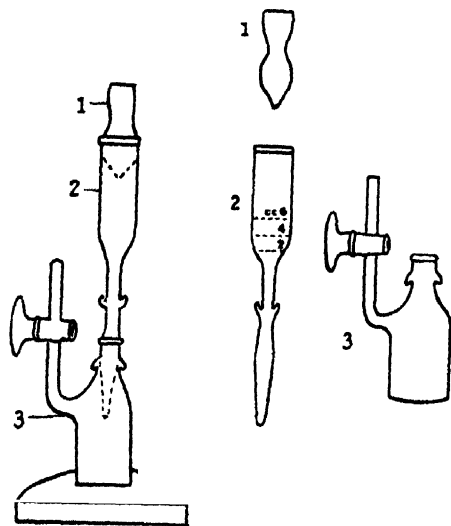
ARTHUR GROLLMAN

Stalagmometric determination of lipases. B. J. KRIJGSMAN. *Natuurw. Tijdschrift* 10, 137-44(1928).—The stalagmometer consisted of a rather wide-mouth calibrated pipet of 10 mm. diam., the flow from which was regulated by the air supply through a narrow dust-protected capillary. For 6 cc. of distd. water 160 drops were found, for 6 cc. of satd. tributyrin soln. 220 drops. Lipase was prepd. from intestinal glands of *Helix pomata*, dried to const. wt. and pulverized. To 25 mg. powder 3 cc. glycerol (80%) was added, mixed and kept at 30° for 17 hrs., 7 cc. distd. water was then added, mixed and centrifuged, the liquid layer being the test soln. used. For the sapon. expts. satd. tributyrin soln. was used from 500 cc. H_2O + 7 drops com. tributyrin, shaken for 20 min. and filtered after 16 hrs.' standing. Buffer solns. of 7 cc. $M/15 \text{Na}_2\text{HPO}_4 \cdot 2\text{H}_2\text{O}$ + 3 cc. $M/15 \text{KH}_2\text{PO}_4$ were added (1 cc.) to the exptl. solns. of gland ext. (0.25 cc.) and tributyrin solns. of varying concns. (25 cc.) to neutralize the surface action of free butyric acid (p_{H} of mixts. 7.17). The ester content of the mixts. was detd. from a standard tributyrin stalagmometer curve (drop no. vs. percentage). The accuracy was about 2%. By using $1/16$ to 1 cc. of gland ext. in the mixt. the cleavage appeared to be linear up to $1/8$ cc. (24% in 3 hrs.) with time. From there on it slows down with time in consequence of the accumulation of cleavage products. Below 40% cleavage the tributyrin decomposed is directly proportional to time and the amt. of enzyme is indirectly proportional to the time necessary for a certain percentage decompn. MgCl_2 was without effect on the reaction.

B. J. C. VAN DER HOEVEN

The action of magnesium on the coagulation of the blood. A new coagulometer. E. MENEGHETTI. *Boll. soc. ital. biol. sper.* 3, 782-9(1928).—This work deals with the modifications produced in the blood following the subcutaneous injection of MgCl_2 , and the technic used to det. these. The time of coagulation was measured by means of an app. which utilizes the same principle as the Heubner-Rona coagulometer, but

which has certain advantages over the latter. The coagulometer consists of 3 parts (1, 2, 3), supported on a wooden base. (1) Is a glass stopper through which passes a narrow opening widening at the top so that it can be packed with cotton. The stopper fits the inverted ampoule (2), which has an overflow tube the diam. of which may be regulated so that water, blood or any liquid may flow freely through it. The lower end of this tube fits the neck of a bottle (3). This has a side tube fitted with a stopcock by means of which the interior of the bottle is connected to the exterior through this side tube. A liquid introduced into the ampoule cannot flow freely into the bottle if the stopcock is closed, but if opened then the liquid flows continuously into the bottle. However, if before opening the stopcock, the upper end of the ampoule is closed with the glass stopper (1) the liquid falls from the ampoule into the bottle drop by drop. The app. is cleaned, dried and placed in an



incubator at 38° at least $1/2$ hr. before using. By means of a syringe a sample of blood is taken from a vein and rapidly introduced into the ampoule. For very accurate detns a cannula is inserted into the vein and the blood allowed to flow directly into the ampoule. The glass stopper is then inserted and the whole app. placed in the incubator again. Before shutting the door of the incubator, the stopcock on the side tube of the receiving bottle is opened. The blood can then be seen through the glass door to fall drop by drop into the bottle until coagulation takes place. The interval between the taking of the sample of blood from the vein and the fall of the last drop, is the time of coagulation of that particular sample of blood. By this method the coagulation time of normal rabbit blood is about 10 min. A drop falls every 10 sec. so that it takes about 3 cc. of blood for a test. The coagulometer is sensitive and gives const. results. The subcutaneous injection of 1 g. MgCl_2 per kg. of body wt. into rabbits causes an increase in the time of coagulation which persists for several hrs. later. If C is the coagulability of the blood, t its normal time of coagulation, then $C = 1/t$. Let $C = 1$, and $C' =$ the new coagulability

to be detd. after a time t' ; $C' = t/t'$. In addn. to the increase in the time of coagulation, the injection of $MgCl_2$ produces variations in the concn. and physical state of the Ca in the blood.

PETER MASUCCI

Contribution to blood microanalysis. I. TEPLOV. Med. Inst., Leningrad. *Biochem. Z.* 202, 14-7(1928).—A microtitration app. is described. Nothing new.

S. MORGULIS

A new method of measuring blood flow. O. S. GIBBS. Dalhousie Univ. *J. Pharmacol.* 34, 293-8(1928).

C. RIEGEL

Results obtained in the cuttle fish by the use of various vital stains. JACQUES GOLDNER. *Compt. rend. soc. biol.* 99, 1323-4(1928).—Stainings with trypan blue, neutral red and other dyes are studied histologically.

L. W. RIGGS

Method for the determination of the alveolar air in the dog. MIGUEL OZORIO DE ALMEIDA AND A. ROCHA E SILVA. *Compt. rend. soc. biol.* 99, 1658-60(1928).—The app. and method of use are described. The differences in the CO_2 in samples taken by this method from those taken by the Haldane-Priestley tube are slight with low percentages of CO_2 , but these differences increase with an increase of CO_2 . L. W. R.

Microtechnic for the determination of the water content of blood. LORENZO BRACALONI. Central Military School, Rome. *Arch. farmacol. sper.* 46, 115-8(1928).—Bang's micromethod with a few unessential alternations is described. G. SCHWOCH

Human blood, studied by new methods. I. Comparison of the ocular micrometer and the photograph for measuring the diameter of erythrocytes. BERTHOLD COLLATZ. Univ. Giessen. *Arch. ges. Physiol.* (Pflüger's) 220, 691-702(1928).—II. Absolute determinations of the hemoglobin, the number of erythrocytes, and the diameter of erythrocytes on 20 students and 20 soldiers for ascertaining the hemoglobin content of the single erythrocyte and the hemoglobin per μ^2 of surface. LUTZ HORNEFFLER Univ. Giessen. *Ibid* 703-15.

G. H. S.

An improved gas-analysis apparatus according to Carpenter (STRICK) 11B. Colloidal gold. (NICOL) 2. Microestimation of Bi (DUMONT, BOUVILLENE) 7.

HEITZMANN, LOUIS: **Urinary Analysis and Diagnosis by Microscopical and Chemical Examination.** 5th revised ed. With a chapter on the "Determination of Functional Efficiency of the Kidneys." By Walter R. Dannreuther. New York: Wm Wood & Co. 350 pp. \$5. Reviewed in *Military Surgeon* 63, 781(1928).

Differential medium for use in the microscopic examination of blood. XAVER F. RINGOLD. Ger. 467,604, Jan. 4, 1927. A soln. to be applied after the usual staining with an aq. alk. soln. of borax and methylene blue comprises a 2-3% soln. in water of tannic acid to which very small addns. of alc. and salicylic acid and, in certain cases, concn. have been made. The soln. takes up the excess stain so that a sharp picture is obtained.

C—BACTERIOLOGY

CHARLES B. MORREY

Action of bacterial proteolytic enzymes; Influence of p_H on the proteolysis. MOYCHO. *Compt. rend.* 187, 681-3(1928).—In a medium with p_H 4 the proteolytic enzyme of *B. pyocyaneus* did not act on gelatin, whereas the enzyme of *B. prodigiosus* acted slightly. With a diminution of acidity the proteolytic action increased and attained a max. at p_H 8, after which it diminished.

L. W. RIGGS

Toxic index of races of *Bacillus coli*. New remarks on the experimental bases of anticolibacillary serotherapy. H. VINCENT. *Compt. rend.* 187, 787-90(1928).

L. W. RIGGS

Conditions of action of asparaginase of *Aspergillus niger*. D. BACH. *Compt. rend.* 187, 955-6(1928).—The enzyme was active only in neutral or slightly alk. media, the optimum p_H being 8.4 to 8.8. At the same time *Aspergillus niger* was able to utilize asparagine completely in media more acid than p_H 6.4. The optimum temp. varied with the p_H of the medium being 42° for p_H 8.6 and 31° for p_H 7.6. The temp. zone of action was wide, extending from 7° to 70°. When the concn. of the substrate (asparagine) increased beyond 1%, the NH_3 produced tended toward a limit which was independent of the concn. of the substrate. Complete hydrolysis of the asparagine was not attained, but reached about 80% under optimum conditions. As the hydrolysis proceeded there was a diminution in its velocity after about 36 hrs., due principally to a destruction of the enzyme. The presence of asparagine tended to protect the asparaginase from autodestruction.

L. W. RIGGS

Nephelometer in mycology. GEORGE HOCKENYOS. Univ. Illinois. *Science* 68, 459(1928).—Directions are given for the prepn. of water cultures of the fungus *oidium*

for observation in the nephelometer. The readings are proportional to the amt. of growth present in the culture.

L. W. RIGGS

Some factors influencing the germicidal efficiency of alkalis. MAX LEVINE AND J. H. BUCHANAN. *Am. J. Public Health* 18, 1361-8(1928).—The alk. washing compds. used in the carbonated-beverage industry function as detergents and germicides. L. and B. studied the germicidal properties of a number of these compounds. The exposed bacteria did not die at a const. rate. These rates were considered to be unsatisfactory for comparative purposes. The "killing time" for 99.9% of the exposed bacteria was considered to be a suitable, determinable, and desirable criterion of the relative germicidal efficiencies of the alkali solns. studied. The germicidal efficiency of an alkali increased with its normality and OH concn. However, neither of these can be a suitable index of the comparative sterilizing powers of different alkalis. At the same normality the alkalis ranked as sterilizing agents in the order: (1) NaOH; (2) Na_3PO_4 ; (3) Na_2CO_3 . At the same OH-ion concn. the order of sterilizing efficiency was reversed: (1) Na_2CO_3 ; (2) Na_3PO_4 ; (3) NaOH. Addition of NaCl, Na_2CO_3 or Na_3PO_4 to NaOH markedly reduced the "killing time" but did not affect the p_H . The germicidal properties of the alkalis is not a direct function of the OH-ion concn. but is affected by other factors. Undissocd. NaOH may be the controlling factor in the germicidal powers of alkalis. Alky. expressed as NaOH (normality) is a more suitable and reliable index than the p_H .

F. W. TANNER

Rate of the multiplication of yeast at different temperatures. OSCAR W. RICHARDS. *J. Phys. Chem.* 32, 1865-71(1928).—The rate of multiplication of *Saccharomyces cerevisiae* increases regularly with the increase of temperature between 4° and 30° except that the rate of change alters at 9°. Above 30° a decrease in the rate of growth is associated with an increase in temp. At 30° abnormal elongated cells are produced, which indicates that this temperature affects the process of bud formation in a critical manner. More of these abnormal cells appear if the temperature is maintained within narrow limits of variation (cf. *C. A.* 22, 2961).

F. W. TANNER

Germicidal and hemolytic action of α -bromo soaps. ARNOLD H. EGGERTH. Hoagland Lab., Brooklyn. *J. Exptl. Med.* 49, 53-62(1929).—The soaps of the α -bromo fatty acids are usually more germicidal than the unsubstituted soaps. Only when *B. typhosus* was the test organism was there no increase in germicidal action. For any test organism, germicidal action of the brominated soaps increases rapidly with increasing mol. wt. up to a certain point, then diminishes. This is likewise true of the hemolytic titer. The point of max. germicidal action varies with the different species of test organisms. In the series studied, brominated soaps of 12 and 14 C atoms were most germicidal for the Gram-negative organisms, while soaps of 16 and 18 C atoms were most germicidal for Gram-positive organisms. The brominated soaps are, in general, more active in acid than in neutral or alk. reactions. For certain organisms, the brominated soaps are among the most rapid and potent germicides known.

C. J. WEST

Sensitizing properties of the bacteriophage. CLAUS W. JUNGEBLUT AND EDWIN W. SCHULTZ. Stanford Univ. *J. Exptl. Med.* 49, 127-43(1929).—The work presented in the paper demonstrates two fundamental facts: The bacteriophage virus *per se* is not capable of sensitizing guinea pigs to a degree and extent detectable by ordinary exptl. methods. The bacterial protein, after lysis of the organisms by the bacteriophage, acquires new antigenic properties which differ radically from those of the intact bacteria or bacterial cells dissolved by spontaneous autolysis.

C. J. WEST

The diameter of the pores and the manner of operation of the Berkefeld filter (HOEK) 1. The determination of the bacterial count of water (PLUCKER, BARTELS) 14.

D—BOTANY

THOMAS G. PHILLIPS

Comparison and significance of certain plant serological methods. WALTER SLATMANN. *Planta Abt. E, wiss. Biol.* 6, 277-312(1928).—A large number of serological tests showed that a (+) reaction was obtained for antigens of closely related as well as non-related plants and that the same held true for (−) reactions. Antigens from such genera as *Corylus*, *Amaranthus*, *Delphinium*, *Magnolia*, *Lens*, *Citrus* and *Evonymus* all gave a (+) reaction to immune serum against *Fagus silvatica*. It is believed, therefore, that systematic relationships in plants cannot be demonstrated by the use of serological tests based upon the presence of specific proteins. Immune serum from different rabbits was qual. and quant. very different in many of the tests. The capillary phosphate

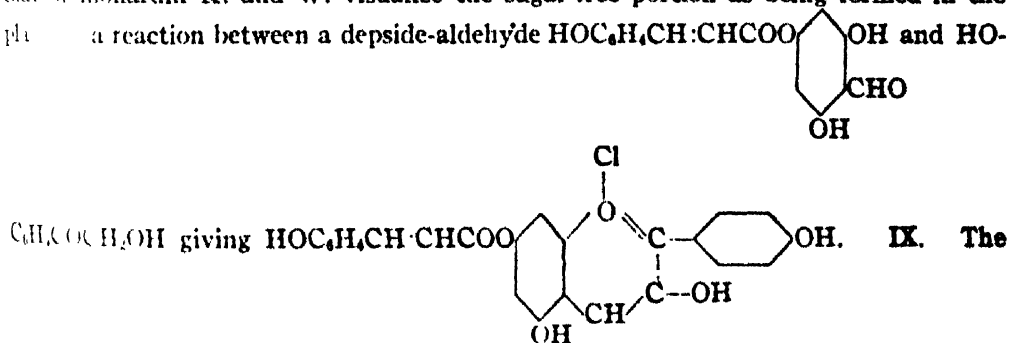
method used by S was shown to be more reliable than either that in which phosphate is omitted or the pptn. method employed by Mez and his co-workers. A. E. HITCHCOCK

The glycerophosphatase action of plant seeds and the enzyme synthesis. ANTONIN NEMEC. Biochem. Inst., Prague. *Biochem. Z.* 202, 229-35(1928).—The glycerophosphatase action is greatly enhanced during germination. In expts. with barley and corn there was noted a lowering of activity in the first 2 days but this is followed by a great rise in enzymic activity. The behavior of the glycerophosphatase furnishes thus another example of the mobilization of enzymic capacity of germinating seeds. During the ripening of the seeds the glycerophosphatase action diminishes considerably, and since the germinating ability increases with ripening it grows in proportion to the reduction of the enzymic activity of the seed meal. However, upon the completion of the ripening process the glycerophosphatase action increases once more. S. M.

The sodium and potassium contents of lentils and peas. W. KÜSTER AND J. UMBRECHT. Tech. Hochschule, Stuttgart. *Z. physiol. Chem.* 179, 139-48(1928).—The literature contains numerous ash analyses of leguminous seeds, particularly peas and beans, showing 1-2% Na and 30-40% K in terms of total ash. The ash of lentils, on the other hand, is reported to contain Na 13 and K 35%. This unusual ratio of Na to K in lentils was thought needful of corroboration. It appears that the analysis was performed in 1844 by Levi working in Liebig's lab. at Giessen, and has been accepted unchallenged by numerous textbooks up to the present time. K. and U. have now examined 2 varieties of lentils, a small lentil from Sigmaringen and the large Heller lentil from Thuringen. The values found averaged 0.782 and 3.063% for Na_2O , and 31.954 and 37.473% for K_2O . Parallel analyses of peas gave similar values, viz., 1.806% Na_2O and 40.35% K_2O . Levi's value of 13.50% for Na_2O in lentils may be regarded as very exceptional, and possibly due to unusual soil conditions where the plants were grown.

A. W. DOX

Plant coloring material. VIII. Constitution of monardaein. P. KARRER AND ROSE WIDMER. *Helv. Chim. Acta* 11, 837-42(1928); cf. C. A. 22, 4149.—Methylation of the coloring material of honey balm with Me_2SO_4 and NaOH, keeping the reaction as nearly as possible neutral gives a product (I) insol. in dil. alkali, contg. no free OH groups. Sapon. of I with MeOH-KOH gives $p\text{-CH}_3\text{OC}_6\text{H}_4\text{CH:CHCO}_2\text{H}$ (II) and the dimethyl ether of monardin chloride which contains a free phenolic OH group in which II was substituted. Monardein (III) shows color change with alkali, similar to anthocyan dyes with free OH in 4'-position. Hydrolysis of III with 20% HCl for 3 min. gives a product contg. $p\text{-HOC}_6\text{H}_4\text{CH:CHCO}_2\text{H}$ (IV) and the residue but no sugar, showing that IV is not combined in the sugar group. On the basis of the foregoing information and a comparison of the dimethyl ether of pelargonidin with that of monardin K. and W. visualize the sugar-free portion as being formed in the following reaction between a depside-aldehyde $\text{HOC}_6\text{H}_4\text{CH:CHCOO}$ and HO -



Yellow coloring material in the red rose. P. KARRER AND KURT SCHWARZ. *Ibid* 916-9. —The sugar free yellow dye (I) which is contained in red rose petals is shown to be identical with quercetin. I was isolated by extg. the rose petals with 5% H_2SO_4 which removes the combined sugar group, and then with ether. I which is present in the ether ext. with a hydrocarbon is sepd. therefrom by means of its soly. in hot water or in alkali. The pentaacetate of I was identical with quercetin pentaacetate (II) m. 193°. The ozone decoloration of II gives diacetylprotocatechuic acid, m. 151°.

FREDERICK C. HAHN

Chemistry of the red and blue pigments of flowers and fruits. ERNEST H. HUNTRESS. Mass. Inst. Tech. *J. Chem. Education* 5, 1392-8(1928).—A brief review of the work of Willstätter, Karrer and Robinson.

LOUISE KELLEY

The color reactions of lignin. FRAN PODBREZNÍK. Inst. du Pin, Bordeaux. *Bull. Inst. Pin* No. 53, 233-6 (Oct.), No. 54, 245-50(Nov., 1928).—P. first discusses the func-

tion and relative importance of surface adsorption and of slow chem. reactions in the production of characteristic colors on treating lignin with various reagents. The 2 chief practical difficulties in applying these reactions to lignified membranes are (a) those due to uneven coloring of the tissues, and (b) those due to non-uniform d. of the material. P. describes the technic which he has devised for carrying out these tests, particularly on wood tissues, in which (a) is eliminated or reduced to a min. by grinding the material to a powder and incorporating suitable inert, white pigments and (b) is eliminated or reduced to a min. by compressing the material. Most of the reactions found in the literature as being given by aromatic amines and phenols (a bibliography of 43 references is given) have been repeated, and in a no. of cases the results obtained contradicted published data. The following new characteristic reaction was found: pine sawdust is colored orange by heating very gently with a soln. of $\text{KClO}_3 + \text{HCl}$. It is shown that the coloring of lignified tissues can be due neither to the methylpentosans nor to other aromatic compds., such as vanillin, coniferyl alc. or Czapek's "hadromal." Of a no. of aromatic compds., eugenol gave reactions which, on the whole, most closely resembled those of lignified tissues. As exd. lignin and oxidized lignin give the same reactions as the lignified tissues, P. concludes that they are due mainly to lignin, but that other factors are also probably involved as lignin may undergo partial hydrolysis or depolymerization in carrying out the reactions. A. PAPINEAU-COUTURE

Localization and disappearance of alkaloids in the epidermis of the tobacco leaf. J. CHAZE. *Compt. rend.* 187, 837-9(1928); cf. *C. A.* 21, 3385.—Tests in the cells of the epidermis of tobacco leaves, during the hot dry month of July, showed exceedingly variable quantities of nicotine as estd. by microchem. color and pptn. reactions. L. W. RIGGS

Critical study of the method of Sachs applied as a measure of the migrations of substances. R. COMBES. *Compt. rend.* 187, 666-8(1928); cf. Thoday, *C. A.* 4, 1312, and following abstr.—In order to eliminate the errors of the Sachs' method noted by Thoday and others, the detns. were made on disks of the leaves cut out with a punch to secure uniform size. Loss of N was detd. during both day and night in green leaves, Sept. 14-20, leaves beginning to turn yellow, Oct. 20-Nov. 2, and yellow leaves, Nov. 2-13. Results by this method showed about $\frac{1}{3}$ as much loss of N during the autumnal yellowing of beech leaves as by the Sachs' method. L. W. RIGGS

Influence of traumatism on the migration of substances in plants. R. COMBES. *Compt. rend.* 187, 993-5(1928); cf. preceding abstr.—Traumatism accelerated the migration of matter from the leaves toward the stock of the chestnut during the night. The action of traumatism upon the exchange of material accounts for an error of the Sachs' method. L. W. RIGGS

Positive null and negative antagonism of binary mixtures of electrolytes with reference to plants. L. MAUME AND J. DULAC. *Compt. rend.* 187, 668-70(1928); cf. *C. A.* 21, 1273, 2491, and following abstr.—Mixts. of any 2 in mol proportions of NaCl, KCl and NH_4Cl did not affect the elongation of the root. In mixts. of NaCl with CaCl₂ or NaNO_3 with $\text{Ca}(\text{NO}_3)_2$ there was a recoil of disocn. leading to a diminution of the pressure of the ions in contact with the root; hence there is a positive antagonism of the salts and a diminution of the toxicity. The case illustrated by mixts. of NaCl and K_2SO_4 is inverse to the preceding condition. Here the mixt. of electrolytes is followed by greater disocn., an increase in the ionic pressure and an increase in toxicity. L. W. RIGGS

Correlation between the positive antagonism and absorption by the plant. L. MAUME AND J. DULAC. *Compt. rend.* 187, 769-71(1928); cf. preceding abstr.—In a series of solns. contg. a Ca salt in const. concn. and a Na or K salt with the same anion as the Ca salt but in variable concns. what influence does increasing concn. of the latter exert on the absorption of the Ca salt? As the concn. of the accompanying salt was increased the absorption of Ca decreased. With concns. of the accompanying salt ranging from 0.0005 to 0.02 the Ca in the leaves of the wheat plant was a decreasing function of the logarithms of the vol. equivs. of the accompanying salt. L. W. R.

Volatilization of iodine in Northern algae. PIERRE DANGEARD. *Compt. rend.* 187, 899-901(1928); cf. *C. A.* 22, 3193.—Volatilization of I in *Laminaria* and *Fucus* was observed on the northern coast of Norway in localities where the temp. of the ocean water was about 0° . L. W. RIGGS

Some effects on *Pisum sativum* of a lack of calcium in the nutrient solution. DOROTHY DAY. Mills Coll. *Science* 68, 426-7(1928).—The object of this study was to det. the effect of the lack of Ca on the gross anatomy and histologic structures of the plant. As compared with plants receiving a complete fertilizer, plants deprived of Ca showed less growth, chlorotic lower leaves, tough curled upper leaves and death

in 9 or 10 weeks. The anatomical structure of root and stem remained practically const., the difference being the amt. of elongation. Plants deprived of Ca for 5 weeks and showing the above-mentioned characters made a rapid recovery of the normal condition upon the addn. of Ca to the nutrient soln. L. W. RIGGS

Easy sampling of plant tissues. R. P. BARTHOLOMEW. Univ. Arkansas. *Science* 68, 516(1928).—A paper cutter with a 10-in. blade is recommended for cutting green plants, such as clover, into 0.5-in. pieces for sampling for chem. analysis. It works better than knife, razor or scissors. L. W. RIGGS

Protochlorophyll. WILLIAM H. EYSTER. *Science* 68, 569-70(1928).—A review of the work of Liro and others indicates that protochlorophyll is not a decompn. product of some other org. substance, as leucophyll, but is a pigment which develops without the influence of light and changes photochem. into chlorophyll upon exposure to light. It is probable that this change occurs only in the presence of a sp. enzyme. L. W. R.

Occurrence of manuka manna. F. P. WORLEY. *Trans. Proc. New Zealand Inst.* 59, No. 2, 404-5(1928).—Manuka manna is a white, finely cryst. and sol. substance found occasionally on the leaves and stems of *Leprospermum scoparium* in dry mid-summer. The substance is a complex sugar which on hydrolysis yields only glucose. Probably it is produced by the sap-sucking *Scolypopa australis* in the nymph form, and perhaps by other insects. L. W. RIGGS

Effects of the absence of boron and of some other essential elements on the cell and tissue structure of the root tips of *Pisum sativum*. A. L. SOMMER AND HELEN SOROKIN. Univ. of Minn. *Plant Physiology* 3, 237-54 (1928); cf. *C. A.* 21, 3700; 22, 613; 23, 414.—*Pisum sativum* (var. Golden Vine) were grown in culture solns. with and without the following elements: B, Mg, S, Mn, K, N, Fe, P and Ca. Each of the last 8 expt. series contained cultures with and without B. The control soln. had the compn. KNO_3 0.80 g.; KH_2PO_4 0.15 g.; $\text{MgSO}_4 \cdot 7\text{H}_2\text{O}$ 0.50 g.; CaSO_4 (satd. soln.) 300 cc.; B (as H_3BO_3) 0.0005 g.; Mn (as MnSO_4) 0.0015 g.; Al (as $\text{Al}_2(\text{SO}_4)_3$) 0.0005 g.; Cu (as CuSO_4) 0.000125 g.; I (as KI) 0.00025 g.; F (as KF) 0.00025 g.; NaCl 0.0127 g. In the absence of B the plants exhibited short, thick and stunted roots. Plants grown in the absence of B and also in the absence of certain of the other essential elements showed pathol. changes roughly similar to those found in the absence of B only. The meristematic region of root tips grown without B became abnormal. The cells ceased dividing normally and existing cells underwent premature development of pathol. changes. Isolated xylem elements appeared in regions occupied by the meristem in normal roots, or in the region of elongation. The primordia of the secondary roots began to be formed abnormally close to the root tip. Usually, however, they were soon suppressed and secondary roots seldom developed. S. and S. believe that the profound structural changes observed in these expts. indicate that physiol. investigations of the various elements must be accompanied by morphological, histological and cytological studies if their fullest significance is to be attained. WALTER THOMAS

Calcium, potassium and iron balance in certain crop plants in relation to their metabolism. WALTER F. LOEWING. Univ. of Iowa. *Plant Physiology* 3, 261-75 (1928).—Samples of 4 acid muck soils known to exhibit marked response to Ca and K were treated with powd. CaCO_3 or KCl in the ratio of 4000 and 400, resp., to 1,000,000 of soil. Yellow Dent corn, Marquis wheat, and Mammoth Red Fancy clover were grown in pots in these soils which were maintained at 20% moisture content. At the end of 10 weeks the compn. of the entire plants (including roots) was detd. with respect to Fe, Mg, Ca, K, nitric N, total N and total carbohydrates. Osmotic pressure and pH detns. were also made in the freshly expressed sap. Two of the soils examd. showed depressed yields of the grain crops from CaCO_3 addns., which L. attributes, in part, to the creation of K_2O insufficiency, resulting in interference with carbohydrate storage and, in part, to a reduction of sap acidity to the point where interference with internal mobility of Fe resulted. KCl proved injurious on 3 of the soils examd. The compn. of the soil will det. the causes operative. With muck soils relatively high in Fe, toxic amts. of this element may accumulate in the tissues because of increased sap acidity. In soils low in Ca and Mg the addn. of KCl may result in the depression of the CaO and MgO content of the tissues to the point of starvation. Soil and sap acidity favor iron solv. and absorption. High yield in young grain plants was assocd. with high carbohydrates and high org. N. Low yields were characterized by low protein, low carbohydrate and high nitrate content. WALTER THOMAS

An apparatus for the growth of plants in a controlled environment. A. R. DAVIS AND D. R. HOAGLAND. Univ. of California. *Plant Physiology* 3, 277-92(1928).—A description, illustrated with 6 figures, of an equipment that has given satisfactory results in expts. on the growth of plants under controlled conditions of light, temp.,

humidity and culture soln. The initial cost of the unit was approx. \$500, and the cost of maintenance per day of use approx. \$2.50, with electricity at 3 cents per kw. The results obtained have definitely shown the feasibility of establishing an environment which can be duplicated at will, thus leading in turn to the duplication of yields, no. of tillers, height of tops and other external evidences of growth. Such a controlled environment permits the isolation of a single variable and a quant. study of diverse physiol. phenomena.

WALTER THOMAS

Aluminum toxicity. FORMAN T. McLEAN AND BASIL E. GILBERT. Rhode Island Agr. Expt. Sta. *Plant Physiology* 3, 293-302(1928).—Following the technic previously described (*C. A.* 22, 293) a no. of different kinds of plants were grown in nutrient culture solns. contained in 250-cc. jars, for the purpose of studying their susceptibility to injury by Al and to test the efficiency of PO_4 as a preventive of Al injury. Very low concns. of Al, 3 to 13 parts per million, were stimulating to plants, while higher concns. were toxic. Al in combination with org. acids, such as citric and tartaric, was dialyzable and toxic at very low acidities (about p_H 6.5). High acidity, therefore, is not an invariable or necessary accompaniment of Al toxicity. Non-dialyzing forms of Al which could not pass through a collodion membrane in sufficient amts. to cause toxicity were decidedly toxic when placed in contact with the roots of barley. P, when put into soln. with Al compds., completely overcame the toxicity of the Al when the concn. of the P in the form of phosphate was equiv. to that of the Al. This is attributed to pptn of Al as AlPO_4 .

WALTER THOMAS

Biochemical studies on seed viability. I. Measurements of conductance and reduction. R. P. HIBBARD AND E. V. MILLER. Michigan State Coll. *Plant Physiology* 3, 335-52(1928).—Postulating that non-living cells should be more permeable than living ones and that, therefore, salts should leach out more rapidly from dead cells than from live ones, expts. were made to det. the change in resistance of distd. water in which seeds were soaking for the purpose of correlating the change in resistance with the viability of the seeds. The app. previously described (Mich. Expt. Sta. *Tech. Bull.* 23, (1915)) was used. The seed samples were added to beakers contg. 100 cc. of 0.00005 M KMnO_4 . These were placed in a const-temp. water bath at 25°. The quantity of seeds used was: timothy, 1 g.; peas, 50 seeds; wheat, 100 seeds. All seeds were sound. Resistances were detd. and the readings made at regular intervals. It was found, for the most part, that resistance rose with germinating percentages. The data obtained indicated that the conductance method is as accurate for distinguishing between seeds of high, low and medium germinating power as most workers have obtained with other methods. The weakness in the method consists in the supposition that the electrolytic content and its nature are the same for different samples of seeds of the same species and that change in soln. resistance would be solely dependent upon the change of permeability of the seed. A new and very simple method of detg. the viability of seeds has been developed. It consists in detg. the time-rate of reduction in KMnO_4 soln. in which seeds are soaking. Seeds of low viability exhibit the property of reducing the KMnO_4 in less time than is required by seeds of higher viability. The method is as follows: 100 corn seeds are ground coarsely in a meat chopper and then with quartz sand to rupture the individual cells. One-g. samples are allowed to stand in 20 cc. of distd. water for 1 hr. After filtering, 1 cc. is drawn off and added to 0.5 cc. 0.00125 M KMnO_4 . With the exception of a few of the high germinating samples there was a correlation between viability and time of reduction of KMnO_4 . The higher the germination the longer the time required for complete reduction of KMnO_4 . The substance that reduces the KMnO_4 is not an enzyme, but is probably an amino acid, amide or peptide.

WALTER THOMAS

Plant physiology in Russia. R. B. HARVEY. Cambridge Univ., England. *Plant Physiology* 3, 353-5(1928).—An account of a visit to the principal agr. expt. stations and universities in European Russia. H. was impressed with the thoroughly conscientious and helpful governmental support for fundamental research throughout Russia. Very few of the scientists in Russia are Communists; yet their work is given excellent support. The physiol. labs. visited are well equipped. The scientists are left alone by the politicians. The work of Kostychev on respiration and enzyme action and of Maximov on photosynthesis, root physiology and development, and drought resistance is briefly described.

WALTER THOMAS

Classification of coal from the viewpoint of the paleobotanist (THIESSEN) 21.

ULBRICH, E.: *Biologie der Früchte und Samen (Karpobiologie)*. Berlin: Julius Springer. 230 pp. G. M. 12. Reviewed in *Nature* 122, 437(1928).

E—NUTRITION

PHILIP B. HAWK

The effect of animal and vegetable proteins on the respiratory metabolism of normal and diabetic individuals. S. BERNSTEIN AND A. LEIMDÖRFER. *Wiener med. Wochschr.* 78, 1342-7(1928).—Animal and vegetable proteins are found to be different in their effects on the respiratory metabolism. Ingestion of large amts. of animal protein increases the O consumption, decreases the respiratory quotient, and produces a definite ketonuria. In the case of diabetics these effects are more pronounced. They may be neutralized by the ingestion of an equiv. amt. of vegetable protein. A. G.

Recent advances in animal nutrition. W. GODDEN. Rowett Research Inst., Aberdeen. *Agr. Progress* 5, 20-31(1928).—This paper reviews the results of recent research on animal nutrition with particular reference to vitamins and mineral elements.

K. D. JACOB

Premature alterations of the intestinal permeability in slow avitaminosis. Attenuated scurvy of the guinea pig. IGINO SPADOLINI AND GIOVANNI DOMINI. *Boll. soc. ital. biol. sper.* 3, 771-3(1928).—The behavior of the intestinal permeability in attenuated avitaminosis was investigated. Guanidine and curare were used as test drugs. In attenuated scurvy of the guinea pig the intestinal permeability for both drugs was increased; the animals were particularly sensitive to these convulsant poisons. P. M.

The effect of experimental fasting on the potassium and calcium ion content of blood serum. B. A. SCHATZILLO AND D. CH. KONSTATINOWSKAJA. *Biochem. Z.* 201, 318-22(1928).—It is corroborated that the blood serum Ca in advanced stages of fasting is diminished.

S. MORCULIS

Physiologic action of vitamin B. Phenomena of secretion of certain glands. MARIE SKARZYNSKA-GUTOWSKA. *Compt. rend. soc. biol.* 99, 1168-9(1928); cf. *C. A.* 22, 3437. —Intravenous injection of ext. of vitamin B caused no secretion of the saliva, whereas excitation of the *chorda tympani* caused a secretion in the same subject. In the dog with a permanent gastric fistula, the injection of 2 cc. per kg. of ext. of vitamin B caused $\frac{1}{6}$ to $\frac{1}{8}$ the flow of gastric juice that followed the injection of 0.5 mg. of histamine. In vivisection expts. ext. of vitamin B was without action on the gastric secretion, while 0.5 mg. of histamine caused about $\frac{1}{6}$ the flow of gastric juice that was produced by the same dose in a dog with a permanent gastric fistula. The pancreas secretion was not affected by vitamin B. In this test the pylorus must be ligated. Vitamin B increases slightly the renal secretion.

L. W. RIGGS

Pathogenesis of avitaminosis B in the dog: Lipuria. J. A. COLLAZO AND A. MUNILLA. *Compt. rend. soc. biol.* 99, 1448-9(1928).—The pathogenesis of avitaminosis B in the dog is explained in part by the large increase in the elimination of fats by the kidneys. This appears sufficient to account for the loss of wt. and the cachexia which precedes the death of the animal.

L. W. RIGGS

F—PHYSIOLOGY

E. K. MARSHALL, JR.

The chemistry of body processes. The nature of the action between gelatin and electrolytes. A. L. FERGUSON. *Fifth Colloid Symposium Monograph* 1928, pp. 159-78. In the first half of his paper, F. gives his reasons for the view that "this attempt at isolation and segregation of so-called colloid phenomena from classical chemistry is, in my judgement, fundamentally unscientific and unwarranted by the facts." The author concludes that, just as the gulf between org. and inorg. chemistry was filled in, so will be that between colloid and classical chemistry, and states: "But even after complete harmony is established between the adsorption and chemical views, substances of large mol. wt. and also substances while they are temporarily existing in a highly associated condition, will be best studied in a group by themselves under the subject colloid chemistry." F. then considers the work of Ehrlich, Kolmer, H. G. Wells, K. G. Falk, stressing the chemical aspect, and then gives an epitome of his results from complex boundary potentials, etc., with gelatin, acid and alkali (see *C. A.* 21, 3517). The combining wt. of gelatin is given as 1090. A concluding note refers to colloidal medicinal, which ends thus: "From the remarkable success attending the very small amount of work which has been done thus far in the prepn. of medicinals in the colloidal form, it would seem that there are wonderful opportunities here for work in chemotherapy."

JEROME ALEXANDER

Studies in the physiology of work. V. The economy (energy) of work in building a wall. ERNST BAADER AND GUNTHER LEHMANN. Kaiser Wilhelm-Inst. für Arbeits-

physiologie, Berlin. *Arbeitsphysiologie* 1, 40-53(1928).—The purpose of the study was to det. the energy output in laying a brick wall. The bricks used were American, 2.3 kg., Berlin, 3.2 kg. and the cloister form, 6.6 kg. The bricks were laid at the rate of 6 per min. and the height of the wall was 1.04 m. The work was divided into 4 sections, the lower 3 of which each measured 28 cm. and the top layer 20 cm. high. The energy output was measured by means of the Benedict respiration app. A det. of the metabolism standing was first made and then in 1-3 work periods, and the energy output of the work calcd. by subtracting that during standing from the total during the work periods. The energy requirement in small cal. varied per brick from 611 with the cloister form in the lowest layer to 156 with the American form at the top layer. Laying bricks at the bottom of the wall required the most energy with all 3 forms. The heat output per unit vol. of wall was inversely proportional to the size of the brick, but this was limited because with the larger form, the static work which caused fatigue was too great. The most practicable form of brick is one of medium size. T. M. C.

The economy (of energy) of carrying a load over a level stretch. E. ATZLER AND R. HERBST. Kaiser Wilhelm-Inst. für Arbeitsphysiologie und das physiol. Lab. der deut. Hochschule für Leibesübungen, Berlin. *Arbeitsphysiologie* 1, 54-74(1928).—The purpose was to det. the optimum conditions in the economy of energy output in carrying loads with the hands. The subject was 31 years old, 176 cm. in height and weighed 69 kg. The respiration expt. were made in the postabsorptive state by means of the Douglas method. The loads were either sacks of sand or metal disks with handles. In the first series, the load was equally divided between the two hands with the arms hanging nearly straight downward. The loads were 9.1, 18.2, 29.1 and 38.2 kg. The speed was 30 to 120 m. per min. The loads were also carried with arms at a slant forming an angle of 22° in order to increase the static work. In a second series, the load was carried either in the left or in the right hand straight downward or at an angle. The min. heat output for subject with load was at 60 m. per min. and varied from 0.576 small cal. per horizontal kilogram-meter with a load of 9.1 kg. to 0.731 for a load of 38.2 kg. carried with both hands. With double the speed the heat output was double that at 60 m. per min. The relation shown between speed and load based upon the cal. per horizontal kg. m. indicated that a speed of 100 steps per min. of 60 cm. length was most economical for all loads. The optimum load, independent of the speed, was 43% of the body wt. Right-handed carrying by a right-handed person was more economical than left-handed carrying. The efficiency of carrying with both arms at the sides was 17%. T. M. CARPENTER

Chemical studies on sex differences of blood protein in *Caudina chilensis* J. Müller. TETSUTARO TADOKORO AND SHUKICHI WATANABE. Hokkaido Imp. Univ., Sapporo. *Science Repts. Tohoku Imp. Univ.* [4], 3, 535-45(1928); cf. C. A. 22, 1181. —The serum protein of this organism was examd. for sex differences with the following results: Male protein combines with a greater quantity of HCl, has a higher isoelec. point, higher N and S content, higher NH_2N , and greater quantities of arginine and lysine N are found in the hydrolytic products. The acetylated male protein shows a lower acetyl content than the female. These differences agree with those found in the muscle and serum proteins of higher animals. DAVID DAVIDSON

The influence of external temperature on the endogenous nitrogen metabolism of homotherms. EMILE F. TERROINE AND HELENE SORG-MATTER. Inst. Physiol. Strasburg. *Arch. intern. physiol.* 30, 115-25(1928). —When the external temp. was decreased in expts. with mice and pigeons, there was an increase in respiratory metabolism and a proportional rise in the endogenous N metabolism. The minimal N metabolism can therefore only be attained at thermal neutrality. The ratio [(N output: energy output) \times 1000] was constant at 2 to 2.4 with both types of animals at various temps. These results are in agreement with author's results on other homotherms. (Cf. C. A. 22, 796-7.) H. J. DEUEL, JR.

The quantitative law of the minimal nitrogen metabolism of the homotherms. HELENE SORG-MATTER. Physiol. Inst., Strasburg. *Arch. intern. physiol.* 30, 126-32(1928); cf. C. A. 22, 796-7, 2194. —In expts. on rats and roosters of varying wts., the energy loss showed variations of more than 50%, while the minimal N loss presents exactly the same variation, the ratio between them remaining const. The ratio

$\left[\frac{\text{N output}}{\text{energy loss}} \right] \times 1000$ agreed with those of the previous paper at 2.20-2.53. The law, therefore, holds for animals of widely differing wts. H. J. DEUEL, JR.

The action of adrenaline on the respiratory metabolism of normal and ovariectomized female rats. L. ASHER AND SIL. HONKABE. Univ. Berne. *Arch. sci. biol.* (Italy) 12, 8-19(1928). —Ovariectomy in 3 rats caused no change in the basal metabolism

or the basal respiratory quotient. The average increase in O consumption following the subcutaneous administration of 1 mg. of adrenaline was 30.1% in the normal animals and 19.5% in the operated ones. There was practically no change in the respiratory quotient caused by the injection of adrenaline in either series of expts. The action of adrenaline is therefore dependent in part on the presence of the ovaries. The thyroid and ovaries stand in a functional relationship. H. J. DEUEL, JR.

The adrenaline content of the suprarenal capsule in the chick embryo. MIZUHO OKUDA. Nagasaki Col., Japan. *Endocrinology* 12, 342-8(1928).—Adrenaline appears in the suprarenal gland of the chick embryo about the 8th day at approx. the same time the chromic reaction in the cells appears, confirming the intimate relationship between them. The adrenaline content of the gland increases parallel to that of their wt. but a somewhat marked increment is found on the 14th and 20th days. The behavior of tyrosine found by Sendju (cf. *C. A.* 20, 2362) in the chick embryo suggests its closer relation with adrenaline. H. J. DEUEL, JR.

Basal metabolism studies. A. I. ÖW AND A. KRÉMA. Krankenhaus wiener Kaufmannschaft. *Wiener klin. Wochschr.* 41, 1453-6(1928).—Administration of quinine lowers basal metabolic rate (B. M. R.) 9 to 15% and lowers blood sugar about $\frac{1}{4}$. Neither *pyrimidone* nor ergotamine tartrate (*gynergen*) had a consistent effect on B. M. R. or blood sugar. The ingestion of 50 to 250 g. of fat daily by normal individuals lowers B. M. R. but the B. M. R. in Basedow's disease is unchanged or increased by the ingestion of this quantity of fat. Subcutaneous injection of 0.5 mg. adrenaline increased B. M. R. 22 to 30% after 20 min. and 4 to 6% after 50 min. During the same intervals blood sugar changed from 116 mg. % to 171 and to 165. D. B. DILL

Regulation of carbohydrate metabolism. II. The role of lactic acid in the intermediary metabolism of carbohydrate. ALEXANDER PARTOS. *Fermentforschung* 10, 50-65(1928); cf. *C. A.* 22, 2596.—Not only does lactic acid injected intravenously bring about an increase in blood sugar by activation of the prodiastase of the liver but expts. *in vitro* show that the glycogen of finely ground rabbit liver is more rapidly converted into glucose in the presence of lactic acid. Control expts. with liver inactivated by heating to 100° showed that the lactic acid alone does not hydrolyze glycogen. In the presence of adrenaline ("Tonogen") the glycogen cleavage in pulped liver is greater and it is still further increased by addn. of lactic acid. With the living animal the effect is quite the opposite, the adrenaline hyperglucemia being changed to a hypogluccemia by injection of lactic acid. The effect of insulin *in vitro* is to inhibit glycogen cleavage, and this inhibition is counteracted by lactic acid. This compensating effect is not observed *in vivo*, but instead there is an increase in the insulin hypogluccemia when lactic acid is injected. Pituitary ext. ("Glandutrin") accelerates glycogen cleavage *in vitro* and still more when lactic acid is added; *in vivo* the acceleration is counteracted by injection of lactic acid. Thyroxine alone has little influence on glycogen cleavage but with lactic acid the cleavage is accelerated. On the other hand, thyroxine hyperglucemia is hardly affected by lactic acid. Ovarin ext. ("Glanduovin") promotes glycogen cleavage and still more so in the presence of lactic acid; but *in vivo* the hyperglucemia is changed to hypogluccemia by subcutaneous injection of lactic acid. The paradoxical effect of lactic acid is probably due to an action not only on the liver prodiastase but also on the nerve systems which control glucemia in the living animal. III. The action of electrolytes on the blood sugar. *Ibid* 66-71.—To ascertain whether lactic acid is specific in causing hyperglucemia when injected intravenously into rabbits, similar expts. were performed with other acids, all at the same H-ion concn. H_2SO_4 gave hypogluccemia; HCl, HNO_3 , H_3PO_4 and AcOH gave hyperglucemia. The effect on blood sugar is therefore not a matter of H-ion concn. Na salts of the above acids showed the same effect as the free acids themselves; hence the influence on blood sugar is due to the anion present. A. W. DOX

Arginine metabolism. II. K. FELIX, H. MÜLLER AND K. DIRR. Univ. Munich. *Z. physiol. Chem.* 178, 192-201(1928); cf. *C. A.* 18, 2366.—Two possible series of reactions have been suggested to explain the biol. conversion of arginine into creatine. The first of these is an oxidative process without intervention of the enzyme arginase, the intermediate steps being guanidinebutyric acid, and guanidineacetic acid, while the second series postulates the cleavage of arginine into ornithine and $CNNH_2$, the latter then uniting with glycine or sarcosine. To det. what substitutions protect the arginine mol. from the action of arginase several derivs. were prepd. and tested. An alteration in the guanidine or in the carboxyl group inhibits enzymic cleavage. The α -amino group must also be present, but one of its H atoms may be replaced by an acyl or presumably by an amino acid radical, but substitution by an alkyl inhibits the cleavage. Esterification of the carboxyl has a greater inhibiting effect in the case of

monobenzoylarginine than with arginine itself. Although the optimum pH for cleavage of arginine is at 9, that for its mono-Bz deriv. is at 7. This may possibly be due to the greater soly. of the latter in neutral than in alk. reaction. The arginase was prepd. from calf liver by the Edlbacher and R  thler method. (*C. A.* 20, 55.) *d*-Arginine-HCl, *d*-arginine- HNO_3 , monobenzoyl-*d*-arginine and *d*-arginine Me ester HCl gave cleavage varying from 97 to 65%, *d*-monobenzoylarginine Et ester only 7%, and *d*-nitro-arginine, *d*-dibenzoylarginine and *d*-arginic acid no cleavage at all. Control expts. showed the absence of histozyme, and addn. of BzOH had no inhibiting effect. The prepn. of mono- and di-benzoylarginine is described in detail. A. W. Dox

The nuclear substance of liver cells. N. ISHIYAMA. Univ. Berlin. *Z. physiol. Chem.* 178, 217-20(1928).—By digesting finely minced calf liver with pepsin-HCl and centrifuging the turbid soln., the nuclear substance was obtained free from protoplasm. The yield after removal of fat by EtOH and Et₂O was 3.5 per kg. liver. The product contained 13.08% N and 2.72% P, giving a P:N ratio of 1:4.81. The corresponding ratio for herring sperm is 1:3.237, for protamine nucleate 1:3.21, for thymus nucleohistone 1:3.44. The nuclear substance of avian blood, however, according to Ackerman, has a P:N ratio of 1:4.4, more closely approximating that of liver. Nucleic acid prepd. from the liver nuclei gave a P:N ratio of 1:1.89, as compared to 1:1.7 for thymonucleic acid. If the P is assumed to be present as thymonucleic acid, the 2.72% P in the liver prepn. would represent a nucleic acid content of 31.55%. The remaining 68.45% must be protein with N content of 12.36%. Although this value is vitiated by accumulation of analytical errors, the conclusion seems justified that the protein component of the nuclei of liver cells does not belong to the known basic proteins such as the protamines and histones, whose N content is much higher. This may explain the fact that no one has yet succeeded in extg. basic proteins from the nuclei of liver cells. A. W. Dox

The rate of lactic acid formation in muscle contraction. Comments on the paper of the same title by G. Embden and E. Lehnartz. OTTO MEYERHOF. Inst. Biol. Berlin-Dahlem. *Z. physiol. Chem.* 178, 306-10(1928); cf. *C. A.* 22, 3441.—Polemical. The high oxidation quotient reported by E. and L. is erroneous and is due to the fact that the manometer measurements before muscular contraction were made with the muscle satd. with O, while after the contraction the measurements were made with muscle deprived of O. Sufficient time was not allowed for the muscle to come to O equil., hence the O consumption reported is too low and the calcd. oxidation quotient too high. The accuracy of the method used for micro detns. of lactic acid is also questioned. The rate of lactic acid formation in muscle contraction. Reply to the foregoing remarks of O. Meyerhof. G. EMBDEN AND E. LEHNARTZ. Univ. Frankfurt. *Ibid* 311-5.—Meyerhof's objections are not considered valid. Microtitrations in the lactic acid titrations were made with 0.002 *N* instead of 0.005 *N* I, the reagent being added in portions of 0.01-0.005 cc. and the end point being remarkably sharp. The max. error could hardly have been over 2%. The error in measurement of O consumption is greatly overestimated by M. High lactic acid formation and high O consumption ran parallel, which could not have been the case if M.'s contention were valid. A. W. Dox

The cleavage of lactacidogen in muscle contraction. G. EMBDEN AND H. JOST. Univ. Frankfurt. *Z. physiol. Chem.* 179, 24-40(1928).—Previous studies on the cleavage of lactacidogen are not altogether satisfactory because the method of detn. did not take into account the H_2PO_4 derived from cleavage of phosphocreatine and hydrolysis of $H_4P_2O_7$, the 2 recently discovered constituents of muscle. The present method is based on the fact that lactacidogen is quant. pptd. in the presence of an excess of Mg ions by EtOH contg. NH_3 , and easily freed from all other reducing substances. The reducing power of the ppt. is then detd. by the Hagedorn-Jensen micro method (*C. A.* 17, 2721) and multiplied by the factor 1.5, since lactacidogen has only $\frac{2}{3}$ the reducing power of the glucose contained therein. By means of this improved method it is shown that in the moment of muscle contraction a rapidly reversible lactacidogen cleavage occurs wherein the liberated H_2PO_4 is a multiple of the amt. of lactic acid simultaneously formed. The amt. of preformed lactacidogen in the muscle is much smaller than was previously claimed on the basis of detns. made by the older method, which is now shown to be inaccurate. A. W. Dox

Liver glycogen and muscle training. YOSHIAKI WAKABAYASHI. Univ. Hamburg. *Z. physiol. Chem.* 179, 79-82(1928).—A difference in the glycogen content of the liver after strenuous muscular exercise is shown in the case of rats before and after a period of training. Rats that had been forced to operate a tread wheel for 4 periods of 5 min. each during 1 hr. on a no. of successive days showed a glycogen content of 11.3-36.3

mg. per g. of liver immediately after a 5-min. run, whereas control animals making their first run showed an almost complete absence of glycogen. Coincident with the disappearance of glycogen from the liver is an extreme lowering of blood sugar. Possibly various phenomena of severe exhaustion in untrained individuals may be a matter of hypoglycemia.

Is thyroxine the complete hormone of the thyroid gland? A. OSWALD. Univ. Zurich. *Z. ges. expth. Med.* 58, 623-8(1928).—Thyroxine, unlike thyreoglobulin, does not increase the reactivity of the vago-sympathetic nerves. This reactivity is a general protein property. The work of Harrington (*C. A.* 20, 2506) clears up the relationship between thyroxine and the other diiodotyrosine derivs. of the thyroid secretion.

Studies on the excretion of unoxidized substances in the urine. II. The oxygen deficit in health under various diets and in diabetes. HANS E. BÜTTNER. Universität-Poliklinik Würzburg. *Z. ges. expth. Med.* 59, 192-205(1928); cf. *C. A.* 22, 2787.—The O deficit in 7 well individuals for 14 days varied from 7 to 13 g. per day, av. 10.22 g. per day. The O deficit divided by the N excretion averaged 1.35, being lower in the morning. Diets with excess of carbohydrates or proteins did not change the O deficit on the av. Diabetes showed an increased O deficit which did not parallel the acidosis. Insulin reduced the O deficit in diabetes.

The changes in the hydrogen-ion concentration of the blood during sleep. JÁNOS KUNZE. Königl. ung. Pazmany-Peter-Universität zu Budapest. *Z. ges. expth. Med.* 59, 218-51(1928).—A lowering of 0.02-0.06 in the p_H was observed in sleep as compared with the subjects when awake. This difference was greater than the exptl. error.

The action of parathyroid hormone on the actual reaction of the blood. K. CSEPAI AND ST. WEISS. Königl. ungar. Pazmany-Peter-Univ. zu Budapest. *Z. ges. expth. Med.* 60, 133-4(1928).—By the colorimetric method of Hollo and Weiss the p_H was determined in 23 patients with various diseases following the administration of 1 unit per kg. parathyroid hormone. In about 50% of the cases the p_H was lowered. There was no relation between blood Ca and p_H .

Studies on the physiological chemistry of the aging of tissues. III. Studies on beef cornea. M. BÜRGER AND G. SCHLOMKA. Univ. Kiel. *Z. ges. expth. Med.* 61, 466-76(1928); cf. *C. A.* 22, 3203.—The wts. of the cornea were: 1 year, 0.41 g.; 1-4 years, 0.62 g.; 5-9 years, 0.72 g.; 10-14 years, 0.75 g.; 15-18 years, 0.75 g. The N contents were: 3 weeks, 2.53 and 17.3%; 3 weeks, to 1 year, 2.55 and 16.5%; 1-9 years, 2.75 and 17.8%; 10-17 years, 2.88 and 15.3%, resp., for the moist and the dried cornea. The cholesterol content similarly was: up to 2 years, 0.079 and 0.525%; 2-14 years, 0.10 and 0.562%; 15-18 years, 0.125 and 0.665%.

The place of absorption of active iron oxide (Siderac) in the alimentary canal. JEROME MARKS. Univ. Berlin. *Z. ges. expth. Med.* 61, 560-1(1928).—Fasting guinea pigs were fed 5 mg. "Siderac" Baudisch, and at intervals of 1-72 hrs. the alimentary canal were sectioned at various levels and the Fe identified by the Turnbull blue reaction. The Fe was found intracellularly only in the duodenum.

The effects of maximal bodily exertion. V. The influence of various maximal exertions upon the composition of the blood. W. EWIG AND R. WIENER. Universitäts-Poliklinik zu Königsberg. *Z. ges. expth. Med.* 61, 562-89(1928).—Bibliography. VI. **The influence of training upon the composition of the blood, especially the acid-base balance.** WILHELM EWIG. *Ibid.* 590-607.—Bibliography.

Basal metabolism of young women. HUGHINA MCKAY. Ohio State Univ. *J. Home Econ.* 20, 591-4(1928).—Tentative conclusions drawn from observations on the 15, 16, 17, and 18-year groups of girls indicate that calories per sq. meter steadily decrease with age. The heat production for every year was found higher than the corresponding values of Benedict and Hendry (*C. A.* 15, 3644).

The relationship of lactic acid to the optical activity of normal and diabetic blood before and after glycolysis. SYDNEY L. WRIGHT, JR., ELIZABETH F. HERR AND JOHN R. PACE. Univ. of Pa. and Pa. Hospital, Phila. *J. Biol. Chem.* 80, 571-7(1928).—A study was made of the levorotatory substances formed from glucose by the glycolytic action of blood. The assumption is favored that these levorotatory substances are, in large measure, the salts of *d*-lactic acid.

The physiology of ergothioneine. BLYTHE A. EAGLES AND HARRY M. VARS. Yale Univ. *J. Biol. Chem.* 80, 615-22(1928).—Feeding expts. on pigs and the application of the diazo color reaction to protein hydrolyzates indicated that certain proteins yield a precursor of ergothioneine in the living organism. The ergothioneine content of pig blood could be raised from an undetectable, to a measurable quantity. A. G.

The nature of blood sugar. MICHAEL SOMOGYI AND HILDEGARDE V. KRAMER. Jewish Hospital of St. Louis. *J. Biol. Chem.* **80**, 733-42(1928).—Detns. of the true sugar of blood by the Shaffer-Hartmann, ferricyanide and the colorimetric methods gave identical results. The assumption that blood contains any fermentable sugar other than glucose, is thus unwarranted. The variation in the results obtained by the various methods for detg. blood sugar are due to the presence of reducing substances, other than glucose.

ARTHUR GROLLMAN

The metabolism of the bile. III. The enterohepatic circulation of the bile acids. CARL H. GREENE, MARTHA ALDRICH AND LEONARD G. ROWNTREE. Mayo Clinic. *J. Biol. Chem.* **80**, 753-60(1928); cf. *C. A.* **22**, 3917.—Curves of the excretion of bile acids in the bile after their oral administration are given which indicate absorption in the intestine. The quant. *Pelletier* test gives similar readings in the arterial jugular and portal blood of a fasting dog. When the bile acids are injected into the duodenum, there is an increase in their concn. in the portal blood.

ARTHUR GROLLMAN

Gas analytical investigations of the cerebrospinal fluid. EDITH KLEMPERER AND MAX WEISSMANN. *Wiener med. Wochschr.* **78**, 919-21(1928).—The CO_2 and O_2 contents of the cerebrospinal fluid were detd. in a number of psychiatric patients. The CO_2 tension varied from 45.93 vol. per cent in a case of *lues latens* to 64.05 vol. per cent in a case of progressive paralysis after treatment with malaria. Highest values were obtained in cases of progressive paralysis. Maniac-depressives and schizophrenic types gave values as low as 47.29%. The O_2 tension varied only slightly.

A. G.

The behavior of α -ketovalerolactone- γ -carboxylic acid in the animal body. R. ENGER AND H. SIEDENTOPF. Phys.-Chem. Inst., Leipzig. *Ber. Verhandl. sächs. Akad. Wiss. Leipzig, Math.-phys. Klasse* **80**, 122-6(1928).—The distn. residue from pyruvic acid does not produce sugar but might produce MeAc. The authors tested it by intravenous injection into carefully prepd. dogs without obtaining a trace of MeAc. When perfused through the isolated liver by the procedure of Friedman MeAc was produced in quantity. There was an immediate temporary increase in the β -hydroxybutyric acid. The substance as such disappears from the blood stream. It does not seem to split into 2 mols. pyruvic acid as was expected but to split off CO_2 and oxidize to β -hydroxybutyric acid and thus to MeAc.

H. C. HAMILTON

The problem of calcification: its influence on the tenure of human life. MAXWELL LAUTERMANN. *J. Dental Research* **8**, 563-77(1928).—An address devoted to the processes of both normal and pathological calcification.

JOSEPH S. HEPBURN

Coefficient of diffusion of lactic acid through muscle. GRACE P. EGGLETON, P. EGGLETON AND A. V. HILL. Univ. London. *Proc. Roy. Soc. (London)* **B103**, 620-8(1928).—The coeff. of diffusion of lactic acid through muscle is detd. by means of the equation: amt. diffused per $\text{cm}^2 = 2c \sqrt{kt/\pi}$, in which c is the uniform concn. of lactic acid in the muscle, k the diffusion const., and t the time. The stimulated upper legs of a frog are kept in well-stirred O-free Ringer soln., and detns. are made of the surface area of the muscles, their lactic acid content, and the lactic acid content of the liquid. In a live muscle, k is approx. 6×10^{-6} when the initial concn. of lactic acid is low, and approx. 5×10^{-6} in extreme fatigue. Apparently diffusion in a live muscle occurs (1) through the lymph interspaces as rapidly as in free soln. with a diffusion const. of approx. 6.6×10^{-4} , and (2) through the living fibers with a const. of approx. 5×10^{-6} . In a relatively unfatigued muscle, the lymph spaces occupy approx. 8% of its vol. In fatigue, the osmotic pressure increases within the fibers, lymph is absorbed, and the diffusion const. decreases to a value representing closely packed fibers. In dead muscle after heat rigor, the diffusion const. tends to increase to its value in free soln. since the membranes of the fibers are no longer intact.

JOSEPH S. HEPBURN

Further investigation of the influence of mental activity upon respiratory gas exchange and upon energy loss. GREGOR V. KHLOPIN, V. YAKOVENKO AND V. VOLSHINSKII. *Arch. Hyg.* **98**, 158-75(1927).—Mental work, such as the reading of scientific books, caused an increase in the rate of O consumption and of CO_2 excretion with av. increases of 7.5% and 4.3%, resp. At the same time there was a slight quickening of the pulse and of the respiration. Mental arithmetic exercises, lectures and exams., caused even larger increases. The memorizing of foreign words, or of meaningless combinations of letters, was not sufficiently difficult to cause decided increases in the rate of gas exchange. The effect of mental activity upon the rate persists for some time after the end of the exercise. The increased loss of energy, measured in calories, was scarcely noticeable when words were memorized (0.1%); with scientific reading, 7.3%; with mental arithmetic, 20.74%. These changes in the rate of gas exchange and in heat production can be attributed not only to increased rate of metabolic change in the nervous system, but also to physiological changes in other organs.

P. Y. JACKSON

A comparison of various formulas for the calculation of basal metabolism. HERM. v. HOESSLIN. *Arch. Hyg.* 99, 91-5(1928).—Tables are given to show corresponding values for basal metabolism calcd. by the formulas of Benedict, Du Bois, Dreyer and Gruber. The formula of Meek for the surface area of the body gives results about 14% higher than the corresponding formula of Du Bois; but there is no theoretical basis for reporting basal metabolism in terms of body surface. P. Y. JACKSON

The role of the blood in transmineralization. CURT OEHME AND PAUL TÖRÖK. *Deut. Arch. klin. Med.* 160, 233-48(1928).—Following a milk diet the ingestion of 280 mille-equiv. of NaCl or KCl dissolved in warm water produced in the blood, in a number of expts., a temporary condition of acidosis; after a potato diet the result was an alkalosis. The Ca and K concn. of the plasma showed no variations corresponding to change in the quantity of these elements in the diet. P. Y. JACKSON

The relation of the reaction to epinephrine to the potassium-calcium ratio and other ratios. W. F. PETERSEN, S. A. LEVINSON AND SERGIUS ARQUIN. Univ. of Illinois. *Arch. Internal Med.* 42, 256-69(1928).—An analysis was made of 20 normal persons, 100 seemingly normal subjects (who however showed on examn. the presence of healed tuberculosis, cardiovascular-renal changes, a high degree of nervousness or a positive Wassermann test), 49 patients with various diseases and 12 patients with exophthalmic goiter. They were sepd. into a sympathetic (76) and a parasympathetic (73) group. A comparison of the outstanding cases of each group showed the following differences: In the sympathetic group the permeability of the skin capillaries (1) and the serum globulin (2) were higher, K/Ca (3), CO₂-combining power (4), electrical muscular reactivity (5), weight-length ratio (6) and blood pressure (7) were lower. The cholesterol content (8) and the time of appearance of erythema after irradiations with the Kromayer lamp (9) were also slightly lower. There was no material difference in the basal metabolism. The exophthalmic goiter group approached the sympathetic group in its response to adrenaline and in 1, 2, 3, 4, 6, 8 and 9, and the parasympathetic group in 5 and 7. MARY JACOBSEN

Absorption of undigested proteins in human beings. III. The absorption of unaltered egg protein in adults. HENRY SUSSMAN, ALEXANDER DAVIDSON AND MATTHEW WALZER. *Arch. Internal Med.* 42, 409-24(1928); cf. C. A. 22, 4588.—Unaltered protein was absorbed by 85.3% of 34 adults. In 4.3% the wheal appeared 15 min., in 26.1% 30 min. and in 78% 1 hr. after ingestion. The absorption is influenced by the same factors as that of fish protein. Most persons showing absorption from the upper intestinal tract also showed absorption from the rectum. The latter was slower and less pronounced. MARY JACOBSEN

Lactose metabolism in women. O. WATKINS. Harvard Med. School and Huntington Memorial Hosp., Boston. *J. Biol. Chem.* 80, 33-66(1928).—"Certain peculiarities in lactose metabolism are assocd. with the sexual activities of women. During the last stages of pregnancy there is a more or less const. excretion of small quantities of lactose. During the last few days before delivery there is a sudden very marked rise in lactose excretion which reaches its height on the day of delivery. After delivery, the lactose excretion immediately drops to a low level where it remains for 2-5 days. There is then a sudden and often tremendous excretion (as high as 4%) of lactose and, during the first few weeks of lactation, the fluctuations are very marked. By the end of the 1st month the lactose excretion has assumed a const. and lower level and this level slowly approaches the normal values for residual reduction of the urine as lactation progresses. The tolerance for lactose of most normal women is, in the intermenstrual period, the same as that of normal men, the tolerance dose being 10 g. Menstruation causes an increase in the tolerance of women so that at this time many women show no urinary response to the ingestion of 20 g. of lactose. During pregnancy the tolerance is increased, being in some women 3 times as high as in other individuals. Also the urinary response to the ingestion of lactose is slower in pregnant women and the return to normal is correspondingly slow. During lactation the tolerance is apparently the same in every way as it is in normal men and in most women in the intermenstrual period. None of the phenomena observed seems to be related in any way to the degree of activity of the mammary glands. Considering the fact that the endocrine glands are so clearly assocd. with sexual activity, it seems entirely possible that the interpretation of all the data that have been collected in the course of the investigation may lie within the field of endocrinology." A. P. LOTHROP

Animal calorimetry. XXXVII. The specific dynamic action of glycine given orally and intravenously to normal and to adrenalectomized dogs. FOLKE NORD AND HARRY J. DEUEL, JR. Cornell Univ. Med. Coll. *J. Biol. Chem.* 80, 115-24(1928); cf. C. A. 22, 460.—A clear specific dynamic action results from the intravenous injection of glycine.

tion of 10 g. of glycine into normal dogs. The values of this effect average about the same as by oral administration. Similar results are obtained with adrenalectomized dogs. The av. increase per hr. is 2.99 (oral) and 2.87 (intravenous) as compared with 3.26 and 3.39 cal. in normal animals. It seems clear, therefore, that the adrenals do not play any significant part in the production of the specific dynamic action of glycine. After adrenalectomy the basal metabolism of the dogs was markedly increased.

A. P. LOTHROP

Differences in serum and plasma content of cholesterol ester. RICHARD E. SHOFF. Rockefeller Inst., Princeton, N. J. *J. Biol. Chem.* 80, 125-6(1928).—The cholesterol ester values obtained for serum and heparin plasma more nearly represent the correct values for the non-cellular portion of the blood than do the values obtained for citrate or oxalate plasma since either Na citrate or $K_2C_2O_4$ appears to be able to cause a partial hydrolysis of that portion of the serum cholesterol generally detd. as ester of cholesterol. The differences are not very great but are of importance in that they are a source of potential error. **Cholesterol esterase in animal tissues.** *Ibid* 127-32.—

"Blood serum obtained from an animal post mortem always contains less cholesterol ester than did serum obtained from the same animal preceding death and often contains none. Passage of CO_2 into freshly drawn blood has no effect on the cholesterol ester content of the serum. Cholesterol esterase capable of splitting either cholesterol ester in normal cow serum or cholesterol oleate in H_2O suspension is present in many animal tissues. The continued activity of cholesterol esterase post mortem with cessation either of cholesterol ester formation or absorption may explain the complete absence or diminution of cholesterol ester in blood serum obtained from an animal after death."

The effect of age on the total and combined cholesterol of the blood serum. *Ibid* 141-8. There is a marked and rather rapid increase in serum cholesterol and cholesterol ester from birth for a relatively short period of time during the early life of the animal. This is followed by a less marked and more gradual decline with advancing age. The sera of calves at birth and before having received colostrum contain very small quantities of free cholesterol only. The ester appears soon after the first nursing and the total cholesterol content of the serum begins to increase. Changes with age are more uniform and regular in males than in females.

A. P. LOTHROP

The composition of human milk. MARION BELL. N. Y. Homeopathic Med. Coll. and Flower Hosp. *J. Biol. Chem.* 80, 239-47(1928).—The comps. of the milks of 88 normal women were detd. The av. amts. of ash and protein decreased and of lactose and fat increased with the time interval post partum. Individual cases frequently failed to follow the trend. Supplementary feedings of carbohydrate or fat made only slight differences in the compn. of the early milk but in general the lactose content was a little higher in both cases and the milk fat was highest in those receiving supplementary fat. The av. vols. secreted were greater after supplementary carbohydrate feeding and less after fat feeding than in the controls. The results obtained in this study are compared with those reported by other investigators.

A. P. LOTHROP

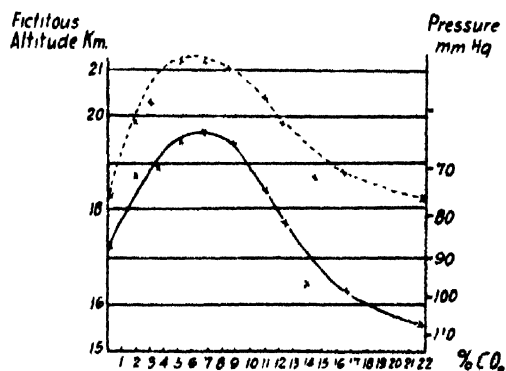
Cutaneous and venous blood sugar curves. I. In normal individuals after insulin and in liver disease. MYER FRIEDENSON, M. K. ROSENBAUM, E. J. THALHEIMER AND JOHN P. PETERS. Yale Univ. and New Haven Hosp. *J. Biol. Chem.* 80, 269-88 (1928).—"Cutaneous and venous blood sugar values have been detd. simultaneously before and at $1/2$ hr. intervals after the ingestion of 50 g. of glucose or a mixed breakfast contg. from 75 to 100 g. of carbohydrate in normal subjects and patients with diseases of the liver. Similar detns. on normal individuals in the postabsorptive state have been made before and after the administration of 10 units of insulin. The characteristics of the normal arterial (cutaneous) and venous blood sugar after 50 g. of glucose and after a mixed breakfast are indistinguishable and are as follows: In the postabsorptive state there is usually little or no difference between cutaneous and venous sugars; but positive (arterial > venous) differences of moderate degree occur with reasonable frequency and negative differences of significant magnitude are occasionally observed. At 30 min. a definite arterial hyperglucemia is established which usually still exists at the end of an hr. It is usually higher at 30 than at 60 min. In $1/3$ of the expts. the cutaneous blood sugar had returned within the normal fasting range at the end of 90 min. The venous sugar never rose as high as the arterial. Hence a definite positive arterial-venous difference, varying in magnitude from 6 to 50 mg., was detected in every instance. This was sometimes absent at either the 30 or 60 min. interval, but never at both. It was usually maximal at the point of greatest hyperglucemia. It was found even when cutaneous or venous sugar or both showed minimal rises. It had often disappeared by the end of 90 min. and, indeed, at this time negative differences of significant or even considerable size were sometimes observed. Insulin (10 units)

when given to a normal individual in the postabsorptive state results in hypoglucemia which is usually most marked at the 60-min. period. The appearance of a distinct and significant positive arterial-venous difference can usually be demonstrated. During the recovery definite negative differences were demonstrated in 1 subject. In severe liver disease an excessive or prolonged hyperglucemia can usually be demonstrated after 50 g. of glucose. All subjects, however, developed a positive arterial-venous difference. The deviation from the normal in some of these cases is so small and the range of normal variation so large, that it is doubtful whether the detn. of such curves will aid in the diagnosis of hepatic disease."

A. P. LOTHROP

The resistance of animals to barometric depression with various mixtures of oxygen and carbon dioxide. RODOLFO MARGARIA. *Arch. sci. biol.* 11, 425-52(1928).—The aim of the present studies was to det. whether the effects of diminished pressure is due exclusively to the diminished partial pressure of O_2 , and if CO_2 really enables one to reach larger depressions and to what degree. The expts. were performed on guinea-pigs kept under a bell jar fitted with the proper devices for introducing gas mixtures, for reducing the pressure, recording instruments, etc. Each expt. was run contemporaneously on two animals and repeated at least once for each gas mixt. The max. limit of resistance in air and O was first detd. and this was followed by similar detns. with mixts. of O_2 and CO_2 until the latter reached 21.5%. The resistance of the animals to depression was noticeably increased by the addition to O_2

of small amts. of CO_2 . The variations in the resistance of the animals as a function of the percent of CO_2 in the inspired air is given in the fig. The ordinates represent the fictitious altitudes on the left, and on the right the log of the corresponding pressure in mm. Hg; the abscissas show the % CO_2 in the O_2 - CO_2 gas mixt. The dotted curve indicates the corresponding partial pressure of O_2 .



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PETER MASUCCI

New physiological data on the hormones of the hypophysis. RENZO AGNOLI. *Boll. soc. ital. biol. sper.* 3, 448-50(1928).—The influence of the hormones of the hypophysis on the deamination of amino acids was studied. The expts. were made on dogs kept on a meat-free diet. In the first group of animals the influence of the active principle of the posterior lobe was investigated. The latter was injected intravenously together with the same quantity of glycocoll previously used in detg. the curve for the velocity of deamination on the same animal. The animal was then bled from an artery, the amino acid detd. colorimetrically by Folin's method, and the results compared to those previously obtained by injecting glycocoll alone. Various preps. contg. the active principle of the posterior lobe were used. None of these showed any influence on the curve of velocity of deamination. In the 2nd group of animals, an ext. of the whole fresh hypophysis was used. The deamination process was accelerated. The difference between this and the control was 1.90 mg. after 5 min.; 2.01 mg. after 10 min.; 0.75 mg. after 30 min., and 0.80 mg. after 60 min. In the 3rd group, the animals were injected with the lipoidal extract of the anterior lobe prepd. according to Robertson's method. These were the most active in accelerating the velocity of the deamination process. The anterior lobe contains, therefore, an active principle which speeds the removal of amino acids from the circulation and enables the tissues to either fix them or to deaminate them. The principle appears to be of a lipoid nature and is specific since it is found in no other gland but the hypophysis.

PETER MASUCCI

The solution of egg-albumin and the digestion of fibrin by pure pancreatic juice with and without calcium chloride. S. D. FRISCO. *Boll. soc. ital. biol. sper.* 3, 465-8 (1928).—Fibrin (0.5 g.), previously boiled for a long time, and 5 cc. of pancreatic juice were placed in a test tube into which was introduced a Mett tube. Another set of tubes was treated likewise except that 0.1 g. $CaCl_2$ was added. Observations were made from time to time to detect the digestion of fibrin during the interval in which the Mett tube remained intact. The results show that it was possible to detect a marked digestion of fibrin by pure pancreatic juice at a time when the Mett tube immersed in the same juice appeared perfectly intact. In the tubes containing pure pancreatic juice, and pancreatic juice and $CaCl_2$, both Mett tubes were dissolved but the one containing the $CaCl_2$ was dissolved twice as much. The difference in the digestion of fibrin detd.

by Sörenson's method was very small, hardly comparable to the difference noted in the solution of the Mett tubes. This indicates that the phenomenon of solution in the Mett tubes does not constitute a reliable index or even an approx. method of detg. proteolytic digestion by pancreatic juice.

PETER MASUCCI

The index of refraction of blood serum during muscular work. U. CASSINIS. *Boll. soc. ital. biol. sper.* 3, 481-3(1928).—The n of blood serum of 8 subjects was taken at rest and after a run of 600 m. and a march of 4800 m. The n was always greater after the exercise and corresponded to an increase of 0.38 to 1.01% of protein in the serum. This increase was not real but only apparent; it was due to the loss of H_2O from the blood.

PETER MASUCCI

The group-specific absorption power of blood lipoids. L. LATTES, P. SCHNEIDER AND K. V. BEOTHY. *Boll. soc. ital. biol. sper.* 3, 511-7(1928).—Exts. were made of blood groups O, A and B (1) by collecting the blood directly into 95% EtOH in the proportion of 1:10, incubating at 37° for 24 hrs., filtering, and evapg. the filtrate to dryness at 37°; (2) extg. powdered blood with boiling alc., washing with Et₂O and benzine to remove impurities, evapg. the alc. filtrate to dryness; (3) the residue from (2) and (4) extn. in the cold with Et₂O. The various exts. were tested by the hanging-drop method with A and B erythrocytes. Conclusions: The conception of Landsteiner and Schiff that group-specific isoantigens are not true proteins but lipoproteins was confirmed. The cold and hot alc. exts. gave rise to group-specific absorption of isoagglutinins of normal human blood and likewise did the lipoids obtained by extg. the alc. with Et₂O or benzine. The alc. ext. deprived of its ether-sol. fraction had no group-specific absorption power.

PETER MASUCCI

Rates of elimination of hormones. II. Lymph and adrenaline. EMILIO GHIRARDI. *Boll. soc. ital. biol. sper.* 3, 541-2(1928).—G. was unable to confirm Viale's results that normal dog lymph when added to Ringer soln. increases the amplitude and frequency of pulsation of an isolated heart. The lymphatic system cannot be considered as a route through which adrenaline circulates.

PETER MASUCCI

The state of sugar in the blood. P. DE LUCIA. *Boll. soc. ital. biol. sper.* 3, 626-31(1928).—The addn. of 5, 6 and 12% butyric acid and of 2, 5 and 10% valeric acid to blood lowers the surface tension, and increases the residual N in the phosphotungstic acid filtrate. The reducing power of such filtrates is the same as that of blood not treated with the acids. Conclusion: sugar (glucose) in the blood is not combined with the proteins and is not adsorbed. The increase of residual N cannot be due to creatine or uric acid, which are reducing substances, but is probably due to uric acid amino or undetd. N fractions.

PETER MASUCCI

Variations in the glucemic titer during the menstrual period. LUIGI MANZI. *Boll. soc. ital. biol. sper.* 3, 631-6(1928).—Women who were affected with inflammatory lesions of the genital organs showed an increase in blood sugar from 0.097 to 0.118% during menstruation and 0.065 to 0.098% during the intermenstrual periods. In healthy normal women, the blood sugar was 0.089 to 0.103% during menstruation and 0.084 to 0.096% during the intermenstrual period. The ovarian hormone has some influence, although slight, on carbohydrate metabolism.

PETER MASUCCI

Pancreatic secretion produced by hydrochloric acid with a blocked and unblocked vagus. U. LOMBROSO AND ANTONINO TOMASINO. *Boll. soc. ital. biol. sper.* 3, 789-92(1928).

PETER MASUCCI

The dry content and hydrogen-ion concentration of normal feces. N. C. LUNDIG. *Acta Med. Scand., Suppl.* XXVI, 50, 384(1928).—The usual p_H of normally passed feces is 6.0-8.0. A fecal p_H of 1.1 was observed in one individual. The dry residue depends on the length of time the feces remain in the colon and does not depend upon the food.

S. MORGULIS

Oxalic acid in the urine. ERIK M. P. WIDMARK. *Acta Med. Scand., Suppl.* XXVI, 340(1928).—On a normal diet the daily elimination of oxalic acid is 14-56 mg. Lying in bed seems to lower the excretion. Normal values for oxalic acid excretion were found in chronic polyarthritis, in oxalate calculus, etc.

S. M.

The hydrogen-ion concentration, and the lipase content of duodenal juice. TH. E. H. THAYSEN AND A. NORGGAARD. *Acta Med. Scand., Suppl.* XXVI, 390-1(1928).—The lipase content of various duodenal samples varies much and in accordance with the p_H . With low p_H values the lipase activity is slight but at p_H 6.1-8.0 a low lipase action is rare.

S. MORGULIS

The electrolyte content of the cerebrospinal fluid. L. ABRAMSON. *Acta Med. Scand., Suppl.* XXVI, 399-404(1928).—The Ca detd. by de Waard's method was 4.7-6.3 mg. per 100 cc.; the K 15.5-19.5 mg. The K/Ca for cerebrospinal fluid is 2.7-3.82.

S. MORGULIS

The place of formation of blood acetone. MARTIN ODIN. *Acta Med. Scand., Suppl. XXVI*, 457-61(1928).—Following intravenous injection of 5% NaHCO_3 , the acetone content of alveolar air rose from 0.25 to 0.45 mg. per l. At the same time there was noted an increase in the acetone bodies of the urine. The CO_2 capacity of the blood increased from 39 to 60 vol. % and the p_{H} from 7.42 to 7.57. It is believed that the alkali aids in dissolving the acetone bodies retained in the tissues and thus aids in their removal.

S. MORGULIS

Calcium and phosphorus metabolism. PAUL SCHULTZER. *Acta Med. Scand., Suppl. XXVI*, 560-5(1928).—Rats were fed McCollum's mixt. 3143 modified to contain 1.2 instead of 3.0% CaCO_3 but during the after-period the CaCO_3 was raised to the original 3143. As soon as the Ca was increased in the food the retentions of both Ca and P diminished considerably and they began to manifest rachitic bone changes. The diminished retention was caused by a reduced absorption from the intestine. In another series the Ca of the 3143 mixt. was reduced during the after-periods. The result was a far greater retention of Ca and P which was due to better resorption. In a third series the P of mixt. 3143 was varied by the addn. of phosphates. This effected a very great increase in the retention of both Ca and P, but while that of the P was caused by greater resorption, the increased retention of the Ca was due to diminished excretion in the urine.

S. MORGULIS

The natural guanidinophosphoric acids (phosphagens) in striated muscle. I. Physiological behavior of phosphagen. O. MEYERHOF AND K. LOHMANN. Kaiser Wilhelm-Institut für Biologie, Berlin-Dahlem. *Biochem. Z.* 196, 22-48(1928).—The rate of enzymic hydrolysis of creatine-phosphoric acid in muscle ext. is slower in the presence of carbohydrate, depends much on the p_{H} , and is inhibited by F. The optimum rate is at p_{H} 6.4 to 7.0; at p_{H} above 8.0, especially following preliminary hydrolysis, there is a resynthesis of creatine- H_2PO_4 which can be increased by adding creatine. The phosphagen in crustacean muscle, argininephosphoric acid behaved similarly to the phosphagens from vertebrate muscles, the differences being more of quant. nature. It undergoes hydrolysis in muscles during contraction but is resynthesized during the relaxation in the presence of O_2 . The arginine- H_2PO_4 of the muscle ext. undergoes enzymic hydrolysis and resynthesis like creatine- H_2PO_4 , the tendency to synthesis appearing at p_{H} 7.0 and becoming max. at p_{H} 8.0. The synthesis of the arginine H_2PO_4 is generally greater than that of creatine- H_2PO_4 . The inorg. amidophosphoric acid can likewise be split enzymically by the muscle ext., this being again inhibited by F. The heat formation of this enzymic hydrolysis is 14,000-15,000 cal. per mol. **II. Physico-chemical properties of the guanidinophosphoric acids.** *Ibid* 49-72.—A method is described for the pptn. of arginine- H_2PO_4 and for the identification of its split products. For the understanding of the constitution it is important that the α -amino group is free in the unhydrolyzed compd. The arginine- H_2PO_4 is not attacked by arginase. The heat production for the acid hydrolysis is calcd. at acid and neutral reactions. The heat liberated in the hydrolysis of creatine- H_2PO_4 per mol. is 12,000-13,000 cal. and 10,000-11,000 cal., resp.; of arginine- H_2PO_4 , 11,000-12,000 cal. and 8000-10,000 cal., resp.; and of aminophosphoric acid 16,000 cal. and 15,000 cal., resp. The heat of dissoen. of the arginine and creatine indicates that both exist as amphoteric ions. In arginine the guanidine base is the stronger with a basic dissoen. const. $K_{\text{B}1} > 1$ while the α -amino group has a $K_{\text{B}2} = 10^{-4.8}$, while the acid const. is approx. $K_{\text{A}} = 10^{-2.6}$. In the guanidine- H_2PO_4 the strongest base seems to be esterified with the weakest acid radical. The creatine- H_2PO_4 also has 2 acid dissoen. const. $K_{\text{A}1} = 10^{-3.7}$ and $K_{\text{A}2} = 10^{-4.6}$; the arginine- H_2PO_4 has 2 acid and 1 basic dissoen. const.: $K_{\text{A}1} = 10^{-4.5}$; $K_{\text{A}2} = 10^{-9.8}$; $K_{\text{B}} = 10^{-2.8}$. Amidophosphoric acid has 2 acid dissoen. const.: $K_{\text{A}1} = 10^{-2.8}$ and $K_{\text{A}2} = 10^{-6.2}$.

S. MORGULIS

The decomposition of creatinephosphoric acid in connection with the activity of the muscle. I. D. NACHMANSOHN. Kaiser Wilhelm-Institut für Biologie, Berlin-Dahlem. *Biochem. Z.* 196, 73-97(1928).—The hydrolysis of creatine- H_2PO_4 is followed simultaneously with the lactic acid formation and the development of tension in active muscles. The lactic acid production during tetanus is directly proportional to the tension and is independent of the nature of the stimulus (direct or indirect stimulation) or curarized muscle. The phosphagen hydrolysis is the same in direct or indirect stimulation but is less in curarized muscles. The ratio $\text{H}_2\text{PO}_4/\text{lactic acid}$ is about 2 during 5 sec. of tetanus by the first 2 methods, and then diminishes greatly. In curarized muscles, however, is the ratio 0.8 from the beginning. The "isometric coeff." of phosphagen increases very much corresponding to the great decrease in phosphagen hydrolysis in non-curarized muscles; in curarized muscles, on the contrary, it remains nearly const. up to about 100 kg. tension per g. of muscle. Besides the aerobic phase of phosphagen

synthesis following the stimulation of the frog muscle there is also an anaerobic synthesis during the relaxation lasting about 20 sec., during which about 30% of the phosphagen is resynthesized. This brief period of anaerobic synthesis is not due to the presence of traces of O_2 , because it was also found under conditions of strictest anaerobiosis as well as following 6 tetani when of course, all traces of O_2 must be removed. Following 10 tetani this anaerobic resynthesis fails to occur, but then the muscle also fails to develop much tension. During the anaerobic restitution of phosphagen there is no lactic acid formed, and no NH_3 disappears during that interval. S. MORGULIS

Conditions of calcium deposition in animal tissues. I. The state of calcium in tissues and tissue fluids. HANS KLEINMANN. Univ. Berlin, Charité. *Biochem. Z.* 196, 98-145(1928).—It is concluded from exptl. evidence that Ca in the tissues and tissue fluids may be present as ions in satd. or supersatd. forms as complex salt, as colloid or in combination with protein. To det. why cartilage and connective tissue have a stronger binding effect on Ca than other tissues, it was attempted to find the relative position of the isoelec. zone, the binding capacity for anions and cations being measured at varying acidities. Cataphoresis expts. show that cartilage is a markedly stronger acid than the proteins of muscle or other organs, and therefore has a stronger binding capacity for Ca. Compensation dialysis expts. with serum against solns. of $CaHCO_3$ or Ca phosphate indicate the complete dialyzability of these compds., thus excluding the possibility of their colloidal state. The fact that both the Ca^{++} and the CO_3^{--} content of serum diminishes when shaken with $Ca_3(PO_4)_2$ is corroborated, a condition which does not occur when glass, $CaCO_3$ and other substances are used as the solid phase. The loss of Ca in the presence of $Ca_3(PO_4)_2$ was studied under different concns. of Ca^{++} , PO_4^{--} , alkali, pH, and both in serum and in Ringer soln. **II. Studies on the acidity of the tissue in dystrophic calcification.** HANS KLEINMANN AND I. RENESOW. *Ibid* 146-60.—To find an explanation of the origin of the first $Ca_3(PO_4)_2$ crystals which, according to the previous study, initiate the dystrophic calcification, the acidity of necrotizing tissue has been compared with that of normal tissue. The material consisted of rabbit kidneys which were made necrotic and in which calcification was induced through ligation. The measurements were made with the aid of a micro form of Michaelis' V-electrode in the tissue juice and organ pulp. The method of course, gives no reliable abs. values but acceptable comparative values. In both the press juice and in the finely ground organs there was no *post mortem* acidification and the reaction was much more alk. than in the case of fresh organs. It is concluded that a tissue undergoing coagulation necrosis but remaining sterile within the organism tends to assume the acidity of the surrounding serum, which serves to initiate the crystal formation of $Ca_3(PO_4)_2$ leading to further calcification. **III. Experimental calcification through introduction of calcium salts.** HANS KLEINMANN. *Ibid* 161-76.—Expts. were made on mice, to which Ca and PO_4 ions were introduced with the food or subcutaneously with the addn. of acid- or base-forming substances. It was possible to produce calcification within the lumen of the kidney tubules, kidney epithelium, heart muscle, in epithelium and connective tissue of stomach and intestine as well as in the walls of the lung alveoli by administering an acid phosphate diet, but not with an alk. phosphate diet. Expts. where the Ca and H_3PO_4 compds. were given subcutaneously demonstrate more clearly the effect of alkali or acid on the Ca deposition than do feeding expts. This is manifested first of all in the excretion of the Ca and PO_4 , which is greatly increased by acid. Expts. on $HgCl_2$ poisoning show that the calcification is due to defective Ca and PO_4 excretion in the poisoned animal. The calcification is regarded as being caused by an accumulation of Ca^{++} and PO_4^{--} to the point of exceeding their soly. product, when $Ca_3(PO_4)_2$ ppts. out; a diminished acidity of the tissue fluid in an organ like the kidney will promote this pptn. Part of the $Ca_3(PO_4)_2$ in the presence of CO_3^{--} must be converted to $CaCO_3$, so that the two are found together. S. MORGULIS

Experimental sympatricotony in rabbits. III. How to interpret the temporary cessation of chemical processes determined by sympatricotony following ligation of the pancreatic duct. J. WOHLGEMUTH AND S. HAYASHI. Rudolf Virchow-Krankenhaus, Berlin. *Biochem. Z.* 196, 309-22(1928).—Normal rabbit plasma gives off a small but definite amt. of glucose to human red blood cells, but this is greatly increased almost immediately after ligation of the pancreatic duct. This is attributed to a discharge from the liver of glucemin, which inhibits the glucose fixation. The massive discharge of this substance is conditioned by the loading of blood with pancreatic secretion. This primary effect is then followed by an increased glucose fixation which persists for several days and becomes normal once more. If a few weeks later signs of sympatricotony reappear the loss of glucose again falls considerably below the normal and persists as long as the sympatricotony does. This is due to the circulating adrenaline, as can be

proved by the opposite effect which the administration of ergotamine produces, causing an increase in the amt. of glucose given off by the plasma. Rabbits in which the ligation of the pancreatic ducts failed to produce sympathicotony behave like normal animals in the matter of the glucose-yielding capacity of their plasma, but this capacity is raised when ergotamine is injected into these animals, showing that the animals are nevertheless under the influence of a certain adrenaline action. At the same time, however, there is also produced an insulinemia, because the red cells of these rabbits show distinct capacity for fixing glucose, a property not found in the cells of normal rabbits. The increased glucose-fixing capacity of the cells is an insulin effect. It is thus, concluded that ligating the duct of Wirsung releases in some rabbits an adrenaline production which, perhaps in a reflex way, increases the production of insulin. S. M.

Metabolism of stationary and growing tissues. O. ROSENTHAL AND A. LASNITZKI. Universitäts-Institut für Krebsforschung an der Charité, Berlin. *Biochem. Z.* 196, 340-425(1928).—In mesenchymic tissues (connective, smooth muscle and lymphadenoma) no definite conclusion as to the relationship between metabolism measurements and growth could be formed because the morphological character of these tissues changes so much during growth. However, the anaerobic fermentative process is always greatest when growth is most intense. Nevertheless, the fermentation in 3 cell-rich human sarcomas was smaller than in Jensen's rat sarcoma. Of stationary epithelial tissues the mucous membrane with its higher proportion of growing cells ferments much more strongly than epithelial glands. The fermentative process of liver and kidney during fetal and post-fetal growth is considerably greater than during their stationary state, and the process diminishes with advancing development. The respiratory function changes in the opposite direction. Pathologically growing epithelial tissues likewise possess a high fermentative capacity. In an orderly growing thyroid gland tissue the fermentation process seems to be greater than in the stationary state according to the colloid content. The highest fermentation values are found in the human and animal carcinoma tissues. The fermentation excess ($U = Q_M^{N_2} - 2 QO_2$) is pos. in disorderly growing tissues, except the human sarcoma, but in the case of most other tissues it is neg. The Warburg coeff. $Q_M^{H_2}/QO_2$ is for normal stationary tissues ≈ 3 ; 0.5-1.3 for most orderly pathological growths and is > 2 in all disorderly growths with the following exceptions: stationary lymph nodes, 0.5; strumas, < 0.3 ; human sarcomas about, 1.0. In a number of expts. the metabolism was detd. both in Ringer soln. and in serum. The anaerobic fermentation of fetal and adult rat liver as well as of rat tumors is not altered in inactivated horse serum. On the contrary, the respiration of rat kidney in inactivated serum is 50% greater, while that of the smooth muscle from the rabbit large intestine 50-100% greater than in Ringer. The paper contains comparative data on the respiratory and fermentative function of the same type of tissue from different organisms. S. MORGULIS

The metabolism of body cells. AKIJI FUJITA. Kaiser Wilhelm-Institut für Biologie, Berlin Dahlem. *Biochem. Z.* 197, 175-88(1928).—All organs and cells glycolyze anaerobically but this glycolysis is almost entirely suppressed by satn. with O_2 . This holds also for the placenta and leucocytes, which are thus not to be compared to carcinoma cells. In full-grown animals the metabolism of the eye lens is very nearly nil, but in embryonic lenses the anaerobic glycolysis is a function of the wt., and is greater the younger the embryo. Furthermore, the embryonic lens glycolysis does not cease in O_2 , and considerable aerobic glycolysis continues. In this respect the organs made up of practically non-nucleated cells behaves like the non-nucleated erythrocytes, the respiratory metabolism being absent in both. S. MORGULIS

Reversible transformation of cathemoglobin. BR. JIRGENSONS. Lättländische Univ., Riga. *Biochem. Z.* 198, 206-8(1928).—The transformation of cathemoglobin to hematin (and globin) is reversible. At higher temp. (70°) the hematin spectrum appears, at lower temp. it again changes to the cathemoglobin spectrum. S. M.

The volume changes of red blood cells of cows and fetuses in hypertonic salt solutions. D. VON DESO. Tierärztliche Hochschule, Budapest. *Biochem. Z.* 199, 41-7(1928). Salt solns. of such concn. were selected as to avoid the occurrence of salt swelling. The vol. changes in the red blood cells were measured with a hematocrit at 3500 revolut'ns per min. The expts. show that the fetal blood cells shrink relatively more than the mother's cells in hypertonic solns., contain more free water and also more colloids than the adult red cell. S. MORGULIS

Experimental studies on the relation of the carbon coefficient to the oxygen coefficient of the urine. ADOLF BICKEL. Universität Berlin. *Biochem. Z.* 199, 195-201(1928).—The C coeff. of urine is the ratio C/N; the O coeff. is the ratio to the total N

of the O_2 necessary for the complete oxidation of urinary products. For instance, creatinine would require 6 atoms of O for its complete oxidation; hence the coeff. is $6 \times 16/3 \times 14 = 2.286$, or 2.286 g. O_2 for every g. N. Urea is in this respect the most ideal nitrogenous waste product, its O/N coeff. being zero (infinitely small). For urine the magnitude of this coeff. will be directly proportional to the C, N and S contents, and inversely proportional to the O content, and it is also obvious that it cannot conform with the value of the C/N coeff. The O_2 required for the complete oxidation of urinary substances is detd. by the following procedure of Müller. A definite amt. of pure KIO_3 (either as the solid or in soln.) is placed in 300-cc. Erlenmeyer flask contg. a little water. To this is added 30 cc. concd. H_2SO_4 and, after leaving it 15 min. a measured quantity of urine is introduced and the mixt. is heated on a sand bath to 200° . The oxidation of the org. matter may be considered completed when no more I_2 fumes come off. After cooling the mixt. is dild. with a little H_2O and the free I_2 is driven off by boiling. The clear, colorless soln. is again cooled and made up to 500 cc. with H_2O . In 100-cc. portions the N is detd. by the usual procedure of liberating the NH_3 with an excess of $NaOH$, while in other portions the excess of KIO_3 is detd. by titrating with 0.1 N $Na_2S_2O_3$ after addn. of an excess of pure KI . A correction, of course, must also be made for urinary Cl because the reaction: $2KIO_3 + 10NaCl + 6H_2SO_4 = K_2SO_4 + 5Na_2SO_4 + 6H_2O + I_2 + 5Cl_2$ takes place. This is done by a sep. Cl detn. by the usual method. The O_2 consumption in the complete oxidation of the urinary org. matter is calcd. from the following formula: $mg. O_2 = 0.1869 \times (a - 17.84 b - 1.207 c)$, where $a = mg. KIO_3$; $b = cc. 0.1 N Na_2S_2O_3$ used in the titration of 100-cc. aliquot; and $c = mg. Cl$ in 10 cc. urine. The results of expts. in which both ratios O/N and C/N were simultaneously detd. by the methods described show that these do not always vary in a parallel manner.

S. MORGULIS

The acid-base ratio in the organism and the activity of the gastrointestinal canal. Acid-base equilibrium in man following removal of the stomach. P. ASCHMARIN AND E. MARRISON. *Inst. Exptl. Med., Leningrad. Biochem. Z.* 199, 307-25(1928).—A study of the acid-base metabolism in a patient after gastrectomy shows that the reduced NH_3 no. exceeds the normal. The p_H of the urine is lowered on changing to a strongly alk. diet, during which period the difference between the acid and base in the urine becomes very large. The CO_2 -tension in the alveolar air falls after eating. A large amt. of $NaHCO_3$ is required to raise the p_H of the urine.

S. MORGULIS

The carbon dioxide combination in the blood. I. The velocity of dehydration and hydration of carbon dioxide components in blood. O. M. HENRIQUES. *Staats Seruminst., Copenhagen. Biochem. Z.* 200, 1-4(1928).—The av. length of a lung capillary is 0.3 mm. and it requires 1 sec. for the blood to pass this distance. The reaction between hemoglobin and O is so rapid that the time suffices for the gas exchange. From Faurholt's data on the velocity of hydration of CO_2 and of dehydration of H_2CO_3 and HCO_3^- at 0 and 18° have been recalcd. for a p_H 7.4. This is found to require very considerable time. Thus, within the 1 sec. which the blood occupies in passing the lung capillary only 0.4% at 0° and 16% at 38° will change from $H_2CO_3 \rightarrow H_2O + CO_2$. Under av. conditions in the change from the venous to the arterial blood 5 and 11.75 vol. % bound CO_2 (at 0 and 38° , resp.) must be freed from the erythrocytes. By the dehydration process within 1 sec. only 0.02 and 1.95 vol. %, resp., could thus be freed. The CO_2 exchange in the lungs can, therefore, not be explained simply on the basis of dehydration. II. **The experimental demonstration of rapidly reacting bound carbon dioxide in hemoglobin.** *Ibid* 200, 5-9.—By means of a special app. described in the text, the rate of liberation of CO_2 was studied both from serum and hemoglobin solns. Whereas in the former only 22 vol. % CO_2 is liberated *in vacuo*, in the latter 28 vol. % is set free in 5 sec. The rate of the liberation of CO_2 follows the order of a monomol. reaction, $K = 0.0048$, for the hemoglobin soln. It is concluded that a part of the CO_2 in hemoglobin is a chemically bound complex which gives off its CO_2 with a very great rapidity. III. **The experimental demonstration of a CO_2 -hemoglobin complex in solutions of carbon dioxide and hemoglobin.** *Ibid* 10-17.—The HCO_3^- -ion activity in a soln. of CO_2 and hemoglobin is measured electrometrically according to Donnan's principle, with a Donnan dialysis app. as an ion-electrode (figures of the various app. are given in the text). The Donnan potential, the p_H , the total CO_2 and total Cl^- were detd. The calcn. of the Cl analyses shows that the Cl^- is also partly in a complex combination with the hemoglobin, but the degree of combination is differently related to the p_H than that of the CO_2 . At the same time the isoelec. point of the hemoglobin shifts from p_H 6.8 to 5.5 so that at a given p_H hemoglobin is more electroneg. than in a salt free soln. The value of pK_1 is about 0.2 less in erythrocyte pulp than in serum. The name "carbhemoglobin" is proposed for the CO_2 -hemo-

lobin complex. IV. The carbon dioxide-binding capacity of reduced and oxyhemoglobin. *Ibid* 18-21.—At the same CO_2 tension reduced hemoglobin binds much more O_2 into a complex than does oxyhemoglobin, but at tensions above 100 mm. Hg both forms of hemoglobin combine with practically the same amt. of CO_2 . V. Physiological considerations concerning the carbohemoglobin problem. *Ibid* 22-4.—In blood the exchange of chemically bound CO_2 proceeds entirely through carbohemoglobin, both the bicarbonate (HCO_3^-) and the CO_2 (H_2CO_3) playing the same subordinate role in respiration as do the Cl ions. S. MORGULIS

A note on the supposed chemical basis of the physiological action of hypertonic solutions. NICOLAI SHILOV. Research Inst., Moscow. *Biochem. Z.* 200, 145-8 (1928).—In view of the tenacity with which blood regulates its H-ion concn. and osmotic pressure, the effect of hypertonic salt soln. injections must exert an important influence on the potential difference between capillary wall and the moving blood column ("flow potential"), whereby also the wall acts as a neg. adsorbent. Evidence is cited to show that HCO_3^- is absorbed much better than CO_3^{2-} ions, and in cases of acidosis CO_2 will tend to accumulate in the capillary wall. This is found to be the first step in the chem. change which underlies sclerosis. In other words, the adsorption of CO_2 activates the capillary wall, making it susceptible to various physical and chemical actors. Normally this CO_2 adsorption is inhibited by the proper Cl^- and HCO_3^- balance. Apparently this CO_2 adsorption affects also the deposition of cholesterol, a problem which is now investigated by the author. S. MORGULIS

The physiology of the thyroid gland. XI. The role of the thyroid gland in the specific dynamic phenomenon in metabolism. G. MANSFELD AND ELIZABETH SCHEFFER CSILLAG. Univ. Pécs. *Biochem. Z.* 200, 194-200 (1928).—The specific dynamic effect of meat and sucrose was studied on 2 male dogs before and after thyroidectomy. Removal of the thyroid gland, leaving intact 2 parathyroids, has no influence upon the specific dynamic action of food. Likewise, castration following the thyroidectomy, does not alter the specific dynamic action. S. MORGULIS

Kidney metabolism and kidney development. P. GYÖRGY, W. KELLER AND TH. BREHME. Kinderklinik, Heidelberg. *Biochem. Z.* 200, 256-66 (1928).—The kidney cortex of young and old animals has a low, while the kidney papillary tissue has a relatively enormous anaerobic glucolytic function, so that the lactic acid fermentation of the latter is 4 to 5 times as great as that of the cortex. In nearly the reverse order to the glucolysis values are the respiration quotients of the different kidney portions. For the papillary region, in accordance with Warburg's value U for the classification of tissues, the values are pos. or strongly pos. Previously, pos. values for N in normal tissue were found only in the retina, so that the canal system of the kidney like the retina must be recognized as an organ with specialized functional properties. The same results were obtained with kidneys from animals and man. S. MORGULIS

The permeability of cells. XIV. The problem of the elimination of different sugars through the salivary gland. JULES JEANGROS. Univ. Bern. *Biochem. Z.* 200, 367-78 (1928). When intravenous injections of concd. solns. of various sugars are made and the secretion of saliva is at the same time greatly stimulated through pilocarpine, there was no sugar found in the saliva. Even when in addn. to the above 0.9% NaCl soln. of 37° was also injected intravenously in order to produce hydremic plethora still no sugar passed through the salivary glands. This fact shows that the permeability of the salivary gland cells differs very fundamentally from that of the kidney cells. S. MORGULIS

The relation between phosphoric acid and glucolysis in blood. W. A. ENGELHARDT AND A. E. BRAUNSTEIN. Biochem. Inst., Commissariat for Public Health, Moscow. *Biochem. Z.* 201, 48-65 (1928); cf. *C. A.* 22, 2781.—No appreciable increase is observed in the inorg. P of rabbit blood in incubation for several hrs. provided there is no hemolysis (cf. *C. A.* 19, 3276). Hemolysis causes a very great increase in the P values, and the same effect is found even when blood is dild. with isotonic salt solns. The change in P varies according to the nature of the anion, whereby the effectiveness of these anions corresponds to the Hofmeister lyotropic series $\text{F} > \text{Cl} > \text{Br} > \text{CNS}, \text{NO}_3$. Likewise, the more the concn. of the soln. differs from isotonicity the larger is the resulting increase in inorg. P. This rise in P is due to the cells and does not occur in serum or plasma dild. with salt soln. However, if washed erythrocytes are boiled with 1.5 vols. of Ringer soln. and this ext. is added to serum an increase is found in the total inorg. P after several hrs. This leads to the conclusion that the corpuscles contain the substrate from which P is hydrolyzed. When either washed erythrocytes or serum and boiled erythrocyte ext. were dild. with variable quantities of isotonic soln. of different salts no effect was observed except in case of NaF, which inhibited the formation of

P. This difference in behavior of whole blood and of the 2 artificial systems is attributed to the presence of glucose in the former and to the glucolysis. On adding glucose to the latter the behavior becomes similar to that of whole blood. Expts. with glucolyzing systems show that the factors promoting an increase in the inorg. P cause a corresponding diminution in glucolysis, so that there is a definitely reciprocal relationship between the intensity of glucolysis and the P increase. The hydrolysis of inorg. P is believed to proceed unhindered by glucolysis but is immediately transformed into an org. ester which becomes stabilized. The inorg. P balance in whole blood represents the algebraic sum of these 2 opposite processes. Anything which inhibits glucolysis results at the same time in a rise of the org. P.

S. MORGULIS

Studies on the effect of the sympathetic innervation on the phosphate and creatinine content of the striated muscles of vertebrates. WERNER SCHMID. Univ. Bern. *Biochem. Z.* 201, 125-47(1928).—The masseter and sublingual muscles were used for analysis. The inorg. P was detd. in an ext. prepd. from 0.2-g. portions, deproteinized with an equal vol. of 7% CCl_3COOH and dild. exactly to 30 cc. The detns. were made either by the Fiske-Subbarow or by the Lohmann-Jendrassik method. For the total P the muscle was ashed with 1 cc. H_2SO_4 + 2 cc. H_2O_2 . Kleinmann's nephelometric method was followed. For the creatinine detn. several samples of about 0.15 g. were boiled with 1% HCl until soln. was complete. After neutralization the soln. is boiled once more to ppt. the proteins and filtered when cool. An aliquot of the filtrate (0.8) is placed in a 50-cc. flask with an equal vol. 2 N HCl and autoclaved 20 min. at 115° and the creatinine is detd. colorimetrically. With these methods comparative analyses were made on the muscles above mentioned with or without sympathetic innervation as well as in animals deprived of their suprarenals. On the side on which the sympathetic nerve was destroyed the muscles regularly showed a lowering of about 10% of the org. P as compared to the muscle on the unoperated side. There was no difference in the creatinine content. Removal of the suprarenal glands had no effect of this nature. It is concluded that the muscle deprived of the sympathetic innervation has an increased permeability. The factor of the vasodilation due to loss of sympathetic innervation has been excluded.

S. MORGULIS

The physiology of glands. CXVI. The respiratory metabolism during work in the normal condition and after treatment with adrenaline. LEON ASHER AND WALTER H. SCHEUCHZER. Univ. Bern. *Biochem. Z.* 201, 148-64(1928); cf. *C. A.* 23, 426.—Subcutaneous injection of adrenaline into rats causes a slight rise in the metabolism during work as compared to the untreated rats. In view of the fact that adrenaline causes an increase in the basal metabolism it follows that work is done more economically under adrenaline.

S. MORGULIS

The lactic acid metabolism of the central nervous system. I. HANS JUNGEMANN. Univ. Breslau. *Biochem. Z.* 201, 259-68(1928).—The lactic acid is detd. by the Mendel-Goldscheider veratrole reaction in the spinal cord of frogs and toads. The av. lactic acid content of cords surviving in salt soln. is 0.14%. The lactic acid passes into the salt soln. at first very rapidly, then more and more slowly, and this continues even after 8 hrs. Even in the presence of O there is an increased lactic acid in the cord after 2 hrs., and a relatively large increase after 4 hrs., but in a N atm. much more lactic acid is produced. The lactic acid formed in N atm. is not removed by subsequent admission of O. Stimulation in O, however, causes a loss of lactic acid, while in N the lactic acid remains unchanged.

S. MORGULIS

The artificial raising of the lipid content of the central nervous system. I. MARC SEREJSKI. Inst. for study of Nervous Activity, Moscow. *Biochem. Z.* 201, 292-7(1928).—A rise in the lipid content of the brain was produced by feeding homologous brain lipids.

S. M.

The cholesterol in the protoplasmic structure. I. Studies on beef heart. G. PFEIFFER. Landwirtschaftliche Hochschule, Bonn. *Biochem. Z.* 201, 424-34(1928).—The total cholesterol was extd. from the heart tissue, either fresh or dry. Preliminary hydrolysis of the tissue with 2% NaOH and ether extn. yield exact results. The sapon. of cholesterol esters is very slow and is not completed even after 10-12 hrs. S. M.

The destruction of acetoacetic and β -hydroxybutyric acid in the muscles. I. SNAPPER AND A. GRÜNBAUM. *Biochem. Z.* 201, 464-72(1928).—On perfusing the lower extremities of the dog with blood to which β -hydroxybutyric acid has been added 45-75% is destroyed without being oxidized to acetoacetic acid. When acetoacetic acid is added to the blood used for the perfusion about 80% disappears, but 18-20% is recovered as β -hydroxybutyric acid adsorbed in the muscles and bones. On perfusing artificially the calf tongue, 13-40% of the added β -hydroxybutyric acid is destroyed and no acetoacetic acid is produced; while on perfusing with acetoacetic acid 75.5-

84.5% disappears, of which 29–67.5% is recovered as β -hydroxybutyric acid, so that in 4 expts. only 13–21% but in one expt. as much 54.5% acetoacetic acid actually disappeared. In all these expts. it is necessary to analyze not only the blood, but also the perfused muscles, fat, skin and bones.

S. MORGULIS

Iron metabolism. V. HENRIQUES AND H. ROLAND. Univ. Copenhagen. *Biochem. Z.* 201, 479–85(1928).—Analyses of 24-hr. urines from healthy or sick individuals 0.08 to 0.32 mg. Fe were found. Usually it is claimed that a mg. is secreted per 24 hrs. Through prolonged intravenous injection of iron salts the Fe excretion in the urine of the dog was raised to 13.5 mg. per 24 hrs. The excretion of Fe through the bile is not significant and in the dog does not exceed 0.2 mg. daily. In a patient with a bile duct fistula a max. daily secretion of 0.5 mg. was observed. Long-continued intravenous injection of ferrous lactate causes no increase in the Fe excreted through the bile. S. M.

The restitution of the fluid after hemorrhage. Kozo HIROTA. Kyoto Imperial University. *J. Biochem. (Japan)* 9, 87–102(1928).—A rabbit is killed by a loss of 50% of its blood even if this is due to several bleedings carried out at intervals of a few hrs. If the hemorrhage is less than 30% of the total blood, more than half of this loss is restored from tissue fluids, but the restoration of the fluid does not go on parallel to the recovery of the blood pressure. The liver is very active in this restoration. This effect manifests itself principally in the rise in colloidal osmotic pressure to counteract its lowering due to diln. The relation between the restitution of the blood pressure and that of the colloidal osmotic pressure and blood vol. offers evidence in favor of Bayliss-Starling's theory of lymph production. With a high blood pressure and a low colloidal osmotic pressure there is little restoration of the blood vol., but the vol. restoration is marked when there is a high colloidal osmotic pressure and a low blood pressure.

S. MORGULIS

The utilization of nutrient material following shortening of the intestine. VILJO TUOMIKOSKI. Univ., Helsingfors. *Skand. Arch. Physiol.* 54, 249–320(1928).—Removal of the large intestine from the cecum to the pelvic colon has the following effect on the utilization of food. The utilization of water was generally poorer, only about 71%. The addn. of water produced only a slight improvement in the water resorption, while the addn. of fat or vegetables made it somewhat worse. Also the utilization of protein was somewhat diminished, particularly that of vegetable protein, while that of animal protein was almost as good as under normal circumstances. The addn. of fat seems to have made the utilization of protein less effective. The utilization of fat was as good as normal. The utilization of carbohydrate was definitely diminished, which holds also for the utilization of ash. The assimilation threshold was somewhat lower than normal, and with increasing amts. of food the utilization became less effective.

S. MORGULIS

Fat and lipid metabolism. VII. Cholesterol and lipid phosphorus of the bile. S. LEIBER. Inst. Medicine, Charkow. *Zhurnal expil. biol. med.* 9, 181–93(1928); cf. *C. A.* 23, 419.—Loading dogs with olive oil, olive oil and cholesterol or with oleic acid causes very little alteration in the cholesterol content of the bile 1–24 hrs. after the administration. On the contrary loading the animal with meat and lecithin does lead to a considerable increase in the bile cholesterol during the first 6 hrs. Loading with lecithin alone also produces at times a certain rise in the total and lipid P of the bile during the first 4–6 hrs. a similar result following also the loading with olive oil. Following the blocking of the reticulo-endothelial system the cholesterol of the bile is increased, while after splenectomy the amt. of cholesterol and of lipid P in the bile decreases. It is concluded that in the dog the liver does not generally function as an excretory organ for cholesterol or phosphatides.

S. MORGULIS

Experiments on the comparative value of thyroxine and meat feeding on the movement of the empty crop of chickens. A. S. LIERNERFARB. Communist Univ., Moscow. *Zhurnal expil. biol. med.* 9, 492–500(1928).—Thyroxine injections, like feeding the dry gland substance, prolongs the activity of the empty crop but does not affect the duration or rhythm of individual contractions. On the contrary, meat feeding has little influence on the duration but does affect the rhythm and the crop twittings become very prominent. In all 8 cases, however, feeding meat or thyroid and thyroxine injection, there is a preliminary brief period of inhibition of crop activity. S. M.

Evidence drawn from a study of the therapeutics of Graves' disease of two functions in the thyroid physiology. G. SCOTT WILLIAMSON AND INNES H. PEARSE. St. Bartholomew's Hosp., London. *Quart. J. Med.* 22, 21–32(1928).—There are 2 functions in the thyroid physiology—the secreting function and the iodo-colloid function. These are not mutually derivative. The secreting function of the gland is directly related to the thyrotoxicosis of Graves' disease, which is relieved by simple removal of

pure secreting tissue. Iodo-colloid functions has only an indirect relation to thyrotoxicosis. An abs. loss of a thyroid reserve of iodo-colloid occurs in 48% of Graves' diseases. This mobilization of colloid depends on some factor in secretion, since, when I feeding is excluded, excision of pure secreting tissue causes or allows a reserve of normal colloid to appear in the remainder of the gland. I feeding can also restore a reserve of colloid. However, such a restoration does not abolish the thyrotoxicosis. There is no abs. lack of circulating I in Graves' disease, but there is a complicating relative lack in 48% of cases, which is relieved by I feeding.

JOHN T. MYERS

The precipitate obtained by cooling the plasma, or the precipitate of Wooldridge. EDGARD ZUNZ. *Arch. sci. biol.* (Italy) 12, 121-40(1928).—The Wooldridge ppt. may be sepd. into 2 fractions, one sol. and the other insol. in abs. alc. The portion sol. in abs. alc., confers on a soln. of serzyme contg. Ca, the property of coagulating the dild. dioxalated plasma used as a solvent for fibrinogen. This fraction also appears to contain a cytozymic substance, probably of the phosphatide group, which hinders coagulation. The portion insol. in abs. alc. contains a substance of a protein nature. After filtration through a Berkefeld filter, the Wooldridge ppt. does not appear in the oxalated or citrated plasma of the normal dog or rabbit, nor in the plasma not spontaneously coagulable by anaphylactic or peptonic shock. Apparently the cytozymic constituents sol. in abs. alc. are retained by the Berkefeld filter, a fact which favors their cellular origin. The portion sol. in abs. alc. acts on the plasma filtered through a Berkefeld filter in a manner analogous to that of the cytozyme. It causes incomplete coagulation of normal citrated plasma filtered and then recalcified, but does not modify the fluidity of filtered plasma from shock. Under the combined effect of the addn. of this product and the passage of a current of CO₂, the coagulation becomes complete in normal, citrated, filtered and then recalcified plasma and appears in the filtered plasma from peptonic shock, but generally not in the filtered plasma from anaphylactic shock.

L. W. RIGGS

Relativity applied to biological problems. Value of urinary acidity. L. TIXIER. *Bull. sci. pharmacol.* 35, 571-4(1928); cf. *C. A.* 22, 2957, 3927.—The relations of urinary monometallic phosphates, acid Na urate and amino acids to each other and to the total acidity of the urine are discussed. The following ratio multiplied by 100 gives a coeff. of alkalization of the phosphates: (phosphoric acidity—uric acidity—amino acid acidity)/(total acidity detd. with phenolphthalein indicator). The various factors in this ratio are expressed as $\frac{1}{2}(P_2O_5)$. If the coeff. is less than 100 it indicates free org. acids furnished by secondary fermentation in the digestive tract. If the ratio is greater than 100 it indicates an elimination of phosphates in the bimetallic state.

L. W. RIGGS

Isolation of the gastric and pancreatic secretory excitants from the circulation by vivi-dialysis. H. NECHELS AND R. K. S. LIM. *Peking Union Med. Coll. Chinese J. Physiol.* 2, 415-34(1928); cf. *C. A.* 22, 2180.—Vivi-dialyses of the carotid, femoral, caval and portal blood in dogs show that secretory excitants for the stomach and pancreas may be present in blood during fasting as well as after feeding. The excitants are more easily obtained from the portal than from the arterial blood. There is evidence of an increase of pancreatic excitant after meals or the introduction of HCl into the small intestine, and there is presumptive evidence of a similar increase of the gastric excitant. It is suggested that the excitants in fasting blood may be left over, either directly or indirectly through the action of secretagogue remainders, from the digestive period, and are not spontaneously and continuously increted.

L. W. RIGGS

Chemical regulation of cardiac activity. Effect of certain tissue products on the activity of the isolated heart. L. STERN, S. J. RAPEPORT AND A. F. SCHARIKOWA. *Compt. rend. soc. biol.* 99, 687-9(1928); cf. *C. A.* 21, 3972.—Exts. of most tissues have the power of stimulating the activity of cardiac muscle as shown in perfusion expts. with the isolated frog heart. This would indicate the absence of a sp. substance or particular hormone, but does not exclude the action of special products of internal secretion on the heart *in situ* in the living organism. Ratio between the effects of various tissue products on the coronary circulation and on cardiac activity. *Ibid* 689-91.—Liquid suspension of muscle and liver in concns. of 0.1 to 1.0 cc. per 100 cc. of Ringer-Locke soln. increases both cardiac activity and coronary circulation. In concns. of 2 cc. per 100 cc. it decreases both the cardiac activity and coronary circulation. Liquid suspension of spleen in concns. of 0.1 to 1.0 cc. per 100 cc. of Ringer-Locke decreases the cardiac activity, but increases the coronary circulation.

L. W. RIGGS

Relations between the adipose bodies of the sexual glands and the hypophysis. ALEXANDRE LIPSCHÜTZ AND RAMON PAEZ. *Compt. rend. soc. biol.* 99, 693-4(1928).—The adipose body of the guinea pig testicle injected into the male or female rat or mouse

had no influence on the development of the genital organs. The adipose body of the ovary or testicle of the large Chilian frog was equally inactive, as was also the hypophysis of the same frog. These expts. were made at a time of sexual repose, when perhaps the active substances were temporarily absent. L. W. RIGGS

Differential properties of the collagen fibers of the cornea and sclerotic. R. COLLIN. *Compt. rend. soc. biol.* 99, 833-4(1928).—In the ox the percentage of water in the cornea was 81.53, in the sclerotic 66.03. Notwithstanding the larger water content of the cornea, its ash content is also greater than that of the sclerotic in the ratio of 7:4. These findings are discussed histologically. L. W. RIGGS

Variations of the alkaline reserve and erythrocyte chlorine as a function of the pulmonary ventilation. A. SCHWARTZ AND F. SCHMID. *Compt. rend. soc. biol.* 99, 856-8(1928).—Hyperventilation in the rabbit caused a fall in the alk. reserve and in the erythrocyte Cl. Respiration for 1 min. in an atm. rich in CO_2 caused a rise in each of these factors. Hyperventilation following the administration of lobeline caused a fall in each of these factors. The administration of H_3PO_4 was followed by a fall in the alk. reserve and a rise in the erythrocyte Cl content. L. W. RIGGS

Are there nonfermentable reducing substances in the blood? Estimation of reducing substances of the blood by the method of Hagedorn-Jensen. JEAN ROCHÉ. *Compt. rend. soc. biol.* 99, 861-3(1928); cf. Fontes and Thivolle, C. A. 22, 2177, 2588, 3185; Bigwood and Wuillot, C. A. 22, 3673.—Filtrates from the defecation of blood by Na_2WO_4 contained more sugars than those defecated by $\text{Zn}(\text{OH})_2$ (Hagedorn-Jensen), and much less nonfermentable residue. Comments on the preceding paper. G. FONTES. *Ibid* 863-4.—The different yeasts used in fermentation and the different methods of defecation are discussed. L. W. RIGGS

Content of normal ocular tissues in reduced glutathione. D. MICHAEL AND P. VANCEA. *Compt. rend. soc. biol.* 99, 891-2(1928).—The reduced glutathione content is practically the same in similar tissues of the eye of the ox, rabbit and dog. Its distribution was: cryst. lens 356 mg. per 100 g., retina 162, choroid 78, lacrymal gland 50, cornea (vitreous body) 33, conjunctiva (sclerotic) 10. L. W. RIGGS

Influence of the testicular sexual hormone on the basal metabolism in animals. L. PTASZEK. *Compt. rend. soc. biol.* 99, 929-31(1928).—The testicles intervene in the basal metabolism and insure the stability of heat production. Double castration in healthy animals causes a stable lowering of the basal metabolism, and in this condition a subcutaneous injection of the testicular hormone produces a temporary return to normal of the respiratory exchanges. The extirpation of the testicles stimulates the activity of other endocrine glands, causing their temporary hyperfunctioning, which may for a time compensate for the diminution of respiratory exchanges. L. W. R.

Influence of rarefied air on the number of erythrocytes. G. LEJHANEK. *Compt. rend. soc. biol.* 99, 982-4(1928).—Between Nov. 7 and Dec. 1, a rabbit weighing 936 g. and under 300 mm. Hg pressure lost slightly in wt. while the erythrocytes increased from 5.48 to 9.45 millions. Under ordinary pressure between Dec. 1 and Apr. 13 the animal reached a wt. of 1825 g. while its erythrocytes fell from 9.45 to 4.72 millions. An attempt is made to express the relation between the no. of erythrocytes and the pressure by an equation. L. W. RIGGS

Urobilin in the organs. M. ROYER. *Compt. rend. soc. biol.* 99, 1006-7(1928).—In 4 healthy dogs the liver contained an av. of 32.5 mg. per kg. of organ, spleen 6.0, kidney 19.6 and heart 8.38. That of the muscle, pancreas, lung and blood was much lower. With dogs carrying a biliary fistula for several days and in which the feces contained no stercobilin and the urine no urobilin, the content of urobilin in the organs fell to 0 or less than 0.5 mg. per kg. It appears that the urobilin of the organs arises from the intestinal urobilin after its passage into the general circulation. L. W. RIGGS

Instability of the number of red corpuscles in splenectomized animals. E. TROILLO. *Compt. rend. soc. biol.* 99, 1008-9(1928); cf. C. A. 22, 4602.—In splenectomized guinea pigs the av. no. of red corpuscles is the same as in normal animals, but there is a diminution in the hemoglobin with relation to the no. of erythrocytes. The leucocytes nearly double in no. in the course of a year. A striking difference between normal and splenectomized guinea pigs is in the sudden changes in the red cell count of the latter, which may be 6, 4 or 8 millions within a period of 2 weeks. Apparently the spleen exerts a regulatory action on the no. of red corpuscles. L. W. RIGGS

Presence of adrenaline and of choline in the lymph. G. VIALE. *Compt. rend. soc. biol.* 99, 1009-10(1928).—Lymph of the normal dog added in the variable proportions of 1 to 20 per 100 of a perfusion liquid in the isolated toad heart increased the amplitude and rhythm of the contractions. Lymph from dogs deprived of their suprarenals did not produce these effects. Lymph from the normal dog intravenously

injected into dogs caused an increase in arterial pressure. Its effects are comparable to those of adrenaline. The most active lymph was that collected under the lymphogogic action of choline. Lymph from dogs deprived of their suprarenals was without action on the arterial pressure. Lymph from normal animals had a mydriatic action on the isolated eye of the toad, while lymph from animals deprived of suprarenals was without action.

L. W. RIGGS

Influence of diathermy of the thyroid gland on the basal metabolism. L. PRASZEK AND M. SZUPERSKI. *Compt. rend. soc. biol.* 99, 1028-9(1928).—In hyperthyroidism a remarkable lowering of the basal metabolism was observed after a 10-min. application of heat. In hypothyroidism heat caused an increase in the basal metabolism. Subjects with normal thyroid functioning showed slight changes in basal metabolism on the application of heat to the thyroid.

L. W. RIGGS

Purines extracted from muscles. A. DMOCHOWSKI. *Compt. rend. soc. biol.* 99, 1148-9(1928).—Dog and rabbit muscle were extd. with water at 40° and also at 100°, then, after defecation with AcOH, the purine content was detd. by the method of Krüger and Schittenhelm, also the purine N contents of fresh muscle and of extd. muscle. The quantity of purine N obtained directly from the ext. averaged only 5 mg. per 100 g., but after hydrolysis with H₂SO₄ the quantity was 40 mg. per 100 g., or about 1/4 the total purine N of the muscles. The distribution of purines between adenine and hypoxanthine on the one hand and guanine and xanthine on the other is considered. Further work is in progress.

L. W. RIGGS

Intestinal biodialyzates as agents inhibiting gastric secretion. JULIAN WALAWSKI. *Compt. rend. soc. biol.* 99, 1169-71(1928).—Intestinal biodialyzates, prepd. according to Gutowski (cf. C. A. 18, 3616), and introduced into the circulation of animals caused a pronounced inhibition of secretion of gastric juice.

L. W. RIGGS

Serocholesterolemia in the experimental anorchitic syndrome. GH. WERNER. *Compt. rend. soc. biol.* 99, 1185-6(1928).—In 10 adult guinea pigs there was an increase in the cholesterolemia 2 to 8 months after castration. Rabbits gave similar results 3 years after castration. The results with sheep were contradictory, but there was a tendency to a diminution of cholesterolemia during the 6 months following castration, after which the cholesterolemia rose to the av. normal figure.

L. W. RIGGS

Determination of urea in different samples of the same bleeding. BROCC-ROUSSEU, G. ROUSSEL AND GALLOT. *Compt. rend. soc. biol.* 99, 1203-4(1928).—Tests were made with 36 healthy horses, the urea being detd. by the xanthidrol method in 50-cc. samples of blood at the beginning and end of the bleeding. At the beginning the urea averaged 0.312 g. per l., at the end 0.316 g. per l.

L. W. RIGGS

The lungs and cholesterolemic regulation. L. BOUISSET AND L. C. SOULA. *Compt. rend. soc. biol.* 99, 1206-9(1928).—Expts. with dogs showed that increase of pulmonary ventilation caused a decrease in the cholesterolemia in arterial blood. Asphyxia produced the opposite effect.

L. W. RIGGS

Variations in the inorganic phosphorus, calcium and potassium in the blood serum produced by intracardiac and subcutaneous injections of peptone in the rabbit. X. CHAHOVITCH AND (MLLE.) M. VICHNJITCH. *Compt. rend. soc. biol.* 99, 1264-7(1928).—Repeated subcutaneous injections of peptone in the rabbit caused a fall in the inorg. P, Ca and K. Intracardiac injections of peptone caused nearly the same results. After the injections are discontinued the inorg. P, Ca and K rapidly tend to assume their initial figures. In the course of the injection of peptone, there are short periods when the soln. is not absorbed. During these moments the P and K tend to approach their initial figures. (Cf. following abstr.).

L. W. RIGGS

Content of inorganic phosphorus, calcium and potassium in experimental peritoneal effusions. X. CHAHOVITCH AND (MLLE.) M. VICHNJITCH. *Compt. rend. soc. biol.* 99, 1267-70(1928); cf. preceding abstr.—In exptl. peritoneal effusions, produced by injection of NaCl and MgSO₄, the content in Ca and K is lower than in the blood serum. Also in peritoneal effusions produced by the injection of peptone the content in K is lower than in the blood serum. Effusions produced by the injection of Na₂SO₄ contain less Ca but more K than blood serum. Effusions caused by the injection of NaCl, MgSO₄ or Na₂SO₄ contain generally less or sometimes the same content of inorg. P as the blood serum.

L. W. RIGGS

Variations in the alkaline reserve and chlorine content of the blood in experimental intestinal occlusion. F. DOMENECH ALSINA AND J. RAVENROS PIJOAN. *Compt. rend. soc. biol.* 99, 1278(1928); cf. Orr and Haden, C. A. 23, 435.—Expts. with dogs showed that occlusion at the terminal part of the duodenum by section of the intestine and invagination of the walls was followed by an increase in the alk. reserve and a diminution in the Cl content of the blood. Occlusion at the terminal part of the ileus

by the same procedure caused but little change in the alk. reserve, but a diminution in the Cl content. Ligature of the intestine caused similar changes but less pronounced. If a 10-12-cm. segment of the upper intestine is deprived of blood circulation, the alk. reserve and Cl content of the blood are affected the same as by occlusion at the same level. If a segment is deprived of blood circulation at the terminal portion of the ileus, there is a lowering of the Cl content of the blood without much change in the alk. reserve, or the same results may follow as with occlusion at this level. L. W. R.

Virtual adrenaline. G. MOURIQUAND AND A. LEULIER. *Compt. rend. soc. biol.* 99, 1309 11(1928).—The work of Molinelli and Mazzocco (cf. following abstract) is questioned. L. W. RIGGS

Alleged existence of a virtual adrenaline in the suprarenals. E. A. MOLINELLI AND P. MAZZOCCO. *Compt. rend. soc. biol.* 99, 1000-3(1928); cf. Mouriquand *et al.*, *C. A.* 21, 954, 2142.—The detn. of adrenaline was made simultaneously by the methods of Bailly, of Folin, Cannon and Denis, and by biologic tests on the chloralosed dog under artificial respiration after section of the vagus. With beef suprarenals the adrenaline content of glands was detd. 3 hrs. and 24 hrs., resp., after death. The method of Bailly showed an increase in the adrenaline content of suprarenals 24 hrs. after death; that of Folin, Cannon and Denis a slight increase or decrease, and the biologic method a decrease or no change. The increased intensity of the color reaction by the method of Bailly is attributed to some substance other than adrenaline. L. W. RIGGS

Influence of muscular work on the appearance of rigidity by monobromoacetic acid. MIGUEL O. ALMEIDA AND THALES MARTINS. *Compt. rend. soc. biol.* 99, 1346-7(1928).—From perfusion expts. with frogs it appears that muscular contractions cause a modification of the state of the muscles which favors the contracting action of $\text{CH}_2\text{BrCO}_2\text{H}$. This modification, which is not sp., rapidly disappears if the muscle receives sufficient O, but persists if the muscle is deprived of O. L. W. RIGGS

The estrual cycle of normal and splenectomized rats. E. B. DEL CASTILLO. *Compt. rend. soc. biol.* 99, 1403-4(1928).—The ablation of the suprarenals in white rats did not hinder the estrual cycle or the appearance of puberty. **Action of splenectomy and of epiphysectomy on the estrual cycle of the white rat.** *Ibid* 1404-5.—No change in the estrual cycle could be attributed to the loss of either gland. **Action of poisoning by fluorine or thallium on the estrual cycle of the white rat.** *Ibid* 1405.—The results support the conclusion of Buschke, Zondek and Bermann (cf. *C. A.* 21, 3084) with reference to Tl. Rats receiving 0.05 mg. NaF per day, with or without ultra-violet irradiation, failed to show the estrual cycle. L. W. RIGGS

Regulation of pulmonary ventilation by acidity of blood, tissue fluids and tissue. ROBERT GESELL. Univ. Mich. *J. Am. Med. Assoc.* 91, 1256-8(1928).—The exceptions to the rule that H-ion concn. of the blood controls ventilation are so many, that a rule for the exceptions is suggested by a theory formulated as follows: The respiratory center possesses an acid metabolism of its own. The rate of formation of acid in the center and the rate of transport of acid from the center det. the acidity of the center. Changes in the H ion concn. of the respiratory center rather than of the blood constitute the prime factor in respiratory control. By virtue of its own metabolism and its extreme sensitivity to minute changes in its own H-ion concn., the respiratory center is sensitive to minute changes in its own oxidations, and therefore to changes in the tension of O in the arterial blood. Since the supply of O det. the abs. and relative amts. of lactic acid and CO_2 formed in living tissues, and since it controls the efficiency of transport and elimination of acid, it constitutes an indirect regulator of pulmonary ventilation. The capacity of the center to respond to changes in the arterial CO_2 tension consequent on fluctuations in the general metabolism, however, must also be a factor. This theory receives exptl. support from the results of intravenous injections of HCl and of NaHCO_3 . L. W. RIGGS

Energy output during harvesting work. G. FARKAS, J. GELDRICH AND A. SZAKÁLL. *Magyar Orvosi Arch.* 29, 265-79(1928).—By means of the Douglas bag method it was detd. that the O_2 consumption during mowing was 2000 cc. per min., *prepn. of sheaves* 950, *binding into sheaves* 1800 and *collecting sheaves immediately after mowing* 1700. **Energy used during threshing.** *Ibid* 280-99.—The consumption of O_2 was least in filling the bags and was at a max. in carrying the sacks of grain to the second story of the barn. The values oscillated between 700 and 2170 cc. per min. The laborers lost much wt. during harvest but this loss ceased during threshing. The total energy used by a laborer in 24 hrs. when engaged in threshing is estd. upon the basis of gas metabolism expts. at from 3000 to 4500 kg.-cal. Upon the basis of wt. measurements, taking into account the estd. amt. of food consumed, the total energy was under 5000 kg.-cal. **Energy expenditure of man during industrial work.** G. FARKAS AND J. GELD-

RICH. *Ibid* 300-22.—The sep. parts of industrial operations in a particular trade were evaluated and the results were combined to show the total activity. During work the net heat increase of the tailor was 59 to 65 kg.-cal. per hr., shoemaker 72, locksmith 95, joiner 177, cartwright 176-208 and blacksmith 257 during light work and 327 during heavy work. Consumption of energy during dancing. G. FARKAS AND A. SZAKÁLL. *Ibid* 323-31; cf. Liljestrand and Stenström, *C. A.* 14, 2654; 16, 1611.—The energy consumption of the waltz, fox-trot and charleston was studied by the Douglas bag method. The detns. were made on the basis of the no. of steps per min. and the speed, using only the basic steps of the dances. The subjects danced alone. Speed is much less in dancing than in walking, while the no. of steps per min. is greater. The rhythmic movements of the over-body entailed by dancing increase the metabolism. **Respiratory exchange of man during organ playing.** G. FARKAS AND J. GELDRICH. *Ibid* 332-8.—During normal organ playing the av. energy increases were 80 kg.-cal. per hr. for easy selections and 130 kg.-cal. for difficult. Of the total energy output 30 to 40% was expended with hand work and the remainder with the pedals. **Respiratory exchange of man during horseback riding.** J. GELDRICH. *Ibid* 339-51.—When sitting on horse back so that rider and animal are at complete rest the respiratory exchange was increased 7%. Slight movements such as to control an uneasy horse at stand-still caused an increase of 37%. Riding at walk caused an increase of 122%, trot 490% and at gallop 672%. The increased energy output per m. of distance at walk was 0.012 kg.-cal., trot 0.022, gallop 0.018. Values of respiration experiments in childhood. A. SZAKÁLL AND I. LÉVAY. *Ibid* 352-62.—The subjects were 5.5 to 14 years of age. Variations in the amts. of energy of -9.9 to +17% below or above the Benedict and Talbot standard figures were considered as normal and due to the restlessness of the child and other uncontrolled factors. Increases or decreases of energy outside of these limits may indicate a pathological condition. Puberty had no apparent influence on the metabolism.

L. W. RIGGS

Changes of the p_H of the gastric content after the drinking of water, alcohol and acetic acid solutions. J. VÁNDORFY AND E. BARÁTH. *Magyar Orvosi Arch.* 29, 399-404 (1928).—Tests were made by the electrometric method on samples of gastric contents taken by fractional extraction. In normal acidity the p_H ranged between 1.5 and 2. in cases of superacidity between 1 and 1.5 and in cases of sub- and anacidity over 2 and 3, resp. The fluctuations caused by drinking water, alc. or AcOH solns. were not large.

L. W. RIGGS

Influence of hormones on the thallium epilation in rats. K. BERDE. *Magyar Orvosi Arch.* 29, 405-10(1928).—Sixty white rats were given 0.2 mg. of $TlAcO$ by mouth each day for 90 days. The animals were divided into several groups which received thyroid, parathyroid, thymus and adrenaline, resp. Animals of one group were castrated before beginning the expt. These various treatments had no apparent effect on the loss of hair by Tl except in the animals which received thymus ext., in which case the epilatory action of Tl was increased.

L. W. RIGGS

Production of fibrinogen. F. FALUDI. *Magyar Orvosi Arch.* 29, 424-33(1928).—From expts. with dogs provided with a gall bladder fistula it was concluded that the bilirubin secretion had no relation to the production of fibrinogen, the latter being produced probably in the reticulo-endothelial system.

L. W. RIGGS

Physics and vital processes. W. F. G. SWANN. Bartol Research Foundation. *Science* 68, 411-9(1928).—A lecture.

L. W. RIGGS

Pancreatic hormone and mineral metabolism. II. Influence of the pancreas hormone on the blood constituents, especially on the inorganic salts. SOSHIO TAKEUCHI. Tohoku Univ. *Tohoku J. Exptl. Med.* 11, 327-43(1928); cf. *C. A.* 22, 2624.—More than 40 references are made to the literature. With normal dogs the pancreas hormone causes a decrease of blood sugar, inorg. P, K and Ca; a tendency to increase Cl and serum albumin; and no particular change in Na or Mg. In dogs with pancreatic diabetes the pancreas hormone decreases the blood sugar, inorg. phosphates, K and Ca; increases the Cl and serum albumin; shows a tendency to increase Na, but causes no notable change of Mg.

L. W. RIGGS

Influence of air pressure changes on the composition of the blood. II. Animal respiration under increased and diminished pressures. (Ratio between blood composition and the type of respiration.) KOKICHI IZUMIYAMA. *Tohoku J. Exptl. Med.* 11, 374-406(1928); cf. *C. A.* 22, 4171.—As with man, so also with the dog and rabbit, a sudden application of increased breathing pressure was followed by a diln. of the blood. Breathing pure O at atm. pressure gave the same result. This diln. of the blood may be considered as a regulatory mechanism of the respiratory surface of the blood, which,

under some conditions such as anemia, does not take place. Under diminished respiratory pressure the blood thickens. By abnormal changes of the partial pressures of O in the air, a compensation through the respiratory surfaces of the lungs and blood occurs. Changes of the blood concn. by increased or decreased respiratory pressure results from a water exchange between tissues and blood. L. W. RIGGS

The influence of the endocrine glands on the catalase action of the blood. II. Pancreas and catalase. STEFANO CASTAGNA. Univ. Sassari. *Arch. farmacol. sper.* 45, 241-4 (1928); cf. *C. A.* 22, 4541.—Total pancreatectomy was performed on 3 dogs and the catalase action of the blood examd. for a certain period after the operation. The method used was the same as employed in previous expts. (cf. *C. A.* 20, 2529; 22, 97). The catalase action was normal for about 7 days after the operation; then it decreased slowly, being after 18 days 76, 78 and 88%, resp., of the original effect as detd. before pancreatectomy. **III. Catalase and thyroid.** *Ibid* 245-8.—In 4 dogs, thyroidectomy was followed by an immediate decrease of the catalase content of the blood. Five days after operation, the values for catalase ranged between 49 and 69% of the original values. G. SCHWOCH

The effect produced on the respiratory rhythm by varying the chemical composition of the blood circulating in the nervous system (with special regard to the variation of the cations). LUIGI CONDORELLI. Univ. Napoli. *Arch. farmacol. sper.* 46, 7-28 (1928); cf. *C. A.* 21, 3941.—Blood to which a certain amt. of an electrolyte had been added was allowed to act on the respiratory centers of dogs. The animals were prepd. for the expts. in a special way, making it possible to restore the normal blood circulation at any moment. The blood was administered under a pressure of 200 mm. Hg; its temp. was kept at 38°. The respiratory rhythm was recorded by 2 pneumographs according to Marey's method, one being applied to the thorax and the other to the abdomen. From the graphs obtained the following results were noted: By allowing Ringer soln. to circulate in the nervous system, hardly any deviation from the normal state was observed in the animal. Also depriving the blood of O₂ scarcely caused a disturbance. Satn. of the blood with CO₂ caused violent disturbances, the most conspicuous being the complete independence of the thoracic and abdominal movements. The symptoms observed in the expts. with blood satd. on CO₂ are the same as are seen in cases of uncompensated heart disease. After restoring normal circulation, the respiratory troubles disappear soon. Hypercalcemia produced by adding 10 mg. % Ca (as CaCl₂) to the blood causes polypneic dyspnea. Immediately after adding 13 mg. % K (as KCl), a marked increase in the depth of the respiratory movements was observed, while addn. of 26 mg. % K at first causes intensive dyspneic polypnea, then tachypnea and finally respiratory paralysis. By adding 600 mg. % NaCl, a marked tachypnea and a strong dysharmony between thoracic and abdominal respiration was observed. The addn. of 1000 mg. % NaCl caused at first polypnea, then irregular bradypnea and finally respiratory paralysis; by adding 1250 mg. of Na citrate, very similar effects were produced. The mere elevation of the osmotic pressure of the blood is not responsible for the injurious effects observed in the expts.; this view was proved by the fact that by raising the content of electrolytes in the blood to a level twice as high as normal, no noteworthy phenomena were observed. G. SCHWOCH

Sexual hormones, especially feminin. F. WADEHN. *Z. angew. Chem.* 41, 352-5 (1928). A survey of the different methods of prepg. ovarian hormone is given, the prepn. of which in H₂O-sol. form is designated as the most important feature of the progress made during the last 2 years in regard to this subject. The chem. properties of the hormone as far as they are known are described. As other sources, from which ovarian hormone may be obtained, are mentioned: testicles, blood of females, urine of males and females. Substances very similar in action have been isolated from wheat grains, pussy-willows, potatoes, yeast and rape seed. The various methods of testing the activity and the more or less favorable therapeutic results are discussed. G. S.

The effect of gestation and lactation upon the growth and composition of swine. D. J. GRISWOLD, P. F. TROWBRIDGE, A. G. HOGAN AND L. D. HAIGH. *Missouri Agr. Exp. Sta. Res. Bull.* 114, 6 pp. (1928).—The ash of prenatal and newborn pigs contains more Na, Cl and S, and less Mg, K and Si than the grown and partly grown animals. The higher percentages of Si in the older animals may be due to dirt carried in the hide and hair. The percentage of Fe is low and fairly const. for all ages and conditions. The large part of the ash is CaH₄(PO₄)₂, and the proportion is about the same in all animals, about 75% of the total ash. Before birth this proportion appears to be somewhat less. Digestion trials indicate that the coeffs. of digestibility of the pregnant animals are somewhat higher than those of non-pregnant animals. Less fat is digested after the animals have been confined in crates for a few days than at the begin-

ning of this period. More ash is excreted than is digested by the lactating animal.

J. J. S.

Inorganic iron in the body. E. STARKENSTEIN AND H. WEDEN. Univ. Prag. *Arch. expil. Path. Pharm.* 134, 274-87(1928).—Both in the blood and in the tissues inorg. Fe is always to be found, although but a small portion of it can be recovered in aq. exts. It cannot be all extd. even with weak HCl, but if 5 N HCl is used and the ext. is pptd. with trichloroacetic acid all of the inorg. Fe can be recovered without breaking down the hemoglobin combination with Fe to any considerable extent. Not more than half of the total inorg. Fe of the blood (1 mg. % per 1 kg. of body wt.) is recovered from the filtrate of protein-free blood. Of the organs, the liver contains by far the highest percentage of Fe, with spleen, stomach, brain, kidney and bone-marrow showing lower values. Beef blood contains somewhat less inorg. Fe than does rabbit blood. Human blood approaches that of other mammals, and varies in Fe but little from one person to another. In a given individual the amt. is const. The inorg. Fe of the body is to a large extent present in a form insol. in water, and when extd. with HCl the greater part is found in the ferrous form. Stomach, intestine, liver and urine contain HCl-sol. inorg. Fe in the ferrous form exclusively. In the blood and in the spleen ferrous and ferric Fe are present in about equal proportions. Aq. exts. of organs, blood serum and milk have the inorg. Fe almost entirely in the ferric form.

G. H. S.

Fate of inorganic iron in surviving organs. E. STARKENSTEIN AND H. WEDEN. Univ. Prag. *Arch. expil. Path. Pharm.* 134, 288-99(1928).—The various tissues and organs may be arranged according to their oxidizing power as follows: very strong, blood; strong, milk; moderate, brain, lung, urine; slight, muscle; very slight, heart, kidney and intestinal content. The liver, spleen and gastric content were inert. Arranged according to reducing power the tissues are: strong, brain, lung; moderate, liver, urine, and gastric and intestinal contents; slight, kidney and blood; and very slight, heart and muscle. Milk and spleen were inert. These facts indicate the behavior of the tissues as regards ferrous and ferric compds. Of particular significance is the power for reduction possessed by the contents of the stomach and intestine. It is also of interest that the reducing power of the blood is confined entirely to the erythrocytes.

G. H. S.

Central water regulation and hypophysis antidiuresis. S. JANSSEN. Pharmacol. Inst. Freiburg i. Br. *Arch. expil. Path. Pharm.* 135, 1-18(1928); cf. *C. A.* 23, 424 — Section of the cord at the level of the 5th cervical does not interfere with central regulation of water, except that immediately after the operation the urinary output is diminished because of shock. The concn. of the urine undergoes no marked change. Apparently the impulse regulating water metabolism does not follow the pathways involved in the regulation of temp., metabolism and the circulation. Since the vagus is also not concerned in the regulation it would seem that central water regulation is hormonal in character. Apparently the secretions of the hypophysis are the substances involved in stimulation of the centers regulating water output.

G. H. S.

Origin of the bile acids. IV. Experiments on dogs with a complete biliary fistula and a reversed Eck fistula. E. ENDERLEN, S. J. THANNHAUSER AND M. JENKE. Surg. Clin. Heidelberg and Med. Clin. Düsseldorf. *Arch. expil. Path. Pharm.* 135, 131-6(1928); cf. *C. A.* 22, 2973 —The formation of bile acids directly from cholesterol is impossible, and apparently the oxidation products of cholesterol cannot serve for the origin of bile acids through processes of intermediary metabolism. When allocholesterol is administered intravenously bile acids are formed, suggesting that perhaps allocholesterol is formed within the body and that it may be of biol. significance. V. Is there any connection between the decomposition of fatty acids and the formation of bile acids? E. ENDERLEN, S. J. THANNHAUSER AND A. DISTL. *Ibid* 137-42.—In dogs the injection of fats and fatty acids does not lead to an increased excretion of bile acids.

G. H. S.

Experimental study of the "vagus pressure phenomenon." LUDWIG BRAUN AND BERNARD SAMET. Univ. Wien. *Arch. expil. Path. Pharm.* 135, 362-8(1928).—Injury to the coronary arteries results in an increase in the irritability of the vagus.

G. H. S.

Cerebral innervation of respiration. I. Respiration after extirpation of definite portions of the brain, and the point of attack of exciting and paralyzing agents, morphine in particular. RUDOLF SCHOEN. Med. Klin. Leipzig. *Arch. expil. Path. Pharm.* 135, 155-87(1928).—Respiration in rabbits is regulated from two distinct regions of the brain; being stimulated from the mid-brain, and retarded from the thalamus, striatum and apparently also from the cerebrum. Exciting agents, such as 5% CO₂, lobelin, and cardiazole attack the bulbar centers; and morphine intoxicates through the suprabulbar centers.

G. H. S.

Changes in the soluble ferrous salts in the body. MARIANO MESSINI. Univ. Padua. *Arch. expil. Path. Pharm.* 135, 346-61(1928).—Intoxication phenomena, from both the quant. and qual. points of view, indicate that within the body ferrous sulfate is changed to phosphate. G. H. S.

Influence of bile upon absorption from the digestive tract. HEDWIG LANGECKER. Univ. Prag. *Arch. expil. Path. Pharm.* 136, 257-77(1928).—Bile markedly increases absorption from the gastrointestinal tract, so that substances otherwise non-toxic become toxic and those capable of absorption normally exhibit an accelerated effect. G. H. S.

Relation between hemolysis and viscosity. I. Hemolysis with hemolytic serum—nature of its early stages. YASUTARO OGAWA. *Acta Schol. Med. Univ. Imp. Kioto* 9, 431-47(1927).—An effort was made to det. if the hemoglobin colorimeter is a reliable index of hemolysis when the liberation of cell constituents other than hemoglobin is measured by changes in viscosity. Two vols. of 85% NaCl, 1 vol. of 5% red-cell suspension of goat blood, 1 vol. of hemolytic serum were mixed, let stand and centrifuged. Sp. viscosity was measured with an Ostwald viscometer and the degree of hemolysis with an Autenreith colorimeter. By means of dilution the hemoglobin and viscosity curves were found to be parallel. Viscosity is therefore a measure of hemolysis. The degree of viscosity and hemolysis by hemolysin were parallel. In relation to time, viscosity increased rapidly while change in hemoglobin content was gradual. The increase in viscosity is probably due to the distension of protein by the liberation of electrolytes from red blood cells. This precedes the release of hemoglobin. The degree of viscosity in its time course rather than the liberation of hemoglobin is best in detg. hemolysis. II. **Physical and chemical hemolytic agents.** *Ibid* 449-64.—A study was made of viscosity when hemolysis is caused by phys. and chem. agents. Viscosity increases more rapidly with temp. (40-60°) than the liberation of hemoglobin. A hypertonic salt soln. produces a similar effect. A hypotonic soln. of 0.8% has the same result but with less than 0.8% the viscosity curve rises gradually, paralleling the hemoglobin curve. Ultra-violet rays produce no change in viscosity for 2-4 minutes. After that the viscosity and hemoglobin curves increase. Caustic potash, if isosmotic, causes gradual increase in viscosity; with more concd. KOH the increase is rapid. III. **Difference of hemolysis in different species with reference to viscosity.** *Ibid* 465-78.—The effect of heat, sublimate and saponin on the red blood corpuscles of different animals in relation to viscosity and hemolysis was studied. The goat, rabbit, guinea-pig, dog, ox and man were chosen to represent the mammals, the hen and duck birds, the tortoise reptiles and the toad amphibia. The blood was citrated and centrifuged and the red corpuscles were washed with isotonic NaCl soln. and centrifuged. A 5% suspension of red corpuscles was made in 0.85% NaCl for mammals and the toad, 0.9% for the birds and tortoise. A 1% hemolyzed soln. of red corpuscles was used as the standard soln. in the colorimeter. Hemolysis with heat 55° occurs before 16 min. in dog, rabbit, man and guinea-pig; after 16 min. in goat, ox, tortoise, toad, hen and duck. Heat at 55° causes the following changes in viscosity: rapid rise in goat and toad in 1-4 min.; after 4 min. a slight change in man, rabbit, hen, ox and duck; a gradual rise in 1-4 min. in guinea-pig, dog, and tortoise. Hemolysis with an isosmotic saline soln. of 0.000843% sublimate is generated before 22.56 min. in tortoise, hen, rabbit and goat; after 22.56 min. in ox, toad, man, guinea-pig, dog and duck. The viscosity in hemolysis by sublimate rises rapidly in 1-4 min. and then gradually in goat, guinea-pig, rabbit and dog while in man, ox, hen, toad and tortoise there is no change in 1-4 min. An isosmotic saline soln. of 0.00002% saponin produces hemolysis in 2-4 min. with exception of the ox. Change of viscosity in hemolysis by saponin occurs in 1-2 min. in toad, hen and goat. No change at first and then gradually a rise in viscosity occurs in ox, dog, guinea-pig, man, duck, rabbit and tortoise. JOHN T. WOLF

Chemical composition of the mammary gland of the cow. O. LAXA. *Lail* 7, 336-42(1927).—Analyses of whole gland in the original condition, on the dry basis and on the dry, fat-free basis, resp., gave: H₂O 76.40, —, —; fat 9.50, 39.32, —; protein (N × 6.37) 11.84, 51.07, 82.41; ash 1.18, 4.92, 8.48; undetd. 1.08, 4.98, 9.11; dry matter 23.60, —, —%. Consts. of fat (washed in boiling water): sapon. no. 196.5-197.1, Reichert-Meissl no. 6.82, Wauters-Polenske no. 1.5, refractive index (40°) 48, iodine no. 48.13-48.23, free acids 36, Hehner no. 94.9, mol. wt. of insol. acids 286. In two samples cholesterol was 0.52% and phosphatides 0.97%. Nitrogenous matter in the fresh gland, on the dry basis and in the total protein, resp.: insol. albumin (nucleoproteins) 6.52, 24.78, 69.54; albumin and globulin 0.72, 2.73, 7.67; casein 0, 0, 0; albumoses and peptones 1.74, 6.61, 18.54; amino acids 0.40, 1.52, 4.25%. H. F. Z.

Percentages of chlorine and sodium in milks of various animals. L. BARTHE

AND E. DUFILHO. *Lait* 8, 97-9(1928).—In human milk there is more Cl than Na, and there is more Cl present than is needed to combine with Na to form NaCl. The extra Cl is probably largely combined with Ca. In the colostrum period Cl exceeds 0.1%, but after a few weeks becomes established at 0.06-0.07%, finally increasing with Na as period of lactation advances. In mare milk there exists above 0.1% Cl in the colostrum period, descending later to 0.05-0.07%. Only traces of Na can be found at any time. Cl as detd. in various biological fluids, particularly milk, is wrongly expressed as NaCl. H. F. ZOLLER

Individuality of quarters of the cow's udder. J. PROKS. *Inst. Lact. École Polytec. Prague. Lait* 8, 553-62(1928).—The quarters of the udder give similar but not identical milks. Points noted were: variability in compn. of ash and a difference in const. of the butterfat. It is maintained that each quarter is largely independent of the others and functions individually. H. F. ZOLLER

HENDERSON, LAWRENCE JOSEPH: *Blood—A Study in General Physiology*. New Haven: Yale Univ. Press; London: H. Milford, Oxford Univ. Press. 397 pp.

G—PATHOLOGY

H. GIDEON WELLS

The changes in blood produced by Röntgen therapy. CASSIO STARNOTTI. *Phototherap. Inst., Florence. Arch. farmacol. sper.* 46, 49-89(1928).—A study of the influence of x-rays on the blood picture of 12 healthy employees of the institute, 7 of whom worked in the Röntgen or radium dept., and of 7 patients suffering from psoriasis or eczema. G. SCHWOCH

Basal metabolism in pulmonary tuberculosis. ANTHONY AND H. L. KOWITZ. *Beitr. klin. Tuberk.* 68, 18-27(1928).—In febrile and subfebrile cases of pulmonary tuberculosis increased basal metabolism rates are found more frequently than in afebrile cases. Increased basal metabolism is not necessarily associated with fever, but is more frequently an expression of the activity of the tuberculous process. The extent and type of the process is not a measure of the basal metabolism. An unfavorable prognosis cannot be concluded from an increased basal metabolism and *vice versa*. A temporary increase in basal metabolism need not go hand in hand with an unfavorable general condition. Since the respiratory quotient in febrile cases of pulmonary tuberculosis is usually lower than in the afebrile and diminishes in cases in which the basal metabolism increases, it is assumed that in pulmonary tuberculosis there is a disturbance of the carbohydrate metabolism. H. J. CORPER

Immunizing action of "Kotoimmunogen" of the tubercle bacilli. R. TORIKATA AND Y. IMAMAKI. *Torikata-inst. f. Immunitätsforsch. Osaka. Beitr. klin. Tuberk.* 68, 306-35(1928).—"Koktoimmunogen" is prepd. from a glycerol bouillon culture of human tubercle bacilli, heated for a half hr. on a water bath, and filtered through a Silberschmidt thimble. The filtrate was injected into the right lung of guinea pigs, followed several weeks later by the injection into both lungs of a suspension of living tubercle bacilli, with the result that the right lung either did not become infected or proved less infected than the left non-treated lung and in addition the remaining organs in the immunized animal revealed less tuberculosis than the organs of the similarly infected untreated controls. No apparent injury resulted from the "Koktoimmunogen" treatment. Similar results were obtained with the protein-free "Koktoimmunogen". H. J. CORPER

Non-specific tuberculin reactions in tuberculosis-free individuals receiving prior old tuberculin treatment. J. HAMEL. *Univ. Würzburg. Beitr. klin. Tuberk.* 68, 345-52(1928).—A typical tuberculin reaction was obtained in 12 of 20 adults free from tuberculosis and reacting negatively to subcutaneous injections of old tuberculin ranging from 50 to 100 mg. and receiving treatment at intervals of 8 to 40 days ranging to a total as high as 593 to 1593.6 mg. of old tuberculin. The reaction occurred several days after the last injection given subcutaneously by using for intracutaneous injection 0.01 mg. of old tuberculin. H. J. CORPER

Comparative study of basal metabolism and sedimentation reaction in tuberculosis at low and high altitudes. H. KAPP. *Beitr. klin. Tuberk.* 68, 378-93(1928).—The basal metabolism in av. decreased at high altitude, at Davos, as compared to low altitude in the same tuberculous individual. Mild cases revealed greater limitation of basal metabolism than severe ones. The sedimentation rate also diminished at the higher altitude. The voluntary respiratory pause which is naturally shortened in the tuberculous individual was further shortened at high altitude with a diminution of from 14 to 25% in com-

paring Basel with Davos. The climatothrapy of tuberculosis at high altitudes is believed to be more of a protective than a stimulative treatment. H. J. CORPER

The Costa reaction in bone and joint tuberculosis. M. M. ALTSCHULER. Ukrain orthop. Kinder-Inst., Kiev. *Beitr. klin. Tuberk.* 68, 399-405(1928).—The Costa pregnancy reaction was tested on 175 patients with the result that it was found not to be sp. for tuberculosis but could be used as a substitute for the sedimentation reaction. The test consists of taking 1.5 cc. of 2% novocaine soln., adding 3 drops of 5% Na citrate and 3 drops of blood from the finger, shaking a number of times and centrifugating or allowing the mixt. to stand 12 hrs. in a cool place to complete sedimentation. A drop of pure formalin is added which results in a positive case in flocculation over the erythrocyte sediment within 15 min. which later becomes a ppt. The severe and moderately severe cases of bone and joint tuberculosis gave a pos. reaction. The reaction frequently would become pos. before the development of severe clinical symptoms and thus was of prognostic value. The highest percentage (79%) of pos. findings attained in severe closed forms of the disease. H. J. CORPER

The sugar content of skin in physiological and pathological conditions. ERICH URBACH and GRETE SICHER. Univ.-klinik Syphilidologie u. Dermatologie in Wien. *Wiener klin. Wochschr.* 41, 1481-2(1928).—Values for sugar in skin and musculature, resp., are: Dog 67, 54 mg.%; rabbit 117, 55 mg.%. Analysis of blood does not always reveal abnormal conditions in skin. In pathological conditions after ingestion of sugar, the skin tissue may retain sugar for a long while. Skin tissue amounts to $\frac{1}{4}$ the body wt., its mass being 3 times that of the liver. D. B. DILL

The variation of circulating proteins in the course of various diseases. I. The problem, normal values, diphtheria, scarlet fever, measles, typhus, grippe, sepsis, pneumonia, fibrinous bronchitis, asthma, bronchiectasis. WILHELM STARLINGER and FISBERTH WINANDS. Universitätsklinik in Freiburg. *Z. ges. expil. Med.* 60, 138-59 (1928). II. Phthisis, lues, malaria, rheumatic fever, circulatory disorders, kidney diseases. *Ibid* 160-84. III. Diseases of the hematopoietic system and the liver, malignant tumors, leucemia, granuloma, peptic ulcer, gastroenteritis, diabetes and other diseases of the organs of internal secretion. *Ibid* 185-208. IV. Spontaneous and irritability variations in health and disease, purulent and serous effusions, conclusions. *Ibid* 208-32. —This is an extensive review with the addition of a large mass of new data not suitable for abstracting. Bibliography. F. L. DUNN

The variations in the potassium, calcium and magnesium content of the cerebrospinal fluid. BELA FISLER. Medizinischen Klinik zu Kiel. *Z. ges. expil. Med.* 61, 549-59(1928).—Detns. were made in 154 patients with various diseases. F. L. DUNN

The behavior of the blood-sugar after the intravenous injection of dextrose. L. WISLICKI. Krankenhaus am Urban, Berlin. *Deut. med. Wochschr.* 54, 1831-2(1928).—The rapidity with which the blood of normal individuals resumes its normal sugar content after the injection of glucose is used in the diagnosis of diabetes mellitus. In this disease, the rate of disappearance of the injected sugar, is markedly diminished. ARTHUR GROLLMAN

The calcium in diseases of the skeletal system. H. K. BARRENSCHEEN and E. GOLD. Univ. of Vienna. *Wiener med. Wochschr.* 78, 1340-2(1928).—The Ca contents of the blood and urine were detd. in 22 clinical diseases of the skeletal system. The detn. of the Ca contents of these fluids is considered of diagnostic and prognostic value. ARTHUR GROLLMAN

Protein metabolism in fever. J. DONATH. *Wiener med. Wochschr.* 78, 1349-50 (1928). —A review with references to the literature. ARTHUR GROLLMAN

The relation of the carbohydrate and protein metabolism of intestinal bacteria to the etiology, prognosis, therapy and epidemiology of infectious intestinal diseases. E. PRIBRAM. *Wiener med. Wochschr.* 78, 1369-70(1928).—The ability to split carbohydrate is inversely proportional to the toxicity of intestinal bacteria. The carbohydrate-splitting enzymes inhibit the formation of toxic protein products. ARTHUR GROLLMAN

The histogenesis of essential lipoid histiocytosis (Niemann-Pick's disease). W. BLOOM. *Arch. Path.* 6, 827-59(1928).—Essential lipoid histiocytosis is a congenital lipoid dystrophy in which there is a great increase in phosphatides and a less increase in cholesterol in practically all of the cells and tissues (including the blood). The stored lipoids in Niemann-Pick's disease are probably lecithin, while in Gaucher's disease the stored material is kersin. The reactive connective tissue of the body responds in this disease by mobilization, hypertrophy and accumulation of large quantities of lipoids.

The various epithelial, muscle, ganglion and cartilage cells respond by lipoidal degeneration.

HARRIET F. HOLMES

The chemical analysis of liver and spleen from a case of lipoid histiocytosis (Niemann-Pick's disease). R. P. MACFATE. *Arch. Path.* 6, 1054-7(1928).—The liver and the spleen from a case of Niemann-Pick's disease showed a great increase over the normal in total lipid, fatty acid, lipid P and cholesterol content and a decrease in lipid N content. Kerasin was negligible. The analytic results reported agree, in general, with those of other workers. Lipemia and hypercholesterolemia are present in Niemann-Pick's disease but absent in Gaucher's disease, while kerasin is present in Gaucher's disease, but not to any considerable extent in Niemann-Pick's disease. H. F. H.

The value of the diazo test in blood. S. MILTON RABSON AND LILLIAN JACOBS. Lebanon Hospital, N. Y. *Arch. Internal Med.* 42, 386-9(1928).—Of 415 consecutive routine tests and 40 selected cases with severely damaged kidneys, 7 patients gave a positive diazo test (plasma by Hewitt's method). Four of these are living and their condition has improved. The diazo reaction seems to run parallel with the creatinine content rather than with that of the other N compds. Positive reactions were found below 1.8 mg. creatinine and negative ones above 3 mg. (max. 7.9 mg.) The test is not always positive in uremia, or even in uremic coma, and does not permit differentiation of the latter from coma of other origin. In a case of kidney obstruction the reaction became negative after the obstruction was relieved. The diazo test should be carried out as a routine test.

MARY JACOBSEN

Observations on the work of W. Schmitt on the theory of the colloidal reactions of the spinal cord fluid. JULIUS K. MAYR. *Kolloidchem. Beihefte* 27, 347-8(1928).—Schmitt (*C. A.* 22, 2610) misunderstood statements made in Mayr's article (*Arch. Dermatol. Syphilis* 1923) in regard to effect of electrolytes on coagulation. Mayr's expts. showed a certain amt. of electrolyte was necessary and that the reaction was in direct relation to concn. of electrolyte present.

L. F. MAREK

The action of alcoholic solutions of phenol as a substitute for lipid extracts in the Wassermann reaction. E. CIAMBELLOTTI. *Boll. soc. ital. biol. sper.* 3, 740-2(1928).—An alc. soln. of phenol may take the place of a lipid ext. and act as an antigen in the Wassermann reaction. C. attempted to throw some light on the mechanism of this reaction. Using colorimetric methods, he found that all the phenol could be accounted for when added to a Bordet-Gengou system. This excluded the thought that phenol entered into a definite chem. entity with some constituent of luetic serum. The role of phenol as an antigen may be due to its precipitating action on serum albumins with adsorption of guinea-pig serum.

PETER MASUCCI

The determination of the respiratory quotient and basal metabolism in dermatopathic cases: the problem of specific constant errors. E. CIAMBELLOTTI. *Boll. soc. ital. biol. sper.* 3, 735-7(1928).—The errors creeping into the detns. are enumerated.

PETER MASUCCI

A contribution to the study of the behavior and modifications of fresh and heated serum. E. CIAMBELLOTTI. *Boll. soc. ital. biol. sper.* 3, 737-9(1928).—Fresh and heated serums behave in a profoundly different manner toward abs. alc. added in equal proportions. In the majority of fresh luetic serums exposed to alc. the deviation of the complement does not take place and therefore, hemolysis results. In non-syphilitic serums the deviation of the complement is complete and thus hemolysis is inhibited. If, however, these serums are heated the reaction parallels the Wassermann test. This indicates that alc. reacts with heated serums differently than with fresh serums. The changes caused by heat take place in normal as well as luetic serums. Sachs' theory that heat modifies only the most labile serum globulins is not supported by these facts.

PETER MASUCCI

The action of calcium on uremia, glucemia and chloremia. E. CIAMBELLOTTI. *Boll. soc. ital. biol. sper.* 3, 744-6(1928).—The purpose of these expts. was to det. the effect of Ca on the uremic, glucemic and chloremic titer. Ten cc. of 10% CaCl_2 soln. and of an org. Ca prepn. (Biocal) were injected intravenously into patients whose diet had been regulated and kept const. Samples of blood were taken 24 hrs. after the injection. The results indicated that when the uremic titer was abnormally high, it was either reduced to about normal or arrested at various levels, depending on the patient, by the action of Ca. When uremia was normal, Ca had no effect. Ca influenced the glucemic titer in the same way; this did not include any diabetic cases. The chloremic titer was normal in all cases studied and it was not influenced by the action of Ca. There was definite improvement in the dermatosis, which coincided with the lowering of the uremic and glucemic titer. C. ascribes a much more complex and important role to Ca than is usually attributed to it.

PETER MASUCCI

Alterations of the intestinal permeability in experimental hypocalcemia from oxalates and phosphates. IGINO SPADOLINI. *Boll. soc. ital. biol. sper.* 3, 766-7(1928).—Hypocalcemia was produced in animals by subcutaneous injections of oxalates and phosphates. Adrenaline, guanidine or histamine, was then administered orally. The quantity of these drugs used was such that they were absolutely ineffective in normal animals. In hypocalcemic animals, however, the same quantity of these drugs were toxic, giving rise to those symptoms which are characteristic when the drugs are injected subcutaneously or intravenously. This would seem to indicate functional changes in the gastro-enteric mucosa. PETER MASUCCI

Lesions of the intestinal mucosa in experimental hypocalcemia from oxalates and phosphates. Studies on the pathogenesis of the parathyroidectomy syndrome. IGINO SPADOLINI. *Boll. soc. ital. biol. sper.* 3, 763-6(1928).—Animals were rendered hypocalcemic by injecting subcutaneously $\text{Na}_2\text{C}_2\text{O}_4$ and Na_2HPO_4 . When the hypocalcemia was slight ($\text{Ca} = 8-9 \text{ mg. \%}$) the lesions were slight but significant. The principle part affected was the villus. This showed a transudate with atrophy of the epithelial elements, and stasis with capillary hemorrhages. When the hypocalcemia was more intense ($\text{Ca} = 4-6 \text{ \%}$) the lesions in the villus were more manifest and often there was complete destruction of the villus by necrosis. These lesions are similar to those observed in the initial stages of parathyroid insufficiency. PETER MASUCCI

Hypocalcemia from bacterial toxins in partial parathyroid insufficiency. IGINO SPADOLINI. *Boll. soc. ital. biol. sper.* 3, 768-70(1928).—The expts. were done on dogs with one parathyroid completely removed or on dogs with both parathyroids incompletely removed. The results are given in the form of a chart and show that the introduction into the circulation of bacterial suspensions or bacterial filtrates produces a rapid lowering of blood Ca . This is much more pronounced than that observed in normal dogs. The low Ca values persist for a long time. Successive doses of toxin fail to lower further the Ca content. Besides a deficiency in hormone, bacterial toxins may play a part in the hypocalcemia of parathyroid insufficiency. PETER MASUCCI

The presence of an arsenic-resisting lipase in the blood serum of patients with Basedow's disease. PAOLO INTROZZI. *Boll. soc. ital. biol. sper.* 3, 774-6(1928).—The lipase in serum of 10 patients with Basedow's disease was studied by Rona's method. In 9 the lipase was resistant to atoxyl. Since all the lipases extd. from organs are As-labile except that of the pancreas and thyroid, the question is raised whether the atoxyl-resisting lipase in Basedow's disease is of thyroid or pancreatic origin. PETER MASUCCI

The stomach secretion in achylia and hypochylia gastrica. KNUD FABER AND J. E. HOLST. Univ. København. *Acta Med. Scand.* 69, 46-68(1928).—The gastric secretion was studied in 26 patients with the aid of the test meal or with histamine. In 22 the Congo red reaction following Ewald's breakfast was neg.; in the remaining 4 the reaction was at times pos. and at times neg. Following histamine the reaction of these 4 patients was invariably pos. In achylic patients the injection of histamine had no definite effect on the amt. of secretion. In practically all cases there was a rise in the pepsin content of the secretion after histamine, an effect which appears sooner, is greater and more persistent than the effect on the acid secretion. Furthermore, there may be an effect on the pepsin secretion without a simultaneous influence on the acid secretion. In such cases the histamine has no effect on the chloride concn., although generally the pepsin and Cl concns. vary together. S. MORGULIS

Uric acid loading as a functional kidney test. ERIK VOLLMOND. *Acta Med. Scand., Suppl.* XXVI, 270-7(1928). S. MORGULIS

The functional test of the liver. The effect of diathermy. A. V. FRISCH AND F. LASCH. II Med. Universitäts-Klinik, Wien. *Acta Med. Scand.* 69, 241-53(1928).—The effect of diathermy applied under standard conditions for 30 min. to the region of the liver has been studied by 3 liver functional tests: the galactose elimination after ingestion of 40 g.; the cholesterol and bilirubin contents of the duodenal contents; and through the sugar-regulating mechanisms. The galactose was detd. in the urine polariscopically. In patients without any liver involvement or in such liver patients with a neg. galactose test the diathermy diminished still further the amt. of the eliminated galactose. In liver patients without a pos. galactose test, however, the diathermy had little or no effect at all. The urine excretion was generally increased under the influence of the diathermy, but this was not a very regular effect. The bilirubin test shows a very striking diminution during the treatment which is still appreciable even 30 min. later. In the case of the cholesterol there is a diminution following the treatment but during the diathermy one patient showed a marked drop while another a rise in the cholesterol of the duodenal juice. The blood sugar was not influenced by the diathermy except in 2 cases,

where there was fall in glucemia much greater than could be explained by normal variations, and this was found in a diabetic and nephritic patient. S. MORGULIS

Simple reaction for differentiation of normal and syphilitic serums by aid of organic colloids. R. DOURIS AND J. BECK. *Compt. rend.* 187, 683-6(1928); cf. C. A. 22, 2204.—Na oleate gave a colloidal form of oleic acid upon the addn of H_3PO_4 . These reagents added to normal serum gave a transparent liquid, but with syphilitic serums a cloudy liquid. L. W. RIGGS

Protection against anaphylactoid shocks by means of magnesium thiosulfate. AUGUSTE LUMIERRE AND (MME.) MALESPIN. *Compt. rend.* 187, 736-7(1928); cf. C. A. 15, 393.—Further expts. on the suppression of anaphylactic shock indicated that $MgSO_4$ was superior to $Na_2S_2O_3$ for that purpose. The protection against anaphylactic shock caused by the injection of $BaSO_4$ was less effective if the $MgSO_4$ was injected immediately before the $BaSO_4$, than if injected simultaneously or immediately after. L. W. R.

Adsorption of cobra venom and diphtheria toxin by carbon. A BOQUET. *Compt. rend.* 187, 959-61(1928).—Fifty mg. of desiccated cobra venom was dissolved in 50 cc. of physiol. salt soln., pH 6.8, and 1 g. of sterilized C (variety not stated) was added and agitated. After 2 hrs. the suspension was filtered; the suspension, filtrate and C were equally inoffensive. Injections equiv. to 100 fatal doses had no venomous action. This inactivation of venom by C was independent of temp. between 12 and 38°, it required only 8 to 10 sec. of contact and it acted in the pure serum of the horse as in physiol. salt soln. Neither heat to 70° for 30 min. nor acids, 0.2 to 0.5 cc. of 0.1 N HCl per 10 cc., liberate the venom fixed on C. The tests with diphtheria toxin gave similar results. L. W. RIGGS

Vaccination against viper venom and experimental rabies by mixtures of virus-venom with excess of virus. (MME.) PHISALIX. *Compt. rend.* 187, 1006-8(1928). L. W. RIGGS

Glucemia and glucosuria in normal and in diabetic man. C. BACALOGU AND S. STRUGARIU. *Compt. rend. soc. biol.* 99, 1175-8(1928).—The condition of the nervous system plays an important role in the glucemia of both normal and diabetic subjects and in the curative power of insulin. In diabetics the highest figures for glucemia were not coincident with the highest figures for glucosuria. The strongest acidoses and ketoses were not coincident with the highest figures for glucemia or glucosuria. In uremias complicated with renal impermeability, there was an increase in blood urea and glucemia without glucosuria. L. W. RIGGS

The pH of the blood plasma and cerebrospinal fluid in pellagra. L. BALLIF AND I. GHERSCOVICI. *Compt. rend. soc. biol.* 99, 1187-8(1928); cf. C. A. 22, 2002.—In 20 cases of grave acute pellagra the plasma pH averaged 7.27, alk. reserve 49, Ca 34 and urinary pH 4.8. In 10 cases of chronic pellagra the corresponding figures were 7.34, 54, 28 and 5.4, while in 30 nonpellagra cases the figures were 7.34, 60, 25 and 5.6. In the cerebrospinal fluid of the 30 nonpellagra subjects the plasma pH was 7.21, alk. reserve 46.22 and Ca 27. In grave pellagra the figures were 7.17, 60 and 37.1. L. W. R.

Influence of anthrax infection on the functioning of the hematoencephalic barrier. L. STERN AND N. W. KOLPIKOW. *Compt. rend. soc. biol.* 99, 1191-2(1928).—During the period of incubation and before the bacilli appear, no change is observed in the hematoencephalic barrier. In the period of septicemia beginning with the appearance of the infection, the barrier is changed so that the passage of both crystalloids and colloids into the cerebrospinal fluid may take place. Influence of anthrax infection on the placental barrier. *Ibid* 1192-4.—During the period of incubation the placental barrier showed no alteration. Neither trypan blue nor $Na_4Fe(CN)_6$ passed from mother to fetus. In the period of infection the permeability of the placental barrier was increased so that crystalloids and sometimes trypan blue passed the barrier. L. W. RIGGS

Preparation of precipitating serums with cardiac muscle. E. NICOLAS AND K. KATRANIEFF. *Compt. rend. soc. biol.* 99, 1305-7(1928).—The technic is described. Treatment of animal producers of precipitating serums. *Ibid* 1307-9. L. W. R.

Glucemia in infants with nutritional disturbances. M. MANICATIDE AND A. BRATESCO. *Compt. rend. soc. biol.* 99, 1370-1(1928).—The glucemia was detd. in infants representing several varieties and complications of dyspepsia. The content and duration of alterations of the glucemia are generally in inverse ratio to the power of assimilation by the liver. L. W. RIGGS

The lipoids of the blood after splenectomy. Action of adrenaline. T. J. COMBES. *Compt. rend. soc. biol.* 99, 1435-6(1928).—Cholesterol increased while lecithin remained unchanged in the blood following splenectomy. After a certain period the cholesterol content of the blood became normal in splenectomized animals. This may be due to the existence of vicarious organs, probably the lymph nodes. Injection of adrenaline

did not modify within 30 min. the lipoidal content of the blood. The spleen is not a reserve organ for cholesterol and lecithin. L. W. RIGGS

Milk sickness and the metabolic disturbances in white snake-root poisoning. HAROLD A. BULGER, FRANCIS M. SMITH AND ARLINE STEINMEYER. Wash. Univ. *J. Am. Med. Assoc.* 91, 1964-6(1928).—Disturbances in the metabolism of animals produced by white snake-root suggest the cause of certain clinical features of milk sickness and indicate rational treatment of this disease. Among the symptoms are ketosis, lipemia and a tendency to profound hypoglycemia. Administration of carbohydrate is indicated. L. W. RIGGS

Experimental study of anemia caused by bleeding and hemolysis. J. DVORÁK. *Magyar Orvosi Arch.* 29, 385-98(1928).—With strong bleeding of cats, carried out during several weeks, the red corpuscles remained of about normal size and megalocytes were very scarce. Poisonings by pyrodine, maretine and tolulenediamine caused decided megalocytosis in cats which was similar to human maretine poisoning. The difference between the anemias caused by bleeding and by poisoning indicate that the specificity of the poison is an important factor in producing the typical blood picture of pernicious anemia. L. W. RIGGS

Change in the neuromuscular apparatus in diabetics. I. MARTON. *Magyar Orvosi Arch.* 29, 411-9(1928).—A detn. of the galvanic irritability of the median nerve region in 40 diabetics and 31 nondiabetics of both sexes was made. The decreased irritability of many diabetics points to nerve-muscle lesions, and these lesions may have their source in an originally reversible decrease of irritability caused by the dehydration of the tissues in consequence of the high sugar and Ca contents of the blood, the acidic metabolism and possibly the lack of insulin. There is a remarkable parallelism between the biochem. and colloidochem. action of glucose and Ca salts. L. W. RIGGS

Nuclear derivatives and the lethal action of ultra-violet light. FREDERICK L. GATES. Rockefeller Inst. *Science* 68, 479-80(1928); cf. Harris and Hoyt, C. A. 13, 2384; Cowdry, C. A. 22, 3454.—A discussion. L. W. RIGGS

Radium emanation and goiter. R. R. D. MILLIGAN AND N. M. ROGERS. *Trans. Proc. New Zealand Inst.* 59, No. 2, 389-94(1928); cf. C. A. 22, 1001.—Ra emanations had no apparent effect either in developing goiter in healthy trout, or curing goiter in goiterous trout. L. W. RIGGS

Goiter and water supply. WAGNER-JAUREGG. Wien. *Gas. u. Wasserfach* 71, 817 21(1928).—The literature concerning the relation between water supply and the occurrence of goiter is reviewed and shown to be somewhat conflicting. W.-J.'s expts. with rats indicate that other factors than drinking water are more important in the causation of goiter as rats in regions where goiter prevailed developed goiter even when given drinking water from goiter-free regions and *vice versa*. The possible influence of bacteria or org. impurities in causing goiter make it desirable to secure the purest water supply, free even from bacteria considered to be non-pathogenic. R. W. RYAN

Nitrogen metabolism in experimental blastomatous growth. I. B. MISHCHENKO AND M. M. FOMENKO. Charkow Röntgen Inst. *Z. Krebsforsch.* 27, 427-35(1928).—Rats inoculated with angiomyxosarcoma showed no marked changes in N metabolism during the early stages of the tumor growth, but there was a loss shortly before death. However, highly toxic products of incompletely oxidized nitrogenous substances appear during the growth of the tumor, which greatly depress metabolic activity. There is an increase in residual N in the blood during the growth of the tumor, reaching a max. shortly before death. H. G. WELLS

Further studies on the combined serum-lipoid treatment of mouse carcinoma. P. RONDONI. Univ. Milan. *Z. Krebsforsch.* 27, 495-502(1928).—Mice were inoculated with transplantable carcinoma. Treatment with a mixt. of serum and lipoid causes about 50% reduction in the rate of tumor growth. Lipoid or serum alone has very little effect. H. G. WELLS

The metabolism of carbohydrates, calcium and iodine in experimental malignant tumors. ANNA GOLDFEDER. *Z. Krebsforsch.* 27, 503-36(1928).—With transplanted mouse carcinomas and Rouse fowl sarcoma, carbohydrates increased the rate of tumor growth, by furnishing a source of nourishment. The glycogen content of tumors decreases with increasing malignancy. Ca exerts an inhibiting effect on tumor growth, perhaps because it raises the Ca content of the tumor tissue until it equals that in the normal tissues. I at first increases the rate of growth and then decreases it, sometimes leading to its disappearance. H. G. WELLS

DELAFIELD, FRANCIS, AND PRUDEN, T. MITCHELL: *A Text-Book of Pathology*. 14th ed., revised by Francis C. Wood. Edinburgh: E. & S. Livingstone. 1339 pp. 55s. *J. State Med.* 36, 743(1928).

H—PHARMACOLOGY

A. N. RICHARDS

The vitamin action of preparations of oleum jecoris in experimental tuberculosis. G. PLATONOV. *Am. Rev. Tuberculosis* 18, 458-61(1928).—The subcutaneous injection of oleum jecoris and its preps. produces a vitamin-like effect, the action of Na morrhuate being greater than that of oleum jecoris. The effect of subcutaneous injections of oleum jecoris depends on the form and dose of the injections, and on the length of the intervals between them. In producing oleum-jecoris preps., care must be taken to avoid all factors that destroy the vitamin constituents of this oil, such as high temp., sunlight and oxidation.

H. J. CORPER

The contracture-producing effect of barium chloride on smooth muscle. MARCEL FLORKIN. Inst. Leon Fredericq, Liege. *Arch. intern. physiol.* 30, 148-51(1928).—BaCl₂ has a max. effect in producing contracture in the frog stomach in a concn. of 1%. The contracture can be further increased by subsequent treatment with CHCl₃ or NH₃ but not with additional BaCl₂.

H. J. DEUEL, JR.

The effect of adrenaline-like alkaloids: ephedrine and ephetonine. LADISLAUS TAKACS. Budapest Königl. ung. Pázmány Peter Univ. *Wiener klin. Wochschr.* 41, 1375-8(1928).—Ephetonine, prep'd. by E. Merck, is a HCl salt of synthetic racemic ephedrine. Peroral administration of active ephedrine and ephetonine increases blood pressure. The high level is maintained longer than in the case of adrenaline. Thus when 0.1 g. of ephetonine was administered followed by 0.05 g. portions every 3 hrs. for 12 hrs., blood pressure rose from 95 to a level of about 122 mm. where it remained for the 12-hr. period. Twelve hrs. later, with no further drug administration, it had returned to 97 mm. In larger doses these drugs stimulate the parasympathetics. Emptying of the stomach is retarded. They can be employed in asthma and bronchitis.

D. B. DILL

The effect of peroral administration of "Glukhorment" on the glucose metabolism in animals. R. OESER AND W. B. SACHS. Klin. Charité, Berlin. *Z. ges. expil. Med.* 59, 1-9(1928).—In rabbits "Glukhorment" produces a hypoglucemia in 10-15 hrs. in doses of 1-1.5 g. per kg. Symptoms produced are relieved by administration of glucose. The hyperglucemia following adrenaline is partly inhibited in doses of 0.25-1.0 g. per kg.

F. L. DUNN

The influence of phosphate on the oxygen demand in work. KARL MINSBERG. Univ. Klinik zu Freiburg. *Z. ges. expil. Med.* 59, 262-9(1928).—H. confirms the work of Embden (Handbuch der normalen u. path. Physiol. Bd. 8. Teil 1. 381) on the effect of phosphates in diminishing fatigue. The amt. of O required is less with phosphate, because of a better resynthesis of lactic acid in the muscles.

F. L. DUNN

The place of action of cocaine on the central nervous system. RUDOLF ALLERS AND OTTO HOCHSTÄDT. Univ. Wien. *Z. ges. expil. Med.* 59, 359-68(1928).—In thalamus cats following the subcutaneous injection of cocaine, convulsions of a tonic extensor type occurred. In decerebrate animals cocaine resulted in a decrease of the decerebrate rigidity and an appearance of spontaneous movements, including breathing. A. and H. confirm the increased tolerance of decerebrate animals for cocaine. Psicaine did not have the same effect on decerebrate rigidity.

F. L. DUNN

The effect of insulin on the phosphates in blood and urine. ADOLF HOLLIGER. Henry Ford Hospital, Detroit. *Z. ges. expil. Med.* 59, 717-23(1928).—Insulin lowers the phosphates in both arterial and venous blood, in man and in dogs. The lowering is due not to an increased excretion but to a retention.

F. L. DUNN

Clinical results of chemotherapy in ophthalmology. F. SCHIECK. Univ. Würzburg. *Deut. med. Wochschr.* 54, 1579-81(1928).—A review of the chemotherapeutic agencies used in ophthalmological practice.

ARTHUR GROLLMAN

The distribution of mercury in the various organs of the dog after injections of salyrgan. JOHANNES MÜLLER. Westfälischen Wilhelms-Universität, Münster, Westphalia. *Deut. med. Wochschr.* 54, 1881-2(1928).—Elimination of salyrgan occurs chiefly through the kidneys. Immediately after its intravenous injection, it is found in the gall-bladder, large intestine, kidneys and adrenals.

ARTHUR GROLLMAN

The problem of slow (peroral) poisoning by potassium cyanide. W. GLASER. Heilstätte Denklingen, Rhine Province. *Deut. med. Wochschr.* 54, 1930(1928).—Delayed death from KCN taken by mouth is considered as theoretically possible.

A. G.

Acute iodine intoxication following pyelography with umbrenal. WALTER K. FRÄNKEL. *Deut. med. Wochschr.* 54, 2105(1928).—A report of a case of I poisoning following pyelographic examn. with umbrenal, a com. prepn. of LiI.

A. G.

Blood sugar and respiratory metabolism time curves of normal individuals, follow-

ing simultaneously administered glucose and insulin. I. M. RABINOWITCH AND ELEANOR V. BAZIN. Montreal General and the Shriner's Hospitals, Montreal. *J. Biol. Chem.* 80, 723-31(1928); cf. *C. A.* 22, 262.—The results of a study of the effect of simultaneously administered glucose and insulin showed that insulin not only does not enhance the oxidation of sugar in the normal individual but actually interferes with the normal mechanism.

Chemical substances in the treatment of septicemias. RUDOLF FLECKSEDER. *Wiener med. Wochschr.* 78, 1184-6(1928).—A review of the chemotherapeutic measures used in the treatment of generalized septicemia.

Arsenic, its accumulation, tolerance and distribution, after therapeutic use. K. ULLMAN. *Wiener med. Wochschr.* 78, 1389-95(1928).—A review with references.

Treatment of nervous and other forms of syphilis with sulfosin. KNUD SCHROEDER. *Klin. Wochschr.* 7, 1636-9(1928).—Sulfosin, injected intramuscularly, has a beneficial action on the nervous symptoms associated with syphilis and appears also to be a general antiluetic agent. It is best used in conjunction with other antiluetic chemotherapeutic agents.

A study of the capillaries of the skin in cases of high arterial pressure; and of the influence of nitrites upon them. G. DEUSCH AND A. LIEPELT. *Deut. Arch. klin. Med.* 160, 207-11(1928).—No regular variations were observed in the capillaries which would distinguish between high blood pressure with and without kidney affections. The intravenous injection of nitroscleran (NaCl , 6; Na_2PO_4 , 3.6; K_2PO_4 , 2; NaNO_2 , 29.40, water to 1 l.), is followed in normal or hypertonic persons by a lowering of blood pressure accompanied by an enlargement of the capillaries. The max. effect was observed after about 10 min. The capillary circulation became continuous and more rapid. The small arteries and arterioles are the points of attack of nitrites.

The effect of adrenaline upon calcium; a study of the mechanism of the action of adrenaline. HEINZ LAWACZECK. *Deut. Arch. klin. Med.* 160, 309-22(1928).—The Ca contents of the blood of normal persons and of various pathol. subjects were detd. before and after the injection of adrenaline. In some cases a slight increase in blood Ca was noted; in others a decrease, and in some cases no change; in a few cases there was a decrease in the Ca content of the serum with no change in that of the whole blood. A noticeable increase was observed in the amt. of serum Ca passing through the ultrafilter; the effect of adrenaline apparently was to liberate Ca from protein combination.

Investigation of hypoglycemia after the injection of insulin. II. The causes of the decrease in eye pressure in hypoglycemia. ERNST WIECHIMANN AND FRITZ KOCH. *Deut. Arch. klin. Med.* 160, 361-7(1928).—No parallel was observed between the curves for blood pressure and for eye pressure in hypoglycemia; in fact a case was observed in which a rise in blood pressure accompanied a decrease in eye pressure. The injection of toxic doses of insulin was followed by an increase in hemoglobin, with a decrease in eye pressure. Ingestion of food caused a decrease in blood hemoglobin and usually a rapid rise in the eye pressure. These changes are probably related to the sweating observed in hypoglycemia; the fluid from the eye and from the tissues is poured into the blood, but not rapidly enough to counteract the loss of fluid in the sweat.

Danger of the administration of ephedrine in heart failure. W. A. BLOEDORN AND P. F. DICKENS. U. S. Naval Medical School, Washington, D. C. *Arch. Internal Med.* 42, 323-30(1928).—A patient with heart trouble who took 0.97 g. ephedrine in 20 days against "asthma" gradually developed acute cardiac decompensation and pulsus alternans. The condition improved under digitalis.

Peptone treatment in bronchial asthma. MAXIMILIAN A. RAMIREZ. French Hospital, N. Y. *Arch. Internal Med.* 42, 368-75(1928).—In 60 cases Armour's peptone was given intradermally (Pasteur Vallery Radot, Blamoutier), intramuscularly, intravenously (Auld) and by mouth for 1-2 months and was found to be of no value. Thomas and other authors have arrived at the same conclusion. The literature is reviewed.

Cholesterol in the blood serum and organs of the rabbit after the introduction of adrenaline. MARIO MAZZEO. *Arch. sci. biol. (Italy)* 11, 381-9(1928).—In the first series of expts. the influence of adrenaline on the cholesterol curve was investigated, beginning $\frac{1}{2}$ hr. after and ending 24 hrs. after the injection of adrenaline. In the second series the cholesterol content of the blood and certain organs (suprarenals, kidneys, spleen, liver, ovaries, testicles) of animals not injected with adrenaline was compared to

that of animals injected with adrenaline. The rabbits were injected with 1 cc. of a 1:1000 soln. of adrenaline per kg. of body wt. Conclusions: (1) The introduction of adrenaline causes an increase of cholesterol in the blood; (2) this increase begins $\frac{1}{2}$ hr. and reaches a max. between the 6th and 18th hr. after the introduction of adrenaline; (3) the increase of cholesterol in the blood is followed by a marked decrease of cholesterol (more than $\frac{1}{2}$) in the suprarenal capsules and a slight decrease in the other organs; (4) the introduction of adrenaline in the organism does not seem to produce an increase of cholesterol in all the organs and tissues, but causes a distribution of cholesterol in the tissues and liquids different from that of the normal. PETER MASUCCI

The action of insulin on the glucolysis of blood "in vitro." G. B. TAFURI. *Arch. sci. biol.* (Italy) 11, 414-23(1928).—The technic used was that of Kauffmann, Cosla and Roche. The CO_2 was detd. by the Van Slyke method and the glucose by the Cruto method. Duplicate blank tests were run and the results for CO_2 and glucose differed less than 0.6-0.7% of the amt. present in the blood. Pig, dog and beef bloods were used. The results are given in tabular form, showing the kind of blood used, whether or not insulin was added to the blood, CO_2 in the blood before and after glucolysis, CO_2 produced by insulin action, glucose consumed due to insulin action. The results show (1) that the addn. of insulin to pig and dog blood markedly accelerates the process of glucolysis; (2) there is no acceleration in beef blood; in fact the difference disappears if the concn. of phosphates in beef blood is made equal to that of pig and dog blood; (3) these results support the contention that insulin accelerates the glucolysis and reveals the fundamental importance of phosphates in the process of glucolysis. PETER MASUCCI

The action of carbon dioxide on animals kept under reduced partial pressure of oxygen. RODOLFO MARGARIA. *Arch. sci. biol.* (Italy) 11, 453-66(1928).—The theory that the condition of anoxemia is rendered more tolerable by the more or less direct action of CO_2 was tested experimentally. If the theory is correct, then CO_2 should increase the resistance to anoxemia whether the condition is brought about by diminishing the atm. pressure or by simply reducing the partial pressure of O_2 and maintaining the total pressure unchanged. Guinea pigs were used for test animals. The app. was the same as that mentioned above. The air in the bell jar was replaced at a const. velocity by N_2 gas. The concn. of O_2 in the bell jar at any moment was calcd. by means of the formula $\text{O}_2 = 10^{a-b} + 10^c - 10^{c-b}$, derived from the fact that the velocity with which the per cent of O_2 diminished in the jar was proportional to the concn. of O_2 at that moment. The term, $10^c - 10^{c-b}$, is the correction for the O_2 impurity in the N_2 gas; for the derivation of the formula, the original should be consulted. A table is given, showing the av. values for the partial pressures of O_2 and CO_2 for each gas mixt., the vapor pressure of CO_2 in the alveoli from the inspired air, and the partial pressure which O_2 would reach in the alveoli in the absence of respiratory exchange. Conclusions: Guinea pigs placed under anoxemia by the substitution of the air with N_2 died when the O_2 tension in the alveoli was 10-11 mm. Hg. The presence of CO_2 in the proportion of 0 to 10% did not modify the resistance of the animals to anoxemia. The symptoms of the animals in these expts. were markedly different from those observed when the animals were kept under rarefied O_2 . Conclusion: In barometric depression, the diminution of the partial pressure of O_2 alone is not sufficient to explain all the phenomena observed: there must be another factor intervening. PETER MASUCCI

Sodium thiosulfate as an antidote. The transformation of sodium thiosulfate in the organism. E. MENEGETTI. *Arch. sci. biol.* (Italy) 12, 549-74(1928).—The many poisons for which $\text{Na}_2\text{S}_2\text{O}_3$ is used as an antidote throw some doubt on its real efficacy. Its actual role can only be detd. by studying its chem. properties and the transformation it undergoes in the animal organism. At p_{H} 11 to 5 the decompn. of $\text{Na}_2\text{S}_2\text{O}_3$ is very slow and almost negligible; there is no sepn. of S or change of titer in 24 hrs.; at p_{H} 5, S seps. in 24 hrs. In the presence of weak oxidizing agents and in an alk. or neutral medium, $\text{Na}_2\text{S}_2\text{O}_3$ is transformed into sulfate, trithionate and tetrathionate. In an acid medium it decomposes into sulfate, polythionates, sulfites, and S. In the stomach when in contact with gastric juice p_{H} 1.7, a part is transformed according to the reaction $\text{S}_2\text{O}_3^{++} \rightarrow \text{SO}_2 + \text{S}$. Even in acid urines p_{H} 4.63 the decompn. of $\text{Na}_2\text{S}_2\text{O}_3$ is so slight that it is barely detectable in 24 hrs.; in blood the H-ion concn. is below the min. necessary for decompn.; injected into animals it is not possible to detect any decompn. in any of the organs. When added to tissue pulp only a trace of H_2S can be detected after an hr. but if HCl is added H_2S develops quickly; HCl also accelerates the elimination of H_2S from organs to which S has been added. When $\text{Na}_2\text{S}_2\text{O}_3$ is injected into animals either subcutaneously or intravenously it does not decompose according to the reaction $\text{S}_2\text{O}_3^{++} \rightarrow \text{SO}_2^{++} + \text{S}$ but is partly eliminated as Na_2SO_4 and partly oxidized to sulfate; polythionates are formed but no S is liberated. When $\text{Na}_2\text{S}_2\text{O}_3$

is injected as an antidote, the substances which must be considered as possibly reacting with the poison are: thiosulfate, polythionates (tri and tetrathionate) and sulfate. When given orally the substances formed and absorbed are thiosulfate, polythionates, sulfites, H_2S , polysulfates and sulfides.

PETER MASUCCI

The action of insulin and pilocarpine on the secretion and the quantity of lactose in milk. G. BUCCIARDI. *Boll. soc. ital. biol. sper.* 3, 527-30(1928).—The injection of 20 units of insulin diminished the lactose in milk an av. of 25%. The decrease may be as high as 75% on the day of the injection. The day following the injection the lactose returns to normal, but if the injections are repeated 5-8 times, the animal stops secreting milk. The injection of 0.001 g. pilocarpine showed an increase in milk secretion and the lactose content showed an increase of 10-12%.

PETER MASUCCI

The action of histamine and choline on the tone and rhythmic contraction of blood vessels. MARIO RIGONI. *Boll. soc. ital. biol. sper.* 3, 565-68(1928).—The stomach artery of heef was used for this study, and Roncato's technic was followed. Under these conditions histamine produces vasoconstriction, and increases the frequency and height of the rhythmic contractions. Acetylcholine produces vasodilation followed by slight constriction and diminution of frequency of the rhythmic contractions, whose height remains unchanged; when the diminution of tone is immediate and intense, then there is a momentary arrest of the rhythmic contractions, while at other times this becomes gradual. There is a definite antagonism between histamine and acetylcholine which may be demonstrated on the same specimen without it losing its activity.

P. M.

The supposed vasodilating action of amino acids and of urea. GIUSEPPE RUSSO. *Boll. soc. ital. biol. sper.* 3, 592-5(1928).—The study aimed to establish (1) whether amino acids act on the vessels in concns. approaching those present in the org. external and internal liquids and under isotonic conditions or (2) if the action were negative, whether stronger concns. with isotonic conditions still maintained would react positively. Amino acids in low concn. do not appreciably act upon the tone of the vessels or the stomach muscles of the frog. The vasodilator action of amino acids in strong concn. (0.8%) in Ringer is due to the hypertonicity and is not specific. Urea behaves similarly to amino acids. No specific action on the vessels or the smooth muscle fibers can therefore be attributed to amino acids or urea.

PETER MASUCCI

The behavior of glucemic titer after the injection of diuretin into normal female rabbits, followed by repeated treatments with the citrated blood of pregnant rabbits. G. RIGGIERI. *Boll. soc. ital. biol. sper.* 3, 620-21(1928); cf. C. A. 22, 2210.—After treatment with citrated blood from pregnant rabbits, diuretin causes hyperglucemia, whereas, without the blood treatment, diuretin produces hypoglucemia. After treatment with citrated plasma from rabbits at the end of the gestation period, diuretin has no effect on the blood sugar.

PETER MASUCCI

The toxicity of phenylguanidines and their influence on the glucemic titer. LETTERIO CANNAVO. *Boll. soc. ital. biol. sper.* 3, 618-19(1928).—Phenyl- and diphenylguanidines were administered to dogs, rabbits, guinea pigs and white rats, orally, subcutaneously, intramuscularly, and intravenously. Results: (1) Phenylguanidine was more toxic than guanidine; the animals showed symptoms of acute intoxication of the nervous centers. During the intoxication, the glucemic titer did not change. The administration of glucose and adrenaline failed to influence the degree of intoxication. (2) Diphenylguanidine was still more toxic. The intoxication was manifested by violent tonic clonic contractions and convulsions. Glucose lessened somewhat the toxicity. The animals showed hyperglucemia. The introduction of phenyl groups into the guanidine mol. increased the toxicity and eliminated the hypoglucemic action.

P. M.

Synthetic thyroxine. Pharmacological experiments. G. CORONEDI. *Boll. soc. ital. biol. sper.* 3, 657-59(1928).—Synthetic thyroxine was tested biologically for (a) its action on the vagus-depressor; (b) its influence on diuresis; (c) its physiol. opotherapeutic action. The expts. were made on dogs and rabbits deprived of their thyroid and parathyroid glands. A 0.1% aq. soln. of thyroxine in the form of the K salt was injected intravenously. Results: (a) The injection of thyroxine brings back to the normal physiol. level the excitability of the vagus which had diminished or completely disappeared. The depressor behaves similarly. In both cases, the effect is transitory, as, in a few min., paresis and paralysis again set in. (b) The administration of thyroxine to oliguric and anuric animals produces a renal discharge equal to that obtained by the use of the whole gland ext. (c) The intravenous or subcutaneous administration of the synthetic product to dogs with typical symptoms of thyroid-parathyroid insufficiency attenuates the symptoms without changing the morbid picture of cachexia or the fatal course of the disease. The use of whole glandular exts. under similar conditions gives results that are more clean cut and decisive, and the effect is more sustained.

Conclusion: Thyroxine is a thyroid hormone, but the possibility that the gland secretes other principles must not be excluded. It is not advisable to substitute the synthetic or natural thyroxine for the whole glandular ext. in therapy without further extensive clinical tests.

PETER MASUCCI

The absorption of calcium by intestinal musculature during adrenaline action. L. JENDRASSIK AND SZ. DONHOFFER. Med. Klinik, K. Erzsébet-Üniv., Pécs, Ungarn. *Biochem. Z.* 201, 199-205(1928).—The Ca absorption by the musculature of the intestinal wall of the rabbit reveals no regular behavior during adrenaline action. S. M.

The similarity of action of calcium and adrenaline on the isolated frog heart. S. V. TZIGANOV. Pharmacol. Lab., State Med. Inst., Odessa. *Zhurnal ekspl. Biol. Med.* 10, 35-46(1928).—On the isolated heart of the frog Ca and adrenaline act along different paths and produce finally different results. Adrenaline acting on the neuromuscular substance increases the irritability of the sympathetic nervous system to its normal stimulus, with the result that in the normal heart there is an acceleration of the beat, diminished diastolic relaxation and some increase in systole. The work of a single heart beat diminishes and the systole-diastole cycle is shortened. Adrenaline is thus a real heart stimulant. Ca on the contrary produces a condition of hypodynamia in the heart. Ca produces a lowering of the irritability of the autonomic nervous system of the heart and of its ganglia, and as a result of this the heart beat becomes slow and the rhythm is upset. Ca increases the work of a single contraction, diminishing the working capacity of the heart. Depending upon the duration of its action and various other conditions, Ca may produce either systole or diastole. Adrenaline cannot compensate the effect on the heart of Ca or K, and Zondek's view of the identity of the ionic and nervous stimulus does not find corroboration.

S. MORGULIS

The relation between concentration and action of adrenaline. DAVID WILKIE. Univ. of Edinburgh. *J. Pharmacol.* 34, 1-14(1928).—The isometric and isotonic responses of strips of sheep carotid to varying concns. of adrenaline agree with the formula $Kx = y/(A - y)$, where x = concn., y = % of the max. action (A) and K = const. The relation between the concn. of adrenaline and the output of the frog's aorta perfused with varying concns. of adrenaline also agrees with this formula for concns. above 3×10^{-8} . The relation between the concn. of adrenaline and the rise in blood pressure in the pithed cat also follows the formula given.

C. RIEGEL

The emetic action of digitalis bodies and strophanthidin in cats with denervated hearts. MELVIN DRESBACH AND KENNETH C. WADDELL. Albany Medical Coll. *J. Pharmacol.* 34, 43-64(1928).—In cats with the heart denervated digitalis compds. or strophanthidin caused emesis when administered several days after the operation. In acute expts. where only a few hrs. were allowed for recovery from operation, the animals failed to vomit in the greater no. of cases. **Conclusion:** The heart is not the only seat of action of digitalis compds. in producing emesis.

C. RIEGEL

Further observations on the motility of the human stomach. W. H. DICKSON AND M. J. WILSON. Univ. of Toronto. *J. Pharmacol.* 34, 65-72(1928).—The effect of a no. of compds. on peristalsis was detd. by fluoroscopic observation. Those having no effect included aspirin, NaBr, chlorodyne, CaCO_3 , AcOH , malic acid, tartaric acid, alanine, HCl and parathyroid ext. Those with stimulating action were NaH_2PO_4 , butyric acid, valeric acid, caproic acid, histamine and CaCl_2 . Those causing depression were codeia phosphate, propionic acid, lactic acid and CO_2 .

C. RIEGEL

Comparative studies of pupillary reaction in tetrapods. IV. The mode of action of pilocarpine on the pupil of the rat. THEODORE KOPPÁNYI. Syracuse Univ. *J. Pharmacol.* 34, 73-83(1928).—In the normal eye of the rat pilocarpine causes dilatation of the pupil by incomplete paralysis of the parasympathetic myoneural junction. As proof of this statement the following observations are cited: (1) Physostigmine, arecoline and nicotine constrict the pupil even after dilatation by pilocarpine. (2) No dilatation is produced by pilocarpine after homatropine or atropine. (3) Pilocarpine causes dilatation after the sympathetic myoneural junctions are paralyzed by ergotamine. In the eye with the short ciliary nerves cut, pilocarpine causes constriction, because of stimulation of the parasympathetic myoneural junctions. Observations cited in proof of this are: (1) Constriction occurs after the pupil had been dilated by cocaine or ephedrine. (2) Pilocarpine has no action after atropine. (3) Nicotine, arecoline and muscarine have the same action in the denervated and normal eye.

C. RIEGEL

The site of the toxic action of nicotine on the respiratory mechanism. J. EARL THOMAS AND F. E. FRANKE. St. Louis Univ. *J. Pharmacol.* 34, 111-35(1928).—A portion of the diaphragm in dogs was excised so that it was protected from the direct action of the drug, but retained connection with the central nervous system through the intact phrenic nerve. In such animals administration of nicotine caused paralysis of

the intact side, but the excised portion of the diaphragm continued to contract rhythmically. Evidence that the contractions observed in the excised muscle were true respiratory movements is given by the fact that they were augmented by asphyxia and by stimulation of sensory nerves, that they were inhibited by stimulation of vagus and superior laryngeal nerves, and stopped when the phrenic nerve supplying the muscle was cut. These expts. are taken to indicate that respiratory failure from nicotine is due, not to central action of the drug, but to a peripheral paralysis of respiratory muscles.

C. RIEGEL

The absorption of quinine and hydroxyquinoline sulfate through the vagina. DAVID I. MACHT. *J. Pharmacol.* **34**, 137-45(1928).—Solns. of quinine (1%) and hydroxyquinoline sulfate (1 to 5%) were introduced into the vaginas of rabbits, cats and dogs. After both drugs tremors and spasmodic movements of the extremities were observed, with stimulation of respiration and circulation. With large doses the above symptoms were followed by a state of depression and arrest of the heart. Serum taken from animals after the injection of quinine was much more toxic to the growth of *Lupinus albus* seedlings than serum from animals not so treated. This effect with hydroxyquinoline was not so marked.

C. RIEGEL

The role of the liver in controlling the distribution of blood. ALVAH R. McLAUGHLIN. Michigan State College. *J. Pharmacol.* **34**, 147-68(1928).—The livers of cats and dogs, perfused with sugar-free Locke soln., showed a decreased outflow when the perfusion fluid contained adrenaline, pituitary ext., or BaCl_2 , and an increased outflow when the fluid contained NaNO_2 . With rabbits the majority showed decreased outflow after adrenaline, but in some cases (5 of 43 from recently killed animals; 7 of 26 livers stored in the cold for some time) there was an increased outflow in the first few expts., but decreased outflow in later trials. Three of the 26 stored livers always showed increased outflow. The variable effects are attributed to autolysis and consequent change in H-ion concn. Results on guinea pig livers were similar to those obtained with rabbit livers. When the liver vol. was measured by means of an oncometer it was found that the decreased outflow was accompanied by decreased liver vol. It is concluded that the decreased outflow was due to constriction of intrahepatic portal radicles.

C. RIEGEL

The prevention of experimental effusions by calcium salts. HARRY GOLD. Cornell Univ. *J. Pharmacol.* **34**, 169-77(1928).—Intravenous injections of NaI or of thiosinamine into dogs and cats failed to produce effusions into the serous cavities. In cases of effusion produced by injection of oil of turpentine into the pleural cavity, animals receiving Ca salts prior to the turpentine showed less fluid than those not receiving Ca. In effusions produced by CuSO_4 Ca had an inhibiting effect in cases of less degree of irritation. The effect of more intense irritation is not inhibited by any dose of Ca, and large amts. of Ca in themselves produce toxic symptoms.

C. RIEGEL

Studies on toxicity of sodium fluosilicate. S. MARCOVITCH. Univ. of Minnesota. *J. Pharmacol.* **34**, 179-86(1928).—Cessation of movement in the larvae of *Culex quinquefasciatus* was taken as a measure of the toxicity, which was in the following order: Na_2SiF_6 , Na_3AsO_3 , Na_3AsO_4 , NaF, the fluosilicate being 8 times more toxic than the fluoride. The fluosilicate was also the most toxic of the four to *Lumbricus terrestris*, *Paramecium caudatum*, and *Euglena viridis*. With rabbits, K_3HAsO_3 given by mouth was much more toxic than Na_2SiF_6 , and the latter more toxic than NaF. K_3HAsO_3 intravenously administered was more toxic than Na_2SiF_6 .

C. RIEGEL

The action of acridine antiseptics—acriflavine and rivanol—on streptococci with special reference to subcutaneous infections in mice. C. H. BROWNING AND R. GULBRANSEN. Glasgow Univ. *J. Pharmacol.* **34**, 187-95(1928).—Mice were infected with streptococci and this followed immediately by injections of solns. of varying concns. of acriflavine (trypaflavin) and rivanol at the site of infection. In another series the culture of streptococci and the antiseptic were mixed *in vitro* and then injected immediately after mixing. In both series of expts. the results were so varied that no conclusions could be drawn as to the efficacy of the antiseptics. Tested *in vitro* on cultures of streptococci acriflavine, in two-thirds of the tests, was four times as efficient as rivanol.

C. RIEGEL

Ergotamine tartrate: Its direct hyperglucemic action and its influence on the hyperglucemia produced by adrenaline in normal unanesthetized dogs. G. E. FARRAR, JR., AND A. M. DUFF, JR. Johns Hopkins Univ. *J. Pharmacol.* **34**, 197-202(1928).—Intravenous injection of ergotamine tartrate into dogs increased the blood sugar 25 mg. % in 60 min. Adrenaline after ergotamine caused the usual rise in blood sugar. Ergotamine given during the action of adrenaline does not abolish the hyperglucemia.

C. RIEGEL

A note on the rhythmic contractions of the ureter as influenced by pituitary extract

and by histamine. CHARLES M. GRUBER. Washington Univ. *J. Pharmacol.* **34**, 203-7(1928).—Dil. solns. of pituitary ext. and of histamine caused increased rate and force of contractions of a segment of ureter when added to the Tyrode-Locke solns. in which the segment was suspended. Decreased rate and increased force were observed with higher concns. Addition of histamine to the solns. bathing segments of ureter in which contractions had been inhibited by pituitrin and Na phenobarbital caused the contractions to begin again. C. RIEGEL.

Mercury diuresis. KENNETH I. MELVILLE AND RAYMOND L. STEHLE. McGill Univ. *J. Pharmacol.* **34**, 209-22(1928).—Intravenous injection of HgCl_2 caused diuresis in rabbits. Injection of HgCl_2 into the renal artery caused a decreased outflow of urine. When this injection was followed by an injection into the femoral artery diuresis occurred. Urine collected during diuresis showed normal urea content, no protein, and no sugar, but increased chloride content. There was no increase in lymph flow, and diuresis occurred even after tying of the thoracic duct. The results are taken to indicate the extra-renal action of HgCl_2 injected intravenously. C. RIEGEL.

A study of the fate and toxicity of bromine and chlorine containing anesthetics. G. H. W. LUCAS. Univ. of Toronto. *J. Pharmacol.* **34**, 223-37(1928).—Bromoform mixed with olive oil was given to rabbits by rectum. From 0.3 to 1.2% of the bromoform was recovered in the urine as bromide. Both after the rectal injections and after anesthesia by inhalation of bromoform the livers of the animals contained Br and showed damage to the cells. Bromoform and Br were found in small quantities in tissues other than the liver. Liver tissue *in vitro* decompd. composed bromoform and chloroform. Br was found in urine and livers of animals receiving ethylene bromide, ethyl dibromide, methylene bromide, trimethylene bromide, ethylidene bromide and acetylene dibromide. C. RIEGEL.

Comparative study of ephedrine, racemic ephedrine and pseudoephedrine. CHU-UNG PAK AND BERNARD E. READ. Peking Union Med. Coll. *Chinese J. Physiol.* **2**, 435-58(1928); cf. *C. A.* **22**, 2005.—The blood pressor actions of these 3 optical isomeric substances in doses of 0.5 to 1 mg. per kg. of body wt., have an approx. ratio of ephedrine: racemic ephedrine: pseudoephedrine equals 1.0:7:0.5. Repeated injections of these isomers produce a gradually decreasing elevation of the blood pressure and this phenomenon is more conspicuous in the case of pseudoephedrine and much less in that of ephedrine. The difference of max. rise of blood pressure between repeated injections is much greater between the initial and second injections than between subsequent injections. Vagotomy to a certain degree prevents this. The peripheral blood vessels of the toad are constricted by initial perfusion of 0.2% ephedrine soln. but vasodilatation is produced after prolonged perfusion. These isomers have a mutually immunizing effect on blood pressor action. This phenomenon is more strongly marked in the case of ephedrine after previous injection of pseudoephedrine or *vice versa* than in the case of racemic ephedrine after previous injection of ephedrine. Synthetic racemic ephedrine is less sympathomimetic than natural levo-ephedrine and less musculotropic than dextro-pseudoephedrine. By the use of ergotoxine and cocaine, racemic ephedrine is shown to be more musculotropic than natural ephedrine and more neurotropic than pseudoephedrine. L. W. R.

Cardiovascular action of the semicarbazone of tropinone, oximes of tropinone, and of pseudopelletierine. RENÉ HAZARD AND JEANNE LÉVY. *Compt. rend.* **187**, 676 S (1928); cf. *C. A.* **22**, 3930.—If the ketonic function of tropinone is replaced by semicarbazide, a semicarbazone is produced, m. 254-258°, which has a cardiovascular action of the same quality but much more intense for equal doses than tropinone. With certain individual animals it may act in doses of 1 mg. per kg. Opposite effects follow the combination of ketones with hydroxylamine, when the oximes produced have but slight action in doses of several cg. per kg. L. W. RIGGS.

Sensitivity of higher centers to the hypoglycemia caused by insulin. EDGARD ZUNZ AND JEAN LA BARRE. *Compt. rend. soc. biol.* **99**, 631-2(1928).—The higher nerve centers react to post-insulinic hypoglycemia by modifying, *via* the vagi, the physiologic insulinemia. L. W. RIGGS.

Fever-producing action of dinitro- α -naphthol in the dog. C. HEYMANS AND JEAN J. BOUCKAERT. *Compt. rend. soc. biol.* **99**, 636-8(1928).—In a dog deeply anesthetized, deprived of its central thermal regulation and subjected to artificial respiration, dinitro- α -naphthol causes a rise in temp. to 40.8°. Accordingly this hyperthermia is of peripheral origin. The injection of dinitro- α -naphthol in a dog with intact bulbar centers caused a rise in the blood pressure, the bulbar-stimulating action of dinitro- α -naphthol compensating the hypotensive peripheral action. L. W. RIGGS.

Renal or tissular origin of diuresis by an organo-mercury compound. PAUL GOVAERTS. *Compt. rend. soc. biol.* **99**, 647-9(1928).—Expts. with dogs appeared to prove

that the action of novasurol (a Hg combination of *o*-chlorophenol with diethylmalonyl-urea) was essentially upon the kidneys. L. W. RIGGS

Therapeutic action of antimony on *Spirochaeta duttoni*. J. SCHOCKAERT. *Compt. rend. soc. biol.* 99, 654-7(1928); cf. Uhlenhuth, *C. A.* 20, 1274.—Expts. with mice confirmed the results of Uhlenhuth with syphilitic rabbits. L. W. RIGGS

Action of acetylcholine on the eye of the rabbit. MAX COURLAND AND ERNEST KAHANE. *Compt. rend. soc. biol.* 99, 1136-8(1928).—Acetylcholine produces myosis, and probably increases intraocular tension. L. W. RIGGS

Kottmann reaction in animals injected with potassium carbonate. HÉLÈNE DEREVICI. *Compt. rend. soc. biol.* 99, 1184-5(1928).—Expts. with dogs proved that the injection of K_2CO_3 in doses of 0.03 to 0.05 g., according to the wt. of the animal, caused a retardation of the Kottmann reaction, while the injection of $CaCl_2$ caused its acceleration. L. W. RIGGS

Action of white mistletoe (*Viscum album*). ARNOLD HOLSTE. *Compt. rend. soc. biol.* 99, 1257-9(1928).—The ext. of white mistletoe dilates the arterioles and capillaries by direct peripheric action. L. W. RIGGS

Phylactic action of sodium salicylate against hemolysis by sparteine sulfate. Cellular phylaxis. P. DODEL. *Compt. rend. soc. biol.* 99, 1293-4(1928).—An isotonic soln. contg. 1% Na salicylate and 0.037 to 0.05% sparteine sulfate does not hemolyze sheep erythrocytes. If the erythrocytes, after remaining in contact with Na salicylate for 12 hrs., are washed and centrifuged in 0.9% NaCl soln., they have acquired a strong resistance to the hemolyzing action of sparteine. Similar protection was obtained with Na oleate, stearate and palmitate, and with pyramidone. Na salicylate does not exercise a phylactic action against the hemolyzing action of quinine; on the contrary it increases the hemolyzing action of quinine. The probable mechanisms of these reactions are discussed. L. W. RIGGS

Influence of oxygen inhalations on the hepatic functions. G. PARTURIER, FAQUÉ AND MANCEAU. *Compt. rend. soc. biol.* 99, 1302-4(1928).—Fasting subjects, lying down, respired 50 l. of O in 2-min. periods with a rest of 2 to 3 min. between the periods. Samples of the blood were taken immediately before and after the respiration of the O. The results of 50 tests showed that the blood content in residual N, urea, cholesterol and uric acid and also the cholemia were unchanged in normal, choleocytic and diabetic subjects. The glucemia was increased in the normal subject and was reduced in the choleocytic and diabetic subjects, the insufficient liver being unable to restore the glucemia to its normal value. L. W. RIGGS

Action of natural ephedrine in limited doses on the heart of the rabbit *in situ*. LEON LAUNOY AND PIERRE NICOLLE. *Compt. rend. soc. biol.* 99, 1387-9(1928).—Moderate doses of natural ephedrine injected *in vivo* caused at first a negative chronotropic and inotropic action. Atropine was without effect on this reaction. This first phase was of short duration and was followed by a positive chronotropic and inotropic action, which appeared slowly and was prolonged. This second phase did not appear with doses of 5 mg. per kg., or larger. L. W. RIGGS

Studies of hyperglucemia following injection of morphine. I. Role of the sympathetic. B. A. HOUSSAY, J. T. LEWIS, E. A. MOLINELLI AND A. D. MARENZI. *Compt. rend. soc. biol.* 99, 1406-7(1928).—Expts. with dogs indicated that morphine caused hyperglucemia by direct or reflex stimulation of the sympathetic nervous centers. II. Role of the suprarenals. B. A. HOUSSAY, J. T. LEWIS AND E. A. MOLINELLI. *Ibid* 1408-10. The suprarenals have a certain influence, but are not the sole cause of the production of hyperglucemia by morphine. The diminution of hyperglucemia by morphine which follows the suppression of the adrenaline secretion is a transitory phenomenon which later becomes attenuated or compensated. The suprarenals contribute to the hyperglucemia due to morphine by a discharge of adrenaline. III. Role of the liver innervation. *Ibid* 1411-2.—The injection of morphine causes a glycogenolysis by the excitation of the hepatic nerves, and this is one of the causes of the hyperglucemia produced. IV. Role of the parasympathetic innervation. *Ibid* 1413-4.—In the absence of all sympathetic and parasympathetic innervation of the abdomen, the subcutaneous injection of morphine does not modify the glucemia. L. W. RIGGS

Urobilin of the blood, bile and urine of the dog after injection of urobilin. MARCEL ROYER. *Compt. rend. soc. biol.* 99, 1419-20(1928).—Urobilin dissolved in slightly alk. physiol. saline and intravenously injected was not toxic in doses of 5 to 40 mg. per kg. A dose of 10 mg. disappeared from the blood within 30 min. and a dose of 20 mg. within 80 to 90 min. The quantity of urobilin found in the urine or bile was only about $\frac{1}{100}$ of that injected. **Role of the organs in the disappearance of urobilin injected into the blood.** *Ibid* 1420-2.—Since the liver is not the only organ with power to retain urobilin

from the blood, the increase of urinary urobilin depends not solely on liver insufficiency but also on the insufficiency of other organs, particularly muscle. L. W. R.

Action of a polymethylene derivative of guanidine on glucemia and the glycogen of the liver and muscles. B. VARELA, J. A. COLLAZO AND P. RUBINO. *Compt. rend. soc. biol.* 99, 1441-3(1928).—The action of synthalin on glucemia is different according as it is given by mouth or is parenterally injected. In the latter case with rabbits hypoglucemia always follows, sometimes with convulsions and death. Of 8 rabbits receiving synthalin by mouth only 2 showed a slight diminution of glucemia. The glycogen in the liver, myocardium and muscles appears to be reduced by synthalin, also perhaps by an accompanying fatty degeneration in the liver (cf. following abstr.).

L. W. RIGGS

Experimental toxicity of a polymethylene derivative of guanidine. B. VARELA, J. A. COLLAZO AND P. RUBINO. *Compt. rend. soc. biol.* 99, 1444-6(1928).—Parenteral administration of toxic doses of synthalin is followed by convulsions, which, unlike those produced by insulin, are not relieved by the administration of glucose. Synthalin by the digestive route does not cause convulsions, death occurring after prolonged muscular asthenia and coma. (Cf. preceding abstr.)

L. W. RIGGS

Insulin and folliculin. R. COURRIER. *Compt. rend. soc. biol.* 99, 1630-1(1928).—Expts. with rabbits and guinea pigs indicated that insulin and folliculin do not act in the same way on the genital tract. If these substances cause sterility, it is by mechanisms essentially different.

L. W. RIGGS

Mixed extracts of glands and tissues of warm-blooded animals; their action on the heart of warm-blooded animals in situ. G. KATZ AND E. A. LEIBENSON. *Compt. rend. soc. biol.* 99, 1637-8(1928).—Mixed exts. from endocrine and other glands of the ox were tested with anesthetized and unanesthetized cats. The exts. produced a marked stimulating effect on the cardiac contractions in both cases.

L. W. RIGGS

Action of adrenaline on the heat output, blood calcium and potassium in normal man and in man with thyroid disease. M. R. CASTEX AND M. SCHTEINGART. *Compt. rend. soc. biol.* 99, 1649-50(1928).—The injection of adrenaline increased the heat output, but showed no relation to variations of Ca or K in the blood.

L. W. RIGGS

Action of trypan blue on the blood cells of the rabbit. HARALD BERONIUS. Univ. Upsala. *Compt. rend. soc. biol.* 99, 1675-7(1928).—Intravenous injection of trypan blue in the rabbit was followed by thrombocytosis and leucocytosis.

L. W. RIGGS

Action of thyroxine on the electric excitability of the parasympathetic innervation of the frog heart. JAN WALDENSTRÖM. *Compt. rend. soc. biol.* 99, 1681-2(1928).—In the doses used, thyroxine exercised no dynamic action on the functions of the frog heart.

L. W. RIGGS

Action of chlorophyll on the respiratory metabolism of normal and thyroidectomized rats. HAKAN RYDIN. *Compt. rend. soc. biol.* 99, 1683-5(1928).—Na chlorophyllate (Siegfried of Zofingen) increased the elimination of CO₂ and absorption of O in both normal and thyroidectomized rats. It may be considered a general cellular stimulant having the power to increase the fundamental metabolism of the cells. **Action of chlorophyll and of thyroxine on the sensitivity of the organism to rarefaction of oxygen.** *Ibid* 1685-7.—Both chlorophyll and thyroxine increased the respiratory metabolism of rats. The action of chlorophyll was well marked but less energetic than that of thyroxine. **Action of chlorophyll and thyroxine on body weight.** *Ibid* 1687-8.—Although chlorophyll increased the respiratory metabolism in rats, it did not affect the body wt. Thyroxine, on the other hand, caused either a decrease of body wt., or a decrease of the rate of increase of body wt. With chlorophyll and thyroxine injected simultaneously the results were similar to those following the injection of thyroxine alone.

L. W. RIGGS

Rotogravure ink dermatitis. EDWARD A. OLIVER. *J. Am. Med. Assoc.* 91, 870-3(1928).—Fifteen cases are reported. Para Red, the dry color used in the ink, appears to be the irritating agent.

L. W. RIGGS

Caffeine diuresis. F. FALUDI. *Magyar Orvosi Arch.* 29, 447-52(1928).—Caffeine and its derivs. do not increase the velocity of the ultrafiltration of serum or plasma. The swelling of colloids is not much influenced by the dild. solns. of these materials, whereas their concd. solns. exert an inhibitory effect. Since the same observations can be made in cane sugar solns. it is concluded that the hydration of proteins has nothing to do with the diuretic effect of caffeine.

L. W. RIGGS

Action of wasps poison on oils, triacetin and lecithin. ANGELO CONTARDI AND PIA LATZER. *Rend. ist. lombardo. sci.* 60, 853-6(1927).

R. SANSONE

Pharmacological research on *Digitalis ferruginea* L. V. VERGNANO. Univ. Parma. *Arch. farmacol. sper.* 45, 280-6; 46, 1-6(1928).—The Italian Pharmacopeia does not consider *D. ferruginea* as a substitute for *D. purpurea*. The leaves of the plant

were dried and powdered in the usual way. A 5% infusion was prepd. by treating 1 g. of the powdered leaves with 20 cc. water at 72° and filtering the soln. obtained. Baylat's microchem. reaction was strongly positive with the leaves, and the test of Keller-Kiliani carried out with either the powder or the infusion, gave also a strongly positive result. For comparison, the same tests were carried out with *D. purpurea* and *D. lutea*; they were positive in the first plant and weakly positive in the second one. Biologically, the 5% infusions were compared by examg. their influence on the cardiac rhythm of *Rana esculenta* and also by registering cardiograms according to Engelmann's method. The infusion (1 cc.) was injected into the abdominal cavity. These expts. carried out under identical conditions showed that the action of all 3 infusions is of the same type in regard to the changes produced in the cardiac rhythm. It was evident, however, that *D. ferruginea* was more active than *D. purpurea*, because the reduction of the heart beat, the larger amplitude of the diastolic phase, the peristalsis of the ventricle, and the final ventricular arrest in the systolic phase occurred in a shorter time than with the 2 other prepn's. *D. lutea* had the weakest action; with the doses employed, the ventricular arrest in the systolic phase could not be produced.

G. SCHWOCH

Intensity of action of quinine salts. EZIO MILANESI. Univ. Parma. *Arch. farmacol. sper.* 46, 29-43(1928).—The paralyzing effect of radiated and non-radiated quinine salts was examd. on *Paramecium* and *Vorticella*. The bisulfate (I) and basic hydrochloride (II) of quinine, when irradiated by a Hg-vapor lamp for 30 min. did not differ in their action from the resp. non-radiated salts. In comparing the action of non-radiated quinine salts, it was noticed that I starts to exert its paralyzing effect at a quinine concn. about 4 times as low as do II, the bihydrochloride (III), the sulfate (IV), and the free quinine base. This cannot be caused by the difference of the H-ion concn., since the solns. of II and IV are alk., while those of I and III are acid, a 0.05 N soln. of III even having a lower p_H value (2.8) than a 0.05 N soln. of I (3.1). The solns. II, III, and IV do not show any fluorescence when examd. in sunlight, while I shows azure fluorescence. When examd. with ultra-violet rays, only a slight fluorescence is observed in II, III and IV, while it is intense in I. Wood's light causes II, III and IV to fluoresce rather distinctly; yet it causes a very intense fluorescence in I. M. believes that this higher degree of fluorescence is responsible for the superiority of I in respect to the paralyzing action on protozoa.

G. SCHWOCH

The reticulo-endothelial system and its resistance to inorganic poisons. II. G. VECIA. Univ. Bari. *Arch. farmacol. sper.* 46, 44-8(1928); cf. C. A. 22, 3224.—According to V., the main function of the reticulo-endothelial system is to protect the organism against inorg. poisons; when hyperplasia and hypertrophy of the reticulo-endothelial elements is produced by injecting collargol, this function may be intensified. This hypothesis was confirmed by new expts. V. used groups of rabbits and administered As_2O_3 to the controls, and As_2O_3 + collargol to the test animals. As_2O_3 was given daily in increasing doses ranging from 3 to 25 mg. The collargol was employed as a 2% soln. in physiol. NaCl soln.; it was injected into the marginal ear vein previously to the As_2O_3 administration. One to 5 injections of 2 cc. each were applied to different groups of the test rabbits. The results showed that on the av., the test animals lived longer than the controls, and that the av. total dose of As_2O_3 received by the test animals before the occurrence of death was larger. The max. resistance was observed in the animals having received 3 collargol injections. No relation exists between wt. of rabbit and tolerable dose of As_2O_3 .

G. SCHWOCH

Biochemical studies on iodine. K. SCHARRE. Agr. Hochschule München-Weihenstephan. *Z. angew. Chem.* 41, 980-2(1928); cf. C. A. 21, 3205.—The influence of I given perorally as NaI or KI to different groups of animals was investigated with regard to the milk secretion and the I content of various organs. The effect of inorg. I on the growth of yeast was studied. To groups of goats were given daily I, 7.5, 15, 60, 120 or 180 mg. The intestinal absorption was complete. These doses all caused a considerable elevation of the I content of the body fluids, especially of the milk. Up to 120 mg., no definite increase of the milk secretion could be observed, while 180 mg. caused a considerable increase. With 120 mg., the abs. fat content as calcd. per day was higher, the percentage fat content lower than in the controls. With 180 mg., the percentage fat content was lowered, whereas the abs. fat content first rose and then fell again. The I passes over into the milk very quickly, within fractions of 1 hr. After the I application is stopped, the I content of the body fluids returns to normal within a few days. The health of the animals was not impaired even by the highest I doses. In expts. with cows, similar results were obtained. Small doses had no pronounced effect. A considerable increase of the milk secretion was caused by 76.45 mg. I; at the same time, the percentage fat content was lowered a little, while the abs. fat content was dis-

tinctly raised. In expts. with pigs, S. examd. different organs, after having administered I for a certain time. In lungs, muscles, heart and body fat, no pronounced difference was seen as compared with the controls, while larger differences were found in spleen, liver and kidneys. However, the abs. increase was very small. Cows raised on pastures near the sea-shore of the Northern Sea showed an I content of the milk from 50 to 800% higher than the cows of Upper Bavaria. As to the expts. concerning the effect of I on growth of yeast, the following compds. were tested: NH_4I , KI , NaI , LiI , RbI , CsI , CaI_2 , MgI_2 , HI , $\text{KH}(\text{IO}_3)_2$, KIO_3 , NaIO_3 , RbIO_3 , $\text{Ca}(\text{IO}_3)_2$, KIO_4 , NaIO_4 , and HIO_4 . Conclusion: Inorg. I is of no particular importance for the metabolism of yeast.

G. SCHWOCH

Reaction of the isolated intestine to blood taken from the adrenal vein of rabbits before and after stimulation of the splanchnic nerve. ALEXANDRA PTSCHELINA. W. A. Obuch-Inst. f. Gewerbekrankh.-Forsch. *Arch. ges. Physiol.* (Pflüger's) 220, 371-9(1928).—Blood taken from the adrenal vein before, during and after stimulation of the central end of the splanchnic nerve usually exerts an adrenaline-like effect upon the isolated intestine. The action of the blood is more pronounced in those cases where stimulation of the peripheral end of the nerve also causes the blood to exhibit an adrenaline action. Substances other than adrenaline leading to typical adrenaline effects are present in the blood, and consequently the isolated intestine does not offer a strictly sp. method for demonstrating the presence of adrenaline in the blood. G. H. S.

Mechanism of polyphasic actions. I. Phase effects of the cocaine group. EDUARD RENTZ. Univ. Riga. *Arch. expl. Path. Pharm.* 135, 19-38(1928).—The phase effects of local anesthetics upon frog blood vessels, whose connection with the central nervous system has been interrupted, are not modified by gynergen or atropine, or by a deficiency of Ca or K in the perfusion fluid. In vessels perfused with solns. of local anesthetics the constricting action of BaCl_2 is weakened or completely suppressed, while after exposure to some compds. of the cocaine group atypine and suprarenine may still be active even though the reactivity to Ba is lacking or is reversed. Apparently the phase effects of local anesthetics upon vascular preps. are essentially of a muscular nature, the stimulating and paralyzing effects being referable to reversible changes in state of a single substrate within the vessel wall. G. H. S.

Effect of temperature upon the velocity of combination and of action of digitalis substances. HANS FISCHER. Univ. Zürich. *Arch. expl. Path. Pharm.* 135, 39-81(1928).—The increased activity of digitoxin upon the frog heart brought about by elevation of the temp. is largely independent of thermic effects upon the normal heart itself. Study of temp.-effect relationships shows that the fixation of digitoxin to living substrates must be regarded as a chem. process, or at least is assocd. with a process of chem. nature. What this chem. process is, is not clear, but it probably involves a union between the substrate mol. and one or more of the 5 reactive OH groups of the digitoxin mol. It also appears obvious that the effect-phase is likewise a chem. process, one in which the presence or absence of Ca is of no moment. Elevation of temp. influences the concn. requisite to cause irreversible arrest of the heart. Digitaligenin action is due to processes of like nature, but with this compd. the substrate enters into a loose union, such as is reversible. Ca has no determining effect upon this process. Manifestly, since both digitoxin and digitaligenin both enter into chem. union with the tissues, and with one the reaction is irreversible, with the other reversible, it follows that the tissue may be damaged by the one and not by the other compd. G. H. S.

A hitherto unknown effect of ephedrine. KARL CSÉPAI AND FRIEDRICH DOLESCHALL. Univ. Budapest. *Arch. expl. Path. Pharm.* 135, 109-12(1928).—Ephedrine alters reactivity, or sensitivity to adrenaline. As regards blood pressure adrenaline causes invariably a greater increase if given subsequently to an injection of ephedrine. The most significant effect observed, in a case of hyperthyroidism, gave values as follows: 0.01 mg. of adrenaline intravenously administered increased pressure by 40 cm., 0.01 mg. of ephedrine caused an increase of 30 cm., and a second injection of adrenaline (after the pressure had returned to normal) resulted in an increase of 95 cm. The increases observed do not represent merely summation effects. G. H. S.

Effect of yellow phosphorus upon rickets in rats. H. WESE. Univ. München. *Arch. expl. Path. Pharm.* 135, 111-7(1928).—Rats were rendered rachitic with McCollums diet No. 3143. Yellow P, in olive oil, given by mouth exerted no effect as a preventive or therapeutic agent. The thickening of the subepiphyseal bony tissue caused by the P has no relationship to rickets. G. H. S.

Comparative study of the activity and toxicity of the vapors of the lower aliphatic alcohols. H. WESE. Univ. München. *Arch. expl. Path. Pharm.* 135, 118-30(1928).—White mice were exposed to MeOH , EtOH , PrOH and BuOH and their isomers, under

const. conditions as to temp. with equimol. amts. volatilized in a const. space. The narcotizing and toxic effects, due to absorption through the lung, were detd. With unsatd. vapors the toxic and narcotic effects increased with the no. of C atoms, but with satd. the relations were somewhat changed, in that BuOH and iso-BuOH were less active as narcotics than was PrOH, while sec-BuOH and Me₂COH were more effective. As regards toxicity Me₂COH was between PrOH and AmOH, BuOH between EtOH and MeOH, and Me₂CHCH₂OH was lower in intoxicating power than MeOH. Narcosis, effected with MeOH daily for periods of from 9 to 18 days caused death, the necropsy revealing fatty infiltration of the liver, bronchopneumonia, and nephritis. G. H. S.

Mechanism of the action of hydrocyanic acid: Functional importance of glutathione. I. HANS HANDOVSKY. Univ. Göttingen. *Arch. expil. Path. Pharm.* 135, 143-54(1928).—Study of the muscle of rabbits subjected to a reversible HCN intoxication revealed an increase in free glutathione and an increase in lactic acid with an unchanged carbohydrate value. In later stages the lactic acid is increased as is also carbohydrate, but in still later stages the increase in lactic acid is assocd. with a reduced carbohydrate. In this last condition the glycogen is reduced while the lower sugars are above the normal value. G. H. S.

Effect of histamine on the vessels of the kidney. M. MORIMOTO. Univ. Berlin. *Arch. expil. Path. Pharm.* 135, 194-7(1928).—The vessels of the kidney (dogs, cats) are constricted by histamine in high dilns. G. H. S.

Intensifying the effect of narcotics by antipyretics. K. STEINMETZER. Univ. Wien. *Arch. expil. Path. Pharm.* 135, 198-209(1928).—The narcotizing action of such agents as paraldehyde, chloral hydrate and veronal is intensified by antipyretics, such as antipyrine, pyramidon and quinine. Only under suitable concn. relationships between narcotic and antipyretic is this effect exhibited. G. H. S.

Substances which stimulate and paralyze the respiratory center. FRITZ TIEMANN. Univ. München. *Arch. expil. Path. Pharm.* 135, 213-27(1928).—Study of the effectiveness of vagal inhibition upon respiratory activity revealed the fact that the inhibition is intensified by intoxication by morphine and chloral hydrate and by avertin narcosis. During morphine intoxication, as with the other two substances the irritability of the respiratory center is diminished. The effects of chloral hydrate are dependent upon the dosage, the vagus being not involved. In avertin narcosis a non-irritability of the vagus may develop and the inhibitory effect may thus be reduced. The strongest stimulation of the respiratory center was caused by CO₂, the effect of lobeline and atrinal being less marked. Atropine was without effect. Both lobeline and atrinal are able to overcome or weaken the inhibitory effect of vagal stimulation. With larger doses lobeline paralyzes the respiratory center, leading to an intensified inhibition of the vagus. G. H. S.

Disposal of digitalis and its action in warm-blooded animals. I. Effective dose of different digitalis glucosides on the heart. H. WERSE. Univ. München. *Arch. expil. Path. Pharm.* 135, 228-44(1928).—For the isolated cat heart the minimal lethal dose, per g. of heart, is: digitoxin 0.0046 mg., g-strophanthin 0.002 mg., scillaria 0.0022 mg. When injected intravenously into the intact animal the lethal doses, per g. of heart, are: digitoxin 0.0743, g-strophanthin 0.022, scillaria 0.049 mg.; per kg. of body wt. digitoxin 0.33, g-strophanthin 0.1, and scillaria 0.22 mg. The proportion of glucoside closely bound to the heart is between 4.5 and 9% of that in the circulating blood. The major portion is bound to other organs, as is evident since none of it is excreted. Digitoxin and strophanthin do not appear to be destroyed in the blood, while scillaria, because of hydrolytic cleavage, quickly loses its activity. The heart of the warm-blooded animal will take up a const. quantity of glucoside, without regard to the concn. or abs. quantity present. The velocity of action of the glucoside is a simple linear function of the concn. G. H. S.

Comparative effects of the ganglion poisons on the function of the isolated adrenal. A. I. KOZNETZOV. Militär-Med. Akad. zu Leningrad. *Arch. expil. Path. Pharm.* 135, 15(1928).—The poisons of the group tested influence adrenal function, causing an initial stimulation of secretory activity, and (with large doses) a subsequent inhibition. Cytisine, meotine and lobeline are most active, coniine and sparteine are less so, and gelsemium is of least effect, an arrangement which corresponds to their effect on the autonomic nervous system. It is suggested that this fact may be explained upon the similarity of the embryonic development of the medulla of the adrenal and the ganglia. G. H. S.

Increase in the action of local anesthetics by conducting substances. I. WERNER LIPSCHITZ and RICHARD WEINGARTEN. Univ. Frankfurt a. M. *Arch. expil. Path. Pharm.* 137, 1-24(1928).—Under suitable conditions such substances as methylene

blue and caffeine serve to intensify the anesthetizing properties of cocaine. **II. Caffeine effect on sensory nerves.** WALTHER LAUBENDER. *Ibid* 25-44.—Caffeine increases the effect of alpine, cocaine and novocaine. G. H. S.

Theory of veratrine intoxication. YAHIKO KODERA AND E. TH. BRÜCKE. Univ. Innsbruck. *Arch. ges. Physiol. (Pflüger's)* 220, 274-86(1928).—The behavior of muscle in veratrine intoxication indicates that there is a reactive component whose irritability is essentially different from that of the muscle fibrils. This veratrine component, or "tetanogenic component," may play some part in the normal functioning of muscle. G. H. S.

Isamine-blue therapy of malignant tumors. R. ROOSEN. *Z. Krebsforsch.* 27, 359-61(1928).—The effect of isamine-blue on tumors depends on its reducing their water content. H. G. WELLS

Chemical and pathological study of the effects of copper on the liver. FREDERICK B. FLINN AND WM. C. VON GLAHN. Columbia Univ. *J. Exptl. Med.* 49, 5-20(1929).—Cu or its compds. used does not cause the deposition of pigment in the livers of rabbits, guinea pigs or rats. Neither does it produce a cirrhosis on these animals. Spontaneous deposition of pigment occurs frequently in the livers of normal rabbits on the usual lab diet. The feeding of a diet of carrots exclusively will produce pigment deposition in the livers of rabbits, in every way identical with that ascribed to Cu. The pigment deposited in the livers is probably of exogenous origin. C. J. WEST

A new type of arsenical derivatives of quinoline (BERLINGOZZI) 10.

I—ZOÖLOGY

R. A. GORTNER

Relation of hydrophilic colloids to winter hardiness of insects. WM. ROBINSON. *Fifth Colloid Symposium Monograph* 1928, pp. 199-218.—Newton (*C. A.* 18, 3205) having noted a relation of this kind in wheat, expts were made on a cold-hardy moth, *Callasamia promethia*, a non-hardy granary weevil, *Sitophilus granarius*, and an intermediate type, the "white grub" (genus *Phyllophaga*). Thoenes' (*C. A.* 19, 3497) method was used, which consists in measuring the heat of fusion of ice, the free water being frozen, the "bound water" remaining unfrozen at -20° . "The different insects gained or lost in bound water in direct proportion to their winter hardiness." As winter approaches, it is of great advantage to the species if free freezable water is transformed into bound non-freezable water. JEROME ALEXANDER

The distribution of argininephosphoric acid in the musculature of invertebrates. OTTO MEYERHOF. Zoölogical Stat. Napoli. *Arch. sci. biol. (Italy)* 12, 536-48 (1928).—Argininephosphoric acid (*A*) had previously been shown to occur in the muscle of Crustacea instead of creatinephosphoric acid (cf. Meyerhof and Lohman, *C. A.* 22, 1370); (Fisk and Subbarow *C. A.* 21, 2311; 22, 1184). The amt. of *A* in the muscle of Crustacea is 60-75% of the total PO_4 or 1.5-1.9 mg. per g. fresh muscle. The muscle of *Pecten* contained a max. of 60-75% of *A* but usually less. It was decreased in the animals which had remained for a long period in the aquaria or at a high environmental temp. A smaller quantity of argininephosphoric acid was present in *Pecten jacobaeus* than in *Pecten opercularis*. In *Holothuria tubulosa* and *Stichopus regalis* the amt. varied from 66 to 86% of the total phosphate. Although in previous expts. with invertebrates, a direct relationship was found between the activity of the muscle and the content of *A*, this was not true in *Holothuria* and *Stichopus*. The stimulation of the muscles of these animals for 1 hr. with a tetanizing current or allowing the isolated muscle to stand at 20° for the same length of time decreased the argininephosphoric acid content less than 50%. However, it was largely destroyed when the muscle was allowed to stand for 1 hr. at 45° . The marked stability of *A* may in part be explained by the sluggish rate of contraction of these muscles. The long muscle and the retractor muscle of the proboscis of *Sipunculus* contained *A*. In the retractor muscle there was about 4 mg. of P_2O_5 phosphagen per g. of muscle, which was much higher than in the long muscle. This value was very much decreased on activity. The max. rate of hydrolysis of pure argininephosphoric acid and also of the CCl_3COOH ext. of crab muscle occurred at 0.01N-H ion. However, the exts. of *Pecten*, *Holothuria* and *Sipunculus* showed the max. sapon. rate at 0.1 N-H ion. It is suggested that impurities in the ext. or in the HCl may act catalytically. A strong retardation in the sapon. rate occurred when molybdate was added. No argininephosphoric acid was found in the muscles of the *Cephalopoda*, in the smooth muscle adductors of the muscles or in the ring muscle of the *Holothuria*. Conclusion: In general the argininephosphoric acid decomps. with the activity of the muscle. H. J. DEUEL, JR.

The role of the iodine component in the thyroxine molecule. B. ZAVADOVSKII, N. A. RASPOPOVA, T. P. ROLITSCH AND E. W. UMANOVA-ZAVADOVSKA. *Kommunistischen Swerdlhoff Universität Moskau. Z. ges. expth. Med.* 61, 528-38(1928).—See C. A. 22, 2583.

Studies on the occurrence of arsenic in the organism of fish. ERIK SADOLIN. Univ. Köbenhavn. *Biochem. Z.* 201, 323-31(1928); cf. C. A. 23, 210.—In As poisoning the As_2O_3 is not substituted for H_3PO_4 in lecithin, because ether exts. of the dry As-contg. liver are As-free. Neither does it substitute the H_3PO_4 in nucleic acid, the presence of As in the liver nucleoproteins being simply an adsorption. Likewise the fact that As is partly excreted through hair and nails does not represent a vital function. Since As occurs normally in fish, its distribution has been studied with the following results. The As is present principally in fat-sol. combinations which are easily sol. in the usual fatty acid solvents. The As is apparently an acid compound since it is extracted with dil. alk. solns. The concn. of As is greater in the oily liver than in muscle tissue, where likewise the As is found in larger amt. in the oily portion than in the oil-free residue.

S. MORGULIS

Favoring influence of a diet of murier noir (*Morus nigra*) leaves on the development of grasserie in silk worms. TAHIR ERTOGROUL. *Compt. rend. soc. biol.* 99, 831-2 (1928).—A diet of *Morus nigra* leaves always favored the development of the grasserie disease of silk worms.

L. W. RIGGS

Hypnosis and habituation of fish of the genus *Gobius* under the influence of certain hypnotics of the barbituric series. JEANNE LÉVY. *Compt. rend. soc. biol.* 99, 1325-6 (1928).—*Gobius lota* show habituation to butylethylmalonylurea. Fish already habituated to butylethylmalonylurea show habituation to heptylethylmalonylurea and vice versa.

L. W. RIGGS

Physiologic role of the aerial sacs of birds. P. PORTIER. *Compt. rend. soc. biol.* 99, 1327-8(1928).—The aerial sacs by removing the alveolar air from the lung and rejecting it at the periphery increase the O tension in the lung and consequently in the blood. Thus the O tension in mammals is 97.3 mm. and that of birds 146 mm. By this means anoxemia at high altitudes during long flights is prevented. Birds after a long rapid flight show no signs of dyspnea.

L. W. RIGGS

Elimination of carbon dioxide in the insects. W. H. THORPE. Univ. Calif. *Science* 68, 433-4(1928).—The CO_2 output was studied by means of a 0.1% soln. of *o*-chlorophenol indophenol indicator, the larva being held motionless in a film of fluid under a raised cover slip. The findings were confirmed by means of phenol red, cresol red and bromocresol purple. Also the O absorption was studied by the method of Fox (et C. A. 15, 2453). Both methods gave consistent results when tested upon various aquatic larvae having well-developed tracheal gill systems. Expts. with large, heavily chitinized insects were rather inconclusive.

L. W. RIGGS

Isopropyl alcohol as a preservative. PHILIP H. POPE. Reed Coll. *Science* 68, 487-8(1928).—Newts were preserved in isopropyl alc. of 5 concns. ranging from 36.4 to 72.8% (40 to 80% com. strength). A control was preserved in EtOH at 70%. The results favored the use of isopropyl alc. in concns. of 40 to 50%. It competes in price with EtOH without the restrictions of the latter, and is without the irritating properties of HCHO.

L. W. RIGGS

12—FOODS

F. C. BLANCK AND H. A. LEPPER

Regulations on the use of preservatives in the framing of food laws. A. JUCKENACK. *Z. Untersuch. Lebensm.* 56, 16-25(1928).—A presentation of the case against the indiscriminate use of chem. preservatives in human foods and beverages.

C. R. F.

Fiber containers and food preservation. J. D. MALCOLMSON. Robt. Gair Co., N. Y. *Food Industries* 1, 160-1(1929).—Because of their high insulating value, fiber containers are of special value in the marketing of products in conjunction with dry ice, i. e., frozen CO_2 . Corrugated cardboard with walls 0.625 in. thick had approx. the same insulating value as 1 in. of balsa wood. The uses of grease- and water-proof papers are discussed.

C. R. F.

Identification of coal-tar colors used in food. S. W. SNYDER. *Textile Colorist* 51, 39-42(1929).—The 2 usual methods, dyeing on wool and extg. the color with immiscible solvents, are described.

RUBY K. WORNER

The nature of the water-soluble protein in wheat kernels. R. HERZNER. Hochschule Bodenkultur, Wien. *Biochem. Z.* 202, 320-8(1928).—An ext. with H_2O is made

from the finely ground kernels (4:1) which is allowed to stand 12 hrs. The soln. is siphoned off, satd. with $(\text{NH}_4)_2\text{SO}_4$ and the ppt. is suspended in water. This mixt., under toluene, is dialyzed for 1 and 4 weeks in specially prepd. pig bladders against distd. H_2O . The globulin is removed by filtration and the colored soln. is now concd. by ultrafiltration, and subsequently electrodialyzed. In the course of these 4 essential steps in the purification the ash content changes from 0.97 to 0.54, 0.49 and finally 0.0%. The soln. now has a reaction of p_{H} 6.69, and the soly. of the protein is thus due neither to salt nor to acid. The electrophoresis expts. show that the amphoteric point is at p_{H} 5.10; the max. heat coagulation was observed at p_{H} 4.97; the max. alc. pptn. occurred at p_{H} 5.43 (calcd. p_{H} 4.90). The elementary analysis of this protein is: 51.44% C, 7.24% H and 16.11% N. It is suggested that this protein is similar to the animal pseudoglobulin.

S. MORGULIS

Wheat and flour experiments in England. A. A. J. DE 'SIGMOND. *Kísérlet Közlemények* 30, 530-8(1927).—The strength of wheat or flour depends on two factors chiefly: (a) appropriate quantity and quality of gluten, and (b) sufficient sugars and diastatic energy for the fermentation of the dough. Two methods for improving were found especially interesting; the tempering or conditioning of wheat and the over heating of a small part of the wheat according to the Kent-Jones' method. The lab. of Kent-Jones at Dover is described.

S. S. DE FINÁLY

A new carbohydrate from rye flour and its application in the development of a method for the detection of rye flour in wheat or other flours. J. TILLMANS, H. HOLL, AND L. JARIWALA. Univ. Inst. for Food Chem., Frankfurt a M. *Z. Untersuch. Lebensm.* 56, 26-32(1928).—Differences in the behavior of rye and wheat gliadins pptd. by 70% EtOH, especially in their titration curves, were noted. A carbohydrate, derived from the rye flour by the addn. of alkali to the EtOH ppt., was recovered and purified. It was white, cryst. and very slightly sweet. Before inversion, $[\alpha]_D^{20}$ was -43.93° , and after inversion, -92.70° . The total sugars as invert were 100.2%. Combustion gave C 43.38, H 6.43 and N 0.0%. The mol. wt. was 487.9 with the formula $\text{C}_{18}\text{H}_{30}\text{O}_{11}$. The compd. is designated *trifructose anhydride* or *trifructosan*. The following procedure is used to detect rye flour in flour mixts.: To 5 g. of flour add 20 cc. of 70% EtOH and centrifuge for 15 min. Cool to -3° in a salt-ice mixt., stirring thoroughly the pasty mass during the cooling and centrifuge again for 5 min. The ext. should be perfectly clear. 10 cc. is decanted into a test tube contg. 0.5 cc. N NaOH dissolved in 70% EtOH. Turbidity ranging in degree from slight to a ppt. indicates the presence of rye flour. About 10% of rye flour may be detected thus in flour mixts.

C. R. F.

Determination of glutenin and relation to gliadin. P. SPANYÁR. *Kísérlet Közlemények* 30, 610-4(1927).—The method of Blish (*C. A.* 22, 122) has been tested and slightly modified. Exptl. data show that the ratio of gliadin to glutenin is 60:40 as stated by former analysts. Slight differences do not lessen the "strength" of the flour

S. S. DE FINÁLY

Technical control in bread baking. C. B. MORRISON. *Am. Inst. Baking, Chicago Food Industries* 1, 148-53(1929).—No chem. data yield information of as great importance as the baking test. Dough possesses a typical foam structure caused by the dispersion of gas through the dough during fermentation. The coagulation of the protein by heat fixes this foam structure. Starch undergoes some degree of gelatinization, and the coagulated protein and starch exhibit changes in phys. properties in the direction of elasticity. Though the temp. of the interior of the bread during the baking is near that of the b. p. of water, the exterior of the loaf is at a very much higher temp. The crust, therefore, undergoes dextrinization, and pyro-decompn. of carbohydrates and proteins accompanied by color changes occurs.

C. R. F.

Results of biological milk control methods at Altona. A. BEHRE. Chem. Lab. Altona. *Z. Untersuch. Lebensm.* 56, 38-50(1928).—B. considers that sediment (quant.), acidity, Janus green reductase tests and leucocyte and streptococci counts furnish the most information regarding the quality and wholesomeness of milk.

C. R. F.

The freezing-point determination in milk. P. WEINSTEIN. Chem. Res. Inst., Bochum. *Z. Untersuch. Lebensm.* 55, 590-602(1928).—The f.-p. method when applied to milk will detect about 5% addn. of H_2O . The av. value of $\Delta 10^3$ was 53.5. The use of f. p., catalase, refraction and detn. of fat-free dry matter is valuable in detg. milk quality.

C. R. F.

The importance of choline in summer and winter milk. W. VAUBEL. *Deut. med. Wochschr.* 54, 1971(1928).—Butter produced during the summer months is much richer in lecithin than that produced during the winter. This higher lecithin content is associated with a higher choline content and a higher content of vitamin B.

A. G.

The electrometric determination of chlorine in milk. THURE SUNDBERG. *Bd.*

Health Lab., Stockholm. *Z. Untersuch. Lebensm.* 56, 32-8(1928).—The adaptation of the potentiometer for the detn. of Cl in milk serum was feasible and gave results almost identical with those obtained by the Volhard method. A calomel electrode was used. C. R. F.

The potentiometric determination of chlorine in milk. C. ROHMANN. Chem. Inst., Univ. Münster. *Z. Untersuch. Lebensm.* 55, 580-90(1928).—The method deals with the electrometric titration of the Ag and Cl ions in the presence of a protective colloid such as gelatin. Heating the milk had little effect on the results. Acidity did influence the results unfavorably. In the titration, a reversible adsorption occurs. Complications make the method difficult of application. C. R. F.

"Chromiform," a new preservative for milk samples. FONZES-DIAON AND LAFORCE. *Ann. fals.* 21, 536-9(1928).—Addn. of 0.25 g. $K_2Cr_2O_7$ and 0.25 g. $(CH_3O)_2$ to 250 cc. was found to preserve milk samples, even when exposed to daylight, provided they were in completely filled and well-stoppered bottles. After 2 months the acidity was only slightly increased and the total solids slightly decreased, lactose and Cl were unaffected, casein underwent but very little hydrolysis and its detn. by pptn. was sufficiently accurate, butter-fat could be detd. either by extn. of the coagulum obtained by the official Fr. method or by the Gerber method and the amt. found was the same as in the fresh milk, the various consts. had practically the same values as in the fresh milk, and the total solids and ash had to be corrected only for the amt. of $K_2Cr_2O_7$ added. A. PAPINEAU-COUTURE

Know your foods. I. Oleomargarine. H. A. SCHUETTE. *J. Chem. Education* 5, 1621-6(1928). E. H.

"Tracers" in margarine for detecting its addition in small quantities to butter. L. HIRON. Univ. de Liège. *Ann. fals.* 21, 532-4(1928).—The application of the law requiring addn. of 5% sesame oil and 0.2% potato starch to margarine in Belgium for the last 28 yrs., though it has given satisfactory results, has not necessarily eliminated adulteration of butter entirely, it being probably carried out by addn. of small amts. of coconut oil or neutral lard or both to butters with high volatile-acid contents. The relation between n and Polenske no. is suggested as a promising method for the detection of such fats in butter (cf. following abstract). A. PAPINEAU-COUTURE

Proposed method for the detection of coconut oil in butter. L. HIRON. Univ. de Liège. *Ann. fals.* 21, 534(1928); cf. preceding abstract.—The ratio of the butyrorefractometer reading at 20-5° of the insol. volatile fatty acids obtained in the Polenske distn. to the Polenske no. itself is 6-7 units higher with pure butter than with the butter adulterated with 10% coconut oil. A. PAPINEAU-COUTURE

Judging cheese according to Orla-Jensen. I. SZANYI. *Kísérlet Közlönyek* 30, 507-19(1927).—Instead of the present method of judging cheese on the basis of the fat content of dry matter, the 6th International Dairy Congress proposed Orla-Jensen's method of giving the relation of fat to protein. Fifty full cheese analyses were made. The data of Orla-Jensen were found correct. The judging of cheese is more exact and better by Orla-Jensen's method, but proteins cannot be detd. without lab. app. Moreover, this method does not state the fat content, which is the most valuable component of cheese. S. S. DE FINÁLY

Some factors affecting connective tissue content of beef muscle. H. H. MITCHELL, T. S. HAMILTON AND W. T. HAINES. Dept. Animal Husb., Univ. of Ill. *J. Nutrition* 1, 165-78(1928).—Toughness of lean meat is due largely to the connective tissue fibers which consist of 2 proteins, *elastin* and *collagen*. Chem. methods for their detn. and sepn. are given. No const. or significant differences in connective tissue content were found between heifer and steer beef. Eye muscle of rib and tenderloin in calves gave the lowest % of collagen, while next in order and indistinguishable from each other were round, porterhouse and sirloin. Fore shanks, chuck ribs and navel showed the highest % of collagen. The % of elastin in muscle is a small and usually insignificant part of the collagen. The distribution of elastin among the different retail cuts of meat differs from the distribution of collagen but is significant and consistent. Inconclusive results indicate that age does not greatly influence the content of connective tissue in muscle. The results lend no support to the belief that the appearance, texture and firmness of lean meat gives reliable information concerning its tenderness. No obvious relation was found between the grading of beef carcasses and the fat content of the lean of selected samples. C. R. F.

The evaluation of preserved fish. HANNS LENCGERICH. Res. Inst. for the Fish Ind., Altona. *Z. Untersuch. Lebensm.* 55, 568-78(1928).—A discussion of quality factors, including chem. tests on cooked and raw marinated herring. C. R. F.

Vegetable food as a source of iodine. ROSE E. REMINGTON. S. Car. Med. Coll.

Science 68, 590(1928).—Potatoes, lettuce, beet tops and turnip tops are mentioned among plants grown in S. Carolina as contg. much more I than is usually reported for such plants. L. W. RIGGS

Apple sauce another logical apple product. C. R. FELLERS. Mass. Agr. Coll., Amherst. *Glass Container* 8, No. 2, 11-20(1928).—Methods of manuf. including formulas are given. Canned apple sauce is thought to offer excellent possibilities for off-grade and cull apple utilization. C. R. FELLERS

Principles for the evaluation of marmalades, confections, jams and jellies. A. BEYTHIEN. *Z. Untersuch. Lebensm.* 56, 80-106(1928); cf. *C. A.* 22, 1634.—Definitions and proposed standards in detail for these food products are given. These standards were agreed upon by a Commission composed of the Assocn. of German Food Chemists and representatives of the industries involved. The addn. of 0.3% pectin (calcd. as Ca pectate) to fruit jams and marmalades and 0.6% to fruit jellies is proposed without the necessity of declaring the use of pectin on the label. The use of glucose in amts. up to 25% in jams, jellies and marmalades, with label declaration, is permitted. Added color must be declared but not small quantities of added acids. C. R. F.

Chemical analysis of haw jam. GY. BILUSKA. *Kísérlet Közlemények* 30, 570 (1927).—Several analyses of haw jams were made in order to get data for judging adulterations. An adulteration by gourd-jam (*Cucurbita pepo*) can be detd. by finding high cane sugar content, low acidity and low ash-alkalinity. An adulteration with both gourd-jam and tomato can only be detd. by microscopic examn. S. S. DE F.

California ripe olives. History, research, technology of processing, grading and marketing. W. V. CRUESS. Univ. Calif., Berkeley. *Food Industries* 1, 170-4(1929).—Following the lactic fermentation in brine a 2.5 to 3% NaOH soln. is used to destroy the natural bitterness of the olives. Several treatments with successive bleachings are required for the alkali to penetrate the flesh to the pit. The cause of the bitterness in olives may be a glucoside about which little is known. For canning in either tin or glass containers, the usual process is 60 min. at a temp. of 240° F. in a steam retort, thus precluding danger of *Cl. botulinus* survival in the canned product. C. R. F.

Microscopic pollen analysis of Bohemian honeys. ANNALIESE NIETHAMMER Deut. Tech. Hochschule, Prague. *Z. Untersuch. Lebensm.* 50, 467-70(1928).—The kinds of pollen found in the comb of honey samples obtained in the various sections of Bohemia are enumerated. Among the principal honey-producing plants are lotus, sinapis, onobrychis, trifolium, ranunculus, salvia and geranium. C. R. F.

Extension of the analysis of honey. J. STITZ. *Kísérlet Közlemények* 30, 524 (1927).—A color scale is proposed to judge colors of honeys and another one to state the reaction of diastatic enzymes of the honey. A table gives water content, dry matter and original d. on basis of d. of honey dild. 1:3 with water. In detg. the kinds of honeys, their ash content should be analyzed. From the ash compn. can be detd. the kind of flower from which honey was made. S. S. DE FINÁLY

The adulteration of coffee. A. DUTRA. Brazilian Embassy, Paris. *Ann. fals.* 21, 539-41(1928).—A brief outline of the chief forms of adulteration of coffee and of the measures which should be taken to repress them. A. PAPINEAU-COUTURE

Determination of caffeine in tea. (MRS.) S. GOBERT. Lab. Central du Service de la Répression des Fraudes, Paris. *Ann. fals.* 21, 517-8(1928); cf. *C. A.* 21, 969.—The method previously described for the detn. of caffeine in coffee has been adapted for the analysis of tea, as follows: to 3 g. of finely powdered tea in a glass centrifuge tube add 4 cc. of 22° Bé. NH₄OH, let stand 30 min. with occasional shaking, ext. with four 25-cc. portions of AcOEt, shaking 10 min. each time, centrifuge 3-7 min., decant the solvent, distil carefully, dry the residue 30 min. at 100°, ext. twice with 50, and once with 25 cc. boiling H₂O, letting each ext. stand a few min. on the water bath, cool the combined exts., add 15 cc. 1% KMnO₄, let stand 15 min., ppt. with 12-vol. H₂O₂ contg. 1% AcOH, let stand 15 min. on the water bath, filter, wash, evap. the filtrate to dryness, heat 15 min. at 100°, ext. with three 25-cc. portions of hot CHCl₃, filter into a tared Erlenmeyer flask, evap. carefully, dry 30 min. at 100° and 6 hrs. in a desiccator. *Det. H₂O* by drying 5 g. for 4 hrs. at not over 100°. A. PAPINEAU-COUTURE

Comparative investigations on the detection of inadmissible amounts of cacao shells in cacao and cacao products. J. GROSSFELD AND A. SIMMER. Food Res. Inst., Berlin. *Z. Untersuch. Lebensm.* 55, 553-9(1928).—A comparison of the crude fiber and microscopic methods gives fairly consistent results in the detection of excess shell in cacao. C. R. F.

The lauric acid content of coconut and palm-kernel oils as a means of detecting these oils in food fat mixtures. J. GROSSFELD. *Z. Untersuch. Lebensm.* 53, 529-53 (1928).—By studying a large no. of mixts. of oils contg. coconut or palm-kernel oils

in varying proportions, formulas are proposed whereby the approx. amts. of these oils in fat mixts. can be quantitatively detd. C. R. F.

Bacteriological field studies in canning. Thermophilic contamination in the canning of peas and corn. E. J. CAMERON, C. C. WILLIAMS AND R. J. THOMPSON. Nat. Canners Assn. Wash., D. C., *Bull.* 251, 1-56(1928).—By the use of a motorized field lab., many canners' problems relating largely to bacterial food spoilage were studied. The findings of James (C. A. 19, 2711) that the usual spoilage in canned corn results from holding the raw product before canning, are discredited. Heat-resistant, thermophilic, flat-sour and anaerobic, sulfide-producing bacteria found in sugar, manure and rarely soil, contaminate wooden tanks and equipment in canneries, thus infecting the foods before canning. Not all of the cells are destroyed during the final processing by heat and unless the food is promptly cooled to below approx. 35°, spoilage may result. C. R. F.

Heat transfer determinants. II. K. L. FORD AND A. G. OSBORNE. Glass Container Assn., N. Y. *Glass Container* 8, No. 2, 5-48(1928); cf. C. A. 23, 449. Typical heat transfer graphs using cider and sirups in glass containers show that agitation greatly accelerates the penetration of heat to all parts of the container. It is recommended that bottles be placed on their sides during pasteurization. The use of high initial water bath temps. during the first part of the process decreases the total heat treatment and results in a distinct improvement in the flavor of pasteurized fruit juices. C. R. FELLERS

Detoxicated cottonseed meal. PAUL MENAUL. *Oil and Fat Ind.* 5, 333-5(1928).—Pure gossypol was prepd. by extg. cottonseed meal with ether, concg. the soln. pptg. the gossypol by petroleum ether, washing with the same, redissolving in ether, repptg. and repeating this procedure 5 times. This product decomposed at 100° into H₂O and an insol. reddish brown caramel. This decompn. does not take place unless the gossypol has been removed from the glands and exposed to the air. The method for detoxicating the cottonseed meal comprises raising the H₂O content to about 40%, then heating to above 100° preferably with steam under pressure, which causes a swelling of the meal tissue, forcing the gossypol to exude to the outside where it decomposes. Feeding trials covering 3 years with this detoxicated cottonseed meal failed to disclose a trace of toxicity, even among young animals receiving a ration contg. as much as 30% non-toxic meal. F. SCHERUBEL

Soil and pasture in relation to pining and bush-sickness of sheep. R. E. R. GRIMMETT AND BEATRICE W. SIMPSON. *Trans. Proc. New Zealand Inst.* 59, 395-403 (1928). Scottish pining soil and New Zealand bush-sick soil have similar mech. compns. The pining soil has more available P, K and Mg, but less Ca. The citric-sol. Fe is low in both types. The herbage of pining pasture contained Fe about equal to that of non pining pasture but much less Mn. The pining and bush-sick diseases of sheep are characterized by pronounced anemia. Further study is necessary to det. the relation, if any, between the deficiencies of Ca and Fe and the excess of Mn in the pasture herbage, and the incidence of the disease. (Cf. following abstr.). L. W. R.

Mineral content of pastures. Lime deficiency in King Country soils, and the effect on plant and animal. B. C. ASTON. *Proc. Trans. New Zealand Inst.* 59, 406-14 (1928), cf. C. A. 22, 4182; 23, 462 and preceding abstr.—Analyses of 27 soil samples and the ash of 11 samples of pasture herbage showed a deficiency in Ca. Feeding expts. with sheep in these pastures proved that their food was deficient in Ca. Sheep suffering from a deficiency of Ca in their food recovered rapidly on the pasturage of well-limed soils. The liberal liming of soils in this region is essential to successful sheep husbandry. L. W. RIGGS

Microchemical reactions for caffeine (WAGENAAR) 17. Cylindrical filtering apparatus for milk (U. S. pat. 1,693,741) 1. Apparatus for drying cereals (Brit. pat. 290,776) 1. Apparatus for pasteurizing and cooling milk (Brit. pat. 290,615) 1. Apparatus for sterilizing milk in containers carried in perforated baskets (Brit. pat. 290,555) 1. Pasteurizing milk (U. S. pat. 1,695,300) 4. Fermentation [products for food for live stock] (Swiss pat. 126,986) 16. Preserving fruit and vegetables (Austrian pat. 109,411) 13.

VIVIANI, C. *L'uovo di gallina (processi di conservazione e commercio)*. 2nd ed. Milan: Ulrico Hoepli. 406 pp. L. 22.50. Reviewed in *Chimie et industrie* 20, 800 (1928).

WALKER TISDALE, C. J., and WOODNUTT, WALTER E.: *Practical Cheesemaking*. Revised. London: George Allen & Unwin, Ltd. 204 pp. 4s. 6d., net. Reviewed in *J. Ministry Agr.* 35, 689(1928).

Bread. BRITISH ARKADY CO., LTD., R. WHYMPER and H. HEWITT. Brit. 289,978, Feb. 12, 1927. A compn. for subsequent incorporation into flour or dough for bread-making is prepd. from yeast and an enzyme-producing fungus such as *Aspergillus oryzae* or *Penicillium*.

Curing meat. M. L. BACON. Brit. 290,728, Nov. 18, 1927. Beef, mutton, bacon, hams, tongues or other kinds of meat are placed in an autoclave which is then evacuated (suitably to about 0.5-in. Hg pressure). Dry or liquid curing material is then introduced and evacuation is continued and maintained for the rest of the curing process which may be completed in 60-70 hrs. As a finishing step, pressure may be employed for a short period such as 1 hr. An app. is described.

Preserving fish, etc. D. A. HANSEN. Brit. 290,292, May 12, 1927. Fish or livers, roes or other parts of fish are treated with a soln. contg. borax together with an equal or smaller quantity of an acid preservative such as boric or salicylic acid.

Utilizing meat-pickling brine. EML SCHEITLIN. Can. 285,135, Nov. 27, 1928. To 100 l. pickle resulting from the pickling of meat is gradually added dil. acid, for instance 10% guaiacolsulfonic acid, until no further solid is pptd. The ppt. is then sepd. from the liquor by filtration and dried, preferably *in vacuo*. The dry product is light-colored, and is closely related to the press juice obtained by the pressing out of meat. It is valuable for *pharmaceutical purposes*.

Soluble gum composition. ALBERT LEO. Can. 284,906, Nov. 20, 1928. A sol. gum compn. contains 100 parts pure standardized citrus pectin, 19 parts of HNaCO_3 , 14 parts of citric acid. This compn. is used in making jams and jellies.

Artificial coffee aroma. HERMANN STAUDINGER and THADEUS REICHSTEIN (to Internationale Nahrungs- und Genussmittel A.-G.). U. S. 1,696,419, Dec. 25. Fugitive mercaptans and sulfides are mixed and reacted on by O-contg., N-contg. and other compds. present in natural coffee aroma.

Chocolate. HERMANN STAUB, JR., and CHARLES EGGSTEIN. Swiss 126,813, April 6, 1927. Before or during the milling of the chocolate mass, an alkali carbonate and a substance contg. CO_2H_2 are stirred in.

Food from bananas. C. JAEGER. Brit. 290,195, May 9, 1927. A product rich in vitamins is prepd. by treating thin layers of dried bananas with ultra-violet rays

Conditioning raisins or other dried fruits. SUN-MAID RAISINS GROWER OF CALIF. Brit. 289,722, Nov. 11, 1927. Dried fruits such as raisins are treated with steam and ozone or ozonized air and then, while protected from the air, are quickly dried preferably on a shaking heated metal grill at a temp. of about 400° and vapors are exhausted from the drying chamber. A larger proportion of steam is first used and then a larger proportion of ozone.

Composition for treating fruits and vegetables. HENRY G. ZELLNER (to Zeltrocide Chemical Corp.). U. S. 1,696,704, Dec. 25. A compn. for treating citrus fruits or other fresh fruits or vegetables to prevent decay is formed from borax 100, NaHCO_3 20, Na_2CO_3 18, KMnO_4 2 and CuSO_4 1.5 parts. U. S. 1,696,703 specifies a mixt. suitable for treating citrus fruits comprising borax 100, NaHCO_3 20 and KMnO_4 2 parts, for preventing decay from blue mold, green mold, stem end rot and anthracnose.

Curing ripe olives. GEORGE S. HEWETT. U. S. 1,695,489, Dec. 18. Olives from which the natural bitterness has been removed (suitably by immersion in dil. NaCl soln.) are immersed in a boiling brine and after removal from the brine are heated to a high temp. (suitably about 230°) until crisp.

Apparatus for evacuating and sealing containers for cheese or other perishable food products. D. ROBERTSON. Brit. 290,198, May 9, 1927.

Animal food. HARRY M. WEBER (to Ellis-Foster Co.). U. S. 1,695,567, Dec. 18. A baked and air-dried dog biscuit enriched in vitamins may be formed of ingredients such as wheat flour, rice bran, cod-liver oil, salt, malt ext., glucose, milk and water and has a glazed hard surface substantially free from fissures so that the vitamin content is preserved from oxidation.

Stock food. HOWARD F. WEISS (to Wood Conversion Co.). U. S. 1,695,445, Dec. 18. A stock food is specified comprising the composite sugar products of hydrolysis of western larch wood, including galactose, in a concd. state and in admixt. with finely divided hydrolyzed larch wood residues.

Apparatus and fermentation method of treating hay, straw, clover or other farm "roughage" to prepare it for stock feed. CHARLES R. MABEE (to Mabee Patents Corp). U. S. 1,693,611-2, Dec. 4.

13—GENERAL INDUSTRIAL CHEMISTRY

HARLAN S. MINER

The relation of science to industry. ROBERT A. MILLIKAN. *Science* 69, 27-31 (1929); *Nela Bull.* 16, 13-5(1929).—An address. C. G. F.

Contributions of chemistry to industry. II. WALTER A. SCHMIDT. *J. Chem. Education* 5, 1603-14(1928); cf. *C. A.* 23, 221. E. H.

Industrial changes due to chemistry. EDWARD R. WEIDLEIN. *Am. J. Pharm.* 100, 765-91(1928). W. G. GAESSLER

Studies in chemical patent procedure. I. Hall patents for aluminum production. LLOYD VAN DOREN. *Ind. Eng. Chem.* 21, 120-4(1929). E. H.

Chemical engineering education and research in Great Britain. W. E. GIBBS. *Chemistry and Industry* 47, 1304-7(1928); cf. *C. A.* 23, 653. E. H.

Importance of colloid-chemical and colloid-physical research in future problems of the chemical industry. E. A. HAUSER. *Ind. Eng. Chem.* 21, 102-4(1929). E. H.

Business organization and system in repair shops of the chemical industries. ADOLF JAKOB. *Chem.-Ztg.* 52, 887(1928).—Suggestions are made for increasing efficiency in the conduct of repair shops. W. C. EBAUGH

The Mutual Relief Association (Notgemeinschaft) of German Science and Chemistry. ALFRED STOCK. *Z. angew. Chem.* 41, 1233-4(1928).—In 1920 there arose an organization to ward off the threatened collapse of German science and research. By pooling interests and resources this end was attained. Under the direct control of scientists themselves, money from private and public sources was received; grants were made to institutions and individuals, and materials, app., books, necessary expenses, etc., provided. The "Notgemeinschaft" has developed into an indispensable factor in German intellectual life. W. C. EBAUGH

Nomenclature. G. E. CARLETON AND F. EDER, et al. *Bull.-Tech. Series*. Compressed Gas Manufs. Assoc., T. S. 331-5(1928).—A report by the sub-committee on nomenclature adopted by the cylinder-testing committee of the Association, giving symbols to be used in calcs. of cylinder problems, with their meanings. They have been made to agree, as far as feasible, with those used in engineering practice. AUSTIN M. PATTERSON

Gas reactions in hot-cold vessels in the large-scale technic. HUGO ANDRIESENS. *Chem.-Ztg.* 52, 941-2(1928).—Enumeration of the industrial processes carried out by that method. ALBERT L. HENNE

Extraction of krypton and xenon from air and from gases dissolved in water. GEORGES CLAUDE. *Compt. rend.* 187, 581-5(1928).—The recovery of Kr and Xe from air in com. liquefaction of air and from gases dissolved in water is discussed. Gases taken from great depths will be examd. In the recovery from air the ratio of Kr: Ne remains the same as in the original air notwithstanding the difference in volatility. L. D. ROBERTS

Dust filtering. F. HOYER. *Chem. Rundschau* (Budapest) 5, 1-3(1928).—Two methods for dust filtration are given: (1) arrangements on the principle of rapid change of area, to ppt. small flying particles, and (2) filtration arrangements for systems either under pressure or in evacuated areas. S. S. DE FINALLY

Filtration equations for compressible sludges. A. J. V. UNDERWOOD. *J. Soc. Chem. Ind.* 47, 325-9T(1928); cf. *C. A.* 22, 127.—"The resistance of the cloth" is defined as the resistance when the cloth is coated with a small quantity of sludge. Mathematical derivations for equations of the rate of flow are made for incompressible and compressible "elastic" and "inelastic" sludges. The "scouring" effect in the filtration of heterogeneous sludges is not yet proved since the errors introduced by neglecting the resistance of the cloth lead to similar results as those by assumption of scouring. A. FLEISCHER

Theory and practice of centrifugal separation. B. L. BROADBENT. *Chem. Age* (London) 19, 435(1928).—An abstr. of a lecture on uses and types of centrifuges. G. B. TAYLOR

Generation of electricity in benzine pipes, and the maximum permissible rate of flow in tap hose and pipes. BRUNO MÜLLER. *Apparatebau* 40, 266-8(1928).—The flow should not exceed 13 ft. per sec., but there is no danger of sparks with a tension below 300 v. J. H. MOORE

Amount of condenser water used in ice plants. J. HUBER. *Wochschr. Brau.* 45, 270-2(1928).—A practical discussion with equations is given on the efficiency of different types of condensers. A. SCHULTZ

Flow constants of IG-orifices for water, oil, steam and gas. R. WITTE. Ludwigshafen am Rhein, Germany. *Z. Ver. deut. Ing.* 72, 1493-1502(1928).—A summary of some 18 years' experience in measuring the flow of liquids and gases at the Oppau and Leuna works, where hundreds of metering operations are conducted daily on the most varied materials. The present differences obtained with carefully constructed orifices of several types are used as the basis of calcs. These new calibrations were undertaken because variations of 1 to 3% in results had been obtained by using the older values, and pipe sizes used had changed so much from those employed when the older const. were measured. Results are reported for (1) water in pipes of 50 to 500 mm. diam.; (2) steam in pipes of 50 to 500 mm. diam., and under pressure of 4 to 40 atm., at the same or higher Reynolds numbers (Reynolds number, R , = pipe diam. \times velocity/kinematic viscosity); (3) viscous liquids and air in the region of smaller Reynolds numbers than with water. By the use of 51 curves and diagrams results are reported in detail. An accuracy of $\pm 0.5\%$ is attainable, if due attention is given to pipe diam. and the form of the orifice. For one and the same throttling diaphragm and for different media the mechanics is the same, but this is not the case if one changes over from one pipe size to another. From the experimentally detd. const. and their curves as given values can be found for computing the flow of gases and liquids in pipes of from 50- to 500-mm. diam.

W. C. EBAUGH

Breakdown of oil and high-tension cables. A. GYEMANT. Siemens Schuckert Werke, Gartenfeld. *Z. tech. Physik* 9, 398-404(1928).—The theory of G. on elec. breakdown due to the mech. rupture of the dielec. medium by charged material from the electrode surface with consequent breakdown channel formation is discussed further. It is assumed that gas residues on the electrodes are always present; they ionize if sufficient potential is applied, contract locally to small charged bubbles and finally overcome the cohesion resistance of the oil (or other material). Theoretical considerations on various kinds of stretching of the charged bubble lead to an approx. result for the breakdown potential $F = \sqrt{(10\pi/3)[(\gamma/a) + (2np/3)]}$ with γ the surface tension about 20, a the bubble radius of 10^{-3} , n a factor detg. the shape of the stretched bubble, depending on viscosity η possible = k/η and equaling about 0.03, p the external pressure of 10^{-6} in abs. units. For semisolid cable insulation, paper impregnated with oil, the energy necessary for the fiber sepn. is additional and $F = \sqrt{(10\pi/3)[(\gamma + 0.15K\lambda)/a + 2/3np]}$ with $K\lambda$ the energy required of about 10^2 ergs (K is elastic strength, λ of molecular dimensions). Quant. comparison with practical figures is quite satisfactory, e. g., for $\gamma = 20$ dynes per cm., $a = 10^{-3}$, F is found 150 kv. For "moist" oils a different mechanism of breakdown is obviously required; the theory holds only for dry oils. The temp. influence on F can be found from γ and a as functions of t and gives approx. F^2 proportional to $1 - 0.005 t$. Equally good results are found for the pressure influence on F and for the viscosity. From the theory it is explained why F for treated paper is higher than for paper or oil themselves, because of the additive energy effects. A further approximation for F gives $F^2 = (10\pi/3)[(\gamma + 0.15 K\lambda)/a]$. More study of λ is required; it depends on the fiber size; γ and $0.15 K\lambda$ are of the same order of magnitude.

B. J. C. VAN DER HOEVEN

Ultra-violet light and its application, with special regard to the tanning industry. GIACINTO BALDRACCO. Nat. Inst. for the Leather Ind., Turin. *Boll. ufficiale staz. sper. ind. pelli mat. concianti* 6, 244-58(1928).—The elementary facts are given on the character of ultra-violet light, and its application in science and industry is discussed. Tanning exts., when irradiated with ultra-violet rays, can be distinguished by the difference in fluorescence.

G. SCHWOCH

Utilization of volcanic power. A. RITTMANN. *Naturwissenschaften* 16, 797-800 (1928).—Efforts in Italy, California and the Dutch Indies to utilize high-pressure steam from fumaroles are described. A purification process has to be employed to eliminate the corrosive gases. The steam collected is of up to 14 atm. pressure. B. J. C. v. d. H.

The electric insulator industry in Germany. SCHUL OTTO. *Rev. gén. mat. plastiques* 4, 719-25(1928).—An outline of developments in this industry in Germany since the war, particularly as regards the manuf. of papers impregnated with artificial resins, etc.

A. PAPINEAU-COUTURE

Tests for molded synthetic resin insulators. H. S. *Rev. gén. mat. plastiques* 4, 730-2(1928).—An outline of the methods recommended by the Union des Syndicates de l'Electricité and the French public services for the detn. of surface resistance, transverse resistance, dielec. resistance, difference in phase angle, dielec. const., tensile strength, bending strength, compressive strength, hardness, resistance to shock, effects of water and heat treatment.

A. PAPINEAU-COUTURE

Effects of high temperatures on impregnated and non-impregnated in

J. MÜLLER AND C. H. MÖLLERING. *Leipzig Monatschr. Textil. Ind.* 43, 33. Cotton tapes, non-impregnated and impregnated (I) with yellow linseed oil insulation varnish in naphtha, (II) with "Endolack," a prepn. contg. rosin dissolved in alc., and (III) with "Votalack," a prepn. of stearin and asphalt dissolved in ligroin, were given phys. tests before and after heating for prolonged periods in an oven. The effect of 48 hrs.' heating at 150° on the non-impregnated material was a slight gain in strength. Each of the treated tapes was stronger before heating than the raw material, and tapes treated with I and III showed a further gain in strength on heating. The rosin prepn. (II) apparently caused a slight loss in strength on heating, possibly due to phys. changes in the impregnating material. Heating for 96 hrs. at 150° caused a small loss in strength of all the tapes, with the greatest loss shown by the tape treated with II. Tests made at 135° showed general stability for all the tapes except those prepd. with II. Another series of tests with III, "Votalack," showed no loss in strength in 96 hrs.' heating at 100° but did show losses of 4-5% at 130°. Tests made by heating in an atm. of N₂ gave substantially similar results.

E. R. CLARK

Physiological factors of mine ventilation. R. R. SAYERS. *Bur. Mines, Circ.* No. 6089, 16 pp. (1928).—Data are presented in which recent investigations on the physiol. effects accompanying silicosis and experienced in the presence of high temps. and poisonous gases peculiar to mines, are given consideration. The improvement in health which ensues when siliceous dust is reduced to 5 g. per cu. m., is emphasized. The beneficial effects of air-conditioning in mines is stressed, and figures are furnished showing the physiol. effect of high temps. upon workers. The toxicol. symptoms of lethal gases accumulating in mines and other insufficiently ventilated sources have been studied and blood tests have been made. The employment of a recorder for CO is described, with results obtained by use of this device. The treatment of CO poisoning is discussed. The work is comprehensive and references are given.

FREDERICK G. GERMUTH

Occupational diseases caused by the handling of hydrocarbons and their principal derivatives. DUVOIR. *Ann. méd. légale criminal. police sci.* 8, 453-501 (1928).—A review dealing with intoxication by means of benzene and petroleum hydrocarbons and their Cl and NO₂ derivs., PhNH₂ and its derivs., pitches, tars and bitumens, more particularly from the medico-legal standpoint.

A. PAPINEAU-COUTURE

Some queries about respiratory disease in industry. R. M. HUTTON. Ontario Dept. of Health, Toronto, Canada. *J. Ind. Hyg* 10, 297-304 (1928).—Analysis of data to answer these queries shows that dust is the determining factor; that with some exceptions the metal dust causes high mortality and that brass and iron foundrymen and especially the grinders in the cutlery trades have the highest mortality of all. The organic dust trades do not show similar effects.

H. C. HAMILTON

Bituminous compositions for electrical insulation (Brit. pat. 290,886) 22. Formation of porous castings from carbamide-formaldehyde condensation products [for insulators] (Swiss pat. 120, 827) 18.

Die chemische Industrie des deutschen Reiches, 1928-29. 5th ed., revised and enlarged. Berlin, W. 35: Verlag für Borsen und Finanzliteratur A.-G. 11, Steglitzer Strasse. Reviewed in *Chem. Trade J.* 83, 319 (1928).

Weltadressbuch der Chemischen Industrie. Vol. I. Berlin: Union deutsche Verlagsgesellschaft. 696 pp. Reviewed in *Chimie et industrie* 20, 803 (1928).

HOLLAND, MAURICE AND PRINGLE, HENRY F.: **Industrial Explorers.** New York: Harper & Brothers. 347 pp. \$3. Reviewed in *Eng. Mining J.* 126, 989 (1928).

SOMMERFELD, ARTHUR: **Gummifreie Isolierstoffe.** Berlin: Julius Springer. 103 pp. Reviewed in *Plastics* 4, 387 (1928).

Gas mixtures. UNION PROCESSES, INC. Swiss 126,814, Sept. 6, 1926. A gas mixt. is resolved into its components by a liquid which absorbs some in larger quantities than others.

Separation of gas mixtures. MATHIAS FRÄNKEL. Swiss 126,906, Jan. 12, 1926. A system of cold chambers through which the gas is passed is described.

Cooling, liquefaction and separation of gases. ARTHUR SELIGMANN. Ger. 466,133, Oct. 30, 1924. See U. S. 1,573,752 (*C. A.* 20, 1478).

Apparatus and system for separating methane from natural gas or other gases from mixtures by regulated liquefaction. WM. S. BOWEN. U. S. 1,694,308, Dec. 4.

Distillation and evaporation. I. G. FARBENIND. A.-G. Fr. 640,710, Sept. 9,

1927. Substances such as tar oils or salts which are difficult to distil or evap. are projected by means of a disk rotating at a high speed against the heated sides of a distn. vessel so that they vaporize in thin layers. The disk may be mounted obliquely and rotate on 2 axes. Substances of low b. p. may be added to the liquid to be distd.

Purification of oils. AKTIEN-GESELLSCHAFT FÜR KOHLENSAURE-INDUSTRIE and ERNST B. AUERBACH. Fr. 640,022, Aug. 25, 1927. See Brit. 285,064 (C. A. 22, 4678).

Solvents and emulsifying agents. FRIEDRICH POSPIECH. Can. 284,847, Nov. 13, 1928. Solvents and emulsifying agents for liquid and solid substances which are themselves insol. in water, as for instance oils, fats, mineral oils, hydrocarbons, waxes and the like, are obtained if aromatic or aliphatic alcs. which are difficultly sol. or insol. in water, are treated either by themselves or in combination with hydrocarbons, with the alkali salts of fatty acids, sulfo fatty acids, or naphthenic acids, also with sulfonates or aromatic or hydroaromatic hydrocarbons or their derivs. as well as also with the corresponding free acids.

Concentrating by freezing. SOCIÉTÉ DES ÉTABLISSEMENTS DAUBRON. Fr. 640,857, Feb. 22, 1927. In concg. a liquid by freezing out the water contained therein, the liquid is filtered from the snow crystals through a wall at the base, the upper portion of the snow being gradually heated so that water replaces the liquid and the filtering can continue.

Delivering liquids in measured quantities. SOC. HARDOLL ANCIENS ÉTABLISSEMENTS HARIVEAU & DOLMIER & RENÉ PORTE & CIE RÉUNIES. Austrian 109,367, Dec. 15, 1927. Constructional improvements are described in the means for operating the control valve of a device of the type comprising 2 alternately filled and emptied measuring vessels.

Drying and transporting materials. INTERNATIONAL CEMENT-GUN COMPANY G. M. B. H. Fr. 640,424, Sept. 3, 1927. Substances such as NH_4Cl are caused to descend from one level to the next in a vessel under pressure in which leveling scrapers are caused to rotate and meets a counter current of warm air under pressure to which neutralizing acid gases may be added.

Working medium for vapor engines. SIEMENS-SCHUCKERTWERKE A.-G. (Wilhelm Gumz, inventor). Ger. 467,664, Mar. 11, 1927. α -Methylnaphthalene, alone or mixed with β -methylnaphthalene, is used.

Method for preheating water by steam to a predetermined temperature. I. G. NORKIN. Russ. 4655, Feb. 29, 1928.

Grading materials. KRUPP, F., GRUSONWERK A.-G. Fr. 640,624, Aug. 12, 1927. Materials such as crude mining products are graded according to their phys. properties by submitting the material, piece by piece, to radiant energy such as electromagnetic waves, heat rays, infra-red, ultra-violet, Röntgen or cathode rays. The rays emitted from the piece by reflection are directed towards a wave detector, thermoelectric element, etc., which controls an app. for directing the pieces in different directions.

Sublimation of sulfur and other substances. J. THAME. Brit. 290,849, June 23, 1927. In effecting sublimation of S or other volatilizable substances, the substance is introduced in small quantities into a vaporizing retort and the vapor is conveyed by suction or by a current of an inert gas to a cooled condensing chamber fitted with scrapers to remove the deposit from its walls and to convey it to discharge orifices which may be provided with air-locks. Various details of app. are described.

Coating wire or bands, etc. INTERNATIONAL GENERAL ELECTRIC CO. Brit. 290,252, May 11, 1927. A wire, band or the like being coated is drawn through a receptacle contg. roughened balls which may be formed of glass, while the coating material is caused to flow through the receptacle (preferably in opposite direction to that in which the wire is drawn). The process is suitable for enameling elec. conductors.

Preventing formation of hard incrustations from liquids, particularly boiler incrustation. ENGELBERT JUNGBLODT. Ger. 467,625, July 28, 1925. The liquids are subjected to the action of radioactive substances during heating, so that the deposits sep. in slimy form. E. g., radioactive substances may be applied to the surface to be protected.

Removing cores from a series of vertical molded hollow bodies. ALFRED PRETSCH. Ger. 466,149, Aug. 3, 1926. The cores are joined at their ends by a bridge piece and are withdrawn from the molds, which stand on a common base, by suitable gripping mechanism.

Recovery of fibers from waste liquids. ADOLF M. R. KARLSTRÖM. Fr. 640,568, Sept. 6, 1927. Fibers such as those in waste wood-pulping liquids are recovered by aspirating the liquid mixed with air or gas upwardly into a conical vessel in such a way

that the fiber is carried to the top because of the bubbles of air and is there collected, while the liquid is collected at the base.

Preserving cut flowers, fruit and vegetables. MARIA GARZULY. Austrian 100,411, Dec. 15, 1927. The flowers, etc., are kept in a 0.24 *N* soln. of glucose prior to refrigeration.

Disperse systems. CARL A. AGTHE (to J. R. Geigy S. A.). U. S. 1,696,374, Dec. 25. Material to be emulsified by dispersion such as fish oil, pitch or cresol is mixed with both sulfite cellulose lye and colloidal silica.

Refrigerating apparatus. FRANZ GÄDEKE and WILHELM HENNING. Fr. 640,256, Aug. 30, 1927.

Refrigerating apparatus. HANS HAAGER. Fr. 640,310, Aug. 31, 1927.

Refrigeration system and apparatus (utilizing shavings of solidified carbon dioxide to effect heat transfer through a sheet metal partition). CASSIUS C. PALMER. U. S. 1,695,292, Dec. 18. An app. is described.

Refrigerating system of the absorption type. ZEBULON WIRT. U. S. 1,694,156, Dec. 4.

Continuous-cycle refrigerating apparatus of the absorption type. ELECTROLUX, LTD. Brit. 290,207, July 26, 1926. The inert gas flowing from the absorber and the liquefied refrigerant flowing from the condenser to the evaporator are subjected in a "surface app." to the cooling action of the mixt. of refrigerant and inert gas flowing from the evaporator to the absorber.

Refrigerating system of the constant-pressure absorption type. BALTZAR C. VON PLATEN and CARL G. MUNTERS (to Electrolux Servel Corp.). U. S. 1,693,970, Dec. 4.

Refrigerating system of the reversing absorption type. G. MANSIO (to G. Beaumont) Brit. 290,585, May 13, 1927. The generator-absorber is charged with a soln. of NH_4NO_3 0.25, $\text{Ca}(\text{NO}_3)_2$ 0.7 and water 1 part. An app. is described.

Device for reversing vapor flow in absorption refrigerators. GASWERKSBAU- und MASCHINEN-FABRIKS A.-G. FRANZ MANOSCHEK. Austrian 109,216, Nov. 15, 1927. Constructional details.

Refrigerating system of the compression type. CLAUDE C. VAN NUYS (to Air Reduction Co.). U. S. 1,696,558, Dec. 25.

Refrigerating apparatus of the compression type. A.-G. BROWN, BOVERI, ET CIE. Brit. 290,216, May 9, 1927.

Refrigerating apparatus of the compression type. W. DUNKERLEY. Brit. 290,426, April 19, 1927.

Compression-type refrigerating system for freezing out constituents of oils, wines, etc. M. HIRSCH. Brit. 290,305, May 12, 1927. The app. is also suitable for freezing *peat* to facilitate subsequent drying.

Cable insulation, etc. TELEGRAPH CONDENSER CO., LTD., and S. G. BROWN. Brit. 290,699, Jan. 10, 1927. Spirally rolled condensers and the insulation of cables are divided into a plurality of layers by an isolated conducting sheet or sheets such that the voltage across each layer is below the level (about 300 v. for oil-satd. paper) at which breakdown may occur because of the ionizing action of the voltage assocd. with the air trapped in the material. The isolated layers may comprise "vegetable black" or other C.

Heat- and sound-insulation composition. P. H. USSING. Brit. 289,830, May 3, 1927. Straw is softened with NaOH, milk of lime or the like, washed and pounded and then treated with an Al salt and a sol. soap to ppt. an Al soap (preferably the stearate or resinate) on the fiber. The material is then formed into sheets on a wire screen, dried and pressed.

Apparatus for coating webs of fibrous material with mica for electric insulation. EMIL HASELEY. U. S. 1,696,397, Dec. 25.

14—WATER, SEWAGE AND SANITATION

EDWARD BARTOW

Analyses of the waters of the Salt Creek field applied to underground problems. J. S. ROSS and E. A. SWENDBERG. *Am. Inst. Mining and Met. Engineers, Tech. Pub.*, No. 157, 3 17(1928).—The compn. of water in wells drilled for oil is of importance in detg. the source of the water and the relations of the well to adjacent wells and formations. In the Salt Creek field, Wyoming, a fairly high degree of efficiency has been attained in the control of field operations by utilizing the information afforded by water

analysis. Extensive drilling operations may be avoided by a knowledge of the source of the water encountered.

L. W. RIGGS

Portable water purification in North America with special reference to chlorination. ORNSTEIN. *Gas u. Wasserfach* 71, 1081-3(1928).—A review of the necessity for chlorination and of the methods used. The possibility of destroying excess Cl with SO_2 is noted. O. notes that he installed the first chlorination equipment at Niagara in 1912. Since that time no corrosion phenomena due to chlorination have been noted. The chlorination app. itself has had no repairs outside of the replacement of a low-pressure manometer.

R. W. RYAN

Significance of the B. coli test for ground water and other sources of potable water. M. NEISSER. *Gas u. Wasserfach* 71, 1105-7(1928); cf. C. A. 22, 470.—A discussion of the significance of the usual tests for *B. coli* depending on indole formation. This test is of value for the individual source, provided that inspections of the source are made at least twice every week. It may be carried out by technicians and may give valuable warning, but should not be relied on to too great an extent. The danger of water contamination by men repairing breaks in mains is pointed out.

R. W. RYAN

The determination of the bacterial count of water. W. PLUCKER and W. BARTELS City Food and Res. Lab., Solingen. *Z. Untersuch. Lebensm.* 55, 51-60(1928).—A medium consisting of 5% gelatin and 0.75% agar gave results fully equal to those obtained with nutrient gelatin. The highest bacterial counts were obtained when the media were standardized at p_{H} 7.

C. R. F.

Boiler-feed water treatment advances toward status of exact science. J. A. HOLMES. *Chem. Met. Eng.* 35, 695-6(1928).—Modern equipment in the boiler plant makes desirable the use of frequent chem. tests for the control of both water treatment equipment and the condition of the water in the boiler. Simple test kits suitable for use in the boiler house itself are available.

R. E. GREENFIELD

Origin and prevention of corrosion in boilers. P. WIEGLEB. *Chem.-Ztg.* 52, 922-3(1928).—Descriptive.

ALBERT L. HENNE

Corrosion and corrosion protection as related to the chemical and physical characteristics of water. L. W. HAASE. Berlin-Dahlem. *Gas u. Wasserfach* 71, 1009-16(1928).—The modern theory of corrosion is reviewed with special attention to corrosion by CO_2 and methods for its removal. Removal of free or aggressive CO_2 is best accomplished by lime water as marble does not neutralize much of the bicarbonate acidity on account of the slight soly. of $\text{Ca}(\text{HCO}_3)_2$, while lime water forms the normal carbonate. Under favorable conditions of low salt content and temp., and with suitable mech. arrangements, spraying in air will remove all but 3 to 5 mg. of CO_2 per l. This should precede lime treatment in water containing much CO_2 . The formation of a protective coating on cast iron in the presence of O is noted unless the water was too alk. Addns. of Cl to a water disturbs the CO_2 equil. and may cause the formation of aggressive CO_2 , and should precede the lime treatment. Agents for destroying Cl form HCl, upsetting the CO_2 equil. Pure waters such as rain water have a "salt hunger" and may take up Pb. Fe oxide particles act as centers for the deposition of Ca carbonate from water treated with lime and supersatd. with CaCO_3 . High salt content increases the apparent soly. of the CaCO_3 , thus preventing the formation of a coating. Treated waters form more adherent coatings than natural waters because of the formation of larger crystals of CaCO_3 . The addn. of lime water to waters contg. CO_2 has satisfactorily reduced corrosion.

R. W. RYAN

Tests of the Remscheid system for protecting pipe. THIESING and L. W. HAASE. Preuss. Land. für Wasser-, Boden-, und Luft-Hygiene, Berlin-Dahlem. *Gas u. Wasserfach* 71, 961-4, 988-95(1928).—Very complete tests were made of the Bücher system for protecting iron pipes from corrosion by water contg. excessive amts. of CO_2 . Sufficient lime water prepd. from hydrated lime was added to convert all of the CO_2 and bicarbonate to carbonate. In the presence of O a protective layer was quickly formed. After the initial period, in which an excess of lime was used, the hardness of the water was increased only 0.5 mg. CaO per 100 cc. H_2O . Such coatings are formed on cast iron, zinc or lead but on steel the protective coating is only formed in electronegative places. The Fe content of the treated water from various parts of the system averaged less than the untreated water and the taste, odor and color of the water was satisfactory.

R. W. RYAN

New sewage works, Chesterfield (England). S. THORNHILL. *Munic. Eng. Sanit. Record* 81, 506(1928).—The total area drained is 8468 acres. The detritus tanks hold 84,000 gal. Heavy solids are removed by mech. dredgers. The sewage is then screened, where mech. rakes remove the garbage and floating matter. It passes through a narrow 800-ft. channel, provided with a weir for 3 times dry weather flow to 9 pre-

liminary settling tanks, total capacity 375,000 gal., where most of the remaining solids are removed. The 3 aeration tanks are each 242 by 87 ft. divided into 14 longitudinal channels and have a total capacity of $1\frac{1}{2}$ million gal. at 4 ft. depth. The sewage is agitated by 10 ft. paddle wheels. The sludge from the final settling tanks is pumped back to the aeration tanks for recirculation. The 39 sludge beds (sludge lagoons), total area approx. 16,000 sq. yd., are allowed 1 hr. settlement. The top water is drawn off to the sludge level, while draining, by means of sluice boxes, and the sludge allowed to air-dry.

C. H. BADGER

Sewage purification plant at Sedgley (England). A. E. DICKS. *Munic. Eng. Sanit. Record* 81, 467(1928).—Sewage received at the Beacon Hills disposal works in detritus tanks is screened before exit. Up to 3 times dry weather flow is taken to 3 sedimentation tanks, then to dosing tanks supplying 4 bacterial filter beds made of cold blast slag, each 60 ft. diam. with revolving pipe arm sprinklers, underdraining to a central well. The humus in the filtrate settles in 2 humus tanks, the effluent going into Tipton Brook. Between 3 and 6 times dry weather flow goes to storm tanks, over 6 times dry weather flow directly to the brook. Heavy settling from the detritus tanks is buried. Sludge is air-dried and sold. Humus is dug into land. The Upper Gornal Works and Lower Gornal Works are similar in equipment. Estn. of cost works is £104,200.

C. H. BADGER

Sewage-treatment works of the Sanitary District of Chicago. F. W. MOHLMAN. *Chem. Bull. (Chicago)* 15, 359-61(1928).—The sewage-treatment works of Chicago comprise 3 small Imhoff-tank-trickling filter plants at Morton Grove, Glenview, and Northbrook; the Des Plaines River activated-sludge plant for 60,000 population; the Calumet Imhoff-tank plant for 225,000 population; the North Side activated-sludge plant for 800,000 population and the West Side Imhoff-tank plant for 1,850,000. The Des Plaines and Calumet plants have included large exptl. units for research on sludge drying, handling and secondary sewage treatment. Excess activated sludge from the North Side plant is pumped to the West Side plant where it will be digested with fresh solids in the Imhoff tanks. The West Side plant is now under contract and will be in operation by 1930.

W. D. HATFIELD

Design of sludge-digestion tanks. RICHARD H. GOULD. *Proc. Am. Soc. Civil Eng.* 54, Pt. 1, 2655-65(1928).—After a brief review of the development of sep. sludge digestion, and the recent work on temp. and reaction control, a description is given of some existing sludge-digestion tanks and 6 new sep. sludge-digestion tanks which are utilizing the recent data on capacity, gas collection, temp., reaction control and stirring or recirculating devices.

W. D. HATFIELD

Submerged contact aerators for sewage treatment. KARL IMHOFF. *Surveyor* 74, 421(1928).—Advantages of submerged contact aerators are small area, small construction cost and simplicity, less affected by poisonous industrial wastes than the activated sludge process. Biochem. O demand by use of submerged contact aerators at 7 plants was lowered 27-69%. The quantity of air needed for this process is about 0.2 cu. ft. per gal. sewage when the detention period is from $\frac{1}{4}$ to 1 hr. The process depends on microorganisms which must be regularly removed from the contact material.

A. L. E.

Alkaline digestion of sewage grease. S. L. NEAVE AND A. M. BUSWELL. III. State Water Survey Div. *Ind. Eng. Chem.* 20, 1368-9(1928).—In the acid phase of digestion, the quantity of grease in sewage sludge decreases during anaerobic digestion, the principal products being lower fatty acids and CH_4 . Eighty lab. tests show that alk. digestion mixts. also affect the degradation of grease and soap with CH_4 production. Values between p_H 7.2 and 7.6 were maintained throughout the digestion period. The transformation of Na salts of formic, acetic, propionic, butyric, valeric and oleic acids, Ca acetate and oleate and glycerol by alk. digestion gave yields of CH_4 varying from 50 to 67%. Normally 1 g. of fatty acid undergoing decompn. required from 25 to 40 mg. of solid nitrogenous substances to supply the metabolic needs of the organisms. With the exception of formic acid and AcOH , 1 g. of fatty acid yielded approx. 1 g. of CH_4 . High temps. (37°) favor the digestion of sludge components other than grease more than grease itself.

C. R. F.

Dissolved-oxygen absorption test. III. E. A. COOPER AND S. D. NICHOLAS. *J. Soc. Chem. Ind.* 47, 320-2T(1928); cf. *C. A.* 21, 2520; 22, 472.—Additional expts. confirm the accelerating effect of Na permolybdate solns. on the rate of dissolved-oxygen absorption by sewage effluent. Increased O absorption is due to stimulated bacterial activity and to direct chem. oxidation induced by the permolybdate. Carbohydrates, glycine, and sometimes NH_4 salts undergo oxidation in aq. soln. in the presence of the permolybdate activator. Fatty acids and urea are unaffected. The active substance

has not yet been isolated. Permolybdate made from molybdic acid is most reliable.
EDWARD BARTOW

The development of housing areas in Dublin. P. E. MATHEWS. *Munic. Eng. Sanit. Record* 81, 545(1928).—Condemnation procedure is described. A water main and an elec. cable are laid in each pathway, crossing under the carriage way at the junction of roads. Sewers are also laid in the pathway where the road is not about to be constructed and the positions of the house drains are unknown. A min. pressure of 30 lb. per sq. in. is provided by the water supply system which consists of a network of 4 in. diam. pipes connected to mains surrounding or running, if necessary, through the area. Sewers are built large enough to allow for an av. daily water consumption of 80 gal. per head per day together with a max. rainfall of 1 in. in 3 hrs. The smallest sewers laid are 9 in. diam. Larger sizes are seldom used except where 2 or more large areas join together. Overflow weirs can be regulated to allow not more than 3 times dry weather flow to enter the city sewers.
C. H. BADGER

Water supply in shale retorting (McKee, Parker) 22. Industrial viewpoint of the phenol waste disposal problem (Marquard) 21. Goiter and water supply (Wagner-Jauregg) 11G. Apparatus for supplying boiler feed water in regulated quantities regardless of variations in level in the supply tank (U. S. pat. 1,695,471) 1. Preventing formation of hard incrustations from liquids, particularly boiler incrustation (Ger. pat. 467,625) 13.

Purification of water. RUDOLF ADLER. Swiss 126,829, Mar. 12, 1927. Stagnant water is freed from germs by free Cl or hypochlorite and filtered through a C mixt.

Treating water with chlorine. J. MUCHKA. Brit. 290,166, May 7, 1927. Free Cl is sepd. from chlorinated water by passing it through C or carbonaceous material in an app. which may be provided with a jet reflux device similar to that of a sand filter. The app. may be lined with "bakelite" or similar material.

Nozzles for distributing water in cooling towers. P. J. ROBINSON and A. T. J. GUERITTE. Brit. 290,553, Jan. 10, 1927. Structural features.

Portable water filter with upper and lower compartments and an intervening filter plate. ALBERT E. JERVIS. U. S. 1,696,487, Dec. 25. Structural features.

Tank and associated apparatus for deactivating water by use of steel chips or turnings, etc. FRANK N. SPELLER. U. S. 1,696,106, Dec. 18. Structural features.

Artificial ferruginous mineral waters. SCHERING-KAHLBAUM A.-G. and W. SCHOELLER. Brit. 290,516, Nov. 17, 1927. Ferrous salts together with substances evolving CO₂ are dissolved in water which may have been previously boiled (or water already charged with CO₂ may be used).

Brine tank construction for water softeners. ORLAND R. SWEENEY (to Ward-Love Pump Corp.). U. S. 1,693,829, Dec. 4.

Tanks and circulating systems for softening water by chemical reagents. JAMES E. TREWHITT and PURLEY E. HILLERY (to Oakland Calif. Towel Co.). U. S. 1,696,369, Dec. 25.

Water-softening material. ELI W. SHAWEN and ALBERT C. ARNETT. U. S. 1,693,873, Dec. 4. Pieces of clay or other similar suitable porous vitreous material are treated with NaHCO₃ and acid, heated to about the temp. of fusion and while hot are treated with NaCl.

Water-softening material. ROY C. TELLIER (to R. H. Molitor). Can. 285,044, Nov. 20, 1928. A water-softening material is prepd. from natural clay, consisting essentially of Al silicate, and having in admixt. therewith a greater or less proportion of compds. of more electropositive metals such as the alkali metals K or Na, or alkali earth metals Ca or Mg (these existing as double silicates of Al or other metals). These double silicates are often zeolitic and have exchange properties. The clay is subjected to a soln. of the salt of an alkali metal; then it is dried and hardened by exposure to an atm. contg. CO₂ and at a temp. not exceeding 100°. The material is baked at a temp. of approx. 700° in the presence of an atm. contg. CO₂ and the baked material is subjected to the action of a soln. of an alkali metal.

Water-softening material. ROY C. TELLIER (to R. H. Molitor). Can. 285,045, Nov. 20, 1928. A clay contg. a substantial proportion of alk. earth is treated with a soln. contg. an alkali metal compd., dried and hardened by exposure to the atm. The hardening operation is completed by heating the material to a temp. below 100°, and in the presence of a gas relatively rich in CO₂, and baking the dried material at a temp.

not over 700°, and the baked material is treated with an aq. soln. of a saline compd. of an alkali metal.

Base-exchange compound. HAROLD J. WHEATON (to American Doucil Co.). U. S. 1,694,155, Dec. 4. A base-exchange compd. insol. in water, of great porosity and absorptive power, has a compn. between $Al_2O_3 \cdot 4 Na_2O \cdot 8 SiO_2$ and $Al_2O_3 \cdot 6 Na_2O \cdot 14 SiO_2$.

Base-exchange water softener apparatus, and "salt-pot attachment." CHESTER T. MCGILL (to Reiter Co.). U. S. 1,694,332, Dec. 4.

Apparatus for softening water by use of base-exchange substances. C. HUF-SCHMIDT. Brit. 290,064, July 5, 1927.

Apparatus for softening water by treatment with zeolites. CHARLES P. EISENHAUER. U. S. 1,695,541, Dec. 18.

Apparatus for softening water by treatment with zeolites. CHARLES P. EISENHAUER (to The Duro Co.). U. S. 1,695,542, Dec. 18.

Treatment of boiler water. RALPH E. HALL (to J. M. HOPWOOD). Can. 284,637, Nov. 6, 1928. To inhibit foaming in steam boilers an antifoaming substance such as tannic or gallic acids or their compds. or decompn. products, pyrogallol, or tartaric or citric acids or their compds. or decompn. products is maintained in the water. Other antifoaming substances include alk. earth metal, hydroxyl and an org. substance having an antifoaming effect like that of the tannins; an alcohol, particularly monohydric alcohol; a wax as beeswax, carnauba wax, Chinese insect wax, spermaceti, wool fats or lanolin; oils as sperm oil, arctic sperm oil, castor oil, shark oil, cottonseed oil, corn oil, wheat oil; cholesterol; or sterol-contg. glucosides as found in various tree barks or roots. The antifoaming substance depends on the boiler water used.

Gravity pressure system and apparatus for continuous chemical treatment of boiler water while the boiler is in operation. CHESTER T. MCGILL (to Reiter Co.). U. S. 1,694,331, Dec. 4.

Prevention of scale and corrosion in boilers. SOCIÉTÉ DES PERFECTIONNEMENTS APPLIQUÉS À L'INDUSTRIE. Fr. 640,465, Feb. 10, 1927. See Brit. 285,057 (C. A. 22, 4695).

Preventing boiler incrustation. GIULIO CRAVICH. Austrian 109,461, Dec. 15, 1927. A device is described for causing a small current of water to pass from the boiler-feed pipe through a vessel contg. a suitable reagent and to return, charged with reagent, to the main stream.

Boiler-cleaning apparatus with special alloy parts. WHITEMORE, HULBERT, WHITEMORE & BELKNAP. Brit. 290,924, Dec. 13, 1927. Part of a swivel tube which is journaled in the stationary head of a blower app. is formed of corrosion-resisting metal such as bronze contg. Cu 88 and Sn 12% or an Fe-Cr alloy contg. 12-30% Cr with C under 0.5% and in some cases Ni and Si up to 1.25-1.50%. Various structural features are specified.

Removing boiler incrustation. AUGUSTE BAUMGARTNER. Swiss 126,044, Jan. 17, 1927. The incrustation is treated with NaOH soln. and then heated by a burner to disintegrate it.

Scale remover. HERMANN KOPPLINGER. Can. 285,449, Dec. 11, 1928. Preparations for preventing scale and for removing incrustations already formed consist of mixts. of a resinous substance forming a highly disperse system with the water by reason of the presence of protective colloids, and additions substantially insol. in water but volatile with water vapors. E. g., (1) powd. colophony (100 parts) is intimately mixed with 4 parts of resin soap and 10 parts of essential oils. (2) Raw turpentine (100 parts) is mixed with 100 parts of more or less saponified pitch resin. (3) Elemi balsam of Manila (100 parts) is mixed with 10 parts of essential oils.

Screening sewage. KARL IMHOFF. U. S. 1,696,846, Dec. 25. A screen is exposed to sewage and passage of the sewage through the screen is prevented until a filter of sludge forms on the screen; sewage is then allowed to pass through the screen and the sludge is then removed from the screen. An app. is described.

Settling and filtration system for sewage disposal. GEORGE G. SMITH. U. S. 1,695,669, Dec. 18.

Plant for treatment of activated sludge. FRIEDRICH STERP and FERDINAND FRÄN-SEMIER. Ger. 466,024, Mar. 18, 1928. A settling space and an aerating space are sepd. by a movable wall.

Refuse incinerator or destructor. G. WATSON. Brit. 289,948, Feb. 3, 1927. Structural features.

15—SOILS, FERTILIZERS AND AGRICULTURAL POISONS

J. J. SKINNER

Methods for the examination of soils. J. A. PRESCOTT AND C. S. PIPER. Univ. of Adelaide, South Australia. *Australia Council Sci. Ind. Research, Pamphlet No. 8*, 52 pp.(1928).—Field methods, the prepn. of sample, mech. and chem. analyses and lab. examns. required for soil surveys are described. Under chem. analysis, which occupies the major portion of the pamphlet, are included soil carbonates, ferric oxide and titanium dioxide, Mn oxide, Fe, Al, Ca and Mg, potash and phosphoric acid, citric acid extn., replaceable bases, H_2O -sol. salts, total N, N as nitrate and NH_3 , org. C. and humus and the electrometric and colorimetric detns. of H-ion concn. E. F. SNYDER

Ogle County soils. R. S. SMITH, O. I. ELLIS, F. F. DETURK, F. C. BAUER AND L. H. SMITH. Ill. Agr. Expt. Sta. *Soil. Rept.* 38(1928). **Logan County soils.** R. S. SMITH, E. E. DETURK, F. C. BAUER AND L. H. SMITH. Ill. Agr. Expt. Sta. *Soil Rept.* 39(1928).—The soils of each county are described and mapped. Chem. analyses of the principal soil types are given, together with data secured in pot and field tests with fertilizers. J. J. SKINNER

Soil fertility experiments on Volusia and Westmoreland soils. J. W. WHITE AND F. D. GARDNER. Pennsylvania Agr. Expt. Sta., *Bull.* 229, 31 pp.(1928).—Commercial fertilizer and stable manure reinforced with superphosphate produced a pasture completely free from weeds. J. J. SKINNER

The nitrogen content of Red River Valley soils. J. H. ELLIS AND W. SHAFER. Manitoba Agr. Coll., Winnipeg, Man. *Sci. Agr.* 9, 231-48(1928).—A reputation for high N content has long been ascribed to Red River Valley soils of Manitoba. The early work leading to this reputation is reviewed. The present work shows that the reputation is justified. During a traverse across the Red River Valley to establish the soil types it was observed that all the soils examd. were clay soils, and (with the exception of the soils of the depressions and wet meadow lands) all these soils showed dark intrusions of surface material extending from the surface into the underlying horizon. The N content of these tongued intrusions, and that of the normal profiles were detd. from the analysis of vertical sections through the profiles of 4 different virgin soils. The total N content in the tongued intrusions was higher than that in the normal profiles. The case of Selkirk soil analyzed by Lawes and Gilbert, which showed exceedingly high N content, is presumed to have been taken from tongued intrusions. Nevertheless evidence is given which shows the tongued intrusions in the Red River soil series may have a higher total N content even than that reported by these authors. The cause of the tongued intrusions in the Red River Valley soils is the cracking and opening up of the highly colloidal clay soils through shrinkage during relatively dry periods. These fissures or openings become filled with surface soil and org. material through the action of wind, rains, etc. The dark-tongued intrusions in these soils are shown to be of different forms, depending upon the phys. properties of the soil material. A peculiar broad and relatively shallow type of tongued intrusion, coexistent with a highly developed hummock condition of the surface is shown to have been caused by differential shrinkage and expansion where the profile was composed of clay underlaid by bedded very fine sandy clay. The effect upon the crop due to the peculiar soil heterogeneity described requires investigation. E. F. SNYDER

Soil moisture at permanent wilting of plants. F. J. VEIHMEYER AND A. H. HENDRICKSON. Univ. of California. *Plant Physiology* 3, 355-7(1928).—Although the residual moisture content of some soils at permanent wilting shows close agreement with Briggs and Shantz' ratio of 1.84, which is obtained by dividing the "moisture equiv." of the soil by the percentage of moisture in the soil at permanent wilting, the general use of this ratio for all soils is open to criticism. The exptl. data of V. and H. indicate that the quantity of water available for plant growth cannot be detd. by the "moisture equiv." alone. For accurate work the quantity of readily available moisture can be obtained only when the residual moisture at permanent wilting is known, because the evidence points to the fact that plants are able to reduce the moisture content of different soils to different degrees of dryness before this stage of wilting is reached. W. T.

Statistics of the world production of the most important potassium, phosphorus and nitrogen fertilizers in the years 1925-1927. PAUL KRISCHE. *Ernähr. Pflanze* 24, 451-6(1928). LAWRENCE P. MILLER

Kosseir phosphorite. R. CHIAPPELLI. *Giorn. risicoltura*, 13, 156-60(1928).—Of Egyptian origin and contg. 30% P_2O_5 and 12.50% $CaCO_3$, this rock is finely ground and used especially on Italian soils with an acid reaction. Plot tests with rice on such

soils show the phosphorite in general gives better results than superphosphate, either when they are used alone or when mixed with manure.

ALBERT R. MERZ

Simple and rapid analytical methods for the analysis of insecticides and fungicides.

II. **Titrimetric determination of copper in the presence of iron, arsenic and mercury.** J. BODNÁR AND S. TERÉNYI. *Kísérlet Közlemények* 30, 449-66(1927).—Zecchini's method (*Z. anal. Chem.* 58, 127(1919)) has been examd.; it gave good results, but the method of Bruhns (*C. A.* 13, 939; 15, 351) is better and faster. In the presence of Fe $\text{Na}_2\text{P}_2\text{O}_7$, Na_3PO_4 or H_3PO_4 and H_2SO_4 should be added to the soln. before titrating. If As is present some $\text{Fe}_2(\text{SO}_4)_3$ soln., $\text{Na}_4\text{P}_2\text{O}_7$ and H_2SO_4 should be added. In the presence of Hg, hydroxylamine chloride should be used to ppt. Hg.

S. S. DE FINÁLY

Evaluation of insecticides. C. H. PEET. *Ind. Eng. Chem.* 20, 1164-5(1928); cf. *C. A.* 22, 4734.—Dependable detns. of insecticidal efficiency can be obtained by elimination of controllable variables. Details of the testing are given.

C. H. PEET

Earthworms as pests and otherwise. W. R. WALTON. *Bur. Entomology, U. S. Dept. Agr. Farmers' Bull.* 1569, 1-14(1928).—Earthworms can be eradicated on golf greens or lawns by the use of HgCl_2 , 0.04% aq. soln., for each 1000 sq. ft., followed by a liberal sprinkling of the area with H_2O . Dry *Ph arsenate* when mixed with dry sand or loam in the ratio of 1 lb. to 2 cu. yds., and dusted liberally over the affected areas, likewise proved efficacious. *Mowrah meal*, a product obtained from the madhuca tree in the E. Indies is an excellent vermifuge when fresh, but loses its potency with age and molding. It is applied at the rate of 15 lb. per 1000 sq. ft.; it is comparatively harmless to man, animals and grass.

C. R. F.

Soil and pasture in relation to pining and bush sickness of sheep (GRIMMET, SIMPSON) 12. Mineral content of pastures. Lime deficiency in King Country soils, and the effect on plant and animal (ASTON) 12. Extraction of sugar and K salts contained in molasses (GASPAR Y ARNAL) 28.

MEVIUS, WALTER: *Reaktion des Bodens und Pflanzenwachstum*. Vol. II. Edited by Boas, Neuberg and Rippel 153 pp. Freising-München: F. P. Datterer & Co. Reviewed in *Ecology* 9, 532(1928).

RAMANN, E.: *The Evolution and Classification of Soils*. Translated by C. L. Whittles. Cambridge: W. Hefter & Sons, Ltd. 128 pp. 7 s. 6 d., net. Reviewed in *J. Ministry Agr.* 35, 680(1928).

Fertilizers. VICTOR EHRLICH and STICKSTOFFWERKE A.-G. RUSE. Austrian 109,402. Dec. 15, 1927. Mixts. of CaCN_2 with superphosphate and other fertilizers are prep'd by drying the superphosphate, etc., and mixing it with CaCN_2 during cooling. A little oil may be added to the CaCN_2 to prevent development of dust.

Fertilizers. F. G. LILJENROTH. Brit. 290,518, July 12, 1927. In prep'd fertilizers contg. NH_4 phosphate by leaching crude phosphate with an acid such as H_2SO_4 or HNO_3 and adding $(\text{NH}_4)_2\text{SO}_4$ to ppt. CaSO_4 , the ppt. is washed with $(\text{NH}_4)_2\text{SO}_4$ soln. to recover the phosphoric acid which it contains. Various other details of procedure are specified also.

Mixed fertilizers. I. G. FARBENIND. A.-G. Fr. 640,263, Aug. 30, 1927. A very hot soln. of NH_4NO_3 contg. very little water is mixed with inorg. fertilizing salts, such as $(\text{NH}_4)_2\text{SO}_4$.

Phosphatic fertilizers. D. TYRER. Brit. 290,075, Aug. 2, 1927. Ca phosphate such as ground rock phosphate and K_2SO_4 or KHSO_4 are heated under reducing conditions, as with coal, and the product is treated with H_3PO_4 or other suitable acid or acid salt to decomp. the sulfide formed. The product may be further treated with NH_3 and various modifications of the process are described.

Insecticidal plant food or fertilizer. FREDERICK G. DOKKENWADEL (one-tenth each to T. W. Millner, V. R. Walley, B. M. Stevens, E. C. Fishel and J. E. Green). U. S. 1,696,709, Dec. 25. Cottonseed hulls are mixed with substances such as NaNO_3 , H_3PO_4 , KCl and H_2O .

Insecticides. BRITISH DYE STUFFS CORP., JAMES BADDILEY and ERNEST CHAPMAN. Fr. 640,736, Sept. 10, 1927. An insecticide contains among other ingredients a sulfonated petroleum and an alkylated sulfonated petroleum, particularly sulfonated petroleum condensed with isopropyl alc.

Insecticides. I. G. FARBENIND. A.-G. Fr. 640,782, Sept. 12, 1927. Alcs. or their derivs., such as Bu or Am or their acetates, to which Monopole soap, Turkey red oil or resin soaps may be added are used as insecticides.

Fungicides. G. OSVALD. Brit. 290,288, May 13, 1927. Seeds, plants, wood, etc., are treated with a disinfectant comprising fungicidal org. dyes which directly dye vegetable substances and which contain in the dye mol. poisonous components such as As, Hg, Cu or F. Dyes derived from *p*-phenylenediamine, benzidine and diaminostilbene may be used and may be admixed with diluents such as talc, magnesia, infusorial earth, etc., or with seed germination stimulants such as salts of K and Mg or Mn compds.

Fungicides for seed grain. I. G. FARBERNIND. A.-G. Brit. 290,364, Feb. 12, 1927. Substances such as chloro-*m*-cresol or nitrophenol-mercury compd. are brought into aq. soln. by use of an acid amide such as formamide, acetamide, urea or urethan.

Mixture for killing weeds. RALPH N. CHIPMAN. U. S. 1,694,205, Dec. 4. $\text{Ca}(\text{ClO}_3)_2$ and CaCl_2 are used together.

16—THE FERMENTATION INDUSTRIES

C. N. FREY

Modern factory methods of manufacturing absolute alcohol. G. SZELÉNYI *Magyar Mérnök Építészegylet Közlönye* 62, 41-49(1928).—The azeotropic mixt. of water-alcohol can be sep'd. by 4 physicochem. methods: (1) By either increasing or decreasing the pressure. The app. of Merriman (*C. A.* 7, 2546) works at 100 mm. Hg pressure. (2) By adding a 3rd material in order to form a compd. of a minimal b. p. with either of the components. This compd. can now be dist'd. (3) By adding a 3rd material forming a compd. of a max. b. p., which remains on distg. (4) By adding a 3rd material dissolving either of the components. The b. p. of this component will be raised so that the other one can be dist'd. This latest method is called the extracting or absorbing method in contrast to methods 2 and 3, called azeotropic methods. Various processes applying these principles, either in use or proposed, are discussed.

S. S. DE FINÁLY

Production of glycerol by fermentation. VI. Influence of sugar concentration upon the yield of glycerol. YOSHINORI TOMODA. *Chem. News* 137, 265-6(1928), cf. *C. A.* 22, 2805.—In fermentation expts. with Na_2SO_3 present, the alc fermentation and glycerol fermentation go on parallel from the start to the end of the fermentation. At a given sulfite concn., the yield of glycerol is proportional to the sugar concn. of the fermenting medium, while at a given sugar concn., the yield of glycerol is proportional to the square root of the total sulfite concn. T. expresses these relations in the equation $w = (a + Kx)\sqrt{y}$, where w is the amt. of glycerol produced (g./100 cc.); x , the concn. of sugar in the mash; y , the concn. of total sulfite; a , a const. (0.42); K , a const. (0.11). Acetaldehyde-bisulfite compd. in the mash favors the formation of glycerol. If the reaction of the fermenting medium is made alk. with NaHCO_3 , glycerol formation is very marked. The presence of an appreciable amt. of combined sulfite produces a considerable increase in glycerol.

RUSSELL C. FERR

The identification of other fruit wines in grape wine. J. WERDER. *Mitt. Lebensm. Hyg.* 19, 394-5(1928).—The presence of sorbitol in wines other than from grapes was found to be an excellent way to detect a possible adulteration, as grape wines do not contain this substance. Further investigations are in progress, and will be published later.

J. C. JURRJENS

New method for the estimation of iron in wine for purposes of clarification. E. JEKEL. *Pharm. Monatsh.* 9, 257-8(1928).—A colorimetric procedure is described for use in connection with an illustrated coloriscope in detg. both the ferrous and ferric content of wine prior to adding $\text{K}_4\text{Fe}(\text{CN})_6$ as precipitant.

W. O. E.

Utilization of the Indian tea enzyme and its production in dry condition. HANS VALENTIN. *Königsberg. Apoth. Ztg.* 43, 1533-6(1928).—The importance of this enzyme as used in the production of a refreshing beverage is discussed in connection with a study of its phys. and chem. characteristics.

W. O. E.

Detection of methanol in ethyl alcohol, etc. (KINUGASA, *et al*) 7. Cooler for liquids [beer] (Ger. pat. 466,132) 1. Heater (for use in the alcohol industry) (Austrian pat. 109,213) 1.

Alcohol for Industrial Purposes. New York: American Commercial Alcohol Corp. 420 Lexington Ave. No charge. Reviewed in *Paint, Oil, Chem. Rev.* 87, 22 (1929).

Vorschriften zur Bereitung von Likoren, Branntweinen, Limonadensirupen, Punsch-

essenzen, usw. auf kaltem Wege. Miltitz bei Leipzig: Schimmel & Co. 202 pp. Reviewed in *Chimie et Industrie* 20, 801(1928).

Fermentation. MABEE PATENTS CORP. Swiss 126,986, Jan. 17, 1927. Agricultural products are prepd. for food for live stock by fermentation. The fermenting agents may be hydroxides of Mg, Ca, Na or a mixt. of these with S or malt.

Internal cooling of metallic fermentation vats. BERNDORFER METALLWARENFABRIK ARTHUR KRUPP A.-G. Austrian 109,381, Dec. 15, 1927. The internal cooling tubes of metallic fermentation vats, particularly of Al-lined containers for beer, are electrically isolated or insulated from the container, so as to avoid electrolytic action between the tubes and the container. The tubes may be of Cu coated with enamel or superficially oxidized.

Butyl alcohol and acetone by fermentation. ELLIOTT R. WEYER. U. S. 1,696,022, Dec. 18. A sterilized mash of usual compn. is treated with butylphenol or other suitable antiseptic which is non-toxic to the cultures used for the desired fermentation but toxic to contaminating organisms.

Glycerol. KARL LÜDECKE and NELLY LÜDECKE. Can. 285,399, Dec. 11, 1928. Glycerol is produced from sugar by fermentation in an alk. soln. by distg. off volatile fermentation products of the fermented mash and refermenting the residual mash by the addition of further quantities of sugar, small quantities of Na_2SO_4 and yeast. E. g., 2 kg. of molasses is dissolved with 10 g. of Na phosphate and 750 g. of crystd. Na_2SO_4 in 8.5 l. of water, and a soln. of 10 g. of MgSO_4 , 10 g. NiSO_4 , and 100 g. yeast in 2.5 l. of water is added. This mash is allowed to ferment at 30–35°. After about 2 days the sugar will have fermented. The yeast is then filtered off, the alc. and aldehyde are boiled away and 2 kg. of molasses and 100 g. of sulfite, 5 g. MgSO_4 , the filtered off yeast and 50 g. of fresh yeast are added, the whole being made up to 11 l. After 2 days at 30–35° the sugar will have disappeared. This operation is repeated, 1 l. of water being added each time. If for instance 8 kg. of molasses has been fermented in this manner and the glycerol has been isolated, about 2 kg. of raw glycerol will be obtained, equiv. to 960 g. of pure glycerol.

Diastase. INTERNATIONAL TAKAMINE FERMENT CO. Fr. 640,669, Sept. 8, 1927. A diastatic product is prepd. in a rotating drum on a culture medium of bran which is sprayed with an aq. soln. of Na salicylate and NaF. The acid radical is liberated by spraying in a dil. mineral acid and the medium is inoculated with *Aspergillus oryzae* and incubated. The enzymes are extd. from the koji produced, in the usual manner.

Diastic product. INTERNATIONAL TAKAMINE FERMENT CO. Brit. 290,874, Aug. 29, 1927. A process which may be carried out in a tumbling-drum which is slowly rotated involves treatment of a culture medium which may be prepd. from wheat bran with a water-sol. salt of an antiseptic acid radical such as Na salicylate and NaF, liberation of the acid radical by addn. of a dil. inorg. acid such as HCl, and culturing with *Aspergillus oryzae*. The enzymes are extd. from the koji produced.

Hop extracts. E. C. HORSR. Brit. 290,852, June 29, 1927. Fresh or dried hops are distd. to obtain the oil, the hop pulp is boiled with a sugar soln. to ext. the bitter constituents, the soln. is concd. and the hop oil is added. The sugar soln. used is preferably a dild. malt sirup. An app. is described.

17—PHARMACEUTICAL CHEMISTRY

W. O. EMERY

The deterpenation of essential oils of citrus fruits by the use of surfaced columns. P. LEONE Reale Scuola d'Ingegneria, Palermo. *Ann. chim. applicata* 18, 299–313 (1928).—In view of the promising results obtained by L. (cf. C. A. 22, 3489) and by Romeo (cf. C. A. 22, 3489) on the deterpenation of essential oils of citrus fruits, it was considered advisable to study the possibility of using fractionating columns with packing (cf. Thormann, C. A. 21, 1726). The present paper, which is chiefly mathematical, deals with the application of columns of this type, calcns. showing the proper design of app. for this particular purpose, and the compn. of the vapors evolved from essential oils during deterpenation by fractionation *in vacuo* as a function of the compn. of the liquid. This type of column is highly adapted to deterpenation, and in a single operation should give the max. yield of concd. oil. A simple and rapid method for the detn. of sesquiterpenes and of terpenes is suggested, which involves detns. of their α values after fractionation and isolation.

C. C. DAVIS

The mucilage extracted from the cotyledons of *Anagyris foetida*. PIETRO CONDORELLI AND A. CHINDEMI. Reale Univ. Catania (Sicily), *Ann. chim. applicata* 18, 313-7(1928).—The isolation of a mucilage from the integument of *Anagyris foetida* (cf. Condorelli, C. A. 20, 1095) suggested that there might also be present a similar substance in the cotyledons. The latter were extd. repeatedly with boiling water, the ext. was filtered, evapd. to 0.5 its vol., pptd. with twice the vol. of 96% EtOH, filtered, the mucilaginous mass washed with EtOH, twice dissolved in hot water and repptd. with EtOH, refluxed with EtOH, (even this did not eliminate all colored impurities), boiled in water with animal charcoal, filtered and pptd. with EtOH, which yielded a pale-colored mucilage. In distinction to podalarin (*loc cit.*), this new mucilage was only slightly sol. in cold water and gave a viscous liquid with hot water. It was insol. in EtOH, Et₂O and C₆H₆. It was pptd. even in dil. soln. by basic Pb acetate, but was not pptd. by aq. Na₂SO₄, (NH₄)₂SO₄ or MgSO₄, nor did it give a blue color with I. It was not optically active. Oxidation with HNO₃ yielded 7.03% mucic acid, indicating condensation products of galactose. No saccharic acid was present in the mother liquor. It contains approx. 17% ash composed of SiO₂, P₂O₅, Ca and traces of Fe and K. The mucilage gave the reactions of pentoses. Distn. with dil. HCl yielded furfural corresponding to 6.8% pentosans. Refluxed with 4% H₂SO₄, the mucilage neutralized with BaCO₃, unhydrolyzed mucilage pptd. with 96% EtOH, filtered, distd. *in vacuo* to a small vol. and evapd. to dryness *in vacuo*, yielded a product which gave a negative Seliwanoff reaction (cf. Ber. 20, 181) for ketones and which contained no mannose, but only galactose mixed with a pentose, the latter sugars being isolated by conversion into their phenyllosazones (cf. Ber. 41, 75), the latter in turn being sep'd. by the method of Kultz and Vogel (*Biol. Chem.* 32, 85). The pentosazone m. 160-2°; the hexosazone m. 188-92°. The mucilage has a high absorbent power for salts, and for this reason a large proportion of inorg. compds. present in the cotyledons is extd. with the mucilage and held tenaciously by the latter, which renders difficult the obtaining of a mucilage of a low ash content. Analysis of the mucilage indicated the compn. C₆H₁₀O₅·C₆H₈O₄·8H₂O. The 8H₂O can be eliminated by heating at 110°. The results show that, like the mucilage of the integument, the mucilage of the cotyledons resembles paragalactoaraban, though it differs in some respects from the mucilage of the integument. C. C. DAVIS

Experimental researches on fluid extracts. I. The fluid extract of *Chelidonium*. ADOLFO ALBANESE AND ANTONIO PEDRONI. Reale Univ. Pavia *Ann. chim. applicata* 18, 318-26(1928).—See C. A. 22, 2810. C. C. DAVIS

Microchemical reactions for caffeine. M. WAGENAAR. *Pharm. Weekblad* 65, 1334-9(1928).—In the order of decreasing importance the reactions are (1) pptn. by HgCl₂, (2) pptn. by CsI + I, (3) pptn. by AuCl₃, (4) salting out by (NH₄)₂HPO₄ or (NH₄)₂SO₄, (5) pptn. by Br, (6) pptn. by BiI₃ + KI, (7) pptn. by SbI₃ + KI. For diagnostic purposes PtCl₄ and AgNO₃ are of little value. A. W. DOX

Alcohol in oil of cassia. SCHIMMEL & Co. *Am. Perfumer* 23, 527-8(1928).—Even very small quantities of alcohol in oil of cassia can be easily detected through detn. of the flash point in the same way as has been customary for a long time for petroleum, since it was found that alc. exercises a very decided influence on the flash point. In the present instance the well-known app. of Pensky-Martens was employed. For the execution of the test the container is filled to the mark with the sample previously dried thoroughly with desiccated Na₂SO₄, the cover then adjusted and the insert placed in the tripod by aid of the fork. Now the thermometer ranging from about 30 to 130° is inserted and the heating started with a large direct flame, until the temp. is about 20 to 30° below the flash point expected. Only then the wire netting which first had been turned toward the outside is brought over the flame and the heating regulated so that the thermometer does not rise faster than 2° in 30 seconds. Now, in intervals of about 30 seconds, the ignition is operated by turning the corresponding screw and the ignition flame which should have the size of a pea lowered for a second into the oil container. The temp. at which a distinct flaring up of the vapors takes place is the flash point. For practical purposes a flash point not below 75° would seem sufficient. W. O. E.

Mineral aspects of steatite talc. VICTOR CATET. *Aromatics* 9, 17-8(1928).—The phys. and chem. properties of steatite are considered in connection with its chief sources, and utilization in face and body powders, rouges and powder compacts, etc. W. O. E.

Cajeputh oil from the Far East. G. H. MASSELMAN. *Aromatics* 9, 19-20, 70(1928).—An account of the islands where this oil is produced, the primitive method of production and shipment, and its phys. characteristics. W. O. E.

Optical methods for the perfume and flavor chemist. ANTON V. KAMP. *Aromatics* 9, 30-3(1928).—The optical methods involved in the use of the spectroscope,

refractometer (both Pulfrich and Abbe) and polarimeter are discussed in connection with their illustrations and the customary abbreviations used in expressing the values obtained.

W. O. E.

Transparent emulsions of essential oils. RICHARD E. LINEHAN. *Aromatics* 9, 22-3, 62(1928).—Transparent essential-oil emulsions in concd. aq. sugar soln. and their comparison with other types of flavors are discussed.

W. O. E.

West Australian sandalwood oil. K. VENKATESAIA AND H. E. WATSON. *J. Soc. Chem. Ind.* 47, 322-3T(1928).—Samples of W. Australian oil purchased in London, and of Mysore oil from Bangalore were analyzed, saponified and fractionated. From the results it appears quite obvious that the oils differ widely as regards their main constituents. The component of the Australian oil of high negative rotation had a distinctly higher b. p. than β -santalol; it is, however, possible that certain of the fractions contain one or both santalols. These fractions comprise approx. 50% of the entire oil, but unless an alc. of exceedingly low d. is present, the proportion of santalol in them cannot be very high.

W. O. E.

Sesquiterpene alcohol of the oil of Eucalyptus nova-angelica. L. H. BRIGGS AND W. F. SHORT. *J. Soc. Chem. Ind.* 47, 323-4T(1928).—Eudesmol and globulol have been detected in eucalyptus oils. In the examn. of a specimen of oil from *E. nova-angelica* an alc. m. 80° and with a small *d*-rotation was isolated. Its properties together with those of the HCl salt agree closely with those of eudesmol and eudesmene dihydrochloride, resp. Dehydration with HCO_2H produces a sesquiterpene, the const. of which agree with those of eudesmene, and which yields eudalene, and no other naphthalene hydrocarbon, on hydrogenation.

W. O. E.

Essential oil of Phebalium nudum. C. B. RADCLIFFE AND W. F. SHORT. Univ. of New Zealand. *J. Soc. Chem. Ind.* 47, 324T(1928).—The oil extd. by steam distn. in a yield of 0.24% was a clear, greenish yellow, mobile liquid with a pleasant aromatic odor, and when dry had d_4^{13} 0.9345, n_D^{17} 1.4844, $[\alpha]_D^{14}$ 15.60°. The acid value 146.2 increased after acetylation to 171.6. The aldehydes calcd. as citral amounted to 1.5%; they were found to consist of citronellal and citral. The acidic constituents were cinnamic acid and a very small quantity of an amber-colored phenol which gave a transient green coloration with alc. FeCl_3 . Among the terpenes identified were camphene and limonene. α -Terpineol and terpenyl acetate also were present.

W. O. E.

Balsam of Peru. C. T. BENNETT. *Perfumery Essent. Oil Record* 19, 423-4 (1928).—The common method of extg. the balsam from the tree is described in connection with its characters, constituents and com. statistics. The limits are for $d_{15.5}$ 1.140 to 1.160, n_D 1.588 to 1.595 and that of the extd. cinnamein 1.575 to 1.582, synthetic balsams contg. benzyl benzoate usually having a lower n ; clearly sol. in 90% alc., a flocculent ppt. finally settling out on standing which appears to be of a waxy nature.

W. O. E.

South African geranium oil. W. H. SIMMONS. *Perfumery Essent. Oil Record* 19, 331-2(1928).—The phys. characters of 2 samples from the leaves of *Pelargonium* plants were $d_{15.5}$ 0.901, 0.896; $[\alpha]_D$ -18°0', -19°0'; n_D^{25} 1.4725, 1.4680; ester as geranylacetate 8.6, 9.2%; total alcs. as geraniol —, 56.6%; citronellol by formulation 22.8, 17.6%, soly. in 70% alc. incomplete, 1 in 1.7 and upwards, resp. On comparison with the North African or Algerian oils it will be seen that while there is not much difference in the *d.* the $[\alpha]$ is considerably higher; the ester and citronellol contents also are exceptionally low.

W. O. E.

Cosmetics in ancient times. F. KAISER. *Pharm. Zentralhalle* 69, 793-4(1928).—Certain materials and preps. used in those early periods are discussed.

W. O. E.

Improved method for the examination of pharmaceutical preparations by means of greatly extended capillary pictures, and the analytical quartz lamp. RAPP. *Pharm. Ztg.* 73, 1585-9(1928).—After discussing the studies of Goppelsröder, Kunz-Krause, H. Platz, and Danckwortt in this field, the errors, notably in Goppelsröder's, technic are emphasized, and improvements introduced by enclosing the strip of filter paper in a glass tube prior to immersion in the liquid under examn. Investigations have been made or contemplated on the following points: (1) stability of different alkaloidal solns., aging of such solns.; (2) stability of different liquid specialties on protracted storage; (3) detection of genuine from substitute preps.; (4) differences in com. preps. of ergot and digitalis; (5) comparison of com. galenicals with specially prepd. products; (6) comparison of various plant specialties with galenicals or products bearing similar designations; (7) examn. of homeopathic dilns.; (8) examn. of colloidal preps.; (9) examn. of the compn. of salves; (10) adulterations in balsam of Peru; (11) simplified urine analysis; (12) toxicological investigations. The results obtained in studies on

1, 2, 3, 4 and 6 are reported and discussed, the matters involved under the remaining captions being reserved for future publication. W. O. E.

Content of homeopathic triturations. A. KUHN. *Pharm. Ztg.* 73, 1589-90(1928).—Studies have been made of SiO_2 , Na_2SO_4 and Hg triturations, and the results reported. W. O. E.

Content of iron triturations. ARFRED KUHN. *Pharm. Ztg.* 73, 1590(1928).—A verification of former findings (cf. C. A. 22, 326). W. O. E.

Detection of degallized brandy in pharmaceutical tinctures. WALTER MEYER. *Pharm. Ztg.* 73, 1600-2(1928).—A discussion of certain phenomena involved in the examn. of tinctures made up with alc. products previously denatured with AcMe, MeOH, $\text{C}_2\text{H}_5\text{N}$, phthalic ester, etc. W. O. E.

Simple and rapid detection of fructose alone or admixed with other carbohydrates. LAD. EKKERT. *Pharm. Zentralhalle* 69, 805-6(1928).—In a small porcelain evapg. dish sprinkle 0.01 to 0.03 g. fructose, add 3 to 5 drops 2N KOH or NaOH soln. followed by 0.5 to 1 g. solid caustic alkali. In the course of 0.5 min. the alkali acquires a red to blood-red border, the entire liquid finally becoming bright blood-red. Similar treatment yields with arabinose, yellow to saffron-yellow; xylose yellow; rhamnose yellow; glucose yellow; mannose yellow; sucrose colorless; maltose yellow; lactose lemon-yellow; dextrin yellow; glycogen colorless. W. O. E.

Medicinal use of *Salvia officinalis*. CURT SCHELENZ. *Pharm. Zentralhalle* 69, 806-7(1928).—Attention is directed to the value of this drug in the treatment of night sweats in tuberculosis. W. O. E.

Balsam of tolu. C. T. BENNETT. *Perfumery Essent. Oil Record* 19, 464-5(1928).—A discussion of the physical characters of this balsam, notably its evaluation in detg. the acid no., sapon. no. and tests for resin. The chief constituent is a resin which on sapon. yields an alc., tolu-resinotannol, cinnamic and benzoic acids. Benzyl benzoate with some benzyl cinnamate is present, a trace of vanillin and 1.5 to 3% volatile oil. W. O. E.

Importance of medicinal charcoal in therapy, and nature of adsorption. FRANZ KOENIG. Munich. *Pharm. Ztg.* 73, 1602-3(1928).—An address. W. O. E.

Polarimeter for the practical druggist. R. MAEDER-LÖFFLER. *Pharm. Ztg.* 73, 1621-2(1928).—A discussion of the requirements a druggist may reasonably demand of a polarimeter, and the mode of testing it. W. O. E.

Evaluation of "phosphor solutus." W. BÖTTGER. Leipzig. *Apoth. Ztg.* 43, 1551-3(1928).—An exptl. study of the iodometric evaluation of this product, notably the influence on the results obtainable of working in neutral or acid soln. The results previously reported by Enell (*Pharm. Ztg.* 1905) are discussed. W. O. E.

Recalculation of the "D. A.-B. 5 specific gravity" value into that of the "D. A.-B. 6 density." R. DIETZEL AND F. SCHLEMMER. *Apoth. Ztg.* 43, 1553(1928). W. O. E.

Important aloin reactions. FRITZ WISCHO. Univ. Graz. *Pharm. Monatshefte* 9, 256-7(1928).—After mention of the identity tests commonly applied for aloin, a new reaction is described involving the use of a soln. of 0.4 g. V_2O_5 and 4 cc. concd. H_2SO_4 in 100 cc. H_2O . A freshly prepd. aq. or weakly alc. soln. of aloin or aloes treated with a few drops of this reagent is colored red, finally becoming dirty brown on standing. Various samples of aloes were examd. W. O. E.

The characteristics of the perfumer and his technic. A. MÜLLER. *Genf. parfumeur* 2, 105-6, 109-10(1928). P. ESCHER

Rectification of pine oil. A. BRESSER. *Chem. Rundschau* (Budapest) 5, 27-9(1928).—The process is described for rectifying pine oil in factories either by simple distn. or by previous chem. treatment with alkalies or H_2SO_4 followed by distn. S. S. DE FINÁLY

Change of chemical composition of radix althaeae. J. KABAY. *Magyar Gyógyszerésztud. Társaság. Értesítője* 4, 1, 19-23(1928).—Changes in compn. during the flowering period and during the winter are shown. S. S. DE FINÁLY

G. 2949 (Lopion): A new gold preparation for the treatment of pulmonary tuberculosis. H. SCHMIDT. Lungenheilstätte Ruppertsheim im Taunus, Germany. *Deut. med. Wochschr.* 54, 1757-8(1928).—G. 2949, lopion, an org. compd. contg. 39.25% Au, is considered to be superior to the Au prepn. previously used in the treatment of tuberculosis of the lungs and upper respiratory tract. ARTHUR GROLLMAN

A new chemotherapeutic agent for the treatment of pulmonary tuberculosis. WILHELM MÜLLER. Lungenheilstätte Tátraháza. *Wiener med. Wochschr.* 78, 1534-7(1928).—*Tebeform*, a com. prepn. whose chief constituent is an I deriv. of thymol, is considered as a valuable therapeutic agent in tuberculosis. ARTHUR GROLLMAN

A factory for pharmaceutical preparations in the "Chemischen Industrie A.-G."

HELMUT HILLE. *Chem. App.* 15, 253-4(1928).—The arrangements and dimensions of rooms are shown in 5 cuts, but no details of equipment are given. J. H. MOORE

A new cresol antiseptic. L. M. HIRCHBERG. *Chem.-Ztg.* 52, 826(1928).—It is desirable to have a cresol antiseptic which does not possess the toxic properties of the ordinary cresol-soap preps. A combination of cresol with 5-10% Na stearate offers little advantage, since in dissolving the solid product in H_2O , insol. Na stearate is pptd. By combining cresol with derivs. of the higher fatty acids, especially of stearic acid (either as such or as the Na salts) a solid product is obtained, which forms an emulsion with H_2O and hardly leaves any residue. Unlike the soap soln., which probably increases the toxic action of cresol, the derivs. of stearic acid, *e. g.*, the esters, reduce its toxicity. G. SCHWOCH

Metallic soaps (LAURO) 27. Formula of digitalis glucosides. II. Digitalinum verum (WINDAUS) 10. Detection of methanol in tinctures, etc. (KINUGASA, *et al.*) 7. Determination of calcium in calcium glycerophosphate, calcium lactophosphate and calcium phosphates (LETRUC) 7. Utilizing meat-pickling brine (Can. pat. 285,135) 12. Cyclohexyl-substituted aliphatic acids (U. S. pat. 1,693,801) 10.

LEGALLIENE, RICHARD: *The Romance of Perfume*. New York: Richard Hudnut. 46 pp. Reviewed in *Am. Perfumer* 23, 616(1928).

REDGROVE, H. STANLEY: *Scent and All About It*. London: Messrs. Heinemann, Ltd. 3s. 6d. Reviewed in *Chem. News* 137, 366(1928).

Medicinal wafers and tablets of precipitated magnesium hydroxide with a binder of sugar and corn starch. FRANK CROSSLEY (to James E. Plant). U. S. 1,694,341, Dec. 4

Therapeutic preparations from glandular organs. GEORG SCHRÖDER. U. S. 1,695,612 Dec. 18. See Brit. 263,155 (*C. A.* 22, 141).

Therapeutically active substances from the white blood corpuscle elements of bone marrow. ALFRED NEUMANN. Austrian 109,410, Dec. 15, 1927. Red marrow from the bones of the horse, ox or calf is free from hemoglobin and the like by treatment with 1% salt soln. and the residue is dissolved in a feebly alk. medium contg. a preservative. The product is useful in the treatment of anemic diseases and typhus.

Therapeutically valuable derivatives of choline. PHARMAZEUTISCHE INDUSTRIE A.-G. and SUSI GLAUBACH. Austrian 109,407, Dec. 15, 1927. Choline or its salts are condensed with a halide or the anhydride of a halogenated org. acid, particularly a halogenated fatty acid, and the condensation product is treated with urea, or with urea derivs. such as thiourea or urethans, or with guanidine or other biogenous amine such as histamine. *E. g.*, choline chloride is condensed with $CH_3ClCOCl$ to form $Me_2Cl-NCH_2CH(O_2CCH_2Cl)$, which gives with urea a white, non-deliquescent mol. compd. sol. in H_2O and $EtOH$. Therapeutically, the products are more active than choline but not more toxic.

Diethylmethinepropargylbarbituric acid. I. G. FARBENIND. A.-G. Swiss 126,732, Dec. 13, 1926. Addn. to Swiss 124,869. An alkali salt of diethylmethinebarbituric acid is transformed by a propargyl halide. The substance is a sedative and m. 175-8°

Morphine solutions. M. WOELM A.-G. Brit. 289,819, May 2, 1927. Morphine solns. in HCl are treated with Na_2HPO_4 to adjust the p_H to about that of the blood (7.2-7.5) and render the solns. suitable for injection.

Anesthetic composition containing cocaine and adonidin. ERICH HESSE (to Gehe & Co. A.-G.). U. S. 1,695,656, Dec. 18. An anesthetic compn. suitable for local use is prepd. by treating cocaine with an equal or smaller quantity of adonidin.

2-Phenylquinoline-4-carboxylic acid derivatives. J. D. RIEDEL-E. DE HAËN A.-G. Ger. 468,809, Jul. 3, 1928. 2-Phenylquinoline-4-carboxylic acid is converted into its Cd salt in known manner by the addn. of $CdCl_2$ to a $NaOH$ soln. The product is used for combating malaria.

Vitamins. J. K. MARCUS. Brit. 289,798, April 30, 1927. Vitamins A, D and E are sepd. with the non-saponifiable and difficultly saponifiable matter from fish, vegetable or animal oils or fats or tissue, by sapong. and extg. with an org. chloride such as ethylene dichloride. An example is given of the treatment of cod-liver oil. The vitamin ext. obtained may be dried by Na_2SO_4 or other desiccant, filtered and freed from solvent *in vacuo* and the concentrate may be preserved by dissolving it in medicinal mineral oil. Cf. *C. A.* 23, 242.

Hormones. AKTIENFABRIK ZUR ERZEUGUNG VON CHEMIKALIEN IN KOLIN. (Jan Sil, inventor). Ger. 468,810, July 31, 1925. A substance contg. hormones of vegetable origin is prepd. by treating the germs of ungerminated grains such as rye grain with concd. H_2SO_4 in the presence of a catalyst such as 1% of $MnSO_4$ and chlorinating the resulting product.

Nicotine from tobacco. GENERAL-DIREKTION DER ÖSTERR. TABAKREGIE. Brit. 290,204, May 9, 1927. Nicotine salts are dissocd. and removed by a current of air, dry steam or an inert gas at a temp. above 150° in an app., which is described, in which the tobacco is placed on a series of trays superposed in a housing.

Apparatus for the alternate development of formaldehyde and water vapors and sulfur dioxide for disinfection purposes. TH. BREUNLIN & Co. Swiss 126,076, April 16, 1927. Constructional details

Disinfectant. PEROLIN-FABRIKATION A. BRICK G. M. B. H. Ger. 466,141, Feb. 16, 1926. Starch is heated with an aq. soln. of $KMnO_4$ and the paste is dried and powdered. The powder is stirred with ethereal oils and with absorbents for the oils such as kieselguhr, rice meal, or flakes of soap, and paraformaldehyde is incorporated into the mixt., which is dried and pressed into shapes.

18—ACIDS, ALKALIES, SALTS AND SUNDRIES

E. M. SYMMES

Advances in the manufacture of sulfuric acid in recent years. ST. ZEROMSKI. *Przemysl Chem.* 12, 560-8(1928). A. C. Z.

The effectiveness of various contact catalysts in the sulfuric acid contact process. BERNHARD NEUMANN AND ERICH GOEBEL. *Z. Elektrochem.* 34, 734-40(1928).—Tests were made with (I) pure, pptd. Fe oxide, (II) the same mixed with 4% Bi oxide, (III) mixed with 40% KOH, (IV) mixed with Sr oxide, (V) mixed with equal parts of Sn oxide, (VI) equal parts of Cr oxide and Sn oxide, (VII) pure SnO alone, (VIII) Ti oxide alone. As compared with I, II showed no practical advantage, III a harmful effect, IV a slight improvement, V a marked improvement, VI a remarkable improvement, approaching that of Ag vanadate, VII very poor, (high temp required,) VIII much worse than I.

E. M. SYMMES

Sulfuryl chloride and its production. EGIDIUS TERLINCK. *Chem.-Ztg.* 52, 901-3, 944-6(1928).—Descriptive.

ALBERT L. HENNE

The salts storage-house in the Sollstedt potash factory. H. HECKNER. *Chem. App.* 15, 265-6(1928).—Description, with a cross-section and dimensions. J. H. M.

Salt for preserving, refrigerating and flavoring. H. D. KEISER. *Food Industries* 1, 162-4(1929).—The solar evapn. process in use at Saltair, Utah, is described. The water in Great Salt Lake contains 7 times the amt. of salt that is present in sea water. The brine settles in basins for 30 days, after which complete satn. usually occurs. The satd. brine then flows by gravity to harvest ponds where the $NaCl$ crystallizes out, and the bittern is discharged to waste. The bittern contains the Na_2SO_4 , Ca and Mg salts as impurities, but since they occur at densities well below their satn. points, no pptn. takes place and only pure $NaCl$ is left on the harvest floor. Salt layers of from 4 to 6 in. are pptd. each season.

C. R. F.

Salt, bromine and calcium chloride in 1927. A. T. COONS. Bur. Mines, *Mineral Resources of the U. S.* 1927, Pt. II, 99-112(preprint No. 12, published Nov. 9, 1928).

E. H.

Tests on the catalytic preparation of copper sulfate. E. ABEL AND O. REDLICH. *Z. Elektrochem.* 34, 740-4(1928).—It was found impossible to form $CuSO_4$ from Cu, concd. H_2SO_4 and air with $HNOSO_4$ or NO as the carrier. Although it was possible to reduce the formation of an inactive, protective layer, the sensitiveness of the reaction to H_2O is a difficulty hardly possible to avoid. Also the narrow temp. limits necessary to maintain because the reaction is exothermic give trouble. The inhibiting action of the excess HNO_3 is also troublesome. It is not probable that the process can be used satisfactorily.

E. M. SYMMES

Formation of iron carbonyl on storage of commercial hydrogen under pressure. J. G. KING AND J. A. SUTCLIFFE. *J. Soc. Chem. Ind.* 47, 356T(1928); cf. Roscoe and Scudder, *Proc. Chem. Soc.* 59, 126(1891); Bunte and Terres, *Gas u. Wasserfach*, 65, 145(1922); Griffith and Holliday, *C. A.* 23, 61.—Formation of a dark stain when SiO_2 tubing was fused in an O-H flame, H made by the Lane process being used, indicated small quantities of $Fe(CO)_5$ present. No $Fe(CO)_5$ was present before compression to 120 atm. The

method of analysis was burning a measured amt. of H and passing the products through H_2SO_4 and glass wool moistened with the same. The air for combustion was filtered through cotton wool. The Fe was pptd. by NH_3 , filtered, dissolved in a min. of H_2SO_4 , reduced to Fe^{++} and titrated with $KMnO_4$. Amts. of Fe found were 0.0064, 0.0087, 0.0110 g. per 0.4 cu. ft. of H after storing the H 4, 28 and 72 hrs., resp. The max. value found was 1.29 g. Fe per cu. m., representing conversion of 2.6 l. of CO per cu. m. of H, or 2.6% by vol., a relatively large proportion of the 1% CO originally in the H.

E. M. SYMMES

Bleaching powder. Experience with the Backman process. G. ANGEL. *Chem. Trade J.* **83**, 361-2(1928); cf. *C. A.* **19**, 1475; **20**, 3213.—The app. is similar to pyrites furnaces, but made of concrete. The lime feed and bleaching powder discharge are automatic. Inspection is required only every 10 months. While Lunge stated that 4% excess H_2O in $Ca(OH)_2$ is best, this app. requires not more than 0.5% excess. $Ca(OH)_2$ should be stored 10 days before use. Control of the app. is by temp. of the various floors. Bleaching powder of the highest Cl content is obtained when the temp. of the third floor from the bottom is the highest of all floors. Cl is introduced into this floor. Max. temp. should be 35-40°. If the supply of lime is too low the main reaction occurs on a higher floor, and chlorate will form on a lower floor, indicated by sudden rise in temp. The capacity of a Backman tower is 3.5-5 tons per 24 hrs.; the power consumption is 1 h. p. per chamber. The only labor cost is the filling of the bleaching powder containers. No leaks of Cl are possible, as the app. is under a slight vacuum. No Cl can be detected in the exit gases.

E. M. SYMMES

Use of electrometric measurements in the preparation of bleach liquors. ERICH MULLER. *Chem. Fabrik* 1928, 677-8.—The reaction $Cl_2 + 2OH' = ClO' + Cl' + H_2O$ only takes place as long as there is no excess of Cl present. With a Cl excess the reactions $Cl_2 + H_2O = HCl + HClO$; $2HClO + ClO' = ClO'_2 + 2HCl$ occur, involving a waste of Cl. A galvanometer attached to C electrodes, one immersed in a comparison soln. of chloride of lime and $Ca(OH)_2$, the other in the liquid being chlorinated, gives a very sharp indication of the approach of the neutral point.

E. M. SYMMES

The Alsatian bromine industry. CAMILLE HORST. *Bull. soc. ind. Mulhouse* **94**, 592-8(1928); cf. *C. A.* **22**, 4208.—A brief outline of the development of the Br industry from its discovery to the present day, with a brief description of the method used for its production at the Alsatian potash mines.

A. PAPINEAU-COUTURE

Gypsum in 1927. R. M. SANTMYERS AND JEFFERSON MIDDLETON. *Bur. Mines, Mineral Resources of the U. S.* 1927, Pt. II, 113-28(preprint No. 13, published Nov. 12, 1928).

E. H.

Magnesia-graphite reactions at high temperatures. FRANK T. CHESTNUT. *Chem. Met. Eng.* **35**, 687(1928).—Attempts to vitrify the inner surface of a pure, elec.-sintered MgO crucible by the Ajax-Northrup high-frequency induction furnace verified reactions of MgO with heated graphite. A graphite sleeve was inserted into the MgO crucible and a 100-kw., 2000-cycle load applied. Cr_2O_3 melted, MgO softened and reduced, SiO_2 melted, so that the temp. was about 3000°. At first a flammable gas was evolved, probably from impurities; then the flame became white. At highest temp. much gas was evolved, with white flames, which reaction continued 5-10 min. after the power was cut off. On cooling the MgO was not vitrified appreciably, and considerable flake graphite was formed.

E. M. SYMMES

The action of light on colored bakelite. DONALD MURRAY. *Nature* **122**, 845(1928).—A communication describing color changes with time.

W. E. V.

Ultra-violet transmission of a new window-glass substitute. R. H. CRIST. *Ind. Eng. Chem.* **20**, 1367(1928).—A study of the ultra-violet transmission of a new formaldehyde-urea condensation product, *aldur*. The transmissions were obtained by means of a monochromator (a quartz prism with two lenses and a thermopile) and a constricted Hg-vapor lamp working at atm. pressure is the source of light. Results are shown by table and curve. Remarkable permanence is shown by *aldur*.

W. H. BOYNTON

Ignition of fire-damp by heat of impact of rocks. M. J. BURGESS AND R. V. WHEELER. *Safety in Mines Research Board* (London), Paper No. 46, 3-23(1928).—Fire-damp can be ignited quite easily in lab. tests of rock rubbing on rock. The source of the ignition apparently is the heated area on the stationary rock, not the brilliant shower of sparks often observed. Comparatively small amts. of energy are required for ignition, e. g., 200 ft.-lbs.

E. M. SYMMES

Mosquito remedies and preventatives. L. O. HOWARD AND F. C. BISHOPP. *U. S. Dept. Agr., Farmers' Bull.* **1570**, 1-12(1928).—The best mosquito protective liquid found consisted of oil of citronella 1 oz., spirits of camphor 1 oz. and oil of cedar $\frac{1}{2}$ oz. This will effectively keep away mosquitoes for several hrs.

C. R. F.

Equilibrium between Al_2C_3 and N at high temperatures (PRESCOTT, HINCKE) 2. Flotation of graphite (Brit. pat. 289,848) 21. Kilns for lime, etc. (Ger. pat. 466,191) 1. Shaft kiln for lime or cement manufacture (Ger. pat. 466,190) 1. Electric furnace [for manufacture of activated carbon] (Can. pat. 285,459) 4.

LIRON, R.: *Contreplaqués et colles à la caséine*. Paris: Société de Publications Mécaniques. 115 pp. Reviewed in *Chimie et industrie* 20, 801-2(1928).

MANTELL, C. L.: *Industrial Carbon*. New York: D. Van Nostrand Co., Inc. \$4.50. Reviewed in *Am. Paint J.* 13, No. 13, 78(1929).

VAIL, J. G.: *Soluble Silicates in Industry*. New York: Chemical Catalog Co., Inc. 443 pp. \$9.50. Reviewed in *Chem. News* 137, 382(1928).

Apparatus for concentrating acid. OTTO C. TRAUTMANN. U. S. 1,695,619, Dec. 18. An app. suitable for concg. H_2SO_4 comprises an inclined flue in which the horizontal portions only of a concg. conduit are arranged "in stair-way fashion" with the joints between these horizontal portions outside the flue. Various structural details are specified.

Hydrochloric acid. WILHELM HIRSCHKIND and CARL W. SCHEDLER (to Great Western Electro Chemical Co.). U. S. 1,695,552, Dec. 18. Steam and Cl are passed through hot C in approx. the ratio required to balance the equation $\text{C} + 2\text{H}_2\text{O} + 2\text{Cl}_2 = 4\text{HCl} + \text{CO}_2$ and the gas is passed through an increased or diminished quantity of C as required to prevent the production of H and CO. An app. is described.

Hydrocyanic acid. PAUL J. CARLISLE and PAUL L. MAGILL (to The Roessler and Hasslacher Chemical Co.) Can. 285,200, Nov. 27, 1928. HCN is produced by passing HCONH_2 vapor through a narrow reaction space having brass walls and heated to a temp. above 300° , no portion of the HCONH_2 vapor being more than $1/2$ inch from the heated walls. The brass acts as a catalyst and the temp. control prevents loss of HCN by secondary reactions.

Nitric acid. MONTECATINI SOC. GÉNÉRALE PER L'INDUSTRIA MINERVARIA DE AGRICOLA. Brit. 290,679, May 20, 1927. NH_3 is oxidized catalytically to produce NO and H_2O and the NO after sepn. is oxidized to NO_2 which is absorbed in water and the soln. is treated with O. An app. is described.

Phosphoric acid. ALBERT NOBLE (to Federal Phosphorus Co.). U. S. 1,695,558, Dec. 18. A mixt. of phosphate rock, silica and C is charged into a feed stack over the hearth of a heating chamber, a flame is impinged on the charge in the heating chamber and air is passed downwardly through the feed stack; evolved gases are oxidized in the heating chamber and heat is transferred from the gases to preheat air for combustion of the fuel, and the oxidized P compds. are collected. An app. is described.

Sulfuric acid. SOCIÉTÉ GÉNÉRALE MÉTALLURGIQUE DE HOBOKEN. Fr. 640,203, Aug. 19, 1927. Sulfurous gases, particularly those of variable compn. or flow, are treated to oxidize part of the SO_2 by a contact process and after absorption of the SO_3 formed, the remaining gases are oxidized by oxides of N in a second app. capable of dealing with large fluctuations in the content of SO_2 or in the rate of flow. Cf. C. A. 23, 486.

Sulfuric acid. ROMAN VON ZELEWSKI. Fr. 640,817, Sept. 13, 1927. See Brit. 277,382 (C. A. 22, 2642).

Sulfuric acid by the contact process. VEREIN FÜR CHEMISCHE UND METALLURGISCHE PRODUKTION. Brit. 289,879, May 5, 1927. In catalytic oxidation of SO_2 in stages with sepn. of the SO_3 after each stage, the heat of reaction of each stage is used for heating the chamber of the following stage and the conversion in each stage is so regulated that the heat produced is nearly or quite sufficient for maintaining the conversion in the following stage. An app. is described.

Sulfuric acid production by the contact method. ALPHONS O. JAEGER (to Seldon Co.). U. S. 1,694,123, Dec. 4. Base-exchange material which is not itself catalytically effective is used together with a catalytically effective material such as vanadyl silicate. Numerous examples and details are given. Cf. C. A. 23, 486.

Sulfur trioxide. SELDEN Co. Brit. 290,316, Jan. 4, 1927. SO_2 and O are passed at an elevated temp. over a catalytic mass comprising a 2-component zeolite and contg. a catalyst chemically combined in non-exchangeable form. Various examples are given of the use of artificial zeolitic catalysts contg. V, Mo, Cr, Mn, W and which may contain various non-catalytic elements.

Strongly adsorbing silicic acid. I. G. FARBENINDUSTRIE (Fritz Stöwener, inventor). Ger. 466,439, Sept. 20, 1928. Addn. to 428,041. Silicic acid gel is washed,

formed, pressed or granulated and then dried. The forming, etc., may be brought about by forcing the gel through tubes of small area by means of gases or vapors.

Use of halogen-substituted sulfonic acids and their salts as protective agents. CHEMISCHE FABRIK MILCH A.-G. (to Oranienburger Chemische Fabrik A.-G.). Brit. 289,898, May 6, 1927. Compds. which may be prepd. as described in Brit. 289,841 (C. A. 23, 848) and Brit. 289,863 (following abstr.) are used as protective agents for materials such as wool, silk, artificial silk, cotton, linen, jute, hair, feathers, hides or leather in processes such as washing, fulling, carbonizing, scouring, steeping, bleaching, dyeing, degumming, stripping, ashing, liming and tanning.

Wetting agents (halogen-substituted sulfonic acids). CHEMISCHE FABRIK MILCH A.-G. (to Oranienburger chemische Fabrik A.-G.). Brit. 289,863, May 4, 1927. Various halogen-substituted sulfonic acids (such as may be prepd. by sulfonation of halogenated compds. or as described in Brit. 289,841, C. A. 23, 848) are used in the dyeing, textile, leather and paper industries as wetting, detergent or emulsifying agents. The alkali salts are suitable for washing silk, fine wool and feathers.

Synthesis of ammonia. ALFRED THARSON (to Lazote Incorporated). Can. 285,189, Nov. 27, 1928. In the synthesis of NH_3 a mixt. of N and H is passed over a catalyst contg. oxides of Fe, K and Mg, which is more active than iron alone, at a temp. between 400° and 700° . An iron catalyst contg. a mixed promoter comprising 1% K_2O and 1% MgO will give 25–30% NH_3 under normal synthesis conditions for relatively long periods of time. Mixed promoters comprising Li_2O and MgO , Na_2O and MgO , Na_2O and CaO , or K_2O and BaO can also be employed advantageously.

Catalytic apparatus for ammonia synthesis. SOC. L'AIR LIQUIDE. SOC. ANON. POUR L'ÉTUDE ET L'EXPLOITATION DES PROCÉDÉS G. CLAUDE. Brit. 289,823, Aug. 9, 1926. In an app. in which the gases are circulated through a space so as to have indirect heat exchange with the catalytic material, part of the catalytic material is placed within this space (suitably in concentric tubes). Various structural details are described. Cf. C. A. 22, 3744.

Catalytic apparatus suitable for treating gases for ammonia synthesis. SOC. L'AIR LIQUIDE. SOC. ANON. POUR L'ÉTUDE ET L'EXPLOITATION DES PROCÉDÉS G. CLAUDE. Brit. 289,759, April 30, 1927. The reacting gases are circulated over 2 or more distinct groups of surfaces enclosing the catalytic material and the transfer of heat is regulated by varying the proportions of the gases which circulate over the different surfaces. The app. may be used with H and N contg. varying quantities of CO for NH_3 synthesis.

Separating ammonia from filter liquor produced in the ammonia-soda process. HARALD AHLQVIST. U. S. 1,696,224, Dec. 25. The liquor is distd. and is preheated by direct contact with the vapors produced by the distn. so that further vaporization is effected. The vapors are thereafter conducted in countercurrent heat exchange with fresh liquor and the condensate from the vapors is caused to follow the path of the vapors during the heat exchange, and the condensate consisting of weak NH_3 liquor and the residual uncondensed vapors contg. NH_3 in gaseous phase are separately withdrawn. An app. is described.

Alkali and alkaline earth cyanides. NAAMLOOZE VENNOOTSCHAP NEDERLANDSCHE MIJNBOW EN HANDELSMAATSCHAPPIJ. Dutch 18,802, Oct. 15, 1928. Humic acids or alkali humates are carbonized, e. g., 1000 kg. lignite of 50% water boiled with 150 kg. soda and water is decanted, the soln. evapd., carbonized at 550° to a coke product (revolving kiln) in 30 to 40 mins. (some Fe may be added as catalyzer), then nitrogenized (1000° in N_2 stream).

Alkali and alkaline earth hydroxides. I. G. FARBENIND. A.-G. Brit. 290,719, Feb. 16, 1927. Alkali or alk. earth amalgams are decompd. by stirring with water, by use of stirring devices formed of carbonaceous material such as charcoal, coke or graphite or partly of such material and partly of an alloy comprising mainly Fe, Cr and Ni.

Calcining alkaline earth carbonate material. REED W. HYDE (to Dwight and Lloyd Metallurgical Co.) Can. 284,764, Nov. 13, 1928. Fine particles of alk. earth carbonate material less than $\frac{3}{4}$ " in diam. are placed in a pervious moving layer without admixt. of solid combustible constituents and heated gases are passed downward through the layer to heat the particles to a temp. above the dissocn. temp. of the carbonate but below the fusion temp. of the particles until the CO_2 gas has been expelled. Cf. C. A. 23, 244.

Alkali iodates. I. G. FARBENIND. A.-G. Brit. 290,749, Feb. 22, 1927. See Fr. 633,994 (C. A. 22, 3744).

Alkali nitrates. I. G. FARBENIND. A.-G. Fr. 640,847, Sept. 1, 1927. In the prepn. of nitrates from alkali chlorides by HNO_3 or nitrous vapors, sulfate ions and ions

of metals other than the alkalis are eliminated from the soln. in which the conversion is effected by the addn. of nitrates, oxides or carbonates of metals which form difficultly sol. sulfates. Cf. C. A. 22, 2815.

Metal carbonyls. LEO SCHLECHT and EMIL KEUNECKE (to I. G. FARBENIND. A.-G.). *Cah.* 284,972, Nov. 20, 1928. Scrap Fe is heated to 600° and subjected to the action of air and steam until completely transformed into Fe_3O_4 , then reduced with H at 450–500° and thereupon treated with CO.

Metallic chlorides. VEREINIGTE STAHLWERKE A.-G. Brit. 290,568, May 14, 1927. Chlorides such as those of Mn and Fe which are volatilized during the chlorination of ores are freed from HCl and H_2O before being treated for the production of the metals. Treatment of the chloride vapor with MgO or by fractional condensation may be used to effect the purification.

Metal cyanides or mixtures containing them. NIKODEM CARO and ALBERT R. FRANK. Ger. 467,479, Oct. 24, 1926. Mixts. of NH_3 and CO, at ordinary or raised pressure, are caused to react on carbonates or bivalent metals at a temp. near their dissociation temp. Fluxes such as alkali carbonates or CaF_2 may be included in the reaction mixt. Metals such as Fe or Ni, which promote the decomposition of NH_3 , or compds. of such metals, should not be present; app. of ceramic material or quartz is accordingly preferred.

Decomposition of complex fluorides. MAX BUCHNER. Can. 285,080, Nov. 27, 1928. Complex fluorides or mixts. containing them are decomposed by heating in chambers of a metal containing Fe, Ni and Cr, and of low C content, while maintaining relative movement between the solids and the gaseous products of decomposition.

Calcium, aluminosilicates phosphorus and potash. EMIL COLLETT. Fr. 639,893, Aug. 22, 1927. Phosphates are heated with coke and feldspar or leucite or a mixt. thereof. Bauxite and lime may also be added. The slag obtained is used to produce a cement.

Alumina. ELEKTRIZITÄTWERK LONZA. Fr. 640,737, Sept. 10, 1927. Bauxite or other Al material is ground, mixed with very finely divided C, and made into briquet with tar or pitch and reduced electrothermally. Cf. C. A. 23, 592.

Hydrated alumina. MARTIN TOSTERUD (to the Aluminum Co. of America). Can. 285,147, Nov. 27, 1928. A hydrate of a compn. between Al_2O_3 and $\text{Al}_2\text{O}_3 \cdot 2\text{H}_2\text{O}$ is produced by heating $\text{Al}(\text{OH})_3$ with an aq. soln. of NaOH at about 170° for a suitable period, and digesting the solid residue with a soln. capable of dissolving a portion thereof. E. g., $\text{Al}(\text{OH})_3$ is heated at 170° in a soln. containing about 120 g. of NaOH per l., the soln. being used in the proportion, roughly, of 1 l. per 300 g. of $\text{Al}(\text{OH})_3$. Satisfactory conversion is usually obtained in an hour. Then heat at about 170° in a soln. containing about 160 g. of NaOH per l., using 1 l. of the soln. to 250 g. of the coarse hydroxide, approx. until the desired conversion to the fine state is attained.

Aluminum chloride from clay. OSKAR JONAS, KURT WEGER and GOTTHARD TREBITZ (to I. G. Farbenind. A.-G.). Can. 284,769, Nov. 13, 1928. Calcined clay (100 tons) is dumped into a container having a double bottom so as to form a layer several meters in height. To start the reaction a small part (about $\frac{1}{10}$) of the required total amt. of acid corresponding to 900 tons of 26% HCl is preheated and, together with the acid washing water from a previous extn., flowed over the clay. After the clay is entirely covered with said dil. acid, the main quantity of the above-indicated strong acid required for the extn. is gradually introduced into the container while the corresponding amt. of finished ext. is continuously withdrawn from below, a const. level being maintained. The supply of the HCl and the withdrawal of ext. is regulated so that the temp. in the reaction zone rises to at least 105° and up to 120°. By this means the greatest part of the spent acid leaves the container after one single pass, yielding a clear finished liquor of AlCl_3 corresponding to about 120–130 g. Al_2O_3 per l. The exhausted residue of clay is washed with water and removed from the container.

Ammonium chloride. J. W. MOORE, W. G. POLACK and CASTNER-KELLNER ALKALI CO., LTD. Brit. 290,045, May 18, 1927. Interaction of gaseous NH_3 and gaseous HCl to produce tough crystals of NH_4Cl of fibrous character as described in Brit. 273,093 (C. A. 22, 1831) is carried out with gases which are not dried; the heat of the reaction prevents condensation of moisture and the reaction is effected at a temp. of 230–310°. Cf. C. A. 22, 3497.

Ammonium sulfate. S. ROBSON. Brit. 289,950, Feb. 3, 1927. $(\text{NH}_4)_2\text{SO}_4$ is formed by the direct combination of NH_3 , SO_2 and H_2O while the constituents are in the form of gases or vapors or of a mist dispersed in a gas.

Ferric oxide. T. STORER and C. J. A. TAYLOR. Brit. 290,421, April 9, 1927. Galvanizers' or enamellers' waste liquors or other ferrous salt solns. to which are added

a non-gaseous oxidizing agent such as MnO_2 , with or without addn. of lime or CaCO_3 , are subjected to heat and pressure and the pptd. ferric oxide is washed and dried and is suitable for use as a pigment. A soln. of Mn chloride which may be produced in the process may be used for forming MnO_2 for further use.

Manganese sulfate and oxides. K. E. DITTMANN, K. FAERBER and GELSENKIRCHENER BERGWERKS-A.-G. Brit. 290,491, Sept. 10, 1927. Ores, wastes, etc. contg. Mn are decompd. with SO_2 soln. and the Mn sulfate soln. thus obtained is sepd., boiled down on the sulfate, and roasted in a closed vessel to utilize cyclically the SO_2 liberated. The sulfate may be roasted with C and then sintered with an air supply regulated in accord with the oxide desired.

Sodium acetate. FRANCIS G. RAWLING. U. S. 1,695,742, Dec. 18. The liquor obtained from the treatment of wood sulfite or a similar liquor is concd. treated with NaOH and lime, and the resulting mixt. is heated to produce water-sol. NaOAc and relatively insol. Ca salts and these are then sepd. from each other.

Drying natural sodium carbonate. WILLIAM F. SEYER. Can. 285,137, Nov. 27, 1928. Dry Na_2CO_3 (8 parts) is mixed with 1 part of wet $\text{Na}_2\text{CO}_3 \cdot 10\text{H}_2\text{O}$ and dried in a rotary drum drier, or the wet $\text{Na}_2\text{CO}_3 \cdot 10\text{H}_2\text{O}$ crystals are first ground to a size between 0.5 mm. and 2.0 mm. and then slowly mixed in the proportion of 3 to 5 with dry Na_2CO_3 at 30° and the mixt. is dried in any rotary drier. This single-stage process depends upon the fact that $\text{Na}_2\text{CO}_3 \cdot \text{H}_2\text{O}$, when containing less than 20% of water, will not bake on any hot surface.

Sodium nitrate. ROBERT GRIESSBACH and KURT RÖHRE (to I. G. Farbenind. A.-G.) U. S. 1,696,197, Dec. 25. NaNO_2 is pptd. from solns. as a difficultly sol. double salt by adding Na_2SO_4 and the double salt is decompd. by heating with water required for dissolving the nitrate, the nitrate soln. being then filtered off and cooled to recover the nitrate.

Sodium nitrate. I. G. FARBEIND. A.-G. Brit. 290,860, July 21, 1927. NaNO_2 is recovered from aq. solns. such as those obtained by leaching caliche by converting it into a double or mixed salt sparingly sol. at ordinary temp. (suitably by use of Na_2SO_4) and treating the ppt. thus formed for sepn. of the NaNO_2 (suitably by heating the double salt to above 70° with just sufficient water to dissolve the NaNO_2).

Obtaining sodium nitrate from aqueous solution. I. G. FARBEIND. A.-G. (Robert Griessbach, inventor). Ger. 467,684, Oct. 15, 1926. The NaNO_2 is converted to a difficultly sol. double or mixed salt, for instance by treating the soln. with Na_2SO_4 , and the ppt. is sepd. and worked up. An example is given.

Sodium bisulfate. JOHN N. CAROTHERS and CHARLES F. BOOTH (to Federal Phosphorus Co.). U. S. 1,693,947, Dec. 4. High-grade NaHSO_4 is obtained by adding water and strong H_2SO_4 to crude niter cake to yield a product contg. approx. 85% NaHSO_4 , heating the mixt. to about 150° , cooling to approx. atin. temp., and then disintegrating.

Silicon fluoride. DEUTSCHE GOLD UND SILBER-SCHNEIDANSTALT VORM. ROESSLER (Kurt Andrich, inventor). Ger. 467,637, Dec. 14, 1926. SiF_4 is made by treating mixts. of silicic acid and fluorides with Cl, or substances yielding Cl, at a raised temp. in the presence of a reducing agent. The reducing agent may be solid or gaseous; C and CO are among those specified.

Titanium oxide. REGINALD H. MONK. U. S. 1,695,341, Dec. 18. Refractory Ti compds. such as those from rutile or ilmenite after elimination of other impurities and a large portion of the Fe content are converted into water-sol. sulfates by mixing with alkali metal sulfate and an acid solvent such as H_2SO_4 , heating the mixt. at $120\text{--}300^\circ$ until a solid cake is formed, cooling and crushing the cake.

Titanic oxide. LOUIS E. BARTON and CHARLES J. KINZIE (to Titanium Pigment Co.). U. S. 1,695,270, Dec. 18. Titaniferous ore is heated, but without fusion (suitably at a temp. of about 200° and then at 350°) with an admixt. of H_2SO_4 and alkali metal sulfate, to form water-sol. salts, and the resulting product is treated with water and the soln. heated.

Apparatus for making solid carbon dioxide. JAMES W. MARTIN, JR. (to the Drice Corp. of America). Can. 285,166, Nov. 27, 1928.

Apparatus for the manufacture of solid carbon dioxide. WALTER S. JOSEPHSON (to Drice Corporation of America). Can. 285,526, Dec. 11, 1928.

Carbon disulfide. JULIUS KOMLÓS, ALEXANDER KOMLÓS and ERNST F. ENGELKE. Swiss 126,816, Feb. 11, 1927. S vapor and a hydrocarbon are allowed to react at a temp. at which CS_2 and H_2S are the chief products. Thus, S and C_2H_2 are heated to 445° . Cf. C. A., 22, 484.

Carbon disulfide. I. G. FARBENIND. A.-G. Fr. 640,783, Sept. 12, 1927. CS_2 is solubilized in water by mixing it with an alc. such as Bu or Am and a soap.

Catalytic oxidation of sulfur dioxide. ALPHONS O. JAEGER and JOHANN A. BERTSCH (Jaeger to the Selden Co.). U. S. 1,695,285, Dec. 18. Gases contg. SO_2 , O and at least one catalyst poison (other than As alone) such as HCl are passed at elevated temps. over catalytically active zeolites which are free from Pt, *e. g.*, zeolite catalysts contg. V. Cf. C. A. 22, 1018.

Catalytic oxidation of sulfur dioxide. ALPHONS O. JAEGER and JOHANN A. BERTSCH (Jaeger to Selden Co.). U. S. 1,696,546, Dec. 25. A catalyst is used comprising a zeolite which contains at least one catalytically active element such as V, Mo, W, U, Cr or Mn in non-exchangeable form and is combined with a catalytically active acid radical such as those of acids of V, W, U, Cr, Mo, Mn and Ti.

Catalytic production of sulfur trioxide. SELDEN Co. Brit. 290,089, Sept. 14, 1927. In oxidizing SO_2 at least part of the reaction gas is passed through heat exchange devices embedded in the catalyst, then in reverse direction through a second series of heat-exchangers surrounding the first and then, after a second reversal, through the catalyst itself. An app. is described.

Catalytic material. WALTER A. PATRICK (to Silica Gel Corp.). U. S. 1,695,740, Dec. 18. A hard porous material such as silica gel which has not been completely dried has pores of a size to adsorb water vapor to such an extent as to contain at 30° at least 21% of its own weight of water when in equil. with water vapor at a partial pressure of about 22 mm. Hg, and this material is treated with a substance capable of forming a catalyst such as with a Pt or Fe compd. and then treated, as by heating, to form the catalyst.

Nickel catalyst suitable for hydrogenating processes. KARL SCHIRMACHER, FRIEDRICH STOLZ, HANS SCHLICHENMAIER and WALTER KROHS (to I. G. Farbenind. A.-G.). U. S. 1,695,666, Dec. 18. A highly active Ni catalyst is obtained by the reduction of a finely cryst. Ni compd. such as Ni nitrate assocd. with silicic acid or other suitable inert substratum.

Activated carbon. ARTHUR B. RAY, ERNEST G. DOYING and JOHN J. BUTKOVSKY (to Carbide and Carbon Chemicals Corp.). U. S. 1,694,040, Dec. 4. Nut cellulose is impregnated with H_3PO_4 and the mixt. is heated to a temp. not materially below 350° (and which may be above 600°), steam is passed over the heated material to carry off volatile P compds. and the latter are recovered from the steam and returned for further use. Other dehydrating agents such as ZnCl_2 also may be used.

Apparatus for the production of carbon black. ROY H. UHLINGER (to Thermatomic Carbon Co.). Can. 285,031, Nov. 20, 1928. An app. for carrying out the process of the following patent is specified.

Carbon black. ROY H. UHLINGER (to Thermatomic Carbon Co.). Can. 285,032, Nov. 20, 1928. Carbon black passed from a decomposing furnace admingled with gases produced therein is subjected to a spray of cooling liquid, and the carbon black is sepd. from the gases. The carbon black is freed from moisture by conveying it along a conduit in a direction counter to the passage of a mixt. of heated gases and carbon black from a decomposing furnace.

Purification of hydrogen. GEWERKSCHAFT DER STEINKOHLENZECHE MONT-CENIS. Fr. 640,069, Aug. 26, 1927. See Brit. 276,687 (C. A. 22, 2445).

Purification of hydrogen. GEWERKSCHAFT DER STEINKOHLENZECHE MONT-CENIS. Fr. 639,935, Aug. 23, 1927. See Brit. 276,668 (C. A. 22, 2445).

Fixation of nitrogen. GASINDUSTRIE AKT.-GES. Ger. 468,728, Dec. 16, 1925. A compact highly porous alkali coke for the fixation of atm. N is prepd. by intimately mixing an alkali phenolate with charcoal and heating. A catalyst such as Fe may be added.

Iodine solutions. KARL JUNGMAHN and OSWALD KOLBERT. Ger. 468,710, Sept. 22, 1926. Solid alc. I solns. are stabilized by the addn. of substances which form metastable compds. with I, such as an iodide, preferably NaI. Cf. C. A. 22, 2639, 3020.

Extraction of lead. NORDDEUTSCHE CHEMISCHE FABRIK IN HARBURG. Fr. 640,816, Sept. 13, 1927. Substances contg. Pb and S are treated to convert the Pb into sulfate, and then heated to about $140\text{--}150^\circ$ under 4 to 5 atm. pressure with concd. NaCl soln.

Separating tin and lead. HUTTENWERKE TROTHA A.-G. and W. WITTER. Brit. 290,628, May 18, 1927. A mixt. of oxidic Sn- and Pb-bearing materials is fused with caustic alkali, such as NaOH, for about 2 hrs., with const. stirring, and preferably with addn. of about 5% of granular wood charcoal. The melt contains most of the Sn as stannate and a small quantity of Pb as plumbite. The residue contains mainly undissolved Pb oxide and a small quantity of Sn. The melt is treated with a small quantity

of water or lye which removes free NaOH and most of the dissolved Pb and leaves most of the Sn salts undissolved. The Sn compds. are separately recovered.

Litharge and minium. SALLENAVE, SOSSON ET C^{IE}. Fr. 640,519, Feb. 17, 1927. Spongy Pb, obtained in an extremely fine state by electrolysis in a soln. of a Pb salt, is macerated in such a way that while still impregnated with the electrolyte it is transformed into a complex mixt. of oxides of Pb and oxidized by baking in a closed vessel.

Mining deposits of boron compounds containing kernite. HENRY BLUMENBERG, Jr. U. S. 1,696,075, Dec. 18. The deposit is treated with an alk. soln. of an alkali metal compd. such as Na_2CO_3 to convert the kernite to an easily sol. metaborate and the latter is dissolved and removed from the deposit. Cf. C. A. 22, 484.

Decomposition of water. PIERRE A. J. M. BÉNÉZET. Fr. 32,955, July 10, 1926. Addn. to 615,465. H and O are obtained by spraying water into a tube heated to above 1000° .

Detecting leakage of halogens or their volatile compounds. T. S. LANYON and BARON WOLDEMAR GEORGE NOLCKEN. Brit. 290,324, Jan. 11, 1927. Leakage of Cl or other halogens or their volatile compds. is detected by drawing the gas from the vicinity of the leak to a visual indicating device such as a lamp with a clear Bunsen burner flame which draws the air contg. the gas by suction through a chimney of Cu or Cu alloy. A flame vibration is produced as in Beilstein's test.

Salt evaporating pans. VEREINIGTE SCHWEIZERISCHE RHEINSALINEN. Ger. 468,729, Sept. 21, 1926. The scrapers are mounted on a reciprocating axle and are raised for the return stroke.

Purification of brine. I. G. FARBENIND. A.-G. Fr. 640,237, Aug. 29, 1927. Brine for use in electrolytic tanks is freed from salts of Mg and Ca by satg. it with NaF and the pptd. MgF_2 and CaF_2 are removed.

Evaporating Searles Lake brine. GEORGE B. BURNHAM (to Burnham Chemical Co.) U. S. 1,696,542, Dec. 25. The brine is pumped from its normal subterranean position and is exposed in an open pond of sufficient extent and depth to be conductive to wave action in the brine under the influence of the wind so that the formation of a salt crust is prevented.

Crystallizing solid substances from supersaturated solutions. ISAK ISAACHSEN (to Alkelselskapet Krystal). U. S. 1,693,786, Dec. 4. In effecting crystn. of substances such as NaCl from supersatd. solns. with cyclic circulation of a suspension of granules of the material, the soln. and suspension are circulated as a stream of relatively small cross-sectional area so that the granules are normally positively carried along by the stream, and the no. of granules is regulated before they have materially increased in size, and granules are removed from the circulating stream at definite places.

Magnetic materials. ADOLPH F. BANDUR (to The Western Electric Co., Inc.). Can. 285,214, Nov. 27, 1928. Fe-Ni alloy in finely divided form and contg. more than 25% Ni and the remainder principally Fe is treated with a flux of boric acid and kaolin in colloidal suspension, whereby the alloy particles are individually insulated, after which they are compressed into cores of the desired shape and size. The cores are then impregnated with a soln. of $\text{Zn}(\text{OH})_2$, are heated to expel moisture and finally are heated to the optimum temp. for the particular alloy of which the cores are constructed to stabilize the insulator and to give the required permeability, low hysteresis losses, high specific resistance, hence, low eddy current losses of the rings. The magnetic material is used especially as magnet cores for loading coils for telephone circuits.

Compact magnetic agglomerates from magnetic powders. V. I. VOLUINKIN. Russ. 4676, Feb. 29, 1928. The powdered magnetic material is mixed with a binder, pressed and heated in forms laid out with adsorbent material such as sand, cardboard, etc.

Extracting and drying inorganic jellies. WOLF J. MÜLLER, HANS CARSTENS and JULIUS DECKER (to I. G. Farbenind. A.-G.). U. S. 1,696,358, Dec. 25. Ertg. and drying of inorg. jellies such as silicic acid gel is effected in the form of plates or sheets.

Adsorbent gels. E. B. MILLER and G. C. CONNOLLY (to Silica Gel Corp.). Brit. 289,890, May 6, 1927. Small particles of hard adsorbent gels formed during the manuf. or handling of these substances are added to hydrosols and remain in the hydrogel which forms from the sol, and in the final dried product. Reference is made to the prepn. of gels of silica and of oxides of Al, Sn, Ti and W.

Catalytic and adsorbent gel. WALTER A. PATRICK (to Silica Gel Corp.). U. S. 1,696,644, Dec. 25. A hard stable material having a porous structure substantially the same as silica gel contains Cu oxide and a colloidal oxide such as silica gel and is suitable for use as a catalyst. U. S. 1,696,645 specifies Ni instead of Cu oxide, and the gel contg. Ni may be used as a catalyst.

Thermoplastic composition. CAMILLE DREYFUS and GEORGE SCHNEIDER (to Camille Dreyfus). Can. 285,231, Nov. 27, 1928. Thermoplastic molding powders are manufd. in the absence of volatile diluents, by grinding 80 lbs. of cellulose acetate in a pebble mill for 6-8 hrs., adding 24 lbs. of triacetin and 4 lbs. of diethyl phthalate and grinding the mixt. for an additional 8 hrs., then adding 75 lbs. of ZnO to the mixt. and further grinding for several hrs. until a homogeneous mass is obtained.

Hardened solid artificial masses. KARL OTT, HERIBERT SCHUSSLER, MARTIN LUTHER and CLAUD HENCK (to I. G. Farbenind. A.-G.). Can. 284,967, Nov. 20, 1928. Artificial masses are produced by hardening casein together with dimethylolurea thoroughly mixed therewith under a high pressure at temp. of about from 80° to 120°. E. g., 500 parts of casein and 500 parts of dimethylolurea are thoroughly mixed, and the mixt. is subjected to a pressure of 200 atms. for 3.5 hrs. in a block-press, which is maintained at a temp. of 100°. An artificial mass of yellowish color is obtained.

Condensation products from aldehydes and phenols. MAX WEILER, BERTHOLD WENK and HERMANN STOTTER (to I. G. Farbenind. A.-G.). Can. 284,773, Nov. 13, 1928. An aldehyde is treated with a *p*-halogenated phenol that contains a free ortho position and which may be substituted in the nucleus by indifferent substituents, in the presence of H₂SO₄ of a suitable concn. at temps. of 15-70° and for a time ranging from 3 hrs. to 3 days. E. g., 16.3 parts by wt. of 2,4-dichlorophenol is dissolved in a mixt. of 60 parts of glacial AcOH and 40 parts of H₂SO₄·H₂O and 5.5 parts of an aq. 29% CH₂O are added. After heating several hrs. to 50-70° C. the mass is poured into water and filtered from the ppt. Unattacked dichlorophenol may be removed by blowing steam through or may be dissolved in NaOH soln., from which it is pptd. by pouring into dil. acid. The product of condensation is a nearly colorless powder easily sol. in alkali and ligroin.

Shaped articles from urea-aldehyde condensation products. FRITZ POLLAK Austrian 109,532, Nov. 15, 1926. Manipulative details.

Formation of porous castings from carbamic-formaldehyde condensation products. SOCIÉTÉ ANON. POUR L'INDUSTRIE CHIMIQUE À BÂLE. Swiss 126,827, Dec. 4, 1926. White or ivory-like castings of great strength and high *insulating power* against heat and electricity and capable of being ground and polished are prepd. by pouring a soln. of the condensation products into a mold in the presence of a catalyzer, such as H₂SO₄, which effects further condensation.

Sulfur and silica composition suitable for use as an acid-proof coating or cement, etc. WM. H. KOBBE (to Fleuron, Inc.). U. S. 1,693,714, Dec. 4. About equal quantities of S and SiO₂ are used together. The SiO₂ is comminuted so that approx. 7.2% is held on 80-mesh, 5.6% on 100-mesh, and through 80-mesh, 25% is held on 200-mesh and through 100-mesh, 19% is held on 320-mesh and through 200-mesh and 43% passes 320-mesh screens. This compn. may be used for coating tanks.

Colloidal solutions of silica for coating stone, brick, wood or other surfaces or for impregnating fabrics. G. KING and R. THRELFALL. Brit. 290,717, Feb. 16, 1927. Water (not in excess) is added to a soln. of an alkyl silicic acid ester (or mixt. of such esters) in a solvent such as alc. which is capable of carrying water in soln. or suspension. Preferably the quantity of water is such as not to decomp. all of the ester. Pigments may be added preferably in admixt. with solvents such as cyclohexanol which do not interfere with hydrolysis of the ester. Setting may be retarded by addn. of substances such as CCl₄, turpentine, bromonaphthalene, fatty oils, shellac, synthetic resins or essential oils and the soln. may be added to *pyroxylin lacquers* as a stiffening or fireproofing agent.

Utilizing waste gases of the iron-steam process of making hydrogen. BAMAG-MEQUIN A.-G. Ger. 466,109, Dec. 24, 1926. The waste gases from each phase of the process are collected in a common container and used as heating gas. Small quantities of the reducing gases used in the process may be added.

Rust-removing compositions. ZOELLNER-WERKE A.-G. VORM. S. H. COHN. Ger. 466,077, Nov. 8, 1925. Naphthalenesulfonic acids or their condensation products with formaldehyde are used as ingredients of rust-removing compns.

Removing iron mold. BYK-GULDENWERKE CHEM. FAB. A.-G. Ger. 466,130, April 13, 1926. Bilactates are used, particularly Ca bilactate.

Dispersing agents. BRITISH DYESTUFFS CORP., LTD., JAMES BADDILEY, ARNOLD SHEPHERDSON and ANTONY J. HAILWOOD. Fr. 640,776, Sept. 12, 1927. Dispersing and solubilizing agents, particularly for dyes, are obtained by oxidizing sulfite cellulose pitch with HNO₃, H₂O₂, chromic acid, permanganates or ammoniacal Cu sulfate. When dried, the product forms a friable non-hygroscopic mass.

Cleaning agents. BRITISH DYESTUFFS CORPORATION, LTD., JAMES BADDILEY and ERNEST CHAPMAN. Fr. 640,777, Sept. 12, 1927. See Brit. 284,367 (C. A. 22, 4741).

Cleansing compositions. IGNAZ KREIDL. Austrian 109,387, Dec. 15, 1927. Cleansing compns. comprise an alkali bicarbonate, an alkali carbonate and a fat solvent. A typical compn. comprises NaHCO_3 250 parts, K_2CO_3 20 parts of a 30% soln. and turpentine oil 60 parts.

Cleaning compositions for walls, carpets, etc. ALBERT HEUSSER. Swiss 126,154, Jan. 3, 1928. Meal is stirred into a hot soln. of a metal sulfate in sufficient amt. to give a tough pasty mass. Wheatmeal and CuSO_4 or alum are the preferred ingredients.

Detergent for use on wood, metal, glass, leather, varnished surfaces, etc. HENRY R. LADISLAUS. U. S. 1,695,693, Dec. 18. HCl 4 oz., glycerol 4 oz., pulverized antimony 16 oz., oil of mirbane 4 oz., vinegar 1 gal. and machine oil 1 gal. are mixed together with water $\frac{1}{2}$ gal.

Paint remover. BORIS N. LONGOVY (to The Chadeloid Chemical Co.). Can. 285,351, Dec. 4, 1928. A paint and varnish remover compn. free from any large percentage of water comprises denatured alc., acetone, benzene, wax and a benzoate. It is free from chlorinated hydrocarbons and the benzoate is present in quantity sufficient to give a substantial thickening effect. An example is a compn. made by mixing 450 parts of acetone, 140 parts of the alc. soln. of BzONa and 400 parts of benzene, the latter contg. about 10 parts of ceresin wax. Cf. C. A. 23, 532.

Composition for cleaning drain-pipes. EDWARD A. TAYLOR (to Grasselli Chemical Co.). U. S. 1,693,678, Dec. 4. A mixt. of caustic alkali such as NaOH 95, finely divided Al_2 and "goulac" 1 part.

Separating and cleaning plates or leaves of mica by gravitation against upward air currents. LOUIS MCCARTHY (to Macallen Co.). U. S. 1,695,383, Dec. 18. An app. is described.

Polishing composition. J. MAS. Brit. 290,295, May 12, 1927. See Fr. 634,291 (C. A. 22, 3791).

Polishing pad for lenses. JOHN D. GAMBLE (to Continental Optical Corp.). U. S. 1,693,598, Dec. 4. A pad of felt or the like is impregnated with pitch material and a portion of the latter is then extd. from one side of the pad, e. g., by contact with an absorbent pine board.

Sound records. E. NOACK. Brit. 290,801, April 19, 1927. Material such as artificial phenolic resins or cellulose ester or ether compns. after being formed into pressed blocks and ground to a fine powder is freed from all traces of volatile solvent and moisture, mixed with asphalt as a binder, rolled into sheets or strips and molded under heat and pressure. Various auxiliary ingredients may be added.

System (employing light beams and sensitized films carrying light-restraining dyes) for producing combined sound and picture records. A. C. HARDY (to British Thomson-Houston Co., Ltd.). Brit. 290,668, May 20, 1927.

Loud-speaker diaphragms of thin aluminum-manganese alloy, etc. V. A. SCHLENKER (to Electrical Research Products, Inc.). Brit. 290,235, May 11, 1927.

Viscous composition for dampening vibrations of sound recording and reproducing styli. H. C. HARRISON (to Electrical Research Products, Inc.). Brit. 290,264, May 13, 1927. A mixt. may be used comprising polymerized castor oil 75 and PhNO_2 25%.

Vibration-dampening materials. MARTIN HAHN and KURT B. EISENBERG. Ger. 466,022 Sept. 16, 1926. Materials for suppressing acoustic, mech., elec. or thermal vibrations or oscillations comprise mixts. of viscous liquids with powdery mineral fillers. A typical mixt. comprises oil, loam and alumina.

Dynamo brush. NELSON A. HAAS (to the Dayton Engineering Laboratories Co.). Can. 285,164, Nov. 27, 1928. A mixt. of graphite and phenolic condensation product is heated in a mold to 250–300° F., under a pressure of 3000 lb. per sq. in. for about 6 min.; the mold is cooled by running water for about 3 min. while the pressure is maintained and the briquet is heated in a non-oxidizing atm.

Dielectric material from wood. ANDRE MOUILLEFARINE. U. S. 1,696,501, Dec. 25. Wood is first dyed to resemble ebonite by immersing it in a bath comprising "basic black," HOAc and NaCl for about 24 hrs., during the first 4 hrs. of which the material is heated to about 100° and during the remainder of which time it is permitted to cool, and is thereafter heated and submitted to the action of an insulating mass of bituminous shale and to temps. of 150–300° or higher and is then dried and finally coated with a varnish contg. shellac.

Composition for honing razors and knives. WILHELM HAFNER. U. S. 1,693,697, Dec. 4. A mixt. formed of glue 17 g., glycerol 25 drops, powd. emery 4 g., tripoli 3–5 g., beet juice 7 g., sugar 0.5 g. and gelatin 0.5 g. is applied to wood or other support.

Waterproofing composition. EDWIN C. E. LORD. U. S. 1,693,718, Dec. 4. A compn. suitable for water-proofing walls, cisterns, etc., comprises a mixt. of water-gas tar and paraffin wax dissolved in coal-tar naphtha, having a sp. gr. of about 1.02.

Foam-producing composition suitable for various purposes. ERICH M. A. STHAMER. U. S. 1,696,507, Dec. 25. Saponin and milk sugar are used together in fire-extinguishing or other compns.

Foam fire extinguisher. S. D. BOGOSLOVSKII. Russ. 4658, Feb. 29, 1928.

Foam fire extinguisher. V. V. GESHELIN. Russ. 4207, Dec. 31, 1927.

Fireproofing various combustible materials. DUPONT VISCOLOID Co. Brit. 289,936, Feb. 1, 1927. The material is treated with a hydrated Mg carbonate either as a coating or impregnating substance which may be mixed with rubber soln., varnishes, paints, etc., for application to fabrics, wood or cellulose esters or ethers, and various compns. of these substances contg. hydrated Mg carbonate may be used for making molded articles.

Destroying vermin. KARL SCHNEIDER. Ger. 466,232, Mar. 22, 1925. Vermin, particularly bugs, are destroyed with solns. in benzine of cresol or like substances by atomizing the solns. with compressed air and blowing them into the infested places.

19—GLASS, CLAY PRODUCTS, REFRACTORIES AND ENAMELED METALS

G. E. BARTON, C. H. KERR

Handwork and machinery in glass manufacture. O. KNAPP. *Chem. Rundschau* (Budapest) 5, 67-69(1928).—The following are described: modern glass factories, the continuous process used by Henry Ford, Owen's bottle-making machine, Westlake's flask-blowing machine and Danner's tube-producing app. S. S. DE F.

The effect of solarization on the ultra-violet transmission of window materials. W. W. COBLENTZ AND R. STAIR. *Trans. Illum. Eng. Soc.* 23, 1121-52(1928). The transmission for 302 millimu was measured for various glasses before and after exposure to ultra-violet. Three classes are established: (1) Fused quartz, Corex and Locke glass. Transmission is initially over 85%, and there is little or no decrease on solarization. (2) Vitaglass and Helioglass. Transmission is initially 45-55%, decreasing to about half on exposure. (3) Common glass and Quartzlite. Transmission is initially 0-1.5%; there is no change with exposure. The original, and a previous paper (*Ibid* 23, 247), should be consulted for a discussion of ultra-violet therapy. BENJAMIN MILLER

The relation between moisture content and contraction of clay molds (dough) and its mixtures with sand. V. T. SAPEGO. *Trans. State Exptl. Inst. Silicates* (Moscow) 21, 41-52(1927).—Expts. were conducted on mixts. of a clay with 10 to 70% sand. Water was added to make them all of uniform consistency. Test bricks were weighed and measured daily until shrinkage ceased. The bricks were then dried at 110° to det. hygroscopic moisture. The data are presented in 8 tables. J. S. JOFFE

The contraction of fire bricks. I. V. SMIRNOV. *Trans. State Exptl. Inst. Silicates* (Moscow) 21, 29-39(1927).—S. tested a series of 12 samples of different clays for the linear and cubical decrease and porosity due to contraction when heated to 120°. These measurements were correlated with the plasticity of the respective clays. It was found that clays with a high contraction are the most plastic. J. S. JOFFE

The microstructure of Dinas. N. N. SMIRNOV. *Trans. State Exptl. Inst. Silicates* (Moscow) 18, 5-24(1926).—Quartz changes in Dinas brick proceed as follows: (1) The first influence of the heat causes a breaking up of the quartz grains. (2) A change takes place from the quartz uniaxial to the biaxial. (3) The quartz gradually changes into amorphous glass. (4) Cristobalite is formed from the glass. (5) The cristobalite gradually changes into tridymite. J. S. JOFFE

The microstructure of refractory bricks. N. N. SMIRNOV. *Trans. State Exptl. Inst. Silicates* (Moscow) 18, 25-32(1926).—Considerable recrystn. takes place in most bricks. Slender, long prismatic crystals appear, but they are poorly differentiated. The newly formed crystals resemble very closely the crystals of sillimanite. J. S. J.

Roman potteries. The composition of ancient Roman pottery and terra sigillata fragments found in the exhumed kiln between Nied and Höchst, 1890-1893. ADOLF JACQUET. *Keram. Rundschau* 36, 511-3(1928).—Analyses were made of fragments of pottery associated with an ancient Roman kiln situated between Nied and Höchst and discovered during excavation to det. whether fragments showed dissimilarities in compn. and whether it could be assumed that some clay was imported from Italy over the promi-

nent highway that passed near the spot where the excavation was made. Two general types of ware were distinguished: (1) pitchers, bowls, etc., made from heavy, unwashed clays; (2) bowls and cups made of washed and purified clays, either unglazed or with a thin glaze. Analyses of these two types are given. J. concludes that both types of ware used the same clay, that the clay was dumped into pits, weathered, and washed, and two kinds of clay were obtained. One of these, with the lower SiO_2 content, was used for terra sigillata ware and to it was added a short CaO-rich clay, probably to obtain a glaze-like surface. The clay with the high SiO_2 content and CaO content were used for the lower-grade ware. H. I.

Recent investigations on the system: alumina-silica and their importance in the study of ceramic materials. G. MALQUORI. Reale Univ. Roma. *Ann. chim. applicata* 18, 352-61(1928).—A review and discussion, with 21 references. C. C. DAVIS

Constitution of gold resinate. F. CHEMNITZ AND R. BARFUSS-KNOCHENDÖPPEL. *Chem.-Ztg.* 52, 857-9(1928).—Complete instructions are given for preparing pure Au resinate (used in ceramics to give a golden glance). Complete analysis of such pure samples gives: Au, 63.2, S, 10.0, H, 2.2-2.4, C, 17.95-17.99. ALBERT L. HENNE

The wet process of vitreous enameling. W. MARSHALL. *Foundry Trade J.* 39, 863-4(1928).—M. discusses factors affecting the quality and economy of enameling. Enamels consist of borosilicates to which varying percentages of fluxes and colors are added. Factors contributing to successful enameling are: (1) Careful control of temp. and length of heating period; it is desirable that the heating take place as rapidly as possible and for a short time. (2) Protection from certain products of combustion. (3) Careful cleaning and prepn. of the product to be enameled. (4) The thinner the enamel coat, the higher the quality. Types of furnaces and character of fuel oil are discussed. Fuel cost is a minor factor in general. L. B. MILLER

The production of color in glass by x-rays and radium rays (REINHARD, SCHREINER)
3. Fusing metal caps on to vessels or tubes of glass (Ger. pat. 466,049) 1.

Taschenbuch für Keramiker, 1928. In 2 parts. Berlin: Keramische Rundschau. Pt. I. 40 pp. Pt. II. 360 pp. Reviewed in *Trans. Ceram. Soc.* (England) 27, abstract Sect., 25(1927-28).

Tonindustrie-Kalender, 1928. In 2 parts. Berlin: H. Seger and E. Cramer. Chemisches Laboratorium für Tonindustrie und Tonindustrie-Ztg. Pt. I, 40 pp. M. 1.20, Pt. II, 160 pp. M. 3.50. Reviewed in *Trans. Ceram. Soc.* (England) 27, abstract Sect., 25(1927-28).

JAKÓ, G. *Keramische Materialkunde*. Revised with an appendix on "Technik der vernünftigen Kalkulation keramischer Mineralien," by R. Jäger. Dresden and Leipzig: T. Steinkopff. 153 pp. Paper, R. M. 7.50; bound R. M. 9.

MERNAGH, LAURENCE R.: *Enamels: Their Manufacture and Application to Iron and Steel Ware*. Philadelphia: J. B. Lippincott Co.; London: Charles Griffin & Co. 234 pp. \$7 (18s., net). Reviewed in *J. Franklin Inst.* 206, 864; *Chem. Trade J.* 83, 319(1928).

PEDDIE, C. J.: *Defects in Glass*. London: Glass Publications, Ltd. 205 pp. 8s. 6d. Reviewed in *Nature* (Supplement) 122, 541(1928).

Apparatus for feeding molten glass. C. H. RANKIN. Brit. 200,083, Aug. 24, 1927.

Device for feeding mold charges of molten glass. PAUL G. WILLETTTS (to Hartford-Empire Co.). U. S. 1,696,661, Dec. 25.

Furnace and associated apparatus for supplying molten glass and heating it just before forming it into sheets. JOHN L. DRAKE (to Libbey-Owens Sheet Glass Co.). U. S. 1,695,538, Dec. 18. Structural features.

Distributor for feeding glass-making machines. ALFRED BOUCHER. Fr. 640,854, Feb. 22, 1927.

Apparatus for forming blown molded glass articles. R. F. HALL. Brit. 290,685, Nov. 18, 1926.

Apparatus for the production of blown glass articles. CORNING GLASS WORKS. Fr. 610,604, July 11, 1927.

Sheet glass. WM. K. BROWNLEE (to Libbey-Owens Sheet Glass Co.). U. S. 1,695,528, Dec. 18. A furnace and assocd. app. are described in which glass for drawing is supplied through a refining and cooling chamber and the lower strata and side portions of the glass are simultaneously heated.

Sheet-glass drawing apparatus. LAWRENCE A. GROLEMUND (to Libbey-Owens Sheet Glass Co.). U. S. 1,695,547, Dec. 18.

Draw-table-heating unit for sheet-glass manufacture. WALTER O. AMSLER (to Libbey-Owens Sheet Glass Co.). U. S. 1,695,265, Dec. 18.

Leer for annealing glassware. PERCY Q. WILLIAMS (to Owens Bottle Co.). U. S. 1,695,788, Dec. 18; Can. 284,598, Nov. 6, 1928.

Leer and conveying apparatus for annealing glassware. O. SHACKELFORD (to Thermal Engineering Corp.). Brit. 289,790, April 29, 1927.

Laminated glass made with a film of transparent substantially colorless rubber. JAMES W. H. RANDALL (to Libbey-Owens Sheet Glass Co.). U. S. 1,693,729, Dec. 4.

Fixing designs on glass surfaces. KALMAN WARGA (to Clarence W. Bickford and Mary Bickford). U. S. 1,693,735, Dec. 4. Designs are formed with color films, each contg. a mineral pigment and a vitreous binding material, all the films being fusible at the same temp., and the designs are placed in a mold fitting the glass object to be decorated, the latter is inserted while hot into the mold contg. the design and into contact with the design, and heating in a leer is effected to fix the design. Cf. C. A. 22, 308.

Recuperating circular furnace composed of many chambers for baking Dinas bricks. V. E. GRUM-GRZHIMAILO. Russ. 4322, Sept. 15, 1924.

Press for making brick, tiles, etc., from dry clay. J. YLLA Y CONTE. Brit. 290,243, May 11, 1927. Structural features.

Refractory material. VICTOR M. GOLDSCHMIDT and ROLF KNUDSON (to Borgestad Fabrikker). Can. 285,503, Dec. 11, 1928. Olivine rock fashioned, cut, sawn, etc., into the desired shape is used as a refractory for metallurgical purposes, stoves, chimneys, crucibles, etc., or it may be utilized in finely disintegrated form or in coarser pieces with a binder such as colloidal magnesium silicate, MgO , $Mg(OH)_2$, talc, materials contg. lime or other Ca compds., clay, tar, pitch, asphaltum. The olivine rock and binding agent may be shaped and burned at suitable temp. between 1000° and 1500° before use.

Fusing and purifying alumina and other refractory substances. J. SKAPPEL. Brit. 290,586, May 13, 1927. Substances such as cryst. Al_2O_3 , spinel, TiO_2 , titanite, zirconia and beryl are obtained from impure raw materials contg. them by sintering or fusing with halogen salts such as fluorspar, cryolite or $NaCl$ or $CaCl_2$, or with oxidic alkali or alk. earth metal compds. such as aluminates, removal of impurities by reduction, electrolysis or conversion and cooling of the reaction mass to obtain crystals and a eutectic mixt. which is then mech. sepd. from the desired crystals. Numerous details and modifications are described.

Apparatus for heat treatment of refractory materials. THOMAS S. CURTIS (to Vitrefrax Corp.). U. S. 1,696,794, Dec. 25. Structural features.

Abrasive composition for sharpening razors. W. E. COMERFORD. Brit. 290,123, Nov. 26, 1927. Rollers of razor-sharpening devices are treated with a mixt. formed with equal quantities of finely powd. carborundum and graphite, made into a paste with a hard drying size, applied while hot and, when set, polished by steel burnishers.

Coating ceramic objects. GERHARD KALLEN. Ger. 468,703, Mar. 31, 1925. Addn. to 402,020. The fire resisting coating contg. ZrO_2 described in Ger. 402,020 is applied to ceramic objects before baking or when half baked.

Composition to be added to cement mixtures for cold glazes or the like. JOHN LANGBEIN. U. S. 1,695,808, Dec. 18. A mixt. of polymerized linseed oil 25, ammoniacal water 66, milk of lime 575 and infusorial earth 100 parts is used for rendering cold glazes suitable for gilding.

Furnaces for drying and baking ceramic materials. ALFRED DELECOURT. Fr. 32,840, July 19, 1926. Addn. to 623,441.

Withdrawal indicator for ceramic furnaces. TUILERIES A. BISCH (S. A. R. L.). Fr. 640,799, Sept. 13, 1927. The contraction of the article being baked is measured and recorded on an indicator.

20—CEMENT AND OTHER BUILDING MATERIALS

J. C. WITT

Cement and the chemical industry. HANS. KUEHL. *Tonind. Ztg.* 52, 1817-20 (1928).—An address. F. O. A.

Japanese cement standard specifications. ANON. *Tonind. Ztg.* 52, 1901-2 (1928).—The specification of April, 1927, is given. F. O. A.

Closed-circuit fine grinding and what it should accomplish in the cement industry. A. ANABLE. *Rock Products* 32, No. 1, 66-72 (1928). RAYMOND WILSON

The Lehigh Portland Cement Company plant at Mitchell, Indiana. ANON. *Pit and Quarry* 17, No. 7, 33-44(1928).

Asbestos-cement products used in construction. CHARLES QUILLARD AND PIERRE DESNOS. *Ciment* 33, 422-9(1928).—A general description of the manuf. and application of asbestos-cement products. F. O. A.

Thermal constants and the strength of light aggregates. MINORU HAMADA. *J. Faculty Eng. Tokyo Imperial Univ.* 17, 201-12(1928).—Thermal cond. consts. were detd. by measuring the rate of rise in temp. in the centers of 6-by-12-in. cylinders heated from the surface and calcg. the diffusivity by the mathematical theory of heat conduction. The proportion of cement to aggregate has little effect on heat cond. Concretes made from various Japanese light-weight aggregates have $\frac{1}{2}$ to $\frac{1}{3}$ the heat cond. of those made from common sand and gravel. An approx. relation between heat cond. (k) and voids (v) is $k = 0.005/0.5^v$. RAYMOND WILSON

Protecting concrete. A. W. RICK. *Tonind. Ztg.* 52, 1861-3(1928).—A general discussion of admixtures, impregnators and coatings. F. O. A.

The mechanism of the decomposition of rotary kiln clinker on long storing. ADOLF SPENGLER. *Tonind. Ztg.* 52, 1939-40(1928).—Clinker after 7 years of storage in contact with the air underwent spontaneous pulverization, not shown by similar clinker in a bottle. The former was sepd. by sieves into fractions. On analysis it was found that as the change progressed, the decompd. fractions contained more lime and less SiO_2 than the original. The larger, more poorly burned clinker balls suffered much more than the hard-burned pea-sized pieces. Therefore hard burning tends to prevent this decompn. F. O. A.

The properties of breeze and clinker aggregates and methods of testing their soundness. F. M. LEA. Dept. of Sci. and Ind. Research (British), *Building Research Bull.* No. 5, 17 pp.(1928).—The effect of breeze and clinker aggregates on the properties of concrete are dependent on the amt. and nature of the combustible material in the aggregate. Aggregates having large moisture movements and therefore likely to prove unsound in concrete have high capacities for absorption of moisture, O or dye (methylene blue). A pat test and a dye-absorption test for soundness of such aggregates are described. RAYMOND WILSON

Nomenclature of materials and processes used in the construction of roads, and the standardization of testing methods for tars, bitumens and asphalts. PERCY E. SPILLMANN. *J. Inst. Petroleum Tech.* 14, 774-9(1928).—Definitions of the following terms as agreed upon by the Intern. Comm. on Nomenclature are given: bitumen, asphaltic bitumen, asphalt, asphaltite, tar, pitch. Test specifications are described as follows: tar (water content, consistency, free C, distn. test, density, acid-oil detn., detn. of mixts. contg. naphthalene); pitch, bitumen and asphaltic bitumen (penetration, softening point, loss on heating, soly. in CS_2 , ductility, density, penetration at low temp., flash point, free C and ash, soly. in $(\text{C}_2\text{H}_5)_2\text{O}$); emulsions (water content, sepn. of water and bitumen). D. F. BROWN

Tentative standard methods of sampling and testing highway materials. H. S. MATTHEW, F. H. JACKSON, et al. U. S. Dept. of Agr., *Bull.* No. 1216, 128 pp.(1928).—Methods are described which were adopted by the American Assocn. of State Highway Officials and approved by the Secretary of Agr. for use in connection with federal-aid road construction. RAYMOND WILSON

New testing laboratory of the National Crushed Stone Association. ANON. *Pit and Quarry* 17, No. 7, 45-9(1928). E. H.

Structural materials testing laboratory of the Melbourne University. R. R. BLACKWOOD. *Commonwealth Eng.* 16, 141-8(1928). E. H.

Testing plaster of Paris for quality. WILHELM SCHAPER. *Tonind. Ztg.* 52, 1923-4(1928).—Certain simple tests are very convenient for detg. the quality of plaster of Paris. Put a little plaster in a third of a glass of water and pour out the excess so that a few drops of thin paste flow out also and the plaster has acquired its max. content of water. Stir gently and slowly with a glass rod and invert over a clean glass plate. On removing the glass, plaster from a rotary kiln is level, while from a kettle it will stand higher in the middle. The remainder of plaster in the glass should be divided between the sides and bottom and let stand. After it has set, rinse with water and the whole may be readily removed, if the quality is good. The walls may be only 0.1 mm. thick, but strong and elastic. If poor, the walls and bottom crack. After the temp. of the test piece has just reached that of the room, pieces broken from the side should not chalk on rubbing between the fingers. An improperly burned plaster does not take up the water smoothly and evenly, requiring much working. For dental plaster a burning temp. of 15 to 25° higher is required than for ceramic plaster. Some

of the plaster burned in a shaft kiln has a slow pouring rate and is suitable for making forms. Plaster burned slowly at a temp. const. to $\pm 3^\circ$ is often desired. F. O. A.

Differentiation of green woods from seasoned woods. F. CHARRIER. *Intern. Congress Testing Materials* 1927, II, 539-50.—This is a description of the different characteristics of green and seasoned woods when examd. under the microscope with the use of stains. Ash, fir, poplar, beech, oak and elm were examd. Conclusion: Artificial aging, by air-drying, steam kiln, or ozone treatment does not confer the same characteristics as natural aging.

PAUL J. CULHANE

The effect of electric current on wood. B. F. SCHWARZ. *Inst. du Pin, Bordeaux. Bull. inst. pin* No. 52, 215-20 (Sept.), No. 53, 239-44 (Oct.), No. 54, 251-8 (Nov., 1928).—After a brief review, with bibliography of 25 references, and a description of 3 different forms of app. for studying the effects of an elec. current on wood (test pieces in horizontal and vertical positions, wood in the form of chips), the results obtained in expts. on treatment with H_2O , K_2CrO_4 and $Pb(NO_3)_2$, I , H_2SO_4 , HCl , $NaOH$, $ZnCl_2$, $CaCl_2$, $HgCl_2$, $MgSO_4$, $CuSO_4$, pinewood creosote and tannin are given in detail. Conclusions: Wood can be impregnated with various substances without application of pressure by proper utilization of elec. phenomena. Impregnation takes place throughout the whole of the test piece, but not uniformly in all parts. A partial removal of the sap can be effected by means of electroosmotic pressure. The direction of electroosmosis varies with the impregnating substances used. The elec. cond. varies irregularly during the treatment, generally increasing with time.

A. PAPINEAU-COUTURE

Ca compounds (DONATH) 6. Treating Zn waste [recovery of hydraulic cement] (Brit. pat. 290,035) 9. Apparatus for electrodeposition of Cu or other metals on non-metallic roofing (U. S. pat. 1,693,683) 4. Waterproofing composition (for walls) (U. S. pat. 1,693,718) 18. Sulfur and SiO_2 composition for use as cement (U. S. pat. 1,693,714) 18. Bituminous compositions for paving, building construction, etc. (Brit. pat. 290,886) 22. Colloidal solutions of silica for coating stone, brick, wood or other surfaces (Brit. pat. 290,717) 18. Aluminosilicates of Ca, P and KOH (Fr. pat. 639,893) 18. Kilns for lime, cement, etc. (Ger. pat. 466,191) 1. Shaft kiln for lime or cement manufacture (Ger. pat. 466,190) 1. Phosphorus and aluminous cement (Can. pat. 284,772) 4. Waterproof teredo-repelling paint (Can. 284,580) 26. Porous materials [cements] (Fr. pat. 640,473) 28.

Cement. LUDWIG ZINSSER. Swiss 126,992, April 23, 1927. Pegs are formed by encrusting fibrous or granular vegetable matter with a mineral coating such as cement.

Cement. INTERNATIONAL CEMENT CORP. Brit. 290,890, Sept. 26, 1927. See Can. 281,304 (C. A. 22, 3031).

Cement manufacture by the wet process. WERNER P. ECKDAHL. U. S. 1,693,644, Dec. 4. Setting of a slurry of finely divided siliceous material having a basic reaction, such as blast-furnace slag and limestone, is prevented by passing gases high in CO_2 into contact with the slurry.

Refractory cement. JOHN W. MARDEN and HENRY K. RICHARDSON (to Westinghouse Lamp Co.). U. S. 1,695,812, Dec. 18. A compn. suitable for use with furnace linings or crucibles comprises thoria or zirconia together with a double halide salt such as cryolite adapted to act as a binder and suspender on the addn. of a liquid such as water and also comprises a dry ingredient such as NH_4 phosphate which is adapted to ppt. any colloids present in the compn. and cause them to coagulate.

Machine for making pipes or tubes from asbestos cement. "ETERNIT" PIETRA ARTIFICIALE. Austrian 108,504, Aug. 15, 1927. Constructional details.

Aluminous cements. LOUIS G. PATROUILLEAU (to SOCIÉTÉ ALUMINE ET DERIVES). U. S. 1,694,338, Dec. 4. In the manuf. of aluminous cements from a mixt. comprising baukite and lime, there are added to the mixt. S or compds. of S such as a sulfide or sulfate capable of releasing SO_2 when the mixt. is heated.

Cement and concrete. G. N. WHITE, E. G. BECKETT, J. THOMAS and SCOTTISH DYES, LTD. Brit. 290,309, Nov. 10, 1926. In order to prevent lime incrustation on cement and concrete and to improve its setting properties, com. NH_4 carbonate is added in an available proportion of at least 5%. Coloring substances also may be added.

"Asphalt concrete." KONINKLIJKE STEARINE KAARSENFABRIEK GOUDA. Fr. 640,058, Aug. 26, 1927. An "asphalt concrete" is made by mixing a bituminous emulsion and large stones and then adding powd. stone.

Mortar. ROBERT CACCIA. Ger. 468,778, July 14, 1928. Mortar or artificial stone is made from chalk and sand to which 3 to 5% of dil. H_2SO_4 is added.

Road material. LOUIS FITTE. Fr. 640,387, Sept. 2, 1927. Hard pitch is incorporated in hot tar and used for roads or as a binding agent.

Road material. VERKAUFSGESELLSCHAFT FÜR TEERERZEUGNISSE G. M. B. H. Fr. 640,398, Sept. 2, 1927. See Brit. 278,679 (C. A. 22, 2650).

Compositions for treating roads, roofs, tennis courts, etc. G. A. WELLINGS and E. JOHNSTONE. Brit. 289,737, Nov. 1, 1926. A soln. of bitumen in a solvent such as gasoline and a soln. of S or suspension of S in CS_2 or other liquid is applied, with or without other ingredients such as gold size and before drying granulated cork or other material may be spread on the surface.

Paving-blocks. FREDERICK MORTON. Ger. 468,873, April 8, 1927. See Brit. 261,260 (C. A. 21, 3443).

Bituminous compositions for roads, etc. A. C. BROWN. Brit. 290,725, Feb. 17, 1927. Cold mineral aggregate is first moistened with a liquefier such as kerosene contg. bituminous material in soln. and is then coated with heat-liquefied bitumen and lime and grit are then added. Cf. C. A. 22, 3032.

Bituminous compositions. F. W. VALLE-JONES. Brit. 290,323, Jan. 10, 1927. In prepg. mixts. for road-making, etc., an aggregate such as broken stone, slag or granite is heated and cleansed by steam and then coated with an emulsion or colloidal mixt. of bituminous material.

Bituminous emulsions. SOCIÉTÉ DE RECHERCHES ET DE PERFECTIONNEMENTS INDUSTRIELS. Fr. 640,834, Feb. 21, 1927. A soln. of a neutral salt such as $NaCl$, Na_2SO_4 or $CaCl_2$ is sprayed on to or mixed with a bituminous emulsion to accelerate its drying on the road.

Preserving stone, wood, metals or other surfaces. H. SCHMID. Brit. 290,331, Feb. 7, 1927. The surface is coated with a waxy material such as beeswax which is heated and quenched in a freezing mixt. to raise its m. p. and is burned into the surface by a blow-lamp, electric grid or the like. An acid-proof material such as a protecting layer of kieselguhr also may be applied.

Argillaceous clinker. RICHARD BÖHLIG. Swiss 126,755, June 30, 1927. Thick layers are prepd. by mixing porous calcined clay with bituminous dust and burning the mass to clinker.

Floor covering material. W. F. MARVIN. Brit. 290,488, Sept. 7, 1927. A textile or woven base carries a felted coat of paper or paper pulp and the material is impregnated with a bituminous or other suitable waterproofing compn. after the felted compn. is applied.

Hardened-plaster material. WM. H. KOBBE (to Texas Gulf Sulfur Co.). U. S. 1,693,715, Dec. 4. Articles such as wall tiles or radio panels are formed of dehydrated et gypsum impregnated with S. U. S. 1,693,716 specifies a composition plaster board having an interior including hardened plaster covered in part at least by fibrous material such as a paper, textile or asbestos product which is bonded to the interior of the board by crystals of S.

Coated asbestos board suitable for wall or table surfaces, etc. HENRY C. FLOHR and LEON ORNSTEIN. U. S. 1,695,276, Dec. 18. An asbestos board is treated with a penetrating and adhesive soln. comprising nitrocellulose, a gum such as dammar, Congo or shellac and linseed oil or other suitable vegetable oil; the material is permitted to dry and a filling soln. is then applied which contains an amorphous substance such as kaolin, silic, $CaCO_3$, $CaSO_4$ or $MgCO_3$ incorporated with a boiled vegetable oil such as linseed oil and with nitrocellulose; this is permitted to dry, and a finishing soln. is then applied contg. a pigment together with nitrocellulose, a gum, and a vegetable oil.

Impregnating and preserving wood. CHARLES B. LIPMAN and AARON GORDON (to Regents of the Univ. of Calif.). U. S. 1,693,930, Dec. 4. Salts of Cu, As, Zn or Pb, creosote or other suitable toxic substance of bactericidal and fungicidal character which is capable of distribution by the sap flow is injected into a living tree a few days before cutting and the toxic material may be afterward reduced (suitably by injection of a dextrose soln. if an acid soln. of Cu arsenate is first used).

Water- and fire-proofing composition for wood. FERNANDO S. VIVAS (to The International Fireproof Products Corp.). Can. 284,582, Nov. 6, 1928. A compn. to be used for impregnating wood contains Na tungstate 6, alum 40, borax 40, H_2BO_3 20, $Na_2Cr_2O_7$ 6, isinglass 12, tannic acid 2, $NaHSO_4$ 16, and water 850 parts. Cf. C. A. 22, 2825.

Controlling lumber drying or similar operations. MORITZ L. MUELLER (to Northwest Blower Kiln Co.). U. S. 1,695,738, Dec. 18. In drying material such as lumber which is subject to shrinkage or swelling during the treatment, the treatment is regulated in accord with the movement of a lever which is actuated by variations in dimensions of the material under treatment. An app. is described.

21—FUELS, GAS, TAR AND COKE

A. C. FIELDNER

Progress in fuel utilization in 1928. VICTOR J. AZBE, WM. G. CHRISTY, E. C. SCHMIDT, JOHN VAN BRUNT, R. T. HASLAM AND GEO. A. ORROK. *Mech. Eng.* 51, 61-4(1929). E. H.

Relative cost and value of fuels. E. A. W. JEFFERIES. *Iron Age* 122, 1446-8, 1453(1928).—Data comparing the relative value of various fuels against their cost show the advantages of producer gas in open-hearth and heating-furnace operations. Producer gas reaches the checkers of the open-hearth furnace at about 425°, and its sensible heat at that temp. must be added for comparison with other fuels which reach the checkers cold. After making full allowance for all expenses of gasification and paying \$3.75 per ton (909 kg.) for coal, the av. fuel cost in a heating furnace using 150 lbs. (68.2 kg.) of coal per net ton of steel heated is 33¢, which corresponds to using 12 gals. of oil costing in the furnace \$1.03 and the equiv. amt. of coke gas is 3270 cu. ft. (92.6 cu. m.) costing (at 26¢) 85¢. W. H. BOYNTON

Preliminary information on practical characteristics and equivalents on fuels from European Russia. L. K. RAMZIN. *Bull. Inst. Fuel Research (Russia)* 1924, No. 1, 97-103.—Classification of coal according to moisture and ash-free volatile matter and character of coke is proposed. Formulas are given for calcg. coal analysis to a moisture- and ash-free basis and for calcg. net heating values. A. A. BOEHTLINGK

Characteristics and qualifications of Russian fuels for 1927. L. K. RAMZIN. *Izvestiya Teplolekhn. Inst. (Trans. of the Thermo-Tech. Inst.) (Russia)* 1928, No. 2, 3-7.—Complete thermal data are given on 49 fuels such as fire wood, peat, brown coal, hard coal, anthracite, shale, coke, wood charcoal and mazout, from various parts of Russia. A. A. BOEHTLINGK

Elementary composition of Russian fuels. L. K. RAMZIN. *Izvestiya Teplolekhn. Inst. (Trans. of the Thermo-Tech. Inst.) (Russia)* 1926, No. 8, 25.—Analyses are given of wood, peat, brown coal, coal and petroleum. A. A. B.

The influence of fuel characteristics on engine acceleration. DONALD B. BROOKS. *Bur. Standards. J. Soc. Automotive Eng.* 23, 235-48(1928).—A method enabling precise and detailed measurement of engine acceleration is described, together with results obtained thereby. The effect of fuel volatility on engine acceleration was studied, 6 fuels being used. It is shown that the relative values of these fuels for acceleration depend upon the amt. of vaporization in the manifold. M. B. HART

Status of substitute motor fuels. G. A. BURRELL. *Oil & Gas J.* 27, No. 22, 56 (1928).—A review of various types of compds. which are used as motor fuels. M. B. HART

Artificial motor fuels. W. DAVIES. *Chem. Eng. Mining Rev.* 21, 29-30(1928).—The most important modern developments in the prepn. of artificial motor fuels are briefly reviewed and the economics of their development discussed. DOWNS SCHAAP

Spontaneous combustion of fuels. J. HUDLER. *Brennstoff-u. Wärmewirt.* 10, 419-21(1928).—Experience is cited showing that spontaneous combustion originates in the accumulations of fines resulting from segregation in pouring the coal into the bins. The following remedy proposed by H has proved successful in practice. Bins, of the silo type, are provided with covers contg. 12 trap doors arranged in 3 equal rows. The coal is poured into the bins through these doors, one row at a time. This distribution has the effect of minimizing segregation. F. S. GRANGI

The use of Parr's calorimeter for the determination of the heating value of solid fuels. A. WINKELMANN. *Z. tech. Physik* 9, 422-5(1928).—The Parr calorimeter, improved by Lunge and Offerhaus, is described; it consists of a double-wall fiber vessel and lid contg. a new silver calorimeter (2000 g. water) provided with stirrers and combustion cartridge (0.5 to 1.0 g. coal with oxidizing agent). The coal is mixed with 0.5 g. tartaric acid and 1.0 g. $K_2S_2O_8$ and about 10 g. Na_2O_2 ; it is ignited with a 0.400-g. steel pencil; the heat evolution is finished in 5 mins. From the temp. rise, the water weight and a coeff. (1400 for lignite, 1500 for 1.0 g. coal) the heating value is found. For convenience a calcd. table of coeffs. to be used for temp. rises of 2.30 to 3.90° by 0.01° steps is given. Corrections for the reagents and the ignition material are made; an example of the calcn. method is included. The method is considered to be useful. Previous drying of moist fuels is advised to prevent premature auto-combustion. Approx. detns. with petroleum samples are also possible. B. J. C. VAN DER HOEVEN

Wood-room mill-waste fuel. E. V. AHARA. *Combustion Engineering Corp., New*

York. *Paper Trade J.* 87, No. 19, 61-5(1928); cf. *C. A.* 22, 3278.—A discussion of the factors affecting the economical utilization of wood-room waste as a fuel, showing the conditions required for efficient burning of various types of waste. A. P.-C.

The problem of burning wood waste. I. H. A. HATFIELD. *Pulp Paper Mag. Can.* 26, 1811-4(1928).—A brief discussion of the economic advantages gained by collecting and prep. pulpwood refuse and bark for boiler fuel, together with a review of the particular problems which are met in designing equipment for the prep. and burning of such refuse. A. PAPINEAU-COUTURE

Coppée washing plant at the Loanhead Colliery. WM. MACLAREN. *Colliery Guardian* 137, 2251-5(1928). E. H.

Coal—Cinderella of chemical industry. H. J. ROSE. *Chemistry and Industry* 47, 1301-4(1928). E. H.

Classification of coal. CLARENCE A. SEYLER. *Am. Inst. Mining Met. Eng., Tech. Publ.* No. 156, Class F, *Coal and Coke* No. 19, 4-14(1928).—Correlation of the classifications of Parr, Seyler and Ralston is discussed, with emphasis on the necessary study of other properties disclosed by caking and microscopic characteristics. Parr's unit coal basis is recommended with the modifications that the pyritic S should be cor. by an estd. av. figure for org. S, and the H equiv. of the H_2O as hydrated mineral matter must be deducted from the org. H. II. **Classification of coal from proximate analysis and calorific value.** W. T. THOM, JR. Princeton U. *Ibid* 15-9.—Relationships are graphically shown with the variables being calorific value and volatile constituents (including moisture) on an ash-free basis. Cf. *C. A.* 20, 275. III. **Classification of coals by ultimate analysis.** H. J. ROSE. Koppers Co. *Ibid* 20-4. —The heterogeneous nature of run-of-mine illustrates the phys. peculiarities of coals of which the coking properties cannot be predicted from ultimate analysis. The application of triaxial diagrams ($C + H + O = 100\%$) is demonstrated. IV. **Classification of coal from the viewpoint of the geologist.** M. R. CAMPBELL. U. S. Geol. Survey. *Ibid* 25-7. V. **Classification of coal from the viewpoint of the paleobotanist.** REINHARDT THIESSEN. Pittsburgh Expt. Sta., U. S. Bureau of Mines. *Ibid* 28-46. The geological periods and plant growth are reviewed with relation to various coals; a classification is suggested based on the flora contributing to the coal (bibliography). VI. **Classification of coal in the light of recent discoveries with regard to its constitution.** W. FRANCIS. *Ibid* 47-67; cf. *C. A.* 22, 4760.—The chem. properties of the *ulmins* are subject to measurable changes with the carbonization of coal during formation; hence measurements of these properties furnish a new classification system. Ease of oxidation of the *ulmins* and estn. of the percent present is used as the working basis to measure the reactive constituents and the residue after oxidation gives the inerts. Coals extd. with C_2H_5N and $CHCl_3$ to remove resins and hydrocarbons were ground to 150-mesh; 10 g. samples were oxidized under a stream of dry air at 150° . H_2O , CO_2 and CO were detd. in the exit gases and change in wt. of the sample was noted. From this the O-absorption was calcd. and placed on a unit oxidizable basis by measuring the oxidizable material as that portion of the product sol. in KOH . Parallel samples were oxidized in air at 150° and from time to time the *ulmin* was extd. with 1% KOH , pptd. with HCl , filtered, dried and weighed, giving the periodic formation of sol. *ulmins* formed and the total oxidizable material. This was repeated, oxidizing for 8 hrs. at 100° in dil. HNO_3 varying from 0.083 to 1 N, giving a more rapid method closely checking air oxidation. Sixteen coals have been classified on this basis. VII. **Pure coal as a basis for classification.** F. V. TIDESWELL AND R. V. WHEELER. Sheffield U. *Ibid* 68-72. See *C. A.* 22, 1838. VIII. **Commercial classification of coal.** F. R. WADLEIGH. *Ibid* 73-4. —In reviewing 171 comm. classifications, 11 single and 16 combination bases were found. IX. **Classification of coals from the point of view of the railroads.** EUGENE MCAULIFFE AND MALCOLM MACFARLAND. *Ibid* 75-80. X. **Use of classification of coal as applied to the gas industry.** W. H. FULWEILER. *Ibid* 81-6.—Discussion of the A. S. T. M. gas coal specifications and operating factors. XI. **Classification from the standpoint of the by-product coke industry.** W. H. BLAUVELT. *Ibid* 87-90. XII. **Classification of coal from the standpoint of the steam-power consumer.** S. B. FLAGG. *Ibid* 91-4. XIII. **Classification of coal from the standpoint of the coal statistician.** F. G. TRYON. *Ibid* 95-9.—Classification in the records of production and distribution of coal in the Bur. of Mines. A. S. CARTER

Researches on the chemistry of coal. V. **The maturing of coal considered from the standpoint of its benzene-pressure-extraction.** WM. A. BONE, LAWRENCE HORTON AND LOUIS J. TER. *Proc. Roy. Soc. (London)* A-120, 523-45(1928); cf. *C. A.* 18, 2593.—Previous expts. using C_6H_6 -pressure-extn. under "Soxhlet" conditions on coals are reviewed. Some criticisms of conclusions then published are answered by comparative

examn. of results obtained by other investigators using different kinds of coals and by the further expts. of the authors. Descriptions, geological and geographical sources, chem. analyses and the results of C_6H_6 -pressure-extns. are given for: a Morwell brown coal from Australia; a Tertiary brown lignite, 4 black lignites (sub-bituminous) and one semi-bituminous coal, all of Cretaceous origin from the Western Canadian coal field; weakly coking (Shafton) and hard-coking (Busty, Durham) bituminous coals from England; and for a non-coking (Witbank) coal from S. Africa. Contrary to all previous tests with well-matured sub-bituminous and bituminous coals the dried Morwell brown coal when subjected to C_6H_6 extn. at 40–8 atm. pressure (corresponding with temps. between 250° and 280°) yielded a small quantity of water and of gas (85% CO_2 , 15% CO) and about 15% of C_6H_6 -sol. material of which 50 to 60% was phenolic in character and a'kali-sol. Its compn. was approx. 60% phenol, 25% *p*-cresol, a small quantity of catechol and some unidentified phenolic substances. After these acidic and some basic constituents were removed from the C_6H_6 ext. the remaining 40% of the total ext. consisted of a dark reddish brown neutral oil. This was resolved into 4 portions: (1) a very small portion volatile in steam—largely diphenyl and mesitylene, (2) saponifiable phenolic esters, (3) a dark brown vaseline-like substance, non-nitrogenous, sol. in light petroleum and equal to 60% of the neutral oil and similar to fraction I of the C_6H_6 -pressure-ext. from bituminous coals and (4) a non-nitrogenous, amorphous, chocolate-brown powder insol. in light petroleum making about 25% of the neutral oil, and resembling fraction II from bituminous coals. All the Western Canadian coals were comparatively lean in their yields of C_6H_6 -extractable constituents, which were only from 4.5% to 1.35% of the dry coal substance, and each was absolutely devoid of coking properties. Phenols and phenolic esters were obtained in the ext. from the Tertiary brown coal, but not from the other Canadian coals. Total crude C_6H_6 ext. from the Shafton coal was 10.6%; from the Busty coal 15.6%; and from the S. African coal 7.5%. The % of fractions I, II, III and IV obtained from the different coal exts. and also the quant. analyses for many of the fractions are tabulated. Conclusion: (1) Broadly speaking the results of their earlier work have been confirmed and extended, except that it has now been shown that in some cases fraction II as well as III and IV may contribute to the coking propensities of bituminous coals, which while chiefly bound up with their yields of fraction IV are quite unrelated to their yields of "neutral oils" comprised in fraction I. (2) The coal residues left after C_6H_6 -pressure-extn. never have any coking propensities. (3) The substances removed from coal by C_6H_6 -pressure-extn. are preëxistant in (either as such, or in some loose mol. assocn. with) the original coal complex, and are not derived from it by thermal decompn. in the sense of any real breakdown in the essential structure of the coal substance. (4) Both fractions I and II of the C_6H_6 ext. from bituminous and sub-bituminous coals have their similitudes and counterparts in corresponding fractions obtained from both brown coals and lignites. (5) Materials similar to fractions III and IV of the C_6H_6 exts. of bituminous and sub-bituminous coals were obtained from the laminated black lignites examd. but not from the Morwell brown coal nor the Saskatchewan brown lignite (6) In these last 2 coals the places of fractions III and IV found in the maturer coals were taken by phenolic esters and phenols, resp. (7) Therefore, it seems probable that fractions III and IV which are invariably extd. from the laminated black lignites, sub-bituminous and bituminous coals examd., and which are closely related in the coking propensities to bituminous coals, have originated in the phenols and phenolic esters found in the brown coals tested. (8) The general effect of "maturing" has been progressively to diminish the O contents of the substances comprised in each and all of the various fractions of the C_6H_6 -pressure exts. and of the C_6H_6 -extd. residue. W. W. HODGE

Studies in the composition of coal. Oil-yielding constituents. RONALD HOLROYD AND RICHARD V. WHEELER. *J. Chem. Soc.* 1928, 2669–77.—Slow destructive distns. in a vacuum (1 to 3 mm.) were carried out with several bituminous coals whose chem. and solvent characteristics were known. Detailed results obtained with the bright coal (mixed vitrain and clarain) from the Wigan Six Foot seam are given. Charges of 250 g. of undried coal ground to pass 20-mesh and remain on a 50-mesh sieve (I. M. M.) were put in a cylindrical Jena glass retort fixed vertically in an electrically heated tube furnace. The retort was connected through a series of 3 condensers to an automatic Hg Sprengel pump. The "heavy oils" were collected at atm. temp. in the 1st condenser; the "light oils" in the 2nd and 3rd condensers which were immersed in solid CO_2 dissolved in Et_2O . Thermocouples were placed in the center of the coal and on the outer wall of the retort. Two drawings show the placed retort and the 1st condenser with its specially designed oil-collecting tube. Approx. 12 hrs. elapsed before the inside thermocouple recorded the same temp. as the outside one; thereafter

both records remained const. and identical. After evacuation of the app. the charge was slowly heated to 100° and maintained there continuously for 120 hrs., the liquid and gaseous products being collected. The coal was then slowly heated (48 hrs.) to the 2nd desired temp. and again held at this temp. for 120 hrs. while the products evolved were collected. Yields of gas, water, light oils and heavy oils obtained by distns. carried out at 100°, 200°, 250°, 300°, 320°, 350° and 500°, also the results of fractionation of each of the heavy oils with the % C and % H of these fractions are tabulated and discussed. The ultimate analysis of the coal used and the solvent analyses (C. A. 21, 2780) using pyridine, CHCl_3 , light petroleum and Et_2O (α , β , γ , γ_1 , γ_2 , γ_3 + γ_4 , fractions), are given for the coal and coal residues remaining from each of the expts. up to 350°. These results are also shown graphically. The main conclusions are: The hydrocarbons and resins extractable from coal by org. solvents yield a high proportion of the oils obtained on distn., the former being distd. quant., and the latter partly distd. and partly decompd. The coal has a definite decompn. point, 318°, for the Wigan coal used, and this is not much affected by changes in exptl. conditions, since heating this coal at 310° for one month caused no appreciable decompn. A large increase in the evolution of gases, water and oils and the appearance of phenolic compds. in the distillate are noted when the decompn. point of the coal is reached. These substances come from the break-down of the ulmin constituents in the coal and its character as evinced in behavior toward solvents, caking power and its reactivity in general, undergoes a sudden and marked change.

W. W. HODGE

Study of the transformation of cellulose and lignin into coal. FRIEDRICH BERGIUS. *Mining J.* 163, 1067-8(1928).—From cellulose heated at 340° with water (to absorb the heat of reaction) for 24 hrs. under pressures up to 200 atms., an "end coal" contg. C 84% and H 5% (ash- and moisture-free) can be obtained. This coal is closely related to natural coal; it is aromatic in nature; its berginization products are very similar to those from natural coal; it is $1/3$ sol. in benzene, etc., which B. interprets to mean a similar origin for both coals. The gases evolved include CO_2 , 27.9, CH_4 , H and CO 13 and H_2O 31.6%. The H_2O carries 6% sol. matter, largely AcOH . A. H. E.

Absorption of pyridine vapors by certain grades of Upper Silesian coal. W. SWIETOSLAWSKI AND M. CHORAZY. *Przemysl Chem.* 12, 526-34(1928).—The study of absorption of pyridine vapors at 17-20° by Upper Silesian coals showed that the coking coals absorb markedly more pyridine vapors than the non-coking coals. Further, after mechanically classifying the coals it was found that vitrain absorbs over 70%, durain 54%, and fusain 12% of its weight, figuring on dry, ash-free basis of the coal. (cf. Stopes, C. A. 13, 1755). Under similar conditions the pyridine ext. of the coal as it is usually prepd. absorbs pyridine to over 100% of its weight. These coals absorb only slightly such other org. solvents as C_6H_6 , $\text{C}_6\text{H}_5\text{NH}_2$, dimethylaniline, quinoline, etc.

A. C. ZACHLEN

Recent developments in the utilization of bituminous coal. ANON. *Mech. Eng.* 51, 65-9(1929).

E. H.

A comparison of the acidity of waters from some active and abandoned coal mines. R. D. LEITCH AND W. P. YANT. Pittsburgh Expt. Sta. Bur. Mines. *Repts. Investigation*, No. 2895, 8 pp.(1928).—Mine water samples from the Lower Kittanning and Upper Freeport coal beds were analyzed for dissolved O, acidity, Fe^{++} and H ion. From the total acidity cor. for free acid, Fe^{+++} was calcd. from the Fe^{++} detn. on the assumption that acidity was due to FeSO_4 and $\text{Fe}_2(\text{SO}_4)_3$. From these analytical data it was shown that drainage from abandoned and sealed mines was lower in acidity than from active mines, frequently similar to natural springs. There has been found no relation between total Fe, Fe^{++} and Fe^{+++} , but dissolved O approaches zero within exptl. accuracy and with the decrease in dissolved O, the amt. of Fe^{++} was greater.

A. S. CARTER

The determination of naphthalene in solid, liquid and gaseous coal-distillation products. P. SCHLAFER AND R. FLACHS. Eidgen. Materialprüfungsanstalt E. T. H., Zurich. *Monats-Bull. schweiz. Ver. Gas. Wasserfach.* 8, 224-8, 250-7, 283-9, 302-12(1928). The various other proposed methods are reviewed and discarded in favor of that of Glaser, as modified by Metzger (C. A. 15, 3201). In it, purified illuminating gas is passed through the sample in a glass-stoppered vessel heated in a water bath to volatilize the naphthalene, which is caught in a picric acid soln. This method is further improved as follows, making it more rapid, accurate and generally applicable. The ten bulb absorption tube is replaced by a wash bottle of simpler but efficient design, eliminating the condensation of naphthalene which collected in the pear of the former tube, out of contact with the stream of gas, and permitting easier emptying and rinsing out of the tube by means of a cock at the lower extremity. Ground-glass connections

are installed throughout. Loss of naphthalene by diffusion through rubber was considerable. The sample wts. of various materials that could be handled in $1/2$ hr. distn. with a water-bath temp. of 70° and a gas velocity of 25 l. per hr. were detd. and ranged from 0.02 to 0.5 g. Oxidizable interfering impurities volatilizing with the naphthalene are removed by 2 *N* KMnO_4 soln. in the cold. The picrate can be completely sepd. from excess picric acid by Jena glass filters and titrated with 0.02 *N*, 0.01 *N*, or thiosulfate after decompn. with water. The application to a variety of materials is illustrated. It is shown that cold methods are unsuitable even for the approx. detn. of naphthalene in tar oils and tar. The soly. of naphthalene at various temps. in benzene, toluene, xylene and various tar oils was detd.

F. S. GRANGER

Treatment of montan wax without acid. V. TOKMANOV. *Neftyanoye Khozyaistvo* 15, 224-5(1928).—Montan wax was treated (1) with H_2SO_4 (6% free monohydrate), (2) with absorbents and (3) with a black powder (by-products from $\text{K}_3\text{Fe}(\text{CN})_6$). The acid treatment consumes 20% acid, yielding about 82% of ceresin of high quality. (2) Adsorbents give a much higher yield and the product obtained has a good appearance; the chemical resistance is low because of the presence of unsaturated compds., naphthenes, etc. (3) Treatment with the black powder is expensive, consuming about 120% of the absorbent compared with final product obtained and the operation has to be repeated 3 times, increasing the cost in labor. T. recommends the acid method as the cheapest and giving the best final product.

A. A. BOEHLINGK

The desulfurization of lignite oils. I. B. SALADINI. Reale Politecnico, Torino. *Ann. chim. applicata* 18, 337-52(1928).—The S of lignite oils is in the form of cyclic compds., particularly thiophene, and because of this no com. process has been developed to reduce the S in lignite oils to a point where they are of general use. A systematic investigation was therefore made of various methods for removing S with a view to finding a process which would render lignite oils utilizable for motors. A representative lignite oil, which was golden yellow, had a disagreeable odor, d_{15} 0.8, a distn. range of $55-185^\circ$ (the greater part at $95-145^\circ$), gave an 85% yield after purification with H_2SO_4 and contained 0.5% phenols and 1.40% S, was used in the expts. The 1.40% S was reduced to the following % values after the particular treatments (all known already) which follow: H_2SO_4 (d. 1.30), 1.10; H_2SO_4 (d. 1.50), 0.92; H_2SO_4 (d. 1.84), 0.65; fuming H_2SO_4 , 0.25; NaClO , 0.55; $\text{AcCl} + \text{P}_2\text{O}_5$, 0.80; anhyd. ZnCl_2 , 1.10; SnCl_2 , 0.62; $\text{Fe} + \text{concd. HCl}$, 1.30; AlCl_3 (2.5-20%), 0.52-0.08; NaOH , 1.10; $\text{NaOH} + \text{PbO}_2$, 0.95; CuO , 1.10; $\text{CuO} + \text{PbO} + \text{Fe}_2\text{O}_3$, 0.90; anhyd. CuCl_2 , 0.80; calcined mixt. of CuCl_2 , NaOH , PbO_2 and pumice, 0.64; Cu (shavings), 0.98; Cu (powder), 0.80; PbO , 0.83; Hg , 1.30; Na , 0.92; Na-Hg , 0.68; Pb soap, 1.18; Pb soap + Na , 0.33. Though individual lignite oils differ somewhat, the results are probably indicative of the difficulties inherent in the removal of S from any of the oils without resorting to processes which alter profoundly the desirable properties of the oils. Methods which are effective with petroleum are ineffective, even the Frasch process (CuO) and that using alk. plumbites failing badly. Concd. H_2SO_4 , AlCl_3 and Pb soap reduced the S to the lowest values (0.25, 0.08 and 0.33%, resp.), and were the only processes which were considered worthy of further investigation. Too severe treatment with H_2SO_4 reduces the yield of purified oil, but since treatment with this acid appears to be necessary to remove unsatd. compds., it is probably advisable to employ H_2SO_4 for partial desulfurization, and then to remove the more stable S compds. by successive treatment with a Pb soap, or AlCl_3 in unusually difficult cases. Phys. treatment, such as filtration through an adsorptive agent, is probably also necessary.

C. C. DAVIS

Use of marine animal oils as motor fuels. HENRI MARCELET. *Chimie et industrie* 20, 829-36(1928).—The consts. of the oils previously referred to (*C. A.* 22, 4759) are given in detail.

A. PAPINEAU-COUTURE

Influence of steam and of hydrogen on the burning of carbon monoxide. H. B. DIXON. *Nature* 122, 805(1928).—The ignition temp. of CO -air mixts. with varying quantities of steam and H is largely influenced by the pressure of the atm. When H is added to CO and the air is dry, the ignition temp. falls as the pressure is reduced from 1000 mm. to 200 mm. When the CO is H -free and steam is added to air the ignition temps. increase during pressure reduction from 1000 mm. to 600 mm. and then decrease from 600 mm. to 200 mm. D. briefly discusses past work on the rate of explosion waves in CO -air mixts. and the effect of steam and H on such rates.

ALDEN H. EMERY

Improved efficiency in working of internal producers. F. C. SYLVESTER. *Gas World* 89, 505-6(1928).—The proportion of CO in a producer gas for heating retorts is of greater importance than the total calorific value of the gas because of the high calorific intensity of CO . The use of screened fuel is justified by higher CO content

in the gas, longer periods possible between attentions to the fire, less fuel losses in the ashes, less dust carried into the flues and more const. vol. of gases formed. The limit to the use of steam, for cooling the base of the producer, is approx. 25% of the wt. of coke used. Above this figure, excessive endothermic reaction takes place with a reduction of the CO content of the gas formed. Air satd. with water vapor is a powerful absorber of radiant heat. Thus the use of primary air satd. with steam presents advantages over the use of primary air with the bars cooled by water only. The solid-fuel loss in the pan ash is reduced by working with the front of the producer dry, and it should be possible to work the producer so that the combustible matter in the ash does not exceed 20% by wt.

F. S. GRANGER

Report of Committee on Coördination of Research. H. C. ABELL. *Am. Gas Assoc. Monthly* 10, 801-11(1928).—Discussion of the magnitude and importance of the problem of coördinating research in the gas industry. A large no. of problems are suggested for study.

A. WHITE

Measuring gas at high pressures. v. SCHÜTZ. *Gas u. Wasserfach* 71, 1166-71 (1928).—Methods of measuring gas at higher pressures such as are encountered in long-distance transmission of gas are given. In general, these methods depend on the use of an orifice or similar devices. Methods of measuring widely fluctuating gas vols. are discussed, as well as compensators for pressure and temp. of the gas. R. W. R.

Protection of gas holders against corrosion by mineral oil. J. H. STREINKAMP. *Gasbedrijf, Haarlem. Het Gas* 48, 406-8(1928).—By lab. and semi-plant expts. it was shown that a mixt. of $\frac{3}{4}$ transformer oil and $\frac{1}{4}$ cylinder oil protects iron as well against corrosion by water as the special prepn. "Imunol." After 3 months with daily up and down movement of iron sheets half immersed in water with a 1-cm. oil layer no trace of corrosion could be found in either one. A possible fire hazard of the use of mineral oils covering the water in a gas holder is created by progressive absorption of light hydrocarbons in the oil and consequent lowering of the ignition point. B. J. C. v. D. H.

Heat balance of the central producer plant (Julius Pintsch system) at the gasworks "Keilehaven," Rotterdam. J. G. DE VOOGE. *Het Gas* 48, 418-28(1928); cf. C. A. 22, 4776. During the test one producer of the 5 present was run at full capacity. For a first period of 48 hrs. a coke mixt. without breeze was used, for a second period of 48 hrs. breeze was added. The gas produced was calcd. from the coke consumption; it was mixed in with that of two other producers; all normal precautions were taken. Heats and gas vols. were all reduced to 0° and 760 mm.; the sensible heat of coke and ashes was neglected. During the first test the coke size was 59.5% between 20 and 40 mm., 34.8% between 10 and 20 mm., 4.8% between 5 and 10 mm., 0.9% through 5-mm. screens, for the second test the sizes were 49.0%, 33.8%, 7.7%, 9.5% with 6.3% through a 1.5-mm. screen. The coke consumptions per day were 17,525 and 16,257 kg., resp., moisture 0.28 and 0.36%, ash content 10.44 and 10.72%, C content 86.7 and 86.5%, H content 0.4 and 0.5%. The carbon loss in flue dust per day was 200 and 300 kg., the loss in ashes 9.4 and 18.2% carbon. The gas analysis was CO₂ 5.8 and 6.25%, CO 26.1 and 26.0%, H₂ 12.6 and 13.25%, calorific value (upper, detd.) 1192 and 1208 cal. per cu. m., the gas production per kg. coke (calcd.) 4.94 and 4.81 cu. m. or per day 86,500 and 78,300 cu. m. The gas temps. at the outlet of the producer were 561° and 535°, gas temps. at the outlet of the evaporators 140° and 140°. The air used per day was 122,000 and 108,000 cu. m., satn. points of moist air mixt. 60.2° and 63.5°. The percentage decompn. of the steam was 87.8 and 74.5%. The efficiencies of the gasification calcd. from upper calorific value were 82.6 and 82.5%, from lower value, 78.9 and 78.6%. Per kg. coke 7.2 and 6.2 kg. water were consumed in the jacket, 1.02 and 0.95 in the evaporator, evaporated 0.52 and 0.65 kg. resp., surplus of hot water 7.7 and 6.5 kg. per kg. coke. For the scrubber were used per kg. coke 17.3 and 14.7 kg. water, the cooled gas was of 17° and 18° temp. Relative to the total heating value of the coke per day (100%) (123,500 × 10³ cal.) the heat items (all upper values) on the balance for the producer are as follows: for the first expt. (no breeze) sensible heat air 1.0%, steam 4.6%, cold water 1.4%, hot water -9.3%, heating value gas -82.6%, sensible heat gas -13.1%, undecomposed steam -0.8%, flue dust -1.1%, carbon in ashes -1.3%, radiation -0.9%. The corresponding values for the breeze test were (114,500 × 10³ cal. in coke) 1.0%, 5.7%, 1.2%, -7.8%, -82.5%, -12.1%, -2.0%, 1.8%, -2.5% and -0.9%. Separate balances are calcd. for the evaporators and a graphical representation is given of the heat distribution. The discrepancies in the balances are relatively small. The large surplus hot water from the cooling jacket of this type producer was employed for heating the plant. The dust content of the scrubbed producer gas after boosters was for both expts. 12 mg. per cu. m. The "disadvantage" of using cool gas for underfire of the battery is offset by better utilization

of the waste heat in the regenerators. The use of some breeze lowers the capacity of the producers slightly, does not influence the efficiency and requires a little more operating attention. -

B. J. C. VAN DER HOEVEN
Loss of heat in flue gases through moist air. M. Y. LUR'E (Lourier). *Bull. Inst. Fuel Research* (Russia) 1924, No. 1, 119-20.—Formulas are given for calcg. these losses from analysis of fuel and flue gas, and the humidity of the boiler-house air.

A. A. BOEHLINGK
The natural gas of Karcag (Hungary). G. SZELÉNYI. *Technika* (Budapest) 9, No. 4, 144-5(1928).—Analyses are given. The gas consists of 92% CH₄. The water is slightly alk., contg. bicarbonates.

S. S. DE FINÁLY
Cleaning plant makes obnoxious gas usable. JACK LOGAN. *Refiner Natural Gasoline Mfr.* 7, No. 8, 65-6(1928).—The Koppers soda ash process is used for treating natural gas from the Big Lake field, Reagan and Crane Counties, Texas, by the Gulf Production Co.

M. B. HART
Improvements in methods of manufacturing illuminating gas from brown coal. KARL SCHMIDT. *Gas u. Wasserfach* 71, 1153-61(1928).—The methods of mfg. illuminating gas from brown coal by the (1) K. V. G. oven (of which 32 are in use), (2) Saurerbrey oven, (3) Heller-Bamag oven, are reviewed and illustrations and comparative analyses given. At Halle, attempts have been made to prep. gas from brown coal in vertical retorts designed for bituminous coal. The vertical retorts were partially filled with coke to crack the tar and steamed for varying times. Tables of analyses and calorific value of the gas are given for varying conditions, as well as cost data. In most of these processes CO₂ must be removed from the gas. It is possible to prep. a mixt. of brown-coal gas and water gas (high in H) that can be used in gas systems. R. W. R.

Recent developments in the production of illuminating gas from brown coal. A. SANDER. *Gas u. Wasserfach* 71, 1181-5(1928).—The use of the K. V. G. oven for the production of illuminating gas from brown coal is reviewed. Details are given of the installation at Gölsau. The purification problem has been solved at Edderitz by washing with water at 12 atm. pressure. At 15°, with 9 to 10 cu. m. water for each 100 cu. m. of unpurified gas, the CO₂ content was reduced from 33-34 to 6-7% and the H₂S content from 3.5-3.9 to 0.05-0.08%. Further dry purification was used to remove org. S compds. 100 vols. of the unpurified gas gave about 65 vols. of purified gas with a calorific value of about 660 B. t. u. per cu. ft. Gas from the wash water was burned in a Claus oven, so as to recover S. Mixing brown-coal gas with H produced electrolytically or by the thermal decompn. of the gas is suggested as a means of lowering the gravity and calorific value of the gas so that it can be used in ordinary burners.

R. W. RYAN
The use of illuminating gas for industrial firing. FRANZ MUEHLERT. *Apparatebau* 40, 268-9(1928).—This is not economical for large and medium ovens except with good utilization of waste heat, for which a regenerator is shown.

J. H. MOORE
Interpretation of exhaust-gas analysis. O. C. BRIDGEMAN. *Bur. Standards. J. Soc. Automotive Eng.* 23, 313-4(1928).—In commenting on the article by Minter (C. A. 22, 1459) B. states that the presence of free O₂ in the exhaust gases from an engine when the charge is known to contain fuel in excess is explained by assuming that the charge is not homogeneous but burns as a mixt. of mixts.

M. B. HART
Exhaust-gas analysis calculations. E. H. LOCKWOOD. *Yale Univ. J. Soc. Automotive Eng.* 23, 314-6(1928); cf. C. A. 22, 155.—Formulas and diagrams for the computing of air-fuel ratios of internal-combustion engines from the exhaust-gas analyses are given. Comments by O. C. BRIDGEMAN are given.

M. B. HART
Water gas and the oil industry. J. GWOSDZ. *Petroleum Z.* 24, 859-70(1928).—The methods in use for the manuf. of water gas, its uses and relationships to the modern processes for the production of synthetic hydrocarbons are reviewed.

M. B. HART
Combustion of sulfur-containing material in the calorimetric bomb. V. S. KRUM. *Izvestiya Teplotekh. Inst. (Trans. of the Thermo-Techn. Inst.)* (Russia) 1928, No. 4, 116-9.—K. compares the method of Eschka with the methods worked out in *Fuel* 1928, No. 2; and by Selvig and Fieldner (C. A. 21, 2370) and by Kohout (C. A. 21, 3727) and draws the following conclusion for the last two methods: The O pressure in the bomb must not be below 25 atm.; the products of combustion must be released slowly. In detg. the sulfur, the gold cup and the inside of the bomb must be washed out carefully with distd. water, the ash worked up hot with HCl and the

A. A. BOEHLINGK
Production of low-temperature tar. GUSTAV KROUPA. *Petroleum Z.* 24, 894-8; *Montan. Rundschau* 20, 693-6(1928).—The Kroupa low-temp. app. comprises a vertical

retort provided with a drying and heating zone, the latter consisting of a series of 4 inclined baffles progressively heated by the closed circulation of hot gases. Progressive distn. on the hot baffles is claimed without cracking due to excessive temp. M. B. H.

Volumetric method of determining phenols by means of glycerol in distillation tars of brown coals. B. P. LUGOVKIN. Ural Polytechnicum. *J. Chem. Ind. (Moscow)* 5, 98-9(1928).—The method is based on the observation of Fr. Fischer and Gluud (cf. *Abhandl. Kenntnis Kohle* 4, 215 (1919)) that glycerol dissolves phenols to the exclusion of hydrocarbons. The method is rapid and gives exact results, but can only be used when paraffins are not present in the distillates. The presence of the usual amounts of moisture (8-15%) does not interfere; only when the water content reaches 30-70% is the extn. of phenols incomplete. The distn. tar is introduced into a 35-cc. graduated cylinder, an approx. equal vol. of glycerol (sp. gr. 1.2459 at 25°) is added, the cylinder is stoppered, thoroughly shaken and, after standing 2-3 min. (or on being immersed in a hot water bath), the contents sep. into 2 layers, the upper layer consisting of neutral substances, the lower layer consisting of a glycerol soln. of phenols. In operating with viscous distillates the glycerol should previously be diluted with kerosene. The percentage contents of phenols is calcd. by the decrease of the vol. of the tar layer. The extd. phenols may be recovered by pptn. from the glycerol soln. by dilg. the latter with water. BERNARD NELSON

Modern by-product coke-oven practice. K. BUTLER. *Chem. Eng. Mining Rev.* 21, 49-56(1928). E. H.

Coke-oven repairs. HS. DERINGER. *Gas u. Wasserfach* 71, 1119-20(1928).—The new Koppers device for repairing ovens without cooling is described and illustrated. R. W. RYAN

Dry-quenching of coke. D. W. WILSON. *Fuels and Furnaces* 6, 1705-12(1928).—The sensible heat in coke upon discharge represents 40% of the heat in the gas required for carbonization. Steam production conserves this heat in a dry-quenching process either by radiation to boilers, by heating gases circulated through boiler tubes or by combinations of these. Through the medium of circulating gases (20,000 cu. ft. per min. for a 530 ton-per-day plant), 74.6% of the heat output has been recovered as steam at 361° F. (1005 lbs. per ton coke). Dust is removed from this gas flow in chambers of decreased gas velocity; sprinkling upon discharge with a small and controlled quantity of H₂O eliminates dust and gives standard moisture content. Dry-quenched coke is cleaner, shows less tendency to shatter upon cooling, possesses greater phys. resistance to handling, is more uniform in size though smaller and gives 5% better fuel economy upon use than wet-quenched coke. A. S. CARTER

Improved method for the determination of porosity of coke. G. A. BRENDER A BRANDIS AND P. VAN'T SPIJKER. Techn. Hoogeschool, Delft. *Het Gas* 48, 390-4 (1928). The true porosity p_1 of coke is defined as the vol. of all pores divided by the total vol., it equals $1 - (d_a/d_w)$ when d_a is the apparent d. and d_w the true d. To det. d_w place 5 g. finely powdered coke in a 25-cc. pycnometer half filled with distd. water and evacuate to a 20-mm. vacuum 4 times for 15 min.; then fill up and weigh. Pulverization to 50 mesh per linear cm. is sufficient. The accuracy is 10 in the third decimal place. The entire pulverized sample must be rubbed through the sieve; otherwise there may be differences in d. of 0.05 between coarser and finer particles. Apparent porosity of coke p_1 is the vol. of the open pores divided by the total vol. It is found from $(P_b/P_c)/(P_b/P_a)$, P_a being wt. of the dry pieces of coke, P_b wt. after impregnation with water, P_c wt. of impregnated pieces under water. The apparent d., d_a , equals $P_b/(P_b/P_c)$. Five to 10 pieces coke dried at 110° of about 2 cm. size are weighed, then impregnated with water *in vacuo* (desiccator) for an hr. and P_b is detd. by weighings in a tared beaker. For 6 carbon species the values were detd.: (1) vertical-chamber coke from Bismarck nut coal $d_w = 1.848$, $d_a = 0.86$, $p_1 = 46\%$, $p_2 = 54\%$; (2) Yorkshire coke, Woodall Duckham, 1.858, 0.69, 55 and 63%; (3) Emma foundry coke 1.930, 0.88, 47 and 54%; (4) Friedrich Heinrich foundry coke 1.824, 0.89, 47 and 51%; (5) retort graphite 2.040, 1.38, 24 and 32%; (6) charcoal 1.438, 0.46, 66 and 68%. It appears that p_1 and p_2 are actually different; the individual differences between detns. are up to 2% on account of heterogeneous samples, showing that porosity must be detd. on more than one piece of coke and ought never to be given as 0.1% accurate. Methods for weighing coke under water to find d_w are obsolete; water is taken up in the pores. Several photographs are given of coke sections treated with emery and kaolin. The greater regularity of the pores of foundry coke is evident. B. J. C. VAN DER HOEVEN

Industrial viewpoint of the phenol waste disposal problem. FRANK F. MARQUARD. *J. Public Health* 18, 1497-1500(1928).—At Clairton and Farrell, Pa., waste from coke quenching is reused to avoid discharge into a stream where it would produce taste.

Large settling basins for sepn. of coke dust and a mixing tank for adding make-up water are required. Redesign of pumps to reduce abrasion was necessary. Because of the hot water, pumps were relocated to assure 5 ft. head. NH_3 -still wastes added contain large amts. of CaCl_2 , building up to 2.5% in the quenching water. The coke has a pronounced odor, interfering to some extent with its domestic use. CaCl_2 interferes with obtaining low water contents. Abnormal rusting results from CaCl_2 carried mechanically by the steam, or HCl produced. By the direct system of NH_3 recovery, plants yield 20 gals. of still waste per ton of coal; with washed coal this is 28 gals.; by indirect recovery 90 gals. About 70-80 gals. of water is evapd. per net ton of coal. At Clairton 10 gals. of benzene-plant waste water per ton is also so disposed of. It is not profitable at present to ext. phenols from the NH_3 liquors. Such recovery at 90-95% efficiency is possible but not economical. If it were, CaCl_2 free from phenol could go to the stream and eliminate much corrosion. A table of vols. and analyses of water from each source is given.

FOSTER DEE SNELL

Research fuel flow indicator (ANON.) 1. Research twin buret fuel system (ANON.) 1. Flue ashes eliminator (BERGER) 1. Bureau of Standards investigations [on motor fuels] (KERN) 22. Explosive limits of technical gas mixtures (BUNTE, STEDING) 24. Phenols from anthracite tar (BRÜCKNER) 10. Apparatus for drying coal (Brit. pat. 290,776) 1. Apparatus and system for separating CH_4 from natural gas (U. S. pat. 1,694,308) 13. Purification of oils [coal tar] (Fr. pat. 640,022) 13. Purification of H (Fr. pat. 639,935) 18. Automatic feed for shaft ovens, particularly for gas generators (Ger. pat. 466,229) 1. Driving means for vibrating sieves, particularly for coal (Austrian 109,217) 1. Alcohols and aldehydes from hydrocarbons (Brit. pat. 290,613) 10. Filter for benzene (Fr. pat. 639,923) 1.

Einführung in die Chemische Technologie der Brennstoffe. By various authors Edited by F. Graefe. Dresden and Leipzig: T. Steinkopff. 192 pp. Paper, M. 10; bound, M. 11.50. Reviewed in *Chemistry and Industry* 47, 975(1928).

FRIEDLAENDER, P., FIERZ-DAVID, H. ED. AND DOHRN, M.: **Fortschritte der Teerfarbenfabrikation und verwandter Industriezweige.** Teil 15. Februar 1, 1925 to Juni 30, 1927. Berlin: Julius Springer. 1882 pp. Reviewed in *Chimie et industrie* 20, 803(1928).

GENTRY, FRANKLIN MARION: **The Technology of Low-Temperature Carbonization.** Baltimore: The Williams & Wilkins Co. 399 pp. \$7.50. Reviewed in *Gas Age-Record* 62, 655(1928). *Am. Gas Assoc.* 11, 50(1929).

LITINSKY, L.: **Gasfernversorgung Westsachsens.** Leipzig: Kreishauptmannschaft. 31 pp. M. 1.50. Reviewed in *Chimie et industrie* 20, 803(1928).

TRUTNOVSKY, H.: **Schmelzgas.** Vol. II of series Kohle, Koks, Teer. Halle (Saale): W. Knapp. 124 pp. Paper, R. M. 9.40; bound, R. M. 10.90. Reviewed in *Chemistry and Industry* 47, 1099(1928).

Fuel. AMERICAN COALINOIL CORP. Fr. 640,278, Aug. 30, 1927. A fuel is prepd by eliminating impurities from a powd. coal, coke, etc., and suspending it in a liquid fuel to which an emulsion of soap has been added to retain the coal, etc., in suspension.

Briquetted fuel. HERBERT E. WETHERBEE (one-third each to Richard F. Grant and Howard M. Hanna). U. S. 1,696,511, Dec. 25. Before briquetting materials such as fine coal or lignite the particles of the material while in a moistened condition are subjected to the action of a moisture-displacing filming oil binder such as linseed or corn oil. The treatment may be effected in a rotating drum. Cf. *C. A.* 22, 3978.

Fuel briquets. KNUT H. R. TILLBERG. Ger. 466,035, Aug. 25, 1925. Molasses or like mixts. caramelized by heating to about 200° are used as the binding agent.

Heating briquets of fuel or ores, etc. R. LESSING. Brit. 289,932, Jan. 31, 1927. Briquets which may or may not contain a binder such as pitch are heated while embedded in granular or coarsely powd. material such as metal shot, iron ore, coke breeze, coarse sand, anthracite duff or granular Al. Steam or gas may be passed into the retort to equalize the temp. in its different portions. Various examples and details are given.

Pretreatment of fuel containing water, particularly lignite. HANS FLEISSNER. Austrian 109,406, Dec. 15, 1927. The fuel, before distn. or gasification, is treated with steam in a closed container and then traversed by the hot distn. gases. The treatment with steam may be given in a chamber arranged above and connected to the retort.

Fuel for internal-combustion engines. GES. FÜR INDUSTRIEGASVERWERTUNG. Brit. 289,891, May 6, 1927. Highly compressed gases for use as fuel for internal-combustion engines are obtained by intensely cooling coke-oven gases to liquefy certain constituents such as CH_4 or C_2H_4 and then vaporizing the liquid products thus obtained. O which has also been liquefied and then vaporized may be admixed with the fuel.

Motor fuel. AVENARIUS GEBRÜDER. Fr. 640,311, Aug. 31, 1927. See Brit. 277,326 (C. A. 22, 2455).

Fuel from coal and oil. PIERRE H. LEVEQUE (to Société de recherches et de perfectionnements industriels). U. S. 1,693,790, Dec. 4. A mixt. of coal and oil obtained in the "oil purifying" of coal is mixed with "close burning" coal in pulverized state, and the mixt. is pressed and then distd. to obtain a fuel somewhat similar to anthracite in burning properties.

Apparatus for powdering fuel and mixing it with air. JACK ARNOUL DE GREY and LEON PELLEGRIEN. Fr. 640,125, Feb. 7, 1927.

Destructive distillation of solid fuels. P. GIRARD, F. PETIT and A. CHARBONNEAU. Brit. 290,606, May 16, 1927. Light hydrocarbons are obtained in destructive distns. by use of a halogen, halogen acid or substance such as CaCl_2 or $\text{Ca}(\text{OCl})_2$ which will dissoc. in the process. The reaction may be facilitated by use of high-frequency elec. discharges. Solid or liquid catalysts may be placed either in the fuel or in the gas current. A distn. temp. of $400\text{--}450^\circ$ is suitable.

Low-temperature distillation. IMPERIAL CHEMICAL INDUSTRIES LIMITED. Fr. 640,559, Sept. 5, 1927. Powd. carbonaceous materials are heated to above the temp. of condensation of steam and showered through steam entering at a temp. of 450° in a horizontal rotary retort, the temp. of the steam at the exit being 300° . The mixed steam and distillates are cooled to 150° and scrubbed with oil. Catalysts such as Fe oxide with or without alkali may be added to the charge.

Plant for low-temperature distillation of bituminous fuels. KAROLINE DOBBELSTEIN NÉE BUSSMANN, ROLF DOBBELSTEIN, ALINITA DOBBELSTEIN, OTTO DOBBELSTEIN and IRMGARD DOBBELSTEIN. Ger. 466,087, Jan. 7, 1926. The fuel is treated with hot gases in a series of annular chambers arranged one above the other and supported in a casing by a central column between which and the casing there is relative rotation.

Two-stage low-temperature carbonization of fuels. A. ABRASSART. Brit. 290,205, May 9, 1927. Fuel such as coal is mixed with semi-bituminous coal and after the first stage of distn. is ground, mixed with pitch, briquetted, and distd. at $550\text{--}580^\circ$ to leave a product contg. 7-8% volatile matter. An app. is described. The briquets obtained after the first distn. stage are suitable for use as a semi-bituminous fuel.

Feeding device for low-temperature carbonization plants. CHEMISCHE-TECHNISCHE G. M. B. H. Ger. 466,086, Oct. 28, 1925. The charge is fed in by a side-discharge helical conveyer between which and the carbonization chamber there is relative movement.

Method for sorting coal by flotation. E. P. SLEPTZOV. Russ. 4643, Feb. 1928.

Flotation of coal, graphite, ores, etc. W. SCHAEFER and ERZ- UND KOHLE-FLotation G.m.b.H. Brit. 289,848, May 4, 1927. Flotation seps. are carried out in the presence of polythionates or other derivs. of polythionic acids (suitably polythionates of multivalent metals). Substances such as acids or alkalies may also be added to adjust the H or OH concn. in the pulp and these substances may be applied successively to effect differential flotation of various constituents of the material treated.

Washing coal, ores, etc. LEON HOVOIS. U. S. 1,696,767, Dec. 25. An app. is described and various mech. features of manipulation are specified.

Continuous distillation and grinding and coking of coal in a ball-mill retort which is externally heated. HARRY S. REED and RALPH D. LAMIE. U. S. 1,696,731, Dec. 25. Mech. features. An app. is described.

Briquetting coal. R. LESSING. Brit. 290,380, Feb. 21, 1927. To incorporate catalytic materials such as FeCl_3 , Al sulfate and spent liquor from pickling iron or steel, in anthracite or bituminous coal, the coal is sepd. in a flotation process which is described and the last portion of the liquid used in the flotation is displaced with a soln. of the metal compds. used as catalysts.

Estimating the ash of coal, etc. K. KEGEL. Brit. 290,913, Nov. 19, 1927. An app. is specified provided with means for detg. the vol. as well as the wt. of the specimen and with a computing scale on which the ash content can be read off when the wt. and vol are known.

Tank, filter and circulating system for filtrate suitable for thickening or dewatering coal slimes, etc. WALTER L. REMICK. U. S. 1,696,014, Dec. 18.

Oil-impregnated firewood. DEUTSCHE ÖLHOLZWERKE HÜLSTER & Co. Ger. 466,036, Sept. 24, 1927. Oil-impregnated firewood is subjected to reduced pressure in order to prevent subsequent exudation of oil.

Treating peat to obtain soluble carbohydrates and a combustible product. PAUL DUTOIT AND LOUIS FRIDERICH. Swiss 126,185, Feb. 8, 1927. Peat contg. 15-35% dry matter is malaxated with concd. H_2SO_4 and heated under pressure to 110-120°. The soln. of carbohydrates is sep'd. and the residue, after washing, compressed into briquets.

Apparatus for drying and screening peat or other similar materials. EDWARD P. DECKER. U. S. 1,693,747, Dec. 4. The app. is suitable for treating various "light chemical substances."

Gas. BAMAG-MEGUIN A.-G. Fr. 640,216, Aug. 29, 1927. A gas of high calorific value is made by using superheated water gas for degasifying coal. Large quantities of tar are produced which are used for carbureting the gas.

Lighting and heating gas. SOCIÉTÉ INTERNATIONALE DES COMBUSTIBLES LIQUIDES. Fr. 639,959, Aug. 24, 1927. The calorific power of gas is increased by passing the gas under pressure through a liquid having a greater power for dissolving hydrocarbons than H in the manner described in Ger. 394,497, using the gas enriched in H for hydrogenation of coal, etc., and adding the gas liberated from the solvent, by reducing the pressure, to the ordinary gas supply.

Carbureted water gas. PAUL DVORKOVITZ. Can. 285,091, Nov. 27, 1928. Oil having a sp. gr. of 0.85 to 0.9 may be gasified by subjecting it to a regular temp. of 600 to 700° and the oil gas so produced is mixed with water gas to form a carbureted water gas of high calorific value.

Producer gas. V. P. IZHEVSKII. Russ. 4307, Sept. 15, 1924. The gases are withdrawn and the producer is charged at the lower end. The gases are produced on the upper end and the solid and still hot material (ashes) left, is used to preheat air.

Producing gas. LINUS P. BURROWS. U. S. 1,695,914, Dec. 18. Coal is agitated in a rotating drum retort which is externally heated in a furnace. Steam is led through iron pipes embedded in the furnace walls at a temp. which will produce H and O from a portion of the steam. The O combines with the iron and the H and undecompd. superheated steam are passed into the retort and the resulting gases are taken off from the retort. The app. is described.

Apparatus for producing gas from fuel and for using the gas for heating. JOHN MACKENZIE (one-half to Walter Heynacher). U. S. 1,695,854, Dec. 18.

Gas producer construction and valve control devices. WELLMAN SMITH OWEN ENGINEERING CORP., LTD., and A. V. KEMP. Brit. 289,963, Feb. 5, 1927.

Gas-producer plant with an annular boiler and heat-exchange devices. POWER-GAS CORP., LTD., and N. E. RAMBUSH. Brit. 290,970, July 20, 1927.

Apparatus for charging gas producers with fuel. THE POWER GAS CORP., LTD. Fr. 640,613, July 28, 1927.

Safety flap for preventing access of gas to the air conduits of gas producers. STORCH & SCHÖNEBERG A.-G. Ger. 466,228, Nov. 8, 1925. Constructional details.

Shaft-like gas generator for fine coal. G. K. ZAITZEV. Russ. 4660, Feb. 29, 1928.

Treatment of hot coke-oven gases. STUART P. MILLER (to the Barritt Co.). Can. 285,502, Dec. 11, 1928. Hot coke-oven gases are subjected in the collector main and the goosenecks leading therefrom to intimate contact with oils derived from the condensation of vapors from the coke-oven gases in the condensing system. The intimate contact of the oils with the gases results in the partial cooling of these gases from the temp. at which they normally escape from the coke ovens to that desired, that temp. being ordinarily such that the major portion of the oil vapors in the gases and those derived from the vaporization of oils supplied to the collector mains are retained in the gases, while substantially all the tarry materials are thrown down in the collector main and are washed therefrom by the residual oils which flow through the bottom of the main.

Separating constituents of coke-oven gases, etc., by liquefaction. GES. FÜR LINDE'S EISMACHINEN A.-G. Brit. 289,817, May 2, 1927. In order to prevent formation of explosive or resinous compds. of C_2H_2 or other triple-linkage hydrocarbons in the sep'n. of coke-oven and similar gases at low temps., the C_2H_2 or similar hydrocarbon is removed before entering the separator to a degree sufficient to prevent deposition in solid form. The sep'n. may be effected by passing over heated catalysts, with hydrogenation or decompn., by polymerization over heated Cu, or by soln. in water or acetone. Other constituents likely to cause explosion or resinification such as NH_3

or NO may be removed, *e. g.*, by use of concd. H_2SO_4 . Parts of the app. made of Cu may be coated with Sn or Pb or their alloys.

Purifying gases. F. W. SPERR (to Koppers Co.). Brit. 290,660, May 19, 1927. H_2S is removed from fuel gas by use of an ammoniacal liquid, which is subsequently aerated in the presence of a metallic compd. such as oxide or hydroxide of Fe, Co or Ni to oxidize sulfide to thiosulfate without liberation of H_2S or S. The treatment is preferably effected prior to complete removal of NH_3 from the gas. An app. is described. Cf. C. A. 23, 455.

Apparatus for purifying exhaust gases from internal-combustion engines by charcoal from nut shells, etc. LEONARD MARKELS. U. S. 1,695,554, Dec. 18.

Ammonia from coal gas. CARL OTTO. U. S. 1,696,446, Dec. 25. Distn. gases are passed into a cooler in which they are cooled to obtain fresh condensate; part of the condensate is fed to a hydraulic main, thus replacing the portion of liquid evapd. therein and another part of the condensate is fed to the pipe leading to the cooler so as to irrigate the gases, and the condensate is returned to the cooler with a fresh supply of gas. An app. is described.

Rectifying columns and associated apparatus for continuous preliminary purification of crude benzenes. EMILE A. BARBET. U. S. 1,693,774, Dec. 4.

Montan wax. I. G. FARBENIND. A.-G. Brit. 289,621, April 8, 1927. Fr. 640,264, Aug. 30, 1927. See U. S. 1,690,876 (C. A. 23, 504).

Montan wax. FRIEDRICH W. GUTHKE and WILHELM PUNGS (to I. G. Farbenind. A.-G.). Can. 285,530, Dec. 11, 1928. An improved bleached montan wax is produced by converting at least part of the free org. acids present in the bleached montan wax into a mixt. of salts by the action of an alkali or an alk. earth metal hydroxide. *E. g.*, 100 parts of montan wax, bleached with chromic acid, is treated at 110–120° with a soln. of 2 parts of Na_2CO_3 or KOH in 5 parts of water, until all the water has evapd. The wax obtained shows no tendency to crystallize and forms homogeneous preps. when used, for example, in shoe creams and floor polishes. Cf. preceding abstract.

Distilling tar. S. P. MILLER (to Barrett Co.). Brit. 289,832, May 3, 1927. The hot gases produced in part of a battery of coal retorts are cleaned and freed from tar by passage through an elec. precipitator and the ptd. tar is distd. by contact with hot gases from the remainder of the battery; vapors thus produced are passed through another precipitator and finally condensed to obtain oils. Various details of the app. are described. Cf. C. A. 23, 693.

Resolving emulsions of tar oils. HERBERT W. ROBINSON and DERIC W. PARKES. U. S. 1,696,057, Dec. 18. The emulsion is rendered faintly acid and there is added to it a quantity greater than 10% by wt. of the oleaginous phase of naphthalene or like solid hydrocarbon which is sol. in the oleaginous phase and which has a m. p. below 100°, the mixt. thus formed is heated to a temp. above the m. p. of the added solid hydrocarbon and the mixt. is then rapidly cooled to ppt. the hydrocarbon in a finely divided state, and the water is settled out from the resulting stiff agglomerate of the oleaginous phase and hydrocarbons. Cf. C. A. 22, 1419.

Apparatus for separating tar from gas. J. BECKER (to Koppers Co.). Brit. 289,768, April 30, 1927. Foraminous baffles are placed in the path of the gas and the latter is given a whirling motion to deposit globular tar.

Coke. S. W. PARR and T. E. LAYNG (to Urbana Coke Corp.). Brit. 290,575, May 12, 1927. In a 2-stage carbonization process, the coal is first heated in a closed container to below the crit. temp. at which the coal becomes plastic and then heated to 650–850°; the coke produced contains 4–5% volatiles, is easily ignitable, resists crushing about the same as high-temp. coke and has smaller pores than high-temp. coke. An "improved" tar high in cresylic acid is obtained. An app. is described.

Plant for cooling coke by leading in cool gases. GEBRÜDER SULZER A.-G. Swiss 126,761, May 10, 1927.

Coking oven. O. HELLMANN. Brit. 290,838, June 2, 1927. An oven as described in Brit. 2,2,193 (C. A. 22, 1843) is modified in various details.

Regenerative coke-oven battery. THE KOPPERS COMPANY. Ger. 467,478, Nov. 14, 1923. Constructional details.

Coke-oven discharging apparatus. DR. C. OTTO & Co. Ges. Brit. 289,871, May 6, 1927.

Regenerative furnace adapted for the production of metallurgical or gas coke. PIERRE E. H. FORSANS. Fr. 640,467, Feb. 19, 1927.

22—PETROLEUM, LUBRICANTS, ASPHALT AND WOOD PRODUCTS

F. M. ROGERS

Progress in the petroleum industry. WALTER SAMANS, P. L. GUARIN, T. H. KERR, H. R. PIERCE, C. F. BRAUN AND W. G. HELTZEL. *Mech. Eng.* 51, 56-61(1929).

E. H.

Some present and future aspects of petroleum chemistry. BENJAMIN T. BROOKS. *J. Inst. Petroleum Tech.* 14, 738-55(1928).—Research problems which are engaging the investigators in the field of petroleum chemistry are discussed under the headings "The Relation of Research and Engineering in the Present Petroleum Industry," "Present Trend of Petroleum Research," "Polymerization," "Synthetic Rubber" and "The Sulfur Problem."

D. F. BROWN

Viscosity testing of petroleum. V. L. CHECHOT. *Intern. Congress Testing Materials* 1927, II, 447-56.—A description of the work of the Am. Petroleum Industry Comm. with reference to standardization of the Saybolt universal and Saybolt Furol viscometers.

F. O. A.

Development of American oil shale. H. H. HILL. S. O. Co. of N. J. *Oil & Gas J.* 27, No. 25, 124(1928).—The location and extent of American shale deposits are given together with a review of com. developments and Bur. of Mines lab. studies.

M. B. HART

Water supply in shale retorting. RALPH H. MCKEE and HAROLD H. PARKER. Columbia Univ. *Oil & Gas J.* 27, No. 23, 104, 137, 141, 176, 199(1928).—Shale processes are described and the water supply problem is discussed, with rainfall reports, and mean wind velocity reports at Colorado and Scotland stations.

M. B. HART

Extra high gravity of Cat Creek oil. ANON. *Oil & Gas J.* 27, No. 21, 113(1928).—Crude oil from Cat Creek Field, Fergus County, Mont., shows an av. gravity of 47.4, a naphtha content of 56.8%, kerosene 29.6%, wax distillate 10%, fuel oil 1.6%, S 1.0%. The oil runs as high as 54 gravity and the naphtha content as high as 64%.

M. B. H.

Synthetic crude oil from cholesterol and from Lycopodium clavatum. N. A. ORLOV. *J. Applied Chem. (Russia)* 1, 117-8(1928).—Cholesterol (50 g.) and 3 g. of a mixt. of Al_2O_3 and Fe_2O_3 were charged in an autoclave (Ipat'ev) and H_2 was admitted under 75 atm. pressure; the app. was then heated to 440-450° for 14 hrs. and a max. pressure of 175 atm. obtained. This dropped to 64 atm. at room temp. The gas so obtained contained, including H_2 , 7% of saturated compds. (calcd. on CH_4) and 43 g. of a liquid was left in the app. Under similar conditions 47 g. of cholesterol heated for 17 hrs. gave 11.5% of CH_4 , the quantity of gas depending evidently on the duration of heating; the liquid amounted to 38 g. or 83.5% of the original product. The liquid combined from the two expts. has a specific crude-oil odor, is transparent, of a yellow tint, and characteristic green fluorescence, $[\alpha]_D^{25} 1^\circ 54'$. It loses 7% in vol. after treatment with a 4-fold quantity of H_2SO_4 at 40-50°. Sixty g. of the treated oil was washed with caustic, dried with $CaCl_2$ and distd., yielding 16 g. at 60-150°, 15 g. at 150-300°, 10 g. at 300-330° and 14 g. at 330-370°. The first two fractions have a pronounced gasoline and kerosene odor, do not react with H_2SO_4 or $KMnO_4$, are colorless and not fluorescent. Fractions 3 and 4 have a yellow tint, are slightly attacked by H_2SO_4 and decolorize $KMnO_4$ slowly. Their d_4^{25} was 0.7067, 0.8600, 0.9653, 0.9783, the n_D^{20} 1.414, 1.473, 1.529 and 1.542. Fraction 2 contained C 86.93, H 13.07%. The residue left after the distn. could not be distd. over without decompn. Under similar conditions 50 g. lycopodium heated for 16 hrs. gave 16% of H_2 and CH_4 , 26 cc. of a brownish liquid and 11 cc. of H_2O . The oil had a petroleum and NH_3 odor and gave the pyrrole reaction. Twenty cc. could be distd. over below 300°; the rest decomposes when heated. H_2SO_4 reacts very little. The oil was further neutralized and washed with water. A distn. over Na yielded 3 g. at 50-150° and 10.5 g. at 150-300°. Neither fraction reacted with H_2SO_4 or $KMnO_4$ and both had a very weak and pleasant odor; d_4^{25} 0.7081 and 0.7878 and n_D^{20} 1.400 and 1.441. Analysis of both fractions gave C 85.94 and H 14.26%. The saturated compds. prevailed in the gasoline fractions of the cholesterol and the character of other fractions indicated paraffin compds.

A. A. BOEHLINGK

Recent progress in oil refining. C. K. FRANCIS. *Oil & Gas J.* 27, No. 22, 128 (1928).—A review of developments in 1927.

M. B. HART

Capillary phenomenon in (oil) production. FREDERICK G. TICKELL. Stanford Univ. *Oil & Gas J.* 27, No. 22, 172, 175-6(1928).—The mechanics of fluid movement as it pertains to the oil pool are discussed.

M. B. HART

Effect of varying temperature on absorption efficiency of oil. A. J. L. HUTCHINSON. *Oil & Gas J.* 27, No. 21, 155, 162(1928).—In liquid absorption of natural gasoline the most stable product is produced by lowering the oil temp. and the oil rate

M. B. HART

Motor-oil characteristics. R. E. WILKIN, P. T. OAK AND D. P. BARNARD, 4TH. *J. Soc. Automotive Eng.* 23, 380-4(1928).—A discussion of the annual meeting paper. Cf. *C. A.* 22, 1675.

M. B. HART

Treating heavy oils by acid sludge. N. GRAMENETZKII. *Neftyanoye Khozyaistvo* 15, 212-6(1928).—Heavy bottoms are treated with acid sludge at 70-80° without a preliminary diln. or a subsequent distn. About 10-12% of acid (from the sludge) or 6-8% of monohydrate is required and the capacity of the treating plant should be about one-half of the usual size. In using kerosene and oil sludge for treating, only 10% must be distd. off to prep. "vapor M" oil. The sludge obtained ppts. in flakes after a comparatively short time and is collected on the bottom, forming a solid mass when cold. (A soviet patent application covering this method was filed by A. Vorob'ev on March 17, 1927 under the No. 13,695.)

A. A. BOEHLINGK

Separating and concentrating acid sludge. H. L. KAUFFMAN. *Refiner Natural Gasoline Mfr.* 7, No. 9, 78-84, 86, 88, 90(1928).—The method of sepg. acid from acid sludge, and the Simonson-Mantius vacuum and "geyser action" processes of H_2SO_4 concn are described.

M. B. HART

The hydrogen-ion test applied to acid sludge emulsions. L. J. CATLIN. Standard Oil Co. of Kansas. *Refiner Natural Gasoline Mfr.* 7, No. 8, 77(1928).—In the neutralizing of acid sludge emulsions with caustic solns., including spent caustic from the treating system, the breaking of the emulsion occurs most readily at the neutral point or within a range pH 6.4 to 7.6. A method of detg. the pH of the mixt. consists in adding a few drops of the emulsion to about 10-15 cc. of acetone in a separatory funnel, shaking for a few min. and adding 20-30 cc. H_2O , again shaking, withdrawing some of the H_2O and testing with H-ion detn. indicators and color standards as sold by the La Motte Chem. Products Co.

M. B. HART

Developments of the cracking process. G. EGLOFF. Universal Oil Products Co. *Oil & Gas J.* 27, No. 22, 255, 259, 262, 360, 362(1928).—A general paper on the present status of cracking processes. A typical Dubbs installation is described with tabulated data on yields from various charging stocks.

M. B. HART

Cracking plants will have to make fuel for 75 million cars by 1938. G. EGLOFF. *Natl. Petroleum News* 20, No. 47, 88, 91, 93, 97-8(1928).—A general discussion of the motor fuel demand, cracking processes, refining methods and anti-knock fuels from the American point of view.

M. B. HART

Fundamental factors of liquid-phase cracking. A. N. SACHANEN (SAKHANOV) and M. D. TILICH'EV. *J. Inst. Petroleum Tech.* 14, 761-7(1928).—The 4 fundamental factors affecting cracking are time, temp., pressure and the character of the oil used. Results of expts. carried out on 7 different fractions obtained from Grozny crude oil indicate that cracking begins immediately after the necessary temp. conditions are reached, i. e., there is no "induction period" during which gasoline is not formed. Velocity of cracking depends greatly on the nature of the cracking stock, being lowest for the lightest fractions. Cracked oils decompose more slowly than straight-run oils. The velocity of cracking doubles for every 10° but is not dependent upon pressure. High pressure, however, produces the best conditions for heat transfer and absence of local overheating with economy of fuel. Condensation appears to take place readily in the heavier fractions but is almost absent in the lighter fractions. The velocity of coke formation increases with increasing time of cracking. Because of the accelerated velocity of coke formation and the decreased velocity of gasoline formation after a time, it is economically advantageous to stop cracking in the first cycle when coke formation begins and recycle those fractions which do not form great quantities of coke during cracking.

D. F. BROWN

Liquid-phase cracking processes show modern developments. E. OWEN. *Chem. Met. Eng.* 35, 677-81(1928); cf. *C. A.* 23, 267.—The capacity of a cracking unit should be based on the basis of either the charging stock (gas oil) charged to it or the gasoline produced by it per 24 hrs. Brief descriptions of the following processes are given: Burton, Coast, Fleming, Jenkins and Isom.

D. F. BROWN

Indian Refining Co. has singular operation of cracking units. ANON. *Refiner Natural Gasoline Mfr.* 7, No. 11, 60-2(1928).—At the Indian Refining Co.'s Lawrenceville, Ill. plant, gas oil is charged to 4 Dubbs and 3 Cross units, from which 35% of finished gasoline is obtained. The recycle stock from these units is charged to a new double Cross unit where it is re-cracked to give 33% of gasoline. Reflux from the bubble towers

of the double unit is redistd., bottoms from the distn. are sent to fuel oil after being centrifuged with Dubbs residuum, while the gas oil cut is cracked in a third bank of Cross units at higher temp. and pressure. The gasoline is treated while fresh in 9 treating columns, part filled with NaOH and the rest with H_2O . The finished product has 440° end point and has 40% benzene equiv. M. B. H.

The analysis of cracked spirits. Determination of aromatic, olefin, naphthene and paraffin hydrocarbons. F. H. GARNER. *J. Inst. Petroleum Tech.* 14, 695-732(1928).—A method of detg. the relative amts. of olefin, aromatic paraffin and naphthene hydrocarbons in cracked gasoline is described. This consists in removing the olefin and aromatic hydrocarbons simultaneously by means of fuming HNO_3 and detg. the percentages of paraffins and naphthenes in the remaining mixt. by aniline point detns. The method is modified somewhat, depending upon whether the I no. of the original sample is above or below 25. The value of the method is questioned in the discussion of the paper. D. F. BROWN

Yield of unsaturated hydrocarbons in pressure distillates. ANON. *Refiner Natural Gasoline Mfr.* 7, No. 8, 90, 92(1928).—Lab. Hempel distn. tests using fire, steam, and fire and steam, on treated and untreated pressure distillate from the Dubbs process were carried out and the yield, color and % unsatd. hydrocarbons detd. for each fraction. Results indicate that 22.5% is about the max. yield of +25 color gasoline from Dubbs raw distillate. In order to obtain a max. yield of gasoline of good color, 400-430° F. end point, the raw pressure distillate must be treated with H_2SO_4 . M. B. HART

Design visible distillation apparatus. RALPH H. ESPACH. *Oil & Gas J.* 27, No. 24, 120-1, 131(1928); cf. *C. A.* 23, 1.—A continuous distn. app. for the lab. study of fractionation is described. The app. comprises a pipe-still and a bubble tower, having stainless steel plates sepd. by Pyrex glass sections, which is supported on an evaporator. Reboilers are provided on the side of the tower and in the evaporator. Results of distn. tests with and without the use of the reboilers indicate that the latter are effective in producing better fractionation, one reboiler replacing 4 or five bubble trays. M. B. H.

Results of study of adsorptive power of clay. R. O. MEADER. *Refiner Natural Gasoline Mfr.* 7, No. 9, 61-4(1928).—The various explanations are reviewed as to the reaction that takes place when constituents in a hydrocarbon oil that give color to it are removed by an absorbent material. Four clays have been investigated to det. whether the adsorptive power toward a typical base such as Ba varies with the decolorizing values of the clay. No direct ratio between decolorizing values and Ba adsorption value of clays was noted. Conclusion: If comparative figures obtained under mutually identical conditions were obtained a definite conclusion as to the nature of the relationship between decolorization and adsorption could be reached. M. B. H.

Economical recovery of valuable products from "spent" doctor and caustic solutions. F. J. MECHLIN. *Ind. Eng. Chem.* 20, 1352-3(1928).—Spent doctor soln. from mineral-oil-treating processes may be reclaimed by evapn. and oxidation by heating and air blowing. The Pb is reconverted to plumbite while colloidal org. material forms as a top layer and Na sulfate forms a distinct layer of crystals on settling the concd. mixt. A Pb recovery of 80-90% is claimed. D. F. BROWN

Specifications for suitable mixing tank for contact filtration. H. L. KAUFFMAN. *Refiner Natural Gasoline Mfr.* 7, No. 11, 68, 75(1928). M. B. HART

Inert gas used to reduce fire hazards on tanks. GEORGE REID. *Oil Weekly* 50, No. 6, 67-8, 130(1928).—The use of CO_2 in the protection of tanks is described. M. B. HART

Firefoam apparatus. B. MILLS. *Refiner Natural Gasoline Mfr.* 7, No. 9, 76-8(1928).—The asbestos extension tube for the application of fire foam to oil tank fires has proved to be one of the most efficient contributions to fire extinguishing equipment. It is owned by the S. O. Co. of Calif., and may be used by any company. Complete directions for its use are given. M. B. HART

Spectrograph study of fuels and analysis of detonation theories. GEORGE L. CLARK. *J. Soc. Automotive Eng.* 23, 167-73(1928).—The data obtained from the ultra-violet spectrum study of the detonation flames of 13 com. gasolines are discussed. Twelve theories of the action of knock suppressors are outlined with the pro and con evidence for each. Conclusion: No single theory yet propounded seems entirely satisfactory. M. B. HART

Bureau of Standards investigations. CHARLES E. KERN. *Oil & Gas J.* 27, No. 22, 136, 212, 215(1928).—Tests conducted by the Bur. of Standards on motor fuels, oils and motor-fuel-combustion problems are reviewed. M. B. HART

Natural Gasoline Association adopts motor-fuel specifications. ANON. *Refiner*

Natural Gasoline Mfr. 7, No. 10, 116(1928).—The tentative grades and specifications adopted by the Natural Gasoline Asscn. for blended natural gasoline fuels effective Oct. 1, 1928 are as follows:

	Grade 90	Grade 50	Grade 10
Vapor pressure at 90° F. (lb./sq. in.)	6.5	9.0	11.5
Initial b. p.	95° F.	90° F.	82° F.
Temp. at 5% point	120° F.	120° F.	120° F.
Temp. at 50% point	200–220° F.	180–200° F.	160–180° F.
Temp. at 90% point	380–410° F.	360–410° F.	340–410° F.
End point	425–450° F.	425–450° F.	425–450° F.

M. B. HART

Present tendencies in motor-fuel quality. GEORGE G. BROWN. Univ. of Mich. *1. Soc. Automotive Eng.* 22, 559–64(1928).—The present tendency in automotive fuels is away from misleading values such as color and gravity and toward high partial volatility upon which ease of starting and good acceleration depend, and toward a relatively high end point upon which max. power and high fuel efficiency depend. Methods of improving motor car performance from the mech. point of view must come from an increase in compression ratio. If an engine having a compression ratio of 5.5 to 1 can be operated satisfactorily on ordinary gasoline, no advantage is obtained by the use of anti-knock premium fuels.

M. B. HART

Contributions to the knowledge of the oxidation process in motor fuels. E. BERL, K. FEISEL AND K. WINNACKER. *Z. physik. Chem. Abt. A, Haber Bd.* 139, 453–81(1928).—A discussion of the peroxide and dehydrogenation theories of the combustion process in motor fuels followed by a presentation of the authors' own theory. The influence of anti-knock materials on the oxidation process of knocking fuels is studied by means of compounds in which self-ignition temps. are detd. and intermediate oxidation products are identified, for various constituents of motor fuels. An explanation is advanced as to the cause of the action of these anti-knock agents.

A. WHITE

Amly conducting important tests. CHARLES E. KERN. *Oil & Gas. J.* 27, No. 22, 136(1928).—Tests being conducted on gasoline and lubricating oils are outlined.

M. B. HART

The importance of analysis in the natural-gasoline industry. W. W. ROBINSON, JR. *Calif. Natural Gasoline Co. Refiner Natural Gasoline Mfr. 7*, No. 6, 85–9(1928).—A general review of the methods for natural gas and natural gasoline is given contg. 14 references.

M. B. HART

Use of controls as aid to rectification in natural-gasoline plant. EMBYRE KAYE AND A. H. JAMES. Skelly Oil Co. *Natl. Petroleum News* 20, No. 42, 138, 140(1928).—The necessary equipment for stabilizing natural gasoline in a two-column rectification plant is described.

M. B. HART

Sweetwater plant operation minimizes sulfur trouble. ANON. *Refiner Natural Gasoline Mfr. 7*, No. 8, 63–4(1928).—The distn. system of the Sweetwater Refg. Corp., Sweetwater, Texas, for operation with Crane and Winkler county crudes is described.

M. B. HART

Sulfur compounds and natural gasoline. HENRY COONEY. *Refiner Natural Gasoline Mfr. 7*, No. 9, 92, 96(1928).—A summary of properties of S compds. present in gasoline and methods of detecting them, from the operator's point of view.

M. B. HART

Cross hot oil-recirculating unit makes finished gasoline. GORDON GRANGER. *Barnsdale Refineries Natl. Petroleum News* 20, No. 42, 82, 84, 86(1928).—Hot-oil-recirculating pumps have been incorporated into the Cross cracking installation at the Barnsdale Refinery of Barnsdale Refineries, Inc. The Cross process as it is now carried out, with the recycle feature and Gray vapor-phase gasoline-treating app., these pumps making it possible to produce finished gasoline in one operation.

M. B. H.

Detonation of olefins. P. S. SMIRNOV. *Neftyanoye Khozyaistvo* 15, 217–21(1928).—Olefins in cracked gasolines are detd. with liquid NO. The gasoline is added by drops to the NO with const. cooling (–15° to –20°) and stirring, after which a 10% soln. of FeSO_4 is added until the liquid becomes alk.; this is followed by steam distn., sepd. from water, drying over Na_2SO_4 and repeated filtration through silica gel. The silica gel is washed out with ether from gasoline adsorbed and the soln. centrifuged. The ether is then carefully evapd. and the top layer consisting of gasoline is sepd. and added to the gasoline left after the Na_2SO_4 treatment. The total vol. of gasoline left after treatment is subtracted from the vol. of the original gasoline and the difference represents the amt. of unsatd. compds. contained in the gasoline.

A. A. B.

Refractometry of liquid mixtures with a Zeiss butyrorefractometer and investigations on motor fuel. I and II. P. FUCHS. *Chem.-Ztg.* **52**, 921-2, 942-4(1928).—A butyrorefractometer is used to det. the % of benzene in gasoline. An empirical curve: concn. of benzene vs. graduation of the instrument is to be constructed first. Results are very reliable. Only a rough degree of accuracy can be expected. A. L. H.

Anti-knock tests in laboratory. H. J. ROBERTSON AND R. G. BOWERS. *Pierce Petroleum Corp. Oil & Gas J.* **27**, No. 22, 139, 234, 237(1928).—The anti-knock-fuel-testing engine and grease-testing equipment in use at the Pierce Petroleum Corp.'s Sand Spring, Okla., plant are described. M. B. HART

Fuel knocking test. N. A. BUTKOV. *Izvestiya Teploekhnicheskogo Instituta (Trans. of the Thermo-Techn. Inst. (Russia))* **1928**, No. 1, 9-10.—A study was made of the effects of β -C₁₀H₇OH, of β -C₁₀H₇NH₂, and of PhNH₂ on the oxidation by air at 230° of heptane, of aviation gasoline and of toluene. β -Naphthol is an antioxidant at low temps., but loses this characteristic at higher temps. Detonation is attributed to low resistance of the fuel against oxidation. β -C₁₀H₇NH₂ and PhNH₂ retard the oxidation and are good antiknock agents. The addition of toluene decreases the oxidizability of aviation gasoline. This method of testing is recommended for the detn. of knock values in gasolines. A. A. BOEHLINGK

The danger of using gasoline containing lead compounds. CH. SCHWEIZER. *Mitt. Lebensm. Hyg.* **19**, 392-4(1928).—A discussion of the findings and recommendations of the commission appointed at the time in the U. S. when tetraethyl lead was introduced as an anti-knock compd., as well as those of the Brit. commission. J. C. JURRJEES

Stopcock lubricants for high vacua and other purposes. F. PETZOLD. *Chem. Fabrik* **1928**, No. 47, 667-8.—The prepn. of the following 7 varieties of stopcock greases is described:

	High vacua	General purposes		Buret	Travers	Ostwald Luther	Vanino
		#1	#2				
Pale crepe rubber	31 parts	6	2	10	16 (para)	?	70
White vaseline	24 parts	7	1	18	8	3	—
Paraffin (m. 36°)	5 parts	1	1/8	1	1	1	—
White wax	—	—	—	—	—	?	30

J. H. PERRY

Oxidation test for lubricating oils. TYPKE. *Petroleum Z.* **24**, 874-6(1928).—The extension of the oxidation test now used for transformer oils and insulating oils, etc., to the testing of all kinds of lubricating oils is recommended. M. B. HART

New process for the filtration and dehydration of transformer and circuit-breaker oils. R. E. DENNIS. *Industr. ital. olii trasf.* **9**, No. 7, 4-7(July 1927); *Chimie et industrie* **20**, 867(1928).—The app. consists of an autoclave contg. filtering tubes, which are built up of rings 0.01 mm. apart (this sepn. is obtained by electrolytically depositing on the rings small spots 0.01 mm. thick). The oil is forced to pass between these rings and deposits all its impurities; the H₂O is removed on account of the great difference in surface tension. A. PAPINEAU-COUTURE

Volatile acids formed during the oxidation of transformer oils. H. VON DER HEYDEN AND K. TYPKE. *Industr. ital. olii trasf.* **9**, No. 7, 8-10(July 1927); *Chimie et industrie* **20**, 867(1928).—By titration of the acidity of oxidized transformer oils in presence of methyl orange and of phenolphthalein, it is shown that this acidity is due chiefly to volatile acids. A. PAPINEAU-COUTURE

New considerations on transformer oils. ANON. *Industr. ital. olii trasf.* **11**, No. 12, 4-13(Dec., 1927); *Chimie et industrie* **20**, 867(1928).—The n of oil treated with H₂SO₄ was plotted against time. The greater the difference between this curve and that of the original n of the oil, the more oxidizable the oil. A. PAPINEAU-COUTURE

Unique methods produce French transformer oils. G. W. CUPIT. *Refiner Natural Gasoline Mfr.* **7**, No. 7, 63-6(1928).—The French specifications for transformer oils require a high degree of refining. Crude oils are topped to 31.0-31.5 gravity or 145° viscosity (Saybolt at 100° F.) and treated with acid (1 lb. 60° Bé. H₂SO₄ per gal.) followed by a caustic treatment below 180° F. The neutral stock is fire- and steam-distd., the 34-28° Bé. fraction of the distillate pressed, re-run with acid and alkali and treated with clay. The French method of applying the acid is described. M. B. HART

Insulating oils. N. A. BUTKOV. *Neftyanoye Khozyaistvo* **15**, 222-3(1928).—Among various causes for the deterioration of transformer oils are soaps which might have been left after treatment with caustics. These soaps are liable to absorb moisture.

Sulfonic acids increase the formation of sludge and the sulfur reacts on the metallic parts of transformers. Insulating oils are tested in an autoclave at 15 atm. pressure in the presence of pure O_2 . A weighed amount of oil is placed in test tubes together with copper strips and the app. heated for 4 hrs. at 150° . The oil is then taken out and dild. with a ten-fold quantity of petroleum ether and the sediment detd. after 24 hrs.; the acidity of the filtrate is also checked. To det. the acidity of the sludge, it is dissolved in hot benzene or in a mixt. of benzene and alc. This method was compared with the usual method (heating for 70 hrs. at 120° and blowing O_2 through the oil). A. A. BOEHTLINGK

Oils, greases and vacua. C. R. BURCH. Metropolitan-Vickers Elec. Co., Manchester. *Nature* 122, 729(1928).—B. has prepd. by distn. a quantity of oil with satn. pressure about 1 dyne/sq. cm. at 118° , which is about the pressure of Hg at room temp. This oil can be heated to 100 dynes/sq. cm. without decompn., and when used as the working fluid in a condensation pump without artificial cooling, gives a performance comparable with that of a Hg condensation pump with a cold trap 100° below room temp. Pressures of 10^{-3} – 10^{-4} dynes/sq. cm. are reached. A grease (petroleum jelly residue) was prepd. with a vapor pressure less than 10^{-3} dynes/sq. cm. at 70° ; it may be used for lubrication of joints in high-vacuum work. R. J. HAVIGHURST

Proper raw materials essential to successful grease making. H. L. KAUFFMAN. *Refiner Natural Gasoline Mfr.* 7, No. 7, 86, 88(1928).—General properties of the raw materials, e. g., alkalis and oils, which enter into grease compns. M. B. HART

Composition and properties of wax. G. A. BURRELL. *Oil & Gas J.* 27, No. 22, 130(1928).—A review of recent investigations relating to crystn. of wax, contg. 22 references. M. B. HART

Cracking Rangoon paraffin wax with aluminum chloride at temperatures below 330° . H. I. WATERMAN AND L. L. W. VAN SOEST. *J. Inst. Petroleum Tech.* 14, 756–60(1928).—Rangoon paraffin wax (mol. wt., Rast method 414; setting point, Shukoff method, 57.7°) was heated in a lab. distn. flask with $AlCl_3$. Gasoline began to form at 180° . Paraffin began to form in the condenser at 300° . The yields of gasoline were between 18 and 23%. The residual paraffin wax varied from 50 to 62% of the original material. It is assumed that the $AlCl_3$ works in 2 ways, 1st it causes the cracking at a lower temp. and 2nd the unsatd. products eventually formed are attacked by $AlCl_3$ to form satd. products. The action of the $AlCl_3$ is very limited, as shown by the amt. of unchanged paraffin. D. F. BROWN

Asphalts their origin, manufacture and use. G. W. CUPIT, JR. *Refiner Natural Gasoline Mfr.* 7, No. 8, 81, 83, 86, 88; No. 11, 76–8, 80, 82(1928).—The history of asphalt products, methods of manuf. and types of asphalts are described in detail. M. B. HART

Water gas and the oil industry (GWOSDZ) 21. The origin of mud volcanoes and their significance with regard to oil products (OSWALD) 8. Breakdown of oil and high-tension cables (GYRMANT) 13. Generation of electricity in benzine pipes (MÜLLER) 13. Analyses of the waters of the Salt Creek field applied to underground problems (ROSS, SWEDENBORG) 14. Oil filter (U. S. pat. 1,696,735) 1. Cleaning agents (Fr. pat. 640,777) 18. Purification of oils (Fr. pat. 640,022) 13. Textile oils (Can. pat. 284,807) 25. Apparatus for separating oil, gas, sand and water by settling and scrubbing (U. S. pat. 1,693,849) 1. Alcohols and aldehydes from hydrocarbons (Brit. pat. 290,613) 10. Heater (for use in the oil industry) (Austrian pat. 109,213) 1. Filter for oils (Fr. pat. 639,923) 1. Polymerization of hydrocarbons (Fr. pat. 640,534) 10.

LOCKHART, I. B.: **American Lubricants.** 3rd ed., revised and enlarged. Easton: The Chemical Publishing Co. 408 pp. \$5. Reviewed in *J. Phys. Chem.* 32, 1892 (1928).

Distilling petroleum. HENRY H. HEWETSON (to Standard Oil Development Co.). U. S. 1,694,259, Dec. 4. In the continuous distn. of petroleum, a series of bodies of petroleum are maintained at successively higher temps., vapors formed are led away and condensed, and a continuously flowing stream of petroleum is maintained from each body to that of the next higher temp. (each stream having an up-flowing and a down-flowing section) and there is introduced into the stream a quantity of liquid such as steam or water having a b. p. lower than the temp. of the stream, to produce by vaporization a gas or vapor in the form of bubbles commingled with the liquid in the up-flowing section. An app. is described.

Converting petroleum oils by heat and pressure. WALTER M. CROSS (to Gasoline Products Co.). U. S. 1,696,030, Dec. 18. After raising oil to a conversion temp. in a heating stage (which may be effected in a pipe coil) it is passed to a reacting stage (suitably an insulated chamber) and a pressure of 400-750 lb. per sq. in. is maintained in both these stages. A combustion-supporting gas such as air or O is introduced to the reacting stage to raise the temp. above that which is employed in the heating stage. the converted product is passed from the reacting stage to a distn. stage maintained under reduced pressure, evolved vapors are refluxed in sep. stages of dephlegmation, and the sepd. products are collected. An app. is described.

Refining petroleum oils. A. M. NASTYUKOV Brit. 289,920, Jan. 28, 1927. In producing lubricating oils, the oil is treated with CH_2O in the presence of strong H_2SO_4 to form a hardened condensation product and the material is heated, dild. with water, treated with steam to remove light volatile hydrocarbons, filtered, neutralized and washed and the adsorbed satd. heavy hydrocarbons are extd. by cold solvents such as C_6H_6 or gasoline. Illuminating oil may be obtained by heating the filtered condensation product at atm. pressure to 350° to effect cracking of adsorbed oil without decompg. the condensation product itself. Various details and modifications are given.

Cracking hydrocarbons. MILON J. TRUMBLE U. S. 1,696,658, Dec. 25 Hydrocarbon material is caused to flow downwardly in a film over the surface of an internally heated flue within a pressure chamber at a temp. sufficiently high to cause cracking; residual carbonaceous products of the cracking are removed from the heating surface by combined mech. action and washing and vapors produced by the cracking are led off and condensed. An app. is described.

Cracking hydrocarbons. I. G. FARBERIND. A.-G. Fr. 639,994, Aug. 25, 1927 Hydrocarbons of low b. p. are obtained from hydrocarbons of high b. p. by treating the latter with HCl at temps. above 100° , with or without pressure in the presence of metals or alloys activated by treatment with salts of metals of a higher potential. Several examples are given.

Purifying hydrocarbons. JOHN C. BLACK and WILSON H. LOW (to Pan American Petroleum Co.). U. S. 1,696,377, Dec. 25. Hydrocarbon material such as gasoline produced by cracking is treated with $\text{Cd}(\text{OH})_2$ suspended in an aq. soln. of NaOH or other suitable aq. soln., to combine with S-bearing substances to be removed from the hydrocarbon material, and sepn. is then effected, suitably by filtering after adding fuller's earth. A system of app. is described.

Cracking hydrocarbon oils. JOHN E. BELL (to Sinclair Refining Co.) U. S. 1,693,946, Dec. 4. A pressure still system is specified in which vapors from the still are subjected to a refluxing action in a zone sep. from the vaporizing zone in direct contact with fresh charging stock to the still and the reflux and unvaporized charging stock from the refluxing operation are introduced into a portion of the still stock which is immediately subjected to high temp. Vapors from the refluxing are passed successively through a series of sep. condensing chambers maintained at progressively lower temps. and fresh charging stock is passed to the still in indirect heat-interchanging relation with the vapors in the condensing chambers. Part of the condensate from condensing chambers of lower temp. is refluxed to chambers of higher temp. and preheated charging stock from the condensing chambers is introduced directly to the pressure still. Various details of app. are described. Cf. C. A. 22, 3288; 23, 273.

Cracking hydrocarbon oils. FRANK A. HOWARD (to Standard Oil Development Co.). U. S. 1,694,262, Dec. 4. A stream of light gas oil is fed into a heating passageway at a temp. of about 480 - 540° to effect a material cracking in vaporous condition; the products are then passed into a passageway which is protected against heat loss, and a heavy gas oil is introduced and vapor and liquid materials are contacted and conversion in liquid phase is effected solely by the heat already taken up; liquid products together with any vapors are passed from a point substantially above the bottom of the passageway protected from heat loss into a vapor-sepg. zone and lighter are sepd. from heavier hydrocarbons. An app. is described.

Cracking hydrocarbon oils. FRANK A. HOWARD (to The Standard Oil Development Co.). Can. 284,608, Nov. 6, 1928. Hydrocarbon oils are indirectly heated by mercury vapor at 700 - 1000° F. The hydrocarbons are cracked, and the vaporous cracked products are taken off and condensed.

Converting hydrocarbon oils. OSWALD C. BREWSTER (to Standard Oil Co. of Ind.). U. S. 1,694,092, Dec. 4. A body of oil is maintained under pressure at a conversion temp. by supplying into the body of oil quantities of air or other O-contg. gas, vapors evolved from the body of oil are removed, fresh oil is preheated to conversion

temps. and is contacted with the vapors evolved from the body of oil undergoing conversion and is then fed into such body of oil. An app. is described.

Treating residues from hydrocarbon-oil distillation. RAYMOND E. POWELL (to Standard Oil Development Co.). U. S. 1,694,280, Dec. 4. A distn. residue contg. water-sol. constituents such as is obtained in redistg. naphthenic lubricating stocks is mixed while hot with a fluxing agent such as gas oil and the hot mixt. is discharged on to the surface of a stream of water, and after stratification is effected the oil and water contg. dissolved constituents are separately withdrawn. An app. is described.

Cracking oils. SOC. ANON LE CARBONE. Brit. 290,060, May 14, 1927. Vegetable or mineral oils are passed through heated activated porous C in block form, *e. g.*, gas oil contg. 75% of material distg. above 250° may be passed through activated block C heated to 350° to obtain a mixt. of gases and hydrocarbons b. 110-250°, with 6% of liquid hydrocarbons b. under 110°.

Distilling oil shale. HARRY S. REED and RALPH D. LAMIE. U. S. 1,696,730, Dec. 25. An externally heated sealed tumbling-barrel ball-mill retort is used; various details of app. and procedure are specified. The shale is progressively ground to successively smaller sizes as it passes from chamber to chamber of the retort through foraminous partitions with progressively smaller openings, and distd. products are flushed from the retort with steam.

Gasification of heavy oils. CONSTANTIN CHILOWSKY. Fr. 640,686, Sept. 8, 1927. In the gasification of heavy oils by partial combustion with air, the air is heated to 500-1000°. Details of the app. are described. Cf. C. A. 23, 697.

Crude-oil filter made from pipes. N. I. RODNENSKII. Russ. 4344, Jan. 31, 1928.

Apparatus for dehydrating crude oils by heating and centrifugal action. WM. L. PALMER (one-half to Regan Forge & Engineering Co.). U. S. 1,696,859, Dec. 25. Structural features.

Apparatus for separation of gas from crude oil. A. G. KHARNASON. Russ. 4347, Jan. 31, 1928.

Removing petrolatum from oils. CHARLES ZWEIG (to Standard Oil Co. of Ind.). U. S. 1,694,090, Dec. 4. Oil contg. petrolatum is dild. and subjected to settling at a low temp. at which the wax seps., after a preliminary agitation of the dild. oil before the settling. An app. is described.

Trap for separating gas and liquid at oil wells. FRED A. LANGHERST. U. S. 1,696,192, Dec. 25.

Oil-storage tank with water-jacketed tubes extending vertically above its top. BOYD K. APPLEMAN. U. S. 1,695,358, Dec. 18. The water-cooled vertical tubes serve to check evapn. of volatile substances.

Hardening paraffin waxes and the like. WILHELM PUNGS and MICHAEL JAHRTORFER (to I. G. Farbenind. A.-G.). Can. 284,971, Nov. 20, 1928. Solid or semi-solid org. substances of low melting point such as hydrocarbons, esters, fatty acids and their glycerides, or alcs., such as occur for example in various kinds of paraffin, ozocerite and ceresin, in waxes of vegetable and animal origin, in stearin, tallow and the like, are hardened and have their melting point raised by adding thereto small quantities (*i. e.*, up to 10%) of montan wax bleached with oxidizing agents such as chromic acid, or by the anodic action of the elec. current or other oxidizing means. It is generally sufficient to add 2 to 4% of the oxidation-bleached montan wax.

Lubricant. ROSCOE F. CLOUGH (to The Castorlube Refining Co.). Can. 284,562, Nov. 6, 1928. Castor oil is gradually heated to a temp. of 540° F. until 4.1% of the contents of the still has passed over. The product of the heat treatment is a modified castor oil having a viscosity of 1000 at 100° F. and 121 at 210° F. This product is mixed with 2-20 parts of good mineral oil. The proportions may be varied, as the blend remains in permanent suspension. This blend constitutes a good lubricant for internal-combustion engines.

Lubricants. KLEMENS BERGL. Ger. 406,104, Nov. 18, 1925. Known solid lubricants, such as graphite or talc, are dispersed in a medium forming a dry solid film, such as cellulose esters, celloid, artificial resin solns., lacquers, or varnishes. Rust-preventing substances, such as PbO, may be included.

Lubricant (for refrigerating apparatus) containing a glycol. ROBERT F. MASSA (to Carbide & Carbon Chemicals Corp.). U. S. 1,696,642, Dec. 25. Trimethylene glycol or a similar glycol may be used.

Viscous lubricating mixture for shock absorbers, etc. ARTHUR W. SWANBERG (one-half to B. P. Higby). U. S. 1,696,152, Dec. 18. A viscous stable suspension of castor oil is formed with an admixt. of approx. 25% as much finely divided plaster of Paris as castor oil.

Lubricating oils from distillation of solid fuels. H. NIELSEN and B. LAING. Brit. 290,551, Dec. 4, 1926. An oil contg. heavy lubricating bases having over 9% of H and having a sp. gr. of 0.95–1.08 at 15° is obtained by condensing the oil vapors obtained by passing a controlled vol. of heating gases, at a predetd. temp. gradient, in counter-flow to and in direct or indirect contact with pieces of carbonaceous material not exceeding 2-in. cube. The evolved oil vapors, in the case of internal heating are carried to cooler zones with the heating gases, and in the case of external heating are withdrawn from the retort at about the temps. at which they are produced so as to avoid excessive cracking. Some free O may be supplied to effect polymerization of resinous substances, and a method is specified for refining the primary tar oils obtained by use of NaOH, H₂SO₄ and filtration to obtain the lubricating oils in purified form. Various details and modifications are described.

Filter for lubricating oil of engines. CHARLES F. LIENESCH (to Charles L. Stokes). U. S. 1,693,717, Dec. 4. Structural features.

Filter for lubricating oil, etc. ROBERT P. F. LIDDELL (to Central Union Trust Co.) U. S. 1,696,313, Dec. 25. Structural features.

Filter for lubricating oil, etc. ELTON S. STEPHENS. U. S. 1,696,367, Dec. 25.

"Magazine filter" for lubricating oil, etc. FRED W. MANNING (to Stewart-Warner Speedometer Corp.). U. S. 1,695,811, Dec. 18. Structural features.

Treating used lubricating oil from internal-combustion engines. R. WISCHIN. Brit. 290,923, Nov. 3, 1927. Used oil is mixed with 5–7% of concd. H₂SO₄, gradually heated (over a period of several hrs.) to 50–60°, passed through a sludge separator and filtered (suitably with fuller's earth) and treated with steam. An app. is described.

Gasoline. NATHANIEL E. LOOMIS (to Standard Oil Development Co.). U. S. 1,694,272, Dec. 4. A light condensate such as is obtained from oil stills or natural gas, which contains some hydrocarbons that are normally gaseous, is introduced into the intermediate region of an absorber tower and vaporizing constituents are passed up through progressively cooler zones while maintaining a pressure of 100–300 lb. per sq. in. and supplying a counter-current flow of heavy naphtha; a "balanced" gasoline is drawn off from the bottom of the tower (which is described).

Purification of gasoline, benzene, etc. KENNETH COX and PERCIVAL J. McDERMOTT (to Refiners Ltd.). Can. 284,602, Nov. 6, 1928. Gasoline or benzene is treated with Fe₂(SO₄)₃, filtered and the filtrate is neutralized by alkali and distd. in the ordinary manner. Cf. C. A. 22, 1233.

Lead tetraethyl. CHARLES A. KRAUS and CONRAL C. CALLIS (to Standard Oil Development Co.). U. S. 1,694,268, Dec. 4. An alloy contg. Na 20 and Pb 80% is subjected to the action of water in substantially equimol. proportion to the Na, in the presence of EtI (and without use of any org. catalyst) while maintaining the mass at approx. its b. p.

Oil-injecting valve for asphalt mixers. WALTER A. SMITH. U. S. 1,695,722, Dec. 18.

Bituminous compositions for paving, building construction, electrical insulation, etc. AUSTRALIAN BITUMINOUS COMPOUNDS, LTD. Brit. 290,886, Sept. 20, 1927. Oil shale and tar are used together and may be mixed with various specified filling materials.

Carbonizing wood. VERLASSENSCHAFT NACH DR. HUGO STRACHE & GÜNTHER POLCICH. Austrian 109,397, Dec. 15, 1927. A furnace for the continuous carbonization of wood is described in which provision is made for spraying water into the carbonization zone so as to adjust the compn. of the gaseous products.

Furnace for carbonizing wood. PIERRE PÉREY. Fr. 640,845, Feb. 22, 1927. The hearth of the furnace slopes toward the center for recovery of the tar.

Dismountable furnace for carbonizing wood. ÉMILE TRIHAN. Swiss 126,997, April 22, 1927.

Refining wood rosin. GEORGE E. JENKS (to Hercules Powder Co.). U. S. 1,694,179, Dec. 4. Wood rosin is vaporized under a high vacuum by the concurrent action of an external heating medium and of superheated steam which is injected into the rosin and a portion of the distillate is condensed at a temp. not less than about 175°. An app. is described.

23—CELLULOSE AND PAPER

CARLETON E. CURRAN

Chemistry of the cellulose determination. C. E. PETERSON and M. W. BRAY. *Ind. Eng. Chem.* 20, 1210–3(1928).—The Cross and Bevan method of detg. cellulose applied to spruce wood shows the reaction to be similar to an ordinary pulping reaction

but a higher yield contg. less lignin results. Oven-dried residues yield less cellulose than the original wood. Protracted chlorination does not remove all the lignin. Pentosans in the cellulose are removed slowly over the entire period of isolation while those not in the cellulose are removed very rapidly. Furfural-yielding substances are not formed by decompn. of the cellulose during chlorination. The sample should contain its own wt. of water evenly distributed for max. reactivity. F. A. SIMMONDS

X-ray investigations on cellulose and its derivatives. J. J. TRILLAT. *Rev. gén. colloïdes* 6, 57-68, 89-95(1928); cf. C. A. 22, 3043.—A review. The principal results obtained to date may be summarized as follows: (1) Natural cellulose (cotton, flax, ramie, straw, etc.) seems in all cases to have a cryst. structure; moreover, the microcrystals can exhibit a general orientation in the direction of the fiber, which is revealed by a characteristic appearance of the diagrams. (2) By making certain hypotheses, it is possible to det. the cryst. network of cellulose, which seems to be rhombic, with an elementary unit contg. 4 to 6 hexose groups. (3) The transformation of cellulose under the influence of various reagents (acids, alkalis) can easily be followed by means of x-ray diagrams; in this way, the combination of alkalis with cellulose (formation of alkali-cellulose), the phenomena of swelling, and hydra-, hydro-, and oxycellulose can exist in 2 forms, (a) native cellulose, and (b) mechanically deformed cellulose (hydracellulose), which is the form under which it is generally found after being subjected to treatments causing swelling. (4) Cellulose acetates and nitrates are amorphous, but in certain particular instances they may present a cryst. character. (5) The dimensions of the cellulose crystallites have been detd., and found to correspond practically to the av. dimensions of colloidal micellas. A. P.-C.

Copper and silver numbers as factors for the evaluation of cellulose products. J. RINSE. *Ind. Eng. Chem.* 20, 1228-30(1928).—The reducing impurities of 3 bleached sulfate pulps were measured by detg. the copper values by the Braidy and Fehling soln. methods and the Ag value. Possible improvements are indicated. A comparison of the methods shows that the Ag no. is nearer the true value of the reducing impurities and that the technic of the method is simpler. The caustic used in the Cu no. methods attacks the cellulose. F. A. SIMMONDS

Action of alkalis on cellulose. GALO W. BLANCO. *Ind. Eng. Chem.* 20, 926-30(1928). A portion of the literature published during the last 80 yrs. is summarized. The views of various investigators on the action of NaOH on cotton cellulose are reviewed. According to some authors the published data show that cellulose and NaOH react to form a true chem. compd., while others take the view that the combination is merely phys. A brief review of the use of alkalis other than NaOH is given. A bibliography of 66 references is appended. E. R. SCHAFER

Action of fatty acids on cellulose. C. J. MALM AND H. T. CLARKE. Eastman Kodak Co. *J. Am. Chem. Soc.* 51, 274-8(1929).—Native cellulose is esterified on heating with AcOH, the reaction coming to an end when the resulting product contains 6-7% Ac (100 hrs. boiling under atm. pressure); this corresponds to the compd., $C_{24}H_{40}O_{20}Ac$. An analogous effect is produced with $EtCO_2H$ and $PrCO_2H$. Hydrated cellulose, prepd. by regeneration of cellulose from its nitrate, from viscose, from its soln. in Schweitzer's reagent or from dissolved cellulose acetate, on heating with AcOH, yields esters having a limiting compn. expressed by the formula, $C_6H_9O_5Ac$. Mercerized cellulose behaves in the same way as hydrated cellulose, while cellulose regenerated from cellulose acetate, which has preserved its original fibrous structure, behaves, in this reaction, more like native cellulose. In view of the definite limit of esterifiability of native cellulose by acids alone, it is concluded that the constitution of cellulose must be expressed as a multiple of the unit, $C_{24}H_{40}O_{20}$. C. J. WEST

Action of ultra-violet rays in the bleaching of cellulose. RENÉ ESCOURROU. Société des papeteries Navarre. *Pulp Paper Mag. Can.* 26, 1549-52(1928).—See C. A. 22, 1791. A. PAPINEAU-COUTURE

The use of liquid chlorine for the preparation of bleach liquors. J. NAIMAN. *Papier* 31, 1155-7(1928).—A brief illustrated description of a plant installed in a German paper mill (not specified) which has been found satisfactory. A. PAPINEAU-COUTURE

Multiple-stage bleaching. ANON. *Pulp Paper Mag. Can.* 26, 1657-8(1928).—A brief discussion of the merits of the Thorne bleaching system. A. P.-C.

Testing the quality of cotton cellulose. A. J. HALL. *Ind. Chemist* 4, 376-9(1928).—The agents causing the degradation of cellulose, and the behavior of degraded cellulose toward cuprammonium soln., alk. $Cu(OH)_2$ soln., and methylene blue, are discussed. Methods for detg. the degree of degradation by means of these reagents are described. The relation of the strength quality of cotton and of viscose and cellulose acetate lacquers and filaments to the viscosity and the Cu. no. is presented by curves and data. The

Cu no. is a reliable measure of degradation provided the detn. is not preceded by alk. treatment, and when it is employed to reveal a high degree of degradation. The methylene blue absorption test, while not affected by previous alk. treatment, gives low results if the degradation has been caused by HCl and high results if caused by H_3PO_4 or H_2SO_4 . The cuprammonium viscosity test is the most reliable since it responds to all types of degradation. The Cu no. and methylene blue tests are serviceable if the cause of the degradation and other previous treatment the material may have received are known.

E. R. SCHAFER

Relations between carbon, hydrogen and oxygen contents in cotton cellulose under thermal decomposition, and its weight loss. TAKEO AKAHIRA. *Sci. Papers Inst. Phys. Chem. Research (Tokyo)* 9, 165-80(1928); cf. *C. A.* 19, 2094.—Deterioration and compn. of cotton cellulose heated at const. or varying temp. from 200° to 300° in air or N_2 under ordinary or reduced pressure and in a high vacuum were detd. on about 70 samples. Drawings of the app. are given. The equation $\log t = Q/T - F(w)$, in which t is the time, T the abs. temp., Q the material const., and $F(w)$ a term depending on the loss in wt. w , formerly derived for const. temp., is applicable for varying temp. Plotting the % C, H and O contents of the residues against the % wt. loss gives straight lines. The equations for these lines are: $x = a - pw$, $y = b - qw$, $z = c - rw$, in which x , y and z represent C, H and O, resp., and $a = 44.4\%$, $p = 0.286$, $b = 6.2\%$, $q = 0.08$, $c = 49.4\%$, $r = 0.635$, $w = \%$ wt. loss. At the point $w = 50\%$ the values show some deviation. The relations are independent of the heating conditions and thus the % compn. of samples carbonized to the same wt. loss are comparable. The wt. decrease is, therefore, a definite measure of the thermal deterioration. The ratio of H to O is const. and equal to that of the original cotton. The straight line for C retains a value as residual C after H and O have vanished at the point $w = 77.8\%$. F. A. S.

Lignin. KARL KÖRSCHNER. *Cellulosechemie* 8, 5-7(1927).—Polemical with Th Lieser (*C. A.* 21, 821). Lignin as isolated by ordinary chem. processes or by means of a fungus is not like the natural compd. in the tree. For instance, as a result of acid treatment, lignin may polymerize, resinify, condense or carbonize and become somewhat changed as a result of the loss of water.

J. L. PARSONS

The sulfonation of pine-wood lignin. I. ERIK HÄGGLUND AND TORSTEN JOHNSON. *Inst. Holzchemie Akad. Åbot. Biochem. Z.* 202, 439-52(1928).—Lignin isolated from pine wood by means of concd. HCl was boiled with NaHSO_3 . The soly. was found to be greater the more carefully the lignin was treated in the isolation process. It was possible to prep. lignins of the same soly. as those present in the wood. The presence of cellulose or sugar had no influence on the reaction velocity. In the sulfonation process insol. salts of ligninsulfonic acid are produced which in the presence of acid are converted to sol. ligninsulfonic acid. The resolution stands in direct relationship to the H-ion concn. of the boiling soln. Solns. of lignosulfonic acid display strong fluorescence of violet color under the influence of the Hg lamp, provided the lignin is carefully prepd. Certain groupings of the lignosulfonic acid mol. responsible for the fluorescence are extremely sensitive to acids.

S. MORGULIS

Observations on Lilienfeld rayon. ROBERT HAZARD. *Russa* 3, 1135-7(1928).—The new product which is about to be marketed by the Nuera Artsilk Co., Ltd., is a modified viscose. It can be manufd. with existing viscose equipment (with a few minor modifications). It has a much better resistance to the action of water, acids and alkalis than ordinary viscose. On treatment with 6-8% NaOH solns. at temps. down to -25° , with or without addn. of catalyzers (sol. Cr, Ni or Fe salts or peroxides), it undergoes little or no maturing. It is coagulated by strongly acid solns. (55% H_2SO_4 and over).

A. PAPINEAU-COUTURE

Spent soda liquors in the manufacture of viscose. A. HELLE-STAUZ. *Russa* 3, 259-65(1928).—A discussion of the possibility of regenerating spent NaOH liquors from the manuf. of viscose by dialysis, and of the merits of the process.

A. P.-C.

Determination of sulfur in viscose. T. VITALE and T. MARESCA. *Ann. chim. applicata* 18, 461-4(1928).—S can be detd. precisely by burning in a Parr bomb a soln. of viscose in absorbing carbon (whose S content must be known); Eschka mixt. is used as oxidizing agent. Results accurate to 1% can be obtained by oxidation with H_2O_2 in NaOH soln. and subsequent ppt. with BaCl_2 . Results to $\pm 3\%$ can be obtained by the Parr photometric method.

A. W. CONTIERI

A brief contribution to the chemistry of sulfite pulping. ANON. *Papier-Fabr.* 26, 707-9(1928).—The lignin-chlorine compds. formed when sulfite pulp is treated with dil. $\text{Cl}_2 \cdot \text{H}_2\text{O}$ (Rys, *C. A.* 22, 3526) have been sepd. and tested in a preliminary way. Apparently lignin after sulfite pulping exists in 4 forms: (a) a highly sulfonated, H_2O -sol. compd., (b) a less sulfonated compd., insol. in H_2O but giving a H_2O -sol. chloride,

(c) a slightly sulfonated compd. giving a chloride insol. in H_2O but sol. in dil. alkalies, (d) unchanged lignin, behaving like c. The compd. or group of compds. a goes to the waste cooking liquor; b, c and d remain in the pulp. R. H. DOUGHTY

The question of the construction of a straw-pulp mill. WILLI SCHACHT. *Wochbl. Papierfabr.* 59, 581-8(1928).—A general discussion of the economics of several processes in use. R. H. DOUGHTY

Maize (corn stalk) pulp. A. ST. KLEIN. *Wochbl. Papierfabr.* 59, 1175-7(1928).—A review of early patents, and summary of an article by Hulbert (*C. A.* 22, 4810). R. H. D.

A Diesel-driven ground-wood mill in Roumania. ANON. *Wochbl. Papierfabr.* 59, 917-8(1928).—An engine is directly connected to each grinder, with special control devices; a sep. engine furnishes the other power needed. The arrangement has proved very satisfactory. R. H. DOUGHTY

The penetration of wood chips with liquids. E. RICHTER. *Pacific Pulp Paper Ind.* 2, 66; *Papier-Fabr.* 26, 734; *Wochbl. Papierfabr.* 59, 1115-7(1928).—A known wt. of chips, of known moisture content, is treated with a measured amt. of cooking liquor. The liquor is analyzed at intervals until the concn. no longer changes markedly. It is assumed that penetration is practically complete at this point. By this method penetration with acid or alk. liquors was complete in $1/2$ hr. at about 40° with several woods, which is much faster than is generally supposed. Free acid of sulfite liquor penetrates faster than the base. A continued slow change in concn. over several days indicates adsorption or reaction with the wood. It appears that under-cooked chips are due to heated conditions unfavorable to the reaction between cooking agent and non-cellulosic components of the chips rather than to poor penetration. R. H. DOUGHTY

Stensson chip filler for sulfite digesters. ANON. *Pulp Paper Mag. Can.* 26, 158-1; *Paper Trade J.* 87, No. 25, 58(1928).—The app. consists of 2 concentric steel pipes connected by a cross-pipe, each pipe having a separate valve. These 2 valves are connected by means of intermediate gears in such a way that when one valve is closed the other one opens slowly. The steam from the outer pipe effects a straight downward motion of the chips, and the other one spreads the chips sideways. By opening the valve either by hand or automatically, the filling is taken care of in such a way that the chip lies flat and form an almost horizontal surface. The chips are blown by means of steam at about 60-75 lbs. The charge in the digester is thus increased, with resultant increase in output per digester, averaging about 16-20%, and going as high as 28% in some cases. A. PAPINEAU-COUTURE

Effect of temperature on sulfite cooking. ERIK HAGGLUND. *Pulp Paper Mag. Can.* 26, 157-58(1928). See *C. A.* 22, 4801. A. PAPINEAU-COUTURE

Sawmill waste for manufacturing pulp. W. B. GREELEY. *West Coast Lumbermen's Assn. Paper Mill* 51, No. 46, 24-5(1928); *Paper Trade J.* 87, No. 25, 57-8(1928).—A brief discussion of the possible use of sawmill waste as pulpwood on the Pacific Coast. A. PAPINEAU-COUTURE

Pulping eastern hemlock by the sulfite process. I. The effect of varying the time and temperature of impregnation. W. H. MONSSON AND G. H. CHIDESTER. Forest Products Lab., Madison, Wis. *Paper Trade J.* 87, No. 20, 45-7(1928).—Pulp yield decreased with an increase in temp. during the penetration period, the amt. of screenings remaining practically const. Increasing the time of the penetration period increased the yield for temps. of $115-20^\circ$, but failed to do so at 110° . Increasing the time of penetration decreased the amt. of screenings. Increase in temp. of the penetration period reduced the bleach requirements of the pulp. With a penetration period of 1 hr. the bursting strength factor decreased as the temp. was increased from 110° to 120° . When the time of penetration was increased for 115° and for 120° , resp., the bursting strength factor was increased. A. PAPINEAU-COUTURE

Ball mill for the strength testing of wood pulp. W. F. MOORE. U. S. Testing Co., New York. *Paper Trade J.* 87, No. 21, 59-60(1928).—In order to overcome the disadvantages inherent in the use of the ball mill with the ordinary porcelain jar, comparative tests were carried out using a machined bronze jar with bronze balls, cast non-buckoids and steel rods, resp. Conclusions: The results using the bronze jar are exactly reproducible, while those with the porcelain jar are not. Samples treated in the bronze jar do not show any increase in ash content after treatment; while in a porcelain jar the ash content increases in proportion to the time of treatment in the jar. Bronze balls are unsatisfactory for use in the bronze jar because of the small area of contact. Small and large buckoids are more satisfactory than bronze balls, but are unsatisfactory for com. strength testing because of the time consumed in hydrating pulp to max. strength. Steel rods are satisfactory; they are easily reproducible,

are uniform in structure, and give the greatest possible area of contact which is essential to rapid hydration. It is believed that it is possible to tell when a pulp has reached a max. strength by means of the freeness test; when this test is expressed as % degree of beating, the point of max. strength lies between 45 and 55%. The use of stainless steel instead of ordinary steel rods will improve the accuracy for com. testing; a slight ash content found in one of the tests proved to be entirely Fe rust which was caused by the rods rusting between runs. The work done to date shows that in using the bronze jar all freeness curves are of the same type, but with different slopes, while using the porcelain jar the freeness curves differ considerably in shape. A. PAPINEAU-COUTURE

Bleaching of wood pulp. VI. The effect of bleach ratio on the color, reaction rate and chemical composition in bleaching sulfite pulp. P. K. BAIRD. Forest Products Lab., Madison, Wis. *Paper Mill* 51, No. 45, 9-16, 44; *Paper Trade J.* 87, No. 22, 39-44(1928); cf. *C. A.* 21, 2187.—In a study of the effects of the variation of the bleach ratio and independent factors in the bleaching of sulfite pulp, a const. temp. of 35° and const. agitation of 5.66 r. p. m. of the bleaching app. being used, it was found that within the range of variables studied: (1) With respect to the effect of variations of bleach ratio on color: (a) the higher the bleach ratio the whiter and higher the final color by either the complete exhaustion or the excess chem. method; (b) color-removing efficiency is higher in the complete exhaustion method. (2) With respect to the effect of variations of bleach ratio on the reaction rate: (a) in all cases the chem. consumption of chemicals is a function of the log of the time up to 90% consumption of chemicals; (b) the rate of reaction is approx. proportionally higher for higher bleach ratios. (3) With respect to effects on chem. compn.: (a) the higher the bleach ratio the greater the degradation of the cellulose as indicated by the lower α -cellulose value, the higher Cu no., the higher 1% NaOH soly., and the higher β - and γ -cellulose values, especially beyond the point of bleachability; (b) the best guides to proper bleaching of a pulp are the α -cellulose value, the 1% NaOH soly. and the Cu no., in the order given. (4) In general, relative to bleaching: (a) the "consistency effect" is probably the result of increased chem. ratio and concn., assocd. with accentuated surface action caused by the rubbing together of the fibers; (b) the excess chem. method of bleaching may be the more economical in practice, if it is properly controlled, and if proper conditions, chosen through a careful economic study after technical data are available for the particular pulp, be maintained. **VII. The effect of agitation on the color, reaction rate and chemical composition in bleaching sulfite pulp at several consistencies.** P. K. BAIRD AND R. H. DOUGHTY. Forest Products Lab., Madison, Wis. *Paper Mill* 51, No. 44, 18-22(1928); *Paper Trade J.* 87, No. 22, 44-6(1928).—Bleaching expts. carried out at consistencies of 2, 5 and 7% and with rotational speeds of 1.04, 5.66 and 8.00 r. p. m. of the bleacher showed that: (1) The total time of bleaching is unaffected, but the rate of bleach consumption may show irregularities in consequence of insufficiently rapid initial mixing of bleach liquor and pulp. (2) The final whiteness of the pulp is slightly lowered by an excessive rate of agitation. (3) The 1% NaOH soly. of the pulp bleached at the lower consistencies is slightly decreased at higher rates of agitation. (4) The effects noted in (2) and (3) may be ascribed to a purely mech. action on the fibers. (5) The various effects of change in consistency already established in previous investigations have been substantiated. Conclusion: A min. amt. of agitation during bleaching is apparently necessary for optimum results and, within the limits of the exptl. conditions, the less the agitation above that necessary to maintain fairly uniform concn. in the liquid phase the better the results, especially as regards color. Thus, a satisfactory bleaching process would be one in which the bleach and the pulp were rapidly and completely mixed at the beginning of the reaction, and then agitated very little or not at all. A. P.-C.

Chemistry of the alkaline pulp process. II. Effect of temperature on the rate of delignification and hydrolysis of spruce wood with sodium hydroxide. MARK W. BRAY. Forest Products Lab., Madison, Wis. *Paper Trade J.* 87, No. 24, 64-70 (1928).—The data obtained indicate that increasing the temp. of digestion within the range between 140° and 180° increases the velocity of the pulping reaction, but has little effect on the chem. properties of the resulting pulps when the reaction is carried to the same yield. The rates of removal of lignin, of pentosans and of substances other than cellulose do not materially change relatively to one another with change of temp.; so that, within the temp. range of the expts., pulping to the same yield gives pulps of similar chem. properties regardless of the digestion temp. employed. When the data for the lignin content are plotted against yield of pulp, all conditions except temp. being kept const., the relationship is linear. The "velocity consts." for lignin, calcd. as though the reaction were monomol., decrease with time of digestion in a manner similar to that of those obtained from the yield data. With a rise of 10° in the pulping temp., approx.

the same yield, the same chem. properties of the resulting pulp and the same chem. consumption are obtained in half the cooking time. Under the conditions set forth in the article, the order of the reaction appears to be above that of a monomol. reaction, since const. values are not obtained, either for yield or for lignin, when the proper values are placed in the formula of the monomol. reaction. The velocity consts., K , calcd. as though a first order reaction obtained, decrease with time of pulping. The mathematical relationships of these K values, however, indicate that a logarithmic function expresses the reaction within the limits of the exptl. work, and that the formulas thus derived may be used for predicting from a single expt. (within the temp. range studied) the yields obtainable at any given total time of reaction (all variables other than time remaining const.).

A. P.-C.

The manufacture of sulfite pulp. A. G. NARWICK. Lincoln Mills, Merriton, Ont. *Paper Mill* 51, No. 43, 12, 14, 43(1928).—A brief discussion of a few developments which exemplify the modern trend of progress in sulfite manuf.

A. P.-C.

Modern methods and machinery in the sulfite industry. C. SKOLDERBRAND. Paper Machinery, Ltd., Montreal, and C. D. Jenssen Co., New York. *Pulp Paper Mag. Can.* 26, 1865-70(1928); *Paper Trade J.* 88, No. 2, 45-9(1929).—An outline of modern methods and equipment as seen in American, Canadian and Scandinavian pulp mills. The article deals particularly with the merits of the K. M. W. knife barker, chipper and slab chipper, the Jenssen acid system, the Svensson digester filler, pulp digger, K. M. W. knottter screen, Kaelle system of digester steam-temp. regulation, Decker and Stebbins cooking systems for recovery of heat, the Kamyr press as applied to both wet machines and pulp-drying machines, and the Fidalgo drying system.

A. PAPINEAU-COUTURE

Alkaline pulp mill control problems. C. K. TEXTOR. Northwest Paper Co., Cloquet, Minn. *Paper Trade J.* 87, No. 16, 37-8; *Pulp Paper Mag. Can.* 26, 1479-80(1928).—A brief discussion of the importance of developing an adequate method for evaluating the pulp-making qualities of pulpwood and the paper-making qualities of pulp.

A. PAPINEAU-COUTURE

Technical control in soda pulp mills. E. S. HINMAN. P. H. Glatfelter Co. *Paper Ind.* 10, 1195-7(1928).—A general outline of factors requiring control, starting with the wood room and following the log through the process.

A. P.-C.

Application of meters and instruments in pulp and paper mills. R. V. KNAPP. Bailey Meter Co. *Paper Ind.* 10, 1190-4(1928).—A general discussion indicating the points of application where installation of dependable and accurate meters and instruments in pulp and paper mills would prove a profitable investment, most of the applications discussed being already in use in one or more mills.

A. PAPINEAU-COUTURE

Water power in the pulp and paper industry of Canada. ANON. Canada Dept. Interior, Dominion Water Power and Reclamation Service, *Bull.* 1231, 6 pp.(1928).

E. H.

Sanitary analysis in the pulp and paper industry. L. F. WARWICK. Wisconsin State Board of Health. *Paper Trade J.* 87, No. 20, 42-4(1928).—An outline of methods for the detn. of O demand, dissolved O, O consumed, solids, N, acidity and alky., and a detailed description of a method for the detn. of the O demand of pulp and paper mill wastes, which have been found satisfactory in the investigation of the effect of pulp and paper mill wastes on streams. They are suggested for adoption as tentative standards for such investigations.

A. PAPINEAU-COUTURE

White water treatment. ANON. *Paper Trade J.* 87, No. 20, 49-50(1928).—A description of the Marx funnel filter and of its applications for fiber recovery from white water.

A. PAPINEAU-COUTURE

Report on waste utilization. C. M. BAKER. Am. Paper & Pulp Ass'n. *Paper Mill* 51, No. 51, 22, 26(1928).—A summary of the 1st year's activities of the Natl. Comm. on Waste Utilization and Stream Improvement.

A. PAPINEAU-COUTURE

Corrosion of piping in paper mills. G. R. WYMAN. Bird & Son, East Walpole, Mass. *Paper Trade J.* 87, No. 18, 47(1928).—A brief discussion of the chief sources of interior and exterior corrosion of piping in pulp and paper mills, and of the methods of combating it.

A. PAPINEAU-COUTURE

Iron in paper mill water. FRED GROVE-PALMER. *Paper Maker & Brit. Paper Trade J.* 75, 491-2(1928).—A brief discussion of the methods of eliminating Fe from water for use in fine paper mills.

A. PAPINEAU-COUTURE

Analysis of scale copper from relief liquor and gas piping in sulfite digesters. J. BENJAMIN JONES. Nashwaak Pulp & Paper Co. *Pulp Paper Mag. Can.* 26, 1484(1928).—Detailed directions are given for the detn. of sulfite S and free S, sulfate S, Ca and Cu.

A. PAPINEAU-COUTURE

Hardwoods for pulp and paper. C. E. CURRAN. Forest Products Lab., Madison,

Wis. *Paper Mill* 51, No. 46, 12-4, 38-40(1928).—An outline and discussion of the work done at the Forest Products Lab. on the pulping of hardwoods by the mech. and sulfite processes (cf. Osborne, C. A. 21, 2797; Monsson, C. A. 22, 3294), particularly from the standpoint of their utilization for the manuf. of news print. The work, carried out chiefly on 2 species of New Zealand woods, *viz.*, insignis pine (identical with California Monterey pine) and "tawa" (similar to American maple), showed that a satisfactory sheet could be made from the following furnish: 15% insignis pine sulfite, 50% tawa sulfite, 35% tawa groundwood. Though this furnish differs considerably from that of so-called "standard" news print (25-30% softwood sulfite and 75-70% softwood groundwood), it could probably be produced at a cost slightly lower than the av. cost of production of "standard" news print in the U. S. on account of the lower cost per cord and greater d. and wt. (resulting in higher yield) per cord of hardwoods as compared with softwoods.

A. PAPINEAU-COUTURE

Chemical analysis of pulps and pulpwoods. Methods used at the Forest Products Laboratory. M. W. BRAY. Forest Products Lab., Madison, Wis. *Paper Trade J.* 87, No. 25, 59-68(1928).—Methods are described for sampling, H_2O detn. (by heating and by distn. with xylene), detn. of ash, cold-water soly., hot-water soly., soly. in 1% NaOH and in 10% NaOH, Et_2O soly., lignin, alc.- C_6H_6 soly., cellulose, Cl consumption, α -, β - and γ -cellulose, Cu no., acid hydrolysis, MeOH and pentosans.

A. P.-C.

Recording the history of pulpwood. C. C. HERITAGE AND W. H. MONSSON. Forest Products Lab., Madison, Wis. *Paper Trade J.* 87, No. 18, 52-5(1928).—Various available descriptive and testing procedures have been selected and organized into a tentative scheme for evaluating pulpwood as a preliminary step necessary to the correlation of the properties of the wood with pulping variables and pulp quality. This tentative scheme, which is subject to change as experience may dictate, is in force at the U. S. Forest Products Lab., and is published to permit other establishments to exam. it and to criticize it or to adopt it if such action seems desirable. The procedure comprises (1) identification of species, (2) description of forest and growth data, (3) description of pulpwood, (4) com. evaluation, (5) tech. evaluation.

A. PAPINEAU-COUTURE

The microstructure of a wood-pulp fiber. GEO. J. RITTER AND G. H. CHIDESTER. Forest Products Lab., Madison Wis. *Paper Trade J.* 87, No. 17, 131-7; *Pulp Paper Mag. Can.* 26, 1617-24(1928).—The location in the wood of the 2 forms of lignin is described, and the 2 forms are shown in photomicrographs. The possibility of obtaining a yield of 60% of lignin-free fibers for paper making is suggested. The cell wall of wood fibers is composed of several layers, which can be sepd. into fibrils by chem. means. The fibrils in the outer layer are oriented at approx. right angles to the fiber's axis, while those in the remaining layers are from 0° to 30° thereto. The fibrils can be sepd. into regularly shaped "fusiform bodies" with optical properties similar to those of the fibrils. When either lignified or delignified wood fibers are treated with swelling reagents, the fiber wall thickens outwardly and also inwardly. The polygonal shape of the cross section of undelignified fibers is unaltered, but the cross section of delignified fibers is limited by the outer layer of fibrils which are oriented at 90° to the fiber's axis. The optical phenomenon, when bordered pits are observed between Nicol prisms, is explained on the basis of the ring-like structural arrangement of the cellulosic material of the cell wall. The effect of H_3PO_4 on pulps obtained from 2 series of cooks of spruce and hemlock is described. Its effect is more severe on the pulps from the more drastic cooks, both in the raw and refined condition. The effect increases as the period of milling increases. The swelling and dissecting action of the H_3PO_4 on the fibers is explained on the assumption that part of the outer layer and more of the binding material between the fibrils in the various layers of the cell wall are removed by the more drastic cooking conditions. Milling has the mech. effect of progressively rupturing the outer layer of fibrils and of loosening the inner fibrils. Such an effect permits a more rapid attack by the H_3PO_4 . It is suggested that the H_3PO_4 treatment developed in the study discussed in the article may be further standardized to provide a new method for the evaluation of pulp quality.

A. PAPINEAU-COUTURE

The deterioration of rosin in sizing due to heating the moist paper sheet. E. ÖMAN. *Pulp Paper Mag. Can.* 26, 1651-6(1928).—It has been observed that in some cases the degree of sizing of the sheet decreases as it passes through the driers; *e. g.*, a sample taken before the first drier and then air-dried is better sized than the paper as it comes off the machine after having been dried thereon. This occurs only if the paper is heated to a relatively high temp. while it still contains a considerable amt. of H_2O but if the paper is heated to a relatively high temp. after having been first dried at a low temp., the sizing is not affected. With paper contg. about 55-60% H_2O , this occurred quite sharply at a crit. temp. at about 73° (which also happened to be the m. p.

of the rosin used in the expts.), irrespective of the time or p_H value of the stock, provided the sheet was heated sufficiently long to give it time to reach the temp. of the expt. The crit. H_2O content, below which deterioration does not occur, seems to be in the neighborhood of 50%. The influence of H_2O on the phenomenon is explained by assuming that, when it is present in sufficiently large amt., it gives greater freedom of motion to the rosin particles which, on heating above the crit. temp. (the m. p. of the rosin), readily coalesce into much larger particles having a much smaller covering power; below the crit. H_2O content there is no free H_2O film on the fibers and the rosin particles, being in direct contact with the fiber surface, will not readily coalesce, even when heated above the m. p. With sheets contg. more than the crit. H_2O content and heated for 15-30 sec. at 85° , optimum sizing was obtained with a p_H value of 5.0; deterioration was greater at both higher and lower p_H values, from which the author concludes that the presence of $Al(OH)_3$ is not only of no importance for the sizing but is actually detrimental. It is suggested that in practice sizing trouble may appear on changing pulp, because of differences in the p_H value of different pulps. A. PAPINEAU-COUTURE

The rosin sizing of paper. II. Experimental. S. R. OLSEN AND ROSS A. GORTNER. Univ. of Minnesota. *Paper Trade J.* 87, No. 16, 47-50(1928); cf. C. A. 22, 4811. The curve obtained when the amt. of rosin adsorbed by cellulose fibers is plotted against the time of contact between the stock and the rosin resembles the adsorption isotherm of known colloidal reactions and is considered to be a colloidal phenomenon and not a classical chem. reaction between the rosin, alum and fibers. The amt. of residual ash in the pulp influences the optimum H-ion concn. as well as the amt. of rosin adsorbed. Under the conditions of the expts., the optimum H-ion concn. for max. adsorption or rosin was p_H 4.5-6.5 for com. pulp and 4.0-4.5 for the purified pulp. Under com. conditions, the optimum p_H for the best sizing is probably about 4.5-6.5, depending on the type of pulp used. The results of the expts. indicate that no universal optimum p_H value for the rosin sizing of paper can be used, but rather that this optimum p_H varies with such factors as the kind and quality of pulp and its degree of washing, the kind and amt. of filler used, the amt. and hardness of water used, as well as the quality of paper being manufd. It is therefore recommended that each mill work out its own standards for the sizing of paper, basing its exptl. work on the fundamental principles of the process. A neutral Et_2O extn. does not give a true value for the amt. of rosin adsorbed. A. PAPINEAU-COUTURE

A contribution to the theory of [rosin] sizing. HELLMUTH SCHWALBE. *Papier-Fabr.* 26, 738-40(1928).—Sizing phenomena are divided into those connected with (I) the nature of rosin, rosin size and milk of rosin, (II) pptn. and fixation in the beater, (III) fritting and formation of films in the paper sheet. The preponderance of exptl. work on II gives the impression that this is the most important, whereas S. believes I and III are actually more important. It is pointed out that different lots of rosin even of the same grade behave very differently, and that proper control of sapon. and emulsification in size manuf. may lead to large savings. Such control is still mostly empirical, and research on I should be profitable. In studying III, S. has dried samples taken from the last press of a paper machine by pressing with an elec. iron, the temp. of which was detd. with a Cambridge surface pyrometer. The sizing strength (Klemm, modified by S, C. A. 22, 4811) increased regularly with drying temp. One sample varied from 866 sec. at $95-110^\circ$ to 6540 sec. at 250° , the machine-dried sheet giving a value of 246 sec. only, other samples gave proportionate values. Partial drying at high temp. and finishing at a lower temp. gave lower values than complete drying at high temp. These results are contradictory to those of Klemm (C. A. 2, 2449). As a new theory of sizing mechanics, S. suggests that the rosin forms films closing the pores near the paper surface, rather than covering the fibers as is generally assumed (cf. Edge, C. A. 22, 1084). This is based mainly on the fact that a more hydrated pulp requires less size. R. H. D.

United States patents on paper making. CLARENCE J. WEST. Nat'l. Research Council, Washington, D. C. *Paper Trade J.* 87, No. 16, 38-9(1928); cf. C. A. 22, 4810. —A compilation of patents issued during July, Aug. and Sept. 1928. A. P.-C.

Influence of fiber character and beating upon the strength properties of paper, particularly sulfate paper. GOSTA HALL. *World's Paper Trade Rev.* 90, 1246, 1248 (1928). — See C. A. 22, 3298. A. PAPINEAU-COUTURE

Instrument controls in paper making. REGINALD TRAUTSCHOLD. *Paper Trade J.* 87, No. 19, 46-50(1928).—A brief outline of the various points at which it is advisable and advantageous to control paper-making operations by means of automatic instruments from the beaters to the finishing room. A. PAPINEAU-COUTURE

The requirements for paper-machine rolls. H. BARTHOLD. *Papier-Fabr.* 26,

661-6(1928).—Mech. The method of calcg. the necessary crowning of rolls is given.

R. H. DOUGHTY

Surface characteristics of paper. JANATA. *Papier-Fabr.* 26, 728-31(1928).—Next to color, the most noticeable property of paper is surface texture and finish. J. gives a non-technical discussion of the behavior of paper-making fibers in the beater and on the paper machine, with the effects of this behavior on the surface of the paper sheet. *E. g.*, groundwood has a short, raw, rather incompressible fiber, which does not hydrate or felt well; it has little tendency to take wire or felt marks, or to take a high finish. This leads to a highly diffusing or mat surface, and an opaque sheet. Chem. pulp or textile fibers, on the other hand, tend to give a paper of better finish and of greater gloss and translucence. The final nature of the surface depends much on the beater treatment as well as on the machine operation.

R. H. DOUGHTY

Paper and the influence of pressroom conditions upon it. OTTO W. FÜHRMANN. Intern. Assoc. of Printing House Craftsmen, New York. *Paper Trade J.* 87, No. 24, 54-6(1928).—A brief analysis of printers' paper troubles, particularly those due to atm. conditions, showing that they may be largely overcome by proper humidity control in the press room.

A. PAPINEAU-COUTURE

Some notes on the durability of paper. J. S. ALLEN. *World's Paper Trade Rev.* 90, 958, 960, 1018, 1020; *Paper Maker's Monthly J.* 66, 444-5(1928).—A brief discussion of the factors which affect the durability and permanence of paper.

A. P.-C.

Durability of printed papers and manuscripts. NORMAN PARLEV. *Paper Makers' Monthly J.* 66, 445-51; *World's Paper Trade Rev.* 90, 1292-6(1928).—A brief review of the history of the movement toward establishing standards of durability of paper, together with suggestions for standards of classification and tests of the resolutions of the comm. of experts for the preservation of printed papers and manuscripts of the Intern. Inst. of Intellectual Coöperation (Jan. 30-1, 1928).

A. PAPINEAU-COUTURE

Transparent papers, real and imitation, compared. JAMES SCOTT. *Paper Maker & Brit. Paper Trade J.* 76, 479-83(1928).—A description of the differences in the microscopical appearance of true and imitation transparent papers, illustrated by means of photomicrographs.

A. PAPINEAU-COUTURE

Chlorinating for prevention of slime. V. M. COATES. Mathieson Alkali Works. *Paper Mill* 51, No. 45, 2, 45(1928).—Experience obtained from numerous installations now in operation in various mills has shown that trouble from slime can be completely eliminated by judicious chlorinating treatment. A careful analysis of the stock and water flow of each mill is necessary to det. the most effective points of application; these vary in different cases (raw water, white water, paper machine head box, etc.). In most cases application at 1 point is sufficient; but in exceptional cases application at 2 points may be necessary.

A. PAPINEAU-COUTURE

Opacity determinations with the Ives tint photometer. R. H. DOUGHTY. Forest Products Lab., Madison Wis. *Paper Trade J.* 87, No. 19, 66-9(1928).—The contrast-ratio method as described by Sammet (*C. A.* 19, 3161) gave values of 0.88-0.95 (av. 0.91) for 40 samples of com. news print. A few of the more important factors that might influence the values obtained by this method have been investigated. The effect of varying thickness followed a mathematical law. The character of the paper surface affects the results. It is advisable to use one color filter (preferably green) for all measurements that are to be compared directly. Exact comparison of the opacity values of differently colored papers is not advisable. The results obtained were in satisfactory agreement with those of other methods, including that using the Bur. of Standards instrument, when a suitable black background was employed. The contrast-ratio method is simple, reproducible, and accurate provided proper care is exercised in making the measurements. Through the mathematical relationship detd. between the log of translucency and the thickness, it is possible, with other factors such as color and finish nearly const., to study opacity as a property of the material of which a sheet is made rather than of the sheet itself.

A. PAPINEAU-COUTURE

Fidalgo pulp drying system. OSSIAN ANDERSON. San Juan Pulp Mfg. Co. *Paper Mill* 51, No. 47, 10, 12(1928).—A brief outline of the history and principles involved in the Fidalgo system.

A. PAPINEAU-COUTURE

Paper board manufacturing problems. CLARK C. HERITAGE. Forest Products Lab., Madison, Wis. *Paper Trade J.* 87, No. 26, 48-9(1928).—A statement of the field of work of the newly formed T. A. P. P. I. paper board comm. and of the possible projects to be undertaken.

A. PAPINEAU-COUTURE

Lignin (West) 10. Structure of cellulose fibers (VEIMARN) 2. Genuine lignin. II. Action of bromine on acetylated pine wood (FUCHS, HORN) 10. Wood room mill

waste fuel (AHARA) 21. Burning wood waste. I. (HATFIELD) 21. The color reactions of lignin (PODBREZNIK) 11D. Wetting agents [halogen-substituted sulfonic acids] (Brit. pat. 289,863) 18. Rosin and turpentine from wood [preparation of residue suitable for paper pulp] (U. S. pat. 1,696,696) 26. Evaporators [for waste cellulose lye] (Fr. pat. 640,772) 1. Sulfonic acids [in the paper industry] (Fr. pat. 640,617) 10. Treating paper to permeate it with synthetic resin (U. S. pat. 1,695,912) 26. Recovery of fibers from waste liquids [wood pulp] (Fr. pat. 640,568) 13. Ethers of carbohydrates (Fr. pat. 640,174) 10.

BROWN, NELSON COURTLAND: **Forest Products, Their Manufacture and Use.** Embracing the principal com. features in the production, manuf. and utilization of the most important forest products other than lumber in U. S. New York: John Wiley & Sons, Inc.; London: Chapman and Hall, Ltd. 447 pp. 20 s., net. Reviewed in *Nature* 122, 434(1928).

HAMBURGER, RICHARD, AND FRIEDRICH, HANS: **Die Papierherstellung der Feldmühle, Papier- und Zellstoffwerke Aktiengesellschaft.** Berlin. Organisation Verlagsgesellschaft m. b. H. 49 pp.; R. M. 2.75. Reviewed in *Paper Trade J.* 87, No. 19, 65, *Paper Makers' Monthly J.* 66, 471(1928).

Cellulose. BELA DORNER (to W. Jule Day to Euromerican Cellulose Products Corp. to Cornstalk Products Co., Inc.). Can. 284,755, Nov. 13, 1928. Pulp is produced from straw-like materials by subjecting the uncooked material to a combined washing and disintegrating process, the disintegration being carried to a point where the cell structure is sufficiently opened up to permit ready access of wash waters, but insufficient to form a pulp which substantially retains dirty water, further disintegrating the material and further subjecting it to a chemical pulping process by two alk. cooks, the first with an amt. of alkali just sufficient to unite with silica present, and the second with a larger amt. of alkali sufficient substantially to remove non-cellulosic material, both cooks being carried out at temps. which are not high enough to effect far-reaching decomposition of the non-cellulosic org. materials, such as caramelization of carbohydrate materials. Cf. *C. A.* 23, 277.

Cellulose. PAUL KRAIS. Ger. 468,715, April 26, 1925. In the prepn. of cellulose by the action of dil. HNO_3 on vegetable substances, air is introduced into the boiling vessel, so that the NO formed is oxidized to NO_2 and used again.

Cellulose free from lignin. RUDOLF MÜLLER and KARL HORST (to I. G. Farbenind. A.-G.). Can. 284,055, Oct. 16, 1928. Wood wool (4 kg.) is treated with 0.5% NaOH lye at 95°, washed free from alkali, and mixed in moist condition with 65 l. of a soln. of $\text{Ca}(\text{OCl})_2$ contg. 2.8% by wt. of available Cl and 0.15% of $\text{Ca}(\text{OH})_2$. Milk of lime contg. a total of 200 g. of $\text{Ca}(\text{OH})_2$ is gradually added during the reaction, the temp. being kept at 20–45°, in such a manner that, during the whole of the resolution, free $\text{Ca}(\text{OH})_2$ can just be detected in the liquor. As soon as a sample of the solid matter shows no lignin reaction when tested with phloroglucinol, the cellulose is sepd. from the liquor, washed with water until neutral, freed completely from lime by washing with acid, and again washed until neutral. The yield of dry cellulose is about 55% calcd. on the wt. of the parent material.

Films and the like of cellulose. WOLFF & CO. KOMMANDITGESELLSCHAFT AUF AKTIEN, EMIL CZAPEK and RICHARD WEINGAND. Fr. 640,066, Aug. 26, 1927. Films, etc., of viscose which are made by flowing on to a support which then dips into a pptn. bath are detached from the support after coagulation in the interval of time during which the support remains dry. The support may be used again without cleaning.

Conditioning cellulosic material. GEORGE A. RICHTER, MILTON O. SCHUR and ROYAL H. RASCH (to Brown Co.). Can. 284,944, Nov. 20, 1928. A tissue of cellulose fiber, more especially one of high α -cellulose wood fiber, if subjected to great pressure as in calendering or supercalendering and then nitrated will give a higher yield of nitro-celluloses and lower acid retention, irrespective of whether or not the tissue is composed of beaten or unbeaten, or mercerized or unmercerized fiber.

Treatment of cellulosic material. HENRY DREYFUS and CLIFFORD I. HANEY (to Henry Dreyfus). Can. 285,051, Nov. 20, 1928. Cellulosic material dried or contg. 5–6% of moisture is moistened with about 20 parts of a mixt. contg. 30–40% of HCO_2H and (a) 70% of AcOH . After the desired degree of reactivity has developed the cellulose is acetylated.

Treatment of cellulosic material. HEINRICH HEIMANN, IRNFRIED PETERSEN, ALFONS BAYERL and HERMANN SEEFRIED (to I. G. Farbenind. A.-G.). Can. 284,973, Nov. 20, 1928. Material contg. cellulose is opened up by impregnating with dil. HNO_3

at usual, raised or diminished pressure. The material is then boiled in the known manner with an alk. agent to obtain a cellulose of high degree of purity. *E. g.*, small bits of wood are digested with 20% HNO_3 at 50° , until they are impregnated completely. The wood is then freed from excess of acid by decantation and allowed to stand until a sample is completely disintegrated, when it is boiled with dil. Na_2CO_3 . The opened up material is worked up in known manner by boiling it with an alk. agent. Cf. *C. A.* 22, 2464.

Cellulose derivatives. HENRY DREYFUS. Can. 284,876, Nov. 20, 1928. In the manuf. of cellulose acetate or cellulose esters, after the acetylation or esterification is complete, the resulting product is subjected to a ripening treatment which if prolonged beyond the usual stage of soly., for example beyond the stage at which the acetates become sol. in alcohol-benzene mixts., a gradual diminution in the viscosity takes place, so that products showing a viscosity less than 100, say 50 can be obtained, the cellulose mol. being nevertheless substantially preserved. *E. g.*, 100 parts by wt. of cellulose is treated with 900 to 1000 parts of glacial AcOH , 200 to 250 parts Ac_2O , and 3 to 10 parts of H_2SO_4 at an initial temp. of $0-5^\circ$; this may be allowed to rise to 10 to 15° , or even higher toward the close of the acetylation. When the acetylation is complete, the excess of acetylating agent is destroyed by the addn. of H_2O and the mixt. is allowed to stand at about 20° until a product is obtained which is sol. in acetone contg. about 3-10% of water or more according to the degree to which the viscosity is to be reduced. The cellulose acetate resulting from the ripening treatment above described can be dissolved in mixts. of acetone and water to form spinning solns. contg. from 10 to 25% of cellulose acetate and capable of being spun into filaments of substantially greater strength than any artificial filaments previously known.

Cellulose derivatives. HENRY DREYFUS. Can. 284,877, Nov. 20, 1928. Cellulose acetates are produced by preheating cellulosic material with HCO_2H , freeing the material from HCO_2H and then acetylating substantially in absence of liquid solvents and diluents, as benzene, by subjecting them in presence of a condensing agent, as H_2SO_4 , to the action of vapors of the acetylating agent, and an indifferent gas, particularly air.

Sulfonated cellulose derivatives. I. G. FARBENIND. A.-G. Fr. 640,687, Sept. 8, 1927. See U. S. 1,682,382 (*C. A.* 22, 3988).

Cellulose esters. H. T. CLARKE and C. J. MALM (to Eastman Kodak Co.) Brit. 289,853, May 4, 1927. See U. S. 1,690,620 (*C. A.* 23, 512).

Cellulose esters. H. T. CLARKE and C. J. MALM (to Kodak, Ltd.). Brit. 290,570, May 14, 1927. The process described in Brit. 289,853 (preceding abstract) is modified in order to produce cellulose esters contg. both nitrate groups and halogen-substituted acyl groups; *e. g.*, a nitrocellulose (suitably contg. about 11% N) is first treated with an esterifying agent contg. an acyl group having an ethylenic linking and the unsatd ester thus obtained is then treated with a halogenating agent such as Br or Cl. Esterifying baths contg. an anhydride such as monochloroacetic anhydride as described in Brit. 287,880 (*C. A.* 23, 512) are preferable, and among the esterifying agents which may be used are crotonic acid, undecylenic acid and higher acids of the same series and substituted acids such as cinnamic acid. An example is given of the prepn. of and subsequent halogenation of cellulose nitrocrotonate to obtain a product suitable for making transparent films. Brit. 290,571 specifies a modification of the process described in Brit. 287,880 (*C. A.* 23, 512) for producing cellulose esters contg. both aryl radicals having less than 10 C atoms and also aryl radicals with more than 10 C atoms, in order to produce esters contg. a higher proportion of higher acyl radicals, by use of an esterifying bath prepd. by mixing the fatty acid anhydride corresponding with the lower acyl radicals with the acid corresponding with the higher acyl radicals and then removing, at least in part, the lower aliphatic acid formed in the bath and if necessary adding a non-esterifying solvent. Various details and examples are given.

Cellulose esters. I. G. FARBENIND. A.-G. Brit. 289,973, Feb. 8, 1927. Acidylation of cellulose or of its conversion products is effected by use of an acid anhydride such as Ac_2O together with a halogenide of sulfurous acid such as thionyl chloride and a heavy metal salt such as ZnCl_2 or Cu_2Cl_2 , suitably in the presence also of a diluent. The product obtained, such as cellulose acetate, may by addn. of water be converted into products sol. in acetone or in EtOAc .

Solvent for nitrocellulose. GUY H. BUCHANAN (to the American Cyanamid Co.). Can. 285,149, Nov. 27, 1928. Solvents for nitrocellulose consist of the esters of hydroxy-isobutyric and similar acids. These esters may be prepd. from acetone cyanohydrin and other cyanohydrins by treatment with HCl and the desired alc.

Cellulose nitrate solution. MARION B. HOPKINS and HYMAN E. BUC (to Standard Oil Development Co.). U. S. 1,694,097, Dec. 4. A solvent mixt. contg. nitro compds.

of aliphatic hydrocarbons (such as those derived from gasoline hydrocarbons) together with EtOH and C_6H_6 is used for dissolving cellulose nitrate. Various other solvents may also be used.

Cellulose ethers. OTTO LEUCHS and EDUARD DÖRR (to I. G. FARBENIND. A.-G.). U. S. 1,694,127, Dec. 4. In making ethers such as ethyl cellulose ether, water is removed during the etherification and caustic alkali is added to the alkylation mixt. which may be formed from alkali cellulose and EtCl. The H_2O may be absorbed by solid NaOH. Cf. C. A. 23, 513.

Digester system and associated apparatus for boiling cellulose. CARL HANG-LEITER and ADOLF SCHNEIDER (to Zellstoffabrik Waldhof), U. S. 1,693,983, Dec. 4.

Introducing sulfite solution into cellulose boilers. HANS CLEMM (to Zellstoffabrik Waldhof). U. S. 1,693,999, Dec. 4. Liquid of such a concn. that it can be immediately used for the digesting operation is forced, while heated, into a closed boiler by a pressure pump.

Horizontal press for treating boards of alkaline cellulose, etc. WILHELM DÜTZMANN. U. S. 1,696,474, Dec. 25. Structural features are specified of a press suitable for treating boards of alkali cellulose for use in artificial silk manuf. or for treating other materials in corrosive alk. or acid liquids.

Depolymerizing or degrading cellulose and starch. I. G. FARBENIND. A.-G. Brit. 290,377, Feb. 15, 1927. Depolymerization or degradation is effected by heating with ethylene glycol or monochlorohydrin or their mixts.

Artificial filaments from cellulose xanthate, etc. NAAMLOOZE VENNOOTSCHAP: BOUWONDERNEMING KETAGANG IV. Brit. 289,976, Feb. 9, 1927. Viscose filaments extruded from a nozzle are passed through a coagulating bath of such extended length that the coagulation process is completely finished by the time the filaments leave the bath, and the filaments are then immediately wound on a ring-spinning or flyer-spinning device. An app. is described.

Spinneret for making filaments from cellulose solutions. JACQUES DELPECH. U. S. 1,695,155, Dec. 18. Structural features.

Spinning funnels for manufacture of "cuprammonia silk." OSCAR FREIHERR VON KÖRN (trading as O. Kohorn & Co.) and A. PERL. Brit. 290,560, May 14, 1927. A method is specified for removing deposits which form at the mouths of the spinning

Ultrafilter membrane. JACQUES DUCLAUX. U. S. 1,693,890, Dec. 4. In forming a cellulose acetate filter a nonmetallic cloth is immersed in cellulose acetate dissolved in H_2O until the yarns are impregnated and the interstices are filled; the acetate is then eliminated by water and surplus water is washed out with a liquid such as alc. or acetone which is miscible with water and the substance, e. g., C_6H_6 , which is to be treated by the filter.

Filament from viscose. I. G. FARBENIND. A.-G. Brit. 290,231, May 10, 1927. In producing filaments, bands, etc., having a finely indented cross-section from viscose, there is added to the coagulating bath a trace of a Zn salt such as 0.1% or less of $ZnSO_4$. The bath may contain an org. sulfonic acid.

Threads from viscose. HORACE J. HEGAN and EDWARD HAZELEY (to Courtaulds, Ltd.). Can. 284,960, Nov. 20, 1928. Viscose contg. 1-3% Na_2CO_3 is projected into a bath of 1-11% H_2SO_4 , 10-14% Na_2SO_4 , 8-14% $MgSO_4$ and 0-8% $ZnSO_4$, the said metallic sulfates being used in such proportions that the bath contains 25-28% of total metallic sulfates.

Apparatus (with banks of rollers) for washing or other treatments of viscose films after coagulation. FELDMÜHLE PAPIER- UND ZELLSTOFFWERKE A.-G. Brit. 290,232, May 10, 1927. Brit. 290,233-4 also relate to app. for similar purposes.

Heated drum and associated apparatus for drying films made from viscose and other cellulosic products. FELDMÜHLE PAPIER- UND ZELLSTOFFWERKE A.-G. Brit. 290,290, May 10, 1927. Structural features.

Viscose capsules. KALLE & CO. A.-G. Fr. 639,937, Aug. 23, 1927. Viscose capsules are sep'd from their molds by plunging the mold contg. the viscose into a bath of $(NH_4)_2SO_4$ contg. a small quantity of H_2SO_4 and heated to about 80°, and afterward spraying with cold water.

Artificial silk. COURTAULDS, LTD., and W. H. STOKES. Brit. 290,693, Jan. 15, 1927. Addition of substances such as oil, coloring agents or solids such as C black or china clay are made to material for forming artificial silk (as from viscose) after the spinning soln. has been filtered and decerated and sep'd from the main bulk of soln. on its way to the spinning app. Occlusion of air is avoided and various details of the operation are described.

Artificial silk. OSCAR KOHORN & CO. AND ALFRED PERL. Austrian 109,552, Jan. 15, 1928. Deposits forming at the mouth of a spinning funnel used for the manuf. of cuprammonium silk are removed during the idle periods of the plant by bringing below the mouth a trough fed with liquid for removing the deposits, and operating the cocks so that the liquid is drawn into the funnel.

Artificial silk. GUSTAV BONWITT. Fr. 649,644, Sept. 7, 1927. See Brit. 285,066 (C. A. 22, 4816).

Artificial silk. NAAMLooZE VENNOOTSCHAP NEDERLANDSCHE KUNSTZIJDEFABRIEK. Fr. 640,446, Sept. 5, 1927. A silk having a dull surface is made from acetylcellulose or other ether or ester of cellulose by carrying out the "dry" or "evaporation" process in the presence of steam by passing steam into the spinning chamber or leading the thread not completely freed from solvent into a chamber contg. steam. A little water may be added to the spinning soln.

Artificial silk. ANTON HUWILER. Swiss 126,780, Mar. 12, 1927. The spinning chamber is maintained at a fixed temp. and humidity.

Artificial silk from ammoniacal-copper cellulose solutions. I. G. FARBENIND. A.-G. Brit. 289,942, Feb. 2, 1927. See U. S. 689,895 (C. A. 23, 279).

Artificial silk thread. JOHN BRANDWOOD. Fr. 640,554, Aug. 31, 1927. An app. is described for treating artificial silk in skeins with liquor and removing excess moisture.

Method of spinning artificial silk. COMPTOIR DES TEXTILES ARTIFICIELS and HENRI CHAVASSIEU. Swiss 126,779, Jan. 29, 1927.

Spinning "fine counts" of artificial silk. O. SINDL. Brit. 289,861, May 4, 1927. In operation of a centrifugal spinning app. the filament is moistened with water by a jet nozzle as it passes to a draw-off roller to overcome its tendency to adhere to the roller. An app. is described.

Nitrocellulose and other compositions suitable for use as lacquers or for molding, etc. JOSEPH G. DAVIDSON (to Carbide and Carbon Chemicals Corp.). U. S. 1,693,746, Dec. 4. Triethyleneglycol or other suitable polyethylene glycol having a plurality of ether linkages is used as a solvent and plasticizer.

Pulp. LINN BRADLEY and EDWARD P. MCKEEFE (to Bradley-McKeeffe Corporation). Can. 285,597, Dec. 11, 1928. Residual liquor from the production of pulp with a cooking liquor contg. essentially Na_2SO_3 with or without caustic alkali is treated either before or after concn., and while alk. in reaction, with CaSO_4 to give a ppt. of CaSO_3 and Na_2SO_4 in soln. The resulting soln. is concd., Na_2SO_4 crystd. therefrom and a soln. of the Na_2SO_4 is caused to react with the pptd. CaSO_3 in the presence of a sufficient quantity of acid to give a ppt. of CaSO_4 and a soln. of sodium sulfite for reuse in the pulp-making process.

Conical refiner for pulp. EMIL A. RYBERG. Fr. 640,282, Aug. 30, 1927. Construction details.

Pulp board containing finely ground material of the "ti-tree." HERBERT T. PRICE. U. S. 1,696,896, Dec. 25.

Calcium bisulfite cooking liquor for digesting wood chips. GEORGE A. RICHTER (to Brown Co.). U. S. 1,694,231, Dec. 4. A suspension of finely divided limestone in water is passed in counter-flow contact with SO_2 through a confined mass of limestone rock. An app. is described.

Paper. ALBERT L. CLAPP (to Bennett Incorporated). Can. 284,745, Nov. 13, 1928. A paper having a high finish or glaze may be produced if a dispersion comprising a glazing or polishing wax, such as carnauba, and a wax of lower melting point such as paraffin, is applied to the paper prior to or during the usual calendering operation, after the paper has been dried. The dispersion melts readily at the temp. of the calenders, penetrates the surface of the paper and permits the paper to be highly polished after the drying operation, by the usual calenders, without the necessity of a subsequent super-calendering or friction-calendering operation. A typical dispersion may be composed of 90 parts of paraffin and 10 parts of carnauba dispersed in Na_2SiO_3 soln.

Paper pulp. GASTON A. MOURLAQUE. Fr. 639,900, Aug. 22, 1927. Vegetable material is transformed in a boiler into paper pulp by oxidation with ozone and potash lye obtained from the ash of vegetable substances used for heating the boiler.

Apparatus for screening paper pulp. ANTON J. HAUG. U. S. 1,696,354, Dec. 25.

Paper making. F. W. VICKERY. Brit. 290,326, Jan. 12, 1927. An app. is specified in which the friction between the wire cloth or felt and the suction box is lessened by maintaining a fluid layer (such as may be supplied by a jet of water) between the ends of the suction box and the edges of the wire or felt.

Paper-making apparatus. ERIK A. ÖHLIN and FRANS O. CARLSSON. U. S. 1,695,972, Dec. 18.

Paper-making apparatus. J. WHITE. Brit. 289,938, Feb. 2, 1927. Structural features.

Paper-making apparatus. HARRISON R. WILLIAMS. U. S. 1,695,873, Dec. 18.

Paper-making apparatus. LEON M. YOERG (to American Writing Paper Co.). U. S. 1,695,448, Dec. 18.

Feed control for paper-making apparatus. AUGUST KOLITSCH. U. S. 1,695,380, Dec. 18. Feed of stock to the app. is controlled by variations in the vacuum in the suction devices.

"Doctor" for paper-making apparatus. RALPH F. HEISEL (to Mead Pulp & Paper Co.). U. S. 1,696,119, Dec. 18. Structural features.

Apparatus for controlling the drying operation in paper machines. GEORGE S. WITIAM, JR. U. S. 1,694,349, Dec. 4.

Drying paper on steam-heated cylinders. RUDOLF DOCEKAL. Austrian 109,635, Jan. 15, 1928. The water vapor evolved from the paper is withdrawn by suction, compressed, and returned to the cylinder.

Felt sheet for paper-making machines. HUTTER & SCHRANZ A.-G. Austrian 108,798, Oct. 15, 1927. The sheet is made from compd. threads, each comprising a strong thread with 2 or more loosely twisted woolen yarns.

Apparatus for calendering paper. F. W. LODDING (to Rice, Barton & Fales). Brit. 290,188, May 9, 1927. Elec. devices are provided for controlling the position of each doctor with respect to its roll.

Tracing paper, etc. H. FRIEDLANDER (to Spicers, Ltd.). Brit. 290,625, May 18, 1927. An emulsion of hard wax is incorporated with loose fibers such as cotton, linen, silk, wool or artificial silk in the pulp from which paper or cardboard is made and agents which ppt. the wax on the fibers are added. When the emulsion is added to paper pulp a substitute for "press-spahn" or vulcanized fiber may be obtained. Org. solvents such as CCl_4 may be used, with or without substances such as casein, fats, oils or soaps, resins or their mixts.

Waterproof paper. GEORGE A. BROWN (to Bennett Incorporated). Can. 284,746, Nov. 13, 1928. A furnish comprising 70 parts of waste paraffin paper, together with 30 parts of other fiber is placed in a beater engine with sufficient water to ensure circulation. The furnish is heated to about 170°F . and beaten $\frac{1}{2}$ hr. to disintegrate the paper. About 5 to 20 parts of rosin is then added and disseminated throughout the furnish. A 42° Bé soln. of Na silicate, heated to 210°F ., is added in amt. to produce the desired dispersion, about 3 or 4 parts of silicate to 1 part of rosin being satisfactory. The silicate soln. is beaten into the furnish for $\frac{1}{2}$ hr. and a dispersion of paraffin and rosin into fine, discrete particles is effected. The furnish is then preferably cooled to about 120°F . Alum (about 30-40% based on the wt. of the dry Na silicate) is added. The alum reacts on the Na silicate to produce a voluminous flocculent ppt. of Al silicate, which carries down and fixes the dispersed particles of waterproofing material on the fibers. The furnish is run off on a paper machine. Cf. C. A. 22, 3046.

De-inking printed newspaper, etc. WM. LEWIS. U. S. 1,696,639, Dec. 25. The printed paper is satd. with an alk. soln. and reduced to a pulp and the pulp is then subjected to pressure between opposing surfaces such as those of a beater which are impervious to the pulp but permit passage of the ink and soln. An app. is described.

24—EXPLOSIVES AND EXPLOSIONS

CHARLES E. MUNROE

Explosion temperatures of gaseous mixtures at different pressures. A. B. SAGULIN. Phys. Tech. Lab., Leningrad. Z. physik. Chem., Abt. B, 1, 275-91(1928).—The relation between the min. pressure at which explosion occurs and the temp. has been studied with the following gases: $\text{H}_2 + \text{Cl}_2$; $\text{H}_2 + \text{Br}_2$; $\text{CS}_2 + \text{O}_2$; Cl_2O ; $\text{CH}_4 + \text{O}_2$; $\text{C}_2\text{H}_6 + \text{O}_2$; $\text{C}_2\text{H}_4 + \text{O}_2$; $\text{CO} + \text{O}_2$; $\text{H}_2 + \text{O}_2$. In every case, the relation can be expressed by: $\log(P_m/T) = A/T + B$, where $A = \text{const.}$ peculiar to the reaction. In the majority of the reactions, B shows a min. for a 06% concn. of one of the reagents. B increases when the diam. of the explosion vessel decreases. The values of A were found to be: $\text{H}_2 + \text{Cl}_2$: 2500; $\text{H}_2 + \text{Br}_2$: 4000; $\text{CS}_2 + \text{O}_2$: 4000; $\text{CH}_4 + \text{O}_2$: 7000; $\text{C}_2\text{H}_6 + \text{O}_2$: $A_1 = 7000$, A_2 4200; $\text{C}_2\text{H}_4 + \text{O}_2$: $A_1 = 7000$, $A_2 = 3800$; $\text{C}_2\text{H}_6 + \text{O}_2$: $A_1 = 7000$, $A_2 = 2200$. A discussion detts. which of these reactions is to be regarded as true thermic explosions.

ALBERT L. HENNE

Explosive limits of technical gas mixtures. K. BUNTE AND A. STEDING. Gas Institut. Gas u. Wasserfach 71, 821-2(1928); cf. C. A. 23, 262.—Explosive mixts.

of air with pure coal gas and coal gas contg. from 9.1 to 71.4% CO_2 , 9.1 to 82.0% N_2 and 16.7 to 91.0% water gas, resp., have been tested by the method of Eitner (*J. Gasbel*, 1902) slightly modified. The dried gas and air were measured by capillary flow meters and mixed in a gas buret arranged for ignition at the top of the buret only. The buret was supplied with a manometer which indicated whether an explosion had occurred. Curves and data are given for the explosive limits of the above mixts. The addn. of water gas considerably increased the explosive limits. Among the inert gases the explosive range is greater with the gases to which N_2 had been added than the corresponding gas to which CO_2 had been added. Theoretically, the explosive limits correspond to the base of the curve of rate of flame propagation vs. percent gas curve, where the rate of flame propagation is zero. While this is approx. true for the lower explosive limit the rate of flame propagation is still large at the upper explosive limit, which may be due to radiated heat bringing the layer of gas just inside the inner cone to the ignition temp. R. W. RYAN

The decomposition of explosives. J. P. KOERTNITZ. *Z. Elektrochem.* **34**, 768 (1928).—The thermodynamics of the most important explosives are recalcd., regarding the explosive reaction as an evapn. of liquids or a sublimation of solids, with simultaneous or rapidly following dissoen. with the usual evolution of heat. Mainly a mathematical discussion. E. M. SYMMES

Testing primers for sensitiveness to impact and for flame effect. LUDWIG METZ. Chem.-Tech. Reichsanstalt, Berlin. *Z. ges. Schiess-Sprengstoffw.* **23**, 260-3, 305-8, 353-4 (1928).—M. describes an original app. for testing the sensitiveness of primer caps, wherein the cap is ignited by a firing pin struck by a free-falling wt. of 250 or 500 g. This app. is free from most of the objectionable features of other impact test app., and can be used for testing caps having larger charges (up to 0.24 g.). A tabulation is given of the results of tests with this app., using a no. of types of military and sporting primers, and also a no. of *initial detonating explosives*, the latter being loaded into primer caps for the purpose of testing. Photographs of the flames are shown. Sensitiveness tests of the detonating explosives gave the following results for min. height of drop of 500 g wt.:—tetrazene 10, $\text{Hg}(\text{ONC})_2$ 10.5, hexamethylene triperoxydiamine 10, K dinitrodinitrosobenzene 25, N_4S_4 28, tricycloacetone superoxide 35, PbN_6 (4 different samples) 30-40 cm. Sensitiveness to impact decreases as ignition temp. increases. A method of testing primers is described in which the above app. is used for detg. the distance at which a strip of nitrated paper will be ignited by the flash from a given primer. C. G. STORM

Phosphorus necrosis in the manufacture of fireworks. EMMA FRANCE WARD. *J. Ind. Hyg.* **10**, 314-30 (1928).—P poisoning in the fireworks industries develops more rapidly than in the match industry. The poisoning was mostly by actual contact in the processes of molding and wrapping. No precautions can eliminate the danger. The purchase for resale of fireworks contg. white P was to end in 1927. H. C. HAMILTON

The influence of steam and of H on the burning of CO (DIXON) **21**. Heater [for use in the explosives industry] (Austrian pat. 109,213) **1**.

Explosives. LIGNOZA SPOLKA AKCYJNA. Fr. 639,938, Aug. 23, 1927. Explosives such as black powder are rendered safer by the addn. of inorg. salts such as chlorides, sulfates, etc., while their sensitiveness is maintained by the addn. of org. substances such as toluene, nitroglycerin, etc.

Explosives. DYNAMIT-ACTIEN-GESELLSCHAFT VORMALS ALFRED NOBEL ET CO. Fr. 640,291, Aug. 30, 1927. Gelatinous explosives and gelatinized smokeless powders are prepd. by gelatinizing nitrocellulose with explosive oils formed by solns. of nitrated multivalent alcs. such as nitrosorbitol in nitroglycerin, nitroglycol or similar explosive oils or their mixts. An example of a dynamite-gelatin contains explosive oil 62, cotton-collodion 3, wood dust 8 and NaNO_3 27%, and a smokeless power-explosive oil 40, centralite 1 and nitrocellulose (12.75% N) 59%. The explosive oil used in the above is prepd. by nitration of sorbitol in glycol or glycerol.

Explosive cartridges. ALEXANDER C. SCOTT (to Mexico, Ltd.). U. S. 1,695,932, Dec. 18. Can. 285,000, Nov. 20, 1928. A liquid "spreading agent" such as kerosene or xylene is used to facilitate impregnation of cartridges contg. KClO_3 , KClO_4 or NH_4NO_3 or similar substances with liquid nitro compds. such as PhNO_2 . Castor oil and other ingredients also may be added.

Cartridge case annealing apparatus. HERBERT V. LUCKIE and SAMUEL A. NORTH (to Remington Arms Co.). U. S. 1,096,886, Dec. 25. A screw conveyor moves the cartridge cases through the app. and the cases are locally heated.

Detonator caps. AKTIENGESSELLSCHAFT LIGNOSE (Friedrich Thomas and Julius Dyckerhoff, inventors.). Ger. 468,935, Jan. 8, 1922. One part of Hg fulminate in detonator caps is replaced by the addn. product of more than 3 mols. of PbO and the neutral Pb salt of picric acid, trinitroresorcinol, hexanitrodiphenylamine, trinitrobenzoic acid or nitranilic acid.

Cleaning fire arms. JOSEF WAGNER. Fr. 640,294, Aug. 30, 1927. To remove the deposits of Pb or oxide of Pb from fire arms, esters of hydroxy fatty acids such as ethyl lactate are added to the known cleaning agents. Cf. C. A. 22, 3501.

25—DYES AND TEXTILE CHEMISTRY

L. A. OLNEY

Progress of the heavy organic industry and technology of dyes. JOZEF TURSKI. *Polynest Chem.* 11, 357-64, 543-52(1927). A. C. Z.

Dye-house notes. J. DELACHAIRE. *Tiba* 6, 1381-5(1928).—Practical notes on the dyeing of wool fabrics, woolen velvets, wool-rayon fabrics, rayon-cotton fabrics, cotton fabrics and pure wool skeins. A. PAPINEAU-COUTURE

Scientific dyestuff color synthesis. L. BLIN DESBLEDS. *Textile Recorder* 46, No. 45, 613(1928).—The use of the photoelec. photo-calorimeter in detg. directly the proportion in which 2 colors, A and B, must be mixed to obtain a desired color, C, is described. RUBY K. WORNER

Reserves under sulfur dyes. F. VOZNESENSKII. *Bull. soc. ind. Mulhouse* 94, 657-60(1928).—Sealed notes 1920 (Aug. 3), 1926 (Sept. 2), 1945 (Oct. 30), 1951 and 1952 (Nov. 19, 1909).—No. 1920 *Illuminated reserves*.—Khaki reserve color: nitroso- β -naphthol paste 220, 23° Bé. Cr aceto-nitrate 120, 50% ZnCl₂ soln. thickened with gum senegal and kaolin 600. More or less greenish shades of khaki can be obtained by adding Fe or Co salts to the above color paste. Using only Zn as mordant gives a yellow which can be toned with basic or substantive dyes. Green reserve color: nitroso- β -naphthol paste 130, 38° Bé bisulfite 65, 38% CH₂O 30, 19° Bé. Fe aceto-nitrate 100, malachite green 15, PhOH 60, thickened 50% ZnCl₂ soln. 600. Preferably print on fabric which has been mercerized or prepd. with β -naphthol, so that they may be associated with para red reserves. Steam 5 min., dye, rinse, acidify, rinse and wash with soap. No. 1920 *Reserves illuminated with thioindigo red B, thioindigo scarlet R and brominated indigo*.—Printing color: leuco deriv. corresponding to 40 g. of thioindigo dye 180, glycerol 80, solid hyposulfite 20, thickened 50% ZnCl₂ soln. 720. Steam 2-3 min., oxidize in the air overnight, dye with S dye. Printing can be carried out on fabrics prepd. with β -naphthol and associated with diazotized base reserves. The above vat dyes can be replaced by certain S dyes, such as Schwefelblau BASF toned with a basic dye. Prepn. of the thioindigo red B leuco deriv. can be avoided as follows: thioindigo red B 20, glycerol 80, rongalite (1:1) 50, thickened 50% ZnCl₂ soln. 650, AcONa 200. No. 1945 *Indigo reserve*.—A—indigo powder 50, glycerol 100, rongalite gum (1:1) 150, anthraquinone paste 50, grind together; B—to 550 of thickened ZnCl₂ soln. slowly add 100 of 38° Bé NaOH with cooling, and screen the ppt. Mix A and B. The same formula can be used for thioindigo. Acetates can be used instead of NaOH. No. 1951 *Red and deep blue reserves*.—Deep blue reserves under S dyes cannot be obtained by means of diamidate on β -naphthol, as the Cu lake which must be formed is affected on acidifying after dyeing, this can be overcome by using β -hydroxynaphthoic acid instead of β -naphthol. Prep bath: β -hydroxynaphthoic acid 15, H₂O 760, 20° Bé. NaOH 30, 24% NH₄ 20, ricinoleic acid 100, AcONa 75. Printing color (blue): diazodianisidine soln (5 g. of base) 200, ZnCl₂ soln. thickened with gum senegal and kaolin 800. To obtain a bluish red, use 200 of diazochloroanisidine soln. (contg. 20 g. of base). No. 1952 *S blue reserve*.—Printing color: leuco deriv. of S blue BASF 140, glycerol 80, hyposulfite 20, thickened ZnCl₂ soln. 760. General formula for the prepn. of leuco derivs.: dye 40, 40° Bé. NaOH 40, hyposulfite powder 50, H₂O at 56° (45° for thioindigo) 850, after soln. is complete cool and add: ice 100, 6° Bé. AcOH 90; giving a yield of 140 g. of drained material. Report. PIERRE BINDER. *Ibid* 660-1.—While the principle of reserves under S dyes (printing metallic salts, generally ZnSO₄ or ZnCl₂, and kaolin and dyeing in a vat with S dyes) is well known, no anteriority was found for the modifications proposed by V., which, however, are somewhat difficult to carry out. Only certain vat and S dyes lend themselves to the process, as the Zn salt added to the printing paste interferes more or less with the fixation of the vat or S dye with which it is mixed. A. PAPINEAU-COUTURE

Dyes from the true holly plants. C. D. MELL. *Textile Colorist* 51, 53-4(1929).—Although dyes are obtained from these plants, none of the known species of *Ilex* furnishes a dye-yielding material of any great economic importance. RUBY K. WORNER

Dyes from quinoline-2-aldehyde. AMARENDRA NATH DEY AND SIKHIBHUSHAN DUTT. *J. Indian Chem. Soc.* 5, 535-7(1928).—Quinoline-2-aldehyde (I) condenses very easily with mono- or di-N-substituted anilines in the presence of concd. HCl or $ZnCl_2$, giving colorless leuco compds. which can be oxidized to the coloring material (II) by means of MnO_2 or PbO_2 . II can also be prepd. directly without the intermediate formation of leuco compds. by heating quinaldine tribromide with substituted anilines in the presence of $ZnCl_2$ or ZnO , or without condensing agent. The dyes thus obtained are all green or bluish green in color, very stable toward light, and practically devoid of all photosensitizing properties. Dimethyl-, diethyl-, methylbenzyl-, and ethylbenzyl-anilines were condensed in the foregoing manner with I. The color bases obtained m 196-8°, 144-5°, 172-4°, and 252-4°, resp. FREDERICK C. HAHN

The chemistry of indigosols. WLADYSŁAW KIELBASINSKI. *Przemysł Chem.* 11, 342-7(1927).—A review of the theoretical chemistry of indigosols together with a brief bibliography. A. C. Z.

Formation of lakes of basic dyes. WACŁAW KACZKOWSKI AND T. KOZŁOWSKI. *Przemysł Chem.* 11, 303-7(1927).—Lakes formed of *m*-digallic acid, emetic and basic dye in the proportion of 1:1:1 are insol. in H_2O , C_6H_6 , ethyl acetate, very slightly sol. in $CHCl_3$, readily sol. in C_2H_5OH , $(CH_3)_2CO$, CH_3OH , and dil. CH_3COOH . It is evident that in the formation of lakes of *m*-digallic acid the carboxylic group is active. A. C. Z.

Dyeworks oxalates from waste. E. T. ELLIS. *Dyer, Calico Printer* 60, 148 9 (1928).—Waste products suitable for transformation into oxalic acid include sawdust, strawboard from drapery establishments, and waste paper from offices and book-binding establishments. The acid can then be treated with NH_3 , also prepd. from waste products, or with NH_4Cl to form $(NH_4)_2C_2O_4$; with $Sn(OH)_4$ to form $Sn(C_2O_4)_2$; or with $Sn(C_2H_3O_2)_2$, also prepd. from waste products, to form SnC_2O_4 . $(NH_4)_2C_2O_4$ can be used as a starting product for $NH_4HC_2O_4$ or for $Cr_2(C_2O_4)_3$. RUBY K. WORNER

Action of light on anthracene. EVA HIBBERT. *J. Soc. Dyers Colourists* 44, 377 (1928).—Anthracene exposed to daylight or to fadeometer light becomes yellow or brown on the side toward the light, and this colored portion gives a pos. reaction for anthraquinone. L. W. RIGGS

Gases emitted in the manufacture of sulfur dyestuffs. G. V. KOGAN. *J. Chem. Ind. (Moscow)* 5, 799 801(1928).—The purpose of K.'s investigation was to det. the quantity of H_2S and NH_3 which come off in definite intervals of time in the course of the manuf. of S dyestuffs, and to find the conditions under which the emission of these gases reaches a max. Fifty g. *p*-nitroaniline, 50 g. dinitroacetanilide and 100 cc. H_2O were placed in a small kettle provided with a stirrer, a thermometer tube and a reflux condenser, and the mass was stirred and heated to 98-100°. At this temp. polysulfide was added, and after the addn. the temp. was raised. The polysulfide was obtained by maintaining 210 g. crude Na_2S , 130 g. S and 250 g. H_2O at 100-105° and allowing to settle. In some expts. the polysulfide was added in small portions (25 cc. out of a total of 400 cc.) every 3-5 min.; in other expts. all the polysulfide was introduced in 3 addns. made at intervals of 30 min. The gases which sep. were passed through the condenser either first into 2 flasks contg. a 33% $NaOH$ soln., then into a flask with H_2SO_4 , or into a gasometer in which their vol. could be detd. at any desired interval of time. In 1 expt. the polysulfide was introduced in small portions every 5 min., the gases began to collect in the gasometer when the kettle temp. reached 128°; in the first 6 min. 12 l. of gas was collected, the temp. reaching 150°, and in the next 10 min., the temp. remaining the same, 7 more l. of gas was emitted, after which the gas emission ceased. As a rule the amt. of gas emission is negligible until the temp. of 113-116° is reached and water begins to distil. If the polysulfide is introduced in larger addns. and at greater intervals of time, the reaction is more uniform and less violent. BERNARD NELSON

Fastness to sulfur dioxide of fabric dyed with azo dyestuffs. A. T. KING. *J. Textile Inst.* 19, 249 53P(1928); cf. C. A. 22, 3781.— SO_2 may be present in fiber that has been stripped with hyposulfite, bottomed with indigo, placed in contact with stoved white yarn, or wrapped in paper made from sulfite pulp. Accordingly fastness to stoving is not a sufficient test for fastness of azo dyestuffs. A thorough knowledge of the reactions of SO_2 with the various dyes, and the nature and fastness of the colors produced by these reactions is necessary. The fastness of a dye to SO_2 , hitherto a somewhat obscure factor of limited scope, promises to rival in importance its fastness to light. Several practical examples are discussed. L. W. RIGGS

Fixation of pigments on textile fabrics. G. E. HOLDEN. *J. Soc. Dyers Colourists* 44, 364-8(1928).—A lengthy series of expts. is reported, "designed to det. the capacity of linseed oil as a fixing agent for various pigments on the industrial scale on textile fabrics, chiefly cotton velveteens." This study included the application of linseed oil raw and boiled, China-wood oil, spermaceti, wax, carnauba wax, beeswax, gelatin, isinglass, cellulose acetate and other products. The pigment studied with these fixing agents was Prussian blue. L. W. RIGGS

Industrial poisoning in the manufacture of coal-tar dyes and intermediates and methods of preventing it. A. HIRSZOWSKI. *Przemysl Chem.* 12, 370-8, 419-29, 481-92, 535-40, 587-604(1928).—Symptoms and illustrative cases are described of poisoning by C_6H_6 , $C_6H_5CH_3$, xylene, naphthalene, anthracene, C_6H_4 derivs., nitro compds., aniline and other amines, Cl_2 and aliphatic compds., mineral acids, Cl_2 , H_2S , AsH_3 , and caustic alkalis. Chem. operations in the manuf. of dyes, and prevention of industrial poisoning are discussed. An extended bibliography is included. A. C. Z.

Dyeing of union yarns. T. COPLEY. *Dyer, Calico Printer* 60, 250-1(1928).—Methods and dyestuffs are suggested for dyeing wool and cotton, cotton and silk, and wool and silk unions. RUBY K. WORNER

The dyeing of union fabrics containing cellulose acetate rayon. A. KUNZE. *Russa* 3, 1149, 1151, 1303, 1305(1928).—In French and German. Practical operating hints are given. A. PAPINEAU-COUTURE

Notes on the dyeing of natural silk fabrics. RAFFAELE SANSONE. *Textile Colorist* 50, 164-8, 382-6, 458-60, 526-7, 674-6, 740-1(1928).—A continuation of C. A. 22, 1240. RUBY K. WORNER

Notes on dyeing wool and fur soft hats. E. MEISSNER. *Leipzig. Monatschr. Textil Ind.* 43, 356-7(1928).—The various components of the fiber mixt. used for making felt hats frequently dye differently with the various different colors of the dye mixt. The finer fibers take more mordant and more dye for equal shades than the coarser fibers, the difference being especially marked when fur and wool are used together. Since any traces of vegetable fiber will cause specks, carbonizing should be practiced. In this operation incomplete treatment is a common fault. The H_2SO_4 should be used at 4-5 Be, and the drying should be prolonged over 1-1.5 hrs. at 70-80°. Leonil S is a desirable wetting agent. Subsequent beating and dusting should be very thorough. The dyer can hardly be expected to produce fashionable light shades on hat bodies contg. naturally dark fur fibers, but the darkening of fur fibers in boiling operations can be decreased by use of Feltron C. To avoid a darkening tendency, steam in finishing operations should be dry and the hat bodies should be first given a drying treatment. Among the dyes that are available, preference should be given to the newer Supramin, Radio, Palatine Chrome, and Palatine Chromate series. Over-chroming injures the strength and durability of the felt and should be avoided. Hat dyers are likely to overlook the possibility of variations in shade of certain dyes under artificial light and this should be given more attention in the dyeing of women's hats. E. R. CLARK

Dyeing cotton fast to bleaching. HORACE FLEMING. *Textile Colorist* 51, 38-9(1929). Kier boiling and selection of dyestuffs are considered in particular. R. K. W.

Effects produced by the singeing operation on the dyeing properties of cotton. G. E. HOLDEN. *J. Soc. Dyers Colourists* 44, 368-9(1928).—Singeing imparts a lessened affinity of cotton toward substantive colors during subsequent dyeing. Five to 6 times the quantity of dyestuff is required for thoroughly singed cotton to produce the same depth of color as on non-singed cotton. L. W. RIGGS

Electric color-matching. DAVID PATERSON. *Dyer, Calico Printer* 60, 226-7(1928). The Toussaint photoelec. colorimeter is briefly described. R. K. W.

Progress in textiles. JAMES W. COX, JR., E. H. MARBLE, W. L. CONRAD, McREA PARKER, E. R. STALL AND H. M. BURKE. *Mech. Eng.* 51, 52-4(1929). E. H.

Distinguishing tests for yarns and fabrics. CLIFFORD R. CARTER. *Dyer, Calico Printer* 60, 212-3(1928). Some usual tests are described for distinguishing the ordinary textile fibers, including New Zealand hemp or flax, jute, true hemp, true flax and Manila fiber. RUBY K. WORNER

Stains, dirt and oil spots in yarns and fabrics. H. D. MARTIN. *Textile Colorist* 51, 28, 34(1929). A general discussion is given of the cause and prevention of such troubles. RUBY K. WORNER

Some remarks on drying [textiles]. R. J. WATSON. *Textile Colorist* 51, 52-3(1929). RUBY K. WORNER

Luster in finishing woolens and worsteds. ALEX. J. BENNETT. *Textile Colorist* 51, 35-7(1929). The development of modern crabbing, steaming and cooling machines from the "Roll boiling" process is traced. RUBY K. WORNER

Relation of moisture content of wool to that of air. V. LÖHRMANN. *Kísérlet Közlemények* 30, 472-482(1927).—The moisture content of wool does not depend on the quality. If the moisture content of the air becomes greater, then the moisture content of the wool increases, even after the moisture content of the air is diminished. A dry wool acquires normal moisture in 5-6 hrs. Dirty wool contains 0.5% less moisture than the washed wool if the air contains 40-50% moisture but no difference can be observed in an air contg. more than 65% moisture. S. S. DE FINÁLY

Absorption of acids by wool. II. III. An examination of the experimental data. H. WILKINSON AND A. G. TYLER. *J. Soc. Dyers Colourists* 44, 369-76(1928); cf. C. A. 22, 3783.—In agreement with several other workers it was found that the equil. between the acid absorbed by the wool and the acid remaining in the liquor was represented by the equation $y = a \log bx$, in which y = the percentage of acid absorbed by the fiber (C_f), x = the percentage concn. of the acid left in the bath (C_b), and a and b were consts. These findings and those of other workers are shown in charts of curves. In this study the observations were made on the absorption (or combination) in wool phase when immersed in the liquid phase, in which the concn. of the acid in the liquid phase was gradually diminishing until equil. was reached. In part III the attempt was made to obtain conditions in which the wool phase would be relatively large and the liquid phase small. The results indicate that under these conditions of equil. between absorbed acid and acid concn. the same equation holds. The absorption of acids by wool is a chem. reaction similar to those discussed by Loeb (cf. "Proteins and the Theory of Colloidal Behavior" p. 42 et seq. (C. A. 19, 996)). L. W. RIGGS

Wool lubrication in relation to scouring. F. T. SYKES. *Dyer, Calico Printer* 60, 120-1, 168-9, 204-5, 237, 254-6(1928).—A general discussion is given of the oiling and scouring processes and of the attendant difficulties. The requirements of suitable oils and soaps are especially considered. RUBY K. WORNER

Experiments show how to eliminate barre-marks from broad silks. H. E. WENRICH. *Textile World* 75, 231-9(1929). RUBY K. WORNER

Successful prewinding boil-off for silk skeins to be used in glove-silk fabric. T. P. SHERIDAN. *Textile World* 74, 3248, 3261(1928).—The process is described RUBY K. WORNER

Rayon rain proofs. FRED. GROVE-PALMER. *Textile Colorist* 50, 742-5, 843-5 (1928); 51, 23-6(1929).—A general discussion is given of the theory of waterproofing light cloths, methods of application of various processes, and methods of testing the finished materials. RUBY K. WORNER

Finishing linen cloth and toweling. T. WOODHOUSE AND A. BRAND. *Cotton* 92, 239-40, 1013-6, 1120-2(1928).—The processes and equipment used in handling these goods in the finishing plant are described. RUBY K. WORNER

Many defects appearing in cotton fabric after finishing are fault of weaving mill. ALFRED SCHMIDT. *Melliand Textilberichte; Textile World* 74, 3489-91(1928). RUBY K. WORNER

The starches used in the sizing and finishing of cotton. S. R. TROTMAN. *Dyer, Calico Printer* 60, 136-7, 160-1, 179(1928).—A general account is given of the principal starches used for this purpose, their prepn., general and comparative properties, and methods of analyzing com. starches for chem. compn., stiffening power and viscosity. RUBY K. WORNER

New Zealand hemp. CLIFFORD R. CARTER. *Textile Recorder* 46, No. 546, 44-5 (1928).—A general account is given of its cultivation and conversion into fiber. Tests are described for distinguishing it from jute, true hemp and true flax. R. K. W.

The bleaching of animal fibers. JAMES MOFFAT. *Dyer, Calico Printer* 60, 164-5, 206-7, 236-7(1928).—A general discussion is given of the S and peroxide bleaching processes as applied to wool and silk. RUBY K. WORNER

Resistance of textile oils to magnesium sulfate. H. RUSSINA. *Leipzig. Monatschr. Textil. Ind.* 43, 392-3(1928).—The use of such prepn. as Prestabitol, Gencucol and Appret-Avirol, should be according to rational interpretations of test results. The concn. of sol. oil needed to prevent turbidity is proportional to the concn. of $MgSO_4$. With Appret-Avirol, both low and high concn. gave turbidity with an intermediate concn. which gave clarity. E. R. CLARK

Floranit. ANGELE. *Leipzig. Monatschr. Textil. Ind.* 43, 352(1928).—Floranit is a desirable wetting-agent for bleach baths. When it is used, thorough preliminary wetting of the fabric is not essential, and even paraffin-stained portions are bleached. E. R. C.

Prestabitol. HANS FRIEDRICH. *Leipzig. Monatschr. Textil. Ind.* 43, 352-3 (1928).—This is a wetting-agent for mercerizing baths. Its use enhances the effects of the caustic and increases the uniformity of the treatment. E. R. CLARK

Device for identifying colors (HOLMES) 1. Influence of sulfonic groups and other substituents on the color of trisazo dyes (DINNER) 10. Constitution of delphinin (KONDON) 10. Azo dyes from acetoacetanilides (FIERZ-DAVID, ZIEGLER) 10. Use of halogen-substituted sulfonic acids and their salts as protective agents (Brit. pat. 289,898) 18. Wetting agents [halogen-substituted sulfonic acids] (Brit. pat. 289,863) 18. Colloidal solutions of silica for impregnating fabrics (Brit. pat. 290,717) 18. Dispersing agents [for dyes] (Fr. pat. 640,776) 18. Sulfonated cellulose derivatives [for impregnating cloth] (Fr. pat. 640,687) 23. Sulfonic acids [in the textile industry] (Fr. pat. 640,617) 10. Inclined rotary drying apparatus for treating cotton (U. S. pat. 1,695,652) 1. Artificial threads from chlorinated rubber (U. S. pat. 1,695,643) 30. Dyeing leather (Can. pat. 285,054) 29.

BALLS, W. LAWRENCE: *Studies of Quality in Cotton*. London: Macmillan & Co., Ltd. 376 pp. 20s., net. Reviewed in *Nature* 122, 641 (1928).

REINTHALER, F.: *Artificial Silk*. Revised and enlarged. Translated from the German by F. M. Rowe. London: Chapman & Hall, Ltd. 276 pp. 21s.

Dyes. I. G. FARBENIND. A.-G. Brit. 289,980, Feb. 14, 1927. Green vat dyes are made by fusing with caustic alkali, "under mild conditions," the aminobenzanthrone obtained by reducing the nitrobenzanthrone described in example 2 of Brit. pat. 12,518 of 1906 or substitution products of this aminobenzanthrone which contain exchangeable substituents in the Bz-1 position, or their *N*-acyl derivs. The products can be converted into brown vat dyes by treating them with oxidizing agents either in substance or on the fiber, or the nitrobenzanthrone may be fused directly with caustic alkali to obtain a brown vat dye. Several examples are given.

Dyes. I. G. FARBENIND. A.-G. Brit. 290,230, May 10, 1927. Monoazo dyes which give clear greenish yellow dyeings on wool, fast to light and to water, are made by coupling a diazotized anilinemonosulfonic acid with 1-(2'-chloro-5'-sulfo phenyl)-3-methyl-5-pyrazolone. Among various specified components are the diazo compds. of sulfanilic acid and of aniline-*o*-sulfonic acid.

Dyes. I. G. FARBENIND. A.-G. Brit. 290,408, March 24, 1927. Vat dyes of the anthraquinone series are made by treating a bis-(2'-carboxy-1'-anthraquinonyl)-2,6- or 2,7-dimercaptoanthraquinone with a dehydrating agent to effect ring closure. Examples are given of dyes producing yellow shades and of the manuf. of some of the intermediates used.

Dyes. I. G. FARBENIND. A.-G. Brit. 290,636, May 18, 1927. 1-Aminoanthraquinone-2-sulfonic acids, substituted in the 4-position by an amino residue of a cyclic paraffin, are obtained by replacing the halogen atoms of the corresponding 2-halogen derivs. by sulfonic groups, *e. g.*, by heating with a neutral sulfite preferably under pressure. Dyes as described in examples 1 and 2 of Brit. 276,408 (*C. A.* 22, 2470) and Brit. 282,452 (*C. A.* 22, 3787) may be thus obtained.

Dyes. I. G. FARBENIND. A.-G. Brit. 290,733, Feb. 18, 1927. Insol. disazo dyes are made by coupling the tetrazo compd. of 2,7-diaminocarbazole or an unsulfonated deriv. with a suitable component other than a naphthol, *e. g.*, with a 2,3-hydroxynaphthoic arylide, a hydroxynaphthocarbazole or with a diacetoacetic arylide. The dyes may be formed on a substratum or on the fiber and dyes are obtained (according to examples given) which give blue, bluish black, violet, black or yellowish brown shades. 3,6-Dichloro-2,7-diaminocarbazole (which may be used as a starting material) is made by heating 2,2'-diamino-3,3'-dichlorobenzidine (obtained by nitrating 3,3'-dichlorobenzidine and reducing) with dil. HCl or H₂SO₄ in an autoclave.

Dyes. I. G. FARBENIND. A.-G. Fr. 639,859, Aug. 20, 1927. Sulfurized dyes are prepd. by heating with alkali polysulfides and a Cu salt the indophenols or leucoindophenols obtained by the joint oxidation of *p*-hydroxyaryl-1-naphthylaminesulfonic esters with *p*-aminophenol and its derivs. and reducing if necessary. In an example, 1-*p*-anisylamino-4-*p*-hydroxyphenylaminonaphthalene-8-sulfonic acid (by oxidizing *p*-anisyl 1-naphthylamine-8-sulfonic acid and *p*-aminophenol and subsequently reducing) is refluxed in alc. with S and CuSO₄. The product dyes cotton in a bath contg. Na₂S in pure greenish yellow shades. The product obtained from the leucoindophenol prepd. from *p*-phenethylamino-4-*p*-hydroxyphenylaminonaphthalene-8-sulfonic acid and *p*-aminophenol dyes cotton in greenish yellow shades. The product obtained from 1-*p*-anisylamino-4-*p*-hydroxyphenylaminonaphthalene-6- or 7-sulfonic acid dyes cotton in bluish green shades.

Dyes. I. G. FARBENIND. A.-G. Fr. 639,975, Aug. 24, 1927. Vat dyes are prepd. by treating benzoylaminodiphtaloylacridones with hydrazine. In an example 1,2,5,6-

diphthaloylacridone (by condensing 1-chloroanthraquinone-2,2-dicarboxylic acid with 2-aminoanthraquinone and treating with H_2SO_4 to close the acridone ring) is nitrated and reduced and boiled with $BzCl$ to obtain benzoylamino-1,2,5,6-diphthaloylacridone, which is boiled in pyridine or toluene with hydrazine hydrate. The new product dyes cotton from the vat in fast green shades. Anisoylamino-diphthaloylacridone or halogen derivs. of these acridones may be used as starting materials.

Dyes. I. G. FARBENIND. A.-G. Fr. 640,262, Aug. 30, 1927. Black trisazo dyes are prepd. by diazotizing the *p*-aminoazo compd. *p*-aminobenzeneazo gamma acid (from diazotized *p*-nitroaniline and gamma acid) and coupling with gamma acid, diazotizing again and combining with *m*-phenylenediamine, any one of the 4 org. mols. used for the synthesis of the dye may also contain an extra sulfonic acid group. Examples are given, in one of which gamma acid is used, which is replaced in the second by 2-amino-8-naphthol-3,6-disulfonic acid.

Dyes. I. G. FARBENIND. A.-G. Fr. 640,726, Sept. 9, 1927. Org. dyes contg. acid salt-forming groups are combined with org. bases which will yield stable salts insol. or slightly sol. in water. Such bases are dicyclohexylamine, guanidines, trisubstituted melamines, and diethyl- β -naphthylamine. The products are mixed with hydrate of alumina, heavy spar, blanc fixe, etc., or they may be prepd. in the presence of these substances. In examples: (1) Na 1-amino-4-anilinoanthraquinone-2-sulfonate is treated in aq. soln. with a HCl soln. of dicyclohexylamine. (2) *p*-Nitrophenylazosalicylic acid is similarly combined with quinoline. (3) Sulfonated diphenyldiaminophenolphthalein is combined with ethenylphenylenediamine. A long list of dyes which may be combined is given.

Dyes. I. G. FARBENIND. A.-G. (Karl Zahn, Paul Ochwat and Hans Josef, inventors). Ger. 468,957, Aug. 25, 1925. Vat dyes giving a greenish blue on cotton are obtained by oxidizing isodibenzanthrone with oleum at 0-5° and alkylating the oxidation product. Isodibenzanthrone, prepd. by melting *Bz*-1,*Bz*-1'-dibenzanthronyl sulfide with potash, is oxidized by oleum and boric acid or MnO_2 and afterwards methylated.

Dyes. B. WYLAM, J. R. G. HARRIS, J. THOMAS and SCOTTISH DYES, LTD. Brit. 290,690, Dec. 17, 1926. Various vat dyes are heated with alkyl halides such as $EtBr$ or org. carboxylic halides such as benzoyl chloride or anhydrides such as acetic or phthalic anhydride in the presence of a metal such as Zn and an org. base such as pyridine. Stable products are obtained which are sol. in pyridine and other org. solvents and generally insol. in water and suitable for use in various dyeing processes on vegetable or animal fibers. Examples are given of the treatment of dimethoxybenzanthrone, indigo, flavanthrone and indanthrone.

Dyes, intermediates. FELICE BENSA. Fr. 640,239, Aug. 29, 1927. *Diacetyl- or dipropionyl-dichloroperylene*, which is prepd. by treating dichloroperylene with $AcCl$ or propionyl chloride in the presence of anhyd. $AlCl_3$ in CS_2 , is heated with metallic cyanides giving new vat dyes, the former a fiery red on cotton which passes to reddish violet on exposure to the air, the latter a red which becomes bluer on exposure to air than the former.

Azo dyes. I. G. FARBENIND. A.-G. Brit. 290,253, May 11, 1927. Azo dyes which dye wool yellow fast to light are made by coupling an aromatic diazo or tetrazo compd. with a 1-(*o*-sulfo-halophenyl)-3-methyl-5-pyrazolone. Several examples are given.

Azo dyes. I. G. FARBENIND. A.-G. Swiss 127,169, and 127,170, Mar. 21, 1927. Addns. to Swiss 126,823. Sulfanilic acid is diazotized and coupled with 1-*p*-(carbethoxymethylamino)-, or 1-*p*-(carbethoxyamino)phenyl-3-methyl-5(4)-pyrazolone. Both dyes are yellow powders and dye mixts. of silk and wool with an even tone.

Azo dyes. HEINZ EICHWEDE (to Grasselli Dyestuff Corp.). U. S. 1,694,117, Dec. 4. Diazotized 5-nitro-2-amino-1-phenol or 5-nitro-4-chloro-2-amino-1-phenol is combined with 1-(2'-hydroxy-3-carboxy-5'-sulfophenyl)-3-methyl-5-pyrazolone, 1-(2'-hydroxy-3'-carboxy-5'-sulfophenyl)-5-pyrazolone-3-carboxylic acid or a 1-(2'-hydroxy-2'-carboxy-5'-sulfophenyl)-5-pyrazolone-3-carboxylic acid ester. The dyes thus formed dye wool yellowish to brownish red tints which by after-chroming change to bluish red to claret-red shades of good fastness to fulling, potting and light. The dyes may be printed on cotton with Cr salts to obtain bright red shades fast to washing and to Cl.

Azo dyes. HERMANN WAGNER, HEINZ EICHWEDE and ERICH FISCHER (to Grasselli Dyestuff Corp.). U. S. 1,694,568, Dec. 11. The disazo dye formed from aniline and *p*-phenylenediamine as end components and *m*-phenylenediamine as middle component or other similar disazo dye of the general formula $R-N:N-X-N:N-R-NH_2$, in which R represents a non-sulfonated phenyl group and X a non-sulfonated residue of the group including the benzene and naphthalene series being substituted by at least 1 auxochromic

group, is further diazotized and coupled with an arylamide (e. g., the 5-chloro-1-methyl-2-anilide) of 2-hydroxynaphthalene-3-carboxylic acid. The coupling may be effected either in substance, on a substratum or on the fiber. The dyes obtained are in the dry state black powders insol. in water and yield dyeings of good fastness. Several other examples are given, with details of prepn. of the dyes.

Azo dyes. HERMANN WAGNER (to Grasselli Dyestuff Corp.). U. S. 1,695,164, Dec. 11. Dyes of good fastness to kier-boiling are obtained by the combination of any diazo compd. with an arylamide of 2,3-hydroxynaphthoic acid, halogenated in the aryl residue and substituted by an alkyl or alkyloxy group in the *p*-position to the amino group or by coupling halogenated diazo components contg. an alkyl or alkyloxy group with arylamides of 2,3-hydroxy-naphthoic acid not halogenated in the aryl residue but contg. in the *p*-position to the amino group an alkyl or alkyloxy group. The dyes may be formed to obtain pigment dyes or the coupling may be effected on the fiber in printing as well as in piece and yarn dyeing. Numerous examples and details are given.

Preparation of azo dyes on the fiber. HANS BUCHERER. Ger. 466,033, Nov. 26, 1922. Diazo-hydroxy compds. obtainable from 2,1-naphtholsulfonic acid or its derivs. are brought on to the fiber and treated with a dil. mineral acid, without applying heat, to convert them into insol. and stable hydroxyazo dyes. In an example, the use of the diazonium salt from 2,1-naphtholsulfonic acid and *p*-nitrodiazobenzene is described.

Production of azo dyes on the fiber. I. G. FARBENIND. A.-G. (Wilhelm Acrzberg and Heinrich Ohlendorf, inventors). Ger. 467,634, May 19, 1926. The fiber is treated successively with an alk. soln. of hydroxy compds. of the *p*-diazine series and with a diazo compd. The hydroxy compds. may be employed in the form of their reduction products. In examples describing the treatment of cotton, viscose silk, or cuprammonium silk, the hydroxy compds. employed are (1) 6-hydroxynaphthophenazine obtained as described in Ger. 398,484; (2) the products obtained by reducing 6-hydroxynaphthophenazine with $\text{Na}_2\text{S}_2\text{O}_4$; (3) 4-hydroxynaphthophenazine, obtained as described in Ger. 398,484; (4) 6,6'-dihydroxy-1,2,2',1'-dinaphthazine, obtained as described in Ger. 398,484, with or without a reducing agent; (5) the products obtained by alkali fusion from 1,2,2',1'-dinaphthazone-3,8,6'-trisulfonic acid, obtained by condensing 1,2-naphthoquinone-3,8-disulfonic acid with 1,2-diaminonaphthalene-6-sulfonic acid, (6) 4-hydroxy-1,2-naphtho-2,3-anthraquinoneazine, obtained from 4-hydroxy-1,2-naphthoquinone and 2,3-diaminoanthraquinone; (7) the products obtained by reducing with $\text{Na}_2\text{S}_2\text{O}_4$ the alkali melt from 4,8-disulfo-1,2-naphthophenazine. The diazo compds. specified are diazotized *p*-nitroaniline and 5-nitro-2-diazo-1-methoxybenzene.

Monoazo dye. WINFRED HENTRICH (to Grasselli Dyestuff Corp.). U. S. 1,695,554, Dec. 18. The diazo compd. of 4,6-dinitro-2-amino-1-hydroxybenzene is coupled with 1-amino-8-hydroxynaphthalene. The dye thus formed dyes "acetate silk" fast black.

Vat dyes. WALTER MIEG and ALBERT JOB (to Grasselli Dyestuff Corp.). U. S. 1,696,499, Dec. 25. Monoaminodiphtaloylacridones obtainable by reducing the corresponding mononitrodiphtaloylacridones are blue powders dyeing grayish blue shades from a hyposulfite vat. Cf. C. A. 23, 526.

Vat dyes. I. G. FARBENIND. A.-G. Ger. 466,103, Dec. 29, 1925. Naphthalene-carboxylic acids or their anhydrides obtainable by oxidation from 6-nitro-5-acylacenaphthene and its substitution products are condensed with aromatic bases, particularly with *o*-diamines. In an example, the products obtained by oxidizing 6-nitro-5-acetylnaphthalene, for instance with dichromate, are boiled with *o*-phenylenediamine or with 4-nitro-2,1-diaminobenzene. The use of the products in dyeing cotton is referred to.

Vat dye derived from 2-halo-1,9-pyrazoleanthrone. ROBERT BERLINER, BERTHOLD STEIN and WILLY TRAUTNER (to Grasselli Dyestuff Corp.). U. S. 1,695,631, Dec. 18. A disazo dye is prepd. from 2-bromo-1,9-pyrazoleanthrone by heating with K and Cu acetates which is in the dry and purified form a reddish brown powder only slightly sol. in the usual org. solvents, sol. in boiling PhNO_2 with a green fluorescence, and dyes cotton from a blue vat blue shades changing on oxidation into a "powerful" clear red shade of good fastness.

Benzanthrone dyes. I. G. FARBENIND. A.-G. Ger. 467,697, Dec. 23, 1925. Benzanthrone substituted in the *Bz*-2- or *Bz*-3- position, or in both positions, with an aryl, alkyl, or aralkyl group are converted into dibenzanthrones or isodibenzanthrones by suitable methods. In the examples, (1) *Bz*-2-methylbenzanthrone (obtained by the action of α -methylacrolein on anthrone) is fused with alkali at 230–240°; *Bz*-2,*Bz*-2'-dimethyldibenzanthrone is obtained; (2) *Bz*-2-tolylbenzanthrone may be treated in the same way; (3) *Bz*-2-methylbenzanthrone is treated with SO_2Cl_2 and the *Bz*-1-chloro-*Bz*-2-methylbenzanthrone so obtained is fused with alkali at 130–135°; the product

is *Bz*-2,*Bz*-2'-dimethylisodibenzanthrone; (4) a mixt. of *Bz*-2-methylbenzanthrone and *Bz*-1-chlorobenzanthrone is shaken at 5° with a suspension of Na anilide in aniline; the product is *Bz*-2-methyl-2,*Bz*-1'-dibenzanthronyl, which yields *Bz*-2-methylisodibenzanthrone by heating with alc. KOH; (5) a mixt. of *Bz*-3-methylbenzanthrone (obtained by condensing crotonaldehyde with anthrone) and *Bz*-1-chloro-*Bz*-2-methylbenzanthrone (cf. example 3), treated as in example 4, yields *Bz*-2,*Bz*-3'-dimethylisodibenzanthrone.

Triphenylmethane dyes. ROBERT M. COLE. U. S. 1,694,057, Dec. 4. An aromatic amine such as diphenylamine (in the manuf. of diphenylamine blue) is oxidized with air in the presence of CH₂O, a condensing agent such as HCl and a catalyst, *e. g.*, CuCl₂. An app. is described, in which continuous operation may be effected.

Tetrakisazo dyes. I. G. FARRENIND. A.-G. Fr. 640,225, Aug. 29, 1927. Two mols. of the diazo compd. of *p*-aminoacetanilide are reacted with 1 mol. of the disazo dye obtained by combining the tetrazo compd. of benzidine first with 1 mol. of H-acid in an acid medium and then with 1 mol. of *m*-phenylenediamine in alk. medium, and the tetrakisazo dye thus formed when saponified with an alkali gives a greenish black on chrome-tanned leather.

Dye compositions. BRITISH DYESTUFFS CORP., LTD., J. BADDILEY, A. SHEPHERDSON and A. J. HAILWOOD. Brit. 290,542, July 22, 1927. Products obtained by oxidizing sulfite cellulose pitch with aq. HNO₃, H₂O₂, chromic acid permanganates or air in the presence of ammoniacal Cu sulfate or the like are used in making powder or paste dye preps. to keep the dye in easily dispersible form and to prevent coagulation and settling of dye pastes. Pastes thus formed may be dried at moderately high temps without losing their capability of dispersion. An example is given of the treatment of 1-methylaminoanthraquinone.

Bluish sulfurized indophenol dyes. HERMANN BOTS and ANDRE CATINEAU (to Soc. anon. pour l'ind. chim. à Bâle). U. S. 1,695,756, Dec. 18. Indophenols made from nitrosophenols and carbazole are reduced and the leuco compds. thus obtained are sulfurized in the presence of PhNH₂, *o*- or *p*-toluidine or other aromatic amino compds. corresponding to hydrocarbons having less than 12 C atoms, at a temp. of about 180°.

Anthraquinone derivatives. I. G. FARRENIND. A.-G. (R. E. Schmidt, inventor) Ger. 467,496, Dec. 10, 1924. See Brit. 244,463 (C. A. 21, 329).

Anthraquinone-1,5-dinitrile. I. G. FARRENIND. A.-G. Swiss 126,964, Nov. 8, 1926. Addn. to Swiss 125,469. CuCN is heated with 1,5-dihaloanthraquinone in the presence of a compd. in which a nitrile group is linked with an aliphatic residue, and treated with dil. HNO₃. The substance is a green vat dye m. 380.

Benzanthrone derivatives. I. G. FARRENIND. A.-G. Brit. 288,666, Dec. 10, 1926. Benzanthronecarboxylic acids are made by treating 1,1'-dinaphthyl-8,8'-dicarboxylic acid or its derivs. or nuclear substitution products with an acid condensing agent under "moderate conditions" until the reaction product is sol. in glacial HOAc. By treating the benzanthronecarboxylic acids with alk. condensing agents, highly colored products are obtained which are sol. in alkalis and which are probably of the violanthrone or isoviolanthrone type and these are converted by acid condensing agents into new compds. insol. in alkalis, dyeing cotton from the vat in blue to gray shades fast to washing, Cl and light. Several examples are given.

A derivative of chloro-2-naphthindole-2-anthraceneindigo. MARCEL BADER, CHARLES SUNDER and DURAND & HUGUENIN SOC. ANON. Swiss 126,968, Sept. 28, 1926. Addn. to Swiss 102,540. A fast, sol. deriv. suitable for dyeing and printing is formed by treating the leuco compd. with SO₃ to obtain the ester.

A derivative of monobromoindigo. MARCEL BADER, CHARLES SUNDER and DURAND & HUGUENIN SOC. ANON. Swiss 126,972, Nov. 15, 1926. Addn. to Swiss 102,540. A fast sol. deriv. suitable for dyeing and printing is formed by treating the leuco compd. with SO₃ to obtain the ester.

A derivative of tetrachloro-4,4'-dimethylthioindigo. MARCEL BADER, CHARLES SUNDER and DURAND & HUGUENIN SOC. ANON. Swiss 126,971, Nov. 15, 1926. Addn. to Swiss 102,540. A fast sol. deriv. suitable for dyeing and printing is formed by treating the leuco compd. with SO₃ to obtain the ester.

A derivative of 2-naphthionic phenylchloromethyl-3-indolineindigo. MARCEL BADER, CHARLES SUNDER and DURAND & HUGUENIN SOC. ANON. Swiss 126,970, Sept. 30, 1926. Addn. to Swiss 102,540. A fast, sol. deriv. suitable for dyeing and printing is formed by treating the leuco compd. with SO₃ to obtain the ester.

Derivatives of 2-naphthionic phenyl dichloride-3-indoleindigo. MARCEL BADER, CHARLES SUNDER and DURAND & HUGUENIN SOC. ANON. Swiss 126,969, Sept. 30, 1926. Addn. to Swiss 102,540. A fast sol. deriv. suitable for dyeing and printing is formed by treating the leuco compd. with SO₃ to obtain the ester.

A derivative of dibromo-2-naphthindolechloro-2-naphthaleneindigo. MARCEL BADER, CHARLES SUNDER and DURAND & HUGUENIN SOC. ANON. Swiss 126,966, Sept. 28, 1926. Addn. to Swiss 102,540. To obtain the substance a in fast, sol. condition, suitable for dyeing and printing, the leuco compd. is first obtained by the condensation of dibromo-2,1-naphthisatin, formed by direct bromination; with 4-chloro- α -naphthol. This is then converted into the H_2SO_4 ester by SO_3 .

A derivative of dichloro-2-indolechloro-2-naphthaleneindigo. MARCEL BADER, CHARLES SUNDER and DURAND & HUGUENIN SOC. ANON. Swiss 126,967, Sept. 28, 1926. Addn. to Swiss 102,540. The deriv. is obtained in a fast, sol. form, suitable for dyeing and printing, by treating the leuco compd. of dichloro-2-indole-2-naphthaleneindigo with SO_3 to obtain the ester.

A derivative of dichloro- β,β -naphthylthioindigo. MARCEL BADER, CHARLES SUNDER and DURAND & HUGUENIN SOC. ANON. Swiss 126,973, Nov. 15, 1926. Addn. to Swiss 102,540. A fast, sol. deriv. suitable for dyeing and printing is formed by treating the leuco compd. with SO_3 to obtain the ester.

Bz-Methylbenzanthrone. ARTHUR WOLFRAM and HEINRICH GREUNE (to Grasselli Dyestuff Corp.). U. S. 1,695,626, Dec. 18. Anthracenes contg. an O atom in the meso position, such as anthrones, anthranols or oxanthranols, can be condensed, by use of condensing agents, with crotonic aldehyde, to form *Bz*-methylbenzanthrone. H_2SO_4 is a suitable condensing agent and an oxidizing agent such as arsenic acid or HgO of $HgSO_4$ may be added as may also a diluent such as $HOAc$ and H_2O . The reaction is effected in 2 stages in the first of which it is assumed that there occurs an addn. of the aldehyde on the anthranols, while ring closure is effected in the second stage. In the final product it is uncertain whether the Me group is in the *Bz*-2- or the *Bz*-3- position. The 2 steps can be carried out separately or in a single operation. Condensation with bases may be effected by heating anthrone and crotonic aldehyde in the presence of pyridine and piperidine. The intermediate products thus formed may then be converted into the *Bz*-methylbenzanthrone either by use of H_2SO_4 or of $AlCl_3$, which apparently produce the *Bz*-2- and *Bz*-3- methylbenzanthrone, resp. These products may be used as intermediates in the manuf. of dyes. Numerous details and examples are given.

Benzoyldiaminoanthraquinones. I. G. FARBENIND. A.-G. Fr. 640,236, Aug. 29, 1927. Diaminoanthraquinones are benzoylated with $BzCl$ in org. solvents with the addn. of an acid-binding agent. Examples are given of the prepn. of 1,4- and 1,5-monobenzoylaminoanthraquinone. They are *intermediate products for dyes*.

Dyes for cellulose acetate, etc. I. G. FARBENIND. A.-G. Brit. 289,807, May 2, 1927. Hydroxyalkylaminoanthraquinones are prepd. by the action of hydroxyalkylamines on quinizarin or leuco-quinizarin or their substitution products or on a negatively substituted anthraquinone; the products may be sulfonated, or esterified with H_2SO_4 . The bases are dyes for cellulose acetate and their sulfonic acids are acid wool dyes. When the anthraquinones are used, hyposulfite may be added. Examples are given.

Color lakes. I. G. FARBENIND. A.-G. Swiss 126,121, 126,124, Dec. 23, 1925. Color lakes are obtained from the Et ester of tetraethylrhodamine by treating its salts, in the presence of a substrate, with substances contg. phosphoric and molybdic acid residue, e. g., with NH_4 molybdate and Na_2HPO_4 , together or in either order (Swiss 126,121). The same treatment may be applied to salts of tetraethylrhodamine (Swiss 126,122), to salts of the Et ester of diethylrhodamine (Swiss 126,123) and to salts of tetraethyldiaminodiphenyl- α -monoethylaminonaphthylcarbinol (Swiss 126,124).

Stripping dyes. CHARLES S. HOLLANDER (to Röhm & Haas Co.). U. S. 1,696,164, Dec. 18. In stripping dyes from fibers such as rags the material is soaked in a heated bath contg. dissolved substances in equil. comprising Na sulfoxylate formaldehyde and a sol. Zn salt such as $ZnSO_4$ or $ZnCl_2$, together with a sol. Zn sulfoxylate formaldehyde and a sol. Na salt such as Na_2SO_4 or $NaCl$.

Production of dyes on vegetable fibers. I. G. FARBENIND. A.-G. (Leopold Laska and Arthur Zitscher, inventors). Ger. 467,545, June 8, 1924. The fibers are impregnated with the β -naphthalide of 2,3-hydroxynaphthoic acid and then treated with a diazo compd. of an amine substituted in the 2- and 6- positions relatively to the NH_2 group, at least one of the substituents being Cl. The use of the diazo compds. from 4-chloro-1,2-toluidine and 4-chloro-2-aminodiphenyl ether is given as an example.

Hair dye. MAUDE A. MINGUS (formerly Maude A. M. Wheeler). U. S. reissue 17,153, Dec. 4. See original pat. 1,636,341 (C. A. 21, 2989).

Dyeing. I. G. FARBENIND. A.-G. Brit. 289,730, Nov. 30, 1927. Pelts, hairs, feathers and the like are successively treated with an aq. soln. of a salt of a naphthalene deriv. contg. at least one 3-aminoarylamino group of the benzene series and with an acid nitrite soln., e. g., an unmordanted skin may be treated with a soln. of 2-(3'-aminophenyl)-

aminonaphthalene-HCl contg. some alc. and HCl and then with a bath contg. NaNO_2 and HOAc, which produces a dyeing between yellow and rose color. Other examples also are given.

Dyeing. I. G. FARBENIND. A.-G. Brit. 290,126, Nov. 30, 1927. Pelts, hairs, feather, or like materials, with or without preliminary mordanting, are treated with an aq. soln. of a salt of a naphthalene deriv. contg. at least one 4-aminoarylamino group of the benzene series such as 2-(4'-aminophenylamino)naphthalene-HCl and then treated with an oxidizing agent such as $\text{K}_2\text{Cr}_2\text{O}_7$. Several examples are given for producing black, blue-black, blue-gray and other shades. 4-Aminophenylaminonaphthalenes and their substitution products are made by heating the corresponding hydroxynaphthalenes with a *p*-diamine of the benzene series in the presence of an alkali bisulfite soln.

Dyeing. I. G. FARBENIND. A.-G. Brit. 290,177, May 6, 1927. In producing resist effects in dyeing with vat dyes, the material is first printed with a mixt. of an oxidizing agent and an aq. soln. of a cellulose alkyl ether and then dried before placing it in the vat liquor. Several examples are given.

Dyeing. I. G. FARBENIND. A.-G. Fr. 640,746, Sept. 10, 1927. Azo dyes obtained by coupling diazotized aminosulfonic or aminocarboxylic acids or their derivs. with α,γ -diketohydrindenes or their derivs. are used for dyeing cellulose derivs. In an example a fast yellow shade is obtained on cellulose acetate silk, the dye, 4-sulfobenzene-azo- α,γ -diketohydrindene, being used.

Dyeing. I. G. FARBENIND. A.-G. Swiss 126,823, Mar. 21, 1927. A yellow dye for mixed silk and wool is prep'd. by coupling diazotized *o*-anilinesulfonic acid 1-*p*-(carbethoxylamino)phenyl-3-methyl-5(4)-pyrazolone

Dyeing. I. G. FARBENIND. A.-G. Swiss 126,824, April 29, 1927. A light- and oil-fast green-yellow dye is prep'd. by coupling diazotized 4-chloro-2-nitroaniline with acetoacetic-*p*-chloroanilide.

Dyeing. I. G. FARBENIND. A.-G. Swiss 126,825, Mar. 18, 1927. A sulfurous indigo vat dye is prep'd. by condensing the monomethyl ether of 4-mercapto-1-hydroxynaphthalene with 5,7-dibromoisatin halide. In an alk. yellow hyposulfite vat, it dyes a greenish blue.

Dyeing apparatus with rollers and reversing mechanism. C. S. BEDFORD. Brit. 290,138, Dec. 31, 1927. Structural features

Dyeing of cellulose derivatives. GEORGE RIVAT, ERNEST CADGENE and CAMILLE DREYFUS (to Canadian Celanese, Ltd.). Can. 284,751, Nov. 13, 1928. Cellulose acetate is subjected to the action of a 50% soln. of FeCl_3 for approx. 1 hr. at 40 to 60°; the excess FeCl_3 soln. is removed; the acetate is washed with cold water contg. NH_3 ; and the washed material is then treated with the regular logwood black bath in soap for 1 hr. at approx. 70°.

Dyeing cellulose esters. HENRY DREYFUS. Fr. 640,013, Aug. 25, 1927. Cloth of or contg. cellulose acetate, etc., is dyed, printed or stenciled with sulfonated dyes, preferably monosulfonated, contg. 2 or more anthracene or anthraquinone rings, or contg. 1 or more condensed anthracene or anthraquinone rings. The dyeing is carried out in the presence of a high percentage of inorg. salts such as $(\text{NH}_4)_2\text{SO}_4$ or Glauber salt. A long list of substances is given, including 1,2'-dianthraquinonylaminesulfonic acid, 2,6-di- α -anthraquinonyldiaminoanthraquinonesulfonic acid and its 4,4'-dimethoxy deriv.

Dyeing cellulose esters and ethers, etc. I. G. FARBENIND. A.-G. Brit. 290,720, Feb. 16, 1927. Esters and ethers of cellulose and its conversion products such as hydrocellulose are dyed with the azo dyes obtained by coupling a diazotized dinitroaminophenol or substitution product or deriv. with an unsulfonated and uncarboxylated aminonaphthol. Brownish violet to black dyeings are obtained, fast to washing, the fastness of which is improved by diazotizing and developing on the fiber. Several examples are given.

Dyeing artificial silk. I. G. FARBENIND. A.-G. (Erich Fischer and Carl E. Muller, inventors). Ger. 468,981, July 30, 1926. Cellulose esters or ethers are dyed yellow with monosulfoarylazodiarylamine contg. at least 1 nitro group in the diarylamine complex. Examples are given of dyeing acetate silk with 4-benzeneazo-2,6-dinitro-4'-sulfodiphenylamine and 4-benzeneazo-4'-nitro-2'-sulfodiphenylamine. Cf. C. A. 22, 4834.

Apparatus for dyeing hats. VIKTOR BÖHM. Austrian 109,251, Sept. 15, 1927. Constructional details.

Apparatus for dyeing hats. BÖHM BROS. Austrian 108,518, Aug. 15, 1927. Constructional details.

Dyeing hats. ADOLF SINDERMAN. Austrian 108,691, Aug. 15, 1927. The hats

are placed on a cone carrying strips or other pieces of dye-impregnated felt arranged to give the required pattern.

Pattern printing of hats. BOSSI HUTFABRIKS A.-G. Austrian 108,519, Aug. 15, 1927. Printing precedes felting.

Textiles. OWEN D. LUCAS (to Vickers, Ltd.). Can. 285,211, Nov. 1928. Fibrous vegetable materials are boiled in a soln. of NaOH of a strength not exceeding 2% and with or without an intermediate washing they are then again boiled in a vat contg. a mixt. of oil and alkali in water. After washing with cold water they are placed in a cold acid bath to whiten them or to produce a finer fiber, or for both purposes. All the processes are carried out in open vats. *E. g.*, 100 lb. of scutched flax is boiled for approx. 1 hr. in a soln. contg. 30 lb. of NaOH to 300 gallons of water, then boiled for 15 min. in a similar soln. to which 3 lb. of linseed oil has been added. The flax is then washed in cold soft water. It is then immersed in a cold bath of 300 gal. of water contg. 6 lb. of HCl, then washed and dried again. The duration of each step varies according to the amt. of degumming necessary and fineness required in the finished fiber.

Treating fabrics in breadth with liquids, particularly dyeing liquids. JOHANNES P. SCHUSTER. Ger. 467,477, Oct. 28, 1926. The fabrics are passed through pressing rollers to remove air and, immediately after pressing, are sprayed on both sides with the treating liquid. They are then passed through the bath as usual.

Wetting agents for use in treating textiles. H. T. BÖHME A.-G. Brit. 290,256, May 11, 1927. Wetting agents suitable for use with mercerizing, carbonizing, bleaching or dyeing baths, etc., are prepd. by treating oils or fats or their free acids with concd. H_2SO_4 in the presence of org. or inorg. acid anhydrides or chlorides, org. acids or excess H_2SO_4 with cooling agents.

Treatment of vegetable fibers in the presence of organic derivatives of cellulose. CAMILLE DREYFUS, ROBERT G. DORT and HERBERT PLATT (to Camille Dreyfus). Can. 285,047, Nov. 20, 1928. Mixed fabrics of cellulose acetate, wool and vegetable fibers are treated with 6-13° Bé. soln. of $AlCl_3$ at 90° F., whereby the vegetable fibers are removed, the fabric is soaped to restore the luster of the cellulose acetate fibers, and the fabric is subsequently dyed in a dyebath contg. 50 to 300 g. of Na_2SO_4 per l. of dyebath to prevent the delustering of the cellulose acetate fibers.

Preserving the luster of organic derivatives of cellulose. CAMILLE DREYFUS and HERBERT PLATT (to Camille Dreyfus). Can. 285,048, Nov. 20, 1928. The luster of filaments and fabrics of org. esters of cellulose is preserved by adding to the bath in which delustering of such material is apt to occur 0.1-10% of $Ca(CNS)_2$.

Bleaching textile fibers with ozonized air. EMILIO CRESPI. Ger. 466,220, Feb. 12, 1925. The fibers are first given a mild acid treatment, *e. g.*, with dil. HCl, and are then treated at a low temp. with a stream of ozonized air laden with water vapor.

Mercerizing fabrics. C. G. HAUBOLD A.-G. Ger. 467,678, Nov. 29, 1925. The materials are treated in stages with lyes of increasing concn. at a diminishing temp.

Treating cellulose derivatives. HENRY DREYFUS. Fr. 32,978, Jan. 28, 1927. Addn to 627,072. Org. derivs. of cellulose are dyed, printed or stenciled with compds. (other than azo compds. and urea or thiourea derivs.) contg. one or more ω -amino groups, *i. e.*, compds. in which an aryl dye nucleus is connected to an amino group or aliphatically substituted amino group through a side chain comprising a C atom or atoms, with or without other atoms such as N or O. Such compds. may be produced by the reduction of nitrites or by treating a phenol or amine with an aminoalkyl halide or by treating amino compds. with an alkylenediamine in the presence of a sulfite. In examples 1-methylamino-4 aminomethylantraquinone dyes cellulose acetate red shades. The product obtained by condensing anthrapyrimidone with epichloramine dyes cellulose acetate in yellow shades. Other examples are given.

Apparatus, with rollers, for finishing fabrics by treatment with solutions, hot or cold air, steam, etc. H. MALY. Brit. 290,217, May 10, 1927.

Device for dyeing, steaming and conditioning tubular fabrics. MAURICE M. KASANOJ. U. S. 1,696,682, Dec. 25.

Apparatus for sizing, starching, dyeing or finishing yarns or fabrics. SLASHER ROLLS Co. Brit. 290,706, Jan. 22, 1927.

Emulsion. COMPAGNIE FRANÇAISE DE PRODUITS CHIMIQUES ET MATIÈRES COLORANTES. Swiss 126,796, Mar. 14, 1927. An aq. emulsion for *sizing textile fibers* is prepd. by first dissolving the substance to be emulsified in a hydrocarbon. Thus, *o*-dichlorobenzene, linseed oil and wax are mixed and then emulsified in water.

Treating textile fabrics to produce imitation fur. G. ROMANE. Brit. 290,650, May 19, 1927. Various mech. features, watering, dyeing, etc., are specified.

Fibers from skins of fishes, etc. R. TANDLER. Brit. 290,154, May 7, 1927.

Skins of fishes, intestines, bladders, etc., are softened, treated with milk of lime or with NaOH or Na_2SO_4 , as in tanning, pickled in a 20% soln. of NaCl, $\text{Al}_2(\text{SO}_4)_3$ or Na_2SO_4 to which 10% of H_2SO_4 or HCl is added, milled and mashed and then subjected to a 2-bath chromization and mechanically worked to obtain a fiber which may be formed into yarn, thread, felt, etc.

Protecting animal fibers from acids and alkalis. RONALD S. HORSFALL and LESLIE G. LAWRIE (to British Dyestuffs Corp., Ltd.). U. S. 1,693,926, Dec. 4. See Brit. 285,554 (C. A. 22, 4837).

Artificial yarns and threads. GUILLAUME LARDY (to Société pour la fabrication de la soie "Rhodiaseta"). U. S. 1,693,759, Dec. 4. A fugitive and temporary coloration is imparted to filaments and threads obtained by dry spinning of cellulose derivs. such as esters or ethers (suitably by "Carmine blue" or "Brilliant carmine") in order to serve as a distinguishing characteristic in various operations.

Deforming and drying cakes of artificial silk after washing, sulfiding or bleaching. COURTAULDS, LTD., C. F. TOPHAM, E. HAZELEY and E. A. MORTON. Brit. 290,833, May 23, 1927.

Treatment of acetate silk. CHARLES W. PALMER and STEPHEN M. FULTON (to Henry Dreyfus). Can. 285,049, Nov. 20, 1928. Delustered filaments or fibers of cellulose acetate can have the luster restored by treatment with a soln. of 1 to 5% concn. of one of the following agents $(\text{NH}_4)_2\text{SO}_4$, Na_2SO_4 , K_2SO_4 , $\text{Al}_2(\text{SO}_4)_3$, chromates of K, Na, NH_4 or Al, chlorides of NH_4 , Na, K and Ca and like neutral salts. *E. g.*, acetate silk in fabric or other form, which has become partially or entirely delustered, for instance by steaming for about 10 min., is boiled with a 2-3% soln. of $(\text{NH}_4)_2\text{SO}_4$ or a 1-6% soln. of Na_2SO_4 , whereby the relustering is gradually effected. The normal luster can be substantially restored by about 10-40 min. boiling or longer at lower temps. The goods may be rinsed in water to remove the salt after removal from the bath.

Treatment of cotton fibers. PAUL KARRER. Ger. 467,585, Dec. 16, 1925. Addn. to 438,324. The method of Ger. 438,324 (see Brit. 249,842, C. A. 21, 1019) is modified by effecting the treatment with NH_3 , etc., at ordinary temp. for a longer time.

Treating cotton and flax. MARTHA AUGUSTE SCHWEITZER. Ger. 468,974. Cotton or flax is improved by a short treatment of the disintegrated fibers with hot alkali and then a short treatment with an oxidizing agent, particularly hypochlorous acid in the cold.

Treating wool to prevent shrinking, etc. J. A. CRAVEN and YORKSHIRE DYEWARE & CHEMICAL Co., LTD. Brit. 290,805, April 23, 1927. Tendency of wool to shrink when washed with alk. soap solns. is diminished by treatment with basic salts of Cr, Fe or Al or with a weak and slightly alk. soln. of CH_2O . A preliminary treatment of the wool with an alkali such as lime water or a weak soln. of Na sulfide is desirable, and this may be followed by bating with a natural or artificial bate to remove the outer scales of the wool fiber. Numerous details and modifications are described.

Wool-like fibers from jute. P. CELLI. Brit. 290,071, July 21, 1927. Fibers of jute or similar material are carded and then treated with a 30° Bé. NaOH soln. at a temp. of 25-35°, and subsequently washed with soap, rinsed, bleached and dried.

Forming wool felts by use of air currents. EMIL BRECHT and RUDOLF FUGMANN. U. S. 1,694,032, Dec. 4.

Painting-ground for artists, etc. CHARLES F. CROSS, THE VISCOSE DEVELOPMENT Co., LTD. and WINSOR & NEWTON LTD. Fr. 640,064, Aug. 26, 1927. A painting-ground for artists, decorators and others is prepd. by filling and coating a cellulose textile material with cellulose, a part of which is introduced as such and a part as viscose which is then reverted to cellulose. Cf. C. A. 22, 4816.

Textile oils. AUSSEL M. KINNEY (to The Standard Oil Co.). Can. 284,807, Nov. 13, 1928. Ninety to 50% of a purified mineral oil of low viscosity (say 50 to 60 sec. Saybolt) is mixed with from 1 to 20% of oleic acid and from 1 to 50% of alkali metal soaps of the sulfonic acids derived for example by the treatment of mineral lubricating oils with strong sulfuric acid, such as fuming acid. With the resulting mixt. may be incorporated if desired, from 5 to 15% of lard oil. A predetd. mixt. may contain about 70% of 55 sec. Saybolt oil; 15% of oleic acid and 15% of Na soaps of sulfonic acids. Another suitable mixt. contains 82% of 55 sec. Saybolt oil; 3% of oleic acid; 10% of lard oil and 5% of Na soaps of sulfonic compds. The lard oil may be employed or omitted as desired.

"Dry lubrication" of textile machines. JOHN SPALDING (to Albert T. Otto & Sons). U. S. 1,694,148, Dec. 4. Bobbins and other parts of textile machines subject to contact with the textile product are lubricated with Zn stearate or other suitable metal salt of a fatty acid insol. in water, in dry powd. form.

Driving and conveying belts of woven fabric and rubber. SOC. ANON ÉTABLISSEMENTS FLINOIS, COLMANT ET CUVELIER, COLMANT ET CUVELIER SUCCESEURS. Brit. 289,828, May 3, 1927. Mech. or structural features.

Composition (containing chlorinated rubber) for coating straw hats. CARLETON ELLIS (to Chadeloid Chemical Co.). U. S. 1,695,639, Dec. 18. Chlorinated rubber contg. over 66.7% Cl is used with a solvent such as C_6H_6 and with oil-sol. orange dye or other suitable coloring material which is also sol. in the solvent used.

"Mothproofing" composition containing a quinidine salt and a soap. LLOYD E. JACKSON and HELEN E. WASSELL (to Mundatechnical Products Co.). U. S. 1,694,219, Dec. 4.

Apparatus for disposal or reconditioning of liquids used in laundry operations. A. STERN Brit. 290,247, May 11, 1927.

26—PAINTS, VARNISHES AND RESINS

A. H. SABIN

Testing paint films with the rusting apparatus. H. *Farben-Ztg.* 34, 614-5(1928).—The app. consists of 2 electrodes, one of Hg and the other of the metal upon which the film is prepd. These are immersed in water or suitable salt soln. and the cond. of the system is measured as time elapses. The system is enclosed in a gas-tight bell jar so that the partial pressure of O or other gas may be controlled. G. G. SWARD

Medical and industrial findings among spray painters and others in the automobile refinishing trade in Manhattan, Greater New York. JEROME MEYERS. Dept. of Health, New York City. *J. Ind. Hyg.* 10, 305-13(1928).—The results of phys. blood and urinary examinations among spray painters show that Pb and C_6H_6 have the most important effects. C_6H_6 is a vehicle or thinner. It causes a marked diminution in the leucocytes and polymorphonuclear cells and great reduction in the no. of red blood cells and the % of hemoglobin. Even 1:10,000 may be dangerous. Close medical observation and examns. are recommended in conjunction with improved ventilation, also elimination of C_6H_6 . H. C. HAMILTON

Black and the color circle. CURT KÜHN. *Farben-Ztg.* 34, 560-1(1928).—K. points out that many artists carry no black on their palettes but obtain the same by mixing other colors. Black results when 3 pigments sepd. by 120 on the color circle are mixed. G. G. SWARD

Measurement of specific gravity of varnishes, paints, etc. H. L. HAZELTINE. *Instruments* 1, 515-8(1928).—The use of the hydrometer with a range of 0.650 to 1.000 for detn. of sp. gr. of varnishes, etc., is discussed. A temp. correction of 0.0007 on the sp. gr. scale per degree is given for varnish. Sp. gr. should not be used as a means of comparing varnishes unless the solvent is the same in each case. C. Z. ROSECRANS

Some methods of testing paint and varnish materials. PERCY H. WALKER. *Intern. Congress Testing Materials* 1927, II, 603-24; cf. C. A. 22, 4838.—This is a review of the methods used at the Bur. of Standards. Brushing and flowing tests are made on a glass plate and the paint is allowed to dry in a vertical position and then examd. by transmitted light. Paints are also spun on a rotating clear glass disk. The Bruce method of detg. hiding power and the swinging beam method of detg. hardness of varnish films are used, though W. prefers the Pfund method of measuring the diam. of the circle of contact between the varnish and a small sphere. From the results of exposure tests W. recommends for these tests: small panels facing south and at an angle of 45° with the vertical, with backs and edges protected with 3 coats of Al paint. The panels are to receive 2 or 3 coats of the material to be tested and are best examd. with the microscope. The accelerated exposure procedure is described. PAUL J. CULHANE

The manufacture of clear nitrocellulose lacquers. FRITZ KOLKE. *Farben-Ztg.* 34, 561-3(1928).—K. recommends the following procedure: The resins are first dissolved in the non solvents. The nitrocellulose is then treated with this soln. until complete swelling has taken place. The solvents are then added. Plasticizers may be added at the beginning. If 2 types of nitrocellulose are used, the more viscous type should be swollen first. G. G. SWARD

Soligen-Trockenstoffe. MEIDERT. *Chem.-Ztg.* 52, 859-60(1928).—Soligen-Trockenstoffe is the trade name of a siccativ agent manufd. by the I. G. Farbenindustrie. It is an org. acid capable of incorporating a metallic cation in oils. Its drying properties are emphasized: 0.25% should be sufficient in some cases. Its properties on various types of finished works are enumerated. Its constitution is not revealed. A. L. H.

Metallic soaps (LAURO) 27. Cellulose esters [for making varnishes] (Brit. pat. 289,853) 23. Abietic acid esters of polyglycol [for use in varnishes] (U. S. pat. 1,696,337) 10. Ferric oxide [for use as a pigment] (Brit. pat. 290,421) 18. Nitrocellulose and other compositions for use as lacquers (U. S. pat. 1,693,746) 23. Colloidal solutions of silica [for stiffening or fireproofing pyroxylin lacquers] (Brit. pat. 290,717) 18.

HEATON, NOËL: **Outlines of Paint Technology.** LONDON: Charles Griffen & Co., Ltd. 387 pp. 24s., net. Reviewed in *Chem. Trade J.* 83, 303(1928).

Paint. HERBERT A. SCOLLAN Can. 285,136, Nov. 27, 1928. A paint comprises 1 pint of boiled linseed oil, 2 lb. of portland cement, a little turpentine or drier and a color pigment.

Water paints. W. W. TAYLOR. Brit. 290,700, Jan. 20, 1927. A water-paint or wood finish comprises a drying oil such as raw or boiled linseed oil or tung oil contg. free fatty acid, and an aq. soln. of a single or primary alginate or a mixt. of alginates such as those of Na, K, NH_4 or Mg, with or without pigments.

Waterproof teredo-repelling paint. FERNANDO S. VIVAS (to The International Fireproof Products Corp.). Can. 284,580, Nov. 6, 1928. A fireproof teredo-repellent paint contains sardine oil 450, fireproof drying oil 80, rosin 150, powd. sea shells 220, and ZnO 100 parts.

Fireproof paint. FERNANDO S. VIVAS (to The International Fireproof Products Corp.). Can. 284,576, Nov. 6, 1928. A fireproof paint contains drying oil 75, zinc white 40, PbSO_4 20, PbCO_3 20, SiO_2 or kaolin 10, borax 10, alum 10, H_3BO_3 5, Na tungstate 5, thinner (described in following pat.) 5 parts.

Thinner for paints. FERNANDO S. VIVAS (to the International Fireproof Products Corp.). Can. 284,577, Nov. 6, 1928. A thinner for paints contains "near turps" 40, turpentine 10, ZnSO_4 5, C_2Cl_6 1, drying oil 4 and CCl_4 40 parts. The oil is preferably linseed oil, but tung oil or other known paint oils may be used.

Fireproof structural paint. FERNANDO S. VIVAS (to The International Fireproof Products Corp.). Can. 284,578, Nov. 6, 1928. A fireproof structural paint contains fireproof Chinese wood oil or tung oil 3, ester gum 2, thinner (cf. preceding pat.) 1, ZnO 2, powd. SiO_2 1.5, Zn stearate 0.3, and coloring matter 0.2 parts.

Fireproof shellac. FERNANDO S. VIVAS (to The International Fireproof Products Corp.). Can. 284,579, Nov. 6, 1928. A fireproof shellac contains shellac 4, abs. alc. 2, borax 1, C_2Cl_6 0.05, and CCl_4 2.5 parts.

Fireproof varnish. FERNANDO S. VIVAS (to The International Fireproof Products Corp.). Can. 284,581, Nov. 6, 1928. A fireproof varnish contains drying oil 45, varnish gum 50, glycerol 5 parts, lime 1, $\text{Co}(\text{OAc})_2$ 1, $\text{Pb}(\text{OAc})_2$ 1, borax 15, H_3BO_3 8, Na tungstate 3, C_2Cl_6 2, and thinner 10 parts.

Preventing thickening of paints. I. G. FARBERIND. A.-G. Brit. 289,968, Feb. 7, 1927. The process described in Brit. 289,153 (*C. A.* 23, 721) of adding a free fatty acid to lithopone and linseed oil is applied also to paints contg. other Zn compds. such as Zn white, Zn yellow, lead yellow or cadmium yellow contg. Zn, Rinmans green, cobalt violet, "metal white" (ZnS), or other pigments.

White lead. HOLZVERKÖHLUNGS-INDUSTRIE A.-G. and J. SEIB. Brit. 290,844, June 9, 1927. White lead of approx. the same compn. as stack white lead is obtained by withdrawing the required quantity of CO_2 from a basic Pb carbonate prepd. in the wet way and contg. more CO_2 than stack white lead.

Lithopone. WALTER G. GRAVES (to the Grasselli Chemical Co.). Can. 284,567, Nov. 6, 1928. Green lithopone contg. usually about 40% water is fed continuously through a furnace where it is subjected to hot gases and dried. The lithopone is fed directly to the calcining chambers in a dry condition and without access of air. The muffles of the furnace are preferably kept under a plus pressure to prevent entrance of air from the outside.

Pigments. I. G. FARBERIND. A.-G. Swiss 126,125, April 30, 1926. Bright green pigments are obtained by the interaction of α -nitroso- β -naphthol, a salt of tetramethyldiaminotriphenylcarbinol, an Fe salt and an alk. compd. The reaction may be conducted in presence of a substrate and (or) of Turkey-red oil. In the example 1116 parts of a 15% paste of α -nitroso- β -naphthol is stirred till dissolved with 650 parts of bisulfite soln. of 38° Bé. and 3000 parts H_2O . The soln. is filtered, dild. with H_2O to 5000 parts and treated in turn with 48 parts FeSO_4 in 5% soln., 24 parts Turkey-red oil in 10% soln., 100 parts calcined Na_2CO_3 in 10% soln. and 40 parts Malachite Green B in 1% soln. A gradual addn. of 260 parts calcined Na_2CO_3 is then made and, after

pptn. of the pigment, 4 parts of a 4% paste of $\text{Al}(\text{OH})_3$ is added. The product is washed and dried.

Pigments: compounds of titanium, etc. JOSEPH BLUMENFELD. Fr. 640,181, Aug. 9, 1927. See Brit. 275,672 (C. A. 22, 2474).

Oiled pigments. HAROLD GROSSMAN (one-fourth to Wm. S. Pritchard). U. S. 1,696,034, Dec. 18. An emulsion is formed comprising an oil and a suitable protective colloid; this emulsion is added to a pigment and the colloid is coagulated to break the emulsion and release the oil.

Titanium phosphate. P. SPENCE & SONS, LTD., and S. F. W. CRUNDALL. Brit. 290,683, Nov. 17, 1926. Pptn. of hydrated basic titanic phosphate by mixing H_2PO_4 or a phosphate with a soln. of a titanic salt is effected with a soln. of the Ti salt contg. free acid in excess of the equiv. of 15% SO_3 . A composite pigment may be obtained by conducting the pptn. in the presence of a paste of BaSO_4 . Various details are given.

Titanium oxide from the phosphate. P. SPENCE & SONS, LTD., and S. F. W. CRUNDALL. Brit. 290,684, Nov. 17, 1926. TiO_2 or a mixt. contg. it, suitable for use as a pigment, is obtained from an insol. Ti phosphate such as basic Ti phosphate by treating the latter with a base such as an oxide or hydroxide or with a salt of a weak or volatile acid such as a carbonate. BaSO_4 and compds. of Fe and Cr may be used to obtain either white or colored pigments of composite character.

Coating composition. GILBERT MICHEL. Can. 285,118, Nov. 27, 1928. A coating composition for easily oxidizable metals is prepd. by adding a certain amt. of free phenol to a lac or varnish, and in particular to one having a base of synthetic resin prepd. by the usual means. The usual conditions of prepn. of the varnishes having a base of synthetic resin, from formol and a phenol (cresol, etc.), may be varied by allowing a sufficient excess of free phenol to remain for the metal to be attacked immediately when it is covered by the substance thus obtained.

Non-livering coating composition. JOHN D. MCBURNEY and EDGAR H. NOLLAU (to E. I. du Pont de Nemours and Co.). Can. 284,964, Nov. 20, 1928. A non-livering coating compn. contg. a drying oil and a preventive substance having a dissocn. const. substantially between 1.0 and 3.4 and compatible with the compn. with which it is to be used, for example tartaric, citric or malic acids, etc., the said substance being present in the proportion of from 0.1% upward, based on the total wt. of the compn.

Prevention of livering in pigmented carbohydrate compounds. JOHN D. MCBURNEY and EDGAR H. NOLLAU (to E. I. du Pont de Nemours and Co.). Can. 284,963, Nov. 20, 1928. A non-livering cellulose nitrate-bronze compn. comprising cellulose nitrate, solvent therefor, bronze powder and an acid of the group citric, malic, tartaric, the acid being from 2% upward, based on the total weight of the untreated compn.

Apparatus for making paints and varnishes. L. M. FRASER and W. S. SMITH. Brit. 290,707, Feb. 8, 1927. The constituents are entirely enclosed in a container while mixing, dispersing or dissolving them and are then forced (suitably by compressed air) through a filter to another container. Vapors are condensed and returned to the app. or prevented from escaping by use of liquid seals. Various details of app. and of the production of pigmented cellulosic lacquers are described.

Varnish containing chlorinated rubber. CARLETON ELLIS (to Chadeloid Chemical Co.). U. S. 1,695,638, Dec. 18. A varnish suitable for use on wood, metal or other surfaces comprises chlorinated rubber together with a drying oil such as tung oil and oilene, solvent naphtha or other suitable volatile solvent and thinner.

Varnish "reviver" containing chlorinated gutta percha. CARLETON ELLIS (to Chadeloid Chemical Co.). U. S. 1,695,642, Dec. 18. Chlorinated gutta percha is used with a resinous homogenizing agent such as rosin or fossil resins, together with C_6H_6 , CCl_4 or other suitable solvent and a phenolic phosphate such as cresyl phosphate.

Lacquer. CARL IMMERHEISER, ERNST KNEBEL and OTTO JORDAN (to I. G. Farbenind. A. G.). Can. 284,969, Nov. 20, 1928. A lacquer comprises a nitrocellulose plastic contg. a coloring matter insol. therein in a practically colloidal condition, a solvent of the type glycol monoalkyl ethers or their esters, or glycol dialkyl ethers, or mixts. of the same, and a diluent selected from the group consisting of benzene hydrocarbons, halogen derivs. thereof, aliphatic and hydroaromatic alcohols.

Lacquers. WILHELM PUNGS and KARL EISENMANN (to I. G. Farbenind. A.-G.). Can. 284,970, Nov. 20, 1928. Plastic masses and solns. thereof which comprise nitrocellulose, a condensation product of urea and formaldehyde, castor oil which has been treated with air at 170–180°, a resin, butyl acetate and butyl alcohol, have good properties of elasticity, adhesion and fastness to light and water.

Lacquers. CARBIDE and CARBON CHEMICALS CORP. Fr. 640,364, Sept. 1, 1927. A lacquer is prepd. by incorporating in a soln. of a cellulose ester, such as nitrocellulose,

a polymerized olefin such as a polymerized vinyl ester, *e. g.*, that obtained by the polymerization of a mixt. of vinyl chloride and vinyl acetate.

Coating composition containing chlorinated rubber. CARLETON ELLIS (to Chadeloid Chemical Co.). U. S. 1,695,640, Dec. 18. A compn. suitable for use on wood, metal or other surfaces and which yields a "flat" or dull finish comprises chlorinated rubber together with a smaller quantity of a drying oil such as boiled linseed oil and a volatile solvent, *e. g.*, toluene. Japan drier also may be added.

Reaction product of cashew-nut shell oil. MORTIMER T. HARVEY (to the Harvel Corporation). Can. 285,183, Nov. 27, 1928. A reaction product is obtained from 1 part by volume of cashew shell oil, 1 part nitric acid sp. gr. 1.42 and 1 part water. The reaction is strongly exothermic and is complete in a few minutes. The reaction product is a gum from which excess acid may be washed out. The I value of the reaction product is zero or very close to zero. The product may be dissolved in any vehicles such as amyl acetate, benzine, gasoline, turpentine, alcohol, naphtha or kerosene. It makes an excellent coating, which dries very quickly and which is useful for paints, varnishes, elec. insulation and molded ware of all kinds, and for impregnating paper and woven fabrics. Cf. C. A. 22, 1863.

Linoleum composition. ALFRED EISENSTEIN (one-half to Georg Schicht A.-G.). U. S. 1,693,917, Dec. 4. Liquid and solid constituents such as varnish, cork and resin are mixed together in a proportion in which the mixt. is pulverulent, subjected to oxidation at a temp. above 70° but below the temp. of carbonization. The temp. and pulverulent condition of the material are maintained during the treatment.

Resins. SCHERING-KAHLBAUM A.-G., ERICH FREUND and HANS JORDAN. Ger. 466,262, Sept. 20, 1928. Halogen addn. compds. of naphthalene, *e. g.*, naphthalene chlorides or dibromotetrahydronaphthalene, are heated below 215° alone or in a solvent with catalytically active metals or metallic compds. with the exception of Ag oxide, metallic halides and surface catalysts. The reaction mass is then heated to higher temps.

Bleaching resins. C. CORDES A.-G. and P. STUHLMANN. Brit. 289,859, May 4, 1927. Resins are dissolved in cold dil. alkalis and treated, while agitated, with bleaching agents, some of which may also serve as hardening agents such as chlorates, persalts, H_2O_2 , Na silicate, $NaHCO_3$, CH_3O or other aldehydes. $Al_2(SO_4)_3$ may be used to ppt. the bleached resin and substances such as Na silicate, casein or vegetable or animal glues may be admixed with the resin and bleached with it.

Resinous material. PAUL KNAPP. U. S. 1,696,490, Dec. 25. The distillate, such as is obtained in the distn. of corn cobs or other substances contg. pentosans and pentoses with inorg. acids, is treated with an amine such as aniline or methylamine in the presence of an acid, *e. g.*, HCl or HOAc, to form an insol. resinous material; the latter is sepd. from the large vol. of assoc. aq. liquid. The resinous product is suitable for use in varnishes or moldable compns.

Resinous and ligneous products. D. GARDNER. Brit. 289,774, April 30, 1927. Resinous plants and woods are steam treated, the resulting material (preferably in finely divided state) is treated with alkali to form a soap soln. in the presence of a reducing agent such as $NaHSO_3$ or Na hyposulfite, and the resinous material is pptd. from the soap soln. A colloid mill may be used in the treatment, and various details are given.

Phenolic resin composition. VICTOR H. TURKINGTON (to Bakelite Corp.). U. S. 1,695,566, Dec. 18. A varnish or impregnating compn. contains a reactive phenol-methylene resin, a volatile solvent such as alc. or acetone and a dialkyl ester of an org. acid, *e. g.*, dibutyl phthalate, which serves to facilitate obtainment of flexible products from which water is readily eliminated. Cf. C. A. 23, 722.

Phenolic condensation product suitable for impregnating wood, paper, cement, etc. LAWRENCE V. REDMAN and HAROLD C. CHEETHAM (to Bakelite Corp.). U. S. 1,693,939, Dec. 4. A potentially reactive phenolic resin, capable of setting free NH_3 during its transformation to the infusible state, is used with at least a sufficient quantity of furfural to combine with the liberated NH_3 .

Rosin. IRVIN W. HUMPHREY (to Hercules Powder Co.). Can. 284,987, Nov. 20, 1928. Low-grade rosin is mixed with gasoline and phenol, the temp. of the mixt. being reduced to a point (say 7°) at which the major portion of the phenol will be insol. in the gasoline. The mixt. is allowed to sep. into two layers, one of which is primarily phenol, water and extd. coloring matter with a small proportion of rosin, and the other is primarily gasoline and rosin with a small proportion of phenol. The layers are sepd. by any convenient method and the gasoline-rosin soln. is preferably washed with water and dil. aq. alkali soln. to remove the small amt. of phenol which it contains. The

purified rosin is recovered from the gasoline by distn. Any rosin in the phenol layer may be recovered by distn. as low-grade rosin, which may be dissolved in gasoline and extd. with phenol as above.

Rosin. IRVIN W. HUMPHREY (to Hercules Powder Co.). Can. 284,986, Nov. 20, 1928. Low-grade rosin is mixed with gasoline and aniline and heated to form a homogeneous soln.; then the temp. is reduced to 0° and the soln. allowed to sep. into the layers. The upper layer primarily contains gasoline and rosin with small quantity of aniline, and the lower layer contains aniline and extd. coloring matter and a little rosin. The layers are sepd. by any convenient method. The gasoline rosin soln. is washed with an acid soln. (H_2SO_4) to remove the small proportion of aniline or it may be recovered with the gasoline which is distd. off to recover the purified rosin. The sepd. aniline, with its small rosin content, may be treated with gasoline to ext. the rosin in a refined state, or the rosin may be recovered as low-grade rosin by distg. off the aniline. This rosin may be treated as above.

Rosin. IRVIN W. HUMPHREY (to Hercules Powder Co.). Can. 284,988, Nov. 20, 1928. Low-grade rosin is mixed with gasoline and ethylene chlorohydrin and agitated, the temp. of the gasoline being reduced to a point (say 8°) at which the major portion of the chlorohydrin will be insol. therein. The mixt. is allowed to sep. into two layers, the lower of which comprises primarily ethylene chlorohydrin and the coloring substances of the original rosin, and a little rosin, and the upper a gasoline-rosin soln. with a little chlorohydrin. The layers are sepd. by any convenient manner. The gasoline-rosin soln. is washed with water to eliminate any chlorohydrin, and the chlorohydrin layer is treated with gasoline to ext. any rosin. The gasoline rosin solns. are then distd. to remove the gasoline and to recover the purified rosin.

Rosin. HARRY E. KAISER and ROY S. HANCOCK (to The Hercules Powder Co.). Can. 284,983, Nov. 20, 1928. Wood rosin is dissolved in gasoline and furfural is added for the extrn. of coloring materials from the rosin. The gasoline-rosin soln. is heated to a temp. at which furfural will go into soln., and the temp. of the soln. is then reduced below $25^{\circ} F$. The furfural and extd. coloring material are sepd. from the soln. of gasoline and rosin, and the refined rosin is recovered from the said soln.

Rosin. HARRY E. KAISER and ROY S. HANCOCK (to Hercules Powder Co.). Can. 284,985, Nov. 20, 1928. Low-grade wood rosin is mixed with gasoline and furyl alc. and the mixt. heated to about $115^{\circ} F$. The soln. is then cooled to 60° , at which temp. more or less of the furyl alc. is thrown out of the soln. A soln. of gasoline and the major part of the rosin and some of the furyl alc. is sepd. from the remainder of the furyl alc. and a smaller quantity of rosin. Feryl alc. is added to the soln. and the temp. is reduced to a point below $25^{\circ} F$. A soln. of gasoline and the major part of the rosin with a smaller part of the furyl alc. is sepd. from the larger part of the furyl alc. and a minor part of the rosin, and the refined rosin is recovered from the soln. of gasoline-rosin.

Rosin. GEORGE M. NORMAN (to Hercules Powder Co.). Can. 284,984, Nov. 20, 1928. Low-grade rosin is mixed with gasoline, liquid SO_2 is added, and the mixt. agitated. The mixt. is then cooled to -10° and allowed to sep. into layers, one of which is primarily SO_2 and extd. coloring substances with a small proportion of rosin, and the other primarily gasoline and purified rosin with a small quantity of SO_2 . The layers are sepd. by any convenient method. The gasoline-rosin soln. may be washed with water, and the gasoline distd. off for the recovery of purified rosin. The SO_2 contains some rosin, which may be recovered as low-grade rosin by boiling off the SO_2 , and this low grade rosin may be refined as above. In the above operation a pressure suitable to prevent appreciable volatilization of the liquid SO_2 should be maintained.

Rosin and turpentine from wood. ABRAHAM A. SPIMER (to Hercules Powder Co.). U. S. 1,996,696, Dec. 25. In extg. resinous products from resinous wood and prep. a residue suitable for *paper pulp*, the wood is disintegrated and crushed to form thin flattened pieces without tearing and destroying the fiber; it may then be treated with steam and then with gasoline. An app. is described.

Hydrophobe resins. KURT RIPPER (to Kunsthartzfabrik Fritz Pollak G. m. b. H.). Can. 284,790, Nov. 13, 1928. A neutral or slightly alk. mixt. of 1500 parts of urea and 4000 parts of a soln. contg. 37.6% CH_3O is heated for a short time in a boiler provided with a reflux condenser; 2 parts of HCO_2H is added and 300 parts of thiourea is introduced into the mixt. by portions, and the heating of the mixt. is continued for about 1 to 1.5 hrs. Then about 2 parts of a fixed alkali is added and the mass allowed to cool. After a short time a white resinous product will begin to be pptd. This product remains unaltered for an extended period of time. For the purpose of perfecting the pptn., preferably 2000 parts of water may be added and well mixed with the resin. The purified

resin can be utilized for making lacquers or hard artificial masses. Instead of 300 parts of thiourea, 200 parts of phenol may be added and the operation be continued as above. In this way a soft, kneadable resin is generated which may be utilized for making glass, clear, transparent artificial masses. Instead of 300 parts of thiourea, 230 parts of urea may be added. The final product obtained therefrom resembles milk glass.

Synthetic resins. C. E. BURKE and H. H. HOPKINS (to Nobel Industries, Ltd.). Brit. 289,794, April 28, 1927. See U. S. 1,667,189 (C. A. 22, 2071).

Synthetic resins. R. ARNOT. Brit. 290,327, Jan. 15, 1927. An aldehyde such as CH_2O is condensed with at least one org. compd. contg. an NH_2 group (in which one or both H atoms may be substituted) and with at least one other org. compd. such as an org. acid or salt, a phenol or a naphthol. At least 5% of the total is used of each reagent. Examples are given of the use of urea, thiourea and substitution derivs., salicylic acid, *o*- and *p*-toluidine, PhNH_2 , β -naphthol, α - and β -naphthylamine, benzidine, gallic acid, cresol and similar compds. in various combinations. In some cases, albumin or the like may be added to the product to form an adhesive mixt. Numerous details and modifications are described.

Treating paper or other fibrous material to permeate it with synthetic resin. ARTHUR L. BROWN (to Westinghouse Elec. & Mfg. Co.). U. S. 1,695,912, Dec. 18. Fibrous material such as paper or asbestos is treated with a catalytic agent such as $(\text{CH}_3)_6\text{N}_4$ and then impregnated with a mixt. comprising a condensation product of CH_2O and cresol or other suitable phenolic substance and a polymerizable oil, e. g., China wood oil, and heated (suitably at a temp. of about 100°) in order to form a material which may be rendered insol. by further heating.

27—FATS, FATTY OILS, WAXES AND SOAPS

E. SCHERUBEL

Progress of the chemistry and industry of fat. II. DUBOVITZ. *Chem. Rundschau* (Budapest) 5, 25-7, 33-6(1928).

The methods of investigation and identification of fats and fat mixtures. B. LUSTIG AND G. BOTSTIBER. Chem.-pathol. Lab. der Rudolfstiftung, Wien. *Biochem. Z.* 202, 81-90(1928).—The application of physical methods of analysis (microscopy, ultra-violet investigation) to fats is discussed.

Fat determination in cacao products. A. HEIDUSCHKA AND F. MUTH. Tech. Hochschule, Dresden. *Chem.-Ztg.* 52, 879(1928).—By means of a Schott glass filtering crucible which carries a cover and a small stirring spatula and which can be placed on a sugar funnel, in turn mounted on a 250-cc. distg. flask a complete analysis of cacao products can be rapidly made, including H_2O , fat, crude fiber and starch, the fat detn. requiring only 1.5-2.5 hrs. with 3-20 g. of the sample. The app. is intended for factory control.

The luminescence of oils and fats. A. VAN RAALTE. *Chem. Weekblad* 25, 544-6(1928).—Treatment of rape oil with 50% H_2SO_4 causes luminescence; heating and filtration of linseed oil does likewise; apparently some substance which inhibits luminescence is removed during these refining processes. With the exception of coconut oil, which also luminesces in the crude state, it was found that for butter, lard, sheep fat, horse fat, etc., H_2SO_4 treatment induced luminescence; decolorization with norite had no effect; treatment with fuller's earth also gave luminescence. The anti-luminescent agent is assumed to be a sterol, it can be pptd. by digitonin. In many respects the substance gives reactions attributed to vitamins.

The fluorescence of oils and fats. J. P. CARRIÈRE. *Chem. Weekblad* 25, 632-4(1928).—A. van Raalte (preceding abstract) states that only refined oils are fluorescent. This is incorrect. All oils and fats are fluorescent. Some oils show a greater absorption of ultra-violet light than others. If the former are viewed too far below the illuminated surface, the fluorescence is not apparent. A correct observation must be made close to the illuminated surface. The more absorbent the oil is, the more the fluorescence will be concd. just below the surface.

The fluorescence of oils and fats. A. VAN RAALTE. *Chem. Weekblad* 25, 650(1928); cf. preceding abstract.—van Raalte describes his technic, which consists in observing a thin layer of the oil by transmission as well as by reflection in a horizontal beam of ultra-violet light.

Spontaneous heating of oils. NORMAN J. THOMPSON. *Oil and Fat Ind.* 5, 317-26(1928).—The testing method which gives the most significant results requires the main-

nance of small temp. diff. between the sample and its surroundings. It is expensive to maintain this diff. automatically; and if the regulation is secured manually, the method is laborious. The original Mackey method is not suitable, except to show the hazard of very dangerous oils. By increasing the size of the sample to 30 g., using lean cotton waste carrying an equal wt. of oil, more significant results were obtained with no more attention, though the test time was longer. In testing oils for their tendency to heat spontaneously, it is necessary to take into account the conditions under which the oil may be used. Even a pure castor oil will heat spontaneously to ignition temp. under favorable conditions. In testing unknown samples, the spontaneous heating test should always be made in conjunction with a chem. analysis to det. the presence of agents which serve only to delay oxidation but which may not affect the final result.

E. SCHERUBEL

Olive-oil analytical method. SIDNEY MUSER. *Oil and Fat Ind.* 5, 356-7(1928).—The use of the ultra-violet ray in the detection of refined in virgin olive oil is deemed acceptable because in no less than 10 exptl. labs. where this work has been carried on, the test was shown accurate in every case. Mixts. of refined and virgin oils placed with the Bureau of Standards showed no change in fluorescence. A bibliography is given.

E. SCHERUBEL

Hydrogenation of soy-bean oil. AUGUSTUS H. GILL AND YU M. MA. *Oil and Fat Ind.* 5, 348-51(1928).—An increase of temp., pressure, agitation or amt. of catalyst will increase the hydrogenation rate. In high agitation at 320 r. p. m. or above the change of 10° in temp. between 150° and 180° produces little or no effect. The hydrogenation rate is approx. proportional to the pressure, amt. of catalyst and the speed of agitation. No more than 1% of catalyst is necessary. The course of the reactions of hydrogenation of soy-bean oil is the same as with cottonseed oil. The complete hydrogenation of soy-bean oil, can be a reality; a fat m. 40° was obtained in 1.5 hrs.

E. SCHERUBEL

New method of research and the determination of peanut oil in olive oil. E. JAFFE. *Reale Ist. Com. Gabinetto di Merceologia, Genova. Ann. chim. applicata* 18, 368-86 (1928). The new method for detecting the presence of peanut oil in olive oil depends upon the different solubilities of the Li salts of fatty acids in EtOH. Data in the literature (*cf. Arch. Pharm.* 1903, 552; *Z. angew. Chem.* 1904, 482; *Z. Unters. Nahr- u. Genuss.* 1904, 129) were confirmed and amplified by further expts. of J., which show that the *Li soaps of pure peanut oil and of mixts. of this oil with olive oil* ppt. from their alc. solns. at higher temps. than the Li soaps of pure olive oil, this temp. differential being directly proportional to the quantity of peanut oil present. The fatty acids obtained by decomposition of the Li soaps sepg. at 17-18° ppt. from 90% EtOH only if arachic acid is present, and this temp. of pptn. is proportional to the quantity of peanut oil in the olive oil. From the solid fatty acids sepd. from 90% EtOH can be obtained a crude arachic acid, which m. 72.5-73°. Though the method does not permit the quant. sepn. of crude arachic acid, it is sufficiently precise for industrial analysis, for the lowest proportions of peanut oil ordinarily used for adulteration, e. g., 5%, can be identified as reliably as by the Tortelli-Ruggeri method, considered to be the most precise. The new method offers the advantage of greater ease of manipulation and great rapidity, the procedure requiring not over 2 hrs. **Procedure.**—Add 50 cc. of KOH soln. (90 g. KOH, 62 cc. water, 1000 cc. 95% EtOH) to 10 cc. of oil, reflux until completely saponified, neutralize with 12% aq. AcOH (phenolphthalein), bring to boiling, add 100 cc. of 15% alc. LiCl (in 70% EtOH), put into a water bath at 15-16° and observe the temp. at which crystals first sep. Then cool to 17-18°, filter (suction), wash with 70% EtOH (5 portions of 10 cc. each), transfer the ppt. to a separatory funnel, decomp. the soaps with 50 cc. of HCl (d. 1.10), cooling to aid the sepn. of fatty acids, at 25-30° add 50 cc. of C₆H₆ or petr. ether, agitate violently, sep. the aq. layer, wash with 30 cc. of HCl and then repeatedly with water (50 cc. each time) until neutral, filter the fatty acids, distil off the remaining solvent, add 30 cc. of 90% EtOH and 2 drops of 0.5 N HCl, heat to 60° until a clear soln. is obtained, and cool, observing the sepn. With pure olive oil, the soln. remains practically clear down to 12°. With oil contg. 5% peanut oil, minute crystals appear at 15-16°, the whole liquid becomes turbid and after 0.5 hr. there is considerable deposition. With pure olive oil the liquid is still clear even after 1 month at 15°. To confirm the presence of arachic acid, add 10 cc. of 90% EtOH, dissolve by heating, and cool again. In this case after some hrs. at 13-14° only minute white crystals sep., leaving a clear supernatant liquid. For further confirmation, keep the mixt. for 2 hrs. at 15-16°, filter, wash 3 times with 10 cc. of 90% EtOH, then repeatedly with 70% EtOH, dissolve the residue in boiling 90% EtOH (10-30 cc.), allow to crystallize again, filter, wash as before and dry at 100°. The m. p. should be 72.5-73°. The

following data give the % peanut oil added to pure olive oil and the corresponding temp. of pptn. of the Li salts of the fatty acids and the temp. of crystn. of crude arachic acid from 90% EtOH, resp. 0, 24-6°; —; 5, 25-6°, 15-16°; 10, 26-8°, 17-18°; 20, 29-31°; 21-2°; 30, 32-4°, 25-7°; 40, 36-8°, 29-31°; 50, 41-3°, 33-5°; pure peanut oil, 56-7, 40-3°.

C. C. DAVIS

Basic variations in soy-bean oil from various origins. J. F. CARRIÈRE. *Chem. Weekblad* 25, 630-2(1928).—Detns. are made of d., fluorescence, % unsapon. and I number on samples of extd. and pressed soy-bean oil from Manchuria, Germany and Holland. Pressed oil from Manchuria is lower in d., higher in unsapon. materials, and shows a violet-blue fluorescence. These 2 last properties are due to the presence of about 0.4% unsapon. impurities.

G. CALINGAERT

Analysis of Staphylea oil. A. FERENCZ AND GY. CSERESZNYÁS. *Magyar. Gyógyszerésztud. Társaság Értesítője* 4, 24-9(1928).—*Staphylea* oil has $d_{15} = 0.9355$, $n_D^{25} = 1.47165$, acidity 2.00, sapon. no. 190.28, iodine no. 108.34, Hehner-no. 95.51, Reichert-Meissl no. 2.64, Polenske no. 0.50. Of the acids 90.30% are unsatd. These acids are 94% oleic acid, 5.50% linoleic acid and 0.50% linolenic acid.

S. S. DE FINÁLY

False cola nuts. D. VAN OS AND Y. VAN DER WAL. Univ. Groningen. *Pharm. Weekblad* 65, 1266-71(1928).—A shipment of alleged cola nuts consisted of shea nuts (*Bassia parkii*), which resembled cola nuts in appearance but differed from these mainly in their high fat content and total absence of caffeine. The fat gave the following const.: m. p. 36°, sp. gr. 0.912, n_D^{20} 1.4633, I no. 66, sapon. 198, acid no. 34. Shea nuts have not previously been reported in the literature as adulterants of cola nuts.

A. W. DOX

Thermal analysis of beeswax. J. STITZ. *Magyar Chem. Folyóirat* 34, 18-22 (1928).—The adulteration of beeswax can be easily ascertained by detg. its fusing point. The method of Elser (*Arch. f. Bienenkunde* 8, 177 (1927)) has been simplified. The mixt. is divided into 3 fractions by means of cotton filters, and the fusing points of these fractions are detd. An adulteration greatly changes the fusing point of pure beeswax. On the basis of a series of expts. a practical table has been made, showing fusing points of beeswax adulterated by other waxes, so that percent compn. can be detd.

S. S. DE FINÁLY

Metallic soaps. M. F. LAURO. *Oil and Fat Ind.* 5, 329-32(1928).—The uses of metallic soaps as driers, in pharmacy, in dry cleaning, as emulsifiers and their presence in oils are discussed.

E. SCHERUBEL

Soaps from organic bases. A revolutionary development in the art of organic synthesis. R. B. TRUSLER. *Oil and Fat Ind.* 5, 338-47(1928).—Soaps have been made from fatty acids and org. bases contg. N. The soap-forming bases are alkyl- and arylamines. Alkylamines have been especially considered; and among them hydroxy-alkylamines known as the ethanolamines have outstanding importance. Among the prospective uses are the following: They are excellent emulsifiers for vegetable, animal and mineral oils. They are thickeners for lubricating oils. Incorporated in special compns., they have detergent and cleaning utility. The oleates are efficient dry-cleaning soaps in consequence of their soly. in org. solvents and their sp. detergent action. Their great soly. in almost all liquids will lead to other applications.

E. SCHERUBEL

Determination of the turbidity temperature of textile soaps. W. HERBIG. *Seifensieder-Ztg.* 55, 368-9(1928).—An answer to criticisms by Heilingötter (*Z. ges. Textil ind.* 1928, 565) and Welter (*C. A.* 22, 4851). While it is desirable that all soaps should yield a clear soln. in distd. H₂O, it should be permissible first to filter a soap soln. that is not clear. W.'s explanation that dissolved CO₂ caused a diff. of 10° in the turbidity point of an olive-oil soap, is untenable, since H₂O does not dissolve enough CO₂ to cause any turbidity in a soap soln. as verified by H.'s expts. However, if CO₂ gas is passed into a soap soln., such turbidity does appear. In H.'s opinion the observed differences are probably due to variation in the sampling. A. WELTER. *Ibid* 391-3.—Distd. H₂O which shows absence of Ca and SO₄ by (NH₄)₂C₂O₄ or BaCl₂ may still cause a turbidity in a soap soln., the latter being a more sensitive reagent. W.'s remarks refer mainly to olive-oil soaps used in the silk industry. There should be only 2-3° diff. in the turbidity point of a sample when compared with that of a soap soln. of equal concn. made by neutralizing the liberated fatty acids of the sample; any greater diff. is due to the presence of Ca or Mg in the sample. The present standard for the turbidity point has been lowered to 18-27°, accomplished by proper soap boiling technic and the use of appropriate app. To filter off any turbidity in the soap soln. would nullify the object of the test. The usual soap concn. for the test is 0.2-0.7%. Presence of CO₂ influences the turbidity test considerably; hence the H₂O should be boiled. It

is best to test the distd. H_2O by running a blank test with a soap of known purity. O. E. STEUER. *Ibid* 398.—Comments. P. ESCHER

Alkali determination in soaps. C. BERGELL. *Seifensieder-Ztg.* 55, 327-8(1928).—From expts. B. concludes that anhyd. Na_2SO_4 withdraws from alc. KOH not only H_2O but also considerable alkali, causing erroneous results in the detn. of free alkali in soft soaps. To overcome this, 5 g. of the sample is dissolved in 50 cc. neutral amyl alc. with heat and after cooling is shaken out with 30 cc. neutral 20% NaCl soln. and titration finished as usual. *Ibid* 338-9.—Brine will remove practically all NaOH from a NaOH soln. in amyl alc. Soaps lose much of their free alkali in storage because the slow evapn. of H_2O brings the caustic to the surface where CO_2 gradually neutralizes it. Hot alc. dissolves more Na_2CO_3 than cold and thus the phenolphthalein color diminishes slowly on cooling. P. ESCHER

Utilization of the results of analysis with thiocyanate. M. DIRTMER. *Seifensieder-Ztg.* 55, 337-8(1928).—An answer to Kaufmann's reply to D.'s criticism (C. A. 22, 2476, 4845). P. ESCHER

Glycerol analysis by the International Standard method of 1911. W. PRAGER. Darmstadt, Chem. Testing Station for the trades. *Chem.-Ztg.* 52, 903-4(1928).—Supplement No. 1 of the I. S. M. demands a standardization of the acetin method by means of c. p. glycerol, contg. 9-10% H_2O , furnished by Baird, Tatlock, Ltd. Glycerol of this strength is hygroscopic and there is no good method available for the estn. of its H_2O . It is suggested to use a weaker glycerol as a standard. Another source of error is the CO_2 liberated from contaminated NaOH soln. during neutralization, $\frac{1}{2}$ of the CO_2 remaining dissolved, causing wrong values. A $BaCl_2$ treatment of the NaOH would remedy it. P. ESCHER

The lauric acid content of coconut and palm-kernel oils as a means of detecting these oils in food fat mixtures (GROSSFELD) 12. Detoxicated cottonseed meal (MENAUL) 12. Use of marine animal oils as motor fuels (MARCELET) 21. The glycerides of lauric and myristic acids (BOMER, EBACH) 10. The formation of gels. Vulcanized oils (KNIGHT, STAMBERGER) 2. Extrusion press for expressing liquids from solids [expressing oil from palm kernels] (Brit. pat. 289,954) 1. Halogen derivatives of hydrocarbons [for manufacture of soaps] (Brit. pat. 289,795) 10. Oil filter (U. S. pat. 1,696,735) 1. Cracking oils (Brit. pat. 290,060) 22. Purification of oils (Fr. pat. 610,922) 13. Refining oils (Can. pat. 285,014) 13. Apparatus for the extraction of water, oil and fatty substances from fish, offal or seeds by use of solvents (U. S. pat. 1,694,561) 1. Heater [for use in the oil industry] (Austrian pat. 109,213) 1. Filter for oils (Fr. pat. 639,923) 1.

MELLBOTT, P. B., AND STANISLAUS, I. V. STANLEY: **American Soap Maker's Guide.** A treatise on the art and science of the manuf. of soap, candles and allied toilet preps. New York: Henry Carey Baird & Co., Inc. 750 pp. \$10. Reviewed in *Chemicals* 30, No. 27, 23(1928).

Apparatus for the extraction of water, oil and fatty substances from fish, offal, seeds or other materials by use of solvents. JOHN R. STERLING. U. S. 1,694,361, Dec. 4

Fat extractor. DR. ALEXANDER WACKER GESELLSCHAFT FÜR ELEKTROCHEMISCHE INDUSTRIE G. M. B. H. Ger. 468,772, Apr. 22, 1927. In the extn. of fat or purification by means of an org. solvent, the lower opening of the tube by which the solvent ascends when heated to the wash vessel is so placed that the heating vessel always remains covered with liquid.

Sulfo-fatty-aromatic acids. G. PETROV. Brit. 289,934, Feb. 1, 1927. Fatty acids such as stearic or palmitic are mixed with hydrocarbons such as C_6H_6 or toluene or xylene and the mxt. is treated with fuming H_2SO_4 . The products may be used for hydrolyzing fats, producing emulsions, solid soaps, soap powders and for washing fabrics in the textile industries.

Refining fats and oils. K. F. WILHELM. Brit. 289,801, May 22, 1927. In purifying oils and fats by use of alc. or other suitable solvent which is miscible with water and which dissolves fatty acids, resins and bitter and mucilaginous substances but does not readily dissolve neutral fats, with the addn. of water and NH_3 as described in Brit. 226,767 (C. A. 19, 2140), there is also added a fat solvent such as C_6H_6 or CH_2Cl_2 or trichloroethylene and Na_2SO_4 .

Clarifying and decolorizing vegetable oils. HAROLD E. BIERCE. U. S. 1,696,338, Dec. 25. Substantially neutral vegetable oils such as cottonseed oil are treated with

sufficient alk. soln. such as NaOH to render the oil slightly alk. and then, before removal of the alkali and its reaction products, the oil is treated with an adsorbent earth.

Soap. ÉMILE SAVY. Fr. 640,132, Feb. 8, 1927. Before passing to the machine for pressing it into cylinders, soap is passed through an air drier to form a crust.

Granulated or powdered soap. GEORGE F. DAWES (to F. F. Mason, to The Proctor and Gamble Co.). Can. 285,108, Nov. 27, 1928. To produce granulated or powd. soap, common white laundry soap is soaked in water until it is thoroughly permeated with moisture, and then heated to 350–400° F. at atm. pressure in a vessel or drying chamber. The water vapor or steam escaping causes the soap to swell up so that it is left in an extremely light, porous and spongy condition. This mass may be reduced to a powd. by rolling or kneading or crumbling the soap.

Apparatus for making soap with extraction of glycerol. AUGUSTE C. BERTRAND. Fr. 640,339, Sept. 1, 1927.

Cleaning composition. ALBERT ROBERTS. Can. 284,716, Nov. 13, 1928. A cleaning compn. comprises pure soap powder 100 lb., Na_2SiO_3 50 lb. and commercial borax 50 lb. The compn. is used by dissolving 3 oz. of the mixt. in a gallon of water and brushing the soln. on the article to be cleaned.

Cleansing compositions. SIEGFRIED ZIMMERMANN and FIRMA "HENRY," SEIFEN-, KERZEN- UND FETT-WARENFABRIK G. M. B. H. Austrian 109,404, Dec. 15, 1927. Cleansing compns. comprising soap and a solvent for fat are improved by addn. of small amts. of PrOH or iso-PrOH .

Germicidal cleaning composition. JAMES J. GOODWIN (to Goodwin Laboratories). U. S. 1,696,762, Dec. 25. A compn. for making aq. solns. suitable for washing glassware comprises a mixt. of soap including salts of the fatty acids of coconut and palm nut oils and Na_3PO_4 .

28—SUGAR, STARCH AND GUMS

F. W. ZERBAN

The Indian sugar industry. JAMES MACKENNA. *J. Roy. Soc. Arts* 77, 240–58 (1928). E. H.

Extraction of sugar and potassium salts contained in molasses. T. GASPAR Y ARNAL. *Anales soc. españ. fis. quim. (Técnica)* 26, 73–80(1928); cf. *C. A.* 22, 4001.—The K in beet molasses is pptd. by adding 20% of $\text{Ca}_2\text{Fe}(\text{CN})_6 \cdot 12\text{H}_2\text{O}$ on wt. of molasses, and heating to 70° for 0.5 hr. The ferrocyanide is used in a soln. of 40% concn. The ppt. of $\text{K}_2\text{CaFe}(\text{CN})_6$ is filtered off, and the sugar in the filtrate recovered by the usual methods. The yield is about 64% of the sugar in the original molasses. The final mother liquors from the sugar crystn. may be utilized for the isolation of valuable non-sugars contained in them. The ppt. of $\text{K}_2\text{CaFe}(\text{CN})_6$ is treated with $\text{Fe}_2(\text{SO}_4)_3$, yielding a ppt. of Prussian blue plus CaSO_4 and a soln. of K_2SO_4 with some CaSO_4 and excess $\text{Fe}_2(\text{SO}_4)_3$. This soln. may be dried and sold as a fertilizer, or worked up into high-grade K salts. The Prussian blue is decompd. by heating gently with milk of lime. The ppt. of $\text{Fe}(\text{OH})_3$ is filtered off, and again converted into $\text{Fe}_2(\text{SO}_4)_3$ to be used over again. The soln. of $\text{Ca}_2\text{Fe}(\text{CN})_6$, with a slight excess of $\text{Ca}(\text{OH})_2$, is concd. and used again for pptg. K salts. If necessary, the excess $\text{Ca}(\text{OH})_2$ may first be removed by treatment with CO_2 . The only chemicals not recovered are $\text{Ca}(\text{OH})_2$ and H_2SO_4 , and only the operating loss of the others has to be replaced. "The process is simple and very economical, since the equipment is very elementary and the recovery reactions are such as have long been regarded as quant." No data are given on actual factory operation. F. W. ZERBAN

The (cane) disease suspected to be "pokkahboeng" (in Mauritius). H. F. S. SHEPHERD. *Rev. agr. Maurice* 5, 207(1928).—A disease closely resembling "pokkahboeng," if not identical with it, has been observed in Mauritius since 1915. It does not cause serious losses there. F. W. ZERBAN

"Pokkahboeng" of sugar cane. G. ORIAN. *Rev. agr. Maurice* 5, 208–13(1928); cf. preceding abstr.—A detailed description of the symptoms of the disease, with numerous drawings. F. W. ZERBAN

Disruption of the corn starch granule and its relation to the constituent amyloses. T. C. TAYLOR AND C. O. BECKMANN. Columbia Univ. *J. Am. Chem. Soc.* 51, 294–302(1929).—The α - to β -amylose ratio in corn starch as previously detd. by T. and Iddles (*C. A.* 20, 2918) is not dependent upon the method of treatment. Complete rupture of the starch granule may be accomplished also by grinding. The product of this method yields amyloses of high purity. Additional proof is offered that the

viscosity of a starch paste is directly connected with the no. of swollen granules (gelatinized) in that paste. The structure of starch paste is discussed; its characteristic properties in the case of corn are functions more of the phys. nature of the starch granules than of the chem. nature of the amyloses. Before a sepn. of the constituent amyloses in corn starch can be made, all of the granules must be ruptured. This is evidenced by a drop in the viscosity of the pastes. Any attempt at sepn. before this point results in too high results in insol. material. Although a few granules rupture easily, most of them do so only with great difficulty when a paste is made in the ordinary way.

C. J. WEST

Polysaccharides. II. Acetylation and methylation of starch (HAWORTH, *et al.*)
10. The starches used in the sizing and finishing of cotton (TROTMAN) 25. Depolymerizing or degrading starch (Brit. pat. 290,377) 23. Ethers of carbohydrates (Fr. pat. 640,174) 10.

WOHRZYK, O.: *Chemie der Zuckerindustrie: Ein Handbuch für Wissenschaft und Praxis*. 2nd ed., revised and enlarged. Berlin: Julius Springer. R. M. 30. Reviewed in *Intern. Sugar J.* 30, 609(1928).

Crystallization of sugar. SOCIÉTÉ FRANÇAISE DES ATELIERS DE CONSTRUCTION DE J. J. GILAIN. Fr. 638,367, Dec. 3, 1926. Sugar solns. are evapd. in thin layers with reduced pressure and are kept in movement by passing them intermittently and automatically from a vessel with increased pressure to a vessel with reduced pressure.

Dextrose. CORN PRODUCTS REFINING COMPANY. Ger. 468,751, Sept. 16, 1924. Crystals of anhyd. or hydrated dextrose are obtained from starch conversion liquors by the addn. of a large quantity of crystals of the desired type in the form of crystd. liquor from a previous operation.

Porous materials. ANDRÉ MÉNAGER. Fr. 640,473, Feb. 11, 1927. The filter-press cakes from sugar refineries, contg. a large percentage of CaCO₃, are used for the manuf. of porous cements, etc.

Treating scums formed in sugar refining. RAFFINERIE TIRLEMONTAISE SOC. ANON. Brit. 290,265, May 12, 1927. Scums such as those of alk. earth saccharates are centrifuged to sep. them from the sugar juice, etc., and the centrifugal force is sufficiently increased that the scum remaining in the centrifuge contains only 15-20% of water, juice or liquor.

Treating dextrose solutions produced from starch. CORN PRODUCTS REFINING CO. Brit. 290,847, June 15, 1927. In dextrose solns. produced by the acid hydrolysis of starch the polysaccharides are reconverted by hydrolysis in the absence of the polymerizing metal salts (suitably in a vessel lined with glass enamel and in the presence of adsorption agents). The process is also applicable to mother liquor from crystn., remnants and mixts.

Apparatus for drying, cooling and molding starch. HAROLD W. HARRIGAN (to Hershey Mfg. Co.) U. S. 1,693,649, Dec. 4.

29—LEATHER AND GLUE

ALLEN ROGERS

Henry Richardson Procter. VITTORIO CASABURI. *Boll. ufficiale staz. sper. ind. pelli mat. concianti* 6, 236-43(1928).—An obituary. G. SCHWOCH

Notes on the official method for the quantitative analysis of tannin. AUGUSTO GANSSER. *Boll. ufficiale staz. sper. ind. pelli mat. concianti* 6, 268-76(1928).—Criticism offered of the new official method of tannin analysis. G. SCHWOCH

The electroosmotic phenomena applied in the tanning industry. BEPPE BOCCA. *Boll. ufficiale staz. sper. ind. pelli mat. concianti* 6, 352-7(1928).—A short survey of electroosmosis is given and its application in the tanning industry is explained. The processes of Worms and Balé (Rémy), of von Kowalsky and of Schwerin are described in detail. G. SCHWOCH

Researches on one-bath tanning: the tannin "Alfa C" in the tanning of sole leather. VITTORIO CASABURI. *Staz. sper. Napoli. Boll. ufficiale staz. sper. ind. pelli mat. concianti* 6, 277-302(1928); cf. *C. A.* 22, 2484, 3800.—C. stresses the advantage of one-bath tanning, which process is still more efficient when the synthetic tannin Alfa C is employed. Alfa C is obtained by interaction of alk. cellulose liquors with aromatic sul-

fonic acids. The product thus prep'd. is sol. in H_2O . In a long series of expts. it was revealed that by substituting sulfite cellulose liquor for the alk. liquor, or by adding the alk. liquor to a com. synthetic tannin, the tanning properties of these mixts. are inferior to those of Alfa C. It was also demonstrated that Alfa C is not a mixt., but a definite chem. comp'd.

G. SCHWOCH

The synthetic tannin "Alfa". ENRICO SIMONCINI. Staz. sper. ind. pelli mat. concianti, Napoli. *Boll. ufficiale staz. sper. ind. pelli mat. concianti* 6, 337-51(1928); cf. preceding abstr.—After reviewing history, theory and application in practice of the so-called "synthetic tannins," which can only be used in combination with natural tannins, S. discusses the properties, prepn. and use of Alfa, which is really the only synthetic tannin, because it is capable of producing true leather even when employed alone. In practice, however, it is of advantage to combine it (10%) with chestnut ext. (90%); this mixt. has excellent tanning properties equal, at least, to those of a mixt. of chestnut (70%) and quebracho ext. (30%). Alfa is a reddish brown liquid of 23-4° Bé. and p_H 4.0. It contains, in the av., 23.00% tanning substances, 11.05% non-tannins, 0.00% non-sol. substances, 65.95% H_2O and traces of free H_2SO_4 . It ppts. gelatin and alkaloïds and gives a greenish color with Fe salts. It gives the lignin reaction and therefore ppts. with $PhNH_2 \cdot HCl$. It fluoresces strongly when irradiated with a quartz lamp. Acids have no effect on it, while with alkalies, its color is turned to deep brown. The structure of Alfa is unknown; however, it is shown to be a definite comp'd. formed by the reaction of a sulfonic acid with lignone.

G. SCHWOCH

Ultra-violet light and its application, with special regard to the tanning industry (BALDRACCO) 13. Use of halogen-substituted sulfonic acids and their salts as protective agents (Brit. pat. 289,898) 18. Wetting agents (halogen-substituted sulfonic acids) (Brit. pat. 289,863) 18. Imitation patent leather (U. S. pat. 1,694,258) 30. Sulfonic acids (in the leather industry) (Fr. pat. 640,617) 10.

SAUER, E.: *Leim and Gelatine*. Dresden and Leipzig: Theodor Steinkopff. 54 pp. Reviewed in *Chem. News* 135, 290(1927); *Chimie et industrie* 20, 400(1928).

Tanning. FRIEDRICH POSPIECH. Can. 285,055, Nov. 20, 1928. Vegetable tanning is accelerated and improved by adding to the tanning liquor sulfonic acids, which are obtained by condensing naphthalene or ring substitution products of naphthalene, or the corresponding sulfonic acids in the presence of condensation or oxidation agents with alcs. of the aliphatic series having more than 2 C atoms.

Tanning emulsions. RÖHM & HAAS AKTIENGESellschaft. Fr. 640,349, Sept. 1, 1927. Freshly pptd. metallic hydrates such as damp $Al(OH)_3$ are used for emulsifying fats or oils used in tanning. Urea may also be added.

Synthetic tanning composition. CLARENCE J. HERRLY and ARTHUR M. MATHESON (to Niacet Chemicals Corp.). U. S. 1,695,655, Dec. 18. A monohydroxy-phenolic comp'd. (such as $PhOH$ or cresols) is condensed with an aldehyde such as paraldehyde or AcH at a temp. of 40-65° in the presence of a small quantity of a condensing agent such as H_2SO_4 and the condensed material is added to an excess of H_2SO_4 at about the same temp. to form a sol. product.

Tanning substances. I. G. FARBENIND. A.-G. Fr. 640,224, Aug. 29, 1927. New tanning substances are prep'd. by condensing with S in the presence of alkalies the products which result from the condensation of phenol, its homologs or derivs. with CH_2O and sulfites. Thus, the condensation product obtained by heating *p*-chlorophenol, CH_2O and Na_2SO_3 is heated with S till no more H_2S is evolved.

Tanning and mordanting pelts in one operation. I. G. FARBENIND. A.-G. Ger. 466,107, Feb. 20, 1927. The defleshed pelts are treated with tanning solns. to which suitable mordant salts have been added, so that the dyeing of the hair can follow immediately after the tanning of the skin. In a typical example, rabbit pelts are treated in a bath contg. specified quantities of $CuSO_4$, Cr alum, H_2SO_4 , $NaCl$ and NH_4Cl ; they are then dyed black in a bath contg. specified quantities of *p*-phenylenediamine, *m*-tolenylenediamine, NH_4OH and H_2O_2 .

Single-bath chrome tanning process. I. G. FARBENIND. A.-G. Ger. 466,111 Feb. 27, 1928. Compds. of aldehydes with NH_2 or its alkyl or aryl derivs. are added to chrome tanning baths in order to neutralize liberated acids. In a typical example, to calfskin, which has been pretreated with dil. $NaCl$ soln., there are added three portions, at 40-min. intervals, of a suspension of 7.3% hydrobenzamide in a 20% soln. of Cr alum. The tanning is complete after 6.5 hours. The reagents used, with Cr alum, in other

examples are hexamethylenetetramine, acetaldehyde-ammonia, trimethyltrimethylenetriamine, benzylidenedianiline and anhydroformaldehydeaniline. The use of hexamethylenetetramine with Cr alum, weakened by addn. of a small amt. of soda, is described also.

Composition for treating leather. MARTIN SEGORIA. U. S. 1,696,867, Dec. 25. In order to render leather smooth, durable and pliable, it is treated with a compn. formed from white pine pitch 25 lbs., linseed oil 2.5 qts. and beeswax 6 lbs.

Treating skins. PROGR. Fr. 640,112, Feb. 4, 1927. For unhairing and preserving, skins are treated with proteolytic diastases of bacterial origin. The residual liquids from the growth of *B. subtilis*, *B. mesentericus*, *B. liquefaciens*, etc., may be used.

Treatment of leather and dried hides. FRIEDRICH POSPIECH. Can. 284,846, Nov. 13. Leather and dried hides are moistened and wetted out by treatment with aq. solns. of the sulfonic acids of compds. which are obtained by condensing naphthalene or the ring-substitution products of naphthalene in the presence of condensation and oxidation agents with alc. of the aliphatic series contg. more than 2C atoms. It is also possible to use the salts of such compds. Compds. of the above-mentioned kind are obtained, for instance, by condensing naphthalenemono- or polysulfonic acids at approx. 100° in the presence of H₂SO₄ with propyl alcs., butyl alcs., cyclohexanol or other higher alcs. The surplus of H₂SO₄ is removed from the condensation products in the usual way.

Treating hides or skins with tanning solutions or other liquids. E. LUCKHAUS. Brit. 290,681, May 19, 1927. The liquid is applied under alternate conditions of vacuum and pressure in an app. which is described and in which the hides or skins are moved and the liquid is stirred.

Tawing. VIKTOR SZIDON. Fr. 640,535, Feb. 18, 1927. An emulsion of pure animal or vegetable oils mixed with sulfonated oils is used in tawing instead of egg yolk. The sulfonated oils may be used in the form of their Al soaps. Glycerol may also be added.

Finishing leather. ABRAM SMALL. U. S. 1,696,815, Dec. 25. Leather is treated with a coating compn. contg. latex to lay the nap, allowed to dry, and then further treated with a coating compn. without latex, which may contain casein and other ingredients. It is allowed to dry again, dusted with comminuted material such as talc and subjected to high pressure between hot plates.

Dyeing leather. FRIEDRICH POSPIECH. Can. 285,054, Nov. 20, 1928. Good and uniform color is obtained by treating leather with wetting-out agents before or during the dyeing process, for instance, with aromatic sulfonic acids or their salts. Especially suitable are the sulfonic acids of alkylated naphthalenes, which are obtained by condensing naphthalenesulfonic acids with higher aliphatic alcs. in the presence of condensing and oxidizing agents. When basic dyestuffs or inorg. salts are used, the treatment must take place before the dyeing.

"Artificial leather." PHILIP MAGNUS. U. S. 1,694,129, Dec. 4. Cleaned scrap-leather is incorporated in a mixt. of glue, glycerol, boiled linseed oil, "carbolic oil," (NH₄)₂Cr₂O₇ and CaCl₂.

30—RUBBER AND ALLIED SUBSTANCES

C. C. DAVIS

Method of chemical analysis of rubber. MARJA SAGAJLO. *Przemysl Chem.* 11, 331-42 (1927).—These methods are essentially similar to earlier published methods. Cf. Collier and Boggs, *C. A.* 18, 1763. A. C. Z.

The effect of the silent electric discharge on rubber and decalin. GUIDO FROMANDI. *Kolloidchem. Beihefte*, 27, 189-222 (1928).—Theoretical considerations of the effect of the silent elec. discharge on liquid and solid substances and the methods of producing such discharges are first described. Decalin (decahydronaphthalene) was used as the solvent for rubber because it is free from O, which would otherwise be set free by the discharge in a very reactive form, because it is non-reactive to H, and because it has a low vapor pressure. The work includes a study of the effect of silent elec. discharges on decalin, natural rubber and synthetic rubber. The action of the discharge on decalin is manifest by a far-reaching structural change, which is accompanied by sp. chem. reactions dependent upon the gas to which the liquid is exposed during the discharge. The primary effect is a splitting off of H and the secondary effect a polymerization of the unsatd. mols. In an atm. of O the reaction result in the formation ozonides, while in an atm. of N the introduction of N in the decalin mol. is induced. Natural rubber dissolved in decalin undergoes an isomerization under the influence of the dis-

charge; and the I no., viscosity, softening point, and mol. wt. decrease until a powdery material results which has been termed cyclorubber because of its inactivity. Synthetic isoprene rubber, which because of its I no. might be termed cyclorubber, reacted similarly with the exception that the mol. wt. increased at first. It is probable that synthetic rubber could be transformed in this manner to approx. natural rubber in phys. and chem. reactions. The effects of the silent elec. discharge on decalin cannot be explained on the basis of ultra-violet light because of the difference in wave lengths and characteristics of the two discharges.

L. F. MAREK

Cream from latex. II. Rubber prepared from washed cream. O. DE VRIES, R. RIEBL AND N. BEUMÉE-NIEUWLAND. *Arch. Rubbercultuur* 12, 559-71(1928). (In briefer form in English 572-5).—Earlier expts. on the prepn. of centrifuged cream were continued on a larger scale by dilg. the cream again with water contg. NH_3 , and repeating the centrifuging process, dilg. the cream each time. In this way, primary, secondary and tertiary creams were obtained, from each of which the rubber was coagulated with HCO_2H and converted into crepe. The rubber from the original latex was light yellow; that from the primary and from the secondary latex was whitish; that from the tertiary cream was yellow; and that from underlatex was brown. All these rubbers were sticky, indicating that removal of sol. substances tends toward stickiness. The proportion of non-rubber substances in the cream decreased with each successive washing, while that in the underlatex increased, though these changes were not so great as was to be expected. After vulcanization the tensile strength of rubber from cream is lower than that of rubber from the original latex. The rate of vulcanization diminishes with each successive washing. Rubber from rewashed cream is plastic and has a low viscosity. Underlatex from washed cream yields a plastic rubber with a relatively low viscosity, and (when vulcanized) an abnormally high slope of its compression curve. The NH_3 may play a part in these effects (cf. *Arch. Rubbercultuur* 9, 392(1925); 11, 343(1927)). On keeping for a year or more the viscosity of the rubber from cream diminishes, while the d_{30} value does not change, with no evidence of progressive tackiness or resinification. On keeping, the abnormally high slope of the compression curve (*loc. cit.*) for rubber from secondary and tertiary cream disappears, the high viscosity of the primary underlatex also disappears, and d_{30} remain fairly const. Rubber from secondary and from tertiary underlatex becomes weaker on keeping. Centrifuging does not give a particularly uniform rubber (cf. Blommendaal and van Harpen, *C. A.* 22, 509), since a considerable quantity of serum substances remains in the cream the removal of which increases the time of cure by 20%. Non-rubber substances absorbed and held by the rubber may influence the rate of vulcanization. C. C. D.

Accelerator classification with regard to aging properties. ANON. *India Rubber J.* 75, 585-6(1928).—A criticism of the classification of accelerators given by Dinsmore and Vogt (cf. *C. A.* 22, 4273, 4876). In testing the antioxidant power of accelerators, it is misleading to use the same type of mixt. because certain ingredients have a favorable action on some accelerators and an unfavorable action on others. It is claimed that with accelerators present, accelerated aging tests (air or O) often fail to duplicate the results of natural aging.

C. C. DAVIS

Accelerators as antioxidants. R. P. DINSMORE AND W. W. VOGT. *India Rubber J.* 75, 824(1928); cf. preceding abstr.—A reply. A single type formula is justifiable in that there are no ingredients known which influence differently the antioxidant properties of accelerators. Good aging of vulcanizates is often attributed to a beneficial action of the accelerator used, whereas the natural antioxidants of the rubber are responsible. **Reply.** ANON. *Ibid* 824.—Cases are cited to show that certain well-known ingredients influence the aging of vulcanizates when used in conjunction with certain accelerators. Many accelerators give resistance to aging in addn. to that of the natural antioxidants.

C. C. DAVIS

Dispersoidological investigations. XXIII. The dispersoidology of rubber. I. P. P. VON VEIMARN *et al.* *Repts. Imp. Ind. Res. Inst. Osaka, Japan* 9, 9-50(1928); cf. *C. A.* 22, 4029.—The dispersoidological investigation of natural rubber was undertaken as a preliminary to a study of the conditions under which other substances may be obtained in the rubber-like state. *Hevea* latex and Vultex (preserved with NH_3) contain particles of many shapes, including spheres, egg- and pear-shapes and particles with tails. Particles with such shapes may be found in any emulsion whose drops of disperse phase are coated with a plastic membrane. The original form of *Hevea* latex particles is spherical; the secondary shapes are the result of deformation and flowing together during movement in plants. Spherical particles were observed in latex with diams. from several tenths of $\text{m}\mu$ to 3.5μ . The longest particle with a tail was 6.7μ . The particles are believed to consist of "liquid-gelatinous isospherulites" of latex, surrounded

by a transitory envelope composed chiefly of proteins with an admixt. of resins. The existence of an intermediate layer of solid polymer of rubber as postulated by Freundlich and Hauser is questioned. Latex particles can be caused to flow together by squeezing them or by adding satd. aq. LiI soln., which is a powerful dispergator for proteins. No evidence of microscopical inhomogeneity of the contents of *Hevea* latex particles was obtained, though the presence of the Tyndall effects proves them to be ultramicroscopically disperse. During vulcanization, all of the rubber contents of latex particles become vulcanized, but though the viscosity of the contents of the particles becomes very great, the particles are still capable of flowing together under pressure. Latex and Vultex can be coagulated by mixing with equal vols. of very concd. aq. solns. of LiI, LiCNS, Ca(CNS)₂, CaCl₂, Ca(NO₃)₂ or polyphenols and then washing the coagula very thoroughly in water. The consistency of the dispersion during gelatinization passes through 5 stages, characterized, resp., by very high viscosity, gruel-like consistency, sticky elastic threads, plasticity and high elasticity. A coagulum may possess different consistencies in its different parts. Rods of latex coagulated in test tubes can be stretched to more than double their length without breaking and exude a turbid serum contg. uncoagulated particles. The stretched rods possess a silky gloss, because of their fibrous structure. On releasing they retain a residual elongation which decreases slowly with time. Fresh jellies are distinctly vectorial in properties and may be torn apart easily in the longitudinal direction. Rods of Vultex made in the same way are more easily torn to pieces, do not stretch so far, but require more force for stretching them, contain more uncoagulated particles, and are much more porous in structure. Microscopical and ultramicroscopical study of latex in each of its 5 stages of consistency show that in the viscous stage the latex particles are only beginning to flow together, most of them being still free and in Brownian movement. In the gruel-like stage the particles are clotted together but still retain their individuality. In the stage of sticky threads the rubber contents of contiguous particles have flowed together, so that on deforming the mass, long threads of united particles are produced. In the plastic stage the dispersion medium is rubber in which are dispersed pieces of the non-rubber substances formerly constituting the particle envelopes. In the highly elastic stage the rubber mass has a fibril structure resulting from strains in the films. The changes in consistency of rubber, like those in natural silk, are typical of "coagulation or change in consistency by movement." The only essential difference between the gelatinization of Vultex and that of latex is that the flowing together of the contents of the particles is slower in the Vultex. The structures possible in latex or Vultex jellies are exceedingly numerous, and vary greatly with the age of the jellies and their mech. treatment. Fresh jellies are poly-disperse, micro- and ultramicro-cellular (membranous) jellies. Old jellies possess a fibril structure which may be latent, *i. e.*, the jelly may seem to be ultramicroscopically homogeneous. Lamellar structure is also possible in latex and Vultex jellies. The cause of the high elastic properties of rubber lies only in the inner rubber contents of the latex particles, not in the proteins and resins forming the envelopes of the particles. It is assumed that rubber is a mixt. of liquid and solid polymers, the former changing very slowly into the latter, and that the mol. of rubber has a spiral structure. F. L. BROWNE

The use of rubber as a core binder (GROVES-PALMER) 9. The formation of gels. Vulcanized oils (KNIGHT, STAMBERGER) 2. The resistance to bending of easily deformable materials, especially vulcanized rubber (ARIANO) 2. Varnish "reviver" containing chlorinated gutta-percha (U. S. pat. 1,695,642) 26. Composition (containing chlorinated rubber for coating straw hats (U. S. pat. 1,695,639) 25. Varnish containing chlorinated rubber (U. S. pat. 1,695,638) 26. Coating composition containing chlorinated rubber (U. S. pat. 1,695,640) 26. Driving and conveying belts of woven fabric and rubber (Brit. pat. 289,828) 25.

CARLOS, J., AND SOARES, M. Le caoutchouc, étude économique et statistique. Encyclopédie du caoutchouc et des matières plastiques. Paris: A. D. Cillard. 1929. pp. Retrieved in *Ind. Eng. Chem.* 21, 195(1929).

Rubber. WILHELM L. UTERMARCK. Fr. 639,961, Aug. 24, 1927. A very durable rubber is obtained

Rubber from plant materials. WILLIAM H. YEANDLE (to Intercontinental Rubber Co.). U. S. 1,695,676, Dec. 18. Rubber-bearing plant material such as guayule shrub is permeated with steam and subjected to increased gaseous pressure and the pressure is then suddenly released to disrupt the plant cells and liberate their contents and facilitate the sepn. of the rubber. An app. is described. Cf. C. A. 22, 2685.

Treating latex. DUNLOP RUBBER Co., LTD., D. F. TWISS and E. A. MURPHY. Brit. 290,313, Nov. 13, 1926. A gentle continuous mixing action is maintained during the concn. by evapn. of latex to which compounding ingredients and stabilizing agents have previously been added. Several examples and formulas are given.

Treating latex. W. A. WILLIAMS. Brit. 289,965, Feb. 7, 1927. In electrodeposition of rubber from latex or the li'ce, an electrolyte which will not readily cause coagulation but will act as a self-excitant between electrodes, is added to the latex, and externally connected electrodes are introduced to effect rubber deposition on the anode, e. g., NH_4Cl in aq. soln. may be added to the latex which may have been preserved with NH_3 and may also be admixed with ZnO and S , etc. The anode may be of Zn and the cathode may comprise a porous pot contg. C and MnO_2 .

Treating latex. W. A. GIBBONS and J. MCGAVACK (to United States Rubber plantations, Inc.). Brit. 290,242, May 11, 1927. See U. S. 1,673,672 (C. A. 22, 2855).

Rubber compositions. B. W. NORDLANDER (to British Thomson-Houston Co., Ltd.). Brit. 290,602, May 16, 1927. An amorphous compd. of mixt. of S and a stabilizer such as Se or Te is used for vulcanizing rubber. Details are given of prepn. and use of the compn.

Stabilized chlorinated rubber composition. CARLETON ELLIS (to Chadeloid Chemical Co.). U. S. 1,695,641, Dec. 18. Chlorinated rubber contg. not less than about 67% Cl is admixed with PhNH_2 , toluidine, xyldine, urea or other suitable org. amino antacid.

Apparatus for melting paraffin and mixing it with rubber compositions. ELMER S. WHITTIER (to Fisk Rubber Co.). U. S. 1,696,826, Dec. 25. Structural features.

Porous or spongy rubber. F. RINGER. Brit. 290,447, May 26, 1927. See Fr. 634,694 (C. A. 22, 4007).

Coloring rubber. I. G. FARBENIND. A.-G. Fr. 640,036, Aug. 26, 1927. See Brit. 277,034 (C. A. 22, 2493).

Deodorizing rubber. JEAN L. H. DE G. DE BÉARN. Fr. 640,145, Feb. 7, 1927. Rubber is deodorized by allowing it to remain for several days between 2 layers of finely ground dry charcoal, particularly oak charcoal.

Preserving rubber. ALBERT M. CLIFFORD (to the Goodyear Tire and Rubber Co.) Can. 285,541, Dec. 11, 1928. Naphthalene substituted diamines are used as antioxidants in rubber compds. These materials are prepd. by the reaction of the naphthols with an alkylene- or an arylenediamine. The reaction products of β -naphthol with ethylenediamine and with *m*-phenylenediamine are specific examples of the materials which may be used. Cf. C. A. 23, 309.

Rubber articles. EARDLEY HAZELL (to the Dominion Rubber Co., Ltd.) Can. 284,564, Nov. 6, 1928. Rubber articles are manufd. directly from latex to which has been added a Zn compd. (oxide, hydroxide or any sol. Zn salt dissolved in water or in a soln. contg. NH_4OH in excess) and a soln. of sulfides or polysulfides of Na , K , Li or NH_4 , and depositing rubber from the thus treated latex on a porous form in the shape desired.

Rubber articles. GEORGE G. THORNTON (to the Dunlop Rubber Co., Ltd.) Can. 284,962, Nov. 20, 1928. Rubber articles are formed by depositing the material by electrophoresis on an anodic mold, stripping the deposited material from the mold, placing the material between two surfaces, and vulcanizing by immersing the article in a boiling aq. soln. while permitting the surfaces to move relatively to one another.

Rubber articles manufactured by dipping. GEOFFREY W. TROBRIDGE and EDWARD A. MURPHY (to Dunlop Rubber Co., Ltd.) Can. 284,565, Nov. 6, 1928. A porous mold is dipped into a coagulant (CaCl_2 , AcOH or alum), and afterward dipped into a compounded latex including such materials as ZnO , carbon black and other materials commonly employed in the compounding of rubber. Vulcanizing agents such as S and if desired accelerators of vulcanization may be added to the latex. A suction may be applied to the interior of the porous mold or pressure may be applied to the exterior of the mold. After the dipping process there is removed from that part of the mold farthest from the deposited latex, the coagulant and a part of the water and serum by suction on the interior of the mold. Drying and vulcanization may then be effected, and the article removed. Cf. C. A. 22, 4274.

Rubber conversion products. HARRY L. FISCHER (to the B. F. Goodrich Co.). Can. 284,980, Nov. 20, 1928. Rubber (100 parts) is admixed with 10 parts of catechol and 20 parts of $\text{Ph}_2\text{NH}\cdot\text{HCl}$ and after being thoroughly admixed is placed in a suitable heater maintained at 320° for about 20 hrs. or until conversion is complete. A hard tough material is thereby produced. In general a bath consisting of rubber 100 parts by wt., a phenol 10 to 20 parts and one of the compounds selected from the following empirical class, 20 to 30 parts when treated as above described will yield conversion products. The empirical class includes chlorinated rubber, rubber hydrochloride, rubber sulfur chloride, chlorinated rubber hydrochloride, pinene hydrochloride, $\text{Ph}_2\text{NH}\cdot\text{HCl}$, $\text{Cl}_3\text{C}_6\text{H}_2\text{NH}_2\cdot\text{HCl}$, $m\text{-O}_2\text{NC}_6\text{H}_4\text{NH}_2\cdot\text{HCl}$, HgCl_2 , SnCl_4 , naphthalene tetrachloride, Ph_3CCl , ZnBr_2 , HgBr_2 , rubber dibromide, $\text{Ph}_2\text{NH}\cdot\text{HBr}$, CdSO_4 , $\text{Al}_2(\text{SO}_4)_3$, HgSO_4 , $\text{Ph}_2\text{NI}\cdot\text{H}_2\text{SO}_4$ and $\text{PhNH}_2\cdot\text{Cl}_3\text{CCO}_2\text{H}$.

Rubber conversion products. HARRY L. FISHER (to the B. F. Goodrich Co.). Can. 284,981, Nov. 20, 1928. Conversion products of rubber are produced by forming a liquid admixt. of rubber, a rubber solvent, a phenol and a substance selected from a class comprising HCl , HBr , $\text{CCl}_3\text{CO}_2\text{H}$, dil. H_2SO_4 , org. sulfonic acids, and org. sulfonyl chlorides, and heating the admixt. at approx. the boiling temp. for an extended period, preferably under reflux to prevent loss of solvent in the admixt.

Rubber threads. MAX DRAEMANN and MAX BÜHLING. Fr. 640,179, Aug. 9, 1927. An app. is described for making threads of rubber by pressure of the rubber through perforated plates.

Artificial threads from chlorinated rubber. CARLETON ELLIS (to Chadeloid Chemical Co.). U. S. 1,695,643, Dec. 18. A concd. soln. of chlorinated rubber is formed into filaments (suitable by extrusion through as fine orifice) and the solvent is removed. The product may be used for making fabrics.

Increasing the plasticity of rubber. CARLETON ELLIS (to Chadeloid Chemical Co.). U. S. 1,695,636, Dec. 18. Rubber is given an increased plasticity without dissolving it, by incorporating with the unvulcanized rubber a quantity of an aromatic solvent such as C_6H_6 , which is not greater than the quantity of the rubber and then treating the material with Cl under pressure to effect chlorination to a stage above heptachloro-rubber.

Adhesive comprising chlorinated rubber. CARLETON ELLIS (to Chadeloid Chemical Co.). U. S. 1,695,637, Dec. 18. Chlorinated rubber is used with a solvent such as S_2 or C_6H_6 to form an adhesive which is suitable for various purposes.

Splicing ends of rubber tubes to form tire tubes, etc. JOHN P. COE (to G. & J. Foe Co.). U. S. 1,693,636-7, Dec. 4.

Manufacture of rubber tires for vehicles. ERNEST HIBBERT (to Hibbert Pneumatic Cell Tyre Co., Ltd.). U. S. 1,694,260, Dec. 4. Mech. features.

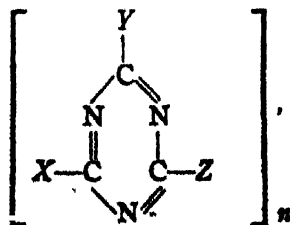
Waste rubber. COGEDEX (COMPAGNIE GÉNÉRALE D'EXPLOITATION) SOCIÉTÉ ANON. Fr. 640,322, Aug. 31, 1927. Waste rubber is powdered and mixed with latex, which acts as a solvent and plastifying agent. S is added and the mass vulcanized.

Rubber substitute. ROGER A. L. SELIGMAN. Fr. 640,147, Feb. 7, 1927. Asbestos is intimately mixed into a soln. of rubber and the solvent evapd. The asbestos is preferably treated with S and heated to about 150° in the absence of O before mixing.

Apparatus for vulcanizing tire casings or similar articles. HENRY WILLSHAW (to Dunlop Tire and Rubber Corp. of America). U. S. 1,695,835, Dec. 18.

Vulcanizing rubber. IWAN OSTROMUISLENSKII (to Revere Rubber Co.). U. S. 1,696,400, Dec. 25. Vulcanization without S is effected in the presence of org. nitro compds. such as 1,3,5-trinitrobenzene by combining the rubber with a nitrobenzene and with C black or other element of the C group and then effecting the vulcanization.

Vulcanizing rubber. SOC. ANON POUR L'IND. CHIM À BALE. Brit. 290,178, May 7, 1927. Vulcanization is effected in the presence of various compds. of the general formula,



in which X and Y are any residues, and Z is a H atom or a radical connected with the C atom by N , O or S .

Vulcanization of rubber. THE INDIA RUBBER, GUTTA PERCHA & TELEGRAPH WORKS Co., LTD. Fr. 640,615, Aug. 1, 1927. In the vulcanization of rubber coverings for rollers, etc., the roller is surrounded with a heating fluid and the interior is independently supplied with a heating fluid. The exterior is treated with hot water under pressure, while steam at a higher temp. is circulated through the interior.

Imitation patent leather. ROBERT C. HARTONG (to Seiberling Rubber Co.). U. S. 1,694,258, Dec. 4. A rubber compn. is calendered upon a smooth surface such as a metal sheet capable of transferring its surface effects to the compn., a textile material frictioned with a rubber compn. is doubled upon the first-mentioned compn., and the product is vulcanized.

Catgut substitutes. DUNLOP RUBBER Co. Swiss 126,171, Nov. 24, 1926. See Brit. 264,640 (C. A. 22, 165).

CHEMICAL ABSTRACTS

Vol. 23.

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No. 5

1—APPARATUS AND PLANT EQUIPMENT

W. L. BADGER

The chemical tablet. ALBRECHT. *Chem. Fabrik* 1928, 658.—Rectangular tablets of wood, rather than of enameled Fe, 40 × 60 × 5 cm., are recommended for holding laboratory app. that must be transported, as for washing, weighing, etc. W. C. E.

Three laboratory devices: a vacuum stirrer, a pressure alternator and a gage for measuring low pressures of permanent gases in condensable vapors. ROGER K. TAYLOR. Johns Hopkins Univ. *J. Am. Chem. Soc.* 50, 2937-40(1928). J. H. P.

Improved laboratory rectifying column. MELVILLE J. MARSHALL. Univ. British Columbia, Vancouver, B. C. *Ind. Eng. Chem.* 20, 1379(1928).—A modification of the lagged lab. column with reflux for partial condensation is described. The figure given in the paper is self-evident.

ALBERT L. HENNE

Dufton distilling column for the preparation of absolute alcohol. W. A. NOYES. Univ. Illinois. *Ind. Eng. Chem.* 20, 1190-1(1928).—Com. alc. is boiled through a brass Dufton column. A chamber on top of the column contains CaCl_2 and a condensing coil, to cause the alc. to reflux through the salt and wash the vapors rising in the column. Alc. of 98-99% is thus obtained.

ALBERT L. HENNE

Rapid method for calibrating burets. Z. MINDALEV. Moscow Tech. Hochsch. *Z. anal. Chem.* 75, 390-2(1928).—The method described is a modification of the Ostwald method. Three burets are used, the first serving to supply water to the others. The burets are connected by a T joint at the bottom of each buret and buret 2 is placed a little lower than buret 1 and a little higher than buret 3. A definite vol. in the middle buret is detd. by accurate weighing. This vol. of water, say 2 cc., is transferred repeatedly to the third buret and the reading noted. When, after careful checking, the third buret is entirely calibrated, it is used as the middle buret for the calibration of all the other burets in the lab.

W. T. H.

Use of the Mariotte bottle as a constant-rate gas-sampling device. O. W. WEIGHT. *J. Soc. Chem. Ind.* 47, 247-8T(1928).—Liquid flows at a const. rate from a Mariotte bottle, but the same is not true for the gas entering the bottle. Consequently, this device is to be modified if used as a constant-rate sampling app.

ALBERT L. HENNE

Apparatus for microanalysis of gas. C. H. PRESCOTT, JR. California Inst. of Techn. *J. Am. Chem. Soc.* 50, 3237-40(1928).—An app. is described capable of analyzing CO_2 , CO, H and N in a $1\frac{1}{2}$ cc. sample. The analysis is carried out at low pressure, and readings are made of the pressure required to obtain a fixed vol. in the measuring chamber.

ALBERT L. HENNE

Unbreakable explosion pipet. FREDERICK W. ISLES. Standard Oil Co. of New Jersey. *Ind. Eng. Chem.* 20, 1163(1928).—The pipet is a steel pipe fitted with a spark plug.

ALBERT L. HENNE

Apparatus for chromic anhydride oxidations. WALLACE F. SHORT. Univ. College, Auckland, New Zealand. *J. Chem. Soc.* 1928, 2630.—A modification of the Walker EtI app. uses the Soxhlet principle to introduce CrO_3 into the reaction mixt. A. F.

The densi-tensimeter. ANDREAS SMITS. Univ. Amsterdam. *J. Chem. Soc.* 1928, 2409-10.—An app. is devised for the simultaneous measurement of the vapor pressure and vapor density of intensively dried gases.

ARTHUR FLEISCHER

Tantalum as a material for making chemical apparatus. FR. HEINRICH AND F. PERTZOLD. *Chem. Fabrik* 1928, 689-91.—A compilation of data on the phys. and chem. properties of Ta, supplemented by the authors' expts., indicates that although it may serve well for the manuf. of chem. app. because of its great resistance to the attack of acids, yet limitations as to the temp. at which it may be used, especially in the presence of various gases, may prevent it from becoming wholly acceptable for this purpose.

W. C. EBAUGH

"Acid-proof" packing for absorption towers. CHARLES H. BUTCHER. *Ind. Chemist* 4, 446-8(1928).—The desirable features of the ideal packing are given in de-

tail under the following heads: (1) max. of effective scrubbing surface in relation to free gas space, (2) distribution of wash liquor with absence of "channelling," (3) length of path in contact with the wash liquor. Avoidance of spread of gas by the baffling action of the packing, (4) resistance offered by the packing to the flow of gas, (5) durability in construction, weight, adaptability to circular or square towers, (6) prevention of stagnant pools of wash liquors and pockets of gas, (7) shapes and methods of placing packing must not induce accumulation of deposits. Illustrations of the best known shapes of manufd. tower packings are included. A tabulation of the characteristics of 66 different variations of packing (including coke and quartz) is given, together with a graph of these 66 in which "free gas space (percent)" is plotted against "surface (sq. ft. per cu. ft. of tower space)." The points plotted have been projected to cut the "50% of free gas space" ordinate, to place the packings in order of efficiency. New packings may be plotted on this chart and projected in the same manner.

E. G. R. ARDAGH

Organic solvents and rubber-lined plant. A. BRESSER. *Ind. Chemist* 4, 482-3 (1928).—The results are given of the effect of the following org. solvents employed in the varnish industry on test pieces of iron strips coated with rubber and of the effect of the rubber on the solvents: isobutyl alc., propyl alc., softener O, butyl acetate (98-100%), Et acetate, butyl alc., acetone oil A, Me-Et ketone, dichlorohydrin, triacetin, diethyl carbonate. Three grades of rubber coating were examd.; the period of test was 12 weeks and the temp. maintained between 18° and 20°. One grade of rubber (German patent 462,457; more detailed information not available) shows in nearly all cases an excellent resistance to these solvents. Cf. *C. A.* 22, 3320. E. G. R. A.

Power-plant development limited by available materials. T. FARRANCE DAVEY. Long Beach, Calif. *Power* 69, 129-31 (1929).—A diagram shows changes in ultimate tensile strength and effect of creep with temp. for 12 metals and alloys. The uses and characteristics of some of these alloys are discussed.

D. B. DILL

A sensitive reducing valve and overflow valve for steam, air and water. F. SCHLEGEL. *Chem. Fabrik* 1928, 656.—A regulating valve (F. Mattick, Dresden-A. 24) is described briefly.

W. C. EBAUGH

Conveying systems in chemical factories. PAUL JACOBI. *Chem. Fabrik* 1928, 654-6, 666-7.—A general description of various types of cranes, power shovels, loading and unloading machinery, elevators, surface and overhead conveyors, rail and truck systems.

W. C. EBAUGH

Potash and borax from Searles Lake. JOHN E. TREPLE. *J. Soc. Chem. Ind.* 47, 345-7T (1928).—A discussion of the circumstances under which the chem. engineer should select standard equipment for his work and of those under which he is justified in designing special equipment. This is illustrated by examples (a continuous vacuum crystallizer, a continuous vacuum cooler, a continuous salt separator, continuous evaporators, etc.) in which it is pointed out in each case why it was necessary to depart from standard equipment and design what T. calls "unconventional equipment." E. M. S.

Methodology of gas chains. S. V. GORBACHEV. *Trans. Sci. Chem.-Pharm. Inst. (Moscow)*, No. 12, 39-41 (1925).—In part I G. describes and illustrates a simple H electrode which may be used for small quantities of liquid. In part II he describes and illustrates his modification of a capillary electrometer, which is not subject to the well-known phenomenon of going "dead" or becoming poisoned.

J. S. JOFFE

The electrode with glass membrane for measuring pH. GUISEPPE A. BRAVO. *Natl. Inst. for the Leather Ind., Turin. Boll. ufficiale staz. sper. ind. pelli mat. concianti* 6, 329-36 (1928).—A review.

G. SCHWOCH

The potentiometric titration apparatus. ISABURO WADA. *Bull. Inst. Phys.-Chem. Research (Tokyo)* 7, 439-51 (1928); *Abstracts* 1, 40-1.—A new rugged app. has been devised by W. and manufd. by the institute; it is claimed to be an improvement, but is not described in the English paper. Its complete description is given in the Japanese paper.

ALBERT L. HENNE

A method of maintaining constant humidity in closed chambers. R. H. STOUGH-TON. *J. Sci. Instruments* 5, 364-6 (1928).—A carbon-filament lamp is covered with muslin, which dips into a beaker of distd. water. The lamp is inclosed in a tin container with a hole for the muslin in the bottom and two holes for rubber stoppers diametrically opposite near the top. A glass tube projects through each stopper, one tube being drawn out to a jet, and the other being widened like a funnel. Air is blown constantly through the tubes and tin into the chamber. A hair-hygrometer in the chamber operates a relay to turn the lamp on and off.

M. W. SEYMOUR

A sensitive thermoregulator. D. H. BLACK. *J. Sci. Instruments* 5, 376-7 (1928).—For the control of an electrically heated air oven, a bimetallic strip 0.25 in. wide, 0.02

in. thick, and 30 in. long is wound around a rod to form a helix, and when heated receives a twisting movement which is conveyed to a contact arm that makes contact with a screw, closing a relay circuit which cuts off the heating current. Temp. of the oven may be kept const. within 0.04–0.1°.

R. J. HAVIGHURST

Construction and installation of a toluene-mercury thermostat. Wm. ROBINSON. Univ. of Minn. *Ann. Entomol. Soc. Am.* 21, 607–13(1928).—Details of construction and installation of the thermostat, the source of current for the thermostat circuit, type of elec. relay, adjustment of the relay, installation of the relay, and care of the app. are considered. The app. is especially designed for use in const.-temp. cabinets.

C. H. R.

Ferro-silicon alloy chemical plant (TUNGAY) 9. Dialyzer diaphragm (Fr. pat. 641,886) 23. Gas producers and furnaces (Fr. pat 641,904) 21.

FÜRTH, A.: *Die Werkstoffe für den Bau chemischer Apparate.* Chemische Technologie in Einzeldarstellungen. Edited by A. Binz. Leipzig: O. Spamer. 220 pp. Paper, R. M. 18; bound, R. M. 20.

MAWHINNEY, MATTHEW H.: *Practical Industrial Furnace Design.* New York: John Wiley & Sons, Inc. 318 pp. \$4. Reviewed in *Mech. Eng.* 51, 93(1929).

Flameless laboratory crucible smelter. P. A. YERMOLOV. Russ. 3861, Oct. 31, 1927.

Mechanical calorimeter. GEORG ISING. Ger. 469,635, Jan. 22, 1926.

Mechanical calorimeter. HERMANN BUSCHBAUM. Ger. 469,669, Jan. 24, 1926.

Centrifuge. SOC. FRANÇAISE DE CENTRIFUGATION AND JEAN A. L. ROZIÈRES. Fr. 642,164, Oct. 11, 1927. A centrifuge particularly for the wash waters from wool is made so that the space of the bowl occupied by the wool powder and water narrows to the axis on the outlet side.

Clarifying centrifuge. SCHWARZWALDWERKE LANZ KOMM.-GES. Ger. 468,442, April 9, 1925. Constructional details.

Centrifugal apparatus for clarifying liquids in bottles. GEORGES RAY. Swiss 127,026, June 15, 1927. Constructional details.

Measuring funnel. MAX HUYINK. Ger. 468,588, Aug. 6, 1927. The funnel and its closing rod are both graduated.

Funnel for filling or filtering liquids into bottles. JOSEF WEISS. Austrian 110,522, April 15, 1928. The funnel has a fixed or movable bell-shaped support which rests on the neck of the bottle and is perforated to allow escape of air.

Filter. HERMAN HILLINGA. Fr. 641,613, Sept. 28, 1927. A filtering app. particularly for rubber latex but applicable for other substances consists of a number of vessels one inside the other with perforated walls, the perforations being so arranged that the liquid flows up and down through the app. and the perforations are always below the surface of the liquid.

Filter. HENRI L. L. LECLÈRE. Fr. 642,113, Oct. 8, 1927. A filter comprises a cylindrical or conical chamber on a horizontal axis, in which a transporting screw turns so as to move the substance to be filtered from one end to the other, and the wall of the chamber or of the screw form the filtering medium.

Filters. GEROLAMO MUSSINO. Fr. 642,370, Oct. 5, 1927. Porous stone is used as filtering medium for air, gasoline, etc. Fr. 642,371 describes a mounting of such filtering medium in a cylinder, the filtrate passing to the center of the cylinder.

Bevelled bars for screening and filtering apparatus. H. SCHUBERT. Brit. 292,054, March 3, 1927. Structural features.

Rotary filters for filtering liquids. BRINJES & GOODWIN, LTD., and F. TITTERTON. Brit. 291,148, Feb. 24, 1927. Structural features.

Cloth and wire-mesh filters for colloidal liquids, emulsions or suspensions. M. G. W. HUMMELINCK. Brit. 291,810, Dec. 8, 1926.

Filter for milk or other liquids. J. COULTHARD. Brit. 291,213, May 11, 1927. Filtering pads are made from a mixt. of absorbent and non-absorbent cotton wool with a backing of adhesive such as starch, farina or gelatin.

Filter for air or gas. DELBAQ-ENTSTAUBUNG G.M.B.H. Fr. 641,329, Sept. 23, 1927. A filter for air or gas is composed of a number of elements mounted in a frame or on a moving band or cylinder, to superimpose one another in the form of scales or tiles, each element being pivoted at one end. By varying the inclination the density of the filtering wall is varied.

Device for separating entrained particles of dust, etc., from air or other gases. GEORGE C. WEBSTER. U. S. 1,697,743, Jan. 1. A device with baffles and filters is described.

Cleaning device for dust filter. ANTON SEIBERL. Austrian 110,391, Mar. 15, 1928. Constructional details.

Apparatus for separating suspended impurities from gases. HENRI HAEGLER. Swiss 127,029, May 17, 1927. Constructional improvements are described in app. of the type in which the sepn. is effected centrifugally or by abrupt changes in the direction of the gas.

Filter press. SEITZ-WERKE G. M. B. H. Ger. 468,474, Mar. 26, 1925. Structural features.

Magnetic separator. FRIED. KRUPP GRUSONWERK A.-G. Ger. 469,165, May 21, 1927. Details of construction.

Drying apparatus. CHARLES LEMALE. Fr. 641,209, Mar. 3, 1927. A rotating drier for drying products such as *casein* at a low temp. under reduced pressure is described.

Drying apparatus. THE TECHNO-CHEMICAL LABORATORIES, LTD. Fr. 642,047, Oct. 6, 1927. App. for drying materials suspended in a gaseous medium and carried by this medium through a series of tubes, the walls of which are heated.

Combined drying and pulverizing apparatus. SOCIÉTÉ ANON. POUR L'UTILISATION DES COMBUSTIBLES. Fr. 641,057, Sept. 16, 1927.

Drying or moistening apparatus. ADOLF BOLEG. Ger. 469,592, June 12, 1927. The app. is of the kind comprising a no. of trays or hurdles on which the material is conveyed down a treating shaft.

Drum for drying granular materials with hot gases. ERNST FROEHLICH. Austrian 111,043, May 15, 1928. In a rotary drying drum of the kind traversed internally along its length by bars or the like over which the material trickles, the bars are screw-shaped or are formed of a no. of Y-pieces irregularly joined together.

Thermometer with scales in Centigrade, Fahrenheit, Reaumur and absolute degrees. P. L. MARKS. Brit. 291,311, Dec. 19, 1927.

Electrical thermometer with weather-proof leads. HARTMANN & BRAUN A.-G. Swiss 127,063, Sept. 5, 1927. Constructional details.

Combined mercury and gas thermometer. G. M. ASTATUROV. Russ. 3737, Oct. 31, 1927.

"Distant-reading" temperature indicator suitable for use on automobile engines. EDWARD L. FONSECA (to Wilcolator Co.). U. S. 1,699,104, Jan. 15.

Apparatus for the rapid adjustment of temperatures or pressures. ASKANIA WERKE A.-G. formerly CENTRALWERKSTATT DESSAU AND CARL BAMBERG FRIEDENAU. Fr. 641,161, Sep. 20, 1927.

Automatic device for controlling temperature and humidity in incubators, etc. RUSSELL J. HILL. U. S. 1,699,143, Jan. 15.

Temperature safety device of the bimetallic strip type. ÖSTERREICHISCHE SIEMENS-SCHUCKERT-WERKE. Austrian 109,934, Feb. 15, 1928. Constructional details.

Magnetic pyrometer suitable for temperature control. THOMAS SPOONER (to Westinghouse Elec. & Mfg. Co.). U. S. 1,697,148, Jan. 1.

Pyrometer. RUDOLF HASE. Ger. 468,360, Dec. 2, 1926. Addn. to Ger. 466,475. Details of construction.

Optical pyrometer. D. C. GALL. Brit. 291,971, June 29, 1927. Structural features.

Optical pyrometer. RUDOLF HASE. Ger. 466,475, July 24, 1926. Details of construction.

Fixing pyrometers in shaft furnaces. WILHELM SCHUSTER. Austrian 110,867, May 15, 1928. The pyrometer is fixed in a conduit in the masonry traversed by part of the furnace gases.

Vacuum-measuring apparatus. ÖSTERREICHISCHE BROWN BOVERI-WERKE A.-G. Austrian 110,821, May 15, 1928. Constructional improvements are described in app. of the kind in which a heating resistance influenced by the vacuum forms a branch of a Wheatstone bridge.

Oxide cathodes of vacuum tubes. KAREL M. VAN GESSEL. U. S. 1,699,639, Jan. 22. A cathode which may be formed of W is oxidized and then subjected to the vapor of a base such as Ba to form the desired coating on the cathode.

X-ray apparatus. WILLIAM K. KEARSLEY, JR. (to General Electric Co.). U. S. 1,698,334, Jan. 8. Structural features.

X-ray apparatus. SIEMENS-REINIGER-VEIFA GESELLSCHAFT FÜR MEDIZINISCHE TECHNIK M. B. H. Fr. 641,001, Sept. 15, 1927.

Safety device for Röntgen tubes. SIEMENS & HALSKE AKTIEN-GESELLSCHAFT. Fr. 641,408, Sept. 26, 1927.

Neon tubes. RAPHAËL FRAJND. Fr. 642,440, Oct. 15, 1927. Neon tubes are made by cleaning and heating the glass tubes, furnishing large and small electrodes previously freed from occluded gas, making a vacuum in the tube, purging it and the electrodes with pure N, and then introducing Ne purified by passing it over wood charcoal at -80° .

Metallic vapor or luminescent rare-gas lamps or tubes. JULES AUGUSTE FLORIMONT. Fr. 641,701, Oct. 1, 1927.

Evacuating audion tubes. ERNEST A. LEDERER (to Westinghouse Lamp Co.). U. S. 1,699,597, Jan. 22. During preliminary heating to drive out gases, a clean-up agent such as Mg is positioned in a portion of the device which is not strongly heated and is afterward moved into a heated position and heated to exert an active effect in removing residual gases.

Manufacture of electron tubes. RADIOWERK F. SCHIRACK. Ger. 469,686, June 30, 1925. Manipulative details

Electron emitter. ANTON LEDERER. Fr. 639,367, Aug. 1, 1927. An incandescent cathode for electron tubes, etc., is composed of Th (2-50%) incorporated with Os or other metal from crude Pt. A core of W may be used.

Electron discharge apparatus. I.E. MATÉRIEL TÉLÉPHONIQUE (SOCIÉTÉ ANON). Fr. 641,413, Sept. 26, 1927.

"Cleaning up" residual gases in vacuum tubes. DUNCAN MACRAE (to Westinghouse Lamp Co.). U. S. 1,699,112, Jan. 15. A galvanized iron electrode is used which may be heated to cause vaporization of the Zn to effect "clean up" of residual gases.

Sealing vacuum cocks or vessels. MARIE ANNA SCHIRMANN. Austrian 109,897, Feb. 15, 1928. The cock or other closure of a vacuum vessel is sealed by the elec. tension set up between microscopically thin, continuous liquid films adsorptively held on the surfaces to be pressed together. Cf. C. A. 21, 2582.

Thermionic valves. H. M. ELSEY and A. T. KROGH (to Westinghouse Elec. & Mfg. Co.). Brit. 291,400, June 1, 1927. A coating material for a thermionic cathode comprises a mixt. of one or more compds. of the alk. earth metals such as carbonates of Ba and Sr and a vehicle such as EtOH and MeOH which is volatile at temps. below 200° and is capable of producing a reducing atm. when heated. Hydrazide salts also may be used. The core wire is passed through the coating material and then heated in a closed furnace contg. CO, and the process may be repeated to obtain a thicker coating. After mounting in a valve, the wire is heated to convert the coating into oxide.

Multiple electrode discharge tube. ANTON BAMBULA. Austrian 110,111, Feb. 15, 1928. Constructional details.

Electric discharge devices. SIEMENS & HALSKE A.-G. Brit. 291,785, June 10, 1927. In making thermionic cathodes suitable for gas rectifiers as described in Brit. 289,381 (C. A. 23, 552) and in which the cathode surface consists of an alloy of the core metal with a high proportion of electron-emitting metal such as Th, there is used for producing the coating a compd. contg. O such as Th nitrate, with a flux such as borax or other suitable P or B compd.

Electric discharge device. V. K. ZWORYKIN (to Westinghouse Elec. & Mfg. Co.). Brit. 291,763, June 8, 1927. Active surfaces are formed by layers of different materials so thin as to be transparent. A layer of an alkali metal such as K, Na or Rb, or Ca may be deposited on a layer of metal of lower vapor pressure such as W or Mo. A device is described which may be used as a *photoelec. cell*.

Electric discharge vessels. ANTON LEDERER. Fr. 641,418, Sept. 26, 1927. A mixt. of one or more alkali metals with one or more reducing agents is introduced into elec. discharge vessels filled with He, etc., and the alkali metal vapors liberated by heating are pptd. on the interior of the vessel.

Electric discharge vessel with two or more anodes. ERICH F. HUTH G. M. B. H. Ger. 469,595, Feb. 7, 1919.

Retort for destructive distillation. "CARLSHUTTE" A.-G. FÜR EISENGIESSEREI UND MASCHINENBAU. Ger. 469,379, Feb. 26, 1925. Structural modifications are described in a retort of the kind in which the material is distd. in stages while descending a series of superposed containers formed by movable slats obliquely arranged within the retort.

Heat regulator. SIEMENS-ELEKTROWÄRME G. m. b. H. Swiss 127,310, June 27, 1927. A heat regulator comprises a vacuous or gas-filled expansible casing contg. a

member connecting two contacts placed at different points of the casing, one of the contacts being adjustable from outside the casing.

Heat exchange apparatus. JOSEF MUCHKA (Max Muchka, inventor). Austrian 111,325, June 15, 1928. Structural modifications are described in heat exchange app. composed of plate-shaped members connected together at opposite edges by U-shaped edge members.

Heat exchangers. PIERRE EUGÈNE JOSEPH JÉRÔME COURTURAUD. Fr. 639,447, Jan. 24, 1927. To prevent hard deposits on heat exchangers traversed by combustion products they are coated with a paste of graphite, water and a sol. silicate, which hardens on drying.

Heat exchanger. SOCIÉTÉ D'ÉLECTRO-CHIMIE, D'ÉLECTRO-MÉTALLURGIE ET DES ACIÉRIES ÉLECTRIQUES D'UGINE. Fr. 641,914, Mar. 16, 1927. A heat exchanger for reactions under pressure such as catalytic gas reactions is composed of a stack of coils in a cylinder, the coils being wound from the center to the outside in one layer before passing to the layer above.

Heat exchange apparatus suitable for heating air by flue gases. THOMAS H. MURRAY. U. S. reissue 17,185, Jan. 1. Original pat., No. 1,548,158, was issued Aug 4, 1925.

Heat-exchange and pumping apparatus for heating and pumping oils. CHARLES E. LUCKE (to Worthington Pump and Machinery Corp.). U. S. 1,697,605, Jan. 1.

Furnaces. ERNEST FERRARI. Fr. 642,569, Oct. 19, 1927. The flue is automatically shut down when the charging doors are opened.

Furnaces. PAUL LEVÊQUE. Fr. 642,198, Oct. 12, 1927. Construction of hearth bars.

Charging furnaces. JOHANN GMEINDL and KARL MAYER. Ger. 470,074, April 30, 1925. Beneath the loading hopper is a rotary stop device with fins, actuated by an electromagnet for regulating the charging.

Annealing furnace. AUGUST FUCHS (to Westinghouse Elec & Mfg. Co.). U. S. 1,699,784, Jan. 22. Structural features.

Furnace for annealing articles in an inert atmosphere. SIEMENS-SCHUCKERTWERKE A.-G. Brit. 291,437, June 3, 1927. Structural features.

Continuous annealing furnace for heating sheets or plates. THADDEUS F. BAILY. U. S. 1,696,900, Jan. 1.

Muffle furnace. FRIED. KRUPP A.-G. (Lothar Otterstedt, inventor). Ger. 468,653, June 22, 1927. Structural features.

Smoke-consuming furnace. VEREINIGTE CHEMISCHE WERKE A.-G. and PAUL GROCHE. Ger. 468,422, Dec. 22, 1926. In a furnace in which steam is let into the fire space to promote smoke consumption, the steam inlets are in two or more superposed layers so arranged that the steam clouds intersect one another.

Furnace for heat treating, enameling, etc. HARRY F. SMITH (to Gas Research Co.). U. S. 1,697,373, Jan. 1.

Furnace and testing apparatus for testing the compressibility of heated materials which soften when compressed. HANS HIRSCH and HANS HECHT. U. S. 1,699,589, Jan. 22.

Furnace regenerator construction. AKTIEBOLAGET LJUNSTRÖM ANGTURBIN. Brit. 291,402, June 1, 1927.

Burner for dust fuel. TELEX APPARATEBAU- G. M. B. H. and WERNER HEINDORFF. Ger. 469,315, Dec. 22, 1923. Details of arrangement.

Rotating burner for powdered coal. SOCIÉTÉ ANON POUR L'UTILISATION DES COMBUSTIBLES. Fr. 641,478, Sept. 21, 1927.

Apparatus for feeding powdered coal and compressed air to furnaces. EWALD HERMSDORF. Fr. 642,437, Oct. 15, 1927.

Charging device for furnaces. ANTON CHMELICEK. Austrian 111,329, June 15, 1928. Structural modifications are described in furnace-charging means comprising a curved swinging shovel brought beneath the outlet of the fuel container.

Charging device for gas producers and other shaft furnaces. SOC. DES GRILLES & GAZOGÈNES SAUVAGROT. Ger. 469,392, May 15, 1927. The device is of the kind comprising a charging shaft having compartments which can be closed at top and bottom by two disks with oppositely set slits.

Charging device for horizontal and inclined retorts. GRAUE A.-G. Ger. 469,522, Mar. 8, 1928. The charge is placed in tubes, the upper and lower halves of which are relatively movable and which are so constructed that they can be introduced into the retort and then withdrawn, leaving the charge behind.

Charging hopper for shaft furnaces. EMANUEL SOBEK. Swiss 127,321, June 15,

1927. The upper part of the hopper is extended on one side to form a shoot for the charge.

Container for furnace charges. HERAEUS-VACUUMSCHMELZE A.-G. and WILHELM ROHN. Ger. 468,406, Sept. 9, 1928. The container is formed from smooth metal plates to which corrugated metal plates are riveted or welded on the inside, or both inside and outside.

Double closure for furnaces. A. G. BROWN, BOVERI, ET CIE. Swiss 127,085, June 2, 1927. Constructional details.

Regulating cooling of furnace parts. ERICH ROUCKA. Austrian 110,379, Mar. 15, 1928. The supply of cooling agent to the grate or other furnace parts to be cooled is effected periodically through a cam-actuated valve, the extent to which the valve is opened at each actuation being adjustable by means of suitably arranged wts.

Conveyor for passing gear blanks, bolts or other articles through heat-treating furnaces. FRANK T. COPE (to Electric Furnace Co.). U. S. 1,699,955, Jan. 22.

Furnace grate. JOSEF MUCHKA. Austrian 110,062, Feb. 15, 1928. The bars are arranged in 2 independent groups, in each of which the alternate bars are vertically adjustable relatively to the adjacent bars.

Furnace grate. MASCHINENFABRIK ING. HANS SIMMON. Austrian 110,056, Feb. 15, 1928. Constructional improvements are described in a grate of the kind having longitudinal bars, of tapering cross-section, which are bent over at the top so as to deflect the entering air.

Inclined furnace grate. RICHARD BABOUCZEK. Austrian 110,321, Mar. 15, 1928. In an inclined furnace grate constructed in sections, each section is fitted with longitudinal bars adapted to move in an opposite direction both to the adjacent bars and also to the corresponding bars in the adjacent sections.

Inclined furnace grate. PEDRO SALABERRI Y TELLECHEA. Ger. 468,520, Mar. 5, 1927. The overlapping, independently movable, plates of the grate can be fixed in more than one position.

Conveying furnace grate. FABRIK FÜR INDUSTRIEFUEHRUNGEN V. A. KRIDLÖ EISENGESEREI MASCHINEN FABRIK. Austrian 110,325, Mar. 15, 1928. In a furnace grate of the kind having alternate moving and stationary parts, each stationary part constituted by a double inclined plane rising gently from the adjacent moving part to the fuel feed side and falling steeply toward the other adjacent moving part, while the moving parts are of arcuate form and swing to and fro.

Chain guide for traveling grates. OTTO LEISSNER. Ger. 469,545, Feb. 2, 1926.

Swing closure for the discharge end of traveling grates. C. H. WECK COMM.-GRS. et 468,521, Aug. 28, 1926. Constructional details.

Oscillating bar-mover for furnace grates. GEORG PFEIFFER. Austrian 111,005, May 15, 1928. Constructional details.

Shakeable grate-bar frame for furnaces. MIROSLAV STOHR. Austrian 110,622 April 15, 1928. Constructional details.

Ovens heated by shaft-furnace gases. SOCIÉTÉ ANON. DES APPAREILS DE TRAITEMENT ET FOURS STEIN. Fr. 641,976, Mar. 21, 1927.

Oven for low temperatures. A. V. GRUM-GRZHIMAILO. Russ. 4881, Mar. 31, 1928.

Revolving ring-hearth oven suitable for drying, dry distillation, etc. LUDWIG HONIGMANN and FRIEDRICH BARTLING. U. S. 1,697,006, Jan. 1. Structural features.

Drying tunnel for ceramic ware or other materials. CLARENCE L. COLBERT (to Fiske & Co.). U. S. 1,697,556, Jan. 1.

Device for utilizing heat from rotary kilns. FRITZ LUTHER (to the firm G. Polysius). U. S. 1,698,313, Jan. 8. Means are provided for passing air through a cylindrical cooling drum associated with the kiln and the air may thence be passed to the interior of the kiln.

Pipe system for heating liquids flowing over the pipes. OTTO PROLLIUS (to Bergedorfer Eisenwerk A.-G.). U. S. 1,699,919, Jan. 22. Two groups of pipes are arranged in series with the upper group open to the air and the lower group enclosed in a jacket.

Electrical apparatus for heating liquids. V. V. PLOTNIKOV. Russ. 3983, Nov. 30, 1927.

Liquid heater. ALOIS JORDA. Austrian 110,625, April 15, 1928. The circulation of hot gases around the tubes of a tubular liquid-heater is assisted by a fan driven by the incoming liquid.

Preheater for liquids. V. M. ERIMOV. Russ. 4617, Feb. 29, 1928.

Apparatus for heating water or other liquids by combustion gases. JOSEPH SCHNEIBLER. U. S. 1,698,456, Jan. 8. Structural features.

Apparatus for superheating steam. TEODORO LARREY and LUIS GODARD. U. S. 1,697,123, Jan. 1.

Electric water-heater. OTTO GRAETZER. Swiss 127,192, July 5, 1927. Constructional details.

System for heating and supplying air to apparatus for drying paper (as made) or other materials. JOHAN G. OLSSON (to Aktiebolaget Svenska Fläktfabriken). U. S. 1,697,927, Jan. 8.

Apparatus for supplying liquid fuel under pressure to burners. ERNEST A. REID (one-half to Filma Oil Burners, Ltd.). U. S. 1,699,407, Jan. 15.

Burners for gaseous or liquid fuel. ANTOINE FERRACCI. Fr. 641,469, Sept. 16, 1927.

Oil burner. M. G. MALININ. Russ. 5110, April 30, 1928.

Intermixing oil and air to effect complete combustion. JOHN T. COOK (to Adolf F. Haffenreffer). U. S. 1,698,258, Jan. 8. An app. is described in which the oil is dispersed in the form of a rotating cone.

Combustion chamber for powdered and liquid fuels. ERICH VOGT and LUDWIG KIRCHHOF. Ger. 469,546, Dec. 7, 1924. A stack within the chamber carries channels for supplying cooling air to the hot gases, which pass from the combustion space on one side of the stack to an outlet in the cooling space on the other side.

Method for the indirect determination, or regulation, of the air for combustion in a gas furnace. CARL LÖBBECKE. Ger. 469,180, Nov. 9, 1927.

Gas-analysis apparatus. RICHARD H. KRUEGER (to Charles Engalhard, Inc.). U. S. 1,698,887, Jan. 15. An app. is specified which comprises a resistance heating element mounted in a thermal cond. cell having walls adapted for dissipating heat and adjustable means are provided for varying the capacity of the walls for dissipating the heat.

Washing apparatus for gas. MARCEL MALLET. Fr. 641,522, Sept. 27, 1927

Drying gas. W. C. HOLMES & CO., LTD. Fr. 640,961, Sept. 14, 1927. An app. is described for drying gas in which the gas is brought in intimate contact with a liquid hygroscopic agent.

Apparatus for the recovery of gas or vapors by absorbent charcoal. SOCIÉTÉ DE RECHERCHES ET D'EXPLOITATION PÉTROLIFÈRES. Fr. 33,081, Sept. 24, 1926. Addn. to 612,386. Constructional improvements.

Apparatus for bringing a gas in contact with an absorbent reagent. AUGUSTIN AMÉDÉE LOUIS JOSEPH DAMIENS. Fr. 641,864, Feb. 23, 1927. A rotating agitator carrying paddles and plates alternately one above the other is used for bringing a gas in intimate contact with a liquid.

Gas reaction apparatus. ALBERT BERENBRUCH (to I. G. Farbenind. A.-G.). Can. 285,713, Dec. 18, 1928. An app. is specified for carrying out exothermic catalytic gas reactions.

High-pressure gas burner. FRIEDRICH WOLFF. U. S. 1,697,549, Jan. 1. Structural features.

Gas burner construction. FRANK W. SHUELL and ELMER E. LEDBETTER (to Everhot Heater Co.). U. S. 1,699,032, Jan. 15.

Gas burner construction. ROBERT B. TYSON (39% to Ruth C. Berry and 20% to Lowell C. Butler). U. S. 1,699,318, Jan. 15.

Device for controlling gas supply to gas-burner pilots. ELMER E. LEDBETTER (to Everhot Heater Co.). U. S. 1,699,297, Jan. 15.

"Bubbling apparatus" for treating gases or vapors with liquids in counterflow. C. F. BRAUN. Brit. 291,527, March 3, 1927. Structural features.

Automatic gas or liquid shut-off valve. PARREN D. LINDSEY. U. S. 1,697,280, Jan. 1.

Automatic charging device for gas generators, blast furnaces and the like. THEODOR DE FONTAINE. Ger. 470,023, Oct. 31, 1925, and Ger. 470,024, Dec. 19, 1925.

Regulator for maintaining constant proportions in mixtures from gas or liquid currents. DEUTSCHE ROTAWERKE G. M. B. H. Ger. 469,184, April 12, 1927. Details of arrangement.

Device for abstracting an aliquot part of a stream of air, gas, steam, etc. WOLDEMAR ALLNER. Ger. 469,665, Oct. 16, 1925. A valve in the conduit of the secondary stream is automatically adjusted in accordance with the variations in pressure of the main stream.

Automatic acetylene generator. EMIL MENZ. U. S. 1,698,645, Jan. 8. Structural features.

Acetylene generator (in which carbide is fed into water). J. HAWORTH. Brit. 291,897, March 17, 1927.

Acetylene generator (feeding carbide into water). J. HAWORTH. Brit. 291,872, March 10, 1927. Structural features.

Air-removing means for acetylene generators. JAC. KNAPPICHT. Ger. 469,508, Dec. 23, 1926. Connections between the gas holder and the generator are described which operate in such a way that gas is supplied to the generator when either the cover of the charging hopper or the sludge-removing cock is opened.

Apparatus for classifying coal and other minerals. MIGUEL BONGERA. Fr. 642,215, Oct. 12, 1927.

Reciprocating concentrating table. MARTIN J. LIDE. U. S. 1,696,918, Jan. 1, 1928. Structural features.

Eccentric rotating apparatus for intimately mixing substances. ÉTABLISSEMENTS TENCE & COMPAGNIE FRANÇAISE D'APPLICATIONS CHIMIQUES RÉUNIS (Rodolphe Spatz, inventor). Fr. 641,892, Mar. 12, 1927.

Mixing and grinding apparatus. HARTSTOFF-METALL, A.-G. Swiss 127,089, June 17, 1927. Constructional improvements are described in app. of the type in which the material is whirled into two or more eddies which are repeatedly made to impact one on another.

Mixing and grinding apparatus. HERMANN HILDEBRANT. Ger. 469,535, Aug. 16, 1924. Addn. to 440,089. Modifications are described in app. of the kind covered by Swiss 127,088 (C. A. 23, 1188).

Distributor for finely granular or powdered materials. MASCHINENFABRIK GREVENBROICH A.-G. Ger. 469,468, May 19, 1927. A no. of angular bars arranged side by side at the bottom of a hopper are oscillated about their longitudinal axes by common oscillating means. The app. is useful in adding CaO to dild. molasses.

Machine for pulverizing stone. ERNST HJALMAR CARLSSON. Swiss 127,732, Oct. 27, 1927.

Diffusion apparatus. KARL KOMERS. Fr. 642,278, June 8, 1927. In the continuous diffusion of materials, the material passes round a horizontal cylindrical vessel in which the diffusion liquid is maintained at a const. level and is caused to travel counter to the material which is evacuated after treatment above the level of the liquid.

Liquid-distributing apparatus. SOC. ANON. POUR TOUS APPAREILLAGES MÉCANIQUES. Swiss 127,213, May 19, 1927. Constructional improvements are described in app. of the type comprising two measuring vessels, one of which is being filled while the other is being emptied.

Apparatus for determining the distribution ratio of a solute between two miscible solvents, etc. GRINNELL JONES. U. S. 1,699,070, Jan. 15, 1928. An app. is specified having sep. vessels for two different solvents, with communication for gas and vapor between them, which by mere rotation causes a continuous circulation of gas or vapor so that it bubbles through the two solns. for as long as the rotation continues. The const. variation in the level of the liquids in the vessels gives rise to a pulsating effect with a resultant circulation of the gas or vapor. An equality in the vapor pressure of the common volatile constituent is thus ensured between the two sepd. liquid phases. After the desired equil. has been established the liquids may be withdrawn from the system by removing stoppers and inserting siphons into the vessels. The two solns. are then separately available for analysis. The app. is suitable for the study of the distribution of CO₂ between water and any salt of carbonic acid from which conclusions as to the const. of the acid can be computed. Similarly, the distribution of SO₂ between water and solns. of its salts can be studied. Likewise, the amount of free NH₃ formed by the hydrolysis of any of its salts can be found and the const. of the acid detd. Or, the equil. between NH₃ and its complex compds. of the type Ag(NH₃)₂ can be detd. If it is desired to use the app. as an extractor, say of moisture, concd. H₂SO₄ may be placed in one tube and any substance placed in the other tube will have its moisture extracted more quickly than in a desiccator. An example is given of the use of the app. for detg. the distribution ratio of I in the systems NaI-H₂O and KI-H₂O and it may be used with Br, NH₃, CO₂ or other volatile solutes generally.

Device for delivering two different measured quantities of a liquid. KOMMANDIT GES. ROSENTHAL & Co. Austrian 110,231, Mar. 15, 1928. Addn. to 108,102. Constructional improvements are described in app. of the kind comprising two measuring vessels, one of which is in process of filling while the other is emptying.

Siphon for transferring liquids. M. M. MIKAEVYANTZ. Russ. 4739, Feb. 29, 1928.

- Atomizer for liquids.** A. I. KOLYUBAKIN. Russ. 4776, Feb. 28, 1928. Mechanical. Device for the uniform evaporation of liquids, and for the uniform mixing of gases with the vapor. ROBERT MEZGER. Ger. 469,290, Jan. 31, 1928. Description of app.
- Apparatus for making aqueous solutions of carbon dioxide for baths or beverages.** HEINRICH JUNGHANS. Swiss 127,277, July 28, 1927. Structural features.
- Apparatus for producing dispersions of solids in liquids.** WILLIAM H. WHATMOUGH (to Standard Products Corp.). U. S. 1,698,354, Jan. 8. A beater formed of superposed layers of wire gauze is mounted within a liquid-tight casing and may be rotated at high speed.
- Apparatus for treating water or other liquids with proportioned quantities of reagents.** CHARLES B. CUSHWA. J. S. 1,698,537, Jan. 8.
- Pump (with concrete casing and impeller) for handling acid iron chloride solutions or other corrosive liquids.** GEORGE P. FULLER. U. S. 1,698,495, Jan. 8. Structural features.
- Mashing vessel with cooling coils (suitable for treating massecuit from the boiling apparatus or other crystallizable substances).** A. ROLZ. Brit. 291,035, May 24, 1927.
- Device for breaking down foam formed on skimmed milk or other liquids in bulk.** MAGNUS KRISTOFFERSSON. U. S. 1,699,196, Jan. 15.
- Automatic steam escape and pre-heater for distilling apparatus.** GEORG KNOTH. Ger. 469,167, July 30, 1927. Description of arrangement.
- Measuring vessel.** NATHAN LEBOVITS. Austrian 110,057, Feb. 15, 1928. A measuring vessel for liquids is enclosed in a 2nd vessel which receives the overflow, and the space between the 2 vessels is closed at the top except for an opening diametrically opposite to the beak of the measuring vessel.
- Apparatus for measuring ultra-violet radiations.** LUCIEN MALLET and MME. DANNE (née Marie-Thérèse Rouffiac). Fr. 641,721, Oct. 1, 1927.
- Apparatus for transmission, measurement and registration of small pressures.** S. A. NOZDROVSKII. Russ. 3967, Sept. 15, 1924.
- Chemical analysis of liquids.** UNITED WATER SOFTENERS LIMITED AND HENRY STAFFORD HATFIELD. Fr. 641,572, Sep. 20, 1927. An app. is described for indicating the % of a constituent in a liquid, any alteration in elec. cond. due to chem. change, disson. or elimination of the constituent in the liquid being recorded automatically. An application to the *measuring of temporary hardness in water* is described.
- Device for recording sudden accelerations and decelerations.** JOHN B. BASKERVILLE (to Impactograph Corp.). U. S. 1,698,576, Jan. 8.
- Apparatus for colorimetric testing.** R. L. REES. Brit. 291,174, March 11, 1927. Liquid is automatically delivered by a siphon from a mixing vessel to a colorimeter where it is inspected; variations in pressure in the mixing vessel cause movement of a Hg seal so as to entrap a measured volume of indicator and deliver it to the mixing vessel. Various details of construction are specified.
- Colorimetric and photometric apparatus.** A. C. HARDY and F. W. CUNNINGHAM. Brit. 291,397, June 1, 1927.
- Illuminating device for microscopes.** AUGUST KÖHLER (to the firm of Carl Zeiss). U. S. 1,699,667, Jan. 22.
- Apparatus for determining the hardness of materials.** I. N. KLINNIKOV. Russ. 4749, Feb. 29, 1928.
- Apparatus for the determination of the rate of evaporation of water.** V. V. SHULEIKIN. Russ. 5229, April 30, 1928. Lab. app.
- Catalytic apparatus.** THE SELDEN COMPANY. Fr. 642,471, Oct. 13, 1927. Cooling elements, imbedded in the catalyst, consist of external tubes with closed ends imbedded in the catalyst and internal tubes with open ends in the external tubes, and means for causing the reaction gases to pass down the internal tubes, up the external tubes and down through the catalyst. The tubes at the center are nearer one another than those at the outside. The speed of the gases is decreased in going from the central tubes to those at the outside by varying the cross section of the tubes, whereby a substantially uniform cooling is produced in the catalyst. Cf. C. A. 22, 4015.
- Discharging liquids from containers under low pressure into containers at higher pressure.** V. G. SHUKHOV, I. I. YELIN, N. E. BERNZOVSKII and I. N. ACKERMAN. Russ. 4902, Mar. 31, 1928. An intermediate container connected with the low and high pressure containers has the inlet and outlet valves connected to a shaft which opens one valve at a time while closing the other.
- Differential pressure gages.** S. O. MAXIMOVICH. Russ. 4819, Mar. 31, 1928. A U-shaped tube is filled with a liquid, the level of which depends on the heat generated by an elec. heating element immersed in the liquid in one end of the tube. Russ. 4820,

Mar. 31, 1928, specifies a bent tube with 3 bulbs filled with a liquid, the level of which depends on the heat generated by an elec. heating element immersed in the liquid on one or both ends of the app.

Steel digesters with aluminum or other lining resistant to oxidation.. C. HAUTIER. Brit. 291,364, May 30, 1927.

Mercury vapor jet pump for removing air from rectifiers, etc. ALLGEMEINE ELEKTRIZITÄTS-GES. (to International General Electric Co.). Brit. 291,744, June 7, 1927.

Extractor, especially for cellulose manufacture. GEORG PAUL KROPP. Ger. 468,656, May 11, 1926. An extractor of the kind having a false bottom on which the material to be extd. is placed and beneath which is a heating space for the circulating liquid is constructed so that the heated liquid rises up tubes and is sprayed over the material, returning to the heating space through openings not directly above the heating means.

Activating refractory metal filaments. JOHN W. MARDEN (to Westinghouse Lamp. Co.). U. S. 1,698,850, Jan. 15. In activating filaments such as those of W for electron-emission purposes, a mixt. of powdered Al and K Th fluoride is held on the filament by a suitable binding material such as cryolite and the filament is heated in an evacuated enclosure to cause interaction between the Th compd. and the Al with liberation of free Th on the filament.

Air-excluding device for benzene, petroleum and like substances. SIEMENS & HALSKE A.-G. Ger. 469,293, Oct. 18, 1925.

Device for removing scale from bent pipes. A. M. LIPSKII. Russ. 4969, Mar. 31, 1927.

Apparatus for proportioned mixing of soap and water or other substances. KENT W. BARTLETT. U. S. 1,698,183, Jan. 8.

Mill for grinding paint or other wet or dry materials. J. H. J. WOOD. Brit. 291,952, June 7, 1927.

Grinding mill for paints, etc. MACAO-WALZENMÜHLEN-GES. Brit. 291,803, June 9, 1927. Structural features.

Apparatus (with rotary disks) for emulsifying or mixing or grinding inks, paints, dyes or pharmaceutical products, etc. C. P. WALKER. Brit. 291,957, June 13, 1927.

Annealing box and cover of sheet iron. V. DEMMER. Brit. 291,718, March 3, 1927. Structural features.

Apparatus for molding multiple or stack molds. JOHN A. RATHBONE (to Rathbone Machine Co.). U. S. 1,697,022, Jan. 1.

Light-operated device suitable for operating electric switches, etc. IRA E. McCABE. U. S. 1,697,986, Jan. 8. Structural features.

Thermostatic apparatus for control of heating systems. BENJAMIN F. GAINES. U. S. 1,698,191, Jan. 8. Structural features.

Thermostatic control for electric circuits. AXEL O. APPELBERG. U. S. 1,699,940, Jan. 22.

Thermostatic control device for electric circuits. COREL A. STILWELL. U. S. 1,699,317, Jan. 15.

Thermostatic control for fuels supplied to furnaces. HARRY F. SMITH (to Gas Research Co.). U. S. 1,697,209, Jan. 1. Structural features.

Thermostatically controlled apparatus for regulating the temperature of mandrels, etc. THOMAS M. KNOWLAND and HOWARD A. HANDS (to Hood Rubber Co.). U. S. 1,699,296, Jan. 15.

Thermostatically controlled valve. CLARENCE H. MORROW (to Hotstream Heater Co.). U. S. 1,698,413, Jan. 8.

Thermostatic disk for control of electric circuits. JOHN A. SPENCER (to Spencer Thermostat Co.). U. S. 1,697,886, Jan. 8. Structural features.

Thermostatic safety cut-off device for gas burners. T. HERSZLIK. Brit. 291,309, Dec. 16, 1927.

Thermostatic valve for controlling flow of heating or cooling fluids. W. A. VAN BERKEL. Brit. 291,669, Oct. 20, 1927.

Thermostatically controlled electric water heater. ARTHUR J. KERCHER and WILLIAM W. HICKS. U. S. 1,699,738, Jan. 22. Structural features.

Thermostatic and safety devices for control of valves supplied to burners, etc. S. J. LONERGAN and H. E. GINTHER (to Bastian-Morley Co.). Brit. 291,076, May 28, 1927. Structural features.

Interconnected thermostatically controlled valves for controlling proportional flow

- of air and fuels or other fluids supplied through separate passages. CHARLES A. MARTIN. U. S. 1,697,432, Jan. 1.
 Thermostat for controlling the supply of gas to burners. H. J. YATES, M. HOW-
 LETT & Co., LTD., and J. DOLPHIN. Brit. 291,223, May 24, 1927.
 Thermostat suitable for controlling valves of gas burners. JOHN H. GRAYSON.
 U. S. 1,699,468, Jan. 15.
 Thermostat of the bimetallic spring type. SIEMENS & HALSKE A.-G. Swiss 127,-
 062, June 3, 1927. Constructional details.

2—GENERAL AND PHYSICAL CHEMISTRY

FREDERICK L. BROWNE

Evolution of the odd-numbered elements. W. V. HOWARD. *J. Phys. Chem.* 32, 1725-42(1928).—On the basis of the following hypothesis of at. evolution is developed. The first to form were the even-numbered elements between C and Ni, together with H and He; these are the building materials of the universe. Odd-numbered elements whose mass numbers are higher than those of Ni were then formed by the addn. of He atoms and neutrons to atoms already existing. The evolution of heat and activity and the formation of H. This hypothesis of at. disintegration will account for volcanic activity and the formation of the hydrosphere and the atmosphere. LUCIEN MALLARD and HAVIGHURST.

Helium. III. Behavior of helium toward glass and palladium and of helium compounds. FRITZ PANETH AND KURT PETERS. *Univ. Berlin. Chem. Abt. B*, 1, 253-69(1928); cf. *C. A.* 23, 328.—Even at room temp. glass is permeable to He. With He at 0.5 atm. about 10^{-11} cc. He per hr. pass through 1 cm.² of glass wall 0.5 cm. thick. He present in the air will accumulate in a vessel by mere diffusion through the glass walls, at room temp., but the small pressure of He in the atmosphere makes the process so slow that it requires a long time and very sensitive devices to detect the He inside the vessel. The permeability of glass to He increases decidedly with the temp. Since Ne is practically stopped by a glass wall, Ne free He can be prepared from atmospheric air by one diffusion through glass. Glass seps. Ne from He not only by diffusion but also by adsorption and soln. He dissolved in glass can be more easily recovered by heating in an atm. of H₂ than in *vacuo*. Red hot Pd is impermeable to He. A sharp sepn. is obtained in He-H₂ mixt. The ratio of mols. of H₂ to mols. of He in gases passed through hot Pd is 10^{12} to 1. Attempts were made to prepare As, Sb, Pb, Ge, Se, I and Cl helides, but without success. There is no evidence that such compds. exist. ALBERT L. HENNE.

Note on magnetic properties of evaporated films of nickel. K. J. MILLER. *St. Univ. of Iowa. Phys. Rev.* 32, 689-90(1928).—Films of Ni formed by evapn. on foil were tested in fields up to 167 gauss. The coercive force reached a value approx. 3 times that for hard-drawn wire and the retentivity was as high as 65%. Coercive force decreased as the temp. of deposit decreased and as the thickness of the film decreased. A critical thickness was not observed. The films were uniform in thickness and their properties were not influenced by distortion of the deposit. B. L.

Effect of magnetic fields upon the thermal conductivity of iron, copper, gold, silver and zinc. HUGH M. BROWN. *Univ. of Calif. Phys. Rev.* 32, 508-14(1928).—A "bar method" was used to measure thermal cond. and elec. resistivity for Fe, Cu, Ag and Zn in and out of a longitudinal field of 10,000 gauss, and transverse fields of 8000 and 4000 gauss. Cu-constantan thermocouples spot-welded to the bars were used to measure the temps. For Fe, the 10,000-gauss longitudinal field caused a decrease of 1.14% in heat cond. and the transverse field of 4000 gauss a decrease of 0.4%. Elec. resistivity was increased 0.2% by the 10,000-gauss field. For Cu the thermal cond. was decreased 0.23% by the field of 10,000 gauss. In all the other cases the fields produced no effects large enough to detect, although the method would readily show a change amounting to 0.04%. Both ordinary cast Zn and slowly grown crystal Zn were used. The values for elec. and thermal cond. were higher in the crystal bar, but the magnetic fields produced no change in either bar. Thus, the thermal cond. of these metals does not increase in strong fields. BERNARD LEWIS.

The principal types of chemical compounds of the first order, illustrated by the carbides. A. ANTROPFF. *Univ. Bonn. Z. Elektrochem.* 34, 533-6(1928).—All 5

types of compds. of the first order distinguished by Grimm (Handbuch d. Physik XXIV), are illustrated among the carbides. (1) Elements of the lower left-hand portion of the periodic table form carbides, like Na_2C_2 , that are polar, salt-like in character, analogous to NaCl . They have high m. ps., crystallize in ionic space lattices and conduct electrolytically. (2) Elements of the upper right-hand portion of the table form carbides, like CH_4 or CCl_4 , that are non-polar, analogous to H_2O , HCl , ZnS . They have low m. ps. that increase with mol. wt., crystallize in mol. space lattices and are non-conducting. (3) Elements of the upper middle part of the table form carbides, like CSi , that are tetrahedral (diamond-like). They have very high m. ps., and pseudoatomic space lattices which are really single mols. of unlimited size. (4) Elements of the lower middle part of the table form carbides, like Fe_3C , that are non-polar, metallic in character, analogous to compds. between metals. They have true at. space lattices and conduct and reflect like metals. (5) Intermol. compds. are exemplified by the condensed hydrocarbons. Compds. of types 1, 2 and 3 are "valence compds." in which both elements have their normal valences and the force causing combination is the formation of a stable shell by the valence electrons of both atoms. In type 1 the shell encloses the anion only, in types 2 and 3 it encloses the nuclei of both atoms. In type 3 the atoms are all bound together like the C atoms in satd. aliphatic compds. Compds. of type 4 are "atomic compds." or "packing compds." in which the valence of the atoms is abnormal, or if normal only fortuitously so. The force causing combination is a "packing effect" due to van der Waals' forces. F. L. BROWNE

Dipolar momentum of some methane and ethane derivatives. JOHN WARREN WILLIAMS. Univ. Leipzig. *Z. physik. Chem., Abt. A*, **138**, 75-84 (1928).—The dielec. consts. of $\text{C}_2\text{H}_4\text{Cl}_2$, $\text{C}_2\text{H}_4\text{Br}_2$, MeI , EtI , $\text{C}_2\text{H}_4\text{I}_2$, $\text{C}_2\text{H}_4(\text{OH})_2$, MeCN , EtCN , $\text{C}_2\text{H}_5(\text{CN})_2$, and PhCN have been detd. at 25° in C_6H_6 . The values, in electrostatic units $\times 10^{-18}$ are, resp.: 1.75, 1.4, 1.6, 1.7, 1.3, 1.5, 3.4, 3.4, 3.8 and 3.85. The dipolar momentum is attributed to one definite group, and the rest of the mol. is regarded as non-polar. The derivs. resulting from substitution of the same group in C_6H_6 , CH_4 or H_2O , resp., differ in dipolar momentum. In the cases of mols. of the $\alpha\text{CH}_2\text{-CH}_2\alpha$ type, the angle between the vectors and the axis of the mol. is calcd. ALBERT L. HENNE

The dielectric constant and the electric moment of CO , COS , CS_2 and H_2S . C. T. ZAHN AND J. B. MILES, JR. Princeton Univ. *Phys. Rev.* **32**, 497-504 (1928); cf. *C. A.* **20**, 2613.—By the heterodyne null method measurements of the variation of the dielec. const. with temp. were made on a further series of gases. The results are very well interpreted by the Debye equation $(\epsilon - 1)/T = A/T + B$. The values for A are: CO , 0.000670; CS_2 , 0.002798; COS , 0.001970 and H_2S , 0.001223. The values for B are: 0.0078; CS_2 , 0.089; COS , 0.352 and H_2S , 0.722. These values of B give for the electric moment in e. g. s. c. s. units $\times 10^{18}$: CO , 0.10; CS_2 , 0.326; COS , 0.650; H_2S , 0.1. All measurements in the same app. are compared with those of other observers, the important discrepancies are discussed. CS_2 and COS may have a rectilinear structure like that of CO_2 . BERNARD LEWIS

Dielectric constants of aqueous solutions of methyl orange, helianthine and other pholytes. A. THIEL AND E. HORN. Univ. Marburg. *Z. anorg. allgem. Chem.* **176**, 15 (1928).—The results obtained by O. Blüh, on the dielec. const. of methyl orange, *o*- and *p*-aminobenzoic acids could not be duplicated. The ϵ - c curves of these compds. show a steady decrease. The dielec. consts. of aq. solns. of helianthine differ little from that of H_2O to be detected accurately. The soly. of this ampholyte is probably too small to cause any detectable effect. The ϵ - c curves of $\text{H}_2\text{NCH}_2(\text{CH}_2)_2\text{NH}_2$, $\text{Me}_2\text{CHCH}(\text{NH}_2)\text{CO}_2\text{H}$ and $\text{NH}_2\text{CH}_2\text{CONHCH}_2\text{CO}_2\text{H}$ were detd. When c increases, ϵ falls rapidly to a min., then rises regularly to a value higher than the initial ϵ . ALBERT L. HENNE

The electric resistance of alloys under pressure. C. W. UFFORD. Harvard Univ. *Phys. Rev.* **32**, 505-7 (1928).—The av. pressure coeffs. of elec. resistance up to 12,000 $\text{atm.}/\text{cm}^2$ are tabulated for three series of alloys: Li-Sn , Bi-Sn , Ca-Pb and for one Mg alloy of 10% Mg . The variation of the pressure coeff. with concn., the temp. coeff. and the relative change of the temp. coeff. with pressure are as would be expected from the variation in the structures of the alloys as given by the equil. diagrams for the 3 series of alloys. The cond. and the pressure coeff. of a dil. solid soln. of Bi-Sn are the same as those of pure tin under pressure. Since hydrostatic pressure and impurities have the same effect on the pressure coeff., elec. conduction probably depends on the geometrical properties of the conductor. BERNARD LEWIS

The electrical conductivity of dilute liquid amalgams of gold and copper at various temperatures. T. C. WILLIAMS AND E. J. EVANS. Univ. Coll., Swansea. *Phil. Mag.* **16**, 1231-53 (1928).—The conductivities of dil. amalgams of Cu and Au were detd.

at 11.5°, 100° and 300°. At each temp. the cond. was detd. over the max. range of concn. possible at 11.5° in the case of Au amalgams and in the case of Cu amalgams over the max. range of concn. possible at the temp. of measurement. For Au amalgams of concn. 0.1221 and 0.2441, the cond. was also measured at 217.3° and 257.5°. (Concn. is given in gram atoms of metal per 100 gram atoms of Hg.) The av. temp. coeffs. of resistivity between 11.5° and t° were measured for Au amalgam of concn. 0.1221, and for Cu amalgam of concn. 0.0322; in both cases the coeffs. were found to increase as the difference in temp. increased. However, the values were less than the corresponding ones for pure Hg. The av. temp. coeff. of resistivity for Au amalgams of various concns. between 11.5° and 100°, diminished as the concns. increased. In Au amalgams, at 11.5° and 100° the increase in cond. as compared with the cond. of Hg at the same temp. was nearly proportional to the concn., but at 300°, in both Cu and Au amalgams such was not the case. For Cu and Au amalgams, the ratio of the increase of cond. over that of Hg to the concn. was detd. at each temp. and for each concn., and the values compared with the corresponding ones obtained by Johns and Evans (*C. A.* 22, 1892) for Ag amalgams. This value at infinite dilm. was found practically the same at the same temp. for amalgams of Cu, Ag and Au, indicating that, atom for atom, the different metals in Group Ib in the Periodic Table have the same effect on the cond. of Hg.

GEORGE GLOCKLER

Wiedemann-Franz law. E. GRÜNEISEN. *Z. physik. Chem., Abt. B*, 1, 379-84 (1928); cf. *C. A.* 23, 563.—Answer to the criticism of Eucken (*C. A.* 22, 3090). The calcd. and observed values of G . are in better agreement than indicated by E.

ALBERT L. HENNE

The polymerization distance between charged ions in the process of persulfate formation. O. A. ESIN. Ural Polytech. Inst. *Z. Elektrochem.* 34, 758-60(1928).—An equation is derived which gives the distance between charged sulfate ions at which polymerization is possible as a function of the thickness of the layer of ions around the anode and as a function of the time which the mols. so formed can exist. The distance is relatively great, namely 10^{-6} cm.

MALCOLM DOLE

Deformation of ions and molecules based upon refractometric data. K. FAJANS. *Z. Elektrochem.* 34, 502-20(1928).—The 2 limiting forms of chem. combination are: (1) ideal undeformable ions, (2) completely non-polar combination attained with two equal atoms, as in the cases of alkali halides (both as vapor and in crystal lattice), H_2 , N_2 , diamond, Si and gray Sn. The behavior of most substances is intermediate between these extremes, for example, HCl with a known nuclear distance (1.26 A. U.) is shown to have a dipolar length of 0.216 A. U. instead of zero, which the ideal non-polar mol. would show. It is a valid law that cations of the noble-gas type and the H nucleus lower the refractivity of neighboring anions or neutral mols. as a result of the compressive effect of the additional positive charge, the more so the smaller and more highly charged the cation and the larger the deformability, i. e., the refractivity of the anion or mol. There is a distinct diminution of refractivity of ions in soln. as compared to gaseous condition due to the deforming compressive effect of the cations on the mols. of H_2O hydrating the ions. In the majority of cases when ions unite with each other or with neutral mols. or even the latter with each other, larger or smaller deviations of the Lorentz-Lorenz function from additivity occur, which certainly in the case of ions and possibly also in the case of interaction between neutral mols. alone may be considered evidences of an effect on the electron shells of the components of the system by elec. fields of the adjacent particles.

A. P. SACHS

Variation with state of the optical properties of potassium and cesium. J. B. NATHANSON. Carnegie Inst. Tech., Pittsburgh, Pa. *J. Optical Soc. Am.* 17, 343-9 (1928); cf. *C. A.* 22, 4060.—The optical properties of the surface of an alkali metal in the liquid and in the solid state are nearly identical. They were observed by allowing monochromatic light, polarized in a plane at an angle of 45° to plane of incidence, to be reflected from a mirror at an angle of 45°. The difference in phase of the vertical and horizontal components of the reflected elliptically polarized light was detd. by a Babinet compensator while the azimuth of the restored plane polarization was detd. by means of the analyzing nicol in the eye-piece.

A. P. SACHS

Absorption of light by strong electrolytes. H. v. HALBAN. *Z. Elektrochem.* 34, 489-97(1928).—In homogeneous systems the absorption of light by strong electrolytes is assumed to be an additive function of the concns. of the mol. species present and appreciable deviations from additivity are attributed to changes in compn. and to the existence of equilibria. The mol. extinction coeff. ϵ of individual weak electrolytes depends upon the dilm. in the same manner as the mol. cond., μ . This means that the ions absorb appreciably in the spectrum region examd. while undissociated mols.

do not. But Hantzsch and Bjerrum noted that for certain strong electrolytes ϵ is const. in certain ranges of concn. in which μ varies, leading B. to call this behavior characteristic of strong electrolytes and indicating complete dissociation. For solns. more dil. than $M/100$ Beers' Law is obeyed. v. H. examd. solns. contg. NO_3^- as the absorbing ion and various non-absorbing cations, and found that all cations, including those of alkali metals, produce an effect on the absorption spectra. Quant. study of the data shows that in solns. of strong electrolytes we have not only free (hydrated) ions but also a limited no. of particles contg. both anion and cation, which may be united in equiv. or non-equiv. amts. to form either undissociated mols. or complex ions. The anion in these groups has suffered considerable deformation (compared to its free condition) which is, however, less for the nitrates than the deformation of the HNO_3 mol. or its esters.

A. P. SACHS

Color of iodine solutions. FREDERICK H. GETMAN. *J. Am. Chem. Soc.* 50, 2883-90 (1928).—Extinction coeffs. of solns. of I in purified solvents, measured at 10 $m\mu$ intervals throughout visible spectrum, indicated that there are 2 classes of solns.: (1) violet, with max. absorption at 520–540 $m\mu$ and (2) brown, with max. absorption at 460–480 $m\mu$. Solvents giving violet solns. ($n\text{-C}_6\text{H}_{14}$, C_6H_6 , C_7H_8 , CS_2 , CCl_4 and CHCl_3) are satd., while those giving brown solns. ($\text{C}_2\text{H}_5\text{OH}$, $\text{iso-C}_3\text{H}_7\text{OH}$, $(\text{CH}_3)_2\text{CO}$, $\text{C}_6\text{H}_5\text{N}$ and $\text{C}_6\text{H}_5\text{COCH}_3$) are unsatd. Solns. of I tend to change upon standing, the extent of the change depending upon the unsatn. of the solvent.

A. P. SACHS

Interpretation of Laue patterns when the incident bundle of rays does not coincide with any crystallographic axis. J. PALACIOS. *Anales soc. españ. fis. quim.* 26, 215–8 (1928).—In Laue patterns obtained with bundles of rays parallel to a crystallographic axis it suffices to resort to a gnomonic projection to obtain easily the indices of the crystallographic plane to which belong each one of the many which appear in the photograph. However, it often happens that it is convenient or necessary to obtain patterns where the incident rays do not coincide with any crystallographic axis. In such cases gnomonic projection gives points which, since they do not hit the nodes of a rectangular network, cannot be interpreted directly. The Hilton gnomonic model serves to pass from the gnomonometric projection obtained directly to that which would have resulted if the bundle of rays were parallel to a crystallographic axis. It has the inconvenience, however, of serving only for a given distance between the crystal and the plate. A simple geometric method, is described by which is obtained the same result as with the Hilton model and which, moreover, permits interpreting by simple inspection the relations between the gnomonic projection obtained directly and that which would have resulted in the case of incidence parallel to an axis.

E. M. SYMMES

Crystalline structure of praseodymium. P. SCHERRER AND J. PALACIOS. *Anales soc. españ. fis. quim.* 26, 309–14 (1928).—A black and a brown PrO_3 used by Cabrera for magnetic measurements were tested by the Debye-Scherrer method with radiation from Cu rays and a 2.90-cm. aperture. The diagrams were identical, showing a fluorite structure.

E. M. SYMMES

The arrangement of crystallites in multiple crystals (fibers). E. SCHMID. *Z. Metallkunde* 20, 370–7 (1928).—The anisotropy of crystals, and its significance in fibering is discussed. The x-ray method of detg. fibering, especially in metals, is compared with etching and similar methods. The results of studies on fibering due to crystal growth, crystal deformation, and recrystn. are summarized.

R. L. HERSHEY

The crystal structure of solid methane. J. C. McLENNAN AND W. G. PLUMMER. *Nature* 122, 571–2 (1928).—Solid CH_4 was examd. by the powder method at a temp. between that of liquid air and liquid H. A cubic modification, $a = 6.35$ A. U., with 4 mols. to the unit cell, was the only one found. The lattice is apparently face-centered. If it may be assumed that all C atoms are crystallographically identical, and that all H atoms are identical in this sense, the symmetry of the C atom in solid CH_4 is either T or T_d .

R. L. HERSHEY

The crystal structure of silver subfluoride. HENRY TERREY AND HUGH DIAMOND. *J. Chem. Soc.* 1928, 2820–4.— Ag_2F crystals were prepd. by electrolyzing a concd. soln. of Ag_2F at 60° with a low current density. An examn. by the x-ray powder method showed that Ag_2F has a hexagonal unit cell of dimensions $a = 2.989$ A. U. and $c = 5.710$ A. U. There is one mol. to the unit cell. Intensity considerations appear to indicate a CdI_2 type of structure with $\mu = 0.3$.

R. L. HERSHEY

The crystal structure of potassium sulfate. FRANK P. GOEDER. Univ. of Chicago. *Proc. Natl. Acad. Sci.* 14, 766–71 (1928).— K_2SO_4 is known to have 4 mols. to the unit cell, lattice const. as follows: $a = 5.746$ A. U., $b = 10.033$ A. U. and $c = 7.443$ A. U., and the space-group 2 D_6 -13. If K^+ and SO_4^{--} are considered to appear as such in the lattice, and the SO_4^{--} group to have the symmetrical tetrahedral structure generally

assumed, a comparison of exptl. results with the theory of space groups indicates the following positions for K: 000; $\frac{1}{2}$ 0 $\frac{1}{2}$; 0 $\frac{1}{2}$ $\frac{1}{2}$; $\frac{1}{2}$ $\frac{1}{2}$ 0; 00 $\frac{1}{2}$; $\frac{1}{2}$ 00; 0 $\frac{1}{2}$ 0; $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$; and for S: 0 $\frac{1}{2}$ $\frac{1}{2}$; $\frac{1}{2}$ $\frac{1}{2}$ 0; 0 $\frac{1}{2}$ 0; $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$. The positions of O are tabulated for a structure of K_2SO_4 in which each K is equidistant from two O atoms and the two K's and the S atom lie on the same straight line. The powder diagram predicted for this arrangement agrees exactly with the diagrams found exptly.

R. L. HERSHEY

The space-group of staurolite and its regular parallelism with cyanite. GABRIEL M. CARDOSO. *Ber. Verhandl. sächs. Akad. Wiss. Leipzig Math.-Phys. Klasse* **80**, 165-98(1928); cf. *C. A.* **22**, 2342.—A series of rotating and oscillating crystal diagrams were made, with Lilienfeld and Coolidge tubes with Mo targets, and a Müller tube with a Cu target and Lindemann windows. The unit cell of staurolite contains 2 mols., having the formula $[SiO_6]_4Al_1Fe_2H$; the translation group is Γ'_0 ; the dimensions of the unit cell are: $a_0 = 7.81$ A. U.; $b_0 = 15.69$ A. U.; $c_0 = 5.64$ A. U. The space group is found to be V_{11}^{17} . The cyanite structure is studied by comparison with staurolite, a pseudorhombic cell being assumed for cyanite. On this basis a cell contg. 16 mols., having the dimensions $a_1 = 26.868$ A. U., $b_1 = 7.883$ A. U. and $c_1 = 5.650$ A. U. and having angles, $\alpha_1 = 90^\circ 5' 30''$, $\beta_1 = 90^\circ 5' 2''$ and $\gamma_1 = 90^\circ 26' 55''$ is developed. The direction [411] of cyanite is parallel to the [010] direction of staurolite on this basis. Hence a close similarity of the microstructure of staurolite and cyanite is shown to exist.

R. L. HERSHEY

Molecular theory of crystal growth. F. BRANDENBERGER. *Z. Krist.* **66**, 120-30 (1927).—A mol. theory of crystal growth, in accord with the lattice theory of crystal structure, is proposed.

B. C. A.

Isomorphism, polymorphism and morphotropy. I. Compounds of the ABX_3 type. G. NATTA AND L. PASSERINI. Reale Politecnico, Milano. *Gazz. chim. ital.* **58**, 472-84(1928).—The close relation between isomorphism and polymorphism on the one hand and the dimensions and structure of the lattice on the other shown by Goldschmidt (cf. *C. A.* **20**, 3414) for salts of oxygenated acids (chlorates, nitrates, etc.) of the ABX_3 type suggested a similar study of *alk. halomercuriates and halocadmicates*. The present paper deals with the x-ray examn. of some *halomercuriates and halocadmicates* of Ce by the Laue powder method and by the rotating-crystal method. The cubic forms of $CeHgCl_3$ and of $CeHgBr_3$ have an elementary cell with $a = 5.44$ and 5.77 A. U., resp., and contg. 1 mol. The calcd. densities of $CeHgCl_3$ and of $CeHgBr_3$ are 4.53 and 4.97, resp. They are isomorphic and form solid solns. in all proportions. Neither $CeHgBrCl_2$ nor $CeHgClBr_2$ exists as a chem. individual; they belong to a continuous series of solid solns. passing from $CeHgCl_3$ to $CeHgBr_3$, and have the same lattice as these, though of a deformed character. The unit dimension of the cell for such mixed crystals follows with good approximation the law of Vegard. $CeCdBr_3$, like $CeCdCl_3$, crystallizes in the cubic system and is isomorphic with $CeHgCl_3$ and $CeHgBr_3$. Its elementary cell has $a = 5.33$ A. U. and calcd. d. 5.38. The at. structure of all the compds. described is defined by the coördinates: Ce = (000); (Hg, Cd) = ($\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$). (Cl, Br) = ($\frac{1}{2}$ $\frac{1}{2}$ 0); (0 $\frac{1}{2}$ $\frac{1}{2}$); ($\frac{1}{2}$ 0 $\frac{1}{2}$). $CeCdI_3$ and $CeHgI_3$ are not isomorphic with the corresponding chlorides and bromides and have a lower cryst. symmetry. $CeCdI_3$ was prepd. by dehydration of $CeCdI_3 \cdot H_2O$. Its d. is 5.48 and it m. 193° . The relations that should obtain among the A, B and X atoms of ABX_3 compds. in order that certain types of cryst. structures should exist were then detd. The value of the expression: $t = (R_a + R_x)/[\sqrt{2}(R_b + R_x)]$, where R_a , R_b and R_x are the at. radii of the A, B and X ions (cf. Goldschmidt, *loc. cit.*) was calcd. for various series of compds. For oxygenated compds. it is less than 0.8 for a rhombohedral structure of the corundum and ilmenite type, 0.8-1.0 for a cubic structure of the $CeHgCl_3$ type, 1.0-1.20 for a rhombohedral structure of the calcite and $NaNO_3$ type, and 1.20-1.30 (1.40) for a rhombic structure of the aragonite type. Dimorphism appears at the limits among the various series. Similar relations hold true within certain limits with double halides of the ABX_3 type. The cubic modification of the $CeHgCl_3$ type appears at values of t greater than 0.830. Compds. having a t value near 0.830 are dimorphic. Compds. with t less than 0.825 possess low symmetry (rhombic or monoclinic). Only 1 derivs. depart from these limits. Though having a t value of 0.840, $CeCdI_3$ is not isomorphic with other halocadmicates of Ce because the I ion is strongly polarizable.

C. C. DAVIS

X-ray and chemical investigation of various oxides of iron and cobalt. B. HENDRICKS AND WERNER H. ALBRECHT. Rockefeller Inst., N. Y. *Ber.* **61B**, 2153-61(1928).— Co_2O_3 shows by x-ray analysis the same crystal structure as Fe_2O_3 , although the at. distances in Co_2O_3 are somewhat smaller. The at. grouping, derived from the

space diagram and expressed by the Wychoff system, is Co^{++} at 8f, Co^{+++} at 16c and () at 32b. Ferromagnetic $\text{CoO} \cdot \text{Fe}_2\text{O}_3$, prepd. by Hilpert's method (cf. *C. A.* 4, 13), showed the same crystal structure as Fe_3O_4 and Co_3O_4 , but had different at. dimensions. The ferromagnetic $\text{CoO} \cdot \text{Fe}_2\text{O}_3$ could be oxidized with $\text{K}_2\text{S}_2\text{O}_8$ without change in crystal structure. The a_0 dimensions for the 3 oxides were Co_3O_4 , 8.04 A. U.; $\text{CoO} \cdot \text{Fe}_2\text{O}_3$, 8.35 A. U. and $\text{Co}_2\text{O}_3 \cdot 2\text{Fe}_2\text{O}_3$, 8.35 A. U. Crystal-structure diagrams are given.

R. L. DODGE

Arrangement of minute crystals in electrolytic bismuth and antimony precipitation.

I. HIDEJU HIRATA. Kyoto Imp. Univ. *Elec. Rev. (Japan)* 16, 651-61(1928).—H. studied röntgenographically the crystal structure of blocks of Bi and Sb made by electrolysis under different conditions and found: (1) The minute crystals of Bi tend to be arranged more regularly, the smaller the current density and the concn. of electrolyte. (2) The black slime or tabular matter having the appearance of Pt black which deposits on the cathode in electrolyzing Bi or Sb, consists mostly of small crystals having the same lattice structure as that of blocks of Bi or Sb. (3) When the small crystals of Bi are arranged in fibers, each crystal tends to orient itself so that the axis [211] is parallel to the axis of the fiber. When the small crystals are arranged in the form of a single pointed crystal, the axis [211] coincides with that of the single crystal. II. *Ibid* 761-7(1928) —From the diffraction line exhibited by a fibrous structure, H. tried to det. which crystal axis was parallel to the axis of the fiber. The distribution with respect to each at. surface of the angles of the small crystals composing the fiber was calcd. by Ono's method. The axis sought was parallel to [211]. The same result was obtained when the index of the at. plane was calcd. from the position of spots appearing in some of the diffraction lines. It was confirmed again by taking the interference figures obtained when the specimen was rotated 22° around the axis in question or when rotated 22° about an axis perpendicular to the axis [211] and to the projected pencil. H. also proved by calcg. from their position that interference figures consisting only of Laue spots were formed when the projected pencil makes angles of 48° , 27° and 18° with the axes [011], [001] and [101], resp., and that their directions are perpendicular to the crystal axis [211]. The reason why the Laue spots appeared somewhat elongated is also discussed.

K. SOMEYA

Joffe's work on electric break-down strength. ADOLF SMEKAL. *Naturwissenschaften* 16, 743 4(1928).—Joffe (*C. A.* 22, 518) considers the difference between low actual and high theoretical lattice strength of crystals to be due to superficial crystal defects. He found that after dissolving the surface of the crystal the strength increased as much as 100-fold. In accord with Ewald and Polanyi, S. attributes this result to a strengthening of the crystals by plastic deformation, not to their inherent strength. On stretching crystals of rock salt colored by x-rays beyond the elastic limit, the colors of plastic deformation were seen. Also cond. measurements seem to confirm the view that water penetrates into the crystal. When rock salt is heated rapidly, slip occurs spontaneously, contrary to J.'s view. Ionic conduction throughout the lattice (Joffe theory) does not play an important role in the elec. breakdown; from the temp. relation of the cond. of solid salts it has been shown that migration of ions takes place only through lattice defects. Reply. A. JOFFE. *Phys. Tech. Lab., Leningrad. Ibid* 744-5.—On the increased elasticity J. maintains his point of view considering slip or strengthening immaterial. The mech. irregularities of crystals are considered to have practically no influence on their elastic behavior. On the relation between work of dissociation and temp. coeff. of cond. no actual controversy exists. B. J. C. VAN DER HOEVEN

Electrical anisotropy of liquid crystals in a magnetic field. M. JEZEWSKI. *Z. Physik* 52, 268 74(1928).—An improved resonance method was used to det. the dielec. const. of *p*-azoxyanisole and *p*-azoxyphenetole while in the nematic state. A magnetic field was applied at the same time. Various shaped vessels were used to avoid the capacity effect of the walls. It was found that the dielec. const. varies with the relative orientation of the elec. and magnetic fields in agreement with the theory of Ornstein, *C. A.* 18, 2827. Also in *Bull. intern. acad. Polonaise* 1928, No. 8A, 397-404. GEORGE GLOCKLER

The Hall effect in galena and molybdenite. C. W. HEAPS. Rice Institute. *Phil. Mag.* [7], 6, 1283-6(1928).—Galena and molybdenite crystals exhibit a very large Hall effect. The magnitude of the Hall coeff. in the cubic crystal of galena does not appear to depend on the orientation of crystal axes. Impurities probably exert a very great influence on the Hall effect in PbS , apparently even changing the coeff. from a large negative to a large positive value. The difference between the adiabatic and the isothermal Hall effects appears to be small in these minerals. It is appreciable in molybdenite but by no means as great as Göttstein has calcd. (*C. A.* 8, 2100). G. G.

Magnetic rotation of a crystal of tysonite. J. BECQUEREL. *Z. Physik* 52, 342-55

(1928).—The magnetic rotation of tysonite $[(\text{La}, \text{Ce}, \text{Ne}, \text{Pr})\text{F}_3]$ was studied in directions oblique to the optical axis. The magnetic rotation decreases as the angle between incident ray and optical axis increases. On the assumption that there exist in a crystal two types of magnetic rotation, one along the optical axis and the other at right angles to it, a generalization of Verdet's law is derived with which the observations are in good agreement.

GEORGE GLOCKLER

The testing of the piezoelectricity of some crystals. W. SCHNEIDER. Tech Hochschule Karlsruhe. *Z. Physik* 51, 263-7(1928).—A series of crystals were tested for piezoelec. properties by a modification of the method of Giebe and Scheibe (*C. A.* 19, 3207). All crystals known to have a center of symmetry showed no piezoelectricity, but some which are known to have no center of symmetry also gave a negative test. The test may, however, be used to supplement information from other sources regarding crystalline structure.

G. CALINGAERT

Electrolytic conductivity of crystal surfaces and conduction by free ions in solid salts. O. BLÜH AND W. JOST. Univ. Berlin. *Z. physik. Chem., Abt. B*, 1, 270-4 (1928).—The electrolytic cond. of good-conducting AgI crystals is not influenced by limiting surfaces, indicating that the cond. of such salts does not depend on internal boundary surfaces.

ALBERT L. HENNE

The entropy and thermodynamic potentials of real gases and mixtures of real gases, and a mass-action law for chemical reaction between real gases. II. Integrated equations. JAMES A. BEATTIE. Mass. Inst. of Technology, Cambridge, Mass. *Phys. Rev.* 32, 691-8(1928); cf. *C. A.* 22, 2509.—The general thermodynamic equations derived in the first paper are integrated by means of a new equation of state for gas mixts. Thus the energy, heat content, entropy and thermodynamic potentials $F_{p,T}$ and $F_{p,T}$ of a mixt. of real gases, and the chem. potential and fugacity of a gas in a mixt. are expressed as integrated functions of V, T, n_1, n_2, \dots , and the consts. of the equation of state of the pure gases composing the mixt. The expression for the thermodynamic potential $F_{p,T}$ is a fundamental equation in the Gibbs sense. A mass-action law for reactions between real gases is given, the "mass-action const." K_p being expressed in terms of the variables $V, T, X_1, X_2, \dots, v_1, v_2, \dots$, and the consts. of the equation of state of the pure gases composing the equil. mixt. The detn. of the various integration consts. is discussed for the following cases: (a) non-isothermal and (b) isothermal variations in the state of a system composed of gases that react chemically, (c) non-isothermal and (d) isothermal variations in the state of a system composed of non-reacting gases. III. Relations for pure gases, and the equilibrium pressure of a gas in a mixture. JAMES A. BEATTIE. *Ibid* 699-705.—By assuming that the pressure of a real gas approaches nRT/V as the vol. approaches infinity, general thermodynamic equations for the energy, heat content, entropy, thermodynamic potentials $F_{p,T}$ and $F_{p,T}$, chem. potential and fugacity of a pure gas are developed in terms of the appropriate independent variables V, T, n , or p, T, n . Each expression contains a definite integral, which can be evaluated by using an equation of state. The integrations are accomplished by means of a new equation of state and all the thermodynamic quantities are expressed in terms of the variables V, T, n and the consts. of the equation of state. From the relations developed in this and a former paper for the chem. potential of a pure gas and of a gas in a mixt., there are obtained general expressions for the d. and pressure at const. temp. of a gas that is in equil. through a semi-permeable membrane with a mixt. contg. the gas in question. The integrations are again accomplished by using an equation of state for gases and gas mixts. The evaluation of the various integration consts. is discussed briefly.

BERNARD LEWIS

The functional form of the constant of mass action and atomic activation. R. D. KLEEMAN. *Science* 68, 462(1928); cf. *C. A.* 22, 4040.—For reactions in the gas phase the law of mass action as usually understood becomes invalid if the volume of gas is increased sufficiently. What happens to 2 mols. in a gas depends not only upon their chance of encounter, but also upon previous encounters with other mols. which may activate them. The changes in the spectra of substances with temp. show that such changes are associated with mol. collisions and their violence. If the pressure changes continually, the av. activation of a mol. at any instant is likely to differ in nature and magnitude from that corresponding to a state of equil.

J. H. PERRY

A new equation of state for fluids. II. Application to helium, neon, argon, hydrogen, nitrogen, oxygen, air and methane. JAMES A. BEATTIE AND OSCAR C. BRIDGEMAN. Mass. Inst. Tech. *J. Am. Chem. Soc.* 50, 3133-8(1928); cf. *C. A.* 21, 3146.—The new equation of state is $p = [RT(1-\epsilon)(V+B)]/V^2 - A/V^2$, where $A = A_0[1 - (a/V)]$, $B = B_0[1 - (b/V)]$, $E = C/(VT^2)$, R is the gas const. and A_0, a, B_0, b , and c are parameters characteristic of the substance under consideration. This

equation is applied to the compressibility data for He, Ne, Ar, H₂, O₂, N₂, air and CH₄. A method is outlined for transforming the exptl. pressure-vol.-temp. data into isometric form and a description is given of the methods used in evaluating the consts. of the equation of state. The observed pressures are compared with those calcd. from the equation at more than 1700 points for the ten gases. The av. deviation for the entire range of pressure and temp. was 0.08 atm. or 0.18%. III. The normal densities and the compressibilities of several gases at 0°. *Ibid* 3151-7.—The above equation of state was used to calc. for several gases the ratio at 0° of the product PV at 1 and at 0 atm. pressure, resp. The ratio was then used to compute the mol. wt. of a normal l of H₂, O₂, N₂, CO₂ and CH₄. The results agree well with similar data detd. by chem. methods.

J. H. PERRY

Viscosity of rare gases. A. G. NASINI AND C. ROSSI. Reale Univ. Firenze. *Gazz. chim. ital.* 58, 433-42(1928).—Research into the viscosity of mixts. of monoatomic gases gave the opportunity to measure the coeff. of internal friction of pure gases. The viscosity of He seems well established, but the only data for Kr and Xe are doubtful. Therefore Kr and Xe, as pure as could be obtained (99.99%), were examd. with a new type of viscometer, the construction and technic of which are described and illustrated. The following data give the mean viscosities measured for the 3 gases at the particular temps. He, 14°, 1943×10^{-7} ; 99.8°, 23.32×10^{-7} ; Kr, 15.2°, 2436×10^{-7} ; 99.4°, 3062×10^{-7} ; Xe, 16.5°, 2250×10^{-7} ; 99.4°, 2871×10^{-7} . From these values the coeffs. of friction are calcd. viz., He, $\eta_{99.8^\circ}/\eta_{14^\circ} = 1.200$; Kr, $\eta_{99.4^\circ}/\eta_{15.2^\circ} = 1.256$; Xe, $\eta_{99.4^\circ}/\eta_{16.5^\circ} = 1.276$. With these data, the values of the Sutherland consts. were recalcd., giving 81.06, 290.0 and 210.4 for He, Xe and Kr, resp., thus agreeing well with those of Rankine (cf. C. A. 16, 668).

C. C. DAVIS

The structure of water. S. W. PENNYCUICK. Univ. Adelaide, S. Australia. *J. Phys. Chem.* 32, 1681-96(1928).—The mol. of H₂O is assumed to be a tetrahedron, with pairs of electrons at two of the corners, and positive H nuclei attached by electron pairs to the other two corners. Thus the mol. possesses 4 points of auxiliary valence, 2 positive and two negative. Such a structure accounts for W. H. Bragg's x-ray analysis of the cryst. structure of ice (C. A. 16, 3016), the mols. being held together by their auxiliary valences in hexagonal 6-oxygen rings, a benzene ring arrangement. Normal H₂O is quasi-associated, the diff. between associated and normal (quasi-associated) liquids being that, though both show mol. combination through auxiliary fields, the compd. mol. in an assoc. liquid presents an abnormally weakened field to the surroundings, while the quasi-compound mol. in a normal liquid possesses a strong field by which it tends to grow and to become immediately incorporated in the whole liquid system. Liquid H₂O consists of associated (H₂O)_n mols. with a benzene-ring structure, in a normal (quasi assoc.) solvent. A ring structure for assoc. acetic acid mols. is suggested. Evidence from the effect of pressure on aq. systems, the addn. of a solute, the max. d. of H₂O, the latent heat, the dielec. const., the self-ionization and the abnormal velocities of the H and OH ions is in favor of the author's view of ring assocn. and of abnormal activity of the auxiliary fields of the O and H atoms. R. J. HAVIGHURST

The general theory of distillation of liquid mixtures of many components and its experimental verification. YOSHIYUKI TSUKAMOTO. Univ. of Tokyo. *Japan J. Chem.* 2, 129-48(1926).—Ideal mixts. of liquids are considered first. Here neither vol. nor heat content changes on mixing. Latent heats are additive and the ratios of $\Delta L/RT$ are assumed to be independent of temp. if the differences in temps. are not too great. For non ideal solns. the partial mol. latent heat of evapn., \bar{L} must be substituted for L . The theory was verified exptly. in the system benzene-bromobenzene. The equations derived may be applied also in calcg. the composition of the vapor phase in equil. with a given liquid mixt. Calcn. is made for the system oxygen-nitrogen as an example of an ideal soln. and for CCl₄-EtOH as a non-ideal soln. R. H. L.

Theory of steam distillation. H. STANLEY REDGROVE. *Perfumery Essent. Oil Record* 19, 453-5(1928).—The theory of steam distn. is discussed, notably in its application to the production of essential oils. W. O. E.

The fluidity of mercury. EUGENE C. BINGHAM AND THEODORE R. THOMPSON. *J. Am. Chem. Soc.* 50, 2878-83(1928).—The fluidity of Hg from 0° to 100° was measured in a glass capillary. Evidence of slipping based on the flow of Hg in metal capillaries is not conclusive, because with Cu, for example, there is a differential soly. due to the slight soly. of Cu in Hg that results in the growth of the large crystals at the expense of the small ones. EUGENE C. BINGHAM

The variability of viscosity with temperature. G. BANDTE. *Erdöl u. Teer* 4, 543-6(1928).—The Herzberg temp. no. (C. A. 22, 3770) and the Vogel formula (C. A.

17, 318, 2661) are compared. The former, the av. viscosity drop per 10° over a given practical temp. range, has the advantage of being simple in calcn. and requiring only 2 detns., but gives only the abs. viscosity drop, which, though often sufficient for practical purposes, does not express the true relative sensitiveness to temp. except in the case of 2 oils having the same viscosity at the initial temp. The Vogel formula shows the true relative sensitiveness in all cases, since it compares not the abs. drops but the variable percentage drops, by means of the consts. of the equilateral hyperbolas, which are obtained when the logs of the viscosities of mineral oils are plotted against temp. The calcns. are complicated. A method of soln. requiring 3 detns. is given. Walther, C. A. 23, 316, accomplishes the soln. with 2 detns. through the linear relationship of the double logs.

F. S. GRANGER

Observations of density streaks in chemical work. FRIEDRICH EMICH. *Monatsh.* 50, 269-83(1928).—A microscopical method is described of observing the streak appearing when 2 liquids of differing optical d. are mixed. Liquids like H_2O and 1% alc. give a streak although differing in d. only 0.002 and in refractive index 0.0003. The method is useful in checking purity of compds., for example.

G. B. TAYLOR

The measurement of the dielectric constants of liquids in electrical fields of high strength. II. J. MALSCH. *Physik. Z.* 29, 770-7(1928); cf. C. A. 22, 3090.—According to the dipole theory of Debye, a decrease in dielec. const. with increase in field strength is to be expected. An exptl. arrangement for measuring this effect is described and the theory of the method is discussed. The dependence of the dielec. const. upon the field strength was investigated for H_2O , $C_6H_5NO_2$ and C_2H_5OH . The effect is greater the smaller the dielec. const. D . The abs. value of the effect, at about 250000 v./cm. amounts to $\Delta D/D = 1.0\%$ for $C_6H_5NO_2$, 0.7% for H_2O , 1.5% for C_2H_5OH . Substantially larger values would be expected on the basis of the simple Debye theory, without considering association phenomena.

E. R. SMITH

The determination of reaction affinity in systems of solid salts. J. N. BRØNSTED AND W. T. RICHARDS. *J. Am. Chem. Soc.* 50, 3028-35(1928).—The equation $nd\pi_0 + n_1d\pi_1 = 0$, where π_0, π_1 indicate chem. potentials of the components K_0 and K_1 , is applicable to homogeneous mixts. of K_0 and K_1 when satd. with pure solid components K_2, K_3, \dots . By means of this equation, the free-energy change during the reaction of solid salts can be calcd. from measurements of the vapor pressure of the solvent. A novel differential tensimeter is described. Vapor-pressure data are given for the solns. $CuCl_2$, $CuCl_2 \cdot 2NH_4Cl \cdot 2H_2O$; NH_4Cl , $CuCl_2 \cdot 2NH_4Cl \cdot 2H_2O$; $NaCl$, $CuCl_2$, $CuCl_2 \cdot 2NH_4Cl \cdot 2H_2O$; $NaCl$, NH_4Cl , $CuCl_2 \cdot 2NH_4Cl \cdot 2H_2O$. The affinity of formation of one g. mol. of dihydrated ammonium chlorocuprate from its solid components is found to be 3560 cal.

FRANK URBAN

The electrical conductivity of mixtures of compressed salts. P. FISCHER. *Polytech. Inst. Kiev. Z. Elektrochem.* 34, 756-8(1928).—This is continuation of F.'s work of measuring the cond. of solid mixts. (C. A. 22, 4343). He investigates different mixts. each contg. 3 of the following, PbI_2 , HgI_2 , KI , CdI_2 and AgI . The temp. ranged from 130° to 165° . Often ternary mixts. give much better conductivity than the same salts in binary mixts. The Ag electrode formed AgI in accurate concordance with Faraday's law; it is also indicated that the mixts. act as purely electrolytic conductors. M. D.

The internal friction and the elastic limit of lead. V. D. KUZNETZOV. *State Univ. Tomsk, Siberia. Z. Physik* 51, 239-62(1928).—The coefficient of internal friction η of solids is a function of the rate of deformation. When expressed without considering the elastic limit, η varies considerably. In expts. with Pb in torsion, for instance it varied from 10^9 to 10^6 grams per cm. per sec. If the elastic limit is introduced into the equation as a function of the rate of plastic flow, η remains practically const. In a series of torsion expts. on Pb, the elastic limit varied from 0.43 to 1.1 kg. per mm.². It can be increased considerably by increasing the load. Under increasing loads for 4 months, the elastic limit of Pb was increased from 0.05 to 0.32 kg./mm.².

G. CALINGAERT

The doctrine of amorphism is in error. P. P. VON VEIMARN AND TOKUTARO HAGIWARA. *Kyoto, Japan. Japan J. Chem.* 3, 15-70(1926).—Frankenheim's hypothesis that all solids are cryst., V.'s theory of ppts. and of the vectoriality of matter and Haber's theory of the initial condition of cryst. and amorphous ppts. are reviewed critically to justify V.'s assumption that there is no truly amorphous solid in the universe. V.'s three laws of pptn. are cited as proof that all apparently amorphous materials are really cryst. The conception of vectoriality is still more general than that of crystallinity. V. emphasizes the proof of crystallinity of many colloids afforded by studies in polarized light and with x-rays.

R. H. LAMBERT

A new equation for the determination of surface tension from the form of a sessile

drop or bubble. N. ERNEST DORSEY. Nat. Research Council. *J. Wash. Acad. Sci.* 18, 505-9(1928); cf. *C. A.* 22, 1071.—Heydewiller (*Wied. Ann.* 65, 311-19(1898)) computed a table upon the basis of several involved formulas, whereby surface tension can be calcd. from the form of sessile drops. Several of the exptl. quantities are difficult of accurate detn. and in certain cases the resultant errors are large. With the view of overcoming these difficulties, D. obtained from the data of Bashforth and Adams (*An Attempt to Test the Theory of Capillary Action*, Camb. Univ. Press, 1888) an empirical equation $A^2 = r^2 [(0.05200/f) - 0.12268 + 0.0481 f]$, which satisfies exptl. detns. of surface tension with a max. error of 1.34%. $A^2 = T/g(d-d')$. T is the surface tension, g the acceleration of gravity and d, d', r and f are factors dependent upon sp. measurements of the drop. These terms are explained diagrammatically and a table of calcd. values is given.

WILLIAM E. VAUGHAN

The electrical double layer in colloids. Silver iodide sol. H. R. KRUYT AND P. C. VAN DER WILLIGEN. Univ. Utrecht. *Z. physik. Chem.*, Abt. A., 139B, 53-63(1928).—Stable sols of AgI are produced by pptn. in the presence of small amts. of KI, KBr, KCl, KCN, KCNS and $K_3Fe(CN)_6$. The Ag salts corresponding to all but the last of these are isomorphous, showing that the anions can all take places in the crystal lattice of AgI. The conclusion is drawn that the origin of the double layer about crystals of AgI in the sol lies in these lattice forces. The peptizing action of $K_3Fe(CN)_6$ may be due to CN^- ions present in equil. with it or to the action of the trivalent anion in increasing the negative charge of AgI in contact with pure H_2O . Why AgI takes a negative charge in H_2O is unexplained, but it is true of many substances and is perhaps connected with the high mobility of OH^- . Cataphoresis measurements on positively charged AgI sol, peptized by $AgNO_3$, show that the charge decreases on diln. until finally the charge becomes negative.

F. L. BROWNE

Investigations on molecular sieve membranes. LEONOR MICHAELIS. *Fifth Colloid Symposium Monograph* 1928, 135-48.—Membrane permeability may be due to their selective soly. in the membrane or to sieve action, occasionally to both. Sieve membranes are classified according to their "mesh" as ordinary filters, filters for blood cells, bacteria filters, colloid filters and mol. sieve membranes. A specially strong mol. sieve filter is made by allowing a soln. of collodion to evap. on a surface of Hg. The "fineness" of a mol. sieve can be tested by placing it between 0.1 and 0.01 N KCl solns., between which there is ordinarily zero boundary potential, and observing the magnitude of the p. d. across the membrane. The dil. soln. becomes positive and the p. d. is 55 mv. for a perfect mol. sieve, which is permeable to the ion of charge opposite to that of the material of the sieve and impermeable to the ion of like charge. The diam. of the pores in mol. sieve membranes is probably of the order of magnitude of single mols. The following values in mv. were observed for different membranes: parchment paper 10, paraffined paper 13, waxed paper 21, mastic-impregnated paper 24, rubberized paper 29, collodion 5 to 10, dried "gun-cotton" 25, dried "celloidin" 45-55. The relative velocity of diffusion through membranes sepg. H_2O from 0.1 M solns. of the following solutes, arranged in the order of increasing mol. wt., was detd. analytically: MeOH 9.2, EtOH 3.0, PrOH 1.0, urca 1.0, BuOH 0.8, glycerol 0.22, chloral hydrate 0.11, monochlorohydrin 0.067, glucose 0.00. NH_3 diffuses much more rapidly than NH_4 . The diffusion of electrolytes is extremely slow, good membranes showing no passage after many days. But with KCl and $NaNO_3$ solns. sepd. by a membrane, diffusion of cations proceeds with reasonable speed, apparently by "exchange." The anions diffuse little, if at all, even here. With poor membranes these differences vanish. By using other combinations of electrolytes it was found that the valency of the anions has little influence, H ion plays no peculiar role, and with bivalent cations the p. ds. are very uncertain. The p. ds. across the membranes are due to differences in the mobilities of anions and cations within the small openings in the membrane. Thermodynamic factors play only a minor part.

JEROME ALEXANDER

Osmosis of ternary liquids. V. and VI. General considerations. F. A. H. SCHREINEMAKERS. Univ. Leiden. *Verslag Akad. Wetenschappen Amsterdam* 37, 374-83, 634-45(1928); *Proc. Acad. Sci. Amsterdam* 31, 459-68, 811-22.—Mathematical.

ALBERT L. HENNE

Effect of electrolytes on electroendosmose through wood membranes. ALFRED J. STAMM. *Fifth Colloid Symposium Monograph* 1928, 361-8.—Dil. alkali solns. increase the rate of electroendosmose through wood membranes, and dil. acid solns. decrease it, there is a straight-line relation between rate and pH . Dil. acids affect the membrane permanently, possibly causing hydrolysis on internal surfaces. Concd. acids and bases both permanently reduce the rate. Aq. salt solns. show the normal effect of salts with anions and cations of different valence on negatively charged mem-

branes. Tervalent and quadrivalent cations cause a reversal of the direction of flow and of the sign of the contact potential. Multivalent anions increase the rate of flow and the negative contact potential. The concn. at which a cation causes a max. in the rate of flow is less, the higher the valence of the ion.

JEROME ALEXANDER

Adsorptive combination. H. CASSEL. Univ. Berlin. *Z. Elektrochem.* 34, 536-8 (1928).—The point of view is set forth that solid adsorbents may not be sepd. from the gas phase by a sharp boundary corresponding to the surface of the crystal lattice, but that there may be an adsorbed layer of free mols. of the solid itself in thermal agitation. The existence of similar adsorbed layers about crystals undergoing growth or soln. has been demonstrated by other workers. Presumably the energy required to move mols. from the crystal lattice of the solid to the adsorbed layer is of the order of the heat of fusion and an arrangement of the Langmuir formula for adsorption expresses the no. of liberated mols. on the surface of the solid. During adsorption of a gas there would then be 2 possibilities, depending upon whether forces of attraction or of repulsion between mols. of adsorbent and adsorbate predominate; either (1) mols. of adsorbent are displaced from the adsorption layer to take up positions in new planes of the crystal lattice, on the surface of which more gas may be adsorbed, or (2) more mols. of adsorbent may be drawn into the adsorption layer. Usually both effects are in operation to greater or less extent. In case (1) adsorption affects the adsorbent much like a lowering of the temp. and in case (2) much like an increase in temp.

F. L. BROWNE

The process of adsorption. W. KÄLBERER AND H. MARK. I. G. Farbenindustrie, Ludwigshaven a. R. *Z. physik. Chem., Abt. A*, 139, 151-62(1928).—The initial portions of the adsorption isotherms for A and for CO₂ on many SiO₂ gels are linear for a considerable distance. For other SiO₂ gels the initial portion of the isotherm exhibits a much faster increase in the amt. adsorbed than in the succeeding linear region of the curve. The heat of adsorption in the linear regions of the isotherms is 2500 cal. per mol. for A and 6200 cal. for CO₂. In the steeper initial portion of the isotherm for one SiO₂ gel the av. heat of adsorption was 7500 cal. for CO₂. The thickness of the layer of adsorbed CO₂ on Al foil at 0°, 45° and 65° is of the order of 1.5×10^{-8} cm.

F. L. BROWNE

The expansion of charcoal accompanying sorption of gases and vapors. D. H. BANGHAM AND NAZIM FAKHOURY. Egyptian Univ. *Nature* 122, 681-2(1928).—The linear expansion of charcoal during sorption of H₂O vapor and of CO₂ at pressures short of satn. was measured. The expansion was directly proportional to the square of the amt. sorbed. The expansion caused by the sorption of a given no. of mols. was 10 to 11 times as great in the case of CO₂ as in that of H₂O. For CO₂ at 30° and 1 atm. pressure it amounts to roughly 0.101%. The usual form of the sorption isotherm may be due to the fact that the mechanical disturbance suffered by the solid becomes greater as the sorption proceeds.

F. L. BROWNE

Siloxene as an adsorbent. H. KAUTSKY AND G. BLINOFF. Kaiser Wilhelm-Inst. f. physik. Chem. u. Elektrochem., Berlin-Dahlem. *Z. physik. Chem., Abt. A*, 139, 497-515(1928).—Siloxene (C. A. 22, 2121, 3367) is a chemically and morphologically definite substance. It is a highly polymerized Si₆O₃H₆. It consists of "elementary planes" consisting of hexagons of 6 Si atoms joined together in the same plane by Si-O-Si linkages, with the H atoms disposed above and below this plane near the Si atoms. Many such elementary planes are attached parallel to each other by forces of adhesion. This simple structure is in marked contrast with the complicated capillary constitution of other adsorbents. Siloxene is also unusual among adsorbents in that different preps. of it always have the same adsorption isotherm toward a given adsorbed material. The sp. gr. of siloxene can be detd. directly, in contrast to charcoal. Siloxene is a very good adsorbent, taking up many org. substances from aq. soln. in an apolar manner. The adsorption of formic, acetic, propionic, butyric and valeric acids is shown to take place in accordance with Traube's rule. Oxidized siloxene exhibits exchange adsorption toward aniline-HCl. Only the cations are bound.

F. L. BROWNE

The physical chemistry of color-lake formation. HARRY B. WEISER AND EVERETT E. PORTER. *Fifth Colloid Symposium Monograph* 1928, 369-90; cf. C. A. 22, 1510-11.—The positive charge on dispersed particles of hydrous oxides decreases as the pH increases, and the capacity for adsorbing anions decreases correspondingly, becoming nil at pH 9.2. Adsorption of anions in alk. soln. is shown exptly. for OH⁻, SO₄⁻⁻ and C₂O₄⁻⁻. When both ions are present, SO₄⁻⁻ is less strongly adsorbed than C₂O₄⁻⁻, especially in neutral or alk. soln. The ratio of concns. of SO₄⁻⁻ to C₂O₄⁻⁻ for equal adsorption is 1.1 at pH 2.5 and 128 at pH 7. Miller's view that anions are taken up by hydrous oxides in solid soln. is disproved. Study of the taking up of dyes from solns.

at varying p_H by hydrous oxide mordants led to the conclusion that lake formation is due to adsorption of colored ions analogous to the adsorption of inorg. ions. Alizarin SW, alizarin and orange II were chosen to represent acid dyes and methylene blue as a basic dye. The conclusion of Marker and Gordon that Fe_2O_3 and Al_2O_3 form salts with orange II at low p_H is incorrect, because they failed to notice that the dye acid is pptd. in sufficient concn. of H_2SO_4 , forming a mixt. with the oxide. Methylene blue is adsorbed by hydrous oxides only when the p_H is high enough to peptize the oxide with a negative charge, the quantity of blue adsorbed being proportional to the amt. of the negative charge. In alizarin lakes, the dye ion is adsorbed, not neutral Na alizarinate. SO_4^{--} influences the adsorption of alizarin ion much as it does that of $C_2O_4^{--}$, replacing it in acid soln. but not in alk. soln. Ca^{++} increases the charge on the mordant and therefore its capacity for adsorption. In general, a strongly adsorbed cation increases and an anion decreases the adsorption of acid dyes. The effects are the reverse for basic dyes. The effects increase with concn. and with p_H . Cation and anion effects operate independently, the former predominating in basic and the latter in acid baths. The same generalizations apply to dyeing fibers in the absence of a mordant.

JEROME ALEXANDER

Physical chemistry of color-lake formation. IV. Red Congo acid and Congo red lakes. HARRY B. WEISER AND ROBERT S. RADCLIFFE. Rice Institute. *J. Phys. Chem.* 32, 1875-85(1928).—Aq. solns. of Congo red contain a red colloidal anion which is too small and hydrous to be visible in the ultramicroscope but which will not pass a membrane permeable to ions in true soln. Replacing the Na in Congo red with H gives a blue colloidal acid. A typical equation for the reaction is: $2Na^+ + R^{--}(\text{red}) + 2H^+ + 2Cl^- \rightleftharpoons H_2R(\text{blue}) + 2Na^+ + 2Cl^-$, where R^{--} stands for the anion of the dye. Since this reaction is partly reversible Congo red is not suitable for an indicator in acidimetry, in the presence of salts. The blue acid is very slightly sol. in H_2O , yielding the red colloidal anion. The soly. increases with rising temp. In the blue soln. the following equilibria exist: $nH_2R(\text{blue}) \rightleftharpoons nH_2R(\text{in soln.}) \rightleftharpoons 2nH^+ + nR^{--}(\text{red})$. The positively charged hydrous oxide mordants, such as alumina, adsorb the blue colloidal acid giving blue lakes. If the amt. of blue acid is small the blue lakes change to red very slowly at ordinary temps. and more rapidly at higher temps. The process consists in the adsorption of the red anion by the hydrous oxide, displacing the above reaction to the right until all the blue acid disappears. If the H-ion concn. of the bath is too high or the amt. of blue acid is in excess of the adsorption capacity of the hydrous oxide for the red anion, the lake remains purple to blue in color. The blue lake is an adsorption complex of the blue acid and the hydrous oxide. The red lake is an adsorption complex of hydrous oxide and the red acid (or alkali salt). The red alumina lake is not an Al salt of Congo red as assumed by Bayliss (*C. A.* 4, 405). Definite assurance of the existence of the red Congo acid in the solid state is lacking. The product formed by decomposing the pyridine salt is blue by transmitted light and reddish brown by reflected light. It is probable that Shaposhnikov and Bogoyavlenskii (*C. A.* 7, 1172, 1291) and Hantzsch (*C. A.* 9, 1175) mistook the surface color of the blue acid for the alleged red isomer.

H. B. W.

The adsorption of iron by kaolin and talc from solutions of ferric hydroxide and chloride. A FODOR AND A. ROSENBERG. *Kolloid-Z.* 46, 91-5(1928).—Kaolin adsorbs colloidal $Fe(OH)_3$ completely and instantaneously. It adsorbs the $Fe(OH)_3$ formed by partial hydrolysis in solns. of $FeCl_3$, but since it does not adsorb or neutralize the HCl liberated the hydrolysis reaches an equil. Kaolin does not adsorb $Al(OH)_3$; so a mixt. of $Fe(OH)_3$ and $Al(OH)_3$ can be sepd. quant. by adsorbing the $Fe(OH)_3$ on kaolin. Talc adsorbs colloidal $Fe(OH)_3$ and also neutralizes the HCl formed by the hydrolysis of $FeCl_3$; addn. of talc to a $FeCl_3$ soln. therefore causes complete hydrolysis of the $FeCl_3$ and the iron is entirely adsorbed.

J. G. McNALLY

The velocity of dehydration of gypsum at different temperatures. PETER P. BUDNIKOV. *Kolloid-Z.* 46, 97-9(1928).—The rate of drying of powdered natural and synthetic gypsum was detd. at 40°, 100°, 140° and 160°. The synthetic gypsum lost more water and lost it more slowly than the natural product at each temp. except 160°, at which the rates were equal.

J. G. McNALLY

The velocity of hydration of dry gypsum. PETER P. BUDNIKOV. *Kolloid-Z.* 46, 95-7(1928).—Both natural and synthetic gypsum previously dried at 140° adsorbed H_2O rapidly until 0.5 mol. of water of crystallization was taken up. The rate of adsorption then fell off markedly but increased on prolonged standing in contact with H_2O . The latter rapid adsorption is caused by the formation of a gel on the surface of the gypsum particles. Gypsum dried at 600° adsorbed H_2O only very slowly.

J. G. McNALLY

Studies of adsorption and swelling. II. V. KUBELKA AND J. WAGNER. *Kolloid. Z.* **46**, 107-14(1928).—The adsorption of HCl and H₂SO₄ by hide powder from aq. soln. was studied. The apparent adsorption of acid by unit mass of hide, x/m , increases with concn. of HCl until a concn. of 0.06 millimole per l. is reached; above this concn. x/m is const. With H₂SO₄, x/m steadily increases as the concn. of acid is increased. Hide powder shows a max. swelling in dil. HCl solns. but no max. was found in H₂SO₄, the swelling at low concn. being almost equal to that in pure water and lower at higher concn. of acid. When the concn. of acid in the solns. used in the adsorption expts. is corrected by allowing for the vol. of water adsorbed by the hide, x/m is almost a linear function of the equil. concn. of both HCl and H₂SO₄. J. G. McNALLY

The colloidal state as a universal property of matter. P. P. VON VETMARN. *Japan J. Chem.* **3**, 1-14(1926).—V. takes exception to the statement by J. Duclaux (*C. A.* **19**, 761) that the idea of the colloidal state of matter being a universal state in the same sense as the solid, liquid and gaseous states has no real advantage over the old doctrine of inherently colloidal substances. V.'s well-known arguments and examples are again presented in support of his point of view. RAYMOND H. LAMBERT

The stability of submicrons. I. The disintegration and formation of crystals and the formation of emulsions. I. TRAUBE AND WILHELM V. BEHREN. *Techn. Hochschule Charlottenburg. Z. physik. Chem., Abt. A*, **138**, 85-101(1928).—Previously (*C. A.* **16**, 518) T. and Klein concluded that the submicrons of lyophobic sols are not necessarily unstable, but that on the contrary solns. of substances of limited soly. contain submicrons in equil. with single mols. or ions. If the soly. is small enough practically all the "dissolved" substance may exist as submicrons. By observing the dissoln. of crystals of many substances under the ultramicroscope it is now shown that the crystals break up at least in part into submicrons before passing into mol. soln. and that the lower the soly. the more numerous the submicrons. Likewise during the formation of crystals, submicrons appear first and gradually clump together, lose their identity as submicrons, and unite as crystals. When CHCl₃ is emulsified in saponin soln., many very stable submicrons are formed in addition to the large drops of the emulsion. F. L. BROWNE

The constitution of micelles. IV. Colloidal aluminum oxide and ferric oxide. R. WINTGEN AND O. KÜHN. *Univ. Köln. Z. physik. Chem., Abt. A*, **138**, 135-57(1928); cf. *C. A.* **18**, 2989.—Sols of Al₂O₃ made by peptizing freshly pptd. Al₂O₃ with HCl are stable only for a short time. Sols made by adding to AlCl₃ soln. slightly less than enough NH₄OH to ppt. and purified at once by hot dialysis (*C. A.* **10**, 1957) are stable even in high concn. If dialyzed cold the Al₂O₃ is largely lost in the dialyzate. (Similar sols of Fe₂O₃ must be partly purified by cold dialysis before they will withstand hot dialysis.) The Al₂O₃ sols are not coagulated by KCl until they are dialyzed; if dialyzed too long they coagulate spontaneously. The lowest ratio of Cl to Al attained was 0.00144, but this sol was stable only for a few weeks. The ratio was 0.03 to 0.13 in the stable sols studied most carefully. Interrupting the dialysis to age the sol several weeks permits readjustment of the partition of electrolytes between the intermicellar soln. and the electrolytes enclosed within the micelles. During such aging the elec. conductivity of the ultrafiltrate increases measurably, and subsequent dialysis removes Cl⁻ from the sol more rapidly. This influence of aging is more marked the lower the temp. of the initial hot dialysis. Sols aged in this way during dialysis finally reach an equil. beyond which further dialysis fails to change the ratio of Cl to Al. From measurements of elec. conductivity and cataphoresis, the partition of Cl⁻ between intermicellar soln., "compensating" ions, and soln. enclosed in the micelles is calcd. and found to agree with interpretation of the elec. conductivity of the ultrafiltrate. The electrolyte in the intermicellar soln. proves on analysis to be AlOCl rather than NH₄Cl. For both Al₂O₃ and Cr₂O₃ sols the same straight line of negative slope serves to express the relation between the logarithms of the "equiv. aggregation" and of the ratio of Cl to Al or Cr; the corresponding line for Fe₂O₃ sol lies at higher values of the equiv. aggregation, indicating a greater tendency for Fe₂O₃ to form colloidal aggregates. In Al₂O₃ and Cr₂O₃ sols a far smaller proportion of the Cl⁻ is enclosed in the micelles than in Fe₂O₃ sols. In the ultramicroscope most of the Al₂O₃ sols exhibit only a Tyndall cone, but by using sunlight for illumination the micelles in some sols were resolved and counted. As in Fe₂O₃ sols, the no. of Al atoms per micelle increases when the ratio of Cl to Al decreases. The no. of atoms in the surface of the micelle carrying charge is approx. const. F. L. BROWNE

The structure of colloid particles and the formation of sols and gels. H. FREUNDLICH. *Ber.* **61B**, 2219-33(1928).—In general, gels differ from sols in that the solid particles of disperse phase are no longer free to move independently of each other but

are more or less firmly bound together. In both sols and gels the dispersion medium is liquid. By examn. with x-rays, the constitution of the disperse particles can be detd. Colloidal Au and Ag are shown to be small crystals of the metals; Bredig Cu sols are CuO; freshly prepd. sols of Al_2O_3 , ZrO_2 , ThO_2 , S and As_2S_3 have amorphous particles. Graham's Fe_2O_3 is basic FeCl_3 and Fe_2O_3 sol made by oxidation of $\text{Fe}(\text{CO})_5$ with H_2O_2 is $\text{FeO}(\text{OH})$. X-ray examn. reveals the compn. of the mass of the particles, but not that of the surface layer, which may be quite different. Three groups of methods have been used to distinguish spherical particles from non-spherical, and rod- from leaf-shaped particles. (1) In the ultramicroscope, spherical particles scatter a uniform light while non-spherical ones scintillate because the scattered light is most intense when the particle, in course of Brownian movement, lies with its long axis in the plane of the microscope and at right angles to the illuminating light. Such observations are made most conveniently in a cardioid ultramicroscope provided with an "azimuth diaphragm" by means of which light may be passed through the colloid along any chosen azimuth. Gels with non-spherical particles can be made to scintillate by changing the azimuth along which light is admitted. (2) In sols with spherical particles, the intensity of the Tyndall light is the same whether the sol be at rest or in motion, but in sols with non-spherical particles the intensity is different in the two cases because flow tends to orient the particles. In sols at rest or in gels the shape of the particles is revealed by the proportion of polarized to normal light in the Tyndall beam. (3) Sols with non-spherical particles which are themselves doubly refracting exhibit specific double refraction when the particles are oriented by causing the sol to flow. Sols with non-spherical particles that are amorphous or of the regular crystal system exhibit rod-double refraction when caused to flow. Much less is known about the disposition of disperse particles in sols and gels and about the forces acting between them. The phenomenon of thixotropy shows how slight the change from sol to gel condition must be. Although on gelation the particles are bound together and cease their Brownian movement, the negligible vol. change shows that they must retain their comparatively thick shells of the liquid phase and that the force of attraction between particles must operate over distances as great as $100\ \mu\text{m}$. Such forces cannot be ordinary mol. attraction but are believed to reside in the adsorbed shells of electrolytes and dispersion medium about the disperse particles. Even in concd. sols with non-spherical particles these forces often cause orientation of the particles in sols at rest and they are responsible for the departure from Poiseuille's law in the flow of such sols. F. L. BROWNE

Dispersoidological investigations. XXIV. The dispersoidology of gold. P. P. VON VEIMARN *et al.* *Repts. Imp. Ind. Res. Inst.* (Osaka, Japan) 9, 9-79(1928); cf. *C A* 23, 1010.—Zsigmondy holds that increasing the concn. of the soln. from which colloidal Au is sepg. increases the size of the particles, in contradiction to v. V.'s fundamental postulate. v. V. maintains that the reaction is anomalous in that, under many exptl conditions, an insol. compd. of Au rather than Au itself first seps. as a colloid and is later transformed into Au. Expts. are described in which colloidal Au is made by reaction between AuCl_3 and KI, KCNS, or Na citrate, resp. Here the corresponding Au salt seps. as the colloid first and is then reduced to Au. With equal concns. of reactants, the degree of dispersity and the stability increase in the order KI, KCNS, Na citrate, which is also the order of soly. of the Au salts. Orange-red and orange colloidal Au sols were made by boiling a dil. soln. contg. AuCl_3 and Na citrate until it became red, and then adding KCN. The sols were stable only for a few hours. The failure of a Au sol to give a blue ring at the point of contact with a superimposed layer of concd. NH_4OH does not prove the absence of compds. of Au. "Au is far from being one of the simplest objects for dispersoidological investigation; it is a multivalent chem. element and is inclined to the formation of complex combinations, which not seldom happen to be more stable than the simple Au combinations; on the other hand, the combinations of Au, being very numerous, are not characterized by stability and suffer rapid changes in their chem. compn., which changes often are difficult to define practically." F. L. BROWNE

Human saliva as a reagent for the preparation of a red dispersoidal solution and a red dispersed precipitate of gold. P. P. VON VEIMARN. Kyoto, Japan. *Japan J. Chem.* 2, 123-8(1928).—The technic of prepg. a Au sol by reduction with human saliva is described. Reproducible results may be obtained. Not only may the saliva of different individuals differ in its power of reducing AuCl_3 but that of any individual differs from time to time. A red Au sol can be made quickly by adding saliva to boiling distd water to which is then added a soln. of a Au salt soln. Continued digestion increases the intensity of the red sol. Photographs are shown of the tendency of such a sol to form rings when evapd. at room temp. Such Liesegang rings are not identical

with those formed chemically in gels. One photograph is that of Fe_2O_3 sol contg. a small amt. of Na citrate a spot of which was allowed to dry in the same manner as the Au sols.

RAYMOND H. LAMBERT

The technic and economics of mechanical dispersion methods. FELIX HEBLER. *Kolloid-Z.* 46, 225-7(1928); *Chem. Fabrik* 1928, 665-6.—As the problem of producing colloidal matter mechanically has not been satisfactorily solved despite numerous expts., a series of tests was carried out with different mills to compare the cost and efficiency of producing colloidal dispersions. Peptization is independent of type of mill and was not studied. The tube mill gives satisfactory results where large output at low cost is required, but fine dispersion is not required. The ball mill has a large capacity, requires little attendance, has a low cost but takes a long time. With proper control of time and water the "cross blow" mill is especially suited for the prepn. of colloidal dispersions. Usually no advantage is found in the high-speed colloid mill.

L. F. MAREK

The relation between the stability of a carbon suspension, the gas adsorbed by the particles and the p_H of the suspension medium. NATHALIE BACH-NIKOLAJEWA AND A. FRUMKIN. *Kolloid-Z.* 46, 89-90(1928).—Platinized C suspended in dil. HCl soln. was more stable when in contact with an atm. of air than one of H_2 . Unplatinized C suspended in dil. HCl in contact with air gave a system of intermediate stability. In dil. alk. soln. the suspension in contact with H_2 was much more stable than the one in contact with air. These results correspond to the fact that platinized C adsorbs acid when the suspension is in contact with air but it does not adsorb alkali. In an atm. of H_2 , however, it adsorbs alkali and not acid.

J. G. McNALLY

Flocculation of mixtures of colloids bearing the same sign. A. BOUTARIC AND (MLLE.) M. DUPIN. *Bull. soc. chim.* 43, 1059-62(1928).—The quantity of electrolyte (KCl, BaCl_2 , LiCl) required to flocculate a mixt. of (1) gamboge and As_2S_3 sols or (2) gamboge and mastic sols was detd. For (1) the quantity of electrolyte is always smaller than that calcd. from the proportions of the constituents, indicating a tendency for the two colloids to flocculate mutually. For (2) the amt. of electrolyte needed to flocculate the mixt. is the sum of the amts. needed for each one separately.

A. L. H.

Mechanical coagulation as a coagulation at boundary surfaces. H. FREUNDLICH AND S. LOEBMANN. *Z. physik. Chem., Abt. A*, 139, 368-74(1928).—The velocity of mech. coagulation of a sol is given by $k = (n_0 - n_t)/t$, where k is the velocity const., n_0 the initial concn. of the sol, n_t the concn. at time t . Sols of CuO and of $\text{FeO}(\text{OH})$ were studied. The velocity of coagulation was detd. by centrifuging the sol and titrating the supernatant soln. according to Zimmerman-Reinhardt. The velocity of mechanical coagulation was shown to be unaffected by the following: (1) changing from a contg. vessel and stirrer of glass to app. made of the same material as the sol (CuO) and having the same ζ potential; (2) concn. of sol; (3) temp. between 0° and 20° ; (4) amt. of liquid stirred; (5) negative charge acquired by the stirrer. The velocity of coagulation was proportional to the square of the speed of stirring. Coagulation was never complete, the amt. pptd. ranging from 20 to 70%. The ζ potential remained const. during coagulation. The coagulated sol showed anisotropic properties and examn. with the ultramicroscope showed that coagulated particles cohere with their longitudinal axes parallel. It is likely that coagulation occurs at the boundary between the sol and the air. Stirring increases this boundary surface. Coagulation was obtained by bubbling purified air through the sol, and also by bubbling C_4H_{10} , which has a lower dielec. const. than the sol. Addn. of substances that lower the surface tension increased the velocity of coagulation by stirring. According to Deutsch (*Z. physik. Chem.* 136, 353(1928)) equil. is displaced at the boundary of 2 phases of high and low dielec. consts. in favor of the electrically more satd. phase.

FRANK URBAN

The lyophilic colloids I. General introduction: agar sol. H. R. KRUYT AND H. G. BUNGENBERG DE JONG. Univ. Utrecht. *Kolloidchem. Beihefte* 28, 1-54(1928).—Marked contrasts in the theory of lyophilic as compared with lyophobic colloids are attributed in part to the fact that the former have been studied largely by physiologists seeking immediate application to biological systems and in part to the temptation to explain all of the behavior of the proteins on the basis of ionic reactions of amino acids. Agar, a carbohydrate, was therefore chosen as a less complex material for beginning a general study of lyophilic colloids. It was purified by thorough washing in H_2O , which reduced the ash content to 2.05%. Observations were made of the viscosity of 1/1% sols at 50° , with the Ostwald viscometer. Above 40° agar sols of this concn. behave like simple liquids obeying Poiseuille's law, free from ambiguity on the score of pre-history, hysteresis, or mechanical agitation. On standing at 50° the viscosity decreases only very slightly in 12 hrs., nevertheless correction was made for this change when

necessary. The viscosity of agar sols is some 200 times that predicted by the Einstein-Smoluchowski equation. It decreases when the temp. rises. Agar particles are therefore highly hydrated, the hydration decreasing with rising temp. just as the positive heat of swelling indicates. The curve relating the concn. of the sol with the difference between its viscosity and that of H_2O is very nearly linear but exhibits 2 distinct bends. Such a curve would result if the hydration of the particles increases on diln. All electrolytes in small concn. decrease the viscosity. The higher the valence of the cation of the electrolyte the lower the concn. necessary to produce a given reduction in viscosity. Salts of all cations of like valence are equally effective in equiv. concns. Cataphoresis proves agar sol to be negatively charged; the charge is decreased by cations. The elec. charge of agar sol is therefore of capillary-elec. origin, like that of lyophobic sols. Agar sol does not coagulate when discharged, so that its stability must be due to factors other than particle charge. HCl and KOH lower the viscosity more than $BaCl_2$, but this is in agreement with v. Smoluchowski's formula. Fuchsin is more effective than KCl , probably because of greater adsorption of org. ions, but strychnine nitrate behaves like KCl . At higher concns. of electrolytes the electro-viscous effect no longer dominates; the v. S. formula expresses the hydration and the lyotropic series is revealed in the influence of electrolytes on the hydration. Emulsoid agar sols possess 2 stability factors, elec. charge and hydration. To cause coagulation, both must be decreased. Thus addn. of electrolytes merely discharges the sol without coagulating, but if alc. or acetone is also added, dehydration with resulting coagulation takes place. The coagulum hydrates again reversibly but does not peptize at room temp. Addn. of alc. or acetone to electrolyte-free agar sol dehydrates without discharging, producing a lyophobic suspensoid which is then coagulated by electrolytes. The change from emulsoid to suspensoid is reversible. These generalizations for agar sol are extended to lyophilic sols in general and to proteins in particular.

F. L. BROWNE

Physical-chemical periodicity. N. v. RASCHEVSKY. *Z. Physik* 52, 372-81 (1928).—A cellular structure (foam-like or made up of drops) resulting from a sequence of reactions is necessarily rhythmic because of its cellular nature. Although the conditions necessary for this periodicity are quite general, very special conditions must obtain if the periodicity is to be of const. amplitude. R. will give these conditions in a note to follow.

GEORGE GLOCKLER

Certain physicochemical properties of pineapple-stem colloids. C. P. SIDERIS. *Plant Physiology* 3, 309-21 (1928); cf. *C. A.* 23, 171.—The colloids present in pineapple tissue were studied in the hope of discovering the reason for the optimum growth of the plant in soil and H_2O cultures at pH 4.5 to 6.5 (*C. A.* 22, 3683). From the fluid expressed from the stem, the colloids were sepd. by fractional pptn., by using acids and bases alternately. By applying the color reactions with protein reagents, 2 proteins and a carbohydrate were identified among the fractions. The 2 proteins, being amphotene, exhibit an isoelec. point, but the carbohydrate does not. The sepn. of one of the proten colloids on evapg. a sol also contg. $NaCl$ was observed under the microscope. If the soln. was on the alk. side of the isoelec. point the protein formed the central portion of the crystal mass; if the soln. was on the acid side $NaCl$ took the central position. At the isoelec. point the protein formed transparent threads made up of flakes chaotically arranged. On adding 0.1 N $NaOH$ dropwise to sols of the carbohydrate, hollow spheres or doughnuts of membranous ppt. were formed. These bodies were 0.05 to 0.5 mm thick and retained their identity from a few secs. in an acid soln. to many mins. in solns. of higher pH . Their formation is attributed to orientation of the active- $COOH$ groups of the protein colloid toward the interior of the bodies, the enclosed H_2O being that formed by neutralization of $-COOH$ by $NaOH$. The bodies break up finally as a result probably of osmosis. The hypothesis is advanced that the carbohydrate colloid has a hollow spherical structure, the shell of which is formed by aggregated micelles held together by electrostatic forces. Protein colloids may have similar structures. At the isoelec. point they would then be like collapsed rubber balloons; at pH values fairly close to the isoelec. point on either side they would be like inflated balloons; at pH values farther removed from the isoelec. point the micelles becomes so highly charged that they disperse, breaking up the structure. In the spherical bodies the $-COOH$ groups project inward and the $-NH_2$ groups outward as long as the soln. is on the acid side of the isoelec. point; on the alk. side the orientation is reversed.

W. T.

A general definition of acids, bases and salts. H. P. CADY AND H. M. ELSEY. Univ. of Kansas and Westinghouse Elec. and Mfg. Co. *J. Chem. Education* 5, 1425-8 (1928).—In order to make these terms applicable to any system involving an ionizing solvent, an acid is defined as "a substance which forms by its direct ionization only cations identical with the positive ions formed by the ionization of the solvent mols."

A base is "a substance whose mols. yield by a process of direct ionization only anions identical with those formed by ionization of the solvent mols." A salt is "a substance whose soln. in a solvent has an elec. cond. of a higher order than that of the pure solvent, and which by a process of direct ionization yields at least one kind of cation and one kind of anion different from those formed by direct ionization of the solvent." The terms *solvation*, *acid of a system*, *acidic*, *neutral*, *basic*, *acid ion*, *base ion*, *neutralization*, *acid salt*, *basic salt*, *neutral salt* and *solvolysis* also are discussed. A. M. P.

Invasion and solvation of gases in water. GEORG-MARIA SCHWAB AND EMIL BERNINGER. Univ. Wurtzburg and Chem. Lab. des Staates, München. *Z. physik. Chem.*, Abt. A, **138**, 55-74(1928).—A method is described for detg. quickly the soly. and the invasion coeff. of a gas in H₂O at temps. ranging from 15° to 80°. The method is based on the change in pressure in a bubble rising through a column of H₂O. The values of these coeffs. at various temps. are given for O₂, H₂, N₂O, CO₂, C₂H₄ and C₂H₂. The abs. solution velocities differ widely in their order of magnitude and their temp. coeffs. The soly. of CO₂ was detd. above 60°, that of N₂O, C₂H₄ and C₂H₂ above 30°. As the temp. rises the solubilities of CO₂ and C₂H₂ reach a min., the soly. of N₂O falls rapidly, and that of C₂H₄ remains nearly const. From the soly. data, the invasion coeffs. were calcd. At 20° they are of the same order of magnitude for the gases investigated, although their temp. coeffs. vary decidedly. The differences are attributed to differences in the H₂O films. Approx. calcns. give rough values of the hydration numbers. A comparison of the figures obtained at 20° and 60° shows that CO₂ and C₂H₂ have an abnormal positive temp. coeff. of hydration. This fact is to be connected with the soly. min. exhibited by these two gases. ALBERT L. HENNE

Molecular condition of salts in solution. H. ULLICH AND E. J. BIRK. Univ. of Rostock. *Z. angew. Chem.* **41**, 1075-8, 1141-4(1928); cf. *C. A.* **22**, 4326.—Deviations from the Debye-Hückel laws are discussed for moderately dil. and concd. solns. and for fused salts. The effects of ion radii, solvation and association are considered. *Associated ions* are pairs of ions whose charges have approached closer than a certain definite interval. In some ways they resemble undissocd. mols., and compared with individual ions they exert small elec. forces upon their environment. They represent a loose union of solvated undeformed ions, while undissocd. mols. are closely bound, unsolvated, deformed ions. The min. interval, b_{\min} , between two ions is given by the expression $b_{\min} = 4.16 \times 10^{-4} Z^2/DT$. In H₂O solns. of univalent electrolytes this is 1.76×10^{-8} cm. As long as b is greater than this value, Debye-Hückel's formulas are applicable for concns of 0.1 to 1.0 *M*, but if b becomes less than this they lose their value. In such solvents as EtOH and acetone, b_{\min} for a univalent salt is about 7×10^{-8} cm. A values are plotted against $\sqrt{2c}$ for KCl, KNO₃, LiCl and LiNO₃ in H₂O. With solvents having a dielec. const. (Dk) < 30, cond. curves show large deviations from the normal. In such solvents as acetone ($Dk = 21$), ethylene chloride ($Dk = 10$), and tetrachloroethane ($Dk = 8.15$), b_{\min} for univalent salts attains values of 7, 14 and even 19×10^{-8} . With falling Dk of solvent even stronger ion association occurs, and the A values show larger deviations. With "weak" salts such as (C₂H₅)₄NI, (C₂H₅)₄NCl and NaI, A values indicate the formation of undissocd. mols. In such solvents as H₂O, NH₄OH and EtOH most salts are almost completely dissocd., but in such non-polar solvents as C₂H₆ and acetone only such salts are dissocd. to a considerable extent as are also strongly dissocd. when fused. Three characteristic properties are found in concd. solns. of strong salts; polymerism in mol. wt. detns. by the osmotic method, anomalous cond. and increase in Dk . These are attributed to assocd. ions and are not found in concd. solns. of weak salts. Salts which possess poor cond. and show low dissocn. in solvents of low Dk , behave similarly in a state of fusion, while salts strongly dissocd. in such solvents are likewise strongly dissocd. in a state of fusion. H. STOERTZ

Free energy of nitric acid solutions in water. B. LENGVEL. *Magyar Chem. Folyóirat* **34**, 9-16, 23-32, 39-44(1928).—The freezing points of dil. HNO₃ solns. were detd. as an exptl. basis for the calcn. The exptl. app. consisted of 2 Dewar bottles contg., resp., ice water and ice in HNO₃ soln. The difference of temp. was detd. by means of a thermoelement combined with a galvanometer and a mirror. The accuracy of the detns. is 0.0002° for very dil. solns. Various dilns. were examd., from about 0.005 to 4 *N* HNO₃. The expts. gave a basis for the detn. of the activities of both components, as well as the activity coeff. of HNO₃ and the free energy of diln. for HNO₃ solns. S. S. DE FINÁLY

Incompatibility between any theory of complete dissociation and migration data for bivalent ions. JAMES W. MCBAIN AND PIERRE J. VAN RYSSELBERGE. *J. Am. Chem. Soc.* **50**, 3009-17(1928).—When SO₄²⁻ is added to 0.05 *M* MgSO₄ or CdSO₄, the Mg or Cd migrates toward the anode. All bivalent salts resemble Cd₁₂ in their

tendency to form complex anions. The extension of any hypothesis of complete dissociation to multivalent ions seems futile. Recent publications by Nernst, Fajans and MacInnes and Cowperthwaite support this view. *Measurements of migration* of Cd^{++} , Mg^{++} , Li^+ , K^+ and Ca^{++} in 0.05 *M* solns. of one of their salts contg. at least one bivalent ion were made in the presence of a 0.95 *M* soln. of a sulfate or chloride. Assumption of excessive hydration of cations does not explain the results. FRANK URBAN

The application of the distribution coefficient method for estimating the undissociated and dissociated portions of salicylic acid in a neutral salt solution. BOHDAN VON SZYSZKOWSKI AND ADAM VON SHAPSKI. *Z. physik. Chem.* 137, 238-62(1928).—The distribution coeff. of salicylic acid between C_6H_6 and solns. of NaCl , NaClO_3 , NaNO_3 , BaCl_2 , Na_2SO_4 and MgSO_4 for a range of concns. from 0.005 and 2.0 *M* was detd. The activity coeffs. of dissocd. and undissocd. acid were calcd. from the data. From the solubilities a general formula for the influence of weak solns. of weak electrolytes on soly. is obtained as follows: soly. in salt soln. \div soly. in H_2O = $[(1 - \alpha)/f_0] + (\alpha/f)$, where f_0 is the activity of undissocd. and f of dissocd. acid. Salicylic acid definitely forms hydrated single and double mols. in the C_6H_6 phase and its degree of dissocn. does not deviate much from 0.5 over the range of concns. studied. R. H. LAMBERT

The deviations of electrolytes from Ohm's law. M. WIEN. *Physik. Z.* 29, 751-5 (1928); cf. *C. A.* 22, 906.—The cond. of electrolytic solns. was measured in elec. fields of high voltage, in which the ions attain velocities as great as several m. per sec. The current impulse produced by the high voltage was used to measure the cond. The electrolytic cond. always increased when the field strength was increased. In weaker fields the cond. increased in proportion to the square of the field. The proportionality const. increased as the square of the product of the valences and was greater at lower concn. and at lower dielec. const. This effect can be expressed by the formula $\Delta\lambda = AX^2(1 - BX^2)$, where X is the field strength, A and B are consts. and $\Delta\lambda = (\lambda - \lambda_0)/\lambda$. In fields of very high strength the cond. approaches a limiting value. The more dil. the soln. the faster the limiting value is approached. This limiting cond. is identical, within the exptl. error, with the cond. at infinite diln. No increase of cond. occurs if the field is perpendicular to the voltage used in the measurement of the cond. E. R. S.

The theoretical explanation of the dependence of electrolytic conductance on the voltage and frequency. GEORG JOOS. *Physik. Z.* 29, 755-60(1928); cf. *C. A.* 22, 2861.—The concepts underlying modern theories of electrolytes are reviewed briefly. The increase in electrolytic cond. at high field strengths observed by Wien (cf. preceding abstr.) is explained by means of the Debye-Hückel theory and the equations of Onsager (*C. A.* 21, 2412). The equations of Debye and Falkenhagen (*C. A.* 22, 3573) for the formation of the ionic "atmosphere" predict that the force of relaxation of the ionic "atmosphere" vanishes at high frequencies and that the electrophoretic force vanishes at very high voltages, in agreement with the exptl. results of Wien. E. R. SMITH

The influence of glycocoll upon the electrical conductivity of salt solutions. TERUICHIRO MURAYASU. *Hokkaido Univ. Hokkaido J. Med.* 6, 328-36(1928).—By ordinary methods M. measured the elec. cond. of 0.5 *M* solns. of NH_4Cl , NaCl , etc., with and without addn. of glycocoll. The conductivities of the salts of univalent cation with uni- or bivalent anion, and of salts of bivalent cation with univalent anion decreases upon adding glycocoll, in the order: $\text{HCl} > \text{NaCl} > \text{Co}(\text{NO}_3)_2 > \text{Na}_2\text{CO}_3 > \text{CaCl}_2 > \text{K}_2\text{Cr}_2\text{O}_7 > \text{BaCl}_2 > \text{AlCl}_3 > \text{NH}_4\text{Cl}$. The cond. of the salts of bivalent cation with bivalent or multivalent anion, and of the tervalent cation with quadrivalent anion increases upon adding glycocoll, the order being $\text{FeCl}_3 > \text{CrCl}_3 > \text{ZnSO}_4 > \text{CuSO}_4 > \text{MgSO}_4 > \text{K}_4\text{Fe}(\text{CN})_6$. K. SOMEYA

The electrolytic oxidation of formaldehyde in alkaline solution. ERICH MÜLLER AND S. TAKEGAMI. *Z. Elektrochem.* 34, 704-13(1928).—The curves of current vs. voltage for the electrolytic oxidation of alk. H_2CO (24% H_2CO in equal vol. of 2 *N* or 4 *N* NaOH) were observed at 18-20°, with anodes of polished and spongy Au, Ag, Pd, Rh or Pt wire; the e. m. fs. were measured against a normal calomel electrode. They were typical decompn. curves and were similar for all anodes, the current beginning to increase within 0.1 v. of the H potential. With smooth anodes the c. d. at the turn in the curves varied with the metal; with spongy anodes the current up to the turn in the curves increased more rapidly and the turn occurred at higher c. d. The evolution of H_2 up to the turn in the curve was rapid with Au and Ag, slow with Pd and Rh and nil with Pt anodes. The max. c. d. at the turn increased with increasing concn. of alkali. The case of reduction of the oxide film by H_2CO (shown clearly on smooth Au and Ag anodes, less clearly on Pd and Rh, after the turn) detd. the returning leg of the curve. The processes taking place in the low-potential field were further studied, with 12% H_2CO and 4 *N* NaOH . Here the oxidation at Pt anodes is such that no H is formed

(I), while with the other anodes H is evolved (II). These studies show that both I and II occur simultaneously, the ratio II:I depending upon the anode metal (great with Au and Ag, small with Pd and Rh, and zero with Pt). For metals at which II takes place principally, the ratios are smaller with increasing anode potentials. At const. p. d. the ratio decreases somewhat with time. A mechanism is suggested for the part played by metals in the catalytic decompn. of HCOOH and H₂CO, and in the electrolytic oxidation of H₂CO up to the turn in the low-potential field. J. BALOZIAN

The anodic behavior of palladium in chloride solutions. FRIEDRICH MÜLLER Tech. Hochschule, Dresden. *Z. Elektrochem.* 34, 744-52(1928).—Pd behaves differently than Pt when used as a Cl₂ electrode in a chloride soln. It gives a less positive voltage and is attacked. On lifting the Pd electrode into the air for a moment the metal suddenly becomes passive and when replaced in the soln. gives the same potential as the Pt electrode and is no longer attacked. A Pd electrode which acts as a passive electrode in 0.01 N HCl is active in 1 N and 5 N HCl. In Cl-free NaNO₃ and HNO₃, the Pd as anode is passive. M. discusses the various theories of passivity that might account for the phenomena, in particular the theory that a higher oxide, PdO₂, which is only attacked by HCl, makes the metal passive. Results similar to those with chlorides were obtained with alkali bromides and iodides. Except in Na₂SO₄ solns. the passivity was destroyed by touching the Pd with a zinc wire. MALCOLM DOLE

Chemical reactions of the third order. FRANK E. GERMANN. Univ. Colorado J. Phys. Chem. 32, 1748-50(1928).—In case of a 3rd-order reaction of the form $A + 2B \rightleftharpoons R_1 + R_2 + \dots$, the form of the expression for velocity of reaction differs according to the use of mols. or equivalents per liter as the measure of concn. The expression obtained when mols. per liter is used is given and integrated. In all other cases of 3rd-order reaction, the equations are the same, whether mols. or equivs. per l. are used. R. J. HAVIGHURST

Reply to O. Warburg's comments (on the catalysis of the oxidation of iron). HANS HANDOVSKY. *Biochem. Z.* 202, 157 8(1928); cf. *C. A.* 22, 4333.—H. points out that Fe heated in an atm. of N₂ loses its ability to catalyze the oxidation of amino acids. S. MORGULIS

Catalysis in the hydration of acetic anhydride. MARTIN KILPATRICK, JR. Polytech. Inst., Copenhagen. *J. Am. Chem. Soc.* 50, 2891-902(1928).—The velocity const of hydration K_h of Ac₂O was detd. at 0° by a dilatometric method. The effect of a no of neutral salts upon K_h as well as the medium effect of acetic acid was also detd. The consts. for H⁺, AcO⁻ and formate-ion catalysis were measured, the latter being a very active catalysis. In propionate-propionic acid and in butyrate-butyric acid buffer solns. the hydration is slower than in H₂O alone. J. H. PERRY

The reversible addition of ethyl alcohol to *p*-bromobenzonitrile catalyzed by sodium, potassium and lithium ethylates. III. C. N. MYERS AND S. F. ACREB. Johns Hopkins Univ., H. A. Metz Lab., and Bur. Standards. *J. Am. Chem. Soc.* 50, 2916-22(1928).—The velocity of the reversible addn. of EtOH to *p*-bromobenzonitrile at 25° was measured in solns. of Na, K and Li ethylates in concns. from N/32 to N/2048 to det. whether both the ions and the non-ionized mols. are active catalytically. By substituting the different values of α and K_n in the equation $K_n = K_i\alpha + K_m(1 - \alpha)$, a series of equations was obtained which were solved for the individual and best av. values of K_i and K_m for each ethylate. K_i is the sum of the activities of the EtO ion in the two opposing reactions and K_m is the corresponding sum of the activities of the non-ionized metallic ethylate. The activities of the EtO ion in the three cases were the same. The corresponding values for the cations Na⁺, K⁺ and Li⁺ were: 0.163, 0.144 and 0.093, resp. The conclusions of this study agree with the application of the ion mol. theory of catalysis to 62 quant. studies of previously studied reactions of previous investigators. J. H. PERRY

Stopping corrosion by hydrogen-ion control. F. R. MCCRUMB. *Power* 68, 1038-40 (1928).—A description of the use of a comparator in detg. p_H of brine. D. B. DILL

Formation of nitrite and nitrate from ammonia and oxygen upon alkaline surfaces. K. A. HOFMANN. *Sitzb. preuss. Akad. Wiss.* 1928, 461-5.—It was shown previously that mixts. of NH₃ and air form nitrates rapidly at temps. even below 400°, without loss of NH₃ through decompn., provided that the gases react only on the alk. surfaces. The mechanism of the reaction is now discussed. The first product actually detected is nitrite, formed thus: $2\text{NH}_3 + 3\text{O}_2 + 2\text{NaOH} = 2\text{NaNO}_2 + 4\text{H}_2\text{O}$. N₂ is not formed, probably because =NH is produced first, as in the reaction between O₂ and NaN₃, NaNH₂, or NH₂OH. To hasten the formation of nitrate and nitrite, catalyzers like Cu, Ni, Co and Ag are necessary; the reactions then involved are similar

to those observed when Ag and Au dissolve in alk. cyanides or in NH_3 solns.

W. C. ERAUGH

Oxidation of mercury in the presence of incandescent platinum. A. I. LEIPUNSKII. *Physik. tech. Röntgen Inst., Leningrad. Z. physik. Chem., Abt. B*, 1, 369-74(1928).—The kinetics of the oxidation of Hg vapors in the presence of incandescent Pt are investigated. The reaction velocity is little affected by the pressure of O_2 ; it decreases with increasing vapor pressure of Hg, and increases with the temp. of the Pt filament. The reaction is considered as a catalytic process in which O_2 is activated by adsorption on the Hg-free surface of the Pt wire.

ALBERT L. HENNE

The states of aggregation of condensed helium. W. H. KEESOM. Univ. Leyden. *Nature* 122, 847-9(1928).—Helium was liquefied with the use as preliminary cooling agents first of H_2 vapor and then liquid H_2 boiling at -258° under reduced pressure. Although Kammerlingh-Onnes was unable to solidify the liquid even at 0.8°K ., K. succeeded. His app. is described in detail. By varying the pressure exerted on the He bath the fusion curve of the element was followed for pressures varying from 25 to 144 atms., with a corresponding temp. range of 1.2 to 4.2°K . The curve at its lower end becomes nearly parallel to the temp. axis and shows no evidence of meeting the vapor curve in a triple point; sublimation (below the crit. temp.) appears impossible. The dielec. const. of liquid He undergoes a sudden change at approx. 2.3°K .; liquid He evidently exists in two modifications, He I being stable above 2.3°K . and He II at lower temps. The heat of transformation of He I to He II is -0.13 cal./g . Helium has a triple point; liquid He I, liquid He II and vapor. The diagram is given. W. E. V.

The system: ammonium sulfate-sulfuric acid-ethyl alcohol. H. B. DUNNICLIFF, A. L. AGGARWAL AND R. C. HOON. Univ. of the Punjab, Lahore, India. *J. Phys. Chem.* 32, 1697-704(1928); cf. *C. A.* 20, 3627.—The system was investigated by a study of the action of EtOH or alc. H_2SO_4 on NH_4HSO_4 . When the liquid phase at equil. contains 0.28-2.53% H_2SO_4 as ester and 2.72-12.77% H_2SO_4 in the free state, the solid phase is $3(\text{NH}_4)_2\text{SO}_4 \cdot \text{H}_2\text{SO}_4$. When NH_4HSO_4 reacts with EtOH in a wt. ratio of one or more to one, there are indications of the formation of $2(\text{NH}_4)_2\text{SO}_4 \cdot \text{H}_2\text{SO}_4$. This solid phase is not formed when alc. H_2SO_4 acts on NH_4HSO_4 . When the liquid phase contains 3.08-4.37% H_2SO_4 as ester and 11.97-13.48% free acid, the solid phase has the compn. $3(\text{NH}_4)_2\text{SO}_4 \cdot 2\text{H}_2\text{SO}_4$, but it is doubtful whether a compd. of this formula is actually formed. When the liquid phase contains 5.48-12.06% H_2SO_4 as ester and 13.49-12.51% free acid, the solid phase is $(\text{NH}_4)_2\text{SO}_4 \cdot \text{H}_2\text{SO}_4$. When alc. H_2SO_4 with a total acidity of 80% or over reacts with NH_4HSO_4 , the solid disappears and no solid phase seps. down to -18° . The equil. depends upon some factor or factors other than the concn. of free H_2SO_4 .

R. J. HAVIGHURST

Heterogeneous elementary reactions I. The action of Cl_2 on Cu. L. FROMMER AND M. POLANYI. *Z. physik. Chem.* 137, 201-8(1928).—The reaction between halogens and metals is rapid and markedly influenced by temp. When the reaction proceeds exothermically all impacts of mols. are successful; when the reaction is endothermic the successful impacts may be calcd. from the equation, $n/n_0 = e^{-Q/RT}$, where Q is the heat evolved. The object of the expt. was to det. whether or not the reaction between Cl or Br and a metal is actually a "heterogeneous elementary reaction." The app. was so constructed that the gas reacted with the metal at very low pressure. The temp. of the metal could be varied independently of that of the gas. In the action of Cl on Cu at 470° , 0.33 to 0.44 of the impacts produce double decompn. while at 300° the successful impacts are about 1.5 times as many. Since Q is only 2.6 cal. it can hardly be the heat of activation as usually considered. The results appear to show that the Cl mols. tear Cu atoms from the crystal lattice to form CuCl , and that Cu_2Cl_2 is formed only in a secondary reaction. The study is being continued.

R. H. LAMBERT

The equilibrium diagram of the iron sulfide-manganese sulfide system. ZEN-ICHI SHIBATA. *Tech. Repts. Tohoku Imp. Univ.* 7, 279-87(1928).—FeS was prepd. by reducing Fe free from C, Si, Na_2CO_3 , N, and As with H_2 and mixing with flowers of S. The powder was strongly heated in H_2S and then in H_2 at 500° . MnS was pptd. by adding freshly prepd. $(\text{NH}_4)_2\text{S}$ to a soln. of MnCl_2 and heating on a water bath for 2 hrs., filtered, washed and dried. The dried mass was heated at 1000° in a current of H_2S and then in H_2 at 500° . Both the FeS and MnS were very pure. The m. ps. of FeS and MnS are $1163 \pm 2^\circ$ and $1610 \pm 3^\circ$, resp. An equil. diagram obtained from the result of thermal analysis shows that the 2 sulfides mix with each other in all proportions in the fused state, and partially in the solid state. On cooling from the melt, the eutectic is formed at 1164° with 93.5% FeS and 6.5% MnS. Twelve photographs are included showing the microstructure of specimens contg. 6.48, 9.68, 16.40, 25.57, 39.51, 48.10, 81.05 and 100% MnS, resp.

DOWNES SCHAAF

Spark ignition. E. TAYLOR JONES. Univ. of Glasgow. *Phil. Mag.* [7], 6, 1090-1103 (1928).—The chief topics discussed are the nature of the action of an elec. spark in igniting an inflammable gaseous mixt., and the conditions which det. whether a spark will ignite a given mixt.

GEORGE GLOCKLER

Kindling temperatures of mixtures of air and hydrogen. M. PRETTE AND P. LAFFITTE. *Compt. rend.* 187, 763-5(1928).—Because of differences in exptl. methods the data on the kindling temp. of air and H_2 are so contradictory that it is impossible to draw a curve connecting kindling temp. with concn. The following method is shown to be reliable and is proposed as a standard. The gaseous mixt. is prepd., dried thoroughly, stored over Hg and analyzed. The reaction vessel is a Pyrex cylinder (35 mm. diameter, 110 cc. capacity) surrounded by a steel jacket and elec. heated. The Pyrex vessel is evacuated to $1/10000$ mm. Hg before the gaseous mixt. is admitted. If a flame is observed, the vessel is again evacuated, its temp. lowered and gaseous mixt. readmitted, this being repeated until no flame appears. The temp. is then recorded. The expts. are then repeated with the same mixt. but at increasing temps. until kindling takes place. This new temp. is recorded. The av. of the two temps. is taken as the kindling point. Thorough evacuation is imperative because errors of 50-100° may be observed when the vacuum is only 1 cm. of Hg. When the concn. of H_2 in % by volume is: 10.10, 14.30, 19.90, 24.30, 29.70, 35.85, 42.90, 47.20, 58.80, 68.85, 79.40, 90.45, the kindling temps. are resp.: 456, 460, 462, 465, 468, 471, 475, 477, 482, 496, 514, 540.

ALBERT L. HENNE

A generalized Gibbs-Boltzmann equation. F. RUSSELL BICHOWSKY. Naval Research Lab., Wash. D. C. *Phys. Rev.* 32, 494-6(1928).—A generalized form of the Gibbs-Boltzmann canonical equation $1 = \int \phi(e/kT)e^{-(\alpha+e)/kT} d\omega$ is derived by reversing the line of proof used by Gibbs in showing the correspondence of statistical formulas with thermodynamics. The proof involves only the assumption of the first 2 laws of thermodynamics, the idea that thermodynamic quantities are the phys. av. of complicated mol. processes, and the assumption that energy, entropy and temp. give a sufficient description of the system considered. The equation allows a treatment by statistics of the most generalized type of systems.

BERNARD LEWIS

New thermochemical and refractometric investigations in the field of strong electrolytes. E. LANGE. *Physik. Z.* 29, 760-70(1928); cf. *C. A.* 22, 4337.—The heat effect caused by the diln. of a soln. contg. 1 mol. of salt from an initial concn. m to infinite diln. is the integral heat of diln. According to the Debye-Hückel theory this heat effect depends on interionic forces in a soln. of a completely dissoed. electrolyte. Aq. solns. in the concn. range below 0.01 M give a positive heat of diln. The simple expansion of the ionic system from a definite initial concn. to infinite diln. must have a cooling effect but, at the same time, in the dipole medium surrounding the ions heat is developed since the H_2O mols. added in the diln. process increase the hydration envelopes of the ions. At room temp. the quantity of heat given out by these H_2O mols. is greater than the heat effect of negative expansion and thus a positive net heat effect occurs. An adiabatic differential calorimeter sensitive to 0.5×10^{-6} degree, by means of which the net heat of diln. can be measured, is described. The theoretical expression for the heat of diln. (V_m) can be reduced to the formula $V_m = \text{const.} \sqrt{m}$, which requires that the heats of diln. of uni-univalent electrolytes be identical in the dil. concn. range, where the \sqrt{m} rule holds. Exptl. results with KF, KCl, CsCl and LiBr verified this prediction. KNO_3 showed a marked deviation from the rule in 0.01 M soln. The assumption that an appreciable number of mols. in solns. of strong electrolytes remains undissociated has not, as yet, been proved either by thermochem. or optical means.

E. R. SMITH

The heat capacity and entropy of barium bromate from 16° to 300° absolute. The entropy of bromate ion. BERNARD S. GREENSFELDER AND WENDELL M. LATIMER. Univ. of Calif. *J. Am. Chem. Soc.* 50, 3286-90(1928); cf. *C. A.* 22, 3570.—The sp. heat of $Ba(BrO_3)_2 \cdot H_2O$ was measured from 16° to 300°K., by technic developed in similar studies of Cs alum. The sp. heat together with the heat of soln. and the free energy of soln. of $Ba(BrO_3)_2$ were used to calc. the entropy of bromate ion in hypothetical 1 M aq. soln. $S^\circ_{BrO_3-} = +43.6$ E. U., with respect to $S^\circ_{H+} = 0$.

J. H. P.

The heat of formation of cementite. TAKEO WATASE. *Science Repts. Tohoku Imp. Univ.* 17, 1091-1109(1928).—Cementite prepd. by subjecting plates of C steel (2% C) to electrolysis with N HCl and a current d. of 0.075 amp. per sq. cm., was burned in a Berthelot-Mahler bomb calorimeter and its heat of combustion detd. From the observed amt. of heat evolved and the compn. of the combustion residue, the heat of the reaction $Fe_3C + 3O_2 = Fe_2O_3 + CO_2$ was found to be 366.3 kilocalories. From

this figure and those found in the literature for the formation of Fe_3O_4 and for CO_2 , the heat of formation of cementite is calcd. to be -4.8 kilocalories at 20° . D. S.

Particles of high velocity in the chromosphere. R. W. GURNEY. *Month. Not. Roy Astron. Soc.* **88**, 377-9(1928).—A discussion of the kinetics of the rapidly moving particles in the chromosphere. B. C. A.

Catalytic dehydration of alcohols with alkaline bisulfates (SENDERENS) 10. The mathematical theory of filtration (UNDERWOOD) 13. The gelling of fatty oils (SCHEIBER) 27. Possibility of ring-chain valency tautomerism and of a type of mobile-hydrogen tautomerism analogous to the Wagner-Meerwein rearrangement. V. Pinacolic electron displacement as an explanation of various intramolecular transformations (SHOPPER) 10. The validity of the Hagen-Poiseuille equation for vegetable oils (SLANSKY, KÖHLER) 27. Some properties of the alkali metals (HACKSPILL) 6. Separation of pure yttrium from yttrious earths (CANNERY) 6. Effect of inhibitors on the acid solution of copper and copper alloys (FORREST, *et al.*) 9. The system ferrous oxide-silica (HERRY, FITTERER) 9.

BLOCK, W.: *Messen und Wagen*. Introduction to the historical development and art of measuring practice by Fritz Plato. *Chemische Technologie in Einzeldarstellungen*. Edited by A. Binz. Leipzig: O. Spamer. 339 pp. Paper, R. M. 25; bound, R. M. 28.

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MELLON, MELVIN GUY: *Chemical Publications—Their Nature and Use*. New York: McGraw-Hill Book Co., Inc. 253 pp. \$2.50. Reviewed in *Chem. Age* (London) 19, 514(1928); *Ind. Eng. Chem.* 21, 94(1929).

PARTINGTON, J. R., AND TWEEDY, S. K.: *Calculations in Physical Chemistry*. London: Blackie and Son, Ltd. 152 pp. 7s. 6d. Reviewed in *J. Phys. Chem.* 33, 160(1929).

TRAVERS, M. W.: *The Discovery of the Rare Gases*. London: Edward Arnold & Co. 128 pp. 15s. Reviewed in *Chem. Age* (London) 19, 514; *Chemistry & Industry* 47, 1290(1928); *J. Phys. Chem.* 33, 159(1929).

Determining optical properties of fluids. FREDA HERZFELD GEB. HOFFMANN. *Ger.* 468,428, Feb. 1, 1927. For the detn. of optical properties of fluids by methods in which light that has traveled a short distance through the fluid is compared with light that has traveled a longer distance, there is provided a transparent body to be immersed in the fluid in a suitable container and shaped so that longer and shorter paths for the transmitted light are available.

3- SUBATOMIC PHENOMENA AND RADIOCHEMISTRY

S. C. LIND

Quantum theory and the analysis of observations. F. J. SELBY. *Phil. Mag.* [4], 6, 801 6(1928).—The notion of quantum theory is an inherent property of our minds. GEO. GLOCKLER

New quantum statistics of distribution phenomena. R. FÜRTH. *Z. Physik* 48, 323-39(1928).—Mathematical. H. G.

The quantum theory of the atom nucleus. G. GAMOW. *Z. Physik* 51, 204-12 (1928).—G. studies the process of emission of α -particles in the light of wave mechanics, and tries to derive theoretically the experimentally discovered relationship between life period and energy of the α -particle. G. CALINGAERT

The blind-alley of modern atomistics. DAN RĂDULESCU. *Scientia* 44, 307-16

(1928).—A number of the advances of modern physics are reviewed and the conclusion is drawn that while the new laws of statistical mechanics furnish a good description of phenomena, the theories explaining their causes have not kept pace, and a point is being approached where nothing will be comprehensible. L. A. SARVER

Experimental confirmation for Sommerfeld-Fermi-Dirac degenerate-gas theory of conduction electrons. JESSE W. M. DU MOND. *Calif. Inst. Science* 68, 452(1928).—Preliminary results of a study of the Compton modified line structure confirm the Sommerfeld theory of conduction electrons in metal crystal lattices. Al and Be have been studied, the results being most striking with Be, where probably 2 of the total 4 electrons per atom are in the degenerate gas-state. J. H. PERRY

Recent progress in the study of the structure of the nucleus. S. C. LIND. *Chem. Reviews* 5, 365-9(1928).—Review. GEO. GLOCKLER

Helium nucleus as the foundation of other atom nuclei. H. PETTERSSON. *Z. Physik* 48, 799-804(1928).—From the point of view of the new at. wt. detns. of Aston, arguments are brought forward against the theory that elements in general are built up from He nuclei. B. C. A.

Problems of radioactivity. S. C. LIND. *Chem. Bulletin* 15, 319-21(1928).—The exact branching point of the actinium family should be detd. and also the at. wts. of the members of the Ac series. The isotopes of U should be studied by the mass-spectrography. Atomic disintegration by means of α -particles must be carried further. The elements 85 and 87 are probably radioactive and should, therefore, be discovered by the methods of radioactivity. Elements higher than U in at. wt. should be sought and finally our knowledge of nuclear structure should be extended by studies in radioactivity. GEO. GLOCKLER

Problem of actinium. L. IMRE. *Magyar Chem. Folyoirat* 34, 49-56(1928); cf. C. A. 22, 1094.—It is not yet definitely decided whether the Ac-group is connected genetically with the U-Ra-group. If they were connected another branch-group might be expected at U₁₁. There are, however, some difficulties which cannot yet be explained. A method was found for sepg. Radio-Ac by means of two liquid phases. Exams. proved Radio-Ac to be an element of the character of thorium. Some quant difference between Th and Radio-Ac are now under actual examn. S. S. DE FINÁLY

Radium and geology. CHARLES S. PIGGOT. *Geophys. Lab. Carnegie Institution of Wash. J. Am. Chem. Soc.* 50, 2910-6(1928).—The significance of radioactivity to geology is discussed. The radioactivity of 7 granites of the eastern U. S. is given. A method for detg. U and U-derived Pb involved in an age detn. is outlined. L. D. R.

The physics of the universe. JAMES JEANS. *Nature* 122, 689-700(1928).—From a consideration of the transformation of matter into radiation, as in radioactive disintegration for example, and of the conditions under which radiation might be transformed into matter, it is concluded that "there can be no creation of matter out of radiation, and no reconstruction of radioactive atoms which have once broken up. The fabric of the universe weathers, crumbles and dissolves with age, and no restoration or reconstruction is possible." Millikan's hypothesis that matter is formed by combination of protons and electrons in interstellar space is rejected as a violation of the second law of thermodynamics. F. L. BROWNE

The rate of emission of α -particles from radium. H. J. J. BRADDICK AND H. M. CAVE. *Proc. Roy. Soc. (London)* A121, 367-80(1928).—A detn. by the "total charge" method, suggested by Rutherford, gave 3.68×10^{10} α -particles per g. per sec. This is in agreement with recent values calcd. from heating effects. Sources of Ra active deposit were used. Ra A was allowed to decay before measurements were made. γ -Rays from Ra C were used to measure the source. L. D. ROBERTS

The internal conversion of gamma rays. II. BERTHA SWIRLES. *Girton College, Cambridge. Proc. Roy. Soc. (London)* A121, 447-56(1928); cf. C. A. 22, 18.—A mathematical discussion of the absorption in the K- and L-levels, based on the exptl. results of Ellis and Wooster, is presented. L. D. ROBERTS

Loss of charge of positive rays and the influence of neighboring metallic walls. E. RÜCHARDT. *Z. Physik* 48, 594-9(1928).—Polemical. A reply to Koenigsberger (C. A. 22, 19). J. W. SMITH

Variation in radioactivity and mineralization of springs. V. SPRITZIN. *Trav. Radium et Minerais radioactifs Acad. sci. U. S. S. R.* 2, 272-6(1928); cf. *Ibid* 264 71.—A consideration of the relation between radioactivity and salt content of the water of radioactive springs. B. C. A.

Ionization measurements of γ -rays. J. A. CHALMERS. *Queens' College, Cambridge. Phil. Mag.* [7], 6, 745-62(1928).—The ionization produced in a chamber depends only on primary γ -rays through the agency of the secondary β -rays, and hence

may not measure any definite property of the γ -ray beam; expts. have been carried out which show striking alterations in the relative ionizations of the Ra B and Ra C γ -rays when the electroscope lining is altered, the γ -ray beam being the same. A qual. and a very roughly quant. explanation are given, by using well-known ideas of adsorption and scattering of β - and γ -rays. This demonstrates the part of an "ionization function" in γ -ray measurements, and the consequences of this are considered in relation to past work and in connection with the limitations necessary in the use of ionizations to measure γ -rays.

GEO. GLOCKLER

The effect of refraction on electron diffraction. G. P. THOMSON. Univ. Aberdeen. *Phil. Mag.* [7], 6, 939-42(1928).—Criticism of Rupp's calcn. of the refractive index of electrons passing through a metal (*C. A.* 22, 3094).

GEO. GLOCKLER

Dirac's theory of spinning electrons. J. VON NEUMANN. *Z. Physik* 48, 868-81 (1928), cf. *C. A.* 22, 1729, 3584.—Mathematical (cf. Dirac, *C. A.* 22, 1535, 2710).

H. G.

Is it possible to test by direct experiment the hypothesis of the spinning electron? L. BRILLOUIN. Univ. of Wis. *Proc. Nat. Acad. Sci.* 14, 755-63(1928).—L. discusses the theory of a proposed expt. on electronic motion in a magnetic field, designed to test the spinning-electron hypothesis. The order of magnitude of the expected effects is so small that the expt. would be very difficult.

R. L. HERSHEY

The ballistic method of ionization measurement with a quadrant electrometer. DAVID L. WEBSTER AND ROBERT M. YHATMAN. *J. Optical Soc. Am.* 17, 248-53(1928).—W and Y. discuss the theory of the true ballistic method of ionization measurement with quadrant electrometer, i. e. exposing the chamber to rays for a predetd. time and reading the farthest point of swing. Four conditions must be satisfied to insure the validity of the method: (1) linearity of the differential equation of motion; (2) its homogeneity, except for the term proportional to the ionization; (3) initial values of velocity, deflection and charge of zero; and (4) constancy of exposure time. The last is easily satisfied; the second and third demand cancellation of natural ionization by a const. opposite current. Tests on a Compton type electrometer show no systematic deviation from linearity discernible below 500 mm. For large deflections a departure from linearity of about 1% appears, but calibration in this range enables accurate comparisons to be made.

R. L. HERSHEY

The recombination of positive ions with free electrons. R. d'E. ATKINSON. Göttingen Univ. *Z. Physik* 51, 188-203(1928).—A. attempts to det. exptly. whether recombination takes place when a stream of positive ions is passed through a cloud of electrons. No loss of electrons could be detected and therefore it is only possible to calc. an upper limit for the probability of recombination.

G. CALINGAERT

The energy losses of electrons in hydrogen. H. JONES AND R. WHIDDINGTON. Univ. of Leeds. *Phil. Mag.* [7], 6, 889-910(1928).—The energy losses of electrons in H_2 of controllable velocity are measured, and also the relative no. in the different energy groups. The results of the measurement of the photographs and their photometric curves may be summarized as follows: By far the most probable effect of a collision between an electron of 50 v. or more velocity and a H_2 mol. is the excitation of the C state with a certain amt. of vibrational energy. The probability of effective collision at 150 v. is in the neighborhood of 1 or 2%. At low velocities, smaller losses, the upper limit of which is 8 or 9 v., varying slightly with the primary electron velocity, are observed, these may be connected with the disocn. of the mol. and the excitation of the continuous spectrum. There is no loss of about 11.1 v. to be found, indicating that the B and other low vibrational states cannot be stimulated directly by electron impact. There is no indication, except at very low velocities (8 to 10 v.) when it is very faint, of a loss occurring which might be connected with direct disocn.

G. G.

Electrical properties of neon. J. S. TOWNSEND AND S. P. MACCALLUM. *Phil. Mag.* [7], 6, 857-78(1928).—Impurities so small in amt. that they cannot be detected spectroscopically, affect the sparking potential. The ionization coeffs. α and β in Townsend's well-known equation are studied.

GEO. GLOCKLER

The investigation of predischarges. F. TREY. Riga Univ. *Phil. Mag.* [7], 6, 854-7(1928).—In 1922 T. published (*Physik. Z.* 23, 193) photographs of brush-discharge "Schlieren," and showed that the "Schlieren" method has been useful in giving more precise information about the life-history of the spark. Cf. Zinszer, *C. A.* 22, 2879.

GEO. GLOCKLER

The electric arc in gases at low pressures. F. H. NEWMAN. University Exeter. *Phil. Mag.* [7], 6, 811-7(1928).—Further study of a new type of elec. arc (*C. A.* 20, 2451) in which with cold electrodes an arc could be started and maintained in various gases at very low pressure provided that an initial elec. discharge was passed between

one of the "arc" electrodes and a third electrode placed within the discharge tube. There were two sep. effects: first the ordinary arc in which the current reached 10-15 amp., and second a brilliant glow discharge during which a very small current passed through the tube. Both of these effects could be excited at such low gas pressure that there was practically no luminosity due to the elec. discharge. GEO. GLOCKLER

The motions of electrons in ethylene. J. BANNON AND H. L. BROSE. Univ. Sydney. *Phil. Mag.* [7], 6, 817-24(1928).—Study of energy losses of electrons in C_2H_4 by the method of Townsend. GEO. GLOCKLER

Penetration of an electric field through wire-gauze. W. B. MORTON. Queen's Univ., Belfast. *Phil. Mag.* [7], 6, 795-801(1928).—Mathematical analysis of the problem as applied to the method of measuring mobilities of ions. The conclusion is that the error introduced by the interpenetration of the fields is small. G. G.

The increase of thermionic currents from tungsten in strong electric fields. RUSSELL S. BARTLETT. Yale Univ. *Proc. Roy. Soc. (London)* A121, 456-64(1928).—Exptl. results are in general agreement with theory, but exptl. deficiencies do not account for the departure from a predicted straight line. A modification of Schottky's equation to account for the influence of neighboring electrons close to the surface is suggested. Surface impurities in the cathode produce a marked effect upon the exptl. results. L. D. ROBERTS

Systematic variations of the constant A in thermionic emission. LEE A. DU BRIDGE. Cal. Inst. Tech. *Proc. Nat. Acad. Sci.* 14, 788-93(1928).—The tabulation of published exptl. results shows that the value of A in Richardson's equation for thermionic emission $I = AT^2e^{-b/T}$ is not strictly const. but that $\log A$ is linear with b . The slopes of the lines are not identical for different metals; however the lines for Cu, W, Pt and thoriated W all intersect at or near the value of $\log A$ corresponding to $A = 60$ amp./cm.² deg.² the theoretical value according to Dushman. The curves may thus be expressed: $\ln A = \ln A_0 + \beta(b - b_0)$, where $A_0 = 60$, β is a const. depending upon the nature of the surface, and b_0 is the same for the more refractory metals. (The line for K is also plotted but does not intersect the others.) These conclusions agree with latest theoretical conclusions of Bridgman. R. L. HERSHEY

Hydrogen ions as cause for the appearance of the photoelectrical spectral selectivity of potassium. RUD. SUHRMANN. *Physik. Z.* 29, 811-5(1928).—Hydrogen which has been carefully purified and dried produces no increase in the photoelectrical sensitivity of K but expts. are described which indicate that the selective max. of K at 440μ is caused by the appearance of positive H ions on the surface of the K. These H^+ ions probably combine very loosely with atoms of the K surface, forming ionized KH mols. W. F. MEGGERS

The photoelectric long wave limit of potassium vapor. R. C. WILLIAMSON. Univ. of Wis. *Proc. Nat. Acad. Sci.* 14, 793-6(1928).—The ionization of K vapor by ultra-violet light has been measured, by using a monochromator, and drawing the vapor from the liquid through a slightly superheated tube into a vacuum. Part of the ionizing radiation is reflected upon a photoelec. cell for comparison purposes. Ionization begins at about 3027 A. U., reaching a max. at about 2800 A. U.; it then declines to a min. at about 2600°, and rises sharply to a second max. at 2150 A. U. The spectroscopic limit of the K atom being at 2856 A. U., the presence of ionization at longer wave lengths indicates mol. ionization, and of two kinds, with and without dissociation. Thus the ionizing potential of a mol. without dissociation would be between 4.08 v. and 3.94 v. and with dissocn. about 4.74 v. R. L. HERSHEY

Emergent energy of photoelectrons in potassium vapor. R. C. WILLIAMSON. Univ. of Wis. *Proc. Nat. Acad. Sci.* 14, 796-801(1928).—Some preliminary expts. on the emergent energy of photoelectrons in K vapor have been performed. Two sets of observations were made, one using the total radiation of a quartz Hg arc, the other using a monochromator with a Hg arc. The evidence is strong that the currents due to electrons emitted from the internal surfaces of the vessel have been made small relative to those due to electrons from photo-ionization of the vapor and that the values of the stopping potentials obtained agree with those to be expected from the data relative to the ionization wave limits of the vapor. The measurements are only preliminary and reference should be made to the original for details. R. L. HERSHEY

The space distribution of the initial directions of the photoelectrons produced by monochromatic x-rays. PIERRE AUGER. *J. phys. radium* 9, 225-30(1928); cf. C. A. 21, 1754.—A series of new measurements permitting the precise definition of the form of the longitudinal distribution of the initial directions of the photoelectrons arising from the excitation of argon by monochromatic penetrating x-rays has been accom-

plished with app. similar to that described in former articles. The monochromatic x-rays were selected by reflection from a rock-salt crystal. Measures and calcs. have been improved by special app., taking into account the non-orthogonality of projections obtained by photography. The statistics, bearing upon 1000 secondary rays, give bipartition angles and av. cosines very different from those obtained in previous work; this is explained by the non-homogeneity of the rays formerly used. These values do not agree with the predictions of former theories, the forward displacement being about 50% too great; but the form of the dispersion is well represented by the $\sin^2 \omega$ formula.

L. A. SARVER

Electric conductivity and optical absorption of metals. EDWIN H. HALL. Harvard Univ. *Proc. Nat. Acad. Sci.* 14, 802-11(1928).—H. discusses the relations between the optical properties of metals and the various mechanisms of elec. conduction and concludes that nothing now known about such properties invalidates the mechanism in which elec. current is maintained partly by free electrons sharing the energy of heat agitation, but mainly by an interchange of electrons in encounters between atoms and positive ions.

R. L. HERSHEY

Recombination of ions in the chamber of an x-ray spectrometer. DAVID L. WEBSTER AND ROBERT M. YEATMAN. *J. Optical Soc. Am.* 17, 254-9(1928).—Tests on the ionization chamber used in these expts. show that the fraction of ions lost by recombination may be const. for any loss up to 10%. This permits accurate comparisons of ionization current with only 45 v. across the chamber. The constancy of fraction lost indicates the recombination is nearly all columnar, i. e. between ions produced by the same photoelectron in the x-ray case. Thus low voltages may be used only with the relatively weak rays used in spectrometry. Stronger rays would probably cause volume recombination; hence these tests indicate nothing about ordinary x-ray dosage measurement.

R. L. HERSHEY

What are the practical applications of Röntgen research? R. BERTHOLD. *Z. Metallkunde* 20, 378-86(1928).—B. discusses four general applications of x-rays: the detn. and description of the crystal structure of a material; the detn. of the presence and the quant. description of preferred orientations in cryst. masses; the measurement of grain size in metals and particle size in colloids; the study of lattice deformations. Examples from published researches are given in each of these four fields.

R. L. HERSHEY

The apparatus for microstructure research with x-rays. R. BERTHOLD. *Z. Metallkunde* 20, 350-8(1928).—After a brief discussion of the production of heterogeneous and homogenous x-rays, B. discusses x-ray tubes, high-tension app., universal and multiple diffraction app., protective measures and their relation to app. set-up, and the various types of x-ray diffraction cameras.

R. L. HERSHEY

The origin and character of x-rays and their application to crystal-structure research. I. MARK. *Z. Metallkunde* 20, 346-50(1928).—The physics of x-rays, as regards their origin, their propagation and their scattering by crystal lattices, is briefly discussed. The characteristics of Laue, Debye-Scherrer and the rotating-crystal methods are presented.

R. L. HERSHEY

Scattering by free gratings and the statistical significance of the distribution of rating spectra on the interference of plane waves. A. WINTNER. *Z. Physik* 48, 445-512(1928).—Mathematical.

H. G.

Reflection of soft x-rays. JOS. E. HENDERSON AND ELIZABETH R. LAIRD. *Proc. Nat. Acad. Sci.* 14, 773-7(1928).—The reflection of soft x-rays (194 v. to 4000 v.) from glass and iron surfaces has been measured. No sharply defined total reflection was obtained. It is shown that absorption by the mirror largely affects the reflection.

R. L. HERSHEY

K x-ray absorption spectra and chemical constitution. OTTO STELLING. *Chem. Inst., Lund Z. Elektrochem.* 34, 520-2(1928); cf. *C. A.* 22, 4056; 23, 32, 336.—A study of the K absorption limit of inorg. salts with similar anions, showing that similarly constituted compds. have the same limit.

WALLACE R. BRODE

The K x-ray absorption edge of iron. GEO. A. LINDSAY AND H. R. VOORHIES. Univ. of Mich. *Phil. Mag.* [7], 6, 910-20(1928).—The multiple structure for Fe, both as a metal and in compds., has been demonstrated to extend over a range considerably greater than that of any structure previously reported. The magnitude of this range is best explained by simultaneous ejection of electrons from outer orbits together with the K electron. Kossel's hypothesis appears satisfactory only as a possible explanation of the white-line absorption. As has been found previously, the principal edge shifts to shorter wave lengths as the valence increases. The effect of valence on the multiple

structure is small. When bivalent and trivalent iron are mech. mixed, the expected superposition of the 2 patterns can be detected, but when the 2 valencies were in the same chem. compd., as in lepidomelane, no such overlapping could be found. G. G.

Slip-bands produced when crystals of aluminum are extended. KEIJI YAMAGUCHI. *Bull. Inst. Phys. Chem. Research Tokyo* 7, 363-82; Abstracts 1, 34-5(1928).—When a test piece made from a single Al crystal is extended under tension, the following relations are found experimentally between the resistance to shear, and the shear as well as the slip-bands produced on a polished surface of the test piece. The slip plane and the direction of shear were detd. from Laue photographs for the condition of max. shearing stress, and were verified by the direction of the slip bands, the change of direction accompanying extension and Laue photographs taken after the extension. If ϵ = extension of the test piece + 1, s = shearing strain (elastic strain being omitted), S = resistance to shear on the slip plane to the direction of slip in kg./mm.², θ = angle between the normal to the slip plane and the initial direction of tension, φ = angle between the direction of slip and the projection of the initial direction of tension on the slip plane, N = no. of slip bands appearing per unit length along the axis of the specimen (no./mm.), N' = no. of slip planes per unit length on the normal to the slip plane (no./mm.), P = tension in kg., p = tensile stress in kg./mm.², A = original cross section of the test piece in mm.², the following relations are true: $N' = (\epsilon/\cos \theta)N$,

$(\sqrt{\epsilon^2 - 1} + \cos^2 \varphi \sin^2 \theta - \cos \varphi \sin \theta)/\cos \theta$, $p = (P/A) \epsilon$, and $S = (P/A) (\cos \theta \sqrt{\epsilon^2 - 1} + \cos \varphi \sin \theta/\epsilon)$. By calcg. these values after detn. of those of N' , P , A , ϵ , θ and φ by expts., the following relations were ascertained for the range $\epsilon = 1$ to 1.4: $S - S_0 = 0.0048(1/N')^{-1}$ and $s = 0.015 S^{2.5}$, where S_0 corresponds to the elastic limit of slip as found from the time of the first appearance of the slip-bands, and though it has the numerical value of about 0.5 kg./mm.², since the permanent strain already exists for this stress, S_0 is no more than an apparent elastic limit, and from the last equation it is seen that the elastic limit is nearly zero in reality. Slip bands disappeared completely when the surface was repolished after the extension, and did not appear again even by deep etching with Viella's reagent. Since the points representing the values of N' obtained from the further extension of this repolished specimen lie on the same line as the original one, it was concluded that the amts. of slip on the respective slip planes were nearly all equal. A special case is mentioned where the direction of tension is (110): the slip takes place on the plane {111} or {111} according to the locality and their boundary surface is parallel to {100}, presenting a macroscopical appearance as if the slip had taken place in this plane. This agrees with the conception that in order that there may not exist any irrationality of a gap, compression, etc., formed at the boundary of two slips, that boundary surface must be the one contg. the two directions of slip (011) and (011), i. e. {100}. Although the strain is as complex as described, the relation between the tensile stress and extension is the same as in the case of slip in a single plane.

ALBERT L. HENNE

Polarization of Compton scattering according to Dirac's new relativistic dynamics. Y. NISHINA. Univ. of Copenhagen. *Nature* 122, 843(1928).—The intensity of the scattered light in the x - z plane in a direction forming an angle θ with the z axis, is given by
$$I = \frac{e^2}{2m^2c^2r'^2} \left\{ \frac{I_0}{(1-\alpha)^2} \sin^2 \theta + \frac{2\alpha^2 + 2\alpha^3 + \alpha^4}{2(1+\alpha)^2} \right\}$$
, wherein $\alpha = h\nu/mc^2$, e and m the charge and mass of the electron, c the velocity of light, I_0 the intensity of the incident unpolarized beam, ν the frequency, r the distance of the first electron from the origin and r' the distance of the second electron from the first. This expression differs from the original equation of Dirac and Gordon by the second term. Present exptl. data are not sufficiently complete to test either theory and more accurate measurements with x-rays and γ -rays are desirable.

WILLIAM E. VAUGHAN

A plausible generalization of the Planck formula for radiation. L. STRUM. *Physik. Forschungskatheder, Kiew. Z. Physik* 51, 287-91(1928).—A generalized form of the Planck radiation formula is derived, also a new expression for the coeffs. of the Stefan Boltzmann equation, which clarify the discrepancies between exptl. and theoretical values (cf. C. A. 19, 1655).

G. CALINGAERT

Behavior of some hydrogen spectra in various excitation conditions. I. Hydrogen spectrum in oscillating discharges and in the Paschen hollow cathode. Z. BAY AND W. STEINER. Univ. Berlin. *Z. Physik. Chem., Abt. B*, 1, 239-52(1928).—Description and comparison of spectra obtained in tubes with and without electrodes, with ordinary and oscillating discharge, and under different voltages and pressures.

ALBERT L. HENNE

"Forbidden" hydrogen lines. A. RUBINOWICZ. *Physik. Z.* 29, 817-23(1928).

W. F. MEGGERS

Studies on the emission band spectrum of chlorine. YORITSUNE ŌTA AND YŌICHI UCHIDA. Kyoto Imperial Univ. *Japan J. Physics* 5, 53-60(1928).—The emission spectrum of Cl gas under reduced pressure and at low temp. (-20°) was studied and 58 bands were identified. The data have been analyzed into 3 series of bands or lines, each arranged in a 2-dimensional scheme of vibrational quantum nos. No relation was found between the emission spectrum and the absorption spectrum of Cl (cf. C. A. 21, 19).

WALLACE R. BRODE

Studies on the emission band spectrum of bromine. YŌICHI UCHIDA AND YORITSUNE ŌTA. Kyoto Imperial Univ. *Japan J. Physics* 5, 59-60(1928); cf. preceding abstr.—The emission spectrum of Br was studied under similar conditions to those used in the Cl investigation. Approx. 80 bands were identified and analyzed into 2 systems having final states in common. No relation was found between the emission spectrum and the absorption spectrum of Br.

WALLACE R. BRODE

The Lyman bands of hydrogen. E. C. KEMBLE AND V. GUILLEMIN, JR. Harvard Univ. *Proc. Nat. Acad. Sci.* 14, 782-7(1928).—A study of the structure of the Lyman bands (B_2-A_1) on the hypothesis that they consist of two branches has been made. The normal alternating intensity of the H_2 band spectrum is practically absent in these bands; the distribution of mols. among different rotational states is one corresponding to a lower temp. than actually exists; there is an intensity dissymmetry favoring the P branch which has nothing to do with the distribution of population among different rotational levels. Peculiarities of the method of excitation may cause some of these results. Details of the discussion will be found in the original paper.

R. L. H.

Active nitrogen. JOSEPH KAPLAN. *Nature* 122, 771(1928); cf. C. A. 22, 2323.—Remarks on the article by Hinshelwood (C. A. 22, 4066). Glowing active N can be produced in air. Practically the entire first positive group of N band spectra is present in the afterglow. Independent evidence of the existence of metastable N_2 mols. is given. C. N. HINSHELWOOD. *Ibid* 771—Remarks on K.'s article.

R. J. H.

The ultra-violet band spectrum of nitrogen. R. T. BIRGE AND J. J. HOPFIELD. *Astrophys. J.* 68, 257-78(1928).—The ultra-violet emission spectrum of N_2 consists chiefly of a clearly defined system of more than 60 bands, degraded to the red. A number of spectrograms of this system have been obtained with a vacuum spectrograph, and the weighted av. wave length of each band is tabulated, together with the vibrational quantum analysis of the system. The absorption spectrum of N_2 also contains this system, and the absorption measurements have been used to det. most accurately the vibrational consts. of the upper level. Numerous emission and absorption bands occur in addn. to the foregoing system. Among the emission bands can be recognized 3 distinct progressions, representing presumably 3 new systems. The analysis of each of the 3 systems indicates that it is due to a transition from a new upper level to the vibrational states of the normal electronic level of the mol. One of these systems occurs, however, when commercial, partially purified N_2 is used, but not with chemically prepd. N_2 , and its origin is therefore in doubt. The intensity distribution in all 4 N systems presents several interesting features, some of which have not been explained. Further study is being made of the many remaining unassigned bands, in emission and in absorption. From the vibrational consts. of the several electronic levels one can calc. approx. the heat of dissocn. of N_2 . Two possible alternatives lead to most probable values of 11.9 and 9.5 v., resp.

W. F. MEGGERS

The Stark effect of lithium. YOSHIO ISHIDA AND MASAICHI FUKUSHIMA. *Sci. Papers Inst. Phys. Chem. Research* (Tokyo) 9, 141-50(1928).—By means of a special cathode permitting elec. fields up to 180 kv. the Stark effect of the following Li lines was studied: 6708.2, 6103.77, 4971.98 and 4273.3 Å. U. The inverse Stark effect of the line 4113.7 Å. U. was photographed.

W. F. MEGGERS

The Stark effect of helium. YOSHIO ISHIDA AND GENJI KAMIJIMA. *Sci. Papers Inst. Phys. Chem. Research* (Tokyo) 9, 117-40(1928).—Stark-effect photographs have been obtained for He lines as follows: 6681.89, 6068.77, 5380.3, 5043.6, 4277.1, 4054.8 Å. U. The polarization of these lines and their elec. deflections were observed. The results for the most part agree with Foster's theory (C. A. 22, 728), both as regards the number of branchings and their relative intensities.

W. F. MEGGERS

The continuous spectrum of hydrogen. F. H. NEWMAN. Univ. College, Exeter. *Phil. Mag.* [7], 6, 808-11(1928).—A continuous spectrum, which is quite distinct from that one which begins at the limit of the Balmer series and continues toward the shorter wave lengths, appears in celestial spectra in the absence of the Balmer lines and the secondary spectrum, and its limit on the red side is always a wave length greater than

λ 3646; for example, as an absorption spectrum it begins in α Cygni at λ 3710, having a max. intensity at λ 3660, approx., and in Vega it commences at λ 3800, its max. being at about λ 3710. This continuous spectrum may be produced at very low pressures, viz., by means of the elec. arc passed between cold electrodes in a rarefied H atm. An intermittent elec. discharge is passed between two Fe electrodes in a discharge tube, and between one of these electrodes and a third one a potential diff. of 200 v. is applied continuously.

GEO. GLOCKER

Some multiplets of doubly ionized lead. STANLEY SMITH. *Proc. Nat. Acad. Sci.* 14, 878-9(1928).—Lines of Pb III in the Schumann region have been classified as the combinations of 2S , $^3P'$ and 3D terms with a common term 1P . A group of lines in the near ultra-violet results from the combination of 1F with 3D .

C. C. KIESS

Some multiplets of singly ionized thallium. STANLEY SMITH. *Proc. Nat. Acad. Sci.* 14, 951-3(1928).—The regular and irregular doublet laws have been employed to interpolate from the known spectra Hg I and Pb III (cf. preceding abstract) the multiplets of Tl II which represent the term combinations $^3P-^1S$, $^3P-^3P'$, and $^3P-^3D$. The lines lie in the Schumann region. In addition to these the terms 1S , 1P and 1D have been established and the combinations of these with the triple terms identified.

C. C. KIESS

Spectral intensities of radiation from non-harmonic and aperiodic systems. BENEDICT CASSEN. *Proc. Nat. Acad. Sci.* 14, 880-2(1928).—Theoretical.

C. C. KIESS

The aurora red line. JOSEPH KAPLAN. *Proc. Nat. Acad. Sci.* 14, 882-4(1928).—The red line at 6654.8 Å. U., described in a previous note (C. A. 22, 2887) as appearing when the auroral green line is excited in O mixed with active N, is shown to be a band belonging to the first pos. group of N. It cannot, therefore, be observed in the spectrum of the aurora. The only lines in the red capable of appearing in the auroral spectrum must result from the combination $^1D_2-^1P_{0,1,2}$, and these have wave lengths longer than 1 μ .

C. C. KIESS

The infra-red absorption spectra of ammonia, phosphine and arsine. ROBERT ROBERTSON AND J. J. FOX. *Nature* 122, 774-6(1928).—A résumé at length of work already published in detail (C. A. 22, 3835).

C. C. KIESS

Reaction of activated mercury with oxygen. A. I. LEIPUNSKII AND A. V. SAGULIN. Physik. Tech. Röntgen Inst., Leningrad. *Z. physik. Chem., Abt. B*, 1, 362-8(1928).—In the photochem. action between Hg and O, or when the action is promoted by ionic impacts, the reaction occurs between an activated Hg atom and oxygen. The following scheme is proposed: $Hg + E = Hg'$; $Hg' + O_2 = HgO + O$; $Hg + O = HgO$; $HgO' + Hg = HgO + Hg'$. This scheme is compatible with the formation of chains. Influence of the O_2 formed during the expts. remains unexplained.

ALBERT L. HENNE

Calculation and test of an apparatus for quantitative measurement of absorption spectra in the visible and ultra-violet ranges. HANS FROMHERZ. Bayer. Akad. Wiss., München. *Z. physik. Chem., Abt. B*, 1, 301-23(1928).—Discussion of the optics of an app. for photographic measurement of absorption spectra. It is a slight modification of Scheibe's app. (C. A. 19, 609). It has been tested with K_2CrO_4 solns. and satisfactory results have been obtained.

ALBERT L. HENNE

Characteristic differentiation in the spectra of saturated hydrocarbons. F. S. BRACKETT. *Proc. Nat. Acad. Sci.* 14, 857-64(1928).—Preliminary measurements of the absorption spectra of successive members of the paraffin series revealed marked differences in the band at 1.2 μ ; this led to a more detailed investigation with higher resolving power and with specially purified materials. Results are presented graphically for the normal hydrocarbons, pentane, hexane, octane and decane and for their isomers. In normal compds. the 1.2 μ band consists of a doublet of which the short-wave component shows almost no variation in frequency, but the long-wave component shows a marked shift of center of gravity toward lower frequencies with increase in length of chain. In the isomers the doublet character of the 1.2 μ band is not so evident, the absorption in the dominant, and shorter, component being much more intense than in the longer component. These differences furnish the basis for detg. the relative binding forces exerted upon the H atoms when attached to the primary, secondary and tertiary C atoms. A similar study of benzene leads to the conclusion that the binding force is much greater than in the satd. hydrocarbons.

C. C. KIESS

The origin of the continuous spectrum of the hydrogen molecule. J. G. WINANS AND E. C. G. STUECKELBERG. *Proc. Nat. Acad. Sci.* 14, 867-71(1928).—The continuous spectrum of the H mol., extending from the extreme ultra-violet into the visible region, is explained as resulting from transitions from any one of the excited triplet levels to the ground state, 1^1S , of this system.

C. C. KIESS

The structure of the Compton shifted line. JESSE W. M. DUMOND. *Proc. Nat.*

Acad. Sci. **14**, 875-8(1928).—To det. the natural structure of the Compton modified line in app. was designed which practically eliminated the exptl. widening of the line due to inhomogeneity of the scattering angle. The scatterers employed were Al and Be, and the scattering angle at which most observations were made was 176° . With Al the agreement between observed and theoretical structure for the shifted line is close; but with Ba the observed structure is wider than theory predicts. C. C. KRESS

Observations on the rare earths. XXX. Studies in the absorption spectra. LAURENCE L. QUILL AND PIERCE W. SELWOOD WITH B. S. HOPKINS. *J. Am. Chem. Soc.* **50**, 2929-37(1928).—The absorption spectra of carefully prepd. solns. of salts of Nd, Pr, Sm and Er were photographed with a quartz spectrograph. Addn. of HNO_3 in various concns. to the solns. of the nitrates affected the widths and positions of the bands, although the effect was not the same for all the elements. Addn. of $\text{Mg}(\text{NO}_3)_2$ to $\text{Nd}(\text{NO}_3)_3$ solns. produced similar but slightly greater changes than an equal normality of HNO_3 . The effects produced by adding HCl to the solns. of the chlorides were not the same as those of HNO_3 on the nitrates. In studying the influence of one rare earth salt on the absorption bands of another it was found that in the presence of a colored or colorless rare earth the absorption bands of an element present in small amts. cannot be relied upon for its quant. analysis and should be used with utmost caution for its qual. identification. C. C. KRESS

The quenching of cadmium resonance radiation. JOHN R. BATES. *Proc. Nat. Acad. Sci.* **14**, 849-52(1928).—An expt. is described in which the monochromatic resonance radiation of Cd irradiated a tube contg. a mixt. of Cd vapor with H_2 . The energy thus acquired by the Cd atoms was either re-emitted or quenched by the H_2 , the amt. of the quenching being detd. by photographing the intensity of the fluorescent light with a spectrograph. The energy obtained by the H mol. is 3.78 v., the excitation energy of the 2^3P_1 state of Cd, which results in an increase of the vibrational energy of the H mol. On account of the strong quenching the attempt to measure the temp. coeff. of the reaction between Cd atoms in the 2^3P_1 state and H mols. to give H atoms was not successful. C. C. KRESS

The intensity decay of the Balmer series. JOHANNES PORT. *Ann. Physik* **87**, 581-9(1928).—Canal rays in H were caused to emerge from the relatively high pressure of the discharge space through a narrow slit into the highly evacuated observation space, in which their decrease in intensity was measured by a method of photographic photometry. The observed fall in intensity along the ray for the lines H_α , H_β and H_γ , was found to be represented by a pure exponential function without deviation in the neighborhood of the slit. Such deviation, when it was observed, could be fully accounted for by the additional excitation produced by the gas issuing from the canal-ray slit and forming a cloud of higher pressure in the immediate vicinity of the slit. This instrumental defect was eliminated only after prolonged operation of the tube. It was found that the coeff. of intensity decay is the same for the lines H_α , H_β and H_γ . C. C. KRESS

Series limits. A. G. SHENSTONE. *Nature* **122**, 727-8(1928).—Hund's theory of the limits of component series is in error in that it fails to recognize that the magnetic field may be strong enough to break down the LS coupling but leave the (l_1l_2) and (s_1s_2) couplings intact. In the case of series terms obtained by adding an s electron to the limit term the usual rule is followed that, as the magnetic field increases, sub-levels of the same m must not cross. But in cases where the series terms result from addition of a p or a d electron to the limit term this rule cannot be adhered to, since the final result depends on the order in which the increasing field breaks down the various couplings. C. C. KRESS

An experimental test of Schrödinger's theory. E. GAVIOLA. *Nature* **122**, 772(1928).—The ratios of the intensities of the Hg lines 4358 and 4046 Å. U. in fluorescence were measured both when the optically excited vapor consisted only of Hg and when it consisted of Hg to which a few mm. of N_2 or H_2O vapor was added. In the latter case the foreign gases change the relative populations of the states 2^3P_0 and 2^3P_1 by several hundred times by bringing the resonance atoms, in the 2^3P_1 state, down to the metastable 2^3P_0 state. In both cases the value of the measured intensity ratio was 2, which proves that the ratio of the intensities of the lines in emission does not depend on the no. of atoms in the lower levels, in contradiction with the common interpretation of Schrödinger's theory. C. C. KRESS

A spectroscopic analysis of caliche. J. BANCELIN. Univ. of Chile. *Caliche* **10**, 97-8(1928).—By using an elec. arc between C electrodes, several photographs were made from one larger sample to obviate errors, in a study of the wave lengths between 2500 and 3500, exclusive of Na, K, Ca and Mg, well known to be present. All showed

Fe. Five trials showed Ti, the more frequent lines being 3186.6, 3200.1, 3349.6, 3354.8, 3361.4, 3371.6, 3373.0, 3377.7, 3388.0 and sometimes 2956.0, 3192.1, 3248.7. In one trial also appeared 3075.3, 3078.8, 3088.1, 3161.9, 3168.6, 3341.5, which indicate that possibly Ti would be shown by usual chem. method, though the whole spectrum of Ti contains 350 lines. Six trials showed 3183.5, 3184.1, 3185.5, which indicate V in not over 0.001%. Of the 1070 lines of the Mo spectrum, six trials showed 3152.7, 3194.1, 3170.5, 3158.3. Of the six lines of the Ga spectrum there were found in 7 trials 2500.3, 2659.9, 2874.2, 2943.7.

J. HOWARD FLINT

A new resonance series of selenium. BARBARA SCHMIDT. *Bull. intern. Acad. polonaise* 1928, No. 3A, 61-8.—A new series of resonance in Se excited by line 4481 of Mg is found. The greatest intensity is at 400°. The absorption of this line corresponds to the passage of state $n = 14$ to $n' = 1$. The results are in accord with former expts. of Ehrenfeucht and Rosen.

L. D. ROBERTS

Spark spectrum of sulfur, S II, in the Schumann region. PIERRE LACROUTE. *Compt. rend.* 187, 975-6(1928).—Spectral terms published for S II by Ingram (C. A. 23, 36) combine to explain 13 additional lines in the interval 1813 to 2004 Å. U. (cf. C. A. 22, 4373).

W. F. MEGGERS

Temperature classification of the stronger lines of cerium and praseodymium. ARTHUR S. KING. *Astrophys. J.* 68, 194-245(1928).—Previous results for Ce and Pr, confined largely to measurements of wave length, have been extended by studying the dependence of line intensity upon the conditions of the source, with special attention to the distinction between lines of the neutral and ionized spectra. Lines arising from the two states were segregated by a comparison of furnace, arc and spark spectra. This was facilitated by mixing Cs with the elements studied, which suppresses the ionized lines appearing normally in the furnace. The resemblance between the arc and spark spectra of rare-earth elements in the blue and violet has frequently been noted. The furnace is especially effective in this region for the lines of the neutral atom, which in these spectra are faint in the arc at shorter wave lengths and have been to a large extent unrecognized. In agreement with astrophys. evidence, it indicates that the prominent lines of Ce and Pr here belong to the ionized atom. At greater wave lengths, the neutral lines are stronger and form a large part of the arc spectrum. The relative energy levels at which the more sensitive lines originate are indicated as usual, for the neutral lines, by their behavior at different temps., and, for ionized lines, by the degree to which they persist in the furnace spectrum. The lines classified number 1362 for Ce and 1018 for Pr. These were selected from the very rich spectra on the basis of usefulness for identification of the elements in either the neutral or ionized states, and as probably the lines of lower energy-levels in each condition of the atom. A distinct variation in general intensity with wave length is noted for both the neutral and singly ionized spectra, and, further, that certain lines of each element appearing in the near ultra-violet probably arise from the doubly ionized state. The lines listed were selected not only from the available tables, but also from the large no. of neutral lines measured in the furnace spectrum by the writer, which number about 1700 for Ce. Most of these had not been measured previously, since in the arc they are relatively weak or obscured by blends. Of the ionized lines selected, many appear in the furnace spectrum, and in the case of Pr, even at moderate temps. A notable feature of the Pr spectrum is the large proportion of highly complex lines, nearly 40% being of this class. The no. and arrangement of their components are given as an aid to the series grouping of lines of similar type. Preliminary spectrograms made with high dispersion give improved resolution of the fine-structure patterns.

W. F. MEGGERS

Absorption spectra and molecular structure of the dihalogen derivatives of benzene. J. ERRERA AND V. HENRI. *J. phys. radium* 9, 205-24, 249-64(1928); cf. C. A. 20, 3388.—Absorption spectra of dihalobenzenes in vapor state were studied, because it had been previously observed that the ultra violet absorption bands of the *p*-benzene compds. and the *trans* ethylene compds. are situated nearer the red than in the case of the *o* and *cis* forms, showing a greater energy of electronic activation for the latter than for the former. Recent theoretical work had shown necessity of measuring intensities of bands as well as their position. The exptl. method was to introduce a small sealed tube contg. a few mg. of material dissolved in 0.1-0.2 cc. optically pure hexane into an observation tube 100 cm. long with quartz end-plates; upon crushing the sample tube, the soln. evapd. and filled the 450 cc. vol., whereupon the absorption spectrum was photographed. For higher pressures, a quartz tube with fused-on optically worked quartz end-plates was used, the whole being enclosed in a brass sleeve having quartz end-plates, and electrically heated. The spectra were thus studied at temps. up to 400° and with thicknesses of 10, 20, 30, 40, 50 and 100 mm. The light

source was a strong condensed high-frequency spark between Cu or Al electrodes submerged under water; and the comparison spectra were obtained from a condensed spark between Fe electrodes by introducing a self-inductance into the circuit according to the method of Hemsalech. Min. concn. of vapor for which any band appeared in a thickness of 100 cm. could be detd. with an accuracy of 5-10%. The method can thus be used to classify bands in the order of their intensities, and for the *quant. analysis of vapors*. The absorption spectra of the three dichloro- and dibromo-benzenes show two regions of absorption, one composed of bands and lines between 2850 and 2500 A. U., the other continuous, commencing at about 2350 and increasing toward the ultra-violet. The spectra of the diiodides show no narrow bands; the continuous absorption commences at 3100 or 3000 A. U. and increases toward the ultra-violet. The study of these spectra shows: (1) The bromides and chlorides exist in two states of electronic activation, the first provoking deformation of the mol., with increase in its moment of inertia. The energy necessary for this activation decreases in the order *o*, *m*, *p*, and is greater for the chlorides than for the corresponding bromides, the difference *m* - *p* being much greater than the difference *o* - *m*. The second state of electronic activation leads to decompn. of the mol. For the iodine compds. there is but one state of activation, and this leads to decompn. of the mol. (2) The spectra corresponding to the first state of activation of the chlorides and bromides are formed of doublets of electronic origin, and are comparable in form and magnitude to those of the univalent alkali metals. (3) In addn. to the electronic activation, there are 4 or 5 successive states of atomic vibration, the bands being sharper for the chlorides than for the bromides. (4) From numerical data given in tables, it is shown that the distribution of bands can be represented by equations of the type $\nu = \nu_0 + (p' - p_0)\alpha' - p_0(\alpha' - \alpha_0) + (q, -q_0)\beta' - q_0(\beta' - \beta_0) + (r' - r_0)\gamma$, ν_0 taking the values ν_1 and ν_2 , since the spectra are composed of doublets; the last term applies only to the para derivs. where $\gamma' = \gamma_0$. Another table gives the positions of the beginning of the states of activation, with the energies corresponding to them. (5) The movements of intramol. vibration are two in number for the *o* and *m* compds., and three for the *p*. Frequencies are lower from bromides than for corresponding chlorides, and slightly greater for the *m* compds. than for the *o*. The frequency differences for normal and activated mols., which measure the deformation during activation, show that the deformation is relatively great for the *o* and *m*, and slight for the *p*, of which the third vibration has the same frequency in the two states. The negative values of these differences indicate that the moment of inertia and the distances between vibrating atomic states are greater in the active state. (6) The spectra of mol. rotation are very crowded and represent large moments of inertia. (7) The spectrum of *o*-dichlorobenzene alone gives quant. information for the moment of inertia, and for the difference between normal and activated states, I_0 and I' . With allowance for the unharmonic character of the atomic vibrations, a value of from 38×10^{-40} to 75×10^{-40} is given for I_0 ; while the value 11×10^{-40} for $I' - I_0$ is deduced by measuring the distance between origin and head of the bands due to rotational movements of the mol.

L. A. SARVER

The spectrum of the solar corona. IRA M. FREEMAN. *Astrophys. J.* 68, 177-93 (1928). The origin of emission lines observed in the spectrum of the solar corona during total eclipses has been a mystery for 60 years. Thirty-three of the 38 lines of undoubted coronal origin are now identified with emission lines in the spectrum of argon. A systematic examn. of the spectra of prominent solar elements gave no significant correlation.

W. F. MCGOWERS

An analysis of the fine structure of the D_2 line of helium. H. R. WEI. *Astrophys. J.* 68, 246-56 (1928).—The D_2 line of He has been resolved into a triplet with plane diffraction gratings of high resolving power and large dispersion in high orders. An analysis of the triplets obtained with a self-recording microphotometer gives the ratios of intensity 4.5 : 3 : 1 and the interval ratio 10.3 : 1. These results are checked with an echelon spectrograph but the triplet structure of the line could not be observed with a concave grating giving somewhat smaller dispersion.

W. F. MCGOWERS

The rarest ultimes of mercury and of aluminum. ADOLFO T. WILLIAMS. *Compt. rend.* 187, 761-3 (1928).—According to a rule by Croze (*C. A.* 18, 627) the most persistent line of an element should not include combinations between terms of different multiplicity. Contradicting this rule the singlet line of Hg 1849.57 A. U. is much less sensitive than the intercombination line 2536.52 A. U. The 3S - 3P doublet of twice ionized Al, *vis.* 1862.90 and 1854.67 A. U., is found to persist in a concn. of Al of about 0.005%.

W. F. MCGOWERS

The infra-red absorption spectra of organic carbonates. FREDERICK K. BELL. Johns Hopkins Univ. *J. Am. Chem. Soc.* 50, 2940-50 (1928).—The absorption spectra

between 1 and 12μ of dimethyl, diethyl, dipropyl, dibutyl, diisobutyl, diisoamyl and diphenyl carbonate are given in graphical form. There is a quite apparent difference in the data for normal, iso and phenyl compds., although all of the compds., had certain bands in common.

WALLACE R. BRODE

Infra-red spectra of ammonium salts in the transformation range. GERHARD HETTNER AND FRANZ SIMON. Univ. Berlin. *Z. physik. Chem., Abt. B*, 1, 293-300 (1928).—An app. is described for measuring adsorption spectra at low tem. Infra-red spectra of NH_4 salts have been taken between 2 and 8μ . With NH_4Cl and NH_4SO_4 , a transformation of the NH_4 radical is evident between -30° and -40° , since the bands at 7.1 and 5.6μ are affected while the band at 3.1μ remains unchanged. It is not yet possible to throw light on the nature of change in the NH_4 radical. ALBERT L. HENNE

Fluorescence and solid solution. MABEL K. SLATTERY. Cornell Univ. *Proc. Nat. Acad. Sci.* 14, 777-82(1928).— NaF and LiF , activated to fluorescence by the addn. of small amts. of U, show no difference in crystal structure from the pure salts. This may be due to replacement of Li or Na by U in the lattice at random points, no distortion being expected since U has a quite small atomic radius. Mixts. of LiF and NaF (5% to 50% LiF) and a small and uniform amt. of U were fused. The fluorescent lines show a shift from the positions found in the pure fluorophors, but this shift is the same for all mixts., the increase in intensity of the LiF lines being the only change in going from the 5% to the 50% LiF mixt. Also the amt. of shift of the NaF x-ray diffraction lines is the same for all mixts. It thus appears that some Li had entered the NaF lattice but the remainder had crystallized separately. It finally appears that an increase in crystal dimensions causes an increase in wave-length of the fluorescent emission. R. L. HERSHEY

Fluorescence of mercury vapor under low excitation. LORD RAYLEIGH. *Nature* 122, 725(1928); cf. *C. A.* 22, 4065.—Photographs of the fluorescence show the well-known broad max. at about $\lambda 3300$, with effective exciting wave length about $\lambda 3000$. The fluorescence is of sufficiently long duration that it can be distilled away from the origin when the exciting wave length is about $\lambda 2650$. Exptl. difficulties have made it impossible to get this latter effect with longer waves. R. J. HAVIGHURST

The electric emission of incandescent platinum in an atmosphere of iodine. S. KALANDYK. *J. phys. radium* 9, 231-5(1928); cf. *C. A.* 19, 926.—Both the electronic and positive emissions of Pt at varying filament temp. were detd. in atm. of iodine vapor at varying pressures. I vapor increases only the negative emission and is without effect upon the positive emission. The effect of I is greatest at low filament temp., and becomes zero at high temp. Augmentation of emission at low temp. is attributed to formation of a layer of P iodide on the surface of the Pt; at high temp. this immediately sublimes. With the Pt only faintly incandescent, the electronic emission varies directly with the pressure of I vapor, but at high temp. the variation is much more complicated. L. A. SARVER

Velocity of photochemical reactions. JEAN PERRIN AND Mlle. CHOUKROUN. *Compt. rend.* 187, 697-8(1928).—The discoloration velocity of a soln. of indigo carmine in ammonium oxalate, by air oxidation under the influence of violet light, and for concns. ranging between 1% and $1/30000$ obeys the mass-action law. The oxidation of helianthine in oxalic acid or in ammonium oxalate also follows the mass-action law, even in the range of concns. where solns. exhibiting an appreciable fluorescence do not follow this law. ALBERT L. HENNE

Mechanism of the photochemical decomposition of nitrogen pentoxide. WARREN P. BAXTER AND ROSCOE C. DICKINSON. Gates Chem. Lab. Cal. Inst. Tech. *J. Am. Chem. Soc.* 51, 109-16(1929); cf. *C. A.* 22, 1545.—From a comparison of the rates of photochem. decompn. of N_2O_5 and NO_2 at wave lengths 4350, 4050 and 3660 A. U. it is concluded that the mechanism of the reaction is that suggested by Norrish (cf. *C. A.* 21, 1409). The photochem. decompn. of NO_2 into NO and O is followed by a dark reaction of NO and N_2O_5 . ARTHUR FLEISCHER

Action of ultra-violet light upon ferric citrate solutions. H. SHIPLEY FRY AND ELMER G. GERWE. Univ. Cincinnati. *Ind. Eng. Chem.* 20, 1392-4(1928).—Pharmaceutical solns. contg. citric acid and ferric compds. are readily decompd. when exposed to light. CO_2 is evolved and Me_2CO is formed; the ferric compds. are reduced. Three mols. of CO_2 are liberated per mol. of $\text{Fe}_2(\text{SO}_4)_3$. The photochem. change involves the oxidation of citric acid, with the liberation of 1 CO_2 , to the unstable acetonedicarboxylic acid. This also loses 1 CO_2 , yielding acetoacetic acid. The latter decomposes to acetone and CO_2 . ALBERT L. HENNE

The yield of photochemical reactions with pulsating monochromatic light. M. PADOA AND N. VITA. *Inst. chem. ind., Bologna. Gazz. chim. ital.* 58, 461-72(1928);

cf. *C. A.* 21, 2104; 22, 1913.—Under the influence of pulsating radiations of wave lengths 670.8, 587–589.6, 535 and 460.7 A. U., resp. (corresponding to quanta of 42.51, 48.57–48.35, 53.30 and 61.9 cal., resp.), the reaction: $2\text{FeI}_2 + \text{I}_2 \longrightarrow 2\text{FeI}_3$ gave the following relative max. yields: 1.40, 1.60, 1.70 and 2.15, resp. This shows that the greater the quanta of light, the higher the yield, the relation showing 3Q cal. as the min. necessary to start the reaction, the yields then being in proportion to the quanta. A comparison of the curves showing the relation between the yields with intermittent light and with continuous light reveal very frequent periodic oscillations for light of short wave length and similar periods of somewhat less frequency for light of longer wave length. Such oscillations may be explained by assuming the existence of active mols. which are the seat of adiabatic transformations and the period of existence of which appears to be the longer the higher is their level of energy. The relation between the yields and the quanta agrees with the expts. of Kistiakowsky (cf. *C. A.* 21, 1933) and of Franck (cf. *C. A.* 20, 548) but is at variance with those of Rideal and Williams (cf. *C. A.* 19, 1663).

C. C. DAVIS

Photochemical action of bromine on maleic and fumaric dimethyl esters. RICHARD SCHMIDT. Univ. Berlin. *Z. physik. Chem.*, Abt. B, 1, 205–38 (1928).—The photochem. reaction: dimethyl maleate + $\text{Br}_2 + h\nu \longrightarrow$ dimethyl fumarate is studied. It is admitted that the mechanism of reaction depends on the atoms of Br liberated by the absorbed light. The chief conclusions are: the quantic yield γ_0 of the transformation is dependent on the ester concn., the light intensity, the Br_2 concn., the wave length of the incident light and the temp. The relation between γ_0 and the ester concn. and the light intensity is expressed in a formula whose phys. meaning is not interpreted. The relations between γ_0 and the wave length and temp. are represented graphically and discussed. The addn. of Br on dimethyl maleate which takes place at the same time cannot be explained, because of many complicated side reactions. The quantic yield of the Br addn. on dimethyl fumarate is of the same order of magnitude as that found by Wachholtz (Dissertation, Berlin) for the bromination of diethyl maleate or fumarate. The reactions are thus considered to be similar in the case of the dimethyl and the diethyl esters. The quantic yield is of the same order of magnitude whether aq. or CCl_4 solns. of Br are used.

ALBERT L. HENNE

The effect of sunlight on citric acid in the presence of ferric salts (with special reference to the elixir of iron, quinine and strychnine and elixir of iron, quinine and strychnine phosphates). JOSEPH B. BURT. *J. Am. Pharm. Assoc.* 17, 650–8 (1928).—Expt. showed that citric acid does not dissolve $\text{Fe}(\text{OH})_3$ in mol. proportions, but that an excess of 12.5% of acid is required. Six solns. of Fe citrate of known strength were divided into 3 equal groups. Two were not treated, two were neutralized by NH_4OH and 2 were half neutralized by NH_4OH . All were exposed to sunlight in nitrometers. CO_2 was formed, the amt. being proportional to the amt. of free citric acid present; acetone and H_2O also were formed. The reaction ceases when all of the Fe^{+++} has been reduced to Fe^{++} . Detns. of the CO_2 and acetone formed indicate that for each mol. of acetone formed 3 of CO_2 are liberated. The reaction is probably: $\text{C}_6\text{H}_8\text{O}_7 + \text{O} = (\text{CH}_3)_2\text{CO} + 3\text{CO}_2 + \text{H}_2\text{O}$. The facts observed indicate that the various elixirs of Fe, quinine and strychnine should be as nearly neutral as possible and that they should be stored and dispensed in amber-glass containers.

L. E. WARREN

Constitution of thiourea. The absorption spectra of thiourea (RIVIER, BOREL) 10. The absorption spectra of irradiated and unirradiated ergosterol (SMAKULA) 11E. Evolution of the odd-numbered elements (HOWARD) 2.

Method for separation of barium chloride from radium chloride. I. YA. BASHILOV. *Russ.* 5046, Apr. 30, 1928. Conc'd. solns. of CaCl_2 or other chlorine salts are added to the repeatedly recrystd. Ba and Ra chlorides in soln., which do not form compds. sol. in the soln. of Ba and Ra salts.

4—ELECTROCHEMISTRY

C. G. FINK

Electric furnace indispensable in modern mine foundry. A. E. GREENE. *Eng. Min. J.* 126, 949 (1928).—At the Britannia Mining and Smelting Co., of B. C., castings are made from scrap melted in a 600-kw. Greene arc melting furnace. This installation has facilitated mining operations in preventing excessive delays when new castings are

needed. At the Wallace Foundry a large crusher jaw weighing $8\frac{1}{2}$ tons when cleaned was made from steel poured from a 3-ton Greene furnace (1100 kw.). The furnace operation lasted 5 hrs. and current consumption was 504 kw.-hr. per ton of scrap melted.

A. D. S.

Electric furnaces in the ceramic industries. S. R. HIND. *World Power* 10, 599 (1928).—The present status of the application of elec. heat to ceramic practice is reviewed. The characteristics of ceramic heat treatments are described with the aid of heating curves. In firing enamel a normal coal-fired muffle requires 19 hrs. to give satisfactory results. With elec. furnace better results can be obtained in half the time. Features favorable to the elec. heated kiln are: (1) purity of furnace atm., (2) good temp. control, (3) elimination of muffles, (4) economy of capital due to use of small unit furnaces and rapid output of ware, (5) const. load factor in continuous elec. tunnel-type kiln, (6) high availability of energy compared with fuels, (7) min. labor charges. In the tunnel kiln of Campbell and Moore, used for decorated ware, Ni-Cr heating elements are used. The hottest zone is near the middle of the tunnel, which is kept full of trucks of ware at all times. The maintenance cost ratio, per kiln doz. of ware, in elec. vs. coal is $\frac{1}{2}$ d. to $1\frac{1}{2}$ d. The overall cost showed a saving in favor of elec. heating. The Morgan elec. kilns are designed with special graphite ceramic resistors for lengths up to 60 ft. The Harper kiln is 68 ft. long equipped with 30 kw. looped wire in the 24-ft. pre-heating zone and 60-kw. Acheson graphite plate in the hot zone. Details of tests on this furnace are awaited.

A. D. SPILLMAN

Heat distribution in an electric furnace. B. M. RIKER. *Elec. World* 93, 96 (1929).—Kenworthy bright annealing furnaces for copper wire operate at 61% efficiency, have low operating and maintenance costs, and have high service factor.

B. M.

A valve-maintained high-frequency induction furnace and some notes on the performance of induction furnaces. G. ERIC BELL. *Proc. Phys. Soc. (London)* 40, 193 (1928).—Description of a valve-maintained induction furnace of 12 to 15 kv. amp. input for research lab.; frequencies ranging from 700 to 1000 kilocycles per sec. permit use of small condensers. Modification of Hartley circuit using center-tapped coil gave reliability, safety in operation and simplicity; air-cooled silica transmitting tubes were used. The furnace proper consists of SiO_2 tube round which is the inductor coil of solid Cu strip or flattened Cu tubing wound edgewise. The general lay-out is illustrated. Performance of high-frequency induction furnaces in general is discussed with exptl. results upholding the theory.

M. McMAHON

A high-frequency, variable-frequency induction furnace, with rotary spark gap. M. H. KRAEMER. *Stahl und Eisen* 48, 1120-4 (1928).—The high-frequency app. used for making C-free alloys at the Eisenhüttenmännischer Institut der techn. Hochsch., Berlin, is described in detail, with photographs. The primary of a transformer is connected to the 220-v., 50-cycle generator of a direct current driven motor-generator set. The 8000-v. secondary is connected to the furnace coil through a rotary spark gap. A variable capacitance, 0-0.66 microfarad, shunts the transformer secondary, and the inductance of the furnace coil may be varied by means of taps, so that the circuit may be tuned for frequencies between 14 and 230 kilocycles. A wave meter is used to det. the frequency. The advantage of variable frequency, over the const. frequency furnished by a rotary generator, is that the optimum frequency increases as the particle size decreases. With this app. charges of a few g. of powder are as easily handled as 10 kg. of lumps. The Northrup gap might have been used, but was not tried because of explosion risk. The quenched spark gap proved unsuited. Expts. with vacuum tubes at frequencies up to 2000 kilocycles gave good results, but they are too delicate and expensive for the melting industry. The efficiency depends on the load; the highest mentioned is 31%. The installation has been so satisfactory that a larger one—30 or 40 kg. capacity—is planned for the same institution, and a commercial organization is building a similar 75 kv.-amp., 60-kg. outfit for producing high-grade alloy steels for valve parts and ordnance.

BENJAMIN MILLER

How direct-current power is made for electrolytic processes. E. B. DAWSON. *Chem. Met. Eng.* 35, 668-71 (1928).—A discussion of the factors to be considered in installing machines for producing d.-c. power. Synchronous converters and motor-generator sets furnish most of the electrolysis power, but in a few cases it has been found economical to drive generators by steam turbines through reduction gears. Diesel engines may be used in some districts, and the Hg-arc rectifier may be developed for this service, especially where high voltage is required. The synchronous converter is in general more expensive to buy and maintain than the motor generator set, but is $1\frac{1}{2}$ % more efficient. In some cases the supply voltage may be too high for motor-generator sets, but not too high for synchronous converters. Under these conditions the

transformers required for the motor-generator sets will make the total cost higher than that for synchronous converters, and the efficiency advantage of the latter will increase to 3%. The motor-generator set has the advantage that its voltage may be easily varied over a wide range; it is not likely to pass on transient disturbances in a. c. supply to the d. c. lines; and it can be made to run with a leading power factor so as to correct the power factor of the plant or system.

BENJAMIN MILLER

Boiling points of electrolytic caustic solutions. C. C. MONRAD AND W. L. BADGER. *Ind. Eng. Chem.* 21, 40-2(1929).—The app. and the procedure employed in detg. the b. p. of caustic, purified over EtOH and satd. with NaCl, are described. NaCl was added to duplicate more nearly commercial caustic evaporator practice. The conditions were controllable to 0.05°. The recorded data are believed accurate to within $\pm 0.1^\circ$ up to 50 parts caustic per 100 parts water, and to $\pm 0.2^\circ$ above that concn. W. H. B.

The electrochemical manufacture of hydrogen peroxide. LEO LÖWENSTEIN. *Z. Elektrochem.* 34, 784-6(1928).—Two successful electrochem. processes for the manuf. of H_2O_2 have shown their superiority over the BaO_2 process. In one a soln. of $H_2S_2O_8$ is produced by the electrochem. oxidation of H_2SO_4 . The soln. is distd., whereupon the $H_2S_2O_8$ decomposes, forming H_2O_2 , which passes over with the steam, and regenerating the H_2SO_4 . The success of this process is due to the distn. method, which consists of passing the soln. to be distd. in thin films over hot walls. If distn. in bulk is attempted, the principal product is O_2 . By fractional condensation of the vapors H_2O_2 soln. of any strength can be prepd. In the other process a soln. of NH_4HSO_4 is electrolyzed. The $(NH_4)_2S_2O_8$ soln. formed is treated with $KHSO_4$, which ppts. $K_2S_2O_8$ and regenerates the NH_4 salt. The ppt. is charged into a stoneware still contg. H_2SO_4 and superheated steam is blown through the mass. H_2O_2 vaporizes, and $KHSO_4$ is regenerated. The current efficiency is greater with the salt process, 80-90% as against 40-70% for the acid process. The distn. cost is less with the salt process. The acid process has the low labor cost and low space requirement of a continuous process handling only fluids, whereas the salt process contains several batch operations and requires the handling of solids.

BENJAMIN MILLER

Electrochemical study of the action of acids on solutions of some zinc salts. J. GURRON. *Compt. rend.* 187, 599-601(1928).—The cell PtH_2 , soln. studied (x), satd. KCl, satd. or 0.1 N KCl, Hg_2Cl_2 , Hg is set up. After each addition of acid to (x) the e. m. f. of the cell is measured. The following solns. (x) were studied: $Zn(OAc)_2 - HCl$, $Zn(OAc)_2 - HOAc$, $ZnSO_4 - H_2SO_4$. $E = f(\log C)$ is traced for each salt and concn. studied. C = acid titer of the soln.

L. D. ROBERTS

The electrogalvanizing of wire and strip. A. C. J. CHARLIER. *Metal Ind.* (London) 33, 557-8(1928).—For successful working, the use of the highest no. of amp. at the lowest possible voltage is important. Each amp. will deposit 1.22 g. of Zn per hr. $ZnSO_4$ is the usual electrolyte, with addns. of substances to increase the throwing power of the soln. and to prevent the formation of undesirable gases. Dextrin, glucose or other org. compd. aids in the production of a smooth deposit. The soln. should be approx. 100% regenerative, requiring, rarely, a little new soln. to replace that adhering to the work when it leaves the vat. Voltage above 4 causes a granular deposit. Advantages of the electrogalvanizing process over the hot-spelter process are: a pure Zn deposit; a fine amorphous coating not tending to peel, crack, or fracture when wound round its own diam.; permissible use on the finest wire without disturbance of its original strength or ductility; greater economy where production is intermittent; and lower costs.

W. H. BOYNTON

Electric galvanizing. WALLACE G. IMHOFF. *Am. Metal Market* 35, No. 240, 2nd Sect., 13-7, 47(1928).—Some fundamental galvanizing principles are discussed. The powerful corrosive or dissolving action of molten Zn upon iron and steel at and above galvanizing temps. is indicated by tabulated exptl. results. Features to be considered in the choice of fuel are briefly discussed. Some plant figures on a commercial basis cover: (1) the B. t. u. value of the fuel used; (2) the cost of the fuel in the locality where used; and (3) actual production. Fuel costs are calcd. on a 1-ton (909 kg.) basis.

W. H. BOYNTON

Manufacturing metal parts by electrodeposition. JAMES SILBERSTEIN. *Metal Ind.* (N. Y.) 26, 474(1928).—Seamless Cu tubes, sheet Cu for punchings and stamps, Cu gaskets, light reflectors and Cu float-shells for steam traps and water columns are being produced by electrodeposition. By using cast Cu as anode and electrodepositing it on a roll to form an endless strip, all scrap from punchings and trimmings go back as anode metal.

W. H. BOYNTON

The Madsenell process—its products and their uses. F. M. DORSEY. *Ind. Eng. Chem.* 20, 1094-9(1928).—The "periodic" plating method is designed for job or

contract plating, the tanks are arranged in a straight line so that the work progresses from one solution to another until finally plated and dried. The order of operations including: cleansing, rinsing, pickling, degasification, plating bath, etc., are discussed. The "continuous" process consists of an assembly of equipment designed to prepare continuously, degasify and plate such material as wire strip, ribbons, etc. The process is adaptable to plating Ni, Cu, Pb, Sn, Zn, Cr and Cd. The elec. and mechanical designs for this method are included. The various patents issued covering the Madsenell process are listed.

A. D. SPILLMAN

Cathodic potential in electrolysis of chromic acid. Y. KATO AND T. MURAKAMI. *Chem. News* 137, 323(1928).—The "cathodic potential-current density" curve for chromic acid electrolysis shows several breaks which are explained by the authors on a hydrogen overvoltage basis. Cu ion increases cathodic polarization. C. L. MANTELL

Conduction and discharge of electricity in dielectric liquids. A. NIKURADSE. *Physik. Z.* 29, 778-81(1928).—Ohm's law is valid in very pure mineral oil at low field strengths. Between plate electrodes at higher field strength, the current increases more slowly until a satn. current is obtained. If the field strength is increased still further the current increases markedly. Just before discharge the current often increases without increase in voltage. This phenomenon is not observed if a point electrode is substituted for one of the plates. By purifying the liquid its cond. is decreased and the discharge potential is increased, but not in direct proportion. For many oils both the cond. and discharge potential increase with temp. between 20° and 60-80°. The cond. is independent of the pressure between 3 and 760 mm. The discharge potential increases with increase in pressure.

E. R. SMITH

Ohm's and Fourier's law of conductance. SATYENDRA RAY. Lucknow, India. *Z. Elektrochem.* 34, 753-6(1928).—R. shows the analogy between Ohm's law and the Fourier law of heat conductance. He derives an equation showing that the sp. resistance is proportional to the speed of the elec. current. He also shows, by means of the Poiseuille viscosity equation, the analogy between sp. resistance and viscosity and states that "super-cond." is due to the fact that the viscosity of the "electron gas" becomes zero at the abs. zero of temp. R. derives the well-known equation for tangential magnetic intensity, shows that a new phys. significance of induction must be given to Gilbert's expt. (carried out in connection with the theory of the earth's magnetism), and concludes that it is wrong to assume that lines of magnetic induction form closed curves while those of elec. induction do not.

MALCOM DOLE

The selenium cell: its properties and applications. GEORGE P. BARNARD. *J. Inst. Elec. Eng. (Brit.)* 67, 97-120(1928).—A survey with bibliography is given. The author's expts. show that the change in conductance is an exponential function of the illumination, for a given spectral distribution. The exponent is a const. for any cell, but differs somewhat for cells of the same type, and differs widely for cells of different types. Two commercial cells had values of 0.252 and 0.390. The law connecting stimulus with response is not simple, but the effect depends on the incident watts rather than on the incident foot-candles. No satisfactory theory has been advanced. The photoelec. theory is inadequate because of the enormous quantum yield. It is suggested that the change in conductance takes place at the boundaries of the crystals. The Se cell should have many applications, since it is 100 times as sensitive as the human eye, which is 1000 times as sensitive as the photoelec. cell. The chief disadvantage is the time lag, especially in recovering dark conductance after having been illuminated.

BENJAMIN MILLER

Characteristics of alkali cells and their use in photoelectric measuring methods. R. FLEISCHNER AND H. GOLDSCHMIDT. *Physik. Z.* 29, 691-8(1928).—Discrepancies in results caused the authors to investigate the methods used in photoelec. photometry and the cells designed for that purpose. The theory of the discharge method was discussed. The slope of current-voltage characteristics depends on frequency of radiated light. Importance of insulation errors is stressed. Current voltage characteristics on radiation with light of different wave length were measured for 5 cells: cell (1) had a Pt layer deposited on the wall of the bulb with additional layer of K on Pt, an anode of ring-shaped Pt wire, H filled-pressure of 0.1 mm. Hg; cell (2) was similar to (1) with H pressure of 0.01 mm. Hg; cell (3) was Osram G. E. C. Ltd. product with wire grid anode, alkali metal of cathode unknown, H-filled; cell (4) Rb cell with A filling, wire anode; cell (5) K cathode, cell was charged with H and then evacuated to best vacuum, anode of ring-shaped Pt wire. Error-free use of this measuring method is possible only when, for the spectral field investigated, the corresponding voltage curves are known or cells of type 5 are used. Evacuated cells show current voltage satn. curves parallel to abscissas; gas-filled cells and alkali cells are difficult to bring to satn.

M. McMAHON

A simple mercury arc lamp. T. H. OSGOOD. *J. Sci. Instruments* 5, 329(1928).—A Hg lamp of typical American design using Pyrex glass bulb with electrodes of tungsten wire 1 mm. in diam. is described. M. McMAHON

An application of electrical precipitation to the abatement of smoke. E. L. HALL. *Am. Gas Assoc. Monthly* 10, 745-8(1928).—Cottrell elec. precipitator is used to remove objectionable tar fog from stack gases in a lamp-black briquetting plant. More than 90% of the solid and liquid particles are removed by passing through a precipitator operating at 50,000 v. A. WHITE

A basic experiment on the contact theory of triboelectricity. Volta effect of first order and separation of two kinds of electricity by contact. ELIGIO PERUCCA. R. Scuola Ingeg., Torino, Italy. *Z. Physik* 51, 268-78(1928).—It is shown that when a solid and a liquid dielec. are brought in contact they become elec. charged. The point is of importance in the study of the development of electricity by friction. G. C.

Overload and reverse-current circuit breakers. ROBERT EDLER. *Elektrotech. Maschinenb.* 46, 1101-3(1928).—A mathematical treatment of the windings on electromagnetic protective devices for battery charging and for parallel operation of direct-current generators and rectifiers. Formulas are given for the sensitivity attainable by the combination of a potential winding with a current winding. BENJAMIN MILLER

Making rubber goods of latex by electrodeposition (KLEIN) 30. Recent progress in metallurgy (DROUOT) 9. The anodic behavior of Pd in chloride solutions (MÜLLER) 2. The electrolytic oxidation of formaldehyde in alkaline solution (MÜLLER, TAKEGAMI) 2. Arrangement of minute crystals in electrolytic bismuth and antimony precipitation (HIRATA) 2. The electrical conductivity of mixtures of compressed salts (FISCHER) 2. The polymerization distance between charged ions in the process of persulfate formation (ESIN) 2. Precious metals in the Sudbury nickel ores and their recovery (LANGER, JOHNSON) 9. Electrodeposition of rubber (Brit. pat. 291,471) 30. Electric discharge device (Brit. pat. 291,763) 1.

LEVASSEUR, ALBERT: *L'électrochimie et l'électrometallurgie*. 3rd ed. revised and enlarged. Paris: Dunod. 361 pp. F. 73. Reviewed in *Mech. Eng.* 51, 94(1929).

Electric battery. VAN RADEN & CO., LTD., AND J. P. STARLEY. Brit. 291,599, May 24, 1927. Structural features.

Electric battery. SOC. ANON. LE CARBONE. Brit. 291,420, June 4, 1927. In forming batteries similar to those described in Brit. 230,307 (*C. A.* 19, 3224), there is added to the porous C which has been rendered impermeable to liquids, a metal such as Pb which is capable of combining with Cl. The other electrode may be of Zn or galvanized iron and the electrolyte is a soln. of $ZnCl_2$ or $ZnBr_2$.

Dry cell electric battery assembly. HENRY W. PORTH (to National Carbon Co.). U. S. 1,699,446, Jan. 15. Structural features.

Device for sealing dry cell electric batteries. WILLIAM F. HENDRY (to National Carbon Co.). U. S. 1,697,596, Jan. 1.

Primary battery. WILLIAM A. F. BLEECK. U. S. 1,699,580, Jan. 22. In a primary battery of the double fluid type, an excitant is used consisting of a soln. of NaOH to which Na silicate is added, which serves to retard diffusion of the excitant.

Battery. ALBERT THURNHERR. Swiss 127,618, Sept. 9, 1927. The containers of the dry cells are acid proof and contains a paste-like electrolyte such as sal ammoniac or $ZnCl_2$.

Battery. SIEMENS & HALSKE A.-G. Ger. 469,133, Nov. 19, 1926. A Zn-C- $(NH_4)_2CO_3$ battery has metal plates carrying a rectifying compd. for prolonging its life.

Accumulator battery. NELKEN & CO. TECHNISCHES BÜRO FÜR PROJEKTIERUNG & PRÜFUNG ELEKTR. ANLAGEN. Ger. 469,440, Nov. 23, 1926. An accumulator battery having vertical bipolar electrodes is constructed with side leads, to reduce surface leakage.

Galvanic battery. ELEKTROTECHNISCHE FABRIK SCHMIDT & CO. G.M.B.H. Austrian 110,884, May 15, 1928. Constructional improvements are described in a battery of the type in which an electrolyte container is ruptured from outside when the battery is required for use.

Galvanic cell. HEINZ KÖHNKE and WILLIAM SUHRCKE. Swiss 127,617, July 23, 1927. The cell is of the Bunsen type and comprises a container with an alk. soln. and a detachable positive electrode chamber which is filled with concd. depolarizing acid and has a porous base.

Galvanic cell of the Leclanche type. D. F. TROFIMOVSKII. Russ. 4935, Mar. 31, 1928. Characterized by the negative pole being a rod from Pb-Zn alloy, preferably in the proportion 1:3.

Container for galvanic cells and storage batteries. V. S. LUIZLOV. Russ. 4596, Feb. 29, 1928.

Storage battery. HART ACCUMULATOR CO., LTD., AND W. SCHOFIELD. Brit. 291,138, Feb. 22, 1927. Structural features.

Storage battery. FRED L. SEARS. U. S. 1,699,633, Jan. 22. Structural features.

Storage battery. A. V. BELYAVSKII. Russ. 4973, Mar. 31, 1928. The electrodes of box shape are arranged in layers with a canal between for the escape of gases. The electrodes intended to carry the active mass have cone-like openings with the base inside of the walls.

Storage batteries. DONAT DE GIOVANNINI. Fr. 642,038, Oct. 6, 1927. To retard the discharge of a storage battery 5 to 10% of a hard absorbent C is added to the paste of each electrode. The C is preferably obtained by carbonization of vegetable substances rich in lignone such as olive husks, date stones or coconuts.

Storage batteries. GASTON GOSSET and JEAN SCHWARTZ. Fr. 640,935, Aug. 25, 1927. Terminals or other exposed metal parts are protected by a compn. contg. celluloid 150, acetone 750, NH_3 10, alc. 100 and an aniline dye 2 parts.

Storage batteries. MORITZ KUGEL. Fr. 642,145, Oct. 10, 1927. In Pb batteries a little phosphoric acid is added to the dil. H_2SO_4 electrolyte and may be renewed from time to time. Cf. C. A. 22, 2889.

Storage batteries. FRIEDRICH SCHÄFFER. Ger. 469,334, Feb. 1, 1928. Perforated plates are inserted in the acid, the diam. of the perforations in each plate increasing as their distance from a middle plate.

Storage batteries. COMPAGNIE GÉNÉRALE D'ÉLECTRICITÉ. Fr. 642,018, Oct. 6, 1927. Storage batteries having an alk. electrolyte have surrounding the positive plates a steel sheet which is corrugated to be elastic in the direction perpendicular to the plane of the plates.

Electrodes for storage batteries. M. KUGEL. Brit. 291,020, May 24, 1927. In order to compensate for loss of H_3PO_4 in an electrolyte as described in Brit. 280,197 (C. A. 22, 2889), due to combination of the H_3PO_4 with the PbO_2 of the positive electrode, addnl. quantities of H_3PO_4 are added during the working of the battery.

Storage-battery electrodes. J. M. LARGE. Brit. 291,745, June 7, 1927. Structural features.

Storage-battery electrodes. E. F. DRAISMA. Brit. 291,833, Feb. 22, 1927. Structural features are specified, of soft Pb plates surrounded by a border of Pb-Sb alloy formed by casting in a mold.

Storage-battery electrodes. I. G. FARBERIND. A.-G. Brit. 291,032, May 24, 1927. Electrodes are made from plates of Pb alloy by subjecting them to electrolysis in an acid soln. (suitably H_2SO_4 of 1.1 sp. gr. with a current d. of 1.2 amp. per sq. decimeter of electrode surface) to remove the alloying metal and simultaneously form the plates.

Storage-battery electrodes. I. G. FARBERIND. A.-G. Brit. 291,413, June 1, 1927. Electrodes consist of a rod or bar of porous Pb with a core of solid Pb; the porous Pb is formed by removal of a metal alloyed with the Pb as, e. g., by the removal of Na with H_2SO_4 or with alc. The alloying metal may be removed electrolytically and the electrodes simultaneously formed. Various details and modifications are described. Cf. C. A. 23, 777.

Storage-battery plates. RAYMOND T. MURRAY and FRANK M. KELLY. U. S. 1,697,078, Jan. 1. Structural features.

Storage-battery electrolyte. ANTHONIE JEAN ANDRÉ DE LA PORTE. Fr. 641,644, Sept. 29, 1927. The electrolyte of a Pb-PbO₂ battery is composed of dil. H_2SO_4 in which ammoniacal alum is dissolved.

Storage-battery receptacle covered with rubber composition. EDWARD LYNDON. U. S. 1,699,850, Jan. 22. Structural features.

Electric device for testing the condition of storage batteries. JOHN E. KENNEY (to Joseph E. Dunne). U. S. 1,699,893, Jan. 22.

Charge indicator (showing gas bubbles when the battery has reached full charge) for storage batteries. F. H. ROYCE. Brit. 291,885, March 11, 1927.

Electrodeposition of natural or synthetic resins. DUNLOP RUBBER CO., LTD., AND R. C. DAVIES. Brit. 291,477, Dec. 3, 1926. Deposition is effected on a body connected as anode or on a ceramic or other porous body enclosing the anode, from dispersions (which are described in detail) such as those prepd. from intermediate phenol-

CH_2O condensation products, aq. NH_3 , casein, gelatin, etc., to which various modifying agents may be added.

Apparatus for electrodeposition of metal sheets. J. C. F. A. SCHÜTTE. Brit. 292,015, Nov. 14, 1927. A cell is specified having a Pb lining serving as a cathode in which there is mounted an annular perforated vessel contg. scrap, ore or other anode material. The electrolyte is driven through the anode material toward the cathode by a mech. driven propeller. Various other structural details are described.

Electroplating. J. STRONG & Co. Fr. 641,037, Sept. 16, 1927. For plating the inside of tubes the anodes are placed in the tubes absolutely concentrically, the tubes being held in a frame which is immersed vertically in the electrolytic bath.

Electroplating process. FELIX KIRSCHNER and JOSEF HESS. Austrian 110,913, May 15, 1928. Metallic articles are coated electrolytically with a layer of a readily fusible metal, such as Sn, compatible with the metal of the article, and this layer is united with the article by smelting. Other metals or alloys are then deposited on the product, Ni and Ag, or Ni and a Cu alloy, for instance, being deposited in turn.

Electrical apparatus for heating electroplating baths or other liquids. WILFRED Y NEWLAND. U. S. 1,697,732, Jan. 1. Structural features.

Apparatus for controlling the movement of revoluble electroplating drums. FOREST H HARTZELL. U. S. 1,697,240, Jan. 1.

Metallic sheets formed by electroplating. GIBSON YUNGBLUT (to The Richardson Co.) U. S. 1,698,486, Jan. 8. In forming articles such as sheets a cathode is used shaped like the article but of another metal (suitably of Cu when plating with Fe) and the cathode is plated on one face and the cathode metal is then stripped from the plating in an electrolytic cell in which a like cathode is used and upon which the stripped metal is plated. An app. is described.

Chromium plating. METALS PROTECTION CORP. Fr. 640,913, July 12, 1927. Metals are plated with Cr at a temp. of about 20° at which the current efficiency is high, a dull deposit being obtained. The metal is further plated at about 40° to obtain a bright finish. Both platings may take place in the same electrolyte, consisting of a soln. of chromic acid with small amts. of hydrated $\text{Cr}(\text{OH})_3$ and $(\text{NH}_4)_2\text{SO}_4$.

Chromium plating. SOC. CHIM. DE LA SEINE. Fr. 642,242, Oct. 13, 1927. Cr is deposited electrolytically in a vat preferably of Fe surrounded with water maintained at $45-50^\circ$, and is provided with a neck so that the gas formed during the reaction may be evacuated. The bath may consist of chromic acid 25, CrSO_4 0.1–0.4, Na_2CO_3 0.1 to 0.4, H $^+$ BO $^-$ 0.1 to 0.4 parts in 100 of water.

Electrolytic gas cells. A. G. KHOTYAN. Russ. 3922, Oct. 31, 1927.

Stirring device for use in the electrolysis of fused electrolytes. FRANZ ELLINGER. Austrian 110,861, May 15, 1928. Constructional details.

Anodes for electrolysis of copper solutions. FREDERICK LAIST and FREDERICK F FRICK. U. S. 1,697,771, Jan. 1. Anodes suitable for use in deposition of Cu from solns. contg. chlorides and nitrates are composed of alloys of Pb, Sb and As which are resistant to corrosion.

Deoxidizing molten copper. HIRAM S. LUKENS and RUSSELL P. HEUER. U. S. 1,698,443, Jan. 8. Molten Cu is covered with slag capable of taking up Cu oxide from the Cu and the slag is treated *in situ* as a continuing operation to reduce its Cu oxide (suitably by electrolysis); the reduction of the oxide in the slag is effected while at the same time oxide is being extd. from the molten metal by the slag and without adding any of the initial slag to the Cu. An elec. furnace employing C electrodes is described.

Lightning rods and conductors from the rods to ground. W. PICKARD and R. SPENCER. Brit. 291,673, Nov. 1, 1927. The rod and preferably the conductor also are electrolytically coated with Pt, iridio-Pt or like non-oxidizing and non-fusible material. A formula is given for a bath for coating with Pt.

Electrometallurgy. NEW METALLURGY, LTD. Ger. 469,090, Mar. 9, 1927. Metals are extd. by the electrolysis of fused compds. with a carbon or graphite electrode free from or oxidizable S compds. The electrode is protected from the action of O by the introduction of S or S compds. into the electrolyte.

Recovery of tin. LUIGI UGHETTI LA CORSA. Fr. 642,313, Aug. 23, 1927. Waste sheet tin is treated with FeCl_3 to form SnCl_2 and FeCl_2 and the mixt. is electrolyzed, a deposit of Sn being obtained at the cathode and FeCl_2 at the anode with liberation of Cl $_2$, which may be collected, or if NH_4Cl is added to the bath FeCl_2 becomes reformed.

Aluminum. V. VERNEY and SOCIETÀ ITALIANA DI ELETTROCHIMICA. Brit. 291,219, May 19, 1927. Al is obtained by electrolysis of a fused electrolyte contg. $\text{Al}(\text{OH})_3$ produced by complete decompn. of hydrated AlCl_3 by heat.

Aluminum. SOCIÉTÉ ANON. POUR L'IND. DE L'ALUMINIUM. Fr. 642,550, Oct. 18,

1927. Al is prepd. electrolytically by using a solid anode composed of the material contg. Al to be refined and a solid cathode, both being disposed vertically in a bath of Al halides and alkali or alk. earth halides. The anode residues rich in Si are used to make the alloys which will constitute the anodes in the process. Cf. C. A. 23, 46.

Galvanizing. CARL JULIUS ZEYEN. Ger. 469,192, Oct. 23, 1927. The stamped blanks for chimney covers are smoothed before applying the layer of Sn by electrolysis.

Galvanizing. INTERNATIONAL COPPERCLAD CO. Ger. 469,097, Aug. 1, 1925. At least one cathode and one anode are moved through the bath in a closed cycle, as on a conveyer belt. The app. is described.

Galvanizing. GROOVE & WELTER. Ger. 470,105, July 2, 1926. The wire is clamped to one or more projections on the Zn anode which is then immersed in the bath up to the projections.

Electrolytic apparatus for galvanizing pipes. ALBERT KNEPPER. Ger. 469,429, Feb. 24, 1924.

Electric induction furnace. P. E. BUNET and ACIÉRIES DE GENNEVILLIERS. Brit. 291,455-6, June 2, 1927. Structural features.

Electric induction furnace. MARC GLIKSMAN. Fr. 641,071, Sept. 17, 1927.

Electric high-frequency induction furnace. SIEMENS & HALSKE AKT.-GES. Brit. 291,774, June 10, 1927. Structural features.

High-frequency induction furnace. SIEMENS & HALSKE AKT.-GES. Fr. 642,577, Oct. 19, 1927.

Cooling coil for an induction furnace. C. LORENZ A.-G. Ger. 469,247, Sept. 26, 1926. Details of arrangement.

Electric resistance and induction furnace. W. HAMMER. Brit. 291,450, June 2, 1927. A furnace suitable for smelting, annealing or hardening is heated by a fluid resistance in which currents are induced. Fe, Sn and Pb are suitable resistance materials. Various structural features are specified.

Electric resistance furnace. METALLWERK PLANSEE GES. AND PAUL SCHWARZKOPF. Swiss, 127,640, June 13, 1927. The resistance consists of W, Mo or alloys thereof which are coated with non-conducting layers of air-excluding, acid-resisting material. Cf. C. A. 22, 1737.

Electric resistance furnace suitable for melting various materials. JAMES C. WOODSON (to Westinghouse Elec. & Mfg. Co.). U. S. 1,697,486, Jan. 1. Structural features.

Electric annealing furnace. AKT.-GES. BROWN, BOVERI & CIE. Fr. 640,710, Sept. 9, 1927. Cooling of elec. annealing furnaces is accelerated by the provision of a cover which may be raised without admitting air and the insertion of a conducting wall between the body and cover of the furnace.

Electric furnace with resistance heating. HERMANN BÜHRLIN. Austrian 111,245, June 15, 1928. Tubular heating elements are provided through which a cooling medium may be circulated when the heating is finished.

Electric smelting furnace with resistance heating. DEMAG A. G. Swiss 127,394, Aug. 10, 1927. Structural features.

Electric furnace for heat treatment of metals. VICTOR SORREL and LOUIS ANDRÉ LAFONT. Fr. 641,635, Sept. 29, 1927. The heating chamber is entirely of metal. The temp. is recorded and regulated by a balance, the movement of which is controlled by the variation of magnetism of a body as a function of its temp.

Furnace (heated interiorly by electric heating elements) suitable for the heat treatment of metal articles. JAKOB SCHONBRUNN and GOTTLIEB KELLER (to Akt.-Ges. Brown, Boveri & Cie). U. S. 1,697,144, Jan. 1. Structural features.

Rotary electric furnace suitable for producing wrought iron. ARTHUR J. BRIGGS (to Onondaga Steel Co.). U. S. 1,697,259, Jan. 1.

Electrode holder for electric furnaces. GOTTLIEB KELLER and ERNST WIRZ (to A.-G. Brown, Boveri & Cie). U. S. 1,697,188, Jan. 1. Structural features.

Electrode holder for an electric furnace. SIEMENS & HALSKE A.-G. (Otto Rönitz, inventor). Ger. 469,287, Nov. 20, 1925. Addn. to Ger. 422,777.

Renewing furnace electrodes. RUTGERSWERKE A. G., ABTEILUNG PLANIAWERKE. Swiss 127,122, May 19, 1927. App. is described by which the new electrode is brought vertically above the electrode in use and mech. attached thereto.

Means for insulating the electrodes of electric furnaces from the means for moving them. AKT. GES. BROWN, BOVERI & CIE. Swiss 127,392, May 11, 1927. Structural features.

Seal for electrodes of smelting and refining furnaces, especially for steel manufac-

ture. SOCIETÀ ITALIANA ERNESTO BREDÀ. Austrian 110,914, May 15, 1928. Constructional details.

Charging inductively heated smelting furnaces. HIRSCH, KUPFER- UND MESSINGWERKE A.-G. (Otto Apel, inventor). Ger. 468,426, Dec. 24, 1926. The charge is rammed down into a metallic vessel and set, with the vessel, into the hot furnace. The vessel may be made of the material to be smelted.

Electric resistance unit variable by the action of light. JOHN L. BAIRD. U. S. 1,697,451, Jan. 1. Structural features.

Electric resistances. NAAMLLOOZE VENNOOTSCHAP PHILIPS' GLOEILAMPENFABRIEKEN. Brit. 291,591, May 5, 1927. Resistances suitable for use as grid leaks have leading-in wires of ferro-chrome, and are made with a thin layer of cond. material deposited on an insulator such as a glass tube. The cond. coating may be formed by disintegration of a W or Mo wire by heating to incandescence after exhaustion.

Metallic rectifier plates. CLARENCE E. OGDEN (to Kodak Radio Corp.). U. S. 1,698,921, Jan. 15. A plate of metal such as Cu is formed with a terminal extension, an oxide film is formed on the plate, and the oxide on the extension is then fractured to scale it off so that an elec. connection may be attached.

Dry surface contact devices for rectifying alternating current. K. BRODOWSKI. Brit. 290,985, May 21, 1927. Contact elements of Zn or alloys of Cu or Al are used in conjunction with elements of a metallic sulfide such as Cu sulfide or PbS, and one at least of the elements is subjected, prior to use, to heating by passage of current in a direction opposite to that of the rectified current.

Dry surface contact (metal-metal oxide) device for rectifying alternating current. SIEMENS & HALSKE A.-G. Brit. 291,026, May 24, 1927. Structural features.

Electric transformers and similar apparatus. HERBERT H. DOW (to Dow Chemical Co.) U. S. 1,697,418, Jan. 1. A dielectric liquid used between a casing and transformer windings comprises an aryl compd. such as diphenyl oxide together with another material such as CCl₄ which serves to lower the freezing point.

Electric transformers or similar apparatus. CLARENCE J. RODMAN and AYLMER H. MAYER (to Westinghouse Elec. & Mfg. Co.). U. S. 1,697,141, Jan. 1. Oil subject to heating from a device such as an elec. transformer coil which is immersed in the oil has an overlying body of gas such as N, the coeff. of soly. of which in the oil increases with the temp., which serves to facilitate maintaining the pressure within desired limits.

Ozone. MICHEL CHATAGNIER and LOUIS LECARME. Fr. 640,874, Feb. 24, 1927. An app. is described for the production of ozone elec. from O or air, at a temp. below the b. p. of ozone. The liquid ozone may be dild. with N or CO₂ for safety.

Device for producing ozone. SIEMENS & HALSKE, A.-G. Swiss 127,518, July 1, 1927. An iron free transformer is used for producing the high-tension discharge in the ozone tube.

Electrical purification of gases. SIEMENS-SCHUCKERT-WERKE A.-G. (Richard Heinrich, inventor). Ger. 469,469, Dec. 1, 1923. The elec. charges and the gas velocity are so correlated that the suspended dust, etc., follows a predetermined path to dust-withdrawing devices opening inside the app. These openings may be upstanding vents arranged on the pptg. electrode so that the gas passing over the surface of the electrode follows sinuous paths while the dust, on account of its velocity, passes on through the vents.

Electric gas-purification apparatus. SIEMENS-SCHUCKERT-WERKE AKTIENGESELLSCHAFT. Fr. 641,802, Oct. 4, 1927. An. elec. rectifier is specified.

Electrical gas-purifying plant. SIEMENS-SCHUCKERTWERKE. A.-G. (Carl Hahn, inventor). Ger. 469,205, Jan. 29, 1924. Addn. to Ger. 409,269.

Electrical gas-purification plant. SIEMENS-SCHUCKERT-WERKE A.-G. (Richard Heinrich, inventor). Ger. 469,652, Dec. 19, 1925. Addn. to 438,972. A gas-purification plant having a pptg. electrode of the kind described in Ger. 438,972, i. e., a box-shaped electrode with slits for withdrawing the dust, is provided with means for moving the electrode in such a way that dust which has settled in the slits is driven into the interior of the electrode.

Precipitating electrodes for electric gas purifiers. METALLGES. A.-G. Ger. 469,594, Sept. 14, 1923. The electrodes are prepd. from carbonaceous materials and may be made similarly to furnace electrodes. Compns. comprising semi- or non-conductors, e. g., chamotte, and a carbonaceous binder may be shaped and burnt, or layers of different elec. cond. may be superposed.

Cleaning the electrodes of electrical gas purifiers. METALLOES. A.-G. Ger. 469,697, Mar. 24, 1926. A device for striking the electrodes is operated by a stream of

compressed gas supplied from a source remote from the electrodes; the necessity for insulating the electrodes from the gas conduit is thus avoided.

Accumulator. MANUEL LORING. Austrian 110,269, Mar. 15, 1928. An accumulator comprising a negative electrode of Zn, a positive electrode of graphite, and an electrolyte of ZnCl_2 or other Zn halide is improved by coating the positive electrode with finely divided Ag.

Circuit for rapidly regulating values such as current, voltage, or gas or vapor pressure by means of electron tubes. ÖSTERREICHISCHE SIEMENS-SCHUCKERT-WERKE (Josef Ebner, inventor). Austrian 111,157, June 15, 1928. Elec. details.

Metal foil. JOHN R. CAIN (to The Richardson Co.). U. S. 1,698,472, Jan. 8, 1928. A metal powder such as Cu is deposited on the surface of an acid aq. soln. or other suitable electrolyte so as to form an integral film on the surface and an elec. current is passed between an anode below the surface and a spongy electrode which is maintained in contact with the floating film, in order to produce a film of the metal.

Galvanoplastic manufacture of hollow bodies. ERNEST KELSEN. Austrian 109,695, Jan. 15, 1928. Models made of a readily fusible material such as wax are rendered electrically conductive in known manner and thinly coated with metal in the cold, for instance in an acid copper bath. The metal coating, preferably after removing the wax, is then coated in a hot bath, for instance, with iron, to the desired degree of thickness.

Impregnating fibrous materials. THE ANODE RUBBER CO., LTD. Ger. 469,602, July 24, 1926. In impregnating fibrous materials with water-insol. org. substances, such as rubber, artificial resins, and casein, by elec. pptg. the impregnating agent from an aq. dispersion, the depth to which the impregnating agent penetrates is regulated by preheating the fibrous materials with a soln. of a hydrophilic colloid such as glue, agar, starch, or dextrin. To the colloid soln. there may be added coagulants or buffer electrolytes, the nature and amt. of the addns., and also the concn. of the soln., depending on the result to be attained. Examples are given.

Device for cooling mercury vapor rectifiers. GLEICHRICHTER-G. M. B. H. Swiss 127,639, Aug. 23, 1927. Details of construction.

Cooling device for a mercury vapor rectifier with means for positively regulating the oil current. ALLGEM. ELEKTRIZITÄTS-GES. (Gustav W. Müller, inventor). Ger. 470,101, July 14, 1923.

Lenard cathode-ray lamps. C. H. F. MÜLLER AKTIENGESellschaft. Fr. 641,134, Sept. 7, 1927. Air-cooling means for the metallic foils are described.

Electron lamps. LA RADIOTECHNIQUE. Fr. 641,863, Jan. 21, 1927.

Displacing harmful and adsorbed gases from electric bulbs. Y. A. KHEVESH. Russ. 3667, Sept. 15, 1924. The bulb after removing the main part of the air when cold is filled with H_2 or a mixt. of H_2 and an inert gas, for example N, which is then pumped out, whereby the filament is brought to red heat at a const. or increasing voltage.

5—PHOTOGRAPHY

C. E. K. MEES

Warm tones on development papers. ANON. *Amat. Phot.* 65, 191(1928).—Pleasing warm tones may be obtained on gaslight paper by overexposing and using one of the following developers: (a) pyrocatechol 8.5 g., Na_2SO_3 (dry) 8.5 g., Na_2CO_3 (dry) 25 g., KBr 3 g., H_2O 1 l., or (b) glycine 8.5 g., Na_2SO_3 (dry) 40 g., hydroquinone 8.5 g., Na_2CO_3 (dry) 25 g., KBr 2 g., H_2O 1 l.

Photographic printing on canvas. ANON. *Il prog. fot.* 35, 128-31, 168-70(1928).—A canvas such as that used for oil painting is sized with the following soln.: casein 10 g., H_2O 90 cc., NH_4OH 10 cc. When the casein is dissolved, there are added 20 g. of Zn white and 5 cc. of linseed oil. This will be dry on the canvas in 24 hrs. and can then be coated with an emulsion. That suggested is a simple bromide emulsion made with ammoniacal AgNO_3 .

C. E. K. MEES

New principle of photographic development, especially of the so-called compensation development, its theoretical explanation and practical application. FRITZ HAGELSTEIN. Allg. Krankenhause St. Georg, Hamburg. *Arch. Pharm.* 266, 673-94(1929).—A detailed discussion of the various known factors relating to the taking and making of photographs. Among the points especially considered are: the advantage of individual tech. expts.; technic of photographic developing in general and in particular; analogies with Hans Windisch; the practical principle; supplement to the theoretical principle of a developer by Mereschkosky; new methods of detg. p_n and their importance in the action of developer solns.; principle of dilut.; theory of p_n in practice;

chem. reductions and the importance of light reductions of the latent picture for the theory of compensation development; practice of automatic equalization in over- and under-exposures; action of surface or equalization developers in comparison with deep or rapid developers; and "novobrol-detrast" developer as the universal composition in practice. Photographic reproductions are shown in connection with the discussion.

W. O. E.

Developer oxidation. R. E. LIESEGANG. *Phot. Korr.* 64, 240-2(1928).—A large crystal of AgCl surrounded by gelatin was treated with adurol developer. A stronger oxidation of the developer took place at the crystal surface than at the air. An envelope of strongly tanned gelatin was formed around the crystal. The phenomenon of development is compared to the Warburg model of biol. oxidation where reacting substances are concd. at the reacting surfaces by adsorption on a catalyst.

M. L. D.

Stains in photography. ANON. *Brit. J. Phot.* 75, 573-4(1928).—A permanganate salt-AcOH stain remover (Ilford bleacher) is recommended for treatment of pyro stains. This is followed by clearing in metabisulfite and redevelopment in amidol or metol. Stains on film packs resulting from failure to remove the paper separators are claimed to be removed wholly or partially by soaking in the following: chrome alum $1\frac{1}{2}$ oz., HCl $1\frac{1}{2}$ oz., H₂O 40 oz. Hg intensifier stains caused by insufficient washing between the two baths usually can be removed by bathing the negative in a weak metabisulfite soln. Stains with Farmer's reducer result from an excess of ferricyanide. Bathing a negative or print in vinegar is claimed to assist in removing dye stains; if persistent stains are found, an AcOH-sulfite soln. is recommended.

G. E. M.

Luminography. WITOLD HENNEL. *Przemysl Chem.* 11, 297-300(1927); cf. Vanino and Rothchild, *C. A.* 19, 2787.—H. describes the playertype method for copying pictures or script in a book. In order to copy a figure in a book it is covered with a sensitized paper, emulsion side to the figure. The paper is covered with a glass plate and placed under a lamp. The light passes through the photographic paper directly from the lamp and is also reflected from the figure. The paper is then developed to great contrast. Unevenness in the paper is compensated for on printing the positive by exactly the same procedure. By this method copying may be done any time and anywhere, even in the reading room of a public library.

A. C. ZACHLIN

Solarization theory. LÜPPO-CRAMER. *Phot. Ind.* 26, 596-9, 960-1(1928).—The regression theory of solarization is defended. Solarization after primary fixation as proposed by Leszynski is not a deciding argument; the lessening of reversal through presence of halogen-absorbing agents, such as nitrite, is decisive.

C. E. M.

Subhalide theory. R. E. LIESEGANG. *Phot. Ind.* 26, 933-4(1928).—Modern theories of exposure dealing with escaping electrons, and theories of development dealing with ions instead of atoms, do not necessarily exclude the existence of Ag subhalide as an intermediate product.

C. E. MEULENDYKE

Studies on irradiation. R. WILDT. *Z. wiss. Phot.* 25, 153-84(1928).—Influence of turbidity and of the law of blackening of the emulsion on the diam. of the image of a point of light is described. The experiences of W. indicates that the spreading of the image varies with the wave length (Ross), but is independent of the diam. of the opening used. W. has observed a slight contraction of the image during drying. Study is made, principally from an astronomical point of view, of the factor of turbidity (as measured by the rate of increase of the size of the image as a function of the time of exposure).

A. P. H. TRIVELLI

Catalytic poisoning in photography. LÜPPO-CRAMER. *Z. wiss. Phot.* 25, 133-7(1928).—AgBr adsorbs dyestuffs; but negative Ag adsorbs them also, and its catalytic action is thereby greatly enfeebled. Reduction by persulfate is hindered; by Rhodamine B, it is completely stopped. Whether the dyestuff be a sensitizer or a desensitizer the results are similar, and so whether the dyestuff be acid or basic.

A. P. H. TRIVELLI

New investigations on the Herschel effect. LÜPPO-CRAMER. *Phot. Korr.* 64, 108-11(1928).—The Herschel effect is well shown in the case of Satrox paper and a red safe-light, a white-light latent image being rapidly weakened by exposure, before development, to the red light. An orange light is nearly as effective as the red, and a yellow light less. Several other chloride-contg. papers showed a progressive destruction of the white-light image by an exposure to red light, as also did a pure AgCl emulsion prep'd by L.-C. Villard (1907) showed that treatment with red light restored a plate to its original condition. L.-C., however, with Satrox paper, now observes a notable increase in sensitivity to white light after destroying a previously impressed white-light latent image with red light. The Herschel effect can then be obtained a second time and probably repeatedly.

E. R. BULLOCK

Enhancing of the Herschel effect by oxidizing agents. LÜPPO-CRAMER. *Kino-technik* 10, 506-7(1928).—Lantern slide plates were bathed in weak solns. of the following oxidizing agents: $K_2Cr_2O_7$, $(NH_4)_2S_2O_8$, HNO_3 , H_2O_2 , $KMnO_4$, quinone and citric acid to each of which was added about 0.1% of KBr. They were then given a flash exposure and subsequently exposed under the Chapman-Jones scale as well as special red, yellow and blue filters. Bleaching was obtained with all the salts under the red and yellow filters and various amts. under the blue filter. Good bleaching was also obtained with a soln. of amidol and less with *p*-phenylenediamine. H. C. C.

Fine-grain images. R. NAMIAS. *Il progresso fotografico* 35, 253-6(1928).—Some of the very small cameras now on the market, as well as the amateur motion-picture cameras, make desirable images of the finest possible grain. High resolving power can be obtained only by the use of fine-grained emulsions. Reduced graininess in the developed image can be obtained by developers contg. little alkali and much sulfite, such as the Kodak borax formula, or the following formula of Mente: Metol, 15 g.; Na_2SO_3 (cryst.), 150 g.; 10% KBr soln., 2 cc.; H_2O , 1 l. C. E. K. MEES

Latent image bleaching. LÜPPO-CRAMER. *Phot. Ind.* 26, 627(1928).—The red-light bleaching of the latent image with chloride and bromide emulsions has been discovered to take place with certain gaslight papers. Such papers give bleaching not only in red, yellow and green light, but also in blue light. With light of short wave length, it is necessary to maintain low intensity or fogging, with little bleaching, results. The Herschel effect in blue light differs from solarization in that it takes place all along the upper portion of the curve. Both phenomena are related since they are types of regression. Reproductions of the original prints are given. C. E. M.

Weakening of latent image. LÜPPO-CRAMER. *Z. wiss. Phot.* 25, 129-33(1928).—Persulfate attacks most strongly the denser parts of a negative; Farmer's reducer, the thinner parts. Dichromate attacks most strongly the denser parts of a latent image. All oxidizers and Ag solvents appear to do the same, provided there is at the same time a solvent for the Ag halide adsorbed by the negative Ag, in the absence of which the attack may be mainly on the thinner parts. Persulfate promotes fogging, but not with bromide paper; H_2O_2 acts analogously, powerfully promoting fogging. The explanation is based upon the fact that the last remains of adsorbed substances or those in solid soln. are the most difficult to dissolve. A. P. H. TRIVELLI

Fogging by acids and oxidizing agents and the intensification of the photographic latent image. E. P. WIGHTMAN. *J. Am. Chem. Soc.* 50, 2923-9(1928).—Further arguments are given in support of the viewpoint of Wightman (*C. A.* 21, 3318) that latent fog formation from the action of certain oxidizing agents and acids is probably due to formation of bromine from the sol. bromide in the plate, with which hypothesis Lüpko-Cramer disagrees (*C. A.* 22, 1738). The hypothesis was originally based on the fact, discovered by Lüpko-Cramer himself, that very dil. Br soln. causes fog and on a previously proposed mechanism of latent image intensification and fog formation by H_2O_2 , further evidence for which is now presented. E. P. W.

Toning and intensification of selenium-toned prints and negatives. A. STEIGMANN. *Phot. Ind.* 26, 902(1928).—Se toning is followed by a bleach bath of dichromate acid and KBr. Redevelopment is effected with a soln. of $AgNO_3$ in Na_2SO_3 soln. Satisfactory chocolate-brown tones are claimed. C. E. MEULENDYKE

Intensifying the shadows of bromide prints. S. JASIENSKI. *Foto. Polski* 12, 199-200(1927).—Excellent gradations of tones ranging from clear highlights to a 10% intensification of the shadow can be obtained by the following method. The hardened dry prints are immersed in a warm 2% soln. of potassium chlorochromate and bleached thoroughly. The prints can then be redeveloped in two ways: (1) without washing, to produce warm tones; (2) after thorough washing, to produce cold tones. An unbromided pyrocatechol developer is recommended. If the highlights are not clear, a preliminary bathing is recommended in a weak soln. of $KMnO_4$ acidified with a few drops of H_2SO_4 . T. J. GASKI

Sensitization of emulsions by colloid materials. B. H. CARROLL AND D. HUBBARD. *Bur. Standards. J. Research* 1, 565-88(1928); *Brit. J. Phot.* 75, 711-2, 724-7, 738-9, 753-5(1928).—A study of the effect upon sensitivity of the adsorption of gelatin-protected insol. colloid nuclei to the surface of the Ag halide grains. Emulsions were treated with the colloid materials after ripening and washing, adsorption was facilitated by control of the charge on the grains, and unadsorbed colloid material removed by centrifuging. Colloidal AgI gave marked increase in contrast with chem. development and great increase in speed with physical development. Both effects are probably caused by acceleration of development by increased adsorption of the developer. Colloidal Au and Ag increased the speed of acid emulsions contg. slight excess of sol. Ag salts. This

it can possibly be explained by orientation of the photolysis. Ag_2S gave negative results.

C. E. MEULENDYKE

Light standard for sensitometry. E. CALZAVARA. *Sci. ind. phot.* 8A, 113(1928).—gives arguments against the use of pyridine and mannitol as standard media in connection with the prepn. of colored filters as recommended by the committee of the Soc. of Am. during the 7th Intern. Congress of Photography at London. Some of the objections to pyridine are considered from the standpoint of purity, doubtful degree of hydration, and reactivity to certain dehydrating agents forming dihydro derivs. Objections to mannitol are based upon the difficulty of obtaining a definite isomer, the change of optical rotatory power of *d*-mannitol (ordinary) in the presence of moisture, or of soda, potash, lime, baryta, magnesia, NH_4OH , boric acid, borates and other foreign compds.

L. E. MUEHLER

Interchangeability of zinc oxide and dyes in optical sensitization. C. NEUWEILER. *Phys. Phot.* 25, 187-224(1928).—In light, ZnO acts on aq. solns. of org. dyes of widely different classes. In pure, air-free aq. soln. the dyes are both oxidized and reduced. In vat dyes, photolysis still occurs even at the highest reduction potentials (safranin, $- +0.15$ v.). Considerable differences of potential, up to about 0.8 v., between anodic and cathodic photolysis processes can be overcome by light. With azos the photolytic reduction is not reversible; i. e., the reduction products were not converted into dyes by the O of the air. The alkyl. of the ZnO and heating play no part in the reactions studied. Under certain conditions, sensitizing dyes can exert the same photolytic effect on org. dyes as ZnO . The necessary condition is that the absorption region of the sensitizer must coincide with that of the acceptor on the short wave-length side.

A. P. H. TRIVELLI

Cellulose acetooleate (U. S. pat. 1,698,048) 23. Cellulosic esters containing Brstituted stearic acid groups (U. S. pat. 1,698,049) 23. Smooth metal coatings for photographic purposes (Swiss pat. 127,548) 9.

Photography. GUSTAV KÖGEL. Ger. 466,326, Dec. 14, 1927. Optically sensitive papers for yielding positives from negatives are produced by combining ferric salts with rhonyl compds. Thus, 1 part ferric ammonium citrate is mixed with 3 parts of an ethylrhinosoketone with excess of hydrolyzed starch and BaCl_2 and applied to paper. Rhinosoketone or β -naphtholquinone-4-sulfo acid may be used.

Photography. GUSTAV KOPPMANN. Ger. 469,224, Aug. 17, 1926. Ag prints are developed by reduction and the Ag compds. still capable of being blackened removed from the developing zone together with the colloid. The halogen-Ag film may be treated with a light absorbing medium.

Photography. JOHANNES HERZOG & Co. Ger. 466,327, July 6, 1927. Colored pictures are produced by using pigments capable of oxidation and exposing them to the action of leuco-dye solns.

Photography. KALLE & Co. A.-G. (Maximilian Paul Schmidt, Wilhelm Krieger and Rudolf Zahn, inventors). Ger. 467,162, Oct. 20, 1927. Natural color photographs are prepared by using diazo compds. which are not bleached by light. Thus, yellow, blue and red sheets of transparent material are separately impregnated with solns. containing, esp., boron fluoride of 1-diazo-4-ethylamino-3-methylbenzene, tartaric acid and phenol, boron fluoride of 1-diazo-4-ethylamino-3-methylbenzene, tartaric acid and the Na salt of 1-amino-8-naphthol-3,6-disulfonic acid, and 1-diazo-2-naphthol-4-sulfonic acid, $\text{Al}_2(\text{SO}_4)_3$ and resorcinol. The pictures are completed successively on the sheets, developed with gaseous NH_3 and superimposed on the same base. A further example is given (cf. C. A. 23, 349).

Photography. I. G. FARBENIND. A.-G. (Walter Dieterle, Otto Matthies, Emil Mauerhohl and Josef Reitsretter, inventors). Ger. 468,604, May 15, 1926. Addn. to Ger. 464,450. Gelatin for light-sensitive Ag salt emulsions, containing disintegrated animal and vegetable proteins, has also a content of disintegrating agent. Cf. C. A. 23, 571.

Photography. SOCIÉTÉ CIVILE POUR L'ÉTUDE DE LA PHOTOGRAPHIE ET DE LA CINÉMATOGRAPHIE EN COULEURS. Ger. 470,005, June 3, 1927. To prepare a lenticular film for color projection requiring a minimum of treatment with liquid reagent, a carrier of gelatin, celluloid, or cellulose is provided on one side with a layer of celluloid or other plastic material to form the lenticular light-refracting surface, and on the other side with a layer of gas-permeable material impregnated with light-sensitive azo derivs. gas-forming alkali is used for developing.

Color photography. JACOB F. LEVENTHAL. U. S. 1,697,194, Jan. 1, 1928. Registered images are produced in a single layer of colloid containing a light sensitive salt

and after developing and fixing to obtain an image capable of being bleached the colloid is treated with a bleach retardant such as dil. CH_3O soln. which diminishes the rapidity of action of a bleaching compn. such as a dil. aq. soln. of NH_4Br , KI and I which is subsequently applied.

Three-color photography. "SIRIUS" KLEUREN-FILM MAATSCHAPPIJ. Ger. 469,416, Mar. 19, 1927. To ensure accurate registration, the two-color picture is prepd. with a double-coated film having circular perforations of smaller diameter than the height of the oblong perforations usually provided, the normal perforations being made after the third layer has been applied.

Screens for color photography. JENS HERMAN CHRISTENSEN. Ger. 469,578, Sept. 8, 1927. The color particles contain a dye or dyes in addn. to a lake, e. g., one or more acid dyes in addn. to a lake prepd. in known manner from tannic acid and a basic dye.

Decolorizing colored films, film waste, and celluloid strips. BERLINER CELLULOID-VERWERTUNG G. M. B. H. Ger. 469,688, Aug. 4, 1927. The photographic emulsion is removed in known manner and the film, etc., then treated in a bath of dil. KMnO_4 soln. contg. HCl , with or without a chlorate. An after-treatment with dil. NaHSO_4 soln. may be given to remove MnO_2 .

Photographic films. I. G. FARBENIND. A.-G. (Hermann Lummerzheim and Eduard Schnitzler, inventors). Ger. 468,374, Aug. 13, 1927. Addn. to 467,780 (C. A. 23, 571). In the method of producing visible numerals or lettering on films described in Ger. 486,374, colloids which are not sol. in the liquid used for polishing the films are added to the printing soln., and finely divided pigments may replace partly or wholly the dyestuff of the printing soln.

Photographic sensitive material. WILLIAM B. DAILEY. U. S. 1,699,340, Jan. 15. A light-sensitive coating is applied to paper, "film" or other suitable sheet material and after the coating has set but before it is dried a protective coating such as non-sensitized gelatins is applied over it and both coatings are dried at the same time. An app. is described.

Printing plates. R. KLASTERNIGG (to C. Schinzel). Brit. 291,063, May 25, 1927. Printing plates are produced by electrolytic action on gelatin, albumin or similar colloid layers contg. substances such as hydroquinone or other photographic developers, chromic salts, ferric salts, and catalytic or hygroscopic salts, which under electrolytic action produce tanning or detanning agents.

Cinematograph films. PAUL REHLÄNDER. Ger. 469,415, Jan. 10, 1928. Celluloid rendered opaque by particles of high reflectivity is used to support the emulsion.

Lubricating motion picture films. ALBERT FIEDLER. U. S. 1,697,858, Jan. 8. A compn. of gelatin and oil dissolved in water and alc. is applied to the film edges.

Photographic developers. I. G. FARBENIND. A.-G. Fr. 641,409, Sept. 26, 1927. Cyanides of heavy metals, particularly $\text{Hg}(\text{CN})_2$, are added to photographic developers of all kinds.

Metallized photographic paper. LEOPOLD RADO and JULIUS MODERN. Austrian 110,592, Apr. 15, 1928. Metal foil, made adherent by a layer of hardened albumin, is inserted between the paper and the emulsion.

Photomechanical reproduction. FRIEDRICH PUPPE. Ger. 470,087, Dec. 15, 1926. Two-color prints are obtained by different color media. The printing elements for the two colors are etched by a common photomechanical color ext. and then sepd. for the introduction of the different media.

Package of sensitized material for x-ray purposes. FREDERICK C. MARTIN (to Eastman Kodak Co.). U. S. 1,698,058, Jan. 8. Structural features.

6—INORGANIC CHEMISTRY

A. R. MIDDLETON

The rare earths. N. A. ORLOV. *J. Russ. Phys.-Chem. Soc.* 60, 515-44 (1928).—A review of the methods of separation and purification written in 1913 or 1914 and published after the author's death. B. SOYENKOFF

Separation of pure yttrium from yttrious earths. G. CANNERI. *Atti accad. Lincei* 8, 164-8 (1928).—Pure Yt can be obtained from gadolinite by fractional crystn. of double carbonates with Na_2CO_3 as precipitant. HNO_3 soln. of the earth oxides is treated with K_2SO_4 which ppts. out most of the Ce earths as double sulfates. Then there is added $\text{Mg}(\text{NO}_3)_2$, which ppts. double nitrates of the other earths, leaving a

mother liquor rich in Yt. This is now treated with excess Na_2CO_3 till the ppt. is redissolved, and the soln. is fractionally crystd., the Yt being thus concd. in the various mother liquors as it is the most sol. of the double carbonates, the order of decreasing soly. being Yt, Er, Ho, Tm, Tb and Yb. The product gives an oxide with only a trace of Er and the mol. wt. detd. for Yt using the $\text{Yt}_2\text{O}_3:\text{Yt}_2(\text{SO}_4)_3$ relation was 94.5. The last traces of Er were removed by a modification of Prandtl's method, i. e., by partial pptn. of ferrocyanides with addn. of a Zn salt to help coagulate the gelatinous ferrocyanide ppt. C. improved this method by adding the precipitant $\text{K}_4[\text{Fe}(\text{CN})_6]$ (1% soln.) in small portions, slowly while stirring, in presence of excess alkali. After several mins. heavy yellow crystals form which quickly settle as an incrustation. This is easily sepd. from the mother liquor. Four pptns. were enough to give pure Yt, no absorption bands being shown by the HNO_3 soln. of the oxide. Mol. wt. of this pure Yt = 89.12. (Honigschmid and Meuwesen find 89.00.)

A. W. CONTIERI

Chemistry of gallium. II. R. FRICKE AND K. MEYRING. Univ. Münster i. W. *Z. anorg. allgem. Chem.* 176, 325-48(1928); cf. *C. A.* 19, 1543.—The Ga metal used contained as impurities 0.16% In, 0.10% Zn, 0.01% Pb and a trace of Ag. Ga is detd. by pptn. as $\text{Ga}(\text{OH})_3$ from a soln. of the chloride and ignition as Ga_2O_3 or by electrolysis from an alk. gallate soln. and deposition on Pt. The metal drops off the Pt electrode, collects as a liquid in the bottom of the vessel, is redissolved in aqua regia and pptd. as $\text{Ga}(\text{OH})_3$, followed by ignition. Freshly pptd. $\text{Ga}(\text{OH})_3$ dissolves readily in excess of NH_4OH , and cond. and f. p. detns. in these solns. show that $\text{Ga}(\text{OH})_3$ behaves as a relatively strong acid, the ammoniacal solns. being apparently due to its formation rather than to complexes. The sp. cond. of a soln. of 0.0315 mol. Ga in 0.219 *N* NH_3 is 3.47×10^{-3} as compared with 5.70×10^{-4} for the same NH_3 soln. without Ga, while the f. p. depression of these 2 solns. is 0.524° and 0.481° . The $[\text{H}^+]$ concn. of the NH_3 soln. is therefore strongly reduced by Ga. Colorimetric tests give for the Ga soln. $p_{\text{H}} = < 9.3$, while the NH_3 soln. has $p_{\text{H}} = > 10.1$. The basic and acid properties of $\text{Ga}(\text{OH})_3$ are studied by electrometric titration of GaCl_3 in with NaOH and of NaOH soln. with GaCl_3 , using the H electrode. On neutralizing GaCl_3 , the hydrolysis consts. for the 1st and 2nd stages are given as 1.4×10^{-3} and 3.5×10^{-4} , and the dissocn. consts. as 4×10^{-12} and 1.6×10^{-11} . The hydrolysis and the 3rd stage of neutralization cannot be detd. due to the formation of considerable ppt. In the titration of NaOH with GaCl_3 soln. the hydrolysis consts. for the first 2 stages are given as 3×10^{-3} and 1.2×10^{-4} , while the dissocn. consts. are 1×10^{-12} and 4.8×10^{-11} . The results show, however, that the dissocn. consts. for the 2nd stage in either direction can only be slightly less than the const. for the 3rd stage.

H. STÖERTZ

Some properties of the alkali metals. L. HACKSPILL. *Helv. Chim. Acta* 11, 1003-26 (1928). An address dealing with the prepn. and properties of the alkali metals.

FRANK URBAN

Univalent iron, cobalt and nickel. W. MANCHOT. Tech. Hochschule, München. *Monatsh. chem. ital.* 58, 560-2(1928).—Evidence already presented in original articles (cf. *C. A.* 20, 2455; 21, 869; 22, 1134) is repeated in its essentials in support of the existence of univalent Fe, Co and Ni, and in refutation of papers by Cambi (cf. *C. A.* 21, 1408, 22, 193). The conclusion that Fe can be univalent does not rest on absorption spectra evidence, but on the proof that NO behaves as a neutral mol., a proof which is well established by expts. already published on compds. of CO and NO (cf. M. and Pilgum, *C. A.* 22, 200). Researches on the mechanism of the reduction and the univalence of Mn (cf. M. and Gall, *C. A.* 21, 869; 22, 2522) also support the existence of univalent Fe.

C. C. DAVIS

The compounds of osmium tetroxide. F. KRAUSS. Tech. Hochschule Braunschweig. *Z. anorg. allgem. Chem.* 175, 343-6(1928).—Polemic against E. Fritzmann (cf. *C. A.* 22, 3362) who claims to have prepd. $\text{OsO}_4 \cdot 2\text{KOH}$, etc.

G. L. CLARK

The oxides of ruthenium and osmium. F. KRAUSS AND G. SCHRADER. Tech. Hochschule, Braunschweig. *Z. anorg. allgem. Chem.* 176, 385-97(1928).— RuO_4 is prepd. by reduction of an aq. soln. of RuO_4 with 4% H_2O_2 , and settles out as a black flocculent ppt. after heating the reaction mixt. on a H_2O bath. Dried in a vacuum desiccator over P_2O_5 , finely powdered, and heated to const. wt. at 500° , the product is amorphous and shows a d_{41}^{21} of 4.98. Calcd. from this, mol. vol. is 26.8. X-ray photographs show interference lines which the authors believe to be due to the presence of a small amt. of a cryst. modification. Efforts to prep. this by heating the amorphous form to 800° failed. OsO_4 is prepd. by heating Os with NO at 540° . It is a dark brown cryst. substance with $d_{41}^{21} = 11.32$, and mol. vol. = 19.6. The amorphous form is

unstable, and efforts to prepare it were unsuccessful. Its mol. vol. is about 29.0. RuO_4 in the fused condition gives a d. of 3.28 and mol. vol. of 50.7, the O vol. possessing its full zero point value of 10.7. RuO_4 has an extremely high vapor pressure and is very unstable. Addition of a small quantity of Cl to its soln. increases the stability. RuO_4 dissolves in liquid NH_3 with a violet-brown color. OsO_4 was prepd.; it has $d_4^{21} = 4.95$, mol. vol. = 51.4, the zero vol. of O having its full value of 10.7. Thus, the normal crystd. forms of the oxides of Ru^{IV} and Os^{IV} have for the zero vol. of O its half value of 5.35, while the crystd. oxides of Ru^{VIII} and Os^{VIII} have the full value of 10.7. The (iv) oxides also exist in an amorphous form in which the O vol. has its full value. If OsO_4 is dissolved in HCN , evapn. of the soln. leaves a white, cryst. substance with the probable compn. $\text{H}_2[\text{OsO}_4(\text{CN})_2]$.

H. STOERTZ

Microchemical reactions for theobromine. M. WAGENAAR. *Pharm. Weekblad* 66, 1-5(1929).—Various reagents for pptn. of complex salts of theobromine gave results as follows: (reagent; min. concn. of theobromine at which pptn. occurs; min. amt. of theobromine required for test, mg.) dil. AcOH to ppt. free base, 1:100, 10; HgCl_2 , 1:1000, 5; AuCl_3 , 1:100, 10; AgNO_3 , 1:100, 10; $\text{I} + \text{KI}$, 1:1000, 2; $\text{Br} + \text{KBr}$, 1:1000, 1; $\text{BiI}_3 + \text{KI}$, 1:1000, 2; $\text{SbI}_3 + \text{KI}$, 1:1000, 1.

A. W. DOX

Oxidation of cobalt in a solution of cobaltous nitrate by means of sodium bismuthate. SANSEI KITASHIMA. *Bull. Inst. Phys.-Chem. Research (Tokyo)* 7, 1035-40(1928); *Abstracts* 1, 100-1.—When a soln. of $\text{Co}(\text{NO}_3)_2$ in concd. HNO_3 is shaken with a sufficient quantity of Na bismuthate and any insol. residue is removed, a blue soln. is obtained, owing to the oxidation of Co. But if HNO_3 is very dil., the soln. remains red. In order to detect any oxidized Co in the red soln., the absorption spectrum has been taken. Oxidized Co is found in the red solns.; the degree of oxidation partially depends on the amount of bismuthate used. The duration of the shaking influences little the degree of oxidation in the presence of small amts. of HNO_3 , but has considerable influence when the acid concn. is large. On standing, the amt. of oxidized Co decreases decidedly.

ALBERT L. HENNE

The action of iron vapor on molecular nitrogen and the problem of nitrogen fixation on iron. A. MITTASCH AND W. FRANKENBURGER. *Forschungslab. Oppau Z. physik. Chem., Abt. A*, 139, 386-96(1928).—Although a number of Fe nitrides are mentioned in the literature nothing is known about the action of Fe vapor on gaseous N_2 . The authors, therefore, undertook a study of the action of Fe at high temps. on N_2 at a pressure of 0.1 mm. Hg. Thin wires of Fe, free from adsorbed gases, were electrically heated in the rarefied atm. of N_2 to temps. at which the metal vaporized readily (between 1200° and 1500°K). More than 100 expts. were performed but the results were negative: the Fe atoms do not combine with the N_2 mols.

H. S. v. K.

Action of hydrogen sulfide on chromates. I. H. B. DUNNICLIFF AND C. L. SONT. Punjab Univ., Lahore, India. *J. Phys. Chem.* 33, 81-7(1929).—When pure H_2S acts upon K_2CrO_4 in aq. soln. (concn. varying from 2 to 15%) at $80-5^\circ$, the products of the reaction are found to be $\text{K}_2\text{S}_2\text{O}_8$, K_2S_8 , S and $\text{Cr}(\text{OH})_3$.

LOUISE KELLEY

The reactions of hydrogen chloride with the dioxides of selenium and tellurium between 0° and 170° . THOMAS W. PARKER AND PERCY L. ROBINSON. Univ. of Durham. *J. Chem. Soc.* 1928, 2853-7; cf. Lenher, *C. A.* 3, 1124; 15, 480 and Ditte, *Compt. rend.* 83, 56, 336(1876).—Two addn. compds. exist between SeO_2 and HCl , viz., (1) $\text{SeO}_2 \cdot 4\text{HCl}$, a yellow solid, stable at 0° , and (2) $\text{SeO}_2 \cdot 2\text{HCl}$, a yellow liquid, stable up to and partly distillable at 170° . This liquid dissolves HCl in amts. varying with the temp. At 0° TeO_2 absorbs HCl in varying quantities, giving a non-homogeneous product, which loses H_2O continuously with rising temp. when heated in a stream of the gas. There is no evidence that TeO_2 forms a definite addn. compd. within the range $0-150^\circ$.

H. F. JOHNSTONE

Transformation of ortho-ferric oxide hydrate into meta-ferric oxide hydrate. ALFONS KRAUSE. Univ. of Posen. *Z. anorg. allgem. Chem.* 176, 398-402(1928); cf. *C. A.* 22, 4075.—Brown ortho-ferric oxide hydrate is produced by pptn. of ferric salts with NH_4OH . Its $p_H = 7.7$, and its particle size is relatively small. Dried on a watch glass in the air it forms almost black particles, which do not adhere to the glass. Allowed to age under H_2O , after removal of NH_4 salts, it is gradually converted into the meta-compd., which is bright yellow in color. After 8.5 months, the gel contains about 59% meta- and after 19.5 months about 68% meta-compd. This is easily peptized in dil. AcOH , HCl or NH_4OH , its particle size is relatively large, and when dried in the air on a watch glass, it adheres tenaciously to the glass. The isoelec. point of the meta-gel corresponds to $p_H = 5.2$. Dried samples of the aged ortho-gel show that Fe_2O_3 content increases with age. When fresh it contains about 70% Fe_2O_3 , after 3 months 77.3% and after 1 yr. about 80%. The dried meta-gel contains about

82.5% Fe_2O_3 . In the presence of OH ion the conversion from *ortho* to *meta* is very rapid. Freshly pptd. well-washed *ortho* compd. is added to N NaOH and allowed to stand 3-4 days at room temp. The gel is bright yellow and has the same properties as a gel aged for a long time under H_2O . H. STOERTZ

The reduction of selenious acid. LESLIE M. CLARK. *J. Chem. Soc.* 1928, 2388-93.—In the reduction of H_2SeO_3 by SO_2 in the presence of CuSO_4 and HCl, the ppt. varies in compn. from pure Se in the presence of high concns. of HCl to Cu_2Se in very dil HCl solns. SO_2 reduces SeO_3 directly to Se which reacts with Cu ions to form Cu_2Se ; the latter reaction depends on the concn. of HCl. ARTHUR FLEISCHER

Decomposition of trithionate solutions. A. HORNIG. *Tech. Hochschule, Dresden Z. anorg. allgem. Chem.* 176, 423-4(1928); cf. Riesenfeld and Sydow, *C. A.* 23, 352.—A method is developed for demonstrating the presence of $\text{S}_2\text{O}_3^{2-}$ in the decompn. products of $\text{S}_2\text{O}_6^{2-}$ in H_2O soln.: $\text{S}_2\text{O}_6^{2-} + \text{H}_2\text{O} = \text{SO}_4^{2-} + \text{S}_2\text{O}_3^{2-} + 2\text{H}^+$. The decompn. is conducted in a cold satd. soln. of copper acetate, $\text{S}_2\text{O}_6^{2-}$ being added to make it 0.2-0.3 M . After a few days at room temp. and in the dark, a yellow, cryst. substance seps., which on analysis is found to be $\text{K}_2\text{S}_2\text{O}_3 \cdot \text{Cu}_2\text{S}_2\text{O}_3 \cdot 2\text{H}_2\text{O}$. Microscopic examn. shows the crystals to be yellow, monoclinic prisms. This complex becomes brown and finally black in the air, with sepn. of CuS , which is also formed when it is heated with H_2O . H. STOERTZ

Solid solutions of lime and arsenic acid. A. T. CLIFFORD AND F. K. CAMERON. *Univ. North Carolina. Ind. Eng. Chem.* 21, 69-70(1929).—There seems to be no evidence that $\text{Ca}_3(\text{AsO}_4)_2$ can be formed from aq. solns., or persist in contact with them. Analytical methods purporting to sep. it from other Ca compds. should be viewed with caution. E. F. SNYDER

The system: zinc oxide-water. A. GUTBLER AND HORST-RUDOLF BARFUSS-KNOCHENDOPPEL. *Univ. of Jena and Tech. Hochschule, Prague. Z. anorg. allgem. Chem.* 176, 363-71(1928); cf. *C. A.* 20, 2628; 22, 3568.—Crystd. zinc oxide monohydrate ($\text{ZnO} \cdot \text{H}_2\text{O}$) (I), aged amorphous zinc oxide hydrate ($\text{ZnO} \cdot 0.342\text{H}_2\text{O} \cdot 0.027\text{CO}_2$) (II), and fresh amorphous zinc oxide hydrate ($\text{ZnO} \cdot 0.275\text{H}_2\text{O} \cdot 0.005\text{CO}_2$) (III) are prepd. The decompn. of these compds. on heating is studied by means of H_2O vapor pressure detns. The bulk of the H_2O in prepn. I is loosely held and is given up at a uniform velocity on heating. A small part of the H_2O (0.060 mole) is very firmly held. Thus after heating at 73° , the amt. of H_2O (N) is 0.060 mole, at 175° $N = 0.058$, at 190° $N = 0.048$, at 260° $N = 0.034$, at 305° $N = 0.027$, at 500° $N = 0.018$. If $\text{ZnO} \cdot \text{H}_2\text{O}$ is heated to 73° in a vacuum, decompn. commences and continues without abatement even if the temp. is dropped to 56° . The temp. of the 4-phase point $\text{ZnO} \cdot \text{H}_2\text{O} | \text{crystd. ZnO} | \text{condensed H}_2\text{O} | \text{H}_2\text{O}$ vapor is not far removed from room temp. Decompn. of II and III shows that the first contains more H_2O and retains it more firmly. Chem. activity, however, decreases on aging, III taking up Ag from a Ag gel in greater quantity than II, the ratio being 31/9. X-ray examn. shows no interference lines with III, broad indistinct lines with II corresponding to those of ZnO , and sharp interference lines with I differing in position from those of ZnO . A freshly prepd. ppt. of zinc oxide hydrate is the richest in energy and the least stable component of this system; the most stable and lowest in energy is liquid H_2O + crystd. ZnO (contg. a small amt. of H_2O). However, under a definite temp. (60°) crystd. zinc oxide monohydrate can exist as a stable compd. H. STOERTZ

The quaternary system: $\text{Na}_2\text{C}_2\text{O}_4$, H_2SO_4 , Na_2SO_4 (or $\text{H}_2\text{C}_2\text{O}_4$)- H_2O at 25° . E. BLOD AND F. ACKER. *Tech. Hochschule, Karlsruhe. Z. anorg. allgem. Chem.* 176, 305-24(1928). This quaternary system is studied as an aid in understanding the double decompn.: $\text{Na}_2\text{C}_2\text{O}_4 + \text{H}_2\text{SO}_4 = \text{Na}_2\text{SO}_4 + \text{H}_2\text{C}_2\text{O}_4$. The principal points of the 4 ternary systems involved are given in tables. In the investigation of the satn. equl. between the solids and solns., a new substance is discovered which has the compn. $\text{Na}_2\text{H}_2(\text{SO}_4)_2 \cdot \text{C}_2\text{O}_4$ and is designated *acid sodium sulfate oxalate*. Microscopic examn. of the isolated salt shows that it occurs in more than 10 types of crystals. It is sol. in H_2O with sepn. of $\text{NaHC}_2\text{O}_4 \cdot \text{H}_2\text{O}$ when satn. is attained. Its zone of existence is found to extend over the great H_2SO_4 concn. range of 20-67%, and with bin-oxalate dominates the field of satd. solns. at 25° . The satn. field is detd. for the compds.: $\text{Na}_2\text{H}_2(\text{SO}_4)_2 \cdot \text{C}_2\text{O}_4$, $\text{H}_2\text{C}_2\text{O}_4$, $\text{H}_2\text{C}_2\text{O}_4 \cdot 2\text{H}_2\text{O}$, NaHC_2O_4 , $\text{Na}_2\text{C}_2\text{O}_4$, Na_2SO_4 , $10\text{H}_2\text{O}$, $\text{Na}_2\text{SO}_4 \cdot \text{Na}_2\text{H}_2(\text{SO}_4)_2 \cdot \text{H}_2\text{O}$, $\text{Na}_2\text{H}(\text{SO}_4)_2$, $\text{NaHSO}_4 \cdot \text{H}_2\text{O}$, NaHSO_4 , $\text{NaH}_2(\text{SO}_4)_2 \cdot \text{H}_2\text{O}$. The results of the solv. detns. are plotted in the form of a horizontal projection of the phase diagram. By graphic detn. of the isothermal crystn. course with removal of the sepg. products, in addition to 2 actual crystn. end points, a final crystn. path is located along which the progress of crystn. practically comes to a standstill in the direction of a third, but "virtual" crystn. end point. H. STOERTZ

Complex salts. I. The preparation and properties of some selenitopentamminecobalt salts. HARRY L. RILEY. College of Science and Technology, S. Kensington. *J. Chem. Soc.* 1928, 2985-9.—Selenitopentamminecobaltic chloride (I), $[\text{Co}(\text{SeO}_3)(\text{NH}_3)_5]\text{Cl}$, was prepd. by adding NH_4Cl to a suspension of $\text{Co}(\text{OH})_2$ and SeO_2 . Large red crystals were obtained by evapn. of the liquid and crystn. from alc. Yield, 80%. A soln. of I is slowly reduced by SO_2 , pptg. Se. BaCl_2 gives no ppt. in the cold, while AgNO_3 ppts. the chloride on boiling. When boiled with HCl the chloropentamminecobaltic chloride is formed, along with H_2SeO_3 . Cryoscopic mol. wt. detns. indicate that this compd. is a binary electrolyte, 97% dissociated in 0.1 N soln. No evidence of a selenitetetrammine compd. was found. Selenitopentamminecobaltic selenite (II), $[\text{Co}(\text{SeO}_3)(\text{NH}_3)_5]_2\text{SeO}_3 \cdot 3\text{H}_2\text{O}$, was prepd. by adding NH_4OH to a suspension of CoSeO_3 and SeO_2 followed by evapn. and pptn. with alc. The action of II with BaCl_2 indicates the existence of the different SeO_3 groups. These results are evidence that ions of the sulfate and sulfite type have a tendency to occupy only one position in a complex, while those of the carbonate type usually occupy two, but sometimes only one position.

H. F. JOHNSTONE

Silver-alkali thiosulfates. ARTHUR ROSENHEIM AND GERT TREWENDT. *Ber.* 61B, 1731-5(1928).—Methods are described for prep. and isolating $\text{NH}_4(\text{Ag}(\text{S}_2\text{O}_3)_3)$, $(\text{NH}_4)_2(\text{Ag}_2(\text{S}_2\text{O}_3)_4)$, $\text{K}(\text{Ag}(\text{S}_2\text{O}_3)_3)$, $\text{K}_2(\text{Ag}_2(\text{S}_2\text{O}_3)_4)$, $\text{K}_3(\text{Ag}(\text{S}_2\text{O}_3)_3) + \text{H}_2\text{O}$, $\text{Na}(\text{Ag}(\text{S}_2\text{O}_3)_3)$ and $\text{Na}_2(\text{Ag}_2(\text{S}_2\text{O}_3)_4) + 3\text{H}_2\text{O}$. $\text{Na}_4(\text{Ag}_2(\text{S}_2\text{O}_3)_3) + 2\text{H}_2\text{O}$ does not exist; the compd. so designated is actually $\text{Na}_5(\text{Ag}_3(\text{S}_2\text{O}_3)_4) + 3\text{H}_2\text{O}$.

B. E. ROETHELI

Multinuclear cobaltamines and a productive method of preparation of the non-electrolyte $\text{Co}(\text{NH}_3)_6(\text{Cl})_3$. ERWIN BIRK. Tech. Hochschule, Hannover. *Z. anorg. allgem. Chem.* 175, 405-12(1928).—From $[\text{Co}(\text{NH}_3)_3(\text{NO}_3)_3]$, triquo-triammino cobaltchloride, $[\text{Co}(\text{NH}_3)_3(\text{H}_2\text{O})_3]\text{Cl}_3$ (I) is prepd. by the method of Werner (*Ber.* 39, 2678(1906)) and this in turn is converted to the hexamine-triol-dicobaltchloride

$$\begin{array}{c} \text{Co} \quad \text{OH} \quad \text{Co} \\ \diagdown \quad \diagup \\ (\text{NH}_3)_3\text{CO} \quad \text{OH} \quad \text{CO}(\text{NH}_3)_3 \\ \diagup \quad \diagdown \\ \quad \text{OH} \end{array} \text{Cl}_3 \cdot \text{H}_2\text{O} \text{ (II) with KOH and } \text{NH}_4\text{Cl. From the filtrate}$$

of this reaction the dodecammine-hexol-tetra-cobaltchloride $\left[\text{Co} \left(\begin{array}{c} \text{OH} \\ \text{OH} \end{array} (\text{NH}_3)_4 \text{Co} \right) \right]_4 \text{Cl}_6 \cdot \text{NH}_3\text{O}$ (III) is pptd. with alc. Dichloride $[\text{Co}(\text{NH}_3)_3(\text{H}_2\text{O})\text{Cl}_2]\text{Cl}$ (IV) prepd. by the method of Jörgensen (*Z. anorg. Chem.* 14, 418(1897)) is also a source for prepn. of II. Now 10 g. of II are thoroughly triturated with 30 cc. concd. HCl with the production of pure $[\text{Co}(\text{NH}_3)_6\text{Cl}_3]$.

G. L. CLARK

Some carbonatocobaltamines. JEAN KRANIG. Faculté des Sciences de Paris *Bull. soc. chim.* 43, 989-95(1928).—A concd. soln. of CoSO_4 contg. NH_4OH and $(\text{NH}_4)_2\text{CO}_3$ was oxidized by a current of air and the product recrystd. using alc. With BaCl_2 a soln. of the salt gives a ppt. of BaSO_4 contg. no BaCO_3 . Thus the SO_4 ion is free and is not a part of the complex, which has the formula $[\text{Co}_2(\text{NH}_3)_{10}\text{CO}_3](\text{SO}_4)_2 \cdot 4\text{H}_2\text{O}$. The chloride and oxalate of the pentamine series, discovered by Werner, were isolated and found to have the formulas $[\text{Co}(\text{NH}_3)_5\text{CO}_3]\text{Cl} \cdot \text{H}_2\text{O}$ and $[\text{Co}(\text{NH}_3)_5\text{CO}_3]_2\text{C}_2\text{O}_4 \cdot 3\text{H}_2\text{O}$. Contrary to Werner K. finds that the transformation of the nitrate of carbonatopentamine to the bromide is not quant., but by double decompn. between KBr and the chloride the bromide is easily obtained.

E. G. VAN DEN BOSCHE

The system: ammonium sulfate-sulfuric acid-ethyl alcohol (DUNNICLIFF, *et al.*) 2.

SWARTS, FRED: Cours de chimie inorganique. Brussels: M. Lamertin. 786 pp. F. 72. Reviewed in *Pharm. J.* 121, 630(1928).

7—ANALYTICAL CHEMISTRY

W. T. HALL

Analytical work by untrained staff. G. B. VANKAMPEN. *Chem. Weekblad* 25, 626-7(1928).—J. HUDIG AND C. W. G. HETTERSCHY. *Ibid* 627-8.—A polemic concerning the quality of the analytical work in a large testing laboratory employing some untrained analytical chemists.

G. CALINGAERT

Chemical analysis for the small foundry. L. D. H. *Iron & Steel Ind.* 2, 103-4 (1929).—Methods for detg. C, Si, Mn, P and S in cast iron are described. W. T. H.

Refractometric analysis of solutions of pure compounds. FRANK URBAN AND V.

W. MÜLCHER. Univ. of Wis. *J. Am. Chem. Soc.* 50, 3003-9(1928).—Three tables are given which can be used for the analysis of pure solns. of H_2TeO_4 , H_2SeO_3 and $K_4Fe(CN)_6$, resp., by means of an *immersion refractometer*, at 25° . The concn. range for H_2TeO_4 is 0.656–11.226 g. per 100 cc. of soln., for H_2SO_3 0.758–10.474 g. and for $K_4Fe(CN)_6$ 0.466–15.516 g.

FRANK URBAN

A new replacement titration for the determination of strong acids which are combined with ammonia or with an organic amine. C. P. A. KAPPELMEIER. *Rec. trav. chim.* 47, 1064–71(1928).—It is sometimes desirable to det. the amt. of free acid and the amt. of combined acid present in a soln. The free acid, of course, can be titrated directly with standard NaOH. Now if, after the soln. has been neutralized in the usual manner, more NaOH is added, then if a drop of the soln. is placed on phenolphthalein paper which is heated, say, by placing it upon a steam pipe, the phenolphthalein color will disappear if an NH_4 salt or the salt of an amine (such as an alkaloid for example) is present. The reason for this is clear. When NaOH is heated with an NH_4 salt, the NH_4 is replaced by Na and the free NH_3 is volatile. By continuing the titration until the phenolphthalein color will not disappear on heating, it is possible to det. how much combined acid is present in combination with a weak, volatile base. It is necessary to carry out a blank detn. with the same vol. of water and also allow for the effect of a large quantity of amine. The reaction is showed to give good results with the sulfate, nitrate, chloride and oxalate of nicotine, but fails, as is to be expected, with an acetate.

W. T. H.

Rapid electrodeposition of cadmium and zinc and their separation by controlling the potential of the bath. ERNA BRENNKE. Univ. Leipsic. *Z. anal. Chem.* 75, 321–71(1928).—An attempt was made to develop a rapid electrolytic method for detg. first Cd and then Zn in solns. Many expts. were performed, most of which were unsuccessful. The conclusion is drawn that the deposition of Cd from very dil. H_2SO_4 , from dil. AcOH or from KCN solns. is never absolutely complete. If, however, a little concd. NH_4OH is added just prior to the washing of the electrode, the residual Cd can be reduced to about 0.5 mg. In spite of this loss of Cd, the deposit usually weighs too much, because of oxidation, especially when impure ether is used. The use of amalgamated brass gauze or of Pt gauze plated with Cu-Hg does not help matters. The use of Cu-Hg electrodes is also out of the question in the Zn detn. when $(NH_4)_2SO_4$ is present, because of the danger of forming NH_4 amalgam. In the presence of $(NH_4)_2SO_4$, Zn is best detd. electrolytically from an acetate soln. A fairly satisfactory sepn. of 0.2 g. Cd in the presence of an equal quantity of Zn can be effected in 110 cc. of sulfate soln. contg. 20 millimols. of H_2SO_4 by using an e. m. f. of 3 v. for 2 min. and then 2.80 v. for 25 min. The advantage of measuring the e. m. f. between the terminals rather than at the cathode is explained but it is necessary to measure the e. m. f. immediately after breaking the circuit and not while the current is flowing and to use a Cu-plated cathode. When they are deposited in the above manner, a slight correction should be applied both for the Zn and Cd detns. To sep. 0.5 g. of Cd from 0.16 g. of Zn it is best to have 24 milli-equiv. of H_2SO_4 in 110 cc. of electrolyte and to keep the terminal voltage 2.8 v. for 25 min. or with 20 milli-equiv. of the acid, use 2.8 v. for 6 min. and 2.70 v. for 35 min.

W. T. H.

Potentiometric determination of octavalent osmium. WILLIAM R. CROWELL AND H. DARWIN KIRSCHMAN. Calif. Inst. Tech. *J. Am. Chem. Soc.* 51, 175–9(1929).—A potentiometric method for titrating octavalent Os with hydrazine sulfate is described; the results are accurate to about 0.25% by comparison with the usual gravimetric and iodometric methods. The Os soln. is heated in boiling water with a little less than 1 mol. of hydrazine sulfate for each g.-atom of Os and enough HBr to make the soln. 1.5 N. Then the tube is opened and the contents are titrated with more hydrazine at 70° . A large drop in potential takes place at the end point. The Os is reduced 4 valences and the hydrazine is oxidized to N_2 .

W. T. H.

Determination and separation of the alkalis. A. THÜRMER. *Chem.-Ztg.* 52, 974–5(1928).—Various methods for the detn. of Na_2O and K_2O in glass are discussed, preference being given to the Berzelius method of decompn. rather than that of J. L. Smith.

W. T. H.

Determination of lead with 8-hydroxyquinoline. V. MARSSON AND L. W. HAASE. *Chem.-Ztg.* 52, 993–5(1928).—Pb can be pptd. quantitatively by o-hydroxyquinoline in a soln. of $pH = 8.5$ – 9.5 . As reagent the satd. aq. soln. is preferable to the alc. soln. The ppt. is best formed in a hot soln. but should be allowed to stand overnight in a cool place, to insure complete pptn. The ppt. should be washed with as little water as possible, and dried at 105° to const. wt.

W. T. H.

Determination of cadmium in cadmium-copper wire. CLEMENT BLAZEY. *Chem.*

Eng. Mining Rev. 21, 74-6(1929).—If no other volatile elements are present, the Cd content can be detd. by heating the wire in H_2 and weighing the residual metal. Details are given.

W. T. H.

The present situation with respect to the determination of oxygen in steel and iron. OSKAR MEYER. *Z. angew. Chem.* 41, 1273-6, 1295-8(1928).—The methods for the detn. of O in Fe and steel are discussed in considerable detail.

W. T. H.

Standard method for the analysis of ferrocyanides. ANON. *Chemistry & Industry* 47, 1308-10(1928).—The methods of testing the purity of ferrocyanides are discussed and a translation is given of the findings and method agreed upon by the European Prussiate Manufacturers. It was agreed that titration with $ZnSO_4$ standardized against pure $K_4Fe(CN)_6$ is the best method for detg. the ferrocyanide content, a 15% soln. of Fe alum being used as indicator.

W. T. H.

Potentiometric determination of silver as ferrocyanide. W. STEYER. *Z. anal. Chem.* 74, 108-13(1928).—The titration of Ag with Li or Na ferrocyanide gives satisfactory results although the steep drop in the titration curve does not always lie between the same e. m. f. readings in different expts. With $K_4Fe(CN)_6$ the results were not as satisfactory.

W. T. H.

Notes on the analytical chemistry of tungsten. I. Determination as mercurous tungstate by the method of Berzelius. VICTOR SPITZIN. Moscow Univ. *Z. anal. Chem.* 75, 433-40(1928).—If Hg_2WO_4 is pptd. from neutral soln. by adding $HgNO_3$, all of the W is pptd. without the necessity of adding any base. On the other hand, if the $HgNO_3$ is added to an acid soln. the results are not quantitative even if the soln. is subsequently made basic. The explanation seems to be that Hg_2WO_4 is decomposed by HNO_3 , forming H_2WO_4 and some such salt as the complex $9Hg_2O \cdot 24MoO_3 \cdot N_2O_5 \cdot 29H_2O$ described by Copaux. II. Quantitative analysis of tungsten compounds in the dry way. VICTOR SPITZIN AND L. KASCHTANOV. *Ibid* 440-57(1928).—The analysis of W compds. which are insol. in water or caustic alkali solns., like the W-bronzes, is not as simple as the analysis of water-sol. compds. By a suitable combination of heating in H_2 and in HCl it is possible to make a complete analysis of a W-bronze and the method is sensitive for the detn. of oxides in metallic W. By ignition in H_2 at 650-700°, Na_2WO_7 is reduced to Na_2WO_4 and W. Then, if the temp. is raised to 900°, volatile Na and non-volatile W are formed. By ignition in dry HCl at 500-550°, it is possible to volatilize W as WO_2Cl_2 , leaving a residue of NaCl in the case of W-bronze. The following methods of analysis are based on this behavior. *Analysis of tungsten bronze.*—(a) Heat in a dry stream of air at a temp. below 300°; the loss in wt. is H_2O . (b) Heat 2-4 hrs. at 500°; the gain in wt. corresponds to the oxidation of all W compds. to the sexivalent state and in this way the quadrivalent W is detd. (c) Det. the Na as NaCl by heating the oxidized bronze in HCl and weighing the non-volatile residue. (d) Det. the total W by heating in pure H_2 at 900° and weighing the residual W. (e) Det. the quadrivalent W by igniting in H_2 at 650°; the loss in wt. corresponds to the wt. of O combined with W in excess of that required to form Na_2WO_4 . Thus, $Na_2W_2O_9$ ignited in this way leaves Na_2WO_4 and 2W. *Analysis of metallic tungsten and its oxides.*—By ignition in air, all the W is converted into WO_3 . By ignition in H_2 all the combined O is detd. By ignition in O-free HCl, metallic W is unchanged but oxides are converted into volatile WO_2Cl_2 ; if the W is all sexivalent, the volatilization is complete, otherwise a part of the W is reduced to metal and the remainder is oxidized to WO_2Cl_2 . Thus $3W_2O_6 + 10HCl = W + 5WO_2Cl_2 + 5H_2O$.

W. T. H.

Determination of molybdenum by reduction of molybdic acid with zinc. J. KASSLER. *Z. anal. Chem.* 75, 457-66(1928).—If the reduction of the Mo takes place in hot acid soln. with 10 g. of Zn shavings, the reduction is complete to the tervalent condition and the reduced Mo can be titrated with $KMnO_4$ provided care is taken to prevent air entering the flask, by using a Bunsen valve or a Contat valve with $NaHCO_3$ soln.

W. T. H.

Electrometric iron-dichromate titrations. F. J. WATSON. *Chem. Eng. Mining Rev.* 20, 396-9(1928).—Typical titration curves were obtained in 0.8 N HCl solns. using several forms of indicator electrodes.

W. T. H.

Rapid analysis of brass and bronze, etc., without the use of rapid electrolysis. K. RIES. *Chem.-Ztg.* 52, 1007(1928). H. KRUG. *Ibid.*—A polemical discussion with respect to whether there is any new idea in the paper recently published by K. (C. A. 23, 792).

W. T. H.

Assay of low-grade tin ores and tailings. G. E. GABRIEL. *Chem. Eng. Mining Rev.* 20, 407(1928).—The method is based upon Low's well-known procedure and

depends upon fusion with NaOH and C, dissolving in HCl, reducing with Sb and titrating with I_2 in an atm. of CO_2 . W. T. H.

The oxidation of carbon compounds by sulfo-chromic acid. A general method for the microdetermination of carbon in the wet way. ANDRÉ BOIVIN. *Compt. rend.* 187, 1076-9(1928).—Nieloux's method of oxidizing C compds. with H_2SO_4 and CrO_3 in the presence of Ag salt as a catalyzer sometimes results in the formation of CO as well as CO_2 . This difficulty can be overcome by heating the oxidizing mixt. (with not more than 2% of moisture present) on the water bath for 30 min. and passing the gas, together with O_2 , over a heated Pt spiral. The CO_2 can be absorbed by KOH and then pptd. as $BaCO_3$ which can be weighed or, when very little CO_2 is present, estd. from the size of the ppt. W. T. H.

The determination of zinc as pyrophosphate in the presence of considerable sodium chloride. L. DEDÉ. *Ber.* 61B, 2463-65(1928).—When $ZnNH_4PO_4$ is pptd. by the method of Dakin in the presence of considerable Na salt, there is always some $ZnNaPO_4$ formed which is not changed to $Zn_2P_2O_7$ on ignition. The best way of overcoming this error is to sat. the concd. aq. soln. with HCl, filter off the pptd. NaCl, wash with concd. HCl, evap. off the acid and then proceed in the usual manner. A series of results shows that the error is very serious if the NaCl is not removed, but when the above-described method is carried out, it is possible to det. accurately 0.05 g. of Zn in the presence of 25 g. of NaCl. W. T. H.

Determination of metallic lead in litharge and in red lead. PAUL FLUCH. *Z. anal. Chem.* 75, 371-90(1928).—Commercial litharge is likely to contain about 1.5% of metallic Pb in very finely divided form. Red lead is much purer. For most purposes, as for making storage batteries, the Pb content does no harm. Three methods are given for the detn. of the Pb. (1) Treat 5 g. of sample in a 250-cc. Philips beaker of Jena glass with 25 cc. of glacial AcOH. Stir well, add another 25-cc. portion of AcOH and heat. Filter, wash with hot, dil. AcOH (25%) and finally with hot water, avoiding contact with air as much as possible. Dissolve the residue in hot 6 N HNO_3 and in the resulting soln. det. the Pb as $PbSO_4$ in the usual way. This method works well with litharge but it is sometimes difficult to dissolve all the Pb_3O_4 present. In that case a residue of PbO_2 and Pb is usually obtained but it can be digested with hot, dil. HNO_3 and only the Pb will dissolve. For rapid lab. control of the Pb content of litharge, dissolve the sample as outlined above and weigh the residue as Pb, finally washing with alc. and drying at 110° . (2) For red lead treat as above but add 0.5-0.6 g. of hydrazine sulfate to reduce the quadrivalent Pb. (3) Treat 5 g. of litharge with 50 cc. of water and after mixing well add 10-15 g. of solid NaOH. Heat, filter and wash the residual Pb in water. W. T. H.

Colorimetric determination of copper in zinc dust. S. S. FROLOV AND K. O. SVETLYAKOV. Ivanovo-Vosnesensk Polytechnicum. *J. Chem. Ind. (Moscow)* 5, 942-3(1928).—Moisten 0.5-1 g. Zn dust with a few drops of alc. and digest in a beaker while slightly heating with a definite vol. of $CuSO_4$ soln. of known concn. and stirring frequently. After 30 min. cool, add a few drops of H_2SO_4 or AcOH to dissolve the metallic oxides, and filter. Wash the deposited Cu carefully on the filter, and add an excess of ammonia to the filtrate. Compare the color in a colorimeter with standard solns. of $CuSO_4$ made ammoniacal. BERNARD NELSON

The determination of nitrates and nitrogen. EMERY M. EMMERT. Iowa State College. *Science* 68, 457-9(1928).—The method depends on digesting the sample with cold 75% H_2SO_4 , finally heating till all the HNO_3 and H_2O are expelled. The distillate is caught in ClO_2 soln. Eventually this soln. is boiled, neutralized, evapd. to dryness and analyzed for nitrate by the phenol-disulfonic method. The residue in the digestion flask is tested for N other than nitrate by the usual Kjeldahl method. E. F. SNYDER

Dimethyl- α -naphthylamine for determination of nitrite ion. FREDERICK G. GERMUTH. Dept. Pub. Works at Baltimore. *Ind. Eng. Chem., Anal. Ed.* 1, 28-9(1929).— α - $C_{10}H_7NMe_2$ produces a more stable and more distinct coloration than α - $C_{10}H_7NH_2$ in solns. contg. a small quantity of NO_2 anions. A soln. contg. 5 g. of the amine dissolved in MeOH which has been made 4 N in AcOH is recommended as reagent in water analysis. W. T. H.

Decomposition of barium sulfate by solutions of sodium carbonate. EDWARD WOLESIENSKY. Bur. Standards. *Ind. Eng. Chem., Anal. Ed.* 1, 29-31(1929).—By boiling 0.6-0.8 g. of $BaSO_4$ with at least 15 times the equiv. wt. of Na_2CO_3 in 2-4 N soln. it was found possible to convert 99% of the $BaSO_4$ into Na_2SO_4 in 1 hr. in the case of a fresh ppt. and in 2 hrs. in the case of native barite. For the detn. of S in rubber, the fusion with Na_2CO_3 can be omitted. W. T. H.

Evaluation of stibnite. I. Determination of sulfur. WALLACE M. McNABB AND E. C. WAGNER. *Ind. Eng. Chem., Anal. Ed.* 1, 32(1929).—For the analysis of Sb_2S_3 to be used in primers, an evolution method like that used for detg. S in steel (using concd. HCl) gives good results. The Br_2 oxidation method recommended by Cushman in 1918 usually gives higher results, due to the fact that a little free S is likely to be present in artificial samples of Sb_2S_3 . W. T. H.

A new titrimetric determination of the sulfate ion. Z. MINDALEV. Moscow Tech. Hochsch. *Z. anal. Chem.* 75, 392-5(1928).—If the conditions are kept uniform, it is possible to titrate 10 cc. of 0.1-0.05 N K_2SO_4 soln. in a 150-cc. Erlenmeyer flask with 0.1 N $\text{Pb}(\text{NO}_3)_2$ soln. after adding 10 cc. of alc. and 3 drops of cold, satd. KI soln. The end point is a permanent yellow color which does not disappear on shaking. The $\text{Pb}(\text{NO}_3)_2$ soln. used for titrating must be standardized in the same way against a known quantity of sulfate. W. T. H.

Method for the volumetric determination of phosphoric acid in alkali, alkaline-earth iron and aluminum phosphates. DRACHOUSSOF AND DOUCHY. *Chimie et industrie* 20, 823-8(1928).—The principle of the method consists in titrating an HCl or HNO_3 soln. of the phosphate contg. 4-5 mol. CaCl_2 (or $\text{Ca}(\text{NO}_3)_2$) per mol. P_2O_5 in presence of methyl orange and in presence of phenolphthalein. One cc. N NaOH = 0.0355 g. P_2O_5 . The soln. to be titrated should not contain both Cl^- and NO_3^- ; if NH_3 is present it should first be removed by boiling with NaOH; the solns. require to be filtered only if the insol. residue interferes with the end point. When little or no insol. phosphates are present, titrate to neutrality to methyl orange, add a suitable amt. of CaCl_2 (or $\text{Ca}(\text{NO}_3)_2$) and phenolphthalein indicator, make distinctly alk. with N NaOH and titrate back with N acid. In presence of phosphates which are insol. after neutralization to methyl orange, it is preferable to make the 2 titrations on sep. aliquots; if there is insufficient material for this, make acid again after titrating to methyl orange, add excess alkali, and titrate the excess. Examples are given showing the applicability of the method to the detn. of Na phosphate, CaHPO_4 , and of P_2O_5 in presence of Fe or Al, the results being practically identical with those of the gravimetric detns. in every case. By first dissolving CaHPO_4 in a measured vol. of N acid, the free CaO (or CaCO_3) can be detd. at the same time. The method is suitable for the detn. of total, H_2O -sol. and citrate-insol. P_2O_5 in fertilizers, but the citrate-insol. P_2O_5 is generally lower than by the usual method. A. PAPINEAU-COUTURE

The estimation of borate in natural waters. MARGARET D. FOSTER. U. S. Geol. Survey. *Ind. Eng. Chem., Anal. Ed.* 1, 29-31(1929).—Add 1 cc. of 0.46 N HCl and 1 cc. of 1% turmeric soln. to 10 cc. of the sample in a white dish. Evap. to dryness slowly on the steam bath. If the residue is pink or rose, H_3BO_3 is present and can be detd. by comparison with suitable standards. W. T. H.

Invert sugar as a satisfactory substitute for mannitol or glycerol in the titrimetric determination of boric acid. WERNER MYLIUS. *Keram. Rund.* 35, 365-8(1927). H. I.

Determination of iron and aluminum oxides, magnesium oxide and calcium oxide in portland cement. J. STANTON PIERCE AND W. C. SETZER. Georgetown College. *Ind. Eng. Chem., Anal. Ed.* 1, 25-6(1929).—A rapid control method. Cf. C. A. 22, 1557.

Methods applicable to determination of sulfur. RALPH E. GOODE. *Refiner Natural Gasoline Mfr.* 7, No. 9, 96-7(1928).—A brief review of current methods for detn. of S in various products. M. B. HART

The behavior of sulfur dioxide in the Orsat apparatus. G. N. BEZRADETSKII AND V. P. FEDOROV. *Izvestiya Teplotekhnicheskago Instituta (Trans. of the Thermo-Techn. Inst. (Russia))* 1928, No. 4, 3-4.—To check up a much discussed question in connection with the absorption of SO_2 gas present in flue gases by the water present in the Orsat app., various proportions of air and pure SO_2 gas were sent through a container with water. No absorption of SO_2 takes place at a concn. below 4.3%, where 0.5% is absorbed; the absorption increases then gradually and is 4.8% at a concn. of 25.5%. Therefore for the analysis of flue gases the presence of this gas, which as a rule is below 4%, is without effect. A. A. BOEHTLINGK

A new microcolorimetric method for chloroform. KASATARO YODOMIGAWA. Niigata Med. Univ. *Bul. Hokuetsu Med. Soc.* 43, 355-63(1928).—Pyridine in strongly alk. soln. gives a red color with CHCl_3 . Mix 3 cc. of 10% NaOH and 2 cc. of pyridine, heat to 740° in a glycerol bath and add the liquid to be tested for CHCl_3 . Shake, allow to settle and compare the color of the CHCl_3 layer with standards prepared from phenol red, KHPO_4 and Na_2HPO_4 solns. K. SOMEYA

Determination of small amounts of carbon monoxide in ethylene. WRIGHT M.

WELTON AND N. L. DRAKE. Univ. of Md. *Ind. Eng. Chem., Anal. Ed.* 1, 20-4(1929).—The method described will serve to det. satisfactorily less than 5 parts of CO per 100,000, which is about one-twentieth of the detectable amt. in the Bur. of Mines test. The gas under examn. is freed from ethylene by means of 25% oleum, then, after diln. with air, from traces of ethylene by 60% oleum, from SO₂ by 98% H₂SO₄, from the last traces of moisture by P₂O₅, and is then allowed to act upon hot, very pure I₂O₅. The I₂ liberated by the action of CO on I₂O₅, heated in a bath of Crisco, is absorbed in 1% KI soln. contg. some starch indicator; eventually the KI₂ is titrated with 0.0001 N arsenite soln. W. T. H.

The microscopic detection of substances which by the action of certain reagents yield aldehydes or ketones (chloral hydrate, glycerol, lactic, citric and malic acids). C. GRIEBEL AND F. WEISS. *Z. Untersuch. Lebensm.* 56, 158-67(1928); cf. *C. A.* 22, 1933.—The use of *p*-, *o*- or *m*-nitrophenylhydrazine to obtain crystals with aldehydes or ketones is described. C. R. F.

Detection and determination of methylpentose. TOSHI FUKAI. Tokyo Inst. Ferm. *Bul. Ferm.* 100, 106-29(1928).—F. distd. various kinds of sugars with HCl (d. 1.06), and examd. the furfural and the methylfurfural ext. of the distillate. The same test was made with the hydroxymethylfurfural obtained from insulin. By comparing all the reactions with the cholesterol-H₂SO₄ test it was found that the last reaction is the most sensitive of all. The HCl distillate of methylpentose gives a beautiful violet red coloration with vanillin in 0.5% H₂SO₄ reagent, and the other 2 furfural solns. do not, so that this test can be used for the detection of methylfurfural or methylpentose. The red color appears in 1 min. even with 0.0008% soln. of pentose. F. next prepd. phloroglucide, of the 3 kinds of furfural and found that each can be sepd. and detd. by their difference in soly. When 3 pentoses are present in a mixt. the phloroglucide of methylfurfural is first extd. with acetone, then the phloroglucide of hydroxymethylfurfural, finally leaving the phloroglucide of furfural. The H₃PO₄ distillate of various sugars shows only a faint test for furfurals. K. SOMEYA

Rapid method for distinguishing between tartaric and citric acids. LUIGI ROSSI. Med. School at Buenos Ayres. *Ann. chim. applicata* 18, 366-8(1928).—In this preliminary note, the hope is expressed that it will be found possible to differentiate between citric and tartaric acids by the color changes which the latter produces with alk. vanadate or pyrovanadate solns. C. C. DAVIS

The Gutzeit test (COMBRIE, WARD) (HENLEY) 16. Physical chemistry of color lake formation. IV. Red Congo acid and Congo red lakes (WEISER, RADCLIFFE) 2.

SMITH, D. P. AND MILLER, H. K.: Introduction to Qualitative Chemical Analysis and the Related Chemical Principles. New York: McGraw-Hill Book Co. 275 pp. \$2.25. Reviewed in *J. Western Soc. Eng.* 33, 599(1928).

Analysis of brass. MICHAEL POLANYI AND STEPHAN VON BOGDANDY. *Fr.* 640,903, Mar 23, 1927. A weighed fraction of the alloy is heated to 900-1100° in a narrow extension to a cylindrical tube, the top of which has cooling means and is connected to a high vacuum. The residual Cu is weighed.

8—MINERALOGICAL AND GEOLOGICAL CHEMISTRY

EDGAR T. WHERRY AND J. F. SCHAIRER

New mineral names. W. F. FOSHAG. *Am. Mineral.* 13, 491-4(1928).—A compilation of the properties of the new minerals antamokite, tikhvinite, slavikite, viterbite, fraiponte and tanatarite, with additional data on schafarzskite, arakawite, chevkinit and potarite, and a redefinition of the species, nontronite. A. M. BRANT

New mineral names. W. F. FOSHAG. *Am. Mineral.* 13, 569-70(1928).—A compilation of new minerals and their properties is given, comprising isomorphous members of the calcite group, alumohydrocalcite, hydrothorite and codazzite. A. M. B.

New mineral names. W. F. FOSHAG. *Am. Mineral.* 13, 592-3(1928).—Data, with references, are given on zirklerite, kolbeckite, gudmundite, haematophanite, gosseletite and lohestite. A. M. BRANT

New mineral names. W. F. FOSHAG. *Am. Mineral.* 14, 41-2(1929).—A summary of the properties of klockmannite, kerzinite and julienite, and additional data on

plumboferrite are given. Discredited species discussed are shannonite, graminite, pinguite, hoeferite, morencite, müllerite and eisenbrucite.

A. M. BRANT

Fluorescence of minerals in ultra-violet rays. L. J. SPENCER. *Nat. Hist. Mag.* 1, 291-8; *Am. Mineral.* 14, 33-7(1929); cf. C. A. 22, 1935.—A discussion of the phenomenon of fluorescence and a description of the results obtained with various minerals and artificial materials. A description of a museum case to illustrate the effects is given.

A. M. BRANT

The phosphorescence and fluorescence of Franklin minerals. CHARLES PALACHE. *Am. Mineral.* 13, 330-3(1928).—In ultra-violet light from an Fe arc, willemite is generally fluorescent green; manganiferous calcite vivid red to pale pink; calcium larsenite vivid lemon yellow; larsenite negative or pale violet; pectolite pure yellow; clinohedrite slight orange yellow; margarosanite pale violet; hardystonite dull faint violet; roebbingite negative or pale pink; hedyphane indistinct bluish gray. Willemite is the only one showing phosphorescence.

A. M. BRANT

Mineralogical notes on Franklin and Sterling Hill, New Jersey. CHARLES PALACHE. *Am. Mineral.* 13, 297-329(1928).—This article deals with the occurrence, crystallography and optical and chem. properties of the following minerals: azurite, bornite, cabnite, clinohedrite, clinozoisite, crocidolite, gageite, glaucocroite, heterocroite, hodgkinsonite, leucophoenicite, manganite, quartz, smithsonite, sussexite, tephroite, tennantite and willemite.

A. M. BRANT

Paragenetic classification of the minerals of Franklin, New Jersey. CHARLES PALACHE. *Am. Mineral.* 14, 1-18(1929).—Four main subdivisions are made and described: (1) primary ores; (2) pegmatite contact minerals divided into (a) skarns and recrystn. products and (b) pneumatolytic products; (3) hydrothermal vein materials; and (4) surface oxidation products. A table of the 137 species found in this district with their chem. formulas is given. The origin of the Zn ores is discussed, P.'s theory being that metasomatic deposits of hydrated oxides and silicates of Fe, Mn and Zn were formed by the replacement in white limestone, and that these ore-bodies were changed to their present compn. simultaneously with the recrystn. of the enclosing limestone during the Pre-Cambrian regional metamorphism.

A. M. B.

Seligmannite from Bingham, Utah. CHARLES PALACHE. *Am. Mineral.* 13, 402-5(1928).—A presentation of crystallographic data on this rare mineral, $\text{Cu}_2\text{S} \cdot 2\text{PbS} \cdot \text{As}_2\text{S}_3$, previously known only from the Binnenthal.

A. M. BRANT

The crystal form of boleite. B. GOSSNER. *Am. Mineral.* 13, 580-2(1928).—X ray evidence shows cubic structure. In the unit cube $a = 15.6 \text{ A. U.}$, the unit cell contg. 32 mols. The crystals show anomalous behavior, indicating a strained condition.

A. M. BRANT

Doubly terminated quartz crystals occurring in gypsum. W. A. TARR. *Am. Mineral.* 14, 19-25(1929).—Doubly terminated quartz crystals, showing the sequence in which the successive faces made their appearance, occur in massive gypsum near Acme, N. M. Silica-bearing solns. entered the gypsum and replaced it by these quartz crystals, which are colored by residual hematite.

A. M. BRANT

Spodumene and autunite from Alstead, New Hampshire. G. R. MEGATHLIN. *Am. Mineral.* 13, 578-9(1928).—Spodumene, occurring in large crystals, and autunite in small scales are reported as new in this district.

A. M. BRANT

The chemistry, optics and genesis of the hastingsite group of amphiboles. MARLAND BILLINGS. *Am. Mineral.* 13, 287-96(1928).—Chem. and optical data are given on ferrohastingsite, femaghastingsite, magnesiohastingsite and alkaliastingsite. The classification is based on the molecular FeO/MgO ratio. The last member is characterized by an alkali content of more than 6%. The genesis of the hastingsite group is given in tabular form.

A. M. BRANT

The nature and origin of the amphibole-asbestos of South Africa. MARTIN A. PEACOCK. *Am. Mineral.* 13, 241-86(1928).—The South African asbestos-bearing ironstones range from crypto-cryst. ferruginous cherts to fine-grained magnetite-quartzites. The dominant asbestos is blue crocidolite occurring chiefly in thin extensive cross-fiber seams conforming strictly with the bedding of the ironstones. New analyses conform tolerably well with the metasilicate $3\text{H}_2\text{O} \cdot 2\text{Na}_2\text{O} \cdot 6(\text{Fe}, \text{Mg})\text{O} \cdot 2\text{Fe}_2\text{O}_3 \cdot 17\text{SiO}_2$, in which H_2O is wholly basic. New optical data were obtained for crocidolite: $\alpha = 1.698$, $\beta = 1.699$, $\gamma = 1.706$, X, indigo, Y, yellow, Z, indigo, $XAc = 0^\circ$; $Z = b$; X and Y may possibly be interchanged. Amosite, the long-fibered ash-gray asbestos is an orthorhombic amphibole with ferrous oxide as the dominant base. It is sustained as a mineral species. Ash-gray amosite gave the following data: mean of α and $\beta = 1.675$; $\gamma = 1.702$; mean of X and Y, pale greenish brown; Z, pale greenish brown; $Z = c$. Greenish amosite gave: mean of α and $\beta = 1.663$; $\gamma = 1.680$; mean of X

and Y, grayish green; Z, grass green; Z = c. On the grounds of typical non-detrital character and uniquely simple chem. compn., the ironstones are regarded as having originated as chem. ppts. deposited in an extensive marine basin. Crocidolization is conceived as a mild, static, non-additive, metamorphic process resulting in the chem. union, along soda-rich bedding planes, of the necessary constituents already *in situ*. The process is described as a "sweating action," facilitated by interstitial rock moisture, and induced by a moderate rise of temp. and pressure, such as would result from simple burial of the ironstones to moderate depths. The transverse orientation of the fibers is believed to have developed after crocidolization was virtually completed. Chem. analyses of the ironstones, crocidolite, amosite and related amphiboles are given.

A. M. BRANT

Chemical investigation of Japanese minerals containing rarer elements. IV. Analysis of beryl from Ishikawa, Iwaki province. TAKU UEMURA. Tokyo Imp. Univ. Japan J. Chem. 2, 117-21(1926).—Analysis of Ishikawa beryl gave: SiO_2 49.60, BeO 19.31, Fe_2O_3 0.11, Al_2O_3 24.09, CaO 0.79, MgO 0.14, loss on ignition 2.81, sum with alkalis excluded 96.85%; sp. gr. 2.8. Another detn. gave Na_2O 3.65. The structural formula of this beryl contains a mol. of orthosilicic acid which was not present in the Naegi beryl (cf. Shibata and Uemura, C. A. 19, 2008), or in F. W. Clarke's formula for beryl. The fact that Copaux's method for estg. Be gave no const. results with this beryl, is due perhaps to a difference in mol. structure. The powd. mineral and each of the fractions obtained in analysis were examd. spectroscopically. In addn. to the elements reported above, Sc was detected, but no alkali other than Na was revealed.

L. W. RIGGS

Relations between index of refraction, density and chemical composition in the garnet group. H. VON PHILIPSBORN. Abhandl. math.-phys. Klasse sächs. Akad. Wiss. 40, 1-42(1928).—Light dispersion has been measured for 16 specimens, and chem. analyses are recorded. The relations between n , light dispersion, d , and chem. compn. have been detd. for the quaternary mixed crystals: pyrope + almandite + grossularite + andradite, and they are represented in tetrahedric diagrams. More complete data are tabulated, to make it possible to draw the diagrams on a larger scale. The relations are generally simple, often straight lines. The diagrams are reliable enough to permit detn. of the compn. from the phys. properties without chem. analysis. A method is outlined of representing the relations between the phys. properties and chem. compn. of mixed crystals contg. 5 components, and diagrams are given which include spessartite and uvarovite in addn. to the 4 previously named minerals.

ALBERT L. HENNE

Olivine: I, from the Hawaiian Islands, II, pure forsterite. M. AUROUSSEAU AND H. E. MERWIN. Am. Mineral. 13, 559-64(1928).—New and previous analyses of olivine are given with a discussion. Measurements of n for pure forsterite are tabulated. The effects of the constituents of olivine especially Fe, on n and on dispersion are pointed out. The d and n should be correlated with wt. % of the 2 oxides of Fe, and the % of the latter can be estd. when the properties are definitely known.

A. M. BRANT

Larsenite, calcium-larsenite and the associated minerals at Franklin, New Jersey. C. PALACHE, L. H. BAUER AND H. BERMAN. Am. Mineral. 13, 334-40(1928); cf. C. A. 22, 3115.—The paragenesis of the minerals is described. The crystallographic features of larsenite are given. The axial ratio is $a:b:c = 0.4339:1:0.5234$. The hardness is about 3, luster adamantine to pearly. The method of chem. analysis used and the results obtained are given.

A. M. BRANT

Friedelite, schallerite and related minerals. L. H. BAUER AND HARRY BERMAN. Am. Mineral. 13, 341-8(1928).—Accepted members of the group are friedelite, pyrosomalite and molybdophyllite. They are rhombohedral hemimorphic. Chem. analyses and phys. properties are tabulated. Probable additional members of the group are beneditite, schallerite, dixenite, mcgovernite and hematolite.

A. M. BRANT

Dipyrite and associated contact minerals from the Franklin mountains of Texas. JOHN T. LONSDALE. Am. Mineral. 14, 26-32(1929).—The district contains a large supply of this scapolite mineral in an unaltered condition. The dipyrite is light grayish blue in color and occurs in roughly radiating groups and bundles of vertically striated long-bladed crystals without crystal faces. It is optically —, with $\epsilon = 1.543$, $\omega = 1.553$; the cleavage is prismatic, excellent to perfect. The paragenetic relations are described.

A. M. BRANT

Zircon from North Burgess, Ontario. CHARLES PALACHE AND H. V. ELLSWORTH. Am. Mineral. 13, 384-91(1928).—The crystals possess unusual brilliancy. The polar angles of all forms were found to be from 5 to 6 mins. larger than the accepted values.

These angles lead to an axial ratio of $a:c = 1:0.6429$. Heating to redness increased the angles by about 1 min. It also changed the color from red to pure white and increased the sp. gr. from 4.646–4.658 to 4.659–4.667. Heating lowered n , as brought out by a table. Chem. analysis showed it to be very pure Zr silicate with a small Hf content.

A. M. BRANT

Occurrence of germanium in topaz. JACOB PAPISH. Cornell Univ. *Science* 68, 350–1(1928); cf. *C. A.* 22, 361.—By the arc spectrographic method Ge was found in slight traces in all the specimens of cassiterite examd. Of 34 specimens of topaz from 27 localities, all contained Ge. The quant. detn. of Ge in topaz is being studied.

L. W. RIGGS

Norbergite from Franklin, New Jersey. ESPER S. LARSEN, L. H. BAUER AND H. BERMAN. *Am. Mineral.* 13, 349–53(1928).—Most minerals labeled chondrodite or humite from Franklin, N. J., are norbergite. Optical and crystallographic data indicate norbergite to be orthorhombic. The color varies from tawny to chamois; $\alpha = 1.565$ –1.561, $\beta = 1.570$ –1.566, $\gamma = 1.591$ –1.587, optically +, $2V = 49$ –50°. Lighter color and lower n indicate lower Fe content. An analysis is given of material with sp. gr. 3.20 and hardness 5.5.

A. M. BRANT

The optical properties of the humite group. ESPER S. LARSEN. *Am. Mineral.* 13, 354–9(1928).—Chem. analysis and optical data are given for a no. of specimens of chondrodite, humite, clinohumite and norbergite. A definite correlation of chem. compn. and optical constants was not found possible.

A. M. BRANT

Tourmaline-bearing quartz from Amelia, Va. GERALD R. MACCARTHY. *Am. Mineral.* 13, 531(1928).—Light-colored smoky quartz crystals were found apparently containing needles of rutile. The color of the needles was brownish black rather than the usual red-brown, and they gave a negative test for Ti, but reacted strongly for B. The "rutile" was evidently tourmaline.

A. M. BRANT

The mineral dumortierite. MACKAY SCHOOL OF MINES STAFF. Univ. Nevada. *Bull.* 2, (1928); *Am. Mineral.* 13, 532(1928).—The existing data on this borosilicate are summarized. The Humboldt Queen deposit is the only com. occurrence thus far known in the world. The dumortierite occurs in lenticular masses and quartz veins, the former originating through the replacement of preëxisting lenses of andalusite formed in an earlier stage of metamorphism. The use of the mineral, and of andalusite, in the manufacture of special chem. porcelain, is described.

A. M. BRANT

Studies in the mica group. A discussion. A. F. HALLIMOND. *Am. Mineral.* 13, 451–2(1928).—A criticism of a contribution by A. N. Winchell (*C. A.* 22, 2904). The composition of muscovite (further discussion). A. N. WINCHELL. *Am. Mineral.* 13, 567–9(1928).—The dispute centers around which of the various elements or their oxides proxy for one another in different micas.

A. M. BRANT

Chlorophaeite, sideromelane and palagonite from the Columbia River plateau. MARTIN A. PEACOCK AND RICHARD E. FULLER. *Am. Mineral.* 13, 360–83(1928).—The definition of chlorophaeite should be extended to cover all hydrous, amorphous, pitch-like materials having deuterite origin, some of which have been named palagonite, in basalts and dolerites. Sideromelane should be continued, as distinct from tachylyte, as a specific name for ideal basaltic glass formed under conditions of specially rapid cooling. A chem. and genetic distinction exists between chlorophaeite and palagonite; the latter name should be restricted to a gel produced essentially in the hydration of sideromelane by water or water-vapor of exotic origin. The phys. properties, microscopic study and chem. analyses of these 3 mineraloids are given, and list of references included.

A. M. BRANT

The formula of glauconite. A. F. HALLIMOND. *Am. Mineral.* 13, 589–90(1928).—A discussion of a contribution by H. Schneider (*C. A.* 21, 3584), showing that the compns. deduced from the latter's theory do not agree so well with the analyses as do the theoretical values of H.

A. M. BRANT

Beryllonite and other phosphates from Newry, Maine. CHARLES PALACHE AND EARL V. SHANNON. *Am. Mineral.* 13, 392–6(1928).—The beryllonite crystals, more or less altered, were imbedded in platy albite. The sp. gr. was 2.806. Herderite occurred in radial fibrous form, yielding botryoidal or spheroidal aggregates which are new to the species. Eosphorite occurred in free crystals implanted on quartz in open cavities or on albite. The color varies from opaque blackish brown to transparent hair brown. The optical characters and chem. analysis are given for each mineral.

A. M. BRANT

Newberyite and other phosphates from Ascension Island. GRAGG RICHARDS. *Am. Mineral.* 13, 397–401(1928).—Newberyite, collophanite and martinite were

identified in thin phosphate deposits found on basaltic lava flows. Their optical properties are given. A. M. BRANT

A new meteorite from Washington County, Colorado. CHARLES PALACHE AND EARL V. SHANNON. *Am. Mineral.* 13, 408-9(1928).—A single sym. disk of iron, slightly ellipsoidal with major dimensions of 15 and 20 cm. and a max. thickness of 6 cm., was found. It weighs 5750 g. The analysis shows it to be a moderately Ni-rich ataxite. The presence of Cu and Pt is noteworthy. Troilite and schreibersite are practically absent. A. M. BRANT

The Rutherford Mines, Amelia County, Virginia. A. A. PEGAU. *Am. Mineral.* 13, 583-8(1928).—The pegmatites are briefly described and notes are given on the various minerals to be found at present. A. M. BRANT

Sequence of the mineralization in the Keystone, South Dakota, pegmatites. KENNETH L. LANDES. *Am. Mineral.* 13, 519-30, 537-58(1928).—The Etta, Peerless, Hugo and Bob Ingersoll pegmatites of the Keystone district are described, and notes on the geology given. The mineralization of these pegmatites was a continuous process, magmatic in its earlier, and hydrothermal in its later stages, with the later minerals filling cracks and replacing the older minerals. The evidence is given under the detailed description of the different minerals. Four magmas are thought to have existed, (1) a hypothetical deep-seated magma which crystd. and differentiated, producing (2) the Harney Peak "granite"; and then developed through residual concn. of mineralizers (3) the pegmatite magma, which followed a similar course and produced (4) hydrothermal solns. which dissolved and replaced earlier minerals. The first-stage minerals are microcline, quartz, muscovite, black tourmaline, apatite, triphylite and beryl, with K as the outstanding alkali. In the second stage were deposited spodumene, amblygonite and later beryl, Li being the chief alkali. The greatest variety of minerals was deposited in the third, or vein-forming stage. Important in this group are albite (cleavelandite), cassiterite, lepidolite, columbite and a second generation of quartz, muscovite and tourmaline, Na being the chief alkali, with less Li. In (1) and (2) P and Be were included, in (1) and (3) B; metals, except Fe, appear in (3) only. Rarer elements occur in the minerals cassiterite, columbite and tantalite. Detailed descriptions of all the minerals found, according to stages, are given. A. M. BRANT

Petrology of the North Conway quadrangle in the White Mountains of New Hampshire. MARLAND BILLINGS. Harvard Univ. *Proc. Am. Acad. Arts Sci.* 63, No. 3, 1-137(1928).—The relations of the petrology to the dynamical and historical geology of the area are studied. Nine chem. analyses of the rocks of the region are reported from Herdsman, 4 from Perry and 2 from Mrs. S. Parker. Other analyses of similar rocks are quoted. L. W. RIGGS

Constitution of the lavas of the Island Mehetia (Maitea), Society Islands. A. ACRON. *Compt. rend.* 187, 857-60(1928).—Chem. analyses by Raoult showed the compn. of ankaratritic limburgite, augite, doleritic luscladite, β doleritic melanocrate and β labradoric basalt. These rocks ranged from 41 to 46.2% in SiO_2 . The discussion is mainly lithological. L. W. RIGGS

A preliminary examination of the profile of the country rocks along the coast of southern Norrland, Sweden, as observed in the cuttings of the East Coast Railway. LARRY VON ECKERMANN. *Geol. Fören. Förh.* 50, 309-67(1928).—Until recently the geological mapping of the rocks of Southern Norrland was based on 2 general surveys. These surveys did not give any comparative data on the mineralogical and chem. compn. of the different rocks. Coördination of these rocks was therefore largely guesswork. In 1927 E. studied fresh railway cuttings, before they had weathered or blackened by smoke. The observations were confirmed by short field excursions both sides of the railroad and by examn. of some new exposures in road-making. Twenty-six new analyses of rocks were made: leptitic gneiss (2), tuffitic leptitic schists, quartzitic leptite, red Ljusne-type granite, pegmatitic granite and porphyritic gneiss-granite, red schistose granite, gray Ljusne granite and gneiss-granite (2), garnet-bearing gneiss-granite, cordierite-bearing gneiss-granite, spotted granite, Rapakivi granite, contact of hornröngite dike, center of the same, leptitic gneiss (2), Härnö granite, white aplitic Härnö granite, red aplitic Härnö granite, granite and gneiss granite at Bergfors and olivine diabase (2). Each analysis is accompanied by the Niggli classification, and some are followed by detailed descriptions of the specimens. The variations in the analyses are discussed in detail. E. finds that the differentiation follows entirely that of the normal granite magmas, i. e., with rising α -values, and increasing α -percentage, and a still more sharply rising alkali content, accompanied by a corresponding sharply decreasing fm -percentage and a somewhat less sharply falling c -content. E. distinguishes between 3 different gneiss granites: the red and gray

Ljusne granites and the gray Härnö granite with its basic variant, the Bergefors granite. E. proposes the hypothesis that the origin of migmatites depends less on pressure and temp. conditions, as such, than on the regenerated magma's fitting in with the normal differentiation scheme of the remelting granite under prevailing conditions of stability, both as regards temp. and pressure; this explains some of the differences in the granites studied.

WILHELM SEGERBLOM

Petrological notes on some alkaline basic rocks of New South Wales. W. R. BROWNE. *J. Proc. Roy. Soc. N. S. Wales* 61, 371-82(1928).—The rocks discussed are analcite-bearing basalt, nepheline-basalt, analcite-bearing theralitic dolerite, theralitic dolerite, analcite-theralite and teschenite-aplite. No chem. analyses are reported.

L. W. RIGGS

Some metamorphosed dolerites from Broken Hill. W. R. BROWNE. *J. Proc. Roy. Soc. N. S. Wales* 61, 383-400(1928).—These rocks, originally ophitic dolerites belonging to the quartz-dolerite kindred, have suffered high-grade thermal metamorphism with the production of augite, hypersthene, brown hornblende, very basic plagioclase and in some cases a little spinel, with partial or complete obliteration of original textures. Genetic relations are discussed.

L. W. RIGGS

The oceanic limestone cycle. J. THOULET. *Compt. rend.* 187, 898-9(1928).—CaCO₃ is made constantly in the upper layers of the ocean by *Globigerina* and other organisms, and destroyed in the volcanic acid waters of the abysmal layers.

L. W. RIGGS

Chemical criteria of peneplanation. The duricrust of Australia. Presidential Address. W. G. WOOLNOUGH. *J. Proc. Roy. Soc. N. S. Wales* 61, 1-33(1928).—A review.

L. W. RIGGS

The estimation of borate in natural waters (FOSTER) 7. Complete dissociation of silicates by carbonic acid and humic acids (GUILLIN) 15. Radium and geology (PIG-GOR) 3. New observations on the origin of fusain (BODE) 21. A spectroscopic analysis of caliche (BANCELIN) 3. The space-group of staurolite and its regular parallelism with cyanite (CARDOSO) 2. The Hall effect in galena and molybdenite (HEAPS) 2. Magnetic rotation of a crystal of tysonite (BECQUEREL) 2.

9—METALLURGY AND METALLOGRAPHY

D. J. DEMOREST, R. H. ABORN

Emil Schrödter. ANON. *Stahl u. Eisen* 47, 1633-6(1928).—An obituary, with portrait.

J. A. S.

Recent progress in metallurgy. H. DROUOT. *Tech. moderne* 20, 857-61(1928).—The high- and low-frequency induction furnaces are compared. Rolling mills of great capacity are described. The properties of nonferrous metals are greatly altered when extreme purity is attained. The properties of *Be* and *Ta* and their possible uses are discussed. New alloys are coming into use.

P. THOMASSET

Dressing of molybdenum ores. GAICHI YAMADA. Kyoto Imp. Univ. *J. Min. & Met.* 6, 186-95(1928). For the modern work, more than 85% of molybdenite is required as a refined ore; the refining from 1% ore is complicated by its property of producing a scaly cleavage and by the presence of foreign materials such as mica, graphite and pyrites. In powdering the ore, it is broken into scales, the accompanying rocks into grains; thus the sieving of the mixt. will help the refining, but it is made less effective by the presence of such scaly minerals as mica and graphite. Electrostatic concn. is effective when the ore contains such non-conductors as quartz and feldspar, but fails in the presence of such good conductors as pyrites and graphite. The film flotation method utilizes the difference of surface tension of minerals. The ore must be powd. below 10-mesh and must be thoroughly dried. The vacuum flotation method makes the ore float by reducing the pressure over the ore slime.

K. SOMEYA

The influence of hydrogen-ion concentration on recovery in simple flotation systems. A. M. GAUDIN. *Mining & Met.* 10, 19-20(1929).—Ions react with the mineral surfaces in some instances and have much to do with the adherence of collectors in others. Xanthates collect in acid circuits, though their almost general use in alk. circuit has led to the belief that they function only in alk. circuit. Twelve curves show the relation of recovery to H-ion concn.

W. H. BOYNTON

Flotation and leaching at Kennecott. E. J. DUGGAN. *Eng. Mining* J. 126,

3-15(1928).—"Much greater efficiency over the former all-leaching process has been achieved by sulfidizing the finely ground carbonate ore and floating the concentrate." Practically all of the freed sulfide ore is recovered and a good proportion of the carbonate. The av. % of tailings from the various depts. is as follows: jigs 76; sand tables 14; and shaker tables 10. Assays and screen tests are tabulated. Few changes have been made in the leaching process. A brief description is given of the plant and the leaching cycle. The Cu carbonate is treated by flotation. Sulfidizing is effected by use of a relatively small amount of oils and a critical amount of Na_2S added in stages with flotation following each stage. Flotation equipment consists of 8 mechanically agitated, single-spitz type flotation machines. A thickener and an Oliver filter de-water the flotation concentrate; Cu recovery of 72-75% is made on a concentrate assaying 32-35% Cu. Flotation reagents used in lb. per ton are Na_2S 3.0, S 0.8, quicklime 0.4, coal-tar creosote 0.1 and steam-distd. pine oil 0.3. All reagents are added directly to the mixing cell. General flow sheets and tables are included.

W. H. BOYNTON

Effect of the selective flotation reagents for pyrites and copper pyrites. GAICHI MADA AND KEIKICHI MAYAHARA. Kyoto Imp. Univ. *Suiyokashi* 5, 643-54(1928). To simplify the conditions, pure materials were used and the sample was prepd. by mixing with quartz sand in various proportions. A small wooden machine of the M. S. type was used; 500 g. of the sample was taken each time. Water of the Kyoto city water-works, with the mineral slime about 20%. Blue camphor oil 80 and 20% of oil tar was used. The reagents tested were CuSO_4 , CuSO_4 and Fe powder, H_2SO_4 , NaOH , K xanthate, T.T. mixt., KCN and alum. For copper pyrite, best result was obtained when 2 lbs. of H_2SO_4 per ton was used, yield 26.23%; next comes in efficiency lime and CuSO_4 . For copper pyrite, the yield with each reagent is good and there is no considerable difference with different reagents. For pyrite, best result was obtained when 2 lbs. of H_2SO_4 per ton was used; the poorest with 4 lbs. of lime. When CuSO_4 and Fe powder was used, the surface of the pyrite becomes clean from the galvanic action of the Fe powder, and a good rich ore results, but the yield is poor. For the mixt. of pyrite and copper pyrite, best result was obtained when 0.114 lb. of K xanthate, and 0.5 lb. of lime per ton was used. The result was also good when 0.05 lb. of KCN, 0.08 lb. of alum, and 0.5 lb. of lime per ton were used. Poorest result was obtained with 0.5 lb. of T.T. mixt. and 0.5 lb. of lime, probably because of the excess of oil. Even in the case where the flotation of a single substance can be effected by oil only, some reagent must be added to make a selective flotation; the combination of various reagents being most effective. For the sepn. of pyrite, alk. reagents, esp. xanthate-lime or KCN-alum-lime combination, are most effective. For making the soln. alk. NaOH is more effective than lime. In using CuSO_4 , an iron ball-mill should be used because of the good effect of the Fe powder.

K. SOMEYA

Advantages and disadvantages of the combined process of concentration by gravity and flotation, with relation to the mechanical preparation plant of the American Smelting & Refining Co. at Angangueo, Mich. C. BRUCHHOLD. *Bol. minero* 26, 188-99(1928).

E. M. SYMMES

The evolution of slime treatment on the Witwatersrand gold mines. J. R. THURLOW AND T. K. PRENTICE. *J. Chem. Met. Mining Soc. S. Africa* 29, 101-3(1928); cf. *C. A.* 22, 3608.—A discussion by A. King. The operation of the Sub Nigel slime plant is outlined. Of 5 vats, 2 were converted into Dorr thickeners and the other 3 into Dorr agitators. In the first agitator the pulp is diluted with cyanide soln. to an av. sp. gr. of 1.31. The pulp passes through the agitators arranged in series and flows by gravity from the last agitator to the Oliver continuous filter. In the Merrill vacuum filtration method of Zn dust pptn. the Au-bearing soln. is drawn through filter leaves suspended in a tank by a small centrifugal pump. A standard leaf may have a capacity of 45-50 tons soln. per 24 hrs. with periods of 15-17 days between clean-ups. The tanks have a conical or sloping bottom leading to a pump to which the Zn-Au slime ppt. is washed at the clean-up.

W. H. BOYNTON

Precious metals in the Sudbury [nickel] ores and their recovery. C. LANGER, SR. AND C. JOHNSON. *Trans. Can. Inst. Mining and Met.* 30, 903-8(1927).—The residues from the carbonyl volatilization of Ni in the Mond process of treating CuS-NiS ores contain practically the whole of the precious metals contd. in the original ore and represent a concn. of these metals of 16,000:1. A typical analysis of these residues is 1.85% Pt, 1.91% Pd, 0.56% Au, 0.39% Ir, Ru and Rh and 15.42% Ag, together with Sb, Pb, Ni, Cu, As, Se, and Te. The residues are roasted to expel volatile constituents, and smelted with litharge and alk. fluxes to obtain a lead regulus. This is cupelled with more Ag to give at least 6 times as much Ag as other precious metals in the resulting bullion, which is then electrolyzed in a AgNO_3 bath. Pure Ag is thus obtained at the cathode and a rich

slime at the anode, from which the Pt metals and Au may be recovered by the usual procedure.

B. C. A.

The recovery of precious metals from jeweler's waste. ERNEST A. SMITH. *Metal Ind.* (London) 33, 513-5, 565-7 (1928).—Filings, polishings and sweeps are heated to remove org. matter, and after a magnet is passed through them to remove Fe they are smelted down with a flux of soda and borax and the Pb is sepd. by cupellation and the Ag by electrolysis from Au and Pt. The slimes contg. Au and Pt are dissolved in aqua-regia and the Au is pptd. by FeSO_4 and the Pt is sepd. by the addn. of NH_4Cl ; the ppt. on heating gives a spongy gray mass of metallic Pt.

DOWNES SCHAAF

Smelting titaniferous ores of iron. A. STANSFIELD. *Trans. Can. Inst. Mining and Met.* 30, 802-18 (1927).—Titaniferous iron ores with a high percentage of titania can be smelted in blast furnaces under suitable conditions to obtain a pig iron and a fusible slag contg. about 20% of Ti oxide in the form of a lower oxide, probably Ti_2O_3 . Under too highly oxidizing conditions no reduction of the titania takes place and pasty slags are formed, whereas under very highly reducing conditions Ti carbide and cyanonitride are obtained and the slags are fusible only at very high temps.

B. C. A.

The reclamation and reconditioning of foundry sands. W. E. DENNISON. *Foundry Trade J.* 39, 447 (1928).—The reclamation and reconditioning of sand hitherto wasted will progress considerably as soon as the chem. and phys. characteristics of the sands come to be better understood. The "feel" of the sand as recognized by the molder is still today the main criterion in judging the qualities of molding sand. The proper interpretation of the tests in use today can be extremely useful in the synthesis of foundry sand. To facilitate the moisture content of sand various combinations of elec. instruments have been designed, the moisture being detd. by measuring the elec. cond. of the sand, which increased with the percentage of H_2O .

DOWNES SCHAAF

Properties of manganese in the basic open-hearth process. ISAMU KOTAIRA AND MOTOZO MAEDA. Yahata Steel Works. *J. Study of Ferrous Met.* 103, 110-33 (1928).—The effect of FeO and MnO upon the m. p. and the fluidity of the basic-furnace slag was studied; it is advantageous to make a slag rich in these oxides at the first stage of the melting. The affinities of CaO, FeO and MnO for SiO_2 were calcd. by means of Nernst's formula and compared. In the basic furnace a large proportion of FeO and MnO is liberated as a so-called mobile slag. The relation between the dissocn. pressure and concn. of FeO and MnO was deduced from the law of mass action, and the reaction of the oxidation of the impurities in these oxides is explained. For the reactions $\text{MnO} + \text{Fe} \rightleftharpoons \text{Mn} + \text{FeO}$ are deduced the expressions $C_{\text{MnO}}/C_{\text{FeO}} = K C_{\text{Mn}}$; $C'_{\text{MnO}}/C'_{\text{FeO}} = K' C_{\text{Mn}}$ for the equil. at the contact surface of the slag and of steel; this shows that increase in the concn. of FeO causes decreases in the concn. of Mn in steel, and conversely, the greater the concn. of Mn in the steel, the more complete the deoxidation, with consequent good killing. For this purpose the increase of furnace temp. and of CaO in the slag is necessary. With increased CaO, the liberation of MnO is increased in comparison with that of FeO, and hence this causes the increase of Mn in the steel. This explains why operation that causes Mn concn. in steel at the end of the melting is better than adding Mn from without. Desulfurization and the effect of Mn on the dephosphorization are discussed. Desulfurization is more effective the greater the CaO concn. Also the reason a reducing slag for desulfurization and an oxidizing slag for dephosphorization are needed is explained.

K. SOMEYA

Operation of Siemens Martin furnace with mixed gas. WERNER HEILIGENSTAEDT. *Stahl u. Eisen* 48, 1465-71 (1928).—Theoretically producer gas and mixed gas are of equal value, yet practical experiences showed that the use of mixed gas, consisting of coke-oven and blast-furnace gases, caused considerable variations in the production; so that either 15-20% producer gas, or tar (tar oil) had to be added in order to insure the regularity and continuity of production. The underlying principles of mixed-gas operation and the changes required when mixed gas is used instead of producer gas were investigated. The heat transfer between gas and hearth is regulated by the temp. of combustion, which should be sufficiently high to cause an adequate temp. difference, and also by the capability of the gas to give up heat. The temp. of combustion of mixed gas is as high as that of producer gas. The media of the exchange of heat are those constituents of the gas which are radiating heat, such as CO_2 and H_2O (steam), and that part of the gas which is commonly called flame, consisting of burning C particles of mol. dimensions. As mixed gas is somewhat richer in CO_2 and H_2O than producer gas, the only possible explanation of the poor performance of mixed gas is the inferior heat radiation of its flame. During the passage of the producer gas through the chambers its tar content is decompd. to H and C; this explains the high C content of the flame, also its good radiating qualities. Mixed gas does not contain tar. Blast-furnace gas con-

s only 2-3 g./m.³ C₆H₆, and no other hydrocarbons; if all the hydrocarbons contained in the av. coke-oven gas (3670 kcal./m.³) are decompd., the following amts. of C are obtained: 2.5 g. C/m.³ from C₆H₆, 20 g. C/m.³ from C₂H₂, and 135 g. C/m.³ from CH₄. Obviously the only way to increase the amt. of C particles in mixed gas and the luminosity of its flame is by facilitating the decompn. of CH₄. This can be attained by proper heating in the chambers. The producer gas enters the chambers at a temp. of 600° and has to be heated up to 1050°. Mixed gas enters the chambers at about 0° and has to be heated up to 1250°, that is above the temp. of decompn. of CH₄. For mixed gas chambers have to be enlarged and the draft increased. The above considerations are based as the basis to calc. the size of the chambers. The total heating surface of the chambers is 250 m.² or 20-22 tons of brick per ton of steel for producer gas; the corresponding figures for mixed gas are 320 m.² or 25-30 tons of brick per ton of steel. The luminosity of the flame of mixed gas can also be increased by catalysts such as Ni (cf. Meyer, *et al.*, *C. A.* 4, 2724). The 2 constituents of the mixed gas can be supplied separately to each furnace, or the mixing can be done on the sample place for all the furnaces, so that each furnace receives the same gas. The use of mixed gas requires a more rigid control than does producer-gas operation.

J. A. SZILARD

Results of Röntgen research upon alloys and metals—investigation of the fine structure of the metals and alloys. F. WEVER. *Z. Metallkunde* 20, 363-70(1928).—presents a valuable summary of results of x-ray research on metals and alloys. The following phases of the work are discussed: the structure of elementary metals and their distribution in the periodic table, polymorphism; the dependence of properties upon the constitution of alloys, mixed crystals and metallic compds.; examples of complete alloy systems.

R. L. HERSHEY

Mechanical properties and angle of fracture of cold-rolled metals. FRIEDRICH KÖRBER AND HUBERT HOFF. *Mitt. Kaiser-Wilhelm-Inst. Eisenforsch. Düsseldorf* 10, 5-87(1928).—The authors studied the mechanical properties of metal sheets as a function of crystal structure, degree of cold-rolling and orientation of the sheets with regard to the direction of rolling. Strips of Cu (99.9%), Al (99.1%), brasses (83/17 and 27/73), electrolytic Fe and Ni (98.6%) were tested. The reduction in thickness was from 50 to 98%. The sheets were cut in such a way that the angles with the direction of rolling varied in steps of 22.5° from 0 to 90°. The width was 1 cm. and the length 5 cm. The results were as follows: (1) Tensile strength and Brinell hardness increase with increasing degree of cold work, reaching a max. value between 90 and 98% reduction, followed by a slight decrease at the highest degrees of rolling. (2) The elongation shows a corresponding decrease and a min. value around 94% reduction. (3) The orientation of the sample has a marked effect on the value of the tensile strength and the changes in the elongation are rather irregular. (4) Samples less than 3 mm. thick contract on rupturing with the formation of an angle of fracture of less than 90° with respect to the length dimension of the strip. For specimens oriented in the direction of rolling this angle varies as a rule from 60° to 70°. For all other samples the angle is around 55°. (5) There is apparently no direct connection between the lattice structure and the angle of fracture. The angle of fracture can be accounted for by assuming 2 directions of slip which form an angle of 45° with the main axis of the sheet and intersect the other axes likewise under an angle of 45°. Under those conditions the angle of intersection with the surface of the sheets is 55°. Tables, graphs and photographic reproductions showing the fractured sheets are included.

H. S. v. K.

Angle of fracture and the mechanism of plastic deformation. FRIEDRICH KÖRBER AND ERICH SIEHEL. *Mitt. Kaiser-Wilhelm-Inst. Eisenforsch. Düsseldorf* 10, 189-92(1928), cf. preceding abstr.—K. and S. develop a theoretical explanation for the mechanism of plastic deformation in metal strips which accounts for the appearance of angles of fracture in broken test pieces.

H. S. v. K.

Fatigue failures of mill shafts. H. J. B. SCHARNBERG. *Facts About Sugar* 24, 16-23, 38-47(1929).—S. believes that the failure of the open-hearth-steel shafts of the top rolls of cane mills is due not to chem. changes in the metal but to mech. deformation in the structure of the metal fiber, caused principally by const. reversal of the load stresses. He recommends the use of nickel steel or chrome nickel steel shafts. Deflection measurements were made on rolls under load with each kind of shaft and the results are reported in 2 tables. Impact-test data on samples of carbon, nickel, chrome nickel, manganese and silicon manganese alloy steels, and the exptl. data of 4 tests on the hydraulic mechanism of cane mills are also reported.

M. J. PROFFITT

The effect of cold-work and heat treatment on the electric conductance of copper, aluminum and iron. PETER BARDENHEUER AND HEINZ SCHMIDT. *Mitt. Kaiser-Wilhelm-Inst. Eisenforsch. Düsseldorf* 10, No. 10, 193-212(1928).—Previous work is

reviewed and new expts. are performed to clear up existing discrepancies. The lowering of the cond. resulting from mech. deformation is due to cold-work strains which vary considerably, depending on the methods employed. Cold-rolled Cu wire when reduced 50% showed a max. decrease in cond. of 3-4% but only after the application of *several light passes*. Annealing, if carried out below the temp. of beginning recrystn., generally improves the cond. without materially reducing the cold-work hardness. Annealing of Cu at temps. of 600° and higher produces excessive brittleness and a marked drop in cond. Subsequent heat treatment at lower temps. does not improve the cond. appreciably. Annealing of cold-rolled brass wire (72/28) (with 75% reduction) at 200° for 4 hrs. increases the conductance 7%. When annealed for 4 hrs. at 225° recrystn. sets in, and the increase in cond. amounts to 17%. The cond. of cold-drawn Al wire is increased by 3-6% when the wire is annealed at 200° (before recrystn. is complete) but subsequent prolonged heating at 150° again reduces the cond. by 3-4%. Cold-rolled electrolytic Fe exhibits a max. cond. after annealing for 1 hr. at 500°. Expts. performed with ingot iron indicated that the cond. of Fe is independent of the grain size. The effect of C in steel is to decrease the cond. linearly as the C content increases. The reduction is greater for steel contg. *lamellar pearlite* than for the same steel contg. finely distributed *granular cementite*.

H. S. VAN KLOOSTER

Recrystallization of metals. R. KARNOP AND G. SACHS. *Z. Physik* 52, 301-13 (1928).—The influence of repeated heating on commencement of recrystn. and grain-size is studied. The retardation of the recrystn. through deformations is investigated

GEO. GLOCKLER

Relation between the Shore hardness and the thickness of metals. YOSHIO NISHI. Tohoku Imp. Univ. *Kinzoku-no-Kenkyu (J. Study of Metals)* 5, 314-8 (1928).—N. made 10 specimens of 0.1, 0.5, 0.9% C-steel and 70:30 brass having various thicknesses ranging between 0.5 and 30 mm. and measured their Shore hardness to study the effect of thickness upon the hardness no. The result shows that up to 5 mm. thickness the hardness no. is independent of the thickness, but increases abruptly at about 5 mm. thickness and then decreases with decreasing depth. N. considers this to be due to the anvil effect and the way in which the specimen is attached to it. When the thin piece is soldered on to a hard metallic plate, accurate results can be obtained up to the thickness of 1 mm.

K. SOMEYA

A method for accelerating the transformation of the retained phase by means of an alternating current or field. TAKESHI TAKEI. Tohoku Imp. Univ. *Kinzoku-no-Kenkyu (J. Study of Metals)* 5, 267-70 (1928).—In a Co-Mo alloy contg. 16% Mo, a large part of the transformation from a face-centered cubic lattice to a hexagonal close-packed one is retarded and brought down below room temp. by supercooling, and the rest may take place by cooling the alloy in liquid air. T. has observed that the transformation is much accelerated by passing an alternating current through an alloy or placing it in a strong alternating field during cooling in liquid air.

K. SOMEYA

The use of Zeiss' bromonaphthalene immersion objective and other objectives of lower aperture in metallography. C. BENEDICKS AND P. SEDERHOLM. *Arkiv. Mat. Astron. Fysik* 21A, No 4, 8 pp. (1928); cf. *C. A.* 23, 74.—From a comparative study of immersion objectives of numerical aperture 1.6 and less B. and S. infer that the objective of 1.6 numerical aperture can be recommended in all cases where a magnification above 1600 is desired. For lower magnifications an aperture of 1.4 is preferable on account of lower cost and greater freedom from fogging.

H. S. v. K.

Fusible metal safety plugs in chlorine containers. ANON. *Compressed Gas Manufacturers Assoc. Bull. Tech. Series* 1929, 359-60.—A report of researches by the Niagara Alkali Co. on fusible metal plugs for 150-lb. cylinders. Failure to function properly is due to one of two causes; (1) corrosion (most important), and (2) segregation, the packing of primary Bi crystals across the plug. The formula of the quaternary eutectic is: Cd 10.10, Sn 13.13, Pb 27.27 and Bi 49.50%. This alloy is now employed and the plugs are chilled immediately after pouring. The use of pure metals, the prepn. of the alloy and the filling of the bodies of new valves are outlined.

W. H. BOYNTON

Metallic electrodes for cast-iron arc welding. SHUNICHI SATO. Mitsubishi Research Lab., Tokyo. *Am. Inst. Mining Met. Eng. Tech. Publication* 162, 3-16 (1929).—A short bibliography on elec. welding of cast Fe is given. Wrought-Fe welding rods of 0.49 cm. diam. were used, and they were wrapped with asbestos cord of 1 mm. diam., and coated with a paste of graphite, carborundum and water-glass up to a diam. of 9 mm. The coating compn. varied in steps of 10% from 100% graphite to 100% carborundum. Metal from these coated electrodes was deposited on steel plates, by using 25 v. and 140 amp. with the plain graphite coating, 20 v. and 155 amp. with the plain carborundum coating, and intermediate voltage and current for the mixed coatings. The micro-

structures, chem. analyses and hardness of the various deposits are shown. Good gray Fe contg. 1.5 to 3.4% graphite, 1.3 to 0.3% combined C, and 2.8 to 4.3% Si, was deposited by the electrodes coated with the 40 to 60% mixtures. With coated wires of only 7 mm. diam., the deposited metal contained only a trace of graphite. With the coated electrode positive and 3 to 5% of calcined borax, CaCO_3 , or BaCO_3 , in the coatings, the results were poor, but were improved by preheating. With the electrode negative, and 1 to 3% BaCO_3 added to the coating, fusion was much slower, requiring more energy, so that preheating was not necessary. With an 8 mm. diam. coated negative electrode, the coating contg. 40 to 60% graphite, 60 to 40% carborundum, mixed with water-glass, and with 1% BaCO_3 , good gray cast Fe was deposited on cast Fe without preheating. No hard zone was formed in the Fe, and bending tests of welded bars with the weld in tension gave results as good as those from the original cast Fe. Holes in a large casting were filled by cast Fe deposited in this way, and it then withstood hydraulic pressure of 230 lbs. per sq. in. GEO. F. COMSTOCK

Electric welding joins the field in high-pressure equipment. NORMAN W. KRASE. Univ. Ill. *Chem. Met. Eng.* 35, 661-7(1928).—The manuf. of all sorts of large-scale app. by a special welding process at the plant of A. O. Smith Corp. is described. J. H. P.

Eutectic cast iron. A. MITINSKI. *Foundry Trade J.* 39, 413(1928).—Eutectic cast Fe shows more nearly uniform distribution of all the elements in the metal on solidification than any other C concn. Since com. cast Fe is not a pure Fe-C alloy but a complex alloy of Fe, C, Si, Mn and P, the eutectic compn. is lowered by the concn. of Si and P, i. e., the eutectic compn. of cast Fe with 2% Si and 1% P would be 3.33% C, rather than the 4.3% C content of the pure Fe-C eutectic. DOWNS SCHAAF

Graphite in gray cast iron and its influence on strength. PETER BARDENHEUER AND KARL LUDWIG ZEYEN. *Tech. Hochschule, Aachen. Giesserei* 15, 354-65(1928); cf. *C. A.* 22, 2729.—The development of the theory of graphite (I) formation in cast Fe (II) is outlined. The soln. of I in the melt is found to be dependent on the overheating temp. and the C content. The I crystals composing the flakes are invisible under a powerful microscope. With increasing overheating temps. fine eutectic I displaces the coarser flakes. White spots, which appear in the structure of specimens heated above 1500°, increase with the overheating temps. The Si in the gray outer zone is greater than that in the original II, but less than that of the interior. *Ibid* 385-97.—The influence of C on the I formation and the mech. properties of II (cylinder, Fe poor in P and S, the same with 3.5% Si) cast in chill (then annealed) and sand molds is studied. The chill castings show higher tensile properties than the sand. Expts. with specimens annealed at 750-800° and 850-900° show that only at the higher temps. is the white structure transformed into the pearlite-ferrite. *Ibid* 411-20.—The influence of the overheating and pouring temps., and stirring of the bath on I formation and strength of I is studied. With increasing overheating temps. the fineness of the I formation is constant in cylinder II, and decreases in the other types. When poured at the highest temps. the I is finely divided, while at the lowest it occurs as coarse flakes. The overheating and pouring temps., and mech. stirring of the melt have no marked influence on the mech. properties of II. Numerous photomicrographs, tables and references to the literature are given. J. BALOZIAN

Hardness and tool behavior of cast iron. WALTER MELLE. *Giesserei-Ztg.* 24, 485-6. *Chem. Zentr.* 1927, II, 2100.—M. defines the term "tool behavior" ("Bearbeitbarkeit") as the length of the abscissa in cm. in the boring diagram for every 100 revolutions of the boring-shaft at certain definite working conditions. From many expts. on samples of cast iron with 100-230 Brinell units it was concluded that under certain exptl. conditions there exists a relation $B. II^{1.47} = e$ between the tool behavior B and the hardness II. In the expts., which were carried out without regard to the analysis and the strength of the walls, the const. e was found to be 10,000. G. SCHWOCH

The system ferrous oxide-silica. C. H. HERTY, JR. AND G. R. FITTERER. *Ind. Eng. Chem.* 21, 51-7(1929).—The following conclusions are drawn from the m. p. detns. and microstructure of the ferrous silicates: (1) the m. p. of FeO lies between 1355° and 1377°; (2) at 22% SiO_2 a eutectic is indicated by m. p. data, the eutectic temp. being 1240°; (3) the compd. fayalite is present in the system; it m. 1355°; (4) a second eutectic, m. 1260°, is found at 35% SiO_2 ; (5) the transformation from cristobalite to tridymite is found noticeably to distort the diagram. DOWNS SCHAAF

The critical points of pure carbon steels. TOMOO SATO. *Tech. Repts. Tohoku Imp. Univ.* 8, 27-52(1928).—The crit. points of pure Fe and C steels were detd. for different rates of heating and cooling by means of dilatometric and differential dilatometric methods and also by magnetic analysis. The degree of superheating and supercooling of the A_3 change increases as the C content increases. An equil. diagram of the

Fe-Fe₃C system in the solid state was constructed from the data obtained in the investigation. DOWNS SCHAAF

Influence of temperature upon the mechanical properties of steel. Kiyoshi SASAKAWA. *Tetsu-to Ko (Iron and Steel)* 14, 567-86(1928).—S. devised an app. for measuring the impact resistance in which the Izod impact testing machine is used, and which requires only $\frac{1}{8}$ second from the time of the removal of the furnace to the application of impact with consequent small lowering of temp. This app. was used for impact test of 6 kinds of C steel (0.11-1.20% C), Ni-Cr steels (2.40-3.74% Ni, 0.63-0.78% Cr) quenched at 820° and annealed at 620°, 3 kinds of stainless steels, high-speed steel, Si-Cr steel (11% Cr, 3% Si) and Ni-Si-Cr steel (4% Ni, 1.5% Si, 10% Cr), the temp. range of the test being 20-1000°. In C steels the max. of impact resistance becomes higher with higher C content, with 0.1% C, it is at ordinary temp. and with 1.2% C it is near 400°; at higher temp. it once lowers and then increases abruptly near 700°, showing there again a max., and finally decreases considerably above 800°. In Ni-Cr steels the same value is maintained up to 300°, the value lowering once, then increasing abruptly to a max. near 720° and gradually decreasing at higher temps. In stainless steels, the impact resistance decreases with temp. rise if the structure is ferrite-sorbite. When the structure is martensite-sorbite, no change of value is observed up to a high temp., while when it is austenitic, the value lowers up to 400°, then does not change up to 700°, and above 700°, abruptly decreases. With high-speed steels, the resistance is small at low temp. but increases gradually with temp. rise. In Si-Cr steel or Ni-Si-Cr steel, there is a max. near 800°. K. SOMEYA

Alloy steels and their application in the automotive industry. B. E. EGERBERG Intern. Silver Co. *J. Soc. Automotive Eng.* 23, 362-70(1928).—The progress of research in the development of alloy steels is outlined. The resistance of various steels to corrosive agents is discussed. Transverse and bending tests, S print and gelatin paper tests are described. M. B. HART

The equilibrium diagram of iron-zinc system. YOSHIKI OGAWA AND TAKEJIRO MURAKAMI. *Tech. Repts. Tohoku Imp. Univ.* 8, 53-69(1928).—The equil. diagram of the Fe-Zn system was studied by using specimens prepd. for the most part from powd. mixts.; the Fe-rich alloys were made by packing ground mixts. of the mother alloy (approx. FeZn₇) and reduced Fe in porcelain tubes fused at one end, heating in H to 650° to reduce any oxide film, and then after cooling, closing the other end of the tube in a C arc; the tube and contents were then heated to 900°, cooled down to 740° and kept there for 12 hrs. The results of thermal analysis confirm in general the work of previous investigators. The magnetic change of Fe was lowered by the addn. of Zn until a concn. of 25% was reached and remained constant at 623°. An abrupt change was observed at 623° by the thermal dilation method and was confirmed by microscopic investigation to be a eutectoid change. The limit of soly. of Zn in α Fe was found to be 18% and the eutectoid compn. to be 25%. DOWNS SCHAAF

Cause of the thermal brittleness of cupriferous steel. ISAMU KOTAIRA. Yahata Steel Works. *Seitetsu Kenkyu (J. Study of Ferrous Met.)* 8, 25-39(1928).—K. examd. microscopically 8 kinds of Cu-Fe alloys contg. 0-9% Cu and found that with more than 1% Cu, there is a dendritic structure of solid soln. rich in Cu, which cannot be made to vanish by simple annealing. With the alloy contg. 9% Cu, sepn. of reddish yellow Cu solid soln. occurs at the center of the dendrite. No similar thing happened with the Cu content less than 0.8%. Expts. on the diffusibility of Cu and copper oxide at 1100-1200° show the sepn. of the net of the Cu-rich solid soln. around the Fe crystal, the latter being surrounded by an Fe-rich solid soln. This phenomenon can be observed only in Cu steel. When the cupriferous steel is heated at 1000° for 22 hrs. the surface oxide is removed, and when the Cu content in the surface oxide and in the remaining steel is analyzed, it is found that only 10-20% of the original Cu is contained in the oxide, the Cu content in the unoxidized steel increasing by 5-10%. Microscopic examn. of the heated specimens shows the sepn. of reddish yellow Cu-rich and the brownish yellow Fe-rich solids solns. on the surface, having the thickness of 0.5-1 mm. The same thing can be observed even with low-Cu steels if long annealed. T. discusses the mechanism of the sepn. of these solid solns. K. SOMEYA

Influence of copper on mild steel. SHINKYO KODAMA. Yahata Steel Works. *Seitetsu Kenkyu (J. Study of Ferrous Met.)* 8, 1-23(1928).—In the Yahata steel works it was observed that C steels contg. more than 0.3% Cu form a surface fissure on rolling at 1100°, this tendency being more marked in low-C steels. Microscopic examn. of the fissures of mild steels showed the presence of a substance colored like natural Cu. To study the nature of this substance, thermal and magnetic analyses were made with 32 specimens, the result being in agreement with Ruer's equil. diagram of the Cu-Fe sys-

tem, according to which 0.3% Cu can be completely dissolved in Fe as a solid soln. Test of the diffusibility of Cu in solid Fe at high temp. showed that it is great above 1200° but very small at 1100°, and there is a tendency of Cu entering into the boundary of the ferrite grain to destroy the latter. Similar diffusibility tests with Al, pyrite, S, Pb, Si and Mn showed that the above tendency is peculiar to Cu. Repeated heating of the cupriferous steel, removal of the surface crust, and analysis of the remainder showed that with the progressive increase of the portion removed by heating, there is a corresponding increase of Cu in the remainder. Hence K. concludes that in the surface oxidation of steel, Cu remains unoxidized and enters the boundary of ferrite which is present on the surface and makes the Cu concn. there large, and this constitutes the cause of the fissure formed in hot rolling.

K. SOMEYA

Specific gravity of some tool steels and special steels. SABURO UMINO. Yahata Steel Works. *Denki Seiko (Electro-met. of Steel)* 4, 287-93; *Seitetsu Kenkyu (J. Study of Ferrous Met.* 8, (4) 1-7 (1928).—U. annealed 8 kinds of ordinary tool steels, and 8 kinds of special steels by cooling them from 950° in the furnace, polished and then measured their sp. gr. at 0°. With one or two exceptions the normalized steels show a decrease of sp. gr. of 0.27% on the av. In C steels the increase of C decreases the sp. gr. Some microscopic examn. of the specimens were also made.

K. SOMEYA

Incipient shrinkage in some non-ferrous alloys. J. W. BOLTON AND S. A. WEIGAND. Lukkenheimer Co., Cincinnati, O. *Am. Inst. Mining Met. Eng. Tech. Publication* No. 163, 3-18 (1929).—The literature on soundness of bronze castings is briefly reviewed. Porosity is generally due to intercrystalline fissures, which cause red or brown stains in fractures. The alloy studied contained 6% Sn, 4% Zn, less than 2% Pb, 0.5% Ni, balance Cu. When melted in an atm. contg. much CO this alloy gave unsound castings. Even with a good fracture, the castings might be porous. The porosity occurs as minute shrinkage cavities between the dendritic crystals, which are prominent in this alloy because of the long interval between primary and final crystallization. It is most serious in the central parts of sand-castings, and may be decreased by pouring at the correct temp. and by proper gating. The porosity is increased by gas evolution from the solidifying alloy. The alloy on a large scale was melted and cast under different conditions, and the porosity was detd. by the use of a special test-casting, machined all over. In melting by gas, lowering the CO in the furnace atm. from 6.78 to 0.9% reduced the percentage of porous castings. Melts in an indirect arc furnace showed that the soundest castings were obtained by melting in an atm. contg. below 2% CO, and pouring at about 2200°F. The presence of P, S, Si and other impurities in the bronze had no effect on the porosity. The product of this foundry has been much improved in soundness and strength since reducing atm. have been avoided in melting. Porosity and discolored fractures are not generally due to oxidation. GEO. F. COMSTOCK

Gases in a sample of overpoled fire-refined copper. O. W. ELLIS. Westinghouse, East Pittsburgh, Pa. *Am. Inst. Mining Met. Eng. Tech. Publication* No. 158, 3-7 (1929). A ladle of Cu contg. small amts. of impurities was overpoled with green hard wood, and cast in a small mold. Some absorption of oxide occurred to a depth of 10 mm while the Cu was liquid in the mold, but it was hard to detect any oxide particles below that level. A detn. of the gases extd. from half this ingot showed no N, O, CO or H, and only 5.6% CO₂ and 2.5% H₂O by vol. The gases contained 23.1% C by wt. The absence of CO and H was surprising. The C content of the gas is the same as was found in Cu melted under oxidizing conditions, and perhaps such Cu retains its C content unchanged after being overpoled.

GEO. F. COMSTOCK

Dispersion hardening in copper and silver base alloys. J. L. GREGG. Western Elec Co., Chicago. *Am. Inst. Mining Met. Eng. Tech. Publication* No. 161, 3-7 (1929).—Alloys of Cu with a 3% addn. each of the following were rolled or forged, quenched from 870°, aged at lower temp. for 1 hr., and their final hardness was compared with the hardness as quenched: Ni₃Si, Co₃Si, Mn₃Si, Mg₃Si, Si, Be₃Si, FeSi, FeAl₃, Fe₃Sn, NiAl, Ni₃Sn₃, CoAl, Co₃Sn, CoZn₃, Mn₃Al, Mn₃Sn, Al₃Zn₃, Ni₃Sn. Only the Cu-Si alloys showed significant dispersion hardening, and the only one not previously described by Corson was the Be₃Si alloy. It scaled little on heating, and hardened very rapidly on cold working. When quenched its tensile strength was 52,200, and when aged at 427°, 71,200 lbs. per sq. in. The hardenable Cu-Co₃Si alloys showed max. elec. cond. (about 63%) for the compn. corresponding to no excess of either Co or Si over the proportions in the compd. Co₃Si. Alloys of Ag with 3% of CuAl₃, Cu₃Mg, Cu₃Sb, MgZn₃, Cu₃Cd and CdSb, resp., were quenched from 815°, aged and tested for hardness. Only those contg. CuAl₃ showed marked dispersion hardening. GEO. F. COMSTOCK

Investigation of high-strength brass. II. TOMOJIRO TANABE. *J. Min. Japan* 44, 219-31 (1928). T. has made a detailed investigation of the structure and mech. proper-

ties which results on adding several pairs of such metals as Mn + Ni, Mn + Fe, Mn + Al, Mn + Sn, Ni + Fe and Ni + Sn, to 60% Cu brass. The paper contains extensive exptl. data with a few photomicrographic plates. Among the results the notable findings are: (1) with the alloy made by adding Ni + Al, a suitable heat treatment can give it properties comparable with those of steel. Thus, alloys contg. 2% Ni, 1% Al attain the tensile strength of 81 kg./mm.² by quenching at 800° and annealing at 350°; the alloy contg. 4.7% Ni, 4.0% Al attains the tensile strength of 70–75 kg./mm.², elastic limit 45–50 kg./mm.², 19–14% of elongation and 25–16% of area contraction. K. S.

Gold alloy 750–2. Its behavior after cold working and annealing. W. HEIKE AND F. WÜSTERHOLT. Freiberg i. S. (Berg Acad.). *Z. anorg. allgem. Chem.* **176**, 200–4 (1928).—Alloy 750/2 is 18 karat Au, contg. 75% Au, 4% Ag, 21% Cu. Wires 3 mm. diam. were given 33% cold working and were then annealed at different temps. up to 750°. Below 450° the annealing time was 1 hr., 450–550° 45 mins., and above 550° 30 mins. In one set of tests the wires were cooled in the furnace and in the other quenched in H₂O, and in each case ultimate strength, elongation and reduction in area were detd. With slow cooling ultimate strength is 100 kg./sq. mm. after annealing at 20°, 102 kg./sq. mm. after annealing at 150°, 124 at 280°, 110 at 350°, 105.5 at 450° and 101 at 750°; elongation is 1% after annealing at 20°, 0.5% at 150°, 0.8 at 280°, 2.0 at 350°, 3.4% at 450°, 4.2% at 650° and 2.5% at 750°, while reduction in area is 32.5% at 20°, 16% at 150°, 10.0% at 350°, 12.0% at 550° and 11.5% at 750°. In the quenched samples the ultimate strength falls above 360° from about 100 kg./sq. mm. to 50 kg./sq. mm., while the elongation correspondingly increases from about 2 to 40% at 750°. Reduction in area falls up to about 300°, and then rises very sharply, being about 60% with an annealing temp. of 600°. With slow cooling this alloy is very brittle, probably because of the formation of the compds. AuCu and AuCu₃. These compds. are formed from mixed crystals at 367° and 371°. H. STÖRTZ

The equilibrium diagram of the cadmium-antimony system. TATEJIRO MURAKAMI AND TOSHIO SHINAGAWA. Tohoku Imp. Univ. *Kinzoku-no Kenkyu (J. Study of Metals)* **5**, 283–96 (1928).—M. and S. studied the Cd-Sb system by thermal analysis, elec. resistance and microscopic examn. **Conclusions.**—(1) This system has 2 conditions, metastable and stable. When the velocity of cooling from the melt is great, the β -phase belonging to the metastable system appears and changes into the γ -phase of the stable system during its further cooling; when the cooling is slow, γ -phase is formed directly from the outset. (2) The β -phase is a solid soln. contg. the compd. Cd₂Sb₃ and has the min. temp. 420° on the liquidus line of the metastable system and forms a eutectic with Cd at 395° (54% Sb). (3) The β -phase is present in the range of 40–45% Sb, makes a eutectic change at 250°, decomp. into Cd and Sb (or γ -phase). (4) The γ -phase is a solid soln. contg. the compd. CdSb, and has a max. temp. 456° along the liquidus line of the stable system, forms a eutectic (7.5% Cd) with Cd, and then also forms a eutectic with Sb (59–53% Sb) and slightly decreases its soly. with lowering temp. (6) The solid-soly. limits of Cd in Sb are 0.15% at the eutectic temp. and less than 0.1% at ordinary temp. Also the soly. of Sb in Cd is less than 0.1% at its eutectic as well as at ordinary temp. K. SOMEYA

Investigations regarding the influence of remelting as well as rolling and annealing upon aluminum. E. MAASS AND W. WIEDERHOLT. *Korrosion und Metallschutz* **4**, 245–51 (1928).—Al was remelted at the m. p. and at a temp. 800° above the m. p. and the following properties were detd.: Chem. analysis, sp. gr., hardness, penetrability, acid resistance, corrosion in ammoniacal NaCl in presence of H₂O₂, corrosion in NaCl in presence of H₂O₂. With exception of the tests in the NaCl-H₂O₂ soln. the material which was melted at the low temp. stood up better in chem. tests, while there was little difference in mech. properties. B. E. ROETHELT

Properties of aluminum ingot. GUNJI SHINODA. Kyoto Imp. Univ. *Suiyokuishi* **5**, 593–5 (1928).—S. carried out x-ray analyses and tests of the mech. properties of 99.8% Al ingot from the Aluminum Co. of U. S. A. The result shows that the portion in contact with the metallic mold consists of a large no. of small fibrous crystals but in the portion which is distant from the wall of the mold and is near the surface, there is a large fibrous structure with [110] as its common axis. There is sometimes a large, almost single crystal having a peculiarly regular structure. That the axis along which the development of the crystal takes place coincides in Al (also probably in all metals having a face-centered cubic lattice) with that of the case of recrystn. seems to S. very interesting in that it indicates the similarity of the crystal growth in both cases. The hardness no. measured by "baby Brinell" machine (5-mm. sphere, 30 sec.) is 19–21. The sp. gr. of Al forged at 400°, and annealed for 2 hrs. at 450°, is 2.710, m. p. 659.0°. K. S.

The development of aluminum for automotive purposes. R. S. ARCHER. J.

Soc. Automotive Eng. 23, 149-61(1928).—Development of the production of Al and its alloys and their application to the automotive industry. M. B. HART

Studies in light alloys for casting purposes. IV. KIYOSHI TAKAHASHI. Tohoku Imp. Univ. *Kinzoku-no Kenkyu (J. Study of Metals)* 5, 209-33(1928).—T. took the 4 elements Cu, Zn, Mg and Si, and detd. the effective range of concn. of each element. The alloys made by adding 2 of these elements to Al were made to test their mech. as well as their casting properties. A review of these ternary alloys shows that, in comparison with the case of binary alloys, the tensile strength is great, and although the elongation and area contraction are small, the hardness is large, and especially the casting properties are very good, showing that they are decidedly superior to binary alloys in many respects. On the other hand, the effect of added elements is not necessarily as large as in the case of binary alloys, *i. e.*, the individual effects cancel each other to some extent. For details of this very extensive investigation the original article must be consulted. K. SOMEYA

Drop-hammer method for the study of forging temperature of light alloys. CHUYO HISATSUNE. Kyoto Imp. Univ. *Suiyokaishi* 5, 627-32(1928).—It is well known that there is a suitable forging temp. for Al alloys. This was studied by the drop-hammer test. The test was also made to see whether there is cold- or hot-shortness in the alloy. A light Fe hammer (2 kg.) was dropped repeatedly from the height of 1 m. upon a cylindrical specimen. The ratio of height/diam. of the specimen is 1.5. The deformation is measured at every drop, the contraction only being taken as the measure of forgeability for convenience. Preliminary expt. was made with Al and then the test was applied to duralumin (4% Cu, 0.5% Mn, 0.5% Mg), Y alloy (4% Cu, 2% Ni, 5% Mn, 1.5% Mg), A alloy (English) (3% Cu, 20% Zn) and E alloy (English) (2.3% Cu, 20% Zn, 0.5% Mg, A 5% Mn) in the temp. range: room temp.—600°. From the result H recommends as a suitable forging temp. the following: Al 400-550°, duralumin, 480-520°, Y alloy 480-90°, A alloy 450°, E alloy 350-450°. The thermal brittleness of alloys contg. Zn mentioned by some authors could not be found in this investigation. K. SOMEYA

Equilibrium diagrams of the aluminum-antimony-silicon and aluminum-antimony-copper system with aluminum as their chief constituent. TATSUO MATSUKAWA. Kyoto Imp. Univ. *Suiyokaishi* 5, 596-603(1928).—(1) *Al-Sb-Si diagram*.—Although there are many equil. diagrams proposed for the Al-Sb system, M. recognizes only one compd., AlSb. The eutectic crystals consisting of Al and AlSb, and that consisting of AlSb and Sb are present on both sides of the compd. Since in the Al-Si system there are many reliable investigations, M. did not study it. M. next considered the sections corresponding to Sb 3, 6 and 10% parallel to the Al side, made the thermal analyses of the alloys corresponding to them, plotted the results, and considered the ternary diagram consisting of Al and less than 10% Sb, 20% Si. M. confirmed that the ternary eutectic almost coincides with the binary eutectic of Al-Si and also indicated all the primary surfaces and the primary crystals sepg. from them, and detd. that the univariant reaction occurring on the liquidus surface is $\text{Liq.} \rightarrow \text{AlSb} + \text{Si}$. Many microscopic observations are described to support the result. (2) *Al-Sb-Cu diagram*.—M. did not repeat the study of the Al-Cu system and considers the 3 sections contg. Sb 2%, 4% and 6%. M. made the thermal analyses of the alloys belonging to them. The result obtained was plotted to construct the equil. diagram of the Al side, which is bounded by the straight line passing through the compn. of the compd. CuAl_2 and that of AlSb. Various primary surfaces were detd., the univariant reactions on the liquidus surfaces being $\text{Liq.} \rightarrow \text{CuAl}_2 + \text{AlSb}$, $\text{Liq.} \rightarrow \text{CuAl} + \text{AlSb}$ and $\text{Liq.} \rightarrow \text{CuAl} + \text{CuAl}_2$. At 585°, a new reaction of a non-variant system $\text{Liq.} + \text{CuAl} \rightarrow \text{CuAl}_2 + \text{AlSb}$ was found at Sb 2.5%, Cu 47%, rest Al. The ternary eutectic point almost coincides with that of the Al-Cu binary eutectic. Microscopic observations are described to support these conclusions. K. SOMEYA

Study of the aluminum-copper-nickel system with aluminum as chief constituent. HIROO NISHIMURA. Kyoto Imp. Univ. *Suiyokaishi* 5, 616-26(1928).—The results are given of a number of thermal analyses made with alloys corresponding to 98, 96, 94, 90, 85, 80, 75, 68 and 60% Al and also with many of the alloys corresponding to each of the sections made by connecting the point of Cu 50% in the Al-Cu system and those of Ni 40% of the Al-Ni system. Many sectional equil. diagrams have been constructed from the results, by which N. found besides those invariant reactions occurring at 540-85°, a new invariant reaction occurring at 600°, each being interpreted as $\text{melt} \rightarrow \alpha + \text{CuAl}_2$ + T, melt $\rightarrow \text{NiAl}_3$ + T, melt + $\text{NiAl}_3 \rightarrow \text{NiAl}_2$ + T, where α is a solid soln. contg. Al as chief constituent and T a ternary compd. which was assumed by Bingham and Haughton (*Proc. Roy. Soc.* 99, [A], 47(1921)); (cf. C. A. 17, 2854) to be Cu_3NiAl_3 (or CuAl_3Ni).

Al₃). But N. concludes from the equil. diagram obtained as well as from the measurement of sp. gr. that T is 3CuAl₂.NiAl₃. N. made a detailed microscopic examn. of many of the alloys which had been cooled very slowly so as to reach equil. From the above results N. constructed the equil. diagram, and gives the kinds of primary crystals and the reactions occurring along the 7 univariant liquidus lines. N. gives Cu 32, Ni 0.5, Al 67.5% for the invariant point at 540°, and Cu 23, Ni 4.0, Al 73.0% for the invariant point at 600°, and also the range of compn. for each of the reactions.

K. SOMEYA

Röntgenographic study of the improvement of aluminum alloys. GUNJI SHINODA. Kyoto Imp. Univ. *J. Jap. Min. and Met.* 44, 514-62(1928).—(1) *Improvement of the Al-Si alloys.*—Although the Al-Si alloys contg. 8-13% Si with a small quantity of alkali metals or their salts as flux are generally known as silumin or alpac, and have good properties, there is no definite theory as to the mechanism of their improvement or "modification." S. considers that for the study of the mechanism, the investigation of the case of the addn. of Na only is insufficient, but the cases of addn. of other alkali or alk. earth metals as well as the effect produced when these metals are added to other Al alloys than of the Al-Si system must also be considered, and made his expts. from this standpoint. A comparatively wide and flat part in the surface of fracture when the Al-Si alloy scrap is remelted and remodified consists of the Al dendrite and the silumin structure, the Al belonging to both of these having the axis [110] as the one along which the crystal growth occurs, the plane of the flat part above mentioned coinciding with the face [001]. To study the effect of K salts upon the Al-Si alloys, thermal analyses were made of the alloys to which 5 or 10% of KHF₂ was added and it was found that although the temp. of the beginning of the eutectic crystn. is slightly lowered, there is no clear stepwise change near the eutectic point, so that S. concludes that the solidification of the Al dendrite and the silumin structure occur at almost the same time. Röntgenographic and microscopic investigation give almost the same result as in the case of the NaF addn. When Na₂O₂ is added to Al-Si alloys, a marked improvement occurs, but not so when borax, Na₂CO₃ and K₂CO₃ or their mixt. was added. For the cases where Ca was added to the alloys, S. expected some difference from the case of Na addn., since Al and Ca easily form alloys, and made the thermal analyses of numerous alloys from 2 to 13% Si and detd. a part of the ternary equil. diagram, finding a ternary eutectic (576°) at 11.5% Si, 0.9% Ca. Microscopic study showed that the modified alloy made by Ca addn. is ternary, differing somewhat from that made by Na addn. Measurement of the mech. properties showed that those of the former are all inferior to the latter. (2) *Improvement of Al-Ni alloys.*—Addn. of Na to Al-Ni alloys brings no marked improvement in the Al-Ni alloys. S. also detd. the ternary equil. diagram of the Al side made by adding up to 8% Ca to Al-Ni alloys contg., resp., 2.46 and 10.0% Ni. Al-Ni and Al-Ca systems have binary eutectics, and in the ternary alloy, there is a non-variant reaction near 610°, which is considered by S. to be a ternary eutectic reaction, the approx. compn. of the eutectic being 5.7% Ni, 6.7% Ca, the rest Al. Microscopic examn. shows a close agreement with the above conclusion, and when considered also from the results of x-ray investigation, refinement of the structure occurs in alloys contg. more than 2% Ca, but the refinement is not comparable with the silumin structure. S. considers that in such a ternary alloy, insufficient refinement is obtained, and conversely, the modified structure of the silumin is not of the ternary alloy type. Addn. of Ca does not improve the mech. properties. Finally S. emphasizes the fact that in every case the direction of the axis along which the crystn. of Al develops is always found röntgenographically at [110], in the Al-alloy castings.

K. SOMEYA

A solution of the ternary equilibrium diagram and a contribution to the aluminum-copper-zinc system. MATSUJIRO HAMASUMI AND SACHIO MATOBA. *Tech. Repts. Tôhoku Imp. Univ.* 8, 71-98(1928).—Since the binary equil. diagram can be considered as the assemblage of many soly. curves, the conditions of their intersections being controlled by the phase rule, the authors have proposed a general soln. of the ternary equil. diagram upon the same principle, the soly. curves of the binary system becoming in a wide sense soly. surfaces in a ternary system. By this method the equil. diagrams of the Al-Cu-Zn system, the one by Hanson and Gayler, the other by Nishimura, are both found to be correct from a theoretical point of view, but the Hanson and Gayler diagram is more probable in so far as liquidus surfaces are concerned.

DOWNS SCHAFF

Ferro-silicon alloy chemical plant. S. J. TUNGAY. *Chem. Age* (London) 19, 456(1928).—The advantages and limitations of acid-resisting, high-silica irons in the manuf. and use of H₂SO₄ and HNO₃ are outlined. Some general information concerning the manipulation of high-silicon irons is given.

E. G. R. ARDAGH

Regarding the colloidal theory of corrosion. GERHARD SCHIKORR. *Korrosion*

Metallschutz 4, 242-5(1928).—A discussion to show that J. A. N. Friend's colloidal theory of corrosion (cf. C. A. 18, 1461) is incorrect in its assumptions. B. E. R.

Corrosion and metal protection in boiler operation. R. STUMPER. *Korrosion Metallschutz* 4, 217-27(1928).—The problem of boiler corrosion is subdivided into 1) scaling and burning of grates, tubes and superheaters, (2) attack of metals by steam, (3) attack of condenser systems, and (4) corrosion of wetted boiler parts. Scaling and burning of parts are influenced by the structure of the metal, analysis of combustible, and purity of the boiler H_2O . Porous, graphitic irons are most easily oxidized, the oxidation starting at the graphitic particles. S. in coal accelerates oxidation by forming FeS , which loosens structure and fluxes the oxides. Impure H_2O causes scale formation inside the pipes, local overheating and burning out. Steam causes oxidation with formation of H_2 . Introduction of H_2 into the boiler is a possible preventative but too expensive. The corrosion of wetted boiler parts is discussed in the light of the electrochemical theory. The driving force of the reaction is the difference in H_2 and Fe potentials, which is shown to have only a small temp. coeff. Pressure and temp. have opposing tendencies on O_2 soly. and hence on corrosion. Chlorides, sulfates and nitrates of Na, Ca and Mg increase the corrosion in boiler waters; 0.2% NaOH minimizes the boiler corrosion. Too high an alk. tends to cause H_2 embrittlement; this can, however, be remedied by the presence of sulfates. B. E. ROETHLI

Light alloys in aircraft from the standpoint of corrosion. H. SUTTON. *Metal Ind. (London)* 33, 391-4, 417-25(1928).—The corrosion of Al is accelerated by Cl^- . Contact with Cu rivets causes failure due to cells set up. Corrosion often follows soldering due to incomplete removal of fluorides or chlorides used as fluxes. Duralumin usually fails by intercryst. corrosion decreasing static tensile strength and elongation. The tendency for intercryst. corrosion is increased by heat treatment, high-temp. quenching, cold work and inclusions of foreign material. Addns. of Cu or Si decrease corrosion resistance while 2-3% Cu and Ni increase it. Enamels, paints and varnishes protect Al and light alloys. Anodic oxidation affords considerable protection, especially when grease films are also used. Deposits of Ni have been found unsuccessful unless they are very heavy. Zn and Cd have been plated on duralumin. Pure Al coatings on duralumin combine the corrosion resistance of Al with the mechanical properties of the light alloy. Fatigue limits of Al and Al alloys are markedly lowered by corrosion in sea water. Mg has been used in Germany and is found satisfactory when the metal is covered with a film of oil. It is not resistant to marine corrosion. Paints and enamels satisfactory for Al in sea water are useless for Mg or Mg alloys. Dipping in 10-20% solns of $Na_2Cr_2O_7$ or $K_2Cr_2O_7$ improves corrosion resistance and forms films which are good paint bases. B. E. ROETHLI

An apparatus for corrosion testing. V. DUFFEK. *Korrosion u. Metallschutz* 4, 1-3(1928).—A description of a gas-tight app. in which the progress of corrosion is measured by measuring the current flowing between the test piece and a Hg electrode. The app. is said to show when rusting starts and to give in a short time results which are comparable to long-time tests. The app. permits control of the atm. compn. and partial pressure of the gases. B. E. ROETHLI

Relative corrosion of electro- and hot-galvanized steel. W. S. PATTERSON. *J. oc. Chem. Ind.* 47, No. 44, 313T-17T(1928).—Expts. conducted on hot-galvanized and electro-galvanized mild steel showed hot-galvanized material to be more resistant to corrosion in atm., dil. KCl and dil. acids. In cases where a corrosion product was formed little difference was apparent between the two. B. E. ROETHLI

Influence of grain size of brass and bronze upon corrosion resistance. W. KÖHLER. *Korrosion u. Metallschutz* 4, 227-30(1928).—Two brasses 70-30 and admiralty 70-29-1 untreated, and annealed at 450° and 750° for 12 hrs. were treated in hot salt and acid solns. In general, corrosion resistance decreased with higher annealing temps. and more so in the case of the 70-30 brass. B. E. ROETHLI

Prevention of corrosion under water. R. A. BOYD. *Columbian Gasoline Corp. Refiner Natural Gasoline Mfr.* 7, No. 7, 78, 92(1928).—Various methods for preventing corrosion under water are reviewed briefly. M. B. HART

Effect of additions of lime and soda ash to brackish water on the corrosion of iron and steel. H. O. FORREST, J. K. ROBERTS AND B. E. ROETHLI. *Ind. Eng. Chem.* 21, 33-5(1929).—Addns. of lime to waters high in HCO_3^- and Ca cause formations of $CaCO_3$ scales. Waters high in Mg salts require Na_2CO_3 as well as lime to increase pH and supply CO_3^{--} to permit scale formation. A pH of 8.5 or more is favorable to formation of protective scales. B. E. ROETHLI

Coil corrosion. E. L. FISHER. *Bell Laboratories Record* 7, 155-6(1928).—Coils in electromagnetic app. corrode electrolytically in consequence of imperfections in in-

sulation (especially enamel insulation) which permit moisture from the atm. to form an electrolyte with impurities from the coating. Various materials were investigated such as impregnated papers, cotton fiber and coil coverings contg. starch loading materials. These promoted corrosion in presence of moisture. A satisfactory soln. consisted in using insulating material of high quality in addn. to a highly moisture-proof covering on the outside of the coil such as a film of cellulose acetate, which is also heat resistant.

B. E. ROETHELI

Corrosion of aluminum. J. HAUSEN. *Wochschr. Brau.* **45**, 344-7(1928).—Al of over 99% purity is more resistant than the com. form contg. 1% or more of Fe and Si. Local electrolytic action set up by foreign metals is the chief cause of corrosion. Impurities in the form of mixed crystals are harmless. Hence the importance of proper heat treatment to prevent sepn. of crystals or isolated particles.

A. SCHULTZ

Effect of inhibitors on the acid solution of copper and copper alloys. H. O. FORREST, J. K. ROBERTS AND B. E. ROETHELI. *Mass. Inst. of Tech. Ind. Eng. Chem.* **20**, 1369-71(1928).—Cu and various Cu-Zn alloys dissolve in strong HCl with H evolution. Increasing temp. decreases the min. concn. of acid necessary for H evolution. Inhibitors become effective in decreasing the corrosion of Cu and Cu alloys when depolarization by mol. H formation becomes important. A min. concn. of inhibitor is necessary to decrease the soln. rate, greater amts. being of little value. This concn. is unaffected by temp. Inhibitor action consists in the formation of a film of inhibitor substance or reaction product of the inhibitor substance on the metal, thereby decreasing the area effective for depolarization.

A. L. HENNE

Prevention of corrosion of pipes. WEIGELIN. *Gas u. Wasserfach* **71**, 1190-2(1928).—Protective coatings for the inside and outside of pipes are reviewed.

R. W. RYAN

Protection of underground pipe from corrosion. E. O. SLATER. *Ind. Eng. Chem.* **21**, 19-21(1929).—A discussion of the technic and precautions necessary in the application of coatings for protection of underground pipe.

B. E. ROETHELI

Practical corrosion research. E. H. SCHULZ. *Stahl u. Eisen* **48**, 1393-1402(1928).—A review of the literature and an outline of the most important problems of practical corrosion research.

J. A. SZILARD

Power plant development limited by available materials (DAVEY) 1. The equilibrium diagram of the FeS-MnS system (SHIBATA) 2. The heat of formation of cementite (WATASE) 2. Evaluating grinding efficiency by graphical methods (COGHILL) 13. The arrangement of crystallites in multiple crystals (SCHMID) 2. Stopping corrosion by hydrogen-ion control (MCCRUMB) 2. App. for detg. the hardness of materials (Russ. pat. 4749) 1. P and ferrosilicon (Brit. pat. 290,971) 18. Automatic charging device for gas generators, blast furnaces, etc. (Ger. pat. 470,023) 1. App. for classifying coal and other minerals (Fr. pat. 642,215) 1.

KERPELY, K. VON: *Die Betriebspraxis der Eisen, Stahl und Metallgiesserei. Heft 7. Die metallurgischen und metallographischen Grundlagen des Gusseisens.* Halle (Saale): Wilhelm Knapp; London: Penton Publishing Co., Ltd. 120 pp. Paper, \$3 (15s.); cloth, \$4 (20s.). Reviewed in *Foundry* **57**, 21(1929).

VERNON, W. H. J.: *A Bibliography of Metallic Corrosion.* With introduction by H. C. H. Carpenter. London: E. Arnold & Co., Ltd. 341 pp. 21s. Reviewed in *Chemistry & Industry* **47**, 1367(1928).

Oesterreichisches Montan-Handbuch, 1928. Issued by the Mine Owner's Association of Austria. Vienna: Verlag für Fachliteratur G. m. b. H. M. 12. Reviewed in *Engineering* **126**, 802(1928).

Table for sorting ores. S. A. PODYAKONOV. *Russ.* **3,503**, Sept. 15, 1924.

Concentrating ores by froth flotation. RALPH E. SAYRE (to Metals Recovery Co.). U. S. 1,697,614, Jan. 1. Minerals such as Utah Cu ore are subjected in the form of pulp to froth flotation in the presence of a mineral collecting agent which is an org. compd. of Se in which the Se is present "in a negative state," e. g., seleno-benz-amide.

Concentrating ores containing lime. I. Y. BASHILOV. *Russ.* **4,594**, Feb. 20, 1928. The ore is decompd. by use of NH₄Cl, which is later recovered.

Apparatus (with trays on inclined reciprocating tables) for concentrating ores. A. R. HARVEY. *Brit.* **291,498**, Feb. 26, 1927.

Apparatus for wet-magnetic separation of ores, etc. GEORG ULLRICH (to Fried. Krupp Grusonwerk A.-G.). U. S. 1,697,375, Jan. 1.

Preparing ores for roasting. F. L. WILDER, E. MORRIS, E. SCHIFF and E. S. KING. *Brit.* **291,568**, April 6, 1927. Ores are prepd. for roasting by mixing the finely divided

ore with an aluminous binding material such as clay and a soln. of FeSO_4 and shaping the material into forms of large surface such as rings of hexagonal section with axial projections. If the material is low in pyrites, S, pyrites or other S compd. may be added.

Briquetting ores and the like. BRUCK, KRETSCHEL & CO. AND OTTO KIPPE. Austrian 110,246, Mar. 15, 1928. The briquetting of ores and the like by roasting them with iron shavings or other iron waste in presence of water and air, with or without the addn. of salts or acids promoting oxidation and hydration, is facilitated by using the iron in a finely divided state.

Calcination of ores evolving carbon dioxide, particularly spathic iron ore. ANTON APOLD and HANS FLEISSNER. Austrian 109,862, Aug. 15, 1926. In a process of the kind in which hot gases are forced through the ore while the partial pressure of the formed gases is simultaneously reduced, the inlet for the hot gases is arranged above the inlet for the gases which reduce the partial pressure. A shaft furnace with inlets about half way down and at the bottom is suitable.

Apparatus for determining variations in the average size of ore particles in a flow of ore pulp. HERBERT E. T. HAULTAIN. U. S. 1,697,867, Jan. 8.

Reducing iron ores on carriages in channel furnaces. NYBERGS GRUFKÄTBOLAG. Brit. 291,822, Jan. 31, 1927. Ore loaded in carriages is fed through a preheating and roasting zone, where it is desulfurized and strongly heated by combustion of a combustible gas with an excess of air, and is then passed into a "pre-reduction" zone in which reduction by means of a current of reducing gases is begun, and thence into a final reduction zone, where it is subjected to the action of gases contg. CO; gases from this zone are regenerated in recarbonizing furnaces and the excess of gas is wholly or partly supplied to the prereduction zone and then burned in the roasting zone. An app. is described.

Treating various ores, etc. F. L. WILDER, E. MORRIS, E. SCHIFF and E. S. KING. Brit. 291,919, April 6, 1927. Pyritic ores, residues, regulus, hardheads and other materials contg. metals such as Sn, Pb, Zn, Cu, Bi, W, Sb, Fe and precious metals are oxidized, finely ground and treated with NH_3 soln., preferably in the presence of an NH_4 salt such as the carbonate, to remove Cu and W, and the residues, after removal of the ammoniacal liquors and washing, are treated with acid brine for removal of Ag, Zn, Pb, Bi and Sb. Various details of procedure and an app. are described.

Treating iron ores. GRANULAR IRON CO. Fr. 640,917, July 26, 1927. The ore is passed through a no. of sloping rotatable cylinders, the crude ore and the treated ore both acting as hermetically sealing agents.

Treating vanadium ores. IRA M. PAUL (to Metal & Thermit Corp.). U. S. 1,606,923, Jan. 1. V ore in finely divided condition is heated with a hydrated alkali metal sulfide until the latter first melts in its H_2O of crystn. and then solidifies by loss of H_2O . The material may then be leached, the soln. purified by adding $\text{Al}_2(\text{SO}_4)_3$ and the V then pptd.

Treating ores of titanium, zirconium, etc. DEUTSCHE GASGLÜHLICHT AUER-GES. Brit. 291,004, May 23, 1927. Ores of Ti and of Zr and other rare earths are sulfatized with H_2SO_4 and the resulting sulfates are roasted to form oxides. SO_2 and SO_3 evolved are passed over finely divided ores in the presence of O or air to form addnl. sulfates and the partially sulfatized ore is then treated with H_2SO_4 . The process may be carried out in 2 rotary furnaces.

Treating flue gases obtained in smelting lead ores, etc. S. J. WARREN (to J. D. McLachlan). Brit. 291,079, May 28, 1927. Substances in smoke carrying Pb and S are converted into a product similar to "sublimed white lead" by a direct oxidation process, either while still carried by the smoke gases or after sepn. as by bag filters. Air or gases carrying addnl. S may be supplied as necessary to effect the desired oxidation or increase of sulfate content of the product. The Cd present may be rendered sol. but if the added S is in the form of a very stable sulfate the Cd may remain insol. Cf. C. A. 23, 216.

Extracting iron. ERNST DIEPSCHLAG. Ger. 470,015, Dec. 12, 1926. Fe is extd. from ore, slag or other materials by treatment with HCl gas and decomp. the volatile FeCl_2 compd. with H in the warm. The HCl and powd. ore are heated prior to the reaction to about 300° to avoid formation of FeCl_3 .

Separation of metals. PAUL RIBES and LÉON PIROT. Fr. 640,982, Sept. 14, 1927. White metals having a basis of tin are sepd. from bronze turnings by centrifuging in a closed vessel in a chamber heated so as to melt the tin.

Apparatus for separating gold and platinum from rock. A. M. CHEREPUKHIN. Russ. 4583, Feb. 29, 1928.

Recovering gold or platinum carried off during the washing process. S. M. KO-

LESNIKOV. Russ. 4608, Feb. 29, 1928. Sand contg. Au is passed over a 900-mesh sieve. The sifted material drops on to flowing water with a thin crude oil film (100–200 mm. below) whereby small particles of Au are held by the oil, from which they are removed by known methods.

Plant for opening up and washing ores. ILSEDER HÜTTE. Ger. 469,549, Nov. 19, 1928.

Precious metals and copper from cyanide solutions. LIONEL H. DUSCHAK (to Oliver Continuous Filter Co.). U. S. 1,699,350, Jan. 15. Cyanide solns. contg. Cu and precious metals are treated with an amalgam contg. a metal electropositive to Cu such as Zn or Na for a short period to remove the precious metals from the soln. and then treated with a sep. portion of an ama'gam of the same character for a longer period to remove the Cu; the treated soln. is used for treating a fresh quantity of ore.

Flux for aluminum. WILHELM REUSS. Ger. 468,540, Feb. 16, 1928. Addn. to 464,338. Ger. 464,338 describes a flux for Al comprising equal parts of borax, $B(OH)_3$ and caustic alkali. This compn. is now improved by addn. of a salt and of H_2SO_4 . For example, to an aqueous soln. of 10 g. each of borax, $B(OH)_3$ and caustic alkali in 70 cc. water there may be added 15 g. of NaCl and 1 g. of H_2SO_4 of 66° Bé. dissolved in 9 cc. of water.

Granulating molten slag. FRIEDRICH W. E. SPIES. U. S. 1,699,575, Jan. 22. Molten slag is brought into contact with water so as to form a spongy mass and the latter is then exposed to the action of a relatively cool gas stream such as air or steam to convert it into a substantially dry, granular form, suitable for manuf. of cement, bricks, etc.

Improving basic slag. JACOB LUKASCZYK. Ger. 469,609, Oct. 28, 1926. To increase the citric acid soly. of the slag, the Thomas process of steel manuf. is modified by adding to the charge, preferably shortly before the after-blow, a ferrous silicate slag, *e. g.*, reheating-furnace slag or tap cinder, in granular or liquid form.

Centrifugal sand-feeding machine for mold making. WILHELM KURZE. Ger. 469,346, July 31, 1926.

Parting material for foundry molds. CHARLES P. STAMM. U. S. 1,698,972, Jan. 15. Finely ground residual oil shale is used as a parting material.

Spraying device for applying mineral blacking to foundry molds. JAMES DEAN. U. S. 1,697,167, Jan. 1.

Pouring device for a centrifugal mold. CARL BILLAND. Ger. 469,199, Apr. 14, 1927. Details of arrangement.

Molds for casting metals. BRITISH MAXIUM CO., LTD. (Maurice-Noël Lacell, inventor). Fr. 641,962, Mar. 18, 1927. See Brit. 287,164 (*C. A.* 23, 368).

Two-part mold for casting metal boxes. WALTER HADDON and JOHN A. FULLILOVE. Ger. 469,572, Feb. 5, 1926.

Steel molds for centrifugal casting of iron pipes. J. H. UHRIG (to International De Lavaud Mfg. Corp., Ltd.). Brit. 291,759, June 8, 1927. The inner surface of the mold, in zones most likely to crack, is somewhat roughened and preferably also hardened as by a blast of spherical steel shot.

Retaining rod for interior mold pieces. THEODOR WEYMERSKIRCH. Ger. 469,569, Nov. 27, 1926.

Means for lifting the prepared mold from the pattern. SVEND DYHR. Ger. 469,567, May 8, 1926.

Hot top for ingot molds. MAX R. TREMBOUR. U. S. 1,696,986, Jan. 1. Structural features.

Bituminous material for making foundry models. CHEM. FABRIKEN WORMS A.-G. Ger. 469,292, Dec. 9, 1925. Coal pitch and S-contg. material, intimately mixed with the correct quantity of powd. kaolin or loam for setting, is used for the models. The brittleness is diminished by adding resin or wax.

Apparatus for molding bearing cages or other metal articles under pressure. HERMANN BARTHEL. U. S. 1,698,010, Jan. 8. Structural features.

Casting machine using compressed gas. JOSEPH SOSS. Ger. 468,621, July 10, 1924.

Centrifugal casting machine. SAND SPUN PATENTS CORP. Ger. 469,571, Sept. 13, 1925.

Centrifugal casting apparatus for making bearings or similar articles. NATHAN M. LOWER, WILLIAM H. STEELE and LOUIS P. MORRIS. U. S. 1,699,848, Jan. 22.

Apparatus for manufacture of die castings. CONRAD VAUGHAN. U. S. 1,697,741, Jan. 1. Structural features.

Apparatus for casting hollow ingots. HEINRICH LEMCKE. U. S. 1,698,308, Jan. 8.

Apparatus (with movable furnace and mold) for casting metal in molds. ROBERT KOLB. U. S. 1,698,441, Jan. 8.

Casting metal articles in molds. AUGUST KADOW (to Vacuum Casting Co.). U. S. 1,699,592, Jan. 22. Mech. features.

Casting iron or other metals in rotary molds. ROBERT B. DALE. U. S. 1,698,624, Jan. 8. Mech. features.

Casting gray iron. MASCHINENFABRIK ESSLINGEN. Brit. 291,112, May 27, 1927. In a casting process as described in Brit. 260,990 (C. A. 21, 3342), the C content is maintained unaltered for all, or sep. groups of, compns. and for all wall thicknesses and only the Si content is varied (increasing as the thickness decreases, according to a diagram which is given).

Casting steel tires on cast-iron car wheels or other metal articles without cracks, fissures or undue stresses. CERROL E. REINHARDT. U. S. 1,699,120, Jan. 15. Sufficient pressure is applied substantially throughout the period of solidification over all parts where greatest obstruction to normal contraction occurs, to prevent formation of fissures, cracks or undue internal stress. An app. is described.

Casting gears or like articles of manganese steel with soft-iron centers. WALTER H. NOURSE (to Electric Steel Foundry). U. S. 1,697,470, Jan. 1. Mech. features.

Casting automobile fittings from light-metal alloys. AUGUST SCHUSTER. Ger. 469,627, Sept. 14, 1927.

Unhardened castings formed in rotating metal molds. HENRI DOAT (to Compagnie générale des conduites d'eau). U. S. 1,699,612, Jan. 22. While the mold is rotating and before the introduction of the molten metal, a loose powder of ferro-Si alloy is introduced into the mold and the powder is held against the interior surface of the mold by centrifugal force; this protects the mold during casting and converts the white cast metal with which it contacts into gray cast metal without large excess of cementite.

Manufacture of pipes by centrifugal casting. CARL BILLAND. Ger. 469,570, Feb. 3, 1926.

Crucibles for molten metals. COMPAGNIE FRANÇAISE POUR L'EXPLOITATION DES PROCÉDÉS THOMSON-HOUSTON. Fr. 641,148, Sept. 20, 1927. Crucibles are made impermeable to molten metals by impregnating them with a liquid contg. C such as tar or pitch, then baking them to remove volatile constituents of the liquid.

Preventing sticking or freezing of foundry ladle plugs. WERNER STUDTE. Ger. 469,573, Sept. 28, 1926. The plug is impregnated with an easily inflammable material, e. g., gilsonite, which burns while the ladle is in use.

Furnace for heat-treatment of metal articles, etc. HARRY P. McCANN. U. S. 1,697,129, Jan. 1.

Muffle furnace for heat treatment of metals. A. SMALLWOOD and J. FALLON. Brit. 291,270, Sept. 20, 1927. Structural features are given of a furnace comprising preheating, heating and cooling sections.

Crucible furnace. ANTON SCHAUER and HERMANN FRITZ. Aust. 109,688, Jan. 15, 1928. The heating gases circulate through an annular space, the bottom surface of which supports the crucibles and is rotatable.

Fusion furnace for copper, manganese, etc., using liquid fuel. GEORGES REGNAC-P. Fr. 641,556, Aug. 12, 1927.

Pit furnace suitable for heating ingots. GOTTFRIED KEHREN. U. S. 1,698,367, Jan. 8.

Smelting furnace. MAX KIENE, JR. Ger. 468,463, July 1, 1926. A smelting furnace having an inner trough is fitted with independent burners for the internal and the external heating of the trough, the burners for internal heating being movable.

Cupola furnace suitable for melting pig iron, steel, scrap metal, etc. G. SIMON. Brit. 291,248, July 21, 1927.

Metallic lock for the discharge opening of a cupola furnace. D. I. YERSHOV. Russ. 1897, Mar. 31, 1928.

Martin furnace with air-cooled cupola and supports. I. V. LEONT'EV-LEVIN. Russ. 5092, Apr. 30, 1928.

Tunnel furnace for annealing. H. A. PROCTER. Brit. 291,570, April 9, 1927. Structural features.

Tunnel annealing furnace suitable for heating wire coils. BRITISH FURNACES, LTD. AND E. W. SMITH. Brit. 291,909, March 23, 1927.

Continuous furnace for heating small metal articles to effect hardening, annealing, etc. R. M. HEAMES, H. STARK and B. W. LINDQUIST (to Surface Combustion Co.). Brit. 291,446, June 2, 1927.

Furnace, quenching tank and associated apparatus for hardening shafts such as

automobile rear axles. HARRY O. LANG and JOHN McGEORGE (to General Motors Corp.). U. S. 1,697,820, Jan. 1.

Apparatus for heat treatment of bars of tungsten or other metals. EMILIO ROMANELLI (to Westinghouse Lamp Co.). U. S. 1,698,824, Jan. 15.

Furnace suitable for heating long metal bars or tubes. A. SMALLWOOD and J. FALLON. Brit. 291,153, Feb. 25, 1927.

Furnace for heat-treating wire. OSCAR C. TRAUTMAN. U. S. 1,700,002, Jan. 22

Heat treatment of metal wire. A. G. BROWN, BOVERI ET CIE. Swiss 127,086, June 2, 1927. The treatment is carried out in an elec. heated oven having tubes for the inlet and outlet of indifferent gas and perforated partitions of good heat-conducting material on which the layers of wire are placed.

Heat treatment of metal bands. MANSFELD AKT.-GES. FÜR BERGBAU UND HÜTTENBETRIEB AND OTTO BUSSE. Swiss 127,087, June 11, 1927. The bands are heated on a heat-resistant support arranged above the furnace hearth and capable of taking up impurities, splinters, etc., from the bands. The support may be an endless belt of asbestos on which the bands are conveyed through the furnace. Cf. C. A. 23, 89.

Heat treatment of ball races or other metal articles. A. HILGER, LTD., AND F. TWYMAN. Brit. 291,483, Jan. 27, 1927. Heat is applied during the cooling of the heated articles, to prevent too rapid cooling; an app. is described in which the articles are handled automatically and continuously by electromagnetic force generated by the elec. heating means.

Iron penetrable by nails, etc. J. HUNDHAUSEN. Ger. 469,626, Apr. 17, 1927. Iron is made penetrable by nails or screws by incorporating heat-resistant non-metallic substances, e. g., SiO_2 , Al_2O_3 , MgO , talc, graphite, or asbestos in such a way that they appear in strips on the surface of the finished product.

Hardening iron or steel. DEUTSCHE GOLD UND SILBERSCHNEIDANSTALT VORM. ROESSLER. Brit. 291,423, June 4, 1927. A process as described in Brit. 277,030 (C. A. 22, 2351) is carried out at temps. of 900° or higher and local overheating of the bath is avoided by adjusting the heating flame so as to avoid pointed flames, and the addn. of a froth-preventing agent is dispensed with. The surface of the bath may be protected from the air by a protective layer which may be formed by adding graphite. Cf. C. A. 23, 368.

Hardening composition for iron and steel. FRANZ KRUSEK. Aust. 111,239, June 15, 1928. The compn. comprises 54-36% powd. wood charcoal, 22-26% NaCN , 10-15% colophony, 12-18% graphite, and 2-5% NH_4Cl . It can be applied either in case-hardening processes or by blazing off.

Steel. F. SIEMENS A.-G., R. DURRER, F. C. SIEMENS and A. SPRENGER. Brit. 291,717, Dec. 24, 1926. In producing steel in a Siemens-Martin furnace, dust from coal poor in gas, semi-coke or "poor coal" or coke is introduced into the furnace at least from the termination of the refining stage so as to form a protective layer over the bath. Various details and modifications of operation are described.

Steel ingots. CHARLES A. PARSONS. Fr. 641,505, Sept. 27, 1927. Molten steel is poured into a mold of greater length than height, a thick refractory material covering the sides of the mold, and the base being of large dimensions and in metal. The mold is heated before pouring in the metal to about the temp. of the molten metal, and the upper surface of the metal is heated continuously so that it is last to solidify. Heaters may be built into the sides of the mold.

High-speed steel. HERMAN J. BIEFANG. U. S. 1,699,683, Jan. 22. In order to facilitate hardening of high-speed steel it is immersed in a molten bath of Cu 7 and Pb 1 part for about 20 mins. in the case of a piece 0.5 in. thick, at a temp. between the m. p. of the bath and about 980° .

Hollow rock drill steel. LESLIE PRYCE. U. S. 1,697,086, Jan. 1. See Can. 284,179 (C. A. 23, 592).

Manufacture of chrome steel. EMIL HERGET. Aust. 110,259, Mar. 15, 1928. The manuf. of Cr steel from a mixt. of Cr_2O_3 and ferrosilicon is carried out, without other addns., in a furnace without an acid lining.

Vanadium steel. ALEXANDER L. FEILD (to Electro Metallurgical Co.). U. S. 1,697,759, Jan. 1. Uncombined V oxide is brought into contact with a steel bath in the presence of only such reducing agents as are normally present in a steel bath and the material is maintained in molten condition for a sufficient time to permit the desired quantity of V to become incorporated in the steel.

Nickel manganese steel. CHARLES MCKNIGHT, JR., THOMAS H. WICKENDEN and PAUL D. MERICA (to International Nickel Co.). U. S. 1,697,130, Jan. 1. An alloy steel capable of developing in heavy sections high physical properties and ductility, by mild

heat treatment, and suitable for heavy forgings, etc., contains Ni 0.5-3.5, C 0.1-0.6 and Mn 0.9-2.0%.

Tempering powder for steel. ENGELBERT GASTINGER. Austrian 110,591, Apr. 15, 1928. The powder contains beech-wood charcoal 50, anthracite 20, Na_2CO_3 25 and NaNO_3 5%.

Apparatus for heat treating steel, etc. JOHN B. DAILEY. U. S. 1,697,811, Jan. 1.

Alloy. FRIEDRICH EICHLEITER. Austrian 111,204, June 15, 1928. A resistant alloy, particularly for the condenser tubes of marine engines, comprises 48-55% Cu, 3-10% Ni, 0-3% Mn, 1-2% Fe, 0-1% Al and the remainder Zn, the amt. of Zn being over 40%. The preferred compn. is Cu 52, Ni 3, Mn 1, Fe 1, Al 0.5 and Zn 42.5%.

Alloys. ALFRED KROPP. Swiss 127,586, Jan. 15, 1927. Alloys of high m. p. contain C, W and at least one other metal. The proportions are 1.5% C, 50% and upward W, and 0.5 to 50% Mo, Ta, Co, Cr, Ni, Fe, V and Si. Cf. C. A. 22, 1568.

Alloys. FRIED. KRUPP A.-G. Fr. 642,203, Oct. 12, 1927. Alloys to be used for tools, etc., contain the heavy metal forming the principal constituent in the form of the carbide but contain no free graphite. Thus, W is carburized with the calcd. amt. of C in an elec. furnace in an atm. of H, and the carbide is utilized by adding the required amt. of softer metals. Fr. 642,204 describes a method of making an alloy whose fracture at a magnification of 50 does not show pores. Thus, a heavy metal, e. g., W and a softer metal such as Co are separately ground so that each particle is less than 10^{-4} mm.; the W is carburized, ground as before and mixed with the Co and again ground, after which the articles to be made are formed in a press and submitted to a fritting.

Alloys. WILLOUGHBY S. SMITH, HENRY J. GARNETT and JOHN A. HOLDEN. Fr. 641,620, Sept. 28, 1927. Alloys of the Fe group are made by introducing an ore or oxide of the metal or metals of the alloy with a reducing agent into the charge of molten metals, the reduction preferably taking place in a reducing atm. without a slag. To make, e. g., an anti-rust Fe contg. 12% of Cr, steel is melted in a reducing atm. in an induction furnace, and calcined powdered chromite mixed with a reducing agent such as terosilicon is added. After the chem. action has taken place the slag formed is removed and the cycle of operations continued until the desired alloy is produced. Fr. 641,621. See Brit. 282,901 (C. A. 22, 3877).

Alloys for fusing in or on glass. HERAEUS-VACUUMSCHMELZE A.-G. Ger. 469,630, June 8, 1927. Fe-V alloys contg. 20-30% V, or Fe-Cr-V alloys contg. 10-40% Cr and 20-50% V are used.

Treatment of copper-beryllium alloys. SIEMENS & HALSKE A.-G. (Georg Masing and Otto Dahl, inventors). Ger. 468,688, May 22, 1926. Cu-Be alloys contg. 0.5-11% Be, with or without other addns. such as Zn up to 25%, or Ni, Al or Sn up to 10%, are improved as regards hardness and resistance to corrosion by heating them to above 600° and rapidly cooling. The alloys may be further modified by heating at 150-500°.

Alloys for making springs and parts of plants subjected to friction, especially electrical contacts. SIEMENS & HALSKE A.-G. (Georg Masing and Otto Dahl, inventors). Ger. 469,218 and 468,219. May 23, 1926. Addns. to 468,688. Cu-Be alloys treated according to Ger. 468,688 (preceding abstract) are used.

Fusible alloys for use in safety devices. RUDOLF KELLER. Swiss 127,385, Nov. 9, 1926. Sn-Pb alloys for use in safety devices are improved by addn. of Sb, suitably in amts. of 2-15%, whereby the interval between the m. p. and the softening point of the alloys is diminished. Addns. of Bi and Cd may also be made.

Alloy for high-speed tools. PERCY C. CHESTERFIELD (to Chesterfield Metal Co.). U. S. 1,698,935, Jan. 15. Alloys are formed contg. Co 15-50, Ni 7-30, Cr 20-45 and Mo 35%, together with a small quantity of C (suitably about 0.5-3.5%). U. S. 1,698,936 describes alloys contg. Co 15-55, Ni 7-30, Cr 20-45, together with a metal not of Cr group such as V capable of forming a hard carbide and having a m. p. between 1000° and 2100°, with a small quantity of C (suitably about 0.5-3.5%).

Alloys suitable for high-speed tools. PERCY C. CHESTERFIELD (to Chesterfield Metal Co.). U. S. 1,698,934, Jan. 15. Alloys are formed contg. Ni and Co which together constitute about 40% of the alloy, together with about 30% each of Cr and W and some C (suitably about 0.5-3.5%).

Aluminum alloys. COMPAGNIE DE PRODUITS CHIMIQUES ET ÉLECTROMÉTALLURGIQUES ALAIS, FROGES ET CAMARGUE. Fr. 641,200, Mar. 2, 1927. Wires of Al alloys such as Al Mg₂Si, Al-Cu, Al-Li, etc., are made suitable for elec. conductors by raising them to a temp. of 150-175° after tempering and before cold-hammering.

Aluminum alloy. VEREINIGTE ALUMINIUM-WERKE A.-G. Fr. 641,005, Sept. 15, 1927. An Al alloy resistant to corrosive agents and sea water contains 0.05-1% of Ti and 1 to 6% of Mg. The Ti may be alloyed in the electrolytic bath.

Improving objects of aluminum or its alloys. BOHUMIL JIROTKA. Ger. 469,534, June 8, 1926. The appearance of objects of Al or its alloys is improved by immersing them in a bath of concd. HNO_3 or in a bath contg. HNO_3 and heavy-metal salts. According to the nature and concn. of the bath, brighter, duller, or iridescent durable surface layers of different colors may be obtained. E. g., an iridescent green surface layer is obtained by immersion for about 1 hr. in a bath comprising 5 g. $\text{Cr}_2(\text{SO}_4)_3$ dissolved in 50 cc. H_2O and mixed with 1 l. HNO_3 of sp. gr. 1.40.

Forge-iron alloy. THE INTERNATIONAL NICKEL COMPANY. Fr. 642,626, Oct. 20, 1927. The physical properties of forge iron are improved by the addn. of 0.25–5% of Ni, up to 1% of Cr or Mo, or Cu may also be added. The content of C should be below 0.08%.

Method for obtaining decarbonized iron-carbon alloys, particularly cast iron, in the cupola furnace. A. P. VOLKOV. Russ. 4628, Feb. 29, 1928.

Heat-resisting alloy containing iron, chromium and nickel. NOAK V. HYBINETTE. U. S. 1,698,098, Jan. 8. Alloys which are highly resistant to oxidation when heated contain approx. 30% Cr and 35% Ni, the remainder of the alloy being principally Fe. The alloys are heat resistant at high temps. in the presence of alkali salts. Cf. C. A. 22, 3128.

Bearing alloys containing lead. W. J. MERTEN (to Metropolitan-Vickers Electrical Co., Ltd.). Brit. 291,462, June 4, 1927. Alloys such as bronzes contg. Sn 2–10 and Pb 10–28% are melted with CaC_2 in order to effect uniform distribution of the Pb. About 2% of the CaC_2 is sufficient.

Magnesium and its alloys. GILBERT MICHEL (to Hart O. Berg). U. S. 1,698,647, Jan. 8. In purifying Mg and its alloys, complexes with the oxychlorides and oxides in the bath are formed by admixture with MgF_2 acting as the main purifier and the complexes are collected at the surface of the bath.

Treatment of alloys containing silicon. OTTO H. DÖBNER. Swiss 126,451, Apr. 11, 1927. The elec. properties of the alloys are improved by subjecting them once or more to "critical cold working" followed by heating to the recrystn. temp., which must be ascertained. In connection with "critical cold working" cf. A. von Vegesack, *Stahl u. Eisen*, 1923, 1280.

Tungsten alloys. HENRY L. COLES and JOSEPH G. DONALDSON (to Guardian Metals Co.). U. S. 1,698,212, Jan. 8. Alloys contg. over 60% W and contg. 10–25% Ni and which also may contain C or carbides and Cu are incased in a different metal such as Cu which has a materially higher heat cond. than the W-Ni alloy, in order to form composite plates for safe or vault walls, etc.

Alloy steels. JOHN L. ANDREN. U. S. 1,699,731, Jan. 22. A mixt. of Fe ore, ore contg. alloying metal such as Mn, Cr, Mo or V, approx. the quantity of coal required to reduce the ores and give the desired C content in the finished product is heated to a temp. sufficient to reduce the ores but below the m. p. of the metals in an externally heated container, and the metals are thereafter melted.

Steel alloys. JOHN HARRIS. Fr. 641,852, Oct. 5, 1927. A steel alloy for articles resistant to heat contains Fe and Cr 16, W 4.5, Si 0.7, Mn 0.8, S 0.006, P 0.004, Ni 5.5, C 1.75. The above figures may be varied somewhat.

Ferrocerium. SIGMOND GOLDFINGER. Fr. 641,940, Mar. 14, 1927. Ferrocerium is made unalterable by treatment in a galvanoplastic bath contg., e. g., double sulfate of Ni and NH_4 725, $(\text{NH}_4)_2\text{SO}_4$ 225 and citric acid 25 g. in 10 l. of water. The impurities are removed and a coating is deposited in the pores.

Brass. OTTO JUNKER. U. S. 1,699,665, Jan. 22. Brass-forming metals comprising more than 63% Cu and less than 37% Zn are melted in the presence of soot and stirred while molten to effect thorough deoxidation.

Core for use in making hollow metal rods. A. P. PEHRSON and F. LLOYD. Brit. 291,147, Feb. 24, 1927. In forming hollow metal rods or bars by rolling, forging or drawing, from hollow billets, blooms or ingots, a core is used comprising an asbestos tube or cylinder filled with friable material such as sand. Cf. C. A. 22, 1323.

Hollow metal bars. R. A. BEDFORD. Brit. 290,951, Feb. 7, 1928. In making hollow metal bars such as those formed of tool steel by rolling a hollow billet on a core of ductile metals such as Cu, the core, after insertion in the billet and before rolling, is compressed, to avoid tendency of the billet during rolling to produce "blind" or waste ends. Various mech. features are specified.

Hollow metal bars. A. P. PEHRSON, F. LLOYD and L. T. BREARLE. Brit. 291,161, Feb. 28, 1927. In the manuf. of hollow metal bars by reducing a billet on a core of austenitic steel as described in Brit. 273,008 (C. A. 22, 1754) the billet and core are heated to different temps. prior to reduction in order that the core may be readily elongated

during the reduction and may be of the required ductility for withdrawal from the finished bar. The core may be heated to about 1150–1250° and the billet to about 950–1100°.

Cold rolling of metal bands or strips. O. BUSSE. Brit. 291,323, Dec. 3, 1927. A cooling liquid (suitably heavy oil or glycerol or a mixt. of oil and water) is supplied directly to the roll surfaces. An app. is described.

Detection of unhomogeneous spots in metals with x-rays. E. Z. KAMINSKII. Russ. 3703, Sept. 30, 1927.

Fusing aluminum waste. KURT ALBRECHT. Swiss 127,078, June 30, 1927. Flawless ingots are obtained from Al waste by fusing it in a bath of a mixt. of NaCl, NaF and CaF₂ which is specifically lighter than Al. A suitable bath comprises 60 parts NaCl, 3 parts NaF and 1 part CaF₂, this mixt. melting at 740–760°. The packed waste may be preheated and cleaned by the gases and vapors evolved from the bath.

Working zinc foil. GEBRÜDER REISS. Austrian 110,841, May 15, 1928. In working Zn foil, especially in making hollow bodies of light wt. for pocket batteries, the tendency of the metal to tear is overcome by using, instead of oil, an aq. soln. of soap and soda, with or without glycerol. A suitable soln. comprises 50–60 g. curd soap and 30 g. soda in 500 g. water, to which 30 g. glycerol may be added.

Treatment of non-ductile metals. RUDOLF AUERBACH and WILHELM STEINHORST. Ger. 469,358, Mar. 8, 1928. Non-ductile metals such as Cr are powdered and mixed with a binding agent, *e. g.*, gelatin, and the mixt. is pressed through nozzles into a hardening agent, *e. g.*, Cr alum soln., fibers or bands being so obtained. Reference is made to the similar treatment of mixts., *e. g.*, Cr and Ni and C, or Cr, Fe, Ni and C, and to the manuf. of alloys from the products.

Spherical metal particles. EMIL PODSZUS and ERWIN KRAMER (to Hartstoff-Metall A.-G. (Hametag)). U. S. 1,699,205, Jan. 15. Flake-shaped particles of metal are subjected to an operation such as a rubbing and rolling together in a cylinder which will gradually turn over their edges and convert the particles into hollow spheres which are suitable for making magnet cores, dynamo brushes, etc.

Mercury. ITALO CAVALLI. Fr. 641,178, Sept. 22, 1927. Hg is extd. from poor ores or waste by concg. the finely divided material by levigation and treating with a soln. of NaOCl, which oxidizes the HgS to HgSO₄.

Machine for testing the tensile strength of tin. RENÉ GUILLERY. Ger. 469,058, Feb. 15, 1927. Details of construction.

Manufacture of iron sheets containing silicon or boron, especially core sheets. SIEMENS & HALSKE A.-G. Ger. 469,368, Jan. 10, 1925. Thin sheets of Fe are treated at a raised temp. with gaseous compds. of Si or B with H. The Si or B pptd. on the sheets may be incorporated by tempering *in vacuo*.

Apparatus for quenching articles of ferrous metal. ROY H. SMITH. U. S. 1,698,858, Jan. 15.

Ferrous metal containing molybdenum. WILLIAM H. PHILLIPS (to Molybdenum Corp. of America). U. S. 1,697,083, Jan. 1. A hard, tough coherent and adherent nitrogenized surface is formed on articles of ferrous metal contg. Mo. The Mo facilitates the nitrogenization and lessens the time required for it. Al may also be added.

Magnetic material. WESTERN ELECTRIC Co. (Standard Telephones & Cables, Ltd.) Brit. 290,736, Feb. 19, 1927. A magnetic material which can readily be reduced to fine particles for forming cores of telephone loading coils and the like is made from a Ni-Fe alloy contg. at least 10% of Fe or Ni by adding to the molten material a substance (such as Sb 5–8%) which will render it brittle. Numerous details of treatment including use of deoxidizers, etc., are given.

Metallic reflectors. WILLIAM E. WUELKER. U. S. 1,697,216, Jan. 1. After cleaning a metal reflecting surface such as Al the metal is treated or pickled (suitably with H₂SO₄ and HNO₃), polished and then brushed with a wire brush. The process is suitable for making reflectors of spotlights, etc.

Gramophone needles pointed with chromium. G. GÖFLER (to W. Tuchmann). Brit. 291,755, June 8, 1927.

Coating metals. MAX LEHNIG. Fr. 641,349, Sept. 23, 1927. A coating on metals which is resistant to chem. influences is composed of a mixt. with artificial resin or substances forming it of an emulsion of sol. glass, clay, metallic oxides, Si compds. or other mineral substances. The final hardening preferably takes place in a bath of oil of high b. p., *e. g.*, castor oil.

Smooth metal coatings, particularly for photographic purposes. MAX ULRICH SCHOOP. Swiss 127,548, June 14, 1927. Finely powd. metal intimately mixed with

explosive gas is blown on to the object and melted. The app. comprises a mixing nozzle into which the powder and gas are conducted.

Protecting adsorption vessels against corrosion. WACLAW DEMEL. Ger. 468,389, Oct. 16, 1926. Iron adsorption vessels, for instance vessels in which gasoline is adsorbed in active charcoal, are protected against corrosion by fixing to the inner wall of the vessel, to the grate carrying the charcoal, and to the heating coil a no. of pieces of a metal more electropositive than iron, such as Zn. It is found that these pieces are preferentially corroded.

Rust-removing compositions. I. G. FARBENIND. A.-G. Ger. 468,598, Jan. 6, 1926. Addn. to 466,077. Rust-removing compns. prepd. according to Ger. 466,077 are improved by addn. of a soln. of a fatty acid in an org. solvent, particularly a soln. of oleic acid in hexalin. The addn. prevents re-formation of rust.

Rust-removing compositions. I. G. FARBENIND. A.-G. Ger. 468,599, May 29, 1926. Addn. to 466,077. Rust-removing compns. prepd. according to Ger. 466,077 are improved by addn. of substances which delay the drying of the compn. on the treated surface. Suitable addns. are CaCl_2 , MgCl_2 , PhOH , glycerol and glycol.

Galvanizing bath heated internally by heat-conducting bars of iron and aluminum. N. K. TURNBULL. Brit. 291,961, June 14, 1927. Structural features.

Plating rustless chrome or chrome-nickel steel with iron or other base metal. GUSAV SEIDL. Austrian 110,685, Jan. 15, 1928. The plates to be united are encased in iron coated with Al, Cr or Ni, or in rustless steel, before introducing them into the smelting furnace.

Aluminum plating and welding sheet iron. FRANZ JORDAN. U. S. 1,699,434, Jan. 15. Sheet iron is plated with Al and pieces of the plated material are elec. welded without addition of other welding materials at a temp. at which the iron melts and the Al is converted into oxide which is permitted to combine with molten iron to effect the welding.

Welding iron. BOHLER & Co. A.-G. Austrian 109,975, Feb. 15, 1928. The welding pieces contain 0.1 to 15% Al.

Solder. JAMES SILBERSTEIN (to Westinghouse Elec. & Mfg. Co.). U. S. 1,699,761, Jan. 22. A solder suitable for use with Cu comprises Ag 0.25-5 and Cu about 0.25-10%, together with Pb and minor impurities. The solder m. 301-325°.

Solder for cast iron and other metals, for surfacing them. JEREMIAH BUTLER (one-half to Isaac P. Walton). U. S. 1,697,714, Jan. 1. A compn. suitable for soldering or welding cast iron is formed of ground steel 3, pure Pb 1.5, block Sn 1.5, flux of steel and emery (approx. equal proportions) 2, tobin bronze 1.5, plaster of Paris 1, borax 1, Epsom salt 1.5 and salt 0.5 part.

Flux-cored solder. JOHN H. ADAMS (to Western Electric Co.). U. S. 1,697,815, Jan. 8. Extruded soldering material is made with a core of enamel-removing flux comprising naphthalene 1 and rosin 2 parts.

Composition for soldering aluminum. JEREMIAH BUTLER (one-half to Isaac P. Walton). U. S. 1,697,715, Jan. 1. Steel filings 16, block tin 400, steel 0.5, borax 3.5, plaster of Paris 4, salt 16 and Ag 12 oz.

Soldering stick. HERMANN A. MEINHARDT. U. S. 1,699,438, Jan. 15. An outer casing of soldering metal contains a core of soldering metal of higher m. p. than that of the casing, and the core also carries a fluxing agent. Cf. C. A. 22, 3625.

Electrodes for arc welding. COMPAGNIE FRANÇAISE POUR L'EXPLOITATION DES PROCÉDÉS THOMSON-HOUSTON. Fr. 640,991, Sept. 15, 1927. The properties of the electrodes are improved by immersion in a bath of molten NaNO_3 , KNO_3 or $\text{Ca(NO}_3)_2$.

Coating electrode for arc welding. D. A. DULCHEVSKII. Russ. 4708, Feb. 29, 1928. Electrodes are coated with a mixt. of 25-75% of vegetable sugar and 75-25% of lime.

10—ORGANIC CHEMISTRY

CHAS. A. ROUILLER AND CLARENCE J. WEST

Reactions of simultaneous reduction and oxidation, and isomeric transformations. A. E. FAVORSKII, V. VASIL'EV, A. I. UMNova, E. KOCHERGINA AND E. VÉNUS-DANILOVA. *J. Russ. Phys. Chem. Soc.* 60, 369-414(1928).—See C. A. 22, 3136, 4199, 4472, 4473. E. J. C.

The synthesis of methane from carbon monoxide and hydrogen by nickel. H. A. BAHR AND TH. BAHR. *Ber.* 61B, 2465-9(1928).—A mixt. of CO-H_2 in a ratio of 1:3 is passed over a Ni_3C catalyst at 250°. This catalyst is much less sensitive than Saba-

tier's Ni catalyst for the same reaction. The Ni_3C catalyst is pyrophoric and therefore must be handled in an atm. of inert gas, as N_2 . The reactions occurring are: $2\text{CO} + 2\text{H}_2 = \text{CH}_4 + \text{CO}_2$; $\text{CO} + 3\text{H}_2 = \text{CH}_4 + \text{H}_2\text{O}$; $\text{Ni}_3\text{C} + 2\text{H}_2 = \text{CH}_4 + \text{Ni}_3$; and $2\text{CO} = \text{C} + \text{CO}_2$. After a short period of operation the initial catalyst Ni_3C is reduced to Ni, but again reacts to give Ni_3C . The main reactions are (1) $\text{Ni}_3 + \text{CO} = \text{Ni}_3\text{C} + \text{O}$ and (2) $\text{Ni}_3\text{C} + 2\text{H}_2 = \text{CH}_4 + \text{Ni}_3$. J. H. PERRY

Formation of allyl alcohol. Preparation of formates of glycerol. RAYMOND DELABY AND PIERRE DUBOIS. *Compt. rend.* 187, 767-9(1928).—Allyl alc. is obtained from glycerol by the HCO_2H method with higher yields than reported in the literature. [No figures are given but the method is claimed to be even better than that given by Kamm and Marvel, *Org. Syntheses* 1, 15. ABSTRACTOR.] The formation of formates as intermediary products is evident since the following compds. were isolated: a monoformate of glycerol, b_{10} 154-7°, d_4^{20} 1.3052, $n_D^{12.5}$ 1.4614; a diformate (chief reaction product), b_{18} 148-9° d_4^{20} 1.3209, $n_D^{23.4}$ 1.4492. No triformate was observed. Syntheses have been made of: 1-glyceryl formate, from the 1-chlorohydrin and HCO_2Na ; it is unstable, decomp. 150° during vacuum distn.; 1,3-glyceryl diformate, from 1,3-dichlorohydrin, b_{11} 144-6°, d_4^{20} 1.3218, $n_D^{18.3}$ 1.4486, very hygroscopic, sol. in EtOH , Me_2CO , little sol. in Et_2O , insol. in C_6H_6 ; 1,2-glyceryl diformate, from 1,2-dibromohydrin, b_{17} 151-3°, d_4^{20} 1.3252, d_4^{17} 1.3214, n_D^{17} 1.4503, same soly. characteristics as the 1,3-compd. The yields of these syntheses are very poor. ALBERT L. HENNE

The preparation of neutral sulfuric esters. R. LEVAILLANT. *Compt. rend.* 187, 130 2(1928); cf. *C. A.* 22, 3880.—Adding PrOH to SO_2Cl_2 (I) in the cold gives 70% PrOSO_2Cl (II), b_{16} 65°, b_4 44°, $n_D^{19.6}$ 1.4214, $d_4^{17.5}$ 1.288. PrNO_2 with II at 80° gives 32% Pr_2SO_4 , b_4 90-94°. I with $\text{HOC}_2\text{H}_4\text{Cl}$ gives 70% $\text{ClC}_2\text{H}_4\text{OSO}_2\text{Cl}$ (III), b_{23} 101°, d_4^{20} 1.4587, $d_{20.8}$ 1.552. $\text{ClC}_2\text{H}_4\text{NO}_2$ with III gives 40% $(\text{ClC}_2\text{H}_4)_2\text{SO}_4$, $b_{3.6}$ 130°, n_D^{20} 1.4620, d_{20} 1.481. D. H. POWERS

The constitution of organic magnesium compounds. QUINTINO MINGOIA. *Istituto Chimico-Farmaceutico, Reale Univ., Pavia. Gazz. chim. ital.* 58, 532-41(1928).—The results obtained by Kierzek (cf. *C. A.* 22, 573) in the hydrolysis of MeMgI suggest that the unstable white ppt. is HOMgI , and that the latter during the extn. with Et_2O decomps. to $\text{Mg}(\text{OH})_2$ and MgI_2 . On this supposition the action of $\text{C}_6\text{H}_5\text{N}$ and quinoline bases on the decompn. product of MeMgI and water was studied. If MgI is formed directly, as believed by Kierzek, then with $\text{C}_6\text{H}_5\text{N}$, either $[\text{Mg}(\text{C}_6\text{H}_5\text{N})_6]\text{I}_2$ or

$\left[\begin{array}{l} (\text{C}_6\text{H}_5\text{N})_4 \\ \text{Mg} \\ (\text{EtO})_2 \end{array} \right] \text{I}_2$ should be formed (cf. Spacu, *C. A.* 17, 1395, 2090). On the other

hand, HOMgI should not form addn. compds. with $\text{C}_6\text{H}_5\text{N}$. Mg (2.4 g.) dissolved in EtBr (11 g. in twice its vol. of Et_2O), water (1.8 g.) added cautiously while cooling, heated on the water bath several min., anhyd. $\text{C}_6\text{H}_5\text{N}$ (15.8 g. freshly distd.) in Et_2O added, heated on the water bath several min., cooled, the ppt. washed with anhyd. Et_2O , extd. in a Soxhlet for 10 hrs. with anhyd. Et_2O , washed with Et_2O and dried *in vacuo* over H_2SO_4 yielded a product which contained no N, and which was either HOMgBr or a mixt. of MgBr_2 and $\text{Mg}(\text{OH})_2$. Analysis showed that it was neither (25.01% Mg , 44.61% Br), and moreover MgBr_2 was found in the residue obtained by evapn. of the Et_2O in the Soxhlet, and concn. of the Et_2O used for the original washing yielded nearly all the $\text{C}_6\text{H}_5\text{N}$. Therefore no $\text{C}_6\text{H}_5\text{N}$ addn. compd. is formed, and the stability of HOMgBr is a function of the time and temp., for though it may be formed at first, it decomps. into MgBr_2 and $\text{Mg}(\text{OH})_2$ during the extn. with Et_2O . For the prepn. of BrMgSH , a method already described by M. (cf. *C. A.* 20, 879) was used. Addn. of anhyd. $\text{C}_6\text{H}_5\text{N}$ (2 mols. freshly distd.) in Et_2O , heating for 2 hrs. on the water bath, extn. for 10 hrs. in a Soxhlet with anhyd. Et_2O and drying *in vacuo* over H_2SO_4 yielded the compd. $\text{C}_{10}\text{H}_{11}\text{N}_2\text{SMgBr}$, which conforms perfectly with previous results. The reactions support the view that org. Mg compds. have an asym. structure (cf. Grignard, *C. A.* 21, 731, 3894; Terentiev, *C. A.* 21, 564; Ivanov, *C. A.* 21, 3893; Meisenheimer and Schlichenmaier, *C. A.* 22, 2365). C. C. DAVIS

Some factors influencing the yields of *tert*-butylmagnesium chloride and *tert*-amylmagnesium chloride, and the preparation of acids obtained from them and carbon dioxide. H. GILMAN AND E. A. ZOELLNER. Iowa State College, Ames. *Rec. trav. chim.* 47, 1058-63(1928).—Previously G. and McCracken (*C. A.* 17, 3859) had shown that the yield of organomagnesium halide decreases with increasing branching of the alkyl group, the normal halide giving higher yields than the secondary and the secondary higher yields than the tertiary. The 2 outstanding exceptions to this general

rule are Ph_3CCl and PhBr , which, under optimal conditions (cf. C. A. 17, 531), give yields of 90%. For *tert*-Bu and *tert*-Am chloride low yields of the Grignard compds. have always been recorded in the literature and these prepn. were now improved considerably by G. and Z. The following factors are of importance: (1) temp.: in both cases (cf. C. A. 22, 942) better yields are obtained when the reaction mixt. boils during the addn. of the *tert*. chloride, continuous stirring being, of course, applied; (2) amount of ether: in small runs (0.1 mole) 7-8 moles of ether are to be used, with 1-2 moles of the chloride 6 moles and with larger quantities 5 moles of ether; (3) rate of addn. of the org. chloride: the soln. of the org. halide in ether is to be added slowly, the yield of the Grignard reagent decreasing continuously with increasing velocity of the addn. of the halide soln.; (4) kind of Mg: the yields of Grignard compds. are the higher, the more finely divided the Mg, finely divided Mg powder giving better results than the commercially available Mg turnings; the highest yield was obtained with 200-mesh powd. Mg, prepd. directly before use. Excellent yields having been obtained in the prepn. of allylmagnesium bromide by the use of 2-3 atoms of fine Mg, it seems reasonable to predict that a liberal excess of Mg will give still better results. The yield of $\text{Me}_2\text{EtCCO}_2\text{H}$ was 53% and the highest yield of $\text{Et}_2\text{CCO}_2\text{H}$ 69.5%. C. F. v. D.

Reply to H. Reihlen [univalent iron]. W. MANCHOT AND H. GALL. Techn. Hochschule, München. *Ann.* 465, 304-5(1928).—Polemical; cf. C. A. 22, 1134, 4476; 23, 1073. C. J. WEST

The action of ketones upon mercuric iodide in alkaline medium. E. MONTIGNIE. *Bull. soc. chim.* 43, 1115-7(1928).—Five g. HgI_2 , 1.0 g. KOH , 70 g. H_2O and 1.0 g. Me_2CO added together, shaken thoroughly and boiled for 10-15 mins., gave a compd. $\text{MeCOCHHg}_2\text{I}_2$, insol. in all solvents, which begins to decomp. 180° , turns black 210° and at 250° is entirely volatilized. The reaction is characteristic of all ketones, having been repeated with MeCOEt , a mixt. of $\text{MeCOC}_7\text{H}_{15}$ and $\text{MeCOC}_8\text{H}_{17}$, $\text{CH}_2:\text{CMe}(\text{CH}_2)_3\text{COMe}$, MeCOPh , $\text{PhCH}_2\text{CH}_2\text{COMe}$, MeCOCH_2Ph , $\text{PhCH}:\text{CHCOMe}$, Ph_2CO , cyclohexanone, camphor and antipyrine. This reaction is specific and sensitive enough to be used in detg. Me_2CO in urine. R. C. ROBERTS

The stereochemical hypothesis of Hantzsch and Werner in its relation to experimental facts and the constitution of isomeric oximes. GARTANO MINUNNI. Reale Univ., Catania (Sicily). *Gazz. chim. ital.* 58, 504-21(1928).—Recent researches by various workers on aldoximes and ketoximes have raised problems of constitution which were previously considered settled by the stereochem. hypothesis of Hantzsch and Werner. A long crit. discussion, with much evidence from the literature, leads to the conclusion that the hypothesis of Hantzsch and Werner both in its fundamental principles and in its deductions is at variance with exptl. facts, particularly the cleavage of acyl derivs. of α -aldoximes into an acid and nitrile. The Hantzsch and Werner hypothesis cannot therefore explain the phenomena of isomerism among the oximes. On the other hand all known facts, recent as well as old, are still readily explainable by the structural hypothesis advanced by M. many years ago (cf. *Gazz. chim. ital.* 21, i, 113, 136(1891); 21, ii, 192(1891); 22, ii, 139, 149, 164, 174, 183, 191, 431(1892); 23, ii, 244(1893); 26, i, 456(1896); 27, ii, 263(1897); 29, ii, 387, 404, 452(1899); 34, ii, 373(1904); *Rend. accad. Lincei* [5], 14, ii, 420, 518(1905)). At first generally accepted relations between the symmetry and stability of the mols. of org. compds. were utilized in conjunction with the hypothesis to formulate the structure of the individual oximes, but at the present time it is possible to utilize the many new facts concerning NH_2OH derivs. to establish on a still sounder basis the structure of isomeric oximes. C. C. DAVIS

The oxidation of hexadecylene. STANISLAS LANDA. Czech Polytechnic School, Prague. *Bull. soc. chim.* 43, 1086-8(1928).—Hexadecylene, obtained by distn. of spermaceti, gave hexadecane, m. 18° , which was oxidized by KMnO_4 to pentadecylic acid, b_p $193-5^\circ$; m. $52-2.5^\circ$. The acid may be purified by forming its Et ester, b_p $172-4^\circ$. This method of prepn. is preferable to those involving the oxidation of Me pentadecyl ketone or pentadecylaldehyde. R. C. ROBERTS

Chemical constitution of the iwashi acid. MITSUMARU TSUJIMOTO. Inst. Tokyo Ind. Research. *Bull. Inst. Tokyo Ind. Research Lab.* [3], 23, 1-23(1928).—T. extd. from the "sardine oil" from Hokkaido sardine a higher unsatd. acid by his Li salt-acetone method, made its Me ester, fractionated the part b_p $217-26^\circ$ which was sapond. to obtain the "iwashi (sardine) acid," $\text{C}_{22}\text{H}_{40}\text{O}_2$, d_4^{15} 0.9410, n_D^{15} 1.5057, I no. (bromopyridine method) 388.8. This acid and its Am ester were each ozonized in CHCl_3 soln., hydrolyzed, obtaining among the volatile matter AcH , EtCHO and CO_2 together with comparatively large quantity of succinic acid. T. considers AcH and CO_2 to have come from malonic aldehyde or its semi-aldehyde, and calcg. from the quantity of CO_2 infers the

presence of 1 $\text{=CHCH}_2\text{CH=}$ group in the mol. of iwashi acid. The ozonization of the Am ester was successfully made to produce a large quantity of insol. ozonide decompn. product, which when sapond. gave succinic acid and T. infers the presence of the initial double bond at the 4th and 5th C. No conjugate double bond is present. Hence T. concludes the acid to contain the groups: (1) EtCH= , (2) $\text{=CHCH}_2\text{CH=}$, (3) $\text{=CH(CH}_2)_2\text{CH=}$, (4) $\text{=CH(CH}_2)_2\text{CO}_2\text{H}$. From the analogy that the C_{22} acid, docosenic acid, which is widely distributed among oils of sea animals, has the double bond at $\Delta^{11,12}$, T. infers the constitution of iwashi acid to be one of the following: (1) $\text{EtCH:CH(CH}_2)_3\text{CH:CH(CH}_2)_2\text{CH:CH(CH}_2)_2\text{CH:CHCH}_2\text{CH:CH(CH}_2)_2\text{CO}_2\text{H}$; (2) $\text{EtCH:CH(CH}_2)_3\text{CH:CH(CH}_2)_2\text{CH:CHCH}_2\text{CH:CH(CH}_2)_2\text{CH:CH(CH}_2)_2\text{CO}_2\text{H}$. T. also infers the acid to have a straight chain because on hydrogenation it forms behenic acid.

K. SOMEYA

Chemical constitution of tetradecenic acid obtained from *Tetradenia glanca* Matsum. (MITSUMARU TSUJIMOTO. Inst. Tokyo Ind. Research. *Bull. Inst. Tokyo Ind. Research Lab.* [3], 23, 53–60(1928); cf. C. A. 22, 4470.—T. found another kind of tetradecenic acid, $\text{C}_{14}\text{H}_{26}\text{O}_2$ (cf. *Bull. Inst. Tokyo Ind. Research Lab.* [6], 21, 113; cf. C. A. 20, 2482) from the oil of *Tetradenia glanca*, which acid differs from the 5,6-tetradecenic acid, m. 20° , found by T. in the oil from the whale *Physeter macrocephalus*. To det. the constitution of the new acid T. ozonized it with O_3 in CHCl_3 and obtained capraldehyde, $\text{C}_{10}\text{H}_{18}\text{O}$, capric acid, succinic acid and its semi-aldehyde; hence the constitution is $\text{Me-(CH}_2)_3\text{CH:CH(CH}_2)_2\text{CO}_2\text{H}$. T. proposes to designate the two different tetradecenic acids by physeteric and tsuzuic (Tsuzu, Japanese for *Tetradenia glanca*) acid, resp.

K. S.

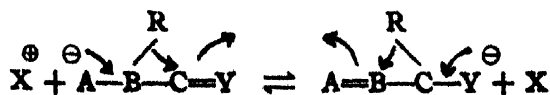
Esters of α -bromoisovaleric acid. VENANCIO DEULOFEU. Faculty of Sciences, E. F. N., Buenos Aires. *Bull. soc. chim.* 43, 1229–30(1928); cf. C. A. 22, 3881; 23, 596. By treating α -bromoisovaleryl bromide with dehydrated PrOH , iso- PrOH and $\text{CH}_2\text{:CHCH}_2\text{OH}$, D. obtained, resp., 38% of the *Pr*, b_m 115°, 41% of the *iso-Pr*, b_m 104°, and 38% of the *allyl* esters of the acid.

R. C. ROBERTS

The catalytic influence of hydrogen ions in the internal dehydration of a *cis*-ethylenic γ -glycol in the presence of water. M. BOURGUEL AND RAMBAUD. *Compt. rend* 187, 663–6(1928); cf. C. A. 22, 4106.—It has been shown that dehydration of the glycols is dependent on H-ion concn. Any dil. acid accelerates it markedly. The *cis* isomer of $\text{Me}_2\text{C(OH)CH:CHC(OH)Me}_2$, m. $69\text{--}70^\circ$, is dissolved in H_2O and the rate of dehydration studied in unsatd. soln. The reaction is stopped by making the soln alk. and removing the anhydride under vacuum. The unchanged glycol is detd. by Br₂ adsorption of the ethylenic bond. For a given concn. of acid the dehydration is monomol. The catalytic effect of the acid is not directly proportional to the H-ion concn. 0.1 *N* and 0.01 *N* HCl have the coeffs. for *K* of 0.0108 and 0.00102 at 50° . The value of *K* for 0.1 *N* H_2SO_4 and 0.1 *N* $[\text{CH(OH)CO}_2\text{H}]_2$ is 0.0056 and 0.00069, which is in close agreement with the predicted value. The variation of *K* is directly proportional to the change of the concn. of H ion. With an H-ion concn. of 0.0065 and 0.09 the ratio of $K/II \times 10$ is 1.06 and 1.18. It is noted that the sensitivity of the glycol to H-ion concn. is greatest when it is first prepd. In prepg. this glycol by the reduction of the acetylenic glycol with colloidal Pt the ethylenic glycol dehydrates rapidly when first formed, even at 20° .

D. H. POWERS

Possibility of ring-chain valency tautomerism and of a type of mobile-hydrogen tautomerism analogous to the Wagner-Meerwein rearrangement. V. Pinacolic electron displacement as an explanation of various intramolecular transformations. C. W. SUOPPEE. Univ. Leeds. *Proc. Leeds Phil. Lit. Soc., Sci. Sect.* 1, Pt. VII, 301–11 (1928), cf. C. A. 23, 109.—After discussing the older theories on the mechanism of several intramol. transformations, S. gives a new theory, which is more general than the others. The mechanism involved has been named "pinacolic electron displacement," and with its help the pinacol-pinacolin change, the Wagner-Meerwein change, the benzil benzilic acid transformation, the pinacolic deamination and the conversion of α -HO ketones and α -Cl ketones into CO_2H acids are explained in a satisfactory way. The new theory also accounts for the function of the reagents, which have to be anionic or cationic. The transformations proceed according to the scheme:



Both an electron source and an electron-sink must be present in the mol. to make the pinacolic electron displacement possible.

G. SCHWACH

Propyl ethers of β,γ -dibromopropyl alcohol. VENANCIO DEULOFEU. *Anales asoc. quim. Argentina* 16, 53-5(1928).—Boiling PrONa , free of PrOH , with $\text{CH}_2\text{:CHCH}_2\text{I}$ for 2.5 hrs. gives 90% of the ether; similarly iso-PrONa gives 88% of the allyl ether. Bromination of the latter gives 50% of $\text{iso-Pr } \beta,\gamma\text{-dibromopropyl ether}$, b. 205-7°.

C. J. WEST

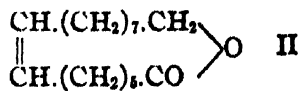
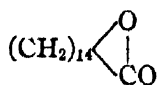
Glycerides of fatty acids. A. HEIDUSCHKA AND H. SCHUSTER. *Techn. Hochschule, Dresden. J. prakt. Chem.* 120, 145-59(1928).—Triglycerides contg. 1, 2 or 3 different aliphatic acid residues have been synthesized by methods which define their constitution. Mono- and diglycerides were prepd. from the appropriate Na salts and halohydrins and the diglycerides converted into triglycerides by interaction with the requisite acid chloride in dry $\text{CHCl}_3\text{-C}_6\text{H}_5\text{N}$ or with the anhydride; when using unsatd. acid chlorides or anhydrides the reaction should be carried out in dry CO_2 . SOCl_2 reacts only with primary alc. groups in the glyceride and thus serves to differentiate between α,β - and α,α' -diglycerides. The wandering of an acyl group has been investigated by this means and under the conditions of reaction α,β -distearin is converted into the α,α' -isomer to the extent of 20%. SOCl_2 , followed by the appropriate Na salt, may be used to introduce an acid residue into the α -position in the glyceride mol. and by suitable combination of this with the above method any triglyceride may be obtained. The m. p. of glycerides are subjected to alteration on keeping. α,α' -Dipalmitin, m. 72°, prepd. from α,α' -dichlorohydrin and Na palmitate, with lauryl chloride in $\text{CHCl}_3\text{-C}_6\text{H}_5\text{N}$ for 8-10 hrs. at 45-50°, yields *glyceryl β -laurate α,α' -dipalmitate*, m. 54.6°. From α,β -dipalmitin, m. 66.5°, SOCl_2 gives *α,β -dipalmitin- α' -chlorohydrin*, m. 48.6°; heated with Na palmitate for 8 hrs. at 150°, there results 65% of *glyceryl α,β -dipalmitate α' -laurate*, m. 53.5°. α,α' -Dimyristin, m. 60.5°, heated with excess of palmitic anhydride for 8-10 hrs. at 75-80° and 20-25 mm. in CO_2 , yields *glyceryl β -palmitate α,α' -dimyristate*, m. 49.5°. α,β -Dimyristin, m. 58.1°, and palmityl chloride at 50° for 8 hrs. in $\text{CHCl}_3\text{-C}_6\text{H}_5\text{N}$ give 60% of *glyceryl α' -palmitate α,β -dimyristate*, m. 47.8°. α -Myristin and $\text{C}_7\text{H}_{15}\text{COCl}$ in $\text{CHCl}_3\text{-C}_6\text{H}_5\text{N}$ at 50-60° for several hrs. give *glyceryl α -octoate α' -myristate*, oily, which yields with lauric anhydride (1.5 mols.) at 70-80° for 9 hrs. in CO_2 *glyceryl α' -octoate β -laurate α -myristate*, m. 17.7°, f. 3°. Similarly, α -chloro- α' -myristin gives the β -octyl deriv., which, heated with Na laurate for 8 hrs. at 150°, gives *glyceryl β -octoate α -laurate α -myristate*, m. 18.8°, f. 4.55°. α -Laurin, successively treated with $\text{C}_7\text{H}_{15}\text{COCl}$ and myristyl chloride in $\text{CHCl}_3\text{-C}_6\text{H}_5\text{N}$, gives 54% of *glyceryl α -octoate α' -laurate β -myristate*, m. 14.1°, which closely resembles the product isolated from coconut oil. α -Octoin, treated with oleyl chloride in CO_2 and then with myristic anhydride, gives 60% of *glyceryl α -octoate β -myristate α' -oleate*, m. 10.5°, f. -1°. The isomeric *glyceryl α -octoate α' -myristate β -oleate*, m. 15.8°, f. 3.5°, is obtained in 35% yield from α -myristin with $\text{C}_7\text{H}_{15}\text{COCl}$ and oleyl chloride. α -Chloro- α' -myristin and Na oleate, 8 hrs. at 150° in CO_2 , give 80% of *glyceryl α' -myristate α -oleate*, m. 20-3°, converted by $\text{C}_7\text{H}_{15}\text{COCl}$ in $\text{CHCl}_3\text{-C}_6\text{H}_5\text{N}$ into *glyceryl β -octoate α' -myristate α -oleate*, m. 14.8°, f. 6.7° in 67% yield; this appears to be identical with the glyceride isolated from palm kernel oil. Improved methods for the prepn. of α -stearin and α,α' -distearin are given.

C. J. WEST

Ricinic acid. CH. SUNDER. *Bull. soc. ind. Mulhouse* 94, 477-81(1928).—Acid products obtained by treating castor oil with dil. NaOH or acids remained liquid at the lowest temp. obtainable by means of ice and salt, but a ricinic acid which solidified at a higher temp. (not specified) was obtained by effecting the sapon. with 36° B $\acute{\text{e}}$. NaOH at 100-20°; this latter acid is not identical with the one previously described by Juillard (*Bull. soc. ind. Mulhouse*, Aug.-Sept. 1892). These new ricinic acids are capable of acting as mordants for alizarin dyes in the presence of alum.

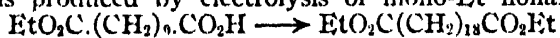
A. P.-C.

Carbon rings. XIII. Oxidation of the 13- to 17- membered monocyclic ketones with Caro's acid to the 14- to 18-membered lactones. L. RUZICKA AND M. STOLL. *Helv. Chim. Acta* 11, 1159-73(1928); cf. *C. A.* 22, 4482.—Angelica oil contains the lactone (I) of pentadecan-15-ol-1-acid, and musk-seed oil the lactone (II) of ambrettolide acid:



Kerschbaum (*C. A.* 21, 2118) does not state the properties of I. Ambrettolide is described as a liquid b $_b$ 185-190°, and d 20 0.938. Its C content is 1-1.5% above the theoretical. Kerschbaum obtains by catalytic reduction of ambrettolide the lactone of hexadecan-16-ol-1-acid, a thin liquid b. 175-180°. The constitution of this acid is proven by oxidation to the HO acid. He describes a synthetic mode of formation of I which has a musk fragrance but no further properties are given. The evidence that

the musk fragrance comes from the lactone lies in the loss of the odor after sapon. The exact proof of relation between the no. of ring members and odor necessitates knowledge of the pure lactone. The pure lactone originates through the reaction of Caro's acid on the ketone. The authors believe that 3 classes of compds. arise, a simple peroxide, polymeric peroxide and the lactone. Baeyer and Villager now assume the simple peroxide to lie in the lactone. The lactone is isolated by means of menthol or camphor. With exaltone (cyclopentadecanone) the direction of the reaction of Caro's acid on a high-membered ketone is investigated. In petroleum ether below 20° there is a slow reaction, at 30° the lactone and polymeric peroxide are formed, and at 50–65° a 50% yield of rather pure lactone is given. In all cases arises a mixt. of ethoxide, which, purified by sapon., gives the pentadecan-15-ol-1-acid. The lactone of the acid, sapond. by warm alc. alkali, forms the HO acid, which on oxidation yields tridecane-1,13-dicarboxylic acid. In an analogous manner and with similar results the 13-, 14-, 16- and 17-membered ketones are transformed to lactones. The phys. properties of this homologous series of 5 high-membered lactones run in a regular course. The HO acids show a homogeneous oscillation of m. p. like the other series of aliphatic compds. **XIV. The ketones of the 19-, 21- and 29-membered carbon rings.** L. Ruzicka, M. Stoll and H. Schinz. *Ibid* 1174–80.—Fifty g. of octadecane-1,18-dicarboxylic acid is converted with NaOH to a di-Na salt. This salt pptd. with $\text{Th}(\text{NO}_3)_4$ forms a Th salt, b_p 60°–60.5, 260°. The various fractions are treated with alc semicarbazide. After crystn. the pure semicarbazone yield is 2.5%. This pure semicarbazone heated with $(\text{CO}_2\text{H})_2$ soln. forms the cyclononadecanone, b_p 160°. 185 g. of eicosane-1,20 dicarboxylic acid is converted to an Yt salt, decompd. and distd.: (1) 90–162°, 18.8 g.; (2) 162–215°, 21 g.; (3) 215–45°, 6 g. These fractions are shaken with semicarbazide acetate, evapd., washed with water and petroleum ether. The result is 18.6 g., b. 160–170°, of raw semicarbazone. After several crystns. 8.6 g. of pure semicarbazone, b. 177–8°, is obtained. The ketone, regenerated with 20% HCl, b_p 176–7° and forms a colorless, rapidly solidifying oil. 3 g. of the ketone is allowed to stand with 3 g. BzH and 1.5 g. of Na in 40 cc. of alc. The pulp formed is decompd. in water and the BzH distd. off. The residue is distd. under 1 mm., the viscous substance is treated with NaHSO_4 , reheated to 200°, dehydrated, washed, dried and redistd. This 1.7 g. of benzal compd. is dissolved in 30 cc. of glacial AcOH and ozonized. The resulting liquid is oxidized, heated to 60°, mixed with HCl and water and extd. with ether. The resulting acid is esterified and distd. The fraction between 210–25° is sapond. and crystd. successively from C_6H_6 , AcOH and C_6H_6 . A white powder, nonadecane-1,19-dicarboxylic acid, m. 118–20°, is formed. 195 g. of octacosane-1,28-dicarboxylic acid is converted to an Yt salt, decompd. at 300–470°, the distillate dissolved in ether and collected in alc. The fraction between 225–85° is boiled in 500 cc. alc. The ppt. is dissolved in 3 g. of an aq. semicarbazide acetate. The ppt. is filtered, dried (m. 137–40°) and crystd. The semicarbazone is split with 15% HCl and the ketone extd. with ether and dried. After several crystns. cyclononacosanone is obtained, m. 45–7°. The octadecane-1,18-dicarboxylic acid is produced by electrolysis of mono-Et nonane-1,9-dicarboxylate.



The neutral part is distd. The fraction between 210–30° is crystd. 3 times and sapond. The resulting acid after 5 crystns. m. 124–5°. The eicosane-1,20-dicarboxylic acid is obtained by electrolysis of mono-Et decane-1,10-dicarboxylate. The octacosane-1,28-dicarboxylic acid is produced by electrolysis of mono-Me tetradecane-1,14-dicarboxylate.

C. SCOTT

Neutral salt addition compounds of *N*-methylated glycines: their formulation and that of their hydrates. WINSTON K. ANSLOW AND HAROLD KING. National Institute for Med. Research, London. *Biochem. J.* 22, 1253–63(1928).— $\text{Me}_2\text{NCH}_2\text{CO}_2\text{H}$ gives a series of additive compds. with the chlorides, bromides and iodides of Ca, Sr, Ba, Li and Na, but only 1 compd. with a K halide. These compds. contain a metallic salt associated with 1, 2, 3 or 4 mols. of the amino acid. B. H.

Comparative studies on the cleavage of polypeptides and their derivatives by erepsin, trypsin-kinase and *N* alkali. EMIL ABDERHALDEN AND OSKAR HERRMANN. Univ. Halle. *Fermentforschung* 10, 145–58(1928).—The following peptides and derivs. were prepd. by the usual procedure. *dl*- α -Aminobutyrylglycine (I), m. 220°, from glycine and $\text{MeCH}_2\text{CHBrCOBr}$ and treatment of the intermediate bromobutyrylglycine with NH_4OH ; *PhNCO deriv.* (II), m. 203°; *2,4-Me(NO_2)_2C_6H_3SO_2 deriv.* (III), m. 170–2°; *p-O_2NC_6H_4CO deriv.* (IV), m. 188–9°; *m-O_2NC_6H_4CO deriv.* (V), m. 204°. I was coupled with *dl*- MeCHBrCOBr to yield *dl*- α -bromopropionyl-*dl*- α -aminobutyrylglycine, m. 173°, and this by treatment with NH_4OH was converted into *dl*-alanine-*dl*- α -amino-

butyrylglycine (VI), m. 225°; *PhNCO* deriv., m. 208–10°; the Bz and β -C₁₀H₇SO₂ derivs. could not be obtained. *dl*-Valylglycine (VII), m. 245°, was obtained from *dl*- α -bromoisovalerylglycine and NH₄OH. This was coupled to *dl*-MeCHBrCOBr to form *dl*- α -bromopropionyl-*dl*-valylglycine, m. 202°, and the latter converted by NH₄OH into *dl*-alanyl-*dl*-valylglycine (VIII), m. 248°; β -C₁₀H₇SO₂ deriv. (IX), m. 198°; *PhNCO* deriv. (X), m. 218°. *dl*-Leucyl-*dl*-phenylalanine was sepd. by means of 50% EtOH into 2 racemic dipeptides, m. 220° and 260°, resp. The latter (XI) is attacked by erepsin and is therefore the *ll* + *dd* mixt., while the other (XII) is the *ld* + *dl* mixt. *PhNCO* deriv. of XI, m. 193° (XIII); 2,4-Me(NO₂)C₆H₃SO₂ deriv. (XIV), m. 75°; *PhNCO* deriv. of XII (XIIIa), m. 183°. Glycyl-*dl*-phenylalanine (XV), m. 260° (decompn.), was obtained from phenylalanine, ClCH₂COCl and NH₄OH; *PhNCO* deriv. (XVI), m. 208°; β -C₁₀H₇SO₂ deriv. (XVII), m. 100° (decompn.); Bz deriv. (XVIII), m. 172°. Phenylalanine and *dl*-Me₂CHCHBrCOBr yielded *dl*- α -bromoisovalerylphenylalanine, m. 135°, but treatment of this with NH₄OH gave only an unsatd. compd., decomp. 260°, instead of the expected dipeptide. *N* alkali at 37° slowly attacks I, giving almost complete hydrolysis in 209 hrs. It attacks II much more readily than the free dipeptide with complete hydrolysis in 20 hrs.; IV and V are also hydrolyzed more readily than I but less so than II. The tripeptide VI is easily hydrolyzed and its *PhNCO* deriv. still more so. VIII is slowly hydrolyzed. Both isomers XIII and XIIIa are attacked by alkali. XV and XVII remain unaltered, whereas XVI and XVIII show 50% hydrolysis in 96 hrs. In general the *PhNCO* derivs. are more susceptible to the influence of OH ions than the unsubstituted peptides, although the *PhNCO* remains attached to the amino acid after cleavage has occurred. On the other hand, a substitution in the free NH₂ group renders the peptide resistant to the action of erepsin. I, VI and VIII are attacked by erepsin, but not their *PhNCO*, Me(NO₂)C₆H₃SO₂ or O₂NC₆H₄CO derivs. Neither the dipeptide XV nor its substitution products XVI and XVII are attacked by erepsin. Trypsin-kinase, however, is without action on the free peptides but attacks their substitution products. Thus I is resistant, while II, III, IV and V undergo cleavage. VI is resistant, but its *PhNCO* deriv. is slowly hydrolyzed. VIII, XI, XII and XV remain unaltered, whereas the derivs. of the last 3 undergo hydrolysis. In some cases the extent of hydrolysis is small, possibly because further enzymic action is inhibited by the cleavage products.

A. W. DOX

The specific mode of linkage between substrate and enzyme complex which initiates the hydrolysis of polypeptides. EMIL ABDERHALDEN AND HANS BROCKMANN. Univ. Halle. *Fermentforschung* 10, 159–72 (1928).—According to v. Euler the cleavage of polypeptides by erepsin requires the presence of a free NH₂ group which enters into combination with the enzyme, and according to Waldschmidt-Leitz the cleavage by trypsin requires the presence of a CO₂H in order to form the intermediate complex. A no. of new derivs. of amino acids and peptides are described in which the CO₂H is masked by condensation with PhNH₂, etc., to form substances of the anilide type. If the theory is correct these derivs. should be amenable to hydrolysis by erepsin but not by trypsin. Cholamine, b₁₈ 75–8°, was prepd. by the Knorr method from (CH₂)₂O and NH₄OH in 30 g. yield from 100 g. (CH₂)₂O. It was condensed with 0.5 mol *dl*-MeCHBrCOBr in CHCl₃, yielding 90% *dl*- α -bromopropionylcholamine, m. 78.5°. The condensation was also performed in aq. NaOH with an 80% yield, the advantage here being that all of the cholamine is utilized. Treatment of this product with NH₄OH yielded *dl*-alanylcholamine-HBr from which the free base, m. 78–9°, was obtained by addn. of K₂CO₃ and extn. with CHCl₃, and purified by pptn. from EtOH by petroleum ether. It is best isolated through the *picrate*, m. 105–8°, from which the free base is obtained by dissolving in *N* H₂SO₄, extg. the picric acid with Et₂O and removing the H₂SO₄ by Ba(OH)₂. Alanylcholamine gives the ninhydrin reaction. PhNH₂ and ClCH₂COCl were condensed in Et₂O to ClCH₂CONHPh and this converted into 45% glycylaniline, m. 62–3°, by treatment with NH₄OH; *picrate*, m. 186° (decompn.). A residue insol. in dil. HCl consisted of a *sec. amine*, (PhNHCOCH₂)₂NH, m. 144.5°. This was condensed with *dl*-MeCHBrCOCl to form the *bromopropionyl deriv.*, m. 244–5°, which on treatment with NH₄OH decompd. into the original *sec. amine* and alanine. In a similar manner PhNH₂ was condensed with *dl*-MeCHBrCOBr, yielding *dl*- α -bromopropionanilide, m. 101°, and the latter aminated by NH₄OH to *dl*-alanyl-aniline, b_{16–8} 190–6°; *picrate*, m. 175°. Condensation of this in CHCl₃, and in aq. NaOH, with ClCH₂COCl gave *chloroacetyl-dl-alanylaniline*, m. 156°, which was then aminated to 60% glycyl-*dl*-alanylaniline, m. 80°; *picrate*, m. 186° (decompn.). An insol. residue from the amination was the *sec. amine of the dipeptideanilide*, (PhNHCO-CHMeNHCOCH₂)₂NH, which m. 207° Glycyaniline was coupled with *dl*-Me-CHBrCOBr in CHCl₃ in the presence of aq. NaOH and yielded 70% *dl*- α -bromopro-

glycylglycylaniline, m. 145–6°, and the latter aminated to 45% *dl*-*alanylglycylaniline*, m. 124–5°; *picrate*, m. 198° (decompn.). In Et₂O, Ph₂NH and *dl*-MeCHBrCOCl condensed to *dl*- α -*bromopropionyl*diphenylamide, m. 110°. This was aminated to *dl*-*alanyldiphenylamine*, m. 86°. For detg. the *picric acid* content of picrates of the above bases an *app.* is described which consists of a micro-Kjeldahl flask to which is fitted a stopper bearing a syphon tube and a dropping funnel with 3-way stopcock. The sample is weighed into the flask, 0.1 *N* H₂SO₄ and a layer of Et₂O are added. The flask is shaken with the syphon raised flush with the stopper, then the syphon lowered to the bottom of the Et₂O layer and air pressure applied which forces the Et₂O through the syphon on the principle of a wash bottle. The Et₂O is renewed and the operation repeated several times. After evapn. of the solvent the extd. *picric acid* is dissolved in H₂O and titrated with 0.1 *N* NaOH and phenolphthalein. Erepsin at *p*_H 8 hydrolyzes all of the peptide-aniline derivs. except *alanyldiphenylamine*, while trypsin at *p*_H 8.5 is without action except in the case of *alanylcholamine* where the increase in amino N is almost negligible. The PhNH₂ derivs. of glycine, *alanylglycine* and *glycylaniline* undergo hydrolysis by *N* alkali.

A. W. Dox

Comparative studies on the influence of *N* alkali, erepsin and trypsin-kinase on polypeptide-like compounds containing β -alanine. EMIL ABDERHALDEN AND FRITZ REICH Univ. Halle. *Fermentforschung* 10, 173–8(1928).—Two dipeptides contg. β -alanine were prepd. by the usual method of peptide synthesis and examd. with respect to their susceptibility to enzymic hydrolysis. *Chloroacetyl- β -alanine*, a non-crystg. oil, was obtained from β -alanine and ClCH₂COCl with *N* NaOH. Treatment with NH₃ in abs. EtOH converted it into *glycyl- β -alanine* (I), which decomps. 230°. β -Alanine and *dl*-Me₂CHCH₂CHBrCOCl reacted in the same manner to form *dl*- α -*bromoisocaproyl- β -alanine*, m. 69–72°, which on treatment with NH₃ in EtOH yielded *dl*-*leucyl- β -alanine* (II), m. 202–4°; its PhNCO deriv. (III), which m. 160–2°, is strongly acid. Both dipeptides are faintly acid, and give an intense ninhydrin but no biuret or *picric acid* reaction. *N* alkali at 37° hydrolyzes I rather rapidly, II only slightly and III very rapidly. None of the 3 is attacked by erepsin or by trypsin-kinase.

A. W. Dox

The specific action of erepsin and trypsin-kinase. EMIL ABDERHALDEN AND ERNST SCHWAB. Univ. Halle. *Fermentforschung* 10, 179–87(1928).—In continuation of studies on the influence of substituents in the NH₂ group of peptides toward enzymic hydrolysis, several new peptides, ureido and PhNCO derivs. were prepd. and examd. *dl*-*leucylglycine* and ClCH₂COCl were condensed to form *chloroacetyl-dl-leucylglycine*, m. 141°, and the product aminated by NH₄OH to 75% *glycyl-dl-leucylglycine*, m. 206° (decompn.). Condensation of the *l*-component of this with *dl*-Me₂CHCH₂CHBrCOBr gave *dl*- α -*bromoisocaproylglycyl-l-leucylglycine*, m. 180°, which was aminated to *dl*-*leucylglycyl-l-leucylglycine*, m. 256°. Diglycyl-*l*-leucine and *dl*-Me₂CHCH₂CHBrCOBr gave *dl*- α -*bromoisocaproylglycylglycyl-l-leucine*, m. 84°, which was converted into the tetrapeptide *dl-leucylglycylglycyl-l-leucine*. The PhNCO deriv. of *dl-leucyl- γ -aminobutyric acid*, prepd. from the dipeptide and PhNCO, m. 166°. The ureido derivs. of *dl*-leucylglycine, *glycyl-dl-valine* and *dl-leucylglycylglycine* were obtained from the corresponding CO₂Et and CO₂Me derivs. by means of alc. NH₃ under pressure and are to be described in a later paper. These were subjected to the action of erepsin and trypsin-kinase, along with a no. of peptides previously described. The ureido derivs. were not attacked by purified erepsin or purified trypsin-kinase, but gave 27–65% cleavage with ext. of powd. pancreas. The PhNCO derivs. of *dl-leucylglycylglycine* and *dl-leucylglycine* gave 8–13% hydrolysis with purified trypsin-kinase and 58–66% hydrolysis with ext. of dried pancreas. It is possible that pancreatic ext. contains another enzyme or activator which is removed in the sepn. of pure enzymes by the Waldschmidt-Leitz method. A group of polypeptides contg. *l*-leucine was studied for comparison of the action of erepsin and trypsin. *l*-Leucylglycyl-*l*-leucine, *glycyl-l-leucylglycyl-l-leucine*, *dl-leucylglycyl-l-leucylglycine*, *dl-leucylglycylglycyl-l-leucine* and *l-leucylglycyl-l-leucylglycyl-l-leucine* were attacked by both enzymes, while *glycyl-dl-leucylglycine*, *dl-leucyl-dl-leucylglycylglycine*, *l-leucylpentaglycylglycine*, *di-[l-leucyltriglycyl]-l-leucylpentaglycylglycine*, and *tri-[l-leucyltriglycyl]-l-leucylpentaglycylglycine* were attacked by erepsin only. Trypsin-kinase attacks those compds. in which leucine carries the CO₂H group but not those in which the terminal amino acid is glycine. One might infer a sp. affinity of trypsin for the leucine complex were it not for certain exceptions such as *leucyltriglycylleucine* and *glycyl-l-leucyl-l-leucine* which are resistant to trypsin-kinase. Peptides contg. an amino acid with NH₂ in other than the α -position, e. g., *dl-leucyl- γ -aminobutyric acid* and its PhNCO deriv., are not attacked by either enzyme. Only the *d*-isomer of *glycyl- α -amino-*

butyric acid is hydrolyzed by erepsin. Of special interest is the observation that *d*-leucylglycyl-*l*-leucine but not *l*-leucylglycyl-*d*-leucine is hydrolyzed by trypsin-kinase. The terminal amino acid appears to be the detg. factor. Neither of these tripeptides is attacked by erepsin. A. W. Dox

The behavior of α,δ -di-(*dl*-leucyl)-*dl*-ornithine and its phenyl isocyanate compound toward *N* alkali, erepsin, trypsin-kinase, pepsin-hydrochloric acid and arginase. EMIL ABDERHALDEN AND HANS SICKEL. Univ. Halle. *Fermentforschung* 10, 188-94 (1928).—As the 1st model of a peptide contg. a diamino acid the dileucyl deriv. of ornithine and its PhNCO deriv. were subjected to the action of enzymes. *dl*-Ornithine, obtained by hydrolysis of its di-Bz deriv., was condensed with *dl*-Me₂CHCH₂-CHBrCOCl in the presence of NaOH and the pasty product treated with Et₂O and petroleum ether and finally crystd. from dil. MeOH. A yield of 43% α,δ -di-[*dl*- α -bromoisocaproyl]-*dl*-ornithine, m. 126-8°, was thus obtained. A by-product, m. 165°, was probably the mono deriv. with a Bz still attached to the δ -NH₂. Amination of the di-deriv. with alc. NH₃ and removal of the NH₄Br by Ag₂SO₄ and Ba(OH)₂ yielded α,δ -di-[*dl*-leucyl]-*dl*-ornithine, which sinters 95°, m. 105-10° and decomps. 150°. It takes up CO₂ from the air with formation of a sirup, gives the ninhydrin and a bluish violet biuret reaction, and negative picric acid reaction. It is pptd. by picric acid, phosphotungstic acid, Millon reagent and Nessler reagent. Its PhNCO deriv. is amorphous sinters 98° and forms a viscous foam at 130°. *N* alkali hydrolyzes the tripeptide, but its PhNCO deriv. more rapidly. Erepsin and trypsin-kinase are without action on either. The tripeptide is not attacked by pepsin-HCl or by arginase. A. W. D

Malonitrile and malonitrile condensations. II. RUDOLF SCHENCK AND H. FINKEN WITH P. MICHAELIS, K. PAPPE AND FR. PLEUGER. Univ. Münster. *Ann.* 462, 267-83(1928); cf. C. A. 22, 3631.—Me₂C(CN)₂ (6.6 g.) and 10 cc. Me₂CO in 30 cc. abs. EtOH, treated with 0.75 g. K in 10 cc. abs. EtOH, give 70% of dimethyldicyanoethylene, m. 171.5°; a freshly prepd. sample showed a normal mol. wt., while a sample 2 yrs. old showed twice the normal mol. wt. Similarly BzPh gives diphenyldicyanoethylene, m. 136°, and fluorenone gives 86.8% of biphenylenedicyanoethylene, m. 213°; soly. in hot AcOH, 1:40; in hot EtOH, 1:250. In the condensation of Me₂C(CN)₂ with esters, using Et₃NH or EtONa, there results a *tris*-malonitrile (I), m. about 290° (decompn.); a 2nd isomer (II) results from the action of NH₃ in C₆H₆, this m. 218°; heating II several degrees above its m. p., there results a 3rd isomer (III), which m. 300° and may be the same as I. II reacts with PhNH₂, giving the yellow compd. C₁₂H₈N₄, m. 236° (decompn.). The use of Me₂C(CN)₂ as a cryoscopic solvent is discussed; the av. const. found is 48.90; results are given for H₂O, BzOH, *o*-HOC₆H₄CO₂H, NH₂CH₂CO₂Et, CO(NH₂)₂, NaI, KI, Me₄NI and Et₄NI. C. J. WEST

Existence of a second oxalic acid. A. F. CHICHIBABIN. *J. prakt. Chem.* 120, 214-20(1928).—C. discusses the possibility of the existence of a 2nd (CO₂H)₂ and describes certain expts. in which he attempted its prepn. Thus far no evidence for the existence of the 2nd isomer has been obtained. C. J. WEST

The sulfopyrotartaric acids. III. H. J. BACKER AND J. BUINING. Groningen (Holland). *The University. Rec. trav. chim.* 47, 1000-10(1928); cf. C. A. 22, 1138.—*Propane-1,2-dicarboxylic-1-sulfonic acid* (I) was prepd. from MeCH(CO₂H)CH(CO₂H)₂ (II) by sulfonation with SO₃, concd. H₂SO₄, oleum contg. 65% SO₃ and ClSO₃H, the latter reagent being preferred for the prepn. of larger quantities. II was prepd. by a modification of Bischoff's method (*Ann.* 214, 53(1882)): 362 g. MeCHBrCO₂Et is added gradually to a solution of CHNa(CO₂Et)₂, prepd. from 46 g. Na, 500 cc. abs. alc. and 320 g. CH₂(CO₂Et)₂; after boiling the mixt. 1 hr. the reaction is complete. Yield of Et propenyltricarboxylate 93%, from which on sapon. with an excess of aq. alc. KOH, II, m. 147-8°, was obtained in almost theoretical yield. The sulfonation of II by any one of the methods mentioned above always yields a crude Ba salt with a too high S content, showing that at the same time some disulfonation takes place; the pure Ba salt was obtained on recrystn. from water. The best way to obtain I consists in heating at 100-5° during 5 hrs. 17.6 g. of II and 29 g. ClSO₃H; yield 40% of the Ba salt, obtained from the reaction mixt. in the usual way. The free I, C₅H₇O₇S.2H₂O, is hygroscopic and m. 115-20°; the Ba salt, (C₅H₇O₇S)₂Ba₂, was obtained with 6 and 9 mols. water of crystn.; even after drying at 110-20° it contains 2H₂O; at 25° 100 g. of a satd. aq. soln. contains 5.84 g. of the anhyd. salt; the Ca salt, (C₅H₇O₇S)₂Ca₂.7H₂O, of a satd. aq. soln. contains 5.84 g. of the anhyd. salt; the Ca salt, (C₅H₇O₇S)₂Ca₂.7H₂O, is very sol. in water. The interaction of Et propenyltricarboxylate and ClSO₃Et does not give rise to the formation of the ester of I, but yields NaEtSO₃ and Et chloropropenyltricarboxylate (III) on MeCH(CO₂Et)CCl(CO₂Et)₂. The optical resolution of I may be carried out by means of the strychnine and quinine salts, both giving the *d*-rotatory acid. The resolution with the secondary strychnine salt, C₁₂H₁₇O₇S.2C₁₇H₂₁N₂O₈

$\text{H}_{22}\text{O}_2\text{N}_2 \cdot 4\text{H}_2\text{O}$, is described by B. and B.; one "cold crystn." of this salt gave the optically pure compd. (*d*), which is racemized only with difficulty, even in alk. soln. at higher temp. $[\text{M}]_{\text{D}}$ for the ion $\text{MeCH}(\text{CO}_2\text{H})\text{CH}(\text{CO}_2\text{H})\text{SO}_3' = 35^\circ$, for the ion $\text{MeCH}(\text{CO}_2')\text{CH}(\text{CO}_2')\text{SO}_3' = +19^\circ$. The constitution of I was proved only by the fact that this acid is different from the other isomers, the constitution of which was proved by an independent synthesis, *viz*, by the interaction of $\text{BrCH}_2\text{CH}(\text{CO}_2\text{H})\text{CH}_2\text{CO}_2\text{H}$ and $\text{MeCBr}(\text{CO}_2\text{H})\text{CH}_2\text{CO}_2\text{H}$ and sulfites (cf. *C. A.* 22, 847). When sulfites act upon $\text{MeCH}(\text{CO}_2\text{H})\text{CHBrCO}_2\text{H}$, hydrolysis takes place with the formation of methylmalic acid, even in neutral solns. C. F. VAN DUIN

Mercuric-oxycyanide compounds of a few organic acids and their sterilizing action upon gonorrheal bacilli. HITOSHI TAKAOKA. Inst. of Osaka Ind. Research. *Bull. Osaka Inst. Ind. Research* 4, 1-8(1928).—Since the compds. of tartaric acid with Hg'' salts are known to have a good sterilizing action upon gonorrheal bacilli, T. synthesized pure condensation products of a few org. acids and Hg'' salts and tested their sterilizing action. In the detn. of Hg in these compds. a good result was obtained by using a tube instead of boat for holding the silver asbestos for Hg absorption. *Mercuric cyanide*

tartrate, $\begin{array}{c} \text{CH}(\text{OH})-\text{CO}_2 \\ | \\ \text{CH}(\text{OH})-\text{CO}_2 \end{array} \text{Hg} \cdot \text{Hg}(\text{CN})_2 \cdot \text{H}_2\text{O}$, obtained by making $\text{C}_4\text{H}_6\text{O}_4$ react with

$\text{HgO} \cdot 3\text{Hg}(\text{CN})_2$ in 90% alc., colorless prisms, was easily sol. in H_2O , difficultly in acetone and EtOH. The soln. has an immediate sterilizing action upon gonorrheal bacilli even with 1/50,000 diln., the same effect being obtained in 10 min. with 1/400,000 diln. If pure H_2O is used in the reaction, the acid salt is formed. *Mercuric-cyanide-salicylate* $[\text{C}_6\text{H}_4(\text{OH})\text{CO}_2]_2\text{Hg} \cdot \text{Hg}(\text{CN})_2 \cdot 2\text{C}_2\text{H}_5\text{OH}$, obtained by making mercuric oxy-cyanide act upon salicylic acid in 99% EtOH is difficultly sol. in H_2O , sol. in EtOH and acetone. It effloresces. *Mercuric cyanide citrate*: a cryst. substance was obtained also from citric acid. K. SOMEYA

Constitution of thiourea. The absorption spectra of thiourea. H. RIVIER AND JAMES BOREL. Univ. Neuchâtel. *Helv. Chim. Acta* 11, 1219-28(1928).—Thiourea and its trimethyl, tetramethyl, dimethyldiphenyl and tetraphenyl derivs. and pentamethyldithiobiuret (including both normal and iso forms of all except thiourea and trimethylthiourea) were prepd. and spectroscopically studied to det. whether the S atom in thiourea is linked by a double bond, $(\text{S} \cdot \text{C}(\text{NH}_2)_2)$ (normal) or a single bond $(\text{HN} \cdot \text{C}(\text{NH}_2)\text{SH})$ (iso). The normal derivs. have a stronger absorption than the iso derivs. which is caused by the presence of the C:S group in the structure. R. and B. conclude that thiourea and trimethylthiourea can exist only in the iso state and do not contain the C:S group. New compds. described: isodimethyldiphenylthiourea, m. 30° , b.p. 175° (picrate, m. 131°); isotetraphenylthiourea, m. 70° . W. R. B.

Preparation of some substituted guanidines. FRITZ BISCHOFF. Santa Barbara Cottage Hospital. Santa Barbara. *J. Biol. Chem.* 80, 345-55(1928).—Diguanylpiperazine, guanylpiperidine, guanyl-*p*-aminodimethylaniline and diguanidinooctamethylene were prepd. by the usual methods of guanidine synthesis. Diguanidinopentamethylene was also prepd. by a new method utilizing the Erlenmeyer synthesis. ARTHUR GROLLMAN

The biuret reaction. I. The biuret reaction of acid imides of the barbituric acid type. MARY M. RISING AND CLARENCE A. JOHNSON. Univ. of Chicago. *J. Biol. Chem.* 80, 709-22(1928).—Diethylbarbituric acid acted as a typical acid imide in its behavior with the biuret reagents, forming a product of formula $\text{X}_2\text{Cu}(\text{imide})_4 \cdot x\text{H}_2\text{O}$. Na_2Cu diethylbarbitate and K_2Cu diethylbarbitate were isolated and analyzed. The role of the biuret reagents and the atoms concerned in the reaction are discussed. ARTHUR GROLLMAN

Constitution of hexosediphosphoric acid. II. The dephosphorylated α - and β -methyl hexosides. WALTER T. J. MORGAN AND ROBERT ROBISON. Lister Inst., London. *Biochem. J.* 22, 1270-6(1928); cf. *C. A.* 21, 3064.—Proof is given that methylhexosediphosphoric acids (I) are derivs. of γ -fructose. The I have been converted into α - and β -Me hexosides (II) by the action of bone phosphatase. The properties of the II correspond to those of α - and β -Me- γ -fructosides. The II have been converted into fully methylated derivs. from which tetramethyl- γ -fructose has been obtained by acid hydrolysis. It is suggested that hexosediphosphoric acid is γ -fructose-1,6-diphosphoric acid. BENJAMIN HARROW

Trehalosemonophosphoric ester isolated from the products of fermentation of sugars with dried yeast. ROBERT ROBISON AND WALTER T. J. MORGAN. Lister Inst., London. *Biochem. J.* 22, 1277-88(1928).—A monophosphoric ester of the disaccharide trehalose (I) has been isolated from the products of fermentation of fructose

by dried yeast, and has been purified by its Ba and brucine salts. The ester is non-reducing and *d*-rotatory. Bone phosphatase converts I into cryst. trehalose. Hydrolysis converts I into glucose and glucosemonophosphoric ester, the latter being then further hydrolyzed into glucose and phosphoric acid. I is fermented by dried yeast and more slowly by yeast juice and zymoin.

BENJAMIN HARROW

The mechanism of the oxidation of some carbohydrates and polyhydric alcohols by hydrogen peroxide with iron salts as catalyst in acid media. (Preliminary communication.) A. TH. KÜCHLIN AND J. BÖSEKEN. Techn. University, Delft, Holland. *Rec. trav. chim.* 47, 1011-26(1928).—The oxidation of glucose with H_2O_2 and Fe salts to *d*-arabinose may proceed either via gluconic acid, or via 1,2-glucosone, both being oxidized further to the α -keto acid, which splits off CO_2 with the formation of *d*-arabinose. That the oxidation proceeds to a great extent according to the 2nd way is now shown by taking as a measure of the rate of the oxidation of the various intermediate compds. or the original sugar the quantity of CO_2 evolved in unit time at 70° . Gluconic acid proved to be much more slowly oxidized than glucose, fructose more quickly than glucose and *d*-arabinose practically at the same rate as glucose. After all the H_2O_2 had disappeared, all expts. showed the Fe in the Fe'' state; further it was shown that HCO_2H , $(CO_2H)_2$, $HOCH_2CO_2H$, glyceric, tartronic and keto-acids of the nature of 1,5-ketogluconic acid, are present among the oxidation products of glucose. In connection with the investigation of Wieland and Franke (*C. A.* 22, 1065) it was found that the osones, the first oxidation products, are oxidized by Fe''' salts; consequently, there is a regular reformation of the Fe'' ion which promotes the catalytic oxidation much better than the Fe''' ion. At low H-ion concns. the osones are oxidized more slowly; with an insufficient amount of H ions at the beginning of the expt. basic Fe''' sulfate or $Fe(OH)_3$ are formed, the latter being without oxidizing action on the osones. This course of the reaction does not take place, of course, if acids are formed by the catalytic oxidation of the substrates. The CHOH group is much more rapidly oxidized than the CH_2OH group, whereas with more concd. solns. and at higher temps. several side reactions occur. In studying these reactions K. and B. therefore recommend working with low concns. of H_2O_2 at low temps., taking compds. of simple structure in order to avoid side reactions as much as possible, and preventing the auto-decompn. of the H_2O_2 as much as possible so that it only acts as an oxidizing agent. The oxidation product of erythritol gave with semicarbazide the 1,2- or 2,3-disemicarbazone, m. 222° , which, according to the slightly low N content, was contaminated with a small amount of the semicarbazone of $OHCCO_2H$, formed by further decompn. For details the original paper must be consulted.

C. F. VAN DUIN

Oxygen bridges in sugars. IV. Anhydrides of 2,3,6-trimethylglucose. KURT HESS AND FRITZ MICHEL. *Ann.* 466, 100-14(1928); cf. *C. A.* 22, 226.—Repetition of the prepn. of 2,3,6-trimethylanhydroglucose previously described yielded the same product, b.p. $111-3^\circ$, $[\alpha]_D^{19}$ 70.6° ($CHCl_3$), contrary to the statement of Freudenberg and Braun (*C. A.* 22, 3635), but the behavior of the product with C_6H_5N and Ac_2O and the action of Br indicate that instead of being a mixt. of the strained and unstrained forms of trimethylanhydroglucose in the proportions 75 and 25%, resp. (not 25 and 75% as previously given), it contains an unstrained form and an unsatd. compd., which gives an oily Ac deriv., $[\alpha]_D^{18}$ 45.5° ($CHCl_3$). An attempt was made to complete an analogous series of reactions with derivs. of 2,3,6-trimethylglucose(I) contg. a butylene oxide ring. I, conveniently prepd. in quantity by hydrolysis of trimethylcellulose with $MeOH-H_2SO_4$, was converted into a mixt. of the α - and β -forms of butylene oxidic 2,3,6-trimethylmethylglucoside. The action of $BzCl$ in C_6H_5N yielded the 5-Bz deriv., $[\alpha]_D^{20}$ -35° to -43° in $MeOH$; HCl in Et_2O converted this into butylene oxidic 2,3,6-trimethyl-5-benzoyl-1-chloroglucose, m. $122-3^\circ$, $[\alpha]_D^{19}$ -114.5° ($CHCl_3$); this reacts with Me_3N to give 2,3,6-trimethyl-5-benzoylglucosidotrimethylammonium chloride, m. $146-9^\circ$ (decompn.), $[\alpha]_D^{17}$ -60.2° (H_2O); $C_6H_5N.HCl$ addn. product, m. $102-4^\circ$, $[\alpha]_D^{20}$ -48.4° (H_2O). Attempts to prep. an anhydride by the action of alkali gave only butylene oxidic 2,3,6-trimethylglucosidotrimethylammonium hydroxide, m. $187-8^\circ$, $[\alpha]_D^{21}$ -68.3° (H_2O); chloride, m. 165° , $[\alpha]_D^{17}$ -68.4° (H_2O). Butylene oxidic 2,3,6-trimethyl-5-acetylglucosidotrimethylammonium chloride, amorphous, $[\alpha]_D^{19}$ -33.9° (H_2O), could not be converted into an anhydride. V. A method of determining α - or β -configuration of disaccharides. F. MICHEL AND O. LITTMANN. *ibid.* 115-30. If a disaccharide is hydrolyzed by $MeOH-HCl$, the proportions of α - and β -Me hexosides derived from the hexose present as hexoside may be expected to vary according to the nature of the linking in the original disaccharide and an excess of 1 form as compared

with the proportion present in the equil. mixt. may be taken as evidence that the hexoside linking in the disaccharide is of that configuration, assuming that no inversion takes place. In the application of this method to the detn. of the configurations of lactose and cellobiose, the fully methylated sugars were used, in order to avoid the shifting of the O bridge and the hydrolysis was performed at 0°, with the addn. of sufficient MeCl to keep the concn. of the acid sensibly const. The tetramethylmethyl hexoside mixt. was sepd. from the mixed sugars after benzylation by extn. with H₂O and distn. The equil. mixts. were obtained by keeping the hexosides under the conditions used in the hydrolysis and working up in a similar way. Both lactose and cellobiose yielded hexoside mixts. contg. the β -form in larger proportion than the equil. mixt. as detd. by observations of the rotatory powers of the mixts. and the pure components, and the β -configuration deduced by fermentation methods was thus confirmed. α -Me galactoside, prepd. by passing HCl into galactose in MeOH was converted by Ac₂O in C₆H₅N into 2,3,4,6-tetraacetyl- α -methylgalactoside, m. 86–7°, $[\alpha]_D^{20}$ 132.5° (CHCl₃), which yields the unchanged galactoside on hydrolysis. Methylation of the acetate by Me₂SO₄ and alkali yields 2,3,4,6-tetramethyl- α -methylgalactoside, b.p. 80–4°, $[\alpha]_D^{20}$ 188.5° (H₂O). Octamethylcellobiose, m. 86°, $[\alpha]_D^{19.5}$ -15.70° (H₂O), 14.63° (CHCl₃), was prepd. by repeated treatment of the heptaacetylmethylcellobiose with Me₂SO₄ and NaOH. C. J. WEST

Substances accompanying cellulose. III. Isolation of mannan and xylan from pine sulphite pulp. KURT HESS AND MAX LÜDTKE. Kaiser Wilhelm Institut für Chemie. *Ann.* 466, 18–26 (1928); cf. *C. A.* 22, 2964.—Extn. of pine sulphite pulp with 2 N NaOH and addn. of AcOH to the ext. yields a ppt. contg. mannan, cellulose and xylan. The mannan was isolated by pptg. the Cu-alkali complex from cuprammonium soln. by the addn. of NaOH to the concn. of 0.2 N. From the soln. of the complex in H₂O, made faintly acid with AcOH, MeOH ppts. crude mannan. After redissolving it in cuprammonium soln. and 2 repetitions of the above process, pure mannan is obtained, the rotatory power of which was unchanged by further purification and shows identical properties with mannan A from ivory nuts. The alk. cuprammonium soln. from which the mannan had been pptd. yields on neutralization a ppt. of cellulose. Crude xylan was pptd. from the filtrate by MeOH and purified by repptn. The xylan thus obtained differs from that from bamboo; it gives no reaction with ZnCl₂, was sol. in H₂O only when freshly pptd. and has $[\alpha]_D^{20}$ -87.44° in 2 N NaOH and $[\alpha]_{435}^{20}$ -4.55 in cuprammonium soln. under standard conditions. Xylose, characterized by the osazone and the CdBr₂ compd. of xylonic acid, is the only product of hydrolysis. IV. Cell membrane of plants. *Ibid* 27–58.—Bamboo stalks, after disintegration by treatment with ClO₂ and Na₂SO₃, yields a fiber with 70% cellulose. By extn. with NaOH, pptn. of the ext. by MeOH and purification by pptn. from cuprammonium soln. with AcOH, a xylan was isolated, $[\alpha]_{435}^{20}$ -4.85° in cuprammonium soln. under standard conditions, colored violet by ZnCl₂ and yielding only xylose on hydrolysis. Further fractionation from cuprammonium soln. gave no evidence of sepn. The pentosan content of the fiber is 22.5% but after removal of long fibers by sieving this rises to 39% and it is concluded that the xylan is essentially a constituent of the parenchyma. This is confirmed by microscopical observation of corrosion of the fibers by NaOH and by 12% HCl. Cutin was detected in the residual epidermal cells after treatment of the fiber with cold 75% H₂SO₄. A further account is given of the detection of a substance of "furfuroid" nature, not a carbohydrate, present in the primary layer of the bamboo fiber, characterized by a reddish violet color with phloroglucinol and EtOH-HCl which appears after 1–2 days. Bamboo fibers swollen in cuprammonium soln. assume the appearance of a string of beads. This phenomenon appears to be due to an outer skin on the fiber and crosswise subdivision of the fibers of 10–30 μ by layers of the above substance. Microscopical observation of the swelling also indicates that the fiber is constructed of concentric layers, probably sepd. by a substance similar to that which forms the skin, and a lengthwise striation is also visible. It is suggested that the sections of fibers formed in this way yield the "cell-wall units" isolated by Hess and Schultze from the bast fibers of ramie. Further subdivisions of the cell wall may exist in the form of actual or potential fibrillae. The investigation of bamboo fibers confirm the previous conclusion that lignin is not chemically bound with the cellulose. V. Cellulose from young shoots and old heart wood. K. HESS, M. LÜDTKE AND HERBERT REIN. *Ibid* 58–72.—The fiber obtained from 14-day old beech shoots by treatment with ClO₂ and Na₂SO₃ was repeatedly extd. with NaOH of increasing concns. The residue was pure cellulose. The exts. contd. no cellulose but only a xylan and a small amt. of a new glucosan. Similar treatment of a 385-year old wood

of *Sequoia gigantea* yielded cellulose indistinguishable from the 1st in rotatory power or viscosity in cuprammonium soln. (With C. Trogus.) The sepn. of the cellulose from each of the raw materials was followed by observation of the x-ray diagrams. In each case the characteristic cellulose interference rings, at first faint, are intensified as the interference by foreign substances decreases. The crystallites appear to be less uniformly oriented in the young shoot.

C. J. WEST

Cellulose. XXXII. Characterization of cellulose preparations by the rotation method. KURT HESS AND NOAH LJUBITSCH. Kaiser-Wilhelm-Institut für Chemie. *Ann.* 466, 1-18(1928); cf. *C. A.* 22, 4793.—The identity of the rotatory power of cuprammonium solns. of cellulose from different sources and of the course of variation of rotatory power with concn. is reaffirmed, contrary to the observations of Hägglund and Klingstedt (*C. A.* 22, 1234). The exact exptl. procedure is now described in greater detail. Repetition of the measurements recorded by H. and K., using samples of the same material, showed that when appropriate precautions were taken, including prepn. of solns. in absence of air and complete removal of foreign materials from the crude cellulose material, the figures for cotton and pine wood cellulose agreed closely with those for "standard cellulose." In view of the suggestion that foreign materials might influence the values of the rotatory power, the behavior of mannan and xylan from pine wood was examd. The mannan is completely pptd. as a Cu-alkali complex under the standard conditions of the detns. and therefore has only an indirect influence on the figures obtained if it is not removed. In the absence of alkali the rotatory power is much less than that of cellulose but the rotatory power-concn. curve is of the same type. The xylan has a slightly greater rotatory power than cellulose, and the curve is again of the same type. Rotatory powers, but not the course of the curve, may, therefore, be affected by these impurities and an estimate of their amt. may be obtained by measurement of the rotatory power of the crude material. **XXXIII. Detection of a foreign substance in cellulose fibers. II.** KURT HESS, FRITZ MICHEEL AND WATROSLAV REICH. *Ibid* 73-9.—Further investigation of the N- and ash-contg. foreign substance in cotton fibers showed that it was destroyed completely by hydrolysis with concd. HCl, partly destroyed by acetolysis with AcOH and HBr or, to a smaller degree, with AcO and H₂SO₄. The last process yields an ash-free substance. A similar foreign substance can be isolated from ramie fibers. The substance can be obtained practically free from ash by pptn. of the Ca in H₂O by (CO₂H)₂. Treatment of the ash-free substance with Ca(OH)₂ yields a substance contg. 33% ash. **XXXIV. Trimethylcellulose.** K. HESS, CARL TROGUS AND HERMANN FRIESE. *Ibid* 80-94.—There is no real discrepancy between the results of methylation of cellulose by Hess and Pichlmayr (*C. A.* 21, 174), by Urban (*C. A.* 20, 3080) and by Freudenberg and Braun (*C. A.* 22, 3635). A sample of the product obtained by the last named could be partly dissolved in H₂O with suitable mech. treatment (shaking with glass beads in H₂O or keeping in H₂O for several weeks) or after swelling and dissolving in indifferent solvents. The H₂O-sol. fractions in each case had the same rotatory power and x-ray diagrams. Such difference as appears to exist at first sight is caused by preservation of the non-cellulosic coating of the fiber due to incomplete purification in the case of cotton from which "insol." trimethylcellulose is prepd. There are, therefore, no grounds for assuming either that an insol. trimethylcellulose exists or that sol. trimethylcellulose is a disintegration product. (With H. PICHLMAYR.) Further details are given of the prepn. of cryst. trimethylcellulose. **XXXV. Crystalline triethylcellulose. II.** K. HESS AND ALEXANDER MÜLLER. *Ibid* 94-9.—Triethylcellulose was prepd. in 70% yield by repeated treatment of purified cotton with Et₂SO₄ and NaOH and had the same properties as the material from other sources. Hydrolysis by EtOH-HCl gives triethylglucoside, b_{0.2} 120-3°, [α]_D¹⁸ 63.37° in H₂O, in 94% yield. Further hydrolysis of the latter yields triethylglucose.

C. J. WEST

The pectin and hemicelluloses of the flax plant. S. T. HENDERSON. *J. Chem. Soc.* 1928, 2117-25(1928).—Three products are described: (1) Pectin was extd. from unretted straw by 0.5% (CO₂NH₄)₂ at 80-90° for 7 hrs. Most of the MeO was removed by NaOH, and the resulting product appeared to be (C₆H₁₀O₆)₄C₆H₅O₆·(H₂O)_n. This differs from Nangi, Paton and Ling's proposed pectic acid by the lack of arabinose. By hydrolysis with dil. acid this became a polygalacturonic acid, probably (4C₆H₅O₆·H₂O)_n, and corresponded closely to Ehrlich's "tetragalacturonic acid a." (2) Extn. of flax fiber or straw with water at 100 to 145° gave a material low in uronic acid and in MeO, agreeing fairly well with the formula (C₆H₇O₆)₄CaMg(C₆H₁₀O₆)₆·H₂O, and designated a "hemicellulose." (3) After pptn. of (2) with alc., the filtrate yielded a hexopentosan, free from uronic acid, and contg. galactose, xylose, and arabinose.

J. J. WILLAMAN

Strained and strainless rings. T. M. LOWRY. *Chemistry and Industry* 47, 1149-50(1928).—Positive evidence has been recently obtained that satd. rings contg. more than 5 atoms are strain-free and that this state is brought about by the buckling of the ring. The atoms are then not in a ring but assume such positions that free rotation is possible at every single bond in the ring. The atoms may be arranged in two forms: (1) chair-shaped and rigid with 3 atoms above and 3 atoms below the *av.* plane; (2) boat-shaped and flexible, capable of being flexed freely, and its plane of symmetry capable of being passed through any opposite pair of atoms. In a 6-atom ring the angle between the bonds of a 1,2-di-deriv. can be decreased to 60° in the *trans*-, and increased to 60° in the *cis*-isomerides. In a 7-atom ring, these angles can be decreased to 10° and increased to 110° , which would make the formation of the *trans*-ring nearly as easy as that of a *cis*-ring. Huckel's discovery of the new type of isomerism in the simple derivs. of decahydronaphthalene is the most conclusive vindication of the theory of strainless rings.

J. H. PERRY

The cyclohexanediols. I. Separation and properties of *cis*- and *trans*-quinitols. L. PALFRAY AND B. ROTHSTEIN. Catholic Institute, Paris. *Bull. soc. chim.* 43, 1122-31(1928).—*Cis*- and *trans*-quinitols may be sep'd. by recrystg. from Me_2CO contg. a little BuOH to diminish the volatility of Me_2CO . The *trans*-isomer is insol. and can be identified by its *phenylurethan*, m. 262° ; the *cis*-isomer is sol. and gives a *phenylurethan*, m. 188° . Soly. coeffs. are given so as to det. the amt. of solvent to use while the table of m.-p curves gives the approx. compn. of any mixt. of the 2 isomers.

R. C. ROBERTS

Catalytic dehydration of alcohols with alkaline bisulfates. JEAN-BAPTISTE SENDERLUS. *Compt. rend.* 187, 1102-5(1928).—The dehydration of cyclohexanol is obtained with 2 parts of NaHSO_4 to 100 parts of cyclohexanol but the reaction is slow due to the insoly. of both NaHSO_4 and KHSO_4 . The conversions with methylocyclohexanols are of the same order as those with cyclohexanol. NaHSO_4 is more active than KHSO_4 due to its greater affinity for H_2O .

J. H. PERRY

The structure of the benzene ring. K. LONSDALE (née YARDLEY). Univ. Leeds. *Nature* 122, 810(1928). Preliminary note on the x-ray analysis of hexamethylbenzene, indicating that the C atoms in benzene exist in 1 plane.

WALLACE R. BRODE

Formation of benzene and hydrocarbons by the action of heat on methane. FRANZ FISCHER. Kaiser Wilhelm Institut für Kohlenforschung. *Chem. Markets* 23, 587-91(1928). By conducting CH_4 of various origins through tubes at certain temps., pressure, rate of flow and cooling speeds, it was shown that C_6H_6 , C_{10}H_8 and other aromatic hydrocarbons could be formed, whereas earlier investigators had pointed to the formation of C (carbon black) and H_2 as the chief or only products. Exptl. conditions and results are detailed, and the suggestion is made that in some countries where carbon black is now made by wasteful processes it may be feasible to resort to CH_4 as raw material for synthesizing C_6H_6 .

W. C. EBAUGH

Reduction of mono- and polynitro compounds. XI. Reduction of aromatic mono- and polynitro compounds. K. BRAND AND A. MODERSOHN. Univ. Giessen. *J. prakt. Chem.* 120, 160-76(1928).—The reduction of aromatic mono- and polynitro compds. to β -arylhydroxylamines in so-called neutral soln. has been investigated and it is shown that, using H_2O - EtOH CaCl_2 soln. and Zn dust, the soln. becomes alk. slowly at the ordinary temp. and more rapidly on heating. The role played by the CaCl_2 is obscure and a scheme is given for the reaction which includes Zn and H_2O only. Zn dust and NH_4Cl react in the absence of a NO_2 compd. to produce HO ions, but the concn. of the latter is much lower than that produced by Zn dust, CaCl_2 and a NO_2 compd. On the basis of the above facts it is possible to explain the results of Brand (*Ber.* 38, 4006(1905)), who showed that reduction of $m\text{-C}_6\text{H}_4(\text{NO}_2)_2$ with Zn dust and CaCl_2 gives, not $m\text{-O}_2\text{NC}_6\text{H}_4\text{NHOH}$, but $m,m'-(\text{O}_2\text{NC}_6\text{H}_4)_2\text{N}_2\text{O}$ (I). Brand and Kowallek find that the velocity of combination of $m\text{-O}_2\text{NC}_6\text{H}_4\text{NO}$ with $m\text{-O}_2\text{NC}_6\text{H}_4\text{NHOH}$ to yield I in neutral soln. is greater than that of PhNO with PhNHOH to azoxybenzene, under the same conditions. This difference is due to the acceleration by small HO -ion concns. of the velocity of the reactions: $\text{O}_2\text{NC}_6\text{H}_4\text{NO} + \text{O}_2\text{NC}_6\text{H}_4\text{NHOH} \rightarrow \text{O}_2\text{NC}_6\text{H}_4\text{NO} \cdot \text{NC}_6\text{H}_4\text{NO} + \text{H}_2\text{O}$ and $3\text{O}_2\text{NC}_6\text{H}_4\text{NHOH} \rightarrow \text{O}_2\text{NC}_6\text{H}_4\text{NH}_2 + \text{O}_2\text{NC}_6\text{H}_4\text{NO} \cdot \text{NC}_6\text{H}_4\text{NO}$. Since these small HO -ion concns. prevail the velocity of formation of I increases and becomes greater than the reduction velocity of $m\text{-O}_2\text{NC}_6\text{H}_4\text{NO}$ to $m\text{-O}_2\text{NC}_6\text{H}_4\text{NHOH}$ and the formation of the I proceeds at the expense of the $\text{O}_2\text{NC}_6\text{H}_4\text{NHOH}$. The velocity of formation of azoxybenzene is smaller than that of I and although accelerated by increased HO ion, does not overtake the velocity of reduction of PhNO to PhNHOH ; consequently the latter is the main product. By adding traces of acids or acid salts (e. g., KHSO_4) at the commencement of the reaction, the hydroxylamines

may be intercepted and preserved and the formation of azoxy compds. checked. Owing to the lower concn. of HO ions produced, the use of Zn dust and NH_4Cl is preferable to that of Zn and CaCl_2 for the general prepn. of β -arylhydroxylamines; by adding traces of acids (AcOH is recommended) hydroxylamines sensitive to very small HO-ion concns. are readily obtained. The prepn. of the following is described: $m\text{-O}_2\text{NC}_6\text{H}_4\text{NHOH}$, m. 118° ; $2,6\text{-O}_2\text{N}(\text{NHOH})\text{C}_6\text{H}_3\text{Me}$, m. $120\text{--}1^\circ$ (68% yield); $2,4\text{-O}_2\text{N}(\text{NHOH})\text{C}_6\text{H}_3\text{Me}$, m. $108\text{--}9^\circ$ (50% yield); $2,4\text{-O}_2\text{N}(\text{NHOH})\text{C}_6\text{H}_3\text{OMe}$, m. 129° ; $2,6,4\text{-(O}_2\text{N)}_3(\text{NHOH})\text{C}_6\text{H}_2\text{Me}$, m. $143\text{--}4^\circ$. C. J. WEST

New syntheses in the group of amino acids. I. Condensation of aldoximes with esters of β -ketonic acids. GAETANO MINUNNI AND SALVATORE D'URSO. Reale Univ. Catania (Sicily). *Gazz. chim. ital.* 58, 485-504(1928).—The general method of synthesis of pyrazole derivs. from arylhydrazones of acyclic or isocyclic aldehydes and esters of β -ketonic acids developed by M. (cf. C. A. 20, 599) suggested a study of the action of oximes and esters of β -ketonic acids, which might lead to NH_2OH derivs. of keto compds., of interest because of the means of identifying the CHO or CO function, because of the isomers formed, and because of the mol. transpositions involved. PhCH:NHOH (I) and $\text{AcCH}_2\text{CO}_2\text{Et}$ (II) react energetically when heated with a trace of ZnCl_2 and tend to resinify completely. I (5 g.), II (5 g.) and ZnCl_2 (0.1 g.) heated 90 min. at $120\text{--}5^\circ$, removed with the aid of boiling water to a cold receptacle, washed 3 times with water and then with EtOH, the solvents being decanted each time, filtered and washed with EtOH, yields 2.40 g. of *benzylidene- α -amino- β -crotonolactone*, $\text{MeC:C(N:CHPh).CO.O}$ (III), yellow, m. $146.5\text{--}7.5^\circ$. Almost the same yield is

obtained with H_3PO_4 by allowing to stand 20 days at room temp. A higher yield in a shorter time is obtainable with H_3PO_4 . I (10 g.), II (10 g.) and H_3PO_4 (10 g.) heated very cautiously around $110\text{--}5^\circ$ for 30 min., boiling water added, the latter sepd., the residue washed with 10% Na_2CO_3 , filtered, washed until neutral, extd. and washed with EtOH, yields 10.5 g. of III. Boiled with HCl (d. 1.19), III decomps. to BzH. Heated with 1% aq. KOH, III hydrolyzes to BzH, which was removed with EtO. The aq. residue freed of Et_2O , dil. HCl added, the ppt. dissolved in Na_2CO_3 , reprecip. by HCl and recrystd. from a hot mixt. of EtOH and C_6H_6 , yields a hydrolytic compd. (IV), m. $150\text{--}1^\circ$, very sensitive to heating (decomps. when maintained at $85\text{--}90^\circ$). IV is also formed by refluxing III with dil. alc. Na_2CO_3 . $\text{C}_6\text{H}_5\text{OH}$ (2.5 g.) and Na_2CO_3 (2 g.) in a little water added to III (5 g.) in EtOH (20 cc.), let stand 1 hr., filtered, dild. with water, acidified with dil. HCl, and the ppt. recrystd. from a mixt. of EtOH and C_6H_6 , yields IV. III refluxed for several hrs. with excess $\text{C}_6\text{H}_5\text{OH}$ and EtOH, distd., the residue poured in water, the sepd. oil (after solidification) dissolved in EtOH, pptd. with dil. EtOH, extd. with the latter and filtered, yields a residue which was proved to be a mixt., m. $130\text{--}42^\circ$. III (5 g.), $\text{C}_6\text{H}_5\text{OH}$ (3 g.) and EtOH (50 cc) kept (with periodical agitation) at room temp. for 2 months, then allowed to evap., yielded, after washing the ppt. with water and recrystg. from a mixt. of EtOH and C_6H_6 , 4 g. of IV. III (6 g.) in 50% EtOH (70 cc.) refluxed for 10 min. with PhHNNH_2 (4 g.), cooled, and the ppt. recrystd. from boiling EtOH, yields 6.2 g. (98.4%) of *benzaldehyde phenylhydrazone* (V). Addn. of $\text{Pb}(\text{OAc})_2$, HgCl_2 or CdSO_4 soln. to the dil. alc. mother liquor ppts. yellow compds., CuSO_4 ppts. a brown compd. and AgNO_3 ppts. a yellowish compd. which turns brown on exposure to light. These ppts. do not form if the mother liquor is dild. with water and extd. with Et_2O . The yellow ppt. with $\text{Pb}(\text{OAc})_2$, filtered, washed, dried, suspended in 50% EtOH, H_2S passed through, filtered, the filtrate cooled and refiltered several times, allowed to evap., yields a brown, amorphous mass which could not be crystd. Another way was then tried to isolate the 2nd product of the action of PhHNNH_2 on III. The dil. alc. mother liquor of V was distd. *in vacuo* to eliminate EtOH, and was then let stand, whereby there slowly sepd. a yellow amorphous substance which, dried in air, m. below 100° , but which could not be crystd. If to the residue after elimination of the EtOH is added cold, dild. HCl, a flocculent yellow substance (VI) seps., which redissolves in excess HCl, and which could not be crystd. Since VI was sol. in Na_2CO_3 , the attempt was made to purify it by soln. in 10% Na_2CO_3 , filtration and reprecip. with dil. HCl, but after 3 treatments a substance was obtained which m. $105\text{--}15^\circ$. I (5 g.), $\text{BzCH}_2\text{CO}_2\text{H}$ (VII) (4 g.) and H_3PO_4 (5 g.), heated 3 hrs. at $100\text{--}5^\circ$, let cool several hrs., a little EtOH added, filtered, washed with EtOH, yield 2.2 g. of a substance (VIII), more of which is obtained by allowing the wash liquors to evap. The 2nd filtrate heated to eliminate EtOH, leaves an oil which, treated with water and steam-distd., yields an uncrystallizable pitch and a distillate from which addn. of AcOH and PhHNNH_2 yields V. VIII purified by crystn. from a hot mixt. of EtOH and C_6H_6 , yields *benzylidene- α -amino- β -cinnamolactone*,

$\text{PhC}:\text{C}(\text{N}:\text{CHPh})\text{CO}_2\text{O}$, (IX), lustrous yellow, m. $194-5^\circ$. I, VII and H_3PO_4 also

react at room temp., the yield of IX being higher. By first heating the mixt. until homogeneous, and then leaving it to itself the reaction is complete after about 1 month. IX heated with 1% aq. KOH yields BzH, while the residual liquor after extn. of the BzH by Et_2O , treated with dil. HCl, ppts. a flocculent mixt. which turns yellow and then pink in air. Extd. with hot water, this mixt. yields a cryst. compd., extd. with hot glacial AcOH it yields another cryst. compd. and still another cryst. compd. less sol. in AcOH which is yellow and m. $191-3^\circ$ (decompn.). IX (2 g.) suspended in EtOH (40 cc.) refluxed with PhHNNH_2 (2 g.) for 15 min. and the ppt. washed with boiling EtOH, yields the compd. $\text{C}_{22}\text{H}_{19}\text{O}_2\text{N}_3$, not altered by exposure to light, decomps. violently at 140° . The yield corresponds exactly to the reaction $\text{IX} + \text{PhHNNH}_2 \longrightarrow \text{C}_{22}\text{H}_{19}\text{O}_2\text{N}_3$. I (2 g.), VII (1.6 g.) and ZnCl_2 (0.05 g.) heated 90 min. at $125-30^\circ$, cooled rapidly, the cryst mass extd. with hot water, steam-distd. to eliminate excess VII, the residue filtered hot (0.35 g. of pitchy residue), cooled, and the ppt. recrystd. repeatedly from hot water, yields about 50% of the compd. $\text{C}_7\text{H}_7\text{ON}$ (X), m. $132.5-3.5^\circ$, dissolves in dil. KOH with evolution of heat, from which soln. Et_2O exts. a substance which m. 130° . X is also formed from I and ZnCl_2 alone. I (2 g.) and ZnCl_2 (0.05 g.) heated 1.5 hrs. at $125-30^\circ$, more ZnCl_2 (0.10 g.) added, the mixt. heated 2 hrs. longer at $125-30^\circ$, let stand several hrs., heated with water, filtered, and the filtrate cooled, ppts. about 1 g. of X. The residue insol. in hot water treated with hot EtOH and allowed to cool slowly, yields, a cryst. compd., m. $226-7^\circ$. The formation of III and of is a general reaction, and the products can be shown to be of the character described, to contain the $\text{RCH}:\text{N}-$ group, by their chem. properties, particularly by their reaction with PhHNNH_2 , a reaction already shown by Diels (C. A. 14, 2631, 3243) to be characteristic of compds. congt. this group. It is considered that III is formed by and II first reacting thus: $\text{I} + \text{II} \longrightarrow \text{H}_2\text{O} + \text{AcCH}(\text{N}:\text{CHPh})\text{CO}_2\text{Et}$, the latter intermediate compd. in its enolic form $\text{MeC}(\text{OH}):\text{C}(\text{N}:\text{CHPh})\text{CO}_2\text{Et}$ then losing 1 mol of EtOH, thus forming III. This is in harmony with the known property of II to oliv. i. e., to behave as β -hydroxycrotonic acid. The expts. open an interesting field of research, since the simple technic, good yields and available raw materials are a generally practical method for synthesizing a new type of compds. which belong to the hydroxy- and amino-acid groups, and which may be readily converted by hydrazes, NH_2OH , mineral acids, NH_4OH , alk. hydroxides and other reagents, into various products.

C. C. DAVIS

Mercuration of aromatic amines and the problem of substitution. AUGUST F. LEBERT AND W. SCHNEIDER. Techn. Hochschule, Munchen. Ann. 465, 257-72 (1928). —(On the basis of Wieland's addn. theory of substitution, Kharasch and Jacobson postulated the production of complex salts in the mercuration of aromatic amines. Such salts have now been isolated. The action of $\text{Hg}(\text{OAc})_2$ on an aromatic amine may be represented by the typical scheme: $\text{PhNH}_2 \longrightarrow [\text{H}_2\text{NPhHgOAc}]\text{OAc}(\text{I}) \longrightarrow [\text{NPhH}_2\text{HgOAc}(\text{IIa}) + \text{HNPhHgOH}(\text{IIb}) \longrightarrow \text{H}_2\text{NC}_6\text{H}_4\text{HgOAc}(\text{III})$. With PhNH_2 the amine in MeOH is treated with MeOH- $\text{Hg}(\text{OAc})_2$; after addn. of a little AcOH the mixt. becomes clear and on cooling deposits aniline acetate *N*-mercuriacetate (I), m. 87° ; similarly are obtained the *p*-toluidine, m. 155° , *o*-toluidine, m. 76° , *m*-aminotolophenone, m. 104° , *p*-anisidine, m. 125° and *bis*-*o*-toluidine, acetate *N*-mercuriacetate, m. 96° . These compds. are very unstable, changing slowly on keeping or at once on melting, or heating in aq. H_2O or EtOH, into the mono- or dinuclear-substituted products. When $[\text{H}_2\text{NPhHgOAc}]\text{OAc}$ is kept *in vacuo* no change of compn. occurs but the m p changes. In the cold $(\text{NH}_4)_2\text{S}$, NaOH or NaI solns. all give with I the corresponding Hg compd. NaI may be employed to distinguish between the different stages of the reaction, since with I AcONa is formed in soln., but with II NaOH also. At stage III alkalinity is developed only in so far as Hg is being removed from the nucleus. The stage II compd. is obtained, in the case of PhNH_2 , by shaking I with Et_2O ; amine *N*-mercuriacetate is obtained impure, m. about 154° . Stage II is the 1st result of the action of $\text{Hg}(\text{OAc})_2$ on *p*- $\text{H}_2\text{NC}_6\text{H}_4\text{CO}_2\text{Et}$, which gives a product, m. 117° , estimated, from the analytical results, to contain 80% of IIa, 12% of IIb and 8% of $\text{Hg}(\text{OAc})_2$. Stage I compds. have a great surface activity, e. g., in absorbing impurities; the above product when prepd. in Et_2O yields a solid mass, which contains absorbed Et_2O and becomes gelatinous in H_2O . *p*- $\text{H}_2\text{NC}_6\text{H}_4\text{Ac}$ and *m*- $\text{O}_2\text{NC}_6\text{H}_4\text{NH}_2$ also gives stage II products. These are more stable than I but are converted by AcOH into nuclear-substituted compds. *p*-Ethylaminophenylmercuric acetate and *p*-dimethylaminophenylmercuric acetate have been prepd., without intermediate products being isolated. It is suggested that if the stage I \longrightarrow II cannot take place at the

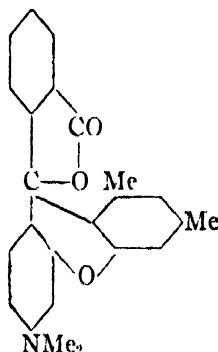
ordinary temp., mercurization will not occur. Attention is directed to the danger that, since impurities may be introduced by absorption, pharmacol. Hg compds. may be impure.

C. J. WEST

Symmetrical *m*-xylenol derivatives. E. NOELTING. *Bull. soc. ind. Mulhouse* 94, 648-9(1928); Sealed Note 2333, Jan. 4, 1915.—Under N.'s direction P. Pfeiffer and J. Lichtenberger began a detailed study of sym. $C_6H_3Me_2OH$, which was stopped by the war. Pfeiffer prepd. a few acyl derivs. (acetate, benzoate) and the *acetophenone*, 2,4,6- $Me_2(HO)C_6H_2COMe$ (I), and found that only the *o*-compd. is formed. From I he prepd. the *chalcone*, $Me_2(AcO)C_6H_2COCH:CHPh$, (II) and its dibromide, and the *flavone* $Me_2C_6H_2.CO.CH:CPh.O$, (III) which was studied in detail and treated with $MeMgI$.

From the *chloroacetophenone* (IV), *coumaranone*, $Me_2C_6H_2.CO.CH_2.O$, (V) was prepd.

and condensed with various aldehydes. Lichtenberger studied the mono- and diazo compds. of *m*-xylenol. *Aminoxymenol*, 3,5,4- $Me_2(H_2N)C_6H_2OH$, (VI), obtained from the monoazo deriv., was converted into *m*-xyloquinone (VII), which can easily be prepd. in this way. In the prepn. of the *nitroso deriv.*, $Me_2(ON)C_6H_2OH$, (VIII) the *o*-compd. is apparently not formed. Hydroxyaldehydes were obtained by treatment with $CHCl_3$ and $NaOH$. By condensation with dimethylaminohydroxybenzoylbenzoic acid, *aporphodamine* (IX) is formed.



By condensation with tetramethyldiaminobenzohydrol, the *triphenylmethane deriv.*, (p - $Me_2NC_6H_4$) $_2CHC_6H_2(OH)Me_2$ (X), was obtained, which gives a green dye by oxidation. Treatment of aminoxymenol with Na_2S and S gave a brown S dye. Report. M. BATTEGAY. *Ibid* 650-1.—*m*-Xylenol acetate was prepd. by Zimmermann (*Thesis, Fribourg*, published in the summer of 1914). The benzoate was prepd. by Béhal and Choay (*Bull. soc. chim.* [3], 11, 702(1894)) in the isolation of *m*-xylenol from wood creosote. I, V, VIII and the *o*- and *p*-hydroxyaldehydes were prepd. by Steinich (*Thesis, Greifswald*, passed May 7, 1914) and described in detail by von Auwers *et al* (*C. A.* 9, 1057; 10, 200, 202; 17, 736). VI was prepd. by Bamberger and Rising (*Ann.* 316, 300(1901)) by the action of dil. H_2SO_4 on 2,6- $Me_2C_6H_3NHOH$. Mono- and diazo-*m*-xylenol were prepd. by von Auwers and Michaelis (*C. A.* 8, 2389, 2391) and at the same time by Zimmermann (*Thesis*). II and its dibromide, III, VII, IX, X and the S dye are new.

A. PAPINEAU-COUTURE

Nitration of phenol. KARL BEAUCOURT AND ECKHARD HÄMMERLE. *Techn. Hochschule Wien. J. Prakt. Chem.* 120, 185-92(1928).—Nitration of $PhOH$ in H_2O , $EtOH$ or glacial $AcOH$ with HNO_3 of d. 1.35 at 7-12° yields 77-82% of NO_2 compds, which consists of 40% *o*-, 35-40% *p*- NO_2 and 2.5% 2,4-(O_2N) $_2C_6H_2OH$. With HNO_3 of d. 1.42 a yield of 75% mono- NO_2 compds. is obtained but the *o*:*p*-ratio is shifted in favor of the *p*-isomer. Variation of temp. has only a small effect on the *o*:*p*-ratio, rise in temp. favoring the production of the *o*-isomer and *vice versa*. The yield of o - $O_2NC_6H_4OH$ is but little affected by employing excess of HNO_3 but the yield of the *p*-isomer is largely depressed, while the production of 2,4-(O_2N) $_2C_6H_2OH$ is correspondingly increased; this is probably due to the greater soly. of p - $O_2NC_6H_4OH$ in the residual HNO_3 . This residual acid, contg. dissolved p - $O_2NC_6H_4OH$, after restoration to the original HNO_3 concn. by addn. of HNO_3 , may be used again.

C. J. WEST

Odor and molecular structure—derivatives of 5-acetocarvacryl methyl ether and certain other 1,2,4,5-tetra-substituted benzenes. MARSTON T. BOGERT AND ISRAEL GOLDSTEIN. *Am. Perfumer* 23, 524-6(1928).—The primary purpose of this investigation was to discover in what way the strong and persistent aromatic odor of carvacryl Me ether would be affected by the introduction of additional substituents in position 5,

since this arrangement of substituents is found in certain naturally occurring odorous compds., as *e. g.*, the asaric aldehyde of calamus oil, or the asarone present in the essential oil of *Asarum arifolium*. The results of the investigation may be summarized as follows: Carvacryl Me ether was converted into the 5-Ac deriv. and this in turn into the chalcone, from which a dibromide and several reduction products were prepd. From the oxime of the Ac deriv. the 5-AcNH deriv. was secured by a Beckmann rearrangement, while direct oxidation of the Ac deriv. itself led to the methylisopropylanisic acid. Another series led from carvacryl Me ether, via the methylisopropylanisaldehyde to the corresponding methylisopropylanisalacetone. Attempts to rearrange carvacryl acetate or carvacryl allyl ether were unsuccessful. Methylisopropyl-*p*-hydroxybenzaldehyde and methylisopropyl-*p*-coumaric acid were also produced from carvacrol; and from its Me ether a Bz deriv., reduction of which gave the benzohydrol. Efforts to oxidize the cymyl ester of *p*-MeC₆H₄SO₃H, so as to replace the cymene Me by the CHO group, failed. With the exception of carvacryl allyl ether, which had a sharp aromatic odor, the other new compds. prepd. were practically odorless. 5-Cinnamylcarvacryl Me ether, C₂₀H₂₂O₂, m. 72-3°, (oxime, C₂₀H₂₃O₂N, m. 201-2°); 2-isopropyl-4-methoxy-5-methylphenylstyrylcarbinol, C₂₀H₂₄O₂, m. 54-5°; 5-cinnamylcarvacryl Me ether dibromide, C₂₀H₂₂O₂Br₂, m. 175° (decompn.); 5-benzoylcarvacryl Me ether, C₁₈H₂₀O₂, m. 55°, b₂₅ 218-21°; 2-isopropyl-4-methoxy-5-methylbenzohydrol, C₁₈H₂₂O₂, m. 113-5-4°. Cf. the recent article of Rosenmund and Wha, ketones of carvacrol, C. A. 22, 3402.

W. O. E.

Aromatic allyl and propenyl compounds. II. The geometric isomerism of isosafrole H. I. WATERMAN AND R. PRIESTER. Tech. University, Delft, Holland. *Rec. trav. chim.* 47, 1027-30 (1928); cf. C. A. 22, 3643.—Hoering and Baum have investigated the geometric isomerism of isosafrole (C. A. 3, 2946) and claim to have isolated the α -(*cis*)-isosafrole as well as the β -(*trans*)-compd. usually investigated; the same result was recorded by Nagai (C. A. 16, 418) who converted safrole into isosafrole by means of *dil.* alc. KOH in order to obtain a product which should be rich in the γ -compd. W. and P., however, did not succeed in converting safrole into isosafrole by means of such *dild.* alc. KOH, but were able to convert the larger part of the safrole into isosafrole on boiling 150 g. safrole during 30 hrs. with 90 g. KOH in 510 g. 96% alc. The reaction product, however, consisted only of unchanged safrole and *trans*-isosafrole, on treating the lower boiling fractions with an aq. Hg(OAc)₂ (cf. Balbiano, C. A. 3, 2156) the safrole dissolves, leaving β -isosafrole behind. On boiling 1 kg. safrole, 2.5 kg. 96% alc. and 450 g. KOH during 25 hrs., a mixt. of 55% *trans*-isosafrole and 45% unchanged safrole was obtained; this figure was found by sepgg. the components with Hg(OAc)₂, by the I addn. method (cf. C. A. 22, 3643) and from the mol. refraction which is additive in such mixts., provided no other compds. be present (cf. Eisenlohr, *Spektrochemie org. Verb.* 1912, 39). On heating such a mixt. in a sealed tube during 8 hrs. at 200°, the refraction is raised a little, but as the mixt. assumes a strongly yellow color by this treatment, the higher refraction cannot be ascribed to a transformation of *cis*- into *trans*-isosafrole (Nagai, *l.c.*) but may just as well be due to decompn., oxidation or polymerization. From this research it follows, that the conversion of safrole into isosafrole by means of alc. KOH only gives rise to the formation of *trans*-isosafrole.

C. F. VAN DUIN

Constitution of mylistinol and isomylistinol. KINZO KAFUKU AND NOBUTOSHI ISHIKAWA. Centr. Research Lab. Government of Formosa. *Bull. Ind. Dept. Centr. Research Lab. Government of Formosa* 24, 27-34 (1928).—The constitution of these compds. must be mylistinol, 3,5,4- or 4,5,3-HO(MeO)(EtO)C₆H₂CH:CH₂, isomylistinol, 3,5,4- or 4,5,3-HO(MeO)(EtO)C₆H₂CH:CHMe, as may be inferred from the analogous case of the action of the Grignard reagent upon safrole. K. and I. synthesized mylistinol according to the following scheme and established its constitution. 4,3-HO(MeO)C₆H₂CH:CH₂ \rightarrow 4,3,5-HO(MeO)(O₂N)C₆H₂CH:CH₂ \rightarrow 5,3,4-HO(MeO)(EtO)C₆H₂CH:CH₂ (I) \rightarrow 5,3,4-BzO(MeO)(EtO)C₆H₂CH:CH₂ (II); 4,3,5-HO(MeO)(O₂N)C₆H₂CH:CH₂ \rightarrow 5,3,4-BzO(MeO)C₆H₂CH:CH₂ (III). II, m. 55.5-7°, mixed with benzoylated mylistinol, it m. 57-8°. The KMnO₄ oxidation product of III is a liquid, by comparing which with the oxidation product of mylistinol Me ether, m. 91°, it was established that mylistinol (I) is 5-hydroxy-eugenol Et ether. Et and Me ethers. 15 g. of nitro-eugenol, 15 g. EtI (13 g. MeI) and 130 cc. abs. EtOH(MeOH) are heated in a pressure oven for 5-6 hrs. Nitro-eugenol Et ether, b₂₅ 156-7.6°. Me ether decomps. on heating. Amino-eugenol Et and 3-Me ether. To 1 to 12 g. nitro compd. and 12 g. metallic Sn 20 cc. concd. HCl is slowly added and the mixt. heated on a H₂O bath. After the reaction is over the soln. is made strongly alk., distd. with steam, the distillate being made acid by HCl. The unchanged

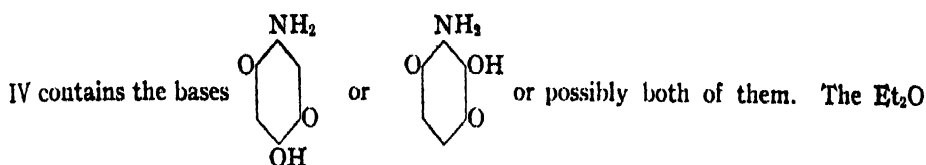
substance is removed by Et_2O , again made alk. and extd. with Et_2O , *Et ether*, b_{10} 165–8°, *Me ether*, b_{10} 162–4°. 5-Hydroxyeugenol *Et* and *Me ether*. A mixt. of 25 cc. H_2O , concd. H_2SO_4 and 10 g. of amino compd. is diazotized with NaNO_2 with cooling, and hydrolyzed. After distg. with steam and extg. with Et_2O , the phenol is removed by NaOH , the soln. made acid and extd. with Et_2O ; *Et ether*, b_{10} 156–60°; *Me ether*, b_{10} 134°. Other const. of the former also coincide with those of mylistinol. 5-Benzoyl-4-ethoxy-3-methoxy-1-allylbenzene, from the above *Et ether* benzoylated by Schotten-Baumann's method, m. 55.5–7°, unchanged when mixed with benzoylmylistinol.

K. SOMEYA

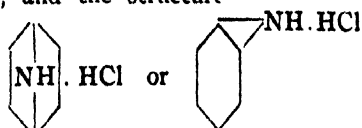
Synthesis of safrovanillin from isosafroegenol. KINZO KAFUKU AND NOBUTOSHI ISHIKAWA. Centr. Research Lab. Government of Formosa. *Bull. Ind. Dept. Centr. Research Lab. Government of Formosa* 24, 24-7(1928).—When isosafroegenol is oxidized with various oxidizing agents among which ozonized O (5–10%) is best (yield, 60–80%), 3-hydroxy-4-ethoxybenzaldehyde, m. 125°, is obtained, as a white or dirty red mass which may be purified by sublimation. Oxime, m. 181–3°. Semicarbazone, m. 202–3°.

K. SOMEYA

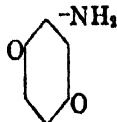
The action of potassium ferricyanide on sodium formanilide in alkaline medium. Preparation of derivatives of imidoquinones. E. I. ORLOV. *Ukrainskii Khim. Zhurnal* 3, No. 2, Pt. sci., 161-9(1928).—The action of strong oxidizing agents on aniline and its salts produces *p*-quinone and quinonediimides (aniline black) studied by Willstätter. The action of mild oxidizing agents, particularly in alk. media, was not studied before. As starting material there was selected not aniline but PhNNaCHO (I) in solid form and $\text{K}_3\text{Fe}(\text{CN})_6$ (II) as oxidizing agent. The supposition was that I will reduce II to $\text{K}_2\text{NaFe}(\text{CN})_6$: $2\text{PhNNaCHO} + 2\text{K}_3\text{FeCN}_6 = [\text{PhN}(\text{CHO})_2]_2 + 2\text{K}_2\text{NaFeCN}_6$. However in the presence of H_2O complications occur, and II acts in alk. medium as a strong oxidizing agent. *Exp. I.*—29 g. I and 140 g. II are ground in a mortar, then 160 g. NaOH (1:2) is added, the mixt. is transferred to a flask, 100 g. H_2O added, and the resulting magma is agitated with Et_2O . An exothermic reaction takes place, while the Et_2O becomes brown. The Et_2O ext. is sepd., and the extn. is repeated 5–6 times. The mass in the flask is of a dark violet color. After sepn. of the Et_2O the mass is treated with some more H_2O and Et_2O , this being repeated until the Et_2O ext. is only faintly tinged yellow. The combined Et_2O exts. are evapd. to a thick dark brown liquid, which on heating becomes more mobile, and on drying at 100° is converted into a viscous mass (III). Analysis gives the formula $\text{C}_6\text{H}_3\text{O}_2\text{NH}_2$ (mol. wt. 123). The yield is 18 g., which, computed on the basis of the aniline contained in the I used, is 75.7% of the theory. Thus about 25% remained in the alk. soln. combined as some phenolic substances not extractable with Et_2O . The presence of an amino group was shown by diazotizing and coupling with β -naphthol in alk. soln., giving a Bordeaux-red pigment. III was converted into HCl salts. The action of dil. HCl on heating is very slow with changes in color of the soln. from muddy black with dark granules through dark green to muddy violet until the mass on further heating becomes dry and free of excess of HCl. This mass of salts is either black or muddy gray, sol. in H_2O with muddy violet tinge, and is easily diazotized and coupled with β -naphthol in alk. soln., giving a Bordeaux-red pigment. These salts are fairly sol. in 95% alc. with muddy violet color; the last alc. ext. has a faint smoky color. On evapg. the excess of alc. and adding NaOH , the concd. soln. is blue. Not all of the salts are sol. in alc. and NaOH , there remaining some fraction sol. in glacial AcOH with dark green color, and in AcOEt with violet color. Besides, during the treatment of the salts with NaOH to liberate the bases there is formed free NH_3 . Such a behavior toward alc. and NaOH indicates that the black mass of salts is a mixt. of several compds. To obtain free bases from this mixt. of salts, the latter is treated with NaOH (1:2) at 60–70°; there is formed a supernatant oily brown layer contg. free bases, which was extd. with Et_2O and evapd.; the residue was dried first on the water bath and then in a dryer at 70°, resulting in a pitch-like black substance (IV). The yield was 14 g. from 46 g. of the mass (about 30%). The NaOH became brown, and on addn. of HCl pptd. a black powder, thus indicating the phenolic character of the substance. Analysis of IV dried in a desiccator over H_2SO_4 , gives the formula $\text{C}_6\text{H}_3\text{NO}_2$ or $\text{C}_6\text{H}_3\text{O}_2\text{NH}_2$. IV is a heavy mass sol. in AcOH with dark violet color, readily diazotized and coupled with β -naphthol in alk. soln., giving a Bordeaux-red pigment. Some of it was dissolved in 50 cc. alc., to which were added 10 cc. AcOH , 1–2 cc. HCl and 50 cc. H_2O . The soln. is readily reduced with Zn dust, $\text{Na}_2\text{S}_2\text{O}_4$, but less readily with NaHSO_3 , whereby the violet color of the soln. is changed to a faint yellow. On standing in the air the soln. reverts to the violet color. These properties indicated the presence in IV of compounds with NH_2 groups and of quinone character. Therefore



of the IV is satd. with HCl gas, whereby is formed a black cryst. ppt. of s. 14 g. of free bases yield 18 g. of carefully dried salts, which are readily sol. in) with muddy violet color. Analysis gave an av. of 10.6% N and 13.7% HCl. computation of the formula was impossible, for the salts on drying decomp. with tial volatilization. Attempts were made to obtain pure salts by sublimation which ms at 100° and proceeds at higher temp. with melting of the substance. The sub-
ing crystals deposit on the walls of the upper flask as a yellowish powder. When
ely heated there are formed needle-like yellow crystals and whitish scales. The
stals are never free of some moisture no matter how well the original mass of salts
ried. The yellow and the white sublimes in the air and in presence of moisture
one dark and then violet. At the bottom of the lower flask is formed a C-like
duc, *e. g.*, in one case this amounted to 4 g. from 18 g. of the original substance.
e subliming product is not uniform in appearance: in the upper parts of the flask
deposited a yellow cryst. powder; nearer the neck the crystals are green-yellow
ed with some white scales; in the bottom flask, carrying the charge, the upper
ts are coated with yellowish and whitish crystals. The entire sublimed product
carefully dried in a desiccator over H_2SO_4 , and then well ground in an agate mortar.
e tests showed that the product consisted of 3 components: one sol. in H_2O , the
er sol. in HNO_3 , while the 3rd imparted a faint azure blue color to HNO_3 without
solving. The mixed crystals were extd. in a Soxhlet with Et_2O , and the residue, a
yellow powder, was analyzed, giving the formula $\text{O}(\text{C}_6\text{H}_4\text{NH}_2 \cdot \text{HCl})_2$ (V) (mol.
136.5). It was expected that the free base could be isolated by treating the soln.
th solid Na_2CO_3 and extg. with Et_2O ; however, only a yellow oil denser than H_2O
is obtained, analyzing for $\text{H}_2\text{NC}_6\text{H}_4\text{OC}_6\text{H}_4\text{NH}_2 \cdot \text{HCl} \cdot 6\text{H}_2\text{O}$. It began to lose its
O only upon extended drying in a desiccator over H_2SO_4 . The Et_2O ext. on slow
apn deposits whitish scales becoming brown in the air. No analysis of them was
ide. By changing the conditions of sublimation of the black mass of salts [the free
ses of which have the formula $\text{C}_6\text{H}_3\text{O}_2\text{NH}_2$, (see above)], and pptg. from Et_2O soln.
th HCl gas, different results are obtained. The substance was placed between two
osely set watch glasses and dried slowly at 100° for a few hrs., whereby there were
rmed on the upper glass transparent crystals (VI) in the shape of elongated plates and
langles contg. 10.98% N and 28.5% HCl, *i. e.*, a substance of the compn. $\text{C}_6\text{H}_4\text{:}-$
H HCl (mol. wt. 127.5), and the structure



The free base when diazotized in HCl and coupled with β -naphthol in alk. soln. gives a
ponceau red (not a Bordeaux-red) pigment. The initial product of oxidation (III)
of I in alk. medium with I_2 , extractable with Et_2O , has the probable structure



Its salts on further treatment with NaOH give IV according to the equation: $\text{III} + \text{H}_2\text{O} \rightarrow \text{IV} + \text{C}_6\text{H}_4\text{O}_2 + \text{NH}_3$. The yield of IV is 30.4% (calcd. 44.15%). The IV gives salts which on sublimation under one condition give V and under another condition VI, depending upon the method of heating. The reaction of transposition in this can be thus formulated: $2 \text{IV} \cdot \text{HCl} = \text{C}_6\text{H}_3\text{O}_2 + \text{VI} + \text{NH}_4\text{Cl}$. The salts of IV diazotized and coupled in alk. soln. with β -naphthol give a pigment of Bordeaux-red color; when this pigment is dried and sublimed at 100° there are formed on the upper watch glass crystals of ponceau-red color identical with the pigment obtained under similar cond.
are 2 derivs
sublimed un
intermediate products obtained in the course of all the reactions of transposition from

one deriv. to another are phenolic substances, the nature of which was not detd. as their isolation from ferric-ferrocyanide medium presented difficulties. The use of $K_3Fe(CN)_6$ as an oxidizing agent proved to be unfavorable, and $KMnO_4$ should be substituted, also in alk. soln. This would make it possible to isolate also the intermediate products of the 1st reaction of oxidation, i. e., the products of dihydroxy-quinone nature. The investigation was not completed, yet it indicated that it will be possible to study the transition stages from aniline to quinone and imidoquinones by the use of more suitable oxidizing agents, preferably $KMnO_4$ in alk. soln. The expts. show the possibility of producing from the products of the reactions valuable red pigments directly on the fiber.

CHAS. BLANC

Tautomerism of *o*-nitrobenzaldehyde. II. Response to objections of Henry Gilman, Robert Fothergill and F. Arndt. IOAN TANASESCU. Chem. Inst. Cluj, Roumania. *Bull. soc. chim.* 43, 1117-22(1928); cf. *C. A.* 22, 236, 2932.—**Polemical. III. The action of diazomethane on *o*-nitrobenzaldehyde.** *Ibid* 1264-9.—Nitraldine, the product obtained from the action of CH_2N_2 upon $o-O_2NC_6H_4CHO$, was treated with dimethylhydroresorcinol in concd. HCO_2H and boiled. Pouring this reaction mixt. into cold H_2O , gave methylenbisdimethyldihydroresorcinol and a small amt. of methylenbisbenzisoxazolone. The latter suspended in 10% $HCHO$ and dil. HCl gave *N*-hydroxybenzisoxazolone. T. explains these reactions by the tautomerism of $o-O_2NC_6H_4CHO$.

R. C. ROBERTS

Succinic acid derivatives from acylbenzyl cyanides. GUSTAV HELLER, HELMUT HERRMANN AND GERHARD SPIELMEYER. Univ. Leipzig. *J. prakt. Chem.* 120, 193-8 (1928).—Oxidation of acetobenzyl cyanide (I) with $NaNO_2$ in $AcOH$, HNO_3 or $MeONa$ and I gives a small yield of diacetodiphenylsuccinodinitrile, m. 173° ; the purification is rendered difficult by the formation of by-products and stereoisomeric compds. Using a greater diln. of $MeONa$ there results diphenylsuccinonitrile. I yields an anil, m. $102-3^\circ$, and a phenylhydrazone, m. 114° . Similarly benzoylbenzyl cyanide yields dibenzoyldiphenylsuccinodinitrile, m. 207° ; in 1 expt. sapon. gave the anhydride, m. 243° .

C. J. WEST

Velocity of esterification of anisic and gallic acids in ethylene glycol and glycerol. ANTON KAILAN AND AURELIE BRABBÉE. Univ. Wien. *Monatsh.* 50, 149-80(1928). The velocity of esterification of anisic (I) and gallic acids (II) at 25° in anhyd and moist $C_2H_4(OH)_2$ (III) and $C_3H_5(OH)_3$ (IV) in the presence of HCl as catalyst has been measured and the unimol. velocity coeffs. have been expressed as a function of the concn. of $H_2O(w)$ and of $HCl(c)$ in intrapolation formulas. The velocity coeffs., even at small H_2O concns., increase more rapidly than the concns. of HCl . The ratios of the velocity coeffs. in $EtOH(k_a)$ in $IV(k_g)$ and in $III(k_\gamma)$ are for I at $c = 0.166$ mol./l., k_a/k_g 1.53, k_γ/k_g 0.87, and at $c = 1.35$, 0.34 and 1.64. The corresponding figures for II are 1.90, 1.06, 0.41 and 1.25. Thus II, like most of the acids already investigated, is more rapidly esterified in III than in IV but this is the case with I only at high concns. of H_2O . In III and IV, as in $EtOH$, the effect of methylation of a *p*-HO group is small. In the case of II, as of all disubstituted $BzOH$ so far investigated, the velocity coeff. of the esterification catalyzed by HCl is less than that calcd. on the assumption that the effect of substituents is simply additive. At 183° the uncatalyzed esterification of I in IV, similarly to previously investigated acids, follows the equation for a "sesquimol." reaction. The coeffs. in IV when $w = 1$ are about 20% less than in anhyd IV. Increase of w to 2 causes no further decrease. In the uncatalyzed reaction at 183° the back-reaction cannot be neglected as in the catalyzed reaction at 25° .

C. J. WEST

Constitution of β -resodicarboxylic acid. KARL BRUNNER, NIKOLAUS MADERSBACHER AND ERWIN GORITSCHAN. Univ. Innsbruck. *Monatsh.* 50, 216-24(1928).— β -Resodicarboxylic acid, first prepd. from 3,5-(HO) $_2C_6H_2CO_2H$ by Senhofer and Brunner (*Sitzber. Akad. Wiss. Wien.* II, 80, 519(1879)), has now been prepd. by an improved method; from its method of formation, the non-formation of an anhydride or imide and comparison of the di-Me ether of the acid with 3,5-(MeO) $_2C_6H_2(CO_2H)_2$, it is concluded that it is 3,5-dihydroxyterephthalic acid (I). 3,5-(HO) $_2C_6H_2CO_2H$, prepd. from $BzOH$ and fuming H_2SO_4 contg. 50% SO_3 and HCl or by heating with $ClSO_3H$, and sepd. as the di-K salt, yields 3,5-(HO) $_2C_6H_2CO_2H$, subliming at $190-5^\circ$ and 14 mm., when fused with KOH . Heated with $KHCO_3$ and $C_6H_5(OH)_3$ in CO_2 , there results I, sepd. as the mono-*NH* $_4$ salt, crystg. with $1H_2O$; the di-Me ester, m. $151.5-2^\circ$, gives with MeI and KOH Me 3,5-dimethoxyterephthalate, m. $121.5-2^\circ$, which is hydrolyzed to the free acid, m. 285° .

C. J. WEST

Mono- and sesquiterpene series. IV. (1) West Indian sandalwood oil. ERNST DEUSSEN AND A. AWRAMOFF. Univ. Leipzig. *J. prakt. Chem.* 120, 119-44(1928);

cf. *C. A.* 22, 954.—Previous work by v. Soden and Rojahn (*Pharm.-Ztg.* 45, 229, 878 (1900)) and by D. (*Arch. Pharm.* 238, 149(1900); 240, 288(1902)) indicates that the oil contains a mixt. of sesquiterpene hydrocarbons and alcs. The hydrocarbon fraction contains at least 2 isomers, 1 being β -caryophyllene; the other is now shown to be *d*-cadinene (I). By repeated fractionation in a vacuum over K, 2 fractions, b_{10-11} 131–3.5° and b_{11} 138–40°, of almost pure I were obtained, which, when dehydrogenated with S yielded cadalene, b_{11} 159–63°, identified as the picrate, m. 114.5°, and the styphnate, m. 138°; catalytic reduction with Pt black in 96% EtOH gives tetrahydrocadinene, b_{14} 135–7°, $d_{15.2}$ 0.8874, $n_D^{16.2}$ 1.48157. The sesquiterpene alc. fraction appears to consist of 2 alcs., $C_{15}H_{24}OH$ (termed amyrol by v. S. and R.) and $C_{15}H_{23}OH$, the former predominating, which can be only imperfectly sepd. by fractionation owing to the proximity of their b. ps. After removal of the latter alc. by oxidation, the resulting amyrol has been shown to consist of a mixt. of 2 isomeric alcs., $C_{15}H_{23}OH$, called α - and β -amyrol. A fraction consisting mainly of amyrol, b_{15} 160°, d_{22} 0.972, on dehydrogenation with S, yielded cadalene. Na did not react with amyrol in $C_6H_5Me_2$ but K gave a *K deriv.*, which reacted with MeI, yielding KI; no other product was isolated. On treatment with $PhNCO$, 1 mol. of H_2O was eliminated, yielding $(PhNH)_2CO$ and a sesquiterpene hydrocarbon, $C_{15}H_{24}$. Attempted benzoylation of amyrol using Einhorn's method led to the production of a sesquiterpene hydrocarbon, $C_{15}H_{24}$, b_{12} 130.2°; by the Ruzicka-Stoll method a small amt. of an impure *Bz deriv.* was obtained. Zn dust at 100–60° under pressure had no effect, but at 220° loss of 1 mol. of H_2O occurred, yielding cadinene. Similarly 85% HCO_2H , with amyrol, yields a sesquiterpene hydrocarbon, $C_{15}H_{24}$, b_{21} 157–60°, d_{15} 0.9192. By treatment of amyrol with $KMnO_4$ in dil. Me_2CO at 0° and fractionation of the product were obtained α -amyrol, b_5 137–8°, $d_{17.5}$ 0.9814, $n_D^{17.5}$ 1.51147, catalytically reduced in EtOH by Pd- $CaCO_3$ to the *dihydro deriv.*, b_4 134–6°, d_{15} 0.9659, n_D^{13} 1.50068, and β -amyrol contaminated with a little of the α -isomer, b_{10} 149.5–50.5°, $d_{15.2}$ 0.9463, $n_D^{15.2}$ 1.50158. (2) Nomenclature of the caryophyllene series. In reply to Chapman (*C. A.* 22, 2377), D. admits the identity of humulene and α - or inactive caryophyllene but suggests that the latter name be retained for the hydrocarbon to avoid confusion. The work of Henderson (*C. A.* 20, 1072) in the caryophyllene series is criticized on the ground of nomenclature and the apparent non-acquaintance of H. with the work of Deussen and Ober and of Ashina and Tsukamoto.

C. J. WEST

Fun, i dyestuffs. VI. Constitution of atromentin. FRITZ KÖGL, HANS BECKER, J. DETZEL AND G. DE VOSS. Univ. Göttingen. *Ann.* 465, 211–42(1928); cf. *C. A.* 20, 225. The fungus dyestuff, atromentin (I) (*C. A.* 19, 639; 20, 406) was regarded as having the formula $C_{20}H_{14}O_7$ and as being a deriv. of 2,5-diphenylbenzoquinone onto a 3,2'- $HOCH_2C(OH)$: bridge linkage. The analogy between I and polyporic acid, which has been shown (*C. A.* 20, 1225) to be 3,6-dihydroxy-2,5-diphenylbenzoquinone, has, however, suggested a reinvestigation of I, which is now found to have the formula $C_{18}H_{12}O_7$. The structure now favored is that of 3,6,4',4''-tetrahydroxy-2,5-diphenylbenzoquinone. The penta-Ac deriv., m. 242°, is now found to be a *tetra-Ac deriv.* (II) and heptaacetylleucoatromentin, m. 236°, to be the *hexa-Ac deriv.* Reduction of II by Zn and AcOH yields 3,6,4',4''-tetraacetylleucoatromentin, m. 248°. Sapon of II (1 g.) with 10 cc. *N* MeOH-KOH gives a *mono-Me deriv.* (III), reddish brown, m. 239°; since this is easily hydrolyzed it contains the Me group in position 3, the tri-Ac deriv., yellow, m. 202°; reduction of III with $NaHSO_3$ and acetylation gives methylpentaacetylleucoatromentin, m. 196°. The di-Me ether (IV) of I is easily hydrolyzed, supporting the 3,6-structure; with Ac_2O and concd. H_2SO_4 it yields a di-Ac deriv., orange, m. 212°, oxidized by CrO_3 in AcOH to *p*- $AcC_6H_4CO_2H$ (no anisic acid); reduction and acetylation gives 1,4,4',4''-tetraacetylleucoatromentin 3,6-di-Me ether, m. 263.1°. Complete methylation of I is effected by the action of CH_3N_3 on leucoatromentin or of Me_2SO_4 on IV in MeOH-KOH; I *tetra-Me ether* (V), red, m. 199°. If IV is suspended in EtOH during the methylation, there results 3-ethyltrimethylatromentin, orange, m. 186°, readily converted into V by heating with 0.1 *N* MeOH-KOH. V is slowly decompd. by MeOH-KOH, giving 3,4',4''-trimethylatromentin, reddish brown, m. 167°, which in turn is hydrolyzed by satd. Na_2CO_3 to the 4',4''-di-Me ether, brown, m. 290°. Methylation in MeOH-KOH gives the *hexa-Me ether*, m. 238°. All these compds. agree with the formulation $C_{18}H_{12}O_6$ for I, which cannot be considered to have degraded in any way during methylation. Oxidation of I by alk. H_2O_2 normally yields *p*- $HOC_6H_4CO_2H$. In hot AcOH, however, a small quantity of HCl and H_2O_2 to furnish 4 atoms O cause the sepn. of the atromentic acid lactone (VI), $C_{18}H_{12}O_6$, yellow, m. 346° (decompn.); di-Ac deriv., yellow, m. 271°; standing in EtOH gives

the *Et* ester, orange, m. 346°, of *atromentic acid* (VII), crystg. with 1 mol. H₂O, red, m. 332°. CH₃N₃ converts VII into the *tri-Me ether* (VIII), yellow, m. 170°, while VI in MeOH gives *Me atromentate tri-Me ether*, yellow, m. 167°. Oxidation of VIII with CrO₃ gives anisic acid and *Me p-methoxyphenylglyoxylate*, m. 54°, which is also obtained by the oxidation of *p*-MeOC₆H₄Ac and methylation. Hot 50% KOH converts VII into *p*-HOC₆H₄CH₂CO₂H; this can be explained on the assumption that it is *p,p'*-dihydroxypulvinic acid, HOC₆H₄C:C(OH).C:C(CO₂H)C₆H₄OH, and the VI is the



corresponding dilactone. Since no other aromatic degradation product is obtained, it is established that the Ph groups of I carry only *p*-HO groups; the old bridge formula is thus excluded. The action of boiling 10-5% aq. KOH on polyporic acid gives rise to 3 products: the known α -benzylcinnamic acid, m. 158°; a new isomeric acid, m. 100.5°; and phenylbenzylsuccinic acid. The action of alkali on I follows a similar course; the action of 30% alkali at 100° gives α -keto- β -*p*-hydroxyphenyl- γ -*p'*-hydroxybenzylbutyrolactone- γ -carboxylic acid, C₁₈H₁₄O₇, crystg. with 3 H₂O, m. 202°. At 140-65°, 50% alkali gives 2 acids, m. 183° and 164°; the former is 4-hydroxy- α -[*p*-hydroxybenzyl]cinnamic acid, whose *Me ether*, m. 161°, was synthesized. Since the 2 acids yield the same Ac deriv., the acid, m. 164°, may be an *allo form*. VII. Synthesis of atromentin. Atromentic acid. F. KÖGL, H. BECKER, G. DE VOSS AND E. WIRTH *Ibid* 243-58.—Atromentin (I) is synthesized by condensing *p*-MeOC₆H₄CH₂C(OMe)Me with (CO₂Me)₂, using Na in Et₂O, which gives the 4',4"-di-Me ether (3,6-dihydroxy-2,5-bis-[*p*-methoxyphenyl]benzoquinone), from which the tetra-Me ether is prepd., and by the use of HI, I itself. A 2nd synthesis consists in heating 2,5-bis-[*p*-hydroxyphenyl]benzoquinone with MeOH and ZnCl₂ at 160°; I 3,6-di-Me ether is thus obtained and is identified as the di-Ac deriv. Free I is obtained by heating with satd. Na₂CO₃ soln. The yield is poor but is better than in the 1st described method. Completely methylated atromentic acid is synthesized as follows: (CO₂Et)₂ is condensed with *p*-MeOC₆H₄CH₂CN by use of Na, giving *p,p'*-dimethoxydiphenylketipinodinitrile, yellow, m. 260° (decompn.); sapon. with 60% H₂SO₄ and EtOH gives *p,p'*-dimethoxy-

pulvinolactone, O.C(C₆H₄OMe).C.CO.O.C:C(C₆H₄OMe).CO, m. 268.5° (which has not

been demethylated). Soln. in MeOH-KOH and acidification gives *p,p'*-dimethoxypulvic acid, orange-red, m. 174.5°, whose *Me ether*, m. 168°, is identical with *Me atromentate tri-Me ether* (see above). In an attempt to hydrolyze this ester by MeOH-KOH there results a yellow compd., C₂₀H₁₄O₆, which is regarded as 3-hydroxy-4-methoxy-2,5-bis-[*p*-methoxyphenyl]cyclopenta-2,4-dien-1-one, m. 174°. Similarly vulpinic acid *Me ether* gives the corresponding 2,5-diphenyl deriv., m. 94-5°, identical with "oxalyl-dibenzyl ketone *Me ether*" (Claisen, *Ann.* 284, 250(1894)). Pulvinone *Me ether*, m. 104-5° (obtained by C. as an oil), gives with MeOH-KOH the same compd. Atromentic acid forms red crystals contg. 1 mol. H₂O, lost at 100° to give yellow crystals which very rapidly absorb H₂O, becoming red, loss and reabsorption of H₂O occurring without loss of transparency.

Acid from the oxidation of α -naphthol. OTTO DISCHENDORFER. Techn. Hochschule Graz. *Monatsh.* 50, 97-104(1928).—The acid obtained by Henriques (*Monatsh.* 9, 527(1888)) by the oxidation of α -C₁₀H₇OH with alk. KMnO₄, to which he assigned the formula C₂₀H₁₄O₆, is identified as benzil-2,2'-dicarboxylic acid (Graebe and Juillard, *Ann.* 242, 229(1887)); *Ag* and *Ba* salts; di-Et ester, m. 154-5°. It is suggested that its formation from α -C₁₀H₇OH proceeds through the stages di- α -naphthol, di- β -naphthoquinone, a compd. of *o*-carboxycinnamic acid type being a possible intermediate compd. in the last stage. Observations made by H. of the reactions of the acid were repeated and corrected. When heated for a few min. above its m. p., the acid yields the anhydride, m. 164°, probably C₆H₄.CO.O.CO.CO.C₆H₄.CO, which decomp. on

further heating with the formation of diphthalyl and C₆H₄(CO)₂O. Heated with PhNHNH₂ in EtOH, the acid yields a *bisphenylhydrazone*, decomp. 175°; when the heating is prolonged, the *bisphenyllactazam*, m. 305-6°, is formed.

Thiophenols. XII. Triphenylmethane series. K. BRAND AND HEINRICH PABST. Univ. Giessen. *J. prakt. Chem.* 120, 199-213(1928).—4,2-Cl(H₂N)C₆H₃OMe, through the diazo reaction, gives 65% of 2-bromo-4-chloroanisole (I), *bis* 127-30°, m. 29-30°, *d*₄²⁰ 1.6170, *n*_D²⁰ 1.58025, 1.58592, 1.60078 for α , D and β . 2-Cyano-4-chloroanisole, m. 99° (60-70% yield); hydrolysis gives 2-methoxy-5-chlorobenzoic acid, m. 82°; *Me*

ester (II), b. 235–40°. The Grignard reagent from I and PhBz give 50–60% of 2-methoxy-5-chlorotriphenylcarbinol, m. 124°; reduction gives 2-methoxy-5-chlorotriphenylmethane, m. 120°. The Grignard reagent from I and BzOEt give 60–70% of 2,2'-dimethoxy-5,5'-dichlorotriphenylcarbinol, m. 190°, reduced to the corresponding triphenylmethane, m. 144–5°. Using II and the Grignard reagent from I there results 2,2',2'-trimethoxy-5,5',5"-trichlorotriphenylcarbinol, m. 165°; the corresponding methane m. 212°. If the basicity of Ph₃COH is called 1, that of the 3 Cl derivs. are: 5-Cl, 0.62; 5,5'-Cl₂, 0.38; 5,5',5"-Cl₃, 0.24.

C. J. WEST

Bathochromic action of the methylthiol group in azo dyes. I. EUGEN BLUMEN-TOCK-HALWARD AND EGON JUSA. Univ. Wien. *Monatsh.* 50, 123–38(1928).—Advantage is taken of the bathochromic action of the MeS group observed by Brand to rep. from 3,6,8-trimethylthiol-β-naphthol and p-O₂NC₆H₄N₂X a reddish violet azo dye, markedly deeper in shade than the other dyes of this class ("ice colors"). The shade deepens successively in the dyes derived from the trisulfonic acid, trithiol and trimethylthiol derivs., corresponding with the change from sexavalent to bivalent S and methylation resp. The poor yields of the trithiol derivs. obtained makes tech. application impossible in this case. K O-Carbethoxy-β-naphthol-3,6,8-trisulfonate, heated with PCl₅, gives the trisulfonyl chloride (I), m. 195°. The action of PhNH₂ causes partial hydrolysis of the CO₂Et group, completed on recrystn., and yields β-naphthol-3,6,8-trisulfonanilide. O-Carbethoxy-3,6,8-trithiol-β-naphthol, m. 80–6° (decompn.), which could not be obtained pure, was formed in 15–20% yield by the reduction of I by adding HCl to the EtOH soln. contg. Zn dust in suspension. It is readily oxidized to polysulfides, and yields, with simultaneous hydrolysis of the CO₂Et group, a dark red azo dye, with p-O₂NC₆H₄N₂X, slowly formed in neutral soln., rapidly in alk. soln. The orange-red Pb salt of the trithiol was obtained with EtOH-Pb(OAc)₂. The action of ClCO₂Et yields O-carbethoxy-6,8-dithiol-3-carbethoxythiol-β-naphthol, m. 115–20° (decompn.). Hydrolysis with KOH yields 2,2'-dihydroxy-6,6',8,8'-tetrahydiodinaphthalene-3,3'-disulfide (Pb salt), which yields 3,6,8-trithiol-β-naphthol (Pb salt) on reduction. O-Carbethoxy-3,6,8-trimethylthiol-β-naphthol, resinous, has no characteristic m p, accompanied in certain cases by 2,2'-di(carbethoxyoxy)tetramethylthiodinaphthalene disulfide, it was obtained from the trithiol with Me₂SO₄ and Na₂CO₃, and yields 3,6,8-trimethylthiol-β-naphthol, m. 140°, on hydrolysis with EtOH-KOH. II. EUGEN RIESG. *Ibid* 139–43.—The azo dye derived from 3,6-dimethylthiol-β-naphthol and p-O₂NC₆H₄N₂X has a similar dull reddish violet color to the 3,6,8-trimethylthiol deriv., the 8-MeS group thus appears to have no influence on the color of the dye. Carbethoxy 3,6-dithiol-β-naphthol, m. 117° (from the disulfonyl chloride); hydrolysis with dil alkali yields 3,6-dithiol-β-naphthol, m. 152°. 3,6-Dimethylthiol-β-naphthol, m. 125° (Me ether, m. 93°); 1-p-nitrobenzeneazo-3,6-dimethylthiol-β-naphthol, m. 258°. Combined reduction and acetylation of O-carbethoxy-β-naphthol-3,6-disulfonyl chloride & treating with Ac₂O, AcOH, Zn and AcONa gives O-carbethoxy-3,6-diacylthiol-β-naphthol, m. 120°.

C. J. WEST

Indene and styrene. Crude materials in industrial quantities. RALPH L. BROWN. U. S. Bureau of Mines, Pittsburgh. *Ind. Eng. Chem.* 20, 1178–80(1928).—Fractional analyses of 13 representative samples of the oily condensate (drip oil) from carbureted water-gas mains and attached appliances such as meters are presented. For fresh dry oil the indene content is normally about 35%, the styrene content is about 15%. Crude supplies of either indene or styrene of about 75% concn. are possible: the other 25% is almost entirely stable aromatic hydrocarbons. Industrial supplies of crude indene and styrene can be produced from the drip oil and holder oil from systems distributing carbureted water-gas. These 2 hydrocarbons can be used in the production of resins and plastics. Styrene is interesting for the rubber and the perfume industries. The present potential supply is about 8,000,000 lbs. styrene per year and about twice that of indene.

ALBERT L. HENNE

Stereochemistry of aromatic compounds. VII. Inclination of rings in α-dinaphthyls. RICHARD KUHN AND OTTO ALBRECHT. Techn. Hochschule, Zurich. *Ann.* 465, 282–7(1928), cf. C. A. 22, 3654.—1,1'-Dinaphthyl-2,2'-dicarboxylic acid (I), m. 268.5–70° (cor.), obtained from 1,2-ClC₁₀H₇COCl through 1,2-ClC₁₀H₇CO₂Me, has been resolved by means of its quinine salt, m. about 202° (decompn.), [α]_D²⁵ 230.4° (CHCl₃), which is sepd. by crystn. from Et₂O into the salt, m. 197.5–8°, [α]_D²⁴ 301.6° (CHCl₃) of l-I, m. 177°, [α]_D²⁵ –101.6°, and the impure salt, m. about 230°, [α]_D^{22.6} 15.4°, of the d I, m. 339–48°, [α]_D²² 46° (0.1 N NaOH). The d-I when treated with H₂SO₄ gives anthanthrone with no apparent optical rotation. It thus appears that the effect of the 2,2'-di-CO₂H groups is to cause the C₁₀H₇ rings to assume a multi-

planar configuration, not adopted by α -dinaphthyl itself, nor by anthanthrone. Attempts to racemize the *l*-I were unsuccessful.

C. J. WEST

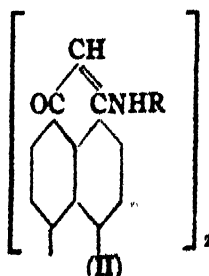
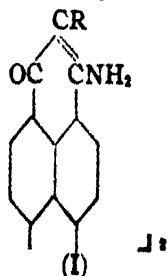
Condensation of chloroindan with the phenols. CH. COURTOT. *Compt. rend.* 187, 661-3(1928).—The recent French Patent assigned to the I. G., F. P. 636,606 is based on work of G. (C. A. 18, 252). It was shown that indanyl chloride or bromide reacts in the cold with phenols splitting out HCl or HBr. Further incomplete work along this line carried out in 1924 is published to avoid the loss of all the benefit of these observations. α -Chloroindan (I) reacts with PhOH in C_6H_6 or Et_2O at 15° to form α -chloroindanyphenol (II), m. $92-3^\circ$, b_D $190-3^\circ$, b_{14} 200° ; benzoate, m. 108° ; *m*-nitrobenzoate, m. $96-7^\circ$. II with diazotized p - $O_2NC_6H_4NH_2$ or p - $HO_3SC_6H_4NH_2$ gives a brown or an orange dye. II with Me_2SO_4 forms the Me ether (III), b_D $187-8^\circ$, b_{14} $201-2^\circ$, m. 40° . I condensed with p - $MeOC_6H_4MgBr$ gives a compd. identical with III, proving the MeO group to be in the *p*-position. I also reacts with *o*- and *m*-cresol and slowly with *o*- $HOC_6H_4CO_2Me$. In the reaction of I with PhOH, a vitreous mass, b_D 293° , is isolated which is probably the condensation product of I with II.

D. H. POWERS

The derivatives of β -methylantracene obtained with oxalyl chloride. D. BUTESCU Industrial Chem. Inst., Univ. Bucharest. *Bull. soc. chim.* 43, 1269-72(1928).—Nascent $(COCl)_2$ prepd. by allowing a mixt. of 1 mol. anhyd. $(CO_2H)_2$ and 2 mols. PCl_5 stand for 24 hrs. was treated with a CS_2 soln. of β -methylantracene contg. some $AlCl_3$. From this reaction, besides β -methylantracene- γ -monocarboxylic acid, 10-chloro- β -methylantracene-9-carboxylic acid, m. 158° , and β -methyl-9,10-dichloroanthracene, m. 214° , were obtained.

R. C. ROBERTS

Perylene and its derivatives. XVII. ALOIS ZINKE, A. DADIEU, K. FUNKE AND A. PONGRATZ. Techn. Hochschule, Graz. *Monatsh.* 50, 77-86(1928); cf. C. A. 2: 3162.—3,9-Dichloroperylene is not changed by the action of Zn and HCl. When the compd. $C_{20}H_{11}Cl_2$ was similarly treated, with the hope of prepg. a mono-Cl deriv. the resulting product consisted of a mixt. of about equal parts of perylene and the di-Cl deriv. (analysis and absorption spectra); therefore the compd. $C_{20}H_{11}Cl_2$ is a mixt. of the compds. $C_{20}H_{12}Cl_{10}$ and $C_{20}H_{10}Cl_8$; since this cryst. in needles of const. compn., this must be a mol. compd. or a case of isomorphism. Reduction of the compd. $C_{20}H_8Cl_4$ also gives the di-Cl deriv., and is thus a mixt. of $C_{20}H_8Cl_8$ and $C_{20}H_{10}Cl_4$. Bromination of perylene gives a mixt. of the 3,9- and 3,10- Br_2 derivs., while the mother liquor contains a tri-Br deriv., since with CuCN in boiling quinoline there results the dark brown *tricyano deriv.*, sapond. by MeOH-KOH to an amorphous red brown tri- CO_2H acid, whose Na salt is cryst.; the orange-brown Ag salt and EtI gives the *tri-Et ester*, yellow, m. 252° ; the $C_6H_5Me_2$ soln. is golden brown with a deep green fluorescence. The cyanide and concd. H_2SO_4 give *peryene-3-anhydrocarboxylic acid-4-sulfinide-9,10-dicarboxylic anhydride*, deep red; H_2SO_4 gives a red soln. with a red fluorescence; $PhNO_2$ a deep orange-red soln. with a green fluorescence. XVIII. ALFRED PONGRATZ. *Ibid.* 87-96.—3,9-Dichloro-4,10-diacetylperylene contg. aliphatic acyl groups yield, when boiled with CuCN in quinoline, vat dyes having the constitutions I or II, of which I is supported by the absence of detectable alkylimino groups and II by the non-reactivity of BzH with the dyes from the propionyl and butyryl derivs. 3,9-Dichloro-4,10-dibutyrylperylene, m. $258-9^\circ$, was prepd. by a Friedel-Crafts reaction from 3,9-dichloroperylene and $PrCOCl$. The dyes from the 4,10-diacetyl-, dipropionyl- and dibutyrylperylene were colored dark violet. They were purified by reduction to the vats (red) and reoxidation. The dye from the di-Ac deriv. was also formed in C_6H_5N at 200° under pressure. Oxidation of the dyes by $KMnO_4$ or CrO_3 yielded perylene-3,4,9,10-tetracarboxylic acid. The dye from the di-Ac deriv. yielded a *tetra-Bz deriv.*, which did not form a vat and reacted with BzH to form a *benzylidene deriv.*, which was reduced to a vat with difficulty.



C. J. WEST

Anthocyan. II. Zurich investigations. J. DUKKER, *Pharm. Zen*

89-94(1928).—In a former paper it was shown (cf. *C. A.* 22, 1437) that the anthocyanins are hexosides which on acid hydrolysis are resolved into a sugar residue and an glucone, the dyestuff anthocyanidin. In a few cases anthocyan in addn. to free anthocyanidin was detected in flowers. In this connection the most important results of Karrer's studies in anthocyan chemistry are pointed out. In conclusion the conditions under which salt formation of anthocyanins and anthocyanidins takes place are discussed.

W. O. E.

Bicyclic 2,6-methylenepiperidine. JULIUS V. BRAUN, WERNER HAENSEL AND FRIEDRICH ZOBEL. Univ. of Frankfurt. *Ann.* 462, 283-300(1928).—*m*-C₆H₄(OH) (800 g.), in 2.5 l. EtOH and 175 g. Na, treated with 1 kg. iso-AmBr, gives 40% of *esorcinol iso-Am ether*, *b*₁₂ 165° (*benzoate*, *m.* 31-2°); reduction by Sabatier's method gives 55-70% of the *hexahydro deriv.*, *b*₁₆ 140°, which is then oxidized by CrO₃ to *β*-*isoamyloxycyclohexanone*, *b*₁₆ 128-30°, *d*₄¹⁸ 0.9421, *n*_D¹⁸ 1.4518 (65% yield); *semicarbazone*, *m.* 146°; *oxime* (I), *b*₁ 162°; the compd. is easily decompd. by alkali, giving a *ketone*, C₈H₈O, *b.* 170-2°. A mixt. of Mg and BrCH₂CO₂Et gives about 50% of a *hydroxy ester*, C₁₄H₂₀O₄, *b*₁₂ 175°; heating at 150° for 2 hrs. with KHSO₄ splits off H₂O, giving 60-70% of the *compd.* C₁₄H₂₀O₃, *b*₁ 170°, *d*₄²³ 0.9740, *n*_D²³ 1.4670. Reduction of the ester with Na and EtOH gives about 10% of the corresponding *acid*, *b*₁₁ 190°, and *β*-3-*isoamyloxycyclohexylethyl alc.*, *b*₁₁ 162°, *d*₄²⁴ 0.951, *n*_D²⁴ 1.474. Reduction of the same ester with Pt or Pd in MeOH produces 3-*ethylcyclohexyl isoamyl ether*, *b*₁₂ 110-20°, together with *β*-3-*isoamyloxycyclohexylethyl alc.*, *b*₁₂ 160°, *d*₄²¹ 0.941, *n*_D²¹ 1.468 (yield, 7 g. from 500 g. *m*-C₆H₄(OH)(OC₆H₁₁)); PBr₃ in CHCl₃ gives the corresponding *bromide*, *b*₁₆ 155°, which is converted by MeNH₂ in C₆H₆ at 100° into *β*-3-*isoamyloxycyclohexylethylmethylamine*, *b*₁₄ 140°; the latter, with concd. HCl at 125° yields the HCl and then the *chloroplatinate* of *β*-3-chlorocyclohexylethylmethylamine, *m.* 171-3° (obtained only in minute amounts). Na and EtOH reduce I with a 60-70% yield of 3-*isoamyloxycyclohexylamine*, *b*₁₃ 120°, *d*₄¹⁷ 0.898 (HCl salt, *m.* 134-6°; *chloroplatinate*, yellow, decomp. 240-3°; *Ac deriv.*, *b*₁₃ 190-2°; *Bz deriv.*, *m.* 61-4°). When the base is heated with concd. HBr at 100°, it is converted into 3-*bromocyclohexylamine-HBr*, *m.* 206-8° (corresponding *picrate*, *m.* 175-7°). Cold alkali, or warm alkali for only a short time liberates the free base, but prolonged action of warm alkali gives a mixt. of the following substances: tetrahydroaniline (II), giving a *p*-toluenesulfonyl *deriv.*, *m.* 75°; 2,6-methylene-piperidine (III), whose HCl salt *m.* 258°; *picrate*, *m.* 158-62°; *N*-*p*-toluenesulfonyl *deriv.*, *m.* 123°, reduced by H and Pd-charcoal to cyclohexylamine; *N*-cyclohexenyl-1,3-diaminocyclohexane, *b*₁₁ 112-5° (*di-Bz deriv.*, *m.* 188-9°), giving when exhaustively methylated (one stage) a salt from which a *chloroplatinate*, C₁₇H₂₄N₂Cl₂Pt, *m.* 185-6°, is isolated; finally a *base*, (C₈H₁₁N)₂, *b*₁₄ 140-5°. II yields a *methiodide*, *m.* 241-2°; III a *iodide*, *m.* 206-8°. When the above isoamyloxycyclohexanone is treated with HNHI, etc., in the course of a dihydrocarbazole synthesis, AmOH is eliminated. removal is much less ready in the case of 2-*isoamyloxycyclohexanone*, *b*₁₃ 116°, 19377 (*semicarbazone*, *m.* 166°; *oxime*, *b*₁₄ 155°), which may be obtained by oxidizing *hexahydroprocatechol iso-Am ether*, *b*₁₁ 122°.

C. J. WEST

Triphenylmethanes whose benzene nuclei are bound with each other. IV. Preparation of an iminophenyleneacridine derivative; dependence of color of compounds

... give 2 g. 2-tolyl-5-anilinoanthranilic acid, *m.* 190-3° (decompn.); 1 g. with ZnCl₂ in AcOH gives 1-anilino-4-methylacridone, brownish red needles (1 AcOH or 1 mol. EtOH, *m.* 140-60°; the action of POCl₃ on the acridone gives 1-aminophenyleneacridine, deep blue, does not *m.* 355°; HCl gives a H₂O sol. salt (a. blue). Thus the replacement of a ring-closing CO group by an NH group causes considerable deepening of the color. 2-Methyl-5-nitrodiphenylamine-2'-carboxylic acid, from 2,5-Me(O₂N)C₆H₄NH₂ and *o*-ClC₆H₄CO₂H, *m.* 220-1°; *Me ester*, *m.* 153-5°; reduced with SnCl₂ in HCl-AcOH gives 2-methyl-5-aminodiphenylamine, 93-5°.

C. J. WEST

Stereochemistry of the saturated tervalent nitrogen atom. VIII. Methylisopelletierine. JACOB MEISENHARTER AND EMIL MAHLER. Univ. of Tübingen. *Ann.* 462, 1-16(1928); cf. *C. A.* 20, 1081.—Methylconhydrinone (I) and methylisopelletierine (II), regarded by Hess and Grau as stereoisomers (*C. A.* 19, 1290), are shown to be actual isomers. I is, as these authors suppose, *α*-2-*N*-methylpiperidylpropan-*α*-(2-propionyl)-methylpiperidine) but II is now shown to be *α*-2-*N*-methylpiperidyl-

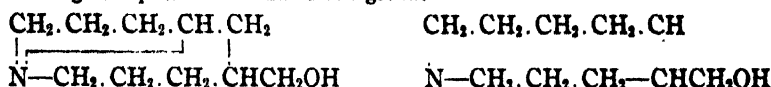
propan- β -one(2-acetonyl-1-methylpiperidine). If H. and G.'s contentions were correct I and II should give 1 and the same MeI deriv. but 2 distinct MeI derivs. are obtained. Further, I and II differ greatly in their reactions as ketones. II is readily reduced to an alc., I is not, and so on. Hess' supposed II is shown to be a mixt. The pure II has been synthesized as follows: 2- β -hydroxypropylpyridine (for which preparative details are given) is converted into the Me_2SO_4 deriv., which is catalytically reduced (Pt-Pt oxide) to 1-methyl-2- β -hydroxypropylpiperidine (III), b_p 110-20°. Oxidation of the latter with CrO_3 in AcOH at the b. p. gives II, identified by conversion into various salts and other derivs. Catalytic reduction of 2- β -hydroxypropylpyridine yields 2- β -hydroxypropylpiperidine (IV), m. 69-70°; oxidation with CrO_3 in AcOH gives isopelletierine, whose picrate m. 147-8°. The Me deriv. of IV is identical with III; the picrate m. 145° and the semicarbazone-HCl decomps. at 210°. C. J. W.

Industrial ethylation. Manufacture of dionin. JOH McLANG. *Chem. Trade J.* 83, 143-4(1928).—Dionin is a trade name for ethylmorphine-HCl. Directions are given for the manuf. of $p\text{-MeC}_6\text{H}_4\text{SO}_3\text{Et}$, Et_2SO_4 , ethylmorphine and its HCl salt in batches of about 20 kg. No novel feature is included in the directions. A. L. H.

The optical activity of pseudomorphine. A. K. BALL AND WILLIAM A. WOLFF. Univ. of Pa., Philadelphia. *J. Biol. Chem.* 80, 403-11(1928).—The optical rotations of pseudomorphine solns. and the effect of the addn. of KOH to such solns. were detd. It is shown that for a given ratio of pseudomorphine and alkali the same rotation is observed, independent of the actual concns. The results follow the equation $M[(f(a)/c) + 10]^{0.435} = -572$, in which f is the activity coeff. of the KOH; (a) , its molar concn.; c the molar concn. of pseudomorphine, and M , the optical rotation.

ARTHUR GROLLMAN

Lupines. P. KARRER, F. CANAL, K. ZÖHNER AND ROSE WIDMER. *Helv. Chim. Acta.* 11, 1062-84(1928).—Lupine, $\text{C}_{10}\text{H}_{19}\text{ON}$, contains an unsatd. alc. $\text{C}_{10}\text{H}_{19}\text{O}$ and a satd. alc. $\text{C}_{10}\text{H}_{21}\text{O}$. By CrO_3 oxidation the unsatd. alc. yields γ - or δ -lactone. Therefore the OH group in lupine is in the γ - or δ -position and both alcs. turn the plane of polarized light. The satd. alc. is by PBr_3 changed to the bromide. One-half is reduced to the satd. hydrocarbon $\text{C}_8\text{H}_{18}\text{CHMe}$, one-half to the quaternary NH_4 salt $\text{C}_8\text{H}_{18} > \text{CHCH}_2\text{NMe}_3\text{Br}$ which on distn. gives the unsatd. hydrocarbon $\text{C}_{10}\text{H}_{18}$. The satd. hydrocarbon and NH_4 salt are optically active but the unsatd. hydrocarbon possesses no rotating power. The unsatd. hydrocarbon $\text{C}_8\text{H}_{18} > \text{C}:\text{CH}_2$ is decompd. with O_3 to an optically inactive ketone, AmCOPr . The N is now introduced into this C frame. The following two possible formulas are given.



Of these the 2nd appears the more probable and contains a ring system similar to that occurring in the berberine alkaloids. From this base by addn. of 5 carbon atoms and a tertiary N-atom a probable structural formula for sparteine can be derived. C. S.

Paprika coloring matters. III. Catalytic hydrogenation. Z. ZECHMEISTER AND L. V. CHOLNOKY WITH V. VRABÉLY. Univ. Pécs, Ungarn. *Ann.* 465, 288-99(1928); *C. A.* 21, 2919.—The method of isolation of capsanthin is improved and the new α -ula, $\text{C}_{44}\text{H}_{68}\text{O}_8$, is obtained. The strongly unsatd. nature of the compd., suspected from its ready resinification, is confirmed by catalytic reduction. In EtOH, or better, AcOH, reduction in the presence of Pt introduces 9 mols. H. A colorimetric survey of the reaction shows that 6 mols. of H are 1st introduced, removing all the color, which during reduction is constantly less than would be expected calcd. on the assumption that there are 9 conjugated ethylenic linkings present. The product, *perhydrocapsanthin*, is a liquid (perhaps a mixt. of stereoisomers), with $[\alpha]_D^{20} -23.3$ to -24.7° , possibly too low a value owing to racemization, since a prepn. kept for 2 hrs. at 80° had $[\alpha]_D^{23} -15.3^\circ$. The paprika pigment must be considered to belong to the class of natural "polyene" pigments; the l -rotation of its reduction product is compared with the similar property of perhydroxanthophyll. It is assumed that the deepening of color of paprika during ripening is due to dehydrogenation of the parent substance; attempts to influence this by injection were unsuccessful. C. J. WEST

Porphyrin syntheses. XVII. Syntheses of opso- and hemoporphyrin carboxylic acids. New synthesis of coproporphyrin II. H. FISCHER AND W. LAMATSCH. Techn. Hochschule, München. *Ann.* 462, 240-50(1928); *C. A.* 22, 2570.—The methods by which opso- and hemoporphyrin carboxylic acid (4-methylpyrrole-3-propionic acid) (I) was obtained are unsuitable for preparative work and other methods have been sought. Reduction of bis[5-carbethoxy-4-methyl-3- β -carboxyethylpyrrol]methane with HI and

AcOH gives 40–8% of I but, in addn., 80–4% of the theoretical yield of cryptopyrrole-carboxylic acid (II), so that this method is also unsuitable. The readily obtained 5-carbethoxy-2,4-dimethylpyrrole-3-aldehyde is convertible without difficulty into the 3-acrylic and thence into the 3-propionic acid, *viz.*, 5-carbethoxycryptopyrrolecarboxylic acid. The bromination of the latter is now under investigation; the resulting Br deriv. (readily characterized by heating it with EtOH, which converts it into 5-carbethoxy-4-methyl-2-ethoxymethylpyrrole-5-propionic acid, m. 152°) reacts with 3 mols. of SO_2Cl_2 in cold Et_2O to give 5-carbethoxy-4-methyl-3- β -carboxyethylpyrrole-2-carboxylic acid, m. 243°, hydrolyzed by 10% NaOH to 4-methyl-3- β -carboxyethylpyrrole-2,5-dicarboxylic acid, m. 220°. The latter, when heated *in vacuo* at 220°, passes into I, which is, however, better prepd. by heating the ester, m. 243°, with alkali at 175–80° under pressure. I resists all attempts at esterification and when treated with NaNO_2 gives, not the oxime of II, but 50% of hematic acid. When heated with HCO_2H and HBr I is converted into [3-methyl-4- β -carboxyethylpyrrol][3-methyl-4- β -carboxyethylpyrrolenyl]-methene-HBr, m. 194–5° (decompn.), which decomps. with glacial AcOH and HI at 100° into I and hemopyrrolecarboxylic acid (III). I in CHCl_3 and Et_2O reacts with HCN and HCl to give the expected imine (not isolated), which, when reduced by the Kishner-Wolff method at 160°, gives a good yield of III. Bromination of the methene-HBr affords [5-bromo-3-methyl-4- β -carboxyethylpyrrol][5-bromo-3-methyl-4- β -carboxyethylpyrrolenyl]-methene-HBr, which, when heated with II and $(\text{CH}_3\text{CO}_2\text{H})_2$ at 180°, is converted into the tetra-Me ester, m. 288°, of coproporphyrin II. When opsopyrrolecarboxylic acid methene-HBr is heated at 120° with HCO_2H and HBr, only traces of porphyrin are produced but the ester, m. 288°, results when the methene-HBr is heated with HCHO and HBr at 120–5°, the constitution of coproporphyrin II thus being definitely established. Opsopyrrolecarboxylic acid 2-aldehyde, when heated with HBr or with HCO_2H and HCl, gives a methene identical with that obtained from I (when the methene so formed is heated with HBr and HCHO, coproporphyrin II is formed and may be identified as the tetra-Me ester). XVIII. Syntheses of three tetraethylporphintetrapropionic acids (homologous coporphyrins), xanthoporphinogen from etioporphyrin III and a homologous opsopyrrolecarboxylic acid. H. FISCHER and G. STANGLER. *Ibid* 251–67.—Heating 5 g. 2-methyl-4-ethyl-5-carbethoxypyrrol-3-propionic acid with 30 cc. HI-AcOH for 2 hrs. on the boiling H_2O bath gives 2 g. 2-methyl-4-ethylpyrrol-3-propionic acid, m. 78° (picrate, yellow, m. 140°); 3 mols. Br transforms this into [2-bromo-3-ethyl-4-propionic acid pyrrol]-[2-methyl-4-ethyl-3-propionic acid pyrrolenyl]-methene-HBr, red, decomp. 230°; heating with $(\text{CH}_3\text{CO}_2\text{H})_2$ 0.5 hr. at 200° gives 34% of 1,3,5,7-tetraethylporphin-2,4,6,8-propionic acid (homocoproporphyrin), whose tetra-Me ester m. 193° (Cu salt, red, m. 265°; Fe salt, m. 170°). 2-Bromomethyl-4-ethyl-5-carbethoxypyrrole-3-propionic acid, m. 174°; heated with H_2O 4 hrs., there results bis-[3-propionic acid 4-ethyl-5-carbethoxypyrrol]-methane, m. 161°; sapon. with 5% NaOH gives bis-[3-propionic acid 4-ethylpyrrol]-methane-2,2'-dicarboxylic acid, decomp. 180°; HCO_2H transforms this into 1,4,5,8-tetraethylporphin-2,3,6,7-tetrapropionic acid, whose tetra-Me ester m. 170°. Bis-[2-bromo-3-ethyl-4-propionic acid pyrrol]-methene-HBr, red, decomp. about 200°. 2-Methyl-4-ethylpyrrol-3-propionic acid and HBr in HCO_2H , heated 1 hr., give bis-[2-methyl-3-propionic acid 4-ethylpyrrol]-methene-HBr, red, which gives with Br in AcOH the 2-bromomethyl deriv., red needles; a mixt. of the last 2 HBr salts, heated with $(\text{CH}_3\text{CO}_2\text{H})_2$ 0.75 hr. at 200°, gives 1,4,6,7-tetraethylporphin-2,3,5,8-tetrapropionic acid, whose tetra-Me ester m. 182°. The action of SO_2Cl_2 upon 2-bromomethyl-4-ethyl-5-carbethoxypyrrole-3-propionic acid in Et_2O gives 4-ethyl-5-carbethoxy-3-propionic acid pyrrol-2-carboxylic acid, m. 248 (decompn.), which, heated with 10% NaOH 1 hr. at 165–70°, gives 3-ethylpyrrol-4-propionic acid, m. 133°. Etioporphyrin III results by heating [2-bromomethyl-3-methyl-4-ethylpyrrol]-[2-bromomethyl-3-ethyl-4-methylpyrrolenyl]-methene-HBr and the methene from opsopyrrole with $(\text{CH}_3\text{CO}_2\text{H})_2$ 1 hr. at 195°; oxidation in CHCl_3 -AcOH with PbO_2 gives xanthoporphinogen, which may be reduced by Na-Hg to the etioporphyrin. XVIII (XIX?). Syntheses of coproporphyrin I and II and also mesoporphyrin II, V and XII. H. FISCHER, H. FRIEDRICH, W. LAMATSCH and K. MORGENROTH. *Ibid* 466, 147–78.—When the brominated methene from cryptopyrrolecarboxylic acid (I) is heated with $(\text{CH}_3\text{CO}_2\text{H})_2$ at 180–90°, HBr is eliminated and esterification of the resulting product with MeOH gives coproporphyrin tetra-Me ester (II), m. 252° (cor.), Mn complex, m. 267° (cor.); Zn complex, m. 299° (cor.); tetrahydride, does not m. 320°. The absorption spectra of the Mn and Zn salts are given. MeOH-HBr converts I into the compd. $\text{C}_{20}\text{H}_{24}\text{O}_4\text{N}_2\text{Br}$, m. 117° (cor.), which, treated with $(\text{CH}_3\text{CO}_2\text{H})_2$ or $(\text{CHOHCO}_2\text{H})_2$ at 180–200°, gives 3 or 6% of coproporphyrin (III). Treatment of III Fe salt, m. 240° (cor.) with hot 10% NaOH and then with $\text{C}_2\text{H}_5\text{N}$

and AcOH gives the *acetate* of the *Fe salt*. Similar treatment of coprohemin tetra-Me ester in HCl gives *coprohemin*, which, crystd. from Ac_2O , loses a part of its halogen. Oxidation of II with PbO_2 in CHCl_3 -AcOH yields *coproxanthoporphinogen tetra-Me ester*, m. 315° (decompn.), reduced by Na-Hg in AcOH to II. When [4-methyl-3-ethyl-5-carbethoxypyrrolyl][2,4-dimethyl-3-propionic acid pyrrolenyl]methene is heated progressively with MeONa at 130 – 210° a mixt. of NH_4OH -sol. and insol. porphyrins, m. 204° (cor.), is obtained. When heated with HCO_2H and HBr Et 2,4-dimethyl-3-propionic acid pyrrole-5-carboxylate and cryptopyrrolecarboxylic acid are converted into [3,5-dimethyl-4-propionic acid pyrrolyl][3,5-dimethyl-4-propionic acid pyrrolenyl]-methene-HBr, reddish yellow, m. 214 – 5° (cor.); HCl salt, yellowish red needles; *picrate*, red, m. 214° . When this is heated with [3-methyl-5-bromomethyl-4-propionic acid pyrrolyl][3-methyl-5-bromomethyl-4-propionic acid pyrrolenyl]methene-HBr, obtained by bromination of bis[2,4-dimethyl-3-propionic acid pyrrolyl]methene-HBr, in the presence of $(\text{CH}_3\text{CO}_2\text{H})_2$ at 140 – 50° , mesoporphyrin XII, whose Me ester m. 190 – 1° (*Cu complex*, red, m. 215° ; *hemin deriv.*, dark glistening needles); Et ester, m. 195 – 6° (cor.) (*Cu salt*, red, m. 203°); *ITCl salt*, red needles; *Cu complex*; *hemin*, glistening dark needles. Opsopyrrolecarboxylic acid aldehyde (IV) and hemopyrrolecarboxylic acid with HBr give [3-methyl-4-propionic acid pyrrolyl][3-propionic acid-4,5-dimethylpyrrolenyl]methene-HBr, red, m. 175° (decompn.), brominated to the 5-Br deriv., yellow leaflets; heated with $(\text{CH}_3\text{CO}_2\text{H})_2$ at 220° , coproporphyrin I (tetra-Me ester) is produced IV and cryptopyrrolecarboxylic acid aldehyde condense with HBr to give [3,5-dimethyl-4-propionic acid pyrrolyl][3-methyl-4-propionic acid pyrrolenyl]methene-HBr, yellow, m. 200° (decompn.); bromination gives the 5-Br deriv., red, which, heated with $(\text{CH}_3\text{CO}_2\text{H})_2$ at 220° gives 6% of coproporphyrin II. [3-Methyl-4-propionic acid 5-bromopyrrolyl][3,5-dimethyl-4-ethylpyrrolenyl]methene-HBr, m. 251° (decompn.), is converted by heating with $(\text{CH}_3\text{CO}_2\text{H})_2$ at 180° , into mesoporphyrin V (18% yield); *di-Me ester*, m. 274° ; *Cu salt*, red, m. 285 – 6° ; *hemin deriv.*, bluish black. [3,5-Dimethyl-4-ethylpyrrolyl][3-methyl-4-propionic acid pyrrolenyl]methene-HBr, yellow, m. 180 – 90° (decompn.); 5-Br deriv., orange-red needles; this also gives mesoporphyrin V. IV and hemopyrrole give [3-methyl-4-propionic acid pyrrolyl][3-ethyl-4,5-dimethylpyrrolenyl]methene-HBr, whose 5-Br deriv. yields with $(\text{CH}_3\text{CO}_2\text{H})_2$ mesoporphyrin II; *Me ester*, m. 233° ; *Cu salt*, m. 261° ; *hemin deriv.* This porphyrin is also obtained from the 5-Br deriv., light red, of [3-ethyl-4,5-dimethylpyrrolyl][3-methyl-4-propionic acid-pyrrolenyl]methene-HBr, red, m. 209° (decompn.). Et 4-n-ethyl-3-propionic acid-pyrrole-5-carboxylate, m. 106° , is prepd. by decarboxylation of the corresponding 2- CO_2H acid at 250° . 5-Carbethoxyopsopyrrolecarboxylic acid, with HCN and HCl, gives the 2-formyl deriv., m. 230° . 2,5-Dicarbethoxy-3-propionic acid-4-methylpyrrole, m. 147 – 8° . XIX (XX?). Synthesis of deuterohemin and deuteroporphyrin. H. FISCHER AND A. KIRSTAHLER. *Ibid* 178–8.—2,3-Dimethylpyrrole and 2,4-dimethylpyrrole-5-aldehyde are condensed by EtOH-HBr to give [4,5-dimethylpyrrolyl][2,4-dimethylpyrrolenyl]methene-HBr (I), brown, m. 217° (decompn.); the free base m. 115° (cor.); bromination in AcOH gives a compd (II) $\text{C}_{13}\text{H}_{15}\text{N}_2\text{Br}_2$, red, does not m. 300° . When a mixt. of I and bis[2-bromo-3-methyl-4-propionic acid pyrrolyl]methene-HBr (III) is heated with $(\text{CH}_3\text{CO}_2\text{H})_2$ at 180 – 90° , deuteroporphyrin is obtained (*Me ester* (IV), m. 219 – 20° , whose complex *Fe salt*, m. 250°). Similar treatment of a mixt. of II and III gives deuteroporphyrin together with another porphyrin, whose *Me ester* m. 232° . Treatment of deuteroporphyrin with $\text{Fe}(\text{OAc})_2$, AcOH, NaCl and HCl gives deuteroporphyrin with $\text{Fe}(\text{OAc})_2$, AcOH, NaCl and HCl gives deuteroporphyrin *Fe salt* (deuterohemin). $\text{C}_{30}\text{H}_{28}\text{O}_4\text{N}_4\text{FeCl}$. Bromination of IV in AcOH gives a *perbromide*, m. 138° , which on treatment with Me_2CO passes into *dibromodeuteroporphyrin di-Me ester*, m. 274° , which does not depress the m. p. of the natural product. The absorption spectra of the synthetic deuteroporphyrin and the above salts are tabulated. "Pryporphyrin" and deuteroporphyrin are identical.

C. J. WEST

Aminofibroin. A. MOREL AND P. SISLEY. *Bull. soc. chim.* 43, 1132–3(1928).—Diazotized fibroin, from wool or silk, was reduced to aminofibroin, which is easily diazotized and with amines and phenols gives the same colors as fibroin treated directly with HNO_3 .

R. C. ROBERTS

Constitution of chitin. KURT H. MEYER AND H. MARK. *Ber.* 61B, 1936–9 (1928).—M. and M. extend the theory of Fürth and Russo (*Beitr. chem. Physiol. Pathol.* 8, 161) that the acetylglucosamine residues in chitin consist of *amylenic oxide* rings linked glucosidically, by visualizing the 1,5-rings as being bound together through 1,4-O bridges, the rings being alternately rotated about 180° , and the so-formed principle valence chains being united to one another to form micelles. Gonell's theory (cf. *C. A.* 20, 1246) on the structure of the elementary groups in chitin is criticized

because the blotting-out of certain reflections demanded by this theory are not actually observed. M. and M. mention that the rhombic elementary grouping proposed by G. might be visualized as contg. 8 acetylglucosamine anhydrides. There may be also, spirial axis parallel to the fiber axis, thus making chitin differ in general structure from cellulose by its different edge length, *a* and *c*, and by its different edge angle.

FREDERICK C. HAHN

Absorption spectra and molecular structure of the dihalogen derivatives of benzene (ERRERA, HENRI) 3. The infra-red absorption spectra of organic carbonates (BELL) 3. Antirachitic substances—ergosterol and its esters (BILLS, HONEYWELL) 11E. The reaction between amino acids and glucose (AMBLER) 28. Dufton distilling column for the preparation of absolute alcohol (NOYES) 1. Physical properties of pure triglycerides (JOGLEKAR, WATSON) 27. Structure of silk fibroin (MEYER, MARK) 11A. The crystal structure of solid methane (McLENNAN, PLUMMER) 2. The coal-tar phenols (BRÜCKNER) 21. The "*e*-phenols" of primary tar (VAVON, ZAHARIA) 21. The electrolytic oxidation of formaldehyde in alkaline solution (MÜLLER, TAKEGAMI) 2. Fish powder (Fr. pat. 641,887) 12. Catalyst for use in producing vanillin (U. S. pat. 1,698,009) 18. Dispersion of org. substances in liquids in which they are not readily sol. (Swiss pat. 127,514) 13. Catalyzers (Swiss pat. 127,516) 18. Pyramidone (Ger. pat. 469,285) 17. Purification of benzene and trichloroethylene (Fr. pat. 641,836) 18.

Hydrocarbons. MICHAEL G. CORSON. Fr. 642,170, Oct. 11, 1927. Hydrocarbon derivs. of C_2H_2 are prepd. by heating to 150–300° under a pressure of 6–40 atm. simple org. substances contg. OH or Cl, but not COOH, and CaC_2 . The hydrocarbon obtained from a compd. contg. Cl may be hydrogenated in the presence of an active metal and HCl to a less complex mol. In examples, $(EtC\equiv)_2$ is obtained from EtOH, and this is hydrogenated to $EtCH_2CH_2Et$. $(PhC\equiv)_2$ is obtained from PhCl, and this may be converted to PhMe. Cf. C. A. 22, 2751.

Liquid hydrocarbons. I. G. FARBENIND A.-G. Brit. 291,137, Feb. 22, 1927. Liquid hydrocarbons of low b. p. are obtained by passing olefinic gases at elevated temps. and either at ordinary or increased pressure over catalysts such as Au, Ag or Cu, O-contg. compds. of alkali metals with addn. of other metal salts or oxides, or salts of the O acids of P, B or Sb with metals such as Ca, Zn or Cu or their reduction products or the solid acids or anhydrides themselves.

Synthesis of hydrocarbons. THE GENERAL CARBONALPHA CO. Fr. 641,520, Sept. 27, 1927. Hydrocarbons are formed by combining with or without heat, pressure and a catalyst, H and C obtained in an extremely active form, e. g. by dissociation CO or gases contg. it. Cf. C. A. 22, 2571.

Synthesizing hydrocarbons from carbon oxides and hydrogen. ALWIN MITTASCH, CARL MÜLLER, LEO SCHLECHT and WALTER SCHUBARDT (to I. G. Farbenind. A.-G.). U. S. 1,698,602, Jan. 8. A gaseous mixt. comprising oxides of C and somewhat less H than is theoretically necessary for the conversion of the oxides of C into CH_4 is subjected to the action of a metal catalyst such as Fe which is prepd. from the corresponding metal carbonyl.

Hydrogenation of organic substances. ADOLF SPILKER, CARL ZERBE and GESELLSCHAFT FÜR THERVERWERTUNG M. B. H. Fr. 641,035, Sept. 16, 1927. H is caused to act on distn. products of coal or on coal itself at a high temp. and pressure in the presence of I or other halogen or a halogen compd. which will liberate the halogen or halogen hydride at the temp. used. Examples are given of the hydrogenation of $C_{10}H_8$ using I or NH_4Cl as catalyst, of coal-tar pitch using I or KBr, of coal using KI, of crude lignite tar or coal using a mixt. of KI, NH_4Cl and Fe_2Cl_3 . Cf. C. A. 22, 2835.

Catalytic oxidation of organic compounds. A. O. JAEGER (to Selden Co.). Brit. 291,419, June 3, 1927. Various oxidations such as those effected by an oxidizing gas on vapors of org. compds. are controlled or limited to produce intermediate products by use, with the catalyzer, of a "stabilizer" which may be a salt or compd. of an alkali metal, alk. earth metal, some alk. earth metals or metals which form oxides not reducible by H. The salts may be acid or neutral sulfates, phosphates, halides, chlorates, nitrates, simple or complex cyanides, arsenates, antimonates, bismuthates, borates or carbonates. "Stabilizer promoters" also may be used which may comprise compounds of catalytic elements such as heavy metals and some amphoteric metals such as Al, Zn or Pb which are not catalysts or have only slight direct catalytic action on the reaction involved. Various examples are given among which are oxidation of C_6H_6 , toluene, phenols or furfural to maleic and fumaric acids, of cresols to salicylaldehyde and salicylic acid and of

$C_{10}H_8$ to naphthoquinone, phthalic anhydride and maleic acid and of ethylene chlorohydrin to chloroacetic acid.

Intermediate oxidation products from hydrocarbon oils. JOSEPH H. JAMES (to Clarence P. Byrnes, trustee). U. S. 1,697,653, Jan. 1. A liquid partial-oxidation product contg. org. aliphatic acids and intermediate oxidation products (with the oxidation products short of aldehyde fatty acids in excess of such acids) is obtained by catalytic oxidation at a temp. just below redness. An app. is described, and Mo or U compds. may be used as catalysts.

Olefins from carbon monoxide and hydrogen. A. W. NASH, A. R. BOWEN and O. C. ELVINS. Brit. 291,867, March 9, 1927. A mixt. of H with an excess of CO is passed at atm. pressure and at a temp. of 280–300° over a catalyst comprising a mixt. of the reduced oxides of Co, Cu and Mn. Various details are given.

Ethylene and other olefins. SYNTHETIC AMMONIA & NITRATES, LTD., AND G. F. HORSLEY. Brit. 291,186, March 30, 1927. Gas mixts. contg. CO such as coal gas, after removal of S compds., are scrubbed to sep. C_2H_4 and other olefins with an acid soln. of $AgNO_3$ under ordinary or increased pressure and at a temp. of 0–10° and the absorbed olefins are removed by heating to 50–70° with or without reduction of pressure.

Separating paraffin constituents from fluid hydrocarbons. ERIK A. FORSBERG, (to Aktiebolaget Separator-Nobel). U. S. 1,699,286, Jan. 15. A liquid is added such as CCl_4 which acts as a selective solvent for liquid hydrocarbons from which paraffin constituents are to be sep'd. and the associated materials are then subjected to a special centrifugal sepn. which is described.

Methylol compounds of organic acid amides. G. WALTER. Brit. 291,712, Nov. 29, 1926. Methylol compds. of org. acid amides are made by the method employed according to Brit. 284,272 (C. A. 22, 4538) for production of methylol compds. of urea and like compds. (treating the amide at about ordinary temp. with CH_2O in an org. solvent and in the presence of an inorg. base). An example is given of the production of methylol-acetamide by dissolving polymerized CH_2O in EtOH contg. a small quantity of KOH and adding acetamide.

Alkylated aromatic compds. I. G. FARBERIND. A.-G. Fr. 33,067, Feb. 26, 1927. Addn. to 608,949. Alkylated, aralkylated or cycloalkylated compds. are obtained by causing sulfuric esters of alcs. which contain 3 or more C atoms to react with aromatic compds. Under energetic conditions sulfonation also takes place. In an example the sulfuric ester of BuOH is heated with $C_{10}H_8$. Other alcs. such as PrOH, AmOH, cyclohexanol or its homologs may be used.

Organic arsenic compounds. DEUTSCHE GOLD- UND SILBERSCHEIDENANSTALT VORM. ROESSLER (August Albert and Wilhelm Schulenburg, inventors). Ger. 468,403, Feb. 4, 1923. Bromine substituted mixed aliphatic-aromatic ketones, e. g. 4-bromoacetophenone or 3-amino-4-bromoacetophenone react with arsenites in hot solution to form mixed aliphatic aromatic ketone arsonic acids. Cf. C. A. 22, 4128.

Unsymmetrical arseno compounds. JOHANNES PFLEGER and AUGUST ALBERT. U. S. 1,688,351, Oct. 23. Unsym. arseno compds. are produced which contain carbonyl groups in non-cyclical linkage by subjecting different arseno-carbonyl compds. in combination to reduction (suitably with hydrosulfite); or in place of As compds. having free carbonyl groups their condensation products with amino compds. of any kind contg. amino groups susceptible of reaction such as hydrazine derivs., hydroxylamine and its derivs., amino sulfonic acids, amino carboxylic acids, amino aldehydes and ketones, acid amides, urea, etc. can be used. Also, As compds. with free carbonyl groups may be reduced together with condensation products as mentioned; or, As compds. having free carbonyl groups or their condensation products with amino compds. may be reduced with any other tervalent or quinquevalent As compds., such as halogen-, nitro-, hydroxy-, aminoarylsarsine oxides or carboxylated or sulfonated arsonic acids, glycine arsonic acids, urea derivs. of arsonic acids, etc. Thus there may, e. g., be produced unsym. As compds. which are on the one side of the formula free from carbonyl groups and contain on the other side this therapeutically valuable group either in the free state or combined by condensation with an amino compd.

Production of alcohols. OSKAR LOEHR (to I. G. Farbenind. A.-G.). Can. 285,921, Dec. 25, 1928. Primary alcs. are produced by reacting upon an olefin oxide of primary structure with H in the presence of a hydrogenation catalyst, a carrier and a promoter. *Example.*—A catalyst is prepd. by pptg. a soln. of 291 parts of $Ni(NO_3)_2$ in 5000 parts of H_2O by means of 89 parts of NaOH, decanting, filtering, washing at first with water until the last traces of nitrate ion have disappeared, and then with a 0.1% NaOH soln. and drying the alk. reacting ppt. at about 100°. The dry ppt. is introduced into a tube, reduced with pure H at 250° to 300° to Ni metal and then a mixt. of H and the vapors of

propylene oxide is passed over the catalyst at about 170°. The products of reaction are condensed. The unchanged propylene oxide is distd. off and again passed through the tube, while the residue (35 to 40%) consists of *propyl alc.* A Co catalyst which is obtained by reducing an alk. Co hydroxide at 400° also yields *propyl alc.* by passing H and the vapors of propylene oxide thereover at about 250°. Cf. C. A. 22, 2753.

Esters of hydrogenated aromatic alcohols. ROBERT H. VAN SCHAACK, JR. (to Van Schaack Bros. Chemical Works). U. S. 1,697,295, Jan. 1. Esters of monocarboxylic acids such as stearic acid which contain more than 7 C atoms in their mol., with hydrogenated aromatic alcs. such as cyclohexanol are produced by heating the acid with an excess of the alc.

Separation of amines. SILESIA VERBIN CHEM. FABRIKEN. Fr. 642,630, Oct. 20, 1927. See Brit. 280,877 (C. A. 22, 3417).

Glycol esters of abietic acid. ARTHUR LANGMEIER (to Hercules Powder Co.). U. S. 1,697,530, Jan. 1. Abietic acid is heated with an alkali such as alc. NaOH and an olefin dihalide such as ethylene dichloride or amylene dichloride to produce esters, Cf. C. A. 23, 848.

Alkyl chlorides. I. G. FARBERIND. A.-G. (Otto Ernst and Walter Berndt, inventors). Ger. 467,185, Dec. 19, 1929. Addition to Ger. 444,799. The process of the main patent (which applies to MeCl) is extended to the reaction of dilute HCl with other alcohols boiling below 110°, e. g. EtOH and PrOH to form ethyl and propyl chlorides.

Alkyl resorcinols. ALFRED R. L. DOHME (to Sharp & Dohme). U. S. 1,697,168, Jan. 1. An acyl resorcinol such as hexylresorcinol is subjected to reduction with Zn amalgam and HCl (using not over 2.5 times as much Zn amalgam as acylresorcinol) with vigorous agitation at a reactive temp. (suitably about 105°). Cf. C. A. 22, 434.

Aromatic mercaptans. I. G. FARBERIND. A.-G. Fr. 642,128, Oct. 8, 1927. See Brit. 279,136 (C. A. 22, 2754).

Aromatic polysulfides. R. EDER. Brit. 291,100, May 27, 1927. Aromatic mercaptocarboxylic acids or esters are treated with S halides to produce polysulfides in which 2 aromatic nuclei each contg. a carboxylic group are connected by a bridge of S atoms. With S dihalides, trisulfides are produced, and with S monohalides tetrasulfides are formed. Alternatively, the mercaptocarboxylic acids may be treated with S halides and the product then esterified. Examples are given of the production of compds. such as dibenzoic acid 3,3'-tri- and tetra-sulfide, dibenzoic acid ethyl ester 3,3'-tri- and tetra-sulfide, disalicylic acid 5,5'-tri- and tetra-sulfide and similar compds.

Aldehydesulfoxylates. I. G. FARBERIND. A.-G. Fr. 641,509, Sept. 27, 1927. Aldehydesulfoxylates are prepd. by reducing aldehyde bisulfites with H in the presence of catalysts such as Ni, Co or Pt, preferably under pressure and heat. Examples are given of the prepn. of formaldehyde- and benzaldehydesulfoxylates from the corresponding bisulfites.

Dinitrohaloaryls. I. G. FARBERIND. A.-G. Fr. 642,420, Oct. 14, 1927. Dinitrohaloaryls of the formula 1-halo-2-nitro-4-X-6-X-benzene where one X represents either SO₂-N (aryl) R or ---CO-N (aryl) R, R being an alkyl, aryl or aralkyl group, and the other X a nitro group, are prepd. by treating 1-halo-2-nitro-4-X'-6-X'-benzene, where one X' represents a SO₂-halogen or CO-halogen and the other X a nitro group. The products are *intermediates for dyes* and other products. In examples, 1-chloro-2,6-dinitro-4-sulfonic acid chloride is heated in water or other diluent with Ph-NHMe, the SO₂Cl group being replaced by a phenylmethylsulfamide group, which product has a feeble yellow color, m. 161° (not corrected). The formulas of other products which may be obtained in the same way are given.

Acidyl naphthalenes and acenaphthenes. I. G. FARBERIND. A.-G. Brit. 291,347, May 30, 1927. Diacidyl derivs. of the naphthalene and acenaphthene series are made by treating the hydrocarbon with an aromatic or aliphatic acid chloride in the presence of an acid condensing agent such as AlCl₃ (suitably is the presence of a solvent such as CS₂). 1,5-Dibenzoylnaphthalene is prepd. from C₁₀H₈ and benzoyl chloride and dichloroacetyl chloride and diacetylnaphthalene from acenaphthene and monochloroacetyl chloride and acetyl chloride, resp.

Diazo compounds. I. G. FARBERIND. A.-G. Swiss 127,705 and 127,706. Mar. 24, 1927. Addns. to 126,406. The method of Brit. 268,789 (C. A. 22, 1365) for the manuf. of a diazo compd. from 2,5-dichloroaniline is now applied to 2,5-dichloro-4-methylaniline (127,705) and to 2,3-dichloro-4-methylaniline (127,706).

Stable diazo compounds. SOCIÉTÉ ANON POUR L'INDUSTRIE CHIMIQUE À BÂLE. Swiss 127,430 to 127,437. Nov. 18, 1926. Addns. to 108,486. Stable diazo compds. are prepd. by treating with naphthalene-1,3,6-trisulfonic acid the diazo compds. prepd. from (1) 4-chloro-o-anisidine (127,430); (2) 5-nitro-o-anisidine (127,431); (3) 4-nitro-

o-anisidine (127,432); (4) *m*-nitroaniline (127,433); (5) 2,5-dichloroaniline (127,434); (6) 4-chloro-2-nitroaniline (127,435); (7) 5-chloro-2-toluidine (127,436); (8) 4,4'-diamino-3,3'-dimethoxydiphenyl (127,437). The dried products may be mixed with acid-binding agents.

Formates of the cyclic series. RUDOLF WIETZEL and FRANZ KREMP (to I. G. Farbenind. A.-G.). U. S. 1,698,573, Jan. 8. In producing formates such as those of cyclohexanol or benzyl alc., alcs. of cyclic compds. such as cyclohexanol or benzyl alc. are treated with CO at elevated temp. (suitably about 80–90°) in the presence of alcoholates such as those of Na or K, under 200 atm. pressure.

Cyclohexyl alkyl phthalic esters. ROGER ADAMS and JAMES F. HYDE (to Newport Co.). U. S. 1,689,761, Oct. 30. Liquid compds. of high b. p., which dissolve cellulose acetates and nitrates and can be used with other solvents in the prepn. of pyroxylin and similar lacquers, are made by heating phthalic anhydride with 1 mol. equiv. of cyclohexanol or substituted cyclohexanol such as hexahydro-*p*-cresol to produce a cyclohexyl acid phthalate and then further reacting with an alc. and a catalyst such as a small quantity of HCl or H₂SO₄. Examples are given of the production of the following phthalates: cyclohexyl Et, cyclohexyl Me, cyclohexyl Pr, cyclohexyl isopropyl and cyclohexyl Bu. U. S. 1,689,762 relates to the prepn. of similar compds. among which are *o*-, *m*- and *p*-methylcyclohexyl Et phthalates and *o*-, *m*- and *p*-methylcyclohexyl Bu phthalates.

Ethylene derivs. HANS FINKELSTEIN (to I. G. Farbenind. A.-G.). Can. 285,920, Dec. 25, 1928. Derivs. of ethylene, propylene and butylene are obtained from waste gases from cracking operations after a previous sepn. of the readily condensable constituents, the corresponding chlorohydrins, by treating HClO with the remaining olefins, converting the chlorohydrins by treatment with milk of lime into a mixt. of olefin oxides, sepg. the individual oxides by fractional distn. under super-atm. pressure and converting each olefin oxide into the corresponding olefin glycol by treating it with water contg. small quantities of strong acid.

Halogenation of benzene, etc. MARTIN BATTEGAY. Fr. 641,102, April 29, 1927. C₆H₆ or its derivs. are halogenated in the presence of concd. H₂SO₄. Examples are given in which Cl is passed into C₆H₆ mixed with concd. H₂SO₄ to obtain mixts. of chlorinated compds.

Benzene-containing product. I. G. FARBENIND. A.-G. Swiss 127,690, July 7, 1926. Addn. to Swiss 123,330. Xylene is treated with H at a high temp. in the presence of a catalyzer, which may be a contact mass including a dehydrogenating element or oxide.

Toluene sulfochlorides. IGNAZ KREIDL. Austrian 110,128, June 15, 1927. Toluene is introduced into chlorosulfonic acid cooled to about -7°, and the cooling is intensified so as to maintain that temp. throughout the reaction.

Alkali metal salts of halogenated amides of aromatic sulfonic acids. HEINRICH GÜNZLER (to Winthrop Chemical Co.). U. S. 1,699,888, Jan. 22. An amide of an aromatic sulfonic acid compd. such as *p*-toluenesulfonamide is decomposed in concd. aq. soln. by bleaching powder and reaction is then effected between an alkali metal salt such as Na₂CO₃ or Na₂SO₄ and the Ca compd. formed by the first reaction.

Alkaline earth metal salts of alkali metal derivatives of chlorosulfamyl aromatic carboxylic acids. FRANZ PROSCHKO (to Esseff Chemische Industrie- und Handels-A.-G.). U. S. 1,697,139, Jan. 1. An aromatic sulfamyl carboxylic acid such as *p*-H₂NO₂SC₆H₄CO₂H is treated with CaOCl₂ or other suitable alk. earth metal hypochlorite and the salt thus produced is then treated with an alkali metal salt such as NaCl. An example is given of the formation of (ClNaNO₂SC₆H₄CO₂)₂Ca.

Benzanthrone derivatives. I. G. FARBENIND. A.-G. Brit. 201,131, Feb. 21, 1927. *Bz*-1-methoxybenzanthrone and its derivs. are obtained by treating benzanthrone derivs. contg. an interchangeable negative substituent in the *Bz*-1-position (such as halogen or a nitro, sulfonic or sulfone group) with MeOH in the presence of alk. agents (suitably by boiling under reflux or in an autoclave). In cases where nitrites are likely to be formed during the reaction substances which destroy the nitrites are added such as Na₂SO₃ or urea. Several examples are given. Cf. C. A. 23, 847.

Benzanthrone derivatives. I. G. FARBENIND. A.-G. Brit. 286,685, March 9, 1927. By reactions similar to some of those described in Brit. 268,830 (C. A. 22, 1366), condensation is effected between O-contg. reduction products of the anthraquinone series with α,β -unsatd. carboxylic acids contg. either H or mono-valent substituents such as alkyl, aryl or halogen in the positions R' and R² (of the formula given in the previous pat.). The process is also applicable to similar unsatd. carboxylic acids in which the double bond has been opened by the addition of H halide, water or the like, such as β -hydroxybutyric acid or β -chloropropionic acid. The *Bz*-1-hydroxybenzanthrone

can be obtained directly or the intermediate products obtained during the reaction can be isolated and closure of the benzene ring of the benzanthrone molecule effected by condensing agents such as oleum or chlorosulfonic acid; sulfonation of the products can be avoided by the addition of a diluent such as Ac_2O . Examples are given of the production of *Bz*-1-hydroxybenzanthrone, a sulfonic acid deriv. of *Bz*-1-hydroxybenzanthrone, β -anthronyl- β -methylcrotonic acid and *Bz*-1-hydroxy-*Bz*-3-phenylbenzanthrone-sulfonic acid, and, by treatment of the latter with NH_3 in the presence of ZnCl_2 , *Bz*-1-amino-*Bz*-3-phenylbenzanthrone (from which the NH_2 group can be eliminated by the diazo reaction, so as to obtain *Bz*-3-phenylbenzanthrone).

Pyridine and its homologs. H. TH. BÖHME A.-G. Fr. 642,391, Oct. 10, 1927. Pyridine and its homologs are prepd. by passing aldehydes or components forming them with NH_3 over catalysts such as oxides or carbides of Fe, Al, Cr, W, U or of rare earths under pressure of about 50 atm. and between 200° and 400° . In an example a mixt. of AcH , or C_2H_2 and steam, and NH_3 using as catalyst W carbide, gives a product composed principally of picolines.

Pyridine derivatives. DEUTSCHE GOLD- UND SILBERSCHNEIDANSTALT VORM. ROESSLER. Fr. 641,422, Sept. 18, 1926. New derivs. of pyridine are obtained by treatment, at ordinary or raised temp. 3-hydrazinopyridine or derivs. of 3- or of 2-hydrazinopyridine with aliphatic, aromatic or mixed aliphatic-aromatic aldehydes or ketones. In examples, *BzH* is poured on to pyridylhydrazine obtained by diazotizing and reducing α -aminopyridine; light colored crystals are obtained, m. $165\text{--}166^\circ$. A product, m. $127\text{--}124^\circ$, is obtained from α -chloro- β -hydrazinopyridine and acetoacetic ester, one, m. $93\text{--}95^\circ$, from α -hydrazino- β' -nitropyridine (I) and acetoacetic ester, one, m. 163° , from I and acetone, one, m. 151° , from I and propionaldehyde, one, m. $226\text{--}228^\circ$, from I and *BzH*.

Halogenating perylene. ALFRED PONGRATZ and ALOIS ZINKE (to Felice Bensa). U. S. 1,697,137, Jan. 1. Perylene is dissolved in a solvent such as PhNO_2 which is inert to the nascent and elementary halogens to be used and a halogen compd. such as HCl is gradually introduced together with a substance such as H_2O_2 which serves to liberate nascent halogen; these compds. are added in calcd. quantities to effect halogenation to the desired extent and the quantity of solvent used and its temp. are sufficient to hold the product in soln.

Dinitroperylene and its derivatives. FELICE BENSA. Ger. 468,453, Dec. 12, Austrian application Oct. 28, 1925). See U. S. 1,688,837 (C. A. 23, 155).

Naphthalene derivatives. I. G. FARBENIND. A.-G. Brit. 291,965, June 16, 1927. 2-Hydroxynaphthalene-6-carboxylic acid is sulfonated with H_2SO_4 of at least 1.82 sp. gr. The normal salts are formed by adding Na_2CO_3 and the less sol. normal di-Na salt of 2-hydroxy-3-sulfo-6-carboxylic acid is sepd. by fractional crystn. from the more sol. normal di-Na salt of 2-hydroxynaphthalene-8-sulfo-6-carboxylic acid. 2,3-Dihydroxynaphthalene is made by fusing 2-hydroxy-3-sulfo-6-carboxylic acid with alkali and splitting off the carboxylic group. Cf. C. A. 22, 3669.

Chlorinating naphthalene. BRITISH DYESTUFFS CORP., LTD., J. B. PAYMAN and W. GIBSON. Brit. 292,056, March 4, 1927. Cl is passed into a soln. of C_{10}H_8 in CCl_4 or similar solvent at a temp. of about 5° in the presence of a small quantity of an inorg. Cl carrier such as FeCl_3 , with or without use of light. The product is distd. under reduced pressure.

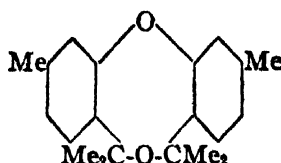
Chlorinating naphthalene. BRITISH DYESTUFFS CORP., LTD., J. B. PAYMAN and W. GIBSON. Brit. 291,849, March 4, 1927. Cl gas is passed into molten C_{10}H_8 at ordinary pressure and at temps. of $130\text{--}160^\circ$ in the presence of a small quantity of an inorg. Cl carrier such as FeCl_3 , either with or without exposure to light. After the desired reaction the product is distd. under reduced pressure.

Producing products such as heptaldehyde from heavy vegetable oils. HAROLD S. AVERY and LUDWIG MEUSER (to Naugatuck Chemical Co.). U. S. 1,697,337, Jan. 1. Oil such as castor oil is introduced into a heated zone such as an elec. heated nichrome pipe in the absence of air or catalytic agents and maintained at a relatively high temp. (sufficiently about $500\text{--}600^\circ$) to effect substantially complete decompn. of the oil with production of heptaldehyde. An app. is described.

Making preparations for the condensation of phenols with aldehydes. A. K. PETROV and G. S. PETROV. Russ. 4592, Feb. 29, 1928. Phenolic solns. of alk. earth metals are concd. in the presence of a small quantity of HCHO .

Condensation product from *m*-cresol and acetone. SCHERING-KAHLBAUM. A.-G. Swiss 127,722, May 31, 1927. The two substances are heated to 100° in the presence of a condensing agent. The product can be distd. without decompn. at 0.8 mm. and 187° and is a clear highly refractive liquid which congeals to a resin-like solid when cold. It

can be crystd. from a soln. in petrol ether of low b. p. to give crystals m. 82–83°. The formula is



Condensation products from reaction products of disulfur dichloride and primary arylamines. RICHARD HERZ (to Grasselli Dyestuff Corp.). U. S. 1,699,432, Jan. 15. Various new aromatic substances contg. N, S and Cl are formed by the action of S_2Cl_2 on primary arylamines and their substitution products which contain in their mol. at least one amino group and one unsubstituted H in *o*-position to the amino group, *e. g.*, aniline and its homologs, α - and β -naphthylamine, aminophenols, aminoaryl hydroxyalkyl and aminoaryl thioalkyl ethers, *m*- and *p*-aryldiamines, such as *m*- and *p*-phenylenediamine, benzidine, tolidine, dianisidine and the acyl derivs. of these bases preferably as the dry mineral acid salts and also the substitution products of all these arylamino compds., including the sulfonic and carboxylic acids. Probably the S—S—Cl group enters in the *o*-position to the amino group, or amino groups, resp., forming with same a new ring, consisting of N, S_2 and Cl; in some cases there occurs also a chlorination of the aromatic nucleus. The new substances, possessing probably the general chemical

constitution, $R.N:S(Cl).S(R = \text{aryl})$, are useful as raw materials for the production of dyes and pharmaceutical compds. They are in a dry state yellow, to orange, to red, to brown, to dark colored substances sol. with their own color in water and alc. and are distinguished by the following characteristic properties: (1) When brought into contact with aromatic bases such as aniline, toluidine, etc., most of them yield red, to violet, to blue, to green colorings, which represent unstable basic dyestuffs contg. S. (2) By reaction with H_2O OH is substituted for Cl. (3) If the original substances or these latter products of transformation are treated in a suitable manner with alkalies, the ring is split and new compds. result which when condensed in an alk. soln. with monochloroacetic acid form new condensation products having the character of *o*-aminoarylthioglycolic acids. These latter reactions together with the converting of these condensation products into vat dyes form the subject matter of U. S. Pats. 1,243,170 and 1,243,171. The process may be worked with or without the addition of a suitable diluent which takes no part in the reaction as, for instance, benzene, naphtha, glacial acetic acid or formic acid free from water. When free amino bases are used which react rather violently with the S_2Cl_2 , the reaction should be restrained by adding such a suitable dilg. agent. The temp. of the reaction must be kept below the b. p. of S_2Cl_2 and preferably not below about 40°, as at more elevated temps. more complicated substances result. Cf. C. A. 22, 1365.

Water-soluble condensation products. I. G. FARBENIND. A.-G. (Karl Daimler, Gerhard Balle and Franz Marschall, inventors). Ger. 466,361, July 24, 1924. Addn to Ger. 436,881. *Polynuclear aromatic hydrocarbons, e. g.* naphthalene or tetrahydronaphthalene, and *aryl alkyl halides, e. g.* benzyl chloride, benzyl bromide, xylyl chloride or bromide, nitrobenzyl chloride, chlorobenzyl chloride or tetrahydronaphthalene chlorinated in the hydrogenated ring, or condensation products from these components, are treated with strong sulfonating agents, *e. g.* oleum or mixts. thereof with chlorosulfonic acid, to obtain water soluble condensation products.

Monocarboxylic acids. I. G. FARBENIND. A.-G. Brit. 291,326, Nov. 22, 1926. Monocarboxylic acids are prepd. by passing dicarboxylic acid vapors (alone or with water vapor) or dicarboxylic acid anhydride vapors together with water vapor, at elevated temp. and at ordinary or increased pressure, over oxides of Zn, Cd, Pb or Bi which may also be mixed with other oxides, hydroxides or silicates. Examples are given of the production of benzoic acid from phthalic acid with different catalysts; phthalic anhydride directly as produced from $C_{10}H_8$ may be used.

Sulfonated hydroxy fatty acids. CARL DREYFUS. Fr. 636,488, June 23, 1927. Sulfuric esters of di-, tri-, and polyhydroxy fatty acids are produced by introducing H_2SO_4 contg. 5–10% SO_3 in a very fine mist from spraying nozzles into cooled and agitated hydroxy fatty acids. Ricinoleic acid is converted into sulfodihydroxystearic acid prepd. by oxidizing isoleic acid. Trihydroxy- and polyhydroxystearic acids are converted into their sulfuric esters without the use of solvents. Sativic acid prepd. from linoleic acid by permanganate may be esterified in this way.

Extracting anhydrous fatty acids from aqueous solutions. SOC. ANON. DISTILLERIES

DES DEUX-SÈVRES. Swiss 127,254. June 27, 1927. Anhyd. fatty acids are extd. from their aq. solns. with an ester of AcOH, alone or mixed with a hydrocarbon such as benzene, the ext. being distd. so as to sep., in turn, an aq. ester, the rest of the ester, and the anhyd. acid. Examples are given.

Concentrating volatile aliphatic acids. ADOLF GORHAM (to Holzverkohlungs-Industrie A.-G.). Can. 285,930, Dec. 25, 1928. Dil. volatile aliphatic acids are converted into concd. form, by passing the dil. acid in vapor form through a column in contact with a salt (AcOK) which is capable of forming with the acid an acid salt, and extg. the acid in concd. form from the acid salt which is formed by distn. without isolation.

Concentration of volatile aliphatic acids. ADOLF GORHAM (to Holzverkohlungs-Industrie A.-G.). Can. 285,928, Dec. 25, 1928. Dil. volatile aliphatic acids are concd. by treating solns. of the acids in org. solvents (acetone or wood spirit, oils, ether, butyl alcs.) with salts (AcOK, acetates of the other alkali metals or of the alk. earths, also mixts. of such salts) which are capable of forming with the acid in question acid salts, and heating the acid salts, without isolation, to temp. at which the acid distills off in concd. form. Cf. C. A. 23, 605.

Extraction of concentrated volatile aliphatic acids. ADOLF GORHAM (to Holzverkohlungs-Industrie A.-G.). Can. 285,929, Dec. 25, 1928. Concd. volatile aliphatic acids are extd. from dil. solns. thereof by treating solns. of fatty acids in org. solvents with salts capable of combining with the acids and having a low m. p. so that they remain substantially liquid during the subsequent decompn. process and decompg. the acid salts thus obtained by heating.

α -Aminoanthraquinone- β -carboxylic acids. KARL WILKE (to Grasselli Dyestuff Corp.). U. S. 1,698,900, Jan. 15. 1-Aminoanthraquinone-2-carboxylic acid is prepd. by subjecting anthraquinone-1,2-isoxazole to the action of a saponifying agent such as a hot soda soln. Cf. C. A. 23, 395.

Acetic acid. HENRY DREYFUS. U. S. 1,697,109, Jan. 1. Me formate is isomerized by heating it in vapor form under pressure in the presence of a catalyst comprising $Zn(OAc)_2$ or other metal acetates which decompose with formation of HOAc at temps. not exceeding about 450° or metal compds. such as metal oxides or methylates which are capable of forming such acetates.

Acetic acid, etc. HOLZVERKÖHLUNGS-INDUSTRIE A.-G. Brit. 291,433, June 2, 1927. Aq. HOAc or similar acid is vaporized and caused to react with a salt such as NaOAc or KOAc capable of combining with the acid to form an acid salt and the latter is either directly used for reactions such as production of esters or is heated to effect sepn. and recovery of the acid itself. Brit. 291,434 specifies treatment of the aq. acid with an org. solvent such as acetone or "wood spirit oils," ether, BuOH or mixts. such as "acetone oil" or BuOH and benzene, followed by treatment of the soln. thus formed with a salt such as KOAc or other alkali or alk. earth acetates which form acid salts with the acid.

Apparatus for continuous rectification of acetic acid. GEORGES F. LEGENDRE (to Soc. des Établissements Barbet). U. S. 1,698,798, Jan. 15. An app. with 2 rectifying columns and various auxiliary app. is specified.

N-(Carbamylmethyl)-2-chloroarsanilic acid. ÉTABLISSEMENTS POULENC FRÈRES and ERNEST FOURNEAU. Fr. 636,658, Oct. 21, 1926. See C. A. 22, 2755.

Maleic acid. I. G. FARBERIND. A.-G. Swiss 127,034, Mar. 21, 1927. Maleic acid is obtained by heating C_6H_6 with oxidizing gases in the presence of an oxidation catalyst, subjecting the reaction products, without sepn., to decarboxylation with the aid of catalysts such as ZnO or a mixt. of CdO and Al_2O_3 , and then again oxidizing the products as before. Cf. Brit. 268,775.

Hydroxybenzoylbenzoic acid. THE NEWPORT CO. Fr. 641,145, Sept. 17, 1927. See U. S. 1,654,289 (C. A. 22, 788).

4'-Halo-2-benzoylbenzoic acid intermediates. WILHELM MÜLLER and ERNST APFENZELLER (to Grasselli Dyestuff Corp.). U. S. 1,699,671, Jan. 22. Phthalic anhydride, monohalobenzene and anhydrous $AlCl_3$ are mixed in approx. equimol. proportion and the oily reaction product is slowly heated to between 40° and 209° (suitably about 80–100°) until evolution of HCl ceases, to obtain a product which by dil. acid is converted into 4'-chloro-2-benzoylbenzoic acid.

Methanol. SOCIÉTÉ ANON. DES CHARBONS ACTIFS ÉDOUARD URBAIN. Fr. 641,195 Mar. 2, 1927. A mixt. of CO and H for the production of MeOH is obtained by passing over known catalysts a mixt. of a hydrocarbon such as CH_4 , CO_2 and steam at temps. between 600° and 1200°.

Phenethyl alcohol. EDGAR C. BRITTON (to Dow Chemical Co.). U. S. 1,698,932,

Jan. 15. In order to purify synthetic phenethyl alc., the crude alc. is converted into a monophenethyl phthalate, and after steam distn. the phthalate is hydrolyzed.

Formaldehyde. I. G. FARBENIND. A.-G. Fr. 641,750, Oct. 3, 1927. Solus. of CH_2O are obtained by heating polymerized formaldehydes with water above 100° .

Formaldehyde from methane. FRANCIS J. CARMAN and THOMAS H. CHILTON U. S. 1,697,106, Jan. 1. A gaseous mixt. comprising CH_4 , O and a halogenating agent such as Cl is heated above 500° but below ignition temp. An app. is described.

Producing formaldehyde or other partial oxidation products of hydrocarbons. FRANCIS J. CARMAN. U. S. 1,697,105, Jan. 1. A gaseous mixt. comprising a hydrocarbon material such as CH_4 together with O and a halogen such as Cl is heated to a temp. suitable for effecting limited oxidation and a desired oxidation product such as CH_2O is sep'd. from the products leaving the reaction chamber, and at least a portion of the halogen is rendered available in the oxidation and used for reaction with further quantities of hydrocarbon. An app. is described.

Acetaldehyde. I. G. FARBENIND. A.-G. Fr. 641,406, Sept. 26, 1927. See Brit. 278,324 (C. A. 22, 2573).

α -Amylcinnamaldehyde. I. G. FARBENIND A.-G. Swiss 127,159, Mar. 1, 1927. Addns. to 125,473. PhCH:CAmCHO is prepd. by the method described in Brit. 284,458 (C. A. 22, 4725).

5-Nitro-1-aminoanthraquinone-2-aldehyde. I. G. FARBENIND. A.-G. Swiss 127,165, Mar. 7, 1927. Addn. to 125,967. 5-Nitro-1-aminoanthraquinone-2-aldehyde is prepd. by reduction of 5-nitroanthraquinone-1,2-isoxazole, suitably with FeSO_4 in dil. H_2SO_4 suspension.

1,5-Diaminoanthraquinone-2,6-dialdehyde. I. G. FARBENIND. A.-G. Swiss 127,166, Mar. 7, 1927. Addn. to 125,967. 1,5-Diaminoanthraquinone-2,6-dialdehyde is prepd. by reduction of anthraquinone-1,2,5,6-diisoxazole, suitably with FeSO_4 in dil. H_2SO_4 suspension.

1,8-Diaminoanthraquinone-2,7-dialdehyde. I. G. FARBENIND. A.-G. Swiss 127,167, Mar. 7, 1927. Addn. to 125,967. 1,8-Diaminoanthraquinone-2,7-dialdehyde is prepd. by reduction of anthraquinone-1,2,8,7-diisoxazole, suitably with FeSO_4 in dil. H_2SO_4 suspension.

Ketene from acetone. KETOID Co. (D. A. Nightingale, inventor). Ger. 468,402, June 27, 1925. See U. S. 1,602,699 (C. A. 20, 3697).

1-Aminoanthraquinone-2-methylketone. I. G. FARBENIND. A.-G. Swiss 127,168, Mar. 7, 1927. Addn. to 125,967. 1-Aminoanthraquinone-2-methylketone is prepd. by reduction of anthraquinone-1,2-methylisoxazole, suitably with $\text{Na}_2\text{S}_2\text{O}_4$ in dil. NH_4OH suspension.

Methyl ether. DELCO-LIGHT Co. Fr. 641,580, Sept. 27, 1927. See Brit. 278,353 (C. A. 22, 2573).

Methyl formate. CONSORTIUM FÜR ELEKTROCHEM. IND., G. M. B. H. (Martin Mugdan and Josef Wimmer, inventors). Ger. 466,516, Jan. 23, 1925. CH_2O or, preferably, a dried polymerization product, *e. g.*, paraformaldehyde, is vaporized and fed over finely divided copper catalyst prepd. by pptg. Cu oxide on pumice and reducing it. The reaction is exothermic with small decompn. below 250° . The formaldehyde may be vaporized with the help of an indifferent gas or vapor, *e. g.*, Me formate. The yield approximates 90%.

Butyl acetate. ROBERT H. VAN SCHAAK, JR. (to Van Schaack Bros. Chemical Works). U. S. 1,700,103, Jan. 22. Butyraldehyde is condensed with acetaldehyde in the presence of Al butoxide which serves as a promoter.

Carbazole. SOCIÉTÉ ANON. POUR L'INDUSTRIE CHIMIQUE À BALE. Fr. 641,674, Sept. 30, 1927. Carbazole is extd. from residue of $\text{C}_{10}\text{H}_{18}$ by a fractional distn. followed by a treatment with solvents such as xylene or toluene. If the content of $\text{C}_{10}\text{H}_{18}$ is low the distn. may be omitted.

Thymol and its homologs. CHEM. FABRIK AUF ACTIEN VORM. E. SCHERING. Fr. 641,437, Aug. 9, 1927. Thymol, and its homologs and their hydrogenation products are prepd. by treating the condensation products of alkyl phenols and ketones in the presence of catalysts with H, until they have absorbed 4 or 6 atoms of H. In examples, the condensation product of *m*-cresol and acetone is heated with H in the presence of 1% of Ni to a temp. of 180 - 190° until 14 atoms of H are absorbed. Thymol is sep'd. in known manner. Similarly, 4-methyl-6-isopropylphenol is obtained from the condensation product of *p*-cresol and acetone; if the hydrogenation is continued 4-methyl-6-isopropylcyclohexanol is obtained. Other examples are given.

Chlorothymol. F. RASCHIG. Swiss 127,035, Mar. 23, 1927. Chlorothymol (1-methyl-3-hydroxy-4-isopropyl-6-chlorobenzene) is obtained by condensing the corre-

sponding chloro-*m*-cresol with suitable isopropyl derivs., such as the chloride. Cf. *C. A.* 22, 1366.

Butadiene and its homologs. I. G. FARBENIND. A.-G. Brit. 291,748, June 7, 1927. 1,3-Butylene glycol or a homolog is passed in vapor form (and preferably mixed with a diluent gas or vapor such as steam) over dehydrated alum (suitably at a temp. of 240–250°).

Isatins. KARL SCHIRMACHER and KONRAD RENN (to Grasselli Dyestuff Corp.). U. S. 1,698,894, Jan. 15. Isatins or N-arylsulfo compds. of isatins are obtained by causing oxalyl chloride to react upon a salt of a N-aryl-sulfoanilide (or a homolog, deriv. or substitution product) in the presence of an indifferent solvent such as CS₂ and treating the oxamic acid chlorides thus obtained (which also may be isolated in substance) with an acid condensing agent such as AlCl₃. N-arylsulfo compds. of the isatins which are produced may be treated with a suitable saponifying agent such as H₂SO₄ to convert them into the corresponding isatins. Several examples are given and the process is applicable to the prepn. of isatins heretofore difficult of production.

Benzanthrone. I. G. FARBENIND. A.-G. Swiss 127,032, Feb. 28, 1927. Benzanthrone is made by fusing with AlCl₃, preferably in presence of NaCl, the anthrone-cinnamic aldehyde condensation product described in Swiss 126,579, (*C. A.* 23, 611).

Bz-1-Methylbenzanthrone. I. G. FARBENIND. A.-G. Swiss 127,206, April 2, 1927. Bz-1-Methylbenzanthrone is prepd. by condensing anthrone with methyleneacetone in the presence of an acid condensing agent.

Bz-1-Phenylbenzanthrone. I. G. FARBENIND. A.-G. Swiss 127,033, Feb. 28, 1927. Bz-1-Phenylbenzanthrone is made by heating, preferably at 240–260° in an org. solvent or in suspension, the anthronecinnamic aldehyde condensation product described in Swiss 126,579, (*C. A.* 23, 611).

Nitroanthrone and 2,7-dinitroanthraquinone. I. G. FARBENIND. A.-G. Brit. 291,886, March 11, 1927. Anthrone is nitrated with strong HNO₃ and the product, which contains the nitro groups mainly in the β -positions, yields 2,7-dinitroanthraquinone by boiling in an indifferent solvent such as glacial HOAc or Ac₂O.

4,8-Dimethylamino-1,5-dihydroxyanthraquinone. ROBERT E. SCHMIDT (to Grasselli Dyestuff Corp.). U. S. 1,700,083, Jan. 22. 4,8-Dimethylamino-1,5-dihydroxyanthraquinone-2,6-disulfonic acid is reduced to the corresponding hydro compd. by treatment in a substantially neutral medium such as water with an alkali metal hypsulphite and the resulting hydro compd. is heated in an aq. alk. soln. at 80–95°.

Tetranitrodianthrone and 2,7-dinitroanthraquinone. I. G. FARBENIND. A.-G. Brit. 289,958, Feb. 4, 1927. See Swiss 126,196 and 126,403 (*C. A.* 23, 613).

Chlorinated 1-amino-2,4-dimethylbenzene. I. G. FARBENIND. A.-G. Fr. 641,498, Sept. 26, 1927. See Brit. 278,720 (*C. A.* 22, 2573).

1-Hydroxyethylamino-4-hydroxybenzenes. I. G. FARBENIND. A.-G. Brit. 290,997, May 23, 1927. Mono and di-N hydroxyethyl derivs. of 4-amino-1-hydroxybenzene are made by condensing 4-amino-1-hydroxybenzene with ethylene oxide, suitably in the presence of a diluent and a catalyst such as CaCO₃ or aq. NaOH. Various details are given.

3-Nitropyridine. CURT RATH. Swiss 127,257, Mar. 18, 1927. 3-Nitropyridine is prepd. by oxidation of 2-hydrazino-5-nitropyridine, suitably with CuSO₄ soln.

α -Tetrahydro- α -naphthylamine. I. G. FARBENIND. A.-G. Swiss 127,524, April 28, 1927. Acetyl- α -naphthylamine is treated under pressure with H in the presence of a metal contg. catalyzer, and the Ac group split off from the hydrogenated compd. by sapon. The substance is an oil, b. 275°.

α,α' -Dimethyl- γ -benzoyloxypiperidine- β -carboxylic acid methyl ester. I. G. FARBENIND. A.-G. Swiss 127,127, May 2, 1927. Me α,α' -dimethyl- γ -hydroxypiperidine- β -carboxylate is benzoylated. Cf. Brit. 271,467 (*C. A.* 22, 1054).

Purifying carbon tetrachloride. WALLACE B. VAN ARSDEL and HAROLD P. VANNAH (to Brown Co.). U. S. 1,697,483, Jan. 1. Crude CCl₄ is treated with an alkali metal salt soln. in order to remove volatile "side reaction" products. An app. is described.

Aluminum chloride fusions. FELICE BENSA. Austrian 110,530, April 15, 1928. Improved yields are obtained in fusion reactions in which AlCl₃ takes part by including in the reaction mixt. an oxidizing substance such as MnO₂, Fe₂O₃, FeCl₃, CuO, KNO₃ and N₂SO₄. Reference is made particularly to the manuf. of vat dyes and examples are given in which perylene, dibromoperylene, chloroperylene and tetrachloroperylene are heated with benzoyl chloride and AlCl₃, and also examples in which dibenzoylperylene and dibenzoyldioxyperylene are heated with AlCl₃, in each case in presence of one of the reagents named above.

Tetraethyl lead. HERBERT W. DAUDT. Fr. 642,120, Oct. 8, 1927. EtCl is mixed

with Mg turnings suspended in ether contg. MeI and a crystal of I. This soln. is added to a suspension of PbCl₂ in ether and allowed to remain for 5 hrs., after which it is poured into water. After removal of ether PbEt₄ is obtained.

11—BIOLOGICAL CHEMISTRY

PAUL E. HOWE

A—GENERAL

FRANK P. UNDERHILL

Glucemin and insulin. O. LOEWI. *Klin. Wochschr.* 6, 2169-76(1927).—The mechanism of the fixation of dextrose by insulin and its conversion into lactic acid is discussed. Diabetic plasma contains an inhibitor, "glycemin." This antagonistic substance is dialyzable, is not decomposed when the dialyzate is dried, and is sol. in abs. alc. Diabetic hyperglucemia is ascribed to an increased secretion of glucemin, and a deficient secretion of insulin. B. C. A.

Taka-invertase. II. R. WEIDENHAGEN AND B. B. DEY. *Z. Ver. deut. Zucker-Ind.* 1928, 242-61; cf. *C. A.* 22, 4134-5.—Comparison of the rates of inversion of sucrose by taka-invertase and by invertase from a top-fermentation yeast showed that as the reaction proceeded the velocity coeff. decreased in the former, but increased in the latter case. These departures from the unimol. form of the reaction may be characteristic of invertases from the two sources. Contrary to the statement of Leibowitz and Meehlinski (*C. A.* 20, 3173), taka-invertase hydrolyzed raffinose more than twice as fast as did yeast invertase of a similar sucrose-inverting power. This reaction closely followed the unimol. form. The action of taka-invertase on sucrose and raffinose was markedly inhibited by α -glucose, less by β -glucose, and only slightly by levulose; in fact, levulose was without influence in the case of sucrose. The action of yeast invertase was most strongly inhibited by β -glucose; α -glucose had the least effect on its hydrolyzing action on sucrose, levulose least on its action on raffinose. Since the inhibiting effect of the hexose was found to increase with decreasing amts. of substrate, it is concluded that the effect is due to affinity between hexose and enzyme. B. C. A.

The problem of the bioelectric model. R. BEUTNER AND TAKEO KANDA. *Z. physik. Chem. Abt. A., Haber Bd.* 139, 107-16(1928).—Höber (*C. A.* 18, 3131) had maintained that by means of proteins exclusively the production of elec. currents by tissues can be reproduced. This cannot be true in all cases as the relation of e. m. f. to concn. which is observed on plants can never be reproduced satisfactorily by those proteins, like gelatin or albumin, which Höber uses. This is shown by the fact that the e. m. f. of a cell—concd. salt soln. | gelatin | dil. salt soln. + is only $\frac{1}{4}$ of the e. m. f. of the cell—concd. salt soln. | plant | dil. salt soln. +. A few selected water-immiscible substances or mixts. only exhibit the same extraordinarily large variability of the e. m. f. as plants. According to Michaelis and Fujita (*C. A.* 20, 1015), one of these substances is a dried collodion membrane. The present authors show that collodion is the only substance to reproduce also the typical effect of amines on the e. m. f. of plants. The systems: NaCl soln. plant (or collodion) | amine HCl soln. + have an e. m. f. in the same direction, while all other substances known so far to reproduce the typical effect of the concn. produce an e. m. f. in the opposite direction with amines. R. BEUTNER

The specificity and mode of operation of proteolytic enzymes and their importance for the determination of the structure of proteins. ERNST WALDSCHMIDT-LEITZ. *Collegium* 1928, 543-54.—A lecture. I. D. CLARK

The problem of the specific action of erepsin and trypsin or trypsin-kinase. The inhibiting effect of various additions, e. g., α - and β -amino acids, amines, etc., to the substrate enzyme mixture. EMIL ABDERHALDEN, HERMBRECHT RINDTORFF AND ADOLF SCHMIDT. *Univ. Halle. Fermentforschung* 10, 233-50(1928).—The fact that cleavage of polypeptides by erepsin is dependent on the presence of a free NH₂ group, and the cleavage by trypsin kinase on the presence of a free COOH, suggested the possibility that inhibition of enzymic cleavage would be different for the 2 enzymes, according to the presence of NH₂ or COOH in the added substance. A study was made of the rate of cleavage of the 2 dipeptides, *dl*-leucylglycine and glycyl-*dl*-leucine, and their Bz and PhNCO derivs., in 0.1 M soln. in the presence of various concns. of amino acids and amines. The extent of cleavage after a given period was measured by the increase in amino N as detd. by the Willstätter titration method. The substances examd. for inhibiting power were β -aminobutyric acid, *l*-leucine, glycine, *l*-valine, *l*-alanine, β -alanine,

d-alanine, sarcosine, *l*-phenylalanine, hippuric acid and the amines α - and β -C₁₀H₇NH₂, *p*-MeC₆H₄NH₂ and cholamine. Not only the naturally occurring amino acids, but also their optical isomers and even the isomeric β -amino acids were found to be inhibitory. Ereptic action on the 2 dipeptides was inhibited most strongly by hippuric acid and *l*-phenylalanine, while β -aminobutyric acid in contrast to β -alanine had a slightly favorable influence. Of the amines, α -C₁₀H₇NH₂ inhibited the cleavage of one peptide and cholamine that of the other, while the other amines had very little effect. With the Bz and PhNCO derivs of the 2 dipeptides, cleavage by trypsin-kinase was inhibited by these amino acids in a different order. For example, *d*-alanine was inert, while β -aminobutyric acid, *l*-alanine and glycine were inhibitory toward the cleavage of benzoyl-*dl*-leucyl-glycine, and all 4 of the amines inhibitory. With the PhNCO deriv. of glycyl-*dl*-leucine the greatest inhibition was produced by phenylalanine, glycine and hippuric acid. α - and β -C₁₀H₇NH₂ caused a slight inhibition, but *p*-toluidine, cholamine and urea none at all. The relationship between constitution and specific inhibition evidently depends upon too many factors to permit of generalizations.

A. W. DOX

Starch hydrolysis as affected by polarized light. ALBERT E. NAVEZ AND B. B. RUBENSTEIN. Harvard Univ. *J. Biol. Chem.* 80, 503-13(1928).—Ordinary and polarized light, of the same intensity and spectral compn., have the same effect on the starch-*diastase* system. Light increases the rate of hydrolysis of this system over that of the same reaction in the dark. Contrary results reported by previous observers were due to faulty exptl. control.

ARTHUR GROLLMAN

The rate with which tryptophan is liberated from proteins by enzymes. IDA KRAUS RAGINS. Univ. of Chicago. *J. Biol. Chem.* 80, 551-6(1928).—Pepsin does not liberate tryptophan, nor does erepsin do so, after the action of pepsin on casein, edestin or squash seed globulin. Trypsin liberates tryptophan more readily from casein than from edestin or squash seed globulin.

ARTHUR GROLLMAN

Structure of silk fibroin. KURT H. MEYER AND H. MARK. *Ber.* 61B, 1932-6 (1928).—Analogous to their theory on the constitution of cellulose (see p. 1263), the authors visualize silk as consisting of 4 principle valence chains of glycyl-alanyl residues. The length of the micelle, and therefore of the principle valence chains, is 150 Å which corresponds to a polypeptide of at least 20 glycyl-alanyl residues. The elementary size and the symmetry of suitable arrangements of such chains are discussed. As with cellulose, rhombic and monoclinic symmetry are discussed, but in this case a greater no. of assumptions are required, because the spiral axis is lacking, and therefore the Weissenberg building principles for chain building units are not applicable. It may be possible, however, to prove that in the case of silk, by a special form of glycyl-alanine anhydride, the translation very nearly agrees with the spiral of the half glycyl-alanyl residues, so that the total character of the structure still comes near to that of cellulose and rubber.

FREDERICK C. HAHN

The second protein (livetin) of egg yolk. HERBERT D. KAY AND PHILIP G. MARSHALL. London Hospital. *Biochem. J.* 22, 1264-9(1928).—K and M. confirm Plimmer's statement (*C. A.* 3, 445) that another protein beside vitellin is present in the yolk of the hen egg. The substance has the properties of a pseudoglobulin. *

BENJAMIN HARROW

Structure and enzyme reactions. VII. The system glycogen-*amylase*-liver tissue. STANISLAUS J. PRZYŁECKI AND JOSEPH WÓJCIK. Warsaw Univ. *Biochem. J.* 22, 1302-6(1928); cf. *C. A.* 22, 4543. Liver tissue has a high adsorptive action on glycogen. This adsorption is reversible, elution taking place when the concn. of glycogen falls. Glycogenolysis is the resultant of the reactions: adsorbed glycogen \rightleftharpoons free glycogen \rightleftharpoons glucose.

BENJAMIN HARROW

The oxidation of cholesterol by molecular oxygen. GUNNAR BLIX AND GERHARD LÖWENHEIM. Univ. of Upsala. *Biochem. J.* 22, 1313-22(1928).—Atm. O converts cholesterol into oxycholesterol on heating in air at temps. slightly above the m. p. This is not true, however, of pure cholesterol. The catalytic impurities probably have a peptizing action.

BENJAMIN HARROW

Oxidizing enzymes. X. The relationship of oxygenase to tyrosinase. MURIEL W. ONSLOW AND MURIEL E. ROBINSON. Biochem. Lab., Cambridge. *Biochem. J.* 22, 1327-31(1928).—The authors do not agree with Pugh and Raper (*C. A.* 22, 909) that "tyrosinase has all the properties ascribed by Onslow to oxygenase."

B. H.

Poisonous matter of toads. VI. Poisonous constituents of *Bufo bufo japonicus*. MUNIO KOTAKE. *Bull. Inst. Phys. Chem. Research* (Tokyo) 7, 1244-8(1928); *Abstracts* 1, 117. A correction to the author's previous papers (cf. *C. A.* 22, 3066). The toad investigated was *Bufo vulgaris formosus* instead of *Bufo bufo japonicus*. Crystals of bufotalin have been sep'd. from the alc. soln. and several derivs. prep'd. ALBERT L. HENNE

Proteolytic enzymes of the liver. O. A. STEPPUN AND K. UTKINA-LYUBOVITZOVA. *Trans. Sci. Chem.-Pharm. Inst. (Moscow)* No. 13, 35-46(1926).—The authors investigated the autolysis of the liver of a rabbit at various p_H concns. after various time intervals. The detn. of N in the samples served as the basis for following up the autolysis reaction. To some substrates casein was added. **Conclusions.**—(1) The intensity of the breaking down of the proteins of liver as well as of casein in autolysis varies with the reaction. Proteolysis slows down gradually at an acid reaction (p_H 3.8); at a neutral reaction the intensity of proteolysis slows down more rapidly but there is always a phase of increased proteolysis. This seems to indicate the presence of at least 2 enzymes. (2) The explanation for this fact may be this: the antitrypsin, which reacts only in a neutral medium, is destroyed during autolysis; trypsin is also destroyed, because of unfavorable conditions and because of the action of pepsinase. J. S. JOFFE

The protease of liver. L. M. UTKIN-LYUBOVITZOV. *Trans. Sci. Chem.-Pharm. Inst. (Moscow)* 13, 47-62(1926).—The effect of the reaction on the protease of rabbit liver was investigated and the conclusions are: (1) At p_H 4.7-5.0 the ppt. from macerated liver contains 70% of the N and the proteolytic enzymes are distributed between the ppt. and the soln. (2) The action of such a soln. on casein has 2 maxima: at p_H 5.2-5.4 and 3.0-3.4; it has a well defined min. at the isoelec. point of casein. (3) With edestin this soln. shows a max. at p_H 4.0. (4) The action of the soln. on casein begins at p_H 7.5; no decompn. of casein takes place at more alk. reaction. (5) The pptd. proteins from liver, treated with acetone, break down casein in an alk. medium with a max. at p_H 7.5-7.6. (6) On the basis of the results obtained one may postulate the existence of 3 enzymes in the liver which are capable of decompg. casein. In autolysis all 3 are probably active, depending on the reaction. J. S. JOFFE

Denaturation of insulin protein by concentrated sulfuric acid. FRITZ BISCHOFF AND MELVILLE SAHYUN. Potter Metabolic Clinic, Santa Barbara, Cal. *J. Biol. Chem.* 81, 167-73(1929).—"Concd. H_2SO_4 at a low temp. dissolves insulin and renders it H_2O -insol. at a p_H more acid than 4.8. Half the potency is retained. NaCN and Me_2SO_4 in concd. H_2SO_4 do not augment inactivation while HCHO completely destroys the potency. The same concn. of aq. HCHO only partially destroys the potency. Nitrite in several instances produced a biuret-free product, retaining half the original potency." Murlin's biuret-free insulin is regarded as a denatured protein. Insulin denatured by concd. H_2SO_4 is not reactivated by standing in dil. alk. soln. A. P. LOTHROP

The mode of action of ultra-violet light in decreasing sugar metabolism. G. C. WICKWIRE AND W. E. BURGE. *Proc. Am. Physiol. Soc., Am. J. Physiol.* 81, 514(1927).—A decreased metabolism in paramecia subjected to ultra-violet light was attributed to the destruction of insulin in the paramecia by the ultra-violet radiation. J. F. LYMAN

The osmotic pressure of egg albumin. JOHN MURRACK. *Proc. Physiol. Soc., J. Physiol.* 66, V(1928).—The osmotic pressure of isoelec. egg albumin, using solns. of NaCl buffered with AcONa and AcOH as external fluid, corresponded with a mol. wt. of 43,000. J. F. LYMAN

The loosely bound sulfur in the white of eggs. W. D. TREADWELL AND W. EPPENBERGER. *Helv. Chim. Acta* 11, 1035-42(1928).—The white of eggs was hydrolyzed at 78° by 0.05 N NaOH in an atm. of N_2 to prevent oxidation. The reaction followed the bimol. law and reached an end value of 0.266% sulfide S at the end of 3 hrs. Of the total S $\frac{1}{2}$ can be easily hydrolyzed. If there are 6S atoms in the egg-albumin mol., the min. mol. wt. is about 12,000. J. G. McNALLY

Studies on buffered solutions. X. The buffering of feces. 2. M. KARTAGENER. *Helv. Chim. Acta* 11, 1084-94(1928); cf. *C. A.* 22, 3671.—NaOH solns. ranging in concn. from 0.00015 to 1N were shaken with $CaHPO_4$ and $Ca_3(PO_4)_2$ and the p_H values of the solns. detd. with the H electrode. These solns. gave p_H values far below those for the corresponding concn. of pure NaOH; the decrease depended on both the concn. of NaOH and the nature of the salt. Titration curves are given for the system AcOH- $Ca_3(PO_4)_2$. The importance of the Ca salt present is pointed out in connection with p_H detn. in feces. J. G. McNALLY

The hydrolysis of protein material by hydrofluoric acid. E. CHERBULIEZ AND R. WAHL. *Helv. Chim. Acta* 11, 1252-5(1928).—It is stated in the literature that HF may be used to advantage in hydrolyzing substances contg. protein if it is desired to avoid the formation of humin or carbohydrate resins. The expts. of C. and W., however, on the hydrolysis of casein by 25% HF at 100° showed a greater yield of humin than is obtained with HCl. The NH_3 yield was also higher which was proved by control expts. with amino acid mixts. to be caused by the decompn. of NH_2 groups to form NH_3 . To investigate the action of HF on carbohydrate material, glucose was boiled with HF in

the presence of amino acids, the HF eliminated by pptn. of CaF_2 and glucose estd. in the liquor. A loss of 36% of the original glucose was found. J. G. McNALLY

The structure of living matter in the light of colloid research. J. SPEK. *Kolloid Z.* 46, 314-20(1928).—Expts. with micro-dissection methods on *Opalina ranarum* are described. The effect of dissection in physiol. KCl soln. is different from that in water in that the plasma remains firm although turbid in the soln. In water the plasma is a sol and in KCl soln. it is a gel which is capable of swelling, indicating osmotic effects. Apparently all protoplasm has the same elementary structure. The plasma is on the border between sol. and insol. and the structure is only evident through differences in soly. of the protoplasm. A factor to be detd. is the way in which the different phys. properties coöperate in the cell. L. F. MAREK

Action of suprarenal tissue on lecithin. ANSELMO DA CRUZ *Compt. rend. soc. sci. 99*, 1530-2(1928).—Expts. with guinea pigs proved that suprarenal tissue and hepatic tissue can hydrolyze lecithin, the intensity of the action being exceedingly variable. The addn. of cholesterol increases the lecithinase action. Liver tissue is not superior to suprarenal tissue in lecithinase action. L. W. RIGGS

The qualitative reaction of protein. I. Reaction of acid in the acetic acid-sodium chloride test. SUN OGATA. Hokkaido Imp. Univ. *Hokkaido J Med.* 6, 26-36 (1928).—The quantity of NaCl required to ppt. gelatin from its soln. decreases with the addn. of AcOH but becomes const. at a certain concn. This const. quantity of NaCl differs with different concn. of gelatin, the increase of the latter causing the decrease of NaCl; but at a concn. above 3%, the quantity of the necessary NaCl is independent of the gelatin concn. The above phenomenon is related to the change in p_H , the increase of the latter to a certain degree facilitating the pptn. by NaCl. Increase of acid above $p_H = 9.6$ can cause no difference upon the action of NaCl. K. SOMEYA

Products of partial decomposition of hair. JUNJIRO MOTOMURA. Hokkaido Univ. *J. Agr. Chem.* 4, 384-93(1928).—M. decompd. hair by heating it with 1% HCl in a steam oven for 6 hrs. and the decompd. soln. was concd. under reduced pressure and extd. with Et_2O . From the resulting soln. the following substances were obtained: *cryst. product A*, m. 226°. This gave by hydrolysis with concd. acid *leucine* and *valine*, and considering the analysis also *A* was concluded to be *valylleucine anhydride*. Next, the soln. was extd. with AcOEt and a sirup was obtained, which M. concludes from its reactions contains an anhydride and an amino acid. On extg. with CHCl_3 , *A* was again obtained. The mother liquor from the CHCl_3 ext. was evapd. under reduced pressure, extd. with MeOH, the extd. product being recrystd. from MeOH, whereby a crystal product *C* was obtained. Analysis and the detn. of the amino radical showed it to be *glutamine* or *leucylglycine*. The extd. residue and the alc. mother liquor was extd. with alc. The ext. was inferred from the hydrolytic product of the anhydride to contain *alanine*. When measured potentiometrically with a Pt-quinhydrone electrode, it was shown that the production of the acid is always greater in the male than in the female. Detn. of N, S and P in the muscular fibers shows that S is more plentiful in male than in female, while the opposite is true for P. Detn. of the amino acid no. by the Van Slyke method shows that a considerable difference in the values with male and female exists. In the case of male, *arginine* and *lysine* N are always richer, while in the case of female, the monoamino and *histidine* N are richer. The above facts are in good agreement with the observations made by M. with serum albumin, globulin and myogen of male and female animals. In general, more strongly acidic proteins contain more P than do more weakly acid ones, and are poor in arginine and lysine N, while they are richer in monoamino and *histidine* N. This phenomenon is considered by M. to be common to all of the vegetable and animal proteins of a more acidic nature. K. SOMEYA

The erythrocytes as a colloid-chemical system. II. The isoelectric zone of the erythrocytes. A. KONIKOV. *Med. Acad., Kyoto. Zhurnal expil. biol. med.* 6, 408-20(1927); *Ber. ges. Physiol. expil. Pharmacol.* 44, 598-9(1928).—The method is one of acid agglutination. To an 8% cane sugar soln., buffer mixts. (acetate or phosphate buffer) of p_H 3.7 to 7.2. are added and this mixt. is divided in a series of test tubes. In each test tube there is placed 1 drop of the blood to be examd. After 1 hr. or more it is noted in which tube an agglutination occurs and the degree of agglutination. At the same time the influence of the p_H on hemolysis is noted. K.'s studies show that the agglutination of red corpuscles proceeds in low electrolytic levels within definite p_H limits which are characteristic for each type of animal although the range of the limits is very different: in certain species of animals it is very small (rabbits, between p_H 5.0 and 5.6) and in others very large (man, between p_H 4.0 and 7.0). The intensity of the agglutination is very different in different species. Similarly the resistance of the erythrocytes to the H ions shows a large difference, wherein a reciprocal relation exists

between the acid hemolysis and acid agglutination: the stronger the agglutination, the weaker the hemolysis, and *vice versa*. K. explains the differences in the agglutination by the assumption that the stroma of the erythrocytes is composed of a series of more or less closely related proteins with diff. isoelectric points, whereby the inequality of the isoelectric zones of the blood corpuscles of the different species of animals must result. He assumes that the stroma which is less capable of agglutination must be more strongly hydrophilic and thereby promote the hemolysis.
R. C. WILLSON

Porphyrin syntheses (FISCHER, *et al.*) 10. Constitution of hexosediphosphoric acid. II. The dephosphorylated α - and β -methyl hexosides (MORGAN, ROBISON) 10. Constitution of chitin (MEYER, MARK) 10. Odor and molecular structure (BOGERT, GOLDSTEIN) 10. The specific mode of linkage between substrate and enzyme complex which initiates the hydrolysis of polypeptides (ABDERHALDEN, BROCKMANN) 10. Comparative studies on the cleavage of polypeptides and their derivatives (ABDERHALDEN, HERRMANN) 10. Comparative studies on the influence of *N* alkali, erepsin and trypsin-kinase on polypeptide-like compounds containing β -alanine (ABDERHALDEN, REICH) 10.

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Promoting action of enzymes. F. F. NORD. *Brit.* 291,443, June 3, 1927. In order to increase the speed of enzymic reactions, the surface of the colloiddally dissolved enzyme is increased, as by freezing and subjecting it to the action of an easily adsorbed substance which acts as a protector against the deleterious effects of the end or intermediate products of the reaction. Examples are given of the use of ethylene for the treatment of yeast, zymase extd. from yeast and catalase of tobacco leaves. N_2O , C_4H_2 , propylene, butylene or amylene or their mixts. with each other or with ethylene also may be used as treating agents.

B—METHODS AND APPARATUS

STANLEY R. BENEDICT

A method for microdetermination of the coagulation velocity of blood. G. C. VAN WALSEM. *Nederland Tijdschr. Geneeskunde* 72, II, 4944(1929).—A micropipet is used.
R. BRUTNER

Physicochemical principles of the mastic reaction. II. The reactions of serum albumin and mastic suspension in alkaline medium. K. SAMSON. Univ. Staatskrankenanstalt, Hamburg-Friedrichsberg. *Z. ges. expil. Med.* 60, 1-10(1928).—Changes in salt concn. and p_H do not change the position of the max. pptn. but only the intensity. Albumin protects against salt and albumin flocculation. Increasing the proportion of globulin to mastic shifts the flocculation to greater dilns.
F. L. DUNN

Urinary calcium. C. H. COLLINGS. *Chem. News* 137, 263-5(1928).—A description of a method which depends on the pptn. of Ca as CaC_2O_4 and titration with $KMnO_4$.
RUSSELL C. ERB

Stomach diseases. VII. Investigation of the gastric contents. WALTER ZWEIF. Kaiser Franz-Joseph-Spitals und Ambulatoriums, Wien. *Deut. med. Wochschr.* 54, 2179(1928).—A review of the various lab. procedures used in investigating the gastric contents.
ARTHUR GROLLMAN

The further application of the vanillin-hydrochloric acid reaction in the determination of tryptophan in proteins. IDA KRAUS RAGINS. Univ. of Chicago. *J. Biol. Chem.* 80, 543-50(1928).—The vanillin-HCl reaction previously described (C. A. 19, 1438) is slightly modified to save time and material. Applied to 16 purified proteins, satisfactory results were obtained. The filtrate from the Hg-tryptophan ppt. was shown to contain no tryptophan. Peptide tryptophan reacts like the free amino acid; proline or proline-contg. proteins, in small concns., do not affect the color reaction; $[Cl^-]$ or $[Na^+]$ in high concns. interferes with the pptn. of tryptophan by $HgSO_4$.
ARTHUR GROLLMAN

Determination of carnosine. WINIFRED MARY CLIFFORD AND VERNON H. MOTTRAM. King's College of Household and Social Science, London. *Biochem. J.* 22, 1240-

(1928).—Despite criticism of Clifford's method (*C. A.* 15, 3856) by Hunter (*C. A.* 16, 2), C. and M. claim good results with C.'s method. BENJAMIN HARROW

Use of the Hildebrand hydrogen electrode in biological solutions. ROBERT E. FINISH. Univ. California. *J. Am. Chem. Soc.* 50, 3310-1(1928).—An ordinary rubber bulb from an atomizer is inserted in the hydrogen supply line. By simply passing H₂ through the electrode, the correct e. m. f. will not be obtained before several hours, but if rubber bulb is pressed a few times while H₂ is being passed, the correct reading will arrive at almost instantaneously. ALBERT L. HENNE

Citric acid metabolism. The effect of citric acid and citrates on the determination of "acetone body" content by the Van Slyke method. B. E. CLARKE AND H. HANSMANN. *Arch. Path.* 6, 881-4(1928).—Sodium citrate used as an anticoagulant is a source of error in the detn. of "acetone body" content in blood by the method of Van Slyke. Citric acid administered by mouth does not have any effect on either the "acetone body" content or the power of the blood to combine with CO₂. Citric acid and its salts are not a source of error in the detn. of "acetone body" content in urine by this method. HARRIET F. HOLMES

A colorimetric method for the determination of lipoidal phosphorus in blood. J. LERNOFF. Lebanon Hosp., N. Y. *J. Biol. Chem.* 80, 211-4(1928); cf. *C. A.* 22, 331-2(1928).—The lipoids are extd. from blood with an alc.-Et₂O mixt. and, after evapn. of the solvent, the org. matter is destroyed with concd. H₂SO₄ and H₂O₂; the phosphate is pptd. as ammonium phosphate and detd. colorimetrically. It is recognized that other substances containing phosphorus but not lipoidal in character are extd. by the alc.-Et₂O mixt. but this is the only means available, since isolation of lipoids in a pure state is utterly impossible in small quantities of blood. A. P. LOTHROP

The colorimetric determination of blood calcium. JOSEPH H. ROE AND BERNARD KAHN. George Washington Univ. Med. School. *J. Biol. Chem.* 81, 1-8(1929); cf. *C. A.* 20, 3474.—The colorimetric method for the detn. of blood Ca has been simplified and shortened and is adaptable to the detn. of as little as 0.02 mg. of Ca. There is no possibility of compensating errors as is found in other methods. The Fiske and Subbarow method of detg. inorg. P has been substituted for the Benedict and Theis method although the latter procedure has been retained as an optional method where a reagent of greater keeping qualities is desired. A. P. LOTHROP

The amide nitrogen of blood. II. A quantitative method. SIDNEY BLISS. Cornell Univ. *J. Biol. Chem.* 81, 129-35(1929); cf. *C. A.* 22, 2605.—The proteins are pptd. from blood by H₂WO₄ and the ppt. is washed with H₂WO₄ to remove traces of urea. The ppt. is worked up into a smooth emulsion with H₂O and dissolved by the addn. of 2 N NaOH. An aliquot portion of the soln. is subjected to hydrolysis with 4 N H₂SO₄ in a boiling water bath. After neutralization, the mixt. is aerated with an excess of acOH and the NH₃ isesslerized as in the standard microaeration method of Folin and Wallace. The unavoidable error is less than 1%. The amide nitrogen content of normal human blood drawn from the cubital vein varies from 134 to 144 mg. per 100 cc. of blood. A. P. LOTHROP

The fluctuation in the composition of the alveolar air during the respiratory cycle in muscular exercise. R. S. AITKEN AND A. E. CLARK-KENNEDY. London Hosp. *J. Physiol.* 65, 380-411(1928).—An app. was devised for collecting the respired air from a single expiration during moderate work and dividing it into 6 successive portions. From the CO₂ content of the different portions the varying concn. of CO₂ in the alveolar air during expiration was deduced and found to rise steadily at the rate of about 0.5% per l. of air expired. The physiol. dead space was calcd. to vary between 300 and 400 cc., increasing slightly with increase in vol. of tidal air. The av. CO₂ concn. in the alveolar air by this method was about 10% lower than that obtained by Henderson's method for alveolar CO₂. J. F. LYMAN

The influence of activity on the Manoïlov reaction in blood and tissue extracts. OSCAR FIDDLE AND WARREN H. REINHART. *Proc. Am. Physiol. Soc., Am. J. Physiol.* 81, 500(1927). Blood and tissues of active pigeons give a lighter color in the Manoïlov reaction than do those of inactive animals. The reaction is primarily a better indicator of metabolic rate than of sex. J. F. LYMAN

The isolation and estimation of serum globulin by electrodialysis. L. REINER AND H. KEMP. *Kolloid-Z.* 46, 99-107(1928).—The pptn. of globulin during the electrodialysis of serum is related to the quantity of protective colloid present and alterations produced in this by changes in pH and salt concn. caused by the dialysis. Colloidion is impregnated with protein were satisfactory membranes. J. G. McNALLY

Studies on microchemical cholesterol determinations. YORISADA HORIYU. Univ. Bern. *Biochem. Z.* 202, 403-8(1928).—A comparative investigation of the titrimetric

and gravimetric methods of Szent-Györgyi (*C. A.* 17, 3197) shows that while the first gives consistently high results which are about 14% in excess of the theoretical values and therefore entirely unreliable, the gravimetric procedure yields results which are quite acceptable.

S. MORGULIS

Remarks on the work of W. Blumenberg "On the indole titer according to Gersbach in water analysis." M. NEISSER. Stadt. Hyg. Univ. Inst. Frankfurt a. M. *Centr. Bakt. Parasitenk.*, I Abt., 109, 346-50(1928); cf. *C. A.* 22, 3473.—The method is useful in water analysis and in pure bacteriology.

JOHN T. MYERS

Hydrogen-ion determinations of streaming fluids. KL. GOLLWITZER-MEIER AND W. STEINHAUSEN. Univ. Frankfurt a. M. *Arch. ges. Physiol.* (Pflüger's) 220, 551-7 (1928).—With Sb or Mn electrodes connected with the carotid changes in p_H corresponding to pulse were observed.

G. H. SMITH

Apparatus for the study of the hearts of warm-blooded animals according to the procedure of Langendorff. W. HEURNER AND R. MANCKE. Pharm. Inst. Göttingen. *Arch. expil. Path. Pharmacol.* 137, 257-63(1928).—The app. described permits, with the heart of warm-blooded animals, detns. of the effects of different concns. of a poison upon the organ.

G. H. S.

Metallic expansion clinical thermometer. PIERONI & CORI. *Brit.* 292,018, Nov 19, 1927. Structural features.

C--BACTERIOLOGY

C. B. MORREY

Relationships between oxybiotic and anoxybiotic metabolism of culture yeasts. FRITZ WINDISCH. Inst. Gärungsgewerbe, Berlin. *Z. physiol. Chem.* 179, 88-98(1928).—Parallel fermentations with brewery yeast under aerobic and anaerobic conditions show a distinct difference with respect to rate of fermentation and cell proliferation and morphological aspects of the cells. With air access the disappearance of sugar and reproduction of cells is greater than when air is excluded by CO_2 pressure, but the morphological appearance, as judged by form and size of cells, vacuole formation, granulation and increase in fat content, is less favorable. The rate of sugar consumption becomes more nearly equal for the aerobic and anaerobic cultures after repeated cultivations under the same conditions. If the 2 series of cultures are transferred to eudiometers contg. a 5% sucrose soln. and the fermentations allowed to proceed under identical conditions, a greater vol. of CO_2 is produced by the culture that has previously been anaerobic. Pasteur's view, deduced from his expts. on *Mucor*, that fermentation is the consequence of life without air finds corroboration in these expts. with yeast. A. W. D.

Disinfectants retard bacteria in incubators. J. L. BOYD. Mich. Agr. Expt. Sta., *Quart. Bull.* 11, 79-83(1928).—Comparisons between untreated and variously disinfected chicken incubators showed a marked reduction in bacterial count where 3% NaOCl, 5% I-suspensoid, 0.0015% "sterilac" or .037% chlorinated lime were used. Thorough cleaning of the incubators was the greatest factor in reducing bacterial count. Infection increased as the period of incubation progressed. Broken eggs form a very favorable medium for the development of bacteria.

C. R. FELLERS

Reactivation of culture media. II. Higher alcohols. V. CIANCI. *Boll. soc. ital. biol. sper.* 3, 712-4(1928).—*B. coli*, *B. lactis aerogenes* and *B. paratyphosus* B were used, and for reactivating the media mannitol and dulcitol; the technic used was the one previously reported (cf. *C. A.* 23, 408). Definite reactivation was obtained, although at times it was rather slow. There is a direct relation between capacity and velocity of attack of a sugar or alc. by an organism, and the reactivation of the respective culture media.

PETER MASUCCI

The bactericidal power of boiled linseed oil. I. GIUSEPPE MAZZETTI. *Boll. soc. ital. biol. sper.* 3, 747-9(1928).—Sterile pieces of pressed brick were satd. with boiling commercial linseed oil. Other pieces of brick were sterilized but not immersed in oil; these served as controls. All the pieces were cooled, allowed to dry, and then by means of a small sterile brush painted with an emulsion of the organism to be tested. After various times of contact, the surface of the brick previously painted with the organism was scraped with a sterile knife and 2 loopfuls of this material were introduced into nutrient broth. The latter was incubated at 37° for 5 days. The pieces treated with the oil had a strong bactericidal action towards *B. typhosus*, *B. diphteriae*, *B. tuberculosis*, *B. anthracis* and *Staph. aureus*. This bactericidal power was due to the presence of commercial linseed oil in the bricks; pure, unheated linseed oil did not possess this action, but if heated for a long time at a high temp. it readily acquired this property. II.

The bactericidal power of heated linseed oil on tuberculous excretions. *Ibid* 749-54.—By the technic described above, M. found that bricks satd. with heated oil had a definite bactericidal action toward *B. tuberculosis* when this organism was present in non-homogenized excretions. The bactericidal power was revealed by cultural tests 48 hrs. after contact and by biol. tests 72 hrs. after contact. III. Further observations on the bactericidal power of boiled linseed oil and other vegetable oils. *Ibid* 754-8.—Further studies were made to det. (1) whether the bricks satd. with boiled linseed oil retained their bactericidal power over long periods of time; (2) if this bactericidal power could be used for practical purposes such as in the destruction of anthrax spores in the skins of animals infected with this organism and (3) if other vegetable oils had any bactericidal action. (1) The oil-treated bricks showed a bactericidal action for long periods of time against saprophytes found in the air; a few pieces gave a positive cultural test but the organism found was usually *B. subtilis*, which forms very resistant spores. Against *Staph. aureus* there was a gradual loss of activity, but the activity was still evident 10 months after treatment. (2) With the technic used, it was found impossible to sterilize anthrax-infected skins with boiled linseed oil. (3) The other vegetable oils tested were raw, crude linseed oil, almond oil, soy-bean oil and castor oil. Only the crude linseed oil showed a slight action against *Staph. aureus*. However, if the oils are heated to 280°, then they all acquire more or less this bactericidal property. In the case of olive oil, this may be of importance in the culinary art. PETER MASUCCI

Respiration and glucolysis of trypanosomes. II. B. VON FENYVESSY AND L. REINER. Elizabeth Univ., Pec's. *Biochem. Z.* 202, 75-80(1928).—Trypanosomes degrade sugar added to Ringer soln. partly through oxidation and partly through glucolysis. The aerobic and anaerobic glucolysis are approx. equal. Neither HCN nor germanin has any effect on oxidation and glucolysis. In media of p_{H} 7 to 8, oxidation predominates in the alk. solns. while glucolysis in the acid solns. The shift toward the acid reaction and the corresponding diminution in oxidation and rise in the respiratory quotient could be demonstrated together

S. MORGULIS

The production of acids by the mold *Aspergillus fumigatus*. REINHOLD SCHREYER. Tech. Hochschule, Hannover. *Biochem. Z.* 202, 131-56(1928).—The mold loses in course of time the ability to produce fumaric acid and assumes the character of a citric and gluconic acid producer. The nature of the N compds. has no influence on the kind or quantity of acid produced. Sugars with 3, 5, 6 or 12 C atoms serve to form citric acid; likewise lactic acid, glycerol or mannitol is utilized. Only the salts of glyceric and, to a limited degree, of gluconic acid give rise to citric acid. The mold causes an accumulation of gluconic acid in young CaCO_3 cultures, which is much increased by better supply of O_2 , improved conditions for diffusion and removal of CO_2 . In BaCO_3 cultures very little gluconic acid is produced. The max. acid formation by the mold is between 17° and 22°. The mold utilizes for its growth all carbohydrates, including lactose and starch, also glycerol and mannitol, or salts of gluconic acid. The growth optimum is at 21-23°; the min. at 6° and the max. at 31-32°. NH_4NO_3 as the source of N yields the largest growth in the shortest time.

S. MORGULIS

The chemistry of citric acid formation by molds. III. Various hypotheses of citric acid formation and the appearance of acetaldehyde in mold cultures. K. BERNAUPE AND K. SCHÖN. Chem. Lab. deut. Univ., Prag. *Biochem. Z.* 202, 164-79(1928).— As_2SO_3 being used, small quantities of AcH were found, but not exceeding 0.6% of the amt. of sugar used up, glycerol giving the lowest while sucrose and fructose gave the highest results. However, because of the alky. caused by the Na_2SO_3 , little citric acid was produced while dimedon could not be employed at all as it is toxic. Dimedon could not be used in expts. with *Aspergillus niger* to combine with AcH because this mold destroys it. Nevertheless the conclusion seems justified that the formation of AcH and the transformation processes leading to citric acid production are independent of each other, and the expts. fail to substantiate hypotheses which derive the citric acid from methylglyoxal or pyruvic acid.

S. MORGULIS

Biochemistry of *Penicillium glaucum*. A contribution to the problem of methyl ketone formation from triglycerides and fatty acids in the metabolism of molds. OSKAR ACKLIN AND WALTER SCHNEIDER. Tech. Hochschule, Zürich. *Biochem. Z.* 202, 246-83(1928).—In unbuffered glucose-peptone nutrient media molds do not grow when the p_{H} falls below 2.8. The optimum condition for growth, however, is detd. by the nature of the source of C and N. The mannitol-peptone system permits the growth of *Penicillium glaucum* with the least effect on the H-ion concn. With a concn. of nutrient stuffs C:N = 1:0.3 the optimum conditions for the growth of the mycelium is between p_{H} 3.8 and 5.0, but the actual increase will be much greater when the C:N = 2:0.6. A study of the catalytic action of ionogenic Fe and of Fe in the form of hemin on growth shows

that while the former has practically no influence, the latter exerts an unquestionable influence between p_H 5.8 and 7.4 and with a concn. of foodstuff C:N = 2:06.

S. MORGULIS

Comparative studies on the resistance of different leptospiras to outside influences. SABURO ANJOW. Kaiserlichen Univ. zu Tokyo. *Centr. Bakt. Parasitenk.*, I Abt., 109, 61-80(1928).—The saprophytic water leptospiras were more resistant to the "oligodynamic" influence of Fe, Pb, Cu and Hg, than were the pathogenic varieties. Fe had the least effect. There was little difference in the effect of colloidal Ag and Se. The saprophytes grew in smaller concns. of serum and in higher concns. of NaCl than did the parasites. The parasites were more resistant to bile and bile salts. All leptospiras were distinctly and equally sensitive to HOAc.

JOHN T. MYERS

Investigations on the action of light on bacteria. FRITZ V. GUTFELD AND LUDWIG PINCUSSEN. Stadt Krankenhaus am Urban zu, Berlin. *Centr. Bakt. Parasitenk.*, I Abt., 109, 107-15(1928).—The action of ultra-violet light on *B. coli*, *B. typhosus*, *B. paratyphosus* B and *B. dysenteriae* Shiga-Kruse was studied. Suspensions were made in distd. water and in 0.2 and 0.1 N solns. of KCl, NaCl, MgCl₂ and CaCl₂. With these organisms the type of salt had no effect. With *Staphylococcus aureus*, the effect in the presence of CaCl₂ was about 3 times that in distd. water, but the other salts were without influence. CaCl₂ had a protective effect on *B. diphtheriae*, the action being about 4 times greater in distd. water.

JOHN T. MYERS

Amino nitrogen determination with ninhydrin in the Abderhalden reaction or in the investigation of bacterial metabolism. E. KUSTER AND K. KOULON. Inst. für Exper. Therapie, Frankfurt-a.-M. *Centr. Bakt. Parasitenk.*, I Abt., 109, 135-43(1928).—The methods of Herzfeld-Klinger and of Riffert for the colorimetric detn. of amino N with ninhydrin may be combined. This makes a very sensitive and reliable technic. It is useful in studying N changes in bacterial cultures. The Abderhalden method is not practicable.

JOHN T. MYERS

The demonstration of bacterial flagella on living cells in the dark field. II. FRANZ NEUMANN. Univ. Giessen. *Centr. Bakt. Parasitenk.*, I Abt., 109, 143-80(1928).—The visibility of bacterial flagella in the dark field depends on their thickness. The index of refraction of the medium plays no part. If the width of the flagella is about 0.05 μ they can be seen in any medium; below this size they cannot be thus demonstrated. The addn. of 5 to 10% of gelatin or of a gum aids in demonstration. There is a mass of detail as to number, size and shape of flagella. There is a good bibliography.

JOHN T. MYERS

The action of bile on *B. rhinoscleromatis*. B. J. ELBERT AND W. M. GERKES. Weissruss. Microbiol. Inst. in Minsk. *Centr. Bakt. Parasitenk.*, I Abt., 109, 310-20(1928).—Ox bile inhibits the growth of *B. rhinoscleromatis* *in vitro*, but not that of other members of the capsulated group of bacteria. Hence it has considerable value as a differentiating characteristic.

JOHN T. MYERS

Esculin media. KURT MEYER. Rudolph Virchow-Krankenhaus, Berlin. *Centr. Bakt. Parasitenk.*, I Abt., 109, 350-2(1928).—Hiss serum water medium contg. 0.2% of esculin and 0.8% of tincture of litmus is very useful for bacterial differentiation. The addn. of a drop of an Fe salt to a culture will produce a black color if the glucoside is split; hence the detection of cleavage is easier than in most org. substances.

JOHN T. MYERS

Several varieties of agar-splitting marine bacteria isolated along the Norwegian coast. JON LUNDESTADT. Univ. Oslo. *Centr. Bakt. Parasitenk.*, II Abt., 75, 321-44(1928).—Agar-splitting bacteria were easily isolated from sea water. Preliminary enrichment cultures of sea water contg. Floridean algae were made. From these the bacteria were plated on a medium contg. fish, of sea water and agar; or ext. Floridean algae and agar. By these methods, 7 species of agar-splitting bacteria were isolated which had not been previously described, all of which produced gelase. One variety was found which corresponded with *B. gelaticus* of Gran. A fluorescent variety was isolated which produced a green pigment on fish gelatin. One species, *Bact. granii*, can completely liquefy gelatin. Undoubtedly other gelase-producing varieties will be found. It was not possible to demonstrate the formation of reducing sugars. With agar as the sole source of food there is no change in reaction.

JOHN T. MYERS

Decomposition of fatty acid salts and carbohydrates by thermophilic bacteria. II. The cleavage of starches and sugars by thermophilic bacteria. C. COOLHAAS. Landwi. Hochschule zu Wageningen, Holland. *Centr. Bakt. Parasitenk.*, II Abt., 75, 344-60(1928); cf. C. A. 22, 4146. —Several carbohydratolytic thermophilic organisms were isolated from mud. The following medium was best for starch-splitting species: Agar 2%, starch 2%, NH₄Cl 0.1%, K₂HPO₄ 0.1% and MgSO₄ 0.05%. The most active starch-

splitting species was named *Bact. thermoamylolyticus*. It produced characteristic colonies in 24 hrs. at 55° to 60°, the cells penetrating the starch grains. In 24 hrs. the starch is largely dissolved, and in 9 days, 80% is changed to maltose. Acids appear in very slight amts. only, and no gas is evolved. When 1% dextrose and 1% CaCO₃ was substituted for starch, and the medium inoculated and incubated 24 hours at 60°, CO₂ was formed. From starch, dextrose or sucrose these organisms produce CO₂, H₂, large amts. of butyric acid, small amts. of acetic acid and traces of propionic acid. One facultative, anaerobic, spore-forming bacillus was named *Bact. thermobutyricus* because of its outstanding production of butyric acid. The K salt of pyroracemic acid is fermented by these organisms, it being apparently an intermediate product in the carbohydrateolytic action previously mentioned. III. The cleavage of cellulose by thermophilic bacteria. *Ibid* 76, 38-44(1928).—Suspensions of filter paper in salt mixts., inoculated with mud and incubated at 55° to 60°, almost always showed methane production. Cultures which were pasteurized and reinoculated produced H and CO₂. It is probable that the metabolism of certain thermophiles produces substances from cellulose which serve as sources of food for other bacteria which produce CO₂, the latter not being able to attack cellulose directly. A thermophilic, aerobic, cellulose-splitting bacterium was isolated and named *Bact. thermocellulolyticus*. There is a good bibliography.

JOHN T. MYERS

Remarks on the paper "Cellulose as a source of energy for free living nitrogen-binding microorganisms," by Dr. Paoli Tuorile. HANS PRINGSHEIM. *Centr. Bakt. Parasitenk.*, II Abt., 75, 459(1928); cf. Tuorila, *C. A.* 22, 4147.—Similar results had been published in this Journal in 1909 and 1910; (cf. *C. A.* 6, 877).

JOHN T. MYERS

The thermophilic flora of sugar in its relation to canning. E. J. CAMERON AND C. C. WILLIAMS. Natl. Canners Research Lab., Washington, D. C. *Centr. Bakt. Parasitenk.*, II Abt., 76, 28-37(1928).—Three groups of thermophilic spore-bearing bacteria are of major importance in the spoilage of non-acid canned vegetables: (1) the flat sour bacteria producing acid but no gas; (2) thermophilic anaerobic bacteria producing acid and gas but no H₂S; (3) thermophilic anaerobic bacteria producing H₂S with little change in reaction. Most of these reach the canning plant in the sugar. Group (1) was present in every sample of cane sugar examd. Group (2) was present periodically. Group (3) was rare. These organisms were all less common in beet sugar. Contamination was very high in the vacuum evapn. pans in one sugar factory examd.

JOHN T. MYERS

The course of dextrose metabolism and nitrogen fixation by *Azotobacter*. P. G. KRISHNA. Cornell Univ. *Centr. Bakt. Parasitenk.*, II Abt., 76, 228-41(1928).—The accumulation of metabolic products does not depress N fixation by *Azotobacter*. Varying numbers of cells in the inoculum had no effect on N fixation during 2 weeks incubation. Varying concns. of dextrose had no effect. The quantities of N fixed and dextrose utilized increased progressively as the incubation period was prolonged, and continued as long as energy material was available. But the quantities of N fixed and dextrose utilized from day to day were quite variable. The period of intense activity was followed by a slow or decreased activity. There was a good correlation between the amts. of N fixed, of dextrose consumed and of CO₂ evolved each day, showing that the greatest cell multiplication and energy utilization coincides with the period of largest N fixation. The max. CO₂ evolution was reached between the third and sixth days for 3 strains of *Azotobacter*. The optimum range or reaction was between p_H 6.3 and 8.4, and the limiting reaction on the acid side was between p_H 5.8 and 5.9. Between 65 and 70% of the C in the dextrose consumed was given off as CO₂, the values being quite const. The ratio between total C assimilated and N fixed was between 35 and 36:1. The C:N ratio within the *Azotobacter* cells was between 6.5 and 8:1.

JOHN T. MYERS

Investigation on the origin of yeasts. J. GRÜSS. *Wochschr. Brau.* 45, 341-4, 353-7 (1928).—G. has found striking evidence in Devonian plant fossils of the presence of sporangia contg. yeast-like spores and of single cells and groups of cells capable of reproducing by budding.

A. SCHULTZ

Certain abundant non-spore-forming bacteria in soil (CONN) 15. The biochemical factors in sulfur and swamp soils in Latvia (KUPZIS) 15. Microbiological investigations of strongly acid swamp soils (DREWS) 15. Mercuric-oxycyanide compounds of a few organic acids and their sterilizing action on gonorrheal bacilli (TAKAOKA) 10.

TANNER, FRED W.: *Practical Bacteriology. An Introduction to Bacteriological Technic.* New York: John Wiley & Sons, Inc.; London: Chapman & Hall, Ltd. 235 pp. \$2.50. Reviewed in *Ind. Eng. Chem.* 21, 94(1929).

D—BOTANY

THOMAS G. PHILLIPS

Effects of external conditions on diastatic and peroxidatic activity in plants. HEINRICH KERN. Botan. Inst., Erlangen. *Z. Botan.* 21, 193-252(1928).—K. studied the effects of heating, desiccation and ether narcosis on the diastatic and peroxidatic activity of seedlings of *Zea mays* and *Avena*. Seeds were washed with sterile water as a protection against molding and germinated on moist filter paper. Seedlings 5 to 12 days old were used in most of the expts. Detns. were made both on root tips (0.5 cm.) and whole seedlings. The enzyme solns. were prepd. by grinding 10 g. fresh plant material and 90 cc. of distd. water with quartz sand in a porcelain mortar. One % toluene was added as a preservative. The mixt. was filtered through hard filter paper, which retained any starch that was present. The enzyme solns. were used fresh. It was not necessary to use buffers as the p_H in all cases was around 5.4, which is assumed to be near the optimum for amylase. For the estn. of diastatic activity the 24-hr. iodine method of Wohlgemuth (Grundriss der Fermentmethoden. Berlin, 1913) was used. The number of cc. of 1% starch soln. which could be hydrolyzed by 1 cc. of the enzyme soln. in 24 hrs. at 38° was calcd. This value is denoted as diastatic activity or D_{24}^{38} . It was confirmed that enzymes of dormant seeds are more resistant against heating than after germination. During germination the enzyme activity was found to increase greatly. For dormant corn seed, D equals approx. 20. For corn seedlings 5-12 days old D equals 1280 to 2560. Diastatic activity of the root tips was much less than that of the seedling as a whole. Heat treatments were carried out in a thermostat. Two-hrs. heat treatment of seedlings at 60° weakened their diastatic activity. Activity returned slowly (24 to 48 hrs.) after heating in spite of cessation of growth. However, normal diastatic power was rarely reached. Root tips on the other hand, after similar treatment, showed no lessening of diastatic activity. Twenty-four to 48 hrs. after treatment the diastatic activity of these treated root tips rose to 2 to 4 times that of controls. Similar results were reached after 1.5 hrs. at 50°. However, the development ability of these seedlings was only slightly impaired. Other expts. were tried which showed that in general heat stimulation of the diastatic activity of root tips is more rapid, stronger, and is retained longer than with the seedling as a whole. Peroxidatic activity was detd. by the method of Willstätter and Stoll (*C. A.* 13, 453). The amount of purpurogallin was detd. by comparison with a standard soln. in a colorimeter (cf. *C. A.* 18, 236). In contrast to diastatic activity, the peroxidatic activity of root tips is 2 to 3 times greater than that of the seedling as a whole. During germination, in both the seedling as a whole and in the root tips, there is an increase of peroxidatic activity up to a max. on the 8th to 9th day. Heating for 1.5 hrs. in a moist atm. at 50° lessened the peroxidatic activity in both the seedling as a whole and in the root tips. Twenty-four to 48 hrs. after heat treatment peroxidatic activity had returned to normal. A different behavior of the peroxidatic activity of the seedling as a whole as compared with the root tips was not observed in any of the expts. tried. In general it is shown that external factors can affect the activity of the enzyme system of the living plant, even if the external influence is only of short duration and the development ability of the plant is not impaired. On the other hand, where the lethal temp. is exceeded, in spite of complete cessation of growth, strong enzyme activity often still persists. Further, the different effects of external conditions on diastatic and on peroxidatic activity show that the enzyme system of the plant does not react as a unit.

R. C. BURRELL

Investigations on the fruits of *Schinus molle*. ACHILLE CREMONINI. Reale Univ., Bari. *Ann. chim. applicata* 18, 361-5(1928).—A preliminary note. The difference of opinion in the literature regarding the presence or absence of piperine in the fruit (cf. Wittstein, *Vierteljahrsschr.* 9, 72; *Repl. chim. appl.* 4, 288(1862); *Jahresber. Chem.* 1862 514; *Gazz. chim. ital.* 14, 199(1884); Villavecchia, *Dizionario di Merceologia* 3, 373 (1925); cf. *C. A.* 20, 1875; *Dizionario di Chim. A. Wurtz* 3(1889); *Enc. del Selmi* 8, 978; Guareschi, *Nuova Enc. Chim.* 10, 781(1927)) induced C. to study the problem. The present paper deals with ripe fruit with the epicarp removed. The fruit reduced boiling Fehling soln. A sugar and a bitter cryst. substance were obtained, which, however, were not identified. This sugar had a neg. α value, but after treatment with hot acids this rotation became positive, which, coupled with the fact that it did not contain mannose or fructose and with certain other evidence, indicated the presence of a glucoside. No piperine was detected. The yield of ethereal oil was 3-4%, and it was a mobile, refragent liquid, with odor resembling turpentine or pepper, and turned brown on exposure to light and air. In it were found β -phellandrene, pinene, transterpine and carvacrol, but no thymol and no limonene. The drupe also contained a small quantity of ferrojone, indicating

the presence of aeroöxidases. The alc. ext. of the fruit did not reduce Fehling soln., evapd. it yielded a yellowish red resin, which was neutral, without taste, had an aromatic odor, was insol. in water, was partially sol. in caustic alkalies, could not, after purification, be crystd. and did not contain N. The portion sol. in KOH gave a yellow soln., from which by addn. of HCl was pptd. a light yellow substance, m. approx. 102°.

C. C. DAVIS

The growth of the tomato as correlated with organic nitrogen and carbohydrates in roots, stems and leaves. G. T. NIGHTINGALE, L. G. SCHERMERHORN AND W. R. ROBBINS. N. J. Agr. Expt. Sta., *Bull.* 461, 1-38(1928).—Fresh greenhouse-grown tomato plant tissue only was employed for the N dissections and carbohydrate detns. Plants were grown both with and without light. The N fractions which were detd. in various parts of the plant were total nitrate-free, protein, nitrate-free sol., proteose, basic, amide, amino, NH_2 , humin and nitrate. The carbohydrate fractions were reducing sugars, sucrose, starch and dextrin and total carbohydrates. The roots are low in carbohydrates but very high in protein N, indicating that the roots do not serve chiefly for storage. In vigorously growing tomato plants the assimilated N is high in all parts of the stem, but protein N is low except in tissue of the growing point and closely adjacent cells. In meristematic cells of the growing point of the tomato stem, and in adjacent tissue made up of thin-walled cells with dense contents, assimilated N is high and much of it is in the form of protein. There is some fluctuation in quality of carbohydrates, but in general sucrose, starch and dextrin do not accumulate unless reducing sugars are high. Petioles and veins appear to correspond very closely to stems in % and quality of carbohydrates and nitrate-free N. Blades are exceedingly high in assimilated N in the form of proteins. In general, throughout the plant, proteose, basic, amino, amide and NH_2N increased during the period of darkness, doubtless at the expense of the protein. In the upper stems, however, the catabolic action included a decrease in proteose and basic N as well as protein. Associated with the loss in protein, proteose, and basic N in the upper stems, amino, amide and NH_2N greatly increased. Accompanying this increase were very weak vegetative growth and eventually death at the growing point of the stem and tips of young leaves of plants that were allowed to remain in darkness after other plants were either analyzed or shifted to light conditions. Before death of any tissue, some plants were returned to the light, following which carbohydrates and protein increased, all forms of nitrate-free sol. N decreased, and the plants again became vigorous.

C. R. F.

Effect of sulfate on lemon leaves. A. R. C. HAAS AND E. E. THOMAS. Univ. of Calif. *Bot. Gaz.* 86, 345-54(1928).—In controlled sand cultures it was found that large concns. of sulfate in the soln. bathing lemon-tree roots may bring about toxic effects in the leaves. A reduction in toxicity may be brought about by increased concns. of phosphate and nitrate.

BENJAMIN HARROW

Relation of phosphorus content to shrivelling of walnut kernels. A. R. C. HAAS AND L. D. BATCHELOR. Univ. of Calif. *Bot. Gaz.* 86, 448-55(1928).—The degree of shrivelling has no effect on the total P content of mature walnut kernels obtained from trees growing on a given soil type. There is a progressive increase in the total P of the kernels as they increase in age.

BENJAMIN HARROW

Effect of hydrogen ion on the protoplasm of root hairs of *Hordeum vulgare* L. SOEFRIED STRUGGER. *Sitzb. Akad. Wiss. Wien* 137, 143-69(1928); cf. *C. A.* 22, 101.—The effect of H-ion concn. from p_{H} 6.8 to p_{H} 7.55 upon the protoplasm of the root hairs of barley (*Hordeum vulgare* L.) was studied with dark field illumination. Changes in the protoplasm resulting in an increase in microsomes, in vol. and linking of morphological structures as related to the H-ion concn. fall into 3 distinct max. Three max. for pptn. are (1) p_{H} 6.85 to 6.90, (2) p_{H} 7.00 to 7.05 and (3) p_{H} 7.35; for rate of protoplasmic streaming (1) p_{H} 6.85 to 6.90, (2) p_{H} 7.00 to 7.05 and (3) p_{H} 7.35. This offers an explanation for the periodic pptn. of protoplasm as found by Sakamura and Loo (*Bot. Mag. Tokio* 39, 61).

H. R. KRAYBILL

Coumarin in the genus *Rudbeckia*. ALEXANDER V. LINGELSHHEIM. *Ber. deut. botan. Ges.* 46, 593-4(1928); cf. *Ibid* 44, 641.—Through the microsublimation methods of Nestler and Molisch and Tunmann the presence of coumarin in *Rudbeckia speciosa* Wenderoth was established.

LAWRENCE P. MILLER

The physics of stomatal transpiration. I. The maximum diffusion ability of porous membranes. BRUNO HUBER. *Ber. deut. botan. Ges.* 46, 610-20(1928).—After a study of evapn. through Cu foil pierced with holes of varying diam. and representing in area various percentages of the total surface, the early conclusions of Brown and Escombe were substantiated. It was further shown that the stomatal areas of plants are such that for the highest values they allow a diffusion which is practically that of a

free surface, while each decrease of this area brings about a marked lowering of diffusion. Were the stomatal area of plants larger, not only would the amt. of diffusion be scarcely increased but the ability of the plant to regulate it would be impaired because a greater decrease in stomatal area would be required to bring about a corresponding lowering of the amt. of diffusion.

LAWRENCE P. MILLER

Photoperiodic adaptation of plants. V. N. LYUBIMENKO AND O. A. SZEGLOVA. *Jardin Botan., Leningrad. Rev. gen. botan.* 40, 513-36, 577-90, 675-89, 747-68 (1928); cf. *Compt. rend.* 176, 1915.—The periodicity of light which is found in natural conditions has caused specific adaptation of green plants to various lengths of day. Of the plants investigated it seems that those whose natural habitat is the tropics are short-day plants, while arctic plants require a long day, and those of the temperature zone are intermediate. The length of day at which a plant will show a max. increase of dry wt. per hr. of illumination is less than the length of day required for optimum growth. A detn. of the respiratory activity and the amt. of starch present before and after the period of illumination in plants belonging to various length of day groups shows that a fundamental physiological difference between these plants is the specific ratio between the energy of the respiratory processes and the processes of photosynthesis. The periodicity of light affects not only the total production of dry wt. but also its distribution among different organs of the plant; it seems that there is an optimum length of day for each organ of the plant. The amt. of chlorophyll attains its max. at a certain length of day; an increase or a decrease of length of day results in a lowering of chlorophyll content. The intensity of the light must also be considered; if it is artificially diminished the results are affected.

LAWRENCE P. MILLER

The biochemistry of the growth-stimulating action of warm bath. II. KARL BORESCH. *Deut. tech. Hochschule Tetschen-Liebwerd. Biochem. Z.* 202, 180-201 (1928); cf. *C. A.* 19, 2688; 21, 115.—The detn. of the alc. and acetaldehyde formed in walnut plants treated with warm baths shows that fermentation cleavage takes place in the quiescent buds. This is due to the injury of respiration which manifests itself also in a diminished O_2 consumption.

S. MORGULIS

The aromatic oils of germinating anise fruits which undergo no alteration. NICOLAIN IVANOV AND V. F. GRIGOREVA. *Biochem. Lab., Inst. Applied Botany, Leningrad. Biochem. Z.* 202, 284-93 (1928).—During 12-20 days of germination in the dark the aromatic oils of anise fruits are entirely unaffected, both quantitatively and qualitatively. The aromatic oils are regarded as by-products of the plant cell metabolism which like the alkaloids or rubber cannot be used by the organism after they have once been formed.

S. MORGULIS

The enzyme action of *Alternaria solani*. GEZA V. SZELENYI AND GEORG V. BEEZE. *Tech. Univ. Budapest. Centr. Bakt. Parasitenk., II Abt.,* 76, 121-4 (1928).—*Alternaria solani* produces the exoenzymes, invertase, maltase and lactase, and the endoenzyme invertase.

JOHN T. MYERS

Boron: Its importance in plant growth. EARL S. JOHNSTON. *Maryland Univ. J. Chem. Education* 5, 1235-42 (1928); cf. *C. A.* 22, 1994.—One-half part of B in a million parts of soln. brought about a wonderful transformation in tomato plants. Care should be exercised not to contaminate the solns. or plant containers with B. Distd. H_2O should be used in making up the solns. rather than tap H_2O and the plant containers should be made of substances free from B. The use of Pyrex vessels or glazed pottery should be avoided. Expts. show that tomato plants apparently obtain enough B from the glaze of new jars. If tap water instead of distd. H_2O was used in making up nutrient solns. it was found possible to grow tobacco plants to maturity. In all of the expts. the growing points and other meristematic tissue seem to be greatly affected by a deficiency of B. Microscopic examn. and chem. analyses point to the breaking down of the conducting system. In the tomato plant it was found that starch and total sugars were more abundant in the leaves and stems of B-deficient plants than in the corresponding tissues of normal plants. The plants were apparently able to manuf. starch and sugars, but because of broken down or undeveloped conducting systems these products remained in the leaves and stems. Care should be taken not to add too much B since a concn. of only 5 p. p. m. is extremely toxic. Although the amt. of B used by plants is extremely small it appears necessary to include this element among those essential for plant growth.

E. F. SNYDER

Carotene, a yellow coloring substance in plants. C. D. MELL. *Textile Colorist* 51, 37 (1929).—Its prevalence, chem. compn. and properties, and present economic unimportance are briefly considered.

LUBY K. WORTNER

The occurrence and destruction of gossypol in cottonseed products (GALLUP) 12. Factors that influence the chemical composition of hay (FAGAN) 12. Certain physico-

chemical properties of pineapple-stem colloids (SIDERIS) 2. The pectin and hemicelluloses of the flax plant (HENDERSON) 10. Anthocyanins (DEKKER) 10.

POOL, R. J., AND EVANS, A. W.: *First Course in Botany*. Boston: Ginn & Co. 414 pp. Reviewed in *Botan. Gaz.* 86, 472(1928).

RABER, O.: *Principles of Plant Physiology*. New York: Macmillan Co. 377 pp. Reviewed in *Botan. Gaz.* 86, 471(1928).

E—NUTRITION

PHILIP B. HAWK

Terminology of vitamin B. E. C. VAN LEERSUM. *Nederland. Tijdschr. Geneeskunde* 72, 5905-7(1929).—To discriminate the various B vitamins, L. terms them vitamin B₁, B₂, etc. Also in *Science* 69, 166-7(1929). R. BEUTNER

The absorption spectra of irradiated and unirradiated ergosterol. ALEXANDER SMAKULA. *Nachr. Ges. Wiss. Göttingen* 1928, 49-64.—The absorption spectra of ergosterol, when in soln. in the presence of O, reduced on standing for some time. By excluding O from the soln. in a special sealed cell this effect was greatly decreased. In this cell a study was made of the absorption spectra of ergosterol and of irradiated solns. of ergosterol, the data being recorded by a photoelec. method. Irradiated ergosterol can be preserved for some time by the exclusion of O. The irradiated ergosterol produces a vitamin which is decomposed by prolonged irradiation. (Cf. Morton, *et al.*, *C. A.* 21, 3937.) WALLACE R. BRODE

The antirachitic action of bone marrow. GERTRUD FUCHS AND RICHARD PRIESEL. Univ.-Kinderklinik in Wien. *Z. ges. expil. Med.* 61, 539-48(1928).—Red bone marrow in small amounts will heal rickets in rats produced by feeding them the McCollum diet. The curative effect depends upon the cholesterol content. Radiating the bone marrow before feeding with a quartz lamp for a half hour at 70 cm. did not change its healing power. F. L. DUNN

The effect of the cow's ration on the food value of milk. W. E. KRAUSS. Ohio Agr. Expt. Sta., *Bimonthly Bull.* 13, 195-8(1928).—A complete diet is defined as contg. adequate amts. of energy-producing substances, protein of good quality, certain minerals such as Ca, P and Fe, and also vitamins. Cows do not need vitamin B in their food inasmuch as it can be synthesized in the rumen. Vitamin A potency in milk increases with the richness of the feed in this vitamin. Milk is at best a rather poor source of vitamin D. For feeding milk cows, a good grain mixt. supplemented with some form of well-cured leafy roughage and silage in the winter and with pasture in summer is recommended. C. R. F.

The effect of the cow's ration on the vitamin A and vitamin B content of milk. W. E. KRAUSS. Ohio Agr. Expt. Sta., *Bimonthly Bull.* 13, 198-201(1928).—Detns. by the usual animal technic of vitamins A and B in the milk of cows fed on high-protein and low-protein rations showed differences too small to be of any practical significance. Apparently a cow can tolerate extreme levels of protein feeding without materially affecting these 2 factors of the milk. C. R. F.

The effect of inadequate vitamin B upon sexual physiology in the male. HERBERT M. EVANS. Univ. of Calif., Berkeley. *J. Nutrition* 1, 1-2(1928).—The invalidation of most previous researches because of non-assurance of the presence of vitamin E caused the author to conduct carefully controlled expts. with rats. The source of vitamin E was purified wheat-germ oil. The animals were not allowed access to their feces. In 1 series, inadequate sources of vitamin B along with an abundance of vitamin E were used while in other series vitamin B was suddenly withdrawn from adult animals properly nourished, and continuing to receive a nutrition adequate in every respect, especially as regards E, and suffering merely deficiency in B. In the first series, sex interest as well as anatomical and functional integrity of the male cell were studied by biweekly or monthly matings, after the 60th day of life, with vigorous females known to be in the estrous stage. Approx. 40 copulations were studied. In all cases, the sexual physiology of rats fed on vitamin-B-deficient diets was practically normal up to within a few days of actual death. The normality of the testis and its secretion did not depend on adequate levels of vitamin B but solely on the presence of vitamin E. Copulations occurring during the last stages of beriberi resulted in normal offspring. The second series of expts., i. e., the sudden withdrawal of vitamin E from an otherwise adequate diet, resulted in immediate and precipitous drop in body wt. Weekly matings with females in estrous gave frequent copulations which practically all resulted in vigorous offspring. Providing vitamin E is adequately high, injury to the productive function in the male caused by

inadequate B would appear to be due solely to this interference with behavior and to no extent to actual injury of the male germinal elements. C. R. F.

Relation of vitamin E to growth and vigor. HERBERT M. EVANS. Univ. of Calif., Berkeley. *J. Nutrition* 1, 23-8(1928).—Vitamin E is concerned not only with the physiology of reproduction, i. e., the degeneration of the fetal placenta and testis in its absence, but also that lack of E in mother's milk entails a peculiar paralytic disease in the suckling young. As a result of numerous expts. conducted over a period of 3 yrs. with rats, uniformly improved growth and vigor occurred in animals receiving vitamin E in the form of wheat-germ oils as contrasted with their litter-mate sisters or brothers on identical dietary regimes, save for the omission of E. Even though fertility could be resuscitated in only 25% of the cases where sterility existed, vitamin B (wheat-germ oil) gave a clear response in improved growth and constitutional state of the animals so treated. This improvement was not sex-linked for it continued even after removal of the testes. The improvement was likewise attained by feeding a highly concd. sterol-free fraction of the non-saponifiable part of wheat germ oil, though the growth increase occurred largely after 8 months. There was little difference in growth curves among animals fed E-high or E-free diets up to 90 days. It is concluded that vitamin E does not exert its favorable effects upon growth and the general state of the animal indirectly through its established value to the sex glands but in some other, possibly more direct, way. The diminution in sex activity late in life of males held upon E-free diets may not be due to impairment of the testes, but may result from the constitutional inferiority of such animals. C. R. F.

Supplementary values among foods. II. Growth and reproduction on white bread with various supplements. MARY SWARTZ ROSE AND GRACE MACLEOD. Columbia Univ. *J. Nutrition* 1, 29-38(1928); cf. Rose and McCollum, *Proc. Soc. Exptl. Biol. Med.* 25, 697(1928).—Using 3 samples of bread, a diet composed of dried bread 70%, and dried whole milk 30% gave normal growth in rats, excellent health and good reproduction in females. However, lactation was poor and only 5 young were successfully weaned out of a total of 81. When dried egg powder was substituted for the milk, similar though less encouraging results were obtained. Signs of rickets and general weakness were evident and only one-half of the animals made normal gains from the 3rd to 6th month. Using 90% bread with 10% milk or 70% bread with 30% carrot gave even poorer results. Growth was poor and only 1 mother on the carrot diet bore young. Diets contg. dried bread 70% and almond meal 30% or dried bread 90% and spinach up to 10% did not allow animals to maintain health in spite of good food consumption. At the end of 6 to 8 months most of them had a wt. which they should have had in 2 months. Reproduction was nil. The poorest records of all were made on bread and lean beef even when fed *ad lib.* Normal growth took place for 5 weeks only, after which serious decline in wt. and health occurred. The addn. of butter equiv. to 9% of the wt. of the bread or Calactate 2.6% had little effect on growth but 2% cod-liver oil was slightly beneficial. All the animals were crippled and could scarcely move. Of 13 animals, only 8 lived 8 months. No marked differences were attributed to differences in compn. of white breads. C. R. F.

The distribution of vitamin E. NINA SIMMONDS, J. ERNESTINE BECKER AND E. V. MCCOLLUM. Johns Hopkins Univ. *J. Nutrition* 1, 29-47(1928).—The authors withdraw their previous conclusions (*C. A.* 21, 2495) that wheat germ oil because of its content of vitamin E, protected animals against the injurious effect of feeding FeSO_4 . The injury due to FeSO_4 is now interpreted as a result of destruction of vitamin A. There is no evidence that vitamin E has any role in Fe assimilation. — Certain samples of lard and of cod-liver oil promote fertility to an extent which compels the conclusion that they contain considerable amts. of E. The study of the distribution of E is complicated by the considerable variation in the degree to which individual male rats withstand the effects of diets low in E. Some remain potent much longer than others. C. R. F.

A detailed study of the role of vitamin B in anorexia in the albino rat. BARNETT SURR. Univ. of Ark., Fayetteville. *J. Nutrition* 1, 49-56(1928).—Using avitaminized albino rats, various vitamin-B-rich concentrates gave striking curative results even after the animals had developed severe symptoms of beriberi. In nearly every case after the animals had failed to eat for 1 or more days following the use of prolonged vitamin-B-free diets, there was a sharp rise in food consumption which lasted only a day or two. This is attributed to the liberation of B by the breaking down of the depots in the body during the advanced stages of catabolism. The liver is a depot of vitamin-B storage and where it is absent, the liver shows atrophy, capillary congestion, marked vacuolization and an edematous condition. It is concluded that vitamin-B deficiency is a detg. factor in the development of anorexia, even complete cases of which may be entirely cured by

vitamin-B therapy using highly concd. yeast preps. Since the calorific intake of the American people has as its source mainly degerminated cereals, sugar and meat, and since their diet is not balanced by sufficient amts. of fresh vegetables to insure an optimum vitamin-B intake, it is suggested that the org. and functional anorexias so frequently encountered in the human may be largely attributable to cumulative effects of vitamin-B deficiency.

C. R. F.

The character of energy metabolism during work. M. ELIZABETH MARSH. Univ. of Rochester, N. Y. *J. Nutrition* 1, 57-89(1928).—The old question of carbohydrate and fat utilization by muscles during work is critically reviewed, M. leaning to the theory that fats are not transformed to carbohydrates in higher animals under normal conditions. Extensive exptl. data using Prony-brake and Krogh magnetic-brake types of ergometers are described. Boys and young men were used as subjects. Chem. data were taken. The respiratory quotient (R. Q.) of the excess metabolism was obtained by deducting from the total CO_2 and O_2 of the work and recovery period, the CO_2 and O_2 obtained in the previous resting period. About 100 expts. were made on subjects subsisting on uncontrolled diets. The work varied in intensity from 0.76 to 1.4 Cal. per min. and continued for from 5 to 20 mins. With 2 boys the av. R. Q. of the excess metabolism due to the work, in 41 out of 49 and in 15 out of 18 expts., resp., was lower than the R. Q. of the previous resting period, the av. being 0.78. With the mature, athletic subject, this was true in 15 out of 16 trials, giving an av. of 0.95. With the mature subject on a high, carefully controlled carbohydrate diet, the recovery to the pre-work level of O_2 absorption and CO_2 elimination was much slower than on high carbohydrate. The av. excess R. Q. of work and recovery on both diets was higher than the R. Q. of the previous resting period, but the abs. level of the excess R. Q. was influenced very clearly by the diet. The alveolar values in these expts. on special diets showed more CO_2 in circulation at the end of work and recovery on high carbohydrate than previous to work, and either no change or less CO_2 in circulation at the same time on high fat. Acetoacetic acid was present in the urine on high fat diet. The presence of acidosis explains the higher R. Q. of the work metabolism on this diet. In general, the evidence from this study lends support to the belief that the human body uses for the energy muscular work, both carbohydrate and fat. A bibliography of 21 references is appended.

C. R. F.

Muscular efficiency on high-carbohydrate and high-fat diets. M. ELIZABETH MARSH AND JOHN R. MURLIN. Univ. Rochester. *J. Nutrition* 1, 105-37(1928).—Relative efficiency of carbohydrate and fat diets in muscular work was studied by performing 47 expts. on 1 subject riding the bicycle ergometer. In 12 trials, a normal unrefined diet was used as a basal series to compare with the high-fat and high-carbohydrate diets. The work period was 8 mins. followed by a recovery period of from 17 to 25 mins. nine samples were collected in the pre-work, work and recovery periods. The av. net efficiency on the normal diet at the rate of 1.4 Cal. of work per min. was 22.1%; on high carbohydrate at the same rate 22.7% and on high fat at the same rate 21.5%. At the lower rate of 1.1 Cal. of work per min. the av. net efficiency on the same high-carbohydrate diet was 23.4%, and on the high fat 22.6%. The av. difference in efficiency between high carbohydrate and high fat first series, calcd. to pure carbohydrate and pure fat combustion, was 11 or 12%. A difference in the diminution of N excretion from pre-work to work and recovery periods was noted on the high-carbohydrate as compared with the high-fat diet. The difference is due to the greater sparing effect of increased carbohydrate combustion.

C. R. F.

Vitamin requirements of nursing young. III. A quantitative biological method for the study of vitamin B requirements of nursing young of the albino rat. BARNETT SURE, DOROTHY J. WALKER AND E. H. STUART. Univ. Ark., Fayetteville, and Eli Lilly Co., Indianapolis, Ind. *J. Nutrition* 1, 139-53(1928).—A technic is described for determining the vitamin-B requirements of nursing young which is sensitive to the extent of 1 mg. per nursing per day. A vitamin-B unit, applied to nursing young, is defined as the daily amt. of vitamin-B which must become available to a nursing young of the albino rat weighing 30 g., in order to permit a gain of 10 g. in from 7 to 10 days. Several vitamin B concns. when tested by the biol. method of assay showed variations of from .44 to .25 units per g. IV. Vitamin B versus vitamins A and D requirement for growth of nursing young of the albino rat. *Ibid* 155-64.—Nursing young need approx. 100 times as much vitamin B, calcd. in terms of dehydrated baker's yeast, as vitamins A and D (from cod-liver oil), for continuous growth during the nursing period.

C. R. F.

Improved rate of growth of stock albino rats. ARTHUR H. SMITH AND FRANKLIN BING. Yale Univ. *J. Nutrition* 1, 179-89(1928).—A biometrical study indicating

that evolution is occurring in this species because of the more perfect mode of nutrition now used by this animal. Care will be required in properly evaluating data obtained in expts. involving the use of the albino rat.

C. R. F.

Nutritional significance of our present knowledge of the multiple nature of vitamin B. H. C. SHERMAN. Columbia Univ. *J. Nutrition* 1, 191-9(1928).—A review of the more important investigations on vitamin B.

C. R. F.

What do we know of the chemistry of vitamins? L. ILOSVAY. *Termesztud. Közlöny* 60, 313-24(1928).—A summary on the chemistry of vitamins.

S. S. DE FINÁLY

Raw and cooked hen egg as the exclusive diet of growing rats. FOLKE STENQVIST. Med.-chem. Inst., Lund. *Deut. med. Wochschr.* 54, 1920-3(1928).—Raw and cooked eggs were compared as to their relative value when used as the exclusive diet of young rats. The cooked egg is superior to the raw in so far as its food value is concerned and also because of the absence of the toxic effect which raw eggs are said to possess. A. G.

Further experiments on the effective value of raw and cooked foods. E. FRIEDBERGER, A. ABRAHAM AND S. SEIDENBERG. Forschungsinst. für Hyg. und Immunitätslehre, Berlin. *Deut. med. Wochschr.* 54, 2092-3(1928).—Owing to the toxic effect of the fresh white of egg, when fed to rats, cooking improves the apparent food value of eggs.

ARTHUR GROLLMAN

The effects of protein-split products upon metabolism. III. Further investigation of the fractionated protein hydrolyzates and of amino acids, and their relation to the specific dynamic action of the proteins. DAVID RAPPORT AND HOWARD H. BEARD. Western Reserve Univ., Cleveland. *J. Biol. Chem.* 80, 413-30(1928); cf. *C. A.* 22, 3686.—Both the dicarboxylic acid and the diamino acid fraction of casein and gelatin hydrolyzates increased the total metabolism of a dog. Glutamic acid, aspartic acid, arginine and cystine had a specific dynamic action while histidine did not. The specific dynamic action of the proteins was fully accounted for by the summated actions of their constituent amino acids.

ARTHUR GROLLMAN

The destruction of vitamin E in a ration composed of natural and varied foodstuffs. J. WADDELL AND H. STENBOCK. Univ. of Wis. *J. Biol. Chem.* 80, 431-42(1928).—The vitamin-E potency of a ration of natural and varied food materials was completely destroyed by treatment with FeCl₃. The vitamin-A content was unaffected. A. G.

Studies on the metabolism of Eskimos. PETER HEINBECKER. Washington Univ., St. Louis. *J. Biol. Chem.* 80, 461-75(1928).—The diets of Polar and Baffin Island Eskimos are described. Glucose tolerance curves showed these people to have a high tolerance for carbohydrate, which was decreased after fasting. Despite their habitually high-protein diets, the non-protein nitrogen of blood is the same as that of other races. Very small amts. of acetone bodies are excreted in the urine in fasting. The basal metabolism of Eskimos is higher than that of persons living in temperate zones. During fasting the R. Q. may reach values as low as 0.45.

ARTHUR GROLLMAN

The intestinal p_H in experimental rickets. BERNARD L. OSER. Food Research Labs., N. Y. *J. Biol. Chem.* 80, 487-97(1928).—Expts. on rats indicated that the fecal p_H test for vitamin-D potency was faulty. The reaction of the feces was not uniform and fluctuated considerably. The decreased alkyl. of the colonic contents is attributed to inadequate P reabsorption at this level of the intestinal tract. ARTHUR GROLLMAN

The effect of scurvy-producing diets and tyramine on the blood of guinea pigs. MILTON T. HANKE AND KARL K. KOESSLER. Univ. of Chicago. *J. Biol. Chem.* 80, 499-502(1928).—Tyramine injected subcutaneously into guinea pigs caused no anemia. An exclusive diet of autoclaved soy beans and minerals led to scurvy and death. In these animals an abnormal blood picture, associated occasionally with anemia, was obtained.

ARTHUR GROLLMAN

The manganese-copper-iron complex as a factor in hemoglobin building. R. W. TITUS, H. W. CAVE AND J. S. HUGHES. Kansas Agr. Expt. Sta., Manhattan. *J. Biol. Chem.* 80, 565-70(1928); cf. *C. A.* 23, 422.—Mn and Cu are both effective, in the formation of hemoglobin, when added to the milk-iron diet of rats. When both Mn and Cu are added, the response is quicker than when either is added alone to the diet. A group of substances, rather than a single substance, seems to be active in hemoglobin building.

ARTHUR GROLLMAN

The influence of fasting and creatine feeding upon the creatine content of the tissues and blood of the white rat. ALFRED CHANUTIN AND HERBERT SILVETTE. Univ. of Va. *J. Biol. Chem.* 80, 589-608(1928).—The creatine content of rat muscle is progressively increased during fasting or after feeding high-creatine diets. The creatine content of the kidney is also increased early in fasting. The heart, testes, liver and brain show little change in creatine content. The total solids of muscle are increased

in the early part of fasting but decreased at the close of fasting. The creatine reservoirs in muscle and liver are shown to be quite flexible, being easily affected by the exptl. conditions. Blood studies during and after fasting, and during creatine feeding were also made.

ARTHUR GROLLMAN

Bile salt metabolism. I. Control diets, methods and fasting output. H. P. SMITH, A. H. GROTH AND G. H. WHIPPLE. Univ. of Rochester. *J. Biol. Chem.* 80, 659-69(1928).—Bile salt secretion in dogs was uniform during the 24 hrs. despite a single daily feeding. The output of bile salt on a diet of standard salmon bread is 80 to 130 mg. per kg. of body wt. per 24 hrs. but is fairly const. for any given dog. Fasting reduces the bile salt output to 30 to 40 mg. Sugar feeding reduces it to a still lower level.

II. Influence of meat and meat extractives, liver and kidney, egg yolk and yeast in the diet. H. P. SMITH AND G. H. WHIPPLE. *Ibid* 671-84.—Meat and meat products fed to bile fistula dogs increase the bile salt output 2- or 3-fold. Feeding of cholesterol, alc. extractives of meat or yeast nucleic acid cause no change in the bile salt output. "Food protein is of primary importance and detcs. the level of the exogenous bile salt output."

III. Tryptophan, trysoine and related substances as influencing bile salt output. G. H. WHIPPLE AND H. P. SMITH. *Ibid* 685-95.—Gelatin feeding, supplemented with tyrosine, gives a bile salt output of only 70 mg. per kg. per 24 hrs. Tryptophan added to gelatin gives a sustained rise to the low meat-diet level. Isatin and indigo may also cause a rise but this effect is inconstant. *p*-Hydroxyphenylglycine like tyrosine is inert. Tryptophan, isatin or indigo has a cholagog effect, even when combined with sugar feeding. This cholagog effect may be completely dissociated from the bile salt effect. Tryptophan added to a sugar diet is inert except for its cholagog effect. Some other substance present in gelatin is thus needed together with tryptophan to complete the cycle of bile salt production.

IV. How much bile salt circulates in the body? G. H. WHIPPLE AND H. P. SMITH. *Ibid* 697-707(1928).—Daily bile re-feeding of all bile secreted from a bile fistula raised the bile salt secretion to a stable plateau level of 700 to 800 mg. of bile salt per kg. of body wt. per 24 hrs. Injection of bile salts leads to prompt secretion in the bile. Supplementary feeding raised the level of bile salt secretion to high levels but the output always fell behind the intake. The fate of this surplus could not be detd.

ARTHUR GROLLMAN

Protein and vitamin B. GLADYS A. HARTWELL. King's College for Women, London. *Biochem. J.* 22, 1212-20(1928).—For normal metabolism edestin requires more vitamin B than does caseinogen or egg-albumin (cf. *C. A.* 22, 615). On a diet of 20% edestin and 5 g. yeast ext. per 100 g. dry solid, many young rats die, showing kidney abnormality. More yeast prevents these symptoms. The yeast "protective" factor is not destroyed by autoclaving at 120° for 4½-5 hrs.

BENJAMIN HARROW

Minimum amount of vitamin D required for a positive antirachitic effect in the "line" test. KATHERINE H. COWARD. Pharmaceutical Society of Gt. Britain, London. *Biochem. J.* 22, 1221-2(1928).—C. is in agreement with Steenbock (*J. Biol. Chem.* 64, 243(1925)) that the actual amount of vitamin D required to give a positive reaction in the "line" test is 2×10^{-8} g.

BENJAMIN HARROW

Note on quantitative methods of measuring the nutritive value of proteins. HAROLD HANSON MITCHELL. Univ. of Illinois. *Biochem. J.* 22, 1323-26(1928).—Polemical. An answer to Kon's paper (*C. A.* 22, 2399).

BENJAMIN HARROW

Protein metabolism in infancy. PHILIP S. POTTER. *Arch. Pediatrics* 45, 580-91 (1928). A review with chapters devoted to digestion of protein, N retention and absorption, dynamic action, protein requirement, respiratory quotient, the feces, uric acid and creatinine and a bibliography of 49 references.

JOSEPH S. HEPBURN

Mineral salt and water metabolism in infancy. PHILIP S. POTTER. *Arch. Pediatrics* 45, 633-52(1928).—A review with sections on (1) Ca, Mg, K, Na, Fe, S and P, (2) mineral salts in relation to food, stools, fever and nutrition, (3) water metabolism, and (4) a bibliography of 33 references.

JOSEPH S. HEPBURN

Nutrition of the world in past, present and future. MAX RUBNER. *Naturwissenschaften* 16, 713-20(1928).—Statistical considerations on types of food, especially cereals as used by various peoples.

B. J. C. VAN DER HOEVEN

The influence of certain foods on the wool growth of Angora rabbits. J. N. PICKARD. Univ. Edinburgh. *Scottish J. Agr.* 11, 344-6(1928).—Addn. of a few drops of cod-liver oil to the daily ration increased the growth of wool on Angora rabbits. The 28 rabbits which acted as controls yielded 1364 g. of wool, while the same no. which were also given cod-liver oil produced 1806 g. of wool. Addn. of mineral mixts. decreased the yield of wool as compared with the yields obtained from the control animals and from those receiving cod-liver oil. The expts. are being continued.

K. D. JACOB

Cancer as a result of vitamin deficiency. ORTO STRYER. *Mitt. Lebensm. Hyg.* 19,

388-91(1928).—A discussion of the different cancer theories. Autopsy of animals fed on a vitamin-free or vitamin-poor ration usually showed infection of the lungs caused by *staphylococci*. With a certain number of animals, however, this lung infection changed partly or entirely into a cancer swelling. According to S. this infection had its origin in decayed teeth, which can be traced to lack of vitamins. The vitamins A and C are the ones referred to. They retard growth of the different glands and cause only partly developed cells of an embryonic nature, the so-called cancer cells. S. recommends nutrition as a starting point in the study of human cancer. J. C. JURRIJENS

Nutritional chemistry of raw food substances. I. Banana. KINSUKE KONDO, MICHIO NAKAJIMA AND TETSUO SUZUKI. *Mem. Coll. Agr. Kyoto Imp. Univ.* 1928, No. 6, 23-53.—The compn. of banana fruit produced at Inrin, Formosa, and after ripened at Kyoto was detd. About 70% of the edible part consists of H_2O and a greater part of the solid matter is invert sugar and sucrose. One banana may supply about 75 Cal. of energy on the av. The green banana fruit consists of a large amt. of starch beside 70% of H_2O . The amt. of invert sugar is small. During ripening about 10% of the carbohydrate is lost. The amt. of pectin, fiber and tannin may not be changed. The presence of glucose and fructose was shown by the osazone test and detd. to be in the ratio of 4:1. Dextrin and sucrose may be present in the after-ripened banana fruit, but their amts. are varying. The riper the fruit, the more these sugars change to monosaccharides. The carbohydrates (diastase, maltase and sucrase) were detected in banana flesh. All of them are pptd. by the addn. of alc. to their aq. soln. The banana diastase and sucrase may be extd. with water from the banana flesh. If the banana mash be mixed with a suitable amt. of $CaCO_3$ and toluene, the banana maltase will go into soln. in a few days. Treatment of the banana mash with $CaCO_3$ and $CHCl_3$ or with water only may not result in isolation of a powerful maltase. The optimum p_H and temp., resp., of the banana carbohydrates are: diastase 6.4, 30-40; maltase 4.88, 37; invertase 4.5, 30-50. Banana fruit will supplement and raise the nutritive value of a diet. The methods used in all detns. are given. Analysis of the ash is tabulated. The ash consists principally of K_2O and Na_2O . MgO and P_2O_5 are high but CaO is low. Cu was found in both flesh and peel. II. Watermelon. KINSUKE KONDO AND TSUNETOMO HAYASHI. *Ibid* 55-72.—The general compns. of the watermelons, Yamato, Kurobe, Taisen and Kaho, were detd. The edible portion of the Taisen is only about 50% but that of the Yamato or Kurobe is about 70%. The edible portion consists of about 92% H_2O . The principal constituent of the solid matter is sugar, which amounts to about 6-8% in the juice. The amt. of sugar varies with the melon and in its location in the melon. The greater amt. of sugar may be found in the center of the edible portion. The mineral constituent in the watermelon juice amounts to only about 0.3%, of which more than 50% consists of K_2O . Na_2O , P_2O_5 , SO_3 and MgO are high. The amt. of CaO is low. Fructose was confirmed by the formation of phenylosazone and methylphenylosazone. Under the assumption that the juice contains a certain amt. of glucose and sucrose besides the fructose, the amts. of these sugars were detd. and it was found that the solid matter of the watermelon juice consists principally of sugar, two thirds of which is fructose. Therefore, it may be reasonable for watermelons to be taken by kidney-diseased persons, as a medicine. The presence of sucrase in the juice was detected and its optimum p_H detd. The juice of the watermelon inhibits the action of the digestive enzymes. J. A. KENNEDY

Vitamins and their relationship with fruit and vegetable products. JIRÍ KRASL. *Chem.-obzor* 3, 311-3, (313 English)(1928).—General JAROSLAV KERČERA

A new process for the separation of the vitamin fraction from cod-liver oil. JOSEPH K. MARCUS. Pitman-Moore Co. Research Labs., Indianapolis. *J. Biol. Chem.* 80, 9-14(1928).—The success of the new process is due to physical condition of the cod-liver oil soap produced by its H_2O and alc. content and to the sp. properties of $C_2H_4Cl_2$ used to ext. the vitamin fraction. All operations are carried out under anaerobic conditions wherever possible in order to safeguard vitamin A from oxidation. A. P. LOTHROP

Antirachitic substances. VIII. Studies on highly purified ergosterol and its esters. CHARLES E. BILLS AND EDNA M. HONEYWELL. Mead Johnson Co. Research Lab., Evansville, Ind. *J. Biol. Chem.* 80, 15-23(1928); cf. *C. A.* 22, 801.—Crude sterol from the common yeast, *Saccharomyces cerevisiae*, is a mixt. of ergosterol and 2 other sterols, one dextrorotatory and probably identical with MacLean's zymosterol and the other, *cervisterol*, m. above 240° , levorotatory. Ergosterol may be purified by recrystn. from a boiling 3:1 alc.- C_6H_6 mixt. (an exceptionally effective solvent) or by sapon. of purified ergosterol isobutyrate. The pure ergosterol has a value $[\alpha]_D^{20} - 132^\circ$, the highest ever ascribed to yeast ergosterol and identical with Tanret's ergot ergosterol. The m. p. is of little value as a test of purity as it varies from 166° to 183° according to the hydration of the sample. The spectrographic and physiol. properties associated with

ergosterol of ordinary purity are exhibited by the highly purified prepn. Three new esters were prepd. and purified: *ergosterol isobutyrate*, $[\alpha]_D^{25} -84^\circ$ when $c = 1$ in CHCl_3 , sinters 146° , becomes a viscous turbid liquid 148° , becomes a thin turbid liquid 159° , m. clear 162° ; *ergosteryl isovalerate*, $[\alpha]_D^{25} -82^\circ$, sinters 135° , becomes a viscous turbid liquid 138° , becomes a thin turbid liquid 157° , m. clear 160° ; *ergosteryl cinnamate*, $[\alpha]_D^{25} -22^\circ$, sinters 175° , liquefies 177° , m. clear 179° , the melt solidifies on cooling at $145-40^\circ$ with a beautiful play of colors. IX. Quantitative biophysical studies on the activation of ergosterol. CHAS. E. BILLS, EDNA M. HONEYWELL AND WARREN M. COX, JR. *Ibid* 557-63.—Parallel spectroscopic and biologic detns. on irradiated ergosterol showed that the reaction product exhibiting max. absorption at 248μ is not vitamin D. Oxidation is a factor in the destruction of this substance which is suggested as having a mol. configuration similar to isoergosterol. ARTHUR GROLLMAN

The effect of hydrogen-ion concentration upon adsorption of the active factors of vitamin B complex by fuller's earth. W. D. SALMON, N. B. GUERRANT AND I. M. HAYS. Ala. Polytechnic Inst., Auburn. *J. Biol. Chem.* 80, 91-101(1928); cf. *C. A.* 22, 1383.—The max. adsorption of the B-P factor of dry bakers' yeast by fuller's earth was obtained between p_H 3.0 and 5.5 (equil. reaction) with the optimal point at p_H 4.0. The adsorption diminished rapidly beyond p_H 5.5, becoming negligible at p_H 9.0 and practically zero at p_H 11.0. Significant inactivation of the B-P factor occurred in the alk. solns. The max. adsorption of the P-P factor occurred at p_H 0.08 which was the most acid soln. tested. It decreased gradually to a min at p_H 6.3 and remained practically const. to p_H 12.07, the most alk. soln. tested. The B-P factor is more efficiently adsorbed by fuller's earth than the P-P factor. As there is increasing evidence that at least substances are involved in the dual function of the P-P fraction (a growth-stimulating and a pellagra-preventing action), there is the possibility that the adsorption of the P factor as detd. in these expts. represents a composite adsorption of more than one active substance. A. P. LOTHROP

The determination of vitamin A. E. M. NELSON AND D. BREESE JONES. U. S. Dept. of Agr. *J. Biol. Chem.* 80, 215-26(1928).—The U. S. Pharmacopeia X method vitamin A assay of cod liver oil does not eliminate vitamin D as a growth-promoting factor. When this factor is provided ophthalmia usually develops before growth ceases, that the curative test cannot be carried out on an animal free from disease. In curative tests on animals which have developed incipient ophthalmia permanent cure of ophthalmia does not take place unless the level of vitamin A fed is high enough to permit growth of the rat at or near its max. rate. In curative tests for vitamin A, although observations on the presence and change of severity of ophthalmia are essential, the growth response seems to offer a more tangible means of judging vitamin A potency. The vitamin A potency of a sample of butter fat was found to be approx. $1/16$ of that of a good grade of cod liver oil. A. P. LOTHROP

The metabolism of levulose with a colorimetric method for its determination in blood and urine. RALPH C. CORLEY. Tulane Univ. *J. Biol. Chem.* 81, 81-98(1929).—After enteral administration of levulose to rabbits, it appears in the blood in small amts. and mild poisoning with hepatotoxic agents has little influence on the amt. of levulose in blood after enteral ingestion. After intravenous injection of 2 g. per kg. of body wt., levulose practically disappears from rabbit blood in 90 mins. and liver poisons have little influence on the rate of disposal except in massive doses. If injected simultaneously with insulin, levulose protects the rabbit from the effect of insulin without there being any striking influence on the rate of removal of the circulating levulose. Insulin shock was observed on several occasions and levulose disappeared more rapidly from the blood if insulin was given subcutaneously or intravenously an hr. or more previous to the intravenous injection of levulose. In the colorimetric method for the determination of levulose in blood and urine the soln. to be analyzed is heated with concd. HCl and an alc. soln. of diphenylamine in a boiling water bath. The color is developed by the addn. of melted CaH_2OH and compared with a standard in a colorimeter. The method has been found satisfactory in the analysis of aq. solns., urine and H_2WO_4 blood filtrates. Recoveries of 97 to 103% of levulose added in aq. soln. have been made; 95 to 105% added to blood has been recovered; recovery from urine has been found to be more or less satisfactory. Glucose gives about 3% of the color of levulose. A. P. LOTHROP

The antirachitic effect of ergot. E. MELLANBY, E. M. SURIE AND D. C. HARRISON. Proc. Physiol. Soc., *J. Physiol.* 65, xxix(1928).—Ergot was found to have a definite antirachitic effect on dogs. The active fraction was sol. in alc. and in ether. When the active fraction was saponified and the soap soln. extd. with petroleum ether the active substance was left, for the most part, in the soap. It is suggested that the antirachitic

factor may be produced directly from ergosterol in ordinary growth independently of sunlight.

The presence of vitamins in certain canned vegetables. G. RIGOBELLO. *Boll. soc. ital. biol. sper.* 3, 422-5(1928).—The object was to det. to what extent the vitamins in certain vegetables and fruits survive the canning process, and if any can be activated by irradiation. Peas, tomatoes, tomato sauce, oranges in sirup, and marmalade tested on guinea pigs, pigeons and rats with the following results:

	Preserved vegetables					Fresh vegetables				
	A	B	C	D	E	A	B	C	D	E
Tomatoes	+++	+	++	++	++	+++	++	+++	++	?
Peas	+	++	+	+-	+-	+	+++	++	+	?
Peaches	+	-	-	-	+	+	?	+	?	?
Oranges and marmalade	+	-	++	+-	+	+	-	+++	?	?

There was a small fraction in the canned products which could be activated by ultra-violet rays. In general the vitamins remained unaltered if the products were heated under reduced pressure and at a temp. not exceeding 100°.

The effect of the ingestion of definite doses of glucose and alcohol on the glucemic and alcoholemic curve. A. GALAMINI. *Boll. soc. ital. biol. sper.* 3, 483-6(1928).—To 2 healthy men 40 g. of glucose was given in 1, 2, 4, 8 and 16 doses and 30 cc. of 95% EtOH was administered in 1 and 8 doses. Detailed analytical results show the effect of these 2 substances on the glucemic and alcoholemic curve.

Alimentary sucroseemia and physical exercise. III. U. CASSINIS AND L. BRACALONI. *Boll. soc. ital. biol. sper.* 3, 487-9(1928).—Sucrose was given to 5 healthy men in one lump dose in soln. and in fractional doses in cubes. Sucrose and glucose were detd. in the blood before and during a march of 4800 meters. When the sucrose was given in one large dose the % in the blood diminished continuously during the march. When the same amt. was given in fractional doses the sucrose in the blood approached that before the march. IV. *Ibid* 499-502. The march was increased to 9600 meters. The sucrose was ingested in the proportion of 1 g. per kg. body wt. and taken in 5 aliquots. The sucrose and glucose in the blood were detd. before and during the march. Detailed results are given. If one must resort to the use of sugar during excessive muscular work, the ingestion of this in cubes and in small doses is preferable to taking it in soln. form; in the first form absorption is regular; in the second form it is very irregular.

The glucemic curve after the ingestion of sucrose in fractional doses. A. GALAMINI. *Boll. soc. ital. biol. sper.* 3, 490-3(1928).—The administration of sucrose in fractional doses in the prop. of 1 to 1.5 g. per kg. body wt. has a tendency to raise the glucemic titer to higher levels than when the same amt. is ingested in one dose. The curve becomes more irregular; instead of reaching a max. 30-60 min. after ingestion and then gradually decreasing, the curve shows 2 or 3 max.

The utilization of certain carbohydrates. GIUSEPPE SUNZERI. *Boll. soc. ital. biol. sper.* 3, 793-4(1928).—If a concd. soln. of sucrose is administered to a pigeon that has been fed with corn, the utilization of the sugar is variable depending on the quantity given to the animal. One-third of the sucrose is found in the feces. Other carbohydrates tried were glucose, levulose, galactose and maltose. Of these lactose was the least utilized, followed by galactose, levulose, glucose and maltose. The amt. of carbohydrate in food utilized depends on its phys. state. The feces of pigeons fed with corn kernels had greater reducing power after hydrolysis, than the feces of pigeons fed with an equal wt. of corn meal.

Determinations of the organic acids in urine. ERIK M. P. WIDMARK. *Acta med. Scand., Suppl.* XXVI, 335-9(1928).—The author's method for extg. org. acids from urine was applied to the study of org. acid excretion under different conditions. On Petré's carbohydrate-free diet as well as on a vitamin-B-free diet considerable org. acid production has been found.

Studies on the hydrogen-ion concentration in the different regions of the intestinal canal in animals on a normal diet and a diet containing no vitamin B. NIELS SCHOUVE. *Acta med. scand., Suppl.* XXVI, 537-46(1928).—The reaction in both portions of the rat stomach was p_H 2-3. In the small intestine there is a rise in p_H from pylorus to Bauhin's valve, and in the last portion of the ileum there is actually a change to the alk. side. The reaction reached p_H 7-8, in the lower ileum, but over the larger portion of the intestinal canal the contents remained acid. In rats exhibiting B avitaminosis the highest alk. is found in the cecum, the p_H decreasing in the large intestine to p_H 6-7.

J. MORGULIS

Studies on the biochemistry of avitaminosis. XI. The effect of scurvy and starvation on the chemical composition, especially the creatine content of the brain. ALEXANDER PALLADIN AND E. SAVIN. *Ukraina Biochem. Inst., Charkow. Biochem. Z.* 200, 244-9(1928).—The brain of the guinea pig contains much creatine, the cerebellum being richer in this substance than the hemispheres. The creatine content of the guinea-pig muscles is 1.6 times as great as that of the cerebellum and 2.3 times as great as that of the hemispheres. Scurvy produces certain alterations in the chem. compn. of the brain, both the hemispheres and the cerebellum becoming richer in water and N but poorer in P. The creatine content, however, remains normal on the av. Scurvy affects the dry residue and P content of the brain as does polyneuritis, but the creatine content is influenced differently by these 2 forms of avitaminosis. Scurvy differs from starvation in its influence on the P content of the brain.

S. MORGULIS

Studies on the in vitro respiration in beriberi pigeons. MARGRET GUGLER. *Physiol. Inst., Univ. Zürich. Biochem. Z.* 200, 340-50(1928).—The respiration of the breast muscle extd. with water was measured by means of the Barcroft method on 13 beriberi pigeons, and parallel with this the respiration was detd. in fresh muscles. A similar number of healthy pigeons furnished the control material. Washed muscle gives more const. results than the unwashed muscle, but both give lower results as far as O_2 consumption is concerned in the beriberi animals. The difference is 25 and 10%, resp., for the washed and fresh muscle. With phosphate buffering the respiration of fresh muscle as well as the difference between normal and beriberi muscle is greater than with bicarbonate buffering, but the water-extd. muscles respire equally well in both buffers. The O_2 consumption is not proportional to the mass of the tissue. The interval between the killing of the pigeon and the respiration expt. diminishes the respiration but no definite relationship to the duration of the interval could be found. S. M.

Metabolism studies on the protein gain in suckling pigs. WERNER WÖHLBIER. *Friedrich Wilhelm Univ., Breslau. Biochem. Z.* 202, 29-69(1928).—Growing suckling pigs excrete progressively increasing amts. of N metabolic products so that continually a smaller fraction of the consumed food protein is retained by the growing organism. The protein gain during the first 4 weeks of life was found to be: 89.1, 84.8, 74.7 and 67.7%. The reason for this has been found partly in the diminishing protein content of the mother's milk, but more especially in the fact that on the av. the same amt. of protein per unit of body wt. undergoes destruction and, therefore, larger quantities of N are excreted with increasing wt. This relationship, however, is greatly obscured by individual variations not easily interpreted, so that the only definite finding is really the coincidence of the max. protein catabolism and the max. gain in wt. The N excretion was 0.957 g. per 100 g. gain in wt. and similar results are obtained if the calcn. is made on the basis of body surface of the animal. Per kg. gain in wt. the caloric expenditure was for the first week 3776 cal., for the second week 5032 cal., for the third week 5156 cal. and for the fourth week 5628 cal. The milk compn. showed the following variation: colostrum 13.58% protein and 3.65% fat; 1 and 2 days of lactation 8.56 and 3.08%, resp.; 3 to 5 days of lactation 6.17 and 7.65%, and from 6 to 50 days 5.50 and 9.12%, resp. The total daily output of milk varied from 4.5 to 4.9 kg.

S. MORGULIS

Mineral nutrition of agricultural animals. II. The effect of calcium carbonate on the development of calves. I. ZAVKOVSKII AND A. KRASNOKUTSKA. *Zoötech. Expt. Sta., Detskoje Selo, Leningrad. Biochem. Z.* 202, 239-45(1928).—Numerous data are given in the text. The addn. of $CaCO_3$ to the food had no effect upon the growth of calves.

S. MORGULIS

The vitamin B content of wheat bread baked with the addition of different quantities of yeast. ARTHUR SCHEUNERT AND MARTIN SCHIEBLICH. *Univ. Leipzig. Biochem. Z.* 202, 380-6(1928).—With the use of increasing amts. of the com. Melasse press yeast employed in bread making it is possible to produce from practically vitamin-B-free wheat flour bread of greater vitamin B content, but the quantities of yeast must be much larger than the usual (5 g.) and should be at least 15-30 g. Of course, with such large quantities of yeast the resulting bread is really no longer wheat bread. S. MORGULIS

An experience with a ketogenic dietary in migraine. TRUMAN G. SCHNABEL. *Ann. Internal Med.* 2, 341-7(1928).—Nine cases out of 23 showed some improvement on a ketogenic diet. This is sufficiently encouraging to warrant further study of high-fat diets.

JOHN T. MYERS

The influence of diet on natural immunity. YUKITAKA HOTTA. *Staatl. Kontrolle am Serotherapeutischen Inst. Wien. Contr. Bakl. Parasitenk., I Abt.* 106, 413-30(1928). White mice on a salt-poor or a vitamin-free diet showed a definitely increased susceptibility to infection with *B. typhi-murium*. This change was not parallel to growth rate.

JOHN T. MYERS

Nomenclature of the accessory food factors. ROBERT L. JONES. *Science* 68, 480-1(1928).—McCarrison's term *adivant* is favored as a class name to replace "vitamin." It is proposed to name the individual factors by the use of prefixes indicative of the diseases for which they are preventive, with *-amin* as a provisional ending. As soon as the chem. nature is known, this ending would be replaced with a more appropriate one. Thus, "vitamin A" would yield to *ophthalamin*, "vitamin B" to *polyneuramin* and *pellagamin*, "vitamin C" to *scorbutamin*, "vitamin D" to *rachilamin* (and this, if the sterol nature is established, to *rachitasterol*), and "vitamin E" to *sterilamin*. A. M. P.

A new method for characterizing the immediate physiological action of water-soluble vitamins. N. BEZSSONOV. *Bull. soc. chim. biol.* 10, 1179-98(1928).—More than 40 references are made to the literature. In previous studies of exptl. vitamin deficiency at least 14 days has been allowed for the appearance of characteristic symptoms. This paper gives details for conducting expts. in a manner to show certain effects of vitamin deficiency in the exptl. animal within 48 hrs. The method is based on the comparison between the state of animals subjected for 48 hrs. to a diet deprived of the vitamin in question but contg. an excess of all other vitamins, and the state of animals receiving the same ration made complete by the addn. of a sufficient quantity of the vitamin in question. The variations in body wt., food consumed and the character of the urine as shown by its Br-fixing power and its blue reaction with monomolybdophosphotungstic acid were selected as measures of the changes caused by the absence or presence of the vitamin. **Immediate physiological effects of avitaminosis C.** *Ibid* 1199-1212.—These tests were made with guinea pigs in lots of 6 to 14 animals each. With adult animals avitaminosis C within 48 hrs. diminishes the urinary excretion of phenol and paracresol and of C compds. generally as shown by a lowering of the Br absorption value of the urine. Vitamin C activates the urinary excretion of phenol and paracresol. With young full grown animals vitamin C helps to maintain the normal content of C compds. in the blood and favors their utilization by the tissues. It has both excretory and plastic functions. The increase of phenols in the blood in avitaminosis C causes an intoxication, which is accompanied by a diminution of appetite and inanition. The dose of vitamin C for the best health of the animal is equiv. to at least 4 times the dose which is just sufficient to maintain animals, which are on a scurvy-producing ration, in good health for 80 to 100 days. This method is of equal application to the study of avitaminosis B. L. W. RIGGS

Conditions of formation and destruction of vitamin D in the course of irradiation of ergosterol. (Mlle.) D. VAN STOLK, E. DUREUIL AND HEUDEBERT. *Compt. rend.* 187, 854-6(1928).—Pure ergosterol shows 4 absorption bands with max at 2932, 2815, 2700 and 2600 A. U., resp. During irradiation with the Chalonge and Lambrey hydrogen lamp, the first 3 bands disappear, the 4th band increases in intensity and, simultaneously, 2 new bands appear at 2503 and 2405. The band at 2600 is common to ergosterol and vitamin D. The band at 2503 develops an intensity equal to that of 2815 and 2700 of ergosterol. On continuing the irradiation these 3 bands do not disappear. The ultra-violet irradiation

conclusion is that the reaction ergosterol $\xrightarrow{\text{ultra-violet}}$ vitamin D \rightarrow decomposition product is a phenomenon of oxidation. The final destruction of vitamin D by the irradiation of the Hg lamp is not due to harmful radiations but to an oxidation, which, in alc. soln. cannot be avoided entirely, but which may be retarded by operating in an atm. of N. L. W. RIGGS

Variations of the urinary carbon-nitrogen ratio in the rat during starvation and deficiency of factor B. Differentiation of death by starvation and death by avitaminosis B. JEAN ROCHE. *Compt. rend. soc. biol.* 99, 671-3(1928).—Starvation in the rat causes a pronounced lowering in the urinary C/N ratio due to hypocarbonuria and hyperammonuria. During the first 10 to 15 days on a diet deficient in factor B the urinary C/N ratio remains about normal. From the beginning of loss of wt. there is a mild hypercarbonuria with an increase of C/N of about 0.2, which persists until about 8 days before death when a nervous crisis appears and the C/N ratio increases to 1.2 or 1.3 instead of the normal figure 0.8 to 0.9. The mechanism of death by starvation is not identical to that of death by avitaminosis B. L. W. RIGGS

Influence of food on the consistence of butter of cows. Chemical interpretation of the variations of consistence. A. TAPERNOUX AND M. LORCY. *Compt. rend. soc. biol.* 99, 1329-31(1928).—Two cows previously fed pasturage received a mixed ration of pasturage and pea hulls, a waste product of canning peas, during 18 days. The following figures give the usual chem. factors of the butter before and after 18 days of consumption of more or less pea hulls: water 19.3, 12; sol. volatile acids 27.94, 29.92; Reichert index (calcd.) 30.73, 32.9; insol. volatile acids 1.71, 3.53; iodine index 38.98, 20.57; sapon. index

218.4, 238; Crismer index (calcd.) 52.77, 50.6. The figures for the butter of the second cow were closely parallel to those of the first. The increased hardness of the butter, its changes in compn., notably of the iodine index, and the changes in the food of the cows appear to be closely related.

L. W. RIGGS

Influence of minute doses of iodine and iron on the growth of rats fed a vitamin-free diet. F. E. CHIDESTER, A. G. EATON AND G. P. THOMPSON. W. Va. Univ. *Science* 68, 432(1928).—These authors believe that the benefits ascribed to the "vitamins" are really due to minerals, and that these minerals acting as catalyzers make available the proteins, carbohydrates and fats supplied with them. The expts. are still in progress.

L. W. RIGGS

Changes in the hemoglobin and water contents of the blood of rabbits caused by differences in diet. HIROSHI TACHI. Tohoku Univ. *Tohoku J. Exptl. Med.* 11, 366-73(1928).—Two series of rabbits were kept in metal and wood cages, resp., and each were fed daily about 250 g. of "tōfukara." The rabbits in the metal cages were without straw, while those in the wood cages had an abundance of straw of which the animals ate freely. Other conditions were identical. Rabbits in the metal cages showed more hemoglobin and less water in the blood than those in the wood cages with straw.

L. W. RIGGS

Water economy. II. Effect of diet upon the amount of plasma. CARL KORTH AND HELLMUT MARX. Univ. Bonn. *Arch. exptl. Path. Pharm.* 136, 120-8(1928).—Considerable changes in plasma vol. can be brought about in dogs by the administration of NaCl and water.

G. H. S.

Effect of a continued dietary regimen on the secretory activity of the stomach. H. S. KOSHTOYANTZ. W. A. Obuch-Inst. z. Gewerbekrankh. in Moscow. *Arch. ges. Physiol.* (Pflüger's) 220, 642-52(1928).—Secretory activity depends upon the changes induced by a continued diet of a given type. With a meat diet the first phase of secretion is characterized by a prolonged latent period and a diminished secretion of gastric juice, while in the second phase the amt. secreted is increased, secretion continues for a long time and the acidity is increased. With a carbohydrate diet the latent period is shortened, the amt. of juice secreted in the primary phase is increased, while in the second phase the amt., duration, and acidity are all diminished.

G. H. S.

McCOLLUM, E. V., AND SIMMONDS, NINA: **Food, Nutrition and Health.** Baltimore: Published by authors. Reviewed in *Home Economist* 6, 362(1928).

F—PHYSIOLOGY

E. K. MARSHALL, JR.

The sugar equivalent of insulin under physiological conditions. K. HOLM. *Arch. exptl. Path. Pharmacol.* 121, 368-86(1927); *Physiol. Abstracts* 12, 564. H. G.

The alkali reserve of the blood at elevated body temperatures. FRANZ WALINSKI. Univ. Berlin. *Deut. med. Wochschr.* 54, 1831(1928).—When the body temp. was elevated to 41°, the alk. reserve dropped immediately, rose to a max. and then again gradually decreased to its original value.

ARTHUR GROLLMAN

The effect of acidity on the glycogen content of cells. H. ELIAS AND ISTVAN WEISS. *Wiener med. Wochschr.* 78, 1351-2(1928).—Increasing the $[H^+]$ of the medium in which frog eggs were suspended caused a gradual decrease in their glycogen content.

ARTHUR GROLLMAN

Decomposition of uric acid in blood. MARIE GOMOLINSKA. Biochemical Lab., Warsaw Univ. *Biochem. J.* 22, 1307-11(1928).—Uric acid is oxidized by blood at 37°. The products are allantoin, urea and ammonia.

BENJAMIN HARROW

Glucose in normal urine. ALI HASSAN. Faculty of Medicine, Cairo. *Biochem. J.* 22, 1332-40(1928).—Provided the necessary precautions are taken (such as removal by charcoal of certain substances which interfere with the osazone test), it can be shown that glucose is a constituent of normal urine.

BENJAMIN HARROW

New observations on the decomposition of "phosphagen" in the muscle. O. MEYERHOF AND O. NACHMANSOHN. Kaiser Wilhelm Inst. f. Biologie Berlin-Dahlem. *Naturwissenschaften* 16, 726-7(1928).—It was found recently that the phosphagen (guandimosphoric acids) decompn. during activity of the muscle is not directly related to the contraction, but is to the excitation process. During curare condition of the muscle (no excitation) only $\frac{1}{2}$ of the phosphagen decomposed with unchanged energy yield and lactic acid formation (cf. C. A. 23, 877). In a more marked degree the same effect appears on paralyzing the muscle with Me.NCl. During a 5-sec. tetanus which normally causes $\frac{1}{2}$ of the phosphagen to decompose only a trace of decompn. occurred after nerve paralysis. During the height of contraction a part of the phosphagen is

cleaved but it is restored almost completely as soon as limpness sets in. This amt. is the same which ordinarily is restored by anaerobic condition. Hill (*Proc. Roy. Soc. (London)* B103, 134(1928)) and Stella (*J. Physiol.* 1928) have found a favorable influence of phosphate in Ringer soln. on the excitability of the muscle. This action seems to be due to the restoration and maintenance of the phosphagen content; PO_4 in the soln. higher than in the muscle may even give synthesis of up to 95% of the creatine present to creatine phosphoric acid (normal 75 to 80%). The previous views on the energetics of the phosphagen problem need to be revised. B. J. C. VAN DER HOEVEN

Changes in the hemoglobin content of the blood of dogs following splenectomy. G. B. RAY AND B. STIMSON. *Proc. Am. Physiol. Soc., Am. J. Physiol.* 81, 506(1927).—Following splenectomy in dogs there was a gradual decrease in blood pigment and in the O_2 capacity of the blood. J. F. LYMAN

The constancy of amino acids in the sweat of normal individuals. G. A. TALBERT AND C. HAUGEN. *Proc. Am. Physiol. Soc., Am. J. Physiol.* 81, 510(1927).—Sweat contained from 1.66 to 4.76 mg. amino acids per 100 cc. There was no const. relation between the amino acids in the sweat and urine. J. F. LYMAN

Partition of potassium in the animal organism. ALBERT LEULIER, LÉON VELLUZ AND HENRI GRIFFON. *Compt. rend.* 187, 957-9(1928); cf. C. A. 23, 627.—With the authors' recent method for the microdetn. of K, the results showed that for the guinea pig the K in g. per kg. of dried tissue averaged: small intestine 18.4, heart 20.2, thigh muscle 23.1. In 5 analyses the wt. of K in g. per kg. of fresh small intestine muscle ranged from 2.49 to 2.67, in 8 analyses of heart muscle the range was 3.88 to 4.15, and in 9 analyses of thigh muscle the range was 5.06 to 6.10. L. W. RIGGS

Action of glutathione and hemoglobin on the growth of fibroblasts in vitro. ILLIAN E. BAKER. Rockefeller Inst. *Science* 68, 459-61(1928); cf. C. A. 20, 3467; Hart, C. A. 22, 3199.—Recent work is reviewed. It seems probable that hemoglobin and glutathione function, not only by regulating the respiratory oxidations or reductions within the cell, but also by causing a desirable oxidation-reduction potential in the medium. Without doubt they furnish constituents which are essential as foods for the synthesis of cell protoplasm. Further work is in progress. L. W. RIGGS

Transplantation of preserved ovaries. I. Endocrine effect of ovaries preserved on ice. ALEXANDER LIPSCHÜTZ. Univ. Concepcion, Chile. *Arch. ges. Physiol. (Pflüger's)* 220, 11-28(1928).—Guinea pig ovaries are so injured by exposure to temps. below 0° that transplantation is impossible, but if held at temps. between $+1^\circ$ and 3° the transplants take, even though the ovaries have been preserved for as long as 16 days, and the characteristic endocrine effect becomes manifest. II. Endocrine effect of ovaries preserved at room temperature. *Ibid* 29-34.—When preserved at temps. between 14° and 20° ovaries retain for 8 days their capacity to undergo transplantation and to induce endocrine effects. III. Microscopic studies. *Ibid* 321-8.—Microscopic studies of ovarian transplants showed that the results with ovaries which have been preserved on ice or at room temp. prior to implantation were the same as those obtained when fresh tissues were transplanted, although as regards follicles the implanted ovary was less active than is the normal organ. G. H. S.

Digestion leucocytosis. B. SZABUNIEWICZ. Univ. Krakau. *Arch. ges. Physiol. (Pflüger's)* 220, 35-43(1928).—Digestion leucocytosis begins in 1-3 hrs. after the ingestion of a protein-contg. meal and persists for from 10 to 30 hrs. The intensity and duration of the leucocytosis depend upon such factors as age, the leucocyte count at the beginning of the expt., and the quantity of food ingested. G. H. S.

Influence of the adrenals on the urea-forming and barrier functions of the liver. N. V. PUCHKOV AND V. V. KRASSNOV. Kasaner Staatl. Univ. *Arch. ges. Physiol. (Pflüger's)* 220, 44-55(1928).—After the extirpation of the adrenals the N of the blood and urine is considerably increased. This change chiefly involves the amino acids and the biogenic amines. Simultaneously there is an abrupt reduction in the quantity of urea. These changed relations as regards nitrogenous substances are referable to a loss in liver function, and are identical with the disturbances associated with removal of the liver. The increased values for amine N occur chiefly at the expense of the biogenic amines, and to them can be ascribed the death of the animal in cases where the choline accumulation is not pronounced. Isolated liver from an animal deprived of adrenals is far less active than is the liver from a normal animal in attacking NH_4 salts and biogenic amines, and it is considerably less effective in producing urea. Thus, the increased amines of the blood and urine are due to a loss in the barrier function of the liver. Exts. of fresh adrenals will restore the liver functions. The active principle to which these activities are due is sp. for the adrenal but it is not adrenaline. It is extremely labile and decomposes within 15 to 20 min. G. H. S.

The heart hormone. R. RIGLER AND R. SINGER. Univ. Wien. *Arch. ges. Physiol.* (Pflüger's) 220, 56-68(1928).—There is no conclusive evidence that the substance described by Haberlandt is a hormone in the strict sense of the word. G. H. S.

Permeability of striated muscle to ions. RUDOLF MOND AND KLAUS AMSON. Univ. Kiel. *Arch. ges. Physiol.* (Pflüger's) 220, 69-81(1928).—From perfusion expts., the frog leg being used, it appears that resting, uninjured muscle fibers are impermeable to anions and to the cations Ca, Li and Na. They are, however, permeable to K and Cs. When perfusion takes place with the amt. of K in the Ringer soln. at about 13 mg. % the amt. of K in the muscle increases, but when there is less K in the perfusion fluid K is given up by the muscle. G. H. S.

Mechanism whereby the blood sugar is changed by hypophysis extract. GUSTAV FRITZ. Péter Pázmány Univ. of Budapest. *Arch. ges. Physiol.* (Pflüger's) 220, 101-6(1928); cf. C. A. 22, 1405.—Intramuscular injections of exts. of the posterior lobe of the hypophysis increase the blood sugar in mammals, but only in a secondary or indirect fashion through their effect on the mobilization of adrenaline. This latter action is in turn due to a general stimulation of the sympathetic. G. H. S.

Electrolyte equilibrium in membranes with an elective permeability to ions, and its biological significance. HANS NETTER. Physiol. Inst. Kiel. *Arch. ges. Physiol.* (Pflüger's) 220, 107-23(1928).—A discussion of the questions of permeability and electrolytic equil. in relation to metabolic processes. G. H. S.

Effect of thyroid on the higher nerve functions in dogs. I. Influence of single doses of thyroid upon conditioned reflexes under simple experimental conditions. B. M. SAVADOVSKII AND A. L. SACK. Kommunistischen J. M. Swerdlow Univ. *Arch. ges. Physiol.* (Pflüger's) 220, 155-75(1928).—During the first few days after the exptl. administration of thyroid dogs exhibit a phase of generalized suppression of their conditioned reflexes. This phase is followed by one in which irritability is increased and the latent period is shortened. These effects are clearly shown in expts. involving the secretion of saliva. G. H. S.

Effect of frog blood on vagus substance and on acetylcholine. F. PLATTNER AND R. BAUER. Univ. Innsbruck. *Arch. ges. Physiol.* (Pflüger's) 220, 180-2(1928).—Both mammalian blood and frog blood destroy the activity of vagus substance and acetylcholine. G. H. S.

Glycogen content of cartilage and its significance. AUGUSTE HOFFMANN, G. LEHMANN AND ERNST WERTHEIMER. Univ. Halle a. S. *Arch. ges. Physiol.* (Pflüger's) 220, 181-93(1928).—The quantity of glycogen to be found in cartilage varies very greatly (0.02 to 0.6%), being dependent upon such factors as age and the type of cartilage as well as upon individual characteristics of the animal. The amt. of glycogen present is directly related to the changes which cartilage undergoes. Thus, in young animals and in older embryos the cartilages of the ribs undergoing slow calcification show definitely lower values for glycogen in those portions where the calcification is most advanced. In older animals this difference becomes less marked, or the relationship may even be reversed. In general, increased calcification, and increased age correlate with a diminished glycogen content. G. H. S.

Hormone of heart activity. X. Action of the hormone on warm-blooded animals. HABERLANDT. Univ. Innsbruck. *Arch. ges. Physiol.* (Pflüger's) 220, 203-11(1928); cf. C. A. 22, 4159.—With isolated, as well as with *in situ* exposed rabbit hearts the hormone prepn. in dilns. up to 1:100 caused a strengthening, and an accelerating effect. It activates the pulse and favors rhythmic action. Higher concns. of the hormone cause a transitory fall in blood pressure because of vasodilatation. G. H. S.

Hypodynamic heart conditions and the heart hormone. ALFRED TRITTEL-BERNARD. Univ. Bukarest. *Arch. ges. Physiol.* (Pflüger's) 220, 212-9(1928).—Distention of the hypodynamic frog heart by inflation with air or other mechanical means expresses from the heart musculature an active substance, of hormonal nature but not identical with Loewi's accelerans substance, which favors heart activity. G. H. S.

Strict connection between contractility and irritability. Origin of stimuli in contracting heart muscle during different stages of the contraction. S. DE BOER. *Arch. ges. Physiol.* (Pflüger's) 220, 220-33(1928).—Contractility and irritability are not based upon two different processes. G. H. S.

Quantitative relation between hemoglobin content and the oxygen supply of the body. FRITZ MAINZER. Med. Abt., Städtischen Krankenhause, Altona/Elbe. *Arch. ges. Physiol.* (Pflüger's) 220, 234-42(1928).—Detns. of the hemoglobin under different degrees of satn. showed that with increasing concn. of hemoglobin the fall in the O pressure in the capillaries is at first very abrupt and then diminishes, so that it appears

that increases in hemoglobin exert less effect upon the O supply of the tissues when the initial hemoglobin concn. is high. G. H. S.

Mechanism of hypotonic hemolysis. JULIUS BARON. *Arch. ges. Physiol.* (Pflüger's) 220, 243-50(1928).—During partial hypotonic hemolysis only a fraction of the red cells are disintegrated, the majority of them yielding up a portion of their hemoglobin without being destroyed. G. H. S.

The so-called reversion of hemolysis. JULIUS BARON. *Arch. ges. Physiol.* (Pflüger's) 220, 251-67(1928).—The clearing of a blood corpuscle suspension is not necessarily identical with hemolysis. The transformation of a laked soln. to an opaque condition does not represent a true reversion of hemolysis. G. H. S.

Hemolytic function of the spleen. III. Relation between erythrocyte resistance and blood cholesterol, as modified by splenectomy. GEORG FRENKEL AND V. N. NEKLUDOV. Leningraden Med. Inst. *Arch. ges. Physiol.* (Pflüger's) 220, 356-60(1928).—In dogs, cats and rabbits splenectomy is followed by an increase in the cholesterol content of the blood, and in some instances the resistance of the erythrocytes is also increased, but the latter change takes place only when the hypercholesterolemia is marked. G. H. S.

Reflex origin of digestion leucocytosis. B. SZABUNIEWICZ. *Physiol. Inst. Krakau Arch. ges. Physiol.* (Pflüger's) 220, 366-70(1928).—Digestive leucocytosis can occur only through nervous activity. When dogs are fed regularly a leucocytosis develops after each feeding, and after this reflex has become established the leucocytosis will appear even though feeding does not take place, indicating the conditioned reflex character of the leucocytosis. G. H. S.

Formation of urine in the frog kidney. XV. Microscopic observation of glomerulus function in the perfused frog kidney. HEINZ BRÜHL. Univ. Kiel. *Arch. ges. Physiol.* (Pflüger's) 220, 380-98(1928); cf. C. A. 22, 4161.—By direct observation it appears that during artificial perfusion the no. of glomeruli involved in activity is relatively const., and that any gradual reduction in this no. is indicative of damage. By means of the addn. of caffeine or glycocoll (after a lack of glycocoll) glomeruli which have become inactive may be restored to function. In reversible cyanide asphyxia urine formation diminishes, although the circulation in the glomeruli is unchanged. Caffeine dilates the glomerular capillaries, while a lack of glycocoll completely stops the glomerular circulation. The addn. of glycocoll restores circulation but not urine formation. Increasing the pressure of the perfusion fluid augments perfusion but causes very little change in the glomeruli, and usually there is no increase in the formation of urine. G. H. S.

The carbohydrate of the skeletal muscles in normal rabbits. HANS HANDOVSKY AND KURT WESTPHAL. Univ. Göttingen. *Arch. ges. Physiol.* (Pflüger's) 220, 399-409(1928).—In the healthy adult rabbit the quantities of carbohydrate and of lactic acid in the muscles vary only within narrow limits, although each of them may be varied independently. Seasonal changes in the amts. of carbohydrate and lactic acid may be detected. A transformation of carbohydrate into lactic acid during the killing of the muscle probably does not take place and changes in the glycogen or lower sugar content of muscle referable to treatment of the animal must be regarded with suspicion unless the values depart widely from normal or the expts. are abundantly controlled. G. H. S.

Acid-base composition of gastric secretions. JAMES L. GAMBLE AND MONROE A. McIVER. Harvard Med. School. *J. Exptl. Med.* 48, 837-47(1928).—The chief inorg. factors in secretion obtained from isolated pouches constructed in the fundus and in the pyloric antrum of the cat's stomach were found to be Cl ion and fixed base. In a series of samples obtained from the fundic pouch, Cl ion was approx. stationary at 165 cc. 0.1 N per 100 cc. During digestion of food in the stomach, secretions from the pouch contained fixed base in amts. varying considerably from an equiv. of 47 cc. 0.1 N per 100 cc. Material allowed to remain in the pouch after the completion of food digestion in the stomach showed an increasing content of fixed base, to as much as 140 cc. 0.1 N per 100 cc. The alk. secretion taken from a pyloric pouch contained fixed base in excess of Cl ion. C. J. WEST

Acid-base composition of pancreatic juice and bile. JAMES L. GAMBLE AND MONROE A. McIVER. Harvard Med. School. *J. Exptl. Med.* 48, 849-57(1928).—Pancreatic juice contains fixed base at approx. the concn. found in the blood plasma. Cl-ion is present in concns. varying from 25 to 50% of the fixed base value and the remainder of the acid equiv. is composed of HCO_3 ion. In bile, as delivered by the liver, both the fixed base and Cl-ion values correspond closely with their respective concns. in blood plasma. In gall bladder bile, however, the concn. of fixed base is,

roughly, double that in hepatic duct bile and Cl ion has been almost entirely removed.

C. J. WEST

Body fluid changes due to continued loss of the external secretion of the pancreas. JAMES L. GAMBLE AND MONROE A. McIVER, WITH PAULINE MARSH AND DOROTHY SLOAN. Harvard Med. School. *J. Exptl. Med.* 48, 859-69(1928).—Explanation of the effects of continued loss of the external secretion of the pancreas is offered. C. J. W.

Calcium and inorganic phosphorus in the blood of rabbits. IV. Influence of light environment on normal rabbits. WADE H. BROWN AND MARION HOWARD. Rockefeller Inst. Med. Research. *J. Exptl. Med.* 49, 103-26(1929); cf. *C. A.* 22, 1800-1.—A study was made of whether a light environment comprising radiations of comparatively long wave length and only a small amt. of energy was capable of affecting the chem. equil. of the blood as indicated by the Ca and inorg. P content of the blood of normal rabbits. The effects produced by prolonged exposure to neon light and darkness were compared with a varying environment of diffuse, filtered sunlight and a change from 1 environment to another. The chem. equil. of the blood was definitely affected by the conditions employed and the effects produced could be correlated with differences in org. constitution on the 1 hand and, on the other, with certain differences in the functional activity of the same animals, involving nutrition and growth and the proliferative activity of hair follicles.

C. J. WEST

Calcium and phosphorus metabolism. V. Study of the bone trabeculae as a readily available reserve supply of calcium. WALTER BAUER, JOSEPH C. AUB AND FULLER ALBRIGHT. Mass. Gen. Hosp. *J. Exptl. Med.* 49, 145-61(1929).—Bone trabeculae are easily depleted by the prolonged administration of parathormone, long-continued negative Ca balance and growth. A long-continued high Ca diet results in a rapid accumulation of the trabeculae. Alizarin red is deposited in newly formed bone; its use has made clear that easily mobilizable Ca is not deposited in the shafts of adult animals but in the trabeculae of bone; they therefore serve as the storehouse of readily available Ca. The shafts have a slow progressive exchange of inorg. salts and are not influenced except in the case of unusual body demands. Parathormone administration to growing or adult cats has been without effect. Daily injection of parathormone in growing rats results in an increased no. of trabeculae and smaller bones.

C. J. WEST

G—PATHOLOGY

H. GIDEON WELLS

Studies of urea excretion. IV. Relationship between urine volume and rate of urea excretion by patients with Bright's disease. E. MÖLLER, J. F. McINTOSH AND D. D. VAN SLYKE. *J. Clin. Investigation* 6, 485-504(1928).—The diurnal variation of urea excretion in normal individuals and patients with Bright's disease. E. M. MACKAY. *Ibid* 505-16.

ARTHUR GROLLMAN

Uranin as a means of diagnosing meningitis. J. C. SCHIPPERS AND HENDRIKA PETERS. *Nederland. Tijdschr. Geneeskunde* 72, II, 4514-25(1929).—Uranin, given by mouth in a dose of 20 mg. per kg. body wt., passes over into the cerebrospinal fluid in a concn. of more than 0.04×10^{-4} , which is not the case in any other affection of the central nervous system.

R. BEUTNER

The sugar cure of epilepsy. G. C. VAN WALSEM. *Nederland. Tijdschr. Geneeskunde* 72, II, 4673-5(1929).—Epileptics have a higher blood-sugar content during those periods which are free from fits.

R. BEUTNER

A study of the chlorine interchange between red blood cells and plasma in asphyxia. T. KUBO AND T. MITSUI. Hokkaido Imp. Univ. *Japan Med. World* 8, 259-61(1928).—From detns. on the blood of normal rabbits by Rusznyak's method for estn. of chlorides in the blood, it was concluded that the chlorides of whole blood and erythrocytes always increase while those of plasma decrease.

N. K.

Carbohydrate metabolism of certain pathological overgrowths. HERBERT G. CRABTREE. Imperial Cancer Research Fund, London. *Biochem. J.* 22, 1289-98(1928).—C. finds that the magnitude and relationships of the respiratory and glycolytic processes, found by Warburg to be characteristic of malignant tissues (see Warburg, "Ueber den Stoffwechsel der Tumoren," Springer, Berlin, 1926), are not sp. for malignant tumors but are a common feature of pathol. overgrowths.

B. H.

The distribution of the globulin and albumin fractions in the blood and in the urine in nephrosis. F. W. SCHULTZ AND M. R. ZIEGLER. Univ. of Minn. *Am. J. Diseases Children* 36, 756-63(1928).—The changes in the blood plasma which accompany nephrosis in children are: a decrease in the total concn. of protein; an increase in the concn.

of cholesterol; and a lowering or an inversion of the albumin-globulin ratio. The non-protein N content of the blood varies from 19.6 to 43.2 mg. per 100 cc. during nephrosis. The urine may contain fat and globulin as well as albumin, with the concn. of the globulin eventually exceeding that of the albumin. The kidney appears to maintain its ability to secrete the end products of protein metabolism, but loses some of its selectivity.

E. R. MAIN

Observations on the chloride, sugar and calcium contents of the cerebrospinal fluid in children. A. VICTOR NEALE AND MARION S. ESSLEMONT. *Arch. Disease Childhood* 3, 243-56(1928).—The chloride, sugar and Ca contents of the cerebrospinal fluid in children, in diseases with symptoms referable to the nervous system and not involving the meninges, are usually normal, but may become subnormal during pneumococcal infections. The chloride and the sugar contents of the cerebrospinal fluid in both tuberculous and meningococcal meningitis fluctuate with the progress of the disease. Tuberculous meningitis is assocd. with low concns. of the sugar and chloride during the early stages of the disease and with concns. approaching the normal during the later stages. The concns. tend to decrease progressively during fatal meningococcal and pneumococcal meningitis, but in recoverable cases, the early, low concns. may be followed by a gradual rise to the normal. The Ca content of the cerebrospinal fluid becomes slightly increased from the normal value in diseases involving the meninges and may become markedly increased during convulsions.

E. R. MAIN

The influence of experimental leucocytosis on the production of hemolytic amboceptors. ROBERTO FRANZA. *Boll. soc. ital. biol. sper.* 3, 714-9(1928).—Rabbits injected daily with nucleic acid, Na nucleinate and NaI, followed by injections of a suspension of beef red blood corpuscles at a time when leucocytosis was the greatest, showed a noticeable increase in the production of hemolytic amboceptors as compared to the control animals. The increase in the value of the hemolytic serums was not proportional to the degree of leucocytosis observed in each individual animal. The production of hemolysins was almost the same in those rabbits which showed only a moderate increase in leucocytes as in those which presented a very marked leucocytosis.

PETER MASUCCI

The relation between the urinary carbon : nitrogen and of the "vacat oxygen : nitrogen" quotients in phlorhizin diabetes. A. ROBERT PESKIN. Univ. Berlin. *Biochem. Z.* 202, 5-13(1928).—In phlorhizin-diabetic dogs and rats there are eliminated through the urine increasing amts. of dysoxidizable substances beside sugar. These substances must be particularly rich in H and, therefore, have nothing in common with ketone bodies. The exptl. animals showed absence of glycogen in their livers and in dogs in addn. there was fatty degeneration of the organs.

S. MORGULIS

The treatment of acid mouth. J. E. RUSH AND W. W. ZWICK. Univ. of Kentucky *Ann. Internal Med.* 2, 550-1(1928).—The oral administration of HNaCO_3 and the use of an alk. mouth wash increased the acidity and consequent erosion of teeth in a case which was studied. Dobell's soln. decreased it. The acid was apparently due to bacterial action. An alkali neutralized the free acid, thus allowing more to be produced in accordance with the law of mass action. Dobell's soln. decreased the acidity by slowing bacterial action.

JOHN T. MYERS

The influence of parenteral injections of lipoids on hemolysin formation in rabbits. HANS GROSS. Inst. für Exptl. Therapie, "Emil von Behring," Marburg-Lahn. *Centr. Bakt. Parasitenk.*, I Abt., 109, 8-10(1928).—Simultaneous parenteral injections of cholesterol, lecithin or ext. of beef heart together with sheep erythrocytes had no augmenting influence on hemolysin production.

JOHN T. MYERS

Plasma coagulase and the pathogenicity of staphylococci. B. KREMKES. Stadtischen Hyg. Univ.-Inst. zu Frankfurt a. M. *Centr. Bakt. Parasitenk.*, I Abt., 109, 11-6(1928).—The plasma coagulase reaction was pos. only with pyogenic staphylococci, not with non-pathogenic varieties or with other bacteria. It paralleled a pos. Dreyer virulence test, and hemolysis production. Neither normal human nor horse serum, or human serum from staphylococcus diseases, which was high in antistaphylococcal activity inhibited the coagulase.

JOHN T. MYERS

Immunization against trypanosome infection in stallions with the help of Bayer 205 (Naganol). V. L. YAKIMOV, V. S. PELAVINE AND S. F. RUBKEVICH. Veterinar Bakteriolog. Inst. zu Leningrad. *Centr. Bakt. Parasitenk.*, I Abt., 109, 48-50(1928).—Three injections of from 3 to 3.5 g. of Naganol conferred a definite resistance to trypanosome infection.

JOHN T. MYERS

Phagocytosis-inhibiting substances from bacteria, especially "coccoimmunogens" or "immunological trias." S. FUJITSUNA. Univ. Kyoto. *Centr. Bakt. Parasitenk.*, I Abt., 109, 93-8(1928).—The centrifuged supernatant fluid from cultures of cholera

vaccine mixed with NaCl soln. suspensions of staphylococci and injected into guinea pig increased phagocytosis and decreased the usual leucocytic response to the staphylococcus. Boiling for 20 min. increased the effect of the cholera exts. Such exts. increased the amt. of antistaphylococcus agglutinins as well as producing anti-cholera agglutinins. Without phagocytosis no immune bodies are formed, the 2 processes going hand in hand. These substances sol. in NaCl soln. are called "immunological trias."

JOHN T. MYERS

The role of the lipoids of bacteria to their phagocytosis in the circulating blood of experimental animals. II. The influence of homologous and heterologous lipoids on phagocytosis, in the blood stream. Y. ISCHIMOTO. Univ. Kyoto. *Centr. Bakt. Parasitenk.*, I Abt., 109, 100-7(1928).—The addn. of homologous or heterologous lipoids to suspensions of staphylococci decreases the toxicity of these organisms, as manifested by a less marked leucocytosis. Phagocytosis is more active. Antigenic power is increased. The effect of homologous lipoids was greater than that of heterologous lipoids. Proteins make the specificity of an antigen while lipoids increase antigenic power.

JOHN T. MYERS

Can the administration of narcotics weaken a positive Wassermann reaction or Meincke flocculation test or make them entirely negative? F. WEYRAUCH. Univ. Jena. *Centr. Bakt. Parasitenk.*, I Abt., 109, 129-34(1928).—A positive Wassermann reaction may be weakened or become entirely negative following the administration of paraldehyde or alc. The Meincke flocculation reaction was not thus influenced. This might influence a diagnosis especially in psychiatry.

J. T. M.

The meaning of the spleen in spirochetal infections. P. REGENDANZ. Inst. für Schiff- u. Tropenkrankheiten zu Hamburg. *Centr. Bakt. Parasitenk.*, I Abt., 109, 321-7(1928).—Removal of the spleen almost prevents antibody formation against spirochetes; hence it must be the principal site of antibody formation in these infections.

JOHN T. MYERS

Investigation on the individual variations in hemolysin production in rabbits and the possible influence of the oral administration of lipoids. HANS GROSS. Inst. für Exptl. Therapie "Emil von Behring," Marburg-Lahn. *Centr. Bakt. Parasitenk.*, I Abt., 109, 339-41(1928).—Rabbits under 1 year of age do not produce nearly as much hemolysin as do older rabbits. There are some species differences, "hasen" rabbits producing a low titer. Sex or pregnancy made no difference. The daily oral administration of 1 g. of either cholesterol or lecithin during immunization had no influence.

JOHN T. MYERS

Normal hemolysins in animals and the erythrocyte content of heterologous antigens. E. V. EKSEMPLIARSKII. Microbiol. Forschungsinst. des Volksbildungskommissariats in Moskau. *Centr. Bakt. Parasitenk.*, I Abt., 109, 341-4(1928).—No normal hemolysins were found in the blood of the sheep, chicken, turtle or cat, for these or other species, even in cases where heterologous antigens exist in the erythrocytes.

JOHN T. MYERS

Studies in serum calcium. II. Experimental tuberculosis—intraperitoneal inoculation. J. C. HOYLE. Pharmacol. Lab., Cambridge. *J. Pharmacol.* 34, 259-76 (1928), cf. C. A. 22, 1806.—Rabbits given intraperitoneal injection of bovine *B. tuberculosis* show a fall in serum Ca. When the inoculating dose is small and life after inoculation is more prolonged, changes in serum Ca show three stages: (1) a slight rise, followed by a slight fall (both within the physiological range) during the 1st 3 weeks; (2) a slight rise during the 4th week of disease; (3) a progressive fall in serum Ca during the terminal stages. Changes in wt. were also observed during these three periods, there occurring first a slight increase, then a period when the weight was more or less constant, and finally a steady decline. III. Experimental tuberculosis—subcutaneous inoculation. *Ibid* 317-24.—Changes in serum Ca after subcutaneous inoculation with *B. tuberculosis* were as follows: during the 1st 3 or 4 weeks a slight rise; from the 4th to 10th week a fall of 16 to 37%; from about the 8th or 10th week to death a rise to normal or slightly higher. These changes coincide with definite stages of the disease—(1) a local lesion which finally ulcerates and discharges caseous material, (2) "open" lesion, which discharges freely, and (3) healing of local lesion, which may or may not be complete before the animal dies from generalized disease.

C. RIEGEL

Physiology of fever. Importance of the thyroid and of the adrenals in fever. Relation of the adrenals to the leucocytosis and the hypothetical leucocytosis nervous center. W. BORCHARDT. Inst. Schiff- u. Tropenkrankh., Hamburg. *Arch. expil. Path. Pharmacol.* 137, 45-70(1928); cf. C. A. 22, 4617.—Apparently diverse fever-producing agents operate through the same physiol. mechanisms. Decapitate or decerebrate cats fail to respond to stimuli, such as tetrahydronaphthylamine, which induce

fever. The thyroid glands and the adrenals are not essential to the development of fever, but the adrenals are requisite for the appearance of a neutrophile leucocytosis.

G. H. S.

Excretion of choline in the urine. PH. KLEE AND S. PETROPULIADES. Med. Klin. München. *Arch. expil. Path. Pharmacol.* 137, 129-42(1928).—Studies conducted upon rabbits, dogs and man showed that the amt. of choline excreted in the urine is governed by the diet and the mode of life. During hunger it falls and with the addn. of lecithin to the diet it increases, as it does also after athletic activity. In those diseases which are characterized by severe tissue destruction extremely high values are found. Choline chloride introduced into the stomach or the duodenum does not increase the amt. to be found in the urine, but if administered intravenously or per rectum excretion is increased.

G. H. S.

Cause and origin of pathologic hemagglutination (panagglutination). JENO KRAMÁR AND LADISLAUS R. LINER. Elizabeth-Univ. in Pécs. *Arch. expil. Path. Pharmacol.* 137, 315-28(1928).—In chronic inflammatory diseases attended by considerable destruction of tissue, the serum acquires an agglutinating property, unrelated to group-sp. agglutination, active upon the red cells of all human groups. This behavior is due to the formation during the disease of auto-lipoid-antibodies directed against the lipoids of the erythrocytes. These panagglutinins may be adsorbed from such sera by lipoids derived from pus.

G. H. S.

Irritability and inflammation. I. Gas metabolism. F. BRICKER. Med. Inst. in Charkow. *Arch. expil. Path. Pharmacol.* 137, 329-38(1928).—Inflammatory reactions were induced by chem. agents, such as xylol; by hot water, and by mere mech. friction, and detns. of the CO_2 and O_2 of the blood were made. The response to chem. irritation was of two types; either the O_2 content of the treated ear was greater, and the CO_2 content the same as that of the untreated ear, or the O_2 might be changed but little while the CO_2 was markedly increased. Two types of response were also found to result from the application of heat: the first showing an increased CO_2 in the treated ear with but little change in O_2 ; the second showing but little difference between the bloods taken from both ears. To mech. stimulation no change in gas relationships resulted. **II. Sugar metabolism.** *Ibid* 339-42.—The inflammatory response was characterized by an increased dissimilation and a reduced assimilation.

G. H. S.

Anoxemia and the circulation. KL. GOLLWITZER-MEIER. Univ. Greifswald u. Frankfurt a. M. *Arch. ges. Physiol.* (Pflüger's) 220, 434-47(1928).—Reduction of the O pressure of the inspired air from 160 to 120 mm. causes but slight changes in the circulation of dogs in the acute expt. Both the arterial and venous pressures remain unchanged while the frequency and min.-vol. of the heart are increased. When the O pressure is reduced below 100 mm. the arterial pressure is increased as is both the frequency and the min.-vol. Venous pressure does not fall, but rather tends to increase also. When the O satn. is below 40 mm. the min.-vol. falls below normal values while the frequency is further increased. In the final stages of anoxemia the heart rate falls as does the arterial pressure and the min.-vol. while venous pressure augments. A parallelism exists between respiratory regulation and circulation. The regulatory mechanism is central, the stimulus being changes in the p_{H} .

G. H. S.

H—PHARMACOLOGY

A. N. RICHARDS

New experimental data on the biochemistry of the heart. R. AGNOLI. *Boll. soc. ital. biol. sper.* 2, 1049-52(1927).—In the abstract in *C. A.* 22, 2410, the author name is incorrectly given as Messini.

E. H.

New means of adsorption therapy. H. BECHHOLD. Inst. f. Kolloidforschung, Frankfurt a. M. *Japan Med. World* 8, 262-6(1928); cf. *C. A.* 22, 4136.—A silver chloride silicic-acid-gel called "Silargel" and a silver chloride silicic-acid-silver charcoal called "Adsorgan" have been developed which show much greater adsorptive capacity than other materials ordinarily employed for the adsorption of toxins, bacteria, etc., in the intestinal and other tracts.

N. K.

The influence of epinephrine and insulin upon the distribution of glycogen. N. R. BLATHERWICK AND MELVILLE SAHYUN. Potter Metabolic Clinic, Santa Barbara, Calif. *J. Biol. Chem.* 81, 123-7(1929).—"Epinephrine, when injected into rabbits, causes glycogen to be deposited in the liver. The muscle glycogen appears to decrease at the same time. The amt. of epinephrine used and the time chosen for the expt. undoubtedly have a great bearing upon the result. The diminished resistance of rabbits to insulin following the injection of epinephrine cannot be attributed to a depletion of

liver glycogen." These results support those recently reported by Cori and Cori (C. A., 22, 4590) in similar expts. on rats.

A. P. LOTHROP

The influence of choline upon blood-sugar content. FRANK P. UNDERHILL AND JOSEPH PETRELLI. Yale Univ. *J. Biol. Chem.* 81, 159-62(1929).—Choline administered subcutaneously to fasting rabbits in suitable doses produces a significant hyperglucemia without glucosuria. The hypoglucemia reported by previous investigators was never encountered. Comparable doses of choline injected into fasting dogs does not appreciably alter the content of blood sugar.

A. P. LOTHROP

The influence of alcohol on absorption of glucose. Part I. NORA EDKINS. Bedford College, London. *J. Physiol.* 65, 381-4(1928).—Glucose placed in the cat stomach with the pylorus ligated disappeared at the rate of 0.3 g. per hr. When alc. (10% soln.) was also present the rate was more than doubled, 0.67 g. per hr. In a ligated segment of the small intestine 100 cm. long glucose was absorbed at the rate of 0.59 g. per hour without alc. and 0.78 g. per hr. with alc. **The effect of alcohol on the absorption of glucose from the alimentary tract. Part II.** NORA EDKINS AND MARGARET M. MURRAY. *Ibid* 66, 102-8(1928).—When EtOH and glucose were introduced together into the digestive tract of an animal under amylal anesthesia the EtOH accelerated the rate of glucose adsorption as shown by the increase in blood sugar in these animals in comparison with controls that were given EtOH alone or glucose alone.

J. F. LYMAN

Experiments with tar or mice stained with trypan blue. G. A. KREUZWENDEDICH VON DEM BORNE. *Nederland. Tijdschr. Geneeskund.* 72, II, 5689-96(1929).—It is impossible to produce blastoma by tarring the back of mice which have been injected with trypan blue, using 0.25 cc. of a 1% trypan blue soln. 6 times. Even after tarring 30 times during 27 weeks no trace of blastoma was formed.

R. BEUTNER

The dosage of standardized ovarian preparations containing menformone. E. LAQUEUR, A. H. M. J. VAN ROOY, K. DE SNOO, S. E. DE JONGH AND I. A. WIJSENBECK. *Nederland. Tijdschr. Geneeskunde* 72, II, 6184-8(1929).

R. BEUTNER

Chronic poisoning from potassium cyanide administered in a single dose by mouth. RAESTRUP. Univ. Leipzig. *Deut. med. Wochschr.* 54, 2179(1928).—The case of chronic or delayed poisoning by KCN, as described by Ernst (C. A. 23, 198), is considered as obviously due to acute poisoning.

ARTHUR GROLLMAN

The pharmacodynamical action of chloralose. SWALE VINCENT AND J. H. THOMPSON. Middlesex Hosp. Med. School. *J. Physiol.* 65, 449-55(1928); cf. C. A. 22, 1627.—Chloralose introduced intravenously raised blood pressure, inhibited the sciatic and anterior crural nerves to all stimuli, augmented the vasomotor reflexes of a depressor character and exaggerated the effect on blood pressure obtained by stimulating the peripheral end of the divided left splanchnic nerve. Chloralose is believed to stimulate the production and discharge of adrenaline from the adrenal gland.

J. F. LYMAN

The effect of morphine on the adrenaline content of the suprarenal glands. G. P. CROWDEN AND M. G. PEARSON. *Proc. Physiol. Soc., J. Physiol.* 65, xxxii(1928).—Morphine alone did not cause exhaustion of the adrenaline content of the adrenal gland; but morphine plus excitement or morphine given to a cold animal brought about a depletion of the innervated gland.

F. L. LYMAN

The biological action of iodides. JOHN FREUD. *Proc. Physiol. Soc., J. Physiol.* 65, xxviii(1928).—Injection of KI in Ringer soln. into the jugular vein of dogs gave an increase in O₂ consumption of about 30%. Injection into the saphenous vein had but little effect. Of 8 thyroidectomized dogs 3 reacted to large doses of KI intrajugularly.

J. F. LYMAN

The influence of ethyl alcohol upon the oxidative metabolism and the mechanical efficiency of the dog's heart. M. B. VISSCHER. *Proc. Am. Physiol. Soc., Am. J. Physiol.* 81, 512(1927).—The presence of EtOH in the circulating blood caused a marked dilatation of the ventricles of the dog heart and a reduction in its mechanical efficiency.

J. F. LYMAN

The comparative toxicity of quinine and quinidine. P. M. NICCOLINI. *Boll. soc. ital. biol. sper.* 3, 698-9(1928).—Most treatises state that quinidine is less toxic than quinine. N. calls attention to a fatal case of poisoning in a normal human being by the ingestion of 10 g. quinidine sulfate. Statistical studies showed that an equal quantity of quinine sulfate had not been fatal to normal human beings. Quinidine is probably more toxic because it is less completely and less rapidly transformed and fixed by the parenchyma. The organ most affected is the heart. The ever-increasing use of quinidine in therapy makes it necessary to correct the error that it is less toxic than quinine.

PETER MASUCCI

Variations in muscle phosphagen caused by strychnine and by dissection of the nerves. G. ZANGHI. *Boll. soc. ital. biol. sper.* 3, 723-6(1928).—Five white rats were

injected with a soln. of strychnine nitrate graduated in strength so that the animal died only after repeated spasms. Before the injection, one of the soleus muscles was removed and its normal inorg. phosphoric acid and phosphagen were detd. After the death of the animal, the corresponding muscle from the other side was removed. The results show that the phosphagen content of the muscles diminished more or less markedly until it disappeared as a result of strychnine spasms. The diminution was 3-17%. There was a corresponding increase in inorg. phosphoric acid. Ten rats were operated on and a unilateral dissection of sciatic nerve was made. By the technic already described detns. of phosphoric acid and phosphagen were made. During the first 72 hrs. of muscular inactivity the phosphagen increased; this increase was greater compared with the 20-24-hr. test, but smaller after the 72-hr. test. From the 5th to the 90th day after the operation there was a gradual diminution of phosphagen in the paralyzed muscle.

PETER MASUCCI

The effect of thyroxine on the glycogen content of skeletal muscles and of the liver in guinea pigs. O. BÖSL. Univ. München. *Biochem. Z.* 202, 299-319(1928).—A subcutaneous injection daily of 5-6 doses of 0.2 mg. thyroxine each into young as well as grown guinea pigs causes a marked drop in wt. on a diet sufficient to maintain the body wt. of untreated normal animals. The skeletal muscles do not lose any glycogen under the condition of the expt. but the liver glycogen content is diminished, though this varies in each individual. The effect on the liver glycogen of small thyroxine doses can be compensated by increasing the amt. of food. By reducing the quantity of food to $\frac{1}{2}$ of the normal need the glycogen content of the skeletal muscles is diminished in the thyroxine-treated animals, the decrease being greater than in the control animals. The liver, under these expt. conditions, becomes glycogen-free. Increased muscle work with unlimited supply of food leads to an increase in the glycogen of the muscles and especially of the liver as compared to the resting animals. The increase occurs in both control and thyroxine-treated animals, but more in the former.

S. MORGULIS

The renal blood-flow of the bird. O. S. GIBBS. Dalhousie Univ. *J. Pharmacol.* 34, 277-91(1928).—The renal blood flow of the bird as measured in these expts. was at least 10 cc. per g. min. The action of adrenaline, ergotoxine, amyl nitrite, choline, acetylcholine, pituitrin, histamine, Ringer soln., soln. of Na_2SO_4 , and of uric acid, as well as the effect of CO_2 and stimulation of the vagus, are discussed in relation to blood flow and urinary secretion. No relation was found between blood pressure and rate of blood flow in kidney, blood pressure or blood flow and functional activity of the kidney (measured by uric acid removal), secretion of water and of uric acid.

C. R.

The stimulating effect of alcohol and the depressing effect of anesthetics on sugar utilization directly determined. W. E. BURGE AND D. J. VERDA. Univ. of Ill. *J. Pharmacol.* 34, 299-303(1928).—The % decrease of sugar from oxygenated sugar soln. in which were placed 2 gold fish was greater for a given period of time when MeOH , EtOH , or glycerol was added to the soln., and less when CHCl_3 , ether, or ethylene was added. Nitrous oxide had no effect.

C. RIEGEL

The renal excretion of chlorides and water. A. R. FEE. Univ. College, London. *J. Pharmacol.* 34, 305-16(1928).—After CHCl_3 , ether, morphine, urethan, paraldehyde, or amylal the diuresis following water ingestion found in normal unanesthetized dogs is absent, although there is a fall in urinary chloride concn. and a decrease in blood concn. Hypotonic and isotonic salt solns. cause no diuresis and bring about blood diln. This inhibiting effect of anesthetics is not due to thirst or to loss of consciousness, as in man the taking of large amts. of water after injection of atropine, which causes thirst, brings about diuresis, and no blood diln. Taking of water after morphine injection does not result in diuresis, although there is a slight blood diln., with an increase and then a decrease in chlorides in the urine. These results are not explainable on the basis of phys. theories of renal excretion, and it is suggested that there is present in normal animals a mechanism which inhibits the output of pituitary hormone (absence of which causes increase in urine flow) during ingestion of large amts. of water, and that this mechanism is disturbed by anesthetics.

C. RIEGEL

Thermal conductivity methods of gas analysis in the study of pharmacological problems. P. D. LAMSON AND B. H. ROBBINS. Vanderbilt Univ. *J. Pharmacol.* 34, 325-31(1928).—Description of the app. and its application to the study in dogs of absorption of CCl_4 by analysis of expired air.

C. RIEGEL

The effect of colloidal sulfur (sulfosolo) on the blood sugar level of normal men and animals. GIULIO BUCCIARDI. Univ. Modena. *Arch. farmacol. sper.* 46, 90-114(1928); cf. *C. A.* 21, 773.—The question was investigated whether colloidal S is acting similarly to insulin in respect to its effect on the blood sugar and the liver glycogen. B. experimented on guinea pigs, rabbits, dogs, sheep and humans. In the animal

expts., the S was administered intraperitoneally, intramuscularly, or perorally, using a 0.5% soln. It was found that small doses produce hypoglycemia (max. 25–30%). Large doses give rise to hyperglycemia (max. 60–100%) followed by a slight hypoglycemia; besides, they have a toxic effect causing loss of strength, reduction of mobility and respiratory disturbances in the animals. The min. doses capable of producing hypoglycemia or hyperglycemia, resp., vary for the different species of animals examd. The sheep was most sensitive; then came the dog, rabbit and guinea pig. In the guinea pig, doses smaller than 0.0005 g. per kg. body wt. are ineffective, while doses between 0.0007 and 0.01 g. often produce a hypoglycemia lasting for 1–3 hrs. With larger doses than 0.013 g. a hyperglycemia is caused, which lasts for 2–3 hrs. In the rabbit, the blood sugar level is not influenced by doses smaller than 0.0005 g. Doses varying between 0.0006 and 0.0065 g. may cause hypoglycemia, while with doses larger than 0.0065 g. rise is given to hyperglycemia. In case of intramuscular injection, approx. the same dose is required to produce a similar effect as in case of intraperitoneal injection. Application by mouth had only a slight effect in the animals. In man, oral administration of small doses was not followed by definite changes of the blood sugar. Detn. of the liver glycogen of guinea pigs showed that it was not noticeably influenced by either small or large doses. B. concludes from his expts. that the hypothesis of the parallelism in action of insulin and colloidal S is unproved as yet. G. SCHWOCH

Action of nicotine on the blood-sugar level. CAPONNETTO ANDREA. Univ. Catania. *Biochim. terap. sper.* 15, 376–82(1928).—The expts. were carried out on 4 normal and 3 diabetic persons, some of whom were smokers. First the normal curve of the fasting blood sugar was established with blood samples taken at intervals of 30 mins. for at least 3 hrs. The next day, the test was repeated after the persons had smoked a certain no. of cigarets. While under normal conditions the curve showed a slow decrease, a sudden rise was observed after the smoking. The blood sugar increased for about 2–2½ hrs. When nicotine hydrochloride (1 mg.) was injected intramuscularly, an increase lasting for 1–1½ hrs. and amounting to 70–95 mg. % was noticed. The nicotine, whether inhaled or injected, produced the same effect in every instance. When ergotamine (1 cc. gynergen Sandoz) or neutral atropine sulfate (1 mg.) was injected intramuscularly 30 mins. after administering the nicotine hydrochloride, the blood sugar ceased rising and returned to the initial level. The action of nicotine was also neutralized in regard to its effect on the pulse, respiration and blood pressure. Numerous references are given. G. SCHWOCH

Acetylcholine contraction of the musculature of frogs. KIKUO TODA. Univ. Greifswald. *Arch. expil. Path. Pharmacol.* 137, 71–95(1928).—As has been previously shown irritability is not changed by prolonged exposure to contraction-producing concns. of acetylcholine. Not only is the neural region susceptible to acetylcholine and K salts, but it is also sensitive to NaOH, HCl and caffeine, and the so-called initial shortening of contraction is apparently the reaction of these particularly susceptible tonus fibers. Acetylcholine contraction as an expression of a reaction of the neural region is intensified by heat, diminished by cooling. Narcosis with alc. frequently paralyzes elec. irritability more strongly than acetylcholine contraction. It is not possible to eliminate the Tiegel contraction of isolated muscle by concns. of atropine or novocaine which completely abolish acetylcholine contraction, and unlike the latter it is not intensified by KCl. This suggests that the Tiegel contraction is not due to the formation of acetylcholine-like substances in the muscle. Not only does O reduce the concn. threshold of a number of contracting agents but N and CO₂ exert a similar effect, apparently because diffusion processes are favored. G. H. S.

Hydroxyquinoline (chinosol). CARL GRABBE. Pharm. Inst. Göttingen. *Arch. expil. Path. Pharmacol.* 137, 96–115(1928).—Hydroxyquinoline is absorbed quickly from the intestine (in dogs) and is promptly eliminated by way of the urine. A small amount is excreted through the bile. It is almost completely transformed into the H₂SO₄ ester, this change taking place to some extent within the lumen of the intestine. The chief effect of hydroxyquinoline upon metabolism is in its effect upon the excretion of N in the urine, but this influence becomes apparent only after a latent period of from 1 to 2 days and attains its max. after by far the greater portion of the hydroxyquinoline has been excreted. This effect is most marked in dogs which have been deprived of food and in such animals the excretion of hydroxyquinoline is retarded. G. H. S.

Relation of season to the susceptibility of the frog heart to magnesium salts and to lack of oxygen. BRUNO KISCH. Univ. Köln a. Rh. *Arch. expil. Path. Pharmacol.* 137, 116–28(1928).—From the end of May until the middle of July the frog heart exhibits an increased sensitivity to Mg salts. The ventricle is more sensitive than is the auricle, both reacting to concns. which are without effect on skeletal muscle. At this

time the Mg effect cannot be abolished by increasing the concn. of CaCl_2 although acetaldehyde is effective. The changed susceptibility to Mg is independent of temp. and is not modified by atropine. Although during this period contractility is altered, stimulus formation is unchanged. Susceptibility to a lack of O is also increased, and a synergism between Mg and lack of O is evidenced. G. H. S.

Tests of commercial ovarian preparations. M. KOCHMANN. Friedrichs-Univ. Halle-Wittenberg. *Arch. exptl. Path. Pharmacol.* 137, 187-200(1928).—Tabulated data are presented which bear upon the results of tests made by injection and by ingestion of a number of ovarian preps. of com. manuf. P. TRENDELENBURG AND H. GREMELS. Univ. Berlin. *Ibid* 201-2.—Detns., similar to those reported by Kochmann, were made and were confirmatory. G. H. S.

Sclerotic changes in organs, particularly in arteries. I. Experiments with activated ergosterol. H. KREITMAIR AND U. HINTZELMANN. Univ. Göttingen. *Arch. exptl. Path. Pharmacol.* 137, 203-14(1928).—The administration of irradiated ergosterol to lab. animals caused a deposition of Ca in the organs, a preliminary necrosis of the cells or tissues not being requisite. **II. Vascular changes in rabbits induced by irradiated ergosterol.** HEINZ WENZEL. *Ibid* 215-49.—In arteries, as in other organs, the deposition of Ca follows the administration of irradiated ergosterol. G. H. S.

Fixation of suspension colloids by anesthetizing and narcotizing substances. G. SPAGNOL. Univ. Padua. *Arch. exptl. Path. Pharmacol.* 137, 250-6(1928).—See C. A. 22, 3230. G. H. S.

Chronic effects of irradiated saponin and irradiated ergosterol. HANS HANDOVSKY. Pharm. Inst. Göttingen. *Arch. exptl. Path. Pharmacol.* 137, 264-8(1928); cf. C. A. 23, 207.—While the continued administration of saponin causes a reduction in the carbohydrate and cholesterol of the muscle, a like treatment with irradiated saponin results in an increased carbohydrate content, the reduction in cholesterol is less marked, the serum cholesterol is increased, and blood sugar values are changed. With irradiated ergosterol the carbohydrate and cholesterol of the muscle are likewise reduced, the cholesterol content of the liver is increased, but the blood sugar is unchanged. G. H. S.

Effect of blood and iron in anemia in dogs due to bleeding. GEORG STIEGER. Pharm. Inst. Göttingen. *Arch. exptl. Path. Pharmacol.* 137, 269-304(1928); cf. C. A. 23, 189.—The formation of blood in dogs rendered anemic by bleeding is accelerated by both ferrous and ferric compds. The nature of the therapeutic effect of bloods is complex. G. H. S.

Pharmacology of lead. III. Distribution of lead between the blood and the tissues after intravenous injection. BEHREND BEHRENS AND GÜNTHER ANTON. Univ. Heidelberg. *Arch. exptl. Path. Pharmacol.* 137, 305-10(1928); cf. C. A. 22, 275.—The curve expressing the distribution of Pb between tissues and plasma parallels that expressing the distribution between erythrocytes and plasma. **IV. Mechanism of lead poisoning in fish.** BEHREND BEHRENS. *Ibid* 311-14.—The lethal effect is due primarily to damage to the branchial app. G. H. S.

Effect of ephedrine upon adrenaline hyperglucemia. EDMUND HAINZ. Univ. Budapest. *Arch. exptl. Path. Pharmacol.* 137, 343-7(1928). Having no effect in causing hyperglucemia, ephedrine administered prior to adrenaline causes but a slight reduction in the hyperglucemia caused by the latter. G. H. S.

Tonus of heart muscle. Influence of poisons on resting elasticity. G. WEISMAYER AND H. QUINCKE. Med. Klin. Heidelberg. *Arch. exptl. Path. Pharmacol.* 137, 362-79(1928).—The resting elasticity of the heart can be modified by a variety of agents. Marked fatigue reduces the tonus, while glucosides which act on the heart, and cardiazole increase elasticity, as does adrenaline. Caffeine and atropine are without effect upon tonus. G. H. S.

Secretory activity of the isolated frog liver. FRIEDRICH HOFFMANN. Univ. Kiel. *Arch. ges. Physiol.* (Pflüger's) 220, 124-31(1928).—Phenylurethan and KCN inhibit, while caffeine and theophylline stimulate secretion through the biliary ducts in the isolated, artificially perfused frog liver. These agents exert a like effect upon the secretion of indigo-carmin. Thus, the secretion of dissolved substances and of solvent as well is a function of living liver cells, and this function can be stimulated or inhibited by pharmacol. agents. G. H. S.

Potential toxic effects. G. FRITZ. Univ. Berlin. *Arch. ges. Physiol.* (Pflüger's) 220, 495-511(1928).—With the isolated rabbit intestine prepn. adrenaline does not exhibit a potential toxic effect. The transitory effect of adrenaline is due to the fact that the adrenaline is in large part destroyed. Considerable amts. of undestroyed adrenaline are absorbed by organs. When large doses of pilocarpine, physostigmine or arecoline are used a second stimulation may be noted after washing. G. H. S.

Permeability and narcosis. KARL J. ANSELMINO. Univ. Kiel. *Arch. ges. Physiol.* (Pflüger's) 220, 524-38(1928).—With collodion membranes narcotics cause a reversible change in permeability, as evidenced by their behavior with respect to the passage of water. G. H. S.

Fate of acetylcholine in the blood. VI. Influence of various narcotics on the splitting of acetylcholine. F. PLATTNER AND O. GALEHR. Univ. Innsbruck. *Arch. ges. Physiol.* (Pflüger's) 220, 606-11(1928); cf. *C. A.* 22, 4161.—Acetone, acetamide and methyl, ethyl, propyl, butyl and amyl alcs. cause a reversible inhibition of the splitting of acetylcholine by red blood cells and by serum. This inhibition represents a suppression by the narcotic of adsorption. G. H. S.

Changes in the circulation of the mesentery of living cats following the intravenous injection of adrenaline. FRANZ KISCH. Univ. Wien. *Arch. ges. Physiol.* (Pflüger's) 220, 612-22(1928).—In the normal animal the capillary circulation of the mesentery is largely independent, as to vol., of the vol. of the total circulation, apparently being detd. by the nutritional needs of the tissues. After the injection of adrenaline this independence is lost. G. H. S.

Effect upon the blood sugar of insulin and adrenaline administered to angiotomized dogs during the digestive period. NINA KOCHNEVA. Inst. exptl. Med. Leningrad. *Arch. ges. Physiol.* (Pflüger's) 220, 628-32(1928); cf. *C. A.* 22, 4660.—Alimentary hyperglucemia does not take place when adrenaline is injected and food is given, but with insulin injection the hyperglucemia occurs. Under normal conditions sugar is present after a meat feeding to the same degree in all vascular beds, but after insulin injections there is a marked retention of sugar by the kidney. With carbohydrate administration and intravenous injection of insulin a diminished absorption from the intestine accompanies the increased retention by the kidney. With meat feeding and adrenaline injection the moderate sugar mobilization in the liver is not accompanied by a retention by the intestine and the muscles but is held back only by the kidney. When carbohydrate is given and adrenaline is injected subcutaneously no absorption from the intestine takes place, the increase in blood sugar being a sugar mobilization by the liver with a complete lack of retention by intestine and muscle. The kidneys retain less sugar than after injections of insulin. The mobilization of sugar in the liver caused by adrenaline during the digestive period is of adrenalinogenic origin exclusively. G. H. S.

Changes in the electromotive activity of collodion membranes by narcotics. KARL J. ANSELMINO. Univ. Kiel. *Arch. ges. Physiol.* (Pflüger's) 220, 633-41(1928).—Changes in potential resulted from the use of salicylamide and compds. of the urethan series. G. H. S.

Effect of intravenous injections of histamine and peptone upon the pressure in the portal vein in dogs. W. FELDBERG, E. SCHILF AND H. ZERNIK. Univ. Berlin. *Arch. ges. Physiol.* (Pflüger's) 220, 738-59(1928).—In histamine shock in dogs the liver plays no particular role, but in peptone shock the importance of this organ is considerable. G. H. S.

Validity of the all-or-none law of stimulation. I. G. MANSFELD AND ANNA LINGGERS. Univ. Pécs. *Arch. ges. Physiol.* (Pflüger's) 220, 760-73(1928).—The results of narcosis expts. with nerves indicate that the all-or-none law of stimulation is not valid. G. H. S.

Effect of insulin on regeneration. Biologic role of potassium and calcium ions in these processes. B. A. SHAZILLO AND M. YE. KSENDISOVSKII. Odessaer Med. Inst. u. Odessaer Wissenschaftl. Forschungsinst. d. "Ukrnauka." *Arch. ges. Physiol.* (Pflüger's) 220, 774-81(1928).—Insulin stimulates the regeneration of bone, and the restorative processes are modified if in conjunction with the insulin isotonic KCl or CaCl₂ solns. are injected subcutaneously, KCl exerting an inhibition, CaCl₂ causing an acceleration. G. H. S.

Effect of internal secretions and of poisons upon the chemistry of muscle. HANS HANOVSKY. Univ. Göttingen. *Arch. ges. Physiol.* (Pflüger's) 220, 782-813(1928).—In skeletal muscle the content of lactic acid is detd. solely by processes within the muscle, but the amt. of glycogen or lower sugars is modified by processes, such as glycogenolysis and liver fermentation, taking place without the muscle. The factors which det. the lactic acid and carbohydrate content of muscle are (1) the general metabolic level, (2) the activity of the central nervous system, (3) the presence of internal secretion, and (4) the integrity of the enzymes active upon carbohydrates. G. H. S.

Mercuration of aromatic amines and the problem of substitution (ALBERT, SCHNEIDER) 10.

I—ZOOLOGY

R. A. GORTNER

Purinolytic enzymes of the leech (*Hirudo medicinalis*) and the fresh-water mussel (*Anodonta*). RICHARD TRUSZKOWSKI. Warsaw Univ. *Biochem. J.* 22, 1299-1301 (1928).—Purine-N detns. before and after autolysis indicate that the end product of purine catabolism of leeches and mussels is xanthine and hypoxanthine. B. H.

Studies on the evaporation of nectar. O. W. PARK. Iowa Agr. Expt. Sta. *J. Econ. Entomol.* 20, 510-6(1927).—No concn. of nectar occurs within the body of the honey bee (*Apis mellifera*) from the time it leaves the flower until it enters the hive. Evapn. within the hive accounts fully for the rate of nectar concn. **Further studies on the evaporation of nectar.** *Ibid* 21, 882-7(1928).—Further expts. agree with those reported above. C. H. RICHARDSON

Water conservation in insects. WM. ROBINSON. Univ. of Minn. *J. Econ. Entomol.* 21, 897-902(1928); cf. *C. A.* 23, 440. C. H. R.

Responses of insects to smell and taste and their value in control. N. E. MCINDOO. U. S. Bur. of Entomology. *J. Econ. Entomol.* 21, 903-13(1928).—A review of the literature with bibliography covering: uses of smell in bee-keeping, attractive baits and attractants, chemotropism and repellents. C. H. RICHARDSON

12—FOODS

F. C. BLANCK AND H. A. LEPPER

Formol test for distinguishing artificial from natural foodstuffs. H. E. HILL. *Chem. Eng. Mining Rev.* 20, 401-2(1928).—The test was applied to orange juice, lemon juice, lime juice, several kinds of grape juice and vinegar. The test is applied as follows. The fruit juice and a 40% HCHO soln. are neutralized separately to phenolphthalein with 0.1 N NaOH. The 2 neutralized solutions are then mixed and if the color fades, more NaOH is added to bring back the color. The test depends upon the fact that when protein material is present, as is the case with the natural products, HCHO reacts with the protein and sets free an acid group. With an artificial product the color either does not disappear on mixing or but very little NaOH is required to bring it back. W. T. H.

Salicylic acid and preserved foods. T. GIGLI. *Boll. chim. farm.* 67, 616-7(1928).—G. condemns the use of salicylic acid for preserving tomato juice and instead recommends sterilization by heat. G. SCHWOCH

Adsorption phenomena (with wheat). G. TESTONI. *Rev. gén. colloïdes* 6, 8-15 (1928).—In an attempt to decide whether gluten is already existent in wheat flour, or whether it is produced during the mixing with water, T. has studied the colors produced in a wheat grain by adsorption of various natural and artificial org. coloring matters. It is concluded that gluten is not pre-existent in wheat flour, but is formed under the influence of Ca salts, when mixed with water. The sensitivity of indicators is diminished by adsorption of the indicator at a surface, and measurement of the decrease in sensitivity provides a means of characterizing the adsorbent surface. The values are expressed as "adsorption values," and some of the proteins of wheat have been characterized in this way. Ferric and cupric salts are adsorbed by gluten and gliadin, and the colorless products fail to give reactions for the respective metal ions except towards $K_4Fe(CN)_6$. The product of adsorption of Ni salts fails to give a reaction for Ni ions with any reagent. It is suggested that reaction can take place only when the second substance also is adsorbed, and that this condition is realized in the case of $K_4Fe(CN)_6$. B. C. A.

Modern baking powders. R. M. LADD. *Can. Chem. Met.* 12, 308-9(1928).—The compn. of modern baking powders is considered, and equations are given illustrating the chemistry of these compds. Baking powder should be capable of producing 14% of its wt. of CO_2 . The presence of 20% of starch is essential if the minimum of safe buffer action, resulting in reduction of quantity of CO_2 to that portion required by standard practice, is to be had. $KHC_4H_4O_6$ is so weak in acidic properties that $H_2C_4H_4O_6$ must be used in conjunction with it. Observations on the employment of the various compds. used in baking powders are furnished. The physiol. action of the residue remaining in the finished product is discussed. References are given and authorities quoted. Attention is directed to the famous "Alum War" which, after 50 years, is as yet unsettled. FREDERICK G. GERMUTH

The refractometer in milk analysis. G. D. ELSDON AND J. R. STUBBS.—Lancashire Co. Council Lab., Liverpool. *Chemistry and Industry* 47, 1145-6(1928).—Polemical. J. A. KENNEDY

The lactometer as used in the determination of solids-not-fat in milk. C. F. HOYT, N. C. SMITH, L. M. LAMPERT AND L. G. SAYWELL. Dairy Lab., State Dept. Agr., Calif. Dept. Agr., *Mo. Bull.* 17, 594-603(1928).—Numerous data compiled in 8 tables show that the lactometer reading should be made at the top of the meniscus. Calibration of the lactometer may be made in milk of known sp. gr. Unless the prior treatment of a sample of milk is known, an element of uncertainty is present in values of solids-not-fat derived by formula from the sp. gr. with samples having their max. sp. gr., the av. of results obtained by the Babcock formula from the lactometer readings and the % of fat as detd. by the Rocse-Gottlieb (Mojonnier) method agree fairly well with the av. gravimetric results. With samples in which the original sp. gr. has been restored by heating the av. of results obtained by the formula $S - F = (L/4) + (L/5) + 0.2$, in which $S - F$ = solids-not-fat, L = lactometer reading and F = % fat agrees well with the av. gravimetric results. Values on individual samples obtained by formula may vary considerably from values obtained gravimetrically. The correction table for temp. gives accurate results except at 21°. At that point the values tend to be somewhat low. C. R. F.

Heat coagulation of evaporated milk as affected by mixing different grades of raw milk. BYRON H. WEBB. Bur. of Dairy Ind., U. S. Dept. Agr. *J. Dairy Sci.* 11, 471-8(1928).—Skim milk, aged until positive to 74% EtOH, was mixed in varying amts. with good skim milk heated to 95° for 10 mins., evapd. *in vacuo* to 18% total solids and sterilized at 120° until coagulated. The heat stability of the milk (measured by the time necessary for coagulation) varied with each addn. and each sample of milk. No method is available by which the result of such mixing can be foretold. There is apparently an optimum pH for each milk at which the greatest heat stability is obtained. This may be reached by aging the sample, adding milk which has developed acidity or adding lactic acid. F. L. SEYMOUR-JONES

Studies on the bacteriological content and keeping quality of milk. S. B. THOMAS AND J. LEWIS. Univ. Coll., Aberystwyth. *Welsh J. Agr.* 4, 147-457(1928).—This paper gives the results of the bacteriol. examn. of 908 samples of milk from 141 farms in Mid and West Wales. The keeping quality of the milk decreased as the bacterial count increased and the presence of *B. coli* had a further deleterious effect on the keeping quality. Coliform organisms were detected in only 57% of the samples examd. An increase from 53° to 63° F. in the temp. of the milk during transit decreased the keeping quality by 24 hrs. A difference of 18 hrs. in keeping quality could be accounted for by the variation in personal efficiency during milking alone. K. D. JACOB

The bacterial content of dried milk. H. MACV. Univ. of Minnesota. *J. Dairy Sci.* 11, 516-26(1928).—Spray- and drum-dried milk powders were bacteriologically examd. fresh and on storage up to 6 yrs. Original counts per g. on spray samples varied from 4400 to 5 1/2 million, av. over 50,000; on drum samples, 40 to 7900, av. below 500. There is a decrease of over 90% on 1 yr. storage and a greater decrease with increase of storage temp. up to 37° with spray process powders. The types of bacteria present in the dried milk vary with the drying process. F. L. S.-J.

The cause of the fluorescence of milk and wine irradiated by ultra-violet rays. D. MIGLIACCI. *Boll. chim. farm.* 67, 673-4(1928).—Review of the investigations of Schmetzer (*Milchwirtschaftl. Forsch.* 1927, 359) and of Haitinger and Reich (*C. A.* 22, 4373).

Phosphates and milk production. ERNEST VANSTONE. Seale-Hayne Agr. Coll. *Fertiliser, Feeding Stuffs and Farm Supplies J.* 13, 847-51(1928).—The relation of phosphates to animal nutrition is discussed with particular reference to the production of milk. K. D. JACOB

Relation of soy-bean hay and ground soy beans to flavor and composition of milk and butter. W. B. NEVENS AND P. H. TRACY. Univ. of Illinois. *J. Dairy Sci.* 11, 479-87(1928).—Soy-bean hay and ground soy beans fed to cows had no effect on the flavor or acidity of the milk (raw or pasteurized), skim milk, cream or butter. The body of the butter was somewhat gummy on this ration and the I no. increased slightly. F. L. SEYMOUR-JONES

The present status of density of ice cream. G. D. TURNBOW. *Ice Cream Rev.* 7, 60-3(1927).—Efforts to standardize the weight or density of ice cream as conducted at the Univ. of Cal. are reported. With slow agitation the mix developed nearly twice as much viscosity during aging as with severe agitation. A more stable viscosity was secured by aging the mix at from 83° to 84° F. than by aging at higher temps. Ice

cream aged at this temp. developed superior body and texture. The higher the total solids the less difference there was between the wt. of the first, second and fourth cans of ice cream drawn off. A table illustrates three possible standards for ice cream wts.

H. F. ZOLLER

Effect of lecithin in dairy products upon butter fat determinations. O. W. CHAPMAN. Iowa State College. *J. Dairy Sci.* 11, 429-35(1928).—The ether ext. by the Mojonnier method of various milk products gave av. lecithin percentages: milk 0.0447, cream 0.1981, skim milk 0.0165, buttermilk 0.1302. These represent 1.6, 0.43, 10.78 and 20.25%, resp., of the total ether ext. On adding egg-yolk lecithin to buttermilk, very varying amts. were recovered as "fats" by the Babcock, butyl alc. and Mojonnier methods, averaging 70-75%. Conclusion: About 0.13 of the fat found in buttermilk is lecithin.

F. L. SEYMOUR-JONES

The care of cheese during storage. L. J. LORD. *Food Manuf.* 4, No. 1, 5-6, 10 (1929).—This article is an account of the factors which affect the keeping qualities of cheese in storage such as temp., light, moisture, ventilation and the presence of cheese mites and flies. Practical advice on how to provide the most suitable storage conditions is given.

J. A. KENNEDY

Proximate composition of fresh fruits. CHARLOTTE CHATFIELD AND LAURA McLAUGHLIN. Bur. of Home Economics. U. S. Dept. Agr., *Circ.* 50, 1-19(1928).—Data on the compn. of 65 fresh fruits or their products have been compiled and analyzed. The tabulated results include values for refuse, water, protein ($N \times 6.25$), fat, ash, total carbohydrate, fiber, sugar, total free acid and fuel value per 100 g. and per lb. When justifiable, the following values are given: av., probable error of av., max., min., the compn. of the edible constituent expressed as percentages of the purchased wt. and no. of analysis concerned.

PAUL E. HOWE

Sugars used in the fruit products industries. W. V. CRUESS. Univ. Cal. *Fruit Products J. and Am. Vinegar Ind.* 8, No. 5, 16-9(1929).—A discussion from the point of view of statistics, kinds and compn., fermentations and sirups

J. A. KENNEDY

Chemical examination of finger limes (*Citrus australasica*). G. R. GANNON. *J. Proc. Sydney Tech. Coll. Chem. Soc.* 3, 29-32(1927).—The chief constituents of the juice are water 90.5%, pectin matter (per 100 cc. of juice) 1.23 g., dextrose 0.45 g., citric acid 5.6 g. and unidentified acids 0.25 g. The presence of hesperidin is suspected.

B. C. A

Hydrogen swelling of canned ready-to-serve prunes. E. M. MRAK AND P. H. RICHERT. Univ. of Calif. *Fruit Products J. and Am. Vinegar Ind.* 8, No. 5, 11-3, 15(1929).—The rate of spoilage due to H swells decreased when the wt. of fruit per can was increased above 120 g. in 8 oz. cans; also with increase in concn. of sugar sirup added at time of canning. The kernels in the pits showed no noticeable changes or signs of growth. Visible corrosion was most apparent in the cans having water and 12.5° Balling sirup. The rate of formation of visible H swells decreased as the head space at time of sealing was increased. Increasing the length of time of exhaust slightly decreased the rate of formation of H wells, probably by increasing the vacuum and head space, and thereby requiring the production of more H for the formation of visible swells. The writers do not subscribe to the common belief that long exhausting reduces corrosion by removal of O_2 from prunes as their expts. indicate that a large head space filled with air at the time of sealing retarded swelling of the cans and, secondly, they have found the least Sn in the prunes and sirup in those cans with the greatest head space (greatest initial O_2 supply). **The effect of blanching on the hydrogen swelling of canned ready-to-serve prunes.** E. M. MRAK AND P. H. RICHERT. *Ibid* 14-5(1929).—The rate of formation of H swells in canned ready-to-serve French variety prunes is increased when the blanch is increased; however, the rate of swelling is not in direct proportion to the length of the blanch. The length of blanch is also dependent on the condition of the prunes to be blanched; however, it is recommended that it be not more than 10 nor less than 3 min. in boiling water. The use of a heavy sirup did not counteract the accelerating effect of a long blanch on the rate of swelling. The rate of swelling resulting from steam-blanched prunes increased when the length of blanch was increased. The steam-pressure blanches showed no obvious difference although there was a slight tendency for the rate of swelling to increase when the severity of the blanch was increased.

J. A. KENNEDY

The determination of honey in honey cakes. R. T. A. MEES. *Chem. Weekblad* 25, 674-6 (1928).—On theoretical grounds, the % of fructose is accepted as a unit to express the amt. of honey in sugar mixt. as used in honey cakes. M. has worked out a simplified Kolthoff method as follows: grind 30 g. with water in a mortar and bring to vol. of 200 cc., centrifuge and filter and det. the sp. gr., from which the % ext. can

be calcd. Dil. 10 cc. of this soln. with H_2O to 100 cc., pipet 20 cc. of this soln. into a 200-cc. flask contg. 2.5 cc. $N I$ and 3 cc. $N NaOH$, put in the dark for about 5 min., then acidify with 1 cc. 4 $N HCl$, remove carefully excess I with 10% Na_2SO_3 soln., neutralize with 1 cc. $N NaOH$ add 20 cc. Fehling soln. and det. reducing power according to Schoorl; express as % fructose based on the ext. J. C. JURRIJENS

Studies in the jowars of Gujarat. I. The jowars of the Surat district. M. L. PATEL AND G. B. PATEL. Agr. Research Inst., Pusa. *Mem. Dept. Agr. India, Botanical Ser.* 16, 1-57(1928).—Grain of the *budh perio*, *chapti*, *sholapuri* and *vani* types of jowar (sorghum) grown in the Surat district of the Gujarat area, India, had the following compn.: H_2O 11.7, 11.8, 11.4 and 11.0%; Et_2O ext. 3.1, 2.7, 3.6 and 4.3%; albuminoids 8.2, 6.5, 6.5 and 10.5%; digestible carbohydrates 74.4, 76.1, 75.9 and 69.8%; woody fiber 1.3, 1.2, 1.1 and 2.4%; and ash 1.3, 1.7, 1.5, 2.0%, resp. K. D. JACOB

Protein digestion. J. WILSON. *Food Manuf.* 4, No. 1, 11-12(1929).—This is a review of the knowledge so far accumulated concerning the scientific principles underlying the manufacturing processes available for the prepn. of predigested proteins.

J. A. KENNEDY

Feeding experiments at Karnal, 1925-26 and 1926-27. F. J. WARTH AND F. J. GOSSIP. Agr. Research Inst., Pusa. *Mem. Dept. Agr. India, Chem. Ser.* 10, 1-24 (1928).—A study was made of the value of wheat and rice straw, and sorghum and *dhub* hay as winter feeds for calves. Good sorghum hay and rice straw were approx. equal in nutritive value and rice straw produced better growth than wheat straw. Digestion of protein and carbohydrate increased with the amt. of protein present, and rice straw and sorghum rations gave almost identical digestion results. There was a direct relation between the N content of the rations and the quantity of N present in the feces and this relation may prove valuable in differentiating foders. The most serious fluctuations in fodder consumption occurred with rations low in protein. In general this observation may prove important in indicating that the protein supply is insufficient when serious fluctuations in fodder consumption commence. K. D. J.

Factors that influence the chemical composition of hay. T. W. FAGAN. Univ. coll., Aberystwyth. *Welsh J. Agr.* 4, 92-102(1928); cf. *C. A.* 22, 3468.—Hay cut a few days after it has reached its stage of max. flowering and before seed formation begins, has the highest nutritive value. Further delay in cutting results in deterioration in quality as shown by its chem. compn. Analyses of Italian rye-grass at the end of 2, 4 and 10 weeks of growth showed that as the grass increases in age a considerable fall in protein occurs, accompanied by a rise in fiber content as detd. on the dry matter. The silica free ash in 10 weeks' growth was only about 0.5 that found in the 2 weeks' growth, this being reflected in all the mineral constituents detd., with the exception of CaO . Inclusion of clover in the hay increases the protein and mineral content, especially CaO . Figures are given on the chem. compn. of the dry matter of the hay of Meadow Foxtail, Italian and perennial rye-grasses, and English late flowering and Broad Red clovers, and also on the compn. of the stems, leaves and flower heads of Montgomery red clover and the stems and leaves of Timothy. Fertilization of Italian rye grass with $NaNO_3$ increased the protein content of the stems and leaves and slightly decreased the fiber content of each, while in both cases the P_2O_5 and K_2O appeared to be depressed. Application of K_2O in the form of sylvinit did not have any pronounced effect on the compn. of the hay but caused some increase in the SiO_2 -free ash, CaO , Cl and K_2O . Beyond increasing the protein content, applications of farmyard manure had no effect on the compn. of the hay, while liquid manure increased the protein, SiO_2 -free ash, CaO , Cl and K_2O but had no effect on the P_2O_5 content. Exposure of hay to heavy rains resulted in pronounced loss of all constituents except fiber and P_2O_5 , the former being increased and the latter remaining const. K. D. J.

The feeding value of meadow hay cut at different dates. C. BRYNER JONES. *Welsh J. Agr.* 4, 75-92(1928).—The compn. of the dry matter of meadow hay cut during the months of June, July and August is given for a 4-year period. In general, the % of true protein was fairly const. for the different months, while the % of crude protein was lowest in the August hay. The sol. carbohydrates and Et_2O ext. diminished as the season advanced. The fiber content remained at about the same level in the June and July hay but increased markedly in the August hay in each of the 4 years. Feeding expts. with lambs showed that hay left uncut until the middle of August is decidedly inferior in nutritive value, while owing to variations in weather conditions July hay had a higher feeding value in some years while the reverse was true in other years. K. D. JACOB

Some factors affecting the composition of roughage. R. B. BECKER. Okla. Agr.

and Mech. College. *Proc. Oklahoma Acad. Sci., Univ. Oklahoma Bull.* 1928, New Series, No. 409, Studies Series, No. 29, 188-97.—The compn. of plants depends upon the following factors: inherited characteristics (species and variety), soil, application of fertilizing elements, seasonal rainfall or water supply, stage of development of the plant when harvested, and leaching caused by rain or dew. RUSSELL C. ERB

The occurrence and destruction of gossypol in cottonseed products. WILLIS D. GALLUP. Okla. Exptl. Sta. Stillwater, Okla. *Proc. Oklahoma Acad. Sci., Univ. Oklahoma Bull.* 1928, New Series, No. 409, Studies Series, No. 29, 182-7.—Gossypol probably occurs throughout the cotton plant and accumulates in the seeds. It is destroyed by heat and moisture under favorable conditions as autoclaving. Cottonseed meal so treated is non-toxic and is valuable as a feed. RUSSELL C. ERB

The microflora of Italian ensilage. (Lactic acid ensilage). COSTANTINO GORINI. Der landwirtschaftlichen Hochschule zu Mailand. *Centr. Bakt. Parasitenk.*, 2 Abt., 76, 45-8(1928). JOHN T. MYERS

The bacteriology of silage, 1926-27. J. H. WALTON. Agr. Research Inst., Pusa, *Bull.* 182, 13 pp.(1928).—A study was made of the bacterial content and acidity of maize and juar (*Sorghum vulgare*) silages prepd. in glass jars. There did not appear to be any close relation between the p_H and the total acidity of the juice of maize silages. The acidity increased with age but was not the same at any particular age when different series of silages were compared. With p_H 4.1 the acidity of 6 samples varied from 1.73 to 2.43 g. lactic acid per 100 cc. of juice. Maize silages incubated at 30° had much higher bacterial counts and content of acid than those incubated at 40°. In general, juar silages were less acid and contained fewer bacteria than maize silages, and again there was no close relation between p_H and total acidity. The juar silages never acquired such a pleasant, clean aroma as that of the av. batches of maize silage and were much more liable to possess an unpleasant odor. Whenever there was a good development of acid-forming bacteria, producing over 2% of acid in the juice within 3 to 5 days, the silage produced was always of high quality. *Streptococcus lactis* was almost entirely responsible for formation of acid in the silages. An acid-forming, slender rod organism, apparently belonging to the *Lacto-bacillus* group, was occasionally found. *Achromobacter fermentationis* was also identified in the silages. K. D. J

Fat determination in cacao products (Lang) (HEIDUSCHKA, MUTH) 27. Tea in northeast India (CARPENTER) 15. The presence of vitamins in certain canned vegetables (RIGOBELLO) 11E. The mineral content of feeds, soils and waters of South Carolina (MITCHELL, *et al*) 15. The thermophilic flora of sugar in its relation to canning (CAMERON, WILLIAMS) 11C. The microscopic detection of substances which by the action of certain reagents yield aldehydes or ketones (chloral hydrate, glycerol, lactic, citric and malic acids) (GRIEBEL, WEISS) 7. Steamed straw (RIEFGGERSTE) 23. Treatment of fish (Can. pat. 285,632) 27. Non-alcoholic beverages (Austrian pat 110,543) 16. Clarifying apple juice or other solutions containing tannin (U. S. pat 1,698,985) 13. Use of bakelite or a similar product for making closures of receptacles for foods, etc. (Brit. pat. 291,403) 18. Device for breaking down foam formed on skimmed milk in bulk (U. S. pat. 1,699,196) 1.

Food product. SIMOND GELFAND. U. S. 1,697,312, Jan. 1. A product suitable for use as a dressing is formed by emulsifying oil and egg yolk material and a cultured milk product and adding sufficient edible org. acid material such as vinegar to stabilize the product.

Bread. ALBERT K. EPSTEIN. Can. 285,804, Dec. 25, 1928. A mixt. of urea in combination with $KClO_3$ and $MgSO_4$ is used with yeast and assimilable carbohydrates in dough fermentation.

Apparatus for pasteurizing milk. THE CREAMERY PACKAGE MFG. CO. Fr 641,003, Sept. 29, 1927.

Milk sterilizer. BERGEDORFER EISENWERK A.-G. Ger. 468,431, July 3, 1924. Structural features.

Manufacture of concentrated milk. SALAMON SZEKELY. Austrian 109,670, Jan. 15, 1928. Colloidal solns. of casein salts prepd. in known manner from milk are dissolved in natural milk, to which other nutrients such as yolk or egg, carbohydrates, and cream may be added as required.

Yoghurt. MAX WINCKEL. Ger. 470,035, Nov. 2, 1924. A vitamin contg. yoghurt prepn. is made by mixing milk contg. yoghurt bacteria with $CaCO_3$ and dried yeast. The product may be dried in the usual way.

Concentrated ice cream mix. DEAN W. FISHER (to General Ice Cream Corp.). U. S. 1,699,526, Jan. 22. Milk is heated to a pasteurizing temp. and sugar and pasteurized cream are added to the milk, the emulsion thus formed is condensed in a partial vacuum at a reduced temp. (suitably about 55°) until most of the water is expelled and the concd. product is then cooled. An app. is described.

Beverages containing cocoa and milk. C. E. NORTH. Brit. 291,124, Jan. 19, 1927. In prepg. beverages suitable for sale in glass bottles, the milk or mixt. of cocoa and milk is subjected to heat and pressure under conditions varying with the acidity of the compn. in order to produce a definite increase in the viscosity by partly coagulating the casein and albumin without effecting curdling or sepn. A detailed example is given.

Meat paste. RICHARD W. DYER. U. S. 1,697,857, Jan. 8. Chickens or other domestic fowls are cooked under such conditions as will soften the gelatinous constituents of the bones and leave the phosphate of lime bone framework in a friable condition, the flesh and bones are comminuted by grinding and the ground flesh, softened bones and marrow are formed into a homogeneous paste suitable for packing in sealed containers.

Fish powder. FRANÇOIS BILLON. Fr. 641,887, Mar. 11, 1927. See Brit. 286,709 (C. A. 23, 454).

Sausage casing. BERNARD JOSEPH MUMM and BERNARD JOHN MUMM. U. S. 1,699,076, Jan. 15. Animal intestines of irregular diam. are expanded and contracted at different portions to render them of uniform diam. and are permanently fixed in this configuration (suitably by tanning).

Lard-refining (cooling and washing) devices. JAMES S. HUNTER. U. S. 1,698,756, Jan. 15.

Nutritive vegetable juices. JOHANNES KORSELT. Ger. 470,012, Jan. 18, 1927. Juices rich in vitamins are prepd. from chlorophyll-contg. vegetable matter by pressing and then heating to 100° with a Ca salt such as the citrate, lactate, or carbonate, together with a non-injurious aliphatic oxy acid. The ppt. is filtered off and the liquid reheated in a closed vessel in an atm. of inert gas to 100°.

Removing the skin from vegetables. MINNIE B. TAYLOR. U. S. 1,699,456, Jan. 15. Vegetables are treated with a boiling aq. soln. of NaCl and NaHCO₃ and are then chilled in cold water and the skin is removed by hand friction.

Preventing discoloration of canned foods. GEORGE S. BOHART (to National Canners Association). U. S. 1,699,274, Jan. 15. The inner surface of tinned cans is coated with a lacquer contg. ZnO or other suitable substantially insol. compd. of a metal the sulfides of which are not dark colored.

Apparatus for macerating grain. I. G. FARBERIND. A.-G. Fr. 641,172, Sept. 20, 1927.

Apparatus for moisture determination in grain and for the determination of uniformity of the moisture by the hardness of the grain. V. A. ROMAN. Russ. 5151, April 30, 1928.

Fertilizer and food for animals from vegetable refuse. J. JACKSON. Brit. 291,514, March 2, 1927. Fruit refuse or other refuse is pulverized, washed and floated with water, drained, pressed and dried, for use as a poultry or animal feed or for a fertilizer depending on its character. An app. is described.

13—GENERAL INDUSTRIAL CHEMISTRY

HARLAN S. MINER

American chemical industry. JOSEF SCHNEIDER. *Chem. obsor* 3, 286-90(1928).—Description of some American industrial processes. JAROSLAV KUČERA

Trends in industry and expansion. E. W. McCULLOUGH. *Chem. Markets* 23, 607, 8(1928).—In considering the question of bringing new plants to a community, attention should be given first to the interests of the factories already there, and whether the newer plants will compete with them or complement them. With the increased competition among manufacturers, increased selling costs, etc. there have come also decreased profits. Greater efficiency of operation, increased mechanization, better planning are all necessary to meet the demands of changed styles and customs, newer lines and commodities replacing the old, and modern methods of selling and distribution. Help through investigations carried on through coöperating agencies, trade associations, etc. leads to practical results of value. W. C. EBAUGH

Gantt's graphical methods in the chemical industry. M. BORNSTEIN. *Przemysl Chem.* 12, 647-54(1928).—Principles and illustrative examples. A. C. Z.

Accidents in the chemical industry. LEYMANN. *Chem. Fabrik* 1928, 704-6.—Discussion of 22 accidents in the chem. industry due to carelessness of chemists in charge. Instruction for chemists in the university in protection against and prevention of accidents is advocated. A. WHITE

Patent office of the Czechoslovakian Republic. J. SOUČEK. *Chem. Obzor.* 3, 346-8 (348 English), (1928).—Activities and progress of Czechoslovakian Patent Office are described. JAROSLAV KUČERA

Legal protection for originality. GEOFFREY W. TOOKEY. *India Rubber J.* 76, 1044-6, 1082-4(1928). C. C. DAVIS

An economic discussion of the nitrogen situation with regard to its future development. FIRMAN E. BEAR. Ohio State Univ. *Chem. Markets* 23, 594-7(1928).—Instead of fear of the starvation of the race because of the insufficient supply of N fertilizers, there is now a question of methods of use to secure the best results. The farmers of the world will be asked to increase their annual consumption of fertilizer N by 1,000,000 tons within a period of 4 yrs. When Europe doubles its N consumption it imports less foodstuffs; if we in America double ours, we produce a greater surplus at lower prices. Expts. are cited to show the increases expected by using more N fertilizer per acre. The most important problem still to be solved is that of detg when the N should be applied under our climatic conditions. Apparently only a part should be used at the time of planting a crop, but when the remainder should be applied is not known. Practices within the corn belt and in the area beyond it, less subject to drought, will necessarily be different. W. C. EBAUGH

The relations between specific volume, voids and size composition in systems of broken solids of mixed sizes. C. C. FURNAS. *Bur. of Mines Repts. of Investigations*, No. 2894(1928).—A mathematical theory and method are developed to permit easy and accurate prediction of a compn. of max. d. for a system of broken solids of various mixed sizes. Min. voids are obtained by piling the materials in layers with 2 sizes, one large and one small in each layer. These data are generalized into 3 sets of curves showing the relation between size ratio, voids, sp. vol. and compn. of 2-component systems. Such data can be applied to the *handling of sludges*, to *lubricants* made of solid material suspended in liquids, or to the *storage of coal* or other broken material. T. P. KELLER

Low-temperature evaporation to prevent decomposition. ERNST JANTZEN AND HANS SCHMALFUSS. *Chem. Fabrik* 1928, No. 50, 701-3.—Description of lab. app. for rapid evapn. (7.5 liters of water per hour) with a small temp. difference between evaporator and condenser (6°). Vacuum evapn. of solns. of org. substances that decompose on heating is discussed. A. WHITE

Possibilities of high-pressure steam in chemical works. H. GRIFFITHS. *Ind. Chemist* 4, 461-2(1928).—New materials and new types of construction should hasten progress in the use of high-pressure steam in chem. works. From the point of view of economy, the use of exhaust steam for heating is advantageous. By raising the initial pressure from 150 lbs. per sq. in. to 300, the back pressure may be raised from 30 lbs. per sq. in. abs. to approx. 60 without any change in the steam consumption per h. p. hr., and by raising the initial pressure to 600 lbs. the back pressure may be raised to 120 lbs. without any increase in the steam consumption of the power plant. High temp. of exhaust steam permits an increase in the number of effects in multiple-effect evapn. Of all known substances satd. steam has the max. carrying capacity for heat. The thermal efficiency of superheated steam when used for heating is low. Temps. up to 300° can be obtained with satd. steam at about 1500 lbs. per sq. in. Such pressures present no difficulty from a constructional point of view and temp. control is secured simply by the use of a reducing valve. E. G. R. ARDAGH

The mathematical theory of filtration. A. J. V. UNDERWOOD. *Ind. Chemist* 4, 463-6(1928).—The factors to be taken into account in calcg. the rate of flow through the cloth and cloth + cake in a filter press are discussed. Equations are developed for calcg. the relation between vol. filtered and time of filtration for incompressible and compressible ppts. A list of references is included (cf. *C. A.* 22, 127). E. G. R. ARDAGH

Metafiltration. J. A. PICKARD. *Ind. Chemist* 4, 505-8(1928).—Some objections to filter presses are discussed. The metafilter, a development of Danchell's edge filter, as designed by P., is described and illustrated, and examples of its effectiveness in filtering finely divided BaSO₄, beer and hot boiled linseed oil, with a filter bed of kieselsguhr, are given. E. G. R. ARDAGH

Evaluating grinding efficiency by graphical methods. WILL H. COGHILL. *Eng. Mining J.* 126, 934-8(1928).—A graphical method is given for evaluating the efficiency of grinding machines. The data of a screen sizing analysis are laid off as hypothetical forces on a force diagram to det. *mean mesh* and *mean surface*. The mean mesh is used to det. the reduction ratio obtained by grinding and the mean surface as the basis for calcg. work done.

T. P. KELLER

Local examination of the tensile strength of textile fabrics, rubber, etc. A new method instead of the ordinary tearing test. F. SCHUBERT. *Forschungsinst. für Textil-Ind., Wien. Chem.-Ztg.* 52, 913-5(1928).—The fabric is weighted by a bolt producing a fissure of only a few mm. The new process is rapid and exact; it is very economical on account of the smallness of the fissures, thus enabling one to do numerous tests with little material.

G. SCHWOCH

Pulverizing hard materials. H. VON WARTENBERG WITH BR. STRZELCZYK AND G. BORRIS. *Tech. Hochschule, Danzig. Chem. Fabrik* 1928, 617-9.—Comparative tests under carefully controlled conditions as to sizes of particles used and quantities and sizes of particles produced, together with their degrees of contamination by the mortars employed, were made with SiO_2 (quartz), ZrO_2 (fused, pure) and Al_2O_3 (fused). These were ground by hand in mortars of (1) chrome-plated steel, (2) "hard metal" (a W carbide in Co), (3) 12% Mn-steel, (4) agate and (5) porcelain. The losses of weight of mortars, in mg. per g. of material ground, showed 5, 6 and 13 for (1); 6, 4 and 9 for (2); 7, 9 and 15 for (3); 12, 17 and 21 for (4); and 43, 55 and 102 for (5); for SiO_2 , ZrO_2 and Al_2O_3 , resp. The Cr-plated steel is recommended as best, not only because its wearing qualities are so excellent, but because it can be detected very easily as an impurity in the product, Cr is found so rarely in materials to be ground, and its ease of removal by use of HCl if needed. For the opposite reasons agate is the least desirable material for use in making mortars. Since contamination took place in all grinding mortars, the use of (impact) diamond mortars was studied. Only about 30% of the charge can be reduced to an impalpable powder in a 12%-Mn-steel mortar without contamination from the mortar resulting.

W. C. EBAUGH

Condensate and hot water systems in Cuba. GEORGE W. CONNON. *Facts About Sugar* 23, 1168-9(1928).—This is a very general discussion with few engineering details.

M. J. PROFFITT

Glycerol and glycols. J. H. FRYDLENDER. *Rev. prod. chim.* 31, 772-5, 805-8 (1928).—The uses of these products in industry are described, also the substitutes employed.

P. THOMASSET

War-time chemical progress and peace-time chemical products. ALAN A. CLAFLIN. *Chem. Markets* 23, 471-5, 579-82(1928).—The war brought a succession of new experiences to the military authorities, and at first the Germans showed more initiative in meeting them, as is evidenced by their use of high explosives, gas attacks, etc. This advantage was later overcome by the superior potential resources of the Allies. An outline of gases used, their classification, measures to combat them, protective devices and similar matters is given. The war-time production of acetone was very important because of its use as a solvent for nitrocellulose, as a raw material for making "tear gas" and as a solvent for airplane dope. Methods of its manuf. are reviewed. The prepn. of butyl alcohol by fermentation processes led to the *synthesis of rubber* by the isoprene process. The development of atm. N plants and their conversion to peace-time purposes has been slower in the United States than in Europe, as the aim has been rather to get the most efficient processes instead of simply any process at all that would work. Coal-tar intermediates and dyestuffs; lacquers consisting of a pigment, a plastic and a solvent, with plasticizers such as triphenyl and tricresyl phosphates replacing camphor; Et and Bu phthalates; the sepn. of C_4H_4 from coal- and natural-gas; the refining of petroleum by better methods, etc., have led to the formation of many compds. on a commercial scale that were not looked upon heretofore as being particularly available. Many improvements of technical processes can, therefore, be traced directly to the intensive research devoted to the production of war-time necessities.

W. C. EBAUGH

Thermal insulation. VILÉM I.ÖVY. *Chem. Obzor.* 3, 37-40, 170-5, 316-9(1928).—A review of the insulators used in industry with theoretical and practical considerations. An English summary is included with each article.

JAROSLAV KUČERA

PARTINGTON, F. B.: **Chemical Plumbing and Leadburning.** London: Allen Riversidge, Ltd. (Victoria Station House, Westminster, S. W. 1). 3s. 6d. Reviewed in *Chem. Trade J.* 83, 510(1928).

Finding and Stopping Waste in Modern Boiler Rooms. A reference manual to aid the owner, manager and operator in securing and maintaining boiler plant economy. Philadelphia, Pa.: Cochrane Corp. 788 pp. \$3. Reviewed in *Ind. Eng. Chem.* 21, 94(1929).

Purifying gases. JOSEPH G. DELY (to Atmospheric Nitrogen Corp.). U. S. 1,698,718, Jan. 15. A flowing gas (such as gas to be used for NH_3 synthesis) contg. CO and CO_2 is passed through 3 scrubbing stages. In the first stage water is continuously introduced; in the second stage ammoniacal cuprous liquor is continuously introduced without refrigeration; in the third stage ammoniacal cuprous liquor is introduced with refrigeration. An arrangement of app. is described.

Drying gases. DEUTSCHE GLÜHFADENFABRIK RICH. KURTZ & PAUL SCHWARZKOPF. Swiss 127,515, April 16, 1927. The gas is led through porous tubes passing through concd. H_2SO_4 .

Separating hydrogen from gaseous mixtures. H. M. R. BARJOT. Brit. 291,576, April 14, 1927. An app. is specified for sepn. of H from gaseous mixts., such as water gas or coke-oven gas, by diffusion through porous media. Several units are arranged in connected series.

Separating gases by liquefaction. GES. FÜR LINDE'S EISMASCHINEN A.-G. Ger. 469,446, Jan. 25, 1927. See Brit. 284,213 (*C. A.* 22, 4678).

Liquefaction of gases. EISEN- u. STAHLWERK HOESCH A.-G. Ger. 470,014, Aug. 6, 1922. Gases and gaseous mixts. which are not readily liquefied are subjected to a preliminary cooling in the compressed state by a heat-absorbing machine. The excess cold of the liquefied gases is used for cooling the condenser or absorber of the machine.

Effecting reactions between gases. VEREIN FÜR CHEMISCHE INDUSTRIE A.-G. Swiss 127,243, May 27, 1926. Reactions between gases are effected by supplying one of the reagents to each side of a porous wall, the gases meeting and reacting in the pores of the wall. Suitable app. comprises a porous tube arranged within an impermeable tube, connections being provided for passing gases, preferably in counter-current, through the porous tube and through the annular space between the tubes. The porous tube may be impregnated with a catalyst. Examples describe the prepn. of (1) CH_4 from CO and H_2O ; (2) MeOH from CO and H_2O ; (3) MeOH from $HCOOH$ and H; (4) MeOH from $HCOOMe$ and H; (5) Ac_2O from ethylidene diacetate and air; (6) AcOH from CH_3CHO and air; (7) SO_2Cl_2 from SO_2 and Cl.

Reactions between gases and liquids. SOCIÉTÉ GÉNÉRALE MÉTALLURGIQUE DE HOBOKEN. Fr. 641,796, Oct. 4, 1927. Means is provided in the reaction chamber for giving a whirling movement to the gas to increase its speed and the length of its path through the chamber.

Treating gases with liquids. EDOARDO M. SALERNI and F. M. S. INDUSTRIAL PROCESSES, LTD. Fr. 641,291, Sept. 21, 1927. See Brit. 282,493 (*C. A.* 22, 3556).

Extraction of suspended substances from gases or liquids. ADAM H. PEHRSON. Fr. 642,012, Oct. 6, 1927. Suspended substances are extd. by introducing the gas or liquid contg. them into a rotating cylinder containing a material which is turned over with a falling movement and the gas, etc., passed through it. The app. may be used for extg. chem. agents from paper pulp residues by means of wood to be used for the manuf. of pulp. Cf. *C. A.* 22, 2628.

Utilizing gases containing nitrogen, hydrogen and carbon dioxide. WILLIAM N. HENDERSON (to Solvay Process Co.). U. S. 1,698,722, Jan. 15. A gaseous mixt. contg. N, H and CO_2 , such as a gas to be used for NH_3 synthesis, is subjected to pressure and while under pressure is scrubbed with water to absorb CO_2 and the latter is made to react with Na_2CO_3 to produce $NaHCO_3$ and the gas remaining from this reaction is returned to the gas mixt. on its way to the water scrubber; the unabsorbed mixt. of H and N from the water scrubber is purified and used to produce NH_3 .

Detecting gas leakage. WILHELM GORLITZER. Austrian 100,988, Feb. 15, 1928. Odoriferous substances, such as residues from the manuf. of oil gas, are placed in the pipes near the points of use or just in advance of the points where the pipes enter rooms.

Recovering volatile substances from absorbents. CARBIDE & CARBON CHEMICALS CORP. Brit. 291,277, Oct. 22, 1927. In effecting the recovery of vapors such as those of ether or alc. from gaseous mixts. such as from air by absorption with liquids or solids from which the vapors are subsequently expelled by heating, the incondensable gases are removed from the system before regeneration of the absorbent commences (suitably by displacement with steam). Various details are given and an app. is described.

Comminuting and mixing materials. HERMANN HILDEBRANDT. Swiss 127,088, May 18, 1925. The materials to be treated, together with a large no. of loose balls,

are continuously projected by centrifugal force over a grinding track, or driven over the track frictionally or by impact, and continuously returned to the starting point. App. is described comprising deep shells, with steep upwardly and outwardly rising walls, which impart rotary and centrifugal movement to the balls and the materials, the balls and the materials being returned downwardly to the middle of the innermost shell. The app. can be used to prep. substances of colloidal fineness.

Mixing "wood wool" and "sorrel-cement" or other long-fibered and powdery materials. KONRAD ERDMANN. U. S. 1,698,881, Jan. 15. Mech. features.

Lixiviating materials. PAUL H. MULLER. Fr. 642,417, Oct. 14, 1927. In a lixiviating or the like app. in which the liquid and solid descend together in a wide chamber the liquid is sepd. from the solid and is pumped off, passed through a heat exchanger and aspirated into a tube below the chamber and draws the solid from the chamber with it, both being led into the chamber again at the top.

Solid carbon dioxide. SOC. ANON DES ATELIERS DE CONSTRUCTIONS MÉCANIQUES ESCHER WYSS & CIE. Fr. 642,057, Oct. 7, 1927. Solid CO_2 is obtained by cooling liquid CO_2 , before expansion, by means of a cooling agent which describes a closed cycle in a sep. refrigerating app.

Drying powdered metals with ethyl alcohol or similar reagents. RINGSDORFF WERKE A.-G. Brit. 291,949, May 28, 1927.

Dry separation of materials such as coal and slate. HENRY M. SUTTON, WALTER L. STEELE and EDWIN G. STEELE. U. S. 1,699,382, Jan. 15. An app. is described which effects sepn. by reciprocating action on an air cushion.

Device for separating dust from granular or piece materials. KARL ORTMANN. Ger. 468,560, Dec. 1, 1926, and 469,377, Sept. 2, 1927. Addn. to 468,560. The material falls through a casing traversed by a no. of horizontal hollow pieces of triangular cross-section. These pieces are open to the casing at their lower edges and are connected internally to a common conduit leading to a suction device, through which the dust is drawn off. In Ger. 469,377, baffles, which may be movable, are arranged over the open lower edges of the hollow pieces.

Filtering effluents. EUGEN GEIGER. Ger. 469,477, Mar. 8, 1925. The effluent is filtered through a traveling endless filter-band, the deposit on which is removed by a jet of water which is then filtered through a sec. band.

Steam supply to a vertical distilling chamber. FRANZ HERZBERG. Ger. 469,214, Jan. 7, 1926. Description of arrangement.

Molding difficultly fusible materials. ROBERT KOLB. Ger. 468,465, Dec. 8, 1926. The mold is arranged in an oven beneath a perforated crucible carrying the material, rotary motion being imparted to the oven in the line from the crucible to the mold.

Molding plastic substances. SOCIÉTÉ D'EXPLOITATION DES PROCÉDÉS HIDOUX. Fr. 642,538, Oct. 18, 1927. To remove air fissures the plastic substance is submitted to 2 successive compressions, so that the brick or the like coming from the first mold and contg. air fissures is compressed in a slightly larger mold, the air being expelled before the compression is complete.

Economical application of heat. HANS BRANDT. Fr. 640,945, Sept. 7, 1927. A system is described whereby heat in the form of very hot water or steam under pressure can be economically used at any required point, particularly in the chem. industries.

Sectional boiler with waste-gas-collecting chambers arranged under the heaters. ADOLF SCHULZE. Ger. 469,623, Aug. 10, 1926.

Waste-gas boiler for the simultaneous production of high- and low-pressure steam. RICHARD NÜBLING and ROBERT MEZGER. Ger. 469,607, Jan. 18, 1927.

Preventing incrustation and corrosion in boilers, condensers, etc. FRIEDRICH HAUPTVOGEL. Austrian 111,316, June 15, 1928. The boiler, etc., is included in an elec. circuit actuated by d. c. and comprising a regulable resistance in parallel with the boiler and lamp resistances between the regulable resistance and the source of current.

Purifying solutions containing dissolved salts and organic coloring substances. ARTHUR B. RAY (to Carbide and Carbon Chemicals Corp.). U. S. 1,699,449, Jan. 15. Soln., such as those of sugar are treated with a quantity of tri-Ca phosphate or other water insol. alk. earth metal phosphate adjusted for the pptn. of the principal portion of the salts present and with a quantity of absorptive C sufficient for removal of substantially all the coloring matter.

Purifying liquids such as oil mixtures which tend to emulsify. FORD H. McBERTY (to DeLaval Separator Co.). U. S. 1,698,270, Jan. 8. In treating used automobile crankcase oil, a liquid such as aq. Na_3PO_4 soln. is added which tends to agglomerate impurities present but which also tends to form a relatively persisting emulsion and the liquids are sepd. (suitably by centrifuging) before a "tight emulsion" is formed,

and may then be further admixed and reseed. until the desired purification is effected. An app. is described.

Methyl formate or similar formates as solvents in purifying oils. I. G. FARBENIND. A.-G. Brit. 291,817, Jan. 7, 1927. Mineral oils, fatty oils or oils formed by distn. or hydrogenation of coal may be treated with Me formate or like formates to ext. resinous or other constituents.

Removing liquids such as oil from wells. ROBERT DEMING. U. S. 1,697,856, Jan. 8. A column of liquid of relatively small diam. is subjected to a continuously applied gas pressure less than would be required to elevate out of the well a column of liquid lightened by the addition of gas, and a stream of gas is impinged upon the top portion of the column and above the liquid level of the well to disperse and remove the liquid as a mist suspended in a continuous phase of gas. An app. is described.

Solubilizing liquids. ROBERT HOUBEN. Fr. 642,449, Oct. 15, 1927. Liquids are made sol. in water by making a paste by sapon. a vegetable or mineral oil, mixing an org. solvent and water in approx. equal vols. with the paste, and then adding and mixing the liquid.

Dispersion of organic substances in liquids in which they are not readily soluble. I. G. FARBENIND. A.-G. Swiss 127,514, Mar. 8, 1927. The org. substance is treated with liquid in the presence of acid aryl phosphates. Thus, ditolyl Na phosphate is dissolved in water and mixed with cyclohexanone, giving a clear soln. which can be dild. with any quantity of water. Similarly, cyclohexanol, oleic acid, PhNH_2 and C_6H_6 can be dispersed in water.

Solutions of resins, dyes, cellulose esters and ethers, etc. I. G. FARBENIND. A. G. Swiss 127,241, Apr. 19, 1927. The water-sol. esters of polyhydric alcohols with fatty acids are used as solvents for org. or inorg. substances of diverse kinds. According to the examples, (1) shellac is dissolved in glyceryl formate and (2) acetylcellulose or benzylcellulose is dissolved in a mixt. of glycol mono- and di-formates.

Clarifying apple juice or other solutions containing tannin. WILLIAM A. BENDER (to Certo Corp.). U. S. 1,698,985, Jan. 15. Solid casein is added and the sediment which forms is removed.

Extracting sugar, etc. KARL KOMERS and KARL CUKER. Fr. 642,277, June 8, 1927. In a diffusion process for treating beet, sugar cane, wood, bark, etc., the material is given a gentle squeezing or suction without damaging the cell membrane and then subjected to an oxidizing current of gas, which dries the cells and concentrates their internal juices, thus raising the osmotic pressure and accelerating the diffusion. Centrifuges, etc., for the preliminary treatment may be interposed between some of the diffusers.

Large crystals from salt solutions. PAUL SEIDLER. U. S. 1,697,543, Jan. 1. Vegetable substances such as ext. of field hay are added to salt solns. such as NH_4Cl and the solns. are concd. by heating, allowed to cool slowly, and the crystals formed are removed from the mother liquor, centrifuged and dried.

Mining oil deposits and other lethal or combustible gas-producing deposits. EWART G. SINCLAIR (to Midwest Refining Co.). U. S. 1,697,788, Jan. 1. Gas-producing workings are isolated by suitable barriers and an atm. of gas is maintained in the workings under superatm. pressure to prevent entrance of air and excavating and removal operations are effected in the gas under pressure, e. g., by miners wearing respiratory app. An app. is described.

Electric cables. C. E. A. T. CONDUOTORI ELETTRICI ED AFFINITORINO. Brit. 291,416, June 3, 1927. A method of effecting controlled impregnation and drying of paper insulation in the manuf. of high-tension single-phase elec. cables comprises covering the central Cu of the cable with a porous paper layer on which is wound a Cu strip in a close continuous spiral, the edges of the turns of which do not touch, and a paper insulation is placed also around this strip. Insulation resistance, capacity, etc., measurements are made during impregnating and drying of the cable to serve for control of the process.

Luting. I. G. FARBENIND. A.-G. (Adolf Menger, inventor). Ger. 469,189, Nov. 6, 1925. Joints of tube systems are luted by applying liquid cellulose esters and then adding substances which improve the mechanical properties of the mass. Ethyl-acetanilide, with or without diethyldiphenylurea, and triphenyl phosphate are given as examples of the added substances.

Refrigeration plant. EUGENIO BIAGGINI. Ger. 469,557, Feb. 3, 1925. In plant in which a reducing nozzle of unvaried cross-section is arranged between the condenser and the evap. coils, a vessel of greater capacity than the total vol. in the liquid state

of the cooling medium circulating in the plant is arranged between the evap. coils and the compressor.

Refrigerating apparatus of the absorption type. I. AMUNDSEN (to Aktieselskabet Amundsen Refrigerator Co.). Brit. 291,039, Oct. 29, 1926.

Refrigerating apparatus of the absorption type. CARL HOCHHERZ. U. S. 1,697,187, Jan. 1.

Refrigerating system of the absorption type. FREDERICK G. KEYES (to National Refrigerating Co.). U. S. 1,698,847, Jan. 15. In utilizing absorption material such as CaCl_2 which is capable of forming with the refrigerant fluid such as NH_3 definite addn. compds. of higher and lower order, the alternating stages of emission and absorption are confined between limits corresponding to the higher-order and lower-order addn. compds. An app. is described.

Refrigerating apparatus of the compression type. EDWIN H. HULL (to General Electric Co.). U. S. 1,698,306, Jan. 8. Structural features.

Refrigeration apparatus of the compression type. EUGENE L. BARNES (to Barber Asphalt Co.). U. S. 1,699,681, Jan. 22.

Refrigerating apparatus of the compression type. ROSCOE R. STITT (to Stitt Refrigeration Co.). U. S. 1,698,350, Jan. 8.

Refrigerating apparatus of the compression type. FRANK W. SCHWINN. U. S. 1,697,542, Jan. 1. Structural features.

Refrigerating apparatus of the closed-cycle compression type. RANSOM W. DAVENPORT (to Chicago Pneumatic Tool Co.). U. S. 1,698,939-40-1, Jan. 15. Structural features.

Refrigerating system of the compression type. C. W. VOLLMANN. Brit. 291,856, March 7, 1927. Structural features.

Heat-exchange system suitable for use in connection with refrigerating systems. RANSOM W. DAVENPORT (to Chicago Pneumatic Tool Co.). U. S. 1,698,938, Jan. 15. A mixt. of CH_2Cl_2 and a lubricant may be used.

Thermostatic control for refrigerating apparatus. HERBERT W. WOLVERTON (to Frigidaire Corp.). U. S. 1,699,576, Jan. 22.

Device for indicating the pressure and temperature of a refrigerating machine. GES. FÜR LINDE'S KISMASCHINEN A.-G. Swiss 127,613, Jan. 12, 1927.

Preventing corrosion by salt solution of metal parts of refrigerators. ALFONS SPIZER. Austrian 110,863, May 15, 1928. An addn. of quinoline, suitably in amts. 10-5 1%, is made to the salt soln.

Liquefaction apparatus for refrigerators. DR. ING. SILLER & RODENKIRCHEN G. M. B. H. Fr. 642,495, Oct. 17, 1927.

Ice-making machine using liquid ammonia. MARCEL MOULIN. Fr. 641,448, Sept. 3, 1927.

Electric insulation. D. ANDERSON & SON, LTD., AND R. O. CHILD. Brit. 291,858, Aug. 16, 1927. Bituminous materials, tar, gutta-percha, rosin, varnish and the like are treated with a colloid such as casein, glue or starch in a partially coagulated condition and the mixt. is centrifuged to remove suspended matter. Heat and solvents may be employed and the casein may be partially coagulated by sulfonated oil or other slightly acid agent.

Insulating material. ISOLA-G. M. B. H. Ger. 469,073, Aug. 21, 1925. Mg-contg. minerals are first melted and then pulverized in a current of steam or compressed air. Cl. C. A. 22, 3719.

Insulating material. I. G. FARBENIND A.-G. Fr. 641,487, Sept. 23, 1927. An elec. insulating material for sepg. partitions is made from a fibrous inorg. substance mixed or not with other inorg. substance and treated before or after molding with a binder composed of a mixt. of nitrocellulose and a softening agent such as phenol ethers or phosphoric acid, with or without the addn. of resins. Examples are given in which slag wool and "asbestos" are used.

Electric insulating material. I. F. SLASTIKOV. Russ. 4799, Mar. 31, 1928. Equal quantities of SbCl_3 and S are melted and heated up to 400° without boiling, poured in a thin stream into cold water, taken out and left to harden. Three parts by wt. of the substance so obtained is then mixed with, e. g., 4 parts of wood tar, 2 parts of coal tar heated preliminarily to 200° until beginning darkening and 1 part of paraffin wax boiled until it starts to become brownish.

Insulating coating composition. SIDNEY M. HULL (to Western Electric Co.). U. S. 1,698,870, Jan. 8. A compn. suitable for use on wires comprises cellulose acetate 30, a phenolic condensation product 10 and furfural 300 parts.

14—WATER, SEWAGE AND SANITATION

EDWARD BARTOW

Progress in chlorination of water, 1927-1928. L. H. ENSLOW. *J. Am. Water Works Assoc.* 20, 819-46(1928).—Following a discussion—strengthened by many successful examples—of prechlorination, there is also reference to super- and de-chlorination. The use of ammonia or permanganate with chlorination and the use of chlorine in algae control as well as preventing sludge putrefaction are considered.

D. K. FRENCH

Chlorine absorption as a substitute for oxygen consumed. HARRISON HALE, MAY SULLIVANT AND CHARLES B. DEWITT. *J. Am. Water Works Assoc.* 20, 847-53(1928).—A method using *o*-tolidine is described and recommended for the detn. of chlorine absorption. This method is rapid and a more accurate index to nitrogenous matter than O consumed.

D. K. FRENCH

Use of the physical qualities of a water in judging its quality. F. DIENERT. *Rev. hyg.* 50, 881-93(1928).—More extensive use of color, taste, odor, temp. and fluorescence in water examn. is advocated.

C. R. F

Electroosmotic water purification. II. A. H. W. ATEN. Gemeente Electriciteitswerken, Amsterdam. *Chem. Weekblad* 25, 646-48(1928); cf. *C. A.* 22, 2421. A calcn. shows that purification can also be obtained with diaphragms in which the ions have the same mobility as in water, providing the anolyte and catholyte are of a definite acidity and alky., resp.

G. CALINGAERT

The relationship between carbonates and p_H and conductivity in natural waters. RONALD SENIOR-WHITE. *Water and Water Eng.* 30, 455-6(1928).—It is difficult to det. carbonate, bicarbonate, and CO_2 content of waters in the field. If titrations are delayed until return to the lab., considerable change may take place. p_H is detd. with portable field app. and only small samples of water must be carried back to the lab. for the detn. of cond. Routine analyses of several waters show a close relationship existing between (1) p_H values and percentages of the free and half-bound carbonate (movable carbonate) and (2) the total carbonate, including dissolved free CO_2 , and the cond. of the water as measured by a Kohlrausch bridge and cell. The relations of (1) are shown to be reasonably accurate. The relations of (2) are open to sources of error except in pure waters of low cond., because of interference with chloride, sulfate, etc.

E. BARTOW

The problem of biochemical decomposition of phenol in natural water. H. BACH. *Gesundh. Ing.* 51, 773-4(1928).—Phenol finds its way into natural water from gas plants, coke plants, etc. Expts. were carried out in a glass vat of 210-l. capacity. The bottom was lined with sand and goldfish were placed in the water. When 10 p. p. m. was added, only a trace remained after 4 days. A second addn. of 10 p. p. m. gave similar results. Phenol in amts. up to 25 p. p. m. was rapidly destroyed. Further addns. resulted in retarded decompn. Addns. of 10 p. p. m. phenol seemed to have no harmful effect on the goldfish.

WAYNE L. DENMAN

Removing gas from water. M. EULE. *Gesundh. Ing.* 51, 801-6(1928).— CO_2 and O are known to be important in the corrosion of iron and steel. CO_2 is ordinarily removed by means of alkalis. O can be removed by chemical means. It is also removed by mechanical means. Illustrations of app. used in removing dissolved gas in water are given.

WAYNE L. DENMAN

Water works improvements on a cost plus basis. H. V. PEDERSEN. *J. Am. Water Works Assoc.* 20, 809-12(1928).—For reconstruction and questionable jobs, cost plus is recommended.

D. K. FRENCH

Hydrogen sulfide removal and water softening at Beverly Hills, Calif. R. L. DERBY. *J. Am. Water Works Assoc.* 20, 813-18(1928).—The problem involves removal of H_2S from air as well as from water. H_2S in the supply varied from 1 to 20 p. p. m. Aeration took care of the H_2S after which lime, alum and Cl are used. A clarifier is used between the primary and final coagulation.

D. K. FRENCH

Engineering problems in the water supply system of Chicago. LORAN D. GAYTON. *J. Western Soc. Eng.* 33, 561-5(1928); cf. *C. A.* 22, 3473.—In order to supply the more than three million people in Chicago and its suburbs, there have been constructed 6 intake cribs and 11 pumping stations. They are inter-connected. 1,070,000,000 gals. per day was pumped during August, 1928. The engineering features include cribs, pumping stations, both steam and electrically driven, tunnels and distribution mains. The drainage canal and the sewage treatment plants of the Sanitary District of Chicago protect the water supply.

EDWARD BARTOW

Water supply situation in Kentucky. E. E. JACOBSON. *J. Am. Water Works Assoc.* 20, 854-9(1928). D. K. FRENCH

Water supply purification in Tennessee. HOWARD R. FULLERTON. *J. Am. Water Works Assoc.* 20, 860-2(1928).—Advances have been made in iron removal, disinfection and filtration. D. K. FRENCH

Six years' operation of filter plant at Peterborough, Ont., Can. R. L. DOBBIN. *J. Am. Water Works Assoc.* 20, 795-805(1928).—The supply is river water. Its treatment includes aeration, sedimentation, filtration and chlorination. Treatment is primarily for color removal; 50% bacterial reduction is obtained at the filters. Every step is described in detail. D. K. FRENCH

History of Utica's water supply. F. E. BECK. *J. Am. Water Works Assoc.* 20, 806-8(1928). D. K. FRENCH

London water supply. HENRY E. STILGOE. *Water and Water Eng.* 30, 528(1928).—The drainage area is 558 square miles. The av. daily consumption is over 260 million gals. or 36 gals. per capita. There are 49 storage reservoirs with a capacity of 19,657 million gallons. 92 service reservoirs with a capacity of 321 million gallons, 176 acres of sand filters. 58% comes from the Thames, 25% from the Lea, and 17% from wells. Rapid filters and chlorination are used in some of the plants. EDWARD BARTOW

New waterworks for Scarborough. ANON. *Water and Water Eng.* 30, 506-10(1928).—The new works included a well 428 ft. deep and the covering of a reservoir to prevent discoloration of the water by the growth of algae. EDWARD BARTOW

Sheffield's water supply. WOMERSLEY, *et al.* *Water and Water Eng.* 30, 451-4(1928).—Sheffield's water supply includes 12 storage reservoirs with a capacity of 5745 million gals. and 18 service reservoirs with a capacity of 94 million gals. It supplies 336,000 people. All the water is filtered. The new works have a capacity of 4 million gals., an addition to the filter plant filters Derwent water. The plant contains suitable tanks and app. for the application of suitable doses of chemicals for removing color and neutralizing acidity. Lime and alumino-ferrie soln. are used. There are 32 filter units, 8 ft. in diam., giving a total filtering area of 1600 sq. ft. The water is soft, varying between 2° and 3° of Clark's scale. Since the soft water attacks metals, a small amount of lime is used to prevent corrosion in the mains. The new supply increases the resources by a little more than 12%. EDWARD BARTOW

The future of Berlin's water supply. A. FEILITZSCH. *Gesundh. Ing.* 51, 785-7(1928). The supply is largely surface water; it requires filtration and chlorination. It is estd. that the yearly demand in 1945 will be 400 million cu. m. Much descriptive material is present in this article. WAYNE L. DENMAN

The use of artesian water for the water supply of Mitau. G. THIEM. *Gesundh. Ing.* 52, 7-10(1929).—Mitau is a city of 40,000 inhabitants in Lettland. Hydrological charts show that Mitau is situated in the center of a concave fold in the earth's strata. The water is found in Devonian water-bearing sandstone; it enters this stratum from openings at much higher levels. Two borings of 186 meters and 205 meters yield artesian water. The normal capacity of these wells is about 2420 cu. m. per day. The first boring gives a water of 56 p. p. m. CaO temporary hardness and 64 p. p. m. permanent hardness, whereas the temporary hardness of the second well is 30 p. p. m. and the permanent hardness is 90 p. p. m. The total hardness of the two wells is the same. WAYNE L. DENMAN

Town water supply in India. J. W. MADELEY. *J. Roy. Soc. Arts* 77, 24-47(1929). Because of lack of funds and scarcity of good water, it is very difficult to obtain sufficient water to meet the needs of Indian towns. Water was supplied to Madras at the rate of 25 gals. per head for an estimated population of 600,000. Regular methods of purification including filtration, and chlorination are used. Slow sand filtration is not satisfactory. Chlorination is used as a second line of defense. Great difficulty is experienced in preventing waste of water. EDWARD BARTOW

Practical points on feed-water treatment. J. GUEST. *Blast Furnace and Steel Plant* 16, 1461-65(1928).—Water for the power plant should be (1) free from scale-forming solids, (2) free from corrosive properties gaseous or otherwise, (3) free from a high concn. of solid matter likely to cause foaming or priming and excessive blow-down. Treatment with lime and soda with or without coagulants, with zeolites or by combined methods are used in accordance with the character of the water to be treated. Dissolved gases are removed by increase of temp. either at atm. or reduced pressure. A const. check should be kept on the treated water. EDWARD BARTOW

Feed water and boiler efficiency. W. G. LEWIS AND G. S. IRVING. *Eng. and Boiler House Rev.* 41, 378, 380; *J. Am. Water Works Assoc.* 20, 157(1928).—A review

of a wide field, including references to the colloidal phases of water treatment.

Dissolved oxygen in boiler-feed water. WM. E. SMITH. *Facts About Sugar* 23, 1194-5(1928).—The corrosive effects of dissolved oxygen and methods of degasification of water are described. *Dissolved oxygen* is estd. by reduction with MnSO_4 and iodometric titration with $\text{Na}_2\text{S}_2\text{O}_3$.
D. K. FRENCH

Sodium-aluminate treatment for boiler-feed water. C. C. SPILMAN. *Power* 69, 94-6(1929).—A soln. of Na aluminate in NaOH and soda ash is a powerful coagulant. When daily tests are made on each boiler for reaction and hardness, it is possible to maintain boiler-feed water approx. const. despite large fluctuations in raw water compn. The advantages are less excess chemicals, less sol. salts, low hardness, less foaming and less scale than result from other methods of treatment. In a plant treating one million gals. per day the cost of chemicals ranges from \$0.0258 to \$0.0386 per thousand gals.
M. J. PROFFITT

Comparing detergents and wetting agents by their effects on the hardness test for water. H. PERNDANNER AND J. HACKL. *Melliand Textilber.* 9, 913-5(1928).—The presence of detergents other than soaps and of wetting agents cause a change in the apparent hardness of H_2O as estd. by the Clark test, and this may be suggestive of useful test methods for such products. Using a standard water of 12° (German) hardness, and solns. contg. 0.1 to 0.2 g. per 100 cc. of various products, apparent hardnesses of from 6.9° to 11.1° were obtained. The data were considered favorable to Nekal BX.
D. B. DILL

Dissolved iron and manganese in stored water at Kernersville, N. C. W. H. WEIR. J. N. Car. Section. *Am. Water Works Assoc.* 5, 119-26(1927); *U. S. Pub. Health Repts.* 43, 3265(1928).—A review of unusual problems developed at Kernersville, N. C., when a new filtration plant designed to treat a typical turbid water of a flowing stream was placed in operation to treat the same water after storage in a shallow reservoir contg. large quantities of org. matter. Storage of this water led to a marked change in its quality, leading to the soln. of Mn and Fe from mineral deposits at the site and to a large increase in the color of the water. Expts. conducted at the plant indicate that aeration of the water failed to ppt. the Fe and Mn, probably because of the large org. content. Prechlorination of the water led to the pptn. of the Fe and Mn, but the org. color remained unchanged. Addn. of lime to the raw water produced excellent flocculation of the Fe and Mn, but no change in the org. color. Subsequent coagulation with alum, however, resulted in a reduction of the color. Expts. were duplicated on a plant scale by the addn. of lime to the raw water entering the mixing basin. The dose of lime was detd. by the maintenance of a faintly caustic reaction to phenolphthalein. The formation of the $\text{Fe}(\text{OH})_3$ was extremely rapid, allowing the alum soln. to be added about half way down the mixing chamber. The alum dose was adjusted to maintain the optimum p_{H} for color coagulation. The sedimentation of the floc, however, was slow; so that the settled water was more turbid than desirable, thus requiring frequent washing of the filters and the use of large vols. of wash water. This situation indicates the great desirability of thoroughly studying the quality of raw water to be treated before the final plans for water-purification plants are completed, in order that the plant may be provided with the necessary auxiliary equipment, and for special treatment when such is necessary.
E. R. CLARK

Experiences with *Crenothrix* in ground water supplies. K. W. BROWN. *Munic. News and Water Works* 75, 93-4(1928); *U. S. Pub. Health Repts.* 43, 3267-8(1928) - *Crenothrix* infections in ground water supplies can be eliminated by application of either CuSO_4 or Cl in those systems operating pumping plants augmented by reservoirs of adequate capacity. It is advisable, however, in order to avoid occurrence of obnoxious conditions, that introduction of the chemical be made prior to the reservoir. For systems operating a series of scattered wells there is apparently little opportunity of destroying filamentous organisms; resorting to chem. treatment will occasion inevitably distressing features, the extent of which cannot be foretold. Combating algae by chem. application to water pumped directly to distribution from a system of scattered wells is, therefore, nothing less than a gamble, with odds somewhat in favor of the *Crenothrix* survival.
C. R. F.

A system of analysis for oil-field waters. C. E. REISTLE, JR., AND E. C. LANE. Bur. Mines, *Tech. Paper* No. 432, 14 pp. (1928); cf. *C. A.* 22, 4192.—Description of the Bur. Mines method for quantitatively detg., calcg. and reporting the characteristic constituents in oil-field water for the identification of waters from different strata. Tables show the relation between the sp. gr. and the quantity of water to be used for detg. the metallic ions and between the sp. gr. and the total solids. It is recommended

that the analyst report the characteristic constituents in the water in parts per million (mg. per l.) and reacting values in percentage.

L. MARSH

The dissolving of lead from water pipes. A. FARINE. *Tech. Ind. Schweiz. Chem.-Ztg.* 1927, No. 3/4, 29-32.—Theoretical deductions check with the lab. data in demonstrating that free CO_2 in water greatly accelerates the lead-dissolving action of that water. On the other hand, bicarbonates greatly reduce the action. A sample contg. only free CO_2 dissolved 10.5 mg. Pb per l., but when the CO_2 was replaced by bicarbonate the Pb content was only 0.6 mg. per l. Formulas are derived for calcg. the Pb-dissolving power of water.

C. R. F.

Modern sewage purification. F. EGGER. *Städt. Chem. Untersuchungsamt, Stuttgart. Tech. Ind. Schweiz. Chem.-Ztg.* 1927, 76-81; *Ibid* 93-6.—A description of the activated sludge system with diagrams for the city of Stuttgart.

C. R. F.

Modern sewage treatment plants in England and America and their importance to German municipal sewage treatment. F. LANGBEIN. *Gesundh. Ing.* 51, 738-42 (1928).—Activated sludge processes are finding greater favor in these countries. Milwaukee has built a plant which has a normal capacity of 386,000 cu.m. sewage daily, and many other cities operate large installations. Four schematic representations of this process are given and illustrations of plants in the principal cities.

WAYNE L. DENMAN

Theory and practice of sludge decomposition. M. PRÜSS AND H. BLUNK. *Gesundh. Ing.* 51, 769-73 (1928).—Artificial heating results in more rapid decomposition and as a result the min. retention period is lowered. Artificial circulation and mixing with fresh sludge results in more efficient operation (German patent 465,211). Also gas formation is greater.

WAYNE L. DENMAN

The purification of sewage from the city Elmshorn, with special reference to tannery wastes. A. SNOEK. *Collegium* 1928, 612-21.—Data on the quantity of sewage are given. Purification by sand filters or absorption on clay was not satisfactory. An exptl. activated-sludge plant operating on $\frac{1}{3}$ tannery waste and $\frac{2}{3}$ city sewage reduced the total bacteria from 970,000 to 375,000 and spore formers from 62,000 to 200. The effluent was optically clear and was discharged through a small tank contg. fish which remained healthy. The sludge in the putrifying room was soon reduced to a tenth of its original quantity; the end product was a black humus-like mass having an earthy odor and good fertilizing value. The gas which was given off was 90% CH_4 and in gas engines would supply enough power to operate the plant.

I. D. C.

The causes and prevention of hydrogen sulfide in abattoir sewage. A. B. PORTER AND J. A. CRESSWICK. Metropolitan Meat Ind. Board, Sydney. *J. Soc. Chem. Ind.* 47, 380-2T (1928).—A gravity sewer about 2 miles long leads the sewage into large collecting wells. From this point the sewage is pumped through a rising main about $\frac{1}{4}$ miles to one of the city trunk sewers, thence 12 miles to the Pacific Ocean. The abattoir waste is dild. with 60% of other sewage in the collecting wells where H_2S and other offensive gases created a serious nuisance to persons residing in a large area. Blood decomposed faster in salt than in fresh water. Paunch contents (manure) hastened decompn. but casing-refuse had no effect. The effect of increased temp. on decompn. was very marked, the same results being obtained in 1 hr. at 37° at 6 hrs. at 32° , or 24 hrs. at room temp. The principal source of the H_2S was the bacteria present in the paunch manure. The elimination of coarse paunch manure from abattoir sewage greatly improved conditions both as to H_2S evolution and accumulation of waste in the sewers. By keeping the waste at a cool temp., improvements were also effected. In order to combat rapid fermentations, all wastes are now treated with lime and FeSO_4 to fix any small amts. of sulfide as FeS and render them sufficiently alk. to prevent further bacterial action.

C. R. F.

Sanitary program of the Chicago district. LANGDON PEARSE. *J. Western Soc. Eng.* 33, 554-6 (1928).—The district takes the sewage in interceptors to the drainage canal and to treatment plants. The district is not allowed to take sufficient water for disposal by dildn. and is building treatment plants to make it possible to deliver the treated sewage into the Illinois River without nuisance. Plants to treat the sewage from two and a half million people are either built or under construction and the district has plans for treatment plants to serve the city for 10 years and interceptors for 40 years. The wastes from Packing Town are equiv. to 1,300,000 in addn. to the human population.

EDWARD BARTOW

Carbon monoxide hazard in city streets. JOEL I. CONNOLLY, MATHEW J. MARTINEK AND JOHN J. ARBERLY. *Am. J. Public Health* 18, 1375-83 (1928).—Analysis of 600 street air samples from Chicago, taken at the curb, 3 ft. above the sidewalk shows a distribution of CO according to the type of street. Analyses were by a modi-

fied iodine pentoxide method. 85% showed 50 p. p. m. or less, 63% 30 p. p. m. or less. The av. for the city was 31 p. p. m., in the downtown area ("Loop") 53 p. p. m., in the densely populated district around this 21-30 p. p. m. and in less thickly populated districts 15-18 p. p. m. The amt. increases according to the number of automobiles passing in 5 min. from 10 p. p. m. to 64 p. p. m., the latter with 400-1000 cars. Ten p. p. m. is considered a residual amt. and above it the amt. varies approx. as the logarithm of the no. of automobiles passing in 5 min. In residential and industrial streets the av. concn. is 12.5 p. p. m., on traffic streets 25 p. p. m. and on boulevards 47.6 p. p. m. A table of percentage of samples in each range of 10 p. p. m. for each class is given. On boulevards hourly fluctuations occur with maxima at 8-9 A. M., 11-12 A. M., 1-2 P. M. and 5-6 P. M. On a 2-level street, Wacker Drive, open to a river on one side, the av. was 62 p. p. m., the max. 133 p. p. m. and only one sample was under 33 p. p. m. The Dept. of Health does not permit use of this level as a source of air supply for adjoining buildings. It was concluded that in general CO in the air of city streets other than boulevards does not constitute a serious health hazard. At times automobile boulevards and the lower level of double-decked streets contain enough CO to menace the health of those exposed for several hrs and this air should not be used for habitable rooms. Recommendations for consideration are mech. ventilation of double-decked streets, reduction of idling of motors and studies of the effect of CO in amts. below 100 p. p. m. on susceptible age groups or individuals. FOSTER DEE SNELL.

The bacterial examination of water in public swimming baths. G. K. BOWEN. *J. State Med.* 36, 521-45(1928); *U. S. Public Health Eng. Abstracts* E-676d(1928). B reviews the literature of transmission of disease by swimming baths and of bacterial standards. Practically all of the standards considered are of U. S. origin. Exptl. results obtained from a number of places in England during the yrs. 1925-26 are given. These data include bacterial results, methods of operating the bathing pools, no. of persons using baths and effects of temp. B. concludes in part that: (1) Pollution is less in cold weather than in warm, regardless of methods; (2) continuous filtration is superior to occasional emptying and filling with fresh water; (3) the standard adopted should be as stringent as that of drinking water (U. S. Treasury); and (4) it is not possible to maintain this standard without continuous disinfection with some agent such as Cl. J. A. KENNEDY.

Dimethyl- α -naphthylamine for determination of nitrite ion (GERMUTH) 7. The estimation of borate in natural waters (FOSTER) 7. Effect of additions of lime and soda ash to brackish water on the corrosion of iron and steel (FORREST, *et al.*) 9. The mineral content of feeds, soils and waters of South Carolina (MITCHELL, *et al.*) 15. Corrosion and metal protection in boiler operation (STUMPF) 9. The indole titre according to Gersbach in water analysis (NEISSER) 11B. Chemical analysis of liquids (Fr. pat. 641,572), 1.

BÖHM, BRUNO. *Gewerbliche Abwässer*. Berlin: Otto Elsner Verlagsbuchhandlung m. b. H. R. M. 17.50. Reviewed in *Internl. Sugar J.* 30, 663(1928).

Purifying water. R. E. HALL. *Brit.* 291,970, June 28, 1927. For filtering boiler water or other hot alk. waters free from oil or oily substances silicates are used such as granulated slag from Cu smelting, forsterite, or other members of the olivine group of minerals, or some members of the pyroxene and amphibole group, ilmenite or chromite. An app. is described.

Filter construction suitable for municipal water filtration plants. WALTER WAGNER (to General Zeolite Co.). U. S. 1,698,079, Jan. 8.

Purifying boiler feed water. LEOPOLD SCHINDL. Austrian 110,070, Feb. 15, 1928. The water passes through a container in which it is first treated with steam, for removal of gases, and then filtered through successive gratings of increasing fineness.

Device (associated with the smoke box) for heating and purification by steam treatment of feed water for locomotive boilers. JOHANN STUMPF. U. S. 1,699,965, Jan. 22.

Prevention of boiler incrustation by electrical means. LEOPOLD FRÄNZL. Austrian 109,792, Jan. 15, 1928. The system includes a charged elec. condenser, the surface to be protected against incrustation corresponding to a plate of the condenser.

A compound for removing boiler scale. M. I. GLIBOV. Russ. 4829, Mar. 31, 1928. A concd. soln. of NaOH is mixed with an aq. ext. from oak bark and moss, a mixt. of tanning ext. and linseed-oil foots with the addn. oft annin, marshmallow

root and viscous salep roots until the liquid so obtained has a viscosity range of 34–44° Bé.

Extracting tannates from boiler scale. HERMANN MENZ, KURT TREUBENER AND WALTER FAHDT. Ger. 467,021, July 29, 1924. A device for the lixiviation of boiler scale to ext. the tannates is fitted with an internal sieve which retains solid matter.

Apparatus for softening water with base-exchange substances. CHESTER T. MCGILL (to Reiter Co.). U. S. 1,697,835, Jan. 1. Structural features.

Apparatus for softening water by treatment with base-exchange materials. CHAS. P. EISENHAEUER (to Duro Co.). U. S. 1,699,836, Jan. 22.

Apparatus for softening water by treatment with base-exchange material. EDWARD T. TURNER. U. S. 1,697,095, Jan. 1.

Filtration apparatus adapted for softening water with base-exchange silicates. CHESTER T. MCGILL (to Reiter Co.). U. S. 1,698,890, Jan. 15. Structural features.

Forming screen plates for water softener filters, etc. CHARLES P. EISENHAEUER (to Duro Co.). U. S. 1,699,693, Jan. 22. Mech. features.

Artificial zeolite. ORDEIG, SOCIEDAD LIMITADA. Fr. 641,755, Oct. 3, 1927. A colloidal ppt. is obtained by the action of an alkali aluminate on a colloidal soln. of a metallic salt with Na_2SiO_3 . The mother liquors are extd. by pressure, dried and fractioned in water giving a fine sand of artificial zeolite for *water purification*.

Decreasing the hardness of water used for treating fibrous material. G. S. PETROV and N. A. ALEKSEEV. Russ. 4630, Feb. 29, 1928. H_2SO_4 sludges obtained from treatment of crude oil, shale and brown-coal distillates, peat tars, hydrogenated aromatic hydrocarbons, terpenes or sulfonic acids obtained from sulfination of aromatic hydrocarbons or phenols with fats or fatty acids are used to soften water in a proportion to obtain a slightly acid reaction followed by a neutralization with soda.

Apparatus for treatment of distillery slop or other organic wastes. GUSTAVE T. REICH. U. S. 1,698,171, Jan. 8. An app. is specified suitable for heating in retorts to obtain a *fertilizer* and various structural details are described.

Incinerator for garbage, etc. WILLIAM C. EPSTEIN (to Duo-Tor Mfg. Co.). U. S. 1,697,524, Jan. 1.

Retorts and associated apparatus for drying and incinerating garbage and rubbish. JOHN SCHAAF. U. S. 1,698,454, Jan. 8. Structural features.

Incinerator for household garbage and refuse. LEE O. HABER (to Buffalo Co-operative Stove Co.). U. S. 1,699,531, Jan. 22. Structural features.

15—SOILS, FERTILIZERS AND AGRICULTURAL POISONS

J. J. SKINNER

Soil experiments. O. LIEHR. *Z. Pflanzenernahr. Dungung.* 7B, 201–6(1928).—Nutrient values of a large number of soils were detd. by the Neubauer seedling method and by that of Lemmermann and König. No general relationship existed between these values and the soil reaction. A general lack of phosphate in German soils is indicated. B. C. A.

Soil analyses and their limitations. W. N. C. BELGRAVE. *Malayan Agr. J.* 16, 289–3(1928). The older well-known standard methods are very briefly reviewed and the limitations to the usefulness of such methods and recent modifications are discussed and lastly an explanation of the present sphere of usefulness of soil analyses is given. While mech. analyses are useful, chem. analyses in themselves cannot be recommended. Chem. analysis can be of use for comparing a soil with another of the same type and in the same habitat of which the reaction to fertilizers for the crop under consideration has been ascertained, either by long planting experience or by field expts. when and only when this basic information is available can use be made of chem. analysis. E. F. SNYDER

The theory of the soil substance rule. A. V. BUZAGH. *Kolloid Z.* 46, 178–85 (1928). The adsorption theory of soil substance is discussed with the conclusion that factors other than adsorption are of importance. This conclusion was then substantiated with exptl. data. It was shown that the principle is applicable to non-peptized coarse dispersed systems with the conclusion that the soil substance effect enters into the production of colloidal solns. by the solvent interchange method. It was shown that degree of peptization depends not only upon sp. adsorption but also on the concn. of the gel suspension independently of whether a peptization, in the narrow sense, had taken place, or whether only a suspension occurred. L. F. MARK

Colloids and soil fertility. A. DEMOLON. Lab. du ministère de l'agr. *Rev. gén. sci.* 39, 604-12(1928).—This is a brief review, in the light of recent work, of the importance of colloids in some problems of chem. agriculture. The constitution and properties of mineral and humic colloids, the complex clay and humic colloids, colloids and H_2O , the absorbing power of colloids and colloids and soil reaction are discussed. There is another subject which appears outlined and which perhaps is no less suggestive. It is that which concerns the relation of the plants to the colloidal complexes. Perhaps it is not too fanciful to hope that this same path will lead shortly to a satisfactory detn. of the elements of the soil at the disposition of the plant. At this moment, the study of the soil appears as the most solid basis of agronomy. E. F. S.

Colloidal behavior of soils and soil fertility. V. The distribution of soluble and colloidal iron and aluminum in soils. J. S. JOFFE AND H. C. MCLEAN. *N. J. Agr. Expt. Sta. Soil Sci.* 26, 317-25(1928); cf. *C. A.* 22, 4701.—It was found that colloidal Fe and Al sols of various degrees of dispersion may exist, especially in the presence of the NO_3 anion and at moments of the relative absence of the SO_4 and PO_4 anions. Dialysis expts. on samples of surface and subsoil from soil fertility plots prove that only extreme conditions of acidity may bring about Fe and Al in the mol. state. Water exts. of the dialyzed soils should contain the Fe and Al which may be present in the sol state, and in expts. with a large no. of soils it was found that very little of the sol state exists. Fertilizer treatments of the soils investigated do not seem to show marked effects on the state of aggregation of the Fe and Al. The mineral fertilizers tend to coagulate the colloids. The bulk of the Fe and Al split off from the mineral complexes in the process of weathering exist in the soil as the gel, and, as such, are distributed throughout the soil profile. $BaCl_2$ exts. of the same soils which were used in the dialysis expts. give large quantities (as high as 370 p. p. m) of Fe and Al. This is due to the soly. effects of the acid produced by the release of H ions in the process of replacement with the Ba ion. HCl thus formed reacts with the gels, bringing them in soln. The relation of the acid formed by the base exchange reactions to the quantities of Fe and Al going in soln. is discussed. It is shown that the Fe and Al going in soln. do not represent the total quantity of gel present in the soil. A certain correlation may be found between the amt. of titrable acidity of the acid produced by replacement and the amt. of Fe and Al in soln. J. J. SKINNER

Exchangeable bases in soil. V. NOVÁK AND B. MALÁČ. *Bull. Czechoslov. Acad. Agr.* 1927, No. 5; *Proc. Intern. Soc. Soil Sci.* 3, 73-4(1927-8).—Carbonate-free soils. The methods of Hissink, Gedroiz, and Kelley for detg. exchangeable bases in soils give comparable results. By the Kelley method the sum of the individual bases agrees with the amt. of NH_3 absorbed from NH_4Cl . In podsol profiles Fe and Al must be included in the calcn. of exchangeable bases. The Gedroiz (0.05 N HCl) method in many cases involves some decompn. of the absorbing complex, and in neutral soils the liberation of detectable amts. of Fe and Al. During the operation of all methods (Hissink not examd.) considerable amts. of silica may be rendered sol. In degraded chernosem profiles, where the A_1 and A_1' horizons are carbonate-free and the C horizon contains much chalk, only Na, K, Mg, and Ca were found among the absorbed bases. Fe and Al only appeared when the Gedroiz method was adopted. Ca was usually present in greatest amts., and Na and K were present only to a small extent. Podsol profiles with acid reaction differ from tchernosem in having only a small content of total exchangeable bases and by the presence among these of Fe and Al. In horizons A and A_1 the sum of replaceable Fe and Al represents 60-70% of the total replaceable bases, whereas in horizons B and C_1 Ca and Mg are predominant, and the Fe and Al content falls to 5-9%. With soils contg. carbonates the Hissink and Kelley methods diverge considerably, the former giving values averaging twice those of the latter. Bobko-Askinasi's method agrees with Hissink's. Gedroiz' method using 0.05 N NH_4Cl yields irregular results. With N NH_4Cl the Gedroiz method gives values double those by Hissink's. Generally speaking, for carbonate-free soils, the Gedroiz simplified method (0.05 N NH_4Cl) is recommended for speed and ease of working. For detg. total bases without individual identification, Kelley's method is better. None of the processes examd. gives a reliable and satisfactory result for soils contg. carbonate. B. C. A

The identification and composition of the soil aluminosilicate active in base exchange and soil acidity. H. W. KERR. Univ. of Wis. *Soil Science* 26, 385-98(1928); cf. *C. A.* 22, 2021.—The base-exchange material of soils is confined largely to the clay fraction and seems to be so intimately mixed with other colloidal material that it is impossible to sep. it by sp. gr. methods. Sepn. by the use of solvents is complicated, because of the soln. of other materials which obscure the results. By employing the contents derived according to the base-exchange equil. theory, as developed by K.,

it was possible to identify active aluminosilicates from different sources. The equil. const. seems to be characteristic of each compd. involved in base exchange. The soil from which the active org. matter had been completely removed by gentle ignition gave a value for K agreeing very closely with samples of a clay material (bentonite) and differing markedly from the values found for the true zeolites tested. This suggests that the inorg. compds. involved in base exchange of soils and bentonite are identical. Bentonite is a mixt. of at least 2 minerals, which are very difficultly sepd. by mech. means, because of the colloidal properties of the substance. It was found possible to decompose the active material of bentonite by boiling for 18 hrs. with *N* HCl. The liberated silicic acid was then extd. with a 10% soln. of Na_2CO_3 . The analyses of these exts. showed that the ratio of Al_2O_3 to SiO_2 was almost 1 to 6. By further consideration of the base-exchange reaction for cations of different valence, it was shown that the active aluminosilicic acid was monobasic, and when due allowance was made for the unsatn. of the compd., the analyses calcd. from the free acid agreed fairly well with the formula: $\text{H}_2\text{O}(\text{Al}_2\text{O}_3 \cdot 6\text{SiO}_2) \cdot 8\text{H}_2\text{O}$. By leaching a sample of bentonite with 0.1 *N* HCl and washing the sample with H_2O , the free acid was prepd. This acid suspended in H_2O gave a p_{H} of 2.73. It is suggested that the compd. described is of widespread occurrence in soils and, for those which are non-alk., is possibly the predominant if not the only mineral in their inorg. exchange complex. E. F. SNYDER

Distribution of nitrates in three layers of fallow soil. JOHN B. SMITH. Rhode Island Agr. Expt. Sta. *Soil Science* 26, 347-50(1928).—The distribution of NO_3 among 3 layers of fallow soil was studied in the summer season of 1926. A fertilizer analyzing 6% NH_3 , 8% P_2O_5 and 6% K_2O was mixed with the surface 7 in. of Merrimac silt loam. For the entire season, there was little actual loss of easily nitrifiable N from the upper 2 ft. of a fallow plat but vicissitudes of weather and activities of microorganisms caused decided temporary disappearances of nitrates. Proportionate disappearances of NO_3 under growing crops might well constitute critical deficiencies of available N. Nitrates moving downward after leaching rains were often retained in the subsoil layers, and at such times the quantities there present were in excess of those remaining in the surface layers. Under midsummer conditions, nitrates leached from the upper soil layers were returned by the upward movement of soil water to replace that lost from the surface by evapn. J. J. SKINNER

Methods for determining "available" soil calcium. H. D. CHAPMAN. Univ. Calif., Citrus Expt. Sta., Riverside. *J. Am. Soc. Agron.* 21, 92-106(1929).—All the methods show in general a higher Ca extn. from soils growing good alfalfa than from those growing poor alfalfa. The exceptions are probably due to the influence of other fertility conditions. The total quantities of Ca leached out by carbonated H_2O were found to approximate closely the exchange Ca in the soils. While the detn. of such total amts. is important in indicating something as to the potential supply of usable Ca a soil may contain, it does not furnish evidence as to that portion which must be available to enable a plant to maintain normal growth. The Ca leached out by the first liter of satd. carbonated H_2O shows something as to potential supply, represents the more easily sol. Ca and shows considerable correlation to field results with alfalfa. Leaching with satd. carbonated H_2O in a closed system is more accurate than shaking given quantities of soil and 0.04 *N* H_2CO_3 and detg. the Ca dissolved. The former procedure approaches more nearly to the hypothecated mechanism of plant feeding and possesses, therefore, more significance as a method for detg. so-called available Ca. The extn. of Ca by means of plant seedlings offers interesting possibilities in detg. the relative amt. of easily sol. constituents in a soil. Used in conjunction with chem. methods, it enhances their significance in detg. that portion of an element which is available. Not as wide a range of Ca could be removed from the soil by buckwheat seedlings as by carbonated H_2O , but the results obtained were in somewhat the same order and quantities. F. F. SNYDER

Complete dissociation of silicates by carbonic acid and humic acid and side reactions. R. GUILLIN. *Compt. rend.* 187, 673 5(1928); cf. *C. A.* 22, 835.—Whatever may be the nature of humified soils, whether they are calcareous or not, carbonic acid and humic acids are able to cause the complete dissocn. of the rocks with elimination at first of K and Na, then of lime and magnesia and finally of alumina which remains solely fixed to the humic acids, iron oxide being eliminated by reduction. E. F. S.

The buffer method and the determination of exchangeable hydrogen for estimating the amounts of lime required to bring soils to definite p_{H} values. W. H. PIERRE AND S. L. WORLEY. Alabama Agr. Expt. Sta. *Soil Science* 26, 363-75(1928).—The buffer capacity of soils toward base can be detd. in the lab. by means of the "dialysis-colorimetric" method. A 3-day period of contact between the soil and $\text{Ba}(\text{OH})_2$ was sufficient

for establishment of equil. The H-ion concn. of soils after being treated with base in the lab., according to the buffer method, was lower than that of the soils treated with equiv. amts. of lime in greenhouse pots. The relation between the amts. of base required in the lab. and the amts. of lime required in the field or greenhouse to bring soils to similar p_H values is called the "liming factor." The "liming factor" of 77 soils of widely different texture and acidity was found to be noticeably uniform and to average about 1.50. Liming of soils in accordance with their content of exchangeable H brought the soils to p_H values of about 6.5. The detn. of the buffer action of soils toward base and the detn. of the exchangeable H of soils are recommended as methods of detg. the amts. of lime required to bring soils to definite p_H values. The advantages of these methods are briefly discussed. The reason why soils to which have been added amts. of lime equiv. to their content of exchangeable H do not reach a p_H of 7.0 but only of about 6.5, is believed to be because the lime reacts with other than the exchangeable H of soils. The non-exchangeable soil complex is also believed to be responsible for the presence of the "liming factor."

E. F. SNYDER

The biochemical factors in sulfur and swamp soils in Latvia. J. KUPZIS. Univ. zu Riga. *Centr. Bakt. Parasitenk.*, II Abt., 76, 48-65(1928).— H_2S in hot springs usually arises by the splitting of sulfides by steam. In cold water it is usually due to the reduction of sulfates by microorganisms. $CaSO_4$ in the boggy soils in the region about Riga is reduced by anaerobic bacteria, particularly *Spirillum desulfuricans*, thus producing H_2S and Ca humate. The reaction continues as the water percolates over the gypsum and dolomite strata as long as food is available and O is absent. Food in the water is derived from vegetation in the swamps. The presence of aerobic bacteria favors the reaction using up available O. The action of CO_2 coming from dolomite yields free S which is found in the soil. The S waters of this region contain not only H_2S but also mineral salts, sol. material from the bogs, and products of bacterial metabolism.

JOHN T. MYERS

Microbiological investigations of strongly acid swamp soils. K. DREWES. Univ. Kiel. *Centr. Bakt. Parasitenk.*, II Abt., 76, 114-20(1928).—The p_H of certain swamp soils ranged from 2.4 to 5.2. At a p_H below 3.5, no vegetative bacterial cells except the S bacteria were found. In the upper humus contg. layers of soil, only mycelial forms and bacterial spores were present. The lower humus layers were sterile. The number of cells and the intensity of microbiological processes are related to the reaction of the soil. At a p_H of 2.4, there was practically no biological action, as protein or cellulose cleavage, nitrification or denitrification. In the production of acid, *Thio bacillus thiooxidans* was most important, by producing H_2SO_4 .

JOHN T. MYERS

Certain abundant non-spore-forming bacteria in soil. H. J. CONN. N. Y. State Agr. Expt. Sta. Geneva, N. Y. *Centr. Bakt. Parasitenk.*, II Abt., 76, 65-88(1928)

A non-spore-forming bacterium, which produces punctiform colonies on agar or gelatin, is abundant in the soil. There are 2 morphological groups, one consisting of typical short rods and the other growing in the lab. for a day or two as rods and then going over to a form resembling micrococci. It is named *Bact. globiformis*. It is capable of utilizing various amino acids, ammonium salts and nitrates, as well as complex compds. like peptone. It can derive its C from polyhydric alcs., carbohydrates and org. acids, even such a simple one as acetic. In spite of this it will not grow in certain poor soils as Volusia silt loam and Hoosick coarse sandy loam, unless furnished with C and N in an available form. These soils have a low crop productivity. It is not suggested that the organism is necessary for the growth of plants but that plants do not thrive in a soil deficient in substances required for the nutrition of *Bact. globiformis*. The presence of such compds. cannot be detected in such small amts. by chem. means. Hence the ability of a soil to support this organism might serve as a rapid means for their detection. One soil, Dunkirk fine sand, will support this organism and yet does not have a good crop-producing capacity. There is a long bibliography. J. T. M.

A preliminary study of the potential fertility of Oklahoma soils. HORACE J. HARPER AND HENRY F. MURPHY. Oklahoma Agr. Expt. Sta. *Proc. Oklahoma Acad. Sci., Univ. Oklahoma Bull.*, N. S. No. 409, 7, 138-41(1928).—A preliminary study of the total N, total P and the acidity was made on 106 samples of soil from various parts of the Expt. Sta. Farm at Stillwater, Okla. There was a wide variation in the total N and total P content, varying from 6940 to 325 lbs. per acre in the case of total N and 2040 to 220 lbs. per acre in the case of the total P. The av. total N content was 2057 lb. and the av. total P content was 601 lb. per acre. These data would indicate that Oklahoma soils on the av. contain only about $1/3$ as much total N and P as should be present in good fertile soil. About 30% of the soils tested should be limed in order to correct the soil acidity which is an important factor in obtaining the best growth

of crops like alfalfa and sweet clover. It was also found that there was a gradual decrease in the N content of the soils in the central part of the U. S. beginning from North Dakota and going south to Texas. Climatic conditions are apparently the cause of this condition. The total P content of the northern states studied was also higher than that of Oklahoma, Arkansas and Texas. The cause of this condition can only be explained on the basis that the original soil-forming materials were higher in those regions. Indications are that the soils in western Oklahoma are not as heavy in texture as the soils in eastern Oklahoma.

E. F. SNYDER

The nitrogen contents of weeds and their relation to soil fertility. HORACE J. HARPER AND HENRY F. MURPHY. Oklahoma Agr. Expt. Sta. *Proc. Oklahoma Acad. Sci., Univ. Oklahoma Bull.* 1928, New Series No. 410, Studies series 30, 73-7.—The growing of legumes is not the right method for building up poor soils, because it is expensive and increases the content of N and org. matter to only a moderate extent. It is known from old that by allowing weeds to grow on poor land, the fertility of the soil rises. This is due to the fact that the weeds transfer to the soil large amts. of org. and nitrogenous substances, the latter being derived from compds. that are originated through the activity of non-symbiotic bacteria capable of assimilating atm. N (*Azotobacter*). The N contents of many plants were examd. including sunflower, ragweeds, osin weed, coreopsis, wild lettuce, cocklebur, crab grass, black-eyed Susan, water hemp, Russian thistle, Bermuda grass, oat and wheat straw, soy beans, peas, hairy vetch, sweet clover, cotton burrs, sesbanis and rye. The hairy vetch samples had the highest N content (2.67-4.1%); next came peas (2.36-3.24%). The lowest amt. was found in straw, the av. of 25 samples being 0.519%. The N values of the majority of the plants examd. ranged between about 1.0 and 2.5%. The question whether weeds should be used as a means of maintaining the fertility of the soil needs serious consideration.

GUENTHER SCHWOCH

The constitution of the soils of the Swiss Romande. RABATÉ AND L. DESHUSSES. *Compt. rend. acad. agr. France* 14, 1207-12(1928).—The soils studied may be put in the category of brown soils. They are delimited to a variable depth, 80 cm. at most. They are relatively not very acid, sometimes neutral and do not require liming, for the reason notably that the roots of the cultivated plants are able to reach the zone of accumulation of lime. The carrying away of the bases goes beyond the first phase of the simple decalcification. The carrying away of the sesquioxides, although not being very rapid, is none the less evident and one is able to note the formation of a layer of accumulation where the humus concs. itself. The soils are therefore finally brown weakly podsolized soils.

E. F. SNYDER

Action of soil acids on cultivated plants. H. FORKERT. *Diss., Hamburg* 1925.—The exchange acidity plays a prominent part in the effect of soil acids on plant growth. In water cultures, nutrient solns. having a p_H value below 5 are injurious. In ranges of less acidity crop increases are obtained. Corresponding effects are observed in soil. Among plants examd. in the seedling stage, oats are the most sensitive to acidity, followed in order by barley, rye and wheat. Peas, flax and sugar beet are but slightly affected by soil acids. Among cereals, acidity brings little change in straw yields, and the relative grain yield is affected only when the total acidity is above 10 cc. No morphological differences are noted.

B. C. A.

Desirable soil-nitrate levels for certain market-garden crops. JOHN B. SMITH. Rhode Island Expt. Sta. *Soil Science* 26, 265-79(1928).—The following quantities of NH_4 are designated as desirable to maintain in soil throughout the season: celery, lettuce and beets, 10 p. p. m.; cabbage, 15 p. p. m.; tomatoes and squash, 20 p. p. m. NH_4 resulting from the decomposition of oats, rye and timothy green manures were correlated with the percentages of N in the crop decompd.

J. J. SKINNER

The influence of the reaction of the soil on the development of *Hevea brasiliensis*. A. KORTLANDT. *Arch. Rubbercultuur* 12, 605-15(1928)(In English 617-27)(Appendix on calculated data 629-58).—The relation between the soil acidity and the growth of *Hevea brasiliensis* was studied by analyzing 1200 samples of soil from various estates in Sumatra and correlating the results with the growth on the various estates. In the majority of cases there was not the slightest relationship evident between the acidity of the soil and the development of *Hevea brasiliensis*. Only when p_H was over 8 was there good evidence that growth was adversely affected (cf. Bobiliov, *C. A.* 19, 3036). Excellent growth prevailed where the acidity was as high as p_H 3.13. In general the soil of the east coast of Sumatra has a high acidity, and only in a few cases was an alkali above p_H 8 found. From a practical point of view, *Hevea brasiliensis* is insensitive to a strongly acid soil, and the degree of acidity is only one of many factors which are of importance for the satisfactory growth of *Hevea brasiliensis*. $(NH_4)_2SO_4$ produces

an acid soil, and consequently should be used to counteract excessive alkali. The results of various fertilizing expts. indicate that no fear need be attached to the regular use of this fertilizer.

C. C. DAVIS

Soil survey of Wales. Progress report, 1925-1927. G. W. ROBINSON, J. O. JONES AND D. O. HUGHES. Univ. Coll., Bangor. *Welsh J. Agr.* 4, 303-21(1928).—Data are given on the soils of the Glamorgan and Monmouth, Eastern Anglesey and East Denbighshire areas of Wales.

K. D. JACOB

Adsorption of potassium from different sources and nitrification studies with Norfolk sandy loam. G. V. C. HOUGHLAND. Univ. of Maryland. *Soil Science* 26, 329-43(1928).—Samples of Norfolk sandy loam soil adsorbed considerable amts. of K when leached with 0.1 N solns. of K salts. The addn. of NaCl to a soln. of KCl, in the proportions found in fertilizer salts, did not reduce the amt. of K adsorbed by the soil. K_2SO_4 was adsorbed to a slightly greater degree than KCl. The K adsorbed from a soln. of KCl was replaced by dil. acid more rapidly than the K adsorbed from a K_2SO_4 soln. The addn. of NaCl did not effect the replacement of the K adsorbed from KCl. The nitrification of dried ground fish, packing house tankage and $(NH_4)_2SO_4$ was inhibited when fertilizer salts were used as the only source of K in complete fertilizer mixt. A slight stimulating effect on nitrification was obtained when K_2SO_4 was used. In general nitrification decreased as the concn. of the K materials increased, but the decrease was greatest where fertilizer salts were used.

J. J. SKINNER

Rhode Island soils in different parts of the state. BURT L. HARTWELL AND JOHN B. SMITH. Rhode Island Agr. Expt. Sta. *Bull.* 214, 24 pp.(1928).—This bulletin includes work of all the field and chem. tests which have been made at the Rhode Island Expt. Sta. on soil from various parts of the state. The ingredients dissolved from the soils by HCl (d. 1.115) on the whole were not related to the immediate needs of the soils. Field tests with corn on unlimed soils showed that the needs are in the decreasing order, P, N and K. After liming one of the soils, P was not then the principal deficiency as was the case before liming. Aside from swamp, meadow, tidal marsh and coastal beach, the soils of the entire state were classified in 1904 by the U. S. Bureau of Soils into 6 types. For beets, a high-lime-response crop, practically all the soils were benefited by liming, and the proportion of timothy to redtop was increased. The early chem. methods of measuring soil acidity proved less useful than one which consisted in digesting the soil with dil. ammonia and titrating the excess alkali with dil. HCl. Field tests, with turnips, on soils after liming showed that P and N are the principal deficiencies in about an equal number of cases. Four cords of cow-stable manure usually did not supply sufficient N. Spring wheat missed the K more than it did the N. The percentage of P_2O_5 in turnips bore an inverse relation in a general way to the increased growth caused by adding P_2O_5 to the soil, and thus furnished useful information concerning the relative need for P. In only three of 38 field tests did the effect of the equiv. of 2.5 tons of limestone fail to improve the growth of alfalfa. The av. yield on the limed sections was 4.13 tons of alfalfa hay. Heretofore unpublished chem. data on surface soil taken in 1925 from 12 different areas representing about 2000 acres of land, not generally in a high state of cultivation, showed that acid soil conditions were high in about two-thirds, and medium in one-third, of the samples. The worst of each factor was represented by pH 4.8, relative active acidity 160, CaO absorption 4.320 p. p. m. and active Al 869 p. p. m. The N ranged from 0.138 to 0.559% and the P_2O_5 sol. in 2 N acetic acid from 14 to 78 p. p. m.

J. J. SKINNER

Utilization of nitrogen by grass land in the North Sea marshlands. F. TRILLING. *Z. Pflanzenernähr. Düngung* 7B, 226-34(1928).—Considerable variation in the efficiency of nitrogenous manures in marshes is recorded. Newer soils respond more markedly to treatment with $(NH_4)_2SO_4$ than do older ones. Increases in hay yields following nitrogenous fertilization are greater in soils having little clover in the herbage. Botanical examn. shows this increase is largely in the proportion of meadow grass, with a diminution in that of dogstail. The relatively small effect of $(NH_4)_2SO_4$ on rich clover land is ascribed to the influence of the different type of herbage on the phys. and chem. properties of the soil.

B. C. A.

Growth of seedlings of conifers in crude humus. I. Transformation of nitrogen in crude humus. H. HESSELMANN. *Rept. Swedish Inst. Exptl. Forestry* 23, 337-432 (1927).—The growth of conifer seedlings in sand contg. crude humus showed the latter to contain N in a form capable of rapid conversion into nitrate on exposure. Artificial inoculation with the requisite organisms was important. Crude humus from birch forests proved better than that from pines. There was a very definite connection between the rate of nitrification of the crude humus, the development of seedlings and the growth of assocd. mycorrhiza. The last-named varied with the nature of the humus.

II. Formation of mycorrhiza in connection with seedlings of *Pinus sylvestris* in different kinds of crude humus. E. MELIN. *Ibid* 433-94.—The general parallelism between the growth of pine seedlings in humus and the production of mycorrhiza is a direct consequence of the nitrification of the humus, and the rate at which this occurs tends to regulate the symbiotic relationship.

B. C. A.

Tea in northeast India. P. H. CARPENTER. Indian Tea Assoc. *Agr. J. India* 23, 256-66(1928).—Mech. and chem. analyses of various types of *Indian tea soils* are tabulated, the compn. varying rather widely with soils from different localities. Most of the tea soils of northeast India are classed as new alluvium and vary in type from sandstones and heavy clays to peats. Soils with an acidity as high as 3000 parts CaO per million, as detd. by the Hopkin's method, and a p_H value as low as 3.8 grow good tea. Soils showing practically no acidity by the Hopkin's method but with a p_H value of about 6.5 may be successful as tea soils. Tea cannot be successfully grown on neutral soils of p_H 7.0. The *tannin content of the various tea leaves and stalk* is as follows: bud 27.9, first leaf 27.9, second leaf 21.3, third leaf 17.8, fourth leaf 14.5, upper stalk (bud to second leaf) 11.7 and lower stalk (second to fourth leaf) 6.4%.

K. D. JACOB

An analytical study of the putting greens of Rhode Island golf courses. BASIL E. GILBERT. R. I. Agr. Expt. Sta. *Bull.* 212, 15 pp.(1928).—This bulletin reports certain analytical studies made of green-keeping practices, and chem. analyses of soils of putting greens of 22 R. I. golf courses. The seed mixtures in use, fertilizer practices, nurseries, water at greens, brown patch and worms are discussed in the light of prevailing practices. The use of $(NH_4)_2SO_4$ was found to be common, and relations between its use, the discouragement of weeds, and the acidity of the soil were found to exist. Where consistent use had been made of this fertilizer, high-acidity conditions were found. In some cases definite indications were obtained to show that weeds were prevented from growing. Mech. analyses of the soils were made. No positive correlation was found to exist between fineness of soil and good turf. Measurements were made of soil acidity and active Al. Indications are given to show that the practice of top-dressing with sand causes diln. of the soils with the result that the active Al content was affected. An inverse correlation between the finer portions of the soil and the active Al was found. Total N and calcd. humus are given. The courses which had the best turf on their greens were highest in total N and, therefore, also in humus.

J. J. SKINNER

Some factors involved in studying the fixation of phosphorus by soils. A. G. WEIDEMANN. Michigan State College. *Soil Science* 26, 281-90(1928).—Very acid mucks show indications of negative fixation of P when treated with a highly concd. soln. of $CaH_4(PO_4)_2$. This phenomenon is due to the fact that the mucks cannot fix as much P from a concd. soln. as there is in the water that is rendered unfree, and some of this P is liberated and goes to concentrate the remaining soln. Mucks with a relatively high p_H value do not show any indications of negative fixation of P regardless of the concn. of the soln. with which they are treated. This is, no doubt, due to the fact that the P reacts chemically with the lime to form an insol. compd. Very acid mucks show no indications of negative fixation of P from solns. of any concn., provided they are treated with lime before the fixation studies are made. In this case again the P reacts with the lime to form an insol. compd. When high-lime mucks are treated with acid their ability to fix P from soln. is considerably lessened. When mucks that show an indication of negative fixation are treated with as much H_2O as they can render unfree the P fixation results will be positive regardless of the concn. of the P soln. with which they are treated.

J. J. SKINNER

Researches on the composition of spinach. LOUIS FONDARD AND LOUIS MARGAILLAN. Faculté des Sciences de Marseille. *Compt. rend. acad. agr. France* 14, 1265-70(1928).—The detn. of the needs of spinach has been given in previous researches, the considerable need of this plant for N, and in addn. perhaps K. The study of its common and its various stages of development confirm this first conclusion, in showing that K exercises a marked influence during the entire duration of the growth of the vegetable, and N more particularly at the beginning. Phosphoric acid intervenes, at the period of prepn. of fructification, in favoring the absorption of K. The results for 1926 show that the influence of K employed alone does not appear decisive, upon the formation of the elementary principles. The general explanation still holds in the absence of phosphoric acid, of which the tests for 1925 have shown the necessity for favoring the action of K. This action from the sole point of view of yield has nevertheless been considerable.

E. F. SNYDER

Utilization of waste water from sugar factories. M. GREVEMEYER. *Z. Ver. deut. Zucker-Ind.* 1928, 135-9.—Pots contg. the following materials were shown with

mustard: (a) loamy soil, (b) similar soil saturated with waste water, (c) soil with lime sludge, (d) soil with N as $(\text{NH}_4)_2\text{SO}_4$ and lime as chalk to correspond with sludge, and (e) completely manured soil. The fresh weights of the crops (in g.) were (a) 128.5, (b) plants all died down, (c) 132.1, (d) 224.5, (e) 265.2. Oats sowed subsequently in the same pots yielded 38, 252.5, 45, 45.5, and 46 g. as fresh plant weight, resp. The failure of mustard in (b) is attributed to the possible presence of harmful salts and the slimy condition of the soil. In the case of oats, soil (b) was less exhausted by the previous crop, and nitrogenous substances may have broken down to a more available form. To other series of pots soil which had been irrigated by waste water was applied as manure at a rate corresponding to 10 tons/acre. The materials used, when extd. with 10% HCl, yielded 0.109–0.299% K_2O , 0.305–0.484% N, 0.038–0.332% P_2O_5 , 0.70–0.84% CaO, 0.054–0.123% MgO, and with barley gave increased yields of about 10%. With mustard the increase was less marked. B. C. A.

Influence of neutral salts and fertilizers on soil reaction. F. TERLIKOWSKI AND B. KURYLOWICZ. *Rocz. nauk. lesnych* 13, 622(1925).—The effect of chlorides and sulfates of K, Mg, Ca and NH_4 , and of some neutral fertilizer salts, on the reaction of soil suspensions and the reduction in buffer capacity are recorded. There is a definite individuality among the different horizons of a soil profile in respect to the action of neutral salts. The effect is most marked in the A_1 horizons, when salts of bivalent metals are used, whereas salts of univalent metals are most active on podsol eluvials. The action of neutral salts is greater on loams than on podsoles or sandy podsoles. Changes in reaction values of soils following neutral salt treatment are proportionally greatest for the smallest quantities of salt added. In quantities such as are used in common practice neutral salts have little or no effect on soil reaction. B. C. A.

Chemical and microbiological principles underlying the decomposition of green manures in the soil. SELMAN A. WAKSMAN. N. J. Agr. Expt. Sta. *J. Am. Soc. Agron.* 21, 1–18(1929).—The problem of the decompn. of green manures, involving a knowledge of the rapidity of liberation of the N in an available form and of the amt. of undecompd. or only very slowly decompd. residues which goes to increase the soil org. matter, resolves itself into a problem of the chem. compn. of the plants which make up the green manure, a problem of decompn. of the various org. complexes in the plant by the different groups of soil organisms, as well as a knowledge of the metabolism of these organisms. E. F. SNYDER

Fertilization of soils poor in lime. Comparative tests of different carbonates. GUSTAVE RIVIÈRE AND GEORGES PICHARD. *Compt. rend.* 187, 1068–70(1928).—All of the carbonates, namely Ca, Mg, Na and K, which were employed have increased the yields, sometimes very considerably, by comparison with the checks, but it is the Na_2CO_3 which in all of the cases shows itself the most active. The authors are not able to affirm that its action is limited, the same as that of the other carbonates, in favoring nitrification by modifying the reaction of these too weakly alk. soils as the other carbonates should act as effectively, it being given that the no. of basic ions contributed has been the same in all of the plots. They are therefore lead to accept Na in this instance as an actual fertilizer. The increase in yield is probably due to the very easy nitrification of the reserve N contained in the soil and to the needs for Na of the plants tried. E. F. SNYDER

Influence of soil and manuring on the quality and growth of barley 1926. E. J. RUSSELL. Rothamsted Expt. Sta. *J. Inst. Brewing* 34, 307–20(1928); cf. C. A. 22, 1010.—Expts. in 1925 showed generally that neither phosphates nor potassic fertilizers increased the yield of barley. Sulfate and particularly NH_4Cl gave increased yields. The growing period of the 1926 barley was characterized by its sunlessness and the data obtained unexpectedly showed no great yield increases and suggest that under wet, sunless conditions nitrogenous fertilizers may have a harmful effect. However, the diastatic power of the malts made from the barleys was higher where the barley received $(\text{NH}_4)_2\text{SO}_4$ and indications are that increased diastatic power follows with an increase of N in the barley. The 1926 barleys were very similar in N content to the barleys of previous years. This season proved as before that NH_4Cl is superior to the sulfate as a fertilizer. Tabulated analytical data on the barley and malts made therefrom are given of the several growing plots, which show the results from untreated and fertilized soils. In the appendix are given observations on the plots of ground used in growing the barleys. PETER J. F. WEBER

The chemical effect of gypsum, sulfur, iron sulfate and alum on alkali soil. W. P. KELLEY AND ALEXANDER ARANY. Calif. Agr. Expt. Sta., Berkeley. *Hilgardia* 3, 393–420(1928).—The application of gypsum, S, FeSO_4 and alum produced important chem. changes in the black-alkali soil near Fresno, Calif. With each of these materials

the chem. reactions involved the sol. carbonate and the exchange complex of the soil. Gypsum pptd. the sol. carbonate as CaCO_3 in accordance with theory, while the other materials either decomposed carbonate or else converted it into bicarbonate. Simultaneously with the effect on sol. carbonate, the exchange complex was affected. The effect of gypsum depends on its sol. Ca, while S, FeSO_4 , and alum are effective because of the H ions that are formed. The acid formed by the oxidation of S, or the hydrolysis of FeSO_4 and alum, dissolves CaCO_3 and possibly other minerals, and thus brings Ca into soln. As a result, the Na content of the exchange complex is decreased and the Ca content is increased. In consequence of these chem. transformations the phys. conditions of the soil have been markedly improved and the growth of crops has been pronouncedly stimulated. The theoretical and practical aspects of the black-alkali soil problem are discussed. Twenty-one references are appended. C. R. F.

Manufacture of manure from straw and calcium cyanamide. F. ZUCKER. *Z. Pflanzenernähr Düngung* 7B, 206-15(1928).— CaCN_2 was used successfully in making artificial farmyard manure from straw. The best results were obtained when the heaps of straw were about 90 cm. in height. Careful control of moisture conditions was necessary to ensure complete rotting through the stack with min. losses in dry wt. of expts. served to show the value of the manure, but, in general, this was somewhat low that of ordinary yard manure. B. C. A.

Liquid manure, urine and drainage water. STIEHR AND M. BERGOLD. *Z. Pflanzenernähr Düngung* 7B, 216-26(1928).—The addn. to cattle urine of H_2SO_4 or H_3PO_4 in mts. corresponding to its total N content reduces N losses by checking fermentation. The loss of N during the fermentation of liquid manure is traced almost entirely to be volatilization of NH_3 , no free N being liberated. Drainage from "hot fermented" manure (Krantz) differs from ordinary liquid manure in that a large proportion of its total N is in org. combination. It is also richer in potash and phosphate, the latter existing mainly in colloidal suspension. B. C. A.

Comparative biological and chemical investigations on stable manures. IV. G. REICHMANN. *Inst. für Gärungsgewebe, Berlin. Centr. Bakt. Parasitenk.* II Abt., 75, 66-26(1928).—Only a small number of species of the microflora are active in the incense destructive processes of heating horse manure. The degree of heating, age and compactness has little relation to the rate of ammonification. After manure is well rotted, nitrification and denitrification are slow; hence the sp. organisms are scarce in this stage. As manure ripens, humus forms, but this is a late manifestation, being followed by the early rapid oxidative processes; many biol. data are included in this article. There is a bibliography of 68 titles. JOHN T. MYERS

A preliminary note on the effect of fertilizer constituents on the quality of sugar-cane juice and gur. P. B. SANYAL. *Agr. J. India* 23, 277-86(1928).—Sugar cane fertilized with superphosphate alone produced juice contg. the highest % of sucrose and lowest % of glucose and highest coeff. of purity, while fertilization with $(\text{NH}_4)_2\text{SO}_4$ alone produced the opposite effect. CaCN_2 and mustard cake gave results closely paralleling those obtained with $(\text{NH}_4)_2\text{SO}_4$. K_2SO_4 alone gave results intermediate between those obtained with the N fertilizers and superphosphate but more nearly approaching those obtained with the latter. Gurs (unrefined raw sugar) obtained from cane fertilized with superphosphate and with K_2SO_4 alone were also of much higher quality than those from cane receiving N fertilizers alone. Gur prepd. by the *Honn. super defecation method* was distinctly superior to that prepd. by the ordinary boiling process. K. D. JACOB

Fertilizer experiments with sweet potatoes. G. V. C. HOUGHLAND. Univ. of Maryland. *Soil Science* 26, 291-304(1928).—From a comparison of different forms of N in a 3-8-8 fertilizer used for sweet potatoes, the sol. materials such as urea, NaNO_3 , and $(\text{NH}_4)_2\text{SO}_4$ produced the highest av. yields of prime potatoes. Of the inorg.-org. combinations the 60%-40% ratio gave the highest av. yield of prime potatoes. It was suggested that a sol. N material in the fertilizer mixt. helped to establish the sweet potato sprout in the field. The results on one year's work with Leuna saltpeter indicated that it was a very suitable N material for sweet potatoes, when used in conjunction with organics. In this respect, it compared favorably with NaNO_3 and $(\text{NH}_4)_2\text{SO}_4$. J. J. SKINNER

The barley experiments of 1926. H. M. LANCASTER AND H. LLOYD HIND. *J. Inst. Brewing* 34, 321-33(1928).—This paper gives the fertilizer treatment of the plots of barley of 1926 expts. in tabulated form with analytical data of the barleys, and malts made from the barleys by the "stocking" and bulk malting process, together with market valuation. The report also gives the valuation and analytical data of various varieties of barleys and malts made therefrom by the "stocking" method,

on barleys from the National Institute of Agricultural Botany, Cambridge.

PETER J. F. WEBER

The degree of response of different crops to various phosphorus carriers. B. L. HARTWELL AND S. C. DAMON. Rhode Island Agr. Expt. Sta., *Bull.* 209, 19 pp. (1927).—As a result of several years' experimentation, beets, cabbages, rape and turnips are classed as high-P response crops. Cereals, millet, potatoes, tomatoes and spring wheat are low-P response crops, and soy beans, corn and oats are intermediate.

J. J. SKINNER

The mineral content of feeds, soils and waters of South Carolina. J. H. MITCHELL, J. D. WARNER AND K. S. MORROW. So. Carolina Agr. Expt. Sta., *Bull.* 252, 31 pp. (1928).—Detailed analyses are given of various crops used for feed, and grown under different conditions together with the analyses of soils and water from various sources.

J. J. SKINNER

The influence of fertilizer treatments on the content of exchangeable cations in Hagerstown silt loam. F. G. MERKLE. Penn. Agr. Expt. Sta. *Soil Science* 26, 377-8; (1928).—Soils repeatedly fertilized with chem. fertilizers or with org. manures undergo significant changes in the quantity and proportion of replaceable cations. Liming tends to saturate the absorption complex with Ca. A part of the K applied in chem. fertilizers is retained in the acidoid complex. NH_4 from soils may be retained and constitute a large percentage of the total absorbed cations.

J. J. SKINNER

Fluosilicates; their use as insecticides. J. FRERE. *Rev. prod. chim.* 31, 880-4 (1928).—A review of these products with reference to their value as insecticides. Their manuf. is briefly described.

P. THOMASSET

Some phases of the Japanese beetle insecticide investigations. E. R. LEEUWEN, O. G. ANDERSON AND P. A. VAN DER MEULEN. U. S. Bur. of Entomology. *J. Econ. Entomol.* 21, 805-13 (1928); cf. *C. A.* 22, 1011.—Measures for the protection of plants from injury by the Japanese beetle (*Popillia japonica*) are discussed. With the exception of early peaches and the bloom of certain flowering plants, fruit and shade trees, shrubs, grape vines and garden plants may be adequately protected from beetle injury by means of sprays. The beetles are so strongly attracted to early peaches that even a heavy coating of As fails to protect them. Highly toxic compds. are more or less repellent to the beetles. Even such inert substances as China clay and chalk are highly repellent, indicating that toxicity is not the only factor concerned in repellence from sprayed foliage. Beetles do not approach or alight upon sprayed trees so readily as upon unsprayed trees. Tests bear out the value of a spray of PbHAsO_4 coated with Pb oleate. As only 30% (av.) of the beetles on the tree at the time of spraying with PbHAsO_4 are killed by the spray, the protection afforded is largely due to the repellent action. When geraniol, an attractant for the beetle, is emulsified and mixed with PbHAsO_4 the efficiency of the mixt. is not greatly increased. Geraniol cannot be relied upon to attract beetles under all conditions. Foliage sprayed with PbHAsO_4 and sucrose soln. is readily eaten and has given the highest % kill of any mixt. yet used in the field. The use of traps is described.

C. H. R.

Soil insecticides for the Japanese beetle. WALTER E. FLEMING. U. S. Bureau of Entomology. *J. Econ. Entomol.* 21, 813-8 (1928); cf. *C. A.* 22, 1647.—This paper treats the most effective compds. which have been found to kill the soil-infesting stages of the Japanese beetle, *Popillia japonica*. Although a no. of compds. were more toxic than CS_2 in air at 70% relative humidity, this compd. only could be depended upon to permeate the soil and destroy the insects within 24 hrs. Other compds. penetrated only the surface layer, dissolved in the soil water near the surface, reacted with soil constituents or had such low vapor pressures that they penetrated soil very slowly. CS_2 is used in the form of a dild. emulsion. A group of org. compds., solid under ordinary conditions, has been intimately mixed with soil containing larvae of the Japanese beetle. A table is given showing the min. concn. and min. time necessary to kill the larvae for the 47 compds. tested. Hydroquinone and naphthalene are the most effective, β -naphthyl benzoate and tolidine among the least. The insecticidal treatment of soil is discussed.

C. H. R.

Deterioration of soap-nicotine preparation. II. C. C. McDONNELL AND J. J. T. GRAHAM. U. S. Dept. Agr. *Ind. Eng. Chem.* 21, 70-3 (1929).—Soap-nicotine preps. ordinarily found on the market decrease in nicotine content on storage. Hard soda soaps lose nicotine more rapidly on exposure to the air than potash soaps. The loss of nicotine from soap-nicotine preps. made with drying oils and packed without exclusion of air is due mainly to oxidation. When made from non-drying oils and stored without air being excluded the loss of nicotine is due to volatilization of nicotine. Hard and soft soaps, whether made from drying or non-drying oils, when packed with

complete protection from air, suffered no loss in nicotine content during 2 years' storage.

E. F. SNYDER

Talc and mica dusts as a control for lepidopterous larvae. BYRLEY F. DRIGGERS. N. J. Agr. Expt. Sta. *J. Econ. Entomol.* 21, 938-9(1928).—These dusts proved highly effective against larvae of the Oriental fruit moth (*Laspeyresia molesta*). The effect is phys. rather than chem.

C. H. RICHARDSON

Effect of early summer and late summer white oil and nicotine sulfate sprays on the number of eggs of the European red mite overwintering on peach trees. BYRLEY F. DRIGGERS. N. J. Agr. Expt. Sta. *J. Econ. Entomol.* 21, 878-82(1928).—Five applications of nicotine sulfate (1-800) and white petroleum oil emulsion (1%) on peaches in May and June failed to prevent the European red mite (*Paratetranychus pilosus*) from depositing large nos. of eggs. Ground tobacco dust and nicotine sulfate spray (1-800) did not greatly reduce the no. of eggs. Four applications of white petroleum oil emulsion in August killed nearly all the eggs. Peach trees sprayed with white petroleum oil emulsion in May and June suffered a slight yellowing of the foliage and a noticeable dropping of young fruit. A single tree sprayed in August with the oil emulsion shed some foliage, the older leaves appearing to be most sensitive to the oil.

C. H. RICHARDSON

Influence of spray practices on arsenical residues. HARRY C. McLEAN AND ALBERT L. WEBER. N. J. Agr. Expt. Sta. *J. Econ. Entomol.* 21, 921-8(1928).—Expts. conducted in N. J. during a season in which the rainfall was above normal show that heavy applications of $PbHASO_4$ may be made on fall and winter varieties of apples without exceeding the spray residue tolerance for 1928 of 0.01 grain As_2O_3 per lb. fruit. If sprayed heavily in June no further applications can be made without exceeding this tolerance. Fruit dusted with $PbHASO_4$ showed only a trace of As residue when picked. Apples sprayed up to July 1, followed by dusting later in the season, held low As residues at harvest. The greatest residues were found on fruit from the lower section of the tree.

C. H. RICHARDSON

The use of arsenites in the control of Mormon crickets. F. T. COWAN. U. S. Bureau of Entomology. *J. Econ. Entomol.* 21, 928-32(1928).—The Mormon cricket (*Leptoglossus simplex*) is not satisfactorily controlled by a poisoned bran bait. Dust mixts. of Na arsenite 1 part, $Ca(OH)_2$ 4 parts and of Ca arsenite 1 part, $Ca(OH)_2$ 3 parts were very effective. The Na arsenite-lime dust is applied at the rate of 5 lbs. per acre, the Ca arsenite-lime dust at 8 lbs. per acre. No serious injury from the dusts to growing grain or alfalfa was observed.

C. H. RICHARDSON

A method of volatilizing carbon disulfide for soil fumigation. H. K. RILEY. Purdue Univ. Agr. Expt. Sta. *J. Econ. Entomol.* 21, 932-3(1928).—A method of volatilizing CS_2 with steam under pressure for the control of the greenhouse centipede (*Scolopendrella immaculata*) is described. The app. is figured.

C. H. RICHARDSON

An economic discussion of the nitrogen situation with regard to its future development (BEAR) 13. Solid solutions of lime and arsenic acid (CLIFFORD, CAMERON) 6. Arica soil conditions in two districts of the Philippine Islands and their relation to fiber production (SHERMAN) 25. Responses of insects to smell and taste and their value in control (McINDOO) 111. The determination of nitrates and nitrogen (EMMERT) 7. Treatment of fish (Can. pat. 285,632) 27. Working up stable manure, rancid fodder and other fermentable substances (Austrian pat. 110,536) 16. Fertilizer and food for animals from vegetable refuse (Brit. pat. 291,514) 12. Apparatus for treatment of distillery slop or other org. wastes (U. S. pat. 1,698,171) 14. Improving basic slag (Ger. pat. 469,000) 9. Recovering glycerol from materials containing proteins (Ger. pat. 467,350) 26.

Agricultural Research in 1927. Royal Agr. Soc. of England. London: John Murray. 190 pp. 1s. 3d., post free. Reviewed in *Chem. News* 137, 399(1928).

Fertilizers. ANTALDO ANTALDI. Fr. 641,253, Aug. 24, 1927. Fertilizing substances are recovered from smoke by drawing it successfully through an acid and an alkali.

Fertilizers. ADOLF BAUMANN. Austrian 110,254, Mar. 15, 1928. Stable mixts. of fertilizers are prepd. by dissolving or suspending one of the ingredients in water, absorbing the soln. or suspension in an absorbent such as peat, drying, and finally mixing in the other ingredient. Stable mixts. of CaO and superphosphate may be so prepd.

Fertilizer. BAPTISTIN BODRERO. Can. 285,789, Dec. 25, 1928. Fertilizer is manufd. by heating and stirring $\text{Ca}_3(\text{PO}_4)_2$ in a mixing app. and injecting into the plastic mass S vapors, whereby the S is sublimed into the mass and a homogeneous complex product ("sulfo-calcium phosphate") is obtained.

Fertilizer. WILHELM GAUS, ROBERT GRIESSBACH and OTTO SCHLIEPHAKE (to I. G. Farbenind. A.-G.). U. S. 1,699,234, Jan. 15. K fluosilicate obtained from KCl is decomposed with aq. NH_3 into a soln. of KF and NH_4F and this is treated with a soln. contg. $\text{Ca}(\text{NO}_3)_2$ to produce a composite fertilizer.

Fertilizer. HEINRICH HEIMANN (to I. G. Farbenind. A.-G.). U. S. 1,698,793, Jan. 15. A hot concd. aq. soln. of NH_4NO_3 is mixed with inorg. fertilizing salts such as heated KCl, K_2SO_4 or $(\text{NH}_4)_2\text{SO}_4$ and the mixed salts in solid phase are obtained by evapg. water by the heat contained in the mixt.

Fertilizers. FRITZ FLOTHE and HANS BRENEK (to Rhenania Kunheim Chemischer Fabriken A.-G.). U. S. 1,696,975, Jan. 1. Mineral phosphorites are mixed with alkali metal chlorides and alkali metal sulfates and the mixt. is treated with steam and heated to 900° or higher, with such proportioning of the materials that the mixt. to be heated contains for each mol. of P_2O_5 about 1 mol. of alkali metal oxide and at least 1 mol. of SiO_2 with such a proportion of CaO that in addn. to an alkali Ca phosphate, orthosilicate also may be formed.

Fertilizer. ERNST SCHWARZ (to I. G. Farbenind. A.-G.) U. S. 1,699,254, Jan. 15. A mixed fertilizer is prepd. contg. urea, di-Ca phosphate and a fertilizing K salt such as KNO_3 or K_2SO_4 . NH_4 phosphate also may be used.

Fertilizers. PHOSPHATES ET SUPERPHOSPHATES DE TEBBAKA. Fr. 640,888, Feb. 25, 1927. Natural phosphates ground to pass through a sieve having a mesh of at least 180 per sq. cm. is used as a fertilizer.

Fertilizers. SOCIÉTÉ ANON. DES MANUFACTURES DES GLACES ET PRODUITS CHIMIQUES DE SAINT-GOBAIN, CHAUNY ET CIREY. Fr. 641,199, Mar. 2, 1927. A phospho-ammonium-potassium fertilizer is obtained by decomposing KCl and NH_4Cl by a soln. of phosphoric acid at a temp. not above 130° , with agitation, and saturating the free phosphoric acid in the product by NH_3 or $(\text{NH}_4)_2\text{HPO}_4$.

Use of free nitric acid as a weed destroyer and fertilizer. E. J. BURBAN. Brit. 291,461, June 2, 1927.

Treatment of bones. GELATINES HASSELT & VILVORDE SOC. ANON. Ger. 469,211, Aug. 26, 1926. See Fr. 634,361 (C. A. 22, 3748).

Increasing the germinating power of seeds. IGNAZ KREIDL. Austrian 110,553, Apr. 15, 1928. The seeds are mixed dry with one or more insol. or sparingly sol. compds. of Mn, Mg or Ce, or with radioactive materials; sparingly sol. basic salts may be added also.

Treating cotton plants. WILLIAM EGGERT, JR. U. S. 1,698,539, Jan. 8. Seed-producing cotton plants have supplied to their roots during the blossoming period a fermented soln. prepd. from cotton plant leaves and blossoms together with a saccharine compd. such as sugar or molasses and an ext. of sassafras leaves, for the purpose of repelling attacks of insects, etc.

Fungicide. GEORGE E. SANDERS. Can. 285,659, Dec. 18, 1928. A fungicide is produced by bringing together quick lime, water and polyhydrated CuSO_4 in crystal form, the CuSO_4 being added while the lime is hydrating and the amt. of water being controlled to cause the CuSO_4 to be brought to the monohydrated form by the action of the hydrating lime and producing the product in a dry powd. form. Salts of Ni, Al, Co, Zn, Ag, etc., may be substituted for the Cu and copper carbonate or other copper salt may be substituted for the sulfate.

Combined fungicide and insecticide in dry form. GEO. E. SANDERS. Can. 285,660, Dec. 18, 1928. Equal parts of hydrated lime and white arsenic are mixed with water to form an imperfect arsenite of lime. An excess of CuSO_4 is added to react completely with the arsenical salt; a paste is formed, which is allowed to stand 24 hrs. to permit a complete reaction to take place. Enough quicklime is then added to the paste so that in hydrating it takes up all of the excess moisture and a dry powder results, suitable for dusting on plants.

Insecticide. MICHEL-JOSEPH POUÉY. Fr. 641,062, Sept. 17, 1927. Residual juices from the manuf. of nicotine or from waste tobacco stalks are dried and powdered to form an insecticide.

16—THE FERMENTATION INDUSTRIES

C. N. FREY

New meters for the brewing industry. J. OELSCHLÄGER. *Wochschr. Brau.* 45, 272-5(1928).—A description is given of a power meter, Geiger's Pi-meter and Torsio-graph, and Thyssen's vibration indicator. A. SCHULTZ

Analytical data on raw materials and brewery by-products for March, April and May, 1928. F. ANCKER. *Wochschr. Brau.* 45, 326-7(1928). A. SCHULTZ

The determination of the fusel oil content of alcoholic solutions containing a large amount of fusel oil. W. KILP AND B. LAMPE. *Z. angew. Chem.* 41, 1163-4(1928).—The Röse method has been modified to give the percentage of amyl alc. in solns. rich in fusel oil. The following formula gives accurate results in grams fusel oil per 100 cc.: $Z 0.5428 V/a$, in which Z = vol. increase of CHCl_3 , V = total vol. of soln., a = aliquot of original soln. 0.5428, detd. by Röse, is g. amyl alc. corresponding to increase of 1 cc. in vol. of CHCl_3 . C. N. FREY

The analysis of hops. A. STÁDNÍK. *Chem. Obzor.* 3, 142-5, 176-80(1928) (English summary).—After a review of recent chem. literature on hops a new acidimetric method for sepg. lupulone from humulone is described. It consists in shaking and neutralizing the ether soln. of hops with NaHCO_3 and titrating the remaining acid portion of lupulone. The lupulone portion can be calcd. from the difference of the acid portion of lupulone and the titrimetric value of the original unshaken soln. By means of this method the aging process of hops can be ascertained in the course of which humulone is changed into neutral derivs. much more rapidly than lupulone whose acidity decreases slowly. A new method of I no. detn. and detn. of tannin exts. on an iodometric basis has been worked out; this enables one to evaluate the efficiency of hops. JAROSLAV KUČERA

The antiseptic power of hops. M. FRYS. *Bull. assoc. élèves inst. sup. fermentations* 29, 403-10, 429-34(1928).—A detailed account is given of an investigation carried out by Chapman's biol. method. **Conclusions:** (1) The quality of hops can be partly judged by their antiseptic power. (2) The antiseptic power is not proportional to the quantity of hops added; up to a certain quantity, all the antiseptic substances go into soln., but above that point some of them remain undissolved. (3) During cooling there is a loss of antiseptic power, which varies with the methods of cooling, being greater in presence of air than in its absence; this loss is due to the oxidation of the hop resins during cooling. (4) There is quite an appreciable loss in antiseptic power during fermentation. Up to about 200 g. of hops per hl. of wort, there is little or no loss, but above this proportion the loss increases rapidly with increase in the amt. of hops. The antiseptic power tends to a limiting value of about 33.3 in the finished beer, irrespective of the amt. of hops used. (5) Alc. content, ext. and acidity of the wort do not affect the antiseptic power. (6) Quite a no. of so-called hop exts. which are sold have but little antiseptic power. A. PAPINEAU-COUTURE

The Gutzeit test. A. D. COMBRIE AND T. J. WARD. *J. Inst. Brewing* 34, 530-3 (1928).—The method and app. used in the Gutzeit test for arsenic in the authors' lab are described. The evolved gases pass through a definite area of HgCl_2 paper. The procedure employed in testing malts, hops, grains, sugars and liquids contg. org. matter is given, together with tests of reagents employed in the test. In the brewing of beer any arsenic present in the malt or hops is very largely eliminated during the brewing processes. PETER J. F. WEBER

Note on standards for Gutzeit test. A. T. HENLEY. *J. Inst. Brewing* 34, 608-9 (1928).—H. describes his preparation of permanent standards from artists water colors, "Chrome Lemon" and "Chrome Deep." PETER J. F. WEBER

Critical analysis of malt. A. T. HENLEY. *J. Inst. Brewing* 34, 223-5(1928).—H. elaborates upon the "sinker" test by making a sepn. of the malt into fractions using liquids of varying sp. gravities. PETER J. F. WEBER

The seasons' malts of 1928 (made from 1927 barleys). F. W. COOKE, G. HADLEY AND H. LLOYD HIND. *J. Inst. Brewing* 34, 595-607(1928).—The av. malts showed an av. ext., slightly low N, with correspondingly lower sol. N and a diastatic power almost up to the av. PETER J. F. WEBER

Defective wines. E. HUGUES. *Station Oenologique de Montpellier. Ann.* 21, 519-32(1928); cf. C. A. 22, 1822.—A review of the causes of defective wines and their effects on the chem. compn. of the wines, together with tables giving the compn. of such wines. A. PAPINEAU-COUTURE

Testing beers for May and June, 1928. F. ANCKER. *Wochschr. Brau.* 45, 357-8

(1928).—For this period, 125 beers were examd. Of 7 top fermentation beers, 4 contained sweetening agents. The p_H of light beers was 4.21–4.98. A. SCHULTZ

Finings. H. W. HARMAN, J. H. OLIVER AND PHYLLIS WOODHOUSE. *J. Inst. Brewing* 34, 203–13(1929).—The analysis of the beer, and finings as normally used in the brewery, shows that an appreciable amount of the finings remains in the beer, and can help in stabilizing the colloidal condition of the beer. Finings from different sources cut under the same conditions gave differences in fining properties when used on beers of different p_H values. Penang isinglass had the widest range, making it applicable to nearly all classes of beer. Saigon and Indian are suitable for the more alk. beers brewed from hard waters. Russian isinglass was also satisfactory for the latter class of beers. Brazil and China isinglasses worked well on acid beers only. Where Irish moss had been used in the boiling of the wort, finings gave an increased amount of precipitated isinglass protein. Other factors also influence the finings such as alkalinity and CaSO_4 content of the brewing water; whether beer worts were made from all malt, or malt and raw cereal or sugar; temp. of conversion; break while boiling wort; character of fermentation; separation of hop resins in a hop back and presence of metal, particularly iron. PETER J. F. WEBER

Notes on the washing of yeasts. R. VAN DAELE. *Bull. assoc. élèves inst. sup. fermentations Gand* 29, 421–9(1928).—A discussion of the possibilities of washing more or less contaminated yeasts (particularly top fermentation yeasts) with a view to rendering them utilizable without danger of infection: the various possible antiseptics are mentioned, together with their method of use, permissible doses and effects.

A. PAPINEAU-COUTURE

The substitution of malt sprouts by ammonium salts in the manufacture of yeast. H. CLAASSEN. *Z. angew. Chem.* 41, 1161–3(1928); cf. *C. A.* 22, 1209, 3485.—Duclaux and later Ehrlich had shown that yeast utilizes ammonium salts. Wohl and Scherdel's work is not accurate. The ratios of org. to NH_4N are based on the assumption that all the N of malt exts. is available to the yeast, but only 65% is available. When the optimum amt. of org. N is present, replacement of 40% of this N by NH_4N does not affect the yield or the N content of the yeast. Replacing more than 40% causes the yield to decrease and the N content of the yeast to increase. In a medium contg 3 times the optimum N content in the form of NH_4N , the yeast yield is decreased and the N content increased. Some irregularities in these results were obtained. The addn. of excessive amts. of NH_4 salts caused the baking strength of the yeast to decline

C. N. FREY

Dufton distilling column for the preparation of absolute alcohol (NOYES) 1. The barley experiments of 1926 (LANCASTER, HIND) 15. Trehalosemonophosphoric ester isolated from the products of fermentation of sugars with dried yeast (ROBISON, MORGAN) 10. The cause of the fluorescence of milk and wine irradiated by ultraviolet rays (MIGLIACCI) 12. Characteristics of commercial gelatin and glue (RÜDIGER, MAYR) 29. Apparatus for treatment of distillery slop or other organic wastes (U. S. pat. 1,698,171) 14. Sugars from cellulosic materials (Swiss pat. 127,238) 23.

Solidified alcohol. HEINZ OHLE. Fr. 642,173, Oct. 11, 1927. See Brit. 281,662 (*C. A.* 22, 3486).

Glycerol. VEREINIGTE CHEMISCHE WERKE A.-G. Fr. 642,083, Oct. 7, 1927. See Brit. 278,703 (*C. A.* 22, 2636).

Glycerol by fermentation. KARL LÜDECKE and NELLY LÜDECKE. U. S. 1,698,800, Jan. 15. See Fr. 636,121 (*C. A.* 23, 235).

Non-alcoholic beverages. WILLIBALD WINKLER, GUSTAV WINKLER and HERMANN FRIEDRICH HIRSCHLER. Austrian 110,543, Apr. 15, 1928. Non-alcoholic beverages with a wine- or beer-like taste are made by subjecting sweetened decoctions of plants or their roots, fruits, seeds or leaves to 3 consecutive fermentations. The first fermentation is suitably effected at 25–30° in open vessels with organisms of the group *B. xylinum* symbiotically associated with yeasts of the groups *Mycoderma* and *Saccharomyces*. The second is suitably effected in closed vessels at 20° with yeasts of the groups *Saccharomyces*, *Torula*, *Tychia* and *Willia*. The third proceeds at 8–15° during the storage of the products. Suitable initial materials are plants or plant-parts of medicinal value, except those having undesired sp. effects.

Brewing. LUDWIG FISCHER. Ger. 469,120, May 13, 1925. A fermenting funnel has a filling of glass wool, glycerol and SO_2 -evolving material.

Working up stable manure, rancid fodder and other fermentable substances. HERMANN KASERER. Austrian 110,536, Apr. 15, 1928. The subdivided org. substances

are mixed with suitable liquids and freed from excess of liquid by pressing to a convenient degree.

Yeast. ARNE BOYE. Fr. 642,019, Oct. 6, 1927. Wort contg. yeast is passed in a continuous manner through a no. of compartments, and the nutrient substances are brought in a continuous manner to the different compartments in such a manner as to obtain the most favorable concn. for the state of fermentation in any particular compartment.

Yeast. H. BÜCHER. Brit. 291,146, Feb. 24, 1927. A continuous process for yeast production comprises causing a sugar soln. together with nutrient inorg. salts to flow in a stream with the seed yeast and new growth, while aerating the materials, and supplying additional inorg. nutrients and preferably also additional sugar or other org. nutrients to the stream; yeast is sepd. and liquor returned to the process. An app. is described. Alc. and acetaldehyde may be recovered from the discharged air by treatment with a counter-current absorbent stream or with solvents.

Yeast. K. A. JACOBSEN. Brit. 291,770, June 8, 1927. In the manuf. of yeast with continuous addition of nutrient soln. and continuous discharge of yeast-contg. soln., the supply of carbohydrate nutrient is periodically varied in such a manner in relation to the alternating budding and ripening periods of the yeast that an increased quantity of nutrient soln. is added at the times when the budding tendency of the yeast tends to decrease, so that the ripening periods which tend to intervene are prevented from occurring and the yeast is kept in a budding condition until withdrawn to a sep. container for ripening. Various details and modifications are described.

Yeast. H. C. JANSEN and J. P. H. JANSEN. Brit. 291,127, May 3, 1927. Nutrient substances such as NH_3 are added to the vats during yeast propagation by use of the gas current used for aeration as a carrier.

Yeast. W. SCORR. Brit. 291,135, Feb. 22, 1927. Yeast after use in fermentation is reconditioned by circulating beer or other suitable liquor over it at a controlled temp. in an enclosed vessel, with or without an addnl. air supply. An app. is described.

17—PHARMACEUTICAL CHEMISTRY

W. O. EMERY

Ethereal oil of Siberian fir (*Abies sibirica*). YU. S. ZALKIND AND S. ZABOEY. *J. Russ. Phys. Chem. Soc.* 60, 553-9 (1928).—The ethereal oil obtained from the needles of the Siberian fir contains *l*-pinene, camphene, phellandrene, traces of santene, possibly nopinene and *l*-bornyl acetate. The bark contains *l*-pinene, camphene, phellandrene and *l*-bornyl acetate. B. C. A.

Evaluation of mercury oxycyanide and mercury cyanide tablets. E. SCHULEK and A. STASIAK. Hygien. Inst., Budapest. *Arch. Pharm.* 266, 638-41 (1929).—Prep. a 0.1% soln. of the finely powdered sample (if necessary by the addn. of a few drops dil. H_2SO_4), transfer an aliquot of 10 cc. to a 100-cc. flask, add 5 cc. 20% H_3PO_4 and 1 cc. satd. $\text{Br-H}_2\text{O}$. After 5 mins. add 1 g. KBr or NaCl, and after a further 5-10 min., 3 cc. H_2O and 1 to 2 cc. 5% PhOH soln. in order to remove the excess of Br, shake thoroughly and add 0.5 g. KI. After 10-15 mins. titrate the sepd. I with 0.01 N thio-sulfate (1 cc. of which = 0.000013005 g. CN). W. O. E.

Decomposition of morphine in aqueous solution, especially during sterilization. R. DIRIZEL AND W. HUSS. Univ. Munchen. *Arch. Pharm.* 266, 641-6 (1929).—The purpose of this investigation was to clarify the chem. changes which take place in aq. solns. of morphine on heating and in storage, to det. the degree of such decompn. and from the resulting data to develop a suitable method of sterilization. The stability of morphine in aq. soln. depends largely on the p_{H} . Alk. morphine solns. change markedly at room temp.; nearly neutral solns. also, especially at elevated temp., are relatively unstable; acid solns. are more stable. With a $p_{\text{H}} \leq 5.5$, heating at the temp. of boiling water for 60 mins. is followed by no further spectral displacement, from which it is concluded that no change takes place from the chem.-constitutional standpoint. The changes taking place in aq. soln. are oxidative in character. W. O. E.

Alkaloid of *Carnegiea gigantea* (Engelm.) Britt. and Rose. GEORG HEYL. Tech. Hochschule Darmstadt. *Arch. Pharm.* 266, 668-73 (1928).—An alkaloid, *carnegine*, $\text{C}_{19}\text{H}_{19}\text{NO}_2$, was isolated in the form of a thick sirup, which apparently decomposed on standing, *HCl* salt, $\text{C}_{19}\text{H}_{19}\text{NO}_2 \cdot \text{HCl} \cdot \text{H}_2\text{O}$, m. 207°; *HBr* salt, $\text{C}_{19}\text{H}_{19}\text{NO}_2 \cdot \text{HBr}$, m. 228°; *chloroaurate*, $\text{C}_{19}\text{H}_{19}\text{NO}_2 \cdot \text{AuCl}_3 \cdot \text{HCl}$; *chloroplatinate* $(\text{C}_{19}\text{H}_{19}\text{NO}_2)_2 \cdot \text{PtCl}_4 \cdot 2\text{HCl}$. W. O. E.

Animal drugs in the materia medica. P. MANICKE. Univ. Leipzig. *Pharm. Ztg.* 73, 1427-9(1928).—An address giving an account of the numerous preps. from animal sources employed in ancient and modern times. W. O. E.

Simple evaluation of spiritus aetheris. F. WRATSCHKO. *Pharm. Presse* 33, 384-6 (1928).—Into a 25-cc. glass-stoppered measuring cylinder graduated in 0.1 cc. introduce 10 cc. of the sample, 10 cc. H_2O and 5 cc. petr. ether. Shake vigorously, and after sepn. of the liquid into layers read off accurately the lower (k). Calc. the % of alc. (x) and Et_2O (y) from the expressions: $y = 72(20 - k)/d$ and $x = p - 5y/4$, in which d = sp. gr. of the sample, p = alc. vol. % of the alc.- H_2O mixt. having the same d . as that of spir. aether. The method is carried out at 15° , if at higher or lower temps. a suitable correction is made by use of the expression: $y = 10d_1(20 - k)/d_2$, in which d_1 and d_2 = the d . of Et_2O and spir. aether. at the examg. temp., resp. The value p is obtained by reference to the customary alc. tables for the temp. $15^\circ/15^\circ$. W. O. E.

Euphorbium resin. K. H. BAUER AND P. SCHENKEL. Univ. Leipzig. *Arch. Pharm.* 266, 633-8(1928).—Euphorbon, obtained from the resin, m. $67-8^\circ$ and $115-6^\circ$ when crystd. from petr. ether and MeOH, resp., is a composite substance; on fractional crystn. from MeOH it yields the unsatd. alc. *euphorbol*, $C_{28}H_{48}O$, m. 122° , susceptible of hydrogenation to either a di- or a tetrahydro deriv., the latter giving with $AcCl$ the deriv., $C_{28}H_{47}OCOCH_3$, needles, m. 129° . W. O. E.

An attempt to prepare mercury compounds of triphenylmethane dyes. FREDERICK R. GREENBAUM. *Am. J. Pharm.* 101, 34-46(1929).—Brilliant green, malachite green, gentian violet, night blue and basic fuchsin were mercurated. Not all these dyes gave definite mono- or di-Hg compds.; the mercuration usually resulted in mixts. of various Hg compds. The very slight soly. of the compds. makes them less useful from a pharmaceutical point of view. The soly. was no higher than 0.3% in alc.; the alc. soln. can be dild. with H_2O without pptn. For practical purposes and for therapeutic investigations it was necessary to obtain H_2O - or alkali-sol. Hg compds. of triphenylmethane dyes. The condensation of phenolbenzotrichloride and of resorcinolbenzotrichloride resulted in alkali-sol. triphenylmethane dyes, which on mercuration furnished di-Hg compds. easily sol. in alkalies. Therefore, further investigation will be necessary along the line of alkali-sol. triphenylmethane dyes and their mercuration. A short bibliography is appended. W. G. GAESSLER

Testing some common antiseptics. EDWARD S. ROSE. *Am. J. Pharm.* 101, 52-5 (1929).—R. examd. some 20 so-called antiseptic proprietary preps. Very few were antiseptic in accordance with the Government's interpretation. Briefly, the procedure of examn. is to inoculate the sample or allow it to come in contact with a specially prepd. culture of *Staph. aureus*, either in liquid or solid form as the case requires. Five mins. is the time allowed to kill in most instances. However, in a few cases, 10- and 15-min. periods are permitted. In the case of inhibition it should show after a period of incubation. R. also examd. a no. of common articles sold in the drug store and generally considered by the laity to have antiseptic properties. The following were found to be antiseptic: Ointments (mercurial 30%; ammoniated Hg 10%; I U. S. P.; thymol iodide 10%; yellow oxide Hg 2%; calomel 30%); soaps (germicidal 1%); liquids ($AgNO_3$ 5-10%; neosilvol 5-10%; solargentum 5-10%; argyrol 5-10%); spirit of camphor U. S. P.; alc. 70%; bay rum; Al_2Cl_3 soln. 25%; tincture of I, U. S. P.; tincture of I, colorless N. F.; Lugol's soln. U. S. P.; soln. of H_2O_2 U. S. P.; turpentine; phenol 1-70; mercurochrome 2% in acetone 10, alc. 55, H_2O 35; above mixt. without mercurochrome; antiseptic soln. N. F.; zonite; flexible collodion). The following are either not antiseptic at all or only very weakly antiseptic: Ointments (ZnO U. S. P.; S U. S. P.; ichthyol 10%; compd. resorcinol N. F.; tar U. S. P.; Lassar Zn paste N. F.); soaps (castile; Pear's glycerin); liquids (distd. ext. of witch-hazel; satd. soln. of H_3BO_3 ; satd. soln. of $MgSO_4$; mercurochrome 2% aq.; mercurochrome 3% aq.; alkaline aromatic soln. N. F.; Dobell's soln. U. S. P.). W. G. GAESSLER

New medicaments. ZERNIK. *Deut. med. Wochschr.* 54, 20-1, 61-2, 101, 148-9, 233-4, 275-6, 480-1, 657-8, 1091-2, 1173-4, 1472, 1811, 2071(1928); cf. C. A. 22, 665.—A summarized description of the compn., dosage and uses of the new preps. introduced into medicine, with references to the literature. ARTHUR GROLLMAN

The determination of morphine. A. K. BALLS AND WILLIAM A. WOLFF. Univ. of Pa., Philadelphia. *J. Biol. Chem.* 80, 379-402(1928).—In the existing methods of detg. morphine, several errors were encountered. The pptn. of impurities usually results in the retention of some morphine by the ppt. Evaph. of morphine solns. results in decompn. Methods are, therefore, proposed for estg. morphine which avoid

the above errors. They are suitable for amts. of morphine greater than 20 mg. per 100 g. of material.

ARTHUR GROLLMAN

Chemico-pharmaceutical control of the sterilized dose solutions in ampoules. D. N. POPOV. *Trans. Sci. Chem.-Pharm. Inst.* (Moscow) No. 9, 45-63(1924).—P. presents control analyses on novocaine 1-2% with 1:10000 adrenaline and camphor oil. The standard methods of analysis are described in detail and the advantages and disadvantages of some of these are discussed.

J. S. JOFFE

Digitalis preparations, their standardization and their standard titers. O. A. STEPPUN. *Trans. Sci. Chem.-Pharm. Inst.* (Moscow) No. 13, 80-98(1926).—S. reviews the development of the chemistry of digitalis and describes his method of prepg. gitalin.

J. S. JOFFE

The standardization of preparations of *Secale cornutum* and some physiological observations on the properties of *Secale* and histamine. S. I. CHECHULIN. *Trans. Sci. Chem.-Pharm. Inst.* (Moscow) No. 13, 110-31(1926); cf. *C. A.* 20, 2706.—C. presents exptl. data on the effect of the drugs on guinea-pig uterus. For calcg. the standard the following formula is suggested: $V = 0.02 \times D\beta \cdot 100/Ds$, where V = the value sought, $D\beta$ = dose of histamine in cc., Ds = dose of *Secale*, 0.02 = no. of mg. of active histamine in 1 cc. of a standard soln. and 100 = cc. of the test prepn.

J. S. JOFFE

Biological methods of determining the value of some drugs. O. A. STEPPUN. *Trans. Sci. Chem.-Pharm. Inst.* (Moscow) No. 13, 99-105(1926).—A discussion of the principles underlying the methods of detg. the value of drugs.

J. S. JOFFE

The biological value of some cardiac drugs. O. A. STEPPUN. *Trans. Sci. Chem.-Pharm. Inst.* (Moscow) No. 13, 106-9(1926).—A discussion of the principle of the method of Fokke on the value of cardiac drugs.

J. S. JOFFE

The determination of the total geraniol content of Java citronella oil and the analytical examination of the latter in general. A. RECLAIRE AND D. B. SPOELSTRA. *Ber. Aldeel Handelsmuseum Ver. Koloniaal Inst.* No. 36, 3-11(1928); cf. *C. A.* 22, 2237.—Comparative tests showed that the method of Radcliffe and Chadderton is much more accurate than that of Schimmel & Co. It has been suggested to add to the analysis of citronella oil a detn. of distn. residue, namely, the substances boiling over 250° . It was found that so many factors in connection with the distn. influenced the results, that this detn. was of little value for the evaluation of screeh oil.

J. C. JURRJENS

Final report from the Imperial Institute dated June 21, 1928, on *Hydnocarpus* seeds from Ceylon. ANON. Imperial Inst. *Tropical Agr.* (Ceylon) 71, 208-10 (1928).—The seeds and oil of several species of *Hydnocarpus* were examd. to det. their suitability as sources of chaulmoogric and hydnocarpic acids for treatment of leprosy. Analyses of *Hydnocarpus alpina*, *H. octandra* and *H. venenata* seeds gave the following results: kernels 28.5, 69.6 and 62.5%, resp. The kernels contained H_2O 4.3, 3.8 and 4.9, and oil 62.7, 66.7 and 63.7%, resp. The optical rotation of the respective oils in CH_2Cl was $+47.58^\circ$ at 20° , $+54.11^\circ$ at 17° and $+53.47^\circ$ at 21° . The fatty acids gave optical rotations as follows: 50.12° at 18° , 54.03° at 18° and 56.19° at 22° and solidifying points of 39.2° , 48.5° and 47.0° . Treatment of the fatty acids by the method of Power and Barrowcliff indicated the presence of chaulmoogric acid in each oil. Hydnocarpic acid was not definitely detected in any of the 3 oils but may be present in small quantities. Samples of seed from *H. venenata* were sent to the Leprosy Research Lab. at Calcutta. The oil gave the following analysis: oil from seeds by cold expression 24%, acid value 20.5, sapon. value 212.2, I value 89.1, sp. rotation at 20° $+58.4$. Clinical tests of the oil in leprosy cases gave results which do not appear to differ from those obtained with oil from *H. wightiana*.

A. L. M.

A principle easily extracted from *Sphacele parviflora* L. V. HASENFRATZ. *Compt. rend* 187, 903-4(1928).—The plant, which is of the order Labiateae, was collected in the Pacho region, Columbia, at an altitude of 1800 to 2000 m. The leaves are made into cigars, which are smoked by the inhabitants as an alleged prophylactic. Upon aging, a white deposit appears on the cigars. The dried and pulverized leaves on extrn. with steam yielded a waxy product at the rate of about 3 g. per kg. This product was insol. in water but sol. in alc., Et_2O or $CHCl_3$, cryst. needles, m. 105° . Analysis led to the formula $C_{15}H_{24}O$, the same as that of a camphor, ledol, obtained from *Ledum palustre*, order Ericaceae. These 2 substances appear to be identical.

L. W. R.

The stabilization of medicinal plants. FRANCESCO NICOLA. *Giorn. farm. chim.* 77, 357-78(1928).—A survey is given of the plant enzymes and the changes produced by them in the chem. compn. of the active principles of medicinal plants subjected to drying. The methods used for stabilizing the plant material, i. e., for destroying the enzymes without injury to the drugs, are discussed.

G. SCHWOCH

Titration of preparations of the posterior lobe of the hypophysis by means of the

sheep uterus. PAUL TRENDLENBURG. Univ. Berlin. *Arch. expl. Path. Pharm.* 138, 301-5(1928).—With the sheep uterus the results corresponded within 20% to actual values. G. H. S.

Antivenin (Nearctic Crotalidae). JOSIAH C. PRACOCK. *J. Am. Pharm. Assoc.* 17, 750-60(1928).—Methods of collecting venom and production of antivenin by injection into the horse are described. The antivenin is standardized by injection of a mixt. of venom and antivenin into a pigeon's wing. One cc. of antivenin must neutralize 0.002 g. of venom. The serum is antidotal to the venom of the rattlesnake, copperhead and moccasin. It is believed that the antivenin will retain its potency for 10 yrs. L. E. WARREN

Medicinal plants of Florida. ERNST T. STUHR. *J. Am. Pharm. Assoc.* 17, 761-6(1928).—A catalog arranged according to botanical families. L. E. WARREN

Epsom salt of today. EDWARD S. ROSE. *J. Am. Pharm. Assoc.* 17, 771-2(1928).—Twelve specimens of Epsom salt were purchased in drug stores between N. Y. City and San Francisco. Each was subjected to the U. S. P. tests. All were of good quality. One specimen had effloresced somewhat with consequent high assay. L. E. WARREN

Stability of solutions of potassium arsenite. ELIZABETH PICKERING. E. R. Squibb and Sons *J. Am. Pharm. Assoc.* 17, 848-50(1928).—Review of the literature L. E. WARREN

The pharmacopeia of the United States. E. FULLERTON COOK. *J. Am. Pharm. Assoc.* 17, 1078-80(1928).—The status of the researches which are being conducted by or for the Committee of Revision is given. L. E. WARREN

Stability of homatropine hydrobromide solution. PAUL S. PITTINGER AND JOHN C. KRANTZ, JR. Sharp and Dohme. *J. Am. Pharm. Assoc.* 17, 1081-4(1928).—A 1% soln. of homatropine-HBr was prepd. with distd. H₂O and another soln. with NaCl soln. isotonic with the tear. Each soln. was biologically tested by the cat-eye method and they were found to be identical. Each soln. was subdivided into 8 parts and the several fractions were kept under various conditions of storage. Some of the subdivisions were sterilized; others were exposed to ultra-violet light; still others were placed in ampoules and stored. The mydriatic action was not decreased by any of the treatments. Ampoules retained their strength for 9 months. L. E. WARREN

Mercuric iodide determination in tablets. H. O. MORAW. *J. Am. Pharm. Assoc.* 17, 1084-6(1928).—Place a weighed quantity of the powd. tablets, equiv. to 0.25-0.4 g. of HgI₂, in a beaker, add 0.2 g. of lactose and mix with a glass rod. Add sufficient 10% NaOH to make a paste and mix well. Add more NaOH soln. to make about 30 cc. Digest over a low flame for 30-50 min. Dil. to 75 cc. with H₂O and filter the mixt. while hot. Add a slight excess of AgNO₃ soln. and 25 cc. of HNO₃ and boil the mixt. gently until clear. Collect the AgI, dry it and weigh in the usual way. If Cl is present, wash the AgI with dil. NH₄OH soln. The incomplete reduction of HgI₂ in alk. soln. is due to incomplete peptization and occlusion. Thorough mixing of the tablet material with lactose followed by careful manipulation with the alk. soln. insures the complete reduction of the Hg compd. The method is accurate within about 1%. L. E. WARREN

Indian Ephedra species. H. E. READ AND C. T. FENG. Peking Union Med. Coll. *J. Am. Pharm. Assoc.* 17, 1189-92(1928).—Four species of *Ephedra* growing in northern India were examd. for alkaloids and the proportions of ephedrine to total alkaloid detd. *Ephedra intermedia* (dry broken stems) 1.17% alkaloids; 30-40% ephedrine. *E. intermedia* (unbroken stems) 1.14% total alkaloids; 30-40% ephedrine. *E. gerardiana* 1.65-1.70% total alkaloids; 70-80% ephedrine. *E. sinica* 1.32% total alkaloids; 80-85% ephedrine. *E. equisetina* 1.75% total alkaloids; 85-90% ephedrine. The large proportion of pseudoephedrine in *E. intermedia* does not disqualify its use in manufacturing, since it is easily possible to convert one isomer into another up to 50%. L. E. WARREN

The incompatibility of sodium salicylate and sodium bicarbonate mixtures. JOHN C. KRANTZ, JR. Sharp & Dohme, Baltimore, Md. *J. Am. Pharm. Assoc.* 17, 1203-6(1928).—Chemicals free from Fe were selected. A soln. of Na salicylate (about 6%) was prepd. and portions were mixed, resp., with a soln. of (A) NaHCO₃, Na₂CO₃ and NaOH. The mixt. contg. (A) gave a black ppt. in 6 days, that with Na₂CO₃ became brown in 10 days and that with NaOH remained practically colorless after several months. Oxidation is one of the important causes in producing the reaction. Light is without influence. The action of NaHCO₃ solns. upon certain compds. related to salicylic acid, such as Na benzoate and PhOH, was studied. In some there is a slight darkening

after a long time; in others there is no reaction. The reaction is peculiar to *o*-hydroxybenzoic acid.

L. E. WARREN

The alkaloids of *Bocconia frutescens* L. EMERSON R. MILLER. *Ann. Polytech. Inst. J. Am. Pharm. Assoc.* 18, 12-4(1929).—*Bocconia frutescens* L., family Papaveraceae, is found in tropical America. The plant reaches a height of 10-12 ft. Examn. of the bark of the larger specimens showed it to be rich in alkaloids and to contain a red resin. The leaves were studied. At last 4 alkaloids were obtained. Two were identified as γ -homochelidonine and protopine. The others are probably β -homochelidonine and chelerythrine. Because of the large size of the leaves and their high alkaloidal content it is believed that *Bocconia* is probably the best known source of protopine.

L. E. WARREN

Ammonium acetylsalicylate—"ammon-aspirin." NORMAN E. WOLDMAN. *J. Am. Pharm. Assoc.* 18, 14-7(1929).—Acetylsalicylic acid was prepd. by the usual methods and the product neutralized by NH_4OH . The crystals of NH_4 acetylsalicylate were sepd. by centrifugation, washed with H_2O contg. a little NH_4OH and dried. The product is a white, cryst. compd., odorless, sour, decomp. above 70° and non-toxic.

L. E. WARREN

The stability of anesthetic ether. F. W. NITARDY AND M. W. TAPLEY. *Anesthesia and Analgesia* 7, 318-20(1928).—Peroxides do not exist in freshly prepd. anesthetic ether, but develop as a result of subsequent changes in the material when stored in the glass and tin containers now used commercially. An adequate surface of Cu on the interior of the container will prevent this formation of peroxides, but will not remove peroxides from deteriorated ether.

R. C. WILLSON

Industrial ethylation. Manufacture of dionin(MCLANG) 10. Chemical composition and properties of some special kinds of glass (PESHEL, POPOV) 19. Determination of alkalinity of glass for medical ampoules (POPOV, KLYACHKINA) 19. Theory of steam distillation (of essential oils) (RENGROVE) 2. Action of ultra-violet light on ferric citrate solutions (FRY, GERWE) 3. The effect of sunlight on citric acid in the presence of ferric salts (BURT) 3. Oil and fat treatment (Can. pat. 285,879) 27. Unsymmetrical areno compds. (U. S. pat. 1,688,351) 10. Yoghurt (Ger. pat. 470,035) 12. Turkey-red oil substitutes (Fr. pat. 642,392) 27. Condensation products from reaction products of S_2Cl_2 and primary arylamines (U. S. pat. 1,699,432) 10.

Annual Report. Essential Oils, Synthetic Perfumes, etc., 1927. Miltitz near Leipzig: Schimmel & Co. 250 pp. Reviewed in *Am. J. Pharm.* 100, 797(1928).

Chemist and Druggist Diary, 1929. London: Chemist & Druggist, Offices. Reviewed in *Pharm. J.* 121, 602(1928).

LANDER, H. H.: *Weltproduktion und Welthandel von ätherischen Oelen*. Berlin: Verlag Chemie G. m. b. H. 400 pp. M. 15. Reviewed in *Chem. Met. Eng.* 35, 758 (1928).

Synthetic drugs (anesthetics). CHEMISCHE FABRIK VORM. SANDOZ. Brit. 291,850, March 4, 1927. Salts of *m*-aminobenzoic acid alkyl esters with alkylsulfonic acids are made by interaction of the 2 components in equimol. proportions or by double decompn. of sol salts of *m*-aminobenzoic acid esters such as hydrochlorides, hydrobromides or sulfates, with alkali or alk. earth metal salts of alkylsulfonic acids. The products are sol in water and form solns. which are stable on boiling. Examples are given of the prepn. of salts of the Et, Pr and iso-Bu esters with methane- and ethane-sulfonic acids. The *m*-aminobenzoic acid Pr and iso-Bu esters are made by heating *m*- $\text{O}_2\text{NC}_6\text{H}_4\text{COCl}$ with PrOH and iso-BuOH and reducing the resulting nitrobenzoic acid esters with Fe and H OAc .

Medicinal iron preparation. ALFRED STEPHAN. Ger. 468,424, Feb. 3, 1927. Aq. solns. of iron glycerophosphate contg. sugar are preserved by addn. of benzoic acid.

Medicinal quinine solutions. CHEMISCHE-PHARMAZEUTISCHE A.-G. Brit. 291,565, April 4, 1927. In prepg. solns. of basic quinine in oils by means of terpenes, as described in Brit. 266,209 (C. A. 22, 481), the solvent effect of the terpenes is increased by addn. of fat-sol. alcs. such as octyl alc., decyl alc., benzyl alc., phenethyl alc. and cinnamyl alc. Olive oil, sesame oil, paraffin oil and wool fat may be used and cineole and oil of turpentine are suitable terpenes. Other drugs such as alkaloids may be added.

Medicinal waters. G. H. ORGLMEISTER & CO., VEREINIGTE PRODUKTE UND DERIVATE. Austrian 111,248, June 15, 1928. Solns. having a beneficial effect when used as

beverages or baths are prepd. by carefully burning carbonaceous materials of vegetable origin, such as coal or peat; and extg. the ash with water. Coal rich in Cl and As and contg. more K than Ca is washed before burning.

Medicinal colloidal adsorption of hydrochloric acid. VINCENT A. LAPENTA. U. S. 1,699,596, Jan. 22. An infusion of agar-agar is subjected to steam pressure in an autoclave, HCl is added, and the material is further admixed with siliceous earth contg. tribasic Ca phosphate, to prepare a product suitable for internal administration for liberating HCl in the stomach.

Medicinal product from amniotic fluid. HERBERT L. JOHNSON. U. S. 1,696,958, Jan. 1. A therapeutic compn. suitable for preventing peritonitis and adhesions after surgical operations is prepd. by removing or neutralizing possibly harmful ingredients of amniotic fluid, *e. g.*, by filtration and sterilization of amniotic fluid from cows.

Purified product from amniotic fluid. JASPER P. SCOTT (to Eli Lilly & Co.). U. S. 1,699,479, Jan. 15. A purified and concd. product which is suitable for preventing adhesions after surgical operations comprises a fraction of amniotic fluid sol. in alc. of 70-80% concn. but insol. in alc. of 90-95% concn. and from which the fractions insol. in alc. of less than 70% concn. also have been removed as have also those fractions sol. in alc. of above 95% concn.

Emetine. CHEMISCHE FABRIK VORM. SANDOZ. Brit. 291,088, May 27, 1927. Emetine is produced from cephaeline by methylating with salts of phenyltrimethylammonium hydroxide or with a mixt. of substances forming the quaternary base, among the salts which may be used are the *p*-toluenesulfonate and the hydrochloride. Cf. C. A. 23, 612.

Theobromine. C. H. BOEHRINGER SOHN. Fr. 640,955, Sept. 13, 1927. Theobromine is extd. from substances contg. it such as cacao pods, by means of water, or aq. solns. of alk. earth hydroxides, at ordinary or slightly raised temp., and sepg. the theobromine in known manner.

Organometallic compounds. ALFRED EHRENREICH and RUDOLF HAUSCHKA. Fr. 641,514, Sept. 27, 1927. New substances which have remarkable bactericidal properties and have a great affinity for vegetable fibers, such as wood fiber, are made by reaction of an alk. soln. of Hg salts and KCN with halogenated phenols, cresols or their homologs. The structure is probably Halogen-X-Hg-O-Hg-CN, where X represents a phenol or like nucleus.

Complex antimony compounds. HANS HAHN (to Winthrop Chemical Co.). U. S. 1,688,964, Oct. 23. An antimonyl compd. such as antimonyl pyrocatechol, derived from a polyphenol contg. 2 OH groups in *o*-position to each other, is caused to react with a neutral salt of an aliphatic hydroxy acid such as tartaric or citric acid, *e. g.*,

with Na tartrate, to produce derivs. such as $\text{NaO}_2\text{CCH}(\text{OSb} \begin{array}{c} \diagup \diagdown \\ \diagdown \diagup \end{array} \text{C}_6\text{H}_4)\text{CH}(\text{OH})\text{CO}_2\text{Na}$

which may be used as *therapeutic agents*. Their aq. solns. have no irritating effect and can be sterilized at 100°. They are not pptd. by alkalis but are pptd. by alkali metal sulfides. Cf. C. A. 22, 2812.

Ammonium salt of hydroxyacetylaminophenylarsonic acid. ERNEST FOURNEAU. U. S. 1,697,910, Jan. 8. A compn. comprising water, the NH_4 salt of hydroxyacetylaminophenylarsonic acid and Na_2SO_3 or other alkali salt of sulfurous acid is suitable for dispensing in ampoules.

Lecithin compound. SOC. ANON. POUR L'IND. CHIM. A BÂLE. Swiss 127,256, Dec. 23, 1926. The prepn. of an additive compd. of lecithin and CaCl_2 , from which lecithin of high purity can be prepd., is described.

Lecithin preparation. HANS MARTIN. Austrian 110,850, May 15, 1928. A prepn. of lecithin for diabetic subjects is prepd. by mixing yolk of egg, opened up with alc. in known manner, with dried milk and cacao butter. Other suitable sugar-free addns., such as grated almonds, may be made.

Pyramidone. I. G. FARBENIND. A.-G. Ger. 469,285, April 11, 1923. To prepare pyramidone, 1-phenyl-2,3-dimethyl-4-nitroso-5-pyrazolone is treated with CH_3O or its polymers and a reducing agent such as Zn dust or Fe and mineral or org. acid. Examples are given.

Iodine-substituted benzonitriles having pharmaceutical uses. WALTER SCHOBLE and KURT SCHMIDT (to Chemische Fabrik auf Actien, vorm. E. Schering). U. S. 1,693,055, Nov. 27. Condensation of I-substituted phenol ethers is effected with metal salts of I-substituted hydroxybenzonitriles, without the halogen being split off or the nitrile group being destroyed, by effecting the reaction at temps. of 210-240° in the presence of a catalyst such as Cu bronze ("Naturkupfer C"). Examples are given.

of the production of 4-(4-methoxy-3-iodophenoxy)-3,5-diiodobenzonitrile (m. 154° and readily sol. in ether, CHCl_3 and hot alc. but insol. in ligroin and water), 4-(4-iodo-3-methoxyphenoxy)-3,5-diiodobenzonitrile and an I-substituted nitrile derived from the K salt of the 1-methyl ether of 2-iodohydroquinone and 3,4,5-triiodobenzonitrile. I substituted nitrobenzenes also may be used as starting materials and the products thus derived then subjected to reduction, as with SnCl_2 , and after diazotization boiled with cuprous cyanide.

Solutions of β -tribromoethyl alcohol. I. G. FARBENIND. A.-G. (Karl Schrans and Siegfried Jaeger, inventors). Ger. 469,825, May 10, 1927. The difficulties met with in prepn. of aq. solns. of $\text{CBr}_3\text{CH}_2\text{OH}$ for medical use are avoided if the $\text{CBr}_3\text{CH}_2\text{OH}$ is first treated with HCONH_2 , suitably in amts. of 20–40%, whereby a liquid product readily sol. in H_2O at body temp. is obtained.

Alkyl- and aralkylresorcinolcarboxylic acids. HANS STENZL. U. S. 1,697,332, Jan. 1. Carboxylic acids of the 4-alkyl- and 4-arylalkyl derivs. of 1,3- $\text{C}_6\text{H}_4(\text{OH})_2$ are formed by treating the starting materials with CO_2 in the presence of alkali, *e. g.*, by use of NaHCO_3 . 4-Phenethyl-1,3-dihydroxybenzene yields a carboxylic acid m. (with decompn.) 208°. The 4-*p*-bromophenethyl-1,3-dihydroxybenzene-6-carboxylic acid m. 204°. 4-Heptyl-1,3-dihydroxybenzene-2-carboxylic acid m. 109–10°. These and similar compds. such as 4-benzyl-1,3-dihydroxybenzene-2-carboxylic acid are of relatively low toxicity and are suitable for use as *internal disinfectants* in the treatment of infections of the urogenital system. In usual therapeutic doses they pass through the body unchanged.

Derivatives of quinolinecarboxylic acid. KARL MIESCHER (to Soc. anon. pour l'ind. chim. à Bâle). U. S. 1,688,409, Oct. 23. An acid halide of haloquinolinecarboxylic acid is caused to react with Me_2NH or other N compd. of the general formula $\text{HN}^+\text{R}^+\text{R}^-$ in which R^+ and R^- represent H or a univalent radical, and the haloquinolinecarboxylic amides thus obtained are then caused to react with compds. of the general formula $\text{R}'\text{OH}$ in which R' represents a univalent radical such as Na alcoholate or alk. potash. Compds. the production of which is described or mentioned include 2-chloro-4-quinolinecarboxylic acid dimethylamide (m. 114°) and the corresponding derivs., di-Et (m. 124°), di-Pr (m. 77°), diallyl (m. 104°), diisoamyl, EtPh (m. 126°), mono-Me (m. 143°), monobenzyl (m. 217°) and piperidide (m. 140°); 2-cyclohexyloxy-4-quinolinecarboxylic acid diethylamide (m. 63°); 2-phenoxy-4-quinolinecarboxylic acid diethylamide (m. 112°); 2-diethylaminoethoxy-4-quinolinecarboxylic acid diethylamide (b.p. 665 168–70°); 2-ethoxy-4-quinolinecarboxylic acid amide (m. 205°) and the following derivs., di-Me (m. 69°), di-Et (m. 68°), di-Pr (m. 60°), diallyl (m. 53°), diisoamyl, EtPh (yellowish oil), mono-Et (m. 152°), monobenzyl (m. 166°) and piperidide (m. 90°); 2-methoxy-4-quinolinecarboxylic acid diethylamide (m. 93°); 2-propoxy-4-quinolinecarboxylic acid diethylamide (m. 61°) and the corresponding 2-iso-propoxy compd. (a colorless oil); 2-allyloxy-4-quinolinecarboxylic acid diethylamide (m. 33°); 2-phenethoxy-4-quinolinecarboxylic acid diethylamide (m. 59°); 2-diethylaminoethoxy-4-quinolinecarboxylic acid anilide (m. 122°). These compds. may be used as *therapeutic agents*.

Barbituric acid derivatives. FRITZ HEFTI. Swiss 127,126, Mar. 14, 1927. 5,5-Disubstituted barbituric acids are prepd. by reaction between alkyl halides and dry salts of 5 monosubstituted barbituric acids in presence of a small amt. of an org. base. Examples are given describing the prepn. of phenylethyl- and phenylallylbarbituric acids from the K salt of phenylbarbituric acid and ethyl or allyl bromide, resp., in each case in presence of pyridine.

Stabilizing solutions of alkali salts of substituted barbituric acids. J. D. RIEDEL-ERL. HAN A. G. Ger. 469,395, Jan. 16, 1928. Gelatin, agar, or the like is added to solns. during or after their prepn. *e. g.*, 100 g. Na *sec*-butylbromoallylbarbiturate is dissolved in 1 l. of sterilized gelatin soln. of 10% concn.

5-Hexylsalicylic acid. F. HOFFMANN-LA ROCHE & Co. A.-G. Swiss 127,649, May 17, 1927. The compd. is obtained by treating the Na salt of *p*-hexylphenol with CO_2 . Its m. p. is 86° and it can be used as a disinfectant.

Water-soluble silicic acid-albumin compound. JOHANN ABRAHAM VON WÜLFING. Swiss 127,125, Jan. 27, 1927. Casein, preferably suspended in an org. medium, is treated with Na_2SiO_3 soln. until a sample dissolves in hot water giving a neutral or feebly acid soln. The product is then sepd., dried and ground; it is intended for medical use.

N-Methyl dianisylisatin. F. HOFFMANN-LA ROCHE & Co. A.-G. Swiss 127,128, Oct. 9, 1926. N-Methyl dianisylisatin is prepd. by methylating dianisylisatin. The product melts at 153°. It is of therapeutic value.

2-Styryl-4-amino-6-ethoxyquinoline. I. G. FARBENIND. A.-G. Swiss 127,650, Sept. 7, 1926. The substance is prep'd. by heating 2-styryl-4-carbazido-6-ethoxyquinoline with alc. and sapon. the thus obtained urethan. The m. p. is 212°. The substance is a strong bactericide.

6-Methoxy-8-(α -diethylamino- δ -methylbutyl)aminoquinoline. I. G. FARBENIND. A.-G. Swiss 127,178, Aug. 8, 1925. Addn. to 125,832. 6-Methoxy-8-(α -diethylamino- δ -methylbutyl)aminoquinoline is prep'd. by treating *N*-diethylaminomethylbutyl-2-amino-4-methoxy-1-aminobenzene with glycerol, H_2SO_4 , and H_3AsO_4 . The product boils at 189–90° under 2 mm. pressure. It is of *therapeutic value*. *N*-Diethylamino- δ -methylbutyl-2-amino-4-methoxy-1-aminobenzene may be prep'd. from 2-nitro-4-methoxy-1-acetylaminobenzene by reduction of the NO_2 group, conversion of the amino comp'd. into the *N*-diethylamino- δ -methylbutylamino comp'd. and removal of the Ac group.

Blood coagulant. MORTIMER BYE (to William S. Merrell Co.). U. S. 1,697,162, Jan. 1. A sol., powdered, blood-clotting ext. of body tissue that will dissolve to form a clear, neutral, water-white soln. is obtained by pptg. an aq. saline lung tissue ext. with acid and neutralizing the ppt. with NaOH or other alkali.

Hormones. NAAMLÖÖZE VENNOOTSCHAP ORGANON TOT BEREIDING VAN ORGAN-PREPARATEN OP WETENSCHAPPELIJKE GRONDSLAG. Brit. 291,081, May 28, 1927. Ovarian hormones are obtained from the urine of pregnant women or animals by use of a volatile solvent, evapn. of the solvent, and extn. of the residue with water. Dil. acids or salts or their mixts. may be present in the extn.

Hormones. I. G. FARBENIND. A.-G. Brit. 291,018, May 23, 1927. Two active substances, having opposite effects on the female sexual organs, are obtained from the anterior lobe of the hypophysis by extn. with org. liquids and with aq. solvents, resp. Various details and modifications of procedure are given.

Hormones. SCHERING-KAHLBAUM A.-G. Brit. 291,005, May 23, 1927. Hormones obtained from sexual organs are rendered more active by irradiation with ultra-violet rays. Brit. 291,006 specifies treatment of extracts from animal organs of internal secretion such as placenta with an alk. earth such as $Ca(OH)_2$ in an aq. org. solvent preferably in the presence of an inert adsorbent, such as 40% alc. used together with kaolin, or 50% acetone used with silica gel (in the case of ext. of testicle tissue).

Tube for holding and spraying ethyl chloride. JOSEPH W. BATCHELOR. U. S. 1,698,528, Jan. 8. Structural features.

Tube for dispensing ethyl chloride. HERMANN A. MÜLLER. U. S. 1,697,731, Jan. 1. Structural features.

Increasing the production of serum in the animal body. ADOLF SABELLA. Austrian 111,252, June 15, 1928. Solns. of physiol. salts of 5 to 25 times the concn. of these salts in the animal blood are introduced into the animal intravenously.

Food compositions to be taken percutaneously. KARL STEJSKAL. Austrian 109,714, Jan. 15, 1928. Food compns. to be taken by rubbing into the skin comprise carbohydrates, albumins, decompn. products of these substances or equiv. foodstuffs, singly or in admixt., dissolved or dispersed in emulsions or solns. of fats or oils in hygroscopic media, particularly such as are assimilable by the body. A typical compn. comprises dextrose 30, glycerol 17.5, fat 35 and egg yolk 17.5%. Cf. C. A. 22, 1655.

Extraction of products from vegetable materials. I. G. FARBENIND. A.-G. (Karl Dorschky, inventor). Ger. 469,494, July 15, 1926. The extn. from vegetable materials of water-insol. or difficultly sol. products for medical, cosmetic, or other purposes is effected with an aq. soln. of a sulfonic acid of high cleansing properties, or its salts.

Composition containing isopropanol for cleansing the hair and scalp. CARLETON ELLIS. U. S. 1,700,035, Jan. 22. Isopropanol may be used with other ingredients such as tertiary butanol.

Lavage and degreasing composition. CARLETON ELLIS. U. S. 1,700,036, Jan. 22. A vehicle suitable for use on the skin contains not more than 3% of water and consists mainly of isopropanol with a small quantity of tertiary butanol together with odorous substances.

Cosmetic preparations for baths, etc. S. L. LEICHNER. Brit. 292,042, Jan. 21, 1928. Finely divided rice starch is mixed with carbonates and acids, in dry condition, and with perfumes.

Reducing the nicotine content of finished tobacco goods. GENERAL-DIREKTION DER ÖSTERREICHISCHE TABAKREGIE. Austrian 110,885, May 15, 1928. The dry goods are heated rapidly to above 150° and subjected to a rapid stream of air, dry steam, or other gas preheated to the same temp. Suitable plant is described.

Disinfectant from beechwood tar. HERMANN SUIDA. Austrian 111,381, July 15, 1927. The crude oil obtained by the distn. of beechwood tar over a free fire is fractionally distd. *in vacuo* without preliminary chemical treatment, the fraction passing over at 100–170° under 700–740 mm. vacuum being used as the base of disinfectant compns.

Disinfectant, particularly for preventing or curing foot-and-mouth disease. ADDE VON DER WAL. Ger. 468,579, Feb. 26, 1928. The disinfectant is prepd. by warming $\text{Pb}(\text{OAc})_2$ soln. with PbO in such proportions that a filtrate of sp. gr. about 1.24 is obtained, adding alum to the filtrate, with or without $\text{B}(\text{OH})_3$ and filtering again. The compn. may be improved by addn. of insectifuges such as tincture of eucalyptus, myrrh, or aloes, citronella oil, etc.; it may also be colored and prepd. in ointment form by suitable addns. Examples of suitable proportions are given.

18—ACIDS, ALKALIES, SALTS AND SUNDRIES

E. M. SYMMES

The activity of various contact substances in the sulfuric acid contact process. I. BERNHARD NEUMANN, HEINZ PANZNER AND ERICH GOEBEL. Tech. Hochschule, Breslau. *Z. Elektrochem.* 34, 696–704 (1928).—An investigation of the catalytic activity of Ag_2VO_4 , V_2O_5 , $\text{Cu}_3(\text{VO}_4)_2$, V_2O_6 , WO_3 and Ag as compared with Pt in the H_2SO_4 contact process. A contact app. is devised in which the SO_2 and air used are so passed through connected tubes that they are dried, mixed, measured (velocity and amt.), contacted with the catalyst placed in a hard-glass tube running through an elec. furnace and the resultant SO_3 is properly absorbed for analysis. The gas mixt. consists of 7% SO_2 , 19.53% O_2 and 73.47% N_2 . Curves of % SO_2 converted into SO_3 against the temps. (up to 700°) are plotted for the various gas velocities (150 and 300 cc./min. usually, occasionally 75, 500 and 750 cc.). The app. is tested with platinized asbestos contg. 7% Pt, the max conversion being 99.5–99.7% at 425°. Conversion curves show a max. of 97% at 150 cc./min. and 450° with asbestos contg. 5% AgVO_4 ; 90% at 150 cc./min. and 512° with pumice stone contg. 33% V_2O_5 ; 91.3% at 150 cc./min. and 512° with $\text{Cu}_3(\text{VO}_4)_2$, V_2O_6 , thus increasing the activity of V_2O_5 only slightly. WO_3 and Ag act very poorly as catalysts in this reaction. The catalytic activity of these agents is below that of Pt in the order given. With increase of gas velocities and temps. the maxima are lowered.

J. BALOZIAN

Gas investigations in the Opl tower system. II. W. HANSEN. *Chem.-Ztg.* 52, 830 2 (1928); cf. *C. A.* 23, 484. —A long series of analytical methods for the examn. of tower gases showed that the procedures satisfactory for chamber H_2SO_4 plants were not applicable, and no certain conclusion was reached as to the best methods to recommend. Absorption of the gas in NaOH solns. and later detn. of the SO_2 gravimetrically and the N_2O_5 by reduction to NH_3 (Dewarda's method) and distn. were the most promising schemes used.

W. C. EBAUGH

Manufacture of aluminum sulfate from clays. I. E. ADADUROV. Kharkov Inst. of Applied Chem. *J. Chem. Ind. (Moscow)* 5, 941–2 (1928).—Clays whose Al_2O_3 is mostly in the form of kaolinite are more easily attacked by H_2SO_4 if preliminarily calcined at 800° rather than at 700°. Clays in which the Al_2O_3 is only about 34% in the form of kaolinite are more sol. in H_2SO_4 after a preliminary calcination at 700° rather than at 800°. The latter clays also require a stronger acid (50% H_2SO_4 instead of 20%) for soln. and give a poorer yield. A certain quantity of Fe always contaminates the $\text{Al}_2(\text{SO}_4)_3$ obtained, but this impurity is less for clays rich in kaolinite than for those whose Al_2O_3 is mostly not in form of kaolinite. To obtain $\text{Al}_2(\text{SO}_4)_3$ almost free from Fe it is advisable to eliminate the latter by chlorination of either crude clays or of $\text{Al}_2(\text{SO}_4)_3$. In treatment of crude clays Fe begins to chlorinate at 300° and is ended at 400° without affecting the Al of clays mixed with charcoal, since the latter does not begin to chlorinate below 500°. Chlorination of $\text{Al}_2(\text{SO}_4)_3$ gives even better results but requires preliminary dehydration and expensive operation, and also a stricter regulation of temp., as $\text{Al}_2(\text{SO}_4)_3$ begins to chlorinate just above 400°. B. N.

Ferrous oxide from iron and magnetite. C. TRAVIS ANDERSON. Bur. Mines, Repts. Investigations, No. 2898 (1928).—New data on the formation of FeO from Fe and Fe_3O_4 indicate that an increase in temp. decreases the % FeO in the product. The comparisons show that the reaction to produce FeO purer than 85% must be carried out at temps. at which the reactants are all in the solid state, and that this is impracticable because of the slowness of reaction under these conditions. The curves

indicate the extent to which the reduction of Fe_2O_3 by Fe takes place in the temp. range from 1350° to 1550° .

T. P. KELLER

Manufacture of red oxide by the Neill process. J. ARTHUR REAVELL. *J. Soc. Chem. Ind.* 47, 347-51T; *Chem. Age* (London) 19, 431-2(1928).— FeSO_4 soln. from steel pickling is nearly neutralized by scrap iron and evapd. in a spray drier. Solid FeSO_4 is roasted in rotary kiln to pigment, Fe_2O_3 . Flue gas from the kiln is used in the spray drier.

G. B. TAYLOR

Manufacture of potassium chloride from Solikamsk sylvite. II. F. F. WOLF AND V. S. YATLOV. *J. Chem. Ind.* (Moscow) 5, 909-15(1928); cf. C. A. 22, 4207.—Hot solns. of av. Solikamsk sylvite samples have approx. the same compn. as solns. of mixts. of pure KCl and NaCl. At $90-92^\circ$ sylvite solns. contain 26.91 g. NaCl instead of the theoretical 26.35 g. NaCl at 90° , per 100 g. H_2O and 32.25 g. KCl. The equil. of these solns. is reached within 30 min. After these hot solns. are crystd. by cooling to $18-22^\circ$ the mother liquors contain 15.7 g. KCl per l. If crystn. of the hot solns. is done without previous settling of mech. admixts., chiefly clays, gypsum and Fe_2O_3 , and without stirring, by mere standing at room temp. for 24 hrs., followed by filtration *in vacuo* and drying in an oven at $100-105^\circ$, the crystals contain about 90% KCl. If suspended mech. impurities are sepd. from the hot solns. by settling and decantation, then the solns. artificially cooled and stirred, the crystals contain 98% KCl and 2% NaCl. The presence of 2% NaCl in the crystals is chiefly because the latter, after being drained *in vacuo* or by centrifuging, are still contaminated by 5% of the mother liquors which, on evapn. in the oven, leave a residue rich in NaCl. It is not necessary to wash the crystals on the filter until the mother liquors, which have been used over and over again, become enriched by MgCl_2 and thus contribute to crystn. of larger amts. of NaCl. In the latter case the crystals are thoroughly drained on a Büchner funnel, moistened with H_2O and after standing a few minutes are drained again. CaSO_4 , always present in sylvites, cannot sep. with KCl under the conditions of crystn.

BERNARD NELSON

Manufacture of manganates and permanganates. E. GRAY. *Rev. chim. ind.* 37, 214-7, 318-20, 349-54(1928).—A review of processes.

P. THOMASSET

Activated carbon: Some industrial applications. J. T. STRACHAN. *Chemistry and Industry* 47, 1203-14(1928).—Different types of active C are described, together with their uses in gas masks, recovery of vapors, bleaching oils and fats, purifying chemicals and decolorizing sugar.

G. B. TAYLOR

Carbon black. A study of its volatile constituents. C. R. JOHNSON. *Ind. Eng. Chem.* 20, 904-8(1928).—Because of the discovery of important relationships between volatile matter and reinforcing properties of blacks when used in rubber the volatile constituents were studied. The rates of evolution of gas from C black with variation of time, temp. and pressure were detd. Complete analyses were made of 5 types of C black by org. combustion of the original sample, org. combustion of the sample after the gases have been removed, detn. of the loss in wt. due to gases removed, analyses of the gases removed and finally a complete accounting, or balance, of the C in the steps considered. In an attempt to supply some missing information not revealed by the foregoing some special gas analyses under varying conditions were made. The relationship between the amt. and compn. of volatile matter evolved from C blacks and the properties imparted to vulcanized rubber when compounded with these blacks has been studied. Lab. methods are described in detail. Temp. rises encountered in rubber compounding and the effect of C black discussed.

C. L. MANTELL

Survey of the important kinds of plastic masses. F. SCHMIDT. *Kolloid-Z.* 46, 324-9(1928).—A short survey of the important plastic masses, raw materials used in production, methods of production, uses and methods of application, properties and possibilities. General divisions are cellulose derivs., condensation products and casein derivs.

L. F. MAREK

Dyeworks ferrocyanides from waste. E. T. ELLIS. *Dyer, Calico Printer* 61, 18-9(1929).—Such wastes as spent bog iron ore from the manuf. of gas, brewer's yeast, horn dust from knife-handle factories, leather dust, skin scraps and slaughterhouse refuse may be used for the production of certain ferro- and ferricyanides.

RUBY K. WORNER

Etching stereotype plates. K. SCHUCH. *Chem.-Ztg.* 52, 829-30(1928).—A general description of the methods used in prepg. etchings and half-tones with Zn (using HCl of varying concns.), brass (employing FeCl_3) and Cu (with HNO_3 and KClO_3).

W. C. EBAUGH

Carbon dioxide foam as a fire-extinguishing material. J. BRANDL. *Kolloid-Z.* 46, 145-8(1928).—The cost and phys. properties of a no. of fire-extinguishing materials

are tabulated and the characteristics of the different types of app. in use for generating CO_2 foam are discussed.

J. G. McNALLY

"Acid-proof" packing for absorption towers (BUTCHER) 1. Potash and borax from Searles Lake (TREFLER) 1. A spectroscopic analysis of caliche (BANCHELIN) 3. Recovery of caustic soda (Fr. pat. 641,901) 23. Removing S compounds from gases (Fr. pat. 641,695) 21. Recovery of H_2SO_4 (Fr. pat. 641,460) 21. Apparatus for obtaining C from peat and sawdust (Russ. pat. 3809) 21. Utilizing gases containing N, H and CO_2 (U. S. pat. 1,698,722) 13. Purifying gases (U. S. pat. 1,698,718) 13.

Arsenic acid. FRITZ ULLMANN and GERT TREWENDT (to J. Michael & Co.). U. S. 1,699,823, Jan. 22. A soln. comprising As_2O_3 10 and an oxidizing agent such as NaClO_2 4 parts is heated to about the b. p. and a small quantity of acid such as HCl is added. Cf. C. A. 22, 3269.

Chromic acid. R. SCHUSTER. Brit. 291,249, June 23, 1927. A solid chromic acid prepn. sol. in water is obtained by evapg. a mixt. of CrO_3 or Na or K chromate or dichromate, H_2SO_4 , Na or K silicate or their mixt. and water until the gelatinous mass first obtained becomes cryst. A special order of admixt. is preferred and described.

Phosphoric acid. Édouard Urbain (to Urbain Corp.). U. S. 1,698,484. Jan. 8. Gases produced by burning P are brought into contact with dil. H_3PO_4 previously formed in the cycle of operations, so that the acid is concd. and the gases are mixed with steam and the mixt. of gases and steam formed is passed through a heat exchanger so that heat is given up by the gases to previously formed H_3PO_4 ; the mixt. of gases and steam is converted into liquid H_3PO_4 in the presence of a catalyzer such as coke and the resulting dil. acid is further concd. in the cycle of operations as described. An app. is described.

Water gas, phosphoric acid and molten cement. Édouard Urbain. Fr. 639,412, Jan. 30, 1927. See Brit. 280,763 (C. A. 22, 3269).

Sulfuric acid. WILHELM A. BODAMER and OSCAR ÉMILE RAMUZ. Fr. 641,711, Oct. 1, 1927. Part of the gas is drawn off from the top of the Glover tower and injected into the stream of gas entering at the base, thus producing a regular flow of gas.

Simultaneous production of contact sulfuric acid and hot combustion gases with high sulfur dioxide content. C. PEAUL. Ger. 466,812, Dec. 22, 1926. Combustion gases from the vertical pyrite burners are divided. One part, taken off further from the end of the burner, is passed to a chamber unit or to a sulfite liquor app. The other part goes through a contact app. and an absorption system. The gases from this are led back through the burner entering at a point above the fresh air which is preheated by passage through a heat exchanger in which the pyrite residues give up their heat and absorbed S contg. gases. The gases led off first are richer in SO_2 and poorer in O than the gases taken off below.

Sulfuric anhydride. THE SELDEN CO. Fr. 641,619, Sept. 28, 1927. A gaseous mixt. of SO_2 and O is caused to pass at a high temp. over a catalyst which contains active zeolites which are the products of reaction of a silicate with at least one metallate and at least one metallic salt. In an example, a mixt. of V_2O_5 and WO_3 in KOH soln. is stirred with cellite or ground quartz or diatomaceous earth. The mixt. is heated and made acid with H_2SO_4 and the ppt. is dried and ground and mixed with a soln. of K_2SO_4 and KAlO_2 and the product formed into pieces of convenient size. Other examples are given.

Sulfur trioxide from a gas mixture containing hydrogen sulfide. FRIEDRICH SUMERS A. G. and HANS BÄHR. Ger. 451,530, April 13, 1928. SO_3 is obtained by the catalytic oxidation of H_2S in gas mixts. at temps. slightly above 200° . The catalyst contains at least one S-binding metal such as Fe, Ni or Cu and one metal serving as an oxygen carrier such as W, V or Cr. The metals may be in the elementary form as oxides or as salts and the catalyst may be heated, preferably by electricity. The gas mixt. may be distn. or generator gases and may contain ammonia.

Removing dissolved silicic acid from aqueous liquids. A. ROSENHEIM. Brit. 291,435, June 4, 1927. To remove dissolved silicic acid from liquids such as water or aq. salt solns., the liquid is filtered through or otherwise brought into contact with gels (such as those of ferric oxide or hydroxide, chromic oxide or hydroxide or of oxides or hydroxides of elements of the third group of the periodic system or of Ce or other rare earths) which are capable of forming insol. or only slightly sol. silicic acid adsorption compds. Alkali-contg. gels of the specified substances, as described in Brit. 286,307 (C. A. 23, 228), may be used and the water thereby also softened and freed from Fe

and Mn. The gels may be regenerated with alkalis, substances of alk. reaction or substances which by hydrolysis yield alkalis.

White titanic acid. I. G. FARBENIND. A.-G. Fr. 641,712, Oct. 1, 1927. Reducing agents such as SO_2 or its salts which cannot transform quadrivalent Ti into tervalent Ti are used for the production of white titanic acid, and in such a concn. as to correspond not only with all the tervalent Fe present but with all the other oxidants present. During the subsequent washing reoxidation of the Fe is prevented.

Vanadic acid. THE SELDEN CO. Fr. 642,362, Sept. 30, 1927. Vanadic acid is purified by treating a crude vanadate soln. with oxidizing agents sufficient to transform the impurities into easily separable substances, and convert the V into the quinquevalent state. A part of the oxidation may be carried out in an alk. soln. and part in an acid soln.

Carbon dioxide. ERNEST W. GEERE. Fr. 641,706, Oct. 1, 1927. See Brit. 276,146 (C. A. 22, 2444).

Ammonia from nitrogen and electrically generated hydrogen. HANS RICHLEER. Swiss 127,519, Oct. 30, 1925. The N is led to the cathode of a specially designed elec. cell to permit it to combine with the nascent H.

Ammonia synthesis, etc. H. HARTER. Brit. 201,253, July 4, 1927. In exothermic catalytic processes such as NH_3 synthesis or oxidation of NH_3 to produce HNO_3 , the gas supply pipe is subdivided into several branches and the outlet openings from it are distributed uniformly along the length of the catalytic tube. The gases may be introduced under pressure and expanded to effect cooling if desired and pure O may be used in producing HNO_3 . An app. is described.

Ammonia separator from crude ammonia water. V. V. PAPKOV. Russ. 4237, Dec. 31, 1927. Mech. features.

Separation of alkali salts. JOHANN A. VON WÜLFING. Fr. 641,244, May 27, 1927. K salts of different acids or Na salts of different acids are sepd. by adding NH_3 to their soln. A sepn. of salts from solns. which contain mixts. of K or Na and NH_3 salts of inorg. acids is also described by adding NH_3 .

Alkali metal cyanide. HERMAN B. KIPPER. U. S. 1,697,529, Jan. 1. Reactive material such as Na_2CO_3 , C and Fe is placed in a closed receptacle in which it is subjected to continuous beating and stirring with great rapidity and maintained in finely divided and disseminated condition; the inner walls of the receptacle are also subjected to a slow scraping to keep them free from the material and the material is continuously subjected to the action of highly heated reactive gases such as producer gas contg. N and CO to effect cyanide production. An app. is described.

Alkali metal cyanide. HERMAN B. KIPPER. U. S. 1,699,362, Jan. 15. In effecting reaction at high temps. between gas mixts. contg. N and a mixt. contg. Na_2CO_3 , C and a Mn Fe ore, reaction is first effected in an insulated receptacle and further action of N-contg. gas on the products is then effected in an externally heated receptacle. An app. is described.

Alkali metal nitrates. WILHELM WILD and CHRISTOPH BECK (to I. G. Farbenind. A.-G.). U. S. 1,699,643, Jan. 22. A soln. of alkali metal chloride is treated with a mixt. contg. N oxides and O, under superatm. pressure, the pressure is released after the oxidized N oxides are absorbed and sufficient of the alkali metal chloride is added that the alkali metal nitrate formed is deposited without evapn. of the soln. U. S. 1,699,644 specifies forming alkali metal nitrates from alkali metal chlorides and HNO_3 and freeing the resulting gas mixt. contg. N oxides and HCl from the N oxides by treatment with H_2SO_4 under superatm. pressure. Cf. C. A. 22, 2815.

Alkali metal titanate. LONNIE W. RYAN (to Titanium Pigment Co.). U. S. 1,697,929, Jan. 8. A calcined product of 2.3-2.9 sp. gr., in the form of a fine, minutely cryst. powder, slightly hygroscopic, white and contg. a preponderance of TiO_2 and sol. in org. and in dil. inorg. acids, is obtained by heating an alkali metatitanate to a temp. below the m. p. It is suitable for use in making various other Ti compds.

Carbonates or oxides of alkaline earth metals. RENÉ DALOZE. Fr. 641,013, Sept. 15, 1927. Crude alk. earth oxides are treated with sugar to form the sucrate, Fe is pptd., the soln. filtered and the alk. earth carbonates are pptd. with CO_2 , giving a very pure product.

Purifying salt and recovering by-products. VICTOR YNGVE. U. S. 1,697,336, Jan. 1. A brine is treated with an excess of NaOH, pptd. hydroxides such as those of Ca and Mg are removed, the purified brine is evapd., salt is sepd. from it, and the mother liquor is used, with removal of Na_2SO_4 , for treating more brine in a cyclic process, and the pptd. salt is washed with a neutral brine. Cf. C. A. 22, 396.

Anhydrous metal chlorides. WILLIAM F. DOWNS. U. S. 1,699,220, Jan. 15. A

metal oxide such as Al_2O_3 is mixed with a soln. of molasses or other suitable residual C-yielding org. compd. in such proportions as to give the required ratio of C to the oxide used, the solvent is evapd. and the residual mass is charred and the solid material is fed into a revolving reaction chamber against a regulated current of hot Cl_2 ; the temp. of the chamber is maintained by external heating and the metal chloride formed is condensed from the evolved gases.

Metal sulfides. K. BRODOWSKI. Brit. 290,986, May 21, 1927. Metals such as Cu, Fe or Pb and S are heated together under pressure in the absence of O and the reaction mass is forced into molds during the heat treatment. The molded blocks obtained are suitable for use as rectifiers or in the production of thermocouples.

Metallic nitrogen compounds. ROBERT GOLDSCHMIDT and SYLVAIN COULIER. Fr. 641,156, Sept. 20, 1927. Cyanides, cyanamides or nitriles are obtained by mixing compds. of alkali metals with peat, drying, carbonizing and treating with N or gaseous N compds. The residual C may be added to the next charge or used as active C for other purposes. A catalyst such as Fe oxide may be added.

Metallic nitrogen compounds. ROBERT GOLDSCHMIDT and SYLVAIN COULIER. Fr. 642,338, Sept. 20, 1927. N or gaseous N compds. such as NH_3 are caused to react on mixts. of activated C and an alkali, alk. earth or earth compd. at a high temp. The C may be activated during the reaction by the addn. of activating agents such as chlorides or oxides of Zn or Mg or phosphates. The mixt. of activated C and metal compd. may be produced by carbonizing a mixt. of the metal compd. and a carbonaceous material and one of the above activating agents.

Cyanogen chloride. I. G. FARBENIND. A.-G. Fr. 642,548, Oct. 16, 1927. CNCl is produced by treating cyanides with Cl hydrate with or without indifferent solvents. The prepn. of the hydrate and its transformation may be carried out in the presence of NaCl or other salts sol. in water. In an example Cl is introduced into a soln. of NaCl in water cooled to 0° in a tightly closed vessel. A soln. of NaCN is run in, the temp. being kept below 8° ; the yield is about 90%.

Alumina. I. G. FARBENIND. A.-G. Fr. 641,623, Sept. 28, 1927. Alumina is extd. from clay, bauxite, etc., with acid, the level of which is maintained above the material treated and the flow of acid, is regulated in such a way as to reach a temp. above 105° in the reaction zone, increasing from the top to the bottom of the charge.

Alumina. ELEKTIZITATSWERK LONZA. Fr. 641,805, Oct. 4, 1927. In the production of Al_2O_3 from bauxite, etc., electrothermally by the addn. of a magnetic metal or compd., the latter is added at the end of the charging period, followed by the addn. of other reducing means such as C, to obtain an even distribution throughout the mass. The Fe may be added in the form of aluminous substances obtained by dissolving primary aluminous substances in HCl , sepg. the soln., evapg. and decompg. the salts by heat. Cf. C. A. 23, 938.

Alumina. ELEKTIZITATSWERK LONZA. Fr. 641,692, Sept. 30, 1927. In the electrothermal prepn. of Al_2O_3 from bauxite, etc., using reducing agents such as C, the initial charge contains less C than is necessary for the reduction of the impurities, and the proportion is afterwards increased to the theoretical amt. and finally an excess is introduced. Towards the end of the charge or after it a heavy metal, preferably Fe or compds. thereof, is added with the C.

Aluminum chloride. CLAUDE G. MINER. U. S. 1,698,238, Jan. 8. Aluminous material such as bauxite or alunite residue is reacted upon with HCl in the presence of C, at a temp. of at least about 1500° .

Aluminum chloride. RENE DE M. TAVREAU and CYRIL B. TYGERT (to Texas Co.). U. S. 1,698,324, Jan. 8. Al ore such as bauxite is dehydrated before being treated with a chloridizing gas, by passing into the ore a stream of hot gas obtained from treating another quantity of Al ore with chloridizing gas. An app. is described.

Aluminum hydroxide. AKTIESELSKAPET NORSK ALUMINIUM CO. Swiss 127,248, May 19, 1926. $\text{Al}(\text{OH})_3$ contg. comparatively little SiO_2 is prepd. from slag or like material contg. compds. of Al and Ca by treating the material with an alkali carbonate soln. contg. an amt. of alkali hydroxide slightly in excess of that required to dissolve the Al_2O_3 , and pptg. $\text{Al}(\text{OH})_3$ from the soln. The extg. soln. may contain also some $\text{Al}(\text{ONa})_3$.

Barium aluminate. RHENANIA-KUNHEIM, VEREIN CHEM. FABRIKEN. AKT.-GES. Fr. 642,291, July 22, 1927. BaSO_4 and aluminous substances are heated to temps. above 1100° in the presence of steam in a neutral or oxidizing atm. to form Ba aluminate.

Barium carbonate from barium silicate. CAMILLE DEGUIDE. U. S. 1,697,722, Jan. 1. Ba silicates contg. silica are ground with water and treated with CO_2 and the

BaCO₃ produced is sepd. from gelatinous silica set free (suitably by use of caustic alkali).

Cooling crude barium sulfide. FIRMA G. POLYSIUS. Ger. 468,390, May 19, 1926. Crude BaS and similar substances are cooled directly in the revolving furnace which is uninsulated and prolonged at the cooling end.

Copper sulfate from industrial liquors and residues. J. P. BEMBERG A.-G. Brit. 291,380, May 31, 1927. Wash liquors and ppts. such as are obtained in the manuf. of "cuprammonium silk" are treated with H₂SO₄ to form CuSO₄ and to carbonize any org. matter which may be present. The CuSO₄ is recovered for further use after heating and sepn. of C formed.

Agglomerating calcium cyanamide. SOC. D'ÉTUDES CHIM. POUR L'INDUSTRIE. Swiss 127,455, May 3, 1927. Addn. to 117,362. In agglomerating CaCN₂ by treating it with a fused bat'l of an acid K salt, the salt is produced *in situ*. For example, a mixt. of KCl and CaCN₂ may be treated with H₂SO₄ or H₃PO₄ in the amt. required to give KHSO₄ or KH₂PO₄.

Dicalcium phosphate and ammonium sulfate. JACOB F. C. HAGENS, LUDWIG ROSENSTEIN and WILHELM HIRSCHKIND (to Barrett Co.). U. S. 1,699,393, Jan. 15. A mixt. of H₃PO₄ and CaSO₄ is treated with NH₃ to produce di-Ca phosphate and (NH₄)₂SO₄.

Potassium silicate. GEORGES ROUYER. Fr. 641,174, Sept. 20, 1927. K₂SiO₃ is stabilized by the addn. of about 35 parts of pure, preferably distd., water to 65 of K₂SiO₃. When so treated the silicate may be readily mixed with paint powders, etc.

Acid sodium pyrophosphate. JOHN N. CAROTHERS and CHARLES F. BOOTH (to Federal Phosphorus Co.). U. S. 1,699,093, Jan. 15. An alkali metal compd. such as Na₂CO₃ is added to H₃PO₄ until neutral to methyl orange indicator, acid Na orthophosphate is crystd. from the soln., the crystals are freed from adhering mother liquor and they are then converted into acid Na pyrophosphate, as by heating to about 240°.

Sodium sulfide. BENJAMIN ROOS (one-half to Roessler & Hasslacher Chemical Co.). U. S. 1,699,377, Jan. 15. Na sulfide is prepd. in the form of substantially spherical pellets which are suitable for shipment and readily dissolve.

Sodium sulfate and hydrochloric acid. HERMAN B. KIPPER. U. S. 1,697,399, Jan. 1. In effecting reaction between NaCl and H₂SO₄ or NaHSO₄, the reacting materials are ground and mixed in a reaction vessel such as a heated cylinder by rapidly moving agitating devices and caking of the material is prevented by more slowly moving devices.

Sodium aluminate. ALUMINUM COMPANY OF AMERICA. Swiss 127,249, Dec. 10, 1926. In the manuf. of a product contg. Al(ONa)₃ by sintering together aluminous materials and Na₂CO₃, the necessary fuel is intimately mixed with the reaction mixt., which is then spread out in uniform layers. The fuel is ignited at a surface of the mixt. and rapidly burnt. The mixt. may be damped to prevent loss as dust. Suitable plant is described.

Complex silver cyanide compounds. C. H. BOEHRINGER SOHN. Ger. 468,808, Feb. 14, 1925. Argentocyanides and chlorates of ammonium, alkali or alkaline earth metals or Mg react with one another in the presence of solvents and the double salts formed are sepd. by careful evapn. or pptn. with org. liquids such as (CH₃)₂CO, Et₂O, etc. The reaction may also be accomplished by fusing the components together.

Activation of silica. I. G. FARBENIND. A.-G. (Wolf Johannes Müller and Hans Carstens, inventors). Ger. 467,464, Dec. 23, 1925. Gelatinous silica is dried until a solid mesh work results. The product is then dried in a rotating furnace.

Titanium compounds from ores. I. G. FARBENIND. A. G. Brit. 290,174, May 6, 1927. See Can. 285,355 (C. A. 23, 673).

Titanium oxide from titaniferous iron ores. CARL R. WHITTEMORE. U. S. 1,699,173, Jan. 15. The Fe content of the ore is reduced to sponge iron without fusion or sintering and after cooling in a non-oxidizing atm. the sponge and Ti content are sepd. from the non-magnetic portion, the treated ore is dissolved with a solvent such as 10% H₂SO₄ soln. and the residue is sepd and heated to about 250° with an acid such as H₂SO₄ in a digester, to form Ti salts; the disintegrated mass is lixiviated with cold water and the soln. is hydrolyzed to ppt. Ti hydroxide, which is sepd. and calcined.

Production of zinc compounds. NAPOLEON A. LAURY. Can. 285,834, Dec. 25, 1928. ZnCO₃ is produced by heating roasted Zn ore to 180° F. in a 20% aq. soln. of (NH₄)₂SO₄, then sepg. out the clear soln., and then satg. the clear soln. with CO₂ at a pressure of 20 lb.

Zinc oxide. JAMES A. SINGMASTER, FRANK G. BREYER and EARL H. BUNCE (to the New Jersey Zinc Co.). Can. 285,734, Dec. 18, 1928. An agglomerated or bri-

quitted charge (with sulfite waste liquor as a binder) of zinciferous material and carbonaceous reducing agent is externally heated in an appropriate chamber, under substantially complete reducing conditions, to a sufficiently high temp. (1200° to 1300°) to reduce the compds. of Zn and volatilize the resulting Zn. The Zn vapor so formed is then conducted into an appropriate oxidizing environment, and the resulting ZnO product collected. Cf. C. A. 22, 1219.

Zirconium compounds. RHENANIA-KUNHEIM VEREIN CHEM. FABRIKEN AKT.-GES. Fr. 642,568, Oct. 19, 1927. See U. S. 1,681,195 (C. A. 22, 3745).

Apparatus for refining "raw" carbon disulfide. PHILIPP SIEDLER and EUGEN SCHULTE (to I. G. Farbenind. A.-G.). U. S. 1,699,255, Jan. 15. Two similar columns are provided with reflux condensers and with boilers, the second of which surrounds the bottom end of the first column; a device for condensing the purified CS₂ is arranged at the level of the reflux condensers and a low-temp. condenser is arranged above the reflux condensers.

Separation of borax and sodium sulfate. CHEMISCHE FABRIKEN OKER UND BRAUNSCHWEIG A.-G. Ger. 468,756, Mar. 17, 1928. Borax is separated from Na₂SO₄ by conversion to an easily soluble sodium borate, *e. g.*, to sodium metaborate by addition of NaOH or to sodium decaborate by addition of boric acid and filtering from the sodium sulfate which remains undissolved.

Baryta. RHENANIA KUNHEIM VEREIN CHEMISCHER FABRIKEN A.-G. Fr. 641,551, Aug. 3, 1927. Crystals of Ba(OH)₂·8H₂O are obtained by treating silicates of Ba with water under pressure above 100° or with a soln. of baryta.

Green corundum. ANTON KRATKY. Austrian 110,676. April 15, 1928. Addn. to 108,704. The method of Austrian 108,704 (C. A. 22, 4213) is modified by including in the initial mixt. very small amts. of La₂O₃ alone or mixed with oxides of Ca, Mg, Sc, Yt, Gd, and Yb. Suitable initial mixts. comprise, in parts, Al₂O₃ 1000, ZnO 40 and CoO 20 with (1) La₂O₃ 1.2 or (2) La₂O₃ 0.6, Yt₂O₃ 0.3, and MgO 0.3.

Hydrogen. JOHN S. BEEKLEY (to The Lazote, Inc.). Can. 284,584, Nov. 8, 1928. H is manufd. by subjecting a S-contg. mixt. of steam and CO under a pressure higher than atm. to the action of a magnesium chromate catalyst. Cf. C. A. 23, 677.

Hydrogen. ROGER WILLIAMS (to The Lazote, Inc.). Can. 284,585, Nov. 8, 1928. H is prepd. by passing a mixt. of steam and CO over a briquetted Cr oxide gel catalyst at 300° to 700°. Cf. C. A. 23, 677.

Hydrogen. I. G. FARBENIND. A.-G. Swiss 127,030, Mar. 8, 1927. In the manuf. of H from hydrocarbons and steam, the catalyst employed contains at least one metal, or compd. of a metal, of the iron group and at least one other metal or metal compd., preferably a metal forming a difficultly reducible oxide or a compd. of such a metal. In the example, the catalyst is prepd. from a soln. contg. Ni(NO₃)₂, Al(NO₃)₃, and Mg(NO₃)₂ by adding K₂CO₃ soln., filtering, mixing the ppt. with KNO₃ soln., drying, and reducing in H at 350°. Over the catalyst so obtained is passed a mixt. of CH₄ (1 vol.) and steam (6.2 vols.) at 430–650°. The process may be conducted in stages with sepn. of CO₂ between the stages.

Hydrogen from water gas, etc. SOCIETÀ ANON. BREVETTI CICALI. Brit. 291,409, June 1, 1927. To obtain H, free from CO and CH₄, from gaseous mixts. such as water gas, coke-furnace gas and the like which also contain N, the gaseous mixt. is preliminarily purified to remove CO₂, SO₂, H₂S, water and other deleterious gases and is then compressed and cooled and washed with liquid N which removes part of the CO which is liquefied and falls to the bottom of the column used. After further cooling and scrubbing with liquid N and then with a mixt. of liquid H and gaseous H to remove all remaining CO the H is evapd. and recovered. An app. is described.

Hydrogen from methane hydrocarbons and steam. I. G. FARBENIND. A.-G. Brit. 291,244, June 18, 1927. In the catalytic production of H such as that from a mixt. of CH₄ with 5–7 times the theoretical quantity of steam in successive stages (such as with alternate use of a Ni catalyst and cerous oxide in 4 stages), the CO₂ is sepd. from the reaction mixt. by absorption at such high temps. that condensation of steam does not occur.

-nitrogen mixture

Phosphorus. I. G. FARBENIND. A.-G. Swiss 127,246, Jan. 19, 1927. Crude phosphates and reducing substances are heated with sufficient Al_2O_3 to give a *cement-like by-product* contg. Ca aluminate.

Separation of phosphorus from gases. I. G. FARBENIND. A.-G. Swiss 127,247, Apr. 4, 1927. The P mist produced when the temp. of the mixt. is lowered below the dew point is sprayed with rapidly moving liquid drops. Suitably, two washers are arranged in series, one being supplied with water at a temp. slightly above the m. p. of phosphorus and the other with water at a lower temp.

Phosphorus and ferrosilicon. I. G. FARBENIND. A.-G. Brit. 290,971, May 21, 1927. P may be obtained from ferro-P by reaction (suitably in an elec. furnace) with substances such as S or Si which will combine with the Fe. Removal of the P vapor for condensation may be facilitated by introducing inert gases.

Concentrating sulfur. EDWARD H. NUTTER and JOHN W. LITTLEFORD (to Minerals Separation North American Corp.). U. S. 1,697,402, Jan. 1. S-contg. material such as Wyoming ore is heated to cause the particles of S to unite, ground to a size suitable for froth-flotation sepn., agitated with a suitable aq. liquid (which may contain pine oil) to produce a S-bearing froth and the froth is sepd.

Apparatus for the sublimation and distillation of sulfur. LUDOVIC KOCH. Fr. 641,946, Mar. 17, 1927.

Dissociating sulfur vapor. I. G. FARBENIND. A.-G. (Philipp Siedler and Eugen Schulte, inventors). Ger. 468,506, Oct. 13, 1927. SiC is used for coating the vessels contg. the heating elements by which S is heated to a temp. at which S_8 dissociates into S_4 or S_2 mols.

Making granulated aluminum for the thermite process. CITY OF MOSCOW. Russ. 4651, Feb. 29, 1928.

Pure carbon. DANIEL GARDNER. Fr. 641,908, Mar. 15, 1927. A pure C is obtained by carbonizing wood or other material at a temp. not above 300° reducing this charcoal to a fine powder and treating with HNO_3 , preferably in the presence of H_2SO_4 , washing with water, treating with a mixt. of HNO_3 and HCl at $75-80^\circ$, washing and treating with an alk. soln. and again washing. The C may be finally heated in a neutral gas to $1000-1300^\circ$. The treatment with alkali may be replaced by a fusion treatment with NaHSO_4 or KHSO_4 , followed by washing and a treatment with an acid soln.

Active carbon. NAAMLIOOZE VENNOOTSCHAP ALGEMEENE NORIT MAATSCHAPPIJ. Fr. 642,262, Oct. 14, 1927. See Brit. 279,104 (C. A. 22, 2817).

Activated carbon. NAAMLIOOZE VENNOOTSCHAP ALGEMEENE NORIT MAATSCHAPPIJ. Brit. 291,725, Oct. 16, 1926. For supplemental activation or reactivation of activated C, the material is treated with substances such as K or Na hydroxides or carbonates, lime, HCl , H_3PO_4 , HNO_3 , chlorides or compds. evolving Cl, phosphates, nitrates, sulfates, bisulfates, sulfides, peroxides, perchlorates or other persalts or oxidizing agents or org. acids or salts and heated. Cf. C. A. 22, 2817.

Activated carbon. METALLBANK UND METALLURGISCHE GES. A.-G. and E. SCHELLER. Brit. 292,039, Jan. 4, 1928. Carbonaceous materials such as wood, sawdust, peat, starch, sugar or lignite are carbonized and activated by treatment at high temp with Na_2O , and carbonized material may be similarly activated or reactivated. The process is preferably conducted *in vacuo* or in an inert gas such as N.

Adsorptive carbon. CARRIDE AND CARBON CHEMICALS CORP. Fr. 642,360, Sept. 30, 1927. A non-coking coal mixed with a carbonizing agent such as ZnCl_2 is calcined at a high temp. to produce an adsorptive C. The activation may be carried further by a limited oxidation with steam for example.

Increasing adsorptive power of charcoal. HARVEY B. LEMON. U. S. 1,699,243, Jan. 15. Suction is applied to vegetable charcoal while heating to $450-800^\circ$, a permanent gas such as air is subsequently adsorbed in the charcoal at a temp. substantially below 0° (suitably "liquid air temp.") and the gas is then removed by suction at a temp. of $450-900^\circ$.

Adsorbent. ARTHUR ROSENHEIM. Fr. 641,549, July 27, 1927. Natural or artificial zeolites or substances resembling them after extn. of the bases (alk. or alkali metal) which they contain are used as adsorbents for dissolved substances, gases or vapors. Cf. C. A. 23, 679.

Adsorbents. LURGI GESELLSCHAFT FÜR WARMETECHNIK M.B.H. Fr. 642,135, Oct. 10, 1927. The ashes recovered from the gases escaping from furnaces of all kinds are used as adsorbent agents, e. g., for clarifying liquids. The ashes are sorted after recovery and activated by washing with water and acids. Cf. C. A. 22, 3270.

Catalyzers. I. G. FARBENIND. A.-G. Swiss 127,516, Mar. 26, 1927. A Ni

catalyzer especially suitable for reducing or hydrogenating org. compds. is deposited by an electropositive metal in an aq. soln. of a Ni salt in the presence of a base. Thus, NiCl_2 is dissolved in water and mixed with NH_4Cl and concd. NH_4OH . Diatomaceous earth and powd. Al are stirred in, causing Ni to sep. Other bases which may be used are urea, PhNH_2 , toluidine, pyridine, MeNH_2 , piperidine, and hexahydroaniline.

Catalysts for the production of methanol, etc. IMPERIAL CHEMICAL INDUSTRIES, LTD. Fr. 642,318, Sept. 5, 1927. Catalysts for the production of MeOH and other compds. from CO and H are prepd. by heating a mixt. of ZnCO_3 or basic ZnCO_3 and a Cr compd. which may be ZnCrO_4 or basic ZnCrO_4 , in which case the heating takes place in the presence of H or the reacting gases. Examples are given in which (1) ZnSO_4 is boiled with Na_2CO_3 and the washed ppt. is digested with chromic acid; (2) aq. solns. of ZnSO_4 , Na_2CO_3 and $\text{Na}_2\text{Cr}_2\text{O}_7$ are heated together and the ppt. is washed.

Platinum catalyst. TIBOR VON ARTNER. Swiss 127,224, Feb. 14, 1927. To avoid deposition of Pt in the interior of a support, where it is less useful, the support is impregnated with a volatile liquid before treatment with the Pt soln. and is then dried. The volatile liquid may contain CH_3O or other reducing agent for the Pt soln. Cf. Brit. 265,938 (C. A. 22, 482).

Manufacture of nickel catalyst. I. G. FARBENIND. A.-G. Swiss 127,157, July 20, 1926. Addn. to 123,728. A soln. of a Ni salt contg. a support is treated with Na_2CO_3 soln. in the warm to ppt. NiCO_3 in cryst. form on the support. The product is reduced in H at 450° . Cf. Brit. 255,884 (C. A. 21, 2965).

Catalyst for use in producing vanillin or for other purposes. FRIEDRICH W. WEBER. U. S. 1,698,009, Jan. 8. A porous catalyst comprises asbestos carrying in its capillary spaces a ppt. of SiO_2 and Th oxide.

Catalytic reactions. I. G. FARBENIND. A.-G. Fr. 641,652, Sept. 29, 1927. Highly active catalysts are prepd. by pptg. finely divided metals from solns. of their salts by the reducing action of O compds. of Si, in the presence of carriers if necessary. In an example PhNO_2 is reduced to PhNH_2 by H under pressure in the presence of Ni obtained by heating a soln. of $(\text{AcO})_2\text{Ni}$ with oxydisiline, neutralizing the AcOH and washing. Other examples of reduction are given. For oxidation Os or Ir obtained in the same way may be used, and for reduction Au, Sn, Ag, Co, Pb, Tl or Bi may also be used.

Condensation products of urea. I. G. FARBENIND. A.-G. Fr. 641,770, Oct. 3, 1927. Oily or resinous condensation products of urea with alcs. or ketones or their derivs. are obtained by heating urea with an excess of alc. or ketone, and if desired with the addn. of a catalyst and under pressure. The products may be treated with CH_2O . Cf. C. A. 22, 3056.

Urea condensation products. I. G. FARBENIND. A.-G. Fr. 641,420, Sept. 11, 1926. Condensation products are produced by dissolving urea or its derivs. and CH_2O , preferably separately, in org. solvents, in the presence of little or no water, and heating them together with or without condensing agents. Solvents such as ethylene chlorohydrin, glycol monoacetate or monoalkyl ethers of glycol are suitable. The soln. of urea is preferably poured into the soln. of CH_2O .

Condensation products of aldehydes with urea and thiourea. KUNSTHAZFABRIK. F. POLLAK GES. Brit. 291,366, May 31, 1927. Clear homogeneous products are obtained by pressing condensation products such as those of urea or thiourea and CH_2O , in a powdered form which is capable of swelling and which contains but little CH_2O . The products must be of a low degree of polymerization and a minimum quantity of acid salt should be used for gelatinization and the water present must be removed from the gel at a low temp. (suitably *in vacuo*). NH_3 may be used for removal of excess CH_2O . Dry NH_4 salts also may be added as may also fillers, etc. Cf. C. A. 22, 1659.

Condensation products from aldehydes and phenols. G. S. PETROV. Russ. 4,538, Mar. 31, 1928. Acid and alk. catalysts are added to Cl derivs. of ethane and ethylene boiling above 100° and this mixt. is then added to the semi-condensed products from phenols and aldehydes followed by the usual final condensation in forms.

Plastic compounds. A. E. PORAI-KOSHITZ and G. S. PETROV. Russ. 3951, July 31, 1928. Fillers such as hydrocellulose (in the form of the waste product obtained in the manuf. of furfural), husks, shells from seeds, etc., are treated with acids and added to the usual components of plastic compds.

Agglomeration of plastic substances. DE CARSLADE AND REGIMBEAU. Fr. 641,896, Mar. 12, 1927. The agglomeration of plastic substances having a basis of casein is carried out in an app. under vacuum to avoid the formation of air bubbles.

Plastic compositions containing sulfur. F. N. BURT CO., LTD. Brit. 291,500,

Feb. 28, 1927. Cellulose or other porous material is impregnated with a larger quantity of S to which has been added a substance (designated as an "introfier") which decreases the viscosity, such as $C_{10}H_8$ or $C_{14}H_{10}$ or their derivs., diphenyl, di- or triphenylmethane, benzyl ether, dibenzyl ketone, fluorene, carbazole, naphthols, naphthylamines, tetrahydronaphthalenes, mono-, di-, tri-, tetra- or penta-chloronaphthalenes, quinoline or triphenylphosphate. A temp. of 130–135° is suitable for effecting the impregnation.

Metal mold for albuminous plastic masses. MÜLLER & MANN. Ger. 469,280, April 29, 1925. The mold has a coating of Cr or Cr alloy.

Method and apparatus for pressing plastic casein. GEBRÜDER ECKERT. Ger. 470,104, Feb. 3, 1925.

Metallic ornamentation of articles formed of casein. A. I. G. WARREN and PRECIOUS METAL INDUSTRIES, LTD. Brit. 291,877, Mar. 10, 1927. Metallic decorations are pressed into the casein while enclosed in a vessel contg. steam under pressure.

Molded products from casein and cellulose derivatives. G. JAKOVA-MERTURI and J. A. POGGIOLI. Brit. 291,765, June 8, 1927. See Fr. 635,637 (C. A. 22, 4739.)

Use of bakelite or a similar product for making closures or receptacles for foods, etc. BAKELITE CORP. Brit. 291,403, June 1, 1927.

Molding board and pattern plate composition. KARL WERNER (to Wilhelm Christoffers). Can. 285,973, Dec. 25, 1928. A compn. for producing molding and pattern plates consists of the double silicates appearing in the production of Al by means of bauxite, or the residues contg. silicic acid left over in the production of Al sulfate and alum, or both residues simultaneously, combined with magnesia cement.

Sulfur composition for use in making molded articles. CARLETON ELLIS (to Ellis-Foster Co.). U. S. 1,699,694, Jan. 22. A dry dispersion is formed of S and a material such as starch, gum tragacanth and highly colloidal clay together with a filler such as wood flour or asbestos. The material may be molded by hot pressing and when thus molded has a strength greater than that of a similar material formed with undispersed S. The dried dispersion may be mixed with water to form an aq. dispersion.

Wetting agents. H. T. BÖHME A.-G. Brit. 291,070, May 27, 1927. Wetting and penetrating properties of liquid used in the textile and leather industries are improved by adding a mixt. of a heterocyclic compd. and an aromatic sulfonic acid alkylated in the nucleus, preferably a sulfonic acid of an alkylated polynuclear hydrocarbon, e. g., a suitable compn. may be prepd. by heating dipropyl-naphthalenesulfonic acid with pyridine bases. Other examples are given.

Wetting agents. H. T. BÖHME A.-G. Brit. 291,096, May 27, 1927; Fr. 641,629, Sept. 28, 1927. Wetting and penetrating properties of liquids used in the textile and leather industries are improved by the addition of a mixt. of a heterocyclic compd. and an aromatic sulfonic acid alkylated in the nucleus, both of which ingredients may be hydrogenated. By heating the mixt. before use, a salt-like compd. is produced which is especially efficient. Dipropyl-naphthalenesulfonic acid may be heated with pyridine bases, and other similar examples also are given.

Detergent. AMEDEO MENGHINI. Fr. 642,039, Oct. 6, 1927. A detergent for glass, metal, etc., consists of tripoli or like earth mixed in aq. solns. of weak acids such as oxalic or salicylic.

Cleansing and emulsifying agents. I. G. FARBENIND. A.-G. Swiss 127,222, Nov. 15, 1926. Cleansing and emulsifying agents comprise a known cleansing, etc., agent of the sulfonic acid type and a water-sol. salt of another acid. Mixts. of the Na salt of butyl-naphthalenesulfonic acid with Na_2SO_4 , and of the Na salts of butyl-naphthalenesulfonic acid and isopropyl-naphthalenesulfonic acid are described by way of example. Water-insol. org. compds. may be included in the compns.

Cleansing and emulsifying agent. CHEMISCHE FABRIK. POTT & Co. Swiss 127,252, Dec. 27, 1926. A water-sol. condensation product of α -naphthalenesulfonic acid, having good cleansing and emulsifying properties, is prepd. by the interaction of naphthalene, a sulfonating agent and butylene, or from α -naphthalenesulfonic acid and butylene, in either case in the presence of a condensing agent. Alternatively, naphthalene and butylene may be brought to reaction in the presence of a condensing agent and the product then sulfonated. Cf. C. A. 22, 880.

Cleaning fatty or oily vessels. GUSTAV BOHNSACK. Ger. 469,504, Jan. 8, 1928. The cleaning agent is an aq. suspension of kaolin which has been finely ground, washed, dried and re-ground.

Paint removers. CARBIDE AND CARBON CHEMICALS CORPORATION. Fr. 641,616, Sept. 28, 1927. Polyglycols or their mono- or di-aryl or alkyl ethers are used as paint removers. Fr. 641,617 describes the use for the same purpose of esters of glycol or polyglycol ethers such as the acetate of the Et ether of diethylene glycol.

Removing paint and varnish. F. C. DEAN and O. P. SWIFT. Brit. 291,812, Dec. 8, 1928. See Can. 283,159 (C. A. 22, 4215).

Cement. SANDFORD S. COLE (to The Koppers Co.). Can. 285,932, Dec. 25, 1928. A refractory cement which contains approx. 87.8% silica, 0.2% of Prussian blue and 2% of borax is specified.

Metal cement. WILLIAM R. CHAPIN. U. S. 1,699,346, Jan. 15. A cement suitable for joining pieces of steel comprises silico-Mn about 60, powdered Ni 25 or less, powdered borax glass 10 or less and ferro-Si about 10%, all thoroughly mixed in powdered form.

Desulfurization of pyrite ash. ITALO CAVALLI. Fr. 641,401, Sept. 26, 1927. S contained in pyrite ash is oxidized with an alkali hypochlorite, the solns. being recovered and used again for the production of hypochlorite.

Bodies of pressed powdered magnetic material. WALTHER EHLERS (to General Electric Co.). U. S. 1,698,300, Jan. 8. In forming articles such as magnetic cores loading coils a mass of powdered material is subjected to a regulated pressure within range over which the d. of the material remains substantially const. with variations in the pressure employed.

Laminated sheets of fibrous material. JAMES MCINTOSH (to Diamond State Fibre Co.). U. S. 1,697,077, Jan. 1. Fibrous sheets such as paper, asbestos or textile fabric are passed through a soln. of cellulose acetate or nitrate or other suitable cellulose ester, the solvent is evapd. and dried sheets are superposed on each other to form a product of the desired thickness and are heated under pressure. The product is suitable for gears, radio panels, etc. Synthetic resins, etc., may be added.

Treating asbestos or similar mineral fibers. SOC. GÉNÉRALE D'EXPLOITATIONS INDUSTRIELLES. Brit. 291,002, May 23, 1927. Asbestos or like material is treated with acid reagents such as dil. H_2SO_4 to facilitate opening up and to improve the adhesion of binding agents. Fibers which are not attacked by dil. acid are treated before their opening up with an alk. silicate and subsequently with acid.

Separating asbestos fiber from crushed rock by use of water and mechanical treatment. H. SIMON, LTD., and F. R. JOLLEY. Brit. 291,864, March 8, 1927. An app. is described.

Matrix board for stereotyper's use. HOWARD J. BLAKE. U. S. 1,699,579, Jan. 22. A fibrous flong or mat for a matrix blank has a coating of cellulose xanthate which serves to render it more durable.

Reflector for producing colored light effects. BOHUMIL JIROTKA (to Otto Sprenger Patentverwertung Jirotká m. b. H.). U. S. 1,697,655, Jan. 1. Reflectors suitable for use in illuminating fountains, etc., comprise small metallic areas made iridescent by treatment in a metallic bath contg. Cr, Co, Cu, Ag and Mn.

Colored substances from volatile metal compounds. I. G. FARBENIND. A.-G. (Walter Schubardt and Marta Grote, inventors). Ger. 466,463, June 16, 1928. Metal powder, prepd. by decomposing volatile compds. such as metal carbonyls, is subjected to oxidation at a temp. chosen to produce the desired color. The powder may be previously mixed with an oxidizing agent.

Fabric for pulley coverings. EDWARD F. GINGRAS. U. S. 1,697,236, Jan. 1. A belting fabric is satd. with a gum soln. such as copal gum in acetone which when hardened will prevent the stretching or contracting of the material, excess moisture is allowed to evap. and the surface is coated with a rubber soln. and stretched to approx. its elastic limit and held under tension until completely dry.

Wax-like coating compositions. BRITISH DYE STUFFS CORP., LTD., J. B. PAYMAN AND W. GIBSON. Brit. 292,057, March 4, 1927. Coating compns. which adhere firmly to metals, paper, wood and other materials are prepd. by adding S to molten polychloronaphthalenes such as may be produced by the processes described in Brit. 291,849 and Brit. 292,056 (C. A. 23, 1139).

Cylindrical printing rolls with renewable metal coatings. ERNEST S. BALLARD (to Ballard Process Co.). U. S. reissue 17,179, Jan. 1. A permanent metallic cylindrical base which may be formed of Cu or brass carries a smooth or polished outer layer such as Cu which does not permanently unite with the base and which is suitable for carrying an electrodeposited surface layer and to receive an engraved image. An intermediate layer of alloy of low m. p. is used.

Stencil sheet. SHINJIRO HORII. U. S. 1,698,705, Jan. 8. A base of fibrous material such as yoshino paper carries an impregnating compn. comprising a natural or synthetic resin, cellulose nitrate or cellulose or mannan acetate or other suitable esters of polysaccharides and a tempering agent such as stearin and castor oil. Cf. C. A. 23, 680.

Chemically heated appliance (similar to a hot water bag) for personal use. W. REICHMANN (to Radio Pack Co., Ges.). Brit. 290,212, May 9, 1927. A rubber-covered flexible heater may contain iron filings mixed with coal dust to which NaCl soln. or KCl, CaCl_2 or NH_4Cl is added when desired for generating heat.

Mirror. WILLIAM LAHODNY (to Standard Mirror Co.). U. S. 1,698,307, Jan. 8. A coating of light porous Ag is applied to the rear of a transparent material such as glass and over the Ag coating there is applied a protective material and over this a coating of opaque material.

Dry-cleaning composition for walls, etc. WALTER SPENGLER. Swiss 127,485, April 13, 1927. The compn., in the preferred proportions, comprises 20 g. CuSO_4 , 5 g. Na_2CO_3 , 5 g. alum and 15 drops NH_3 soln. in 500 cc. distd. water mixed with 500 g. wheat meal and a little disinfectant.

Purification of benzine and trichloroethylene. FIRME AUGUST JUNGNIKKEL. Fr. 641,836, Oct. 5, 1927. Crude benzine or trichloroethylene used for cleaning is purified in a continuous manner by aspiration from the washing machine through a primary filter, then through a second filter contg. laminated plates and then to the usual purifiers.

Polish. JOHN GOLAZ and MAURICE GAGNIÈRE. Fr. 642,410, Oct. 14, 1927. A liquid polish contains tripoli 0.5, colza oil 0.5, vitriol 0.025, turpentine oil 0.5, AcOH 1.0, distd. H_2O 5.0 g.

Polishing compositions. BRITISH DYESTUFFS CORP., LTD., J. B. PAYMAN and W. GIBSON. Brit. 292,058, March 4, 1927. Waterproof polishes for wood, linoleum, varnished surfaces, etc., are prepd. by adding α -chloronaphthalene to polychloronaphthalenes such as those produced by the process described in Brit. 291,849 and in Brit. 292,056 (C. A. 23, 1139).

Composition for protecting the skin or other surfaces from dirt and dust. ERNST TEUFEL. U. S. 1,697,936, Jan. 8. A pasty compn. is formed of Na soap 18, K soap 9, waterglass 22, talcum 12 and 20% alc. 90 parts.

Preserving ether in tin cans. EDWARD MALLINCKRODT, JR., and HENRY V. FARR (to Mallinckrodt Chemical Works). U. S. 1,697,320, Jan. 1. A tin can for holding ether has a complete inner surface of material such as bakelite varnish or a coating formed by reaction of KMnO_4 on the Sn which is non-catalytic to ether and air placed in the can and the can also has a cap of non-catalytic material.

Material for brake linings. RICHARD J. EVANS (to Asbestos Mfg. Co.). U. S. 1,700,037, Jan. 22. Cords of wire and twisted asbestos are treated with a soln. of Na silicate, formed into a basket weave fabric of equal spacing and strength in both directions, heated and dried, treated on one side only with a coating of plastic rubber and friction material and subjected to heat and pressure and a plurality of plies of this material are then united by heat and pressure.

Fluid for use in pressure systems such as those of hydraulic brakes. ANDREW T. K. TSENG (to Hydraulic Brake Co.). U. S. 1,698,973, Jan. 15. A mixt. is formed of castor oil 7 gals., dibutyl phthalate 3 gals., an alkali metal hydroxide such as KOH in proportion to free fatty acid present and an alkali metal As salt such as K arsenate which serves to prevent corrosion.

Acid-resisting packing suitable for use with sulfuric acid, etc. WALTER RAUTENSTRAUCH (to Metalastic Inc.). U. S. 1,698,655, Jan. 8. A packing contg. a large proportion of Pb particles contains also asbestos and a coating of acid-resistant waxy material such as paraffin and graphite some of which constitutes a coating on the particle of other materials.

Packing for use with steam turbines, etc. WALTER RAUTENSTRAUCH (to Metalastic Inc.). U. S. 1,698,654, Jan. 8. Cu or other suitable metallic particles of high m. p. are mixed with graphite, tallow and a fibrous material such as asbestos which is resistant to heat and another fibrous material such as flax which will burn out when the packing is subjected to heat and benzaldehyde also may be added.

Packing for use in stuffing-boxes, etc. HUGH T. STEWART (to Metalastic Inc.). U. S. 1,698,660, Jan. 8. Fibrous material such as carded asbestos is mixed with oil, particles of antifricition metal such as babbitt metal are added and the mixing is continued, a solid lubricant such as graphite is then added and the materials are still further mixed.

"Hot joint paste." WILLIAM HOSKINS (to Standard Oil Development Co.). U. S. 1,699,294, Jan. 15. A paste suitable for sealing pipe joints exposed to high temps. comprises graphite and solids from sulfite liquor.

Cooling liquid. I. G. FARBERIND. A.-G. Swiss 127,369, Mar. 2, 1927. A cooling liquid of low f. p. for use with motors, etc., contains at least one monoalkyl ether of a

bivalent alc., with or without a polyglycol or a monoalkyl ether thereof, or glycol or Pr alc.

Irradiating liquids. HERMANN SCHOLL. Can. 285,853, Dec. 25, 1928. Liquids to be irradiated with ultra-violet rays are first freed from air dissolved or otherwise admixed therewith to prevent the formation of O_3 by passing a gas either inert or chemically active, as desired, through the liquid, after which the liquid is distributed in shallow layers and subjected to ultra-violet ray treatment. Cf. C. A. 22, 4015.

Reheating saline solutions. GERHARD JANDER and HANS BANTHEIN. Fr. 641,530, Sept. 27, 1927. To protect the Cu pipes, saline solns. in the potash industry are passed through filters contg. substances to reduce the Fe, before reheating.

Waterproofing. KARL WILHARM. Ger. 469,217, Oct. 1, 1927. Natural horn or articles made by pressing powd. horn are rendered waterproof by treating with a soln. of $ZnCl_2$ to which $(AcO)_3Al$ or $HgCl_2$ is added.

Acid-proof material. I. G. FARBENIND. A.-G. Fr. 640,938, Aug. 29, 1927. See Brit. 276,697 (C. A. 22, 2476).

Moth-proof goods. I. G. FARBENIND. A.-G. (Erich Hartmann, Wilhelm Lommel and Hermann Stötter, inventors). Ger. 469,256. June 24, 1926. A dry powder contg. talcum and 5% chlorocresotic acid is revolved in a drum with fur or other goods. After the removal of the powder, the goods are moth-proof. The anti-moth prepn. described in Ger. 347,722 may be used with or without the addn. of AcOH. Cf. C. A. 23, 290.

Stiffening for footwear. MAURICE MOREL. Swiss 127,231, June 30, 1927. Leather, felt, cardboard or fabric is impregnated, before cutting out, with a soln. contg. at least one cellulose ester, allowed to dry, and then, when required for use, treated with a soln. which softens it temporarily. The first soln. may comprise, in parts, nitro-cellulose 20, camphor 10, acetone 100, benzine 50, alcohol 50, ether 50, copal 20, ocher 10, and preferably also kaolin 5 and plaster 25. The second soln. may comprise, in parts, cellulose acetate 30, acetone 250, benzyl alcohol 10, tricresylphosphate 5, abietic acid 20, ZnO or other pigment 25. Cf. C. A. 22, 2272.

Shoe-bottom filler. ANDREW THOMA (to North American Chemical Co.). U. S. 1,698,806, Jan. 15. Starch and a "sleeking constituent" such as Na_2CO_3 are mixed while both are in powdered form and this mixt. is then intermixed with a separately prepd. mixt. contg. granular and sticky material such as cork and wax tailings.

Extraction of vegetable and animal material. SCIENTIFIC CHEMICO PHARMACEUTICAL INST. OF THE N. T. U. Russ. 3,575, June 30, 1928. Exts. of the above materials obtained by one of the known methods are treated with a strong soln. of tannin to ppt. the solid material, followed by a treatment with a soln. of barite to ppt. the excess of tannin. The excess of barite is eliminated by an immediate pptn. with H_2SO_4 .

Treating animal intestines. MORITZ NIESZNER. Austrian 110,001, Feb. 15, 1928. The intestines are swollen with $NaHCO_3$ soln., stretched diametrically by mech. means, and finally hardened with alum soln.

Vermin-destroying composition. ANDREAS BURTSCHER. Swiss 127,471, Sept. 1, 1927. The compn. contains 5% CaO , 5% yellow ocher, 50% $B(OH)_3$ or a borate, and 40% Na_2CO_3 . It is effective against cockroaches, rats and mice.

Fire extinguisher. ÉMILE BÉCHARD. Fr. 641,438, Aug. 12, 1927. Fire extinguishers, such as CCl_4 , tetrachlorethane, trichloroethylene, are mixed with fatty substances at the moment of use. Agglomerants such as $C_{10}H_8$, naphthol, glycerol, etc., may be added. Cf. C. A. 22, 3502.

Automatic fire extinguisher. A. G. KRIVOSHEYEV. Russ. 4930, Mar. 31, 1928. The app. is set in action through melting of an alloy of low m. p.

Foam fire extinguisher. S. Y. BORUNSKII. Russ. 3696, Sept. 30, 1927.

Foam fire extinguishers. G. S. DOLGORUKOV. Russ. 3708-9, Sept. 15, 1924.

Foam fire extinguisher. S. Y. BORUNSKII. Russ. 4427, Jan. 31, 1928.

Portable foam fire extinguisher. S. YU. BORUNSKII. Russ. 4841, Mar. 31, 1928.

Foam fire extinguisher. L. I. YANISHEVSKII. Russ. 3867, Oct. 31, 1927.

Acid tube for portable fire extinguisher. FRIEDRICH RIEDL. Austrian 109,840, Jan. 15, 1928. The tube has strong side walls and weak end walls and is so constructed that both the end walls are fractured when the extinguisher is used.

19—GLASS, CLAY PRODUCTS, REFRACTORIES AND ENAMELED METALS

G. E. BARTON AND C. H. KERR

Conveying the glass from the melting furnace to the place of fabrication. L. BOCK. *Sprechsaal* 61, 621-2(1928).—The molding and shaping of glass took place at the melting furnace until quite recently. Transporting of the molten glass required either the use of the blowers pipe or a ladle. On account of the necessity of working the glass within narrow temp. limits the transportation of the liquid glass caused great inconveniences. To overcome these troubles a sep. working hearth for the molten glass was built and the glass was run from the melting tank to the hearth by means of a channel all of which were kept at the required working temps. of the glass. A description of the construction is included.

R. A. HEINDL

Glass tank refractories and their chemical relationship with the molten glass. KAI-CHING LU. Ohio State Univ. Eng. Expt. Sta., *Bull.* No. 44, 40 pp.(1928).—The corrosion of glass-tank blocks depends upon chem. action and upon the mech. texture of the block. Factors influencing corrosion were studied by means of chem. and microscopic analysis. An aluminous clay (Mandle Porter No. 4) and a siliceous clay made by mixing 60% ground flint with the former were used. The life of a refractory depends upon the rate of formation and soln. of a porcelainous surface at the glass interface. Mullite was sepd. from this layer by digestion with 15% HF. The aluminous clay burned to cone 28 contained about 46% mullite; the siliceous clay burned to cone 23 contained about 14%. The presence of impurities seemed to aid the crystn. of mullite. The rate of soln. is less in the aluminous refractory than in a highly siliceous one. No volatilization of alkalis took place on heating the aluminous refractory to cone 16 for 60 hrs. The presence of mullite in the white layer of a used tank block was verified microscopically. About 20 to 30% mullite was found in the glassy matrix. The brown glassy layer which covers the white layer was found to contain labradorite crystals and a little mullite. Analysis of this glass showed its chem. compn. to be near that of feldspar. In a highly siliceous refractory this brown glass is replaced by a white layer which contains cristobalite. The viscosity of the aluminous glass matrix was estd. to be about half that of the siliceous matrix at their respective m. ps.

A. L. BADGER

Chemical composition and properties of some special kinds of glass. I. A. PRSHEL AND D. N. POPOV. *Trans. Sci. Chem.-Pharm. Inst. (Moscow)* No. 9, 9-35(1924).—The results are given of a series of phys. and chem. analyses of glassware used in chem. pharmaceutical work.

J. S. JOFFE

Determination of alkalinity of glass for medical ampouls. D. N. POPOV AND B. A. KLYACHKINA. *Trans. Sci. Chem.-Pharm. Inst. (Moscow)* No. 9, 36-44(1924).—P. and K. present analyses of ampouls for the excess of alkali present in them.

J. S. JOFFE

Opacification of lime-lead glass and alumina-lead glass. SUKEAKI SAKAI. Mazda Research Inst., Tokyo. *Bull. Mazda Research Inst.* 3, 51-8(1928).—On a lime-lead-soda glass (LF-5), and alumina-lead-soda glasses (AF-3 and AF-6) the opacification test was made by means of the following 4 methods of heating. (A) Heat gradually to a definite temp. and keep at this temp. for some time. (B) Heat rapidly up to this temp. and keep at this temp. for some time. (C) Cool from the melt to a definite temp. (D) Cool once from the melt to a lower temp. and then gradually heat to a definite temp. LF-5, contg. less than 1.5% Al_2O_3 , is more likely to opacify than AF-3 and AF-6 contg. 3.4 and 2.4% Al_2O_3 . LF-5 begins to become opaque at about 600° and becomes most so at 750-800°. AF-3 and AF-6 are very difficult to opacify; the crystal first formed vanishes again above 1000°. The difference between the results of the treatment according to (C) and (D) is not clear. In the treatment (D), those first cooled to room temp. and then kept at a definite higher temp. for a few hrs. are more liable to become opaque. The boundary between the clear portion and the milky cryst. portion is clearly recognizable, the formation of a fissure taking place at the boundary by reason of the difference of expansion coeff. The opacification begins at the portions which are in contact with the outside atm. or with some such substance as a refractory material, or with a small particle of stone which is present as an inclusion.

K. SOMEYA

A discussion leading to the clear understanding of "increasing" or "decreasing" decolorization. ANON. *Sprechsaal* 61, 622-3(1928).—A discussion on decoloration of

glasses on the basis of the following classification: I. Decreasing: (A) chem. decolorization (oxidation of the ferrous oxides to ferric oxide as with the aid of saltpeter); (B) phys. decolorization (withholding iron from the melt; less impurities in raw materials and chemicals). II. Increasing: Suppression of the tinge (of color) by means of its complementary color.

Dangerous incidents in the preparation of mirror coatings. WALTER MEYER. *Sprechsaal* 61, 599-601(1928).—A discussion on the reactions occurring in the prepn. for coatings for silvering mirrors, the dangers incident to the prepn. of certain explosive mixts. and the application of these prepn. R. A. HEINDL

The problem of obtaining raw clays which are not washed away by water. P. P. BUDNIKOV. *Trans. State Expt. Inst. Silicates* (Moscow) No. 21, 97-106(1927).—One type of clay was treated with NaOH, KOH, $\text{Ca}(\text{OH})_2$, FeSO_4 , $\text{Al}_2(\text{SO}_4)_3$, CaSO_4 , $(\text{NH}_4)_2\text{SO}_4$, $\text{Cr}(\text{CH}_3\text{COO})_3$, Na_2S , CuSO_4 , NaHSO_4 , CrO_3 , H_2SO_4 , H_3PO_4 , HCl , HNO_3 , made up into a dough, shaped into pyramids, air dried and then immersed in H_2O . The HNO_3 - and HCl -treated clays did not dry out and were not tested. The time period for the variously treated clays to disintegrate when immersed in H_2O is recorded in tables. Of the alkalis only $\text{Ca}(\text{OH})_2$ (5% and higher) increased the stability of the clay to such an extent that the pyramid retained its shape for a long time (the exact period is not given). Of the different salts and acids, H_3PO_4 was most effective. From 3 to 5% of H_3PO_4 gave the best results. Samples of clay thus treated were immersed in H_2O for more than a year and showed no signs of disintegration. $\text{Ca}_3(\text{PO}_4)_2$ with enough H_2SO_4 to give from 3 to 6% H_3PO_4 gave the same results as with H_3PO_4 alone. Tests showed that the H_3PO_4 or H_2SO_4 additions decrease the burning shrinkage. Clays with different SiO_2 contents (from 5.5 to 42.5%) when treated with H_2SO_4 or $\text{Ca}_3(\text{PO}_4)_2 + \text{H}_2\text{SO}_4$ manifested stability up to 21.7% SiO_2 content. Superphosphate + H_2SO_4 was not effective, but additions of 10% asbestos to this treatment made the clays stable. Attempts to clear up the factors responsible for the behavior of clays upon the addition of H_3PO_4 , H_2SO_4 , $\text{Ca}_3(\text{PO}_4)_2 + \text{H}_2\text{SO}_4$, were futile. $\text{Fe}(\text{OH})_3$, $\text{Al}(\text{OH})_3$, addus. or humus from raw peat gave no clue as to what is happening. J. S. JOFFE

Clay gels. D. G. R. BONNELL. Univ. of Göttingen. *Z. anorg. allgem. Chem.* 176, 116-22(1928).—Different samples of clay have been prepd. according to Willstätter (C. A. 18, 2990). Their ability to adsorb malachite green, methyl violet, methylene blue, Congo red, nigrosin, azo blue, Bordeaux extra and eosin has been investigated. The acid dyes are much more adsorbed than the basic ones. In each case the amt. adsorbed is practically independent of the method of prepn. of the clay. It is concluded that the size of the clay particles has a negligible effect. In prepg. the clay samples, the more HCl used for peptization, the smaller the particle size. A. L. H.

Waterproofing clays. B. S. SHVETZOV AND K. G. ELSHANKIN. *Trans. State Expt. Inst. Silicates* (Moscow) No. 21, 73-89(1927).—Different clays when made up to a dough, or air dried, differ in their rate of disintegration when immersed in H_2O . The problem was to increase the time interval necessary for the H_2O to penetrate the clay, thus giving it greater stability. Addns. of Na_2SO_4 , CuSO_4 or CaCl_2 showed no effect. H_2SO_4 and Na_2SiO_3 alone and mixts. of these in different proportions increased the time from 7 or 9 mins. to 2 hrs. and 45 mins. for the 5 cc. addn. of a 10% H_2SO_4 soln. to 18 g. of clay. Several other trials with different per cents of H_2SO_4 showed that 2-3% is the best amt. The authors do not explain the possible reactions which might cause these clays to resist the entrance of H_2O upon treating with H_2SO_4 . They suggest the possible formation of compds. of the oxides of Al and Fe with SO_4 . When fibrous material, such as asbestos or peat, was added in conjunction with H_2SO_4 , the clay did not form any cracks, but the time interval was not increased. The H_2SO_4 has no effect on shrinkage. J. S. JOFFE

The action of sulfuric acid on clay at ordinary temperatures. P. N. GRIGOR'EV AND P. I. GALKIN. *Trans. State Expt. Inst. Silicates* (Moscow) No. 21, 91-5(1927).—The authors conducted a series of expts. to det. the chemistry of the phenomenon reported by Shvetzov and Elshankin on the action of H_2SO_4 on the waterproofing of clays (cf. preceding abstr.) and formation of "keramolit" ("keramolit" is "waterproof" clay). The postulate was that gypsum is formed in the reaction between the Ca of the clay and the H_2SO_4 and this binds the clay. Eleven different kinds of clays and kaolins were treated with H_2SO_4 , kneaded into pyramids and immersed in H_2O . The time period the pyramids kept their shape under water served as an index for the effect of the H_2SO_4 on the waterproofing of the clays. The results of the expts. are summarized: (1) "Keramolit" cannot be prepd. from any clay. (2) There can be no set rule as to which of the clays is capable of forming "keramolit." (3) There is no proof that the formation of gypsum is responsible for imparting the "keramolit"

property to clays: Clays with a high Ca content gave no "keramolit" while other clays with a low Ca content did give "keramolit." (4) The explanation offered by the authors is the dehydration of the clays by the H_2SO_4 ; the presence of impurities in clays, especially Fe, seems effective in the formation of the "keramolit." J. S. J.

The volume increase of brick upon heating. P. I. GALKIN. *Trans. State Expt. Inst. Silicates* (Moscow) No. 21, 107-10(1927).—G. presents data on burning shrinkage and expansion of various clays. J. S. JOFFE

Suspensions of kaolin. A note. R. DUBRISAY AND ASTIER. *Compt. rend.* 187, 978-80(1928).—The effect of acid and alkali on the rate of flocculation of water suspensions of kaolin has been followed quant. HCl , Li_2O , Na_2O , K_2O and phosphate buffer solns. of varying p_H values were added to suspensions of washed kaolin, and the rate of descent of the division between the suspension and the clear, supernatant liquid was noted. When p_H is plotted against the rate of sedimentation, the values for all of the above solns., excepting the phosphate buffer, fall on the same curve. The minimum rate is at p_H 11.0-12.0. The protective action of acids and bases seems to depend on their ionization, but this is not the only factor, since the phosphate buffer causes more rapid sedimentation than the other solns. of the same p_H , and since alk. earths are known to coagulate kaolin at great diln. Nephelometric measurements on month-old suspensions of kaolin in Li_2O solns. show a max. of opacity at the same p_H as the min. sedimentation. Microscopic and ultra-microscopic examn. revealed particles left only in the suspensions in less than $N/30$ alkali. M. W. SEYMOUR

Methods of research newly applied to refractories. WILLIAM F. BOERCKE. *Mining & Met.* 10, 16-8(1929).—The theoretically perfect refractory would possess the following properties: (1) high softening and melting points under normal load, (2) high resistance against sudden and sharp changes of temp.; (3) chem. inertness when confronted with the influence of metal oxides, fluxes and products of combustion that cause corrosion; (4) min. possible change of shape and vol. under all furnace conditions; (5) high resistance to mech. stresses and shocks, in both hot and cold state; and (6) uniform compn. so that a buyer may be sure at all times to receive the same product. The characters of the phys. and chem. tests employed by the General Refractories Co. at their Baltimore, Md., plant are discussed. Increasing importance is being given to petrographic study. The petrographic microscope permits the study of component minerals present in the raw material, in partly processed minerals, and in finished brick. Transparent sections are examd., also the brick or mineral in finely powd. condition. Melts are made of 2 or 3 components in various concns. and then subjected to different temps. for varying lengths of time. Petrographic studies of various Al silicates point out the best means to form the max. amount of mullite which is the most stable high-temp. form of Al silicate. Other instances of the value of petrographic study are mentioned. W. H. BOYNTON

The requirements of modern refractory materials. A. T. GREEN. *Ind. Chemist* 4, 484-9(1928).—A table giving the sp. gr., porosity, refractoriness and coeff. of expansion of 10 kinds of refractory materials is followed by a discussion of industrial applications. A bibliography is appended. E. G. R. ARDAGH

A manufacturer's viewpoint regarding specifications (for refractories). GEORGE A. BALZ. *Am. Refractories Inst. Tech. Bull.* No. 26, 4 pp.(1928).—Specifications serve as a target at which manufacturers are either inclined or compelled to aim, and have contributed much to industrial progress. Danger lies in demanding materials to meet certain specifications as to manuf. and behavior that are not related to the uses of the given refractories in practice. In particular the water-spalling tests is a relic of the dark ages, and should be abandoned. Specifications should be prepd. jointly by manufacturers and users to ensure the greatest value to both parties. W. C. E.

Determination and separation of the alkalis [in glass] (THÜRMER) 7. Electric furnaces in the ceramic industries (HIND) 4. Refractories in the gas industry (SMITH, SPIERS) 21. Refractory materials. Their uses in vertical retorts (GREEN) 21. Invert sugar as a substitute for mannitol or glycerol in the titrimetric determination of boric acid (MYLUS) 7. Furnace for heat treating, enameling, etc. (U. S. pat. 1,697,373) 1. Mirror (U. S. pat. 1,698,307) 18. Drying tunnel for ceramic ware (U. S. pat. 1,697,556) 1. Forming deposits of latex, etc. (Brit. pat. 291,339) 30. Alloys for fusing in or on glass (Ger. pat. 469,630) 9. The mineral dumortierite (Mackay School of Mines Staff) 8.

Melting glass batch materials. R. L. FRANK. *Brit.* 291,853, March 29, 1911.

The materials are melted as they pass downwardly over an inclined hearth of a furnace, various structural details of which are described.

Mold for pressing glass objects. CHARLES E. SCHMUNK. Ger. 469,628, Jan. 24, 1925.

Apparatus for feeding mold charges of molten glass. ALBERT N. CRAMER (to Owens Bottle Co.). U. S. 1,699,563, Jan. 22.

Burner for glass furnaces. PAUL R. VITTE. U. S. 1,697,334, Jan. 1. Structural features of a burner utilizing oil.

Forming sheet glass. EDWARD DANNER. U. S. 1,697,227, Jan. 1. Mech. features.

Apparatus (with forming, conveying and lehr rolls) for making sheet glass. RICHARD D. HUMPHREYS (to Mississippi Glass Co.). U. S. 1,697,504, Jan. 1.

Traction rolls and associated apparatus for drawing glass. JOHN A. SWEET (to Pittsburgh Plate Glass Co.). U. S. 1,698,378, Jan. 8. Mech. features.

Regulating temperatures on opposite sides of the draw bar in a glass drawing tank. WALTER G. KOUPAL and JOSEPH S. GREGORIUS (to Pittsburgh Plate Glass Co.). U. S. 1,698,369, Jan. 8. Mech. features. An app. is described.

Drawing sheet glass. CLARENCE P. BYRNES. U. S. 1,697,104, Jan. 1. Mech. features. An app. is described.

Apparatus for drawing sheet glass. JOHN L. DRAKE (to Libbey-Owens Sheet Glass Co.). U. S. 1,698,492, Jan. 8. Structural features.

Apparatus for drawing glass. JEAN LADURÉ. Fr. 641,913. Mar. 15, 1927.

Pot-draining device for glass-blowing apparatus. FREDERICK A. OST. U. S. 1,698,000, Jan. 8. Structural features.

Conveyors for carrying glass sheets through leers. NAAMLÖÖZE VENOOTSCAP Nij. tot BEHEER EN EXPLOIT. VAN OCTROOIEN. Brit. 291,358, May 30, 1927. Structural features.

Tunnel and associated apparatus for annealing glassware. CLAUDE NAGLE (to Hartford-Empire Co.). U. S. 1,697,996, Jan. 8.

Apparatus for annealing sheet glass. VERGIL MULHOLLAND (to Hartford-Empire Co.). U. S. 1,698,479, Jan. 8.

Apparatus for annealing glassware. VERGIL MULHOLLAND (to Hartford-Empire Co.). U. S. 1,698,480, Jan. 8.

Means for feeding small glass objects into annealing leers. EMANUEL LINKE. Ger. 469,495, Dec. 10, 1926.

Means for feeding glass objects into annealing leers. PERCY Q. WILLIAMS. Ger. 469,629, Jan. 13, 1924.

Apparatus for uniting glass sheets under pressure. WILLIAM O. LYTLE (to Pittsburgh Plate Glass Co.). U. S. 1,698,371, Jan. 8.

Forming necks on hollow glass bodies. FELIX MEYER. U. S. 1,699,305, Jan. 15. Mech. features.

Apparatus for forming bottles or similar molded glass articles. RICHARD LA FRANCE (to Owens Bottle Co.). U. S. 1,699,566, Jan. 22.

Device for the separation of unbroken glass rods or tubes. GLASWERKE RUHR. A. G. Ger. 469,215, Mar. 11, 1926.

Colored glass. EDGAR J. BRASSEUR and WILLIAM R. GEDDES (to Libbey-Owens Sheet Glass Co.). U. S. 1,698,491, Jan. 8. A layer of colored glass is caused to flow upon the surface of a moving body of ordinary more or less colored glass and (by an app. which is described) a glass sheet is drawn upwardly which is plain on one side and colored on the other side.

Decolorizing or coloring borosilicate glasses. CORNING GLASS WORKS. Ger. 469,474, Mar. 5, 1922. See Brit. 194,888 (C. A. 17, 3590).

Coating glass surfaces. BYRON C. GOSS (to General Electric Co.). U. S. 1,698,302, Jan. 8. In order to form coatings which give "frosted" or similar effects, a liquid mixt. is applied which contains an insol. body material such as kaolin, MgO, Al₂O₃, and ZrO₂ together with Na silicate or other alk. silicate and an alk. hydrate such as NaOH in such proportions that there is present materially more of the alk. hydrate than is contained in commercial grades of the silicate; the coating thus formed is dried and is afterward treated with a fixing soln. such as ZnCl₂ and Al₂(SO₄)₃, which reacts to form insol. compds. Cf. C. A. 22, 2648.

Polishing glass surfaces. JOSEF PIVIN. U. S. 1,697,609, Jan. 1. See Brit. 263,858 (C. A. 22, 148).

Glass permitting passage of ultra-violet rays. SOC. ANON. DES MANUFACTURES DES GLACES ET PRODUITS CHIMIQUES DE SAINT-GOBAIN, CHAUNY, ET CIREY. Brit. 291,468, June 4, 1927. In order to counteract a tendency of glass transparent to ultra-

violet rays to lose this transparency a small proportion of Mn oxide is incorporated in the glass. Silica glass and transparent cast silica may be similarly treated.

Uniting glass objects with iron-chromium alloys by fusion. NAAMLÖÖZE VENNOTSCHAP. PHILIPS' GLOEILAMPENFABRIKEN. Ger. 468,555, Mar. 13, 1926. A small addn. of Al, suitably 0.5%, is made to the alloy before the fusion.

Bricks, tiles, etc. H. PARDOE, T. PARDOE and H. HILL. Brit. 291,960, June 14, 1927. Bricks, tiles and the like are made from pulverized slate or shale waste mixed with $1\frac{1}{2}$ -3% of Fe_2O_3 or of a siliceous Fe oxide ore. Water is added to effect binding when pressed and the compn. is then molded and is fired at a temp. of about 1000° . Mention is also made of the possible use of glass makers' waste, sand or slag together with Fe ore.

Impregnating composition for bricks, tiles, etc. JOHANN TANZER. Austrian 111,389, Mar. 15, 1928. The compn. comprises soft (tar) pitch, hard (coal) pitch, and a coal tar distillate of high b. p. (Carbol'neum) in the resp. proportions 60:38:2.

Artificial bricks and plastic hardening masses. A. A. BRYUSHKOV. Russ. 4824, Mar. 31, 1928. Small quantities of sulfonic acids from mineral oils are added to a mixt. of clay, tripoli, etc., and resin soap. No baking is required.

Decorated tiles. V. LEFEBURE. Brit. 291,884, March 11, 1927. Production of colored tiles contg. silicates and reacting oxides or salts and hardened by heat as described in Brit. 268,851 (C. A. 22, 1455) is modified by printing decorations with an ink contg. the same reacting ingredients, or some may be in the ink and some in the base. A fibrous material may be used as base material and impregnated with fillers and reacting substances.

Apparatus for coating flat tiles. LOUIS S. JONES, GARFIELD W. FISHER and CARL G. HENRIKSON (to National Tile Co.). U. S. 1,699,972, Jan. 22. The app. is suitable for applying glazing compds.

Silicon ware. I. G. FARBERIND. A.-G. Ger. 469,169. July 23, 1927. Addn. to Ger. 462,052. The acid-proof mass made from molten siliceous material described in the former patent is made into lining-plates. If heated to 1200° , the material is rendered alkali-proof.

Insulators for high-frequency currents. ALBERT E. MARSHALL (to Corning Glass Works). U. S. 1,700,066, Jan. 22. Insulators are formed of glass with a high silica content, a low alkali content, and contg. boric oxide.

Assembling portions of porcelain insulators while in plastic condition. KENT A. HAWLEY (to Locke Insulator Corp.). U. S. 1,699,063, Jan. 15. Mech. features.

Insulating material. STUDIEN-GES. FÜR WIRTSCHAFT U. INDUSTRIE M. B. H. Ger. 469,616, May 19, 1925. Addn. to 458,475. AlMg silicate prepd. by the method of Ger. 458,475, *i. e.*, by fusing MgCl_2 with quartz, feldspar and Al_2O_3 , with or without CaF_2 , and electrolyzing the melt, is used for insulating purposes. The silicate can be molded in fireproof molds.

Anti-damp covering for porcelain insulators. A. GROSSAUER. Swiss 127,627, Aug. 4, 1927. A coating of paraffin wax is used.

Cementing insulators. STUDIEN-GES. FÜR WIRTSCHAFT UND INDUSTRIE M. B. H. Ger. 469,015, July 7, 1925. Hydrocarbons and finely divided vulcanized rubber are added to a cement for earthenware insulators.

Apparatus for charging kilns with coal. KARL KOLLER. Austrian 110,995, May 15, 1928. App. is described whereby the coal is forced from the center to the upturned edge of a pan arranged over an annular charging opening.

Drainage system for brick kilns. THEO. F. MERTEN. Ger. 469,583, Feb. 16, 1927.

Stone door for annular kilns. OTTO BRADEMANN. Ger. 469,582, June 16, 1927.

Pottery kiln construction. H. WEBSTER. Brit. 291,482, Jan. 27, 1927.

Tunnel kiln suitable for burning clay products. GEORGE W. BOOTH. U. S. 1,698,700, Jan. 8.

Tunnel kiln for manufacture of ceramic ware, etc. AMERICAN ENCAUSTIC TILING Co., LTD. Brit. 291,504, Feb. 28, 1927. Structural features.

Ceramics. JOSEF BEIERL. Ger. 469,196, May 29. Raw potsherds are coated with a soln. of colophony in turpentine and a decorative pattern or picture is applied by transfer. The potsherd is then fired, after which the glaze is applied over the pattern in the usual way.

Ceramic materials. T. S. CURTIS. Brit. 291,524, March 3, 1927. A ceramic article is composed of fibrous mullite crystals and a binder; the crystals are produced by firing a natural alumina silica-bearing substance such as kyanite with addnl. alumina in splintery form.

Molding ceramic articles. T. S. CURTIS. Brit. 291,523, March 3, 1927. Materials are used in such form that they remain fluid while under constant vibration,

but solidify very rapidly on the vibration being stopped, and molding is effected while vibration is in progress. An electrolyte such as Na silicate may be added to promote fluidity. An arrangement of app. is described. Brit. 291,525 also relates to app. for use in processes of this character.

Molding ceramic or other material in vacuum under successively higher pressures. HENRY L. CROWLEY (to Isolantite Co. of America). U. S. 1,699,502, Jan. 15. Mech. features are specified of a method suitable for molding tubes or other articles.

Apparatus for baking ceramic articles. JOHANN MITTERER. Ger. 468,384, Feb. 12, 1928. A hood made of the same material as the articles protects them from contamination.

Muffle ceramic furnace. LÉON-LÉONARD DENIS. Fr. 641,397, Sept. 26, 1927. Constructional details of hearth and recuperation means.

Glass melting-pots and other refractory clay articles. J. HOCHHUT. Brit. 291,305, Dec. 12, 1927. A mixt. of "shortening material" such as burnt clay and disintegrated crucible shivers is mixed with clay and water to produce a loose, incoherent mass, and this material is introduced in successive small portions into an open mold and stamped, and then removed from the mold, dried and fired.

Making refractive materials by dry pressing. V. V. YURGANOV. Russ. 4916, Mar. 31, 1928. Clay, bauxite and magnesite which have not been roasted but have been dried and ground are mixed with materials which make the material porous after baking, pressed dry or slightly wet and baked. The shrinkage is thus minimized.

Coating for furnaces. VEREIN FÜR CHEM. UND METALLURGISCHE PRODUKTION. Fr. 641,181, Sept. 22, 1927. A refractory coating for furnaces is made of a mixt. of molten refractory substances, refractory clay, a binding agent and easily fusible sol. salt. In an example 100, parts of finely ground CeO_2 are mixed with 20 parts of bauxite and 0.5 of K_2SO_4 and agitated with water to obtain a mud.

20—CEMENT AND OTHER BUILDING MATERIALS

J. C. WITT

The setting of cement. I. HERMANN GESSNER. *Kolloid Z.* 46, 207-16(1928).—The modern theories are given and the work of the past few years is reviewed in the light of the colloid chem. aspect, with a discussion of the importance of particle size and degree of hydration. Some of the methods used for detg. particle size are given. Attempts to clear up the question of the chem. equil. between particle surface area and solution have failed. Work in regard to hydration in set cement is discussed with the conclusion that most of the water is held in a gel structure. The effect of aging on dehydration and crystn. is discussed. The outer shell of the particle apparently dehydrates while the inner part hydrates.

L. F. MAREK

Electrical investigation of the setting and hardening of rapid-hardening cements. YOSOMATSU SHIMIZU. Tohoku Imp. Univ. *Kinzoku-no-Kenkyu* (J. Study of Metals) 5, 217-82(1928); cf. *C. A.* 22, 1836.—The process taking place during the setting and hardening of the so-called "rapid-hardening cements," which are aluminous cements or super cements of the portland type, was studied by means of the elec.-resistance measurement. Two breaks, the first corresponding to the hydration of Ca aluminate and the second to that of Ca aluminosilicate or Ca silicate, were observed in the cond.-time curve of aluminous cements; but only one break, which corresponds to the hydration of the Ca aluminosilicate or Ca silicate was observed in that of super cements of the portland type. From these facts S. concludes that Ca aluminate does not exist in the clinker of portland cement, in agreement with Jänecke and Kühl. Also the fact that the rate of increase in the elec. cond. of alumina cements is much greater than that of the rapid hardening cement of the portland type is in agreement with the observation that the strength of the former is in its earlier stage of hardening much greater than that of the latter. S. also detd. the setting time of the above rapid-hardening cements from their time-cond. curve and studied the effect of temp. on the setting of those cements. The setting time detd. by this method of the alumina cement and of the rapid-hardening cements of the portland type does not differ much from each other, the result being also in agreement with that obtained by the method of Vicat's needle.

K. SOMEYA

Calcium chloride as setting accelerator for bore hole cement. V. N. KOREPANOV and E. K. MACHINSKII. *Neftyanoe Khozyaistvo* 15, 633-5(1928).—American CaCl_2 (76.13% CaCl_2 and 23.87% H_2O) and Russian (62.11% CaCl_2 and 37.89% H_2O)

were added to cement in various proportions. Breaking tests indicated that both types of CaCl_2 act alike when added to mortar with 25% of H_2O , the Russian CaCl_2 being superior at higher dilns. and the mortar mixt. having a higher strength after 4 and 7 days.

A. A. BOEHLINGK
Gypsum and anhydrite in the control of setting time. C. R. PLATZMANN. *Tonind.-Ztg.* 53, 59-61(1929).—A review of the literature. F. O. A.

Fused cements with a high alumina content. R. PERET. *Ann. ponts et chaussées* 1927, Nov./Dec.; *Building Sci. Abstracts* 1, 207; cf. C. A. 22, 149, 3024.—A comprehensive series of expts. has been carried out on binary and ternary systems of chemically pure SiO_2 , Al_2O_3 and lime. The fused materials have been cooled quickly, by quenching, or gradually, then ground to a uniform fineness and tested for strength, soundness and resistance to chem. attack. Contrary to experience with granulated slag, these products, if plunged in water while still fluid, give less favorable results than those cooled normally. Their setting time is shorter and their strength inferior. In general, the products fall into three classes: (1) those incapable of setting, (2) quick-setting cements of low strength, in some cases expanding or disintegrating in water after hardening, (3) slow-setting, high-strength products resistant to those salt solns. which are highly injurious to ordinary cements. A ternary diagram is given showing the zones occupied by the three classes mentioned, and details are presented in the form of a table. The diagram shows that the replacement of lime by silica, in a compd. of fixed alumina content, results in a rapid decrease in strength. The proportion of alumina should lie between 45 and 70 per cent; of lime, between 47 and 28 per cent; and of silica, between 12 and 0 per cent. These values hold only for chemically pure substances, the impurities present in commercial raw materials causing considerable modification. H. G.

Analysis of portland cement for factory purposes. WALTER J. PITT. *Chem. Eng. Mining Rev.* 20, 402-6(1928).—The methods described are excellent. The procedure is practically the same as that accepted as standard in this country. W. T. H.

Old vs. new methods of calculation of portland cement and clinker analyses. E. L. DRURY. *Rock Products* 32, No. 2, 57-8(1929). RAYMOND WILSON

Effect of calcium chloride and calcium oxychloride on portland cement. W. J. PITT. *Chem. Eng. Mining Rev.* 21, 65-70(1928).—Both of these chemicals accelerate the hardening of portland cement. RAYMOND WILSON

Flue dust—is it detrimental to portland cement? ALTON J. BLANK. *Rock Products* 32, No. 2, 48-50(1929). RAYMOND WILSON

Improving the qualities of concrete. C. H. BUTCHER. *Carp. & Build.* 102, 624(1928); *Building Sci. Abstracts* 1, 135.—The use of hydrated lime as an admixt. in portland cement concrete to render it watertight and increase plasticity is discussed. Tables are given showing the amt. to be added to mixes of various ratios. It is stated that the addn. of hydrated lime lightens the color of the concrete and that the initial set may be delayed for about $\frac{1}{4}$ hour by adding 10-20 lb. per bag of cement, allowing 12 bags to the ton. H. G.

The harmful effect of an excess of water on poured concrete. ORTHAUS. *Tonind.-Ztg.* 52, 2043-5, 2078-80(1928).—Proper tech. control is needed to design the mix to avoid the addn. of an excess of water in order to get the consistency required for concrete to run through troughs. F. O. A.

Rust removal from iron in concrete. P. MECKE. *Tonind.-Ztg.* 53, 27(1929).—Where a cement contg. slag is used for making concrete the rust is removed from the reinforcing iron under certain conditions. When the concrete is kept damp and out of contact with the air, sulfide from the slag reduces the rust to form the dark-colored iron sulfide. On coming in contact with the air this changes to compounds almost colorless. F. O. A.

Protective and waterproof coatings for concrete, mortar and stone. H. E. SCHUBERT. *Bauing* 9, 325(1928); *Building Sci. Abstracts* 1, 170(1928).—The author describes 9 proprietary compns. for coating the surface of concrete mortar or stonework to render it waterproof and weather resistant and the "Contex" process for surfacing concrete so as to expose the aggregate. H. G.

Experiments with Tricosal III. KLEINOGEL. Materialprüfungsamt, Berlin-Dahlem. *Beton Eisen* 28, 20-1(1929).—Tests showed the presence of this addn. agent increased the strength, the resistance to abrasion and to corrosive oils, as well as making the mortar denser. F. O. A.

Preparation of special limes from brown-coal ashes. HEINRICH LUFTSCHITZ. *Tonind.-Ztg.* 53, 64-5(1929).—On igniting coal ashes, after fine grinding, to 1200-1300°, F. obtained some products high in CaSO_4 and again a hydraulic lime. By igniting with

limestone, much of the SO_2 was reduced and portland cements were obtained having fair hydraulic properties.

Efflorescence: causes and the remedies. H. FENELON. *Carp. & Build.* 102, 1038, 1088-90(1928); *Building Sci. Abstracts* 1, 182.—Effects of efflorescences on stone, plaster and cement are discussed. The peeling of distemper off Keene's cement surfaces is not as much due to lack of adhesion, as to the wet rendering behind the cement, the alum in which is thus kept wet and prevents close adhesion between distemper and cement. The only remedy is to allow sufficient time for thorough drying of the wall. The failure of distempers is to be mainly attributed to the presence of salts in the mortar which cannot be reached by ordinary treatment with solns. A method for eliminating salt from sand by using HCl and AcOH is explained. Where the sand has not been thoroughly washed, and the rendering has already been done, the latter may be coated with a mixt. composed of alum and Fe sulfate.

Creosote treatment of timber. S. W. KEYS. *Facts about Sugar* 23, 1230-7 (1928).—K. reviews the methods and results of this treatment.

Thermo-conductivity and shrinkage of wood. A. HERMANN. *Timberman* 29, 51(1928); *Building Sci. Abstracts* 1, 178.—Rept. on expts. carried out on the thermal cond. of various woods, as related to their ds., indicates that the lighter the wt. of the wood the less is the heat transmission. Tests on shrinkage are also discussed. In ponderosa pine there is a shrinkage of 1 per cent in width with every 5 per cent variation in moisture content. Idaho white pine, sapwood and heartwood, each shows a shrinkage of approx. 1 per cent with every 4 per cent change in moisture content. The shrinkage ratio in both light and heavy boards of ponderosa pine is approx. equal but in Idaho white pine light boards shrink slightly more than do heavy boards. These tests are being continued and amplified.

The velocity of dehydration of gypsum at different temperatures (BUDNIKOV) 2. The velocity of dehydration of dry gypsum (BUDNIKOV) 2. Mixing "wood wool" and "soft cement" or other long fibered and powdery materials (U. S. pat. 1,698,881) 13. Swiss pat. 127,246) 18. Water gas, H_2PO_4 , and molten cement (Fr. pat. 639,412) 18. Granulating molten slag (U. S. pat. 1,699,575) 9. Determination of Fe and Al oxides, Mg oxide and Ca oxide in portland cement (PIERCE, SERZER) 7.

Cement. CELSO P. BACCOVICH. U. S. 1,696,899, Jan. 1. Acidic rocks such as granites, granulites, porphyries, syenites or pegmatites contg. a substantial quantity of alkali are crushed and dried at a temp. of 200-500°, reduced to an impalpable powder (finer than ordinary commercial portland cement) and then intimately mixed with portland cement contg. SiO_2 in preponderance over Al_2O_3 .

Cement. THOMAS RIGBY. U. S. 1,699,451, Jan. 15. Slurry is subjected to a heat treatment in an elongated cylindrical heated kiln inclined slightly to the horizontal and is supplied to the kiln in a plurality of streams from nozzles which are spaced from the intake end of the kiln; the kiln is rotated to effect passage of the material through it.

Cement. CHARLES E. KRAUS. Swiss 127,196, June 17, 1926. A mixt. of baked clay with CaO , $\text{Ca}(\text{OH})_2$, CaCO_3 or other Ca compd. is treated with H_2SO_4 to give a product contg. CaSO_4 , $\text{Al}_2(\text{SO}_4)_3$ and colloidal SiO_2 , and this product is mixed again with a Ca compd. It is preferred to use clay pretreated with NaOH soln. and to operate at 100-216°.

Cement. INTERNATIONAL CEMENT CORPORATION. Fr. 642,168, Oct. 11, 1927. Clinker of normal portland cement contg. or mixed with additional CaCO_3 sufficient to sat. the SiO_2 , Al_2O_3 and Fe is submitted to one or more bakings and ground after cooling. A retarder such as gypsum may be added before grinding. Cf. C. A. 22, 3031.

Portland cement. HARVEY R. DURBIN (to International Cement Corp.). U. S. 1,700,032, Jan. 22. A portland cement having a tensile strength of at least 240 lbs. per sq. in. at 24 hrs. with a 1:3 sand mixt. is prepd. by burning portland cement clinker comprising a large proportion of tri- Ca silicate together with incompletely lime-satd. silicate in intimate mixt. with lime in quantity not greater than that required to complete the satn. of the incompletely satd. silicate, and then grinding the product. U. S. 1,700,032 specifies a portland cement having a tensile strength in excess of 300 lbs. per sq. in. at 24 hrs. in a 1:3 sand mixt. and which is prepd. by using silica, alumina and iron with lime in quantity not more than theoretically necessary to sat. the silica, alumina and iron in one burning operation, burning to incipient fusion, grinding, re-burning to incipient fusion, and grinding the re-burned product. Cf. C. A. 22, 3031.

Slag cement. ANDRÉ CHARTIER. Fr. 641,753, Oct. 3, 1927. Granulated moist

slag from blast furnaces and quick or slaked lime are carried by sep. elevators to a mixer from which the mixt. is led to a rotating furnace and from thence to a grinder.

Waterproof cements. INTERNATIONAL PRECIPITATION CO. Brit. 291,988, Aug. 15, 1927. Portland or other hydraulic cements are mixed with a natural earthy material such as a shale, clay or diatomaceous earth contg. at least 5% of oil-sol. bituminous or oily material. The selected material may contain amorphous silica and other substances such as the chlorides, fluorides, sulfates, silicates or fluosilicates of Mg, Ca or Zn may be added.

Quick-setting cement mortar. RICHARD SCHNOBEL. Aust. 110,265, Mar. 15, 1928. Solns. of heavy metal oxides in alkalis, for instance $\text{Zn}(\text{ONa})_2$, are added to the cement mortar.

Concrete. F. W. McRAE (to Barber Asphalt Co.). Brit. 291,784, June 10, 1927. Material such as concrete, after being laid, and after the surface water has dried off, is sprayed or otherwise treated with an adherent waterproof coating, such as a soln. of asphalt and gilsonite in a petroleum distillate, to prevent further evapn. of water. This coating may also serve as an "anti-glare" coating on pavements. Cf. C. A. 22, 4757.

Concrete. ARTHUR C. KNIPE. Swiss 127,195, Apr. 22, 1927. The damp-mixing of the ingredients is effected under reduced pressure so as to free the mass from air. A suitable plant is described.

Pitch concrete. MARCEL LEVY (to "Prodor" fabrique de produits organiques soc. anon.). U. S. 1,699,705, Jan. 22. A pitch concrete with a mech. strength substantially equal to that of cement concrete is formed with a brittle pitch dried so as to remain hard at temps. of 80° together with an aggregate such as broken stone and fine powdered material such as limestone powder sufficient to form a thick pasty mass with the pitch. The pitch concrete thus formed is suitable for making conduits, etc. Cf. C. A. 22, 3756.

Manufacture of concrete blocks. HUGO APFELBECK. Austrian 110,270, Mar. 15, 1928. The steam pressure under which the blocks are hardened is caused to fall comparatively slowly.

Artificial stone. FRANZ GUNTER. Austrian 110,118, Oct. 15, 1928. In the manuf. of artificial stone from mineral fillers and water-insol. binders, particularly from limestone and asphalt, the binder is emulsified with an aqueous soln. of hexahydrobenzoic acid or its salts or with an alkali resinate, the filler is stirred in, and the emulsion is then broken by addn. of alk.-earth or heavy metal salts. The coagulate is sepd. and washed.

Artificial stone. KURT SCHENKEL. Ger. 468,780, Mar. 29, 1927. Addn. to Ger. 468,170 (C. A. 23, 684). In making porous artificial stone from gypsum or other water-solidified material as described in the prior patent, the hydraulic binding material is mixed with org. or inorg. colloidal soln. such as gelatin or glue.

Hardening lime. AKT. GES. DER VEREINIGTEN ASPHALT AND BAUMATERIALIEN-WERKE WIEN-FLORIDS DORF-WOPFING (Otto Grafes Nachf. N. Schefftel). Austrian 111,371, June 15, 1928. In the manuf. of objects of artificial stone by mixing an aq. soln. of $\text{Ca}(\text{OH})_2$ with fillers, etc., shaping, and hardening with CO_2 , the hardening is accelerated by adding to the initial mass substances, such as sugar, which combine with $\text{Ca}(\text{OH})_2$ and increase its soly. in water but are set free again by CO_2 . The objects may be heated to $60\text{--}80^\circ$ after hardening.

Road making. CARL ALEXANDER AGTHE. Swiss 127,731, May 4, 1927. Bituminous material contg. only a small quantity of C or other binding material and a small addn. of rubber or lignite tar is used.

Road-making composition. F. RASCHIG. Brit. 291,276, Oct. 20, 1927. Clay, water and bituminous material such as coal tar pitch or petroleum pitch are used together to form a hard mass which is emulsifiable with water. The ingredients may be mixed while heated to about $40\text{--}50^\circ$ and sand may be added.

Road-making composition. MINERAL A. G. BRIG. Swiss 127,189, Nov. 29, 1926. Petroleum asphalt thinned down with org. solvents such as crude benzine is mixed with granular fillers such as sand to form a powdery mass which is applied by rolling or stamping in the cold. Rubber, drying oils, and alk. earths may be included in the compn.

Bituminous road-making materials, etc. W. SCHROTH. Brit. 291,749, June 7, 1927. Tars or tar mixts. are used, the phenol content of which is higher than that of the high-temp. tars and lower than that of the low-temp. tars. The material is treated with oxidizing agents or S or both, as by boiling with injection of air, and contact substances may be added.

Making building material water-tight. A. A. BRYUSHKOV and P. I. SHABLUKIN. Russ. 4939, Mar. 31, 1928. Fatty soap solns. are added to mineral oils and mixed with prepd. mortar either straight or in the form of a water emulsion.

Composition shingles. ALBERT L. CLAPP (to Flintkote Co.). U. S. 1,698,886, Jan. 15. Asbestos fiber is beaten in water together with cellulosic fiber and a waterproofing material such as montan wax and gilsonite and a precipitable sizing such as in size is added, followed by addn. of a pptg. agent such as $Al_2(SO_4)_3$ and further beating after each of these addns.; the material is then run off on a paper machine, and is then fluxed and cut into shingles.

Apparatus for treating sheet roofing material with waterproofing substances. WILLIAM T. HOFMANN (to Flintkote Co.). U. S. 1,697,464, Jan. 1.

Impregnated roofing felt or similar material. ROBERT T. JOHNSTON (to Flintkote Co.). U. S. 1,698,886, Jan. 15. The material is passed through hot asphalt or other suitable impregnating substance at atm. pressure and after removal from the impregnating bath is subjected to a vacuum in order to remove air, moisture, etc. An app. is described.

Building slabs. S. MINACHE. Brit. 291,647, Aug. 20, 1927. The 2 outer layers of the 3-layer slab described in Brit. 213,495 (C. A. 18, 2416) are formed of $MgCl_2$, MgO and pulverulent waste material such as sawdust. The 3 layers are molded and pressed together and after setting are placed in water for a time.

"Wood substitute" comprising layers of artificial resin and pulp board united by heat and pressure. AGASOTE MILLBOARD CO. Brit. 291,633, July 12, 1927.

Construction material formed of fibrous and bituminous materials. RAY P. JERRY AND KENNETH B. HOWELL (to Barrett Co.). U. S. 1,698,733, Jan. 15. A material suitable for roofing or other uses is formed of layers of substantially uniformly distributed fibrous material and bituminous material rigid at ordinary atm. temp., softened by heat and pressure and having asbestos surfacing material adhering by action to the bituminous material.

Plastic bituminous product. MARK R. CONE (to Union Trust Co.). U. S. 1,698,877, Jan. 15. In forming a plastic mass suitable for use in roofing or paving, material such as asphalt or pitch is sprayed at a temp. above its m. p. to divide it into small particles and these are caused to solidify out of contact with each other, then immersed in heated water, gradually cooled at atm. temp. and the water is sepd. to obtain a moist plastic paste. U. S. 1,698,878 relates to a similar product.

Lined wallboard. OLIVER W. STOREY (to C. F. Burgess Laboratories). U. S. 1,698,851, Jan. 8. A mixt. of soap and Na silicate or other intumescent plastic and a liner such as $CaCO_3$ is heated while confined between paper facings to puff and solidify the mixt. and cause it to adhere to the facings and the edges of the board are closed during the heating to maintain a steam pressure upon the inner surfaces of the liners during the puffing operation.

Preparing sand molds. RUDOLF ULLMANN. Austrian 111,272, June 15, 1928. In preparing sand molds for use in forming *molding boards from MgO cement*, sand mixed with orax is used, and the upper surface of the mold is strongly heated.

Floor-covering material. CHARLES F. HUMPHREYS and JOHN C. MCCARTHY (to Armstrong Cork Co.). U. S. 1,697,426, Jan. 1. A sheet material of felt is impregnated with a plastic filling material such as a bituminous compn. and is provided with a colored pattern in relief.

Superficially coloring wood. MALCOLM SPARKES. U. S. 1,697,026, Jan. 1. The surface of Oregon pine or similar wood is first treated with a soln. contg. $FeSO_4$, moisture is evapd. from the surface and it is then treated with a soln. formed from $K_2Cr_2O_7$ mixed with an aq. soln. of NH_3 .

Preserving wood. L. P. CURTIN. Brit. 291,857, March 7, 1927. Wood may be impregnated with $Ba(OH)_2$ which is converted into $BaCO_3$ in the wood. Oil, Na_2CO_3 , etc., also may be used.

Wood-preserving composition. KARL H. WOLMAN. U. S. 1,700,010, Jan. 22. Dinitroresol, NaF, arsenates and alkali dichromates are used together. Cf. C. A. 22, 1026.

Preserving cellulosic material such as wood. LEO P. CURTIN (to Western Union Telegraph Co.). U. S. 1,698,622, Jan. 8. Material such as red cedar or Douglas fir is impregnated with an emulsion contg. a liquid hydrocarbon material, such as a petroleum oil and an aq. soln. formed from arsenious acid and NH_3 , which is capable of depositing free As_2O_3 upon exposure to the air.

Impregnating wood, etc. MORRIS SMITH. U. S. 1,699,635, Jan. 22. Wood or similar porous material is dried by the action of hot and humid air, impregnated with a softening agent preferably of oleaginous character such as an aq. Turkey-red oil emulsion or cod oil emulsion by use of a vacuum and the softening agent is then "vaporized"

at a relatively high temp. (suitably about 110–120° with cod oil emulsion) to cause it to penetrate the wood.

Impregnating and compressing wood. FELIX LAUTER (to Lignel Corp.). U. S. 1,697,248, Jan. 1. A liquid contg. an aldehyde, such as CH_3O or furfural, is used for impregnating pine or other wood and the latter is then heated under pressure to reduce its vol. and obtain a product suitable for furniture or elec. insulation. Phenolic compds. also may be used.

Method of impregnating wood. KARL BUBLA. Austrian 109,709, Jan. 15, 1928. The wood is treated first with a weak soln. of a suitable impregnating agent and then with a stronger soln. of the same agent, each treatment being applied at first under reduced pressure and later under increased pressure.

Apparatus for dyeing or impregnating tree trunk sections. FRANZ A. BRAUSIL. Austrian 109,990, Feb. 15, 1928. The app. is of the type in which the dyeing or impregnating liquid is forced through the trunk section in the direction of its length, and is designed to deal with sections differing widely in diam.

21—FUELS, GAS, TAR AND COKE

A. C. FIELDNER

Notes on recent developments in fuel technology. R. WIGGINTON. *Fuel Science Practice* 7, 469–71, 515–7(1928).—Brief reviews of: low-temp. carbonization at power stations, Japanese gas industry, coal classification, calorimetry of coke and clinker, and use of hot springs in Iceland.

Australian fuels: their industrial utilization and investigation. L. M. HIRCHBERG. *Chem. Fabrik* 1928, 619–20; cf. *Chem. Fabrik* 1928, 605.—Low-temp. distn. of lignites, prepn. of fuels to replace coal in locomotives, high-temp. distn. processes of lignites, coking of coal and lignite mixts., expts. on gas generators using Victoria lignite, and expts. with oil shales are reported in brief. A plant for treating coal by the Bergius process is to be operated near Melbourne. Opinions as to the best methods for treating Australian coals have not become unified; proposals for utilizing the fuel resources to best advantage are offered public and private support.

Auto-ignition temperatures of liquid fuels. OSCAR C. BRIDGEMAN AND CHARLES F. MARVIN, JR. *Ind. Eng. Chem.* 20, 1219–23(1928).—Data of more than 30 investigators of this problem are studied and correlated. Among the significant factors bearing on auto-ignition are (1) material and vol. of ignition vessel, (2) concn. of O_2 in mixt., (3) time lag before ignition, (4) pressure and (5) compn. of fuel. Recent work by the authors at the Bureau of Standards with a bomb of special design is discussed from these standpoints.

Five hundred tests of various coals in house-heating boilers. P. NICHOLLS, S. B. FLAGG AND C. E. AUGUSTINE. *Bur. Mines, Bull.* 276, 70 pp.(1928).—The av. over-all efficiency from all tests was 58% for an av. rate of output of 65,700 B. t. u./hr., equiv. to 262 sq. ft. of steam radiation. The hot-water boilers gave 3% higher efficiency than the steam boilers. The boiler having the larger grate, combustion space, and heating surface gave 4% higher efficiency. If the ash-pit loss is neglected, the efficiency of boiler and furnace shows a slow but const. increase from the subbituminous coal to the semianthracite, and the increase then becomes rapid. The av. over-all efficiency was independent of the calorific values of the coals. This can mean only that the combustible part burned as efficiently when associated with high as with low ash content. The dollar value of the coals depends upon the calorific value and is proportional to the calorific value multiplied by the over-all efficiency.

Coal washability tests as a guide to the economic limit of coal washing. GEORGE S. SCOTT. *Am. Inst. Mining Met. Eng., Tech. Publication No. 159*, 3–13(1929).—The highest economic purity of washed coal can be detd. from washability studies of the raw coal, costs of mining and washing coal, and data on the effect of ash and S on the value of the coal for the particular use for which it is intended. The numerous numerical data assumed, it is hoped, approach closely enough the av. working conditions to give some idea of the order of magnitude of the various economics evolved.

Heating value of coal in nickel-lined bombs. A. E. STROPPEL AND E. P. HARDING. *Ind. Eng. Chem.* 20, 1214–8(1928).—A method for detg. the amount of Ni dissolved in a Ni-lined bomb by the acids of combustion involves a titration of the bomb washings for free acid with Me-red indicator followed by a continuation of the titration in hot soln. with the same alkali using phenolphthalein. To correct for heat of corrosion

in coal tests a method is proposed involving titrations of the washings for free and for combined acids, and a knowledge of the S content of the coal. H. L. OLIN

Heat balance spots controllable losses. A. A. POTTER AND H. L. SOLBERG. *Purdue Univ. Power* 68, 1045-8(1928).—Heat losses consist of sensible heat carried away by flue gas, CO in flue gas, C in ash, heat required to evaporate H₂O of coal and to superheat H₂O of coal and air, combustion of H at temp. of flue gas and unclassified losses such as radiation, etc. Charts and equations are given from which these losses can be evaluated. D. B. DILL

The propagation of a zone of combustion in coal. V. 1. The effect of temperature. 2. Temperature of spontaneous propagation. S. H. JENKINS AND F. S. SINNATT. *Fuel Science Practice* 7, 556-62(1928).—Previous work (*C. A.* 22, 153) has shown that when coal is formed into a train of fixed dimensions, and one end of the train is heated momentarily, the combustion traverses the train of coal. The zone in which combustion proceeds is followed by observing the color change from the brown of the coal dust to the black of the oxidation product. On placing the train of coal dust in an oven at various temps. it was found that the rate of travel of the combustion zone increased as the oven temp. was raised. At 16° the rate was approx. 0.16 in. per min.; at 150°, 0.42 in. per min. After heating 10 min. at 210° the entire train burned spontaneously. When the coal was formed into a conical pile the heating originated within the pile. Packing of the particles together retarded the combustion. D. A. REYNOLDS

The hydrogenation and liquefaction of coal. V. The influence of composition, pressure, temperature and catalysts upon hydrogenation. D. G. SKINNER AND J. IVON GRAHAM. *Fuel Science Practice* 7, 543-55(1928).—Hydrogenation expts. were carried out in a large rotating autoclave, previously described (*C. A.* 19, 1188, 1767). The procedure has also been described (*C. A.* 21, 1175). A charge of 200 g. of 60-mesh (I. M. M.) coal, together with 100 g. of pure PhOH, was used in each expt. The products were sep'd. into: (a) PhOH-insol. residue; (b) PhOH-sol., CHCl₃-insol. powder; (c) PhOH-sol., CHCl₃-sol. liquid; (d) light spirit boiling below 150°; (e) water; (f) gases. Destructive-distn. tests at 450° were made for comparison, and the results of these tests show that, with most coals, there is a marked increase in oil production under the conditions of hydrogenation. The effect of catalysts was studied by using 5% of the oxide, or equiv. mixed intimately with the coal. Fe₂O₃ caused an increased oil yield of as much as 3% with some coals, the effect being the greatest with those coals otherwise giving moderate oil yields. Use of Fe₂O₃ on destructive distn. caused a decrease in oil yields, with one exception. Ni₂O₃ was a more effective catalyst; with one bituminous coal, products d and c were increased approx. 2.5 and 6.0%, resp., while products b and a were reduced 0.7 and 8.6%. Ni oxalate increased d 4%, c 9.0% and reduced b 3.7% and a 11.0%. NH₄ molybdate was the most effective catalyst, causing yields of 12.6% of d, 60% of c and only 5.5% of a. Hydrogenation of the residues of coal following extns. with PhOH and C₆H₅N shows that, with one coal at least, the PhOH-sol. constituents of coal are unattacked during hydrogenation whereas the greater portion of the C₆H₅N ext. is convertible to oil. Increasing the pressure from 155 atms. (that used as standard) to 245 atms. caused an increase of 5.3% of product c. Very fine grinding apparently favored the caking of coking coals, thus preventing the action of H. Product b was formed in quantities varying from 0.6 to 33%. It was in each case a brown powder of low sp. gr., contg. approx. 33% volatile matter. It melted between 260° and 310° and evolved oil between 320° and 340°. Rapid swelling attended its decompn.; the cokes thus formed were very fragile and exceedingly swollen. When b was mixed with the non-coking residue a, in the proportions in which produced by hydrogenation, and the mixt. coked, a very swollen coke was obtained. Product c was a viscous liquid with aromatic odor. It contained approx. 86% C, 7.5% H, 4% O, with less quantities of N and S. Generally 30% or less of c distd. below 300°. Unsaturated substances were found in the liquid, but not in the gaseous products. D. A. R.

Net hydrogen-volatile matter ratio in American coals and its use in producer-gas calculations. WILBERT J. HUFF. *Ind. Eng. Chem.* 20, 1371-2(1928).—The ratio carbon/(oxygen + ash) is not satisfactory for high-grade cannel, boghead, and similar coals when used as a basis for calcg. heating values. Such a method also disregards S. The equation of Diederichs, $H = V[7.35/(V + 10)] - 0.013$, and that of Seyler $H = a + b \log V$, where H is the % net hydrogen and V is the % volatile matter, have found extensive use. H. proposes the following formulas based on the work of Fieldner and Selvig (*C. A.* 13, 66): B. t. u. per lb. between 12,000 and 12,499, $H = 2.1 + 0.06 V$; B. t. u. between 12,500 and 14,499, $H = 3.95 \log_{10} V - 1.19$; B. t. u. per lb. over

14,500, $H = 0.42 + 3.2 \log_{10} V$, where H is the % net hydrogen and V is the % volatile matter. The correspondence between calcd. and exptl. values is within 0.2% of H . The use of the equations in producer-gas calcs. is illustrated by an example.

A. J. MONACK

A method of calculating pounds of air per pound of coal. W. H. MARTIN. Oregon State College. *Power* 68, 1059(1928).—The wt. ratio O/C is calcd. for flue gas from its compn. If one lb. of fuel contains a lbs. C, b lbs. H and c lbs. O, then wt. of air supplied per lb. of fuel = $[(O/C) a + 8b - c]/0.23$.

D. B. DILL

A partial dehydrogenation process for rendering certain hydrocarbons suitable for agglomeration of coal. ANDRÉ LÉAUTÉ AND GEORGES DUPONT. *J. usines gas* 52, 507-8(1928); cf. *C. A.* 22, 3761.—Application of the process to pitch was not successful.

F. S. GRANGER

The relationship between the specific gravity and ash contents of the coals of Korea and Bokaro: coals as colloid systems. L. LEIGH FERMOR. *Fuel Science Practice* 8, 16-29 (1928); cf. *C. A.* 22, 2452.—A definite empirical relationship between the ash contents and density of Korea coals is $a = 100(g - K)$; where K , the sp. gr. of pure ash-free bright coal equals 1.26, the ash contents (a) of other Korea coals of sp. gr. (g) were governed by this formula. This formula does not hold for carbonaceous substances contg. over 50% ash nor for certain coals that yield ashes of quite different chemical compn. The macroscopically homogeneous substances making up the majority of these coals are vitrain, durain, and micaceous carbonaceous shale. Fusain occurs infrequently in films.

D. H. REYNOLDS

The Bristol and Somerset coalfield: The carbonization of "Parkfield large gas" coal. C. H. LANDER, et al. Dept. Sci. Ind. Research. *Fuel Research* 1928, No. 12, 35 pp.—The purpose of the survey was to evaluate coals from the Somerset field with respect to their suitability for gas making. Tests were made in both vertical and horizontal retorts at high temps. as well as at low temps. Analytical data and logs of yields are given.

H. L. OLIN

Low-temperature carbonization at Dunston. ANON. *Ind. Chemist* 4, 473-7 (1928).—The purpose of the process is not to make domestic smokeless fuel, but to obtain certain liquid by-products from the coal without any additional charge for fuel for the generation of elec. power. Northumberland "rough slack" is screened to remove all below 0.25 in., preheated by chimney gases, and delivered to the retorts from which the coke is extracted by hydraulically operated toothed rollers. The fuel bed in the retorts is relatively shallow, and the coal requires about 3 hrs. to pass through the retort. The heating medium is a mixt. of hot gases and low-pressure steam, the former supplied by the combustion of fuel in a fire-brick chamber below each retort. The temp. in the retorts is adjusted to between 650° and 700° C. The rich gas from the top of the retorts is purified in the usual way, and the light oils are absorbed by wash oil. The through-put is about 100 tons per day. Illustrations, a diagram of one section of the plant and a flow-sheet are included.

E. G. R. ARDAGH

New observations on the origin of fusain. H. BODE. *Mitt. Abt. Geistes Kohle u. Sals. Untersuch.* 3, 12-22(1927); *Fuel Science Practice* 7, 487-92(1928); cf. *C. A.* 22, 2727.—A historical and critical review is given of many investigations of the origin of fusain. Fusain is a primary constituent of coal because of its proved existence in coal balls, in the sphaeroiderites of brown coals, and in primeval peat. While the theory of forest-fire formation is the only one which stands scientific criticism and is realizable experimentally, other theories must not be excluded.

D. A. REYNOLDS

Vitrain. M. M. EVANS, L. SLATER AND R. V. WHEELER. *Fuel Science Practice* 8, 30-6(1928).—Vitrain has been studied mainly with polished and etched surfaces viewed with incident light because transparent sections of this brittle substance are difficult to prep. All specimens of vitrain examd. in this manner have disclosed the appearance of plant cells, usually derived from cortical tissues; these plant cells are evidently pseudomorphs of the original structures. Vitrain is newly defined as a simple substance (as distinct from the aggregates, clarain and durain) consisting of ulmin compds. which have infilled plant cells and partly, if not entirely, replaced the materials of the cell walls, from which much of the ulmin material may have been derived *in situ*. Three main types of structures in British vitrains are: (1) parenchyma—thin-walled polygonal cells; (2) periderm—composed chiefly of sclerenchyma; (3) xylem—thick-walled cells of fragmented form. These structures are described and illustrated. The methods of polishing and etching specimens for microscopic examn. are described.

D. A. REYNOLDS

Refractory materials. Their uses in vertical retorts. A. T. GREEN. Derbyshire Silica Firebrick Co. *Gas World* 89, 554-7(1928).—A lecture.

F. S. GRANGER

Remarks on the operation of Woodall-Duckham continuous verticals at Lausanne. F. GILLIARD (in French) AND H. HAEMIG (in German). *Monats-Bull. schweiz. Ver. Gas u. Wasserfach.* 8, 317-26(1928). F. S. GRANGER

Recent developments in the production of motor fuels from coal. A. C. FIELDNER. *Fuel Science Practice* 7, 492-501(1928); cf. *C. A.* 23, 259.—A review of the production of motor fuel by: (1) the carbonization of coal, (2) the Bergius process and (3) the complete gasification of coal and conversion of the gases by pressure synthesis. F. believes the Bergius process, or some modification of it, will prove most economical. D. A. REYNOLDS

Motor alcohol. KAREL PETRLÍK. *Chem. Obzor* 3, 337-8(1928).—Dynalkol, the composition of which has been already given (*C. A.* 22, 3513) proved to be an ideal fuel in Czechoslovakia. JAROSLAV KUČERA

Distillation of peat. V. I. RAKOVSKII. *J. Chem. Ind. (Moscow)* 5, 915-9(1928).—If water vapor is injected into the retort in the course of distn. of peat, the distd. tar contains less asphaltenes than is the case in absence of a vapor current. Thus, in the former case the asphaltenic content is 1.5%, in the latter 5%. While F. Fischer (*Umwandlung der Kohle*, 97) expressed the opinion that this phenomenon is due to oxidation by water, R. does not believe that H_2O is the source of O combinations in the tar. The role of H_2O is rather that of impeding the condensation processes which normally take place with formation of water. BERNARD NELSON

Heat transfer in ammonia condensers. II. ALONZO P. KRATZ, HORACE J. MACINTYRE AND RICHARD E. GOULD. Univ. Ill. *Eng. Expt. Sta. Bull.* 186, 26 pp. (1928); cf. *C. A.* 22, 1228.—The condenser used was a 10-ton vertical shell-and-tube previously employed but modified by raising the level of the liquid or by blocking off a number of tubes, thus reducing its effective surface. By varying this surface it was found that the condenser tonnage per unit of surface is independent of the size or the proportion of the condenser and that it is a function only of the initial temp. of the water and of the amount circulated per unit of surface and time. The results confirm also the general principle that rate of heat transfer varies inversely with the thickness of film of liquid NH_3 on the tubes and directly with temp. gradient. Tests with superheat removers showed that the coeff. of superheated NH_3 to water was only one-eighth that of satd. NH_3 . H. L. OLIN

Waste-heat boilers conserve oil and make saving. S. H. GRAF. *Am. Gas J.* 129, 12-7(1928).—Waste-heat regenerative boilers at a Portland Oregon, gas plant return 10% on investment costs. H. L. OLIN

Cost of gas dehydration. G. A. BRAGG. *Am. Gas J.* 129, No. 6, 37-41(1928); cf. *C. A.* 22, 1670. Cost figures are given, based on studies made with different types of plants, viz (1) absorption with hygroscopic solus., (2) refrigeration and (3) compression. H. L. OLIN

Effect of carbon dioxide on plant economy. B. C. SPRAGUE. *Power* 69, 62(1929).—Changes in % CO_2 in boiler outlet gases should be considered in relation to temp. of outlet gases, temp. rise of water in economizer, temp. rise of air in air heater, temp. of superheated steam, combustible material in refuse of stoker-fired boilers and amt. of combustible gas in flue gas. D. B. DILL

Gas-producer theory and design. E. TERRES. *Gas Wasserfach* 71, 1205-13 (1928). Gas producers should be designed and operated to give max. H with minimum CO_2 . Charts are given for efficiency and air requirements for combustion with varying percentages of H and CO_2 . The ordinary diagram of CO_2 concn. at diff. points of the producer is erroneous. Actually the central part of the producer has the lowest CO_2 percentage (4.2% in one instance) and the highest (7.0%) near the walls. The av. CO_2 percentage can be reduced by proper design. For a fuel of a given size the efficiency of a producer increases with increasing height and diam. to max. values and then decreases. Diam. is also limited by difficulty in air distribution. The zone of high CO_2 at walls can be reduced by reducing radiation. Water cooling of walls increases CO_2 as much as 3-4%. Coke smaller than 2 mm. is likely to form "flying dust" and comprises 80% of that carried by the gas. Slight increases in diam. and height decrease dust in gas. Ash content of fuel has little effect on the amount of gas which a given producer can make, as higher ash content results in higher air temp. Details are given of the exptl. producer and the method of air distribution is illustrated. R. W. RYAN

Commercial possibilities in the use of synthetic hydrocarbon processes in the gas industry. W. W. ODELL. *Bur. Mines, Repts. Investigations* No. 2903, 15 pp. (1928).—Peak requirements demand available gas-generating app. which is idle a large part of the year. To care for irregular demand, as well as to insure independence of petroleum

products for enriching, it has been suggested that water-gas and synthetic hydrocarbon production be carried out together to give an enriched gas. During off-peak demand, liquid hydrocarbons could be prep'd. for motor fuels and for enriching requirements of future peak gas production. Sufficient data are not available to det. the applicability of this process; purification requirements are uncertain and the com. development of the proper type of catalyst has not been studied.

A. S. CARTER

Refractories in the gas industry. E. W. SMITH AND H. M. SPIERS. *Gas World* 89, 579-88; *Chemistry & Industry* 47, 1278-84(1928).—Raw materials and requirements, including constancy of volume, freedom from disintegration under temp. fluctuation, refractoriness under load, chem. stability, mech. strength, shape and texture, are discussed.

F. S. GRANGER

The regenerative complete gasification system. A. K. COLLINGE. *Gas World* 89, 557-60(1928).—The Preston plant is described. Also in *Gas*, J. 184, 673-6(1928).

F. S. GRANGER

Water gas from bituminous coal. J. GWOSDZ. *Gas Wasserfach* 71, 1233-9, 1253-9(1928).—A critical review of methods of producing water gas from bituminous coal, including American methods, especially the "back run" method, the production of low-gravity water gas, tar cracking, the new Winkler generators at Leuna Works, and complete gasification. The last method is suggested for stand-by equipment if gas is purchased from a super-gas system.

R. W. RYAN

The new Sulzer dry quenching installation at the municipal gas works at Schaffhouse, Switzerland. H. KAESER. *Directeur du Service. J. usines gaz* 52, 529-31(1928).—Operation and performance are described.

F. S. GRANGER

Detecting leaks in gas lines. HANS LÖFFLER. *Z. kompr. u. flüss. Gase Pressluft-Ind.* 27, 77-8(1928).—Illuminating-gas leaks can be readily detected by means of Strache's instrument, called the "Rapid" gas detector. The instrument operates by indicating the increase of pressure within a metallic bellows when the gas diffuses through a porous diaphragm forming one side of the bellows.

R. L. DODGE

New catalytic processes for the utilization of coal-tar crudes. A. O. JAEGER Selden Co., Pittsburgh. *Ind. Eng. Chem.* 20, 1330-5(1928).—One of the chief obstacles to the production of vat dyes derived from anthraquinone has been the difficulty of obtaining high-grade anthracene from the crude material. The processes usually employed for purification of crude anthracene are expensive and slow. Two basically different processes are described. (1) By selective catalytic oxidation at 360° to 440° in the vapor phase, the heterocyclic impurities, paraffin impurities and aliphatic compds including phenanthrene, may be burned out, yielding anthracene of high purity. The catalysts are metallic oxides "stabilized" by compds. of the alkali metals, alkaline earth metals and some earth metals that form difficultly reducible oxides. The purified anthracene may be condensed as such, or may, in the same operation, be passed directly through a second specific catalyst for direct air oxidation to anthraquinone. Zeolites contg. V_2O_5 as one of the amphoteric oxides are eminently adapted for this latter purpose. (2) If it is desirable to recover the carbazole impurity of the crude anthracene, a different method of purification is described, using furfural as a specific sepg. solvent for anthracene. The recovery of anthracene is about 96%. The product is usable for catalytic oxidation to anthraquinone. The phenanthrene and carbazole are recoverable from the mother liquor.

R. L. DODGE

The coal-tar phenols. HORST BRÜCKNER. *Tech. Hochschule, Dresden. Erdöl u. Teer* 4, 562-4, 580-3, 598-602(1928).—The first complete even qual. sepn. of the cresols and xylenols in coal tar has been accomplished quantitatively. Various methods and their limitations are reviewed. The decompn. of the sulfonic acids with superheated steam, yielding the original phenols (Raschig, *D. R. P.* 114,975 (1900)), previously applied only to *m*- and *p*-cresol, was used for the primary sepn. The phenols are heated with an equal wt. of H_2SO_4 (sp. gr. 1.84) for 3 hrs. at 103°. The product is dild. with several vols. of water and distd. As concn. progresses, the b. p. rises, and the temp. is held at each decompn. interval, until no more phenol passes over, by regulating the passage of steam through the mixt. For each phenol there was found to be a definite temp. interval at which its sulfonic acid decompd., namely, for phenol (I) 123-6°, *o*-cresol (II, III) 133-6°, *m*-cresol (IV) 116-9°, xyleneol 1, 2, 3 (V) 115-8°, 1, 2, 4 (VI) 11°, 1, 3, 2 (VII) 124-8°, 1, 3, 4 (VIII) 121-5°, 1, 3, 5 (IX) below 105°, 1, 2, 4 (X) 8°, *o*- or *p*-ethylphenol (XI, XII) below 105°, *m*- (XIII) 125-30°. Starting with individuals, the yields are 90 to 100%. The method was tried successfully first on synthetic mixts. and then on com. high-temp.-coal-tar cresol and xyleneol fractions. The sepn. was facilitated by first fractionating the mixts. and treating various fractions separately. In cases where 2 or more phenols were obtained within the same temp.

range, secondary sepn. by other methods were resorted to. IX was sepd. from XI and XII, and IV from V and X, by means of the *soly. of the Na phenoxides in 25% NaOH*, the salts of IX, V and X being only slightly and all of the others very sol. I was sepd. from VIII, and II from III, by the differences in *soly. of the Na phenoxycetates*, prepd. as below, VIII and II giving easily sol. and I and III only slightly sol. salts. XI and XII may be sepd. as Ba salts of their sulfonic acids (Scmpotowski, *Ber.* 22, 2674 (1889)). The sepn. of X from V was effected only qualitatively, by means of the slight *soly. of the sulfonic acid of X in 50% H₂SO₄* (Ges. f. Teerverwertung, Duisberg-Meiderich, *D. R. P.* 447,540). VII, owing to its very weak acidic properties, is not extd. in considerable quantity by the usual NaOH treatment and so is not likely to be found in tar phenols. Good yields, usually about 80%, were obtained in most cases, and the identities of the products were confirmed by the mixt. m. p. method, applied to the phenoxycetic acids. For the prepn. of these, Glud and Breuer's method (*C. A.* 14, 938, 1432) was found unsuitable. The method of Steinkopf and Höpner (*C. A.* 20, 2905) proved satisfactory when modified as follows. Ten g. of the phenol, in a 100-cc. Erlenmeyer, is stirred intimately with 2.5 equivs. of finely powd. NaOH until the heat liberated is dissipated. Ten g. of ClCH₂COOH is then stirred in, an air condenser is attached at once and the flask is well shaken. The reaction is completed in about 2 mins. The product is dissolved in water, pptd. as free acid by HCl, dissolved in ether and extd. as pure Na salt by Na₂CO₃ soln. IX was obtained in such a pure state, in the steam distn. of the sulfonated crude tar-xlenol mixt., that it crystd. even in the condenser. In the tar products, the cresols were found in the proportions, ortho 35%, meta 37% and para 28%, and the xlenols, VI 18.1%, VIII 11.1%, IX 36.6% and V + X 21.4%. VII and the ethylphenols were absent. The sepn. of *m*-cresol, from the other cresols, as the trinitro deriv., by the method of Raschig (*Z. angew. Chem.* 13, 759 (1900)), in which the other cresols are destructively oxidized, was found inapplicable in the presence of either phenol or xlenols, because of the formation of cryst. di- and trinitro derivs. with the former and resinous products with the latter.

F. S. GRANGER

The "e-phenols" of primary tar. G. VAVON AND N. ZAHARIA. *Inst. de chimie de Nancy J. usines gaz* 52, 534 7(1928).—It is shown experimentally that phenols in general are extd. from their aq. phenolate solns. by org. solvents, because of hydrolysis, and that the % of total phenol extd. increases with the *soly. of the phenol in the solvent used* and with the relative vol. of the solvent, and decreases with increasing concn. of the aq. soln. or excess of alkali. At very high concns., however, aq. phenolate solns. become miscible with ether, leaving only a small aq. layer, contg. only free alkali liberated by hydrolysis. Phenol itself is hydrolyzed much less than any of the large no. of homologs tried. The degree of hydrolysis, or % extd., is decidedly greater with the ortho derivs. and increases with the no. and size of the side chains. These facts are presented in explanation of the results of Weindel (*C. A.* 19, 3368), who extd. primary tar phenolate solns. with ether and considered the phenols so extd. to belong to a different class, which he designated as "e-phenols."

F. S. GRANGER

Fire protection of tar operations with special reference to extinguishing methods using foam. VON BEZOLD. *Teer u. Bitumen* 26, 613 7(1928).—A general discussion.

F. S. GRANGER

Water instead of mercury in the Kraemer-Sarnow method. TH. HEYDECKE. *Teer u. Bitumen* 26, 567-8(1928).—Water can be substituted if the softening point of pitch is not over 90°, thus avoiding the danger of Hg poisoning. Exact agreement between the 2 methods was obtained on a variety of samples. The accuracy was improved by inserting a loose wad on top of the pitch, to hinder the chilling effect of the slightly cooler exposed water.

F. S. GRANGER

A further study of coke formation. R. A. MOTT AND T. SHIMMURA. *Fuel Science Practice* 7, 472 86(1928); cf. *C. A.* 21, 1700. —Fourteen coals, 9 "brights" and 5 "hards" from the Yorkshire and Derbyshire collieries were used. The C content (pure coal basis) of the hards ranged from 82.1 to 85.2%. Both lump and powd. samples were heated in N to 900° at rates of 1° and 5° per min. At the slower rate, the swelling was roughly proportional to the C content. Swelling was not found to be due to rate of gas evolution during the plastic state. By carbonizing coals preheated, 390° to 450°, both before and after ether extn. of the preheated coals, it was shown that removal of these ether sol. oils causes marked decrease in the coke strength. It is suggested that the first stage of coke formation from crushed coal is the liquation of oil to the surfaces of the coal particles until these are completely wetted, and the second stage is the loss of identity of the coal particles with the formation of pore structure due to swelling. Numerous photographs of the cokes produced are included.

D. A. REYNOLDS

The grinding of coke for analysis. J. HILKS AND R. A. MOTT. *Fuel Science*

Practice 7, 509-11(1928).—The ashes were analyzed from several cokes pulverized by 5 methods: (1) agate mortar and pestle, (2) Mn-steel mortar, (3) Wedgewood mortar, (4) iron mill and (5) iron bucking board. The results show that the use of the Mn-steel mortar does not introduce an error such as may be caused by contamination on grinding by methods 3, 4 and 5.

The coking industry in Hokkaido. MASANA KAWAGUCHI. *J. Fuel Soc. (Japan)* 7, 1093-7(1928).—A review.

D. A. REYNOLDS

F. I. NAKAMURA

Preparation of special limes from brown-coal ashes (LUFTSCHITZ) 20. Operation of Siemens-Martin furnace with mixed gas (HEILIGENSTAEDT) 9. Spark ignition (JONES) 2. Indene and styrene (BROWN) 10. Carbon monoxide hazard in city streets (CONNOLLY, *et al.*) 14. Distn. of tar or oils (Fr. pat. 641,473) 22. Detecting gas leakage (Austrian pat. 109,988) 13. Hydrogenation of org. substances (Fr. pat. 641,035) 10. H from water gas, etc. (B. it. pat. 291,409) 18. Dry sepn. of materials such as coal and slate (U. S. pat. 1,699,382) 13. C_2H_4 and other olefins (Brit. pat. 291,186) 10. App. for classifying coal and other minerals (Fr. pat. 642,215) 1. Automatic charging device for gas generators, blast furnaces, etc. (Ger. pat. 470,023) 1. Water gas, H_2PO_4 and molten cement (Fr. pat. 639,412) 18. Charging device for gas producers and other shaft furnaces (Ger. pat. 469,392) 1. Sepg. gases by liquefaction (Ger. pat. 469,446) 13. Me formate or similar formates as solvents in purifying oils (Brit. pat. 291,817) 13.

THIEMANN, A. E.: Kraftstoffe, Verbrennung und Schweröl-Vergasermotoren. Berlin: R. C. Schmidt & Co. M. 15.50. Reviewed in *Engineering* 126, 766(1928).

Fuel. THE CARBOCITE CO. Fr. 641,110, Aug. 3, 1927. A smokeless fuel is made by forming into balls in a rotating retort residues while still plastic from the distn at low temp. of very volatile coals.

Fuel. TRENT PROCESS CORP. Fr. 640,324, Aug. 31, 1927. Finely divided coal is heated with oil under pressure until soln. takes place.

Liquid fuel. GRANT HAMMOND (to Fuel Development Corp.). U. S. 1,699,355, Jan. 15. In prepg. a fuel suitable for use in automobile engines commercial gasoline is treated with a small quantity of a water-sol. alc. such as $EtOH$ and the mixt. is heated in a closed retort to produce a pressure of about 25 lbs. per sq. in., then cooled to normal atm. temp. and pressure and the mixed alc. and hydrocarbon is then decanted.

Liquid fuel. HANS HERZOG-IN ALBON and W. HÜSSY-BÜHLER. Swiss 127,555, Mar. 8, 1927. Motor fuel consists of petroleum and alc. in the proportion 9:1, which is led over a catalyst such as fused Pb or unslaked lime. Cf. C. A. 22, 1229.

Fuel and air supply apparatus for burning finely divided fuels. JOSEPH MOLZ (to Babcock & Wilcox Co.). U. S. 1,698,555, Jan. 8. A stream of fuel is projected downwardly into a conical space in the upper part of a combustion chamber to which air is supplied tangentially below the fuel inlet.

Fuel blocks. H. V. T. MILLS and V. D'O. NOBLE. Brit. 291,958, Aug. 8, 1927. Small coal is mixed with cement, sawdust and creosote.

Distilling fuel. HENRI DE LIPKOWSKI and PIERRE-JUSTIN-PAUL FUSIER. Fr. 640,940, Sept. 1, 1927. A distn. furnace has one combustion chamber in which individual furnaces contg. the fuel to be distd. are disposed in series so that combustion and distn. are propagated from one end to the other so that the distn. as a whole is continuous. Alternately the individual furnaces are movably mounted on a movable frame.

Distilling fuel. HARALD NIELSEN and BRYAN LAING. Fr. 640,451, Sept. 5, 1927. See Brit. 287,381 (C. A. 23, 503).

Distillation of fuels. PAUL GUSTAVE GRENF. Fr. 33,079, Sept. 24, 1926. Addn. to 629,406. The vapors from the distn. of solid fuels are treated in the presence of a catalyst on a base of active C as described in Fr. 629,406 for liquid fuels.

Distillation of solid fuel. MISTISLAV KULZINSKI. Fr. 642,046, Oct. 6, 1927. The fuel is placed in a tunnel-still in layers permeable to gas and is moved from one end of the tunnel to the other, during which it is heated with superheated steam mixed with gases and vapors from bitumen and oil. The steam, etc., passes transversely through the layer several times and at the same time is moved longitudinally in the tunnel, being reheated after each passage.

Distilling solid fuels of coking character. H. NIELSEN and B. LAING. Brit. 292,060, Dec. 4, 1926. The material treated is subjected to the action of hot gases contg. a controlled quantity of O (2-8%) or an oxidizing constituent to oxidize some

of the coking constituents and influence their coking power and, after carbonization, the solid residue is treated with steam to effect gasification. Carbonizing may be effected at 600° or lower, followed by a high-temp. treatment up to 1200°. A free-burning residue is obtained, which is not coated with graphitic C and is easily oxidized by the O of ores such as oxides of Cu or Fe or by steam in a water-gas producer. Various details are given.

Gasifying bituminous fuels. ALBERT BREISIG. Austrian 110,369, Mar. 15, 1928. Addn. to 107,421. The method of Austrian 107,421 (see Austrian 109,169, C. A. 22, 4778) is modified by circulating the gases through the accumulators without preliminary sepn. of tar.

Agglomerating powdered fuel. AURÉLE LOUIS JOSEPH VOINCHET and ACHILLE ARMAND LERCIU. Fr. 641,137, Sept. 14, 1927. Kaolin or Al silicates and silicates of Na or K are added to powd. coal and the mixt. is pressed and treated with a soln. of an alk. earth salt, e. g., CaCl₂.

Process and plant for burning powdered fuel. ÉMIL BARTHELMESS. Swiss 127,483, Mar. 21, 1927. The fuel is fed to a furnace directly from a crushing mill and the feed is regulated by feeding addnl. fuel from a storage receptacle arranged between the mill and the furnace.

Oven for heat-treating, coking or partly distilling fuel. OTTO HELLMANN. Ger. 467,845, June 9, 1926.

Fuel for gas engines. DEUTSCHE ERDÖL A.-G. Ger. 468,500, Feb. 12, 1925. Fuel for gas engines, particularly suction gas engines, is prepd. from semi-coke obtained by the low-temp. distn. of compressed bituminous materials, such as lignite, coal, shale or peat, the semi-coke having a moisture content not exceeding about 15% by wt. and being so subdivided that at least 90% is in granules of less than 5 mm. diam.

Coal containing less than 2% of ash. SOCIÉTÉ ANON. D'OUGRÉE MARIHAYE. Fr. 640,925, Aug. 9, 1927. After the usual flotation treatment with a soln. of ZnCl₂ to obtain a coal having 3–5% ash, the latter is again treated with a liquid of lower density to obtain a coal having less than 2% of ash.

Apparatus for sorting anthracite. A. A. LOTOTZKII. Russ. 4831, Mar. 31, 1928. Mech. device.

Disintegrator for preparing coal dust. N. I. GRIGORIEV and P. I. GRIGORIEV. Russ. 4860, Mar. 31, 1928. The app. is heated with steam and the gases and moisture from the coal are carried off by a blower.

Oven for drying coal. G. A. ARONS. Russ. 5054, Apr. 30, 1928.

Treatment of coal, peat, schist, etc. THOMAS D. KELLY. Fr. 642,310, Aug. 22, 1927. Coal, etc., is heated to 70–300° with an alk. soln. of Na, K or NH₄ oleate and Al₂(SO₄)₃ is added to solidify the oleate. The solid material is sepd. and molded or used as a pigment or mixed with rubber or polymerized oils. It may be distd. with water or steam to form a gas or can be used as a fuel. The liquid products may be fractionally distd. or used for making waterproof dressings or on roads.

Heat treatment of coal, mineral oils, etc. I. G. FARBENIND. A.-G. Fr. 641,344, Sept. 23, 1927. Coal, tar, mineral oils or their products of distn. as well as carbonaceous material of animal or vegetable origin which is to be submitted to a high temp. under pressure, e. g., for hydrogenation, are given a preliminary treatment in a vessel the walls of which form an elec. resistance and are heated by an elec. current. The vessel may be a straight or a serpentine tube. The material enters the heating chambers from the tubes, and the walls of the chambers may be heated in the same way.

Carbonizing finely divided coal or similar fuel. SAMUEL MCFEWEEN (to International Coal Carbonization Co.). U. S. reissues 17, 181–2, Jan. 1. See original pat. 1,481,140, issued Jan. 15, 1924 (C. A. 18, 895).

Carbonizing coal. COMPAGNIE HOUILLERE DE BESSEGES. Brit. 291,341, May 27, 1927. Non-caking or anthracite fines are agglomerated with about 5% of tar, pitch or a phalt, and briquets formed of this mixt. are suddenly heated to 700° or a higher temp. to form an "artificial anthracite" and a gas rich in H. Semi-coke obtained by low-temp. carbonization of coal may be similarly treated.

Carbonizing coal. WALTER RUNGE (to The International Combustion Engineering Corp., to the International Coal Carbonization Co.). Can. 285,723, Dec. 18, 1928. Pulverized coal is fed into the top of a vertical retort, the upper portion of which is cooled and the lower portion heated, and there is introduced into the retort at a point near the bottom a combustible gas whose temp. is approx. 1500° F. and at a point approx. midway a combustible gas whose temp. is such that when mixed with the gases rising from the bottom of the retort the resulting temp. is below the dew point of the vapors. The coal is caused to pass counter to the upwardly rising gases in such a manner that

it loses a large part of its volatile hydrocarbon content in the form of gases and vapors. The condensable vapors are condensed in the upper part of the retort and returned to the bottom portion for a second heat treatment. The coke and gases produced are removed and collected. Cf. *C. A.* 23, 691.

Heating and carbonizing powdered coal. W. E. TRENT (to Trent Process Corp.). Brit. 291,062, Oct. 25, 1926. Powdered coal or similar material is heated and carbonized by utilizing the heat obtained by the exothermic reaction which occurs during the heat treatment. Hot waste gases from a boiler plant may be utilized to distil powdered coal and the residue of the coal may be gasified in a producer and the gas employed to heat the boiler. The gases and vapors generated during the heat treatment of the powdered coal travel with the particles of the latter and serve to assist in agitating and conveying it and to heat it slowly to its fusion temp. and prevent agglomeration during carbonization.

Low-temperature carbonization of coal. M. J. McQUADE. Brit. 291,962, June 14, 1927. Coal is moved through a retort by forward movements alternating with backward movements of lesser extent, to facilitate escape of volatile matter into the space above the charge by agitation of the fuel. An app. is described comprising a horizontal retort contg. a screw conveyor which is periodically reversed.

Apparatus for low-temperature carbonization of coal or similar materials. FRANZ PUENING. U. S. 1,698,349, Jan. 8. Solid heat-transfer bodies such as iron balls or cubes are heated outside of a distn. chamber to a sufficient temp. to impart heat to a charge in the distn. chamber and are then introduced into the latter to effect distn. and carbonization of the material under treatment.

Distilling coal, etc. T. A. GOSKAR. Brit. 291,836, March 1, 1927. Finely divided caking coal and a binder consisting of a solid hydrocarbon of the paraffin or terpene series, bitumen, resin, etc., are intimately mixed and finely ground coal waste, anthracite duff, coke breeze or the like is added, and the mixt., preferably after being formed into briquets, is distd. The material may be fed continuously to the distn. retort and the latter may be supplied with producer gas, water gas or superheated steam and may be externally heated. Various details are given.

Distilling coal in a continuous tunnel kiln. PHILIP D'H. DRESSLER (to American Dressler Tunnel Kilns, Inc.). U. S. 1,698,493, Jan. 8. Coal is passed through the kiln passageway and heat is transmitted to the coal by circulating the kiln. atm. through a space partially sepd. from the passageway and in which the circulating atm. is heated and mixed with a decarbonizing fluid such as steam before being returned to the passageway. Various details of app. are described.

Low-temperature distillation of bituminous coal. RICHARD H. CARR and CORNELIUS B. WATSON (to Pure Oil Co.). U. S. 1,698,907, Jan. 15. In effecting coking and low-temp. distn. without active combustion, a body of the fuel is forced upwardly through a closed receptacle into the upper part of which is introduced a gaseous heating medium comprising superheated steam under temp. conditions which suffice to coke the fuel body in the upper portion of the receptacle without combustion; a portion of the primary distn. products is removed from the fuel body at a point between the fuel inlet and the coke outlet and these products of distn. are caused to traverse the fuel body in a direction counter-current to the direction of travel of the fuel body prior to the release of the distn. products from the receptacle. An app. is described.

Distilling coal or other solid carbonaceous materials. FRANZ PUENING. U. S. 1,698,345, Jan. 8. The entire distn. is effected by use of heat stored in solid heat-storing bodies such as iron balls which are brought into contact with the material undergoing distn. after they have been previously heated. An app. is described.

Distilling coal, peat, shale, lignite or other solid carbonaceous materials. FRANZ PUENING. U. S. 1,698,346, Jan. 8. Heat effective for causing carbonization is stored in vertical parallel spaced plates which may be formed of iron and preliminarily heated by hot gases and the material to be carbonized is then fed into the spaces between these heated plates and is carbonized by the heat previously stored in them. Various details of construction are described.

Distilling coal, lignite, shale, peat or other carbonaceous materials. FRANZ PUENING. U. S. 1,698,240, Jan. 8. The material is charged into spaces between relatively movable heating walls which may be formed of iron and after the distn. is effected the walls are moved apart to widen the space between them and facilitate discharge of the residue and are then returned to their original spacing. Various structural details are described.

Apparatus for distilling coal or other carbonaceous materials. FRANZ PUENING. U. S. 1,698,348, Jan. 8. Heating walls are carried by relatively movable supports pro-

vided with cooling channels and various details of construction of these and other features of the app. are specified.

Destructive hydrogenation. KOHLENVEREDLUNG A.-G. Brit. 291,481, Jan. 20, 1927. Solid bituminous substances, fuel and the like, are simultaneously distd. and hydrogenated in suspension in a stream of heating gas which may either be itself a hydrogenating agent or into which H or a H-supplying substance is admixed. CaH_2 , NaH, formic acid, H, steam and water gas may be used for effecting the hydrogenation.

"Smokeless fuel" from coal, lignite, etc. ILLINOIS ANTHRACITE CORP. Brit. 291,206, April 26, 1927. Coal, lignite or similar material is continuously passed through a retort or gas producer at a "comparatively fast" rate while maintaining a shallow bed of fuel which is continuously agitated to prevent sticking; heat is generated by restricted combustion so that only a part of the volatile matter is consumed and substantially none of the fixed C. The residue may contain about 12% volatile matter. An app. is described.

Rotary retort construction for distilling shale, coal, peat, etc. G. MENELL. Brit. 291,550, March 17, 1927.

Working coal-dust furnaces for steam boilers with superheater attached. ALLGEMEINE ELEKTRIZITÄTS-GES. (Friedrich Reinhardt, inventor). Ger. 469,370, May 8, 1925. To raise the temp. in the superheater, the hot gases from the fire space are mixed with waste gases from other furnaces in such amts. that the required temp. can be maintained.

Protecting furnace masonry, especially in coal-dust furnaces. ALLGEMEINE ELEKTRIZITÄTS-GES. (Günter Schimmelpfennig, inventor). Ger. 469,369, Mar. 29, 1924. To prevent damage as the result of large temp. differences, the hot fire gases are circulated around the masonry.

Regulating combustion furnaces. ASKANIA-WERKE A.-G. (formerly Centralwerkstatt-Dessau). Fr. 641,321, Sept. 22, 1927. An instrument is influenced by the compn. of the flue gases, e. g., their content of CO or CO_2 or their sp. gr. in such a way as to control the addn. of fuel to the furnaces.

Device for preventing rise of pressure in flues. MAX SOELLNER. Austrian 111,318, June 15, 1928. The waste gases are led obliquely into and out of an enlargement in the flue, etc.

Separating fibers from peat. GES. FÜR MASCHINELLE DRUCKENTWÄSSERUNG M. B. H. Ger. 469,603, Apr. 20, 1927. The peat is dewatered by simple pressing and is then mech. disintegrated to such an extent that the fibers can be sepd. by sifting. The making of briquets is thus facilitated.

Dewatering peat. JOSEPH HORST, MARIA GRAUL NÉE HORST, KATHARINA BREHM NÉE HORST, NIKOLAUS PETER HORST, FRANZISKA GERTRUD HORST, JOSEPH HORST and HEINRICH HORST. Ger. 468,566, Jan. 25, 1927. In dewatering peat by adding auxiliary substances such as dry peat and pressing in a no. of stages, the stages comprise a preliminary pressing ending at a relatively low pressure and a final pressing ending at a relatively high pressure and, between these stages, a repiling or rearrangement of the peat, with or without subdivision.

Dewatering peat. JOSEPH HORST, MARIA GRAUL NÉE HORST, KATHARINA BREHM NÉE HORST, NIKOLAUS PETER HORST, FRANZISKA GERTRUD HORST, JOSEPH HORST, and HEINRICH HORST. Ger. 468,565, Oct. 10, 1926. Peat or like material is dewatered in presses of known kind to such an extent that it can be further dewatered in band presses, that is, presses with two wedge-shaped, oppositely moving bands, without the application of additional pressure.

Drying peat and the like. HEINZ DICKMANN. Swiss 127,173, Feb. 16, 1928. Addn. to 124,804. In drying blocks of peat and like fuels by passing air around the suitably arranged blocks, psychrophilic and thermophilic microorganisms are added before forming the blocks so that fermentation is set up as the drying proceeds, the heat of fermentation assisting the drying. The material may be warmed to initiate fermentation.

Hydrolyzing peat. N. A. ELMANOVICH. Russ. 5062, Apr. 30, 1928. Peat is hydrolyzed by fermentation with yeast at a pressure above 6 atm. without the addition of acids but only by the acids contained in, and formed by the decompn. of peat.

Peat-briquetting machine. M. A. NARMIN. Russ. 3564, Sept. 15, 1924.

Apparatus (retort) for obtaining carbon from peat and sawdust. S. S. KUTZEV. Russ. 3800, Sept. 15, 1924. The fuel charged into a revolving retort is heated and the C and gas are withdrawn continuously into a container, where the gas is withdrawn through the top and the C through the bottom after being sprayed with water.

Underblast-traveling-grate peat furnace with drying and smoldering shaft. TICHON MAKARIEFF. Ger. 469,314, Nov. 16, 1922. Details of construction.

Apparatus (with a perforated revolving drum) for drying lignite or other combustible materials. HANSEN EVESMITH. U. S. 1,697,268, Jan. 1.

Distillation of lignites. ALEXANDRE FOLLIET. Fr. 642,518, Oct. 18, 1927. Lignite descends on a rotating helicoidal hearth in a thin layer and meets a current of combustible gases heated to 400–700°.

Purifying fuel gases. C. COOPER. Brit. 291,832, Feb. 11, 1927. Fuel gas is first treated with water-absorbing material to reduce its moisture content and is then treated with liquid oil to remove $C_{10}H_8$. An app. is described.

Gases for hydrogenation. FRIEDRICH BERGIUS. U. S. 1,699,177, Jan. 15. Waste hydrogenation gas such as that from the hydrogenation of coal is subjected to steam treatment in 2 successive stages at different temps.; in the first stage the higher temp. is used (suitably about 1100°) which is sufficiently high to decompose CH_4 in the absence of a catalyzer and to cause formation of CO and H_2 ; the second stage may be effected at a temp. of about 300–500° in the presence of a catalyzer such as Fe oxide adapted to enhance the reaction between CO and steam. An arrangement of app. is described.

Sampling furnace gases. SIEMENS & HALSKE A.-G. Ger. 469,404, Oct. 17, 1926. A vertical sampling tube passing through the furnace wall is surrounded for the greater part of its length by a closed vessel contg. a liquid heated by the furnace gases; condensation of water, etc., in the tube is thus prevented.

Producer gas. KARL KOLLER. U. S. 1,697,920, Jan. 8. In effecting total gasification of coal in a producer having a distn. and a gasifying zone, regulated quantities of mixed air, steam and CO_2 are admitted to the gasification zone to generate producer gas, the hot producer gas is passed through the distg. zone to distil and gasify coal in that zone and simultaneously a limited and regulated supply of O is introduced directly into the distg. zone to oxidize colloidal constituents of the coal and prevent caking in the distg. zone. An app. is described.

Gas producer. FERNAND FURET. Fr. 641,034, Sept. 16, 1927.

Gas producer. JEAN LOUIS PIERSON. Fr. 641,445, Aug. 29, 1927. $C_{10}H_8$ or the like hydrocarbon is introduced along with the steam into gas producers, producing C_2H_2 principally.

Gas producer. I. G. FARBERIND. A.-G. Fr. 642,315, Aug. 30, 1927. A gas producer using powdered fuel comprises a cylindrical chamber with horizontal axis. The fuel and gasifying agents are introduced tangentially, preferably at several points of its circumference so that the mixt. is given a rotating movement, and the gases leave the chamber at the center of one of the side faces. Cf. C. A. 22, 2830.

Gas producers. SOCIÉTÉ ANON. DES APPAREILS DE MANUTENTION ET FOURS STEIN. Fr. 641,903, Mar. 12, 1927. A leveling arm and automatic feed for the fuel are described.

Gas producer using wood. S. I. DEKALENKOV. Russ. 4615, Feb. 29, 1928.

Gas producers and furnaces. FRANÇOIS SCHWALLER. Fr. 641,904, Mar. 12, 1927. The hearth is constructed with rotatable bars.

Combined tubular boiler and gas producer. JULIUS PINTSCH A.-G. Ger. 468,481, Mar. 4, 1926. In a gas producer of the kind having vertical water-tubes arranged in its shell, the tubes are set in bundles and sep. collecting and delivering vessels are provided for each bundle.

Apparatus for mixing coal and tar and producing gas from the mixture. HARRY F. SMITH (to Gas Research Co.). U. S. 1,699,166, Jan. 15.

Water-jacketed furnace or gas-producer construction. STETTINER CHAMOTTE FABRIK A.-G. VORM. DIDIER AND E. TERRES. Brit. 292,052, March 1, 1927.

Water-gas generator construction. OWEN B. EVANS (to Ira C. Copley). U. S. 1,699,231, Jan. 15. A solid bridge structure is spaced below the top of the generator shell and above the grate providing radial vertical walls within the shell.

Arrangement for the automatic periodic reversal of the valve of a water-gas producer. PIERRE PLANTINGA. Ger. 469,086, May 16, 1924. Details of the device.

Plant for producing and carbureting water-gas. DEUTSCHE KOKSGAS G. M. B. H. Ger. 468,635, Mar. 6, 1924. In plant of the kind in which a superheater is superposed on the gas-producer and in which the carbureting agent is sprayed into the free space between the superheater and the upper surface of the fuel, the inlet for the carbureting medium is placed sufficiently far from the fuel surface to prevent the liquid medium from reaching the fuel.

Apparatus for generating gas for burners from fuels such as oil. WILLIAM C. SCHEU (to Harrison, Paul, Scheu Co.). U. S. 1,697,781, Jan. 1.

Apparatus (with a tangential air supply) for producing gas from finely divided carbon fuels. GEORGE L. REICHELTM (to Gasifier Co.). U. S. 1,699,543, Jan. 22. Structural features.

Gas carbureter. S. M. GLÄICHENHAUS. Russ. 4741, Feb. 29, 1928. Gasoline is placed in the lower part of a gasometer which has trays with wooden shavings. The gasoline is pumped into the upper part and the air through the gasoline layer in the lower part.

Ammonia and ammonium compounds from distillation gases. FIRMA CARL STILL. Ger. 469,003, June 24, 1923. The gases are cooled and the cloud of condensed NH_3 compds. is extd. by washing above the dew point of the gas in a jet app.

Desulfurizing gases. SINDICAT D'ÉTUDES DES MATIÈRES ORGANIQUES. Fr. 642,695, Feb. 8, 1927. Gases to be freed from S compds. are led through 2 or more purifiers, heated to about 250° , the first contg. oxides of Ni to remove inorg. S compds., the second contg. oxides of Cu, Fe or other suitable metal to remove org. S compds. and, if the gas contains water vapor, through a third contg. oxides of Ni to remove any H_2S formed in the second. The purifiers are in duplicate so that one set is being regenerated while the other is in use.

Removing sulfur compounds from gases. THE SILICA GEL CORPORATION. Fr. 641,695, Sept. 30, 1927. See Brit. 280,947 (C. A. 22, 3519).

Recovery of sulfuric acid. CARL STILL. Fr. 641,460, Sept. 13, 1927. H_2SO_4 used in the purification of benzene is recovered by mixing it with a concd. aq. soln. of $(\text{NH}_4)_2\text{SO}_4$ and heating until the resin acids sep. as a tar. The purified mixt. may be sent to NH_3 saturators.

Device for continuous filtration of benzine. KARL KIEFER. Austrian 109,838, Jan. 15, 1928. Constructional improvements are described in app. of the type in which a filter is fitted in the ascension pipe of a container from which the benzene is forced by compressed air.

Bleaching montan wax. WILHELM PUNGS and THEODOR HELLTHALER (to I. G. Farbenind. A.-G.). U. S. 1,698,450, Jan. 8. Montan wax is exposed to anodic action of an elec. current while finely divided in an electrolyte such as H_2SO_4 in the presence of an O transferer such as Cr sulfate.

Bleaching montan wax with chromic acid in the presence of acetic acid or other organic acids. WILHELM PUNGS (to I. G. Farbenind. A.-G.). U. S. 1,699,250, Jan. 15. Can. 285,712, Dec. 18, 1928.

Montan wax. WILHELM PUNGS and MICHEL JAHRSTORFER (to I. G. Farbenind. A.-G.). Can. 285,711, Dec. 18, 1928. Highly bleached montan wax is produced by treating montan wax with a larger amt. of oxidizing agents than is needed for completely bleaching the wax and converting at least part of the carboxyl groups of the free org. acids present in the product into compds. contg. the CO group, but not contg. a carboxyl H atom. Cf. C. A. 22, 2851.

Wax from lignite. MAURICE DEVAUX and HYDROCARBURES ET DÉRIVÉS. Fr. 641,203, Mar. 3, 1927. Wax is extd. from damp lignite with a volatile solvent b. below 100° and not miscible with water, such as C_6H_6 , and then with a binary org. solvent, b. below 100° , of which 1 component is miscible with water, e. g., a mixt. of equal parts of C_6H_6 and EtOH .

Coal tar. URBANA COKE CORP. Fr. 640,989, Sept. 15, 1927. Coal is distd. at a temp. of about $750\text{--}850^\circ$ to obtain a tar of sp. gr. 1.1 to 1.15 and contg. between 12 and 18% of tar acids. A suitable plant is described.

Recovery of tar. RENÉ L. A. GESSIEN and LOUIS GRANGER. Fr. 642,444, Oct. 15, 1927. In the distn. of substances yielding tar in closed containers, the tar is drawn off from the retorts without being distd.

Recovery of tar. PETER FRANKE. Fr. 642,586, Oct. 19, 1927. Waters from coke-oven plants and the like are freed from org. substances rich in tar by means of the fraction of tar oil boiling between 230° and 350° , from which PhOH and pyridine have been removed.

Coking. FRANS PUENING. U. S. 1,699,448, Jan. 15. An app. is specified comprising spaced parallel members such as iron walls which are preliminarily heated sufficiently to supply heat for subsequent coking, material to be coked is placed in the chambers between these heated members and the latter are moved closer together to compress the material while coking it by the heat thus supplied; evolved vapors are removed, and the coked material is removed by sepn. of the confining walls which retain it.

Coking. RICHARD FEIGE. Fr. 642,144, Oct. 10, 1927. Coking at low temps. is carried out in a vessel contg. rotating plates flat or funnel-shaped on to the center

of which the matter to be treated is directed in thin layers and is carried outwards by centrifugal force on to a stationary funnel, which directs it to the center of the next plate.

Coking. INTERNATIONAL COMBUSTION ENGINEERING CORPORATION. Ger. 469,168, Oct. 25, 1925. Coal dust in suspension is heated to between 260° and 480° to drive off the water before being submitted to the coking process. App. for carrying out the coking is described.

Coke oven. FIRMA CARL STILL. Ger. 469,124, July 10, 1927. Details of construction.

Regenerative coke oven. GUSTAV O. WOLTERS. Ger. 469,284, Mar. 15, 1925. Details of gas currents.

Coke-oven construction. CARL OTTO. U. S. 1,698,272, Jan. 8.

Coke-oven construction. WILLIAM M. PERSON. U. S. 1,698,651, Jan. 8.

Regenerative coking oven. HINSELMANN, KOKSOFFENBAU G. M. B. H. Ger. 469,480, Feb. 23, 1926.

Apparatus for operating coke-oven doors. CARL STILL. Fr. 642,239, Oct. 13, 1927.

Means for compressing coal in coking ovens. HEINRICH SALLEN. Ger. 468,682, Feb. 8, 1925. A removable wedge-shaped attachment to the oven door compresses the coal against the sides of the oven.

Coke briquets. SYNTHETIC AMMONIA & NITRATES, LTD., AND H. A. HUMPHREY. Brit. 291,543, March 11, 1927. Powdered fuel is preheated in an uncompressed state and on nearing the coking temp. is forced by pressure through a container where coking occurs and the coke takes the shape of the container, which may contain a grid for dividing up the coked mass. An app. is described.

Coking carbonaceous material such as coal or lignite. FRANZ PUENING. U. S. 1,698,347, Jan. 8. Coking receptacles which may have metal walls are moved progressively through a heating region of a described app., in which they are heated sufficiently to supply subsequently heat for coking, and are then charged with the material to be coked, and after coking is effected the contents of the receptacles are discharged and they are then reheated and the process is continued cyclically.

Plant for dry-cooling glowing coke. GEBRÜDER SULZER. A.-G. Swiss 127,684, Mar. 26, 1927. Addn. to Swiss 122,951. Details of construction.

22- -PETROLEUM, LUBRICANTS, ASPHALT AND WOOD PRODUCTS

F. M. ROGERS

Varied factors control choice of cracking process. ERNEST OWEN. *Chem. Met. Eng.* 35, 737-40(1928).—Factors affecting the choice of a cracking process are (1) yields of gasoline, (2) quality of products, (3) capital investment, (4) fuel consumption, (5) gas and coke production, (6) flexibility of operation, (7) safety of operation, (8) ease and simplicity of control, (9) service factor, (10) operating costs, (11) license charges and patent protection. The following processes are discussed briefly and illustrated with sketches, Cross, Holmes Manley and Tank and Tube. The characteristics of cracked gasoline are discussed briefly. A superior anti-knock motor fuel is now being obtained from cracked gasoline.

Cracking of gas oil from Boryslaw. ANTONI SZAYNA. *Przemysl Chem.* 11, 451-46(1927); cf. *C. A.* 23, 507.—A fraction of Boryslaw gas oil above 225° was submitted to cracking influences under various conditions of temp., pressure, catalysts, and contg. vessels. Conclusions drawn are strictly limited to the oil studied. The only effect of the contg. vessel, whether made of Cu, Fe or quartz, is that of heat cond. of the material. Of activated charcoal, reduced Ni, and AlCl₃ tried as catalysts only the last showed a positive effect on the yield of benzine, a 44.4% yield by wt. being obtained. As the temp. of the treatment rises the yield on one treatment rises to a max. of 27% sp. gr. of the product and residue increases, % of unsatd. hydrocarbons in the product diminishes slowly, % of the aromatic compds. increases, and of the satd. compds. diminishes. Pressure has no effect on yield within exptl. error, but the degree of satn. rises rapidly with increasing pressure. H₂ used under high pressure as in the Bergius method is undoubtedly absorbed, probably by satisfying the newly produced free valences.

The Edeleanu refining process in the large plant. BERNHARD NEUMANN. *Chem. Fabrik* 1928, 641-4.—A very complete description is given of the Edeleanu process of

treating petroleum distillate with liquid SO_2 with diagrams and photostats. Nothing new. D. F. BROWN

The variation of viscosity with temperature. III. C. WALTHER. *Erdöl u. Teer* 4, 614-6(1928).—It is shown that the rate of change of viscosity of different oils, with pressure, increases, at const. temp., with their viscosities, and, for the same viscosity, with their temp. factors. Hence, at const. bearing temp., the best lubricating oil is the one with the largest temp. factor. With fluctuating bearing temp., the oil with the lowest temp. factor is best adapted. F. S. GRANGER

Natural crude-oil emulsions from the region Boryslaw-Tustanowic. II. TADEUSZ KUCZYNSKI. *Swow Polytech. Przemysl Chem.* 11, 429-50(1927); cf. *C. A.* 23, 270.—Droplets of water or of aq. solns. suspended in pure oil are always positively charged, i. e., they obey the rule of Coehen. Droplets of water suspended in unrefined or crude oils are positively charged when they show an acid reaction, but negatively charged when they show an alk. reaction. This rule clears up in full the mechanism of action of alk. solns. on natural emulsions in the crude oils. Loam, sand and asphalt obtained from acid leavings are charged negatively. This explains the mechanism of filtering action of sand. A phenomenon analogous to rapid electrolysis was discovered, depending on the fact that cataphoresis proceeds the faster the more rapidly revolving are the electrodes used. The asphaltic substances are an emulsifying agent in emulsions, and it is because of this that oils can be refined by means of producing emulsions. Attempts to synthesize emulsions without the aid of emulsifying agents led to a new convenient method of obtaining emulsions by elec. dispersion without producing an arc. The dielec. consts. of various oils before and after refining with H_2SO_4 and by physical methods were investigated; they are always lower in the product than in the raw material. Through the study of the influence of the elec. field on some very easily polymerizing substances, e. g., turpentine, it was shown that the emulsion probably changes the chem. compn. of the crude oil, polymerizing some of its components. A. C. Z.

Refining mineral oils with decolorizing powder. STANISLAW GASIOROWSKI. *Przemysl Chem.* 11, 466-72(1927).—Distillate of spindle oil from Boryslaw-Tustanowic crude oil was studied under the influence of a decolorizing powder. After the treatment the oil was filtered and the color of the filtrate compared with a standard $\text{K}_2\text{Cr}_2\text{O}_7$ soln. The adsorption is practically complete within less than 1 min. This shows that laborious or protracted mixing is superfluous. The effect of temp. between 20° and 110° is practically insignificant but outside these limits adsorption falls off sharply. It is useless to employ more than a certain min. amt. of the powder as further addns. do not help. Repeated treatments with fractional parts of a given quantity of powder are not so effective as one treatment with the whole batch. A. C. ZACHLIN

Water-miscible mineral oil preparations. RALPH HART. *Ind. Eng. Chem.* 21, 50-56(1929).—The manuf. of clear water-miscible mineral oils is primarily a problem in miscibility; free oleic acid is essential to a uniform product. Miscibility curves for sodium oleate and Turkey-red oil as emulsifiers are given by means of which uniform and non uniform mixts. were traced. Free oleic acid decreases the stability of the emulsion and may even prevent it altogether. The kind and quantity of mineral oil have practically no effect on the quantity of oleic acid the mixt. will tolerate and still give a good emulsion. Alc. acts as a liquefier for the soap, at first decreases and then as more alc. is added increases the quantity of oleic acid required for a homogeneous product and exerts no direct effect on the emulsion. Addn. of alkali in the absence of alc. first decreases and then increases the amount of free oleic acid required for a homogeneous product. In the presence of alc. the more alkali the less oleic acid is required to clear. The more neutralized the Turkey-red oil the better it functions as an emulsifier. Tests for the raw materials and for the stability of sol. oils are given. D. F. BROWN

Grozny oil gases. P. I. BOGAYEVSKII. *Neftyanoe Khozyaistvo* 15, 636-8(1928). The quantity of gasoline absorbed by natural gas was detd. by the absorption method. 9.42 gal. of gasoline (sp. gr. 0.700) per 1000 cu. ft. of gas were obtained from Novo-Grozny gushers, 5 gal. (sp. gr. 0.640) from Staro-Grozny gushers and 1.687-3.928 gal. (sp. gr. 0.635-0.658) from Staro-Grozny wells, where exhaust pumps had to be used. This includes gasoline condensed in the pipe lines. A. A. BOEHLINGK

Thermal characteristics and heat balance of a large oil-gas generator. ROBERT D. PIKE AND GEORGE H. WEST. *Ind. Eng. Chem.* 21, 104-9(1929).—The results of a five-day test on a large city-gas generator of the Jones type at the San Francisco plant of the Pacific Gas and Electric Company are described. The operating cycle is 10 min. of "make," during which oil and steam are introduced at several points in each of the two connected shells, passing downward in each shell, and the gas is removed to

the wash box, where the temp. is slightly above atm., and lampblack and tar are removed; a "blow" of five min., intended to burn out the C deposited in the generator during the make. Here the oil and most of the steam is shut off and air is blown in the top of the primary shell and auxiliary air is introduced at the bottom of the secondary after the first min. of the blow. The "heat" lasts five min., during which oil and air are fed in at the top of the primary and burn while passing both shells, leaving at the top of the secondary. Detailed material and energy balances are included for the test. 83,500 B. t. u. is lost as sensible heat in waste gases per 1000 cu. ft. of gas made or 376×10^6 B. t. u. per 24 hrs. operation, the temp. of the waste gases being 790° . A waste-heat boiler at 50% efficiency could recover 188×10^6 B. t. u. per 24 hrs. An economic analysis of lampblack production shows that 18.5% of the output is lampblack and 3.28% is tar, both of which are utilized in the boiler plant for steam production. The efficiency of the gas-producing process can then be materially increased by elimination of the production of these two by-products. A patented modification of the Jones process which allows this elimination is described briefly. J. H. PERRY

The Conradson value. W. JUNOSZA PIOTROWSKI AND J. WINKLER. Chem. Lab. Refinery "Galicja," Drohobycz. *Przemysl Chem.* 12, 573-80(1928); cf. Conradson, C. A. 21, 2379.—A detn. of the Conradson value when performed strictly according to the standard procedure is sufficiently accurate (showing an error of 0.2%) and because of its simplicity should be made frequently in tests on lubricating oils. For well-refined oils it can be used to decide whether a given oil is a distillate or a residue, because in the former it never exceeds 1%, and in the latter it is as a rule over 1%, and may go as high as 7%. The addn. of fatty acids up to 10% does not affect the value. Practical tests give results proportional to the detd. Conradson values, i. e., the lower the Conradson value the less carbon is there left in the cylinders of the automobile engine. It can be noticed in results of tests on Polish oils that the distillate from a naphthenic crude oil as well as crude oil of aromatic character has the least inclination to carbonization, while oils from naphtheno-aliphatic crude oils have a greater tendency to coking. Oils obtained as low-pressure (3 mm. Hg.) distillates although unrefined have the lowest Conradson value. From all this it follows that a high content of unsatd. hydrocarbons which at a higher temp. easily decompose, leaving a carbon residue, probably influences the Conradson value. Method, procedure and exptl. data are presented. A. C. Z

Sediments in turbine oils. N. I. CHERNOZHUKOV. *Izvestiya Teploekhnicheskogo Instituta* (Russia) (*Trans. of the Thermo-Tech. Inst.*) 1927, No. 4, 41-4.—Reviewing the literature, C. disagrees with the statement of Funk (cf. C. A. 18, 3711) that cases are known where oil with a comparatively high % of acids (org.) was used for a considerable time without any noticeable harm. According to C., the higher viscosity of such an oil is likely to cause trouble owing to insufficient circulation and lubrication. To investigate the sludge a sample was taken of oil used in one of the turbines for 4 months. The sludge was composed of water (Dean and Stark) 35.5%, oil 29.5% and 35.0% of compds. insol. in gasoline; these latter were composed of 16.5% alc.-sol., 72.6% C_6H_6 -sol. and 11.2% C_6H_6 -insol. compds. The alc. soln. comprised org. acids and org. Fe salts. The benzene soln. contained Fe and Cu salts from org. acids and asphalts. The C_6H_6 -insol. part was composed of free Fe (detd. as Fe_2O_3) 13.92%, and free Cu (detd. as CuO) 5.06%, the rest being sand, C, etc. The ash contained Fe_2O_3 66.6%, CuO 5.1%, sand, etc., 28.0%. This turbine oil had the following characteristics before use: d_{15} , 0.8825, flash pt. (Brenken) 198° , viscosity E 50° , 3.98, ash 0.001%, acidity 0.006% SO_3 , sapon. none, water by Dean and Stark none. The corresponding figures for used oil were: d_{15} 0.8961, 192° , 5.35, 0.007%, 0.11% SO_3 , 5.1%, 0.4%. The same turbine was washed out and charged with new oil which formed emulsions and showed characteristics of an inferior oil; this is explained by the presence in the turbine of a part of the sludge from the old oil evidently not properly removed. C. distinguishes 3 different kinds of sludge: (1) Sludge formed through the polymerization and oxidation of tarry substances and having the appearance of the so-called asphaltenes. This sludge is never formed in properly refined oils. (2) Sludge of a distinctly acid character formed through the oxidation and polymerization of unsaturated compds. and the basic hydrocarbons of the oil. The sludge is usually a sticky and viscous mass of a brownish color. (3) Sludge comprised of Fe and Cu salts from org. acids; they are formed through the presence of water in the turbine, whereby $Fe(OH)_3$, etc., are formed, which react with org. acids and forms org. salts. Iron soaps are good emulsifying agents and the excess ppts. on the walls of the turbine forming very adherent crusts, this applies also to Cu and other soaps. The soap increases the viscosity of oil decreasing its lubricating value, the thermometers become covered interfering with temperature readings, etc. A. A. POERTLING

Methods of analysis of light gasolines. J. GIRZEJOWSKI. Chem. Lab. "Gazolina," Boryslaw. *Przemysl Chem.* 12, 584-6(1928).—Gases from the Engler condenser are led to a long glass tube from which there are branching several outlets to as many adsorption towers contg. activated charcoal. By manipulating the proper stopcocks, gases from the various fractions are led to desired towers where they are completely adsorbed, and with which they are later weighed. In some of the expts. reported as much as 68% of the gasoline was recovered as adsorbed gases. The resulting error of the distn. analysis falls from 40% to 1 or 0.5%. A. C. ZACHLIN

Action of nitric acid on Polish gasoline. EUGENIUSZ TURKIEWICZ. Jan Kazimir Univ., Lwow. *Przemysl Chem.* 11, 381-9(1927).—This investigation was concerned with the action of HNO_3 in presence of H_2SO_4 on the lightest fractions of Boryslaw gasoline prep'd. by the compression method. The presence of benzene and toluene in this gasoline was established. They probably undergo quant. nitration. Trinitrohexane obtained by Zaloziecki (Akad. Umiejetnosci, Krakow. 1903) could not be identified, perhaps because of decompn. caused by many crystns. A. C. ZACHLIN

Anti-knock fuels. GRAHAM EDGAR. *J. Soc. Chem. Ind.* 47, 230-2T(1928); cf. C. A. 23, 270.—General explanation in simple terms. ALBERT L. HENNE

Metallic colloids and knock suppression. H. L. OLIN AND W. J. JEBENS. *Ind. Eng. Chem.* 21, 43(1929).—A repetition of the work reported in an earlier paper (C. A. 21, 817) on the effect of metallic colloids dispersed in gasoline showed, as before, that they played no part in knock suppression. It was found also that Sims and Mardles (C. A. 20, 2750, 2806) who reached entirely opposite conclusions in work done at approx. the same time were in error, because of faulty technic in prepg. their materials. H. L. O.

X-ray quantitative analysis of tetraethyl lead in gasoline. R. H. ABORN AND R. H. BROWN. *Ind. Eng. Chem. Anal. Ed.* 1, 26-7(1929).—A quick method requiring standardization and with an error in analysis of 0.1 cc. of PbEt_4 is described. M. D.

Greases to withstand high vacua. FR. HEINRICH AND F. PETZOLD. *Chem. Fabrik* 1928, 692-3.—Nine samples of greases for stopcocks were tested by use of stopcocks connected to small vessels provided with vacuum gages. Commercial greases show wide variations in properties, and "home-made" stopcock greases are quite as good as those on the market. Greases contg. vaseline, pale crepe and paraffin are recommended, but very careful work is necessary in prepg. them. W. C. EBAUGH

Paraffin wax in Apsheron crude oils. A. N. SAKHANOV AND L. G. ZHERDEVA. *Vysvanye Khozyaistvo* 15, 639-42(1928).—To det. paraffin wax in mineral oils mix 10 g. of crude oil with 500 cc. of light gasoline and treat at room temp. with 60-70 g. of fuller's earth; ext. the fuller's earth with gasoline in a Soxhlet extractor for 2 days, to dissolve the paraffin wax; evap. the ext. so obtained to 10-20 cc. and ppt. the wax by Holde's method with alc.-ether; redissolve the crystals in ether and reppt. by the Holde method to sep. the last traces of oil. By this new method 2-3 times more paraffin wax, m. 65° , was detected in the Surakhanui crude oil. Surakhanui paraffins have a ceresin character; the low-melting fractions are plastic. Balakhanui-Sabunchi crude oil yielded 1.95% of wax, m. 50.5° ; the sepd. wax recrystd. from ether was similar to the Surakhanui wax except in m. p. (37.5°). Bibi-Eibat crude oil contains 1.25% wax, m. 50° , which is also of the ceresin type. Binagadui crude oil has 0.7-0.8%, m. 47° , and Kutmaki crude oil only traces amounting to 0.1-0.2%. The paraffin contained in Apsheron crude oils is distributed in the higher fractions and particularly in the heavy bottoms as compared with the Grozny crude oils, where paraffin distills over with the medium fractions. The Surakhanui paraffin was further dissolved in Baku solar oil and the satn. temps. were detd. 100 g. of this oil dissolved 0.18% of wax at 19° ; the soly. was 10.42% at 65° for a wax m. 83° . The soly., then, of Surakhanui wax is the higher the lower its sp. gr. and the lower the m. p. of the ceresin. Surakhanui waxes crystallize in the form of many single crystals, which drop to the bottom of the container and hardly form a compact mass; the Grozny waxes soon become gelatinized. A Surakhanui crude oil congeals at -20° having 6% wax as compared with Grozny crude oil with a smaller amount of paraffin, which congeals at 10° . The Grozny crude oils having a high proportion of wax in the lubricating oil fractions are noted for their viscous lubricating oils at low temp., while the Baku oils, which have a high % of wax in the heavy bottoms, give lubricating oils with lower freezing points. A. A. B.

Resin determination in mineral oil products. N. I. CHERNOZHUKOV. *Izvestiya Tekhnicheskogo Instituta (Trans. Thermo-Techn. Inst. (Russia))* 1927, No. 4, 35-6.—A 15 cc. centrifugation flask graduated in 0.1 cc. is charged with 5 cc. H_2SO_4 (d. 1.84) and an equal vol. of the oil to be tested is added from a buret (viscous oils must be dild. in equal parts with gasoline with initial b. p. above 100° which has been previously

treated with an equal vol. of $H_2SO_4.H_2O$ to ext. olefins and aromatics). The temp. is noted and the flask shaken for at least 5 mins., and centrifuged for 5 mins. Naphthenic acid (1-2 drops) is added if the sludge does not ppt., the flask is then shaken again and centrifuged for another 5 mins. or longer until the sludge level becomes const. The quantity of naphthenic acids used must be added to the final readings, which are made after the soln. has cooled to the original temp. The readings are accurate within 0.05 cc. The reading so obtained less the vol. of acid divided by the vol. of the oil and multiplied by 100 gives the % of sludge (resin) by vol. in the mineral oil product. A. A. B.

Petroleum asphalts and resins. N. I. CHERNOZHUKOV. *Neftyanoye Khozyaistvo* 15, 670-3(1928).—Paraffinum liquidum of viscosity E_{60} 5.0, oxidized by Butkov's method at 150° under 15 atm. O_2 for 4 hrs., yields, on diln. with petroleum ether, 9.25% of a white ppt., contg. C 71.64, H 8.81, O 19.55%; S is absent; acid no. 75; the acidity of oxidized oil 36 mg. of KOH. The same oil heated with O_2 at 250° and 12 atm. for 2 hrs. had dark yellow tint; a flaky sediment was again obtained on adding petroleum ether. Neither asphaltenes nor carbenes were formed. Crude oils from Balakhanui, Grozny (non-paraffinic) and Emba with O_2 or air for 3 to 12 hrs., at $150-200^\circ$ and 15 atm. gave sediments of an asphaltenic character; simultaneously the oils become brighter. The asphaltenes sepd. from turbine oil distillate had the formula $C_{172}H_{176}O_{14}S$; from light spindle oil $C_{136}H_{142}O_{12}S$. Baku and Emba white oils of viscosity E_{60} 5 heated with 3% of S for 3-4 hrs. at $200-270^\circ$, the S-contg. oils oxidized under pressure, and dild. with petroleum ether gave a dark-colored ppt. This ppt., filtered, washed with petr. ether, dissolved in benzene and reprecipitated with petr. ether 5 to 6 times gave finally a ppt. amounting to 0.2 to 0.4% of the original oil, sol. in C_6H_6 , CS_2 and $CHCl_3$, insol. in petr. ether. On heating to 100° in the presence of air it became insol., melted at higher temp., with decompn. and swelling; i. e., asphalt-like compds., $(C_{24}H_{27}O_3S)_x$, were obtained from medicinal oil and $(C_{36}H_{41}O_6S)_x$ from white "viskozin." Tuichinin after pptg. the asphaltenes from crude oil with petr. ether treated this oil with dry HCl and obtained a considerable amount of a compd. after another petr.-ether treatment which was very much like asphaltenes. When treating the sulfur-treated oil with HCl asphaltenes were also obtained. On treating the S-treated oils with H_2SO_4 , SO_2 is developed proving that an oxidation process is taking place; the acid sludge looks like ordinary acid sludge and the oil so obtained has a yellow tint. The compds. obtained as a result of S treatment and oxidation are adsorbed by fuller's earth. These tars obtained from Baku medicinal oil after the sepn. of asphaltenes amounting to 5.3% had the compn. C 80.69, H 11.26, O 7.05, and S 1.00%. They are very similar to tars obtained by Sakhanov from machine-oil distillate from Grozny non-paraffinic crude oil. Conclusion: Asphaltenes are formed from crude oil by unknown S compds. All S compds. contained in oils and able to change into asphaltenes are in the following state: (1) Purely sulfurous compds., (2) S compds. in different stages of oxidation, sol. in oil products and pptg. on diln. of the crude oil with petr. ether, (3) sulfurous compds. with a higher degree of oxidation, pptg. with petr. ether and sol. in benzene (asphaltenes), (4) sulfurous compds. highly oxidized insol. in benzene, CS_2 , etc. (carbenes). A. A. BOEHLING.

Asphalt-precipitating benzene from mineral oils. II. H. BURSTIN AND J. WINKLER. Chem. Lab. Refinery "Galicia," Drohobycz. *Przemysl Chem.* 12, 581-3(1928). To establish further the recommendations made earlier (cf. C. A. 22, 4786) B. and W. report the results of comparative tests on the asphaltene-pptg. power of 3 benzenes, one of Kahlbaum, and two others made by mixing Boryslaw gasoline with Boryslaw benzene and cracked gasoline, both of which conformed to the specifications of Holde; all three gave different results. In order to establish a uniform detn. of asphalts in oils purely aliphatic benzenes conforming to the specifications earlier devised should be used.

A. C. ZACHLIN

Simplification of oil-testing processes (FRIEDEBACH) 27. A system of analysis for oil-field waters (REISTLE, LANE) 14. Pure C (Fr. pat. 641,908) 18. Heat treatment of coal, mineral oils, etc. (Fr. pat. 641,344) 21. Separating paraffin constituents from fluid hydrocarbons (U. S. pat. 1,699,286) 10. Purifying liquids such as oil mixts. which tend to emulsify (U. S. pat. 1,698,270) 13. Heat exchange and pumping apparatus for heating and pumping oils (U. S. pat. 1,697,605) 1. Apparatus for separating oil and water by gravity (U. S. pats. 1,698,002; 1,698,067 and Brit. pat. 291,123) 1. $PbEt_4$ (Fr. pat. 642,120) 10. Me formate or similar formates as solvents in purifying oils (Brit. pat. 291,817) 13. Air-excluding device for C_6H_6 petroleum, etc. (Ger. pat. 469,293) 1.

EHLERS, CURT: *Schmiermittel und ihre richtige Verwendung.* Leipzig: Otto

Spamer. 112 pp. Paper covers, M. 8; bound, M. 10. Reviewed in *Ind. Eng. Chem.* 21, 95(1929).

Distillation of petroleum. ALLGEMEINE GES. FÜR CHEMISCHE INDUSTRIE M. B. H. (Lazar Edeleanu, inventor). Ger. 469,289, June 26, 1927. To reduce the S content and improve the odor of petroleum hydrocarbons, the distillate is treated with liquefied SO_2 and the part insol. therein sepd. and treated with a dil. alk. soln. of PbO , with or without addn. of S. A table of distillates and their properties is given.

Distilling petroleum oil. WARREN K. LEWIS and NATHANIEL E. LOOMIS (to Standard Oil Development Co.). U. S. 1,697,195, Jan. 1. A body of oil is distd. by direct fire heat under very low abs. vapor pressure and at a temp. below that at which substantial cracking would occur in the body of oil; vapors are led off through substantially unobstructed passages for condensation and no substantial drop in temp. is permitted in the vapors until they approach the condensing zone, so that refluxing is "minimized." An app. is described. Cf. *C. A.* 23, 967.

Still (with scrapers moving over its bottom) for distilling petroleum oils. HENRY S. BETTINGILL, JR. (to Empire Refineries). U. S. 1,698,507, Jan. 8.

Catalytic oxidation of petroleum hydrocarbons. CARLETON ELLIS (to Ellis-Foster Co.). U. S. 1,697,262, Jan. 1. A reaction mixt. of petroleum vapor and air is passed over a catalytic mass which may comprise Cu gauze or Al and V oxide and which is maintained at a "black heat" just below a temp. of redness by suitable cooling. The process is applicable to the production of aldehydes and acids from oil gas, etc. U. S. 1,697,263 specifies effecting similar processes with kerosene or other petroleum hydrocarbons with use of a catalytic mass such as Fe and V or their oxides which possesses high heat conductivity. U. S. 1,697,264 specifies production of org. acids or other oxidation products by cracking oil such as kerosene under a pressure of 4 or 5 atm., removing the heavier products of the cracking, and passing the residue of the cracked products admixed with air through a mass of catalytic material which may comprise Mo or V oxides supported on a granular carrier, at oxidation temp., passing the oxidation products through water, oil and silica gel, resp., and recovering gasoline, org. acids and other products of oxidation from the scrubbing agents. U. S. 1,697,265 specifies subjecting vapors derived from petroleum cracking to the action of O in the presence of a catalyst which may comprise V oxide on pumice and which is maintained at a temp. of incipient redness so that oxidation products such as aldehydes and acids are obtained. U. S. 1,697,266 specifies oxidation of petroleum oils such as kerosene by treatment with an or other O-contg. gas at a temp. below redness under conditions which will produce oxidized products such as alcs., ketones, aldehydes, acids, etc. while controlling the quantity of O used to regulate the extent of oxidation effected. U. S. 1,697,267 specifies passing gas from petroleum cracking into contact with a heated catalyzer which may comprise Cu gauze or Fe, Cr, V or Ag compds. and which is maintained at a temp. of just below dull redness, in the presence of an O-contg. gas such as air while using more than 1 atom of O for each mol. of readily oxidizable constituents in the gas to produce products such as aliphatic acids, etc.

Petroleum spirit. WILLIAM-MAY KNOWLING (Michael Kostevitch, inventor). Fr. 641,926, Mar. 16, 1927. Petroleum spirit, particularly for motors, is purified by means of active C either alone or with SiO_2 gel.

Hydrocarbons from rock and sand. BRUCE M. CLOUD. U. S. 1,697,260, Jan. 1. Natural hydrocarbon-contg. rock and sand such as that of depleted wells is treated with water gas or other gas comprising CO and H, together with C_2H_2 , in order to effect further oil recovery.

Purifying hydrocarbons. ALLGEMEINE GESELLSCHAFT FÜR CHEM. INDUSTRIE M. B. H. Fr. 641,312, Sept. 22, 1927. The products of distn. of natural hydrocarbons have their quantity of S reduced and their disagreeable odor removed by a treatment with an alk. soln. of Pb oxide after the usual Edeleanu treatment with liquid SO_2 .

Purification of hydrocarbon compounds. ERNST B. AUERBACH. Can. 285,782, Dec. 25, 1928. Oils contg. constituents of different mol. wt. are purified by bringing the oils into contact with liquid CO_2 , absorbing constituents of lighter mol. wt. in the liquid CO_2 , sepg. the liquid CO_2 and absorbed constituents from the remaining oil and then sepg. the absorbed constituents from the CO_2 .

Treating hydrocarbon oils. CHAUNCEY B. FORWARD. U. S. 1,698,811, Jan. 15. A stream of oil such as crude oil is passed through heating coils exposed to superheated steam and the heated product is atomized together with a compressible fluid such as superheated steam in a closed vessel; the volatilized and atomized product is forced from the closed vessel through heating coils exposed to superheated steam of about

540° or higher until highly heated and volatilized material is finally liquefied and the liquids thus obtained are sepd. An app. is described.

Distilling hydrocarbon oils under pressure. FRANCIS M. ROGERS and EDWARD J. SHAEFFER (to Standard Oil Co. of Ind.). U. S. 1,697,573, Jan. 1. In order to produce products of low b. p., an oil such as an oil of 30° Bé. is heated under pressure to a conversion temp., and liquid hydrocarbon oil is introduced into the vapors evolved by the oil, the liquid hydrocarbon having approx. the characteristics of the desired products, vapors of the desired products are removed together with vapors of the oil introduced and condensed products of higher b. p. than those desired are returned to the oil undergoing heating for further treatment. An app. is described. Cf. C. A. 22, 3289.

Refining hydrocarbon oil distillates. HENRY J. BRODERSON (to Standard Oil Co. of Ind.). U. S. 1,698,428, Jan. 8. A flowing stream of distillate such as naphtha, pressure still distillate or "burning oil" is heated to about 32-37° and there is continuously added to the oil stream a treating reagent such as Na plumbite soln. and the oil stream and admixed reagent are then conducted into a body of the liquid treating reagent below the surface of the latter so that the oil passes through the reagent and is continuously withdrawn as it seps. above the main body of reagent. An app. is described.

Partial oxidation of cracked hydrocarbon products. CHARLES S. PALMER. U. S. 1,699,627, Jan. 22. Oil or gas is cracked to obtain products more active and capable of oxidation and these products are then partially oxidized to form aldehydes and other products by the further action of oxidizing gas such as O or air and steam which is preheated by heating from the cracking operation. An arrangement of app. is described.

Desulfurizing liquid hydrocarbons. T. B. KIMBALL. Brit. 291,379, May 31, 1927. S compds. such as mercaptans are removed from hydrocarbon distillates such as gasoline or kerosene by bringing the hydrocarbons in vapor form into contact with an alk. soln (suitably an aq. NaOH soln.) heated to above the condensation temp. of the vapors but below the b. p. of the soln. used. The treatment may be effected counter-currentwise in a scrubbing tower.

Cracking oils. G. C. HARGROVE (to Gasoline Products Co.). Brit. 290,996, May 23, 1927. Conditions of temp., pressure and time of a cracking operation are so controlled that not more than 25% of the crude oil is converted into gasoline in a single passage through the app. The process may be carried out continuously and the fresh feed of crude oil may be dild. with about twice its volume of clean overhead distillate produced. The crude oil is preferably subjected to a preliminary "stripping" to recover gasoline which it naturally contains. An app. is described.

Cracking of oils. LOUIS J. WALSH. Can. 285,669, Dec. 18, 1928. Liquid hydrocarbons for cracking are preheated and forced in a stream under initial pressures of 40 or more atms. in succession through several tubular heaters having hydraulic resistance to flow, whereby flow is under successively diminishing pressures in each of said heaters. The material is heated in each of said heaters to a temp. appropriate to cracking in liquid phase at the pressure in the heater and acted upon during flow from heater to heater to volatilize and remove from the liquid stream substantially all of the volatile substance produced during flow in the preceding heater. The liquid material effluent from the heaters is subjected to vaporization at a temp. of 650°F. and a pressure of 4 atms. or less, and a portion of higher-boiling fractions of the product are recycled with the addn. of fresh feed stock.

Coatings for oil-cracking retorts. A. C. HOLZAPFEL. Brit. 291,585, April 30, 1927. The interior surfaces of oil-cracking retorts are coated with a paint-like compn. comprising water-glass, water, an alk. earth compd. such as slaked lime or magnesite and one or more powdered inert refractory mineral substances such as Ti oxide and fireclay and the coating is heated to an oil-cracking temp. Several coatings may be applied, as may also a temporary waterproofing coating of heavy mineral oil.

Purifying mineral oils. G. PETROV. Brit. 291,823, Feb. 1, 1927. Mineral oils and naphtha are treated in the presence of fatty acids such as stearic and oleic acids with a sulfonating agent. Tarry matter seps. and is heated with water to remove the sulfonic acids and the treated oil may be washed with alkali.

Refining mineral oils. ERIC T. HESSLE. U. S. 1,696,913, Jan. 1. Oils such as crude petroleum or shale or tar oils or gas oils while heated (suitably to about 250-400°) and in the form of a "true fog" (which may be produced by a special described app.) are subjected to a "decompn. catalyst" contg. Sn together with about 1% of Sb. An app. is described. A high yield of gasoline may be obtained.

Oils, etc., for use as electric insulating materials. FELTEN & GUILLEAUME CARLS-

WERK A.-G. Brit. 291,722, June 3, 1927. Insulating oils, mixts. of oils and resins, transformers, switch-gear casings, storage containers for cable-impregnating substances, etc. are stored in an inert gas such as N.

Electrical insulation. I. G. FARBENIND. A. G. (Erik Reissmann and Adolf Richter, inventors). Ger. 488,394, Dec. 5, 1924. The non-resinifiable parts of natural mineral oils sol. in liquid SO₂ are used as insulating materials for high-tension switches, transformers, etc.

Cleaning crude oil. WILLIAM L. PALMER. U. S. 1,699,374, Jan. 15. Oil such as crude petroleum is treated with a reagent mixt. prepd. by dissolving oxalic acid in a solvent such as glycerol, honey or castor oil and admixing this soln. with glacial HOAc, cresylic acid and oleic acid, and the oil and reagent are permitted to stand until water settles out from the mixt.

Refining crude fuel oil. ELMER A. SPERRY (to Sperry Development Co.). U. S. 1,699,379, Jan. 15. The oil is centrifuged under pressure and simultaneously heated, in order to prepare it for use in Diesel engines. An app. is described.

Handling distillation residues of asphaltic crude oils. OSCAR E. BRANSKY and FRANCIS M. ROGERS (to Standard Oil Co. of Ind.). U. S. 1,698,471, Jan. 8. The residue is dild. with a hydrocarbon oil having a b. p. within the gasoline range, and undissolved asphaltenes are sepd.

Oil from shales, coal or similar oil-bearing materials. N. H. FREEMAN. Brit. 291,475, Dec. 1, 1926. The material is heated to and maintained at a predetd. crit. temp. until substantially all the hydrocarbon content is sol. in a hydrocarbon oil, as described in Brit. 248,014 (C. A. 21, 647), and the oil is removed in a heated entraining agent such as superheated steam, gas or oil vapor. Heating to about 300° for about 1 hr. is ordinarily suitable. An app. and various details are described.

Automatic crude-oil discharge valve. K. M. MOSHKOVSKII. Russ. 3916, Oct. 31, 1927.

Distillation of tar or oils. INTERNATIONAL COMBUSTION ENGINEERING CORP. Fr. 641,473, Sept. 20, 1927. A hollow heating body, the cross section of which is star shaped, is mounted inside the still and heated by hot gas.

Forged tubes suitable for oil pressure distillation apparatus. WALTER M. CROSS (to Gasoline Products Co.). U. S. 1,699,688, Jan. 22. In forming tubes for withstanding high temps. and pressures, an ingot of steel is annealed and drilled longitudinally rotated and forged on a mandrel to a definite length so as to leave end portions of greater wall thickness than the main portion of the tube, and the ends are forged on a mandrel of smaller diam. to produce constricted openings and bottle-neck-shaped ends.

Oil filter. WILLIAM H. McMACHEN and MARION F. McMACHEN. U. S. 1,698,600, Jan. 8. A filter is described which is suitable for purifying oil from internal-combustion engine crankcases.

Preservation of heated oils. COMPAGNIE FRANÇAISE POUR L'EXPLOITATION DES PROCÉDÉS THOMSON-HOUSTON. Fr. 641,147, Sept. 20, 1927. Deposition of solids or mud in oils heated for a long time as in transformers is prevented by the addn. of fuller's earth.

Detecting moisture in transformer oil. GOVERNMENT ELECTROTECHNICAL TRUST. Russ. 4712, Feb. 29, 1928. A strip of paper, asbestos, etc. is placed between 2 electrodes connected to an outside source of elec. supply. This app. is immersed in transformer oil which if wet displaces the oil in the paper, etc. by water and an elec. current begins to flow which is indicated on an electrometer.

Apparatus for separating oil from water. J. CRICHTON and J. CRICHTON & Co., Ltd. Brit. 291,123, Dec. 21, 1926.

Apparatus for separating oil and water or other liquids of different densities by gravity. FRANK PINK. U. S. 1,698,067, Jan. 8.

Apparatus for separating oil and water or other liquids of different densities by gravity. FRANK PINK. U. S. 1,698,002, Jan. 8.

Apparatus for separating benzene and water or other liquids by gravity. W. LINNMANN. Brit. 291,608, June 9, 1927.

Apparatus and system of operation for producing oil-gas. ALVIN J. BASSETT (to Bruce Macbeth Engine Co.). U. S. 1,698,525-6, Jan. 8.

Coking oils. STANDARD OIL CO. Fr. 641,168, Sept. 20, 1927. Hydrocarbon oils are coked at a temp. above 482° in vessels made of an Ni-Fe or Ni-Cr alloy, such as Monel metal to which the coke when formed does not adhere. A suitable app. is described.

Oil burner. M. I. L'VOVICH-KOSTRITZ. Russ. 4606, Feb. 29, 1928.

Oil burner. N. V. OSTRIKOV. Russ. 3888, Oct. 31, 1927.

Oil burner from steam boilers. V. A. VARGANOV. Russ. 3735, Oct. 31, 1927.

Fire-fighting equipment for oil wells. S. A. MNATZAKANYANTZ and K. K. RIDEL. Russ. 4601, Feb. 29, 1928.

Equipment for emptying mazout separated from water from oil tankers. N. F. SKVORTZOV. Russ. 3753, Oct., 1927.

Lead tetraethyl. CHARLES A. KRAUS and CONRAL C. CALLIS (to Standard Oil Development Co.). U. S. 1,697,245, Jan. 1. Pb is alloyed with about 10% of Na, the alloy is subdivided, suitably in N, while avoiding oxidation and is then reacted on with EtCl at a temp. of 35-70°. Cf. C. A. 23, 970.

Lubricant. JAMES W. FINLAY (to Pierce Petroleum Corp.). U. S. 1,699,961, Jan. 22. A "grease lubricant" contains mineral oil 73.5%, heavy tar 5% and small quantities of Ca and Na soaps of animal fats.

Lubricant. JOSEPH H. JAMES (to Clarence P. Byrnes, trustee). U. S. 1,700,055, Jan. 22. A lubricant suitable for various uses comprises partial oxidation products of mineral oil in the range from alcs. to oxygenated org. acids. U. S. 1,700,056 specifies greases contg. soap of mineral oil oxygenated org. acids.

Lubricating oil. GEORGE H. TABER, JR. (to Sinclair Refining Co.). U. S. 1,698,076, Jan. 8. Steam is injected into a body of oil contg. lubricating oil constituents and the latter are vaporized and the lubricating oil vapors are sep'd. from heavier constituents of the oil vapors produced and are treated with a caustic alkali soln. and condensed. An app. is described.

Filter for lubricating oil as used in internal combustion engines. ERNEST J. SWEETLAND. U. S. 1,699,680, Jan. 22. Structural features.

Treating used lubricating oil. EDWIN S. PEARCE. U. S. 1,698,273, Jan. 8. In order to clean oil such as that which has been used for lubricating railway car journals, the oil is introduced continuously into a tank and caused to flow upwardly in the tank, heated at the lower portion of the tank, and impurities are sep'd. at different points in the tank as the oil flows through it and may be retained by raffle bars on baffle plates. An app. is described.

Reclaiming used lubricating oil. GEORGE L. CHERRY (to DeLaval Separator Co.) U. S. 1,698,257, Jan. 8. Used oil contaminated with water and solids is heated to not above about 99° and mixed with NaOH in a substantially dry state until the NaOH is dissolved, and the oil is then sep'd. from impurities (suitably by centrifuging). An app. is described. Cf. C. A. 23, 698.

Apparatus for the dry distillation of schists. PATENTAKTIEBOLAGET GRÖNDAL-RAMÉN. Fr. 641,798, Oct. 4, 1927.

Treatment of bituminous schists. PATENTAKTIEBOLAGET GRÖNDAL-RAMÉN. Fr. 641,669, Sep. 30, 1927. Schists are prepd. for dry distn. by fine grinding and making into small balls by mixing with water and passing through a rotating drum.

Destructive distillation of bituminous materials. DEUTSCHE ERDÖL A.-G. Ger. 469,366, Feb. 21, 1926. The materials descend a shaft in sep. streams while a current of O-free heating gases ascends the center of the shaft out of contact with the materials. The distn. gases are withdrawn from the annular circumferential space in the shaft, the pressure in the gas-withdrawing space being always the same as that in the hot gas space.

Aqueous pastes from bituminous materials. LOUIS C. JONES, CHAUNCEY C. LOOMIS and HENRY W. BANKS, 3RD. U. S. 1,699,536, Jan. 22. Bituminous materials such as crude Trinidad asphalt are ground with water to produce a pasty mass, and then, without heating, gasoline or other suitable solvent for bitumens is added, while the grinding is continued to produce a smooth paste, and a small quantity of alk. material such as soap is also added to facilitate dispersion and form a product which is suitable for paints or other coating compds. U. S. 1,699,537 specifies forming a viscous mixt. of china clay and denatured alc., pouring into this mixt. while stirring a previously melted soln. of blown asphalt and resin, to effect dispersion, and adding alc. to maintain the viscous condition of the mixt. during the stirring and form products which may be used as an elec. insulation.

Aqueous emulsions of oils, tars, asphalt, sulfur, rubber, etc. NAAMLÖÖZE VENNOOTSCHAP DE BATAAFSCHE PETROLEUM MAATSCHAPPIJ and H. LIMBURG. Brit. 291,393, June 1, 1927. Aq. emulsions or dispersions are prepd. by use of aromatic or hydroaromatic sulfonic acids of mol. wt. not less than 250 or their alkali, Ca or Mg salts. Sulfonic acids derived from treatment of mineral oil, contg. aromatic substances, with "oleum" may be used. Emulsions of asphalt or other materials thus prepd. are stated to be stable even in the presence of HCl, lime or concd. salt solns. and to be unaffected by boiling or freezing. Albumin in weakly acid soln., basic dyes, solns. of salts of multi-

valent metals or hydrosols having positively charged particles may be added to the prep'd. emulsions or dispersions. The sulfonic compds. may be added as stabilizers to rubber latex or similar compns.

Emulsions. BENNETT, INC. Brit. 291,502, Feb. 28, 1927. Aq. emulsions of bitumens, gums, waxes, etc., are prep'd. by feeding the molten substances continuously into an inclined cylinder wherein they are agitated by rotating helical blades while adding a continuous stream of emulsifying agent such as Na silicate soln. Various details of app. and manipulation are described.

Emulsion. ASPHALT COLD MIX (1925), LTD. Ger. 470,306, May 5, 1923. An aq. bituminous emulsion is prep'd. by mixing fatty acids with molten bituminous material with addn. of caustic alkali or alkali carbonate. The amt. of fatty acid is less than 5% of the wt. of the bitumen. The mixt. may contain 4% oleic acid, 0.5% of 1-2% NaOH and 25-50 parts of water to 100 parts of bitumen.

Artificial asphalt. ALBERT TUREK. Austrian 110,401, Mar. 15, 1928. Tars, tar mixts. and pitches which are unsuitable for the manuf. of artificial asphalt by treatment with air or O are rendered suitable for that purpose by mixing them with other tars so that their phenol content reaches 12-24%. Mixts. so prep'd. may be treated with warm air in presence of catalysts such as Fe_2O_3 contg. S.

Treating asphaltic residues of oil distillation. FRANCIS M. ROGERS (to Standard Oil Co. of Ind.). U. S. 1,698,452, Jan. 8. Residues obtained by distn. of asphalt-bearing crude oils are mixed with a hydrocarbon oil of lower viscosity such as "miner's oil distillate" and the mixt. is treated with H_2SO_4 and the added oil is thereafter sepd. from the residue (suitably by distn.) and the sepd. residue may be mixed with naphtha and treated with fuller's earth.

Apparatus for determining the crushing point of asphalt and bituminous products. HELFRIED FERMITZ. Ger. 470,119, Feb. 22, 1927.

Treating carbonaceous material such as asphalt or oil shale. DANIEL PYZEL (to Simplex Refining Co.). U. S. 1,699,989, Jan. 22. Bituminous material such as asphalt is initially mixed in a closed vertical retort with pieces of fire brick or other suitable inert non-combustible material in the form of pieces which will withstand high temps. without disintegration, and steam is injected into the lower part of the resulting porous mass to generate water gas; air is injected into the mass above the point of steam injection to establish a partial combustion zone, and gases of combustion are allowed to rise to the top of the porous mass to distil volatile matter from the carbonaceous material. An app. is described.

Acetic acid from wood carbonization. HERMANN SUIDA. U. S. 1,697,738, Jan. 1. A "detarred" mixt. of wood gases, pyrolygneous acid vapors and wood-spirit vapors, in vaporious or gaseous condition, is subjected to direct extn. with an extn. agent such as cresol which is difficultly sol. in water and has a b. p. higher than that of HOAc, to remove the HOAc from the mixt. and the HOAc is withdrawn in coned. form as a liquid with the extn. agent.

Dismountable plant for carbonizing and distilling wood. JEAN BONELLO. Fr. 641,893, Mar. 12, 1927.

Charcoal kiln. M. A. TOKARSKII. Russ. 4158, Aug. 31, 1928. The kiln is characterized by channels or free space between the brick work and the jacket provided for the escape of gases or vapors

23—CELLULOSE AND PAPER

CARLETON E. CURRAN

What the x-ray tells us of the structure of cellulose. E. A. HAUSER. *Ind. Eng. Chem.* 21, 124-5(1929).—A review. R. J. H.

The structure of the crystallized components of cellulose. KURT H. MAYER AND H. MARK. *Ber.* 61B, 593-614(1928).—X-ray studies of cellulose show a cryst. component to be present, having a unit cell 10.3 A. U. long in the fiber axis direction and 7.9 and 8.7 A. U. long in the other directions. The unit cell contains 4 glucose residues. The following model is discussed in the light of the x-ray results and chem. considerations. Five C atoms and 1 O atom form a hexose ring with a 1:5 linkage. Two hexose rings are joined to form cellobiose by linkage through an O atom, the latter joining N C of one ring to No. 4 of the other. The C-C distance is 1.5 A. U., the C-O distance 1.2 A. U. The length of the two joined rings is 10.3 A. U., agreeing with the x ray identity period along the fiber axis. The cellobiose residues are thus joined

by an O bridge from unit cell to unit cell, the axis of the chain thus formed being the fiber axis, which from the geometry of the model must be a two-fold screw-axis. In the monoclinic system C_2^2 is a satisfactory space-group from the standpoint of the model; for the special case where the planes of the hexose rings are parallel to the a axis (8.7 A. U.) the proper axial ratios and good agreement with observed x-ray intensities result. In this cell the cellobiose chains are arranged along the (010) edges, and the (010) axis in the center, of the cell; (010) is a polar direction. In the rhombic system V^3 and V^4 are in agreement with the x-ray intensities and axial ratios but (010) is not polar. Mercerized cellulose shows a diagram of a unit cell shorter along the fiber axis and larger in the other directions. A turning of the cellobiose chains about the fiber axis through an angle of approx. 45° , half clockwise and half counter-clockwise, supplies an arrangement which agrees with the x-ray data. The lateral expansion of the cell indicates a weaker bond between parallel cellobiose chains than in native cellulose and hence explains the greater reactivity of the mercerized product. Alkali-cellulose diagrams indicate that the alkali penetrates into the voids in the cellulose lattice, causing the changes noticed in the mercerized diagram. Completely nitrated cellulose shows a simple fiber diagram, somewhat similar to that of cellulose. There are no distinct diagrams corresponding to the mono- and di-nitrates. The diagrams of a nitrated cellulose of 7-12% N may either show both the cellulose and tri-nitrate patterns or no distinct pattern at all, depending upon the conditions of nitration. In the first case some fibers have been completely nitrated while others are not affected; in the second all fibers are partly nitrated. The acid is apparently taken into the lattice, causing some distortion, until sufficient is present for the complete nitration when a new sharply defined lattice is formed, which is closely related to the original. In this view of the structure of cellulose the masses osmotically, etc., effective in solns. are not mols. in the usual sense, but particles or micelles made up of cellobiose chains, arranged in parallel and held together by inter-micellar forces, which are similar in nature to van der Waal forces. The great tensile strength in the fiber axis direction of cellulose fibers is due to the primary valence structure of the cellobiose chains. The strength in lateral directions indicates a strong inter-micellar force, as might be expected from the length of the chain and the known strong attraction of OH groups (e. g., in H_2O and the alcohols). The increased solubility of cellulose nitrates and acetates may be due to the replacement of the OH groups and the consequent weakening of the attractive forces. The breadth of the x-ray interference lines and diffusion coefficients indicate about 1500-2000 glucose residues per micelle. 40-60 cellobiose chains each having 30-50 glucose residues is approx. the constitution of a micelle. Whereas alkalis penetrate the lattice without rupturing the O linkages of the chains, acids do cause such rupture and induce decomposition, simultaneously weakening the inter-micellar forces, which depend upon the chain length. A series of decomposition products from cellulose to glucose might be expected and are obtained as a result of this chain breakage. Coagulation of solns. of cellulose or its esters is not a true recrystn. in the sense that new lattice units are built up during the coagulation. The strength of the products is increased if the dissolved particles are forced to assume a parallel arrangement, apparently bringing the inter-micellar forces into play, but no new O linkages along cellobiose chains are established. This primary valence linkage into long chains may be expected to be characteristic of a number of natural compds. R. I. H.

Action of reagents upon cellulose. CHAS. E. MULLIN. Clemson College Textile School. *Textile Colorist* 50, 92-4; *Textile Weekly* 2, 437-8(1928).—A review of the effects of the various more common reagents upon cotton, linen, rayon (except acetate), etc. CHAS. E. MULLIN.

The nature of nitrocellulose. H. BRUNSWIG. *Z. ges. Schiess-Sprengstoffu.* 23, 337-40, 384-7(1928).—Convincing arguments are presented to show the fallacy of the claim of Herzog and von Naray-Szabó (*C. A.* 22, 4244), based on x-ray studies, that the various cellulose nitrates are simply mixts. of the trinitrate and unchanged cellulose. In the examn. of many hundreds of samples of nitrocellulose, B. has found none with any appreciable content of unchanged cellulose. The existence of a heterogeneous chem. equil. between product and nitrating acid is shown by the fact that products of the same chem. and phys. properties (% N, soly., hygroscopicity, etc.) result from either nitration or denitration under appropriate conditions, as in examples cited. The rate of decompn. of nitrocellulose shows no linear relation to its N content, as would be the case in a mixt. of trinitrocellulose and unchanged cellulose. A product of 13% N requires long boiling with H_2O for stabilization, while one of 11% N can be stabilized to an equal degree by mere washing at room temp. The relation is undoubtedly an exponential one, indicating that cellulose nitrates of different N content are

mixts. of unlike components. Both N content and soly. are functions of the compn. of the nitrating acid at completion of the nitration. This depends upon both the original compn. and the ratio of cotton to acid mixt. The results of numerous expts. showing the effects of variations in these factors are tabulated and plotted. A "gelatin cotton" of 12.25% N was dissolved in Me_2CO (1% soln.) and pptd. in 3 fractions by successive addns. of H_2O . The N contents of the fractions were 12.43, 12.28 and 11.92%. The 2nd fraction was repptd. into 2 portions of 12.34 and 12.15% N. C. G. STORM

Steamed straw—a new process for the conversion of straw. JANATA. *Wochbl. Papierfabr.* 59, 978-81(1928).—An exposition of German patent 413,285. Straw is steamed without the addn. of chemicals at about 5 atm. pressure for 2 to 4 hrs., broken up in kollergangs and finally beaten in hollanders. The yield is some 67% of a dark brown pulp, relatively free from lignin, and about twice the strength of ordinary lime-cooked straw pulp. Possible new uses are enumerated. **Steamed straw.** RIEFGERSTE. *Ibid* 1241-3.—A patented process of the Berlin Gesellschaft für mechanische Cellulose, which is similar to that of the foregoing abstract, is described. The small amt. of waste liquor obtained by pressing the steamed straw may be used as sizing agent, dyestuff or cattle feed. R. H. DOUGHTY

Viscose—fibers, pulp, gel and filaments. JAMES SCOTT. *Silk J.* 5, No. 49, 67-8(1928).—A discussion of the microscopy of these products. C. E. M.

Manufacture of viscose silk with special regard to the dyeing properties. H. F. CROW. *Silk J.* 5, No. 50, 54, 66(1928).—The affinity of rayon for dyestuffs is largely a phys. property and therefore the phys. form of the thread is quite as important as its chem. constitution. The properties of viscose depend on a variety of factors from the kind of pulp used to the temp. of the factory. Pulp shipments should be checked regularly and the Cu number should be below 0.3 or the fastness of the colors on the rayon may be impaired. The methylene blue absorption factor gives a clue as to the evenness of dyeing and a low figure is desirable. Uneven caustic impregnation of the pulp causes uneven dyeing rayon, just as does uneven mercerization on cotton. Experience indicates that a low temp. in aging the crumbs gives a more level dyeing silk. Viscose which has been ripened for only a short time gives a silk dyeing heavier than that from a ripper viscose, but the colors are brighter on the latter. The ripper viscose gives threads of lower elasticity and it has been noticed that as the elasticity of the threads grows less, so does the dyestuff affinity, and this applies equally well to the products of different manufacturers. The temp. and concn. of the spinning bath are also important for even dyeing silk. But in spite of all of the above, the majority of dye-house faults are caused by the mechanical processes through which the silk passes in the finishing department. Great care is necessary in reeling the damp cakes into hanks as the wet fiber has little strength or elasticity, so that if the tension varies, with uneven stretching, uneven dyeing will result. Inefficient desulfurization may also cause uneven dyeing, as well as dull and yellow rayon. Bands in woven fabric caused by uneven steaming during finishing may be removed by rewetting the goods, but if caused by uneven yarn or defects in knitting, they cannot be removed. If strain has occurred after dyeing, bright spots will appear running across the fabric. If the strain occurred before dyeing, the dyestuff is taken up unevenly. Rayon oils, sizing and scouring are also discussed. CHAS. E. MULLIN

Denitration in the manufacture of rayon from nitrocellulose. A. NADAI. *Z. physik. Chem.* 136, 289-313(1928).—A study of the reaction velocity of the denitration of nitrocellulose with NaSH shows that this process can be expressed as a reaction of the first order although it occurs in a heterogeneous system. Temp., concn. of soln., and addn. of swelling agents influence velocity analogous to that of a homogeneous reaction. Alc. up to 1% increases velocity, 1.5% giving no further increase. NaSH becomes oxidized by the NO_2 to polysulfides, simultaneously the NO_2 being reduced to NO and NH_3 . The NH_3 catalyzes the denitration. Addn. of NaNO_2 increases this autocatalysis. NaNO_2 was not detected in the reaction liquor. F. C. H.

Manufacture of fine-fiber artificial silk. ADOLF HILRINGHAUS. *Silk J.* 4, No. 48, 54-5(1928).—A brief discussion of the method of manuf. and some of the patents. CHAS. E. MULLIN

The manufacture of acetate silk. CHAS. E. MULLIN. *Silk J.* 4, No. 46, 49-50; No. 48, 50; No. 49, 62; No. 50, 51-2(1928).—A discussion of the patents and literature upon the manuf. and properties of cellulose acetate and its conversion into acetate silk. CHAS. E. MULLIN

Acetic acid. Its recovery in the manufacture of acetate silk. J. L. GENDRE. *Rev. chim ind.* 37, 378-82(1928).—A review of the present methods in use and others not commercially developed. P. THOMASSET

Cellulose (Hess, *et al.*) 10. Substances accompanying cellulose (Hess, *et al.*) 10. Survey of the important kinds of plastic masses (Schmidt) 18. Cellulose ester solvents (Wolff, *et al.*) 26. Extraction of suspended substances from gases or liquids (Fr. pat. 642,012) 13. Cyclohexyl alkyl phthalic esters (U. S. pat. 1,689,761) 10. System for heating and supplying air to apparatus for drying paper (U. S. pat. 1,697,927) 1. Extractor, especially for cellulose manuf. (Ger. pat. 468,656) 1. Solutions of resins, dyes, cellulose esters and ethers, etc. (Swiss pat. 127,241) 13. Luting (Ger. pat. 469,189) 13.

Wise, Louis F.: *Chemical Treasures of the Forest*. Washington, D. C.: The Am. Forestry Assoc. 28 pp. Reviewed in *J. Chem. Education* 5, 1712(1928).

Cellulose. CHARLES HARNIST. Ger. 469,372, July 9, 1920. See Brit. 156,777 (C. A. 15, 1811).

Cellulose. WOLFF & Co. KOMMANDIT-GESELLSCHAFT AUF ACTIEN AND RICHARD WEINGAND. Fr. 642,176, Oct. 11, 1927. See Brit. 289,997 (C. A. 23, 703).

Cellulose from beechwood. HERMANN SUIDA and HANS SADLER. Austrian 111,385, July 15, 1927. Cellulose suitable for the manuf. of artificial silk is prepd. from beechwood by treatment at a temp. not exceeding 85° with a dil. mixt. of HNO₃ and H₂SO₄ contg. 15-25% HNO₃ and less than 10% H₂SO₄, followed, after removal of excess acid, by treatment with 9% alkali lye

Method for obtaining cellulose from wood, straw and other vegetable materials. G. S. PETROV, N. L. ALEKSEEV and V. Y. RYABTZOVSII. Russ. 4590, Feb. 29, 1928. The alk. soln. used with the above materials is mixed with high mol. sulfonic acids from crude oil hydrocarbons and phenol.

Cellulose articles. CHARLES ZARFEL and WILLY DESIRÉ STROEVER. Fr. 641,573, Sept. 20, 1927. Waste products, lignified vegetable fiber, spent tan and crude bark are boiled for several hours in a closed vessel with a caustic lye contg. 3-4% of the wt. of the material in alkali, the mass being freed from lye, washed and molded into articles. The hardness of the mass may be increased by adding paper fiber.

Cellulose compounds. I. G. FARBENIND. A.-G. Fr. 642,220, Oct. 13, 1927. Cellulose is rendered more easily convertible into ethers or esters by a treatment before or during conversion with softening agents such as propylnaphthalenesulfonic acid or higher substituted derivs. thereof or their salts. Examples are given of the prepn. of viscose, nitrocellulose and alkali-cellulose.

Treating cellulose compounds. CAMILLE DREYFUS. Fr. 642,628, Oct. 20, 1927. Artificial silk contg. cellulose acetate or other org. deriv. of cellulose is treated with a swelling agent such as HCOOH, AcOH, PhOH, pyridine, etc., and then with a weighting agent such as SnCl₄ or ZnCl₂, or the swelling agent may be added to the bath contg. the weighting agent. The weighting agent may be used in such concn., *e. g.*, a soln. of SnCl₄ of sp. gr. 1.2, that it acts as a swelling agent.

Cellulose derivatives. I. G. FARBENIND. A.-G. Fr. 641,043, Sept. 16, 1927. Sol. derivs. of aminocellulose are prepd. by treating cellulose esters from organically substituted inorg. acids with an acid chloride or acid anhydride in the presence of a tertiary aliphatic aromatic or aralyphatic amine; or by esterifying or etherifying in either order and treating with a primary, secondary or tertiary amine. In examples, cellulose-toluene-4-sulfoacetate, from acetylcellulose and toluene-4-sulfochloride, is heated with isoamylamine, di- or tri-ethylamine, diphenylamine or PhNMe₂. Alkali cellulose is esterified with benzenesulfochloride, acetylated and heated with PhNH₂. Cellulose-toluene sulfonate is boiled with pyridine and BzCl. The products have a pronounced affinity for acid colors. They may be converted into threads or films which are easily dyed in fast tints, and if added to cellulose esters or ethers they render the latter more easily dyed. Cf. C. A. 23, 703.

Thin foils of soluble cellulose derivatives. CELLON-WERKE ARTHUR REICHENGRUN. Ger. 469,317, Aug. 11, 1922. A soln. of one cellulose deriv., especially an ester or an ether, is spread on a base composed of another cellulose deriv. which is not easily sol. in the solvent.

Treatment of cellulose derivatives. HENRY C. OLPIN (to Henry Dreyfus). Can. 285,979, Dec. 25, 1928. Materials comprising cellulose acetate and an animal or a cellulosic fiber are dyed in solid or differential effects, by applying thereto a sulfuric ester of an anthraquinonylamino alc. in the form of an alkali salt thereof.

Treatment of cellulose derivatives. HENRY DREYFUS. Can. 285,800, Dec. 25, 1928. Goods made of or contg. cellulose esters of org. acids which are homologs of AcOH are loaded with a metallic salt or salts by treatment in succession with a bath

contg. in soln. a salt or salts of a metal or metals such as Sn, Zn, W or Al and a bath contg. a soln. of phosphate, silicate, tannin or other compd. or compds. adapted to deposit the metal or metals as an insol. salt or salts or compd. or compds. upon the goods. The loading operation may be repeated as it increases the capacity for absorbing dyestuffs. The goods, after loading, may be dyed with direct acid, basic or other dyestuffs.

Treatment of cellulose derivatives. HENRY DREYFUS. Can. 285,801, Dec. 25, 1928. Material comprising ethyl cellulose is dyed with an aq. dispersion of a relatively water-insol. coloring compd. prepd. by pretreating the compd. with a solubilizing agent comprising a Na salt of sulforicinoieic acid.

Weighted cellulose compounds. HENRY DREYFUS. Fr. 642,331, Sept. 16, 1927; Can. 285,802, Dec. 25, 1928. Cellulose derivs. in the form of artificial silk, etc., are weighted with metals, e. g., Sn, partly or wholly in the form of thiocyanate. Examples are given of treatment with solns. contg. SnCl_4 and NH_4CNS in proportions suitable for the formation of $\text{Sn}(\text{CNS})_4$, $\text{SnCl}(\text{CNS})_3$ and $\text{SnCl}_2(\text{CNS})_2$. The material may be treated afterward with a soln. of phosphate.

Preparing cellulose for esterification. HENRY DREYFUS and CLIFFORD I. HANEY (to Celanese Corp. of America). U. S. 1,697,907, Jan. 8. Cellulosic material is preliminarily treated with a small proportion of formic acid, which renders it highly reactive for esterification, e. g., with acetylating reagents.

Cellulose esters. I. G. FARBENIND. A.-G. Brit. 291,360, May 30, 1927. Cellulose esters of lower aliphatic acids are prepd. by treating the cellulosic material with a halide of a lower aliphatic acid such as acetyl chloride in the presence of an org. base such as pyridine and an "indifferent" org. medium such as PhCl which at least partly dissolves the addn. product of acid halide and org. base formed in the esterification mixt. but which is not a solvent of the cellulose ester which is produced.

Cellulosic esters containing bromine-substituted stearic acid groups. HANS T. CLARKE and CARL J. MALM (to Eastman Kodak Co.). U. S. 1,698,049, Jan. 8. Cellulosic material such as cotton or bleached sulfite pulp is treated with an esterifying bath contg. Br-substituted stearic acid and chloroacetic anhydride. The product is suitable for making non-inflammable films.

Soft and pliable masses from cellulose esters. OSKAR LOEHR (to I. G. Farbenind. A. G.). Can. 285,919, Dec. 25, 1928. A compn. of matter contains a cellulose ester and an ester of a polyethylene glycol with an aromatic carboxylic acid. The product is suited to the manuf. of plastic masses, lacquers, artificial leather, etc. Example: Dissolve 16 parts by wt. of acetylcellulose together with 8 parts by wt. of a mixt. of the benzoic acid esters of a mixt. of polyethylene glycols consisting essentially of diethylene glycol b_{15} from 230° to 260° and contg. no free OH group, in 50 parts by wt. of acetone and 20 parts by wt. of cyclohexanone. The soln. on pouring and evapg. the solvent yields a film of excellent properties.

Plastic cellulose compositions. SOC. CHIMIQUE DES USINES DU RHÔNE. Swiss 127,543, June 24, 1927. Plastic and finely divided compns. are prepd. from cellulose esters by adding an adjuvant to the soln. of the ester. A coloring matter may also be added. Thus, ultramarine blue and ethyl-*p*-toluenesulfonamide are added to a soln. of cellulose acetate in acetone. The cellulose acetate is then pptd. and washed. Other examples are given.

Plastic substances in powder form. SOCIÉTÉ CHIMIQUE DES USINES DU RHÔNE. Fr. 333,066, Feb. 22, 1927. Addn. to 622,733. Plastic substances having a basis of cellulose ether are obtained as a powder by dissolving them in a solvent and adding a liquid precipitant which does not dissolve the plastic substance, but is miscible with and less volatile than the solvent, and distg.

Moldable powders containing cellulose esters and ethers, etc. A. EICHENGRÜN (trading as Cella-Werke, Dr. A. Eichengrün). Brit. 290,989, May 20, 1927. Compns. contg. viscous solns. of cellulose derivs. such as esters or ethers, with or without addnl. substances such as softening agents, fillers, resins, dyes, artificial resins, rubber, etc., are pressed through narrow apertures in a highly heated state so that the issuing mass swells and the solvent evaporates, leaving a dry brittle product which may be easily disintegrated into a powder suitable for molding.

Cellulose acetates. A. WACKER GES. FÜR ELEKTROCHEMISCHE INDUSTRIE GES. Brit. 291,001, May 23, 1927. Cellulose acetates sol. in CHCl_3 and of high viscosity and good mech. properties are obtained with use of ZnCl_2 as catalyst by carrying out the first phase of the acetylation at an elevated temp. (suitably 55 – 60°) and the second phase at a lower temp. (suitably about 40°). An "indifferent" liquid such as benzene may be added to the acetylation mixt.

Sheets, filaments or other forms from cellulose acetate or other cellulose derivatives. A. EICHENGRÜN. Brit. 291,386, May 31, 1927. The material is caused to swell by use of a liquid which is a non-solvent or acts as a solvent only when heated or of a mixt. of a non-solvent with only a small proportion of a solvent. A doughy plastic mass is formed which can be made into molded articles, sheets, films or filaments, with or without addn. of fillers, artificial resins, etc. Several examples are given.

Cellulose acetoöleate. HANS T. CLARKE and CARL J. MALM (to Eastman Kodak Co.). U. S. 1,698,048, Jan. 8. Partially deacetylated cellulose acetate is treated with an esterifying bath including chloroacetic anhydride and oleic acid. The product obtained is suitable for making films. Other similar esters also are referred to.

Nitrating cellulose. M. G. MILLIKEN (to Hercules Powder Co.). Brit. 291,082, May 28, 1927. An app. is described in which cellulose is passed through a body of nitrating acid in which it remains submerged until the desired degree of nitration is effected.

Nitrocellulose. I. G. FARBENIND. A.-G. Fr. 640,087, Aug. 27, 1927. Cellulose is heated with water under pressure to 140–170° for a prolonged time to obtain any desired viscosity of solns. in the usual solvents of nitrocellulose made from this cellulose. Cellulose heated for 6 hrs. in this way gives a nitrocellulose with 0.1 the viscosity of ordinary nitrocellulose. Cf. C. A. 23, 703.

Cellulose solutions. I. G. FARBENIND. A.-G. Fr. 641,685, Sept. 30, 1927. Ammoniacal CuO solns. of cellulose are prepd. by using the cellulose in the form of paper.

Cellulose wadding. JULIUS RICHTER. Austrian 109,878, Feb. 15, 1928. A cellulose pulp is dried in a loose unpressed state. The drying may be effected on perforated bands with warm air, if necessary with application of suction.

Manufacture of cellulosic products. ERNEST MULLER. Swiss 127,275, May 30, 1927. In the manuf. of cellulosic products by coagulation from solns., particularly in the manuf. of films from viscose, a softening agent is added only during the drying stage, and preferably toward the end of that stage.

Sugars from cellulosic materials. Soc. D'ÉTUDES CHIMIQUES POUR L'INDUSTRIE. Swiss 127,238, April 25, 1927. Fermentable sugars, not intended for human consumption, are obtained by boiling cellulosic materials with dil. mineral acids, first at ordinary pressure and then at 150° under increased pressure.

Synthetic materials. LEON LILIENFELD. Ger. 467,003, May 20, 1924. Prior Austrian application April 4, 1924. *N-Alkyl thiourethans of cellulose* with or without other colloids, plasticizers, pigments, fillers, etc., in alk. soln. are ppt. with a suitable precipitant. A similar soln. of the cellulose deriv. and its admixtures in a volatile solvent may be dried. The process yields *plastics, paints, lacquers, artificial silk, cements, textile and paper sizes and coatings, waterproofing agents, artificial leather, linoleum substitutes, electric insulators and bookbinding material.*

Treating cork with esterifying reagents. I. G. FARBENIND. A.-G. Brit. 291,773, June 8, 1927. Cork is suspended in an inert vehicle such as PhCl and caused to react with reagents such as are used for esterifying cellulose, *e. g.* with Ac₂O or lauryl chloride in the presence of pyridine or POCl₃ in the presence of pyridine. The products are plastic under pressure and when heated.

Viscose. LOUIS CHARLES PHILIPPE JARDIN. Fr. 641,868, Mar. 5, 1927. Cellulose in any form is transformed into defibered alkali cellulose by a simultaneous cutting and wetting with the calculated amt. of NaOH soln. The app. may consist of a vat contg. rotating screws and a fixed cutting piece between which the cellulose is torn.

Viscose. LOUIS CHARLES PHILIPPE JARDIN. Fr. 641,866, Mar. 4, 1927. Sheets of cellulose pulp are transformed into alkali cellulose by intimate and homogeneous impregnation with a soln. of NaOH which is determined beforehand to correspond exactly with the amt. necessary for the transformation. The sheets are freely suspended in a frame which can be immersed in a steeping vessel and raised again for washing.

Artificial silk. I. G. FARBENIND. A.-G. Swiss 126,778, June 28, 1927. A device for receiving spun artificial silk is made of a durable alloy impervious to acids, especially HNO₃. A suitable alloy contains Fe, Cr, Ni and Mo.

Artificial silk. I. G. FARBENIND. A.-G. Swiss 127,493, Apr. 29, 1927. In spinning artificial silk from cuprammonium solns. of cellulose, a pptg. bath contg. free CO₂ is used. An aq. soln. of CO₂ is suitable. Cf. Brit. 289,942 (C. A. 23, 982).

Artificial silk, etc. KIKUCHIKO HAGIWARA (to Toshiya Iwasaki). U. S. 1,699,615, Jan. 22. In forming artificial silk and like filaments from viscose or similar materials, an elec. current (suitably an induction current) is passed between electrodes, one of which is in a soln. of the raw material and another in the coagulation bath, in order to

accelerate flow through the spinning nozzle and decompose S compds. Cf. C. A. 23, 705.

Perpendicular spinning device for artificial silk and other artificial threads. C. G. HAUBOLD A.-G. Ger. 469,345, Feb. 5, 1927. Details of arrangement.

Digesting fibrous material. THOMAS L. DUNBAR and AUGUST F. RICHTER (to Chemipulp Process, Inc.). U. S. 1,699,056, Jan. 15. Fibrous material such as wood chips is digested with acid liquor and high pressure existing in the digester during a portion of the cooking period is utilized for discharging heated high-pressure gas and vapor from the digester during that portion of the cooking period and for introducing the same in its heated condition into acid liquor in an accumulator; suction is exerted on the digester during another portion of the cooking period to withdraw heated low-pressure gases and vapors from the digester and these low-pressure gases and vapors are contacted while heated with a flowing stream of acid liquor; acid liquor thus pre-conditioned, from the accumulator and flowing stream, is utilized for digesting fibrous material. An arrangement of app. is described.

Calcium bisulfite liquor. RICHARD BÖHLIG. Ger. 464,262, July 26, 1928. $\text{Ca}(\text{HSO}_3)_2$ liquor contg. 1–5° Bé. of SO_2 is prepd. by treating lumps of CaO with water and SO_2 in a rotating app. contg. iron balls, the purpose of these being to expose fresh surfaces of the lime.

Sulfite pulp. GEORGE H. TOMLINSON. U. S. 1,697,032, Jan. 1. Hot liquor discharged with the cooked pulp from a digester into a blow-pit is used to preheat and to wash into position a second charge of chips in the digester and there is mixed with the second charge a quantity of cooking acid which has been preheated by the fluid passing through the relief valve of the digester while the first-mentioned charge of pulp was undergoing cooking. Cf. C. A. 22, 4247.

Sulfite cellulose lye. Soc. BARBOU ET CIE. Fr. 642,270, Jan. 21, 1927. The waste liquor from the treatment of cellulose with Na_2S is treated with H_2SO_4 to convert the sulfonated org. content into Na_2SO_4 with the ptn. of the org. substances and liberation of SO_2 . Na_2S is reformed and used again.

Treatment of residual liquor. PIERRE A. BARBOU (to Soc. Barbou et Cie). Can. 285,952, Dec. 25, 1928. The lye or liquor accruing from the boiling of vegetable matter with Na_2SO_3 is treated with lime at 75° in an open or closed container. The mixt. so formed is agitated and then allowed to stand. After leaving the mixt. for 24 hr. the liquid supernatant on the ppt. is drawn off and transferred to a further open or closed container. The correct amt. of calcium bisulfite soln. is now added to the liquor. The mixt. is then agitated for a few min. and allowed to stand. After an hour the clear supernatant liquid is drawn off and neutralized with NaOH to obtain a soln. of NaSO_3 which may be used for further lixiviating operations.

Treatment of black or brown liquors from sodium sulfate-cellulose manufacture. FRITZ WALLENBERGER. Austrian 110,272, Mar. 15, 1928. The liquors are treated in a closed container with a mineral acid or acid salt, the H_2S being drawn off and absorbed in NaOH soln. in a closed system.

Recovery of caustic soda. GIUSEPPE DONAGEMMA. Fr. 641,901, Mar. 12, 1927. The water used in the dialyzers for the recovery of NaOH solns. used in *alkali cellulose* manuf. has 1 to 2% of NaOH added to it to prevent crust formation on the diaphragms.

Dialyzer diaphragm. GIUSEPPE DONAGEMMA. Fr. 641,886, Mar. 11, 1927. Diaphragms used for the recovery of NaOH solns. used in *alkali cellulose* manuf. are made of natural stone having a micro-granular structure by cutting from a single block of stone having no chem. reaction with NaOH or fragments of stone cemented together with a binding agent.

Treating strawboard waste. JOHN T. TRAVERS (to Travers-Lewis Process Corp.). U. S. 1,699,257, Jan. 15. Waste such as the fluid wastes from strawboard manuf. is initially subjected to the action of CaSO_4 and $\text{Ca}(\text{OH})_2$, the pptd. material is permitted to settle, the effluent is removed and the removed effluent is treated with a mixt. contg. mono- Ca phosphate (such as a mixt. also contg. waste cement dust and FeSO_4) in order to effect coagulation.

Treating sulfite pulp waste. JOHN T. TRAVERS (to Travers-Lewis Process Corp.). U. S. 1,699,258, Jan. 15. Sulfite pulp mill waste is permitted to stand quiescent in a settling zone to permit suspended matter to settle out, and the liquid waste thus sepd. from substantially all the suspended matter is then passed through porous CaCO_3 and maintained in contact with the CaCO_3 for about 2 min., in order to clarify the effluent.

Treating waste sulfite liquor. ERIK L. RINMAN. U. S. 1,699,808, Jan. 22. The waste liquor is evapd. and combustion of its combustible matter is then effected in

such a manner that the Na compds. present are converted into Na sulfide and soda; the combustion residue is dissolved in water and treated with an oxide of a metal such as ZnO, the S compds. of which are insol. in NaOH soln. so that all the Na_2S is transformed into NaOH; the sepd. soln. is then treated with SO_2 to produce fresh digester liquor.

Treating waste sulfite liquor. GUY C. HOWARD. U. S. 1,699,845, Jan. 22. An alk. soln. of sulfite liquor from which the major portion of the Ca ligninsulfonic acid constituent has been previously decomposed and removed is treated with an excess of a solid reagent such as lime to effect complete decompn. and removal of the residual ligninsulfonic acid and the ppt. and associated solid reagent thus formed are used together in treating a further quantity of the liquor to effect removal of the major portion of its Ca ligninsulfonic acid constituent.

Paper-making apparatus. HAROLD F. DUNBAR. U. S. 1,698,189, Jan. 8.

Suction box for paper-making apparatus. ARCHELAUS LEWIS. U. S. 1,696,917, Jan. 1. Structural features.

"Beating engine" for treating paper pulp. J. WHITE. Brit. 291,173, March 9, 1927. Structural features.

Paper pulp by the acid sulfite process. ROBERT B. WOLF. U. S. 1,699,556, Jan. 22. An app. is specified comprising a digester and acid liquor storage tanks and an absorber, arranged for circulation of the contents of the storage tanks through the absorber; a connection is provided for delivering gas from the digester to the absorber, and a separator for moisture and fiber is interposed between the digester and absorber.

Apparatus for separating impurities from fluent aqueous paper pulp by gravity and straining. S. MILNE. Brit. 291,154, Feb. 25, 1927.

Plant for semi-continuous digestion of cellulose or paper pulp from bamboo, etc. EXECUTORS OF BARON CABLE, G. C. GODFREY, F. C. BENTHALL, E. S. TARLTON and H. F. WHEELER (trading as Bird & Co.) and E. SPENCER. Brit. 291,064, May 28, 1927. A plant is specified which is adapted for carrying out processes such as described in Brit. 283,910 (C. A. 22, 4248) in which the digesting liquor after use in any one digester is passed to the digester next-but-one lower in the cycle of operative sequence. Brit. 291,065 specifies a semi-continuous progressive process for prepn. of cellulose or paper pulp from bamboo, grasses, wood or reeds by digestion under a gradually increasing pressure and digesting liquor concn. and in which the liquor concn. in the last stage or the compn. of the liquor, and if desired also the pressure in the final stages, may be so reduced or modified as to render its action less severe and thus avoid hydrolysis of the fiber. Mixed digesting liquors may be used such as caustic alkali, sulfides and sulfites with a greater proportion of the latter during the later stages of the process.

Tank and mixing devices suitable for treating wet paper stock. JOSEPH A. WHITE (to Grellet Collins). U. S. 1,696,994, Jan. 1. Structural features.

Centrifugal apparatus for purifying paper-making material. HERMANUS THOMASSEN. Ger. 469,318, Apr. 8, 1923. Description of method and app.

Manufacture of fibrous materials. EMIL CLAVIEZ. Ger. 469,393, Apr. 12, 1925. Fibrous husks, *e. g.*, of the coconut, are subjected to the same grinding and other treatments as are applied in prepn. wood fibers.

Waterproofing fibrous materials or paper. E. I. ORLOV. Russ. 4821, Mar. 31, 1928. The above materials are impregnated with a Reinicke salt, *e. g.*, $[\text{Cr}(\text{NH}_3)_4(\text{SCN})_2]\cdot\text{NH}_4(\text{K},\text{Na})$ or a Morland salt, *e. g.*, $[\text{Cr}(\text{NH}_3)_2(\text{SCN})_4]\cdot\text{H}\cdot\text{NH}_2$ and

preliminarily heated with neutral salts until the color of the soln. changes from purple to violet. These operations are followed by drying with heat, washing and drying again.

Waterproof straw pulpboard. EDWARD B. WESTON and WILLIAM G. CLARK (to Terre Haute Paper Co.). U. S. 1,697,702, Jan. 1. Pulpboard is formed from straw fibers substantially free from alkali and having a rosin size incorporated with them.

Means for tightening loosely wound paper rolls. FREDERIK SCHADE. Ger. 469,676, July 12, 1927.

Apparatus for making coreless rolls of paper, etc. CARL NEBRICH. Ger. 469,675, July 13, 1927.

Carbon or duplicate paper. FELIX PELTZER & Co. Swiss 127,545, Mar. 7, 1927. Details of prepn. of the colored layer.

Manufacture of pasteboard. "CARINTHIA" PAPPENFABRIKEN GUSTAV HORNBORG & Co. Austrian 110,727, May 15, 1928. The manuf. of a uniformly thick product is

facilitated by measuring micrometrically the distance between the rollers, or the spindles of the rollers, from which the damp sheet is delivered.

Felt paper. PIERRE DREWSSEN (to The Barrett Co.). Can. 285,687, Dec. 18, 1928. Felt paper is produced by blending flax tow fibers which have been cooked by a pentasulfide process with felt paper-making material which has high satg. qualities and forming a sheet of felt paper contg. said components.

Felt. PIERRE DREWSSEN (to The Barrett Co.). Can. 285,686, Dec. 18, 1928. Cordage fibers are placed in a paper mill beater with hot water maintained at 90° to 100°, to which strong alkali, such as NaOH, or Ca(OH)₂, etc., has been added to approx. 10% by wt. of the raw fibrous substance used. Live or exhaust steam is used for heating. The time of treatment varies with the strength of alkali used and nature of the fibrous substance. Before the fiber produced in this manner is used for paper making it is washed to remove the chemicals, in order to avoid difficulties in the subsequent paper-making operations.

Apparatus for forming bottles, cups, plates, etc., from paper pulp. EUGENE P. KENNEDY. U. S. 1,697,244, Jan. 1. A mold is passed through a pulp vat and then through a drying chamber in both of which continuous suction is maintained on the mold.

Baking pan. OTTO HERTING (to Sani Paper Products Co.). U. S. 1,699,843, Jan. 22. A pan suitable for baking pies is formed of wood or vegetable pulp or other suitable fibrous material impregnated with substances such as those which may be formed by the interaction of Al₂(SO₄)₃, Ti sulfate, Na tetraborate and Na silicate. U. S. 1,699,844 specifies similar impregnated utensils, the inner surface of which is coated with paraffin of high m. p. and carnauba wax.

24—EXPLOSIVES AND EXPLOSIONS

CHARLES E. MUNROE

Present situation of the question of mercury fulminate substitutes. F. BLECHTA. *Chem. Obzor* 3, 330 6(306 English)(1928).—The fulminates of other metals, PbN₃, and other azides, diazo compds., Pb salt of methylenediisonitramine, and cyanuric triazide, though many of them possess greater initial igniting acceleration, have proved to be either too sensitive or too unstable for practical use. JAKOSLAV KUČERA

Ignition of mixtures of air with natural gas and with methane by induction-coil sparks. E. G. MEYER. *Ind. Eng. Chem.* 20, 1353-4(1928).—The U. S. Bureau of Mines uses natural gas rather than methane for producing explosive atms. for its investigations of the safety of mining equipment and of explosives. A knowledge of the relative inflammabilities of mixts. of air with each of the two gases is important because the flame properties have been considered approx. the same. The app. and method have been described by Sastry, Wheeler, Coward and Meier (*C. A.* 10, 2149; 11, 1596; 14, 3157; 21, 1185-6). The results show that the most sensitive mixt. of a natural gas (CH₄ 88.9, C₂H₆ 7.4, C₃H₈ 2.4, C₄H₁₀ 0.8, higher hydrocarbons 0.1, N₂ 0.1%) and air is more easily ignited by an induction-coil spark than the most sensitive mixt. of CH₄ (natural and with less than 2% impurity; purified) and air; but the difference is small. The use of natural gas instead of CH₄ for testing the safety of elec. machinery in explosive atms. is therefore on the side of safety. The most readily ignited mixts. of natural gas and air, under the conditions used, are those which contain between 7.3 and 8.6% natural gas. A. J. MONACK

Determination of sensitiveness to friction of priming compositions. H. RATHSBURG. *Z. angew. Chem.* 41, 1284-6(1928).—No reliable method of expressing numerically the sensitiveness to friction of priming compns. is known. The falling wt. test is only a compromise. A steel pestle rotating at 80 r. p. m. pressed by definite loading wts. on priming compn. contained in a porcelain or steel mortar gives definite, reproducible results. E. M. SYMMES

The continuous nitroglycerin process of Dr. Arnold Schmid as installed at Brig. GOTTFRIED VON FRILITZEN. *Z. ges. Schiess-Sprengstoffw.* 23, 343-4(1928).—The app. installed in the Swiss plant at Gamsen-Brig has a vol. of only 25 l., but produces 100 kg. C₃H₅(ONO₂)₃ per hr. (cf. *C. A.* 21, 4070). Its many advantages over the batch process from the standpoint of safety are discussed (cf. *C. A.* 22, 3047), and the process is fully indorsed. C. G. STORM

The initiation and propagation of explosion and the testing of detonators, based on foreign reports. HAID AND GLOBIG. *Z. ges. Schiess-Sprengstoffw.* 23, 302-5, 350-2 (1928).—The authors review the various published articles on the influence on rate

of detonation in high explosives of such factors as diam. of charge, confinement, temp., cryst. size, aging of gelatin dynamite and strength of detonators. The limitations of various tests proposed for detonators are discussed (cf. C. A. 10, 1930; 16, 4347; 21, 3270). C. G. STORM

Fighting dust explosions. HYLTON R. BROWN. *Pit and Quarry* 7, 74-5(1928).—The use of inert gases properly introduced into the dust producing or conveying system is discussed. In planning for this there must first be known (1) quantity of air which normally enters the machine or systems, (2) reduction of O necessary to prevent explosions of the materials being handled, (3) percentage of O, if any, in the gas used to create the inert atm., (4) quantity of gas required, (5) availability of the required quantity of gas, (6) type of gas-conditioning equipment, if necessary, (7) the type of gas-distributing system best adapted to the plant. By giving consideration to these important points on planning the protective system accordingly it is possible to eliminate from the most hazardous points in industrial plants all danger of dust explosions.

CHARLES E. MUNROE

Evaluation of stibnite (McNABB, WAGNER) 7. The spontaneous ignition of benzene (TROTMAN) 25.

Explosive. ALEXANDER C. SCOTT (to Mexico, Ltd.). U. S. 1,700,085, Jan. 22. Particles such as those of KClO_3 or like compds. are isolated from each other by a synthetic resin which forms a continuous phase between the particles.

Black powder. LIGNOZA S. AKCYJNA. Fr. 641,442, Aug. 23, 1927. C in black powder is replaced by hydrocarbons such as C_{10}H_8 , sulfo acids of C_{10}H_8 or of phenols, or nitrosulfo acids of phenols. Carbohydrates such as cellulose, starch or sawdust also may be used.

Smokeless powder. SOC. ANON. ITALIANA DINAMITE NOBEL. Fr. 642,598, Oct. 19, 1927. A powder contains nitroglycerin 20-45, nitrocellulose 50-70, plastifier 2-10 and vaseline 2-6%. The plastifier may be diphenylurethan.

Flameless gun powder. N. I. DOVGELVICH. Russ. 5039, Sept. 15, 1924. Flameless powder is obtained by adding 3 to 10% of un-nitrated cellulose to the nitrocellulose during treatment in hollanders.

Apparatus for testing percussion caps. S. A. BROUNS. Russ. 3841, Oct. 31, 1927.

25—DYES AND TEXTILE CHEMISTRY

L. A. OLNEY

Classification of dyestuffs. CHAS. E. MULLIN. *Clemson College Textile School Textile Colorist* 50, 17-8(1928).—The classification of dyestuffs, including those for acetate silk, based upon their methods of application. CHAS. E. MULLIN

Dyeing in the seventeenth century. DAVID PATERSON. *Dyer, Calico Printer* 61, 8-9(1929). RUBY K. WORNER

Applying Indigosol O by the steaming process. CHAS. E. MULLIN. *Clemson College Textile School. Rayon J.* 2, No. 12, 15-6, 42(1927).—Methods and formulas are suggested. CHAS. E. MULLIN

Iron carbonyl in dyeing. H. POMERANZ. *Melliand Textilber.* 9, 843-4(1928). Iron carbonyl, $\text{Fe}(\text{CO})_5$, according to Ger. 441,179, is capable of reducing indigo and similar dyestuffs suspended in alk. soln. Mol. wts. indicate that 118 parts by wt. of Rongalit C is equal to 196 parts by wt. of $\text{Fe}(\text{CO})_5$. E. R. CLARK

The luminosity of dyeings. FRIEDRICH JACOBY. *Kaiser Wilhelm Institut für Physik. Chem., Berlin. Melliand Textilber.* 9, 837-40(1928).—Practical observation suffices to teach that with increasing time of dyeing or increasing concn. of dyestuff, a max. is reached beyond which the dyeing loses in brightness. Physically expressed, the effect is due to an approach to total absorption or blackness. With various methods of dyeing and with the aid of various dyeing assistants some variation in the shade corresponding to max. brightness is possible. Rational technological procedure should be based on the most economical production of lively, attractive shades. E. R. C.

Causes of unlevel dyeing on artificial silk. WM. BENNETT. *Silk J.* 5, No. 49, 66-7(1928).—A general discussion of the causes and suggested remedies. CHAS. E. MULLIN

The dyeing phenomena of acetate artificial silk. V. KARTASCHOFF AND G. FARINE. *Inst. chim. phys. Bâle. Helv. Chim. Acta* 11, 813-36(1928).—The soly. of several

anthraquinonic derivs. in abs. alc. has been detd.: 1-aminoanthraquinone, 3.51 g./l. at 60°; 1,4-diamino-, 5.54; 1,5-diamino-, 6.85; 1,8-diamino-, 6.82; 1,4,5,8-tetraamino-, 1.84; alizarin, 3.70; purpurin, 3.61; 1-hydroxy-4-amino-, 5.14; diaminoanthrarufin, 1.06; 1-methylamino-, 14.96; 1-amino-2-methyl-, 5.83; 1-amino-4-anilino-, 6.57; 1-amino-4-*p*-toluino-, 0.47; 1,4-di-*p*-toluino-, 0.34; 1,4-di-*p*-toluino-2-methyl-, 2.25. By using alc. solns. to dye the acetate silk, it is found that the partition coeff. is a const. The silk dyeing is thus a soly. phenomenon. There is an analogous mol. formation in the alc. and in the silk. In the dyeing with suspension of the dye in H₂O, pptn. on the surface of the fiber occurs first; solubilization in the fiber is a secondary process. The solubilities of the dyes in the silk have been detd. by color titration of the alc. soln. before and after dyeing. An NH₂ group favors the soly. of the silk. The 1,8-position is the most favorable. OH is a little more effective yet. CH₃ *para* to NH₂, or introduced into the NH₂ group itself, is favorable. Ph and MeC₆H₄ are unfavorable. The dyeing of acetate silk is explained as a soln. of the dye in the fiber. A. L. HENNE

Formulas and procedure for printing viscose rayon in the skein. RAYMOND CURTIS. *Textile World* 75, 493-5(1929). RUBY K. WORNER

Advances in textile chemistry. Recent German patents. ANON. *Wool Record* 33, 1639-41(1928).—A review. RUBY K. WORNER

Electrical conduction in textiles. I. E. J. MURPHY AND A. C. WALKER. Bell Tel. Lab., N. Y. *J. Phys. Chem.* 32, 1761-86(1928).—A study of the resistance of cotton, silk and wool samples with relative humidity and moisture content. The conductance of a cotton thread is equal to the sum of the conductances of the fibers of which it is composed; the rate of change of insulation resistance with relative humidity is independent of the form of the sample and of its electrolyte content. Equations are given for calcg. the resistance of a cotton sample for any moisture content. The rate of change of resistivity with moisture content is much greater for silk and wool than for cotton, and for a given moisture content the resistivity of silk or wool is greater than that of cotton. E. G. VAN DEN BOSCHE

A fiber comparator. S. G. BARKER AND M. C. MARSH. *Wool Record* 33, 1564-6, 1571(1928).—A comparator for fiber diams. is described and illustrated. It is a sample projection microscope with 2 sep. optical systems, giving adjacent images on the same screen of 2 sets of fibers, one being the sample and the other the standard. R. K. W.

Moisture content of textile fibers. W. G. SCHAFOSCHNIKOFF. *Melliand Textilber.* 9, 844-50(1928).—Samples of various types of cotton and of hemp, jute, wool, silk, linen and flax were weighed daily in Kiev for a period of 549 days. These tests showed that the international standards adopted in Turin in 1874 do not properly represent Russian conditions. Thus while 8.5% has been considered as the normal regain for cotton, the tests showed a min. of 6.87%, a max. of 15.28% and an av. of 11.66%. The av. regain of silk was 13.75%, of water-retted flax 14.15%, of hemp 14.72%, of jute 16.35%, of rayon 18.79%, of woolen 19.56% and of worsted 19.54%. The av. relative humidity was 76.8%. Hence the use of the Turin standards based on 65% relative humidity leads to transactions in terms of wts. which are quite erroneous in Kiev. It would seem that the maintenance of international standards of regain is impractical and that these should be replaced by standards suited to the given locality. E. R. CLARK

Absorption of colloidal solutions by fibers. W. HERBIG AND H. SEYFERTH. *Melliand Textilber.* 9, 921-4(1928).—The evaluation of wetting agents by measurement of the rise or spread of solns. in a supported or stretched thread gives data obviously contradictory to practical observation. So tested, soap solns. for example did not appear superior to plain H₂O. E. R. CLARK

Abacá-soil conditions in two districts of the Philippine Islands and their relation to fiber production. P. L. SHERMAN. *Philippine J. Sci.* 37, 1-19(1928); cf. following abstr. This study was made in 5 Bicol provinces and in Davao Province, thus furnishing examples of culture methods of 75 yrs. ago and those introduced within 2 or 3 yrs. Mech. and chem. analyses of 39 soil samples are tabulated, also the chem. analyses of ash of abacá fiber. The results of the continued cropping of the past are an exhaustion of plant-food minerals, a permanent acid condition, and a lack of essential mineral salts on which the plant depends for growth and resistance to disease. In the long-cultivated districts the yield is low, the fiber contains an excess of acidity and is low in tensile strength. The benefits of modern practice of abacá production in the Davao district are shown in increased yield and a uniformly high quality of fiber. L. W. RIGGS

Tensile strength of abacá fibers in relation to their acidity. P. L. SHERMAN AND HARTLEY EMBREY SHERMAN. *Philippine J. Sci.* 37, 21-40(1928); cf. preceding and

following abstr.—As the tensile strengths of abacá samples decrease about 10 kg. per g. of wt. per m. of length, the natural acidity of the fiber increases about 0.42 cc. (0.1 *N* NaOH, phenolphthalein indicator) for each 10 g. The natural acid content is also higher for Canton fibers with a low tensile strength, but the mathematical relationship between tensile strength and the acid content is less definite for these hybrids than it is for true abacá. Loss of tensile strength in abacá during storage is affected by the acid content, but the mathematical relation between loss of tensile strength and acid content so far has not been discovered. L. W. RIGGS

Fermentation as affecting the quality of Philippine abacá. TRINIDAD BANUELOS AND P. L. SHERMAN. *Philippine J. Sci.* 37, 41–65(1928); cf. preceding abstr.—In the Philippines some 85% of the semi-annual plant growth is cut down in the harvesting of the fiber and is allowed to ferment and decay underneath the growing immature plants. Accordingly the growing plant is infested with a large diversified bacterial flora. The process of drying, which should immediately follow the stripping of the fiber, sterilizes the fiber so long as it remains dry. Failure to dry the fresh fiber promptly and thoroughly, or wetting after once drier, results in fermentation, the immediate effects of which are the production of increased acidity, lowering of tensile strength, change of color and all of the phenomena that characterize damaged and perished fiber. These damaging effects on the fiber appear to be caused by the acid fermentation products of its sol. constituents, as well as by direct action of the bacteria on the fiber. L. W. RIGGS

Foreign matter in fabric and its effects on finishing operations. C. MARTINI, JR. *Melliand Textilber.* 9, 745–8(1928).—A collection of photographs showing the damage caused by metallic particles, pins, etc., present in fabric becoming embedded in calender rolls. E. R. CLARK

Cloth milling with acids. ALEXANDER YEWDALL. *Wool Record* 33, 830–3, 892–5, 955–7, 1018–21(1928).—General characteristics of the process, prepn. of solns., effects of stronger concns. and milled worsteds are considered. RUBY K. WORNER

What constitutes good fulling practice? A. W. DAVISON. *Textile Recorder* 46, No. 547, 67(1928).—See *C. A.* 22, 2468. RUBY K. WORNER

In mercerization, practice has kept ahead of the knowledge of principles. JOHN H. SKINKLE. Lowell Textile Inst. *Textile World* 75, 371–3(1929).—A brief survey of the theory of mercerization is given. RUBY K. WORNER

Measuring whiteness. ERHARD ZIEGER. *Melliand Textilber.* 9, 916–21(1928). Detrs. of the whiteness of cloth by use of the Ostwald half-shadow photometer gave results which varied with the nature of the illumination, the position of the sample, and particularly with the character of the fabric surface as this is influenced by the fiber, the weave and the smoothing operations of finishing. The use of such a test in com. transactions seems impractical; yet carefully handled the photometer gives data for routine operation control which are superior to the results of visual examination and comparison with fixed standards. E. R. CLARK

Warp sizing. PAUL SEYDEL. *Cotton* 90, 759–60; *Chem. Zentr.* 1927, II, 1399–S. describes the production, properties and chem. compn. of the weighting materials and other chemicals used for sizing the warp, as china clay, talcum, BaSO₄, CaSO₄, BaCl₂, MgSO₄, Na₂SiO₃, Na₂SO₄, glucose, dextrans and starch solns. G. S.

Four most likely causes for the shedding of size from warp yarn. GEOFFREY E. GOVIER. *Textile World* 75, 364–6(1929).—The chief cause is improper cooking of the starch. Other causes are the prepn. of too viscous or heavy a size, the excessive use of fatty matter, and the maintenance of too low a temp. in the size box. R. K. W.

Testing of cloth for wear resistance. H. MALDWIN WILLIAMS. *Wool Record* 34, 105–7(1928).—Various machines designed for this test are described. With the possible exception of one recently devised by Morton and Turner, none of these gives a practical measure. RUBY K. WORNER

Electrolytic bleach liquor for artificial silk. WM. BENNETT. *Silk J.* 4, No. 48, 60–1(1928).—General. CHAS. E. MULLIN

The progress of rayon. JANICE REED. *Wool Record* 34, 363–7, 379–83(1928). RUBY K. WORNER

Differences among commercial cottons and some suggestions regarding test methods. H. FIKENTSCHER. *Melliand Textilber.* 8, 521–4, 606–8, 685–8, 777–80, 855–8, 933–5(1927); 9, 129–31, 389–92, 479–82, 506–7(1928).—The results of phys. tests of 48 samples of cotton of different geographical origin are given. For technological purposes, cotton should be graded on color, purity, staple length, fineness, breaking length, roughness and extensibility. Each might be expressed numerically and a number arrived at which concisely represents the quality. Thus the number 2,136,548 would indicate cotton which rated No. 2 in color, No. 1 in purity, etc. E. R. C.

Some characteristics of wool as affecting worsted spinning. S. G. BARKER AND R. BURGESS. *Wool Record* 33, 823-9, 883-91, 951-3(1928). RUBY K. WORNER

Oils for wool. CHAS. E. MULLIN. Clemson College Textile School. *Textile Colorist* 50, 591-6(1928).—Where the oil must subsequently be removed by an aq. scouring bath, only mineral oils suitably blended with fatty oils, emulsifiers, etc., should be used. Emulsifying bases, the prepn. of wool oil emulsions and p_H control of the same, the "scourability" of wool oils, and p_H control in scouring are considered. C. E. M.

Effect of chemical and physical treatments on the hygroscopicity of wool. L. G. LEITES. *Melliands Textilber.* 9, 835-6(1928).—In connection with the operation of dryers for wool it is necessary to note that excessive temp. causes a permanent reduction in the affinity of wool for atm. moisture. Lab. tests with an oven operated at 10° intervals showed that the permanent change takes place at about 180° in 1 hr. of heating. This limiting temp. may be greatly reduced by the presence of residual chemicals. Cloth dried out of dil. Na_2CO_3 , H_2SO_4 and $K_2Cr_2O_7$ shows a permanent reduction in hygroscopicity. The mech. treatments given wool in the course of mfg. yarns and fabrics all tend to decrease its hygroscopicity, and the effects are permanent as was shown by weighings of the samples at regular intervals over a period of 1 year. The estn. of the H_2O absorption of wool in a definite atmosphere is suggested as a means of detecting undesirable effects of mfg. operations. E. R. CLARK

Solvents used for removing foreign matter in woollen pieces. KENNETH E. MARSDEN. *Textile Recorder* 46, No. 546, 66(1928).—A list of solvents is given for the removal of such impurities as spinning oils used in the mfg. process and loose dirt. Suggestions are also given for the removal of Fe, alum and white paint stains. RUBY K. WORNER

The spontaneous ignition of benzine. S. R. TROTMAN. *Textile Recorder* 46, No. 547, 65(1928).—In the dry-cleaning industry, conditions which favor ignition of the benzine are absence of moisture, presence of air, presence of hydrocarbons with a low flash point, and friction between the garment and solvent, or in the case of materials contg. 2 different fibers, friction between the adjacent threads. All the vessels used should be made of metal and be grounded. All sudden movements of the garments when not completely immersed in the solvent must be avoided. R. K. W.

Carotene (MELL) 11D. Comparing detergents and wetting agents by their effects on the hardness test for water (PERNDANNER, HACKL) 14. Ricinic acid (SUNDER) 10. The pectin and hemicelluloses of the flax plant (HENDERSON) 10. Physical chemistry of color lake formation. IV. Red Congo acid and Congo red lakes (WEISER, RADCLIFFE) 2. Steamed straw (RIEFIGERSTE) 23. Local examination of the tensile strength of textile fabrics, etc. (SCHUBERT) 13. New catalytic processes for the utilization of coal-tar ends (JAEGER) 21. Dyeworks ferrocyanides from waste (ELLIS) 18. Decomposition of tithionate solutions (HORNIG) 6. The physical chemistry of color-lake formation (WEISER, PORTER) 2. Structure of silk fibroin (MEYER, MARK) 11A. Bathochromic action of the methylthiol group in azo dyes (BLUMENSTOCK-HALWARD, JUSA) 10. Perylene and its derivatives (ZINKE, *et al.*) 10. Aminofibroin (MOREL, SISLEY) 10. Deterioration of some silk-scouring soaps on storing (TSUNOKAE) 27. Oil and fat treatment (Can. pat. 285,879) 27. Decreasing the hardness of water used for treating fibrous material (Russ. pat. 4,630) 14. $AlCl_3$ fusions (Austrian pat. 110,530) 10. Treatment of oils or fats or mixts. of same or fatty acids for the production of H_2SO_4 compounds. (Can. pat. 285,772) 27. Wetting agents (Brit. pat. 291,070) 18. Centrifuge (Fr. pat. 642,164) 1. Impregnating fibrous materials (Ger. pat. 469,602) 4. Condensation products from reaction products of S_2Cl_2 and primary arylamines (U. S. pat. 1,699,432) 10. Dinitrohaloaryls (Fr. pat. 642,420) 10. Turkey-red oil substitutes (Fr. pat. 642,392) 27.

HALLER, R.: *Chemische Technologie der Baumwolle*. GLAFKY, H.: *Mechanische Hilfsmittel zur Veredlung der Baumwolltextilen*. This is Band IV, Teil 3, of "Technologie der Textilfasern." Berlin: Julius Springer. 700 pp. \$16.50 net plus duty. Reviewed in *Textile Colorist* 50, 701(1928).

ORILEY, F. L.: *Long Vegetable Fibers*. London: Ernest Benn, Ltd. 180 pp. \$3. Reviewed in *Textile World* 74, 3550(1928).

WOODHOUSE, THOMAS: *Finishing Jute and Linen Fabrics*. 2nd ed. revised. London and New York: MacMillan & Co., Ltd. 350 pp. \$5. Reviewed in *Textile World* 74, 3550(1928).

Colour Lakes. Imperial Chemical Industries, Ltd. British Dyestuffs Corp., Ltd. Glasgow: British Dyestuffs Corporation, Ltd. 75 pp.

Dyes. FELICE BENSA. Fr. 640,959, Sept. 14, 1927. Perylene-3,9-dinitrile is heated with concd. H_2SO_4 , whereby a product contg. S and N is obtained, whose aq. or slightly acid soln. dyes wool and silk directly in yellow shades.

Dyes. D. GARDNER. Brit. 291,827, Feb. 5, 1927. Water-sol. products suitable for direct dyeing are obtained by treating dyes with anhydrous tetrachlorides or tetrabromides of metals of the fourth group of the periodic classification, with the use if necessary of an anhydrous org. solvent such as glacial HOAc. The process is applicable to insol. dyes such as "Indanthrene" vat dyes, indigoid dyes and aniline black and may also be applied to "more or less sol." dyes such as rhodamines and purpurin. Examples are given of the use of SnCl_4 and TiCl_4 .

Dyes. BRITISH DYESTUFFS CORP., LTD., ARNOLD SHEPARDSON and SYDNEY THORNLEY. Fr. 641,251, Aug. 23, 1927. Vat dyes are prep'd. by condensing a sulfo-benzanthrone with NH_4OH followed by alkali fusion. The products dye cotton from the vat in shades going from bluish violet to gray-blue or black. Examples are given using benzanthrone sulfonated with H_2SO_4 of 60° Bé. and with oleum, and 3-chloro-benzanthrone sulfonated with oleum as starting materials.

Dyes. J. R. GEIGY A.-G. Swiss 127,529, July 8, 1927. A monoazo dye is prep'd. by coupling the diazo comp'd. of 1-amino-2-sulfo-4-chlorobenzene-5-carboxylic acid with β -naphthol. The dye is a light red powder giving an orange color in water and a magenta color in concd. H_2SO_4 .

Dyes. E. I. DU PONT DE NEMOURS & Co. Ger. 469,179, Mar. 18, 1926. Dye comp'ds. sol. in org. solvents are prep'd. by converting a dye contg. the carboxyl or sulfo group into salts of di- or polyaryl- or aralkylguanidine. Thus, Pontamine yellow CH is dissolved in water and treated with dixylylguanidineacetate. The dye is ppt'd. It is readily sol. in $(\text{CH}_3)_2\text{CO}$, MeOH and AcOEt. It gives a fast blue color. Other examples are given.

Dyes. I. G. FARBERIND. A.-G. Brit. 291,546, March 14, 1927. The product obtained by alk. fusion of 1,2,1',2'-dinaphthazine-8,8'-disulfonic acid (which is regarded as 8,8'-dihydroxy-1,2,1',2'-dinaphthazine) is converted into halogenated products contg. more than 4 halogen atoms in the mol. by vigorous halogenation. The acyl derivs., or the lower halogenated products obtained by the process described in Brit. 241,270 (C. A. 20, 3576) may also be used as starting materials. The halogenation may be carried out in a diluent such as Ac_2O , a halogenated fatty acid, PhNO_2 , a halogenated hydrocarbon or a mixt. of diluents; a halogenation catalyst such as I also may be added. The products are converted into vat dyes, with partial removal of the halogen, by treatment with agents capable of splitting off halogen hydride such as concd. H_2SO_4 , inorg. or org. bases, NaOAc and the like, or by treating with reducing agents such as metals, SO_2 and its salts, hyposulfites, alcs., phenols, hydrazine and hydroxylamine. The final products in all cases contain more than 4 atoms of halogen in the mol. and dye vegetable and animal fibers from the vat in red shades, with a bluish or yellowish tinge depending on the temp. of the vat. By treatment with H_2SO_4 , or with org. solvents, the products may in some cases be sep'd. into dyes dyeing with a bluish tinge and those dyeing with a reddish tinge. Several examples are given.

Dyes. I. G. FARBERIND. A.-G. Brit. 291,552, March 18, 1927. *N* Dihydro 1,2,1',2'-anthraquinoneazine is chlorinated in H_2SO_4 of 85-95% strength, preferably with warming (suitably to 50°) and in the presence of a catalyst. The product is stated to be faster to Cl than that obtained by chlorinating in the presence of 96% H_2SO_4 .

Dyes. I. G. FARBERIND. A.-G. Brit. 291,851, March 7, 1927. The 9,10 disulfuric acid esters (or their salts) of anthrahydroquinones having an amino group (mono-substituted or not) in β -position and a free α -position ortho to the amino group are converted into vat dyes by the action of oxidizing agents while heated in a slightly acid soln. Examples are given of the manuf. of several dyes which give various blue shades on cotton from the vat. Details are also given of the production of the starting materials for the dye manuf.

Dyes. I. G. FARBERIND. A.-G. Brit. 291,878, March 10, 1927. 1-Aminoanthraquinone-2-aldehyde is condensed with a 1-haloanthraquinone (or a deriv. or substitution product) in the presence of an acid-binding agent such as NaOAc and a catalyst facilitating the elimination of halogen hydride such as Cu or a Cu salt. The dianthraquinonylamine-2-aldehydes thus formed yield condensation products with aniline and by treatment with acids or alkalies are converted into dianthraquinone-acridines, which dye cotton from the vat. Examples are given of dyes which give yellow-brown and dark blue-violet dyeings.

Dyes. I. G. FARBERIND. A.-G. Brit. 291,887, March 11, 1927. Triarylmethane dyes are obtained by condensing 2 mols. of an aromatic *o*-hydroxycarboxylic acid with 1 mol. of 4-benzylamino-3-sulfobenzaldehyde or one of its salts and oxidizing the resulting leuco compd. By using *o*-cresotic acid and 4-benzylamino-3-sulfobenzaldehyde as starting materials, a dye is obtained which dyes wool violet.

Dyes. I. G. FARBERIND. A.-G. Brit. 291,888, March 11, 1927. Dyes giving orange-red to yellow shades are obtained by condensing a 1,3,3-trialkyl-2-methyleneindoline base or substitution product with an ester or salt of nitrous acid in the presence of an acid anhydride such as Ac_2O which serves as a condensing agent. NaNO_2 or AmNO_2 may be used.

Dyes. I. G. FARBERIND. A.-G. Fr. 640,939, Aug. 30, 1927. Vat dyes are prepd. by condensing *N*-benzanthranylpyrazoleanthrones with alk. condensing agents. Other dyes may be prepd. by halogenating the condensation products, or by nitrating and reducing, or by oxidizing and alkylating. In examples, the benzanthranylpyrazoleanthrone obtained by treating pyrazoleanthrone with *Bz*-1-bromobenzanthrone in the presence of K_2CO_3 is condensed with KOH , giving a product which dyes cotton pure blue from the vat. If a higher temp. is used a different product is obtained which dyes cotton grayish green to black. *Bz*-2-Phenylbenzanthranylpyrazoleanthrone gives a product which dyes cotton green. *N*-*Bz*-1-Benzanthranyl-4-methylpyrazoleanthrone (from 4-methylpyrazoleanthrone and *Bz*-1-bromobenzanthrone) when condensed gives a greenish blue on cotton. *N,N'*-Dibenzanthrondipyrazoleanthrone (from 1 mol. of dipyrazoleanthrone and 2 mol. of *Bz*-1-bromobenzanthrone) when condensed gives a reddish blue. Several other examples are given.

Dyes. I. G. FARBERIND. A.-G. Fr. 641,816, Oct. 4, 1927. Azo dyes are obtained by combining aromatic diazo compds. with 2,6-naphtholcarboxylic acid. In an example PhNH_2 is diazotized and the soln. run into an aq. soln. of Na 2,6-naphtholcarboxylate with the addn. of the necessary amt. of NaOAc to neutralize the free mineral acid. The dye colors wool in yellowish red shades. Similar shades are obtained with the dye from *p*-chloroaniline-*o*-sulfonic acid, and brown shades are obtained with the dye from *p*-nitro-*o*-aminophenol. A further list of components and colors obtained is given.

Dyes. I. G. FARBERIND. A.-G. Fr. 641,716, Oct. 1, 1927. Vat dyes are prepd. by treating benzanthrone compds. contg. one or more arylsulfonamido groups with alk. condensing agents. If compds. contg. one or more arylsulfonamido groups in positions other than the 2- and *Bz*-1 positions are used, the condensation products are treated with saponif. agents to sep. the arylsulfonyl radical from the arylsulfonamido group in these positions. In examples: *Bz*-1-(*p*-tolylsulfonamido)benzanthrone (by treating *Bz*-1-benzanthrone with *p*-toluenesulfonyl chloride, or by condensing *Bz*-1-halobenzanthrone with *p*-toluenesulfonamide) is condensed with KOH in alc. giving a product which dyes cotton reddish blue from the vat. 6-Phenylsulfonamido-*Bz*-1-bromobenzanthrone (by nitrating *Bz*-1-bromobenzanthrone, reducing and treating with benzenesulfonyl chloride) is condensed and the phenylsulfonyl radical removed from the phenylsulfamido- in the 6-position by H_2SO_4 ; the product dyes cotton in grayish blue shades of excellent fastness. 6-*Bz*-1-Bis(phenylsulfonamido)benzanthrone prepd. as above is condensed and saponif. as above, giving a product which dyes cotton in gray to black shades.

Dyes. I. G. FARBERIND. A.-G. Fr. 641,769, Oct. 3, 1927. New *o*-hydroxyazo dyes are prepd. by combining aromatic *o*-hydroxydiazo compds. with 2,8-dihydroxynaphthalene-6-carboxylic acid, preferably in alk. soln. In examples: 4-chloro-2-aminophenol is diazotized and coupled with the above acid, the dye giving uniform brown shades on cotton. Chroming gives black shades. With 4-nitro-2-aminophenol, a dye is obtained giving brownish red shades on cotton, turning to brown after chroming. Other examples are given.

Dyes. I. G. FARBERIND. A.-G. Fr. 641,832, Oct. 5, 1927. Dinitroarylamino-diarylamine dyes are obtained by condensing *p*-aminodiphenylamine, its homologs or its substitution products with 4-halo-1,3-dinitro-6-*X*-benzene or 4-halo-3,5-dinitro-1-*X*-benzene, where *X* may be $-\text{COOH}$, $-\text{COO}$ metal, $-\text{COO}$ alkyl, $-\text{CON}$ -arylalkyl,

$-\text{SO}_2\text{N}$ arylalkyl or $-\text{SO}_2\text{O}$ aryl. The products dye animal fibers yellow to brown-red shades and give fast dyes on cellulose esters or ethers. In examples, 4-aminodiphenylamine 4-methyl-2-sulfonic acid is heated in water contg. chalk with 4-chloro-3,5-dinitro 1 (SO_2N -PhMe)-benzene. 4-Aminodiphenylamine-2-sulfonic acid is heated

with 4-chloro-3,5-dinitro-1-benzoic acid. *p*-Aminodiphenylamine is heated with 4-chloro-3,5-dinitro-1-benzoic acid.

Dyes. I. G. FARBENIND. A.-G. Fr. 642,127, Oct. 8, 1927. Vat dyes of the dipyrazoleanthrone series are obtained by heating dipyrazoleanthrone obtained as in Fr. 451,093, or its substitution products, contg. at least 1 atom of H attached to the N capable of being substituted, with aromatic or aliphatic aldehydes in the presence of chlorides of P, Sb or Al, with or without diluents. In examples, dipyrazoleanthrone is suspended in BzH and PCl_3 is added. The mass is heated to 130–140°. The product dyes cotton a clear yellow from the vat after exposure to the air. Dichloropyrazoleanthrone (see Fr. 599,479) is suspended in PhNO_2 , BzH and SbCl_5 are added and the mixt. is heated as before. The product dyes cotton brownish yellow shades. Tetra-bromodipyrazoleanthrone (see Fr. 599,479) is heated in BzH in the same way, giving a product which dyes cotton an orange shade. Other examples are given.

Dyes. I. G. FARBENIND. A.-G. Fr. 642,206, Oct. 12, 1927. New azo dyes are prepd. by coupling diazo compds. of 2-aminobenzene-1-carboxylic-sulfonamides or their derivs. or substitution products with any components and the products are treated in substance or on the fiber with substances yielding metals. In examples, 2-aminobenzene-1-carboxy-5-sulfo-2'-anisidide is diazotized and coupled with 1-naphthol 5 sulfonic acid. The product dyes wool orange-yellow in an acid bath. By chroming the color changes to Bordeaux. 2-Aminobenzene-1-carboxy-5-sulfonanilide is diazotized and coupled with the pyrazolone and 2-amino-1-phenol-4-sulfo-6-carboxylic acid. A reddish yellow is obtained on wool, which is changed to a greenish yellow by chroming. Other examples are given.

Dyes. I. G. FARBENIND. A.-G. Fr. 642,248, Oct. 13, 1927. Azo dyes are obtained by combining the arylides of 2-arylamino-8-naphthol-6-carboxylic acid with a diazo compd. In examples, cotton is impregnated with the anilide of 2-phenylamino-8-naphthol-6-carboxylic acid in the usual way and the color is developed in a soln. contg. diazotized 3-chloroaniline. An olive shade of good fastness is obtained. A tetraazo soln. of dianisidide is combined with a soln. of the β -naphthalide of 2-phenylamino-8-naphthol-6-carboxylic acid in dil. NaOH contg. NaOAc to neutralize the mineral acid. With the usual substrata a black lake of excellent fastness is obtained. Other examples are given.

Dyes. I. G. FARBENIND. A.-G. Fr. 642,351, Sept. 13, 1927. New vat dyes are obtained by treating with alk. agents the aminobenzanthrone (I) which is formed by reduction of the nitrobenzanthrone (II) prepd. according to Fr. 6,435,349,531 or its derivs. contg. substituents in the *Bz*-1 position capable of being exchanged or their *N*-acylated derivs. The crude dye may be subsequently treated with oxidizing agents, or the nitro compd. may be used instead of the amino compd. In examples I is heated with KOH-EtOH; the product dyes cotton in full green shades. If the product is oxidized with chromic acid it dyes cotton brown shades. If molten KOH is used instead of KOH-EtOH a gray color is obtained on cotton. Amino-*Bz*-1-bromobenzanthrone (III) (by brominating the acetyl deriv. of I and sapon.) is heated with KOH-EtOH; the product dyes cotton green which turns brown by chloring. Examples are also given, using acetylaminobenzanthrone-*Bz*-1-thiocresylic ether (by condensing III with *p*-thiocresol), the Me ether of amino-*Bz*-1-benzanthronemercaptan (by methylation of the Na compd. of amino-*Bz*-1-benzanthrone (IV) formed as a by-product in the reduction of (II) with Na_2S), and diacetyl-amino-*Bz*-1,*Bz*-1'-dibenzanthronylic sulfide (by condensing the acetyl deriv. of IV with the acetyl deriv. of III).

Dyes. I. G. FARBENIND. A.-G. Fr. 642,501, Oct. 17, 1927. Cellulose esters and ethers are dyed brown by dyes not contg. free sulfo groups obtained by condensing *p*-aminodiphenylamine or its homologs or substitution products with 1,2,4,6- $\text{ClC}_6\text{H}_2\text{X}_2$, where 2 of the X symbols represent nitro groups and the 3rd is any substituent, the dye contg. at least one carboxyl group. Examples of dyeing with these compds. are given.

Dyes. I. G. FARBENIND. A.-G. (Kurt H. Meyer, Heinrich Hopff and Arthur Krause, inventors). Ger. 469,019, Aug. 28, 1925. Addn. to Ger. 436,536. A further development of the method of prepn. of vat dyes of the anthraquinone series consists in condensing with aminoanthraquinone or its derivs., *m*-substituted derivs. of benzoic acid, including the carboxylic acid, halide and anhydride. Thus diaminoanthraquinone, nitrobenzene and *m*-toluyl chloride are heated, giving a dark violet vat which dyes cotton a fast bluish red color. Isophthalic acid, α -aminoanthraquinone and trichlorobenzene are heated and thionyl chloride is added at 70–80°, giving a cherry-red vat, which dyes cotton a fast greenish yellow. A table of dye constituents with the corresponding vat, and cotton colors is given.

Dyes. I. G. FARBENIND. A.-G. (Karl Schirmacher and Hans Neumann, inventors).

Ger. 469,178, Oct. 22, 1926. Benzocoumaranone is condensed with a 2-deriv. of isatin, 2,3-diketodihydronaphthene, coumaranone, penthiophene, or an *o*-diketone; or a 2-deriv. of benzocoumaranone is treated with indoxyl, oxythionaphthene, coumaranone, penthiophene or methylene compds. having a removable H atom in the methylene group. Thus, benzocoumaranone dissolved in pyridine, glacial AcOH, or PhNO_2 , with isatinanilide, produces a dye which appears as copper-red crystals of m. p. 350° . It colors animal and vegetable fibers a red-violet tone. Another example is given.

Dyes. I. G. FARBENIND. A.-G. (Richard Stüsser, inventor). Ger. 469,341, Apr. 22, 1927. Disazo dyes are prep'd. by coupling the urea or thiourea substitution compds. contg. aminoaroyl-2,5-diaminobenzoic acid groups with azo compds. The substitution compd. may have one or more similar or different aminoaroyl groups. Thus, nitroanthranilic acid is diazotized and coupled with 1-*p*-mercaptophenyl-3-methyl-5-pyrazolone. The nitroazo dye resulting is then reduced to the aminoazo dye and condensed with $m\text{-O}_2\text{NC}_6\text{H}_4\text{COCl}$ until no free amino group is left. The filtered *m*-nitrobenzoyl-aminoazo dye is then treated with Na_2S to obtain the *m*-aminobenzoylaminoazo dye. This is converted to the urea compd. in the usual way with AcONa . The dye is a yellow-brown powder, coloring unmordanted cotton light and washing-fast yellow. Other examples are given.

Dyes. I. G. FARBENIND. A. G. (Wilhelm Bauer, Wilhelm Neelmeier and Theodor Nocken, inventors.) Ger. 469,343, June 12, 1926. An indigoid dye is prep'd. by condensing the reactive α -deriv. of 2,3-naphthisatin which has been halogenated in the nucleus, with the ethers of 1,4-naphthalenediol or derivs. in which there is no substitution of the hydroxyl group in the *o*-position. Thus, bromo-1-chloro-2,3-naphthisatin is coupled with 4-methoxy-1-naphthol in a soln. of chlorobenzene. The dye so formed gives a fast green color to textile fabrics.

Dyes. I. G. FARBENIND. A.-G. Swiss 127,525, Mar. 15, 1927. A mordant disazo dye is prep'd. by sulfonating the benzene-1,4-disazosalicyclic acid obtained by the action of the diazo compd. on *p*-aminobenzencazosalicyclic acid. A sulfo group is introduced into the *o*-position of both salicylic acid radicals in the dye mol. The dye is salted out from alk. soln. as a red-brown powder which, in water, is orange-red, and in H_2SO_4 red-violet.

Dyes. I. G. FARBENIND. A.-G. Swiss 127,526, Apr. 21, 1927. A black azo dye is prep'd. by coupling diazotized diethylphenosafranin with *p*-cresol.

Dyes. I. G. FARBENIND. A.-G. Swiss 127,527, May 4, 1927. An azo dye is prep'd. by coupling the diazo compd. of 2,4,6-trinitro-1-aminobenzene with *N*-ethyl- λ -1'-sulfobenzyl-*m*-toluidine. The dye is a reddish blue in water, and blue-black in acid baths.

Dyes. I. G. FARBENIND. A. G. Swiss 127,528, July 8, 1927. An azo dye is prep'd. by coupling the diazo compd. of 1,3-dimethyl-4-amino-6-chlorobenzene with 2-hydroxynaphthalene-3-carboxylic acid 4'-chloro-2'-methylanilide. The dye is a red powder giving in alk. baths a clear red color, fast to light.

Dyes. I. G. FARBENIND. A.-G. Swiss 127,532, Apr. 1, 1927. An indigoid dye is prep'd. by halogenating 8-chloro-1,2-naphthisatin in the α -position, and acting upon the product with 4-methyl-6-chloro-3-hydroxythionaphthene. The dye is dark violet and gives a green color in concd. H_2SO_4 . It dyes cotton from an orange-yellow vat with a violet tone which is fast to light, water and Cl.

Dyes. I. G. FARBENIND. A.-G. Swiss 127,533, May 4, 1927. A vat dye is prep'd. by brominating 7-methyl-2,2-indolethionaphtheneindigo in H_2SO_4 till two atoms of Br are taken up. The dibromo-7-methyl-2,2-indolethionaphtheneindigo gives a fast violet color.

Dyes. I. G. FARBENIND. A.-G. Swiss 127,704, May 7, 1927. Addn. to Swiss 117,356. A stable diazo compd., $\text{Cl}(\text{MeO})\text{C}_6\text{H}_3\text{N}_2\text{Cl}$, is prep'd. by treating 4-chloro-2-aminoanisole with a Zn compd. It reacts readily with coupling components to form dyes.

Dyes. SOC. ANON. POUR L'IND. CHIM. A BALE. Brit. 291,768, June 8, 1927. Derivs. of vat dyes are obtained by treating their leuco compds. such as leucothioindigo or indigo white with org. acids such as chloroacetic acid, contg. an exchangeable halogen atom. β -Chloropropionic acid and sulfobenzyl chloride also may be used. The products may be used for printing and may be developed with oxidizing agents. Several examples are given.

Dyes. SOC. ANON. POUR L'IND. CHIM. A BALE. Brit. 290,179, May 7, 1927. Dyes which give dyeings on cotton, from a Na sulfide bath, that are fast to washing and to light are obtained by the action of sulfurizing agents on Cr compds. of various azo dyes. Dyes of various bluish shades are thus obtained and among the dyes which may be

used as starting substances are the monoazo dye from 1-naphthol and 1,2-aminonaphthol-4-sulfonic acid and the monoazo dye from 5,8-dichloro-1-naphthol and 1,2-aminonaphthol-4-sulfonic acid.

Dyes. SOC. ANON. POUR L'IND. CHIM. À BÂLE. Ger. 467,349, Mar. 12, 1925. Metallic compds. of *o*-hydroxymonoazo dyes are prepd. from 1,8-naphthosultone either by sulfonation, nitrication, splitting the sultone rings by adding ammonia, and reducing, or by sulfonation, splitting the sultone rings by adding ammonia, nitrication, and reducing. The 1-hydroxynaphthalene-8-sulfamido-2-amino-4-sulfonic acid so produced is diazotized, united with developing components, and the hydroxyazo dye resulting is treated with suitable metallic compds., such as those of Cu and Cr. A table of developing components and corresponding dye colors is given.

Dyes. SOC. ANON. POUR L'IND. CHIM. À BÂLE. Swiss 127,715. Addn. to Swiss 119,986. Brominated violanthrone contg. about 30% Br is treated with a chlorinating agent immiscible with water, at 80°. The substance obtained is a mixt. of the tetra- and pentachloro derivs. and only contains a trace of Br. It dyes cotton blue, fast to water.

Dyes. SOC. ANON. POUR L'IND. CHIM. À BÂLE. Fr. 636,970, July 4, 1927. New azo dyes are prepd. having the general formula $R^1-N=N-R^2-NH-C(:X)-NH(R^3)$, in which R represents an α -naphthol residue coupled in the *peri*-position to the azo group, R² an aromatic ring coupled in the 4-position to the amino group, X an atom of O or of S, R³ a complex group contg. at least 2 aromatic rings united by an azo group, by combining by means of COCl₂ or its substitutes or CSCI₂ or CS₂, two mols. of aromatic amino compds. of which at least one is an aminoazo dye obtainable by coupling a diazotized 1,8-aminonaphthol (of which the OH group may be acylated) with a primary amine of the benzene or naphthalene series, while the other is any ammono- or polyazo dye or a component of such a dye which can be transformed into the dyestuff after being united with the first-mentioned aminoazo dye. The products dye vegetable fibers in various shades of orange, red and blue, fast to light. The fastness in some cases may be increased by after-treatment with metal salts, or the dyes may be converted into metal compds. In an example the monoazo dye obtained by coupling the *p*-toluenesulfonate of 1,8-aminonaphthol-3,6-disulfonic acid with cresidine is treated with COCl₂ and the product obtained by salting out is treated with NaOH soln. to remove the acyl group. It dyes cotton in blue-red tints. Several other examples are given.

Dyes. SOC. ANON. POUR L'IND. CHIM. À BÂLE. Fr. 641,675, Sept. 30, 1927. Amino azo dyes obtained by coupling non-sulfonated diazo compds. contg. a nitro group *o*- to the diazo group with primary, secondary or tertiary amines, are used for dyeing cellulose derivs., e. g., acetate silk. In examples, diazotized *o*-nitroaniline is added to Na aniline-*o*-methanesulfonate and NaOAc. The sulfonic group is saponified and the dye pptd. Diazotized *o*-nitroaniline is coupled with PhNMe₂. The nitroamine may be replaced by 4-chloro-2-nitroaniline, *m*-nitro-*p*-toluidine, etc., and these may be coupled with PhNEt₂, *o*-toluidine, *o*-anisidine, *p*-xylydine, etc.

Dyes. SOC. ANON. POUR L'IND. CHIM. À BÂLE. Fr. 642,578, Oct. 19, 1927. New vat dyes are prepd. by sulfonating violanthrone and isoviolanthrone dyes, fusing with caustic alkalis and treating with etherifying agents or with halogenating agents followed or not by etherification. Similar dyes are obtained by sulfonating benzanthrone, fusing with alkalis and etherifying. In examples violanthrone is sulfonated with oleum; the product dyes cotton blue from the vat. If this dye is fused with KOH a product is obtained which dyes cotton gray tinged with blue, and methylation gives a product which dyes cotton bluish gray fast to Cl. Halogenation with SO₂Cl₂ instead of methylation gives a product which dyes cotton slightly bluer. Other examples are given.

Azo dyes. ERWIN HAFFA, ERWIN THOMA and HANS HRYNA (to Grasselli Dyestuff Corp.). U. S. 1,698,884, Jan. 15. By coupling a 2,5-dimethyl-4-halo-1-diazo-benzene in which one of the H atoms standing in the 3 and the 6 positions is replaced by a further halogen with an arylamide of 2-hydroxynaphthalene-3-carboxylic acid, azo dyes are obtained which are of especially good fastness to kier-boiling. Examples are given of dyes producing various red shades. Cf. C. A. 23, 990.

Azo dyes. HERMANN WAGNER and OTTO SOHST (to Grasselli Dyestuff Corp.). U. S. 1,698,898, Jan. 15. 4-Benzenesulfomethylamino-2-amino-1-methoxybenzene or a similar aromatic amine (such as may be produced by causing an aryl sulfonyl chloride to react upon a 4-amino-2-nitro-1-alkoxybenzene and subsequently alkylating or benzylating and reducing) is diazotized and coupled with a 2-hydroxynaphthalene-3-car-

boxylic acid arylamide. Numerous examples are given, for the production of dyes giving various shades of red.

Azo dye. I. G. FARBENIND. A.-G. Swiss 127,261, Feb. 14, 1927. An azo dye is prep'd. by coupling diazotized 4,6-dinitro-2-amino-1-hydroxybenzene with 1-amino-8-hydroxynaphthalene in the presence of an acid-binding agent. The product is sol. in water and is useful in the direct dyeing of ethers and esters of cellulose or its conversion products. Acetate silk, for instance, is dyed in black shades, which are deepened if the dye is diazotized on the fiber and developed with 2,4-tolylene-diamine.

Azo dyes. I. G. FARBENIND. A.-G. Swiss 127,441-127,444, May 10, 1926. Addns. to 123,737. Azo dyes are prep'd. by treating the following compds. with salicylic acid sulfonyl chloride: (1) 1,1'-azobenzene-3,4'-disulfoazo-2-methylamino-5-naphthol-7-sulfonic acid (127,441), (2) 1,1'-azobenzene-3,4'-disulfoazo-2-methylamino-8-naphthol-6-sulfonic acid (127,442), (3) 2',5'-dimethyl-1,1'-azobenzene-2,5-disulfoazo-2-methylamino-5-naphthol-7-sulfonic acid (127,443), and (4) 2',5'-dimethyl-1,1'-azobenzene-2-sulfoazo-1-ethylamino-8-naphthol-3,6-disulfonic acid (127,444).

Azo dye. I. G. FARBENIND. A.-G. Swiss 127,714, Apr. 27, 1927. Addn. to 126,200 (C. A. 23, 715). An azo dye is prep'd. by coupling diazotized *p*-aminoacetanilide with *p*-cresol and splitting off the Ac group from the product by heating with NaOH. The dye is suitable for cellulose esters and ethers.

Azo dyes. I. G. FARBENIND. A.-G. Fr. 637,131, July 6, 1927. Certain halogenated xylydines, particularly the 5-halo-2,4-xylydines and the 3,5-dihalo-2,4-xylydines when diazotized and coupled with an arylamide of 2-naphthol-3-carboxylic acid give dyes fast to Cl, light and boiling. Similar dyes are obtained if the 5-halogen is replaced by H or an alkyl group. Thus, yellow or red shades are obtained by coupling diazotized 5-chloro-2,4-xylydine with the 5-chloro-2-methoxyanilide of 2-naphthol-3-carboxylic acid or with the 4-chloro-2-methylanilide of 2-naphthol-3-carboxylic acid or with the *β*-naphthylamide. Examples are given. The dihalogen bases referred to are new and are prep'd. by halogenating 2,4-xylydine in H₂SO₄.

Azo dye. I. G. FARBENIND. A.-G. (Richard Stüsser, inventor). Ger. 469,340, Mar. 11, 1927. A disazo dye is prep'd. by coupling tetraazotized 4,4'-diaminodiphenyl-3,3'-dicarboxylic acid and its derivs. in any sequence with an aryl-naphthylaminesulfonic acid or one of its derivs., and such azo components as contain sulfo, carboxyl, hydroxyl or amino groups. Thus, 4,4'-diaminodiphenyl-3,3'-carboxylic acid is tetraazotized and coupled with 8-hydroxy-1-phenylaminonaphthalene-4-sulfonic acid. The dye so obtained colors cotton a blue fast to light and to washing. Other examples are given.

Azo dye. I. G. FARBENIND. A.-G. (Ernst Fellmer, inventor). Ger. 469,288, Oct. 15, 1925. A trisazo dye is prep'd. by combining an aminoazo substance derived from a nitro- or acyl-*p*-diamine or its derivs. and a further diazotized intermediate component, with an amino group-contg. deriv. of aminonaphtholsulfonic acid. The diazo dye so obtained is further diazotized and coupled with methylketol or methylphenylpyrazolone or its derivs. and the acyl group of the initial component split off, or the nitro group reduced. Thus 4-acetyl-amino-1-aminobenzene-2-sulfonic acid is diazotized, and 1,2-aminoethyl-naphtholate-6-sulfonic acid added. The product is diazotized and coupled with *p*-aminobenzoyl-2-amino-5-naphthol-7-sulfonic acid. The diazo dye is then diazotized and coupled with methylphenylpyrazolone. The acetyl group is split off by heating in a weak acid or alk. soln. and the trisazo dye isolated in the usual way. It gives a clear green color when used directly and when developed by *β*-naphthol. Other examples are given.

Azo dye. SOC. ANON. POUR L'IND. CHIM. A BALR. Swiss 127,259, Dec. 4, 1926. A yellow azo dye is prep'd. by coupling diazotized 4-acetamido-2-amino-1-benzene-sulfonic acid with 1-*p*-sulfophenyl-5-pyrazolone-3-carboxylic acid. On wool, the product gives effects like those of tartrazine.

Azo dye. SOC. ANON. POUR L'IND. CHIM. A BALR. Swiss 127,260, Dec. 24, 1926. A yellow azo dye is prep'd. by coupling diazotized 2-nitro-1-amino-4-methylbenzene with 3-methyl-5-pyrazolone. The product dyes acetate silk in yellow shades.

Disazo dyes. HEINRICH CLINGSTEIN and HARRY W. GRIMMEL (to Grasselli Dyestuff Corp.). U. S. 1,697,107, Jan. 1. A disazo dye which gives deep black dyeings is formed from 7-hydroxynaphthocarbazole and 2,7-diaminocarbazole. Other similar components produce brown, to violet, to blue, to black dyes.

***o*-Hydroxyazo dyes.** SOC. ANON. POUR L'IND. CHIM. A BALR. Ger. 468,483, Aug. 28, 1926. The aminoazo dyes formed by reduction of the coupling products from nitrated diazo compds. of 1-amino-2-naphthol-4-sulfonic acid and naphthols are treated with CH₂O and NaHSO₃ or with formaldehydesulfurous acid (sulfurous acid methylol ester) or its salts. An example is given. Cf. Brit. 258,854 (C. A. 21, 3133).

Polyazo dyes. RUDOLPH KRECH and ERICH KEINER (to Grasselli Dyestuff Corp.). U. S. 1,697,122, Jan. 1. A disazo dye which gives red dyeings is formed from 4,4'-diamino-3,3'-dichlorodiphenylmethane and Na 2-naphthol-4-sulfonate and similar dyes may also be produced from various similar starting materials.

Vat dyes. GEORG KALISCHER and RUDOLF MÜLLER (to Grasselli Dyestuff Corp.). U. S. 1,697,361, Jan. 1. Yellow to orange vat dyes are obtained by heating, to above 200° (suitably to about 240–250°) 2-methylantraquinone, S and a primary aromatic diamino compd. such as 1,5-naphthylenediamine or diaminobenzanthrone and purifying the products by the action of alk. oxidizing agents such as NaOCl. Cf. C. A. 23, 991.

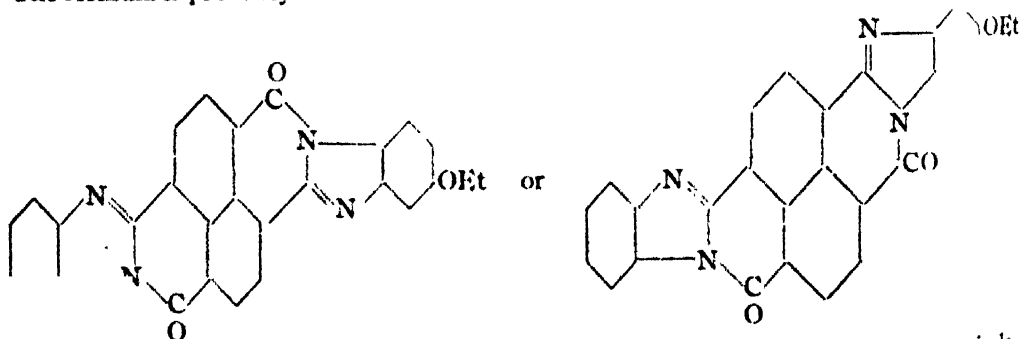
Vat dye. I. G. FARBENIND. A.-G. Swiss 127,264, Jan. 13, 1927. A vat dye is prep'd. from the benzobenzanthronecarboxylic acid described in Swiss 126,194 (C. A. 23, 991) by treating it first with an alk. condensing agent and then with an acid condensing agent. The product gives violet-black vats with alk. Na₂S₂O₄ from which cotton is dyed in the same colors, changing to greenish blue on hanging or soaping.

Vat dye. I. G. FARBENIND. A.-G. Swiss 127,265, Feb. 24, 1927. A vat dye is prep'd. by heating 2-bromo-1,9-pyrazoleanthrone in the presence of an acid-binding agent and a metalliferous catalyst. The product dyes cotton blue in the vat, the color changing to red on hanging. 2-Bromo-1,9-pyrazoleanthrone may be prep'd. from 1-amino-2-bromanthraquinone by diazotizing and reducing to the hydrazine deriv., which undergoes internal condensation.

Vat dye. I. G. FARBENIND. A.-G. Swiss 127,268, Feb. 14, 1927. A vat dye is prep'd. by condensing 4,7-dimethyl-5-chlorohydroxythionaphthene with a 5,7-dichloroisatin having a labile substituent in the α -position. 4,7-Dimethyl-5-chlorohydroxythionaphthene may be prep'd. from 1-amino-4-chloro-2,5-xylene by conversion into 4-chloro-2,5-xylene-1-thioglycolic acid and effecting ring closure by known methods. Cf. Brit. 274,527 (C. A. 22, 2277) and 266,382 (C. A. 22, 689).

Vat dye. I. G. FARBENIND. A.-G. Swiss 127,448, Dec. 28, 1926. Addn. to 125,722. 1-Hydroxy-3,4-benzo-8,9-(γ -methyl)benzopyrone-5,10-quinone is prep'd. by treating the *p*-toluic acid ester of Bz-2-hydroxybenzanthrone with acid-condensing agents. The product is useful as a dye or dye intermediate. The *p*-toluic acid ester of Bz-2-hydroxybenzanthrone is prep'd. by heating Bz-2-hydroxybenzanthrone with an equal amt. of the acid chloride.

Vat dyes. I. G. FARBENIND. A.-G. Fr. 33,005, Jan. 29, 1927. Addn. to 600,843. 1,4,5,8-Naphthalenetetracarboxylic dianhydride or the acid itself is condensed with *o*-nitroamino compds. or their salts in the presence or absence of a solvent or diluent and the product reduced to obtain the same dyes as obtained in Fr. 600,843. In examples 1,4,5,8-naphthalenetetracarboxylic acid is boiled with 3-nitro-4-aminophenetole in PhNO₂ and the product reduced. The dye gives brown-red shades on cotton from the vat. The formula is probably



A clear brown shade is obtained if the phenetole compd. is replaced by the anisole compd., and a brilliant red if *o*-nitroaniline is used.

Vat dye. I. G. FARBENIND. A.-G. (Hans Heyna, Carl J. Müller and Ernst Fischer, inventors). Ger. 469,342, Feb. 21, 1926. A dye of the 2-thionaphthene-2'-indole-indigo series is prep'd. from 3-hydroxy-1-thionaphthene which has substituted in the 4-, 6- and 7-positions, three halogen atoms, or two halogen atoms and an alkyl group, or one halogen atom and two alkyl groups, by condensing it with α -derivs. of isatin or its substitution products, homologs, or analogs. Thus, 5-chloro-*o*-toluidine-HCl is transformed into 4-methyl-6,7-dichloro-3-hydroxy-1-thionaphthene by 1-methyl-2-amino-4,5-dichlorophenyl-3-thioglycolic acid. By condensation of this hydroxy-thionaphthene with 5,7-dichloroisatin-2-chloride in chlorobenzene, the 4-methyl-6,7-

lichloro-2-thionaphthene-5',7'-dichloro-2'-indoleindigo is obtained. It colors cotton red-violet fast to light and washing.

Nitrogenous vat dyes. I. G. FARBENIND. A.-G. (Max Kunz and Karl Köberle, inventors). Ger. 468,577, Jan. 19, 1927. Vat dyes are prepd. by reaction between negatively substituted *ms*-naphthodianthrone or its derivs. and aminoanthraquinones having at least one unsubstituted H atom in the NH_2 group. The reaction is preferably conducted in presence of diluents; acid-binding substances may also be present. Examples describe the prepn. of dyes from tribromo-*ms*-naphthodianthrone (prepd. from tribromo-*ms*-benzodianthrone by heating with AlCl_3) and α -aminoanthraquinone; tetrabromo-*ms*-naphthodianthrone (prepd. from tetrabromo-*ms*-benzodianthrone by treatment with AlCl_3) α - and β -aminoanthraquinone; dichloro-*ms*-naphthodianthrone (prepd. by chlorinating *ms*-naphthodianthrone) and α -aminoanthraquinone; and bromo-2,2'-dimethyl-*ms*-naphthodianthrone (prepd. by brominating 2,2'-dimethyl-*ms*-naphthodianthrone) and 1-amino-4-methoxyanthraquinone, each reaction being effected in PhNO_2 soln. or suspension and in presence of AcONa and CuCO_3 . The product from tetrabromo-*ms*-naphthodianthrone and 1-amino-4-methoxyanthraquinone is mentioned also.

Vat dyes of the anthraquinone series. I. G. FARBENIND. A.-G. (Paul Nawiasky and Arthur Krause, inventors). Ger. 468,356, Nov. 23, 1926. Vat dyes of the anthraquinone series are prepd. by oxidizing the condensation products from 1-aminoanthraquinone or its derivs. and *Bz*-1-halobenzanthrones. An example describes the oxidation of *Bz*-1-halobenzanthronyl-1-aminoanthraquinone with MnO_2 and H_2SO_4 . The products prepd. by oxidizing (1) the condensation product from 1,5-diaminoanthraquinone and 2 mols. of *Bz*-1-bromobenzanthrone and (2) the condensation product from 1-benzoylamino-5-aminoanthraquinone and *Bz*-1-bromobenzanthrone are also mentioned.

Dyes and intermediates. I. G. FARBENIND. A.-G. Fr. 642,221, Oct. 13, 1927. Thio ethers of the anthraquinone series are prepd. by reaction of either any diazo compd. on anthraquinonemercaptans, their derivs. or substitution products, or diazo compds. of the anthraquinone series on any mercaptan. The reaction is of importance in the prepn. of 1-thioarylanthraquinone 2-carboxylic acids, which are starting materials for the production of anthraquinonethioxanthenes. The thio ethers which are formed by the action of 1 mol. of the sulfate of 2,6- or 2,7-tetraazoanthraquinone on 2 mols. of 1-mercaptoanthraquinone-2-carboxylic acid or 2 mols. of 1-diazoanthraquinone-2-carboxylic acid on 1 mol. of 2,6- or 2,7-dimercaptoanthraquinone or by condensation of 2 mols. of 1-chloroanthraquinone-2-carboxylic acid with 1 mol. of 2,6- or 2,7-dimercaptoanthraquinone and which are the bis-(2'-carboxy-1'-anthraquinonyl)-2,6-2,7-dimercaptoanthraquinones, furnish by cyclization valuable vat dyes different from the known dyes containing 3 anthraquinone radicals. In an example, 1-rhodanthraquinone 2-carboxylic acid (from diazoanthraquinone-2-carboxylic acid by the method Ger. 206,054) is heated with NaOH soln. and 2,5-dichloro-1-aniline is run in, and the mixture is heated. The 1-dichlorothiophenylanthraquinone-2-carboxylic acid is converted by heating to 90–100° into the corresponding thioxanthone, which dyes cotton a golden yellow from the vat. Other examples are given.

Intermediates and dyes. I. G. FARBENIND. A.-G. Brit. 291,361, May 30, 1927. 6-Dialkoxypheyl- and 4,6-dialkox-5-halophenyl-1-thioglycolic-2-carboxylic acids are prepd. from 3,5-dihydroxy- and 3,5-dihydroxy-4-halobenzoic acids, resp., by alkylation, nitration and reduction and substitution of the resulting amino group by the thioglycolic acid residue. 5,7-Dialkox- and 5,7-dialkox-6-halo-3-hydroxythionaphthenes are made by treating the thioglycolic carboxylic acids with alk. condensing agents and removing CO_2 or by treating with Ac_2O and removing the Ac group. Thio-indigoid dyes are prepd. by oxidation of the thionaphthenes or by coupling them or their α -anils or other α derivs. with usual components of the benzene, naphthalene, or anthracene series. Several examples are given.

Naphthoquinone derivatives. I. G. FARBENIND. A.-G. Brit. 291,340, May 28, 1927. 7-Acylamino-1,4-naphthoquinones (which may be used as dye intermediates) are made by oxidation of a 7-acylamino-1-hydroxynaphthalene or a substitution product. Several examples are given.

6-Amino-5-acenaphthenecarboxylic acid. WILHELM ECKERT (to Grasselli Dyestuff Co., Inc.). U. S. 1,697,111, Jan. 1. 6-Amino-5-acenaphthenecarboxylic acid can be made by reducing (suitably with FeSO_4 in ammoniacal soln.) the 6-nitroacenaphthene-5-carboxylic acid obtainable by nitrating 5-acenaphthenecarboxylic acid. The product may be used as an intermediate for making vat dyes. Various details are given.

Lakes. I. G. FARBENIND. A.-G. Swiss 127,452–127,454, Mar. 30, 1926. Addns.

to 122,815. The manuf. of a lake by the interaction in an acid medium of substances forming complex W compds. and a salt of the Et ester of tetraethylrhodamine is carried out in the presence of an acid of a greater degree of dissocn. than tartaric acid. In the example, a substrate is prepd. by mixing heavy spar with Na_2SO_4 soln. and pptg. with BaCl_2 and to this are added, in turn, specified amts. of a salt of the Et ester of tetraethylrhodamine, Na_2WO_4 , Na_2HPO_4 , and HCl (127,452). Lakes are prepd. in the same way from a salt of the Et ester of diethylhomorhodamine (127,453) and from a salt of tetraethyldiaminodiphenyl- α -monoethylaminonaphthylcarbinol (127,454). Cf. Brit. 265,032 (C. A. 22, 323).

Anthraquinone dyes. SOC. ANON. POUR L'IND. CHIM. A BAËLE. Fr. 641,748, Oct 3, 1927. Vat dyes of the anthraquinone series contg. cyanuric radicals as described in Fr. 552,266 are purified by a treatment with aq. solns. of hypochlorites, the colors obtained with the dyes being purer and brighter. Thus, the crude product obtained by condensing 2 mols. of 1-aminoanthraquinone with 1 mol. of $(\text{CN})_2\text{Cl}_2$ are treated with a soln. of NaOCl contg. 8% active Cl, purer yellow shades being afterwards obtained on cotton.

Anthraquinone derivatives. I. G. FARBENIND. A.-G. (Paul Nawiasky and Fritz Helwert, inventors). Ger. 469,135, Jan. 1, 1927. 1-Hydroxyanthraquinone or its derivs. are treated with caustic alkali in the presence of an org. solvent or suspension medium in the warm, preferably in the absence of O. Thus, PhNH_2 is heated to 160° , and 1-hydroxyanthraquinone with powd. K added with the max. exclusion of O. The mixt. is heated to the b. p. of PhNH_2 and stirred and the dye extd. in the usual way. Other examples are given.

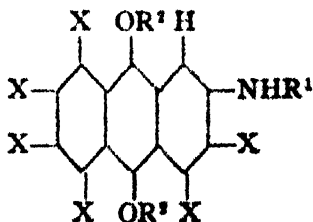
Anthraquinone derivatives. SOC. ANON. POUR L'IND. CHIM. A BAËLE. Swiss 127,530, Feb. 12, 1927. Amino anthraquinone derivs. are prepd. by heating $p\text{-C}_6\text{H}_4(\text{NH}_2)_2$ and PhNMe_2 with a deriv. of the general formula 1-amino-4-x-anthraquinone where x is a residue replaceable by an aminoaryl residue. Thus, 1-amino-4-methoxyanthraquinone gives 1-amino-4-(4-aminophenylamino)anthraquinone, which dyes acetate silk green-blue and has a m. p. of $247\text{--}248^\circ$. Instead of PhNMe_2 , PhNO_2 , $o\text{-C}_6\text{H}_4\text{Cl}_2$ or naphthalene can be used.

Arylaminoanthraquinones. KARL ZAHN and PAUL OCHWAT (to Grasselli Dyestuff Corp.). U. S. 1,699,419, Jan. 15. Dyes are obtained by heating 5,8-dihaloquinizarin with primary aromatic amines either in the presence or absence of an acid binding agent. Reaction of aniline or of *p*-toluidine on 5,8-dichloroquinizarin produces the corresponding dianilino- or ditoluino-dihydroxyanthraquinones which can be easily converted into sulfonic acids that give on wool fast pure yellowish green dyeings.

Green dye of the anthraquinone series. JAMES OGILVIE (to National Aniline and Chemical Co.). U. S. 1,698,821, Jan. 15. By the sulfonation of 1,4-*p*-toluinoanthraquinone or a similar 1,4-diarylaminoanthraquinone in which the aryl groups are of the benzene series, with oleum of about 10-30% strength, in the presence of H_2BO_3 , a dark green dye is obtained which dyes wool from an acid bath yellowish blue-green shades.

Sulfamic acids of the anthraquinone series. I. G. FARBENIND. A. G. (Walter Duisberg, Winfried Hentrich, Ludwig Zeh and Fritz Baumann, inventors). Ger. 469,564, July 20, 1924. Aminoanthraquinones or their derivs. are sulfonated in the presence of NH_3 or primary amines. The examples describe the prepn. of sulfamates from 2-aminoanthraquinone, 1,4-diaminoanthraquinone, and 1,4,5,8-tetraminoanthraquinone. The product of the last example dyes wool and acetate silk in clear blue shades.

Anthracene dyes. I. G. FARBENIND. A.-G. Fr. 636,352, June 13, 1927. Dyes of the anthracene series are prepd. by treating with an acid or alk. oxidizing agent an anthrahydroquinone of the general formula



in which, R^1 denotes H or an alkyl group, R^2 the radical of a compd. capable of reaction with the H of the OH groups in the 9,10-positions of an anthrahydroquinone, e. g., a halosulfonic acid, a halogenated fatty acid, or a H_2SO_4 ester, and X a H or any univalent substituent. Several examples are given.

Tetrakisazo dyes. I. G. FARBENIND. A.-G. Fr. 637,743, July 15, 1927. Tetra-kisazo dyes are prepd. (1) by diazotizing aminodiazodyes of the type $R^1-N=N-R^2-N=N-R^3-NH_2$, where R^1 represents an amine, R^2 a middle component of the naphthalene series which is capable of being further diazotized, and R^3 a deriv. of α -naphthylamine or its sulfonic acids joined in the *p*-position to the amino group and contg. hydroxy groups substituted or free, (2) coupling with derivs. of 2-amino-5-hydroxy-naphthalene-7-sulfonic acid substituted or not in the 1- or 3-position and contg. diazotizable amino groups in the heteronuclear side chain, (3) diazotizing again and combining with methylketol, its analogs or substitution products, pyrazolones or derivs. of β -ketoaldehyde, 1,3-dihydroxyquinoline, sulfazones or salicylic acid or its derivs. The dyes give a clear green fast to light on cotton. In examples (1) 1-aminobenzene-2,5-disulfonic acid-azo-1-aminonaphthalene-7-sulfonic acid-azo-1-amino-2-ethoxynaphthalene-6-sulfonic acid is diazotized and coupled with (4-aminobenzoyl)-2-amino-5-hydroxynaphthalene-7-sulfonic acid. The product is diazotized and coupled with methylketolsulfonic acid; (2) 2-aminonaphthalene-4,8-disulfonic acid-azo-1-aminonaphthalene-azo-1-amino-2-methoxynaphthalene-6-sulfonic acid is diazotized and coupled with (3-aminophenyl)-1,2-naphthimidazole-5-hydroxy-7-sulfonic acid, again diazotized and coupled with 1-(4-carboxyphenyl)-3-methyl-5-pyrazolone. A further example and lists of substituents in the examples are given. Cf. C. A. 23, 992.

After-chromable triphenylmethane dyes. I. G. FARBENIND. A.-G. Swiss 127,531, Apr. 29, 1927. Two mols. of *o*-cresotic acid are condensed with one mol. of 4-benzyl-amino-3-sulfobenzaldehyde or a salt thereof, and the obtained leuco base is oxidized. The new dye is a red powder, giving a deep red color in alk. soln. It dyes wool a red-blue in acid soln. and on chroming, a red-purple which is fast to light.

Indigoid dyes. I. G. FARBENIND. A.-G. Brit. 291,825, Feb. 3, 1927. A monoalkyl, monoaralkyl or monoaryl ether of 4-mercapto-1-naphthol, in which the hydrocarbon radical is attached to the S, is condensed with a reactive α -deriv. of an isatin, such as isatin chloride or anilide; e. g., 5,7-dibromisatin chloride is condensed with -methylmercapto-1-naphthol or 4-*p*-tolylmercapto-1-naphthol (which is obtained by condensing *p*-tolylsulfur chloride with 1-naphthol). The products dye cotton from blue to greenish blue shades. Cf. C. A. 23, 716.

Vat indigoid dyes from dihaloalkylisatins. CARL KRAUSS (to Grasselli Dyestuff Co.) U. S. 1,698,233, Jan. 8. Dyes giving fast blue shades are produced by condensing a dihaloalkylisatin compd. contg. a reactive substituent in α position with a dihaloalkylindoxyl or (preferably) by reducing dihaloalkylisatin compds. contg. a reactive substituent in α position. Such reactive substituents may be halogens (particularly Cl), S, arylamino groups, alkoxy groups, etc. Examples are given of dyes produced from the reduction with H_2S of the α chloride formed by reaction of PCl_5 on a soln. in $PhCl$ of 5,7-dichloro-6-methylisatin or 4,6-dimethyl-5,7-dichloroisatin.

1-Amino-4-hexahydroanilinoanthraquinone-2-sulfonic acid. I. G. FARBENIND. A.-G. Swiss 127,030, Apr. 4, 1927. 1-Amino-4-hexahydroanilinoanthraquinone-2-sulfonic acid is obtained by the action of hexahydroaniline on 1-aminoanthraquinone-2-sulfonic acid suitably substituted in the 4-position, for instance with halogen or OH. The product dyes wool blue.

Dyes from 1,3,3-trimethyl-2-methyleneindoline. I. G. FARBENIND. A.-G. Swiss 127,037, Apr. 29, 1927. 1,3,3-Trimethyl-2-methyleneindoline or a substitution product thereof is treated in presence of a condensing agent, such as Ac_2O , with ester or salts of HNO_3 . The products dye natural or artificial silk or tannin-mordanted cotton in greenish yellow shades.

Mordant dyes. DURAND & HUGUENIN A.-G. Swiss 127,445 and 127,446, July 7, 1926. Addns. to 123,930. Mordant dyes are prepd. by coupling diazotized *p*-amino-*o*-sulfobenzeneazo-*o*-cresotinic acid with *o*-cresotinic acid (127,445) and with *m*-cresotinic acid (127,446). *p*-Amino-*o*-sulfobenzeneazo-*o*-cresotinic acid may be prepd. by coupling diazotized monoacetyl-*p*-phenylenediaminesulfonic acid with *o*-cresotinic acid and eliminating the Ac group, or by coupling diazotized *p*-nitroaniline-*o*-sulfonic acid with *o*-cresotinic acid and reducing the NO_2 group. Cf. Brit. 255,086 (C. A. 21, 2804).

Reducing mordant on indigo. ADMINISTRATION OF THE IVANOV-VOZNESENSKII GOVERNMENT TEXTILE TRUST. Russ. 4586, Sept. 15, 1924. Indigo-dyed goods are printed by use of mixts. of hyposulfite or sulfoxylate compds. stable at low temp. and metal ammonia compds. which are not decompd. by H_2O or a mixt. of the same metal salts with ammonium salts, or a mixt. of the same metal oxides and ammonium salts with or without the addn. of anthraquinone, followed by a hot alkali wash, water wash, acid wash and final water wash.

Treatment of cellulose derivatives. GEORGE H. ELLIS (to Henry Dreyfus). Can. 285,978, Dec. 25, 1928. Materials made of or contg. cellulose acetate have applied thereto metallic mordants in the form of thiocyanates, the concn. of thiocyanate radical present being in excess of that chemically equiv. to the mordant metal radical, and subsequently applying a dyestuff.

Treatment of insoluble or difficultly soluble dyes. I. G. FARBERIND. A.-G. Swiss 127,223, Apr. 16, 1927. The finely divided state of freshly prep'd. insol. or difficultly sol. dyes is preserved by pasteing them with an alkylcellulose. Examples describe the treatment with methylcellulose of azo dyes from (1) 2-hydroxy-3-naphthoic acid anilide and diazotized 4-nitro-2-aminobenzoic acid methyl ester, and (2) β -naphthol and diazotized 3-nitro-4-aminotoluene.

Yellow dye containing chromium. I. G. FARBERIND. A.-G. (Hans Kämmerer, inventor). Ger. 468,576, Feb. 10, 1927. The dye from diazotized metanilic acid and salicylic acid is treated with chroming agents, for instance with $(\text{HCOO})_2\text{Cr}$.

Green dischargeable dyes for silk. ERNST FELLNER (to Grasselli Dyestuff Corp.) U. S. 1,699,427, Jan. 15. Dyes producing level green shades on silk, fast to washing but dischargeable to a perfectly clean white, are obtained by diazotizing aromatic monoacid diamines or their sulfonic or carboxylic acids, combining the diazo comp'd. thus produced with 1,2-aminonaphthol ethers or their sulfonic acids, rediazotizing the monoazo dye thus formed and further coupling with *peri*-amino-naphthol-, *peri*-dihydroxynaphthalenesulfonic acids or their derivs. Several examples are given.

Dyes for acetate silk. BRITISH DYESTUFFS CORP., LTD., A. SHEPHERDSON, W. W. TATUM and F. LODGE. Brit. 291,814, Dec. 13, 1926. Symmetrical 1,4-dialkyldiaminoanthraquinones are converted into products contg. fewer alkyl groups by treatment with H_2SO_4 at temps. above 150° or in the presence of H_3BO_3 at 130 - 150° . The dye thus formed from 1,4-dimethyldiaminoanthraquinone dyes acetate silk bright violet-blue shades.

Dyeing. HENRY DREYFUS. Fr. 641,566, Sept. 16, 1927. Compds. of or contg. cellulose esters are dyed with an aq. dispersion of an insol. or relatively insol. dye, obtained by grinding in a colloid mill or dissolving in an org. solvent and pouring into water, with or without a treatment with a solubilizing agent. Examples are given.

Dyeing. I. G. FARBERIND. A.-G. (Georg Wolfsleben, inventor). Ger. 467,060, Sept. 7, 1926. A triazo dye is prep'd. by diazotizing *p*-aminophenylazogamma acid, coupling with gamma acid and further diazotizing with *m*-phenylenediamine. Thus, nitroaniline is diazotized, coupled with gamma acid and reduced. The resulting aminophenylazogamma acid comp'd. is diazotized, further coupled with gamma acid and further diazotized with *m*-phenylenediamine. The resulting dye is bronze-black and sol. in water.

Dyeing. I. G. FARBERIND. A.-G. (Richard Fischer, inventor). Ger. 469,326, Aug. 17, 1926. In dyeing with leuco ester compds. of the indigo series and other vat dyes, the vat is mixed with dextrin, size, starch paste or similar substances to prevent uneven drying of the dye in the material.

Dyeing with vat dyes. D. GARDNER. Brit. 291,828, Feb. 5, 1927. In dyeing with vat dyes, such as indigo, the dye is reduced with a titanous salt such as titanous chloride and is used in an aq. non-alk. bath. Dyes may be used which are prep'd. as described in Brit. 291,827 (preceding abstract). The process may be applied to all kinds of fiber including wool and silk. For dyeing vegetable fibers or artificial silk, a substantially neutral bath is preferable such as may be obtained by dissolving the dye in an aq. soln. of glucose.

Dyeing cellulose. SOC. CHIMIQUE DES USINES DU RHÔNE. Swiss 127,542, June 24, 1927. Cellulose esters are colored by forming the pigment in the body of the soln. of the ester, and then sepg. the colored ester. Thus, cellulose acetate is dissolved in acetone and FeCl_3 added. After stirring, $\text{K}_4\text{FeC}_6\text{N}_6$ is added. The cellulose acetate is then pptd., washed and dried. Other examples are given. The pigment may be org. or inorg.

Dyeing acetylcellulose. BRITISH DYESTUFFS CORP., LTD., JAMES BADDILEY, JAMES HILL and ARNOLD SHEPHERDSON. Fr. 33,009, Feb. 5, 1927. Addn. to 623,761. The final phase in the prepn. of a dye is carried out in the presence of a dispersing agent and the paste obtained is dried. In examples, 5-nitro-2-anisidine is combined with PhNEt_2 in the presence of ligninsulfonic acid, and the product ground to a powder. In the same way, aniline \rightarrow α -naphthylamine is diazotized and coupled with PhOH in the presence of ligninsulfonic acid, mixed with the condensation product of sulfo-naphthalene and CH_2O , dried and powdered.

Dyeing cellulose derivatives. HENRY DREYFUS. Fr. 642,473, Oct. 14, 1927.

Cellulose derivs. are treated with a swelling agent such as HCOOH , AcOH , glycolic acid, lactic acid, EtOH , Me_2O , diacetone alc., diacetin, phenol or a thiocyanate, before dyeing, printing or stenciling with insol. or relatively insol. org. dyes which may be solubilized in known manner. Cf. C. A. 23, 718.

Dyeing cellulose esters. SOCIÉTÉ CHIMIQUES DES USINES DU RHÔNE. Fr. 33,001, Feb. 9, 1927. Addn. to 619,764. Cellulose esters are dyed with lakes by forming the lake in a soln. of the ester and isolating the ester from the soln. In an example, cellulose acetate is dissolved in acetone contg. eosin. A slight excess of $(\text{AcO})_2\text{Pb}$ in soln. in water is added. The colored cellulose acetate is pptd. with water, and may be used for varnishes, films, etc.

Dyeing cellulose esters. HENRY DREYFUS. Fr. 642,330, Sept. 16, 1927. Cellulose esters of carboxylic acids, other than AcOH , such as the formic, propionic or butyric esters, in the form of artificial silk, etc., are dyed, printed or stenciled with aq. dispersions of insol. or relatively insol. dyes. Several examples are given, the dispersion agents used being Na or NH_4 sulforicinolate, Na naphthalenesulforicinolate, Turkey red oil or glue.

Dyeing cellulose esters and ethers. H. DREYFUS. Brit. 291,118, Nov. 23, 1926. Materials such as cellulose formate, acetate, propionate or butyrate, "immunized cotton," or cellulose methyl, ethyl or benzyl ethers or condensation products from cellulose and glycols, are dyed, printed, stenciled or otherwise colored with compds. in which an aryl dye nucleus is linked to one or more thiocyanate, cyanate, isothiocyanate, isocyanate or simple or aliphatically substituted urea or thiourea residues. Numerous details and examples are given.

Dyeing cellulose esters and ethers. H. DREYFUS. Brit. 291,816, Dec. 14, 1926. Org. substitution derivs. of cellulose such as described in Brit. 291,118 (preceding abstract) are dyed, printed or otherwise colored with compds. in which an aryl dye nucleus or component is linked, directly or indirectly, to one or more thiourethan or substituted thiourethan residues. The dyes or components may be prepd. by heating the corresponding isothiocyanate compds. with alcs. or with alc. caustic alkali, by treating the corresponding thiourea chloride compds. with alc. or alcoholates, by treating halogen compds. with esters of sulfocarbamic acid, or in some cases by boiling an amino compd. with an alc. and CS_2 . Examples are given.

Dyeing and printing cellulose esters or ethers. I. G. FARBENIND. A.-G. (Erich Fischer and Erich Müller, inventors) Ger. 469,514, Apr. 24, 1926. The dyes employed are monoazo dyes prepd. by coupling suitable *p*-substituted phenols with diazo compds. of the C_6H_5 or C_{10}H_7 series having one SO_3H group at the most. An example describes the dyeing of acetate silk with the dye from *p*-phenylenediamine and *p*-cresol, and the use of the dyes from acetyl-*p*-phenylenediamine and *p*-cresol, *m*-chloroaniline and *p*-cresol, and *p*-phenylenediamine-*o*-sulfonic acid and *p*-cresol is referred to. Yellow shades are produced in each case.

Dyeing textiles containing cellulose derivatives. HENRY DREYFUS. Fr. 32,949, Jan. 28, 1927. Addn. to 627,071. Org. derivs. of cellulose are dyed, printed or stenciled with azo compds. contg. one or more amino groups substituted by one or more aliphatic side chains, each contg. two or more OH groups but no COOH groups. The dvestuffs may be solubilized by the known solubilizing agents, and protective colloids may be added to the dye baths. In examples (1) *p*-nitroaniline is condensed with chlorobutylene glycol, reduced, diazotized and coupled with α -naphthylamine giving a dye which may be diazotized on the fiber, e. g., with *o*-dihydroxypropylaniline, (2) the product obtained by coupling diazotized picramic acid with dihydroxypropylaniline, (3) the product of condensation of 2,4-dinitrochlorobenzene with δ -amino- α,β -dihydroxypropane reduced to 2-amino-4-nitrodihydroxypropylaniline, diazotized and coupled with *p*-xylylidine.

Dyeing textiles containing cellulose derivatives. HENRY DREYFUS. Fr. 32,948, Jan. 28, 1927. Addn. to 627,072; Can. 285,799, Dec. 25, 1928. Org. derivs. of cellulose are dyed, printed or stenciled with compds. in which an aryl dye nucleus or component thereof is linked directly or indirectly to one or more thiourethan or substituted thiourethan residues. Dyes of the anthraquinone, nitrodiarylamine, nitrodiarylmethane and azo series are specified; in the latter case the dyes may be applied in substance or developed on the fiber. Examples of dyes used are (1) 1-acetylaminanthraquinone-4-thiourethan, obtained by heating 1-acetylaminanthraquinone-4-isothiocyanate (from 1-acetylaminanthraquinone and CSCl_2) with EtOH or alc. KOH , (2) the disazo dye obtained by diazotizing phenylazo- α -naphthylamine and coupling with salicylic acid-5-thiourethan. Other examples are given.

Dyeing, printing or stenciling materials made of or containing cellulose derivatives.

HENRY DREYFUS. Can. 285,798, Dec. 25, 1928. Materials made of or contg. org. substitution derivs. of cellulose are dyed or otherwise colored with compds. comprising one or more aliphatic hydroxy ether or hydroxy thio ether groupings, *i. e.*, with compds. in which an aryl dye nucleus is linked through O or S with an aliphatic side chain or chains contg. 1, 2, 3 or more OH groups.

Dyeing artificial silk. KALLE & Co. A.-G. (Bruno Helmert, inventor). Ger. 469,513, June 5, 1925. Artificial silk made from esters or ethers of cellulose or its conversion products is dyed with azo dyes prepd. from nitrated hydroxydiazo compds. and aromatic amines or phenols or their substitution products. In the examples, acetate silk is dyed with dyes prepd. from diazotized picramic acid and β -naphthylamine, α -naphthylamine, *m*-phenylenediamine, and α -naphthol with the production of yellow, violet, orange and brown shades, resp. The dyes prepd. from amines can be diazotized and further coupled on the fiber.

Dyeing automatically and continuously ribbons of artificial silk fibers or yarn. BERTETTO MANUELLO, 2ND. Ital. 244,794, April 13, 1926. Mech. features.

Dyeing animal fibers. EDMOND DU BOIS (to Chemische Fabrik vorm. Sandoz) U. S. 1,698,226, Jan. 8. Animal fibers are treated with acylating agents such as *p*-toluenesulfonyl chloride in order to increase their affinity for dyes.

Process and apparatus for dyeing hat bodies. ADOLF SINDERMANN. Austrian 109,814, Jan. 15, 1928. The dye is applied in dry powder form, suitably by blowing through fine nozzles on to the damp bodies. Cf. C. A. 23, 994.

Dyeing apparatus. FRANK DAVIS. Fr. 641,138, Sept. 15, 1927. A coned dye soln. or reagents are led through a pipe immersed in the dye bath and added to the dye bath at the bottom along with a certain amt. of the liquid of the bath and aspirated by the said pipe from one side of the bath, the liquid thus revived, reentering the bath at the opposite side.

Dyeing apparatus, especially for natural- or artificial-silk stockings. U. PORNITZ & Co. A.-G. Ger. 469,600, Aug. 19, 1925.

Vat for bleaching and dyeing. FIRMA JOS. RIEDEL. Ger. 469,123, Feb. 11, 1927. Details of securing the acid-proof lining.

Apparatus suitable for dyeing goods in long lengths in a vat through which dye liquor is circulated. FRANK DAVIS. U. S. 1,699,391, Jan. 15.

Apparatus for dyeing sheets of fabric a uniform shade with circulating dye liquor. FRANK W. CLARK. U. S. 1,698,778, Jan. 15.

Printing colors. I. G. FARBENIND. A.-G. Fr. 642,079, Oct. 7, 1927. Pure nitrosamine printing colors are obtained by dissolving the colors in appropriate org. solvents, filtering and removing the solvents. Thus, to a soln. of 50 parts of the anilide of 2,3-hydroxynaphthoic acid, and 14 of NaOH in acetone, the Na salt of nitrosamine corresponding to 31.2 parts of *m*-nitro-*p*-toluidine is added, the soln. filtered and the solvent removed. A dry yellow compd. is obtained easily sol. in water without a harmful residue.

Luster or color differences in rayon textures by difference in dye absorption qualities. NAAMLIOOZE VENNOOTSCHAP NEDERLANDSCHE KUNSTZIJDEFABRIEK. Dutch 18,635, Sept. 15, 1928. Previous to the weaving part of the rayon (viscose) is heated (*e. g.*, 24 hrs. in glycerol at 150°) or oxidized (2 hrs. at room temp. in dil. NaClO-HCl soln.) so as to give it smaller or larger absorptive power for the dyeing after the weaving process.

Treating textiles. RENÉ VAN BUGGENHOUDT and RENÉ HOMMEYER. Fr. 642,492, Oct. 17, 1927. See Brit. 279,137 (C. A. 22, 2847).

Finishing textile materials. H. T. BÖHME A.-G. Brit. 291,094, May 27, 1927. Deleterious effects upon fabrics resulting from the liberation of free sulfuric acid during calendering and drying at elevated temps. are avoided by using, instead of the usual Turkey-red oil, the product obtained by treating castor oil or other suitable fats or oils or their free acids with H₂SO₄ in the presence of org. acid anhydrides or chlorides, *e. g.*, Ac₂O.

Producing patterns on vegetable textile material. EMIL GMINDER. Ger. 469,601, Mar. 14, 1928. The material, *e. g.*, cotton fabric, is mercerized and put under tension. The mercerizing agent is then neutralized at certain parts, *e. g.* with dil. HCl, with the fabric still under tension, and the tension is then released.

Impregnating textile materials with condensation products of phenols and formaldehyde. FOOTAL BROADHURST LEE CO., LTD., R. P. FOWLES, J. T. MARSH AND F. C. WOOD. Brit. 291,474, Dec. 1, 1928. Various fabrics of natural or artificial cellulosic material are rendered "non-creasing" or "non-crumpling" when crushed or folded under pressure by impregnating them with a condensation product of a phenolic compd.

and CH_3O . The compds. may be formed by condensation within the material. Various details and modifications are given.

Forming synthetic resins within textile materials. TOOTAL BROADHURST LEE CO., LTD., R. P. FOULDS, J. T. MARSH, F. C. WOOD, H. BOFFEY and J. TANKARD. Brit. 291,473, Dec. 1, 1926. Yarns or fabrics of cotton, silk, ramie, jute, hemp, artificial silk, etc., are rendered less susceptible to creasing or crushing, while retaining their original suppleness, by impregnating them with components for producing phenol- CH_3O or urea- CH_3O resins and then forming the resins within the material. Many details are given.

Embossing fabrics. C. DREYFUS (to British Celanese, Ltd.). Brit. 291,445, June 3, 1927. In order to produce permanent embossed effects on circular knitted fabrics or stockings of thermoplastic derivs. of cellulose such as the acetate, formate, or propionate, or methyl or ethyl ethers of cellulose, either alone or mixed with other materials such as cotton, wool or silk or artificial silk of the "cellulose type," the fabric is dampened with a swelling, softening or plasticizing agent such as a soln. of acetone, MeOAc , triacetin, *p*-toluenesulfonamide, diethyl phthalate, alkylated xylene or sulfonamide and then, while still in the double thickness, is subjected to an embossing operation.

Mercerizing or similar treatments of fabrics. F. THIES. Brit. 291,130, Feb. 18, 1927. Mech. features. An app. is described.

Apparatus for steam treatment of printed fabrics. HEINZ BACKHAUS. Austrian 110,386, Mar. 15, 1928. The steam is circulated across the fabrics by blowing and suction devices.

Apparatus (with a heated "nichrome" roller) for singeing and drying fabrics. A. W. MACHLET. Brit. 291,300, Dec. 3, 1927.

Cold-washing process for fabrics, etc. HULDREICH H. VONTOBEL. Swiss 127,227, May 12, 1927. The fabrics are washed in a cold aq. soln. contg. soda, soap, borax, enzymes such as peroxidase and tyrosine and heavy metal salts such as $\text{Al}_2(\text{SO}_4)_3$ and FeSO_4 . Cf. C. A. 22, 3789.

Fabric for making hats. GEORGE E. MCLEAN. U. S. 1,697,877, Jan. 8. A fabric specified with plies of regenerated cellulose fiber and linen and an intermediate ply of cotton.

Improving the tensile strength of vegetable fibrous materials. PAUL B. COCHRAN (to Westinghouse Elec. & Mfg. Co.). U. S. 1,699,779, Jan. 22. Materials such as cotton tape for elec. insulation are exposed to the action of ozonized air while heated (suitably at a temp. of about 75–150°).

Increasing the wettability of vegetable or animal fibers. I. G. FARBENIND. A.-G. Fr. 642,222, Oct. 13, 1927. Sulfonic acids of aromatic compds. particularly of the C_{10}H_8 or tetrahydronaphthalene series, alone or combined among themselves or in combination with hydrocarbons, alcs. or ketones are incorporated in fibers to increase their wetting and absorbing properties.

Artificial fibers resembling wool. E. K. SCOTT. Brit. 291,120, Nov. 24, 1926. Materials as used for artificial silk manuf. are extruded and while still in a plastic condition are subjected to mech. treatment which will produce curls, spirals or crimps along their length and will also produce on the surface of the filaments serrations, projections or nodules. An app. is described.

Rendering jute woolly and resistant to washing. GIAN CARLO GUARNIERI. Ital. 245,907, October 3, 1927. For this purpose and to render the jute fiber capable of being milled with natural wool, it is treated in a lukewarm fermentation bath with cultures of ferments capable of strongly reacting on the lignin of the fiber. A Cl and NaOH bath then gives the woolly appearance, curliness and resistance to boiling H_2O and milling. An acidified bath of antichlor is then used, followed by washing and treatment with an emulsified fat for giving softness and luster.

Finishing or dressing composition for jute. JOSEF GÜRTLER. Austrian 110,864, May 15, 1928. The compn. comprises semisapond, colophony, alkali salts contg. water of crystn. and NH_3 soln. A typical compn. comprises, in 100 parts of water, 35 parts of colophony sapond. at 70–80° with 3 parts of NaOH , 2 parts of cryst. Na_2CO_3 and 5 parts of NH_3 soln. (0.91), to which addns. of Na_2SO_4 , NH_4 salts, AcONa and NaCl may be made.

Making artificial silk waste wool-like. ARTILIO DEL MASTRO. Ital. 244,247, Jan. 28, 1926. The waste is immersed in a 20% soln. of Na hyposulfite at 30°. After $\frac{1}{4}$ hr the excess of soln. is eliminated and 25° Bé. H_2SO_4 is added in slight excess over the theory (4 times the wt. of the waste) while agitating. After 15 min. the fiber is dark yellow, and is taken out, washed completely, pressed and dried. A slight soaping

renders it less hard. The shine disappears, and better calorific properties and a wooly appearance are acquired, without weakening occurring and without elasticity being reduced.

Treating artificial silk. HENRY DREYFUS. Fr. 637,764, July 16, 1927. Fabrics made of or contg. cellulose esters or ethers are rendered less liable to develop faults due to want of cohesion by a single or repeated impregnation at 80–100° with aq. solns. or dispersions contg. at least 10% of one or more of the following: (1) higher fatty acids such as oleic, stearic and palmitic acids or sulfonated or other derivs. thereof, (2) sulfo-aromatic fatty acids, such as sulfophenylstearic, sulfohydroxyphenyl or sulfonaphthylstearic, (3) sol. resin soaps. After impregnation the fabrics are piled and rolled and left for some time. Fr. 637,765 describes a treatment for the same purpose with one or more org. substances having a solvent or solute action upon the fibers. Examples are (a) hydrocarbons of the paraffin, aromatic, naphthene or terpene series and their hydrogenation and halogenated derivs., (b) alcs. and phenols of the various chem. series and their derivs., (c) amino compds., (d) ketones and aldehydes. Lists of substances under each heading are given.

Apparatus for treating yarn with paraffin. A. BÜRK and K. WILDER. Brit. 291,250, June 30, 1927.

Washing yarn. CARL RUDOLF LINKMEYER. Ger. 469,004, Mar. 1, 1925. Suspended skeins of yarn, especially artificial silk, are washed by intermittent irrigation.

Bleaching. H. GOLDARBEITER. Brit. 291,743, June 7, 1927. Catalysts such as Ni salts, Co salts, Ag salts or $K_2FeC_6N_8$ are used to control the speed of the reaction in bleaching vegetable fibers, feathers, skins, furs, bristles, etc., by H_2O_2 in the presence of an alkali.

26—PAINTS, VARNISHES AND RESINS

A. H. SABIN

Colloid-chemical problems (in paint industry). A. V. BLOM. *Farben-Ztg.* 33, 1969–72(1928).—A lecture dealing with general aspects of wetting power and interfacial tension applied to pigments and paints. B. C. A.

Ultra-violet light and its use in accelerated weathering tests on paints. E. BECKER. *Farben-Ztg.* 33, 2232–4(1928).—In a general theoretical discussion on the nature of electromagnetic waves it is shown that the use of the light emitted by the Hg-vapor lamp to represent the action of sunlight in accelerated weathering tests on paints, etc., must give erroneous results. The Hg-vapor lamp emits short-wave radiation down to λ 185 μ , while the radiation from the sun contains no waves shorter than 300 μ . It follows, therefore, that the greater energy quanta liberated by the former source induce reactions that cannot occur under the influence of sunlight. It is suggested that filtration of the Hg-vapor emission through suitable glass filters in order to eliminate the wave region not present in sunlight would render the artificial source applicable to accelerated weathering tests. B. C. A.

"Wetting-out agents" for the paint industry and their investigation. A. NOLL. *Farben-Ztg.* 33, 2293–9(1928); cf. C. A. 22, 710, 3795.—A general dissertation on the chem. nature of wetting-out and emulsifying agents used in water-paint manuf. (chiefly Na salts of complex org. sulfonic acids). Details of the compn., properties, purification and fluorescence characteristics of various com. products of this type, e. g., Nekal, Leonil, Betan, Majamin, Algosol, etc., are given, and the stability of emulsions formed by the aid of various combinations of these is tabulated. B. C. A.

Color standardization and testing in the paint and color industry. II. I. A. JORDAN, et al. *J. Oil Colour Chem. Assoc.* 11, 383–95(1928).—A discussion of different methods of color measurement and efforts to use them in the paint and dye industries. The effect of surface condition such as gloss on the color sample under examn. is large and interferes with exact measurement. Each color sample should be given a coat of high-gloss varnish, so that all measurements are made under a const. gloss factor.

R. J. MOORE
Standardization of dry colors. F. A. WERTZ, et al. *Am. Paint Varnish Manufs. Assoc. Circ.* No. 341, 874–9(1928).—The value of standardization is problematical but the committee (Federation Paint Varnish Clubs) recommends standard procedures for testing and a standardized nomenclature. Accelerated fading tests are included on various samples of chrome yellows and greens.

R. J. MOORE
Discoloration of paints and its prevention. ANON. *Farbe u. Lack* 1928, 578, 596.—

A review of the causes and prevention of discoloration due to the nature of the pigment and to various external influences.

G. G. SWARD

Experiments on colors fast to flue gas. A. JUNK. *Korrosion und Metallschutz* 4, 230-4(1928).—Various paints on various priming coats were exposed to vapors given off in coke quenchers. The best primers were those not attacked by the vapors such as red oxide or iron mica. White lead was almost as good while Pb oxides did not fare as well. Better results were obtained by using several coats of the covering paints and no primers.

B. E. ROETHELI

The distribution of pigment in paint films. HANS WOLFF. *Farben-Ztg.* 34, 669-70 (1928).—W. removed films of white lead and of ZnO paints in 10 steps by rubbing with pure SiO_2 and H_2O . The ether-sol. soaps and total PbO or ZnO were detd. in each layer. With white lead paints the outer and inner layers contained much more pigment than the intermediate layers. With ZnO paints only the layer next to the panel contained the greater quantity of pigment. The white lead paints showed evidence that neutral PbCO_3 had been formed in the outer layers. The results are further proof that paint films are not necessarily homogeneous.

G. G. SWARD

Oil consumption in the grinding of pigments. A. EIBNER. *Farben-Ztg.* 34, 725-9(1928).—The nomenclature of oil absorption should be standardized. The order of magnitude of the difference in the oil absorption of most pigments disappears if it is expressed as a vol. percentage. In order to clarify the situation, there are needed more accurate data concerning the quantity of oil necessary to form a paste (artists' colors), the quantity necessary to convert this paste to a brushable paint and the effect of the structure of the pigment. A close observance of the 3 stages in the absorption of oil by a pigment should be of value. These stages are the "crumbly," "critical" and "paste."

G. G. SWARD

Iron oxide pigments. A new process of manufacture. G. C. *Rev. prod. chim.* 31, 878-9(1928).—A soln. of FeSO_4 obtained from H_2SO_4 and Fe plates is spray dried in a hot chamber. The finely divided material is calcined by use of a rotary furnace heated by coke. The exhaust gases are used in the spray chamber. The SO_2 is oxidized to SO_3 by the presence of the Fe_2O_3 , and recovered as H_2SO_4 .

P. THOMASSET

A study of red lead. A. JUNK. *Farben-Ztg.* 34, 671-6(1928).—The sp. gr. of ordinary red lead was slightly higher (8.7-9.0) than that of the highly dispersed (8.5-8.7). The av. diam. of the former was over 5μ , of the latter from 2 to 5μ . Paints made from the former contained 15% oil compared with up to 28% for paints from the latter. The spreading quality ($5.7-6.9 \text{ m}^2/\text{kg}$) of the former was approx. half that of the latter ($8.2-13.25 \text{ m}^2/\text{kg}$) but with twice the pigment concn. per unit area probably affords twice the protection. In general, pigments contg. the most PbO_2 produce the least thickening in paints, 32% PbO_2 being recommended as a minimum. The settling of the pigment in the paint is inversely proportional to the thickening. An accelerated thickening test is carried out by heating the paint at 80° for 4 hrs.

G. G. SWARD

Pigment and vehicle. V. G. JOLLY. *J. Oil Colour Chem. Assoc.* 11, 361-75 (1928).—Relationships between pigment and vehicle are discussed which influence the character and properties of paints. Some expts. are cited of pastes thinned with various paint media and examd. periodically for settling. A medium oil enamel varnish contg. a poor grade Congo and petroleum thinners gave hard settling. The same varnish with turpentine as thinners gave much less and soft settling. The same varnish with petroleum thinners but a high-grade Congo gave soft settling. The use of various wetting agents is discussed. A slight modification of Gardner's mobilometer is described.

R. J. MOORE

Testing paint and varnish. HANS WOLFF. *Farben-Ztg.* 34, 732-4(1928).—Paints and varnishes which prove superior in one test may not do so in another and the early history of a coating is of more importance than usually recognized. W. advocates the deductive or statistical method of judging the probable merits of a coating.

G. G. SWARD

Auer's conception of the drying of oils. A. EIBNER. *Farben-Ztg.* 33, 2165-9 (1928).—The "gas-coagulation" theory is criticized mainly on the grounds that in its evolution Auer has ignored the work of earlier investigators on the individual characteristics of various oils, the hydrophilic nature of linseed oil films, etc. Some of the author's expts. in this field are briefly recapitulated.

B. C. A.

Tung oil. HENRI BLIN. *Mat. grasses* 20, 8370-2(1928).—Characteristics, production and uses of tung oil are described.

P. THOMASSET

Oil conversion. AMASA BOWLES. *Paint Oil Chem. Rev.* 86, No. 22, 10(1928).—The classes of condensation products suitable for varnish products are briefly reviewed.

A resin is described which is a combination of vegetable oil and a coal-tar product. This resin reacts with tung oil, changing the latter from an oxidizing oil to a gum or oleoresin through polymerization.

R. J. MOORE

Production of flat oil varnishes. F. WILBORN. *Farben-Ztg.* 33, 2169-70(1928).—Various substances are added to oil varnishes to produce a "matt" finish, e. g., waxes, $\text{Al}(\text{OH})_3$, MgCO_3 , kaolin, Al stearate, palmitate, resinate, Zn stearate, etc. The properties and suitability of the various types are discussed.

B. C. A.

Nitrocellulose finishes. BERTRAM CAMPBELL. *Ind. Chemist* 4, 522-6(1928).—The article includes accounts of manuf. of nitrocellulose, the addition of resins, the nature and effect of softening agents, the selection of pigments and of solvents and diluents. The factors affecting the durability of nitrocellulose finishes and methods for evaluating the durability of the finish are discussed.

F. G. R. ARDAGH

Cellulose ester solvents. H. WOLFF, G. ZEIDLER AND W. TOELDT. *Farben-Ztg.* 33, 2228-32, 2301-4(1928).—In dealing with cellulose ester solvents in connection with lacquer manuf., considerable misapprehension has been caused by confusing "solvent power" of a solvent with a more important factor of "power to withstand diln. by non-solvents without pptn. of the nitrocellulose." This diln. factor should be correlated with a definite end-concn. of nitrocellulose in the soln., results being obtained indirectly by graphical methods exemplified in the present communication by the behavior of solvents of the glycol type with respect to various diluents and qualities of nitrocellulose. In this respect as well as in considering viscosity of soln. and rate of evapn. of solvent, it is shown that the influence of non-solvent and of concn. of soln. must be taken into account if results of any practical value in lacquer technology are sought. The relative softening effect of solvents on oil undercoats is also discussed.

B. C. A.

Testing of finished lacquers. J. D. JENKINS AND P. R. CROLL. *Ind. Eng. Chem.* 19, 1356-8(1927).—Description of the equipment and cycle in use at the Milwaukee laboratories of the Pittsburgh Plate Glass Company for accelerated exposure tests and discussion of 3 physical tests: tensile strength, paper curling and sanding.

ALBERT L. HENNE

Albertol synthetic resins. T. HEDLEY BARRY. *Ind. Chemist* 4, 501-4(1928).—In previous articles B. described the coumarone and glyptal types of resins (*Ibid* 3, 431, 479(1927)) and Bryson the Bakelite resins (*Ibid* 1, 10, 73, 145(1925)). None of these replaces entirely the natural resins which are essential ingredients of oil varnishes. Some of the characteristics, advantages and limitations of these resins are discussed. The Albertol resins (Amberol in America) were developed mainly by K. Albert and his colleagues who at the outset used phenol-formaldehyde and natural resins together with a condensing agent sol. in the usual resin solvents. Much information on the prepn. of such resins, their properties and applications is given. Methods for making Albertols at low temps. are also described (thermo-setting Albertols). A bibliography is appended.

F. G. R. ARDAGH

Hardening and esterification of rosin. EWALD PYHALA. *Farben-Ztg.* 34, 616-7(1928); cf. *C. A.* 22, 3055.—The stoichiometry of the previously reported work is given in detail. The actual yields of ester based on the rosin used were with Ca glyceride 104, Mn glyceride 94.5, Ca phenolate 22.6, cresolate 19 and β -naphtholate 18.85, resp. The last 3 extremely low yields may be due to the extremely high viscosities of the melts.

G. G. SWARD

Organic solvents and rubber-lined plant (BRESSLER) 1. The gelling of fatty oils (SCHEIBER) 27. Electrodeposition of natural or synthetic resins (Brit. pat. 291,477) 4. Impregnating fibrous materials (Ger. pat. 469,602) 4. Solutions of resins, dyes, cellulose esters and ethers, etc. (Swiss pat. 127,241) 13. Grinding mill for paints, etc. (Brit. pat. 291,803) 1. Mill for grinding paint or other wet or dry materials (Brit. pat. 291,952) 1.

Lithopone. GUSTAV JANTSCH and PAUL WOLSKI (to I. G. Farbenind. A.-G.). U. S. 1,693,902, Dec. 4. Lithopone fast to light contains a Co salt, the Co content of which is equal to 0.02-0.5% of the Zn content of the lithopone. Salts of Cu or of Fe up to 0.5% also may be used.

Determination of the covering power of paints. V. V. CHERNOV. Russ. 4593, Feb. 29, 1928. A unit of wt. of paint after being thoroughly mixed with oil or similar material is placed between 2 glass plates and pressed. The transparency of a given paint is checked against other paints tested under the same conditions.

Glossy finish on lime paint. O. S. GOLOROVAKII. Russ. 5202, July 30, 1928.

Walls, ceiling, etc., of a room after being covered with lime paint for a second time are exposed to steam for a few hrs. before drying.

Anti-corrosive paints containing dehydrated oil gas tar and powdered aluminum or other metal powder. S. A. McMINN. Brit. 291,486, Jan. 28, 1927.

Colored nitrocellulose solutions or paints. I. G. FARBENIND. A.-G. Brit. 291,539, March 10, 1927. Nitrocellulose, wet with water, is ground and mixed with chrome yellow, fast Bordeaux red, or other suitable inorg. or org. coloring substance, in the presence of water or other "indifferent" liquid and in the absence of gelatinizing agents, and the resulting colloidal material is dried by heat, use of alc. or otherwise, and dissolved in a suitable solvent.

Red-lead paint. CARL D. FAHSEL. U. S. 1,697,388, Jan. 1. A light oil varnish and a paraffin oil are mixed with each other and then with boiled linseed oil as a primary vehicle, and red lead is mixed with this vehicle.

Red lead. S. A. ZADOLINE. Russ. 4579, Feb. 29, 1928. Massicot is oxidized and heated in a rotating drum by air heated in an oven above the highest temp. required for the reaction.

Apparatus for treating with carbon dioxide the spongy mass of basic lead acetate for obtaining lead white. D. I. LISOVSKII and A. A. SINTZOV. Russ. 4582, Feb. 29, 1928.

Pigment. C. DEGUDE. Brit. 291,355, May 30, 1927. A ZnSO_4 soln. is treated with Ba(OH)_2 to ppt. BaSO_4 together with Zn(OH)_2 ; the ppt. is dried and calcined to obtain a mixt. of BaSO_4 and ZnO .

Pigments from volatile metallic compounds. I. G. FARBENIND. A.-G. (Walter Hubardt and Marta Grote, inventors). Ger. 466,463, June 26, 1928. Pigments are prepd. from volatile compds. of Fe, Co or Ni, e. g., Fe carbonyl by thermal decompn. and superficial oxidation of the metal thus obtained.

Calcination of lithopone. FARBENFABRIKEN VORM. F. BAYER & CO. Ger. 418,258, Feb. 14, 1919. Lithopone is calcined in a rotating cylinder furnace by gases free from dust and oxygen which are preheated to a temp. slightly above the calcination temp.

Duplicating ink. RUDOLF JARMAI and EUGEN LORAND. Fr. 642,349, Sept. 7, 1927. The ink or color used for carbon papers, typewriting ribbons, etc., contains tramarine besides the usual wax, oil and resin and coloring substance.

Apparatus for grinding inks and colors. GUSTAV A. VASEL. U. S. 1,699,641, Jan. 2, 1929.

Polymerizing linseed oil. ALEXANDER SCHWARCMAN (to Spencer Kellogg & Sons, Inc.). Can. 285,744, Dec. 18, 1928. Light-colored, odorless, polymerized oil of low acid value is produced by heating a body of linseed oil to a temp. around $570-600^\circ\text{F}$. under vacuum while introducing into the body of oil a slow feed of gases free from O_2 and advantageously consisting of, or contg., CO_2 .

Treating, drying or semidrying oils with chromic acid. G. S. PETROV and Z. M. KALATZEV. Russ. 4577, Aug. 31, 1928. Such oils are brightened by treatment with bromates in the presence of H_2SO_4 which form insol. salts with the H_2SO_4 .

Driers. GEBR. BORCHERS A.-G. Ger. 466,046, May 26, 1927. Driers contg. Bi and Co in the ratio of 1:3 or 4 are obtained by heating Bi compds., e. g., oxide, acetate, citrate, with drying oils or rosin and adding Co compds., e. g., acetate or nitrate or *vice versa*. The Bi confers hardness on the film.

Coating compositions. FRANZ SCHMID. Austrian 111,037, May 15, 1928. The viscous liquid obtained by heating with S, for a sufficient time, a mixt. of wool fat with linseed oil, rape-seed oil, or like oil is mixed with dyes or fillers.

Varnish. ELMER E. WARE (to Acme White Lead & Color Works). U. S. 1,697,213, Jan. 1. A liquid varnish-making ingredient such as an oil mixt. is passed as a continuous stream through a series of containers at regulated temp. and pressure and the app. is arranged for proportionate addn. of a resinous ingredient to the flowing stream. Details of the app. used are described.

Varnish. BAILEY F. WILLIAMSON and WALTER H. REISLER. U. S. 1,699,646, Jan. 22. The rosin content of gum thus is combined with glycerol and a drying oil such as tung oil in a single operation by heating the materials together in a still and passing steam through the heated mixt.

Varnish. Soc. ANON. POUR L'IND. CHIM. A BALE. Swiss 127,534, Feb. 10, 1927. A colored, fast to light varnish contains a dye of the general formula $\text{R}'\text{N}:\text{NR}''$, in which R' is the aromatic nucleus of a negative substituted, unsulfonated diazo compd., and R'' an aromatic amine with the amino group at the 4-position. Thus, the dye obtained by coupling diazotized *p*-nitroaniline and cresidine is dissolved in varnish, giving a scarlet color. An orange-red varnish is produced with nitrocellulose and 4-nitro-4'-aminoazobenzene. Other examples are given. Cf. C. A. 22, 4844.

Manufacture of varnishes, lacquers and insulating enamels. LUCIEN LEVY. Swiss 127,039, June 30, 1927. Varnishes, etc., are made by sulfonating the condensation products of phenols with aliphatic aldehydes and dissolving the sulfonation products in suitable solvents, such as alcs., hydrocarbons, furfural, nitrobenzene, pyridine, mesityl oxide, acetins, or cyclohexanol.

Lacquers. PIETRO ROSSI. Austrian 110,245, Mar. 15, 1928. Lacquers, particularly for leather goods, of the kind comprising an alc. soln. of gum-lac colored with aniline dyes are improved by addn. of Fe_2O_3 . A suitable lacquer comprises 10 parts of gum-lac, 50 parts by wt. of 94-95% alcohol, and 12.5 parts Fe_2O_3 .

Lacquer. WILHELM SCHMIDTING. Fr. 33,071, Feb. 28, 1927. Addn. to 610,863. See Brit. 282,574 (C. A. 22, 3791).

Preparation of permanently clear lacquers. CHEMISCHE FABRIK KURT ALBERT G. M. B. H. Ger. 448,297, June 11, 1925. Permanently clear lacquers containing rosin are obtained by the addition of Li or Cd compds. which are sol. directly or after reaction with other components of the lacquer. The rosin may be present as such, as ester gum or with synthetic resins such as phenol-acetone-formaldehyde or cresol-formaldehyde resins.

Base for nitrocellulose lacquers. ELEKTRIZITÄTSWERK LONZA. Swiss 127,270, Feb. 12, 1927. The binding agent of a base for nitrocellulose lacquers comprises a mixt. of an oil lacquer with a nitrocellulose lacquer, both of which have been prepd. with solvents capable of dissolving dried oils and resins as well as nitrocellulose. An example describes the incorporation with such a lacquer mixt. of CaCO_3 , ZnO and lithophone.

Synthetic resins. BAKELITE G. M. B. H. Ger. 468,391, May 20, 1925. Synthetic resins sol. in fatty oils are prepd. by heating above their m. p. the cryst. products obtained by condensing β -naphthol with CH_2O or its polymers in presence or absence of an acid condensing agent. The cryst. products may be heated while dissolved in fatty oils and the solns. used as varnishes or lacquers. Cf. C. A. 23, 293.

Synthetic resins. KUNSTHARZFABRIK F. POLLAK GES. Brit. 290,963, May 21, 1927. Colloidal solns. of phenol-aldehyde resins obtained as described in Brit. 267,901 (C. A. 22, 1244) are freed from water, as by distn., *in vacuo*, or with a large surface or with the addition of solvents such as glycerol, so that final hardened products are obtained which are transparent or opalescent. Glass-clear products may be obtained by use of a suitable acid for neutralizing the alk. condensing agent. Various details and examples are given, among which are the use of piperidine as condensing agent followed by use of HCl for neutralizing and use of KOH as condensing agent with neutralization by lactic or phthalic acid.

Purifying phenol-formaldehyde resins. FRITZ SEEBACH (to Bakelite G. m. b. H.). U. S. 1,697,885, Jan. 8. In purifying fusible sol. phenol-aldehyde condensation products, the uncombined phenols and by-products are combined with oxides or hydroxides of Ca, Mg, Al, Cu, Zn or Ni or other metal compds. "higher than the alkali metals" which form sol. compds. with the phenols and by-products, forming by thorough mixing a colloidal soln. and pptg. the resins by means of water. Cf. C. A. 22, 4262.

Condensation products of methylol compounds of ureas. MARTIN LUTHER and CLAUS HEUCK (to I. G. Farbenind. A.-G.). U. S. 1,699,245, Jan. 15. Cryst. compds. sol. in usual lacquer solvents are obtainable by condensing a methylol compd. of urea in an alc. such as MeOH or EtOH with the aid of acid condensing agents under "mild conditions" and stopping the condensation instantly after all the initial material is dissolved and cooling the reaction mixt. Cf. C. A. 22, 3056.

Phenolic condensation products. ARCHIE J. WEITH (to Bakelite Corp.) U. S. 1,699,727, Jan. 22. A preformed phenol-methylene resin of the fusible type is mixed with a phenolic material and with sufficient CH_2 -contg. substance such as CH_2O to provide a higher ratio of CH_2 to phenol than existed in the fusible resin; the resulting mixt. may be heated to obtain an infusible product.

Derivatives of condensation products of aldehydes and phenols. HANS BUCHERER. U. S. 1,697,713, Jan. 1. An alkali-sol. resinous condensation product of cresol or other monohydric phenolic compd. and an aldehyde such as CH_2O is caused to react with an org. halogen compd., e. g., acetyl chloride, the halogen of which can combine with the H of the phenolic groups of the condensation product, in order to form products sol. in ordinary org. varnish solvents.

Electrical heating apparatus for metal objects to be enameled or lacquered. HUNDT & WASSER G. M. B. H. Ger. 468,597, Jan. 19, 1927. Structural features.

27—FATS, FATTY OILS, WAXES AND SOAPS

E. SCHERUBEL

Absorption spectra and fluorescence of fats. W. SPROESSER. *Chem. Umschau Fette, Oele, Wachse, Harze* 35, 325-7(1928).—An attempt to detect foreign fats and extd. cacao butter in pressed cacao butter by means of absorption spectra in the ultra-violet region using 5% CHCl_3 solns. failed because the differences were not great enough. S. enlarges upon the possibility of a quant. method by applying Lambert's law of absorption coeffs. to the fluorescence produced by the analytical quartz lamp for ultra-violet light and by measuring the intensity of the emitted fluorescence with Pulfrich's step-photometer. The color of the fluorescence might also be detd. quant. by means of color filters and a procedure is suggested.

P. ESCHER

Fat determination in cacao products. W. LANGE. *Chem.-Ztg.* 52, 1006(1928).—L. points out the similarity between the fat detn. method of Heiduschka and Muth (*C. A.* 23, 1002 and the method described by himself (*C. A.* 10, 941)). A. HEIDUSCHKA AND F. MUTH in their reply to this statement assert that there exists an essential difference.

P. ESCHER

Coloration of fats by the alcoholic extract of *Daucus carota*. PIERRE GALESESCO AND SERBAN BRATIANO. *Compt. rend. soc. biol.* 99, 1460-1(1928).—The constitutive and degenerative fats, as well as the lipoids, are colored a golden-yellow with outline sharply limited by the alc. ext. of *Daucus carota*.

L. W. RIGGS

The gelling of fatty oils. JOHANNES SCHEIBER. *Kolloid Z.* 46, 337-45(1928).—The fatty oils are classified according to drying action into the following groups: wood oil, which dries rapidly with formation of a film; linseed oil, which dries to a transparent, non-tacky film; poppy oil, which dries to a transparent, tacky film; and olive oil, which does not dry. Formulas for these different classes are given. Autoxidation plays an important part in gelling. The "dry point" of drying oils is approx. at the max. on the drying curves. Light and heat accelerate the drying of fatty oils. Differences in action of driers and antioxidants are discussed. The effect of polymerization on gellation is influenced by added materials. By direct heating all fatty oils including olive oil may be gelled by a process of polymerization. Certain catalytic agents (AlCl_3) promote gelling. Apparently the power to gel is not natural but an induced property of the fatty oils.

L. F. MAREK

Simplification of oil-testing processes. M. FRIEDEBACH. *Chem.-Ztg.* 52, 964-6(1928).—A discussion of app. and methods of oil-testing recently recommended, with the conclusion that simpler processes are more desirable and that uniformity in technic must be had to get concordant results.

W. C. EBAUGH

Determination of iodine values (of oils) by Hanus' method. M. WIERNIK. *Farben Ztg.* 33, 1973(1928).—Linseed and Chinese wood oils have been found to give different I values by the Hübl-Waller and Hanus methods, the latter usually being much higher. Polymerized oils show bigger deviations than unpolymersed oils.

B. C. A.

The validity of the Hagen-Poiseuille equation for vegetable oils. PAVEL SLANSKY AND LUDWIG KÖHLER. *Kolloid Z.* 46, 128-36(1928).—A capillary viscometer was constructed that is particularly well suited for the investigation of the flow of highly viscous liquids at low rates of shear. Linseed, hempseed, soy-bean, sesame, rape, castor, olive and peanut oils were found to deviate from the Hagen-Poiseuille equation at low rates of flow. No difference was found in the flow characteristics of drying and non-drying oils. A 2-phase structure for the vegetable oils is suggested. W. OSTWALD, V. TRAKAS AND R. KÖHLER. *Ibid* 136-44.—Pure mineral oils show no structure viscosity at ordinary rates of flow. Purified vegetable oils show little or no plasticity at room temp. but the effect is marked at 5-7°. Structure viscosity is also found in partially polymerized vegetable oils and in com. mixts. of mineral and vegetable oils. The relation between the radius of the capillary used in the viscometer and the detection of plasticity is discussed.

J. G. McNALLY

Jaboty kernel oil. L. MARGAILLAN. *Ann. Musée Colonial Marseille* 3, No. 3, 37-8(1925).—Jaboty kernels (Brazil) contain water 5.7, ash 4, protein 7.9, oil 53.7, cellulose 12.4, N-free ext. 10.3%. The oil m. 45°, f. 36°, n_D^{20} 1.4553, sapon. value 228, I value 23.1, Reichert-Meissl value 1.3, acetyl value 32, unsaponifiable matter 1.6%, resin 3%. The insol. fatty acids (94.3%) have f. p. 35.1°, mean mol. wt. 250, and contain liquid acids 25%, stearic acid 3.4%, palmitic acid 43.6%, myristic acid 28%.

B. C. A.

Pracaxy and owala kernels and their oils. L. MARGAILLAN, A. DUPUIS AND J. ROSELLO. *Ann. Musée Colonial Marseille* 3, 23-8(1925).—Pracaxy (pracachy) kernels,

from *Pentaclethra filamentosa* (Brazil), contain water 10.6, ash 1.4, protein 14.4, fat and resin 48.3, cellulose 4.2, and N-free ext. 21.1%. The yellow, slightly bitter fat m. 28°, n_D^{40} 1.4561, sapon. value 182, acid value 3.6, I value 67.3, Reichert-Meissl value 1.2, acetyl value 54.2, resin content (mol. wt. 470) 0.7%. Owala kernels, from *P. macrophylla* (Congo), contain water 8.5, ash 2.1, protein 25, fat 41, cellulose 5, and N-free ext. 18.4%. The oil m. 24°, f. 23–10°, n_D^{40} 1.4682, d_4^{20} 0.902, sapon. value 181, acid value 3.7, I value 98.9, Reichert-Meissl value 1.27, acetyl value 0, resin 0.5%. The av. mol. wt. of the fatty acids was 309. B. C. A.

Extraction of olive oil. ANTONIN ROLLET. *Mat. grasses* 20, 8364–7(1928).—A description of the Acapulco app. working method, its value and the probable cost of installation and operation. P. THOMASSET

Carbon disulfide and the Spanish olive-oil industry. J. ARTHUR CADDICK. *Chem. Age* (London) 19, 536–7(1928).—The extn. of olive oil by CS₂ and the manuf. of CS₂ are described. E. SCHERUBEL

Oil from *Aleurites montana*. C. D. V. GEORGI AND GUNN L. THIE. *Malayan Agr. J.* 16, 296–8(1928).—The oil content of the whole seed is 22.8%, and of the kernel 43.2%. The consts. of the oil are: d_{15}^{20} 0.939, n_D^{20} 1.5098, sapon. no. 195.5, I no. 160.3, unsapon. 0.6%, titer 36.8°, mean mol. wt. of fatty acids 298.4, neutralization value of fatty acids 188.0, I no. of fatty acids 164.7. The consts. are similar to those of Chinese wood oil, except for a small diff. in I no.; but there are marked differences from candlenut oil. E. SCHERUBEL

Physical properties of pure triglycerides. R. B. JOGLEKAR AND H. E. WATSON. *J. Soc. Chem. Ind.* 47, 365–8T(1928).—The values of Scheij have been confirmed, the main diff. being in the densities of palmitin and stearin. The m. p. and n afford little criterion as to purity. Viscosity is the most sensitive test for impurity, but requires a very careful temp. adjustment. Tables show solidifying point, n , sp. gr., viscosity and surface tension of triglycerides at different temps. The sp. gr., viscosity and surface tension of palmitin-stearin mixts. present no unusual features. E. SCHERUBEL

Fish and marine animal oils. H. M. LANGTON. *Chemistry and Ind.* 47, 1334–43 (1928).—This paper discusses the fish-oil industry, the various oils produced, equipment used, and contributions of various workers regarding the compn. of the oils. E. SCHERUBEL

Liver oil of *Paralithodes camtschatica*. MITSUMARU TSUJIMOTO. Inst. Tokyo Ind. Research. *Bull. Tokyo Inst. Ind. Research* [3], 23, 25–41(1928).—The oil was freed from H₂O by heating it at 110°, and filtering, d_4^{15} 0.9456, acid value 97.9, sapon. value 155.6, I, value (Wijs method) 63.6, n_D^{20} 1.4750, unsapon. matter 1.39%. It has a characteristic bad odor. The fatty acid contains an acid of more than C₁₁. The cholesterol detd. by the digitonin method is 22.67%; 1.45% for the original sample. By treating 1000 g. of the sample by the usual method, 58 g. of unsapon. matter was obtained. This was dissolved in MeOH, cooled with ice and NaCl, and the sepd. crystals (A) (26 g., contg. a small portion of solvent) filtered off. The mother liquor (B) resulting from the removal of A is a viscous liquid which is believed to contain the so-called liver-resin. The crystals obtained (3–2 g.) by crystg. from MeOH and by acetylating it is near the Ac compd., C₂₁H₄₂O(COCH₃)₂ of batyl alc. When hydrolyzed, the latter forms batyl alc. When (B) is acetylated, fractionated and the distillate is sapond. cholesterol-batyl alc. results. The liquid remaining after removing this is *cerakyl alc.*, C₂₁H₄₂O₂. By sepg. the lower-boiling up to b_p 195° acetylation product of (B) a new unsatd. alc. with the probable formula C₁₁H₂₀O₂ is obtained, which is to be more closely examd. later. This liver oil contains besides a resinous substance which can not be distd., probably also *kimyl alc.* and another unsatd. alc. K. SOMREVA

Effect of temperature change on the color of red and yellow Lovibond glasses. DRANE B. JUDD. *Bur. Standards J. Research* 1, 859–66(1928); cf. C. A. 22, 4265.—The relative spectral transmission at 12 wave lengths of Lovibond glasses 35Y and 7.2R were detd. at 15° and at 40° by means of the Koenig-Martens spectrophotometer (McNicholas, C. A. 23, 333) equipped with a thermostat for control of the temp. of the sample. The effect of increasing the temp. of the glasses is to shift the curve of spectral transmission somewhat toward the red. Both glasses show this sort of shift; the shift for the 35Y glass is about 4 or 5 times as great as that for the 7.2R glass. Thus the 35Y glass or the combination of 35Y + 7.2R must become more reddish on being heated. Heating either the 35Y or the 35Y + 7.2R filter 25° above normal is nearly equiv. to adding 0.2 Lovibond red. This difference is almost negligible in the color grading of cottonseed oil. Preliminary work on 2 samples of cottonseed oil shows that the oil changes in color with change in temp. even less than the glasses do. A. J. MONACK

Detergent action of soap. F. H. RHODES AND S. W. BRAINARD. *Ind. Eng. Chem.* 21, 60-8(1929).—A method is described which measures detergent power directly under conditions of laundry practice. Variations in temp. between 20° and 60° have little effect. The max. effect was produced in 7.5 mins. Increasing the concn. of soap above 0.25% produces little change in detergent effect. Solns. contg. 0.05 and 0.1% of soap remove about the same amt. of dirt in 5 washings as do more concd. solns. but solns. of 0.01% soap are less efficient.

E. SCHERUBEL

Deterioration of some silk-scouring soaps on storing. The so-called "ase" or sweat of soaps. R. TSUNOKAE. *J. Soc. Dyers Colourists* 44, 377-9(1928).—According to Tsujimoto the discoloration of soap is due to the oxidation of the unsatd. aliphatic acids. No relation was proved between the moisture content of the soap and the "ase" produced. The greater the quantity of petrolic ether ext. of the soap the greater the production of "ase." The greater the quantity of "ase" in the soap the less its degree of hydrolysis and the less its scouring power on silk. "ase" is produced on the surface of soaps even in sealed sample bottles. The color varies from light yellow to dark brown. At first "ase" appears on the surface, but as it increases it flows and forms a layer at the bottom of the sample bottle. The production of "ase" is related to air and light. Moisture in soap and in "ase" from that soap was 23.07 and 24.42%, resp., petrolic ether ext. 5.51 and 6.99%, resp. The soap in "ase" contained over 50% of oxidized aliphatic acids, whereas soaps which did not produce much "ase" contained 5.6 to 12.9%. The silk-degumming power of non-oxidized aliphatic acid soap was greater than that of oxidized soaps; hence the production of "ase" marks the deterioration of soap.

L. W. RIGGS

Oils for wool (MULLIN) 25. Glycerides of fatty acids (HEIDUSCHKA, SCHUSTER) 10. Ricinic acid (SUNDER) 10. Chemical constitution of tetradecenic acid obtained from *Tetradenia glanca* (TSUJIMOTO) 10. Chemical constitution of iwashi acid (TSUJIMOTO) 10. Heat-exchange and pumping apparatus for heating and pumping oils (U. S. pat. 1,697,605) 1. Apparatus for separating oil and water by gravity (U. S. pats. 1,698,002; 1,698,067 and Brit. pat. 291,123) 1. Producing products such as heptaldehyde from heavy vegetable oils (U. S. pat. 1,697,337) 10. Me formate or similar formates as solvents in purifying oils (Brit. pat. 291,817) 13.

BAUER, K. H.: *Chemische Technologie der Fette und Öle*. Pareys Bücherei für chemische Technologie. Berlin: P. Parey. 420 pp. R. M. 24.

Treating fatty substances. VIKTOR A. R. FAURSKOV. Fr. 642,172, Oct. 11, 1927. Fatty substances are passed with a whirling motion between cylinders for the prepn. of substances such as margarine.

Forming glycerol esters from free fatty acids. METALLBANK UND METALLURGISCHE GES. A.-G. Brit. 291,767, June 8, 1927. Fatty acids or oils or fats contg. them are heated with glycerol *in vacuo*, in an app. which is described and in which the pressure may be reduced to 2 mm. by an ejector placed between the reaction vessel and a condenser.

Apparatus for distilling fatty acids with steam. METALLBANK UND METALLURGISCHE GES. A.-G. Brit. 291,093, May 27, 1927. The steam used may be passed through a compressor to raise its temp.

Bleaching and deodorizing fats, oils and fatty acids. FRITZ GRUBER. Austrian 109,719, Jan. 15, 1928. The fats, etc., are treated with com. H_2O_2 soln. and with a peroxide insol. or sparingly sol. in water, such as BaO_2 .

Oil and fat treatment. HEINRICH BERSYCH (to H. Th. Böhme A.-G.). Can. 285,879, Dec. 25, 1928. Preps. or compds. suitable for use in the textile, leather and pharmaceutical industries are produced by mixing a phosphoric acid compd. with a fatty substance to be treated, maintaining temp. control during the reaction, washing the reaction product with water, and sepg. the wash water from the product.

Treatment of oils or fats or mixtures of same or fatty acids for the production of sulfuric acid compounds. HANS STOCKHAUSEN, FRITZ SCHLOTTERBECK, CONRAD CREMER AND ARNULF HECKING. Can. 285,772, Dec. 25, 1928. The process consists in sulfonating the said oils, etc. with more than 30% H_2SO_4 , which is rapidly added, and simultaneously cooling the mixt. intensively so that the temp. does not exceed 10-15°, washing the mixt. immediately and neutralizing in the usual way. The products are useful as *wetting out agents*.

Sulfonated oils and fats. CARL DREYFUS. Fr. 636,586, June 25, 1927.

fonated oils and fats contg. a large proportion of H_2SO_4 in org. combination are prepd. by the action of $AcOH$ and SO_3 , or $AcOH$ and chlorosulfonic acid in simple or multiple equimol. proportions. $AcOH$ may be replaced by other low aliphatic acids such as formic, propionic, butyric or lactic acid, or the anhydrides or chlorides of low aliphatic acids may be used. Examples are given of the sulfonation of olive oil, ricinoleic acid, olein and ricin oil. Cf. *C. A.* 23, 536.

Extracting oils from animal and vegetable materials. JOHN W. BECKMAN. U. S. 1,698,294, Jan. 8. Coconut copra or other oil-bearing materials are macerated with water and inoculated with lactic acid-producing bacteria and maintained at a temp. to promote bacterial action and a reagent such as $MgCO_3$ is added to maintain the mixt. approx. neutral as the bacterial action progresses; oil thus released from the cells is then sepd. by gravity and decantation or in other suitable manner.

Extraction of oil, gelatinous water and solid substances from animal and vegetable matter. KRISTIAN HOLTER and SVERRE THUNE. Ger. 469,020, Apr. 16, 1925. See *Can.* 274,972 (*C. A.* 22, 1246).

Turkey red oil substitutes. H. TH. BÖHME AKTIENGESSELLSCHAFT. Fr. 642,392, Oct. 10, 1927. Oil and fats are treated with P_2O_5 , acetylphosphoric acid or mixts of H_3PO_4 with Ac_2O or $AcCl$. Examples are given of the treatment of castor oil and oleic acid. The products may replace Turkey red oil in the textile and leather industry, as emulsifying agents or for making pharmaceutical products.

Treatment of castor oil. ALEXANDER SCHWARCMAN (to Spencer Kellogg & Sons, Inc.). Can. 285,743, Dec. 18, 1928. Castor oil is heated to a high temp. (between 550° and 575° F.) *in vacuo* to produce polymerization and improve the miscibility of the oil with mineral lubricating oils; a slow flow of CO_2 or gases contg. the same, is usually, but not invariably, passed through the oil during heating. The action is usually carried on until the miscibility of the castor oil with alc. disappears, and the miscibility of the castor oil with mineral oils, including lubricating oil, increases.

Treatment of fish. GEORGE R. HENSHALL. Can. 285,632, Dec. 18, 1928. Fish or fish offal is cut into small pieces and treated with a soln. of $Fe_2(SO_4)_3$ (frequently in combination with $Al_2(SO_4)_3$) and the mass is left to pickle for 2-24 hrs. This releases all the oil. When the pickling is complete the material is put through a helical conveyor immersed in boiling water to ext. the oil. Oil, fish meal and fertilizers are produced.

Rotating shaker for rapid saponification. CYPRIEN GILLET. Fr. 641,194, Mar. 2, 1927.

Soap. PAUL SERRE. Fr. 641,359, Sept. 23, 1927. Cakes of soap pulp are prevented from becoming hard by dipping them in melted paraffin to obtain a thin protecting layer.

Soap. GUBSER-KNOCH. Swiss 127,536, Jan. 27, 1927. Soap is prepd from neutral curd fat and alkali by heating the fat with concd. alkali lve till the water is almost completely evapd.

Powdered soaps. D. R. LAMONT (to Industrial Spray-drying Corp.). Brit. 291,041, May 25, 1927. A heated, freely flowing soap soln. is sprayed in fine drops into a current of heated gas (such as combustion gases from an oil burner, dild with air) to produce hollow globular particles.

Cleansing agent. KARL MAIER. Swiss 127,537, Aug. 13, 1927. A cleansing agent for the hands contains soap paste, an alk. Na salt and sawdust.

Recovering glycerol from materials containing proteins. JOHANNES ALTENBURG. Ger. 467,350, Mar. 12, 1927. Materials containing glycerol mixed with proteins, such as hectograph masses or printing cylinders, are brought into solution in hot water, treated with formaldehyde to render the protein insol. and the product is ground and extd. with water. The resulting glycerol soln. is rectified. The hardened protein may be used as a fertilizer. Cf. *C. A.* 23, 610.

28—SUGAR, STARCH AND GUMS

S. W. ZERBAN

Measuring the hydrogen ion concentration of sugar products. N. LOGINOV. S.-Kh. Inst. of Voronezh. *Bull. Sakharotrests (Bull. Sugar Trust)* 49, No. 5, 40-4 (1927).—This study was undertaken for the purpose of introducing colorimetric or elec. methods of p_H detn. in the chem. control of beet-sugar factories; the old titration method does not give satisfactory results, and only p_H can be used to det. the real acidity of the

acts. The meaning of p_H is explained and the indicator method is described. s. have shown that diln. with H_2O has no effect on the p_H of molasses and only ght one on that of massecuite. This proves that molasses is a good buffer soln. solns. contg. sugar have a lower p_H than the same solns. free from sugar. This e to the formation of monosucrate of Ca, of the formula $(C_{12}H_{22}O_{11}Ca).(OH)'$. acid disocn. const. of sucrose in H_2O soln. is 2.4×10^{-13} at 25° . V. E. B.

Determination of moisture in sugar sirups. E. W. RICE. *Ind. Eng. Chem., Analytical Ed.* 1, 31-2(1929).—The definition of "moisture" is merely arbitrary, because ent salts lose water of crystn. at different temps., and because certain non-sugars wt. at a temp. as low as 70° . Const. wt. can be reached by placing the sample 8 hrs. in a Hempel desiccator over H_2SO_4 at a pressure of 1 inch. No further loss .. was found after 10 days. It is undoubtedly wise to accept this method as stand-

The present official A. O. A. C. method is cumbersome, and it does not yield a l. wt. The original Bidwell and Sterling method (C. A. 19, 620) also gives unre- results if the % of invert sugar is high, even when an oil bath is substituted for id bath. The addn. of 10 g. Na oxalate to the mixt. of product and toluene increased listn. rate and prevented blackening. The most satisfactory results were obtained lacing approx. 5 g. of Filter-Cel in the distn. flask, and weighing 15 g. of sirup into psule formed from a piece of thin waxed paper resting in a 15-cc. Gooch crucible. weighed capsule is dropped into the flask, and 5 more g. of Filter-Cel added. The r is carried out according to Bidwell and Sterling. The results obtained with 3 distn. agreed closely with those of the official method. F. W. ZERBAN

The determination of sucrose and starch sirup. J. D. FILIPPO. *Chem. Weekblad* 57:6 9(1928).—In several sirups of known compn. F. has detd. the amt. of water-starch sirup and invert sugar. For inversion it was found that a 3.5 N HCl soln. the right strength to use. In a mixt. of starch sirup and invert sugar sirup, the water-starch sirup can be found by taking a 20% soln., treating 25 cc. with 50 cc. 3.5 N , and from the rotation in a 4-dm. tube the total amt. of glucose can be calcd. In ther portion the amt. of fructose is detd. by the Kolthoff-Kruisheer method. The rence between the 2 findings gives the amt. of water-free starch sirup. J. C. J.

The reaction between amino acids and glucose. J. A. AMBLER. *Ind. Eng. Chem.* 50(1929).—This preliminary study has shown that the course of the reaction end. entirely on conditions of concn., temp., and time of heating. At the b. p. ugh as 10 mols. of glucose may be destroyed per mol. of amino acid, but lowering of temp. reduces the effect. In this reaction compds. of progressive complexity, beg- ing to the general class of melanoidins, are formed by dehydroxylation. CO_2 is evolved, except at high concns., but if any gas be formed in molasses or sirups through er reactions, the melanoidins greatly increase the tendency to froth. They also ease the color of the products. F. W. ZERBAN

Notes on the bleaching of off-color crystals. J. P. OGILVIE AND R. G. W. FARNELL. *ern Sugar. J.* 30, 92-3(1929).—A great deal of work has been done on the bleach- of sirups, and juices with SO_2 , ozone, Cl, and other gases, but apparently little has n done on the bleaching effect of these substances upon sugar crystals. Cane (Mauri- nsultation white) and beet after-product (washed crystals), both having a decidedly low color, were treated with Cl, SO_2 , ozone, NO and NO_2 , at varying temps., and some tests in the presence of superheated steam. The results showed considerable provement was obtained with Cl, and ozone on the beet sugar, but none of the gases ed produced any noteworthy improvement in the cane sugar. The explanation of is to be attributed to the presence of insol. tannin matter, which constitutes the lor of the cane product, and which is not affected by the treatment as above described. W. L. OWEN

Pokkahbong and twisted top diseases of cane. C. N. PRIODE. *Facts About* 23, 1244(1928).—P. describes the diseases briefly. M. J. PROFFITT

Maceration practice. W. R. MCALLEP. *Facts About Sugar* 23, 1240-3(1928).— reviews the results obtained with various methods of juice extrn. from cane and as- ibes the defects of ordinary mills to deficient maceration and the failure of the diffu- on methods to insufficient drying of the bagasse. He suggests adopting the practice removing about 80% of the juice in 2 high-pressure mills with ordinary maceration, treatment of the resulting bagasse in a continuous diffuser with systematic circulation f the maceration liquid, and, finally, drying the extd. bagasse by passing it through or 2 high-pressure mills of standard type. M. J. PROFFITT

Carbonation according to Pshenichka. YA. B. FEIGIN. *Bull. Sakharotresta* Bull. Sugar Trust) No. 11, (55), 15-8(1927).—Good filtration work in the Shaluginiskii ugar factory is due to the use of the Pshenichka process. Milk of lime (0.2 to 0.3%

on the total wt. of beets) is mixed with diffusion juice which remains very slightly acid. In the same tank unfiltered juice from the 1st carbonation (5-15% on total wt. of beets) is added. The mixt. is heated to 90°, pumped to defecators, and 2% CaO added. After 20 mins. the juice is sent to the 1st carbonation. CaO added to diffusion juice and CaCO₃ in carbonation juices adsorbs colloidal non-sugars and ppts. coagulated albumin. The filter cakes are hard, granular and easily washed. Purification is high, 81-82%.

V. E. BAIKOW

The analysis of unchopped bagasse. V. KHAINOVSKY. *Arch. Suikerind.* 36, 111, *Mededel. Proefstat. Java Suikerind.* 843-916(1928).—In this paper are discussed all expts. on the sampling and analysis of bagasse made at sugar mills and at the expt. station, which led to the new method of analysis described previously (*C. A.* 21, 3481). Chopping bagasse takes too much time; the polarization is changed by inversion, and the moisture by drying out. Possible errors of a chem., phys., mech. and personal nature are discussed. Addn. of NaHCO₃ when boiling bagasse is advised, because the acidity of bagasse from stored or diseased cane is too high and causes inversion. Lead subacetate should be added after boiling to avoid the soln. of non-sugars which affect the polarization. If the filtrate is not clear enough for correct reading, Filter-Cel should be used. Comparative tests showed that polarizations of bagasse made with the new app. are accurate to 0.1%, if the boiling time is 1 hr. and the circulation in the app. is sufficient. Comparative tests on the moisture of chopped and unchopped bagasse showed that moisture is lost during chopping. The drying must be done in a specially constructed oven where a circulation of hot air is possible. Expts. showed that a temp. of 130° is permissible and 1 hr. is sufficient for complete drying. The limits of error in the moisture detn. with the new oven amount to 1% on bagasse. P. R. P.

The production and refining of Indian gur or jaggery. J. T. J. CROOKS. *Intern. Sugar J.* 30, 189-92(1929).—The cane from which jaggery is made is of the thin hard-rind type of very high fiber content, and the extn. of the juice by the primitive mills employed, is very inefficient. The juice is evapd. in open pans, and the inversion of the sucrose is very high. Losses from inversion are accentuated by the prejudice of the natives towards the use of lime in clarification. Jaggery made with lime always brings lower prices in the market. The juice is evapd. to a stage where it will solidify on cooling. It is then cooled and rolled into balls known as belli gur or poured into holes in the ground that have been previously prepd. for that purpose. The latter method produces a sugar known as chunkie gur. The refining of gur is carried out both in modern refineries and by primitive native methods. Although the sugar from the refineries has a polarization of 98.5 as compared with 94.5 for the product from the native refineries, the latter brings a much better price in the market. The colloid content of jaggery is very high, and the yield is very much affected by it. W. L. O.

Inulin. VI. H. PRINGSHEIM AND I. FELLNER. *Univ. Berlin. Ann.* 462, 231-9 (1928); cf. *C. A.* 20, 3017.—Results of mol. wt. detns. of inulin in AcOH, PhOH and H₂O are given as well as of the sapon. products of inulin after heating at 250°, 260° and 290°. The enzymic degradation of inulin was also followed for 192 hrs.

C. J. WEST

Röntgen diagram of native starch. ST. V. NÁRAY-SZABÓ. Kaiser Wilhelm Institut für Faserstoffchemie. *Ann.* 465, 299-304(1928).—The Debye-Scherrer method of x-ray analysis has been applied to starch from different sources. A Cu-K anticathode is used and the starch is contained in a glass capillary. Starches may be divided into the potato group (from potato, *Curcuma angustifolia*, *Canna indica* and *C. edulis*, *Musa paradisica*, *Dioscorea alata*, *Arracalia esculenta*, *Jatropha manihot* and *Araucaria brasiliensis*) and the rice group (from rice, wheat, millet, *Maranta arundinacea*, *Ipomoea tjalappa*, *Arum esculentum* and *Balata edulis*). The former are characterized by a strongly marked ring 1 (not observed by Sponser or by Otto), from which the distance between the planes of the crystal lattice is calcd. as 16.0 Å. U.; there is a 2nd strong interference at ring 5. In the rice group ring 1 is absent and rings 5 and 8 are present. The variations in strength of the rings from the 2 groups cannot be due to contamination or deformation; the amt. of amylopectin has no influence on the diagrams and swelling by absorption of H₂O has only normal effects. It is therefore suggested that the parameters of the unit cell (of which the vol. is calcd. to be 2.524×10^{-21} cm., i. e., 16 C-H₂O₂ groups) vary, through either phys. or chem. differences between the different starches.

C. J. WEST

The effect of fertilizer constituents on the (SANYAL) 15. Fatigue failures of [cane] mill shafts
phlic flora of sugar in its relation to canning (CA

of sugar-cane juice and gur
MARANDAO) 9. The thermo-
VILLIAMS) 11C. Utilization

of waste water from sugar factories (GRØVEMBYER) 15. Condensate and hot water systems in Cuba (CONNOR) 13. Purifying solutions containing dissolved salts and organic coloring substances (U. S. pat. 1,699,449) 13. Cyclohexyl alkyl phthalic esters (U. S. pat. 1,689,761) 10. Mashing vessel with cooling coils (for treating massecuit from the boiling apparatus) (Brit. pat. 291,035) 1. Extracting sugar, etc. (Fr. pat. 642,277) 13. Distributor for finely granular or powdered materials (Ger. pat. 469,469) 1.

KRYZ, FERDINAND: *Chemische Kontrollmethoden und Verlustberechnung der Zuckerfabrikation*. Leipzig: Max Jänecke. R. M. 9.60. Reviewed in *Internl. Sugar J.* 30, 663 (1928).

SIDERSKY, D.: *The Oxford Process for the Desiccation of Sugar Beet and the Extraction of Sugar from Dried Cossettes*. London: Sugar Beet & Crop Driers, Ltd. (Lincoln House High Holborn W. C. 2). Reviewed in *Internl. Sugar J.* 30, 663 (1928).

Sugar from beets. A. W. F. CAPPS. Brit. 291,866, March 9, 1927. Before drying for subsequent extn., beet cossets, freshly cut, are passed through a hot sugar soln. contg. a low-grade sugar or sprayed with steam or a gas contg. water vapor.

Sugar-extracting apparatus. ALOIS RAK. Austrian 111,253, June 15, 1928. The app. comprises a series of diffusers and press-worms arranged alternately, and the arrangement is such that the slices to be extd. rise in the diffusers, while the extg. liquid descends through the diffusers in turn.

Centrifuge, especially for sugar manufacture. FRANZ MARCZINEK. Ger. 468,619, Mar. 29, 1927. Structural features.

Glucose from starch. CORN PRODUCTS REFINING CO. Brit. 291,991, Aug. 19, 1927. See Fr. 638,956 (C. A. 23, 541).

Purification of starch. W. H. UHLAND G. M. B. H. Fr. 641,277, Sept. 21, 1927. To remove albumins, crude starch is treated with dil. solns. of hypochlorites, contg. at least 1.6 parts of active Cl for each part of albumin.

29—LEATHER AND GLUE

ALLEN ROGERS

Tanning leather with badan extract. A. SMETKIN AND A. PISSARENKO. *Collegium* 1928, 481-7.—From badan ext. alone (see following abstract) a satisfactory sole leather was prepared. A brief description of the method of tanning is given. Penetration and swelling were best at pH 3-4. With increasing concn., the viscosity of badan ext. increased much more rapidly than that of oak wood or quebracho exts. This and the slow diffusion into skin indicate that badan ext. has a low degree of dispersion. It is not, however, as readily salted out as quebracho probably because it contains gum-like nontannins. I. D. CLARKE

Factory experiments on the preparation of purified tannin extracts from badad by the Smetkin-Yakimov method. A. SMETKIN AND P. YAKIMOV. *Collegium* 1928, 477-80; C. A. 22, 4002.—Ground roots contg. 20.17% tannin and 20.66% nontannin were used. Instead of H_2O at 4°, it was necessary to use sea water at 23° for the cold- H_2O leach. This ext., 93.6 cu. m. from 650 kg. of roots, contained 6.28 kg. of nontannin and 2.75 kg. of tannin per cu. m. The ext. from the 95° leach., after concn. to 20° Bé. contained 21.60% tannin and 11.44% nontannin. The quality of the ext. from finely ground roots, 3-6 mm. diam. was a little better than that from coarsely ground roots, 6-15 mm. diam. I. D. C.

Some phenomena in vegetable tanning. CESARE SCHIAPARELLI AND GIOVANNI BUSSINO. Lab. Unit. Ital. Tanneries, Turin. *Boll. ufficiale stas. sper. ind. pelli mal. concianti* 6, 259-67 (1928); cf. C. A. 22, 2483.—This is a contribution to the question: Is the process of vegetable tanning truly chem. in nature or not? In the expts., the increase in wt. of 100 parts of dry protein when treated with various tannins was detd. A piece of hide corresponding to 10 g. protein dried at 100° was tanned with tannin purissimum Merck or Kahlbaum, or with oak bark ext. The latter was prepd. by extg. at low or at elevated temp. Twelve g. tannin was used for 10 g. dry protein. In some expts. the solns. were acidified with 1.125 parts of lactic acid for 100 parts of protein. The progress and the end of the tanning were detd. by means of the hydrostatic balance. After the tanning, the sol. substances were eliminated by rinsing the leather for 4-6 hrs. with H_2O at 45-50°. In the expts. with pure tannin, 100 parts of dry protein combined irreversibly with about 70 parts of tannin Kahlbaum and with about 78 parts of tannin Merck. The difference between the quantities of tannin fixed is due to a

difference in chem. compn. One hundred parts of dry protein combined with about 57 parts of oak bark tannin regardless of the temp. of prepn. of the ext. Acidification had only a slight effect on the leather yield. S. and B. conclude that their results favor the conception that vegetable tanning is chem. in nature. G. SCHWOCH

The diosmosis of tannin in presence of mineral salts dissolved in the tannin solutions. ANDREA PONTE. Lab. della S. N. Industrie Conciarie, Corsico (Milan). *Boll. ufficiale staz. sper. ind. pelli mat. concianti* 6, 308-28(1928).—The diosmosis of a pure tannin soln. was compared with that of tannin solns. contg. certain quantities of mineral salts. The former soln. contained 8% tannin, while the latter solns. contained, besides 8% tannin, 1.5 g. mols. of NaCl, Na₂SO₄, NaHSO₄, Na₂SO₃, or NaHSO₃, resp., per 1000 cc. Three hundred cc. of the soln. to be examd. was placed in a dialyzer of special construction and dialyzed against 1200 cc. of distd. H₂O at 25° for 24 hrs.; after that period the process was repeated in the same way. Then the external and internal solns. were analyzed, the latter after being dild. in the ratio 1:50. For the tannin detn., the method of Vigna (*Staz. aper. agr.* 1895, 22) was given preference to that of Löwenthal-Hunt. According to Vigna's method, the tannin was pptd. with an 8% K alum soln. and a slight excess of NH₃. The ppt. was collected on a filter, washed with cold water, redissolved in boiling 25% H₂SO₄ and titrated with indigo and KMnO₄. P. found Vigna's method better suited for his expts. than that of Löwenthal-Hunt because, unlike the latter, it is not much influenced by the tannin concn., provided that the total tannin content ranges between 0.025 and 0.050 g. Furthermore, the tannin can be detd. in presence of bisulfites or sulfite cellulose liquors. In case gallic acid is present, Vigna's method cannot be used. When comparing the diosmosis of tannin solns. with that of solns. of tannin-mineral salts, it was found that NaCl, Na₂SO₄ and NaHSO₄ had no influence on the velocity of the tannin diffusion, no increase in the amt. of the diffusing tannin being noticed. The color of these solns. was orange-brown. In the tannin-NaHSO₃ soln., which was of yellowish green color, the velocity was increased, and it was still greater with the Na₂SO₃-tannin soln., which had a garnet-red color. P. believes that in case of the 2 latter solns. chem. reactions take place giving rise to formation of compds. that are of a character less colloidal than tannin itself. G. S.

The bark of the Siberian larch as a raw material for the preparation of tannin. P. YAKIMOV AND N. VELTISTOVA. *Collegium* 1928, 488 95.—The larch, *Larix decidua* var. *Sibirica*, is abundant in central and eastern Siberia. The quantity of bark is estd. to be 500,000,000 tons. The bark contains 8-18% tannin, 5-9% nontannin and up to 1.4% reducing sugar. There was more tannin in the inner layers than in the other layers of the bark, probably because tannin is removed from the latter by weathering. With increasing distance from the ground the percent of solubles, nontannin and sugar in the bark increased, while the purity of the ext. and thickness of the bark decreased. Diseased trees contained 4-6% tannin. I. D. CLARKE

Synthetic tans. S. R. TROTMAN. *Ind. Chemist* 4, 499 500(1928).—The chem. constitution of the natural tannins is still uncertain, but numerous attempts to synthesize tannin compds. have nevertheless been made, among the earliest being those of Fischer and Freudenberg (1912). The methods of prep. synthetic tans as given in the patent literature from 1913 are briefly outlined for the better-known processes. E. G. R. ARDAGH

Chrome tan. E. STIASNY. *Collegium* 1928, 554 67.—A lecture reviewing the application of Werner's theory to basic Cr salts. Only salts which are semi-colloidal tan. Recent work with Olschansky has shown that the action of soda on Cr salts differs from that of NaOH in that soda gives a violet instead of a green color, the pptn. no with soda is much greater, and the turbidity does not redissolve on aging. With soda, carbonate complexes are formed; these rapidly condense to ol compds. Since part of the soda is used in forming carbonate groups, the basicity is less than calcd. The usual methods of detg. basicity do not give true values, for in hot dil. solns. the carbonate compd. is not stable. The oxidation method (Burton) gives correct values if after adding the excess of NaOH and oxidizing the Cr to chromate with H₂O₂, BaCl₂ is added to ppt. carbonate. Then the excess NaOH can be detd. as usual. I. D. CLARKE

The catalytic effect of some organic substances on the activity of the macerating agents. MAX HOTZ. *Boll. ufficiale staz. sper. ind. pelli mat. concianti* 6, 303 7(1928).—In order to find substances more efficient in activating the enzymes used for macerating hides than are KCN, amino acids and acetaldehyde-cyanohydrin (M. Jacoby, *C. A.* 21, 2000), H. examd. the action of nitriles. Aliphatic and aromatic nitriles of the type RCN have a positive effect, but are of little practical value. More suitable are nitriles of the type RNHCH₂CN (R = aryl), which are easily prepd. according to R. Lepetit's method. PhNHCH₂CN (I) has the disadvantage of being only slightly sol. The

SO_3H , COOH and OH derivs. of I, however, are sol. enough. Thus *p*-cyanomethylaminophenol (II), *p*-cyanomethylaminobenzoic acid (III), the Na salts of *m*- (IV) and *p*-cyanomethylaminophenylsulfonic acid (V), and Na 1,4-cyanomethylaminonaphthylsulfonate (VI) were prepd. II and III slowly decompose in soln., while the solns. of IV, V, and particularly of VI are stable. All 5 nitriles accelerate the action of the macerating enzymes; besides, they exert a favorable influence on the hide by completely eliminating the subcutaneous fat. Very small quantities of the nitriles are required for the effect. V and VI produce a lighter-colored hide than do II and III, the shade of the color produced by the 2 latter nitriles corresponding with the color of the slowly decomposing solns.

G. SCHWOCH

Valuation of cellulose extracts. E. ANACKER. *Collegium* 1928, 495-9.—A complete analysis of a cellulose ext. must include total solubles, ash, affinity for hide, hygroscopicity, acidity, color and odor. Det. the affinity for hide, "tannin," with solns. contg. 10 g., and 20 g. of ext. per l.; the less the difference between the results the greater the affinity. Dry in a desiccator a small amt. of ext., absorbed on a weighed filter paper, then expose it for 3 hrs. to a known humidity and reweigh; the gain in wt. is a measure of the hygroscopicity. The odor of the ext. is not characteristic of the odor it will impart to leather but if a 5° soln. is dialyzed 24 hrs. and the dialyzate is evapd. the odor of the residue is characteristic. The acid no. is the no. of cc. of 0.1 N alkali required to neutralize to phenolphthalein 1 g. of ext.

I. D. CLARKE

The analysis of artificial leather bates. V. KUBELKA. *Collegium* 1928, 604-11.—Casein has been chosen as substrate for detg. the activity of bates because uniform lots having practically identical properties can be supplied. This is more important than similarity to hide substance. Bates have a proteolytic and a peptolytic enzyme. The proteolytic enzyme renders the interfibrillary substance of the hide sol. Any action of the peptolytic enzyme on this sol. matter is of no importance in bating. Therefore the Kubelka-Wagner method (C. A. 20, 3835), which measures decrease in the quantity of substrate, is better than the Schneider-Vleck (C. A. 21, 4090) or a similar method which measures the quantity of decompn. products, especially if the degree of decompn. influences the measurement.

I. D. CLARKE

The action of salt on skin. MAX BERGMANN. *Collegium* 1928, 599-604.—The permeability or no. of cc. of liquid passing through skin in 15 mins. under a pressure of 1 atm. was measured with H_2O (I), salt solns. (II) and again with H_2O (III). A calf skin unharmed by sweating was used; the salt solns. were N/160 to N/2.5. II was always less than I or III. III was less than I except after N/160 salt soln., when it was 150% of I. Concd. salt solns. caused a falling of the skin and greatly decreased porosity. With N/2.5 salt soln. II was 2.3% of I and III was 8.8% of I.

I. D. CLARKE

Hide defects. I. Salt stains. FRITZ SEATHER. Kaiser Wilhelm Inst. für Lederforschung, Dresden. *Collegium* 1928, 567-99.—The following defects are usually classed as salt stains: (1) salt pricks caused by crystn. of salt in the grain, (2) blue, red or lilac colorations of the flesh caused by chromogenic bacteria, (3) brick- or carmine red heat stains on the flesh which often cause loose hair and grain damage, (4) lemon yellow or orange-brown specks, 4-8 mm. in diam. scattered over the flesh, (5) bright yellow or orange spots, 3-5 mm. in diam. close together, forming large bands across the flesh. Only the last class of stains was investigated. These do not cause hair slip but can be found on the grain after shaving the hair. There is often damage around the hair roots. Holes may be formed within the skin. After liming with sulfide, large brownish gray stains are found. The damaged hide fibers do not show double refraction; they are not swelled by NaOH and their affinity for dye is different from that of unchanged skin. Several pure cultures of bacteria were isolated from stains. The following are described; *B. mesentericus*, *Staphylococcus pyogenes aureus*, *sarcinae*, *Corynebacterium* and 2 types of *Actinomyces*. Cultures of these were grown on agar medium contg. NaCl. 1 or 2% NaCl did not check and sometimes stimulated growth; 8% NaCl checked growth but did not kill; 4-8% NaCl contg. 5% Na_2CO_3 decreased growth greatly. In stained hide as compared to unstained, Fe was 4-15 times as high, P_2O_5 was 1.5-10.9 times as high and SO_3 and Ca were unmistakably higher. The P_2O_5 must be set free from nucleic acids by bacteria. Attempts to liberate Fe from blood by bacterial action were unsuccessful. Hide inoculated with the pure cultures of bacteria developed salt stains. Blood on the hide also caused stains; if the blood was inoculated with the isolated bacteria the stains were more pronounced. Solns. of $(\text{NH}_4)_2\text{PO}_4$ or CaCl_2 caused stains similar to those of class 4. The methods of prevention suggested are: clean or keep the hides free from dirt, blood, etc.; salt soon after flaying; use 15-20% salt and cover all parts of the hide; add an antiseptic material such as 5% soda to the salt.

I. D. CLARKE

Characteristics of commercial gelatin and glue. M. RÜDIGER AND E. MAYR. *Kolloid-Z.* 46, 81-9(1928).—Chem. analysis of com. gelatin and glue was found to be an unsatisfactory method of evaluating material to be used in *wine clarification*. The degree of degradation of the protein detts. the suitability of the stock for this purpose and this is best indicated by tannin pptn., viscosity and change in viscosity with time.

J. G. McNALLY

The significance of mechanical wood joint tests for the selection of woodworking glues. T. R. TRUAX, F. L. BROWNE AND DON BROUSE. U. S. Forest Products Lab. *Ind. Eng. Chem.* 21, 74-9(1929).—All kinds and grades of glues used in woodworking make *good joints* (as distinguished from the 3 types of poor joints, chilled, starved, and dried joints, resp.) provided that the proper gluing conditions are followed, but the conditions giving good joints with animal glue of low grade, for example, produce poor joints with glue of high grade and *vice versa*. Furthermore, good joints with all glues in common use are as strong as the wood joined. In selecting glue, therefore, the woodworker is not concerned about its "strength," but he does want to know the gluing conditions under which it will make good joints. Measurements of such properties as viscosity and jelly strength give him that information, but mechanical tests of wood joints made under an arbitrary set of gluing conditions do not. Mechanical wood joint tests find their place in research into gluing technic.

F. L. BROWNE

The nature of adhesion between glue and wood. F. L. BROWNE AND DON BROUSE. U. S. Forest Products Lab. *Ind. Eng. Chem.* 21, 80-4(1929).—Evidence that specific adhesion between wood and glue is necessary for satisfactory gluing was offered by Browne and Truax (*C. A.* 21, 3485). Other workers have maintained that mechanical adhesion alone obtains in wood joints (cf. *C. A.* 21, 3254). It is now shown that the wood joints on which the arguments of the latter rest were probably typical of starved joints (cf. preceding abstr.) and that good joints of the kinds in question satisfy the criteria set forth for specific adhesion.

F. L. BROWNE

The purification of sewage from the city Elmshorn, with special reference to tannery wastes (SNOEK) 14. Studies of adsorption and swelling (KUBELKA, WAGNER) 2. Oil and fat treatment (Can. pat. 285,879) 27. Wetting agents (Brit. pat. 291,070) 18. Turkey red oil substitutes (Fr. pat. 642,392) 27.

Tanning composition. OSKAR SPENGLER AND ALFRED THURM. U. S. 1,698,659, Jan. 8. Salol or 2-naphthol salicylate or other suitable ester of a hydroxyarylecarboxylic acid compd. is subjected to the action of a sulfonating agent such as chlorosulfonic acid which is capable of reacting with H₂O until a sample of the reaction product dissolves in water.

Synthetic tanning compositions. I. G. FARBENIND. A.-G. Brit. 291,245, June 18, 1927. S is condensed under alk. conditions with the water-sol. condensation products obtained by reaction between CH₂O and phenol, or its homologs or halogen derivs., and sulfites. For use in tanning a soln. formed by the reaction products is acidified and boiled to remove SO₂. The products obtained may be used with various other tanning compns. Examples are given.

Spray desiccation of chrome tanning liquors. CLYDE D. MARLATT AND WALTER H. DICKERSON (to Marlatt Industrial Waste Products Corp.). U. S. 1,698,505, Jan. 8. In order to convert chrome tanning liquor into dry powdered form it is sprayed into a hot gaseous drying medium after preliminary heating of the liquor to a temp. of about 115°. An app. is described.

Leather-coating composition. SOC. ANON. FRERICUIR. Swiss 127,041, Sept. 20, 1926. The compn. comprises a cellulosic varnish contg. at least one aliphatic acid. A suitable compn. comprises acetylcellulose (6 parts), acetone (70 parts), AcOH (6 parts), amyl acetate (12 parts), ethyl glycollate (5 parts), and amyl ricinoleate (3 parts).

Waterproofing leather. HENRY V. DUNHAM. Can. 285,960, Dec. 25, 1928. Leather is waterproofed by impregnating with a hot molten mixt. contg. about 78 to 85% of paraffin wax, and at least about 10% of rubber dissolved therein, such mixt. having been heated to about 150°, to impart the desired readily penetrating property thereto. Cf. *C. A.* 22, 3316.

Imitation leather. C. E. SIMPSON. Brit. 291,890, March 12, 1927. Woven fabric with a raised or pile surface is printed or grained on one face to resemble leather or in a desired design and then treated with a compn. contg. cellulose acetate or other suitable coating material and may be embossed. Various other details and modifications of the treatment are also described.

Leather-like substance. ALFRED EHRENREICH. Fr. 641,513, Sept. 27, 1927. A substance which can be used for clothing, hand bags, or drum skins is made by treating with a tanning agent the large intestine and the stomachic wall of cartilaginous fishes, particularly the plagiostomes.

Gelatin solutions. I. G. FARBERNIND. A.-G. Fr. 642,235, Oct. 13, 1927. See Brit. 279,443 (C. A. 22, 2855).

30—RUBBER AND ALLIED SUBSTANCES

C. C. DAVIS

The Research Association of British Rubber Manufacturers. ANON. *Rubber Age* (London) 9, 414-20(1929).—An illustrated description of the new laboratories.

C. C. DAVIS

Dispersoidological investigations on latex. PHILIP SCHIDROWITZ. *India Rubber J.* 76, 875(1928).—A review of a paper by von Weimarn (cf. *Bull. Chem. Soc. Japan* 1928, 157; *Repts. Imp. Ind. Res. Inst.* 9, No. 5(1928)).

C. C. DAVIS

Making rubber goods of latex by electrodeposition. PAUL KLEIN. *India Rubber J.* 76, 879-81(1928).—A description of early expts. and present developments in the Klein process of electrodeposition of rubber (cf. C. A. 19, 3037; K. and Szegvari, C. A. 21, 512, 2576, 2820; K. and Healey, C. A. 22, 4007; Dunlop Rubber Co., K. and Healey, C. A. 22, 4877). Methods involving deposition directly on a metallic surface are preferable to those involving porous diaphragms. Cataphoresis takes place independent of the current strength, whereas electrolytic deposition can take place only above a certain decompn. tension. Therefore, below this tension homogeneous deposits are formed directly on metal with no evolution of gas. This method requires low currents and therefore is slow. Deposition also takes place above the decompn. tension, so that addn. to the latex of certain electrolytes having a lower decompn. tension than water, i. e., OH ions, and which give solid anodic products, can be used. Sulfides and thiosulfates are particularly effective, since S is liberated and forms a homogeneous mixt. with the rubber. The generation of gas at the anode is caused chiefly by OH ions in the serum, and so if these are diminished and an anode which ionizes continuously and combines with the OH ions is used, generation of gas is avoided. The quantity of rubber deposited is a function of the c. d. The following equations (where V is the velocity of migration, H the potential applied, D the dielec. const. of the bath, Σ the absorption potential of the globuloids, μ the internal friction of the liquid, i the current strength and χ the cond. of the liquid): $V = HD\Sigma/(4\pi\mu)$; $H = Ai/\chi$, and $V = (AiD\Sigma)/(4\pi\mu\chi)$ show that the velocity of migration is inversely proportional to the cond. of the bath. These equations were not strictly true in actual expts. but the thickness of the deposit decreased with increase of cond. The concn. of bath is of industrial importance, a change of concn. between 20 and 30% making little difference, whereas with a concn. below 10%, the quantity of rubber deposited varies greatly with slight changes of concn. Deposition must be at a const. rate to avoid continual change of time, c. d. and cond. Methods have been developed for keeping the concn. of the mixt. practically const., a diaphragm between the latex and cathode with the latex compd. inside the diaphragm and contg. the anode causing migration and deposition of rubber on the anode and electroendosmotic flow (the inverse of cataphoresis) through the diaphragm so that the serum passed to the cathode. Since alky., concn. and cond. remain const., the rate of deposition is also const. for a given current. The process has been made very economical, 0.2 kw.-hr. being sufficient for the deposition of 1 lb. of rubber mixt., even with cathode diaphragms. The quality of the vulcanized products is superior to that of the corresponding mixts. made by standard methods of milling. The process offers new uses for rubber, particularly in the coating of metals with soft or hard rubber.

C. C. DAVIS

Stress-strain curves of raw rubber-carbon black mixtures at low temperatures. M. KRÖGER AND WAN-NIEN YAO. Univ. Leipzig. *Gummi-Ztg.* 43, 649(1928).—In expts. on the effect of chilling (-20° to -65°) on the stress-strain curves of raw rubber it was found that the stress-strain curves at low temps. conform closely to the stress-strain curves of the vulcanized rubber at normal temps. Further expts. now show that the incorporation of gas black into raw rubber changes the stress-strain curves at these low temps. in much the same way that it changes the stress-strain curves of the vulcanized rubber at normal temps. With Congo, Para and sheet rubber, 10 parts of gas black per 30 parts of rubber were added, and with crepe, 10 parts per 20 parts

of rubber. The optimum absorption of energy was at -25° , for though at lower temps. higher stresses were obtained, the disproportionately low elongations made the total energy less. The optimum is then, in comparison with that of pure rubber, displaced toward a higher temp., and is also increased in magnitude by the addn. of the gas black. Further details are published elsewhere (cf. *Z. Elektrochem.* 34, 725(1928)). C. C. D.

Blacks for rubber mixtures. WERNER ESCH. *Gummi-Ztg.* 43, 421-2(1928); cf. *C. A.* 23, 306.—A discussion of properties of different types of C black, with particular comments on papers by Kirchhof (cf. *C. A.* 23, 731) and by Johnson (cf. *C. A.* 22, 4273). C. C. DAVIS

Reply to the "corrections" of Dr. W. Esch, Hamburg. F. KIRCHHOF. *Gummi-Ztg.* 43, 422-3(1928).—A further polemical discussion of the properties of blacks. C. C. DAVIS

Determination of sulfur in rubber by the perchloric acid method. EDWARD WOLESENSKY. Bur. Standards, Washington. *Ind. Eng. Chem.* 20, 1234-8(1928).—In a search for a rapid and accurate method for detg. S in rubber, it was found that oxidation by means of Na_2O_2 in a Parr bomb is unsatisfactory when the S content is low, because the samples which can be used are too small for accurate results, and with larger samples oxidation is incomplete. The use of a mixt. of HNO_3 and HClO_4 as described by Kahane (*C. A.* 21, 2817) is also unsatisfactory, but with certain modifications his method may give very good results, and if fusions are unnecessary, it will save time and labor. The chief modifications recommended are the use of more dil. HNO_3 (equal vols. of concd. acid and water), allowing the rubber to dissolve completely on the steam bath before heating more strongly, then heating to gentle boiling until oxidation is complete, and finally destroying the residual HNO_3 by HCl . The use of a larger flask (500-800 cc.) is also recommended, and suggestions are made for the adaptation of this method to the analysis of rubber mixts. which contain Ba, Pb, etc. It is recognized that this method has its limitations and that there are cases where it is inapplicable, but in the majority of cases it should be useful. C. C. DAVIS

Importance of temperature and humidity control in rubber testing. I. Stress-strain and tensile properties. J. E. PARTENHEIMER, et al. *Ind. Eng. Chem.* 20, 1245-73(1928); *Rubber Chemistry and Technology* 1, 515-94(1928); cf. *C. A.* 22, 511.—A report of the Phys. Testing Com. of the Rubber Division of the Am. Chem. Soc. An extensive investigation proves that temp. variations which occur from day to day in an uncontrolled lab. may effect the phys. properties of vulcanized rubber as much as 25-45% in the time of cure, while relative humidity affects the properties relatively little. Furthermore variations in the abs. humidity where the uncured rubber is stored between mixing and curing may affect the tensile strength and modulus as much as does the temp. after curing. Therefore, tests without control of temp. and humidity may be highly erroneous and misleading. The investigation leads to definite recommendations. Uncured rubber mixts. should be conditioned for not less than 24 nor more than 28 hrs. at an abs. humidity of 5.24 grains of water per cu. ft. of dry air (0.012 g. of water per l.), and cured mixts. should before testing be conditioned for not less than 24 hrs. at $80^{\circ} \pm 2^{\circ}$ F. and $45 \pm 3\%$ relative humidity. The testing room should be maintained at $82^{\circ} \pm 2^{\circ}$ F. The time between removing samples from the conditioning cabinets and curing or testing should be not over 2 hrs. If uncured mixts. cannot be conditioned at 82° F., the relative humidity should be that corresponding to the temp. used, which gives an abs. humidity equal to that obtained under the former conditions, viz., 5.24 grains of water per cu. ft. of dry air. It is not necessary to control the humidity of the testing room, a small cabinet humidified with the proper satd. salt soln. or H_2SO_4 soln. being sufficient. A study of the effect of variations of relative humidity before mixing showed negligible differences in stress-strain and tensile properties, so that it is unnecessary to use more than ordinary care in storing rubber and compounding ingredients. The methods used throughout the investigations are described in detail and the results are recorded in tables and graphs. Control of temp. and humidity are not the only variables in testing rubber, and only when all variables are brought under control will the results of various investigators be strictly comparable. C. C. DAVIS

Inaccuracies in determination of acidity of raw rubber by water extraction. A. D. CUMMINGS AND H. E. SIMMONS. Univ. of Akron. *Ind. Eng. Chem.* 20, 1213-4(1928).—Expts. on the detn. of water-sol. acids in raw rubber by direct extn. with hot water showed that high and erratic values are obtained, probably on account of hydrolysis of the esters present. An increase in the acid no. also takes place if the acetone ext. is boiled with water. In the hot water extn. of rubber, the extent of the ester hydrolysis depends upon the time and temp. of extn., extensive hydrolysis occurring only toward

the b. p., which readily accounts for the erratic results of direct extn. where there is uneven heating. To avoid fallacious results in detg. water-sol. acids in rubber ext. first with acetone, and then digest this ext. with water on a boiling-water bath until there is no increase in acidity of the water ext. This is a part of the procedure of van Rossem and Dekker (cf. *C. A.* 21, 195).

C. C. DAVIS

Normal aging (of rubber). PHILIP SCHIDROWITZ. *India Rubber J.* 76, 765-6 (1928).—A review and discussion of a paper by McKee and Depew (cf. *C. A.* 22, 2490).

C. C. DAVIS

Reënforcement of rubber by fillers. PHILIP SCHIDROWITZ. *India Rubber J.* 76, 1071(1928).—A crit. review and discussion of a paper by Blake (cf. *C. A.* 22, 4876).

C. C. DAVIS

Rubber thread and tape manufacture. A. E. PENFOLD. *India Rubber J.* 76, 1035-7, 1075-6(1928).—A description of present developments, including the raw materials, methods of compounding, equipment and technic.

C. C. DAVIS

Effect of repeated reclaiming of rubber. GEORGE W. MILLER. Firestone Tire & Rubber Co., Akron. *Ind. Eng. Chem.* 20, 1165-9(1928).—In view of the increasing importance of the problem whether vulcanized rubber can be reclaimed repeatedly without the quality of the successive reclaims becoming poorer and poorer, a representative whole tire reclaim was cured, was then reclaimed by the NaOH process and the cycle repeated 3 times more. The quality of each new reclaim was detd. by tests, before curing, of the plasticity, acetone and CHCl_3 exts., free and combined S and, after curing, of the tensile strength, ultimate elongation, modulus and aging. Repeated reclaiming resulted in a decrease in the CHCl_3 ext., plasticity and ultimate elongation and an increase in the acetone ext., combined S and modulus, while the tensile strength remained practically the same. When incorporated in a tire tread mixt. of relatively poor quality, the modulus increased and the elongation and tensile strength diminished with successive reclamations, while by heating in air at 70° there was little difference in the aging properties of the tread mixts. contg. the successive reclaims. The results show in general that when vulcanized rubber is repeatedly reclaimed and recured, its phys. properties become progressively poorer.

C. C. DAVIS

Some observations with ultra-accelerators. A. D. CUMMINGS AND H. E. SIMMONS. Univ. of Akron. *Ind. Eng. Chem.* 20, 1173-6(1928).—Several thiuramdisulfides, one of them not previously described, were prepd. and their behavior as accelerators was studied with a view to explaining the mechanism of their action and obtaining evidence for or against existing theories of acceleration. The disulfides were prepd. by the method of Braun (cf. *Ber.* 35, 817(1902)). The following data give the thiuramdisulfides prepd. (the 1st one new) the m. p. found and the m. p. recorded in the literature: dimethyldiethyl (I), 72° , -; tetramethyl (II), 146° , 146° ; tetraethyl (III), $69.5-70^\circ$, 70° ; dimethyl (IV), $101.5-102^\circ$, 102° ; dimethyldiphenyl (V), 192° , 198° ; tetramethyl (VI), 105.6° , 106° . IV was almost inactive, whereas II was extremely active (cf. Romani, *C. A.* 16, 854; Twiss, Brazier and Thomas, *C. A.* 16, 2043). On the assumption that inactivity and ease of decompn. may be related, IV was heated alone, with S and ZnO, and with S, ZnO and rubber. In all cases H_2S and MeNCS were evolved. Hence the reaction: $\text{IV} \longrightarrow 2\text{MeNCS} + \text{H}_2\text{S} + \text{S}$ proceeds so rapidly that there is little opportunity for cyclic changes involving the activation of S before IV is irreversibly decompd. (cf. Twiss and Thomas, *C. A.* 18, 1764). IV decompd. slowly at room temp. and more rapidly on the steam bath. Heated in a rubber-S-ZnO mixt., VI first evolves alk. vapors, followed by H_2S at higher temps., the mechanism of which probably depends upon the explanation of Bedford and Sebrell (*C. A.* 16, 855) and of Bedford and Gray (*C. A.* 17, 2797). Addn. of II and the equiv. proportion of VI + S to a rubber-ZnO mixt. gave vulcanizates of the same degree of cure, indicating that the same active substance is found in each case, probably Zn dimethyldithiocarbamate. COS passed into ice-cold NH_4Et , the product dissolved in water, satd. with the I, and evapd. yielded an oil which after purification decompd. slowly on standing at room temp. with evolution of H_2S and sepn. of S, which were increased by the addn. of HCl. Boiling and neutralization of this acid soln. gave NH_4Et . The decompus. probably involved the reactions: $(\text{Et}_2\text{NC}(\text{O})\text{S})_2 \longrightarrow (\text{Et}_2\text{N})_2\text{CO} + \text{COS} + \text{S}$; $\text{COS} + \text{H}_2\text{O} \longrightarrow \text{CO}_2 + \text{H}_2\text{S}$; $(\text{Et}_2\text{N})_2\text{CO} + \text{H}_2\text{O} \longrightarrow 2\text{NH}_4\text{Et} + \text{CO}_2$. An aq. soln. of the oil gave with $\text{Zn}(\text{OAc})_2$ a ppt. (probably Zn diethylmonothiocarbamate), which had some accelerating power. Comparative tests showed that accelerators derived from an ethylamine are more rapid than the corresponding ones from a methylamine. The dithiocarbamates were more active than the corresponding thiuramdisulfides. The data are recorded in detail, including artificial aging tests.

C. C. DAVIS

Accurate method for comparison of scorching qualities of accelerators. H. R.

THIES. Miller Rubber Co., Akron. *Ind. Eng. Chem.* 20, 1223-7(1928).—A discussion of various methods already known for judging the scorching caused by accelerators leads to the conclusion that none is satisfactory and that there is still need for a simple and reliable method. The new method described overcomes to a large extent the shortcomings of previous methods, and is based on the fact that when a rubber-S-accelerator-ZnO mixt. begins to vulcanize its tendency to disperse in gasoline rapidly diminishes. A mixt. is heated for a given time at a definite temp., is then shaken with gasoline under standardized conditions and the obscuring power of the resulting liquid is then measured. An arbitrary point in the degree of obscurity is chosen as the crit. point at which scorching begins. By varying in a systematic way the time, temp. and proportions of S and accelerator and detg. the crit. points at which the soly. of the heated mixts. begin to diminish, it is possible to obtain useful information on the behavior of different accelerators. To obtain an adequate idea of the behavior of an accelerator, crit. point detns. should be made at 2 or 3 temps., one corresponding to the milling temp., another to the warm storing temp. of the mixt. and another at room temp. C. C. DAVIS

Heat transfer in the vulcanization of rubber. T. K. SHERWOOD. Hood Rubber Co., Watertown, Mass. *Ind. Eng. Chem.* 20, 1181-5(1928).—The paper is based upon exptl. data, the results of which are given graphically. The temp. lag which prevails in the heating of rubber articles causes a marked non-uniformity of cure in the product. The theory of an "unsteady state" of heat flow is discussed and a *method of analyzing data on temps. in a rubber article while heated* is described. From data on the temps. at different times during the heating and on the relation between the rate of cure and the temp., the *method for calcg. the resulting vulcanizing effect at different points in a solid rubber object* is shown. A new "water cure" process for tires is described, a process which is very effective in reducing the non-uniformity of cure resulting from temp. lag, and at the same time reduces appreciably the necessary time of vulcanization. C. C. D

Local examination of the tensile strength of textile fabrics, rubber, etc. (SCHUBERT) 13. Decomposition of barium sulfate by solutions of sodium carbonate (WOLESENSKY) 7. Organic solvents and rubber-lined plant (BREXNER) 1. The influence of the reaction of the soil on the development of *Hevea brasiliensis* (KORTLEVE) 15. Carbon black. A study of its volatile constituents (JOHNSON) 18. Impregnating fibrous materials (Ger. pat. 469,602) 4.

Rubber. THE ANODE RUBBER CO., LTD. Swiss 127,539, May 17, 1926. Rubber objects are prepd. from an aq. rubber dispersion by means of a water-permeable mold in which the rubber is deposited, a conglomerating agent being employed.

Forming deposits of latex, etc. COMPAGNIE GÉNÉRALE D'ÉLECTRICITÉ (to Anode Rubber Co. (England), Ltd.). Brit. 201,339, May 27, 1927. Gel-forming substances are added to latex or like suspensions or solns. and the mixt. is subjected to conditions which will form a gel. Gelatin, agar-agar, carrageen moss or albumin and ZnCl₂ are among the substances which may be used. Heating or cooling may also be used for effecting gelling, and the process may be applied to the formation of shaped articles of ceramic material, hard rubber and papier mache. Porous molds may be used and various details and modifications are described.

Treating latex. COMPAGNIE GÉNÉRALE D'ÉLECTRICITÉ (to Anode Rubber Co. (England), Ltd.). Brit. 291,805, June 9, 1927. Aq. rubber dispersions are made viscous (to facilitate dipping, spreading or spraying) by adding polysaccharides, albuminoids or plant exts., such as gum arabic, which form viscous solns. but not jellies, or such as starch, gelatin or agar-agar which normally form jellies but are partially hydrolyzed to destroy this property. NH₃ or amines present in the latex treated may serve as hydrolyzing agents.

Preserving rubber latex. JOHN MCGAVACK and ROY A. SHIVE (to Naugatuck Chemical Co.). U. S. 1,699,368, Jan. 15. A stable uncoagulated rubber latex having a p_H of between 7 and 4.5 contains an org. preservative such as a sulfonic reaction product of cinnamic acid and BuOH capable of exerting its effect on both sides of neutrality. U. S. 1,699,369 specifies treating latex with a sulfonic alkyl aryl reaction product such as a sulfonic reaction product of BuOH and cinnamic acid together with CH₂O to prepare a stable product having a p_H less than 7. Cf. C. A. 23, 731.

Preserving rubber. SILESIA VERREIN CHEMISCHER FABRIKEN. Brit. 291,431, June 2, 1927. Aging is retarded by adding to rubber reaction products formed by reaction between polyhydroxyaldehydes such as aldoses, polysaccharides as milk sugar or hydrolyzed products such as glucose or invert sugar, and amines such as aniline, and β -naphthylamine, *m*-toluylenediamine, urea or *p*-aminophenol.

Treating rubber films. CARL PLAAT. U. S. 1,698,275, Jan. 8. Rubber films are subjected to the frictional action of a narrow rotary surface such as two rolls of different speeds in order to produce ornamental effects.

Forming hollow rubber articles. DUNLOP RUBBER CO., D. F. TWISS AND E. A. MURPHY. Brit. 291,479, Dec. 4, 1926. A fusible or sol. former is dipped in natural or artificial rubber dispersion, drying and vulcanization are effected, and the former (which may be made of fusible metal, wax or mixts. of S and other suitable materials) is removed at any time after drying has been at least partially effected.

Rubber articles. THE ANODE RUBBER CO., LTD. Fr. 642,183, Oct. 11, 1927. The molds for molding latex mixed with fillers, etc., are coated with gelatin, etc., contg. a coagulant such as Na_2SiF_6 , AcOH or a salt of Ca, Mg, Zn or Al. The mold is agitated to make the coating more uniform.

Baseball centers. MILTON B. REACH (to A. J. Reach Co.). U. S. reissue 17,200, Jan. 22. Two hollow hemispheres of rubber compn. are vulcanized, a cork sphere is enclosed between them and the materials are vulcanized together with an interposed layer of quick-curing rubber compn. (The original pat. No. 1,530,410 was issued March 17, 1925.)

Electrodeposition of rubber. S. O. COWPER-COLES. Brit. 291,471, Nov. 20, 1926. Electrophoretic deposition of rubber from aq. dispersions is effected intermittently, to permit of disposal of any gas bubbles which have formed. The anode may be caused to rotate or to vibrate during the deposition. Metal molds may be used such as Cd or Zn or Zn-coated Fe or Al which may be dipped in adhesive such as gum arabic or gum tragacanth or coated with plumbago, French chalk, etc. Coloring, "compounding" or vulcanizing substances may be added, and various details of operation are given.

Coating wires, threads or filaments with rubber, etc. DUNLOP RUBBER CO., LTD., D. F. TWISS AND E. A. MURPHY. Brit. 291,485, Jan. 28, 1927. The material is passed through a bath contg. a concd. and compounded aq. dispersion, in the form of a cream or viscid fluid contg. rubber, gutta percha, balata or the like, and the uniform coating thus applied is dried without allowing it to contact with any foreign body. The coating may be vulcanized. An app. is described and numerous formulas and details for prepn. compns. are given.

Uniting metals in layers with rubberized fabrics. HAROLD GRAY (to B. F. Goodrich Co.). U. S. 1,697,275, Jan. 1. The surface of material such as steel or other metals to be united with rubberized fabric is coated with a film of a reaction product of turpentine with a substance such as trichloroacetic acid, S chloride or SnSO_4 comprising either a strong inorg. non-oxidizing acid or a compd. which by thermal or hydrolytic disson. will give such an acid and the materials are assembled under pressure with the coated surfaces in contact.

Rubber substitute. JEAN BAHR. Fr. 640,967, Sept. 14, 1927. An elastic material resembling rubber is obtained by the action of S or S yielding substances on saturated halogenated hydrocarbons of the group $\text{C}_n\text{H}_{2n+2}$ such as CH_2Cl_2 , CH_2Br_2 , CH_2I_2 , $\text{C}_2\text{H}_4\text{Cl}_2$, $\text{C}_2\text{H}_4\text{Br}_2$, etc., or mixts. thereof in the presence of an aq. alk. or alc. solvent.

Apparatus for vulcanizing tires. DUNLOP RUBBER CO., LTD., H. WILLSHAW, T. NORCROSS AND F. G. BROADBENT. Brit. 291,905, March 19, 1927. Structural feature.

Mold for vulcanizing tires. CLAUDE A. WITTER. U. S. 1,697,703, Jan. 1. Structural features.

Rubber vulcanization. METALLBANK UND METALLURGISCHE GES. A.-G. Brit. 291,438, June 2, 1927. Org. Se compds. (such as those which may be obtained by reaction between H_2Se , NH_3 and benzaldehyde or other suitable aldehyde) are used as accelerators.

Vulcanizing rubber. WILLIAM P. TER HORST (to Rubber Service Laboratories Co.). U. S. 1,698,569, Jan. 8. Phenylpiperidylguanidine is used as an accelerator and other similar compds. also may be used. Cf. C. A. 22, 2685-6.

Vulcanization of rubber. THE NAUGATUCK CHEMICAL COMPANY. Fr. 642,264, Oct. 14, 1927. Vulcanization is accelerated by means of a halogen-contg. or other deriv. of the condensation product of an aliphatic aldehyde having 2-7 C atoms in the mol. with a primary amine. In an example a soln. of the condensation product of heptaldehyde and PhNH_2 in C_6H_6 or CCl_4 is treated with Cl until HCl begins to be evolved; the product contains 26.4% of Cl. Other examples of the prepn. of suitable derivs. of the same condensation product are given.

Rubber vulcanization. SIDNEY M. CADWELL (to Naugatuck Chemical Co.). U. S. 1,698,712, Jan. 15. A rubber compn. is prepd. contg. a metal compd. such as

ZnO together with S and a CS₂-contg. material or deriv. such as hydroxybutyl thiocarbonic acid disulfide and a second compn. is also prepd. contg. rubber, a metal compd. such as ZnO together with S and dibenzylamine or other suitable amine. One of these compns. also contains a material such as phthalic anhydride which will check the vulcanizing action of ingredients associated with the rubber. The compns. are brought together in the form of plies and the amine and CS₂-contg. material are permitted to diffuse throughout the compns. and vulcanization is effected. U. S. 1,698,713, specifies control of vulcanization by prepg. a cement comprising rubber, a Zn compd. such as ZnO, a S-contg. material such as S itself, a CS₂-contg. material or deriv. such as normal butylthiocarbonic acid disulfide, together with phthalic anhydride and C₆H₆. When it is desired to effect vulcanization, aniline is added in excess of that required to counteract the checking effect of the phthalic anhydride. U. S. 1,698,714 specifies controlling vulcanization by treating vulcanized rubber contg. hydroxybutylthiocarbonic acid disulfide or other accelerating ingredient with a material such as NH₃ which will check the functioning of the accelerating ingredient. U. S. 1,698,715 specifies causing a vulcanizing ingredient contained in rubber to react with a substance such as phthalic anhydride for checking the vulcanizing function of the ingredient and then, when desired, adding an agent such as PhNH₂ which will cause vulcanization. Numerous examples and details are given. Cf. C. A. 22, 2856.

CHEMICAL ABSTRACTS

Vol. 23.

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No. 6

1—APPARATUS AND PLANT EQUIPMENT

W. L. BADGER

Developments in temperature indicating, recording and control instruments during 1928. D. I. MATHIAS. *Instruments* 2, 23-5(1929). E. J. C.

Optics of the total-radiation pyrometer. HILDEGARD MIETHING. *Wiss. Veröffentlich. Siemens-Konzern* 6, 135-46(1928).—The reflection and absorption of incident light by the lenses of a total-radiation pyrometer distort the intensity wave-length curve; quartz cuts off wave lengths greater than 5.5μ , while glass cuts off at 4μ . The corrections thus necessitated for measuring the temp. of a black body were calcd., and the results verified by expt. If a gray body is radiating, the observed black-body temp. may be converted to the true temp. by use of a simple factor. But if a selective radiator is measured, the black-body temp. will not be observed, since the pyrometer will be over-corrected (read high) for substances, such as metals, which have a lesser proportion of their radiation in the infra-red, and will be under-corrected for substances, such as oxides, which have a greater proportion of their radiation in the infra-red than a black body. This does not mean that the radiation pyrometer is useless for industrial control, as it can always be calibrated for a particular substance in a particular set of working conditions. BENJAMIN MILLER

Standardization of chemical apparatus construction for the purpose of shortening the time of delivery. ANON. *Chem. App.* 16, 1-2(1929). J. H. MOORE

Remarks on the steps in the technical working of lead for chemical apparatus. KARL KIEFER. *Chem. App.* 16, 2-4(1929).—Notes are given on lining and covering app. with sheet Pb, and on pipes and heating coils. J. H. MOORE

Methods and apparatus of the cryogenic laboratory. XX. A high-vacuum pump of large capacity. W. GAEDE AND W. H. KESOM. *Verslag Akad. Wetenschappen Amsterdam* 37, 819-22(1928).—A diffusion pump of capacity 400 l. per sec. of He at 0.001 mm. pressure is briefly described. The pump is cooled by a water jacket and by an internal cooling coil with a liquid at -10° to -20° . The annular diffusion slot is about 20 mm. wide and has a diam. of 160 mm. The pump contains 7 kg. Hg. It is electrically heated. The capacity for air was found to be 130 l. per sec., const. to the lowest pressures. The initial vacuum used with the pump was 0.15 mm. Hg. B. J. C. VAN DER HOEVEN

A simple apparatus for the determination of carbon dioxide. R. C. WILEY. *J. Am. Chem. Soc.* 51, 222-3(1929).— CO_2 is liberated by a CrO_3 soln. and absorbed in a standard $\text{Ba}(\text{OH})_2$ soln. The app. is very simple and the results are quite accurate. J. H. MOORE

Atomizer for flame coloration. HERMANN EMDE. *Chem.-Ztg.* 52, 1003(1928).—An improved Gouy atomizer is described. J. H. MOORE

A basket centrifugal for fusion work. CARL HÜTTER. *Chem. App.* 16, 5-6(1929).—Cf. C. A. 23, 2, 353. J. H. MOORE

How may we economize in the procuring and use of filter cloths? LEO STEIN. *Chem. App.* 15, 242-3, 280-1(1928).—In most cases cotton is preferable to jute, but one must be guided by experience. Coöperation between manufacturer and user is urged. J. H. MOORE

Measuring temperatures of calender rolls. L. R. KELTNER. *India Rubber World* 79, 60(1929).—A new instrument is described and illustrated. C. C. DAVIS

An improved miscometer. JOHN HOUSTON. *Analyst* 54, 30(1929).—The new measuring device consists of a buret instead of the hollow stopper recommended in a previous paper (cf. C. A. 21, 1). W. T. HALL

A brine circulator for cooling condensers. HAROLD T. GERRY. *Mass. Inst. of Tech. J. Am. Chem. Soc.* 51, 475(1929).—A simple modification of the "air lift" pump as used in some H_2SO_4 plants. E. SCHOTTE

The use of the oscillograph for measuring non-electrical quantities. D. F. MCKER AND W. B. BATTEN. *J. Am. Inst. Elec. Eng.* 48, 126(1929).—The problems of application involve the translation of mechanical phenomena into elec. changes which are proportional. Several typical applications are described showing how motion, time, stress, pressure, etc., are measured. C. G. F.

Recording precision meter for weak currents. C. MÜLLER AND R. FRISCH. *Phys. Tech. Reichsanstalt. Z. tech. Physik* 9, 445-51(1928).—The app. consists principally of a photoelec. cell acting on a string galvanometer with photographic recording device. It is used for the measurement of faint light and other radiations. Several applications are discussed and pictures of the records reproduced. B. J. C. VAN DER HOEVEN

Vacuum tube potentiometer for rapid electromotive force determinations. H. M. PARTRIDGE. *J. Am. Chem. Soc.* 51, 1-7(1929).—An app. is described in which a triode and a tetrode are used in a "simple potentiometer circuit and arranged in such a manner that calibration of the valves and the constancy of their characteristics are unnecessary." J. H. MOORE

A simple reference electrode for potentiometric titrations. H. H. WILLARD AND A. W. BOLDYREFF. Univ. of Michigan. *J. Am. Chem. Soc.* 51, 471-4(1929).—A review is given of the different types of reference electrodes. A simple one is devised, eliminating the use of a standard half-cell and consisting of a Pt wire fused into the tip of a buret. E. SCHOTTE

A convenient form of hydrogen sulfide generator. D. C. BARRUS. *J. Chem. Education* 5, 1428(1928).—An 8- or 10-in. test tube has a hole about $\frac{1}{16}$ in. ground in its bottom, and a stopper and delivery tube fitted to the open end. In it large pieces of FeS are placed, and the tube, supported by a test tube clamp, is then lowered into a cylinder contg. dil. HCl. When the gas is no longer needed the position of the clamp is altered so as to hold the tube out of the acid. The same app. works well for generating H_2 and CO_2 . W. C. EBAUGH

The use of chamotte, stoneware and porcelain as apparatus in the chemical industry. FELIX SINGER. *Chem. Fabrik* 1928, 680 2, 691-2.—A lecture. The 3 products have 3 things in common: (1) formed from Al hydrosilicate, (2) molded from plastic mass and (3) hardens on drying and burning to form sillimanite crystals ($Al_2O_3 \cdot SiO_2$). Chamotte is used extensively in chem. industries wherever the reaction temp. exceeds 200° and where in special cases it reaches 1500° or over. Chamotte high in clay is used for heating basic chemicals while for acid chemicals high SiO_2 ware is required. Where sudden temp. changes occur, the more porous chamotte is desirable, the more compressed product having a higher temp. coeff. Normal chamotte absorbs 10-14% H_2O , but it may be so manufd. as to absorb 0% or 50%. Chamotte is prepd. from fire-resisting kaolin or clay, with from $\frac{1}{2}$ to $\frac{2}{3}$ of the mass made up of previously burnt and nonshrinkable materials. The normal m.-p. limits are cone 26 and 36 ($1580-1790^\circ$). Stoneware is used in acid plants for prepg., storing or shipping these chemicals. It is resistant to acids, mech. wear or temp. changes and is easily obtained in the form of large vessels (6000 l), tubes, flasks, etc. Stoneware is usually colored; it is prepd. from tertiary clays into which is mixed a small quantity of finely powd., previously burnt nonshrinkable materials. It is usually salt glazed. Porcelain is limited in its applicability in chem. industries; it finds most extensive use in labs. It is made from white burning kaolin, quartz and feldspar. Large containers can be made only at great expense; they are rather sensitive to sudden heat changes, fragile, and thus transported with difficulty. S. then discusses the effects of different oxides, carbides, silicates, etc., on chamotte and stoneware, and finally suggests methods of studying porcelains. O. A. NELSON

Wax vessels for experiments using hydrofluoric acid. FRANK C. MATHERS. *Chemist-Analyst* 18, 15(1929).—It is recommended to use old HF bottles, molding the wax around a beaker of the desired size. W. T. H.

Useful intermittent extraction apparatus. C. W. EDDY. *Chemist Analyst* 18, 15-6(1929).—From 2 ring-necked, liter Pyrex flasks, some rubber stoppers, a condenser and a little glass tubing, any one can make an effective extn. app. in about 90 mins. With the app. shown, a limited amt. of solvent is required; the same flask can serve for distn. and for extn., and a large amt. of material can be extd. As set up for use, the lowest member of the app. is a 1. Pyrex flask carrying a 2-holed rubber stopper. One hole serves for the escape of vapors and the other for a siphon tube from the upper flask. Above this is a second flask, like the first, except that an opening has been made at the bottom through which vapors enter from below and liquid is periodically withdrawn by a siphon tube. Around the glass tubing through which vapors enter this second flask, is a cooling coil of glass tubing through which water flows. Above, con-

nection is made with a condenser. When this flask is used for distn. purposes, a solid stopper is inserted at the bottom. W. T. H.

Numbering and lettering of apparatus. GERALD G. GIFFORD. *Chemist-Analyst* 18, 16(1929).—Auto enamel and a toothpick are used. W. T. H.

Marking porcelain and glassware. C. J. SCHOLLENBERGER. *Chemist-Analyst* 18, 17(1929).—Take a piece of discarded alundum ware, wet the surface and rub the glass or porcelain until the surface is ground off a little. Such a surface takes pencil or ink marks better than the sand-blasted spots often provided on beakers. Porcelain and SiO_2 ware can also be marked with concd. H_2PtCl_6 soln. mixed with oil of lavender. On heating, a stain of Pt is obtained. W. T. H.

Waterproof varnish for paper labels on reagent bottles. C. J. SCHOLLENBERGER. *Chemist-Analyst* 18, 17(1929).—Dissolve transparent celluloid in acetone, making a sirupy soln. Old photographic film from which the emulsion has been removed by soaking in warm NaOH is excellent celluloid for this purpose. The varnish can be used for attaching labels and for repairing celluloid articles. W. T. H.

Liquid storage apparatus for supplying solvents. RALPH E. GOODE. *Chemist-Analyst* 18, 18(1929).—The app. consists of a storage tank for holding the desired solvent, with 0.5 in. connection equipped with valves leading from an air storage cylinder. The storage tank for the liquid is also equipped with 2 outlets of pipe fitted with valves. The top of the tank has a 0.25-in. outlet pipe, the tank end being screwed into large cap and this cap in turn being screwed into the storage tank. The large cap is for the admission of liquid in volume. The bottom of the storage tank for the solvent is equipped with a 1-in. outlet pipe with valve for removing sediment. The air cylinder is about one-fourth the size of the liquid storage tank and is filled with air from a tire pump through Schrader valves. W. T. H.

The marking of glass ware by lead etching. JOHN W. ROBBINS. Iowa State Univ. *Chemist Analyst* 18, 18(1929).—Dry some PbO or Pb_3O_4 by heating over a flame. Clean the glass to be etched from finger prints, moisture and grease. Using an ordinary rubber stamp, stamp the glass with ink, shake a little of the PbO over the wording and brush off the excess carefully. Run through a flame until the oxide has a glossy appearance. Do not use too hot a flame. If the deposit becomes black, heat in the outer upper part of the flame. W. T. H.

Protecting combustion tubes. GORDON L. VON PLANCK. *Chemist-Analyst* 18, 19(1929).—A thin clay cover molded in the shape of a split cylinder greatly prolongs the life of tubes used for detg. C in steel. W. T. H.

Prolonging the life of rubber stoppers. C. J. SCHOLLENBERGER. *Chemist-Analyst* 18, 20, 11(1929).—By removing the stoppers while the flask is still hot, there is less danger of shrinkage. When the stopper has shrunk so that it is no longer safe to use, it may be freed by inserting some rubber tubing a little longer than the stopper is deep and then pushing the wet glass connection through the tubing and the stopper. W. T. H.

An electric steam bath. GILES B. COOKE. Univ. of Maryland. *J. Chem. Education* 5, 1447, 1463(1928).—An elec. current is passed through a coil consisting of 4 ft. of No. 24 Chromel "A" resistance wire placed in a 3-neck 3-l. flask and covered with H_2O . Through each small neck of the flask a Cu wire, inside a glass tube, is led to the heating coil, with soldered joints. By using 2-hole stoppers in each small neck, tubes for filling and draining the flask can be provided. A 1-hole stopper passes through the large neck of the flask and carries a tube leading to the steam bath. Safety and convenience are claimed. W. C. EBAUGH

A new carbon resistor. C. A. HARTMANN AND H. DOSSMANN. Siemens-Halske A. G. *Z. techn. Physik* 9, 434-8(1928).—Carbon deposits consisting of cryst. C were produced from hydrocarbons in vacuum furnaces at 600° to 1000° (cf. Hofmann, C. A. 21, 1649) and used for technical resistors. They are 130 to 1300 atom diameters thick (0.02 to 0.2 μ) and therefore cool very efficiently. The sp. gr. is from 2.04 to 2.07; it increases with the temp. of formation. The sp. resistance is 30×10^{-4} ohm cm.; its temp. coeff. is -3×10^{-4} per degree. Its tech. qualities, high overload capacity, etc., are discussed. B. J. C. VAN DER HOEVEN

Natural gas burners as used in the Southwest. HAYLETT O'NEILL. *Power* 69, 268-70(1929).—Various types of burners are described with illustrations. One of the best types of low-pressure combination oil- and gas-burner is set inside the furnace with air openings below the firing floor. Strains in furnace walls due to steep temp. gradients are thus avoided. With the proper air-gas ratio, a highly luminous flame results which, by radiation, results in high heat transfer through boiler tubes. It was found that with this burner 5330 cu. ft. of natural gas was equiv. to 1 barrel of oil. D. B. DILL

Daily, instead of yearly, inventory, as carried out in plants for building apparatus. KARL BEHLERT. *Apparatebau* 41, 1-3(1929).—Sample sheets are shown. J. H. M.

Illumination for Stammers' colorimeter. KARL ZERT. *Listy Cukrovar.* 47, 172-3(1928); cf. *C. A.* 22, 1707.—Z. advocates the use of daylight or artificial light with a compn. of daylight; he eliminates the various color effects of solns. by using color filters.

FRANK MARESH

pH Measurement with the glass electrode and vacuum tube potentiometer (ELDER, WRIGHT) 2. The behavior of the Sb electrode in buffered and unbuffered solutions (LAVA, HEMEDES) 2. Report on the optical axial angle and relation of its plane to the plane of symmetry in mica (ANON.) 2. Electrical methods in hygrometry (BURBIDGE, ALEXANDER) 2. New colorimetric methods (MĚŠT'AN) 2. A precision method for measuring temperatures of *n* liquids on a crystal refractometer and on a microscope slide (ASHTON, TAYLOR) 2.

Educational apparatus for determining the mechanical equivalent of heat. W. D. HILLS. Brit. 292,807, Aug. 30, 1927.

Hydrometer syringe. GEORGE E. ANDERSON. U. S. 1,701,654, Feb. 12. Structural features.

Hydrometer suitable for testing liquids in continuous flow systems. EDWIN L. DENNIS. U. S. 1,701,404, Feb. 5.

Comparison colorimeter or turbidimeter. W. G. EYTON. Brit. 292,337, May 30, 1927.

Electric resistance thermometer suitable for use in cold-storage chambers. SHEMENS BROS. & CO., LTD., and L. G. SALMON. Brit. 292,773, June 27, 1927.

Stirrer construction for mixing slurry or like materials in tanks. R. F. MINOGUE. Brit. 292,714, April 2, 1927.

High-speed mixing or emulsifying apparatus. G. S. P. DE BETHUNE. Brit. 292,592, June 24, 1927.

Filter. SERGE YAKOVENKO and ANDRÉ HÉLÈNE. Fr. 643,172, Oct. 28, 1927. A filter comprises a no. of perforated cylinders inside one another or plates placed together, the perforations of which do not coincide.

Filters. H. CHABAL ET CIE. Fr. 33,291, Mar. 30, 1927. Addn. to 600,282. Porous plates for supporting filter beds for *water*, etc., are described.

Suction filter. MASCHINENFABRIC BUCKAU R. WOLF A.-G. Ger. 470,276, May 28, 1925. The filter has a rotary cell with heated walls. The lead-off tubes for the liquid are only subjected to suction at the periods of their lowest position. At other times they are automatically closed.

Filter with a bed of granular material. JOHN I. GOADE. U. S. 1,700,160, Jan. 29. Structural features.

Air filtering device. AXEL W. KOGSTROM (one half to Allison F. H. Scott). U. S. 1,701,782, Feb. 12.

Filter for air or other gases. ALFRED M. GOODLOE (to American Kreuger & Toll Corp.). U. S. 1,700,126, Jan. 29. Structural features.

Filters for filtering liquids in filter presses. L. A. J. REVEL. Brit. 292,117, June 14, 1927. Structural features.

Rotary vacuum filter. BRINJES & GOODWIN, LTD., L. STEWART (Executive of R. Stewart) and C. F. N. SEAMAN. Brit. 292,644, Feb. 24, 1927.

Filter-cake-discharging apparatus for continuous filters. JASPER A. McCASKELL. U. S. 1,700,772, Feb. 5. Structural features.

Filter-press dialyzers. HEIBIG & CIE. Fr. 642,884, Oct. 22, 1927.

Vertical drying apparatus with rotating plates. BAECHELER KISER ET COMPAGNIE. Fr. 33,264, Dec. 4, 1926. Addn. to 601,168.

Apparatus for drying briquets. FRANCIS M. CROSSMAN. U. S. 1,701,873, Feb. 12.

Apparatus for drying materials of pasty consistency. I. G. FARBENIND. A.-G. Brit. 293,028, June 30, 1927. The material is treated with a current of heated air while carried through the app. as a film on a band of wire netting moving around rollers.

Vacuum drying apparatus for grain or other materials. A. E. JONSSON. Brit. 292,105, June 13, 1927.

Apparatus for drying and recovery of solvents from various materials. I. G. FARBENIND. A.-G. Brit. 292,564, June 22, 1927. The material undergoing drying is passed on a band conveyor through a drying chamber which has inlet and outlet seals to prevent escape of solvent vapor, and either air or an inert gas may be forced into the seals under a pressure greater than that in the drying chamber.

Apparatus for distilling or drying coal or other materials. TROCKNUNGS-, VERSCHWELUNGS-, UND VERGASUNGS-GES. and L. HONIGMANN. Brit. 293,147, April 22, 1927. Heat is transferred from hot gases passing through the upper part of a stationary cylinder, to the material being treated, which is in the lower part of the cylinder, by perforate plates mounted on a rotary or oscillating shaft. Various details and modifications are described.

Evaporation apparatus. EDOUARD C. KREBS. Ger. 470,182, Sept. 26, 1924. The app. has one or more pivoted tubular heating elements which can be swung over near the surface of the liquid.

Evaporator for liquids. G. AND J. WEIR, LTD. and J. SIM. Brit. 292,842, Nov. 22, 1927. An evaporator is specified of the type having superposed chambers with steam pipes arranged in parallel.

Rotating separator for extracting dust, etc., from air or gases. PNEUMATIC CONVEYANCE AND EXTN., LTD. and WM. A. SMITH. Fr. 643,441, Nov. 7, 1927.

Device for gravity separation of oil from water, etc. J. B. MACLEAN. Brit. 293,091, March 26, 1927.

Apparatus (employing a riffled table and air currents) for separating dry solids. MARTIN J. LIDE. U. S. 1,701,621, Feb. 12.

Apparatus for separating hard substances such as pips from fruit pulp. SOCIÉTÉ P. NAVARRE ET FILS. Fr. 643,557, Apr. 11, 1927.

Flotation apparatus for graphite or other material. ANDRÉ LIOTARD. Fr. 643,068, Jan. 15, 1927.

Rotary bed for Röntgen ray apparatus. ERNST POHL. Ger. 470,191 and 470,193, Apr. 22, 1926 and Ger. 470,192, Apr. 11, 1926. Addns. to Ger. 428,476.

Electron tube. EAGLE GES. FÜR RADIOBEDARF A. JACOBI & Z. DEZSÖ. Austrian 111,725, Sept. 15, 1927. One lead to the V-shaped hot wire is attached to the point of the V and the other to a T-shaped holder, the cross piece of which joins the ends of the V.

Electron tubes having several cathode filaments in parallel. LA RADIOTECHNIQUE. Fr. 612,744, Mar. 28, 1927.

Discharge tubes. SIEMENS-SCHUCKERTWERKE A.-G. Fr. 643,300, Nov. 3, 1927. A metal such as Ca or Mg is vaporized, after closing the tube, continuously or repeatedly, whereby any gases liberated during use are permanently removed.

Electric discharge tubes. THE M-O VALVE CO., LTD. Fr. 643,704, Nov. 9, 1927. Cathodes of elec. discharge tubes are made of Fe or Ni. They are covered with a layer of $\text{Ba}(\text{NO}_3)_2$ and heated so that a reaction takes place between the Fe or Ni and the nitrate.

Electric discharge tubes with cathode surface of hafnium. GILLES HOLST and EKKO OOSTERHUIS (to Naamlooze Vennootschap Philips' Gloeilampenfabrieken). U. S. 1,701,849, Feb. 12. Hf is used for the cathode surface of devices such as x-ray tubes, rectifiers, tubes for wireless telegraphy, etc.

Mercury-vapor rectifier. AKT.-GES. BROWN, BOVERI ET CIE. Brit. 292,500, June 20, 1927. The cathode spot is fixed by a member which may be made of W, Mo or Ta or their carbides, and the cathode vessel is formed in one piece with the container or is electrically connected with it. Some structural details are specified.

Thermionic cathode. EARLE E. SCHUMACHER (to Western Electric Co.). U. S. 1,700,454, Jan. 29. Cathodes are formed with a core of metal such as W, Ta or Mo capable of withstanding high temp., a metallic sleeve (which may be formed of Ni, Co or Pt) on the core and a coating of alk. earth oxide on the sleeve. The metal of the sleeve forms an oxide which, when heated in air, reacts with the alk. earth oxide to form compds. which, when heated *in vacuo*, break down to alk. earth oxide.

Coating compositions for electron-emitting elements. LEON McCULLOCH (to Canadian Westinghouse Co., Ltd.). Can. 286,282, Jan. 8, 1929. Dissolve equal parts by wt. of the nitrates of Ba, Sr and Ca in water, add Na_2CO_3 , ppt. the mixed carbonates, and sep., wash and dry them. Add 16 g. of the carbonates to 10 cc. of a 15% AcOH soln. The material produced is a paint-like substance having a consistency of thick cream.

Furnaces. KARL KOLLER. Austrian 111,630, July 15, 1928. The efficiency of furnaces in which gaseous or liquid fuel and air are supplied to a fire space under such pressure that the combustion products have a slight pos. pressure is improved by providing means for maintaining the pos. pressure at a const. value. For instance, the air supply may be made dependent on the pressure of the combustion products.

Furnaces. SOCIÉTÉ D'ÉLECTRICITÉ DE LA RÉGION DE VALENCIENNES-ANZIN. Fr. 642,731, Mar. 26, 1927. In furnaces using powd. coal, a current of air is drawn

across the space below the combustion chamber and is heated by the ashes, which are thereby sufficiently cooled to be immediately removed. The heated air is then mixed with the powd. coal passing to the furnace.

Continuous vertical distillation furnace for coal, etc. JULIEN PIETERS. Fr. 642,769 and 642,770, Mar. 30, 1927.

Coal-dust furnace. FRITZ MARTIN. Ger. 470,179, Sept. 9, 1925. Compressed air enters the combustion chamber through nozzles corresponding in shape with those in the side of the chamber.

Furnace for burning coal dust. RICHARD UHLIG. U. S. 1,701,900, Feb. 12.

Furnaces for utilizing powdered fuels. GEORGE P. JACKSON (to Combustion Engineering Corp. and International Combustion Engineering Corp.). U. S. 1,701,852-3-4-5, Feb. 12. Structural features.

Nozzle furnace. CHARLES W. BURROUGHS. Ger. 470,189, July 8, 1926. The series of nozzles surrounds the flame in order to produce a whirling effect.

Furnace with a combustion chamber formed largely of carborundum or material of like thermal conductivity. HIRAM B. CANNON (to Carborundum Co.). U. S. 1,701,834, Feb. 12. U. S. 1,701,835-6 (Hiram B. Cannon and John W. Cannon) and U. S. 1,701,837-8 (Hiram B. Cannon) also relate to similar and other structural features of furnaces for various purposes.

Brick checker work construction for open-hearth regenerative furnaces or similar apparatus. JULIUS M. BOCEK. U. S. 1,700,398, Jan. 29.

Combustion system for reverberatory and similar furnaces. R. WARSITZ. Brit. 292,146, June 15, 1927.

Apparatus for the automatic regulation of liquid or gaseous fuel and air to burners. PAUL LINKÉ. Fr. 642,726, Mar. 26, 1927.

Burner for coal-dust furnaces. DEUTSCHE BABCOCK & WILCOX DAMPFKESSELWERKE. A.-G. Ger. 469,948, Apr. 2, 1927.

Automatic oil burners for furnaces. CALORIL BURNER CORP. Fr. 643,148, Oct. 25, 1927.

Oil burner. FREDERICK C. FOX. Australia 9390, Sept. 15, 1927. A proportion of the air under pressure is diverted to enter the oil passage in the burner and atomize the entering oil.

Apparatus for washing smoke from boiler furnaces, etc. C. J. SCHOBRONE. Brit. 292,380, Aug. 15, 1927. The app. is provided with spray nozzles and with a rotary shaft carrying staggered baffle plates.

Turbidimeter for vapors, smoke, etc. M. BUCHHOLZ. Brit. 293,034, June 30, 1927.

Apparatus for treating smoke gases with supersaturated steam and water, etc. D. RADULESCU. Brit. 292,118, June 14, 1927. Structural features.

Gas burner. GEORGE BAKER (one-third to Lee McCrory and one-sixth each to A. S. Sands and A. B. Campbell). U. S. 1,700,918, Feb. 5. Structural features.

Gas burner. BERNARD A. GEURINK. U. S. 1,700,886, Feb. 5. Structural features.

Gas-burner construction. CLARENCE H. MORROW (to Hotstream Heater Co.). U. S. 1,702,054, Feb. 12.

Gas-burner construction comprising a plurality of Bunsen tubes. JOHN H. GRAYSON (to J. H. Grayson Mfg. Co.). U. S. 1,700,199, Jan. 29.

Safety device for gas burners of water heaters. ROY W. JOHNSON (to Time-O Stat Co.). U. S. 1,700,316, Jan. 29.

Oil-firing systems for ovens, boilers, etc. FREDERICK C. FOX. Australia 9325, Sept. 12, 1927. Means for establishing the required oil and air pressure are described.

Tunnel kiln. A. HERMANSEN. Brit. 292,781, July 7, 1927.

Annular tunnel kiln. JEAN HEINSTEINSEN. Ger. 470,260, Aug. 17, 1926. The kiln has floats and 3 concentric tunnels of which the outer forms the muffie, the middle the drying tunnel and the inner the pre-drying tunnel.

Retort construction for carbonizing scrap leather, etc. STANLEY B. MATHEWSON and WALTER K. JAMISON (to trustees of Lecar Carbon Co.). U. S. 1,700,684, Jan. 29. Structural features.

Standpipe construction for coke ovens, etc. JOSEPH BECKER (to Koppers Co.). U. S. 1,700,971, Feb. 5.

Jacket-enclosed fire-tube boiler especially for combustible dust. ALLGEMEINE ELEKTRICITÄTS-GES. (Friedrich Reinhardt, inventor). Ger. 470,190, May 10, 1925. Details of arrangement are described.

Device for generating gas for inflating life preservers, etc. STEPHEN O. LANGE. U. S. 1,701,927, Feb. 12.

Device for controlling the pressure of gases supplied to burners. GEORGE KEITH (to Surface Combustion Co.). U. S. 1,701,500, Feb. 12.

Electrically heated outlet device for cylinders containing gases under pressure (to prevent freezing). RHEOSTATIC CO., LTD., and L. SATCHWELL. Brit. 292,395, Sept. 20, 1927.

Bell-alarm device for indicating changes in the specific gravity of a gas. A. H. OLSSON and P. D. PETERSON. Brit. 292,083, June 11, 1927.

Apparatus for effecting continuous feed of solids reacting with gases at high temperatures and pressures. E. HAYWARD. Brit. 292,642, Feb. 22, 1927.

Safety device for preventing back flashing of gas flames. CHRISTEL SCHRAUB. U. S. 1,701,276, Feb. 5.

Gas-analysis apparatus. PLATEN-MUNTERS REFRIGERATING SYSTEM AKTIEBOLAG (to Electrolux, Ltd.). Brit. 292,607, June 23, 1927. Gas is diffused through a porous medium into a measuring chamber and exposed to the action of an absorption medium having a constant absorption capacity such as a liquid of constant compn. passing in continuous flow. Various structural details are described.

Gas-analysis apparatus for determination of the proportion of inflammable gases in a gas mixture. H. T. RINGROSE. Brit. 293,125, April 1, 1927. The gas is ignited in a closed chamber and the degree of vacuum thus produced is measured and may be utilized to light a lamp when the proportion of inflammable material reaches a certain limit. Cf. C. A. 22, 3.

Analysis of gas. LUCIEN PLANTEFOL and GEORGES C. BOULITTE. Fr. 642,930, Oct. 24, 1927. An arrangement of bottles, a buret, and 2-, 3- and 4-way taps is described for the simple, rapid and accurate analysis of gases, particularly respiration gases.

Absorption tower for gases, particularly sulfur dioxide. ALOIS DANNINGER AND A. PORR, BETONBAU-UNTERNEHMUNG, G. M. B. H. Austrian 111,848, Aug. 15, 1928.

Apparatus for irradiating milk and other liquids. FRANZ HOFFMANN. Austrian 111,853, Aug. 15, 1928. The liquid flows downwardly in a thin layer over a cylinder of gauze which encloses the source of radiation.

Apparatus for pasteurizing milk or other liquids in bulk. AAGE JENSEN. U. S. 1,701,777, Feb. 12.

Evaporators for sugar solutions, etc. B. BOULOGNE. Brit. 292,915, June 25, 1927. Devices are provided for cooling the liquid as it passes from one to another of a series of evaporators.

Apparatus for liming sugar juices or mixing other materials. RALPH W. SHAFOR (to Gilchrist & Co.). U. S. 1,701,164, Feb. 5.

Vortex classifier suitable for elutriation of powdered materials. LEONARD ANDREWS. U. S. 1,701,942, Feb. 12.

Device suitable for delivering powdered reagents in measured and regulatable quantities. A. S. LEGG. Brit. 292,713, April 1, 1927.

Device for measuring the flow of fluid currents. PAUL VON VÁGÓ. Ger. 470,238, Oct. 20, 1925. Details of arrangement and formulas are given.

Device (comprising an absorbent pad in a sealed package) for fumigating with hydrocyanic acid, chloropicrin, etc. A. AUTRAN. Brit. 292,547, June 22, 1927.

Identifying crystals. FAYETTE F. READ. Fr. 643,142, Oct. 24, 1927. An app. is described in which crystals, particularly diamonds, are identified by directing a light ray into the crystal and measuring the position of the resulting secondary rays.

Apparatus for clarifying liquid used for drying cleaning, etc. ALAN E. FLOWERS (to De Laval Separator Co.). U. S. 1,701,068, Feb. 5.

Acid-proofing chemical apparatus with synthetic resins. J. K. WIRTH. Brit. 292,334, May 26, 1927. Various compns. and modes of use of phenol-aldehyde resins for making, cementing or coating chem. app. are described. Fibrous material or other inert fillers may be added.

Acidity-testing apparatus. DONALD W. SUTHERLAND, JR. U. S. 1,700,655, Jan. 20. An app. is described which is suitable for titrating milk, cream, etc., to determine their acidity. A float valve in the reagent-supply receptacle serves to operate a pointer which indicates the acidity on a scale.

Liquid air power machine. ALOIS HOHENSINN. Ger. 470,348, Oct. 21, 1927. Construction and operation are described.

Apparatus for the production of foam. NIKOLAUS SANDOR. Fr. 643,276, Nov. 2, 1927.

Use of purified iron for apparatus for use at high temperatures and pressures. I. G. FARBERNIND, A.-G. Brit. 293,077, March 3, 1927. App. suitable for use with

materials comprising H, O or S may be made of iron such as that prepd. from mild steel by treatment with H at 900° or with a weakly oxidizing mixt. of H and water vapor at 550–600° and 150 atm. pressure. The app. may be coated with Cr, W, U, Mn, Al, Ag, Cu or enamel.

Photometric apparatus for inspection and sorting of tin-plated or galvanized sheets, paper, cardboard, fabrics, etc. V. K. ZWORYKIN (to Westinghouse Elec. & Mfg. Co.). Brit. 292,474, June 16, 1927. A series of light sensitive devices serve to "scan" successive portions of the articles as they move past and may serve to control app. for segregating articles of certain characteristics. Numerous structural details are described.

Apparatus for circulating rubber dispersions, etc., to prevent separation of their constituents. DUNLOP RUBBER CO., LTD., R. F. MCKAY, H. WILLSHAW, W. G. GORHAM and R. F. LEE. Brit. 293,072, March 2, 1927.

Apparatus for marking glass articles such as lamp bulbs. DANIEL K. WRIGHT (to General Electric Co.). U. S. 1,701,348, Feb. 5. An app. is described suitable for applying and burning in inks carrying finely powdered enamels of low m. p.

Thermostat for regulating gas burners of water heaters. CLARENCE H. MORROW (to Hotstream Heater Co.). U. S. 1,702,053, Feb. 12.

Thermostat for regulating electric heating devices. JAMES E. SMITH. Australia 9641, Sept. 30, 1927.

Bimetallic thermostat. LAURENCE K. MARSHALL (to Spencer Thermostat Co.) U. S. 1,700,173, Jan. 29. Elements such as those of monel metal and nickel steel are united with an intervening bonding layer of phosphorus bronze or other suitable Cu-contg. alloy.

Thermostatic valve control. CALEB E. SUMMERS and FOREST H. HARTZELL. U. S. 1,700,210, Jan. 29.

Thermostatic valve control device. JAMES L. BREESE, JR. (to Oil Devices Corp.) U. S. 1,700,428, Jan. 29.

Thermostatic control for electric circuits. JOHN M. JOHNSON. U. S. 1,701,680, Feb. 12.

Thermostatic device for controlling electric alarms, etc. FRANK HICKOK. U. S. 1,702,209, Feb. 12.

Thermostatic control for electric heating apparatus. AXEL O. APPELBERG (to Aktiebolaget Birka Regulator). U. S. 1,700,661, Jan. 29.

2—GENERAL AND PHYSICAL CHEMISTRY

FREDERICK L. BROWNE

Recent advances in science: physical chemistry. R. K. SCHOFIELD. *Science Progress* 23, 404–9(1929).—A review of recent work on chem. kinetics in homogeneous systems, and the reactions between ions.

JOSEPH S. HEPBURN

The old and new quantum theory. EUGENE BLOCH. *Rev. gen. sci.* 39, 695–700 (1928).

E. J. C.

Transformation of the world's physical image. HANS REICHENBACH. *Z. angew. Chem.* 41, 347–52(1928).—An address on the relativity and quantum theories.

A. L. HENNE

C. S. Hudson, Willard Gibbs medalist for 1929. J. W. E. GLATTFELD. Univ. Chicago. *Chem. Bull.* (Chicago) 16, 3–4, 36(1929).—A brief biography with portrait

E. J. C.

Henry Richardson Procter. A. S. *J. Chem. Soc.* 1928, 3300–7. —An obituary with portrait.

E. J. C.

Frederick Mollwo Perkin. A. J. G. *J. Chem. Soc.* 1928, 3299–3300. —An obituary.

E. J. C.

The seventieth birthday of Auer von Welsbach. FRITZ PANETH. *Naturwissenschaften* 16, 1037–8(1928).

B. J. C. VAN DER HOEVEN

Another method of presenting first-year college chemistry. ROY I. GRADY. College of Wooster. *J. Chem. Education* 6, 82–4(1929).

E. J. C.

Finding the superior high-school chemistry student. B. CLIFFORD HENDRICKS AND P. G. JOHNSON. Univ. of Nebraska. *J. Chem. Education* 6, 76–81(1929).

E. J. C.

The prediction of the future performance of students from their past records. OTTO M. SMITH AND H. M. TRIMBLE. Okla. Agr. and Mech. College. *J. Chem. Education* 6, 93-7(1929). E. J. C.

The chemistry training of high-school and college students. JACOB CORNOG AND GEORGE D. STODDARD. Univ. of Iowa. *J. Chem. Education* 6, 85-92(1929). E. J. C.

Positions open in various colleges and universities to graduate students majoring in chemistry. WM. MCPHERSON. Ohio State Univ. *J. Chem. Education* 6, 109-114(1929). E. J. C.

Funds available in the United States for the support and encouragement of research in science and its technologies. II. CALLIE HULL AND CLARENCE J. WEST. *Bull. Natl. Research Council* No. 66, 5-76(1928); cf. *C. A.* 22, 3558. E. J. C.

Chemistry as a profession. J. W. SHIPLEY. *Can. Chem. Met.* 13, 48-53(1929). E. H.

Acids and bases. NORRIS F. HALL. *The Nucleus* 6, 87-8, 91(1929).—Conflicting definitions of acids and bases are quoted from standard textbooks. When a small amt. of a strong acid is dissolved in H_2O a definite reaction occurs as follows: $HCl + H_2O \rightleftharpoons H_3O^+ + Cl^-$. The condition of any acid in any solvent is the resultant of 2 main factors, (1) the intrinsic strength of the acid as measured by its tendency to liberate a proton according to the reaction $HX \rightleftharpoons H^+ + X^-$, and (2) the tendency of the solvent to pick up protons, as in $H^+ + H_2O \rightleftharpoons H_3O^+$, $H^+ + NH_3 \rightleftharpoons NH_4^+$, and $H^+ + HOAc \rightleftharpoons H^+HOAc$. An acid is a substance that liberates protons, and a base a substance that picks them up, irrespective of the charge of the acid or base. The author's expts. arrange acids in the order of decreasing strength as $HClO_4$, H_2SO_4 , HNO_3 and CCl_3COOH . W. C. EBAUGH

Electrical methods in hygrometry. P. W. BURBIDGE AND N. S. ALEXANDER. *Proc. Phys. Soc. London* 40, 149-55(1928).—The possibility of applying elec. methods to the measurement of humidity is investigated. The 2 methods considered depend on (1) the change in resistance of org. materials when exposed to water vapor and (2) the change in mobility of ions due to water vapor. In neither case is the method suitable for general use, although each could be applied in special cases. B. C. A.

The periodic system. I. **The ionic potential as a periodic function.** G. H. CARLEDGE. *J. Am. Chem. Soc.* 50, 2855-63(1928). If Z and r are, resp., the valence and the radius of an ion, $Z/r = \phi$, the ionic potential. By plotting $\sqrt{\phi}$, against the ionic no., a two-dimensional periodic chart is obtained. The ionic charge may be added to produce a three-dimensional representation which provides for all valence forms of all elements and represents the behavior of H, the eighth group and the rare earths. By introducing the concept of electronic structure an arrangement of families on the basis of the structure of the outer electronic shell is presented which serves to bring out differences among members of a family in the Mendelyev arrangement. II. **The ionic potential and related properties.** *Ibid* 2863-72.—On comparing ϕ with properties of the ions the following regularities are found: Heats of hydration stand in the same order as ϕ . In a series of salts, the heat of soln. (evolution) of the anhyd. salt varies as the ionic potential. Development of acidic properties is closely associated with increase in ionic potential. For exclusively basic ions ϕ is less than 2.2, for amphoteric ions between 2.2 and 3.2 and for acid ions greater than 3.2. Ions forming stable oxy salts occur only in the amphoteric region of potentials. The discharge potentials of cations in fused electrolytes decrease with increasing ϕ . The line of Bltz and Klemm dividing the high-melting, conducting chlorides from the volatile, non conducting chlorides corresponds to an equipotential line at $\sqrt{\phi} = 2.2$. Ionic potentials indicate the order of increasing dissociability of carbonates and nitrates. There is a parallel increase in hardness, as indicated by Goldschmidt's data, and ϕ .

DON BROUSE

The multivalence. A. F. RICHTER. *Z. physik. Chem.* 135, 444-60(1928).—R. considers the influence of stability of the electron configuration striven for in an atom upon the work of detachment. Besides the octet which remains stable to the 6th period, the restricted stability of the shell of 18 (best represented by Pd) and the "coupled" pair shell (as in Hg) are depicted. The influence of the "coupled" pair shell, stabilized in the series of elements, upon the course of the work of loosening or detachment, especially in groups IV and V, is sought and these magnitudes are brought into relation with the chemistry of the elements. The neg. valence function is made known through the positive heat tone. Such deductions of at. models leads to the assertion that multivalent K and N^{---} ions do not exist. G. L. CLARK

A determination of the atomic weight of nitrogen occluded in fergusonite. H. P. CADY AND HARRY UNANGST BRECHER. Univ. of Kansas. *Science* 48, 594-6(1928).—1800 cc. of gas was obtained from Norwegian fergusonite. The N_2 was absorbed from the gas by hot metallic Ca, and was converted into NH_3 by hydrolysis, and then into NH_4Cl . The Cl in a weighed sample of the salt was detd. gravimetrically, and the at. wt. of the N_2 was calcd. The "Norwegian" NH_4Cl gave an at. wt. of N_2 only 0.02% greater than that of a control sample of N_2 from liquid NH_3 . The possibility of an isotope of N_2 of at. wt. 15 (a possible decompn. product of K) is therefore disposed of.

R. L. DODGE

Atomic (magnetic) moments. PIERRE WEISS AND G. FOËX. *Compt. rend.* 187, 744-6(1928).—To test the various theories of at. magnetism, W. and F. present a table of those at. magnetic moments which, in their judgment, are most accurately known. At zero abs. the moments of Fe and Ni are given as 11.00 and 3.000 magnetons, resp. In the entire table, only 2, viz., Fe^{++} in ammoniacal sulfate soln. and Co^{++} in the hexagonal sulfate, differ from integral nos. by more than the exptl. error.

W. W. STIFLER

The Debye-Hückel theory and stellar atmospheres. J. A. GAUNT. *Month. Not. Roy. Astron. Soc.* 88, 369-77(1928).—Mathematical. While showing some indications in favor of the Debye-Hückel theory, the reasoning developed is claimed to indicate that statistical mechanics provides no firm basis for the use of Boltzmann's theorem on an atomic scale. A summary is also given of an unsuccessful attempt to distinguish between bound and free electrons in the manner suggested by Eddington.

B. C. A

Rare earths in the stellar atmospheres. LUIGI ROLLA AND GIORGIO PICCARDI. Reale Univ. Firenze. *Gazz. chim. ital.* 58, 521-32(1928).—A review of present knowledge concerning the presence and distribution of rare earths in the fixed stars.

C. C. DAVIS

The fusibility of the elements and the electronic numbers. P. VINASSA. *Atti accad. Lincei* 8, 121-5(1928).—At. wt. is a static conception of an element; the electronic no., on the other hand, is dynamic and should be more significant of phys. changes. Fusibility must be a function of the no. of electrons, as well as of the nucleus, so that if there is a relation between the electronic no., N_e , and the abs. temp. of fusion, T_f , it should be a simple no., $\epsilon = T_f/N_e =$ coeff. of fusion. For He, $N_e = 2, T_f = 1^\circ$, and thus $\epsilon = 0.5$, so that all elements must have a coeff. $= \epsilon$ which is a multiple of 0.5. The temp. of fusion so calcd. agrees with the values found by expt. except for Sb, which is polymorphic. A graph is also shown in which the value ϵ (ordinates) is plotted against N_e (abscissas). As a corollary of the above relation, one may consider the body solidifying at 0° , abs. that is $\epsilon = 0 = 0^\circ/N_e$. This is possible when $N_e = 0$, but $N_e = 0$ is the proton alone, which should, therefore, solidify at zero absolute

A. W. CONTIERI

The allotropic modifications of phosphorus. A. SMITS. *Compt. rend.* 187, 980-2(1928).—P has 3 allotropic forms: α_1 , and α_2 stable at room temp. and β stable at higher temps. They can be studied by fractional distn. at a low temp. or by heating white P at varying temps. and pressures and for varying times, then lowering the temp. until changes cease to take place. Nicolaieff (*C. A.* 22, 3324) measured the changes of vapor pressure of such mixed crystals as a function of the density. The results indicate 3 allotropic forms instead of the 4 suggested by Nicolaieff.

AMY LEVESCONTE

Electrical resistance of titanium and zirconium at low temperatures. P. CLAUSING AND G. MOUBIS. *Physica* 7, 245-50(1927).—With Ti and Zr at $70-273^\circ$ abs., the dependence of elec. resistance on temp. is normal (cf. Koenigsberger and Schilling, *C. A.* 4, 3160). The sp. resistance at 273° is 0.80×10^{-4} and 0.41×10^{-4} , resp., and the temp. coeff. 0.00469 and 0.00438.

B. C. A.

The fluorine tension of metal fluorides and the chemical constants for fluorine and hydrogen fluoride. KARL JELLINEK AND A. RUDAT. Techn. Hochschule, Danzig. *Z. anorg. allgem. Chem.* 175, 281-320(1928).—Reduction equil. at temps. from 100 to 800° were measured for AgF , CuF_2 , PbF_2 , NiF_2 , CoF_2 , FeF_2 , FeF_3 , FeF_4 , CdF_2 , ZnF_2 , CrF , to CrF_3 , CrF_2 and MnF_2 . For FeF_2 , the equil. was approached from both sides, viz., $FeF_2 + H_2 \rightleftharpoons Fe + 2HF$. The following formula expresses the dissoen. of HF into the elements: $\log p_{H_2}^2/p_{HF} = (128000/4.57T) + (4.82/4.57) - (28000/T) + 1.05$. The F tension curves of the fluorides enable calcn. of the heats of formation as follows: PbF_2 , 155,600, NiF_2 , 157,500, CoF_2 , 160,700, $2FeF_2 + F_2 = 2FeF_3$, 158,100, FeF_2 , 154,200, FeF_2 , 233,250, CdF_2 , 162,200, ZnF_2 , 172,700, $2CrF + F_2 = 2CrF_2$, 157,900, CrF_2 , 152,000, CrF , 230,950 cal. per mol. These compare well with calorimetric

values. The chem. const. of F and HF are calcd. to be, resp., $+0.7 \pm 0.3$ and -1.0 ± 0.3 .

G. L. CLARK

Thermal expansion of magnesium and some of its alloys. PETER HIDNERT AND W. T. SWEENEY. *Bur. Standards J. Research* 1, 771-92(1928).—Three types of equipment were used (a) precision comparator (cf. Souder and Hidnert, *C. A.* 20, 2568); (b) interferometer (*Bur. Standards Sci. Paper* No. 393); (c) vitreous silica tube. Method (c) is described. The Mg used contained less than 0.03% impurities. The linear thermal expansions of 6 samples were measured over various temp. ranges between -183° and $+500^\circ$. The expansion of magnesium between 20° and 500° is represented by the following av. equation: $L_t = L_0[1 + (24.80t + 0.00961t^2) 10^{-6}]$. The Al content of the Mg-Al alloys varied from 4.36 to 10.35%. The expansions were measured between 20° and 300° . In nearly every case the coeffs. of expansion of extruded alloys are slightly less than those of cast alloys. For the range 20° and 300° the coeffs. of these Mg-Al alloys are practically the same as the coeffs. for Al-Cu alloys containing from 4 to 12% Cu. The addn. of 0 to 10% Al to Mg causes almost no change in the coeffs. of expansion. The expansion curves of the Mg-Al alloy (10% Al) which was extruded and heat treated show crit. regions above 200° . The Mg-Al-Mn alloys had an Al content ranging from 0.01 to 4.14%, while the Mn varied from 0.27 to 0.91%. The addns. of Mn caused slight changes in the coeffs. of expansion. The av. coeffs. detd. are: Mg $20-100^\circ$, 26×10^{-6} ; $20-200^\circ$, 26.9×10^{-6} ; $20-300^\circ$, 27.9×10^{-6} ; $20-400^\circ$, 28.8×10^{-6} ; $20-500^\circ$, 29.8×10^{-6} ; Mg-Al alloys $20-100^\circ$, 25.4 to 26.4×10^{-6} ; $20-200^\circ$, 26.1 to 27.8×10^{-6} ; $20-300^\circ$, 27.7 to 28.1×10^{-6} ; Mg-Al-Mn alloys $20-100^\circ$, 25.6 to 26.6×10^{-6} ; $20-200^\circ$, 26.4 to 27.3×10^{-6} ; $20-300^\circ$, 27.2 to 28.1×10^{-6} .

A. J. MONACK

The electrolytic preparation of magnesium amalgam and its decomposition in air. N. V. KONDIRYEV. *J. Russ. Phys. Chem. Soc.* 60, 545-51(1928).—A current of 0.05-0.06 amp. (at 12-15 v.) was passed through an Et_2O soln. of EtMgBr , the negative electrode being Hg and the positive Mg. The Mg content of the resulting mixt. of amalgam and excess Hg was less than 1% but was increased to about 2% by heating and squeezing out the liquid Hg. Both the electrolytic preps. and solns. of Mg in boiling Hg decomp. in air, the reaction being $\text{Mg} + 2\text{H}_2\text{O} \rightarrow \text{Mg}(\text{OH})_2 + \text{H}_2$. Thus, the max. gain in wt. corresponds to $\text{Mg} \rightarrow \text{Mg}(\text{OH})_2$, and an equiv. amt. of H_2 is given off. The decompn. velocity decreases with rising temp. This is not due to the formation of inert Mg-Hg compds., since the temp.-cond. and cooling curves of the amalgams were found to be continuous. Furthermore, the Mg amalgam is acted on at all temps. by air satd. with H_2O . K. concludes that the temp. effect is due to the decrease in relative humidity of air.

B. SOYENKOFF

Behavior of bismuth films in the magnetic field. FRIEDRICH GROSS. *Z. Physik* 50, 100(1928).—Bi films (0.3 to 3μ in thickness) change in resistance in a magnetic field similarly to a Bi spiral. The change is greater the thicker the film, but the effect is only about half that for a Bi spiral under similar conditions. The method of prepn. affects both the sp. resistance and the change in resistance. For very thin films the change in resistance depends upon the angle between the plane of the film and the lines of magnetic force, but for thicker films the inclination has no effect. W. W. S.

Volta effect. E. DUBOIS. *Compt. rend* 186, 1832-3(1928).—The Volta effect, measured in water vapor, between a fixed, electrically heated, cylindrical spiral electrode of the metal studied, and a cool mobile cylindrical electrode, shows differences of about 0.1 v. for Fe, Ni, Mo, Al, or Cu, but none for Au, Ag or Pt (*C. A.* 21, 3536). The metal becomes more electropos. and the change is a qual. indication of the action of water vapor on the metal.

B. C. A.

Conductivity and Hall effect in sputtered platinum films. A. RIEDE. *Z. Physik* 48, 302-9(1928).—The cond. of Pt films sputtered on glass in the presence of H is proportional to the thickness of the film in the range 4.7-136 $m\mu$. The Hall effect in such films is const. until the thickness is reduced below 30 $m\mu$, when the magnitude of the effect diminishes rapidly.

B. C. A.

Disturbance of the superconductivity of mercury by a magnetic field. W. J. DE HAAS, G. J. SIZOO AND H. K. ONNES. *Arch. néerland. sci.*, III A, 11, 1-47(1928).—The hysteresis effect in the disturbance of supercond. which has already been found in the case of Sn (cf. *C. A.* 21, 690, 3305) was also found for Hg. The effect was observed in all cases examd. While the increase of resistance as the field was increased was regular in the majority of instances, the return to a state of supercond. as the field was diminished occurred in a series of jumps, the no. and extent of which varied for the different resistances used. It is supposed that the difference in the intensities of field when these discontinuities occur is due to the different orientation of crystals

in relation to the field. The hysteresis effect, and also the discontinuities in the curve, were obtained both in transverse and in longitudinal fields, although the position of the discontinuities was different in the 2 cases. The area of the hysteresis diagram varies with temp. The relationship between the temp. and the strength of the field when the resistance has been half restored can be expressed by a straight-line graph. It is also shown that when a superconductor is placed in a magnetic field of sufficiently great intensity the resistance curve shows no anomalies.

B. C. A.

Superconductivity of gallium. W. J. DE HAAS AND J. VOOGD. Univ. Leiden. *Verslag Akad. Wetenschappen Amsterdam* 37, 702-5(1928).—In accordance with former results, Ga does not show supercond. even at 1.1°K. It is believed that supercond may appear at a lower temp. The presence of In decreases the resistivity at low temp. At about 1.1°K., the resistivity of Ga is very sensitive to the current intensity used for the measurements.

ALBERT L. HENNE

Electrical conductivity. W. J. DE HAAS. Univ. Leiden. *J. phys. radium* 9, [6], 265-77(1928); cf. *C. A.* 20, 2779; 21, 1747, 3305; 22, 4287.—Many expts. on supercond. in the work of H., Onnes, Sizoo, *et al.*, are not in agreement with the free-electron theories of cond. Sn becomes superconducting at 3.7°K. When in thin films over Cu, it behaves like Sn below this temp., but above, it has the resistance of Cu. If the electrons are free to move as gas mols. between the metal atoms, there should be some diffusion of electrons from metal to metal and not the sharp break in resistance at 3.7°K. By studying the cond. of single crystals in a magnetic field, there is found a difference when the axis of the crystal is parallel and when it is perpendicular to the field; yet no change is observed when the axis is maintained perpendicular to the field whether the current is in the same or opposite direction. There is no elec or magnetic influence on the resistance in this case and it can be explained by direct movement of electrons from atom to atom, rather than by free electrons. The discontinuities and hysteresis of superconducting metals below their leap point (*C. A.* 20, 1170) calls for an explanation other than that of free electrons.

A.S. CARTER

Relation between polarization and association. JOHN W. WILLIAMS. Univ. of Wis. *Proc. Natl. Acad. Sci.* 14, 932-6(1928).—Data published by W. (*C. A.* 21, 3151, 3783) can be used to test Rolinski's treatment of the Debye modification of the Clausius-Mosotti law for calcg. degree of assocn. of a liquid. R assumes that the resultant dipole moment of 2 associating mols is zero (cf. *C. A.* 23, 29) and concludes that the degree of assocn. is the larger the greater the dipole moment. W's studies of acetone, ethyl acetate, methyl acetate, ethyl ether and CHCl_3 in CCl_4 show R's sweeping conclusions to be unjustified. $\text{C}_6\text{H}_5\text{OH}$ and $\text{C}_6\text{H}_5\text{CO}_2\text{H}$, which are admittedly assocd. by ordinary criteria, show no change in molar polarization from extremely dil. to satd. solns in C_6H_6 and are by R's criterion zero associated.

A. P. SACHS

The electrical moment of molecules. A. KIRRMANN. *Rev. gen. sci.* 39, 598-603 (1928).—K. compares values of the mol moments for HCl , SO_2 , H_2O , CHCl_3 , EtOH , AmOH , Et_2O and $\text{C}_6\text{H}_5\text{NO}_2$ obtained by several workers and by different methods, and shows that all are of the order of 1 or 2×10^{-18} , so that there is little question about the existence of the mol. moment. As regards the worth of individual detns., exptl. methods and calcns. there is much uncertainty. A bibliography is appended.

L. A. SARVER

A determination of the Stefan-Boltzmann radiation constant using a Callendar radio balance. F. E. HOARE. *Phil. Mag.* [7], 6, 828-39(1928).—The concordance of the results obtained with the radio balance under widely differing conditions shows that the method used for evaluating the abs. measure of radiation is extremely satisfactory, and that the instrument is well suited for this purpose. The instrument has the further advantages of being easy to manipulate, quick in working and accurate. The value $\sigma = 5.725 \times 10^{-8}$ is obtained.

GEO. GLOCKLER

New colorimetric methods. F. MEŠT'AN. *Chem. Obzor.* 3, 367-72(1928). After discussing the defects of present color detns. the photometric methods based on Ostwald's color theories are sketched. A new colorimeter "Stupo" was constructed which proved to be 10 times more sensitive than the photometers used in the brewing industry, permitting detns. of slightly turbid and colloid solns.

JAROSLAV KUČERA

The crystallographic foundations of crystal-structure analysis. H. MARK. *Z. Metallkunde* 20, 342-6(1928).—The development of crystallographic theories, *e. g.*, of the axial systems, the point groups, and space groups, is traced historically and the significance of the theories and their practical results for modern x-ray work are outlined.

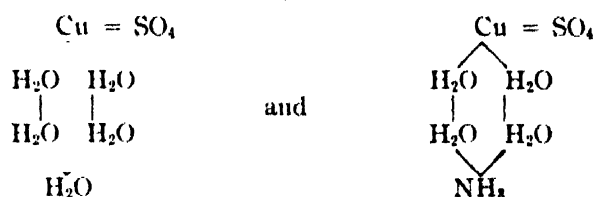
R. L. HERSHEY

Spontaneous and linear crystallization velocity in binary mixtures. W. RAWITZER. Kaiser-Wilhelm-Inst. für Silicatiforschung, Berlin-Dahlem. *Z. anorg. allgem. Chem.*

175, 321-34(1928).—With the aid of Volmer's theory of crystal growth and consideration of reaction kinetics, relations are derived between the velocity of linear crystn. and the ability to crystallize spontaneously in supercooled melts, and between the velocity of crystn. and concn. These relations have certain analogies in spite of the great difference in the influence of temp. upon them. The relation for the linear crystn. velocity in simple binary mixts. is in agreement with the expts. of Tammann and Bot-schwar. An exptl. trial for the spontaneous crystn. velocity with the simple binary system palmitic-stearic acids shows satisfactory agreements in the limit although complicated in alloys.

G. L. CLARK

The constitution of hydrated crystals. M. A. RAKUZIN. *Bull. soc. chim.* **43**, 984-8(1928).—After having studied the various hydrates and their stability R. believes that we must settle the question as to the nature of the linkage of H_2O of crystn. He believes that the theory of Wurtz should be developed further. The formulas of W. for $CuSO_4 \cdot 5H_2O$ and $CuSO_4 \cdot NH_3 \cdot 4H_2O$ may be written



R. believes with W. that it is the metal and not the acid radical of a salt which attracts the H_2O

E. G. VAN DEN BOSCHE

Structure of topaz. $[Al(F,OH)_2]_2SiO_4$. N. A. ALSTON AND J. WEST. *Proc. Roy. Soc. (London)* **A121**, 358-67(1928). Topaz is holohedral. The O and F atoms (regarded as of equal size) together form a close-packed assemblage which belongs strictly to neither the cubic nor the hexagonal types of close-packing, but which may be regarded as a combination of these two types. Some of the more complex structures not yet analyzed, exhibiting certain features of close packing but not belonging to the hexagonal or cubic type, may be based on some such arrangement as in topaz, the essential feature of all the types being that they represent ways in which identical planes consisting of similar atoms in contact may be closely stacked together, one on top of the other, so as to form a series of layers in periodic succession. In topaz, the results appear to indicate the 4 atoms about each Si atom are O, while of the 6 about each Al atom, 4 are O and 2 F.

W. WEST

Tetrahedral carbon atom and the crystal structure of pentaerythritol. A. HET-TICH, A. SCHLEERDE AND E. SCHNEIDER. *Naturwissenschaften* **16**, 547(1928); cf. *C. A.* **22**, 895. The authors' exptl. results can be interpreted only in terms of a tetrahedral mol. structure, as against the pyramidal structure (cf. Weissenberg, *C. A.* **21**, 3776).

B. C. A.

Dispersion of magnesium sulfide. M. HAASE. *Z. Krist.* **66**, 236-8(1927).— MgS has $n_{D589} 2.284 \pm 0.002$, $n_{D570} 2.277 \pm 0.002$, $n_{D515} 2.265 \pm 0.001$, $n_{D410} 2.259 \pm 0.001$, $[F] 1 \pm 3$.

B. C. A.

The crystal structure of Cu_3Al_4 . (Copper-aluminum.) A. J. BRADLEY. *Phil. Mag.* [7], **6**, 878-88(1928). Powder photographs of δ Cu_3Al contg. 16-19% Al show a cubic structure with 52 atoms per unit cell. The space-group is T_d^d , and there are eight sets of structurally equiv. atoms. There are 36 Cu atoms and 16 Al atoms in each unit cube, corresponding to the formula Cu_3Al_4 . The structure is essentially of the $CaCl_2$ type, each lattice point being replaced by a cluster of 26 atoms, with tetrahedral symmetry. The cluster around the center of the unit cell contains a different number of Al atoms than that around the corners of the unit cell. The coordinates of the atoms are not appreciably different from those in the alloy Cu_3Zn_4 .

GEO. GLOCKLER

Report on the optical axial angle and relation of its plane to the plane of symmetry in mica. ANON. *J. Sci. Instruments* **5**, 577-80(1928).—The angle (in air) between the optical axes is measured with the aid of a simple app. consisting of 2 Nicol prisms set at 45° to the vertical plane, with the crystal under investigation mounted between them. The crystal is rotated until one of the hyperbolic "brushes" cutting the interference pattern crosses the center of the field vertically, then further rotated until the other brush is in the center of the field. The angular difference is the angle between the axes, which varies between 55° and 75° for muscovite micas, 5-25° for phlogopite micas, and 0-5° for biotite micas.

R. J. HAVIGHURST

The discordance between the thermodynamics of gases and the kinetic theory.

KAMEKICHI SHIBA. *Bull. Inst. Phys. Chem. Research (Tokyo)* 7, 357-62, Abstracts 1, 33(1928).—Under the ordinary assumption that the mols. of a gas are all similar, perfectly elastic spheres with a force of mutual attraction varying as x/r^n , the kinetic theory shows that the equation of state of the gas is $pV + (a/V) = RT \dots$ (A), provided that for simplicity the mol. diameter is taken as negligibly small. It is proved, by calcg. the virial, that the total potential energy of the gas in vol. V , is $E_p = -3a/(n-1)V \dots$ (B). Therefore, the total energy of the gas is $U = -(3a/(n-1)V) + CT \dots$ (C). On the other hand, as a direct consequence of the second law of thermodynamics: $(\partial U/\partial V)_T = T(\partial p/\partial T)_V - p \dots$ (D). The relation D is not satisfied by A and C, unless $n = 4$, which is not plausible. G. L. HENNE

Critical isotherms and the equation of state of A. Wohl. RUDOLF WEGSCHEIDER. *Univ. Wien. Z. physik. Chem.* 135, 362-7(1928).—Polemic with K. Wohl and A. Wohl (*C. A.* 8, 1895; 16, 868, 869; 22, 3074). Remarks on the preceding paper of R. Wegscheider. KURT WOHL. *Ibid* 368. G. L. CLARK

The equation of state of a substance at the absolute zero of temperature, and properties connected with it. R. D. KLEEMAN. *J. Franklin Inst.* 206, 631-46(1928); cf. *C. A.* 23, 319.—The equation of state is mathematically derived from thermodynamic considerations. Max. work, characteristic const. for a substance, additive nature of the at. vols. of a mixt., pressure at any given state, coeffs. of compression and mass addn., work of compression and internal energy, heat and work of evapn., zero of the internal energy of a substance or mixt. under constraint, magnetic properties of inductivity, mixing substances under a pressure, and the radiation properties of a substance are discussed and an equation is derived for each. In the equation $k = M_a A_0 / V_{a0}$, k is an abs. const. for the pure substance a and one of the important consts. of nature. In this equation M_a is the no. of mols. of the substance a ; A_0 is a characteristic const. of the substance at zero abs. and V_{a0} is the vol. occupied by the substance under its own vapor pressure at zero abs. F. E. BROWN

An equation of state for gaseous mixtures. I. Application to mixtures of methane and nitrogen. JAMES A. BEATTIE. *Mass. Inst. Tech. J. Am. Chem. Soc.* 51, 19-30(1929).—The equation of state proposed by B. and Bridgeman (*C. A.* 21, 3146), $p = (RT(1 - \epsilon)/V^2)(V + B) - A/V^2$ was applied to mixts. of CH_4 and N_2 by using the following method of calcg. the consts. of the mixt. from those of the pure constituents. The consts. R , a , B_0 , b and c , which contain the dimension of d to the first power are combined linearly; e. g., $B_{0x} = B_{01}(1 - x) + B_{02}x$; and for A_0 by $A_{0x} = (A_{01}(1 - x) + A_{02}(x))$. It is then possible to write a single equation by means of which pressures for all compns. of CH_4 and N_2 mixts. can be calcd. from temp. d . and the compn. Very satisfactory agreement between observed and calcd. pressures was obtained. J. H. PERRY

Vapor pressures of related compounds. The application of Duhring's rule. A. R. CARR AND D. W. MURPHY. *College City of Detroit. J. Am. Chem. Soc.* 51, 116-21(1929).—The Duhring lines representing the vapor pressure data for each one of a family of substances intersect in a common point. The requirements for the construction of a Duhring chart for a family of substances are: (1) the vapor pressure of some reference substance must be accurately known, and (2) at least two b. ps. at different pressures of two substances in the family should be detd. in order to establish the common point of intersection. J. H. PERRY

Determination of vapor tension of chloropicrin at temperatures around 100° . H. BLASZKOWSKA-ZAKRZEWSKA. *Roczniki Chem.* 8, 210-8(1928).—The vapor tension of chloropicrin was detd. at 98 – 105° in Swientoslawski's ebullioscopic thermostat by the air-current method, which consists in detg. from the loss of wt. the quantity of substance carried away at the given temp. by a definite amt. of air. The app. consists of a 500-600-cc. flask A connected by a narrow 28-cm. tube with the thermostat proper, C a cylinder of 55 mm. diam. which carries a thermometer, a syphon fused into the bulb of A and a reflux condenser. The latter is connected with the pressure-regulating system. The app. in which the air current is satd. with the vapors was constructed by Wojnicz-Sianozecki and resembles Gahl's wash bottle (*Z. phys. Chem.* 31, 178(1900)). The velocity of the air current was 300 cc./min. The mean error was 0.6 – 0.8° . A control expt. with *toluene* gave for 100.2° and 100.4° 559 and 562.6, resp., while an extrapolation of Kahlbaum's values (Landolt-Börnstein Tabellen) gives 562.8 and 566.8. The values obtained were: 98° , 502.1; 100.0° , 532.0; 102.0° , 564.4; 103.0° , 567.6; 104.0° , 583.0; 105.0° , 597.0. The curve $\ln p - 1/T$ is almost a straight line. In view of the possible errors, too high velocity of the air current and carrying over of liquid drops, the detns. will be repeated by another method. MARY JACOBSEN

Method for the determination of vapor tension of very small quantities of substance. Vapor tension of chloropicrin. H. BLASZKOWSKA-ZAKRZEWSKA. *Roczniki Chem.* 8, 219-28(1928); cf. Smith and Menzies, *C. A.* 4, 2595.—The immersed-bulb method permits detns. of vapor tension with 0.03-0.5 g. The bulb was placed in the ebullioscopic thermostat for the detn. of the vapor pressure of CCl_3NO_2 at 97-105°. Water and 25-30% CaCl_2 were used as boiling liquids. A CaCl_2 soln. (d. 1.44, b. 120°) served as immersion liquid. For detns. at 78-96° a paraffin bath served as a thermostat. The error was 0.3% in the ebullioscope, and 0.8-1% in the ordinary thermostat. For toluene 563.4 at 100.2° instead of 562.8 (Landolt-Börnstein). For water the values at 65-88° were 0.6-0.5% lower than those in L.-B. The following values were obtained for CCl_3NO_2 : 98.0°, 491.4; 100.0°, 524.3; 102.0°, 558.2; 103.0°, 577.9; 104.0°, 595.2; 105.0°, 612.8. The results differ considerably from those obtained by the air-current method and may be considered more trustworthy, because of the exptl. errors inherent in the latter and because Avogadro's law, which underlies the calcs. of vapor tension by the dynamic method, probably does not obtain for satd. vapors. The curve $\ln p - 1/T$ is a straight line, or: $\ln p = A - (B/T)$ (1), where $A = 7.8704$ and $B = 1921.4$. Baxter, *et al.* (*C. A.* 14, 2570), however, find A 8.2424 and B 2045.1, which suggests that (1) obtains only for a certain temp. range. Hertz's equation, $\ln p = \alpha - (\beta/T) - (\gamma \ln T)$, where $\alpha = 18.3014$, $\beta = 2485.5$ and $\gamma = 3.468$, covers the entire temp. interval from 0° to the b. p. and the calcd. results agree well with the exptl. ones. The b. p. of CCl_3NO_2 is calcd. to 112.21°. MARY JACOBSEN

Vapor pressure of toluene-cyclohexane mixtures. N. N. NAGORNOV. *Ann. inst. anal. phys. chem.* (Leningrad) 3, 584-92; *Chem. Zentr.* 1927, II, 2668; cf. *C. A.* 22, 4298.—The PhMe used b₇₆₀ 110.4°. For pure PhMe the following expression was found to be valid: $\log P = 7.06831 - 1409.9/(226.28 + t)$ (from 36 to 760 mm. of Hg). For the mixt. contg. 10.07% PhMe (by wt.): $\log P = 7.02006 - 1304.0/(233.07 + t)$; for the mixt. contg. 20.06% PhMe: $\log P = 6.95869 - 1277.0/(229.67 + t)$; for the mixt. contg. 40.06% PhMe: $\log P = 7.26319 - 1467.96/(248.21 + t)$; for the mixt. contg. 60.06% PhMe: $\log P = 7.25991 - 1492.2/(249.29 + t)$; for the mixt. contg. 79.97% PhMe: $\log P = 7.15982 - 1441.7/(239.05 + t)$. When the temp. is maintained const., the total vapor pressure increases progressively with the cyclohexane content. The partial pressures were calcd. by the empirical formula of Konovalov (*Z. physik. Chem.* 35, 129(1907); cf. *C. A.* 2, 619). The relative concn. of PhMe in the vapor is always less than in the liquid phase, while with every mixt. it increases with increase of temp. C. C. DAVIS

Change of state from liquid to vapor. H. I. CALLENDAR. *Engineering* 126, 594-5, 625-7, 671-3(1928).—C. gives a crit. discussion of the theoretical and exptl. contributions concerning the change liquid-vapor and reviews his own expts. carried out from 1886 onward, dealing mainly with water and steam. He detd. the ds. of water up to 380°, 6° above the crit. point at which the meniscus disappears. At 384 the d. of water was $\frac{2}{3}$ that of steam. The d. of steam could be measured up to 371°. At 380° both ds. become equal and the latent heat is zero. The expts. were performed with pure water in new quartz tubes. The results do not agree with van der Waals' equation, which requires that liquid and vapor curves should have a common tangent. The exptl. data show that the curves meet at an angle. C. checked these results by detg. total heats near the crit. point, using the method of condensing the steam in suitable app. The satn. lines for steam and water could be measured beyond 384°, where the meniscus vanished, nearly up to their junction at 380.5°. The satn. pressures were deduced from the measurements of the vols. of satd. water and steam and agreed (between 0° and 380.5°) with the formula: $\log p = A - (B/T) - C \log T + (kR/2) \log [(1+Z)/(1-Z)]$, where Z is a factor connected with C.'s coaggregation theory. This theory assumes that the change liquid-vapor is a mol. change such that in the liquid mols. of steam are dissolved while in the vapor there are complex (co aggregated) water mols. The dissocn. or formation of these co-aggregated mols. is assumed to be accompanied by a corresponding liberation or absorption of heat. H. S. VAN KLOOSTER

Measurements of the velocity of sound in air, nitrogen and oxygen, with special reference to the temperature coefficients of the molecular heats. W. G. SHILLING AND J. R. PARTINGTON. *Phil. Mag.* [7], 6, 920-9(1928).—The mol. heats of air, N_2 and O_2 were detd. at 0° to 1000° by a method depending on the measurement of the velocity of sound in the chem. pure gases. Further measurements for air up to 1300° are added, and a reply is given to criticism of the method of detg. the tube const. (*C. A.* 21, 1399 and *C. A.* 22, 1267). GEO. GLOCKLER

Thermal conductivity of carbon monoxide and nitrous oxide. H. GREGORY AND

C. T. ARCHER. *Proc. Roy. Soc. (London)* **A121**, 285-93(1928).—Measurements are described of the thermal cond. of CO and N₂O by the hot-wire method, details of the method being reported in earlier papers (cf. *C. A.* **20**, 1166). The cond. of both gases varies linearly with temp. between about 5° and 13°, the temp. range through which the measurements extend. The extrapolated values for 0° are 5.633×10^{-8} for CO and 3.740×10^{-8} for N₂O, and the respective temp. coeffs. 0.00317 and 0.00462. The factor f in the equation $K = fC_p\eta$, where K = thermal cond., C_p sp. heat at const. vol. and η the viscosity is 1.97 for CO and 1.70 for N₂O, C_p being calcd. from the measured C_p and γ . A detn. of the thermal cond. of air gave a mean value at 0° of 5.83×10^{-8} . While exptly. the viscosity of CO equals that of N₂ (1665×10^{-7}) and the viscosity of N₂O equals that of CO₂ (1366×10^{-7}) there is a material difference between the thermal conductivities of the members of these pairs; $K \times 10^7$ for CO, 563.3, N₂ 580; N₂O 374, CO₂ 360.4. W. WRST

Chemical reaction in the interferometer U-gage. CARL BARUS. *Brown Univ. Proc. Natl. Acad. Sci.* **14**, 939-43(1928).—The U-gage has shallow pools of Hg and each arm communicates with a Dewar flask contg. thermometer sensitive to 0.01°. P is introduced into one flask and both are closed. Temps. are read and the induced changes in level observed by the micrometer of the interferometer. The rate of absorption of O₂ after 16 min. drops to $\frac{1}{6}$, although only $\frac{3}{4}$ has been absorbed. A theoretical rise in temp. of 186° appears as only 1.4°, in consequence of loss of heat nearly as fast as it is liberated. In observing truly initial behavior there is no evidence of gas absorption but rather the increase in pressure on oxidation of P indicates the formation of an emanation. The initial rise in pressure is accompanied by a drop in temp. so that emanation is produced with a loss of heat. A. P. SACHS

Optical measurement of a small degree of dissociation of metal salt vapors. H. L. WYNEKEN. *Univ. Jena Z. physik. Chem.* **136**, 146-58(1928).—By photometric comparison of the intensity of the Hg absorption line 2536 in HgCl₂ vapor with the intensity of the same line in pure Hg vapor at known pressure, the degree of dissociation of HgCl₂ vapor at 200° is found to be 3×10^{-4} , agreeing with the value calcd. by the Nernst heat theorem. G. L. CLARK

Vapor pressures of fumigants. I. Methyl, ethyl, isopropyl and secondary butyl chloroacetates. O. A. NELSON. *Ind. Eng. Chem.* **20**, 1380-2(1928). The method of Smith and Menzies (*C. A.* **4**, 2595-6; **5**, 232) was employed. The vapor pressures of the chloroacetates were detd. for the following ranges of temp. Me, 20-135°; Et, 20-145°; isopropyl, 20-150°; secondary butyl, 20-170°. The following interpolation formulas, derived from Ramsay and Young's b. p. law as a basis, are valid: Me chloroacetate, $\log_{10}P = 8.4073 - (2222.2/T(\text{abs.}))$; isopropyl, $\log_{10}P = 8.3321 - (2298.6/T(\text{abs.}))$; Et, $\log_{10}P = 8.3893 - (2291.6/T(\text{abs.}))$; secondary butyl, $\log_{10}P = 8.3210 - (2393.44/T(\text{abs.}))$. Such equations do not hold very far beyond the b. p. By means of the fundamental equation, $PI = (x/M)RT$, the weight of fumigant that will vaporize into a 1000-l or a 1000-cu. ft. chamber can be calcd. A table shows these values for the temp. range 20-50°. **II. Methyl, ethyl, propyl, isopropyl, butyl, secondary butyl and isobutyl formates.** *Ibid* **20**, 1382-4. The vapor pressures of the formates were detd. as above for the following temperature ranges: Me, 20-32°; Et, 20-55°; Pr, 20-85°; iso-Pr, 20-70°; Bu, 20-110°; sec-Bu, 20-100°; iso-Bu, 20-100°. The equations developed are: Me, $\log_{10}P = 7.2203 - (1320.8/T(\text{abs.}))$; Et, $\log_{10}P = 7.8457 - (1621.6/T(\text{abs.}))$; Pr, $\log_{10}P = 7.9925 - (1806.5/T(\text{abs.}))$; iso-Pr, $\log_{10}P = 7.8909 - (1710.5/T(\text{abs.}))$; Bu, $\log_{10}P = 8.1232 - (1983.3/T(\text{abs.}))$; sec-Bu, $\log_{10}P = 8.0306 - (1888.9/T(\text{abs.}))$; iso-Bu, $\log_{10}P = 7.9060 - (1863.7/T(\text{abs.}))$. A table shows the wt. of fumigant necessary to sat. a 1000-l or a 1000-cu. ft. chamber. A. J. MONACK

Determination of the pressure and density of moist, saturated ammonium bromide vapor. ANDREAS SMITS AND RONALD PURCELL. *Univ. Amsterdam. J. Chem. Soc. (London)* **1928**, 2936-44, 2944-52. By means of the previously described densitometer, the vapor pressures and vapor ds. of NH₄Br were measured simultaneously between 332° and 395°. $\log p$ was found to be a linear function of $1/T$. It follows, then, that the latent heat of evaporation between 300° and 400° is not a function of the temp. The mol. heat of evapn. $(Q_{\text{H}_2\text{O}})_{\text{NH}_4\text{Br}} = 44 \times 10^3$ cal. was calcd. from the data. The vapor d. measurements as well as those made by an independent method, based on observations of the pressure of the satd. and of the unsatd. vapor of a weighed quantity of salt in a known vol., indicated that the vapor was completely dissocd. at 300-400°. The vapor pressures and vapor ds. of NH₄Cl were measured simultaneously between 254° and 353°. $\log p$ was found to be a linear function of $1/T$. It follows then that the heat of evapn. between 250 and 350° is not

a function of the temp. The mol. heat of evapn. $(Q_{80})_{\text{NH}_4\text{Cl}} = 39.6 \times 10^3$ cal., was calcd. from the data. From the derived vapor pressure formula the sublimation temp. was calcd. as 339.3° . The vapor d. measurements, as well as those made by an independent method, based on observations of the pressure of the satd. and of the unsatd. vapor of a weighed quantity of salt in a known vol., indicated that the vapor was completely dissociated at $250\text{--}350^\circ$. R. L. DODGE

Irrespirable atmosphere in the high Alpine mining district. GUSTAV HIESSLEITNER. *Montan. Rundschau* 26, 535-8(1928).—In certain districts about 1900 m. above sea-level, there are places where the atm. is irrespirable by human beings and where flames burn with great difficulty, or are put out. The phenomenon shows a max. intensity when the snow is rapidly melting. In each of these districts there are springs that deliver a very large vol. of water. It is suggested that the water of the springs and the water resulting from the melting of the snow are completely air-free and dissolve O_2 and N_2 from the air in the ratio of their solubilities multiplied by their partial pressures; i. e., about 1:2. Owing to this considerable absorption of O_2 the O_2 content of the air near such springs actually drops from 21 to 17%, a value too low for normal human life. After a time, diffusion counteracts the absorption of O_2 . A. L. H.

The approximate prediction of vapor pressure. JOHN CHIPMAN. Ga. School of Tech. *J. Phys. Chem.* 33, 131-5(1929).—For a given class of liquids there is a const. ratio between the apparent heat of vaporization, obtained by application of the Clausius-Clapeyron equation to vapor pressure data, and that given by the equation of Kistiakowski (*C. A.* 17, 3274). If the class to which a liquid belongs is known and the value of the ratio for that class is known, the approx. vapor pressure equation of the liquid may be estd. With the same data, a simple and reliable correction of the b. p. to normal pressure may be made. H. F. JOHNSTONE

The characteristic density and the properties of liquids. W. HERZ. Univ. of Breslau. *Z. anorg. allgem. Chem.* 175, 277-80(1928). Having found that $L/(d - d_K)$ where L is the heat of vaporization, d is the density at a given temp. and d_K the crit. density, is a const. for many liquids and that $\sqrt{L} \propto \sqrt{\eta}$ where η is the surface tension is also const. H. calcs. values for $\sqrt{\eta} \cdot (d - d_K)$ and finds const. for Et acetate, CCl_4 , C_6H_6 and even associated EtOH. The values of $\sqrt{\eta} \cdot (d - d_K)$ where η is viscosity, are const. for Me acetate, $\text{C}_6\text{H}_5\text{Cl}$, CCl_4 and octane. G. L. CLARK

A precision method for measuring temperatures of refractive index liquids on a crystal refractometer and on a microscope slide. F. W. ASHTON AND W. C. TAYLOR. *Am. Mineral.* 13, 411-8(1928). The method presented is of use in any microscopic work requiring the accurate measurement of temp. of single drops of liquids where η s are to be detd. to ± 0.001 . By using a differential thermocouple the temp. of the liquid can be measured with the desired accuracy, even when on a slide. The method differs in 2 essential points from that in common use: the location and protection of the thermometer, and the use of the thermocouple. A description of the app. and procedure is given. A. M. BRANT

The theory of the variation of refractive index with temperature measured in liquids by an interferometric method. GERHARD PETERS. *Ann. Physik* 86, 494-510(1928).—P. discusses the theoretical considerations in some detail, dealing not only with the formulas deduced by Newton, Dale and Gladstone, and Lorentz and Lorenz, but also with those obtained from thermodynamic considerations. A practical method is described using interferometer measurements on liquids, by means of which it is possible to obtain values of the η s at various temps. Results are given for HCN, the ds. being measured by means of a pycnometer. Refinement of this app. should lead to results which will allow of comparison of the measured and calcd. values. This comparison will give a true idea of the resp. values of the 3 formulas connecting d and η . G. L. CLARK

The influence of intensive drying on inner equilibria. III. ANDREAS SMITS. Univ. Amsterdam. *J. Chem. Soc.* 1928, 2399-409; cf. *C. A.* 22, 1523.—Baker's results on intensively dried liquids confirm S.'s theory of allotropy. Vapor density, rapid evaporation and distillation are "velocity" phenomena and large effects are to be expected from intensive drying, whereas vapor pressure is an equil. phenomenon and little or no effect should be observed. Surface-tension measurements are not trustworthy in the study of the change in properties of intensively dried systems. An elec. field has no influence when care is taken to prevent superheating. A. FLEISCHER

Theory of electrostriction and its experimental control. G. BRUHAT AND M. PAUTHENIER. *Compt. rend.* 186, 1289-91(1928).—The isothermal and adiabatic electrostrictions have been calcd. in terms of directly measurable quantities, and the agreement with the results obtained experimentally by means of the Lorentz-Lorenz

formula has been shown to be fairly good in the few cases for which data are available.
B. C. A.

Manipulation of the Engler viscometer. S. ERK. *Physik.-Techn. Reichsanstalt, Berlin. Erdöl Teer* 4, 583-4; *Chem.-Ztg.* 52, 995(1928); *Chem. Fabrik* 1928, 715-6.—The outflow vol. must be measured with flasks graduated for filling, cleaned and dried before each measurement, instead of graduated for delivery, draining 1 min. and using again, as sometimes practiced. The quantity of liquid remaining after draining 1 min. varies greatly, according to viscosity, introducing very appreciable errors. During the detn. temp. of the water bath must be held const. The drop in the thermometer reading, at the end of the detn., is due only to exposure of the thermometer bulb.

F. S. GRANGER

The theory of Brownian molecular motion. RICHARD GANS. *Ann. Physik* 86, 628-56(1928).—A detailed mathematical analysis.

G. L. CLARK

The Brownian motion of a wire. A. HOUDRIJK. *Arch. néerland. sci.* IIIA, 11, 212-77(1928).—A study was made of the movement of the lower end of a very fine suspended wire. The prepn. of very fine wires and the method of suspending them are described. The modulus of elasticity of very fine quartz threads probably is much less than 6000 kg./mm.², the value generally given. A formula is deduced for the mean longitudinal displacement of the end of the wire undergoing Brownian movement. Expts. with wires of various materials, lengths and diameters, suspended in various gases both at ordinary and reduced pressures were carried out. Results accord with calcd. values. The displacement is not influenced greatly by the gas in which the wire is suspended nor does change in pressure affect it greatly. The mean value calcd. for Avogadro's no. was 63.6×10^{23} . A rotatory Brownian motion was also observed and found to accord with theory.

RAYMOND H. LAMBERT

Diffusion of zinc in copper and in copper-zinc mixed crystals at 350°. Diffusion in the solid state. W. KÖHLER. *Zentr. Hütten- u. Walzwerke* 31, 650-7(1928).—Mean diffusion coeffs. are: Cu-Zn, 0.000033 cm. per day; α -brass-Zn, 0.000039 sq cm per day; β -brass-Zn, variable.

B. C. A.

Resistance and thermoelectric phenomena in metal crystals. P. W. BRIDGMAN. Harvard Univ. *Proc. Nat. Acad. Sci.* 14, 943-6(1928).—Summary of results of detailed paper to be published in *Proc. Am. Acad. Arts Sci.* An improved method of making rods of a single crystal of metal with varying orientations and an app. for measuring the thermal e. m. f. have been developed. 16 rods in which crystal orientation was the only variable factor were studied. The thermal e. m. f. between 20° and 88° of single crystals of Zn, Cd, Sb and Bi against Cu shows that the heat absorbed by an electron of Sb or Bi on changing its direction of motion from perpendicular to parallel to the axis is resp. 0.2 and 0.4 the energy of a gas mol. at same temp. The Kelvin-Voigt law for thermal e. m. f. is only approx. The failure of the K.-V. law is due to the Peltier heat as distinguished from the Thomson heat. The pressure coeff. of resistance of Sb and Bi was detd. over the entire range of orientation. From 3rd law of thermodynamics, the symmetry of the Peltier and the Thomson heat are the same and the apparent exptl. difference is due to greater error in measuring the Thomson heat. The local surface heat where current leaves a metal crystal is a function both of the direction of flow with respect to the crystal axis and of the orientation of the surface. Expts. offer no proof that electrons must move along fixed channels through crystals.

H. W. WALKER

The effect of gases on the resistance of granular carbon contacts. P. S. OLINSTEAD. Bell Telephone Labs., N. Y. *J. Phys. Chem.* 33, 69-80(1929).—A method is described whereby reproducible measurements of the resistance of C contacts can be made. The results show that when their surfaces are in equil. with the surrounding atm., the contact resistance between C granules increases with the gas pressure. The increase is reversible and is related approx. logarithmically to the pressure of the gas. At const. pressure, the increase in resistance diminishes as the temp. is raised. These facts suggest that the resistance of a granular C contact is detd., in part, by the amt. of gas adsorbed on the C surfaces. Furthermore, at const. pressure, the contact resistance decreases as the voltage is increased. This is due partly to the increased temp. of the contact. The evolution of gas entrapped in the pores opening on the area of contact causes an increase or decrease in the resistance, depending on the gas pressure surrounding the granules. After the voltage is increased to a certain value, depending on the kind of C used, there is a sudden decrease in resistance. This crit. voltage may be related approx. to the temp. at which further thermal decompn. of the granules begins. On the basis of this idea, if the amt. of combined H is a measure of the sp. resistance of the C, then the instantaneous resistance at the crit. voltage should

also be a measure of the resistivity of the C. The results indicate that there is a linear relationship between the resistance in ohms at this voltage and the percent H of compn.

H. F. JOHNSTONE

Reflective powers of some eutectic alloys in relation to their microstructures. G. ANDO. *Mem. Coll. Sci., Kyoto Imp. Univ. A*, 11, 43-84(1928); cf. Chikashige, *et al.*, *C. A.* 21, 1088.—The reflective powers of the binary alloys Ag-Cu, Cu-Cd, Cd-Sn, Cd-Bi, Bi-Sn have been investigated in their dependence on wave length and compn. The reflective power is usually minimal at the eutectic point. When, however, the reflective powers of the two components differ considerably, the min. tends to deviate toward the side of the weaker component.

B. C. A.

Optical properties of the highly refractive isostructural compounds of magnesium, calcium, strontium and barium with oxygen, sulfur, selenium and tellurium. M. HAASE. *Z. Krist.* 65, 509-87(1927).—The following n_s are recorded: MgO (d. 3.579 \pm 0.002), n_D 1.7366 \pm 0.001, n_{Ti} 1.7416 \pm 0.0005, n_C 1.7335 \pm 0.001; CaO n_D^{20} 1.838 \pm 0.002, n_{Ti} 1.845 \pm 0.003; SrO n_{355} 1.880, n_{570} 1.875, n_{800} 1.8675, n_{820} 1.863, n_{866} 1.8565 \pm 0.001; BaO n_{120} 2.002 \pm 0.001, n_{557} 1.989 \pm 0.002, n_{559} 1.980 \pm 0.001, n_{650} 1.960 \pm 0.004; the value for BeO increases with rise of the temp. of prepn. from the nitrate; MgS n_D 2.26 \pm 0.07; CaS n_{120} 2.161, n_{559} 2.137, n_{632} 2.124, n_{656} 2.120 \pm 0.002; SrS n_{510} 2.122, n_{570} 2.114, n_{595} 2.105 \pm 0.003, n_{656} 2.087 \pm 0.005; BaS n_D 2.155 \pm 0.005; MgSe n_D > 2.42; CaSe n_{555} 2.292, n_{559} 2.274, n_{620} 2.261, n_{656} 2.245 \pm 0.002; SrSe n_{540} 2.252, n_{565} 2.236, n_{589} 2.220, n_{620} 2.208, n_{656} 2.190 \pm 0.003; BaSe n_{560} 2.289, n_{589} 2.268, n_{620} 2.252, n_{675} 2.230; CaTe n_D > 2.51; SrTe n_D 2.408 \pm 0.004, n_C 2.367 \pm 0.005; BaTe n_D 2.440 \pm 0.005, n_C 2.379 \pm 0.003 (lattice constant a 6.82 \pm 0.02 A. U.).

B. C. A.

The refractive index of quartz. W. R. C. COODE ADAMS. *Proc. Roy. Soc. (London)* A121, 476-7(1928); cf. *C. A.* 22, 722.—The following equation is put forward for the extraordinary ray: $n^2 = n_\infty^2 + \Sigma[M_m/(\lambda^2 - \lambda_m^2)]$, where λ_m = the wave length corresponding to the natural frequency of an electron and M_m the corresponding refraction const. A table gives the calcd. and observed refractive indices of 18 lines in the visible and ultra-violet.

L. D. ROBERTS

Concerning Monel metal. I. Electrical and thermal properties and magnetostriction. ALFRED SCHULZE. *Z. Metallkunde* 20, 403-6(1928).—Nine specimens of Monel metal of several degrees of hardness were prep'd., both in the form of wire and in sheets. The sp. resistance at room temp. is approx. the same as that of manganin, varying from 42.63×10^{-6} for the softer specimens to 48.65×10^{-6} for the harder. The temp. coeff. of resistance varies from 1.66 to 2.12×10^{-3} , decreasing in general with increasing sp. resistance. Results are given for 2 samples at approx. 100° intervals from 0° to 600°. In both cases there is an abrupt change in the rate of change of resistance with temp. at approx. 100°. This is attributed to the change from the ferromagnetic to the paramagnetic state. The thermoelectric e. m. f. against Cu is the same for the 2 specimens, dE/dt being 29.0 microvolts per degree at 100° and 39.9 at 600°. For 2 specimens the coeffs. of expansion from 20° to 100° are 0.00001350 and 0.00001443, while from 500° to 600° the same specimens give 0.00001697 and 0.00001710, resp. The 2 "hard" specimens which were exam'd. for magnetostriction show no effect even in fields of 400 gauss. The 4 softer specimens all show a contraction which is approx. proportional to the applied external field for small values but in every case become approx. const. for all fields above a certain value, never greater than 25 or 30 gauss. The actual amt. of contraction varies between wide limits, being greatest for the specimen having the greatest Ni content. None of these specimens shows the after-effects reported by Williams (*Phys. Rev.* 29, 370(1927)).

W. W. STIFLER

Monel metal. II. Magnetization curves of Monel metal. A. KUSSMANN. *Z. Metallkunde* 20, 406-7(1928).—Results are given for a series of magnetic measurements on one of the samples studied by Schulze (cf. preceding abstract) of which the compn. is 65.8 Ni (trace of Co), 30% Cu, 1.9% Fe, 1.1% Mn, 1% Zn. When the metal is heated to 600° and cooled slowly the magnetization curve rises rapidly, the value of $4\pi J$ being 82 for a magnetizing force of 0.04 gauss, 1110 for 3.45 gauss and 1500 above 2750 gauss; the coercive force is 0.1 gauss and the initial permeability is approx. 1100. When quenched in H₂O from 600°, the curve rises more slowly, the value of $4\pi J$ for 3970 gauss being 850. The coercive force is 0.32 gauss and the initial permeability about 200. When annealed, for a magnetizing force of 50 gauss the value of $4\pi J$ decreases from 2600 at -79° to 155° at 58°. The results in general confirm earlier work by Barrows (*Elec. World* 78, 115(1921)). A discussion of the various factors affecting the magnetic behavior of alloys contg. Ni is included.

W. W. STIFLER

The crystallization and deliquescence of quaternary pyridine bases. G. D. SCHRIV.

J. Russ. Phys. Chem. Soc. **60**, 325-30(1928).—Crystals resulting from the action of PhCH_2Cl or PhCH_2Br on $\text{C}_6\text{H}_5\text{N}$ deliquesce and, when dissolved in EtOH , can be recovered only in the form of oily drops. The drops lose moisture and crystallize after 1-2 days over H_2SO_4 in a desiccator. The absorption of moisture from the atm. occurs with diminishing velocity. The max. amts. absorbed indicate the formation of the monohydrates of $\text{PhCH}_2(\text{C}_6\text{H}_5\text{N})\text{Cl}$ and $\text{PhCH}_2(\text{C}_6\text{H}_5\text{N})_2\text{Br}$, resp. A detailed description of the crystals is given.

BASIL C. SOYENKOFF

Magnetism of zirconium hydrate. F. BOURION AND (MLLE.) O. HUN. *Compt. rend.* **187**, 886-8(1928).—With a Curie balance, the magnetic susceptibility of $\text{Zr}(\text{OH})_4$ at various degrees of dehydration was measured. The ratio of magnetic susceptibility to that of H_2O was found to be a linear function of the H_2O content above 5% H_2O . Hence, from the magnetic point of view, $\text{Zr}(\text{OH})_4$ behaves like a mixt. of H_2O and the feebly paramagnetic hypothetical ZrO_2 . By extrapolation the susceptibility of ZrO_2 is found to be of the order of 0.4×10^{-7} .

W. W. STIFLER

Magnetic susceptibilities of single crystals of zinc and cadmium. J. C. MCLENAN, R. RUEDY AND ELIZABETH COHEN. *Proc. Roy. Soc. (London)* **A121**, 9-21(1928), cf. *C. A.* **22**, 1897.—An equation for magnetic susceptibility, based on the Pauli-Fermi theory is developed. From this it is deduced that the susceptibility should be independent of the temp. The effect of orientation on susceptibility is then discussed for crystals belonging to the hexagonal system. Full details of the method of prep. single crystals of Zn and Cd are given. The susceptibilities of these, for various orientations, were measured by Gouy's method. The susceptibilities parallel and perpendicular to the hexagonal axis are, resp., for Cd 190×10^{-6} and 145×10^{-6} ; for Zn 261×10^{-6} and 160×10^{-6} . Attempts also were made to prep. single crystals of Hg. The results with these seemed to indicate that the Hg was crystd. in the rhombohedral form.

W. W. STIFLER

Change in elastic properties on replacing the potassium atom of Rochelle salt by the ammonium group. W. MANDELL. *Proc. Roy. Soc. (London)* **A121**, 122-30(1928).—The method of prep. large crystals of $\text{Na}(\text{NH}_4)\text{C}_4\text{H}_4\text{O}_6 \cdot 4\text{H}_2\text{O}$ is described. The 9 elastic consts. and 9 elastic moduli were detd. for this salt in the same manner as for $\text{NaKC}_4\text{H}_4\text{O}_6 \cdot 4\text{H}_2\text{O}$ (*Proc. Roy. Soc.* **A116**, 623(1927)). In general the results are similar but, both for twisting and bending expts, the NH_4 salt is less elastic than the K analog. The elastic curves show slight differences, especially in the directions of max. piezoelec. response. While it is to be expected that the effects of replacing K by NH_4 would be largely masked in so complex a mol., the fact that the elastic properties are diminished in all directions suggests that the K must be a sort of "key" atom in the mol.

W. W. STIFLER

Determination of hydration from surface tension. H. FREUNDLICH AND A. SCHNELL. *Z. physik. Chem.* **133**, 151-64(1928).—The surface tension of aq. isoamyl alc. solns. contg. sugar or electrolytes at various concns. has been measured. Szyszkowski's equation is valid for the mixed solns. From the results the degrees of hydration of dextrose and sucrose and of a no. of Na and K salts have been calcd. The hydration of the anions corresponds with the lyotropic series. The calcd. values of the hydration are in agreement with those obtained by other workers from partition and solv. data, but for the Na and K cations the values deviate widely from those derived from mobilities; with the anions no such deviation exists.

B. C. A.

Electroosmosis and electrolytic transport of water in solutions of alkali chlorides. J. BABOROVSKÝ AND J. VBLÍŠEK. *Chem. Listy* **22**, 265-7(1928).—Measurements of the proportion of solns. of NaCl, KCl or LiCl transported by one faraday, of the electrolytic transport of water in these solns., of the transport of these salts themselves, and finally of the transport nos. of their cations in normal soln. show that these are linear functions of the concn. in g.-equivs. This confirms the work of Hephurn on other electrolytes (*C. A.* **21**, 202, 1742).

B. C. A.

Dipolar nature of adsorbed gas molecules. A. MAGNUS. *Z. Elektrochem.* **34**, 531-3(1928).—A theoretical discussion, based chiefly upon the behavior of CO_2 and H_2SiO_3 gel, and the Henry and van der Waals equations, leads to the conclusion that adsorbed gases are dipolar.

W. W. STIFLER

Magnetic properties of some substances in the adsorbed phase. S. S. BHATNAGAR, K. N. MATHUR AND P. L. KAPUR. *Indian J. Physics* **3**, 53-66(1928); cf. *C. A.* **22**, 4049.—Fe, Ni, Co and Mn lose their paramagnetism and become diamagnetic when adsorbed on charcoal. Adsorption is not analogous to mixing, but would appear rather as a chem. combination. Adsorption on SiO_2 increases the paramagnetism of Fe slightly.

ALBERT L. HENNE

Adsorption of the alkali metals on a mercury-vacuum interface. R. STEVENSON

BRADLEY. Univ. Leeds. *Phil. Mag.* [7], 6, 775-9(1928).—For the amalgams of the metals Na, K and Cs at low concns. $d\sigma/d(\log a_2)$, in which σ = surface tension, a_2 = activity of the dissolved metal, is const. Values of the surface excess, are in agreement with compd. formation in the surface-layer, roughly to the extent of Na-Hg for Na, rather less for K. Cs atoms alone occupy the surface of Cs amalgams. G. G.

The thickness of adsorbed vapor films. II. G. H. LATHAM. *J. Am. Chem. Soc.* 50, 2987-97(1928); cf. *C. A.* 21, 2585.—Measurements of adsorption by detg. the temp.-vapor pressure curves showed that, on plane surfaces of fire-glazed glass and of Ag covered with Hg, acetonitrile and MeNO_2 were adsorbed in layers only one mol thick. Thus polar compds. do not differ from non-polar ones in this respect (cf. *C. A.* 21, 2585). But if the glass is treated with acid, or if Pt-covered Ag is used, the adsorbed layers are, resp., 30-60 and 28-33 mols. thick, and similar results are obtained with non-polar compds. Conclusion: The glass treated with acid and the Pt covered with Hg do not present plane surfaces and polymol. adsorption occurs only on surfaces that are not plane. DON BROUSE

The phenomenon of molecular-ionic sorption. I. (1) Autosorption, (2) ionic sorption by means of a solution of nonelectrolyte. S. V. GORBACHEV. *Trans. Sci. Chem.-Pharm. Inst. (Moscow)*, 7 30(1925).—A review. J. S. JOFFE

A rapid method for the approximate determination of the sorption isothermals of vapors on charcoal. I. The principle of the method. A. J. ALLMAND AND J. E. MANNING. Univ. of London. *J. Soc. Chem. Ind.* 47, 369-72T(1928).—A complete and satisfactory evaluation of the relative sorbent properties of a set of activated charcoals can be based only on a full knowledge of the courses of their resp. isotherms. A rapid method of measuring adsorption isotherms was devised, based on measuring the rate of evolution of an adsorbed vapor into a current of air at 100° . The retentivity curves (wt of adsorbed vapor retained *versus* time) are similar to those obtained by evacuation of the charcoals. Plotting the slopes of these curves against the vapor contents of the charcoals gives curves bearing a striking resemblance to the isothermals for 25° . By suitable selection of a scale, values for adsorption vs. pressure can be obtained that show general agreement with those detd by direct vacuum method of adsorption measurements. **II. A working description of the simple retentivity test.** A. J. ALLMAND AND L. J. BURRAGE. Univ. of London *Ibid* 47, 372-6T.—A detailed description is given of the app. and method to be used in applying the retentivity test as a means of measuring adsorption on charcoals. The factors affecting the results, such as quantities of charcoal used, rate of air passage and satn. of the charcoal, were studied. R. L. DODGE

Sorption of carbon tetrachloride at low pressures by activated charcoals. Pt. I. Apparatus and method. RUFUS CHAPLIN. *Proc. Roy. Soc. (London)* A121, 344-58 (1928). A detailed description is given of the app. and technic by which the sorption isothermals of CCl_4 vapor on charcoal in the absence of foreign gases were detd. Pressures were measured by a Pirani gage, the calibration and method of use of which are fully described. The pressure range was 1×10^{-4} to 2.3×10^{-4} mm. Hg, pressures being fixed by immersing solid CCl_4 in const. temp. cooling mixts. The 25° isothermal was detd. directly, and a series of isosteres (pressure of CCl_4 as a function of temp. at const. quantity of sorbed material), were measured at higher temp. from which the isotherms at higher temps. could be obtained indirectly. It was noticed that CCl_4 vapor displaced gases from charcoal even after evacuation at 800° and reevacuation at 25° the presence of these gases greatly increased the time required to attain equil. between the charcoal and CCl_4 . Reversible effects were obtained only after the displacement of these gases by a large amt. of CCl_4 and subsequent evacuation. Exptl. results are promised in a subsequent paper. W. WEST

Adsorption of vapor on a quartz or a glass wall. ANDREAS SMITS. *J. Chem. Soc.* 1928, 2952-4. It has been affirmed and denied that adsorption on a plane, unetched, is in multimolecular layers (cf. *C. A.* 19, 3188; 20, 3367; 21, 1576, 2585; 22, 3560, 4299). Expts. with NH_4Br show that a layer 300 mols. thick is required to account for the adsorption. When a container is partly filled with a liquid or solid, mols. leave the liquid or solid phase and attach to the walls until the wall-phase is in equil. with the liquid or solid phase. This may require several layers of mols. As temp. is increased the number of adsorbed layers increases until all liquid or solid disappears. Further heating then decreases the number of adsorbed layers. F. E. BROWN

Adsorption of potassium chromate on zinc. R. F. REED AND S. C. HORNING. Univ. of Cincinnati. *J. Phys. Chem.* 33, 136-7(1929).— K_2CrO_4 reacting on Zn surfaces gives new properties by depositing a compd. of Cr. Studies on the adsorption of K_2CrO_4 on Zn and on the effect on the chem. reactivity of Zn indicate this compd.

acts as a strong poison for Zn catalysts. The compd. deposited is either ZnCrO_4 or K_2CrO_4 .

RAYMOND H. LAMBERT

The interaction of acids and neutral salts with stannic oxide and its relation to electrical charge. BHUPENDRA NATH GHOSH. Univ. Coll., London. *J. Chem. Soc.* 1928, 3027-38.—A study of the interaction of hydrated SnO_2 with electrolytes shows that the adsorption theory offers a better explanation of the observed facts than the chem. theory of insol.-salt formation; i. e., H ions are liberated by displacement from the double layer by the cations in soln. (cf. Mukherjee, *C. A.* 20, 1739). The α -oxide has a greater active surface per unit wt. than the β -oxide. The capacity of the cations for liberating H ions is in the order $\text{Mg} > \text{Ba} > \text{Sr} > \text{Li} > \text{Na} > \text{K}$. H ions are primarily adsorbed and the adsorption of an acid is greater, the less the pos. charge of the surface. The order of adsorption of acids is $\text{H}_2\text{PO}_4 > \text{H}_2\text{SO}_4 > \text{HCl} > \text{HNO}_3 > \text{C}_6\text{H}_5\text{SO}_3\text{H} > \text{CCl}_3\text{COOH}$. The greater the capacity of the anion for diminishing the pos. charge of the surface, the greater is the adsorption of the H ions. In the presence of salts with inactive cations, the adsorption of H ions is increased. Hence, salts with multivalent anions are more effective than those with univalent anions. The active surface varies nearly proportionately with the amt. of substance.

H. F. JOHNSTONE

Notes on dual emulsions, with examples of interest in the spraying of trees. ROWLAND M. WOODMAN. Horticultural Research Sta., Cambridge, Eng. *J. Phys. Chem.* 33, 88-94(1929); cf. *C. A.* 22, 4707.—Observations were made on some dual emulsions at the phase-vol. ratio used in spraying. The examples were petroleum ether-K oleate soln., emulsified in one expt. by vigorous intermittent shaking and in a second by gentle rotational shaking followed by vigorous shaking. Studies were then made with hydroxyl compds. of such types as the insecticide, ovicide, etc., emulsified with a soap soln. Stability of the emulsion depends on previous treatment of the container with one of the phases. The partition coeff. of a system should give valuable information and such studies are therefore being made.

RAYMOND H. LAMBERT

Application of the Fourier function to sedimentation. E. L. LEDERER. *Kolloid-Z.* 46, 173-6(1928).—Formulas were derived and tables calcd. for particle distribution at different levels and for different times during sedimentation of non-coagulating suspensions. The results agree well with Perrin's data. The formulas weaken Burton and Bishop's interpretation of Perrin's expts. The sedimentation equil. of dissimilar, large non-coagulating particles was calcd. for a detd. frequency distribution. L. F. MAREK

Application of the Fourier function to diffusion. E. L. LEDERER. *Kolloid-Z.* 46, 169-73(1928); cf. *C. A.* 22, 1884.—The Fourier function, unaided by other formulas, was used to calc. the diffusion coeff. from diffusion expts. carried out in the customary manner. Tables were calcd. which approx. closely those of Stefan-Kawalki. The coeffs. so detd. are larger than those calcd. from the Stefan-Kawalki tables and have the same value as the true coeff. when calcd. on the basis of other theoretical considerations such as ion mobility. L. F. MAREK

Effect of non-electrolytes on the stability of colloids. II. Ferric hydroxide sol. SUBODH GOBINDA CHAUDHURY AND ASHUTOSH GANGULI. Univ. Coll. of Sci., Calcutta. *J. Phys. Chem.* 32, 1872-4(1928); cf. *C. A.* 22, 4311.—The $\text{Fe}(\text{OH})_3$ sol was prepd. by peptizing freshly prepd. $\text{Fe}(\text{OH})_3$ with FeCl_3 and then dialyzing. MeOH, EtOH and pyridine sensitized the sol independently of the valence of the pptg. ions. Urea sensitized the sol toward KCl and K_2SO_4 ; glycerol sensitized it toward K_2SO_4 and $\text{K}_4\text{Fe}(\text{CN})_6$.

E. G. VAN DEN BOSCH

Ion antagonism in colloidal systems. I. Some rules on the ion effect in the coagulation of hydrophilic sulfur sols. W. A. DORFMAN. *Kolloid-Z.* 46, 186-98(1928).—In the coagulation of hydrophilic S sols opposing effects were noticed between pairs of coagulating ions. H ion was used as the first member of pairs of ions and the degree of antagonism followed the Schulze-Hardy rule. The effects on coagulation of a no. of metal ions paired with H ion were studied, and curves plotted for these combinations. Combinations of MgCl_2 , CaCl_2 and NaCl with HCl show a max. effect only 50% that of HCl . The curve for KCl differed considerably from that for NaCl . Dilm. of the sol decreased the opposing effects of the ions noticeably. The discharge of the sol reduces the degree of hydration. Two factors det. the stability of the colloid: the charge on the sol particle and the degree of hydration. The combined action of these 2 factors det. the degree of ion opposition. II. Influence of the anion on the opposing effect of cations in the coagulation of hydrophilic sulfur sols. *Ibid.* 198-201.—Substitution of H_2SO_4 for HCl caused the opposing effects of cations in the mixt. to increase. This effect was studied for the pairs: H_2SO_4 - NaCl , H_2SO_4 - MgCl_2 , H_2SO_4 - AlCl_3 . The effect of the anion on the pair H_2SO_4 - $\text{Th}(\text{NO}_3)_3$ was very noticeable. The

increase in opposition was noticed only when the anion of the first member of the pair was changed. The change of anion of both members or of the second member only caused a slight decrease in degree of opposition.

L. F. MAREK

Ionic equilibrium in colloidal solutions. H. D. MURRAY. Imperial Coll. of Sci. and Tech., South Kensington. *J. Phys. Chem.* 33, 138-42(1928).—Ionic equil. in colloidal solns. is treated from the standpoint of mass action. Adsorption of electrolyte on the particle surface followed by ionization of the adsorbed electrolyte gives rise to the charge on the particles. Consideration is given to the possibilities of an unsatd. particle surface, of a satd. surface where little change in ionization occurs and of repressed ionization. Stabilizers having an ion in common with the substance of which the particle is composed are most efficient.

RAYMOND H. LAMBERT

The use of tartaric acid in the synthesis of electronegative sols. III. Adsorption of sodium tartrate and sodium succinate by aluminum hydroxide. A. DUMANSKII AND A. YAKOVLEV. *Bull. soc. chim.* 43, 969-77(1928); cf. *C. A.* 22, 4308.—A general method for prepg. negative hydrosols of heavy metal hydroxides is described which is based on the reaction between an acid-alc., an alkali and the hydroxide of a metal. The primary products of varying compn. are transformed slowly into the hydroxide of the metal either as a sol or a gel. Solns. of Na tartrate and succinate of varying strength were shaken with: (1) hydrosol of $Al(OH)_3$ prepd. by the reaction of $Al(NO_3)_3$ & $(NH_4)_2CO_3$; (2) freshly pptd. $Al(OH)_3$; (3) $Al(OH)_3$ four months old. Both salts were adsorbed by the $Al(OH)_3$, but the tartrate was adsorbed more than the succinate; (1) adsorbs more than (2), and (2) more than (3). With concd. solns. (6.5 to 0.8 *N*) there is $Al(OH)_3$ formed, in greatest amt. with (1) and least with (3). The addn. of either salt increases the surface tension of H_2O slightly.

E. G. VAN DEN BOSCHE

The dielectric constants of silver sols when diluted with varying amounts of ethyl alcohol. GEORGE D. ROCK AND SIMON KLOSKEY. Catholic Univ. of Am. *J. Phys. Chem.* 33, 143-7(1929).—Dielec. consts. of $EtOH-H_2O$ mixts. with and without Ag sol suspension were measured by means of high-frequency oscillators of the vacuum-tube type. The app. is described. Dielec. consts. of Ag sols were found to be essentially the same as those of the dispersion media.

RAYMOND H. LAMBERT

The coalescence of an unfilterable precipitate of barium sulfate. H. M. TRIMBLE. Okla. Agr. and Mech. College. *Proc. Oklahoma Acad. Sci., Univ. Oklahoma Bull., New Series No. 409, Studies Series No. 29*, 197(1928).—The coalescence of $BaSO_4$ ppt. on digestion which renders them filterable cannot be explained by growth of large particles at the expense of smaller ones. Apparently there is a collection of particles into larger aggregates, followed by cementation of the unit particles in the aggregates.

RUSSELL C. ERB

The coagulation of highly solvated sols by organic liquids and salts. II. B. JIRGENSONS. *Kolloid-Z.* 46, 114-28(1928); cf. *C. A.* 22, 4312.—The coagulation of casein, hemoglobin and egg albumin sols by $MeOH$, $EtOH$, $PrOH$ and ethyl urethan was studied in the presence of inorg. salts. At low concn. of both the org. liquid and the salt, coagulation in the mixt. is more rapid than in the presence of either the salt or org. liquid alone. At higher concn., i. e., 50% by vol. of $PrOH$ or 0.3 mol./l. of $CaCl_2$, the sols were stabilized. At still higher concn. the sols were coagulated. Glycerol sensitized casein sols to $MgCl_2$ at all concns. Sensitization is considered as caused by dehydration of the micelles and change in dielec. const. of the medium by the org. liquid. Stabilization is due to the peptizing action of the salt.

J. G. McNALLY

Spectrophotometric and cataphoretic experiments on the absorption of methylene blue chloride by gelatin. A. FODOR AND KURT MAYER. *Kolloid-Z.* 46, 201-7(1928).—Qual. expts. by cataphoretic, spectrophotometric and diffusion methods were carried out to discover if adsorption of the dye by gelatin is observable. The cataphoretic expts. indicated that gelatin adsorbs amts. of dye which change the charge on the gelatin at certain concns. Diffusion of the dye in gelatin gels contg. different salts gave rise to ring formation in alk. and neutral conditions but not in acid condition. The spectrographic method showed a significant adsorption at $pH = 4.8$. Quant. expts. were by the diffusion method and an attempt to evaluate the factors influencing the effects observed.

L. F. MAREK

The origin of concentration differences in dissolved substances opposed to the osmotic pressure in gelatin. RUDOLF AUERBACH. *Kolloid-Z.* 46, 321-3(1928).—Physicochem. studies in biology produce examples of concn. differences apparently in opposition to osmotic pressure. Using Congo red dye solns. over gelatin solns., A. attempts to explain this on the basis of the combined action of diffusion and adsorption and graphically illustrates the concn. differences obtained. Future work is intended with other dyes.

L. F. MAREK

A survey of the field of colloidal gels. WO. OSTWALD. *Kolloid-Z.* **46**, 248-67 (1928).—Previous attempts to classify gels are discussed. It is proposed to classify them by method of formation as follows: gels made by (1) lowering the soly., (2) chem. reaction, (3) coagulation, (4) swelling, (5) fermentation, (6) bacterial action, (7) mixing org. substances, (8) geologic processes. There are often many sub-types. Systems related to gels include supercooled melts, supercooled and supersatd. solns, concd. dispersions of solid in fluid, and concd. dispersions of gas in liquid. Distinction is made between lyophilic gels and desolvated gels and examples of each class are given. Phenomena of gelatinization are discussed in detail; the main characteristics of gelatinization are the immobility of the liquid phase with respect to the entire system, and the surface area of the solid phase, the cessation of Brownian movement, progressive sepn. into component parts and flocculation. No general swelling theory can be given because different gels possess different swelling factors. Thermodynamic considerations point to a neg. temp. coeff. of swelling but expt. proves it to be strongly pos. The different ways of destroying gels by drying, crystn., coagulation, liquefaction, etc., are discussed briefly. L. F. MAREK

The constitution and the stable condition of hydrogels. A. SIMON. *Kolloid Z.* **46**, 161-9 (1928).—The double role of the water in a gel is discussed in the light of different theories and expts. Water is present both in the capillary pores of the gel and as water of constitution. Much experimentation has been done on the detn. of the water of constitution with conflicting results. Correctly produced metal hydroxides which are amorphous hold the water by osmotic pressure. Crystn. marks a change from free or osmotically held water toward chemically held water. The primary product of an amorphous metal oxide hydrate changes with time to a crystn. stable compd. which is either an anhydride or a stoichiometric hydrate with the potential energy at a minimum. L. F. MAREK

The behavior of nitrocellulose gels in polarized light. A. J. PHILLIPS. Georgia School of Tech. *J. Phys. Chem.* **33**, 118-30 (1929).—Nitrocellulose gels prepd. in various ways were studied in polarized light under the microscope. The color observed both with crossed nicols and by a gypsum plate together with crossed nicols is tabulated for the many samples examd. The color in polarized light is a function of the dispersion of the nitrocellulose. It is influenced by the proportion of H_2O and the ratio of HNO_3 to H_2SO_4 in the nitrating bath, by treatment to reduce viscosity, by ultra-violet light, by heat and by superheating the water. The degree of nitration is of less importance in this respect than the degree of dispersion. As the latter decreases the color of transmitted light ranges from red to blue. RAYMOND H. LAMBERT

Solubility relationships of lactose-sucrose solutions. I. Lactose-sucrose solubilities at low temperatures. PHILIP N. PETER. U. S. Dept. of Agr. *J. Phys. Chem.* **32**, 1856-64 (1928).—The soly. of lactose in H_2O and in sucrose solns. of varying concn. was detd. at 0° and at -3° . The soly. of lactose was also detd. in glucose solns. The soly. of lactose in nearly satd. sucrose solns. is reduced to about one-half of its value in H_2O . Consequently, in ice cream the H_2O may be greatly supersatd. with respect to lactose. Because of the high viscosity of the medium it may require several weeks or even months for crystn. The presence of lactose has but a slight effect upon the soly. of sucrose. E. G. VAN DEN BOSCHE

Solubility. XI. Solubilities of liquid stannic iodide in several liquid paraffins. MIRIAM E. DICE AND J. H. HILDEBRAND. *J. Am. Chem. Soc.* **50**, 3023-7 (1928); cf. *C. A.* **21**, 1578.—Because of its high internal pressure SnI_4 is incompletely miscible with liquid paraffins. The critical mixing temps. were observed in mixts. contg. increasing mol. fractions of SnI_4 by heating the mixt. in a sealed glass tube. Mol. fraction-temp. curves are plotted for mixts. with *n*-octane, *n*-heptane, *n*-hexane and iso-octane, the maxima of which are the critical mixing temps. Critical mixing temps. agree well with relative internal pressures as calculated by Hildebrand's equation (Hildebrand, "Solubility," Chem. Catalogue Co., New York, 1924, p. 198). The critical mixing temps. probably represent the true order of internal pressures more accurately than heats of vaporization. The order of increasing internal pressure is the same as the order of increasing mol. wt.; *n*-octane is higher in internal pressure than iso-octane. An expression is proposed which fits the liquid-liquid solubility curves. D. B.

Solubility of sodium benzenesulfonate in water and in solutions of sodium sulfate. F. H. RHODES AND A. W. LEWIS. Cornell Univ. *Ind. Eng. Chem.* **20**, 1366-7 (1928).—The soly. of NaO_3SPh in water, in g. of salt per 100 g. of soln. is 26.8, 35.8, 37.4, 38.0, 40.4, 41.9, 45.1, 48.0, 49.4, 51.1, 58.5, resp., at 0° , 30° , 35° , 40° , 45° , 50° , 60° , 70° , 75° , 80° , 105° . A soln. of $5Na_2SO_4 + 95H_2O$ dissolves 32.2 g. sulfonate at 30° , 38.6 g. at 50° and 45.2 g. at 70° . At the same temps., the solubilities in $10Na_2SO_4 + 90H_2O$ are

resp.: 27.7, 34.4 and 42.1; in $20\text{Na}_2\text{SO}_4 + 80\text{H}_2\text{O}$, they are resp.: —, 25.8 and 31.9. At relatively low temp. the salt crystallizing out is the dihydrate. The temp. of transformation of this dihydrate to the anhyd. form is 66.8° , as detd. with a dilatometer.

ALBERT L. HENNE

Note on the ebullioscopic method of molecular-weight determination. HIKOICHI SHIBA AND TOSHIKAZU IMASE. *Bull. Inst. Phys. Chem. Research* (Tokyo) 7, 996-8(1928), *Abstracts* 1, 96.—An improved form of Cottrell's app. was constructed to det. accurately the mol. wt. in soln. The funnel-shaped part was changed to a double wall which always contained the vapor phase to facilitate boiling. The b. p. elevation was measured within 0.001° with a Beckmann thermometer. The mol. wt. of cane sugar was detd. accurately in as little as 2.5 cc. of soln.

ALBERT L. HENNE

The apparent hydration of ions. II. The densities and viscosities of some mixed aqueous solutions of lithium chloride and hydrochloric acid. JOHN W. INGHAM. Heriot-Watt College, Edinburgh. *J. Chem. Soc.* 1928, 2381-8; cf. *C. A.* 22, 4034.—The methods for measuring densities and viscosities were those previously described. The hydration of the ions decreases according to the series Li, Na, K. The decrease in viscosity upon replacing LiCl by HCl is due to the relatively small hydration of H ion. An equation of the type $d = K + k_1a + k_2b$ represents the density data fairly well. In the LiCl-HCl system the greater free space is counterbalanced by the increased hydration of the Li ion.

ARTHUR FLEISCHER

The viscosity of supersaturated solutions. II. I. K. TAIMNI. Univ. College, London. *J. Phys. Chem.* 33, 52-68(1929); cf. *C. A.* 22, 2095.—The effect of change of temp. and concn. on the viscosity of concd. solns. of sucrose, urea, AcNH_2 , citric acid and $\text{Na}_2\text{S}_2\text{O}_7$ in H_2O and of resorcinol, AcNH_2 and urethan in EtOH, and of phenylthiurene and urethan in MePh, in the neighborhood of their resp. soly. temps. was detd. The relations between viscosity and concn. can be represented by 1 of the equations: $\log \eta = \theta c + \phi$, or $\eta = mc + n$, where θ , ϕ , m and n are consts. For the systems, the viscosity may be represented as a function of temp. and concn. $\log \eta' = (kt + k')c$. Here η' is the relative viscosity and k and k' are consts.

H. F. JOHNSTONE

Distribution of ammonia between water and chloroform at 25° . HAROLD G. ETRICH. Yale Univ. *J. Phys. Chem.* 33, 95-8(1929).—The distribution of NH_3 between H_2O and CHCl_3 was detd. at 25° for three stock samples of CHCl_3 . Two of these gave mean coeffs. of distribution of 35.82 and 35.83 m_w/m_c . The third was slightly lower, perhaps because of traces of impurity inhibiting hydrolysis of CHCl_3 . Discrepancies in the coeffs. given in the literature may be due to the same cause.

RAYMOND H. LAMBERT

The ionization of aromatic nitro compounds in liquid ammonia. II. WILLIAM GARNER AND HENRY F. GILLBE. University College, London. *J. Chem. Soc.* (London) 1928, 2889-904; cf. *C. A.* 19, 2588.—The velocity of ionization in solns. of dinitrobenzene and of *m*-dinitrotoluene in liquid NH_3 was found to follow a first-order law, even in those cases where the ionization did not go to completion. The mic concns. were detd. by measuring the extinction coeffs. of the colored solns. The mic concn. at any time was found to be proportional to the cond. The most probable course of the reaction is $\text{R}(\text{NO}_2)_2 + 2\text{NH}_3 \rightleftharpoons \text{R}(\text{NO}_2)_2 \cdot 2\text{NH}_3 \rightleftharpoons \text{R}(\text{NO}_2)_2^{--} + \text{N}_2\text{H}_5^{+}$, the velocity of the reaction being governed by the first step. The color is very probably due to the org. anion $\text{R}(\text{NO}_2)_2^{--}$. The temp. coeff. is that of ordinary chem. reactions. The calcd. crit. increment is 7520 cal. No evidence was obtained of the existence in the solid state of complexes such as $\text{R}(\text{NO}_2)_2 \cdot x\text{NH}_3$.

R. L. DODGE

The average activity coefficients of the hydrogen and bicarbonate ions in potassium chloride and concentrated sodium chloride solutions, and the dissociation constants of several indicators in these solutions. E. GÜNTHERBERG AND E. SCHÖDT. Techn. Hochschule, Kopenhagen. *Z. physik. Chem.* 135, 393-443(1928).—From measurements with the quinhydrone electrode the av. activity coeff. for H^+ and HCO_3^- ions $\sqrt{a_{\text{H}^+}a_{\text{HCO}_3^-}}$ and the apparent first disson. const. of H_2CO_3 , $K_c = C_{\text{H}_2\text{CO}_3}/C_{\text{CO}_2} + C_{\text{HCO}_3^-}$, in 0.1 to 3 *N* KCl and in 3, 4 and 5 *N* NaCl solns. are detd. K_c behaves as the disson. const. of other weak acids; it rises from 3.2×10^{-7} in pure H_2O to about three times as much in *N* KCl and again decreases: in satd. NaCl the value is only about 30% higher than in pure H_2O . The statements of Szyzskowski and Wilke that H_2CO_3 in strong salt solns. is more than 100 times stronger as an acid than in H_2O are erroneous since they have used several of the classical laws applying only to very dil. solns. for the entire transition to very concd. salt solns. without correcting for the change in the soln. medium (e. g., activity coeff.). The disson. const. of Me orange,

bromophenol blue and dimethyl yellow are detd. in the same solns. in which the values for H_2CO_3 were obtained. A characteristic but natural difference in the variation of the acid dissocn. const. of a nonelectrolytic acid, a univalent cation and a bivalent ion in the presence of salts is observed. The av. activity coeff. and dissocn. const. of benzoic acid are measured in 3 *N* KCl and 3, 4 and 5 *N* NaCl. The benzoate ion has an extraordinarily high activity coeff. while HCO_3^- has a very small one. Several observations are made on the "salt-error" in colorimetric p_{H} measurements and the relative magnitudes of ion activity coeffs. in strong uni-univalent salt solns. bearing on the work of Harned and Åkerlöf.

G. L. CLARK

Methods of determination of hydrogen-ion concentration, and applying such methods in sugar manufacture. I. A. KUKHARENKO AND B. G. SAVINOV. *Monograph on the sugar industry* (Russian, with summary in English) 1928, 11-147.—The literature on the electrometric and colorimetric detn. of p_{H} in general, and on the special applications in the sugar industry is reviewed comprehensively. The results obtained are often contradictory, and no definite conclusions can be drawn as yet, but the subject merits intensive methodological study.

F. W. ZERBAN

The behavior of the antimony electrode in buffered and unbuffered solutions. V. G. LAVA AND E. D. HEMEDES. Univ. of the Philippines. *Philippine Agr.* 17, 337-49(1928).—Sb electrodes were tested in buffer solns. of KH_2PO_4 and NaOH and in mixts. of 0.01 *N* NaOH and 0.01 *N* HCl at 26-29°. By use of the equation $E = 0.052 + 0.057 p_{\text{H}}$, the p_{H} of such solns. may be satisfactorily detd. In sugar solns $E = 0.052 + 0.057 p_{\text{H}}$. Since the Sb electrode is mechanically sturdy, cheap, gives quick responses, has a wide range of p_{H} values at which it gives accurate results and requires little care, it is recommended for continuous reading of p_{H} in sugar juice during clarification. The Sb electrode may also be used for centrifugal sugar, molasses and soils. Unexplained errors occur, however, when used for soils.

A. L. MEHRING

p_{H} Measurement with the glass electrode and vacuum tube potentiometer. L. W. ELDER, JR. AND W. H. WRIGHT. Univ. of Ill. *Proc. Nat. Acad. Sci.* 14, 936-9 (1928).—Oxidizing agents, Pt poisons and other substances catalytically decompd. by Pt and for which ordinary H or quinhydrone electrodes are inapplicable may be titrated electrometrically, but only 2 methods are sufficiently reversible and reproducible to serve for p_{H} measurement, i. e., the Sb_2O_3 and glass electrodes. The glass electrode has the wider application but has required a quadrant electrometer, which is affected by atmospheric conditions and involves other difficulties. E. and W. find a vacuum tube potentiometer with Type UX222 tube very satisfactory. The wiring and method of reading are given. Operation is much simpler than with a quadrant electrometer.

A. P. SACHS

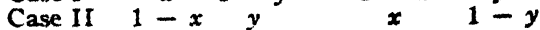
The potential of solutions of glucose. RENE WURMSER AND JEAN GELOSO. Institut de Biologie physicochimique, Paris. *J. chim. phys.* 25, 641-57(1928); cf. *C. A.* 21, 1467; 22, 3343.—The oxidation-reduction potentials of 0.016 *M* glucose solns in the presence or absence of dyes, in 0.1 *M* phosphate buffers at temps. from 40° to 91° and p_{H} range of 6.5 to 11 is expressed by the equation: $E_{\text{H}} = -0.00020 T p_{\text{H}} - 0.00088 T + 0.50 \pm 0.02$. The results confirm previous publications.

A. F.

The new law of mass action. VI. The possibility of exchange of components within the limits of the equation of the new mass-action law. RICHARD LORENZ Frankfurt. *Z. anorg. allgem. Chem.* 175, 257-69(1928); cf. *C. A.* 23, 23.—A complex mathematical analysis is made of the law $[x/(1-x)][(1-y)/y] = Ke^u$,

$$u = (\alpha/RT) \left\{ \frac{x^2 - [(1-x)^2/(1+r)]}{(1+rx)^2} \right\} - (\alpha'/RT) \left\{ \frac{y^2 - [(1-y)^2/(1+r')]}{(1+r'y)^2} \right\},$$

where α and r are the const. a and b of van der Waals' equation. The typical example is



in terms of molar thermodynamic potential.

G. L. CLARK

Keto-enol isomerism and the mechanism of homogeneous reactions. F. O. RICE AND J. J. SULLIVAN. *Trans. Faraday Soc.* 24, 678-82(1928).—The rate of the keto-enol change of acetoacetic ester was detd. The const. for the rate of reaction varied considerably with the particular fraction of enolic distillate used. Acetyl chloride, carbonyl chloride and phthalic anhydride proved to be accelerators rather than stabilizers for the change. The order piperidine, NH_3 , Br, pyridine, quinoline is that of decreasing activity for these substances toward the change. It is suggested that the change takes place through a unimol. mechanism, the enolic form or a complex thereof with the catalyst undergoing a unimol. decompn.

P. H. EMMETT

The behavior of butyl bromide at its transformation. GEORGES DIENGER. Techn. Hochschule Zürich. *Z. physik. Chem.* 136, 93-134(1928).—The velocities of transformation of isobutyl bromide into tertiary butyl bromide and *vice versa* are measured at several temps. from 178.5° to 240°. The discovery of Michael that with respect to the equil. point the velocity of transformation of the tertiary bromide is much too small is substantiated. In the neighborhood of equil. there is a region in which the reaction velocity is too small to detect. This is reached only from the side of the tertiary bromide. G. L. CLARK

Oxidation of ferrous hydroxide in sodium hydroxide solution by means of air. S. MIYAMOTO. *Sci. Papers Inst. Phys. Chem. Research* (Tokyo) 9, 203-8(1928); cf. *C. A.* 22, 3566.—The velocity of the oxidation of Fe(OH)_2 by air is independent of the amt. of Fe(OH)_2 present. The velocity const. is almost the same as for the oxidation of Na_2SO_3 and Sn(OH)_2 under the same conditions. The effect of temp. is slight. NaOH decreases the velocity of oxidation because the velocity of oxidation is nothing but the velocity of solution of O_2 under the given conditions, which is decreased by NaOH. ALBERT L. HENNE

Equilibrium between methanol, carbon monoxide and hydrogen. DAVID F. SMITH AND BRIANT F. BRANTING. Pittsburgh Expt. Sta. *J. Am. Chem. Soc.* 51, 129-39(1929).—The equil. $\text{CH}_3\text{OH}/(\text{CO})(\text{H}_2)^2$ at 1 atm. over ZnO and the 4Zn:1Cr catalyst of Smith and Hawk (*C. A.* 22, 1520) was studied by a direct method giving $K = 5.57 \times 10^{-4}$ at 303.8°, error $\pm 5\%$. From this equil. value and the heat data of S. (*C. A.* 21, 2783), the free-energy change is $\Delta F = -20,857 + 41.17 T \log T - 6,01123 T^2 - 54.42 T$, giving 16,070 Cal. at 700° K. A. S. CARTER

Relationship between velocity of hydrolysis by alkali and structure of esters. H. OLSSON. *Z. physik. Chem.* 133, 233-52(1928); cf. *C. A.* 21, 1581.—A no. of esters have been prep'd. in a pure state and their rates of hydrolysis in presence of alkali measured. The velocity coeffs. of the hydrolysis of some 85 typical esters, given in the literature, have been reduced to the same units and the results compared from the same point of view of structure. The velocity coeff. is mainly influenced by the strength of the acid component of the ester, but in other cases steric hindrance influences the locity in the opposite sense. It may be that these 2 influences are manifestations one fundamental property, *viz.*, the force of dissoen. of the sep. components. B. C. A.

Homogeneous catalysis. C. N. HINSHELWOOD. *Trans. Faraday Soc.* 24, 552-9(1928).—The present status of our knowledge of the mechanism of activation in homogeneous, uni-, bi- and tri-mol. reactions is outlined. In 87 papers dealing with the effect of traces of moisture upon reaction rate the oxidation of NO by O_2 is the only homogeneous gaseous reaction proceeding at a reasonable rate that is affected by moisture. Even in this case there is exptl. uncertainty. It is suggested that water vapor influences the rate of reaction only in that type of homogeneous gaseous reaction that may be termed "uncontrollable," in which the rate is either zero or immeasurably great. A summary of the influence of foreign gases on homogeneous gaseous reactions indicates that the effect depends upon the sp. transfer of energy from mols. of the reactants to those of the inert gas. P. H. EMMETT

Some problems in homogeneous catalysis. T. M. LOWERY. *Trans. Faraday Soc.* 24, 545-51(1928).—A review of modern theories of homogeneous catalysis and an outline of the problems now being attacked by various workers. P. H. EMMETT

Investigations of salt action in homogeneous catalysis. HERBERT S. HARNED AND GOSTA ÅKERLÖF. *Trans. Faraday Soc.* 24, 666-78(1928); cf. *C. A.* 22, 715.—It is futile to try to use the individual ion activity coeff. of the catalyst ion. If the catalyst is a weak electrolyte whose dissoen. const. is known, the primary and secondary salt effects can be conveniently sep'd. Study of the primary salt effect in more than 6 reactions fails to reveal any simple generalization. The distribution of the effects of the salts is different in each reaction. The addn. of a salt in acid catalysis usually tends to increase the reaction velocity while in hydroxide catalysis the reverse is usually, but not always the case. Data are presented for the numerous systems in which the primary salt effect was studied. P. H. EMMETT

Acid and salt effects in catalyzed reactions. XVII. Variation of the catalytic activity of an acid with its concentration and the determination of ionization constants. HARRY M. DAWSON, GEORGE V. HALL AND ARTHUR KEY. *J. Chem. Soc.* 1928, 2844-53; cf. *C. A.* 22, 3338, 3339, 4333.—"The catalytic effects produced by propionic, acetic, succinic, β -chloropropionic, glycolic and chloroacetic acids have been studied with reference to the variation of the catalyzing power with the concn. It is shown that the connection between the reaction velocity and the concn. affords a means

of detg. the ionization const. of the acid as well as the catalytic activity of the undissocd. acid. The ionization const. derived from the catalytic data are in close agreement with those afforded by the elec. cond. of dil. solns. of the acids. In general, the catalytic activity of the undissocd. acid increases with the ionization const. The relation between the catalytically detd. const. K and the thermodynamic const. K_a is considered in reference to the various factors which affect the value of K under the conditions which obtain in the exptl. detns."

P. H. EMMETT

Catalytic effects of acids and bases and the influence of inert salts. H. M. DAWSON. *Trans. Faraday Soc.* 24, 640-51(1928); cf. *C. A.* 22, 3338, 4333.—Recent investigations have shown that the catalytic effects produced by acids cannot be interpreted in terms of H ions, OH ions, H_2O mols. and inert salt effects alone. The activity both of the unionized acid and of the acid anion must be taken into account. In general the entire catalytic relations in acid salt mixts. can be represented by a series of juxtaposed catenaries, the combination of which gives rise to a catenary surface in space defined by coördinates which correspond, resp., with reaction velocity, H-ion concn. and concn. of the catalyzing acid. There are 2 distinct effects involved in the action of the catalytically inert salts, (1) an increase in the activity of the H ion and (2) a change in the ionization const. of the acid. The first of these effects increases continuously with the salt concn., while the ionization const. increases to a max. value and then decreases. Catalytically inert salts do not, however, affect the nature of the relations which find expression in the sym. catenary curves as applied to weak acids.

P. H. EMMETT

The theory of acid and basic catalysis. J. N. BRØNSTED. *Trans. Faraday Soc.* 24, 630-40(1928); cf. *C. A.* 22, 4323, 4334.—The way in which recent studies have altered and extended the original Arrhenius interpretation of acid and basic catalysis is reviewed and B.'s comprehensive theory is presented. It rests fundamentally upon the definition of an acid as a compd. which can lose a proton, and of a base as a compd. which can add a proton.

P. H. EMMETT

The kinetics of acid and basic catalysis. ANTON SKRABAL. *Trans. Faraday Soc.* 24, 687-96(1928); cf. *C. A.* 21, 3798.—From the kinetic point of view 2 types of unstable intermediate compds. can be postulated: the Arrhenius type, which is in chem. equil. with the initial materials in that the rate of decompn. is slow compared to the rate of formation of the intermediate, and the "van't Hoff type," which is not controlled by this equil. and in which the rate of decompn. of the intermediate is high compared to its rate of formation. The intermediate complexes postulated by Lowry's theory are of the van't Hoff type.

P. H. EMMETT

Determination of the catalytic coefficient of the hydroxyl ion in the mutarotation of glucose and lactose. THOMAS M. LOWRY AND GORDON L. WILSON. *Trans. Faraday Soc.* 24, 683-7(1928); cf. *C. A.* 22, 722.—The catalytic coeffs. of OH ion in the mutarotation of glucose, lactose and tetramethylglucose were found to be 8000, 5000 and 1600, resp. "The wide variation in the value of this const. in sugars which are so closely related to one another, and which undergo mutarotation with very similar velocities in water is a noteworthy result of the research."

P. H. EMMETT

Ionization in chemical change. N. R. DHAR. *Trans. Faraday Soc.* 24, 565-7(1928); cf. *C. A.* 12, 111; 15, 2028; 16, 1691; 18, 3520.—The ions and electrons shown by various authors to be formed by exothermal chem. reactions are suggested by D. as activators for the reacting constituents in 4 types of chem. change (1) induced reactions—as in the reduction of $HgCl_2$ by $H_2C_2O_4$ in the presence but not in the absence of a drop of $KMnO_4$, (2) influence of moisture on chem. change—the water vapor tending to form clusters with the electrons and ions thus decreasing the chemiluminescence and after-glow of gases and (4) abnormal photochem. yields, the decompn. of H_2O_2 and of HCl being given as examples.

P. H. EMMETT

The influence of nitrogen peroxide on the union of hydrogen and oxygen. A problem of "trace catalysis." C. H. GIBSON AND C. N. HINSHELWOOD. *Trans. Faraday Soc.* 24, 559-62(1928).—The effect of small quantities of NO_2 on the homogeneous combination of H_2 and O_2 between 352° and 421° was investigated by a static method, porcelain reaction vessels being used. Between 372° and 421° , with pressures of H_2 and O_2 , resp., 440 mm. and 200 mm., no reaction occurs if the partial pressure of NO_2 is less than 0.17 mm. or greater than a value varying from 0.83 at 370° to 3.3 or more at 421° . Within this range of partial pressure of NO_2 the mixt. explodes. The curves for max. and min. partial pressure of NO_2 appear to intersect at about 350° and partial pressure of about 0.5 mm. of NO_2 . The action of the NO_2 is believed analogous to that of a "detonator" in that some reaction between NO_2 and one of the reacting gases is either sufficient or insufficient to initiate the explosion of H_2 and O_2 .

The exact nature of this reaction of NO_2 is not known. Possible analogy may exist between this detonator effect and the effect of traces of water vapor on such actions as the formation of NH_4Cl from NH_3 and HCl .

P. H. EMMETT

Compounds between catalysts and substrates and their reactivity. H. V. EULER. *Trans. Faraday Soc.* 24, 651-62(1928); cf. *C. A.* 20, 3739; 22, 717.—A theory of the hydrolysis of esters postulating the formation of compds. between catalysts and substrates is presented. The expression for the rate of reaction contains 2 consts., K , the dissocn. const. of the substrate and rq the reaction velocity const. of the substrate ion. The theory, in contrast to the "shock theory" of catalysis in solns., introduces chem. criteria for the possibility of salt formation between catalytic acid and substrate. No case has been found in which the supposition of salt formation between substrate and acid or basic catalyst contradicts chem. experience. The possibility of enzyme action occurring through the formation of an enzyme-substrate complex is pointed out and calcs. are made for the value of rq of the substrate enzyme complex.

P. H. EMMETT

Negative catalysis in slow and induced reactions. N. R. DHAR. *Trans. Faraday Soc.* 24, 567-70(1928); cf. *C. A.* 19, 2590; 22, 3539.—The application of the principles of neg. catalysis to the preservation of oils, turpentine, Na sulfite, etc., and to the prevention of *photooxidation of rubber, wood, paper, etc.*, have been successfully tried. Explanations of induced thermal oxidations and photochem. reactions on a basis of activation by ions formed in the exothermic reactions are discussed. Christiansen's concept of chain reactions to explain neg. catalysis is deemed unnecessary.

P. H. EMMETT

The catalytic activity of hydrogen ions in ethyl alcohol. HEINRICH GOLDSCHMIDT. *Trans. Faraday Soc.* 24, 662-6(1928); cf. *C. A.* 22, 1891.—A study of the rate at which esters are formed in EtOH by acetic, phenylacetic, normal butyric and isovaleric acids, using as catalysts picric acid, trinitro-*m*-cresol, trichloroacetic acid and trichlorobutyric acid led to the conclusion that "the H-ion concn. is not the only decisive factor in the catalytic effect of acids in EtOH."

P. H. EMMETT

Phosphorescence and autocatalysis during slow combustion. F. GILL, E. W. J. MARPLES AND H. C. TERR. *Trans. Faraday Soc.* 24, 574-87(1928).—The temp. at which phosphorescence and chem. change appear during the slow combustion of mixts. of air with CS_2 , Et_2O , AcH , amylene, or hexane was studied exptly. CS_2 was unique in that the rate of combustion decreased when the partial pressure of CS_2 in the mixt. increased. Autoxidation of C_6H_6 , CH_4 , EtOH , etc., took place when these vapors were added to the mixt. of air and CS_2 or of air and ether. PbEt_4 , iron carbonyl, I, C_2H_4 and numerous other materials acted as inhibitors in each of the above gas mixts. The results suggest that peroxidation, occurring at the interface of nuclear particles, is directly responsible for phosphorescence, for autocatalysis and for *detonation* in the internal-combustion engine. Inhibitors, by reacting with the peroxides primarily formed, remove their active O and energy and thus destroy the positive catalyst of combustion and the cause of phosphorescence and detonation. The marked action of PbEt_4 and of iron carbonyl in contrast to AcH in inhibiting the combustion of hexane leads to the conclusion that the phosphorescence in the case of the hexane is due to formation of peroxides of hexane and not to the intermediate formation of aldehydes. The insertion of metal foils in the glow seemed to conc. the latter on the surface of the metal and at the same time increase the temp. to which the mixt. had to be heated to enable it to undergo self-ignition. This inhibitory action of metals is in accord with the view that organo-metallic compds., such as PbEt_4 , owe their efficacy to the colloidal metal formed by thermal decompn. at the surface of nuclear particles.

P. H. EMMETT

Catalytic phenomena in the tautomerism of certain α -diketones. HENRI MOUREU. *Trans. Faraday Soc.* 24, 562-4(1928); cf. *C. A.* 22, 1341, 3155.—The activity of alk. catalysts including KOH, diethylamine, piperidine, pyridine, quinoline, etc., toward the tautomeric transformation from A to B form of methylbenzylglyoxal and of phenylbenzylglyoxal was detd. Glass was found to be a sufficiently good catalyst to transform 40% of the Me compd. from A to B form in less than an hour, while the phenyl compd. changes completely to equil. by mere distn. *in vacuo*. Quartz manifested no catalytic activity toward the transformation. Detns. of the equil. in the liquid phase at 100° showed 64% of the enolic form A, and 36% of the ketonic form B for the Me compd., while at 70° the values were 71 and 29%, resp. The catalytic transformation probably involves the formation of an intermediate compd.

P. H. EMMETT

Interaction between nitrogen trichloride and nitric oxide—reactions of compounds with odd electrons. WILLIAM A. NOYES. Univ. of Illinois. *J. Am. Chem. Soc.* 50,

2902-10(1928).—At 0°, the action of NO on NCl₃ in CHCl₃ + CCl₄ is chiefly that of catalytic decompn. of NCl₃; at -20°, about 1/4 of NCl₃ is converted into N₂O + Cl₂; at -80°, the reaction is chiefly NCl₃ + 2NO = N₂O + NOCl + Cl₂. Attempts to isolate NCl₃, which is considered an intermediate product, were unsuccessful. In petroleum ether at -130° to -140°, the reaction is NCl₃ + NO = N₂O + 1/2 Cl₂. The HCl formed by the action of NCl₃ on petroleum ether catalyzes the reaction NOCl + NCl₃ = N₂O + 2Cl₂. The structure of N₂O is probably $\ddot{O}:\overset{+}{N}::\overset{-}{N}:$, the bond between O and N being semipolar.

DAVID DAVIDSON

Kinetics of nitrous acid. V. Kinetics of the nitrous acid-nitric acid-nitric oxide reaction. E. ABEL, H. SCHMID AND S. BABAD. Techn. Hochschule Wien. *Z. physik. Chem.* 136, 419-29(1928); cf. *C. A.* 22, 4329.—The complete velocity equation for the decompn. or the formation of HNO₂: $\pm d(\text{HNO}_2)/dt = \pm k_1(\text{HNO}_2)^4/p^2_{\text{NO}} \mp k_2(\text{HNO}_2)(\text{H}^+)(\text{NO}_3^-)$, was verified. The HNO₂, in the directions of its decompn. and formation has a neg. or pos. role, and otherwise is a negative autocatalyst. The latter action is in spite of the high potential with which HNO₂ acts as an anticatalyst. The values of k_1 and k_2 obtained in the formation and decompn. reactions are in satisfactory agreement. VI. Equilibrium of the nitrous acid-nitric acid-nitric oxide reaction together with its kinetics. E. ABEL AND H. SCHMID. *Ibid* 430-6.—The equil. const. K_e for the HNO₂-HNO₃-NO reaction, as detd. from the forward and reverse reactions, is defined by the relation: $(\text{H}^+)(\text{NO}_3^-)p^2_{\text{NO}}/(\text{HNO}_2)^3$. The thermodynamic equil. const. $K = (a_{\text{H}} \cdot a_{\text{NO}_3} \cdot p^2_{\text{NO}})/a^3_{\text{HNO}_2} = 29$ at 25°C. was obtained, in which a represents the activity of the ion in question. From this equation, the activity coeff. of HNO₂ was calcd. With the activity coeffs. the equil. equation becomes: $\pm d(\text{HNO}_2)/dt = (\pm k'_1 a^3_{\text{HNO}_2}/p^2_{\text{NO}} \mp k'_2 a_{\text{H}} a_{\text{NO}_3})(\text{HNO}_2)$, where $k'_1 = 46$ and $k'_2 = 1.6$ at 25° and the concns. are in moles/l., the pressure in atms., and the time in mins.

J. H. PERRY

Reaction between nitric oxide and hydrogen sulfide. J. A. PIERCE. Johns Hopkins Univ. *J. Phys. Chem.* 33, 22-36(1929).—The reaction between NO and H₂S was studied in a glass chamber at temps. between 28° and 100°. The velocity of reaction was slowest when no catalyst was used. Silica gel or glass wool accelerated the reaction about equally. The mechanism of the reaction is as follows: 2 mols. of NO associate to form N₂O₂. When H₂S impinges upon N₂O₂ adsorbed by the catalyst or by the walls of the contg. vessel, S, N₂ and H₂O are formed. The H₂S is adsorbed by the colloidal S and oriented so that its H ion extends outward from the surface. Accumulation of colloidal S inhibits the reaction, apparently by coating the catalyst. P. believes that the glass in the reaction chamber was acted upon by H₂O and H₂S to form amorphous SiO₂, which acted as a catalyst even in the absence of added SiO₂ gel or glass wool.

LOUISE KELLEY

The conversion of thiosulfuric acid to polythionic acids with the help of catalysts. A. KURTENACKER AND A. CZERNOTZKY. Techn. Hochschule, Brünn. *Z. anorg. allgem. Chem.* 175, 367-82(1928).—Detailed expts. are made on the effects of arsenite, arsenate, SbCl₃, SnCl₄ and Mo^{VI}, W^{VI}, Hg^{II}, Pb and Bi on the conversion of thiosulfate to polythionate. Only salts of those metals which belong to the group of thio acids, and which form thio or thiooxy salts assist in the decompn. of thiosulfates in the direction of polythionate formation. The results of Bassett and Durrant (cf. *C. A.* 21, 3844) are confirmed.

G. L. CLARK

Inhibition in chemical reactions. ERIC K. RIDEAL. *Trans. Faraday Soc.* 24, 571-4(1928).—The mechanism of inhibitor action in the 2 types of chain reactions, namely the "atom chain" of Nernst, and the "activated product chain" of Christiansen, is discussed. The inhibitors function on the first type of chain by acting as atom acceptors, and on the second by deactivation of the active products formed in a given reaction. Ions may function in chain reactions either by initiating chains through the energy evolved on recombination, or by forming clusters capable of undergoing reaction. The latter possibility is well illustrated by the fact that at. H reducing CuO does not induce reduction by mol. H₂, whereas if H⁺ is present, 3 hydrogens react, presumably an H₃⁺ cluster.

P. H. EMMETT

The inhibitive action of alcohols on the oxidation of sodium sulfite. HUBERT N. ALYEA AND HANS L. J. BÄCKSTRÖM. Princeton Univ. *J. Am. Chem. Soc.* 51, 90-109(1929); cf. *C. A.* 21, 2835; 22, 717.—The oxidation of Na₂SO₃ was studied in the presence of isopropyl, secondary butyl, and benzyl alcs. at 21 ± 0.5°. The chain length of the sulfite oxidation was the same for the thermal and photochem. reactions; the breaking of a chain induced the oxidation of two alc. mols. With increasing concn. of alc. the rate of oxidation of alc. increased until a concn. was reached

bove which the rate was const. In mixts. of alcs., each one was oxidized in proportion to its concn. and relative inhibitory power. This did not hold for hydroquinone-*lc.* mixts. where most of the chains were broken by the hydroquinone. The presence of Cu accelerates the thermal reaction without altering the ratio of sulfite oxidized to alc. oxidized. *Isopropyl and secondary butyl alcs.* were purified by refluxing several liters with 2 g. of *p*-nitrophenylhydrazine and fractionating in an atm. of N₂. Methods for the colorimetric detn. of acetone, ethyl methyl ketone and benzaldehyde are described.

ARTHUR FLEISCHER

Definition of "area" in contact catalysis. F. P. BOWDEN. *Nature* 122, 647-8 (1928).—The methods for detg. the surfaces of contact catalysts are (1) the electrolytic method, and (2) the surface oxide method. The former (cf. *C. A.* 22, 4045) gives the area accessible to H ions in soln. and may be termed the "accessible" area. The second method is that developed by Constable (cf. *C. A.* 22, 4335) and is the area of metal catalysts deduced by observing the formation of surface oxide films many mols. in thickness. The area found by method (2) for an activated Ni catalyst is 1.3 to 4.5 times the apparent area. By method (1) the accessible area of rolled metal may be from 2 to 5 times its apparent area, for sand-papered metal 10 times, and for Ni after activation by alternating oxidation and reduction—46 times its apparent area.

P. H. EMMETT

Theory of wall reactions. M. PÓLÁNYI. *Chem. Rund. Mitteleuropa Balkan* 4, 160 (1927).—For the sp. case of the catalytic acceleration of the formation of diatomic from monatomic H at glass walls Frenkel's relation $q = 15T$ g.-cal., where q is the adsorption potential, is applied. The av. value of q for moist glass is 1500-4000 g.-cal., for dry glass and quartz > 4500 g.-cal., and for metal 40,000 g.-cal.

B. C. A.

The catalytic activity of metallized silica gels. V. The oxidation of ethylene. I. H. REYERSON AND L. E. SWEARINGEN. *J. Am. Chem. Soc.* 50, 2872-8 (1928); cf. *C. A.* 22, 1520.—Mixts. of C₂H₄, O₂ and N₂ were passed at temps. from about 100° to 500° and varying rates of flow over SiO₂ gel metallized with Ag, Au, Pt or Pd. The products of oxidation were CO₂ and water. In no case did the tests show the presence of intermediate products of oxidation. The catalysts were effective at lower temps. than previously reported, Cu, Pt and Pd beginning to be effective at about 100°. Ag appeared to be less effective. It is suggested that collisions of C₂H₄ mols. with O₂ mols. which are adsorbed and activated by the effective catalyst centers, result in a reaction, whereas collisions of O₂ mols. with adsorbed C₂H₄ mols. are ineffective.

DON BROUSE

Ceria-thoria catalysts. A. B. GOGGS. *J. Chem. Soc.* 1928, 2667-9.—The influence of mixed Ce₂O₃-ThO₂ catalysts on the combustion of CO was studied. The rate of formation of CO₂ attains a max. with mixts. contg. 0.96% Ce₂O₃. The catalyst found by Swan most effective for the oxidation of H₂ is therefore the most efficient for the oxidation of CO also.

ALBERT L. HENNE

Catalytic decomposition of sodium hypochlorite solutions. II. Iron oxide as promoter in the copper oxide catalysis of sodium hypochlorite. JOHN R. LEWIS. Univ. of Wisconsin. *J. Phys. Chem.* 32, 1808-19 (1928); cf. *C. A.* 22, 1522.—The mixed oxides were obtained by adding NaClO soln. to a known amt. of a mixt. of FeCl₃ and CuCl₂, the fixed alkali present in the former reacting to give the hydrated oxides of Fe and Cu. The results show that the most effective mixt. of catalyst and promoter is about 1 mg. atom of Cu to 1 mg. atom of Fe. The temp. coeff. is low for the unpromoted reaction, but normal for the promoted reaction. The function of the promoter, acting as a support for the catalyst, is to stabilize the catalyst by preventing the destruction of the active centers. The rate of reaction is proportional to the concn. of catalyst present.

E. G. VAN DEN BOSCHE

The synthesis of water with a silver catalyst. II. Energy of activation and mechanism. ARTHUR F. BENTON AND JOSEPH C. ELGIN. Univ. of Va. *J. Am. Chem. Soc.* 51, 7-18 (1929); cf. *C. A.* 21, 691.—An earlier study of the rate of combination of H₂ and O₂ in contact with a Ag catalyst was in part repeated at 110° and 100°. Measurements of the adsorption of H₂, O₂ and H₂O by the catalyst were made at 110° and 100°. H₂ was not measurably adsorbed. O₂ was strongly adsorbed, the amt. being nearly independent of temp. and pressure. The effective surface area of the catalyst was calcd. from the O₂ adsorption, on the assumption that the latter represents a monatomic layer. Kinetic adsorption expts. on H₂O vapor showed some adsorption of H₂O from a current of H₂, but much more from a current of O₂. A Langmuir adsorption isotherm fits the results for adsorption of H₂O. From this equation the fraction of the surface free from adsorbed H₂O during catalysis was calcd. The rate of the reaction 2H₂ + O₂ → 2H₂O was found by measurement to be independent

of the O_2 pressure, but proportional to the H_2 pressure and to the fraction of the surface free from adsorbed water. The energy of activation calcd. from the temp. coeff. was 16,000 cal. \pm 1000. The rate of reaction measured agrees with that calcd. on the hypothesis that the reaction results from every collision of gaseous H_2 with "dry" adsorbed O_2 in which the total energy available on collision exceeds 16,400 cal.

R. L. DODGE

Studies of copper catalysts prepared from precipitated hydroxides. I. Activity as a function of the temperature of precipitation. PER K. FROLICH, M. R. FENSKE AND D. QUIGGLE. Mass. Inst. Tech. *J. Am. Chem. Soc.* 51, 61-5(1929); cf. *C. A.* 22, 3338.—The activity for the decompn. of CH_3OH of Cu catalysts prepd. from the NH_3 pptd. hydrates varied markedly with the temp. of pptn. A max. in activity was observed with catalysts pptd. at about 22°. X-ray examn. of the dried gels before reduction indicated that the activity was assocd. with small particle size. The max. of the activity curve may have been the result of 2 opposing factors, (1) the tendency for the initial particle size to decrease with decreasing temp. of pptn.; and (2) the tendency for the initially formed particles to grow while drying at 110°. II. Comparison of sodium hydroxide and ammonia as a precipitating agent. PER K. FROLICH, M. R. FENSKE, L. R. PERRY AND N. L. HURD. Mass. Inst. Tech. *Ibid* 187-93(1929). Cu catalysts prepd. by pptn. with NaOH are more active in the decompn. of CH_3OH than those pptd. with NH_3 . The difference is due to promoter action of the occluded Na salts. The NaOH-pptd. catalysts, like other promoted Cu catalysts, favor $HCOOCH_3$, rather than $HCOOH$ production from CH_3OH .

R. L. DODGE

Catalysts for the formation of alcohols from carbon monoxide and hydrogen. III. X-ray examination of methanol catalysts composed of copper and zinc. PER K. FROLICH, R. L. DAVIDSON AND M. R. FENSKE. Mass. Inst. Tech. *Ind. Eng. Chem.* 21, 109-11(1929); cf. *C. A.* 22, 3338; 23, 816.—Catalysts composed of Cu and Zn in various proportions, made by co-pptn. of the hydrates, dehydration of the gel and reduction with CH_3OH vapor at 200-220°, were examd. by x-rays. The details of the expts. will be reported elsewhere by Aborn. The results show that at every compn. the catalyst is decidedly cryst., possessing the characteristic crystal structure of the 2 components, Cu and ZnO. However, the unit-cell sizes of each are markedly influenced by the presence of the other. Correlation of these dimensions with measurements of the decompn. of CH_3OH points to a definite relation between the sp. catalytic effect (as indicated by the character of the product) and the distance between the atoms of the 2 components. ZnO, ordinarily considered a non-reducible compd., undoubtedly is partly reduced in the presence of CuO.

R. L. DODGE

The graphical representation of a four-component system. H. v. PHILLIPS-BORN Tonind. *Zig.* 53, 45-8(1929).—A projection of the usual tetrahedron on a square or on 2 adjacent equilateral triangles will allow any 4-component cement to be represented by a line joining 2 points. Examples are given.

F. O. A

The determination of vapor and liquid compositions in binary systems. I. Methanol-water. J. B. FERGUSON AND W. S. FUNNELL. *J. Phys. Chem.* 33, 1-8(1929). By means of a new type of app. which consisted entirely of glass the total and partial pressures of the system CH_3OH-H_2O were measured at 39.90°. The data were obtained from 3 sets of observations, viz., the wt. of the liquid of known compn. first introduced, the pressure of the system at equil., and the wt. of a known vol. of the vapor. The results, together with those of former investigators, were critically examined by means of Miller's abacus (cf. *C. A.* 19, 3413).

H. F. JOHNSTONE

The diagram of state of the system silver nitrate-cesium nitrate. A. P. PALKIN. *J. Russ. Phys.-Chem. Soc.* 60, 317-20(1928).—M. ps. were detd. from cooling curves, other transition points from heating curves. Temp. was measured with a registering pyrometer. $AgNO_3$ m. 208°; a polymorphic transformation occurs at 159° (for $CsNO_3$ at 151°). There are eutectics at 168.5° (82.5% $AgNO_3$) and 163° (67.5% $AgNO_3$). The liquidus curve exhibits a max. at 75% $AgNO_3$ and 171.5°; at 173° and 52.5% $AgNO_3$ there is a sharp break, beyond which the curve rises smoothly towards the m. p. of $CsNO_3$. There is thus evidence for the existence of the compds. $AgNO_3.CsNO_3$ (vitreous mass crystg. 172-2.5°) and $3AgNO_3.CsNO_3$ (elongated prisms). The system $AgNO_3-3AgNO_3.CsNO_3$ is a binary alloy with a eutectic at 168.5°. Polymorphic transformation was traced up to 80% $AgNO_3$. No solid solns. exist. The system $3AgNO_3.CsNO_3-CsNO_3$ contains the compd. $AgNO_3.CsNO_3$ decompg. above 173°. Solid solns. are again absent. The formula $Ag_3[Cs(NO_3)_4]$ is proposed for the double salt.

B. SOYENKOFF

The equilibrium diagram for the system sodium thiosulfate + sodium chloride + water at 255°. V. P. RADISHCHEV. *J. Russ. Phys.-Chem. Soc.* 60, 821-4(1928).—The

satd. solns. were dried at 105° , weighed and titrated for $\text{Na}_2\text{S}_2\text{O}_4$. The soly. of NaCl at $25^\circ \pm 0.1^\circ$ in H_2O was 26.45% by wt., that of $\text{Na}_2\text{S}_2\text{O}_4$ 43.10%. At the mutual satn. point, 9.86% NaCl and 32.98% $\text{Na}_2\text{S}_2\text{O}_4$ were found. The soly. isotherm consists of 2 rectilinear branches meeting at the above point. Conclusion: $\text{Na}_2\text{S}_2\text{O}_4 \cdot 5\text{H}_2\text{O}$ is not dehydrated by the addn. of NaCl at 25° . B. SOYENKOFF

A phase-rule investigation of cupric bromide in aqueous and hydrobromic acid solutions. SYDNEY R. CARTER AND NORMAN J. L. MEGSON. Univ. of Birmingham. *J. Chem. Soc.* 1928, 2954-67.—The soly. curve of the system $\text{CuBr}_2\text{-H}_2\text{O}$ over the range 0° to 50° indicates the presence of one or the other of the 2 solid phases, $\text{CuBr}_2 \cdot 4\text{H}_2\text{O}$ and CuBr_2 . Below $18.0 \pm 0.05^\circ$, $\text{CuBr}_2 \cdot 4\text{H}_2\text{O}$ is stable; above that temp. CuBr_2 is stable. The soly. of CuBr_2 is about 1030 g. per l. and there is but little variation from 0° to 50° . The density, d_{40}^{25} , for the satd. soln. = 1.84. The soly. of $\text{CuBr}_2 \cdot 4\text{H}_2\text{O}$ is less than that of CuBr_2 , below 18° , and decreases to about 1000 g. per l. at 0° . The soly. curves for the system $\text{CuBr}_2\text{-HBr-H}_2\text{O}$ at 25° indicate only 1 solid phase, CuBr_2 , but it has 2 forms the α , rhomboidal crystals and the β non-cryst. The break between the 2 forms occurs at 26% HBr . A metastable portion of the system has as its solid phase at 25° , a compd. whose probable formula is $3\text{CuBr}_2 \cdot 2\text{HBr} \cdot 6\text{H}_2\text{O}$. At 0° the soly. curve for the system $\text{CuBr}_2\text{-HBr-H}_2\text{O}$ shows a break corresponding to the 2 stable phases $\text{CuBr}_2 \cdot 4\text{H}_2\text{O}$ and $\beta\text{-CuBr}_2$. No indications of the compd. $\text{CuBr}_2 \cdot 2\text{H}_2\text{O}$ were found. At high acid concns. the solns. are violet and $\beta\text{-CuBr}_2$ is present at both 25° and at 0° . As the concn. of HBr decreases the color changes to brown and $\alpha\text{-CuBr}_2$ is present at 25° and $\text{CuBr}_2 \cdot 4\text{H}_2\text{O}$ is present at 0° . F. E. BROWN

System: beryllium oxide silicon dioxide. F. MACHATSCHKEI. *Z. physik. Chem.* 133, 253-62(1928).—Comparison of the Debye-Scherrer diagrams given by mixts. of BeO and SiO_2 in proportions corresponding with the ortho- and metasilicates indicates the existence, at temps. between 1000° and the m. p., of the orthosilicate phenacite. Both molten phenacite and molten mixts. of the 2 oxides yield when cooled rapidly cryst. BeO and a glass contg. BeO ; Be metasilicate cannot be obtained by this method and is probably not stable in the cryst. condition. B. C. A.

Equilibrium in the systems: zinc sulfate-sodium sulfate-water at 0° and 25° ; manganese sulfate-sodium sulfate-water at 0° , 25° , and 35° and cobalt sulfate-potassium sulfate water at 25° . ROBERT M. CAVEN AND WM. JOHNSTON. Royal Tech. Coll., Glasgow. *J. Chem. Soc.* 1928, 2506-14; cf. *C. A.* 18, 3329; 21, 523.—At 25° $\text{ZnSO}_4\text{-Na}_2\text{SO}_4 \cdot 4\text{H}_2\text{O}$ forms, but at 0° it does not. The soly. of Na_2SO_4 is increased by ZnSO_4 , while the soly. of ZnSO_4 is decreased by Na_2SO_4 . At 25° and 35° $\text{MnSO}_4\text{-Na}_2\text{SO}_4 \cdot 2\text{H}_2\text{O}$ forms but not at 0° . The soly. of MnSO_4 is decreased by Na_2SO_4 . At 0° the solid phase is the heptahydrate, at 25° the tetrahydrate, and at 35° the monohydrate. At 0° and 25° the soly. of Na_2SO_4 is increased while at 35° it is decreased, the solid phase being anhyd. Na_2SO_4 . At 25° $\text{CoSO}_4\text{-K}_2\text{SO}_4 \cdot 6\text{H}_2\text{O}$ forms. The soly. of each salt is increased by the other. ARTHUR FLEISCHER

Decomposition pressure of nitrides. RICHARD LORENZ AND JAMES WOOLCOCK. Univ. of Frankfurt. *Z. anorg. allgem. Chem.* 176, 289-304(1928).—A short-circuit vacuum furnace is used for this work, a device for maintaining const. voltage being described. The action of N_2 upon Ti , Ta , Mo , Zr , U and B is studied, neg. results being obtained with Ti , Ta , Mo and Zr . The decompn. pressure of boron nitride is measured between 1695° and 2045° , and ranges from 23 mm. at 1695° to 158 mm. at 2045° . The reaction is reversible, but its velocity in the vicinity of equil. is very small. $\log p$ plotted against $1/T$ gives an approx. straight line. The heat of formation per mol of BN is calcd. as 28,100 cal. In the system U-N it is shown that N_2 pressure in equil. with substances contg. U and N increases with increasing N content. The equil. is studied at 1280° and 1480° , p ranging from 2.5 mm. to 676 mm. at 1280° as absorbed N increases from 0.0992 to 0.9230 g. atoms/g. atom U . At the higher isotherm, a smaller N content is obtained at a given p than at 1280° . The compds. U_3N_4 and U_5N_7 are obtained only if the furnace is quickly cooled from higher temps. Products with lower N content are regarded as solns. of nitride in the metal. H. STOERTZ

Melting-point curves of refractory oxides. H. v. WARTENBERG, H. LINDE AND R. JUNG. Tech. Hochschule, Danzig. *Z. anorg. allgem. Chem.* 176, 349-62(1928).—The furnace used in this work and its method of operation are described in detail. The heating chamber is composed of ZrO_2 in the form of a tube, and the heat source is an oil- O_2 burner with a H_2O -cooled tip. Temps. up to 2600° can be attained. The material to be examd. is formed into a hook by means of a suitable binding material, and this is attached to a ZrO_2 rod, the softening point and m. p. being detd. by observing the temp. at which the hook bends or drops form. A control run on a known system

(CaO-Al₂O₃) indicated reasonable accuracy. Study of the system: ZrO₂-Al₂O₃ shows that softening and m. p. can be detd. in mixts. contg. up to 20% ZrO₂; from 20 to 60% ZrO₂ only m. p. can be detd., due to the eutectic (m. 1920°); with 80% ZrO₂ only softening occurs. No indication is given of the formation of an ortho- or metazirconate (Al₂Zr₂O₇ with 35.5% Al₂O₃ or Al₂Zr₂O₇ with 21.6% Al₂O₃). In studying the system CaO-ZrO₂, bakelite lacquer is used as a binder in prepg. the sample. Although CaO melts at 2580° and boils at 2850°, loss of CaO due to vaporization begins to occur at about 2350°. A eutectic is shown at about 40% ZrO₂ and 2230°, with a second eutectic indicated in the vicinity of 75% ZrO₂ (m. 2380°). The meta-compd. CaO·ZrO₂, contg. 69% ZrO₂, probably exists, but doubt is thrown upon the ortho-compd. 2CaO·ZrO₂.

H. STOERTZ

Influence of certain corrections on the results of measurements of the heat of combustion of organic substances. W. SWIENTOSLAWSKI AND H. STARCZEWSKA. *Bull. intern. acad. Polonaise* 1928, No. 3A, 85-97; *Roczniki Chem.* 8, 195-209(1928).—In a study of a series of org. substances the general equations are given and the corrections for reduction to isothermal heat of combustion are calcd. as coeffs. of variation of heat of combustion with temp. The value of 6324 cal._{15°} per g. of C₆H₅COOH is taken as the standard for the heat of combustion. If the combustions are made between 15° and 20° the correction for the coeff. *du/dt* can be neglected. The unknown and the standard should be at the same temp.

L. D. ROBERTS

Calometric researches. II. The heat of combustion of a proposed secondary calorimetric standard, salicylic acid. L. J. P. KEFFLER. Univ. of Liverpool. *J. Phys. Chem.* 33, 37-51(1929).—The heat of combustion of salicylic acid was found to be 5234.8 cal._{15°}/g. weighed *in vacuo*, as a mean obtained from 19 adiabatic combustions of 8 different samples. This value supposedly holds for an isothermal reaction at a temp. of about 20°. A comparison of the degrees of reliability of the data of several investigators is made, and, as a conclusion, the value of 5235 ± 1 cal._{15°}/g. weighed *in vacuo* is suggested for the heat of combustion of the acid. This is to be used as a secondary standard, benzoic acid being the primary. A short survey of the more important errors entailed in bomb calorimetry is also presented.

H. F. JOHNSTONE

The heat capacities at low temperatures of the oxides of tin and lead. RUSSELL W. MILLAR. *J. Am. Chem. Soc.* 51, 207-14(1929).—The heat capacities of SnO and SnO₂, PbO, and H₂PbO₄ have been detd. from 70° to 300°K. A table of their entropies, free energy change and heat of formation at 25° is given.

RAYMOND H. LAMBERT

The heat capacity of methanol from 16°K. to 298°K. and the corresponding entropy and free energy. KENNETH K. KELLEY. Univ. of Calif. *J. Am. Chem. Soc.* 51, 180-7(1928).—The method and app. used are described briefly. Two cryst. forms of the NH₄Cl type were observed. The heat of transition was found to be about 154 cal./mol. and the entropy detd. at 157.4°K. is 30.3 ± 0.2 E. U.

R. H. I.

The heat capacities at low temperatures of "ferrous oxide," magnetite and cuprous and cupric oxides. RUSSELL W. MILLAR. *J. Am. Chem. Soc.* 51, 215-22(1929).—The heat capacities are tabulated and the entropies at 25° calcd.

R. H. I.

Joffe's studies on electric breakdown strength. ADOLF SMEKAL. *Naturwissenschaften* 16, 1045(1928).—Continued polemics (cf. *C. A.* 23, 1031).

B. J. C. VAN DER HOEVEN

The system W-C (BECKER) 9. Diagram evaluation (HERRMANN) 9. Negative catalysts and β-naphthol as a medium for preventing spontaneous combustion of oily textile fibers (POMERANZ) 27. The synthesis of atoms, the whole-number rule and the periodic system of atomic species (HARKINS) 3.

3—SUBATOMIC PHENOMENA AND RADIOCHEMISTRY

S. C. LIND

The new physics. E. SCHROEDINGER. *Elektrisch. Nachr. Techn.* 5, 485-7(1928).—An address.

C. G. F.

► **Progress in the physics of Röntgen rays and their uses.** MAURICE PONTE. *Rev. gen. sci.* 40, 11-21(1929).

E. J. C.

Sommerfeld as founder of a school. MAX BORN. *Naturwissenschaften* 16, 1035-6(1928). Sommerfeld and the atom theory. NIELS BOHR. *Naturwissenschaften* 16, 1036(1928).

B. J. C. VAN DER HOEVEN

A symposium on atomic structure and valence—an introduction. GEORGE L.

CLARK. Univ. of Illinois. *Chem. Reviews* 5, 361-4(1928).—A description of the status of theories of at. structure and valence resulting in the joint symposium of chemists and physicists at the 1928 St. Louis meeting of the Am. Chem. Soc. and an introduction to the papers there presented and now published as a monograph. G. L. CLARK

The nucleus of the atom. J. A. CROWTHER. Univ. Reading, England. *Smithsonian Inst. Pub.* 2932, Rept. for 1927, 209-16.—A review. MARIE FARNSWORTH

The atom. W. F. G. SWANN. *Proc. Am. Phil. Soc.* 67, 235-66(1928); cf. *C. A.* 22, 4352.—A review of the story of modern at. structure, and especially of the spectroscopic aspect of the problem of the atom. The theories of Bohr, Sommerfeld, Schrödinger, Born, Heisenberg and others are discussed. FRANK V. JOHNSON, JR.

Statistical deduction of the properties of the elements. E. FERMI. *Atti accad. Lincei* [vi], 7, 342-6(1928); cf. *C. A.* 22, 1902.—From a statistical analysis of the electrons surrounding the nucleus considered as a completely degenerated gas, the general characteristics and some of the anomalies of the periodic classification of the elements can be predicted. B. C. A.

The synthesis of atoms, the whole-number rule and the periodic system of atomic species. WM. D. HARKINS. Univ. of Chicago. *Chem. Reviews* 5, 371-435(1928).—This is a review of H.'s work on: (1) the disintegrative synthesis of atoms (*C. A.* 17, 3449; 21, 855), (2) the evidence for the whole-no. rule (*C. A.* 9, 2335), (3) the building of atoms from H and He (*C. A.* 14, 3573), and (4) the periodicity of properties originating in the nucleus (*C. A.* 14, 1628). The last is revealed by the high stability and abundance of atoms of even at. no., or electronic no., and of those of which the at. wt., or isotopic no., is divisible by 4 and which possess a secondary periodicity of 2.

H. F. JOHNSTONE

Molecular hydrogen in sunspots. GIORGIO PICCARDI. *Nature* 122, 880(1928).—A photograph of the spectrum of sunspots taken in the second order with dispersion 1 A. U. = 1 mm., and comprising the red portion of the spectrum between $\lambda 5900$ and $\lambda 6200$, contained unidentified lines which were relatively intense in the spots and very faint or entirely absent in the photosphere. Since mol. H_2 can exist under conditions prevailing in the spots ($4000^\circ K.$ and 10^{-2} or 10^{-1} atm.), P. compared these lines with recent accurate measurements of the secondary spectrum of H_2 (cf. Gale, *C. A.* 22, 757) and a large-scale map (0.25 A. U. = 1 mm.) of the sunspot spectrum taken at Mt. Wilson. The comparison between $\lambda 6400$ and $\lambda 4450$ showed numerous coincidences with a max. error of about ± 0.03 A. U. in the I. A. system. All the lines which are presumed to be those of the secondary spectrum of H_2 show no trace of the Zeeman effect as is seen in the map. They behave as do the lines of CaH_2 , MgH_2 , etc., also present in the spots. Hence mol. H_2 can be present in the higher regions of a sunspot beyond the influence of the magnetic field. FLORENCE N. SCHOTT

The energy levels of the elements from chromium to lanthanum in the region of x-rays. F. P. MULDER. Univ. Groningen. *Arch. neerland. sci.* IIIA, 11, 167-205 (1928).—The app. and procedure for obtaining energy levels of solid elements is described. The elements from Cr to La in the periodic system have been studied. The method of placing a quantity of the element on the anticathode to which a photographic plate is then exposed and that in which the absorption takes place on a photographic plate itself were both used to record results. The manner of prep. screens is described. The results are given in tabular form where both new and old data are recorded for wave length for some of the L series. The calcd. energies are also tabulated. The general trend of curves for energy levels is discussed at length.

RAYMOND H. LAMBERT

Sub-atomic energy. A. S. EDDINGTON. *Mem. Proc. Manchester Lit. Phil. Soc.* 72, 101-17(1927-8).—The problem of sub-at. energy is now a very practical and urgent one for the astronomer. The source of stellar energy may originate from various sub-at. processes. Consideration is made of why some form of liberation of sub-at. energy—either annihilation or transmutation of atoms—must be postulated for the sun and stars. Investigations of Kohlhörster and Millikan on the penetrating radiation from space may indicate sub-at. processes in celestial regions. FRANK V. JOHNSON, JR.

The question of the existence of "mezo" products in the actinium decomposition series. J. v. WESZKLSZKY AND L. IMRE. Univ. Budapest. *Z. anorg. allgem. Chem.* 175, 141-60(1928).—The deviation of the α -ray products of the Ac series from the Geiger-Nuttall relation and the complex α - and β -rays of RdAc need further study. A study of RdAc, quantitatively sep'd. from other Ac decompn. products by sublimation, shows no indication of contamination by "mezo" products of the Ac series. MARIE FARNSWORTH

Decrease of luminosity of self-luminous materials. W. S. ANDREWS. *Gen.*

Elec. Rev. 31, 610-1(1928).—*Mesothorium* gives greater luminosity than an equal wt. of Ra, and the decline is slower.

BENJAMIN MILLER

An attempt to polarize electron waves by reflection. C. J. DAVISSON AND L. H. GERMER. Bell Telephone Labs., New York. *Nature* 122, 809(1928).—A homogeneous beam of electrons is reflected at 45° incidence from a {111} face of a Ni crystal and the reflected beam is then reflected at the same angle of incidence from a 2nd similar crystal, rigidly attached to a Faraday cage placed in the direction of regular reflection. The second crystal and cage can be rotated about the axis of the electron beam, the whole forming a reflection polarizer for electrons. Only electrons which have retained nearly all of the original energy are allowed to enter the cage. Any variation of current as the analyzing crystal was rotated was less than $1/100$ of the total current, which corresponds to the uncertainty of the measurements; to this order of accuracy, there is no polarization of electron waves by reflection. Two new maxima of regular reflection of bombarding potentials of 20 and 55 v. were found in addn. to those of 77, 103 and 120 v. previously reported.

W. WEST

Distribution of electrons in a metal. J. E. LENNARD-JONES AND H. J. WOODS. *Proc. Roy. Soc. (London)* A120, 727-35(1928).—Thomas has applied the new statistics of Fermi-Dirac to the distribution of electrons in heavy atoms. The basic idea is that the "electron gas" surrounding a nucleus is "degenerate," so that every cell of extension h^3 of a six-dimensional phase space contains 2 electrons, spinning in opposite directions to one another. A differential equation is obtained which has been solved by Thomas and Fermi by numerical methods. Another application of the statistics has been made by Sommerfeld to the free electrons of a metal. S.'s work is criticized on the ground that he has neglected the interaction of the electrons and the atomic cores. The object of the present paper is to find the av. distribution of electrons (by the means used by T. and F. for isolated atoms). The same differential equation is obtained as that of T. and F., but the boundary conditions are different. The differential equation inside a cube subject to the simple boundary conditions that $V_r \rightarrow E$ at the center and $\partial V/\partial n = 0$ at the boundary proves to be insol., and the problem has been further simplified to give a kind of two dimensional metals, where the nuclei are replaced by a series of parallel line-charges so arranged as to intersect a plane perpendicular to them in a square array. The following equation is ultimately obtained: $(\partial^2 V/\partial x^2) + (\partial^2 V/\partial y^2) = k^2 V$, where $k^2 = 16\pi^2 m e^2 / \hbar^2$, being the mass of the electron, e the charge and U the potential field. This is solved subject to certain conditions. By this means, the work required to move an electron from any point in the crystal is obtained, and a number of equipotential lines for a crystal are plotted. Near a nucleus, the equipotential lines are nearly circles, which are gradually deformed until a critical curve is reached. This extends throughout the crystal and encloses another system of closed curves. The electrons in these regions may be regarded as "shared," the shared electrons forming a lattice array which interpenetrates that of the nuclei. This provides some justification for the model of a metal proposed by Lindemann and Thomson.

ALBERT L. HENNE

The effect of the image force on the emission and reflection of electrons by metals. L. W. NORDHEIM. *Proc. Roy. Soc. (London)* A121, 626-39(1928); cf. *C. A.* 22, 1903, 3829.—A mathematical presentation of a more accurate calcn. of D , the emission coeff., and R , the reflection coeff., for electrons emitted and reflected by metals

H. W. WALKER

The special distribution of photoelectrons produced by x-rays. H. J. WILLIAMS, J. M. NUTTALL AND H. S. BARLOW. *Proc. Roy. Soc. (London)* A121, 611-25(1928); cf. *C. A.* 22, 1538.—Expts. on the longitudinal distribution of photoelectrons emitted from O_2 and N_2 by absorption of x-rays of wave lengths of 0.54, 0.61 and 0.71 Å U. resp., show that the av. forward momentum of a photoelectron is 40% greater than that of an absorbed quantum. The dispersion of the photoelectrons is satisfactorily represented by the "cos²θ" law of Auger and Perrin. A discussion of theory and previous exptl. results is given. The possible sources of error in the measurements of the photoelectron tracks such as the heterogeneity of the incident radiation, the photography of the photoelectron track, choice of tracks and statistical errors from inaccurate measurement of directions of the photoelectrons are recognized and the precautions taken to eliminate them are described.

H. W. WALKER

The number of "recoil" electrons and the intensity of modified scattering. E. J. WILLIAMS. *Mem. Proc. Manchester Lit. Phil. Soc.* 72, 1-16(1927-8).—The value of the coeff., σ_m , of modified scattering for O and N and radiation of wave length 0.6 Å U., is estd. from exptl. results for the neighboring elements, C and Al. This value agrees to within exptl. error (10%) with the observed mean value of $\tau N_p/N_p$, where

N_r represents the no. of recoil electrons, N_p the no. of photoelectrons, and τ the photoelec. absorption coeff. This result shows that β -rays are produced in these cases which are distinct from the photoelectrons and whose no. is equal to the no. of modified quanta scattered. Comparison of the results is made with the data obtained by Waller and Wentzel. Comparison of the observed ratio of the intensity of modified to unmodified scattering with C, with the theoretical values of the ratio, shows rather serious differences and it seems that the theoretical values as calcd. here are too high. F. V. J., JR.

Some transient effects with ions of low mobility. H. P. WALMSLEY. *Mem. Proc. Manchester Lit. Phil. Soc.* 72, 29-41(1927-8).—In the measurement of ionization curves, the change in field strength, and the time at which the steady state is reached, may be the source of unexpected results. With a variable ionization, the observed currents show a lag with time behind the changes producing them. This is of moment only in dealing with ions of very low mobility. Any change which causes a redistribution of such ions in the elec. field which is employed to measure the currents, produces transient effects which may be comparable in magnitude to the currents measured, and which persist an appreciable time. FRANK V. JOHNSON, JR.

Motion of electrons in gases. J. S. TOWNSEND. *Proc. Roy. Soc. (London)* A120, 511-23(1928).—A reply to the criticisms of Atkinson (cf. C. A. 23, 1049) and others of T's work on ionization of gases by impact. In the investigation method adopted by A, no account has been taken of the motion of agitation of the gas in finding the loss of energy in the simplest case where the mols. or atoms of the gas are supposed to be perfectly elastic spheres. ALBERT L. HENNE

Hysteretic effects in the positive emission from hot bodies. H. P. WALMSLEY. *Mem. Proc. Manchester Lit. Phil. Soc.* 72, 139-56(1927-8).—A review of some of the work on the properties of the pos. ions emitted from hot Pt. It has been suggested that some of the hysteretic effects are due to the presence of ions of comparatively low mobility. The explanations have been extended by taking account of the properties of the particles when charged. They are then found to give a fairly consistent qual. account of the time lag effect when the pressure of the medium is altered, when the temp. is suddenly changed and when changes are made in the elec. fields employed to measure the currents. The effect of particles on the measurements of e/m is discussed. FRANK V. JOHNSON, JR.

Effect of electric fields on the emission of electrons from conductors. A. T. WATERMAN. *Proc. Roy. Soc. (London)* A121, 28-40(1928).—Sommerfeld's modification of the Lorentz electron theory of metals is applied to the problem of thermionic emission in a strong elec. field. This includes a discussion of the vol. distribution of surface charge for a "degenerate electron gas" obeying the Fermi-Dirac statistics. The equations are applied to the extn. of electrons from cold metals and discrepancies between the exptl. and calcd. results are discussed. Conclusion: The extn. of electrons from metals by intense elec. fields involves some factor not considered in any theory as yet proposed. W. W. STIFLER

Photoelectric current as a function of the field in air at ordinary pressures. A. BLANC. *Compt. rend.* 186, 1835-7(1928).—Comparison of the curves obtained for the same metal subjected to different illuminations with those for different metals showed that the form of the curve depends on the nature of the metal. Satn. is attained rapidly in a vacuum, since the no. of electrons emitted does not depend on the field. At sufficiently high pressures, however, the electrons ionize the gas in accordance with Thomson's theory, the mean no. of ions produced by each increasing with the field in a manner depending on the metal. The initial energy and capacity for ionization of the electrons depend on the distance they travel in the direction of the field before meeting a mol. They may even ionize several mols. before uniting with one of them, and satn. is not attained. B. C. A.

Origin of magnetism based on the structure of atoms. KÔTARÔ HONDA. *Sci. Repts. Tohoku Imp. Univ.* 17, 1st. ser., 997-1009(1928); cf. C. A. 22, 2309.—It is shown that while the electrons revolving about the nucleus can produce diamagnetic effects, they cannot give rise to para- or ferromagnetism. By applying the theory of the gyroscope to the H_2 mol. in a magnetic field it is shown that the magnetization due to rotation is exactly offset by that due to precession. Possible effects due to the electrons and protons composing the nucleus are then investigated. Here the electrons revolve with a speed approx. that of light and cannot alone account for ferromagnetism. By assuming that a no. of protons revolve in the opposite direction in a circular orbit outside the electrons, this difficulty is overcome. The effects of thermal agitation in cryst. solids, and changes in magnetic susceptibility due to allotropic transformations are treated on this theory, as well as the formation of a diamagnetic compd. by the union

of 2 paramagnetic atoms and the formation of a ferromagnetic substance from diamagnetic or paramagnetic elements. An explanation is also offered for the fact that the scattering of x-rays from Fe is not affected by a strong magnetic field. W. W. STRIFLER

Magnetic moment of the electron. G. BRATT. *Nature* 122, 649(1928).—Instead of the familiar expression for the magnetic moment of a spinning electron, viz., $eh/4\pi mc$, which leads to the Bohr magneton, a much more complicated equation is deduced from wave mechanics, following particularly the work of Dirac and Darwin. When applied to the very intense fields of the nucleus, this new expression indicates the possibility of magnetic moments considerably less than 1 Bohr magneton. Recent results of Mulliken's on the spectra of isotopes are correlated with this result. W. W. S.

Atomic structure as revealed by crystal reflection of x-rays. G. E. M. JAUNCEY. Washington Univ., St. Louis. *Chem. Reviews* 5, 437-49(1928).—A review of the recent work on the distribution of the electrons in the atoms of rock salt (cf. *C. A.* 22, 2712, 3581). H. F. JOHNSTONE

The influence of the presence of hydrogen on the L_{III} x-ray absorption edge of palladium. J. D. HANAWALT. Univ. of Wisconsin. *Proc. Natl. Acad. Sci.* 14, 953-8(1928).—An x-ray investigation of the distension of the Pd lattice due to absorbed H_2 indicates the existence of Pd_2H . X-ray absorption studies, a Siegbahn vacuum spectrograph being used, showed the occluded H_2 was in chem. combination with the Pd when absorbed (1) during electrolysis and (2) from the gas phase. The relative intensities of the L_{III} absorption edge supports the hypothesis that the complex edge corresponds to the superposition of edge l_1 , due to Pd atoms alone, and edge l_2 , due to Pd atoms combined with H atoms. The latter edge is shifted from the position of the pure Pd edge by 10 X. U., toward shorter wave lengths. It is difficult to say whether the Pd loses or gains an electron in the PdH mol. On this hypothesis the Pd_2H crystal lattice would be a face-centered cubic lattice in which the alternate grating points are PdH mols. and the remaining points Pd atoms. Bibliography 1924-1928. H. W. WALKER

X-ray diffraction of crystal powders and liquids in relation to their constitution. P. KRISHNAMURTI. *Indian J. Physics* 3, 225-40(1928); cf. *C. A.* 22, 2691, 4291, 4292.—X-ray diffraction patterns from liquid ethyl *o*-phthalate, *n*-butyl salicylate, *p*-cymene, salicylaldehyde, methyl salicylate, methyl benzoate, ethyl benzoate, *n*-butyl benzoate, benzyl benzoate, benzyl acetate, oleic acid, *o*-toluidine, geraniol, terpineol, diphenylmethane, and from both liquid and solid *o*-nitroaniline, *o*-nitrophenol, *o*-nitrobenzaldehyde, diphenylamine, *m*-nitrobenzaldehyde, *p*-toluidine, acetophenone oxime, acetamide, show the following characteristics. Liquid *o*- and *m*-disubstituted benzene derivs. give 2 sep. diffraction rings, whereas the *p*-compds. give 1 ring only. For the *o*- and *m*-compds., the outer ring is probably due to the thickness of the mol., the inner ring to its length and breadth. The spacing calcd. for the inner ring alters considerably with change in size and length of substituting groups. For the *p*-compds., just as for long-chain aliphatic compds., only the spacing due to the av. thickness of the mol. is obtained. The inner ring for geraniol was smaller than that due to terpineol, showing that the former consists of longer mols. The most prominent rings of the powder pattern of solids persist in the diffraction pattern of the liquids, undergoing a slight decrease in size, and the rings are broader and more diffuse at the edges for the liquids. Apparently, some of the crystal planes remain intact, though considerably modified, when the substance passes from the cryst. to the liquid state. The spacing corresponding to the outer ring in most of the ortho-compds. is about 3.5 A. U., in fair agreement with Bragg's value of 3.0 A. U. for the thickness of the benzene mol. R. J. HAVIGHURST

The diffraction of x-rays by aqueous solutions of cane sugar, levulose and glucose. P. KRISHNAMURTI. *Indian J. Physics* 3, 209-23(1928).—The x-ray diffraction pattern of a dil. soln. of a sugar, made with $Cu K\alpha$ radiation, shows in addn. to the ring due to water, a general scattering confined to a small region around the central spot, having the appearance of a corona. The intensity of this diffraction disk increases with increased concn. of the soln., until the soln. contains equal quantities of solvent and solute. This disk is attributed to the mols. which are distributed through the solvent at random, much in the same way as gaseous mols. At concns. higher than 1:1, there is diminution of scattering at small angles, and the corona develops into a halo, probably because of the mols. acquiring an approx. uniform spatial arrangement, the scattered waves at small angles destroying each others' effects by interference. The pattern for the most concd. solns. is very much like the pattern for the powder. If the mols. of the 1:1 solns. are distributed at random through the solvent, the angular radius of the disk surrounding the central spot just before it develops into a ring should

give a measure of the av. diam. of the mols. This is found to be 5.86 A. U. for glucose and levulose, and 7.73 A. U. for cane sugar.

R. J. HAVIGHURST

X-ray spectra. Recent investigations in the domain of chemistry. CHARLES PRÉVOST. *Rev. gen. sci.* 39, 663-8(1928).—The hypothesis of induced polarity of an atom or radical is advanced to account qualitatively for recent exptl. results obtained in work on the displacement of wave-length limit for absorption and emission of x-rays and on the fine structure of the absorption edge. Recent work by Krishnamurti, and Stewart and Morrow on x-ray diffraction in liquids is reviewed.

R. J. HAVIGHURST

Direct and indirect characteristic x-rays: their ratio as a function of cathode-ray energy. D. L. WEBSTER. *Proc. Natl. Acad. Sci.* 14, 330-9(1928); cf. *C. A.* 22, 1539, 4363.—The work of a previous paper (*C. A.* 22, 1539) on the ratio of direct rays to total indirect x-rays produced from any ordinary x-ray target is extended. The app. was reconstructed to obtain greater accuracy and the same method was used as in the previous work. The calcn. was carried out in practically the same way as before, except that the assumption that all the primary continuous spectrum x-rays originate in the surface is replaced by the assumption that they originate at a depth equal to the av. depth as measured by the absorption limit method. The value of the ratio of direct rays to total incident rays for Ag is found to be almost const., the data giving 1.83 at 35 kv., and 1.96 at 80 kv. The probable error is high, amounting to 10-20%. The variation of the ratio is not sufficient to vitiate current comparisons of observed line intensities with theories.

B. C. A.

Structure analysis. H. OTT. *Z. Krist.* 66, 136-53(1927).—A general method for the detn. of the positions of atoms in a lattice without the assistance of the structure theory is based on the extinction of x-ray interference.

B. C. A.

Charged spheres, the photoelectric effect, and the fluorescence spectra of x-rays. L. DÉCOMBE. *Compt. rend.* 186, 1291-3(1928).—The production of the characteristic and continuous x-ray spectra is explained on the assumption that all monochromatic x-radiation of given frequency is due to the beats arising from the pulsatory frequencies of 2 cathodic electrons considered as small pulsating spheres, one of which is brought to rest by impact, while the other has a restricted speed less than that of impact. The explanation is also applied to the photoelec. effect of x-rays, to resonance, and to the Compton effect.

B. C. A.

Production and absorption of the K-rays of aluminum. F. HOLWECK. *Compt. rend.* 186, 1203-5(1928).—The absorption coeffs. of rays produced from a water-cooled Al anode with an incandescent cathode in a highly evacuated metallic tube provided with an Al window are 550 and 7400 (approx.) for wave lengths slightly greater and less than the K-discontinuity, resp. This gives a value of about 13 for the ratio J , which is in agreement with that found (14) from the values obtained for the absorption in air at voltages above the critical potential using an Al filter 15μ thick, and from the absorption coeff. of the soft rays of O and N.

B. C. A.

Thermodynamics of the Compton effect with reference to the interior of stars. S. CHANDRASEKHAR. *Indian J. Physics* 3, 241-50(1928).—In a system contg. electrons and quanta under the conditions of a star's interior, the ratio of the probability coeffs. connected with "Compton-type" collisions in which the quantum loses energy and "reversed-Compton-type" collisions in which the quantum gains energy at the expense of the electron is nearly unity. In a system contg. electrons, ionized atoms and quanta, this ratio is nearly 3.3×10^{27} , the reason for this large value being that the reversed Compton effect is due to triple collisions, while the direct effect is due to double collisions between atoms and quanta. It seems probable, therefore, that the softening of high-frequency radiation created in the interior of stars is due to Compton scattering in systems contg. electrons, ionized atoms and quanta; that is, to Compton scattering with bound electrons.

R. J. HAVIGHURST

The Raman effect in the x-ray region. M. PONTE AND Y. ROCARD. *Compt. rend.* 187, 828-9(1928).—The scattering or diffusion of x-rays reported by Davis and Mitchell (*C. A.* 23, 765) is similar in character to the Raman effect in the optical region. Analogies may be observed between the modulation of a wireless carrier wave, explicable by the classical wave theory, the Raman effect, for which the classical theory is not entirely adequate, and the scattering of x-rays for which the wave theory is inadequate and the quantum theory affords the only satisfactory explanation.

A. W. KENNEY

The coloration of kunzite and hiddenite by x-rays. P. L. BAYLEY. *Lehigh Univ. J. Optical Soc. Am.* 17, 350-5(1928); cf. *C. A.* 22, 4067.—Spodumene, a natural Li Al silicate occurs sometimes in large crystals of which one variety called kunzite is pink or purple, and the other variety called hiddenite is yellowish green. A spectro-

photometric study was made to see if the natural green of hiddenite is related to the green color produced in kunzite by x-rays. Polished, nearly perfect crystals were used, and the transmission was studied over a range of wave length from 0.3 to 4.5 μ . The samples were measured in their original condition and after 5 hrs.' exposure to x-rays at a distance of 5 in. from the Mo target of a Coolidge tube operating at 3-5 ma. and 40 kv. There was no marked change in hiddenite after exposure but kunzite turned a distinct bluish green with a transmission similar to that of hiddenite over a considerable range in the optical region and differing most markedly in the infra-red region. The production by x-rays of an absorption band in the infra-red region is so far unique. This behavior of kunzite is completely reproducible. A survey of previous work is given.

A. W. KENNEY

Rotation of molecules induced by light. C. V. RAMAN AND K. S. KRISHNAN. *Nature* 122, 882(1928); cf. *C. A.* 22, 4060.—R. attributes the accompanying continuous spectrum in the scattered spectrum of benzene to a mol. rotation set up when a mol. collides with a light quantum. That the probability of such a mol., rotation should depend, among other factors, on the degree of optical anisotropy of the mol., is supported by the fact that strong optical anisotropic substances as benzene, toluene, and pyridine exhibit the wings of the scattered lines strongly, whereas compds. as CCl_4 , ether, and EtOH , which are more nearly isotropic, optically exhibit the effect feebly. CS_2 , highly anisotropic optically, exhibited strong wings, which appear to consist of unpolarized light.

FLORENCE N. SCHOTT

Rydberg term tables. F. PASCHEN. *J. Optical Soc. Am.* 16, 231-43(1928).—Values of $Z^2N/(m+a)^2$ are tabulated for $Z = 1, 2, 3$ and 4, Z being the no. of the spectrum, N Rydberg's const., m the order no. of the term, and a the Rydberg correction.

B. C. A.

Broadening of Debye lines with cold-worked metals. U. DEHLINGER. *Z. Krist.* 65, 615-31(1927).—With cold-worked Ag, Cu, Ta and α -brass the $K\alpha$ doublet is not resolved, whereas with cold-worked Al and Zn it is sharp. Hence periodic strain and distortion may be a cause of broadening of Debye-Scherrer lines.

B. C. A.

Method of horizontal comparison in the location of spectra of elements. MEGHNAD SAHA AND KANAKENDU MAJUMDAR. *Indian J. Physics* 3, 67-76(1928).—Theoretical

ALBERT L. HENNE

Experimental proof of "negative" dispersion. H. KOPFERMANN AND R. LADENBURG. Kaiser Wilh.-Inst. physik. Chem., Berlin-Dahlem. *Z. physik. Chem.*, Abt. A, 139, 375-85(1928); cf. *C. A.* 23, 25.—"In the pos. column of a Ne discharge at increasing current d. up to about 0.1 amp. per sq. cm. there is found an increase in the anomalous dispersion in the yellow-red s - p lines (p is the state of higher, s that of lower energy content). This indicates a corresponding increase in the excited atoms in the s states. On further increase in current d. a continuous decrease is observed in the amt. of anomalous dispersion of the different s_k - p_k levels ($k = 10, 9, 8, 6, 4, 2$), just as would be expected in consequence of the stronger exciting of the atoms in the p_k states, if the quantum theory dispersion formula concerning "negative" dispersion is true. Control expts. excluded other explanations of the exptl. results, particularly that of a systematically different decrease in the anomalous dispersion of the s_k lines combining at different p_k levels, that is, the lower the p level in question lies, and the stronger it is excited, the greater is the decrease in the corresponding anomalous dispersion."

F. L. BROWNE

Excitation function of spectral lines. W. HANLE. *Naturwissenschaften* 15, 832-3(1927).—The excitation function (excitation probability in relation to the acceleration voltage of the bombarding electrons) of the Hg line 2537 A. U. has been observed in the neighborhood of the excitation potential.

B. C. A.

Temperature of the acetylene-oxygen flame. F. HENNING AND C. TINGWALDT. *Z. Physik* 48, 805-23(1928).—The temp. in different parts of the acetylene-O flame was detd. by Kurlbaum's method of spectral line inversion. Observations were made in the visible region by coloring the flame by means of Li_2CO_3 and in the infra-red region by measurements on the CO_2 band 4.39 μ in the colorless flame, the former giving the temp. in the interior of the flame and the latter that of the outer cone. The hottest point in the normal flame is about 3 mm. above the tip of the luminous cone, where the temp. is about 3100°.

B. C. A.

Dissociation of molecules as disclosed by band spectra. KARL K. DARROW. Bell Telephone Labs., N. Y. *Chem. Reviews* 5, 451-66(1928).—Just as in an atom there may be different ways in which the ionization takes place, with different expenditures of energy, so in a mol., it need not be the normal state of the atoms into which the dissocn. leads. The continuous regions in absorption spectra may be the signs of

dissoen. with transfer of extra energy to the sepd. particles. Such an explanation accounts for the differences between the values for heats of dissoen. as found by thermal methods and as calcd. from the band spectra. The thermal method yields the net amt. of energy expended in transforming the mol. into normal neutral atoms while the spectroscopic method yields the amt. which was spent in effecting the primary dissoen. with no deduction for that restored by the resulting atoms in their succeeding actions. Dissoen. is viewed as taking place when (1) a change in the arrangement of the electrons causes a change in the amplitude of oscillation of the nuclei to the extent that the latter tear themselves apart, or (2) when the mol. spontaneously passes from an excited to a normal state with the emission of enough energy to tear the atoms apart.

H. F. JOHNSTONE

Optical investigations on perylene and its derivatives. I. The visible absorption spectrum of several simple derivatives. ARMIN DADIEU. *Tech. Hochschule, Graz. Z. physik. Chem.* 135, 347-61(1928).—The absorption bands of perylene, $C_{22}H_{14}$, and the 3,9-dichloro, tetrachloro, hexachloro, 3,9-dibromo, 3,9-dicyano, 3,9-diacetyl, 3,9-dicarboxylic acid diethyl ester, 3,9-dibenzoyl and 3,9-*p*-chlorodibenzoyl derivs. in C_6H_6 soln. are detd. with a König-Marten spectrophotometer. The influences of the substituents upon the bands are a displacement towards longer wave lengths, broadening and intensity decrease. A proportionality exists between broadening and the no. of outer-shell electrons of the substituents. The intensity decrease runs parallel; the electron affinities of the substituents and the structure of their electron shells account for the displacement.

G. L. CLARK

Variation of the extinction coefficient with temperature. B. K. MUKERJI, A. K. BHATTACHARJI AND N. R. DHAR. Allahabad Univ., India. *J. Phys. Chem.* 32, 1834-40(1928).—The extinction-coeffs. of the following solns. when measured at varying temps. from 10° to 60° with a Hilger-Nutting spectrophotometer: $N/40 H_2Cr_2O_7$; $N/39.6 I_2$; $N/29.5 K_2C_2O_4$; $N/29.5 I_2$ and $N/10.8 KI$; $N/20 H_2Cr_2O_7$ and $N/28.4 H_2C_2O_4$; $N/10 H_2Cr_2O_7$ and $M/47$ quinine sulfate; $N/3.03$ Rochelle salt, $N/125 Br_2$ and $N/1.65 AcONa$; $KMnO_4$; $AcONa$, $NaNO_2$ and I_2 ; $HCOONa$, I_2 and $AcONa$; $FeSO_4$ and I_2 ; eosin; $(NH_4)_2C_2O_4$ and I_2 ; $CuSO_4$; $CuCl$ and HCl . In all cases the extinction coeff. increases with the increase in temp. of the solns. showing a considerable absorption of light. This may be due to a change of hydration of the solutes at higher temps. In all cases straight lines are obtained by plotting extinction-coeffs. against temps.

E. G. VAN DEN BOSCHE

Photography of the infra-red solar spectrum. H. D. BABCOCK. *Nature* 121, 830 1(1928).—About 12 lines between 10,000 and 10,750 Å. U. have been observed on prismatic plates, one at 10,049.8 Å. U. being especially conspicuous; it is evidently the fourth member of the Paschen series of H. On grating plates a no. of lines were also observed.

B. C. A.

H_α emission in the positive column. E. LAU. *Z. Physik* 48, 824-30(1928).—The intensity and polarization of the H_α line from the pos. column in a discharge tube have been examd. with respect to the gas pressure in the range 0.05-0.7 mm. The observed Stark effect is of the same order as that calcd. by Sommerfeld's theory.

B. C. A.

Optical characterization of spark emission spectra. G. I. POKROVSKII. *Z. Physik* 48, 586-93(1928).—By assuming that the energy consumed in a spark is proportional to the square of the root mean square value of the current flowing through the arc, the total intensity I of n spectral lines is shown to be related to the current i and to the absorptive power, k , of the metal vapor, through which the spark takes places by the expression $I = ai^3 + b(1 - e^{-koi^2})$, where a , b and c are consts. It is also shown that for a given value of i , I is linearly related to the width of the spark gap. Data relating to lines 5000, 5200, 5890 Å. U. in the spark between Cu and electrodes are shown to be in agreement with the above expression.

B. C. A.

Infra-red reflection spectra of sodium chlorate and sodium bromate. G. LASKI. *Z. Krist.* 65, 607-14(1927).—The characteristic frequency is 25μ for $NaClO_3$ and 23μ for $NaBrO_3$, both substances exhibit absorption between 40 and 120μ , with a max. at 83μ and 82μ , resp. A triangular configuration is postulated for the chlorate and bromate radicals.

B. C. A.

Broadening of hydrogen chloride lines by foreign gases. H. W. KUSSMANN. *Z. Physik* 48, 831-44(1928).—The influence of various indifferent foreign gases has been investigated by absorption measurements, a quartz lens method of focal sepn. being used. A, in spite of its at. symmetry, exerts a strong influence, so the broadening is supposed to be due, not to an intramol. effect, but to Lorentzian collision damping. Hence for any single foreign gas the absorption change brought about by the broadening

of the line is proportional to the increase in the no. of collisions, but this proportionality factor differs with different gases. B. C. A.

Structure of Fraunhofer lines and quantitative spectrum analysis of the atmosphere of the sun. W. ANDERSON. *Z. Physik* 48, 447-8(1928).—The assumption made by Unsöld (C. A. 22, 1277) that when the partial pressure of free electrons in the chromosphere is 10^{-4} atm. the latter still shows a continuous spectrum is held to be irreconcilable with observation. B. C. A.

The retarded luminescence observed in the air. WITOLD BERNHARDT. *Bull. intern. acad. Polonoise* 1928, No. 3A, 69-83.—A relation exists between the retarded luminescence in the air and the pos. pole. The drop of potential on the free path of the mol. plays a decisive role in the formation of mols. capable of giving this luminescence. New types of green retarded luminescence in air have been obtained under varying pressures from 0.01 mm. up to 170 mm. The coloration varies from a clear green to an emerald green. A yellow exists under a pressure of 30 to 40 mm. of Hg. The duration of the green luminescence diminishes with pressure. The spectra of all these types are continuous. The limits of temp. are -130° and $+200^{\circ}$. L. D. ROBERTS

Fluorescence of mercury vapor. H. NIEWODNICZANSKI. *Z. Physik* 49, 59-72 (1928).—The spectrum of the fluorescence radiation emitted by superheated Hg vapor excited by an Al spark has been investigated over the temp. range $245-910^{\circ}$. The bands generally became weaker with rising temp., except the continuous band with an intensity max. at about 3300 Å. U., which attains a max. intensity at about 500° . In the presence of H all the lines and bands were much weaker, except the band with a long-wave convergence frequency of 2349 Å. U., of which the intensity remained unchanged. From the data obtained the carriers of the bands are deduced. The decrease in the intensity of the band with a convergence frequency of 2349 Å. U. with increasing vapor d. in the satd. vapor is attributed to increased band absorption. B. C. A.

Studies on fluorescence and photosensitization in aqueous solution. I. Introduction. W. WEST, R. H. MÜLLER AND E. JETTE. New York Univ. *Proc. Roy. Soc. (London)* A121, 294-8(1928).—Certain ions suppress the fluorescence of various chemically dissimilar compds. in aq. soln. in a definite order, which is identical with the order of the ionic deformabilities. Also, when a photochem. sensitizer is fluorescent, the fluorescence is diminished by the addn. of the reactant; moreover, the addn. of ions suppresses the sensitizing power of a fluorescent sensitizer in the same order as it suppresses the fluorescence. Finally, a non-fluorescent sensitizer is affected in the same way by the addn. of ions. The whole group of phenomena can be simply explained in terms of the hypothesis of "collisions of the second kind," and parallels similar phenomena found in gaseous fluorescence and sensitization. The fluorescent mol. assumes a higher energy state by the absorption of light; it may become deactivated by reradiation (fluorescence) or by transfer of its energy by collision with ions, causing polarization of the ions (extinction by ions), or it may polarize the mol. with which it collides so completely as to disrupt it (photochem. sensitization). II. Fluorescence in aqueous solution. E. JETTE AND W. WEST. *Ibid* 299-312.—A detailed examn. of the effect of ions on the fluorescence of aq. soln. of quinine bisulfate, uranine and uranyl sulfate. The intensity of fluorescence was measured by a balanced photoelec. cell method. For these substances the extinguishing effect is assocd. with the anion, Ag^+ being the only cation with an appreciable effect. Li^+ , Na^+ , K^+ , Rb^+ , Mg^{++} , Hg^{++} and La^{+++} salts were examd. The order of the anions is $\text{I}^- > \text{CNS}^- > \text{Br}^- > \text{Cl}^- > \text{Ox}^- > \text{Ac}^- > \text{SO}_4^{--} > \text{NO}_3^- > \text{F}^-$. The series is identical with the deformability series of the anions, as measured by mol. refraction and dispersion and is closely related to the Hoffmeyer series. III. Photosensitization and fluorescence. R. H. MÜLLER. *Ibid* 313-7.—The quantum efficiency for the photolysis of oxalic acid in presence of UO_4^{++} ion approaches unity at a ratio of $\text{H}_2\text{Ox}/\text{UO}_4^{++}$ of 1:1 and remains const. for higher ratios. The fluorescence of UO_4SO_4 , which was measured by photoelec. cell and amplifier, diminished with increasing addns. of H_2Ox , reaching zero at the same mol. ratio. The rate of decompn. of the H_2Ox is diminished by the addn. of ions, in the order $\text{I}^- > \text{CNS}^- > \text{Br}^- > \text{Cl}^-$ in the same order as the fluorescence of UO_4SO_4 is affected by ions. The same order holds for the inhibition by these ions of Eder's reaction sensitized with Fe^{+++} ion. W. WEST

Action of light on acetylene. H. REINICKE. *Z. angew. Chem.* 41, 1144-6(1928).—Carefully purified and dried C_2H_2 is not changed by daylight or sunlight either in glass or quartz. Polymerization occurs under the action of rays from Hg vapor light with

wave lengths under 300μ , at atm. or higher pressure and at room temp. without sepn. of C, giving an amorphous hydrocarbon insol. in most org. solvents. O_2 and moisture disturb the process, the latter causing the formation of aldehyde. F. C. H.

Photochemical studies. VIII. The photochemical decomposition of malonic acid both in the presence and absence of uranyl sulfate. WILLIS C. PIERCE, A. LEVITON AND W. ALBERT NOYES, JR. Univ. of Chicago. *J. Am. Chem. Soc.* 51, 80–89 (1929).—P., L., and N. find that, at least in the early stages of the reaction, the products of decompn. are almost exclusively CO_2 and $AcOH$, both in the presence and in the absence of the catalyst. With unvaried malonic acid concn., increase in the uranyl sulfate concn. causes the rate to approach an approx. const. value. For av. wave length $250m\mu$, the quantum efficiency of the uncatalyzed reaction is 0.73 (± 0.25); for the catalyzed reaction at av. wave length $290m\mu$, the quantum efficiency is 0.27 (± 0.02); at av. wave length $320m\mu$, it is 0.025 (± 0.04). With const. concn. of uranyl sulfate, the reaction rate increases with increase in the concn. of malonic acid and is found empirically to be proportional to the cube root of the latter quantity. No evidence is found to indicate strongly the existence of a light-sensitive complex, nor does it seem that ionization plays an important part. Several mechanisms and equations therefrom derivable are discussed. WILLIAM E. VAUGHAN

The photoexpansion of chlorine. W. H. MARTIN, A. F. W. COLE AND E. E. LENT. Univ. of Toronto. *J. Phys. Chem.* 33, 148–53 (1929).—Careful purification and drying of Cl_2 do not cause expansion on exposure to light to be greatly lessened. Such Cl_2 shows no abnormal scattering nor any fluorescence visually or photographically. The results do not accord with assumptions published on the theory of photochem. reactions involving dry Cl_2 . RAYMOND H. LAMBERT

The hydroxyl radical in flames. K. TAWADA AND W. E. GARNER. *Nature* 122, 879–80 (1928).—The infra-red radiation from hydrogen flames is usually ascribed to the H_2O mol. (Paschen, *Ann. Physik. Chem.* 52, 214 (1894)). The 3064 A. U. band, present in spectra of H_2 flames, is doubtlessly emitted by the OH radical. That some of this infra-red emission from the flame may be due to OH present in H_2O vapor at high temp. is shown by T. and G. The total radiation from flames of H_2 and O_2 with varying compn., emitted through a fluorite window, was measured by a Moll thermopile and a Downing galvanometer (cf. Garner, *C. A.* 22, 1903). A curve for varying compns. is given. Max. emission of radiation occurs for very nearly equal mixt. of H_2 and O_2 . The assumption of the formation of a OH radical would explain these data, and the quantity of radiation will depend on its duration of life. Excess H_2 will diminish av. life of the radical; decrease of radical due to excess O_2 may be due to inelastic collisions (see also Bonhoeffer and Haber, *C. A.* 23, 772). FLORENCE N. SCHOTT

Chemical rays. H. PLAUSON. Hamburg. *Chem.-Ztg.* 52, 357–9 (1928); cf. *C. A.* 23, 40. S. L. B. ETHERTON

Chemical rays. HUGO SPIEL. *Chem.-Ztg.* 52, 916 (1928).—S. discusses the article of Plauson (*C. A.* 23, 40 and preceding abstr.). G. SCHWOCH

Rontgenographs of the refinement of Be-Cu alloys (DAHL, *et al.*) 9. The Debye-Hückel theory and stellar atmospheres (GAUNT) 2. The multivalence (RICHTER) 2.

4—ELECTROCHEMISTRY

COLIN G. FINK

Norway's products. Electrochemistry and electrometallurgy. THV. LINDEMAN. *Times Trade and Eng. Supplement* (London) 23, 53 (1928). E. M. SYMMES

The future of electrodeposition and electroplating. COLIN G. FINK. Columbia Univ. *Metal Ind.* (N. Y.) 27, 9–10 (1929). E. H.

The growth and future of electroplating. CHARLES H. PROCTOR. *Metal Ind.* (N. Y.) 27, 19–21 (1929). E. H.

Outstanding developments in electroplating in 1928. F. T. TAYLOR. Hanson-Van Winkle-Munning Co., Mattawan, N. J. *Metal Ind.* (N. Y.) 27, 16–7 (1929). E. H.

Past, present and future of chromium plating. OLIVER J. SIZELOVE. *Metal Ind.* (N. Y.) 27, 10 (1929). E. H.

The progress of nickel deposition in recent years. D. J. MACNAUGHTAN AND R. A. F. HAMMOND. *Metal Ind.* (London) 34, 79–82 (1929). E. H.

Electric furnace developments. D. F. CAMPBELL. *Foundry Trade J.* 39, 467–8 (1928).—A review. BENJAMIN MILLER

Theoretical considerations in electric tunnel kiln design. J. KELLEHER. *Trans. Am. Electrochem. Soc.* 55, preprint, 5 pp.(1929).—The variables in elec. tunnel kiln design, and the order in which they are detd. are: (1) time-temp. curve for the material; (2) most economical cross section; (3) velocity; (4) length; (5) rate of energy absorption (in each section); (6) furnace temp. (in each section); (7) losses (in each section); and (8) heat input (in each section). A general set of curves is given, but neither details nor an example of the calcns. is included. B. M.

Electric arc-resistance furnaces powered over 10,000 kw. J. CYRUS-SOBOLEWSKI. *Przemysl Chem.* 12, 655-8(1928).—Max. power is obtained by individual regulation of voltage in the 3 phases. A. C. ZACHLIN

Manganese-steel production in the electric furnace. I. J. TRANTIN, JR. *Foundry* 57, 15-9(1929).—Design, chem. analysis, method of alloying, finishing and pouring temps., foundry practice and heat treatment are factors which enter into the production of good Mn-steel castings. In this installment Mn steels are classified according to use, with analyses and phys. properties for each class. Detailed instructions are given for lining a 3-ton Héroult furnace and for making Mn steel in the furnace. These include brick requirements, patching, materials to be charged, placement of charge, time of melting, addns., test procedure, etc. The other factors, except heat treatment (which is only mentioned), are treated in more general fashion. BENJAMIN MILLER

Researches on the high-frequency induction furnace. III. Contribution to the metallurgy of the iron-free induction furnace. FRANZ WEVER and GUSTAV HINDRICH. *Mitt. Kaiser-Wilhelm Inst. Eisenforsch. Düsseldorf* 9, 319-37(1927); cf. C. A. 22, 3609.—Clay-charcoal crucibles could be used for only one melt, because of their temp. sensitivity. Hearths of luting sand (85% silica, 13% alumina) were mechanically rugged and not harmed by high temperature. Corundum hearths (94% alumina plus 3% clay to improve working quality) were not affected by oxidizing slags nor by the highest temps. reached. They are somewhat more sensitive to temp. change than the high-silica hearths. The high-frequency crucible process differs from the orthodox crucible process in that there is no quiescent period to allow non-metallics to come to the top. Clean metal is produced nevertheless; the stirring causes the minute oxide-particles to coagulate. The stirring also promotes the reaction between iron oxide and silica, so that deoxidation takes place without the addition of Mn, Si or Al. With C steels there is actually a gain in Si from the refractory. Since the corundum hearth is not injured by oxidizing slags, it is possible to add the excess oxide required for quant. decarburization. Logs are given for 14 melts, showing that diverse products can be made, which have any desired analysis, with properties as good as those of similar materials made in conventional ways, and with the advantage that cheap scrap can be charged. BENJAMIN MILLER

Electrolytic copper refining. I. F. CHEMNITUS. *Chem.-Ztg.* 52, 981-3(1928).—An elementary sketch, including history, theory, app. and methods. The numerical values given do not apply to present-day American practice. II. *Ibid* 1002-3.—The recovery of values from scrap brass and scrap bronze, the winning of Cu from lean ores, the recovery of Cu from rayon plant waste water (cuprammonium process), and the removal of Cu from Ag-refinery electrolyte are briefly described. B. M.

Production of the heavy metals by the fused-electrolyte method. II. Production of iron, chromium and manganese from oxides and silicates. G. NEUENDORFF and F. SAUERWALD. *Z. Elektrochem.* 34, 199-204(1928); cf. C. A. 20, 872.—Practically carbon-free Fe, steel and pig iron were obtained by using (a) a mixture of Fe_2O_3 and 25% SiO_2 , (b) Fe_2O_3 without admixt., (c) two magnetic iron ores with and without 25% SiO_2 . Different current yields were obtained, depending on the material used. O is split off in melting. Chromite contg. 57.7% Cr_2O_3 , 15-17% Fe_2O_3 , Al_2O_3 and MgO could not be electrolyzed, because the melting temp. was too high. Admixt. of SiO_2 reduced the temp. to about 1475°. Expts. with Fe cathode gave a product contg. 10.9% Cr, and a second product contg. 10.81% Cr and 1.79% C. A C cathode was substituted for Fe because of the melting together of the Fe cathode. With C cathode a product with 39.51% Cr, 49.4% Fe and 7.27% C was obtained. Electrolysis of south Russian Mn ore (69.36% Mn_2O_3 , 2.2% Fe_2O_3 , 9.31% SiO_2) with addn. of 25% SiO_2 , m. 1250°, gave rapid evolution of gas, which prevented the use of large amounts of material. The deposit consisted of Fe with only 0.8% Mn. Apparently decompn. voltages of Mn and Fe oxides are widely apart despite the soly. of both metals in one another. M. M.

Electrolytic zinc production by "Tainton Pring" process. ELLERY R. FOSDICK. *Elec. World* 93, 135-8(1929).—See C. A. 23, 341. BENJAMIN MILLER

Electrolytic solutions. WALTER R. FETZER. *J. Phys. Chem.* 32, 1787-1807(1928).—A cell of the Castner-Kellner type for prep. carbonate-free NaOH

is described. Methods are developed for detg. the constituents of a Na_2S soln. after electrolysis. When electrolysis is carried out at low current d. the only product is Na polysulfide; at higher current d. sulfate and dithionate are formed. When NaSH is electrolyzed the products are $1\text{Na}_2\text{S}_4:2\text{H}_2\text{S}$. The limiting current (l. c.), or the current necessary to liberate S from a soln. of Na_2S or Na_2S_4 , increases at first with the concn. of polysulfide, passes through a max. and decreases toward zero. The l. c. for polysulfide solns. remains unchanged when rotation is increased from 220 r. p. m. to 700 r. p. m.; with Na_2S this change doubles the l. c. Increase in temp. increases the l. c.

E. G. VAN DEN BOSCHE

The calculation of theoretical potentials from thermodynamic quantities. P. DROSSBACH AND G. DEVOTO. *Z. Elektrochem.* 34, 715-6(1928).—Drossbach recalcs. thermodynamically his results given in *C. A.* 23, 42 for the potentials of Na, K and Ca to meet objections raised by Devoto (*Z. Elektrochem.* 34, 326(1928)). DEVOTO replies briefly.

J. BALOZIAN

The influence of a film of moisture on the Volta effect. R. DEAGLIO. R. Scuola Ingeg., Torino, Italy. *Z. Physik* 51, 279-86(1928).—The moist gaseous film surrounding a metallic conductor behaves like a second-class conductor. This effect can be destroyed by drying or by rarefying the surrounding atmosphere. This has, however, no influence on the Volta effect between metals, which therefore cannot be ascribed to the presence of a moist film.

G. CALINGAERT

Structural development of the Deion circuit breaker up to 15,000 volts. R. C. DICKINSON AND B. P. BAKER. *J. Am. Inst. Elec. Eng.* 48, 96(1929). C. G. F.

Field tests of the Deion circuit breaker. B. G. JAMIESON. *J. Am. Inst. Elec. Eng.* 48, 101(1929). C. G. F.

Some photoelectric and glow-discharge devices, and their applications to industry. J. V. BREISLEY AND E. O. ERICKSON. *J. Am. Inst. Elec. Eng.* 48, 118-21(1929).—Brief descriptions of the photoelec. cell, the grid glow tube, and the photo glow tube. The grid glow tube has been applied to the control of oil burners. The change in cond. of the gases is used to turn off the oil if the flame goes out. The photo glow tube has not yet been developed sufficiently to have long operating life, so that it can be used only for intermittent service.

BENJAMIN MILLER

A precision regulator for alternating voltage. H. M. STOLLER AND J. R. POWER. *J. Am. Inst. Elec. Eng.* 48, 110(1929). C. G. F.

Uniting rubber to metal (ROSSMAN) 30. The importance of H (HARKER) 18. High speed steel-crucible versus electric-furnace products (BROPHY) 9. The effect of gases on the resistance of granular C contacts (OLMSTEAD) 2. Theory of electrostriction and its experimental control (BRUHAT, PAUTHENIER) 2. Behavior of Bi films in the magnetic field (GROSS) 2. The electrolytic preparation of Mg amalgam and its decomposition in air (KONDIREV) 2. Volta effect (DUBOIS) 2. Investigations on cements and plastics, with special reference to their use in the electrical industry (NAGEL, GRUSS) 18. Electric furnace for the manufacture of articles in SiO_2 glass (Fr. pat. 33,288) 19. Refining mineral oil (U. S. pat. 1,700,347) 22. Deposition of rubber from latex (Brit. pat. 203,005) 30. Electrolysis of metallo-organic compounds (RODEBUSH, PETERSON) 10.

Electric battery charge indicator with hydrometer and temperature scale. LESTER S. KELLHOLTZ and EUGENE J. BARNEY (to Delco-Light Co.). U. S. 1,701,569, Feb. 12.

Storage batteries. GASTON FROMONT. Fr. 643,487, Apr. 1, 1927. Charged plates are covered with spongy products unattacked by the electrolyte, particularly celluloses, pasteboard, etc. Plates thus covered may be preserved dry in the absence of an

Storage batteries. CHARLES H. V. HARDING. Australian 10,747, Dec. 6, 1927. Cast metal plates which have an active coating so applied that a plate is pos. on one side and neg. on the other are clamped together but sepd. from one another by insulating flanges of hard rubber, etc., so that the spaces between the plates form the container for the electrolyte.

Storage batteries. ACCUMULATEURS EDISON. Fr. 643,445, Nov. 7, 1927. The series connection between 2 neighboring elements is made by a U-shaped iron having claws at its ends which enable it to be fixed to the 2 electrodes.

Storage battery. DEUTSCHE ELEMENTE FABRIK A.-G. Ger. 469,736, Nov. 27, 1926. Double storage batteries are formed with concentric cylindrical electrodes.

Storage batteries. I. G. FARBENIND. A.-G. (H. Rötger, inventor). Ger. 469,917, Dec. 9, 1926. The active mass of electrodes for storage batteries having alk. electrolyte

contain finely divided metal such as Fe or Ni obtained by the decompn. of the corresponding carbonyls.

Storage battery electrodes. E. PARVILLE ET CIE. Brit. 292,122, June 14, 1927. Rods of active material are enclosed in sleeves of wood. Various structural details are described.

Calomel electrode cell. DONALD S. HAKE. U. S. 1,700,796, Feb. 5. A cell is specified having an inlet tube near its upper end for the introduction of KCl soln. and a contact tube extending from the cell at a point below the inlet, and with the end of the inlet tube extending into the contact tube.

Electrodeposition of chromium. J. F. K. McCULLOUGH and B. W. GILCHRIST (to Ternstedt Mfg. Co.). Brit. 292,094, June 13, 1927. A bath is used contg. chromic chloride and alkali or alk. earth metal salts such as KCl, NaCl and NH_4Cl . NaF, oxalic acid and HNO_3 also may be added. An anode of Cr or a sol. Cr compd. is used with a voltage of 8-12 and a c. d. of 250-1000 amps. per sq. ft. of cathode surface.

Electrolysis. ÉTABLISSEMENTS SINGRÜN. Fr. 642,713, Mar. 25, 1927. In aq. or igneous electrolysis by means of a. cs., in addn. to the main electrodes, supplementary electrodes at zero potential are used, and may surround the main electrodes. If the main electrodes are sol., the auxiliary electrodes are of the same nature.

Electrolytic apparatus with annular cells in stacked relation arranged at right angles to a hollow rotatable shaft. ILIHU THOMSON (to General Electric Co.). U. S. 1,701,346, Feb. 5. An app. is specified which is adapted for producing H and O from H_2O .

Electrolytic cell for generating gases from alkaline electrolytes. MONTECATINI SOC. GÉNÉRALE PER L'INDUSTRIA MINERARIA ED AGRICOLA. Brit. 292,130, June 11, 1927. Cu supply bars are plated with Ni to protect them from the electrolyte. Various structural details are described.

Apparatus for the electrolytic production of sheet or other form of metal from ores or other raw material. FIRMA J. C. F. A. SCHÜTTE. Ger. 469,931, Dec. 30, 1925. The ore is stored between 2 circular walls, one of C sticks, the other of perforated C plates. Cf. C. A. 22, 3847; 23, 1065.

Aluminum. ELEKTRIZITÄTWERK LONZA. Fr. 641,140, Sept. 16, 1927. Al_2O_3 in a state suitable for the production of Al by electrolysis is obtained by sudden chilling in water of molten Al_2O_3 .

Aluminum. SOCIÉTÉ ANON POUR L'INDUSTRIE DE L'ALUMINIUM. Fr. 642,664, Oct. 21, 1927. Pure Al is prepd. electrolytically using a solid anode of the material to be refined and a solid cathode, both in a bath contg. halogenides of Al and of alkalies or alk. earth metals and a salt or oxide such as Al_2O_3 , Mg oxide of Fe, NH_4Cl , PbCl_2 or salts of Mg, Fe, Pb, Cd, Ni or Mn, which facilitate the obtainment of a dense deposit on the cathode. The salt used may be incorporated in the anode. Cf. C. A. 23, 1065.

Plating tools. COMPAGNIE FRANÇAIS POUR L'EXPLOITATION DES PROCÉDÉS THOMSON-HOUSTON. Fr. 642,846, Oct. 6, 1927. Cutting tools have their edges improved by an electrolytic deposit of Cr. A c. d. of 0.1 amp. per sq. cm. or more is used between an anode and a cathode formed by the tool, and the latter is kept in rotation. The bath may be agitated and air bubbled through. A preliminary treatment may be given in which the tool forms the anode.

Electrometallurgy. ARTHUR DOSSMANN. Ger. 470,200, Jan. 15, 1926. In a device for the extn. of metals deposited by galvanic or other elec. methods, the contact between the electrode clamps for the metal is improved by a transverse bar connecting the current leads.

Electric control device for pressure, temperature and humidity regulators, etc. H. J. NORBALLE. Brit. 292,670, March 21, 1927.

Gas purification. METALLGESELLSCHAFT A.-G. (Arno Nättcher and Franz Seipp, inventors). Ger. 469,780, Feb. 27, 1926. In the elec. removal of suspended matter from gas, the gas is led through a helical chamber contg. the elec. field and out at the axis of the helix.

Gas purification plant. METALLGESELLSCHAFT A.-G. and ILSE, BERGBAU A. G. Ger. 470,109, June 22, 1926. The outlet pipe contains an elec. dust-catching device divided by a partition, and is closed by a pair of covers with adjustable closing plates.

Shaker for the electrodes of a gas purification plant. SIEMENS-SCHUCKERTWERKE A.-G. (Franz J. Mosch, Curt Gerhardt, inventors). Ger. 469,909, Aug. 24, 1927.

Carbon electrodes. IMRE SZARVASY. Austrian 111,831, Aug. 15, 1928. The tarry products obtained by the thermal decompn. of natural gas are coked, preferably in a stream of CH_4 dild. with H, before being worked up in the usual way. The gas carbon also obtained may be mixed with the coked product or worked up alone. Cf. C. A. 22, 3101.

Incandescent cathode. SIEMENS-SCHUCKERTWERKE A.-G. Fr. 643,378, Nov. 5, 1927. A cathode with high emission power contains besides a compd. of an alk. earth metal, one or more alk. earth metals in metallic form.

Coating cathodes to prevent development of excess voltages in working. A. VOGEL. Brit. 292,131, June 14, 1927. Cathodes are provided with colloidal or finely divided metal or metallic compds. (suitably after roughening or covering with wire gauze). The material may be formed by preliminary anodic oxidation of the electrode material, e. g., iron. The working anode may be formed of Ni.

Electric induction furnace. MICHAEL SURJANINOFF. Fr. 643,020, Oct. 26, 1927.

Electric resistance furnace. J. L. MCFARLAND (to British Thomson-Houston Co., Ltd.). Brit. 292,165, June 16, 1927. Structural features.

Electric annealing furnace with wire or strip resistances. SIEMENS-SCHUCKERTWERKE A.-G. Brit. 292,139, June 15, 1927. Structural features.

Regulable electric heater for laboratory purposes. HERMAN GOLDBERG (to Precision Scientific Co.). U. S. 1,702,078, Feb. 12.

Oven. ÖSTERREICHISCHE SIEMENS-SCHUCKERTWERKE. Austrian 111,545, July 15, 1928. An electrically heated oven is described into which the materials to be warmed or strongly heated are fed by a horizontal conveyor which transfers them to a vertical conveyor. The latter carries the materials through the hottest zone of the oven and then immediately discharges them through an outlet near the top of the oven on the opposite side to the inlet.

Heating non-metallic molds and castings. ALEXANDER MEISSNER. Ger. 470,196, Jan. 6, 1926. Metal bodies such as plates or disks are placed in the casting or mold and an a. c. is passed through them.

Apparatus for registering electrical processes by means of a layer modified chemically by electricity. SIEMENS-SCHUCKERTWERKE A.-G. Fr. 643,688, Nov. 9, 1927. Elec. valves are placed in the circuit of the electrode to allow passage of the current in one direction only.

Electric deflagrators. WILHELM ESCHBACH and WALTER FRIEDERICH. Fr. 643,706, Nov. 9, 1927. Fulminating material for elec. deflagrators used in mines, etc., is composed of mono- and poly-basic Pb salts of nitrated compds. particularly nitrophenols with 2 or 3 nitro groups, having a short flame duration which will not light mixts. of CH_4 and air. Cf. C. A. 22, 3532.

Continuously loaded submarine cable. ARCHIE R. KEMP (to Western Elec. Co.). U. S. 1,700,766, Feb. 5. A continuously loaded submarine conductor is impregnated with a filling material such as liquid bitumen which is fluid at the temp. and pressure at which the conductor is to be used; a reservoir of the material surrounds the impregnated conductor.

Luminous electric tubes. "OSA" PARTICIPATIONS INDUSTRIELLES (Société Anon.). Fr. 643,960, Oct. 27, 1927. Luminous elec. tubes are filled with a mixt. of CO_2 and a rare gas such as He to obtain an effect comparable with daylight.

Carbon filaments. ANTON LEDERER. U. S. 1,700,901, Feb. 5. See Can. 282,800 (C. A. 22, 4072).

Lamp filaments. SOCIÉTÉ FRANÇAISE DES LAMPES À INCANDESCENCE LUXOR. Fr. 643,554, Apr. 11, 1927. See Brit. 288,557 (C. A. 23, 571).

Filament for incandescent lamps. FRANZ SKAUPY (to General Electric Co.). U. S. 1,701,342, Feb. 5. In order to convert refractory oxides such as Th oxide into a uniaxial structure, the material is provided with a casing of ductile metal such as Cu, Ni or Fe; after drawing to filamentary size an elec. current is passed through the drawn product of sufficient intensity to heat the product and convert it to uniaxial condition; the casing is then removed e. g., by use of HCl.

5—PHOTOGRAPHY

C. E. K. MEES

The representation of the density relations of photographic materials in the form of surfaces. H. ARENS and J. EGGERT. *Z. physik. Chem.* 131, 297-309(1928).—For const. density the relations between $\log I$ and $\log t$ are shown in the form of curves, I and t being intensity and time, resp. When the reciprocity law holds straight lines are obtained. When all 3 parameters, I , t and D , are varied, surfaces may be employed to represent the results; they are of great value. *Alfa Extra-rapid plates* have been studied for an intensity range of $1-10^7$ and a time range of $1-10^6$. R. H. L.

Sensitometry of desensitized layers. H. ARENS AND J. EGGERT. *Z. wiss. Phot.* 26, 111-26(1928).—During this investigation the failure of the reciprocity law was taken in account and three-dimensional curved surfaces were constructed (cf. preceding abstr.) Normal extra-rapid Afga plate was compared with a desensitized plate. The latter was treated with phenosafranine 1:2000 + 2% KBr (desensitized plate). The surfaces given by the normal- and d.-plates were quite different. No single no expressed the degree of desensitizing.

A. P. H. TRIVELLI

The preparation of highly sensitive negative emulsions in the laboratory. KARL KIESER. *Z. angew. Chem.* 41, 1292-5(1928).—The equipment used for making emulsions in the lab. is described. A typical procedure is given for prepg. a fast emulsion by the use of ammoniacal AgNO_3 and NH_4 halides. Long digestion at a low temp. is more easily controllable than a short digestion at a high temp. A rapid and efficient method of washing to remove sol. salts may be carried out by flowing the emulsion in a thin film over the wall of a large flask and chilling, whereby it may be conveniently washed. Ten min. digestion, at 45° , of such an emulsion gives a speed of about 100 H. and D. The limit of speed depends on the gelatin used. Coating of plates, chilling and drying are all described. Preliminary treatment of plates is also mentioned.

R. H. LAMBERT

Artificial sensitization of emulsions with metallic nuclei and the theory of photographic light-sensitivity. A. STEIGMANN. *Phot. Ind.* 26, 1062-3(1928).—It is suggested that artificial sensitization with adsorbed metallic nuclei according to methods of Genisch and natural sensitization from ripening nuclei may involve different explanations.

C. F. MEULENDYKE

Topography of the nuclei. LÜPPO-CRAMER. *Kinotechnik* 10, 555-6(1928).—The latent image on fast bromide plates is apparently destroyed by bathing in weak chromic acid when given normal development. Schmidt states that with fixation and development in a phys. developer, such a plate suffers only a 10° Eder-Hecht reduction in speed. L.-C. claims that the first effect is due to the absorption of the chromic acid and inhibition of development. Fixation removes the occluded acid and leaves the nuclei for phys. development. A few nuclei are dislodged in the process and account for the loss in speed.

H. C. CARLTON

Nuclei isolation and fog formation. LÜPPO-CRAMER. *Kinotechnik* 10, 612-6(1928).—Various emulsions were given a graduated exposure and then bathed in a soln. with 1% KBr, 1% AcOH and a group of substances as the third constituent, and then washed and developed. The desensitizers, phenosafranine and pinakryptol green, gave bleaching of the latent image which is ascribed to isolation of the nuclei. Methylene blue, however, gave some bleaching action and fogging simultaneously. Hypo and K thiocyanate behave in the same way as the desensitizers.

H. C. C

Practical cinematographic tests. A. P. RICHARD. *Cinemat. franç.* 10, 127-8(1928).—A 7-step color tablet composed of white, red, yellow, light green, green, blue and black color bands is used as an exposure test for the color sensitivity of an emulsion. The emulsions tested were developed for varying times in metol-hydroquinone and glycine developers. Some of the tests indicate that glycine developer is superior to other developers, particularly metol hydroquinone. Having obtained similar results on check tests with glycine, R. suggests that glycine developer be more widely used.

D. E. HYNDMAN

The fibrous structure of silver bromide in photographic dry plates. HANS H. MEYER. *Ann. Physik* 86, 325-52(1928).—The relative intensities of the lines of the x-ray diffraction pattern (Debye and Scherrer) of the AgBr emulsion of a high-speed photographic dry plate were affected by preferred orientations among the AgBr grains. Photographs made by passing the x-rays through the sample parallel to the gelatin layers gave a typical x-ray fiber diagram, and analysis of the patterns showed a strong preponderance of the octahedral planes parallel to the gelatin layer. Similar exposures made on the plain dried gelatin gave the fiber diagram characteristic of stretched gelatin. A slow fine-grained emulsion gave a much less pronounced fiber diagram. As shown by calculation by Silberstein in 1921, AgBr grains in the form of flat plates are brought parallel to the plate by the shrinkage of the gelatin thickness during drying; it is known that these plates are generally parallel to the octahedral planes of the crystal.

R. B. WILSEY

Determination of the sensitivity of color-sensitive plates. A. HÜBL. *Phot. Ind.* 26, 758-9, 901-2; *Camera (Luzern)* 7, 59-62; *Phot. Korr.* 64, 229-31, 265-71, 299-302, 332-5(1928).—A simple method of detg. tricolor (threshold) sensitivity ratios. A strip of the color-sensitive plate is exposed, together with a strip of an ordinary plate of which the Scheiner sensitivity (to the Hefner lamp) is known, in an Eder-Hecht

sensitometer, to Mg light. H. points out the need for more powerful color sensitizers, particularly in the red, to facilitate cinematography by artificial light; he believes that such sensitizers are to be found.

E. R. BULLOCK

Silver halide pseudomorphs. LÜPPO-CRAMER. *Phot. Korr.* 64, 297-9(1928).—It is shown that AgBr produced by the action of KBr soln. on grains of AgCl adsorbs phenosafranine and certain optically sensitizing dyes more strongly than does the untreated AgCl, or than does AgBr produced directly from AgNO₃ as in a pure bromide emulsion. The effect (which is not invariable) is attributed to the large internal surface of the (porous) pseudomorphs of AgBr after AgCl.

E. R. B.

Herschel effect with copper and iron salts. LÜPPO-CRAMER. *Kinotechnik* 10, 407-8(1928).—Carroll's results relative to the sensitizing of emulsion to red light with Fe and Cu salts have been checked by L.-C. Some paper emulsions show considerable bleaching of the latent image with red or yellow light but this is enhanced by the presence of Fe or Cu salts. These may be introduced by addn. of the emulsions before coating or by bathing after the exposure has been made. Like strong desensitizers, they destroy the latent image in the absence of bleaching light if present in too high concn.

H. C. CARLTON

Photography. GEOFFREY WHEELER. *Ger.* 469,811, Jan. 13, 1927. See *Brit.* 271,578 (*C. A.* 22, 1552).

Color photography. M. AUDIBERT (to S. de Procaudine-Gorsky). *Brit.* 293,038, June 30, 1927. Each of the component color-record pos. images which are superimposed to produce a multicolor photograph is colored by immersion first in an iodized soln. to convert the metallic Ag of the image completely into AgI and then in a stable bath contg. a basic aniline dye of appropriate color and also Na hyposulfite so that a partially tanned image in colored gelatin free from Ag results. A tanning developer such as pyrogalllic acid is preferably used. Various details are given.

Optical systems for color photography. SOCIÉTÉ CIVILE POUR L'ÉTUDE DE LA PHOTOGRAPHIE ET DE LA CINÉMATOGRAPHIE EN COULEURS. *Brit.* 293,047-8, June 30 and July 1, 1927.

Photography without plates. JOSEPH ALBANES-VILARO. *Fr.* 642,733, Mar. 26, 1927. A photographic paper for the direct production of positives has an emulsion similar to that of AgBr papers in which the base of AgBr is raised to the max. and the layer of BaO used for sizing the support is reduced to a min. The first developing bath is composed of genol 10, hydroquinone 15, Na₂S 100, Na₂CO₃ 80 g. in 1000 cc. of water. The inversion bath is composed of K₂Cr₂O₇ (satd. soln.) 500 cc., sulfochrome 10 g., HNO₃ 25 g., alc. 200 cc. and water 1000 cc. The sulfochrome is made by mixing 100 g. of K₂Cr₂O₇ or NH₄ in 10 cc. of water and 50 cc. of H₂SO₄ and drying. The second developing bath is the same as the first with the addn. of 10% of a 20% soln. of KBr.

Photographic antihalation plates. I. G. FARBENIND. A. G. *Brit.* 292,990, June 29, 1927. A coating for the backs of plates is formed by adding to an alk. casein soln., CH₃O and a coloring material such as acid black 2B, nigrosin D sol. in water, wool black 4B or lampblack.

Desensitizing photographic plates and films. I. G. FARBENIND. A. G. *Brit.* 292,140, June 15, 1927. Plates or films coated with AgBr emulsion are desensitized by treatment with an isophenosafranine which does not stain the fingers or clothes of the operator. A dil. soln. of 1, 3- (or 2,3-) isophenosafranine may be used.

Films. PALMIRE H. NICOLIC and MAURICE JEAN EDMOND CLAUDE. *Fr.* 635,828, Oct. 5, 1926. A deposit of metal or conducting metal salt is applied either on the edges and on the spaces between the images or on the whole surface of cinematographic films, or a layer of radioactive substance between 2 metallic layers may be used to prevent accumulation of static electricity.

Films. PALMIRE H. NICOLIC and MAURICE J. E. CLAUDE. *Fr.* 33,191, Nov. 17, 1926. Addn. to 635,828 (cf. preceding abstr.) A deposit of metal or conducting metal compd. is applied on the back and sides of a film so that the whole film is enclosed in a conducting layer, whereby accumulation of static electricity is prevented.

Photographic films. AKTIENGESSELLSCHAFT FÜR FILM-FABRIKATION. *Ger.* 469,810, June 9, 1928. Photographic films are dipped for about a min. into a dil. HCl bath before developing.

Photographic reversal films. I. G. FARBENIND. A. G. (Erwin Mankenberg, inventor). *Ger.* 469,968, Mar. 20, 1927. Photographic films are developed to produce thereon, by reversal, positives having the correct gradation by subjecting the film after exposure to a short development fixed for the particular film material, re-

the image in known manner by dissolving out the Ag image, treating the film

in a clearing bath, exposing to light and re-developing. The density of the resulting positive is reduced by means of a reducing bath comprising a mixt. in the proportion of 8:100 of the following (A): 1 g. I, 2 g. KI in 200 cc. water; (B) 4 g. thiocarbamide in 100 cc. water. This reducing bath may also be used for dissolving out the Ag image produced by the first development.

Cinematograph film material. JOHN E. THORNTON. U. S. 1,700,617, Jan. 29. A positive film material comprises a strip of waterproof material such as celluloid of double standard width and half standard thickness, a layer of colored colloid in 2 parallel differently colored stripes on 1 side of the strip and a layer of differently colored colloid in 2 parallel stripes on the other side of the strip; the strip is adapted to receive 4 component image impressions and then to be severed and reassembled by cementing. U. S. 1,700,618 specifies a strip of film material for production of color pictures comprising a transparent support having 2 filter-screens arranged side by side, each screen having 2 colors and being covered by a layer of panchromatic emulsion.

Photographic emulsions. I. G. FARBERNIND. A.-G. Fr. 33,152, Jan. 17, 1927. Addn. to 620,935. A gelatin for photographic emulsions of Ag salts contains products of decompn. of animal or vegetable proteins formed by alk., fermentative or acid hydrolysis accompanied by a partial oxidation.

Dyes suitable for sensitizing photographic emulsions. KODAK, LTD. Brit. 292, 374, July 28, 1927. Dyes effective for sensitizing photographic emulsions to that portion of the spectrum from about 740μ to about 1100μ are made by the action of a strong base, such as NaOH and CHI_3 , upon a quaternary NH_4 salt derived from lepidine or from a lepidine deriv. substituted in the benzene nucleus such as lepidine ethiodide or other lepidine alkyl halide, etc.

Photographic toning agent. SOCIÉTÉ INDUSTRIELLE DES APPLICATIONS CHIMIQUES ("I. N. D. A. C"). Fr. 643,264, Nov. 2, 1927. Na_2S is prepd. c. p. for use as a toning agent by treating it with steam under pressure in an autoclave to liquefaction, followed by a purification with terinoline, decanting, filtering and washing with NaOH soln.

Treating photographic prints. J. HALDEN & CO., LTD. and JOSEPH B. HALDEN. Fr. 643,401, Nov. 5, 1927. Prints are developed, washed and otherwise treated while on an endless band passing over rollers in a circuitous path from one end of a machine to another with jets of liquid of sufficient force to keep the print on the band.

Negatives for photomechanical printing processes, etc. WILLIAM HEINECKE. U. S. 1,700,262, Jan. 29. A sensitized material is provided with an ink impression, as by use of an engraved plate or electrotpe, and after development the impression is removed, e. g., by a KHCO_3 soln.

6—INORGANIC CHEMISTRY

A. R. MIDDLETON

Study of germanium. I. Treatment of germanite, preparation of pure germanium dioxide and the purest germanium tetrachloride. L. DEDE AND W. RUSS. *Ber.* 61B, 2451-9(1928).—The germanite available is a *copper thiogermanate* with a variable content of Fe, Zn and other elements. A typical analysis would be about 44% Cu, 30% S, 8.7% Ge, 4% As, 2.7% Zn, 5-6% Fe and 1-2% Pb. The mineral is decomposed and analyzed by Kriesel's method (*C. A.* 19, 949). For purification of the Ge from As, the decompn. of the finely powdered mineral is accomplished with a mixt. of HNO_3 , H_2SO_4 and H_2O in the proportions of 50:20:50 parts by vol. The GeO_2 in the residue is nearly free from As, but further purification is best obtained by means of the easy vaporization of GeCl_4 from HCl solns. of GeO_2 : $\text{GeO}_2 + 4\text{HCl} = \text{GeCl}_4 + 2\text{H}_2\text{O}$. The GeCl_4 is passed into H_2O , hydrolyzing it again to GeO_2 ; this is quite pure except for a small Cl content. Pure GeCl_4 is prepd. by heating GeO_2 in a stream of HCl gas. The HCl contamination is removed by sucking dry air through the tetrachloride, the last traces are removed by standing for 12 hrs. over anhydrous Na_2CO_3 . B. p. is 83° . II. **The action of carbon tetrachloride upon germanium dioxide.** *Ibid* 2460-3.—The vapor of boiling CCl_4 is allowed to pass over GeO_2 , or a mixt. of inert gas and CCl_4 is caused to react with GeO_2 . The latter method is preferable. The reaction is studied with variation in temp. and time, appreciable reaction taking place already at 500° . The results are tabulated and velocity is plotted against temp., showing that the reaction velocity increases very rapidly with increase in temp. At 500° for 203 mins. the relative velocity is 0.010, and at 865° for 72 mins. the relative velocity is 47.95. The curve giving the relation between velocity and temp. is a parabola. The reaction is expressed by the equations:

$\text{GeO}_2 + \text{CCl}_4 = \text{GeCl}_4 + \text{CO}_2$ and $\text{GeO}_2 + 2\text{CCl}_4 = \text{GeCl}_4 + 2\text{COCl}_2$. The formation of an intermediate GeOCl_2 is not observed.

H. STOERTZ

Oxidation of silver in dilute ammonium hydroxide solutions. K. A. HOFMANN AND ULRICH HOFMANN. Tech. Hochschule, Berlin. *Ber.* 61B, 2566-75(1928).—Finely divided Ag goes into soln. in NH_4OH satd. with O_2 , rapidly at first and then more slowly until the action gradually ceases. Ag powder is prepd. by reduction of AgNO_3 soln. with Zn. The strength of the NH_4OH soln. used is 6.4%, and the Ag in soln. is expressed as AgCl, although the compd. formed is $\text{Ag}(\text{NH}_3)_2\text{OH}$. With about 9 g. of Ag powder in 300 cc. of NH_4OH , the action continues until the concn. of Ag taken up expressed as g. AgCl in 50 cc. is about 0.27, by which time (about 60 days) the action has completely ceased. If the Ag remaining is washed with pure NH_4OH and the expt. repeated, the action continues again but ceases this time at a concn. of about 0.10 g. AgCl in 50 cc. This is reached in about 100 days. Increase in the quantity of Ag powder produces a proportional increase in the amt. of Ag dissolved, as do also additions of NH_4NO_3 , KNO_3 , NaNO_3 and $(\text{NH}_4)_2\text{SO}_4$. Alkalies and halides diminish the soly. while AgNO_3 and AgOH prevent the action entirely. The authors conclude that the slowing up of the reaction is due to the deposition upon the surface of the Ag powder of an insol. and only slowly oxidizable substance which is gradually formed from $\text{Ag}(\text{NH}_3)_2\text{OH}$ and which is identical or related to Berthollet's fulminating Ag compds., Ag_3N , Ag_3NH .

H. STOERTZ

Constitution of hydroxides and hydrates. II. Complex compounds containing water of coordination. G. NATTA. Reale Politecnico, Milano. *Gazz. chim. Ital.* 58, 619-26(1928); cf. *C. A.* 23, 350.—To ascertain the function of water in cryst. lattices, certain hydrates contg. water of coordination or of crystn. were studied, the present paper dealing with the x-ray examn. of the complexes $\text{Co}(\text{NH}_3)_4\text{I}_2$ and $\text{Co}(\text{NH}_3)_4\text{H}_2\text{OI}_2$ by the Laue powder method. Both of these compds. crystallize in the cubic system, with elementary cells contg. 4 mols. with dimensions of 10.88 and 10.84 Å. U., resp. This value of 10.88 agrees with that found by Wyckoff and McCutcheon (*C. A.* 21, 1384), but not with that of Hentschel and Rinne (*C. A.* 22, 1711). The calcd. ds. were 2.83 and 2.81, resp. The 2 compds. have a similar lattice structure, each atom of Co occupying the center of an octahedron, the vertices of which are occupied by the centers of the coordinated NH_3 and H_2O groups which behave as isomorphous groups. The substitution of a mol. of NH_3 by a mol. of H_2O leads to a slight contraction of the lattice which otherwise remains unaltered. An x-ray examn. of this character serves to obtain an insight into the action of so-called secondary valences on the positions of coordinated groups with respect to the coordinating element, and to add further exptl. proof of the theory of Werner.

C. C. DAVIS

The reduction of permanganate ion by chromic ion in acid solution. H. A. FALES AND P. S. ROLLER. Columbia Univ. *J. Am. Chem. Soc.* 51, 345-59(1929).—The oxidation of Cr^{+++} by MnO_4^- in acid soln. at 25° is very slow. It is accompanied by oxidation due to the direct action of Mn^{++++} and the indirect action of Mn^{+++} . Mn^{++++} oxidizes Cr^{+++} rapidly. Mn^{+++} formed from $\text{Mn}(\text{HSO}_4)_2$, acts indirectly as a result of its decompn. into Mn^{++++} . Mn^{++} , by reducing Mn^{++++} to Mn^{+++} , retards the oxidation of Cr^{+++} by MnO_4^- .

LOUISE KELLEY

Double salts. XVIII. The amines corresponding to double oxalates. G. SPACU AND O. VOICU. Univ. Cluj. *Bul. soc. stiinte Cluj.* 4, 154-63(1928); cf. *C. A.* 22, 3106.—By treating $\text{NiC}_2\text{O}_4 \cdot \text{K}_2\text{C}_2\text{O}_4 + 6\text{H}_2\text{O}$ with benzylamine in boiling petroleum

ether, a sky-blue ammine is obtained, $\text{Ni} \left[\begin{smallmatrix} (\text{C}_2\text{O}_4)_2 \\ \text{Bzl}_2 \end{smallmatrix} \right] \text{K}_2 + 2\text{H}_2\text{O}$. This ammine is very stable, a 7 days' exposure in the air fails to alter its compn.; heating liberates H_2O , then benzylamine. $\text{NiC}_2\text{O}_4 \cdot \text{C}_2\text{O}_4\text{K}_2 + 6\text{H}_2\text{O}$ in a boiling alc. soln. of ethylenediamine gives a pink ammine: $[\text{Ni en}_3](\text{C}_2\text{O}_4\text{K})_2 + 3\text{H}_2\text{O}$, sol. in H_2O with decompn., giving a violet color due to $[\text{Ni en}_3]^{+}$. $\text{NiC}_2\text{O}_4 \cdot \text{C}_2\text{O}_4\text{K}_2 + 6\text{H}_2\text{O}$ loses $4\text{H}_2\text{O}$ between 40° and 50° , the fifth between 75° and 125° and the last between 145° and 220° . This indicates that 2 mols. of H_2O are much more tightly bound to the metal than the others, and consequently, are located in the first sphere, the four remaining mols. of H_2O being in the second sphere of the complex. The formula $\left[\text{Ni} \begin{smallmatrix} (\text{C}_2\text{O}_4)_2 \\ (\text{H}_2\text{O})_2 \end{smallmatrix} \right] \text{K}_2 + 4\text{H}_2\text{O}$ is adopted. Two mols. of H_2O of the first sphere are replaceable by benzylamine. Ethylenediamine, being a stronger base, expels the oxalic radicals; besides, the $2\text{H}_2\text{O}$. $\text{CoC}_2\text{O}_4 \cdot \text{C}_2\text{O}_4\text{K}_2 + 6\text{H}_2\text{O}$ treated with benzylamine gives a pink ammine $\text{CoBzl}_2 \cdot \text{C}_2\text{O}_4\text{K}_2 + 2\text{H}_2\text{O}$, stable in air. The formula $\left[\text{Co} \begin{smallmatrix} (\text{C}_2\text{O}_4)_2 \\ \text{Bzl}_2 \end{smallmatrix} \right] \text{K}_2 + 2\text{H}_2\text{O}$ is attributed by reason of analogy. $\text{CoC}_2\text{O}_4 \cdot \text{C}_2\text{O}_4\text{K}_2 + 6\text{H}_2\text{O}$ be-

comes anhydrous at 50°; despite this fact the formula $\left[\text{Co} \begin{smallmatrix} (\text{C}_5\text{O}_4)_2 \\ (\text{H}_2\text{O})_2 \end{smallmatrix} \right] \text{K}_2 + 4\text{H}_2\text{O}$ is postulated by analogy. XIX. Ammines corresponding to double salts of the bromide class. *Ibid* 187-209.—A series of ammines has been obtained by treating $[\text{SnBr}_3][\text{Mn}(\text{H}_2\text{O})_6]$, $[\text{SnBr}_3][\text{Ni}(\text{H}_2\text{O})_6] \cdot 2\text{H}_2\text{O}$, or $[\text{SnBr}_3][\text{Co}(\text{H}_2\text{O})_6] \cdot 4\text{H}_2\text{O}$ with benzidine. When the solvent was abs. alc.: $[\text{SnBr}_3][\text{MnBzd}_6] \cdot 2\text{H}_2\text{O}$, $[\text{SnBr}_3][\text{NiBzd}_6] \cdot 8\text{H}_2\text{O}$, $[\text{SnBr}_3][\text{NiBzd}_6] \cdot 4\text{H}_2\text{O}$ and $[\text{SnBr}_3][\text{CoBzd}_6] \cdot 4\text{H}_2\text{O}$ have been obtained; the quantity of benzidine and the time of reaction determine the number of Bzd mols. in the ammine. These benzidine ammines are cryst. powders, little stable towards air and light. The Mn-ammine is white-beige, Ni- is yellow-green, Co- is pink. All are sol. in, and hydrolyzed by H_2O , decomposed by hot dil. acids, partially decomposed by Me_2CO , insol. in EtOH , MeOH , AmOH , Me_2CO , CHCl_3 and petroleum ether. When the reaction with benzidine was carried out in Me_2CO , $[\text{SnBr}_3] \left[\text{Mn} \begin{smallmatrix} \text{Bzd}_6 \\ \text{Me}_2\text{CO} \end{smallmatrix} \right] \cdot 2\text{H}_2\text{O}$, $[\text{SnBr}_3] \left[\text{Ni} \begin{smallmatrix} \text{Bzd}_6 \\ \text{Me}_2\text{CO} \end{smallmatrix} \right] \cdot 8\text{H}_2\text{O}$ and $[\text{SnBr}_3] \left[\text{Co} \begin{smallmatrix} \text{Bzd}_6 \\ \text{Me}_2\text{CO} \end{smallmatrix} \right] \cdot 6\text{H}_2\text{O}$ have been obtained. The Me_2CO inside the mol. is tightly attached. The compds. are stable crystals, nearly colorless, and have the same soly. characteristics as the benzidine-ammines. When the acetonepentammines are treated with pyridine diluted in Me_2CO , $[\text{SnBr}_3] \left[\text{Ni} \begin{smallmatrix} \text{Bzd}_6 \\ \text{Py} \end{smallmatrix} \right] \cdot 8\text{H}_2\text{O}$, $[\text{Sn} \begin{smallmatrix} \text{Br}_3 \\ (\text{OH}) \end{smallmatrix}] \left[\text{Mn} \begin{smallmatrix} \text{Bzd}_6 \\ \text{Py} \end{smallmatrix} \right]$, $[\text{Sn} \begin{smallmatrix} \text{Br}_3 \\ (\text{OH}) \end{smallmatrix}] \left[\text{Co} \begin{smallmatrix} \text{Bzd}_6 \\ \text{Py} \end{smallmatrix} \right] \cdot 5\text{H}_2\text{O}$ and $[\text{Sn} \begin{smallmatrix} \text{Br}_3 \\ (\text{OH}) \end{smallmatrix}] \left[\text{Ni} \begin{smallmatrix} \text{Bzd}_6 \\ \text{Py} \end{smallmatrix} \right] \cdot 4\text{H}_2\text{O}$ are obtained. The four compds. are yellowish crystals; they are fairly stable and their solubilities resemble those of the parent compds.

ALBERT L. HENNE

The double carbonate of copper and sodium. F. DE CARLI AND P. AGOSTINI. *Atti accad. Lincei* 7, 921-5(1928).—When $\text{Cu}(\text{NO}_3)_2$ soln. is added to a satd. soln. of Na_2CO_3 , NaHCO_3 (or K salt), the double salts $\text{K}_2\text{CO}_3 \cdot \text{CuCO}_3 \cdot 4\text{H}_2\text{O}$ or $\text{Na}_2\text{CO}_3 \cdot \text{CuCO}_3 \cdot 3\text{H}_2\text{O}$ are formed. The Na salt is more easily purified. If the Na salt is heated in trying to dehydrate it, an endothermic reaction takes place at 160° with loss of H_2O and CO_2 . The product is $\text{CuO} \cdot \text{Na}_2\text{CO}_3$. However, in an atmosphere of CO_2 , the salt may be dehydrated; heating at 80° gives the product $\text{Na}_2\text{CO}_3 \cdot \text{CuCO}_3 \cdot 2\text{H}_2\text{O}$, while at 120° the anhydrous salt is obtained. The anhydride is light blue, unstable. Heated from 220° to 230°, it loses CO_2 . This action is reversible. Partial pressures of CO_2 in mm. Hg at the abs temps. given are: 363°, 12.1; 443°, 163.50; 477°, 380.20; 512°, 1175.6. The av. value of Q (from Nernst's equation) is 11,325 Cal., Q being the sum of the reactions (1) $\text{Na}_2\text{CO}_3 \cdot \text{CuCO}_3$ soln. = Na_2CO_3 soln. + CuCO_3 soln. + Q' ; (2) CuCO_3 soln. = CuO soln. + CO_2 gas + Q'' , Q' having been found to be 10,330 Cal., Q'' = 995 Cal. A. W. CONTIERI

Compounds of 2,3-dihydroxynaphthalene with trivalent iron, with aluminum and with arsenic acid. R. WEINLAND AND HERMANN SEUFFERT. *Arch. Pharm.* 266, 455-64(1928).—2,3-Dihydroxynaphthalene yields with FeCl_3 , both in aq. and alc. soln., a blue color. Fe compds. (dark brown-red series) of definite compn. are obtained by the interaction of ferric acetate, 2,3-dihydroxynaphthalene and alkali hydroxide; compds. of the violet series are obtained by interaction of ferric acetate, 2,3-dihydroxynaphthalene and alkali acetate in alc. soln. The tendency of these compds. to crystallize is slight. Among those characterized are: *K tris-2,3-dihydroxynaphthalene ferrate*, $[\text{Fe}(\text{OC}_10\text{H}_7\text{O}_2)_3]\text{K}_3 + 2\text{H}_2\text{O}$, red-brown powder; *NH₄ tris-2,3-dihydroxynaphthalene ferrate*, $[\text{Fe}(\text{OC}_10\text{H}_7\text{O}_2)_3](\text{NH}_4)_3 + 5\text{H}_2\text{O}$, microscopic crystals; *Na tris-2,3-dihydroxynaphthalene ferrate*, $[\text{Fe}(\text{C}_{10}\text{H}_7\text{O}_2)_3]\text{Na}_3 + \text{H}_2\text{O}$, amorphous; *violet bis-2,3-dihydroxynaphthalene ferrate*, $[\text{Fe}(\text{C}_{10}\text{H}_7\text{O}_2)_2]\text{H} + 2\text{H}_2\text{O}$, cryst. powder; *K bis-2,3-dihydroxynaphthalene ferrate*, $[\text{Fe}(\text{C}_{10}\text{H}_7\text{O}_2)_2]\text{K} + 4\text{H}_2\text{O}$, microscopic needles; *NH₄ bis-2,3-dihydroxynaphthalene ferrate*, $[\text{Fe}(\text{C}_{10}\text{H}_7\text{O}_2)_2]\text{NH}_4 + 4\text{H}_2\text{O}$, amorphous; *Na bis-2,3-dihydroxynaphthalene ferrate*, $[\text{Fe}(\text{C}_{10}\text{H}_7\text{O}_2)_2]\text{Na} + \text{H}_2\text{O}$, microscopic leaflets; *K tris-2,3-dihydroxynaphthalene aluminate*, $[\text{Al}(\text{C}_{10}\text{H}_7\text{O}_2)_3]\text{K}_3 + \text{H}_2\text{O}$, rhomboidal plates; *NH₄ tris-2,3-dihydroxynaphthalene aluminate*, $[\text{Al}(\text{C}_{10}\text{H}_7\text{O}_2)_3](\text{NH}_4)_3 + 3\text{H}_2\text{O}$ and $5\text{H}_2\text{O}$, microscopic leaflets; *Na tris-2,3-dihydroxynaphthalene aluminate*, $[\text{Al}(\text{C}_{10}\text{H}_7\text{O}_2)_3]\text{Na}_3 + 2\text{H}_2\text{O}$ and $7\text{H}_2\text{O}$, amorphous white powder; *2,3-dihydroxynaphthalene arsenic acid*, $[\text{As}(\text{C}_{10}\text{H}_7\text{O}_2)_3]\text{H} + 5\text{H}_2\text{O}$, large crystals.

W. O. E.

Stereochemistry of diphenyl and its derivatives. III. G. SPACU. Univ. Cluj. *Bul. soc. stiinte Cluj* 4, 210-24(1928).—Many ammines have been prepd. by the methods used by S. in his previous papers, but by means of toluidine instead of benzidine. The new compounds thus obtained are: $\left[\text{Co} \begin{smallmatrix} \text{Tlid} \\ \text{H}_2\text{O} \end{smallmatrix} \right] \text{Cl}_2$, $\left[\text{Co} \begin{smallmatrix} \text{Tlid} \\ \text{H}_2\text{O} \end{smallmatrix} \right] \text{Br}_2$, $[\text{CdTlid}]\text{Cl}_2$, $[\text{Cd}$

$\text{TlId}]\text{Br}_3, \left[\text{Zn} \begin{array}{c} \text{TlId} \\ \text{H}_2\text{O} \end{array} \right] \text{Cl}_3, \left[\text{Zn} \begin{array}{c} \text{TlId} \\ \text{H}_2\text{O} \end{array} \right] \text{Br}_3, \left[\text{Zn} \begin{array}{c} \text{TlId} \\ \text{H}_2\text{O} \end{array} \right] \text{I}_3, \left[\text{Ni} \begin{array}{c} \text{TlId} \\ \text{H}_2\text{O} \end{array} \right] \text{Cl}_3 \cdot 2\text{H}_2\text{O},$
 $\left[\text{Ni} \begin{array}{c} \text{TlId}_3 \\ (\text{H}_2\text{O})_4 \end{array} \right] \text{Br}_3, \left[\text{Cd} \begin{array}{c} \text{TlId}_3 \\ (\text{H}_2\text{O})_4 \end{array} \right] (\text{NO}_3)_3 \cdot 4\text{H}_2\text{O}, \left[\text{Mn} \begin{array}{c} \text{TlId}_3 \\ (\text{H}_2\text{O})_4 \end{array} \right] \text{Br}_3 \cdot 4\text{H}_2\text{O}, [\text{NiCl}_6] \left[\text{Cd} \begin{array}{c} \text{TlId}_3 \\ \text{Ni TlId} \end{array} \right]$
 $2\text{C}_2\text{H}_5\text{OH}, [\text{NiCl}_6] \left[\text{Cd} \begin{array}{c} \text{TlId}_3 \\ \text{Py}_4 \\ \text{Ni TlId} \\ \text{Py}_5 \end{array} \right] \text{ and } [\text{Hg Cl}_2][\text{CoBzd}_3], \text{ where Bzd = benzidine and Py =}$
 pyridine.

ALBERT L. HENNE

The interaction of acids and neutral salts with stannic oxide and its relation to electrical charge (GHOSH) 2. The conversion of thiosulfuric acid to polythionic acids with the help of catalysts (KURTENACKER, CZERNOTZKY) 2.

7—ANALYTICAL CHEMISTRY

W. T. HALL

Following the course of the reaction in potentiometric titrations. F. L. HAHN, M. FROMMER AND R. SCHULZE. *Z. physik. Chem.* 133, 390-6(1928).—It may be shown mathematically that in a potentiometric titration the turning point on the titration curve occurs before or after the true end point according as the no. of mols., U , of the substance being titrated, which react with one mol. of the reagent, is greater or less, resp., than 1. This error may be quite appreciable even when U diverges only moderately from 1. By the method previously described (*C. A.* 21, 2626), however, it is possible to calc. from the potentials at various stages of the titration both the true end point and the value of U . B. C. A.

A quick method for making starch solution. JOHN C. BAILAR. *Chemist-Analyst* 18, 14(1929).—Into 100 cc. of boiling water, drop about 20 granules of puffed rice. Boil until these granules disintegrate, cool and decant off the starch soln.

W. T. H.

Production of uniform stains in the Gutzeit test. C. H. MANLEY. *Analyst* 54, 30(1929).—The use of "Gloy" is recommended for attaching the HgCl_2 paper.

W. T. H.

Standard solution of magnesium chloride. BENJAMIN FREEMAN. *Chemist-Analyst* 18, 18(1929).—Sometimes a stock bottle of $\text{MgCl}_2 \cdot 6\text{H}_2\text{O}$ becomes too pasty to weigh. If the original wt. is known, all that is necessary is to make up a soln. to a definite wt. and use measured vols. to get any desired wt. W. T. H.

Determination and separation of a few metals by rapid electrolysis without mechanical stirring of the electrolyte. NICOLAS VENSOVITCH. Univ. Louvain. *Bull. soc. chim. Belg.* 37, 353-76(1928).—Ag, Cu and Cd can be deposited rapidly and quantitatively without stirring, if the electrolyte is kept boiling. The appearance of the deposit is a criterion for detg. the optimum conditions. A sepn. of Ag from Cu can be accomplished by mechanically studying the nature of the deposits. A. L. HENNE

Microchemical determination of metallic elements. I. Microchemistry of potassium ferrocyanide. (Microchemical determination of zinc.) R. NAKASEKO. *Mem. Coll. Sci. Kyoto Imp. Univ.* 11A, 95-112(1928).—The min. quantity of iron detectable with $\text{K}_4\text{Fe}(\text{CN})_6$ is 1 in 3×10^6 of soln., the optimum acidity being about 0.1 N (strong acid). When solns. of FeCl_3 are added to dil. solns. of ferrocyanides the presence of neutral salts or of acidity retards the development of the blue color. A method for the microchem. determination of Zn is outlined. The soln., which should be free from Fe and Mn, is evapd. and the residue ignited. The residue is treated with 2 cc. of water, 1 cc. of 6 N HCl and 1 cc. of 5 N NH_4Cl ; 0.02 N $\text{K}_4\text{Fe}(\text{CN})_6$ is added dropwise from a buret until the granular ppt. becomes colloidal (formation of $\text{Zn}_2\text{K}_2[\text{Fe}(\text{CN})_6]_3$). The whole is diluted to 10 cc., inserted in a water bath at 60-70°, and kept in the dark for 30 mins., when it is centrifuged. The excess of ferrocyanide in the supernatant liquor is detd. with the aid of a reference table by observing the time required for the development of the blue color when 0.05 mg. of Fe (1 drop of a standard soln.) is added to 5 cc. The amt. of Zn in the sample analyzed is $(a - 500b) \times 0.47$ mg., where a is the number of cc. of 0.02 N ferrocyanide added and b the normality of the excess of ferrocyanide. Acid solns. of $\text{K}_4\text{Fe}(\text{CN})_6$ undergo rather rapid decompn. when exposed to daylight; they deposit Prussian blue. On long keeping, dil. neutral solns. are slowly hydrolyzed

with deposition of ferrous cyanide. II. Microchem. detection of iron with dimethylglyoxime. *Ibid* 113-7.—The tint and depth of color produced on mixing solns. of Fe, H_2S , NH_3 and dimethylglyoxime vary with the order of mixing, but are const. under const. conditions. For the colorimetric detn. of Fe the test soln. is first treated with a freshly prepd., satd. soln. of H_2S to reduce ferric salts. The mixt. is then treated with dimethylglyoxime (1% alc. soln.) and finally with NH_3 . The foregoing and the thiocyanate method are about equally sensitive. B. C. A.

Method for the determination of traces of antimony in copper and its alloys. S. G. CLARKE AND B. S. EVANS. *Analyst* 54, 23-8(1929).—Dissolve 5 g. of metal in 30 cc. of 9 N H_2SO_4 and 15 cc. of concd. HNO_3 . Evap. to fumes, cool and add 150 cc. of water, 15 cc. of concd. HCl and 10 g. of NaH_2PO_3 . Boil 10 mins. to reduce Cu to the cuprous state so that it will not interfere with the Reinsch test. In the absence of any considerable amt. of As, the liquid may be treated at once by the Reinsch method. If, however, a brownish black ppt. of As appears during the boiling with Cu, the liquid must be boiled for 20 mins. longer, cooled somewhat, treated with 20 cc. of benzene to coagulate the As and well shaken. This treatment removes the greater part of the As except when considerable Sn is present. Although As does not interfere with the subsequent colorimetric detn. of the Sb, it tends to weaken the film of deposited Sb in the Reinsch pptn. and cause it to become detached from the Cu. (In the case of a bronze, add 10 g. of oxalic acid at the start, before adding NaH_2PO_3 .) For the Reinsch pptn. it is well to use a piece of pure electrolytic Cu foil about 20×2.5 cm. in size, rolled into a flat spiral, as open as is consistent with its being dropped into the flask containing the soln. Clean by warming gently with 6 N HNO_3 and rinsing with water. Drop it into the soln. so that it stands upright and boil 2 hrs. Then lift the Cu spiral out of the soln. by means of a hooked glass rod, plunge it quickly into a beaker of cold water and then place it in another beaker of diameter only slightly larger than the spiral. Cover with distd. water and at once add 1 g. of Na_2O_2 . After 5 mins. heat gently until the Cu coil becomes darkened with a layer of CuO . This should accomplish the dissolving of all Sb, provided the deposit has been treated promptly. Pour off the soln., rinse the Cu, and introduce a rapid stream of H_2S for 15 sec. Allow to stand on the water bath for 30 mins. and then filter off any CuS and Bi_2S_3 , washing the ppt. with 1% NH_4NO_3 . Add 5 cc. of concd. H_2SO_4 to the filtrate, evap. to fumes, adding a few drops of concd. HNO_3 toward the last. Cool, take up with 15 cc. of water, heat to boiling and allow to cool. Det. the Sb colorimetrically as follows: Into a 100-cc. Nessler tube add successively, in this order: 10 cc. of 1% gum arabic soln., 5 cc. of 20% K soln., 1 cc. of 10% aq. pyridine soln., 1 cc. of 0.1 satd. SO_2 soln. and 60 cc. of 9 N H_2SO_4 . Then add the Sb soln., stir well and compare the color with standards. The standard Sb soln. should contain 0.2764 g. of tartar emetic in 1 l. of 10% H_2SO_4 . The color produced with 10 cc. of this soln. is as deep as can be measured to advantage.

W. T. H.

A sensitive test for cobalt by means of diphenylthiocarbazon. HELLMUT FISCHER. *Wiss. Veröffentlich. Siemens-Konzern* 6 [2], 147-9(1928).—The new reagent employed is an ammoniacal soln. of diphenylthiocarbazon. The test is extremely sensitive and simple to carry out. Modified directions are given for the presence of interfering elements. The presence of Ni does not affect the sensitivity. Co can be detected in metallic Ni samples providing it is present to the extent of 0.1%. F. A. R.

A new method of colorimetric determination of lead. A. D. PETROV. *J. Russ. Phys.-Chem. Soc.* 60, 311-6(1928).— H_2O_2 does not interfere with the tetramethyldiamidodiphenylmethane test and can, therefore, be used in the detection of 1 mg. or more of Pb. In the analysis, PbO_2 was first formed by the addn. of $(NH_4)_2S_2O_8$ to the HNO_3 soln., the PbO_2 was filtered off and washed, then treated on the filter with 0.5-1% soln. of the reagent in an EtOH-AcOH mixt. (5-7 cc. per 1 mg. Pb). A deep blue solution resulted which can be slowly dild. when necessary. Mineral acids (if present as impurities in AcOH) destroy the coloration; the color is at first violet, but changes to red.

B. SOYENKOFF

The influence of cobalt on the determination of manganese in steel. ISABURO WADA AND SHOICHIRO SAITO. *Bull. Inst. Phys.-Chem. Research (Tokyo)* 7, 1002-27 (1928); *Abstracts* 1, 97-9.—The purpose of the paper is to decide whether the presence of Co interferes with the detn. of Mn when it is oxidized to permanganate in HNO_3 soln. with sodium bismuthate and then titrated with a ferrous salt. It is found that the titration of permanganate in the presence of oxidized Co will be correct only when these 2 elements are present, but will be incorrect if a third element, chiefly Fe (NO_3), is present. Consequently, Mn in steel cannot be titrated by this method in the presence of Co. ALBERT L. HENNE

Aluminum in steels. The hydroxide method of separation. WM. KUEBLER, WM. J. SHANEMAN AND J. J. GALLAGHER. *Chemist-Analyst* 18, 6(1929); cf. C. A. 22, 1746.—Treat 2 g. of steel with 6 N HCl, oxidize with HNO₃ and take down to a sirup. Cool, transfer to a dropping funnel and add dropwise to an excess of boiling-hot, 20% NaOH soln. Boil to make sure all Cr is pptd., cool, make up to a definite vol., pipet off half of the soln. and ppt. the Al with (NH₄)₂CO₃. Weigh as Al₂O₃. W. T. H.

Rapid determination of nickel in iron and steel. STEPHEN SOULÉ. *Chemist-Analyst* 18, 7(1929).—The method recommended is the cyanide titration described by Campbell and Andrews in 1895. W. T. H.

Preparation and use of the sodium salt of dimethylglyoxime for determining nickel. JOHN B. CASEY. *Chemist-Analyst* 18, 8(1929).—Add 7 g. of NaOH slowly to 1 l. of hot water contg. 20 g. of dimethylglyoxime. Some chemists prefer this to the alcoholic soln. of the reagent, largely because of the Volsted Act. W. T. H.

Determination of molybdenum in steel. WALTER F. MURRAY. *Chemist-Analyst* 18, 10(1929).—Dissolve 5 g. of steel in 200 cc. of N H₂SO₄, add 3–4 g. of (NH₄)₂S₂O₈ and boil to decompose the excess. Dil. to 400 cc. and sat. with H₂S at about 80°, passing the gas through the soln. for 45 mins. Filter, wash with dil. H₂S soln. and ignite in a crucible. Dissolve the resulting MoO₃ in 10 cc. of 20% NaOH, wash out the crucible, boil the soln. and filter. Dilute the filtrate contg. Na₂MoO₄ to 400 cc. and make barely acid to litmus by adding 6 N HCl. Boil 5 mins., add 15 cc. of 5% Pb(OAc)₂ soln., 25 cc. of 25% NH₄OAc and 5 cc. of concd. AcOH, stirring well after each addition. Keep nearly boiling for 20 mins., filter off the PbMoO₄ ppt., wash with hot water and ignite at a dull red heat, weighing as PbMoO₄. If W is present, det. this element in the usual way, evap. the filtrate to fumes. Dil. with water and boil until all the salts have dissolved. Then add persulfate and continue as in the absence of W. W. T. H.

Gravimetric method for microchemical determination of molybdenum. JOSEPH B. NIEDERL AND EDITH P. SILBERT. *J. Am. Chem. Soc.* 51, 376–7(1929).—To det. Mo in an org. compound, heat 3–5 mg. in a porcelain boat with a drop of HNO₃ and weigh the residual MoO₃. The temp. must not exceed 450°. W. T. H.

An aid in the deposition of copper on aluminum. GEORGE W. BENNETT. *Chemist-Analyst* 18, 8(1929).—Very pure Al sometimes does not work well in Low's iodide method for detg. Cu. The addition of a few drops of H₂PtCl₆ to the soln. or the deposition of a little NH₄Cl on the Al from lab. fumes will overcome this difficulty. W. T. H.

Determination of arsenic in oxide of antimony pigment. G. SIROIS. *Chemist-Analyst* 18, 14(1929).—For small quantities of As, distil off AsCl₃ from 25 g. of sample in the A. O. A. C. method, sat. the distillate with H₂S and weigh as As₂S₃. For larger quantities, treat 1 g. of pigment with 15 cc. of concd. H₂SO₄ and 5 g. of K₂SO₄, at until all traces of S have disappeared, cool, dil. with 20 cc. of water, heat until salts have dissolved, add 20 cc. of HCl and sat. with H₂S. After drying the As₂S₃ treatment with CS₂ and another drying are recommended before weighing. W. T. H.

Determination of sulfur in metallic antimony. CHAS. G. SNYDER. *Chemist-Analyst* 18, 6(1929).—Fusion of 2–3 g. of sample in a 75 cc. Ni crucible half filled with K₂O₂ is recommended. Extract the melt with 100 cc. of water, remove the crucible, add 100 cc. of concd. HCl and 10 g. of tartaric acid and heat till the soln. is clear. Then dil. with 400 cc. of hot water and ppt. with BaCl₂. W. T. H.

Note on the estimation of sulfur in steels and cast irons. N. D. RIDSDALE. *Foundry Trade J.* 39, 466(1928).—To avoid low results in the evolution method, mix 5 g. drillings with 0.5 g. of powdered cream of tartar in a porcelain crucible. Fill the crucible with a mixt. of 95% acid-washed, 40-mesh, calcined sea sand and 5% cream of tartar. Cover the crucible with a slightly larger silica capsule, invert the crucible, and fill in the space between the crucible and edge of the capsule with SiO₂-tartar mixt. Slowly heat to 750° and anneal at this temp. for 20 mins. Cool and evolve as usual, using concd. HCl. Run a blank on the reagents. W. T. H.

Separation and determination of nitrogen in argon. CHS. LEU. Univ. Lausanne. *Helv. Chim. Acta* 11, 761–3(1928).—N cannot be eliminated completely from A by passing over hot Mg or Ca. Only 70 or 40%, resp., is fixed by these metals. Mg + 1% Na and a trace of CaO fix 97–98% of the N passed over it at 850–70°. By re-running, A contg. 1–5% N can be freed to the extent of 2/10,000 N. A. L. H.

Determination of nitrogen by the Dumas method. I. MAREK, M. KRAJČINOVIC AND G. ZALJEŠOV. *Arch. hem. farm.* 2, 169–73; In French, 174(1928).—The modifi-

cation here proposed chiefly affects the tube in which the combustion is effected. The tube is heated electrically by Ni-Cr windings. In the back end of the tube the substance mixed with CuO is heated and partial oxidation is effected. In the central part of the tube, the layer of CuO is made shorter than is customary and consists of 10 in. of CuO wrapped in a spiral of Cu gauze which is fully oxidized at the beginning of the analysis. The front end of the tube contains the usual reduced spiral of Cu gauze. Both of the gauze spirals are wrapped with asbestos thread so that they do not come into direct contact with the glass. J. KUČERA

Formation of complex anions in the presence of free hydrogen ions. FREDERICK G. GERMUTH. *Chemist-Analyst* 18, 3-4(1929).—A table is given showing the amt. of citric or tartaric acid, in terms of the p_H value of the resulting soln., requisite to prevent the pptn. of Zn, Cr, Cu, Al and Fe by NH_4OH . W. T. H.

Modified procedure for the determination of the phosphate ion as magnesium pyrophosphate. N. KRILENKO. *Arh. hem. farm.* 2, 197-205(1928).—In French. The method proposed is a modification of Mme. Marjanović's method for detg. the SO_4 ion in $MgSO_4$ by pptn. with phosphate and weighing as $Mg_2P_2O_7$. To 20 cc. of soln. contg. not more than 0.2 g. of P_2O_5 , add 1 cc. of H_2SO_4 and evap. to dryness. Add 2 cc. of concd. H_2SO_4 and 4-5 cc. of a cold, satd. soln. of $MgSO_4$, stirring until the residue has dissolved completely. Make alk. to phenolphthalein by adding concd. NH_4OH dropwise, after adding 3-5 cc. of satd. NH_4 citrate if any Fe, Al or Ca is present. After 30 mins. dil. with a hot soln. contg. 5% of NH_3 and 5% of NH_4Cl . Decant through a weighed Gooch crucible, treat with more of the ammoniacal- NH_4Cl soln. and repeat the treatment until the liquid does not clarify after 10 mins. stirring. Then transfer all the ppt. to the crucible, wash with 2.5% NH_3 , dry, and ignite to 900° . J. K.

Precision methods for the determination of the chloride ion. Y. N. SLAVYANOV. *J. Russ. Phys.-Chem. Soc.* 60, 355-9(1928).—The Vollhard and Mohr volumetric methods were subjected to critical study and procedures were described which will give very accurate results. B. SOYENKOFF

Detection and identification of specific cations with sodium alizarinsulfonate reagent. FREDERICK G. GERMUTH AND CLIFFORD MITCHELL. *Am. J. Pharm.* 101, 46-52(1929).—The value of sodium alizarinsulfonate as a qual. reagent for U, Pt (ic), Sn (ic), Ti (ous), Al, Bi, Fe (ic), Cr (ic), Cu (ic), Hg (ic) and Tl is shown in tables. W. G. GAESSLER

Reactions of hydrogen peroxide, perborate and peroxides. G. TELLERA. *Boll. chim. farm.* 67, 705-7(1928).—The following tests for detecting H_2O_2 , perborates and peroxides were compared: $K_2Cr_2O_7$, H_2SO_4 and Et_2O (Gawalowski) (I); $K_2Cr_2O_7$, $PhNH_2$ and $(CO_2H)_2$ (Bach); KI, starch soln. and H_2SO_4 (II); $(NH_4)_2MoO_4$ and H_2SO_4 (Denigès); $(HOCHCO_2H)_2$, $(NH_4)_2Fe(SO_4)_2$ and soda (Denigès) (III); $PhOH$ and $FeSO_4$ (Spiro); guaiacol and fresh milk (Japernoux). The expts. carried out with H_2O_2 , $Na_2B_4O_7$ and the peroxides of Na, Ba, Mg and Zn revealed that the tests I, II and III gave the best, because most uniform, results. G. SCHWACH

Volumetric determination of arsine. H. KUBINA. *Tech. Hochschule Brunn* *Z. anal. Chem.* 76, 39-48(1929).—By the action of $HBrO_3$ ($KBrO_3$ and dil. H_2SO_4) AsH_3 can be oxidized to AsO_4^{3-} and the bromate reduced to Br^- . In one procedure recommended, the AsH_3 was absorbed in 25 cc. of 6 N H_2SO_4 contg. 10 cc. of 10% KBr and a considerable excess of $KBrO_3$. After at least 5 mins., the excess BrO_3^- was reduced by a measured vol. of $AsCl_3$ soln. and the excess of the latter titrated with $KBrO_3$ soln. The expts. were made with a gas mixt. of AsH_3 and H_2 . The results were accurate within 2-3%. A better method consisted in allowing the AsH_3 to react with ICl soln., $AsH_3 + 8ICl + 4H_2O = AsO_4^{3-} + 4I_2 + 8Cl^- + 11H^+$. The liberated I_2 was then titrated with IO_3^- soln. in the presence of CN^- by the method of R. Lang. $IO_3^- + 2I_2 + 5HCN + H^+ \rightarrow 5ICN + 3H_2O$. W. T. H.

Excess nitric acid in phosphate determinations. GEORGE L. HOCKENYOS. *Chemist-Analyst* 18, 14(1929).—In soil analysis it is recommended to stop the evapn. while a considerable excess of HNO_3 is present and then neutralize with $(NH_4)_2CO_3$ rather than with NH_4OH . Then add a little HNO_3 and ppt. with molybdate in the usual way. W. T. H.

Dehydration of silica. GEO. L. HOCKENYOS. *Chemist-Analyst* 18, 11(1929).—Treatment of the dehydrated SiO_2 with 5 cc. of concd. acid for 5 mins. followed by the addition of 15 cc. of water is recommended in the analysis of soils. If the dehydrated SiO_2 is warmed with 6 N acid about 1 mg. more of SiO_2 is dissolved. W. T. H.

The chemical action of lime on siliceous materials and on trass. P. MECKE. *Tonind. Ztg.* 52, 1498-9, 1517-9(1928).—The siliceous residue from alum manuf. was

analyzed with H_2SO_4 , with NaOH , with $\text{Ca}(\text{OH})_2$ and with $\text{Ba}(\text{OH})_2$. The first 2 and the fourth give similar results but the low soly. of lime makes its action slow and incomplete. CaO will act on such material to evolve heat in an amount depending upon the phys. condition. Such Ca silicates are, however, readily decomposed by CO_2 . Lime mortar contg. this material or diatomaceous earth on titrating after 6 months required much less acid than in the absence of SiO_2 . F. O. A.

Analysis of mixtures containing acetone, ethyl alcohol and isopropyl alcohol. CHARLES A. ADAMS AND JOHN R. NICHOLLS. *Analyst* 54, 2-9(1929).—Comparative tables are given of the strengths and immersion refractometer readings of aq. solns. of acetone and of some of the lower alcs. If not more than 10% of these substances present in an aq. soln., the d. and refractometer readings are approx. additive factors. The following rapid method serves to detect and det. acetone colorimetrically and the process can be adapted to the detn. of isopropyl alc. To 10 ml. of soln. contg. not more than 0.02 g. of acetone, add 1 ml. of 1% soln. of *o*-nitrobenzaldehyde in 50% EtOH , mix, add 0.5 ml. of 30% aq. NaOH and allow to stand for 15 mins., avoiding strong daylight. Compare the color with that obtained from standards treated similarly. To detect isopropyl alc., add 5 ml. of satd. Br -aq. to 10 ml. of soln. contg. not more than 10% by vol. of the alc. Stopper loosely and allow to stand 3-6 hrs. longer in a cool place. Then test for acetone as above. To det. EtOH and isopropyl alc., the following conditions provide for their oxidation to acetic acid and acetone, respectively, and the detn. of each. To distillate contg. not more than 1.5 g. of EtOH or 3 g. of isopropyl alc., add water to make 100 ml. in a 800 ml. distg. flask. Add an equal vol. of soln. contg. 10 g. of $\text{K}_2\text{Cr}_2\text{O}_7$ and 25 ml. of concd. H_2SO_4 . Stopper and allow to stand 30 mins. Then add an excess of FeSO_4 and steam distil until the vol. of liquid in the flask is reduced to 100 ml. Titrate the AcOH in the distillate, using phenolphthalein as indicator and 10 g. of NaCl to make the end point sharper. Distil the neutralized soln. and det. the acetone content by a d. detn. (see following abstract). W. T. H.

The specific gravities and immersion refractometer readings of dilute mixtures of acetone and water. JOHN R. NICHOLLS. *Analyst* 54, 9-11(1929).—Tables are given showing the sp. gr. and refractometer readings of acetone solns. contg. 0.2-10 g. of acetone. W. T. H.

Color reaction of diphenylamine and its application to the identification of this substance in powders. LOUIS DESVERGNES. *Ann. chim. anal. chim. appl.* 11, 1-4(1929).—In alc. soln. a violet color is obtained by the action of Cl_2 on diphenylamine. The test serves to detect 1 part of the amine in 65,000 parts of soln. To detect this substance in a powder contg. about 1.5%, digest 2.5 g. of the powder with 20 cc. of pure ether. After 2-3 hrs. and frequent shaking in a glass-stoppered bottle, filter, add 20 cc. of water to the filtrate and heat to remove the ether. Cool, add 10 cc. of EtOH and some Cl_2 aq. The first addition of Cl_2 serves to destroy the yellow color of the soln. and afterwards the violet color characteristic of diphenylamine appears. Thus with 10 drops of satd. Cl_2 water, the soln. remains yellow even after standing 6 hrs. but with 15-25 drops, the violet color is discernible within 30 mins. W. T. H.

Rapid test for detecting glycerol. STEPHEN SOULE. *Chemist-Analyst* 13, 8(1929).—Drop a little upon a hot piece of Fe . The odor of acryl aldehyde indicates glycerol. W. T. H.

A new acidimetric method for the determination of glucose by means of Fehling solution. MICHAEL DIMITROFF HADJEFF. *Agr. Chem. Inst. Univ. Sofia. Z. Untersuch. Lebensm.* 55, 615-8(1928).—The Cu_2O is pptd. by use of the Meissl-Allihn method, washed by decantation with hot H_2O and dissolved in a known vol. of a warm mixt. of 0.5 *N* H_2SO_4 and 0.25 *N* (0.5%) H_2O_2 . The H_2O_2 is added from a buret until it is in slight excess. The acid is used according to the equation $\text{Cu}_2\text{O} + \text{H}_2\text{O}_2 + 2\text{H}_2\text{SO}_4 = 2\text{CuSO}_4 + 3\text{H}_2\text{O}$ and is detd. by back titration of the excess using 0.5 *N* NaHCO_3 soln. in 100 cc. of H_2O contg. 3 drops of methyl orange indicator. The end point is a permanent yellow-green color. The excess of acid is calcd. by use of the factor 1.020, and the amt. of acid consumed multiplied by the factor 0.015378 gives the amt. of Cu in the Cu_2O . The sugar soln. should not contain over 0.5% glucose and the H_2O_2 - H_2SO_4 mixt. should not be used if more than 30 days old. C. R. F.

Determination of maltose and glucose. W. BRAUN, B. BLEYER AND W. ELHARDT. *Chem. Hochschule München. Z. anal. Chem.* 76, 1-38(1929).—The reduction values of the purest obtainable glucose and maltose were detd. very carefully so that with the aid of the tables given in this paper it is possible to det. glucose and maltose when present singly or together. Several different procedures were studied critically. The original paper should be consulted for details. W. T. H.

Determination of sulfur in organic substances. IVAN MAREK. *Bull. soc. chim.* **43**, 1405-7(1928).—See *C. A.* **22**, 1933. E. J. C.

pH measurement with the glass electrode and vacuum tube potentiometer (ELDER, WRIGHT) **2**. The behavior of the Sb electrode in buffered and unbuffered solutions (LAVA, HEMEDS) **2**. The coalescence of an unfilterable precipitate of BaSO₄ (TRIMBLE) **2**. New colorimetric methods (MĚŠT'AN) **2**. Ascertaining the volumetric proportion of a constituent such as CO₂ in combustion gases (U. S. pat. 1,700,852) **21**. The residue in SiO₂ determination (BĚGER) **8**. The determination of acetone groups in acetone-sugars (ELSNER) **10**. The determination of sugar in small quantities of liquids (HUMBERT) **11B**.

Determining carbon dioxide in flue gases. HEINZ GRÜSS (to Siemens & Halske A.-G.). U. S. 1,701,181, Feb. 5. An app. is used comprising at least one testing wire surrounded by the flue gases and another wire lying in a comparison gas, connections between the wires for establishing a Wheatstone bridge, and a double coil instrument inserted in the diagonal branch of the bridge; the bridge is supplied with elec. current of such intensity that the wires have the same temps. and that these lie between 200° and 350°. Cf. *C. A.* **23**, 551.

8—MINERALOGICAL AND GEOLOGICAL CHEMISTRY

EDGAR T. WHERRY AND J. F. SCHAIERER

The color of minerals. I. The absorption of red colored minerals in the visible part of the spectrum. O. WEIGEL AND G. HABICH. *Neues Jahrb. Min. Geol., Abt. A, Beil.-Bd.* **57**, 1-56(1928).—This paper comprises mainly phys. data, but analyses of almandine, pyrope and grossularite are given. J. F. SCHAIERER

Crystal forms of wolfsbergite. E. ERNST. Univ. Heidelberg. *Neues Jahrb. Min. Geol., Abt. A, Beil.-Bd.* **56**, 275-315(1927-8).—The identity of guejarite with chalcostibite (wolfsbergite) Cu₂S.Sb₂S₃, announced by Penfield and Frenzel in 1897 is confirmed by new crystallographic data. J. F. SCHAIERER

New mineral [berthonite] from Tunis. H. BUTTGENBACH. *Ann. soc. geol. Belg.* **46**, 212(1927).—Berthonite, d. 5.49, hardness 4-5, contains Pb 21.83, Cu 23.68, Sb 32.45%, corresponding with the formula 5PbS.9Cu₂S.7Sb₂S₃. B. C. A.

Minerals from new veins in Belgian Congo. H. BUTTGENBACH. *Mém. soc. roy. sci. Liège* [3], **14**, No. 4(1927).—Accounts are given of several minerals from veins of Cu ore in limestone near intrusive rocks recently discovered at several places along the tributaries of the Lubi River. Massive stromeyerite contains: Cu 20.45, Ag 60.00, S 15.65, Fe 0.26, insol. 2.56, sum 98.92%. Planchéite intermixed with shattuckite and chrysocolla gave: SiO₂ 41.24, CuO 50.67, CaO trace, H₂O 5.54, moisture 0.85, insol. 1.36, sum 99.66%. Crystals of willemite, barite, libethenite and volborthite are figured and described. B. C. A.

The minerals of the enargite group and their paragenetic relations in the copper ore deposits of Mancayan in Luzon, Philippine Islands. GEORG FREIBOLD. *Neues Jahrb. Min. Geol., Abt. A, Beil.-Bd.* **56**, 316-33(1927-8).—On the basis of x-ray data, the evidence for the existence of the mineral luzonite is very weak. It is suggested that the so-called luzonite is a mech. mixt. of enargite and famatinite. J. F. S.

Crystallography of aurichalcite, danburite, cerussite, etc. H. BUTTGENBACH. *Mém. soc. roy. sci. Liège* [3] **12**, No. 9(1924).—A review is given of the literature on the crystallography and optics of aurichalcite. A new crystal-form is noted on danburite from Switzerland. Twinned crystals of cerussite from Tunisia are figured and described. Crystallographic data are given for *m*-xylylhydrocotarnine, *o*-, *m*- and *p*-tolylhydrocotarnine, tin dibromodi-*p*-tolyl, tin tetratolyl (*o*-, *m*- and *p*-), tin tetra- α -naphthyl. B. C. A.

Fine structure of the feldspars. E. SCHIEBOLD. *Fortschr. Mineral. Kryst. Petrog.* **12**, 78-82(1927).—The monoclinic feldspars are basal-face-centered, the edges of the unit cell being parallel with the crystallographic axes *a*, *b* and *c*. Values of *a*₀, *b*₀ and *c*₀, resp., are as follows: adularia, 8.61, 13.07, 7.26; sanidine, 8.42, 12.92, 7.14; microcline, 8.44, 13.00, 7.21; hyalophane, 8.50, 12.92, 7.12; albite, 8.23, 13.00, 7.25; oligoclase, 8.16, 12.90, 7.13; labradorite, 8.23, 12.91, 7.16; anorthite, 8.185, 12.895, 7.09 A. U. The space-group for the monoclinic feldspars is C_{2h}, and for the triclinic, C₁. The effect of changes of compn. on the dimensions of the unit cell is considered. B. C. A.

Anorthoclase in caucasites. D. S. BELYANKIN. *Bull. acad. sci. Russ.* 1927, 1115-23.—B. classifies the anorthoclases with orthoclases and distinguishes the 4 series: K and Na anorthoclases, either with low or medium values of $2V$ or with high values of $2V$. It is suggested also that the anorthoclases with low or medium $2V$ be termed K sanidine (or simply sanidine) and Na sanidine, resp. K sanidine occurs widely in igneous rocks, principally in intruded materials and mostly in those of recent age. B. C. A.

Chemical composition of augite and biotite from tephritic lava and the Laacher trachyte. R. BRAUNS. *Min. Inst. Univ. Bonn. Neues Jahrb. Min. Geol., Abt. A, Beil.-Bd.* 57, 131-8(1928).—Analyses of augite and biotite are given. J. F. S.

Analcite. S. DI FRANCO. *Boll. soc. geol. Ital.* 45, 1(1926).—A specimen of analcite contained: H_2O 8.22, SiO_2 54.10, Al_2O_3 23.68, CaO 0.45, Na_2O 13.40, K_2O 0.34%, and had d 2.249. B. C. A.

Apophyllite. S. DI FRANCO. *Atti accad. Gioenia sc. Na. Catania* 15, No. 7 (1926).—A specimen of apophyllite contained: SiO_2 52.75, CaO 25.43, K_2O 4.73, Na_2O 0.43, H_2O 16.8% and had d_{15} 2.375. B. C. A.

Serpentine and chlorite. N. KURNAKOV AND V. CHERNIKH. *Mem. Soc. Russ. Min.* 55, 183-94(1926); cf. *C. A.* 22, 932.—The formula, $H_2Mg_3Si_2O_8$, fairly accurately expresses the compn. of many serpentines; if Al_2O_3 (up to 8.2%) is present, the chlorites are approached. The nature of the heating curves is discussed. With increase in the Al_2O_3 content the orthochlorites show conversion into corundophilite and amesite. B. C. A.

Rare earths of Japanese wolframites. MASATAKE KOSAKI. *Bull. Inst. Phys. chem. Research (Tokyo)* 7, 540 2(1928); *Abstracts* 1, 50.—Wolframites from: (1) Takatori, Hitachi province and (2) Akenoba, Tajima province were fully analyzed giving, resp.: WO_3 70.47, 77.12, MnO 10.55, 0.81, FeO 10.00, 17.52, Fe_2O_3 2.65, 1.61, Al_2O_3 5.71, 2.02, SiO_2 0.89, 0.18, SnO_2 0.09, 0.34, P_2O_5 0.33, —, rare earths 0.04, 0.10%. The mineral from Akenobe is therefore the ferberite variety of wolframite. The spectral analysis shows that the Takatori specimen contains Sc, Yt and Ho, the lines of the latter being predominant. It agrees thus with wolframite from Zinnwald, Bohemia, in contg. Sc as a minor constituent. ALBERT L. HENNE

Recent advances in science: Geology. G. W. TYRRELL. *Univ. Glasgow. Science Progress* 23, 409-17(1929).—A review of recent work on volcanology and the igneous rocks. JOSEPH S. HEPBURN

Transition deposits of the intrusive-magmatic type. I. Tin, tungsten and molybdenum. ARNOLD CISSARZ. *Neues Jahrb. Min. Geol., Abt. A, Beil.-Bd.* 56, 99-274 (1927-8). A detailed geological description of the natural deposits is given. Diagrams showing the chem. compn. of Sn-bearing rocks are included. Practically all Sn, W and Mo deposits are of hydrothermal origin. A very complete bibliography is given, by localities. J. F. SCHAIER

Genesis of the Silver Hill tin deposits. ALFRED L. ANDERSON. *J. Geology* 36, 646-64(1928).—Southeast of Spokane, Wash., are cassiterite-bearing pegmatites carrying both andalusite and sillimanite. These dikes are differentiation products from a magma which has produced submagmas as basic as kersantite and as acid as aplite and quartz veins. The andalusite was pptd. first, followed by cassiterite. Hydrothermal solns reacted with the earlier-formed minerals, producing orthoclase with intergrown sillimanite needles. Wolframite, scheelite, galena and tourmaline also occur in small amts in the pegmatites and associated quartz veins, illustrating a common origin for both. W. F. HUNT

The refractory earths of Novarese. G. MILANI. *Corriere ceram.* 9, 427, 429 (1928).—The av. analysis of some silica earths from Novarese, Italy, is given. "Rosa" is a pulverulent material contg. SiO_2 78, Al_2O_3 12, Fe_2O_3 2, and alkali 2%. "Santuario" is whitish and contains less Fe. The analysis of "Moscotti," which is a yellowish, plastic material, shows SiO_2 66, Al_2O_3 18, Fe_2O_3 1.5%, and traces of CaO and MgO . "Marta" is a very friable earth of blood-red color and contains SiO_2 65, Al_2O_3 16, Fe 2.25, MgO 4%, and traces of CaO ; the min. loss on ignition is 7%. G. SCHWOCH

Dikes belonging to the Alnø formation in the cuttings of the East Coast Railway. HARRY VON ECKERMANN. *Geol. För. Förh.* 50, 381-412(1928).—E. studied the dikes cutting the granites previously described (*C. A.* 23, 1085) and made 8 new analyses, which are given. A mica-carbonate dike at Bergeforsen contained dolomite, sodabiotite, barite, ilmenite, pyrrhotite and a blue unknown mineral. A feldspar-carbonate dike at Bergeforsen contained K feldspar, magnesite, dolomite, magnetite and goethite. A hamrongitic alkaline porphyrite dike at Bergeforsen contained larger and smaller well defined white feldspar phenocrysts within a grayish green ground mass.

A beforsitic biotite-chlorite-carbonate dike at Bergforsen contained light brown biotite, green borders of chlorite, a carbonate, orthoclase, quartz, olivine, serpentine, and an unknown blue mineral. E. selected 4 of the several dikes at Stavre as representative. (1) An alnöite dike rich in carbonates, contg. calcite 37.0, biotite 29.2, hornblende 15.6, augite 14.0, perovskite and ores 3.8, barite 0.4, sum 100.0%. The relation of CaO to MgO and FeO is markedly different from that of older analyses of alnöites. (2) A beforsitic alnöite dike was mostly made up of biotite, chlorite, and calcite. (3) A Sr-bearing aragonitic beforsite dike contained biotite, apatite, magnetite, perovskite, pyrite, fluorite, barite, chalcedonite, and carbonates of Ca, Mg, and Sr (SrO 0.74%). (4) A stavrite dike consisted mainly of a mass of amphibole needles with biotite and some chlorite, calcite, quartz and ilmenite in the interstices. A calcitic beforsite dike at Söråker consisted of fluidally elongated almost banded parts of typical beforsite with mica-phenocrysts alternating with more carbonatic rock: calcite 61.8, biotite 28.4, apatite 6.1, magnetite 1.6, pyrite 1.4, perovskite 0.7, sum 100.0%. E. discusses the differentiation of the dikes at some length and points out new lines of attack on the problem of mineral paragenesis. The relative *cfm* is evidently of very great importance in the differentiations of the dikes. This is illustrated by several examples drawn from the minerals studied. W. SEGERBLUM

Geology and paleontology of South America. XXIX. Eruptive rocks and their contact rocks from the Cordillera of Bolivia and Peru. RICHARD VIELMEYER. Min. Inst., Univ. Bonn. *Neues Jahrb. Min. Geol., Abt. A, Beil.-Bd. 56*, 23-68(1927-8).—An analysis of granite is included. J. F. SCHAIRER

Quartz in porphyritic rocks. FRANZ ANGEL. Min.-petr. Inst. Graz. *Neues Jahrb. Min. Geol., Abt. A, Beil.-Bd. 56*, 1-22(1927-8).—Quartz, either as phenocrysts in the original magma or as xenoliths of sandstone, does not come into equil. with the magma. Resorption aureoles in porphyritic rocks from Rumania and Steiermark are described. J. F. SCHAIRER

The chemical composition of the basalt lavas of the Laacher See region. R. BRAUNS. Min. Inst. Univ. Bonn. *Neues Jahrb. Min. Geol., Abt. A, Beil.-Bd. 56*, 468-98(1927-8).—Analyses are given of loess, basaltic lava, scoriaceous lava, leucite-nephelite-basalt, leucite basalt, and hauynite-rich leucitite. J. F. SCHAIRER

Olivine diabase from Braunlage in the Harz. K. SCHLOSSMACHER AND K. HEYKES. *Neues Jahrb. Min. Geol., Abt. A, Beil.-Bd. 57*, 163-72(1928).—Analysis of the olivine-diabase is given, as well as that of ankerite grains found in the rock. J. F. S

Magmatic differentiation in the Gleinalm region, Steiermark. FRANZ ANGEL. Min.-petr. Institute, Graz. *Neues Jahrb. Min. Geol., Abt. A, Beil.-Bd. 56*, 423-67(1927-8).—The complex chem. and mineralogical changes during magmatic differentiation producing the various rocks of the region are described. J. F. SCHAIRER

Notes on the precipitation of calcium carbonate. R. C. EMMONS. *J. Geology* 36, 735-42(1928).—A series of expts. covering a period of 2-8 months to det. the factors controlling pptn. Conclusions: (1) contact of air with water satd. with $\text{Ca}(\text{HCO}_3)_2$ ppts. CaCO_3 by removing CO_2 from soln.; (2) agitation of soln. has the same effect; (3) reduction of pressure has only a slight effect; (4) in quiet water CaCO_3 ppts as a fine powder while in circulating water the CaCO_3 is coarsely cryst. W. F. H

Area and origin of meteoric glasses (tektites). G. LINCK. Min. Geol. Inst. Jena. *Neues Jahrb. Min. Geol., Abt. A, Beil.-Bd. 57*, 223-36(1928).—Tektites show a range in sp. gr. of 2.337-2.48 and in *n* of 1.486-1.5097. The av. compn. is near that of a fused clay; they are, however, fused sedimentary rocks. Viscous glasses were probably fused under pressure and the surface sculpturing was produced at this time. It is suggested that tektites are volcanic bombs shot from the moon during the Pleistocene period. J. F. SCHAIRER

Fulgurites from the Miocene glass sands of Guteborn near Ruhland. WALTHER FISCHER. Min. Geol. Museum, Dresden. *Neues Jahrb. Min. Geol., Abt. A, Beil.-Bd. 56*, 69-98(1927-8).—Analyses of fulgurites, and the quartz sand and clay deposit in which they occur, are given. The fulgurites found in the sand are nearly pure silica glass (lechatelierite). J. F. SCHAIRER

The residue in silica determination. P. J. BEGER. *Neues Jahrb. Min. Geol., Abt. A, Beil.-Bd. 57*, 237-48(1928).—Analyses of lamprophyre and a coarse grained schlieren were made, and the residue from the SiO_2 detn. was tested and compared with the results of Arousseau on an andesite from California. B. decides that the residue is usually high in rocks rich in R_2O_3 . J. F. SCHAIRER

Report on the optical axial angle and relation of its plane to the plane of symmetry in mica (ANON.) 2. Irrespirable atmosphere in the high Alpine mining district (Hrass-

LEITNER) 2. Structure of topaz (ALSTON, WEST) 2. A precision method for measuring temperatures of π liquids on a crystal refractometer and on a microscope slide (ASHTON, TAYLOR) 2.

9—METALLURGY AND METALLOGRAPHY

D. J. DEMOREST, R. H. ABORN

Merica receives James Douglas medal. ANON. *Mining and Met.* 10, 75(1929).

E. J. C.

Research within an industry creates the demand—and supplies it. EVERETT PARTRIDGE. *Ind. Eng. Chem.* 21, 37-40(1929).—The function of the research department of the Vanadium Corporation of America in creating a demand for V and in supplying necessary material to manufacturers is shown. V used in the United States in 1906 was about 750 lbs., in 1924 about 1,000,000 lbs., and the calcd. demand 1930 is about 1,800,000 lbs., with an additional 800,000 lbs. to be used in other countries. Over 90% of the world's supply is under American industrial control, though the ore comes chiefly from Peru and South Africa; only about 16% of occurs as mineral deposits within the United States. The recovery from V-steel and other alloys by the acid open-hearth furnace is increasing rapidly. Types of research problems are given, including the development of manufacturing processes for Corporation itself and the utilization of products made by it. Among the latest projects are the prepn. of catalysts, medicinals, and rare chemicals of c. p. and technical grades. Coöperation with consumers of its products, with research as a consulting vice, has given valuable results.

W. C. EBAUGH

Aluminum: its present and future status. ERNEST V. PANNELL. British Aluminum Co., Ltd. *Metal Ind.* (N. Y.) 27, 7-9(1929).

E. H.

Arsenic, bismuth, selenium and tellurium in 1927. ANON. Bur. Mines, *Mineral Resources of the U. S. 1927*, Pt. I, 115-8(preprint No. 7, published December 17, 1928).

E. J. C.

Iron ore, pig iron and steel in 1927. HUBERT W. DAVIS. Bur. Mines, *Mineral Resources of the U. S. 1927*, Pt. I, 75-113(preprint No. 6, published December 26, 1928).

E. J. C.

Manganese and manganiferous ores in 1927. J. W. FURNESS. Bur. Mines, *Mineral Resources of the U. S. 1927*, Pt. I, 157-216(preprint No. 9, published January 16, 1929).

E. J. C.

Gold, silver, copper, lead and zinc in Colorado in 1926. CHAS. W. HENDERSON. Bur. Mines, *Mineral Resources of the U. S. 1926*, Pt. I, 733-74(preprint No. 28, published December 15, 1928).

E. J. C.

Silver, copper, lead and zinc in the Central States in 1927. J. P. DUNLOP AND M. MEYER. Bur. Mines, *Mineral Resources of the U. S. 1927*, Pt. I, 217-53(preprint No. 10, published December 31, 1928).

E. J. C.

Plant of the Gulf States Steel Company. CHARLES LONGENECKER. *Blast Furnace and Steel Plant* 17, 147-61(1929).

E. H.

New rolling mill waste recovery plant. F. A. WESTBROOK. Chase Metal Works, Waterville, Conn. *Metal Ind.* (N. Y.) 27, 1-3(1929).

E. H.

The possibilities of reviving non-ferrous metallurgy in Great Britain. WILLIAM GILLEN. *Bull. Inst. Mining Met.* No. 292, 29 pp.(1929).

E. J. C.

European factory methods and equipment in the manufacture of metals. DAVID EVINGEN. *Mining and Met.* 9, 483-6(1928).—In an English plant Cu wire bars cast in vertical molds are carried on conveyors to the hot rolling mill where they are rolled without being allowed to cool, thus conserving heat and saving an operation. Europeans have adopted the use of repeaters in rod mills more than the Americans have. In Germany, Austria and Switzerland hot rolling of brass is replacing cold rolling. Germany excels in the machine tool field. Throughout continental Europe a new German type of automatic screw machine is replacing a popular American type rapidly. The same type has made its appearance in this country.

H. C. PARISH

Secondary metal reclaiming. E. S. TOMPKINS. *Metal Ind.* (N. Y.) 27, 14-5(1929).

E. H.

The speed of reduction of iron ores in flowing gases. HANS H. MEYER. *Mitt. Kaiser-Wilhelm Inst. Eisenforsch. Düsseldorf* 10, 107-16(1928).—At 650° the ores reduced in H begin to sinter, and H diffuses less readily to the center of the kernels. As a result the speed of reduction falls rather sharply. At 900° the speed is again accelerated, since H diffuses more rapidly into the γ -Fe. In CO, sintering is effectually

prevented by the sepn. of C. The speed of reduction, however, is slower than with H so long as there is no sintering. For technical purposes a mixt. of CO and H is very effective, because of the reactivity of the H and the prevention of sintering by the CO. Magnesite reduces chiefly on the surface, and the higher the temp., the greater must the degree of reduction be before C is set free. The presence of H promotes C formation. With minette (Fe silicate) the phenomena are the same, but because of its greater porosity the reduction is more rapid. Likewise the sepn. of C in the interior of the kernel tends to break it up. Above 1000° silicates are formed which close up the pores and retard the reaction. Where no sintering occurs the speed of reduction is about 4 times greater with H, and in both cases the speed is proportional to the surface of the ore and the concn. of the gas, the reaction velocity const. being d/D , where d is the diffusion coeff. and D is the thickness of the adsorbed gas layer. The temp. coeff. of the speed of reaction is consequently quite small. In H-CO mixts. the CO does not appear to reduce directly, but converts the water formed into H and CO₂.

HANS C. DUUS

Colloid slime, finely ground ore, and hydrometallurgical treatment. JOHN GROSS AND S. R. ZIMMERLEY. *Eng. Mining J.* 126, 943(1928).—Some Au is lost in cyaniding by adsorption on the large amt. of particle surface formed by fine grinding. In milled Au ore the total surface on +200 mesh material is small in comparison with that on -200 mesh material. The Bureau of Mines is extending screen sizes and sepg. products down to av. size of 1 micron by elutriation. JOHN DIXON. *Ibid* 943-4.—At Kirkland Lake, Ont., 20-30 ϕ . in dissolved Au was lost with the tailing because of imperfect washing. Detn. of this loss by assaying the soln. decanted from the daily tailing sample and detg. the % moisture in the pulp gave results about 20 ϕ . too low. The discrepancy is explained in part by adsorption of Au on particle surfaces and in part by absorption of soln. in colloid slime; the latter was found to be much the larger factor. A suction filter introduced in the washing circuit broke down the absorption and greatly reduced the dissolved-Au loss. Cyanide and lime consumption have, likewise, been reduced.

A. BURTS

Lime scale as a concentrate. R. F. HEAD U. S. Bur. of Mines and Univ. of Utah. *Mining and Met.* 9, 455-7(1928).—A lime scale contg. 95.32 oz. Au and 35.88 oz. Ag formed in Callow flotation cells at Spring Garden, Cal. Microscopic studies on thin sections showed the mass of scale to be an aggregate of individual calcite crystals which contained quartz grains together with particles of Au, Ag, sulfides and black carbonaceous material. The Au and Ag particles apparently were floated by the coating of carbon, which was of natural origin, and not due to flotation reagents. Since carbon-coated Ag and Au are fairly common the lime scales may prove an important source of revenue in many flotation plants.

HANS C. DUUS

Blast-furnace development in 1928. H. A. BERG. *Blast Furnace Steel Plant* 17, 67-8(1929).

E. H

Progress in German blast-furnace practice. H. A. WAGNER. *Blast Furnace Steel Plant* 17, 81-3(1929).

E. H

Contributions to the knowledge of blast-furnace processes. GEORGE EICHENBERG AND PAUL OBERHOFFER. *Arch. Eisenhüttenwesen* 1, 613-28(1928).—Investigations were made on: (I) the gas compn., pressure and temp. relation in a crude Fe-foundry blast furnace at various depths and the entire height, during 24 hrs.; (II) the position and expansion of the reduction zones during the conversion of the furnace from crude foundry Fe to crude steel Fe by observations on the rising gas streams and by the temps. at the various levels; (III) a comparison of the reduction relations in a blast furnace operating with gray and white Fe. No better results (close to those of previous investigators) can be obtained by the methods used, and new ones should be devised. There is a decrease in the total amt. of gas from the tuyère to the throat, and from the sides towards the center of the furnace. An absorption of the C in the gas layers at 900-1000° takes place, as indicated by its disappearance from the gases in this field. It is shown that the coke consumption of the lower portion of the furnace detcs that of the entire furnace, the excess heat produced here being sufficient to cover the needs of the top portions. The thermal efficiency of the lower portion is considerably greater than that of the top. For the furnace used, the thermal efficiency cannot be increased in using the same type of charge and producing the same sort of Fe. The zones of indirect reduction are shifted considerably after the charged scrap has reached the C-pockets during passage. In the rising gas stream, indirect reduction occurs principally between 400° and 650°, direct reduction beginning at about 900°. There is considerable increase in the degree of the indirect reduction with decreasing gas temps. for crude steel Fe.

J. BALOZIAN

New 800-ton blast-furnace plant of Australian Iron and Steel, Ltd., Port Kembla, N. S. W. ANON. *Commonwealth Eng.* 16, 113-7(1928).—A description of the plant, blown-in in August, 1928.

A. BUTTS

The hydrogen content of blast-furnace gas. BERNHARD OSANN. *Bergakademie Clausthal. Arch. Eisenhüttenwesen* 1, 673-5(1928).—In investigations to det. the relation between the H_2O in the charge and blast, and the H_2 content of the gases in a 550-ton furnace gas samples were taken every 10 mins. for 17 days. The values of the H_2 content as calcd. by O. (*Lehrbuch d. Eisenhüttenkunde*, vol. 1 (Leipzig, W. Englemann, 1923) pp. 507-8, 650; cf. C. A. 18, 1107) av. only 7% higher than those found. By artificially adding H_2O , 50 l./min., to the blast for 30, 12 and 5 mins. the H_2 in the throat gases is trebled. Between $1\frac{1}{2}$ and $2\frac{1}{2}$ of the H_2O introduced is decomposed; this is explained partly by the mass law and partly by the resultant cooling. The H_2 in the gases is not related to the moisture content of the coke and ore, nor to the H_2O of hydration. The H_2 liberated in the lower furnace is not used in the reduction of the Fe-O compds.

J. BALOZIAN

Turbo-blowers for the blast furnace. J. GUEST. *Blast Furnace Steel Plant* 17, 114 6(1929).

E. H.

Automatic blast-gate control for cupolas. H. V. CRAWFORD. *Foundry Trade J.* 40, 65-6(1929).

E. J. C.

Review of modern open-hearth practice. G. D. TRANTER. *Blast Furnace Steel Plant* 17, 69-74(1929).

E. H.

Is the heating chamber of a Siemens-Martin furnace a black body for the optical measurement of temperature? HERMANN SCHMIDT AND WILHELM LIESEGANG. *Arch. Eisenhüttenwesen* 1, 677-85(1928).—Measurements in the visible field of the spectrum with a Wanner optical pyrometer through the peep hole of the withdrawing head of a basic 50-ton furnace show that the upper portion of the Siemens-Martin furnace is not to be regarded as a completely black body. The furnace shows free brick radiation in a reduced amt. The decrease in dispersion following rapidly on starting the furnace must be ascribed to the progressive equalizing of the temps., and the increased blackening of the brick surface by lime, MnO_2 and Fe_2O_3 . With blue light, the highest temp. obtained for the heating chamber varies from 1700° to 1730° . It is recommended to use blue rather than red light in the pyrometer. The dispersion of $20-30^\circ$ corresponded with the blue light at 1725° to a "furnace absorptive power" of 0.85-0.90 in red light. With a Holborn-Kurhlbaum pyrometer it is detd. that for $\lambda = 0.65\mu$, the av. absorptive power is 0.55 at 1300° . The temp. dispersion of free-radiating silica brick averages 53° , at about 1500° . Photographs of the crown and rear wall of the furnace interior, during operation, agree with this. The absorptive power increases with the temp. and with decreasing wave length. The most important optical pyrometric detns. of temps. in the Siemens-Martin furnace of earlier investigators are tabulated.

J. BALOZIAN

Investigations on the addition of carburizing agents to a Siemens-Martin furnace heated by mixed gas. FRIEDRICH STEIN. *Arch. Eisenhüttenwesen* 1, 629-38(1928).—An investigation was made of the influence of firing a stationary (usual construction), a 60-ton Maerz, a 40-ton (usual construction) and a 70-ton tilting furnace, with mixed gas alone and in admixt. with tar or tar oil, or equal parts of both. The furnaces used in the Siemens-Martin Works II Ruhrort-Meiderich Smelter, and the oil burner are briefly described. Carburizing mixed gas with tar or tar oil gives a normal fusion without harmful overheating of the furnace. No unburned gas could be detd., the furnace lasting longer than if generator gas is used alone. Only a small change in the furnace process takes place when the amt. of added carburizer is varied. Operation is simple and requires little attention when the mixt. of tar-tar oil is used, the large excess of throat gases being utilized. The addn. of carburizing agents is of distinct advantage in starting the furnace. A disadvantage is fluctuation in the throat and coke-gas supply.

J. BALOZIAN

Spectral-pyrometric measurements on a Siemens-Martin hearth. HERMANN SCHMIDT AND WILHELM LIESEGANG. *Mitt. Kaiser-Wilhelm Inst. Eisenforsch. Düsseldorf* 10, 71 89(1928).—Spectral-pyrometric measurements made during 8 melts in a period of 2 months showed that a Siemens-Martin hearth cannot be regarded as a wholly black body. This is shown by the fact that the materials of which it is built can readily be distinguished from the melt, and by the further fact that the temps. as measured by blue and red light averaged 53° higher for the blue. The highest temp. measured with blue light was 1720° , which checked well with the softening limit of the stones and with the color of the melt. Consequently blue light is to be

preferred for measurements. The mathematical aspects of the Siemens-Martin hearth as a black body are also considered, and a micropyrometer is described.

HANS C. DUUS

Gas-fired car-bottom furnaces used for annealed steel castings. WM. P. HAND. *Fuels & Furnaces* 6, 1751-2(1928).—A description of the construction and operation of an automatically controlled gas-fired car bottom furnace installation. H. C. P.

High-speed steel—crucible versus electric furnace products. EDWIN A. BROPHY. Braeburn Alloy Steel Corporation. *Chem. Eng. Mining Review* 20, 305-7(1928).—The product from the elec. furnace is considered superior because of better control of temp., greater homogeneity of the product, mathematical precision of the analysis, const. repetition of specifications, and better abs. control of the slag—oxidizing, neutral and reducing.

HANS C. DUUS

Use of pulverized fuel in metallurgical furnaces. GEORGE E. K. BLYTHE. *Fuels and Furnaces* 6, 1661-6(1928); cf. C. A. 22, 3380.—Four stages occur in the combustion of pulverized fuel (1) heating and drying, (2) gasification of the volatile matter and coking the C, (3) combustion of gases and (4) combustion of the coke particles. The distr. stage starts at about 400°F. Gases and volatile vapors are given off until combustion starts. The rapidity with which free C particles combine with O depends largely on the speed of mixing with heated air. Unless the products of combustion of the volatile gases are swept away, the coke remains surrounded by inert gases. Each particle must come into contact with many thousand times its own vol. of air to burn completely. Violent mixing is therefore essential. Operating records show economies resulting from the use of pulverized coal in firing annealing furnaces, tunnel and batch furnaces, heavy and light forge furnaces, puddling, malleable-iron, melting, Cu refining and Ni reverberatory furnaces. B. discusses pulverizers, driers and transporting systems.

H. C. PARISH

Pulverized coal for metallurgical work. W. O. RENKIN. *Blast Furnace Steel Plant* 17, 75-6(1929).

E. H.

The reaction between magnetite and ferrous sulfide. F. S. WARTMAN AND G. L. OLDRIGHT. Bur. of Mines, *Repts. of Investigations*, No 2901, 14 pp.(1928).—This investigation was undertaken (1) to explain the apparently inconsistent behavior of Fe_3O_4 in the Cu reverberatory furnace, and (2) to det. more exactly the rate of reaction of Fe_3O_4 and FeS in this furnace. Previous work on this reaction is briefly reviewed. Mixts. of Fe_3O_4 and FeS were heated in a current of N at predetd. temps. The app. was set up in the following order: a source of N, a flow meter, app. to purify the N, a reaction tube enclosing the boat contg. the $\text{FeS-Fe}_3\text{O}_4$ mixt., a furnace for heating the reaction tube, and an absorption app. for collecting the gaseous products of the reaction. The overall result of the reduction of Fe_3O_4 by FeS in the temp. range 1000° to 1300° can be represented by three equations: (1) $\text{FeS} + 3\text{Fe}_3\text{O}_4 = \text{SO}_2 + 10\text{FeO}$, (2) $\text{FeS} + \text{Fe}_3\text{O}_4 = \text{S} + 4\text{FeO}$; (3) $\text{FeS} + 4\text{Fe}_3\text{O}_4 = \text{SO}_2 + 13\text{FeO}$. With the mixts. tried most of the reduction proceeded according to the first reaction. Increasing the proportion of sulfide increases the rate and also to some extent the importance of the other reactions. Increase of temp. increases the rate of reduction very markedly. Increase of partial pressure over the melt, of the gases formed by the reaction, greatly decreases the rate of reduction. Fe_3O_4 and FeS will be found in stable association in roaster calcines because the temps. found in roasters are below those at which Fe_3O_4 and FeS react to an appreciable extent. Fe_3O_4 and FeS in contact on the surfaces of the charge heaps in the reverberatory smelting zone will react easily because the temp. is high enough and the gases from the burners will dilute and carry away the gaseous products of the reaction as fast as they are evolved. Fe_3O_4 crystals at the bottom of the furnace will not be reduced because the head of overlying mat and slag exceeds the pressure at which the reducing reaction will proceed. J. W. W. S.

The precipitation of copper from mine waters at Britannia Mines. B. C. F. EBBUTT AND W. E. SELNES. *Can. Min. Met. Bull.* No. 199, 1290-1309(1928).—Description is given of expts. beginning in 1924 and development of the com. plant that has resulted. Rain falling on the glory-holed and caved area of the worked-out Fairview mine seeps slowly through crevices and glory-holes to come in contact with ore. The upper levels are partly oxidized and offer excellent conditions for percolation of the water and taking up of Cu, while on the lower levels very little soln. occurs. Due to variation of rainfall with the season, the Cu content of the mine waters varies from 0.6 to 1.2 g. per l., and conditions in the plant operation vary accordingly. To recover the Cu the water is passed through 2 or 3 launders in series, each launder being 10 ft. long and 5 by 5 ft. in section, built entirely of wood. The best precipitant is scrap tinplate obtained from canneries; it is placed on grids in the launders and air at 70

lb. pressure is introduced beneath it through rubber hose. This air agitation was found to double the recovery of Cu as well as eliminate the labor of stirring the tinplate. Total recovery averages over 90% of the Cu content of the water. The cement Cu is 60 to 70% Cu. Over 50,000 lbs. of Cu a month is being recovered at a cost of 7.2¢ per lb., using 1.6 lb. of tinplate per lb. of Cu. Operation is described and the chemistry of soln. and pptn. discussed.

A. BUTTS

Gold leaf—old and new. IVOR GRIFFITH. *Bull. Wagner Free Inst. Sci. Philadelphia* 3, 59-62(1928).—The manuf. of gold leaf is described. In 3 hand-beaten samples of American manuf., the sheets ranged from $3\frac{7}{8} \times 3\frac{3}{8}$ to $3\frac{29}{32} \times 5\frac{5}{32}$ inches in area, and from 0.01662 to 0.01887 g. in wt. The wt. per sq. inch ranged between 0.00093 and 0.00144 g. The Au content (in parts per 1000) ranged between 759 and 791, the Ag content between 190 and 218, and the content of base metals between 19 and 25. They had a fibrous structure. A sample of foreign manuf. had a crystalline structure, and probably was deposited electrolytically; its sheets varied in area, weighed 0.001199 g. per sq. inch, and contained 834 parts Au, 74 parts Ag and 92 parts base metals.

JOSEPH S. HEPBURN

The Hunt Medal awarded to Edgar C. Bain. ANON. *Mining Met.* 10, 76(1929).

E. J. C.

The importance of the equilibrium diagram in metallurgy. W. ROSENHAIN. *National Phys. Lab. J. Inst. Metals* 39, 27-52(1928).—See *C. A.* 22, 2915.

ROBERT F. MEHL

Methods of diagram evaluation. K. HERRMANN. *Z. Metallkunde* 20, 359-62(1928).—The general process of evaluation is described for x-ray diagrams such as are obtained by the *rotating crystal*, *Debye-Scherrer* or *Laue* methods. The geometric and mathematical relations are discussed, and a short graphic method is described.

H. STOERTZ

Thermoelectric power in cold-worked metals. W. F. BRANDSMA. *Z. Physik* 48, 703-5(1928).—The thermoelec. power appearing between cold-worked and recrystd. cathodes was found to be reproducible, providing the preliminary treatment was identical. The effect increases with the degree of working. On heating the cold-worked wire to a definite temp. the effect was found to decrease slowly to a value characteristic of the temp.

B. C. A.

Determination of the degree of tarnishing of a metallic surface by its reflective power. G. ANDO. *Mem. Coll. Sci. Kyoto* 11A, 85-93(1928).—The reflective power of a metal surface is detd. directly after polishing and also after keeping the polished surface for a given time in an atm. contg. known amts. of moisture and CO₂. The ratio of the two reflective powers is a measure of the degree of tarnishing. The method has been applied to several alloys.

B. C. A.

Significance of mechanical twin formation for plasticity and hardness. E. SCHMID. *Z. Metallkunde* 20, 421-5(1928).—The mechanism of crystal deformation is discussed, with particular reference to twin formation. If χ and λ are the angles between the direction of strain and the slip plane or direction of mech. twin formation, the following expression is obtained for elongation (d): $d = l_1/l_0 = \sqrt{1 + 2s \sin \chi \cos \lambda + s^2 \sin^2 \lambda}$, where s is the magnitude of displacement and is generally small. The effect of twin formation is to convert a translation plane located in a direction unfavorable to any extended deformation into a plane in a position very favorable to large deformation in translation. Expts. with Zn and Cd show that an increase in hardness at the point of translation is brought about by twin formation.

H. STOERTZ

Effect of the velocity of test on notch brittleness. JAMES G. DOCHERTY. *Engineering* 126, 597-600(1928).—In view of the conflicting data found in the literature on the relation between slow-bend and impact tests D. carried out a number of bend tests. Standard Izod notched specimens of mild steel (0.25% C), Ni-steel (0.38% C, 3.8% Ni) and naval brass (61% Cu, 37.4% Zn, 1.4% Sn) were used. The speed of the striker was varied from 50 to 0.05 in./min. The results obtained were recorded graphically in diagrams showing the work done as a function of distance traveled by the striker. The tests indicate that increase of speed is connected with an increase in energy absorbed. For mild steel and naval brass the increase seems to be continuous up to the speed of the Izod test. In the case of Ni-steel the energy absorption likewise increases as the speed of the striker is increased but the standard Izod values (at striker speeds of 3500 and 7000 in./min.) are considerably below those obtained for low speeds. This may be a sign that there is a critical speed above which the "cracking" effect predominates with consequent diminution of energy absorbed.

H. S. VAN KLOOSTER

The loading of hot plate rolls. L. WEISS. *Z. Metallkunde* 20, 389-93(1928).—The proper loading of rolls is studied. If M_b is the bending moment for the roll pres-

sure P , L_1 the supported length of the roll, and b the width of the strip being rolled, $M_b = P/2(L_1/2 - b/4)$. If W is the resistance moment in cc., then $M_b = k_b W$ and $P = 2k_b W/(L_1/2 - b/4)$. If σ is the flow pressure in kg./sq. cm., the roll pressure P also $= \sigma bc$, and since $c = \sqrt{2ri - i^2} \cong \sqrt{2ri}$, in which i is half the decrease in thickness of the plate being rolled and r the radius of the rolls, then it follows that $P = \sigma b \sqrt{2ri}$, and $2i = (P/b\sigma)^2/r$. A table is included in which $2i$ is given for various values of k_b and roll widths at 600°, 750° and 900°, for Cu, Al and cast Fe rolls. Curves are also shown. In general $i_{\max.} \cong r/25$. With Al rolls, lighter loads are generally used and the $2i$ value falls quickly with decreasing temp. Thus for Al rolls (850 × 3300) with $k_b = 300$ kg./sq. cm., $b = 360$, $2i = 1.25$ at 500°, 0.23 at 400° and 0.092 at 300°. With the same size Cu roll under the same conditions, $2i = 0.312$ at 900°, 0.138 at 750° and 0.046 at 600°. The life of the rolls can be calcd. with the formula $L_s = 2S.60 ny$, in which L_s is the no. of times the load has been applied, S the no. of hrs. of operation, y the no. of mins. per hr. the rolls are under pressure, and n the r.p.m. of the rolls. The highest value obtained with cast Fe rolls for L_s is 1,800,000. H. S.

Recent investigations of welds by means of x-rays. A. HERR. *Z. Ver. deut. Ing.* 72, 1671-6(1928).—Gross imperfections in the macrostructure of welds can, of course, be detected by radiographic methods using either a fluorescent screen or a photographic film. An explanation of the technic used and some specific examples are given. Tables are presented indicating the writer's experience of the necessary voltage and exposure times to secure satisfactory radiographs with different thicknesses of metal. These range from 100 kv. and one min. to 210 kv. and 240 mins. in the case of electrically welded iron of one and 10 cm. thickness, resp.; and from 120 kv. and one min. to 220 kv. and 240 mins. for gas-welded copper of 0.5 and 6.5 cm. thickness, resp. The indication of the fine structure of different parts of the metal as shown by Laue diffraction diagrams is of interest and will probably be of increasing importance as the interpretation of them becomes more definitely based on experience. At present, considerable difference is shown between diagrams, but the significance of these differences is not always clear. A. W. KENNEY

Cast-iron diagram of Maurer with varying rates of cooling. E. MAURER AND P. HOLTZHAUSEN. *Stahl u. Eisen* 47, 1805-12, 1977-84(1927).—A series of cast irons contg. 2.4-3.8% C, 0.8-1.0% Mn, 0.3% P, 0.1% S and varying quantities of Si were cast in chill molds and in sand molds heated at 250° and at 450° and, from an examn. of the microstructure of the castings, the Maurer equil. diagrams for cast iron under the different casting conditions have been constructed (cf. *C. A.* 18, 3346). For chill-cast specimens the boundary of the pearlite field is displaced towards the right, the line meeting the axis of C content (1% C) at 2.7% Si instead of at 2.5% Si; at its upper end this line bends towards the right with more than 3.1% C. For specimens cast into hot molds (450°), the boundaries of the pearlite field are displaced to the left, cutting the axis at 0.5% Si less than in the Maurer diagram, whereas for specimens cast into molds at 250° the Maurer diagram holds good. The rates of cooling of the castings in sand molds preheated at 250° and at 450° correspond with the rates of cooling of cylinders of 75 and 90 mm., resp., under foundry conditions. From the results obtained with these, therefore, the diagram for castings having walls between 10 and 90 mm. thick has been constructed. The presence of graphite eutectic together with ordinary graphite in both sand and chill castings and the increasing coarseness of the constituents with slower rate of cooling show that the ordinary form of graphite is obtained by a secondary action. The bending strength and hardness of cast iron are reproduced in the form of tables, graphs and space-moldel diagrams. B C A

Relation between the temperature of beginning crystallization and the foundry work. SEIKO HORIKIRI. *Inst. Osaka Ind. Research. Tetsu-to Ko (Iron and Steel)*, 14, 478-93, 549-67(1928).—H. took cooling curves of different kinds of cast Fe under different temps. of melt and the time of heating to det. the temp. of beginning crystn. and the eutectic temp., the comparative study of the structure being made at the same time. H. also classified the compn. of good cast Fe of low-C and high-Si content, examd. the cases of waste product resulting from the lowering of the casting temp., studied the relation between the temp. of beginning crystn. and mech. properties, and recognized that the casting should be made at a temp. which is, at least, 70-100° higher than the temp. of beginning crystn. H. also examd. the relation between the initial C-Si content of iron and the dendritic structure which is undesirable in the production of low-C castings. Although there is some range of compn. for which the wet mold may be used, for cast Fe contg. less than 2.7% C, no perfect casting can be obtained without a dry mold. H. then studied as a cheap means of obtaining low-

carbon castings the production of semi-steel by cupola-melting and showed that with the addn. of mild steel, a rapid solution of C in the melted zone is necessary for limiting the C content of the product, and inferred that the high Si content is favorable for the purpose. Thus, the casting is very easy with 2.0–3.5% Si, a suitable compn. being found for cylinder liner, piston and other high-class castings for engines. K. SOMEYA

Phosphorus and arsenic in steel and the substitution theory. A. E. CAMERON. *Trans. Can. Inst. Mining and Met.* 30, 858–68(1927).—The solid soly. of P and of C in γ -iron is about 1.7%, and the effects of the two elements on the mech. properties of Fe are approx. the same. C, however, increases the tensile strength owing to the insoly. of the carbide in α -iron and its sepn. on cooling together with the resistance to slip afforded by the finely-cryst. state of the eutectoid, whereas P can cause hardening only by producing distortion in the lattice of α -Fe. This distortion of the body-centered lattice of α -Fe produces the well-known cold-shortness of phosphoretic steels. Most steels contain As up to about 0.1%, but as the solid soly. of As in Fe is 6.8% the hardening and, therefore, the embrittling effect of As on steel is much less marked than that of P. An embrittling effect may, however, be caused by segregation of the As due to the presence of C in solid-soln.-producing areas in which the As content is very much higher than the av. The metal in these areas would then have a lower m. p. than the remainder, and during heat treatment may be in semi-plastic state, thus causing serious weakness and possibly breakdown during forging. B. C. A.

Impact resistance of steels at low temperatures. J. F. MORRISON AND A. E. CAMERON. *Trans. Can. Inst. Mining and Met.* 30, 839–57(1927).—The impact resistance of hypoeutectoid steels is decreased by exposure to low temps. At -30° the impact resistance of a normalized steel contg. 0.1% C is about one-tenth that of the same steel at 20° , while a normalized steel with 0.34% C has an impact strength at 20° 3 times as great as at -30° . The same steels in the quenched and fully tempered condition have an impact strength at -30° which is only slightly lower than that at 20° . For structural purposes in cities where a low winter temp. is experienced, the best resistance to shock is obtained by quenching from 900° followed by tempering at 610° . B. C. A.

Decarburization of high-carbon steel in "reducing" atmospheres. J. J. CURRAN AND J. H. G. WILLIAMS. *Trans. Am. Soc. Steel Treating* 14, 809–24(1928).—Carbonaceous packing mixts. may be either carburizing or decarburizing in their action, depending upon the activating material used in the mixt. and on the temp. of heat treatment. W. A. MUDGE

Some properties of quenched steels. KANZI TAMARU. *Bull. Inst. Phys. Chem. Research* (Tokyo) 7, 1028–34(1928); *Abstracts* 1, 99–100.—The magnetization of cementite in different forms is measured. The magnitude of the A_0 transformation of the pearlite cementite is larger than that of the globular cementite. Steel contg. 0.9% C has been quenched in H_2O and tempered at 392° for various times. If the time of tempering is short, the sepd. cementite is fine; its size grows with the time of tempering. The A_0 transformation is large when the cementite particle is fine, and becomes small when the latter grows. When a quenched high-C steel is tempered at a gradually increasing temp., two maxima of magnetization are observable at 120° and 300 – 350° . Both are supposed to be the same phenomenon, and correspond to the decomposition of α -martensite and the growth of minute cementite particles: the former results in the formation of ferrite and cementite and hence increases magnetization. The growth of cementite particles decreases magnetization. Steels containing 0.9% C have been quenched and tempered, the temp. and time of tempering being varied. The tempering effect is complete in 15 minutes at a temp. higher than 200° . Quenched steel contracts up to 200° , then expands to 260° and again contracts above 260° . The first contraction corresponds to the decomposition of the α - to β -martensite; the expansion corresponds to the decompn. of austenite to β - through α -martensite; the last contraction corresponds to the transformation of β -martensite to troostite. ALBERT L. HENNE

A new development in corrosion-resisting steel. F. R. PALMER. *Trans. Am. Soc. Steel Treating* 14, 877–88(1928); cf. C. A. 22, 1939.—The addn. of 0.40% ZrS_2 to high-Cr stainless Fe greatly improves machining and grinding properties and serves to reduce the tendency toward galling, scratching and seizing. A slight loss of toughness and tensile properties results. ZrS_2 tends to prevent air hardening and raises the temp. necessary for hardening. W. A. MUDGE

Progress in alloy steels during 1928. S. J. HEWITT. *Ind. Chemist* 5, 18(1929). E. H.

Silicon-manganese steels with chromium additions for engineering applications. A. B. KINZEL. *Trans. Am. Soc. Steel Treating* 14, 866–75(1928).—The susceptibility

to heat treatment and ease of application of heat treatment of 0.35% C, Si-Mn steels are greatly improved by the addn. of 1% Cr as a hardening element. W. A. M.

Effect of quenching and tempering on the hardness and impact resistance of a high chromium-silicon steel. F. T. SISCO. *Trans. Am. Soc. Steel Treating* 14, 859-65 (1928).—A steel contg. 1.2% C, 1.2% Si and 18.0% Cr attains max. hardness when quenched in oil from 1850°F. Quenching below 1600°F. does not harden. Quenching above 2000°F. forms some austenite with lowered hardness and increased toughness. Its hardness is retained at all temps. below 1000°F. Izod values are low and little affected by tempering temps. W. A. MUDGE

Heating high-speed steel to 2400°F. in molten lead. WILBUR C. SEARLE. *Trans. Am. Soc. Steel Treating* 14, 927-30 (1928).—A description of app. and method of heating high-speed steel to 2300-2400°F. in molten Pb. W. A. MUDGE

The system tungsten-carbon. KARL BECKER. *Z. Metallkunde* 20, 437-41 (1928); cf. C. A. 21, 46; 22, 736; 23, 786.—A metallographic and Röntgenographic study of the system W-C. Two methods were used: (I) W and C were melted together in various proportions in a vacuum elec. arc furnace; (II) W wire was heated in an atm. of H_2 or $H_2 + N_2$ to which a definite quantity of CH_4 or C_2H_6 has been added. Under these conditions, the wire begins to take up C at 975°. The expts. show that only 2 carbides are definitely established, WC and W_2C , the latter existing in 2 allotropic modifications with transformation point at about 2400°. The β -form is stable above 2400° and is coarsely cryst. The carbide, W_2C , is considered probable, but its zone of existence ends just below the m. p. On cooling it decomposes to WC and W_2C . W_2C melts without decompn. in an atm. with sufficiently high C pressure, but in vacuum or H_2 it gives up C. On melting WC even in an atm. with high C pressure, C seps., 50% WC and 50% W_2C being formed. X-ray photographs show no appreciable mixed crystal formation between W and W_2C , WC and W_2C , or WC and W. The min. concn. of CH_4 in H_2 which is necessary to carburize W wire increases with increasing temp. from 0.05% at 1850° to 1.25% at 2870°. Up to 1900° WC is the carbide formed, between 1900° and 2400° α - W_2C and above 2400° β - W_2C . The temp. coeff. of resistance of W_2C is small compared with that of W. Thus the resistance of a carburized wire having the compn. W_2C is 11.8 ohms at 20° and 8.93 ohms at 2355°, while with a pure W wire these resistances are 7.47 and 0.56 ohms, resp. H. STOERTZ

Dependence of the elastic coefficient of extension (α) of copper on the previous (heat and mechanical) treatment. W. KUNTZE. *Z. Metallkunde* 20, 145-50 (1928).—The coeff. of extension, α , is the reciprocal of the modulus of elasticity, i. e., the increase in unit length caused by unit load. In Cu test-pieces that have just previously been subjected to plastic deformation, the value of α is subject to hysteresis with loads up to $1/6-1/3$ of the limit of proportionality in the ordinary tensile test, but increases linearly with the load. With greater loads the value of α increases at a greater rate. The effect of drawing on this value is to cause a rapid increase up to a 3% reduction in area, and then a steady decrease. Tempering at low temps. to remove internal stress decreases α , and severely drawn and tempered wires give a lower value for α than annealed wires. Storing at the ordinary temp. for long periods has the same effect on α as a low-temp. tempering. B. C. A.

Significance of the crystal regions α , $\alpha + \beta$, β in the system: copper zinc in the hot-working of alloys. W. MAYER. *Metallbörse* 17, 2357-8, 2469-70, 2525-7 (1927).—All Cu-Zn alloys of the regions α , $\alpha + \beta$, β can readily be worked hot, except M 66 (66% Cu). The grain size is also of decisive significance. Cu-Al alloys are also considered. B. C. A.

Röntgenographs of the refinement of beryllium-copper alloys. O. DAHL, E. HOLM and G. MASING. *Z. Metallkunde* 20, 431-3 (1928); cf. C. A. 22, 1315.—In cooling supersatd. Be-Cu α -mixed crystals, γ -crystals sep. These are cubic body centered, while the α -crystals are regular face centered. To study the process of refinement, the wires (contg. 2.5% Be) were quenched from 800° and annealed at different temps. Annealed at 350°, x-ray pictures show the lines of the γ -lattice after only 10 mins. heating, while after 8 hrs. heating these lines are sharply and plainly seen. If the annealing is carried out at lower temps. the following results are obtained: At 150°, no lines of the γ -lattice appear even after 243 hrs. heating. The lines of the α -lattice, however, show considerable blurring after a few hrs. heating. If the annealing temp. is 200°, the blurring of the α -lattice lines is much quicker and stronger, although the (111) line seems less blurred than the others. After heating at 200° for 50 hrs., the first lines of the γ -lattice appear and are blurred. As the heating is continued, the blurring becomes less, particularly with the γ -lines, and finally both

α - and γ -lines are strong and well defined. The blurring of the lines is attributed to inner strains which are an indication of the heterogeneous character of the process. This is caused by the sepn. of the γ -lattice, and is the first expl. demonstration of the sepn. of a 2nd crystal type coincident with decrease in elec. cond. The blurred character of the γ -lines is due to the high dispersity of the γ -lattice at the beginning of its formation.

H. STOERTZ

Changes in length and modulus of elasticity of beryllium-copper alloys during refinement. O. DAHL AND C. HAASE. *Z. Metallkunde* 20, 433-6(1928); cf. *C. A.* 22, 1315.

Samples of Be-Cu alloy contg. 2.5% Be were quenched from 800° and annealed at 200° and 250° in a dilatometer, elongation, elec. cond. and hardness being measured from time to time. Modulus of elasticity in torsion and cond. of 0.25 mm. wires were detd. for annealing temps. of 150°, 200° and 400° and the results are given in curves. They show that the refining process is of equal influence upon vol. and the modulus of elasticity, the variation in both properties being directly proportional to the quantity of γ -crystals sepd. Even during the first stage of annealing, where elec. cond. decreases, this sepn. is taking place, as indicated by the change in length and modulus of elasticity. The quantity of γ -crystal sepn. is calcd. from the % change in length with the following results: At the point of lowest cond. (after about 1.5 hrs. at 250°) hardness has risen from a Brinell no. of 124 to 253, cond. has fallen 6.2%, length has shortened 0.075%, which is 30% of the total change in length, and the amt. of γ -crystals sepd. therefore represents 30% of the total amt. which finally seps. When the original value of cond. is again attained (4.8 hrs. at 250°), hardness is 325, change in length is 0.135%, modulus of elasticity has increased 9.5 to 10%, and 54% of the total possible γ -crystal sepn. has occurred. At this point the change in modulus of elasticity is 49-52% of the total change.

H. STOERTZ

Changes produced by rolling, hammering and drawing zinc and cadmium. G. MASING. *Z. Metallkunde* 20, 425-7(1928).—On cold working Zn and Cd, changes in the thermal coeff. of expansion are produced. This is related to the change in orientation of the hexagonal axis and varies with the direction in which it is measured. A specimen of cast Zn, 20 mm. diam. with length 1.0, on being rolled to 18 mm. diam., gives for length 1.23, which is identical with the calcd. value for its particular orientation. Rolled to 10 mm. diam., the length is now 4.00 rather than the calcd. value of 2.22, and a change in orientation has occurred. By photomicrographic examn. this is found to be due to twin formation. The increase in the coeff. of expansion becomes less, however, on further working, for the same specimen rolled to 3 mm. diam. has a length of 4.4 compared with the calcd. length of 3.28.

H. STOERTZ

Production and properties of magnesium alloy castings. F. PLAYER. *Metal Ind* (London) 33, 568, 591-2(1928); 34, 6-8(1929); *Foundry Trade J.* 39, 473-6(1928).—E. H.

Relation between drop hardness of nickel and temperature. F. SAUERWALD. *Z. Metallkunde* 20, 408-9(1928).—The drop hardness of pure Ni in a rolled and completely annealed condition begins to fall rapidly at about 300° and drops from 245 mm kg. cu. mm. at 289° to 204° at 388°, after which it rises sharply again, reaches 218 at 449° and then falls slowly. Another peak occurs at about 800°, drop hardness being 175 at 812° as compared with 170° at 711°. The first sudden change in mech. properties at 300° is due to the magnetic transformation point, and the peak at 450° is due to a Ni "blue tone" phenomenon corresponding to that of Fe. S. suggests that the peak at 800° is, perhaps, due to a redistribution of space lattice forces insufficient to produce a crystallographic transformation.

H. STOERTZ

Electrical resistance of a few silver alloys. W. SCHMIDT. *Z. Metallkunde* 20, 400-2(1928).—In Ag alloys which form an uninterrupted series of mixed crystals, a simple relation exists between the elec. resistance, the at. % content of the alloys and their phase diagrams. For Ag alloys with Cd, Mg, Zn, Al, Sn or Sb,

this relation is expressed by the equation $\sigma = \frac{\sigma_{Ag}}{7} (100p)^{\frac{b}{b+8.12}}$, where σ = resistance in ohms. sq. mm./m., and b is the slope of the curve giving the relation between resistance and atomic % of the added element and $= T_s - T_a/p_a$, where T_s is the m. p. of Ag (961.5°), T_a is the temp. at which a heterogeneous mixt. is first formed, and p_a is the compn. in at. %. For Ag-Mn the relation is different and is given by the equation $\sigma = \frac{\sigma_{Ag}}{1.5} (100p)^{0.85}$. Drawing produces a large increase in the elec. resistance of these alloys.

H. STOERTZ

Mechanical properties of crystals of a refinable aluminum alloy. G. SACHS. *Z.*

Metallkunde 20, 428-30(1928).—A discussion of the relation of mech. properties of Al alloys (contg. 5.0% Cu) to recrystn. phenomena, and the significance of x-ray photo-graphs. H. STÖRTZ

Theory of metallic corrosion in the light of quantitative measurements. II. G. D. BENGOUGH, J. M. STUART AND A. R. LEE. *Proc. Roy Soc. (London)* A121, 88-121(1928).—Corrosion-time curves were detd. for annealed Zn in cond. H₂O and KCl solns. The curves usually have a short branch from zero time to 2 or 3 days in which they are concave upwards. After the initial period they become exponential, providing the O₂ supply is sufficient. If the supply of O₂ is inadequate the curves approach a straight line. The concn. of ions in soln. and phys. condition det. the value of the exponents. Corrosion increases with KCl concn. to a max. and falls off when the soln. is nearly satd. In solns. stronger than 0.0001 N KCl, H₂ is evolved, causing discrepancies between the total-corrosion and O₂-absorption curves. The proportion of corrosion due to H₂ varies from 5 to 15%. The total amount of corrosion that has occurred when the corrosion-time curves of KCl soln. have become nearly horizontal is independent of the O₂ supply but depends upon (1) the concn. of the soln. and (2) the rate of withdrawal of Cl ions from current-carrying capacity either by pptn. or by some other process. The effect of pptd. corrosion products on the rate and total amount of corrosion is very small for periods up to 100 days. B. E. ROETHLI

Continuous furnaces for alloy blooms. A. K. WEST. *Blast Furnace Steel Plant* 17, 124-6(1929). E. H.

Reflective powers of some eutectic alloys in relation to their microstructures (ANDO) 2. Diffusion of Zn in Cu and in Cu-Zn mixed crystals at 350° (KÖHLER) 2. The crystal structure of Cu₃Al₄ (BRADLEY) 2. Broadening of Debye lines with cold worked metals (DEHLINGER) 3. Thermal expansion of Mg and some of its alloys (HIDNERT, SWEENEY) 2. Apparatus for treating smoke gases with supersaturated steam and water, etc. (Brit. pat. 292,118) 1. Use of purified Fe for apparatus for use at high temperatures and pressures (Brit. pat. 293,077) 1. Brick checker work construction for open-hearth regenerative furnaces, etc. (U. S. pat. 1,700,398) 1. Recovering cyanide from solutions (U. S. pat. 1,701,818) 18. Molds (of Al or Al alloy) for molding rubber tires (Brit. pat. 292,905) 30. Flotation apparatus for graphite, etc. (Fr. pat. 643,068) 1. Photometric apparatus for inspection and sorting of tin plated or galvanized sheets, etc. (Brit. pat. 292,474) 1. Furnace lining (Ger. pat. 469,863) 19.

Treatment of complex ores. FRANCES M. SIMONDS (half interest to A. F. Hyder Can. 286,360, Jan. 8, 1929. Ground ores contg. sulfides of Fe, together with sulfides of Cu, Pb and Zn, are heated and a slightly oxidizing gas is passed therethrough for a relatively long time, and then for shorter periods reducing gases and oxidizing gases in alternation; the mass is heated for a relatively long period in a reducing atm. and then cooled in a non-oxidizing atm., the cooled mass is mixed with water, and SO₂ passed through the mixt.; the mixt. is filtered, the residue concd., and the Fe sep'd from the filtrate.

Treating low-grade ore such as cassiterite. R. ANTHOING. Brit. 292,832, Nov. 7, 1927. The ore is treated with a reducing gas such as lighting gas, producer gas or coke-oven gas at a temp. of 300-900° and then concd. by flotation.

Flotation of graphite and other ores. JEAN F. M. R. DE ROBILLARD. Fr. 33,297, Feb. 17, 1927. Addn. to 628,036. The openings described in Fr. 628,036, on which the water jets are directed, are large and covered with metallic gauze or other filtering material. Cf. C. A. 22, 2349.

Roasting ores. COMPAGNIE DES MÉTAUX OVERPELTLOMME. Fr. 643,274, Nov. 2, 1927. Fine ores are mixed with coal, etc., and made into measured grains and afterwards submitted in a permeable layer to roasting and agglomeration on a furnace hearth with air drawn through. The ore may be moistened with water or treated with a binding agent and dried. Fr. 643,275 describes such a treatment of Zn ores. Cf. C. A. 22, 4450.

Smelting ores in reverberatory furnaces. GEORGE W. PRINCE (to United Verde Extension Mining Co.). U. S. 1,700,515, Jan. 29. Ore is deposited along the bottom of the furnace chamber from points spaced from the side walls and fettling material is blown from the firing end wall of the furnace chamber into the space between the smelting ore and the side walls of the furnace chamber, to protect the side walls from the action of the smelting ore and from the intense heat in the chamber.

Reduction of ores. GRANULAR IRON CO. Fr. 642,805, July 28, 1927. An app. for the reduction of Fe ore without fusion, in which the powd. ore is heated to a point

below fusion and then a powd. carbonaceous fuel is mixed therewith with agitation, comprises an inclined cylinder for treating the charge and means disposed at the entrance to accelerate the rapid movement of the charge in the cylinder. Ores of Zn, Pb and Cu may be similarly treated.

Utilization of ore lyes. METALLBANK UND METALLURGISCHE GESELLSCHAFT, A.-G. Fr. 643,733, Nov. 10, 1927. Cu is extd. from ore lyes by cementation with the aid of Fe, while Zn is extd. from the lyes free from Cu and sulfates by coke-oven gases contg. H_2S , and the Fe is then recovered by treating with chalk and oxidizing agents. Part of the sulfates is removed by freezing and the rest by adding $CaCl_2$.

Chromium ore. I. G. FARBENIND. A.-G. (Paul Weise, inventor.) Ger. 469,910, Apr. 25, 1925. Powd. Cr ore is decompd. by an alkali to which Fe_2O_3 and Mg oxide added. The latter are recovered and used again.

Chromium. BOZEL-MALETRA (Soc. industrielle de produits chimiques). Fr. 511, Apr. 6, 1927. Cr ores are treated with alkalies or alk. agents, with or without salts, in furnaces of the type used for roasting pyrites, having agitators permitting stirring up of a thin layer, and being on one or several floors. The heating may be direct contact with the fuel or by external heating.

Zinc. FRÉDÉRIC LEDOUX and PAUL VÉROLA. Fr. 643,483, Apr. 4, 1927. Zn ores coming from the metallurgical treatment of Zn ores are treated in water with H_2SO_4 to form $ZnHSO_4$, which may be calcined to a white oxide for use in paint, or may be used for the production of Zn by electrolysis or may be oxidized to $ZnSO_4$.

Recovery of light metals. I. G. FARBENIND. A.-G. Fr. 33,249, Mar. 21, 1927. In. to 543,215. In the recovery of light metals from machinery or foundry waste, an acid bath of anhyd. $CaCl_2$ contg. 18% CaF_2 is used.

Solidifying and freeing molten metals from gas. N. N. JAROTZKY. Ger. 470,195, Apr. 25, 1926. An app. is described in which the vessel contg. the metal is mounted to rotate about both a vertical and a horizontal axis.

Molding. HERMANN MEISNER. Ger. 470,233, Nov. 18, 1927. A non-metallic mold for castings is made by using a dismountable mold with a suitably shaped interstice, and then filling the mold with quickly setting material such as cement or gypsum.

Molding. MAYBACH-MOTORENBAU G. M. B. H. Ger. 470,234, July 4, 1926. A slush of white metal is applied to a casting by a mold fitting round it.

Molding metals. SIEGFRIED JUNGHANS. Ger. 470,198, Mar. 30, 1927. The central kernel of castings is loosened by subjecting the casting to short steady pressures in different directions in order to take advantage of the elasticity and compression differences of the 2 metals.

Metal molding. MADISON-KIPP CORP. Ger. 470,197, Nov. 12, 1925. A squirting machine which operates automatically as the mold is filled and emptied is worked by the same gas pressure and from the same power device as that which opens and closes the mold.

Coating for protecting metal molds. HARRY P. KIMBER (to Earl Holley). U. S. 1,701,159, Feb. 5. Coatings are formed of an inert refractory material such as insulating earth and a small proportion of $AlCl_3$ which is used merely as a binder. Cf. U. S. 1,612,809.

Billet-mold. TANNIE LEWIN (one-half to William Lewin). U. S. 1,701,721, Feb. 12. Structural features.

Apparatus and method of scouring molding sand to prepare it for reuse. EDWARD W. CAMPION and ARTHUR H. DIERKER (to Buckeye Steel Castings Co.). U. S. 1,700,713, Jan. 29.

Apparatus for casting with separable chills. IRA D. TRAVIS. U. S. 1,700,341, Jan. 29.

Chilled cast iron roll. CHARLES I. NIEDRINGHAUS and LEWIS W. MESTA (to Mesta Machine Co.). U. S. 1,702,128, Feb. 12. Chilled cast iron rolls contain C 2.4, Si 1.8-4, P not over 0.3, S not over 0.2, Mn 0.1-1.5 and Si 0.5-2.5%; the Si, C and Cr are so proportioned that a chill is produced contg. a small but appreciable quantity of very finely divided graphitic C and the chill merges gradually and without abrupt change of grain structure into a core of mottled iron which has a greater tendency toward white iron than that of the usual chilled iron roll.

Rolling metals into long strips. AMERICAN ROLLING MILL CO. and J. B. TYTUS. Brit. 293,229, Sept. 1, 1927. Mech. features.

Rendering nickel forgeable by adding vanadium and magnesium in small quantities. JOHN H. WHITE (to Bell Telephone Laboratories). U. S. 1,700,460, Jan. 29.

Open-hearth metallurgical furnace construction. B. TALBOT. Brit. 293,010, June 30, 1927.

Shaft furnace. FRITZ HENFLING. Ger. 470,282, Mar. 29, 1928. Feelers are mounted in chambers up the shaft to ascertain the height of the charge.

Metal-sweating furnace. TANNIE LEWIN. U. S. 1,701,722, Feb. 12.

Center flame furnace for the purification of steel. JUVÉNAL MAXIMOFF, MARIE STELLA DE COSTA (NÉE VINCENT) and ROBERT KREBS (called Lue Gallicanne). Ger. 470,228, Mar. 31, 1926. The furnace rotates on a vertical axis and is heated from below by a gas nozzle.

Explosion trap for blast furnaces. KÖLSCH-FOLZER-WERKE, A.-G. and PAUL NÖRZEL. Ger. 469,966, Dec. 8, 1926.

Blast-furnace dust and slime. DE WENDEL ET CIE. Fr. 643,530, Apr. 8, 1927. The dust or slime is made into a molten siliceous slag by heating to fusion in an oxidizing medium in a furnace, *e. g.*, a reverberatory furnace, a mixt. contg., *e. g.*, dust 60-70, siliceous sand 20-25, scales from rolling machines 20-5%.

Purifying cast iron. A. F. MEEHAN (to Meehanite Metal Corp.). Brit. 292,164, June 16, 1927. Gray molten cast iron is purified by adding to it silicides substantially free from Fe such as those of Ca or Mg and Ba. A small proportion of Fe may also be added as may also Ni, Al, Cr, Ti or V.

Testing the rusting properties of iron, etc. C. MAULER. Brit. 292,794, July 28, 1927. Specimens are immersed in a soln. which is formed of an alkali such as NaOH or KOH and an oxidizing agent such as a nitrate, permanganate, dichromate, peroxide or aromatic nitro compd. and the temp. is noted at which the first signs of corrosion appear on the metal.

Rustproofing iron, steel, etc. W. H. COLE. Brit. 292,666, March 19, 1927. The articles treated are placed in a revolving sealed container together with a mixt. such as that formed from emery, dry Cu-Zn ppt., Sn and Al, and may be heated, first to 600°, then at about 500° and afterward at about 350°. The Zn-Cu ppt. may be prepd. by reaction of Zn dust on CuSO₄ soln. Various metal salts or fluxing agents also may be added. Cf. C. A. 23, 811.

Low-carbon steel. ADOLF FRY (to Fried. Krupp A.-G.). U. S. 1,700,674, Jan. 29. Low-C steel is rendered less liable to change from aging and less liable to destruction of texture by the action of liquids, gases and vapors, by quenching at a temp. above 650°.

Conditioning articles of manganese steel. GEORGE R. HANKS (to Taylor-Wharton Iron and Steel Co.). U. S. 1,701,976, Feb. 12. Alloy steel shapes such as railway car wheels contg. 10-15% Mn are conditioned by subjecting the areas normally exposed to service self-conditioning to selectively gaged shocks applied while the article is cold and before it is put into service.

Cleaning steel preliminary to painting it. JAMES D. KLINGER and CLETE L. BOYLE. U. S. 1,700,739, Feb. 5. The surface is treated with a rust-removing acid such as H₃PO₄ and with the monoethyl ether of ethylene glycol (suitably in about equal proportions). Water or methyl ethyl ketone may be added. Cf. C. A. 22, 1833.

Heat-treating metals and alloys. WILLOUGHBY S. SMITH, HENRY J. GARNETT and JOHN A. HOLDEN. U. S. 1,700,547, Jan. 29. Articles such as wires, tapes or cables are passed through a heating tube and an inert gas such as N is supplied to the tube at 2 points so that the gas supplied at one point will flow to the atm. at the inlet end of the heating tube and serve to dispel volatilized matter and the gas supplied at the other point will flow to the outlet and prevent oxidation and reduction. U. S. 1,700,548 relates to an *app.* for similar operations.

Alloys. WILLOUGHBY S. SMITH, HENRY J. GARNETT and JOHN A. HOLDEN. Fr. 643,376, Nov. 5, 1927. Alloys suitable for the manuf. of telegraphic conductors contain Fe 55-65, Ni 32-42, Si or Al 1-4, and 1-4% of Cr, W, Mo or V. Up to 1% of Mn may be added. Cf. C. A. 23, 1103.

Alloys. COMPAGNIE FRANÇAISE POUR L'EXPLOITATION DES PROCÉDÉS THOMSON-HOUSTON. Fr. 643,416, Nov. 7, 1927. An alloy for use in elec. app., particularly starting rheostats of elec. motors, contains Fe 80, Al 4-6, Cr 12-14, C less than 0.1, Si 1, Mn 1%.

Alloys. I. G. FARBENIND A.-G. Brit. 291,522, March 3, 1927. One at least of the components of specified alloys is derived from decompn. of the corresponding carbonyl compd. (which may be effected in a melt contg. the other components of the alloy). Various alloys are described, among which are alloys of Fe and Ni; Fe and Si; Fe and Cr, Co, Mo, or Ni and C; and Fe, Cr and C.

Alloys. I. G. FARBENIND A.-G. Fr. 643,041, Oct. 27, 1927. An alloy resistant to corrosion, hard and not brittle is made by melting 91% of Pb and 9 of Sb with the addn. of 0.25% Al, casting and rapidly cooling.

Alloys. THE INTERNATIONAL NICKEL COMPANY. Fr. 642,140, Oct. 10, 1927. A gray cast iron, resistant to wear, contains C 2-4, Si 0.25-3, Mn 0.25-2, Ni 1.5-12 and Cr up to 3%, or C 2.75-3.5, Si 0.5-1.5, Mn 0.5-0.8, Cr up to 2%, with or without Ni 1-2%. Cf. C. A. 23, 812.

Alloys. LE MAGNÉSIUM INDUSTRIEL. Fr. 642,776, Mar. 31, 1927. A Mg alloy having a good heat cond. and capable of being forged, e. g., for motor pistons, contains Mg 93, Al 2, Cu 4 and Cd 1%. Forging is effected after bringing the piece to 485° for a time sufficient for the mol. state of the piece to become homogeneous.

Heat-treating aluminum alloys. H. C. HALL and T. F. BRADBURY. Brit. 292,407, Nov. 5, 1927. The alloys described in Brit. 281,912 (C. A. 22, 3624) are heated to 160-190° for at least 20 hrs. and then quenched.

Improvement of aluminum alloys. WILHELM SANDER and WILLIAM GUERTLER (to Th. Goldschmidt A.-G.). Can. 286,100, Jan. 1, 1929. To produce alloys of high tensile strength, Al is alloyed with 4-26% by wt. of MgZn₂, minor quantities of elements having high melting points (Ni, Ti, W, Mo and the like not exceeding 1%) are added, also minor quantities of elements forming solid solns. with Al, and the alloy is annealed, quenched and aged. Max. strength is obtained after storing at room temp. for 5 to 8 days if the alloys are further heated to temps. between 50° and 150° for 3 to 48 hrs.

Alloys of copper, antimony and lead. S. DRICHES. Brit. 292,936, June 24, 1927. Various alloys of Cu, Sb and Pb are improved by the addn. of elements such as Al, alk. earth metals, Be, Mg, Bi, alkali metals, Co, Fe, Mn, Ni, Sn, or Zn, or of P, Si and S, with or without further addn. of As, Cd or Hg. The alloys may be heated for some time slightly below the hardening point and then quenched.

Tantalum-alloy pen. EDGAR W. ENGLE and MINER M. AUSTIN (to Fansteel Products Co.). U. S. 1,701,299, Feb. 5. Pens are made with nibs of Ta 90 and W 10%.

Steel alloys. F. KRUPP A.-G. Brit. 292,937, June 23, 1927. Steel alloys, the yield point of which cannot be increased by heat treatment such as an austenitic Ni-Mn steel, are hot-worked as by rolling or forging to a hollow form and machined to form an over sized body which is then expanded as by a mandrel to induce a stress in excess of the original yield point. The body is then further machined to produce the desired article, e. g., a winding protection cap for a turbo rotor.

Steel alloys. F. KRUPP A.-G. Fr. 642,942, Oct. 24, 1927. The elastic limit of steel alloys, particularly austenitic steel, is increased by a heat treatment and by turning, in the form of hollow bodies of revolution and these bodies are brought by a centrifugal app. to a high speed of rotation so that the effort thus engendered increases the elastic limit. Addnl. weights may be placed in the bodies to increase the effect. Cf. C. A. 23, 813 and preceding abstract.

Working metals. BERNDORFER METALLWARENFABRIK ARTHUR KRUPP A.-G. Austrian 111,513, July 15, 1928. Operations such as forging, pressing, and drawing are conducted in a liquid bath maintained at the optimum temp. for the process in view. Suitable app. is described.

Case-hardening metals. P. W. SHIMER and E. B. SHIMER. Brit. 292,557, June 22, 1927. In effecting case-hardening by immersion in a bath of fused salts, a CN compd. is added in small quantities at frequent intervals. NaCN or Ca cyanamide or the compd. formed by the fusion of Ca cyanamide and NaCl may be used in a proportion of about 0.25% the wt. of the bath.

Etching aluminum. GÉZA SAILER. Ger. 469,851, Feb. 19, 1927. Sol. derivs. of indigoes, fatty acids, vegetable gum or mixts. of these are added to the alkali lye used for etching Al or its alloys.

Toughening and hardening taps for cutting screw threads, etc. REGINALD F. KNIGHT and FREDERICK LYNCH. U. S. 1,701,570, Feb. 12. See Brit. 281,384 (C. A. 22, 3389).

Sheets or strips of metals such as brass. OTTO JUNKER. U. S. 1,701,889, Feb. 12. A metal block or ingot heated to a temp. to give it a moldable condition is subjected to the action of a cutting tool which "peels off" sheets or strips of the metal.

Metal foil. A. F. G. KLUGE, J. V. W. WINTER and W. G. PINNER (trading as Kluge and Winter). Brit. 292,459, June 18, 1927. Two or more metal leaves are united by interposed leaves of rubber, gutta-percha or like material. The material may be used for packing, manuf. of artificial flowers, etc.

Protecting pipe from corrosion. HOMER S. BURNS and LYMAN S. BUSHNELL (to Freeport Sulphur Co.). U. S. 1,700,995, Feb. 5. Pipes such as those used in S mining are treated with a soln. of salts of Ca and Mg such as sulfates and bicarbonates or sea water which will ppt. out of soln. and a protective scale is formed on the pipe by such

pptn. An app. is described. U. S. 1,700,996 (L. S. BUSHNELL) also specifies an app. and method of procedure of similar character.

Use of a travelling fluctuating electric arc for cutting metals. OSKAR F. A. E. GRUMPELT (to Elektrotrennmashinen G. m. b. H.). U. S. 1,701,919, Feb. 12.

Annealing flat strips of metal. H. W. BROWNSDON and KYNOCH, LTD. Brit. 292,690, March 25, 1927. Heat exchange is effected between annealed metal and cold metal. Various mech. features are described.

Apparatus for annealing, welding, etc., by use of heat concentrated by a lens or reflector. E. SCHRÖDER. Brit. 292,985, June 28, 1927.

Solder. AMERICAN MACHINE AND FOUNDRY CO. Fr. 642,979, Oct. 25, 1927. See Can. 285,319 (C. A. 23, 593).

Solder for aluminum. LA LHOCORYNE (S.A.R.L.). Fr. 642,778, Mar. 31, 1927. A solder for Al contains ZnCl_2 90, NH_4Br 8, and NaF 2%. If an addn. of material is necessary sticks of solder composed of an alloy of Al, Zn and Sn are used.

Soldering metals. NAAMLOOZE VENNOOTSCHAP PHILIPS' GLOEILAMPENFABRIEKEN Fr. 643,450, Nov. 7, 1927. See Brit. 289,553 (C. A. 23, 595).

10—ORGANIC CHEMISTRY

CHAS. A. ROUILLER AND CLARENCE J. WEST

Recent advances in science: Organic chemistry. J. N. E. DAY. Univ. London. *Science Progress* 23, 211-6(1928).—A review of recent work on org. compds. of As, Au, Hg, Pt and Tc. JOSEPH S. HEPBURN

Industrial significance of some recent developments in organic chemistry. ARTHUR D. LITTLE. *Science* 68, 501-3(1928). E. M. S.

The significance of Wöhler's urea synthesis, a century of chemical synthesis. P. WALDEN. *Naturwissenschaften* 16, 831-49(1928).—An extensive historical review. B. J. C. VAN DER HOEVEN

Formation of gaseous and liquid hydrocarbons by the action of steam and alkali on semicoke. F. FISCHER AND H. PICHLER. *Brennstoff-Chem.* 9, 200-6(1928).—Semicokes from bituminous coal, brown coal and charcoal were treated with water in an autoclave with and without addn. of alkali at temps. 380-500°. CH_4 and a small quantity of its homologs together with much CO_2 and H_2 and some CO were formed when H_2O alone was used but the reaction fell off with time, because of decreased activity of the coke. Addn. of KOH and NaOH renews coke activity. These not only catalyze the reactions but also serve to absorb CO_2 formed. Na_2S , Na_2CO_3 , $(\text{NH}_4)_2\text{CO}_3$ and CaO were not effective as catalyzers although the carbonates and CaO absorbed CO_2 . Fe_2O_3 , Fe and Ni salts were also inactive. By continued treatment with H_2O and KOH 82% of a brown-coal semicoke was converted into CH_4 , CO_2 and H_2 and it seemed possible to so convert all the coke. Forty g. brown-coal coke + 360 g. KOH was heated for 13 hrs. at 480° (the max. pressure being 265 atms.), with a yield of 3.5 g. ether-sol oil and 25 l. gas of the following compn.: satd. hydrocarbons 1.6, H_2 43.4, CH_4 44.5, C_2H_6 10.5%. This was the best result obtained. J. D. DAVIS

Reactions between the anhydrous aluminum chloride and the olefinic hydrocarbons. ANTONI SZAYNA. Lwow Polytech. *Przemysl Chem* 12, 637-47(1928).—Olefinic hydrocarbons, i. e., ethylene, propylene, isobutylene, octene and diamylene were subjected to reaction with Al_2Cl_6 at 100° and 150°. C_2H_4 reacts under such conditions with difficulty and gives few heavy products. Other olefins give as products a gas, liquid hydrocarbons and a metallo-org. compd. The gas is composed exclusively of butane, and only in the case of propylene and perhaps also diamylene at 150° it contains also a little propane. Liquid hydrocarbons in lower fractions are composed of paraffins, in heavier fractions of naphthenic hydrocarbons. There are also present small quantities of the unsatd. hydrocarbons. In distn. they show well developed max. which indicate the existence of polymerization and privileged points of attack on the mol. The metallo-org. compd. is a deep brown, very viscous oil which is decompd. by water with formation of heat. Its empirical formula is $(\text{AlCl}_2\text{C}_4\text{H}_8)_n$. An org. oil extracted from this compd. corresponds to the formula $(\text{C}_8\text{H}_{12})_n$ or $(\text{C}_8\text{H}_{14})_n$. Its properties indicate the existence of cyclic non-satd. hydrocarbons. A. C. Z.

Polymerization. XI. Polymerization and depolymerization of amylenes under the influence of silicates. S. V. LEBEDEV AND I. A. VINOGRADOV-VOLZYNSKI. *J. Russ. Phys.-Chem. Soc.* 60, 441-52(1928).—A mixt. of amylenes, consisting of $\text{Me}_2\text{C}:\text{CHMe}$ and methylethylethylene, yielded when heated with floridin (a silicate activated by

heating at 300–50°) diamylene, b. 37–9°. This product when heated at 150–60° with floridin yielded gaseous and liquid products. The former consists of 8.25% of CH_4 and 91.4% of a mixt. of iso- and ψ -butylenes, with possibly traces of propylene. The liquid products consisted of $\text{Me}_2\text{CHCH}:\text{CH}_2$, isopentane, $\text{Me}_2\text{C}:\text{CHMe}$, γ -methyl- Δ^2 -pentene, b. 67–9°, heptylene, octylene and nonylene. B. C. A.

The alcohols. High-pressure synthesis. R. H. HOPKINS. *Times Trade and Eng. Supplement* (London) 23, 34(1928).—A review of processes, patents and work by the Department of Scientific and Ind. Research. Three cuts. E. M. SYMMES

Methanol. Its synthesis. E. AUDIBERT. *Tech. moderne* 20, 861–6(1928); cf. C. A. 22, 4461.—The catalysts in use are CuO and ZnO . CuO is the more active but is easily affected by the formation on its surface of substances of higher mol. wt. To prevent this, H is increased to $\text{CO} + 5\text{H}_2$. A long exposure to high temp. decreases the activity of catalysts. The activity is also affected favorably or adversely by the presence of other metallic oxides. Yields are roughly proportional to the square of the pressure. ZnO requires higher pressures than CuO . Maximum yields are obtained when the mixt. of gases is equal to $\text{CO} + 2\text{H}_2$. MeOH being an intermediate product, greater yields of MeOH to the exclusion of other products are obtained when the speed of the gases through the catalyst chamber is increased. Secondary reactions are increased with higher temp. CuO permits the use of lower temp. Both oxides are subject to poisoning. P. THOMASSET

Formation of primary amines from Grignard reagents and monochloroamine. II. GEORGE H. COLLEMAN AND CHARLES B. YAGER. *J. Am. Chem. Soc.* 51, 567–9(1929); cf. C. A. 22, 1950.—A further modification of the prepn. of NH_2Cl is described. By use of the previously described method, the following yields of primary amine and NH_3 were obtained from the Grignard reagents named, the 3 sets of values being for N, Cl, Br and I, resp.: iso- $\text{C}_3\text{H}_7\text{MgX}$, 65.5, 29.5; 37.2, 54.7; 9.0, 79.0; sec- $\text{C}_4\text{H}_9\text{MgX}$, 70.0, 20.0; 51.1, 38.9; 15.8, 74.13; sec- $\text{C}_5\text{H}_{11}\text{MgX}$, 71.7, 19.0; 31.6, 61.9; 13.7, 79.13; tert- $\text{C}_4\text{H}_9\text{MgX}$, 60.2, 39.0; 20.24, 79.7; 4.8, 81.4; tert- $\text{C}_5\text{H}_{11}\text{MgX}$, 66.2, 30.9; 14.25, 79.2, 2.0, 80.2. These yields are much the same as with reagents prepd. from primary halogen compds. C. J. WEST

Behavior of alcoholate solutions towards nitric oxide. HEINRICH WIELAND (WITH J. CHAVAN AND F. KLAGES). *Bayr. Akad. Wiss. Munchen. Ber.* 61B, 2382–7 (1928). The formation of $\text{CH}_3\text{N}(\text{ONa})\text{NO}$ (I) from NO and NaOEt in EtOH was ascribed by Traube, who believed that the reaction was characteristic for ketones and compds. with active Me and CH_2 groups in general, to the presence of Me_2CO in the EtOH . Many yrs later Stechow concluded that the reaction cannot be used to detect ketones with the grouping MeCO in EtOH , because I is formed from NO and alk. EtOH alone so rapidly that no conclusion can be drawn as to its origin when it is obtained with any given soln. under investigation. Like Traube, he ascribed its formation to Me_2CO which is supposed to be produced in alcoholate solns., even in the absence of air. For this supposed formation of Me_2CO in such solns., however, there is not a shadow of evidence. As a matter of fact the I is formed from AcH :

$$\text{AcH} + 2\text{NaOEt} + 4\text{NO} \longrightarrow [\text{ON}(\text{NaO})\text{N}]_2\text{CHCHO} + 2\text{HOEt} \xrightarrow{\text{NaOH}} \text{I} + \text{HCO}_2\text{Na}.$$

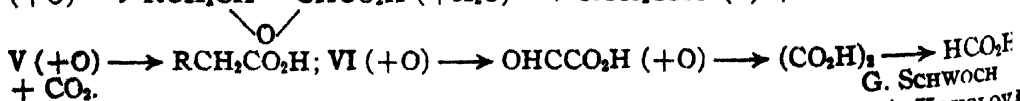
The AcH is formed by dehydrogenation of the EtOH by the NO : $\text{EtOH} + 2\text{NO} \longrightarrow \text{AcH} + \text{N}_2\text{O} + \text{H}_2\text{O}$. The H_2O (or NaOH) produced hydrolyzes the I, so the reaction may be more correctly written: $3\text{NaOEt} + 6\text{NO} \longrightarrow (\text{NaO}_2\text{N})_2\text{CH}_2 + \text{HCO}_2\text{Na} + 2\text{EtOH} + \text{N}_2\text{O}$. The expts. were carried out in a shaking app. connected with a graduated gas container so that the velocity of the absorption of the NO and the relation between the quantities of gas absorbed and I formed could be followed. The NO is at first absorbed quite rapidly at 20°; 100 cc. of 10% KOEt in the 1st 4 hrs. absorbed nearly 11 NO per hr. The absorption then becomes slower, but if the app. is evacuated and NO is then admitted again, the absorption is almost as rapid as before. The retardation is due to the evolved N_2O which continually decreases the concn. of the reacting NO . The velocity of the reaction is detd. by the dehydrogenation of the EtOH which is the main reaction. PhCH_2OH in the presence of benzylate is dehydrogenated much more rapidly than EtOH ; in this case the resulting BzH cannot react with the NO to form an isonitramine salt. iso- PrOH also apparently reacts more rapidly than EtOH . MeOH does not seem to react with NO . The HCO_2H was detd. by removing the NO in the reaction mixt. by long evacuation, dissolving the salts in a little H_2O , shaking overnight with freshly pptd., well washed $\text{Pb}(\text{OH})_2$, filtering off the insol. Pb salt of the diisonitramine, acidifying the filtrate with H_2SO_4 , distg. until the distillate is no longer acid, making the distillate acid with HCl , refluxing for a time with excess of HgCl_2 and weighing the pptd. HgCl_2 . C. A. R.

Thermal decomposition of sodium ethyl. WALLACE H. CAROTHERS AND DONALD D. COFFMAN. E. I. Du Pont de Nemours and Co., Wilmington, Del. *J. Am. Chem. Soc.* **51**, 588-93(1929).— HgEt_2 reacts completely with an excess of Na *in vacuo* with the formation of NaEt . The thermal decompn. of NaEt (in the presence of Na and Hg) begins very slowly at room temp. and is quite rapid at 100° . The gas formed in this decompn. at temps. in the neighborhood of 90 – 100° consists of C_2H_4 and C_2H_2 in the ratio of about 85 to 15. NaH is found in the residue. The principal reaction is, therefore, $\text{NaEt} \rightarrow \text{NaH} + \text{C}_2\text{H}_4$. The gas formed by the spontaneous decompn. of NaEt at ordinary temp. contains more C_2H_2 than C_2H_4 . This is supposed to be due to the reaction $2\text{NaEt} \rightarrow \text{Na}_2\text{C}_2\text{H}_4 + \text{C}_2\text{H}_4$. The analytical data furnish some information concerning the fate of the $\text{Na}_2\text{C}_2\text{H}_4$. C. J. WEST

Preparation of zinc alkyls and their use in the synthesis of hydrocarbons. C. R. NOLLER. Northwestern Univ. *J. Am. Chem. Soc.* **51**, 594-9(1929).—A general procedure is given for the prepn. of Zn alkyls; the yields are increased if the distn. of the crude reaction mixt. is carried out *in vacuo*; a mixt. of alkyl iodide and bromide may be used in place of pure iodide, in the case of ZnEt_2 , while with the higher Zn derivs., a smaller proportion of iodide is necessary. The following b. ps. and yields are reported: ZnEt_2 , b. 112 – 7° , 87 – 9% ; ZnPr_2 , b. 39 – 40° , 85 – 6% ; Zn dibutyl, b. 81 – 2° , 78 – 9% ; $\text{Zn}(\text{iso-Am})_2$, b. 100 – 3° , 50 – 5% . For condensation the Zn deriv. is used with an equal wt. of xylene or tetralin. Only tertiary alkyl halides react with these Zn alkyls. By use of the above Zn alkyls and tert-BuCl , the following hydrocarbons were prepd.: Me_3CEt , b. 49.5 – 50.5 , d_4^{20} 0.6512 , n_D^{20} 1.3675 , mol. ref., 29.6 , 45% yield (without solvent, 18%) (this order of properties will be used below); Me_3CPr , 80 – 1° , 0.6778 , 1.3828 , 34.4 , 40% ; trimethylbutylmethane, 106 – 7° , 0.6967 , 1.3931 , 39.0 , 36% ; $\text{Me}_3\text{C}(\text{iso-Am})$, 121 – 3° , 0.7091 , 1.3997 , 43.7 , 25% ; Me_2CEt_2 (from tert-AmCl), 86 – 6.5° , 0.6952 , 1.3908 , 34.2 , 51% ; Me_2EtCPr , 111 – 2° , 0.7116 , 1.3998 , 38.8 , 24% ; dimethylethylbutylmethane, 137 – 8° , 0.7304 , 1.4095 , 43.3 , 29% . C. J. WEST

Electrolysis of metallo-organic compounds. WORTH H. RODEBUSH AND J. MERRIAM PETERSON. Univ. of Illinois. *J. Am. Chem. Soc.* **51**, 638-9(1929).—Brief note on the electrolysis of EtMgBr and ZnEt_2 . ZnEt_2 shows no appreciable cond. in the pure state but in Et_2O the sp. cond. is 10^{-4} . With a potential of 110 v. appreciable quantities of Zn were deposited on the cathode; the products at the anode were not satisfactorily identified but there can be little doubt that the Et radical was liberated at the anode. C. J. WEST

The slow oxidation of oleic acid with hydrogen peroxide. ALFONSO CRUTO. Nat. Med. Pharmacol. Inst. "Sersono." *Biochim. terap. sper.* **15**, 180-9(1928).— Na oleate in slightly alk. soln. (p_H 7.58) was treated with H_2O_2 after addn. of a small quantity of FeSO_4 . The soln. was kept at 37 – 40° for several days. Since acids were formed during the oxidation, the p_H was kept const. by adding NaOH from time to time; also the H_2O_2 concn. was kept approx. const. The products formed in the oxidation amounted to 10% of the initial quantity of oleic acid; they were found to be identical with those obtained when the reaction was allowed to take place at water-bath temp. In the latter case the yield was better and the reaction velocity was greater. By the latter method there were obtained from 50 g. oleic acid and 100 cc. H_2O_2 : small quantities of HCO_2H , AcOH , $\text{MeCH}_2\text{CH}_2\text{CO}_2\text{H}$ and other acids of low mol. wt., $\text{HO}_2\text{C}(\text{CH}_2)_7\text{CO}_2\text{H}$, 3.5 g. $\text{Me}(\text{CH}_2)_7\text{CHO}$, 2 g. $\text{Me}(\text{CH}_2)_7\text{CO}_2\text{H}$ (I), 4.05 g. of derivs. of I, probably consisting of a mixt. of θ -hydroxynonoic acid (II) and $\text{OHC}(\text{CH}_2)_7\text{CO}_2\text{H}$ (III), 0.25 g. $\text{Me}(\text{CH}_2)_7\text{CH}(\text{OH})\text{CH}(\text{OH})(\text{CH}_2)_7\text{CO}_2\text{H}$ and 3.80 g. of an acid (IV) with the sapon. no. 188.8 and the probable formula $\text{C}_{18}\text{H}_{34}\text{O}_3$. IV is a very viscous, slightly yellowish compd.; it cannot be distd. without decompn. Its mol. wt. was found to be 272 and 279 , resp. By treating IV in the usual manner with H_2O_2 in slightly alk. soln., II and III were obtained. On the basis of his expts., C. develops a theory explaining the oxidation process of the satd. fatty acids. The degradation is assumed to proceed according to the following scheme: $\text{RCH}_2\text{CH}_2\text{CH}_2\text{CO}_2\text{H} (-2\text{H}) \rightarrow \text{RCH}_2\text{CH}:\text{CHCO}_2\text{H}$ ($+O$) $\rightarrow \text{RCH}_2\text{CH}=\text{CHCO}_2\text{H} (+\text{H}_2\text{O}) \rightarrow \text{RCH}_2\text{CHO}$ (V) + $\text{HOCH}_2\text{CO}_2\text{H}$ (VI);



G. SCHWOCH

Action of hydriodic acid on tetraphenylbutinediol. YU. ZALKIND AND A. KRUGLOV. Mediz. Inst., Leningrad. *Ber.* **61B**, 2306-12(1928); cf. C. A. **21**, 56.— $(\text{HOCPh}_2\text{C} :)_2$ (I) behaves quite differently from $(\text{HOCMe}_2\text{C} :)_2$ with HI . With 10 – 2% aq. HI on the H_2O bath I gives chiefly the expected $2,2,5,5$ -tetraphenyl-3-iodo-2,5-dihydrofuran (II), which gives no gas with MeMgI (absence of any HO group) and is oxidized by

KMnO_4 in Me_2CO to Ph_2CO , CO_2 and $\text{Ph}_2\text{C}(\text{OH})\text{CO}_2\text{H}$; together with the II is formed small quantity of a yellow hydrocarbon $\text{C}_{21}\text{H}_{20}$ (III). With a satd. soln. of HI in H_2O or AcOH at 0° , I and II give III as the chief product; at $5-15^\circ$ there is formed simultaneously a small quantity of an isomeric orange hydrocarbon (IV), the yield of which is increased to 60–80% under more rigorous treatment (I, II or III with concd. II on the H_2O bath); at the same time there are sometimes formed very small quantities of $(\text{Ph}_2\text{C}:\text{CH})_2$. III and IV are identical with Brand's $(\text{Ph}_2\text{C}:\text{C})_2$ and 1,10,10-triphenylbenzofulvene, resp. II, m. $139-40^\circ$, mol. wt. in C_6H_6 530–4. III, m. 235° , mol. wt. in camphor 356–73. IV, m. $205-6^\circ$, mol. wt. in camphor 355–7; 0.5 g. with 5 g. Pt sponge in 60 cc. Et_2O under a slight overpressure (about 40 cm. of H_2O) absorbs 4 atoms of H in 122 min., giving 1-phenyl-3-[diphenylmethyl]dihydroindene, small crystals, m. 135° , from concd. alc. soln., large crystals, m. 107° , when crystd. slowly; the latter, on solidification, yield the former. [This compd. has since been repd. by Schlenk and Bergmann (C. A. 22, 4495).] C. A. R.

Strychnos alkaloids. XLVII. Behavior of derivatives of Hanssen's acid, $\text{C}_{19}\text{H}_{22}\text{O}_6\text{N}_2$, especially on oxidation with bromine and mercuric oxide. HERMANN LEUCHS, CURT BENDER AND WERNER WEGENER (in part with F. KRÖHNKE). Ber. 61B, 2349–58 (1928); cf. C. A. 20, 1811.—The acid $\text{C}_{19}\text{H}_{22}\text{O}_6\text{N}_2$ (I) obtained from cacotheline with Br-HBr had been shown to be converted by further action of the Br-HBr into an acid $\text{C}_{19}\text{H}_{22}\text{O}_8\text{N}_2$ (II), which, unlike I, shows ketone properties. A monoöxime had been repd. and a semicarbazone and its HCl salt are now described. Moreover, it has been found that only a simple oxime and semicarbazone can be obtained. According to the first theory proposed, that the oxidation consists in the conversion of the $>\text{C}:\text{C}<$ group into $>\text{CO}.\text{OC}<$, a diketone would have been expected, and the oxidation therefore probably proceeds according to the 2nd theory, viz., addn. of two HO groups at the $\text{C}:\text{C}$ union reducible with Na-Hg and conversion into $>\text{CO}$ of the group $>\text{CH}(\text{OH})$ assumed but not proven to be present in brucine and cacotheline. The $\text{C}:\text{O}$ group moreover appears to be involved in the reduction with Na-Hg which yields, not very smoothly, up to 60% of a dihydro deriv. $\text{C}_{19}\text{H}_{24}\text{O}_6\text{N}_2$ (III), presumably contg. 3 alc. HO groups, yielding a HBr salt and a nitrate and also, under conditions not definitely established, a hydrate $\text{C}_{19}\text{H}_{26}\text{O}_6\text{N}_2$ (IV) (isolated as the HBr salt). Of the other five O atoms, 1 is probably contained in the $>\text{NCO}$ group and the other 4 in two CO_2H groups, as in I itself, for II also gives a mono- and a di-Me ester, which, however, are weakly basic, the di-Me ester still reacting neutral and only the resin present in abundance in the mother liquors showing an alk. reaction. The ability of I to undergo oxidation without cleavage is not exhausted with the formation of II. With HgO in boiling H_2O II quite smoothly gives up to 77% of a salt $\text{C}_{19}\text{H}_{22}\text{O}_8\text{N}_2$. HBr in which the basicity of the amino acid is so weakened that the salt dissociates almost completely in H_2O . The reaction apparently does not consist in the introduction of an O atom but in a dehydrogenation and the simultaneous addn. of a mol. of H_2O , which the acid amide group is available; in the analogous case of the acid VIII (w), HgO oxidizes it to the compd. $\text{C}_{19}\text{H}_{24}\text{O}_8\text{N}_2$ (VI). Furthermore the oxidizability of HgO must be related with the groups introduced by the 2nd Br oxidation, as HgO is produced neither by I nor by the reduction product, $\text{C}_{19}\text{H}_{24}\text{O}_6\text{N}_2$ (VIII), of I. The action of HgO can therefore consist only in a dehydrogenation of the newly formed alc. groups ketone or to a tautomer of the type of dihydroxymaleic acid, although no products which would support this view could be isolated with ketone reagents. V is also obtained from III.HBr, only in 40% yield, to be sure, but without any greater consumption of HgO than with II. If the assumption is correct that the addn. of HO groups occurs on the $\text{C}:\text{C}$ union of I reducible by Na-Hg , the analogous treatment of II with Br would be expected to result only in dehydrogenation to II, but actually it is obtained in good yield (50%) an acid $\text{C}_{19}\text{H}_{20}\text{O}_8\text{N}_2$ (VIII), apparently along with small quantities of III. There is probably an addn. of H_2O , and the further changes exactly as with I itself: dehydrogenation and addn. of two HO groups which must therefore add at another $\text{C}:\text{C}$ bond than that reducible with amalgam. Both VII and II seem to yield only a mono-Ag salt; that of VII reacts with MeI to form the methyl salt $\text{C}_{19}\text{H}_{24}\text{O}_8\text{N}_2$ (IX), like I itself; to be sure, the IX contained 1 mol. MeOH, 0.5 of which was lost at 130° in vacuo, and the MeOH was therefore probably added chem. The Ag salt of II, on the other hand, gave with MeI only the mono-Me salt. Di-Me ester of II, m. $225-7^\circ$ (decompn.), forms a nitrate; mono-Me ester nitrate. In prisms with 3, the free acid with 2, the HCl salt with $3\text{H}_2\text{O}$. The HBr and salts of IX are described. Dihydrazide of VIII, m. $265-8^\circ$ (decompn.), reacts basic. Salt of VII, prisms with $3\text{H}_2\text{O}$. C. A. R.

Polyhydric alcohol—polybasic acid reaction. I. Glycerol-phthalic anhydride,

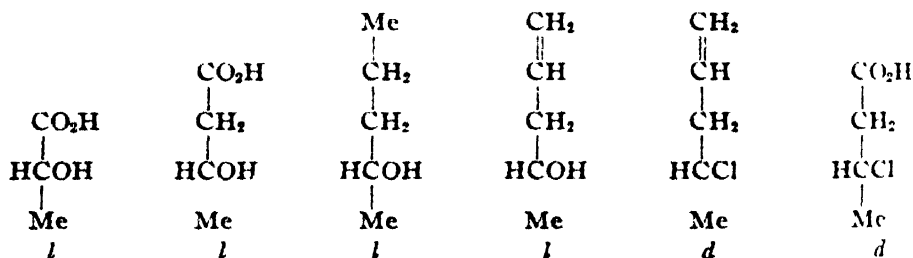
R. H. KIENLE AND A. G. HOVEY. General Electric Co. *J. Am. Chem. Soc.* **51**, 509-19 (1929).—The $C_3H_5O_2-C_6H_4(CO)_2O$ reaction proceeds by esterification, since H_2O was the only product collected. No intermediate aldehyde was detected until near gelation. The reaction went very rapidly at the start, evolving heat, and was apparently about half complete within 1 min. As the reaction proceeds under isothermal conditions, the free acidity decreased, the sapon. no. remained fairly const. and the % of esterification increased. The changes in other properties (flow point, viscosity, d , color, n) with time are reported. Similar resinous products result if other polyhydric alcs. or other polybasic acids are used. At whatever temp. the $C_3H_5O_2-C_6H_4(CO)_2O$ reaction is carried out, gelation occurs before the esterification has an opportunity to complete itself.

C. J. WEST

ω -Hydroxyaliphatic acids. Synthesis of sabinic acid. W. H. LYCAN AND ROGER ADAMS. Univ. of Illinois. *J. Am. Chem. Soc.* **51**, 625-9 (1929).—*Mono-Me decane-1,10-dicarboxylate* m. 51.5-2°. *Me 11-aldehydoundecanoate* forms a *semicarbazone*, m. 90-2°. The following ω -hydroxyaliphatic acids were obtained by sapon. of the *Me* esters, which in turn were obtained by reduction of the corresponding *Me* esters of the ω -aldehyde acids, using methods previously described. *9-Hydroxynonanoic acid* (I), m. 53-4°; *Me ester*, b_p 137-9°, n_D 1.4438, d_{20} 0.9588 (*phenylurethan*, m. 53-4°); *10-hydroxydecanoic acid*, m. 75-6°; *Me ester*, b_p 145-7°, n_D 1.4771, d_{20} 0.9618 (*phenylurethan*, m. 54-5°); *11-hydroxyundecanoic acid*, m. 65.6-6°; *Me ester*, b_p 156-9°, n_D 1.4493, d_{20} 0.9542 (*phenylurethan*, m. 64.5-5.5°); *12-hydroxydodecanoic acid* (II), m. 83-4°; *Me ester*, b_p 164-6°, m. 34-5° (*phenylurethan*, m. 64-5°); *13-hydroxytridecanoic acid*, m. 77-8°; *Me ester*, b_p 170-3°, m. 40.5-1.5° (*phenylurethan*, m. 73.5-4°). II is identical with sabinic acid. When I is heated at 3 mm. and 220-30° for 0.5 hr., H_2O is eliminated with the formation of the *compd.* $(C_9H_{16}O_2)_x$, m. 64-6°; warming with 10% aq. KOH for 1 hr. caused complete hydrolysis and acids ppt. I.

C. J. WEST

Configuration relationship of β -chlorobutyric acid and β -hydroxybutyric acids. P. A. LEVENE AND H. L. HALLER. Rockefeller Inst. *Science* **69**, 47 (1929).—Recent reports on correlation of configurations of HO and halogeno acids by indirect methods are contradictory. Previous evidence warrants the assumption that in simple aliphatic secondary alcs. substitution of OH by halogen proceeds without Walden inversion. Thus, the configuration of halogeno acids can be correlated with carbinols which have already been correlated with lactic acid. The scheme is:



Thus *d*- β -chlorobutyric acid is correlated with *l*- β -hydroxybutyric acid and hence with *l*-lactic acid.

ALBERT P. SACHS

The specificity of erepsin and trypsin kinase. The behavior of these enzyme complexes toward polypeptides and compounds containing both α -amino acids and β -aminobutyric acid. The action of *N* alkali on these compounds. EMIL ABDERHALDEN AND RICHARD FLEISCHMANN. Univ. Halle. *Fermentforschung* **10**, 195-212 (1928).—A no. of new peptide derivs. were prepd. for a study particularly of the effect of addn. of PhNCO to the NH_2 group and of the influence of an amino acid with NH_2 in other than the α -position on their susceptibility to enzymic cleavage. The following were obtained from the appropriate peptide and isocyanate: *di[phenylisocyanate-d-valyl-d-alanyl]-l-cystine*, decomp. above 175°, yield 80%; *di[phenylisocyanate-l-leucylglycyl]-l-cystine*, decomp. 190°, yield 75%; *phenylisocyanate-diglycylglycine*, m. 214-6°, 85% yield; *α -naphthylisocyanate-diglycylglycine*, decomp. 238°, yield 75%; *phenylisocyanate-triglycylglycine*, gradual decompn. above 220°, yield 80%; *phenylisocyanate-tetraglycylglycine*, decomp. above 220°. Tetraglycylglycine was condensed with *d*- $Me_2CHCH_2CHBrCOCl$ to form *d*- α -bromoisocaproyltetraglycylglycine, decomp. above 220°, $[\alpha]_D^{20}$ 12.21°, and this was aminated by 25% NH_4OH to *l*-leucyltetraglycylglycine, decomp. above 222°, $[\alpha]_D^{20}$ 9.41°. New derivs. of $MeCH(NH_2)CH_2CO_2H$

prepd. by customary procedures were *phenylisocyanate-dl-leucyl-β-aminobutyric acid*, m. 188°, yield 70%; *benzoyl-dl-leucyl-β-aminobutyric acid*, m. 182°, yield 75%; *dl-α-bromoisocaproyl-dl-leucyl-β-aminobutyric acid*, m. 172°, yield 80%; *dl-leucyl-dl-leucyl-β-aminobutyric acid*, m. 141°, yield 40%; *PhNCO deriv.* of the preceding, m. 212°. *β-Chlorobutyryl chloride* (I), b_{40} 65–7°, was obtained in 90% yield by refluxing 40 g. $\text{MeCHClCH}_2\text{CO}_2\text{H}$ with 80 g. SOCl_2 4 hrs. at 60°. This was condensed with *dl-leucine* to yield *β-chlorobutyryl-dl-leucine*, m. 132°, and the latter aminated to 30% *β-aminobutyryl-dl-leucine*, m. 265–8° (decompn.). Condensation of I with glycine gave 70% *β-chlorobutyryl-glycine*, m. 199°, which was aminated to 30% *β-aminobutyryl-glycine*, m. 227°.

β-aminobutyryl-triglycylglycine, m. 227°, was obtained from the tetrapeptide and I, and aminated to *β-aminobutyryl-triglycylglycine*, decomp. 249°. Other derivs. prepd. in a similar manner were *β-chlorobutyryl-β-aminobutyric acid*, m. 142°; *β-aminobutyryl-β-aminobutyric acid*, m. 232°; *β-chlorobutyryl-l-leucyltetraglycylglycine*, decomp. above 215°; *β-aminobutyryl-l-leucyltetraglycylglycine*, decomp. above 223°. The *PhNCO* and $\alpha\text{-C}_{10}\text{H}_7\text{NCO}$ derivs. described above are all hydrolyzed by *N* NaOH at 37°, those with *PhNCO* attached to glycine yielding phenylisocyanateglycine as one of the cleavage products. Both *PhNCO* derivs. contg. cystine are hydrolyzed by trypsin-kinase but not by erepsin. Of the other *PhNCO* polypeptides none was attacked by erepsin, and only the tetraglycylglycine deriv. by trypsin-kinase. The hexapeptide is 80% hydrolyzed by *N* alkali into its individual components in 3 hrs., trypsin-kinase effects considerable cleavage, while erepsin is without action. *dl-Leucyl-β-aminobutyric acid* is resistant to *N* alkali for 125 hrs., while its *PhNCO* deriv. undergoes 100% hydrolysis in 20 hrs., but its *Bz* deriv. is not attacked. The dipeptide *β-aminobutyryl-glycine* is resistant, but the tetra-, penta- and heptapeptides with terminal glycine and *β-aminobutyryl* are hydrolyzed. *β-Aminobutyryl-β-aminobutyric acid* is not attacked. None of the peptides contg. *β-aminobutyric acid*, either as a terminal acyl or as a terminal acid, is attacked by erepsin. The same is true with respect to trypsin-kinase with the exception of *β-aminobutyryl-l-leucyltetraglycylglycine* which gave in 22 hrs. a hydrolysis corresponding to 51% of 1 CONH linkage. This observation bears out the theory that tryptic action is dependent upon a free CO_2H which must not be present in a foreign component such as a β -amino acid. A. W. DOX

The influence of substitution in the free amino group of polypeptides by groups of definite character, and their cleavage by *N* alkali, erepsin and trypsin-kinase. EMN. ANDERHALDEN, ERMBRECHT RINDTORFF AND ADOLF SCHMITZ. Univ. Halle. *Fermentforschung* 10, 213–32(1928).—Substitution of a no. of radicals in the NH_2 group of peptides was made for the purpose of detg. their influence on peptide cleavage by alkali and enzymes. *Phthalyl-dl-leucylglycine*, m. 119–20°, previously prepd. by Brigl and Klenk (*C. A.* 18, 2501) in an amorphous state, was obtained cryst. *Trichloroacetyl-dl-leucylglycine*, m. 172–3°, was obtained in 70% yield from Cl_3CCOCl and the dipeptide. *Methyl-dl-leucylglycine*, m. 225°, was prepd. in 60% yield from *dl-α-bromoisocaproylglycine* and aq. MeNH_2 and *methyl-diglycylglycine*, m. 139–40°, from chloroacetyldiglycylglycine and MeNH_2 . *Et* glutamate-HCl was condensed with $(\text{COCl})_2$ by refluxing in C_6H_6 soln. until evolution of HCl ceased, yielding 80% *oxalyl-di[ethyl-d-glutamate]*, m. 94°, and with $(\text{CH}_3\text{COCl})_2$ by the same procedure yielding 60% *Et α-succinimidoglutarate*, a non-crystg. oil. Derivs. obtained from *glycyl-dl-leucine* by simple condensations were: *β-naphthalenesulfonyl deriv.*, m. 123° (50%); *PhNCO deriv.*, m. 177° (90%); $\text{ClC}_6\text{H}_4\text{CO deriv.}$, m. 190° (80%); *butyryl deriv.*, m. 182° (60%). *Oxalyl-di[glycyl-dl-leucine Et ester]*, m. 163°, was obtained in 50% yield by boiling the dipeptide ester-HCl salt with $(\text{COCl})_2$ in C_6H_6 . *Chloroacetyl-dl-valine*, m. 129.5–30.5°, was prepd. in 60% yield from *dl-valine* and ClCH_2COCl , and aminated by treatment with 25% NH_4OH to 67% *glycyl-dl-valine*, m. 240°; *PhNCO deriv.*, m. 155° (68%); $(\text{CH}_3\text{CHCO deriv.})$, m. 151.5–2.0° (88%); *Bz deriv.*, m. 135–6° (36%). *Dichloroacetyl-glycine*, m. 125–6°, was obtained in 81% yield from glycine and Cl_2CHCOCl . *N* alkali at 37° attacks *dl-leucylglycine* more readily than its phthalyl deriv., whereas the *Me* deriv. is almost totally resistant. The Cl_3CCO deriv. splits off $\text{Cl}_3\text{CCO}_2\text{H}$ which makes a detn. of peptide cleavage impossible. Substitution of a *Me* group in diglycylglycine causes some inhibition of cleavage but to a less extent than in the dipeptide. Erepsin does not attack any of the *dl-leucylglycine* derivs. nor the *Me* tripeptide. Trypsin-kinase hydrolyzes them all with the exception of the *Me* deriv. The oxalyl deriv. of glutamic acid is rapidly hydrolyzed by *N* alkali with liberation of $\text{C}_2\text{O}_4\text{H}_2$, while the succinyl deriv. is quite resistant. Neither one is attacked by erepsin, and only the oxalyl deriv. by trypsin-kinase but without liberation of $\text{C}_2\text{O}_4\text{H}_2$. All

of the glycyl-*dl*-leucine derivs. are hydrolyzed by *N* alkali, the PhNCO deriv. most rapidly and the β -C₁₀H₇SO₂ deriv. with extreme slowness. All are hydrolyzed by trypsin-kinase, and none by erepsin. The glycyl-*dl*-valine derivs. are less resistant to alkali than the dipeptide itself. The Cl₂CHCO deriv. first splits off Cl₂CHCO₂H then the residual dipeptide undergoes hydrolysis at its usual rate. The PhNCO deriv. is attacked by trypsin-kinase but not by erepsin. The results obtained with these substitutions support the previously expressed view that the point of attack by the free NH₂ group of polypeptides, while substitution in the NH₂ facilitates may be noted. The trypsin-kinase. With the exception of the Me group, a variety of foreign radicals into the same influence although qual. differences in rate of hydrolysis by trypsin-kinase. The observation is that the introduction of polypeptide group facilitates the breakdown of polypeptide.

Cleavage of diethyl α,α' -dibromodipropionate by secondary amines.

FUSON and RAYMOND L. BRADLEY. Univ. of Illinois. *J. Am. Chem. Soc.* 51, 599-60 (1929).—(CH₃CHBrCO₂Et)₂ is cleaved by piperidine to give 75% of Et β -piperidinopropionate, b₂₂ 114-6°, d₄₀ 0.927, whose methiodide m. 100-2°. Similarly, Pr₂N gives Et β -dipropylaminopropionate, b₂₀ 112-4°; methiodide m. 76°. C. J. WEST

Naphthenic acids. VIII. Polymethylene rings of naphthenic acids in Japanese petroleum.

TSUTOMU KUWATA. *J. Faculty Eng. Tokyo Univ.* 17, 305 (1928); cf. C. A. 19, 486.—Naphthenic acid (I), b₁ 133-70°, d₄²⁰ 0.9629, n_D²⁰ 1.4602, neutralization no. 297.1, was used and corresponds to a mixt. of the 22nd and 24th. I was heated with 1 mol. PCl₅, the POCl₃ removed by distn., dissolved in 1 mol. PhOH and K₂CO₃, heated for 0.5 hr. on the water bath, washed with H₂O, dried with CaCl₂, the PhH removed by distn., the residue was distilled and gave 90% Ph naphthenate (II), a colorless, viscous oil. When II and abs. EtOH in a closed flask with reflux condenser and stirrer were treated with 18 atoms Na, warmed after most of the Na had been added, H₂O added, the removed by distn., the residue extd. with Et₂O, the ext. distd. in vacuo, it gave naphthene alc. (III), a colorless, viscous oil, b₁ 100-33°, d₄²⁰ 0.8953, n_D²⁰ 1.4592.

III (naphthene iodide (prepd. by heating III with 3 mols. I₂ and 1 mol. red P) was reduced by boiling with Zn-Hg in EtOH and gave 70% naphthene hydrocarbon which was purified by washing with H₂SO₄, aq. KOH and distd. over Na; it b. 160-92°, d₄²⁰ 0.791, 1.4336, 85.45% C, 15.04% H, and has an odor of purified petroleum; treatment with Pt black at 290-300° by Zelinskii's method (cf. C. A. 17, 3124) had no effect; concluded that the original acid contains no homologs of hexamethylenecarboxylic acid and that the acids are probably pentamethylenecarboxylic. In a similar manner the following were prepd. from the naphthenic acid derived from Kurokawa petroleum: naphthenic acid, b₁ 168-98°, d₄²⁰ 0.9942, n_D²⁰ 1.4744, neutralization number 160 responding to a C₁₄ acid; naphthene alc., b₁ 126-55°, d₄²⁰ 0.9270, n_D²⁰ 1.4756; naphthene hydrocarbon, b. 203-43°, d₄²⁰ 0.8425, n_D²⁰ 1.4548, 85.66% C, 13.67% H; treatment by the Zelinskii method gave a product of which 6.5% was sol. in 95% EtOH having a higher d. and n; from this it is concluded that the Kurokawa naphthenic acids with d. > 0.99, though in a very small amount, contain the homologs of hexamethylenecarboxylic acid. IX. Chemical constitution of octonaphthenic acid derived from Nishiyama petroleum.

Ibid 311-7.—Nearly pure octonaphthenic acid, C₂₄H₄₀O₂ (IV), was isolated from pure mixed naphthenic acids derived from Nishiyama petroleum distillate by repeated fractional distn. of the acids and their Me esters; it m. 81.5°, b. 231.5-7.5°, d₄²⁰ 0.9417, n_D²⁰ 1.4318, and is either a stereo- or chem. isomer of that reported by Aschan (cf. Ber. 23, 867(1890)); when 11 g. IV and 0.9 g. red P in a flask with reflux condenser was treated with 12 cc. Br₂, warmed for 6 hrs., the condenser removed, excess Br₂ evapd., poured into MeOH, extd. with Et₂O, the ext. washed with H₂O, then with dil. Na₂CO₃, dried over Na₂SO₄, the Et₂O removed and distilled in vacuo, 11 g. of Me α -bromooctonaphthenate, C₂₄H₃₉BrCO₂Me (V), was obtained, 95-105°, d₄²⁰ 1.249, n_D²⁰ 1.4612. V (8.6 g.) and 330 cc. 2% aq. KOH were heated at 60-70° for 10 hrs., cooled, acidified with H₂SO₄, extd. with Et₂O and the Et₂O evaporated, the viscous residue (5.5 g.) is α -hydroxyoctonaphthenic acid, C₂₄H₄₀O₃, d₄²⁰ 1.023, 1.4518, decompd. on warming with H₂SO₄ with evolution of CO; when 3.8 g. is heated with 6 g. PbO₂ and a few drops of H₃PO₄, then distd. with steam, a compd. with aldehyde properties is obtained which is oxidized by alk. KMnO₄ to an acid m. 80-110° gives the CHI₃ test, and forms a semicarbazone, m. 89-90°. The results indicate the

V is a homolog of methylpentamethylenecarboxylic acid having no tertiary carbon atom at the α -position.

N. A. LANGE

Trityl ethers in the chemistry of sugars. B. HELFERICH. *Z. angew. Chem.* 41, 371-5(1928).—A general review of the use of Ph_3C ethers in the study of the various sugars; 25 references are given.

C. J. WEST

Transformations of β -pentabenzoyl-*h*-glucose. HANS H. SCHLUBACH, FRIEDRICH TREFZ AND WOLFGANG RAUCHENBERGER. Univ. Hamburg. *Ber.* 61B, 2368-71 (1928).—The end Bz group in β -pentabenzoyl-*h*-glucose (I) is rapidly replaced by HCl and HBr but the resulting halogenoses lose their halogen with extraordinary ease and change into *tetrabenzoyl-*h*-glucose* (II) (cf. Ohle and his co-workers, *C. A.* 23, 102), the Cl considerably less easily than the Br compd. As far as can be judged from the rotations of these labile compds. there is formed an equil. mixt. of the 2 possible stereoisomeric halogenoses and not 1 of the stereoisomers almost exclusively. A method similar to that of O. and his colleagues, which permits of working up the reaction product without the use of H_2O , is described. The II, most simply obtained by shaking the halogenoses with Ag_2CO_3 in moist Me_2CO , cannot be made to crystallize and its structure was established by converting it back into I. With Ag_2O and MeI II gives a *tetrabenzoyl-*h*-methylglucoside* (III) which, from its rotation, seems to be a β -deriv., are those obtained from the tetraacyl-*n*-glucoses. On the other hand, when III and the *n*-isomer (IV) are treated under the same conditions with NH_3 in MeOH, smoothly yields the β -*n*-methylglucoside, whereas III undergoes both sapon. and isomerization, for the rotation of the product (V) is much higher, $[\alpha]_D^{20} -16.4^\circ$ (H_2O , 1.07), than would be expected for the *h*-glucoside (about -60°). Permethylation of the V with Ag_2O and MeI and conversion into the reducing tetramethylglucose gives a product with an equil. value $[\alpha]_D^{20}$ of -27.5° (CHCl_3), showing that V is merely a mixture of the α - and β -*h*-glucosides and that in its formation there has not been a partial arrangement into the *n*-glucoside after the sapon. NH_3 in MeOH thus effects in the series an isomerization which in the *n*-series has hitherto been observed only with

Since if any of the unstable free *h*-glucose had been formed it would undoubtedly at least, have rearranged into the *n*-glucose, the above observation indicates the stereoisomeric rearrangement occurs without any preliminary splitting off of the Me group. From 5 g. I kept 20 hrs. at 20° with 15 cc. of dry liquid HCl is obtained a sirup with 4.01-4.49% Cl and $[\alpha]_D^{20} -10.5^\circ$, -11.3° (CHCl_3 , c 1.138, 1.060).

With either liquid HBr or HBr in AcOH are obtained products with rotations to 31° and Br contents much lower than that calcd. for a halogenose. II (11.5 g. 15 g. I and HBr in AcOH at 15° , the mixt. then being treated with ice H_2O and product shaken in Me_2CO with Ag_2CO_3), $[\alpha]_D^{20}$ $5.15^\circ \rightarrow 4.96^\circ$ (CHCl_3 , c 1.088) (96% alc., c 1.0112). III, contains 1 mol. MeOH, $[\alpha]_D^{20} -48.6^\circ$ (CHCl_3 , c 1.0112).

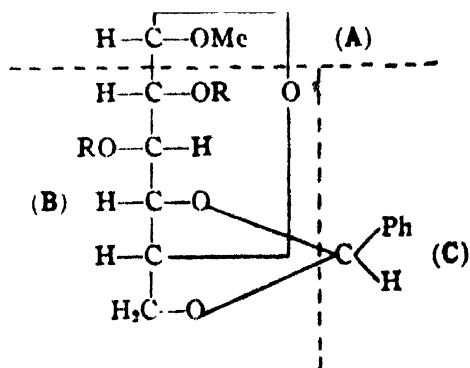
C. A. R.

Structure of β -glucochloralose. H. W. COLES, L. D. GOODHUE AND R. M. HIXON. College. *J. Am. Chem. Soc.* 51, 519-24(1929).— $\text{Cl}_3\text{CCHO} \cdot \text{H}_2\text{O}$ (300 g.), concd. H_2SO_4 and 200 g. glucose at $12-15^\circ$ give 60 g. β -glucochloralose (I) and of about equal parts of 2 dichloralglucoses, m. 225° (II) and 135° ; at times a dimer, m. 188° , is isolated. Reaction of I with $\text{Cl}_3\text{CCHO} \cdot \text{H}_2\text{O}$ and H_2SO_4 gives a 1st isomer, m. 128° ; the 2 Ac derivs. m. 126° and 198° , resp. of II and a 2nd isomer, m. 268° ; the 2 Ac derivs. m. 126° and 198° , resp. and Payne, *C. A.* 17, 3862). I and Me_2SO_4 with solid NaOH give the *tri-Me* in 100-10%; a 4th group could not be introduced. Reduction with Al-Hg and HCl gives *trimethylglucose dichloroacetaldehyde*, m. 68° ; reduction with Na-Hg gives a *mono-Cl* deriv., b. $155-60^\circ$. 3,5,6-Trimethylglucose and $\text{Cl}_3\text{CCHO} \cdot \text{H}_2\text{O}$ in H_2SO_4 give 3,5,6-trimethylmonochloralglucose, m. 120° , $[\alpha]_D^{20} -29.01$ (0.8413 g. 398 cc. CHCl_3); this does not react with MeMgI. The present formulas for I do not explain the formation of the dichloralglucoses; the reaction reported by Hanriot and Kling by which both the aldehyde and glucose are identified would indicate an ether rather than a C-C linkage.

C. J. WEST

Some derivatives of the benzylidenemethylglucosides. HEINZ OHLE AND KURT BER. Univ. Berlin. *Ber.* 61B, 2387-92(1928).—It was shown (*C. A.* 23, 103) that the stability of the O bridge in derivs. of monoacetoneglucose can be greatly increased by appropriate esterification. The structure of the mother substance is the only partially acylated derivs. which can be obtained are those in which the characteristic acid groups are in position 3, 5 or 6. In order to be able to determine the influence of esterification of the 2-HO group the study of the benzal derivs. (I) and β -Me glucoside was undertaken but although this study has not progressed beyond the initial stage the results so far obtained are published now because these

compds. have become of importance in the synthesis of disaccharides (Freudenberg, Toepffer and Andersen, *C. A.* 23, 107). These investigators have shown that in the I the 3-HO group is not combined with the PhCH residue. Of the 3 remaining possibilities (4,6-, 5,6- and 2,4-derivs.), the last is rendered very improbable by the observations of Irvine (*J. Chem. Soc.* 103, 575(1913)) and also because (1) levoglucosan does not condense with BzH and (2) the velocities of esterification of the 2 free HO groups in the I are almost equal and it is a general rule that in glucose derivs. a primary carbinol grouping is more readily esterified than a secondary grouping. If the I were 5,6-derivs. they should be closely related to diacetoneglucose (II) and easily transformable into it or the analogous isopropylidenemethylglucoside (III). To avoid drawing possibly false conclusions from their results, O. and S. first studied the action of the Me glucosides (IV) with Me_2CO . As was to be expected, the IV did not react any more than glucose with Me_2CO in the presence of CuSO_4 ; II was formed only with mineral acids as catalysts. The two IV differ materially in their reactivity; the α -IV shows a detectable transformation into II only with more than 2 cc. concd. H_2SO_4 per 100 cc. Me_2CO , while the β -IV forms II with 0.5 as much acid. Furthermore, by following polarimetrically the changes which occur in solns. of II in Me_2CO with H_2SO_4 , it was found that with 1 or 2 cc. concd. acid per 100 cc. Me_2CO there is no appreciable change in rotation in 5 hrs.; only mono- and diacetoneglucose could be isolated and the weak reducing power showed that only traces of free glucose are formed, *i. e.*, under such conditions the furoid structure of glucose is perfectly stable. α -I under the same conditions would therefore be expected to change, in part at least, into II or the hypothetical III if it were a 5,6-deriv. whereas this reaction would be impossible if it is a 4,6-deriv. because the pyroid α -IV is unchanged under such conditions. The exptl. results are in favor of the 4,6-structure; α -I in 100 cc. Me_2CO with 2.8 cc. concd. H_2SO_4 begins to deposit α -IV in a few min. and is almost quant. decompd. into α -IV and BzH, no II or III is formed. For the tetraacetates of the Me lactolides of the hexoses Hudson obtained the value 53,500 for $2A_M (= M_\alpha - M_\beta)$. For the dibenzoates of the I, O. and S. find 39,750, for the di-*p*-toluenesulfonates 71,500. This is another illustration of the fact that A_M is not const. but is largely influenced by the structure of the rest of the sugar mol. In this particular case, to be sure, the condensation of BzH with α -IV gives 2 isomers (*cis* and *trans*) because the C atom of the PhCH group becomes asym., and the same is of course true for β -IV. It is conceivable that in the 1 case the *cis*-form, in the other the *trans*-form is the chief product, and the esters of the I could not therefore be expected to give the same value for A_M as the tetraacetates of the IV, for in the Hudson formula, $M = A + B$, B would not be identical in the 2 derivs. of I, as it would represent the rotation of the *cis*-form in the 1 case, that of the *trans*-form in the other. But if the mols. of the I derivs. be imagined as split up into 3 parts, as shown in the accompanying formula, with abs. rotation values of A, B and C, then by the principle of optical superposition M_α should be $A_M + B$



+ C and M_β should be $-A_M + B - C$, or $M_\alpha - M_\beta = 2(A_M + C)$; as this formula does not contain B, $M_\alpha - M_\beta$ should be const. for the 2 pairs of esters if Hudson's principle held good. 2,3-Dibenzoyl-4,6-benzylidene- α -methylglucoside (4.5 g. from 5 g. α -I in $\text{C}_6\text{H}_5\text{N}$ with BzCl in CHCl_3 at 38°), m. 148° , $[\alpha]_D^{19}$ 96.89° (CHCl_3 , c 2.828); β -isomer (1.2 g. from 1 g. I), m. 185° , $[\alpha]_D^{19}$ 15.84° (CHCl_3 , c 2.840). 2,3-Di-*p*-toluenesulfonate of α -I (4.2 g. from 3 g. I), m. 149° , $[\alpha]_D^{19}$ 66.5° (CHCl_3 , c 3.068; β -isomer, m. 158° , $[\alpha]_D^{19}$ -54.70° (CHCl_3 , c 2.796).

C. A. R.
Mutarotation of galactose. THOMAS M. LOWRY AND GILBERT F. SMITH. Cam-

bridge Univ. *J. Phys. Chem.* 33, 9-21(1929).—Exptl. mutarotation curves for α - and β -galactose can be represented as the sum of 2 exponential curves, one a simple unimol. curve of long period, the other a unimol. curve of short period (cf. Worley and Andrews, *C. A.* 22, 1332), i. e., $\theta_\alpha = A_1e^{-m_1t} + B_1e^{-m_2t} + C$. If the improbable assumption is made that only 3 sugars are present at equil. we have at 20° $\alpha:\mu:\beta = 28.5:12.0:-59.5$; at 0.8° $\alpha:\mu:\beta = 30.0:5.5:64.6$. Soly. detns. give an uncor. value of 37% α at 0° in contrast to 6.6% by Riiber and Minsaas (cf. *C. A.* 21, 697). A. P. S.

Preparation of triacetylstarch and its molecular weight. YOJIRO TSUZUKI. Univ. Tokyo. *Bull. Chem. Soc. Japan* 3, 276-85(1928).—A new method is described for starch acetylation, which had the advantages of being more rapid than any other, and avoiding partial depolymerization. Forty g. starch is mixed with 50 g. $ZnCl_2$ in 23 g. H_2O to a transparent sticky paste and heated on the water bath; 220 cc. Ac_2O is gradually added, a part of which is converted into $AcOH$ by the H_2O present, which acts as a solvent for the Ac deriv. The temp. is not allowed to rise higher than 70° during the mixing and is kept at this temp. for 0.5 hr. Small lumps of unchanged starch are centrifuged, the $AcOH$ partially evapd. and the remaining liquid poured into ice water. The acetylated product seps. out as a flocky ppt. By repeated H_2O washings, a fine powder is obtained. The yield is 60 g. of dry substance, i. e., 90%. Purification is obtained by alc. pptn. from hot $CHCl_3$. The acetylated deriv. differs from any one previously described. It sinters 258° and slowly decomp. 270°, dissolves in $AcOH$, $CHCl_3$ (free from alc.), pyridine, Ac_2O , concd. H_2SO_4 (remaining undecompd. for 20 min.), $C_2H_4Br_2$, $CHBr_3$, $PhOH$, far more readily at higher temp. The solns. are turbid over 5%. It is a little sol. in Me_2CO , $EtOAc$, $MePh$, less in C_6H_6 , CCl_4 , far less in petroleum ether, Et_2O , alcs., and almost insol. in H_2O . Dissolved in hot $MePh$ and allowed to cool, it gives a strong fluorescence. Its optical properties are: $[\alpha]_D^{25} 170.2^\circ$ (in $CHCl_3$) and 160.4° (in $AcOH$), $[\alpha]_D^{14} 159.6^\circ$ in pyridine. Sapon. with $NaONa$ is instantaneous. The sapon. product is sol. in H_2O . The mol. wt. of the Ac deriv. has been detd. by cryoscopy *in vacuo* and by ebullioscopy. The approx. results were: cryoscopy: 5-6000 in $C_2H_4Br_2$, 5000 in $CHBr_3$, 2000 in camphor, 200, 2000 and 6000 in $AcOH$, ∞ in $PhOH$; ebullioscopy: 5-7000 in $AcOH$, 6-7000 in $CHCl_3$, ∞ in Me_2CO . ALBERT L. HENNE

Synthesis of the basic substance of inulin. HANS H. SCHLUBACH AND HORST ELSNER. Univ. Hamburg. *Ber.* 61B, 2358-63(1928).—Irvine and Garrett (*C. A.* 5, 1077) obtained from fructose and Me_2CO contg. HCl , together with α -diacetonefructose, large quantities of a sirup which they considered to be a mixt. of α - and β -2,3-monoacetonefructoses. S. and E. have improved the method of prepn. by carrying out the after-acetonization with anhyd. $CuSO_4$ instead of HCl , to avoid the rearranging influence of the latter, and by drying the Et_2O -insol. residue in a high vacuum, taking it up in alc. and pptg. it by pouring the soln. into Et_2O . The substance was in this way obtained as a solid, although amorphous, powder. The varying yields led to the suspicion that the course of the reaction depends on the H_2O content of the Me_2CO and systematic expts. showed that with 0.05% H_2O α -diacetonefructose is formed almost exclusively, while with 2% H_2O a max. of the new product is obtained. Detn. of the Me_2CO by the Elsner method (see following abstr.) led to the surprising result that the substance contained only about 0.1 the quantity of Me_2CO calcd. for a monoacetonefructose, and by systematic reppnts. controlled by quant. detns. this small quantity of Me_2CO was completely gotten rid of. The Me_2CO -free material showed, contrary to the observations of I. and G., a distinct reducing power even after treatment with yeast, and by means of abs. alc. was sepd. into 2 components: extremely hygroscopic, white, alc.-sol. powder (I), with the compn. and mol. wt. of a fructose anhydride, and an alc.-insol., only little hygroscopic powder (II), with the compn. and mol. wt. of a difructose. Because of the small yield and difficulty of purifying it, II could not be characterized with abs. certainty. On permethylation, I gave a hexamethyldifructose anhydride, $b_p 150^\circ$, $n_D^{14} 1.4738$, $[\alpha]_D^{20} 31.1^\circ$ ($CHCl_3$, c 1.13), which on hydrolysis yielded a trimethylfructose giving with $PhNHNH_2$ an osazone identical with that of the trimethylfructose (III) obtained by Haworth and Learner from trimethylinulin. They proved III to be a 3,4,6-trimethylfructose<2,5> and concluded that the basic substance of inulin is a 1,2-fructoseanhydride<2,5> or a 1',2,1',2'-difructose anhydride<2,5> (IV). Inulin may be built up from such a basic substance in 2 ways: by a chain-like addn. of fructose mols. to each other through a primary valence, the reducing HO group of 1 mol. combining with 1st HO group of the next, or the I condenses through II to IV which then, under the influence of supermol. forces, associates to inulin. S. and E. believe the latter view better accords with the exptl. evidence now available. II or IV is formed

with the greatest ease from I. Thus, with alk. Me_2SO_4 I gives not a trace of monomol. condensation product but only the Me deriv. of IV which on further treatment yields highly polymerized products. The same phenomenon occurs on acetylation. Although the rotations of these synthetic products do not always agree with those of the natural substances it must be remembered that in the formation of IV there are 3 stereochem. possibilities; the 2 residues may combine at the α,α -, β,β - or α,β -positions; for natural inulin the union is supposed to be at the β,β -position. Numerous reports in the older literature make it probable that IV occurs primarily, and quite frequently, in nature, and on aging polymerizes to the insol. inulin. I, sinters $55-60^\circ$, effervesces $86-8^\circ$, $[\alpha]_D^{18} -8.9^\circ$ (H_2O , c 1.46), -6.9° (EtOH , c 1.16), mol. wt. in H_2O 170, has 14% the reducing power of fructose, gives a strong Selivanov reaction, turns brown with KOH, slowly decolorizes KMnO_4 , is rapidly hydrolyzed, with partial decompn., by 0.5% HCl at 100° to a strongly *l*-rotatory substance, is not fermented by yeast but is attacked by molds. II, decomp. 198° , $[\alpha]_D^{18} -25.5^\circ$ (H_2O , c 1.06), mol. wt. in H_2O 373, has 24% the reducing power of fructose but this disappears after heating 1 hr. with *N* NaOH.

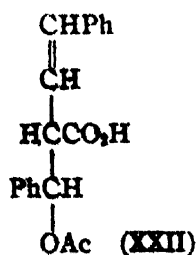
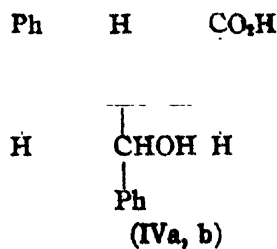
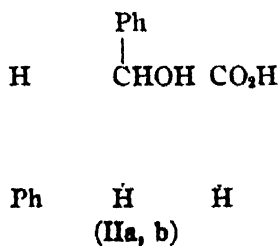
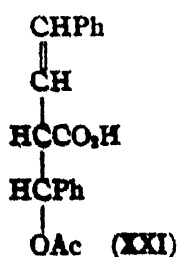
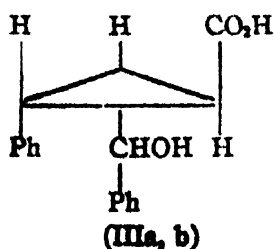
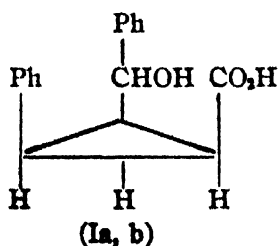
C. A. R.

Method for the determination of acetone groups in acetone sugars. HORST ELSNER. Univ. Hamburg. *Ber.* 61B, 2364-7(1928).—The Me_2CO detn. can be made smoothly and with certainty, with a max. error of $\pm 0.5\%$, by quantitatively splitting and distg. off the Me_2CO and detg. it in the distillate by the Messinger method while at the same time a parallel detn. is run under the same conditions on a soln. of known concn. approx. equal to that of the unknown, the Me_2CO in the latter then being calcd. from the ratio of I consumed by the 2 solns. Special expts. showed that the results obtained by the M. method are greatly influenced by the length of reaction, the temp., the concn. of the Me_2CO and KOH and the excess of H_2SO_4 used. The Me_2CO is quant. split and distd. off by weighing 50-100 mg. of the acetone sugar into a Claisen flask, the side neck of which carries a dropping funnel and is connected through a short Liebig condenser with a 100 cc. measuring flask in ice. Through the dropping funnel are added 4 cc. concd. H_2SO_4 and 30 cc. H_2O and an additional 80 cc. H_2O is added as the liquid dists. over. Rubber stoppers must be used, as corks after a short time give off substances which react with the hypoiodite. The distillate is dild. to the 100 cc. mark and at the same time a soln. of known Me_2CO concn. is prepd. either from specially distd. Me_2CO according to Goodwin or from a distillate prepd. as above from a pure acetone sugar, such as β -diacetonefructose. The 2 solns., after addn. of 30 cc. *N* KOH, are allowed to stand about 1.5 hrs. until they have reached the same temp., then treated with vigorous shaking with the same quantities of 0.1 *N* I (about 40 cc.), acidified after exactly 4 min. with about 35 cc. *N* H_2SO_4 and titrated back with 0.1 *N* $\text{Na}_2\text{S}_2\text{O}_3$.

C. A. R.

Ring cleavages in the cyclopropane series. XIV. R. STOERMER AND FR. SCHENCK, WITH H. BUSCHMANN. Univ. Rostock. *Ber.* 61B, 2312-23(1928); cf. *C. A.* 22, 1142-. It had been shown that a series of truxill- and truxinamic acids can be converted, by degradation of the corresponding amino acids with NOBr, into structurally identical 3-benzoyl-2-phenylcyclopropane-1-carboxylic acids (benzoyl = $\text{PhCH}(\text{OH})$) which can theoretically exist in the 8 *dl*-forms, Ia and b, IIa and b, IIIa and b and IVa and b. Of these 5 were isolated and by oxidation of the PhCHOH group to PhCO were obtained the 4 corresponding Bz acids (V, VI, VII and VIII), 2 of which (VI and VII) had already been obtained by Kohler, Conant and Steele in an entirely different way. They had found that the ring in their acids is ruptured with extraordinary ease by various reagents and ascribed this reactivity to the Bz group. R. and S. had also observed this easy cleavage with V, VII and VIII and it is shown in the present paper for VI by its catalytic reduction to $\text{PhCH}_2\text{CH}(\text{CH}_2\text{Bz})\text{CO}_2\text{H}$ (cleavage between C atoms 2 and 3). But the PhCHOH derivs. I-IV also undergo cleavage, not on catalytic reduction, to be sure, but with strong mineral acids, as HCl or H_2SO_4 , the latter in the presence of AcOH or HCO_2H . Some of these cleavages with Br and HBr had already been described. It has now been found that IIb adds HCl to form α -chlorobenzyl- β -benzalpropionic acid (IX) in which the Cl can readily be replaced by H by means of Al-Hg, the formation of $\text{PhCH:CHCH}(\text{CH}_2\text{Ph})\text{CO}_2\text{H}$ showing that the HCl adds exactly like HBr to the 2- and 3-C atoms of the ring, a conclusion confirmed by the reconversion of IX into IIb with Na_2CO_3 or NaOH. Whether H_2O is first split off and the ring is then ruptured by the HCl, or *vice versa*, has not been established with certainty. Furthermore IX splits off Cl and CO_2 with Na_2CO_3 , forming $(\text{PhCH:CH})_2$, and also decomp. into BzH and $\text{PhCH:CHCH}_2\text{CO}_2\text{H}$. With H_2SO_4 -AcOH, the PhCHOH acids give the compd. $\text{PhCH:CHCH}(\text{CO}_2\text{H})\text{CH}(\text{OAc})\text{Ph}$ (X).

which, since it contains 2 asym. C atoms, can theoretically exist in 2 *dl*-forms and each of these in turn can exist in 2 *cis-trans* forms. As a matter of fact **IIa**, **IIb** and **IIIa** give an acid (**XI**), m. 152–3° (*Me ester*, m. 87°), and **Ia** an isomeric acid (**XII**), m. 152–4° (*Me ester*, m. 92–2.5°); the *Me ester* of **Ia** gives the esters of both **XI** and **XII**. The same is true of the addn. of HCO_2H . The difference between **XI** and **XII** is due to the position of the groups around the asym. C atoms for on catalytic reduction and subsequent sapon. there are formed 2 different α -benzoxyl- γ -phenylbutyric acids (**XIII** and **XIV**). That the cleavage of the ring occurs between C atoms 2 and 3 is shown by the formation of $(\text{PhCH}:\text{CH})_2$ from **X** with $\text{AcOH} \cdot \text{H}_2\text{O} \cdot \text{H}_2\text{SO}_4$; furthermore, sapon. of the *Me esters* with alc. KOH gives $\text{PhCH}:\text{CHC}(\text{:CHPh})\text{CO}_2\text{H}$. The position of the OAc group is detd. by the peculiar decompn. of the **X** into $\text{PhCH}:\text{CHCH}_2\text{CO}_2\text{H}$, BzH and AcOH on boiling with Na_2CO_3 , a decompn. to be ascribed primarily to the double bond, as it no longer takes place after hydrogenation (the esters of **X**, the formyl analog (**XVII**, below) and **IX**, on the other hand, decomp. into $\text{PhCH}:\text{CCH}(\text{:CHPh})\text{CO}_2\text{H}$). The *Me esters* of **XIII** and **XIV** are oxidized to the same *Me* α -benzoxyl- γ -phenylbutyrate (**XV**), a result made possible only by destroying the asymmetry of the C atom carrying the HO group. When **XV** is sapond. the resulting acid at once decomp. into CO_2 and 1,4-diphenyl-1-butanone (**XVI**), identical with a product obtained from $\text{PhCH}_2\text{CH}_2\text{CH}_2\text{MgBr}$ and BzH and subsequent oxidation. The identity of the oily **XV** obtained from **XIII** and **XIV** was established by their conversion with $\text{H}_2\text{NCONHNH}_2$ into 3-phenyl-4-[β -phenylethyl]-5-pyrazolone-1-carboxamide (**XVII**). With HCO_2H , **IIa** and **IIb** give a compd. **XVIII** (**X** with OCH instead of OAc), m. 160° (*Me ester*, m. 96°), while the *Me ester* of **Ia** gives chiefly an isomeric ester (**XIX**), m. 93–4°. In attempting to establish the structural identity of **XIII** and **XIV** by splitting off H_2O to give $\text{PhCH}_2\text{CH}_2\text{C}(\text{CO}_2\text{H})\text{:CHPh}$, there was obtained with moderately concd. H_2SO_4 1-phenyl-tetralin-2-carboxylic acid (**XX**), stable towards KMnO_4 ; Ac_2O likewise did not split off H_2O but gave the oily acetates of the alc. acids. On cleavage of the ring with AcOH- or $\text{HCO}_2\text{H} \cdot \text{H}_2\text{SO}_4$, those acids having the Ph and CO_2H groups in the *trans*-position (**IIa**, **IIb** and **IIIa**) give the same **XI**, while **Ia**, with the Ph and CO_2H groups in the *cis*-position, gives chiefly **XII**. Assuming that the AcOH or HCO_2H adds at C atoms 2 and 3, **Ia** would give **XXI**, while **IIa**, **IIb** and **IIIa** would give the stereoisomeric **XXII**, irrespective of whether H_2O is split off before or after the addn. of the acid, thus seeming to confirm the assumption that after the shortening of the 4-membered ring in the truxillic and truxinic acids to the 3-membered ring in the I-IV the CO_2H and Ph groups remain on the same side of the ring. The I-IV were prepd. as already de-



scribed, partly by the degradation of γ -truxillic acid, partly by that of the ϵ -acid, which gives chiefly IIb. The NH_4 salt of the latter acid, heated 2.5–3 hrs. at $215\text{--}20^\circ$, gives 25% of the diamide (insol. in Na_2CO_3), 30% unchanged acid and 40% of the amidic acid. The diamide on half-sapon. with boiling alc. KOH yields a similar acid mixt. which is subjected, without sepn., to degradation with NaOCl ; the resulting 2,4'-diphenyl-3 ϵ -aminocyclobutane-1 ϵ -carboxylic acid, shaken with NOBr in cold Et_2O until dissolved, freed from excess of Br with dil. NaHSO_3 , shaken with Na_2CO_3 , dried and concd. yields in a few hrs. the almost pure lactone of IIb. XIII, m. $112\text{--}3^\circ$; Me ester, m. $62\text{--}2.5^\circ$. Acetate of XIII, oil; Me ester, m. $50\text{--}1^\circ$. XIV, m. $93\text{--}4.5^\circ$; Me ester, m. $64\text{--}4.5^\circ$. Acetate of XIV; Me ester, m. $69\text{--}70^\circ$. 1,4-Diphenyl-1-butanol, from $\text{PhCH}_2\text{CH}_2\text{CH}_2\text{MgBr}$ and BzH , b. $180\text{--}3^\circ$, m. $45\text{--}6^\circ$. XVI, m. $56\text{--}7^\circ$; oxime, m. $101\text{--}2^\circ$; semicarbazone, m. $126.5\text{--}7.5^\circ$. XVII, m. $131.5\text{--}2.5^\circ$, gives an intense blue color with alc. FeCl_3 . XX, m. $150\text{--}1^\circ$. IX, m. $155\text{--}6^\circ$, decolorizes KMnO_4 instantly, Br only after a long time; Me ester, m. $98\text{--}9^\circ$. C. A. R

The question of liquid crystals in stereoisomeric cinnamic acids. R. SROERMER AND FR. WODARG. Univ. Rostock. Ber. 61B, 2323–30(1928).—It had been observed that $p\text{-MeOC}_6\text{H}_4\text{CH:CHCO}_2\text{H}$ (I) no longer shows the phenomenon of liquid crystals when rearranged into its *allo*-form while this property immediately reappears when the *allo*-acid is rearranged back into the stable I. This is in harmony with Vorländer's views that the cryst. liquid form is most favored by an elongated, linear structure (thus, in C_6H_5 derivs., by *p*-substituents because *o*- and *m*-substituents produce an angular structure), for an angular structure is peculiar to the *allo*-form of unsatd acids. It has now been found that, in full agreement with such a theory, in a series of *p*-alkoxycinnamic acids, the stable, linear forms show enantiotropic cryst. liquid phases which never appear with the angular labile forms. It was attempted to lengthen the alkyl chain in order to increase the range of existence of the cryst. liquid phase. Below are the m. and clarification ps., resp. of the various *p*-alkoxycinnamic acids: MeO (I) 170° , 185° ; EtO (II) 190° , 196° ; PrO (III) 166° , 182° ; BuO (IV) 154° , 185.5° . The cetyl compd., however, did not show the phenomenon; in this case the straight chain has evidently, because of its enormous length, become too mobile to exert the necessary influence or produced decompn. at the m. p. It is worthy of note that substitution of PhCH_2 for the alkyl chain prevents the appearance of liquid crystals; the PhCH_2O acid (V) does not show the phenomenon. As was to be expected, however, branching of the alkyl chain has the same effect; the iso-BuO acid (VI) likewise does not form liquid crystals. In agreement with known facts, the esters of these acids show no cryst. liquid phases and the same is true of the amides, anisidides and *p*-toluidides of the *trans*- and some of the *cis*-acids. On the other hand, enantiotropic cryst. liquid derivs. are at once obtained on esterifying these acids with *p*-anisoleazophenol (VII) in accordance with Vorländer, the region of existence of the cryst. liquid phase being greatly extended as compared with that of the free acids. Below are the 2 m. ps. of the VII esters of the different acids: I 162° , about 320° ; *allo*-I 157° , about 301° ; II 178° , about 317° ; *allo*-II 172° , about 300° (decompn.); IV 177° , about 321° ; *allo*-IV 138° , about 300° (decompn.). These esters were prepd. from the acid chlorides in the presence of $\text{C}_6\text{H}_5\text{N}$. Because of the small differences, in some cases, between the m. ps. of the *cis*- and *trans*-forms, it was established in every case that in the prepn. of the *allo*-chlorides no rearrangement had occurred by converting a part of the chloride into the *allo*-amide which is converted into the stable amide by traces of Br in sunlight or obtained from the latter by radiation with ultra-violet light. The alkoxy-cinnamic acids were prepd. from the corresponding $\text{ROC}_6\text{H}_4\text{CHO}$ by the Perkin method, which, however, did not give a pure product in the case of V and failed completely in that of the cetyl deriv. (VIII). V and VIII were obtained in satisfactory yield only from $p\text{-HOC}_6\text{H}_4\text{CH:CHCO}_2\text{Me}$ with the calcd. quantity of KOH and PhCH_2Br or cetyl iodide. The *allo*-forms were obtained in 30–3% yields by 70 hrs exposure of the aq. Na salts to a Heraeus quartz Hg lamp. The stereoisomers can be sepd. by fractional crystn. but this can be effected far better and almost quant. by first pptg. the stable acid with AcOH and then the labile acid with HCl. *p*-Anisidide of I, m. 184° ; *p*-toluidide, m. 161° . *p*-EtOC $_6\text{H}_4\text{CH:CHCHO}$, m. $255\text{--}6^\circ$; semicarbazone, m. 202° (decompn.). Me ester of II, m. $68\text{--}9^\circ$; Et ester, m. 36° ; amide, m. 195° ; *p*-aniside, m. 179° ; *p*-toluidide, m. 164° . *allo*-II, much more sol. than the *trans*-form, m. 86° (decompn.). Me ester of III, m. 65° ; Et ester, m. 37° ; amide, m. $188\text{--}9^\circ$; *p*-aniside, m. 161° ; *p*-toluidide, m. $166\text{--}7^\circ$. *allo*-III, m. $90\text{--}1^\circ$; amide, m. 115° . *p*-Butyloxybenzaldehyde, yellowish, b. 285° . Me ester of IV, m. 77° ; Et ester, m. 38° ; amide, m. 184° . *p*-anisidide, m. 148° ; *p*-toluidide, m. $146\text{--}7^\circ$. *allo*-IV, m. 74° ; amide, m.

110°; *p*-anisidide, m. 114°. *p*-Isobutylbenzaldehyde, heavy, yellow oil easily oxidizing in the air, b. 258° in CO₂. VI, m. 159°. *p*-Benzoyloxybenzaldehyde, m. 72°. V, m. 199°. *p*-Cetyloxybenzaldehyde, m. 19°; phenylhydrazone, m. 89°. VIII, m. 200–2° (decompn.). *p*-Anisoleazophenyl benzoate, liquid crystals, m. 161° and 173°.

C. A. R.

The so-called liquid distyrene. R. STOERMER AND H. KOOTZ. Univ. Rostock. *Ber.* 61B, 2330–6(1928).—In connection with the detn. of the structure of the alleged diphenylcyclobutane, which turned out to be $\text{PhCH}_2\text{CH}:\text{CHPh}$, the dibromide of the long known "liquid distyrene" (I) was prepd. from a sample of I which had been made in 1923 and from which, at the time, had been obtained on bromination, together with the known dibromide m. 102° (II), a small quantity of an isomer m. 129° (III). On repeating the bromination of this old sample of I, no solid product at all could be obtained and much HBr was evolved. Believing that III might be the dibromide of the isomeric 1,3-diphenyl-2-butene, $\text{PhCH}_2\text{CH}:\text{CMePh}$ (IV), S. and K. synthesized IV from $\text{PhCH}_2\text{CH}_2\text{COMe}$ and PhMgBr through the intermediate carbinol (IVa). IV decomps. into PhCH_2CHO and MeCOPh on ozonization and forms a nitroschloride but no cryst. dibromide, and much HBr is evolved when it is treated with Br. No detectable change in its properties was produced by exposure to a quartz Hg lamp. Ozonization of the old sample of I now gave the same decompn. products as IV, showing that in the course of yrs. the double bond in I had shifted from the 1,2- to 2,3-position. The I, when prepd., had not been purified, and it was suspected that the rearrangement might have been produced by traces of H₂SO₄ adhering to the I, and as a matter of fact it was found that if in its prepn. the $\text{PhCH}:\text{CHCO}_2\text{H}$ is boiled with moderately concd. H₂SO₄ not merely a few hrs. but 1.5 days the product now behaves just like the above old sample of I. The same change can be effected by exposing pure I with a little I in CS₂ to sunlight for 3 days. Before such illumination the I on ozonization gives only BzOH and PhCHMeCHO , thus confirming the structure $\text{PhCH}:\text{CHHMePh}$ assigned to I by Stobbe and Posnjak. On brominating larger quantities of this pure I there were obtained, together with large amounts of II, m. 102° (although not sharply), a little III and, on carefully working up the mother liquors, a 3rd dibromide (V), m. 79°. Since the dibromide of I contains 3 asym. C atoms it can theoretically exist in 4 dl forms, and although the existence of such a 4th isomer could not be proved with certainty, indications of its presence were obtained. The lack of sharpness in the m. p. of II and the fact that it does not depress the m. p. of III suggested that I might be a mixt. and in fact, on crystg. it from petroleum ether instead of alc., it was sepd. into III and a dibromide, m. 122° (VI); a mixt. of equal parts of III and VI crystd. from alc. gives a product m. around 102°. II must therefore be stricken from the literature as a homogeneous compd. That III, V and VI are all derived from the same hydrocarbon (I) is shown by the fact that on debromination with Zn they all yield an unsatd. const. boiling compd. giving BzH and PhCHMeCHO on ozonization, having the same *n* in all 3 cases and again yielding III, V and VI on bromination. The I regenerated from the bromides never evolves HBr on bromination, so the product used by earlier investigators undoubtedly was contaminated with varying quantities of IV. Pure I is also completely colorless and non-fluorescent. Pure I regenerated from the bromides shows *n* 1.590, the product prepd. directly by the Fitts-Erdmann method 1.583, IV 1.577, and the old sample of I mentioned above showed 1.577. The F-E product must therefore contain only about 47% I with 53% IV. A sample of the original Posnjak prepn. of I, brominated after distn. *in vacuo* (which left a considerable residue of polymers), yielded a product, m. around 102°, which was sepd. into III and VI; not enough material was available to det. whether V was also present. IVa, b₁₂ 180–90°, m. 47–8°. IV, b₁₂ 169–70°, d₄²⁰ 1.0149, rapidly decolorizes KMnO₄ and Br, nitroschloride, m. around 126° (decompn.). Pure I b₁₂ 175–6. III seps. in stout crystals the size of a pea, VI in needles 1 mm. thick and 4 mm long. Further fractionation of the mother liquors from V finally gave a product m. 55–65° and the lowest m. p. obtained with mixts. of II and V was 65° (60% V, 40% II), so the above low melting product may have contained a 4th dibromide.

C. A. R.

Hetero-ring formations with thiocarbohydrazide. IV. Reactions of 1-phenylthiocarbohydrazide. PRAPHULLA KUMAR GUHA AND SATYENDRA KUMAR ROY-CHoudhury. Dacca Univ. *J. Indian Chem. Soc.* 5, 163–74(1928); cf. C. A. 23, 139.—The reactions of acid chlorides, anhydrides and mustard oils with 1-phenylthiocarbohydrazide

(I), are studied. I with HCO₂H under reflux gives $\text{PhNHNH}:\text{C}:\text{N}:\text{N}:\text{CH}_2\text{S}$, m. 220°. I with Ac₂O gives the *mono-Ac deriv.*, m. 172–3°. I with EtOCSK in EtOH at 100°

for 5 hrs. gives PhNHNHC:N.NH.CO.S , m. 127° , this latter compd. is converted to the *disulfide*, m. 237° , by heating with FeCl_3 . I with COCl_2 , AcCl or BzCl gives only

the HCl salt of I. With $o\text{-C}_6\text{H}_4(\text{COCl})_2$ I gives $\text{PhNHNHC:N.NH.CO.C}_6\text{H}_4.\text{CO.S}$, m. 206° . With $\text{CH}_2(\text{COCl})_2$, $\text{PhNHNHC:N.NH.CO.CH}_2.\text{CO.S}$, m. $201\text{--}2^\circ$, is

formed. With SOCl_2 , PhNHNHC:N.NH.SO.S , m. 220° . The BzH and the $p\text{-NO}_2\text{C}_6\text{H}_4\text{CHO}$ derivs. of I in C_6H_6 soln. with COCl_2 give the ring compd.

$\text{PhCH:NN:C.NH.NPh.CO.S}$, m. $204\text{--}5^\circ$, and the corresponding NO_2 deriv., m. 258° . I with PhNCO gives $\text{PhNHNHCSNHNHCONHPh}$ (II), recrystd. from MeOH , m. 209° ; with PhNCS I gives the *thio deriv.* (III), m. $173\text{--}4^\circ$. PhNMcNHCSNHNH_2 and $m\text{-MeC}_6\text{H}_4\text{NHNHCSNHNH}_2$ with PhNCS give compds. m. $219\text{--}20^\circ$ and 160° ,

resp. II with 20% KOH for 0.5 hr. gives the ring compd. $\text{PhNHNHC:N.NH.CO.NPh}$ crystd. from dil. alc., m. $244\text{--}245^\circ$. III with 20% KOH 0.5 hrs. gives an oil (PhNH_2) which could be removed by steam distn. leaving a solid which crystd. in white plates,

$\text{PhNHNHC:N.N:C(NHPh).S}$, m. 199° ; the mother liquor on acidification with HCl

sepd. white plates $\text{PhNHNHC:N.N:C(SH).S}$, m. $258\text{--}9^\circ$. This compd. with FeCl_3 gives the corresponding *disulfide*, m. 205° , while heating with Ac_2O gives the *tri-Ac deriv.*, m. $206\text{--}7^\circ$. III boiled for 1.5 hrs. with concd. HCl on hydrolysis gives

OC.NH.NH.CO.S , m. 222° . III with FeCl_3 for 0.5 hrs. gives $\text{PhN:NC:N.N:C(NHPh).S}$, m. $256\text{--}7^\circ$. PhNHN:C(SH)SMe (IV), with $(\text{NH}_2\text{CH}_2)_2$ at once gives

$\text{PhNHN:C.NH.CH}_2.\text{CH}_2.\text{S}$, m. 223° (from $\text{C}_6\text{H}_5\text{N}$). IV with $o\text{-C}_6\text{H}_4(\text{NH}_2)_2$ at

$130\text{--}40^\circ$ for 4 hrs. gives $\text{NH.C}_6\text{H}_4.\text{NPh.N:C(SH)}$, m. 293° (from HOAc); *Ac deriv.*, m. $203\text{--}4^\circ$; *disulfide* by oxidation with FeCl_3 , m. above 300° . D. H. POWERS

Synthesis of cyclobutane acids. I. Norpinic acid. CARL A. KERR. Univ. of Michigan. *J. Am. Chem. Soc.* 51, 614-9(1929).—The condensation of substituted α,α' -dicyanoglutarimides with CH_2I_2 and hydrolysis of the resulting dicyclic compds is a satisfactory method for the formation of substituted cyclobutane acids. β,β -Dimethyl- α,α' -dicyanoglutarimide (20 g.) and 7.2 g. Na in 100 cc. MeOH , refluxed 1 hr and then treated with 44 g. CH_2I_2 with refluxing for 1.5 hrs., give 12 g. *dicyanonorpinimide* (I), m. $305\text{--}6^\circ$ (decompn.) (*Ag salt*). H_2SO_4 gives glutaric acid. Heating 10 g I and 180 cc. 2.15% NaOH gives 5 g. *sym-dicarbamylnorpinic acid* (II), m. 190° (decompn.) and 4 g. *sym-dicyanonorpinic acid* (III), m. $225\text{--}6^\circ$ (decompn.), whose *di-Me ester*, m. $139\text{--}40^\circ$. Evapn. of an aq. soln. of II gives the NH_4 salt of 1-carbamyl-2,2-dimethylcyclobutane-1,3,3-tricarboxylic acid (?); the free acid m. 236° . Refluxing 3.7 g. II with 50 cc. 10% NaOH for 9 hrs. and acidifying gives 2,2-dimethylcyclobutane-1,1,3,3-tetracarboxylic acid (IV), m. 200° (*Ag salt*; *tetra-Me ester*, b_{25} 100°). Heating III with 20% NaOH also gives IV. Heating IV at $200\text{--}5^\circ$ for 0.5 hr. gives *trans-norpinic acid*, m. 146° . C. J. WEST

Alkylation of hydroxymethylenecyclohexanone. HEMENDRA KUMAR SEN AND KANAILAL MONDAL. *J. Indian Chem. Soc.* 5, 609-30(1928).—Contrary to expectation, the reaction between the Na salt of hydroxymethylenecyclohexanone (I) and alkyl iodides (II) gave products which on hydrolysis gave *o*-alkyl-substituted ketones. The first product formed from the Na salt of I and II is a substituted keto-aldehyde as shown by its reduction of $\text{NH}_3\text{-AgNO}_3$ and Cu salt solns. This behavior of I is very different from usual and can be explained best by assuming an aldehydic structure of the Na compd. of I and a direct substitution of the Na by alkyl. To substantiate this view S. and M. show (by Meyer's method) that the hydroxymethylene compds. (III) exist in keto and enol forms. The keto-enol equil. is shifted by different solvents as would be expected, showing therefore the existence of the aldehydic Na compd. AcCl and BzCl react with the Na salts of III, in the usual way, by substitution in the enolic Na . This is in accordance with Lapworth's view. Alk. hydrolysis of the *C*-alkyl ethers of III gives alkylated ketones. This reaction was found to be general with cyclohexanone and substituted cyclohexanones when one *o*-position is free to yield III. The Na salt of I, prepd. by heating I in dry benzene with Na on a water

bath 18 hrs., is heated with MeI 12 hrs. at 100°. The mixt. is cooled, filtered and distd., giving a liquid (IV), b_m 180–50°. Distn. of IV with dil. NaOH gives *o*-methylcyclohexanone. Similar results were obtained by refluxing I in alc. with NaOEt and MeI, or by heating this mixt. in a water bath under pressure. Other alkyl derivs. of I prepd. in similar ways were *o*-Et, 2,5- and 2,6-Me₂, 2,4-Me₂ (impure), 2-methyl-6-benzyl-, 2,3,4-Me₃, and menthone. AcCl and the Na salt of I give an acetate of the enol form; semicarbazone, m. 182–4°. BzCl and hydroxymethylene-*o*-methylcyclohexanone give an unstable benzoate, m. 85°; semicarbazone, m. 175°. Corresponding benzoate of *p*-deriv., m. 95°; semicarbazone, m. 183–4°. The actions of MeI and EtI on hydroxymethyleneacetophenone were studied, but small yields of indefinite products were obtained.

FREDERICK C. HAHN

Action of hypochlorous acid on benzene hydrocarbons. F. W. KLINGSTEDT, G. WIRSE AND G. RUDBÄCK. *Acta acad. Abensis math. phys.* 4, No. 2, 1–36 (1927).—HClO yields with C₆H₆ α - and β -benzene hexachloride, PhCl, and a compd., C₆H₅OC₂Cl₃; with C₁₀H₈ naphthalene dichloride and tetrachloride, 1-C₁₀H₇Cl, and 1,4-C₁₀H₆Cl₂; with toluene, *m*- and *p*-xylene, and *p*-isopropyltoluene only monosubstitution products were obtained. With dil. acid substitution is the chief reaction, and with more concd. acid, addn.; also only substitution derivs. are obtained in the dark. Modifications in the course of the reaction are observed when the acid reacts in presence of Hg oxide or oxychloride (cf. Carius and Neuhoft, *Ann.* 136, 323, 342 (1865)). B. C. A.

Catalytic activity of aluminum chloride. GREGG DOUGHERTY. Princeton Univ. *J. Am. Chem. Soc.* 51, 576–80 (1929).—A mechanism for the Friedel-Crafts reaction is suggested. The hypothesis predicts that metathetical reactions will occur between certain types of aliphatic halogen compds. in the presence of AlCl₃. Exptl. evidence is given that such reactions do occur. Thus, CHCl₃ and EtBr with AlCl₃ at room temp. give EtCl and about 35% of CHCl₂Br, while C₂H₅Cl₂ and C₂H₅Br₂, after 35 hrs. at 25°, give C₂H₅ClBr; the latter reaction is reversible. C. J. WEST

Nitration of substituted anilines. E. RAYMOND RIEGEL, HOWARD W. POST AND F. FRANK REID. Univ. of Buffalo and Johns Hopkins Univ. *J. Am. Chem. Soc.* 51, 505–8 (1929).—Nitrated with mixed acids under similar conditions, the following % of original NH₂ remained after the nitration: *p*-H₂NC₆H₄OH, 72.6; 2,3-HO(H₂N)-CH₂CO₂H, 42.5; 3,4-H₂N(HO)C₆H₃SO₃H, 40.0; *p*-H₂NC₆H₄SO₃H, 34.0; *m*-H₂NC₆H₄HSO₃H, 26.7; 3,4-HO(NH₂)C₆H₃SO₃H, 4.8; *o*-H₂NC₆H₄OH, 3.4; H₂N(HO)C₆H₃CO₂H, 2.1; H₂N(HO)C₆H₃Me, 2.4; H₂N(O₂N)C₆H₃OH, *o*-H₂NC₆H₄CO₂H, 4.6; HO(SO₃H)C₆H₃NH₂, *m*-H₂NC₆H₄OH, 0; 2,4-HO(SO₃H)C₆H₃NH₂, 49. The influence of the groups depends on their position: 2 electronegative groups *p* to each other seem to make the resultant mol. more resistant to oxidation. C. J. WEST

Monoarylguanidines. I. α -Phenylguanidine. G. B. L. SMITH. Polytechnic Inst., Brooklyn. *J. Am. Chem. Soc.* 51, 476–9 (1929).—[MeSC(:NH)NH₂]₂.H₂SO₄, 555 g. and 740 cc. PhNH₂, heated until the evolution of MeSH ceases, give a product contg. about 30% PhNH₂ (as sulfate); the (PhNH₂C(:NH)NH₂)₂.H₂SO₄ cannot be purified by crvstn. from H₂O, but purification may be accomplished by converting the sulfate into the carbonate, which is only slightly sol. in cold H₂O; the HCl and H₂SO₄ salts are described and crystallographic data are given for the free base, H₂SO₄, HCl, HNO₃ salts, picrate and chloroplatinate. C. J. WEST

Identification of the reduction products of azo dyes. III. Classification and identification of compounds belonging to group B. SHIGEZO UENO. *Bull. Inst. Phys. Chem. Research Tokyo* 7, 398–438; *Abstracts* 1, 37–40 (1928); cf. C. A. 22, 3390. The reduction products of azo dyes, the NH₂OH soln. of which manifests in a short time a certain coloration on a filter paper through oxidation by air (compds. of group B) are classified: Class IXa: By addn. of FeCl₃ soln. to a dil. soln. of the HCl salt of any compd. of this class, or on adding NaNO₂ soln. to the ice cold dil. soln. acidified with HCl, a fugitive green color is obtained: *p*-C₆H₄(NH₂)₂, *p*-tolylenediamine, 2-methoxy-, 2,5-dimethyl-, 2-methyl-5-methoxy-, and 2-chloro-1,4-diaminobenzenes, 1,4-C₁₀H₆(NH₂)₂, 2,1,4-C₁₀H₃(OEt)(NH₂)₂, 4,1-C₁₀H₄(NH₂)Et, 4-amino- α -naphthylglycine. Class IXb: A dil. soln. of the HCl salt of any compd. of this class does not give a green color with FeCl₃ or HNO₃. On boiling the dil. soln. with FeCl₃, a quinone smell is perceived. It gives the indamine reaction and the methylene blue reaction. *p*-H₂NC₆H₄NMe₂, *p*-H₂NC₆H₄NHEt. Class X: A suspension in H₂O or a very dil. soln. assumes a green color on adding FeCl₃; the color is not changed by boiling, or HCl addn. Most of the compds. belonging to this class are difficultly sol. in H₂O. 1,2-diaminonaphthalenesulfonic acids (SO₃H = 4, 5, 6 or 7), 1-amino-2-ethylaminonaphthalene-7-sulfonic acid, 1,2-diaminonaphthalene-3,6-disulfonic acid. Class XI: The free acids are difficultly sol. in H₂O. A suspension in water or an aq. soln.

assumes a fugitive or otherwise not easily changeable green color. It gives the indamine reaction. The filter paper moistened with the soln. containing CaCO_3 gives a very feeble coloration by air oxidation, or not at all; on spotting it with FeCl_3 , a fugitive green coloration is obtained: 1,4-diaminobenzene-2-sulfonic acid, 1,4-diaminonaphthalenesulfonic acids ($\text{SO}_3\text{H} = 2$ or 6). Class XII: On adding FeCl_3 soln., a suspension in H_2O assumes a little dark red color which becomes very faint or disappears upon boiling. Aniline or *p*-toluidine is obtained as a decompn. product by boiling with HCl : 4-amino-1-phenylaminonaphthalene-8-sulfonic acid, 4-amino-1-*p*-tolylaminonaphthalene-8-sulfonic acid. Class XIII: A dil. soln. or suspension in H_2O assumes a yellow to brown color with FeCl_3 . The soln. contg. CaCO_3 or the NH_4OH soln. assumes a green color on filter paper by air oxidation. If this green color is further changed to another color, it can be restored by exposure to NH_3 vapors for a short time: 2-amino-1-naphtholsulfonic acids ($\text{SO}_3\text{H} = 3, 4, \text{ or } 5$), 2-amino-1-naphtholdisulfonic acids ($\text{SO}_3\text{H}:\text{SO}_3\text{H} = 3:6, 4:7 \text{ or } 4:8$), 6-amino-2-acetamido-5-naphthol-7-sulfonic acid, 7-amino-2-acetamido-8-naphthol-6-sulfonic acid, 6-amino-2-benzoylamino-5-naphthol-7-sulfonic acid. Class XIV: A suspension in water or a dil. soln. assumes a yellow to pale brown color with FeCl_3 . The filter paper moistened with the soln. contg. CaCO_3 is not colored green by air oxidation. This is also the case even by exposing to NH_3 vapors. The filter paper moistened with the NH_4OH soln. assumes a yellow to brown color by air oxidation: 1-amino-2-naphthol, 1-amino-2-naphthol-3-carboxylic acid, 1-amino-2-naphtholsulfonic acids ($\text{SO}_3\text{H} = 4, 6, 7, \text{ or } 8$), 2-amino-1-naphthol-3,8-disulfonic acid, 1-amino-2-naphtholdisulfonic acids ($\text{SO}_3\text{H}:\text{SO}_3\text{H} = 3:6, 3:7 \text{ or } 6:8$). Class XV: On adding FeCl_3 , an aq. soln. assumes a pale yellow-brown color which turns green immediately. The aq. soln. acidified with HCl turns orange-yellow on adding NaNO_2 soln. The filter paper moistened with the NH_4OH soln. becomes yellow to brownish yellow by air oxidation: 2-amino-1-naphthol- and 1-amino-2-naphthol-3,6,8-trisulfonic acid. Class XVI: When a suspension in water or a dilute soln. is mixed with NaNO_2 soln., in presence of ice, and made alk. with a cold soln. of Na_2CO_3 after a short time it assumes a clear red, bluish red, blue or green color which returns to the original one (orange to brown) on acidulation: 2-amino-1,5-dihydroxynaphthalene, 1-amino-2,7-dihydroxynaphthalene, 2-amino-1,7-dihydroxynaphthalene-4-sulfonic acid, 2-amino-1,8-dihydroxynaphthalene-3,6-disulfonic acid, 2-amino-1,7-dihydroxy-6-carboxynaphthalene-3-sulfonic acid, 1,2-diamino-5-naphthol-7-sulfonic acid, 1,2-diamino-8-naphthol-6-sulfonic acid.

ALBERT L. HENNE

2,3-, 2,5-, 2,6-, and 3,5-Dibromophenylhydrazines, *p*-bromophenylmethylhydrazine and their derivatives with aldehydes and ketones. E. VOTOČEK AND R. LUKES. *Chem. Listy* 22, 217-25 (1928).—The following 2,5-dibromophenylhydrazones were prepd.: acetone, m. 73° ; benzaldehyde, m. 79° ; furfuraldehyde, m. 104° ; arabinose, m. $170-5^\circ$; rhamnose, m. 184° ; galactose, m. 207° ; and the corresponding glucosazone, m. $228-9^\circ$. The following 3,5-dibromophenylhydrazones were prepd.: acetone, m. $85-6^\circ$; benzaldehyde, m. $106-7^\circ$; furfuraldehyde, m. 116° ; and dextrose, m. 172° . 2,3-Dibromophenylhydrazine, m. 112° (benzylidene deriv., m. 106°), and 2,6-dibromophenylhydrazine, m. 110° (benzylidene deriv., m. $51-2^\circ$; furfurylidene deriv., m. 62°), were prepd. as *p*-Bromophenylmethylhydrazine, m. 33° , was prepd. by bromination of PhNMeNH_2 , and also, in order to establish the position of the Br atom, from *p*- $\text{BrC}_6\text{H}_4\text{NH}_2$, by way of *p*-bromophenylmethylnitrosoamine, m. 74° ; the corresponding hydrazone of benzaldehyde, m. $106-7^\circ$, and the osazone of levulose, m. 153° , were prepd. The above bromohydrazones are in no way better for the identification of sugars than those commonly used.

B. C. A.

Derivatives of mono- and diaminohydroxyphenylarsonic acids. BARRETT C. FISHER AND GEORGE W. RAIZISS. Dermatological Research Labs, Philadelphia, Pa. *J. Am. Chem. Soc.* 51, 527-32 (1929).—The *Li* salt, crystg. with $2\text{H}_2\text{O}$, the *Ca* salt, crystg. with $2\text{H}_2\text{O}$, the *Ba* and *Sr* salts of 3-acetyl-amino-4-hydroxyphenylarsonic acid are described. 3-Nitro-4-hydroxyphenylarsonic acid (263 g.), 160 g. Br and 20 g. Fe in MeOH give 154 g. of the 5-Br deriv., yellow, begins to decomp. 280° ; the corresponding 3- NH_2 acid (I) also gives a 5-Br deriv. (II), whose *Ac* deriv. darkens at $267-70^\circ$ but is unmelted at 300° . 3,5-Diamino-4-hydroxyphenylarsonic acid yields the following acyl derivs.: *formyl*, begins to decomp. at 200° ; *Ac* (III), darkens at $235-40^\circ$; *propionyl*, m. $197-8^\circ$; *butyryl*, m. 177° ; *chloroacetyl*, m. $210-1^\circ$ (decompn.). II is neither more trypanocidal or spirocheticidal than I or its *N*-Ac deriv. The least toxic of all the compds. discussed above is III; when injected intravenously into white rats its max. tolerated dose is 4.6 times greater than that of the *Ac* deriv. of I.

C. J. WEST

Mercuration of resorcinol and some alkylresorcinols. REUBEN B. SANDIN. Univ.

of Alberta. *J. Am. Chem. Soc.* **51**, 479–83 (1929).—1,3,4-(HO)₂C₆H₃Et (1.4 g.) and 6.37 g. Hg(OAc)₂ in EtOH-AcOH give 97% of *anhydromercuriaceloxymercuriethylresorcinol* (I), yellow, darkens on exposure to light and when heated at 180° but does not m. 300°. Aq. HCl converts I into the *dichlorodimercuri deriv.*, decomps. 207–9° (cor.); from EtOH this also tends to sep. as a yellow *anhydromercuri deriv.* CO₂ bubbled through I in NaOH gives an *anhydromercurihydroxymercuri deriv.*, dark brown solid. One mol. Hg(OAc)₂ and 2 mols. (HO)₂C₆H₃Et, in AcOH, upon pouring into H₂O, give the *6-aceloxymercuri deriv.*, m. 163–4° (cor.), or, if poured into salt soln., the *chloromercuri deriv.*, m. 145–6° (cor.). These have not been sepd. into isomeric forms. Similarly were prepd. *anhydromercuriaceloxymercurihexylresorcinol*, bright yellow, darkens 200°, does not m. 300°, in quant. yields; the *dichloromercuri deriv.*, yellow, m. 137–8° (cor.); and the *celoxymercuri deriv.*, m. 177–8° (cor.). *m*-C₆H₄(OH)₂ (1.1 g.) and 9.56 g. Hg(OAc)₂ in EtOH-AcOH give quant. a *trimercurated deriv.*, yellow, darkens 210°, does not m. 300°. C. J. WEST

Replacement of carboxyl by mercury in certain 3-substituted phthalic acids. Preliminary paper. FRANK C. WHITMORE AND PAUL J. CULHANE. Northwestern Univ. *J. Am. Chem. Soc.* **51**, 602–5 (1929).—Heating 211 g. 3,1,2-O₂NC₆H₃(CO₂H)₂ in 800 cc. H₂O and 80 g. NaOH with 350 g. Hg(OAc)₂ in 700 cc. H₂O and 50 cc. AcOH for 70 hrs. at 170° (complete evolution of CO₂ and complete soly. in NaOH) gives 90% of *anhydro-2-hydroxymercuri-3-nitrobenzoic acid*; this can be refluxed with fuming HNO₃ without breaking the C-Hg linkage but a short heating with concd. HCl removes the Hg completely from the org. mol.; the Hg compd. reacts with Br and I to give good yields of the otherwise difficultly obtainable 2-bromo- and 2-iodo-3-nitrobenzoic acid 3-Br- and 3-IC₆H₃(CO₂H)₂ behave similarly. The mercuriation reaction consists in the replacement of the 2-CO₂H group by Hg. C. J. WEST

Orientation in the benzene ring. The bromination of 2-aminoresorcinol dimethyl ether. ARTHUR A. LEVINE AND HOOPER LINFORD. State Coll. of Washington. *J. Am. Chem. Soc.* **51**, 524–7 (1929).—Bromination of 1,3,2-(MeO)₂C₆H₃NHAc with 2 equivs. of Br gives a *mono-Br product*, m. 161–2° (I) and a *di-Br deriv.*, m. 212–3° (II). 4 equivs. of Br at room temp. give II, while on the H₂O bath there results an isomeric *di-Br deriv.*, m. 187–8° (III). Bromination of 1,3,2-(MeO)₂C₆H₃NH₂ gives I, while if an excess of Br is used at 100°, III results. I is the *4-Br deriv.*, and on hydrolysis yields *4-bromo-2-aminoresorcinol di-Me ether*, m. 67–8°, also obtained by reduction of the corresponding 2-NO₂ deriv. C. J. WEST

Oxidation of tribromoresorcinol. TENNEY L. DAVIS AND JULIAN W. HILL. Mass. Inst. Tech. *J. Am. Chem. Soc.* **51**, 493–501 (1929).—Oxidation of tribromoresorcinol (I) in C₆H₆ with aq. CrO₃ gives a mixt. of tribromoresoquinone (II), *rhodo-(bromo)-resoquinone* (III) and *tetrabromoresoquinone* (IV), sepd. by crystn. from dry C₆H₆ and mech. sepn. of the crystals. III, the main product of the reaction, crystallizes with C₆H₆, Et₂O, CS₂, CCl₄ and CHBr₃; it m. about 220° (decompn.); free from solvent, it forms a red powder, giving a dark green or black soln. in dil. NaOH and a deep red color in concd. H₂SO₄; it oxidizes the usual ketone reagents with evolution of N. Reduction gives 3,5,3',5'-*tetrabromo-2,4,2',4'-tetrahydroxydiphenyl* (V), m. 277–8°; *tetra-Ac deriv.*, m. 194–5°. II is similarly reduced to the same compd. The action of Br in 50% AcOH gives II, showing that III is intermediate between II and V. The action of heat on III (1 day at 95° and 2 days at 120°) gives a *compd.* C₁₂H₂O₂Br₆, m. 228–9°, which has only 0.5 the oxidizing power of III; it is either isomeric or polymeric with III. IV, m. 227–8° (decompn.); in boiling AcOH it gives II; reduction gives V. II or III is converted into IV with pure Br. The action of CrO₃ on I appears to be first the oxidation of 1 HO group and the removal of 1 Br atom from the nucleus. The resulting intermediate substance apparently doubles up to form the at present unknown dibromoresoquinone; the products which have been isolated are brominated derivs. of this substance. C. J. WEST

Orcein-like dyes. II. F. HENRICH AND W. HEROLD. Univ. Erlangen. *Ber.* **61B**, 2343–9 (1928), cf. C. A. **22**, 2375.—Henrich had obtained by oxidation of amino-orcinol (I) in faintly alk. soln. orcein- and litmus-like dyes of the indophenol group and has since been attempting to build these substances up from the simplest units. The first thing that suggested itself was the synthesis of the hydroxytoluquinone monoinine (II) derived from I. By the Willstätter method of oxidation (carefully dried Ag₂O) H. and Müller readily obtained O:C₆H₄Me:NH (III) from 3,4-Me(H₂N)C₆H₃OH (IV); to their report it may be added that when the Et₂O soln. of the III, after filtration from the Ag₂O, is concd. and cooled, the III seps. in yellow crystals which, after recrystn. from Et₂O, m. 59° and are stable for a long time, especially in the dark. With the isomeric *o*-amino-*m*-cresol, in which the OH is in the *o*-position to the NH₂ group, the

results were not so simple. I, which has OH groups in both the *o*- and *p*-positions to the NH₂ group, forms no quinone imine when shaken or heated in abs. Et₂O or C₆H₆ with pure Ag₂O and anhyd. Na₂SO₄; the Ag₂O seems to be partly reduced and indications were obtained that it contains solid reaction products but these neither have indophenol-like properties nor give blue colors with alk. phenol solns. 3,4,5-Me(H₂N)(MeO)C₆H₂OH (V) (prepd. by reduction of the NO₂ compd.), begins to darken 170°, decomps. above 190°, in which the HO group in I in the *o*-position to the NH₂ group is methylated, gives with Ag₂O and Na₂SO₄ in Et₂O 3-methyl-5-methoxyquinone 4-imine (VI), yellow, m. 111°, unchanged by a few hrs. exposure to direct sunlight, stable for weeks in a desiccator, produces violent sneezing in powder form, sol. in most org. solvents in the cold with yellow color, decolorized by Zn dust in AcOH, regenerates V with SnCl₂ and HCl, slowly dissolves in H₂O at room temp. with light yellow color and neutral reaction to litmus; on heating, the aq. soln. becomes brown-red and on boiling it evolves NH₃ and deposits a brown substance which does not m. 280° and is sol. in acids but not in alkalis. When the aq. soln. is exposed, in a porcelain dish half covered with black paper, to direct sunlight, the illuminated portion soon darkens while the other part remains yellow; an unilluminated aq. suspension allowed to dry leaves a pale yellow residue, m. 130°. NaOH slowly dissolves VI with red-yellow color and dark flocks sep. from the soln. Finely powd. VI added to dil. HCl, HNO₃ or H₂SO₄ at once gives a difficultly sol. salt more intensely yellow than the VI itself, and an intensely yellow picrate is obtained with picric acid in Et₂O. Dry HCl in Et₂O gives a deep yellow HCl salt which, when filtered, rapidly becomes lighter in color and finally gray-white; when spread on clay and dried *in vacuo* over lime and H₂SO₄ it becomes almost white. When solid VI is added to PhOH in alkali or a faintly alk. soln. of PhOH is layered with VI in Et₂O there gradually develops a blue color changing to red on acidification; resorcinol at once gives a blue, orcinol an intense red and cresorcinol a violet color; orcinol slowly gives the color even in the absence of alkali. With SO₂ the Et₂O soln. of VI gradually becomes colorless and deposits a gray ppt. which after a time becomes dark and flocculent and, when filtered, forms a brown-red, somewhat tarry mass sol. with blue color in acids and AcOH, and also in alc. The H₂O soln. of VI is not completely decolorized by SO₂; after a time there sep. colorless crystals which contain N, are difficultly sol. in H₂O and are attacked by concd. H₂SO₄ only on heating. The 3,2,5-isomer of V, in which the *o*-HO group to the NH₂ residue is free, gives with Ag₂O 3-methyl-5-methoxyquinone 2-monoimine (VII), orange yellow, m. 61°, becomes dark with acids (including AcOH), gives an almost black ppt. with picric acid in Et₂O, slowly dissolves in NaOH with orange color and deposits a red substance, gradually dissolves in H₂O with yellow color but soon deposits the red substance, m. 253°, formerly obtained (*Ber.* 30, 1107(1897)) by treatment of the reduction product of a nitrosoorcinol mono-Me ether in faintly alk. soln. with air. In an oxidation of free I in boiling abs. alc. with dry air, recently described, were obtained orcein-like dyes, the difficultly sol. part of which gave on analysis values indicating a trimol. formula. To preclude the possibility that this might have been contaminated with NH₃, set free at the beginning of the reaction, the dye was repeatedly extd. with dil. HCl and carefully washed with H₂O, when it again gave on analysis values agreeing with those calcd. for the trimol. formula. When extd. several days and nights in a Soxhlet with alc., most of it dissolved but the residue still had the same compn. The dye now contained only 0.2% ash and when decompd. with SnCl₂ and HCl no longer gave I.HCl. The alc.-sol. portion, however, extd. 2 days with Et₂O, rubbed 3 times with dil. HNO₃ and washed with H₂O to ensure removal of any I possibly still remaining gave considerable I.HCl with SnCl₂-HCl (1.4 g. from 8 g. dye). C. A. R.

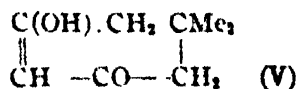
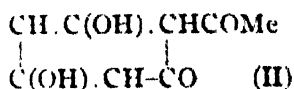
Reactions relating to carbohydrates and polysaccharides. XXI. Comparison of tendencies of saturated and unsaturated aldehydes towards cyclic acetal formation. HAROLD HIBBERT, EDWARD O. HOUGHTON AND K. AUSTIN TAYLOR. McGill Univ. *J. Am. Chem. Soc.* 51, 611-4(1929); cf. *C. A.* 23, 818.—A comparison is made of the tendency of satd. and unsatd. aldehydes to form cyclic acetals. The aldehydes were condensed with (CH₂OH)₂, dil. H₂SO₄ or H₃PO₄ being used as catalyst. The unsatd. aldehydes, PhCH:CHCHO, MeCH:CHCHO and EtCH:CMCHO, show practically no tendency towards cyclic acetal formation under the exptl. conditions used. *β*-Phenyl-*α,β*-dichloropropylideneethylene glycol, b₁₂ 104-6° (37% yield); *α*-monochlorocinnamylidene deriv., m. 69-70° (22% yield); dichlorobutylidene deriv., b₁₂₋₁₃ 100-5° (50.3% yield); *α*-monochlorocrotylidene deriv., b₁₂ 76-80° (22% yield). The greater tendency of the unsatd. aldehydes contg. Cl attached to the *α*-C atom to form cyclic acetals is probably due to the activating influence exerted by the negative Cl atom on the CO group. XXII. The isomeric cinnamylidene glycerols. H. HIBBERT AND MYRON

S. WHELEN. *Ibid* 620-5.— PhCH:CHCHO and $\text{C}_3\text{H}_7(\text{OH})_3$, heated with a small quantity of 40% H_2SO_4 under reduced pressure, readily condense to give a mixt. of 1,1'-cinnamylideneglycerol, m. 121° (β -Me ether, m. $79-80^\circ$) and the 1,2-deriv., which could not be purified but whose constitution was established by the prepn. of the α -Me ether, b_p $164-8^\circ$, n_D^{20} 1.5455 and hydrolysis to the glycerol α -Me ether. When compared with the methyldene and benzylidene derivs., the cinnamylidene derivs. exhibit a very much more pronounced tendency towards hydrolysis. C. J. WEST

Catechin problem. FREDERICK A. MASON. *J. Soc. Chem. Ind.* 47, 269-76T. (1928).—A review of the work of Freudenberg on the structure of gambier catechin.

H. B. MERRILL

Tautomerism of phloracetophenone and related compounds. ADOLF SONN AND KURT WINZER. *Univ. Königsberg i. Pr. Ber.* 61B, 2303-6(1928).—Under certain conditions 1 of the 3HO groups in phloracetophenone (I) behaves differently from the other 2 (with CH_3N_2 also, only 2 of the HO groups react smoothly; see preceding abstr.) and I was accordingly assigned the structure II (C. A. 20, 375). I and a no. of its derivs. in MeOH and CHCl_3 have now been titrated by the Meyer Br method. I and its mono-Me ethers in 15 sec. take up approx. the 2 equivs. Br calcd. for formula II. Phloroglucinol (III) and resorcinol (IV) in MeOH take up about 2.5 equivs. Br in 15 sec. and while III does not take up more on longer action (2 and 10 min.), IV absorbs 2.9 and 3 mols. Br in 45 sec. and 2 min., resp. Dimethyldihydroresorcinol (V) in MeOH takes up about 0.5 equiv. in 15 sec. and no more in even 2 hrs.; in CHCl_3 exactly 1 equiv. is used up. In CHCl_3 the di-Me ether of I in 15 sec. uses up 1.8 equivs. Br, diacetotriketohexamethylene 1.0, triacetotriketohexamethylene 0.15, tri-Me ether of III 1.8. It may be concluded with certainty that I and III, like V, contain in soln. ketonic groups as shown in the formulas II and V. *Et 4-hydroxy-2,6-diethoxybenzoate*, from 4,2,6-MeO₂CO(HO)₂C₆H₂CO₂H and MeCHN₂ in Et₂O, followed by sapon. of the MeO₂CO group with *N* aq. alc. NaOH at room temp., m. $180-1^\circ$. *4-Methoxy-2,6-diethoxybenzoic acid*, from 4,2,6-MeO(HO)₂C₆H₂CO₂Me with MeCHN₂, the crude product bmt. washed with dil. alkali and sapond. with cold coned. H_2SO_4 , m. 166° (effervescence) (Me ester, m. 95°); the alk. washings of the crude product give on acidification *Me6(2)-hydroxy-4-methoxy-2(6)-ethoxybenzoate*, m. $97-8^\circ$, gives a violet color with FeCl_3 in alc.



C. A. R.

Phloracetophenone monomethyl ethers and the supposed hydroxypeonol. ADOLF SONN. *Univ. Königsberg i. Pr. Ber.* 61B, 2300 2(1928); cf. C. A. 20, 375.—The structure 4,2,6- and 2,4,6-Me(HO)₂C₆H₂COMe assigned to the phloracetophenone Me ether: m. $136-7^\circ$ (I) and $205-7^\circ$ (II), resp., have been confirmed. Both I and II give with CH_3N_2 the long known 2,4,6-HO(MeO)₂C₆H₂COMe (III) which with EtI and alkali yields 2,4,6-EtO(MeO)₂C₆H₂COMe (IV), also obtained from I by successive treatment with MeCHN₂ and alk. MeI, while II under these conditions gives the isomeric 4,2-EtO(MeO)₂C₆H₂COMe (V). Neither I nor II is appreciably volatile with steam and the much lower melting (80°) "hydroxypeonol" obtained by steam distn. of an alc. soln. of *Xanthorrhoea* resins (Finlayson, C. A. 21, 798) cannot have been a phloracetophenone mono-Me ether; its m. p. and properties indicate rather that it is the di-Me ether (III), described in the literature as m. 80° to $85-8^\circ$, as being volatile with steam and as having already been found in nature. *Phloracetophenone 2(6)-Et 4(2)-di-Me ether* (IV), m. $69-70^\circ$. *2(6)-Et 4-Me ether*, from I and MeCHN₂, m. $133-4^\circ$. *2(6)-Me 4-Et ether*, from II and MeCHN₂, m. $56-7^\circ$. *4-Et 2,6-di-Me ether* (V), m. $81-2^\circ$, depresses the m. p. of IV. C. A. R.

The so-called nitro humic acids. W. FUCHS. *Brennstoff-Chem.* 9, 178-82(1928); cf. C. A. 22, 583.—Humic acid was prepd. from Kassel brown coal by treatment in the cold for several days with 5% HCl and extn. of the bitumens with EtOH: C₆H₆ (1:1) soln. The humic acid was then nitrated with 5 *N* HNO₃ and the product (as well as its methyl derivs.) was found practically completely sol. in (CH₃)₂CO. Mol. wts. found in acetone soln. for the nitro compd. were 1240 to 1290; for the methyl deriv. 250 to 400. The N introduced by treatment with 5 *N* HNO₃ was not present as NO₂ as it could not be detd. as such and could not be reduced to NH₃. Chem. behavior indicated presence of N as :NOH. The first stage of reaction with HNO₃ probably is oxidation forming the group CO-CH₃ and HNO₂ from which the oxime is formed. When urea (sufficient to take up HNO₂ formed) was added no N entered the humic acid. J. D. DAVIS

Pyrohymatomelanic acid, a new compound isolated from Merck's humic acid. D. J. W. KREULEN. *Brennstoff-Chem.* 9, 197-8(1928).—Natural humic acids are commonly differentiated into: (1) fulvic acids (H_2O sol.), (2) hymatomelanic acids (EtOH sol.) and (3) insol. acids. Merck's acidum humicum contained little fulvic acid, but a new acid was found which could be prepd. from EtOH soln. by digesting at temps. under 100° . This was named pyrohymatomelanic acid; it was completely sol. in PhOH. J. D. DAVIS

Synthesis of ephedrine and structurally similar compounds. I. A new synthesis of ephedrine. RICHARD H. F. MANSKE AND TREAT B. JOHNSON. Yale Univ. *J. Am. Chem. Soc.* 51, 580-2(1929).—A reaction, consisting in taking advantage of the differential additive capacity of the 2CO groups in arylalkyl *o*-diketones, is reported whereby it is possible to synthesize ephedrine. A mixt. of 50 cc. abs. EtOH, 7.4 g. BzAc and an alc. soln. contg. 1.6 g. MeNH₂, catalytically reduced with H (0.1 g. Pt oxide), gives 2.5-4.0 g. *dl*-ephedrine-HCl. C. J. WEST

Ultra-violet absorption of *p*-aminobenzoic esters in water solution. E. RAYMOND RIEGEL AND KENNETH W. BUCHWALD. Univ. of Buffalo. *J. Am. Chem. Soc.* 51, 484-92(1929).—The ultra-violet absorption of the H_2O solns. of *p*-H₂NC₆H₄CO₂H and of 7 of its esters has been detd. In order to assist in the discussion the ultra-violet absorption of *p*-Me₂NC₆H₄CO₂H, PhNH₂ and its HCl and HBr salts, BzOH, *p*-HOC₆H₄CO₂H, guanidine carbonate, nitroguanidine, aminonitroguanidine, stovaine, alypin, C₆H₆ and the free bases of butyn, procaine and tutocaine in H_2O soln. was also detd. The selective absorption of the *p*-H₂NC₆H₄CO₂H compds. averages 14,100, with the extremes 9700 and 15,900, while that for C₆H₆ in H_2O soln. is less than 100; hence the considerable absorption of the *p*-H₂NC₆H₄CO₂H compds. is not due to the benzenoid nucleus but rather to a hemiquinoid state. This conclusion is confirmed by a consideration of the selective absorption of the addnl. substances studied. C. J. WEST

New series of sulfonephthaleins. WILTON C. HARDEN AND NATHAN L. DRAKE Hynson, Wescott and Dunning and Univ. of Maryland. *J. Am. Chem. Soc.* 51, 562-6(1929).—By use of the proper tetrahalogenated *o*-sulfobenzoic anhydride and PhOH or *o*-MeC₆H₄OH, the following sulfonephthaleins were prepd. (the yield and *p*_H range are given): *Phenoltetrachloro*-, pink, 45%, 6.6 to 8.2 (*tetra-Br deriv.*, salmon-colored, 81%, 3.0 to 4.6); *phenoltetrabromo*-, 60%, 6.6 to 8.2 (*tetra-Br deriv.*, cream-colored, 3.0 to 4.6); *o-cresoltetrachloro*-, greenish red iridescent plates, 73%, 7.2 to 8.8 (*di-Br deriv.*, 5.2 to 6.8); *o-cresoltetrabromo*-, 82%, 7.2 to 8.8 (*di-Br deriv.*, 5.2 to 6.8); *o-cresoltetraiodo*-, 7.0 to 8.6; *dibromophenoltetrabromo*-, 5.6 to 7.2. The color changes are also given. The nature of the halogen in the *o*-sulfobenzoic acid part seems to affect the color only slightly. The replacement of 4H atoms by halogens does not materially change the useful *p*_H range of the compds. The halogenated compds. show an addnl. extremely acid range not measurable by the ordinary buffers; this range might possibly prove useful since in *N* HCl they are red shading to yellow at *p*_H in the vicinity of 2.0. They possess no apparent advantage as indicators over those now in general use. C. J. WEST

Pungent principles of ginger. V. Distillation of methylgingerol. HIROSHI NOMURA AND KENJI IWAMOTO. *Science Repts. Tohoku Imp. Univ.* 1st ser. 17, 973-84(1928); cf. *C. A.* 21, 2258, 3359.—Methylgingerol (I), m. 63.5-64°, gives an oxime, m. 85.5-86.5°. Distn. of I under ordinary pressure at 250-400° gives C₆H₁₁CHO, methylzingeronone (II) and an unsatd. ketone, methylshogaol. Distn. of I under diminished pressure gives unchanged I and II. I contains 1 HO group (reaction with MeMgI). These facts lead to the probable formula for I of (MeO)₂C₆H₃CH₂CH₂COCH₂CH(OH)(CH₂)₄Me. C. J. WEST

The production of *p*-cymene and its possibilities as a raw material in the chemical industry. G. AUSTERWEIL. *Chimie et industrie Special No.*, 568-86(April, 1928).—A review. A. PAPINEAU-COUTURE

Synthesis of 6-hydroxypiperonylic acid and incidental compounds. MARSTON T. BOGERT AND FRANK R. ELDER. Columbia Univ. *J. Am. Chem. Soc.* 51, 532-9(1929).—Directions are given for the prepn. of 6-nitropiperonal (I) in 70% yields. 6-Nitropiperonylidenediurethan, pale yellowish green, m. 207-8° (all m. ps. cor.); the yield is only 10% because of difficulty of purification. I gives an oxime, m. 201-3°, reduced to the 6-NH₂ deriv., m. 182-3°. Depending upon the time of heating the NH₂ deriv. gives a *mono-Ac deriv.*, m. 215-7° (10-12 min.) or a *di-Ac deriv.*, m. 146-7° (1 hr.). I may be reduced to the 6-NH₂ deriv. by FeSO₄ and NH₄OH in 60% yield; oxidation of the Ac deriv. gives 6-acetamidopiperonylic acid, m. 124-5°; *Me ester*, m. 183-4°. Through the diazo reaction there results the *Me ester*, m. 99-100° (*Ac deriv.*, m. 97-8°), of 6-hydroxypiperonylic acid, m. 211-2° (*Ac deriv.*, m. 155.5-6.5°); FeCl₃ gives a deep blue color. C. J. WEST

Syringic acid and its derivatives. MARSTON T. BOGERT AND BERNARD B. COYNE. Columbia Univ. *J. Am. Chem. Soc.* 51, 569-76(1929); cf. C. A. 13, 2032.—Modifications of the method of prepn. of trimethylgallic acid are given; also for its demethylation by concd. H_2SO_4 to syringic acid (I). Nitration of the Ac deriv. of I in Ac_2O with fuming HNO_3 at -5° gives 82% of *nitroacetylsyringic acid*, m. 190° (cor., decompn.); *Me ester*, m. 107.5° . Heating with 5% HCl gives *nitrosyringic acid*, m. 218° (cor., decompn.) (78% yield). Reduction with SnCl_2 and HCl gives 59% of *aminosyringic acid* (II), m. 169° , isolated as the *HCl salt*, m. 185° (decompn.); *Me ester*, m. 217° (65% yield). II in Ac_2O with a trace of AcONa gives 78% of the *acetanthranil of acetylsyringic acid*, m. 169° ; evapn. of the aq. soln. gives *acetamidoacetylsyringic acid*, m. 193° ; *Me ester*, m. 154° . Reduction of the NO_2 deriv. with Sn and HCl gives 78% of *3-amino-2,6-dimethylpyrogallol-HCl*, m. 198° (decompn.); *Bz deriv.*, m. 158.3° . *Methyleneaminosyringic acid*, m. 195° (decompn.) (75% yield).

C. J. WEST

Constitution of isocampholic acid. II. JULIUS V. BRAUN AND ALBRECHT HEYMONS. Univ. Frankfurt a. M. *Ber.* 61B, 2276-80(1928); cf. C. A. 22, 2935.—In CH_2CHMe

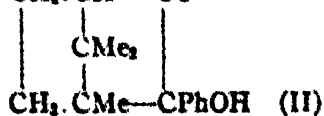
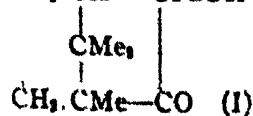
their 1st paper v. B. and H. gave the preference to the formula



for isocampholic acid (I) because their recently developed PCl_5 method indicated that I contains a CH_2 residue adjacent to the CO_2H group. As, however, Rupe and Briellmann had obtained in the oxidation of I small quantities of camphoric acid and Lipp had observed slight differences in the m. ps. of derivs. of I and of α -campholanic acid, which certainly has the above structure, it seemed important to discover a 2nd independent method of establishing the structure of I. When an acid RCO_2H is converted through its ester into the alc. RCH_2OH and the corresponding bromide is condensed with NMe_3 to the quaternary salt $\text{RCH}_2\text{NMe}_3\text{Br}$ and the corresponding quaternary base is subjected to a Hofmann cleavage, the resulting olefin will have the structure $\text{R}'\text{CH}=\text{CH}_2$ if in R there was a CH_2 residue adjacent to the CO_2H group and, in such a case only, will yield on oxidative degradation an aldehyde and the next lower homologous acid: $\text{RCH}_2\text{CO}_2\text{H} \rightarrow \text{RCH}_2\text{CH}_2\text{OH} \rightarrow \text{RCH}_2\text{CH}_2\text{Br} \rightarrow \text{RCH}_2\text{NMe}_3\text{Br} \rightarrow \text{RCH}=\text{CH}_2 \rightarrow \text{RCHO} \rightarrow \text{RCO}_2\text{H}$. Application of this method to I fully confirmed the conclusions reached in the earlier paper. β -[2,2,3-Trimethylcyclopentyl]ethyl alc. (somewhat more than 50% from the Et ester of I with Na and alc.), liquid of pleasant odor, b_{14} $109-12^\circ$, d_4^{20} 0.9046, n_D^{22} 1.4591, gives with 66% HBr at 125° about 90% of the *bromide*, faintly yellow, has only a faint odor, b_{12} 102° . With NMe_3 in C_6H_6 at 100° the *bromide* gives in 14 hrs. 83% of [β -(2,2,3-trimethylcyclopentyl)ethyl]trimethylammonium *bromide*, somewhat hygroscopic, decomp. 277° ; *chloroplatinate*, orange, decomp. 244° . The hydroxide on distn. yields chiefly [β -(2,2,3-trimethylcyclopentyl)ethyl]dimethylamine (II) and only very little [2,2,3-trimethylcyclopentyl]ethylene (III), but if, before the distn., the watery residue from the evapn. of the hydroxide is treated with 3-4 mols. KOH the yield of III is increased to about 40% and somewhat more than 50% II is obtained. II, liquid of basic odor, b_{14} $94-5^\circ$; *picrate*, red-yellow, m. $100-11^\circ$; *HCl salt*, m. 224° . III, b. $155-6^\circ$, has an odor which is rather strong but hardly reminiscent of terpenes, d_4^{20} 0.8024, n_D^{25} 1.4439. On ozonization in 10% AcOH III yields chiefly 2,2,3-trimethylcyclopentane-1-aldehyde, liquid of pleasant odor with pronounced camphor aroma, b_{14} $75-7^\circ$, d_4^{19} 0.9158, n_D^{20} 1.4486 (*semicarbazone*, m. 188°), and a small quantity of the acid (*norisocampholic acid*) (readily obtained from the aldehyde in Na_2CO_3 with H_2O_2), b_{12} 130° , d_4^{16} 0.9995, n_D^{19} 1.4587 (*chloride*, b_{11} 85° ; *ethylamide*, m. $68-9^\circ$).

C. A. R.

Phenylcamphor. H. RUPE AND A. WIRZ. *Verhandl. Naturforsch. Ges. Basel* 38, 164-87(1927).—By the action of PhMgBr on camphorquinone, only 1 keto group is attacked, yielding *phenylhydroxycamphor* (I or II), m. $78-9^\circ$, b_{14} $184-7^\circ$, $[\alpha]_D^{20}$ 7.96°



in C_6H_6 (*Me ether*, b_{10} $161-3^\circ$; *Et ether*, b_{10} $165-6^\circ$, d_4^{20} 1.0600, n_D^{20} 1.5284). The possi-

bility of formulation as $\text{C}_6\text{H}_4 \begin{array}{c} \text{C.OH} \\ \diagup \quad \diagdown \\ \text{C} \\ \diagdown \quad \diagup \\ \text{C.OPh} \end{array}$ $\text{C}_6\text{H}_4 \begin{array}{c} \text{CO} \\ \diagup \quad \diagdown \\ \text{C} \\ \diagdown \quad \diagup \\ \text{CHOPh} \end{array}$ is considered and rejected. The cycloacetal formulation for hydroxycamphor is not approved. Camphorquinone and phenylhydroxycamphor show abnormal rotation dispersion. The rotation dispersion constns. of phenyl camphor deviate markedly from those of the alkylcamphors. Phenylchlorocamphor, $\text{C}_6\text{H}_4 \begin{array}{c} \text{CO} \\ \diagup \quad \diagdown \\ \text{C} \\ \diagdown \quad \diagup \\ \text{CClPh} \end{array}$, from phenylhydroxycamphor and PCl_5 in 36–48 hrs. at the ordinary temp., m. 129° ; it is reduced by Zn dust and AcOH, or by hydrogenation in a mixt. of alc., EtOAc, and water in presence of a Ni catalyst, to *phenylcamphor*, $b_{10} 172-4^\circ$, m. $45-6^\circ$, $[\alpha]_D^{20} 184.42^\circ$ or 180.45° in C_6H_6 . *Phenylborneol*, $\text{C}_6\text{H}_4 \begin{array}{c} \text{CHOH} \\ \diagup \quad \diagdown \\ \text{C} \\ \diagdown \quad \diagup \\ \text{CHPh} \end{array}$, obtained from phenylhydroxycamphor, Na and boiling alc., m. $139-40^\circ$, $[\alpha]_D^{20} -76.19^\circ$ in C_6H_6 (isomeride from petroleum, $b_{10} 179-82^\circ$, $d_4^{20} 1.0897$, $[\alpha]_D^{20} 20.43^\circ$). Treatment of this with HCO_2H or H_3PO_4 affords *phenylbornylene*, $\text{C}_{18}\text{H}_{14} \begin{array}{c} \text{CH} \\ | \\ \text{CPh} \end{array}$, $b_{11} 135-41^\circ$, $d_4^{20} 0.9767$, $n_D^{20} 1.54167$, $[\alpha]_D^{20} 40.56^\circ$, or $d_4^{20} 0.9865$, $n_D^{20} 1.54445$, $[\alpha]_D^{20} 8.33^\circ$, resp. B. C. A.

Stereoisomerism of diphenyl compounds. II. Resolution of 3,3'-diaminodimesityl. WENDELL W. MOYER AND ROGER ADAMS. Univ. of Illinois. *J. Am. Chem. Soc.* 51, 630-8(1929); cf. *C. A.* 22, 3886.—Directions are given for the prepn. of dimesitylene (I) in 22% yield from bromomesitylene through the Grignard reagent with CuCl_2 . Fuming HNO_3 quantitatively converts I into the *tetra-NO₂ deriv.*, m. $270-1^\circ$; by partial reduction a mixt. of NH_2 derivs. is formed. I and Br in CCl_4 give a 3,3'-*di-Br deriv.*, m. $112-3^\circ$ (63% yield); an attempt to prep. a mono-Grignard reagent was not very successful and the action of CO_2 gave no definite product. I and AcNO_2 in CCl_4 at $30-40^\circ$ give 98% of the 3,3'-*di-NO₂ deriv.*, m. $162.5-3.5^\circ$ (cor.); nitration in hot AcOH or in cold CCl_4 gives a mixt. of NO_2 derivs.; nitration with KNO_3 in H_2SO_4 gives a mixt., from which the *tetra-NO₂ deriv.* was isolated. Reduction with Zn and HCl gives 61% of the 3,3'-*di-NH₂ deriv.* (II), m. $206-7^\circ$ (*di-Ac deriv.*, m. $303-4^\circ$). *d-II*, m. $203.5-4.5^\circ$ (cor.), $[\alpha]_D^{20} 12.0^\circ$ (0.1907 g. in 20 cc. 0.3 N HCl), 42.3° (0.2456 g. in 20 cc. Me_2CO), is obtained by pptn. of the *d-camphorsulfonic acid salt*, crystg. with H_2O , m. $186-8^\circ$ (anhyd.), $[\alpha]_D^{20} 32.4^\circ$ (0.2255 g. in 20 cc. 95% EtOH); *Ac deriv.*, m. $312-3^\circ$ (cor.), $[\alpha]_D^{20} 30.8^\circ$ (0.2370 g. in 20 cc. abs. EtOH). The final mother liquors of the resolution, on treatment with NH_3 , give *l-II*, m. $203-4^\circ$ (cor.), $[\alpha]_D^{20} -41.5^\circ$ (0.2265 g. in 20 cc. Me_2CO); *Ac deriv.*, m. $311-3^\circ$, $[\alpha]_D^{20} -30.4^\circ$ (0.2300 g. in 20 cc. abs. EtOH). *d-II* is only slightly racemized after boiling with EtOH-KOH for 5 hrs. or with concd. HCl for 9 hrs. *Nitroiodomesitylene*, buff., m. $96-7^\circ$ (72% yield through the diazo reaction); no definite compd. could be obtained from the reaction product with Cu. These are the 1st Ph_2 derivs. resolved with the 2,6,2',6'-positions, all occupied by the same group. This lends support to the mech. theory for explaining the optical isomerism in certain Ph_2 compds. C. J. WEST

Diphenic acid series. III. H. W. UNDERWOOD, JR., AND L. A. CLOUGH. Mass. Inst. Tech. *J. Am. Chem. Soc.* 51, 583-7(1929); cf. *C. A.* 18, 3186. When Me, Et, Me_2 and Et_2 diphenate were heated with Ac_2O , each ester remained unchanged. Diphenamic acid (30 g.), 60 g. AcOH and 60 g. Ac_2O , heated at 145° for 1 hr., give 18.2 g. diphenimide, m. 219° and 3.8 g. 1-cyanobiphenyl-10-carboxylic acid, m. 168° , the latter being sepd. by its soly. in Na_2CO_3 . The diamide of diphenic acid, through the loss of 2 mols. H_2O , gives 2,2'-dicyanobiphenyl, m. 172° . *p,p'*-Dibromodiphenic acid yields an anhydride, m. $304-5^\circ$. Bischoff and Adkins (*C. A.* 17, 2283) obtained an amorphous substance by condensing diphenic anhydride with $m\text{-C}_6\text{H}_4(\text{OH})_2$ at $135-50^\circ$ with ZnCl_2 . The material is apparently identical with that secured by working at 175° ; it contains resorcinoldiphenic (I) and an amorphous condensation product derived from diphenyleneketone-4-carboxylic acid. The m. p. of I apparently changes when the compd. is heated or allowed to stand for a long time. Solus. of pure I in aq. NaOH do not show marked fluorescence. C. J. WEST

Preparation of certain chloro and bromo derivatives of 2,4-dihydroxydiphenylmethane and -ethane and their germicidal action. EMIL KLARMANN AND JOHN VON WOWERN. Lehn and Fink, Inc., Bloomfield, N. J. *J. Am. Chem. Soc.* 51, 605-10

(1929).—4'-Chloro-2,4-dihydroxydiphenylmethane, m. 80.4°, results in 55% yield from $m\text{-C}_6\text{H}_4(\text{OH})_2$, $p\text{-ClC}_6\text{H}_4\text{COCl}$ and AlCl_3 in PhNO_2 or in 33% yield by the reaction of $m\text{-C}_6\text{H}_4(\text{OH})_2$ and $p\text{-ClC}_6\text{H}_4\text{CN}$ with ZnCl_2 and HCl , decompn. of the imide HCl with boiling H_2O and reduction of the ketone (m. 155°) with Zn and HCl . The 4'-Br deriv., prepd. by the 2nd method in 45% yield, m. 96°; the intermediate ketone m. 169°. 5-Chloro-2,4-dihydroxydiphenylmethane, m. 122°, results in 51% yield from 2,4-(HO) $_2\text{C}_6\text{H}_3\text{CH}_2\text{Ph}$ and SO_2Cl_2 in Et_2O ; 5-Br deriv., m. 122.4° (71% yield). 5-Chloro-2,4-dihydroxydiphenylethane, m. 136.7° (40% yield); 5-Br deriv., m. 152.1°. Halogenation greatly increases the germicidal efficacy of these compds. against *B. typhosus* and *Staph. pyog. aureus*. Some interesting observations are made regarding reduction of the germicidal efficacy of these substances by "org. matter." The substances may be regarded as general disinfectants rather than specifics.

C. J. WEST

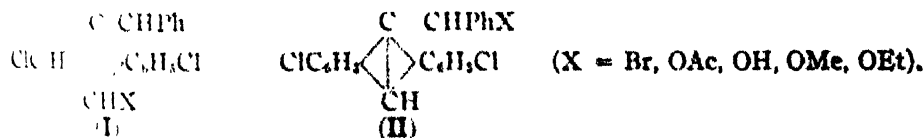
α -Chloronaphthalene. II. Nitration. P. FERRERO AND C. CAFLISCH. Univ. Geneva. *Helv. Chim. Acta* 11, 795-812(1928).—Nitration of $\alpha\text{-C}_{10}\text{H}_7\text{Cl}$ gives a mixt. of the 1,4-, 1,5- and 1,8-derivs. By moderate nitration (low nitration temp., H_2SO_4 at 66° BÉ, HNO_3 d. 1.4, small excess of H_2SO_4), the 1,4- and 1,5-derivs. are predominant. The 1,8-deriv. requires hot reagents, fuming HNO_3 and an important excess of H_2SO_4 to be the principal reaction product. The relative proportions of the 1,4- and the 1,5-derivs. are dependent upon the method of nitration. If the temp. is allowed to rise after the reagents have been mixed, formation of the 1,4-compd. is favored; sometimes the 1,5-isomer is then totally absent. By adding HNO_3 to the mixt. of $\text{C}_{10}\text{H}_7\text{Cl}$ and H_2SO_4 , formation of 1,5-isomer is favored; by adding H_2SO_4 last, it does not form at all. If the nitration is done without special precautions, the relative amounts will be 50% of the 1,4-compd., 10% of the 1,5-compd. and 40% of the 1,8-compd. It has been verified that a 10% glycolic soln. of NH_3 will only react with the 1,4-compd., yielding the amine. Sulfonation with $\text{H}_2\text{SO}_4\text{-H}_2\text{O}$ at 95° for 12 hrs. attacks the 1,8-compd. chiefly, the 1,4-compd. very little and the 1,5-compd. not at all.

ALBERT L. HENNE

Chlorodecalin. P. FERRERO AND M. FEILMANN. Univ. Geneva. *Helv. Chim. Acta* 11, 103-116(1928). Monochlorodecalin is prepd. by atomization of decalin with a Ce current. The halogen is relatively reactive, being easily replaced by a OH group, with formation of decalol. Treatment with NH_4OH does not yield the amine, but decalol. Condensation with amines does not succeed. Octalin and decalol are the products obtained. The Friedel and Crafts condensation is successful with C_6H_6 and PhMe ; it does not give any results with substituted hydrocarbons. Phenyl-decalin obtained by the above method, cannot be used in the phthalic condensation; resin is formed. A study of the chlorination of $\text{C}_{10}\text{H}_{18}$ in soln. shows that the concn. has no effect, but that the nature of the solvent has an enormous importance. A com. method of prepn. of $\alpha\text{-C}_{10}\text{H}_{17}\text{Cl}$ has thus been found, the details of which will be disclosed later on.

ALBERT L. HENNE

Transannular anionotropic migrations. JAMES WILFRED COOK. *J. Chem. Soc.* 1928, 2168-2170. Colorless forms of derivs. of 1,5-dichloro-9-benzylanthracene have a structure of the general type I, while the colored forms are of type II.



The change I to II is a mobile anion tautomerism, since: (a) the order of mobility ($\text{Br} > \text{OAc} > \text{OH}$ or OR) is identical with that found by Burton and Ingold for another system and (b) prototropic and anionotropic changes can be effected by the action of OH and H^+ ions resp.



Thus 1,5-dichloro-10-hydroxy-9-benzylidene-9,10-dihydroanthracene is converted into 1,5-dichloro-9-benzylanthrone by boiling with alc. NaOH . The conversion of a new geometrical isomeride of 1,5-dichloro-10-ethoxy-9-benzylidene-9,10-dihydroanthracene (obtained from 1,5-dichloroethoxyanthrone and PhCH_2MgCl followed by dehydration of the resulting dihydroanthranol) into the $\alpha\text{-EtO}$ compd. by HCl in alc. was slow and incomplete. Replacement of EtO by Br gave a mono-Br deriv. identical

with the monobromination product of 1,5-dichloro-9-benzylanthracene. This inversion of geometrical configuration is considered to pass through a form of type II. Attempts to oxidize compds. of type I to the corresponding anthrones are described. The mobile H was fixed by replacement with Ph: 1,5-dichloro-9-benzyl-10-phenylanthracene gave a reactive *mono-Br deriv.*, m. 179–80°, but the *HO*, m. 189–91°, and *EtO-deriv.*, m. 173–4° (obtained, resp., by treatment with aq. Me₂CO and EtOH in the presence of CaCO₃), were of the "yellow" type, therefore probably like II. 1-Chloro-9-benzylanthracene, m. 119–20° (the corresponding 1-chloro-9-hydroxy-9-benzyl-9,10-dihydroanthracene, m. 126–7°) and 4-chloro-9-benzylanthracene, m. 120°, were prepd. from the appropriate chloro-9-anthrone (obtained by reduction of chloroanthraquinones with Al and H₂SO₄). The former when brominated gave an unstable dibromide, which decompd. into a mixt. of 30% of 1-chloro-10-bromo-9-benzylanthracene (type II), m. 160°, and 70% of benzylidene compd. of type I, m. 151–3°. From the latter, compds. of type I and II were obtained where X = OH, OAc or OR. Thus the action of aq. Me₂CO and CaCO₃ gave 1-chloro-10-hydroxy-9-benzylidene-9,10-dihydroanthracene, m. 185°, acetylation of which gave the 10-AcO compd., m. 151–3°. MeOH in the presence of CaCO₃ gave the 10-MeO compd., m. 129–30°. This last compd. undergoes isomerization when treated with HCl in MeOH, and gives the "yellow" form (type II), m. 157–8°. 4-Chloro-9-benzylanthracene gives an unstable di-Br deriv. leading to reactive 4-chloro- ω -bromo-9-benzylanthracene, m. 165–6° (ω -pyridinium bromide, m. 220–5° (decompn.), after sintering at 215°), which passed into type II with ease, aq. Me₂CO and CaCO₃ giving yellow 4-chloro- ω -hydroxy-9-benzylanthracene, m. 98–100°, acetylation of which gave the ω -AcO compd., m. 129–30°, while MeOH and EtOH in the presence of CaCO₃ gave the ω -MeO compd., m. 144° (also formed by methylation of the ω -HO-compd. with MeOH + HCl), and the ω -EtO homolog, m. 135–7°, resp. The difference between the 1- and 4-Cl derivs. of 9-benzylanthracene are ascribed to steric effects of the α -Cl atom. The ω -MeO compd. gave an unstable dibromide which spontaneously decompd. into BzH and 4-chloro-9-bromoanthracene. The latter product is stable in the presence of an excess of Br. 1-Chloro-9-bromoanthracene was not isolated from the product of thermal decompn. of the dibromide of 1-chloro- ω -methoxy-9-benzylanthracene, only 1-chloro-9,10-dibromoanthracene being obtained. These results are attributed to the steric effect of the α -Cl atom on the assumption that bromination is preceded by 9,10-addn. of Br. Only 4-chloro-9-bromoanthracene was isolated from the action of an excess of Br on 1-chloro-10-bromo-9-benzylanthracene.

ALBERT L. HENNE

Condensation of phthalic anhydride with *o*-dichlorobenzene. MUNENARI TANAKA AND NAOZO TANAKA. Central Lab. Dairen. *Bull. Chem. Soc. Japan* 3, 286–7 (1928) — *o*-C₆H₄Cl₂ condenses with C₆H₄(CO)₂O in the presence of AlCl₃. If the condensation is carried out at 115°, 3',4'-dichlorobenzophenone-2-carboxylic acid is obtained, while at 150°, or at 130° under pressure, 2,3-dichloroanthraquinone is obtained. Correcting a paper previously given, it is stated that *o*-ClC₆H₄OH and C₆H₄(CO)₂O in the presence of H₂BO₃ and H₂SO₄ give alizarin and 1-hydroxy-2-chloroanthraquinone by heating 1 hr. at 240° and 0.5 hr. at 255°, but only purpurin by heating for 3 hrs. at 255°.

ALBERT L. HENNE

Dehydrating action of Japanese acidic earth in the anthraquinone series. MUNI HARI TANAKA AND SUSUMU WATANABE. Central Lab. Dairen. *Bull. Chem. Soc. Japan* 3, 288–9 (1928).—The C₆H₄(CO)₂O condensation is tried with Japanese earth replacing the customary AlCl₃. Hydroquinone reacts easily at 260°; pyrocatechol yields only a limited quantity of hystazarin and alizarin; pyrogallol gives no anthraquinonic deriv., but gallein; α -naphthol gives α -hydroxynaphthacenequinone.

ALBERT L. HENNE

Action of aromatic Grignard reagent on methylsuccinimide. Synthesis of 2,5-diphenyl-1-methylpyrrole. R. LUKES AND V. PRELOG. *Chem. Listy* 22, 244–51 (1928).—*N*-Methylsuccinimide reacts with PhMgBr to yield 2-hydroxy-2-phenyl-1-methylpyrrolid-2-one, m. 139–41° (phenylhydrazone, m. 186°), and 2,5-diphenyl-1-methylpyrrole, m. 204°, b₁₂ 225–35°. Where the Grignard reagent is not present in excess and the time of reaction is short, the former product predominates; otherwise the latter is the main product. The former substance on acid hydrolysis yields MeNH₂ and BzCH₂CH₂CO₂H and on distn. under reduced pressure gives water and 5-phenyl-1-methylpyrrolone, m. 59°, b, 150–65°.

B. C. A.

Alkylation and acylation of thiophene in the presence of tin tetrachloride. G. STADNIKOV AND I. GOLDFARB. Lab. f. Kohlen-Forschung, Moskau. *Ber.* 61B, 2341–2 (1928); cf. *C. A.* 23, 130.—Further study of the reaction of thiophene (I) with acid chlorides in the presence of SnCl₄ showed that the yield of ketones depends to some

extent on the solvent. In new syntheses of acetothienone (II) in benzene (b. 120–40°) the yields varied between 50 and 58%. C_6H_6 , however, gives good yields, so the method may be used for the estn. of I in crude C_6H_6 . Alc. residues can also be introduced into the I nucleus in the presence of $SnCl_4$. II, b_{760} 213.5–4.5°, is obtained in 96% yield from 16.8 g. I and 15.6 g. $AcCl$ in 170 g. C_6H_6 with 52 g. $SnCl_4$ and benzothienone, m. 55°, in 82.5–92% yield with $BzCl$. The reaction of I with Ph_2CHCl , which is formed from Ph_2CHOEt and $SnCl_4$, is so energetic that it may result in the formation of resinous products, but by working cautiously in CS_2 there can be obtained diphenylthienylmethane, m. 65°, and 50% of dibenzohydrylthiophene (ω, ω' -tetraphenylthioxene) (III), m. 85–5.5°, very sensitive to light, mol. wt. in C_6H_6 394–6. I reacts with Ph_2CHCl incomparably more rapidly than does C_6H_6 , so the synthesis can be carried out in C_6H_6 without the simultaneous formation of appreciable quantities of Ph_2CH . With $CrO_2 \cdot AcOH$, III gives Ph_2CO (yield, 78.7% as the oxime). C. A. R.

α, α' - and α, α' -Disubstituted α, α' -dihydro- β, β' -benzofurans. FELIX SEIDEL. Univ. Tübingen. Ber. 61B, 2267–76(1928).—Guyot and Catel obtained from $PhMgBr$ and phthalide a substance which they believed to be α, α' -diphenyl- β, β' -benzo- α, α' -dihydrofuran (I) and from α -phenylphthalide an isomer which they considered to be the sym. α, α' -diphenyl- β, β' -benzo- α, α' -dihydrofuran (II). The 2 substances are very similar to each other, both are colorless and they have nearly the same m. p. (93° and 96°, resp.), and it seemed possible that they might be identical, the 1 form passing into the other by a kind of pinacolin or retropinacolin rearrangement; another possibility was that the substance was neither I nor II but *o*-benzoyldiphenylmethane (III). Further to characterize I, prepd. according to G. and C., attempts were made to make it react with the most varied reagents. It is extraordinarily stable towards reducing agents and does not condense with $PhNHNH_2$, $BzNHNH_2$ or $p-O_2NC_6H_4NH_2$. With oxidizing agents it gives substances strikingly different from those obtained with II and III; $K_2Cr_2O_7$ and $KMnO_4$ in $AcOH$ give α, α' -diphenylphthalide (IV); dil. HNO_3 yields as a stable intermediate product α, α' -diphenyl- β, β' -benzo- α, α' -dihydro- α' -hydroxyfuran ether, $[C_6H_4 \cdot CPh_2 \cdot O \cdot CH]_2O$ (V), which with $K_2Cr_2O_7$ and $KMnO_4$ like-

wise gives IV. V is remarkably stable towards sapon. agents; it is unchanged by long boiling with HCl or dil. H_2SO_4 in $AcOH$ and is attacked only by alc. HCl at 135°, but at the same time is reesterified to the compd. VI; the hemiacetal could not be isolated. If the sapon. is carried out in glacial $AcOH$ there are formed amorphous, dark brown decompn. products from which no cryst. compd. could be isolated. It is very difficult to obtain II according to the meager directions in the literature. It readily yields *o*- $C_6H_4Bz_2$ with $K_2Cr_2O_7$ and dil. HNO_3 , in the latter case without forming an intermediate product. II is unchanged by N_2H_4 or $PhNHNH_2$. The usual ketone syntheses cannot be used for the prepn. of III. *o*- $IC_6H_4CH_2Ph$ and BzI do not react with each other in the presence of Ag, Na and "Naturkupfer," nor does $PhCH_2C_6H_4MgI$ react with BzI , or $(PhCH_2C_6H_4CO_2)_2Ba$ with $BzOH$ at 310° under 15 mm. *o*- $PhCOC_6H_4Br$, $PhCH_2Br$ (or $PhCH_2Cl$) and Cu give only (*o*- BzC_6H_4)₂. $PhMgBr$ and *o*- $PhCH_2C_6H_4CN$, however, give the imine $PhCH_2C_6H_4CPh:NMgBr$ (VIII) which with acids yields III. III normally forms a phenylhydrazone (VIII) and is oxidized by dil. HNO_3 directly to *o*- $C_6H_4Bz_2$. I, II and III are therefore entirely distinct compds. which cannot be converted into each other. V (3.0 g. from 5.0 g. I boiled 1 hr. in 50 cc. concd. HNO_3 and 100 cc. H_2O), m. 259–60°, mol. wt. in $C_{10}H_8$ 560.4–581.8. α, α' -Diphenyl- β, β' -benzo- α, α' -dihydro- α' -hydroxyfuran Et ether (VI), m. 97°, mol. wt. in $C_{10}H_8$ 302.7. II (5.7 g. from 9.6 g. $PhBr$, 2.4 g. Mg and a particle of I in 60 cc. cold Et_2O slowly treated with 6.3 g. phenylphthalide in 150 cc. C_6H_6 , boiled 30 min., cooled, decompd. with aq. NH_4Cl , sepd. from the aq. layer, washed with H_2O , treated with 3% $Na-Hg$, freed from the Et_2O by distn., treated with $MeOH$ and boiled 35 hrs. with frequent stirring), m. 93–5°. III, b_{16} , 220–5°, very faintly yellow liquid crystg. after 5 days in needles, m. 47–50°. VIII, m. 139°. *o*- $PhCH_2C_6H_4NH_2 \cdot HCl$, m. 180°, is obtained in 4.7 g. yield from 8.5 g. *o*- $ClH_2NC_6H_4CH_2Cl$ refluxed 1 hr. in C_6H_6 with 15 g. $AlCl_3$; diazotized in concd. HCl and treated with aq. KI at room temp. it gives *o*-iododiphenylmethane, b_{16} , 175–80°. C. A. R.

Benzidine rearrangement in the heterocyclic series. II. PRAFULLA KUMAR BOSH AND BIJON KUMAR SEN. J. Indian Chem. Soc. 5, 643–55(1928); cf. C. A. 22, 1159–B. and S. have extended B.'s work on benzidine and semidine rearrangements in the heterocyclic series. By condensing 1-*o*-tolylthiosemicarbazide (I) or the *m*-compd. (II) with halogenated ketones (III), heterocyclic hydrazo compds. (IV) are formed which undergo benzidine rearrangement. IV give characteristic color reactions with concd. H_2SO_4 , are affected by light or air, and are oxidized to corresponding azo derivs.

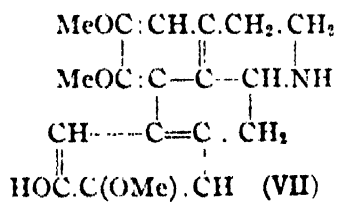
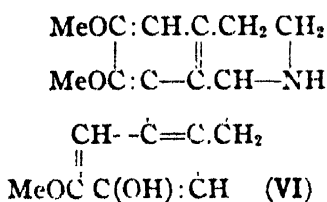
by FeCl_3 . IV are transformed into the isomeric bases when treated with boiling dil. HCl . Condensation of 1-*p*-tolylthiosemicarbazide (V) with III gives products which on b. with dil. HCl split off NH_3 , and are converted into thiazoles of the type $\text{CR}:\text{CH}:\text{S}:\text{CO}:\text{NNHC}_6\text{H}_4\text{Me}$. I, m. $163-4^\circ$ is prepd. by heating *o*- $\text{MeC}_6\text{H}_4\text{NHNH}_2$

and KSCN in alc. on the water bath for 12 hrs. I and PhCOCH_2Br (VI) in alc. at room temp., give 2-*o*-tolylhydrazino-4-phenyl-1,3-thiazole (VII), m. $175-80^\circ$ (decompn.); *Ac deriv.*, m. 152° . Oxidation of VII with FeCl_3 gives the corresponding azo deriv. (VIII), orange crystals, m. 110° , which dyes wool yellow and gives deep blue color with concd. H_2SO_4 . Reduction of VIII with Zn dust and dil. AcOH gives VII. Oxidation of 2-phenylhydrazino-4-phenyl-1,3-thiazole (see C. A. 22, 1158) with FeCl_3 gives 2-benzeneazo-4-phenyl-1,3-thiazole, orange crystals, m. 117° . Similarly, 2-phenylhydrazino-4-*p*-tolyl-1,3-thiazole gives the corresponding azo compd., orange crystals, m. 161° , dyeing wool a deep orange; 2-phenylhydrazino-4-methyl-1,3-thiazole gives the azo compd., m. 120° , dyeing wool yellow. VII with boiling dil. HCl gives 2-amino-4-phenyl-5-*p*-amino-*m*-tolyl-1,3-thiazole, yellow needles, m. 165° ; HCl salt, m. 197° ; *picrate*, red plates, m. 227° (decompn.); *di-Ac deriv.*, m. 182° ; *chloroplatinate*, yellow crystals. I and *p*- $\text{MeC}_6\text{H}_4\text{COCH}_2\text{Br}$ (IX) gives 2-*o*-tolylhydrazino-4-*p*-tolyl-1,3-thiazole (X), m. 179° , giving a green color with concd. H_2SO_4 ; *Ac deriv.*, m. $160-1^\circ$. Oxidation of X with FeCl_3 gives the corresponding azo deriv., brick-red crystals, m. 148° . X and boiling dil. HCl give 2-amino-4-*p*-tolyl-5-*p*-amino-*m*-tolyl-1,3-thiazole, brown needles, m. 181° ; *di-Ac deriv.*, m. 208° ; HCl salt, m. 278° (decompn.); *chloroplatinate*, brown crystals, m. 201° (decompn.). I and AcCH_2Cl (XI) give 2-*o*-tolylhydrazino-4-methyl-1,3-thiazole (XII), reddish needles, m. 162° (decompn.); *Ac deriv.*, m. 96° . XII and boiling dil. HCl give 2-amino-4-methyl-5-*p*-amino-*m*-tolyl-1,3-thiazole, brown needles, m. 144° ; HCl salt, m. 261° (decompn.); *di-Ac deriv.*, m. 266° ; *picrate*, m. 247° (decompn.); *chloroplatinate*, gray crystals. II, prepd. similarly to I, reacts with VI giving 2-*m*-tolylhydrazino-4-phenyl-1,3-thiazole (XIII), m. 188° (decompn.), giving a blue color with concd. H_2SO_4 ; *Ac deriv.*, m. 145° . XIII and boiling dil. HCl give 2-amino-4-phenyl-5-*p*-amino-*o*-tolyl-1,3-thiazole, brown needles, m. 135° ; HCl salt, m. $265-70^\circ$ (decompn.); *di-Ac deriv.*, m. 235° ; *picrate*, m. 215° (decompn.). II and IX give 2-*m*-tolylhydrazino-4-*p*-tolyl-1,3-thiazole (XIV), pale brown needles, m. 191° (decompn.); *Ac deriv.*, m. 121° . XIV and boiling dil. HCl give 2-amino-4-*p*-tolyl-5-*p*-amino-*o*-tolyl-1,3-thiazole, brown needles, m. 175° ; *Ac deriv.*, m. 243° ; HCl salt, m. 247° ; *picrate*, m. 202° . II and XI give 2-*m*-tolylhydrazino-4-methyl-1,3-thiazole (XV), reddish needles, m. 135° (decompn.); *Ac deriv.*, m. 119° . XV and boiling dil. HCl give 2-amino-4-methyl-5-*p*-amino-*o*-tolyl-1,3-thiazole, m. 157° ; *Ac deriv.*, m. 236° ; HCl salt, m. 263° (decompn.); *picrate*, m. 212° (decompn.). V prepd. similarly to I, m. 174° , reacts with VI giving 2-imino-3-*p*-toluidino-4-phenyl-2,3-dihydro-1,3-thiazole (XVI), m. 193° (decompn.), blue color with concd. H_2SO_4 ; *Ac deriv.*, m. 147° . XVI and boiling dil. HCl give 2-keto-3-*p*-toluidino-4-phenyl-2,3-dihydro-1,3-thiazole, yellow plates, m. $210-1^\circ$. V and XI give 2-imino-3-*p*-toluidino-4-methyl-2,3-dihydro-1,3-thiazole (XVII), reddish needles, m. $168-9^\circ$; *p*-tolylthiocarbimide deriv., m. 143° . XVII and boiling dil. HCl give 2-keto-3-*p*-toluidino-4-methyl-2,3-dihydro-1,3-thiazole, yellow crystals, m. 177° . V and IX give 2-imino-3-*p*-toluidino-4-*p*-tolyl-2,3-dihydro-1,3-thiazole, brown needles, m. 184° (decompn.), *Ac deriv.*, m. 155° ; *p*-tolylthiocarbimide deriv., m. 152° .

FREDERICK C. HAHN

The red quinoline dye of Besthorn. HEINRICH WIELAND, OTTO HETTCH and TOSHIO HOSHINO. Bayr. Akad. Wiss., München. *Ber.* 61B, 2371-81 (1928). Although there is hardly any other structure possible for the dye (I) than that (II) proposed by Ibele, and Besthorn himself has made such a formula very probable by his investigations, it is so peculiar in having a N atom with 5 valences not polarly bound to C that the authors have attempted to secure further evidence of its correctness. In 1 of his last papers B. describes a colorless reduction product obtained by adding 6 atoms of H to I by means of Pd black and which on cautious oxidation with CrO_3 - AcOH regenerates I. If II is correct the reduction product should have the structure III. It was hoped that III might be synthesized by catalytically hydrogenating Me quinaldinate to the tetrahydro compd., sapon. this to the free acid, (IV), condensing it with α -chloroquinoline and closing the ring to form III, but the 1st step in the synthesis could not be effected. Quinaldinyll chloride and tetrahydroquinoline (V) were then condensed to the amide VI, but the VI could neither be hydrogenated, as had been intended, nor converted into I by direct oxidation. It was hoped that by protecting IV by substituting the H in the NH group and converting the substituted deriv. into the chloride the latter might be made to react with V, but the urethan (VI) gave the

of prepg. II has been subjected to careful study as his statement that short treatment of I with CH_3N_3 in Et_2O results in methylation on the N also seemed surprising. Methylation in $\text{EtOH-Et}_2\text{O}$ according to his directions gave an amorphous substance; methylation of the phenolic HO group was almost complete but the N remained chiefly secondary. With Ac_2O at room temp. most of the crude product was converted into *N*-acetylaurotelanine *O*-Me ether (IV) and only about 23% remained as a tertiary base which proved to be identical with III. Furthermore, the methylation product with MeI and KOH gave III.MeI. G.'s II was therefore a mixt. of III and I *O*-Me ether. That I on oxidation gives $1,2,3,4,5\text{-C}_6\text{H}(\text{OMe})_2(\text{CO}_2\text{H})_3$ (V) was confirmed. V does not sublime at 150° under 0.005 mm.; in open tubes it loses CO_2 at 260° and now on sublimation in a high vacuum there is obtained *m*-hemipinic anhydride. This, in connection with the other properties of I, indicates that it has 1 of the structures VI or VII. The presence of a phenanthrene nucleus was shown by subjecting the quaternary chloride of the fully methylated I to an Emden degradation and oxidizing the resulting base with HNO_3 , which yielded $1,2,3,4\text{-C}_6\text{H}_2(\text{CO}_2\text{H})_4$. When the base mixt. obtained from I and MeCHN_3 is energetically oxidized with KMnO_4 and the resulting acid mixt. is distd. in a high vacuum at such a temp. that no CO_2 is split off there is obtained MeEt ether of nor-*m*-hemipinic anhydride. It was attempted, by gentle oxidation of I, to destroy the nucleus carrying the free HO group and obtain the tetrahydroisoquinoline complex in the form of a corydaldinecarboxylic acid which on splitting off CO_2 should yield the corydaldine. The KMnO_4 oxidation apparently proceeded smoothly but the corydaldine could not be isolated from the resulting acid without deep-seated decompn. In this connection was synthesized *5,6-dimethoxy-1-keto-1,2,3,4-tetrahydroisoquinoline* (VIII) by condensing $2,3\text{-(MeO)}_2\text{C}_6\text{H}_3\text{CH}_2\text{CH}_2\text{NH}_2$ with ClCO_2Et and closing the ring in the resulting product (IX) with P_2O_5 . These results det. in the main the ring system in I except for the pyridine nucleus. Further conclusions must for the present be based on the synthesis of III by Pschorr and Gadamer. To exclude the possibility that in I there is a double bond in position 3,4, III was subjected to vigorous treatment with Sn and HCl and I to electrolytic reduction at a Pb cathode; in both cases the bases remained practically unchanged, whence it may safely be assumed that the pyridine ring is tetrahydrogenated. The results so far obtained do not permit of deciding between structures VI and VII but VI is provisionally given the preference because in isoquinoline alkaloids with a free HO group on the benzyl nucleus the HO group is generally in position 3. Barger has also shown that II and III are identical. IV (0.723 g. from 1.005 g. I), m. $188-9^\circ$. IX, sirup, b_{0.005} $140-50^\circ$ (bath temp.). VIII, m. $154-5^\circ$.



C. A. R.

Constitution of solanin. GÉZA ZEMPLÉN AND ÁRPÁD GERÉCS. Tech. Hochschule, Budapest. Ber. 61B, 2294-2300(1928).—Contrary to the statements of Heiduschka and Sieger solanin (I) can readily be acetylated. The product breaks down on short treatment with HBr in glacial AcOH, yielding 2 cleavage products: an acetylated solanidine glucoside (II) and the bromoacetyl deriv. (III) of a biose composed of galactose and rhamnose. Although the components are not cryst., their properties could be detd. with certainty. The II on acid hydrolysis yielded solanidine (IV) and glucose and the biose on iodometric oxidation gave a rhamnosidogalactonic acid (V) since on distn. with HCl the V gave large quantities of methylfurfural. Hence in I the IV must be bound to a trisaccharide, the components being arranged in the order $\text{IV} \rightarrow \text{glucose} \rightarrow \text{galactose} \rightarrow \text{rhamnose}$. The data in the literature on the compn. of I and IV vary greatly. Z. and G. obtained as the av. of several analyses values corresponding to the formula $\text{C}_{44}\text{H}_{71}\text{O}_{13}\text{N}$ for I and therefore, assuming that the 3 sugar residues are bound as a trisaccharide, to $\text{C}_{26}\text{H}_{41}\text{ON}$ for IV; direct analyses of IV.HCl also agreed with the latter formula. The I (Merck's Solanin puriss. cryst.) contained 5.35% H_2O and showed $[\alpha]_D -59.45^\circ$ in $\text{C}_6\text{H}_5\text{N}$; 50 g. with NaOAc and Ac_2O on the H_2O bath yielded about 45 g. of a *trideca-Ac deriv.* (VI) (found C 56.44-56.37, H 7.30-7.23, N 1.10-1.23%), $[\alpha]_D^{20} -34.96^\circ$ (abs. alc.), sinters 190° , m. $204-5^\circ$. II (C 59.51-59.75, H 8.03-7.91%) (22 g. from 50 g. VI in CHCl_3 , allowed to stand 1 hr. at room

$C_{37}H_{46}ON_4$, m. 260° . Similarly mesoporphyrin di-Me ester yields a *carbinol*, $C_{37}H_{48}O_3N_4$ or $C_{35}H_{44}O_3N_4$, m. 295° (cor.) from MeOH, 308° from AcOH. The *xanthoporphinogen* from mesoetioporphyrin crysts. with 1 mol. C_6H_6 easily replaced by 1 mol. H_2O . Etio-xanthoporphinogen I (*mono- and di-K and di-Na salts*) crysts. with 3 Me_2CO . *Meso-xanthoporphinogen* (*Et ester*) is intensely yellow and very hygroscopic. Nitration of etioporphyrin I with cold HNO_3 gives a *tri-NO₂ deriv.*, m. 305° (block); (HNO_3 , HCl , Cu salt, m. 313° and Fe salt). *Trinitroetioporphyrin II*, m. 246° (block), is spectroscopically identical with its isomer (HCl salt; Cu salt, m. 285° (block)). Crystallographic data (by STREINMETZ) for several etioporphyrins and the absorption spectra of a large no. of the above compds. and those of the Cu salts and hemochromogen derivs. of meso-, rhodo-, deuterio- and phylloetioporphyrins are given. II. **Rhodins and verdins.** H. FISCHER, A. TREIBS AND H. HELBERGER. *Ibid* 243-64.—In an attempt to introduce an Ac group into the porphin mol. pyrroporphyrin was treated with an excess of $AcCl$ in CS_2 and $AlCl_3$. The product isolated was *pyrro-rhodin*, $C_{31}H_{32}ON_4$, m. 280° (block), probably identical with phyllo-rhodin (cf. following abstr.). Similar treatment of mesoporphyrin gives *meso-rhodin* (I), $C_{34}H_{36}O_3N_4$, m. 297° (block). *Me ester*, m. 268° (cor.), from the *K* salt and Me_2SO_4 ; *Cu salt*; *Fe complex*, $C_{34}H_{34}O_3N_4ClFe$; *Mg complex* (*phyllin*), by the action of $MeMgI$, together with *mesoverdin*, $C_{34}H_{36}O_3N_4$, m. 298° (HCl and Cu salts). Fuming H_2SO_4 converts mesoporphyrin into I. The action of concd. $MeOH-KOH$ on I in C_6H_5N yields a *mesoverdin*, m. 308° (block). Fuming H_2SO_4 at 50° converts 1,4,6,7-tetramethyl-2,3,8-triethyl-5- β -carboxyethylporphin into a *rhodin*, $C_{33}H_{34}ON_4$ (*Cu*, *Mg* and *Fe complexes*), which on oxidation with CrO_2 and H_2SO_4 yields methylethylmaleimide. The absorption spectra of the majority of the above compds. are tabulated. The production of these rhodins from porphincarboxylic acids is due to the elimination of H_2O between the β -carboxyethyl group and either the imino or methene H in the porphin ring. Thus, monoacidic porphins yield chem. indifferent rhodins (*i. e.*, pyrro-), while diacidic porphins give acidic rhodins (meso-). III. A. TREIBS AND E. WIEDEMANN. *Ibid* 264-91. Alk. fission of pheophytin gives a mixt. of phytochlorin *e* (I), $C_{33}H_{34}O_7N_4$ or $C_{35}H_{36}O_7N_4$, and phyto-rhodin *g* (II), $C_{32}H_{32}O_8N_4$ or $C_{34}H_{34}O_8N_4$. Degradation of a mixt. of I and II with $MeOH-KOH$ at 155° in C_6H_5N gives a mixt. of pyrro- and phylloporphyrins, at $145-50^\circ$ only phyllo-; at 210° only pyrro-. Similarly I at 155° affords pyrro- (10%) and phyllo-(40%), while II at 165° yields a small quantity of pyrroporphyrin (III) III (*Me ester*, m. 241° (cor.)) (*Fe salt*, *Cu* and *Mg salts*), when treated with Br in $AcOH$, furnishes a perbromide, which on treatment with Me_2CO passes into *bromopyrroporphyrin* (*Me ester*, m. 261° (cor.)). Wilstätter's phylloporphyrin contains III; pure phylloporphyrin (IV), $C_{31}H_{34}O_3N_4$ (*Me ester*, m. 235° (cor.)) (*Fe salt*); (*Cu salt*), yields a *Br deriv.* (V) (*Me ester*), which on oxidation with CrO_2 and H_2SO_4 yields methylethylmaleimide, bromocitraconimide and hematinic anhydride. When IV or V is heated with $MeOH-KOH$ at $190-200^\circ$ in a sealed tube, III is obtained. Absorption spectra of most of the above compds. are tabulated. Phyllo- and pyrro-rhodins are shown to be identical. C. J. WEST

From cholesterol to the bile acids. A. GRIGAUT. *Bull. soc. chim. biol.* 10, 937-71 (1928).—A review is given of the work of Windaus and Wieland and their collaborators on the structure and relationships of cholesterol, coprosterol and their derivs. and of the bile acids. L. C.

Structure of thymonucleic acid. P. A. LEVENE AND E. J. LONDON. Rockefeller Inst. *Science* 68, 572-3(1928).—Plant nucleic acid is regarded as a tetranucleotide, each nucleotide being composed of H_3PO_4 , a sugar (ribose) and a N component. For thymonucleic acid an analogous structure is suggested, each complex being called a nucleoside. One such nucleoside has been isolated in cryst. form. L. and L. wish to reserve to their lab. work on this substance. L. W. RIGGS

The catalytic hydrogenation of hemins and porphyrins. RICHARD KUHN AND CARL SEYFFERT. *Ber.* 61B, 2509-16(1928).—That hemin (I) in aq., alk. or C_6H_5N

alysts, and that the addn. of H ceases affirmed (cf. *C. A.* 21, 2702); the amt. of for 1 mol. and any appreciable variation

from this is caused by an unsatisfactory catalyst or by the quality of I; some samples of I, although nicely cryst. could not be hydrogenated under otherwise favorable conditions. The time necessary for the absorption was shortened to 1.75 hrs. when 0.05 g. Pd on Norit was used with 4.5 g. I. That the reduction product does not contain mesohemin (II) was shown spectroscopically. When I is subjected to a very energetic reduction (PtO in $C_6H_{11}N-CHCl_3$) II is formed and the reason this could not be duplicated by Fischer and Walter (cf. *C. A.* 22, 1784) was due to their use of C_6H_5N as the

solvent. It was found that mesoporphyrin (III) and its di-Me ester (IV) can be hydrogenated with the same catalysts that are suitable for hydrogenation of I into dihydrohemin; these reduction products when isolated were found identical in cryst. form, absorption spectra and Zerevitinov no. with the resp. starting products because the H which was added during the reaction is so labile that during the operations of isolation atm. O_2 caused the formation of the original starting products. Mesoporphyrin-HCl in AcOH with PtO and H_2 becomes colorless after absorption of 5 mols. H_2 as does mesoporphyrin after absorption of 2-3 mols. H_2 ; both reductions absorb O_2 rapidly with regeneration of starting product; protoporphyrin di-Me ester (V) similarly absorbs about 5 mols. H_2 with the formation of a leuco compd.; but this leuco compd. is oxidized by the atm. O_2 to IV; thus the following conversion can be made with theoretical yields: $V \rightarrow$ mesoporphyrinogen \rightarrow IV; this furnishes a useful method for the prepn. of IV from I since protoporphyrin is obtained by removal of Fe from I.

N. A. LANGE

Cerebrosides. IX. Cerebronic acid. E. KLENK. Univ. Tübingen. *Z. physiol. Chem.* **179**, 312-9(1928); cf. *C. A.* **23**, 603.—By the reduction of cerebronic acid to lignoceric acid the necessary evidence is now supplied for establishing the relationship between lignoceric, nervonic, cerebronic and α -hydroxynervonic acids, the 4 fatty acids of cerebrosides. Instead of being a C_{26} acid as was formerly supposed, cerebronic is a C_{24} acid and fits into the theory proposed by Emil Fischer that higher fatty acids are predominantly multiples of C_8 and are formed directly from hexoses. Levene had performed the reduction of cerebronic acid by concd. aq. HI and obtained a hydrocarbon instead of the expected pentacosanic acid (C_{25}). By the use of satd. HI in AcOH instead of aq. HI, the OH has now been replaced by H without reduction of the CO_2H and the product identified as lignoceric acid, $C_{24}H_{48}O_2$.

A. W. DOX

The crystallization and deliquescence of quaternary pyridine bases (SICHEV) 2. Action of light on acetylene (REINICKE) 3. Stereochemistry of diphenyl and its derivatives (SPACU) 6. Combinations of medicaments as an example of organic molecular compounds (PFEIFFER, SEYDEL) 17. The inhibitive action of alcohols on the oxidation of Na_2SO_3 (ALVEA, BÄCKSTRÖM) 2. Catalytic phenomena in the tautomerism of certain α -diketones (MOUREU) 2. Tetrahedral C atom and the crystal structure of pentacynthritol (HERTICH, *et al.*) 2. X-ray diffraction of crystal powders and liquids in relation to their constitution (KRISHNAMURTI) 3. The diffraction of x-rays by aqueous solutions of cane sugar, levulose and glucose (KRISHNAMURTI) 3. Keto-enol isomerism and the mechanism of homogeneous reactions (RICE, SULLIVAN) 2. Relation between polarization and association (WILLIAMS) 2.

Synthesis of hydrocarbons from hydrogen and oxides of carbon. I. G. FARBENIND. A. G. Brit. 293,185, June 9, 1927. Reaction of C oxides with H or gases rich in H such as CH_4 , or steam, is catalyzed by contact masses which contain Cu, Ag or Au or their oxides or Zn together with elements of the 8th periodic group or their compds. Mn, Co, Cr, Mo, W, Ti, Sb, Bi and Zr or their compds. may be added. The products are mainly unsatd. hydrocarbons but some MeOH may also be formed. Cf. *C. A.* **23**, 1445.

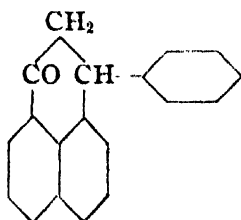
Olefins. I. G. FARBENIND. A.-G. Fr. 643,413, Nov. 7, 1927. Gases rich in olefins are obtained by passing bituminous coal such as lignite in a powd. state, by means of a carrier such as superheated steam or mechanically, through a reaction zone heated to redness and cooling the products in a continuous chamber serving to sep. the coal.

Olefin oxides. I. G. FARBENIND. A.-G. Brit. 292,066, June 11, 1927. Gases such as those contg. C_2H_4 , C_3H_6 and C_4H_8 are treated with HOCl to form chlorohydrins which may then be distd. with milk of lime to produce olefin oxides and the latter may be fractionally distd. (preferably under pressure) to sep. them individually.

Ketones. SOCIÉTÉ H. GOUTHIÈRE ET CIE. Fr. 642,698, Mar. 23, 1927. Ketones are obtained by the dry distn. of crude industrial Ca lactate obtained by the lactic fermentation of sugar juices, etc., in the presence of $CaCO_3$. Crude ketones boiling from 60 to 350° are obtained which may be sepd. by fractionating. Formates, butyrates or propionates of Ca may be similarly treated to produce ketones.

Cyclic ketones. I. G. FARBENIND. A.-G. Swiss 127,692-127,703, Mar. 14, 1927. Addns. to 126,404. The method of Swiss 126,404 (*C. A.* **23**, 613) for the manuf. of α -indanone is applied in the manuf. of other cyclic ketones, as follows: A mixt. of 4- and 6-methyl-1-indanones is prepd. by the interaction of β -chloropropionic acid,

toluene and AlCl_3 (127,692). 3-Methyl-1-indanone is prep'd. from β -chlorobutyric acid, benzene and AlCl_3 (127,693). A mixt. of 4- and 6-chloro-1-indanones is prep'd. from β -chloropropionic acid, chlorobenzene and AlCl_3 (127,694). A mixt. of 4- and 6-chloro-3-methyl-1-indanones is prep'd. from β -chlorobutyric acid, chlorobenzene and AlCl_3 (127,695). The products of 127,695 are obtained when using crotonic acid instead of β -chlorobutyric acid (127,696). 3,4,6-Trimethyl-1-indanone is prep'd. from β -chlorobutyric acid, *m*-xylene and AlCl_3 (127,697). Bromobenzene is used instead of chlorobenzene in the process of 127,695, the corresponding Br compds. being obtained (127,698). A mixt. of isomeric cyclic ketones is prep'd. from β -chlorobutyric acid, *o*-dichlorobenzene and AlCl_3 (127,699). 4,6-Dichloro-3-methyl-1-indanone is prep'd. from β -chlorobutyric acid, *m*-dichlorobenzene and AlCl_3 (127,700). 5-Methyl-6,7-benzo-1-indanone is prep'd. from β -chloropropionyl chloride, α -methylnaphthalene and AlCl_3 (127,701). 3,5-Dimethyl-6,7-benzo-1-indanone is prep'd. as in 127,701 by using β -chlorobutyric acid chloride (127,702). A ketone (m. $140\text{--}142^\circ$ to which the formula



is assigned is prep'd. by condensing cinnamic acid with naphthalene in presence of H_2SO_4 , converting the naphthylphenylpropionic acid so obtained into its chloride, and effecting ring closure with AlCl_3 (127,703). Cf. Brit. 288,441 (*C. A.* 23, 606).

Cyclic ketonic compounds. HEINRICH GREUNE (to Grasselli Dyestuff Corp) U. S. 1,702,002, Feb. 12. Maleic anhydride is caused to act upon an aromatic hydrocarbon such as C_{10}H_8 or acenaphthene or a deriv. having an unsubstituted peri-position in the presence of an acid condensing agent such as AlCl_3 and PhNO_2 or other suitable solvent, at a temp. up to the b. p. of CS_2 .

Aliphatic diamines. I. G. FARBENIND. A.-G. Brit. 292,615, June 23, 1927. Aliphatic diamines contg. one secondary and one primary, secondary or tertiary amino group, are prep'd. by treating a secondary aromatic amine or nuclear substitution deriv. with an aminoalkyl halide and splitting off the aryl residue from the product. Examples are given of the production of α -diethylamino- β -methylaminoethane, α -dimethylamino- γ -methylaminobutane, α -dimethylamino- β -methyl- γ -methylaminobutane and α -dimethylamino- β -diethylaminoethylaminoethane.

Aminoalkylarylcarbinol. E. MERCK CHEMISCHE FABRIK. Ger. 469,782, Nov. 11, 1926. Amino- and N-alkylaminoalkylarylcarbinols are prep'd. by hydrogenating the corresponding ketones in the presence of a Ni catalyst. In an example, an aq. soln. of the HBr compd. of ω -N-methylaminoacetophenone is shaken with H in the presence of Ni, giving phenylethanolmethylamine, m. 77° . Similarly, phenylethanolamine, m. 40° , is prep'd. from ω -aminoacetophenone, and α -N-methylaminoethylphenylcarbinol, m. 189.5° , from α -N-methylaminopropiophenone ($\text{C}_6\text{H}_5\text{CO.CH}(\text{NH.CH}_3)\text{CH}_3$).

Mono- and polyhydric alcohols. JOHANNES MÜLLER and ULRICH HOFFMANN (to I. G. Farbenind. A.-G.). Can. 286,095, Jan. 1, 1929. A crude reaction mixt. of the condensation products of org. aliphatic compds. contg. at least one carbonyl group is hydrogenated in the presence of a catalyst comprising at least one heavy metal selected from the 1st and 8th groups of the periodic system. The hydrogenation can be carried out with or without applying pressure, and at ordinary or elevated temp., but it is preferable to work at a pressure of about 20 to 30 atm. and at a temp. of about 50° .

Azo compounds. THE PYRIDIUM CORP. Fr. 643,446, Nov. 7, 1927. Diazotized PhNH_2 is coupled with α, α -diaminopyridine in solns. of not less than 6% of HCl at a temp. higher than 12° . Two isomers, phenylazo-(β)- α, α -diaminopyridine, m. 203° , and phenylazo-(γ)- α, α -diaminopyridine, m. 135° , are formed and they may be sep'd. by fractional crystn. from boiling water. The mixt. is referred to as *pyridium* and has dyeing and therapeutic properties. If a relatively small quantity of mineral acid or an org. acid is used phenyldiazoamino-(α)- α -monoaminopyridine is formed and this by boiling with water or an aromatic amine is converted into pyridium. Analogous compds. are produced if PhNH_2 is replaced by toluidine, phenetidine, anisidine, etc. The diaminopyridine is obtained by heating pyridine with NaNH_2 and a method of purification of this compd. with trichloroacetic acid is described.

Benzyl ethyl phthalate or similar aryl alkyl esters. ROBERT H. VAN SCHAAK, JR. (to Van Schaack Bros. Chemical Works). U. S. 1,700,960, Feb. 5. Esters of this type (which are suitable for use with pyroxylin as plasticizers for lacquer films or as camphor substitutes in celluloid-like compns.) are obtained by the reaction of equimol. proportions of the polycarboxylic acid and of each of the 2 alcs. the radicals of which are desired in the finished mixed ester to be produced. Benzyl ethyl *o*-phthalate, *b*₂, 199°. In forming various mixed esters, alcs. such as MeOH, PrOH, *n*-BuOH or iso-AmOH may be used with benzyl, tolyl or phenethyl alc. or the like and with phthalic acid or anhydride or succinic, citric or phenylmalonic acid. Details and modifications of methods of making the esters are described and formulas of pyroxylin compns. contg. them are given.

Glycol esters, etc. I. G. FARBENIND. A.-G. Brit. 292,059, Jan. 31, 1927. Alkylene oxides are heated with org. carboxylic acids in the presence of an inorg. acid such as H₂SO₄ or an acid salt such as NaHSO₄ or a salt of a strong base with an org. acid other than that to be esterified. The reaction may be effected under pressure and an example is given of the production of glycol monoacetate by passing ethylene oxide into hot HOAc contg. H₂SO₄. Cf. C. A., 23, 610.

Hydrolysis of esters. EUGENE F. AYRES, JR., and ERLING H. HAABESTAD (to The B. A. S. Co.). Can. 286,076, Jan. 1, 1929. Amyl chloride is hydrolyzed by heating a substantially water-insol. fatty acid, amyl chloride and aq. NaOH in a closed vessel at 150° and thereby producing an org. ester, then heating in a closed vessel at substantially the same temp. the ester and additional quantities of amyl chloride and aq. caustic soda and sepg. amyl alc. from the resulting product.

Formation of esters and intermediate products. EUGENE F. AYRES, JR., and ERLING H. HAABESTAD (to the B. A. S. Co.). Can. 286,077, Jan. 1, 1929. (CH₂Cl)₂ is warmed in an open vessel with Na stearate at a temp. below the boiling point of the org. halide for the purpose of producing a gel. The gel is then placed in an enclosed vessel and heated to a temp. that will give the desired velocity of reaction, *e. g.*, about 150°. After the gel has been maintained at such temp. for about 1 hr. the contents of the vessel will consist of ethylene stearate together with a small quantity of soap, or a small quantity of halide which may have been present in mol. excess, and salt water.

Benzanthrone derivatives. I. G. FARBENIND. A.-G. Fr. 643,266, Nov. 2, 1927. *Bz*-1-methoxybenzanthrone is prepd. by treating with MeOH in the presence of alk. agents *Bz*-11-nitrobenzanthrone or its derivs., with or without the addn. of substances capable of destroying the HNO₂, or other benzanthrone substituted in the *Bz*-1-position by a neg. atom or group or their derivs. Examples are given of the prepn. of *Bz*-1-methoxybenzanthrone, 6-chloro(or bromo)-*Bz*-1-methoxybenzanthrone, 6-nitro-*Bz*-1-methoxybenzanthrone, 6-methyl-*Bz*-1-methoxybenzanthrone and 8-chloro-*Bz*-1-methoxybenzanthrone from the corresponding nitro, chloro or bromo compds.

Purification of diarylguanidines. COMPAGNIE DE PRODUITS CHIMIQUES ET ÉLECTRO-MÉTALLURGIQUES ALAIS, FROGES ET CAMARGUE. Fr. 643,495, Apr. 5, 1927. Diarylguanidines are extd. from the crude material contg. them by dissolving in an appropriate org. solvent, in the presence of NH₃ under pressure, restoring the soln. obtained to atm. pressure to obtain the diarylguanidine in crystal form. An example is given of the treatment of diphenylguanidine with trichloroethylene.

Naphthalene and acenaphthene derivatives. I. G. FARBENIND. A.-G. Fr. 642,907, Oct. 22, 1927. Diacyl derivs. of C₁₀H₈ and of acenaphthene are prepd. by acting on the hydrocarbons or their monoacyl derivs. or their compds. produced by the action of AlCl₃ with an aromatic or aliphatic acid chloride, if necessary with the addn. of more AlCl₃, and with or without a diluent. In examples, α -benzoynaphthalene is mixed with H₂Cl and AlCl₃ is added gradually, the temp. gradually rising. About 60% of 1,5-dibenzoynaphthalene is obtained, and about 20% of an isomer, probably the 1,8-compd. A diacetylenaphthene is prepd. from 5-acetylenaphthene by means of AcCl and AlCl₃, and a new 3,5-di(chloroacetyl)acenaphthene, *m.* 194–195°, is obtained from acenaphthene, CH₃COCl and AlCl₃. Cf. C. A., 23, 1137.

Thio ethers of the anthraquinone series. I. G. FARBENIND. A.-G. (Filip Kačer, inventor) Ger. 469,911, Feb. 3, 1927. Addn. to 460,087. Thio ethers are prepd. by reaction of a diazo compd. of the anthraquinone series with a mercaptan not of the anthraquinone series. In examples, 1-nitro-2-methylanthraquinone is converted into anthraquinone-1,2-isoxazole by the process of Ger. 360,422, and this is converted into 1-diazoanthraquinone-2-carboxylic acid by Ger. 456,859, and a soln. of 2,5-dichloro-1-mercaptopbenzene in water with NaOH is run in. Anthraquinone-1-thio-2',5'-dichlorophenyl-2-carboxylic acid is obtained. If thioglycolic acid is used, anthra-

quinone-2-carboxy-1-thioglycolic acid is obtained. Similarly diazotized 1,5-diamino-anthraquinone and *p*-thiocresol give di-*p*-tolyl ether of anthraquinone-1,5-dimercaptan.

2-Acylamino-9,10-anthrahydroquinones and derivatives. I. G. FARBENIND. A.-G. Fr. 643,243, Oct. 29, 1927. The above compds. and their derivs. contg. substituents in place of H in the 9,10 positions are prepd. by treating 2-acylaminoanthraquinones in soln. or suspension by H under pressure and in the presence of an appropriate metallic catalyst. In examples, 2-acetamidoanthraquinone in suspension in alc. or water and in the presence of Ni is treated with H under 20 atm. By methylating the product with Me_2SO_4 , the dimethyl ether of 2-acetamido-9,10-anthrahydroquinone is obtained, m. 253°. By sulfonating with ClSO_3H instead of methylating and then eliminating the acetyl group, the di-K salt of 2-aminoanthrahydroquinone-9,10-disulfonic acid ester is obtained. Similarly by a treatment of the hydroquinone with Na chloroacetate, 2-aminoanthrahydroquinone-9,10-diacetic acid is obtained.

1,8-Naphthoxyphenanthiophenes. I. G. FARBENIND. A.-G. Fr. 642,946, Oct. 24, 1927. 1,8-Naphthoxythiophenes are prepd. by heating at high temps. and under pressure 1,8-naphthothiolglycolcarboxylic acid and its derivs. substituted in the ring in an aq. soln. or suspension, preferably with the addn. of an electrolyte, such as NaCl. In examples, 1,8-naphthothiolglycolcarboxylic acid (I), m. 175–6°, is heated for some hrs. to 170–200° with water and NaCl. The 1,8-naphthoxyphenanthiophene (II) ppts. on cooling, m. 84–5°. The monobromo deriv. of I, m. 230° (by treating the acid dissolved in AcOH with Br), gives the monobromo deriv. of II, m. 130°.

Dissociation products. CHEMISCHE FABRIK AUF ACTIEN (vorm E. Schering). Fr. 642,944, Oct. 24, 1927. The prepn. of dissociation products of the ether-like condensation products of ketones with *m*- and *p*-cresols prepd. by Gaebel (*Diss*, Marburg 1903) is described; metals or metal compds. are used as catalysts. In examples, the condensation product of *m*-cresol and acetone is passed in a slow current over a layer of franconite, or SiO_2 gel charged with Ni, heated to about 300°. Dimethylcoumarin and 3-methyl-6-isopropylphenol are obtained. 4-Methyl-6-isopropylphenol and dimethylcoumaran are obtained in the same way from the condensation product of *p*-cresol and acetone.

Sodium-nitrogen compounds. DEUTSCHE DOLD-UND SILBER-SCHIEDANSTALT VORM. ROESSLER. Brit. 293,040, July 1, 1927. Na-N compds. are prepd. by the action of Na or K hydride on amino or imino compds. with or without a diluent such as toluene. Examples are given of the prepn. of the mono-Na compds. of aniline, monomethylaniline, diphenylamine, acetamide, urea, guanidine, phthalimide, succinimide, diacetamide and phenylthiourea and of the di-Na compds. of urea and guanidine. Similar reactions also may be effected with *o*- and *p*-toluidine, xylydine, α -naphthylamine, *p*-chloroaniline and benzamide; the employment as parent materials of carbazole, benzidine, α -aminopyridine, *p*-aminoacetophenone, aminotriazole and aminothiazole is also mentioned.

Molybdates. ALAN KISSOCK. Fr. 643,361 Nov. 4, 1927. Molybdenite is roasted to obtain MoO_3 which is mixed with CaO and heated to about 760° giving MoO_4Ca . The CaO is preferably added at a speed proportional to the transformation of the sulfide into MoO_3 . Cf. C. A. 22, 2444.

Alkyl ethers of 3'-nitro-4'-hydroxy- α -benzoylbenzoic acid. THE NEWPORT CO. Fr. 642,796, June 24, 1927. The above ethers are prepd. by treating 3'-nitro-4'-chloro- α -benzoylbenzoic acid with an alc. and a caustic alkali. Examples are given of the prepn. of the Me and Et ethers.

Concentrating fatty acids. HERMANN SUIDA. Austrian 111,575, July 15, 1928. The methods of prepg. concd. AcOH from dil. or crude AcOH described in Austrian 100,721 and 106,231 (see Brit. 218,271, C. A. 19, 523 and 230,447, C. A. 19, 2272) are applied to homologs of AcOH, e. g., PrCOOH .

Arylsulfonic acids derivatives. I. G. FARBENIND. A.-G. Fr. 33,204, Mar. 18, 1927. Addn. to 613,777. Arylsulfonic acids in an extremely anhyd. state are treated with chlorosulfonic acid in the presence of a higher alc. or alicyclic alc. In an example C_{10}H_8 , which has been sulfonated with ClSO_3H is treated at 60–70° with BuOH and ClSO_3H . The product is converted into its Na salt and is used as a wetting or emulsifying agent.

β -Naphtholsulfonic acids and salts. MOSES L. CROSSLEY and GEORGE S. SIMPSON (to Calco Chemical Co.). U. S. 1,701,259, Feb. 5. A soln. contg. β -naphthol-disulfonic acids, such as the mixt. produced by sulfonating β -naphthol is treated with an alk. earth metal compd. such as CaO to form salts with the acids, solids are removed by filtration, and the filtrate is treated with the hydroxide of an alkali-forming metal such as NH_4OH by which the neutral salts are converted into basic salts; after frac-

tional crystn. of the less sol. salt such as the Ca salt of "R acid," the mother liquor is treated with an NH_4 salt of an acid forming an insol. salt with the alk. earth metal such as $(\text{NH}_4)_2\text{SO}_4$, the insol. salt formed is removed by filtration and the soln. is concd. by evapn. to effect crystn. of the NH_4 salt of the β -naphtholdisulfonic acids; the sepd. mother liquor is returned to a subsequent batch mixt. to remove residual salts which it may contain.

Benzanthronecarboxylic acids. I. G. FARBENIND. A.-G. Fr. 642,826, Sept. 17, 1927. The above are obtained by oxidizing alkylbenzanthrones in the presence of an alk. agent. In examples, *Bz*-1-methylbenzanthrone is heated to about 150° in PhNO_2 with powd. KOH; on cooling and filtering the K salt of the corresponding acid is obtained. Similarly, 2-methylbenzanthrone and *Bz*-2-methylbenzanthrone are converted into the corresponding acids.

Benzanthraquinone-*peri*-dicarboxylic acids. I. G. FARBENIND. A.-G. Fr. 642,662, Oct. 21, 1927. The above, their derivs. and substitution products are obtained by treating the corresponding (*o*-carboxybenzoyl)naphthalic acids with acid condensing agents. In examples, 4-(*o*-carboxybenzoyl)naphthalic acid, m. 232° (*Ann.* 327, 101), is heated to 170 – 200° with concd. H_2SO_4 . The mass is poured into water and 1,2-benzanthraquinone-*peri*-dicarboxylic acid is pptd. Acenaphthene is condensed in CS_2 with 3,6-dichlorophthalic anhydride by means of AlCl_3 , giving acenaphthoyl-5,3',6'-dichlorophenyl-*o*-carboxylic acid. By oxidation, naphthalic anhydride-4-benzoyl-3,6-dichloro-*o*-benzoic acid is obtained. By condensing, 1,2-benzanthraquinone-5,8-dichloro-*peri*-dicarboxylic acid is obtained. Other examples are given.

Extracting acetic or other aliphatic acids from aqueous solutions. SOCIÉTÉ ANON. DES DISTILLERIES DES DEUX-SÈVRES. Brit. 290,992, May 23, 1927. In extn. with an acetic ester as described in Brit. 273,744 (*C. A.* 22, 1980), a hydrocarbon is mixed with the acetic ester; *e. g.*, a mixt. of EtOAc 75% and C_6H_6 25% may be used. Toluene, xylene and petroleum fractions similar to "petrol" also may be used.

Acetic acid. HERMANN SUIDA. AUSTRIAN 111,566, July 15, 1928. Concd. AcOH is prepd. from dil. or crude AcOH by extg. the vapors with a water-insol. solvent of high b. p., *e. g.*, cresol, in conjunction with a water-insol. solvent of low b. p. contg. $\text{C}_2\text{H}_5\text{Cl}$, CHCl_3 , CCl_4 or $\text{C}_2\text{H}_5\text{Cl}_2$. Suitable app. is described. Cf. *C. A.*

23, 4

Acetic anhydride. CONSORTIUM FÜR ELEKTROCHEMISCHE INDUSTRIE G. M. B. H. Brit. 282,114, Oct. 10, 1927. AcOH is strongly heated in the presence of small quantities of cond. catalysts, preferably feebly acid minerals which are volatile at the temp. of the reaction. In an example, P or phosphoric acid is mixed with AcOH , and passed through a horizontal tube of C elec. heated to 650° . The condensed liquid contains over 40% Ac_2O . Alkyl esters of phosphoric acid, HCl and H_3BO_3 may also be used, and the process may be combined with that of Fr. 563,452 and Ger. 417,731 in which solid catalysts are used. Cf. *C. A.* 22, 2755.

Acetic anhydride. CONSORTIUM FÜR ELEKTROCHEM. IND. GES. Swiss 127,521, May 20, 1927. AcOH vapor, heated to between 400 – 800° , is maintained at the temp. most suitable for the formation of the anhydride and treated with a catalyzer, such as molten alkali phosphate.

***o*-Amino-*o*-benzoylbenzoic acid.** THE NEWPORT CO. Fr. 642,932, Oct. 24, 1927. See Brit. 282,001 (*C. A.* 22, 3669).

***o*-Nitrochlorobenzene-*p*-sulfonic acid.** HOMER W. HILLYER (to National Aniline & Chemical Co.). U. S. 1,701,367, Feb. 5. Chlorobenzene-*p*-sulfonic acid is treated in the presence of H_2SO_4 with a nitrating agent such as HNO_3 in substantially the quantity theoretically required for the nitration, at a temp. of about 30 – 50° .

***o*-(Dimethylamino)- α -dihydroxyanthraquinonedisulfonic acids.** ROBERT E. SCHMIDT and WILLY TRAUTNER (to Grasselli Dyestuff Corp.). U. S. 1,702,022, Feb. 12. An α -diamino- α -dihydroxyanthraquinonedisulfonic acid is treated with about 5 mol proportions of CH_3O (suitably at a temp. of 95°).

Acetylene. I. G. FARBENIND. A.-G. Fr. 643,387, Nov. 5, 1927. Gases contg. C_2H_2 are enriched in this constituent by washing the gas mixt. under pressure with water or an aq. soln. In an example a gas contg. CH_4 17, H_2 80 and C_2H_2 3% is washed in a tower with water under 25 atm. pressure. The gas leaving the tower contains CH_4 17, H_2 80% and the water liberates a gas when the pressure is removed contg. 70% of C_2H_2 .

Acetone. HOLZVERKOHLLUNGS-INDUSTRIE A.-G. Fr. 642,111, Oct. 8, 1927. In the prepn. of Me_2CO from C_2H_2 and steam, substances such as metallic Fe, MnO_2 , Al_2O_3 , BaCO_3 , ZnCO_3 , are added to the usual oxide of Fe catalyst.

Diacetone alcohol. CARLETON ELLIS (to Ellis-Foster Co.). U. S. 1,701,473, Feb.

5. Acetone is treated with about 0.01–0.02% of alkali metal hydroxide in the absence of other solvent and reaction is permitted at a temp. not substantially over 30°; the alkali is then neutralized and the diacetone alc. formed is recovered by fractional distn.

Synthesis of methanol. LEONARD A. STENGEL (to the Commercial Solvents Corp.). Can. 286,288, Jan. 8, 1929. H and C oxides are passed in contact with liquid methanol under pressure, the gases are heated by thermal contact with the hot gases from the reaction, and contacted with a heated catalyst to produce methanol, the gases are cooled and the methanol formed is removed, the residual gas is combined with fresh gas, and the cycle is repeated.

Synthesis of methanol. WILLIAM J. EDMONDS (to The Commercial Solvents Corp.). Can. 286,289, Jan. 8, 1929. In the manuf. of methanol by the interaction of H and CO₂ in the presence of a catalyst and under elevated pressure and temp., the concn. of CO₂ in the gas in contact with the catalyst is maintained below 11%.

Synthesis of methanol. WILLIAM J. EDMONDS and LEONARD A. STENGEL (to Commercial Solvents Corp.). Can. 286,290, Jan. 8, 1929. Methanol is made by circulating gas contg. a ratio of H to CO₂ far greater than the theoretical proportions required for the reaction, while the reaction pressure is maintained by adding a gas contg. C oxides and H in substantially theoretical proportions.

Catalysts for methanol synthesis, etc. SYNTHETIC AMMONIA & NITRATES, LTD., and R. G. FRANKLIN. Brit. 293,056, Dec. 23, 1926. Catalysts suitable for promoting the interaction of CO and H are prepd. by heating a mixt. of basic Zn and Cr carbonates. Several examples are given. Cf. C. A. 23, 851.

Butyl alcohol and its homologs. ÉDOUARD J. S. BARBE. Fr. 642,689, Mar. 23, 1927. BuOH or its homologs is prepd. by treating a salt of the corresponding acid, e. g., Ca butyrate, with a reducing agent such as Ca formate to obtain the corresponding aldehyde and hydrogenating. An inert substance such as sand or CaCO₃ may be mixed with the reagents.

Menthol. REINISCHE KAMPFER FABRIK G.M.B.H. Fr. 33,127, Jan. 22, 1927. Addn. to 627,694. Inactive menthol, the racemate of natural menthol, is prepd. by submitting solid inactive isomenthol to an isomerization with the aid of hydrogenation catalysts such as Ni and H under pressure or not, with the addn. if necessary of thymol, inactive menthone or isomenthone, the product being sepd. by solidification or distn.

***o*-(β-Hydroxyethylamino)phenol.** I. G. FARBENIND. A.-G. Brit. 292,950, June 27, 1927. *N*-(β-hydroxyethyl) derivs. of *o*-aminophenol are made by condensing the latter with a halohydrin of glycol such as ethylenechlorohydrin in the presence of an acid-binding substance such as CaCO₃. The products are extd., after filtering, with EtOAc. The Na compd. of the *o*-[bis(β-hydroxyethyl)amino]phenol and the *o*-*o*-(β-hydroxyethylamino)phenol sulfate are readily prepd. from solns. of the bases in acetone, by use of NaOH and H₂SO₄, resp. Cf. C. A. 22, 3362; 23, 1143.

Purifying anthraquinone. HARRY F. LEWIS (to National Aniline & Chemical Co.). U. S. 1,701,186, Feb. 5. Crude anthraquinone is heated to 275–350° by circulating superheated steam in indirect contact with it and then into direct contact to effect sublimation, and the resulting vapors are cooled first at an elevated temp. to sep. anthraquinone from them and then at a lower temp. to sep. other constituents. An app. is described.

2,4-Dimethyl-6-ethoxyquinoline. HANS T. CLARKE and ERNST R. TAYLOR (to Eastman Kodak Co.). U. S. 1,701,144, Feb. 5. *p*-Phenetidine is treated with acetone in the presence of I to produce *p*-ethoxyacetoneanil and the latter is heated with HCl to convert it into 2,4-dimethyl-6-ethoxyquinoline.

2-Hydroxy-3-carboxynaphthalene salts. ERWIN SCHWENK. U. S. 1,700,546, Jan. 29. In forming alkali metal salts of 2-hydroxy-3-carboxynaphthalene, an alkali metal salt of 2-hydroxy-1-carboxynaphthalene is heated to above 200°.

Chloronaphthalene. FERDINAND JEAN. Fr. 642,681, Mar. 22, 1927. C₁₀H₇Cl, preferably prepd. by bubbling liquid Cl into melted crude C₁₀H₈, is used as a fuel either for motors or mixed with mazout for furnaces or as a lubricant.

Calcium formaldehydesulfoxylate. I. G. FARBENIND. A.-G. Fr. 643,012, Oct. 27, 1927. See Brit. 281,134 (C. A. 22, 3418).

Hydrogenation of the homologs of aniline. WILHELM LOMMEL and THEODOR GOOSER (to I. G. Farbenind. A.-G.). Can. 286,301, Jan. 8, 1929. Homologs of aniline can be hydrogenated on a technical scale and with a satisfactory yield by the action of H at elevated temp. and pressure in the presence of a catalyst contg. a substance of the group comprising Cu, metals of the Pt and Fe group of the periodic system, and suitable oxides and salts of these metals, e. g., Pt, Ni, Co, Co or Ni oxide, Co formate, Ni oxalate, etc. The time of hydrogenation varies within wide limits depending on

the nature of the catalyst, the temp., pressure and quantity of H to be combined with the starting material.

Sterols. SOCIÉTÉ ANON. POUR L'INDUSTRIE CHIMIQUE À BALE. Brit. 292,133, June 14, 1927. Sterols such as ergosterol are obtained from materials such as yeast by heating under pressure with an alk. soln. such as an alk. hydroxide or carbonate, e. g., yeast may be heated in an autoclave for several hrs. with a strong soln. of KOH. Most of the sterols sep. on the surface of the liquid and are skimmed, the skimmed material is extd. with ether and the exts. washed with water, dried with Na_2SO_4 and evapd. to effect crystn. of the sterol. Further recovery of sterol may be effected by extn. with ether of the alk. liquid.

Hydrogenation of phenol-ketone condensation products. SCHERING-KAHLBAUM A.-G. Brit. 293,001, June 29, 1927. Phenols and their hydrogenation products are obtained by catalytic hydrogenation of the etheric condensation products of alkylated phenols and ketones other than those employed in the process described in Brit. 280,956 (C. A. 22, 3499). Examples are given of the hydrogenation of dimethylcoumaran (which produces thymol and its isomers or menthol and its isomers, according to the conditions and duration of the treatment) and of the hydrogenation of the condensation product of α -naphthol and acetone (which produces a mixt. of isopropynaphthol, naphthol, isopropynaphthalene and naphthalene or their hydrogenation products).

11—BIOLOGICAL CHEMISTRY

PAUL E. HOWE

A—GENERAL

FRANK P. UNDERHILL

Molecular weight of the hemocyanin of *Limulus polyphemus*. THE SVEDBERG AND FRANCIS F. HEYROTH. Univ. of Upsala. *J. Am. Chem. Soc.* 51, 539-50(1929).—Measurements of the mol. wt. of the hemocyanin of the horseshoe crab, *Limulus polyphemus*, have been made in dil. phosphate buffer soln. at p_H 6.63 in concns. of 0.03-0.09% of protein by the sedimentation velocity and the sedimentation equil. methods in the ultracentrifuge. Both methods indicate that at concns. of about 0.06-0.1% the protein undergoes decompn. The existence of this decompn. has been confirmed by measurements of the ultra-violet absorption, as the values of ϵ/c increase with diln. in this range of concn. The decompn. is largely, if not completely, reversible and a protein of the same mol. wt. and ϵ/c as that originally used may be pptd. from the dil. solns. by removing electrolytes by dialysis. The sedimentation velocity method indicates for the hemocyanin a probable mol. wt. of 2.04×10^6 under the conditions described.

C. J. WEST

Influence of the hydrogen ion activity upon the stability of the hemocyanin of *Helix pomatia*. THE SVEDBERG AND FRANCIS F. HEYROTH. Univ. of Upsala. *J. Am. Chem. Soc.* 51, 550-61(1929).—The variations of the sp. sedimentation velocity and the diffusion const. of the hemocyanin of *Helix pomatia* have been measured over the range of p_H from 3.8 to 8.2. Hemocyanin in 0.089% concn. in dil. acetate and phosphate buffer solns. from p_H 4.5 to 7.4 possesses a mol. wt. of 5 million. As these limits of p_H are approached, the protein mols. become hydrated and as the limits are exceeded rapidly undergo disintegration into smaller particles of undetd. magnitude. The acid disintegration is in its earliest stages reversible but the disintegration of the products first formed continues slowly and is in its later stages irreversible. The p_H ranges within which the disintegration occurs are the same as those within which the viscosity of snail serum is known to increase rapidly.

C. J. WEST

The mode of action of enzymes or enzyme systems. A. FODOR WITH LEA FRANKENTHAL AND SONJA KUK. Univ. Jerusalem. *Fermentforschung* 10, 274-301(1928).—The phenomena of varying the activity of enzymes after autolysis, adsorption and elution are explained on the basis of an exchange of "carriers" to which the hypothetical "zymoactive substance" is bound. In fresh yeast maceration the carrier is obviously a protein whose affinity for the zymoactive substance is relatively great, and the active component of the system is dislodged only with difficulty by the substrate. Adsorption on kaolin decreases the apparent activity by introducing an addnl. carrier of relatively great affinity. The filtrate from the adsorbate is still active because it contains zymoactive substance dislodged from protein but united to other carriers, the so-called concomitants (Hegleitstoffe). When the 1st adsorbate is extd. with glycine an elution is

obtained with greater activity than the adsorbate itself. An exchange of carriers has thus been effected in which a colloid has been replaced by a sol. substance giving not only a higher degree of dispersion but also a less stable union which is easily dislocated by the substrate. The enzyme complex has been changed from a "zymostable" to a "zymolabile" form with increased activity. A 2nd adsorbate obtained by treatment of this eluate with kaolin shows very little decrease in activity, because protein is no longer present, and the substrate can combine with the zymoactive substance with the same facility as when the carrier is glycine. Different types of carriers are responsible for different intensities of enzyme activity; this assumption easily explains variations in activity formerly attributed to activation and destruction of enzyme. Enzyme activity, expressed in terms of substrate cleavage, represents in reality the dislocation velocity of carrier by substrate. The increase in activity when a maceration is allowed to age is merely a matter of autolysis whereby the protein carrier is broken down and the cleavage products assume the role of carrier, the enzyme system thus changing from the zymostable to the zymolabile type. The activating effect of adding an amino acid to the macerate is an analogous phenomenon. The substrate must, however, be present in excess, since the final exchange of carriers follows the law of mass action. This explains also the fact that addn. of amino acid to autolyzed macerate is less effective than addn. to fresh macerate. The difference in behavior of the peptidase in maceration of yeast and in that of peas is due to the more rapid autolysis of the latter, thus rendering the glycine elution impracticable since amino acids from the autolysis are already functioning as carriers. A study of the influence of neutral salts on the cleavage of Witte-peptone by yeast and pea maceration shows that the lyotropic order of ions, SO_4 , AcO and Cl , becomes reversed when the reaction of the medium is changed from acid to faintly alk. In the glycine eluate, however, or after extensive autolysis the lyotropic order disappears and the Cl ion appears to exert a sp. action. The SCN ion has a sp. inhibitory action in all cases. Many phenomena of enzyme chemistry may be explained on the basis of "carrier" exchange, e. g., regeneration, stability and instability, activation of papain by HCN , the Abderhalden reaction between serum and sp. tissues, and finally the so-called zymogens or enzyme precursors.

A. W. DOX

Succinic acid as a putrefaction product in cadavers. L. VAN ITALLIE AND A. J. STERNHAUER. Univ. Leiden. *Pharm. Weekblad* 66, 14-5(1929).—Succinic acid was isolated from stomach contents, liver, brain and spleen of cadavers in incipient putrefaction, and identified by m. p. and sublimation of the free acid, and cryst. form of its Pb salt.

A. W. DOX

Sex differences of proteins in animals and plants. II. Sex differences of muscle fiber. T. TADOKORO, M. ABE AND S. WATANABE. Hokkaido Imp. Univ., Sapporo. *J. Faculty Agr. Hokkaido Imp. Univ.* 23, 1-12(1928); cf. *C. A.* 22, 1181.—Muscle freed from tendon, skin and fat was mashed in a mortar, treated with 2 vols. of physiol. NaCl soln., shaken 2 hrs. and settled 24 hrs. in an icebox. The mixt. was filtered through linen, the juice pressed out and the whole process thrice repeated. The pressed cake was washed with distd. H_2O until free from Cl , mounted into 70% EtOH for 24 hrs., then successively into 95% and abs. EtOH and finally preserved over H_2SO_4 in a desiccator for use. The acidity of the solns. which were produced by the muscle fibers of bull, cock, boar, male rabbit, male wild duck, male codfish and male hatahata (*Arctoscopus japonicus*) is always greater than that of the corresponding female muscle fibers. The existence of P in the muscle fibers of different animals was observed to be about 20% of the amt. of S%. There was, however, a tendency to find the higher S and the lower P content in the male muscle fibers of the bull, cock, boar, rabbit, wild duck, codfish and hatahata as compared with the corresponding female muscle fiber. By use of Van-Slyke's method, male muscle fiber of the different animals contained a predominance of arginine and lysine N while in the female muscle fiber there is an excess of monoamino and histidine N. The development of acidity in neutral salt solns. in the presence of male and female muscle fibers showed a corresponding tendency in the oryzenine of common and glutinous rice. The p_H value of the salt soln. produced by the male muscle fiber and by oryzenine of common rice is always less than that produced by female muscle fibers and by the oryzenine of glutinous rice. That is, the former 2 produced a greater acidity than that of the latter 2. Differences of the amino acid, S and P content were observed between male and female muscle fiber with the same tendency as in the oryzenine of common and glutinous rice. In male muscle fiber and oryzanin of common rice, there is a predominance of arginine and lysine while in the female muscle fiber and oryzanin of glutinous rice, there is an excess of monoamino acid and histidine N. Higher S content and lower P contents existed in the male muscle fibers and oryzanin of common rice. III. Sex differences of muscle proteins. *Ibid* 13-27.—Nu-

merous data show that the ash and P contents of female myosin and myogen are always greater than those of male. This explains the greater retention of H_2PO_4 in the female body. The isoelec. point of the female myosin and myogen is always more acidic, i. e., the p_H value is lower than that of the male. The rotatory power of male myosin and myogen is always greater than that of female. This fact constitutes another of the remarkable differences between the proteins of the 2 sexes. With male muscle, myosin and myogen as well as serum albumin and globulin, the quantity of HCl combined is always greater than with female. The content of free amino N of the male myosin and myogen is always superior to that of the female. The quantity of the latter is about 80–90% of the former. In male myosin and myogen there is a predominance of arginine and lysine form of N, while in the female there is an excess of monoamino and histidine forms of N. The quantities of arginine N in the female proteins are about 85% of those of the male, lysine N, 82%, while monoamino N of the male muscle proteins is about 95% of the female, and histidine N approx. 65%. As the N content of the Ac compd. of male muscle myosin and myogen as well as serum albumin and globulin surpasses that of the female and the Ac group is the reverse, a very significant difference is observed in the ratios of the Ac group to N. C. R. F.

Blood catalase. ERICH SCHILLING. *Klin. Wochschr.* 7, 2202(1928).—Blood catalase decomposes H_2O_2 so that the latter cannot injure the tissues. It is assumed, of course, that H_2O_2 is produced during the process of normal metabolism. M. H.

Observations on the function of peroxidase systems and the chemistry of the adrenal cortex. Description of a new carbohydrate derivative. ALBERT SZENT-GYORGYI. Biochem. Lab., Cambridge. *Biochem. J.* 22, 1387–409(1928); cf. *C. A.* 22, 1165.—If H_2O_2 is added to the juice of a peroxidase plant, the first quantity of the peroxide is used up for the oxidation of a "reducing factor (R. F.); this oxidation of the R. F. is catalyzed by the peroxidase. The oxidized R. F. is reduced again by other oxidizing systems. The adrenal cortex contains a reaction isomer of glucuronic acid (1) (A) can also be obtained from oranges and cabbages and forms an essential part of R. F. (A) is autoxidizable; this autoxidation is catalyzed by Cu and inhibited by cyanide. In the presence of a peroxidase and a phenol the H_2O_2 generated by other oxidizing systems can be used for the oxidation of the hexuronic acid. The oxidized hexuronic acid is reduced by the glutathione system. BENJAMIN HARROW

Note on the reduction of the disulfide group by enzyme systems. KENNETH A. C. ELLIOTT. Biochem. Lab., Cambridge. *Biochem. J.* 22, 1410–2(1928).—Neither dithiondiglycollic acid nor glutathione is reduced by succinoxidase and succinic acid. BENJAMIN HARROW

Oxidation of biosterol by ozone. ZIRO NAKAMIYA. *Bull. Inst. Phys. Chem. Research Japan* 7, 1211–43(1928); *Abstracts* 1, 116–7.— O_3 is passed through a cold soln. of biosterol in $CHCl_3$. The ozonides are sepd. into two portions by fractional solv. in petroleum ether. Both fractions give the same hydrolysis products: H_2O_2 , CO_2 , AcH , an acidic oil resembling a sesquiterpene alc., HCO_2H , $HCHO$, $AcOH$, diacetyl and $PrCHO$. Two more compds. were obtained, one having the compn.: C=67–72%, H=9–10%, while the other was acidic in character and had the compn. C=63–65%, H=8–9%. These compds. are supposed to be formed by polymerization of the primary oxidation products. ALBERT L. HENNE

William J. Gies fellowship in biological chemistry at Columbia University. FREDERICK G. GOODRIDGE, PAUL E. HOWE, WILLIAM B. DUNNING AND LEUMAN M. WAUGH. *Dental Research* 8, 679–86(1928).—An account of the history and purposes of this fellowship. JOSEPH S. HEPBURN

Recent advances in science: Biochemistry. R. KEITH CANNAN. Univ. London. *Science Progress* 23, 395–404(1929).—A review of recent work on the physiol. action of drugs, the occurrence of unsatd. hydrocarbons in animal fats, the chemistry of the tyrosinase reaction, and the acid-base relations of proteins. JOSEPH S. HEPBURN

The meaning of blood groups. B. BREITNER. *Naturwissenschaften* 16, 849–56(1928). A review dealing with the significance of blood groups for transfusion, for heredity, criminology, etc. B. J. C. VAN DER HOEVEN

The results of Naegeli's micelle theory in the study of organisms. W. J. SCHMIDT. *Naturwissenschaften* 16, 900–6(1928).—A review of the micellar structure of several biological materials. Photographs are reproduced of unpublished results on the study in polarized light of chromatin threads from isotropic nuclei of *Thalassiosira* (a radiolary); details of their structure are discussed. A few literature references are given. B. J. C. VAN DER HOEVEN

The stereochemical specificity of proteolytic enzymes. E. WALDSCHMIDT-LEITZ AND H. SCHLATTER. *Deut. Tech. Hochschule Prag. Naturwissenschaften* 16, 1026–

7(1928); cf. *C. A.* 22, 93.—Fischer's rule that only those peptides can be split by enzymes which are built up of the naturally occurring amino acid antipodes was found to be incomplete. By means of tryptic hydrolysis of a tyrosine tripeptide, *dl*-leucylglycyl-*l*-tyrosine, and of its synthetic predecessor *dl*-bromisocaproylglycyl-*l*-tyrosine, it was found that hydrolysis is complete (tyrosine sepn.) for both the *d*- and the *l*-leucine-contg. peptides. Hydrolysis by erepsin which attacks the free amino group (trypsin attaches itself to the carboxyl substrate) is, however, asymmetric. Apparently the location of enzyme attack decides about symmetric or asymmetric hydrolysis; the configuration of other groups present is immaterial. The method is valuable for the study of enzyme attack.

B. J. C. VAN DER HOEVEN

The theory of blood clotting. E. WALDSCHMIDT-LEITZ, P. STADTLER AND F. STEIGERWALDT. Deut. Tech. Hochschule, Prag. *Naturwissenschaften* 16, 1027(1928).—From the behavior of hirudin, inhibitor for blood clotting, it is probable that this process is closely related to cleavage by pepsin or trypsin kinase. The hirudin action is due to binding of thrombin in the blood, the latter being considered as a proteolytic enzyme. Several other substances cleavable by trypsin kinase have the same inhibitive action toward thrombin; examples are natural zein, histone, protamines, synthetic acylated dipeptides (benzoyldiglycine, phthalylglycine, benzoylglycyltyrosine). At the same time the corresponding dipeptides (glycylglycine, glycyltyrosine, specific substrates of erepsin) are without inhibitive effect. The conclusion is that blood clotting is a proteolytic process with thrombin as enzyme. From the fact that other proteolytic enzymes, pepsin, trypsin, erepsin and papain, are without action on the clotting process, whereas activated pancreas trypsin (trypsin kinase) accelerates it, it is suggested that thrombin is closely related to this substance, perhaps identical with trypsin kinase. For 4 cc. goat blood the clotting rate was accelerated from 10 to 4.25 min. by 0.05 trypsin units to 1.0 min. by 0.5 units.

B. J. C. VAN DER HOEVEN

Oxidation-reduction systems of biological significance. II. The reducing effect of cysteine induced by free metals. L. MICHAELIS AND E. S. GUZMAN BARRON. Johns Hopkins Univ. and Marine Biol. Lab., Woods Hole. *J. Biol. Chem.* 81, 29-40(1929), cf. *C. A.* 23, 161.—Oxygen consumption can be induced in a cysteine soln. by the free metals, Fe, Cu, Hg, Pt, Ag and Au. Pt black is very active but bright or gray Pt is much less efficient. Au acts only when deposited electrolytically on Pt and then shows only a small effect. KCN does not alter the effect of Hg but inhibits strongly the action of Pt. In general Fe and Cu are active as catalysts as salts; Hg, Pt and Au are active as the free metal; Ag is inactive in either condition.

A. P. LOTHROP

The specificity of pancreatic secretin. M. M. WEAVER. Proc. Am. Physiol. Soc., *Am. J. Physiol.* 81, 517(1927).—Purified secretin injected intravenously stimulated the pancreas to secrete but had no action on the gastric glands.

J. F. L.

The changes in p_H of feces on standing. W. THUNE ANDERSEN AND A. NORGGAARD. St. Elizabeth's Hospital, Copenhagen. *Acta med. Scand.* 69, 393-8(1928).—From the changes in the p_H of feces kept at 37° it appears that they undergo fermentation with formation of acid split products. At the same time, but more slowly, feces also undergo putrefaction with formation of alk. split products. In different cases either one or the other process may predominate. Expts. were made with equal amts of homogenized feces with the addition of 10% of either starch, glucose, olive oil, casein or milk powder. The feces to which starch, glucose or milk powder were added showed a change in p_H always toward acidity; those to which olive oil or casein was added showed very generally a change toward alk.

S. MORGULIS

The complement of amylase. VII. JONAS BONDI. Chem. Inst., Univ. Berlin. *Biochem. Z.* 203, 88-94(1928).—Amylase from pancreas manifests complement activity when used with a peptic digest of egg albumin or tryptic digest of casein. The tryptic digest of egg albumin and of casein acts as a powerful activator of starch hydrolysis, the activator not being destroyed by alkaline fermentation. Besides, the complement action depends upon the amt. of egg albumin used.

S. MORGULIS

The concentration of enzyme iron in the cell. OTTO WARBURG AND FRITZ KUBOWITZ. Kaiser Wilhelm-Inst. für Biologie, Berlin-Dahlem. *Biochem. Z.* 203, 95-8(1928).—One g. baker's yeast (dry substance) contains less than 4×10^{-7} g. respiratory enzyme Fe. Since, however, baker's yeast per g. dry substance contains about 10^{-4} g. Fe the respiratory enzyme Fe is less than 0.004 of the total Fe.

S. MORGULIS

Separation of the enzymes of barley malt. III. Amylase and maltase. HANS PRINGSHEIM AND EDUARD THILO. Univ. Berlin. *Biochem. Z.* 203, 99-102(1928).—The extn. of the malt with glycerol instead of H₂O is recommended. An 87% glycerol soln. is used and the extn. continued for 3 days. The glycerol is removed by dialysis, leaving a very active amylase soln. free from maltase. The maltase can now be extd.

from the residue freed of amylase by 87% glycerol. However, it was not found possible by this procedure to sep. cellobiase from cellulose, or mannobiose from mannanase. Maltase could also be sepd. from amylase by extn. with glycol. Both methods of extn. yield maltase-free amylase, but not amylase-free maltase.

S. MORGULIS

Relation between the structure of egg white and its ability to form threads. J. JOCHINS. Universitäts-Kinderklinik, Kiel. *Biochem. Z.* 203, 142-6(1928).—The capacity to form threads is inherent in many biol. substances. Egg white has this in a very marked degree, this capacity depending upon the presence of special structures in the substance as can be proved by the following expts.: Egg white beaten to a foam loses this capacity to form threads; fibrillar coagula are obtained when a drop of egg white is allowed to fall through boiling water or when egg white drawn out in threads is made to clot; beaten egg white never yields fibrillar coagula.

S. MORGULIS

The reciprocal effect of proteins on their solubility. G. ETISCH, W. EWIG AND H. SACHSSE. Kaiser Wilhelm-Inst., Berlin-Dahlem. *Biochem. Z.* 203, 147-58(1928).—Part of the protein pptd. with $(\text{NH}_4)_2\text{SO}_4$ by $1/3$ satn. of serum goes back in soln. on washing out with this salt. This is only partly due to a change in electrolyte concn. Principally this is due to the fact that the protein remaining in soln. influences the ppt which, however redissolves in the absence of that protein. This can be demonstrated when the washing is carried out with $1/3$ satd. $(\text{NH}_4)_2\text{SO}_4$ to which protein is added. Serum albumin was found especially effective. Furthermore, this protein effect increases with its concn. It follows, therefore, that in fractionating native serum by $1/2$ satn. with $(\text{NH}_4)_2\text{SO}_4$ one obtains 2 types of protein; one sol. in pure $1/3$ satd. $(\text{NH}_4)_2\text{SO}_4$ and another which remains undissolved in it.

S. MORGULIS

The occurrence and decomposition of pyrophosphate in cells. II. The amount of easily hydrolyzable phosphorus compounds in animal and plant cells. K. LOHMANN. Kaiser Wilhelm-Inst. für Biologie, Berlin-Dahlem. *Biochem. Z.* 203, 164-71(1928); cf. C. A. 23, 858.—Exts. prepd. from various cells deproteinized with CCl_3COOH are subjected to partial acid hydrolysis. The amt. of H_3PO_4 appearing in the first 7 min. of hydrolysis in N HCl at 100° is regarded as arising from a pyrophosphate fraction provided the amt. formed from 7 to 15 min. and at 60 min. is a small fraction of that found after 7 min. On this basis pyrophosphate was demonstrated in vertebrate and invertebrate muscles and in baker's yeast. In liver, kidney and brain it was also shown that the pyrophosphate forms a Ba salt insol. in cold water. Muscle contains 0.5-1.0 mg. P_2O_5 while yeast contains 1.6-1.8 mg. P_2O_5 per g. fresh substance. Analyses of bacteria give similar results. It is concluded that every cell possessing the ability to hydrolyze carbohydrate contains the easily hydrolyzable phosphoric acid fraction.

S. MORGULIS

Hematin formation from carbonylhemoglobin and oxyhemoglobin by dilute acids. W. LINZEL AND T. RADEFF. Landwirtschaftliche Hochschule, Berlin. *Biochem. Z.* 203, 212-7(1928).—Oxyhemoglobin and CO-hemoglobin solns. of the same mol. concn. yield, upon treatment with dil. acid, hematin solus. of different pigment content, that from O hemoglobin being 5-10% weaker. This is attributed to destruction of a part of the pigment resulting from the action of dil. acid on oxyhemoglobin. Under the influence of dil. acids corresponding amts. of ionized Fe are formed whereas this does not happen in CO-hemoglobin solns.

S. MORGULIS

The mechanism of fermentation of dihydroxyacetone. KEN IWASAKI. Kaiser Wilhelm-Inst. für Biologie, Berlin-Dahlem. *Biochem. Z.* 203, 237-66(1928).—The max. fermentation rate obtained in a phosphate soln. with 0.1% glucose is not exceeded by the addn. of $(\text{HOCH}_2)_2\text{CO}$. On the contrary, with smaller glucose concns. the addn. of $(\text{HOCH}_2)_2\text{CO}$ leads to the max. fermentation of the glucose. In yeast water or in beer wort the fermentation rate is double that in phosphate soln., but this effect is not observed in the fermentation of $(\text{HOCH}_2)_2\text{CO}$. The ratio between rate of fermentation and $(\text{HOCH}_2)_2\text{CO}$ glucose is reduced to a min. value. of about 0.7 when the yeast has been repeatedly cultured in glucose-beer wort. The $Q_{\text{CO}_2}^{\text{N}_2}$ for $(\text{HOCH}_2)_2\text{CO}$ is 90 at 20° and 150 at 28° . The oxidation quotient, which in fermentation of glucose by *S. ludwigii* is 3-4, is at first very low in the case of $(\text{HOCH}_2)_2\text{CO}$, but after repeated culturing this gradually rises and arrives at the same value as in the case of the glucose. The heat of fermentation measured colorimetrically is about 70-80 cal. more for $(\text{HOCH}_2)_2\text{CO}$ than for glucose.

S. MORGULIS

The parenteral resorption of colloids. I. MARTIN JACOBY. Krankenhaus Moabit, Berlin. *Biochem. Z.* 203, 278-9(1928).—Urease is absorbed into the blood when administered intraperitoneally. Details will be given in the next paper of this series.

S. MORGULIS

The hydrolysis of ethyl esters of lactic acid by liver esterase. P. RONA AND R. ITELSOHN-SCHRECHTER. Univ. Berlin. *Biochem. Z.* 203, 293-7(1928).—Expts. show that pig-liver esterase attacks preferably the *d*-form of ethyl esters of lactic acid when either the racemic compd. or either of the optically active modifications is used as a substrate. S. MORGULIS

Contribution to the problem of the enzymic synthesis of protein. P. RONA AND H. A. OELKERS. Univ. Berlin. *Biochem. Z.* 203, 298-307(1928).—Under the exptl conditions specified by Wasteneys and Barsook sparingly sol. products were formed from sol. protein cleavage products under the influence of pepsin. The diminution in the concn. of free NH_2 groups and of free COOH groups corroborates the assumption that this is a synthesis. When the resulting synthetic product is again subjected to peptic digestion under suitable p_{H} conditions it undergoes hydrolysis with the formation of free NH_2 and COOH groups. In tryptic digestion also sparingly sol. products are formed but these obviously undergo further cleavage. S. M

The liberation of invertin from yeast. RICHARD WILLSTÄTTER AND WOLFGANG GRASSMANN. Bayerische Akad. Wissenschaften, München. *Biochem. Z.* 203, 308-12(1928).—Digestion of killed yeast with papain liberates invertin, and this is greatly accelerated when papain is activated by HCN . S. MORGULIS

Enzymic protein hydrolysis. IV. E. MISLOWITZER. Univ. Berlin. *Biochem. Z.* 203, 323-33(1928).—In the hydrolysis of the CONH groups the freed NH_2 group belongs to the low cleavage product while the freed carboxyl group belongs to the colloidal portion. The total amt. of NH_2 groups in the colloidal fraction thus practically does not change, whereas the total amt. of carboxyl increases very markedly. Under the influence of trypsin and pepsin on casein low cleavage products of non-colloidal nature are formed through hydrolysis of CONH . S. MORGULIS

Enzymes and light. XIII. The effect of light on takadiastase in the presence of sensitizers. Y. KAMAYASHI. Städtisches Krankenhaus am Urban, Berlin. *Biochem. Z.* 203, 334-42(1928).—The injury of takadiastase in the presence of sensitizers diminishes with their concn. Eosin and Na dichloroanthracene disulfonate in a concn of 0.01% diminish the light effect only slightly, but Na anthraquinone disulfonate already has a marked effect. In the dark these substances exert no influence upon the enzymic activity. S. MORGULIS

Studies on the behavior of lignin in the natural decomposition of plants. FRANTZ FISCHER AND RUDOLF LIESKE. Kaiser Wilhelm-Inst. für Kohlenforschung, Mulheim-Ruhr. *Biochem. Z.* 203, 351-62(1928). In the natural decomposition of plants the lignin component tends to increase because the easily hydrolyzable fraction is being removed. The microscopic structure of the wood is not destroyed when cellulose undergoes cleavage, or is entirely removed. The wood structure of coal is therefore no argument against the lignin theory. S. MORGULIS

Membrane studies on the human amnion. H. RUNGE AND H. SCHMIDT. Universitäts-Frauenklinik, Kiel. *Biochem. Z.* 203, 364-9(1928).—In studying the diffusion of dyes through the amnion it was observed that generally this is greater where the dye soln. is in contact with the epithelial not the connective tissue surface. The difference was observed even when the expt. was carried out without O_2 at 37° . S. M

The mechanism of the specific ion action on proteins. The degree of activity of different myogen salts. P. RONA AND HANS H. WEBER. Univ. Berlin. *Biochem. Z.* 203, 429-51(1928).—The distribution of diffusible ions in a protein-contg. inner, and a protein-free outer soln. follows the Donnan law provided the activity of the ions inside and outside is measured. It is therefore possible to compare the activity (active concn./total concn.) of different salts of the same protein. The activity of various myogen acid salts diminishes in this order: myogen $\text{H}_2\text{PO}_4 > \text{HCl} > \text{HBr} > \text{HNO}_3 > \text{HSCN} > \text{H}_2\text{SO}_4$. The osmotic pressure diminishes very markedly and in very good agreement with the change in activity and the calcd. change according to the Donnan law. The specific pptg. effect of anions increases in the same order as the degree of activity of the myogen salts increases. Likewise the smaller the activity of the myogen salt the less is the viscosity of the myogen in soln. S. MORGULIS

Biochemical transformation of dihydroxyacetone into hexoses through fermentation and the rate of fermentation of dihydroxyacetone in connection with the caloric value of these trioses. I. CARL NEUBERG AND MARIA KOBEL. Kaiser Wilhelm-Inst. für Biochemie, Berlin-Dahlem. *Biochem. Z.* 203, 452-62(1928).—In confirmation of earlier observations that dry yeast, as well as alc.-ether or acetone preps. of *Saccharomyces ludwigii*, it is now shown that also fresh *S. ludwigii* yeast ferment dihydroxyacetone. The velocity of fermentation of dihydroxyacetone with fresh yeast is never greater than that of glucose. Since the caloric value of dihydroxyacetone is greater than

that of glucose the dihydroxyacetone cannot directly be fermented to hexose but must do so through an intermediate condensation. The direct proof of the enzymic transformation of dihydroxyacetone to glucose is obtained in the prepn. of a hexosemonophosphoric acid ester. Working with dry *S. ludwigii* with the addn. of co-enzyme in the form of beer yeast the principal product of phosphorylation is hexose-monophosphate with traces of hexose-diphosphate ester. This hexose-monophosphate is optically active, and analysis gives a C:P ratio of 6:1 so that no triose-monophosphoric acid ester is possible, because dihydroxyacetone-monophosphate could likewise be optically active. According to its properties the hexose-monophosphate ester is a mixt. of a little of Neuberg's with a great deal of Robison's ester.

S. MORGULIS

Desmolytic formation of methylglyoxal through yeast enzyme. CARL NEUBERG AND MARIA KOBEL. Kaiser Wilhelm-Inst. für Biochemie, Berlin-Dahlem. *Biochem. Z.* 203, 403-8(1928).—The special enzyme was prepd. as follows: 1 kg. Patzenhofer dry yeast was suspended in 10 l. H₂O and preserved with 200 cc. toluene. This was kept at 37° for 2 days, and centrifuged. Hexosediphosphoric ester of great purity was used as the substrate, in the form of its very sol. Mg salt. Various mixts. were made up and after incubation at 37° for 3 days the proteins were removed by means of 20% CCl₃CO₂H and from the filtrate methylglyoxal was isolated by pptn. with *p*-nitrophenylhydrazine, but still better results were obtained when pptn. was made with 2,4-dinitrophenylhydrazine, which even in the cold yields the very slightly sol. methylglyoxal 2,4-dinitrophenylosazone. By this method the presence of methylglyoxal has been proved beyond any criticism.

S. MORGULIS

The influence of p_H on the glycerophosphatase. KENTARO INOUE. Med.-chem. Inst., Chiba. *J. Biochem. (Japan)* 10, 133-45(1928).—Taka-diastrase was used as a source of the glycerophosphatase. This was freed from the so-called X-substance by the following procedure. Ten g. of taka-diastrase was dissolved in a mixt. of 200 cc. H₂O, 7.2 cc. 0.5 *M* AcOH and 42.8 cc. 0.5 *M* AcONa. To this was added 50 g. kaolin and the mixt. was shaken for 1 hr. After centrifuging the kaolin was washed twice with 250 cc. H₂O and 50 cc. of the previous acetate buffer mixt. The elution was carried out with a mixt. of 17.4 cc. 0.5 *M* AcOH + 32.6 cc. 0.5 *M* AcONa for 3 hrs. at 37°. The liquid was dialyzed 2 days against distd. H₂O in a collodion bag, and finally dild. to 500 cc. The X-substance was prepd. by boiling for an hr. on a water bath a soln. of 10 g. taka-diastrase in 500 cc. H₂O. After removing the protein coagulum by filtration the soln. was treated with 10% Pb acetate until no more ppt. was formed. The ppt. was suspended in 200 cc. H₂O and freed from Pb with H₂S. The soln. was now aerated with a stream of CO₂ and dild. to 250 cc. The raw taka-glycerophosphatase has its optimum activity at p_H 5.6. After purification with kaolin this is shifted to p_H 2.7-3.0. The activity curve at different p_H is a typical dissoen. curve, with $p_K = 4.8$. The X-substance affects only that portion of the p_H -activity curve of the purified enzyme which corresponds to the dissoen. curve of a base, and the greater the concn. of this substance the greater does the basic dissoen. const. become. The unit of X-substance is defined as the quantity necessary to shift the optimum p_H of the reaction from 3.0 to 5.0, and $\frac{1}{2}$ and $\frac{1}{4}$ units to p_H 5.0 and p_H 4.5, resp. The enzyme activities at these optima are 60, 30 and 20%, resp., of that of the purified enzyme at p_H 3.0. S. M.

Cataphoresis of glycerophosphatase. HIDEO KOBAYASHI. Med. Acad., Chiba. *J. Biochem. (Japan)* 10, 147-55(1928).—Glycerophosphatase from taka-diastrase contaminated with the X-substance migrated to the anode on the alk. side of its optimum reaction (p_H 5.56) and to the cathode on the acid side. The enzyme freed from the X-substance has its optimum reaction at p_H 3-4, but it migrates to the anode over the entire p_H range from 3.8 to 6.7. The same was found to be true when the X-substance was added to a purified enzyme sample. The difference in the migration in the elec. field is due to the greater protein content of the raw enzyme, and can also be induced in the purified enzyme through the addn. of egg albumins. S. MORGULIS

Kidney glycerophosphatase. KATSURA ASAKAWA. Med. Acad., Chiba. *J. Biochem. (Japan)* 10, 157-75(1928).—A method is described for the prepn. of the glycerophosphatase from pig kidney. The optimum reaction is at p_H 8.9-9.1, the variation depending upon the enzyme soln. The time required for a definite amt. of hydrolysis is inversely proportional to the enzyme concn. The kidney phosphatase at p_H 8.9 has practically the same activity as the phosphatase of taka-diastrase at p_H 2.8-3.0. The kidney glycerophosphatase is an ampholyte with a basic dissoen. const. $p_K = 4.8$. For the acid dissoen. const. the values for p_K are 10.8 and 9.0, resp. The activity curve for the kidney phosphatase is the mirror image of the taka-phosphatase, both curves being symmetrically arranged on either side of p_H 7.0. S. MORGULIS

"Salt hydrolysis" of starch. N. IWANOWSKY. State Univ., Saratow. *Zhurnal*

expl. Biol. Med. 10, 292-4(1928).—In working with a number of starch preps. no evidence was found of hydrolysis by salt to the stage of erythro-dextrin. Neither do hemolyzed and previously carefully washed red blood cells, nor hemoglobin solns. nor of crystallized hemin have any effect upon starch. These results thus contradict the results of Biedermann, etc.

S. MORGULIS

Enzyme action. I. Amylase from cholam (*Sorghum vulgare*). V. N. PATWARDHAN AND R. V. NORRIS. *J. Indian Inst. Sci.* A11, 121-33(1928).—To supply additional evidence of the presence of a starch-liquefying and a saccharifying enzyme in amylase, a comparative study was made of the enzymes of malted barley and malted cholam. Malting was accomplished by steeping the grains for 30-36 hrs., and germination at 20-25° in moist sand for three days. The grains were washed, dried first at 50°, then at 70° and finally at 100° and then ground. Solid enzyme was prepd. by extn. of 200 g. malt with 600 cc. of 20% EtOH for 24 hrs. and pptn. with 1500 cc. of 95% alc. The saccharifying power was detd. by Fehling's method; the liquefying power by: (a) the wt. of non-saccharin substances obtained by pptn. with 95% alc.; (b) change in viscosity at intervals of digestion. Since cholam enzyme is more active than barley enzyme with regard to liquefying power and less active as to saccharifying power, there is evidence that the ratio of saccharifying to liquefying powers is not the same in enzyme material from different sources. The starch-liquefying and saccharifying powers of cholam enzyme were affected alike by various temps. of digestion, and by the addn. of various chlorides to the digestion mixt. Of several amino acids studied for their influence upon the activity of the enzyme all except hippuric acid showed inhibitory effect upon cholam amylase, which finding is different from that obtained with barley malt amylase. Crude ext. from cholam malt and the pptd., dialyzed ext. showed optimum activity in digestion mixts. at p_H 4.66 to 4.86. **II. Nature of amylase.** D. NARAYANAMURTI AND R. V. NORRIS. *Ibid* 134-9.—Ext. of cholam malt, subjected to electrodialysis (cf. Fricke and Kaja, *C. A.* 18, 1303), showed a greater saccharifying power than the dialyzed cholam malt ext. The product of electrodialysis did not give positive protein reactions but was positive to the Molisch test. When cholam malt ext. was subjected to electroösmosis (app. similar to that used for electrodialysis) it was noted that the cathode cell liquid had a greater liquefying power and lower saccharifying power than the original liquid in the central cell. It was considered that a partial sepn. of the starch-liquefying and saccharifying enzymes had occurred. N. M. N.

Hemochromogen. M. L. ANSON AND A. E. MIRSKY. Harvard Univ. *J. Gen. Physiol.* 12, 273-88(1928).—Hemochromogen consists of a substance contg. heme (the Fe pyrrol complex, $C_{34}H_{32}N_4O_4Fe$, found in hemoglobin), combined with some N substance. It has the following equil.: Hemochromogen \rightarrow reduced heme + N substance. CN forms 2 compds. with reduced heme, one of which is cyan-hemochromogen. Reduced heme in alk. soln. has a great affinity for CN. Cyan-hemochromogen probably contains 1 CN group for each heme group. Hemochromogen prepd. from hemoglobin is a compd. of denatured globin and reduced heme. A denatured globin mol. (hypothetical mol. wt. 16,700) can convert at least 10 mols. of reduced heme into hemochromogen. This capacity to form hemochromogen is greater for globin than for edestin, which, in turn, is greater than for zein.

C. H. RICHARDSON

Syneresis and the swelling of gelatin. M. KUNITZ. Rockefeller Inst. *J. Gen. Physiol.* 12, 289-312(1928).—Solid blocks of isoelec. gelatin swell in distd. water or dil. buffer soln. of p_H 4.7 only when the gelatin content is more than 10%; blocks of lower gelatin content actually lose water. The final quantity of water lost is the same whether the blocks are immersed in a large vol. of water, or whether syneresis, i. e., the breaking up of the gel into solid lumps surrounded by liquid, has been initiated by mech. forces in the absence of an outside liquid. This indicates that syneresis is identical with the process of negative swelling of dil. gels in cold water. Gels contg. acid or alkali show greater syneresis than isoelec. gels after the acid or alkali has been removed by dialysis. Gels contg. salts show greater syneresis at the same p_H than salt-free gels after removal of the salts. The effect of these electrolytes on the syneresis of gelatin disappears at gelatin concns. above 8%. Similarity of behavior suggests that syneresis and viscosity of gelatin solns. are due to the same mechanism, namely the hydration of the micellae by osmosis, brought about by diffusible ions or by the sol. gelatin in the micellae. The greater the pressures that cause the swelling of micellae of the gelatin in the sol state, the greater the loss of water from the gels when the pressures are removed. The laws which apply to the swelling of gels of high concn. apply also to the process governing the loss of water by dil. gels. (Cf. Northrop, *C. A.* 21, 3294). Equations which represent this behavior of gelatin are given.

C. H. RICHARDSON

The effect of the hydrogen ion concentration on the rate of hydrolysis of glycyl-glycine, glycylleucine, glycylalanine, glycylasparagine, glycylaspartic acid and biuret base by erepsin. JOHN H. NORTHROP AND HENRY S. SIMMS. Rockefeller Inst. *J. Gen. Physiol.* 12, 313-28(1928).—The rate of hydrolysis of a no. of peptides by erepsin prepd. from swine intestine was detd. The p_H -activity curves obtained differed for different substrates. The curves can be predicted on the assumption that erepsin is a weak acid or base with dissocn. const. $10^{-7.6}$, and that the reaction takes place between a particular ionic species of the enzyme and of the substrate. The rate of inactivation of erepsin at various p_H values has been detd. and agrees with the above assumption that the enzyme is a weak acid or base. If the assumed mechanism is correct, the detn. of a significant value for the relative rate of hydrolysis of various peptides is an uncertain procedure. C. H. RICHARDSON

The catalytic hydrogenation of hemins and porphyrins (KUHN, SEYFFERT) 10. Structure of thymonucleic acid (LEVENE, LONDON) 10. Cerebrosides. IX. Cerebronic acid (KLENK) 10. The specificity of erepsin and trypsin-kinase. The behavior of these enzyme complexes toward polypeptides and compounds containing both α -amino acids and β -aminobutyric acid (ABDERHALDEN, FLEISCHMANN) 10. The influence of substitution in the free amino group of polypeptides by groups of definite character, and their cleavage by *N* alkali, erepsin and trypsin-kinase (ABDERHALDEN, *et al.*) 10. The origin of concentration differences in dissolved substances opposed to the osmotic pressure in gelatin (AUERBACH) 2. The coagulation of highly solvated sols by organic liquids and salts (JIRGENSONS) 2.

B—METHODS AND APPARATUS

STANLEY R. BENEDICT

[Pipet for] microchemical determination of sugar and chloride in blood. K. SCHUECKER. *Wien. med. Wochschr.* 77, 1519-20(1927).—A rinsing pipet is described, the use of which avoids that of the torsion balance. B. C. A.

The use of mercurochrome and modified mercurochrome as biological stains. JESS D. HERRMANN, WESTERVELT DENNIS AND DALLAS D. DEDRICK, Okla. City Univ. *Proc. Oklahoma Acad. Sci., Univ. Oklahoma Bull., New Series* 409, *Studies Series* 29, 132-3(1928).—Glandular tissue, blood tissue and bacteria can be speedily and completely stained with mercurochrome 220 sol. Mercurochrome stains the same parts of the animal cell as does eosin. It is a superior blood stain, differentiating white and red cells. Fair nuclear differentiation can be obtained with mercurochrome as a single stain, as follows: Flood with 1% aq. soln. for 5 min., wash, dehydrate, wash in xylene, mount in balsam. Better results are produced with counter-stains (methyl-green and cotton violet) as follows: Flood with 4% aq. soln. of methyl green for 7 mins., flood with H_2O , flood with 1% mercurochrome for 3 mins., dehydrate, immerse in xylene, mount in balsam. RUSSELL C. ERB

Progress and experience in the examination and diagnosis of urine. F. SPAETH. *Arch. Pharm.* 266, 703-23(1928).—A discussion of chem. and phys. procedures for the prompt diagnosis of urine. W. O. E.

The isolation of secretin—its chemical and physiological properties. JOHN MEL-LANBY. St. Thomas's Hosp., London. *J. Physiol.* 66, 1-18(1928).—250 g. intestinal mucosa from pigs duodena were ground with sand and extd. with 1000 cc. abs. EtOH for 30 mins. at room temp. and filtered. The filtrate was concd. *in vacuo* to opalescence and filtering; then H_2O was added to the original vol. Fats and soaps were pptd. at 20° by adding 1 cc. *N* $CaCl_2$ to each 100 cc. of the fluid. The ppt. was collected on a coarse paper and discarded. The clear filtrate was cooled on ice and 2 cc. of 10% com. Na taurocholate soln. added to each 100 cc. fluid. After mixing, AcOH was added to 0.2% concn. The mixt. was left 2 hrs. in the ice box and the ppt. was then dissolved in a small vol. of abs. EtOH. Any undissolved matter was sepd. by centrifugalization and discarded. The alc. soln. of secretin and bile acid was added to 5 vols. of acetone. The ppt. was obtained by centrifugalization and washed twice with acetone. It was then dissolved in a small vol. of H_2O and the secretin pptd. by adding AcOH to 0.1% concn. The ppt. was obtained by centrifugalization and dried in the centrifuge tube by means of acetone and ether. Secretin is a polypeptide, contg. P, tyrosine and probably histidine. It is slightly sol. in H_2O , and in dil. alkali; insol. in EtOH, $MeCO$ and Et_2O . It is rapidly destroyed in acid or alkali at 100° and by pepsin, trypsin and autolytic enzymes at 38°. It is adsorbed by bile acids, charcoal, alumina and hardened filter paper. It is most effective when given intravenously. It is not absorbed from the digestive tract even in the presence of bile. It acts on the external

secretions of the pancreas and liver, increases the tone of smooth muscle and has no effect on arterial blood pressure, although it produces local vasodilatation in the pancreas. It has no action on the salivary glands, the gastric mucosa or the glands of the small intestine and is without action on voluntary muscle. J. F. LYMAN

The determination of sugar in small quantities of liquids by the method of Gabriel Bertrand. G. HUMBERT. *J. physiol. path. gen.* 26, 377-83(1928); cf. *C. A.* 1, 1630.—The Bertrand method is modified for use with 2 cc. of blood or other body fluid. The Na-tungstate filtrate is boiled with the usual amts. of CuSO_4 soln. and alk. tartrate soln., plus 1 cc. of a standard glucose soln. to prevent spontaneous reduction of the Cu. The glucose soln. consists of 10 g. pure anhyd. glucose dissolved in 1 l. of a soln. of 2.5% benzoic acid. For titrating the Fe reduced by the Cu_2O a permanganate soln. is used in which 1 cc. is equiv. to 2 mg. Cu. L. A. MAYNARD

The determination of urea by urease. G. HUMBERT. *J. physiol. path. gen.* 26, 392-7(1928).—This is a simple, clinical method for use with urine, blood and other body fluids. The urea of the phosphotungstic acid filtrate is hydrolyzed for 1 hr. with 3 to 4 g. of *Canavalia* urease with the addn. of 5 cc. of a soln. contg. 2 g. H_3PO_4 and 14 g. $\text{Na}_2\text{P}_2\text{O}_7$ in 100 cc. H_2O and the NH_3 distd. into 0.1 N H_2SO_4 . During distn. air freed from NH_3 by passing through H_2SO_4 is drawn through the app. by suction. The excess standard H_2SO_4 is treated with 5 cc. of 10% KI and 2.5 cc. of 5% neutral KIO_3 and the liberated I titrated with 0.1 N $\text{Na}_2\text{S}_2\text{O}_3$. L. A. MAYNARD

A practical wash bottle for measurements by the gas chain and for other purposes. H. SCHREUS. Hautklinik, Med. Akad., Düsseldorf. *Biochem. Z.* 200, 339(1928). See figure in the text. S. MORGULIS

Preservation of urine. GIACOMO TELLERA. *Boll. chim. farm.* 67, 577-80(1928) --- T. discusses the different means by which urine may be preserved. According to his experience, urine remains unaltered for several days by adding 0.15% BzOH (I) or 0.3% BzONa (II). In case that the urine is only slightly acid or neutral, 0.25% of I or 0.5% of II is required. II is to be preferred because it will not interfere with the acidity detns. Since the presence of II might disturb the tests for glucose, especially when employing Fehling's reagent, it is safer to eliminate it from the urine by Courtonne's reagent (30 g. $(\text{AcO})_2\text{Pb}$ in 100 cc. H_2O contg. a small quantity of AcOH). *p*- $\text{HOC}_6\text{H}_4\text{CO}_2\text{Me}$, which does not interfere with Fehling's reagent, also proved to be a good preservative in a concn. of 0.15%. G. SCHWOCH

Method for blood pressure determinations in mice, rats and rabbits. HEINRICH K. KUNSTMANN. Univ. Würzburg. *Arch. expl. Path. Pharm.* 132, 122-3(1928). G. H. S.

Testing of BaSO_4 for x-ray purposes (COCKING) 17. Analysis of gas (Fr. pat. 642,930) 1.

C—BACTERIOLOGY

CHARLES B. MORREY

A milk-fermenting yeast. C. S. R. AYYAR. Agr. Research Inst. Pusa, *Bull.* 183, 5 pp.(1928).—By repeated plating in purple lactose agar, a yeast capable of producing alcoholic fermentation of milk was isolated from sterilized milk which had curdled with an acid flavor. In general the yeast cells are oval or elliptical, being 5 to 7.5 μ long and 4.8 μ broad after 24 hrs. culture in purple lactose agar. Some are round, 4.8 μ in diameter, while elongated cells, 16 μ in length, are found in old cultures. The yeast is non-spore-forming; young cultures are Gram positive; it does not liquefy gelatin; it grows well on maize ext. agar and purple lactose, but scantily on peptone bouillon and potato; it stains readily with the ordinary aniline stains. The optimum temp. for growth is about 30° and the best growth is obtained with a plentiful supply of O; however the yeast is a facultative anaerobe. The thermal death point is 66°. The yeast is similar in many respects to *Torula lactis* but differs from it in the size of the cells and the thermal death point. Gas was produced in milk and in dextrose, levulose, galactose, saccharose and lactose bouillons but no growth was obtained in maltose bouillon. No gas was produced in mannitol, raffinose, arabinose and glycerol bouillons, although growth took place. There was slight growth in salicin bouillon. The yeast was without action on pasteurized cream when inoculated samples were incubated at 30° for 4 days. An 80% conversion of the lactose to alc. was obtained by incubating inoculated samples of steamed sepd. milk at 30° for 6 days. Similar results were obtained with sterilized whey which had been neutralized with NaOH prior to incubation. Very little fermentation took place in acid whey. The yeast possesses possibilities for the economical production of alc. from whey. K. D. JACOB

Twort-d'Herelle phenomenon. B. N. ASTAPOV AND V. K. VARISHCHEV. *Trans. Sci. Chem.-Pharm. Inst. (Moscow)* No. 14, 13-21(1926).—The authors conducted a series of expts. injecting colon bacilli into guinea pigs, and checked the work of Bordet and Cinca. No corroboration could be obtained. The expts. of Callou were also checked, staphylococci from boils and other infections from humans being used. They found no lytic effects. The conclusion is that the views of d'Herelle seem to stand.

J. S. JOFFE

Effect of distilled water upon the tendency to colony formation upon Petri plates. C. S. MUDGE AND B. M. LAWLER. Univ. of California. *J. Dairy Sci.* 11, 436-45 (1928).—In plating out milk there is a significant rise in count if the milk-water diln. be allowed to stand, even in ice water. This is due to dispersion of the clumps, possibly by change of p_H on diln. It is prevented by dilg. in a phosphate or peptone buffer of p_H 6.6.

F. L. SEYMOUR-JONES

The decomposition of fats by bacteria. F. E. HAAG. *Arch. Hyg.* 100, 271-308 (1928).—The ease with which the unsatd. fatty acids are decompd. by bacteria and by fungi depends upon the no. of double bonds in the fatty acid mol. attacked and not upon the phys. properties of the latter. The biol. properties of the acids are also influenced by the arrangement of their constituent atoms, since elaidic and brassidic acids are not as susceptible to decompn. by fungi as are their stereoisomers, oleic and erucic acids. The decompn. of oleic acid through bacterial action proceeds more smoothly than when it occurs as the result of spontaneous oxidation and fewer intermediate products are formed. The utilization of palmitic and of stearic acids by the higher fungi and by *B. pyocyaneus* is probably preceded by a spontaneous dehydrogenation of the acids, which renders them more available. The production of rancidity in fats is not alone the result of the activity of microorganisms.

E. R. MAIN

Bacterial oxidation of crude oils. V. O. TAUSON. State Polytechnic Museum, Moscow. *Neftyanoe Khozyaistvo* 14, 220-30(1928).—*Penicillium* develops on paraffins m. 45-56°, utilizing 80% of the hydrocarbon. *B. fluorescens liquefaciens*, *B. pyocyaneus*, *B. stutzeri* and others utilize paraffins as well as kerosene. Microorganisms obtained from the Baku region (bacteria as well as the mold *Aspergillus flavus*) can utilize hard as well as soft paraffins (m. 78° and 45°) or white vaseline. Conditions necessary for the oxidation of the paraffins are as follows: (1) Presence of water with the mineral salts dissolved in it, the presence of either nitrate or NH_4 salts being a matter of indifference, except that in the latter case $CaCO_3$ must be available to neutralize the acid set free on the escape of NH_3 . (2) Free access of O_2 is essential. (3) The reaction of the soln. should be as nearly as possible neutral. The amt. of paraffin oxidized under favorable conditions is really considerable. The microorganisms utilizing paraffin can also oxidize fats and fatty acids, and *Aspergillus flavus* can also utilize some plant and animal waxes and higher alcs. The oxidation of paraffin to higher fatty acids is doubted because there is no evidence of increasing acidity in the cultures. It is believed that the paraffins are oxidized to CO_2 and H_2O . The question of the oxidation of naphthenes is still open. Members of the olefin group are apparently easily oxidized, and the oxidation of terpenes likewise seems very probable. The oxidation of aromatic compds. by microorganisms is much better known. *B. benzoli* utilizes about 8 g. C_6H_6 in about 34-42 days in the presence of nitrates. This organism oxidizes also toluene and xylene. The bacterial oxidation of the aromatic hydrocarbons with low b. p. differs from that of the oxidation of hydrocarbon of high m. p. in that the former must be in aq. soln. and that partial pressure of the vapor must be in equil. with that of its aq. soln. These conditions are generally satisfied in nature where crude oil undergoes bacterial oxidation. Several types of bacteria were isolated from specially prep'd. cultures contg. the aromatic hydrocarbons in soln. The chemistry of the bacterial oxidation of C_6H_6 and its homologs is not clearly understood. The oxidation of diphenols by bacteria is very rapid, but the organisms are different from all those responsible for the oxidation of other hydrocarbons. Three types of organisms (*B. naphthalenicus liquefaciens*, *B. naphthalenicus* and *B. naphthalenicus nonliquefaciens*) utilize naphthalene as a source of C, and in some expts. nearly 50% was oxidized in the course of 6 weeks, this being even a more rapid rate than in the oxidation of paraffins. *o*-Phthalic acid is obviously not an intermediate product in the bacterial oxidation of naphthalene, nor do the expts. indicate that pyrocatechol is a possible intermediate step. Phenanthrene is easily oxidized by several varieties of *B. phenanthrenicus* but anthracene is attacked slowly. All these findings support the contention that crude oil under the conditions in nature undergoes progressive oxidative destruction. The fact that the soil in the oil-bearing regions is rich in a great variety of microorganisms utilizing hydrocarbons and displaying considerable specificity, and the fact that the natural conditions so very nearly

approach the optimum for their activity, lead to the conclusion that they play a very large role in those alterations of the crude oil which take place in it before it comes out from under the ground.

S. MORGULIS

The Gram stain. The chemical structure of the fatty acids of yeast, and a study of yeast cells made artificially Gram positive. JOSEF SCHUMACHER. *Centr. Bakt. Parasitenk.*, 1 Abt., 109, 181-92(1928).—By HCl-ether hydrolysis of yeast cells, previously freed from free lipoids, there is produced a karyonin-fatty acid mixt. which is a brownish yellow ppt. The fatty acids in this residue can be sepd. from the karyonic acid, because the latter is difficultly sol. in alc. The Gram positive fatty acid of yeast is N-free, unsatd. and contains phosphoric acid. It combines with protein to form the Gram positive lipo-protein of yeast. Yeasts and Gram positive bacteria can be made artificially Gram negative by hydrolysis with HCl-alc. These Gram negative cells again become Gram positive if allowed to remain in contact for several hours with an alc. soln. of lipoids thus split off. Free lecithin or other lipoids, even if extd. from yeast by simple solvents, will not act thus.

JOHN T. MYERS

Studies on the "bios question." G. I. WALLACE AND F. W. TANNER. Univ. of Ill. *Centr. Bakt. Parasitenk.*, 2 Abt., 76, 1-17(1928).—Studies on the "bios" question must be made with cultures of abs. purity. Ordinary pressed yeast must be plated to free it from gross bacterial contamination. This may explain much contradictory data in the literature. One cannot predict what the effect of another microorganism will be on the growth of a culture of yeast in a mineral salt-sugar mixt. Nineteen hundred single cell inoculations of 4 yeasts were made in 6 different synthetic media. Single cells of yeast will grow in pure mineral salt-sugar solns. There were great variations in the growth of the different cells, each being an individual unit. Different species or varieties of yeast act differently in the same medium and the same species acts differently in different salt-sugar mixts. Data obtained by using a large inoculum cannot be compared with data from a small inoculum. A vitamin accessory substance, or the supposedly sp. substance "Bios," does not seem necessary for yeast growth, in the case of the 4 yeasts studied, but they represent different classes and the finding may apply to all yeasts. Yeasts grow better if organic material is added to the salt-sugar mixts., but it is probable that many org. substances may serve as a stimulant. There is a good bibliography.

JOHN T. MYERS

The influence of iodine upon the growth and metabolism of yeasts. J. E. GREAVES, C. E. ZOBELL AND J. DUDLEY GREAVES. Utah Agr. College Expt. Sta., Logan. *J. Bact.* 16, 409-30(1928).—Growth and metabolism of yeasts are extremely slow in a mineral salt-sugar soln. such as Mayer's cultural fluids when it is prepd. from purified chemicals. Heavy seeding or the presence of impurities, such as may occur in com. beet sugar, bacterial and mold growth (especially the latter), accelerates yeast multiplication. Small quantities of I, 1 part per million, either as elementary I or the salts of Na, K or Ca accelerate yeast growth. If this is due to impurities rather than to the I, they would have to be almost infinitesimal in amt. I seems to be essential to yeast growth. It is possible that yeast can build I into org. compds. which may be valuable to higher animals and may be a valuable means of administering I to man. It would be less irritating than inorg. I, and the dosage could be nicely controlled. Org. or inorg. compds. of I may possibly be the cause of the phenomena attributed to Wilder's bios; although bios seems to have a greater accelerating power.

JOHN T. MYERS

Factors which influence the heat destruction of tubercle bacilli in milk. K. KATRANJIEFF. *Compt. rend. soc. biol.* 99, 1478-81(1928).—Guinea pigs inoculated with 1 cc. of non-heated tuberculous milk showed tuberculous lesions in 2 or 3 months. Animals inoculated with whole or skimmed milk which had been heated to 58° for 30 mins. and having a pH of 6.3 or 6.7 showed similar lesions. Animals inoculated with skimmed milk which had been heated to 58° for 30 mins. and having a pH of 6.0, and animals inoculated with whole or skimmed milk heated to 63° and having a pH of 6.0, 6.3 or 6.7 showed no tuberculous lesions within 3 months.

L. W. RIGGS

A bacteriological conductivity culture cell and some of its applications. L. B. PARSONS, E. T. DRAKE AND W. S. STURGES. *J. Am. Chem. Soc.* 51, 166-71(1929).—Application of conductance measurement for following the growth of anaerobic bacteria with cond. culture cell is described. By means of this app. the effect of O tension, temp. and pH on *Cl. sporogenes* is described.

F. W. TANNER

Preparation of certain chloro and bromo derivatives of 2,4-dihydroxydiphenylmethane and 2,4-dihydroxydiphenylethane and their germicidal action (KLARMANN, VON WOWERN) 10.

D—BOTANY

THOMAS G. PHILLIPS

Calcium ion and root growth. W. MEWIUS. *Jahrb. wiss. Botan.* 66, 183(1927).
 O. LOEW. *Forts. Landw.* 1927, 2.—The classification of plants according to the effect of Ca salts on their growth is considered in view of the results of treatment with KCl and MgSO₄ as influenced by reaction and temp. The theory of the "lime factor" (Loew) is not fully supported by the author's results, which accord more closely with the Hanstein-Cranner conception of the effect of the Ca ion in reducing the permeability of the protoplasm. Other injurious effects follow this action. The stability of protoplasmic permeability is specific to plants. Loew observes that the death of cells brought about by treatment with salts which ppt. Ca can be watched microscopically, and asserts that the cell nucleus contains important Ca compds., and when these are decomposed by pptn. the cell must die. This view does not conflict with the fact that K₂CO₃ and Na₃PO₄ are less active in destroying protoplasm than are K₂C₂O₄, NaF and Na₄P₂O₇.
 B. C. A.

The chloroplast pigments, their functions, and the probable relation of chlorophyll to the vitamins. F. M. SCHERTZ. *Quart. Rev. Biol.* 3, 459-85(1928).—A review.
 J. B. BROWN

Development of calcium oxalate cells with particular reference to medicinal plants.

1) BRUNZEMA. *Arch. Pharm.* 266, 86-103(1928).—A histological study. W. O. E.

Recent advances in science: Botany. E. J. SALISBURY. Univ. London. *Science Progress* 23, 417-20(1929).—A review with some attention to the chem. aspects.

JOSEPH S. HEPBURN

Recent advances in science: Plant physiology. WALTER STILES. Univ. Reading. *Science Progress* 23, 420-5(1929).—A review of recent work on photosynthesis and the translocation of carbohydrates.

JOSEPH S. HEPBURN

The chemical composition of mangolds grown in mid Wales. T. W. FAGAN AND J. E. WATKIN. Univ. Coll., Aberystwyth. *Welsh J. Agr.* 4, 102-13(1928).—In expts. with 5 varieties of mangolds, the Yellow Globe variety in general had the lowest content of dry matter but the dry matter of this variety contained the highest percentages of sugar, protein and SiO₂-free ash. With the exception of the Red Intermediate variety, mangolds sown early in the season were distinctly lower in dry matter than those sown later, and the dry matter of the early sown mangolds was appreciably lower in sugar and protein content. The chief effect resulting from the application of nitrogenous fertilizers was to increase the percentage of protein in the dry matter. The application of NH₄Cl or heavy dressings of (NH₄)₂SO₄ reduced the percentage of dry matter and sugar. Applications of K₂O appeared to narrow the ratio of true to crude protein, indicating that it caused the roots to mature earlier than those receiving no K₂O. Storage of the mangolds in clamps until spring resulted in a decrease in the dry matter and sugar content, but the percentage of true protein in the dry matter was greatly increased. The dry matter was also richer in SiO₂-free ash, and, with the exception of SiO₂ and Cl, in the majority of the mineral constituents detd. Allowing the mangolds to run to seed resulted in a reduction in the dry matter and sugar content, the reduction in the latter amounting to an av. of about 29% of the sugar originally present. Mangold leaves had the following compn.—crude protein 21.64, SiO₂-free ash 19.00, CaO 2.19, P₂O₅ 0.98, and K₂O 5.61%.
 K. D. JACOB

Chemistry of the red and blue pigments of flowers and fruits. II. ERNEST H. HUNTRESS. Mass. Inst. of Technology. *J. Chem. Education* 5, 1615-20(1928); cf. C. A. 23, 863.—A consideration of the natural occurrence of the anthocyanins which on hydrolysis give the 3 anthocyanidines—pelargonidine, cyanidine and delphinidine—and of the reasons for the variations in shade and color of the flowers contg. these pigments.
 LOUISE KELLEY

The mineral constituents of cranberries. FRED W. MORSE. Mass. Agr. Expt. Sta. *J. Biol. Chem.* 81, 77-9(1929).—Fresh cranberries contain 88.44% of H₂O and 0.158% of ash and therefore contain no striking amt. of the common mineral constituents which are present in fruits. The following % of mineral constituents were found: K₂O 0.068, Na₂O 0.003, CaO 0.018, MgO 0.009, P₂O₅ 0.019, S 0.005, Cl 0.004, Fe 0.00022 and Mn 0.00057. The I content is from 26 to 35 parts per billion and the alkalinity of the ash has an av. value of 2.2 cc. of N NaOH per 100 g.
 A. P. LOTHROP

Chemical notes. A. W. R. JOACHIM. *Trop. Agr. (Ceylon)* 71, 281(1928).—*Citronella* grass ash dried at 100° contained CaO 3.28, P₂O₅ 1.39 and K₂O 7.06%. Air-dried *Boga medeloa* seed gave the following analysis: H₂O 12.91, ash 5.29, N 5.04, CaO 0.47, P₂O₅ 0.98 and K₂O 1.10%.
 A. L. MEHRING

Formation of plant membranes. KURT HESS. Kaiser Wilhelm-Inst. für Chemie, Berlin-Dahlem. *Biochem. Z.* 203, 409-20(1928).—A study of the chemistry of the plant cell wall.

Studies on the living conditions of wood-destroying fungi. A contribution to the question of the sensitiveness of our woody plants to disease. I. WERNER BAVENDAMM. Forstlichen Hochschule Tharande. *Centr. Bakt. Parasitenk.*, 2 Abt., 75, 426-52, 503-33(1928).

The assimilation of atmospheric nitrogen by blue algae. K. DREWES. Univ. Kiel. *Centr. Bakt. Parasitenk.*, 2 Abt., 76, 88-101(1928).—*Anabena variabilis*, *Anabena* spp. and one variety of *Nostoc*, growing in a mixt. of inorg. salts in cond. water, which was absolutely free from N, were able to bind from 2 to 3 mg. of N per 250 cc. of medium in 2 months. There is a good bibliography.

Moisture content of some eucalyptus woods. M. B. WELCH. *J. Proc. Roy. Soc. N. S. Wales* 61, 296-306(1928).—Contrary to popular belief wood cut in winter does not always contain less water than wood cut in summer. The differences in water content with the season are slight and vary irregularly. The difference between the water content of sapwood and heartwood was generally slight and when considerable, it appears to be due to physiological or ecological factors affecting the particular tree.

A demonstration of the technic of pollen analysis. PHYLLIS DRAPER. Univ. of Oklahoma. *Proc. Oklahoma Acad. Sci., Univ. Oklahoma Bull.* 1928, New series No 410, Studies series 30, 63-4.—The technic of collecting fossil pollens from post-glacial bogs and of prepg. them for the analysis is described.

Seasonal variations in the physical and chemical properties of the leaves of the pitch pine, with especial reference to cold resistance. BERNARD S. MEYER. Ohio State Univ. *Am. J. Botany* 15, 449-72(1928).—A study was made of the seasonal variations in the sugar and the water content, and the vol. of water expressed as sap under pressure after various treatments for the leaves of the pitch pine. The total water content of the mature leaves of the pitch pine does not exhibit any marked variations. It is highest in the recently developed leaves during the first summer of their existence. The water content decreases very slowly during the autumn and winter months until April or May and rises slightly during the following summer months. The lowest leaf water contents occur in the late spring at a season when the leaves are seldom subjected to freezing temps. During the summer months the leaves of the pitch pine are readily killed by freezing in an ice-salt bath and the sap is easily expressed. In the winter the yield of sap from leaves treated in the same way is much smaller, showing that the leaf cells are not killed by the freezing process. The increased water-retaining capacity of the cells in the winter is believed to be due to an accumulation of colloidal gels, which increase the proportion of bound water in them during the late autumn months. The colloidal content of the leaf cells is also believed to decrease in the late spring, accounting for the decrease in the water-retaining capacity of the tissues which occurs at that season. Unfrozen samples of the leaves of the pitch pine show a greater resistance to dehydration under pressure in the winter than in the summer. This is regarded as contributory evidence for the view that there is an accumulation of colloidal gels in the leaf cells during the winter months, since it is to be expected that tissues in this condition would show a greater resistance to dehydration under pressure than tissues in which only a relatively small amount of the water was bound by imbibitional forces. It is believed that the seasonal variation in the relative proportions of bound and unbound water is the most important factor in the cellular physiology of the leaves of this species in relation to cold resistance. That this seasonal variation in the proportion of bound water is due primarily to the seasonal changes in the amt. and condition of the cell colloids appears to be well established. The low winter values for the osmotic pressure lead to the conclusion that this is only a minor factor in the cold resistance of pitch pine leaves. Since, however, it seems certain that the proportion of H₂O available for soln. is reduced in the winter, it is conceivable that the winter osmotic pressure of the cell sap may be much higher than detns. of the osmotic value of the expressed leaf saps seem to indicate, and, therefore, of greater significance than the available exptl. data seem to show. The sugar content of the leaves of the pitch pine increases during the autumn months, is relatively high during the winter, decreases during the spring, and is relatively low during the summer. The increase in sol. carbohydrates during the winter months is undoubtedly the important factor in causing the increase in the winter osmotic values of the saps expressed from these leaves. This accumulation of sugars may also be of importance in the cold resistance of pitch pine leaves through the protective action which sugars exert against pptn of proteins.

J. J. SKINNER

Composition of fungus hyphae. I. The fusaria. R. C. THOMAS. Ohio Agr. Expt. Sta. *Am. J. Botany* 15, 537-47(1928).—Analyses of the cell walls of 12 different species of *Fusarium* were made and the same general structural plan was found to hold for the group. The outer covering of the hyphae was found to be a protein-pectic-compd., a cellulose-fatty-acid complex with a basic skeleton of chitin. The relative quantity of cellulose was very small and the complex with which it was associated had to be broken up before it could be demonstrated. The protein- and pectic-compound part of the complex could be removed by the use of an ammoniacal soln. of $\text{Cu}(\text{OH})_2$ and of 0.5% ammonium oxalate. The fatty acid extd. with hot alc. KOH was found to have an I value of 88.9 and n_{D}^{20} 1.4765. In young cultures the amt. of fatty acid was found to be as high as 8.3% of the original dry wt. of the mycelium while the free uncombined oils and fats constituted 6.8%. It is suggested that the high oil and fatty-acid content in part accounts for the resistance of *Fusarium* hyphae toward the action of strong acids, as well as other reagents. The striking analogy between the structure of the apical meristem of broad bean and of the *Fusarium* hyphae is pointed out. J. J. S.

Relation of cotton root rot and Fusarium wilt to the acidity and alkalinity of the soil. J. J. TAUBENHAUS, W. N. EZEKILL AND D. G. KILLOUGH. Texas Agr. Expt. Sta., *Bull.* 389, 19 pp.(1928).—Root rot of cotton, caused by the fungus, *Phymatotrichum omnivorum*, is the most destructive disease of cotton in Texas. It is especially serious in the "black lands," where the heavy soils usually contain much Ca. The present study was planned to det. whether the distribution of the disease in Texas is actually correlated with differences in the acidity or alk. of the soil. Lab. studies of the growth of the fungus on culture media showed that it grew best at about the neutral point, pH 7.0, and that it would not grow so well in more acid or in more alk. media. Cotton fields in 16 counties of Texas were examd and the acidity or alk. of the soil was studied in relation to the presence of cotton root rot and also of *Fusarium* wilt. Root rot was found in acid soils (pH 5.5-6.4) as well as in neutral (pH 6.5-7.4) and alk. soils (pH 7.5-9.0). However, in the alk. and neutral soils the percentage of fields in which the disease was present was twice that in the acid soils, and root rot was also much more destructive in these fields than when it was found in acid soils. *Fusarium* wilt, on the contrary, was much more common in the acid soils. It is probable that the differences in the distribution of these 2 important cotton diseases can be explained as due in part to differences in soil acidity. J. J. SKINNER

Oenanthe sarmentosa. F. J. GOODRICH AND E. V. LYNN. Univ. of Wash. *J. Am. Pharm. Assoc.* 17, 1096-104(1928).—Several species of *Oenanthe* are known. Some are toxic; the poisonous properties of others are undetd. *Oenanthe sarmentosa* grows in swamps, or on the banks of streams or sometimes immersed in water. Leaves and stems, leaves from submerged plants and rhizomes and roots were collected at intervals throughout the season (1926 and 1927). On drying in the air the various parts lost from 71.5 to 79.4%; at 105° the losses ranged from 77.3 to 88.4%. The stems and leaves lost to petr. ether 1.56 to 1.80%; to Et_2O 3.99-3.96%; to CHCl_3 0.84-0.80%; to EtOH 19.8-23.7%. The rhizomes and roots lost to petr. ether 2.84-2.96%; to Et_2O 2.74-26.2%; to CHCl_3 0.61-0.62%; to EtOH 29.-29.4%. Alkaloids were absent, glucosides, pectins, gums or dextrans, sucrose, resins and starch were found in the rhizomes. All parts of the plant contain a volatile oil which contains S. α -Phelandrene is a component of the fruit oil while furfural is contained in the oil from the leaf and rhizome. Pharmacologic tests indicated that the plant is non-poisonous. L. E. WARREN

Agglutinins in plants. M. EISLER AND L. PORTHEIM. *Ans. Akad. Wiss. Wien* 63, 35-6(1926).—Agglutinins are not found in leaves, stems, roots, anther sacs, pollen, or seed anlage" of *Phaseolus multiflorus*. In this plant, and in *Ricinus communis* and *Datura stramonium*, it is found in the seed at a particular stage of development and of deposition of reserve protein. It is contained largely in the albumin fraction. It is probably not a protein, but a "building stone" of a protein. J. J. WILLAMAN

Chlorophyll. I. Etioporphyrins from plant- and blood-pigment porphyrins (Fischer, Treibs) 10.

E—NUTRITION

PHILIP B. HAWK

The division of animal nutrition: The laboratory at the University of Adelaide. T. BRAILSFORD ROBERTSON AND L. LAYBOURNE-SMITH. *J. Council Sci. Ind. Res.* 1, 321-8(1928).—Descriptive. E. J. C.

Basal metabolism in theory and practice. VIKTOR NIEDERWIESER. Univ.-klinik in Innsbruck. *Wiener klin. Wochschr.* 42, 71-3(1929).—A review. D. B. D.

New color reactions of biosterol. SADAYUKI HAMANO. *J. Agr. Chem. Soc. Japan* 4, No. 1; *Bull. Inst. Phys. Chem. Research (Tokyo)* 7, 392-7(1928); *Abstracts* 1, No. 4, 36-7(1928).—Biosterol was prepd. by Takahashi's method; the unsapon. matter of cod-liver oil was purified by removal of the ppts. produced in its acetone soln. by cooling to -65° , and of traces of cholesterol by means of digitonin. Biosterol thus prepd. gave all the known color reactions attributed to vitamin A; *i. e.*, it presented, like cod-liver oil, a blue color by addn. of a strongly dehydrating agent such as concd. H_2SO_4 , H_3PO_4 , P_2O_5 , acid clay or $AlCl_3$, $ZnCl_2$, $MgCl_2$, $TiCl_2$, $AsCl_3$, or $SbCl_3$. The following new color reactions have been found with polyphenols, aromatic and heterocyclic amines: (1) Phloroglucinol: to an alc. soln. of biosterol, a small quantity of phloroglucinol and a few drops of concd. HCl are added. A green color appears, which turns blue, then remains unchanged for about 10 mins., then becomes Prussian blue and finally rose-pink. In the case of cod-liver oil, a pink color which first appeared in place of the green one turned blue very slowly. In the following tests a similar exptl. procedure is to be followed, except that phloroglucinol is replaced by the reagent indicated. (2) Orcinol: lemon-yellow. (3) Pyrogallol or resorcinol green for a few min. (4) Naphthol resorcinol: deep green persisting for several days. (5) Aniline, xyldine, benzidine, naphthylamine or phenylhydrazine: crimson red. In this case further addn. of glacial AcOH was needed. (6) Indole: dark green gradually turning to brown. (7) α -Methyl-indole: blue as in (1). (8) Skatole: yellowish brown. (9) Pyrrole: green turning to dark brown immediately. (10) Quinaldine: yellowish brown. The color reaction with phloroglucinol or naphthylamine is effective with $1/800,000$ of biosterol. Many aliphatic and aromatic aldehydes when condensing with one of the above reagents produce special colors or ppts. Furfural shows a close resemblance to biosterol in its color reactions, but biosterol reduces Fehling soln., ammoniacal silver oxide and phosphomolybdic acid. From these facts it is not unreasonable to infer that biosterol may contain a carbonyl group in its mol. The color reactions mentioned above are not given by cholesterol.

A. L. HENNE

The value of mineral calcium to the human economy. T. A. BUCKLEY. *Dental Cosmos* 70, 1161-7(1928).—A review.

JOSEPH S. HEBURN

World economy and popular nutrition. F. H. WITTHOEF. *Naturwissenschaften* 16, 831-5(1928).—A lecture.

B. J. C. VAN DER HOEVEN

The physiological significance of important constituents of vegetable matter; in particular of lignin. MAX RUBNER. *Naturwissenschaften* 16, 1011-9(1928).—See C. A. 22, 3908.

B. J. C. VAN DER HOEVEN

The relation of food to the composition of milk. R. O. DAVIES AND A. L. PROVAN. Univ. Coll., Aberystwyth. *Welsh J. Agr.* 4, 114-21(1928).—The effect of summer grazing on the chem. compn. of milk from 14 cows was studied. The milk was sampled immediately before grazing and a fortnight after the cows had been out on grass. The results indicate that after a fortnight's grazing there is generally an increase in the total protein, casein, total P, inorg. P and Ca concn. of the milk. These changes in the compn. of milk were found to depend on the system of winter feeding to which the cows were subjected before being let out on grass. Animals fed on a "low protein" winter ration gave milk contg. higher concns. of total and inorg. P and casein after grazing than was found in milk from animals fed on "control" winter rations. The results are of considerable importance in that they may throw light on the relative efficiency of different winter rations advocated for dairy cows. The rise in concn. of the constituents of the milk occurred simultaneously with an increased flow of milk, which may be due either to an improvement in the health of the animals as a result of being left out overnight; to the much higher nutritive value of the summer grass in comparison with the winter rations; or to a specific effect of some constituents of the grass on the milk gland.

K. D. JACOB

Effects of irradiated ergosterol in animal experiments. W. FRANNENSTIEL. *Munch. med. Wochschr.* 75, 1113-4(1928).—Large daily doses of irradiated ergosterol produced acute and fatal symptoms in animals. Later expts. with 2 drops of vigantol (1% irradiated ergosterol in olive oil) daily produced the characteristic symptoms of hypervitaminosis in healthy adult rabbits. The symptoms disappeared when the vigantol was removed from the diet and reappeared upon its readministration. Control animals gained weight. No permanent injury was noted in the animals not succumb.

R. C. WILLSON

Chemical reaction for the antirachitic vitamin. W. STOLTZNER. Königsberg Klinik. *Munch. med. Wochschr.* 75, 1584(1928).—If P_2O_5 is added to a 1% soln. of the antirachitic vitamin in olive oil (vigantol oil), a reddish brown tint starts from the

P_2O_5 which gradually becomes darker until it is almost black. P_2O_5 gives the same reaction in cod-liver oil, but in ordinary olive oil with or without irradiated cholesterol in lipanin or sesame oil, this reaction does not appear. R. C. WILLSON

Malt extract and oil emulsions. II. Vitamin A content of commercial malt extract and cod-liver oil emulsions. III. Testing malt extract and cod-liver oil emulsions for vitamin A (JONES, *et al.*) 17.

F—PHYSIOLOGY

E. K. MARSHALL, JR.

Hormones. MAX DOHRN. *Arch. Pharm.* 267, 60-76(1929).—An address.

W. O. E.

Influence of training on the work-blood sugar curve of normal persons. A. HOFFMANN. *Klin. Wochschr.* 7, 2043-5(1928).—Muscular activity leads to a hyperglucemia in an untrained person. This effect disappears entirely after a brief period of training.

MILTON HANKE

The ability to change the hydrogen-ion concentration of human blood. GYULA HOLLÓ AND ISTVAN WEISS. *Klin. Wochschr.* 7, 2154-5(1928).—The ingestion of large amts. of $NaHCO_3$ or $NH_4H_2PO_4$ leads to a decided increase or decrease, resp., in the pH of the blood.

MILTON HANKE

Condition of the "free" sugar in serum. I. F. LOEB AND D. KRÜGER. *Z. klin. Med.* 106, 354-9(1927).—Free blood sugar includes the reducing substances (chiefly d-glucose) which are present in whole blood, serum or plasma after complete removal of the proteins. The free blood sugar is present in a state of mol. dispersion in both normal and diabetic persons. The bound blood sugar includes substances which reduce only after hydrolysis, and have not yet been identified. JOSEPH S. HEPBURN

The bilirubin formation capacity of dog spleen in vivo. YUTAKA KOMORI, CHUJI IWAO AND HIDEO NAKAMURA. Med. University Clinic, Niagasaki. *J. Biochem. (Japan)* 10, 11-6(1928).—Intravital hemolysis in the spleen produced through the intravenous injection of distd. water leads to the formation of bilirubin *in vivo*. S. MORGULIS

Activity of the liver in hormonal regulation of diuresis. I. SUSI GLAUBACH AND HANS MOLITOR. Univ. Wien. *Arch. expil. Path. Pharm.* 132, 31-49(1928).—Exts. of beef liver were prepd. in various ways, and these were tested for their influence upon diuresis. The various preps. differed materially in effect, although some were definitely effective in stimulating water output. In a few instances some of the preps. appeared to exert an inhibitory effect.

G. H. S.

Water and fat metabolism. I. L. ELEK AND F. RÓTH. Graf Stephan Tisza Univ. *Arch. expil. Path. Pharm.* 132, 246-52(1928).—Sera which show a lipemia contain more water than do non-lipemic sera, and by dialysis they yield a larger quantity of Ca.

G. H. S.

Modern work on the chemistry of hormones. G. BARGER. *Naturwissenschaften* 16, 940-5(1928).—The analysis and subsequent synthesis of thyroxine by Harington are discussed in detail; it is as active as the natural product and of half the price. Several other hormones are briefly discussed.

B. J. C. VAN DER HOEVEN

Female sexual hormones. BERNARD ZONDEK. *Naturwissenschaften* 16, 946-51(1928); cf. *C. A.* 22, 2597.—A review.

B. J. C. VAN DER HOEVEN

Female sexual hormones. FRITZ LAQUER. *Naturwissenschaften* 16, 952-7(1928).—A review.

B. J. C. VAN DER HOEVEN

G—PATHOLOGY

H. GIDEON WELLS

The distribution of blood groups of the Japanese. III. T. FURUHATA. Kanazawa Med. College. *Jap. Med. World* 8, 287-91(1928).—W. Kruse's method of racial points has been successfully employed in preference to the classifications of Hirsfeld and Ottenburg. Almost 30,000 persons were tested and the frequency of the three hereditary units was calculated.

N. KOPELOFF

Hydrogen sulfide in blood in uremia; hydrogen-sulfide-decomposing power of blood and other body fluids. E. BECHER. *Münch. med. Wochschr.* 74, 1950-1(1927).—In severe renal insufficiency and true uremia H_2S could not be detected in the blood; that obtained on acidification and distn. probably arose from thiocyno compds. All body fluids can oxidize H_2S to thiosulfuric acid. The disappearance of H_2S added to blood does not depend on the formation of sulfohemoglobin.

B. C. A.

The resorption of bile acids from the normal and from the inflamed gall bladder.

F. ROSENTHAL AND H. LICHT. *Klin. Wochschr.* 7, 1952-4(1928).—Bile acids are resorbed by the mucous membrane of the normal gall bladder. The resorption rate is enormously increased when the gall bladder is inflamed by the intravenous injection of Dakin's soln. or of turpentine. MILTON HANKE

The specific dynamic action of liver. ROBERT E. MARK. *Klin. Wochschr.* 7, 2012(1928).—It is well known that the ingestion of meat (muscle) temporarily increases O consumption in normal individuals. This is not the case with liver. Ingestion of liver may lead to a slight increase in O consumption; but it may also lead to a decreased consumption. Kidney tissue is less effective than meat. In hepatopathics, ingestion of liver leads to an increased metabolism that is not far short of that produced by muscle. MILTON HANKE

Paroxysmal hemoglobinuria. ÖDÖN FISCHER. *Klin. Wochschr.* 7, 2061-2(1928).—A mixt. of swine serum plus lipid (alc. ext.) from guinea pig corpuscles injected into rabbit's engenders hemolysins against guinea pig corpuscles. The changes produced in the rabbit's serum may be identical with the changes produced in human serum in cases of paroxysmal hemoglobinuria. MILTON HANKE

The pain-producing action of the potassium ion. The physical chemistry of inflammation. C. HÄBLER AND R. HUMMEL. *Klin. Wochschr.* 7, 2151-3(1928).—A concn. of K ion in excess of 12 mg. % produces inflammation and pain. Neutral or slightly alkaline Na phosphate buffer solns. are not painful when injected. K phosphate buffer solns. of identical p_H are painful. Acid solns. are always painful. The pain produced by the injection of acid solns. subsides rapidly. The pain produced by K solns. is protracted. Inflamed areas contain acid; but they also contain Na, Ca and K in a ratio such that there is an excess of K. MILTON HANKE

The anti-hemolytic action of liver in the therapy of anemics. L. PONTICACCIA AND D. CAMPANACCI. *Klin. Wochschr.* 7, 2153-4(1928).—The action of a liver diet, in pernicious anemia, is primarily anti-hemolytic because (1) the general condition is improved almost immediately and before the blood picture is changed; (2) the concn. of bilirubin in the blood and of urobilinogen in the urine is decreased; (3) the cholesterol content of the blood is increased. MILTON HANKE

The relationship between the colon bacillus infection of the small intestine and liver therapy in pernicious anemia. NORBERT HENNING. *Klin. Wochschr.* 7, 2190-3(1928).—Liver exts. are not antiseptic. The ingestion of liver exts. appears to have no effect upon the colon bacillus infection of the small intestine in cases of pernicious anemia that are otherwise benefited by the treatment. MILTON HANKE

The action of light on blood. MEYERSTEIN. *Klin. Wochschr.* 7, 2244-5(1928).—Blood corpuscles hemolyze spontaneously when they are allowed to remain for some time suspended in sterile physiol. salt soln. The rate of hemolysis is accelerated by sunlight. The hemolysis time (in days) for various bloods kept in the dark or exposed to sunlight is as follows (sunlight periods are in parentheses): human, 13-14 (5-6); guinea pig, 11-12 (2); mouse, 2-3 (1); pigeon, 15-16 (6-7) and frog, 18 (7). The stability of blood cells in the animal body may be affected by light. MILTON HANKE

The action of the serum of non-castrated males on pregnancy in rabbits. W. BUTOMO. *Klin. Wochschr.* 7, 2253-4(1928).—The injection of serum from male rabbits (or oxen) into pregnant rabbits always leads to disturbances. Injection of the serum during the first 10-16 days of pregnancy leads to an arrestment of the fetal development and a resorption of the uterus contents. After 18 days of pregnancy, some of the fetuses are resorbed. Serum injections that are given during the last stages of pregnancy may lead to abortion or to the birth of fetuses, some of which are alive and some dead. In certain of these cases the live fetuses were all male, the dead ones either female or indeterminate. MILTON HANKE

Nature of natural and acquired immunity. JOHN A. KOLMER. Univ. Pennsylvania. *J. Am. Inst. Homeopathy* 22, 12-23(1929).—A concise, comprehensive survey of modern immunology. JOSEPH S. HEPBURN

Newer knowledge on the relations of the cell to immunological processes. RALPH R. MELLON. Western Penn. Hospital, Pittsburgh. *J. Am. Inst. Homeopathy* 22, 35-45(1929).—A discussion of the role of tissue cells in the processes of immunity. JOSEPH S. HEPBURN

Hemolysis. GEORGE F. RAYNOR. *J. Am. Inst. Homeopathy* 22, 100-4(1929).—A review of the various factors which produce hemolysis. JOSEPH S. HEPBURN

The iodine content of milk, its dependence on iodine content of feeding plants and soil; its relation to goiter. F. KIEFERLE. *Naturwissenschaften* 16, 957-62(1928).—A review. B. J. C. VAN DER HORVEN

The arterial blood in ammonium chloride acidosis. J. B. S. HALDANE, G. C.

LINDER, R. HILTON AND F. R. FRASER. St. Bartholomew's Hosp., London and Cambridge. *J. Physiol.* 65, 412-21(1928).—Exptl. acidosis produced in man by giving large doses of NH_4Cl (20 g. per day) disturbed all the equilibria of acid-base regulation in the arterial blood. CO_2 content and CO_2 tension were less; the reaction was more acid; and the increased hemoglobin indicated that concn. of the blood had occurred. NH_4Cl had a damaging effect on the blood and endothelial cells indicated by (1) an increase in the hyaline leucocytes, (2) an increased tendency of the red cells to hemolyze and (3) a mild grade of subsequent anemia. J. F. LYMAN

Endocrine glands and defence. A. SEITZ. Univ. Leipzig. *Centr. Bakt. Parasitenk.*, I Abt., 109, 115-20(1928).—The removal of the adrenal in rats produced a marked decrease in the phagocytosis of anthrax bacilli, independent of whether the organisms were studied *in vitro* or *in vivo*. Capsule formation does not occur. Simultaneous castration adds nothing to the effects. There is a decided decrease in bactericidal formation against most organisms. There is a neutrophilic leucopenia, a lymphocytosis, and a thrombocytopenia. The serum of adrenalectomized rats gives lower interometer readings than that of normal rats. JOHN T. MYERS

Purification of botulinic toxin. S. HOSoya, G. J. STÉFANOPOULO AND S. MIYATA. *Compt. rend. soc. biol.* 99, 1465-7(1928).—The botulinic toxin may be purified by pptn. with ZnCl_2 and sepn. from its Zn compd. by $(\text{NH}_4)_2\text{S}$. The toxin thus purified gives some of the reactions for higher proteins, and is not pptd. by picric or picrolonic acids. Further study of this purified toxin is in progress. L. W. RIGGS

Natural and acquired immunity against tetanus intoxication in the fowl. G. RAMON. *Compt. rend. soc. biol.* 99, 1473-5(1928).—The fowl shows a marked but not unlimited resistance to tetanus intoxication, and is capable of producing abundant quantities of sp. antitoxin when injected with tetanic antigen (toxin or antitoxin), thereby acquiring an artificial immunity in addn. to its natural immunity. These 2 immunities concur in protecting the fowl against tetanus intoxication. Passage of tetanus toxin and antitoxin from the fowl to the egg and to the chick. *Ibid* 1476-8.—Following the injection of tetanus toxin in the fowl a sp. antitoxin is formed which passes readily from the blood to the vitellus of the egg and not to the albumin. The tetanus antitoxin thus concealed in the yellow of the fertilized egg is recovered in the blood of the chick hatched from that egg. L. W. RIGGS

Value of the azotemic ratio in the normal state. MARCEL LABBÉ, F. NEPVEUX AND A. HIERNAUX. *Compt. rend. soc. biol.* 99, 1492-3(1928).—In detg. the N ratio the samples of blood should be taken after a 12 hr. fast. Total N and urea N should be detd. in the desalbuminated serum in preference to desalbuminated total blood. Desalbumination is best made with 20% $\text{CCl}_3\text{CO}_2\text{H}$ and at the isoelec. point of the albumen. The quantity of the sample should be sufficient to give 20 cc. of filtrate from the $\text{CCl}_3\text{CO}_2\text{H}$ ppt. for the detn. of total N by the macrochemical method of Kjeldahl. Methyl orange indicator should be used in the final titration. Urea was detd. by the method of Fosse. In 7 normal subjects the urea N/total N ranged from 40 to 48%. Azotemic ratio in nephritics and in subjects with liver disease. *Ibid* 1493-5.—In all nephritics the ratio urea N/total N of the blood serum ranged from 55.8 to 95%, and in 10 subjects with cirrhosis of the liver the range was from 15 to 37%. L. W. RIGGS

Experimental uremia and the chlorine content of the cortex. F. LEÖVEY AND E. KÉKÉLI-PRONIVS. Univ. Budapest. *Arch. exptl. Path. Pharm.* 138, 372-8(1928).—During Cl hunger the cortex loses but 14.45% of its Cl content while the white matter loses 55%. When an abundance of Cl is administered after ligation of the ureters the gray matter takes up almost three times as much Cl as does the white substance (111.9% and 56.02%). In exptl. uremia with ligation of the ureters the pathologic state, although qualitatively unchanged, is reduced in duration by half if an abundance of Cl is given. G. H. S.

Endemic goiter in rabbits. III. Effect of administration of iodine. BRUCE WEBSTER AND ALAN M. CHESNEY. Johns Hopkins Med. School. *Bull. Johns Hopkins Hosp.* 43, 291-308(1928).—An excess of I administered to rabbits caused a temporary lowering of the metabolic rate, which gradually returned to normal when the I was discontinued. Doses of 0.06 cc. Lugol's soln. given daily produced in the normal thyroid gland a diffuse out-pouring of colloid with a flattening of the alveolar epithelium and a preponderance of the colloid cells. Doses of 0.03-0.06 cc. Lugol's soln. or 25 mg KI daily when administered to goitrous rabbits caused a marked increase in the metabolic rate, rapid emaciation and usually death. I tended to effect involution of the hyperplastic thyroid gland with a lowering of the alveolar epithelium. R. C. W.

The Nobel reaction and the p_n in normal and pathological cerebrospinal fluids. G. HALPER. Univ. of Padua. *Münch. med. Wochschr.* 75, 1628(1928).—On the basis

of the results obtained by other investigators, H. studied the colorimetric ninhydrin reaction to det. if it is possible to detect an increase in the protein content of the spinal fluid by this method. He examd. 60 children with serious diseases of the nervous system and 30 normal children. The strength of the reaction was parallel with the protein content of the spinal fluid. When the protein content was within the normal limits (0.02%), the reaction was always negative. Using the Michaelis method he found that the p_H of the spinal fluid varied from 7.9 to 8.2. In epidemic cerebrospinal meningitis and suppurative meningitis the p_H approaches the neutral point. In tuberculous meningitis this displacement toward the neutral point is very slight, but always detectable. Similar displacement was observed in many of the so-called meningisms of the different diseases.

R. C. WILLSON

H—PHARMACOLOGY

A. N. RICHARDS

Possible action of drugs as antigens and the relation of such possible action to homeopathic prescribing. CONRAD WESSELHOEFT. *J. Am. Inst. Homeopathy* 22, 24-34(1929).—A discussion of the possible role of drugs in the production of antibodies.

JOSEPH S. HEPBURN

Physiology and pharmacology of the isolated iris. I. EMIL LEVKO. *Med. Doswiadczenia i Spoleczna* 7, 311-54, 355-8(English).—The mechanism of the contraction and dilatation of the pupil and relaxing action of adrenaline, ergotamine, ephedrine, tyramine, cocaine, pilocarpine, arecoline, physostigmine, atropine, histamine and BaCl₂ solns. on the excised sphincter muscle of the iris is investigated on the basis of the numerous pharmacol. expts. and it is detd. that the dilating mechanism of the pupil is an inhibitory action of the sympathetic nerve endings on the sphincter muscle. Bibliography.

JAROSLAV KUČERA

The photodynamic action of hematoporphyrin. ETHELBERTA N. RASK AND W. H. HOWELL. Johns Hopkins Univ. *Am. J. Physiol.* 84, 363-77(1928).—Hematoporphyrin injected into dogs sensitized the animals to light, resulting on exposure in cutaneous irritation, motor excitation, erythema and edema of the skin and hyperpnea followed finally by cutaneous cyanosis, loss of sensibility, stupor and death. An isolated illuminated turtle heart perfused with Ringer soln. contg. hematoporphyrin stopped in a contracted state. Illumination of the hematoporphyrin soln. alone had no injurious effect on the heart kept in the dark. The fatal effects in dogs were due to the fall in blood pressure and the vascular collapse was not due to toxic substances but to paralysis of the cutaneous circulation. No significant change in blood sugar or in the blood acidity could be detected.

J. F. LYMAN

Properties of separated active principles of the pituitary (posterior lobe). J. H. GADDUM. Natl. Inst. Med. Res. *J. Physiol.* 65, 434-40(1928).—Com. oxytocin, in addn. to its effect on the uterus, had a depressor effect on blood pressure which could not have been due to histamine. Vasopressin, in addn. to its effect on blood pressure and on the kidney, had a sp. stimulating action on the bowel of the rabbit and a dilator action on the melanophores of the frog.

J. F. LYMAN

The action of ammonium salts. MARY WHELAN, MINARD F. JACOBS AND NORMAN M. KEITH. Proc. Am. Physiol. Soc., *Am. J. Physiol.* 81, 513(1927).—When NH₄ salts were administered to animals some of the NH₄ was quickly synthesized to urea, leaving the liberated anion to increase the acidity of the tissues or to be disposed of by oxidation or combination. Inorg. acids and benzoic acid and their NH₄ salts caused an acidosis; while acetic acid or AcONH₄ had no such effect.

J. F. LYMAN

Tolerance of the animal organism for sodium chloride waters. H. VELU. *Compt. rend. soc. biol.* 99, 1481-2(1928).—Beef animals weighing about 300 kg. were able to tolerate about 1 g. of NaCl per kg. of live wt. Man tolerates about 0.5 g. of NaCl per kg. A further study of this question is promised.

L. W. RIGGS

Action of encephalic anemia on the nerve centers and cardiac, gastric and enteric vagi, with the isolated head. B. A. HOUSSAY AND E. HUG. *Compt. rend. soc. biol.* 99, 1503-6(1928).—Action of encephalic asphyxia on the respiratory, cardio-regulator gastric and enteric centers. *Ibid* 1506-7.—Direct and reflex action of nicotine and of lobeline on the respiratory centers and the cardio-regulator, gastric and enteric vagi. *Ibid* 1508-9.—Heyman's technic of the isolated head was used. In general there was at first an inhibition followed by a reinforcement. Nicotin injected into the decapitated trunk caused an inhibition for 1 to 2 min. of the gastrointestinal movements by direct action and by the discharge of adrenaline. Lobeline caused the same effects as nicotine but its action was less intense for the same doses. Action of ypomorphine and crotalus

venom on respiratory centers and vagi in the technic of the isolated head. *Ibid* 1509-11.—With 3 to 5 mg. doses of the venom there was at first apnea then dyspnea followed by depression or cessation of the respiration. In all cases there was a bradycardia and often a brief arrest of the heart in the decapitated trunk. There was always an inhibition of gastro-enteric movements for 30 to 90 sec. followed by a reinforcement of these movements. The results show that the venom of *Crotalus terrificus* has an intense action on the central nervous system. L. W. RIGGS

Oligodynamic activity of distilled water caused by metallic silver. R. WERNICKE AND F. MODERN. *Compt. rend. soc. biol.* 99, 1519-20(1928); cf. *C. A.* 21, 2716.—Distd. water, rendered oligodynamic by contact with metallic Ag, contains at least 0.0005 mg per cc. of ionized Ag. This activated water loses its power after a prolonged electrolysis in which the Ag is deposited on the cathode. The oligodynamic activity of water after contact with Ag is due to the ionization of the metal. L. W. RIGGS

Hemodynamic action of adrenaline and of choline in suprarenalectomized dogs. E. TROILO. *Compt. rend. soc. biol.* 99, 1521-2(1928).—In suprarenalectomized dogs the threshold of action of adrenaline is lowered, and the action of the drug is more intense and more prolonged. A dog weighing 31 kg. reacted to 1 cc. of a 1 to 8 million soln. of adrenaline. The effect of suprarenalectomy on the action of choline was to retard its action and diminish its intensity. L. W. RIGGS

Discharge of choline into the blood after the injection of adrenaline. G. VIALE AND T. COMBES. *Compt. rend. soc. biol.* 99, 1524(1928).—Expts. with guinea pigs proved that the injection of 1 cc. of a 1 to 10,000 soln. of adrenaline produced an increase of about 7 mg. per l. of choline in the blood in 4 out of 5 cases. L. W. RIGGS

Influence of ergotamine on alimentary hyperglucemia in normal and diabetic subjects. EDUARDO COELHO AND J. CANDIDO DE OLIVEIRA. *Compt. rend. soc. biol.* 99, 1527-30(1928).—Ergotamine lowers the alimentary hyperglucemia in both normal and diabetic subjects, and raises the tolerance for carbohydrates. It also lowers adrenaline hyperglucemia. L. W. RIGGS

Action of insulin on the external secretion of the pancreas in the case of pancreatic fistula. FERNANDO PONSECA AND CARLOS TRINCAO. *Compt. rend. soc. biol.* 99, 1532-3(1928).—Expts. with human subjects showed that insulin increased quantitatively the external secretion of the pancreas when given with a mixed diet, but does not affect the external pancreatic secretion under fasting conditions. Action of certain drugs upon the external secretion of the human pancreas. *Ibid* 1533-5.—Tests with a patient having a pancreatic fistula proved that odor or sight of food, pituitrin, atropine, pilocarpine and ergotamine increased the flow from the fistula. Pituitrin, atropine and ergotamine decreased the quantity of enzymes in the juice, while pilocarpine increased the enzymes. Adrenaline decreased both the flow and the enzymes, while ephedrine and ephedrine diminished the secretion without changing the enzymes. L. W. R.

Action of ergotamine on glucemia. CARLOS TRINCAO. *Compt. rend. soc. biol.* 99, 1538-40(1928).—From a study of 4 diabetic cases, it is concluded that in general ergotamine does not promote the action of insulin, though exceptionally it appears to do so. L. W. RIGGS

Role of colloids in the anagototoxic power of mineral waters. P. L. VIOLLE. *Compt. rend. soc. biol.* 99, 1723-4(1928); cf. Billard, *C. A.* 21, 2007.—Expts. indicated that the colloids played only an accessory role in the anagototoxic action of mineral waters. Crystalloids played the principal role. L. W. RIGGS

Plasmoquine (plasmochine). C. M. HASSELMANN AND MARGARET HASSELMANN-KAHLER. *Philippine J. Sci.* 37, 75-119(1928); cf. Hürlein, *C. A.* 21, 800; Roehl, *C. A.* 21, 963; Barman and Smits, *C. A.* 21, 3085.—Plasmoquine, said to be *n*-diethyl- α -ammonio-pentyl-8-amino-6-methoxyquinoline, was administered in 90 cases of naturally acquired malarial infection. In 40 of these cases, which were tertian infections, the patients were freed from parasites in 2 to 6 days after treatment. In 31 other patients with simple aestival-autumnal infections, and receiving "plasmoquine compd." (a mixt. of 0.01 g. plasmoquine and 0.125 g. quinine sulfate) the parasites were absent in 2 to 10 days after the beginning of treatment. In all cases splenic enlargement rapidly decreased. In double infections treated with plasmoquine certain schizonts appeared but never the sexual forms. In these cases the treatment was continued with plasmoquine compd. Relapses were few as compared to those after quinine medication. There are 60 references to the literature. L. W. RIGGS

Insulin as an aid in pulmonary tuberculosis. GIUSEPPE PACI. *Rass. clin. terap. sci. affm* 27, 341-6(1928).—P. practiced application of insulin in 8 afebrile patients suffering from pulmonary tuberculosis. In 6 of these he noted a conspicuous increase in wt. and improvement of the general condition. In the 7th and 8th case insulin had

a beneficial influence, though the increase in wt. was not permanent. This was due to the fact that these 2 patients also suffered from other grave complications. In all the other cases the increase in wt. was permanent and a further increase was often noted even after stopping the insulin treatment. As a rule 30 units per day were given for about 1 month after slowly building up the tolerance for the hormone with small doses. The insulin was injected in 2 doses about 1 hr. before meals. There were no symptoms indicating hypoglycemia except, occasionally, a strong desire for food and a slight indisposition. Local reactions, urticaria or gastrointestinal disturbances of importance were not observed; the temp. remained normal. G. SCHWOCH

The treatment of epilepsy and the boron preparations. ALBERTO LUNGAROTTI. *Rass. clin. terap. sci. affini* 27, 347-53(1928).—A historical review of epilepsy and the drugs used for its treatment, particularly Br and B preps.; also clinical reports on *Liquor Sacer Serono*, which has a K boro-tartrate as its base. G. SCHWOCH

Has "Bayer 205" an effect upon anaphylactic shock? ERNST WIECHMANN AND FRITZ KOCH. Univ. Köln. *Arch. expil. Path. Pharm.* 132, 118-21(1928).—No effect was observed. G. H. S.

Relation of calcium to the occurrence of narcosis and irritability states in decorticate and completely decerebrate animals. HANS FISCHER. Univ. Zurich. *Arch. expil. Path. Pharm.* 138, 169-89(1928).—The changes in blood Ca occurring in the normal animal during sleep and in narcosis take place in the same way in dogs deprived of cortex. During sleep or narcosis the Ca is diminished; with cerebral stimulation it is increased. If the entire brain is removed no change in the Ca of the blood occurs. The reduction in Ca during sleep and narcosis is reflected in a corresponding increase in K, again exhibiting the antagonism between these 2 elements. G. H. S.

Effect of scopolamine in combination with cyanide, carbon monoxide and reduced air pressure. U. G. BIJLSMA AND J. E. BROUWER. *Arch. expil. Path. Pharm.* 138, 190-207(1928).—Preliminary treatment with scopolamine prevents the development of KCN or CO convulsions, probably because, just as by reduced O tension, the lack of O in the blood in CO intoxication and in the tissues in KCN intoxication enhance the narcotizing effect of the scopolamine. Thus, the cerebral motor centers are depressed, and with larger doses the cord centers also. G. H. S.

Mechanism of the action of ephedrine and differences in the intensity of action of its isomers. OTTO SCHAUMANN. *Arch. expil. Path. Pharm.* 138, 208-18(1928). The effect of ephedrine upon blood pressure is due entirely to its effect upon the peripheral vessels, which become sensitized to suprarenine by ephedrine. Cocaine and anesthetics of the novocaine group exhibit similar phenomena. The *l*-form of ephedrine is definitely more active than is the *d*-form, while the racemic form is but half as effective as the *l*-form. G. H. S.

Reversal of the action of the vagus and the splanchnic on intestinal motility by potassium and calcium. W. BRANDHENDLER. *Arch. expil. Path. Pharm.* 138, 219-27(1928).—The effect of stimulation of both nerves of the intestine is increased or diminished by the intravenous injection of K or Ca. There is a reversal of effect in that stimulation of the vagus causes an inhibition, of the splanchnic an increase in intestinal motility. G. H. S.

Action of poisons on striated intestinal muscle of the tench. ERNEST FREY. Univ. Rostock. *Arch. expil. Path. Pharm.* 138, 228-39(1928).—The intestinal musculature is composed of both striated and smooth muscle, both of which take part in contraction, each responsible for a distinct contraction phase sep'd. by an interval. Ale causes a reduction in the contractions assoc'd. with the first phase, that due to the striated muscle, and a very great increase in that related to the second phase. With chloral hydrate the effect is reversed. Histamine, adrenaline, acetylcholine, pilocarpine, physostigmine and morphine favor the action of the smooth portion of the muscle. The action of papaverine and that of quinine are det'd. by the concn. used. Caffeine causes contraction. Camphor exerts a far greater effect on the smooth than on the striated muscle. Curare influences the striated portion, atropine the smooth muscle. The contraction waves assoc'd. with the smooth muscle are favored by pilocarpine and physostigmine, inhibited by adrenaline. G. H. S.

Increased activity in the effects of some alkaloids. ERNO ANNAU AND IMRE SÁRKÁNY. *Arch. expil. Path. Pharm.* 138, 240-4(1928).—See C. A. 23, 647. G. H. S.

Diuretic effect of organic mercury compounds. B. v. ISSEKUTZ AND F. v. VÉGH. *Arch. expil. Path. Pharm.* 138, 245-55(1928).—Among the various comp'ds. tested toxicity ranged all the way from those as toxic as HgCl₂ to those having about 1/10 as great an intoxicating power. Diuretic action is assoc'd. with a definite chem. structure. G. H. S.

Action of narcotics on nerves. S. FLAMM. Univ. Leipzig. *Arch. exper. Path. Pharm.* 138, 257-75(1928).—Tabulated data covering the paralytic and intoxicating effects induced by a series of alcs. by urethan, brominal, neuronal, hedonal and chloral hydrate upon frog nerve. G. H. S.

Analysis of the differential action of heart poisons. VI. Effect of acetaldehyde on the frog heart. BRUNO KISCH. Univ. Köln a. Rh. *Arch. exper. Path. Pharm.* 138, 329-38(1928).—Acetaldehyde retards stimulus formation and with higher concns. or with repeated exposure to lower concns. arrest takes place. Active doses of acetaldehyde always exert a negative inotropic effect. G. H. S.

A contribution to the chemistry, pharmacology and therapeutics of *Agave salmiana*. G. G. COLIN. Chem. Lab. Dept. Pharmacol., Mexico. *J. Am. Pharm. Assocn.* 17, 1182-9(1928).—The juice obtained by expression fermented rapidly unless sterilized. The crude liquid contains a hemolytic saponin. A highly irritant substance was found in the stems. Two cryst. substances were obtained from the juice, one by evapn. in an acid medium and the other by neutralizing and then adding an excess of EtOH. The acid ppt. contains 15% of Ca but the identity of the 2 ppts. was not established. A did. präpn. of the principle was given to rabbits hypodermically. No effects were observed. Humans were given hypodermic injections of the soln. together with stovaine to prevent pain. No toxic effects were noted. Clinically 30 cases of syphilis in various stages were treated. Some cases which had resisted the usual treatment responded well under *Agave* while others showed no improvement. Cases with secondary ulcers responded best. The effect on the Wassermann test was uncertain and in some instances no relation could be established between clinical improvement and modification in the Wassermann reaction. As a whole the results are inconclusive. L. E. W.

Derivatives of mono- and diamino-hydroxyphenylarsonic acids (FISHER, RAIZISS)

10.

I—ZOÖLOGY

R. A. GORTNER

Iodine compounds in fish products. G. LUNDE AND K. CLOSS. *Tids. Kem. Bergeven* 8, 33-4(1928).—Sea fishes contain a relatively large amt. of I (3.2-4.2 mg. per kg.) and most of this remains in the dried and salted product. A portion of the total I can be extd. by shaking an acidified aq. ext. of the fish with chloroform (lipoid I) and a little is present in the form of protein substances (protein I), but the greater portion is in the form of unknown org. I compds., insol. in water. Deep-sea fishes contain more I than those living near the surface: dried haddock contains 6 times as much I as coalfish, and 20 times as much as herring. In the deep-sea prawn the I appears to be mainly concd. in the skin and internal organs, the muscles being relatively poor in this constituent. B. C. A.

The metabolism of insects. MARY HONORA SAYLE. *Quart. Rev. Biol.* 3, 542-53 (1928). A review. J. B. BROWN

Action of potassium on the dorsal vessel of the larva of the fly functioning in an artificial medium. ROBERT LEVY. *Compt. rend. soc. biol.* 99, 1485-6(1928).—K has a toxic action on the dorsal vessel, and if added in excess arrests the ventricle in systole, the same as in previous expts. with *Daphnia*. L. W. RIGGS

Effect of some iodine compounds upon frog larvae. J. SCHWAIBOLD. *Arch. ges. Physiol.* (Pflüger's) 220, 1-10(1928).—Although inorganically combined I does not cause a thyreomic effect upon metamorphosis it does hasten the development of frog larvae to a slight extent. No more marked effect results if the larvae are fed upon the milk of cows to which inorg. I has been given. Only slight influence of I is exhibited when in combination with protein, or when NaI is given in conjunction with tyrosine. G. H. S.

Studies on oils obtained from insects. I. Oils obtained from fireflies, locusts and grasshoppers. MITSUMARU TSUJIMOTO. Inst. Tokyo Ind. Research. *Bull. Ind. Research* (Tokyo) 23 [3], 65-78(1928).—(1) *Oils from butterflies*.—160 fireflies (wt. 179 g.) consisting of a mixt. of *Luciola ritticollis* and *Luciola parva* were powd. and extd. with EtO in a Soxhlet app., 0.8073 g. (4.8%) of fats being obtained. The oil is orange-yellow, viscous, has a bad odor. I_2 no. is 116. When sapond. it yielded 87% fatty acid and unsaponifiable substance. The former m. 36°, neutralization value 179.2, I_2 value (Wies' method) 110.7; forms 17.9% of an Et₂O-insol. Br. deriv., $C_{18}H_{33}O_2Br$ of $C_{18}H_{31}O_2$ ($C_nH_{2n-5}O_2$ series). The unsaponifiable substance contained a white powder m. 154-5°, and a sterol. In the second expt. the oils obtained from the parts of head and breast, and of the abdomen were separately treated. The former has a higher

I₂ no. The latter contains a highly unsatd. fatty acid m. 37.5–8°, neutralization value 199.5, I₂ no. 100.7; and 14% of unsaponifiable substance. This investigation was made because some relation between the light production and highly unsatd. fatty acid might be expected. (2) *Oils from locusts*.—3% of oil was extd. with Et₂O, d₄₀¹⁸ 0.9688, acid no. 44.3, sapon. no. 171.5, I₂ no. (Wijs' method) 122.6, unsaponifiable substance 15.75%. Linoleic, oleic, palmitic and stearic acids were identified. 44.1% of the unsaponifiable substance is a sterol, the remainder being an orange-yellow semi-solid which is colored dirty blue by a CHCl₃ soln. of SbCl₅. (3) *Oils from grasshoppers*.—*Acheta mitrata* was dried in a steam oven, and 2.4% of oil was extd. The characteristic consts. are (with impurities) d₄₀^{19.6} 0.9312, sapon. no. 181.5, I₂ no. 116, unsaponifiable matter 11.32%. The fatty acids consist of linoleic and other acids of the oleic series. The unsaponifiable matter contains 45.45% of sterols. K. SOMEYA

12—FOODS

F. C. BLANCK AND H. A. LEPPER

Old and new foods and food products. W. PEYER AND H. IMHOF. Halle. *Apoth. Ztg.* 44, 120–2, 136–8(1929).—A descriptive summary of the chief constituents of certain foods and their products as rye, oats, wheat, potato, meat exts., yeast preps., etc. W. O. E.

Know your foods. II. Graham bread. H. A. SCHUETTE. Univ. of Wisconsin. *J. Chem. Education* 6, 59–64(1929); cf. *C. A.* 23, 913. E. J. C.

New investigations concerning low pasteurization of milk and a reaction to control the degree of heating. S. ORLA-JENSEN. *Kemisk Maanedssblad* 9, 41(1928).—Milk heated 5 min. to 68° does not cream, whereas milk heated 30 min. to 63° does cream almost as easily as non-heated milk. The lowest temp. at which the creaming no longer takes place is used as upper limit for the domain of "low-pasteurization." Milk which has been heated to 63° creams more slowly if dild. by water, whereas non-heated milk creams more swiftly. The temp. for which the creaming is neither hastened nor retarded on diln. is the lower limit. Low-pasteurized milk, then, should be able to cream and should cream more slowly if dild. by water. KRISTIAN HØJENDAHL

New investigations concerning low pasteurization of milk and a reaction to control the degree of heating. S. ORLA-JENSEN. *Mælkeritidende* 41, 603(1928); cf. preceding abstr.—The lower limit is about 62°. The author discusses at length why creaming is destroyed by heating. Tables are given for the effects of temp. and certain addns. on creaming. KRISTIAN HØJENDAHL

The utilization of whey. M. A. F. BARNETT. *New Zealand J. Sci. Tech.* 10, 163–6(1928).—A certain amt. of whey produced at present in New Zealand is used for feeding pigs, but in its present highly dil. state, it is rather detrimental as such, increasing in acidity if kept for any length of time, causing a strong laxative action, while very large quantities must be consumed before the animal gets the benefit of an appreciable amt. of solids. Evapg. down to about 60% solids is a considerable improvement, and cost figures are given in detail. A typical analysis of the resulting paste shows: H₂O 49.0, protein 6, ash (mineral) 4.7, acidity (as lactic acid) 1.2, fat 0.3 and milk sugar (by difference) 38.8%. Trials for use as pig feed and its food value are in progress, and the results will be published in a later issue. J. C. JURKENS

The use of fats in baking. M. B. GRAFF. Procter and Gamble Lab. *Oil and Fat Industries* 5, 352 5(1928).—The action of fats in baking presents many unsolved problems. Bread made with 2.5 to 3% fat is preferable to that with more or less. In pie crust, fat probably seps. the layers of gluten. In rich cakes it has a leavening effect from the incorporation of air in creaming. In plain cakes it is used to produce tenderness and a more lasting freshness. In cookies, biscuits and crackers, the consistency and chem. compn. of the fat affect the tenderness of the product. AMY LEVESCONTE

The proteins of fish. JOHN L. ROSEDALE. Malaya Section, Inst. of Chem., Gt. Brit. and Ireland, Singapore. *Reprint of Lecture* July 19, 1928, 5 pp.—While the amino acids of the proteins of plants and meat have been extensively studied, little attention has been given to fish proteins. By use of Plimmer and Rosedale's modification (*C. A.* 16, 1980) of the Van Slyke method for amino acid detn., several fish proteins were found to have the following % compn.: Red snapper, amide N, 6; humin N, 1; diamino total N, 30; monoamino total N, 64. Thread-fin, amide, 7; humin 1, diamino, 28; monoamino, 63. Tunny, amide, 4; humin, 0.75, diamino, 23; and mono-

amino, 69. Carp, amide, 7; humin, 1; diamino, 27; monoamino, 64. In female fish roes (species not stated), the histones obtained by extrn. with EtOH and pptn. as a sulfate contained amide N, 15; humin N, 6; diamino total N, 48; monoamino total N, 32; arginine, 37; histidine, 7; and lysine, 4%. A portion coagulated by heat closely resembled muscle protein. The male roes contained the following per cent of amino acid fractions: amide, 15; humin, 9; diamino total N, 49; monoamino total N, 31; arginine, 41; histidine, 6; and lysine, 2. The time of hydrolysis was varied from 1 to 100 hrs., small differences being noted in 10 hrs. in the diamino and monoamino N detns. in carp and tunny. In tunny, the arginine % of total N varied from 18 after 1 hr. to only 9 after 30 hrs. In the carp, the arginine reached a const. value after 10 hrs.

C. R. F.

Dates in glass. V. CAHALIN. Monrovia Valley Pkg. Corp., Calif. *Glass Container* 8, No. 2, 7-9(1928).—Calif. dates before packing are treated in a vacuum fumigator with CS_2 gas for 2 hrs. to destroy insects and worms. Dates are spray-washed, air dried, packed into jars, sealed under vacuum and given a heat treatment of 5-10 min. at 100° . For package dates, the H_2O content is controlled at approx. 18%.

C. R. F.

Boric acid in oranges. J. T. DUNN AND H. CHARLES BLOXAM. *Analyst* 54, 28, 9(1929).—In 7 samples of oranges 0.14-0.56 grains of H_3BO_3 was found per lb. of pulp and 0.03-2.31 grains per lb. of peel. It is believed that these quantities of H_3BO_3 are normal and do not indicate the use of preservative.

W. T. H.

Natural occurrence of boron compounds in fruits and vegetable products. A. SCOTT DODD. *Analyst* 54, 15-22(1929).—The analysis of some 50 fruits and vegetables showed the presence of 0-0.025% B_2O_3 . This is much less than the minimum quantity which would be of any real value as a preservative. If, therefore, any article of food contains more than 0.1% of B_2O_3 it is reasonable to conclude that preservative has been added.

W. T. H.

Injury to onions and fruits caused by exposure to ammonia. G. B. RAMSEY AND I. F. BUTLER. Bureau of Plant Industry, Wash., D. C. *J. Agr. Research* 37, 339-38(1928).—Brownish and greenish black spots on onions, apples, pears, peaches and bananas that have been kept in storage could not be associated with any causative organism. This type of injury was produced experimentally by exposure to NH_3 . The extent of injury was detd. by the percentage of NH_3 in the air, the relative humidity and the duration of the exposure. Variations in temp. had little effect. The yellow, brown and red pigments become dark brown or greenish black when exposed to NH_3 fumes. The injury in very dil. gas is merely a blemish but in strong concns. it may involve softening and discoloration of the entire fruit.

A. L. MEHRING

The determination of traces of iodine. II. Iodine in vegetables. J. F. McCLENDON AND FOR E. REMINGTON. Minnesota Univ. and Med. College of S. Carolina. *J. Am. Chem. Soc.* 51, 394-9(1929); cf. *C. A.* 22, 1745.—From 5 to 10 kg. of vegetables are ground, dried to a putty, made into sticks 50 by 24 mm., and dried again. These are led into a combustion tube with O, and burned. Volatile chlorides and iodides are absorbed by NaOH in wash bottles and a Cottrell precipitator. The temp. is kept below 450° and the ash must be alk. to prevent fusion. In cereals, Ca lactate is added. Iodine from the ash, wash bottles, and precipitator is detd. colorimetrically in CCl_4 .

AMY LEVESCONTE

"Finger and toe" experiments in Mid-Wales involving the use of resistant varieties of swedes. D. WALTERS DAVIES, MOSES GRIFFITH AND GWILYM EVANS. Univ. Coll., Aberystwyth. *Welsh J. Agr.* 4, 295-303(1928).—Figures are given on the moisture, dry matter, protein, ash, P_2O_5 and CaO contents of 6 varieties of swedes grown in Mid Wales.

K. D. JACOB

Recent advances in science: Agriculture: Animal nutrition. HERBERT E. WEDMAN. Univ. Cambridge. *Science Progress* 23, 432-8(1929).—A review of recent work on the evaluation of feeding stuffs for milk and fat production in the animal, the nutritive value of sugar-beet by-products, and the food requirements of farm animals.

JOSEPH S. HEPBURN

Further studies on the chemical composition and nutritive value of yellow oats and white oats. F. HONCAMP, W. SCHRAMM AND H. STOTZ. *Z. Tierzücht. Züchtungsbiol.* 11, 434-44(1928).—The two varieties of oats are similar in composition and feeding value. Coarsely ground oats are better digested by sheep than whole oats.

L. A. MAYNARD

Protein decomposition in silage formation. BRUNO REETZ. *Z. Tierzücht. Züchtungsbiol.* 13, 93-119(1928).—In normal silage formation the protein decompn. occurs as a result of the action of the plant enzymes and not as a result of bacterial action.

Small amts. of acid and CO_2 result from intramol. changes such as respiration and from enzyme action. A content of 1.5% lactic acid and above injures the activity of the proteolytic enzymes. A smaller injurious effect is caused by 10% toluene. The CO_2 formed in the absence of bacterial action is 0.02 to 0.05 g. per g. dry substance, an amt. which is about one-tenth that observed in normal fermentation. L. A. M.

Solubility relationships of lactose-sucrose solutions (PETER) 2. The relation of food to the composition of milk (DAVIES, PROVAN) 11E. Effect of distilled water upon the tendency to colony formation upon Petri plates (MUDGE, LAWLER) 11C. Perfumery chemicals and flavorings (BOAKE, ROBERTS & Co.) 17. Treating garbage (U. S. pat. 1,700,608) 14. Apparatus for pasteurizing milk, etc., in bulk (U. S. pat. 1,701,777) 1. Apparatus for separating hard substances such as pips from fruit pulp (Fr. pat. 643,557) 1. Acidity-testing apparatus (U. S. pat. 1,700,655) 1. Yeast preparation (U. S. pat. 1,701,200) 16. Sausage casing made of regenerated cellulose (Brit. pat. 292,582) 23. Apparatus for irradiating milk, etc. (Austrian pat. 111,853) 1.

Preserving foodstuffs. JEAN E. W. REEH. Fr. 643,666, Nov. 8, 1927. Foodstuffs to be treated with a freezing liquid are first coated with a liquid, the freezing point of which is higher than that of the freezing liquid, so that the foodstuffs become protected by an envelope.

Treating foods to develop antirachitic properties. A. KNUDSON (to British Thomson-Houston Co., Ltd.). Brit. 292,926, June 24, 1927. Foods are treated with high-velocity electrons such as those from a high-voltage cathode-ray tube. Among the materials treated are mentioned: "breakfast foods," flour, cereals, yeast, starch, cholesterol (as to which an example is given), olive oil, cottonseed oil and other oils, "chicken and other animal foods."

Food product (salad dressing). WILLIAM D. RICHARDSON and ROY C. NEWTON (to Swift & Co.). U. S. 1,701,084, Feb. 5. A blend of oils and fats normally of solid consistency together with spices, salt, vinegar, etc., contains the normally solid blend of oils and fats in the form of minute irregular particles intimately distributed throughout the dressing; by stirring with a liquid such as oil, water, milk and cream the compn may be brought to a suitable fluid condition for use as a liquid salad dressing. U. S. 1,701,085 also relates to similar products.

Food product from yeast. MARTIN NILSSON (to The Fleischmann Co.). U. S. 1,701,081, Feb. 5. Compressed yeast is partially dried (suitably to a moisture content of about 55% at a temp. not substantially in excess of 30°) and admixed with sugar material, such as sucrose, until a sirupy consistency is obtained. The product may suitably have a moisture content of about 20% and a sugar content of about 60%.

Bread. JEAN MATTI (to Augmentine Holding S. A.). U. S. 1,701,580, Feb. 12. See Brit. 266,967 (C. A. 22, 830).

Apparatus for treating milk with ultra-violet rays. FRANZ HOFFMANN. Fr. 643,254, Oct. 31, 1927.

Maturing milk curds. BYK GULDENWERKE CHEMISCHE FABRIK A.-G. Ger. 470,290, May 13, 1925. The process is accelerated by treating the curds with a mixt of bacteria, salt, and compds. contg. the NH_4 group or the amino or amido groups or the disintegration products of albumin. A suitable mixt. contains 30% amino acid, 20% amide compd., 9% NH_4 salt, 40% NaCl , and 1% bacteria. A list of bacteria for various types of cheese is given.

Cheese. AUGUSTE M. QUÉX. Fr. 643,128, Oct. 20, 1927. Cheese is kept from contact with air by dipping it in a bath contg. beeswax 20-30, refined paraffin 30-40, beef suet 15-20, fish gelatin 15-20, and starch 3-5%.

Wrapping cheese. STANIOLFABRIK BURGDORF A.-G. Brit. 292,162, June 17, 1927. Metal foil used for wrapping is coated with an alc. soln. of bleached colorless shellac to which salicylic acid may be added.

Apparatus for freezing packaged meats or other foods, etc. C. BIRDSEYE (to General Foods Co.). Brit. 292,457, June 18, 1927.

Continuous system for preparing cream fondant and its admixtures for confectionery. R. HEAD, C. CLAY, BAKER PERKINS, LTD., and ANCIENS ÉTABLISSEMENTS A. Savy JEANJEAN ET CIE SOC. ANON. Brit. 292,237, March 15, 1927.

Confection comprising gluten. LEON W. STETSON. U. S. 1,700,387, Jan. 29. Gluten such as that used for chewing "gums" is maintained in a substantially plastic and tenacious condition by use of a binder such as hydrogenated peanut oil and glucose.

Treating fruit with paraffin and oil. HOMER C. RICKERTS (to Brodex Co.). U. S.

1,700,908, Feb. 5. An emulsion-like mixt. of creamy consistency comprising paraffin and a refined mineral oil is agitated and immediately applied to fruits such as grapefruit, oranges, lemons, or tangerines and rubbed over the surface to produce a film-like coating. An app. is described. Cf. *C. A.* 23, 652.

Antiseptic material for packing fruits. HENRY BLUMENBERG, JR. U. S. 1,702,103, Feb. 12. Cellular material such as kieselguhr, sawdust, rice hulls or granular C is assocd. with CaF_2 and with an NH_4 salt such as $(\text{NH}_4)_2\text{SO}_4$ capable of reacting with the CaF_2 to form NH_4F .

Pectin. WILLIAM A. BENDER (to Douglas Packing Co., Ltd.). Can. 286,300, Jan. 8, 1929. Saccharine juice is removed from fruit, the fruit pulp is treated with a weak org. acid soln. (as lactic) to obtain the pectin soln., this soln. is treated with solid casein, the clear liquor sepd. from the sediment, the clarified liquor treated with a diastatic enzyme, and then with activated C, and filtered and concd. *in vacuo* and the pectin pptd.

Live-stock feed. CHARLES R. MABEE (to the Mabee Patents Corp.). Can. 286,315, Jan. 8, 1929. Farm roughage is moistened with an aq. admixture contg. approx. 1–1.2% of a compn. contg. $\text{Ca}(\text{OH})_2$, $\text{Mg}(\text{OH})_2$, NaCl and S and is subjected to the action of a ferment.

Live-stock feed. CHARLES R. MABEE (to Mabee Patents Corp.). Can. 286,316, Jan. 8, 1929. Live-stock feed is prepd. by subjecting a mass of moist farm roughage to a conversion reaction in the presence of CaO , MgO , NaCl and S with ready access of air.

Forage. MME. ROSCHERT (née LUCIE ROCH). Fr. 643,236, Oct. 29, 1927. Buckwheat is crushed under high pressure according to the oil-extn. processes, heated to about 70° and pressed into cakes for forage which may be kept indefinitely.

Eccentrically mounted mixing drum for cattle fodder, etc. GEORG WINTERLING. Austrian 111,856. Aug. 15, 1928.

13—GENERAL INDUSTRIAL CHEMISTRY

HARLAN S. MINER

American chemical industries. BAUSCH & LOMB OPTICAL COMPANY, J. W. FORREST. *Ind. Eng. Chem.* 21, 191-2(1929). E. J. C.

The heavy chemical and allied industries in 1928. REX FURNESS. *Chemistry & Industry* 48, 6-8(1929); cf. *C. A.* 22, 3469. E. H.

Heavy chemicals in the United States. FRANCIS M. TURNER. *Times Trade and Eng. Supplement* (London) 23, 59(1928).—A review. E. M. SYMMES

The United States fine-chemical industry. From test tube to tank car. LEON V. QUIGLEY. *Times Trade and Eng. Supplement* (London) 23, 62(1928). E. M. SYMMES

The fine-chemical and allied industries in 1928. H. M. LANGTON. *Chemistry & Industry* 48, 30-2(1929). E. H.

Chemical engineering in 1928. A. J. V. UNDERWOOD. *Chemistry & Industry* 48, 33-5(1929). E. H.

Chemical engineering progress in 1928. J. W. HINCHLEY. *Ind. Chemist* 5, 19-20(1929). E. H.

Chemistry in Canada. Progress in research. I. E. WESTMAN. *Times Trade and Eng. Supplement* (London) 23, 61(1928). F. M. SYMMES

The French chemical industry. Its resources and present position. JACQUES LEVEL. *Times Trade and Eng. Supplement* (London) 23, 48(1928). E. M. S.

Germany's chemical industry. An economic survey. C. UNGEWITTER. *Times Trade and Eng. Supplement* (London) 23, 46(1928). E. M. SYMMES

Italy's (chemical) activities. Wide range of output. RENATO BONINI. *Times Trade and Eng. Supplement* (London) 23, 52(1928). E. M. SYMMES

Chemical production in Italy. Remarkable progress. P. GINORI CONTI. *Times Trade and Eng. Supplement* (London) 23, 50(1928). E. M. SYMMES

The (chemical) industry in Poland. Rich natural resources. TADENSZ ZAMOYSKI. *Times Trade and Eng. Supplement* (London) 23, 51(1928). E. M. SYMMES

The chemical industry in Sweden. Cellulose, matches and explosives. ANON. *Times Trade and Eng. Supplement* (London) 23, 55(1928). E. M. SYMMES

Swiss (chemical) factories. The Basel M. DE MONTMOLLIN. *Times Trade and Eng. Supplement* (London) 23, 54(1928). E. M. SYMMES

Spain's expanding production. Adoption of modern processes. JAIME P. UNZUETA. *Times Trade and Eng. Supplement* (London) 23, 56(1928). E. M. S.

The Netherlands and her colonies. Chemical and allied industries. J. J. A. WIJS. *Times Trade and Eng. Supplement* (London) 23, 58(1928). E. M. SYMMES

Czechoslovakia's chemical industry. Most branches well represented. J. KULHANEK. *Times Trade and Eng. Supplement* (London) 23, 61(1928). E. M. S.

The contribution of Belgium. OCTAVE DONV-HÉNAULT. *Times Trade and Eng. Supplement* (London) 23, 57(1928).—The recovery of the chem. industry is discussed. E. M. SYMMES

Chemical engineering memoranda VI, VII. Flue gases and waste heat in drying and calcination practice. CHARLES H. BUTCHER. *Ind. Chemist* 4, 355-6, 415-7 (1928); cf. *C. A.* 22, 1875, 3069.—Ordinary calcns. of a heat balance for a drier using flue gases are shown. A table of molal heat capacities for the gases in flue gas is given. B. divides the drier into three theoretical zones for convenience in calcg.: preheating, evapg. and superheating. Calcns. are also given showing the amount of heat which can be recovered from the hot, dried charge, and used in preheating air fed to another drier operating at a lower temp. The relative size of this cooler is also estd.

M. C. ROGERS

For profits, industry is turning to commercial research. CHAPLIN TYLER. *Chem. Met. Eng.* 36, 2-5(1929). Price as a determining factor in marketing chemicals. W. M. RAND. *Ibid* 6-7. Tapping the sources of data for commercial research. C. R. DELONG. *Ibid* 8-9. Transportation as a factor in distribution. ANON. *Ibid* 10-12. The tariff as a factor in chemical industry. *Ibid* 13. How the investment banker looks at chemical industry. WM. R. BASSET. *Ibid* 14-5. Foreign marketing methods and their lessons for American chemical industry. JULIUS KLEIN. *Ibid* 16-8. United States—the leading factor in world chemical industry. T. W. DELAHANTY. *Ibid* 19-20. Standards and specifications demand attention of both buyers and sellers. F. J. SCHLINK. *Ibid* 21. Chemical engineers needed in technical sales service. F. J. CURTIS. *Ibid* 22-3. Sales engineering—a necessity in equipment sales. LLOYD C. COOLEY. *Ibid* 23. Correct alloy recommendations require users' cooperation. R. J. MCKAY. *Ibid* 23-4. Are equipment manufacturers in the consulting business? J. MADISON BROWNE. *Ibid* 24-5. Advertising—to help in selling your technical product. CHARLES WADSWORTH. *Ibid* 25-6. Legitimate technical publicity builds prestige and promotes sales. *Ibid* 26.—This series of articles makes up the first part of a special number of *Chem. Met. Eng.* devoted to the com. side of chem. industry. Supplementing these economic and statistical studies are reviews of advances in technology and of improvements in processes and equipment (pp. 27-37) followed by production and trade statistics relating to various chem. substances (pp. 38-58), special attention being given to N, coal, various acids, S, alkalies, Na phosphate, coal-tar chemicals, potash, Cl, wood-distn. products, NH_3 , fats and oils. F. J. C.

American Society for Testing Materials, Tentative Standards 1928. *Separate* 1928, 932 pp.—Tentative specifications are given for: soft steel track spikes; steel tie plates; iron and steel chain; elec. cast-steel stud-link anchor chain; structural steel for locomotives and cars; marine boiler steel plates; C-steel castings for valves, flanges and fittings for high-temp. service; steel pipes of various kinds for ordinary and high-temp. uses; cold-rolled stripped steel; the arbitration test bar and tension test specimen for cast iron; Zn-coated (galvanized) wire of various kinds; Zn-coated chain-link fence fabric galvanized before and after weaving; Zn (hot-galvanized) coatings on structural steel shapes, plates and bars and their products; fire-refined Cu other than lake; sand castings of the alloy: Cu 80, Sn 10, Pb 10%; brass ingot metal, graded and ungraded, for sand castings; Al-base sand-casting alloys in ingot form; Al-base alloy sand castings; Al ingots for remelting; Al sheet; Ag solders; bronze trolley wire; insulated wire and cable: 30% Hevea rubber; Cu tubing for refrigerators; seamless Cu tubes; rolled Zn; non-ferrous insect screen cloth; compressive strength of portland-cement mortars; sand for use in lime plaster; gypsum molding and pottery plaster; Keene's cement; calcined gypsum for use in the prepn. of dental plasters; concrete aggregates; building brick of various kinds; paving brick; required safe crushing strengths of sewer pipe to carry loads from ditch filling; hollow burned clay fireproofing, partition and furring tile; fire tests of building construction and materials; boiled linseed oil; raw tung oil; soy-bean oil, raw or refined; petroleum spirits (mineral spirits); Ti-Ba pigment; Al powder for paints (Al bronze powder); Au-bronze powder; the toxic ingredients in anti-fouling paints; com. sizes of broken stone, broken slag, sand and gravel for highway construction; broken stone for waterbound base, water-bound macadam surface course, bituminous macadam and bituminous concrete base

and surface; sand for sheet asphalt and bituminous concrete pavements; natural or artificial sand-clay mixts. for road surfacing; CaCl_2 for dust prevention; asphalt cement of various amts. of penetration for use in asphalt block, in sheet asphalt, in various kinds of pavements, and for use as filler for brick and block pavements; tar (high- and low-C) for surface treatment, cold and hot application; tar cement (high- and low-C) for use cold in repair work (cut-block product); tar cement (high- and low-C); coal-tar pitch for stone block filler; asphalt filler for brick pavements (blown type); mineral filler for sheet asphalt and bituminous concrete pavements; wooden boxes, nailed and lock-corner construction and those used for shipment of canned foods; canned foods boxes, wirebound construction; 4-one boxes and similar type boxes; acid-resisting asphalt mastic; rubber insulating tape; cotton rubber-lined fire hose for public and private fire department use; steam hose; tolerances and test methods for rayon, asbestos yarn, knit goods, certain light and medium cotton fabrics; specifications and tolerances for 23/5/3 carded American tire cord; Cuban (jute) raw-sugar bags; thermometers for Engler viscometers. *Tentative methods* are given of: sampling rolled and forged steel products for check analysis; testing Zn-coated (galvanized) iron and steel wire and wire products; tension and compression testing of metallic materials; test for resistivity and for change of resistance with temp. of metallic materials for elec. heating; chem. analysis of Al and light Al alloys, of metallic materials for elec. heating; tests for compressive strength of portland-cement mortars; chem. analysis of limestone, quicklime and hydrated lime; test for field detn. of approx. apparent sp. gr. of fine aggregate, of approx. % of voids in fine aggregate, and of surface moisture in fine aggregate; testing brick (compression, flexure and absorption); test for resistance of fire-clay brick to thermal spalling action; tests for hollow-burned clay fire-proofing, partition and furring tile; testing elec. porcelain; tests for coarse particles in dry pigments and coarse particles and skins in mixts. of pigments and vehicles, for alky. or acidity of pigments, for bleeding of pigments, for hygroscopic moisture (and other matter volatile under the test conditions) in pigments, for oil absorption of pigments, for mass color and tinting strength of pigments; testing shellac varnish; sampling and testing lacquer solvents and diluents; routine analysis of white linseed-oil paints, of dry Cu_2O and of dry Hg_2O ; test for detn. of toluene-insol. matter in rosin (chiefly sand, chips, dirt and bark); sampling petroleum and petroleum products; tests for color of lubricating oils and of petrolatum by means of Union colorimeter, for color of refined petroleum oil by means of Saybolt chromometer, for detection of free S and corrosive S compds. in gasoline, for detn. of autogenous ignition temps., for distn. of crude petroleum, for gravity of petroleum and petroleum products by means of hydrometer, for m. p. of petrolatum, for neutralization no. of petroleum products and lubricants, for penetration of greases and petrolatum, for pptn. no. of lubricating oils, for S in naphthas and illuminating oils; tests for abrasion of gravel, for quantity of clay in sand-clay, topsoil and semi-gravel for highway construction, for the detn. of moisture equiv. of subgrade soils in the field, for consistency of portland-cement concrete, for distn. of bituminous materials suitable for road treatment, for ductility of bituminous materials, for residue of specified penetration, testing bituminous emulsions; test for fineness of powd. coal; detn. of S in coal and coke by the bomb-washing and Na_2O_2 fusion methods; tests for cu. ft. wt. of crushed bituminous coal and of coke; test for sieve analysis of coke; tumbler test for coke; analysis of roofing felt for fiber compn.; test for water absorption of slate; flexure testing of slate (detn. of modulus of rupture and of elasticity); test for detg. the insulating qualities of slate; testing insulating varnishes, sheet and tape insulating materials for dielec. strength, elec. insulating materials for power factor and dielec. const. at frequencies of 100 to 1500 kilocycles, cable splicing and pothead compds., untreated insulating paper, laminated sheet insulating materials, insulating materials for resistance to impact, and varnished cloth tapes; test for surface and vol. resistivity of solid insulating materials; chem. analysis of rubber products; tests for Cuban (jute) raw-sugar bags; testing cotton fibers; testing grease wool and allied fibers for scoured content, identification of textile fibers and their detn. in mixed goods. *Tentative recommended practice* is given for: radiographic testing of metal castings; bituminous paving plant inspection; thermal analysis of steel. *Tentative definitions* are given of: terms relating to heat-treatment operations (especially as related to ferrous alloys); terms relating to the gypsum industry; the term aggregate; the term screen (sieve); terms relating to refractories; terms relating to petroleum; terms relating to coal and coke; terms relating to textile materials; terms relating to methods of testing. *Tentative rules* are given for: inspection of concrete and reinforced concrete work. *Tentative revisions of A. S. T. M. Standards* are proposed for: specifications for steel track spikes; structural steel for bridges and for buildings, structural Ni and Si steel, billet-steel

concrete reinforcement bars, iron and steel chain, staybolt, engine-bolt and extra-refined wrought-Fe bars, gray-Fe and high-test gray-Fe castings, cast-Fe soil pipe and fittings; bronze bearing metal in ingot form, cartridge brass, cartridge brass disks, free-cutting brass rod for use in screw machines, naval brass rods for structural purposes, seamless admiralty condenser tubes and ferrule stock; portland cement, hydrated lime for structural purposes, paving brick, cement-concrete sewer pipe, hollow burned-clay load-bearing wall tile and hollow-burned clay floor tile; broken slag for water-bound base and wearing course, shovel-run or crusher-run broken slag for waterbound base, rubber pump valves; standard methods of chem. analysis of plain C steel; standard methods of chem. analysis of Mn bronze; standard methods of test for coarse particles in paint pigments, routine analysis of Ti pigments, testing shellac, lab. sampling and analysis of coal and coke, testing molded insulating materials, testing rubber products; standard definitions of terms relating to the gypsum industry, the term sand, terms relating to refractories, to paint specifications, to textile materials.

E. J. C.

American Society for Testing Materials, 1928 Supplement to Book of A. S. T. M. Standards. *Separate* 1928, 105 pp.—*Standard specifications* are given for: C-steel and alloy-steel forgings; C-steel forgings for locomotives; forged or rolled steel pipe flanges for high-temp. service; alloy tool steel; Al-bronze castings; sand castings of the alloy: Cu 88, Sn 8, Zn 4%; steam or valve bronze sand castings; yellow brass sand castings for general purposes; bronze castings in the rough for locomotive wearing parts; car and tender journal bearings, lined; brazing solder; clay fire brick for malleable furnaces with removable bungs and for annealing ovens, for stationary boiler service, for marine boiler service; raw linseed oil, Prussian blue, ultramarine blue, chrome oxide green, com. para red, friction tape for general use for elec. purposes. *Standard methods* are given of: test for magnetic properties of Fe and steel; test for softening point of fireclay brick; test for detn. of wax in shellac ("machine-made" and dry-bleached refined shellac); testing oleo resinous varnishes; routine analysis of dry red lead; tests for C residue of petroleum products (Conradson C residue), for cloud and pour points of petroleum products, for sapon. no., for steam emulsion of lubricating oils for water in petroleum products and other bituminous materials, for water and sediment in petroleum products by means of centrifuge; testing gas oils (gr., distn., S, C residue, pour point, viscosity, water); decantation test for sand and other fine aggregates; test for distn. of creosote oil; test for steam distn. of bituminous protective coatings. *Standard definitions* are given of: terms relating to the gypsum industry; terms relating to lime; the term sand; clay refractories; terms relating to refractories.

E. J. C.

Progress in steam research. Report on progress in steam research at the Massachusetts Institute of Technology. FREDERICK G. KEYES AND LEIGHTON B. SMITH. *Mech. Eng.* 51, 123-5(1929). Report on progress in steam research at the Bureau of Standards, with determinations of the heat capacity of water between 0° and 270°. N. S. OSBORNE, H. F. STIMSON AND E. F. FLOCK. *Ibid* 125-7. Experiments on the properties of steam at high pressures. JAROSLAV HAVLÍČEK. *Ibid* 127-8. The new critical-pressure tables compared with recent experiments. J. H. KEENAN. *Ibid* 129. Correlation of steam-research data. HARVEY N. DAVIS. *Ibid* 129. E. J. C.

A general steam equation. R. C. H. HECK. *Rutgers Coll. Mech. Eng.* 51, 116-22(1929). E. H.

Calculation of heating surface and steam consumption for heating liquids in open wood vats. HACK. *Chem.-Ztg.* 51, 545-6(1927).—H. discusses heat losses in chemical plants, and gives an example showing the heating surface, steam consumption and saving of money for different conditions of open-tank heating. Twenty percent is added to heat needed for the process to allow for radiation and evapn. M. C. R.

The foundations of the theory of the strength of materials. MAX ENSSLIN. *Z. Ver. deut. Ing.* 72, 1625-35(1928).—Objection is made to the use of the *elastic deformation* in the specifications of metals, because different specimens from the same metal may give widely different values, and as instruments are improved lower and lower values are obtained. The *upper stretch limit* is labile and depends upon accidental peculiarities of the material but the *lower stretch limit* reached after some time is a measurable quantity. The stress-strain curves show the temporary, i. e., elastic, deformation and the lower stretch curve gives a valuable measure of the plastic condition of the metal. Neither of these tests depends on the accidental character of the specimen. The finer the internal structure of the metal the greater the elastic deformation, and the coarser the structure the greater the permanent deformation of plastic flow. In specimens with a fine internal structure the stretch limit often occurs

sharply and at the same load both under tension and compression. The change of orientation during plastic flow explains the difference between the upper and lower stretch limits. The lower stretch limit is a natural const. indicative of the magnitude and internal constitution of the grains. By recrystn. the stretch limit may be made almost completely to disappear. The relation of the tension and twist stretch limit is considered at length. The use of fatigue tests is advocated since failure hardly ever takes place under a dead load.

EUGENE C. BINGHAM

The drying of solids. I. T. K. SHERWOOD. Mass. Inst. Technology. *Ind. Eng. Chem.* 21, 12-6(1929).—The outstanding problems in the drying of solid materials are the questions as to exactly how the water travels through the solid up to the surface, how and where evapn. actually takes place, and how these factors influence the moisture distribution through the solid, the temp. of the material and the rate of evapn. under different conditions of the drying air as to temp., humidity and velocity. The mechanism of the drying process may be divided into those cases where the resistance to internal diffusion is small or great as compared to the resistance to the removal of the vapor. Four general cases result: (1) Evapn. at the solid surface; the resistance to internal diffusion of the liquid is small as compared with the resistance to removal of vapor from the surface. (2) Evapn. at the solid surface; the resistance to internal diffusion of the liquid is great as compared with the resistance to removal of vapor from the surface. (3) Evapn. in the interior of the solid; the resistance to the internal diffusion of the liquid is small as compared with the total resistance to the removal of vapor. (4) Evapn. in the interior of the solid; the resistance to the internal diffusion of the liquid is great as compared with the total resistance to the removal of vapor. Several of these cases may occur in drying of the same material. When the solid is wet enough to dry initially at a const. rate, the drying process may be divided into the const.-rate and falling-rate periods; this paper deals with the falling-rate period, particularly with case 2. The case of drying by internal diffusion of liquid to the surface, with negligible resistance to the removal of vapor, can be covered by equations similar to these of Fourier applying to heat conduction in solids; the drying of solid slabs is a case in point, and a method is described whereby the equations may be used in the analysis of drying data without tedious calcn. or intimate knowledge of the mathematics involved. The theoretical drying equation fits well the data for cases of the drying of wood and clay, and approximates the results in the drying of soap. The diffusion const. of H_2O in soap changes with moisture content of the soap, explaining the deviation of the actual from the theoretical curve. Data obtained on moisture gradients in soap during drying illustrate the same point. W. C. E.

Boiler flue gases are converted into dry ice. G. GROW. *Power* 69, 279(1929).—A popular account of the manuf. of solid CO_2 for refrigeration.

D. B. DILL

Coefficients of flow in concrete pipe. FRID C. SCOBEE. U. S. Dept. Agr., Berkeley, Calif. *J. Am. Water Works Assoc.* 21, 1-30(1929).

E. J. C.

Breathing apparatus and its utility. C. H. BURWOOD. *Munic. Eng. Sanit. Record* 81, 586(1928).—A discussion is given of self-contained O-breathing app. for fire-fighting, etc.

C. H. BADGER

Explosive limits of gases to be observed in factories (WEISSENBERGER, PIATTI) 24.
How volatile solvents behave (SMITH) 24. Research within an industry creates the demand - and supplies it (PARTRIDGE) 9.

Purification of gas. FRANZ FISCHER. Fr. 642,892, Oct. 22, 1927. See Brit. 282,601 (*Ch. A.* 22, 3715).

Purification of gases. THE KOPPERS CO. Ger. 469,316, Nov. 3, 1922. The app. comprises a tower with divisions for the absorption of the gas by a liquid and the regeneration of the liquid by aeration.

Separating gases and vapors. I. G. FARBENIND. A.-G. Brit. 292,204, Dec. 10, 1926. In effecting sepn. or drying of gases, 2 or more adsorbents of different structure are used successively, one at least of which is of hydrophile character. Preferably the mixt. is first brought into contact with a "wide-porous" adsorbent and then with a "fine-porous" adsorbent. The process may be applied to a variety of sepn., among which are mentioned purification of HCl contaminated with hydrocarbons (as obtained in chlorination processes), removal of water vapor or CO_2 from gases which are to be liquefied as in the Linde process, drying of O or other gases which are to be compressed in cylinders, and adsorption of H_2S from illuminating gas or water gas contg. air and NH_3 . Numerous details and modifications are given.

Extracting foreign substances from gases. JAMES GORDON & Co., LTD. Fr.

642,849, Oct. 8, 1927. Foreign substances are extd. from gases centrifugally and are carried away by a thin liquid film moving constantly along a collecting surface in the direction of flow of the gases.

Separating microorganisms or other particles from air or other gases or vapors. PLATEN-MUNTERS REFRIGERATING SYSTEM AKTIEBOLAG. Brit. 292,479, June 18, 1927. The air or other gas is caused to pass through or over a filter carrying resin, wax, rubber, shellac or the like which has been melted and allowed to solidify in a strong elec. field.

Separating air from liquids. UETTWILLER & CIE (S.À.R.L.). Fr. 643,119, Oct. 17, 1927. Air is sepd., particularly from transformer oil, by passing the oil from an exterior vessel in which the speed is diminished to an interior vessel in which the speed is again increased, a filter being placed between the 2 vessels.

Washing gases. I. G. FARBENIND. A.-G. Brit. 293,003, June 29, 1927. A small proportion (suitably about 0.1–0.2%) of a wetting agent such as is employed in the textile industry (suitably a sulfonic acid or salt of suitable character) is added to a gas-washing liquor in order to retain dust. An org. solvent such as tetrachloroethylene may also be added in small proportion to prevent the formation of froth.

Gas reactions. I. G. FARBENIND. A.-G. Fr. 643,127, Oct. 19, 1927. In gas reactions under the influence of mild elec. discharges, the condensation of the products of reaction on the walls of the chamber is reduced or prevented, whereby the process is greatly improved. An example is given of the production of H_2O_2 from H and O, in which the cooling water is kept at 80°. The yield per hour is increased from 2.5 to 4 g. with 10% less energy.

Sterilizing liquids. GEORG A. KRAUSE. Fr. 643,610, Oct. 13, 1927. Water or other liquids are sterilized by being brought into contact with, or into bodies of regular or different shapes, composed of, or covered with metals such as Cu or Ag, or alloys capable of destroying microorganisms. The bodies are arranged to divide up the liquid and to give a large contact area. The treatment may be preceded or followed by filtration, which may be in a filter contg. the metals, and in the treatment itself the bodies may be disposed to give a filtering effect.

Fractional distillation. THERMAL INDUSTRIAL & CHEMICAL, T. I. C., RESEARCH CO., LTD., and WM. J. CHADDER. Fr. 643,451, Nov. 7, 1927. See Brit. 269,090 (Cl. 22, 1463).

Separating products of different density by washing. ARMAND JACQUELIN. Fr. 643,486, Apr. 1, 1927.

Separation of solids from liquids. RESIDUUM SEPARATIONS CORP. Fr. 643,693, Nov. 9, 1927. Solids such as asphalt and carbonized materials are sepd. from liquids, such as crude gasoline, by projecting the liquid on to grinding balls in a rotating cylinder whereby the solids are pulverized and the liquids vaporized.

Separating solids from liquids by a thickening and clarifying process. ALFRED L. BLOMFIELD, LOYAL S. HARNER and HARRISON S. COE (to Cycle Co.). U. S. 1,702,192, Feb. 12. Mech. features. U. S. 1,702,193 also relates to app. for the same purpose.

Washing coal or other solid materials. M. JUNG. Brit. 292,487, June 17, 1927. Liquor is sepd. from the products obtained in washing coal or other materials by "dynamic action" or by the action of gas under pressure or of a vacuum or by centrifugal action or by vibration. An app. for treating coal and sepg. dry products is illustrated.

Fractionation system for separating coal-tar oil constituents or other liquids of different boiling points. BATES TORREY, JR., and GEORGE R. SANFORD (to Smet Solvay Co.). U. S. 1,701,988, Feb. 12.

Recovery of dissolved or suspended substances. WM. BARRS and EDWARD BARRS. Fr. 643,102, Oct. 5, 1927. Suspended or dissolved substances such as *caustic alkalis* in the "black liquor" from paper manuf. are recovered by submitting the liquor directly in a scrubber to the action of a gaseous evapg. agent, such as flue gases coming from incineration operations of the process. A suitable app. is described.

Recovery of volatile products. CARBIDE AND CARBON CHEMICALS CORP. Fr. 643,322, Nov. 3, 1927. See Brit. 291,277 (Cl. A. 23, 1188).

Recovery of volatile solvents. FERDINAND JEAN. Fr. 643,501, Apr. 5, 1927. Volatile solvents used for extn. are recovered by distn. under vacuum, and the vapors obtained are submitted to a thermocompression by addn. of steam at a pressure above atm., and condensing the vapors thus compressed at a temp. higher than that at which they were distd. under vacuum.

Treating gasoline or like volatile oils to prevent evaporation losses. RUDOLPH CONRADER. U. S. 1,701,870, Feb. 12. Oil in a closed receptacle is subjected to the action of a gas which is delivered to and drawn off from the receptacle to maintain

the oil under superatm. pressure, liquid is condensed from the gas removed and the liquid is returned to the receptacle. An app. is described which is suitable for storage of gasoline.

Removing solvent from plastic, gummy or amorphous materials such as styrene. W. S. JOHNSTON and A. W. KEEN (to Naugatuck Chemical Co.). Brit. 292,137, June 15, 1927. See U. S. 1,673,685 (C. A. 22, 2801).

Washing benzene, alcohol, etc. SOCIÉTÉ D'EXPLOITATION D'USINES MÉTALLURGIQUES. Fr. 643,500, Apr. 5, 1927. Benzene, alc., gasoline or oils are treated with denser liquids for washing or chem. treatment in air-tight containers, a current of the lighter liquid ascending against a current of descending heavier liquid, the container being filled with Raschig rings or the like.

Wetting and dispersing agents. BADISCHE ANILIN- & SODA-FABRIK. Fr. 33,246, Mar. 15, 1927. Addn. to 601,823. Sulfonated mineral oils, distn. products of naphtha, tar oils or their Na salts are used for dyeing, milling, bleaching, etc., baths or for transforming org. compds. into a finely divided state.

Determination of the temperature of high-speed bodies such as the rollers of rubber-making machines. SIEMENS-SCHUCKERTWERKE A.-G. and ACCUMULATEUR-FABRIK A.-G. Ger. 470,201, May 10, 1923. A substance is employed which turns suddenly from the opaque to the transparent state at a known temp., thus permitting a colored background to become visible.

Granulating raw cement materials or other powdered substances. O. LELLEP. Brit. 292,987, April 2, 1927. Drops of water are added to the material while it is in motion, as on a rotary drum. An app. is described.

Dehydrating oils, fats, etc. CHARLES V. ZOUL (to Celite Co.). U. S. 1,701,092, Feb. 5. The material to be dehydrated, in liquid condition, is brought into contact with an adsorbent such as diatomaceous earth which is commingled with a substance such as calcined gypsum capable of taking up water from the liquid to be dehydrated to form a hydrate contg. H_2O of crystn.

Drying. WALTER A. DETER. Ger. 470,214, Feb. 1, 1925. Water-contg. raw material is dried between rapidly rotating members provided with small brushes.

Colloidal dispersions. P. G. M. A. PIGACHE. Brit. 292,965, June 27, 1927. See Fr. 639,069 (C. A. 23, 655).

Making colloidal dispersions, etc., by grinding with porcelain balls or the like. P. KLEIN (to Anode Rubber Co., Ltd.) Brit. 293,071, March 1, 1927. An app. is described.

Emulsifying agents and emulsions. I. G. FARBENIND. A.-G. Fr. 33,278, Mar. 25, 1927. Addn. to 608,302. Emulsions of oils, fats, hydrocarbons, etc., for lubricating in spinning are prep'd. by the addn. of alkylated cellulose and sulfonic acids of aromatic compds. or hydrogenated aromatic compds. contg. alkyl, aryl, aralkyl or cycloalkyl groups or their Na salts. If the emulsifying agents are mixed with glue, gelatin, etc., they may be used for the *prepn. of pigments* or for the *treatment of wool, cotton, leather*, etc.

Electric resistance material. JUAN FIDALGO, FRANKLIN ORIVE and FRANCISCO SANSO. U. S. 1,701,916, Feb. 12. A resistance suitable for use with radio receivers comprises a mixt. of "smoke black," "vegetal coal" and sugar sirup surrounded by a linen covering.

Refrigerating system. SETH L. BRIGHT (to G. F. Lathrop and John J. Dodge). U. S. 1,700,429, Jan. 29. A refrigerant such as CO_2 is discharged into a brine soln. to freeze the latter and the discharge is controlled by the change in volume which occurs on freezing of the brine. An app. is described. U. S. 1,700,430 specifies an app. in which different cooling media such as water and chilled brine are successively admitted into a container for cooling in 2 stages.

Refrigerating system with a vaporized propellant for circulating the refrigerant. COMSTOCK & WESCOTT, INC., L. F. WHITNEY and E. A. WEAVER. Brit. 292,812, Sept. 22, 1927.

Refrigerating system suitable for use with ammonia. SILLER & RODENKIRCHEN GES. and W. SILLER. Brit. 292,402, Oct. 15, 1927.

Refrigerating system of the compression type. SIDNEY E. WILSON. U. S. 1,702,445, Feb. 12.

Refrigerating apparatus of the compression type. JUSTUS C. GOOSMANN. U. S. 1,701,753, Feb. 12.

Refrigerating apparatus of the compression type (suitable for use with sulfur dioxide). SOCIETÀ ANON. ITALIANA NORD FRIGOR. Brit. 292,482, June 18, 1927. Structural features.

Refrigerating system of the absorption type. E. B. MILLER (to Silica Gel Corp.). Brit. 292,938, June 27, 1927. In an app. suitable for use with brine or SO_2 and silica gel, adsorber units are employed, which successively undergo adsorption, preliminary heating, heating for activation and cooling preparatory to further adsorption, and the heat is transferred from one unit to the next by a fluid such as air, which is forced or drawn through the app.

Refrigerating system of the absorption type. S. K. D. M. VAN LIER. Brit. 292,326, May 18, 1927.

Refrigerating apparatus of the absorption type. D. F. KEITH. Brit. 292,944, June 27, 1927. A portable valveless app. is described which operates on the reversing system.

Refrigerating apparatus of the absorption type. EDMUND ALTENKIRCH (to Siemens Schuckertwerke A.-G.). U. S. 1,700,276, Jan. 29.

Refrigerating apparatus of the absorption type. ELECTROLUX, LTD., and R. J. CRACKNELL. Brit. 292,199, Feb. 18, 1927.

Refrigerating system of the continuous-cycle absorption type. SIEMENS-SCHUCKERTWERKE A.-G. Brit. 292,556, June 22, 1927. A thermostatic regulation device is described.

Refrigerating system of the continuous-cycle absorption type. PLATEN-MUNTERS REFRIGERATING SYSTEM AKTIEBOLAG (to Electrolux, Ltd.). Brit. 292,480, June 16, 1927. Structural features.

Refrigerating apparatus of the reversing absorption type. C. POHLMANN. Brit. 292,568, June 23, 1927. Structural features.

Condenser for refrigerating apparatus. FOREST O. RIEK. U. S. 1,702,020, Feb. 12.

Evaporators for electric refrigerating machines. COMPAGNIE FRANÇAISE POUR L'EXPLOITATION DES PROCÉDÉS THOMSON-HOUSTON. Fr. 643,417, Nov. 7, 1927.

Float-valve device for controlling the supply of refrigerant in refrigerating apparatus. CHRISTIAN STEENSTRUP (to General Electric Co.). U. S. 1,701,343, Feb. 5.

Refrigerator. SULZER FRÈRES, SOCIÉTÉ ANON. Fr. 643,667, Nov. 8, 1927.

Insulating material. COMPAGNIE FRANÇAISE POUR L'EXPLOITATION DES PROCÉDÉS THOMSON-HOUSTON. Fr. 643,415, Nov. 7, 1927. The elements of an insulating material are agglutinated by a "degelled" oil, *i. e.*, a drying or semi-drying oil heated first to the state of a "gel," then brought to the liquid state.

14—WATER, SEWAGE AND SANITATION

EDWARD BARTOW

An unpurified pure water. F. T. UNDERHILL. *Pub. Health J.* (Canadian) 19, 463-5(1928).—Brief details are given of the water supply of the Greater Vancouver Water District, which is derived from two mountain streams, Capilano River and Seymour Creek, and distributed by gravity without any form of treatment. Logging operations in that portion of the watershed which is not owned by the District or situated in the forest reserve are strictly supervised. Every individual must show a negative Widal test before being admitted to the watershed, and fishing and hunting are prohibited. The av. compn. of the Capilano and Seymour waters, resp., during 1927, was as follows, in p. p. m.: total solids 37.20 and 45.35, chlorides 2.69 and 2.73, free NH_3 0.017 and 0.025, albuminoid NH_3 0.027 and 0.032, N as N_2O_5 0.58 and 0.62, N as N_2O_3 nil; reaction neutral. The av. bacterial counts were 21 and 40 per cc., resp. R. E. T.

Water-purification progress during the year 1928. NORMAN J. HOWARD. Filtration Plant Laboratories, Toronto, Ont. *Contract Record and Eng. Rev.* 42, 1355-61(1928).—An extensive review and discussion. R. E. THOMPSON

The new water-works system of the Greenwich Water Company. DANA M. WOOD. *J. New England Water Works Assoc.* 42, 378-95(1928).

The new purification plant of the Greenwich Water Company. E. SHERMAN CHASE. *J. New England Water Works Assoc.* 42, 396-409(1928).—The water from 2 large drainage reservoirs goes through filters either to aerators or to chem. mixing tanks. Ordinary filter alum and, later, soda ash are added. The settling basins allow a theoretical detention period of 4 hrs. Chlorination follows. The use of soda ash in excess has reduced the corrosive qualities of the supply. D. K. FRENCH

The Montreal Filtration Works. FREDERICK E. FIELD AND JOHN H. HARRINGTON. *J. New England Water Works Assoc.* 42, 359-71(1928).—Works designed for double

filtration without using coagulants, the plant design permits operation of either pre- or final filters as a unit plant. The water is chlorinated afterward. D. K. F.

Recent developments in water purification. WELLINGTON DONALDSON. *J. New England Water Works Assoc.* 42, 372-7(1928).—The discussion is confined to certain improvements and refinements in the more important phases. Clarifying, mixing and filtering practice on the phys. side, and aeration, softening and chlorination on the chem. side are touched on. D. K. FRENCH

Filter and pump layout for Jackson water works. J. H. FERRELL. *Eng. News-Record* 101, 552(1928).—A brief illustrated description of the new plant at Jackson, Miss., treating Pearl River water, which consists of a 7-million gal. raw-water reservoir, mixing flumes, coagulation basins, ten 1-million gal. per day rapid sand filters and a 1-million gal. clear-water reservoir. The chem. machines are of the dry-feed type. The pumping plant consists of electrically driven centrifugal pumps with steam-driven units for stand-by purposes. R. E. THOMPSON

Latest methods for the complete purification and total demineralization of hard waters. A. The zero hydrotitrimetric scale compared with partial purification methods. L. J. SUPERBIE. *Science et Ind.* 12, No. 175, 88-93(1928).—The use of the hydrotitrimetric scale enables the lab. or field worker to grade accurately a water as regards its hardness. Zero on the scale corresponds to entire absence of Ca or Mg salts. The use of pptn. and base-exchange methods is discussed with reactions and lies. Pptn. methods always leave residual hardness in water, which is best removed by base exchange. Soft water is necessary for laundry, textile and various industries. One division on the hydrotitrimetric scale means the consumption of approx. 110 g. of soap per cu. m. of water. Complete softening of industrial waters may be carried out efficiently at a relatively low cost. B. Softening apparatus for domestic use. PIERRE QUIQUANDON. *Ibid* 93-6. —Home water-softening methods and equipment are described with illustrations. C. The demineralization of water without distillation. R. MARIE. *Ibid* 96-9. —Good results were obtained by the combined use of soda lime and base exchange. A water contg. 110 mg. per l. of CaO and 18 mg. per l. of MgO with a hydrotitrimetric titer of 23° was reduced by the treatment to a titer of 0 and with entire absence of CaO and MgO. The ash content was increased from 82 g. per l. to 155 by the process. An electroosmotic app. for demineralization is described. Such an app. on a com. scale is relatively inexpensive and removes a substantial part of the dissolved salts. Where complete demineralization is unnecessary, as in drinking water, the method may be of use. A com. installation is described with approx. cost data. C. R. FELLERS

Chlorination in the field of sanitation. I. Developments in water purification. L. H. ENSLOW. *Compressed Gas Manufs. Assoc.* 1929; (preprint); C. A. 23, 1192.

J. A. KENNEDY

The effect of sunlight on the determination of chlorine by the *o*-tolidine method. F. R. MCCRUMB AND W. R. KENNY. *J. New England Water Works Assoc.* 42, 410-3 (1928).—While direct sunlight does not interfere with color formation, it causes it to fade, thus producing low results. Samples should not be exposed to sunlight in clear glass bottles, as reduction in Cl concn. follows. D. K. FRENCH

The electrical conductivity and refractive index of water from peat marshes. I. A. SMORODINTZEV AND A. N. ADOVA. *J. Russ. Phys.-Chem. Soc.* 60, 497-505(1928).—The cond. varied with the mineral content of the sample while the n was largely detd. by the org. matter. Samples obtained from carex marshes conducted 4-5 times better than those from sphagnum marshes, the latter being characterized by a higher n . B. SOVENKOFF

Further instances of use of artificial turbidity for algae control. LEWIS V. CARPENTER. *Eng. News-Record* 101, 852(1928); cf. C. A. 22, 4682.—Two instances are cited of the use of added turbidity for algae removal. During the summer of 1924 trouble was experienced at Huntington, W. Va., with the filters becoming clogged by *Synedra*. Copper sulfate and prechlorination killed the organisms but they remained in suspension. Addn. of sufficient clay to increase the turbidity from 8-10 to 50-75 p. p. m. aided settling out of the dead organisms and materially increased the length of the filter runs. During the summer of 1925 dry clay was added to the raw water at Evanston, Ill., through a dry-feed machine, as an aid to algae removal. R. E. THOMPSON

Prevention of pollution in the Upper Tame Basin (England). F. L. WARDMAN. *Munic. Eng. Sanit. Record* 82, 10-1(1928).—Discussion. C. H. BADGER

Growing pains. (Municipal work at Hinckley, England.) J. S. FEATHERSTON. *Munic. Eng. Sanit. Record* 81, 575(1928).—A discussion of the highways is given.

Gas production in the p_H 6.4 sludge was as rapid during the first 15-20 days as from the other samples, but gasification from then on was slight. This indicates that the completion of the process depends on organisms which function only at a higher p_H value. Practically no gasification occurred in the sample maintained at p_H 8.4, and there was little evidence of biol. activity. At the end of 163 days the control had a p_H value of 5.0 and contained 61.3% volatile material. The samples maintained near neutrality had no objectionable odor at the end of 35 days and water sepd. readily. The sludges maintained at p_H 6.4, 8.0 and 8.4 had objectionable odors and did not sep. from the water as rapidly. The CH_4 generated in the p_H 6.8-7.6 samples was approx. 450 cc. per g. of fresh volatile solids in 30 days. An additional 20 days increases the vol. to approx. 500 cc.

R. E. THOMPSON

Fertilizing value of Baltimore sewage sludge. C. E. KEEFER AND G. K. ARMELING. *Eng. News-Record* 101, 837-40(1928).—Results are given of field expts. carried out over a period of 5 yrs. The sludge employed consisted of that removed from the primary and final settling tanks of the Baltimore sewage works and digested in sep. tanks. Expts. were made with wet and air-dried sludge, 40 and 20 tons, resp., being applied per acre. The latter, dried on sand beds and consequently contg. 56% of sand, had a moisture content of 65-70% and analyzed as follows (dry basis): N as NH_3 2.2%; total H_3PO_4 as P_2O_5 0.5%; K as K_2O 0.2%; fats 9.8%. Six crops were planted—potatoes, spinach, string beans, tomatoes, corn and cabbage—and comparisons were made with other fertilizers. Application of sludge to the land increased the yield of all the crops, potatoes, cabbage and corn thriving the most and spinach and tomatoes responding the least. The results indicated that the sludge continued to give plant food to the soil the second year after application.

R. E. THOMPSON

Settling tanks lighten burden on Tucson sewage farm. F. M. VEATCH. *Eng. News-Record* 101, 768-70(1928).—Settling tanks, sludge-digestion tanks and sludge-drying beds have been constructed at Tucson, Ariz., to facilitate operation of the 750-acre sewage farm and to reduce odor nuisance. A study of the farm indicated that the odors were due to sludge deposits in poorly maintained irrigation ditches, unburied screenings and improperly prepd. fields, which allowed ponding of the sewage. The 2 settling tanks are equipped with Dorr revolving scrapers and will provide a total retention period of 20 mins., which is believed to be sufficient for removal of the grosser solids. The digestion tank capacity provided is equiv. to 2 cu. ft. per capita, and the drying beds, which consist of 6 in. of sand on 9-15 in. of gravel, underdrained, have capacity equiv. to $\frac{1}{3}$ sq. ft. per capita. Because of the low flow of the Santa Cruz River into which the effluent is discharged, the settling tanks were designed as the preliminary part of an activated-sludge plant which may later be found necessary. The present population is 32,500.

R. E. THOMPSON

Present-day sanitary practice. A. W. GOOD. *Munic. Eng. Sanit. Record* 82, 78(1928).—Certain recommendations for better administration are made

C. H. BADGER

Application of reinforced concrete to public health work. H. J. DEANE. *Munic. Eng. Sanit. Record* 82, 78(1928).—General discussion.

C. H. BADGER

Municipal work at Hartlepool (England). J. H. MIERS. *Munic. Eng. Sanit. Record* 81, 632(1928).—Recreational and other public improvements such as concrete promenades, walls, etc., were built to protect and improve the town as a seaside resort and to reduce unemployment. Brief statements are made regarding subsidy houses, highways and sewers. The sewage is discharged untreated through 4 outfall sewers to low water mark, although, since some of the low-lying districts are tide-locked, flushing is regularly needed.

C. H. BADGER

Salvage plant for refuse disposal (Crewe, England). H. Y. STAZICKER. *Munic. Eng. Sanit. Record* 82, 78(1928).—The refuse is hand-sorted. Paper and tins are baled. A magnetic separator removes metals. Dust, cinders, etc., are screened. The waste from the picking table, screen and garbage extractor is burned.

C. H. B

Notes on public cleansing work, etc., of Liverpool (England). W. MUIRHEAD. *Munic. Eng. Sanit. Record* 81, 664(1928).—About 1500 men are employed in cleaning Liverpool's 27,678 acres. The 1200 tons of daily refuse is removed by 156 carts and 50 motors. The disposal is as follows: tipping 40.23%; destructors 34.55%; dumped at sea 16.39% and sent to farms by canal and rail 8.83%.

C. H. BADGER

Refuse storage, collection and disposal in the borough of Brighouse (England). C. R. MOSS. *Munic. Eng. Sanit. Record* 82, 52(1928).—The rate, amt. of refuse and cost of the plant are given.

C. H. BADGER

Mixed-refuse incinerator for Borough of Queens. JOSEPH C. WOODMAN. *Eng. News-Record* 101, 845-6(1928).—An illustrated description of the incinerator recently

constructed in the Borough of Queens, New York City. The installation consists of three 90-ton furnaces of the Decarie heavy-duty steel water-jacketed type, embodying the distinctive principle of unrestricted upward combustion of the refuse, the wetter material being dried out in a suspended water-cooled basket grate before dropping to the lower grate where final burning takes place.

R. E. THOMPSON

Gas-works effluent (SMITH) 21. Coefficients of flow in concrete pipe (SCOBEY) 13. Vapor pressures of fumigants. I. Me, Et, iso-Pr and sec. Bu chloroacetates (NELSON) 2. Filters (Fr. pat. 33,291) 1. Filtering material (U. S. pat. 1,702,104) 18.

Purifying water. AKTIEBOLAGET FILTRUM. Brit. 293,033, July 1, 1927. An app. is described suitable for removing Ca, Fe and Mn compds. from water and periodically regenerating the treating material.

Purifying water. HÖGANÄS-BILLESOLMS AKTIEBOLAG and NORDISKE NATROLITH AKTIESELSKABET. Fr. 643,228, Oct. 29, 1927. See Brit. 279,788 (C. A. 22, 3010).

Sterilizing and dechlorinating water. O. ADLER and R. ADLER. Brit. 292,099, June 13, 1927. In dechlorinating water by passing it through or over coarse pieces of carbonaceous material, as described in Brit. 286,338 (C. A. 23, 227), the water is first caused to flow over substances insol. in water, resistant to free Cl and capable of pptg. and retaining salts of Fe, Mn and other heavy metals. MnO_2 , "manganese acid," Fe_2O_3 and alk. earth carbonates may be used, alone or pptd. on other materials such as sand, pumice or tuff. To avoid undesired increase of H-ion concn., substances such as $CaCO_3$ or bauxite may be mixed with the carbonaceous material or used for sep. final treatment of the water.

Treating boiler water. JULIUS OSTERTAG. U. S. 1,700,714, Jan. 29. During normal operation of a boiler, sludge-contg. water is continuously blown off and led to a region of lower pressure while maintaining its heat content to generate steam, the generated steam is condensed, make-up water and remaining blow-off water are passed in sep. streams in heat-exchange with each other, and the condensate is added to the heated make-up water. U. S. 1,700,715 and U. S. 1,700,716 relate to similar processes and all three pats. describe app.

Apparatus for softening water by use of zeolites. WALTER J. HUGHES (to Permutit Co.). U. S. 1,701,719, Feb. 12.

Sheet-metal tanks for containing corrosive liquids such as occur in zeolite water-softening systems. EDWIN A. ROBERTSON (to Permutit Co.). U. S. 1,701,729, Feb. 12.

Activated-sludge treatment of sewage. KARL IMHOFF. U. S. 1,700,722, Jan. 29. Sewage is passed through a preliminary settling tank, thence to an aeration tank, then through a sedimentation and sepn. tank, and activated sludge is returned from the last-mentioned to the first-mentioned tank. U. S. 1,700,723 specifies a method of treating sewage in settling basins contg. contact or adhesion filters; a circulating movement is imparted to the sewage so that it is caused to flow through the adhesion filter in one direction and to flow back in the opposite direction through the free space of the settling basin outside of the filter. An app. is described.

Apparatus for removing scum from sewage in treating systems, etc. HENRY E. ELROD. U. S. 1,700,791, Feb. 5.

Treating garbage. EDWARD H. BRUNE. U. S. 1,700,608, Jan. 29. A mixt. of $FeSO_4$ 1, water 18 and CaO 100 parts is used for deodorizing garbage and prepg. it for use as a food for animals.

Incinerator for garbage, rubbish, etc. HARLAN COE. U. S. 1,700,560, Jan. 29.

15 - SOILS, FERTILIZERS AND AGRICULTURAL POISONS

J. J. SKINNER

The soil solution: Its function in the maintenance of fertility. ALEX. M. SMITH. *Fertilizer, Feeding Stuffs & Farm Supplies J.* 14, 11-2(1929).—This paper discusses briefly the relation between the soil soln. and fertility. K. D. JACOB

The influence of the soil reaction on the ionizable constituents of the tomato as determined by electrodialysis. E. S. HABER. Iowa State College. *J. Agr. Research* 37, 101-14(1928).—More acid materials were found by electrodialysis in plants grown in acid soil and more basic materials in those grown on alk. soil. The roots, stems, leaves and fruit from plants grown on a soil of pH 4.0-4.5 contained 15.19, 11.76, 3.46 and 4.87% less titratable base and 60.14, 21.08, 19.29 and 2.54% more acid, resp.,

than those from plants grown on a neutral soil. When the soil reaction was pH 8.5-9.0, the titratable base ranged from 78.06 to 4.48% more and the acid from 19.56 to 1.73% less, resp., than when the plants were raised on neutral soil. The leaves contained more and the roots less ionizable materials than other parts of the plant. Thirteen references are given.

Superphosphate and soil acidity. C. KRUGEL. *Fertiliser, Feeding Stuffs & Farm Supplies J.* 14, 17-8(1929).—This paper reviews briefly the results of recent expts. which show that superphosphate does not cause soil acidity and is not physiologically acid in its action on plants.

A. L. MEHRING

K. D. JACOB

The weed flora of fields and its significance as a biological reagent for the soil reaction. KARL STEYER AND GEORG EBERLE. *Agr. Expt. Sta., Lübeck. Arb. Biol. Reichsanst. Land-Forstw.* 16, 325-422(1928).—Detns. of reaction were made on H_2O and on KCl-soln. exts. by colorimetric and quinhydrone electrode methods. The reaction values preferred by over 25 individual species of weeds were detd. by tabulating % occurrence at each 0.1 pH unit. It then proved possible to est. the H -ion concn. of a given soil area by observation of the frequency of occurrence of the different weeds. The knawel (*Scleranthus annuus*) proved especially well adapted to such reaction-diagnosis, occurring in abundance only in strongly acid soils ($pH < 5.7$), having a high lime requirement. To the practical agriculturalist this method seems likely to be of more value than the physical-chem. methods which are so open to error in untrained hands.

E. T. WHERRY

A possible relationship between soil salinity and stand in cotton. J. ARTHUR HARRIS. *U. of Minn. J. Agr. Research* 37, 213-31(1928).—Soil salinity was measured in terms of the elec. resistance of the satd. soil in a standard soil bridge cup. Four varieties of cotton were planted in field plots at the rate of 6 seeds per hill. The soil samples were taken from the hills in 1 expt. A significant neg. correlation between soil resistance and seedling stand indicated that under the range of exptl. conditions better germination was obtained on more saline soils. The following year soil samples were taken from the middle of the rows and in this case no correlation was found.

A. L. MEHRING

The influence of chilling, above the freezing point, on certain crop plants. JACQ. P. F. SELLSCHOP AND S. C. SALMON. *Kansas Agr. Expt. Sta. J. Agr. Research* 37, 315-38(1928).—Exposure at 0.05-5.0 for 24 hrs. was fatal to rice, velvet beans and cotton. A no. of other crops showed injury of various kinds, but potatoes, tomatoes, buckwheat, soy beans and flax were uninjured by chilling for 96 hrs. Cowpeas, peanuts, maize and velvet beans were more severely injured by chilling when growing in wet than in dry soil. The presence of $NaNO_3$ in the soil soln. was fatal when some plants were chilled, whereas only moderate injury was obtained without it. On the other hand, the presence of KNO_3 protected them from injury. K ions assisted plants to withstand injury; Ca ions were without effect or slightly injurious and Na ions were decidedly deleterious when the plants were chilled.

A. L. MEHRING

The usefulness of capillary potential to soil moisture and plant investigators. LORENZO A. RICHARDS. *Utah Agr. Expt. Sta. J. Agr. Research* 37, 719-41(1928).—Soil moisture is studied from the standpoint of energy potentials. An app. for measuring capillary potential is described and exptl. data are given which show the relation between this function and the moisture content of 4 soils. The flow of moisture through soil, V , can be expressed in terms of capillary cond., K , and potential gradient, $grad \Phi$, thus: $V = -K grad \Phi$ (1). The potential theory is applied to flow of moisture downward after rainfall, upward from a water table, and horizontally. The availability of soil H_2O to plants depends upon the force with which H_2O is held by the soil and the rate of flow of other H_2O to replace that used by the plant. Capillary potential is a direct measure of the force with which the soil holds moisture and the rate of flow may be quantitatively expressed by use of equation (1). A new form of app. is described, with which soil moisture for potted plants may be controlled.

A. L. M.

The water relations of Yakima Valley soil. CARL S. SCOFIELD AND COULSEN C. WRIGHT. *U. S. Bureau of Plant Industry. J. Agr. Research* 37, 65-85(1928).—The sandy loam used in the expts. had a moisture equiv. of 16%. One in. of H_2O in 1 ft. of this soil = 6% of the dry wt. of the soil. When thoroughly irrigated, it holds 16 in. of H_2O in the first 6 ft., and when a crop has absorbed all the H_2O possible, it still contains about 5 in. in the first 6 ft. When irrigation is needed, probably 10 in. of H_2O still remains in this zone. Application of 4-6 acre-in. of H_2O at each irrigation does not result in leaching. If very dry, it may hold 10 in. of irrigation without leaching. When the soil contains less H_2O than its carrying capacity, loss by vaporization takes place well down in the soil as well as at the surface. Movement of H_2O through the

oil takes place by vaporization and condensation as well as by capillarity. With this soil, the proportion of H_2O available to alfalfa is about 70% of the field-carrying capacity. A. L. MEHRING

Soil bacteria and fertility. P. H. H. GRAY. Rothamsted Expt. Station. *Science Progress* 23, 444-56(1929).—A review. JOSEPH S. HEPBURN

Acetic acid as a soil disinfectant. WM. L. DORAN. Mass. Agr. Expt. Sta. *J. Agr. Research* 36, 269-80(1928).—Applications of $AcOH$ temporarily increased the acidity of the soil, but both in the lab. and in the field the original pH value was restored after a few days or weeks according to the quantity used. Applications of 1% $AcOH$ to the soil at the rate of $1\frac{1}{2}$ gal. per sq. ft. was sufficient to protect seedlings from injury by root rot and damping off. When the acid is prepd. from vinegar, the cost of disinfection was about one-half that when formaldehyde was used. $AcOH$ is toxic to plants and must therefore be used a week or two in advance of planting. Twenty-seven references are given. A. L. MEHRING

Quantities of fertilizers used in the year 1927, and their distribution over the area lanted (Java). W. J. HEYLIERS. *Arch. Suikerind.* 36, III; *Mededeel. Proefsta. Java Suikerind.* 917-47(1928); cf. *C. A.* 21, 3414.—Statistical tables show the amts. of each fertilizer material for each plantation, total as well as per unit of area, for all the 178 factories. The relative importance of different fertilizers was about the same as that in the previous year. P. R. PEKELHARING

Present-day tendencies in the fertilizing of grassland. G. A. COWIE. *Fertiliser, Feeding Stuffs and Farm Supplies J.* 14, 39-42(1929).—This paper discusses the results of expts. in Great Britain on the use of fertilizers on pastures and grasslands. In general, ground North African phosphate rock has given practically as good results as basic slag, the availability of phosphate rock increasing with the fineness to which it is ground. K. D. JACOB

Physiological culture. N. A. BARBIERI. *Atti accad. Lincei* 7, 1043-50(1928).—A review of fertilizers and their action and effects in improving plant growth. A. W. CONTIERI

The yields of digestible nutrients and of starch value from two and three mowings and under different fertilizer treatments. SIEGFRIED HIRSCH. *Z. Tierzücht. Züchtungsbiol.* 11, 409-31(1928).—Mowing meadow grass twice during the season resulted in a greater total yield of green material, dry matter, digestible org. matter and starch value than mowing three times. The hay obtained by the more frequent mowing was richer in digestible crude protein, and poorer in crude fiber. The trials were carried out on both fertilized and unfertilized soils. L. A. MAYNARD

Further tests of poison baits in South Wales. H. W. THOMPSON. Univ. Coll., Cardiff. *Welsh J. Agr.* 4, 342-7(1928).— $CuSO_4$ was not an effective bait poison for leatherjackets and slugs. Derris powder gave moderately good results, while Na_2SiO_3 was almost as effective as Paris green. K. D. JACOB

Some experiments for the control of mangold fly. C. L. WALTON. Univ. Coll., Bangor. *Welsh J. Agr.* 4, 347-50(1928).—Green tar oil, nicotine sulfate dusts and Bordeaux sprays did not control the mangold fly (*Pegomyia betae*) on sugar beets and mangolds. Good results were obtained with either paraffin emulsion or nicotine sulfate sprays applied as soon as the plants were through the soil. K. D. JACOB

Seed treatment as a means of preventing turnip flea beetle attack. J. R. W. JENKINS. Univ. Coll., Aberystwyth. *Welsh J. Agr.* 4, 334-42(1928).—Good control of the turnip flea beetle was obtained by thoroughly wetting the turnip seed with turpentine or with liquid paraffin, provided the seed was drilled within 1 day after being treated. The effectiveness of the treatment decreased with delay in drilling. Neither treatment had any effect on the germination of the seed. K. D. JACOB

Experiments on the control of finger-and-toe (disease) in cabbages by the use of mercuric chloride and other substances. N. C. PRESTON. Harper Adams Agr. Coll., Newport, Salop. *Welsh J. Agr.* 4, 280-95(1928).— $HgCl_2$ was compared with a no. of other disinfectants for the control of the finger-and-toe disease of cabbage and cauliflower in a series of expts. extending over a period of 3 years. The best results were obtained with 0.1% solns. of $HgCl_2$, a 30% control of the disease being obtained in 2 seasons and 70% in the third season. A marked stimulation of growth was obtained with plants treated with Me green, 0.005% soln., malachite green, 0.005-0.01% solns., and $HgCl_2$, but with the 2 dyes this effect was not noticeable after 3-4 weeks. Me violet and brilliant green also were ineffective. Uspulun, 0.5% soln., gave good but somewhat inferior results to those obtained with $HgCl_2$, 0.1% soln. 0.2% solns. of $HgCl_2$ not only failed to check the disease but also seriously affected the growth of the young plants. The investigations are being continued. K. D. JACOB

Fertilizing value of Baltimore sewage sludge (KEEFER, ARMELING) 14. The behavior of the Sb electrode in buffered and unbuffered solutions (LAVA, HEMEDDES) 2. Dehydration of silica (HOCKENYOS) 7. Disinfectants and insecticides (RIDEAL, RIDEAL, SCRIVER) 18. Excess HNO_3 in phosphate determinations (HOCKENYOS) 7. Notes on dual emulsions, with examples of interest in the spraying of trees (WOODMAN) 2. Nutritional contents of sediments in settling basins (NOVAK) 28. Pyrohymatomelanolic acid (KREULEN) 10. Relation of cotton root rot and *Fusarium* wilt to the acidity and alkalinity of the soil (TAUBENHAUS, *et al.*) 11D.

Fertilizer. C. W. MARTIN. Brit. 292,809, Sept. 9, 1927. Flue dust or K_2SO_4 is mixed with lime, powdered slag (which may in part be replaced by steamed bone flour), NH_4 sulfate and "agricultural salt."

Fertilizers. H. R. READ. Brit. 293,168, May 21, 1927. Waste org. nitrogenous material is heated to above 100° under pressure in the presence of NH_3 and H_2O . The viscous mass or liquor thus produced is then dried. Leather, hair, felt, wool, shoddy, silk, hoofs, horns, feathers, fish, dried blood and gelatinous material may be used.

Fertilizer. I. G. FARBEININD. A.-G. Brit. 292,098, June 13, 1927. Urea is heated until evolution of NH_3 ceases and the product may be mixed with other fertilizer ingredients, or its constituents such as ammeline or cyanuric acid may be sep'd. and used in fertilizers.

Fertilizer. I. G. FARBEININD. A.-G. Brit. 292,068, June 11, 1927. Mixed fertilizers are prep'd. by spraying or atomizing 2 or more inorg. fertilizing materials such as HNO_3 , H_2SO_4 and H_3PO_4 by use of NH_3 gas or gases contg. NH_3 . NH_4 salts may be used instead of the acids and salts of K, or other fertilizing salts may be added.

Fertilizer. NICODEM CARO and ALBERT R. FRANK. Fr. 642,659, Oct. 21, 1927. An alk. fertilizer is prep'd. by causing NH_3 to act at $500\text{--}850^\circ$ on natural or artificial carbonates until a product is obtained contg. 10–30% of N. The product is further treated to decomp. any carbonate remaining. Cf. C. A. 23, 234.

Fertilizers. SOC. ANON. DES CHARBONS ACTIFS ÉDOUARD URBAIN. Fr. 643,521, Apr. 8, 1927. K phosphates and HCl are prep'd. by heating phosphoric acid with KCl. The product is KPO_3 , which by hydration can be converted into $\text{K}_2\text{H}_2\text{P}_2\text{O}_7$ and KH_2PO_4 .

Fertilizers. SOC. ANON. DES CHARBONS ACTIFS ÉDOUARD URBAIN. Fr. 643,542, Apr. 9, 1927. N is introduced into the fertilizers described in Fr. 643,521 (preceding abstr.) either by fixation with NH_3 , urea, cyanamide, etc., or by introducing N bases, such as NH_3 , urea, etc., into the mol., *e. g.*, $\text{PO}(\text{OK})(\text{ONH}_2)(\text{NH}_2)$.

Fertilizer. UNION AGRICOLE DE JODOIGNE. Fr. 643,178, Oct. 28, 1927. A completely sol. fertilizer is made by reaction of H_2SO_4 and a mixt. of a natural phosphate, rich in phosphoric acid and CaCO_3 , with KCl, and introduction of $(\text{NH}_4)_2\text{SO}_4$. The product of reaction is allowed more or less to solidify and is then neutralized by a phosphate poor in CaCO_3 , dried and ground.

Cultivating edible fungi. JOSEF SZÜCS. Austrian 109,419, Dec. 15, 1927. Solid or semi-solid carrier materials are mixed with nutrient solns. contg. carbohydrates and suitable salts, and the mixt. is infected with bacteria to produce a fermentation similar to that of horse manure. After fermentation, the mixt. is inoculated with mycelium or spores. In an example, *Aspergillus* is cultivated in a medium initially contg. molasses, superphosphate and $(\text{NH}_4)_2\text{SO}_4$.

Fungicide. HUGO L. KLEINHANS. Can. 286,408, Jan. 15, 1929. CuCO_3 (40%) is mixed with 60% S to form a fungicide capable of suspension in water, which at the same time has fertilizing value. The mixt. may be used either dry or as a wet spray.

Colloidal fungicides and insecticides. J. RILEY & SONS, LTD., W. H. BENTLEY and W. M. COATES. Brit. 293,084, March 23, 1927. Reagents which will produce the desired dispersed product are mixed in the presence of gelatin or other suitable jelly-forming substance, and the sol. salt formed may be removed by washing or by permitting efflorescence. Examples are given of the prepn. of products contg. colloidal S, Pb arsenate and other substances.

Insecticide. SEISHIRO NISHIMURA. Can. 286,953, Feb. 5, 1929. Tobacco ($1/4$ lb.) is boiled for 20 min. in 1 gal. water; 2 lbs. of fish offal is boiled in 1 gal. of water for 20 to 30 mins. and then passed through a sieve to remove the solids. The two solns. are mixed together and heated to boiling and then allowed to cool. To this mixt. there is added liquid soap obtained by boiling $3/4$ lb. soap with 1 gal. of water, to which liquid soap is added 6 fluid oz. of moth spray, as petroleum and pyrethrum powder or flytox. The insecticide is sprayed on the plants.

16—THE FERMENTATION INDUSTRIES

C. N. FREY

Phosphorylation and alcoholic fermentation of sugars. CARL NEUBERG AND MARIA KOBEL. Kaiser Wilhelm-Institut für Biochemie. *Ann.* 465, 272-82(1928).—The rate of evolution of CO₂ from sugars fermented with dried yeast or maceration juice in the presence of K phosphate or traces of Mg hexosediphosphate and of PhMe is compared with that from Na hexosemonophosphate similarly treated. The curves for dextrose, levulose and sucrose are very similar, but the induction period is much longer with the 1st. The fermentation of the hexosemonophosphate, however, begins only slightly more rapidly and is soon retarded in such a way that after a few hrs. it has proceeded to a much smaller extent than has that of the uncombined sugars. These results are obtained with yeasts and sugars of varying sources and show that a hexosemonophosphate cannot be, at least in its normal stable form, an intermediate compd. in the fermentation of sugars.

C. J. WEST

Studies on fermentation products. I. Fractional distillation of saké. TUNETO HIGASHI. *Bull. Inst. Phys.-Chem. Research* (Tokyo) 7, 500-26(1928); *Abstracts* 1, 45-7.—Eighteen l. of saké was fractionally distd. Fraction I (b. 50-70°) contained only AcH. Fraction II (b_m 70-1°) contained EtOH and PrOH. Fractions III and IV (at low pressure, b. <60°) contained EtOH, PrOH, AmOH, terpenes from the barrel, and surgi resin, surgi being the wood out of which the barrel was made. Fraction V (b. 50-60° at low pressure) contained H₂O, furfural, AcOH, traces of formic, propionic, levulinic and pyruvic acids, ethyl acetate, lactate and pyruvate. II. Color reactions. *Ibid* 527-39, *Abstracts* 1, 47-50.—The reagent used is obtained by dissolving 1 g. vanillin in 200 cc. concd. H₂SO₄. A drop of the substance to be tested is mixed with 2 cc of reagent; a color develops. By adding gradually drops of H₂O, the color changes progressively as reported in the table:

No of H ₂ O drops					
	0	1	2	64	128 (On standing overnight)
AcH	yellow	yellow	dark green	bluish green	light blue, transparent
EtOH	yellow	yellow	green	blue	light blue, transparent
PrOH	yellow	orange-red	intense purplish red	intense red- dish purple	dark purple, as resinous ppt.
AmOH	red	scarlet-red	dark red	purplish red	dark red, as oily drop
EtOAc	yellow	yellow	greenish yellow	light green	light blue ppt.
Pyruvic acid	yellow	green	deep green	indigo blue	blue ppt.
Levulinic acid	yellow	greenish yellow	greenish blue	indigo blue	blue ppt.
MeCOEt	orange-yellow	dark green	dark bluish brown	deep indigo blue	blue ppt.
Saké distil- late, b. 78- 85°	orange-yel- low	orange-red	purplish red	intense purple	blue ppt.

ALBERT L. HENNE

Comparative brewing trials with certain new and commercial varieties of hops. W. T. SMITH AND A. J. C. COSBIE. *J. Inst. Brewing* 34, 565-70(1928).—Comparative brewing trials were made with 8 varieties of hops, whose origin, valuation and gravimetric and biological grading are given.

PETER J. F. WEBER

Small-scale brewing in the laboratory. F. E. DAY. *J. Inst. Brewing* 34, 570-3 (1928).—A description of, and results obtained through use made of lab. equipment by D. in the making of small-scale brewings which would give results comparable with technical operations.

PETER J. F. WEBER

Brewing liquor. MARC H. VAN LAER. *Petit j. brasseur* 1928, 903, 927; *Brewers J.* 64, 452-4(1928).—Because of the restrictive action of the reaction of the mash on diastase, p_H regulation is important. Primary and secondary phosphates control the reaction of the wort, and expts. show it is possible to calc. the p_H from the formula $p_H = p_K$ plus $\log (A/B)$, in which p_K is a const. characteristic of the acid (7.1 for pri-

mary phosphate) and A and B represent the amounts of primary and secondary phosphates. Addn. of Na_2CO_3 or CaCl_2 in definite amounts to worts gives p_H values in accord with the formula. Na_2CO_3 increases p_H through formation of secondary phosphate from primary. Ca and Mg salts decrease p_H through formation of primary phosphate from secondary, with pptn. of tertiary phosphate, within limits depending upon the quantity of phosphates present; they have a greater influence on strong than on weak worts, also a greater action with a wort made with alk. water. Regulation of the p_H through treatment of brewing water can be had by (a) decarbonation by boiling water, which is costly, or lime-water treatment, which requires careful control but gives excellent results, (b) Burtonization, which is limited by the effect of Ca and Mg salts and compn. of water, and (c) acid treatment, which is most flexible but requires very careful control. Water treatment also requires a modification in brewing methods because of the change it produces in diastatic activity.

PETER J. F. WEBER

The investigation on the preservative principles of hops. FRANK L. PYMAN *J. Inst. Brewing* 34, 447-50(1928); cf. *C. A.* 22, 3484.—A review. P. J. F. W.

Report on the preservative principles of hops. IX. The influence of special methods of drying at low temperatures upon the antiseptic properties of hops. J. J. HASTINGS AND T. K. WALKER. *J. Inst. Brewing* 34, 556-65(1928); cf. *C. A.* 22, 1432.—Hops dried by four different methods, namely: (1) commercial drying, (2) in a current of air at 40° , (3) in a steam-heated vacuum oven at 40° , and (4) in a water-heated vacuum oven at 40° , when graded biologically by the Chapman method (cf. *J. Inst. Brewing* 25, 18), gave figures of 100, 162, 140 and 150, resp., whereas grading gravimetrically (*C. A.* 22, 1432) resulted in figures of 100, 100, 78.3 and 94.4, resp. After 6 months' storage, however, the two methods gave practically identical results, which compared with the gravimetric grading of the freshly dried hops. Green hops were then compared with specially dried and commercially dried hops and gravimetrically gave the same figures, but biologically the figures were 237, 133 and 100, resp. In the green and the specially dried hops no other antiseptics were found than the α and β resins. Biol. tests with septs. and combinations of the resins in the hops showed a greater antiseptic power in the β resin of the green and the specially dried hops; this is attributed to the presence of a large proportion of cryst. lupulone in the β portion of the soft resins. This is partly destroyed by commercial drying and also by storage of the specially dried hops. The antiseptic power of the lupulone, which was still in evidence after boiling the hops with wort or water for one hr., was almost entirely destroyed by a two-hr. boiling period.

PETER J. F. WEBER

The tannin of hops. F. EMSLANDER. *Petit j. brasseur* 1928, 1292; *Brewers J.* 65, 49-50.—The combination of the tannin of the hops with the protein of the wort, which takes place principally in the boiling of the wort in the kettle, is comparable to a tanning process. Just as a hide treated with a strong tannin solution differs from a hide treated with increasing concentrations of tannins, so differences in stability of the proteins in beer may be attributable to "strong or weak" tannins in the hops. Whether the tannin is "strong or weak" is tested with FeCl_3 and gelatin. A test tube with 10 cc. of solidified 25% gelatin to which 2 cc. of 1% FeCl_3 per 100 cc. of soln. has been added is covered with a layer of distd. water. Three hop cones are then placed in the water and on this is put a layer of toluene to prevent infection. If after standing 100 hrs. the whole mass of gelatin becomes dark colored, the hop tannins are considered as weak. If a very dark-colored layer is produced just below the water, then the tannins are considered as strong. Tested by this method the hops of 1927 contained softer resins than those of 1926; and new hops show a stronger tannin than the old hops. Soft tannins in hops are to be preferred to strong tannin, because the strong tannins merely "tan" the outer surface of the protein particle, whereas the soft tannins penetrate the protein complex and therefore these are more thoroughly eliminated. Light and heat (pasteurization) favor protein haze in beers, the cause of each being due to an acceleration of the tanning process. Removal of tannin in the brewing process is very important, particularly in beers intended for export.

PETER J. F. WEBER

The biological stability of beer. R. H. HOPKINS AND J. E. FRASER. *J. Inst. Brewing* 34, 387-402(1928).—The factors investigated as relating to the biological stability are (1) p_H of beer during storage, (2) content of nutrients, particularly assimilable nitrogen, (3) races of organisms present, their quantity and vitality, and the effect of the races of organisms upon each other, (4) effect of antiseptic substances, i. e., hop resins and added preservative, and alcohol content. Other conditions being equal, the beer with p_H approx. 4.0 was most stable. Adding varying amounts of a pepsin digestion of wheat gluten to wort had practically no effect on the resulting beers' stability, indicating that assimilable nitrogen is of little significance. Addition of hop

infusion to worts increased the stability of the beers and the antiseptic value of hops is therefore of considerable importance. The detn. of p_H of the beer at racking and "correlation of the electrometric titration with stability, for each class of beer, should enable the brewer to predict the stability of freshly brewed beer," but the amount and nature of the infection in the beer is of greatest importance. P. J. F. W.

The determination of sulfur dioxide in beers. N. C. BEETLESTONE. *Brewers J* 64, 143-44(1928); cf. *C. A.* 22, 3484.—Direct estn. of SO_2 in beer, may in certain circumstances prove of considerable value, especially where it is only necessary to det. if the beer contains SO_2 below the legal limit. For accuracy and reliability, however, a distn. method must be employed. Two distn. methods are favored: that adopted by the Council of the Institute, of Brewing (cf. *J. Inst. Brewing* 1926, 172), in which the SO_2 is distd. into Br water and the H_2SO_4 formed detd. by pptn. as $BaSO_4$, and the Monier-Williams method in Report 43, of the Ministry of Health. In this method the SO_2 is distd. from acidified beer into H_2O_2 and H_2SO_4 formed is titrated with 0.1 *N* NaOH, with bromophenol blue as indicator. Provided a blank titration on the H_2O_2 is made and 0.05 *N* or 0.04 *N* NaOH used, this method gives good results. However, the results are distinctly different from those of the Institute method, which appears to be influenced by the hopping rate of the beer. Volatile S compds. cause a higher SO_2 figure to be obtained by the Institute method. If a S trap (consisting of a flask with 1% $CuSO_4$ to be placed between the boiling flask and condenser) is used, the result of the Institute method compares well with that of Monier-Williams. This, however, increases danger of leakage through increase in number of joints and also complicates the procedure. B., therefore, considers the Monier-Williams method to be more accurate and more rapid.

PETER J. F. WEBER

Composition of wines of the Malaga type. E. ŠVAGR, J. LUKAS AND A. JILEK. *Chem. Listy* 22, 29-34(1928).—Malaga wines manufd. in Czechoslovakia differ little in chem. compn. and alimentary value from the original products. The calorific value of the above wines is very nearly the same as that of malt wines of the Malaga type both ordinary and medicinal. In compn., however, the malt Malaga types differ from the true Malaga wines in their high content of lactic acid and dextrin, and absence of tartaric acid. While unmatured malt Malaga wines contain sucrose, this is not a sp. constituent. The mineral content of the latter wines is only half as great as for true Malagas, and is remarkable for its low K and high H_2PO_4 content.

B. C. A.

Character in pot-still whiskey. S. H. HASTIE AND W. D. DICK. *J. Inst. Brewing* 34, 17, 94(1928); cf. *Ibid* 32, 209. "Character" is the term used to designate the palate flavor of whiskey, and whiskeys are distinguished from one another by their character, and not by differences in their chemical compn. Acids, esters, aldehydes, furfural, alcohols, and probably other substances affect the character. The present study was made on furfural, as to whether this is influenced by the compn. of the wash (fermented mash) or actual operation of the distn. processes, or both, and what factors control the production of furfural in the stills. Fractional distn. showed that furfural added to the wash is transferred to the distillate mainly at 76.7°, and additional furfural was obtained at the end of the distn. due to slight charring. A wash with added acid but with no furfural added also gave furfural at the end of the distn. Because of the difficulty of obtaining a wash of identical compn. for all the expts., an artificial wash was prepd. contg. arabinose and xylose, the pentoses present in wash. Tests made with this wash with added acids, showed that furfural is only produced when the acid concn. is high; therefore the furfural is not formed in the pot still by the action of acids on pentoses. The conclusion was then reached that furfural is produced by superheating or charring of the wash in the still through direct fire heating. Tests made with pale malt ext., to which alcohol was added, gave no furfural except if distilled with strong acid. Amber, crystal and roasted malt gave furfural in the distillate. Xylose, treated with acid, boiled under reflux and distd., gave furfural if heated by direct flame. These tests confirmed the above conclusion. The formation of furfural having been shown, it was attempted to det. what happens to the furfural present in the wash still distillates, low wines, foreshots and feints, with alcohol contents of approx. 20%, 70%, and 33% by vol., resp. The furfural contents in parts per 100,000 are 1.9, 2.0, 2.0 and 3.0, resp. The sepn. of these fractions is detd. by previous experience, not by any scientific system. Max. furfural passes over at alc. strengths of 32 to 67% by vol., and a temp. of 73-78°; a highly rectifying still confines the furfural to a smaller number of fractions. The presence of pentoses in peat being known, this is also a possible source of furfural and is noted but not studied. Yeast distd. with and without acid did not yield furfural. Seventeen whiskeys varied from

2.2 to 6.3 parts furfural per 100,000 parts absolute alcohol. Furfural content was not in accord with commercial appreciation of the whiskeys. However, furfural additions to a low-furfural whiskey did enhance the flavor up to a point over which it was objectionable. Furfural in maturing of the whiskey is considered of little importance, since as has been shown (Crampton and Tolman, *C. A.* 2, 685) the furfural content increased very slightly on ageing.

The water content of yeast cells. F. E. DAY. *Brewers J.* 64, 99-100(1928).—A criticism of the findings of N. C. Beetlestone (*C. A.* 22, 1649) and R. H. Hopkins (*C. A.* 22, 1650).

Hydrostatic pressure and the yeast cell. N. C. BEETLESTONE. *Brewers J.* 64, 139(1928).—An answer to F. E. Day (above).

PETER J. F. WEBER

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PETER J. F. WEBER

A milk-fermenting yeast (AYYAR) 11C. Decolorizing carbon (U. S. pat. 1,700,342 18.

Fermentation processes. S. BAKONYI (to Deutsche Hydrier Werke A.-G.). Brit. 293,015, June 30, 1927. In the production of EtOH, PrOH, iso-PrOH, BuOH, acetone and the like from amylaceous materials, production of lactic or butyric acids, etc., natural mixed cultures of bacteria and yeast are used and these may be submitted to selection as by allowing them to grow in contact with a small quantity of the desired product to obtain organisms of greater resistance. Filter bodies of slag or broken stone may be used as carriers for the cultures.

Vinegar. SOCIÉTÉ H. GOUTHIERE ET CIE. Fr. 642,697, Mar. 23, 1927. In fermentation for the production of vinegar, fibers of fir wood or other varieties from which resin is first removed are used instead of the usual beech shavings.

Preventing corrosion by spirit. BENZOL-VERZAND G. M. B. H. Ger. 469,921, May 26, 1926. Addn. to 447,526. The corrosive action of spirit is prevented by adding an alkali benzoate before rectifying by distn.

Distilling or evaporating mashies, beer worts, etc. H. KOCK and R. QUIR. Brit. 292,518, June 20, 1927. The material is intensively heated with steam in a tube and the steam and liquid mixt. are raised above the liquid level in a closed current and the mixt. is returned under full pressure through downwardly directed jets on to the surface of the liquid. An app. is described.

Yeast. H. BÜCHER. Brit. 292,202, Feb. 19, 1927. Yeast is produced in an aerated wort, which is maintained slightly acid. The nutrient compds. used either produce no acid (in which case a small proportion of acid is added) or produce just sufficient acid to maintain the optimum acidity so that neutralization is unnecessary and the nutrients used do not form insol. acid compds. Carbamide may be used as a source of N and use of compds. of I, Br, Fe, etc., is referred to. Liquid sepd. from the yeast produced may be used again with an admixture of fresh nutrient materials. Cf. *C. A.* 23, 1211.

Yeast preparation. RICHARD WILLSTÄTTER and HARRY SABOTKA. U. S. 1,701,200, Feb. 5. After initiating autolysis and liquefaction of yeast (suitably by heating with corn sirup) the liquefied mass, which is heated to about 40-50°, is admixed with substantially an equal quantity of a monosaccharide such as cryst. glucose, and the mixt. is heated to 85-100° to obtain a product suitable for use in bakery products or confectionary.

Activating yeast. ERNST PRIBRAM and HUGO WERTHEIM. Austrian 111,532, July 15, 1928. The propagation of yeast is stimulated and the enzymic activity of the product is improved by adding to the usual nutrient media a small quantity, e. g., 5%, of carrot juice and a trace of a sol. salt of a metal, e. g., Mn, Fe, Cu, Zn, Al, or Cr.

17—PHARMACEUTICAL CHEMISTRY

W. O. EMERY

Crystal form of atoxyl [sodium *p*-aminophenylarsonate]. G. CESARO. *Mem. soc. roy. sci. Liège* 12, 1-11(1924).—The results obtained by Mélon (*C. A.* 17, 2629) and by Gilta (*C. A.* 17, 2167) are discussed in regard to the relationship between the two different orientations of the crystal adopted.

Evaluation of nitris aethylicus cum spiritu. L. VAN ITALLIE, A. J. STEENHAUER and A. HARMSMA. Univ. Leiden. *Pharm. Weekblad* 66, 15-22(1929).—A new method of detg. the EtONO content of sweet spirits of niter consists in oxidizing the EtONO

to EtONO_2 by means of KClO_3 and iodometric titration of the excess KClO_3 . To 10 cc. of the sample add 10 cc. of 2 *N* KClO_3 and 5 cc. of dil. H_2SO_4 . Allow the mixt. to stand 5 min. in a volumetric flask with occasional shaking. Dil. to 100 cc. and to a 10-cc. aliquot add 2 cc. NH_4OH and 3 cc. H_2O . Boil in an unstoppered flask to a vol. of about 10 cc., cool, add 1 g. KBr and 15 cc. concd. HCl , insert the stopper and after 5 min. add 1 g. KI in 10 cc. H_2O . Titrate the liberated I with 0.1 *N* $\text{Na}_2\text{S}_2\text{O}_3$. Each cc. of *N* KClO_3 consumed is equiv. to 37.5 mg. EtONO . A. W. DOX

Microchemical study of official alkaloids. L. ROSENTHALER. Univ. Bern. *Apoth. Ztg.* 44, 40-3(1929).—Some 30 alkaloids were examd. in detail respecting the character of ppts. obtained with certain alk. reagents. Eighteen microchemical illustrations are shown. W. O. E.

Examination of dry extracts. A. KOENIG. Tech. Hochschule Braunschweig. *Apoth. Ztg.* 44, 74-6(1929).—A comparative study of dry exts. prepd. *via* Krause (D. R. P. No. 297,388) with standard official preps. and others specially made in the lab showed no marked differences in quality of 4 preps. examd. W. O. E.

Anatomy and chemistry of drugs. Protein tubes therein. TH. BOKORNY. *Pharm. Ztg.* 74, 57-60(1929).—A histological and chem. study of *Potentilla tormentilla* and *Rosa centifolia*, in sections treated with very dil. solns. of certain bases (caffeine, antipyrine, etc.) in order to render visible by agglomeration the active reserve proteins as "proteosomes." W. O. E.

Dermal salve. C. A. ROJAHN, MAX HERTER AND GERTRUD HAMANN. Univ. Halle-Wittenberg. *Apoth. Ztg.* 44, 105-6(1929).—This prepn. contains as essential ingredients hydrophile fatty material 16, alum 11-12, active Cl (as hypochlorite) 0.05%, together with a little NaCl . W. O. E.

Eutirsol. H. SCHREIBLER. Tech. Hochschule Berlin. *Apoth. Ztg.* 44, 106-7(1929).—A new thiophene-sulfur prepn. from the distn. products of Seefeld shale. It is a mobile, bright yellow liquid of faint odor, sol. in nearly all org. solvents, has a $d_{20} 0.96$ and contains 12-13% S almost entirely in the form of thiophene compds., which constitute about one-half the oil. While it is inclined to darken in the light and air, it is in combination with suitable salve bases, expected to prove more satisfactory than ichthol, since it contains all the valuable therapeutic ingredients of the latter and none of its objectionable features. W. O. E.

Bromometric and rhodanometric estimation of essential oils. I. H. P. KAUFMANN AND H. BARICH. Univ. Jena. *Arch. Pharm.* 267, 1-27(1929).—From a large no. of expts. it is shown that the addn. of Br dissolved in NaBr-MeOH proceeds to a very definite point in the case of geraniol, linalool, terpineol, anethole, thymol, citral, vanillin, cinnamaldehyde, carvone, geranyl acetate and linalyl acetate, corresponding to a stoichiometric relationship of the reacting substances, from which fact it is possible to develop true I values. Similar conditions obtained in the rhodanometric estn. of citronellol, geraniol, linalool, terpineol, anethole, thymol, citral, citronallal and geranyl and linalyl acetate. W. O. E.

Organotherapeutic preparations in pharmacopeias, and their methods of examination. KARL NEUMAYER. Univ. Wien. *Arch. Pharm.* 267, 27-30(1929).—An address. W. O. E.

Detection of cantharidin. R. FISCHER. Univ. Innsbruck. *Arch. Pharm.* 267, 31-5(1929).—A highly detailed procedure, involving distn. and sublimation, for the isolation of cantharidin from the urine, stomach contents and other organs, preliminary to its microscopic recognition, in a diln. as high as 1:300000. The method also permits the detection of minute amts. of cantharidin in plasters. W. O. E.

Estimation of potassium iodide in tincture of iodine via D. A. B. 6. J. WEICHERZ. *Arch. Pharm.* 267, 36-42(1929).—The excess values obtained by the official Ger. method for the tincture are due partly to formation of MnO_2 , partly also to oxidation of I to HIO_2 . The formation of MnO_2 can be prevented by addn. of MnSO_4 , which likewise tends to inhibit the formation of HIO_2 . The HIO_2 formation can be counteracted by addn. of CCl_4 . Reduction of very small amts. of HIO_2 by $\text{H}_2\text{C}_2\text{O}_4$ is facilitated by the presence of MnSO_4 . Addn. of CCl_4 also prevents loss of I through escaping CO_2 . Estn. of free I and of the iodide can be effected in either one or 2 sep. samples. The results yielded by the Weichherz-Klinger method are accurate within the usual limits of error peculiar to titration. W. O. E.

Superfluous new pharmaceutical preparations. "Nautisan." CHEMOSAN-UNION AND FRITZ FIEZOLDT A.-G. *Chem.-Ztg.* 52, 777(1928).—An attempt to refute the recent criticisms (cf. C. A. 22, 4202) relative to the above subject matter. Superfluous new pharmaceutical preparations. HANS PICK. *Ibid.*—A reply to the above. W. O. E.

Determination of ionone. R. D. HENDRIKSZ AND A. RECLAIRE. *Perfumery*

Essent. Oil Record 19, 493(1928).—Reflux 5 cc. of the sample 2 hrs. with a mixt. of 15 g. $\text{NH}_4\text{OH} \cdot \text{HCl}$, 18 g. potash and 37.5 g. H_2O . After boiling, pour the hot mixt. into a separatory funnel, draw off the aq. layer and wash the oximated oil 3 times with hot brine, filter as hot as possible (which can be done in a little drying oven at about 100°). In about 0.5 to 1 g. of the oximated product det. the N *via* Kjeldahl (Gunning modification as used in the method for detg. citronellal in Java citronella oil. Calc. the ionone content by means of $x = 53.82 a / (14 - 0.042 a)$, in which a = no. of cc. 0.5 N H_2SO_4 required for 1 g. oximated oil. W. O. E.

Commercial evaluation of cloves. W. A. N. MARKWELL AND L. J. WALKER *Perfumery Essent. Oil Record* 19, 496-7(1928).—Following a discussion of 5 different procedures, a 6th is suggested as being rapid and yielding results closely approximating those obtained by the U. S. P. method, and moreover sufficiently accurate for the evaluation of cloves to be used for oil distn. Weigh out accurately in a tared Petri dish 0.5 to 1 g. of the powdered sample (No. 20 powder), spread in a thin layer on the floor of the dish and heat at 110° to const. wt. The loss in wt. gives the total amt. of volatile matter inclusive of moisture, which latter is detd. meanwhile *via* Dean and Stark. Calc. % of volatile substances other than H_2O by difference. The entire detn. requires only 8 hrs. or less. W. O. E.

Rheuma-Sensit. C. A. ROJAHN. Univ. Halle-Wittenberg. *Apoth. Ztg.* 44, 28-9(1927); cf. *C. A.* 22, 1652. An analgesic stated by the analyst to be essentially a mixt. of soap 40, vaseline oil 15, lanolin or adeps lanae 5, free fatty acids 10, Water 15, salicylic acid as K salicylate 10, essential oils, camphor and menthol 5%. W. O. E.

Simple evaluation of spiritus aetheris. F. WRATSCHKO. *Pharm. Presse* 34, 5 (1929).—In a recent paper (cf. *C. A.* 23, 1212) a correction should be made in the value to be calcd. for $y = 72(20 - k)/d$; 72 should read 7.2. W. O. E.

Jasmine, jasmone and jasminaldehyde. A. ROSENTHAL. *Riechstoffindustrie* 3, 228-30(1929).—A discussion of the enfleurage and extn. processes for isolating the odorous principles from the flowers in connection with the various attempts to reproduce these principles in the lab. W. O. E.

New esters. WILLIBALD RENDERN. *Riechstoffindustrie* 3, 231(1929). Among the newer esters considered are formates, butyrates and phthalates. Of special interest perhaps are: benzyl butyrate for jasmine and rose, citronellyl butyrate in lavender and rose compns., cinnamyl butyrate in eau de Cologne and anisyl isobutyrate as fixative. W. O. E.

Fluid extracts of domestic drug plants. I. KROEBER. *Pharm. Zentralhalle* 69, 115-7, 357-8, 386-9, 438-9, 565 7, 663 5, 727 9, 807-9(1928); 70, 4 6(1929); cf. *C. A.* 22, 1213.—Ext. *Meliloti officinalis* d_{15} 1.122, dry residue 38.05%, ash 3.60%; ext. *Staphis cerasorum* d_{15} 1.0399, dry residue 16.30%, ash 2.30%; ext. *Anagallis arvensis* d_{15} 1.075, dry residue 27.20%, ash 3.40%; ext. *Euphrasiae officinalis* d_{15} 1.79, dry residue 21.00%, ash 2.35%; *Spiraeae ulmariae* d_{15} 1.0696, dry residue 15.90, ash 2.15%; ext. *foliorum vaccinii myrtilli* d_{15} 1.0293, dry residue 13.65, ash 1.00%; ext. *Eupatorium cannabini* d_{15} 1.018, dry residue 12.25%, ash 1.55%; ext. *Erythraee centaurei* d_{15} 1.065, dry residue 22.75, ash 1.05%; ext. *Verbenae officinalis* d_{15} 1.0427, dry residue 16.25%, ash 2.90%. W. O. E.

Estimation of tannin in drugs. O. LINDE AND H. TEUFER. *Tech. Hochschule Braunschweig. Pharm. Zentralhalle* 70, 21-6, 53 60(1929).—Of the very large no. of methods for the detn. of tannin already described in the literature, 4 (involving hide powder, SnCl_2 , $\text{Cu}(\text{OAc})_2$ and volumetric methods) were selected for the present comparative study. There was, however, no agreement in the results obtained. While the hide-powder method was servicable in every case tested, it is too involved for the av. apothecary's lab. As compared with the hide-powder method, the SnCl_2 and $\text{Cu}(\text{OAc})_2$ soln. methods gave too low values, but are well suited to the demands of the apothecary. The SnCl_2 method cannot be used with gambir. In operations with the Loewenthal method the actual content of tannin is not detd. but rather the reduction capacity as compared with that of tannin. With drugs contg. alkaloid compd. of tannin, it is necessary to decompose the latter with alkali preliminary to elimination of these bases and before detn. of the tannin content. A comparative summary is given of the tannin content of some 10 crude drugs as detd. by the 4 methods. W. O. E.

Tinctura ferri pomata. I. G. OBERHARD. *Pharm. Ztg.* 74, 13-4(1929).—An exptl. study of the prepn. and behavior of this Fe compd. of malic acid. Contrary to earlier statements in the literature this prepn., official in several European pharmacopeias, contains Fe^{III} only when freshly made, the older preps. contg. the Fe mostly or entirely in bivalent form. W. O. E.

Improved method for the examination of pharmaceutical preparations by means of greatly extended capillary pictures, and the analytical quartz lamp. C. A. ROJAHN. *Pharm. Ztg.* 74, 14(1929).—A commentary on the paper of like title by Rapp (cf. C. A. 23, 931). W. O. E.

Microcrystallization of alkaloids. HANNS BECKMANN. *Pharm. Ztg.* 74, 28-9 (1929); cf. C. A. 22, 4718.—A microscopical study has been made of the behavior of aq., acid or salt solns. of certain alkaloids on slow evapn., and of the appearance of their residues with or without the addn. of certain reagents. Among the alkaloids examd., the solvent used, the reagent if any subsequently added, and the crystn. picture, the following are given in the order indicated: aconitine in dil. HNO_3 , addn. of AgNO_3 , highly refractive rods; atropine in dil. HCl , NaOH , needles; brucine in HCl , KOH , thin needles and prisms frequently in fan-shaped forms; codeine Na_2CO_3 , —, rhomboidal prisms; caffeine in NaCl 1:100, —, axial angular squares; cocaine in dil. acids, $\text{K}_3\text{Fe}(\text{CN})_6$, rosettes; narcotine in dil. HCl , NaOAc , delicate prisms; papaverine in alc., —, radiating leaflets; papaverine in AcOH , NaOAc , tiny leaves; thebaine in dil. acids, NaOH or NH_4OH , quadratic crystals; strychnine in $\text{K}_2\text{Cr}_2\text{O}_7$, —, yellow stars often in tufts; strychnine in $\text{K}_3\text{Fe}(\text{CN})_6$, —, mat golden radiating crystals; veratrine in dil. HCl , K_2CrO_4 , coalescing stellar aggregates; morphine in NaOH , $(\text{NH}_4)_2\text{CO}_3$, crystal skeletons. In this connection the identification of minute traces of alkaloids by means of their sublimates is discussed. W. O. E.

Estimation of essential oil in folia menthae piperitae. HORKHEIMER. *Pharm. Ztg.* 74, 45(1929).—A commentary on the Ger. Pharm. method for the evaluation of peppermint, including results obtained on a few com. samples. W. O. E.

Pharmacognostic notes. L. ROSENTHALER. Univ. Bern. *Pharm. Ztg.* 74, 75-7(1929).—The paper includes observations on the identification of nitrates in drugs, two *Cinchona* barks (*castrona* and *naradjada*) from S. America, Flores Cinae, Japanese ginger and so called Indian tragacanth (*Sterculia*). W. O. E.

Taste corrigent for urea. H. ESCHENBRENNER. Hamburg. *Pharm. Ztg.* 74, 91-4(1929).—A discussion of various formulas for masking the taste of urea when used as a diuretic. W. O. E.

Evaluation of lecithprotein. C. MASSATSCH. *Pharm. Ztg.* 74, 94-5(1929).—Extn. of fully desiccated egg yolk (preferably in vacuum at 60°) with petr. ether (0.40-60%) yields a dry friable yellowish white residue (lecithprotein) contg. about 25% lecithin, which latter may be in turn completely isolated by boiling alc. The term lecithprotein (Lecithinalbumin) should apply only to a product emanating from egg yolk. W. O. E.

Estimation of morphine in opium, in opium extract and in its tinctures. THEODOR BERTHM. Univ. Berlin. *Apoth. Ztg.* 44, 88-91(1929).—After discussion of the official Ger. methods, the following procedure is suggested for opium: Triturate 3.5 g. of moderately powdered opium with 3.5 cc. of H_2O , transfer to a flask with H_2O so that the total wt. is 31.5 g. After 1 hr. (with frequent shaking the while), pass the liquid through a dry (8-cm.) folded filter, and to 21 g. of the filtrate (= 2.44 g. opium) add 1 cc. of a mixt. of 1 g. NH_4OH and 83 g. of H_2O , mix and pass immediately through a dry folded 8-cm. filter into a tared flask. Remove 18 g. (= 2 g. opium) of the filtrate to a small separatory funnel, the lower constriction of which just above the cock is closed by a small pledget of cotton, wash out the flask twice with 1-cc. portions of H_2O , add 10 cc. of EtOAc and 2.5 cc. of the mixt. of 17 g. NH_4OH and 83 g. H_2O , close the separatory funnel and shake 10 mins., allow to stand 15 mins. with occasional agitation of the liquid, then adjust the separatory funnel to a suction flask, draw off the liquid and wash the residual morphine twice with 2.5-cc. portions of H_2O , closing the separatory funnel during each washing, dissolve the morphine crystals in 10 cc. of 0.1 N HCl , dil. with 25 cc. H_2O and titrate with 0.1 N KOH in the presence of 2 drops of methyl red soln. Continue finally *via* the D. A.-B. VI, page 510. W. O. E.

Iron and ammonium citrate of commerce, its composition and behavior in certain solutions. G. J. W. FERREY. *Quart. J. Pharm.* 1, 351-62(1929).—The ppt. yielded by some samples of Fe and NH_4 citrate in soln. with MgSO_4 depends on the presence of Ca in these samples, probably as a result of the use of tap instead of distd. H_2O in the process of manuf. Some samples of the salt contg. Ca give no ppt. when dispensed with MgSO_4 , because of the high proportion of citric acid to NH_3 in such products. The samples yielding ppts. in simple aq. soln. contain free Fe^{III} ions which accordingly react with $\text{K}_3\text{Fe}(\text{CN})_6$. In some cases the ppts. are due to Fe^{III} in org. combination; in others the Fe appears to be in inorg. combination. Furthermore, samples contg. a low % of NH_3 , a comparatively large quantity of acid NH_4 ferrylcitrate may be present and be pptd. as a green solid in the presence of large concns. of true Fe and NH_4 citrate.

Some conditions during manuf. in which free Fe^{III} ions and acid ferrylcitrate may be formed are indicated in the present study. It is shown that many perfectly satisfactory preps. of Fe and NH_4 citrate may contain less than 5.5% of NH_3 , and that the 6.9% recommended by Todd as a min. is therefore too high. It is recommended that the B. P. assay for Fe should be altered to include washing and re-ignition of the ash, and that in this case the limits for residue on ignition should be 30 to 32%, instead of 31 to 32%, as in the present B. P. Also in *Chemist. and Druggist* 109, 121-5; *Pharm. J.* 121, 87-8(1928). W. O. E.

Melting point of cocaine hydrochloride. WILFRED SMITH. *Quart. J. Pharm.* 1, 387-8(1929).—While the m. p. of cocaine-HCl varies with the rate of heating, the m. p. as given in the various pharmacopeias is evidently too low for the salt as prepd. at the present time. It is suggested that the m. p. be taken by introducing the salt into a bath previously heated to 195° , when the m. p. shall not be below 197° . Also in *Chemist and Druggist* 109, 125-6; *Pharm. J.* 121, 88(1928). W. O. E.

Apiol. J. R. WALMSLEY. *Quart. J. Pharm.* 1, 388-94(1929).—The liquid green apiol met with in trade does not agree with the description given in the monograph in the B. P. C. It has been shown that an ethereal ext. of parsley seed is a fatty oil contg. a small proportion of non-fatty matter, and therefore cannot possess the d or the soly. ascribed to it by the B. P. C. Other solvents except alc. yield exts. which have similar properties to the Et_2O ext. The fatty oil contains glycerides of an unsatd acid peculiar to the Umbelliferae. The non-fatty matter is chiefly phenol ethers which have been shown to be myristicin, and not apiol, in the English and French grown fruits. The non-fatty matter of the American grown seed requires further study. The growing of a variety of parsley (*Carum petroselinum* B and H; *Petroselinum sativum* Hoffman; *Apium petroselinum* L) which will yield apiol, as is stated to be the case with German grown fruit, is a matter which should be taken up by proper authorities, especially as myristicin is stated to be toxic. The use of alc. as a menstruum appears to have advantages, and will be further studied. The terms apiol and liquid apiol are inaccurate when applied to the ethereal ext.; Oleo-resin Petroselinum (or Oleo-resin Apii) is more suitable and should be used in the B. P. C. in place of apiol. The only substance to which the name apiol can be correctly applied is the cryst. stearoptene, formerly official in the French Codex. The essential oil of parsley then appears to be the only substance worthy of the name liquid apiol, and only if obtained from an apiol-bearing variety of parsley. Also in *Chemist and Druggist* 109, 127-9; *Pharm. J.* 121, 89-90(1928). W. O. E.

Infusion of senega. J. F. LIVERSEGE. *Quart. J. Pharm.* 1, 394-9(1929).—Infusion of senega as actually dispensed, as also concd. infusions, showed great variations in compn. Senega roots and infusions prepd. from them show much less variation. It is desirable that the new B. P. should give a formula for 1-8 concd. infusion of senega to be dild. as required, and the product to take the name of "Infusum Senegae" and the name of the present prepn. altered to "Infusum Senegae Recens." Other infusions in common use should be treated similarly. Also in *Pharm. J.* 121, 90-1; *Chemist and Druggist* 109, 129-30(1928). W. O. E.

Malt extract and oil emulsions. I. Composition of commercial malt extract and cod-liver oil emulsions. J. M. JONES AND T. McLACHLAN. *Quart. J. Pharm.* 1, 400-1(1929).—Twelve emulsions of malt ext. and cod-liver oil obtained from various sources have been examd. and the results obtained tabulated. While the majority of the samples contain an adequate proportion of cod-liver oil, it is shown that in the case of 1 sample it is necessary to take 5 fl. oz. of emulsion to obtain a dose of a fl. dr. of cod-liver oil. The methods followed in the investigation are indicated. **II. Vitamin A content of commercial malt extract and cod-liver oil emulsions.** J. M. JONES. *Ibid* 401-2.—In order to avoid the use of a system of units different from the U. S. P. biol. units, which have come into general use, a factor has been employed to convert the no. of blue tintometer (Lovibond) units into values approx. corresponding to U. S. P. biol. units per g. By comparing a no. of samples on which biol. and colorimetric tests have been carried out it has been found that the av. value of this factor is 85. On this system a Norwegian cod-liver oil of good medicinal quality contains on the av. about 500 units of vitamin A per g. The cod-liver oil extd. from a 23-yr.-old emulsion gave a color test of about 250 units, showing that these emulsions retain their vitamin A activity for considerable periods. **III. Note on testing malt extract and cod-liver oil emulsions for vitamin A.** J. M. JONES AND NORMAN EVERS. *Ibid* 402-5.—In the course of the work indicated in the previous abstract, it was considered advisable to det. what loss, if any, of vitamin A occurred in the ordinary methods of extn. of cod-liver oil as used in analysis and incidental manipulations (exposure to light, desiccants, etc.). The

results obtained in these expts. are in some cases conflicting, and further work is evidently required, but there is clear evidence that the use of CaCl_2 for drying solns. of oils which are to be tested for vitamin A should be avoided. There is also sufficient evidence to show that such solns. should be kept as far as possible in the dark. It is clear, too, that further study is needed on the mode of action of CaCl_2 . Light certainly appears to accelerate the loss. Further work is contemplated with other drying agents. Also in *Chemist and Druggist* 109, 130-2; *Pharm. J.* 121, 91-2(1928). W. O. E.

Total alkaloids of *Datura fastuosa* Linnaeus and *Datura alba* Nees from the Philippines. JOAQUIN M. MARAÑON. Univ. of the Philippines and Bureau of Science, Manila. *Philippine J. Sci.* 37, 251-61(1928).—Leaves of *D. fastuosa* contain slightly more alkaloids than those of *D. alba*. In both, young leaves have more alkaloid than either the full-grown or senescent leaves. The same is true of the flowers and seeds, except in the seeds of the very young *D. fastuosa*. The pericarp of the very young fruit has more alkaloid than that of other stages of the fruit, a condition the reverse of that found in the seed. The pericarp of *D. fastuosa* yields more alkaloid than that of *D. alba*. The fruit *D. fastuosa* has more total alkaloid than fruit of *D. alba*. In both, very young and mature fruit contain more alkaloid than the nearly mature fruits. There is only a slight diff. in total alkaloid in stems of *D. fastuosa* and *D. alba*, but the root of *D. fastuosa* contains more alkaloid than that of *D. alba*. S. L. B. ETHERTON

New remedial agents. The ureide hypnotics. ANON. *Am. J. Pharm.* 100, 692-7(1928).—A review and discussion including a study of the claims for a no. of new cyclic ureides from the point of view of their chem. constitution. The following list of the principal cyclic ureides at present in use are discussed. Diethylbarbituric acid ("veronal"; "barbitone"), diallylbarbituric acid ("dial"), dipropylbarbituric acid ("proponal"), phenylethylbarbituric acid ("luminal"), butylethylbarbituric acid ("sonervel"; "neonal"), isobutylallylbarbituric acid ("sandoptal"), allylisopropylbarbituric acid ("allonal") (combination with amidopyrine), ethylisopropylbarbituric acid ("ipral") (calcium salt), cyclohexenylethylbarbituric acid ("phanodorm"), isoamylethylbarbituric acid ("amytal"), isobutylbromopropenylbarbituric acid ("noctal"). W. G. G.

Novonal, a new hypnotic. BOCKMÜHL AND SCHAUMANN. *Deut. med. Wochschr.* 54, 270-1(1928).—A description of the properties of novonal, a com. prepn. of diethylallylacetamide, $\text{Et}_2(\text{C}_6\text{H}_5)\text{CCONH}_2$. ARTHUR GROLLMAN

Instability of precipitin anti-sera in the tropics. HERBERT S. SHREWSBURY. *Analyst* 54, 20(1929).—A study of the literature indicates that anti-sera are unstable compds. produced at the blood temp., which are always tending to revert to their original mol. constitutions. Possibly anti-sera made from the blood of a bird would be more stable than that from a mammal. W. T. H.

New way to detect quinine valerate. STEPHEN SOULE. *Chemist-Analyst* 18, 11(1929).—Bruising the crystals in a glass mortar produces a marked fluorescence which persists until all the crystals have been reduced to fine powder. The fluorescence is very marked in the dark and is noticeable on a dark day. W. T. H.

Combinations of medicaments as an example of organic molecular compounds. P. PICHTER AND R. SEYDEL. Univ. of Bonn. *Z. physik. Chem.* 137, 107-25(1928).—P and R. investigate the freezing-pt. curves of 16 mixtures of compds. used in pharmacy with a view to finding relations between their pharmacological properties and their melting characteristics: antipyrine + orthoform-new, mol. compd. (1:1), m. 92°; pyramidone + orthoform-new; acetyl-aminoantipyrine + orthoform-new; antipyrine + *o*-aminophenol; antipyrine + Me *p*-hydroxybenzoate; pyramidone + *o*-aminophenol; pyramidone + Me *p*-hydroxybenzoate; antipyrine + Me *m*-aminobenzoate; antipyrine + Me *p*-aminobenzoate; pyramidone + Me *m*-aminobenzoate; pyramidone + Me *p*-aminobenzoate; sarcosine anhydride + orthoform-new; mol. compd. (1:1), m. 146°, sarcosine anhydride + Me *p*-hydroxybenzoate, mol. compd. (1:2), m. 99°; sarcosine anhydride + *o*-aminophenol, mol. compd. (1:1), m. 101°; sarcosine anhydride + Me *n*-aminobenzoate, mol. compd. (1:2), m. 62.4°; antipyrine + luminal.

ALBERT L. HENNE

Evaluation of preparations of the posterior lobe of the hypophysis by means of the in situ cat uterus. KONRAD SCHÜBEL AND WALTER GRILLEN. Inst. Erlangen. *Arch. expil. Path. Pharm.* 132, 145-71(1928).—The error in the method described amounted to about 15%. G. H. S.

Digitalis evaluation with the frog heart sinus. G. MANSFELD AND Z. HORN. Univ. Pecs. *Arch. expil. Path. Pharm.* 132, 257-76(1928).—The method is described and the character of the results obtained tabulated. G. H. S.

The British pharmaceutical and medicinal chemical industry. Wide range of production. H. A. D. JOWETT. *Times Trade and Eng. Supplement* (London) 23,

38(1928).—In addn. to well-known compds., briefly reviewed, neostam, an Sb compd. for treatment of kala-azar, avenyl, an org. deriv. of Hg for treatment of syphilitic lepers, and stabilarsan, an improved form of arsphenamine, are now being produced.

E. M. SYMMES

Perfumery chemicals and flavorings. The British industry. A. BOAKE, ROBERTS, AND CO. *Times Trade Eng. Supplement* (London) 23, 44(1928). E. M. SYMMES

Constituents of Chinese drug, "Ma Huang." VI. W. N. NAGAI AND S. KANAO. *J. Pharm. Soc. Japan* 48, 845-51(1928).—N.'s previous work on the constituents of "Ma Huang" showed that *Ephedra helvetica* (I) grown in China contained only *l*-ephedrine (II) and not *d*-isoeephedrine (or *d*- ψ -ephedrine) (III), which is the chief constituent of the plant grown in Europe. Recent investigation, however, showed that even the native Chinese plant contains a small amt. of III. This fact prompted N. and K. to study more thoroughly all the basic constituents in I. As a result 3 other bases were isolated from the plant grown in Pechili district. These are: *l*-methylephedrine (IV), m. 87-7.5, $[\alpha]_D^{20}$ -29.02°; HCl salt, m. 182°, $[\alpha]_D^{20}$ -29.87°; oxalate, m. 187°; picrate, m. 142°; chloroaurate, m. 128-9°. *d*-Methylisoeephedrine (V), m. 28°, b₂₁ 145-5.5°, $[\alpha]_D^{21}$ 48.13 (MeOH); HCl salt, $[\alpha]_D^{23}$ 58.11; chloroaurate, m. 126-7°. *Nor-d*-isoeephedrine (β -phenyl- β -hydroxyisopropylamine) (VI), m. 77.5-8°, $[\alpha]_D^{24}$ 32.69 (abs. alc.); H₂SO₄ salt, m. 290-1°, $[\alpha]_D^{27}$ 39.66; HCl salt, m. 180-1°, $[\alpha]_D^{24}$ 42.1°; oxalate, m. 235°; *l*-bitartrate, m. 202°. The method of isolation is described in detail. IV and V are stereoisomers and identical with compds. obtained by the methylation of II and *d*-isoeephedrine, respectively. Of 18 possible isomers of II, all of which have already been synthesized by N. and K. (*J. Tokyo Chem. Soc.* 32, 426; 36, 424; K.'s Dissertation, Tokyo Imp Univ. 1919) only 5 have thus far been found in nature.

NAO UEI

Imidazoledicarboxylic acid and its 2-methyl derivative as reagents for alkaloids. Y. TAMAMUSHI. Tokyo Imp. Univ. *J. Pharm. Soc. Japan* 48, 863-8(1928).—According to Pauly and Ludwig (*C. A.* 16, 4210), imidazoledicarboxylic acid (I) gives crystalline salts with certain bases which are relatively insol. in H₂O and have characteristic soly. and sharp m. p. so that these salts can be used for isolation and estn. of the bases from the mixt. T. has studied the salts of I and of 2-methylimidazoledicarboxylic acid (II) formed with 42 different bases and found that contrary to the statement of P. and L. salts of I with NH₃, MeNH₂, EtNH₂, Et₂NH and imidazole are sol. in H₂O and further that except for 3 compds., *i. e.*, Et₂NH-salt (m. 177-8°) and C₆H₅Me₂N salt (m. 215°) of I and C₆H₅Me₂N salt of II (m. 205°), all other salts had no sharp m. p. The NH₃ salt of I decompd. 280° and EtNH₂ salt decompd. 262° instead of 275° and 253-4°, resp., as given by P. and L. Conclusion: The compds. I and II can be used to a certain degree for detection of some bases, but they are worthless for their estn.

NAO UEI

"Zyozan" or Chinese drug "Ch'ang shan." K. KIMURA, M. NAKAO AND G. SHIMADA. Tokyo Imp. Univ. *J. Pharm. Soc. Japan* 48, 884-904(1928).—A review of literature and of geographical distribution as well as the anatomical study of the plant is given in detail.

NAO UEI

Compound tincture of benzoin. T. T. COCKING. *Chemist and Druggist* 109, 118-9; *Pharm. J.* 121, 86(1928); *Quart. J. Pharm.* 1, 337-46(1928).—Detn. of total solids alone in compd. tincture of benzoin (A) is not a true guide in judging its medicinal value. The quantities of alc.-sol. matters of its ingredients are given: Aloes, 81.1%; balsam of tolu, 92.0% (min.); benzoin, 65%; prepd. storax 95% (Brit. Pharm.). On this basis C. calcs. a standard of 18.165% for the total solids in A. Different authors have adopted standards varying from 15.85 to 18.0%. Com. samples (from British Drug Houses) showed 17.0-19.6%, others 17.3-21.8% when C.'s method was used: Evap. 5 cc. of A and dry *in vacuo* over H₂SO₄ at ordinary temp. to const. wt., *i. e.*, for about 48 hrs. The results by this method are 1.94% (av.) higher than those obtained by evapg. the tincture and drying at 100°. A complete scheme of analysis should consist of the detn. of (1) total solids, (2) acid no., (3) ester no., (4) sapon. no., (5) free balsamic acid, (6) total, (7) combined balsamic acids, (8) the ratio acid no. : ester no., (9) the ratio free : combined balsamic acids. (Cf. *C. A.* 12, 2229; 13, 162.) The results of a great no. of such detns., with max. and min. values, together with standards calcd. from the analytical data of the drugs are tabulated and discussed. Some striking differences are noted: The ratio (8) showed by calcn. 0.81-1.90, but the com. tinctures gave results far below the calcd. min. Likewise the acid nos. (based on total solids) were far below the calcd. nos., a fact not easily explained because the low value does not correspond to any decrease in balsamic acids. A value of total solids over 20% is regarded with suspicion.

S. WALDBOTT

Testing of barium sulfate for x-ray purposes. T. TUSTING COCKING. *Pharm. J.* 121, 86-7; *Chemist and Druggist* 109, 119-21 (1928); *Quart. J. Pharm.* 1, 363-72 (1928); cf. Bodsworth, *C. A.* 22, 2240.—A critical comparison is made of the tests given in the Brit. Pharm. Codex 1923, the U. S. P. X., and the German Pharm. with the tests recommended by B. and those of the British Drug Houses. The latter tests are put forward as tentative standards. To test for *sol. Ba salts* and for *acid-sol. matter*, boil 10 g. BaSO_4 with 100 cc. of 10% AcOH for 10 mins. and filter. Evap. 50 cc. of the clear filtrate to dryness and weigh the residue. Digest this with 20 cc. H_2O and filter. To the clear filtrate add 1 cc. dil. H_2SO_4 ; no turbidity or ppt. should be produced upon standing for 1 hr. The test for *sulfide* relies on the color produced by H_2S gas evolved on treating BaSO_4 with dil. HCl , upon dry $\text{Pb}(\text{AcO})_2$ paper contained in a tube 5 mm. wide. The dry paper is more sensitive than filter paper moistened with the soln. To test for *As*, treat 10 g. BaSO_4 with 50 cc. hot H_2O , 10 cc. of stannated HCl (As test soln.) and 10 g. of granulated Zn in the Gutzeit app. (Brit. Pharm. 1914). The Pb paper should not be blackened more than that of a blank test (showing absence of *sulfide*, *sulfite* and *thiosulfate*), and the stain on the HgCl_2 paper should not indicate more than 1 p. p. m. of As_2O_3 . The test will detect 0.1 p. p. m. For *heavy metals*, add 50 cc. of clear, satd. H_2S - H_2O to the remaining portion of the test for sol. Ba salts. No darkening should occur. For *phosphate*, boil 2 g. BaSO_4 with 10 cc. of 50% HNO_3 , cool and filter. To the filtrate add 5 cc. NH_4 molybdate soln., allow to stand for 1 hr. in a warm place. No yellow ppt. should appear. For *neutrality*, mix 2 g. BaSO_4 with 5 cc. CO_2 -free distd. H_2O and add 2 drops of Universal Indicator (British Drug Houses). The color produced should indicate a pH of not less than 6.0 nor more than 8.0. This test is about 1000 times more delicate than the test with litmus paper.

S. WALDBOTT

Liquor arsenicalis, Brit. Pharm. W. A. KNIGHT. *Pharm. J.* 121, 396-7 (1928); cf. *C. A.* 23, 241.—**Liquor acidi arsenosi**, Brit. Pharm. Codex (A) recommended to replace Fowler's soln. (B), requires prolonged reflux boiling in its prepn. The use of B should be continued, except that a 10% colorless stock soln. of As_2O_3 in K_2CO_3 be made which keeps well, and B be prepd. only as needed by adding the required quantity of compd. tincture of lavender. Or the original Brit. Pharm. formula may be used, except that K_2CO_3 be replaced by the more stable KHCO_3 in 1% concn.; a 2% concn. (as in U. S. P.) renders the prepn. unnecessarily alk. A 1% concn. may be rendered slightly acid whenever desired, by adding 4% of dil. HCl ; this would take the place of A and of liquor arsenici hydrochloricus, Brit. Pharm.

S. WALDBOTT

Methylated iodine preparations. FRANK SLOMAN. *Pharm. J.* 121, 419 (1928); cf. *C. A.* 23, 481.—Development of the odor is completely obviated by addn. of CHCl_3 to the tincture (1:32 by vol.).

S. WALDBOTT

Chemistry, pharmacology and therapeutics of *Agave salmiana* (COLIN) 11H. Disinfectants and insecticides (RIDEAL, RIDEAL, SCIVER) 18. Development of CaCO_3 cells with particular reference to medicinal plants (BRUNZEMA) 11D. *Oenanthe sumnifera* (GOODRICH, LYNN) 11D. Azo compounds (Fr. pat. 643,446) 10. Colloidal dispersions (Brit. pat. 292,965) 13.

Therapeutic substances. RYK GULDENWERKE CHEMISCHE FABRIK A.-G. Ger. 469,788, June 18, 1925. A strong Ca -contg. soln. of theophylline for injection purposes is prepd. by bringing theophylline, ethylenediamine and salicylic acid, either singly or as compds. of reaction of one on another, into aq. soln., and adding CaCl_2 either at the same time or later.

Molded medicinal preparations. I. G. FARBENIND. A.-G. Brit. 293,090, March 25, 1927. Protargol or other medicaments are used with a carrier vehicle comprising gum tragacanth or like material rendered readily sol. in water by addn. of a hydro-tropic substance such as the Na salt of *p*-toluenesulfonic acid or the Na salt of sulfanilic acid. *Succus liquiritia* and other "indifferent" water-sol. substances such as borax or milk sugar may also be added.

Medicinal capsules of gelatin carrying markings in contrasting colors. KEITH K. KELLER. U. S. 1,701,811, Feb. 12. Markings such as the name of a medicine are imprinted, e. g., with colored wax.

Medicine from the radish. CHEMISCHE FABRIK VORM. SANDOZ. Brit. 292,984, June 28, 1927. A medicinal prepn. is obtained from the fresh roots or juices of the radish by a process similar to that applied to garlic as described in Brit. 235,883. A dry, odorless prepn. of radish and charcoal is obtained which may be administered as a powder or may be compressed into tablets.

Basic cinchona alkaloid salts of bile acids. FRITZ MÜLLER, ERNST BURCKHARDT and ERNST ROTHLIN (to Chemische Fabrik vorm. Sandoz). U. S. 1,701,138, Feb. 5. Salts of alkaloids such as quinine, quinidine or dihydrocupreine ethyl ether with bile acids such as cholic or desoxycholic acids form amorphous powders easily sol. in alc., MeOH and acetone but difficultly sol. in ether and water. They are suitable for combating blood parasites.

Optic-nerve and retina extract. ELMER H. STUART (to Eli Lilly & Co.). U. S. 1,700,691, Jan. 29. Optic nerves or retinas (or both) of animals such as hogs or cattle are repeatedly extd. with alc. and the combined exts. are evapd. and treated with water to obtain an aq. ext. which may be used as a preventive of, or remedy for diseases of the human optic nerve or retina.

Complex organic antimony compounds. HANS HAHN (to Winthrop Chemical Co.). U. S. 1,701,234, Feb. 5. In processes similar to those described in U. S. 1,628,838 (C. A. 21, 2170), by the substitution as starting materials of the neutral salts of carboxylic acids and sulfonic acids of such polyphenols as contain 2 OH groups in *o*-position to each other, such as gallic acid, gallo-carboxylic acid, pyrocatecholdisulfonic acid or 2,3-dihydroxynaphthalenedisulfonic acids, new products are obtained which are solids easily sol. in water and the aq. solns. of which are not irritating and may be sterilized at 100° and may be used as *trypanocides*. Examples are given of the production of derivs. from gallic acid and from pyrocatecholdisulfonic acid. Cf. C. A. 23, 1216.

Organic mercury compounds. CHINOIN GYÓGYSZER ÉS VEGYÉSZETI TERMÉKEK GYÁRA R. T. (Kereszty und Wolf). Austrian 111,579, July 15, 1928. Therapeutically valuable compds. contg. Hg are prepd. by treating an aliphatic or an aromatic acid anhydride, or an aromatic acid anhydride contg. an aliphatic side chain, with a compd. prepd. by the action of a Hg salt on $\text{CH}_2:\text{CHCH}_2\text{NH}_2$ or $\text{CH}_2:\text{CHCH}_2\text{OH}$. The examples describe the prepn. of products from (1) succinic anhydride and a reaction product of $\text{CH}_2:\text{CHCH}_2\text{OH}$ and $\text{Hg}(\text{OAc})_2$; (2) camphoric anhydride and a reaction product of $\text{CH}_2:\text{CHCH}_2\text{NH}_2$ and $\text{Hg}(\text{OAc})_2$; and (3) *o*-carboxyphenoxyacetic acid anhydride and a reaction product of $\text{CH}_2:\text{CHCH}_2\text{NH}_2$ and $\text{Hg}(\text{OAc})_2$.

Organo-mercury compounds. I. G. FARBENIND. A.-G. Brit. 292,245, March 16, 1927. An aq. soln. of a salt of an aromatic aminosulfonic acid is treated with a sol. Hg salt at ordinary temp. Examples are given of the treatment of Na sulfanilate, 2-aminophenol-4,6-disulfonate and 2-anisidine-4-sulfonate. The products are water-sol. and may be used as *disinfectants*; their soly. is increased by use of NaCl and for use in "combating pests" dextrin or other suitable substances may be added to them. 2-Aminophenol-4,6-disulfonic acid is made by sulfonating 2-aminophenol first with concd. H_2SO_4 and then with "oleum."

Organo-tellurium compounds. G. T. MORGAN and H. BURGESS. Brit. 292,222, March 14, 1927. A pentamethylene α,ϵ -dihalide is treated with a metallic telluride such as that of Al, Mg or alkali or alk. earth metals, suitably in the presence of an anhydrous solvent. By heating or by elimination of halogen with reducing agents, the products may be converted into cyclotelluropentane and from the latter, by treatment with halogen or H_2O_2 , the dihalide or dioxide may be formed. The products possess *germicidal properties* and may be used as *therapeutic agents*. Several examples are given, among which are the production of cyclotelluripentane 1,1-dibromide, 1- ϵ -bromopentamethylenecyclotelluripentane 1-bromide, pentamethylene- α,ϵ -biscyclotelluripentane 1-bromide, cyclotelluropentane, cyclotelluripentane 1,1-dioxide, pentamethylene- α,ϵ -biscyclotelluripentane 1-perbromide and dichromates form 1- ϵ -chloropentamethylenecyclotelluripentane 1-chloride and pentamethylene- α,ϵ -biscyclotelluripentane 1-chloride or cyclotelluripentane 1,1-dichloride.

Carbamidoarylarsonic acids and their inner anhydrides. R. W. E. STICKINGS and May & BAKER, LTD. Brit. 293,152, May 3, 1927. Aminoarylarsonic acids and their substitution products are condensed with a cyanogen halide in an aq. medium. Examples are given of the prepn. of phenylurea-*p*-arsonic acid, the inner anhydride of 2-hydroxyphenylurea-5-arsonic acid and the inner anhydride of 2-carboxyphenylurea-5-arsonic acid. The products may be used as *therapeutic agents*.

Essential oils. AKTIEN-GESELLSCHAFT FÜR KOHLENSÄURE-INDUSTRIE and E. B. AUERBACH (to Vianova Ges. für chemische Industrie). Brit. 292,982, June 28, 1927. Essential oils and other odorous substances are extd. from plant material such as cloves, caraway seeds or iris root by use of liquid CO_2 , which is evapd. from the ext. obtained and liquefied for further use.

Hormones. S. FRANKEL (to Société anon. pour l'industrie chimique à Bâle). Brit. 292,962, June 27, 1927. Exts. of female internal-secretory organs are freed from phosphatides, cholesterol, cholesterol esters and fats, and then treated with an agent

such as a heavy-metal acetate or alk. earth acetate, which will form soaps insol. in the solvent used. The soaps and excess of the metal salt are removed, and the hormone thus obtained is crystd. at a very low temp. from a suitable org. solvent or is converted into its dibromide and finally debrominated. Various details and modifications are described. Cf. *C. A.* 23, 242.

Ethyl chloride tube. H. A. MÜLLER. Brit. 292,966, June 28, 1927. Structural features.

Perfumes. I. G. FARBENIND. A.-G. Fr. 643,352, Nov. 4, 1927. Ionones, methyl-ionones and other perfumes such as geraniol have their color cleared and their odor improved by hydrogenation with H in the presence of a Ni catalyst, with EtONa, an amalgam of Al, Zn dust, etc.

Perfumes from flowers, etc. I. G. FARBENIND. A.-G. Brit. 292,667, March 21, 1927. In extg. perfumes in active material as described in Brit. 255,346 (*C. A.* 21, 2760) the process of extg. the perfume from the active material with a solvent and the subsequent sepn. of the perfume from the solvent are effected at a temp. below 30°. Solvents may be used, such as EtCl, which do not dissolve in water, or which absorb water to a small extent only. Brit. 292,668 relates to preliminary drying of the air or other gas, in similar processes and regulating of the velocity of the gas stream.

Coloring material for cosmetics. JULIUS CULMANN and EDGAR AHRENS (to G. Siegle Corp. of America). U. S. 1,702,227, Feb. 12. Al lakes of red dyes are used, such as may be produced by pptn. from a water-sol. halogen deriv. of fluorescein with a sol. Al salt in the presence of Na benzoate.

Tobacco substitute. FRANK K. CHISHOLM. Ger. 469,789, Dec. 11, 1926. See U. S. 1,680,860 (*C. A.* 22, 3737).

18—ACIDS, ALKALIES, SALTS AND SUNDRIES

E. M. SYMMES

The chemical and allied industries. II. The acids, alkalies, and salts. REX FERNES. *Chemistry & Industry* 48, 3-6(1929); cf. *C. A.* 22, 3469. E. H.

Storing, distributing and using hydrochloric acid in the plant. SIDNEY SCHEIN. *Am. Met. Eng.* 35, 673-6(1928). E. M. S.

Fausser process of nitric acid manufacture. JAROSLAV MILBAUER. *Chem. Obzor* 328, 30(1928).—Description of the Fausser process which consists of oxidation of NH_3 to HNO_2 and the use of a Pt catalyst and air under 5 atm. pressure, whereby the yield decreased from 91.6% to 91.2%, the time of contact from 1.8×10^{-4} to 2.2×10^{-4} and the amt. of HNO_3 increased from 2.76 to 12.8 kg. per g. of Pt. JAROSLAV KUČERA

Sulfuric acid. Recent developments. A. GROUNDS. *Times Trade and Eng. Supplement* (London) 23, 24(1928).—By a special circular Dwight-Lloyd sinterer working on Zn ores (illustrated) 80% of the gas will contain 6% SO_2 , useful for H_2SO_4 manuf., and 20% gas will contain 0.2% SO_2 , which is discarded. The best use of the Schmiedel box is in the following order: Glover tower, Schmiedel box, a tower, a second Schmiedel box, a second tower, a Gay-Lussac tower. By the Schmiedel-Klencke system 28% acid can be produced directly without concn. Statistics of the use of pyrite vs. Sare given. Synthetic NH_3 will stimulate the use of CaSO_4 in $(\text{NH}_4)_2\text{SO}_4$ manuf. The Lauenroth dec. furnace treatment of phosphate rock to give P and its acids, then NH_3 phosphate, will reduce H_2SO_4 consumption in fertilizers. Synthetic NH_3 and HNO_3 eliminate H_2SO_4 and NaNO_2 . E. M. SYMMES

Contact process for the manufacture of sulfuric acid from zinc blende roaster gases. S. ROBSON. *Trans. Can. Inst. Mining and Met.* 30, 950-81(1927).—The roaster gases obtained from Zn ores contg. more than 2% Pb carry a large quantity of PbSO_4 fumes as well as As and other impurities. These are removed in modern plants by passing the gases through a series of baffled dust-settling chambers, thence through Glover towers and cooling pipes to an electrostatic separator, from which they are passed through coke filters, and washing and drying towers to the contact plant. For efficient working of the electrostatic separators the temp. of the gases should not exceed 500° and the velocity must not be greater than 1 ft. per sec. Numerous modern types of washing, drying and purifying towers are illustrated diagrammatically, and brief notes of their method of working and efficiencies with various impurities are given. The conversion is effected in two vessels, each of which is provided with a heat-interchanger. The first converter operates at a higher temp. (e. g., 530°) than the second, and converts the greater part of the SO_2 into SO_3 at a rapid rate; the second converter, serving to effect complete conversion, is required only in districts in which SO_2 discharged into the

atm. will affect surrounding industries. MgSO_4 is the most suitable catalyst support for high temps. and asbestos for the lower temps. B. C. A.

Spent oxide as material for the manufacture of sulfuric acid by the chamber process. W. HENRY IBBOTSON. *Ind. Chemist* 4, 513-21(1928).—The relative advantages and disadvantages of spent oxide and S are discussed. The compn. of spent oxide, conditions affecting its value for H_2SO_4 manuf., difficulties surrounding its use, and methods of burning are given in detail. Modern types of burners (H. H. burner, Harris, Carmichael, Bracq-Laurent and Kershaw) are described with several drawings and their operation is dealt with. Testing of spent oxide is given in detail; and its weathering and storage are described briefly. Several patented methods of recovering S, cyanides and NH_3 from spent oxide are covered briefly. E. G. R. ARDAGH

Liquid sulfur dioxide, its manufacture, transportation and uses. CHARLES W. JOHNSTON. *Chem. Markets* 23, 476-9(1928); cf. C. A. 22, 2800. E. M. S.

Acidproof lining for containers. H. E. SCHUBERT. *Bauing* 9, 327(1928); *Building Sci. Abstracts* 1, 180.—A method of rendering containers proof against concd. acids is described. The internal surface is lined with proprietary slabs made of an artificial asphalt laid in cement. These slabs are not as brittle as ceramic tiles, and are odorless, but melt at about 115° . The joints are closed with a mortar made from the same material as the slabs. Reference is made to a compn. which may be applied to wood, cement and iron. H. G.

The synthesis of ammonia. Agriculture's debt to Germany. J. BUER. *Times Trade and Eng. Supplement* (London) 23, 47(1928). E. M. SYMMES

The manufacture of synthetic ammonia by Mont-Cenis process. RUDOLPH BATTIG. Mont-Cenis Process, Westphalia. *Mining J.* 164, 22-3, 39-40(1929).—H from coke-oven gas (45-55% H) is used for the production of synthetic NH_3 after purification by the Linde process. The process operates at 400° and under 100 atm. pressure. Even though the temp. and pressure are lower than customary, the yield is just as high because of the catalyst employed. The life of the catalyst is high (8 months at least). Highly uniform temp. is possible through heat interchangers within the furnace. Costs of repairs and gas losses are low. The world N consumption is reviewed. Fundamental requirements for N fixation are discussed. The value of coal at the mine is compared with its value after processing. ALDEN H. EMERY

Synthetic ammonia plant at Ostend. F. A. F. PALLEMAERTS. Union Chimique Belge, Brussels, Belgium. *Ind. Eng. Chem.* 21, 22-9(1929).—Illustrated, detailed description of an exptl. plant at Ostend, combining the Linde system of coke oven gas fractionation and the Casale synthetic NH_3 process. The rated capacity is 16 tons NH_3 per day, from installed equipment of three 8-ton units. The regular av. output is 50% above the 16-ton rating. The published NH_3 cost is 9 cents per kg. N in the form of $(\text{NH}_4)_2\text{SO}_4$, including the cost of H_2SO_4 , total operation costs, amortization, etc. The H cost is reported as \$0.1883 per 1000 cu. ft. New methods of coke-oven gas purification before liquefaction, such as C_6H_6 removal by refrigeration and pressure water washing, are given, as well as recent improvements in the Casale synthesis system, such as replacement of the circulating pump by an injector system and compressor feed direct from the liquefaction equipment at 9 atm. The $(\text{NH}_4)_2\text{SO}_4$ plant uses a 9 ft. diam. saturator, which produces 100 tons per day. R. L. DODGE

Barite and barium products in 1927. R. M. SANTMYERS. *Bur. Mines, Mineral Resources of the U. S.* 1927, Pt. II, 247-56 (preprint No. 22 published January, 15, 1929) E. J. C.

Titanium salts and pigments. Principal outlets. ANON. *Times Trade and Eng. Supplement* (London) 23, 33(1928).—A review of the main processes. Much interest is now being shown in the Monk-Irwin process involving hitherto unused Canadian ores. E. M. SYMMES

Silicate of soda. Production and applications. ANON. *Times Trade and Eng. Supplement* (London) 23, 25(1928).—A drawing of an approved dissolver is shown. E. M. SYMMES

Fundamental considerations and results of the efforts to open up new sources of potash. G. WAGNER. *Kali* 22, 175-8, 198-201, 223-5, 238-43, 253-6, 267-72, 287-90, 293-300(1928).—Algae and minerals, analyses of which are given, are studied as sources of potash. Difficulties of transport, labor, sanitation, etc., in the production of potash and bromine from the Dead Sea, as well as of potash from mineral deposits in various countries, are considered. PAUL J. CULHANE

The Backman system of making chloride of lime mechanically. GÖSTA ANGEL. *Chem.-Ztg.* 52, 962-4(1928).—A series of superimposed chambers, as in a mech. roaster, is built of reinforced concrete, carefully protected by the use of asphaltum cements.

Slowly revolving arms with plows gradually work the lime from the top to the bottom and mech. conveyors carry the finished chloride of lime to discharging bins. At the same time dry Cl is admitted to the 2nd or 3rd levels, and as it passes up through the remaining floors (there are usually 8 levels) it is absorbed. Cooling coils in the various chambers help in keeping the temp. down; it should not rise above 50° , and a max. of $35-40^{\circ}$ is recommended. Dry, cool air is blown into the upper part of the chloride of lime bins to keep down the temp. and to carry out free Cl from the finished product. Hydrated lime, with an excess of 0.5% H_2O , is made mechanically, stored at least 10 days to give it uniformity, and then fed into the chlorinating chambers in regulated amounts. Successful supervision of the process is dependent upon maintaining temps. nearly const. at desired places throughout the plant. If the CaO feed becomes too small in proportion to the Cl, the highest temp. appears on the 4th or 5th floors, and then chlorates form. Each chamber makes about 3.2-4 tons (metric) per 24 hrs., with a power consumption of 1.5 h.p. Construction costs are about like those for a lead-chamber plant. The chief advantages of the process are the uniformity of the product and the low labor cost. Damage to the neighborhood is practically absent in a well-managed plant.

W. C. EBAUGH

Lime in 1927. A. T. COONS. Bur. Mines, *Mineral Resources of the U. S. 1927*, Pt. II, 139-51 (preprint No. 15, published January 2, 1929).

E. J. C.

Chromite in 1927. J. W. FURNESS. Bur. Mines, *Mineral Resources of the U. S. 1927*, Pt. I, 309-21 (preprint No. 13, published January 15, 1929).

E. J. C.

Magnesium and its compounds in 1927. J. M. HILL. Bur. Mines, *Mineral Resources of the U. S. 1927*, Pt. II, 167-79 (preprint No. 17, published December 28, 1928).

E. J. C.

South America's leading mining industry—nitrate. A. W. ALLEN. *Eng. Mining* 126, 816-24 (1928).

E. M. S.

The importance of hydrogen. Industrial production. A. M. HARKER. *Times Trade and Eng. Supplement* (London) 23, 26 (1928).—Electrolytic cells generating H under 200 atm. pressure are promising. Thermal decompn. of natural gas is not yet established. The Liljevoth process involving P and steam to give H requires large amounts of power and the H contains PH_3 . Liquefaction of coke-oven gas allows economical production of C_2H_4 , and after removal of H the gas remaining has a high calorific value.

E. M. SYMMES

Value of iodine. Extensive applications. E. L. GILL. *Times Trade and Eng. Supplement* (London) 23, 26 (1928).—I has a marked beneficial effect when fed to cattle, horses and fowls. I is also used successfully in Cu lixiviation from ores in Argentine. I aids in dyeing tussah silk and rayon. I is used in aphid sprays, seed and soil treatment, and $CaIO_2$ in small amounts is a food preservative, better than H_3BO_3 . I has been used to treat drinking water.

E. M. SYMMES

The fixed-nitrogen industry. J. F. CROWLEY. *Times Trade and Eng. Supplement* (London) 23, 27 (1928).—The Haber process is confined to large plants where it was installed when no other process was available. The Casale process is the most outstanding of the newer developments, now used in about 25 plants. The Fauser and Claude processes are next best established. The newer processes are more simple to operate and are possible on a small scale. In 1930-31 Chile nitrate will be about 14.25% of the fixed-N supplies. The cost of H is $\frac{3}{4}$ of the $(NH_4)_2SO_4$ cost. In the U. S. by-product NH_3 was 47.5% of the total consumption in 1926-7. This has so far delayed synthetic NH_3 development but demand is increasing so fast that by-product NH_3 can no longer fill the needs.

E. M. SYMMES

Nitrogen fixation in France. LOUIS LHEURE. *Times Trade and Eng. Supplement* (London) 23, 49 (1928).

E. M. SYMMES

The rare earths. Value of monazite sand. EDMUND WHITE. *Times Trade and Eng. Supplement* (London) 23, 37 (1928).—A review of the constituents and their possible uses. One l of He can be expelled from one kg. of sand by mere heating. The form in which He exists in the sand is not known.

E. M. SYMMES

Catalytic agents. Their industrial use. ERIC K. RIDEAL. *Times Trade and Eng. Supplement* (London) 23, 24 (1928).—A review.

E. M. SYMMES

Sand and gravel in 1927. ESTELLE R. PHILLIPS. Bur. Mines, *Mineral Resources of the U. S. 1927*, Pt. II, 153-66 (preprint No. 16, published December 26, 1928).

E. J. C.

Stone in 1927. A. T. COONS. Bur. Mines, *Mineral Resources of the U. S. 1927*, Pt. II, 209-45 (preprint No. 21, published Jan. 10, 1929).

E. J. C.

Investigations on cements and plastics, with special reference to their use in the

electrical industry. I. Bond strength. WERNER NAGEL AND JOHANNES GRÜSS. *Wiss. Veröffentlich. Siemens-Konzern*, 6, 150-73(1928).—The bond strength of a cement is defined as the force required to pull a metal rod out of a porcelain plate in which it is held by the material under investigation. The apparatus and procedure are described, and the results are given for a number of substances. The effect of fillers and changes in technic were investigated. The original should be consulted for details, and for a bibliography.

BENJAMIN MILLER

Mica in 1927. B. H. STODDARD. *Bur. Mines, Mineral Resources of the U. S.* 1927, Pt. II, 187-98(preprint No. 19, published January 10, 1929).

E. J. C

Nature's natural glass—mica—forms basis of important composite molded products. JOSEPH ROSSMAN. *Plastics* 4, 549-51, 562-3, 574, 620-3(1928).—The manuf. of heat-resistant and highly insulating articles from mica sheets and flakes is outlined, also patents covering these products.

W. H. BOYNTON

Styrene products now suitable for molding. IWAN OSTROMUISLENSKII. *Plastus* 5, 20-3, 28-31(1929).—A review of patents.

E. H.

Manufacture of nitrocellulose plastics at "Du Pont Viscoloid Co.," Arlington, N. J. LOUIS A. HELVICH. *Chem. Obzor* 3, 302-8(1928).

JAROSLAV KUČERA

Casein and its industrial applications. W. L. DAVIES. *Chem. Age* (London) 20, 23-4, 43-4(1929).

E. H.

Dental porcelains, glazes, stains and their application to dental restoration. ARTHUR O. KLAFFENBACH. *State Univ. Iowa. Dental Cosmos* 70, 1185-95(1928).—A concise summary of dental ceramics with a bibliography. JOSEPH S. HEPBURN

Amalgam—a typical eutectic mixture alloy. WILLIAM E. HARPER. *Dental Cosmos* 71, 12-8(1929).—A discussion of dental amalgam as a eutectic mixt. of Ag_2Hg_3 , Hg and Sn.

JOSEPH S. HEPBURN

The treasures of the Dead Sea. ERNST MARKOVICZ. *Z. angew. Chem.* 41, 1227-8(1928). Controversial over economic possibilities. CORNER. *Ibid* 1228-9 - Answer

E. M. S

Disinfectants and insecticides. S. RIDEAL, E. K. RIDRAL AND A. SCIVER. *Times Trade and Eng. Supplement* (London) 23, 32(1928).—A review of types and characteristics.

E. M. SYMMES

Testing liquid insecticides. C. H. PEET AND A. G. GRADY. *Rohn and Haas, Research Labs. Soap* 4, No. 3, 97, 99, 115-6; cf. *C. A.* 22, 4734. —The technic for rearing for the following insects is described—Croton bug, clothes moth, weevils. Methods of testing insecticides as repellents and moth killers are given.

E. SCHERUBEL

Recent carbon dioxide fire-extinguishing plants. BRUNO MÜLLER. *Chem.-Ztg* 52, 966(1928).—The use of liquid CO_2 in extinguishers that permits it to be discharged in a liquid condition has proved to be of value in fire fighting aboard ships, in oil refineries and where the fire is raging in an enclosed space. For fires in the open CO_2 snow is preferred. CO_2 , like any other extinguishing agent, is not of universal application.

W. C. EBAUGH

Zn (Fr. pat. 643,483) 9.

Hydrocyanic acid. SYNTHETIC AMMONIA & NITRATES, LTD., and T. EWAN. *Brit.* 292,749, May 21, 1927. In a process involving passing vapors of formamide over a heated catalyst, the reaction gases are heated by internal heaters consisting of electrically heated gauzes (other than Fe or Ni or their alloys) such as brass or phosphor-bronze or a catalytic metal such as Cu which may be covered with a layer of refractory oxides.

Hydrocyanic acid. BADISCHE ANILIN- & SODA-FABRIK. *Fr.* 33,225, Mar. 25, 1927. Addn. to 606,843. HCN is produced by passing formamide, alone or mixed with NH_3 formate, in a dild. or rarefied state with rapidity over metallic catalysts such as Fe, Al, or V_2A -steel heated above 300° . NH_3 may be used as the dilg. gas.

Hydrofluoric acid. MAX BUCHNER (to Albert F. Meyerhofer). *U. S.* 1,701,225, Feb. 5. Impure fluorspar is treated with acid such as H_2SO_4 capable of forming a gas mixt. comprising HF and SiF_4 ; this mixt. is reacted on by a F compd. such as BaF_2 to form a complex fluoride and the latter is then treated (as by heating) to form a compd. for reaction on the gas mixt. and free HF. Various modifications of the process are described. Cf. *C. A.* 22, 1657.

Bottle for hydrofluoric acid, etc. ARTHUR W. WILKINSON and CLARENCE W. RINGEL (to Sterling Products Co.). *U. S.* 1,701,937; Feb. 12. Bottles with a body and neck of wax are reinforced by a cylinder of material such as paper.

Nitric acid. F. C. ZEISBERG (to E. I. du Pont de Nemours & Co.). Brit. 292,951, June 27, 1927. Vapors of dil. HNO_3 are passed into the foot of a dehydrating tower from a boiling vessel and a dehydrating agent such as strong H_2SO_4 is run into the top of the tower. Vapors of strong HNO_3 are condensed in a reflux from which part of the acid is returned to the tower and part led to storage. The app. is described.

Nitric acid from ammonia. H. PAULING. Brit. 292,830, Oct. 31, 1927. A uniform mixt. of NH_3 and air for the catalytic production of HNO_3 is obtained by absorbing the NH_3 in water and removing it by blowing air through the soln. An arrangement of app. is described.

Phosphoric acid and potash. WILLIAM H. WAGGAMAN and HENRY W. EASTERWOOD (to Victor Chemical Works). U. S. 1,701,286, Feb. 5. A briquetted mixt. of a finely ground natural phosphate, a K-bearing silicate, and coal, coke or other suitable carbonaceous material is heated to a smelting temp. of $1200\text{--}1600^\circ$ until substantially all the K, P and H_3PO_4 are driven off and the volatilized products are recovered.

Phosphorus pentoxide and phosphoric acid. GUSTAV PISTOR, HERMANN LANG and ROBERT SUCHY (to I. G. Farbenind. A.-G.). U. S. 1,700,708, Jan. 29. Yellow P is melted and passed through nozzles and the jets of P thus formed are burned. An app. is described.

Sulfuric acid. THE SELDEN COMPANY. Fr. 642,361, Sept. 30, 1927. In a contact app. for the production of H_2SO_4 , the SO_2 and air are led through heat exchangers at least partly immersed in the catalyst, the gases passing down a central tube, up a surrounding tube in direct contact with the catalyst and then down through the catalyst. Cf. C. A. 23, 486.

Ammonia synthesis. M. CASALE-SACCHI. Brit. 292,342, June 7, 1927. Mixts. of H and N for NH_3 synthesis are prepd. by fractionating liquid air to yield pure N and slightly impure O, using the O for prepg. H by incomplete combustion of hydrocarbons and mixing the N with the H thus obtained. In effecting the incomplete combustion of the hydrocarbons, the presence of steam serves to cause conversion of the CO formed into CO_2 and the water and CO_2 are sepd.

Ammonia synthesis. FREDRIK W. DE JAHN (to Atmospheric Nitrogen Corp.). U. S. 1,701,478, Feb. 5. Incoming gases are passed in heat-exchange relation to the hot gases of the reaction and then heated to substantially the temp. required for the reaction by passing the preheated gases through and in unrestricted thermal contact with the catalytic body and thence into direct contact with the catalytic body. An app. is described in which the gases just before coming into reactive contact with the catalytic body are passed through tubes extending through the catalytic mass. Cf. C. A. 23, 486.

Ammonia synthesis. SYNTHETIC AMMONIA & NITRATES, LTD., and J. HUGHES. Brit. 293,138, April 6, 1927. Inert gases such as CH_4 and A are prevented from accumulating in a circulating system by purging a part of the gas, scrubbing it under pressure with a solvent such as kerosene, and if desired then returning it to the system.

Heat-exchange arrangement for ammonia synthesis apparatus. SYNTHETIC AMMONIA & NITRATES, LTD. and F. H. BRAMWELL. Brit. 292,404, Oct. 27, 1927. In a modification of the arrangement described in Brit. 241,817 (C. A. 20, 3541) which comprises one or more spirals of a pair of coaxial tubes, the inner members of these tubes are replaced by tubes through which the gas flows in parallel.

Recovery of salts. FRITZ HORNUNG. Fr. 643,568, April 14, 1927. An app. for recovering salts such as KCl from solns. by cooling under vacuum comprises 2 or more inverted barometric vessels with their open ends in a tank and connected by a tube across which the soln. flows. The hot soln. enters at the side of the first vessel and the cooled soln. flows away at the side of the last, the salt settling into the tank separately.

Briquetting salt. MASCHINENFABRIK BUCKAU R. WOLF A.-G. Ger. 469,822, July 24, 1924. Salt is treated with superheated steam before pressing to briquets.

Ammonium salts. MONTECATINI SOC. GENERALE PER L'INDUSTRIA MINERARIA ED AGRICOLA. Brit. 292,129, June 14, 1927. An acid such as H_2SO_4 is sprayed into an atm. of NH_3 and the concn. of the acid is preferably such that the heat of the reaction vaporizes the water and leaves a dry salt. An app. is described.

Alkali sulfides. WOLF JOHANNES MÖLLER and FRIEDRICH KLEMA. Austrian 111,838, Aug. 15, 1928. The reaction temp. necessary for the reduction of alkali sulfates with carbonaceous reducing agents is reduced to below 850° by adding alkali sulfide to the mixt. The reaction may be effected in a rotary furnace with coke as the reducing agent, and the amt. of added sulfide may be such that the reaction proceeds at a temp. below the m. p. of the mixt. The added sulfide may be the crude product of a previous operation.

Cyanogen compounds. I. G. FARBENIND. A.-G. Fr. 643,039, Oct. 27, 1927. Cyanogen compds. are prep'd. from mixts. of CO and NH_3 , carbides of the Fe group being used as catalysts. Mo, Mn, W, Ce, Ti or Cu in the free state or combined may be added to the catalyst. An example is given in which a mixt. of CO and 10-12% NH_3 is passed over FeC and Mo at 450° , to form HCN.

Recovering cyanide from solutions. LOUIS D. MILLS and THOMAS B. CROWE (to Merrill Co.). U. S. 1,701,818, Feb. 12. Solns. such as those from ore treatment are acidified and air is passed in a closed circuit (in an app. which is described) first through the acidified soln. and then through an alkali soln. which is maintained in circulation.

Cyanamides. NICODEM CARO and ALBERT R. FRANK. Fr. 642,658, Oct. 21, 1927. Cyanamides of alk. earth metals and Mg are obtained by passing a current of HCN alone or mixed with neutral gases at temps. above 400° on to oxides or oxide-forming salts of these metals. Instead of HCN, gases forming it such as NH_3 and CO may be used, preferably between 650° and 850° . In examples, CaCO_3 is heated to 750 - 850° in a current of HCN. The product contains 99% CaCN_2 ; similarly 82.5% MgCN_2 is obtained from MgO. Cf. C. A. 23, 938.

Cyanamides. NICODEM CARO and ALBERT R. FRANK. Fr. 642,660, Oct. 21, 1927. NH_3 is caused to react on natural or artificial carbonates in the neighborhood of the dissocn. temp. of the said carbonates. A pressure of 3-10 atm. may be used.

Aluminum oxide. SVEN E. SIEURIN. U. S. 1,701,510, Feb. 12. Raw material such as bauxite is dissolved with HCl, followed by supersatn. of the AlCl_3 thus formed with HCl and calcination of the crystals of AlCl_3 obtained; the mother liquor remaining after pptn. of the crystals is conducted to the app. where the raw material is dissolved and thence back to the pptn. app. in such quantity and such manner that Al_2O_3 is brought to the pptg. app. at the same rate that it is removed to the calcining app., and that in the same time a quantity of the HCl vapors and steam corresponding to that obtainable from the calcination of the crystals is introduced into the pptn. app.

Concentrated ammonium nitrate solutions. CARLO TONIOLO. U. S. 1,700,911, Feb. 5. A hot dil. NH_4NO_3 soln. contg. added free HNO_3 is brought into contact with heated NH_3 gas contg. an inert gaseous diluent such as air in the presence of sufficient water to prevent formation of a dry product.

Ammonium sulfate. SOC. ANON. DES FOURS A COKE SEMET-SOLVAY ET PIETTE. Brit. 292,995, June 29, 1927. The process described in Brit. 262,320 (C. A. 21, 3716) is applied to the treatment of combustion gases from ovens or furnaces or other gases contg. CO_2 such as those from a Cowper stove. The gases are preliminarily passed through a dust remover and a cooler which lowers their temp. to about 25° .

Calcium arsenite. JEAN ALTWEGG and ANNE-MARIE DUTEL. U. S. 1,700,756, Feb. 5. A current of steam is passed over a dry mixt. of CaO and As_2O_3 .

Calcium nitrate. KARL BLUMRICH (to I. G. Farbenind. A.-G.). U. S. 1,700,116, Jan. 29. $\text{Ca}(\text{NO}_3)_2$ preps. in substantially dehydrated condition are mixed with solid powdery hydrate of $\text{Ca}(\text{NO}_3)_2$ at a temp. below the m. p. of the hydrate, in order to obtain a product which can be readily spread.

Crystallizing calcium nitrate. APPAREILS ET EVAPORATEURS KESTNER. Brit. 292,532, June 21, 1927. See Fr. 637,977 (C. A. 23, 245).

Lead carbonate. RENÉ DALOZE. Fr. 33,119, Mar. 10, 1927. Addn. to 632,020 PbCO_3 is obtained by a double decompn. between PbSO_4 and an excess of $(\text{AcO})_2\text{Ca}$ in soln. after incorporating in this soln. a quantity of neutral $(\text{AcO})_2\text{Pb}$ at least equal to the quantity of $(\text{AcO})_2\text{Pb}$ which will be formed by the reaction. The resulting soln. is treated with a base to transform the $(\text{AcO})_2\text{Pb}$ into dibasic acetate which is decompd. with CO_2 .

Potassium manganate. SOC. CHIMIQUE DES USINES DU RHÔNE. Brit. 292,991, June 29, 1927. MnO_2 is suspended in an excess of aq. melted potash contg. 60-85% KOH and heated to 160 - 200° and pure or dil. O is blown through the mass, which is also stirred. After the reaction, the excess potash may be removed with a limited quantity of water or dil. alk. soln. or by decantation of the fused mass.

Sodium chloride. GEORGE B. BURNHAM (to Burnham Chemical Co.). U. S. 1,701,295, Feb. 5. Searles Lake brine or other similar liquor contg. NaCl together with other salts is evapd. to effect supersatn. with NaCl and brought into contact with crystals of the supersatd. salt held in suspension in an upward flow of gradually decreasing velocity of the liquor so that the supersatd. salt in soln. is deposited upon the crystals; the size of the crystals is controlled by varying the initial upward velocity of the liquor in which the suspended crystals are held. An app. is described.

Neutral sodium phosphate. CHARLES F. BOOTH and ARTHUR B. GERBER (to

Federal Phosphorus Co.). U. S. 1,700,972, Feb. 5. In producing Na_3PO_4 contg. no free alkali, a Na_2HPO_4 substantially free of Na_2CO_3 is treated with NaOH until the resulting soln. has a relation of the phenolphthalein titration to the methyl orange titration of 0.432 to 0.451. U. S. 1,700,973 claims as a new compn., Na_3PO_4 , having no free alkali.

Sodium xanthate. WILHELM HIRSCHKIND. U. S. 1,701,264, Feb. 5. An alc. NaOH soln. and CS_2 are caused to react to produce and ppt. normally sol. Na xanthate and KOH is added to the mother liquor to ppt. a further quantity of the normally sol. xanthate.

Baryta. KARL EBERS. Fr. 643,154, Oct. 27, 1927. Baryta poor in chalk but preferably contg. SiO_2 and Fe and Mn compds. is roasted, slaked with water preferably without cooling, then with an acid, *e. g.*, HCl .

Hydrogen sulfide. RAYMOND F. BACON. U. S. 1,700,578, Jan. 29. Molten S and H are subjected to pressure to promote formation of H_2S by their reaction. An app. is described.

Hydrogen sulfide, etc. I. G. FARBENIND. A.-G. Brit. 292,186, Jan. 10, 1927. H_2S , "either free or in the form of mono-sulfide," is prepd. by heating under pressure, with H_2 , CO , formic acid or formates, S or inorg. compds. such as polysulfides or thiosulfides which yield free S on acidification. The reaction may be effected in the presence of water, NH_3 , solns. of alkali or alk. earth metal hydroxides, catalysts such as metals of the eighth group of the periodic system or their oxides, hydroxides, sulfides or carbonates or of substances such as silica gel, alumina or active C. Pressures up to 130 atm. and temps. below dull redness may be used.

Carbon disulfide. I. G. FARBENIND. A.-G. Brit. 291,382, May 31, 1927. An app. is specified for producing CS_2 by passing superheated S vapors over heated C, comprising a main reaction chamber and a superheating chamber formed side by side in a single casting of cast iron or steel. The superheating chamber is lined with material resistant to S and may contain filling material such as fragments of chamotte, porcelain Raschig rings or aluminous material such as bauxite.

Carbon disulfide and hydrogen or water gas. I. G. FARBENIND. A.-G. Brit. 293,172, May 26, 1927. CS_2 and H or gases contg. H are obtained by reaction, at temps. above 100° , between H_2S or sulfurous gases such as those obtained in the hydrogenation of S bearing coal or oils, and hydrocarbons such as CH_4 , natural gas, gases from cracking, distn. of coal or destructive hydrogenation of coal, tar or oils, etc. Catalysts may be used as Al_2O_3 , active C, silica gel, pumice or carborundum, and an elec. arc or an elec. heated C resistance may be used to effect the reaction. Air or CO_2 may be added if it is desired to produce water gas. Unchanged hydrocarbons may be further cracked or otherwise decomposed to obtain additional H.

Purification of hydrogen. SOC. L'AIR LIQUIDE (SOC. ANON. POUR L'ÉTUDE ET L'EXPLOITATION DES PROCÉDÉS GEORGES CLAUDE). Fr. 642,720, Mar. 25, 1927. See Brit. 287,577 (C. A. 23, 488).

Removing free chlorine or bromine from gases and liquids. BRITISH DYESTUFFS CORP., LTD., J. B. PAYMAN and H. A. PUGGOTT. Brit. 292,307, April 27, 1927. Solid hydrocarbons such as C_{10}H_8 , $\text{C}_{14}\text{H}_{10}$ or solid olefins which will form additive compds. with Cl and Br are used for removing these from gases or liquids such as HCl or HBr or their solns. or from cyanogen chloride or bromide.

Zeolites. ALPHONS O. JAEGER and JOHANN A. BERTSCH (Jaeger to The Selden Co.). U. S. 1,701,075, Feb. 5. Zeolites suitable for various catalytic purposes are prepd. contg. quadrivalent V in non-exchangeable form. Numerous details and examples are given.

Active carbon. A. B. RAY (to Carbide and Carbon Chemicals Corp.). Brit. 291,043, May 25, 1927. Non-coking coals of a bituminous or "sub-bituminous" character are impregnated with an aq. soln. of a carbonizing agent such as ZnCl_2 , H_3PO_4 , or K sulfide, dried by heating and then calcined at temps. above 600° , cooled, leached with water or dil. acid and dried, and may be further activated as by treatment under oxidizing conditions with superheated steam at 800 – 1000° . Coking coals and lignites also may be employed if they are suitably pretreated as by prolonged calcining under oxidizing conditions at 200 – 300° .

Active carbon. A. SCHREINER. Brit. 292,566, June 22, 1927. Wood, peat, lignite, material of spent org. liquors and the like are treated with solns. of alkali or alk. earth metal salts of thiocyanic acid or with $\text{K}_4\text{FeC}_6\text{N}_6$, the impregnated material is dried and distd. at 300 – 350° and is then heated in the absence of air to bright redness for half an hr. and after cooling is leached with water or HCl . The raw carbonaceous material may be first distd. and then impregnated and further heated in the absence of air.

Decolorizing carbon. EDOUARD URBAIN (to Urbain Corp.). U. S. 1,700,342, Jan. 29. Decolorizing C and a liquid such as H_2O , oils or hydrocarbons are thoroughly mixed together by grinding to form a paste which may be used in *wine making* or for other purposes.

Active or decolorizing carbon. J. VAN LOON. Brit. 292,213, March 10, 1927. Carbonaceous material such as wood charcoal, anthracite or bituminous coal and used or unused decolorizing or active carbons are ground in the presence of a wetting agent such as water or benzene heated (suitably under pressure and at $150-180^\circ$ for 10 hrs with steel balls) and the carbon is sepd. A solvent may be used which will remove tarry and other impurities.

Apparatus for manufacture of substantially pure carbon by decomposition of carbon disulfide. ANTON LEDERER. U. S. 1,700,942, Feb. 5.

Carbonaceous product from electric furnace treatment of carbonized lignin residues. JOHN J. NAUGLE. U. S. 1,701,272, Feb. 5. A product having an ash content of not more than about 3% is obtained by heat treatment of carbonized residues of soda pulp liquor or the like. The product is suitable for *treating sugar solns.*, etc.

Filtering material. HENRY BLUMENBERG, JR. U. S. 1,702,104, Feb. 12. A material suitable for filtering hydrocarbon oils, water or sewage comprises cellular material such as diatomaceous earth together with Ca hypochlorite and a small proportion of Na_2CO_3 .

Adsorbents for water vapor. THE SILICA GEL CORPORATION. Fr. 641,694, Sept. 30, 1927. An adsorbent for water vapor comprises a solid porous gel capable of adsorbing at least 10% of its wt. of water at 30° and 22 mm. partial pressure, impregnated with a dehydrating agent such as H_2SO_4 , $CuSO_4$ or metaphosphoric acid. The gel is preferably SiO_2 but may be oxides of metals such as W, Ti, Sn or Al. Cf. C. A. 23, 941.

Hardening casein, etc. I. G. FARBENIND. A.-G. Fr. 643,030, Oct. 26, 1927. Casein and other albuminous substances such as gliadin, zein, gelatin or ossein are hardened by means of glyoxal or a deriv. of a condensation product of glyoxal. By this means *insulating* and *glass-like* materials are obtained.

Drying casein. HERMANN A. AUDEMARS and LOUIS A. LALOY. Fr. 643,270, Nov. 2, 1927. In a continuous automatic drier for casein as in Fr. 626,978 the turbines are placed a distance from the entry of the drying cylinder to allow a preliminary drying of the casein and prevent sticking to the turbines.

Molding objects covered with a layer of cellulose. ROBERT A. L. WEITZEL. Fr. 642,886, Oct. 22, 1927. A layer composed of casein 1, Na sulforicinate $\frac{1}{2}$ and water 3 parts is interposed between the fatty substance and the layer of cellulose in the mold.

Urea condensation products. I. G. FARBENIND. A.-G. Fr. 643,104, Oct. 6, 1927. Urea is condensed with CH_3O in aq. soln. kept slightly acid (p_H 4 to 7), the water being then eliminated at a temp. below 50° , preferably *in vacuo*. The product is hardened by adding substances giving rise to acids on heating, and heating to a temp. between 50° and 100° . In examples (1) an aq. soln. contg. NaH_2PO_4 is used, the H-ion concn. being decreased before evapn. by the addn. of Na_2HPO_4 and Na_3PO_4 , and formamide is added before heating; (2) an aq. soln. of AcOH and AcONa is used, and $MgCl_2$ is added before heating. Cf. C. A. 23, 679.

Plastic material. MICHAEL J. HYNES. Can. 286,405, Jan. 15, 1929. Plastic material is made by mixing dextrin, water, pulp and calcined gypsum, thoroughly agitating and commingling the ingredients, and drying the mixt. It may be utilized by mixing with water and borax.

Objects from plastic substances such as rubber. AXEL T. GUSTAFSON. Ger. 470,270, Feb. 11, 1926. See U. S. 1,665,355 (C. A. 22, 1873).

Adhesives for use on clothing. WANDA STELKENS (née SCHWEGT). Ger. 470,149, Nov. 15, 1927. Worn places in clothing are coated, or patches stuck on, with a plastic soln. contg. rubber, and cellulose derivs. alone or mixed with condensation products and polymers of org. compds., such as the polymers of vinyl chloride.

Brake-band fabric. HEINRICH BORCHERS (in part to Rudolf Aldag). U. S. 1,700,759, Feb. 5. Material, such as asbestos threads, is impregnated with an adhesive such as mucilage or glue and comminuted grit-like roughening material such as fine sand is caused to adhere to the impregnated threads, the product is air-dried and is then woven into a textile fabric.

Impregnating brake linings, clutch facings, etc. RAYBESTOS Co. Brit. 292,371, July 20, 1927. The binder and fibrous base used are heated in a liquid (such as a bath of suitable molten metal) which does not react with nor dissolve the binder. An app. is described.

Coverings for walls, roofs, vehicles, tanks, etc. METALLBANK UND METALLURGISCHES GHS. A.-G. Brit. 292,621, June 23, 1927. Cu sheets supplied in rolls (which may be produced by electrodeposition) are applied "in a manner similar to wall paper" and secured by an adhesive such as asphalt.

Lincrusta. MILTON K. HUPPUGH (to Decorative Co.). U. S. 1,702,161, Feb. 12. Mech. details of lincrusta manuf. are specified.

Composition for removing paint and varnish. JAMES H. GRAVELL. U. S. 1,700,491, Jan. 29. Free and unionized H_2SO_4 is used with cresylic acid. BuOH and $C_2H_5Cl_4$ also may be added.

Compositions for inking rollers, printing surfaces, etc. I. G. FARBENIND. A.-G. Brit. 292,894, March 16, 1927. Hectograph compns., inking rollers and printers' blankets contain sorbitol or its dehydration products or derivs. such as acetyl sorbitol together with usual materials such as gelatin, glue, resins, oils, fats, waxes, glycol, glycerol, acetin and dextrin, in various mixts.

Cementing celluloid to other materials such as metals. HUGO BRUNINGHAUS (to Henkel-Clauss Co.). U. S. 1,702,226, Feb. 12. Mech. features.

Aggregating particles of wood. FELIX LAUTER (to Lignel Corp.). U. S. 1,702,013, Feb. 12. In forming molded products, particles of wood contg. substantial quantities of natural resin are treated with a soln. contg. CH_2O or other suitable aldehyde, dried and subjected to heat and pressure.

Caulking powder. RUDOLPH E. SINRAM and CLYDE T. HELLER. U. S. 1,701,799, Feb. 12. A powder suitable for use on screw joints of steam pipes comprises a flour such as ordinary wheat flour 15, NH_4Cl 1 and pulverized iron 1 part.

Composition for filling punctures in tires. S. SOKABJI. Brit. 292,835, Nov. 8, 1927. Finely powdered mica 10, plaster of Paris 1, plumbago 20 and dextrin 1 are mixed with water 50 lbs. contg. salicylic acid 1 oz. and glycerol 2 ozs.

Artificial filaments, films, etc. PAUL E. KRISMER. Austrian 111,554, July 15, 1928. Solns. or suspensions of org. substances, *e. g.*, carbohydrates, albumin, vegetable mucilages and gums, are treated with muciparous bacteria, and the viscous masses so obtained are drawn out in known manner into filaments, films, etc., and hardened, *e. g.*, with CH_2O . Milk, especially skim milk, may be treated in the same way. The examples describe the prepn. of filaments from skim milk and *B. lactis viscosi* and from a soln. of glucose and *B. viscosi sacchari*.

Automobile motor "cooling oil." ROBERT E. WILSON (to Standard Oil Co. of Ind.). U. S. 1,700,392, Jan. 29. An oil suitable for use in automobile cooling systems has a flash point not less than 88° , a viscosity below 45 sec. Saybolt at 38° and an initial b. p. not below 205° .

Fumigant. WARREN MOORE. U. S. 1,702,168, Feb. 12. Blocks suitable for use as deodorizers comprise a solid inorg. NH_4 compd. such as $(NH_4)_2CO_3$ and hydrated lime dispersed in a cryst. block of *p*-dichlorobenzene.

Anti-moth preparation. I. G. FARBENIND. A.-G. (Wilhelm Lommel, Heinrich Muzel, Hermann Stötter and Berthold Wenk, inventors). Ger. 469,094, July 14, 1926. Fr. 635,973, June 14, 1927. See Can. 280,549 (C. A. 22, 2820).

Polishing leather, wood, metal, etc. EMIL SEIDLER. Austrian 111,536, July 15, 1928. A dil. soln. of wax in a volatile org. solvent is applied as a fine spray. A combined atomizer and brush for practising the method is described.

Waterproofing pliable wire mesh fabric. FREDERICK E. JOHNSON (to Waters Non-Inflammable Wire Glass Co., Ltd.). Can. 286,736, Jan. 22, 1929. A coating soln. for open-mesh fabric consists of gelatin 33 lbs., glycerol 5 lbs. 2.5 ozs., $Al_2(SO_4)_3$ 3 lbs. 2.5 ozs., Na_2CO_3 7 ozs., 40% formaldehyde 50%, methylene blue 15 lbs., or according to requirements, and 22 gals. of water; the mixt. is cooked for 10 mins. at $180^\circ F$. and then cooled to $135-140^\circ$ when the soln. is ready to receive the mesh fabric.

Marine algae. PAUL GLOESS. Fr. 643,534, April 8, 1927. Marine algae are first distd. so as to obtain a liquid fuel, and *I* and *K salts* are extd. from the residue.

Removing mildew, etc. SOCIÉTÉ H. GOUTHIÈRE ET CIE. Fr. 642,699, Mar. 23, 1927. A mud obtained by double decompn. of Ca lactate and $CuSO_4$ is used either alone or mixed with S, talc, etc., for treating mildew, black-rot, etc.

Stock lick or medicine. ROBERT K. McLENNAN. Australia 9342, Sept. 12, 1927. A stock lick for sheep contains Ca phosphates 14, other Ca compds. calcd. as CaO 23, powd. S 5, Fe and Mg sulfate 3, NaCl 50, molasses 5%, $Mn_2(SO_4)_3$ 3 lbs. to the ton, KI $1\frac{1}{2}$ lb. to the ton. For cattle the $MgSO_4$ and $Mn_2(SO_4)_3$ are omitted.

Fireproofing articles. GEORGES ROUYER. Fr. 643,531, April 8, 1927. Wood, cloth, etc., to be fireproofed is covered with a layer of a soln. of K_2SiO_3 (65%), and then with one or more layers of a colorless varnish composed of "Colle d'or" and pyrene.

Fire extinguisher. EXCELSIOR FEUERLÖSCHGERÄTE A.-G. and OTTO TREICHEL. Fr. 643,393, Nov. 5, 1927. A crystd. addn. product of CO_2 and CCl_4 is used as a fire extinguisher.

Fire extinguishers. SOCIÉTÉ BOUILLON FRÈRES. Fr. 643,167, Oct. 28, 1927. A fire extinguisher consists of a mixt. of a liquid which is a bad conductor of electricity, e. g., CCl_4 , tetrachloroethane, etc., and a substance or mixt. of substances, such as $\text{Al}_2(\text{SO}_4)_3$, varnishes, lacquers or bakelites which will form a resisting insulating layer on the material sprinkled.

19—GLASS, CLAY PRODUCTS, REFRACTORIES AND ENAMELED METALS

G. E. BARTON, C. H. KERR

Chemical durability of glass. G. KEPPELER. *Glastech. Ber.* 5, 97(1927); *J. Soc. Glass Tech.* 12, 185-6.—A study of the durability of glasses by the method of curves of equal durability (*C. A.* 21, 4037). Glasses treated were the soda-lime series examd. by Ippach, and the potash-lead series studied by Karmaus.

Thermal conductivity of glasses transmitting ultra-violet light. WILLIAM KUNERTH AND WILLIAM E. BERKEY. Iowa State Coll. *Science* 68, 427(1928).—The thermal cond. measured by Christiansen's method of a no. of glasses transmitting ultra-violet light was less than that for window glass. Also in *Iowa State Coll. J. Sci.* 3, 5, 6 (1928).

Factory smoke, or the coating of glass during melting and working. L. SPRINGER. *Glastech. Ber.* 5, 112(1927); *J. Soc. Glass Tech.* 12, 139-40.—From 15 large glasses coated with a thin bluish white deposit on annealing ("sulfuring") a careful extn. gave a total of 0.553 g. of coating of dark gray color, equiv. to 0.0053 g. of soda, and contg. only a trace of sulfate. Of the total residue 0.3166 g. was insol. in water, and 0.1766 g. insol. in HCl , being chiefly sand. The portion sol. in HCl was largely composed of lime. The lehr was fired by producer gas obtained from lignite, and the impurity was evidently largely composed of ash and impurities from the process of manuf. It was found possible experimentally both by burning lignite and S near glassware to produce the sulfuring effect. By use of a gas of high SO_2 content and subsequent heating of the ware to a sufficiently high temp. it was possible to "burn in" the white residue, so causing it to disappear. There was no relationship between the deposit and the quality of annealing. Analysis of the S content of a producer gas, by absorbing the S gases in alkali, oxidizing and estg. as sulfate, gave a value of 1.91 vols. % of SO_2 . S. also considered the causes of the white deposit formed on the surface of glass during working.

Elastic constants of fused quartz. Change of Young's modulus with temperature. H. D. H. DRANE. *Proc. Roy. Soc. (London)* 122A, 274-82(1929).

Insulation of roofs of glass furnaces. ROBERT D. PIKE. *J. Am. Ceram. Soc.* 12, 56-61(1929).

Clay in 1927. JEFFERSON MIDDLETON. Bur. Mines, *Mineral Resources of the U. S.* 1927, Pt. II, 257-68 (preprint No. 23 published January 15, 1929).

Experiments on the purification of clay by electrophoresis. A. S. TAL. *Trans. State Expt. Inst. Silicate (Moscow)* 1927, No. 21, 115-31. The electrophoresis of clay was resorted to in an attempt to purify it for various purposes. At first the ordinary lab. outfit was used, but later a bath of a semi-factory style was introduced. The anode used after a series of trials was hard lead (an alloy of Pb and 14% Sb). Various electrolytes were tested: sol. glass, soda and ammonia. The latter gave the least difficulties and was used throughout the 250 expts. With a current of 80 v. the gas accumulations at the anode were a hindrance and a depolarizer was introduced. Peat ext. was found to serve the purpose. The final outlay of the expt. was as follows: the clay was ground in a ball mill, sieved through a 900-mesh sieve, mixed with H_2O (2 kg. of clay per l. of H_2O), ammonia added in excess, the current (0.008-0.012 amp. per sq. cm.) varied between 75 and 120 v. The clay thus obtained upon heating gave a lighter product and its contracting upon heating to high temps. was greater than that of contracting when heated up to 100° . Tests were also made on methods of removing the Fe present in forms other than silicates. The magnet was resorted to but without success which was attributed to the weak magnet used. A powerful magnet is contemplated.

Some aspects of plasticity and related properties of clays. D. R. IRVING AND W. F. DISTRICH. *J. Am. Ceram. Soc.* 12, 14-29(1929).—The Talwalkar-Parmelee plasticity

app. is valuable in distinguishing between clay types. Results are given for various California clays and several widely known clays. No correlation was noted between adsorption of malachite green or of methylene blue and phys. properties of the clays.

C. H. KERR

Vanadium and molybdenum compounds in clays. L. A. PALMER. *J. Am. Ceram. Soc.* 12, 37-47(1929).—Eight light-burning clays and shales contg. small quantities of insol. V and Mo compds. were studied. During slow firing, sol. salts of these elements were formed which later appeared as a yellow-green efflorescence on the fired clay. The color was due chiefly to alkali vanadates. The use of either Na_2SiF_6 or CaF_2 was effective in eliminating the efflorescence.

C. H. KERR

The rate of oxidation of porcelain and ball clays. HOBART M. KRANER AND E. H. FRITZ. *J. Am. Ceram. Soc.* 12, 1-13(1929) The rate of CO_2 evolution was detd. by passing a 4% $\text{O} + 96\%$ N gas mixt. over a bar of clay or porcelain while it was being heated. The H_2O and CO_2 evolved were collected in P_2O_5 and soda lime, resp., with 1 hr. weighings. Oxidation took place rapidly between 200° and 550° in both clay and porcelain, whereas 750° has generally been considered the most efficient temp. for oxidation.

C. H. KERR

The problem of active silica. Soluble silica in clays. A. FIOLETOVA. *Trans. State Expt. Inst. Silicate* (Moscow) 1927, No. 21, 111-3. Clay samples were dried at $100-110^\circ$, ground in an agate mortar, treated for 1 hr. with const. stirring with N HCl following the method of Dementev (V. G. Dementev, Scientific Principles of the Technic of Cement. *Isvestia Kievsk. Politech. Inst.* 1905: a text book). The 2 clays treated gave up 0.05 and 0.09% SiO_2 . The clays were then heated to 530° , the sample being allowed to cool 2.5 hrs. between the 2 heatings. After each heating the clays were treated again as above with HCl . After 2.5 hrs. cooling the amts. of SiO_2 extd. from the 2 clays were 0.25 and 0.17%. When extd. immediately after heating, the SiO_2 content was 0.29 and 0.17%. The clays were also heated to 1300° and in this case the HCl extract gave 0.21% SiO_2 for the first sample and none for the other.

J. S. JOFFE

The determination of the reaction of clay and kaolin. P. N. GRIGORÉV. *Trans. State Expt. Inst. Silicates* (Moscow) 1927, No. 21, 133-6. Grigorév describes a method of titrating clay exts. (200 g. in 1000 cc. H_2O), using phenolphthalein and methyl orange as indicators.

J. S. JOFFE

The thermal insulation of kilns. C. PRESSWOOD. *Claycraft* 1, 286-8(1928); *Biochem. Sci. Abstracts* 1, 196-7. Brick-burning is said to be inefficient, and various improvements are suggested such as improved design in kilns, flues and stacks, the use of forced draught, and of continuous kilns.

H. G.

Terra cotta kiln slab investigation. R. L. CLARE, G. H. BROWN AND F. B. ALLEN. *J. Am. Ceram. Soc.* 12, 62-8(1929).

C. H. KERR

Insulation in the ceramic industry. E. A. PHOENIX. *J. Am. Ceram. Soc.* 12, 18-25(1929).—Advantages of sil-o-cel brick are shown.

C. H. KERR

Progress in the refractories industry. J. SPOTTS McDOWELL. *Blast Furnace Steel Found.* 17, 88-90(1929).

E. H.

Progress in refractory materials. ALFRED B. SEARLE. *Metal Ind.* (London) 34, 71-73(1929).

E. H.

Discussion on "prevention of disintegration of blast-furnace linings." R. P. HEILER. *J. Am. Ceram. Soc.* 12, 30-1(1929); cf. *C. A.* 22, 2251.—The recommendation that blast furnace brick be especially treated to convert the Fe oxides to Fe_2O_3 is at least open to question.

C. H. KERR

The use of chainotte, stoneware and porcelain as apparatus in the chemical industry (SINGER) 1. Theoretical considerations in electric kiln design (KELLEHER) 4. The refractory earthen of Novarese (MILANI) 8. Apparatus for marking glass articles such as lamp bulbs (U. S. pat. 1,701,348) 1.

Glass. MONTAN- UND INDUSTRIALWERKE VORMALS JOH. D. STARCK & ARTHUR POLLAK. Fr. 643,711, Nov. 9, 1927. The chamber contg. the glass has a vault, which may be of carborundum, sepg. this chamber from direct contact with the heating gases.

Double glass. YVON BRANCART. Fr. 643,197, Oct. 28, 1927. A double glass is made by rolling on a previously rolled layer of glass a second layer of fluid glass so that the second layer is intimately welded to the first.

Composite glass. CORNING GLASS WORKS. Fr. 643,317, Nov. 3, 1927. A composite glass is made by placing between the unpolished faces of 2 sheets of glass a reinforcing plate in transparent material and uniting the 3 in known manner, then grinding and polishing the outer faces.

Composite glass sheet. PERCY J. PORT (to James Newton). Can. 286,367, Jan. 8, 1929. A coating of white of egg and distd. water is applied on one face of each of two sheets of glass, dried, covered with a soln. of pyroxylin and again dried. A sheet of transparent celluloid of the same size as the glass sheets is inverted in a bath consisting of a soln. of commercial Me_3NH contg. a small quantity of AcOH , the celluloid sheet is placed between the coated surfaces of the glass sheets and all are pressed together in a moderately heated press.

Laminated glass. JOHN L. DRAKE (to Libbey-Owens Sheet Glass Co.). U. S. 1,701,147, Feb. 5. Sheets of glass are united by an intervening sheet of non-brittle material such as "cellulose compn." carrying a film comprising a vegetable oil and camphor.

Laminated glass sheets. J. DUCLAUX (to Société d'étude des verres et glaces de sureté). Brit. 293,052, July 1, 1927. Yellow coloration is prevented by using as the intervening sheet for uniting glass sheets regenerated cellulose formed from any of its sol. ethers or pptd. from a soln. such as cuprammoniacal cellulose soln. or by use of polysaccharides such as caroubin. When celluloid is used, yellow coloration can be prevented by excluding radiations below the wave length 3300 A. U. and for this purpose there may be incorporated in the adhesive used salts such as stannate, antimoniate, molybdate, or a crystalloid or colloid salt of Pb, Hg, Mo, Th, Bi, U or org. compds. such as a ketone of high mol. wt., an aromatic aldehyde, a phthalein, an aromatic hydrocarbon, an aliphatic or aromatic acid having a double bond, a ketonic function, a quinone or nitrated deriv. or one of its salts, a compd. with a "mixed function" such as citral or dibenzalacetone or a substituted urea. PrOH , BuOH and AmOH also may be used for treating the celluloid and castor oil may be added. Brit. 293,053 specifies grinding or coating the contact surfaces of the glass sheets to obtain plane surfaces.

Glass articles. COMPAGNIES RÉUNIES DES GLACES ET VERRES SPÉCIAUX DU NORD DE LA FRANCE. Fr. 642,782, Mar. 31, 1927. Molten refined glass is obtained in a continuous manner and at const. level by the combination of one or several crucible furnaces in which the glass is melted and refined and a small basin furnace which receives the molten glass and transmits it to the app. for making articles from the glass.

Glass-making machines. THE UNITED GLASS BOTTLE MANUFACTURES, LTD. Fr. 642,859, Oct. 12, 1927.

Apparatus for blowing glass bottles, etc. WILLIAM J. MILLER (to William J. Miller, Inc.). U. S. 1,700,326, Jan. 29.

Water-cooled roller construction (suitable for use in sheet glass manufacture). SOC. ANON. DES MANUFACTURES DES GLACES ET PRODUITS CHIMIQUES DE ST.-GOBAIN, CHAUNY, ET CIREY. Brit. 293,013, June 30, 1927.

Apparatus for drawing sheet glass. GEORGE G. ROBERTS (to Virginia Plate Glass Corp.). U. S. 1,700,420, Jan. 29.

Apparatus for drawing sheet glass. JOSEPH M. NEENAN and JAMES P. WEAVER (to Libbey-Owens Sheet Glass Co.). U. S. 1,701,161, Feb. 5.

Apparatus for drawing sheet glass. ARTHUR E. FOWLE (to Libbey-Owens Sheet Glass Co.). U. S. 1,701,151, Feb. 5.

Apparatus for drawing sheet glass. CHARLES W. SWOPE (to Libbey-Owens Sheet Glass Co.). U. S. 1,701,165, Feb. 5.

Apparatus for drawing glass in continuous sheets. R. L. FRINK. Brit. 292,118, March 11, 1927.

Apparatus for drawing and cooling sheet glass. Horace E. Allen (to Libbey-Owens Sheet Glass Co.). U. S. 1,701,170, Feb. 5.

Apparatus for cooling plates of glass. YVON BRANCART. Fr. 643,198, Oct. 28, 1927.

Drawing sheet glass. ARTHUR E. SPINASSE. U. S. 1,701,890, Feb. 12. Mech. features.

Abrasives for polishing glass. SOC. ANON. DES MANUFACTURES DES GLACES ET PRODUITS CHIMIQUES DE SAINT-GOBAIN, CHAUNY, ET CIREY. Brit. 292,104, June 13, 1927. Abrasives such as emery, corundum, quartz or carborundum are prepd. for use by prolonged grinding, followed by suspension in a liquid having a pH of about 11 or 12 which is favorable to retention of fine particles in suspension for a prolonged time. The suspended material is decanted and flocculated by neutralization. Excess CaCO_3 is removed from the water used if present.

Abrasives. SOC. ANON. DES MANUFACTURES DES GLACES ET PRODUITS CHIMIQUES DE ST.-GOBAIN, CHAUNY, ET CIREY. Brit. 292,811, June 23, 1927. An abrasive material is prepd. by heating (suitably to about 1300°) a 1% and 2% on the or less of a material serving to liberate gases having

alumina of the bauxite such as fluorides or fluosilicates of alkali or alk. earth metals.

Electric furnace for the manufacture of articles in silica glass. COMPAGNIE FRANÇAISE POUR L'EXPLOITATION DES PROCÉDÉS THOMSON-HOUSTON. Fr. 33,288, Mar. 30, 1927. Addn. to 595,044.

Brick-making machine. SOCIÉTÉ DES FONDERIES ET ATELIERS DE CONSTRUCTIONS MÉCANIQUES DE PORTILLON. Fr. 643,433, Nov. 7, 1927.

Hollow quartz articles. I. G. FARBERIND. A.-G. Fr. 642,822, Sept. 15, 1927. A furnace is used which acts both as fusion furnace and mold.

Light weight ceramic material. RICHARD ERICSON (to U. S. Gypsum Co.). U. S. 1,702,076, Feb. 12. In order to form a porous product which is suitable for structural purposes, a plastic mixt. of argillaceous material and water is incorporated with a tenacious foam which may be formed of soap bark and water, and the mixt. is shaped, dried and heat treated to obtain a hardened cellular product.

Composition for ceramic articles. AMERICAN ENCAUSTIC TILING CO., LTD. Brit. 293,069, Feb. 28, 1927. A bisque mixt. is used contg. magnesia about 27%, alumina about 6% and silica about 61% together with a small quantity of water; it is fired at a temp. limited to a narrow range at its max. A small proportion of Ca may be added (less than the quantity of alumina) and the finished articles may be treated with paraffin as a waterproofing agent.

Ceramic objects. THOMAS S. CURTIS. Fr. 642,828, Sept. 20, 1927. Ceramic objects are made from a compn. which will solidify when not agitated and which will become fluid when agitated and is composed of a finely divided refractory material submitted to agitation. The fashioning to the required form is effected while the solid particles of the compn. are in movement and without change of temp. and the agitation is stopped to allow the whole to solidify. An electrolyte serves to reduce the viscosity of the mass, and a vacuum is used to remove air from the compn. Fr. 642,829 describes a suitable app. for the above process. Fr. 642,830 describes a ceramic compn., and process of making it, contg. principally mullite and crystals of corindon, the interstices between the crystals being filled with glass. Cf. C. A. 23, 1236.

Ceramic product. PATENT-TREUHAND-GES. FÜR ELEKTRISCHE GLÜHLAMPEN M B H. Fr. 643,282, Nov. 2, 1927. See Brit. 281,249 (C. A. 22, 3505).

Ceramic ware decorated with colored tiles flush with its surface. ROGER B. SHERMAN. U. S. 1,701,313, Feb. 5.

Furnace for ceramic materials. HARRY T. BELLAMY and WILLIAM H. GROVES (to Western Electric Co.). U. S. 1,702,033, Feb. 12.

Furnace with a tunnel-like chamber for heat treatment of ceramic articles. WILLIAM G. BERGMAN (one-half each to Dana P. Ogden and Ermin F. Plumb). U. S. 1,701,223, Feb. 5. Structural features.

Refractory material. DEUTSCHE GOLD- UND SILBER-SCHNEIDANSTALT VORM. ROESSLER. Brit. 292,958, June 27, 1927. The magnesia obtained by the action of air or steam on $MgCl_2$ (such as that obtained as a by-product in the treatment of final potash lyes) may be treated with water or solns. of salts or acids, preferably with addn. of $MgCl_2$ or Zr chloride, and the plastic material thus obtained is fired.

Refractory materials. DEUTSCHE GASGLÜHLICHT-AUER-GES. Brit. 292,529, June 21, 1927. Highly refractory oxides such as those of Zr, Th and Be are rendered plastic for molding or casting by the addn. of up to 5% of oxides of Mg or Al or both and of a small quantity of a soln. of a salt of one or more of the metals, the oxides of which are used. Part of the salt soln. may be replaced by free acid.

Refractory materials. GENERAL ELECTRIC CO., LTD. Brit. 292,997, June 29, 1927. Solid bodies of high density are formed by first sintering W powder, CaF_2 powder or other raw materials, preferably highly compressed, to form a porous body and then subjecting the latter to high pressure between members (of an app. which is described) which offer little resistance to lateral expansion, while heated to above redness but below the temp. at which the previously compressed body would attain a d. of 85% that produced by fusion.

Refractory objects. GEORGES L. CHAUDRON and AUGUSTE L. DESMARQUEST. Fr. 643,473, Apr. 1, 1927. Crucibles or other refractory objects are made by baking com. MgO in an elec. furnace, grinding and making into a paste with a suitable binder, e. g., tar. This paste is afterwards molded under high pressure and baked out of contact with a flame to 1400° , then re-baked to between 2000° and 2200° in an elec. resistance furnace.

Casting refractory materials such as silica or zirconia. GORDON S. FULCHER (to Corning Glass Works). U. S. 1,700,288, Jan. 29. The molten refractory material is poured into a mold, a portion of the material is allowed to solidify and shrink, and addnl.

molten refractory material is fed into the mold to compensate for the shrinkage of the molten material first poured.

Silica. QUARTZ ET SILICE. Fr. 642,692, Mar. 23, 1927. See Brit. 287,522 (C. A. 23, 495).

Fused silica. H. P. HOLLNAGEL (to British Thomson-Houston Co.). Brit. 292,624, June 23, 1927. A mass of fused silica is heated to about 1400° and then shaped while plastic by the progressive application of localized pressure over its surface. Various mech. details are described.

Resistant material. METALLBANK UND METALLURGISCHE GESELLSCHAFT A.-G. Fr. 643,638, Sept. 1, 1927. Natural rocks such as olivine, peridot and dunite are used for making refractory and chemically resistant material. Rocks contg. between 40 and 55% of MgO are best; the content of SiO₂ should not pass 48%.

Electric resistance materials. K. B. McEACHRON (to British Thomson-Houston Co., Ltd.). Brit. 292,110, June 13, 1927. A cryst. resistance material suitable for lightning arresters and similar safety devices carries a large current only above a certain voltage and may be made by mixing carborundum with a binder such as clay cement, Pb borate or glass, drying, heating and firing. The characteristics of the material can be regulated by altering the proportion of free C in the carborundum as by oxidation in free O or with oxidizing agents such as KClO₃, HNO₃, or HNO₃ plus HF and adding C in the form of graphite or lampblack. The cond. may be increased by adding Te, W, Co, Ni, Mo, Fe or Si and, instead of carborundum, zincite, galena and psilomelane may be used. The proportion of free Si in the material may be adjusted to obtain desired characteristics.

Roofs of furnaces. ALFRED-NUMA DE SAINTE-EDME BORNE BONET. Fr. 643,232, Oct. 29, 1927. The refractory bricks of suspended furnace roofs are trapezoidal in shape so that the joints become wedged.

Furnace lining. COMPTOIR TECHNIQUE ALBERT KNAFF and LEON MAYER. Ger. 469,863, Apr. 10, 1925. A lining for converter and other metallurgical furnaces is made by mixing powd. sintered dolomite with ground hard pitch and the mixt. is formed as required in known manner.

20—CEMENT AND OTHER BUILDING MATERIALS

J. C. WITT

Tentative standard specifications for reinforced concrete culvert pipe. ANSON MARSTON, et al. *Second Rept. of the Joint Concrete Culvert Pipe Committee 1928*, 3-15 E. J. C.

Capping device for concrete cylinders. P. J. FREEMAN. *Eng. News-Record* 101, 777(1928).—A description of the method of capping concrete test cylinders employed by the Allegheny County Dept. of Public Works, Pittsburgh, Pa. Perfect caps can be placed on any specimen, regardless of its irregularity, in 10 mins. A quick hardening compd. known as Baselit is used; it will adhere to any concrete. The crushing strength of the compd. is about 8000 lbs. per sq. in. The cost for material is approx. 8¢ per specimen.

R. E. THOMPSON

Test of curing methods for concrete road slabs. D. D. MCGUIRE. *Eng. News-Record* 101, 813-4(1928). Brief details are given of methods being employed in an extensive study of curing methods being carried out by the Dept. of Highways, Tenn. Tests conducted to date have shown that great variations in strength occur when different kinds of earth are used for curing, red clay giving strengths as much as 16.7% lower than brown loam.

R. E. THOMPSON

Significant tests of frost action on concrete. WM. H. BATCHELDER. Minnesota Highway Dept. *Eng. News-Record* 101, 882(1928). Tests were made of frost action on concrete mixed and cured under wet burlap at 70° F. (A) and at 40° F. (B). Freezing immediately after casting resulted in 31% loss of strength in A and 69% in B. If

—Based on

hrs., except, of course, that the strength does not increase while concrete is curing. Effect of alternate freezing and thawing is marked if freezing commences immediately after casting and decreases with addnl. initial curing.

R. E. THOMPSON

Corrosive attack of moorland water on concrete. W. T. HALCROW, G. B. BROOK AND R. PRESTON. *Water and Water Eng.* 30, 579-86(1928).—In hydroelec. plant installations, the loss of head in aqueducts is important, particularly in large tunnels

such as the 15-mile Lochaber tunnel. Expts. show that it is possible to restrict the deterioration of concrete surfaces, and hence the increased friction losses, but at considerable cost. If the surface of the lining deteriorates, the coeff. of friction increases and there results a greater loss of head for an equal quantity of H_2O and also a greater loss of power. Smooth coating will prevent friction. Concrete made with a good aluminous cement will keep deterioration at a min. but costs approx. twice as much as portland cement. With the exception of Straffordshire blue bricks, no other materials give promise of permanent resistance to corrosive attack by moorland waters.

C. R. F.

Shrinkage of mortar and concrete. A. W. KNIGHT. *Eng. News-Record* 101, 981 2(1928).—A criticism of the paper of Levens (cf. C. A. 22, 4754) on the shrinkage effect of Celite in mortar and concrete. Reply. A. S. LEVENS. *Ibid* 965-6.

R. E. THOMPSON

Fires in houses built of concrete or clinker blocks (Winget System). G. PARKER. *Munic. Eng. Sanit. Record* 81, 644(1928).—Houses built of concrete blocks 6 parts crushed boiler clinker ($1/2$ and dust) to 1 part cement are described. These are considered almost fireproof. Aggregates containing quartz such as flint or granite will cause shelling or "spalling" during heating. Crushed firebricks are perhaps the ideal fire resistant material but whinstone also is good.

C. H. BADGER

Cold emulsions. G. BELSON CHILVERS. *Munic. Eng. Sanit. Record* 81, 688-9 (1928).—A discussion on their use in road making.

C. H. BADGER

The advantages of cold dressings. O. N. EDWARDS. *Munic. Eng. Sanit. Record* 81, 702(1928).—The use of cold bitumen emulsions on roads is discussed.

C. H. B.

New and simple method for determining moisture content in aggregates. WALTER M. DUNAGAN. *Eng. News-Record* 101, 738 9(1928).—A direct wt.-displacement method for detg. the moisture content of aggregates is described; it is believed to be more rapid and less subject to error than other current methods. The time required to carry out a test need not exceed 5 min. (See following abstr.)

R. E. THOMPSON

Determining moisture content in aggregates. H. C. MCCALL. *Eng. News-Record* 101, 966(1928).—A discussion of the paper by W. M. Dunagan (cf. preceding abstr.), in which attention is drawn to errors to which the method suggested by D. is subject. The method is considered much the simplest and fastest for detg. added absorption of porous aggregates which are dry or contain less moisture than the total absorption. The most dependable method for sand is to det. absorption and then obtain total moisture by drying to const. wt.

R. E. THOMPSON

Cements and plastics (NAGEL, GRÜSS) 18. Coverings for walls, roofs, vehicles, tools, etc. (Brit. pat. 292,621) 18. Granulating raw cement materials, etc. (Brit. pat. 292,984) 13.

Cement. M. GENSBAUER. Brit. 292,492, June 20, 1927. Raw cement materials are ground or mixed with fuel and pressed into lumps, which are fed into a rotary kiln.

Cement. C. PONTOPPIDAN. Brit. 293,035, June 30, 1927. A hydraulic cement clinker has a ratio of basic to acidic materials of not less than 2.2 and a ratio of silica to alumina and ferric oxide of not less than 3.4 and the raw materials are ground so that 99% passes a 200 mesh sieve. The cement produced is preferably finely ground and may be mixed with various other materials.

Cement. JOHAN A. BONTHRON and TURE R. HAGLUND. Fr. 643,024, Oct. 26, 1927. In the prepn. of a substance contg. Ca aluminate for cement, the primary material contg. Al_2O_3 is treated with a reducing agent for the SiO_2 , with addn. of part only of the CaO contg. material. The rest of the CaO-contg. material is afterwards added to the fused bath. To facilitate the reduction, Fe turnings or Fe ore is added.

Porous cement. JULIUS MEYER and EMIL ASMUS. Ger. 469,864, June 19, 1927. A porous cement is made from mineral substances capable of setting and Ca alloys which are capable of liberating gases in the presence of water and in which the Ca is mixed with Zn, Ca-Mg or Ca-Mg-Zn alloys are suitable.

Waterproofing cement compositions. ORLANDO A. COLLINGS (to Silica Products Co.). U. S. reissue 17,207, Feb. 5. See original pat. No. 1,650,864 (C. A. 22, 675).

Porous concretes. J. MEYER and E. ASMUS. Brit. 292,468, June 18, 1927. Cementitious material is admixed with a powdered alloy of Ca with Zn or Mg or both in which the Ca is preponderant, so that gas is generated by the action of water.

Device for ascertaining the hygroscopicity of building materials. OTTO FÖPPL and EWALD PERTZ. Ger. 470,202, Mar. 23, 1927.

Paving compositions. J. HINES. Brit. 292,871, Jan. 20, 1928. Tar macadam in which the tar has been strengthened by an admixture of bitumen is treated with a colloidal emulsion of bitumen in water or other suitable liquid, to prevent premature hardening; the emulsion may also be used for reconditioning a material which has already set by drilling holes in the mass and filling these with the emulsion.

Bituminous pavement. RALPH C. HEATH (to Barber Asphalt Co.). U. S. 1,701,497, Feb. 12. Structural features.

Use of rubber on a concrete foundation for road surfaces. J. JAGURS and F. W. McCahon. Brit. 292,681, March 23, 1927. Mech. features. The rubber is vulcanized *in situ* and an accelerator may be used.

Slag, scoria, etc. SOCIÉTÉ GÉNÉRALE MÉTALLURGIQUE DE HOBOKEN. Fr. 643,507, April 5, 1927. Slags, scoria, waste from mines, etc., are made into paving blocks and the like by a slow cooling of the molten products in the absence of air.

Artificial stone. A. TETZNER. Brit. 292,925, June 24, 1927. Clay 6 and sand 6 parts are ground to a "meal-like" mass and cement 1 part and water are added.

Molding blocks or slabs of imitation marble. GEORGE E. KENDALL. U. S. 1,701,619, Feb. 12. Mech. features.

"Marble substitute." K. STICHA, J. HUBACEK and J. KNEIFL. Brit. 292,388, Sept. 5, 1927. A glazing compn. is applied to glass or other suitable smooth surface at a temp. of about -2° , dried and polished. The compn. may be formed from Na sulfate 2, black coloring matter 10, red coloring matter 2, waterglass 16 and water 28 parts together with some NH_4Cl .

Colored material suitable for use as a floor covering. GLENN H. WILLIS (to Tanseib Co.). U. S. 1,701,220, Feb. 5. A base stock such as a rubber mixt. is colored to a desired shade (suitably by a red pigment) and fibrous or other filler is colored to match the color of the base stock and then mixed with the latter, formed into sheets or other desired shape, vulcanized, and the surface of the formed article is then removed (suitably by grinding or use of a wire brush) in order to improve its appearance.

Sheet material for roofing. CHESTER E. RAHR and RALPH E. DRAKE (to Anaconda Sales Co.). U. S. 1,700,774, Feb. 5. A base such as asphalted felt carries a facing of granular material such as crushed slate with a metal lying in the interstices only of the facing.

Uniting metal surfacing material to asphalted roofing sheets. JULIUS H. GILLIS (to Anaconda Sales Co.). U. S. 1,701,918, Feb. 12. An app. is described employing elec. heating to soften the asphaltic material where the metal coating is applied under pressure.

Apparatus for coating roofing felt, etc. WILLIAM FREEGARD (to Barber Asphalt Co.). U. S. 1,701,878, Feb. 12.

Impregnation of wood. CHEMISCHES LAB. FÜR ANSTRICHSTOFFE G. M. B. H. (Richard Weithöner, inventor). Ger. 470,199, Nov. 26, 1924. Addn. to Ger. 414,483. Wood is impregnated and primed for the subsequent application of linseed oil and varnish paint by using as the impregnating medium, wood oil heated with petroleum jelly and diluted with a solvent contg. a preservative.

Apparatus for perforating wood preparatory to treatment with preservative materials. CLARENCE N. GRAM (to Valentine-Clark Co.). U. S. 1,701,324, Feb. 5.

21—FUELS, GAS, TAR AND COKE

A. C. FIELDNER

Calorific equivalent of fuels. ANON. *Izvestiya Teploekkh. Inst. (Trans Thermo-Tech. Inst. (Russia))* 1927, No. 5, 55-62.—7000 kg.-Cal. is established as a unit and the following fuels are compared by their heat value: Moscow hard coal Kuznetskii coal, anthracite from Donetz, hard coal from Donetz, etc. A classification of various fuels by their sources is also given.

Pulverized fuel locomotives. J. CLUBLEY ARMSTRONG. *Engineer* 146, 495-7 (1928).—Successful trials for 6 months on the German State Ry. are reported. A pulverized brown coal was used, its compn. being H_2O 11.67, ash 9.04 and combustible 79.29%. Lower calorific value was 9700 B. t. u. and fineness of milling 90% through a sieve with 4900 meshes per sq. cm.

The difference between Kraemer-Sarnow and ring and ball values. H. MALLISON. *Teer u. Bitumen* 26, 602-3 (1928).—It is pointed out that one value cannot be calcd. from the other by a simple conversion formula because the difference depends mainly on the slope of the viscosity-temp. curve of the material tested.

F. S. G.

A revised Mollier chart for steam, extended to the critical point. J. H. KEENAN. Stevens Inst. of Technology. *Mech. Eng.* 51, 109-14(1929). E. H.

Recent developments in the utilization of bituminous coal. ANON. *Mech. Eng.* 51, 142-6(1929); cf. C. A. 23, 953. E. J. C.

Laboratory self-ignition test for some Donetz coals. M. I. KUZNETZOV. *Izvestiya Teplolek. Inst. (Trans. Thermo-Tech. Inst. (Russia))* 1927, No. 7, 43-6.—In a glass tube, which acts as a thermostat and is filled with a high-boiling liquid such as heavy mineral oil and which is heated by elec. current sent through a resistance coil wound and properly insulated with asbestos, a smaller glass tube is inserted with an outlet through the bottom of the thermostat. A layer of wire gauze is placed in the inner tube on which 15 g. of coal under test are loosely placed. The app. is closed with a cork; thermometers are provided for the oil and the coal. The coal sample is first brought up to the desired temp. and a steady stream of air or O₂ is led through the bottom, escaping through a tube in the cork. The initial temp., i. e., the increase of the temp. of the coal due to the beginning combustion is then recorded. A table including tests of 13 samples of Russian coal with O₂ and air is given, also their classification according to Gruwer and Denstedt. A. A. BOEHLINGK

How to avoid fire in storing Indiana screenings. M. A. TUTTLE. Knox Consolidated Coal Co., Indianapolis, Ind. *Power* 69, 271(1929).—Foundations should be firm, level and well-drained. The safe depth of piling can best be detd. by temp. observations. Segregation of fines by the method of dumping used sometimes is responsible for fires. Firmness is a primary essential because of better heat cond. and less air circulation. D. B. DILL

Hydrogenation tests on different Spanish coals. ANTONIO MORA. *Anales soc. españ. fis. quim.* 26, 113-20(1928).—The coals subjected to hydrogenation at high temp. and pressure, from modern geological formations, lignites and peats, show that this method can be used to give combustible oils. The yield of hydrocarbons is better than that obtained with English and German coal, and the return on the mineral oil is more advantageous because of the lower value of the raw material. E. M. SYMMES

Contributions to the knowledge of Moscow coal. H. BODE AND G. FEIST. *Braunkohle* 27, 1070-87(1928).—The industrial history and geological features of the Moscow mining district are briefly reviewed. Petrographical investigation of the coal showed that it existed in two different principal types. One of these is a typical dull brown coal, instead of a cannel or a bituminous coal as erroneously designated in the previous literature. Its petrographic details are described and illustrated. It is to be regarded as a humus coal. In this coal, especially along the seams, layers of a putrefied deposit occur which was formerly designated as boghead. The petrographic investigation showed a considerable proportion of boghead constituents, but it consisted principally of microspores, the characteristic constituent of cannel coal. The brown coal differed somewhat from German brown coal. It yielded only 4% tar and no cellulose. The cannel coal yielded 4 or 5 times as much tar as the usual brown coal. A number of new analyses of both coals are given. The coal is discussed with reference to its value as a fuel and for distn., generators and briquetting. An extensive bibliography is appended. F. S. GRANGER

The rational cleaning of coal. R. LESSING. *Gas J.* 184, 850-3(1928).—A general review and statistical discussion of the various sepn. processes including the effects on the petrological elements of the coal. F. S. GRANGER

Coal liquefaction. The Bergius process. E. W. SMITH. *Times Trade and Eng. Supplement* (London) 23, 28(1928).—A comprehensive review of process, app. and costs. The matter (in England) is of importance only as a war-time measure when fuel oil is high, unless the recent developments in Germany have made it possible greatly to increase the yield of the more valuable motor fuels. E. M. SYMMES

Low-temperature carbonization plant at Dalmarnock. JOHN B. C. KERSHAW. *Engineer* 146, 651-2(1928).—The MacLaurin process is operated with producers of the continuous internally heated type, 8 × 36 ft. in dimensions and resembling a small blast furnace. During the two years ending May 31, 1928, the plant operated at a loss. This was in part related to industrial conditions and in part to difficulty in selling the smokeless by-product fuel, *kincole*, which is objectionable on account of its tendency to decrepitate when heated. D. B. DILL

The application of the Lurgi low-temperature carbonization process to brown coal. F. A. OETIKEN AND O. HUBMANN. *Braunkohle* 27, 1097-1104(1928); cf. C. A. 22, 4766.—The difficulties in the practical realization of circulating gas carbonization and the adaptation of the Lurgi process to the large oven are discussed. The feasibility of the process is demonstrated by examples and results from industrial practice. The

present stage of development promises application to young coals of all kinds.

F. S. GRANGER

A new French low-temperature carbonization oven, Bonnevie type. ANON. *Brennstoff u. Wärmewirtschaft* 10, 481-3(1928).—It consists of 3 superimposed horizontal chambers with slow mech. stirring. The coal, starting at the top, passes successively through each chamber horizontally and through an outside chute into the next lower one and is exposed to a higher temp. in each, emerging from the bottom one into a water-cooled screw conveyor, as semi-coke. The chambers are heated externally by a gas burner. The distn. products are aspirated separately from each chamber upward through a common vertical manifold, downward through a cooling tower and then through a washer.

F. S. GRANGER

The Babcock low-temperature coal distillation system. ANON. *Gas J.* 184, 469 (1928).—The retorts are operated as an integral part of the Dunstan Power Station of the Newcastle-upon-Tyne Elec. Supply Co. Its purpose is to furnish coke for the boilers and to produce motor spirit and other by-products. The operation is continuous. The coal is dried and preheated by the boiler flue gases, to avoid interference of gas-flow through the coal by condensation in the retorts. The distg. medium consists of steam and combustion products obtained by first burning a suitable fuel, powdered coal or gas, in a small combustion chamber immediately connected with the retort from below. Steam is then introduced into the connecting duct or tempering chamber to produce distg. gases of the required compn. at (650-700)°. The hot coke is discharged continuously through breakers, a rotary sealing valve and a screw conveyor to the stoker hopper. The gas passes outside the building through a tar extractor, is stripped of oil and finally burned under the boilers.

F. S. GRANGER

Chemical changes in coal brought about by coking and by oxidation. O. KUNLE. *Brennstoff-Chem.* 9, 295-8(1928).—The influence of increasing coking temp. on coke yield and compn. is detd. in app. ordinarily used for the detn. of volatile matter. The effect of preliminary oxidation at low temps. on the yield of volatile and coking power is also studied. E. g., heating a Saxon bituminous coal 1 hr. at 225° destroyed the coking power and increased the volatile 1%. In 10 hrs. time at 225° the O₂ content rose from 9.93 to 23.86%. The O₂ content of fusain similarly treated increased from 5.48 to 17.42%.

J. D. DAVIS

Chemical reactions in the gasification of crude brown coal. HERBERT KNOTT. *Gas u. Wasserfach* 71, 1218-21, 1242-5, 1259-63(1928).—Chem. reactions in the fuel bed of a Heller gas producer, gasifying crude brown coal, were studied. Gas samples were taken from 4 locations at which the temp. of the gas was also measured. The results of the gas analyses correspond to the water gas equil. rather than to the water gas equation. In the generator, the gas temp. is always higher than the fuel temp. Thermal relations were discussed and the literature was reviewed.

R. W. RYAN

Contribution to the study of humic compounds in low-grade coals and lignites. FRAN PODBREZNIK. *Bull. inst. pin* No 51, 193-6, No 52, 209-14, No 53, 287-8 (1928).—P. sepd. 2 humic acids from the lignites of the Siorac-de-Belve's mines in Dordogne: a humic acid proper and hymatomelanic acid. Their physical properties were studied. By means of quant. analyses of some of the salts of the non-crystallizable acids their approx. mol. wts. were detd. The mol. wt. of the humic acid proper was found to be approx. 1120 and that of the hymatomelanic acid, assuming it to be tetrabasic, about 720. The role of the humic acids consists in the physical envelopment of the bitumens in such a way that the latter can yield the largest amt. of tar only after the removal or destruction of the humic acids. Under the influence of not too high a temp. humic acids change progressively into humic lactones, dilactones and oxetones. According to this change the coking value of lignites and coals can be enhanced by preheating at temps. below 300° and progressively driving off water and CO₂.

R. THIESSEN

The construction of a gas works. W. M. FOX. *J. Chem. Met. Mining Soc. S. Africa* 29, 55-63(1928).—The av. yields per ton of coal carbonized in gas works practice are gas 15,000 cu. ft. of 470 B. t. u./cu. ft., coke for sale 900-1000 lbs., tar 12-16 gals., and 25-33 gals. of 10 oz. strength ammonia liquor. Products obtained by distn. of the tar, a typical volumetric coal gas analysis, and a brief history of the development of gas manuf. and purification are given. The new Johannesburg Gas Works is described and the factors involved in its design and construction are discussed. The retort house contains 18 Glover West continuous vertical retorts of 25 ft. working length. The plant is designed to carbonize 100 tons of coal per 24 hrs., producing 1½ million cu. ft. of gas. Steam is injected on to the coke during its passages through the last 5 feet of the retorts; this results in an increase of 3000-5000 cu. ft. of gas per ton coal

carbonized. Sufficient steam for steaming the coke and for generating the mechanical and elec. power required to operate the machinery in the gas works is secured by passing the hot gases from the retort combustion chambers through "waste-heat" boilers. In this locality very few data are available for use in selecting suitable carbonizing coals. For this reason the plant was designed so that two of the retorts in the bench can be isolated from the main section of the carbonizing plant and be used as an expt. unit to test coals for the company's own use and also treat coals for test purposes for any of the coal mines. A no. of drawings and pictures show the lay-out of the gas works and of the different units constructed and machines installed. W. W. HODGE

Gas storage under high pressure, the spherical gas holder. D. STAVORINUS. Westergasfabriek, Amsterdam. *Het Gas* 48, 526-30(1928).—A review of Horton sphere holders as built by Klonne, Dortmund. Their pro and con (dry gas, illuminants condensation, etc.) are discussed. B. J. C. VAN DER HOEVEN

Dry quenching by the Sulzer process at the Oswald Street Gas Works, Burnley. J. HERBERT CLEGG. *Gas J.* 184, 785-90(1928). Plant, practice and results are described, with photographs and drawings. F. S. GRANGER

A study of comparative costs of gas production in the retort house. E. W. SMITH. *Gas J.* 184, 845-8(1928).—From a statistical comparison of continuous and intermittent vertical and horizontal retorts it is concluded that carbonizing conditions may be varied over wide limits without making any large difference in the final cost per therm. F. S. GRANGER

Gas works effluent. W. P. SMITH. *Gas J.* 181, 690-2(1928).—The subject is reviewed and discussed generally with reference to practical methods of prevention and cure of oxygen absorbing contamination, principally phenolic and thioevanate. The methods include minimizing time of contact between water and tar, or removal of the tar previously to aq. condensation, bacterial purification methods and dephenolation by distn. F. S. GRANGER

Gas purification by activated carbon and recovery of sulfur in the solid form. 1928 Report of the Comm. on Gas Mfr. of the Assoc. Technique. *Gas J.* 184, 526-7(1928). 1 G installations at Recklinghausen, Germany, are described. H_2S is adsorbed by the C at 35° and oxidized to S by admitting the proper quantity of air, through the catalytic action of the residual NH_3 in the gas after passing the scrubbers. The S is extd. by $(NH_4)_2S$ soln. and recovered by boiling. The C is revived by steaming and is originally obtained from lignite coke activated by steam at 900° . F. S. G.

The new plant for carbureted coke gas of the Westergasfabriek at Amsterdam. J. A. MOUL. *Het Gas* 48, 514-21, 533-40(1928). The 2 new Julius Pintsch water-gas sets are described. The generator of internal diam. 2600 mm, external diam. 3630 mm. is jacketed, steam of 1 to 2 atm. being produced (1300 kg. per hr.); the centric conical revolving grate has a dry seal with steam packing; grate and supporting platform with 2 clinker breakers are carried by rollers and driven at variable speed by a 5 h.-p. motor. The slag is removed from the grate table by baffles and drops into two boxes, emptied every 4 hrs. A Ruths steam accumulator of 13.5 cu. m. water capacity, 138 kg. steam between 4.1 and 0.6 atm. is provided; the steam used in the generator is superheated in a jacket surrounding the gas line between superheater and scrubber (heating surface 57 sq. m.). Steam connections in a ring around the charging hole take care of the down-run. The carbureter is cylindrical, 2700 \times 7400 mm., 37 cm. brick lining and 8.5 cm. slag wool; it is filled with staggered checkerbrick. The superheater is 2700 \times 7000 mm., lined as the carbureter and filled with brick; secondary air can enter at the bottom and halfway up. The gases can leave either through a blowoff or through the waste-heat boiler. The scrubber cools the gas partly. The final cooling is done in a Pintsch intensive indirect cooler of 8 sections with a total of 400 horizontal water pipes, surface 384 sq. m. The waste-heat boiler, horizontal fire-tube, is for 12 atm., and has 200 sq. m. heating surface. All large valves are moved by oil pressure of 13 atm., with differential plungers, and the necessary interlocks. Hand operation is used only for the secondary-air valves. During the 24-hr. guaranty test the actual results obtained were as follows: Gas produced 46,770 cu. m. of 4500 Cals., coke used 29,587 kg., oil per cu. m. gas 288 g., steam produced 28,993 kg. of 8.5 atm. in the waste heat boiler, 31,307 kg. in the jacket, av. clinker time 18 mins., blower consumption 616 kw. hrs. The coke weighed 48 kg. per hl. and contained 5.39% moisture, 9.83% ash and 84.78% C; the oil had d. 0.863; the carbureter temp. was 742° ; the av. gas analysis was 3.7% CO_2 , 7.2% illuminant, 0.5% O_2 , 34.7% CO , 12.2% CH_4 , 31.6% H_2 , 9.4% N_2 . The rather high coke consumption per cu. m. gas, guaranty was 60 kg., actual 63.1 kg., is due to unexpectedly high steam production in the jacket. A few drawings are given. There are no operation details. B. J. C. VAN DER HOEVEN

A source of error in the carbon balance (when gasifying fuel). WEHRMANN. *Gas u. Wasserfach* 71, 1253(1928).—In testing the efficiency of gas producers and generators, the C balance from gas analysis and orifice meter measurements gives high results for percentage efficiency, because of absorption of CO_2 in the washer cooler, the aspirator and in the gas buret. In one series of exts., the gas from the generator contained 4.95% CO_2 and only 4.40% was found by analysis. A correction of 0.6 to 0.7% should be added to results of analyses. This figure should be checked for each series of runs.

R. W. RYAN

Low-temperature tar products. A complex mixture. G. T. MORGAN. *Times Trade and Eng. Supplement* (London) 23, 29(1928).—A concise review. E. M. S.

Causes and reduction of the water content of tar. K. BUNTE. *Gas u. Wasserfach* 72, 1-3(1929).—Tar viscosity decreases with increase of temp., facilitating the sepn. of water from tar. In one tar almost no water sepd. out at 25°, but at 70° almost 98% sepd. out. The sp. gr. of both tar and gas liquor are important factors as very light tar and very heavy gas liquor can only be sepd. with difficulty. The sp. gr. of gas liquor and tar are dependent on temp. of carbonization, type of coal and moisture in coal and methods of cooling. Tar wells should be large and deep. The relative changes of sp. gr. of liquor and tar with temp. vary with different tars. Tar sepd. at various stages should be led to a common well. "Free carbon" may act as an emulsifier. Lower phenols may act as solvent for the higher tar acids, increasing the difficulty of sepg. tar and liquor. Ammonia-phenol soaps and other obscure emulsifiers may also hinder sepn.

R. W. RYAN

American coal-tar industry. Growth of dyestuffs production. FRANK TALBOT. *Times Trade and Eng. Supplement* (London) 23, 60(1928).

E. M. SYMMES

The German coal-tar industry. The trend of recent developments. A. SPILKER. *Times Trade and Eng. Supplement* (London) 23, 45(1928).—A review.

E. M. SYMMES

Recommended specifications for quicklime for use in the distillation of ammonia from ammonia liquors obtained in coke and gas manufacture. ANON. Bur. Standards, *Circ. No. 373*, 4 pp.(1928).

E. J. C

Treatment of ammonia water from coke ovens. V. T. POSTOLOVSKII. *J. Chem. Ind. (Moscow)* 5, 992-7(1928).—To obtain ammonia for contact oxidation from the ammoniacal water of coke ovens, the method which consists in using low-pressure dissociators for the removal of CO_2 and H_2S , followed by concn. and purification, is expensive and wasteful, as it involves concn. of very dil. solns. The method which consists in washing the gases with lime water is also unsatisfactory, since the introduction in the column of dilute milk of lime, which must be not stronger than 5° Bé, naturally affects the heat balance of the system, and moreover dilutes the ammonia. Attempts to increase the concn. of the lime water have hitherto been unsuccessful, as they always led to the deposition of residues which required frequent taking apart of the column for cleaning purposes. The formation of deposits in the lime water is due to the following causes: penetration of suspended particles of sand into the column, absence of intensive stirring of the solid particles, insufficient dynamic effect of evaporating gases and water vapor. P. shows, by drawings of proper app. and calcus., that these difficulties can be overcome. Calcus. of the heat balance are also given.

BERNARD NELSON

The by-product coke and gas industry. C. J. RAMSBURG. *Blast Furnace Steel Plant* 17, 84-5(1929).

E. H.

Coke works of the Carnegie Steel Company. F. F. MARQUARD. *Blast Furnace Steel Plant* 17, 77(1929).

E. H.

Standards adopted by the "Bureau of the All-Russian Thermo-Technical Congress." V. P. FEDOROV, G. N. BEZRADETSKII, P. N. MAYEVSKII, T. A. ZIKEYEV AND A. A. NADEZH DIN. *Izvestiya Teplolekhn. Inst. (Trans. Thermo-Tech. Inst. (Russia))* 1928, No. 8, 60-132.—There are included provisional standards for coke ovens, instructions for detg. the heat balance of coke ovens, instructions for calcg. the consumption and distribution of gas, instructions for calcg. the elementary compn. of coking products, instructions for calcg. the heat balance of coke ovens, temporary instructions for measuring gas with Brabbe and Prandtl tubes, instructions for the detn. of the av. flow of gases in pipe lines, instructions for the measurement of the gas flow with diaphragms, standards for the physical-chemical constants of products obtained from coking, temporary instructions for sampling coal in testing coke ovens, temporary instructions for sampling coke of various sizes to det. the H_2O content and for general analytical purposes in testing coke ovens, instructions for sampling coke for the tumbling test in a drum and for making the test.

A. A. BOEHTLINGK

A method for the exact determination of the absorptivity of brown-coal semi-coke against air, steam and gases. M. DOLCH AND K. GIESELER. Universitätsinstitut f. tech. Ch., Halle a. d. S. *Braunkohle* 27, 1025-30, 1051-5(1928).—The detn. of absorptivity of a semi-coke toward gases, especially air, can yield correct or even comparable values only if the sample, directly after carbonization, is cooled and kept in a vacuum until tested. Otherwise it becomes partially satd. to an extent that differs with different specimens. An app. meeting these requirements is described. The absorptivity rises rapidly with the temp. of carbonization, but is decreased if the cooled coke is satd. with air and reheated. Predrying of the raw coal, in contact with O_2 , showed no influence on the reactivity of the semi-coke. Titrimetric results are reported indicating the possibility of distinguishing between adsorption and chem. combination by detg. the loosely combined I, on the one hand, and, on the other, the closely or chemically combined I which can be removed only by an alkali fusion. F. S. GRANGER

Coking coals and the coking process. P. DAMM. *Brenstoff-Chem.* 9, 293-5 (1928).—Coking properties of 6 German coals are studied. Bitumens are extd. by the Fischer method (*C. A.* 21, 814); caking power is detd. by the Meurice method (involving strength of coked mixts. of coal with sand); free expansion and pressure exerted by the coking charge are estd.; softening temp. is also detd. together with relative amts. of volatile matter evolved before, during and after passage of the charge through the plastic state. D. concludes that extn. results do not give complete information on coking properties, but finds that the more "oily" the bitumen found, the higher the strength of coke produced. Other conclusions are: The higher the caking power, the higher the coking pressure and the denser the coke; sticking in the coke oven is due more to lack of shrinkage after coke formation than to pressure exerted during formation; the more volatile evolved after formation, the greater this shrinkage; a good coking coal will have not only sufficient coking material to cause melting but it will also exert a certain coking pressure. Pressures found for the 6 coking coals varied from 0.0 to 0.7 kg. per sq. cm. The last would correspond in a coke oven to 7 tons per sq. m. of wall surface. J. D. DAVIS

The dry quenching of coke. D. W. WILSON. Dry Quenching Equipment Corp., N. Y. *Gas J.* 184, 792-4(1928); cf. *C. A.* 23, 957.—The Sulzer process, the only one com. successful in the U. S., is described and its advantages, as shown by data from an installation at Rochester, N. Y., are discussed. F. S. GRANGER

Use of pulverized fuel in metallurgical furnaces (BLYTHE) 9. Behavior of lignin in the natural decomposition of plants (FISCHER, LIESKE) 11A. The importance of H (HARKER) 18. Pulverized coal for metallurgical work (RENKIN) 9. The H content of blast-furnace gas (OSANN) 9. Pyrohymatomelanic acid (KREULEN) 10. Formation of gaseous and liquid hydrocarbons by the action of steam and alkali on semi-coke (FISCHER, PICHLER) 10. Phosphorescence and autocatalysis during slow combustion (GILL, MARDLES, TETT) 2. The electrical conductivity and refractive index of water from peat marshes (SMORODINTZEV, ADOVA) 14. Apparatus for treating smoke gases with supersaturated steam and water (Brit. pat. 292,118) 1. Turbidimeter for vapors, smoke, etc. (Brit. pat. 293,034) 1. Apparatus for washing smoke from boiler furnaces, etc. (Brit. pat. 292,380) 1. Apparatus for distilling or drying coal, etc. (Brit. pat. 293,147) 1. Gas analysis apparatus for determination of the proportion of inflammable gases in a gas mixture (Brit. pat. 293,125) 1. Fractionation system for separating coal-tar oil constituents or other liquids of different boiling points (U. S. pat. 1,701,988) 13. Washing coal or other solid materials (Brit. pat. 292,487) 13. CS_2 and H or water gas (Brit. pat. 293,172) 18. Standpipe construction for coke ovens, etc. (U. S. pat. 1,700,971) 1. Purification of gases (Ger. pat. 469,316) 13. Chloronaphthalene (Fr. pat. 642,681) 10.

Liquid fuel comprising carbonaceous material suspended in oil. AMERICAN COALINON CORP. Brit. 292,673, March 22, 1927. In processes such as those described in Brit. 149,306 (*C. A.* 15, 431), Brit. 154,605 (*C. A.* 15, 1207), Brit. 160,754 (*C. A.* 15, 2351) and Brit. 165,423 (*C. A.* 16, 484), the oils are thickened to the required consistency (before or after admixt. with the powdered fuel) by oxidation with air.

Oil fuel. JOHN E. HACKFORD. Fr. 643,229, Oct. 29, 1927. Oil is burned by causing a regular current of air to sweep without deflection across a continuously renewed layer or film of oil of about 5 to 7 1/2 cm. width.

Fuel for internal-combustion engines or turbines. R. PAWLIKOWSKI. Brit. 292,116, June 14, 1927. Powdered fuels contain 2 portions, one of which ignites more readily than the other, one portion either being more finely ground or drier or formed of

different material. Among the materials specified are: anthracite, coke residues, peat, powdered wood, fallen leaves or animal carcasses, lignite dust, ash-free coal dust, powdered C_1H_8 , $C_{14}H_{10}$ or sugar.

Fuel for internal-combustion engines. LESTER KIRSCHBRAUN. U. S. 1,701,620, Feb. 12. An emulsion is formed comprising pressure distillate from the cracking of hydrocarbon oils, water and naphthenic acid. U. S. 1,701,621 specifies a fuel comprising an emulsion of hydrocarbon oil and water, cut back with hydrocarbon oil contg. an oil-sol. emulsifying agent such as a naphthenic acid or sulfonic deriv. capable of being expelled from the engine without leaving any substantial residue; the initial emulsion is in the dispersed phase and the oil in the continuous phase.

Combustible fuel emulsion. LESTER KIRSCHBRAUN, HENRY J. ROSSBACHER and GENE ABSON (all to Kirschbraun). U. S. 1,701,622, Feb. 12. An emulsion gel for diln with a hydrocarbon oil is prep'd. by mixing a hydrocarbon oil such as gasoline with a sulfonic acid such as obtained in refining petroleum, and gradually adding and incorporating water in the mixt. to form a gel contg. the water in colloidal suspension.

Fuel briquets. H. LIESENS. Brit. 292,927, June 25, 1927. See Fr. 637,396 (C. A. 23, 501).

Binder for fuel briquets. O. REYNARD and F. F. TAPPING. Brit. 293,135, April 4, 1927. Sulfite cellulose waste liquor is used with bituminous material such as coal-tar pitch, asphaltic pitch or natural bitumen after neutralization of the liquor by NaOH or other alkali and is formed into a paste with finely divided coal, peat, lignite or the like, under pressure and while heated to above 100° . Various other materials such as oils may be added. Brit. 293,136 describes the production of briquets with bituminous binders together with oils and aq. emulsifying agents such as alkali or NH_3 salts or hydroxides or a caseinate, alginate, pectate, tannate, gelatin, glue or acid or neutralized sulfite cellulose liquor or suspensions of cereal materials or potatoes or beets, marine algae, etc.

Carbonizing fuel. HENRI BREUILLÉ and PIERRE BREUILLÉ. Fr. 643,543, April 9, 1927. Fuel is carbonized in compartments in the periphery of a horizontal or slightly inclined tubular furnace, in a chamber heated by the flames from a gas producer, and is stirred in its movement toward the discharging end. The gas products are evacuated as formed in the hollow core of the furnace, and the semi-coke formed is used for heating the gas producer placed immediately below.

Retort (of inverted pear shape) for carbonizing pulverulent fuel in vortical movement. J. N. BAILEY and METROPOLITAN-VICKERS ELECTRICAL CO., LTD. Brit. 293,106, March 29, 1927.

Continuous-working fuel distillation plant with rotary cylinder. EDMUND ROSER. Ger. 469,898, July 7, 1925.

Coal dust fuel plant for annular kilns. CARL ROST. Ger. 470,223, Nov. 25, 1925. Details of arrangement are given.

Hydrogenation. SOCIÉTÉ INTERNATIONALE DES COMBUSTIBLES LIQUIDES. Fr. 33,112, Mar. 5, 1927. Addn. to 618,490. In a process for the hydrogenation of coal, oil, etc., in which a hydrogenated hydrocarbon such as $C_{14}H_{10}$ is added to the crude material, the mixt. of products obtained is brought to a temp. higher than that of the main process, whereby the hydrocarbon is reformed and a further hydrogenation of the products from the crude material takes place.

Hydrogenation of coal. LINDELL T. BATES. Fr. 643,399, Nov. 5, 1927. A liquid fuel is obtained by submitting coal and H to friction and mech. shocks, e. g., in a grinder of the mol. type. The heat liberated by the grinding is used to raise the temp. of the reagents, and the pressure of the H is without importance.

Distillation of coal. FRIEDRICH SENTKE and LUDWIG WACHTER. Ger. 470,216, Mar. 20, 1926. A pressure door for a coking furnace is described.

Suspensions or pastes of coal. I. G. FARBENIND. A. G. Brit. 292,217, Mar. 11, 1927. Finely ground coal is dispersed in alcs. (suitably MeOH or iso-Bu alc.) to which are added basic substances sol. in the alc. such as alkali metal hydroxides, NH_3 , methylamine, pyridine or aniline. Small proportions of mineral oil also may be added and this may be an oil contg. finely divided C such as crude petroleum or brown coal tar oils. The product may be used as a raw material in destructive hydrogenation.

Apparatus (with a reciprocating, air-pervious table) for separating coal from impurities, etc. K. DAVIS (to R. Peale, W. S. Davies and W. S. Wallace). Brit. 292,495, June 20, 1927.

Removing water from peat. G. A. SCHROTER. Brit. 292,661, March 18, 1927. Peat slurry is treated with an alk. coagulating agent such as $Ca(OH)_2$ and liquid is removed by filtering or decanting; dried peat or fiber is added and there may also

be added about 1% of a drying agent such as burnt lime and the mass may be compressed and allowed to dry; a product with less than 10% of water may be thus obtained.

Montan wax. I. G. FARBERIND. A.-G. Brit. 292,298, April 8, 1927. Hot concd. HOAc is used for purifying montan wax which may be previously bleached and deresinified. Glacial HOAc may be used in a Soxhlet app. and various details are given. Cf. C. A. 23, 1253.

Gas from fuel. BAMAG-MEGUIN A.-G. and OSWALD HELLER. Ger. 470,275, April 2, 1926. See Brit. 268,745 (C. A. 22, 1461).

Flue gas. IWAN D. KOSTIN. Fr. 643,440, Nov. 7, 1927. Steam is added to flue gas and condensed again, whereby particles of coal, etc., and harmful gases such as SO_2 are removed.

Water gas. CHARLES W. ANDREWS and HERMAN A. BRASSERT. U. S. 1,701,253, Feb. 5. A mass of carbonaceous residue such as coke is air-blasted to raise its temp., a layer of coal is placed on the residue, steam is passed through the residue to form blue water gas and the heated blue water gas is passed through the coal so that its heat serves to volatilize the volatile matter of the coal; the layer of coal is agitated during the passage of the blue water gas, and the process is continued by alternately air-blasting and then adding coal and passing steam through the residue (the blue water gas passing through the added coal); and the blast air and steam are both preheated by heat derived from the air-blast gases. An app. is described. Cf. C. A. 22, 2656.

Water gas. FRANZ SCHÜSSL. Ger. 470,328, Dec. 3, 1927. The heat accumulator is made up of vertical plates which are sprinkled with water to form the steam.

Water-gas generator. H. S. MOORE and W. S. MOORE. Brit. 292,408, Nov. 10, 1927. The blow gases pass through twin superposed annular recuperative checkered heating chambers surrounding a preliminary distn. retort; each tier of the chamber is divided by vertical division walls into 2 sep. compartments through which the hot blow gases travel, and the 2 sets of chambers are used for carbureting the gas with gas oil or the like. Various structural details are described.

Plant for producing water gas and distillation gas. REGENERATIVE COAL GASIFICATION SYSTEM, LTD., and M. W. TRAVERS. Brit. 292,410, Nov. 11, 1927. A plant as described in Brit. 210,356 is modified by arranging the carbureting chamber in series with the regenerating chamber, so that the whole of the blow gases passes from the regenerating chamber through the carbureting chamber and then through a super-heating chamber.

Coal gas and water gas plant. T. F. CANNING and R. G. CLARK. Brit. 292,235, March 15, 1927. The specified plant comprises a plurality of horizontal or inclined retorts which discharge into a vertical chamber and a producer for supplying gas for heating the exterior of the retorts and chamber under independent control; gases from the chamber are continuously conducted into the retorts. O, air or inert gas may be blown into the chamber through nozzles and connections are provided for supply of superheated steam and oil for carbureting the water gas. Various structural details are described.

Gas producer. IVO SCHWARTZ-ARNYASY. Ger. 469,880, Mar. 12, 1925. The gasifying agent is caused to pass through the fuel descending in zig-zag fashion through the producer.

Gas producer. ANDRÉ LIÉTARD. Fr. 33,177, Oct. 28, 1926. Addn. to 631,717.

Apparatus for controlling the supply of moisture to a gas producer. THE GAS RESEARCH CO. Ger. 469,787, Nov. 15, 1922.

Gas purification. WILLIAM H. HILL and DAVID L. JACOBSON (to Koppers Co.). U. S. 1,700,982, Feb. 5. Humic acid is used to accelerate reactions such as regenerating, by aeration, the Fe sulfide formed in gas purification.

Gas purification. SOC. ANON. LA CARBONITE. Ger. 470,232, Nov. 30, 1927. App. for sepg. and collecting condensable vapor from the gases distd. from wood and peat has a center column contg. a conical rotating member carrying receptacles for the condensate.

Purifying gas. WALTER H. FULWEILER (to U. G. I. Contracting Co.). U. S. 1,700,698, Jan. 29. In using a soln. of a salt such as Na_2CO_3 sufficiently alk. to absorb H_2S as sulfhydrate and thereby rendering the soln. foul but without formation of Fe sulfide, the sulfhydrate is oxidized by passing air through the fouled soln. to form S and regenerate most of the salt used for the gas purification. An arrangement of app. is described. Cf. C. A. 22, 3763.

Purification of gases. THE KOPPERS CO. Ger. 469,021, Mar. 15, 1923. H_2S and other gaseous impurities are removed from gases by treatment with an alk. soln. such

as a soln. of Na_2CO_3 . The soln. may contain in suspension a little freshly prepd. Fe_2O_3 , or a pptd. metallic salt, such as FeSO_4 . Cf. C. A. 23, 961.

Separating hydrogen sulfide and ammonia from gases. I. G. FARBENIND. A.-G. Brit. 292,669, March 21, 1927. In treating coke-oven gases, illuminating gases and the like with solns. such as polythionates, thiosulfates contg. SO_2 , or sulfite-bisulfite solns., a portion of the NH_3 is first sep'd. (suitably as an aq. condensate by cooling the gas) and is added in the latter stages of the washing operations. NH_3 from an external source also may be used. Various details and modifications of procedure are described.

Removing hydrogen sulfide and like impurities from gas. GILBERT E. SEIL (to Koppers Co.). U. S. 1,701,825, Feb. 12. The gas is subjected to the action of bacteria such as *Thiobacillus thioparus* which have the ability to oxidize the impurities. The treatment may be suitably effected in a counter-current app. which is described.

Ascertaining the volumetric proportion of a constituent such as carbon dioxide in combustion gases. HORACE N. PACKARD and EDWIN X. SCHMIDT (to Cutler Hammer Mfg. Co.). U. S. 1,700,852, Feb. 5. Portions of a fluid such as combustion gases are introduced into receptacles of normally equal capacity, before and after removal of a constituent such as CO_2 , and the relative capacities of the receptacles are regulated to maintain equal measurement pressures in them irrespective of variations in proportion of the constituent and a device is provided for continuously indicating the proportion of CO_2 . An app. is described.

Metal parts of gas holders. T. V. MILES and NEWTON, CHAMBERS & Co., LTD. Brit. 292,861, Jan. 3, 1928. Plates, girders, bars, etc., which are subject to corrosion are made from an iron or steel alloy contg. Cu 0.1-3.5%.

Gas holder with a compartment filled with inert gas. H. NIELSEN and B. LAING. Brit. 293,098, March 28, 1927. The inert gas may be heated or mixed with heated gases to prevent the tar seal from thickening in cold weather.

Supplying steam to vertical gas retorts, coke ovens, chemical and tar plants, etc. A. COE. Brit. 293,160, May 14, 1927. A construction is described in which a throttling device is provided for each retort and an indicator shows whether a proper quantity of steam is being supplied.

Coking. C. OTTO & Co. G. M. B. H. Ger. 470,176, June 3, 1925. A coke furnace with vertical heating chambers is given a recurring sequence of 4 heatings.

Coking. C. OTTO & Co. G. M. B. H. Ger. 470,315, Mar. 4, 1928. Addn. to Ger. 454,016. The distd. gases of a vertical chamber furnace are led back to cool the hot coke and are then led to the hot part of the furnace for reheating.

Coke for use in reduction furnaces. P. L. J. MIGUET. Brit. 292,931, June 25, 1927. Fumes and dust from reduction furnaces are mixed with fines of coking coal and the mixt. is coked and used in the reduction furnaces.

Coke for ore smelting. F. HOFMANN. Brit. 293,109, March 29, 1927. Coked coal is briquetted while heated and then converted into semi-coke.

Apparatus for cooling and loading coke coming from the retorts. C. OTTO & Co. G. M. B. H. Fr. 643,320, Nov. 3, 1927.

Coke furnaces. FOUNDATION OVEN CORP. Fr. 643,110, Oct. 8, 1927. To obtain uniform heating in coke furnaces in which the retorts narrow from the pusher the bottom of the furnace comprises a series of openings varying in size according to their position and following the charge to be converted.

Vertical coke oven construction. BAMAG MEGUIN A.-G. Brit. 292,539, June 21, 1927.

Recovery of heat from coke. FRANKFURTER GASGESELLSCHAFT, PAUL F. TILLMETZ and ERNST SCHUMACHER. Fr. 642,865, Oct. 13, 1927. The heat from incandescent coke from retorts or coke furnaces is recovered by inert gases in 3 distinct stages

22--PETROLEUM, LUBRICANTS, ASPHALT AND WOOD PRODUCTS

F. M. ROGERS

Petroleum refining and cracking. Renewed interest in vapor-phase method. A. E. DUNSTAN. *Times Trade and Eng. Supplement* (London) 23, 30-1(1928).—The Gyro, Knox, Leamon and Gray processes are reviewed briefly. In the latter process the vapors pass through a column of heated fuller's earth, removing polymerizable hydrocarbons as a heavy gum capable of use in varnishes and lacquers. The fuller's earth is cleaned by periodical flushing by solvent. The outstanding feature in recent

developments is the increase in use of continuous app., reducing fire risk and vapor losses. In lubricating oils replacement of NaOH by various clays in refining continues to gain. Cracked oil gases contain C_2H_4 , C_2H_6 , C_4H_8 , C_4H_{10} and 1% butadiene, the latter increasing at higher temp. Isopropyl and butyl alc. are produced today, the former finding use as an antiseptic.

E. M. SYMMES

Modern cracking process greatly increases production. G. EGLOFF. *Intern. Fuel Conference* (London) 1928, Paper No. F-12; *Fuels & Furnaces* 6, 1719-21(1928).—The yield of gasoline obtainable from crude oil by simple distn. can be more than doubled by cracking. Gasoline produced by cracking is preferred because of its content of olefin, naphthene and aromatic hydrocarbons, which give it marked anti-knock qualities. Of 15,000,000 gal. of gasoline produced in 1927, 4,000,000 gal. was produced by cracking. Cracking may be of the residual-oil type, the products being gasoline, furnace or Diesel oil, a high-grade fuel oil and gas, or it may be of the non-residual-oil type, the products being gasoline, furnace or Diesel oil, gas and coke. The present-day cracking process is flexible enough to be adaptable to any type of charging stock. Possibilities of cracking low-temp. tar, shale oil, wood tar and vegetable oils are mentioned.

D. F. BROWN

Deparaffining Grozny mazout. ANON. *Neftyanoe Khozyaistvo* 1928, No. 12, 102.—Grozny mazout freezing at 40° was cracked in a tube still at atm. pressure, yielding 2-3% gasoline, whereby the f. p. was decreased by 10° . This light cracking was carried out with the intention of lowering the f. p. of mazout, which is very difficult to handle. The expts. are being continued.

A. A. BOEHLINGK

The spontaneous decomposition reaction of the Bergius process. A reaction common to certain hydrocarbons. EVALD PHYALA. *Tekniska Föreningens i Finland Förhandlingar* 48, 221-6(1928).—Studies were made on the distillation of certain oils from the Baku region with a high paraffin content. A special column was used which made possible a slow heating, thereby providing for a delicate control. The first cracking begins at 380° to 410° , and the second at 410° to 450° . The products are gases, and benzine and kerosene fractions. The process can be applied to naphtha residues with a high f. p., which can thereby be converted into liquid fuels. It is also suggested that it might be applied to the tars obtained in turpentine distns., as well as to used oils from transformers and the like. It is further suggested that the liquefaction of coal in the Bergius process is due to a similar cracking of the hydrocarbons in the coal. Hence, carbonized material such as wood charcoal, coke, or peat coke cannot be liquefied.

HANS C. DUUS

Drying of oil transformers. L. SCHÄTZ. *A E G-Mitt.* 1929, 37-8.—In the A E G process the oil as received from the refinery is dried with nitrogen. The oil is placed in a vacuum tank equipped with a circulating pump, and N from a liquid-air plant is blown into the high-pressure side of the circulating line. When the oil gets back into the vacuum tank the N bubbles expand, and the water distils into them. The wet N is pumped off. When test shows that the resistance has become const. the oil is removed, with the same quality as it had originally. The old process involved heat, and caused the oil to darken, and to increase in acid and tar numbers. To preserve the quality of the oil, the transformer core and windings are thoroughly dried and cooled before the oil is added. The removal of air bubbles by prolonged vacuum treatment completes the process. Transformers so dried need no further treatment in the field, and the oil retains its quality.

BENJAMIN MILLER

The adaptability of cold emulsions. With some simple tests. F. W. VALLÉ-JONES. *Munic. Eng. Sanit. Record* 81, 623(1928).—Advantages and suggested uses of cold bitumen emulsions are given. The tests mentioned are the blotting paper test for moisture content; drying on glass rods to compare thickness, adhesiveness, and tackiness, and detg. with the thumb and index finger the ductility after drying.

C. H. BADGER

Continuous treatment of kerosene. YU. BOGOSLOVSKII. *Neftyanoe Khozyaistvo* 1928, No. 12, 33-7.—The treating method introduced by G. Ya. Torosyan is based on the counter-current principle. A closed container with a conical bottom is charged continuously with kerosene distillate through a pipe connected through the wall on the lower part; the sulfuric acid is admitted through a pipe terminating close to the inlet pipe for kerosene inside of the container, the mixt. being agitated with air. The treated kerosene is displaced gradually by fresh distillate and leaves the agitator to enter an open tank divided by a partition into two parts. The partition reaches the bottom but leaves at the top free space for the kerosene to flow over into the second part; the air bubbles are thus liberated. The kerosene enters further a set of four closed settling tanks arranged in parallel. Special attention must be paid to this part

of the procedure, where most of the suspended sludge has to ppt.; when this is carried out properly it simplifies the following operations, assuring at the same time a good final product. The sludge is continuously withdrawn through the bottom, the kerosene through the top. A caustic treatment in the next container, a settling operation and a second caustic treatment are made, giving finally a product of 0.8180-0.820 sp. gr., 28.5-32.0° flash and 210-300 mm. color (Stammer scale). The treatment requires 0.38-0.35% of H_2SO_4 and 0.11-0.12% caustic (calcd. on solid NaOH). The distillates treated contained 0.44-0.46% naphthenic acids (from Balakhanui crude) and 0.24-0.27% naphthenic acids (from Surakhanui crude). A. A. BOEHTLINGK

Effect of anti-knock materials on the speed of initial uniform movement of the flame in hydrocarbon-air mixtures. YŪZABURŌ NAGAI. Tokyo Imp. Univ. *Proc. Imp. Acad.* 4, 525-8(1928).—The effect of SeEt_2 , SnMe_4 , and PbMe_4 on the speed of initial uniform movement of the flame in a mixt. of air and hydrocarbon vapor has been studied. The hydrocarbon consisted of a mixt. of about 43% dimethylcyclopentane and 57% isoheptane. The speeds of the initial uniform movement of the flame are distinctly lowered by the addn. of the anti-knock materials, the speed-concn. (of hydrocarbon) curve being lowered more and more with the increase in concn. of the anti-knock materials. When the concn. of SnMe_4 or PbMe_4 reaches 1%, the curve is not lowered by further addn. of these compds.; the concn. of SeEt_2 to produce the same result is about 2%. C. J. WEST

Improvements in the separation of naphthenic soaps. V. SHIPEROVICH AND V. GURVICH. *Neftyanoe Khozyaistvo* 1928, No. 12, 26-33.—The kerosene alkali sludge contains 10-25% of naphthenic soaps, depending on its origin and the amount of caustic used in the neutralization process. Two vertical towers (old boilers could be used) have the upper part equipped for burning gas and the lower for evapg. the water from the sludge through the heat generated by above gas burners kept at the required temp. by admission of additional air. The sludge enters the upper part of the first tower, where it is atomized and mixed with the burning gas, losing 25-40% of its water. The concentrate leaves through the bottom, is collected in a receiver and sent through the second tower of identical construction and is finally concd. to 40% in naphthenic acids, which are then salted out. A fan is provided to create the draft needed to move the burning gases and steam. Various calcns. such as heat calcn., gas consumption, etc., are given. A. A. BOEHTLINGK

Lubricating oil and lubrication. WALTER VOGL. *Oesterr. Chem.-Ztg.* 31, 211-2 (1928).—Many useful formulas are available when lubrication is complete, but the exact specification of an oil where the lubrication is only partial and where there are great variations in pressure and temp. is not practicable at present. E. C. B.

New high vacuum distillation plant for lubricating oils of the "Azneft." B. VLAŠENKO. *Neftyanoe Khozyaistvo* 1928, No. 12, 50-70.—Mazout preheated by the bottoms from the last still in two heat exchangers enters the first vacuum shell still, the stripped oil passing gradually all 20 stills by gravity, the last ones being arranged in cascades with approx. 13-cm. drop. The oil having a temp. of 150° in the first still is gradually heated up to 360° in the last still. The stills are provided each with 4 dephlegmators arranged in series; the last is connected with a barometric water spray condenser (the use of this condenser can be discontinued if necessary). Each dephlegmator has an air-cooled condenser attached to the bottom connecting a barometric tube through which the oil cut is withdrawn (80 cuts are obtained). The last dephlegmators (from each still) have a connection with the main vacuum line which terminates in a surface condenser with 360 brass pipes cooled by water and condensing the steam and oil vapors, the gases pass then through a barometric water-jet condenser and a water-jet vacuum pump. A vacuum of 250-300 mm. Hg is maintained in the stills and the steam used for carrying the oil vapors is superheated to 250°. The capacity of this plant is 850-870 metric tons of oil in 24 hrs. Very complete data on all parts of the equipment are given, including the strength of still shells, diam. of piping, etc. A. A. BOEHTLINGK

The alundum crucible in the determination of carbon in crankcase oil. PAUL V. MCKINNEY. *Chemist-Analyst* 18, 21(1929).—The C residue of an oil as detd. by the Conradson method has little relation to the amt. of residue accumulated in the crankcase of an automobile. Difficulty encountered in filtration of this residue can be overcome by using an alundum crucible. If water has been detd. in the oil, use the residue remaining in the flask. Otherwise take 10 g. of the oil and 100 g. of light petroleum ether. Filter through an alundum crucible, wash with 25 cc. of the ether, dry, weigh, ignite and weigh again. W. T. H.

Wood distillation. Modern charcoal burning. K. S. C. BONE. *Times*

and Eng. Supplement (London) 23, 30(1928).—Small waste wood from woodworking factories is satisfactorily carbonized in thin layers in continuous retorts, giving the usual volatile products and flake charcoal for the manuf. of black powder, NaCN, KCN and insulation. This process is used only in England. The Suida process for direct extrn. of 98% HOAc from crude pyroligneous acid is receiving close attention.

E. M. SYMMES

Bacterial oxidation of crude oils (TAUSON) 11C. Manipulation of the Engler viscometer (ERK) 2. Naphthenic acids. VIII. Polymethylene rings of naphthenic acids in Japanese petroleum (KUWATA) 10. Device for gravity separation of oil from water, etc. (Brit. pat. 293,091) 1. Colloidal dispersions (Brit. pat. 292,965) 13. Treating gasoline, etc., to prevent evaporation losses (U. S. pat. 1,701,870) 13. Filtering material (U. S. pat. 1,702,104) 18. Separation of solids from liquids (Fr. pat. 643,693) 13. Emulsifying agents and emulsions (Fr. pat. 33,278) 13. Chloronaphthalene (Fr. pat. 642,681) 10. Washing benzene, alcohol, etc. (Fr. pat. 643,500) 13.

Petroleum oils. FRANK BUREAU. Fr. 642,674, Mar. 22, 1927. Paraffin is removed from petroleum oils by submitting the oil, preferably dild. with gasoline, to a refrigeration which ppts. the paraffin and afterwards filtering through ultra-filters.

Refining petroleum oils. F. HOFMANN and W. STEGEMANN. Brit. 292,932, June 25, 1927. Gaseous or liquid HF, with or without addition of metal halides, is used. Brit. 292,933 specifies a similar process for refining oils derived from coal.

Breaking up crude petroleum emulsions. SAMUEL W. COLE. U. S. 1,700,627, Jan. 29. Metallic Na and CaC₂ are added to effect reaction with the water present and sepn. of oil and water into layers.

Petroleum still. ARTHUR E. PEW, JR. (to Sun Oil Co.). U. S. 1,700,709, Jan. 29. Oil is supplied to an inclined vaporizing pan within a still and a reticulated cover is placed over this pan to restrict foaming.

Hydrocarbons from bituminous sand. COMPAGNIE MINIERE DES PETROLES DE MADAGASCAR. Fr. 643,514, Apr. 7, 1927. Hydrocarbons are extd. from bituminous sand or sandstone by treating the material, ground if necessary, to the action of a salt soln. of a density appreciably higher than that of the bitumen, the operation being carried out at about 100° with stirring. The material may be given a preliminary treatment with oil coming from a previous distn. of hydrocarbons already extd.

"Cracking" hydrocarbons. GASOLINE PRODUCTS CO., INC. Fr. 642,818, Sept. 9, 1927. See Brit. 290,996 (C. A. 23, 1260).

Cracking hydrocarbon oils. WALTER J. PERELIS (to Shell Development Co.). U. S. 1,701,477, Feb. 5. Feed stock is sepd. into more and less volatile fractions; the less volatile constituents are subjected to cracking and a heavier fraction is sepd. from the more volatile products of the cracking; this heavier fraction is mixed with a heavier fraction of the more volatile constituents of the feed stock and this mixt. is subjected to a sep. cracking. An arrangement of app. is described.

Treating hydrocarbon oils with decolorizing clay. FRANK W. HALL (to Texas Co.). U. S. 1,700,479, Jan. 29. Clay which becomes exhausted from treating light-colored oil is partially revived and then used for treating darker oil.

Lining cracking coil or condenser tubes, etc., for treating hydrocarbon oils. W. E. TRENT (to Trent Process Corp.). Brit. 292,535, June 21, 1927. A lining is formed of material such as porcelain, earthenware or a non-metallic paint or other material that has a selective affinity for water and thus causes the formation of a film of water, which prevents formation of C deposits.

Refining mineral oil. HENRY BLUMENBERG, JR. U. S. 1,700,347, Jan. 20. Mineral oil or its products such as "cracked gasoline" are treated with HCl and the latter is decomposed electrolytically in the presence of Al.

Vacuum distillation still for mineral oils, etc. HUGO REIK. Austrian 111,850. Aug. 15, 1928.

Carbonizing heavy oil residues. STANDARD OIL CO. OF IND. Brit. 293,231, Sept. 9, 1927. Heavy residues, such as those produced by distn. of petroleum oils to bottoms of 10%, or less the quantity of the original crude oil, are deposited as a coating on a nickeliferous or chromiferous surface and heated to drive off volatiles and leave a coke layer which is mechanically removed. Monel metal and other specified alloys may be used in making the app. (details of which are described).

Distilling apparatus for oil shale. MAGNUS R. KRAUL. Can. 286,216, Jan. 8, 1929.

Oil-shale retort. MAGNUS R. KRAUL. Can. 286,217, Jan. 8, 1929.

Oil gas. C. CHILOWSKY. Brit. 293,007, Oct. 27, 1926. In gasifying oils by atomization and partial combustion at a temp. above 600° and passage of the resulting products and excess vapors over a catalyst in a heated container, the feed of oil to the atomizer is periodically interrupted to allow the continuous supply of spraying air to remove C deposits by combustion. Superheated steam also may be added. Brit. 293,008 describes an app. for carrying out similar processes.

Apparatus for production of oil gas. FRANK T. NEWITT, SIMON H. LAPLANT and LEWIS I. TURNER (to L. T. N. Mfg. and Development Co.). U. S. 1,701,892, Feb. 12.

Purifying gasoline, etc. SILICA GEL CORP. Brit. 292,231, March 14, 1927. Gasoline and similar hydrocarbon oils are purified by passing them at an elevated temp. (suitably about 120° or higher) through an adsorbent with pores of such size that the material will absorb H₂O vapor to the extent of 21% or more of its own wt. when in equil. with H₂O vapor at 30° and a partial pressure of 22 mm. Hg. The adsorbent may be silica gel as described in Brit. 136,543 and Brit. 195,055 (C. A. 17, 3555) and it may be impregnated with metallic oxides such as those of Cu or Fe not exceeding 1% the wt. of the adsorbent and with about 5% H₂SO₄ to sep. gum-forming constituents. An arrangement of app. is described.

Apparatus for combining natural gas and hydrocarbon oil for the production of gasoline. LESTER S. WORTHINGTON (to C. L. Thompson). U. S. 1,700,556, Jan. 29.

Device for separating water and sediment from gasoline. DAVID SAMIRAN (one-half to Phillips Melville). U. S. 1,700,811, Feb. 5.

Emulsions. BERTHOLD REDLICH. Fr. 643,055, Oct. 27, 1927. Emulsions of substances such as oil in water are obtained by mixing the oil with a solid finely powder and purified substance with large absorptive properties such as SiO₂, clay, oxide of Fe, etc., and mixing with water. The solid material settles out, leaving a pure emulsion.

Bituminous emulsions. ASPHALT COLD MIX, LTD., F. LEVY and L. G. GABRIEL. Brit. 292,251, March 17, 1927. Material such as Mexican asphalt in molten or liquid form is treated with 2-5% of an emulsifying agent comprising fatty acid such as oleic acid and a dil. soln. of an alkali silicate or borate. Several examples are given, borax or Na perborate may be used.

Emulsifying tar, etc. WILFRED E. BILLINGHAM. U. S. 1,700,581, Jan. 29. In emulsifying tar, bitumen, creosote, petroleum and like materials, a concd. emulsion is first prepd. from a small quantity of the material and this is then used as an emulsifying material for emulsifying larger quantities of the same material.

Wire-drawing lubricant. CHARLES V. IREDELL (to The Canadian Westinghouse Co., Ltd.). Can. 286,472, Jan. 15, 1929. A wire-drawing lubricant consists of powder graphite suspended in a gelatinous medium composed of agar-agar boiled with water to a jelly-like consistency to which has been added 0.75-1.0% by vol. of Turkey red oil.

Regenerating lubricants such as those from marine or internal-combustion engines. SWAN, HUNTER & W. RICHARDSON, LTD., and H. J. YOUNG. Brit. 292,300, April 12, 1927. Used lubricating oils contg. corrosive impurities such as H₂SO₄ or metallic sulfates are regenerated by intimate contact with a non-ferrous metal or alloy which produces reaction products without the same deleterious effects. Zn, Al, Mg or their alloys with each other or with Na or Ca may be used. An app. is described.

Lubricating-oil rectifier suitable for use on internal-combustion engines. FRANK E. CARTER. U. S. 1,701,490, Feb. 12.

Filter for oils suitable for use in connection with automobile engines. CHARLES C. BLACKMORE. U. S. 1,701,556, Feb. 12.

Combined oil and air filter suitable for use on internal-combustion engines. WILLIAM C. DEWITT. U. S. 1,702,156, Feb. 12.

Purifying wood-distillation gases. EMIL PIRON (to Piron Coal Distillation Systems). U. S. 1,701,054, Feb. 5. Tar and tar-forming constituents are removed by washing with a soln. of H₂SO₄ while maintaining the temp. above the condensing point of the "nontar" vapors. An arrangement of app. is described.

23—CELLULOSE AND PAPER

CARLETON E. CURRAN

Consideration of the change in colloid structure of natural cellulose by solution and ming. O. FAUST. *Kolloid Z.* 46, 329-36(1928).—Different theories of the colloidal structure of cellulose are mentioned and discussed. To bring cellulose into soln. it is

first necessary to change the cell structure as the compact natural product is insol. The ripening of cellulose in alkali is accompanied by a shortening of the cell and a decrease in particle size, making it more easily reacted upon. The increased soly. of cellulose xanthate is due to a deep-seated deorientation and deformation of the previously well oriented micelli. The increased hydration then gives the micelle a more spherical shape. Too marked a destruction of the bonds in the micelle detracts from the spinning quality of the artificial silk.

L. F. MAREK

The fundamental principles of rayon production. THOMAS F. HUGHES. *Textile Colorist* 51, 89-92(1929).—"A usable spinning solution," a fitting device or contrivance for forming and withdrawing the threads and gathering them after they have coagulated or hardened," and "a suitable coagulating medium for fixation of the filaments" are necessary for producing rayon properly.

RUBY K. WORNER

The behavior of nitrocellulose gels in polarized light (PHILLIPS) 2. The chemical industry in Sweden (ANON) 13. Negative catalysis in slow and induced reactions (DIAR) 2. Immunized and amidated cotton (TROTMAN) 25. Recovery of volatile products (Fr. pat. 643,322) 13. Carbonaceous product from electric furnace treatment of carbonized lignin residues (U. S. pat. 1,701,272) 18. Polysaccharide degradation (Can. pat. 286,179) 28. Drying rubber articles (Brit. pat. 293,061) 30. Recovery of dissolved or suspended substances (Fr. pat. 643,102) 13. Photometric apparatus for inspection and sorting of paper, cardboard, etc. (Brit. pat. 292,474) 1.

Cellulose. F. G. P. LEO. Brit. 293,219, Aug. 15, 1927. The sap of the banana plant is used in the obtainment of cellulose from materials such as bamboo, sugar cane or megass, maize straw and stalks, cereal straws, jute, linen, cahete, cana, tabua, reed, papyrus, banana fiber, *Hedychium coronarium*, stamens of palm leaves, woods and grasses. The banana sap is allowed to act for several days.

Cellulose. GESELLSCHAFT FÜR MECHANISCHE ZELLULOSE M. B. H. Fr. 33,145, Mar. 14, 1927. Addn. to 579,237. Freshly cut grasses, reeds, bamboo or waste from banana plants are cut into little pieces, ground dry in a mill, washed with water and ground in a hollander. The product is used for the manuf. of cellulose.

Cellulose. JOAQUIN JULIO DE LA ROZA, SR. Can. 286,198, Jan. 8, 1929. Vegetable fiber is treated with dil. H_2SO_4 soln., the liquor is sepd., and the fiber is stored for a period substantially longer than the period of treatment with the acid. The fiber is washed with hot water, and then treated with an alk. soln. (KOH or NaOH) at a temp. above 100° and a pressure above atm.

Cellulose from graminaceous plants. GIACOMO ROSSI and UMBERTO GENNARO. Fr. 633,384, Nov. 5, 1927. Cellulose and textile fibers are prepd. from graminaceous plants or, in general, those rich in SiO_2 , by removing the SiO_2 by a cold treatment with alkali, washing or neutralizing and submitting the plants thus treated to a microbiological and enzymic retting by a known method, e. g., by the action of aerobic pectic enzymes in a current of air.

Cellulose from wood. E. HAGGLUND. Brit. 292,534, June 21, 1927. In order to obtain cellulose of good strength and in good yield from woods such as pine and beech, they are boiled with alkali just long enough to sep. the fiber and then treated with Cl by which HCl and lignin chloride which is sol. in water and alkali are produced. "Chloride of lime" is then added and reaction effected with stirring and the material is washed with water and alkali. The treatment with Cl and hypochlorite may take place in stages.

Treatment of cellulose materials. ARNOLD PRINT WORKS. Fr. 642,819, Sept. 9, 1927. Cellulose materials such as cotton are impregnated with a NaOH soln., allowed to dry, and in the dry state are superficially treated either all over or in selected parts of its surface to produce a design, with a soln. of cuprammonium, which may be in the form of a paste contg. dissolved cellulose.

Saccharifying cellulose. COMMERCIAL ALCOHOL CO., LTD. Brit. 292,918, June 25, 1927. Cellulosic material is decomposed with strong acid (preferably HCl) and saccharified by aid of steam or mixts. of steam with inert gases. The preliminary decompn. with acid is effected at such a low temp. (preferably below 0°) that a premature sugar formation is avoided and the decomposed material is then passed into a saccharification vessel without contact with the atm. An app. is described. Brit. 292,919 also relates to a similar procedure in which HCl gas may be used after treating the material with HCl soln.

Preparing cellulose for nitration. GEORGE A. RICHTER, MILTON O. SCHUR and ROYAL H. RASCH (to Brown Co.). U. S. 1,701,543, Feb. 12. Fibers such as those

of alpha-cellulose wood fiber are coated with a cellulose deriv. (suitably nitrocellulose) and permeated with regenerated cellulose.

Nitrating cellulose. A. P. H. DESBOROUGH, W. T. THOMSON and R. S. G. KNIGHT. Brit. 293,190, June 24, 1927. Cellulosic material in sheet or layer form is passed onto a roll mounted over a shallow bath into which nitrating acid is fed at a rate corresponding to its rate of absorption. An app. is described.

Nitrocellulose. VICTOR PLANCHON. Fr. 643,454, Nov. 8, 1927. Wood pulp is nitrated in sheets placed astride parallel sticks and kept apart by projections formed by passing the sheets through a stamping machine.

Nitrocellulose. GEORGE A. RICHTER, MILTON O. SCHUR and ROYAL H. RASCH (to The Brown Co.). Can. 286,079, Jan. 1, 1929. Wood pulp high in α -cellulose is beaten to form nitration tissue, and this tissue is nitrated and dissolved in a nitrocellulose solvent. The tissue suitable for conversion into nitrocellulose possesses the following characteristics: α -cellulose content over 93%, "soda solubility" (in 7.14% NaOH) under 12%, copper number under 2.5, ash under 0.4%, resins under 0.4%.

Cellulosic composition suitable for nitration or other esterification. GEORGE A. RICHTER (to Brown Co.). U. S. 1,700,595, Jan. 29. Mercerized cellulose fiber carrying a deposit of regenerated cellulose is suitable for producing nitrocellulose of less than usual viscosity. U. S. 1,700,596 specifies a mixt. of mercerized and unmercerized fiber, which is also suitable for similar use.

Cellulose esters. HENRY DREYFUS. Fr. 642,329, Sept. 16, 1927. Cellulose substances are rendered more easily esterified, particularly acetylated, by a preliminary treatment with HCOOH, preferably of 70-90%. The cellulose may be treated with AcOH without sepn. of the HCOOH. Cf. C. A. 23, 980.

Cellulose esters. I. G. FARBENIND. A.-G. Brit. 292,929, June 25, 1927. The process described in Brit. 284,298 (C. A. 22, 4815) for varying the soly. of cellulose esters of higher aliphatic acids such as cellulose distearate or dilaurate is modified by use of an acid halide such as P oxychloride or lauryl chloride as a solubilizing reagent.

Cellulose esters. FABRIEK VAN CHEMISCHE PRODUCTEN. Fr. 642,706, Mar. 24, 1927. Stable cellulose formates are prepd. by partially formylating cellulose with a mixt. of concd. H.COOH and ZnCl₂, after which the H.COOH is sepd. and complete formylation is carried out by a mixt. of concd. H.COOH, HCl and ZnCl₂ at a temp. below 0°. The preliminary formylation may be repeated and other salts having a similar reaction may be used. The final formylation may be carried out with other active catalysts such as HCl alone or by SO₂Cl₂, POCl₃ mixed or not with salts such as ZnCl₂ or CaCl₂. Instead of completing the formylation, other esters such as the acetate, propionate, etc., may be made.

Cellulose ester. ERNESTO ORIOLI (to the Ruth-Aldo Co., Inc.). Can. 286,539, Jan. 15, 1929. Sulfuric esters of cellulose contg. up to 3% of combined sulfuric acid are treated with a mixt. of fatty acid anhydride and fatty acid; e. g., 100 g. of sulfuric ester is pressed after neutralization by washing with benzene or other suitable solvent of acetic acid, so as to represent 200 g. of moist substance and is introduced into 240 cc. of Ac₂O and 200 cc. of AcOH. The temp. rises and after 20 to 25 min. a limpid soln. is obtained. The triacetate formed may be pptd. or be subjected in soln. to further treatment.

Cellulose sulfate. ERNESTO ORIOLI (to the Ruth-Aldo Co., Inc.). Can. 286,538, Jan. 15, 1929. Approx. 100 g. of cellulose contg. 2% moisture is treated with a mixt. of approx. 4 g. H₂SO₄, 30 g. Ac₂O and 300-500 g. glacial AcOH, and after several hrs. the product is squeezed and washed with a neutral org. solvent, and then dried *in vacuo* at low temp.

Cellulose acetate. CHRISTIAN EBERT and THEODOR BECKER (to I. G. Farbenind. A.-G.). U. S. 1,701,229, Feb. 5. Cellulosic material such as cotton is treated with an acid anhydride such as Ac₂O in the presence of thionyl chloride or other suitable halogenide of sulfurous acid and a heavy metal salt such as ZnCl₂ or Cu₂Cl₂ and hydrolyzation is effected to obtain a cellulose acetate sol. in acetone or EtOAc.

Cellulose acetates. NAAMLOOZE VENNOOTSCHAP NEDERLANDSCHE KUNSTZIJDE-FABRIEK. Brit. 292,398, July 20, 1927; Fr. 642,909, Oct. 22, 1927. "After-hydrolysis" of cellulose triacetate is effected by use of a H₂SO₄ at 20° and the hydrolysis is prolonged to a point at which the viscosity of the product is 1.5 times that of the original materia

Sausage casing made of regenerated cellulose. SOC. ANON. LA CELLOPHANI. Brit. 292,582, June 24, 1927. A sheet of regenerated cellulose is formed into a tub by autogenous welding along 2 overlapping edges which may be effected by treatin the edges with a solvent such as concd. ZnCl₂ soln. and pressing the edges together.

Pyroxylin compositions. ROBERT H. VAN SCHAAK, JR. (to Van Schaack Bro

Chemical Works). U. S. 1,702,181, Feb. 12. Compns. which are used as *lacquers*, etc., comprise pyroxylin together with dibutyl phthalate, methyl-isobutyl carbinol and the acetate of methyl-isobutyl carbinol.

Esters of hexyl alcohol. HOYLAND E. YOUNG (to Van Schaack Bros. Chemical Works). U. S. 1,702,188, Feb. 12. Esters of aromatic acids such as *o*-phthalic acid, terephthalic, benzoic, salicylic or phenylacetic acid with methyl-isobutyl carbinol are made by the usual esterification methods. They are suitable for use in pyroxylin compns.

Hexyl esters. ROBERT H. VAN SCHAACK, JR. (to Van Schaack Bros. Chemical Works). U. S. 1,702,180, Feb. 12. Methylisobutylmethyl esters of propionic, oxalic, citric, valeric, palmitic, stearic, oleic, tartaric, lauric, succinic or other aliphatic acids b. above 130° are formed by various described methods. They are suitable for use in *pyroxylin lacquers*.

Mat effects on "viscose silk." B. BORZYKOWSKI (to Borvisk Syndicate, Ltd.) Brit. 292,627, June 24, 1927. The process described in Brit. 273,647 (C. A. 22, 2056) is modified by using as an addn. to the viscose org. substances contg. N such as casein or albumin, or inorg compds. such as Ba(OH)₂. The product has a luster resembling that of natural silk.

Treatment of artificial silk. DEUTSCHE ZELLSTOFF-TEXTILWERKE G. M. B. H. Fr. 642,798, July 5, 1927. Artificial silk made on centrifugal machines is submitted to all the necessary baths for its final treatment as a mass or mounted on bobbins or perforated supports in the manner described in Fr. 636,264 or 636,265.

Artificial silk from cellulose acetate. NAAMLooZE VENNOOTSCHAP NEDERLANDSCHE KUNSTZIJDEFABRIEK. Brit. 291,067, May 23, 1927. Cellulose acetate "silk" of reduced luster is obtained by introducing water vapor, as such, into the spinning cell or treating the threads formed with water vapor in a second cell. Cf. C. A. 23, 982.

Device for use in spinning artificial silk. E. WAGNER. Brit. 292,216, March 11, 1927.

Apparatus for dry-spinning of artificial silk. M. KLEIN (to Ruth-Aldo Co.). Brit. 292,561, June 22, 1927. Brit. 292,608 also relates to a modified construction of similar app.

Acidproof reel for winding artificial silk in hanks, etc. HANS C. STUHLMANN. U. S. 1,701,131, Feb. 5. Structural features.

Spinning boxes for artificial silk manufacture, etc. BRITISH THOMSON-HOUSTON CO., LTD., A. P. YOUNG, H. W. H. WARREN and R. J. CHAPMAN. Brit. 293,060, Jan. 2, 1927. Spinning boxes are made of woven fabric impregnated with insulating material such as a synthetic resin (suitably that produced from cresol and CH₂O). Various details of manuf. are described.

Ammonia recovery from dilute solutions obtained in artificial filament manufacture. HUGO HOFMANN (to American Bemberg Corp.). U. S. 1,701,265, Feb. 5. The liquor emanating from the manufacture of filaments by the cuprammonia process is treated with a Mg compd. such as MgCl₂ or MgSO₄ and with a phosphate, e. g., Na₂HPO₄, in order to effect pptn. of the NH₃.

Ammonia recovery from waste waters resulting from artificial filament manufacture by the "cuprammonia process." HUGO HOFMANN (to American Bemberg Corp.). U. S. 1,701,110, Feb. 5. The waste waters are treated with a Mg salt such as MgCl₂ and with Na phosphate, the ppt. is pressed to enrich its ammonia content, and the ammonia is sepd. from the Mg phosphate.

Sulfite liquor. MAX G. T. SCHROEDER. Can. 286,048, Jan. 1, 1929. Sulfite liquor and pure CO₂ are produced by extg. a gas contg. SO₂ with water under pressure for the recovery of SO₂ from said gas, acting with the SO₂ soln. thus obtained on a decomposable carbonate, collecting the CO₂ gas and washing the same to remove the SO₂ still admixed therewith.

Causticizing waste liquor from pulping process. JOHN S. BATES, HARRIS S. CHALMERS and PERCIVAL C. AUSTIN. Can. 286,169, Jan. 1, 1929. Alkali metal carbonate green liquor of kraft or soda pulp processes is treated in successive portions first with the sludge remaining from treatment of a previous portion and contg. Ca(OH)₂ in amt. less than the mol. equiv. of the Na₂CO₃ present in the portion with substantially complete conversion of the Ca(OH)₂, and then is treated with fresh Ca(OH)₂ in amt. substantially mol. equiv. to the original Na₂CO₃ content of the liquor. The sludge resulting from the second treatment and contg. unconverted calcium hydroxide serves for the preliminary treatment of the succeeding portion; thus the excess of Ca(OH)₂ used in treatment of the first portion is in effect transferred to successive

portions and represents the total excess of lime used in treatment of an indefinite amt. of liquor.

Paper making. KARL W. VOLLE. Ger. 470,171, Aug. 29, 1926. A device for raising the sieves of rotary cylinders, washing drums and pressure wheels in machines for paper and pulp manuf. is described.

Paper making. GEORGE A. RICHTER (to The Brown Co.). Can. 286,458, Jan. 15, 1929. A substantially uniform mixt. of mercerized cellulose fiber and beaten unmercerized cellulose fiber is run off on a paper machine and the paper nitrated.

Cellulose composition for esterification. GEORGE A. RICHTER (to The Brown Co.). Can. 286,459, Jan. 15, 1929. Mercerized cellulose fiber is run out on a paper machine into thin sheets. The paper so formed is loose and bulky, but these characteristics may be made less pronounced by incorporating a small proportion of unmercerized fiber, either beaten or unbeaten. The paper is then satd. with a cellulose xanthate soln. of sufficient cellulose concn. to yield 1-5% regenerated cellulose, when regenerated in the paper. The paper is then partially dried and immersed in a cellulose-regenerating reagent, *e. g.*, a soln. of NaHSO_4 and H_2SO_4 to regenerate the cellulose *in situ* in the paper. The paper is washed, steeped, if desired, in a sulfur-removing reagent, *e. g.*, a Na_2S soln., again washed and finally dried. The dry paper is calendered or super-calendered to improve its suitability for nitration.

Paper-making apparatus. ALONZO ALDRICH and EARL E. BERRY (to Beloit Iron Works). U. S. 1,700,301, Jan. 29. Structural features

Paper-making apparatus. RICHARD COLLINS. U. S. 1,701,226, Feb. 5. Structural features.

Paper-making apparatus. EUGENE O'BRIEN. U. S. 1,702,129, Feb. 12.

Paper-making apparatus. PAUL PRIEM (to American Voith Contact Co.). U. S. 1,702,131, Feb. 12.

"Consistency meter" for paper-making apparatus. WILBUR L. MERRILL (to General Electric Co.). U. S. 1,701,331, Feb. 5.

Suction roll for paper-making apparatus. WILLIAM H. MILLSPAUGH. U. S. 1,700,442, Jan. 29. Structural features.

Suction roll with internal stationary suction chamber for paper making and like machines. ALOIS DANNINGER. Austrian 111,746. Aug. 15, 1928.

Treating fiber of non-coniferous origin. GEORGE A. RICHTER (to The Brown Co.). Can. 286,460, Jan. 15, 1929. Sulfite fiber of non-coniferous origin is digested in a soln. of NaOH at a temp. below 70° , and then washed free of alk. soln. The treated fiber is softer and has a higher tear resistance and is better suited for the preparation of cellulose derivatives than the untreated fiber.

Treatment of ground-wood pulp. GEORGE A. RICHTER (to The Brown Co.). Can. 286,461, Jan. 15, 1929. Ground-wood pulp is digested in a 4-10% soln. of NaOH at a temp. below 70° , and the digested pulp is then washed free of alk. soln. The process is similar to that of the preceding patent. The pulp has an original pentosan content of 10 to 14% and is treated until such content is reduced to 5-7%.

Treating paper-making fiber. GEORGE A. RICHTER (to The Brown Co.). Can. 286,462, Jan. 15, 1929. Previously liberated fiber of the character of hemp and jute is digested in a 4-10% soln. of NaOH at a temp. below 70° , and the digested fiber is then washed free of alk. soln. The original fiber has a pentosan content as high as 12% and the fiber is treated until such content is reduced to about 4 to 6%. The process is similar to that of pat. 286,460 (2nd preceding pat.).

Paper bleaching. GEORGE A. RICHTER and MILTON O. SCHUR (to The Brown Co.). Can. 286,463, Jan. 15, 1929. Wood chips are digested in a NaHSO_3 liquor having a combined and a free SO_2 content of about 4% each. The pulp is then treated at a stock density of 10% with Cl water contg. about 1.5-4% Cl based on dry fiber wt. The treatment is at room temp. and for about $1\frac{1}{2}$ hr. The pulp is washed and bleached at a stock density of about 10% in a soln. contg. 5-10% NaClO or $\text{Ca}(\text{ClO})_2$ and about 0.5-2% NaOH based on dry fiber. The treatment is at room temp. or a temp. of 100° to 110° F. until the fiber is brought to substantial ultimate whiteness. The treatment does not injure the paper-making characteristics.

Beater and associated apparatus for treating paper pulp. LLOYD T. MURPHY. U. S. 1,702,230, Feb. 12. Structural features.

Pulp-fiber-cleansing apparatus. MATHIAS DEZURIK. U. S. 1,700,925, Feb. 5.

Bleaching paper pulp. JOHANNES RUTHS (to Ruths Accumulator Aktiebolag). U. S. 1,700,647, Jan. 29. Steam generated in uniform quantity is accumulated in a storage container and substantially the entire volume of stored steam is then supplied to a bleaching hollander contg. pulp.

Pulp refining "engine" of the conical type. W. G. FRASER. Brit. 292,228, March 14, 1927. Structural features.

Apparatus for coloring, sizing or impregnating of paper webs. I. G. FARBERIND. A.-G. Brit. 293,000, June 29, 1927.

Softening paper. I. G. FARBERIND. A.-G. Brit. 292,430, March 16, 1927. Paper such as parchment paper is softened by treatment with sorbitol or its dehydration products which are obtainable from sorbitol by heating with suitable catalysts. Other substances such as glycerol, glycol, Na lactate or inorg. hygroscopic salts may also be added. The sorbitol and derivs. may be mixed with paper pulp or added to the paper at any stage of manuf.

Weighing and indicating apparatus for testing paper in sheets. EDWARD G. THOMAS (to Toledo Scale Co.). U. S. 1,701,021, Feb. 5.

Treated paper for making show cards, etc. G. S. WALPOLE. Brit. 292,804, Aug. 18, 1927. In the "cutter-crush" process the paper from which the characters are cut is treated or coated on its underside with a mixt. such as paraffin or beeswax, to which Japan wax or cacao butter may be added, and may be sized to prevent penetration of the wax.

24—EXPLOSIVES AND EXPLOSIONS

C. E. MUNROE

Explosive limits (of gases) to be observed in factories. G. WEISSENBERGER AND P. PATTI. *Z. angew. Chem.* 41, 1262-4(1928).—Safety precautions. E. M. S.

Safe transportation of explosives underground. F. J. BYRNE. *Min. Congress J.* 4, 781-4(1928). E. M. S.

How volatile solvents behave. A. G. SMITH. *Nat. Safety News* 18, 90-2(1928).—There is danger from flammable vapors. E. M. S.

The relative inflammability and explosibility of coal dusts. T. N. MASON AND R. V. WHEELER. *Safety in Mines Res. Board* (London) Paper No. 48, 3-13(1928).—This paper is supplementary to S. M. R. B. Paper No. 33 (*C. A.* 21, 2190). Expts. are described here in which explosions were produced with a no. of different coal dust under standard conditions with a view to det. their relative "inflammability" as measured by the mean speeds of the flames over a given distance, and their relative "explosibility" as measured by the max. pressure developed and the data show that the order of inflammability and that of explosibility as thus detd. are approx. the same. These orders are also in close agreement with the order of inflammability as detd. for the same coals from the proportions of incombustible dust required to suppress inflammation. In Paper 33 a relationship was shown to exist between the inflammability of the dust and its content of volatile matter. The present work confirms the value of the volatile matter detn. as a guide to the degree of inflammability of a coal dust.

CHARLES E. MUNROE

The behavior of nitrocellulose gels in polarized light (PHILLIPS) 2. The chemical industry in Sweden. (ANON) 13. Negative catalysts and β -naphthol as a medium for preventing spontaneous combustion of oily textile fibers (POMERANZ) 27. How to avoid fire in storing Indiana screenings (TUTTLE) 21.

Device for quenching flame from blasting charges by use of water. M. WITTE. Brit. 292,802, Aug. 11, 1927.

Waterproofing paper shot cartridges. STANLEY L. WILLIS and WATSON H. WOODFORD (to Remington Arms Co.). U. S. 1,701,868, Feb. 12. The top wad and crimp are sealed and impregnated with a compn. contg. a polymerizable oil such as Chinese wood oil and a drier comprising Mn resinate and Pb oxide.

25—DYES AND TEXTILE CHEMISTRY

L. A. OLNEY

World's dyestuff industry. L. J. HOOLEY. *Ind. Chemist* 5, 6-8(1929). E. H. Interesting sources of natural dyestuffs. C. D. MELL. *Textile Colorist* 51, 111-4 (1929).—"Mucic Blue" from the plant *Jacobiana spicigera* is used in parts of Mexico for whitening clothes. The entada or giant-bean (*Entada scandens*), an interesting

plant because of its peculiar growth and varied uses, may be a source of red dye. The natives of South Africa use a small bush known locally as "Eland's boontjes" (according to Bentham, the *Elephantorrhiza burchelli*) for food, medicine, tan and dye. White woods and moleskins are dyed a mahogany hue by it. The amount of tannic acid is said to vary between 13 and 20%. In West Africa, the fruit pods of the tamarind tree (*Tamarindus indica*) are used by the natives as an aid in coloring skins (particularly goat skins) leather and fabric. The use of tamarind pulp appears to be an important factor in the process of dyeing yellow with certain coloring substances. R. K. W.

French dyestuffs. The rise of an industry. DONAT AGACHE. *Times Trade and Eng. Supplement* (London) 23, 49(1928). E. M. SYMMES

Chemistry of the dye bath. Theories of yesterday and today. P. E. KING. *Times Trade and Eng. Supplement* (London) 23, 44(1928).—Wool, silk and cotton are negatively charged when placed in water, as are also certain classes of dyestuffs. Wool in an acid liquor is positively charged, as are basic dyestuffs. The modern tendency is to regard dyeing phenomena as resulting from more than one factor, e. g., chem. adsorption and elec. actions may occur. E. M. SYMMES

Modern theories of dyeing. A. JACKSON. *Dyer, Calico Printer* 58, 248-9(1927); 59, 18-19, 30-1, 52 3(1928).—The mech., chem., soln., absorption, colloidal and elec. theories are discussed; the conclusion favors the elec. theory. C. E. M.

Lactic acid in dyeing. FRED. GROVE-PALMER. *Dyer, Calico Printer* 59, 37, 53 (1928). CHAS. E. MULLIN

Lactic and formic acids in the dyehouse. FRED. GROVE-PALMER. *Dyer, Calico Printer* 59, 122-3(1928). CHAS. E. MULLIN

Mechanism of the stabilizing of Naphthol AS solutions with formaldehyde. KURT BRASS. *Leipzig. Monatschr. Textil.-Ind.* 43, 213-5(1928).—The addn. of HCHO to the alk. soln. of Naphthol AS gives a quant. yield of $(C_{10}H_7(ONa)CONHC_6H_4)_2CH_2$, the reaction following the same course as that between β -naphthol and HCHO. Presumably a similar methylene deriv. is obtained from each of the comm. Naphthol AS products. These products when isolated are found to be more stable than the β hydroxy naphthoic acid arylides otherwise present. In fact, a prepn. of the compd. above represented showed only a trace of cloudiness on standing 48 hrs. while Naphthol AS similarly dissolved gave a dense gray ppt. in the same time. The mono-Na salt, of the Naphthol AS-HCHO reaction product show inferior stability. F. R. CLARK

Fastness of dyed shades. H. MALDWIN WILLIAMS. *Wool Record* 34, 1733-5, 1743(1928).—Methods are briefly described for testing the fastness of dyed fabrics to light, scouring, milling, stoving, potting and steaming, perspiration, carbonizing, rubbing or cracking, street mud, and hot pressing and soaping. R. K. W.

The affinity of wool for dyestuffs. F. T. SYKES. *Dyer, Calico Printer* 59, 94-6 (1928).—The various methods of affecting the affinity of wool for dyestuffs are discussed. CHAS. E. MULLIN

Fastness to light of tints on woolens. J. MOFFAT. *Dyer, Calico Printer* 59, 78-9 (1928).—Dyestuffs suitable for tints on wool are suggested. CHAS. E. MULLIN

Testing the suitability of dyes for viscose silk: a new rapid test. A. J. HALL. *Textile Recorder* 46, No. 548, 85(1928).—See C. A. 22, 4252. RUBY K. WORTNER

Process for correction of viscose unevenly dyed with direct cotton dyestuffs. COURTAULDS, LTD. *Wool Record* 34, 1325-7(1928).—Viscose, thus dyed, may be considerably improved in the majority of cases by working it for 30 min. at 90° in a bath contg. 1 lb. β -naphthol and 1 lb. NaCl per 10 gal. water. Also in *Rayon* 7, No. 12, 18-9(1928). RUBY K. WORTNER

Clearing alizarin reds and aniline black prints—oxidation discharges. WILHELM SIEBER. *Silk J.* 5, No. 51, 61-2(1928).—For clearing alizarin red prints it is suggested to use the clear soln. from 25 l. of 6.5° Tw. $Ca(OC_2H_5)_2$ soln., 2.5 kg. $Na_2I_2O_4$ and 57.5 l. H_2O . This is padded on to one side of the cloth only, and the cloth is then led over the hot drying cylinders as quickly as possible. Aniline black prints are cleared by padding with a 0.1 to 0.5% $KMnO_4$ soln., squeezing and passing full width through a dil. bisulfite soln. The goods are again squeezed and washed, allowed to lie for some time, treated in rope form with very dil. H_2SO_4 or HCl, washed, soaped and washed. Formulas are also given for oxidation discharges on direct colors. CHAS. E. MULLIN

Humidity a greater factor than ever in textile manufacturing. R. H. BROWN. Parks-Cramer Co., Fitchburg, Mass. and Charlotte, N. C. *Textile World* 75, 763-4 (1929). RUBY K. WORTNER

The sizing of warps. J. W. HUTCHINSON. *Wool Record* 34, 1537-9, 1673-5 (1928); 35, 241-3(1929).—The sizing of woolen, worsted, cotton and rayon warps is described and discussed. RUBY K. WORTNER

Sizing of artificial silk. JAMES SCOTT. *Silk J.* 5, No. 51, 65-7(1928).—Very general. CHAS. E. MULLIN

Advance of artificial-silk industry. J. E. FEATHERSTONE. *Dyer, Calico Printer* 59, 84-5(1928).—Recent developments in manuf., uses and production of rayon are briefly discussed. CHAS. E. MULLIN

Immunized and amidated cotton. S. R. TROTMAN. *Dyer, Calico Printer* 59, 92 3, 117(1928).—The properties of immunized and amidated cotton are discussed. CHAS. E. MULLIN

Progress in finishing cotton piece goods during the year. WINN W. CHASE. *Textile World* 75, 927-9(1929). RUBY K. WORNER

Continental wool textile industry. The coördination of research work. ARNOLD FROBISHER AND J. A. F. ROBERTS. *Wool Record* 33, 1627, 1633(1928).—A tour of scientific institutions carrying on wool research in Germany, France and Belgium is described. RUBY K. WORNER

The bleaching of wool piece goods. J. SCHOFIELD AND J. C. SCHOFIELD. *Wool Record* 34, 373 5, 441 3, 509-11, 515, 577 9(1928).—A general account is given of the bleaching of animal fibers by the use of sulfur compounds, peroxides or perborates, permanganates followed by sulfurous acid, etc., and tinting processes. R. K. W.

The chlorination of wool goods. J. SCHOFIELD AND J. C. SCHOFIELD. *Wool Record* 34, 1121 3, 1189 91, 1199(1928).—The methods used in practice for obtaining active Cl and the effects of chlorination on wool fabrics are considered. RUBY K. WORNER

Scouring of worsted fabrics. L. L. LLOYD. *Wool Record* 34, 1257-9(1928).—Practical. RUBY K. WORNER

Solvent scouring and cleaning. VERNON D. FREEDLAND. *Dyer, Calico Printer* 59, 76 7, 118 9(1928). The common solvents used in prepg. the solvent soaps are discussed. *Chlorethol* is a mixt. of tetrachloroethane, alc. and sol. oil; *gartol* is a mixt. of trichloroethane, heavy paraffin oil, soft soap and sol. oil; *tetrapol* is a mixt. of CCl_4 and sol. oil. *Westrol* and *Westropol* are similar mixts. of halogenated hydrocarbons and soap. The *solvent scouring of wool* is also described. CHAS. E. MULLIN

The art of waterproofing. CLIFFORD R. CARTER. *Indian Textile J.* 39, 41-2 1928. Formulas are given for waterproofing tarpaulins, linens, canvas, cart covers and similar materials. The making of "oilskins" is also described. R. K. W.

Nomography is not only easier and quicker—it is more accurate. EDWARD R. SCHWARZ. Mass. Inst. of Technology. *Textile World* 75, 765 8(1929).—A review is given of some recent attempts to simplify textile calcs. RUBY K. WORNER

Sodium silicate. H. O. RICHARDSON. *Dyer, Calico Printer* 59, 150(1928).—The applications of Na silicate in the textile industry are discussed. CHAS. E. MULLIN

Rayon oils. CHAS. E. MULLIN. Textile School of Clemson Coll. *Textile Colorist* 50, 265 8, *Melliand Textilber.* (Ger.) 12, 995 7(1928); *Melliand Textilber.* (Eng.) 10, 29 31(1929). It is common practice to oil rayon (1) at the factory, usually during the last rinse; (2) after dyeing, when dyed in the skein; and (3) before winding on to cones for knitting or on cops for weaving. Different types of oil are generally used for each process but all of these oils should be readily removable from the fiber in the usual soap scour without the addn. of alkalis. Alkali should never be used upon rayon or on goods contg. it if the best results are desired. The chem. and hygroscopic properties of viscose and the other regenerated-cellulose rayons are discussed and compared with those of cotton and mercerized cotton. In order to obtain uniform shades, care must be exercised in scouring and bleaching rayons, and p_H control is suggested. *p_H control of the scouring bath* may also be an aid in obtaining more uniform rayon during the mfg. process. Rayon is oiled in order to (4) soften and (5) lubricate the fiber during the process of winding, knitting, etc.; (6) to reduce the amt. of moisture absorbed from the air, and (7) to give the fibers a certain cohesiveness, which is desirable to avoid the difficulties caused by its natural wiriness in winding it off of the cop or cone. The oiling for winding is often conducted by (8) soaking the skeins in pans of oil and hydroctg. or draining; (9) spraying with the desired percentage of oil and draining; (10) or merely pouring the desired percentage of oil into the opened rayon package and allowing it to permeate through the fibers by capillarity. Mineral oils are excellent for rayon in every way except as regards to their removal by scouring. Therefore, they should seldom be used alone. Blended oils are suggested and some of the oils now in use are discussed. The pin-holes sometimes occurring in viscose goods that have been oiled with animal or vegetable oils are discussed. They are supposed to be due to traces of S remaining in the viscose silk from the mfg. process acting upon the oil. CHAS. E. MULLIN

Stains produced by machine lubrication. L. L. LLOYD. *Wool Record* 34, 1393-5

(1928).—In looms, in consequence of frictional abrasion, the lubricant becomes intermingled with finely divided Fe, which catalyzes the oxidation of the oil. This oil, as well as the iron compounds formed from the fatty acids of the oil, is more difficult to remove either by solvents or by emulsification than is the unaffected oil. Stains from the combination of graphite and oil are even more difficult to remove. The stains are best removed as soon as the material is taken from the loom. Efficient solvents or cleansing agents are available, which can be used without any appreciable damage to the fiber.

The deburring of skins: an Australian invention. ALFRED F. BARKER. *Textile Recorder* 46, No. 546, 51-2(1928).—An illustrated description is given of the Vicar's machine, which removes the vegetable matter by a combing action before the wool is taken from the skin. The method is considered particularly promising.

RUBY K. WORNER

Total-fat determination in sulfonated oils for use in the textile industry (HERBIG) 27. American coal-tar industry. Growth of dyestuffs production (TALBOT) 21. Negative catalysts and β -naphthol as a medium for preventing spontaneous combustion of oily textile fibers (POMERANZ) 27. Orcein-like dyes. II. (HENRICH, HEROLD) 10. Identification of the reduction products of azo dyes (URNO) 10. Apparatus for clarifying liquid used for dry cleaning, etc. (U. S. pat. 1,701,068) 1. Azo compds (Fr. pat. 643,446) 10. Cellulose from graminaceous plants (Fr. pat. 643,384) 23. Photometric apparatus for inspection and sorting of fabrics, etc. (Brit. pat. 292,474) 1. Emulsifying agents and emulsions (Fr. pat. 33,278) 13. Wetting and dispersing agents (Fr. pat. 33,246) 13.

Dyes. I. GUBELMANN and J. B. OESCH (to Newport Co.). Brit. 292,904, June 25, 1927. 4,4'-Dimethyl-6,6'-dichlorothioindigo is treated in concd. H_2SO_4 soln with a brominating agent such as free Br until up to 2 atoms of Br are introduced. The dye contg. 1 atom of Br dyes cotton red from a yellow vat. By varying the concn of acid, dyes giving different shades of red are produced.

Dyes. SOCIÉTÉ ANON. POUR L'INDUSTRIE CHIMIQUE À BÂLE. Brit. 292,622, June 24, 1927. Mixts. of symmetrical 1,2- and 2,1-naphththioindigos are used for dyeing and printing to obtain greater brightness and fullness than when the dyes are used separately. Numerous examples and details are given.

Dyes. I. G. FARBENIND. A.-G. Brit. 292,741, May 5, 1927. Violet vat dyes are made by condensing a halogenated perylenetetracarboxylic acid contg. not more than 3 halogen atoms in the mol. with an *o*-diamine such as *o*-phenylenediamine. The products give dyeings on cotton from the vat fast to soaping, light, Cl and to boiling Na_2CO_3 soln.

Dyes. I. G. FARBENIND. A.-G. Brit. 292,344, June 9, 1927. Cr compds. of *o*-hydroxyazo dyes yielding on wool reddish violet to bluish violet dyeings fast to washing, milling and light, are made by the action of tervalent Cr compds on dyes produced by coupling diazotized 4-chloro-2-aminophenol with a naphtholmonosulfonic acid.

Dye. I. G. FARBENIND. A.-G. Fr. 643,414, Nov. 7, 1927. A new vat dye is prepd. by reaction on the diazo compd. of the aminobenzanthrone obtained by reduction of the nitrobenzanthrone described in example 2 of Fr. 6435/349,531 (by boiling benzanthrone with AcOH under reflux and adding 47° Bé. HNO_3 in AcOH and continuing to heat) with a sulfurized sol. compd. and treatment of the product of reaction with alk. agents. In an example the aminobenzanthrone referred to is diazotized and a suspension thereof in water is poured slowly into a soln. of K xanthate in water, and the mixt. is heated to 85°. The product, with or without removal of resinous matter, is heated to 280° rapidly with KOH-EtOH, and poured into water. The product dyes cotton blue from the vat turning to a strong black in air.

Dyes. I. G. FARBENIND. A.-G. Fr. 643,388, Nov. 5, 1927. New vat dyes are obtained by treating *N*-alkylated benzanthranyl-1-aminoanthraquinones with alkalis. The *N*-methyl deriv. of Bz-1-benzanthranyl-1-aminoanthraquinone is agitated with EtOH-KOH at about 98°. The product is poured into water and the dye is pptd. by bubbling air through. It dyes cotton violet from the vat, which turns to a green-blue much purer than that obtained in example 1 of Fr. 396,583.

Dyes. I. G. FARBENIND. A.-G. Fr. 643,386, Nov. 5, 1927. New orange vat dyes are obtained by introducing polyatomic alc. radicals into the OH groups of 1-benzoylamino-4-hydroxyanthraquinone. Examples, 1-benzoylamino-4-hydroxyanthraquinone is boiled with the chloroethyl ester of *p*-toluenesulfonic acid. The dye obtained

may be divided into 2 components by crystn. from PhNO_2 . The more sol. contains compds. in which the H of the OH group is replaced by $-\text{CH}_2\text{CH}_2\text{Cl}$ and $-\text{CH}_2-\text{CH}_2\text{OH}$. The less sol. portion contains a product of the formula $\text{XCH}_2\text{CH}_2\text{X}$, where X represents the mol. of the starting material less the H atom of the OH group. This less sol. product is also obtained if the di-*p*-toluenesulfonic ester of ethylene glycol is used. The 1-benzoylamino group may be replaced by a 1-*m*-methoxybenzoylamino group to obtain a product which dyes vegetable fiber in strong yellowish orange shades. The tri-*p*-toluenesulfonic ester of glycerol also may be used.

Dyes. I. G. FARBENIND. A.-G. (Georg Wolfsleben, inventor). Ger. 469,946, Sept. 7, 1926. A black tetrakisazo dye, particularly for *chrome leather*, is prepd. by allowing 2 mols. of the diazo compd. of *p*-aminoacetanilide to act upon 1 mol. of the disazo dyestuff obtainable from 1 mol. of the tetrazo compd. of benzidine, by acid coupling with 1 mol. of H-acid, followed by alk. coupling with 1 mol. of *m*-phenylenediamine, the resulting tetrakisazo dye being afterwards sapond. in an alk. medium. An example of the prepn. is given.

Dyes. L. B. HOLLIDAY & Co., LTD., J. KITSON and C. SHAW. Brit. 293,110, March 30, 1927. Chloranil or bromanil is heated with aq. alkali and thus by hydrolysis yields the insol. alkali 2,5-dihydroxy-3,6-dichlorobenzoquinone or alkali 2,5-dihydroxy-3,6-dibromobenzoquinone and a dye which dyes wool and silk brown tints which may be pptd. with acid or by salting out. Other similar processes also are described.

Azo dyes. I. G. FARBENIND. A.-G. (Hermann Wagner, inventor). Ger. 470,178, Feb. 25, 1922. Diazo compds. are combined with *o*-aryloxy- or *o*-aralkyloxyarylides of 2,3-hydroxynaphthoic acid. Thus, chloroanisidine is diazotized and combined with 2,3-hydroxynaphthoic acid 5-chloro-2-phenoxy-1-anilide. Other examples are given.

Yellow monoazo dyes. HERMANN WAGNER and BARTHOLOMAUS VOSSEN (to Grasselli Dyestuff Corp.). U. S. 1,701,248, Feb. 5. Yellow monoazo dyes of good fastness to light are made by diazotizing 2,5,6-trichloro-3-amino-1-methylbenzene-4-sulfonic acid and coupling it with compds. such as 1-sulfophenyl-3-methyl-5-pyrazolone, 1-sulfophenyl-5-pyrazolone-3-carboxylic acid, 1-sulfophenyl-5-pyrazolone-3-carboxylic acid ester or 1-(3-sulfo-6-chloro)-phenyl-3-methyl-5-pyrazolone. The 2,5,6-trichloro-3-amino-1-methylbenzene-4-sulfonic acid can be made by chlorinating *p*-toluenesulfonic acid, *p*-chlorotoluene-*p*-sulfonic acid or 2,6-dichlorotoluene-4-sulfonic acid until these compds. have attained the wt. of a trichloro compd. and then nitrating and reducing.

Green trisazo dyes for cotton. HEINRICH CLINGESTEIN (to Grasselli Dyestuff Corp.). U. S. 1,701,717, Feb. 12. A diazotized aminoazo compd., such as aminoazotoluene-sulfonic acid obtainable from *p*-sulfanilic acid and *o*-toluidines is coupled with a 1-amino-2-naphthol ether or a deriv. such as the Et ether of 1-amino-2-naphthol-6-sulfonic acid, and the intermediate thus formed is diazotized and coupled in an alk. medium such as a soda soln. (with or without the use of pyridine, which, if present, accelerates the coupling) with a 1-acylamino-8-hydroxynaphthalenesulfonic acid. The dyes thus prepd. form alkali metal salts which are generally dark powders, sol. in water, and dye cotton various green shades of good fastness to light. Several examples are given.

Dyes and intermediates. I. G. FARBENIND. A.-G. Fr. 642,906, Oct. 22, 1927. 3,5-Dihal-2-amino-1-toluene is diazotized and converted into the 2-nitrile compd., which is sapond. by means of 65% H_2SO_4 at boiling temp., into the corresponding carboxylic acid. An example is given of the prepn. of 3,5-dichloro-1-toluene-2-carboxylic acid which may be converted by the method of Ger. 189,200 or otherwise into the corresponding oxythionaphthene and thence into a thioindigo dye.

Intermediates for dyes. THE NEWPORT Co. Fr. 642,931, Oct. 24, 1927. 1-Amino-2,4-dichloroanthraquinone is prepd. by condensing *m*-dichlorobenzene with phthalic anhydride to form 2',4'-dichloro-*o*-benzoylbenzoic acid, nitrating to obtain 3'-nitro-4',6'-dichloro-*o*-benzoylbenzoic acid, reducing the latter to the amino compd. and dehydrating with concd. H_2SO_4 at a temp. of 150-160° to close the ring.

Intermediates for dyes. I. G. FARBENIND. A.-G. Fr. 642,810, Aug. 18, 1927. New benzyl compds. are obtained by the reaction at ordinary temp. of a halogenated Me deriv. of a hydroxy aromatic compd. with an aromatic amine or deriv. thereof. In examples, to 2,5- $\text{HO}(\text{ClCH}_2)_2\text{C}_6\text{H}_3\text{CO}_2\text{H}$ a soln. of *m*-sulfanilic acid in Na_2CO_3 soln. is added. The soln. is acidified after 24 hrs., and $\text{HO}_2\text{SC}_6\text{H}_4\text{NHCH}_2\text{C}_6\text{H}_4(\text{OH})\text{CO}_2\text{H}$, a white powder, is pptd.; and similarly, chloromethylcresotic acid and 2,8-amino-naphthol-6-sulfonic acid give a yellow crystalline powder, 2,4- $\text{HO}(\text{HO}_2\text{S})\text{C}_6\text{H}_3\text{NH}-\text{CH}_2\text{C}_6\text{H}_4\text{Me}(\text{OH})\text{CO}_2\text{H}$, 3,4,5. Compds. are obtained with *m*-NHMe and pyridine.

Copper compounds of dyes. I. G. FARBENIND. A.-G. Brit. 292,660, March 18, 1927. See Fr. 632,941 (C. A. 22, 3535).

Isatin derivatives. MAXIMILIAN P. SCHMIDT and OTTO HERRMANN (to Grasselli Dyestuff Corp.). U. S. 1,700,814, Feb. 5. Isatin derivs. which are sol. in water and which can be combined in aq. soln. with a reactive ketomethylene compd. such as naphthol, oxythionaphthene, indoxyl or acenaphthenone to produce *indigoid dyes* are prepd. by the action of sulfites upon isatin- α -chlorides, their substitution products, homologs or analogs. Preferably the isatin- α -chloride is suspended in an aq. soln. of Na_2SO_3 (suitably of 10% strength) and slowly heated to about 90° with stirring; the chloride gradually dissolves and the reaction product may be sepd. from the soln. by salting out as with NaCl . The new isatin derivs. can also be obtained from the dehydroindigo bisulfites described by Kalb (C. A. 4, 201). They differ from the previously known bisulfite addition products by their intense yellow color and by their fastness to dil. acids. When spread in soln. on a support such as paper and exposed to light they are decomposed. Examples and details of procedure are given.

1-Acetylanthraquinone. I. G. FARBENIND. A.-G. Swiss 127,253, May 24, 1927. 1-Acetylanthraquinone is prepd. by oxidizing *Bz*-1-methylbenzanthrone with CrO_3 in AcOH soln. The product is useful as an intermediate for dyes. Cf. Brit. 289,585 (C. A. 23, 715).

Diazo compound of 2-amino-5-chlorophenol. COMPAGNIE NATIONALE DE MATIÈRES COLORANTES ET MANUFACTURES DE PRODUITS CHIMIQUES DU NORD RÉUNIES (Établissement Kuhlmann). Fr. 643,560, Apr. 12, 1927. When alkalis such as Na_2CO_3 or salts of org. acids such as NaOAc are caused to react on the diazo compd. of 2-nitro-4-chloroaniline, the nitro group is replaced by a OH group, giving the new diazo compd. of 2-amino-5-chlorophenol. The latter reacts in the presence of Na_2CO_3 with a large no. of known coupling components, such as naphthols, and their sulfo and amino derivs., dihydroxynaphthalenes and their derivs., resorcinol, and pyrazolones, giving dyes which dye wool in an acid bath, the colors being improved by an after-treatment with $\text{K}_2\text{Cr}_2\text{O}_7$ and H_2SO_4 . The dyes give with metal salts new compds. which dye wool directly in fast shades. Several examples and tables of dyes are given.

Nitro-2,3-dichloro-1,4-naphthoquinone. I. G. FARBENIND. A.-G. Fr. 643,117, Nov. 7, 1927. A mixt. of HNO_3 and H_2SO_4 is heated with 2,3-dichloro-1,4-naphthoquinone to 40 – 50° . The crude product on crystn from AcOH or alc. crystallizes in 2 forms, either as clear yellow needles or yellow scales. Both forms are chem. identical have the same m. p., 175° , and the formula is probably 2,3-dichloro-8-nitro 1,4-naphthoquinone, which is an *intermediate for vat dyes*.

1-Diazoanthraquinone-2-carboxylic acids. LUDWIG EIFFLENDER (to Grasselli Dyestuff Corp.). U. S. 1,700,790, Feb. 5. 1-Diazoanthraquinone-2-carboxylic acids are obtained by the action, in the presence of water, of HNO_2 or substances liberating it, on the nitrogenous anthraquinone derivs. obtainable from 1-nitro-2-methylantraquinone or its substitution products as described in U. S. pat. 1,417,875 (C. A. 16, 2696), these derivs. being generally regarded as anthraquinone-isoxazoles. The diazo compds. thus obtained may be used for the production of other anthraquinone-2-carboxylic acids, otherwise substituted in the 1-position, such as 1-chloroanthraquinone-2-carboxylic acid or its 5-nitro or other derivs. and also may be used for the production of *azo dyes*. Examples are given.

Sulfonated aliphatic acids. I. G. FARBENIND. A.-G. Fr. 636,817, June 29, 1927. Higher unsatd. acids are sulfonated along with phenols by means of oleum. The products are used in the textile and dyeing industry in place of Turkey red oils. Cf. C. A. 23, 536.

Phosphomolybdotungsten compounds; lakes. I. G. FARBENIND. A.-G. Brit. 292,253, March 17, 1927. Phosphomolybdotungsten compds. prepd. as described in Brit. 216,486 (C. A. 19, 183) are reduced by reducing agents such as SO_2 , bisulfites, hyposulfites or grape-sugar to produce black cryst. compds. the salts of which differ from each other in soly. similarly to the unreduced substances. The reduction products are capable of reconversion into the parent substances by use of oxidizing agents such as permanganate or H_2O_2 and are suitable for the *production of lakes* with basic dyes or with acid dyes contg. sulfo groups and free or combined amino groups; rhodamine B gives a red lake very last to light. Cf. C. A. 22, 3996.

Dyeing. I. G. FARBENIND. A.-G. Brit. 292,658, March 18, 1927. Fast dyes are obtained on animal, vegetable or artificial fibers by use of a slightly alk. vat contg. the products resulting from melting 1-hydroxyanthraquinone or a suitable deriv. with NaOH , such as dyes made as described in Brit. 292,806 and 292,897 (following abstract).

Dyes. I. G. FARBENIND. A.-G. Brit. 292,896, March 18, 1927. Fusions as

specified in the preceding abstract are effected in the presence of an org. solvent or suspension medium, preferably with exclusion of O. The products may be purified by fractional pptn. from H_2SO_4 or (as is described in Brit. 292,897) by use of oxidizing agents such as hypochlorite and permanganate solns.

Dyeing. I. G. FARBENIND. A.-G. Brit. 292,100, June 13, 1927. Diazonium and tetrazonium borofluorides of arylamines are combined with 2,3-hydroxynaphthoic arylides, pyrazolones, dipyrazolones, acetoacetic acid arylides or diacetoacetic acid diamini-diaryl compds. on the fiber. Several examples are given of dyes producing various red shades.

Dyeing. MARCEL BADER and CHARLES SUNDER. Fr. 33,148, Mar. 14, 1927. Addn. to 551,666. Products sol. in water are obtained by treating leuco derivs. of vat dyes with NH_2SO_3H in the presence of a tertiary base such as pyridine or $PhNMe_2$. The products, which are the same as those obtained in Fr. 551,666 by using $ClSO_2H$, find various applications in dyeing and printing textiles. In examples, the leuco deriv. of tetrabromoindigo is suspended in $PhCl$ and pyridine is added. To the mixt. heated to 75–80° NH_2SO_3H is gradually added. The product is the NH_4 salt of the sulfuric acid ester of tetrabromoindigo. The leuco deriv. of thioindigo and of dimethoxydibenzanthrone are similarly treated.

Dyeing. BRITISH DYESTUFFS CORPORATION, LTD., and JAMES BADDILEY, PERCY CHORLEY and CARLTON BUTLER. Fr. 33,207, Mar. 21, 1927. Addn. to 631,115. Artificial silks from regenerated cellulose are dyed by diazo compds. prep'd. by combining diazotized aminosalicyclic acids or their homologs with the usual components, diazotizing again and combining with naphtholsulfonic acids, naphthylaminesulfonic acids or the *N* substitution products of the latter. Examples are given.

Dyeing. HENRY DREYFUS. Fr. 33,247, Mar. 16, 1927. Addn. to 568,655. Materials composed of, or contg. cellulose acetate are dyed, printed, etc., by insol. or relatively insol. dyes made sol. by means of soaps of sol. resin or Na salts or soaps of resinic acid. A suitable comp'd. is prep'd. by adding powd. pale com. resin to a boiling $NaOH$ soln., boiling for some hrs. and cooling. Examples are given of dyeing with dyes made sol. with this comp'd.

Dyeing. WOLDEMAR FEHRMANN. Ger. 469,837, Feb. 17, 1925. App. is described for dyeing and other wet treatment of fabric, in which the dye liquor, etc., is kept in motion by air pressure.

Dyeing with aniline black. KARL SCHMIDT. Fr. 643,678, Nov. 9, 1927. To prevent weakening of the fiber in dyeing textile materials with aniline black, large quantities of salt of feeble acids, volatile or easily oxidizable, or salts formed from acids and aromatic amines are added to the mixt. of agents used for the dyeing. This mixt. contains a salt of Fe, Mn, V, Pb or other heavy metal, and aromatic amines, phenols, *N* compds., diazo, halogen or nitro compds. or certain org. acids. Examples of baths are given contg. (1) $PhNH_2 \cdot HCl$ 12, $CuSO_4$ 1.2, $NaClO_4$ 5, $(NH_4)_2SO_3$ 4, and *p*-phenylenediamine 2 parts; (2) $PhNH_2 \cdot HCl$ 12, $K_4Fe(CN)_6$ 9, $NaClO_4$ 5, $(NH_4)_2SO_3$ 5, *p*-phenylenediamine 2, and tartaric acid 3 parts.

Dyeing cellulose derivatives. HENRY DREYFUS. Fr. 643,323, Nov. 3, 1927. Material made of, or contg. cellulose esters is treated with swelling agents before mordanting, whereby the mordants are more easily taken up. As swelling agents, $HCOOH$, $AcOH$, glycolic acid, lactic acid, $EtOH$, Me_2O , alcohol-diacetone, diacetin, phenol, hydroquinone, cyanates, thiocyanates; urea, urethans, thiourea, guanidine and substitution products thereof may be used.

Dyeing cellulose esters and ethers. H. DREYFUS. Brit. 292,452, Dec. 14, 1926. Cellulose derivs. such as those described in Brit. 291,118 (*C. A.* 23, 1287) are dyed, printed, stenciled or otherwise colored with coloring substances of the azo, nitro-diaxylamine, nitrodiarylmethane or anthrapyridone series contg. one or more urethan or substituted urethan residues. When azo dyes are used they may be formed or developed on the fiber. Several examples and methods of prepg. the dyes are given. Brit. 292,454 specifies the use, as coloring substances, of azo compds. (other than urea or thiourea derivs.) contg. one or more ω -groups in the diazo component. Various examples, details and modifications are described.

Dyeing cellulose esters and ethers. H. DREYFUS. Brit. 292,180, Dec. 14, 1926. Materials such as cellulose formate, acetate, propionate or butyrate, "immunized cotton" methyl, ethyl or benzyl cellulose or condensation products of cellulose with glycols or the like are dyed, printed, stenciled or otherwise colored with azo compds. contg. one or more amino groups substituted by one or more aliphatic side chains each contg. 2 or more OH groups but no COOH groups. Various solubilizing agents may be used and several examples are given, among which is the use of the product

table fibers such as flax, jute, hemp, etc., are prepd. for application as textiles and the like by boiling in a 2% NaOH soln., washing with water, then with acid to which a small quantity of NaOCl may be added, again washing and boiling in water contg. an oil such as linseed oil and an alkali.

Extracting fibers. MARCEL VALENTIN. Fr. 643,423, Nov. 7, 1927. A machine is described for extg. agave and like plant fibers in which the leaves are cut into longitudinal strips and passed to a shredder.

Apparatus for preparing fiber from hemp, flax, sisal, yucca, etc., by treatment with liquid reagents, etc. J. C. W. STANLEY. Brit. 292,801, Aug. 10, 1927.

Treating yarns. THOMAS MCCONNELL. Ger. 469,838, Sept. 19, 1925. Yarn is led to a mercerizing or other bath through rollers, over a guide and under a roller in the bath, then between stretching members which are positively rotated and comprise spiders with rollers connecting the free ends of corresponding arms, thence again into the bath and then up between similar stretching members.

Apparatus for sizing textile fibers or threads. CHARLES F. TOPHAM (to Courtaulds, Ltd.). U. S. 1,702,140, Feb. 12.

Apparatus for sizing, dressing and drying threads. V. BONNIER. Brit. 292,935, June 25, 1927.

Washing artificial silk. SPINNSTOFFWERK GLAUCHAU AKTIENGESSELLSCHAFT and HEINRICH VOSS. Fr. 642,645, Oct. 21, 1927. Artificial silk thread on perforated bobbins is washed with liquid while air, gas, or vapors are passed through. Neutralizing gases such as NH_3 may be used.

Crepe de chine from artificial silk. GEORGES COUDENE. Fr. 642,757, Mar. 29, 1927. Artificial silk threads to be used for making "crepe de chine" and the like is made of 2 or more elementary threads twisted together, the said elementary threads being previously twisted in the sense opposite to that of the twisting together.

Moire artificial silk. CAMILLE DREYFUS. Fr. 643,058, Oct. 27, 1927. Permanent moire effects are obtained on fabrics composed entirely or for the greater part of cellulose acetate, cellulose propionate, ethylcellulose or other org. deriv. of cellulose by the method used for other textiles.

Driving and conveyer belts of tussah silk. W. EBELL. Brit. 293,209, July 23, 1927. Tussah silk is stated to be more resistant to chemical action than other varieties of silk. Cf. C. A. 22, 504.

Degreasing wool. I. G. FARBENIND. A.-G. Fr. 642,385, Sept. 21, 1927. Crude wool is degreased by means of hydrocarbon chlorides, the b. p. of which is about 100–150° C., e. g., xylol chloride.

"Substitute for wool" made from jute waste. B. H. KANTAWALA. Brit. 293,161, May 16, 1927. Jute waste is treated with an emulsion of ground-nut oil and NaOH, allowed to stand until thoroughly damped and then passed through a carding-engine. Artificial silk can be added.

Apparatus for singeing cloth. ALBERT N. OTIS (to General Electric Co.). U. S. 2,011,333, Feb. 5.

Gas-proof fabrics. G. CARDILE (trading as Industria Articolli Caoutchouc I. A. C.). Brit. 292,813, Sept. 23, 1927. A fabric is coated with animal glue rendered supple by addition of glycerol and insol. by a dichromate, CH_3O or other suitable reagent, and is coated on both sides with a thin layer of rubber or like material, which is vulcanized.

Recovery of volatile solvents. MARIUS BLANC. Fr. 643,716, Nov. 10, 1927. Volatile solvents used in *calendering* or otherwise *treating cloth* are recovered by a hood of approx. hemispherical or conical shape, the walls of which are cooled.

Purifying benzine after use in "dry cleaning." J. J. WACK. Brit. 292,433, Jan. 15, 1928. The benzine is centrifuged and then injected in a finely atomized state to an alk. soln. which contains Na_2CO_3 or K_2CO_3 , NaCl or other neutral compd. esp. the emulsion, and an alk. bleaching agent such as Ca hypochlorite. The soln. is covered with a viscous layer such as glue through which the benzine alone passes. An app. is described.

Stable and solid solutions of sulfonic acids. I. G. FARBENIND. A.-G. Fr. 643,062, Sept. 27, 1927. The alkali salts, particularly the NH_4 salts, of alkylated or cycloalkylated natic sulfonic acids are dissolved in org. solvents to obtain stable solid solns. for use in the *textile industry* as purifying agents, etc. In examples, Na butylnaphthalenionate (from C_{10}H_8 , BuOH and ClSO_3H) and dipentene (waste from the manuf. of amphor from oil of turpentine) are worked together at 90° in a mixer and pressed on into bars. The product acts as a soap for textiles, etc. Na isopropylnaphthalenionate gives with dipentene and $(\text{NH}_4)_2\text{SO}_4$ a product useful as an auxiliary in the dyeing of wool. Dipentene may be replaced by 1,3-dihydroxybutane, or tetrachloroethane.

26—PAINTS, VARNISHES AND RESINS

A. H. SABIN

The progress of the paint and varnish industry during 1928. R. S. MORRELL AND W. E. WORNUM. *Ind. Chemist* 5, 12-5(1929). E. H.

Paint, varnish and lacquer. A field for each. H. HOULSTON MORGAN. *Times Trade and Eng. Supplement* (London) 23, 35(1928). E. M. SYMMES

Chinese wood oil. V. Crazing and folding during drying. A. FIBNER AND E. ROSSMANN. *Tech. Hochschule München. Chem. Umschau, Fette, Oele, Wachse u. Harze* 35, 281-90(1928); cf. *C. A.* 23, 291.—Microscopic examn. of exptl. films on glass of Chinese wood oil revealed a shrinkage in vol. and the formation of fine cracks while the film was still moist, the cracks reaching through to the bottom. This contraction coincides with the formation of β -eleostearin from the α -variety by polymerization or condensation. The next step in drying is the formation of folds at right angles to the cracks, increasing the vol. and frequently pushing the cracks together again to form a double-lipped joint; this folding coincides with the absorption of O_2 by α -eleostearin. Opposed to this view are the facts that β -eleostearin alone, when melted, will show contraction and crack formation, and also that the drying curves of β -eleostearin indicate primary oxidation, followed by polymerization. Drying the films in the dark always prevents wrinkling and clear films are obtained. In the light of the quartz lamp wood oil never dries clear; in sunlight at lower temp. simple wrinkling occurs without cracking; α -eleostearin does not appear to cause cracking at room temp. It has also been observed in a black wood oil varnish that a network of fine cracks can form after the wrinkles appeared, passing through the wrinkles at all angles. P. ESCHER

Modern solvent and plasticizers. Their use in lacquers. A. BOAKE, ROBERTS AND CO. *Times Trade and Eng. Supplement* (London) 23, 36(1928).—There may come a time when paints, as known for so many years, will be completely replaced by cellulose lacquers. E. M. SYMMES

Synthetic resins. The new raw material. A. A. DRUMMOND. *Times Trade and Eng. Supplement* (London) 23, 31(1928).—A brief review. E. M. SYMMES

Further recent progress in the production of resinoids. CARL MARX. *Plastics* 4, 554, 566, 618, 633(1928). E. H.

Pressureless molding of resinoids. CHARLES W. RIVISE. *Plastics* 5, 9 11, 24 (1929).—A review of patents. E. H.

American naval stores. The steam solvent process. R. W. CORNELL. *Times Trade and Eng. Supplement* (London) 23, 55(1928).—A review of the industry, also pointing out a recent advance in the production of light-colored wood rosin, hitherto impossible. E. M. SYMMES

Ti salts and pigments (ANON) 18. Determination of As in oxide of Sb pigment (SRROIS) 7. Acid-proofing chemical apparatus with synthetic resins (Brit. pat. 292,334) 1. Colloidal dispersions (Brit. pat. 292,965) 13. Pyroxylin compositions (U. S. pat. 1,702,181) 23. Drying rubber articles (Brit. pat. 293,061) 30. Cleaning steel preliminary to painting it (U. S. pat. 1,700,739) 9. Zn (Fr. pat. 643,483) 9.

Paint. E. I. DU PONT DE NEMOURS & CO. Fr. 643,709, Nov. 9, 1927. Coagulation in paint contg. siccative oil is prevented or suppressed by the addn. of 0.1% or more of an acid of the citric, malic and tartaric group.

Water paint. ALFRED P. GOODELL and GARDNER W. TARR. U. S. 1,700,404, Jan. 29. A mixt. is formed including a casein solu., lithopone, clay and paper-maker's wax in such proportions that when dild. with water a spreadable coating compn. is obtained which forms a quick-drying, permanently white film of good white light reflective power and good covering or hiding power.

Paints and varnishes with a vehicle containing rubber. CHARLES M. A. STINE, COLE COOLIDGE and EDMUND B. MIDDLETON (to E. I. Du Pont de Nemours & Co.). U. S. 1,700,778, Feb. 5. An aromatic hydroxy compd. such as hydroquinone is used for counteracting the viscosity-reducing action of driers and pigments on rubber-contg. vehicles in the presence of air.

Roller mill suitable for grinding paints. J. R. TORRANCE and TORRANCE & SONS, LTD. Brit. 292,431, Jan. 3, 1928.

Pigments. FRANK RAHTJEN and MANFRED RAGG. Fr. 642,966, Oct. 25, 1927. Masses contg. metallic powders, particularly Pb, such as pigments for paints, are made

by applying the metals to powd. or liquid substances heated a little beyond the solidification point of the metal, and suitable for use as addns. to paints or colors; the substances are preferably kept in movement. The application is made by pulverization in the fused state and with exclusion of air, or in the presence of air followed by a partial reduction.

Inks. I. G. FARBENIND. A.-G. Brit. 292,655, March 16, 1927. Products such as stamping, copying and hectograph inks contain coloring substances together with sorbitol or its dehydration products or derivs. such as acetylsorbitol, together with various other (usual) ingredients. Several examples are given.

Printing inks. J. AZZOPARDI. Brit. 293,238, Sept. 29, 1927. A petroleum asphalt or pitch obtained as a residue after steam distn. is used with light mineral oils such as "mineral turpentine" in making newspaper inks or the like, forming the main part or all of the vehicle. Other substances may be added, such as turpentine, colophony and Mn resinate for producing inks of better quality.

Treating coatings of cellulosic derivatives. T. T. JUNIOR. Brit. 293,214, Aug. 6, 1927. A soln. of alc. contg. ether and castor oil is applied between or after applications of "cellulose paint" or varnish, and the surface may be finally polished by use of a "partial solvent" of the coating.

Mastics, varnishes, etc. I. G. FARBENIND. A.-G. Fr. 642,799, July 6, 1927. Mastics on coatings for prepg. groundwork to be painted or varnished contains cellulose esters other than nitrocelluloses or ether oxides of cellulose or nitrocelluloses which are insol. or only slightly sol. in the solvents for the varnishes to be applied to the prepd. groundwork. Natural or artificial resins insol. in the said solvents may also be added and mineral substances insol. in water such as silicates, carbonates, oxides or SiO_2 , kieselguhr, powd. stone, whiting, ocher, etc., and substances such as graphite, talc. or mica and org. colors.

Colored lacquers. I. G. FARBENIND. A.-G. Brit. 293,067, Feb. 24, 1927. Colored masses comprising cellulose esters or ethers, artificial or natural resins or their solns. such as lacquers or varnishes are prepd. with salts formed by dyes contg. sulfonic or carboxylic groups with org. derivs. of NH_2 in which the ammonia N atom is not bound to such a C atom as is itself directly connected with 2 other atoms of N. Suitable bases are alkylamines and their derivs., such as ethylamine and di- and tri-ethanolamine; arylalkyl- and aryl-amines such as dimethylaniline, xylidine and pseudocumidine; hydro-aromatic amines such as cyclo- and dicyclo-hexylamine; heterocyclic bases such as pyridine, piperidine and quinoline; and bases of dyes such as those of the triphenylmethane, azine, thioazine and oxazine classes. Several examples are given.

Pyroxylin composition. ROBERT CALVERT (to Van Schaack Bros. Chemical Works). U. S. 1,702,151, Feb. 12. The acetate of methylisobutylcarbinol and a smaller proportion of the monoethyl ether of ethylene glycol are used as solvents in making compns. suitable for use as *lacquers*.

Synthetic resins. BRITISH THOMSON-HOUSTON CO., LTD., H. W. H. WARREN, R. NEWBOND and A. T. WARD. Brit. 292,646, Feb. 25, 1927. Products of the "glyptal" type are hardened by heating the fusible resin, first at 220–300°, then at 170–200° or (for a longer time) at 135–170°, followed by final molding under pressure at 120–170°. Some modifications and details of molding are described.

Synthetic resins. R. W. BELFIT (to Scovill Mfg. Co.). Brit. 292,912, June 25, 1927. Products derived from N-contg. substances such as urea, thiourea or their derivs. such as benzoyl- or acetyl-carbamide, cyanamide, guanidine or their active derivs., such as the products derived from these substances by condensation with CH_2O or the like, are rendered of greater "chemical-resistivity" by addn. of substances such as salicylic acid, acetylsalicylic acid, salicylamide, salicylates of NH_4 , Sr or Mg, gallic acid, hydro-naphthoic acids, hydroxybenzoic acids, benzoic, phthalic and anthranilic acids, succinic and oxalic acids. These addns. preferably amount to 15% or more of the wt. of the N-contg. substance used. The products are suitable for use in plastic compns. or *lacquers*, and many details and examples are given.

Synthetic gum or resin. CANADIAN ELECTRO PRODUCTS CO., LTD. Fr. 643,419, Nov. 7, 1927. Gums or resins are produced by reaction of vinyl esters, such as the acetate or formate, with aliphatic or aromatic aldehydes, preferably AcH or CH_2O ; e. g., 4–15 parts of AcH is heated to 100° under pressure with 100 of vinyl acetate for 6 hrs. A small quantity of a catalyst such as HCl may be added.

Phenolic resins. BAKELITE CORP. Fr. 643,438, Nov. 7, 1927. A resinous compn. is produced by causing a phenol to react with CH_2O in excess and combining at least a part of the excess with urea or other compd. capable of forming a non-phenolic resin. The first reaction is carried out in the presence of a basic catalyst and the second in the

presence of an acid catalyst. Thus, phenol is heated with a soln. of an excess of CH_2O in the presence of Na_2CO_3 till the water seps., preferably under reduced pressure. Urea with a quantity of lactic, boric or phosphoric acid, sufficient to make the mass acid, is added and the heating continued. If a varnish or lac is required, alc. or other solvent is added before or after the urea. Derivs. of urea or *p*-toluenesulfonamide may be used instead of urea. Fr. 643,439, describes the prepn. of a resin from phenol and anhydroformaldehyde-aniline, which is hardened by removing the PhNH_2 . A catalyst such as hexamethylenetetramine may be used.

Urea-formaldehyde resins. KURT RIPPER (to Fritz Pollak). U. S. 1,701,986, Feb. 12. Articles comprising a urea- CH_2O resin are dried in molds formed at least in part of, or coated with a cellulose ester.

Condensation products of alcohols and ketones with urea, etc. I. G. FARBERMUND A.-G. Brit. 292,595, June 24, 1927. Condensation products prepd. as described in Brit. 278,390 (C. A. 22, 2673), Brit. 280,238 (C. A. 22, 3056), Brit. 287,095 (C. A. 23, 533) and Brit. 290,192 (C. A. 23, 852) are treated with CH_2O or with a substance yielding CH_2O , to produce viscous liquids or resinous solids. Several examples are given.

Condensation products of amino compounds with acetylene. SOCIÉTÉ ANON. POUR L'INDUSTRIE CHIMIQUE À BAËLE. Brit. 292,168, June 16, 1927. Aniline or a similar amino compd. is treated with C_2H_2 in the presence of a catalyst such as a Hg compd. Resinous products are obtained which may be used in making lacquers and varnishes or as vulcanizing assistants, wetting agents, fiber-protecting agents or reserves in the textile industry, and may be converted into new products by sulfonation, nitrosation, nitration, reduction, etc.

Phenol-aldehyde condensation products. G. BIA and J. E. D. DE GRANVILLE DE BIELIZE. Brit. 292,629, Jan. 17, 1927. A mixt. of phenol or *m*, *p*-cresol with considerably more than an equimol. proportion of CH_2O and with a catalyst is heated to the b. p. for not more than 1 hr.; the mixt. is then cooled to about 50° , the catalyst (if alk.) is neutralized and the mixt. is allowed to stand; the liquid resinous product is sepd., heated to above 100° and finally molded at 90 – 112° . Either opaque or translucent products can be obtained according to variations in details of the process, which are described.

27—FATS, FATTY OILS, WAXES AND SOAPS

E. SCHERUBEL

Total fat determination in sulfonated oils. W. HERBIG. *Seifensieder-Ztg.* 55, 419–21(1928).—Turkish red oils are used in the textile and leather industry, with different requirements for each. The following remarks refer to textile oils only. The various Turkish red oils are sufficiently similar for unified definitions and analytical methods. Sulfuric acid is the essential constituent and the amt. of org. SO_3 detn. the quality of the oil. The volumetric method and the beeswax-cake method are not accurate. While the per cent of total fat is important, the "wetting" ability and the resistance against lime, MgSO_4 and lye are more important. These properties are functions of the % of org. SO_3 . "Monopol" soap has 71.5% total fat and 6.43% org. SO_3 ; "Avirol K M Extra soap has only 37% and 4.5%, resp.; but the degree of sulfonation for "Monopol" is only 30% and for "Avirol" 51%, and since the latter's stability toward acid and lime is greater than the former's it is superior notwithstanding "Monopol's" higher % of total fat. A new method for total fat detn. is uncalled for. The important considerations are: (1) which properties of Turkish red oils constitute their value and (2) which constituents produce these properties.

A new process for candle making. L. LINDNER. *Seifensieder-Ztg.* 55, 436(1928).—A short description of Grabec's patented method for producing, by machine, both church candles and ordinary candles.

The fermentation method of fat splitting. EMIL HOYER. *Seifensieder-Ztg.* 56, 1–2(1929).—Some factory data are given with explanatory remarks.

The Wijs method as the standard for iodine absorption. J. J. A. WIJS. *Analyst* 54, 12–4(1929).—At the 9th Intern. Union of Pure and Applied Chemistry at The Hague, the Wijs method was recommended as the official method for detg. I values. Papers by Schmidt-Nielsen and by Weiser and Donath have made statements which would appear to cast doubt with respect to the W. method. Here the objections are discussed and explained. Some details are given amplifying the usual directions for carrying out the method.

W. T. H.

Extraction of oils and fats. Presses and solvent machines. ERNEST FYLEMAN. *Times Trade and Eng. Supplement* (London) 23, 36(1928).—A review. In the Simon extractor (illustrated) the material to be extd. is placed in cylindrical cages between 2 end plates and extd. by oil solns. of 3 different concns., finally with pure solvent, followed by steaming, all automatic. The time required was 20-25 mins. A very pure product was obtained at low cost and without skilled supervision. E. M. SYMMES

A simplification in refining edible oils. R. DIETERLE. *Seifensieder-Ztg.* 55, 428-9(1928).—(Illustrated.) Instead of washing the oil after settling the soap stock ("foots"), there is added to the oil some asbestos fiber, and the oil is then filtered through a special press where the asbestos is deposited as a paper-thin film, retaining all the remaining impurities. P. ESCHER

Determination of organic SO_2 in sulfonated oils by the "American method" with normal sulfuric acid. W. HERBIG. *Seifensieder-Ztg.* 55, 427-8(1928); cf. C. A. 22, 743, 1298.—A reply to Bauer (C. A. 22, 2074) who claims that HSO_3 is the radical titrated in the detn. of org. SO_2 in sulfonated oils. H. claims that the org. SO_2 is liberated as H_2SO_4 during boiling with the titrated acid and that the calcn. must therefore be made on the basis of $\text{H}_2\text{SO}_4 = 2\text{KOH}$, instead of one KOH. P. ESCHER

Negative catalysts and β -naphthol as a medium for preventing spontaneous combustion of oily textile fibers. H. POMERANZ. *Seifensieder-Ztg.* 55, 207-8, 214-5 (1928).—The presence of an autocatalyst of peroxidative character is assumed in cases of oxidation of olein to a stage of spontaneous ignition. β -naphthol reduced the self-heating by permitting only a portion of the olein to oxidize, similar to mannitol in preventing the oxidation of NaHSO_3 ; it is not proven that β -naphthol prevents ignition. P. ESCHER

The oils, fats and soap industries in 1928. REX FURNESS. *Ind. Chemist* 5, 15-7(1929). E. H.

Manufacture of automobile soaps. A. J. REDPAR. *Soap* 4, No. 3, 29, 77, 79 (1928).—Methods are given for making potash and soda soaps which are suitable for washing automobiles. E. SCHERUBEL

Determination of sodium carbonate in soaps and soap powders. W. PRAGER AND W. SCHAEFFER. *Seifensieder-Ztg.* 56, 8-9(1929).—(Illustrated.) The method described is similar to W. F. Hillebrand's in "Analysis of Silicate and Carbonate Rocks." Comparison with results by the Geissler app. shows the latter to give low values. P. E.

Soap lather. L. ZAKARIAS. *Z. physik. chem. Seifenforsch.* 1, 66-70(1928).—Some data are given on the influence of size of vessel, amt. of soln., duration of shaking, age, temp. and concn. of soap soln. upon the vol. and consistency of soap lather. P. ESCHER

Jellying of soaps. J. HERRTES. *Z. physik. chem. Seifenforsch.* 1, 70-2(1928).—By means of Luer's pektinometer (C. A. 21, 3007) the jelly strength of 1.5% soap solns. was measured and H. tabulates the results. No conclusions are drawn. P. E.

Determination of the detergent value of washing media. KARL LÖFFEL. *Seifensieder-Ztg.* 56, 7-8(1929).—L. proposes some fundamental definitions and formulates the detergent value X as follows:

$$X = \frac{\text{washing effect}}{\text{degree of damage}} = \frac{\text{condition} + \text{surface tension} + \text{inner friction} + \text{foam number}}{\text{free alkali} + \text{factor in damage to dyes} + \text{factor in fiber damage}}$$

Washing compds. should be grouped according to their use and each group should have such testing methods as will show their fitness for such use: (1) Compds. for body-care: toilet soaps, disinfectant soaps, etc. (free alkali detn. and surface tension). (2) Cleansing compds. for textiles (surface tension, inner friction, foam no., free alkali, damage to dye and fiber). (3) Cleansing compds. for wood and metal (surface tension, free alkali, abrasives, mineral oil, rosin, lampblack, etc.). P. ESCHER

Ravon oils (MULLIN) 25. Oils obtained from insects (TSUJIMOTO) 111. Device for gravity separation of oil from water, etc. (Brit. pat. 293,091) 1. Dehydrating oils, fats, etc. (U. S. pat. 1,701,092) 13.

Fatty substances. RAYMOND VIDAL. Fr. 33,235, Feb. 18, 1927. Addn. to 637,274 (C. A. 23, 536). Fatty substances sol. in water are prepd. by treating sulfonated fatty acids such as sulfo-oleic, and sulfonated oils or vegetable and animal oils, waxes, etc., with alkali hypochlorites.

Fatty acids. GASPARE MICHELINI. Fr. 642,653, Oct. 21, 1927. Clear transparent fatty acids are obtained by decompn. of the sapon. paste below the b. p. and treating the acids with oxidizers in an acid soln. sufficiently dil. to avoid an appreciable increase of temp. or liberation of Cl or O in the form of bubbles.

Apparatus for fat extraction by use of solvent in vapor form under reduced pressure. A. PANSKY. Brit. 293,176, June 2, 1927.

Macerating fatty tissue and rendering and filtering fats. PERFECTION CO. Brit. 292,719, April 4, 1927. An app. is described.

Extracting oils and fats from waste animal and fish material, etc. J. LEWIS. Brit. 292,327, Dec. 22, 1926. The material is heated during maceration, further heated in a sep. chamber to above 100° and finally treated in a centrifugal separator while jets of steam, hot air or the like are directed onto it. An arrangement of app. is described.

Oil extraction press. JOHANNES JAKOBSEN. Fr. 643,657, Nov. 8, 1927. Constructional details are given.

Sulfonating oils. ERBA A.-G. Brit. 292,574, June 23, 1927. Oils are sulfonated by H_2SO_4 in the presence of substances giving off O in acid soln. such as H_2O_2 , alkali or alk. earth metal peroxides, persulfonic acids, alkali persulfates, percarbonates or perborates, peroxides of org. acids such as acetyl peroxide or benzoyl peroxide or compds. of H_2O_2 with org. substances such as benzoic acid or urea. The products are preferably neutralized directly without previous washing and the sulfates may be thrown down by the addn. of alcs. such as EtOH, MeOH or iso-PrOH.

Soap. ARTHUR H. CHARLTON and T. B. ROWE & Co., LTD. Ger. 470,161, Nov. 3, 1926. See Brit. 267,999 (C. A. 22, 1246).

Soap. XAVIER DURTHALLER and PAUL AUBIN. Fr. 643,672, Nov. 9, 1927. An app. is described for cleaning the bottoms of soap-making boilers without interrupting the manuf.

Soap. PERCY H. GRANT (to the Nemo Manufacturing Co., Ltd.). Can. 286,324, Jan. 8, 1929. To a mixt. of 2.25 lbs. stearic acid, 4.5 lbs. coconut oil and 6.5 lbs. of some other vegetable oil, as soy bean, cottonseed, or linseed, is gradually added, with stirring, a soln. of 1.5 lbs. KOH and 1.25 lbs. NaOH in 3 gal. water. The mixt. is heated to boiling until sapon. is complete. Five lbs. Na_2CO_3 in 1 gal. hot water is gradually added; the product is neutralized, if necessary, with oleic acid and poured, while still hot, over 40 lbs. finely sifted sawdust. After thorough mixing the product is dried in warm air until it can be pulverized.

Soaps from low-grade fats. JOEL STARKELS. U. S. 1,701,703, Feb. 12. Low grade fats contg. material of high I no. are converted to esters (suitably by use of MeOH or EtOH with HCl and $CaCl_2$) and the esters are distd., partially hydrogenated and the hydrogenated product is saponified.

28—SUGAR, STARCH AND GUMS

F. W. ZERBAN

The work and the development of the sugar industry in the field of machinery and apparatus from 1919 to 1926. ERICH GUNDERMANN. *Chem. App.* 15, 3-4, 27-8, 62-3, 85-6, 114-5, 125-6, 220-2, 254-7, 266-8(1928); 16, 4-5(1929).—A general review with 25 cuts and many references.

J. H. MOORE

The yield of raw sugar. K. ŠANDERA. *Listy Cukrovar.* 47, 174(1928).—A discussion.

FRANK MARESH

Correct procedure in sulfitation of thin (sugar) juice. I. Sulfitation. E. THIELE PAPE and P. MEIER. *Z. Ver. deut. Zucker-Ind.* 1928, 233-41.—In order to test the relative merits of sulfitation before the second carbonatation and of simultaneous treatment with SO_2 and CO_2 , the amt. of sulfite remaining in soln. in either case has been studied. Solns. of lime, with and without sugar, and limed juices, were treated with known amts. of SO_2 and CO_2 by both methods. Successive treatment removed a distinctly larger amt. of sulfite than simultaneous treatment.

B. C. A.

Clarification of diffusion juices with dolomitic lime and aluminum hydroxide. VÁCLAV KOHN. *Listy Cukrovar.* 47, 147-62(1928).—Purification of raw beet juices with an addn. of 0.7-0.9% per vol. of "calcium aluminate" during digestion and satg. with CO_2 or SO_2 at 80° resulted in a juice of better color and quality than juice from a French satn. with 2.5% CaO. CO_2 is better than SO_2 . Filtering raw juices with an addn. of 0.6-0.8% CaO per vol. and satg. with gaseous CO_2 and an equiv. amt. of

caked $\text{Al}(\text{OH})_3$ resulted in a soln. with the same color, clarity and sucrose content as when treated by the French method with 3.25% CaO . Satn. of raw juices in which 0.25–0.5% CaO was replaced by an equiv. amt. (0.152–0.303% Al_2O_3) in the form of $\text{Al}_2(\text{SO}_4)_3$ resulted in fluids of the same quality, clarity and ash content, but much higher in color than when 2.75–3.0% CaO was used alone. The $\text{Al}_2(\text{SO}_4)_3$ has no effect upon the compn. of sugars in soln. When more than 0.5% CaO was replaced by an equiv. amt. (0.303% of Al_2O_3) in the form of $\text{Al}_2(\text{SO}_4)_3$, the CaSO_4 passed into the satd. soln. in larger quantities (from 0.084% to 0.193% CaO). Diffusion liquors, when 0.2–0.5% CaO was replaced by $\text{Al}_2(\text{SO}_4)_3$ (as 0.121–0.303% Al_2O_3), showed an equal clarity but less color than when 2.25% CaO was used alone. When 0.4–0.5% CaO was replaced by the equiv. $\text{Al}_2(\text{SO}_4)_3$ (as 0.242–0.303% Al_2O_3), the juices contained a larger amt. of CaSO_4 than when 2.0–2.5% CaO was used alone; this increase was from 0.143% to 0.182% CaO . When 0.2–0.3% CaO was replaced by $\text{Al}_2(\text{SO}_4)_3$ having the equiv. 0.121–0.182% Al_2O_3 , the amt. of bound Ca was the same as when 2.5% CaO was used alone. In all expts. the soln. was satd. with CO_2 . The best clarity was obtained when the full amt. of $\text{Al}_2(\text{SO}_4)_3$ was added and the soln. was satd. fractionally with CO_2 . Satn. of the soln. in the presence of $\text{Al}_2(\text{SO}_4)_3$ required less time for the $\text{Al}_2(\text{SO}_4)_3$ also sats. the soln. (with SO_4). The presence of $\text{Al}_2(\text{SO}_4)_3$ permits a more rapid filtration. The $\text{Al}_2(\text{SO}_4)_3$ may be anhyd., cryst. and the presence of Fe_2O_3 is not detrimental to the process. FRANK MARESH

Description of sugar cane varieties (Java). XV. The most important "Royalty" varieties. O. POSTHUMUS. *Arch. Suikerind., Mededeel. Proefsta. Java Suikerind.* III, 949–75(1928).—These varieties, which are described in detail, are mostly crossings of noble canes; they are susceptible to scab and mosaic and have a weak root system. They are inferior to the modern P. O. J. varieties, especially No. 2878

P. R. PEKELHARING

Physical-chemical research in the sugar beet industry. KAREL ŠANDERA. *Chem. (Ožor 3, 339–42(342 English))(1928).*—Phys.-chem. investigations applied to the beet sugar industry have undoubtedly contributed enormously to greater economy, better operation control and perfection of sugar manuf. as shown in diagrams by the Research Institute of the Czechoslovakia Sugar Beet Industry at the Exposition of Contemporary Culture in Brno.

JAROSLAV KUČERA

The De Vecchis method of drying beets. ARNOLD KUHNER. *Listy Cukrovar.* 47, 180–4(1928).—A statistical study.

FRANK MARESH

Variations in the composition of sugar beets during the harvesting period. J. ZAMARON. *Bull. assoc. chim. suc.* 45, 448–9(1928).—From numerous analyses of roots pulled at various dates between Sept. 20 and Nov. 20, 1927, in the neighborhood of Soissons and Laon, graphs were constructed showing the changes in compn. of the roots in the ground during this period. The av. wt. of the roots diminished from 615 g. to 580 g. between Sept. 20 and Oct. 28, then increased to 660 g. by Nov. 12, the weather being favorable to ripening, and finally decreased to 590 g. by Nov. 20, owing to rainy weather. The sucrose content (by hot aq. digestion) increased from 16.2% on Sept. 20 to 17.2% on Oct. 12, and further to 17.4% on Nov. 11, after which date it fell rapidly to 16.8%. The quotient of purity fell continuously from 88.5 on Oct. 12 to 83.5 on Nov. 20, during which period the amt. of reducing sugar increased steadily from 0.25 to 3.5% of the sucrose. The optimum condition was attained on Oct. 12, when the purity was a max. and the amt. of reducing sugars normal. B. C. A.

Studies on the occurrence of methanol and ethyl alcohol in beets. M. JEDLIČKA. *Listy Cukrovar.* 47, 175–80(1928).—Previous studies showed that both MeOH and EtOH occur in the condensor liquors at sugar mills. Both MeOH and EtOH are found in the liquors throughout the process of sugar extn.; the combined amounts range from 0.00085% in the discarded water to 0.008% in the beet juice. Beet shavings show a content of combined alcs. of 0.0019% while beet mash contains 0.020%. During a digestion of beet shavings with lime, both alcs. are evolved in approx. equal quantities although according to the present concept of the compn. of beet pectins, only MeOH should form. The pectin of the treated beets contained both alcs. as a unit of structure.

FRANK MARESH

Comparative experiments with beet seeds. JAROSLAV SOUČEK. *Listy Cukrovar.* 47, 187–210(1928).—From expts. with seeds from 8 seed dealers who supply their seeds to Czechoslovakian growers S. concludes that the domestic beet seeds were equal to the best imported both in yield and sugar content.

FRANK MARESH

Diffusion battery technic. J. HAMOUS. *Listy Cukrovar.* 47, 173(1928).—The last extn. with a density of 1° Bg. without regard to the sugar content of the remaining beets is the limit of economical diffusion; juices with a lower density cannot be evapd. economically enough, for the sugar content is too small.

FRANK MARESH

The question of pressure evaporation. JANKO PROCHÁZKA. *Listy Cukrovar.* 47, 145-6(1928).—From the last campaign, P. shows that vacuum distn. colors the soln. much less than pressure evapn. and is therefore more favorable to use in making white sugar from heavy liquors. Both processes were tried on a com. scale. F. M.

Pressure evaporation in Zidlovice. JAROSLAV TIETZ. *Listy Cukrovar.* 47, 184-6(1928).—Data covering three seasons are given with the conclusion that with pressure evapn. the quality of sugar is not impaired. FRANK MARESH

Pressure evaporation. F. TUREK AND K. SÁZAVSKÝ. *Listy Cukrovar.* 47, 221-3(1929).—A critical analysis of the paper by Janko Procházka (2nd preceding abstract) showing that the statements hold for the local mill only. Data for both pressure and vacuum evapn. in mills of the authors show no dark-colored product encountered in pressure evapn.; sugar solns. evapd. under pressure were lighter in color than those evapd. in vacuum. Fuel economy is greater for pressure evapn. FRANK MARESH

Pressure evaporation. A. SCHULZE. *Listy Cukrovar.* 47, 224(1929).—A report from an Austrian mill using pressure evapn. and producing white sugar from heavy liquors since 1923 without any difficulties. FRANK MARESH

Nutritional contents of sediments in settling basins. JOSEF NOVÁK. *Listy Cukrovar.* 47, 219-21(1929).—Sediments from settling basins of sugar mills located in central Bohemia were analyzed chemically and physiologically. Vessels were filled with mixed loam, sediment from sugar mill and glass blower's sand in the ratio $\frac{1}{2}$ kg., $\frac{1}{2}$ kg. and 5 kg., resp., and planted with oats. Three vessels were fertilized with N, P and K; the next three with all but N, the next with all but P and the last with all but K. A control growth of oats was grown upon loam and sand in the ratio $\frac{1}{2}$ kg. and 5.5 kg. The amount of elements in the sediment according to chem. analysis is: N 0.03%, P_2O_5 0.28%, K 0.14%. The amount of elements absorbed by the plant from the sediment is only N 0.004%, P_2O_5 0.00%, K 0.046%. The percentage of elements absorbed from the sediment is: N 13, P_2O_5 0.00%, K 33%. The analysis of the loam used showed N 0.004%, P_2O_5 0.017%, K 0.028%. The plant uses 13% of the N, 33% of the K and none of the P found in the sediment; the latter is due to the presence of lime. FRANK MARESH

The properties of kieselguhr. P. HONIG AND M. VAN DE KREKE. *Arch. Suikerind Mededeel. Proefsta. Java Suikerind.* III, 977-90(1928).—The uses of kieselguhr as a filtration aid and clarifying agent are discussed. In Java its use is indicated principally for the filtration of muds, and of melted sugars. It may also be used on thick juices and run-offs, but this requires rather large quantities. The properties of 6 kinds of kieselguhr are described. Not only the phys. condition of the material, but also its chem. compn., are of great importance. The results of analyses show that the best brands contain little or no Al, and only very small quantities of Fe sol. in HCl; org. matter is practically absent. Methods of analysis are given in an appendix. P. R. P.

Manufacture of cornstarch, the utilization of its residue and the recovery of corn oil. II and III. O. K. A. KRIZKOVSKY. *Chem.-Ztg.* 52, 466-7, 486-7(1928); cf. C. A. 22, 3313, 4863.—Descriptive. A. L. HENNE

Quantities of fertilizers used in the year 1927, and their distribution over the area planted (Java) (HEYLIGERS) 15. The behavior of the Sb electrode in buffered and unbuffered solutions (LAVA, HEMEDÉS) 2. Methods of determination of H-ion concentration, and their application in sugar manufacture (KUKHARENKO, SAVINOV) 2. The viscosity of supersaturated solutions (TAIMNI) 2. Determination of the catalytic coefficient of the OH ion in the mutarotation of glucose and lactose (LOWRY, WILSON) 2. Preparation of triacetyl starch and its molecular weight (TSUZUKI) 10. Apparatus for liming sugar juices or mixing other materials (U. S. pat. 1,701,164) 1. Evaporators for sugar solutions, etc. (Brit. pat. 292,915) 1. Carbonaceous product from electric furnace treatment of carbonized lignin residues (U. S. pat. 1,701,272) 18.

Sugar. BERNARD H. VARNAU and TRUMAN B. WAYNE. Fr. 642 854, Oct. 11, 1927. Fine-grained soft cane sugar is obtained from the sirups remaining after the purging of hard, granulated massecuites without reboiling the sirups in vacuum pans, by heating to remove any false grain, forming small crystals by cooling rapidly with or without the addn. of seed crystals, and keeping the mass in slow, continuous agitation during crystn.

Sugar. WILLIAM K. MELROSE and JOHN C. STEAD (to Sugar Beet and Crop Driers, Ltd.). Can. 286,333, Jan. 8, 1929. Sirup extd. from dried beet by diffusion with warm water at 50° to 70° is treated at the same temp. with lime to ppt. the dissolved impurities and to render the sirup slightly alk. The ppt. and suspended im-

purities are sepd. and the liquor is decolorized with activated carbon. The final liquor is filtered, boiled and grained to produce a first strike of white sugar. The green sirup obtained from the first strike of white sugar is reboiled to produce a second strike of white sugar. The green sirup resulting from the purging of the said second strike of white sugar is boiled to produce a second product of raw sugar and the second product of raw sugar is continuously remelted in the said final liquor during the course of manuf.

Sugar from beets. R. G. W. FARNELL. Brit. 293,066, Feb. 23, 1927. Dried beet cosettes are extd. with water at reduced pressure and at a temp. below 100° (preferably 50–60°). The pressure may be varied during the extn.

Polysaccharide degradation. KARL FREDENHAGEN and BURCKHARDT HELFERICH. Can. 286,179, Jan. 8, 1929. Water-sol. degradation products of polysaccharides are formed by the action on a material contg. polysaccharides, without more than 7% of water, of HF contg. less than 20% of water and removed from a previous operation at a temp. below 100°, and removal of the HF after the reaction.

29—LEATHER AND GLUE

ALLEN ROGERS

New glue-testing work. OTTO GERNGROSS. *Gerber* 54, 179–80(1928).—Ten different hide and five different bone glues were examd. in eight different labs. for moisture, ash, p_H , viscosity at different concns. and temps., m. p., solidification point and setting time. The results were uniform. Viscosity of bone glue should be measured at 30° and of hide glue at 40° for comparable results. The system of Ostwald and Kohler for the evaluation of glues by treatment of solns. with sulfosalicylic acid cannot be used to compare hide and bone glues because of differences in effects. Although the rapid methods give fair indications of the joint strengths of hide glues they do not give agreements with bone glue values. G. has shown that exptl. disintegration of gelatin does not always alter viscosity, jelly strength or joint strength in the same order or the same direction. The rapid methods of evaluation are valuable but not for evaluating joint strength or adhesion.

L. F. MAREK

Polishing leather, wood, metal, etc. (Austrian pat. 111,536) 18. Recovery of volatile products (Fr. pat. 643,322) 13. Retort construction for carbonizing scrap leather, etc. (U. S. pat. 1,700,684) 1. Dyes (Ger. pat. 469,946) 25. Emulsifying agents and emulsions (Fr. pat. 33,278) 13.

Tanning. O. ROHM. Brit. 292,501, June 20, 1927. Salts of Fe, Cr or Al are used with H_2PO_4 or acids of As or salts or esters of these acids. Examples are given of the use of Fe sulfate chloride with H_2PO_4 and Na_2CO_3 , and of alum with glycerol, H_2PO_4 and salt. The H_2PO_4 and acids of As may be applied during greasing.

Treating leather, etc. FERDINAND JEAN. Fr. 642,682, Mar. 22, 1927. Animal or vegetable oils are mixed with lecithin and oxidized by a current of warm air and used for dressing skins, currying leather, and for the prepn. of moellon.

Waterproofing leather. E. D. VAN TASSEL and VAN TASSEL CO. Brit. 293,062, Jan. 31, 1927. A compn. for waterproofing leather is prepd. by admixture with paraffin of 5–30% of rubber or guta percha or the like at a temp. of 150° or higher, with or without various other ingredients such as gum, thus, gum sandarac, gum yacca, rosin or cumarone resins, japan wax, montan wax, or linseed or tung oil or resin oil. The mixt. is preferably applied to leather at a temp. of about 95–98°. Cf. C. A. 22, 3616.

Apparatus for applying varnish to hides, drying them and treating them with ultra-violet rays. ELIAS L. ELLIOTT (to Turner Tanning Machinery Co.). U. S. 1,702,043, Feb. 12.

Artificial leather. ANTONIO FERRETTI. Austrian 111,535, July 15, 1928. Pulped rabbit skin waste or the like is mixed with crude latex and the mass rolled out.

Chromate recovery from waste materials. AUGUST TREUSCH and RICHARD WÜRTENBERGER (to J. Mayer & Sohn). U. S. 1,700,657, Jan. 29. Cr-bearing wastes from the leather industry are treated (suitably by use of BaO_4) to convert the Cr into an insol. chromate and the latter is sepd. from the soln. and converted into a sol. chromate, as by use of Na_2SO_4 and HCl.

Increasing the waterproof quality of set glue. HENRY L. PRESTHOLDT. U. S. 1,701,763, Feb. 12. Glue used on porous materials such as casein glue used in making plywood is treated with a fluid glue coagulant such as CH_3O gas or soln. which is applied through the pores of the material.

Glues. C. KLINGSPOR. Brit. 293,232, Sept. 9, 1927. A glue dissolved or steeped in water is treated with a condensation product of a phenol and CH_3O , either as a "condensate oil" or in soln., at a temp. not exceeding 75° . In use, the product is applied and then heated to 145° or somewhat higher.

30—RUBBER AND ALLIED SUBSTANCES

C. C. DAVIS

The rubber industry in 1928. SIDNEY A. BRAZIER. *Ind. Chemist* 5, 8-11(1929). E. H.

The chemistry and synthesis of rubber. A. HOWARD. Dunlop Rubber Co., Australia. *Chem. Eng. Mining Rev.* 21, No. 241, 31-2(1928).—A brief historical review. C. C. DAVIS

The colloid chemistry of rubber. BENTON DALES. *India Rubber World* 79, 53-7(1929).—A review, dealing with various phases of the subject, with numerous references to the literature. C. C. DAVIS

The history of elastic fabrics. JOSEPH ROSSMAN. *India Rubber World* 79, 59-62(1929).—A description of various types, with a review of patents. C. C. DAVIS

General laboratories of the U. S. Rubber Co. ANON. *India Rubber World* 79, 63-4(1929).—An illustrated description of the new labs. C. C. DAVIS

Rubber. KURT H. MEYER AND H. MARK. *Ber.* 61B, 1939 49(1928).—New and very careful measurements on x-ray diffraction patterns of stretched rubber give, as the dimensions of the unit, a rhombic cell $a = 12.3 \pm 0.1$, $b = 8.3 \pm 0.1$, c (fiber axis) $= 8.1 \pm 0.1$. The space group is V_1 , which specifies 3 two-fold screw axes. It is perfectly clear that the structural mols. form micelles whose form and size may be detd. from the breadths of the x-ray interferences. The av. length of a crystallite is thus 300 to 600 A. U., thickness and breadth 100 to 200 A. U. Since each unit cell contains 8 C_5H_8 groups, the micelle contains 10,000-20,000 unit cells or 80,000-150,000 isoprene groups. In stretched rubber there are long chains contg. 75-150 isoprene groups held together by primary valence forces. These long chains lie parallel to each other along the fiber axis, and the small unit cell represents simply a turn in the screw axis. The olefin character of isoprene accounts for the fact that in unstretched rubber these long chains may contract and spiral, because of the mutual effects of the double bonds. Under these conditions the structure does not permit x-ray diffraction, although the preformed structural units are present. New expts. on the osmotic pressure of dissolved rubber are reported. These results indicate mol. wts. from 150,000 up to nearly 400,000 on account of the very high degree of solvation. Practically all of the benzene or chlorobenzene is bound to the rubber micelles. New expts. are also reported on cold vulcanization with S_2Cl_2 . Rubber shows a close analogy in its reaction to that between ethylene and SCl_2 or S_2Cl_2 to form mustard gas. The compd., $\text{C}_{10}\text{H}_{16}\text{SCl}_2$, is identified. Many of the properties of vulcanized rubber are accounted for in the formation of bridges between double bonds in the same micelle and in the connection between double bonds of different micelles. These new bonds, therefore, decrease the elasticity, and in the limit lead to hard rubber in which the micelles are solidly bound together. G. L. CLARK

Aging of rubber. ALFONS ZELNICEK. *Chem. Obzor* 3, 233-43, 257-63(1928). A discussion of the causes of aging, aging tests, proposals for storing *in vacuo*, in inert gases, under water and chem. means for the preservation of rubber, with a bibliography. JAROSLAV KUČERA

The aging of rubber under tension. GABRIEL G. BALAZS. *India Rubber & Fire Rev.* 28, No. 10, 20(1928); *Gummi-Ztg.* 43, 708, 710.—Mixts. with and without antioxidants were aged under different conditions, while stretched and while not stretched, to det. the influence of the various factors involved on the rate of deterioration. The results are given in tabular form and admit of certain conclusions. In all cases the greatest deterioration occurred with elongations of 0-50%. At 50-100% elongation the aging was the same as with the corresponding unstretched samples. Because of the permanent elongation the tension diminished during the aging periods. The rate of deterioration was not proportional to the initial elongation. The relative rates of deterioration in the hot air oven and in the O-bomb depend upon the presence of antioxidants, the latter rendering the samples relatively more resistant in the O-bomb. The acetone ext., a measure of the chem. changes during aging, increased with the time of aging. It was not proportional to the initial elongation. Because of fatigue phenomena in

the stretched samples, the phys. properties were influenced to a greater extent than is accountable by O absorption alone. A decrease in wt. in the hot air oven indicates that either free S or antioxidant, or both, are volatilized. No definite relations could be found between increase or decrease in wt. and the % elongation. In every case, however, stretching resulted in a slight decrease in wt. The permanent elongation was smaller after aging in the O-bomb than after aging in the hot air oven, so that the samples in the O-bomb were under greater tension than were the corresponding samples in the hot air oven.

C. C. DAVIS

Technical application of antioxidants. E. R. BRIDGWATER. *India Rubber World* 79, 61-2(1929).—A review and discussion, dealing with the characteristics of antioxidants, *reversion phenomena*, *anti-softeners*, *cracking under tension*, *sun-checking* and *methods of testing the aging of rubber mixts.* The view is taken that the term "antioxidant" should be broadened to include all substances which retard the deterioration of rubber, whether this deterioration results from oxidation or from other causes. The tendency toward reversion in overcured mixts is considerably diminished by anti-softeners, for the continued stiffening effect induced by the latter counteracts the softening which sets in after the free S is exhausted. Some compds., e. g., phenyl- α - and phenyl- β -naphthylamine, are very effective in preventing cracking under tension. Used in conjunction with an anti-softener, they are therefore of great value in the numerous types of rubber products which deteriorate on this account. Emphasis is laid on the importance of testing rubber products by some method more closely simulating the performance of the products than the usual methods. These performance tests should be carried out before and after artificial aging in air or in O.

C. C. DAVIS

The isomerization of rubber to cyclorubber under the influence of high-tension alternating currents. GUIDO FROMANDI. *Kautschuk* 4, 185-9(1928).—Substantially the same as C. A. 23, 1009 only in briefer form, with fewer data. **Correction.** *Ibid* 262 Addn. to charts explaining the curves.

C. C. DAVIS

Determination of the iodine number of raw rubber. ADOLF GORGAS. Lab., Ringe Werke A.-G., Berlin-Spandau. *Kautschuk* 4, 253-4(1928).—If in the Wijs-Kemp method for detg. the I no. of rubber (cf. K. C. A. 21, 1901), the ICl-AcOH soln. is replaced by IBr-AcOH, i. e., by Hanus soln. (cf. Z. Nahr. Genussm. 4, 913 (1901)), the reaction at 0° is incomplete. If IBr-AcOH is added to the rubber in CCl₄, coagulation occurs and the reaction is incomplete. At room temp., on the other hand, IBr gives theoretical I values if used under suitable conditions. Replacement of AcOH by CCl₄ is all that is necessary. **Procedure.**—As reagent dissolve 10 g. of IBr in 500 cc. of pure CCl₄. Disperse 0.15 g. of raw rubber in 50 cc. of CCl₄, add 50 cc. of IBr reagent, agitate, let stand 15 min. in darkness, add 30 cc. of 10% KI soln. and 100 cc. of water and titrate with 0.1 N Na₂S₂O₃ until colorless, adding starch near the end point. With vigorous agitation there is no emulsification. From the wt. *s*, the titer *a* of a blank test, the titer *b* of the IBr soln. on titrating back, the *f* of the Na₂S₂O₃ soln. the I no. is calcd. as $(a-b) \times 0.01269 \times f \times 100/s$. Rubber purified from "Revertex" by the method of Pummerer and Pahl (cf. C. A. 22, 885) gave practically the theoretical I no. corresponding to 1 double bond per C₅-H₈ unit.

C. C. DAVIS

Washing hard rubber dust. MAX RATHKE. *India Rubber World* 79, 69(1929); cf. C. A. 23, 307.—A description, with diagram, of a system devised by R. and now in successful operation in Germany.

C. C. DAVIS

Crystallized gutta-percha which is sensitive to light. F. KIRCHHOF. *Kautschuk* 4, 254-5(1928). Tjipetir gutta-percha contg. 98-99% hydrocarbon was purified by extrn. with cold acetone, soln. in CCl₄, filtration and evapn. of the filtrate. The product was white because of a cryst. structure. Microscopically the crystals were rounded, about 0.5 μ thick and 1-1.5 μ long. When the gutta-percha was heated above 43-4°, the crystals disappeared and on cooling reappeared at 42-38°. Fusion and recrystn. could be repeated indefinitely. Exposed to ultra-violet light, the purified product became brittle and more opaque, even in an atm. of H, the changes probably being the completion of crystn. Exposure of purified gutta-percha in C₆H₆ in an atm. of H gave on evapn. a product which was white, unctuous, and fragile, and which m. at 90° to a limpid oil. On cooling, the latter gave a tough product like the original gutta-percha. Heating thus destroyed the cryst. structure. Gutta-percha in an atm. of H irradiated with ultra-violet lost its turbidity at 39-40°, and this reappeared only at 35°, indicating that the m. p. of the micro-crystals of the irradiated product was definitely lower than that of the original crystals. On evapn. of the C₆H₆ this irradiated product redissolved to a clear soln. in C₆H₆, whereas irradiation of a film with air present gave a product which was partially insol. Exposure to ultra-violet light seemed to increase the ability of the gutta-percha to crystallize. In sunlight and air the chief effect was

oxidation. The difference between the behavior of rubber and gutta-perchu in ultra-violet light is attributed to the higher state of polymerization of the latter. Correction. *Ibid* 272.

C. C. DAVIS

Uniting rubber to metal. JOSEPH ROSSMAN. *India Rubber World* 79, 65-8 (1929).—A review and discussion of recent patents, including those for plating with Cu as a binder, the use of bakelite, the manuf. of solid tires, lining metal tanks, metallic fabrics for tires, coating elec. wires and the electrodeposition of rubber. C. C. D.

Fundamental principles of plasticization. JOSEF OBRIST. *Kautschuk* 4, 250-2 (1928); *India Rubber J.* 77, 25-6 (1929).—A review and discussion (cf. Manfred and O., C. A. 21, 2535).

C. C. DAVIS

Causes of variation in plasticity. CEYLON RUBBER RESEARCH COMM. *India Rubber J.* 77, 32-6 (1929).—The present paper deals with tests on crepe rubber 6 months old which had been prep'd. by (1) keeping the coagulum in the serum for different periods before rolling; (2) passing the coagulum through the rollers for different nos. of times; (3) adding different proportions of NaHSO_3 to the latex; (4) coagulating latex after different degrees of diln., and (5) passing dry crepe through different types of rolls to convert it into blanket crepe. The results of the expts. indicate that 6 months after prepn.; (1) crepe prep'd. by machining the coagulum 3 hrs. after coagulation is approx. 80% more plastic than that prep'd. by machining the coagulum 40 hrs. later; (2) crepe is nearly twice as plastic when prep'd. from coagulum machined more than 20 times instead of the customary no. of times; (3) crepe is approx. 50% more plastic when prep'd. from latex contg. no. NaHSO_3 instead of the proportion officially recommended; (4) crepe is only slightly more plastic when prep'd. from very dil. latex than that from concd. latex or from normal latex, and (5) machine-dried crepe may be 50% more plastic than air-dried crepe, and the type of rolls (whether water-cooled or air-cooled) may have an important effect on the plasticity of blanket crepe. The 6 months' storage comprised a short period in Ceylon and 4 months in London, so that the conditions are representative of those normally prevailing in commerce. Both the period during which the coagulum is kept in the serum before rolling, and the proportion of NaHSO_3 may influence the plasticity of com. grades of rubber. Drying crepe in hot air causes considerable increase in plasticity, a fact which is of importance in the prepn. of blanket crepe, and which suggests a reason why smoked sheet is usually more plastic than air-dried sheet.

C. C. DAVIS

Aldehyde derivatives of Schiff's bases as vulcanization accelerators; A-11, A-16, A-19, A-20 and A-50, and the ultra-accelerator Z-88. RUDOLF DITMAR and MANFRED RACHNER. *Kautschuklaboratorium, Graz. Chem.-Ztg.* 52, 935 (1928); cf. C. A. 22, 4876.—Tabulated data show the soly. of the 6 accelerators in water, benzine, C_6H_6 , CS_2 , CCl_4 and EtOH and their behavior with PbO , ZnO , MgO , and CdO , factice, golden Sb, HgS and 3 "Vulkan" colors (cf. D., C. A. 22, 4273).

C. C. DAVIS

The accelerator "Tuads" and its limitations. WERNER ESCH. *Kautschuk* 4, 255-8 (1928).—A discussion, with quant. data, of the accelerating properties of "Tuads" (tetramethylthiuramdisulfide), with particular reference to its merits compared with "Thionex" or "Monex" (tetramethylthiurammonosulfide).

C. C. DAVIS

Selenium red, the only red which is stable with all accelerators. RUDOLF DITMAR. *Kautschuklaboratorium, Graz. Gummi-Ztg.* 43, 759-60 (1929).—Tests of the value of Se red in rubber mixts. of widely different types showed that it is of almost unlimited application. It can be used whether alone as a pigment or in conjunction with lithopone, ZnO , TiO_2 , etc. It acts as a plasticizing agent, even when only 3% is added to the rubber, and forms a colloidal soln. with the rubber. It is unaffected by any of the com. accelerators or antioxidants or by factice, and can be used in soft or hard rubber mixts. cured with S. It cannot, however, be used when S_2Cl_2 is used as a curative, either as a vapor or in soln. Its coloring power exceeds that of any other inorg. red pigment.

C. C. DAVIS

A further study of the vulcanization of oils. II. P. STAMBERGER. Univ. College, London. *Rec. trav. chim.* 47, 973-6 (1928); cf. C. A. 22, 506.—Triolein (5 parts) and S (1 part) heated 2 hrs. at 160° yielded a vulcanizate wholly sol. in C_6H_6 . This product digested with acetone (5 parts) for 4 days and the extn. repeated 4 times yielded a residue of increased solidity with diminished soly. in C_6H_6 , and which was slightly elastic. The mol. wts. (detd. in C_6H_6) of the acetone-sol. and C_6H_6 -sol. products were 1204 and 2040, resp. These products were heated at 180° until gelation occurred, under which conditions the C_6H_6 -sol. substance swelled more and formed an insol. product far sooner than did the acetone-sol. substance. When they were exposed at $40-60^\circ$ to ultra-violet radiation in air and in N, the acetone-sol. substance swelled more than did the C_6H_6 -sol. substance, but the latter formed an insol. product far sooner. When the C_6H_6 -

sol. substance was kept under acetone for 3 days, or under water for 8 days, it became elastic and insol. in C_6H_6 . After 3-4 months at room temp. the C_6H_6 -sol. substances became an elastic sticky solid which did not dissolve in cold C_6H_6 but was completely sol. in boiling C_6H_6 , and this latter soln. on evapn. yielded a product sol. in cold C_6H_6 . These results, in conjunction with further swelling phenomena under various conditions, show that the properties of these various substances are altered by soln. It is probable that the low mol. wts. obtained with other gels, such as rubber and cellulose derivs., depend upon a depolymerizing action of the solvents. In the formation of elastic substances from sulfurated triolein, no chem. change takes place, so the change in behavior toward solvents cannot be explained by the formation of new compds. It is probable that the complete system changes in solvents, mol. polymerization and aggregation taking place. C. C. DAVIS

Methods of determining abrasion, with particular reference to the relation between road performances and laboratory tests. L. J. LAMBOURN. *Trans. Inst. Rubber Industry* 4, 210-34(1928); *Rubber Chemistry & Technology* 2, 166-92(1929).—The new type of abrasion machine, termed a "controllable slip" abrasion machine (cf. Brit. pat. 282,131), which is described and illustrated, has been so designed that rubber samples are abraded under controlled pressure intensity and slip, which may be regulated before or during the test to meet the conditions to be simulated. In this way the chief factors governing wear, viz., the nature of the surface, the intensity of pressure and the slippage, can be regulated so that each plays the correct relative part, resulting in a close approach to the particular conditions of road wear which it is desired to imitate. The results obtained with the app. indicate that it gives a correct forecast of road performance in 9 out of 10 cases. Expts. show that the work of abrasion is proportional to the magnitude of the slip, so that testing at const. slip is practically the same as testing under const. work. The new app. gives correct results over a greater range of hardness than any previous app. Various facts may be learned or confirmed by the app. Thus it was found that the rate of wear of a tire increased approx. with the square of the slippage, and where one mixt. was better than another at low % slippages, at higher % slippages the order of merit changed so that the mixt. which was inferior at low slippage became more resistant to abrasion when the slippage was high. A relatively hard mixt. is usually best when the speed and therefore the slippage is high, for it consumes less power and does not become so hot. Tests are also described to show the remarkably high rate of wear in summer, the very small wear when rubber is wet and the great effect which the character of the surface, the speed, the acceleration and the construction of an automobile have on the wear of tires. Various other subjects relating to abrasion and lab. and performance tests are discussed. C. C. D.

Measuring temperatures of calender rolls (KELTNER) 1. Negative catalysis in slow and induced reactions (DHAR) 2. Artificial leather (Austrian pat. 111,535) 29. Apparatus for circulating rubber dispersions, etc., to prevent separation of their constituents (Brit. pat. 293,072) 1. Use of rubber on a concrete foundation for road surfaces (Brit. pat. 292,681) 20. Determination of the temperature of high-speed bodies such as the rollers of rubber-making machines (Ger. pat. 470,201) 13. Objects from plastic substances such as rubber (Ger. pat. 470,270) 18.

Rubber latex. THE NAUGATUCK CHEMICAL CO. Fr. 643,122, Oct. 18, 1927. See Brit. 282,011 (C. A. 22, 3805).

Treating rubber latex. SOCIETÀ ITALIANA PIRELLI. Brit. 292,964, June 27, 1927. Latex is rendered coagulable by heat by addn. of oxides or hydrates of bi- and tervalent metals such as Zn, Mg, Al or Ca and a salt of NH_4 such as the sulfate. Salts of the same metals also may be added, and the treated latex may be used for the direct production of rubber articles. Cf. C. A. 22, 4877.

Deposition of rubber from latex. W. A. WILLIAMS. Brit. 293,095, March 28, 1927. In effecting deposition from material such as ammoniacal latex, there is added a salt of the metal employed as anode, e. g., $ZnSO_4$ when Zn electrodes are used. Various other details are described. Cf. C. A. 23, 547.

Rubber compositions. SIDNEY M. CADWELL (to Naugatuck Chemical Co.). U. S. 1,701,946, Feb. 12. Rubber is admixed with 2 or more of the ingredients: dibenzylamine, CS_2 or a material contg. CS_2 such as "oxy-*n*-butylthiocarbonic acid disulfide," (di-Bu ester of dithiobis [thionoformic acid]) Zn in combination such as ZnO and S, and then, substantially without change of form, the remainder of the vulcanizing ingredients are introduced from soln. The dibenzylamine and CS_2 are always separately introduced.

Coating composition containing rubber. CHARLES M. A. STINE and JAMES E. BOOGE (to E. I. du Pont de Nemours & Co.). U. S. 1,700,779, Feb. 5. In order to form a rubber-contg. coating on metals or other materials, a mixt. comprising rubber, a volatile thinner such as benzine and a Co, Mn, Pb, Zn or other suitable metal drier is applied to the surface and is exposed to the air and heated to cure the rubber by the action of the drier and evapn. of the thinner. Cf. C. A. 22, 1705.

Hard rubber coating composition. SAMUEL E. SHEPPARD and JOHN J. SCHMITT (to Eastman Kodak Co.). U. S. 1,701,129, Feb. 5. Commiunited hard rubber is digested in an aq. NaOH soln. for 2-5 hrs., the alkali is washed out and the treated material is dried and is incorporated with a molten flux comprising rosin and China wood oil and heated at 200-250° to produce a homogeneous fusion product; the latter is then dissolved in three times its quantity of a solvent such as benzene and coal tar naphtha to form a compn. suitable for spray-coating of metal.

Rubber articles reënforced with long fibrous material. WILLIAM B. WESCOTT (to Rubber Latex Research Corp.). U. S. 1,702,225, Feb. 12. In forming material for shoe soles or other articles, relatively long fibers such as cotton or ramie impregnated with latex rubber are distributed through a rubber compn. by milling.

Drying rubber articles. P. KLEIN (to Anode Rubber Co., Ltd.). Brit. 293,061, Jan. 25, 1927. Shaped articles of substantial thickness produced by immersing a former in an aq. dispersion of rubber or the like are dried by maintaining one side at a higher temp. and permitting escape of water from the other side on which an impervious skin is prevented from forming until the drying is completed. The articles may be dried on metal molds heated by elec. resistances or by induction. Various details and modifications of procedure are given and the process is applicable to cellulose esters, natural or synthetic resins, casein or albumin compns., etc.

Roughened or ornamental surface on rubber articles. S. D. SUTTON and VEEDIP, LTD. Brit. 293,111, March 30, 1927. A final coating of coned latex is partially dried, treated with a solvent, and then further dried. Various details and modifications are given.

Variegated markings on rubber surfaces. DUNLOP RUBBER CO., LTD. and G. G. THORNTON. Brit. 292,704, March 29, 1927. Irregular embossed markings are produced on surfaces such as rubber by deposition from aq. dispersions, by placing the articles between 2 surfaces such as metal and vulcanizing in boiling water or an aq. soln.

Rubber sheets with grain-like markings. C. MACINTOSH & Co., LTD., S. A. BRAZIER and G. F. THOMPSON. Brit. 292,754, May 26, 1927. Sheets of rubber are coated with a rubber soln. of different color, assembled into blocks (which may be deformed under pressure) and the blocks are sliced.

Artificial rubber. I. G. FARBENIND. A.-G. Brit. 292,103, June 13, 1927. Polymerization of di-olefins emulsified in suitable liquids (such as aq. emulsions which may contain proteids, milk, dextrin, soaps or sulfonates) is effected by the use of H₂O₂ with or without other polymerizing agents, buffer mixts., etc.

Molds (of aluminum or aluminum alloy) for molding rubber tires. H. A. BRITAIN (to Goodyear Tire & Rubber Co.). Brit. 292,905, June 25, 1927. Mech. features.

Rubber-masticating apparatus. PARK E. WELTON. U. S. 1,701,832, Feb. 12.

Waste rubber. THE DUNLOP RUBBER CO., LTD. Fr. 643,357, Nov. 4, 1927. Waste rubber is reduced to small pieces mixed with 1-3% of pure S and 1/2 to 3% of an antioxidant, the whole being vulcanized under pressure. As antioxidant, quinol, aminophenol, diaminophenol, aldol, naphthylamine or condensation products of aldehydes and aromatic amines may be used.

Refining reclaimed rubber. JOHN F. FISHER and WALLACE R. GILLAM (to Philadelphia Rubber Works Co.). U. S. 1,700,287, Jan. 29. The rubber is passed through a mill to form it into a continuous sheet, divided lengthwise into strips to sep. stocks of different grades contained in the sheet, and the stock of one grade is fed back into the mill substantially in constant ratio to the feeding of new stock into the mill. An app. is described.

Tennis balls. C. MACINTOSH & Co., LTD., S. A. BRAZIER and L. R. RIDGWAY. Brit. 293,124, April 1, 1927. A cloth-covered tennis ball is treated by immersion or otherwise with a rubber or gutta percha soln. and is afterwards vulcanized, preferably with use of an accelerator of the dithiocarbamate or xanthate class.

Accelerator for vulcanization. JAN TERPPEMA (to The Goodyear Tire and Rubber Co.). Can. 286,105, Jan. 1, 1929. Rubber is vulcanized by heating a mixt. contg. rubber, S and a reaction product of mercaptobenzoxazole and a basic N compd. contg. at least two hydrocarbon groups. Cf. C. A. 22, 2404.

CHEMICAL ABSTRACTS

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-APPARATUS AND PLANT EQUIPMENT

W. L. BADGER

Continuous laboratory extractor for liquids. ALFRED W. FRANCIS. *Ind. Eng. Chem., Analytical Ed.* 1, 15(1929).—A simple, efficient app. that can be made in the lab. is described. J. H. MOORE

Contemporary tube still. A. M. TREGUBOV. *Azerbeidzyanskoye Neftyanoe Khozyaistvo* 1928, No. 6/7, 46-51, No. 10, 41-8.—Description and calcs. for a shell tube still battery are given. A. A. BOEHTLINGK

New investigation on the mode of operation of high-percentage distilling apparatus. E. LAIDNER AND W. KILP. *Chem. Fabrik* 1928, 713-5, 726-7.—Results are given on further expts. with 2 sets of app., each consisting of a masu column of 16 compartments and a rectifier of about 30 compartments. Cf. *C. A.* 22, 663. J. H. MOORE

Calculation of rectification columns. A. M. TREGUBOV. *Azerbeidzyanskoye Neftyanoe Khozyaistvo* 1928, No. 11, 25-37.—Very complete calculations on the above subject are given. A. A. BOEHTLINGK

Ultrafiltration. R. WASMUTH. *Chem. Fabrik* 1928, 405-6.—Among the advantages of the membrane filter is that adsorption effects, such as the staining brown of filter paper by Fe bromide soln. from the formation of basic salt, do not occur. Two methods of securing a membrane filter held between two filter papers and resting on a perforated porcelain plate are described. Another app. is designed for the treatment of steel turnings with Br soln. and the ultrafiltration of the insol. residue, with exclusion of air. B. C. A.

Apparatus for microfiltration. K. L. MALJAROV. *Mikrochem.* 6, 103-5(1928).—The app. comprises two pieces of thick-walled glass tubing, the lower end of the longer piece and the upper end of the shorter piece being thickened and ground flat so as to form a perfect joint between the two. The lower end of the shorter piece is drawn out to a capillary jet and the two pieces are held together with a bow-shaped spring clamp after a small piece of any type of filter paper is inserted between them. The filter is placed with the jet in the liquid; suction is applied by means of the mouth at the upper end. The filtrate collects above the paper and the collecting tube may, if desired, be provided with a small bulb to increase its capacity. B. C. A.

Method for detecting leaks in glass vacuum apparatus. P. SELENYI. *Z. Physik* 48, 733-4(1928).—The residual gas inside the vacuum app. is excited by a Tesla current while another gas leaks into the app. If the light emitted by the two gases is markedly different, as with CO₂ and air, the leaking spot can be detected directly by the change in color in its vicinity. B. C. A.

Adjustable needle-valve leaks. C. T. KNIPP. *Nature* 122, 131(1928).—Three forms of needle valve, one of which admits of calibration, and all being constructed with very long and narrow needles, are described and figured. B. C. A.

Automatic pipet. O. ORTH. *Chem. Fabrik* 1928, 492.—The pipet has a glass tap at the bottom and is expanded to a bulb at the top. The graduation mark is on the constriction below the bulb and a capillary filling tube ends on a level therewith. The pipet is filled from a wash bottle at a lower level and any surplus runs back. The filling and air release connections are either fused in or taken through a rubber stopper. B. C. A.

A precision valve for gases and liquids, particularly for burets to contain liquid and a description of a buret without stopcock. P. FUCHS. *Z. anal. Chem.* 76, 166-73 (1929).—A novel buret without stopcock is prepd. by drawing out the end of some glass tubing to a hook and fusing a glass bead to the outer part of the bend. Then when a short piece of rubber tubing is placed over the hook, the opening of the tube is pressed air-tight against the tubing. The other end of the tubing is connected tightly with the top of the buret and the whole tubing is about as long as the buret. The lower end of the buret is drawn out for about 10 cm. into a capillary of 1-1.5 mm. diam. By

pressing against the rubber at the valve, air can be made to enter the buret so that the liquid escapes. In this way all contact of the soln. with rubber or with stopcock grease is avoided and the buret can be made to deliver a single drop. Modifications of this valve are also shown at the bottom of a buret; in some cases the lower end of the buret is bent into a hook and in other cases the delivery tip is bent. W. T. H.

Some improvements in apparatus for gas analysis. H. A. BAHR. *Chem. Fabrik* 1929, 13-5.—A modified Czako absorption pipet is described; also an improved Orsat app. with which a complete analysis, including H and CH₄, can be made in 20 mins. with an accuracy of 0.1-0.2%. J. H. MOORE

Apparatus for storing and circulating gases. F. PETZOLD. *Chem. Fabrik* 1928, 716-7; cf. *C. A.* 22, 700. J. H. MOORE

Gas circulating pump. GUY BARR. *J. Chem. Soc.* 1928, 3293-5.—A pump for circulating gases within a closed system is described. It is an improvement on the device of Maass (*C. A.* 13, 273) in that economy of water is attained. A piston of Hg driven by water pressure and embodying its own valve system circulates the gas. Vols. of 100 cc. per min. against a head of 1 in. of H₂O can be circulated, the water consumption being approx. 100 cc. per min. Against higher heads the consumption is somewhat greater. C. Z. ROSECRANS

Gas pump for circulating various gases through a closed system. M. DOLCH AND K. GIESELER. Univ.-Inst. für tech. Chem., Halle. *Chem. App.* 15, 229-31, 268-9(1928).—The pump consists of Hg valves operated by a small motor through an arm to which are suspended the 2 leveling flasks. The rate of circulation has wide limits. J. H. MOORE

The Mawald rotary pump. KARL KLEMM. *Chem.-Ztg.* 52, 985-6(1928) A valveless pump which will pump at a suction of 9 m. and deliver at a pressure of 20 atm. It is especially adapted to handling benzine, NH₃ liquors, petroleum, lyes, curd soap, boiling oils, tar, etc. J. H. MOORE

Thomas recording gas calorimeter. ANON. Dept. Sci. Ind. Res., *Fuel Res., Tech. Paper* No. 20, 42 pp.(1928).—The results of expts. of a fundamental nature carried out on the earlier models indicate that (1) with gas of const. calorific value the record made by the calorimeter is correct within about 1%; (2) when the calorific value alters, there is a lag of about 30 min. before the change appears to its full extent on the record, small or temporary changes being ignored or under-estimated; over long periods the av. of the record agrees satisfactorily with values obtained on a Simmance machine; (3) variations of gas pressure, voltage of elec. supply, room temp. and barometric pressure, within reasonable limits, do not upset the performance. After these tests the instrument was altered in the heat-absorbing air meter where disturbance of the water level was lessened by changes in the construction of the vanes and of inlet and outlet ports, in the const.-level water feed where incoming water was made to splash on to the overflow weir, and in the burner which was constructed of silica instead of metal. Finally, changes were made in the recording mechanism by which it became more sensitive and less liable to lag and to irregular working. Tests on the modified app. indicate that (1) a steady reading can be obtained about 20 min. after lighting the burner, and if the calorific value of the gas is changed, this will appear within about 4 mins., but only to its full extent after about 15-20 mins.; at more frequent intervals than this, changes are not recorded to their proper value, although the periods and the av. will be correct; (2) fluctuations in the speed of the driving motor have small permanent disturbing effects, but may cause larger temporary errors; (3) changes in the level of the water in the tank must be avoided as far as possible, as a decrease of even 0.1 in. produces a rise of about 18 B. t. u. on the chart; (4) the recording mechanism is satisfactory, and no troubles were encountered in other mech. parts; the instrument is more accurate than water-flow or differential-expansion types, although its time lag is greater. B. C. A.

Portable electric stirrer. E. ZIEHL. *Chem. Fabrik* 1928, 729.—Similar to the "Hy-Speed." J. H. MOORE

Improvements in the apparatus of micro-Dumas. SHIGEO OKIDO. *Bull. Inst. Phys. Chem. Research* 8, 25-6(1929); *Abstracts* 2, 2.—The following improvements are applied to the microchemical N detn.: After preheating the combustion tube in a current of air, CO₂ is passed through the tube when it is still red hot and until it is completely cooled down, the purpose of this being to prevent air being trapped in CuO. A 3-way cock is inserted between the CO₂ generator and the bubble counter, which makes it very convenient to stop the CO₂ current at any time during the analysis. ALBERT L. HENNE

Device for carbon and hydrogen analysis of volatile, explosive and easily carbon-

izable organic liquids. MANASSEH G. SEVAG. Columbia Univ. *Ind. Eng. Chem., Analytical Ed.* 1, 16-7(1929).—This simple device consists of a small Pyrex tube contg. kieselguhr in which the liquid is absorbed, weighed and introduced into the combustion tube.

J. H. MOORE

Automatic apparatus for the determination of small concentrations of sulfur dioxide in air. II. MOYER D. THOMAS AND JOHN N. ABERSOLD. *Ind. Eng. Chem., Analytical Ed.* 1, 14-5(1929).—The app. previously described (*C. A.* 22, 2687) is slightly modified and an acidulated soln. of 0.006% H_2O_2 is used as the absorbent.

J. H. MOORE

Drying chamber for analytical and preparative work. F. HAHN. *Chem. Inst. d. Univ. Frankfurt. Chem.-Ztg.* 52, 975(1928).—The app. may be attached to the rod of a stand. The door is not hinged but hangs on a lip at the top of the chamber and remains closed by its own wt.

J. H. MOORE

Weighing systems as illustrated by modern scales. KARSTEN. *Chem. Fabrik* 1929, 3-5.—A description of modern (German) commercial varieties of platform scales, etc.

W. C. EBAUGH

Hartmann and Braun's spring balance. J. E. VERSCHAFFELT AND E. VAN DE CASTEELE. *Natuurwetensch. Tijds.* 10, 35-46(1928).—The balance is described, and the relation between load and reading under ordinary working conditions considered mathematically. The influence of temp. is important; it varies linearly with the load. A method of calibrating is described, and the effect of altering the adjustments examd.

B. C. A.

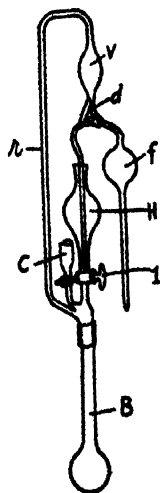
Weight buret. ISHIZO ITABASHI. Research Lab., Government Railway Office. *J. Paints, Pigments and Printing Ink* 2, 107(1928).—For weighing out such viscous liquids as varnish, an all-glass app., weighing about 40 g., consists of burets, a conical flask, which also serves as a receiver of the liquid, tube-like stopper and a lid. The capacity is 15 cc. The app. may be put on the pan of a chemical balance. Advantage is claimed in its ease of cleaning and in lessening the evapn. of volatile liquid.

K. S.

A pneumatic regulator for use with burets without stopcocks. EUGEN SHILOV. Polytech. Inst. Ivano-Woznessensk. *Z. anal. Chem.* 76, 212-6(1929).—S. has already described a buret without stopcock, which was worked by means of a levelling app. contg. liquid. In this paper several forms are described of a device which, in its simplest form, consists of an elastic sheet of rubber stretched over the edges of a glass plate. By movement of a screw, the elastic membrane is pushed outward, accomplishing air pressure on the liquid in the buret so that it flows out, or pulled inward so that the buret sucks up liquid.

W. T. H.

A new universal apparatus for microanalysis. I. Ashing in a closed system. ERNST TSCHOPP. Univ. Basel. *Biochem. Z.* 203, 267-77(1928).—Two types of the app. are described of which the more simplified model is shown in the figure. It consists of 2 parts: (1) the small flask in which the ashing takes place and (2) the condenser. The ashing mixt. (HNO_3 , H_2O_2 , etc.) is admitted from the cup *c*. The fumes rise through *r* and condense in the bulb *v*, from which the material can either be passed into *f* and thence into a receiving soln., or it may be transferred to *H* by the proper adjustment of the 3-way stopcock *d*. By turning stopcock 1 the substance can be readmitted to the flask. The oxidation is carried out by means of HNO_3 and H_2O_2 , but if Cl is to be detd., a measured amt. of $AgNO_3$ is also introduced into the flask. The soln. is transferred to a 25 cc. flask, made up to vol. with H_2O , and is used for detg. Cl, SO_4 , P, Na, K, Ca, Mg, Fe, etc. The Cl is detd. by titrating back the Ag in an aliquot of the soln. Five cc. of the filtered soln. is treated with 5 drops of fuming HNO_3 and 3 cc. of 2% starch and titrated with a standard 0.02 N KI to the first blue color. An alternative procedure is to allow the HCl formed in the acid ashing to pass through tube *f* into a flask contg. a measured amt. of $AgNO_3$. This is continued until no more turbidity is produced when the stopcock *d* is closed and the ashing with HNO_3 + H_2O_2 is started. In case the Cl was bound in the combustion flask with $AgNO_3$, it becomes necessary to get rid of Ag before proceeding with other analyses. This is accomplished by adding concd. HCl and filtering after 20 min. P can be detd. by any of the colorimetric methods depending upon the reduction of phosphomolybdate. The SO_4 is detd. by pptg. with $BaCl_2$ and weighing the ppt. of $BaSO_4$. For details of the procedure consult the test. Ca is detd. by the method of Kramer-Tisdall after previously adjusting the reaction. Mg is detd. in the filtrate from the CaC_2O_4 , the P being measured in the NH_4MgPO_4 ppt. colorimetrically. K is detd. by $KMnO_4$ titration (Kramer-Tisdall)



after the NH_3 is driven off by boiling with K-free NaOH . For the Na detn. the soln. is first treated with a little $\text{Bi}(\text{NO}_3)_3$ and Na-free K_2CO_3 to remove Fe and P, and the Na is pptd. as $6\text{NaNO}_3 \cdot 9\text{CsNO}_3 \cdot 5\text{Bi}(\text{NO}_3)_3$, which is detd. titrimetrically with 0.1 *N* KMnO_4 . The soln. can also be used for Fe analysis by the Fontès-Thivolle method (C. A. 18, 92).

A new apparatus for measuring hydrogen-ion concentrations. P. HANSON. *Dansk Tids. Farm.* 2, 139-40(1928).—The app. described is known as the Wulf's Foil-colorimeter. The working of this app. is based on the fact that the H- and OH-ions diffuse into a colloidal membrane much more rapidly than large mols., e. g., indicators diffuse out from such membranes into the surrounding liquid. If now a membrane contg. an indicator is placed in a soln. not to exceed 2 mins., its color will indicate the H-ion concn. of the soln. The app. is essentially a color scale obtained by mounting on parallel bars transparent strips impregnated with proper indicators and submerged in solns. of known p_{H} values. To make a p_{H} detn. a small strip contg. the proper indicator is submerged into the soln. to be tested for 2 mins., rinsed with distd. H_2O and dried between filter papers. It is then mounted on a slider which fits over the parallel bars (like a slider of a slide rule), and its color matched with one of the "standard" strips.

O. A. NELSON

Permeameter for testing magnet steel. B. J. BARBITT. *J. Optical Soc. Am.* 17, 47-58(1928).—The common com. permeameters are not capable of producing the high magnetizing forces required to det. accurately the magnetic properties of Co steel in bar form. The yoke type of permeameter may be adapted for this purpose by the use of extensions to the poles so that the distance between them is much less. In this way the greater part of the magnetomotive force is distributed over a short portion of the magnetic circuit and the force per cm. is correspondingly greater. The instrument described gives a very uniform magnetizing force directly proportional to the magnetizing current throughout a wide range of values. It is automatically compensated so that it records only ferric induction, is simple and rapid in operation, and possesses a high degree of accuracy.

B. C. A.

Sodium light for polarimetry. T. THUNBERG. *Svensk Farm. Tids.* 32, 569-70(1928).—An asbestos wick is soaked in NaCl soln. This is dried and gently ignited. A part of this is placed in the Bunsen flame when a polarimeter light is needed.

A. R. ROSE

Application of the vacuum tube in the falling-ball method for dark-colored solutions. E. M. SYMMES AND E. A. LANTZ. *Ind. Eng. Chem., Analytical Ed.* 1, 35-6(1929).—The falling-ball viscometer is used with translucent liquids but cannot be used where the ball cannot be seen. A vacuum tube, with suitable A and B supplies, has split grid and plate coils wound around the glass viscosity tube at definite distances apart. When the tube is oscillating at audio frequencies, the passage of the steel ball through the field of the coils causes a sharp change in the audible frequency.

E. M. SYMMES

Discharge tube with variable electrode distance. C. LEISS. *Z. Physik* 52, 750-1(1928).—The electrodes can be set accurately from the outside and the tube can be evacuated and fastened to a spectrograph.

GEORGE GLOCKLER

Something new in the continuous U. V. irradiation of liquids. A. KARSTEN-SALMONY. *Chem.-Ztg.* 52, 955-6(1928).—A description of Scholl's app. consisting of a quartz lamp and 3 water-cooled cells through which the liquid flows in parallel or in series, according to the degree of irradiation desired.

J. H. MOORE

A new large container. OSKAR KRON. *Chem. Fabrik* 1929, 15-6.—Rectangular tanks are made by bolting together plates of standard sizes.

J. H. MOORE

Tuboflex-Rotor pump. R. HEERWAGEN. *Apparatebau* 40, 302-3(1928)

J. H. MOORE

The condensate trap and its heat-technical significance. GUSTAV MANKENBERG. *Apparatebau* 40, 301-2(1928).—Cf. C. A. 22, 3808.

J. H. MOORE

Electrically heated thermocirculator for hot leaching and digesting. M. G. RAEDER. *Ind. Eng. Chem.* 21, 251-2(1929).—The app. consists of a glass bulb connected with a reflux condenser at the top and a circulation tube between the bottom and the upper part. The lower part of the tube is covered by a layer of asbestos sheet bound by a nichrome wire. This coil is insulated and protected on the outside by mica-mantled asbestos fastened with brass caps carrying contact screws and connected with an adjustable resistance. The characteristic feature of the app. is that the material to be leached is brought into vigorous circulation even when high in sp. gr. The form of the lift tube accentuates the pulsating motion. The circulation may be carried on for days without loss of liquid and without supervision. The app. should be well adapted for carrying out reactions between immiscible reactants at boiling temp.

W. H. B.

Supplement No. 6 to the results of the questionnaire to chemical factories on their experiences in the use of aluminum. ANON. *Apparatebau* 40, 274, 286-7, 296-7, 307-8(1928).—Cf. C. A. 22, 1500. J. H. MOORE

Cooling furnaces. ERICH ROUCKA. Ger. 470,327, May 30, 1926. The arrangement of the cooling pipes is described.

Laboratory centrifuge. MAX KIEL. Ger. 470,671, June 30, 1926.

Differential air thermometer compensated for barometric variations. SCIENTIFIC & PROJECTIONS, LTD., C. FAIRWEATHER, A. S. MARCH and G. L. WINDERS. Brit. 293,547, June 14, 1927.

Oil filter. MILLSON M. BASSETT (one-half to Lester I. Weil). U. S. 1,702,489, Feb. 19.

Sand filter (cleansed by agitation with reverse flow). W. PATERSON. Brit. 293,534, May 25, 1927. Structural features.

Filter for separating dust from air or other gases. CHARLES A. WINSLOW. U. S. 1,702,804, Feb. 19.

Dust separator. ÉMILE PRAT. Fr. 643,876, April 1, 1927. Dust is sepd. by a spiral ventilator stretching beyond 360° to continue the action of the centrifugal force on the dust, the gas at the periphery being diverted through a cyclone or other accessory app. in which the diverted gas is freed of its dust and may be returned at a point further on in the ventilator.

Apparatus for separating substances from gaseous mixtures by adsorption. VITALIS PANTENBURG. U. S. 1,702,311, Feb. 19. Material adsorbed at high pressure is released at lower pressure and the adsorbent recovered for further use.

Apparatus for separating oil from water, etc., by gravity and decantation. CARL K. MORSE (to Eleanor H. Morse). U. S. 1,702,612 and U. S. 1,702,613, Feb. 19.

Rough resilient surfaces for separating grains of different character. C. BUSSARD (to Soc. d'applications et de recherches scientifiques et industrielles (S. A. R. S. I.)). Brit. 293,389, July 5, 1927. Surfaces of rollers may be coated with a fine powder such as Pb_3O_4 or silica either embedded in the surface or applied in a flexible paint. Larger grains may be used in admixture with talc powder.

Apparatus for sorting friable material by gravity in a jet of air. V. E. TIR. Russ. 1532, Aug. 31, 1928. Friable material is continuously charged into the app. from a container with a baffle on the bottom and carried by a jet of air over different distances, dropped into containers placed in the chamber at various distances from the jet, whereby particles of diff. sizes are sepd.

High-speed beating apparatus for preparing fine dispersions of solids in liquids. W. H. WHATMOUGH. Brit. 293,510, April 29, 1927.

Röntgen-ray apparatus. E. POHL. Brit. 293,796, July 12, 1927.

Röntgen-ray apparatus. NAAMLOOZE VENNOOTSCHAP PHILIPS' GLOEILAMPEN-FABRIEKEN. Brit. 293,503, April 19, 1927.

Röntgen-ray tubes. E. G. GILSON (to British Thomson-Houston Co., Ltd.). Brit. 293,864, July 15, 1927. An anode is formed by surrounding one end of a metal supporting stem with refractory material and applying heat and pressure. The use of W. powder is described.

Röntgen-ray tubes. E. POHL. Brit. 293,318, July 2, 1927. Structural features.

Röntgen tubes with Lenard window. SIEMENS-REINIGER-VEIFA, GESELLSCHAFT FÜR MEDIZINISCHE TECHNIK M. B. H. Fr. 643,727 and 643,728, Nov. 10, 1927.

Electron discharge tubes. SOCIÉTÉ D'ÉLECTROCHIMIE, D'ÉLECTROMÉTALLURGIE ET DES ACIÉRIES ÉLECTRIQUES D'UGINE and RAUL BRUCKERT. Fr. 642,567, Oct. 19, 1927. An alkali or alk. earth metal is placed in the tubes so that the vapor tension of the metal produces an atm. favorable to the emissive power of the tube.

Electric discharge tubes. WESTINGHOUSE ELECTRIC AND MANUFACTURING COMPANY. Fr. 643,977, Oct. 21, 1927.

Luminous electric discharge tubes suitable for flashing neon beacons. R. R. MACHLETT (to Rainbow Light, Inc.). Brit. 293,681, July 9, 1927. Structural features. Brit. 293,682 also relates to discharge tubes of the same general type. Brit. 293,683 relates to tubes of the glow-discharge type contg. an atm. of rarified A and Hg vapor (preferably evolved from small Hg mirrors distributed along the walls of the tube). The light from the tube is blue with clear glass and green with amber glass and the glow is uniform even at low temps. at which other tubes contg. Ne and Hg have a striated glow. Liberation of alkali metal from the glass, which might produce a striated glow, is prevented by using boro-silica glass and immersing the glass in 2% HF soln. or other

suitable acid for several days before use in making the tube. Various other details are described.

Cathodes for electrical discharge tubes. NAAMLÖÖZE VENNOOTSCHAP PHILIPS' GLOEILAMPENFABRIEKEN. Ger. 470,421, June 29, 1924. The cathodes comprise a core having a surface formed, at least in part, from an oxide of a metal, e. g., Cu, capable of forming alloys with alk. earth metals. A layer of alk. earth metal is applied to the core, which is then heated in a non-oxidizing atmosphere so that the alk. earth metal melts. Finally, the alk. earth metal is oxidized. The cathode may be heated again in a reducing atmosphere, e. g., of H or Mg vapor. The prepn. of a cathode *in situ* is described.

Cathode discharge tubes. SOCIÉTÉ ANON. RÉUNIE DE LAMPES À INCANDESCENCE ET D'ÉLECTRICITÉ. Fr. 644,097, Nov. 18, 1927.

Cathode discharge tubes. SOC. ANON. RÉUNIE DE LAMPES À INCANDESCENCE ET D'ÉLECTRICITÉ. Fr. 644,164, Nov. 19, 1927. A combination of a metal of high emissive power, such as alk. earth metals and Th, and a reducing agent such as finely powdered Mg are placed in the tubes and afterwards heated *in vacuo* so that the metal is first reduced, then vaporized and deposited on the core of the cathode.

Thermionic valves. S. LOEWE. Brit. 293,694, July 9, 1927. Electron-emitting materials such as metallic oxides, sulfides or carbonates are brought into sol. and, preferably, colloidal form and sprayed on a core in the form of minute drops. An app. is described in which a plurality of sprayers may be arranged around a wheel and the cathode may be heated in a reducing flame or in a neutral gas between successive spraying operations.

Vacuum electric tubes with thermionic cathodes. E. Y. ROBINSON and METROPOLITAN-VICKERS ELECTRICAL CO., LTD. Brit. 293,723, March 11, 1927. When an indirectly heated cathode such as a Ni tube coated with Ba and Sr oxide and heated by radiation or conduction from a heater or by electron bombardment from an auxiliary cathode is used, the cathode is originally coated with carbonate and is heated by an elec. current to form the oxides after pumping the vacuum tube without heat-treating the electrodes and after sealing. Other details also are specified.

High-tension cables with passages for leading cooling fluid to and from x-ray tubes. NAAMLÖÖZE VENNOOTSCHAP PHILIPS' GLOEILAMPENFABRIEKEN. Brit. 293,731, April 11, 1927.

Quartz mercury-vapor lamp and associated apparatus for producing ultra-violet rays. F. W. ROBINSON and L. F. BIRD (to Hanovia Chemical & Mfg. Co.). Brit. 293,257, Aug. 24, 1927.

Catalyst tube. SOCIÉTÉ D'ÉLECTROCHIMIE, D'ÉLECTROMÉTALLURGIE ET DES ACIÉRIES ÉLECTRIQUES D'UGINE. Fr. 643,923, Apr. 16, 1927. A catalyst tube for synthesis under high pressure comprises 2 chambers inside a hollow cylinder, and capable of being traversed successively by the gas, both serving as catalyst chambers or one as a preliminary purification chamber. The chambers may be concentric and may be sepd. by a heating element such as an elec. spiral.

Apparatus for regulating electric heating. SIEMENS-SCHUCKERTWERKE A. G. Ger. 470,396, Dec. 9, 1925. App. is described of the kind in which the speed of rotation of a rotary interruptor varies with the temp.

Barrel-shaped combustion chamber for coal-dust furnaces. FRÄNKEL & VIEBAHN. Ger. 470,578, April 2, 1925.

Apparatus for blowing pulverized materials into shaft furnaces. PAUL HESKAMP. Ger. 470,541, Sept. 17, 1927. The tubes, nozzles, etc., are made of basic pig iron.

Discharging means for shaft furnaces. GUSTAV A. STRECKER. Ger. 470,621, Nov. 25, 1926. Constructional improvements are described in app. of the kind comprising a stepped platform reciprocating under the furnace outlet.

Bakery furnaces. ANDRÉ MINNE. Fr. 33,326, Dec. 17, 1926. Addn. to 617,549.

Furnace charger. ROGER M. ANDRÉ. Ger. 470,655, Jan. 5, 1926. Constructional improvements are described in app. of the kind in which a fuel container attached to the grate by a system of levers is automatically brought to its discharging position as the wt. of fuel on the grate falls.

Burner for liquid fuel. SOCIÉTÉ REBOURG ET DUPONT. Fr. 643,906, April 15, 1927.

Gas-burner construction. ERNEST K. ANDERSON and GEORGE A. SIMMONS. U. S. 1,702,625, Feb. 19.

Submerged flame burner. O. BRUNLER. Brit. 293,814, April 7, 1927. Water or steam is supplied to a burner (the construction of which is described) with the fuel mixt. to avoid excessive heating of parts of the burner.

Regenerative chamber kiln with vertical chambers. C. ORRO & Co., G.M.B.H. Ger. 466,752, Oct. 15, 1925.

Annular rotary hearth oven for effecting carbonization of material in thin layers. TROCHNUNGS-, VERSCHWELUNGS- UND VERGASUNGS-GES. Brit. 293,449, July 7, 1927. In an app. such as that described in Brit. 289,137 (C. A. 23, 698), charging and discharging are effected at a plurality of points so that the oven is divided into sections, each forming a complete charge-treating unit.

Apparatus for conditioning and humidifying air. G. D. HARRIS (to Industrial Dryer Corp.). Brit. 293,471, July 8, 1927. A thermostatic valve controls the supply of fresh cold water to the app.

Lixiviating apparatus. MAURICE JUNIEN. Fr. 643,883, April 13, 1927. A lixiviating and washing app., particularly for saccharified sawdust, comprises one or more vats widening towards the top and carried on 2 bearings. The vats may be turned about an axis placed between the 2 centers of gravity of the full and empty vats. A double perforated bottom carrying an appropriate filtering medium is in communication with a vacuum pump.

Emulsifying apparatus. GUY C. HURRELL. Fr. 643,808, Nov. 14, 1927. Liquids to be emulsified are forced under pressure past a piston carefully adjusted in a pump.

Extraction apparatus for wood, bark, fruit, etc. SOCIÉTÉ ANON. BUSS. Fr. 643,763, Nov. 10, 1927.

Apparatus for measuring the mechanical strength of asphalt, tar, pitch or similar materials. E. B. TENTZIOR. Russ. 4990, Mar. 31, 1928. A water-tight container is completely immersed in a heated water bath. A rod having on the upper end a pan for weights is inserted through a packing and its lower end rests against a plate of the material under test in the water-tight container. The degree of indentation is read on a scale on the upper part of the rod.

Apparatus for testing the transverse strength of concrete blocks, etc. ORREN H. HANSARD and DONALD D. MCGUIRE. U. S. 1,702,603, Feb. 19.

Apparatus for drying clay, chalk, etc. R. DE REYTERE. Brit. 293,765, July 11, 1927.

Continuous rotating vacuum drier. JEAN B. VERNAY. Fr. 33,327, Dec. 18, 1926. Addn. to 619,595.

Preventing access of air to acetylene generators. JACOB KNAPPICH. Ger. 469,949, Mar. 25, 1927. Addn. to 469,508. The app. of Ger. 469,508 (C. A. 23, 1023) is elaborated by providing means whereby the sludge-removing cock and the cover of the charging hopper are locked when the gas holder descends.

Gas washer with distributing disks mounted on a rotating shaft. I. G. FARBERIND. A G Brit 293,807, July 12, 1927. Structural features.

Checkerwork construction for heat accumulators or towers for washing and cooling gases. F. KRUPP A.-G. FRIEDRICH-ALFRED-HÜTTE and H. BANSSEN. Brit. 293,447, July 8, 1927.

Plant for production and recovery of carbon by incomplete combustion of gases. AMANDUS HEINRICH. U. S. 1,702,968, Feb. 19.

Apparatus for preparing carbon paper, color pastes, etc. HAROLD W. A. DIXON. U. S. 1,702,380, Feb. 19.

Receptacles for gasoline or similar liquids. RENE COURTIN. U. S. 1,702,631, Feb. 19. The outer wall of a receptacle or tank which may be used on aircraft exposed to gunfire is coated with porous rubber compn., blotting paper or other suitable porous material and then, by use of a mold, is coated with a thicker layer, applied in molten condition, consisting of glycerol, gelatinous material, a "binding substance" such as glucose or molasses and water; after this compn. has set it is further coated with a water-tight protective sheathing material in which wire mesh is embedded.

Thermostatic valve. G. G. ROYER. Brit. 293,930, May 3, 1927.

Thermostatically controlled electrically heated air humidifying system. G. D. HARRIS (to Industrial Dryer Corp.). Brit. 293,692, July 9, 1927.

2—GENERAL AND PHYSICAL CHEMISTRY

FREDERICK L. BROWNE

David Wesson. J. C. OLSEN. *Ind. Eng. Chem.* 21, 290-1(1929). A brief biography, with portrait. E. J. C.

The seventy-fifth birthday of Bernhard Lepsius. *Zwiss. Z. angew. Chem.* 42, 145-6(1929).—Brief biography with portrait. E. H.

Historical paper on chemistry in Russia. The chemists of Moscow from the be-

ginning of the 19th century. B. N. MENSHTUKIN. *Ann. inst. anal. phys.-chim.* (Leningrad) 4, 1-22(1928).

E. J. C.

A graphic method for solving simple stoichiometric problems. CHARLES H. STONE. *J. Chem. Education* 5, 1444(1928).—On a sheet of cross-section paper, ruled in tenths, choose a point in the lower left-hand corner as origin and through it draw two lines at right angles as axes. Find next the values concerned in the problem, e. g., 87 g. of MnO_2 will liberate 71 g. of Cl_2 from HCl . Locate the point 87-71 and from it draw a line to the origin. Any point on this line will mark the intersection of two perpendiculars, one drawn from a position on the ordinate representing a given value, and the other to a point on the abscissa representing the corresponding value of the answer.

W. C. EBAUGH

Nomography. IV. O. LIESCHE. *Chem. Fabr.* 1928, 450-1, 463-5; cf. C. A. 22, 4017.—Nomograms on 3 linear scales effect graphical addn. and subtraction, on logarithmic scales multiplication and division. The first can be used for the soln. of linear equations with 2 independent variables, as in the "indirect" analysis of a mixt. of Sb tri- and penta-sulfides. An example of the use of logarithmic scales is given by the detn. of the vol.-% of converted NH_3 in the Haber process, given the pressure, temp. and equil. const.

B. C. A.

Nomography. V. OTTO LIESCHE. *Chem. Fabrik.* 1928, 583-4, 595-7, 621-3, cf. preceding abstract.—Tables are given of transversals with two parallel vectors and an oblique inner vector. Arrangements of axes and intersecting straight lines are shown whereby computations can be made for problems like (a) Wheatstone bridge, where $u:v::w:s-w$; (b) bimol. reactions, where $t:h::e:1-e$; (c) gas equations, where $u = u:v::q:l$ or $PV = 0.08207 (t + 273.1)$; (d) radioelement disintegration, where $(0.4343t)/(-\log \delta) = \tau$ or $\delta = e^{-(t/\tau)}$; (e) monomol. reactions, where $t:h::-\log(1-e):0.30105$; and (f) reduction of a gas vol. to 0° and 760 mm., where $F = (0.3593p)/(273.1 + t)$. The necessary equations are developed and methods of constructing the corresponding figures fully described.

W. C. EBAUGH

Isotherms of monatomic substances and their binary mixtures. XXVI. Isotherms of helium at -183.0° and -201.5° and pressures of 3 to 8 atmospheres. G. P. NIJHOFF AND W. H. KEESOM. *Proc. Acad. Sci. Amsterdam* 31, 404-7(1928).—See C. A. 22, 4341-2. XXVII. Isotherms of helium between -103.6° and -259.0° and at pressures of 1.5 to 14 atmospheres. G. P. NIJHOFF, W. H. KEESOM AND B. ILIN. *Ibid* 408 9.—See C. A. 22, 4342.

E. H.

Isotherms of diatomic substances and their binary mixtures. XXXIV. Isotherms of hydrogen at temperatures of 0° and 100° . G. P. NIJHOFF AND W. H. KEESOM. *Proc. Acad. Sci. Amsterdam* 31, 410-2(1928).—See C. A. 22, 2861. XXXV. Isotherms of hydrogen at temperatures of -225.5° to -248.3° and pressures of 1.6 to 4.2 atmospheres. *Ibid* 413-4.—See C. A. 22, 4342.

E. H.

Osmosis of ternary liquids. III. Experimental part. F. A. H. SCHREINEMAKERS AND B. C. VAN BALEN WALTER. *Proc. Acad. Sci. Amsterdam* 31, 560-8(1928); see C. A. 22, 4041.

E. H.

Osmosis of ternary liquids. VII. General considerations. Congruent and incongruent osmosis; the membrane. F. A. H. SCHREINEMAKERS. *Verslag Akad. Wetenschappen Amsterdam* 39, 849-56(1928); cf. C. A. 23, 1035, and preceding abstract.—A continuation of previous papers.

B. J. C. VAN DER HOEVEN

Electromotive relations of artificial membranes consisting of surface areas selectively permeable to cations and areas selectively permeable to anions. RUDOLF HOBBER AND FRIEDRICH HOFFMANN. *Univ. Kiel. Arch. ges. Physiol.* (Pflüger's) 220, 558-64(1928).—By simultaneously distributing from two pipets rhodamine collodion and plain collodion upon the surface of Hg contained in a Petri dish membranes are produced with which selective permeability effects can be disclosed. The areas of the membrane composed of the rhodamine collodion exhibit permeabilities and membrane potentials which are quite the opposite of those possessed by the areas formed of plain collodion. Apparently the plasma membrane of *Valonia* is of this complex nature.

G. H. S.

The atomic weight of copper from the Lake Superior region and from Chile. THEODORE W. RICHARDS AND ARTHUR W. PHILLIPS. *Harvard Univ. J. Am. Chem. Soc.* 51, 400-10(1929).—No difference was found in the at. wts. of specimens of Cu from the Calumet and Hecla mines in the Lake Superior region in Michigan and from Chuquibambata, Chile. The ratio of the at. wt. of Cu to that of Ag was detd. by analysis of pure, recrystd. $CuCl_2$. The Cu was detd. electrolytically and the Cl by nephelometric titration with pure Ag. On the basis of Ag = 107.880, the at. wt. of Cu was found to be 63.557.

R. L. DODGE

The atomic weight of silver. O. HÖNIGSCHMID. *Z. Elektrochem.* 34, 625-7(1928).—At. wts. detd. by the analysis of halogen salts are based on the at. wt. of Ag as a secondary standard rather than on O = 16.000 as a primary standard. Although the analyses involved in such at. wt. detns. may have a precision of $1/10,000$, the precision of the at. wt. itself cannot be greater than that of Ag/O₂, estimated to be about $1/10,000$. For elements of high at. wt. this may lead to an uncertainty of several units in the second decimal place. Consequently, for several years past, the Munich at. wt. lab. has been engaged in the more precise detn. of Ag/O₂. The most recent method used is to convert a suitable perchlorate into chloride by heating in HCl gas, and then to analyze the chloride by means of Ag. All this is done on one sample. Ba(ClO₄)₂ has been used because it can be dried without decompn., and converted to the chloride at a temp. so low that loss does not occur. Several independent detns. by this method lead to the at. wt., Ag = 107.880, thus confirming the value adopted by the International At. Wt. Commission. Detn. of Ag/O₂ is also in progress based upon the analysis of Ag₂SO₄, combined with the synthesis and analysis of Ag₂S, thereby detg. the relations Ag₂SO₄/2Ag/Ag₂S. The ratio Ag/O₂ will thus be detd. without the aid of a second reference element. No exptl. details are given. R. H. LOMBARD

Chemical inertness of the rare gases. I. Action of helium on platinum. HORACIO DAMIANOVICH. *Anales soc. españ. fis. quim.* 26, 365-71(1928).—By means of an elec. discharge in a small tube, Pt was deposited in an atm. of spectroscopically pure He. Upon examn. of the deposit so obtained, it was found that the absorption of He, amounting to 14-34 cc. per g. Pt deposited, began with the appearance of the deposit of Pt. The deposit of He and Pt can be decompd. in a vacuum at temps. between 90° and 160°. When thus thermally decompd., the relation between the vol. of He evolved and the temp. resembles the decompn. relations of heterogeneous systems. An examn. by ultra-violet photomicrography indicated structural differences between the Pt-He deposit and the Pt obtained after thermal decompn. In explanation of the observations, it is proposed that the He is held in some state of combination with a part of the Pt. DON BROUSE

The fusion line of hydrogen up to 245 g. per sq. cm. W. VAN GULIK AND W. H. KEESOM. *Univ. Leiden. Verslag. Akad. Wetenschappen Amsterdam* 37, 888-9(1928).—The work of a previous publication (*C. A.* 21, 1387) was extended to higher pressures. From the results, in a table and graph, the following are selected: at 20.345° abs. pressure 245 kg. per sq. cm., at 19.69° 215, at 18.36° 161, at 17.27° 114, at 16.31° 97 kg. per sq. cm. pressure. B. J. C. VAN DER HOEVEN

Some physical constants of rhenium. IDA NODDACK. *Z. Elektrochem.* 34, 629-31(1928).—This is a brief survey of the phys. properties of Re. A spectrogram and table of wave lengths of the lines of the L-series of the Röntgen spectrum, as detd. by Beuthe, are given. The spark and arc spectra also are qual. well known, and several hundred lines in them are known certainly to belong to Re. The ultimate lines of the optical spectrum, especially the triplet at 3640 Å. U., serve to detect Re in concn. down to 10^{-7} , and greatly facilitate the examn. of Re-contg. minerals. The d. of the black metal powder formed by the reduction of ReS₂ in H₂ is 10.4. Re fused in the C-arc is white, similar in appearance to Pt, and stable in air. When melted on the anticathode, Re formed bright spheres 0.05 to 0.01 mm. diam., having a d. of about 20. The m. p. of Re is very high, possibly higher than that of W. There are indications that its b. p. is above that of W and C. Its sp. heat, 0° to 20°, is 0.0346. At. wts. have been detd. by analysis of Re₂O₃ and Re₂O₇, but the values are probably too high because of contamination by lower oxides. The most reliable figure for the at. wt. at present is 188.71 ± 0.25 , detd. by the reduction of ReS₂ to Re in a stream of H₂ at about 1000°. Details of this procedure are given. The analysis of ReCl₅ may furnish the best method for at. wt. detn. as soon as the properties and stability of the different Re chlorides have been studied more thoroughly. R. H. LOMBARD

The electric resistance of hafnium and zirconium between 1.3° and 90° absolute. W. J. DE HAAS AND J. VOOGD. *Univ. Leiden. Verslag. Akad. Wetenschappen Amsterdam* 37, 872-4(1928).—The sp. resistance of Hf at 0° is $0.0000296 \pm 2\%$. Measurements between 1.3° and 90° abs. show for both Hf and Zr a continuous drop of R/R_0 with T , with no indication of superconduction. Below 4.2° R/R_0 for Zr is practically const. at 0.0384, and for Hf at 0.0947. No min. (Koenigsberger and Schiller, *C. A.* 3, 141) was found for Zr. B. J. C. VAN DER HOEVEN

The platinum metals. S. C. OGBURN, JR. *Bucknell Univ. J. Chem. Education* 5, 1371-84(1928).—An address covering the history, occurrence, production, values, uses, properties, sepn. and analyses of the Pt metals. Outstanding features of the Pt metal situation recently have been (a) the development of Pt production in South

Africa, and (b) renewed activity of the Soviet government in establishing refineries and mfg. plants for working up Pt, as well as in mining the metal. To find atomic arrangements which will form stable and insol. substances with the Pt metals that may prove useful in sepg. them, 33 typical inorg. compds. and 90 organic compds. were tried on the 6 metals, [under varying exptl. conditions (cf. C. A. 20, 3663). It is concluded that (1) the most reactive classes of inorg. compds. acting with the formation of metallic ppts. are sulfides, thiosulfates, hydroxides, halides, certain reducing agents (N_2H_4 , NH_2OH and P), and some metals (Mg or Zn) more electropositive than Pt; (2) the most reactive types of org. compds. are alkaloïds, oximes, aromatic amines, non-substituted nitrosohydroxy compds., nitroso aromatic amines, pure hydroxy compds. and aminohydroxy compds.; (3) there is a marked difference in the ease with which these metals act toward both classes of reagents with the formation of insol. compds. and definitely colored solns., it being safe to assume that, with the exception of Ir, the nearer the Pt metal approaches its satn. value, in terms of electrons, in the next to the last electronic orbit, the more reactive is that metal toward the formation of coordinated salts; (4) new color reactions for certain metals (in the absence of others) are (a) Ru—deep violet on boiling with phloroglucinol after the Ru soln. has been made alk. with KNO_3 , and a deep violet soln. on warming with *p*-nitrosophenol; (b) Os—deep rose soln. on warming K osmate with aniline sulfate and a violet soln. with K chlorosmate; a deep blue soln. with β -naphthylamine hydrochloride, pyrocatechol and pyrogallol; (c) Ir—a deep blue soln. on warming with aniline sulfate; (d) Pt—a blood-red soln., changing to brownish red, on boiling with pyrocatechol or pyrogallol, and the same color with resorcinol, if the soln. be made ammoniacal. A short gravimetric scheme for the *sepn. of the Pt metals* is presented, with the claim that an accuracy of 1.5% for each of the metals is obtainable.

W. C. EBAUGH

The sublimation of sulfur between 25° and 50°. ROY P. TUCKER. Calif. State Dept. Agr. *Ind. Eng. Chem.* 21, 44-7(1929).—To det. the relative values of different kinds of S when used to control plant diseases an investigation of ground S, sublimed S and gas-purification S was conducted. Irrespective of its form S sublims at 25-50°, the comparative rates of sublimation at 24-26°, 30-35° and 40-45° were found to be in the ratio of 1:6:80. If mixed with lampblack and exposed to sunlight, temps of the mixts. were 5-10° higher than those of control samples of pure S, thus indicating a method for increasing the quantity of S sublimed. Observations upon (a) area shrinkage of S particles, as detd. by the microscope, and (b) the rate of blackening of Ag foil test pieces exposed to the action of equal wts. of various forms of S and S-mixts., spread over equal areas, showed that the size of particle, moisture and light are without influence upon the sublimation rate, but that heat is the detg. factor. By weighing tests, the Ag-foil test and microscopic study it was learned that there was no material difference in the sublimation rates of the three kinds of S. While the tests were not conclusive it was indicated that S loses its power of sublimation to a considerable extent at 35° and less when in contact with air.

W. C. EBAUGH

The broader aspect of valence: its application to colloid compounds. VICTOR COFMAN. E. I. Du Pont de Nemours & Co. *Chem Reviews* 5, 603-17(1928).—The classical idea of valence was developed to explain the properties of "pure" chem. compds. It is based on the law of const. proportions. In order to apply it to colloids, it will have to part completely from that law, since in colloids the proportions are far from const.

ALBERT L. HENNE

The theory of partial polarity of the ethylene bond and the existence of electroisomerism. M. S. KHARASCH AND F. R. DARKIS. Univ. of Maryland. *Chem Reviews* 5, 571-602(1928).—The various electronic hypotheses that have been advanced to interpret the directed addn. reaction of ethylene derivatives are compared. It is shown that the hypothesis of partial polarity of the double bond (Heinrich: Theories of Org. Chemistry) explains the facts more satisfactorily than any other. Exptl. data recorded for 35 ethylene addn. reactions are in conformity with the theory.

ALBERT L. HENNE

The interference of characteristic vibrations as the cause of energy fluctuations and chemical change. M. POLANYI AND E. WIGNER. *Z. physik. Chem., Abt. A*, 139, 439-52(1928).—Polanyi and Wigner attempt to explain the fact that the velocity const. of monomol. reactions contains, besides an exponential factor, a quantity of the order of magnitude of 10^{14} . They assume that the energy in a mol. vibrates in elastic waves surrounding the at. in the mol. The rupture of a bond in the mol. occurs through interference of waves whose amplitudes have risen above a certain critical value. This leads to the expression $\nu e^{-Q/RT}$ for the velocity const.,

where ν is the frequency of the vibrations and has therefore the right order of magnitude.

J. B. AUSTIN

The inverse process to spontaneous quantum shifts without radiation (inelastic collisions without radiation). ADOLF SMEKAL. *Ann. Physik* 87, 959-64(1928).—In the old quantum mechanics elastic collisions between two bodies without radiation could be pictured only by supposing that the resultant single body could absorb the quantum due to collision. The wave mechanics gives a finite probability of this absorption for every collision.

F. R. BICHOWSKY

Intermediate products of the combustion of methane. E. H. RIESENFELD AND D. GURIAN. Univ. Berlin. *Z. physik. Chem.*, Abt. A, 139, 169-97(1928).—Among the intermediate products of the burning of CH_4 and O_2 in a microflame, CH_2O , H_2O_2 and O_3 have been identified. The max. amt. of CH_2O is formed in the O_2 -flame (O_2 burning in CH_4) when the amt. of excess CH_4 is the largest and the cooling is greatest. The max. amt. of H_2O_2 is formed at the equiv. ratio of CH_4/O_2 and by the greatest cooling. On the other hand, the max O_3 yield is obtained in the CH_4 flame when the excess O_2 is the greatest and only a slight cooling is used. These facts indicate that H_2O_2 is not formed by oxidation of CH_2O but that the 2 are independent of each other. The formation of O_3 , however, is a result of the action of the at. O from the decompn. of H_2O_2 on mol. O_2 . The reactions that take place in the burning of CH_4 are concluded to be: (1) the primary reaction, decompn. of CH_4 into CH_2 and at. H and (2) the secondary reactions, (a) the formation and burning of CH_2O from CH_2 , or the simultaneous oxidation of CH_2 into CO and CO_2 , (b) the formation of H_2O_2 from at. H and O_2 , the decompn. of H_2O_2 into H_2O and at. O and the formation of O_3 by the combination of the latter with O_2 . A large part of the at. H forms H_2 which burns with the O_2 to form H_2O . The flame reactions were independent of the material from which the microburner was constructed. When equiv. amts. of the gases were burned under the same conditions the O_2 flame was more than twice as long as the CH_4 flame. The latter, however, was the hotter of the two.

H. F. JOHNSTONE

Optical properties of arsenic. II. F. GRYSZKIEWICZ-TROCHIMOWSKI AND S. F. SIKORSKI. *Roczniki Chem.* 8, 405-21; French, 421-2(1928); cf. C. A. 22, 1529.—The mol. refraction of 26 org. compds. of As was detd. The refraction no. was found to increase in the order $\text{CN} < \text{F} < \text{Cl} < \text{Br} < \text{I}$. Alkyl groups, Cl, H exert about the same influence on the at. refraction of trivalent As. A decrease of at. refraction was observed on replacing the alkyl groups, Cl and H, by methoxyl and ethoxyl groups.

J. KUČERA

A tabulation of the 32 crystal classes. AUSTIN F. ROGERS. *Am. Mineral.* 13, 571-7(1928).—In this tabulation there are 7 vertical columns which give in order, the crystal system, the no. of the class, the name of the class, the no. of faces in the general form of the class, a prominent example of the class and the symbols used by Schoenflies. There are 6 systems, the hexagonal being divided into 2 subsystems. The trigonal dipyramidal and ditrigonal dipyramidal classes belong to the hexagonal subsystem as proved by the theory of groups, and by the fact that they have as their space lattice a hexagonal prism only. Each of the 32 classes constitutes a mathematical group with its subgroups. Their names are adjectives, mostly derived from the name of the general form. An analytical study of the crystal symmetry with the aid of the theory of groups establishes definitely just what constitutes the symmetry operations and symmetry elements of crystals.

A. M. BRANT

Formation of Neumann bands. I. Mechanism of twinning in the body-centered cubic lattice. S. W. J. SMITH, A. A. DEE AND J. YOUNG. *Proc. Roy. Soc. (London)* A121, 477-86(1928).—The mirror image relation between twin crystals of the body-centered cubic lattice is believed to result from one of several different atomic movements with respect to the twin plane whereby the atoms reach a stable configuration as a result of some large or small distortion in the neighborhood of the twin plane. The atoms are assumed to move under impulsive stresses in the matrix in circular arcs or in lines parallel to the trigonal axis, and by diagrams it is shown how this may occur. The mid-way position of the twinning movement is one of unstable equil. and upon the force of the impulse depends whether the interatomic forces will restore the original orientation or accomplish the passage to the twin position in the matrix. The magnitude of the force may also det. the type of twinning. II. Evidence that the bands are twins. *Ibid* 486-500.—The test for the twin relationship between the orientation in a band and that in the matrix is to make a section of the material perpendicular to the plane to which the band is parallel and compare the pits produced by the same etchant on band and matrix. The authors have derived and drawn the geometric relations to be expected between the pits in the band and in the matrix in planes $\{111\}$,

{110}, {221}, {112} and {100}. Photomicrographs of etched surfaces of the respective crystallographic faces of a section of the Coahuila meteorite show pits corresponding very closely to the theoretical pits. III. Movement from which twinning results. *Ibid* 501-14.—The manner in which displacements are transmitted through the matrix and across bands already existing is illustrated by geometric diagrams and corresponding photomicrographs of the actual results of cross twinning. The calcd. relation between the displacement and the breadth of the band is in very close agreement with the exptl. ratio.

H. W. WALKER

The optical detection of porous regions in the molecular structure of crystal masses. ADOLF SMEKAL. *Anz. Akad. Wiss. Wien* 63, 195-7(1926).—The existence of "lattice pores" or other "deviations from ideal lattice structure" inferred from other properties of actual crystals (cf. C. A. 20, 683) is confirmed by optical data. The existence of internal photoelec. sensitivity exclusively for λ larger than the resonance λ of the lattice structural units of these crystals shows that in the crystal mass mol. units, even if only in small number, must be present, the outer electrons of which are more loosely held than those of the normal lattice structural units. Where the absorption spectrum of the lattice unit is known, direct comparison will show by what less voltage the crystal units not participating in the ideal lattice structure will be ionized than the normal lattice elements. The voltage difference in the case of heteropolar crystals photoelectrically sensitive in the visible region is 1.5-3.0 v. Those regions in the mol. structure of actual crystals in which this loosening of electronic forces exists are to be called "porous regions" (Lockerstellen). In the case of the alkali halides the phenomena of internal photoelec. sensitivity, coloration by quartz ultra-violet, and phosphorescence (Lenard's phosphors), and in the case of Ag halides the non-uniform deposition of Ag under illumination may be suitably correlated to each other and to the existence of porous regions, such mols. with looser outer electrons constituting but 10^{-3} to 10^{-4} of the total.

A. P. S.

Observations on the x-ray structure of the C—C bond. A. REIS AND W. SCHNEIDER. *Tech. Hochschule, Karlsruhe. Z. physik. Chem., Abt. A*, 137, 126-30(1928); cf. C. A. 20, 3104.—Since the earlier publication contg. speculations on the structure of compds. contg. a central C—C group, considerable information on the x-ray structure of such compds. has been obtained which is summarized in tables showing the relation of the different space groups and mol. symmetries. The symmetry characteristics of the mol. can be derived from the x-ray data uniquely in many cases, and in other cases with but few alternatives. The following conclusions are drawn from a survey of the tables. Mol. structure with central symmetry has been found with single as well as with double-bonded C atoms. A plane of symmetry has in no case been observed passing through the C—C bond. A 2-fold axis of rotation through the C—C bond may occur with the active form of the tartaric acid type as well as with compds. without stable isomers. In isomers or in modifications which have the same structural formulas, the occurrence of 2 kinds of 2-fold mol. symmetry has not yet been found. Symmetry elements parallel to the C—C bond have not been proved (except the 3-fold rotation axis of C_2H_6). In the crystal classes C_2 and V there have been found up to now only the space groups C_2^2 and V^4 in which unsymmetrical mols. are arranged on a screw axis. Enantiomorphic crystals of mols. C_2 belong to the trapezoidal classes D_2 or D_4 . Conversely in these classes D_2 and D_4 only those space groups have been found which are built up of mols. having the symmetry C_2 . The Weissenberg theory of crystal structure has been completely substantiated in all the cases investigated.

A. W. KENNEY

The symmetry and structure of cubical nitrates of calcium, strontium, barium and lead. F. M. JAEGER AND F. A. VAN MELLE. *Univ. Groningen. Verslag Akad. Wetenschappen Amsterdam* 37, 528-32; *Proc. Akad. Wetenschappen Amsterdam* 31, 651-5(1928).—Crystallographic evidence points to a tetrahedric pentagon dodecahedric symmetry for the Ca, Sr, Ba and Pb nitrates. However, circular polarization was never found. X-ray work indicated dyakisdodecahedric symmetry (T_h^d). Rotational spectrograms were made of an apparent cubo-octahedron of $Sr(NO_3)_2$ with $[1\bar{1}0]$ and $[100]$ as rotation axes; (210) and $(0\bar{2}1)$ were found present, not (100) , $(00\bar{3})$, (005) or (007) . A simple cubical lattice with $a_0 = 7.80$ A. U. and 4 mols. per unit cell is therefrom deduced. For $Ba(NO_3)_2$ was found $a_0 = 8.10$ A. U., 4 mols. per cell, space group T_4 . Likewise for $Pb(NO_3)_2$ the results indicated T_4 with $a_0 = 7.80$ to 7.81 A. U. ≈ 0.02 (Vegard gave 7.84). The symmetry of all 4 salts is therefore established as tetrahedric pentagon dodecahedric with metal atoms in uuu ; $(u + \frac{1}{2})$, $(\frac{1}{2} - u)$, \bar{u} ; \bar{u} , $(u + \frac{1}{2})$, $(\frac{1}{2} - u)$; $(\frac{1}{2} - u)$, \bar{u} , $(u + \frac{1}{2})$ on a 3-fold axis of sym-

metry; μ is almost zero. The N atoms have 2 similar 4-fold positions with 2 other values for μ , one positive, one negative and almost equal in abs. value; the O atoms take two 12-fold positions around the 3-fold axis with 3 parameters. This structure approaches the dyakisidodecahedral structure closely but is basically different. Only for the Ca salt can the N and O location be measured. Further examn. of the optical rotation, and pyro- or piezo-electricity is in progress. B. J. C. VAN DER HOEVEN

The crystal structure of some rhombic formates. ISAMU NITTA. *Sci. Papers Inst. Phys. Chem. Research* (Tokyo) 9, 151-63(1928).—By the Laue photographic and ionization spectrometric methods the crystal structure of some formates which belong to the orthorhombic system were investigated. The dimensions of the unit of structure, the no. of chem. mols. contd. in it, the corresponding space group and the calcd. d. are tabulated as follows:

Chemical formula	Unit of structure			No. of mols.	Space group	Density
	a	b	c			
Li(HCO ₂).H ₂ O	6.49	10.01	4.85	4	C _{2v} ⁹ or V _h ¹⁶	1.46
Ca(HCO ₂) ₂	10.16	13.38	6.26	8	V _h ¹⁵	2.02
Sr(HCO ₂) ₂	6.86	8.72	7.24	4	V ⁴	2.71
Sr(HCO ₂) ₂ .2H ₂ O	7.30	11.99	7.13	4	V ⁴	2.26
Ba(HCO ₂) ₂	6.78	8.89	7.68	4	V ⁴	3.24
Pb(HCO ₂) ₂	6.52	8.75	7.41	4	V ⁴	4.64

The described isomorphism among the formates of Sr, Ba and Pb was confirmed by the present x-ray investigation. The space group V_h¹⁵ for Ca formate is different from V_h¹⁵ assigned by K. Yardley. The former V_h¹⁵ contains V⁴ as a subgroup. The mols. of the formates of these bivalent metals are all structurally asymmetric. Discussion of the structure of these salts is also made from the view point of the morphotropic relation to the fluorides and nitrates of Sr, Ba and Pb. G. L. CLARK

Metallic fibers. RUDOLF SCHENCK, ROBERT FRICKE AND GEORG BRINKMANN. *Münster. Z. Physik. Chem., Abt. A*, 139, 32-46(1928).—The formation of "hair crystals" of Ag or Cu by heating a mixt. of the metal and its sulfide is probably due to a thermoelec. effect caused by an unequal distribution of heat. An x-ray examn. of the artificially produced and naturally occurring Ag and Cu fibers was made. For the Ag crystals the fiber axis was uniformly parallel to the [112] plane. The Laue diagram, however, was completely changed if the crystal had been tempered at 900°. It was for this reason, or because of their age, that the crystals of natural hair Ag did not show a uniform orientation. The crystals of hair Cu showed no regularity in the direction of their axes. For the greater part the axes were parallel to the planes [112] and [122]. The tempered crystals, however, were reoriented and their axes, like those of the natural crystals, were parallel to the [110] plane. For comparison with these results, an x-ray examn. of the hair crystals of NaCl, another face-centered cubic, was made. The fiber axes in this case were parallel to the [110] plane. H. F. J.

Proof of the adiabatic principle. M. BORN AND V. FOCK. *Z. Physik* 51, 165-80 (1928). Earlier proofs of the adiabatic principle that the quantized angle variable is const. for adiabatic changes of state are improved to cover degenerate but fully quantized single systems. Matrix methods are used. F. R. BICHOWSKY

The reversal point of second order (determination of the T₀ value). WITOLD JAZYNA. *Z. Physik* 51, 292-307(1928); cf. *C. A.* 22, 3816.—T₀ is calcd. from the fact that the H₂ and air thermometer scale converge on T₀. The method places T₀ between 272.9 and 273.1. F. R. BICHOWSKY

Properties of substances and mixtures at the absolute zero of temperature connected with change of state. R. D. KLEMAN. *J. Phys. Chem.* 32, 1841-55(1928); cf. *C. A.* 23, 1324.—The following are discussed: properties of the heat and external work of vapn. at 0° abs.; the properties of the condensed state at 0° abs.; the temp. coeff. of the pressure of the satd. vapor of a substance or mixt. at T = 0; the equation of state of the vapor of a substance near 0° abs.; the properties of the heat and work of mixing of substances in the gaseous state at 0° abs.; properties of the change in free energy and the heat of formation of substances in the gaseous state at 0° abs.; properties of the internal sp. heat of a vapor in contact with the condensed state; the heat of formation of mols. in the gaseous state at infinite vol. at a finite temp. It is shown that the temp. of a substance cannot be reduced to zero abs. in a finite time and that the controllable entropy of a substance is positive and can be infinite only when the temp. is infinite. E. G. VANDEN BOSCH

Relation between the absolute temperature and the mean kinetic energy of a gas molecule. KAMEKICHI SHIBA. *Bull. Inst. Phys. Chem. Research (Tokyo)* 7, 576-9 (1928); *Abstracts* 1, 54.—The discordance between thermodynamics and the kinetic theory of gases is interpreted (*C. A.* 23, 1323-4). The second law of thermodynamics requires the mean kinetic energy $\bar{\epsilon}$ of a mol. with cohesion to depend upon the density. A first approximation calcn. shows for sufficiently high temps. and not too condensed states: $\bar{\epsilon} = \frac{3}{2}kT + (n-4)(A/NV)$, if V is the vol. of the gas, N is the total no. of gas mols. and A is a const.; the law of mol. attraction is supposed to be \bar{x}/r^n . A necessary consequence of the value of $\bar{\epsilon}$ is that the law of equipartition of energy is not generally applicable. Thus the discordance is reduced to that between the second law of thermodynamics and the law of equipartition of energy. *Conclusion.*—In such a case, the law of equipartition of energy is to be given up. ALBERT L. HENNE

Relation between surface energy of liquids and saturation vapor tension. N. BARBULESCU. *Univ. Cluj. Bull. soc. stiinte Cluj* 4, 251-62(1928).—On the ground that the surface energy of liquids is proportional to the heat of vaporization, a relation was sought between the surface energy and the vapor tension. For normal liquids the relation is $\alpha V^{2/3} = KT \log(\pi_0/p)$, where $\alpha V^{2/3}$ = surface energy, π_0 = crit. pressure. For associated liquids, the Nernst formula for the heat of vaporization was used; the formula finally arrived at was: $\alpha V^{2/3} = (A + BT + CT^2)(1 - [p/\pi_0])$. These formulas were verified for C_6H_6 , CCl_4 , $PhCl$, methyl formate, $EtOH$, $MeOH$ and $AcOH$ by using the Bogdan method of calcg. surface energy. ALBERT L. HENNE

Density and temperature. VII. W. HERZ. *Univ. Breslau. Z. Elektrochem.* 34, 857-8(1928); cf. *C. A.* 21, 3505.—At a temp. θ such that $\theta = \frac{1}{10} T_{cr}$ (T_{cr} = critical temp.), the ratio of the d. of the liquid to the d. of the vapor is about 10. At a temp. $\theta' = \frac{1}{3} T_{cr}$, which is generally close to the b. p., the ratio is much larger and is no longer const. The order of the 38 compds. considered changes when the ratios are calcd. for a different reduced temp. ALBERT L. HENNE

The leakage of helium through Pyrex glass at room temperature. GREGORY P. BAXTER, H. W. STARKWEATHER AND R. B. ELLESTAD. *Harvard Univ. Science* 68, 516-7(1928); cf. *C. A.* 21, 1728.—Leakage of He through Pyrex at 0° and atm. pressure was noted in 24 hrs. in change of PV with P expts. Mech. leakage was eliminated by comparative expts. with He at 770 mm., and at 627 mm. showing a like change per day in either case of about 0.0031%, corresponding to 0.04 cu. mm.³ per day per sq. cm.² The app. had previously showed no similar effect with A. These results were confirmed by comparing a spherical Pyrex globe filled with He with a counterpoise of a larger globe contg. A for a year. The loss in wt. per day gradually fell off; 0.02 mg. the 1st day; 0.007 the 18th; 0.006 the 34th, and decreased gradually from 0.0059 to 0.0047 from the 71st to the 366th. The total loss was 1.73 mg. He (1%) corresponding to an av. of 0.059 cu. mm.³ per day per sq. cm.² of Pyrex averaging 1.34 mm. in thickness. The detns. by B. and S. of the d. of He (*C. A.* 19, 1643; 20, 1006) carried out in Pyrex are not affected. The leakage expt. is being continued.

ALBERT THOMAS FELLOWS

Hydrodynamics and the kinetic theory of gases. Corrections to a previous work. Y. ROCARD. *Ann. phys.* 10, 345-8(1928).—Corrections and modifications are given for equations in a previous article (*C. A.* 21, 3779).

R. H. LOMBARD

Constant-boiling mixture of hydrogen fluoride and water. C. W. MUEHLBERGER. *Univ. of Wisconsin. J. Phys. Chem.* 32, 1888-9(1928).—Distn. of pure aq. HF in a Pt app. indicates that the const.-boiling mixt. is 38.18% HF ($\approx 0.10\%$) at a pressure of 735 mm. of Hg. The d. of this concn. of acid is 1.138 g./cc. at 20° . The b. p. of the mixt. detd. in a Pb app. is 110.8° at 732 mm.

E. G. VANDEN BOSCHE

Viscosity relationship in the system; sulfuric acid-nitric acid-water. F. H. RHODES AND H. B. HODGE, JR. *Ind. Eng. Chem.* 21, 142-50(1929).—The viscosities of a large no. of binary and ternary mixts. of these substances were detd. at 0° , 25° , 50° and 75° , showing the existence, in liquid form at ordinary temp., of $H_2SO_4 \cdot H_2O$ and a ternary compd. contg. SO_3 and N_2O_5 in the ratio $10SO_3 : N_2O_5$. There is no definite evidence of the existence of a liquid HNO_3 hydrate.

E. M. SYMMES

Solidification point and viscosity. A. BAADER AND H. GRUBER. *Archiv Eisenhüttenwesen* 1, 653-4(1928).—The app. described was used successfully for detg. viscosities of oils at low temps. Through the cover of a double-walled glass vessel (Dewar) the oil is introduced, contd. in another small glass vessel into which the lower end of a pipet is passed. The first vessel is filled (by means of a separatory funnel) with Et_2O to a few cm. over the bulb of the pipet. The oil is sucked into this to the correct height. Through a tube, leading to the bottom of the large container and provided with a porous plate, dried air is sprayed into the Et_2O and drawn out through another tube in the

cover with a H_2O pump. The viscosities are detd. as usual. The desired temp. is obtained by regulating the flow of air with the pump. By replacing the Et_2O with properly heated H_2O or any other suitable liquid, higher temps. may be obtained. Estg. the fluidity of oils by solidification point detns. is exptly. shown to be inaccurate. With the app. described the viscosities may be detd. at the temps. desired and plotted, the curve being characteristic for the oil.

J. BALOZIAN

The use of internal pressure in metallic systems. The system lead-antimony-copper. RALPH A. MORGEN. *Science* 68, 490-1; cf. *C. A.* 22, 903.—The shape of *miscibility gaps* may be predicted from the assumption that liquids with like internal pressures are more easily miscible than those with unlike. The m. p. and heat of fusion of the metal are also useful. The effect of compd. formation may be even greater, depending upon the stability of the compd. It is treated as a new component with its own properties when it is stable in the liquid phase, but has little effect on the miscibility of the liquid phase if the compd. dissociates before it melts, since then the liquid phase is composed of only the two original atoms. The shape of the liquidus and solidus surfaces depends on these principles and considered with the freezing curves the surfaces may be found. This method is applied to the Pb-Sb-Cu system and the generalization derived that the liquid behaves like a pure solvent or approaches a perfect soln. of the 2 constituents over the range where a solid soln. seps.

A. T. FELLOW

Physical constants of pure carbon-free chromium-iron and vanadium-iron alloys. K. RUF. Heraeus-Vacuum-Schmelze A.-G., Hanau. *Z. Elektrochem.* 34, 813-8 (1928). Many Cr-Fe and V-Fe test pieces with varying amts. of the components were prepd. The influence of compn. on sp. resistivity and its temp. coeff., thermoelectric force, sp. weight and thermic expansion coeff. is shown graphically.

ALBERT L. HENNE

Contact resistances. R. HOLM. *Z. tech. Physik* 9, 454-7 (1928).—The theory of H. (*C. A.* 21, 2216) is further elaborated. The influence of temp. on a typical "sieve" contact resistance is $R_t = R_0 (1 + \frac{2}{3} \alpha t)$ where α is the temp. coeff. of sp. resistance. From the Kohlrausch method relating thermal and elec. cond. the relation is deduced: $t + (\alpha/2)t^2 = 1/s(\lambda/k)V^2$, where λ and k are, resp., elec. and thermal cond. at room temp., and V is contact potential. The relation between R_t and V or t , resp., is shown graphically. With rising temp. R_t first follows the expected curve until recrystn. of the contact surface causes it to drop steeply. Pressure increase makes R drop in inverse proportion, independently of the size of the apparent contact surface. It is here assumed that the no. of isolated "a" surfaces of actual contact is proportional to the pressure. In several curves characteristics of metal contacts (Ni, Ag, Au, graphite) are demonstrated.

B. J. C. VAN DER HOEVEN

Dielectrics at high voltage. II. Impregnating oils. Insulating properties of some high-tension cables. SHOJI SETOH AND AKIRA MIYATA. *Bull. Inst. Phys. Chem. Research (Tokyo)* 7, 581-634 (1928); *Abstracts* 1, 55-7.—Measurements are made of a. c. and d. c. characteristics of cylinder oil, petrolatum, castor oil, transformer oil, rosin oil, paraffin and vaseline. Influence of time of application of voltage and heat (up to 7 hours), intensity (up to 100 kv./cm.), and frequency (30 to 90 cycles) were studied at 20°, 40°, 60° and 80°. *Effect of time.*—In most cases a. c. losses increase, while d. c. losses decrease asymptotically with time; at 80° the d. c. losses of castor oil, paraffin and vaseline tend to increase continuously. A. c. losses are larger than d. c. losses, their ratio approaches unity with rising temp. A preliminary elec. test which can be substituted for "sludge test" is described. *Effect of intensity.*—The tangent of the loss angle increases nearly linearly with a. c. potential for materials without "ionization point." Dielec. const. is independent of the field strength except for transformer oil at 80°. When d. c. potential is applied the current increases rapidly at first, reaches a max., and then falls off gradually. The time required to reach the max. is inversely proportional to the applied voltage and proportional to the viscosity. *Effect of frequency.*—Dielec. const. is independent of frequency within the range tested, whereas dielec. loss increases or decreases linearly. The inclination of the lines is generally positive at low temps. and becomes smaller and finally negative as the temp. rises. The loss corresponding to zero frequency, obtained by extrapolation, coincides with the max. loss obtained with d. c. and its logarithm bears a linear relation to the reciprocal of the abs. temp. A somewhat complicated empiric formula for the loss angle is given with a table of the necessary constns. Tests on high-tension cables showed: (1) parallelism between loss angle and capacity with rise of applied voltage; (2) change of ionization point with the time of applied voltage; (3) frequency dependency of "V"-curves (loss angle-temp. curve), and (4) variation of wave form of the charging current with rise of elec. stress.

A. L. HENNE

New measurements about the way in which the dielectric constant of liquid helium depends on the temperature. M. WOLFFE AND W. H. KESOM. *Proc. Acad. Sci. Amsterdam* 31, 800-6(1928).—See C. A. 22, 4348. E. H.

Ionization potentials and grating energies of atoms in the solid state. SUSIL CHANDRA BISWAS. *J. Indian Chem. Soc.* 5, 561-8(1928).—Assuming a Coulombian force of attraction and a repulsive force following an inverse-power law, B. develops the following equation to express the relationship between compressibility of a solid and its grating energy: $\beta^{1/4} W_{\text{pot}} = [A(n-1)^{1/4} \cdot 9^{1/4}] / n$, in which β is the compressibility of the crystal. W_{pot} is the potential energy in an elec. system of alternately pos. and neg. charges, A is Madelung's const. dependent on the lattice type, and n is Haber's repulsive coeff. A table shows that when the product of the ionization potential and $\beta^{1/4}$ for the elements of the first two groups of the periodic table is taken that two sets of consts. are found. Families IA, IIA and IIB are in one set and family IB is in the other. Data for Al, Tl, C, Pb, Mn, Fe and Ni are given. Haber's n for the alkalis is 2.4-3.6; for Cu, Ag and Au 8-9. This explains the two sets of consts. Sep. calcs. were made for: (a) evapn. of an electron, (b) evapn. of a positive ion and (c) hydration of a positive ion. Comparisons of these values among themselves and with exptl. data indicate that ionization of an individual gas atom and ionization of one of an assemblage of atoms in a crystal is the same process. F. E. BROWN

New superconductors. EDM. VAN AUBEL, W. J. DE HAAS AND J. VOOGD. Univ. Leiden. *Verslag. Akad. Wetenschappen Amsterdam* 37, 706-13(1928).—The conductivities of Cu_3Sb , Ag_3Sb , Ag_3Sn , Cu_3Sn , Bi_3Tl , Sb_3Sn and Sb_3Sn_2 were detd. from 0° to very low temps. At 0° the sp. resistivities $\times 10^3$ are: Cu_3Sb : 0.770; Ag_3Sb : 1.417; Ag_3Sn : 0.190; Cu_3Sn : 0.100; Bi_3Tl : 0.583; Sb_3Sn : 0.302; Sb_3Sn_2 : 0.250. At lower temps the values of R/R_0 are: Cu_3Sb : —24.52°, 0.9876; —44.27, 0.9771; —60.94, 0.9682; —79.29, 0.9583; —103.09, 0.9460; —116.61, 0.9386; —135.74, 0.9277; —149.65, 0.9195; —183.10, 0.8985; —198.93, 0.8886; —217.91, 0.8767; —252.66, 0.8596; —254.38, 0.8591; —256.62, 0.8587; —258.99, 0.8582. Ag_3Sb : —24.51, 0.9851; —44.27, 0.9728; —60.94, 0.9621; —79.32, 0.9501; —103.10, 0.9346; —116.62, 0.9254; —135.74, 0.9122; —149.66, 0.9023; —183.24, 0.8779; —198.93, 0.8657; —217.91, 0.8504; —252.66, 0.8262; —254.38, 0.8255; —256.62, 0.8247; —258.99, 0.8242. Ag_3Sn : —24.54, 0.9528; —44.27, 0.9148; —60.94, 0.8819; —79.34, 0.8453; —103.09, 0.7967; —116.61, 0.7686; —135.74, 0.7274; —149.65, 0.6963; —183.24, 0.6150; —198.93, 0.5729; —217.91, 0.5160; —252.66, 0.4054; —254.38, 0.4015; —256.62, 0.3972; —258.99, 0.3937. Cu_3Sn : —24.50, 0.9081; —44.27, 0.8417; —60.95, 0.7852; —79.32, 0.7224; —103.09, 0.6453; —116.61, 0.5976; —135.73, 0.5271; —149.66, 0.4760; —183.11, 0.3456; —198.94, 0.2801; —217.93, 0.2019; —252.65, 0.0998; —254.38, 0.0979; —256.62, 0.0961; —258.99, 0.0947. Bi_3Tl : —24.48, 0.9344; —44.28, 0.8811; —60.95, 0.8364; —79.29, 0.7871; —103.09, 0.7229; —116.61, 0.6864; —135.72, 0.6342; —149.67, 0.5962; —183.11, 0.5032; —198.93, 0.4582; —217.94, 0.4030; —252.66, 0.2978; —254.38, 0.2927; —256.62, 0.2865; —259.00, 0.2804. Sb_3Sn : —24.52, 0.9424; —44.28, 0.8962; —60.96, 0.8571; —79.29, 0.8149; —103.09, 0.7599; —116.61, 0.7286; —135.74, 0.6840; —149.66, 0.6512; —183.10, 0.5699; —198.94, 0.5297; —217.92, 0.4802; —252.66, 0.4029; —254.38, 0.4007; —256.62, 0.3984; —258.99, 0.3964. Sb_3Sn_2 : —24.53, 0.9333; —44.28, 0.8808; —60.95, 0.8363; —79.31, 0.7885; —103.09, 0.7265; —116.62, 0.6917; —135.74, 0.6417; —149.67, 0.6052; —183.10, 0.8163; —198.93, 0.4728; —217.86, 0.4199; —252.66, 0.3391; —254.38, 0.3368; —256.62, 0.3344; —258.99, 0.3323. The same compds. were then examd. in liquid He. Temps. are given in °K. and followed by the ratio R/R_0 : Bi_3Tl : 4.2, 0.0000. Sb_3Sn_2 : 4.20, 4.10, 4.00, 3.95, 3.80; 0.3257, 0.3196, 0.0637, 0.0062, 0.0000. Sb_3Sn : 4.20, 4.10, 4.00, 3.95, 3.80, 3.75, 3.73, 3.65, 3.55; 0.3917, 0.3911, 0.3672, 0.3080, 0.0927, 0.0616, 0.0537, 0.0349, 0.0261. Ag_3Sn : 4.22, 3.42, 3.00, 2.52, 1.99, 1.36; 0.3865, 0.3857, 0.3492, 0.2838, 0.2230, 0.1668. Cu_3Sn : 4.20, 3.80, 3.55, 2.89, 1.80, 1.54, 1.31; 0.095, 0.095, 0.095, 0.095, 0.093, 0.093, 0.092. It is thus shown that supercond. appears in the cases of Bi_3Tl and Sb_3Sn_2 . The temp. at which an alloy becomes superconductive is higher than that of its constituents. ALBERT L. HENNE

Measurements on the disturbance of the superconductivity of thallium by magnetic fields. W. TUIJN. *Proc. Acad. Sci. Amsterdam* 31, 687-91(1928).—See C. A. 22, 3822. E. H.

Properties of nickel-copper alloys at low temperatures. A. KRUPKOWSKI AND W. J. DE HAAS. Univ. Leiden. *Verslag. Akad. Wetenschappen Amsterdam* 37, 714-22(1928).—Several Ni-Cu alloys were prepd. and their sp. conductivities measured at decreasing temps.: Alloy with 2.08% Ni: $t = 0$, —183.10, —204.82, —252.60, —258.14; sp. resistivity ρ , in microhms/cm.: 3.8676, 2.3177, 2.0767, 1.6691, 1.6833. Alloy with

10.16% Ni: $t = 0$, -182.35, -204.56, -252.54, -258.33; $\rho_t = 13.8039$, 12.3049, 12.1118, 11.8752, 11.8816. Alloy with 19.27% Ni: $t = 0$, -182.81, -205.37, -252.52, -258.44; $\rho_t = 26.2314$, 24.7414, 24.5365, 24.3712, 24.4048. Alloy with 27.54% Ni: $t = 0$, -182.35, -204.56, -252.54, -258.34; $\rho_t = 34.5377$, 33.0830, 32.8685, 32.6754, 32.6970. Alloy with 32.85% Ni: $t = 0$, -183.10, -204.82, -252.63, -258.16; $\rho_t = 39.2349$, 38.0489, 37.8733, 37.6515, 37.6669. Alloy with 38.80% Ni: $t = 0$, -183.01, -205.18, -252.53, -258.39; $\rho_t = 44.4510$, 43.5804, 43.3964, 43.1719, 43.1348. Alloy with 43.45% Ni: $t = 0$, -183.00, -205.19, -252.53, -258.38; $\rho_t = 48.4480$, 47.6376, 47.3932, 46.6870, 46.3799. Alloy with 48.40% Ni: $t = 0$, -182.80, -205.37, -252.52, -258.44; $\rho_t = 50.1182$, 48.6904, 48.1011, 45.5189, 45.1860. Alloy with 57.45% Ni: $t = 0$, -183.10, -204.82, -252.60, -258.13; $\rho_t = 51.4360$, 43.6117, 42.1184, 39.5185, 39.3342. Alloy with 67.90% Ni: $t = 0$, -183.04, -205.07, -252.52, -258.38; $\rho_t = 44.4493$, 30.9304, 29.7221, 28.0419, 27.9572. Alloy with 86.64% Ni: $t = 0$, -182.83, -205.27, -252.52, -258.43; $\rho_t = 22.5152$, 14.2637, 13.6663, 12.9996, 12.9810. Ni 100%: $t = 0$, -182.44, -203.06, -252.57, -258.34; $\rho_t = 6.9330$, 1.2174, 0.8083, 0.2588, 0.2417.

ALBERT L. HENNE

The description of thermoelectric phenomena by a temperature-entropy diagram. KAMILLO KAMMERER. *Ann. Physik* 85, 948-58(1928).—The treatment of thermoelec. effects by the graphical method of Gibbs leads to a generalization of the thermodynamic laws covering thermoelec. effects.

F. R. BICHOWSKY

Thermal and electric conductivity of a copper crystal at various temperatures. W. G. KANNULUIK AND T. H. LABY. Univ. of Melbourne. *Proc. Roy. Soc. (London)* A121, 640-53(1928).—The thermal cond., λ , detd. by the thermal method, was found to be 0.989 cal./cm./sec./deg. at 19.4°, 1.054 at -73.7° and 1.131 at -174.8°. The value of λ at 19.4° is about 4% greater than that of polycrystal Cu, which agrees with Schott's results, while the values of λ at lower temps. are considerably less than Schott's values. In a high vacuum the heat losses were small and at room temp. they were eliminated by the correction detd. from the equation: $\Delta H = \frac{1}{2} \phi h l (\theta_0 + \theta_1 - 2\theta_s)$, where ΔH = lateral loss of heat from a section of Cu crystal rod of perimeter p , length l and temps. θ_0 and θ_1 at the resp. ends, h cal./cm./sec./deg. = the Fourier external cond., and θ_s = temp. of surrounding medium. The sp. elec. cond. K , at 90.1° K. was 311.6×10^4 ohm⁻¹ cm.⁻¹, a value slightly less than that of the purest polycrystal copper. The values of the Wiedemann-Franz const. $\lambda/(KT)$ were 1.69×10^{-8} watt ohm/deg.⁻² at 90.2° K. (Schott— 1.80×10^{-8}) and 2.42×10^{-8} at 273.2° K. (Schott— 2.42×10^{-8}).

H. W. WALKER

The thermoelectric Thomson effect at the temperatures of liquid hydrogen. G. BORELIUS, W. H. KEESOM AND C. H. JOHANSSON. Univ. Leiden. *Verslag. Akad. Wetenschappen Amsterdam* 37, 875-87(1928).—Measurements down to 20° abs. were made on 2 wires, Cu and Ag alloyed with a little Au, and down to 70° on pure Cu wire. The method was largely that of Borelius (*Ann. Physik* 65, 520(1921)), the ends of the wire being at const. temp., and the temp. of the center being varied by means of an elec. current through it. A Thomson effect is caused by the temp. gradient of a different sign for the 2 halves of the wire. The effect σ follows from $(\lambda/I)(\tau/\delta) - (3q^2/\epsilon)\phi$ in v. per degree for y , the distance in cm. of any point of the wire from the center, t the temp. increase by Joule heat, τ the same by Thomson effect heat, q the cross sectional area of the wire in sq. cm., λ the sp. heat cond. in watts per cm. degree, I the current in amps., ϕ a correction factor close to unity. The temps. t and τ were measured by thermocouples (Pt-constantan) in symmetrical points on the wire, the wire temp. was detd. by a Pt resistance thermometer. Careful precautions were taken against radiation, etc. The expts. were made *in vacuo*. It was necessary to det. λ at the exptl. temp. Values found were for the Cu alloy $\lambda = 1.44$ watt per cm. degree at 18.8° abs., 2.87 at 78.9°; for the Ag alloy 2.79 at 18.9° abs., 4.22 at 93.4°. From these values with those of other authors interpolation at the desired temp. was possible. The alloy wires consisted of Cu or Ag both with 0.37 atom % Au in order to make λ as much as possible independent of T . Considerable trouble was caused in the expts. by the Peltier heat of little inhomogeneous spots on the wires; it made σ appear dependent upon I and was eliminated by measuring σ at different I to find the true $\sigma = \sigma_{app.} + (\text{const.}/I^2)$. The final results obtained are tabulated at temps. $T = 20^\circ$ up to 300° abs. and are graphically represented. For the Cu alloy $\sigma \cdot 10^6$ goes from +0.44 at 20°, 1.39 at 30°, 2.17 at 40°, 2.84 at 50° through a max. of 2.96 at 60°. a min. of 1.71 at 130° and a steady rise to 2.33 at 300°. For the Ag alloy $\sigma \cdot 10^6$ is +0.31 at 20° it falls off to -0.03 at 50° and 60°, rises to +0.21 at 100° and continues to rise to 1.38 at 300°. For pure Cu $\sigma \cdot 10^6$ is -0.26 at 70°, min. of -0.49 at 90°, +0.02 at 140°, 1.52 at 300°. For further control of the values the thermoelec. forces were

measured of couples of the same metals. The thermo force per degree (microvolts) was found at 17.3° abs. for Cu alloy against Ag alloy +4.74, against Cu +4.80, against lead +3.75, at 70.6° for the same combinations +2.56, +3.49 and +1.31, at 280.7° +0.37, +0.87 and -2.11. From them by means of the equation $e_2 - e_1 = \int_{T_1}^{T_2} \left[\left(\frac{\sigma_2}{T} \right) - \left(\frac{\sigma_1}{T} \right) \right] dT$, the Thomson values were checked and found within the limits of error.

B. J. C. VAN DER HOEVEN

Preparation and study of noncrystalline piezoelectric substances. A. MEISSNER AND R. BECHMANN. Lab. Telefunkengesellschaft. *Z. tech. Physik* 9, 430-4(1928).—In order to prepare piezoelec. plates of noncryst. material, the pyro- and piezo-elec. qualities of several substances in powd. form were studied. The powder was spread out in a 1-2-mm. film on one electrode which could be heated and was covered with the second electrode. After "formation" of the film, *i. e.*, application of from 100 to 1000 v. and 3 to 7 min. waiting for dielec. after-effects, the powder was heated and its pyropotential detd. Tapping the electrode or heating it during the formation generally raised the pyropotential. For quartz powder a pyroelec. coeff. of 17.3×10^{-1} e. s. u. per cm.² degree was obtained by formation at 200° (ten times the value of solid plate quartz). This is explained by improved orientation of the unit SiO₂ cells. For SiO₂ powder the pyro effect (at 240°) is proportional to the potential and temp. of formation; it increases with decreasing grain size (0.15 to 0.6 mm.), and it is proportional to the temp. Repeated heating causes the formation effects to disappear. By formation at 650 v., 135°, and measurement at 135° the pyroelec. coeff. (times 10⁻¹) of the following substances was found: sugar 23.3, tartaric acid 8.1, Rochelle salt 7.4, tourmaline 20.5, topaz 27.5, ZnS 1.4, pyrite 1.8, pentaerythritol 9.48, cryst. quartz powder 17.3, amorphous quartz powder 11.2, purified quartz sand 6. To prepare plates with permanent pyro- and piezo-electricity quartz powder was imbedded in resins, formed at 1000 to 3000 v. and the potential maintained until complete solidification. The piezo coeff. of such plates was 50 to 70 times higher than that of solid quartz; part of this is due to the resin. The side of the plates positive during formation is at first negative on application of pressure but goes after a short period through zero to a positive piezo potential. The time necessary for this reversal depends on the resin used: it is a few mins. for carnauba wax, sealing wax, bakelite, Japan wax, beeswax, Venetian turpentine, tolu balsam, benzoin, several hrs for colophonium, Canada balsam, and S. The final piezo moment decreases with time at different rates; half the initial value is obtained for S and colophonium after 2 to 3 days, for beeswax, bakelite, Canada balsam 1 to 3 months, sealing wax, turpentine 4 months, electret (45% colophonium, 45% carnauba wax, 10% beeswax) more than 6 months. Plates prepd. of SiO₂ powder with asphalt do not change appreciably in 6 months. Satisfactory piezo-elec. microphones were made of these materials.

B. J. C. VAN DER HOEVEN

Determination of piezoelectric moduli of ammonium Seignette salt. W. MANDL. *Proc. Roy. Soc. (London)* A121, 130-40(1928).—The general math theory of piezoelectricity shows that for salts like Na(NH₄)C₄H₄O₆·4H₂O there are 3 piezoelectric moduli. These moduli were detd. exptly. for this salt. The results (multiplied by 10⁴) are: $d_{11} = +56.0$, $d_{22} = -149.5$ and $d_{33} = +28.3$. The corresponding values for the K salt are +1000, -165 and +35.4. The fact that the corresponding moduli for these two salts have the same sign is of interest because piezoelectricity and optical rotation are closely connected and the NH₄ salt is levo- while the K salt is dextro-rotary. The crystals undergo a slight decomposition at the surfaces on prolonged exposure to the atmosphere or to a drying agent. Expts. indicate no appreciable change in piezoelec. properties between -17 and +30°. Above 30° the loss of piezoelec. properties seems to be due to a viscous change rather than to any abrupt alteration in crystal structure.

W. W. STIFLER

Magneto-resistance effect in single crystals of nickel. SEIJI KAYA. *Sci. Repts. Tohoku Imp. Univ.* 17, 1st ser. 1027-37(1928); cf. *C. A.* 22, 4349.—Three rectangular rods were cut from a large single crystal of Ni, the axes of the rods being parallel to the (100), (110) and (111) axes of the crystal. The rods were 2.6 to 1.3 cm long and varied in cross-section from 1.5 to 1.0 sq. mm. When magnetized longitudinally by external fields up to 1400 gauss, all showed an increase in resistance. This occurred most rapidly and reached the largest value in the case of the (111) specimen, while the effect in the (100) specimen was least. The transverse effect was studied in fields up to 13,600 gauss. If magnetized along the (001) axis the (100) specimen first de-

creased in resistance, then increased more rapidly to a const. pos. value, but if magnetized along the (011) axis the resistance decreased, at first slowly, then more rapidly, and finally approached a negative value asymptotically. On varying the angle of the field, the change in resistance followed a sinusoidal law with max. corresponding to the (001) and the (010) directions and min. to the (011) and (01 $\bar{1}$) directions. For the (110) rod a somewhat similar result was obtained except that the max. for the (001) and (00 $\bar{1}$) directions were much greater than the max. for the (110) direction. For the (111) rod the max. occurred at the (11 $\bar{2}$), (2 $\bar{1}\bar{1}$), (1 $\bar{2}$ 1) and (1 $\bar{1}$ 2) directions, and the min. at (10 $\bar{1}$), (1 $\bar{1}$ 0) and (0 $\bar{1}$ 1).

W. W. STIFLER

Magnetostriction I. ALFRED SCHULZE. *Z. Physik* 50, 448-505(1928); cf. C. A. 22, 937.—Previous work, both exptl. and theoretical, on magnetostriction in ferromagnetic bodies is reviewed. A precise method for measuring magnetostriction is described and the theory underlying it developed. It is essentially an adaptation of Whiddington's ultra-micrometer method, based upon the change in capacity of an air condenser one plate of which is attached to the rod under examn. Change in capacity is measured by the frequency of the beat between the notes produced by two high-frequency circuits. The samples used were approx. 33 cm. long and 6 mm. in diam. Electrolytic Fe at first increases rapidly in length with increasing field and then reaches a max. length in a field strength of about 50 gauss. The rod then shortens more slowly, reaching the Villari point at about 225 gauss and continuing to shorten in still stronger fields. Two specimens of Fe, 99.7% and 98.6% pure, resp., gave similar results, with the Villari points at 265 and 420 gauss. Heat treatment modifies the magnitude of the effect in electrolytic Fe but does not change the position of the Villari point. In cast Fe there is no evidence of change in sign of the effect up to 370 gauss. The chem. and phys. consts. of the samples tested are described fully. In Co and Ni only a decrease in length occurs which in Co is not perceptible in fields less than 12 gauss, but in Ni is revealed in much smaller fields. At 300 gauss the effect in Ni is about 2.6 times as great as in Co. Since magnetostriction was absent in Bi it does not depend upon sp. resistance. Magnetostriction was measured and satn. values and initial permeabilities were calcd. for a series of Fe-Ni alloys varying from 3 to 90% Ni and contg. 4 to 1.8% Mn and traces of Si and C. When the Ni content is less than 80% the change in length is positive. There should be no magnetostriction in an alloy contg. 81% Ni. The curve of magnetostriction vs. Ni content has two maxima sepd. by a sharp min. at 30% Ni. Several of these alloys were tested after being annealed at 930° and the magnetostriction (in the reversible region) was found to be independent of the previous thermal treatment. The high initial permeability of permalloy therefore is not directly connected with its magnetostrictive properties. The intensity of magnetization and magnetostriction of these Fe-Ni alloys are completely analogous, but initial permeability and magnetostriction are not related. This is contrary to McKeehan's theory, which explains the high initial permeability of permalloy by the vanishing of magnetostriction. In a series of Fe-Si alloys contg. from 0.08 to 8.37% Si, the magnetostriction was found negative, with a max. at about 60 gauss in the alloy richest in Si, and positive in the alloys poorer in Si. A Villari point occurred at about 420 gauss in the alloy with 1.03% Si and at a considerably higher field strength in the alloy with 1.93% Si. In a series of Fe-Al alloys, contg. from 0.52 to 10.52% Al, the magnetostriction was always positive and increased with increase in Al content. At 0.52 and 1.04% Al there were indications of a Villari point near 400 gauss. At 300 gauss the effect for the 10.52% alloy was nearly 3 1/2 times as great as for the 5.66% Al alloy. The satn. value of the intensity of magnetization decreased almost linearly with increase in Al content. In both the Fe-Si and the Fe-Al series there were evidences of mixed crystals. A series of Fe-Mn alloys, contg. up to 14.5% Mn showed no direct correlation between Mn content and magnetostriction. The effect was positive or zero in all cases for fields below 250 gauss. In addition to the effects due to mixed crystals common to the series, an alloy containing approx. 8% Mn gave indications of instability which were attributed to an allotropic modification of Fe. While the exptl. results indicate an intimate relation between constitution and magnetostriction, no direct correlation can be established between magnetostriction and other physical properties.

W. W. STIFLER

Magnetostriction. L. W. MCKEEHAN. New Haven, U. S. A. *Z. Physik* 52, 752-4 (1928).—Reply to remarks by A. Schulze. (Cf. preceding abstract.) G. G.

Theoretical and experimental strength. M. POLANYI. Kaiser Wilhelm Inst. f. physik. Chem. u. Elektrochem., Berlin-Dahlem. *Naturwissenschaften* 16, 1043-4 (1928); cf. Joffe, C. A. 22, 518; 23, 1031; Polyani, C. A. 22, 2302.—A

of the results of Joffe and of P. on strengthening and elastic behavior of rock salt crystals. P. considers the strengthening an essential part of the behavior of rock salt under stress and denies the high compressive strengths of 25 and 100 kg. per sq. mm. assumed by Joffe from the behavior of crystal balls at 100° and 600°. At 100° P. found that plastic flow begins at a load of only 0.65 kg. per sq. mm., at 600° of 0.15 kg. per sq. mm. It is concluded that crystals differ from amorphous bodies in that forces smaller than calcd. from surface tension and mol. distances suffice for deformation. Strengthening effects appear which cause the elastic values of crystals to approach the theoretical ones only after prolonged deformation.

B. J. C. v. D. H.

Internal strain produced when crystals of aluminum are extended. KEIJI YAMAGUCHI AND SAKUICHI TOGINO. *Bull. Inst. Phys. Chem. Research (Tokyo)* 7, 668-82 (1928); *Abstracts* 1, 60-1.—When a test piece consisting of a single crystal of Al is extended at ordinary temp., the outward strain is far more uniform than at high temp. but Laue photographs show that a certain sort of strain has taken place in the interior of the crystal. So far as x-ray analysis is concerned, the internal strain is equivalent to a curvature of the crystal about an axis normal to the direction of slip on the slip plane. This is proved by the fact that when x-rays are projected parallel to the axis of this curvature, the corresponding Laue photograph presents spots accompanied by concentric tails. The axis of the curvature is perpendicular to one of the crystal faces (112) and the spot corresponding to this face displays a simple point without tail. The form of the tails (by incident x-rays perpendicular to the axis of curvature) agrees well with the diagram drawn from the calcn. by assuming the strain to be a rotation about the same axis. Since no change of angle (due to strain) between the axis of curvature and any crystal face can be shown, the form of the crystal lattice scarcely changes. The degree of curvature increases with extension, but Laue photographs are not adequate for quant. detn. In contradistinction with the rapid increase of the resistive strength of the crystal to slip following the increase of shearing strain, the degree of internal strain seems to increase proportionally to the strain. Although Polanyi (*Z. Physik* 12, 58(1923) and *C. A.* 22, 2302) says that the slip plane distorts into a conical form when the direction of the tangential component of the stress on the slip-plane does not agree with the slip direction, this does not hold in the case of Al. To ascertain this point, Laue photographs were taken along the axis of curvature as given by the hypothesis of his mode of explanation, but the results were negative. In order to explain the fact that the shearing strength of the crystal increases with an increase in strain by the elastic bending theory, quant. relations between the two must be ascertained. Till then, the bent slip set forth by Polanyi cannot be alone thought the chief cause of work hardening.

ALBERT L. HENNE

Density of molten metals and alloys. YOSHIHARU MATSUYAMA. *Bull. Inst. Phys. Chem. Research (Tokyo)* 7, 1054-77(1928); *Abstracts* 1, 102.—The ds. of 5 molten metals (Sn, Cd, Bi, Pb, Zn), 7 binary alloys (Sn-Cd, Sn-Bi, Bi-Pb, Sn-Zn, Bi-Cd, Cd-Pb, Cd-Zn) and 6 ternary alloys (Sn-Bi-Cd, Bi-Cd-Pb, Sn-Bi-Pb, Sn-Cd-Pb, Sn-Cd-Zn, Cd-Pb-Zn) were measured at different temps. The expansion coeff. of a molten metal is almost independent of temp., but has a slight tendency to decrease with temp. rise. The d. of a molten metal at its m. p. was obtained by extrapolation of the d. temp. curve; the result coincides satisfactorily with the value calcd. from the expansion coeff. of the solid metal and the change of vol. during melting. In the case of a molten alloy, the at. vol. is greater than the mean of the at. vols. of the components. The concn. corresponding to the max. deviation from the linear relation of the at. vol. is not 50 at. %, but is displaced towards the side of the component of smaller d. The amount of the max. deviation is of the order of 1%. The equation of J. J. van Laar and R. Lorenze for heat of mixture may hold good in the cases of Sn-Cd, Pb-Cd, Sn-Zn and Cd-Zn. The writer also measured the thermal expansion of glass to obtain the necessary correction, and found a transformation in glass.

ALBERT L. HENNE

Densities of liquid elements. L. H. BORGSTRÖM. *Finska Kemistamfundels Medd.* 36, 76-81(1927).—A comparison.

H. G.

The surface tension of liquid sulfur dioxide. VERNON M. STOWE. *Univ. of Minn. J. Am. Chem. Soc.* 51, 410-5(1929).—The surface tension of liquid SO₂ was measured by the capillary-height method over a temp. range of -80° to 50° (the data are rather inconsistent in the region -80° to -20°). The radii of the capillaries were ascertained by detn. of the rise of CCl₄ in them, assuming validity of Richards and Carver's data (*C. A.* 15, 1841), from the wt. of a Hg thread of known length; and by direct measurement with a microscope fitted with a micrometer scale. The data secured by the 3 methods agreed with a max. deviation of 2.3% (average deviation about 1.0%). The equation of Ferguson (van der Waals) in the form $\gamma = 0.061584 (157.5 - t)^{1.2}$ fits the

data with an accuracy of 0.5% in the range -20° to 50° ; the Ramsay-Shields const. calcd. for the temps. is 2.134.

WILLIAM E. VAUGHAN

Investigations of surface tension constants in an homologous series from the point of view of surface orientation. K. W. HUNTEN AND O. MAASS. McGill Univ., Toronto. *J. Am. Chem. Soc.* 51, 153-65(1929).—The surface tensions and ds. of propionic, butyric, caproic, caprylic, capric, lauric, myristic, palmitic, margaric and stearic acids and of dicetyl were measured over 100° ranges of temp. The surface tensions are claimed to be accurate to 0.5% and the ds. to 0.05%. (The data in the case of the surface tension of caprylic acid vary more than this limit among themselves.) The angle of contact of these substances was found to be zero. The viscosities of palmitic, stearic and margaric acids were detd. From the graphs the Eötvös consts. of these materials were found. The total surface energy approaches a series const. more rapidly in the fatty acids than in the paraffins. The Eötvös or Ramsay-Shields term increases rapidly in the case of the fatty acids and has an abnormally high value for the higher paraffins. The variation in the R.-S. const. parallels Sugden's parachor. Partial orientation on the surfaces of pure liquids is possible.

WILLIAM E. VAUGHAN

Surface energy and the orientation of molecules in surfaces as revealed by surface energy relations. WILLIAM D. HARKINS. *Z. physik. Chem., Abt. A*, 139, 647-91 (1928).—The work of Haber and his associates on the orientation of mols. in surfaces as related to surface energy is reviewed. The fundamental theory and certain thermodynamic features are discussed at length. A complete bibliography of the author's publications in this field is included.

J. B. AUSTIN

The electric double layer of metals. YA. FRENKEL. *Z. Physik* 51, 232-8(1928).—The old theory of the surface double layer is re-stated in terms of wave mechanics and Fermi statistics. The results have only qual. significance, since the assumption of uniform potential is not in accord with modern ideas of a crystal lattice.

F. R. BICHOWSKY

The effect of gas on the electrical double layer of aqueous solutions. ALFONS BÜHL. Univ. Heidelberg. *Ann. Physik* 87, 877-908(1928); cf. *C. A.* 22, 533.—Evidence that the double layer is situated entirely within the liquid is cited and discussed. The cond. of H_2O and of dil. solns. (KCl, NaCl and LiCl at concns. of from 0.0001 to 0.01 *N*) was shown to be the same, within narrow limits, when the solns. contained dissolved gases (N_2 , O_2 or H_2) as when they were gas-free. It was concluded that the liquid junction potential at the boundary between a gas-contg. and a gas-free soln. of the same salt at the same concn. should be zero. This conclusion was tested by measuring the e. m. f. between two calomel electrodes, one in the gas-contg. and the other in the gas-free soln., connected by a capillary siphon. This cell had an e. m. f. of zero within 0.05 mv. The potential difference of the elec. double layer at the surface of a dil. alkali chloride soln. is not influenced by the adjacent gas but is increased by a dissolved gas. This increase depends on the electrolyte concn. and requires time for its formation. The conception of the arrangement of the elec. charge in the double layer is extended and discussed.

E. R. SMITH

Method of moving boundaries as applied to the measurement of the absolute velocity and the transport number of ions and of the rate of migration of colloidal particles. JNANENDRA NATH MITTHERJEE. *J. Indian Chem. Soc.* 5, 593-607(1928).—A general discussion with no new data. M. concludes that the theoretical basis of methods of cataphoretic speed must rest on securing a "uniform ionic environment during the movement of the colloidal particles."

F. E. BROWN

The application of Langmuir's theory to the adsorption of gases by charcoal. M. POLANYI. Kaiser Wilh.-Inst. f. physik. Chem. u. Elektrochem. *Z. physik. Chem., Abt. A*, 138 459-62(1928).—Zeise, *C. A.* 23, 557, found that isotherms for the adsorption of gases by charcoal can be expressed by Langmuir's adsorption formula and urged this as proof of the correctness of L.'s theory. However, the theory requires that one of the two consts. of L.'s formula be independent of temp. and that the other decrease exponentially with temp. Since expt. reveals that neither const. behaves in the required way, L.'s theory must be rejected. The discrepancies cited by Z. against P.'s theory can be accounted for satisfactorily and there is other exptl. evidence that confirms it.

F. L. BROWNE

Adsorption phenomena in solutions. XVII. The different modifications of activated charcoal. MICHAEL DUBININ. Tech. Hochschule, Moscow. *Z. physik. Chem., Abt. A*, 140, 81-8(1929); cf. *C. A.* 22, 3329.—Sugar charcoal has different adsorbing properties according to the temp. at which it is activated. A charcoal activated at 550° adsorbed mineral acids from aq. solns. of equiv. concn. in the order $HCl < H_2SO_4 < H_3PO_4$ and org. acids according to Traube's rule, i. e., propionic < valeric < hep-

tylic acid. This is called *covalent adsorption*. A charcoal activated at 800° adsorbed both the mineral and the org. acids in the reversed order. This is called *oriented adsorption*. The difference between the charcoals probably lies in the formation of amorphous C at the surfaces of the one activated at 550° and a fine cryst. C at the surfaces of the one activated at 800°. Neither charcoal adsorbs alkali when free from CO₂. An active charcoal of the cryst. type was made by careful heating of a raw wood charcoal.

F. L. BROWNE

The heat of adsorption of oxygen on charcoal. III. DOUGLAS MCKIE. *J. Chem. Soc.* 1928, 2870-89; cf. *C. A.* 22, 531.—A method is described for measuring the heat of adsorption of gases on solid surfaces and the details of construction of a *vacuum calorimeter* are given. Measurements are reported on the heat of adsorption of O₂ on C. The mean molar heat varies from 70 cal. at 20° to 116 cal. at 200°. J. B. A.

Behavior, with regard to time, of the adsorption on silica gels of gaseous mixtures containing alcohol and ether in addition to air. I. LADISLAUS VON PLETNOKY AND GEZA VON SZELNYI. *Z. Elektrochem.* 34, 805-13(1928).—A new dynamic method was devised, suitable for measuring the adsorption of alc. and Et₂O. A 3-chamber gas interferometer was used as analyzing instrument. The adsorption was measured on 5 samples of com. SiO₂ and one sample prepd. by hydrolysis of SiCl₄. The simultaneous adsorption of alc. and Et₂O from air depends on the abs. amt. of these compds. in the atm. and on their relative amts. The ratio: alc./ether in the vapor is not the same as that in the adsorbed phase; they are interdependent, and the former is always smaller than the latter. The relative concns. in the vapors can be so adjusted that the ratio of the adsorbed amts. will equal 1; these concns. are the same with every sample of SiO₂ used; they are little affected by the abs. concns. The adsorption velocity decreases with time, but the ratio: adsorbed alc./adsorbed Et₂O remains nearly const. throughout.

ALBERT L. HENNE

Thermal and magnetic investigations on absorbed gases. FRANZ SIMON. *Z. Elektrochem.* 34, 528-31(1928).—Investigations by S. and his collaborators on the absorption of A and H₂ by chabasite are reviewed. By heating chabasite at reduced pressure the H₂O originally contained in it can be driven out without disturbing the crystal lattice, leaving a sort of honey-comb structure. The absorption isotherm for A, at 90° abs. and concns. from 0 to 1.5 mols. per mol. of chabasite shows a definite break at 1 mol. This indicates an integral no. of gas mols. in each cell. Measurements of the magnetic susceptibility of chabasite contg. various amts. of adsorbed O₂ confirm the conclusion. The curves of susceptibility vs. adsorbed O₂ show definite breaks at 1 and 2 mols. of O₂ per mol. of chabasite. While these results indicate a uniform distribution of gas mols. throughout the cells, the question remains whether the gas mols. are relatively firmly bound in the interior of the cells or are free to move therein. Sp. heat measurements now in progress should make it possible to distinguish between these two cases since the degrees of freedom are different. Some results for the mol. heat of absorbed H₂ at about the temp. of liq. N₂ show no clear relationships. The behavior of "electron gases" in metals is also mentioned.

W. W. S.

Studies in adsorption. XXII. The adsorption of Cu and of cupric salts in the precipitation of cupric hydroxide. M. R. MEHROTRA and N. R. DHAR. Allahabad Univ., India. *J. Phys. Chem.* 33, 216-25(1929); cf. *C. A.* 22, 1073.—The object of the study was to det. whether the high results obtained in estg. Cu by pptn. of sol. Cu salts with NaOH or KOH and igniting the ppt. are due to adsorbed alkali. Cu(OH)₂ pptd. from solns. of CuSO₄ or CuCl₂ adsorbs KOH or NaOH and the ppt. from CuCl₂ adsorbs more alkali than that from CuSO₄. Both Cu⁺⁺ and SO₄⁻⁻ are adsorbed by Cu(OH)₂, the 2 ions in equiv. amt. CuCl₂ is similarly adsorbed. Because of this adsorption Cu is completely pptd. from soln. by slightly less than the equiv. amt. of alkali. The adsorption data suggest a compd. 3Cu(OH)₂.CuSO₄. For the adsorption of NaOH and KOH the formula, $a = A[(KC)^{1/n}/(1 + (KC)^{1/n})]$, holds in which a is the amt. adsorbed, A the max. adsorption, and K and n are consts.

F. L. B.

Adsorption of ions by sols of aluminum hydroxide and vanadimumpent oxide. D. N. CHAKRAVARTI AND N. R. DHAR. Allahabad and Nagpur. *J. Indian Chem. Soc.* 5, 539-43(1928).—The adsorption equation of C. and D. (cf. *C. A.* 22, 1073, 3079) agrees better with the results of adsorption expts. on Al₂O₃ and on V₂O₅ than the adsorptions calcd. by Freundlich's equation. The order of adsorption of anions on Al₂O₃ was: BrO₃⁻ > Cl⁻ > IO₃⁻ > CrO₄⁻⁻ > Fe(CN)₆⁻⁻ > C₂O₄⁻⁻. A sol of V₂O₅ adsorbed more K⁺ than it adsorbed bivalent and multivalent radicals.

F. E. BROWN

E. H.

Adsorption of iodine on calcium fluoride. J. H. DE BOER. *Proc. Acad. Sci. Amsterdam* 31, 906-14(1928).—See *C. A.* 22, 1883.

The physical basis of Naegeli's micella theory. H. MARK. *Naturwissenschaften* 892-900(1928).—A review of optical methods (ultramicroscopy and polarization) qual. examn. of micellae and the newer x-ray methods which give quant. data their structure. The structure of cellulose is specially discussed.

B. J. C. VAN DER HOEVEN

Studies on permeability. Friction constant, interfacial tension and surface layer. J. TRAUBE AND SIAR-HONG WHANG. *Techn. Hochschule, Berlin. Biochem. Z.* 203, 363-9(1928); cf. *C. A.* 23, 749.—The rate of flow of aq. solns. of capillary-active substances varies inversely as the surface tension. The permeability and resorption of a substance thus depend upon its surface tension activity or polarity, also on the activity of the wall.

S. MORGULIS

Membranes for ultrafiltration, of graduated fineness down to molecular sieves.

MCBAIN AND S. S. KISTLER. *Stanford Univ. J. Gen. Physiol.* 12, 187-200

Cellophane, which consists of cellulose and a trace of glycerol, and may be in sheets, is recommended for membranes in ultrafiltration. After swelling in water, it retains the finest colloidal particles but permits mols. such as sucrose to pass. Dense ultrafilters may be made (1) by clogging the cellophane membrane with a suspension of cellulose in water, the suspension being formed by dilg. cellulose in Schweitzer reagent, and (2) by filtering a suspension of cellulose through a membrane that has previously been swollen in water. The behavior of cellophane in aq. and non-aq. solutions. Such membranes may be used for ultra-filtration but do not differ from other membranes. A membrane from cow's intestine, filters rapidly colloids. Different types of membranes may be prepd. by drying it to dry until brittle. Porosity increases with swelling.

Such membranes will retain a fair proportion of colloids. The chief factor in ultrafiltration. The relation to diffusion, dialysis, osmosis, electro-

C. H. RICHARDSON

cholesterol ester in colloidal solution.

203, 313-22(1928).—Cholesterol ester

as protective colloids for cholesterol

since protective action is generally remarkable fact is that 2 sols

fr. S. MORGULIS

I. Experiments with dye sols

Univ. Wien. *Biochem. Z.* 203,

pure Congo blue from Congo red

changed only if kept in Jena glassware.

with the gas chain; only the replacement.

In concd. solns. only a part of the

all the H-ions acquire cond. The electrolyte

univalent electrolytes with strongly polarizable

red, though under certain conditions neutral salts

ppt. can be peptized by H₂O, which is not the case

when the pptn. was due to act. The temp. coeff. of the cond. of Congo blue sol is

greater than of a typical electrolyte. The Congo blue mol. aggregates are destroyed

through heat and the color changes to red to return again to the blue on cooling.

blue when dried is insol. in water. Filter paper, colored blue by Congo blue

red on drying, the color change depending upon impurity of the paper.

ppts. the Congo blue soln. red. The blue Congo rubin sol behaves like

though in its aq. soln. there is always an equil. between the poorly disper

the highly dispersed red form which upon diln. shifts more towards the

electrolytes always ppt. Congo rubin sol blue, but the ppt. can on diln. dissolv

color. All the electrolyte-free proteins studied gave with this extremely

blue sol a blue ppt. which occurred even upon the neutralization of the H-ion

provided the concn. was properly adjusted. It is therefore incorrect to

protective action in the case of a very pure protein and very pure lyophilic

From an extensive discussion of the mechanism of this pptn. the conclusion

that even in this case no other factors need be postulated than the el

ultimately are detd. by the constitution. S.

The influence of mixtures of electrolytes on the viscosity of sols of lyophilic substances. H. J. C. TENDELOO. *Rec. trav. chim.* 48, 23-8(1929).—Expts. on prote

that the influence of electrolytes on the viscosity of lyophilic sols is of

character. Ions alter the elec. charge of the micelles which corresponds to a diminution of the degree of hydration. The magnitude of the effect depends upon the valence of the ions absorbed. KCl , $BaCl_2$ and $Co(NH_3)_6Cl_3$ being used, the influence of different concns. and mixts. on the viscosity of a 1% sol of gum arabic was detd. If a single electrolyte is added, the viscosity decreases as the valence of the anion increases or the concn. of the electrolyte increases. The effect of equiv. concns. of mixed electrolytes is additive. The influence seems proportional to the total amt. of electrolytes present.

DON BROUSE

The coagulation of rod-shaped colloids by electrolytes. I. Rapid perikinetic coagulation. GEORG WIEGNER AND C. E. MARSHALL. Tech. Hochschule, Zürich. *Z. physik. Chem., Abt. A*, 140, 1-38(1929).—The coagulation was observed by counting the particles in the slit ultramicroscope, orienting the rod-shaped ultramicrosols at right angles to the illuminating light by means of an a. c., so that all particles were visible. Coagulation of V_2O_5 sols and of benzopurpurin sols, in which the particles are rod-shaped, takes place more rapidly than in sols with spherical particles, but benzopurpurin sols with approx. spherical particles exhibit normal rapid coagulation, conforming to v. Smoluchowski's theory. The abnormally rapid coagulation of rod-shaped particles does not depend upon the chem. nature of either sol or coagulant. At the beginning of the coagulation it is more rapid the greater the ratio of length to thickness of the particles and the greater the initial no. of particles in the sol. As rapid coagulation progresses, the secondary particles that are formed continue to coagulate less rapidly until finally they follow v. S.'s theory. The velocity of rapid coagulation of the secondary particles is influenced by shaking the sol but that of the primary particles is much less so. II. Slow perikinetic coagulation. *Ibid* 39-63.—In amicroscopic and submicroscopic sols of benzopurpurin AB slowly coagulated with $NaCl$, v. S.'s law was followed as long as the particles were spherical. Shaking had less influence on the slow than on the rapid coagulation. In a typically rod-shaped V_2O_5 sol slow coagulation took place more rapidly in the early stages of the process than in the later, just as was found for rapid coagulation. In the early stages, slow coagulation of rod-shaped particles may be faster than rapid coagulation of spherical particles. On passing gradually from rapid to slow coagulation by adding $NaCl$ the retarding of the rate of coagulation is more marked for rod-shaped than for spherical particles. The relation between concn. of coagulant and no. of particles present after a definite time interval is the same for rod-shaped V_2O_5 particles as it is for spherical lyophobic particles in general. In benzopurpurin sols aged in the presence of small quantities of $NaCl$, the particles become more nearly spherical and the coagulation departs less from v. S.'s law.

F. L. BROWNE

The effect of non-electrolytes on the coagulation of colloids. III. Copper ferro cyanide sol. SUBODH GOBINDA CHAUDHURY AND NIRMALA PADA CHATTERJEE. Univ. Calcutta, India. *J. Phys. Chem.* 33, 244-9(1929); cf. *C. A.* 23, 1332.—The influence of $MeOH$, $EtOH$, urea, cane sugar, gelatin and H_2O_2 on the coagulating concns. of HCl , H_2SO_4 , citric acid, KCl , $BaCl_2$, and $AlCl_3$ for $Cu_2Fe(CN)_6$ sol were detd. The results are compared with previous studies with As_2S_3 and $Fe(OH)_3$ sols. "It is obvious that several factors are at work and that it is *a priori* difficult to predict what is going to happen in a particular case. The specificity of stabilizing or sensitizing effect is to be attributed to the fact that what we observe is the net result of changes in a large no. of variables which affect the coagulating concn." "It is unjustifiable to discuss the observations on coagulation with mixts. of electrolytes and in the presence of non-electrolytes on the basis of amts. of adsorption of the coagulating ion necessary for coagulation as affected by simple considerations in changes in adsorbability or variation in the original charge. . . . There are other equally influential factors such as the elec. forces opposing collisions, the elec. adsorbability, the changes in the energy associated with the agglomeration of the particles, and most of all the change in the critical potential of the sol on the addn. of a non-electrolyte."

F. L. BROWNE

Further studies on the precipitating action of protective colloids. E. MENEGHETTI. *Boll. soc. ital. biol. sper.* 3, 779-81(1928).—Colloidal Sb_2S_3 was made by bubbling H_2S through a soln. of $K(SbO)$ tartrate in the presence of gelatin. The max. concn. of colloidal Sb_2S_3 depends upon the amt. of gelatin used as a protective colloid. When the concn. of gelatin in % is, resp., 0, 0.47, 0.88, 1.68, and 3.80, the max. concn. of Sb_2S_3 is 0.304, 0.151, 0.308, 0.404 and 0.607%. Although in sufficient concn. gelatin exerts a protective action, in small amts. it reduces the max. concn. of Sb_2S_3 in solution.

PETER MASUCCI

Sol and gel transformations by mechanical working. H. FREUNDLICH. *Kolloid Z.* 107, 288-99(1928).—F. believes sol and gel closely related and that the fluid state

is always the dispersion medium from expts. with gels transformable by mech. work into sol which again gel on standing. The effect of p_H and of added electrolytes on gelling time is discussed. Such transformable gels, i. e., *thixotropic* gels, show double refraction in the moving sol indicating some attractive forces between the particles. $Fe(OH)_3$ and $Al(OH)_3$ gels are the best examples although gelatin may be made to behave in the same manner. This transformation occurs in biol. media and is hence of great importance.

L. F. MAREK

Free and bound fluid in gels. W. B. HARDY. *Kolloid Z.* 46, 268-77(1928).—Attraction between ions of a soln. due to elec. properties is a special case of cohesion. This attraction is great enough to affect vapor pressure and f. p. and is measurable through such changes. It is selective. H. believes that the range of cohesion at the surface of steel, copper, glass or quartz is large and is the sum of the attractions of the individual mols. The effect of orientation is to increase cohesion range. To demonstrate bound water H. describes effects obtained in freezing a gelatin gel. Frozen joints of a lubricant between metal surfaces are broken to show the range of influence of metal in preventing crystn. in the adsorbed material. Bound fluid is that which is held more strongly by the dispersed particles than by any other phase present. A gel with positive syneresis is one in which the attraction of the dispersed phase for itself is greater than its attraction for dispersion medium. A study of the range of surface attraction in colloids is of more importance than that of the question of whether a colloidal particle is cryst. or amorphous.

L. F. MAREK

Syneresis. ALFRED KUHN. *Kolloid Z.* 46, 299-314(1928).—The hydration equil. may be approached from both sides, i. e., by syneresis or by swelling. Results of syneresis expts. of others are reviewed. The influences of temp., dispersing medium, alcohol, admixtures, mech. treatment, surface area, etc., are discussed with reference to various exptl. results. Composition of expressed fluid is discussed. From theoretical standpoints syneresis is analogous to crystn., is due to decrease in adsorption, and results in structural changes due to desolvation.

L. F. MAREK

Thermal, mechanical, and x-ray analysis of swelling. R. O. HERZOG AND K. WISSENBERG. *Kolloid Z.* 46, 277-89(1928).—Gels and jellies may be analyzed from material and energy standpoints. With the aid of physical and chem. methods the structure of the micelle, molecule and atom has been studied. In the thermodynamic analysis the system is looked on as a single homogeneous phase and the changes due to energy additions are studied. Mech. energy is divided into elastic energy and a combination of kinetic and heat energy. The kinetic theory involves consideration of translatory, rotational and oscillatory energy of the gel. By optical means the system is divided into phases which are then studied individually. Swelling phenomena are associated with chem. interaction and the consequent changes in aggregation are due to formation of a new substance. Orientation plays an important part in detg. structural characteristics.

L. F. MAREK

Quantum theory of gases and solutions. A. MAYOR. Univ. Cluj. *Bull. soc. chim. Cluj* 4, 166-7(1928).—Criticism of a paper of the same title by Barbulescu (*ibid.* 1, 22, 3341) on the ground of lack of originality, Nernst having already solved the problem.

ALBERT L. HENNE

Observations on solution volume. F. WRATSCHKO. *Pharm. Presse* 34, 4-5, 20-21(1929).—A commentary on recent papers by A. Schlicht, and Karl Otto on sp. gr. of solns. (cf. *C. A.* 22, 1514, 2736).

W. O. E.

A microextraction method. JOSEPH B. NIEDERL. N. Y. Univ. *J. Am. Chem. Soc.* 51, 474-5(1929).—A capillary of 1-2 mm. diam. inside and 8-10 cm. long is filled with one drop of the liquid and an equal amt. of a non-miscible extn. medium, sealed and centrifuged a few times.

E. SCHOTTE

The influence of the solvent on optical rotational dispersion. A. L. TH. MOESVELD. Univ. Utrecht. *Verslag. Akad. Wetenschappen Amsterdam* 37, 823-34(1928).—It was found that for bornyl acetate in various solvents the rotation α_λ can be represented by a single Drude term $k/(\lambda^2 - \lambda_0^2)$ and thus the influence of the solvent expressed in k and λ_0 . The const. k depends upon the stiffness of the vibrating system and deviations of k can be expected whenever considerable deformations of the mol. take place, especially in the case of mixed solvents which are differently attracted by the 2 sides of the solute mol. For the exptl. work a monochromator according to van Cittert was used with arc light. The polarization app. was that of Landolt-Lippich with a plate field and 22.0-cm. tube at 30.0°. Seven colors were used close to known crystal spectral lines; the wave lengths were checked by a standardized quartz plate (Lorenz equation). The bornyl acetate was carefully purified; it m. 27.7 and 715. The accuracy of the angle measurements was better than 0.03°.

For the Drude const. of pure bornyl acetate at 30.0° was found $k = 13.75$, $\lambda_0^2 = 0.03236$. The solns. of bornyl acetate contained usually 20% ester (20 g. per 100 cc.) and followed Drude's equation within 0.2%. In abs. alc. $k = 14.17$, $\lambda_0^2 = 0.03383$ (20% soln.). For a 5% soln. $k = 14.86$, $\lambda_0^2 = 0.02195$ and for a 1% soln. 15.32 and 0.02163, indicating that more alc. mols. are available for each ester mol.; consequently there is more distortion. If enough water is added in a water-alc. mixt. to make the 20% ester soln. a satd. one (38.5% water, 61.5% alc.) k was found to be 14.58, $\lambda_0^2 = 0.2990$. For a 20% soln. was found in AcOH $k = 14.84$, $\lambda_0^2 = 0.03052$; in heptane 13.79, 0.03277; AcOH-heptane 1:1 14.94, 0.03036; nonane 13.82, 0.03253; AcOH-nonane 1:1 14.79, 0.03108; PhH 12.72, 0.03349; AcOH-PhH 1:1 14.24, 0.02904; decalin 13.80, 0.03067; AcOH-decalin 1:1 14.74, 0.03341; EtOH-decalin 1:1 14.55, 0.03154; benzyl alcohol 13.88, 0.03388; benzyl alcohol-heptane 1:1 14.26, 0.03162; decalin-PhH 1:1 13.07, 0.03190; EtOH-PhH 1:1 13.84, 0.03138; benzyl alcohol-EtOH 1:1 14.36, 0.02735; benzyl alcohol-decalin 1:1 14.29, 0.03163; decalin-heptane 1:1 13.79, 0.03145; PhH-benzyl alcohol 1:1 13.59, 0.3419; PhH-heptane 1:1 13.27, 0.02855. In the most indifferent media such as heptane and decalin the value 13.79 is equal to that of the pure ester where there is no deformation. PhH and AcOH have opposite effects, resp., lowering and raising k , due to the localization of forces on the Ph and the AcO group of the ester. The action of benzyl alcohol is small because of internal compensation of these effects. EtOH raises k slightly. Mixing of indifferent media gives nearly additive results but large discrepancies appear for mixts. with AcOH (specially PhH-AcOH) indicative of the above-mentioned effect of increased deformation. In those mixts. where the solute induced complete mixing of the originally immiscible solvent components (EtOH-decalin, benzyl alcohol-PhH) the discrepancy is more than 3%. The values found were always larger than those calcd. for simple mixing.

B. J. C. VAN DER HOEVEN

Separation of thorium and uranium by means of ether. P. MISCIATTELLI. *Atti accad. Lincei* 7, 1019-24(1928).--The literature shows a difference of opinion on whether U and Th may be sep'd. by means of Et₂O. In order to help solve the problem, M. measures the solubilities of UO₂(NO₃)₂ and Th(NO₃)₄ in Et₂O, as follows:

Compn. of upper layer			Compn. of lower layer		
UO ₂ (NO ₃) ₂	Th(NO ₃) ₄	Et ₂ O	UO ₂ (NO ₃) ₂	Th(NO ₃) ₄	Et ₂ O
22%	0%	78%	—	—	—
22.5	1.02	76.48	40.1%	0.52%	59.38%
24	3.5	72.57	48.3	15.6	36.1
24	3.43	72.50	43	20	37
19.2	4.5	76.3	12	40	48
18	5	77	—	—	—
16.5	5.6	77.90	13	27	60
12.2	7	81	9	30	61
8.2	8.3	82.5	7	26	67
3	8	89	1.8	48.5	39
0	5.8	94.2	—	—	—

A small amt. of Th increases the soly. of U. The satd. soln. contains 24% U salt, 3.4% Th salt. The variation of the satd. soln. with temp. is shown below.

Temp.	Compn. of soln.			Compn. of soln.		
	UO ₂ (NO ₃) ₂	Th(NO ₃) ₄	Et ₂ O	UO ₂ (NO ₃) ₂	Th(NO ₃) ₄	Et ₂ O
0°	24%	3.43%	72.57%	48.3%	15.6%	36.1%
16	17.7	1.7	80.6	28.2	20.4	51.4
19	10.5	0.4	89.1	39.2	15	46.8
20	8.78	—	91.22	15.5	26	58.5
22	8	—	92	13.2	23	63.8
25	7.37	—	92.63	12.2	30	57.8

Therefore, at 20° it is possible to sep. the two, providing the Et₂O is satd. with U salt.

A. W. CONTIERI

Effect of neutral salts on the rotary power of tartaric acid and of the tartrates. E. DARMOIS. *Ann. phys.* 10, 70-115(1928).—The large variations in the sp. rotatory power (α) of H₂C₄H₄O₆ with the concn., temp., and addition of neutral salts have been ascribed heretofore to the presence of two or three active forms of the acid having different rotations and dispersions. In mixts. of H₂C₄H₄O₆ and CaCl₂ the variation in (α) followed closely that of the H⁺ ion concn., indicating that, in this case, the degree of disson. of the acid was the important factor rather than the relative proportion of two hypothetical forms of the acid. An attempt to establish the existence

of these hypothetical forms of $\text{H}_2\text{C}_4\text{H}_4\text{O}_6$ requires first a study of α for the $\text{C}_4\text{H}_4\text{O}_6^{--}$ ion. For this purpose α was detd. in solns. of different concn. of the neutral tartrates of the elements of the first three groups of the periodic table. The tartrates which are insol. in H_2O are usually sol. in the presence of an excess of a salt of the metal, and were thus studied. Although these tartrates may be considered largely dissociated in soln., α is not independent of the concn.; and it varies in a regular manner on passing from one element to the following one in the periodic system. These variations are thought to be the resultant of several effects: (1) A dehydration of the ion $\text{C}_4\text{H}_4\text{O}_6^{--}$ in the presence of the cations of the added salt, which increases α . (2) A deformation of the ion $\text{C}_4\text{H}_4\text{O}_6^{--}$ in the field of the other ions, especially the cations. This is the most important effect; it may be demonstrated in the presence of any salt of a metal; and it is large enough in some cases to cause a reversal of the sign of α . The deformation increases with the charge of the ion for cations having the structure of the rare gases. (3) An assocn. of the two ions of the tartrate occurs, especially in the case of multivalent ions. Because of this assocn. in concd. soln. the deformation mentioned in (2) does not increase indefinitely as the concn. increases. The elements Cu, Zn, Hg, etc., which have a structure quite different from that of the alkalis and the alk. earths, give more or less complex tartrates. In fact, the rotary power of the ion $\text{C}_4\text{H}_4\text{O}_6^{--}$ has proved to be a reagent very sensitive to the field of the ions present with it in soln., and by its use one may detect certain deformations and associations postulated by Fajans and Bjerrum for strong electrolytes. The study of the sp. rotary power is a valuable aid in furthering our general knowledge of electrolytes. The above detailed study of the $\text{C}_4\text{H}_4\text{O}_6^{--}$ ion does not permit fixing definitely the forms present in a soln. of $\text{H}_2\text{C}_4\text{H}_4\text{O}_6$, but it does demonstrate the variable sp. rotary power of this ion, further study of which may lead to a more complete knowledge of the still enigmatic substance, tartaric acid.

R. H. LOMBARD

Crystal growth in aqueous solutions. I. Theory. WARREN L. McCABE. Univ. of Michigan. *Ind. Eng. Chem.* 21, 30-3(1929).—Equations are developed for calcg. the yield and screen analysis of crystals obtained when seed crystals of known wt. and size are suspended in the satd. soln. which is cooled under controlled conditions. It is assumed that no new nuclei are formed and that the wt. of solid phase sepg. can be calcd. from the amt. of soln., the change in temp., and the change in soly. with temp. It is further assumed, with theoretical substantiation, that all geometrically similar seed crystals grow at the same rate in each of their linear dimensions, regardless of the original size of the crystals. **II. Experimental.** *Ibid* 112-9.—Seed crystals of known wt. and screen analysis were suspended in satd. soln. at const. temp. for 18 hrs., then removed, weighed and screened. There was no tendency for large crystals to grow at the expense of small ones although there was a 5-fold difference in size. Of 31 expts., 12 were incomplete or obviously inaccurate and 19 satisfactory, of which 13 were made with KCl needles, 3 with KCl spheres and 3 with $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$. Exptl. study of 10 variables verified the basic postulate of the theory that during crystn. all of the crystals grow but the distribution of their relative sizes remains the same.

W. C. EBAUGH

Solubility of magnesium carbonate in aqueous solutions charged with carbonic acid gas. KIYOMATSU TERADA. *Bull. Inst. Phys. Chem. Research* (Tokyo) 7, 452-65 (1928); *Abstracts* 1, 41-2.— MgO , $\text{MgCO}_3 \cdot 3\text{H}_2\text{O}$ and the basic carbonates have widely different soln. velocities in H_2O charged with CO_2 . MgO or Mg(OH)_2 dissolves quickly in H_2O whose satn. with CO_2 is maintained; a state of supersatn. is reached, a metastable soln. of $\text{Mg(HCO}_3)_2$ being formed. $\text{MgCO}_3 \cdot 3\text{H}_2\text{O}$ dissolves slowly and no metastable soln. is yielded. The soly. curve shows that the transition point: $\text{MgCO}_3 \cdot 5\text{H}_2\text{O}$ to $\text{MgCO}_3 \cdot 3\text{H}_2\text{O}$ is at 13.5° . Basic carbonates dissolve very slowly and are not easily transformed into neutral carbonates. The above-mentioned metastable soln. decomposes readily by addn. of some MgCO_3 crystals, giving off CO_2 and pptg. $\text{MgCO}_3 \cdot 5\text{H}_2\text{O}$, $\text{MgCO}_3 \cdot 3\text{H}_2\text{O}$ or basic carbonates. The soly. of $4\text{MgCO}_3 \cdot \text{Mg(OH)}_2 \cdot 3\text{H}_2\text{O}$ is lower than that of $\text{MgCO}_3 \cdot 4\text{H}_2\text{O}$ except near 0° . The transition point: $4\text{MgCO}_3 \cdot \text{Mg(OH)}_2 \cdot 5\text{H}_2\text{O}$ to $4\text{MgCO}_3 \cdot \text{Mg(OH)}_2 \cdot 4\text{H}_2\text{O}$ is at 29° . Under high CO_2 pressure, MgO dissolves readily, forming a supersatd. soln.

ALBERT L. HENNE

Solubility of calcium sulfate from 0° to 200° . EVERETT P. PARTRIDGE AND ALFRED H. WHITE. Univ. of Michigan. *J. Am. Chem. Soc.* 51, 360-70(1929).—Values for the soly. of CaSO_4 in H_2O between 100° and 200° were redetd. Within this range gypsum and anhydrite are the only stable phases. The transition temp. of gypsum into anhydrite lies near 40° . Hemihydrate is metastable in the range 90 – 130° , showing decreasing stability below 90° and above 130° .

LOUISE KELLEY

The solubility of mercuric bromide in ethyl and methyl alcohols. K. L. MAL-

ROTRA. *J. Indian Chem. Soc.* **5**, 545-7(1928).— HgCl_2 of 99.76% purity was dissolved in $\text{C}_2\text{H}_5\text{OH}$ whose purity was 99.78%, in wet alc. 87.73% $\text{C}_2\text{H}_5\text{OH}$, and in 99.88% CH_3OH at several temps. for each solvent. The solubilities in g. per 100 g. of 99.76% $\text{C}_2\text{H}_5\text{OH}$, for the temps. indicated are: 0.0° , 24.04; 16.15° , 26.25; 24.95° , 28.40; 29.15° , 29.28; 31.35° , 30.05; 34.30° , 31.29; 41.60° , 33.53; 44.80° , 34.55; 48.60° , 35.87; 53.20° , 37.80; 58.00° , 39.80; 60.15° , 40.63; 64.80° , 43.10; 79.25° , 60.15. The solubilities of HgCl_2 in g. per 100 g. of 87.73% $\text{C}_2\text{H}_5\text{OH}$ at the temps. indicated are: 39.20° , 17.22; 42.13° , 21.44; 45.20° , 22.91; 49.07° , 25.35; 55.85° , 28.61; 61.60° , 31.84; 68.97° , 37.11. The solubilities of HgCl_2 in g. per 100 g. of 99.88% CH_3OH at the temps. indicated are: 22.10° , 67.62; 27.40° , 68.81; 30.80° , 70.25; 36.10° , 72.21; 40.90° , 84.43. When a satd. soln. of HgCl_2 in CH_3OH stands for a few hrs needle-like crystals form. The probable compn. of the crystals is $\text{HgBr}_2 \cdot \text{CH}_3\text{OH}$.

F. E. BROWN

Cryoscopic studies on the transition points of the compounds of organic solvents with salts. I. HAJIME OSAKA. Univ. Tokyo. *Bull. Chem. Soc. (Japan)* **3**, 289-97 (1928); cf. *C. A.* **23**, 20.—The lowering of the transition point at which $\text{NaI} \cdot 3\text{Me}_2\text{CO}$ loses Me_2CO by soln. of foreign substances was studied and the mol. depression referred to 100 g. Me_2CO found to be 24.0. The transition point was also detd. as 25.5° . The method may be regarded as cryoscopy with an artificially elevated m. p. and can be used practically for the detn. of mol. wts. A similar study was made with $\text{HgCl}_2 \cdot \text{Me}_2\text{CO}$. The mol. depression was found to be 24 and the transition point 20.7° . However, this system shows some inaccuracy so that it can hardly be applied in practical cryoscopy.

ALBERT L. HENNE

The significance of the relaxation time of the ionic atmosphere for the irreversible processes of electrical conduction in strong electrolytes. H. FALKENHAGEN AND J. W. WILLIAMS. *Z. physik. Chem.* **137**, 399-420(1928); cf. *C. A.* **22**, 3573.—In solns. of strong electrolytes there are on the av. more ions of unlike sign than of like sign about any particular ion. For this ionic atm. there are 2 characteristic quantities, its thickness $1/\kappa$, and its relaxation time θ . For the thermodynamics of strong electrolytes only κ is of significance, but for the irreversible processes of elec. cond. both κ and θ are important. The Wien effect is next discussed and it is shown that in a 0.0001 *M* soln. of KCl under a field strength of 100,000 v./cm., the ions move about twenty-five times the thickness of the ionic atmosphere in the time that it is necessary to build up the ionic atmosphere; hence the inter-ionic attractive forces between the ions no longer can exert their braking forces and the cond. of the soln. corresponds to that at infinite diln. The Wien effect can be partially calcd. (cf. *C. A.* **22**, 2861) theoretically by making several successive approximations. The agreement is of the right order of magnitude.

MALCOLM DOLF

Condition of iodic, hydrofluoric and chromic acids and their salts in aqueous solution. N. R. DHAR. *J. Indian Chem. Soc.* **5**, 585-92(1928).—An analysis of the data of others on elec. cond., lowering of f. p., elevation of b. p. and coagulation of $\text{Fe}(\text{OH})_3$ sols by iodic and hydrofluoric acids and their salts shows that the negative ion of iodic acid and iodates is $\text{I}_2\text{O}_6^{--}$ and of hydrofluoric acid and fluorides is F^- . The second disson. const. of H_2CrO_4 is about 5×10^{-8} . $\text{K}_2\text{Cr}_2\text{O}_7$ exists partly in soln. as KHCrO_4 (cf. *C. A.* **16**, 3274).

F. E. BROWN

The determination of the activity of one substance from that of another by a cell with a liquid junction. RALPH F. NIELSEN AND HERMAN A. LIEBHAFSKY. Univ. of Nebraska. *J. Am. Chem. Soc.* **51**, 223-4(1929).—It is pointed out that the measurements by Schuhmann (*C. A.* **18**, 615) on the cell $\text{H}_2, \text{HCl} (c) | \text{HClO}_4 (c)$, II, show that the activity coeff. of the H ion is substantially the same in HClO_4 as in HCl , up to a concn. of 1.1 molal, but do not prove that the mean activity coeff. of HClO_4 is the same as that of HCl .

E. R. SMITH

Solid solutions by precipitation. G. NATTA AND L. PASSERINI. Reale Politecnico, Milano. *Gazz. chim. ital.* **58**, 597-618(1928).—Expts. have already shown (cf. N. and Reina, *C. A.* **20**, 3399) that the simultaneous pptn. of 2 hydroxides is an easy way to obtain solid solns. The x-ray lines of such solns. were known to differ from those of the components, but it is only now with the development of a new app. and technic that it is possible to measure the lines quantitatively. With a chamber of special construction for measurements by the Laue powder method, the slight deformations in the lattice on substituting some atoms for others with only slightly different diams. could be detd. The precision of the method was better than 0.005 Å. U. An extensive series of expts. in which hydroxides, carbonates and sulfides were pptd., yielded solid solns. wherever it was theoretically possible to obtain them. The present paper deals with solid solns. prepd. by pptn. with alkalis from aq. solns. of Ni, Co, Mg,

Cd, Mn and Ca salts, the x-ray structure of the rhombohedral hydroxides and their solid solns. being detd. The following data give the lattice consts. (a , c , c/a and d , resp.) of the individual hydroxides, expressed in A. U.: $\text{Mg}(\text{OH})_2$, 3.11, 4.73, 1.52, 2.40; $\text{Ni}(\text{OH})_2$, 3.075, 4.61, 1.50, 4.09; $\text{Co}(\text{OH})_2$, 3.195, 4.66, 1.46, 3.75; $\text{Mn}(\text{OH})_2$, 3.34, 4.68, 1.40, 3.26; $\text{Cd}(\text{OH})_2$, 3.475, 4.71, 1.355, 4.92; $\text{Ca}(\text{OH})_2$, 3.32, 4.93, 1.40, 2.30. The systems: $\text{Ni}(\text{OH})_2$ - $\text{Co}(\text{OH})_2$, $\text{Ca}(\text{OH})_2$ - $\text{Cd}(\text{OH})_2$, $\text{Cd}(\text{OH})_2$ - $\text{Ni}(\text{OH})_2$, $\text{Mg}(\text{OH})_2$ - $\text{Co}(\text{OH})_2$, $\text{Mg}(\text{OH})_2$ - $\text{Ni}(\text{OH})_2$, $\text{Cd}(\text{OH})_2$ - $\text{Mn}(\text{OH})_2$, $\text{Zn}(\text{OH})_2$ - $\text{Mg}(\text{OH})_2$, $\text{Zn}(\text{OH})_2$ - $\text{Ni}(\text{OH})_2$ and $\text{Zn}(\text{OH})_2$ - $\text{Co}(\text{OH})_2$ were examd. Not all pairs of hydroxides of the rhombohedral series are capable of forming solid solns. even though they have the same cryst. form and similar elementary cells. Simultaneous pptn. results in solid solns. only with hydroxides whose cations have atomic radii not too different. Thus $\text{Mg}(\text{OH})_2$ forms solid solns. with $\text{Co}(\text{OH})_2$, $\text{Ni}(\text{OH})_2$ and $\text{Mn}(\text{OH})_2$, but not with $\text{Cd}(\text{OH})_2$ or $\text{Ca}(\text{OH})_2$. It also forms solid solns. with $\text{Zn}(\text{OH})_2$; in fact though $\text{Zn}(\text{OH})_2$ is generally considered rhombic, it forms solid solns. with a rhombohedral structure by pptn. with $\text{Mg}(\text{OH})_2$, $\text{Ni}(\text{OH})_2$ and $\text{Co}(\text{OH})_2$. The soly. of $\text{Zn}(\text{OH})_2$ in $\text{Mg}(\text{OH})_2$, $\text{Ni}(\text{OH})_2$ and $\text{Co}(\text{OH})_2$ should not be attributed to a polymorphism of $\text{Zn}(\text{OH})_2$, which has not been proved exptly., but rather to the great similarity in the dimensions of the Zn ion and the ions of Mg, Ni and Co. As has been observed already in other types of compds., the chief (if not the only) cause of isomorphism in the hydroxide series lies in the dimensions of the isomorphous groups. The similarity in the dimensions of the Zn, Mg, Co, Ni and ferrous ions allows a miscibility in the solid state. In all cases of solid solns., there was a very great regularity in the variations of the lattice consts. and relative intensities of the lines of the x-ray photographs, and in no case was there observed the formation of solid solns. with regular distribution of atoms of the type assumed by Tammann. The axial ratios, the vol. of the elementary cell and the d were always intermediate between those of the components, and conformed to the calcd. values based on a linear function of the compn. The law of Vegard was thus followed. The following data are for solid solns. contg. 50% of the components, and give the values of a , c , c/a and d (in A. U.), resp.: $(\text{Mg}, \text{Co})(\text{OH})_2$, 3.15, 4.66, 1.48, 3.11; $(\text{Mg}, \text{Ni})(\text{OH})_2$, 3.09, 4.67, 1.51, 3.242; $(\text{Co}, \text{Ni})(\text{OH})_2$, 3.13, 4.63, 1.48, 3.92; $(\text{Ca}, \text{Cd})(\text{OH})_2$, 3.50, 4.83, 1.38, 3.57; $(\text{Mg}, \text{Cd})(\text{OH})_2$, 3.40, 4.655, 1.37, 4.28; and the following data the same consts. for solns. contg. 25-35% $\text{Zn}(\text{OH})_2$: $(\text{Zn}, \text{Mg})(\text{OH})_2$, 3.09, 4.76, 1.54, 2.98; $(\text{Zn}, \text{Ni})(\text{OH})_2$, 3.04, 4.62, 1.52, 4.268; $(\text{Zn}, \text{Co})(\text{OH})_2$, 3.15, 4.66, 1.48, 3.948. By assuming that solid solns. of $\text{Zn}(\text{OH})_2$ follow, as do the others, the law of Vegard, calens. show for a hypothetical rhombohedral modification of $\text{Zn}(\text{OH})_2$ an elementary cell with a dimension around 3.03 A. U. and an axial ratio around 1.60.

C. C. DAVIS

Importance of crystalline form in the formation of solid solutions. II. Thermal analysis of the system lithium chloride-cadmium chloride. A. FERRARI AND A. BARONI. *Atti accad. Lincei* 7, 1040-3(1928); cf. C. A. 23, 744. The chlorides of Mg, Li, Co, Ni⁺⁺, Fe⁺⁺, Mn⁺⁺ and Cd all form crystals whose structures are very similar and, therefore, might be expected to form double salts. The m. ps. of mixts. of LiCl and CdCl_2 were detd. and the equil. curves showed the existence of the compds. $3\text{CdCl}_2 \cdot 4\text{LiCl}$, m. 522° and $3\text{CdCl}_2 \cdot 2\text{LiCl}$, m. 516°.

% CdCl_2	M. p.	Mol. % CdCl_2	M. p.	Mol. % CdCl_2	M. p.
0%	603°	52.0%	506°	75.2%	516°
8.5	593	56.0	518	75.9	512
15.0	578	59.0	521	77.3	501
19.5	564	60.2	522	81.0	494
25.8	555	61.1	511	84.8	497
31.8	535	64.0	502	86.2	513
35.0	514	66.2	494	88.5	532
45.5	505	69.8	500	92.3	551
48.5	502	73.2	507	100.0	560

III. Thermal analysis of the systems: manganese chloride-cobalt chloride; cadmium chloride-cobalt chloride and magnesium chloride-cobalt chloride (anhydrous). A. FERRARI AND A. INGANNI. *Ibid* 8, 238-43(1928).—The equil. curves for the m. ps. of mixts. of MnCl_2 and CoCl_2 , of CdCl_2 and CoCl_2 and of MgCl_2 and CoCl_2 are shown. The curves are perfectly smooth with no max., min., or eutectic points, showing complete miscibility in the solid state for these systems. Thus complete miscibility with similarity of crystal form is shown. IV. The thermal analysis of the systems: magnesium chloride-iron chloride and cadmium chloride-iron chloride (anhydrous). *Ibid* 306-9.—The equil. curves here also are smooth, the m. ps. of all mixts. being

by H ions of an heterogeneous reaction like the hydrolysis of cotton cellulose in solns. of HCl, both alone and in the presence of KCl, NaCl or LiCl. With dil. acid solns. the ultimate product of the hydrolysis is hydroxycellulose, and under such conditions there is a linear relation between the rate of hydrolysis and the H-ion activity of the soln. In strongly acid solns., velocity measurements are untrustworthy, because of the tendency of the hydrocellulose to hydrolyze further. The linear relationship between H-ion activity and rate of hydrolysis does not hold in acid-salt solns. Over the range of concns. examd., the velocity of reaction is higher in a soln. contg. both acid and salt than in an acid soln. of the same H-ion activity but without the salt. It is suggested that the added salt lowers the activity coeff. of the "critical complex" [(cellulose) $\text{H}^+\cdot\text{H}_2\text{O}$].

ALBERT L. HENNE

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A. W. CONTIERI

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Heat of combustion and of solution of dihydroxyacetone. MARIA KOBEL AND WALTHER A. ROTH. Kaiser Wilhelm-Inst. für Biochemie, Berlin-Dahlem. *Biochem. Z.* 203, 159-63(1928).—Freshly prepd. dihydroxyacetone yields 343.1 kg. cal. per mol. upon complete oxidation. The heat of combustion of 2 mols. dihydroxyacetone is 12-16 kg. cal. greater than the molar combustion heat of known hexoses. The heat of soln. is 3.98 kg. cal. per mol. The temp. change during soln. indicates that the substance undergoes a transformation in the soln. which follows a monomol. course. S. MOROULIS

A thermal effect described by Q. Majorana. A. L. TH. MOESVELD. Univ. Utrecht. *Chem. Weekblad* 25, 702-3(1928).—The effect described by Majorana (C. A. 21, 851) of self-heating of metals after previous chilling is attributed here to establishment of equil. in a metastable system. The order of magnitude of the heat effect (12 cal. per day) is correct as expected for a slow transition. The explanation by air absorption (Schirmann, *Physik. Z.* 29, 676(1928)) is less probable. B. J. C. v. d. H.

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Autoxidation and anti-oxygen action. The catalytic properties of arsenic and its compounds. CHARLES MOUREU, CHARLES DUFRAISSE AND MARIUS BADOCHÉ. *Compt. rend.* 187, 917-21(1928).—The catalytic autoxidative properties of 22 substances were examd. A distinct anti-oxygen action with benzoic aldehyde is shown by As. With turpentine oxidation is first accelerated and then retarded. As_2O_3 retards the oxidation of Na_2SO_3 , and is an anti-oxygen in the case of furfurole, while its effect is not so marked with benzoic aldehyde. The org. oxygen compds. of As are in general more active than the inorg. compds., while the halogen compds. of As are more active than either. L. T. FAIRHALL

The system: Aluminum chloride-potassium chloride hydrochloric acid-water between 0° and 80° . G. MALQUORI. Reale Univ., Roma. *Gazz. chim. ital.* 58, 562-8 (1928).—The possibility of sepg. AlCl_3 and KCl from the soln. from the attack of leucite by the Blanc process (cf. C. A. 19, 1616) depends upon the variations of the soly. of the 2 salts with temp. and acidity. For this reason the polythermic diagram of the system AlCl_3 -KCl-HCl- H_2O was constructed for the temp. range of 0 - 80° . Most of the data essential to this have already been published (cf. C. A. 22, 529, 3852), the other necessary data being obtained by further expts. The isotherms show that the only solids in contact with satd. solns. under any of the conditions studied were KCl and $\text{AlCl}_3 \cdot 6\text{H}_2\text{O}$. With these data and the diagrams constructed from the various isotherms it was possible to establish the compn. of a soln.: $x\text{A} + y\text{B} + z\text{C} + \text{H}_2\text{O} \approx 100$, which is satd. with respect to C and having a const. ratio $(x\text{A})/(y\text{B})$, when it is assumed that the satn. curves for different contents of B are similar to those of the ternary system: A-C- H_2O . For the construction of the polythermic diagram, a triangular prism was used, the projection of which on the KCl- AlCl_3 face, and therefore on the vertical plane, is reproduced. The vertices of the triangular base of the prism indicate the 3 components of the solute, viz., KCl, AlCl_3 and HCl, while the altitude represents temps. In the interior of the prism are traced the isotherms for different temps. The superposition of the isotherms forms the surface, every point of which represents the relations of KCl, AlCl_3 and HCl for solns. satd. with respect to the 2 salts. To include the H_2O , the 2-dimensional method of Lodochnikov (cf. C. A. 20, 1939; 22, 2101) was utilized. The resulting diagram, with the surface of the satd. quaternary solns. of the 2 salts within, allows the detn. of the compn. of a soln. with any % HCl. C. C. DAVIS

Heat of combustion and of solution of dihydroxyacetone. MARIA KOBEL AND WALTHER A. ROTH. Kaiser Wilhelm-Inst. für Biochemie, Berlin-Dahlem. *Biochem. Z.* 203, 159-63(1928).—Freshly prepd. dihydroxyacetone yields 343.1 kg. cal. per mol. upon complete oxidation. The heat of combustion of 2 mols. dihydroxyacetone is 12-16 kg. cal. greater than the molar combustion heat of known hexoses. The heat of soln. is 398 kg. cal. per mol. The temp. change during soln. indicates that the substance undergoes a transformation in the soln. which follows a monomol. course. S. MORGULIS

A thermal effect described by Q. Majorana. A. L. TH. MOESVELD. Univ. Utrecht. *Chem. Weekblad* 25, 702-3(1928).—The effect described by Majorana (C. A. 21, 851) of self-heating of metals after previous chilling is attributed here to establishment of equil. in a metastable system. The order of magnitude of the heat effect (12 cal. per day) is correct as expected for a slow transition. The explanation by air absorption (Schirmann, *Physik. Z.* 29, 676(1928)) is less probable. B. J. C. v. d. H.

The determination of the heat of dilution of potassium chloride solutions at infinite dilution. E. LANGE AND P. A. LEIGHTON. *Z. Elektrochem.* **34**, 566-71(1928).—Improvements in the differential adiabatic calorimeter make possible measuring calorimeter temps. to 0.0000005°. The heats of diln. of KCl solns. were measured down to 0.0005 *M*. In very dil. solns. heats of diln. are proportional to ionic strength. The factor of proportionality agrees at 25° within exptl. error with that calcd. from Debye's equation. At 12° agreement is not so close. F. R. BICHOWSKY

Heat capacities in aqueous salt solutions. MERLE RANDALL AND FREDERICK D. ROSSINI. Univ. Cal. *J. Am. Chem. Soc.* **51**, 323-45(1929).—A calorimeter is described for measuring differentially the heat capacities of aq. salt solns. with a precision greater than 0.1 per 1000. Methods of calibrating and operating for direct and for differential heat-capacity measurements are also described. Methods of detg. and calcg. the apparent molal heat capacity of the solute, the partial molal heat capacities of the solute and solvent, and the sp. heat of the soln. are given. Data are reported for the nitrates, chlorides, bromides, iodides and sulfates of Na and K in aq. soln. from 1.0 or 2.5 *M* to infinite diln. A theoretical equation based on the Debye-Hückel theory is derived for the molal heat capacities of the solute which agrees well with the exptl. data. The partial molal heat capacity of an ion depends upon its charge, size and configuration. The partial molal heat capacities of ions are shown to be additive at infinite diln. The bearing of the data upon the hydration of ions and on the temp. coeff. of the heat of soln. of a strong electrolyte in a large amt. of H₂O is discussed. J. H. PERRY

The metastability of elements and compounds as a consequence of enantiotropy and monotropy. XII. Heats of solution. I. ERNST COHEN AND J. KOOP. *Z. physik. Chem., Abt. A*, **139**, 273-350(1928); cf. *C. A.* **23**, 555.—The literature indicates that the heat of soln. of some salts depends on their thermal history. Cohen and Koop confirm this and explain it on the basis of the formation of metastable mixts. of allotropic forms. An adiabatic elec. calorimeter of the type described by Cohen (*C. A.* **19**, 1509) was used. The following observations are reported: (a) K_2SO_4 occurs in two modifications. The heat of soln. at 20.0° of $\alpha K_2SO_4 \rightarrow K_2SO_4 \cdot 400H_2O$ is -6284 ± 4 cal. If the salt has been heated above the transition point the heat of soln. deviates from the above value, the amt. of deviation depending upon the rate of cooling. K_2SO_4 which has been melted and gives a neutral reaction shows this deviation. If the salt has an alk. reaction after melting a large deviation due to the influence of alkali on the change αK_2SO_4 to βK_2SO_4 appears. On standing, spontaneous change to the stable form occurs. (b) KNO_3 shows enantiotropy. The heat of soln. at 20.0° for the stable $\alpha KNO_3 \rightarrow KNO_3 \cdot 200H_2O$ is -8336 ± 2 cal. At 20.5° the heat effect for $\alpha KNO_3 \rightarrow KNO_3 \cdot 350H_2O$ is -8426 ± 2 cal. If the salt is heated above its transition point a deviation in the heat effect appears which vanishes on standing. (c) Tl_2SO_4 has been reported previously only in the rhombic modification. The heat of soln. for $Tl_2SO_4 \rightarrow Tl_2SO_4 \cdot 300H_2O$ at 20.0° is -7940 ± 60 cal. When crystd. in the cold from water or pyridine-water mixts, when melted and quenched or when melted and cooled slowly, the salt has the same heat of soln. as when crystd. from water and heated to 170°. If the water soln. is pptd. with MeOH or EtOH the product shows a deviation. On heating to 160° this deviation disappears. (d) $KCl \rightarrow KCl \cdot 200H_2O$ shows the following heat effects: at 20.0° -4373 ± 2 cal.; at 25° -4191 ± 2 cal. These values are independent of the thermal history. (e) For $NaCl \rightarrow NaCl \cdot 100H_2O$ they found at 20.0° a value of -1100 ± 4 cal. and at 25.0° -965 ± 2 cal. No deviations due to thermal history were observed. J. B. AUSTIN

Influence of x-rays on the structure of bismuth and tellurium. III. E. ADINOLFI. *Atti accad. Lincei* **8**, 381-8(1928); cf. *C. A.* **19**, 3216. —The sp. heat of Bi and Te is increased 5.2% and 4.8%, resp., by chilling the fused metals. By exposing these metals to x-rays the sp. heats are increased 11% for Bi, and 14% for Te, indicating that changes in crystal structure have occurred in both cases. A. W. CONTIERI

The heats of formation of the double chlorides of cadmium and potassium. AGOSTINI. *Atti accad. Lincei* **8**, 393-4(1928).—The heats of formation of the two known double salts $KCl \cdot CdCl_2$ (m. = 431°); and $4KCl \cdot CdCl_2$ (m. = 461°) were measured. $KCl \cdot CdCl_2$: the reaction $KCl \cdot CdCl_2 + 2KOH$ aq. = $3KCl$ aq. + $Cd(OH)_2 \downarrow + Q$ where Q = sum of heat of dissocn. of the double salt + heat of pptn. of a mol. of $Cd(OH)_2$. Subtracting these two values $(+2.01) - (+5.66) = -3.65$, or $+3.65$ as the desired heat of formation. $4KCl \cdot CdCl_2$: The heat of pptn. gave $Q = +4.67$ so that heat of pptn. is $+4.67 - 5.66 = -0.99$ or heat of formation = $+0.99$, which agrees with the fact that this is a very unstable salt. A. W. CONTIERI

Heats of formation of the double chlorides of copper and potassium. P. AGOSTINI. *Atti accad. Lincei* 7, 1030-2(1928).—As the salts $\text{CuCl}_2 \cdot 2\text{KCl}$ and $\text{CuCl}_2 \cdot \text{KCl}$ on soln. dissociate into the component salts, the heats of formations are measured by the heat of soln. minus the heats of soln. of KCl and CuCl_2 . $\text{K}_2\text{CuCl}_4 = 2\text{KCl} + \text{CuCl}_2 + -4.09 \text{ cal.}$ and $\text{KCuCl}_3 = \text{KCl} + \text{CuCl}_2 - 4.59$, the heats of formation are therefore, +4.09 and +4.59 cal.

A. W. CONTIERI

Heats of formation and hydration of the double salts of cobalt and potassium and of copper and sodium. F. DE CARLI. *Atti accad. Lincei* 7, 1033-6(1928).—The heat of formation of $\text{K}_2\text{CO}_3 \cdot \text{CoCO}_3$ was detd. from the reaction $\text{K}_2\text{CO}_3 \cdot \text{CoCO}_3 + 4\text{HCl aq.} = 2\text{KCl aq.} + \text{CoCl}_2 \text{ aq.} + 2\text{CO}_2 + 2\text{H}_2\text{O}$. 460.17 is the heat of formation of the component salts + heat of combination $\text{K}_2\text{CO}_3 \text{ soln.} + \text{CoCO}_3 \text{ ppt.}$; so that the heat of addition = +5.76 cal. and the heat of hydration = +11.37 cal. Similarly the heat of formation of the double salt $\text{Na}_2\text{CO}_3 \cdot \text{CuCO}_3 = +10.33 \text{ cal.}$, and its heat of hydration ($3\text{H}_2\text{O}$) = +9.296 cal.

A. W. CONTIERI

Oxide cells of cadmium, copper, tin and lead. CHARLES G. MAIER. Bureau of Mines. *J. Am. Chem. Soc.* 51, 194-207(1929).—Oxide electrodes of Cd , Cu^I , Cu^{II} , Sn^{II} , Sn^{IV} and Pb^{IV} were compared to the H or HgO electrode in solns. of Ba(OH)_2 . Free energies of formation and heats of formation calcd. from the results are summarized in the following table.

Substance	ΔF°_{298} of formation (cal)	ΔH_{298} of formation from cell coeff.
CdO	-55,064 \pm 500	-62,305 \pm 500
Cd(OH)_2	-112,178 \pm 500	-131,850 \pm 500
Cu_2O	-34,672 \pm 200	-38,400 \pm 2000
CuO	-30,800 \pm 200	-38,652 \pm 1000
SnO	-61,332 \pm 300	-80,000 \pm 15000
SnO_2	-123,200 \pm 400	

E. R. SMITH

Perkin Medal award—The many-sidedness of glass (SULLIVAN) 19. Compounds of hexamethylenetetramine with certain salts of Ag and other metals and the influence of anionic volume on the capacity for association by the central positive atom (RAY, DAS-GUPTA) 6. Theory of the valence octet in the torulus atom (RADULESCU) 3. Permeability of membranes. VI. Mensuration of the dried collodion membrane. (Calculation of dimensions and of relations to certain biological membranes.) (WEECH, MICHAELIS) 11A.

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3—SUBATOMIC PHENOMENA AND RADIOCHEMISTRY

S. C. LIND

Address of the President (High-frequency radiation). ERNEST RUTHERFORD. *Proc. Roy. Soc. (London)* B104, 97-119(1929).—Recent developments in the production and study of high-frequency radiations of the x-ray type are discussed.

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GEORGE GLOCKLER

Rutherford satellite theory. G. SENTILE. *Atti accad. Lincei* [vi], 7, 346-9 (1928).—Arguments are advanced to show that nuclear systems discussed in Rutherford's theory are unstable and that the theory is therefore invalidated.

B. C. A.

Quantum theory of the nucleus. M. v. LAUR. *Z. Physik* 52, 726-34(1928).—The theory of radioactivity of the nucleus proposed by Gamov (*Ibid.* 51, 204(1928)) is discussed and certain mathematical steps in the derivation are corrected. A phys. significance is assigned to the two const. of the Geiger-Nuttall relation.

G. G.

Quantum theory of nuclear disintegration. G. GAMOV. Inst. for Theoretical Physics, Copenhagen. *Nature* 122, 805-6(1928).—In the nuclear model adopted, the region of inverse-sq.-law forces extends from without inwards to a crit. distance r_0 , which is appreciably less than the classical value for the closest approach of α -particles at which inverse-sq. scattering at large angles is still observed. Within r_0 the attractive forces vary very rapidly with distance. While the potential barrier at r_0 would maintain a classical α -particle for an infinite time within the nucleus, it cannot prevent the gradual leaking out of waves which represent the escape of α -particles on the wave theory. The theory gives the Geiger-Nuttall relation between the decay const. and the velocity of the α -particle. The same model allows the calcn. of the upper limit of the probability of nuclear disintegration by α -particles, on the assumption that disintegration takes place only if the α -particle penetrates within the potential barrier. The curves representing the probability of such penetrations plotting no. particles against the atom. no. of the element bombarded fall steeply to zero with large atomic nos. and are in satisfactory agreement with Rutherford's observation of no disintegration of atoms heavier than P, but at variance with the observations of Pettersson and Kirsch.

W. WEST

The application of Geiger's point counter in experiments on atom disintegration. NORBERT KREIDL. Inst. f. Radiumforschung, Wien. *Sitzb. Akad. Wiss. Wien, Abt. IIA*, 136, 589-602(1927).—The Greinacher method was used (*C. A.* 20, 2116) with acoustic or visual observation of the impacts. For measuring chamber the usual cylindrical one (2 cm. diam.) brass tube was used with the tip on one end and a brass shield at the other end, 1200 to 1900 v. being used. As the action of the point was limited to a radius of 3 mm. around it, efforts were made to use a knife edge instead of a point, no satisfactory results were obtained. Difficulties in differentiation of α - and β - (also γ - and H-) rays were experienced. Other methods, retrograde observation, etc., were tried out. On Po radiation the method gave too high results owing to Ra E radiation. It is concluded that a counting chamber without point is preferable for this type of work.

B. J. C. VAN DER HORVEN

Radium in rocks. I. Radium content of some representative granites of the eastern seaboard of the United States. CHARLES S. PIGGOT. Carnegie Inst., Washington. *Am. J. Sci.* 17, 13-34(1929).—A weighed amt. of pulverized rock was decomd. in a stream of pure dry CO_2 gas by fusion with mixed Na and K carbonates. The gases were scrubbed by an aq. soln. of 1 NaOH:3.5 aq., passed over stick NaOH and collected over Hg. Rn was detd. by an emanation electroscope. The granites examined and their respective Ra contents were (all $\times 10^{-12}$ g. per g. rock), Stone Mountain, Georgia (muscovite), 4.826; Mt. Airy, N. C. (biotite), 0.655; Woodstock, Md. (biotite diorite, with epidote), 1.448; Milford, Mass. (pink mottled biotite), 0.378; Rockport, Mass. (hornblende biotite), 0.955; Hurricane Island, Maine (biotite), 3.74. The analyses for these rocks are given. The Ra content is considered to be associated with minerals of high sp. gr. and particularly with the interstices between and the surfaces of grains. Part of the radioactivity can be extd. by hot water.

S. L. B. E.

Analysis of a radioactive pyromorphite from Gennammari (Sardinia). P. MISCIATELLI. *Atti accad. Lincei* 7, 929-32(1928).—A radioactive pyromorphite having the compn PbO 80.243, P_2O_5 14.640, Cl 2.4, As_2O_3 trace, SiO_2 1.06%, Sn and Sb traces, as well as traces of rare earths, was found to deflect an electroscope equiv. to the de-

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Valence electrons of silver. J. M. ADAMS. *Z. Physik* 52, 882(1928).—Referring to Rosenfeld and Witmer on photoelec. work function (*C. A.* 22, 3577), A. points out that Ag may be thought of as having 3 valence electrons per atom since compds. of trivalent Ag are known.

Stability of silver nucleus. J. KAPLAN. *Z. Physik* 52, 883(1928); cf. preceding abstract.—The 10 4d electrons of Ag must form a group of great stability, since Ag is usually univalent and its spectra are alkali-like. However, its crystal lattice must have 3 free electrons and hence the 4d shell has not the stability of the rare-gas shells.

Rutherford satellite theory. G. SENTILE. *Atti accad. Lincei* [vi], 7, 346-9 (1928).—Arguments are advanced to show that nuclear systems discussed in Rutherford's theory are unstable and that the theory is therefore invalidated.

Quantum theory of the nucleus. M. v. LAUE. *Z. Physik* 52, 726-34(1928).—The theory of radioactivity of the nucleus proposed by Gamov (*Ibid.* 51, 204(1928)) is discussed and certain mathematical steps in the derivation are corrected. A phys. significance is assigned to the two consts. of the Geiger-Nuttall relation.

Quantum theory of nuclear disintegration. G. GAMOV. *Inst. for Theoretical Physics, Copenhagen. Nature* 122, 805-6(1928).—In the nuclear model adopted, the region of inverse-sq.-law forces extends from without inwards to a crit. distance r_0 , which is appreciably less than the classical value for the closest approach of α -particles at which inverse-sq. scattering at large angles is still observed. Within r_0 the attractive forces vary very rapidly with distance. While the potential barrier at r_0 would maintain a classical α -particle for an infinite time within the nucleus, it cannot prevent the gradual leaking out of waves which represent the escape of α -particles on the wave theory. The theory gives the Geiger-Nuttall relation between the decay const. and the velocity of the α -particle. The same model allows the calcn. of the upper limit of the probability of nuclear disintegration by α -particles, on the assumption that disintegration takes place only if the α -particle penetrates within the potential barrier. The curves representing the probability of such penetrations plotting no. particles against the atom. no. of the element bombarded fall steeply to zero with large atomic nos. and are in satisfactory agreement with Rutherford's observation of no disintegration of atoms heavier than P, but at variance with the observations of Pettersson and Kirch.

The application of Geiger's point counter in experiments on atom disintegration. NORBERT KREIDL. *Inst. f. Radiumforschung, Wien. Sitzb. Akad. Wiss. Wien, Abt. II A.* 136, 589-602(1927).—The Greinacher method was used (*C. A.* 20, 2116) with acoustic or visual observation of the impacts. For measuring chamber the usual cylindrical one (2 cm. diam.) brass tube was used with the tip on one end and a brass shield at the other end, 1200 to 1900 v. being used. As the action of the point was limited to a radius of 3 mm. around it, efforts were made to use a knife edge instead of a point; no satisfactory results were obtained. Difficulties in differentiation of α - and β (also γ - and H-) rays were experienced. Other methods, retrograde observation, etc., were tried out. On Po radiation the method gave too high results owing to Ra E radiation. It is concluded that a counting chamber without point is preferable for this type of work.

Radium in rocks. I. Radium content of some representative granites of the eastern seaboard of the United States. CHARLES S. PIGGOT. *Carnegie Inst., Washington. Am. J. Sci.* 17, 13-34(1929).—A weighed amt. of pulverized rock was decompd. in a stream of pure dry CO_2 gas by fusion with mixed Na and K carbonates. The gases were scrubbed by an aq. soln. of 1 NaOH:3.5 aq., passed over stick NaOH and collected over Hg. Rn was detd. by an emanation electroscope. The granites examined and their respective Ra contents were (all $\times 10^{-12}$ g. per g. rock), Stone Mountain, Georgia (muscovite), 4.826; Mt. Airy, N. C. (biotite), 0.655; Woodstock, Md. (biotite diorite, with epidote), 1.448; Milford, Mass. (pink mottled biotite), 0.378; Rockport, Mass. (hornblende biotite), 0.955; Hurricane Island, Maine (biotite), 3.74. The analyses for these rocks are given. The Ra content is considered to be associated with minerals of high sp. gr. and particularly with the interstices between and the surfaces of grains. Part of the radioactivity can be extd. by hot water.

Analysis of a radioactive pyromorphite from Gennammari (Sardinia). P. MISCIANTILLI. *Atti accad. Lincei* 7, 929-32(1928).—A radioactive pyromorphite having the compn. PbO 80.243, P_2O_5 14.640, Cl 2.4, As_2O_3 trace, SiO_2 1.06%, Sn and Sb traces, as well as traces of rare earths, was found to deflect an electroscope equiv. to the de-

flexion of 0.0028 g. U oxide. However, U was not found present, nor was Th. The activity must be derived from traces of Ra present in radioactive waters in the vicinity. A similar incident was first noted by Danne in 1905 (*Compt. rend.* 140, 241(1905)).

A. W. CONTIERI

The long-range α -particles of radium C. K. PHILIPP AND K. DONAT. *Z. Physik* 52, 759-66(1928); cf. *C. A.* 20, 3380.—The former app. is improved by taking stereoscopic pictures of the Wilson cloud chamber tracks with an ordinary motion-picture film. In 3000 pictures there are formed 221 long-range tracks. These fall into two groups of 9- and 11-cm. range. A very few α -particles of even longer range were observed. Out of 10^6 normal α -particles there are 29 of range 9.2 cm., 4 of range 11 cm. and 0.5 of even greater range.

GEORGE GLOCKLER

Ionization curve of α -rays from polonium in pure oxygen. TADASHI ONODA. *J. phys. radium* 9, 185-6(1928).—O was prepd. by electrolyzing NaOH soln. between Ni electrodes and purified by passing over red-hot Pd, through concd. H_2SO_4 and over $CaCl_2$ and P_2O_5 . Po was deposited upon a plate of Ni from a soln. of Po slightly acid with HCl. The ionization curve for air corresponded to the one measured by Mme. Curie. The ionization curve for O is given. Tracing a tangent from the point of inflection in the terminal portion of the curve which has a steep slope to the intersection with the abscissa gives a range of 3.63 ± 0.01 cm. at 15° 160 mm. and 3.49 ± 0.01 cm. at 0° 760 mm. From the ionization curve for air, the range is found to be 3.87 ± 0.01 cm. at 15° 760 mm. The stopping power for O is $3.87 \div 3.63 = 1.066 \pm 0.01$. This accords with the value of Gibson and Eyring.

FRANK MARESH

The β -ray spectrum of radiothorium. L. MEITNER. *Z. Physik* 52, 637-44 (1928).—The β -ray spectrum of Rd-Th taken in a magnetic field shows six lines. Four of these come from the L and M levels and are produced by two γ -rays whose energies exactly correspond to the energies of the α lines of the reaction product. This would mean that the α -particles of Rd-Th excite the K radiation of the decompn. product. The difficulties of such a view are discussed.

GEORGE GLOCKLER

New method for the determination of the direction of γ -rays. WERNER KOLHÖRSTER. *Naturwissenschaften* 16, 1044-5(1928).—Two Geiger counters register occasional simultaneous current impulses due to effects from the same secondary electron. In hard γ -radiation the secondary electrons will follow the directions of the γ -ray and by counting of the no. of coincidences in the 2 Geiger instruments locating them in various relative spatial directions, the direction of the γ -ray can be found. For 10 cm. Pb armor 3 times as many coincidences were found in the vertical as in the horizontal direction, in consequence of cosmic radiation. B. J. C. VAN DER HOEVEN

New method for absorption measurements of secondary β -rays. W. BOTHE AND W. KOLHÖRSTER. *Phys. tech. Reichsanstalt, Berlin-Charlottenburg. Naturwissenschaften* 16, 1045(1928).—Placing an absorbing screen between 2 Geiger counters (preceding abstract) gives a method for detn. of the absorption curve and range of the electrons. Even with 1 cm. Pb in between, coincidences were still observed in the records of the instruments. The electrons causing this effect are attributed to cosmic radiation.

B. J. C. VAN DER HOEVEN

The γ -ray spectrum of radiothorium in emission. L. MEITNER. *Z. Physik* 52, 645-9(1928).—Thibaud (*C. A.* 20, 1943-4) has found two γ -rays for Rd-Th at 145 and 168 X. U. The second line could not be observed indirectly by studying the β -ray spectrum of Rd-Th. A repetition of the measurement on Rd-Th with and without the decompn. products shows that the line at 168 X. U. is really double and belongs to Th B.

GEORGE GLOCKLER

γ -Radiation and evolution of heat of radium and mesothorium. D. K. YOVANOVITCH. *J. phys. radium* [6], 9, 297-306(1928).—A calorimetric method for the evaluation of the amount of Ms-Th contained in Ra salts is offered. The method is based on measuring the heat given off in the formation of Rd-Th. A microcalorimeter is used.

L. D. ROBERTS

Theory of scattering of electrons and impact probability. J. HOLTSMARK. *Z. Physik* 52, 485-95(1928); cf. *C. A.* 22, 2710.—Mathematical. GEORGE GLOCKLER

The reason why an elementary quantum of electricity cannot break up into smaller charges. WILHELM ANDERSON. *Ann. Physik* 87, 536-42(1928).—If an electron or proton exploded into infinitesimal particles the resultant gas must be fully degenerate, and according to the Fermi statistics must have infinite energy, which is impossible. If the elementary charges are supposed to be spheres of space-distributed charge, Fermi statistics show that there must be a min. charge that can explode. This min. depends on the spread of the charge, and is of the order of the charge of an electron or proton.

F. R. BICHOWSKY

Liberation of electrons from metal surfaces by slow positive ions. O. KLEMPERER. *Z. Physik* 52, 650-3(1928).—The probability of liberation of an electron from a metal surface by means of a positive ion is calcd. in two different ways: (1) from measurements of current-potential relations by Townsend and (2) from the min. sparking and ionization potential for electrons in gases. The two methods of calcn. check.

GEORGE GLOCKLER

Oscillating discharges in hydrogen. Z. BAY AND W. STEINER. Univ. Berlin. *Z. Elektrochem.* 34, 657-62(1928); cf. *C. A.* 23, 1052.—The continuous H spectrum is always obtained by oscillating discharges through thoroughly dry gas in well-dried electrodeless quartz tubes. This spectrum is to be attributed to H, not to impurities. Several types of tubes have been constructed. They are specially suitable for high c. d., they give a very intense continuous H spectrum, and they are good sources of high absorption measurements between 3300 and 1900 Å. U. ALBERT L. HENNE

The electric charging effect of glass by cathode rays. Its practical application. P. SELENYI. Lab. "Tungsram," Budapest-Ujpest. *Z. tech. Physik* 9, 451-4(1928).—In an electron tube of high vacuum with perforated plate (acting as grid element) and circular Mg anode (10 to 12 kv.) on the side wall the cathode rays reaching the back wall leave traces which can be "developed" on the outside of the tube by dusting with S powder. The effects of magnet coils with alternating field can thus be made visible, a single exposure suffices, i. e., for 1 μ amp. intensity of the (focused) radiation the writing velocity is 3000 cm. per sec., corresponding to 1 e. s. u. per cm. The curves obtained shown from photographs are quite sharp. Under special conditions peculiar light and shadow effects appeared on the irradiated glass, depending on the cond. of the latter.

B. J. C. VAN DER HOEVEN

Abnormal "g" values in the spectrum of ionized argon (A II). C. J. BAKKER. Lab. "Physica," Univ. Amsterdam. *Verslag Akad. Wetenschappen Amsterdam* 37, 835-9(1928).—Calcn. on the basis of the coupling scheme of Russell and Saunders (*C. A.* 19, 1661) of g values for the A II spectrum. Four different classifications are developed and compared with observed values for terms between 4p and 5s; none of them is exactly correct.

B. J. C. VAN DER HOEVEN

The Zeeman effect in the spectrum of ionized neon (Ne II). C. J. BAKKER. Univ. Amsterdam. *Verslag Akad. Wetenschappen Amsterdam* 37, 890-7(1928).—The expl. app. was that of previous work on A (cf. preceding abstract); Ne pressure was 2 to 3 cm.; field 41,400 gauss max. The g values (Landé) of terms from the 3s and 3p electrons were specially detd.; the results are given in tables. For the 3s electrons all normal g values were found. For 3p two anomalous ones (3p²S, and 3p²P) occurred. The sum rule was confirmed.

B. J. C. VAN DER HOEVEN

Note on the communication: The Zeeman effect of the spectrum of ionized argon (A II). C. J. BAKKER, T. L. DE BRUIN AND P. ZEEMAN. Univ. Amsterdam. *Verslag Akad. Wetenschappen Amsterdam* 37, 840-1; *Proc. Acad. Sci. Amsterdam* 31, 780-99 (1928); cf. *C. A.* 22, 2326.—Owing to a slight error in the visual observation of the multiplets of the Zeeman effect several values are now given from improved photometric measurements. They agree better with the theory.

B. J. C. VAN DER HOEVEN

A predecessor of the quantum theory. M. FAERBER. *Naturwissenschaften* 16, 1045(1928).—A historical note on Fechner.

B. J. C. VAN DER HOEVEN

Structure of the spectrum of ionized Argon (A II). T. L. DE BRUIN. *Proc. Acad. Sci. Amsterdam* 31, 771-9(1928).—See *C. A.* 22, 4371.

E. H.

The spectra of ionized neon (Ne II) and ionized argon (Ar II). (Second communication.) T. L. DE BRUIN. *Proc. Acad. Sci. Amsterdam* 31, 593-602(1928).—See *C. A.* 22, 2326.

E. H.

Electrical polarization in insulators produced by acceleration. E. BRODY. *Z. Physik* 52, 884-9(1928).—The possibly induced elec. moment in crystals produced by a gravitational or rotational field is calcd. The magnitude of the effect depends on the relative masses of anion and cation.

GEORGE GLOCKLER

Diffraction of cathode rays by mica. III. SEISHI KIKUCHI. Inst. Phys. Chem. Research. *Proc. Imp. Acad. (Japan)* 4, 354-6(1928); cf. *C. A.* 22, 4052.—A further discussion and description of the black and white lines, previously mentioned, is given. IV. *Ibid* 471-4.—By using monochromatic rays, the previous view is confirmed that the net-like pattern may be due to the diffraction by a 2-dimensional lattice, of which scattering centers are arranged in an equilateral triangular net work. The origin of the sets of concentric rings and pairs of black and white lines is also confirmed.

C. J. WEST

The role of conductivity electrons in ferromagnetism. J. DORFMAN AND R. JAANUS. Phys. tech. Lab., Leningrad-Soosnovska. *Naturwissenschaften* 16, 1026(1928).—From

the magnetomechanic behavior of ferromagnetic substances it is probable that the "spin" moment, not the orbital moment of the electrons, causes ferromagnetism. The authors endeavor to decide whether it is due to the free cond. electrons or to the electrons bound in the pos. metal ion. At the Curie point the heat motion of the elementary magnets destroys the ferromagnetism; at the same point therefore the sp. heat of the elementary magnets will show a discontinuous change, which had already been demonstrated calorimetrically. Considering the metal as a mixt. of ions and electrons it remains uncertain, however, to which one this change is due. A decision is possible by means of W. Thomson's thermodynamic theory for the thermoelec. effect: $eT(d^2E/dT^2) = \sigma_A - \sigma_B$, in which σ is sp. heat of the cond. electron (per electron) in metal A and B . By using for A and B Ni and Cu or Pt, resp., a ferromagnetic and a nonferromagnetic metal, the value of $T(d^2E/dT^2)$ was measured between 220° and 460° (Curie point at 360°). Actually a jump in σ_A was observed identical in magnitude and direction with the calorimetrically detd. jump for Ni (per atom). It means that for Ni the free electrons, equal in no. to the atoms, cause ferromagnetism. Preliminary data show that for Fe and Co the same conclusion holds.

The magnetic moment of the lithium atom. J. B. TAYLOR. *Z. Physik* 52, 846-52 (1928).—If it is assumed that the magnetic moment of the Li nucleus can only assume a parallel or an antiparallel position in the field, then the expts. show that the magnetic moment of the Li nucleus is less than $1/3$ Bohr magneton. The method of Stern and Gerlach was used.

Zeeman effect and term order in single ionized chromium. E. KRÖMER. *Z. Physik* 52, 531-48 (1928).—The Zeeman effect of 50 Cr^+ lines is studied and the magnetic fine structure factors are detd. The term system so found agrees with theory. The electron configuration for each term-multiplet is detd.

The influence of hydrogen on the photoelectric emission of potassium. R. SUHRMANN AND HANS THEISSING. Univ. Breslau. *Z. Physik* 52, 453-63 (1928).—Purified, dried mol. H_2 has no influence upon the photoelec. emission of a solid K surface. However, a monomol. layer of K on a spongy Pt surface has its emission considerably reduced when satd. with mol. H_2 . An elec. discharge has an enormous influence upon the photoemission of K.

The properties of Fournier photoelectric cells. R. DUBOIS. *J. phys. radium* [6] 9, 310-36 (1928).—These cells consist of a very thin deposit of metallic sulfides whose resistance varies with illumination. Their properties differ from Se cells, with sensibility extending into the visible and infra-red, $\lambda = 0.5\mu$ to $\lambda = 1.3\mu$. Their properties are very complex.

Recommended equipment of a modern x-ray laboratory for the study of structures of materials. GEORGE I. CLARK. Univ. of Illinois. *Ind. Eng. Chem.* 20, 1386-90 (1928).—A detailed description is given of the various types of complete x-ray app. such as may be employed advantageously in the study of fine structures of materials by the diffraction method. The equipment is essentially that installed in the new x-ray lab. at the Univ. of Illinois. The more important improvements are special cassettes for the pinhole and oscillation methods to be used with the multiple-diffraction app.; the design and set-up of gas-type, copper-target tubes with the power plant to operate these; a fine leak to regulate air pressure in these tubes; details of manipulation based upon experience; the applicability of various methods to certain types of problems; reproductions of typical diffraction patterns obtained in the study of industrial materials and processes; enumeration of useful auxiliary equipment for a laboratory of this type. In general, an effort is made to give an est. of the present status of the problem of the most dependable and economical installation of x-ray app.

The determination of chemical composition by means of x-rays. P. GÜNTHER. Berlin. *Z. Metallkunde* 20, 394-9 (1928).—The explanation of the origin of the different lines in the x-ray emission and absorption spectra is presented at some length in terms of the Rutherford-Bohr atom. The identification of an element can be made by means of x-ray spectra with relative simplicity because of the relatively few lines compared with optical spectra and because of the simple relationship connecting the wave lengths with at. no. For the quant. detn. of constituents a method depending on adsorption is preferable. This does not require that the material investigated be placed inside the x-ray tube. The absorption edges are characteristic of the elements with only very little change as the result of chemical combination. In favorable cases the process based on measurement of the absorption edges has been developed to a precision and sensitivity comparable to that of chem. analysis. So many factors influence the intensity of the different lines of the emission spectra that quantitatively it is not usable

except in very special cases where calibrations can be made; but recently published work by Glocker (cf. *C. A.* 22, 2880) has demonstrated the possibility of a quant. method making use of secondary radiation. This has the manipulative advantage again that the material does not have to be on the inside of the x-ray tube.

A. W. KENNEY

Applying of Röntgen rays to the investigation of materials. B. LÁNYI. *Technika* (Budapest) 9, 247-51(1928).—A short description of the new Röntgen app. of the Electrochem. Inst. of the Univ. for Technical Sciences at Budapest, Hungary. The investigations of materials which can be made with the app. are briefly summarized.

Š. S. DE FINÁLY

Total reflection of x-rays. V. E. LASHKAREV AND S. D. HERTZRÜCKEN. *Kiew. Z. Physik* 52, 739-42(1928).—A simple total reflectometer for x-rays is described.

GEORGE GLOCKLER

K radiation of the light elements (beryllium to aluminum). M. SODERMAN. *Z. Physik* 52, 795-808(1928).—The wave lengths of the K series of the elements from Be to Al were measured by means of an optical grating of 220 lines per mm.

GEORGE GLOCKLER

X-rays produced by α -rays. W. BOTHE AND H. FRÄNZ. *Z. Physik* 52, 466-84(1928); cf. *C. A.* 22, 1902.—The K, L and M lines of the x-ray spectrum of various elements were excited by means of α -rays from Po. The general radiation is very small in intensity. An attempt is made to det. the ionization function. G. G.

Relation of multiple terms and series limits. F. HUND. *Z. Physik* 52, 601-9(1928).—Theoretical discussion of assignment and designation of terms in band spectra.

GEORGE GLOCKLER

Spectrographic investigation of spark discharge. UKITIRŌ NAKAYA AND YOSHIO FUJIOKA. Inst. Phys. Chem. Research, Tokyo. *Proc. Imp. Acad. (Japan)* 4, 464-6(1928). Photographs are given of the spectrum of a "three-part" spark and of a flame like violet spark. In the former there are 3 distinct zones, corresponding to the positive, middle and negative parts of the spark. The "short" spark with "splitted" structure resembles the middle part of the 3-part spark. The broken-line spark, obtained by attaching a needle to the negative electrode has a stronger elec. field in the positive than in the negative part. The flame-like spark spectrum consists of well-developed positive band systems of N. C. J. WEST

Time lag in the emission of spectral lines excited in vacuum. HANTARO NAGAOKA AND TETSUGORO FUTAGAMI. Inst. Phys. Chem. Research, Tokyo. *Proc. Imp. Acad. (Japan)* 4, 361-3(1928).—Photograms taken in vacuum by applying a strong magnetic field revealed an easy means of distinguishing arc and spark lines. The discharge took place when the vacuum reached a state of producing green fluorescence. During the initial phase of the discharge, the gases remaining in the cylinder give rise to emission of arc lines. Many spark lines are emitted but the arc lines do not appear at the initial moment. It takes a half oscillation (about 10^{-8} sec.) or more before the lines appear; they go on increasing in intensity, reach a max. and gradually fade away. An explanation is offered. C. J. WEST

The polarization of light from hydrogen canal rays. ANTON WEIGL. Univ. Prag. *Naturwissenschaften* 16, 1042(1928).—The polarization of H canal-ray light in an elec. field with lines of force perpendicular to the canal ray is such that the degree of polarization decreases with increasing field down to zero; further increase of the field gives a linear polarization in the field direction which approaches a satn. value. For a 45° angle between field and canal ray the linear polarization becomes elliptical, for a 600 v. per 3 cm. field, almost circular. The observations were visual by interference polariscope; pressure 0.1 mm. Hg. The results are in agreement with Hanle's theory (*C. A.* 20, 2117). B. J. C. VAN DER HOEVEN

Polarization of radiation in helium and neon. K. STEINER. *Z. Physik* 52, 516-30(1928). The degree of polarization of radiation produced by a 50-v. electron beam from a hot cathode is studied. GEORGE GLOCKLER

Depolarization of secondary radiations in the complex light resulting from the molecular diffusion of a monochromatic radiation. JEAN CABANNES. *Compt. rend.* 187, 651-6(1928).—Depolarization measurements on the mol. diffusion of C_6H_6 and Et_2O lead to the conclusion that: If a liquid is radiated with different radiations N, N', \dots , all the secondary rays $N - n_1, N' - n_1, \dots$, relative to the same diminution of frequency, have the same depolarization, which varies widely according to the diminution of frequency considered and may be less (or more) than the depolarization of radiations diffused without change in wave length. The results are discussed and explained in terms of Raman's (*C. A.* 22, 1079; 23, 37) recent discoveries. A. T. F.

Intercombination and new terms in the spark spectrum of sulfur (S II). LÉON AND EUGÈNE BLOCH. *Compt. rend.* 188, 160-2(1929).—Intersystem combinations in the spectrum of S II are given which link together the systems of doublet and quartet terms already established. Combinations between the new terms and those already known are also given. C. C. KIESS

The absorption spectra of oxygen and ozone in the ultra-violet. J. DUFAY. *Compt. rend.* 188, 162-4(1929).—A table is presented in which the wave lengths of the ultra-violet absorption bands of liquid O and gaseous O under high pressure are compared with those ascribed to ozone. The agreement between the 2 appears to be more than accidental. This is supported by the fact that in the ultra-violet beyond 2400 Å. U. the absorption of "ozone" becomes continuous as does that of compressed O. C. C. KIESS

The progression of values of the K absorption edges of simple substances. V. DOLEJŠEK AND K. PESTRECOV. *Compt. rend.* 188, 164-6(1929).—New measurements of the K absorption limits of Fe, Co, Ni, Cu and Zn are given, which together with those detd. by others for elements of at. nos. 15 to 25, give values for ν/R which are well represented by the formula $\nu/R = a' + b'N + c'N^2 + d'N^3 + e'N^4$. The differences between the observed and computed values for the elements Na to Zn vary periodically, being greatest but of opposite sign near $N = 21$ (Sc) and $N = 29$ (Cu). C. C. KIESS

The ultra-violet spectra emitted by a mixture of hydrogen and mercury vapor. HENRYK JEZEWSKI. University of Warsaw, Poland. *J. phys. radium* [6] 9, 278-96(1928); cf. C. A. 22, 4370. C. C. KIESS

Structure of the third-order spectrum of sulfur (S III). J. GILLES. *Compt. rend.* 188, 63-4(1929).—Forty lines of S III, between 4528 and 3323 Å. U. have been classified as resulting from combinations of S, P and D terms of the triplet system. C. C. KIESS

Intensity relations in the spectra of titanium. I. Line intensities in the stronger multiplets of Ti I and Ti II. GEORGE R. HARRISON. Stanford Univ. *J. Optical Soc. Am.* 17, 389-416(1928).—A method of photographic photometry is described which was applied to det. the intensities of lines in the arc and spark spectra of Ti. Detailed results are tabulated for 26 multiplets of Ti I and 8 of Ti II. The measured relative intensities were in agreement with the theoretical intensities in more than half the multiplets examd. in each spectrum. And in the abnormal multiplets the majority of the lines had intensities agreeing with theory. Of all the lines measured 86% had intensities agreeing with theory. No definite correlation was found between intensity abnormalities and departures from Landé's interval rule, although in 17 multiplets having abnormal intervals 10 had abnormal intensities. C. C. KIESS

The continuous spectrum of mercury. JOHN K. ROBERTSON, K. A. MACKINNON AND W. H. ZINN. Queen's University, Kingston, Canada. *J. Optical Soc. Am.* 17, 417-27(1928).—The continuous bands of Hg with intensity max. at 4600, 3300, and 2536 Å. U. were obtained either by rolling a drop of Hg horizontally in an evacuated and heated quartz tube or by exciting the same tube, when heated, with a high-frequency electrodeless discharge. When the latter method of excitation was employed a fourth band with max. intensity at 2650 Å. U. was also obtained. The spectrum thus obtained appears to be identical with that observed in fluorescent vapor, and in vapor subjected to electronic bombardment. Conclusion: The radiation emanates from excited mols., and is not due to a recombination of an electron with an ionized atom to change it from the $(p+1)$ th to the p th state, as suggested by Balasse (C. A. 22, 1277). C. C. KIESS

Transmission of ultra-violet radiations by quartz prism monochromators. WM T. ANDERSON, JR., HUGH D. FRASER AND LESTER BIRD. Hanovia Research Lab. *J. Optical Soc. Am.* 17, 454-62(1928).—A new design of ultra-violet monochromator is described which favors the transmission of the shorter wave lengths. The instrument transmits about 11% of the incident ultra-violet radiations. C. C. KIESS

Transfer of excited mercury atoms to the metastable state. H. KLUMB AND P. PRINGSHEIM. *Z. Physik* 52, 610-26(1928).—The absorption of λ 4047 in Hg vapor with addn. of other gases (He-Nc, A, N₂, CO, CO₂, H₂O) was studied. The line was produced in a water-cooled arc and the absorbing Hg vapor was illuminated at right angles so as to produce a few Hg atoms in the 2^3P_1 state. The absorption was studied as a function of the pressure of the added gas, the pressure of impurities and the intensity of the light coming into the absorption vessel at right angles. The results are compared with certain theoretical deductions. The extreme effect in N₂ is thought to be due to a resonance phenomenon (2^3P_1 — 2^3P_0 0.21 v. and the vibration quantum in N₂ is 0.28 v.). GEORGE GLOCKLER

Intensity ratio at the edges of strongly reversed multiplets. W. BLEEKER. *Z. Physik* 52, 808-14(1928).—With the Na doublet $1s \rightarrow 2p$ it is shown that the intensity ratio near the edges of the lines approaches the theoretical value of 2:1. The same is true with the K and Zn doublets. In the Cs doublet the above ratio is 5.5:1 (cf. *C. A.* 22, 3582).

GEORGE GLOCKLER

Secondary radiation observed in the molecular diffusion of light by fluids (Raman effect). P. DAURE. *Compt. rend.* 186, 1833-5(1928).—The frequencies of the secondary radiations are given by the formula $N - n_p$, where N is the frequency of the exciting radiation and n_p represents the characteristic const. of the fluid and is probably related to its infra-red absorption spectrum. Values of the latter are given. It has been shown for Me_2O , EtOH , C_6H_6 , PhMe , and aq. solns. of salts that spectra of fluids having a common radical contain some rays in common, some different and some slightly displaced. Rays corresponding with the same molecular frequency have the same degree of polymerization, and the spectrum of a C_6H_6 - PhMe mixt. is superposition of the constituent spectra. The intensities probably depend on that of the exciting ray and of the molecular density.

ALBERT L. HENNE

The band spectrum of lithium. K. WURM. Einstein Inst., Astrophys. Observat., Potsdam. *Naturwissenschaften* 16, 1028(1928).—Of the two visible Li absorption band systems (blue-green and red) the first one has been classified by a nucleus vibration scheme. The fluorescence spectrum of Li at 600° to 700° in sunlight is identical with it. A table of its frequency values is given. Dispersion is 14 Å. U. per mm. and 138 Å. U. per mm. for some. The edge formula obtained is $\nu = 20398.4 + (267.5n' - 3.2n'^2) - (347.5n'' - 2.2n''^2)$, from which a dissociation energy of 1.69 v. for the unexcited molecule follows.

B. J. C. VAN DER HOEVEN

Helium bands. Y. FUJIOKA. *Z. Physik* 52, 657-67(1928).—The difference in relative intensity of He bands when excited with d. c. and condensed discharge is studied. Two bands, which appear more strongly in d. c. excitation, are analyzed in detail.

GEORGE GLOCKLER

Band spectra of carbon monoxide. GERHARD HERZBERG. *Z. Physik* 52, 815-45 (1928).—In an electrodeless ring discharge a new band system of CO is found, with the same final state as the Ångström bands. The initial state is a 1D -state. A series of observations on the intensity distribution on these bands shows an analogy to certain N_2 bands. An energy diagram is given and the dissociation of CO and CN are discussed. The behavior of the Swan and CN bands in electrodeless discharge is described.

GEORGE GLOCKLER

A new band spectrum of carbon monoxide. GERHARD HERZBERG. *Tech. Hochschule, Darmstadt. Naturwissenschaften* 16, 1027-8(1928).—Continuing the work on electrodeless ring discharge in N_2 (*C. A.* 22, 3354, 3582) H. examd. CO in a similar way. Weak excitation and 1 mm. pressure gave the well-known Ångström bands. Group "a" was very intense, group "b" failed to appear. In the neighborhood of "b" a group was found like the others in fine structure (30 to 10 Å. U. per mm. dispersion needed), and in dependence on discharge conditions and intensity distribution. In Birge's (*C. A.* 21, 1062) edge scheme the new bands could not be classified however, the value of n being 2.5 from the const. frequency difference between the new group and group "a" (5004 per cm.). It is concluded that the initial term of this group is one different in electron arrangement from that of either of the Ångström bands. It is called the "C" condition; it lies at 91898 per cm. (the Ångström "c" is at 92086). Wave lengths and frequencies of the new bands are given in a table and compared with the "a" bands.

B. J. C. VAN DER HOEVEN

New absorption vessel of variable length. C. LEISS. *Z. Physik* 52, 748-9(1928).—A container for liquids whose absorption of light is to be measured is so designed that the liquid can come into contact with glass only.

GEORGE GLOCKLER

Measurement of light absorption. H. VON HALBAN AND J. EISENBRAND. *Z. phys. Phot.* 25, 138-52(1928); cf. *C. A.* 21, 3831.—The different photoelec. cells show unexpectedly large variations, which need explanation, in the dependence of sensitivity on wave length. Exact knowledge of the properties of the cells employed is especially of importance when measurements have to be carried out with not quite monochromatic light.

E. R. BULLOCK

The action of light rays upon potassium chloride. JACQUES RISLER AND ROYAU DE COUMELLERS. *Compt. rend.* 187, 944-5(1928).—KCl exposed to sunlight and subsequently placed on photographic plates in a dark room registered a photographic impression. On testing different sources of light and different filters it was shown that unfiltered ultra-violet rays produced this effect most rapidly. The authors attach

some significance to these results in view of Zwardemaker's observation of the effect of season in the role of the cardiac action of KCl. The increase in microradioactivity of KCl under the action of luminous rays explains the particularly energetic function of the element in the growth of plants under the action of sunlight. L. T. F.

Fluorescence of fluorspars excited by light of different wave lengths. HISAMITU NISI AND KYŪTIRO MIYAMOTO. *Kyushu Imp. Univ. Proc. Imp. Acad. (Japan)* 4, 357-60(1928).—Fluorspars are classified into 3 groups—those which show blue and red fluorescence, those which show blue only and the 3rd, which have no appreciable fluorescence. The 1st group is here studied. Results are tabulated for the Cd, Fe, Mg and Ni spark and the Fe, Hg and Ni arc. The wave lengths of definite fluorescent lines are const. within the exptl. error, whatever the exciting source may be and nearly const. for different specimens. The blue fluorescence practically disappears when Wratten esculin filter or Wood's glass of about 2 cm. is inserted between the specimen and the exciting source, but a thin Wood's glass has no appreciable effect upon it. Thus, the principal wave lengths able to excite the blue fluorescence is less than 3850 and greater than 3000 Å. U. The red fluorescence is excited by wave lengths from Fe, Ni and Mg sparks of about 2300, 2500 and 2800 Å. U. C. J. WEST

Influence of magnesium metal on the formation of formaldehyde and sugars by the action of ultra-violet rays on calcium bicarbonate solutions. G. MEZZADROLI AND E. VARETON. *Atti accad. Lincei* 8, 511-5; *Zymol. chim. col. e zucch.* 3, 165-71(1928). When a soln. of $\text{Ca}(\text{HCO}_3)_2$ (of about $p_H = 7.5$) is exposed to ultra-violet rays small amts. of CH_2O and sugars are formed. If Mg metal is added, in an open vessel, somewhat more of the reducing substances are formed, while if the reaction is allowed to take place in a closed quartz vessel considerably larger amts. of sugars are formed; represented as cc. 0.1 N I_2 , the max. reduced is 1.2 cc. in 1st instance, 1.5 cc. in 2nd, while in quartz = 2.9 cc. I_2 are used up, although a longer time is required to attain this figure. Mg may act to remove O_2 formed which would, otherwise, destroy the products by oxidation as fast as formed. A. W. CONTIERI

Preliminary studies of action of light on silver nuclear hydrosols and their derivatives. A. GALECKI AND R. SPYCHALSKI. *Roczniki Chem.* 8, 394-404 (404 German) (1928).—The silver nuclear hydrosols and their derivs. were prepd. according to Galecki and Kempf (*C. A.* 22, 4027) and electrometric, viscosity, and cond. measurements of illuminated hydrosols performed. Hydrosols subjected to ultra-violet illumination were decolorized the more readily, the smaller were the colloidal particles of sols. The increased cond. and decreased viscosity point to the partial conversion of Ag into ions. On further illumination with ultra-violet light the process is reversed, whereby the Ag ions, just formed, are reduced out as colloids. All the consecutive changes in various portions of the same sols, prepd. separately, differ considerably. Also in *Z. anorg. allgem. Chem.* 177, 337-44(1928). JAROSLAV KUČERA

The action of x-rays on chloroform and similar compounds. PAUL GÜNTHER, H. D. VON DER HORST AND GEORG CRONHEIM. *Phys.-chem. Institut, Berlin Z. Elektrochem.* 34, 616-25(1928); cf. *C. A.* 15, 2241; 22, 3841. The source of x-rays in this work was a Coolidge tube with an Fe target and a Lindemann window. The tube was operated at 50-75 kv. with 1-3 milliamp. The material radiated was about 10 cm. from the focal point and was contained in a vessel about 10 mm. wide inside of thin Jena glass. When HCCl_3 is radiated with x-rays, HCl is formed in amts. proportional to the energy input, provided that the character of the radiation is const. The HCl was detd. by extn. with H_2O and subsequent titration. By changing the distance between the sample and the x-ray tube it was shown that the yield was inversely proportional to the square of the distance. HCCl_3 in different degrees of purity gave fairly reproducible results. Hexachloroethane is one of the products of the decomposition. Although other org. products could not be identified, presumably other compds. of C, Cl, and H are formed. The yield of acid depends to a large degree on the amt. of H_2O present in the HCCl_3 . In a sp. instance about four times as much acid formed in HCCl_3 satd. with H_2O as in HCCl_3 dried with Na. The effect of the hardness of the x-rays on the yield was observed by using filtered radiation; the harder x-rays are more effective. If CCl_4 is radiated with x-rays Cl_2 is formed, but in extremely small amts. In the presence of other solvents such as ligroin or cyclohexane much larger, though still small, quantities of HCl are formed, suggesting a reaction between CCl_4 and ligroin. It is to be noted that photochem. reactions may be induced by x-rays which are not at all affected by visible light, but there is evidence in the optical region to indicate that the splitting off of HCl and its oxidation in the presence of H_2O and O_2 can take place. HCl_2 was studied in a manner similar to HCCl_3 . I_2 was liberated, presumably the result of a primary splitting off of HI and subsequent

oxidation by O_2 of the air. Mixts. with ligroin and cyclohexane were studied, but the greatest effect was produced in mixts. of HCl_3 and $HCCL_3$. The fact that I_2 is set free when HCl_3 is added to $HCCL_3$ which has been radiated with x-rays has been ascribed to the formation of $HOCl$ from the $HCCL_3$. Quantitatively this explanation is not sufficient and it is suggested that some other compd. than HI forms and can be oxidized by the air. This, in analogy to CCl_4 above, may be a compd. between $HCCL_3$ and ligroin. When the concns. are varied it is found that beyond a certain point the addn. of more ligroin does not have any effect; and from this concn. calcns. indicate the possibility of a combination between 117 mols. octane and one HCl_3 . In the absence of atm. O_2 and in pure $HCCL_3$ the yield of I_2 is proportional to the HCl_3 concn. The photochem. effect of radiation from Ra is presumably similar to that of x-rays.

A. W. KENNEY

Oxidations promoted by ultrasonic radiation. F. O. SCHMITT, C. H. JOHNSON AND A. R. OLSON. Univ. of Calif. *J. Am. Chem. Soc.* **51**, 370-5(1928).—Ultrasonic radiation was found to cause an oxidation of iodide ion, and so to affect bromide and chloride solns. that they would immediately liberate I_2 from KI . The formation of H_2O_2 in the solns. is suspected on the basis of positive evidence with the titanium sulfate reagent; O_3 may be formed but was not indicated by the tests. H_2S solns. give colloidal S when radiated. Aqueous CCl_4 solns. contg. starch and KI become intensely colored; CCl_4 and aq. KBr (two-phase system) impart a yellow coloration of Br_2 to the water when treated. Ferric ion solns. with H_2 are not affected. Bromothymol blue is altered, the blue-green cast giving way to yellow upon radiation (the H -ion concn. increases). This work may tend to vitiate the studies of Richards and Loomis (*C. A.* **22**, 721). The pressures of O_2 above KI and H_2S solns. were varied and there was found a crit. pressure above which a diminution in reaction rate occurred; pressure apparently influences the formation of H_2O_2 .

WILLIAM E. VAUGHAN

Theory of the valence octet in the torulus atom. I. General theory. DAN RADULESCU. *Bul. soc. stiinte Cluj* **4**, 263-79(1928).—The fundamental hypotheses of the torulus atom (cf. *C. A.* **18**, 2640) lead to the octet theory. They make it possible to predict, without accessory assumptions, the stability of chem. substances, the polarity of the various components of the mol., the structure of coordination compds., and their general properties. **II. The valence octet theory in organic chemistry.** *Ibid* 280-91.—Present symbols are grossly insufficient. The use of symbols based on the electronic valence octet affords a decided improvement. Physical and chem. properties of conjugated double bonds can be predicted. Formulas are proposed for benzene, naphthalene and anthracene. These formulas explain the role of the substituting group polarity. **III. General relations between the absorption spectrum and the chemical properties of organic substances. General resonance theory.** *Ibid* 292-305.—A new absorption theory is proposed; general resonance is defined. The so-called "slackening" of the valence electrons is discussed. The Staudinger law is erroneous. A general theory of selective absorption is outlined. **IV. New examples of relations between the absorption spectrum and the chemical properties.** *Ibid* 306-11.—Relations have been found between the red front of the absorption bands and the chemical properties of the chromogens: these relations are exactly the contrary of what was expected from the Staudinger law. The results are easily explained by the general resonance theory. **V. New general theory of halochromy.** *Ibid* 213-22.—Examples are given, explaining the constitution of the metallic derivatives of Schlenk and Bergmann (*C. A.* **22**, 4493) of triarylmethyls and the so-called "carbonium" salts. A general theory of the "true halochromy" and of the coordination halochromy is discussed. The structure and constitution of the resonators are developed in every case. **VI. Relations between photochemical properties and polarity of the substituting groups in the octet theory.** *Ibid* 323-5.—Photochemically active nitro derivatives have a mobile H; polarity of the substituting groups is of great importance. This is easily explained by the torulus electronic octet theory. **VII. New general theory of fluorescence and phosphorescence.** *Ibid* 326-32.—A new theory is proposed, based on the general resonance theory. Fluorescence is due to harmonic oscillation of the resonators, without infra-red harmonics, i. e., without at. vibration. From this a very simple theory of fluorescence and phosphorescence is derived, which is in perfect agreement with exptl. data. A. L. H.

Arsenides of Mg and Zn (NATTA, PASSERINI) 6. Some physical constants of Re (NODDACK) 2. Ionization potentials and grating energies of atoms in the solid state (BISWAS) 2. Breakdown of solid insulators (WERNER) 13. Purification of methyl fluoride. Quantitative gas analysis by high-dispersion infra-red spectroscopy (BENNETT) 10.

DANCKWORTT, P. W.: *Lumineszenz-Analyse im filtrierten ultra-violetten Licht*. Leipzig: Akademische Verlagsgesellschaft m. b. H. 106 pp. Paper, M. 6.50; bound, M. 7.80. Reviewed in *Chimie et industrie* 20, 1224 (1928); *Ind. Eng. Chem.* 21, 294 (1929).

PRINGSHEIM, PETER: *Fluoreszenz und Phosphoreszenz im Lichte der neueren Atomtheorie*. 3rd ed. Berlin: J. Springer. 357 pp.

THOMSON, JOSEPH J.: *Beyond the Electron*. Cambridge, Eng.: The University Press. 42 pp.

A fluorescent salt for x-ray screens, calcium tungstate. M. G. BOGOSLOVSKII, A. A. MAMUROVSKII and P. V. SAVITZKAYA. Russ. 5013, Mar. 31, 1928. CaWO_4 is prepd. by fusing wolframite with soda, dissolving the melt in water, pptg. CaWO_4 by means of CaCl_2 , heating in a muffle furnace, and then adding 0.01 to 0.5% of tin oxide.

Fluorescent salts for x-ray screens. M. G. BOGOSLOVSKII, A. A. MAMUROVSKII and P. V. SAVITZKAYA. Russ. 5012, Mar. 31, 1928. Compounds which are used in fluorescent screens for x-ray apparatus are prepared from ZnSO_4 and MgSO_4 pptd. from soln. by means of water glass and soda. One part by wt. of this ppt. is dried at 150–200° and mixed with 0.2 to 1 part of dry NaCl, heated to 1200–1300° and the NaCl is finally washed off with water.

4—ELECTROCHEMISTRY

COLIN G. FINK

A simple high-frequency vacuum furnace for laboratory use. F. W. FELL. Tech. Hochschule Aachen. *Arch. Eisenhüttenwesen* 1, 659–61(1928); cf. C. A. 22, 2718 — An induction furnace for melting 1–1.5 kg. of metal, operating at 8000 cycles and giving a vacuum of 0.5–3 mm., $\frac{1}{2}$ hr. after starting the pump, is described. Essentially, it consists of a bell-jar (300 mm. diam. and 440 mm. high) which sets on a glass plate with an air-tight joint. Inside the jar is placed a crucible thermally insulated from the rest of the app. with Al_2O_3 and H_2O jackets, and surrounded by an induction coil (Cu tubing 160 mm. high, exterior diam. 160 mm. and interior diam. 110 mm.). Means of obtaining the vacuum, of seeing into the furnace, and of making alloys are indicated.

J. BALOZIAN

Electric furnace for the firing of ceramic ware. MAURIZIO KORACH. Laboratorio Sperimentale Ceramico, Faenza. *Corriere ceram.* 9, 495–7, 499, 501, 503(1928). — K. emphasizes the value of elec. furnaces in the ceramic industry. He gives a detailed description of an elec. furnace built by the firm Scei (Novara).

G. SCHWOCH

Brown-Boveri electric furnaces with electro-hydraulic regulation of the electrodes. E. DE MULINEN. *Génie civil* 93, 143–5(1928); *J. four élec.* 38, 9–11(1929). — A large-capacity Heroult furnace (20 tons) installed in Italy is described. It consists of 3 essential parts: (1) furnace bed with crucible, 3 electrodes and auxiliary motor for moving electrodes, (2) electro-hydraulic automatic control arrangement for electrodes, (3) transformer and distribution app. The regulator operates with optimum pressure between 5 and 10 atm.; a small current excess causes a slow elevation of the electrodes while a short circuit causes elevation of electrodes at max. speed. The hydraulic motors are in the form of cylinders with a piston whose rod acts directly on the carrier of each electrode.

M. McMAHON

Electrothermic manufacture of yellow phosphorus. I. E. SHIKHUTZKII. State Inst. Appl. Chem. *J. Chem. Ind. (Moscow)* 5, 979–82(1928). — Preliminary to the installation of a factory for the manuf. of P by distn. of phosphorites and apatites with sand and coal, expts. were instituted to find the best operating conditions. It was found that if the mass is introduced into the elec. furnace in finely divided form it melts faster and the operation runs more smoothly than when using large pieces; in the latter case a greater expense of energy and a stronger current would be required, and this would lead to greater damage to electrodes and to apparatus. Continuous operation was found to be best, as it avoids the waste of heat required to warm up the furnace; considering that the mass, when it melts, occupies approximately half of its former volume, a new batch may be introduced without unloading the residue of the first. The sudden drop of temp. occasioned by the introduction of a new batch on the top of the old one can be avoided by adding the second batch in small portions which may preliminarily be heated to 200–300° by the use of the flues. Instead of using for the mixt. cryst. silica sand, it is advisable to use amorphous SiO_2 obtained by heating

kaolin up to 550°; with this grade of silica the operation takes place with a 21% decrease in expenditure of energy and a corresponding economy of time. B. N.

Industrial electric heating. The (electric) resistor furnace. N. R. STANSEL AND C. DANTSZEN. *Gen. Elec. Rev.* 32, 162(1929); cf. *C. A.* 23, 341.—A review.

Electric heating and tempering furnace. A. HERBERHOLZ. *Chem. Fabrik* 1928, 717 8; cf. *C. A.* 22, 2114. C. G. F.
J. H. MOORE

The progress of electrodeposition during 1928. SAMUEL FIELD. *Metal Ind.* (London) 34, 48(1929). F. C. M.

Wood's metal as cathode in electrolysis. H. A. J. PIETERS. *Chem. Weekblad* 25, 706-7(1928).—Wood's metal recommended by Paweck and Weiner (*C. A.* 22, 554) was found well suited for cathode material after purification with HCl. It was successfully used for electrolytic analysis of Cu, Cd, Zn, Hg, Ni and Co; it is not recommended for chlorides and nitrates. The results with Pb, Ag and Fe were unsatisfactory. A Pt spiral was used as anode. B. J. C. VAN DER HOEVEN

Electrochemical preparation of anthranilic acid. L. B. ALVAREZ. *Mon. farm. therap.* 34, 121-2(1928).—Sixty g. of *o*-nitrobenzoic acid was dissolved in a mixt. of 20 cc. of alc. and 100 cc. of H₂SO₄ and used as cathode liquid; 100 cc. of H₂SO₄ served as anode liquid. Lead and PbO₂ electrodes and a c. d. of 1 amp. were required. J. L. POWERS

Electrochemical synthesis of anesthesine. L. B. ALVAREZ. *Mon. farm. therap.* 34, 281 2(1928). The ethyl ester of *p*-nitrobenzoic acid was prepd. electrochemically, platinum electrodes being used. For anode liquid there was used a satd. aq. soln. of K *p*-nitrobenzoate and an equiv. amt. of K propionate, and for the cathode liquid a 10% aq. soln. of potassium propionate. Conversion of the nitro into the amino ester was effected by the addition of HCl to the reaction mixture which served as the cathode liquid. 10% H₂SO₄ was used around the anode. Lead and nickel electrodes were employed. J. L. POWERS

The question of the activation of hydrogen in the silent electrical discharge. GEORG-MARIA SCHWAB AND FRANZ SEUFERLING. *Z. Elektrochem.* 34, 654-7(1927).—Electrolytic H passed through an ozonizer at 50 mm. and then through S gives a test for HS about 10 times the blank (due to S in the glass of the ozonizer). Active H reacts with As, but its form is not identified. It may be atomic H. F. R. BICHOWSKY

Tube light as source of artificial daylight (Moore light). M. PÜCHLER. *A. E. G. Mitteilungen* 1929, 42 3.—Illustrated description of app. consisting of 5-m. long Moore-light tubes (CO₂ filled), movable window, transformer and switch, which operates on a c. with special current regulator with current consumption of 1 kw. The blue-white light obtained from tubes is particularly advantageous for spinning, weaving, color and paper industries. M. McMAHON

Life of glass in rectifiers on trains. H. SCHLEUSNER. *A. E. G. Mitteilungen* 1929, 2 1.—Glass rectifiers can be satisfactorily used on trains in place of iron rectifiers. On the basis of statistics a life of over 10,000 hrs. was obtained with glass rectifiers. M. McMAHON

Tests of bakelized paper. I. KUMLIK. *Elektrizitätswirtschaft* 27, 423 31(1928).—Paper prepd. from a series of (wood-free, thin glaze) paper layers either pressed in plate form or wound in the form of a wood cylinder with binding agent either of bakelite or shellac was tested for elec. properties. Various causes of puncture were considered: (a) failure to reach a final favorable state of bakelite or shellac with the result that chem. changes occur after they are applied to paper; (b) air content; (c) bubble-like formation was observed on microscopic investigation as the starting point of the spark which creeps along in canals before puncturing. Values obtained for hardness, cleavage, ductility, elasticity, absorption of water and oil are tabulated. M. McMAHON

Volt-ampere measurement. JOHN TUCHINCLOSS. *Gen. Elec. Rev.* 32, 103(1929).—The influences of leading and lagging power-factor and phase sequence are discussed. C. G. F.

New theory of transformer and autotransformer circuits. A. BOYAJIAN. *Gen. Elec. Rev.* 32, 110(1929). C. G. F.

Manufacturing rubber goods from latex by electrodeposition (KLEIN). 30. Current density-tension curves of various metals in the residual current range (MÜLLER, KONOPICKY) 2. Preparation and study of noncrystalline piezo-electric substances (MEISSNER, BECHMANN) 2. Electrode potential of Ni. III. Mechanism of the re-activation of the passive state of Ni (MURATA) 2. Contact resistances (HOLM) 2. Oxide cells of Cd, Cu, Sn and Pb (MAIER) 2. Effect of various salts on the electrolytic

determination of Cu (JULIARD, LEDRUT) 7. Contact gas reactions (Fr. pat. 644,181) 13. Introducing or eliminating substances from artificial products (Fr. pat. 644,077) 13. Activating substances for promoting chemical reactions by use of electric discharges (Brit. pat. 293,302) 18. Rubber sheets by electrodeposition (U. S. pat. 1,702,705) 30. Deposition of rubber (Brit. pat. 293,815) 30. Rubber deposition by electrophoresis (Brit. pat. 293,343) 30.

PFANHAUSER, WILHELM: *Le chromage électrolytique; résumé de l'état actuel du chromage électrolytique et de ses méthodes de travail*. Translated from the German by A. Allemann. Paris and Liège: C. Béranger. 40 pp.

WILCOX, E. A.: *Electric Heating*. London: McGraw-Hill Pub. Co., Ltd. 469 pp. 25s. Reviewed in *Bull. Brit. Non-Ferrous Metal Research Assoc.* No. 24, 36 (1928).

Electric battery. A. SCHMID (to Schmid-Patent Corp.). Brit. 293,299, July 2, 1927. An outer container encloses a porous C receptacle forming one electrode and within this is placed the other electrode which may be formed of Al or a metal of the Ca or Mg groups. The electrolyte may be basic or acidic. Various electrolyte mixts and various structural features of the battery are specified. Cf. *C. A.* 22, 3590.

Dry cell electric battery. GEORGE W. HEISE and ERWIN A. SCHUMACHER (to National Carbon Co.). U. S. 1,702,473, Feb. 19. Structural features.

Galvanic battery. B. I. TOMILIN. Russ. 5005, Mar. 31, 1928. A galvanic battery is composed of a number of cells which are connected in series and suspended by their electrode connections from wire on a non-conducting rod. Each cell is composed of an electrode rod inserted in a porous cylinder holding the electrolyte, and the other electrode wire wound around the outside of the porous cylinder.

Galvanic batteries. CAESAR VOGT. Ger. 470,597, Mar. 15, 1927. A paste electrolyte for galvanic batteries is prepd. by mixing 50 parts of concd. $ZnCl_2$ soln with 50 parts of water and adding about 5 parts of potato starch to the soln. No heating is necessary.

Galvanic batteries. BATTERIEN- UND ELEMENTE-FABRIK SYSTEM ZEILER & CO. Ger. 470,647, Dec. 17, 1927. The thickening applied to the bottom of a Zn container for dry cells is accurately gaged by forming the thickening compn. into tablets or strands and melting a definite no. of tablets, or a definite length of strand, on the bottom of the container.

Anode battery. NEUFELDT & KUHNKE G. M. B. H. (Otto Emersleben, inventor). Ger. 470,596, Mar. 11, 1927. The principal features are the provision of protecting tubes for the contacts and of a small no. plates attached to each tube.

Storage batteries. ACCUMULATEUR FARAD. Fr. 644,320, Nov. 21, 1927. Construction of tank.

Storage batteries. SOCIÉTÉ ANON. DES ACCUMULATEURS MONOPLAQUE. Fr. 643,932, April 16, 1927. A method of making insulating separators for the plates is described.

Storage batteries. SOCIÉTÉ ED. PARVILLÉ ET CIE. Fr. 644,192. April 21, 1927. Constructional form of plates.

Electric device for indicating the electrolyte level in storage batteries. SOC. DES ACCUMULATEURS ÉLECTRIQUES ANCIENS ÉTABLISSEMENTS A. DININ. Brit. 293,825, July 13, 1927.

Electric devices for indicating the electrolyte level in batteries. WILLIAM J. HEALEY (to Westinghouse Elec. & Mfg. Co.). U. S. 1,702,436, Feb. 19.

Electrolytic apparatus. ALBERT EDGAR KNOWLES. Ger. 467,726, Oct. 19, 1926. See Brit. 261,164 (*C. A.* 21, 3317).

Preventing electrolytic corrosion in steam condensers or other apparatus. E. CUMBERLAND. Brit. 293,909, April 19, 1927. In a system for preventing corrosion, such as that described in Brit. 277,417 (*C. A.* 22, 2518), lamps or other suitable fault-indicating devices are included across the actual or suspected source of stray currents.

Electrolytic precipitation of metals. HJALMAR F. SUNDBERG. Fr. 644,548, Sept. 15, 1927. Metals or metallic compds. of the 4th to the 7th group, such as Cr, Ta and Mo, are pptd. electrolytically using solns. in water, glycerol or pyridine, of simple or complex compds. of the metal at higher or lower degrees of oxidation, e. g., compds. contg. O and H, B, C, Si, N, S, Se, Te or P, such as a fluoborate, fluosilicate or selenate of the metal.

Nickel. SOC. ANON. "LE NICKEL." Fr. 643,879, April 13, 1927. See Brit. 288,605 (*C. A.* 23, 568).

Electrolytic diaphragm cell suitable for producing oxygen and hydrogen. WILLIAM G. ALLAN (to Farley G. Clark). U. S. 1,702,924, Feb. 19. Structural features.

Cell for electrolytic manufacture of oxygen and hydrogen. DE NORDISKE FABRIKER DE-NO-FA A.-S. and CARL FREDERIK HOLMBOE. Ger. 467,399, Nov. 16, 1924. The cell contains a no. of electrodes, the cathodes being enclosed in diaphragm-bags having a small hole in the bottom. Fresh addns. of electrolyte are made as required to the bags enclosing the cathodes.

Electrolysis of alkali chlorides. FRANZ GERLACH. Fr. 33,372, April 16, 1927. See Brit. 269,513 (C. A. 22, 1285).

Electrodeposition of iron. I. G. FARBENIND. A.-G. Brit. 293,442, July 8, 1927. In deposition for subsequent removal, e. g., deposition on a rotating cylinder from which the iron is continuously removed as a band, a cathode of "V2 A" steel or similar acid-resisting alloy is used.

Alloys. LE MATÉRIEL TÉLÉPHONIQUE (Société anonyme). Fr. 644,301, Nov. 21, 1927. Alloys of metals are obtained by depositing the metals electrolytically simultaneously on a cathode, the electrolyte being chosen so that the potentials at the cathode remain practically equal for the series of current densities used. The method is particularly useful for the formation of thin sheets of an alloy of Fe and Ni.

Electroplating apparatus. RIEDEL & Co. Ger. 470,517, Mar. 29, 1927. Means are described for vertically raising and lowering the rotary frames which carry the goods under treatment.

Electroplating apparatus. RIEDEL & Co. Ger. 470,681, Jan. 8, 1927. Improvements are described in the construction and arrangement of the spring grips holding the goods and of the arms which support the grips.

Electrolytic furnace for producing light metals such as aluminum. P. L. HULIN (to Compagnie de produits chimiques et électrométallurgiques Alais, Froges et Camargue). Brit. 293,353, July 4, 1927. Various structural features are specified.

Electric furnace of the tunnel type traversed by trucks. BERNARD J. MOORE, ARTHUR J. CAMPBELL and GIBBONS BROTHERS, LTD. Fr. 644,392, Nov. 23, 1927. Method of supporting the heating resistances.

Electric furnace for the production of iron, steel or steel alloys. EMIL G. T. GUSTAFSSON. Fr. 644,553, Sept. 26, 1927.

Electrode holder for electric furnaces. EINAR MOLMARK. U. S. 1,702,359, Feb.

Protective device for electrical apparatus. M. BUCHHOLZ. Brit. 293,705, July 8, 1927. Evolution of gas by decompn. in elec. transformers or switches under abnormal conditions is utilized to operate an automatic cut-out.

Electric conductors (wire) insulated with rubber overlaid with pyroxylin. GEORGE T. JONES (to Davis-Jones Insulated Wire Co.). U. S. 1,702,652, Feb. 19.

Electric conductors. ANTOINE BORENSZTEDT. Fr. 644,430. Elec. conductors are made on a basis of cellulose nitrate or acetate by adding to the cellulosic soln. 5-10% AgNO₃ and 1-3% HNO₃, reducing with H₂S and treating it in an electrolytic bath.

Electrical treatment of hydrocarbons and fatty oils. SIEMENS & HALSKE A.-G. Ger. 466,413, Aug. 5, 1923. The viscosity of hydrocarbons and fatty oils is increased by treatment under reduced pressure with a silent elec. discharge developed by 2 stationary electrodes, e. g., 2 glass electrodes or 1 glass and 1 metal electrode, in contact with the liquid under treatment. Comparatively pure H which may be used, e. g., for hydrogenating fats is generated in the treatment and renders the known practice of introducing gas from the outside unnecessary. Suitable app. is described.

Material for rectifying alternating electric currents. ALLGEMEINE ELEKTRICITÄTS-GES. (to Patent-Treuhand-Ges. für Elektrische Glühlampen). Brit. 293,300, July 2, 1927. A rectifier may consist of a Cu plate forming one terminal element, a Cu₂I₂ layer in contact with or formed on the plate and an iodide coating on a Ag or Pb plate forming the other terminal element. Details of manuf. are given.

Ozone generator using high-frequency alternating current. WILHELM ESMARCH (to Siemens & Halske A.-G.). U. S. 1,702,254, Feb. 19.

Electric gas-purification plant. OSCAR MURY, MARC PELET and SOCIÉTÉ D'ENTREPRISE ET D'EXPLOITATION ATELIERS D'ARLOD. Fr. 33,312, April 6, 1927. Addn. to 617,411.

Removing dust from gases. SIEMENS-SCHUCKERTWERKE AKTIENGESELLSCHAFT. Fr. 643,860, Nov. 15, 1927. Explosions in elec. app. for removing dust from gases are prevented by placing in the purification chamber a fusible wire so arranged that it will melt on the production of a fire and release safety devices connected therewith.

Electrothermic reduction processes. SOC. ELECTRO-MÉTALLURGIQUE DE MONT-RICHER. Ger. 466,755, July 28, 1926. The furnace is charged for the most part with the usual homogeneous mixt. of reducing agent and material to be reduced, but in the vicinity of the electrode this charge is interspersed with layers of a non-conducting material. Better lateral distribution of the current is so obtained.

Electric incandescent lamps. PATENT-TREUHAND GES. FÜR ELEKTRISCHE GLÜH-LAMPEN (to General Electric Co., Ltd.). Brit. 293,675, April 17, 1928. Caps are coated with a heat-resisting material which forms a thin and glassy layer for preventing their oxidation, especially during the cement-baking operation, as described in Brit. 285,009 (*C. A.* 22, 4393), and which also acts as a flux for soldering the leading-in wires. "Boric acid water-glass" comprising one mol. Na_2O to 3 or 4 mols. of B_2O_3 , or similar phosphoric acid compds., may be used.

5—PHOTOGRAPHY

C. E. K. MEES

Processes of color photography. F. J. TRITTON. *Nature* 122, 687-8, 701(1928). The color processes applicable to prints on paper in use are covered briefly; some of the difficulties involved are mentioned. Methods evolved by the Colour Photographs, Ltd., from the Martinez patents, are discussed in detail; better register and greater ease of manipulation by the use of cellophane films are claimed. Tri-packs, having 3 selectively light sensitive films, are also described.

R. M. EVANS

New effect of chromic acid on photographic plates. E. P. WIGHTMAN AND S. E. SHEPPARD. *Phot. J.* 68, 201-5(1928).—Certain plates made with inert gelatin were treated with chromic acid soln. and it was observed that they apparently showed fog and sensitivity increase above the untreated plate. This phenomenon has been investigated further and it has been found that the increase in sensitivity passes through a max. with time of treatment and finally for treatments of 4 hrs. or longer there is a small desensitizing effect. The phenomenon disappears when the plates are washed thoroughly in rapidly running water prior to desensitizing. The effect may be caused (1) by the liberation of Br from sol. bromide in the plate by the chromic acid- H_2SO_4 . The Br when set free may act, according to a hypothesis proposed by Hickman (*C. A.* 21, 1066) and Wightman and Quirk (*C. A.* 21, 1066). The effect may be caused also (2) by a lessening of the no. of competing sensitivity specks by the chromic acid, the remaining specks thus becoming more effective; or, (3) by the specific action of chromic acid on something in the gelatin giving rise to a new sensitizer. Acid- KMnO_4 does not produce the effect. This effect will be studied over a wider range of conditions

E. P. WIGHTMAN

Effect of environment on photographic sensitivity. I. S. F. SHEPPARD and E. P. WIGHTMAN. *Phot. J.* 69, 22-35(1929).—The reversible p_H effect upon the speed of emulsions as observed by Rawling (*C. A.* 21, 863; cf. also Rawling and Glassett, *C. A.* 537) has been investigated. Aged plates, treated by bathing, give small and uncertain effects. Fresh emulsions appear to show the effect more definitely. Considerably more work is required before the nature of the effect can be definitely established. The possible causes appear to fall in four classes: (1) an action on AgBr ; (2) an action on Ag nuclei; (3) an exhalation of a Br acceptor function of the Ag_2S nuclei during exposure as suggested by Hickman (*C. A.* 21, 1066); and (4) a reversible effect on gelatin.

E. P. WIGHTMAN

Influence of the fixing agent on post-fixation development of reversed or solarized photographic plates. H. BELLIOU. *Compt. rend.* 188, 167-9(1929).—Several fixing agents were used in alkaline as well as acid soln. prior to physical development with either Hg or Ag developers. The results with alk. bath confirm those of Lumière and Seyewetz that post-fixation development is impossible following an alk. fixing bath unless the sensitive grain centers have been pre-treated with a suitable reducing agent. It is concluded that the nucleus of the image consists of three kinds of grains: (1) those directly reduced by the exposure; (2) those which have been rendered developable by the formation of a latent image; (3) and some of those grains, immediately adjacent, which are acted upon by the fixing bath as a reducing agent.

G. A. C.

Artificial silk, films, etc. (Brit. pat. 293,350) 23. Plasticizing cellulose esters and ethers (Brit. pat. 294,008) 23.

Color photography. S. A. SPLENDICOLOR. Ger. 470,411, Feb. 10, 1928. Simultaneous application of color layers to the gelatin layers on both sides of a film is effected by pressing on to the film strips of gelatinized paper which carry the color layers and are allowed to remain in contact with the film for a sufficient time.

Lighting system for color photography. H. BERTLING. Brit. 293,709, July 9, 1927. In supplying colored light of graduated intensity, the red and yellow rays may be produced separately by tubular lamps, having, resp., cathodes of K and Na, with or without fillings of inert gases such as Ne and He.

Films for color photography. SOC. CIVILE POUR L'ETUDE DE LA PHOTOGRAPHIE ET DE LA CINEMATOGRAPHIE EN COULEURS. Brit. 293,306, July 2, 1927. The uncoated surface carries minute refractive elements, and the emulsion layer contains a coloring agent or neutral salt for subduing the activity of rays reflected in the layer without impairing the actinic efficiency of the direct rays. Dyes such as indulines may be used in emulsions for making negatives and tartrazine in emulsions for making positive; salts such as Ag chromate also may be used and are added to the emulsion before coating. The dyes may be added either before or after coating.

Photographic sensitive materials. R. SCHWICKERT Ges. and E. BURG. Brit. 293,347, July 4, 1927. Processes as described in Brit. 284,253 (C. A. 22, 4395) are modified by using as the light-sensitive media compds. produced by the action on diazo or nitroso compds. such as diazotized 1-amino-2-naphthol-4-sulfonic acid, nitrosophenacetin, nitrosophenlactin, or aminophenol substituted by succinic acid, of alkali or alk. earth salts of aliphatic and oxyacids, aromatic carboxylic acids or sulfo acids, amino acids, etc., such as acetic, succinic, lactic, citric, tartaric, oxalic, benzoic, benzenesulfonic, cinnamic and phenylacetic acids. The products, either alone or with coupling compds., yield on exposure visible pictures which require no development, and if mixed with a small quantity of alkali and coupling compds. do not couple in the dark. They yield positive pictures directly; but if given a short exposure in the presence of coupling compds. and alkali in small quantity yield negative pictures. Various details and examples are given. Cf. C. A. 23, 783.

Photographic films of cellulose acetate composition. L. WĘSTRON. Brit. 293,269, Jan. 5, 1928. In order to prevent shrinking or crinkling in the developing or other baths of films contg. cellulose acetate together with aryl phosphates, aryl ethers or ales (and which may also contain NH_3 compds. and glycerol esters) the film base is treated for 6 hrs. or longer (and before it is coated with sensitive emulsion) with water at a temp. not exceeding 70° (suitably for 12–48 hrs. at 30 – 50°). The process may be accelerated by the addn. of a small quantity of an alkali such as NH_3 or an amido or amino compd. such as trimethylamine, aniline, acetamide, phenylacetamide, urea, pyridine, $(\text{CH}_3)_3\text{N}_4$ or benzidine.

Photographic paper. GEORG ENGELMANN. Ger. 470,519, June 9, 1927. Tissue paper is secured to a paper support by means of starch and made sensitive to light in the usual way. The tissue paper adheres to its support during developing and fixing, but can be detached after drying and a very thin picture so obtained.

Printing photographic gelatin layers. I. G. FARBENIND. A.-G. (Hermann Lummerzheim and Eduard Schnitzler, inventors). Ger. 470,618, Jan. 28, 1928. An aq. soln. of a dye is used to which a hardening agent for gelatin is added. The soln. may contain also a wetting agent, e. g., $\text{PhCH}_2\text{COONa}$ or saponin, and a lyophile colloid. According to one example, a soln. of "para-alkali blue" in 40% CH_2O soln. gives an impression which becomes water-resistant after some days and hence can be used for writing on crude cinematograph films. An aq. soln. of "para-alkali blue" and $\text{K}_2\text{Cr}_2\text{O}_7$ is also suitable.

Producing photographic records on sensitive surfaces by use of varying corona discharges. AUSTIN G. COOLEY (49% to Charles C. Henry). U. S. 1,702,595, Feb. 19.

Arc carbons for photographic use. COMPAGNIE LORRAINE DE CHARBONS LAMPES ET APPAREILLAGES ELECTRIQUES. Fr. 644,197, Apr. 21, 1927. Substances such as Si, B, Zr, V or carbides of these metals, with rare earths of the Ce group or with alkalies are incorporated in the arc carbons to give the max. stability to the arc flames.

Photometallization. PIERRE GIGUET and FRANÇOIS GIGUET. Fr. 644,463, Nov. 25, 1927. In metallization the reserves necessary to limit the deposition to desired parts is obtained photographically. Thus, a metal plate is coated with dichromate paste, then placed under a photographic positive and exposed to a suitable source of light. The plate is developed, washed and dried and placed in the electrolytic bath.

6—INORGANIC CHEMISTRY

A. R. MIDDLETON

Indophenol reaction in inorganic chemistry. J. STIEPOVICH AND A. SA. *Rev. Cent. Estud. Farm. Bioquim.* 16, 384-5(1927).—In the indophenol test for Cl the production of hypochlorite is necessary, Na or K hydroxide or carbonate, but not hydrogen carbonate, being added. Carbonate can be detected in a diln. of 1 in 5000. Tertiary phosphates yield indophenol-blue immediately in the cold; secondary phosphates react slowly in the cold but rapidly on warming, while primary phosphates do not react.

B. C. A.

Chlorides of ruthenium. $\text{Ru}(\text{OH})\text{Cl}_2$, RuCl_3 and RuCl_4 . H. REMY AND A. LÜTHRS. *Ber.* 62B, 200-9(1929); cf. *C. A.* 22, 2521; 23, 352.— RuO_4 reacts with concd. HCl with the formation of RuO_2Cl_2 . This is further reduced by excess HCl to RuCl_4 . The latter is not stable and decomposes according to the circumstances into RuCl_3 and free Cl_2 , or into $\text{Ru}(\text{OH})\text{Cl}_2$ by hydrolysis. Before the hydrolysis is finished, it is possible, by passing through an indifferent gas, to obtain reduction to R^{++} . The reduction stops at the 4th stage when the Cl_2 is taken away after the hydrolysis. The valence was estd. according to the method of Howe (cf. *C. A.* 21, 3851).

E. SCHOTTE

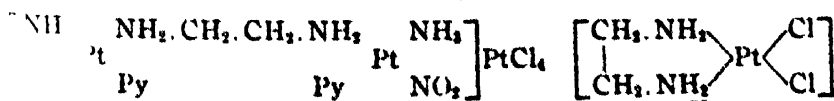
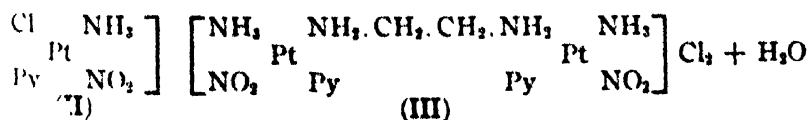
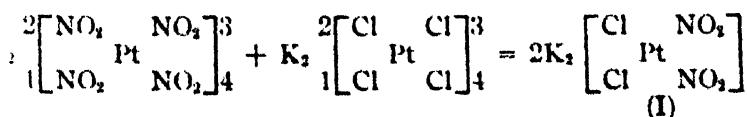
Boron hydrides. XII. $\text{B}_{10}\text{H}_{14}$. A. STOCK AND E. POHLAND. *Inst. Tech. Karlsruhe.* *Ber.* 62B, 90-9(1929); cf. *C. A.* 21, 541.— $\text{B}_{10}\text{H}_{14}$ is a by-product of the prepn. of B_2H_6 on the heating of B_4H_{10} . It m. $99.6-99.7^\circ$, b. 213° . The vapor pressure is expressed by $\log p = -(3218.5/T) + 1.75 \log T - 0.005372 T + 7.4106$. d_4 (solid) = 0.92, d_{100} (liquid) = 0.78. Its gas d. indicates a mol. wt. of 122.9. Heating for 24 hrs. at 250° gives decompn. into H_2 and B_{10}H_6 . By heating with about 1% H_2O for 15 hrs. at 100° in an evacuated tube, H_2 and a yellow soln. are obtained. Evapn. at room temp. of this soln. gives a stable compd. which reduces KMnO_4 but not Cu and Ni soln. On acidifying, the yellow color disappears with H_2 evolution. Air and O_2 do not affect $\text{B}_{10}\text{H}_{14}$ at $50-60^\circ$. Heating in a closed tube at 100° with O_2 gives an explosion. $\text{B}_{10}\text{H}_{14}$ is insol. in H_2O but sol. in NaOH . $\text{B}_{10}\text{H}_{14}$ combines with about 6NH_3 at low temp. but this is given off at room temp. Heating with NH_3 causes evolution of H_2 without formation of $\text{B}_2\text{N}_2\text{H}_6$; different complex compds. are formed, varying with the temp. The compds. are electrolytes. HCl does not react with the hydride but I is easily substituted. $\text{B}_{10}\text{H}_{12}\text{I}_2$ is sol. in H_2O and in NaOH with H_2 evolution.

E. SCHOTTE

Arsenides of magnesium and zinc. G. NATTA AND L. PASSERINI. *Reale politecnico, Milano.* *Gazz. chim. ital.* 58, 541-50(1928).—The lack of knowledge of the chemistry, particularly the lattice structure, of binary compds. of metalloids of the 5th group and metals of the 2nd group induced the authors to undertake a systematic study by means of x-rays of these compds. to det. the *isomorphic and morphotropic relations of N, P, As and Sb*. The present paper deals only with Mg_3As_2 and Zn_3As_2 . Mg arsenide was prepd. by heating Mg and a slight excess of As out of contact of air. Thus prepd. it was gray with a metallic aspect, fragile, microcryst., d. 3.165, and m. 800° . Analysis showed Mg_3As_2 . Zn arsenide was prepd. by heating the calcd. proportions of Zn and As at 800° out of contact of air, under which conditions it was a compact but fragile mass with conchoid fracture and d. 5.578. Analysis showed Zn_3As_2 . Both Mg_3As_2 and Zn_3As_2 were examd. with x-rays by the powder method, radiation from a Philips electron tube and a Cu anticathode being used. Each has a cubic lattice contg. 2 mol. of Me_3As_2 in the elementary cell. Zn_3As_2 has an elementary cell with $a = 5.81$ A. U. and a calcd. d. of 5.854 and Mg_3As_2 has an elementary cell with $a = 6.10$ A. U. and a calcd. d. of 3.26. The arrangement of the atoms in the lattice of Mg_3As_2 and of Zn_3As_2 represents a *new type of lattice structure*, which is defined by the coördinates: As = $(\frac{1}{4}, \frac{1}{4}, \frac{1}{4})$; $(\frac{3}{4}, \frac{3}{4}, \frac{3}{4})$; $(\frac{1}{4}, \frac{3}{4}, \frac{3}{4})$; $(\frac{3}{4}, \frac{1}{4}, \frac{3}{4})$ and Mg or Zn = $(\frac{1}{2}, 0, 0)$; $(0, \frac{1}{2}, 0)$; $(0, 0, \frac{1}{2})$; $(0, \frac{1}{2}, \frac{1}{2})$; $(\frac{1}{2}, 0, \frac{1}{2})$; $(\frac{1}{2}, \frac{1}{2}, 0)$. distance Mg-Mg is 3.05, that of Zn-Zn is 2.90, that of Zn-As is 2.52, that of As-Mg is 2.64, while that of As-As is 4.11 and 4.31 for Zn_3As_2 and Mg_3As_2 , resp. Based on these data, calcs. show the at. radii of Zn and of Mg to be 1.45 and 1.525 A. U., resp., values which correspond roughly to those of neutral Zn and Mg atoms calcd. from the lattices (1.33 and 1.02 A. U., resp.). From the distances Zn-As and Mg-As and the at. radii, the at. diam. of As is calcd. to be 1.19 and 1.02 A. U., resp., which is close to that of the neutral As atom calcd. by Goldschmidt (1.16 A. U.). The x-ray analysis shows that the structure of the arsenides is non-ionic, a conclusion which is confirmed by a detn. of the heat of formation. The heat of formation of Zn_3As_2 is 30.3 cal. per g.-mol., which is low in comparison with that of blende which

though²contg. only 1 atom of Zn in the mol. has a heat of formation of 43 cal. per g.-mol. C. C. DAVIS

The nitrites of platinum. II. I. I. CHERNYAEV. *Ann. inst. platine* 1927, No. 5, 102-18; *Chem. Zentr.* 1927, II, 1556-7; cf. *C. A.* 21, 2620 and following abstract.—In generalizing the rules given in the previous article C. states that in the complex compds. of Pt the stability of the union of a mol. or radical linked in a coordinative way may be weakened by the NO₂ group being in the *trans*-position; other acid radicals exert a weaker "*trans*-effect." This rule explains a series of reactions, which have been verified by C. Thus K₂PtCl₄ and K₂Pt(NO₂)₄ in H₂O give I, because after Cl has substituted the 1st NO₂ group in K₂Pt(NO₂)₄, the 2nd and 4th NO₂ groups are linked more loosely than the 3rd one. If it is assumed, however, that Cl in K₂PtCl₄ is replaced by NO₂, *trans*-K₂[Pt(NO₂)₂Cl₂] has first to be formed; then 2 mols. of *trans*-K₂[Pt(NO₂)₂Cl₂] will give 2 mols. of *cis*-K₂[Pt(NO₂)₂Cl₂]. Likewise *trans*-[Pt(NH₃)₂Cl₂] and *trans*-[Pt(NH₃)₂(NO₂)₂] in H₂O will yield *trans*-K₂[Pt(NH₃)₂Cl(NO₂)]; *trans*-[Pt(NO₂)₂(NH₃)Py] and *trans*-[PtCl₂(NH₃)Py] will give II (Py = pyridine). The displacement of a *cis*-group proceeds slowly; thus to complete the reaction: *cis*-[Pt(NH₃)₂(NO₂)₂] + *cis*-[Pt(NH₃)₂Cl₂] = 2 *cis*-[Pt(NH₃)₂Cl(NO₂)] heating for 10 hrs. on the waterbath is required. The compd. *cis*-[Pt(NH₃)₂Cl(NO₂)] may be cryst. from aq. NH₃, pyridine, H₂NCH₂CH₂NH₂, etc.; with AgNO₃ it becomes turbid only very slowly. Triamines of the quadrivalent Pt may be prep'd. from the corresponding triamines of the bivalent Pt in 2 ways: 2[A₁A₂A₃Pt(NO₂)]NO₂ + 8HCl = 2[A₁A₂A₃Pt(NO₂)Cl₂]Cl + N₂ + Cl₂ + 4H₂O, or: [A₁A₂A₃Pt(NO₂)Cl]Cl + Cl₂ = [A₁A₂A₃Pt(NO₂)Cl₂]Cl. Thus were obtained: [Pt(NH₃)₃(NO₂)Cl₂]Cl (yellowish plates), [Pt(NH₃)₃Py(NO₂)Cl₂]Cl (white needles), [Pt(NH₃)₃(H₃CNH₂)Py(NO₂)Cl₂]Cl (greenish yellow plates) and [Pt(NH₃)₃(EtNH₂)Py(NO₂)Cl₂]Cl (greenish yellow plates), in which the "Cl" in the inner sphere are always situated in *trans*-position to each other, with NH₃ or amines in *cis*-position. One of these Cl atoms may be replaced by the NO₂ group by means of NaNO₂. Under the influence of alkali, these compds. lose 1 mol. HCl. Thus the compds [A₁A₂Pt(NH₃)₂(NO₂)₂Cl₂] or [A₁A₂Pt(NH₃)₂(NO₂)₂Cl], resp., are formed, which with HCl will give the original salts. The expected compd. [Pt(NH₃)₂(NH₂)₂(NO₂)Cl₂] could not be isolated because it is probable that simultaneously the compd. [Pt(NH₃)₃(NO₂)Cl₂]OH was formed. In the compd. [Pt(NH₃)₃(NO₂)Cl₂]Cl reacting with NH₃, the activation of Cl caused by the Cl in *trans*-position gives rise to formation of [Pt(NH₃)₄(NO₂)Cl]Cl₂ even in the cold. This latter salt is converted into the greenish yellow [(NH₃)₄Pt(NH₂)(NO₂)Cl]Cl upon addn. of more NH₃ or alkali. Since in the compd. [Pt(NH₃)₄(NO₂)Cl]Cl₂ the inner Cl is situated opposite the NH₃, it is not exchanged for NH₃. The transition [Pt(NH₃)₄(NO₂)Cl]Cl₂ → [Pt(NH₃)₃(NH₂)(NO₂)Cl]Cl is entirely analogous to the transition MeNH₃Cl → MeNH₂ and therefore could be explained by the older structural theories (Jørgensen), but it does not follow from Werner's theory. C. did not succeed in splitting the salts of the cations [Pt(NH₂OH)Py(NH₃)(NO₂)]⁺ and [Pt(MeNH₂)Py(NH₃)(NO₂)]⁺ into optically active isomers, which agrees with the assumption that the coordinated radicals lie in a plane. The following salts were synthesized: *cis*-[PtPy₂(NO₂)(NH₃)₂(PtCl₄)] salt III (m about 100° (decompn.)) and salt IV (rose-colored plates). Since in contrast to salt V and similar salts, salt IV does not contain a ring structure, it is split by 10% HCl, while V is resistant towards HCl of all concns.



G. SCHWOCH

Platinum nitrites. III. I. I. CHERNYAEV. *Ann. inst. platine* 6, 23-39 (1928); cf. *C. A.* 21, 2620.—*cis*-Nitritochloroplatinates of the general type [A₂PtNO₂Cl]⁺ produced by the action of NH₃ or ethylenediamine on K₂[PtCl₂NO₂], ob-

tained by the action of NaNO_2 on K chloroplatinite. The complex $[\text{en PtClNO}_2]$ yields on treatment with excess of NH_3 the base $[\text{en NH}_3\text{PtNO}_2]\text{Cl}$, which with HCl gives the base $[\text{en NH}_3\text{PtCl}_3]\text{Cl}$, which reacts with alkali hydroxides to produce the amide $[\text{en NH}_2\text{PtCl}_3]$. Where pyridine is substituted for NH_3 in the above series of reactions, the trichlorotriammine base $[\text{en C}_5\text{H}_5\text{NPtCl}_3]\text{Cl} \cdot 2\text{H}_2\text{O}$ is produced, which with dil. alkalis yields $[\text{en C}_5\text{H}_5\text{NPtCl}_3]\text{OH}$; this, when dried at 140° , loses a mol. of water to form the imide $[\text{NH}_2 \cdot \text{CH}_2 \cdot \text{CH}_2 \cdot \text{NH} : (\text{C}_5\text{H}_5\text{N})\text{PtCl}_3] \cdot \text{H}_2\text{O}$. The substance $[\text{en C}_5\text{H}_5\text{NPtNO}_2]\text{Cl}$ reacts in soln. with Cl to yield $[\text{en C}_5\text{H}_5\text{NPtNO}_2\text{Cl}_2]\text{Cl}$, from which $[\text{en} (\text{C}_5\text{H}_5\text{N})(\text{NO}_2)_2\text{ClPt}]\text{Cl} \cdot 2\text{H}_2\text{O}$ is derived by the action of NaNO_2 , and this product again yields with 25% NH_3 $[\text{en} (\text{C}_5\text{H}_5\text{N})(\text{NO}_2)_2\text{ClPt}]\text{OH}$. NH_3 substitutes only one Cl atom of $[\text{en C}_5\text{H}_5\text{NPtNO}_2\text{Cl}_2]\text{Cl}$, the product being $[\text{en C}_5\text{H}_5\text{N} \cdot \text{PtNH}_2\text{NO}_2\text{Cl}]\text{Cl} \cdot 2\text{H}_2\text{O}$, readily convertible into $[\text{en C}_5\text{H}_5\text{NNH}_3\text{PtNO}_2\text{Cl}]\text{Cl}$ by the action of HCl. The *cis*-tetrammines yield Cleve's salt on reduction to bivalent Pt. The tetrammine $[\text{en} (\text{NH}_3)_4\text{PtNO}_2\text{Cl}]\text{Cl}_2$ is sepd. into its optical antipodes, for which $[\text{M}]_D$ is -137° and $+145^\circ$, resp. Two stereoisomerides of $[\text{en C}_5\text{H}_5\text{NPtNO}_2\text{Cl}_2]\text{Cl}$ are prepd. and 3 of $[\text{en NH}_3\text{PtNO}_2\text{Cl}_2]\text{Cl}$. When quadrivalent is reduced to bivalent Pt in these complexes, the 2 substituent groups which are attached to one coordinate are invariably eliminated. IV. *Ibid* 55-97.—The following nonelectrolytic nitrates

of bivalent Pt have been prepd.: dinitrodihydroxylaminoplatinum,
$$\begin{array}{c} \text{NO}_2 \\ \diagup \\ \text{Pt} \\ \diagdown \\ \text{Hx} \end{array} \begin{array}{c} \text{Hx} \\ \diagup \\ \text{Pt} \\ \diagdown \\ \text{NO}_2 \end{array} \quad (\text{Hx} =$$

NH_2OH), its stereoisomeride
$$\begin{array}{c} \text{Hx} \\ \diagup \\ \text{Pt} \\ \diagdown \\ \text{Hx} \end{array} \begin{array}{c} \text{NO}_2 \\ \diagup \\ \text{Pt} \\ \diagdown \\ \text{NO}_2 \end{array}, \text{dinitroplatinumdiammine}, \begin{array}{c} \text{NO}_2 \\ \diagup \\ \text{Pt} \\ \diagdown \\ \text{NH}_3 \end{array} \begin{array}{c} \text{NH}_2 \\ \diagup \\ \text{Pt} \\ \diagdown \\ \text{NO}_2 \end{array},$$

hydroxylaminodinitroplatinumammine, pyridinodinitroplatinumammine, ethylenediamminodinitroplatinum, dihydroxylaminonitrochloroplatinum, hydroxylaminonitrochloroplatinumammine, the corresponding deriv. with pyridine substituted in place of NH_3 , pyridinonitrochloroplatinumammine, ethylenediamminonitrochloroplatinum, nitrochloroplatinumdiammine. The following electrolytic salts of nitro derivs of bivalent Pt have been prepd.: trihydroxylaminonitroplatinum chloroplatinite, amminodihydroxylaminonitroplatinum chloroplatinite, diamminohydroxylaminonitroplatinum chloroplatinite, aminooethylenediamminonitroplatinous chloride, diamminopyridinonitroplatinous chloride, diamminopyridinonitroplatinous chloride, and its isomeride
$$\begin{array}{c} \text{C}_5\text{H}_5\text{N} \\ \diagup \\ \text{Pt} \\ \diagdown \\ \text{NH}_3 \end{array} \begin{array}{c} \text{NH}_2 \\ \diagup \\ \text{Pt} \\ \diagdown \\ \text{NO}_2 \end{array}$$

PtCl_4 , amminodipyridinonitroplatinum chloroplatinite, amminopyridinohydroxylaminonitroplatinum chloroplatinite,
$$\begin{array}{c} \text{Hx} \\ \diagup \\ \text{Pt} \\ \diagdown \\ \text{C}_5\text{H}_5\text{N} \end{array} \begin{array}{c} \text{NH}_2 \\ \diagup \\ \text{Pt} \\ \diagdown \\ \text{NO}_2 \end{array} \quad | \quad \text{PtCl}_4$$
, its isomerides,
$$\begin{array}{c} \text{C}_5\text{H}_5\text{N} \\ \diagup \\ \text{Pt} \\ \diagdown \\ \text{NH}_3 \end{array} \begin{array}{c} \text{Hx} \\ \diagup \\ \text{Pt} \\ \diagdown \\ \text{NO}_2 \end{array}$$

$$\begin{array}{c} \text{Hx} \\ \diagup \\ \text{Pt} \\ \diagdown \\ \text{NO}_2 \end{array} \begin{array}{c} \text{Hx} \\ \diagup \\ \text{Pt} \\ \diagdown \\ \text{NO}_2 \end{array} \quad \text{PtCl}_4 \cdot 2\text{H}_2\text{O}$$
 and
$$\begin{array}{c} \text{NH}_3 \\ \diagup \\ \text{Pt} \\ \diagdown \\ \text{C}_5\text{H}_5\text{N} \end{array} \begin{array}{c} \text{Hx} \\ \diagup \\ \text{Pt} \\ \diagdown \\ \text{NO}_2 \end{array} \quad \text{PtCl}_4$$
 and amminopyridinomethylaminonitroplatinum chloroplatinite. The complex
$$\begin{array}{c} \text{NH}_3 \\ \diagup \\ \text{Pt} \\ \diagdown \\ \text{NO}_2 \end{array} \begin{array}{c} \text{NH}_2 \cdot \text{CH}_2 \cdot \text{CH}_2 \cdot \text{NH}_2 \\ \diagup \\ \text{Pt} \\ \diagdown \\ \text{NH}_3 \end{array}$$

$$\begin{array}{c} \text{NH}_3 \\ \diagup \\ \text{Pt} \\ \diagdown \\ \text{NO}_2 \end{array} \begin{array}{c} \text{NH}_2 \\ \diagup \\ \text{Pt} \\ \diagdown \\ \text{NO}_2 \end{array} \quad \text{PtCl}_4$$
 is obtained by the interaction of the complex
$$\begin{array}{c} \text{NH}_3 \\ \diagup \\ \text{Pt} \\ \diagdown \\ \text{NO}_2 \end{array} \begin{array}{c} \text{NH}_2 \\ \diagup \\ \text{Pt} \\ \diagdown \\ \text{Cl} \end{array}$$
 with

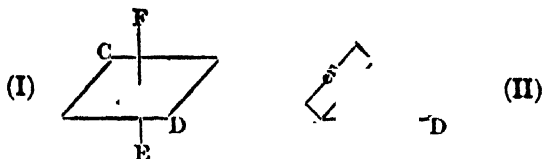
mol. of ethylenediamine and the addn. of K chloroplatinite. The complex
$$\begin{array}{c} \text{Hx} \\ \diagup \\ \text{Pt} \\ \diagdown \\ \text{NO}_2 \end{array} \begin{array}{c} \text{NH}_2 \cdot \text{CH}_2 \cdot \text{CH}_2 \cdot \text{NH}_2 \\ \diagup \\ \text{Pt} \\ \diagdown \\ \text{NH}_3 \end{array} \quad \text{PtCl}_4$$
 is obtained in an analogous way

from
$$\begin{array}{c} \text{NO}_2 \\ \diagup \\ \text{Pt} \\ \diagdown \\ \text{Hx} \end{array} \begin{array}{c} \text{NH}_3 \\ \diagup \\ \text{Pt} \\ \diagdown \\ \text{Cl} \end{array}$$
 and the following complexes are prepd. similarly:
$$\begin{array}{c} \text{NH}_3 \\ \diagup \\ \text{Pt} \\ \diagdown \\ \text{NO}_2 \end{array} \begin{array}{c} \text{NH}_2 \cdot \text{CH}_2 \cdot \text{CH}_2 \cdot \text{NH}_2 \\ \diagup \\ \text{Pt} \\ \diagdown \\ \text{NH}_3 \end{array} \quad \text{PtCl}_4$$
,
$$\begin{array}{c} \text{NH}_3 \\ \diagup \\ \text{Pt} \\ \diagdown \\ \text{NO}_2 \end{array} \begin{array}{c} \text{NH}_2 \cdot \text{CH}_2 \cdot \text{CH}_2 \cdot \text{NH}_2 \\ \diagup \\ \text{Pt} \\ \diagdown \\ \text{Hx} \end{array} \quad \text{PtCl}_4$$
 and

$$\begin{array}{c} \text{NH}_3 \\ \diagup \\ \text{Pt} \\ \diagdown \\ \text{NO}_2 \end{array} \begin{array}{c} \text{NH}_2 \cdot \text{CH}_2 \cdot \text{CH}_2 \cdot \text{NH}_2 \\ \diagup \\ \text{Pt} \\ \diagdown \\ \text{NO}_2 \end{array} \quad \text{SO}_4$$
. Formula indicating the space orientation

of quadrivalent Pt bases are written $[\text{ABCDEFPt}]$, where A to F represents groups substituted within the octahedron in the order shown in formulas (I) and (II), the latter applying to ring derivs. contg. ethylenediamine. The following nonelectrolytic

derivs. of quadrivalent Pt are prepd. and described: *nitrotrichloroplatinumdiammine*, $[\text{NH}_2\text{CINH}_2\text{NO}_2\text{Cl}_2\text{Pt}]$, *pyridinonitrotrichloroplatinumammine*, $[\text{C}_5\text{H}_5\text{NNH}_2\text{NO}_2\text{Cl}_2\text{Pt}]$, and *ethylenediaminonitrotrichloroplatinum*, $[\text{en NO}_2\text{Cl}_2\text{Pt}]$. The following electrolytic quadrivalent Pt derivs. are prepd. and described: *triamminonitrodichloroplatinum chloride*, $[(\text{NH}_3)_3\text{NO}_2\text{Cl}_2\text{Pt}]\text{Cl}$, *triamminodinitrochloroplatinum chloride*, $[(\text{NH}_3)_3(\text{NO}_2)_2\text{ClPt}]\text{Cl}$, *diamminopyridinonitrodichloroplatinum chloride*, $[\text{C}_5\text{H}_5\text{NNH}_2\text{NO}_2\text{NH}_2\text{ClPt}]\text{Cl}$, optically active *diamminopyridinodinitrochloroplatinum chloride*, $[\text{C}_5\text{H}_5\text{NNH}_2\text{NO}_2\text{NH}_2\text{NO}_2\text{ClPt}]\text{Cl}$, *amminopyridinomethylaminodichloroplatinumammine chloride*, $[\text{C}_5\text{H}_5\text{NNH}_2\text{NH}_2\text{MeNO}_2\text{Cl}_2\text{Pt}]\text{Cl}$, optically active *amminopyridinomethylaminodinitrochloroplatinum chloride*, $[\text{C}_5\text{H}_5\text{NNH}_2\text{NH}_2\text{MeNO}_2\text{NO}_2\text{ClPt}]\text{Cl}$, *ethylenediaminopyridinonitrodichloroplatinum chloride*, $[\text{en C}_5\text{H}_5\text{NNO}_2\text{Cl}_2\text{Pt}]\text{Cl}$, its dextrorotatory stereoisomeride, $[\text{en C}_5\text{H}_5\text{NCINO}_2\text{ClPt}]\text{Cl} \cdot 2\text{H}_2\text{O}$, *d-ethylenediaminopyridinodinitrochloroplatinum chloride*, $[\text{en C}_5\text{H}_5\text{NNO}_2\text{ClNO}_2\text{Pt}]\text{Cl} \cdot 2\text{H}_2\text{O}$, *ethylenediaminopyridinotrichloroplatinum chloride*, $[\text{en C}_5\text{H}_5\text{NCl}_3\text{Pt}]\text{Cl}$, *amminothylenediaminonitrodichloroplatinum chloride*, $[\text{en NO}_2\text{NH}_2\text{Cl}_2\text{Pt}]\text{Cl}$, its *d*- and *l*-isomerides, $[\text{en NH}_2\text{ClNO}_2\text{ClPt}]\text{Cl}$ and $[\text{en NO}_2\text{ClNH}_2\text{ClPt}]\text{Cl} \cdot \text{H}_2\text{O}$, *amminoethylenediaminotrichloroplatinum chloride*, $[\text{en NH}_2\text{Cl}_3\text{Pt}]\text{Cl}$, *tetramminonitrochloroplatinum chloride*, $[(\text{NH}_3)_4\text{NO}_2\text{CINH}_2\text{Pt}]\text{Cl}$, optically active *triamminopyridinonitrochloroplatinum chloride*, $[\text{NH}_3\text{C}_5\text{H}_5\text{NNH}_2\text{NO}_2\text{NH}_2\text{ClPt}]\text{Cl} \cdot \text{H}_2\text{O}$, *l-diamminoethylenediaminodichloroplatinum chloride*, $[\text{en NH}_2\text{CINH}_2\text{ClPt}]\text{Cl}$, *l-diamminoethylenediaminonitrochloroplatinum chloride*, $[\text{en NH}_2\text{NO}_2\text{NH}_2\text{ClPt}]\text{Cl}$, optically active *amminoethylenediaminopyridinodichloroplatinum chloride*, $[\text{en C}_5\text{H}_5\text{NCINH}_2\text{ClPt}]\text{Cl} \cdot \text{H}_2\text{O}$, and optically active *amminoethylenediaminopyridinonitrochloroplatinum chloride*, $[\text{en C}_5\text{H}_5\text{NNO}_2\text{NH}_2\text{ClPt}]\text{Cl}$.



B. C. A.

Vanadium compounds and boiling sulfuric acid. A. SIEVERTS AND E. L. MÜLLER. *Z. anorg. allgem. Chem.* 173, 313–23 (1928).—Boiling concd. H_2SO_4 effects partial reduction of V_2O_5 to vanadyl sulfate and partial oxidation of vanadyl sulfate to V_2O_5 . If more than 0.12 g. of V per 100 cc. of acid is present, the salt, VOSO_4 , seps. (cf. Auger, *C. A.* 16, 31). In the presence of $(\text{NH}_4)_2\text{SO}_4$ both quinquevalent and quadrivalent V are completely reduced to the tervalent state by boiling concd. H_2SO_4 and the salt, $\text{NH}_4\text{V}^{III}(\text{SO}_4)_2$, seps. (cf. Rosenheim and Mong, *C. A.* 20, 2626). H_2SO_4 and K_2SO_4 decompose vanadyl sulfate into equimol. proportions of vanadic acid and the salt, $\text{KV}^{III}(\text{SO}_4)_2$ (cf. Eichner, *C. A.* 22, 550).

B. C. A.

Pseudo halogens. III. Tricyanomethyl and bromine tricyanomethylide. L. BIRKENBACH AND K. HUTTNER. *Ber.* 62B, 153–63 (1929); cf. *C. A.* 20, 345.— $\text{BrC}(\text{CN})_3$ is prepd. from $\text{AgC}(\text{CN})_3$ by treating at -10° with Br_2 in abs. Et_2O . *Silver tricyanomethylide* is obtained by treating disodium malononitrile with BrCN in alc. soln. The alc. is distd. off and the residue taken up with Et_2O to remove impurities. Further discoloration is obtained by treating the aq. soln. with charcoal. With NH_4OH and AgNO_3 the bromide is taken away. The filtrate contg. $\text{NaC}(\text{CN})_3$ acidified with HNO_3 gives $\text{AgC}(\text{CN})_3$ after the addn. of AgNO_3 . After dissolving in concd. NH_4OH and filtering, HNO_3 is added. A white salt is formed, which is stable to light. The nomenclature is discussed; $\text{HC}(\text{CN})_3$ is called *hydrogen tricyanomethylide* and the H_2O soln., *hydrotricyanomethylidic acid*. The degree of dissocn. is about equal to that of the halogen acids. $\text{BrC}(\text{CN})_3$ has oxidizing action. The $\text{C}(\text{CN})_3$ group is more electronegative than the Br part. $\text{BrC}(\text{CN})_3$ is sol. in most solvents. At 68° it changes from white to yellow-red and melts at 72° with decompn. to a red liquid. The cond. of the microbenzene soln. is detd.

E. SCHOTTE

Optical activity of platinum. I. I. CHERNYAEV. *Ann. inst. platine* 6, 40–55 (1928).—Two of the stereoisomerides of the complex $[\text{en NH}_2\text{PtCl}_2\text{NO}_2]\text{Cl}$ are resolved into optical antipodes, as are the complexes $[\text{en C}_5\text{H}_5\text{NPtNO}_2\text{Cl}_2]\text{OH}$ and $[\text{en}(\text{NH}_3)_2\text{PtCl}_2]\text{Cl}_2$. Stereoisomerism has a profound influence on the magnitude of the rotatory power and of the dispersion coeff. The application of the amino reaction, leading to the production of $[\text{en NH}_2\text{PtNO}_2\text{Cl}_2]$, brings about a change of sign of rotation, the appearance or the enhancement of Cotton's effect, and an increase in the abs. value of mol. rotation. The inversion of rotation takes place with ionic velocity and is completely reversible and the same applies to that of triamines and tetramines. *trans*-Trichlorotriamines react with ammonia to form *cis*-dichlorotetramines. Inversion of optical rotation is brought about by alkalis only in those complexes into the nucleus of which NH_3 enters.

B. C. A.

Reduction of dichromate to basic chromic salts. G. GRASSER AND T. NAGAHAMA. *J. Faculty Agr. Hokkaido Imp. Univ.* 24, No. 1, 25-38(1928). (In German).—Portions of $K_2Cr_2O_7$ soln. were boiled with 12 reducing agents without acid. Solns. were subjected to perchromate test for chromate, pos. tests indicating incomplete reduction. None of the agents tested gave complete reduction without acid. The amts. of H_2SO_4 , HCl , $AcOH$ and $HCOOH$ necessary to effect complete reduction with each agent were similarly detd. Of the acids, HCl was much more effective than $AcOH$ or $HCOOH$, and of the reducing agents, tartaric and lactic acids required the least acid.

H. B. MERRILL

Reactions of alkaline molybdates on malic and tartaric esters. F. DARMON. *Faculte de Sci., Paris. Bull. soc. chim.* 43, 1214-29(1928).—The reactions of molybdates on Et malate were studied at 80° and the rotation was studied as a function of time and concn. With MoO_3 and varying amts. of $NaOH$ the mutarotation increases until the soln. contains $MoO_3 + 2NaOH$, and then with more $NaOH$ it becomes less rapid. With the mixt. $2NH_4HMoO_4 + C_4H_4O_6(C_2H_5)_2$ sapon. takes place with the formation of a levorotatory complex and then complete decompn. of the malate with the formation of a dextrorotatory salt, showing the reaction to take place in 2 steps. With Na_2MoO_4 the complexes formed are of the type $MoO_3 \cdot 2C_4H_4O_6$. Tartaric acid and tartrates show exactly analogous reactions.

E. G. VAN DEN BOSCHE

Reaction between nitrogen peroxide and sulfur dioxide. E. BRINER, G. H. LUNGE AND A. VAN DER WIJK. *Helv. Chim. Acta* 11, 1125-44(1928).—The method for the study of the reaction between N_2O_4 and SO_2 has been elaborated on. In the liquid phase the reaction is: $\frac{1}{2}N_2O_4 + 2SO_2 \rightarrow S_2N_2O_8$ (I) + NO . I behaves as the anhydride of nitrosylsulfuric acid when treated with water, alkali, or SO_2 . It is stable at ordinary temps., but decomposes when heated into S_2NO_7 and N_2O_4 . The reaction between SO_2 and N_2O_4 in liquid forms is exothermic, 112 cal. In the gaseous phase the reaction takes place rather slowly at ordinary temps. and pressures and more rapidly at higher temps. The av. N content of reaction products above 80° is lower than that for I. In the presence of catalysts this reaction is very rapid but not complete.

FRIEDRICK C. HAHN

The molecular weight and constitution of hypophosphoric acid. ARTHUR ROSENHEIM AND HEINZ ZILG. *Z. physik. Chem., Abt. A*, 139, 12-21(1928).—The decomposition of hypophosphoric acid in aq. soln. into H_3PO_3 and H_3PO_4 is catalyzed by H ions. The rate of the hydrolysis corresponds to a monomol. reaction. This indicates that the formula of the acid is $H_4P_2O_6$ rather than $H_2P_2O_6$. This result agrees with the cryoscopic measurements of Cornec (*C. A.* 4, 725), but is contrary to the mol.-wt. detns. of the alkyl hypophosphates by Rosenheim (*C. A.* 4, 2778). A summary of the properties of the acid leads to the conclusion that the valence of the P atoms is 4 and that the formula is best represented by the coordination $[O_3P \dots PO_3]H_4$. Several new compds. of the acid were prepd. in order to study further the analogy between the hypophosphates and the pyrophosphates. These include the new sesquihydrate of the sodium salt, $Na_2P_2O_6 \cdot 1.5H_2O$ (I), the sodium ammonium salt, $Na_2(NH_4)_2P_2O_6 \cdot 7H_2O$ (II), the complex ammonium chromium phosphate, $(NH_4)_3[CrP_2O_6] \cdot 5H_2O$ (III), and the complex Cu and Ni salts, $(NH_4)[CuP_2O_6] \cdot 4H_2O$ (IV) and $Na_2[NiP_2O_6] \cdot 12H_2O$ (V). The transition pt. between I and the decahydrate lies at 74.6° . The electrolysis of solns. of IV and V indicate that the heavy metallic atom is in the anion.

H. F. JOHNSTONE

Synthesis of hypophosphorous acid. T. MILOBEDZKI AND J. WALCZYNSKA. *Poznanski Chem.* 8, 486-500 (501 French)(1928).—The synthesis of the ethyl ester of hypophosphorous acid was based on the following reaction: $(C_2H_5O)_2(O)PCl + NaOP(OC_2H_5)_2 \rightarrow NaCl + (C_2H_5O)_4P_2O_2$ (I) (cf. *C. A.* 21, 2457). The same product, bp. 114° , is obtained by the action of the chlorides of esters of phosphorous acid on the Na salts of esters of phosphoric acid: $(RO)_2(O)PCl + (NaO)OP(OR)_2 \rightarrow NaCl + (RO)_4P_2O_2$. The dissocn. of I gives diethyl phosphite and metaphosphoric acid: $(C_2H_5O)_4P_2O_2 \rightarrow (C_2H_5O)_2POH + HPO_3$. By dissocn. of menthyl hypophosphite menthene is obtained: $(C_{10}H_{19}O)_4P_2O_2 \rightarrow H_4P_2O_6 + 4C_{10}H_{18}$. These reactions lead for the first time to the synthesis of $H_4P_2O_6$.

JAROSLAV KUCERA

A new fluoboric acid. A. TRAVERS AND MALAPRADE. *Compt. rend.* 187, 765-7(1928).— $H_3PO_3 + 4HF$ is neutralized with KOH . The neutralization curve shows that H_3PO_3 reacts instantaneously with HF to form a new fluoboric acid, the salt of which is easily decompd. by alkali. Tetrafluoboric acid, HBF_4 , is then formed slowly, particularly in a cold medium, until equil. between the 2 fluoboric acids is established. The time taken and the amt. of the latter formed at equil. increase with the concn. of the reagents and the initial acidity of the mixt.

ALBERT L. HENNE

Silicic acids. W. DILTHEY AND E. HÖLTERHOFF. Univ. Bonn. *Ber.* 62B, 24–31 (1929).—The reaction $4\text{Ph}_3\text{COH} + \text{SiCl}_4 = 4\text{Ph}_3\text{CCl} + \text{Si(OH)}_4$ was performed in abs. Et_2O at varying temps. with 4.5 mols. of Ph_3COH . The H_2O content of the hydrates obtained ranged from 26.2 to 29.6%, Si(OH)_4 having 37.5% H_2O . With 3 mols. of Ph_3COH a product was obtained with about 1% higher H_2O content than H_2SiO_3 . Drying and rewetting of a product with 27.3% H_2O gave a const. product with about 25% moisture. The H_2O must be bound constitutionally. There is a possibility that H_2O is split off intramol., followed by polymerization of Si(OH)_4 to $(\text{HO})_3\text{SiOSi(OH)}_3 \rightarrow (\text{HO})_3\text{SiOSi(OH)}_2\text{OSi(OH)}_3 \rightarrow (\text{HO})_3\text{SiO}[\text{Si(OH)}_2]_n\text{OSi(OH)}_3$. For $n = 4$ the H_2O content is 25.1% (cf. C. A. 23, 787). The reaction carried out in different org. media at varying temps. gives varying H_2O contents. V. R. SCHWARZ AND H. RICHTER. *Ibid.* 31–6; cf. C. A. 22, 4028.—The gels from SiCl_4 made at 0° and dehydrated with org. liquids and liquid NH_3 (cf. C. A. 22, 3365) contain the hydrate $\text{SiO}_2 \cdot \text{H}_2\text{O}$. With liquid NH_3 the hydrate seems to undergo a partial dehydration. On raising the working temp. to 100° , hydrates with lower H_2O content were obtained. E. SCHOTTE

Per-acids of uranium, tantalum and niobium. A. SIEVERTS AND E. L. MÜLLER. *Z. anorg. allgem. Chem.* 173, 297–312 (1928).—Peruranic acid may be prepd. either by addn. of excess of 3% H_2O_2 soln. to a soln. of uranyl nitrate or by treating UO_3 with H_2O_2 . Pertantallic and pernibic acids are obtained by treating the corresponding K salts in concd. aq. soln. with the requisite quantity of H_2SO_4 . The acids are finely divided white and yellow powders, resp., contg. one atom of active O to one atom of metal. Both tantalic and niobic acids dissolve in 3% H_2O_2 , forming opalescent solns.; pertantallic acid is pptd. by alc. or NaCl from the soln. but pernibic acid cannot be isolated thus. B. C. A.

Spectrochemical studies on complex formations between mercuric salts and other metallic salts in dilute aqueous solutions. II. TOSHI INOUE. Tokyo Imp. Univ. *Japan J. Chem.* 3, 147–63 (1928); cf. C. A. 16, 2075, 3588; 17, 2217; 22, 1741.—The max. points in the absorption curves given by dil. solns. (concn. $1/15$ to $3/10$ N, where N denotes normality with respect to the Hg atom in the reaction product) contg. mixts. of Hg(CN)_2 with the chlorides of NH_4 , Na, K, Mg, Cd, Ca, Sr, Ba, Mn, Co and La indicate that the complex ion $[\text{Hg(CN)}_2\text{Cl}]^-$ may exist in aq. soln. Hg(CN)_2 in mixts. with the bromides of NH_4 , Na, K, Ca, Sr and Ba (concn. of soln.-mixts. $1/10$ to $1/2$ N) forms the complex ion $[\text{Hg(CN)}_2\text{Br}_2]^{--}$. With the thiocyanates of NH_4 , Na, K, Ca, Ba and Mg and in soln.-mixts. of concn. $1/10$ to $1/300$ N, the complex ion formed is $[\text{Hg(CN)}_2(\text{SCN})_2]^{--}$. In mixts. of dil. solns. of Hg(CN)_2 with the iodides of Na, K, Ca and Ba the complex ion $[\text{Hg(CN)}_2\text{I}_2]^{--}$ is produced, which on standing changes to $[\text{HgI}_4]^{--}$. With ZnI_2 and CdI_2 the ion $[\text{HgI}_4]^{--}$ is formed directly. Spectrochemical studies on the systems Hg(CN)_2 , $\text{K}_2\text{S}_2\text{O}_8$ and Hg(CN)_2 - AcONa in 0.1 M soln. show the existence of the complex salts $[\text{Hg(CN)}_2\text{S}_2\text{O}_8]\text{K}_2$ (Fock and Krüss, *Ber.* 24, 1355 (1891)) and $[\text{Hg(CN)}_2(\text{AcO})]\text{Na}$. LOUISE KELLEY

Spectrochemical studies on complex formations between mercuric salts and other metallic salts in dilute aqueous solutions. I. TOSHI INOUE. Tokyo Imp. Univ. *Japan J. Chem.* 3, 131–46 (1928).—See C. A. 22, 1741. LOUISE KELLEY

A spectroscopic method of studying the formation of complex salts in dilute solution. II. YUJI SHIBATA AND TOSHI INOUE. Tokyo Imp. Univ. *Japan J. Chem.* 2, 109–15 (1926); cf. C. A. 16, 2075, 3588; 17, 2217; 22, 1741.—Making use of the method described previously, S. and I. have studied the formation of complex salts in dil. soln. Stable in 0.005 M soln. were HgCl_2 - LiCl (1:1); HgCl_2 - NaCl (1:1); HgCl_2 - KCl (1:1); HgCl_2 - NH_4Cl (1:1); HgCl_2 - NaBr (1:1). Stable in 0.0025 M soln. were HgCl_2 - MgCl_2 (1:1); HgCl_2 - SrCl_2 (1:1); HgCl_2 - BaCl_2 (1:1); HgCl_2 - CoCl_2 (1:1). Stable in 0.002 M soln. were HgCl_2 - AlCl_3 (1:1); HgCl_2 - $[\text{Co(NH}_3)_6\text{Cl}_3]$ (1:1). Stable in 0.0005 M soln. were HgCl_2 - KBr (1:4); HgCl_2 - NH_4Br (1:4); HgCl_2 - ZnBr_2 (1:2); HgCl_2 - CdBr_2 (1:2); HgCl_2 - KSCN (1:3); HgCl_2 - Co(SCN)_3 (1:3). Stable in 0.00025 M soln. was HgCl_2 - CdI_2 (1:2). These complex salts are similarly constructed, with Hg as the central metallic atom. The stability of the complex salts which contain HgCl_2 and other metallic chlorides increases with the no. of Cl atoms in the complex radical. The complex salts formed from HgCl_2 and NH_4Cl , CoCl_2 , MgCl_2 and Co(SCN)_3 are more stable in alc. than in aq. solns. LOUISE KELLEY

Spatial arrangement and rotatory dispersion of optically active complex salts of cobalt and rhodium. F. M. JAEGER AND H. B. BLUMENDAL. *Proc. Acad. Sci. Amsterdam* 31, 637–50 (1928).—See C. A. 22, 3596. E. H.

"Titanium cyanonitride" and the titanium oxychlorides. ERNEST A. RUDGE AND FRANCIS ARNALL. *Tech. College, Cardiff. J. Soc. Chem. Ind.* 47, 376–80T (1928).—

The hard Cu-colored crystals found on the masonry of blast furnaces used for smelting Fe and supposed to be Ti cyanonitride ($\text{Ti}(\text{CN})_2 \cdot 3\text{Ti}_3\text{N}_2$) by Wöhler (*Ann. Pharm.* 73, 34(1850)) are found to be TiN in admixt. with C. *Titanium oxychloride*, $3\text{TiCl}_4 \cdot \text{TiO}_2$, is prepd. as yellow crystals by passing Cl_2 (dried over H_2SO_4) over TiN with the introduction of moisture. When Cl_2 is passed over the warmed Cu-colored crystals from the blast furnace, TiN, the yellow crystals and graphite are the products, no "Ti cyanochloride" being formed as supposed by Wöhler. J. BALOZIAN

Molybdenum selenides and selenomolybdates. E. WENDEHORST. *Z. anorg. allgem. Chem.* 173, 268-72(1928).—From a H_2SO_4 soln. of NH_4 molybdate hydrogen selenide ppts. brownish black Mo triselenide, which dissolves in solns. of alkali hydroxides, selenides and sulfides, giving deep red to brown solns. (cf. Moser and Atynski, *C. A.* 19, 1231). If the acid molybdate soln. is reduced with Zn until it becomes of a deep reddish brown color and is then satd. with H_2Se , dense brownish black leaflets of *dimolybdenum pentaselenide*, Mo_2Se_5 , are pptd. A mixt. of MoO_3 and Se when heated in H to dull redness yields *molybdenum diselenide*, MoSe_2 , in bluish black, glistening leaflets insol. in alkali solns. When a mixt. of K_2CO_3 , Se and MoO_3 is fused above 1200° , and the product leached with water, a residue of dark lead-gray crystals of *molybdenum sesquiselenide*, Mo_2Se_3 , is obtained. Satn. of a soln. of K_2MoO_4 in concd. KOH with H_2Se results in the sepn. of red needles of *K selenomolybdate*, K_2MoSe_4 . The Na salt cannot be prepd. under similar conditions, but the NH_4 salt, $(\text{NH}_4)_2\text{MoSe}_4$, is obtained in glistening, blue crystals from a soln. of molybdic acid in concd. NH_3 . All Se compds. of Mo prepd. in the wet way rapidly decompose on exposure to the air; their prepn. must therefore be carried out in an atm. of N. B. C. A.

Thio salts. VII. Polythiovanadates. L. FERNANDES. *Atti accad. Lincei* 8, 234-8(1928); cf. *C. A.* 22, 3598.—When $(\text{NH}_4)_2\text{VS}_4$ is treated with a strong acid, V_2S_5 is formed; if, however, H_2S is used, the intermediate products, NH_4VS_3 , $[\text{H}_2(\text{VS}_3)_2] \cdot (\text{NH}_4)_4$, analogous to the corresponding O salts are formed. Metathiovanadate, $\text{NH}_4\text{VS} \cdot 2\text{H}_2\text{O}$, is obtained by treating 12 g. of the normal thiovanadate with 5 cc $(\text{NH}_4)_2\text{S}$, and satg. the soln. with H_2S under pressure it is a dark-violet microcryst. product which is collected on a suction filter and washed with EtOH and Et_2O . Guanidine metathiovanadate, $\text{GuVS}_2 \cdot 2\text{H}_2\text{O}$, is obtained from the meta-salt by suspending the latter in a concd. soln. of Gu.HCl. $[\text{H}_2(\text{VS}_3)_2] \cdot (\text{NH}_4)_4 \cdot 18\text{H}_2\text{O}$ is made by satg. a soln. of $(\text{NH}_4)_2\text{VS}_4$ (12 g.) and $(\text{NH}_4)_2\text{S}$ (2 g.) with H_2S under pressure at 0° . The product is washed rapidly with EtOH and Et_2O . This is very unstable and when dry evolves NH_3 with such evolution of heat as to ignite the filter paper. If the above wet crystals are dropped into Gu.HCl soln., $[\text{H}_2(\text{VS}_3)_2] \cdot \text{Gu}_4 \cdot 18\text{H}_2\text{O}$ is formed, which is much more stable than the NH_4 salt. Added to ThCl soln. the salt, $[\text{H}_2(\text{VS}_3)_2] \cdot \text{Th}_4 \cdot 18\text{H}_2\text{O}$, is similarly formed. This product which is a lighter blue than the Gu salt is also much more stable than the NH_4 salt. A. W. CONTIERI

Complex compounds of gold with mercaptanic radicals. II. Residual affinities of chlorauric acid. PRAFULLA CHANDRA RAY AND KSHITISH CHANDRA BOSE-RAY. *J. Indian Chem. Soc.* 5, 527-33(1928).—Chlorauric acid reacts with some org. compds to form complex compds. in which the valence of the Au atom varies from 2 to 5 (cf. *C. A.* 19, 815). Triethylene tetrasulfide and 1,4-dithian also react with Au chloride yielding: (a) $\text{HAuCl}_2(\text{C}_2\text{H}_4\text{S})_2$ or $2\text{AuCl} \cdot \text{HCl}(\text{C}_2\text{H}_4\text{S})_2$, (b) $\text{AuCl}(\text{C}_2\text{H}_4\text{S})_2$, (c) $2(\text{H}) \cdot \text{AuCl}_2 \cdot 3(\text{C}_2\text{H}_4\text{S})_2 \cdot 2\text{H}_2\text{O}$, (d) $\text{KAuCl}_4 \cdot 3[(\text{C}_2\text{H}_4\text{S})_2] \cdot 4\text{H}_2\text{O}$, (e) $(\text{H})\text{KAuCl}_4 \cdot 3[(\text{C}_2\text{H}_4\text{S})_2] \cdot 2\text{H}_2\text{O}$, and (f) $\text{AuCl}(\text{C}_2\text{H}_4\text{S})_2$. When assocd. with metallic chlorides, the dithian seems to be polymerized into triethylene trisulfide. Compound (e) is acidic, dibasic and furnishes 4 ions in aq. soln. When NH_3 acts on (a), compds. having the formulas $\text{Au}_3\text{Cl}_2 \cdot 6\text{NH}_3$ and $\text{AuCl} \cdot \text{NH}_3$ are formed. With NH_4OH (c) produces $\text{Au}(\text{NH}_3)_2 \cdot 1\frac{1}{2}\text{H}_2\text{O}$. All 3 of these NH_3 complexes are explosive. Pyridine replaces the dithian more or less completely. Directions for prepn. of each complex and the analysis on which the compn. is based are given for each compd. F. E. BROWN

Compounds of hexamethylenetetramine with certain salts of silver and other metals and the influence of anionic volume on the capacity for association by the central positive atom. PRIYADARANJAN RAY AND JYOTIRMOY DAS-GUPTA. *J. Indian Chem. Soc.* 5, No. 5, 519-25(1928).—Ephriam believes that increase in vol. of anions increases the capacity of most cations to assoc. with natural mols. like NH_3 and H_2O . But the reverse is the case when one considers assocn. of NH_3 with salts of Ag formed from the anions: F^- , Cl^- , Br^- and I^- ; and with the anions: ClO_3^- , BrO_3^- , IO_3^- , ClO_4^- , BrO_4^- , IO_4^- , MnO_4^- , NO_2^- and NO_3^- . When hexamethylenetetramine is substituted for NH_3 , in all cases except that of AgF and AgCl , increase in vol. of an anion increased the ability of the Ag ion to assoc. with neutral mols. The following compds. were prepd., where B indicates a mol. of hexamethylenetetramine: $3\text{AgCN} \cdot \text{B}$; 2Ag

CNO.B ; 2AgCNS.B ; $\text{AgClO}_4.\text{B}$; $\text{Ag}_2\text{CrO}_4.\text{B}$; $4\text{Ag}_2\text{CrO}_7.5\text{B}.4\text{H}_2\text{O}$; $\text{Ag}_2\text{MoO}_4.2\text{B}.2\text{H}_2\text{O}$; $\text{Ag}_2\text{WO}_4.2\text{B}.2\text{H}_2\text{O}$; $2\text{Ag}_2\text{SO}_4.3\text{B}.6\text{H}_2\text{O}$; $4\text{Ag}_2\text{SO}_4.5\text{B}.13\text{H}_2\text{O}$; and $\text{Ag}_2\text{SeO}_4.2\text{B}.12\text{H}_2\text{O}$. These complexes are generally insol. in H_2O . They may be formed by dissolving the simple salt in concd. NH_4OH solns. and adding a strong soln. of $(\text{CH}_3)_4\text{N}_4$. On heating, NH_3 evaps. and the hexamine complex ppts. The following series was prepd.: $3\text{CuCN}.2\text{B}$; $3\text{Cd}(\text{CN})_2.\text{B}$; $3\text{AgCN}.\text{B}$. Since Ag and Cd have about the same vol. and Cu has a smaller vol., it seems that decrease in vol. of the central atom of a complex increases its capacity to assoc. with mols. These complex amines are: sol. in NH_4OH solns., decompd. by mineral acids with evolution of CH_2O , decompd. by caustic alkalis with the formation of metallic oxides, decompd. by heating, with charring,* and a fishy odor as of amines. With CuCN , $\text{C}_6\text{H}_5\text{CO}_2\text{Ag}$, Ag_2SO_4 and $\text{C}_6\text{H}_5(\text{HCO})_2\text{Ag}$ unstable complexes of undetd. compn. were prepd. Methods for prepn. and analysis, and results of analyses are given. F. E. BROWN

Bi in pharmacy and chemistry (DYSON) 17.

LATIMER, WENDELL M., AND HILDEBRAND, JOEL H: **Reference Book of Inorganic Chemistry**. New York: The Macmillan Co. 442 pp. \$3.75.

7—ANALYTICAL CHEMISTRY

W. T. HALL

Need of and opportunity for precise analysis. STEPHEN POPOFF. *Chem. Bull.* (Chicago) 16, 43-5, 70(1929).—Many interesting points are touched upon in this paper, and among other things the inadequacy of uncalibrated "Class S" weights is pointed out. W. T. H.

Quantitative analysis with the spectrograph. CHARLES C. NITCHE. New Jersey Zinc Co. *Ind. Eng. Chem., Analytical Ed.* 1, 1-7(1929).—The speed, sensitiveness and certainty of spectrographic methods for the detection of small quantities of impurities and minor constituents are pointed out and the general principles discussed upon which quant. spectroscopic measurements are based, with particular reference to methods developed in the labs. of the N. J. Zinc Co. W. T. H.

Elementary centigram analysis. I. Determination of carbon and hydrogen with automatic regulation of combustion. II. Determination of nitrogen. BOGUSLAW BOBRANSKI AND EDWARD SUCHARDA. *Roczniki Chem.* 8, 290-323 (323-4 French) (1928).—The method described for detg. C and H is similar to that described by Pregl. The combustion is carried out in a hard glass tube contg. Ag gauze, $\text{CuO} + \text{PbCrO}_4$, platinized asbestos, Ag gauze, PbO_2 , and Ag gauze. Each layer is sepd. from the successive layer by a small asbestos plug. The platinized asbestos layer is compressed in such a way as to form a plug, by means of which the rate of flow of the tube is regulated. A large contact surface of $\text{CuO} + \text{PbCrO}_4$ is assured by pptg. these substances on pure pumice. The layer of PbO_2 is maintained at the temp. of $190-200^\circ$ by an oil bath. The products of combustion, H_2O and CO_2 , are absorbed in the app. of Blumer (*C. A.* 12, 642). The detn. of N is based also on the principle of microanalysis of Pregl, the app. being modified for larger quantities of substance used. N is collected in an azotometer, the upper part of which, having a vol. of 8 cc., is graduated in 0.02 of cc. After the vol. of N_2 is read, it is necessary, however, to subtract 1.2% as a correction due to the adhesion of potash to the glass. The app. is shown in 9 pictures. J. K.

Chemistry in the service of arsenals and military factories. ARLINDO VIANNA. *Boll. chim. farm.* 68, 7-8(1929).—A method is described for the rapid qual. analysis of steels for Cr, Mn, Si, Mo, W, Co, Al, Ti, V and Ni. G. SCHWOCH

Directions for the preparation of a "universal indicator" for estimating pH over a wide range. I. M. KOLTHOFF. Univ. Minnesota. *Pharm. Weekblad* 66, 67-70 (1929).—Objections to van Urk's universal indicator (*C. A.* 23, 752) are pointed out, e. g., the non-availability of 2 components, α -naphthalphthalein and cresolphthalein, the high concn. of cresolphthalein which causes a pptn. when 1 drop of the indicator is added to 10 cc. of soln., the lack of color contrasts for intervals of 1-2 units of the pH scale, and the absence of definite color changes beyond pH 7. A more satisfactory universal indicator proposed by K. is prepd. by mixing 0.1% solns. of the following: dimethyl yellow 15 cc., methyl red 5 cc., bromothymol blue 20 cc., phenolphthalein 20 cc., and thymolphthalein 20 cc. With 0.1 cc. of this mixt. per 10 cc. of soln., the colors

obtained at various p_H values are: 1.0 rose, 3.0 red orange, 4.0 orange, 5.0 yellow orange, 6.0 lemon yellow, 7.0 yellow green, 8.0 green, 9.0 blue green, 10.0 violet. A. W. D.

Urotropine as a microchemical reagent. I. M. KORENMAN. *Pharm. Zentralhalle* 70, 1-3(1929).—The salts of many of the heavy metals yield with $C_6H_{12}N_4$ cryst. ppts., for the most part sol. in water. This behavior renders possible the employment of urotropine as reagent in the microchem. detection of certain heavy metals. To this end a series of expts. was carried out with salts of Ag, Pb, Hg, Bi, Sn and Sb in connection with a 2% soln. of $C_6H_{12}N_4$, the resulting crystals being examd. microscopically and their forms illustrated. W. O. E.

Preparing a good tartaric acid reagent for the detection of potassium. GUIDO AJON. *Rivista ital. essenze profumi* 11, 6-7(1929).—Slowly mix 50 cc. of 2 *N* tartaric acid, 25 cc. 0.5 *N* NaOH and 25 cc. of 96° alc. Use the clear liquid as reagent. R. S.

Detection of the presence of reducing radicals in the systematic analysis for the acids. L. J. CURTMAN AND W. PLECHNER. College of the City of New York. *Chem. News* 138, 50-1(1929).—To 5 cc. of the neutral soln. add 0.5 cc. of 3 *N* H_2SO_4 and 2 drops of 0.1 *N* $KMnO_4$. Look for a bleaching effect, finally heating. The presence of 1 mg. of arsenite, sulfite, iodide, thiocyanate, nitrite, thiosulfate, sulfide, bromide or ferrocyanide is sufficient to cause bleaching in the cold and on heating 10 mg. of oxalate or tartrate and more than 10 mg. of cyanide will cause bleaching. This test gives an important clue in the qual. analysis of salts. W. T. H.

New methods for determining and separating metals with the aid of *o*-hydroxyquinoline. VII. Determination of iron, manganese, nickel and cobalt. Separation of iron from aluminum, manganese and alkaline earths. Separation of manganese from nickel, zinc and alkaline earths. R. BERG. Univ. Königsberg. *Z. anal. Chem.* 76, 191-204(1929); cf. C. A. 22, 1929.—As reagent either a 3-4% soln. of oxine in alc. or a 4% oxine acetate soln. was used. In the latter case, about 4 g. of oxine were dissolved in 8-10 cc. of AcOH and diluted with water to 100 cc.; this soln. keeps well Fe^{+++} in the presence of even 25% AcOH and NaOAc is pptd. quantitatively as greenish black $Fe(C_9H_7ON)_2$. The ppt. can be weighed after drying at 120° or ignited to Fe_2O_3 . Or, about 0.5 g. of ppt. can be dissolved in 200 cc. of 2 *N* HCl, treated with 10 cc. of 50% H_2PO_4 , oxidized with $KBrO_3$ -KBr soln. in the presence of KI and the excess of Br measured by titration of the displaced I with thiosulfate. Still another method, which is specially good in certain sepns., is to det. by a similar titration the excess of oxine. Mn gives a dull yellow ppt. of $Mn(C_9H_6ON)_2 \cdot 2H_2O$ in neutral or faintly acid solns. The ppt. does not lend itself readily to direct weighing but it can be ignited with oxalic acid. Titration of the excess oxine gives good results. Ni gives a greenish ppt. of $Ni(C_9H_6ON)_2 \cdot 2H_2O$ which becomes anhyd. by drying at 130°. The ppt. is formed in 5-10% AcOH soln. in the presence of AcOH. With Co a similar flesh-colored ppt. is obtained. Fe is sepd. from Al by making the Al ions form a complex with oxalic, malonic, tartaric or salicylic acid, etc. At the proper acid concn. the Fe will ppt. while the Al remains in soln. Thus in 100 cc. of soln. contain contg. 3 g. NH_4OAc , 3-4 g. of NH_4 tartrate and 15-20% AcOH, the pptn. of 0.05 g. of Fe in the presence of 0.10 g. of Al can be accomplished at 50° by the dropwise addn. of oxine acetate to the well stirred soln. After filtering, the excess oxine can be detd. by titration and in an aliquot part the Al can be detd. in faintly ammoniacal soln. by adding oxine as has been previously described. Excellent results were also obtained with malonic acid in place of tartrate. For sepg. Fe from alk. earths, the Fe can be pptd. as has been described and in the filtrate Mg detd. by pptn. with oxine in ammoniacal soln., Ca can be pptd. as oxalate, Sr as sulfate, Ba as sulfate. Similarly Fe can be sepd. from Be. For the sepn. of Fe from Mn, it is best to ppt. the Fe in the cold in 10% AcOH soln. contg. considerable acetate and then ppt. the Mn in ammoniacal soln. The compd. of oxine with Mn is very sensitive to acids and in that respect is very : Thus Mn can be sepd. from Zn or from Ca in much the same way as has been for the sepn. of Mg from Zn and Ca. The Zn forms a in which $p_H < 5$ while Mn requires a higher p_H value.

Utilization of the spectrophotometer in the determination of minute amounts of aluminum. E. W. SCHWARTZ AND RAYMOND M. HANN. *Science* 69, 167-70(1929).—The reaction between aurine tricarboxylic acid and Al^{+++} can be utilized for the detn. of very small quantities of Al and better results obtained with the spectrophotometer than with the colorimeter. Fuller details concerning the method are to be published later. W. T. H.

The volumetric determination of arsenic in the presence of organic substances, halogens and heavy metals. E. SCHULEK AND P. V. VILLECZ. K. Ung. Staatl. Hygien. Inst. Budapest. *Z. anal. Chem.* 76, 81-103(1929).—See C. A. 22, 3488. W. T. H.

Determination of beryllium as pyrophosphate and as anhydrous sulfate. V. ČUPR. *Inst. für anorg. Chem. Brunn. Z. anal. Chem.* **76**, 173-91(1929).—Attempts to det. Be as $\text{Be}_2\text{P}_2\text{O}_7$ by methods recommended for the detn. of Mg, Zn, Mn, etc., were all futile; the results all came out too high. If, however, the soln. is first made alk. to methyl red (p_H 6.3) so that $\text{Be}(\text{OH})_2$ or BeHPO_4 ppts. and then a slight excess of $(\text{NH}_4)_2\text{HPO}_4$ and enough acid added to make the soln. acid to methyl red (p_H 4.2), a normal ppt of BeNH_4PO_4 is obtained which yields the theoretical value for $\text{Be}_2\text{P}_2\text{O}_7$ upon ignition. The following procedure is recommended: To 250 cc. of cold Be^{++} soln. contg. 5-10 g. of NH_4 salt per 0.5 g. of expected $\text{Be}_2\text{P}_2\text{O}_7$, add concd. NH_4OH until the soln. is basic to methyl red. Then add 1-1.3 g. of $(\text{NH}_4)_2\text{HPO}_4$ and make acid to methyl red. Heat on the water bath until the amorphous ppt. of $\text{Be}(\text{OH})_2$ has changed to crvst $\text{BeNH}_4\text{PO}_4 \cdot x\text{H}_2\text{O}$. Cool, decant through a filter, and wash with 1% NH_4NO_3 soln. made alk. to methyl red with NH_4OH . Ignite and weigh. If the soln. contained HPO_4 originally, the ppt. produced by adding NH_4OH at the start will be Be phosphate instead of hydroxide and all that is necessary for the pptn. of a normal BeNH_4PO_4 ppt is to produce the proper concn. of H^+ as outlined above. Expts. were also tried in weighing BeSO_4 as such after heating at 400° and the results were excellent. Be present as salt of a volatile acid can, therefore, be detd. in this form. W. T. H.

Separation of beryllium from aluminum, iron and copper by means of o-hydroxyquinoline. M. NIESSNER. *Tech. Hochschule, Wien. Z. anal. Chem.* **76**, 135-45 (1929). Be does not form a ppt. with this reagent whereas Al, Fe and Cu give characteristic ppts. It is easy, therefore, to det. these cations as described by Berg and then, in the filtrate, the Be can be pptd. by adding NH_4OH and weighed as BeO . W. T. H.

Microtitrimetric determination of bismuth. JOHANN STRAUB. *Univ. Debrecen. Z. anal. Chem.* **76**, 108-12(1929).—The method depends upon the pptn. of BiOI , decompn. of the ppt. with KOH soln., oxidation of the iodide to iodate by Cl_2 , treatment of the KIO soln. with KI and titration of liberated I_2 with $\text{Na}_2\text{S}_2\text{O}_3$ soln. W. T. H.

New rapid method for determining cadmium. G. SPACU AND J. DICK. *Univ. Cluj. Bul. soc. stiinte Cluj* **4**, 241-4(1928).—The method is based on the formation of $[\text{CdPy}_4](\text{SCN})_2$. Use 50-100 cc. of Cd soln.; add 0.5-1 g. NH_4NCS ; boil; add 1 cc. pyridine to the boiling soln.; stir several times; allow to cool completely, filter through a Gooch filter; wash with (5 cc. pyridine + 3 g. NH_4NCS + 1000 cc. H_2O); wash 4-5 times with 25% alc. contg. some pyridine, add NH_4NCS ; wash 2 times with 1 cc. abs. alc. + 1 drop pyridine) and several times with (Et_2O + few drops pyridine). Dry by suction and then in a vacuum desiccator. The results are perfect, except in the presence of NH_4Cl (large amts.) or NH_4OAc (small quantities). It is very important that the Cd soln. should not ppt. at once, when adding pyridine (too concd. soln.), and that the soln. be very hot, since otherwise some $[\text{CdPy}_4](\text{SCN})_2$ will be formed. By long drying *in vacuo*, $[\text{CdPy}_4](\text{SCN})_2$ loses 2 mols. of pyridine. A. L. H.

New method for the volumetric determination of cobalt. G. A. BARBIERI. *Atti accad. Lincei* **8**, 405-8(1928).—When cobaltinitrites are decompd. by NaHCO_3 , NaNO_2 and a carbonate of trivalent Co are formed. On adding KMnO_4 in H_2SO_4 soln. the HNO_2 can be oxidized to HNO_3 and Co^{+++} reduced to Co^{++} so that for each atom of Co, 11 equivs. of KMnO_4 are reduced. To 10 cc. of the slightly acid Co^{++} soln. add 20 cc. of 50% NaNO_2 and 2 cc. of AcOH . Heat to boiling in a covered beaker and add dropwise 25 cc. of 20% KNO_3 soln. After 3-4 hrs. filter, wash with 5% KNO_3 soln. (150-200 cc.) till the wash water does not color KI paper and transfer the ppt. into a 500 cc. beaker. To the filtrate add 2-3 g. NaHCO_3 to ppt. any remaining $[\text{Co}(\text{NO}_2)_6]$, and again filter. To the ppt. add 15-20 g. NaHCO_3 and water and heat on water bath till clear liquid is obtained. Cool, run into dil. H_2SO_4 contg. an excess of 0.1% KMnO_4 through a sepg. funnel, the outlet of which must remain below the surface of the KMnO_4 soln. Then add standard FeSO_4 soln. in excess and finally titrate with KMnO_4 . A. W. CONTIERI

Low's short method for copper, modified. H. F. BRADLEY. *Chemist Analyst* **17**, No. 4, 14(1928).—Correction to C. A. **23**, 54. "Brown fumes" should read *brown oxides of Mn* and "133 cc. of concd. NH_4OH " should read 13 cc. W. T. H.

Effect of various salts on the electrolytic determination of copper. A. JULIARD AND J. LEDRUT. *Univ. Bruxelles. Bull. soc. chim. Belg.* **7**, 377-84(1928).—Traces of KClO_4 and KClO give a high-grade Cu deposit. Less current and time are required to deposit the last Cu traces. Sulfites, persulfates, permanganates, chromates, dichromates, nitrites, fluorides, tartrates and sulfonitric solns. interfere with the electrolysis. A. L. HENNE

The ferric thiocyanate reaction as used for detection of traces of iron in chemical reagents. H. W. VAN URK. *Chem. Lab. Marinehospitaal den Helder. Chem. Weekblad*

25, 703-4(1928).—The accuracy of the ferric thiocyanate reaction as influenced by salts was studied. In com. Na_2SO_4 , at best only 0.0007% Fe^{+++} can be detected. In water, oxidized with HNO_3 , 0.00002% of Fe can be detected in the absence of HCl and 0.000005% with HCl (cf. C. A. 20, 3861). The thiocyanate reaction influenced by salts. *Ibid* 704-6.—The decrease in color intensity of the $\text{Fe}(\text{CNS})_3$ complex in salt soln. is caused by hydrolysis due to lower p_{H} of the soln. Addn. of some HCl brings the color back. Whereas for water the optimal HCl concn. is 4 milliequivalents of HCl per 100 cc., this amt. has to be raised to 2 and 4 cc. for Na_2SO_4 and NaAcO solns., resp. Chlorides and nitrates have no influence on the color; salts of weak acids have considerable influence.

B. J. C. VAN DER HOEVEN

The transmission of light through thiocyanate solutions of iron and bismuth, with respect to the estimation of iron in red lead. H. HEINRICH. *Glastech. Ber.* 5, 351 (1927); *J. Soc. Glass Tech.* 12, 182.—Spectroscopic examn. of a CNS^- soln. contg. 0.5 mg. of Fe_2O_3 and 2.0 mg. of Bi_2O_3 per 100 cc. indicated an optimum deviation of color from that of pure $\text{Fe}(\text{CNS})_3$ with a depth of 14 to 18 mm. Thus although Bi did not interfere with the Fe test in all cases, it was likely to give trouble with dil. Fe solns. from pure red lead samples, and should be previously removed by H_2S or treatment in strong HCl.

H. G.

New gravimetric method for the estimation of lead. I. Purely from its soluble salts. P. N. DAS-GUPTA, G. C. ROY AND K. M. SIL. *J. Indian Chem. Soc.* 5, 657-60(1928).—In slightly alk. soln. H_2O_2 ppts. Pb as $\text{Pb}_3\text{O}_4 \cdot 3\text{H}_2\text{O}$ and the ppt. can be heated to 180° without decompn. To the neutral soln. of Pb acetate or nitrate, add 2 drops of dil. HNO_3 or HOAc , dil. considerably and, for 0.1 g. of Pb, add 2 cc. of 3% H_2O_2 . Stir and finally add 2 cc. of concd. NH_4OH . After 20 mins. with frequent stirring, allow the ppt. to settle, filter, wash, dry at 110° and weigh.

W. T. H.

Determination of the platinum metals in ores and concentrates. H. R. ADAM. *J. Chem. Met. Mining Soc. S. Africa* 29, 106-15(1928).—The methods of the Govt. Areas Lab. in the Transvaal are discussed. The sample for analysis should at least pass a 90-mesh sieve. All assay methods require a preliminary fusion and collection of the precious metals in a Pb button. The basic nature of the ores demands a flux rich in SiO_2 and if appreciable Ni and Cu are present the addition of some Pb_3O_4 makes it certain that these elements will be slagged off. The temp. of fusion and cupellation should be a little higher than for Au assay. With a good fusion there is little danger of slag loss. In parting with H_2SO_4 there is loss of Pd if the heating is continued too long, it is best to stop heating as soon as all the Ag dissolves. In the Potgietersrust district, the Pt : Pd ratio is about 1:1 and the parting is difficult so that it has become customary to report "total platinoids" by simply weighing the cupelled bead without inquartation but using a high finishing temp. in a coal-fired muffle. The "prills" thus obtained are analyzed periodically and suitable corrections made. There is a slight slag loss by this procedure. For the analysis of ore concentrates the practice of collecting the precious metals in Ag has been abandoned. The final "prills" from the electric furnace are cleaned in AcOH and weighed. When a sufficient weight has been collected, they are dissolved in *aqua regia* and HNO_3 is removed by evapn. with HCl. The soln. is dild. to 20 cc., allowed to settle, filtered and washed with a little alc. The insol. residue is ignited and cupelled. The small resulting "prill" is heated to 1300° ; it contains Pt metals and Pb but usually weighs very little. The Pt in the filtrate obtained above is pptd. with NH_4Cl , filtered and washed with satd. NH_4Cl soln. It is then dissolved in hot water and Pt pptd. with HCO_2H as recommended by Krauss and Deneke. In the filtrate from the Pt, HCO_2H pptn., dimethylglyoxime pptn. and treatment with nitroso- β -naphthol have all been tried and each method has its advantages.

W. T. H.

Assay for platinoids in ores. JOHN WARSON. *J. Chem. Met. Mining Soc. S. Africa* 29, 115-8(1928).—The flux recommended is $3\text{Na}_2\text{CO}_3$, 3PbO , $1\text{Na}_2\text{B}_4\text{O}_7$ and 1.5AgCl . Detailed directions are given for carrying out the fusion, cupelling, parting with H_2SO_4 , testing with KI and recovering AgCl .

W. T. H.

Colorimetric estimation of thallium. CONRAD STICH. *Leipzig. Pharm. Ztg.* 14, 27-9(1929).—The tests were carried out in the usual 100-cc. glass cylinders, the reagents being added in the following order: (1) sample soln. (test soln.), (2) KOH soln. (about 3 cc.), (3) about 50 cc. H_2O , (4) about 3 cc. Na_2S soln. (5%), (5) H_2O to mark, (6) compare with control.

W. O. E.

Determination of molybdenum in steel in the presence of tungsten and vanadium. J. KASSLER. *Lab. der Poldihütte in Kladno. Z. anal. Chem.* 76, 113-20(1929); cf. C. A. 22, 3860; 23, 1078.—In brief, the method is as follows: Treat 5 g. of steel with 80 cc. of concd. HCl and oxidize with 10 cc. of concd. HNO_3 . Heat for 15 mins. at $80-90^\circ$ in a covered beaker. Remove the cover glass and after another 15 mins., transfer

to a 100-cc. measuring flask, using dil. HCl. Make up to the mark, mix and filter through a dry, double filter. Pour the turbid filtrate through the filter again and use 80 cc. for the further analysis. With steels low in W, the ppt. is free from Mo but in the case of high-speed steels, it will always contain appreciable Mo which must be detd. colorimetrically. Provision is made, therefore, for testing the ppt. for Mo. The nitrates in the filtrate are changed to chlorides by repeated evapn. with HCl and SiO₂ removed in the conventional manner. The soln. is nearly neutralized and treated with 25 cc. of 20% Na₂S₂O₅ soln. which serves to reduce about half of the Fe to the bivalent state. The hot soln. is then poured into 120 cc. of 24% NaOH soln. which causes the pptn. of all Fe and V. The liquid is dild. to exactly 500 cc. and 250 cc. used for the Mo detn. This is accomplished either by pptn. with Pb(OAc)₂ and weighing the Pb-MoO₄ or by reducing with Zn and titrating with KMnO₄. W. T. H.

Note on the determination of vanadium in steel. KARL SWOBODA. *Chem.-Ztg.* 52, 1014-5(1928).—The following convenient method provides for the pptn. of V as vanadomolybdate, with ultimate reduction to vanadyl salt and titration with permanganate. Treat 2 g. of steel in a 500 cc. Erlenmeyer flask with 50 cc. of 6 N H₂SO₄, oxidize the resulting soln. with HNO₃ and add 5 cc. of concd. acid in excess. Boil till no more nitrous fumes are evolved, add 50 cc. of 1% (NH₄)₂S₂O₈ soln. and boil 3-8 mins. which should cause all WO₃ to dissolve. Add 50 cc. more of the persulfate soln. and 100 cc. of (NH₄)₂MoO₄ soln. such as is commonly used in steel analysis. Then add concd. HNO₃ until a clear soln. is obtained, heat to boiling and to the boiling soln. slowly add 10% Na₂HPO₄ soln. at the rate of 4-6 drops per min. until the ppt. changes from dark orange to light yellow in color. This should take 10-40 drops according to the V content. Continue heating, while rotating the contents of the flask, until the ppt. begins to bump. Filter and wash with NH₄HSO₄ soln. (20 cc. of concd. NH₄OH and 25 cc. of concd. H₂SO₄ added to 1 l. of water). Transfer the washed ppt. back to the flask and add in succession, 50 cc. of concd. HNO₃, 5 cc. of H₃PO₄ (d. 1.71) and 50 cc. of H₂SO₄. Evap. to fumes, cool, add 20 cc. of water and 5 drops of concd. HNO₃ (or some concd. KMnO₄), cool and evap. with 50 cc. of 6 N HCl till the soln. fumes strongly. Cool, dil. with 200 cc. of water and titrate at 80°. W. T. H.

Method for the rapid determination of zinc. G. SPACU AND J. DICK. *Univ. Cluj. Bul. soc. stiinte Cluj* 4, 177-80(1928).—The method is based on the pptn. of [ZnPy₂](SCN)₂. The following washing solns. are needed: (1) 3 g. NH₄SCN + 5 cc. pyridine in 1000 cc. H₂O; (2) 13 cc. 95% alc. + 85.5 cc. H₂O + 1.5 cc. pyridine + 0.1 g. NH₄SCN; (3) 10 cc. abs. alc. + 1 cc. pyridine; (4) 15 cc. Et₂O + 2 drops pyridine. The procedure is as follows: add 0.5 to 1 g. NH₄SCN to 50-75 cc. of cold, dil., neutral Zn soln., add 1 cc. pyridine; shake; after 15 mins. filter through a Gooch filter, using soln. (1) to transfer the ppt. to the filter; wash several times with (2); use as little as possible of (3) to wash the walls of the filter and drive off H₂O; wash 6 times with (4); dry with suction, then in a vacuum desiccator and weigh. A neg. error of about 0.5% is to be expected when large quantities of NH₄ salts are present. Weakly acid solns. are treated with NH₄SCN, neutralized with pyridine, then given an extra cc. of pyridine for pptn. Strongly acid solns. are evapd. to dryness, then dissolved in H₂O and treated. The results are, on the whole, very good. ALBERT L. HENNE

The separation of zinc as sulfide from slightly acid solutions. J. MAJDEL. *Univ. Laibach. Z. anal. Chem.* 76, 204-12(1929); cf. *C. A.* 22, 3600.—For the pptn. of ZnS the soln. should not contain more than 0.3 g. of Zn in 300 cc. and not less than 3 g. of (NH₄)₂SO₄ should be present, H₂S should be passed through the soln. for at least 30 mins., the temp. should be 65-70° and after the pptn. the soln. must be allowed to stand half an hr. before filtering. The ppt. can be dried, ignited in H₂ in the presence of S and weighed as ZnS. In an ordinary mineral analysis, the Cu and As groups should be removed by treatment with H₂S in the usual manner, the filtrate freed from H₂S by boiling, made neutral with NH₄OH, treated with 8 cc. 0.5 N H₂SO₄, enough additional (NH₄)₂SO₄ added, diluted to 300 cc. and satd. with H₂S. W. T. H.

The detection and determination of mercury as complex ammonium iodide compound. E. H. VOGELZANG. *Pharm. Weekblad* 66, 65-7(1929).—Hg may be detd. by reversing the Nessler reaction for NH₃. A study was made for the purpose of ascertaining the optimum conditions for applying this reaction. Since the color depends on formation of the HgI₃⁻ ion, the concn. of I must be at least 3 times that of Hg. There is also a max. value for the ratio I:Hg, beyond which the reaction no longer occurs. The reaction is quant. only when the ratio lies between 3 and 16. This limitation is a serious objection to the general utility of the reaction. The soln. must be at least 0.02 N in OH⁻; with higher acidity no coloration occurs. An excess of NH₄Cl is without influence, as is also the order in which the alkali and NH₄Cl are added. By judging

the color after several mins. standing, the delicacy of the reaction reaches 2 mg. per l. Colorimetric detn. can be made more accurate by performing several preliminary tests to find the optimum quantity of reagent to add. As a specific application, *e. g.*, in the examn. of Hg_2Cl_2 , 0.04 mg. Hg may be detected in 20 cc. of filtrate. A. W. DOX

New method for determining iodine (halogen) in organic substances. J. SCHWAB-BOLD. *Chem.-Ztg.* 53, 22-3(1929).—The substance is burned in O_2 and the vapors are passed through K_2CO_3 soln. in which the absorbed halogen can be detd. by the method of Winkler or by that of v. Fellenberg. The combustion tube is 90 cm. long and 20-30 mm. in diam. but is drawn out at the front end into a 3-mm. capillary. The tube also contains a Pt contact substance. Excellent results were obtained in the detn. of I in thyroid gland substance, in urine and in moss. W. T. H

Determination of iodine in organic combination, especially in thyroid gland. WILFRED SMITH. *Chemist and Druggist* 109, 125; *Pharm. J.* 121, 88(1928); *Quart. J. Pharm.* 1, 372-7(1929).—A review of previously published methods is given. Hunter's original method is preferred when the I content is fairly high (about 0.2%) and where ordinary accuracy and speed are required. A modification of Kendall's method is given for smaller quantities of I. Other methods are criticized and discussed. W. O E

Method for the quantitative determination of oxygen in the atmosphere. GILES B. COOKE. *Univ. Md. J. Chem. Education* 6, 105-6(1929).—A simple, satisfactory and accurate method suitable for beginners is explained and illustrated. W. T. H

Determination of the sulfur content of gases, particularly gases from coke ovens. FR. HEINRICH AND F. PETZOLD. *Eisen- u. Stahlwerk Hoesch in Dortmund. Z. anal. Chem.* 76, 120-34(1929).—The gas is passed through 2 wash bottles, contg. altogether 270 cc. of a soln. obtained by mixing 180 cc. of 0.5 N NaOH with 90 cc. of 5% H_2O_2 soln. Eventually the residual NaOH is titrated with 0.5 N H_2SO_4 , methyl orange being used as indicator. The gas is passed for about 2 hrs. at the rate of 200 cc. per min. and the change in vol. is taken into consideration. The method provides for the detn. of all gaseous S compds. except thiophene. W. T. H

Determining calcium chlorate in calcium chloride. VITTORIO SACCHI. *La Chim.* 4, 391-2(1928).—Mix 7.092 g. of Ca hypochlorite in a mortar with H_2O , transfer to a 1000 cc. flask, and dil. to the mark. Det. active Cl in 50 cc. of the turbid soln. by Penot's method using iodo-starch paste as indicator, first by spotting on filter paper and finally in the soln. Place another 50 cc. of the turbid soln. in a flask with 2 g. KI, closing with a stopper having 2 holes, each contg. a dropping funnel. Into one funnel place 25-30 cc. concd. HCl and in the other 25 cc. Add the HCl to the soln., agitate and allow the mixt. to stand 1 hr.; then dil. with 200 cc. water. and add the KI soln. Titrate with 0.1 N $\text{Na}_2\text{S}_2\text{O}_3$ without starch paste. R. SANSONE

A quantitatively correct colorimetric method of determining the phosphoric acid of the type molybdenum-blue. A. YU. LEVITZKII. *Nauchno-Agronomicheskii Zhurnal* (Russian) 4, 783-93(1927).—A modification of the Denigés colorimetric method is suggested. The reagents used are: (A) Sulfo-molybdate soln.: made of equal vols. 10% NH_4 molybdate and concd. H_2SO_4 . (B) Cu-Pb reducing buffer; 0.25 g. Pb, 5 cc. of concd. HCl, and 2 drops of 10% CuSO_4 soln. is heated on a water bath until all of the Pb has gone into soln. and then treated with 2.5 cc. of a 10% CuSO_4 soln. The analysis is made as follows: Place a soln. contg. 0.02-0.2 g. of P_2O_5 in a 100 cc. flask, dil. to 80-90 cc. and add 2.5 cc. of reagent A. Shake, add 0.25 cc. of reagent B, dil. to 100 cc., mix and allow to stand 15 mins. Compare in a colorimeter with known P_2O_5 solns. similarly treated. The results of a series of expts. showing the influence of various compds. on the method and results on soils, plants and fertilizers are given. J. S. J.

Why do thiosulfate solutions change their titer? How are they to be stabilized? D. MIGLIACCI. *Boll. chim. farm.* 68, 11-2(1929).—Review of the studies of Mayr and Kerschbaum (*C. A.* 22, 2123). G. SCHWOCH

Decomposition of silicates by strontium salts in metals. J. KAVINA. *Chem. Listy* 22, 267-70(1928).— SrCl_2 or a mixt. with NH_4Cl is used for fusion with silicates in the detn. of alkali metals in the latter. This fusion mixt. corrodes Pt vessels; Ni crucibles cannot be used. Pptn. of Sr as carbonate from aq. exts. of the fused mass is not as complete in the presence of alkali chlorides as in their absence, 0.1 mg. of Sr being, however, readily precipitable from 3 cc. of a soln. contg. 0.2 g. of alkali chlorides. SrCl_2 used alone does not yield satisfactory results. B. C. A.

New method for determining water in calcium nitrate. R. LUCAS. *Z. angew. Chem.* 41, 1367(1928).—The usual method of oven drying is not satisfactory because the hydrated salt becomes liquid below 100° . A more satisfactory method is to use the Markussön method, heating 20 g. with xylene for 6 hrs. and measuring the vol. of the water that distills off with the hydrocarbon. W. T. H.

Note of the determination of water by distillation with hydrocarbons. W. BOLLER. *Chem.-Ztg.* 53, 70(1929); cf. *C. A.* 22, 4408.—The app. is simplified. It consists of a distg. flask, a condenser and a measuring tube all connected glass to glass. The distillate collects in the measuring tube and the lighter hydrocarbon siphons back into the original flask. To avoid bumping, it is recommended to wrap the substance in a bag of fine bolting cloth and the shape of the bottom of the flask is modified with a protuberance on the inside at the lowest point. W. T. H.

Determination of water and crude fat in substances rich in fat. N. D. PRYANISHNIKOV AND S. M. TELNOV. *Landwirtsch. Timirjasev-Akad. Moscow. Z. anal. Chem.* 76, 161-6(1929).—By heating with benzene, the water can be gradually distd. off and measured and by weighing the residue after the heating, the amt. of dry, fat-free substance is detd. In this way excellent results can be obtained with 5-25 g. of original substance. W. T. H.

Method for quantitative analysis of organic arsenites. EWALD URBSCHAT. *Landwirtschaftliche Hochschule, Berlin. Biochem. Z.* 203, 223-5(1928).—A measured amt. of the soln. to be analyzed is placed in a 25-cc. glass-stoppered flask, depending upon the H_2AsO_3 concn. To this are added 0.5 cc. concd. HCl and 0.4 cc. 50% H_3PO_4 and a few drops of a KI soln. The amt. of H_2AsO_3 present can be easily judged by the rate of formation and the extent of the resulting turbidity. The necessary concn. is 0.002-0.010 mg. per cc. The contents of the flask are dild. to about 20 cc. and the reducing reagent is added. This consists of a mixt. of 30 cc. 50% H_3PO_4 , 15 cc. freshly prepd. 20% tannin soln. and 2 cc. 5 N KI. With the amt. of H_2AsO_3 adjusted within the set limits, 3.2 cc. of this mixt. gives the best results when one works with a 25-cc. vol. The contents are then dild. to the 25-cc. mark. Standard solns. are prepd. in the same manner and the turbidity is compared after 24 hrs. shaking. S. MORGULIS

The colorimetric method for the determination of lactic acid. BRUNO MENDEL. *Biochem. Z.* 202, 390(1928).—Two improvements are suggested in the procedure for the lactic acid detn. which depends upon the conversion of the acid into AcH with hot H_2SO_4 , and the formation of a red color with veratrole. The concn. of H_2SO_4 must be const. inasmuch as the degree of AcH formation depends upon the concn. It is recommended to keep the H_2SO_4 in a glass bottle with a glass stopcock fused in the bottom so that the acid can be drawn off without any possibility of the acid absorbing moisture and changing its concn. as is the case when a H_2SO_4 bottle is opened. The air entering the bottle, should pass 2 wash bottles filled with H_2SO_4 and a $CaCl_2$ tube. The color development, too, depends upon the temp. being greatest at 25°. Higher temps. inhibits the color development. The mixt. should therefore be kept in a waterbath, at 25° for 20 mins. before making colorimeter comparison. By means of these improvements it is claimed that even 0.001 mg. lactic acid can be detd. S. MORGULIS

Detection of methanol by mercuric sulfate solutions (Denigès reagent). HERMANN MATTHIES AND PAUL SCHÜTZ. *Univ. Königs-Berg. Pharm. Ztg.* 74, 44-5(1929).—Contrary to the statement of Stainier and Lauwaet, $HgSO_4$ yields with iso-Pr alc. a white (not yellow) ppt. consisting of a mixt. of a mercurio- and mercu-risulfate-acetone compd., since this alc. is first oxidized to acetone before the formation of the ppt. W. O. E.

A new method for determining glycerol with potassium permanganate. A. RAVENNA. *Zymol. Chim. Col. e Zucch.* 3, 174-6(1928).—Treat 140 cc. 0.5% Ag_2SO_4 soln. with 19 cc. N Na_2CO_3 . After standing, decant off the liquid and wash once by decantation. Boil 10% neutral Pb acetate soln. with excess of litharge for 1 hr. and filter off the warm basic Pb acetate ppt. without cooling. For the detn. take 3-5 g. glycerol in a 250 cc. tared flask, and dil. to the mark with water, after standing some time withdraw 25 cc. into a 100-cc. flask, add the Ag_2CO_3 prepd. as described and after 10 mins. add 5 cc. of the basic Pb acetate. Agitate, bring to the mark with water and use 10 cc. of the filtered soln. To this add a little 10% Na_2SO_4 soln. and test with a little more Pb acetate. If further pptn. takes place, repeat the above treatment with another 25 cc. of the original soln., using this time 6 cc. basic Pb acetate. Finally take 25 cc. of the filtered soln. in a beaker, add an excess of $KMnO_4$ and 50 cc. of 18 N H_2SO_4 . Heat on the steam bath for 2 hrs. If the soln. is decolorized add more $KMnO_4$. Titrate in the still hot liquid the excess of $KMnO_4$ with a 0.1 N oxalic acid soln. R. SANSONE

Use of iron reagents in the detection and differentiation of phenols. ALAN H. WARE. *Chemist and Druggist* 109, 126-7; *Pharm. J.* 121, 88-9(1928); *Quart. J. Pharm.* 1, 377-87(1929); cf. *C. A.* 21, 155, 2635, 4023.—Among the more important features of the paper are: (1) a suggested division of the entire group of phenols into 3 classes (A, B and C) which are easily distinguished in practice by the use of Mitchell's ferrous tartrate reagent with appropriate adjustment of pH, phenols of Class A giving a neg.

result to this test, those of Class *B* a violet or purple color and those of Class *C* a deep-brown coloration. Within classes *B* and *C*, individuals may be distinguished by employing an improved pptn. test described for the 1st time. This test is so devised that the Fe complexes produced by individual phenols are pptd. at successive stages in such a way as to give specific results. (2) Expts. are described which show that the textbook accounts of the color reactions given by FeCl_3 with many phenols are inadequate and incorrect. Phenols of Class *B* will give a series of no less than 5 distinct and definite colors with variations of p_H , while those of Class *C*, give only 2 such colors at most. (3) Tests are described in which H_2O_2 is used with FeSO_4 or FeCl_3 in such a way as to give specific distinctive results.

W. O. F.

Method for determining oil of turpentine vapors in air. W. D. BOGATSKY AND W. A. BIBER. Chem.-Radiol. Inst. Odessa. *Z. anal. Chem.* **76**, 103-8(1929).—See C. A. **22**, 4840.

W. T. H.

The determination of sugar from the oxygen content of cupric oxide. MICHAEL DIMITROFF HADJIEFF. Agr. Inst. Univ. Sofia. *Z. Untersuch. Lebensm.* **55**, 613-4 (1928).—The Meissl-Allihn detn. for sugars is used. Into a hot mixt. of 60 cc. of H_2O and 30 cc. of Fehling's soln., 25 cc. of sugar soln. is pipetted. The concn. of the sugar soln. must be kept below 1%. After 2 mins., 100 cc. of cold boiled H_2O are added. The Cu_2O is filtered and washed on an asbestos pad in a Gooch crucible and dried at 120-130°. It is then further dried in a current of dry air. The CuO produced is weighed, heated in a stream of dry H and reduced to Cu which is likewise weighed. The difference in wts. gives the O content of the CuO from which the factor 3.9731 may be used to obtain the Cu no., and therefore the sugar content of the sample from the Meissl-Allihn tables.

C. R. F.

Adsorption. XXII. Adsorption of alkali and of cupric salts in the precipitation of $\text{Cu}(\text{OH})_2$ (MEHROTRA, DHAR) 2. Graphic method for solving simple stoichiometric problems (STONE) 2. A micro-extraction method (NIEDERL) 2. Separation of Th and U by means of ether (MISCIATTELLI) 2. Dr. Tödt's simplified electrodes for electrometric p_H measurements (KÖHLER) 2. Influence of the NH_4 ion on the quinhydrone electrode potential (SHIKATA, TACHI) 2. Sampling and coring in prospecting for oil and gas (CLOUD) 8. Sampling and coring in prospecting for metalliferous deposits (GEORGE) 8.

BLASDALE, WALTER C.: *Fundamentals of Quantitative Analysis*. New York: D Van Nostrand Co. 403 pp. \$3.75. Reviewed in *J. Western Soc. Eng.* **34**, 71(1929).

JORDAN, CHARLES B.: *Qualitative Analysis for Students of Pharmacy and Medicine*. New York: McGraw-Hill Book Co., Inc. 169 pp. \$2.50.

TREADWELL, F. P., AND HALL, WILLIAM T.: *Analytical Chemistry*. Vol. 2. *Quantitative Analysis*. New York: J. Wiley & Sons, Inc. 7th ed., revised. 848 pp. \$5.00. Reviewed in *J. Chem. Education* **6**, 179(1929).

8—MINERALOGICAL AND GEOLOGICAL CHEMISTRY

EDGAR T. WHERRY AND J. F. SCHAIRER

Occurrence of sylvanite (Cu_3VS_4) in the Sierra de Cordoba, Argentine. GEORGE FREBOLD. *Centr. Mineral. Geol.* **1928A**, 27-8.—H. Wiedemann reported sylvanite from this locality, but F. has failed to find it in the same specimens, and believes the mineral described to be galena. No primary V mineral is present.

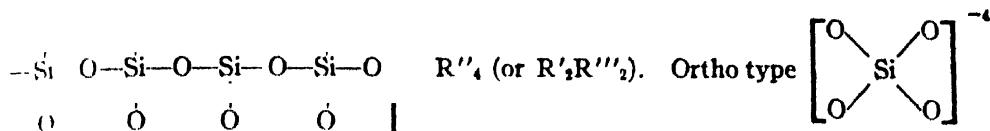
J. E. G.

Spinels of tervalent cobalt: cobaltous and zinc cobaltite. G. NATTA AND M. STRADA. *Atti accad. Lincei* **7**, 1024-30(1928).—Spinels having the general compn. $\text{Me}^{++}(\text{O})\text{Me}_2^{+++}\text{O}_4$ are known for many bivalent metals: Mg, Zn, Fe^{++} , Ni, Mn, Cd, as well as for the tervalent Al, Cr and Fe. However, all the theoretically possible compns of the general formula do not exist, but only those which crystallize in the cubic system, and whose superior at. diam. is less than 2.10 Å. U. Metals which have both Me^{++} and Me^{+++} forms, as Fe_3O_4 as well as Co_3O_4 , form spinels. The new compd. $\text{ZnO}(\text{Co}_2\text{O}_3)$ was prep'd. by evapg. a soln. containing 2 mols. of $\text{Co}(\text{NO}_3)_2$ to 1 $\text{Zn}(\text{NO}_3)_2$ and calcining the residue at 800°. This product is isomorphous with $\text{CoO}(\text{Co}_2\text{O}_3)$, both crystg. in the cubic system; the dimensions of the space lattices are identical: 8.06 Å. U. \pm 0.005; their sp. gr. = 6.11 and 6.27, resp.

A. W. CONTIERI

The structure and constitution of feldspars. FELIX MACHATSKHI. *Centr. Mineral. Geol.* **1928A**, 97-104.—Silicates so far investigated show O^{-2} ions arranged at

the corners of tetrahedra with Si^{+4} ions as nuclei. This unit is regarded as the basis of silicate structure. The different varieties of silica have each O^{-2} ion shared between two tetrahedra. M. believes that feldspars have a similar structure. Al^{+3} with O^{-2} may have a coordination no. 4 or 6; if 4, Al^{+3} ions may take the place of Si^{+4} ions as nuclei of tetrahedra, which are thereby somewhat deformed. $\text{Be}^{+2} + \text{B}^{+3}$ may be substituted for Si^{+4} in some cases. Tetrahedra cannot be packed to fill space completely. Interstices are filled mostly by K^{+1} , Na^{+1} , Ca^{+2} and Ba^{+2} . M. expresses these relations by the following formulas: K feldspar $\left[\begin{smallmatrix} (\text{SiO}_2)_2 \\ \text{AlO}_2 \end{smallmatrix} \right]^{-1} \text{K}^{+1}$; Ca feldspar $\left[\begin{smallmatrix} (\text{SiO}_2)_2 \\ (\text{AlO}_2)_2 \end{smallmatrix} \right]^{-2} \text{Ca}^{+2}$. Because of the similarity in structure it is considered possible for mixed crystals of quartz and feldspar to form. In the "meta type" of silicate structure tetrahedra are arranged so that the only two O^{-2} ions from each are shared by neighboring tetrahedra. In the "ortho type," O^{-2} ions are not shared by neighboring tetrahedra. Meta type



R''_2 (or $\text{R}'\text{R}'''$). True mols. exist only in the latter structure. J. E. GILL

Comparative x-ray investigation of lime-soda silicates. B. GOSSNER AND F. MUSSING. *Centr. Mineral. Geol.* 1928A, 129-38, 167-81.—X-ray data on, and comparisons of, melilite, gehlenites, arcolite and scapolite are given. J. E. GILL

The structure of crystals of heulandite. PAUL GAUBERT. *Compt. rend.* 187, 829-31(1928).—The compn. of the sections or bands in heulandite which have slightly different μ s. is sufficiently different that HF attacks them at unlike rates. Probably the pure heulandite consists of a solid soln. of the hydrated aluminosilicates of Na, K, Sr and Ba in the Ca salt. The bands are due to the presence of foreign material which causes different rotations of the plane of the optical axes. R. J. HAVIGHURST

The effect of heat and of loss of water on the optical properties of heulandite. PAUL GAUBERT. *Compt. rend.* 187, 1057-9(1928).—Microscopic observations have been carried out on the cleavage plane of crystals set upon heated Pt which had an arrangement for rapid heating and cooling. Heat alone increases the birefringence; the plane of the axes turns and the rotation is augmented. The original values are not obtained when the heat is withdrawn. The phenomenon is rarely reversible owing to the modification of optical anomalies whose effect is superimposed upon the optical properties of the substance. The amt. of H_2O present has considerable effect upon the optical properties. S. L. B. ETHERTON

The structural forms of meteoric irons. RUDOLF VOGEL. *Arch. Eisenhüttenw.* 1, 605-11(1928); cf. *C. A.* 22, 4420.—The results of investigations (*C. A.* 19, 2000) on the Widmannstätten structure, the nature of kamacite and taenite, and the conditions of formation of schreibersite and rhodite in meteoric Fe are given. Mixed crystals of kamacite (6% Ni) and taenite (30% Ni) are formed by the δ - γ conversion, this also causing the Wn. structure. Although at this conversion equil. has not been established the characteristic structure of kamacite and taenite is present. The "conversion figures" are caused by the sepn. from the melt of kamacite, which is surrounded by taenite at 1450° . "Shredded" kamacite is given by the twinning formed in the α - γ conversion. By heating schreibersite and rhodite to 1000° (or over) kamacite is formed, which on cooling does not reform the first 2. The structure and compn. of meteoric Fe is duplicated artificially with the aid of the Ni-Fe and Ni-Fe-P diagrams. J. BALOZIAN

Sampling and coring in prospecting for oil and gas. W. F. CLOUD. *Proc. Oklahoma Acad. Sci., Univ. of Oklahoma Bull.* 1928, New Series 410, Studies Series 30, 128-34.—Samples of underground formations are secured: (1) by using the diamond drill; (2) by collecting bit cuttings from a cable tool or rotary driven well; or (3) by the use of various coring devices, or core barrels which are available for either cable-tool or rotary drilling. Correct examn. of these samples involves not only the identification of the fluid content of the strata but also the detn. of the lithological properties such as % of pore space, % of satn. and permeability. These points are discussed in detail. W. T. H.

Sampling and coring in prospecting for metalliferous deposits. H. C. GEORGE. *Proc. Oklahoma Acad. Sci., Univ. of Oklahoma Bull.* 1928, New Series 410, Studies Series 30, 137-40.—The examn. of churn drillings and of diamond drillings are discussed from the standpoint of the mining engineer. W. T. H.

Eastern Canada in 1928. ANON. *Mining J.* Annual Review No. 1929, 21; **British Columbia in 1928.** *Ibid* 23; **Western Australia in 1928.** *Ibid* 23; **New Zealand in 1928.** *Ibid* 24; **Nigeria in 1928.** *Ibid* 26-7; **Cornwall and Devon in 1928.** *Ibid* 27-8; **Mining in Portugal in 1928.** *Ibid* 29; **Ceylon in 1928.** *Ibid* 29.—Brief reviews of the mineral production in various countries for 1928. ALDEN H. EMERY

Mineral wealth of Zambesia. ANON. *Mining J.* Annual Review No. 1929, 25. — There is a wide distribution of Cu in S. Africa. The main known ore bodies are in Katanga and N. Rhodesia. These have numerous outliers. Immense beds of coal have been proved. Rich and extensive bodies of magnetite await exploitation near the Tete coal field. Pb, Zn, Au and Ag are known to occur. ALDEN H. EMERY

Southern Rhodesia. A review of its mineral resources. ANON. *Mining J.* Annual Review No. 1929, 64.—By the end of 1928 Rhodesia had produced about \$500,000,000 of minerals, of which Au was the most important (more than 70%). Quantities of Cu, Cr, Ag and asbestos have also been recovered. Base metals have recently grown greatly in importance. In 1909 they were produced in the ratio of 1:17 to the Au industry; in 1927, 1:1.6. Asbestos is now the second most important mineral product and the country is the leading producer of high-grade material. Cr ore is next. Coal is becoming of increasing importance. ALDEN H. EMERY

Hydrothermal formation of iron ores. R. KLEMM. *Centr. Mineral. Geol.* 1928A, 90-4.—K. failed to obtain anhydrous Fe oxides corresponding to magnetite and hematite by reaction of solns. of Fe chlorides and sulfates with carbonates and silicates at temps. of about 100°. The conditions were identical with those described by Kuhara (*Japanese J. Geol.* 4, 1-32(1925)), who reported such oxide ppts. J. F. GILL

Martitization of magnetite formations. RENÉ VAN AUBEL. *Pub. Rel. Congo Belge, (Ann. soc. geol. Belgique)* 51, c5-8(1928).—Martite occurs as a narrow corona around grains of magnetite. On the faces it forms a triangular network following the trace of the faces of the octahedron. Martite is later than magnetite. The mass in which it occurs is near a diorite-diorite intrusion, and it probably formed as the result of magmatic emanations. O. F. POINDEXTE

Platinum and platiniferous deposits. L. DUPARC. *Rev. univ. mines* 57, 18, 157-66(1928).—Pt occurs mostly in dunite but also in pyroxenite, the chem. compn. of the 2 being somewhat different. D. suggests a theory as to its origin. H. S. W.

The platiniferous deposits of the Birbir (Abyssinia). L. DUPARC AND E. MOLLY. *Bull. suisse min. pet.* 8, 240-57(1928).—Pt occurs in dunite; an analysis of it is given. Chemically the Abyssinian Pt resembles that of the Urals. H. S. WASHINGTON

Cyanite as found in Western North Carolina. A. H. FESSLER AND WM. J. McCaughy. *J. Am. Ceram. Soc.* 12, 32-6(1929).—The deposits are described. The mineral promises to be important in certain phases of the ceramic industry. C. H. K.

A phosphorite conglomerate at Gotland. HERMAN HEDSTRÖM. *Geol. Fören. Förh.* 50, 429-35(1928).—Pebbles in the conglomerate consist of phosphorite and phosphorite-sandstone with round particles of pure quartz 1-2 mm. long. Analysis of the rock as a whole shows: CaCO_3 86.17 and P_2O_5 0.41%, corresponding to 0.90% of $\text{Ca}_3(\text{PO}_4)_2$. The phosphorite pebbles are homogeneous and of a dull gray color, the largest being 2×1 cm. Analysis gave 35.26% P_2O_5 , corresponding to 77.00% of $\text{Ca}_3(\text{PO}_4)_2$. The phosphorite-sandstone pebbles vary in color from brownish yellow to dark brown. They are well rounded. The size varies from a few mm. to nearly 10 cm. A typical one measured $7.5 \times 6 \times 3$ cm. The binding material is rounded grains of quartz. Analysis gave P_2O_5 11.68%, corresponding to 25.51% $\text{Ca}_3(\text{PO}_4)_2$. H. compares the Gotland conglomerate with one found in the Silurian in the nearby Höggrän-Vall region, with special reference to the analysis, to variations in the phosphorite-sandstone, and to the fossils present. W. SEGERBLÖM

Asphalt and some other minerals found in the Silurian strata at Gotland. HERMAN HEDSTRÖM. *Geol. Fören. Förh.* 50, 443-8(1928); cf. preceding abstract.—The asphalt is black, lustrous and coal-like in appearance. Analysis gave 1.9% brownish ash, which after decompn. showed traces of Cr or V; the asphalt melted when heated with blast and gave a large amt. of combustible gas. Later examn. showed that it was radioactive. Other minerals found in the Silurian include: calcite as pyramidal crystals, chalcopryrite, sphalerite, galena, pyrite, marcasite, barite, aragonite, flint, glauconite and a yellowish red to blackish brown Fe oxide. W. SEGERBLÖM

Asphaltite from the Philippine Islands. E. T. HODGE. *Philippine J. Sci.* 37, 263-72(1928).—The properties of grahamite, asphaltite from the Philippines, manjak and uintahite are given; the asphalt is considered to lie between manjak and grahamite. The high % carbon indicates metamorphosis by heat and thus it resembles Oregon asphalt and is dissimilar to many occurrences in other parts of the world. The high

ash may be explained by long surface exposure in a tropical country expedited by the heat of adjacent intrusions, the asphaltenes being oxidized. Grahamite occurs in W. Virginia, Oklahoma, Utah, Colorado, Oregon, Cuba, Mexico, Trinidad and Barbadoes. It is chiefly used in the roofing industry and for varnishes. Trinidad manjak has a higher sp. gr. than the Barbadoes material, the latter being more valuable economically. It is used in paints, varnishes and pipe cements. S. L. B. ETHERTON

Mining geology. J. VOLNEY LEWIS AND JOSEPH M. WANENMACHER. *Eng. Mining J.* 127, 112(1929); cf. *C. A.* 22, 748. E. C. M.

Change in density of minerals and rocks on heating. SHUKUSUKE KOZU AND JUNICHI UEDA. *Tohoku Imp. Univ. J. Geol.* 35, 399-406(1928).—When granite is heated, it expands abruptly at 575° and breaks, so that a special method is necessary to know the expansion coeff. at high temp. K. and U. determined the expansion coeff. of quartz, feldspar and amphibole from ordinary temps. up to 1000° and deduced the formula for calcg. the expansion of granite. Thus, for granite contg. 30% quartz, 65% feldspar and 5% amphibole, there is a vol. increase of 1.85% at 500° and 3.72% at 1000°. The decrease of d. as calcd. from the vol. change is 3.82%. This vol. change of granite is geologically important because it must affect the earth's crust near bodies of this rock very considerably. K. SOMEYA

Some dike-rocks in Japan. TSUTOMU OGURA. *Mem. Ryojun Coll. Eng.* 1, 137-44 (1928).—The dike-rocks in the Tatara-yama region may be divided into quartz veins, pegmatites (feldspar and quartz), aplites (orthoclase, oligoclase and quartz, with a little biotite) and porphyrites, of which 3 types are distinguished: pyroxene-hornblende-porphyrity, two-pyroxene-porphyrity and two-pyroxene-hornblende-porphyrity. Analyses are given of granite, aplite and two-pyroxene-porphyrity. C. J. WEST

Structural differences of the primary and secondary lava flows of Dafni volcano. N. LIATSIKAS AND G. GEORGALAS. *Centr. Mineral. Geol.* 1928B, 337-42.—Differences in texture serve to distinguish the lavas. Their mineral and chem. compns. are almost identical. J. E. GILL

The lava of Etna. W. F. GISOLF. *Proc. Acad. Sci. Amsterdam* 31, 660-9(1928).—*See C. A.* 22, 3868. E. H.

Alkaline rocks of the volcano Merapi (Java) and the origin of these rocks. H. A. BROWER. *Proc. Acad. Sci. Amsterdam* 31, 492-8(1928).—*See C. A.* 22, 2127. E. H.

Conglomerate in the Cambrian sandstone in Djupadal, Västergötland, Sweden. IVAN D. WALLERIUS. *Geol. Foren. Forh.* 50, 799-800(1928).—The pebbles of the conglomerate consist of fine, hard, brownish sandstone with streaks of pyrite, imbedded in a coarse-grained sandstone rich in pyrite. Analysis of the pebbles showed only a trace of P_2O_5 . Fossils and Ca are absent. W. SEGERBLOM

Fossilized sulfur bacteria in aluminum schists at Kinnekulle. SVEN V. BERGH. *Geol. Foren. Forh.* 50, 413-8(1928).—Preliminary notice of fossilized S bacteria occurring in the Al schists gathered from Gössäter, Kinnekulle and placed in the Technical High School Metallographic Institution. The schists are made up of a clay-like, sedimentary, bituminous rock composed of mica, quartz, feldspars, calcite and pyrite. Five photomicrographs, at 250-2000 magnifications, show the bacteria. W. SEGERBLOM

Investigation of the magnetic properties of rocks. A. TOURTSEV. *Bull. Acad. Sci. U. R. S. S.* 1928, 89(1928).—T. shows how hysteresis loops and curves of magnetic permeability of certain rocks and minerals may be obtained, and their mineralogic compn. detd. with a view of ascertaining which components influence these magnetic properties. C. G. F.

The action of carbonated waters on rocks. P. G. LIEGEOIS. *Ann. soc. geol. Belg.* 51, B232-6(1928).—Acid and basic eruptives, metamorphic rocks and vein minerals were immersed for periods from 6 months to a year for the purpose of observing the action of mineral waters on some of the principal materials of construction. Quartzite and compact granite, syenite, diabase, etc., show, no alteration when subjected to a microscopic examn. and compared to the fresh rock. Less compact rocks show alteration of black mica, pyrite and other Fe-bearing minerals. In one granite the feldspar was altered. O. F. POINDEXTER

Action of sulfur dioxide on glasses and basic rocks at high temperature and the probable origin of thermal sulfated waters. ALBERT PORTEVIN. *Compt. rend.* 187, 1148-50(1928).—At a high temp. even a small amt. of SO_2 in a gas superficially and selectively attacks glasses and basic rocks and almost always produces Na_2SO_4 exclusively, in spite of the low Na content. At the surface of some samples coming from the annealing furnace the attack shows as a transparent enamel. The formation of sol. sulfates thus indicated together with the presence of steam and hot water will ac-

count for the existence of thermal waters with a high mineral content and containing alkaline sulfates. S. L. B. ETHERTON

Catalog of Swedish geological, paleontological, petrographic and mineralogical literature for 1927. R. SANDEGREN. *Geol. Fören. Förh.* 50, 788-98(1928).—Continuation with 197 titles of the list described in *C. A.* 21, 881. W. SEGERBLOM

Annual review of Swedish literature concerning Post-Tertiary geology. *Geol. Soc. STOCKHOLM. Geol. Fören. Förh.* 50, 751-87(1928).—The first of a series of résumés of Swedish books and lengthy articles, covering 1927. It is planned to publish this review in English, French and German. This covers 55 titles, on various phases of geology, biogeology, soils, etc. W. SEGERBLOM

Reply to Mr. N. D. Zelinskii (cholesterol as the mother substance of petroleum). WILHELM STEINKOPF. *Ber.* 61B, 1639(1928); cf. *Z.*, *C. A.* 22, 4418. C. A. R.

Natural and synthetic petroleum (WEINBERG) 22. Radium in rocks. I. Radium content of some representative granites of the eastern seaboard of the United States (PIGGOT) 3. Analysis of a radioactive pyromorphite from Gennammari (MISCIALELLI) 3.

KIRSCH, GERHARD. *Geologie und Radioaktivität*. Berlin: Julius Springer. 214 pp. M. 16; bound, M. 17.40.

STANSFIELD, JOHN: *Assimilation and Petrogenesis. Separation of Ores from Magmas*. Urbana, Ill.: Valley Publishing Co. 197 pp.

9—METALLURGY AND METALLOGRAPHY

D. J. DEMOREST, R. H. ABORN

Hydrometallurgy. G. D. VAN ARSDALE. *Eng. Mining J.* 127, 109 (1929)

Pyrometallurgy—copper and lead. E. H. ROBBIE. *Eng. Mining J.* 127, 115 (1929). Zinc. W. R. INGALLS. *Ibid* 115; cf. *C. A.* 22, 748. E. C. M.

Ore dressing. CHARLES E. LOCKE. *Eng. Mining J.* 127, 107(1929); cf. *C. A.* 22, 748. E. C. M.

Ore dressing of molybdenum ore. GAICHI YAMADA. *Monthly J. Mining and Met.* 6, 205-22(1928); cf. *C. A.* 23, 1086.—The raw molybdenite ore contains about 1% of MoS_2 , but the product required in the market as refined ore is of about 85% grade, so that the ore dressing is very important with molybdenite. To meet this demand and also for greater efficiency, froth flotation is exclusively preferred. Molybdenite can be readily treated by flotation and is well fitted for dressing, but the raw ore is accompanied in many cases by pyrite, which considerably lowers the quality of the product of flotation. The dressing method is the same as methods generally applied; i. e., large grains are dressed by hand, while the finer, scaly ones are crushed. To obtain a high-grade ore, a comparatively large grain is necessary, but when too large, there is a danger of its escaping flotation and going away into the tailing; so the grains are usually ground to below 35-mesh fineness. Pine oil is used for frothing, and kerosene for collecting; the quantities vary according to the nature of the ore and the degree of grinding. The usual quantities are: pine oil, 0.25 lb./ton, kerosene, 0.5-0.7 lb./ton. According to Y.'s expt. a mixt. contg. 8 parts of camphor oil and 2 parts of coal tar gave a much better result. Too much oil lowers the quality of the refined ore. Such reagents as lime or soda improve the quality of the refined ore, but make use of a larger quantity of oil necessary. When pyrite or other sol. salts are present, better results are obtained by using alk. reagent. Some of the pyrite found in the refined ore can be removed by sieving. K. SOMEYA

Treatment of complex ores in the southwest. H. B. MENARDI. *Mining J. (Arizona)* 12, 7(1929).—Selective flotation has made possible the profitable handling of many complex ores. E. M. SYMMES

Methods of preparing and cleaning some common heavy liquids used in ore testing. R. G. O'MEARA AND J. BRUCE CLEMMER. *Bur. Mines, Repts. of Investigations* No. 2897, 6 pp.(1928).—To prep. $\text{C}_2\text{H}_5\text{Br}$, place 1000 g. liquid Br in 3 or 4 gas-washing bottles, add a small quantity of water to prevent excessive volatilization of Br. Bubble C_2H_5 gas slowly through the wash bottles until a change in temp. or a light amber color shows the reaction to be complete. Provide a simple cooling device to prevent excessive temp. rise and to increase the rate at which C_2H_5 may be passed into the brominating

chamber. Place the resulting heavy soln. into a separatory funnel and agitate with a dil. caustic soln. to remove the uncombined Br. Allow to stand until a definite sepn. of water and the $C_2H_5Br_4$ takes place. Draw off and dehydrate with $CaCl_2$. A yield of 90 to 96% is obtained. To reclaim from sink-and-float samples wash several times with C_2H_6 or CCl_4 . Remove diluents if desired by evapn. and filter. Avoid overheating as discolored $C_2H_5Br_4$ is of little value and must be cleaned by successive treatments with Br, NaOH and $CaCl_2$. To prep. CH_3I treat a kg. of CHI_3 in a 5 l. round-bottom flask with 500 cc. of Na_2HAsO_3 soln. made by dissolving 274 g. As_2O_3 and 532 g. NaOH in 2600 g. water. Stir with a mech. stirrer, bringing the temp. to 60° to 65° and hold const. during the reaction. Add the remainder of the arsenite soln. gradually during 0.5 hr. In 1 hr. after the last addn. the reaction is complete. Cool to 40° and filter. Draw off the CH_3I , which is the pale yellow oil in the lower layer and dehydrate with $CaCl_2$. If desired to purify distil in vacuum at 7 cm. pressure and 106° . CH_3I may be reclaimed from sink-and-float samples in essentially the same way as $C_2H_5Br_4$, except that heat must not be applied in evapn. to remove C_2H_6 and CCl_4 . If red in color agitate with a dil. soln. of NaOH or KOH, Na_2CO_3 , $Na_2S_2O_3$ or Na_2HAsO_3 . Draw off the lower CH_3I layer and dehydrate with $CaCl_2$. To prep. thallium formate roll Tl metal into a thin sheet and wash with a grease solvent. Add formic acid. Allow to react to completion on a sand bath. Pour off the soln. and add new acid. Repeat until Tl is dissolved. Evap. the liquid to dryness, redissolve in distd. water, again evap., then make into soln. of the desired sp. gr. To recover, wash the products with hot distd. water. Filter through a fast filter, place on a sand or water bath and allow to evap. to the desired sp. gr. or to solid salt. Tl malonate-formate is a mixt. of 1 mol. wt. of the malonate and the formate. Prep. Tl malonate by dissolving Tl in H_2SO_4 . Treat the sulfate with $Ba(OH)_2$. Filter off $BaSO_4$ and add malonic acid to neutralize the filtrate. Evap. the Tl malonate to dryness. Mix a mol. wt. of the malonate and the formate in soln. and evap. to dryness. Recover from sink and float samples in a manner similar to that employed for formate. Filter the salt soln. to remove the residue formed during evapn. Treat the residue with formic acid to produce new Tl formate to be placed in formate washings. Evap. the Tl malonate-formate on the sand or water bath to the desired sp. gr. or to solid salt. $C_2H_5Br_4$ has a sp. gr. of 2.95, CH_3I 3.3, Tl formate 3.5 and Tl malonate formate 3.5 to 4.9.

H. C. PARISH

Concentration of Britannia ores. H. A. PEARSE. *Trans. Can. Inst. Mining and Met.* 30, 915-28(1927).—The ore consists of a mixt. of chalcopryrite and iron pyrites in a hard quartz-porphry gang. The constituents being relatively coarse are readily freed from one another by grinding to 60-mesh. During the coarse-grinding stages in gyratory crushers and rolls the slime and fine ore are periodically washed out through screens in order to remove sol. salts which interfere with the subsequent flotation. The final grinding is effected in wet ball-mills using a pulp contg. 6.5% of solids, and the discharge after addn. of a small quantity of lime passes directly to the rougher cells in which the sulfide minerals and the Au and Ag are sepd. from the gang. The flotation agents used are 0.05 lb./ton of K xanthate, added partly at the head and partly in the middle of every rougher, and 0.15 lb./ton of a mixt. of 80% of coal tar and 20% of Canadian hardwood creosote added at the grinding mills. To produce a stable froth 0.25 lb./ton of steam-distd. pine oil is added with the xanthate, and sometimes small quantities of Na resinate are added at various points along the roughers. The primary slimes obtained in the early stages of crushing are washed, treated with 8 lb./ton of Na_2CO_3 , and floated with 0.3 lb./ton of xanthate, 0.15 lb./ton of pine oil, and 0.05 lb./ton of fumol (a condensation product of AcH). The av. concentrate from the rougher cells contains 9-15% Cu; it is classified and the underflow is reground with 1.5-2 lb./ton of slaked lime. The overflow from the classifiers and the discharge from the regrinding mill are refloats with the addn. of a little pine oil; the concentrates from this operation average 20% Cu, the pyrite having been deadened by the addn. of lime, and the tailings 3% Cu. The latter are retreated in a Forrester pneumatic machine to obtain a middling product with 12% Cu which is re-treated with further quantities of rougher concentrates. The tailings from the Forrester machine are passed over blanket tables to recover free Au, then passed to other Forrester machines in which the pyrite is floated with 0.3 lb./ton of xanthate. The recovery of pyrite is 60% of that in the mill feed, and the product assays 49.8% S, 44% Fe, 0.35% Cu, and 4.5% of insol. material; the recovery of Cu in the first concentrates is 91.3% and the recovery of Au on the blankets about 62%. The cost of treatment of the ore is 42.6 cents/ton, of which 4.5 cents is the cost of flotation reagents and 16.1 cents the labor cost.

B. C. A.

Determination of flakiness of ores. WILL H. COGILL, O. W. HOLMES AND A. B. CAMPBELL. *Bur. Mines, Repts. of Investigations* No. 2899, 7 pp.(1928).—Flakiness

of ores is detd. by sizing on square holes and then screening on oblong holes. In every instance the cubical grains had a higher Zn content than the flaky grains in Tri State jig tailings. E. g., in the 4- to 5-mesh product the cubical grains assayed 1.87% Zn and the flaky grains 1.08%. The same degree of flakiness was shown by Tri State chert and Southeast Missouri Pb belt dolomite when similarly ground. The discharge from rolls was more flaky than that from the ball mill. Some evidence was obtained to show that the size of max. flakiness in the discharge is a certain fraction of the size of the feed.

H. C. PARISH

Preliminary examination of low-grade bauxite with particular reference to flotation. B. W. GANDRUD AND F. D. DE VANEY. *Bur. Mines, Repts. of Investigations* No. 2906, 8 pp. (1928).—The phys. characteristics of low-grade bauxite have been studied, special attention being given to the possibility of applying com. methods of concn. to low-grade bauxite. Silica and Fe are the most objectionable impurities requiring removal in the ores of the Alabama-Georgia-Tennessee-Mississippi district. Na_2S and oleic acid successfully floated gibbsite from kaolinite and free silica. The bauxite required conditioning with the Na_2S before adding the oleic acid. Violent stirring and agitation for 10 min. before the addn. of the oleic acid give sufficient conditioning. The addn. of kerosene or machine oil with the oleic acid facilitated the flotation. Results of flotation tests with 50-g. and with 500-g. machines are tabulated. Sepn. of mineral and gang was very inefficient until the minus-275-mesh material had been removed by screening. The Na_2S cost is about 18¢ per ton (909 kg.) of ore treated. Flotation concentrates, as a rule, showed a higher Fe content than the original ore. The flotation of high-silica bauxite should have possibilities of com. application as a process for obtaining pulverized bauxite of chem. grade from low-grade ores. W. H. BOYNTON

Economy in roasting spathic iron ore. LUDWIG A. RICHTER. *Arch. Eisenhüttenw.* 1, 725-7 (1928).—As contrasted with the roasting methods used at San Fernando and Apold-Fleissner the roasting costs in the old roasting furnaces are high. The most economical is the roasting process of Apold-Fleissner.

J. BALOZIAN

The cyanide process applied to an insoluble manganese-silver ore. HEIKICH SARTO. *Taiu Mining Works. Japan J. Mining* 44, 753-84 (1928).—When the Ag ore accompanies Mn oxide, part of the Ag is difficultly sol. in the cyanide soln. and there is as yet no established theory as to the nature of the insol. portion. S. studied the application of the direct cyanide process, sulfurous acid process and the reduction process to this kind of ore, to find a simple and economic method of operation. *Results.* In the direct cyanide process there is found to be a limit in the amt. of insol. Ag formed, the grain size, time and the concn. of the soln. exerting little influence. T. supposes that the insol. Ag has originally been sol. but has changed into an insol. form, after or simultaneously with its oxidation. When the insol. Mn-Ag ore is treated by H_2SO_4 to remove Mn oxide, the insol. Ag can be made largely sol. The velocity of soln. of Mn oxide in H_2SO_4 is very great but is affected by impurities sol. in the acid so that the dil. acid is most advantageous. *Conclusion:* A good result is obtained by applying the cyanide process after removing Mn oxide. S. next tested the reduction process and concludes: This kind of ore may be made sol. by adjusting the temp. of reduction and the kinds of the gas used. The temp. of C deposition, etc., depends upon the kind of ore used, it being generally important to work at about 350° where the C deposition is small or at a much higher temp. of 700°. In applying the cyanide process to the reduced ore it is important to add a sufficient quantity of protecting lime and cause air oxidation by stirring to take place in order to lessen the danger of making the KCN consumption large. S. states that the insol. Ag ore is probably present as a kind of hard Mn ore of the compn. $x\text{Ag}_2 \cdot y\text{MnO}_2$.

K. SOMEYA

Speiss and the metals of the platinum group. H. RUSDEN AND J. HENDERSON. *J. Chem. Met. and Mining Soc. S. Africa* 29, 66-7 (1928).—Fusion speiss is difficult to roast but a finely crushed sample mixed with damp sand (1:1) should be workable in a good roasting furnace with recovery of As. Fusion of the roasted product mixed with mealie meal in a crucible with assay slag as cover is fused 1 hr. at a high temp. and poured into a mold. The resultant bead consists of Ni and Cu with some platinumoids. The detached slag is returned to the crucible and given a couple of washes to recover the remaining precious metals in the Pb. This means of collection of the bulk of the Ni and Cu renders their recovery by the usual methods possible. No data are given.

W. H. BOYNTON

Problems of the platinum market. ALBERT LINDE. *Edelmetalle-Vertriebs A.-G., Berlin. Mining J. Annual Review* No. 1929, 10.—L. predicts an increased demand for Pt in 1929.

ALDEN H. EMERY

Solving a fume problem. W. H. ROWLEY. *Eng. Mining J.* 127, 232-3.—A de-

scription of the dust recovery system in the lead oxide plant of the Evans-Wallower Lead Co. at Charleston, W. Va. An automatic self-cleaning filter machine has been efficient and economical, eliminating a great deal of waste, labor turn over, sickness and other difficulties. The complete equipment consists of filters, air suction lines, hoods, and accessory equipment in connection with the mills, screens, mech. conveyors, elevators, and packers about the plant.

Can pulp thickening be simplified? E. G. HOWE. *Eng. Mining J.* 127, 157-9 (1929).—Area is a dominant factor in pulp thickening varying with: class of material, d of feed, flocculating agents used, temp., etc. Recent machine developments combine the principle of compression with filtration all more or less intermittent in character. Examples of the use of cones for slime thickening are outlined, also the possibilities of using conical tanks. Everything points to the adaptability of the baffled spitzkasten of large area to the thickening of flotation pulps, with debatable possibilities on cyanide slime and the need for a dense product. The application of such a tank to the thickening of flotation concentrate would be worthy of consideration. W. H. BOYNTON

Mining practice. GEORGE J. YOUNG. *Eng. Mining J.* 127, 104(1929).

E. C. M.

Patiño Mines and Enterprises Consolidated. ANON. *Mining J.* Annual Review No. 1929, 36-9.—A review of the history and a description of the ore, ore reserves, and metallurgy of this important Sn producing company. ALDEN H. EMERY

Chromium. W. G. RUMBOLD. *Mining J.* Annual Review No. 1929, 13.—R. shows statistically the increased production of Cr since 1925, together with the increasing proportion which comes from the British Empire, chiefly due to Southern Rhodesia and the Union of S. Africa. The increased demand will soon make second-grade deposits (30-40% Cr₂O₃) of more importance. The chief uses are outlined. A. H. E.

Magnesium. L. M. WILSON. *Mining J.* Annual Review No. 1929, 12.—A comparison of Al and Mg in properties, uses, prices, etc. ALDEN H. EMERY

Eastern Smelting Co., Ltd. The tin smelting industry in Malaya. ANON. *Mining J.* Annual Review No. 1929, 35.—A description of the Sn smelter at Penang and the methods used for smelting and refining. ALDEN H. EMERY

Tin in 1928. E. BALIOL SCOTT. *Mining J.* Annual Review No. 1929, 5-6.—During 1928 Sn had the most remarkable year in its history. Production was increased about 11 5/7% in spite of a declining price. The 2 greatest increases were in the Federated Malay States and Bolivia. Consumption of Sn for 1928 is discussed and the probable trend of production for 1929 is forecast. ALDEN H. EMERY

Canada's copper position in 1928. S. J. COOK. *Mining J.* 164, 61 2(1929).—Canada produced 1/3 more Cu in 1928 than in 1927. The situation at individual mines is briefly discussed. ALDEN H. EMERY

Great Britain and the world copper position. T. B. HENDERSON. *Metal. Ind.* (London) 34, 27(1929). **Tin: its sources and economic position.** JOHN CARTLAND.

Ibid 29. **The lead industry.** ANON. *Ibid* 33. **The aluminum industry.** EDGAR T. PAXTON. *Ibid* 35. **Zinc: its prospects and applications.** H. M. RIDGE. *Ibid* 37.

Nickel and its alloys. ANON. *Ibid* 38. **Antimony: its sources and applications.** A. SHORT. *Ibid* 39. **Chromium and chrome ores in the world commerce.** JAMES RUBINFELD. *Ibid* 43. **Magnesium.** ANON. *Ibid* 44. **Review of scientific metallurgical progress in 1928.** F. JOHNSON. *Ibid* 45. E. C. M.

Copper in 1928. E. H. ROBBE. *Mining J.* Annual Review No. 1929, 3.—An analysis of the Cu market in 1928 and a prediction for 1929. ALDEN H. EMERY

Iron and steel. ANON. *Mining J.* Annual Review No. 1929, 2.—Figures are given for the world production of Fe and steel by countries. The British trend is shown by monthly averages for 1913, 1925, 1927 and complete monthly returns for 1928 under the headings of furnaces in blast, production pig iron, production steel, imports, and exports. The figures show a great need for improved blast-furnace practice in Britain. The economic condition in England is considered. ALDEN H. EMERY

The development of the use of nickel. A. C. STURNEY. Bur. of Information, Nickel, Ltd. *Mining J.* Annual Review No. 1929, 13.—A brief history of the use of Ni from 235 B. C. to date with special emphasis on modern uses. ALDEN H. EMERY

The Coley process for the production of zinc. ANON. *Mining J.* Annual Review No. 1929, 71.—"Nascent" C from hydrocarbon cracking is used at temps. below the present practice to reduce the ore in 2 stages. Powd. Zn, ZnO and C resulting from the first stage are collected in H₂O and filtered. The cake contains enough finely divided C to require only heating to produce Zn. Costs are below \$25 per ton of Zn. All oxide and silicate ores can be treated. ALDEN H. EMERY

Lead and spelter in 1928. PHILIP W. SMITH. *Mining J.* Annual Review No.

1929, 7.—The 1928 production of Pb in Great Britain, U. S., Spain, Mexico, etc., and Zn in Great Britain, U. S., Belgium, Poland, Germany, etc., is analyzed. A. H. E.

Gold and silver in 1928. ANON. *Mining J. Annual Review No. 1929*, 8.—A brief economic analysis by countries of the world's Au and Ag production for 1927 and 1928.

ALDEN H. EMERY

Gold. R. J. GRANT. *Eng. Mining J.* 127, 83(1929). Silver. W. MONTAGUE FERRY. *Ibid* 84. Lead. CLINTON H. CRANE. *Ibid* 86. Copper. ARTHUR NOTMAN. *Ibid* 89. Zinc. STEPHEN S. TUTHILL. *Ibid* 91. Tin. E. BALIOL SCOTT. *Ibid* 92. Iron. CHARLES D. SKILLINGS. *Ibid* 94. E. C. M.

The famous Kolar gold fields of India. ANON. *Mining J. Annual Review No. 1929*, 68-9.—Since this district was opened 16,000,000 oz. of fine Au have been produced. The workings of the 5 operating companies are briefly described. A. H. E.

Tin mining in Malaya. ANON. *Mining J. Annual Review No. 1929*, 33.—Malaya produces about 35% of the world's Sn output by 4 methods: open-cast mining, gravel pumping, hydraulicking, and bucket dredging. Each is described. A. H. E.

Oxygen in cadmium copper. CLEMENT BLAZEY. *Metal Ind.* (London) 34, 3-4 (1929).—Deoxidation by Cd, while resulting in some loss of Cd, may be controlled in a manner that affords satisfactory results. Expts. show that, with sufficient time, practically all Cd may be removed from a bar, rod, or wire in an oxidizing atm. The properties of wires drawn from rods subjected to prolonged heating in air are tabulated. After 336 hrs. nearly all of the Cd has been driven out of the rod. Analyses of the central and outer portions of the original rod showed that the Cd was uniformly distributed and that the loss of strength and gain of cond. of the wires were not due to removal by oxidation of a high-Cd outer portion of the rod. W. H. BOYNTON

The importance of recovered or "secondary" tin. J. B. RICHARDSON. *Bull. Inst. Mining Met.* No. 291, 32 pp.(1928).—The world is threatened with a Sn shortage because the known Sn fields are being worked out and no new fields are being discovered. A great increase in "secondary" Sn could be accomplished by adopting the following suggestions: (1) Municipal and other authorities should improve and cheapen the methods of collecting Sn-bearing refuse. (2) Industries consuming Sn in any form should give more attention to the classification and retention of Sn-bearing by-products in their most concd. form. At all costs diln. should be avoided. (3) Metal merchants and collectors should use better grading methods. Smelters could assist by putting a greater premium on clean material and more heavily penalizing heavily deleterious matter in all Sn-bearing material. (4) It could be desirable to have the treatment of Sn-bearing metals and residues in the hands of fewer but larger firms possessing ample resources and the technical skill to install new or to improve old plant and to take up new proved processes. Now hundreds of small firms are treating, some wastefully. (5) More assistance should be received from metallurgists in the development or invention of processes for the isolation of Sn; for the disocn. of one or more metals from the alloys of Sn and their residues; and for a greater degree of concn. of Sn in the present processes so that the recovered Sn may become more flexible in its re-applications. (6) Disseminate the accumulated technical work and knowledge on this subject more freely. (7) Collect and publish by appropriate government authority, statistics on production of "secondary" or recovered Sn. H. C. PARISH

Recent developments in non-ferrous metallurgical furnace practice. MAURICE COOK. *Metal Ind.* (London) 34, 51(1929). E. C. M.

Refractory materials in the non-ferrous metal industry. ALFRED B. SEARLE. *Metal Ind.* (London) 34, 57(1929); cf. C. A. 22, 3027. E. C. M.

The cold-rolled non-ferrous trade. ANON. *Metal Ind.* (London) 34, 55(1929). E. C. M.

Wrought iron made by a new process. CHARLES LONGENECKER. *Blast Furnace & Steel Plant* 17, 263-5(1920).—A new process of making wrought Fe is carried out by melting Bessemer pig Fe in a cupola, blowing the cupola metal in a converter and then pouring the fully blown metal into molten slag, the resultant product being a sponge in every respect similar to that produced in a puddling furnace. D. S.

The applicability of coke-oven gas to the iron industry. G. BULLER. *Arch. Eisenhüttenw.* 1, 755-79(1928).—The properties, uses in the Fe industry and the types of burners for coke-oven gases are reviewed. The thermal management of coke gases is discussed. The changing of the properties of the gas with and without changing its sp. gr. is outlined in the appendix. J. BALOZIAN

Metallurgy of steel castings. A. MCCANCE. *Foundry Trade J.* 39, 465-6(1928); 40, 25-6(1929).—The main causes of the difficulties in the manuf. of steel castings are concerned with problems of contraction. The phys. actions causing these contractions,

and foundry methods of taking care of them, are given in detail. The subject is divided into 3 sections: (1) liquid contraction, *i. e.*, the contraction of the molten metal in the mold down until it reaches its freezing temp.; (2) freezing contraction, *i. e.*, the contraction which takes place when the metal passes from the liquid to the solid condition; and (3) cooling contraction, *i. e.*, the contraction which takes place during the cooling down of the casting from the solid condition at high temp. to its condition at ordinary temp.

DOWNES SCHAAF

Siemens basic steel utilizing pig iron from South African ores. G. M. NODEN. *J. South African Chem. Inst.* 11, 41-54(1928).—A brief description of the Newcastle steelworks (S. Afr.) with analyses of raw materials and finished products obtained from basic, open-hearth, steel furnaces operating on pig iron obtained from South African spathic Fe ore and on scrap obtained from the railways and mines. Tabulated details of the construction and working of 4 furnaces and of the necessary gas producers are also included.

B. C. A.

Physical chemistry of rimmed steel. J. I. CARLIN. *Blast Furnace & Steel Plant* 17, 261-2(1929).—The practice of producing rimmed steel and the phys. chemistry of the process are outlined. A summary of the points that have practical value follows: (1) the amt. of CO present in a steel before the addn. of Mn is dependent on temp. only, and is independent of C and FeO content; (2) after the Mn addn. high-C steels contain less CO than low-C steels and for this reason it is impossible to rim high-C steels; (3) the evolution of CO depends upon actual solidification of the metal; (4) C content and temp. are the most important factors in the manuf. of rimmed steel.

D. S.

Charging air by weight. H. V. CRAWFORD. General Elec. Co., Schenectady, N. Y. *Foundry* 57, 114-6, 159-62(1929).—The necessity for controlling the amt. of air supplied to a cupola melting Fe is explained. The cu. ft. of air required per min. equals 4000 times the tons of Fe melted per hr. divided by the ratio of Fe to coke, excluding the bed. The blower should be of variable capacity, so that a const. wt. of air may be delivered in spite of changes in vol. due to variations in temp. and barometric pressure. Errors as high as 46% may occur under certain conditions if a const. vol. of air is always delivered, and errors in either direction result in the Fe produced being too cold. Supplying air under const. pressure is also incorrect. A variable restriction in the air-supply pipe between blower and cupola may be controlled so that the motor operating the blower uses a const. amt. of power. With a blower and motor of suitable type, this control will result in supplying the cupola with a const. wt. of air. The design of this control system is described. The limits between which it operates are adjustable. The results of practical use of this device are given, showing satisfactory operation, and the theory of its action is also discussed.

GEO. F. COMSTOCK

Large-scale experiments for determining the economical method of operating blast stoves. MARCEL STEFFES. Tech. Hochschule, Aachen. *Arch. Eisenhüttenw.* 2, 1-10(1928).—The requirements, efficiencies and conduction and radiation losses of blast stoves used at the "Terres Rouges" mine, during their gas and blast periods, are detd. in expts. lasting up to 12 hrs.

J. BALOZIAN

Construction and operation of Kathner normalizing furnaces. C. P. MILLS. *Proc. Eng. Soc. West Penn.* 44, 305-29(1928).—The two 155-ft. Kathner normalizing furnaces of the Newton Steel Co. are described and various construction details are shown in 6 drawings and 6 photographs. The furnaces are divided into 2 main sections, the heating zone 75-ft. long, and the cooling zone 80-ft. long. The heating zone is equipped with 2 independent sets of burners; the gas burners are of the self-aspirating type and are used with high-pressure natural gas; when gas is not available oil is burned after atomization by high-pressure steam in an inducing type burner. The insulation of the furnace is a very important factor in the efficiency of its operation.

D. S.

A study of sulfur in the basic process. II. HAROLD A. GEIGER. *Blast Furnace & Steel Plant* 16, 1319-21(1928); cf. C. A. 22, 4330.—Reference is made to a portion of the literature concerning the influence of different concns. of Mn and Si on the S content of blast-furnace and open-hearth metal. Cf. following abstr.

DOWNES SCHAAF

A study of sulfur in the basic process. III. HAROLD A. GEIGER. *Blast Furnace & Steel Plant* 17, 287-9(1929).—The importance of the S content of the fuels used in the manuf. of steel by the basic open-hearth process is shown by several references to the literature on Fe and steel. Other sources of S are mentioned and different means of desulfurization are reviewed. Cf. preceding abstr.

DOWNES SCHAAF

Destruction of brick by carbon monoxide. E. DIEPSCHLAG AND K. FEIST. *Blast Furnace & Steel Plant* 17, 280-2(1929); cf. following abstract.—The decompn. of brick in the lower masonry work of the blast furnace by deposited C is explained by exptl.

data to be due to the pptn. of C from CO, which action is intensified by adsorption catalysis in the presence of catalysts.

DOWNES SCHAAF

Destruction of blast-furnace building materials, particularly firebricks. E. DIEP SCHLAG AND K. FEIST. *Feuerfest* 4, 49-51, 106-8(1928); cf. preceding abstract. Methods for testing the resistance of refractories to slags are critically reviewed. Tests were made on a no. of firebricks by filling small hollows in them with weighed quantities of NaOH and KOH and firing to various temps. between 200° and 1100°, the change in the alumina : silica ratio being taken as a measure of the reaction. A considerable quantity of brick material was dissolved by NaOH at 400°, though no corrosion of the refractory was evident. Silica, particularly in the amorphous form, was attacked much more readily than alumina at this temp., but at 600-800° this difference was largely eliminated. KOH behaved similarly, but the quantity of refractory dissolved was much smaller. The melts formed at the low temp. were largely sol. in water, indicating the formation of simple silicates and aluminates, whereas those formed above 1000° took the form of insol. complexes. Between 1000° and 1015° the quantity of brick material dissolved increased considerably, but the lower reactivity of KOH was still more marked at this temp. The degree of penetration into the body of the brick depends almost entirely on the viscosity of the melt produced. It therefore does not constitute a measure of the chem. reaction which has taken place. The alumina content of the refractory has no important effect on the resistance to slag attack.

B. C. A

Autogenous and electric welding. R. W. MÜLLER. *Apparatebau* 41, 3-9(1929)

When the app. must be as uniform as possible autogenous welding is preferred; when high elasticity and toughness are desired elec. welding is better.

J. H. MOORE

Weld efficiency in penstock pipe using overlap welds. OREN REED. *Eng. News Record* 101, 550-2(1928).—Curves are given, based on data obtained in tests of 552 hammer-welded pipe sections, showing weld efficiency and ultimate weld strength. The variation in weld strength with plate thickness is shown graphically. A plate of $\frac{1}{4}$ to $1\frac{1}{4}$ in. in thickness will give the most consistently good welds. In general, the weld efficiency of 90% often assumed in designing penstocks is conservative, but for thin plates (less than $\frac{1}{16}$ or $\frac{1}{2}$ in.) a lower efficiency should be assumed. The data given indicate that a max. thickness of $1\frac{1}{4}$ in. or slightly greater can be used conservatively. The min. weld strength obtained was 41,200 lb. per sq. in., representing a weld efficiency of approx. 80% with plate strength of 52,000 lb. per sq. in. R. E. T.

A new butt-welding machine for 800 square millimeters iron cross-section. CONSTANTAN REDZICH. *Apparatebau* 40, 305-6(1928).—An elec. welder. J. H. M.

Carboly—a new tool material. GUY BARTLETT. General Electric Co., Schenectady, N. Y. *J. Chem. Education* 5, 1399-1405(1928).—W carbide has been joined with Co to produce the hardest cutting material yet developed in a research laboratory. It retains its cutting edge when run at a bright heat, has a Brinell hardness above 2000, a strength of 275,000 lbs./sq. in., is quite tough, withstands shock and abrasion remarkably well. Records of comparative runs in cutting high Ni-steel, alloys, glass, glazed porcelain, concrete, the faces of cast iron castings, hard castings, molded comps., genelite (an alloy of Cu, Sn and C), etc., show performance not attained by other cutting materials.

W. C. EBAUGH

Carbon-silicon relation determines suitability of iron for casting. D. G. ANDERSON AND G. R. BESSMER. Western Elec. Co., Chicago, Ill. *Foundry* 57, 106-8(1929). Small heats of cupola-melted gray Fe, mixed with Si-steel, were melted in a high-frequency induction furnace to det. the phys. properties with various C and Si contents. C contents from 3.4 to 2.3% were investigated with 1.1% Si; from 3.4 to 1.9 with 2% Si; and from 3.4 to 1.8 with 2.2% Si. Bars $1\frac{1}{2}$ in. square were cast in sand molds and tested for hardness, tensile strength and transverse strength with supports 6 in. apart. The results are tabulated, and photographs of fractures and microstructures are shown. With 1.1% Si the combined C rose sharply as the total C dropped below 3.4%, and the strength rose as it dropped below about 2.9%. With higher Si, the combined C rose as the total C fell below 2.5%. With 2% Si the max. strength was found with the lowest C, about 1.9%, but with 2.2% Si the strength was a max. at about 1.95% C. The structures became finer as the C was reduced, and the graphite particles more compact.

G. F. C.

Some causes of sponginess on the upper surfaces of iron castings. T. BUTTERWORTH. *Iron and Steel Ind.* 2, No. 2, 43-4(1928).—Sponginess is caused by dirt accumulated by the hot metal from the mold sides, by slag formed through a reaction of the metal and the mold sand, by iron oxide resulting from a reaction between the metal and the water held in the mold sand, and by gas holes formed during solidification and

originating in the soly. of O, N, CO and H in the molten metal. The question of avoidance of these defects is discussed and a number of partial solutions pointed out.

ROBERT F. MEHL

Whiteheart malleable castings. E. R. TAYLOR. *Bull. British Cast Iron Research Assn.* 1928, Oct.; *Foundry Trade J.* 39, 373(1928).—A discussion of correct testing practice for thin-walled malleable castings, and a description of the testing methods recommended by the British Engineering Standards Association for heavy engineering malleable castings.

ROBERT F. MEHL

The growth of cast iron. FRITZ WÜST AND OTTO LEIHENER. *Mitt. Kaiser-Wilhelm Inst. Eisenforsch. Düsseldorf* 10, 265–81(1928).—Thirty-one papers on the growth of cast iron are reviewed. The growth of cast iron was observed after heating specimens for various periods in a neutral atmosphere at 600° and in superheated steam at 330°. Specimens of the following composition were heated in a neutral atmosphere: 2.49 to 3.90% total C, 1.70 to 3.17% graphitic C, 0.18 to 1.03% combined C, 0.50 to 2.82% Si, 0.39 to 1.42% Mn, 0.09 to 1.87% P, 0.03 to 0.153% S. Specimens of the following composition were heated in superheated steam: 2.45 to 3.86% total C, 1.74 to 3.29% graphitic C, 0.19 to 0.91% combined C, 0.95 to 2.82% Si, 0.39 to 1.42% Mn, 0.09 to 1.87% P, 0.03 to 0.14% S. In each case specimens were selected representing three zones in the metal: (1) border, (2) between border and middle, and (3) middle. The growth in neutral atmosphere and in superheated steam within the three zones was investigated. A comparison was made of the growth of specimens normally prepared and specimens remelted in vacuum. The effect of preliminary heating in vacuum on growth in neutral atmosphere was also investigated. The data are summarized in six tables and 62 graphs. Micrographs illustrate the decomposition of cementite and the formation of graphite. It is concluded that: (1) the influence of chemical composition upon the growth of cast iron is obscured by other factors; (2) the growth in neutral atmosphere with the decomposition of cementite cannot be explained; (3) the finer the form of graphite the smaller is the amount of growth; (4) the material in the middle zone grows faster than that in the border zone; (5) the gas content of cast iron has an important influence on growth. [No conclusion is given on growth in superheated steam.]

JOHN W. W. SULLIVAN

Mechanical properties of steel castings at elevated temperatures. FRIEDRICH KÖRBER AND ANTON POMP. *Mitt. Kaiser-Wilhelm Inst. Eisenforsch. Düsseldorf* 10, 91–105(1928).—Steel castings from a Siemens-Martin furnace, a Bessemer converter, and Si and Ni castings were examd. with respect to elastic limit, tenacity, expansion, twisting strains, and resistance to pounding at temps. ranging from 20° to 500°.

HANS C. DUUS

The resistance of alloys. LOTHAR NORDHEIM. *Naturwissenschaften* 16, 1042–3 (1928). Sommerfeld's theory on metallic resistance is used for computation of the resistance of alloys. Besides the resistance of the pure metal (due to imperfection of the lattice) an addnl. resistance κ is found for alloys, which is derived from the difference in scattering power of the individual lattice units for the electron waves. Using the

Laue theory derived for x-rays for this scattering power N , finds for κ a value $\frac{(1-z)\pi\hbar}{2e^2Z^2}$

$\left(\frac{3\pi}{\pi}\right)^{1/2} \pi Q$, in which z is the fraction of second metal present, Z the no. of conduction electrons per atom, $n = N/V$ the no. of atoms per cc. The Q factor is a function of the scattering coeff. for the 2 metals; πQ can be considered as a sphere of action for the differential scattering. For low temps., where the addnl. resistance κ outweighs the ordinary one, κ as a function of z , the concn., will be a hyperbola, symmetrical when n is const. For very small concns. κ will be proportional to z . For Ag-Au data (Grüneisen) the exptl. values bear out the theory very well between $z = 0.01$ and 0.629 ; for $T = 273^\circ$ $\kappa = 0.0214$. The factor πQ is found to be $1.27 \cdot 10^{-16}$. It is also found that κ will be larger for admixts. of less closely related metals. B. J. C. VAN DER HOEVEN

The influence of grain size on magnetic qualities. II. O. v. AUWERS. *Forschungs-lab. Siemenskonzern, Berlin-Siemensstadt. Z. tech. Physik* 9, 475–8(1928).—Lately (Moos, Oertel and Scherer, *C. A.* 22, 2544) the theory has been abandoned that grain size causes the watt losses to increase proportionally. In order to study the influence of grain size and the cause of irregularities A. used electrolytic Fe of 0.02% C and variable grain size. Iron strips were annealed and stretched to 2, 4, 7, 15 and 25% elongation. These strips were heated for 40 hrs. at 870° in *vacuo* to allow recrystn. and their grain size was detd. The latter varied from 2 sq. mm. for 2% elongation to 4 sq. mm. at 4% and down to less than 0.5 sq. mm. for 15% elongation. The max. grain size was 3000

times that of the original iron heated in similar way. Complete hysteresis loops, satn., coercive force and remanence were measured on all of them. For W_A (the Watt loss) the equation $W_A = c\sqrt{N} + C$ was found to hold, N being the no. of grains per sq. mm., c and C consts. All curves show a min. at 2 to 4% elongation corresponding to the max. in the grain size. After elimination of some C and O from the Fe by 4 hrs. heating at 900° *in vacuo* the curves became more flattened out, i. e., less magnetic loss; particular improvement was shown by the samples of small grain size. Heating in H_2 gave a further improvement although the extended incandescence causes an effect by itself. It is concluded that grain size does not directly influence magnetism but causes indirect effects due to impurities (C and O) on the grain surface. The influence of gases is larger for the smaller grain size.

B. J. C. VAN DER HOEVEN

The influence of rolling temperature on stretching, spreading and work of rolling for various carbon steels in wire drawing. KURT HOPFER. *Mitt. Kaiser-Wilhelm Inst. Eisenforsch. Düsseldorf* 10, 283-99(1928).—The work of previous investigators, particularly O. Eimicke and M. Rodenbach, on the relation of rolling temperature to spreading is reviewed. The wire drawing app. used in the present investigation is illustrated by a flow sheet and by diagrams of the grooving of the roughing rolls. Rolling properties of the following steels were investigated: Thomas steel, 0.05% C, 0.40% Mn, 0.06% P; Siemens-Martin mild steel, 0.04% C, 0.37% Mn, 0.019% P; and three Siemens-Martin hard steels, 0.26% C, 0.40% C and 0.60% C, resp., with 0.20% Si, 0.71% Mn, 0.022% P. The rolling properties of these steels, when drawn down without intermediate reheating and finished, appear to be as follows: the influence of initial rolling temp. on stretching and spreading is proportionately slight; with falling temperature during rolling stretching becomes proportionately less than spreading; concerning carbon content and method of manufacturing the steel as affecting rolling, Thomas steel permits greater stretching and less spreading, whereas Siemens-Martin steel with av. carbon content of 0.45% allows less stretching and greater spreading, and the other Siemens-Martin steels are in between. Without annealing between passes, stretching decreases and spreading increases markedly with falling temp. down to 1000° for all the steels. Just under 950° stretching again increases, whereas spreading simultaneously decreases. Very probably various friction ratios between the surface of the grooves and surface of the bar and the temp. distribution within the bar decidedly influence stretching and spreading. Measurement of the work of rolling confirms the well-known dependence of rolling work on rolling temp. C content and method of manufacture influence the work of rolling in so far as Thomas and mild Siemens-Martin steels for 107-fold stretching require 75 to 87 units of work, whereas low-Si Siemens-Martin steels require 100 to 107.5 units. The max. work is required by the Siemens-Martin steel of 0.45% C, while for higher and lower C content, and at the same rolling temp., less work is required.

JOHN W. W. SULLIVAN

The hot acid etch test for steels. FRANCIS W. ROWE. *Iron and Steel Ind.* 2, No. 2, 37-40(1928).—It is pointed out that standard routine tests often fail to disclose serious defects in steel. Hot acid etch (with dil. H_2SO_4 -HCl mixt.) serves to reveal such defects. Directions on the prepn. of samples for this test and a series of photomicrographs illustrating typical defects revealed by the test are given.

R. F. M

Strength of low-carbon steels at high temperatures. R. G. BATSON. National Physical Lab. *Engineer* 146, 707-9(1929).—The materials used were tubes obtained from boiler-makers with C content ranging from 0.10 to 0.15%. For comparison a normalized steel bar, C = 0.17%, and another with C = 0.09% which had been cold-drawn and annealed at 650° for 6 hrs. were employed. "So long as strain-hardening occurs the elongation is practically general throughout the length of the test piece during a certain period. . . . When little or no strain-hardening is evidenced by the strain duration curves the elongation is found to start locally at the weakest spot, but also occurs at a decreased rate towards the ends of the test pieces." Many tables and figures are included.

D. B. DILL

The case-hardening of steels by nitrogen. ANON. *Engineer* 146, 637-8(1928).—The Fry process, in use by John Brown & Co., Ltd., is described. Machined parts of *Nitr alloy* steel are heated in a current of NH_3 at atm. pressure at 500°. The depth of nitration case is 0.2 mm. after 20 hrs. treatment and 0.8 mm. after 95 hrs. When treatment is complete the furnace is cooled quickly to 370°, and the parts are removed as soon as cool enough to handle. Brinell hardness ranges from 900 to 1100 and Shore scleroscope readings from 102 to 113. Resistance to wear is at least 10 times that of cemented and quenched steels. Max. hardness is about 0.1 mm. below the surface, tapering off gradually until a const. value is reached 0.7 mm. below the surface. Risk of peeling or spalling is eliminated. The process is only applicable to special "Nitr alloy"

steels which contain Al. Compared with cementation and quenching the advantages are: absence of distortion during nitration due to low temp. used, of deformation and of quenching cracks; parts may be nitrated in finish-machined condition; hardness is retained up to 500°; polished nitrated steel does not heat when running with Al alloys; resistance to corrosion by fresh or salt water, steam or moist air is large, and the cost of the process is small.

D. B. DILL

Nitration of steel with ammonia gas under pressure. RAYMOND H. HOBROCK. *Fuels and Furnaces* 6, 1681-2(1928).—A case depth of 0.027 inch was obtained at 875° F. after 100 hrs. at 5 mm. pressure. At 602 mm. pressure the same depth was obtained in 50 hrs. Increase in pressure (1) does not greatly change the time required for reaching the max. surface hardness, (2) tends to decrease the hardness at the surface if the treatment is continued for longer than about 25 hrs., (3) considerably increases the depth of case, (4) decreases the average hardness gradient, (5) permits the establishment of a high hardness at almost any depth depending on the pressure of the gas and the time of the treatment. An alloy intended for the establishment of a hard surface of no great depth might contain much more Al than an alloy intended for use where a deep case is required. Where high surface hardness and deep penetration are to be obtained by nitration under pressure, the amt. of Al in solid soln. in the alloy must be accurately controlled. The increase in hardness due to the nitration of alloy steels is due in part to the formation of a network of crystals of Fe nitrides and in part to the formation of slip interference particles of Al and other nitrides.

H. C. PARISH

The disclosure of the transformations of brasses containing 57.5 to 63.5% copper, by the study of mechanical properties. P. DEJEAN. *Compt. rend.* 188, 169-72(1929).—A study of the plasticity of brasses contg. 57.5 to 63.5% Cu gave very precise indications of the transformations. Cylindrical test-specimens 20 to 30 mm. in diam. and 30 to 45 mm. high were heated to the desired temps. in an elec. furnace and quickly subjected to a standard blow from a falling wt. Tests were made at various temps. from 0° to 900°; and curves show the amt. of distortion at each temp. for six alloys. An inflection is found on every curve at 480°, and another at higher temp. varying from 688° to 800° as the Cu content rose. The first transformation did not occur suddenly at 480°, but proceeded gradually from 250° or 300°. The alloys contg. least beta were more plastic when cold, and less plastic when hot than those contg. more beta. The second inflection was due to a change of alpha plus beta into beta only. This method of investigation is useful, sensitive and unexpectedly precise. G. F. C.

The study of strengthening transitions in alloys. M. HANSEN. Kaiser-Wilhelm Inst. f. Metallforschung, Berlin-Dahlem. *Naturwissenschaften* 16, 1024-6(1928).—In order to study the initial phase sepn. of highly dispersed supersatd. solid solns. H. experimented on aging of Cu-Zn alloys in the $\alpha + \beta$ range between 100° and 400°. Hardness and elec. resistance were measured at different stages of the process. Initially an increase in resistance of all the alloys appeared as expected from cond. isotherms; the first part of this rise is soon finished (1 min.); it is independent of temp.; the second part of the increase lasts longer (20 min. up to 10 hrs.) and depends on temp.; it also runs parallel with hardness changes. The total increase in resistance is at equal aging temp. larger for more supersatd. crystals and for equal compn. larger for higher aging temp. (below 300°). The subsequent decrease in resistance begins earlier for more supersatd. crystals and for higher temp. These results are shown in graphs (59 to 61% Cu, up to 80 hrs. observation). The final resistance is always higher than the initial one. The importance of the measurements in the short initial period is pointed out, the results found here are quite different from those usually assumed. B. J. C. v. d. H.

Note on the crystal structure of copper-gold alloys. CYRIL S. SMITH. Mass. Inst. of Tech. *Mining and Met.* 9, 458-9(1928).—The lattice parameters of Cu-Au alloys, quenched from 600°, were found to be as follows in A. U.; 3.731 for 24.36 atomic % Au; 3.879 for 50.41 atomic % Au; 3.976 for 74.24 atomic % Au. The structure of the alloys was not finally determined, but indications were found that Cu₃Au does not exist as such, but as a solid solution and CuAu.

HANS C. DUUS

Internal stresses as the cause of destruction of construction material. TH. HOFFMANN. *Korrosion* 4, 3(1929).—These stresses are largely due to faulty mech. and heat treatment during manuf., especially in pipes of Cu alloys.

J. H. MOORE

The internal transformations of an aluminum bronze. ALBERT ROUX AND JEAN COURNOT. *Compt. rend.* 188, 172-3(1929).—The structural transformations of a heat-treated 90-10 Cu-Al alloy were studied with x-rays, using a polished face etched with HNO₃, and exposed 6 hrs. The features of the spectrographic patterns obtained are tabulated. The annealed alloy showed only the spectrum of the α -solid soln., with face-centered cubic lattice. The spectrum of the quenched alloy showed the presence

of doubt and disagreement in previous studies. The series of alloys was prepared. Two separate series of examinations were made: (a) microscopic and (b) x-ray. The work of previous investigators is reviewed, their diagrams are presented, and the results of this investigation compared with them. The (a) series showed: (1) Max. soly. of Sn in α br is 15% at room temp., increases to 16% at 520° and falls to 13% at 800°. (2) The boundary of the β field is a smooth curve running from 22% Sn at 800° to 26.75% Sn at 520°; its slope increases when the temp. drops below 600°. The Sn-rich boundary of the β field is a smooth curve starting at 26% Sn at 750°, reaching a max. Sn content of 28.5% at 610–630° and then decreasing to the eutectoid, 26.75% Sn at 520°. An allotropic change was found in the β field. (3) The β - γ field was definitely located with the upper horizontal at 750° from 26 to 27.5% Sn and the lower at 540° from

and solid soln. extending from 26 to 27.5% Sn at room temp., formed directly at 540°. It is not Cu_3Sn . (6) The 38.36% alloy (η) is Cu_3Sn and occurs as such at room temp. (7) Both β - δ and δ - γ fields were found. (8) A new section of the phase diagram was found on the Sn side of δ , existing from 580 to 610° in alloys of 33 to 34.5% Sn. The (b) series of tests showed: (1) α is a solid soln. with face-centered cubic lattice, lattice parameter varying from 3.579 A. U. for pure Cu to 3.691 A. U. at 15% Sn. (2) β is a solid soln. with body-centered cubic lattice; $a_0 = 2.964$ A. U. at 26.5% Sn. No change occurs on passing 580°. (3) δ is a solid soln. (4) γ is unstable. (5) η is pure Cu_3Sn , its lattice is close-packed hexagonal of axial ratio 1.576, $a_0 = 2.74$ A. U., $c = 4.32$ A. U. The experimental procedure is given, results are tabulated, and 81 photomicrographs given and described. A. BUTT

The structure of copper-tin alloys. W. BRONIEWSKI AND B. HACKIEWICZ. *Compt. rend.* 187, 651–4 (1928).—The δ phase of Cu-Sn alloys whose composition is variously given as 40–50 at. % Sn has not been definitely identified because of the uncertainty due to the extreme slowness of establishment of equilibrium. More complete equilibrium than ever before was obtained by annealing the alloys up to 24% Sn *in vacuo* for 330 hrs. at 620°, 670 hrs. at 400°; those from 25 to 40 at. % Sn were annealed consecutively 1000 hrs. at 400° and 6000 hrs. at 200°; the alloys with more than 40 at. % Sn were annealed 7000 hrs. at 200°. Two curves are reproduced which clearly show the compounds Cu_3Sn and Cu_2Sn (previously established) and the new Cu_3Sn_2 corresponding to the δ phase. The formation of δ upon annealing is very slow. The structure of Cu-Sn alloys is much simpler at ordinary temperature than at the solidus. The solid soln. of Sn in Cu reaches 1 at. %, whereas that of Cu in Sn seems to be less than 1%. Cu_3Sn_2 dissolves about 1 at. % Cu and 5 of Sn; Cu_2Sn appears to dissolve about 1% of the metals, although Cu_3Sn only forms mixtures. The great importance of allowing sufficient time for the establishment of equilibria in indirect methods of studying alloy structure is stressed. Also in *Rev. metal* 25, 671–84 (1928); 26, 20–8 (1929). ALBERT THOMAS FELLOWS

Lead-tin-cadmium as a substitute for lead-tin wiping solder. EARLE E. SCHUMACHER AND EDWARD J. BASCH. Bell Telephone Labs., New York, N. Y. *Ind. Eng. Chem.* 21, 16–19 (1929).—In making wiping solder economy will result if Cd (costing about as much as Sn) can be substituted for a part of the Sn, provided it enables a large proportion of Pb to be used in the alloy. Pb-Sn-Cd alloys were therefore prepared and their properties compared with those of standard solder (62% Pb-38% Sn), studied and phase diagrams, solidification ranges, composition changes when heated above their melting points, rates of oxidation, tensile strength, porosity and wiping characteristics, etc. The addition of Cd made possible the use of higher percentages of Pb in satisfactory solders, giving solders cheaper than corresponding Pb-Sn solders. A solder containing 68% Pb, 23% Sn and 9% Cd is satisfactory as a substitute for standard 62% Pb, 38% Sn solder, so far as lab. tests go. Life tests in actual practice are still lacking. W. C. HUBAUGH

The destructive action of molten zinc, at and above zincing (galvanizing) temperatures, upon metals and alloys. WALLACE G. IMHOFF. *Am. Metal Market* 35, 2nd section, 10–13 (1928).—A discussion of the metal Zn, its abundance and importance as a metal for protective coatings. H. C. PARISH

Patching cast aluminum. STYRIE. *Apparatebau* 40, 30A-7 (1928).—A good corrosion-resisting solder consists of 70–5%

Zn and 1-1.5% Mn. It melts from 580 to 640° and should be used at 650°. A less resistant solder consists of 10-12% Al, 15-20% Zn, 20-30% Cd and 30-40% Pb; it melts at 200-400°. A good flux consists of 5 parts powdered borax, 5 parts Na_2CO_3 and 1 part S, well mixed.

J. H. MOORE

Plastic extension of aluminum crystals at high temperatures. KEIJI YAMAGUCHI AND SAKUICHI TOGINO. *Bull. Inst. Phys. Chem. Research Tokyo* 7, 646-58(1928); *Abstracts* 1, 58-9.—Test pieces of a single crystal of Al were extended slowly or rapidly at 525-600°. The change of the direction of tension referred to the crystal axis of the test piece was ascertained from Laue photographs taken before and after the extension had taken place. Where the tension is uniform, the spots are not elongated. Stripes are visible similar to slip bands, in the direction of intersection between the slip-plane and the surface. This direction agrees with that expected from the Laue photograph taken before extension, under the assumption that the strain is a simple shear. Examn. of these stripes under high magnification shows that they are different from ordinary slip bands; they consist of wavy uneven stripes; as far as can be resolved under the microscope, the deformation is a simple shear about every point. When the crystal is extended at a definite temp., with a definite tension, and with a definite velocity, the shear stress always increases as the test piece extends, but it was considered to flow under a steady shear stress, because the increase is less than that of an isotropic material, and because the test piece extended at a high temp. did not increase in hardness. A mechanism is proposed to explain this fact: "Since at high temp., atomic vibration due to heat energy is great, the probability is large that the resistance to shear along a particular slip plane is lowered. In such a case, though the slip takes place in that plane, it is self-stopping since the probability for the continuance of this state must be small. This probability is considered to become nearly zero at ordinary temp. If the slip takes place in this case, the crystal must be strained. The mechanism of self stopping of the slip at a high temp. and at an ordinary temp. differs utterly."

ALBERT L. HENNE

The preparation and mechanical properties of duralumin. MASAHARU GOTO, SINICHI FUKATU, SADA O HORIGUCHI AND TENJI NAGAI. *Report of the Aeronautical Research Inst., Tokyo Imperial University*, 3, 273-403(1928). (Two-page abstract in German.)—Because of the difference in sp. gr. of Cu and Al, homogeneous products can be obtained only by special stirring during mixing. The molds must be heated to 100-150° before casting. The pouring temp. should be 1%-2% higher than that of the melt. The cast metal can be rolled at 450 ± 20°. The greatest tenacity is obtained by quenching at 520° and annealing at 100°. Blisters appear to be caused by the interaction of gases attacking the sheet. The compn. of duralumin is Cu 3-4, Mg 0.5-0.75, and Mn 0-0.5%. Fe improves the pouring and rolling qualities, but is harmful in respect to the other properties. Large quantities of Si are harmful but 1% improves the mech. properties. Zn up to 3% is advantageous. Ag improves the malleability of the poured metal, but not that of the rolled metal. Alkalies in any quantity are very harmful. The tensile strength decreases at 200° and is very small at 500°. The malleability increases up to 400° and then falls. A new hypothesis of the embrittlement of Al alloys is developed.

HANS C. DUUS

Hydrogen ions are the key to corrosion. A. A. MARKSON AND PAUL FRITZ. *Power* 69, 222-5(1929).—A popular discussion.

D. B. DILL

Recent advances in the protection of engineering products with paints (WOLFF) 26. "Ti cyanonitride" and the Ti oxychlorides (RUDGE, ARNALL) 6. Measurement and calculation of pressure losses in the Siemens-Martin furnace (HEIL) 13. Metallic fibers (SCHENCK, *et al.*) 2. Use of internal pressure in metallic systems. The system Pb-Sb-Cu (MORGEN) 2. Physical constants of pure C-free, Cr-Fe and V-Fe alloys (RUF) 2. Properties of the Ni-Cu alloys at low temperatures (KRUPKOWSKI, DE HAAS) 2. Density of molten metals and alloys (MATSUYAMA) 2. A thermal effect described by Q. Majorana (MOESVELD) 2. Retardation and prevention of oxidation (RHODIN) 2. Internal strain produced when crystals of Al are extended (YAMAGUCHI, TOGINO) 2. Permeameter for testing magnet steel (BABBITT) 1. Sampling and coring in prospecting for metalliferous deposits (GEORGE) 8. Electric furnace for the production of iron, steel or steel alloys (Fr. pat. 644,553) 4. Alloys (Fr. pat. 644,301) 4.

Flotation Practice. New York: Am. Inst. of Mining and Metallurgical Engineers, Inc. Papers and discussions presented at meetings held at Salt Lake City, August, 1927, and New York, February, 1928. 257 pp.

Toutes les soudures. By "An Engineer." Paris and Liège: Ch. Béranger. 102 pp. F. 17. Reviewed in *Bull. Brit. Non-Ferrous Metals Research Assoc.* No. 24, 36(1928).

KEFFER, ROBERT AND MCNEIL, CHARLES L.: *Methods in Non-Ferrous Metallurgical Analysis*. New York: McGraw-Hill Book Co., Inc. 535 pp. \$4. Reviewed in *J. Western Soc. Eng.* 34, 72(1929).

LECOEUVRE, R. AND CAZAUD, R.: *Recherches métallographiques sur l'aluminium et ses alliages*. Paris: Blondel la Rougerie. 60 pp. F. 30. Reviewed in *Rev. métal.* 25, 707(1928).

REED, EVERETT L.: *Photomicrographs of Iron and Steel*. New York: J. Wiley & Sons, Inc. 253 pp.

SCHIMPKE, PAUL AND HORN, HANS A.: *Praktisches Handbuch der gesamten Schweisstechnik*. Berlin: J. Springer.

Treatment of ores. MAURICE LAMBOT. Fr. 644,478, Nov. 25, 1927. Ores, particularly Fe ores, are treated in 3 succeeding app. realizing reduction, carburization and fusion. The combustion products from the fusion are used for heating the reduction app. and the gases liberated in the reduction app. are used in the fusion furnace after purification and recovery of by-products.

Froth flotation apparatus for concentrating ores. AXEL W. JOHNSON. U. S. 1,702,443, Feb. 19.

Apparatus (with inclined tiltable tables) for concentrating ores. F. L. WILDER, E. MORRIS, E. SCHIFF and E. S. KING. Brit. 293,411, April 6, 1927.

Apparatus (with internal electric resistance heaters) for reducing iron oxide ore, etc. FREDERICK D. S. ROBERTSON (to Farley G. Clark). U. S. 1,702,575, Feb. 19.

Reducing ores of tin, etc. P. R. BLAMEY. Brit. 293,340, April 2, 1927. Ore such as cassiterite, suitably after concn. and calcination if necessary, is subjected to partial or complete reduction of its metal contents and the product is then brought into contact with molten metal to sep. the metallic contents from assocd. materials. The residue may be further treated, as with an acid or other solvent such as Cl or in an electrolytic cell.

Core sand. F. CARPIN. Belg. 347,585, Jan. 31, 1928. The mixt. consists of fresh sand, white sand, molasses, dextrin and a little linseed oil.

Casting metals in molds. FÉLIX NEUBAUER. Fr. 644,312, Nov. 21, 1927. The mold is filled with metal, allowed to move downward and stopped so that the metal is forced into the mold.

Mold suitable for casting metals. MARIUS GUYOT (to Aluminum Co. of America). U. S. 1,703,075, Feb. 19. Structural features.

Mold suitable for casting metals. ALLEN B. NORTON (to Aluminum Co. of America). U. S. 1,703,082, Feb. 19. Structural features.

Composition for lining molds. L. LEVA. Belg. 346,964, Jan. 31, 1928. Permanent molds are lined with a compn. contg. powdered refractory or carbonaceous material together with a mineral, vegetable or oily binder.

Ingot mold construction. W. H. RAMAGE. Brit. 293,995, Aug. 8, 1927.

Mold and cooling chamber for casting and cooling ingots. HAROLD V. ANDERSON. U. S. 1,702,886, Feb. 19. Structural features.

Hot top for ingot molds. ANDREW R. ROWE. U. S. 1,702,576, Feb. 19. Structural features.

Refractory plug for ingot molds. EUGENE L. MESSLER. U. S. 1,702,790, Feb. 19. Structural features.

Composite metal ingots. HARRY A. KUHN. U. S. 1,702,387, Feb. 19. A metal such as "stainless steel" is poured into a mold and a second metal such as C steel is then poured at a lower temp. under the skin of the first metal without substantial agitation.

Metal powder production from small laminar granules. E. KRAMER and HARTSTOFFMETALL A.-G. (Hametag). Brit. 293,609, Oct. 11, 1927. Mech. features.

Platinum and other metals. ALLGEMEINE ELEKTRO-METALLURGISCHE GESELLSCHAFT M. B. H. Fr. 644,051, Nov. 16, 1927. Ores, gang and products from the metallurgical industry are heated to redness with reducing agents such as C and cooled with avoidance of any oxidation. Pb and other metals such as Ni and Co may be extd. by a magnetic sepn.

Furnace for the reduction of ores. SVEN EKLUND. Fr. 644,294, Oct. 13, 1927.

Steel manufacture in a Siemens-Martin furnace. F. SIEMENS A.-G., R. DURRER, F. C. SIEMENS and A. SPRENGER. Brit. 293,326, Dec. 24, 1926. A layer of gases practically free from H is formed, at the end of the fining process, between the bath and the

heating medium in order to prevent access to the bath of any oxidizing medium which may be present in the furnace. Blast-furnace gas may be used or the gas from a tapping producer which works without steam and in which a coal poor in gases, coke or semi-coke is used. Various structural details of the furnace are described. Cf. C. A. 23, 1102.

Blast-furnace construction. JAMES P. DOVEL. Fr. 644,537, Sept. 7, 1927.

Cupola-furnace construction. FREIER GRUNDER EISEN- UND METALLWERKE GES. Brit. 294,027, July 21, 1927.

Manufacture of basic-converter steel. G. BERGER and L. BERGER. Belg. 347,592, Jan. 31, 1928. The converter comprises a retort of the usual type with a basic refractory lining. Mounted on, and connected with the duct through which the blast is brought to the converter, is a hopper capable of contg. at least the amt. of CaCO_3 required for the charge.

Steel. SOCIÉTÉ ANON. DES HAUTS FOURNEAUX, FORGES ET ACIÉRIES DE POMPEY. Fr. 643,924, Apr. 16, 1927. A mild steel contains Cu 0.2 to 0.5, and Ni 0.2 to 0.4%. An example is given contg. Fe 98.78, C 0.05, Si 0.05, Mn 0.4, P 0.04, S 0.03, Cu 0.4, Ni 0.25%.

Apparatus for "batch tempering" steel articles, etc. JAMES M. SCHOONMAKER, JR., and LASZLO M. STREMPER. U. S. 1,702,524, Feb. 19.

Malleable cast iron. CHRISTIAN É. KLUIJTMANS. Fr. 643,930, April 16, 1927. Belg. 347,522, Jan. 31, 1928. See Brit. 288,980 (C. A. 23, 592).

Coating cast iron with lead. OSKAR SPENGLER. U. S. 1,703,019, Feb. 19. Pb is melted onto the surface of cast iron after the latter has been preliminarily treated with a Cu salt such as CuSO_4 , a Sn salt such as SnCl_2 , and a Zn halide such as ZnCl_2 .

Sponge iron. H. G. FLODIN. Brit. 293,868, July 14, 1927. In producing metal sponge such as that of iron, briquets comprising crushed ore, C and a binder are fed from the briquetting app. through a drier and preheater into a reducing chamber where reduction is effected by heat produced by combustion of charcoal with air in an annular chamber surrounding the reducing chamber. CO from the reduction chamber is also utilized to assist in the heating. Various structural features are described.

Case-hardening iron or steel articles. MORRIS MOTORS (1926), LTD., J. A. RICHARDSON and R. A. SMART. Brit. 293,531, May 21, 1927. Case-hardening or malleabilizing of iron or steel articles is effected by passing an elec. current through carbonaceous material in which they are embedded in a rotary receptacle.

Case-hardening and quenching compound. F. HEYMANS and F. COMPDAER. Belg. 346,883, Jan. 31, 1928. The product consists of a mixt. of Na_2CO_3 , NH_3 , BaCO_3 , prussiate, NaCl, borax and chrome yellow.

Alloys. L. LEVA. Belg. 346,963, Jan. 31, 1928. Abrasion-resisting alloys contain Fe 97.94–95.54, C 0.80–1.30, Si 0.3–1, Mn 0.60–1.80, S and P < 0.18% and optionally 0.5–3% Cr. The alloys are obtained in an elec. furnace.

Alloys for electric resistance heating. GENERAL ELECTRIC CO., LTD., and C. J. SMITHELLS. Brit. 293,740, April 7, 1927. An alloy of Ni 70, Cr 20 and W or Mo 10% or a similar alloy is used for resistance heating or otherwise where good resistance to oxidation at high temps. is required. Impurities are avoided.

Alloys of nickel and chromium, etc. GENERAL ELECTRIC CO., LTD., and C. J. SMITHELLS. Brit. 293,727, April 7, 1927. Alloys contg. Ni and Cr, with or without Mo or W, are prepd. by heating the pure metals in an atm. such as H which prevents introduction of impurities. Details of the process and of prepg. the sep. metal powders are given. Brit. 293,728 relates to the use of an alloy of Ni 70 and Cr 30% or similar alloys in making distn. vessels or oxidation resisting stay rods of boilers, etc.

Iron alloys containing molybdenum. A. KISSOCK (to Climax Molybdenum Co.). Brit. 293,860, July 15, 1927. Mo is added to Fe or other metals or their alloys by adding a Mo compd. such as Ca molybdate to a molten bath or slag on such a bath of which at least, one constituent has a greater affinity for O than Mo has. The addn. may be made during reduction or melting of the iron. Alloys of Mo with Ni, Al, Cu and Si are mentioned.

Magnesium-aluminum-silicon alloys. I. G. FARBENIND. A.-G. Brit. 293,359, July 4, 1927. See Fr. 639,256 (C. A. 23, 594).

Steel alloys. E. H. DOPPEL. Brit. 293,764, July 11, 1927. Elements such as Si, Mn, Ni, Cr, W, Co, V and Ti are introduced into steel in combination with Al (preferably in an alloy contg. at least 9% Al).

Tungsten alloy. HENRY L. COLES and JOSEPH G. DONALDSON (to Guardian Metals Co.). U. S. 1,702,765, Feb. 19. An alloy which is heat-resistant and is suitable for use in safe and vault walls comprises W 86 or less, Ni approx. 14 and C 2–5 parts. U. S.

1,702,766 specifies metal plates suitable for similar purposes formed of an alloy contg. W over 70, Ni 10 and Cu 14% and surrounded and united with a metal such as a casing of Cu having a high heat cond. Cf. C. A. 23, 1104.

Amalgams. DEUTSCHE GOLD- UND SILBER-SCHNEIDANSTALT, VORM. ROESSLER. Fr. 644,412, Nov. 23, 1927. In the prepn. of Hg amalgams particularly for *dentistry*, the Hg is used in the form of a paste contg. a part of the solid with which it is to be amalgamated.

Sulfuric acid pickling baths. V. BERTLEFF. Brit. 293,701, July 9, 1927. To prep. an inhibiting agent for pickling baths, coal tar is heated with not more than an equal quantity of concd. H_2SO_4 until the product is completely sol. in water. The product thus obtained may be neutralized with milk of lime, filtered and concd. $Ba(OH)_2$ may be used as a treating agent to obtain purified sulfonic acids. Various waste products from sulfonation processes also may be used as starting materials.

Apparatus for heat treatment of ball races or other metal articles. FRANK TWYMAN (to Adam Hilger). U. S. 1,702,985, Feb. 19.

Die-casting machine. INJECTA A.-G. Ger. 470,483, Dec. 11, 1926.

Sherardization. SOC. D'ELECTRICITÉ ET DE MÉCANIQUE. Belg. 347,487, Jan. 31, 1928. The surface of the object is coated with Zn powder and a volatile binder, e. g., a nitrocellulose soln., and the object is then heated in presence of air.

Protecting metals during melting from oxidation and absorption of gases. V. N. ZWIBEL. Russ. 5080, Apr. 30, 1928. The melted metal is protected by adding to the usual flux heavy hydrocarbons, such as pitch, tar, etc., in solid form or in powder, whereby a reducing atm. is obtained above the metal.

Protecting cables, pipes or other metal articles from corrosion. CHEMIE-PRODUKTE GES. Brit. 293,835, July 13, 1927. A wrapping is used formed of strips of fabric or paper coated with a compn. comprising residues from petroleum distn., soft bitumen and fillers such as china clay or talc, $BaSO_4$, slate or asbestos. Various details and proportions are given.

Arc-welding electrodes. E. M. F. ELECTRIC CO. PROPRIETARY, LTD. Brit. 293,283, June 28, 1927. Structural features are specified relating to electrodes comprising assembled wires and which may have reënforcing wires of high-C steel, Ni or Ni-Cr alloy which is melted simultaneously with the electrode core.

Soldering composition. N. N. KVSHEV. Russ. 5238, April 30, 1928. A mixt. of powd. Pb 2 parts and Sn 1 part is mixed with a soln. of 2 parts of rosin in 1 part of gasoline.

10—ORGANIC CHEMISTRY

CHAS. A. ROUILLER AND CLARENCE J. WEST

Biochemical studies on pityrol. I. Introduction to the biochemistry of pityrol. SHIGERU KOMATSU. *Mem. Coll. Sci. Kyoto Imp. Univ. Ser. A*, 11, 481-95 (1928). The tar which is obtained on the destructive distn. of rice bran is said to possess curative properties in cases of eczema; this tar has been called *pityrol*. Bran from the rice named "Shinriki" and grown near Osaka was subjected to dry distn. in an Al retort; a colorless oil begins to distil with some water at about 200° , the color of the distillate becoming darker with rise in temp.; the largest fraction b. $350-400^\circ$ and the distn. is ended at 450° ; the yields were 24% tar, 28% coke, 36% aq. liquor, 12% gas, the tar is sol. in EtOH, Me_2CO or PhH; about 15% of the tar is volatile with steam and consists of 4% basic, 29% acidic and 67% neutral compds.; 85% of the tar is non-volatile with steam and consists of 3% basic, 29% acidic and 68% neutral compds. The hydrocarbons in pityrol are similar to those in Russian or Japanese petroleum and low temp. coal tar, appearing mostly as members of the polymethylene series with a mol. wt. equiv. to $C_{20}H_{40}$ and with also a few aromatic hydrocarbons. The non-volatile neutral fraction, b_{10} above 250° , when applied to the inner surface of a rabbit's ears produces first malignant epithelioma which finally terminates in true cancer; this production of cancer is never observed with pityrol. Previous workers have shown that true cancer can be produced by an unknown and unstable compd. which occurs in the fraction of coal tar b. $250-500^\circ$ and which is removed by purification of the tar. The cancer-producing principle of the tars, therefore, seems to bear the same relationship to the tar as a vitamin does to a food material. The difficulty often encountered in isolating an enzyme or a vitamin in a pure state gives support to the belief that the behavior, particularly the biol. actions of a compd., would not be the same in every respect when it is employed in assocn. with other substances with which it occurs in

ture. **II. Distillation of rice bran.** SHINZABURO FUJITA. *Ibid* 497-503.—Rice bran was heated to 80° for 1 hr. to destroy the enzymes; it was divided into 2 parts (A and B) and 1 part (B) was extd. with petr. ether; analysis of A gave C 46.2, H 7.4, N 2.4, S 1.5, H₂O 14.7, ash 9.3, fat 22.4, protein 12.9, cellulose 11.4, pentosan 8.7, reducing sugar 1.3, sucrose 10.6%. The acid and I nos. of the fat were 160 and 118, sp. Analysis of B gave C 39.9, H 6, N 3, S 2, H₂O 14.1, ash 12, fat 0.7, protein 16.5, cellulose 14.6, pentosan 11.1, reducing sugar 1.5, sucrose 13.6%. Dry distn. of A and of B gave, resp., tar 24, 15; coke 28, 31; aq. liquor 36, 40; gas 12, 14%; 13% of the tar from A is volatile with steam, having d_4^{25} 0.967, and 87% is non-volatile with steam, having d_4^{25} 0.871; similarly from B, 17% volatile, d_4^{25} 0.981, 83% non-volatile, d_4^{25} 0.919; the aq. liquor A, d. 1.021 with 22% org. matter; aq. liquor B, d. 1.035 with 19% org. matter; the compn. of the gas from A and from B was, resp., 22%, 31% bases; 25.4%, 17.4% C_nH_{2n}; 0.4%, 0.4% C₂H₄; 2%, 3% C_nH_{2n+2}; 17.3%, 20.6% CO, 31.8%, 31.6% CO₂. **III. Neutral constituents of pityrol.** SABURO SAKAMI. *Ibid* 505 15.—The tar obtained on destructive distn. of rice bran when steam distd. gave 12% of volatile material; the volatile (A) and non-volatile (B) portions were sep'd into neutral, acidic and basic fractions by treating with 7% NaOH and 10% H₂SO₄, successively. Analysis of the neutral fraction gave b. p. up to 150°, paraffin 5, aromatic 13, unsatd. hydrocarbons 79%; b. 150-80°, paraffin 9, aromatic 5, unsatd. hydrocarbons 86%; b. 180-210°, paraffin 13, unsatd. hydrocarbons 87%; b. 210-40°, paraffin 14, unsatd. hydrocarbons 86%; b. 240-70°, paraffin 24, unsatd. hydrocarbons 76%. The following were isolated and identified: octane, nonane, decane, undecane, dodecane, tridecane, tetradecane and pentadecane; the principal parts of the neutral oil are the C₁₀, C₁₁, C₁₂ and C₁₃ paraffins. The unsatd. hydrocarbons were sep'd. by treatment with concd. H₂SO₄ and then distd. *in vacuo*; hydrocarbons of the mol. formulas C₁₆H₃₂, C₁₈H₃₆, C₂₀H₄₀, C₂₄H₄₈ and C₂₈H₅₆ were identified; it is believed that these are polymers formed by the action of H₂SO₄ on the compds. C_nH_{2n} or C_nH_{2n+2}, and that C₉H₁₈, C₁₀H₁₈, C₁₂H₂₀ and C₁₄H₂₄ are the main constituents of the volatile neutral oil. The neutral non-volatile part of pityrol is composed mostly of hydrocarbons of the polymethylene series C₁₀, C₁₁, C₁₄ and C₁₅. **IV. Acidic constituents of pityrol.** BUNKICHI MASUMOTO. *Ibid* 517-9.—The acidic constituents from 20 lbs. of pityrol were isolated by extn. with 5% NaOH and gave 90 g.; it is a dark brown oil with phenolic odor, partly sol. in H₂O. After drying with Na₂SO₄ 80 g. were fractionally distd. at 19 mm. and gave 35.1 g. b. 30-120°, 32.1 g. b. 120-50°, 12.8 g. b. above 150°. Further treatment with Me₂SO₄ and fractional distn. gave evidence of a compd. C₁₀H₁₈OMe. **V. Basic constituents of pityrol.** SHIGEKIYO SUZUKI. *Ibid* 521-32.—The basic fraction by extn. with dil. H₂SO₄ is a dark brown viscous liquid with a pyridine odor; it was purified by steam distn. giving 460 g. insol. in H₂O and 190 g. sol. in H₂O. These 2 fractions were further sep'd. by fractional distn. and conversion to salts with picric acid, HCl and HgCl₂. The following were isolated and identified in the basic fractions: 2- and 3-methyl-, 2,4- and 2,6-dimethyl-, and 2,4,6-trimethylpyridine, aniline and quinoline, there is also some evidence for the presence of 2,5-dimethyl- and tetramethylpyridine and an unknown base, 47% C and 3.5% H. **VI. Distillation of palmitic acid.** SEIICHI SHOYAMA. *Ibid* 533-42.—Distn. of Na palmitate in an Al retort gave 70% tar, 24% coke and 6% gas and loss. The gas is 11.8% CO, 12.2% CO₂, 1.7% C₂H₄, 27.4% C_nH_{2n+2} + H₂. On steam distn. of the tar 45% is volatile and consists of a trace of acids, 25% satd. hydrocarbons, 23% unsatd. hydrocarbons; the non-volatile part is 3% palmitone, 8% satd. hydrocarbons and 47% unsatd. hydrocarbons. **VII. Distillation of oleic acid.** HIROSHI OGATA. *Ibid* 543-7.—Distn. of Na oleate gave tar 65, coke 17, gas 18% and loss. The tar has d_4^{25} 0.794, n_D^{25} 1.445, I no. 142, and on steam distn. 47% is volatile, b. 41-260°, I no. 158, d₄ 0.766, n_D^{25} 1.427; the non-volatile portion has d_4^{25} 0.828, n_D^{25} 1.457 and I no. 105. The main constituents of the tar are hydrocarbons of the olefin series with the formulas C₈H₁₆, C₉H₁₈, C₁₅H₃₀, C₁₆H₃₂ and C₁₇H₃₄. **VIII. Distillation of sucrose.** YOSHINORI HIDAKA. *Ibid* 549-51.—Distn. of sucrose from an Fe retort between 240° and 610° gave 25% tar and aq. liquor, 45% coke and 20 l. of gas. The compn. of the tar and aq. liquor was H₂O 75, neutral substances 4.5, acidic substances 1.5 and humus 8.5%; another analysis gave hydroxymethylfurfural 1, furfural 2.6, methylfurfural 2.5, HCO₂H 8.1 and levulinic acid 0.4%. **N. A. LANGE**
Glycol. J. ALTENBURG. Charlottenburg. *Seifensieder Ztg.* 55, 393-4, 403-4 (1928). Prep'n. and properties of glycol. **P. ESCHER**
Ethylene glycol as a glycerol substitute. KARL BRAUN. *Am. Perfumer* 23, 513-4 (1928).—The sugar fermentation process for glycerol is reviewed. (CH₂OH)₂

is made in America from the gases of kerosene by increased pressure and low temp. By treatment with Cl_2 ethylene chloride is formed and from this by hydrolysis with NaOH glycol is obtained. It has a lower f. p. than glycerol and the cost is less.

E. SCHERUBEL.

Molecular compounds of organic iodides with sulfur. HEINRICH RHEINBOLDT AND KURT SCHNEIDER. Univ. Bonn. *J. prakt. Chem.* 120, 238-48(1929).—P. p. diagrams are given for a no. of org. iodides with S. The following eutectics were observed, the % being that of S: MeI , 42 and 69%, 85° and 91°; the compd. $\text{MeI} \cdot 3\text{S}_8$ (66.2% S) is indicated. C_2I_4 , 54 and 68%, 95.5° and 101°; the compd. $\text{C}_2\text{I}_4 \cdot 4\text{S}_8$ (65.9% S) is indicated. $\text{C}_3\text{H}_7\text{I}$, 28%, 65°; $\text{C}_2\text{H}_5\text{I}$, 29%, 54°; $\text{C}_4\text{I}_4\text{NO}_2$, 35%, 80°; C_3I_3 , 29%, 48°; C_2Br_4 , 13%, 44°; *p*- $\text{C}_6\text{H}_4\text{I}_2$, 58.5%, 91°; Ph_2I_2 , 94%, 117°. CHI_3 and AsBr_3 do not form an addn. compd. No eutectic was observed with S and CH_2I_2 , CHBr_3 or C_6I_6 .

C. J. WEST

Purification of methyl fluoride. Quantitative gas analysis by high-dispersion infra-red spectroscopy. WILLARD H. BENNETT. *J. Am. Chem. Soc.* 51, 377-81 (1929).—A method is described for the prepn. of MeF from KF and KCH_3SO_3 . A spectroscopic examn. in the infra-red was made on purified and unpurified samples of the gaseous MeF and from these data a quant. detn. was made of the amount of MeF and of Me_2O present.

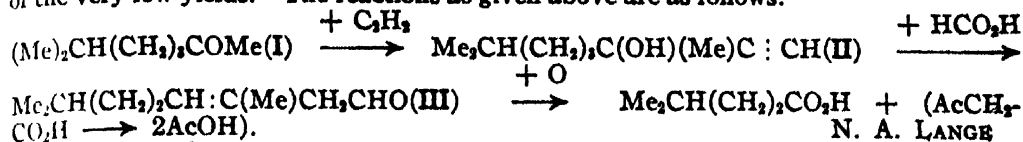
WALLACE R. BRODE

Organic arsenic derivatives. Action of alkalis on diethylchloroarsine. E. GRYSZKIEWICZ-TROCHIMOWSKI, M. BUCZWIŃSKI AND J. KWAPISZEWSKI. *Roczniki Chem.* 8, 423-31(431 French)(1928).—By the action of alkalis on Et_2AsCl , diethylarsine oxide (I), AsEt_3 (II), (mercuric chloride, m. 163-4°), and EtAsO (III) are obtained. II and III correspond to the decompn. products of I: $(\text{Et}_2\text{As})_2\text{O} = \text{Et}_3\text{As} + \text{EtAsO}$, a reaction analogous to the pinacol rearrangement. I has an irritating odor resembling that of $(\text{Me}_3\text{As})_2\text{O}$, oxidizes in the air forming $\text{Et}_2\text{AsO}_2\text{H}$, crystallizes with 2HgCl_2 , b. 8-9, 90.5-3.5°, b. 760 225-30°, d_4^{20} 1.2989.

J. KUČERA

Aldehydes and acetylenecarbinols. II. Dimethyloctenaldehyde, *tert*-butylmethylacrolein and experiments with the acetylenecarbinol prepared from acetophenone. H. RUPF AND LOUISA GIESLER. Basel. *Helv. Chim. Acta* 11, 656-69(1928), cf. C. A. 22, 2928.—*Isohexyl Me ketone* (I) was purified to remove unsatd. ketones by adding 4% KMnO_4 with stirring at 0° until the color was no longer discharged, steam distg., sepg. and drying; it b. 162-3°, *semicarbazone*, m. 151°. *Isohexyl*(α -methyl-ethinyl)carbinol (II), prepd. in 66-70% yield by adding 36 g. powd. NaNH_2 to 100 g. I in Et_2O cooled with ice, then satg. with C_2H_4 , stoppered, allowed to stand overnight, poured on ice, washed with HCl , extd. with Et_2O , dried with MgSO_4 , the Et_2O removed, shaken with NaHSO_4 , redissolved in Et_2O , washed with Na_2CO_3 , dried and fractionated under 10 mm., b. 80-2°; it forms a Na salt with concd. NaOH , a Ag salt with alc- NH_3 - AgNO_3 and a benzoate, b. 64° (from 10 g. II, 8 g. $\text{C}_6\text{H}_5\text{N}$ and 4 g. BzCl). When II was boiled for 0.5 hr. with 6-7 parts HCO_2H , poured on ice, extd. with Et_2O , washed with Na_2CO_3 , dried over MgSO_4 , fractionated under 11 mm., the fraction b. 82-91° converted to *semicarbazones* which were fractionally recrystd. from EtOH , it gave a slightly sol. *product A*, m. 170°, and a sol. *product B*, m. 122°, which are the *semicarbazones* of β,β -dimethyl- β -octenaldehyde (III) and of a structural isomer of unknown constitution, resp. (88% total yield of aldehydes of which 90% is A and 10% is B); these *semicarbazones* on steam distn. with $\text{H}_2\text{C}_2\text{O}_4$ gave the aldehydes; III is a colorless oil with an odor like citral, b. 94°; the *isomer* is an oil with the same odor, b. 98-100°, because of the low yields no derivs. of the *isomer* were prepd.; III forms an oily *oxime* with an odor like caraway, b. 131-2°, and an unstable cryst. *phenylhydrazone*. Oxidation of III in CCl_4 with O_3 or in Na_2CO_3 with 4% KMnO_4 gave isocaproic and acetic acids; reduction of III (25 g.) with H (4.3 l.) and Ni (50 g.) in dil. EtOH gave β,β -dimethylcaprylaldehyde (22 g.), b. 78-9°; *semicarbazone*, m. 97°; *oxime*, colorless oil, b. 131-2°. When methyl-*tert*-butylethinylcarbinol (IV) (cf. C. A. 18, 2682) was boiled for 3 hrs. with 8 parts of HCO_2H , it gave 18% of β -methyl- β -*tert*-butylacrolein (V), $\text{Me}_3\text{CCMe}:\text{CHCHO}$ and the *isomeric aldehyde* (?) (in the ratio of 2:1, resp.) which were sepd. as *semicarbazones*, m. 193° and 148-9°, resp.; V is a colorless oil with an odor like coumarin, easily oxidized in air, n_D^{20} 1.46718, d_4^{20} 0.8822 (*oxime*, b. 131°); the *isomeric aldehyde*, b. 150°; when IV is treated with H_2SO_4 , the proportion of this *isomer* is increased. *Pinacol* was prepd. like II in 10% yield and satg. with C_2H_4 ; it b. 102-3°, m. 20°, it was also prepd. with C_2H_4 but by adding 8 g. Na to 40 g. BzMe in 160 g. cold Et_2O and then satg. with C_2H_4 but *pinacol* is obtained as a by-product (cf. Ciamician and Silber, *Ber.* 33, 2912(1900));

when boiled for 10 mins. with HCO_2H it gave a very poor yield of *phenylmethylacrolein*, PhCMe:CHCHO , b_{12} 122–3°, an oil with an odor like PhCH:CHCHO ; *semicarbazone*, m . 201°. Attempts to prep. similar compds. with BzEt were abandoned because of the very low yields. The reactions as given above are as follows:



N. A. LANGE

Aldehydes from acetylenecarbinols. III. Preparation of two dimethylhexenaldehydes. H. RUPE, A. WIRZ AND P. LOTTER. *Anstalt für organ. Chemie, Basel. Helv. Chim. Acta* 11, 965–71(1928); cf. *C. A.* 22, 2928 and preceding abstract.—Mesityl oxide when reduced at room temp. and atm. pressure with Ni as catalyst gave iso-BuCOMe (I) (90% yield). To 250 g. I in 300 cc. abs. EtOH was added 125 g. powd. NaNH_2 . The mixt. was stirred 3–4 hrs., cooled to 0° and pure C_2H_2 passed in. The product (80–90% yield) was methylisobutylethynylcarbinol (II), b_{80} 85–7°, peppermint-like odor. When 50 g. II was heated 40–60 mins. with 400 g. 70% HCO_2H , it gave a mixt. of 2 aldehydes in a yield of 60–70% of the quantity of II used. One aldehyde gave no compd. with NaHSO_3 , and was β,δ -dimethyl- β -hexenaldehyde (III), peppermint-like odor, pale yellow, b_{80} 94–6°. The other, of which only a small quantity was obtained, formed a compd. with NaHSO_3 and was β,δ -dimethyl- α -hexenaldehyde (IV), coumarin-like odor, b_{80} 102–12°. IV polymerized readily but could be stabilized by a small quantity of hydroquinone. III in Na_2CO_3 with 4% KMnO_4 was converted into AcOH and iso- PrCO_2H ; IV on oxidation in the same way gave I and a small quantity of a substance of unknown constitution, m . 88–9°. On reduction with Ni as catalyst, both III and IV gave β,δ -dimethylcaproaldehyde, b_{80} 93–4°; *semicarbazone*, m . 121–2°.

LOUISE KELLEY

Pinacols and pinacolins. E. PACE. *Atti accad. Lincei* 8, 309–14(1928).—In a previous paper it was shown that γ -diketones when treated with Grignard reagents give tertiary glycols which are very readily converted to heterocyclic derivs. of tetrahydrofuran tetrahydropyrrole and tetrahydrothiophene. The same reaction has been applied to α - and β -diketones. The β -compds. do not react, but the α -derivs. give pinacols and pinacolins. The following were prepd. Ac_2 with MeMgBr added drop by drop gives $[\text{Me}_2\text{C}(\text{OH})]_2$ when the product is decompd. with ice-water; crystd. from Et_2O , m . 38°, b . 175°; it recryst. also from water with 6 H_2O , m . 47°. With EtMgBr the corresponding $[\text{MeEtC}(\text{OH})]_2$, m . 51°, b . 216°, is formed. With PrMgBr , $[\text{MePrC}(\text{OH})]_2$, m . 62°, b . 228–30°, is formed. The above pinacols when treated with H_2SO_4 ($1/4$) and subsequently steam distd. give the corresponding pinacolins according to the scheme $[\text{MeRC}(\text{OH})]_2 \rightarrow \text{RCOCrMe}_2 + \text{H}_2\text{O}$. A. W. C.

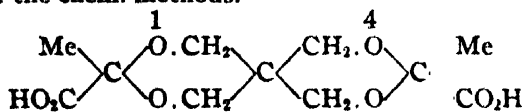
Effects of the spatial position of substituted groups on acidic strength. DONALD H. HEY. Univ. Coll., Swansea. *J. Chem. Soc.* 1928, 2321–3.—Rule, Hay and Paul (*C. A.* 22, 3157) support their conclusions regarding the effect of terminal alkyloxy and CO_2H groups upon rotatory power by citing parallel phenomena in the influence of substituents on the acidity of geometrically isomeric acids. The dissociation consts. of the 2 crotonic acids and of other acids of the same type indicate that the spatial proximity of a Me or Cl group to the CO_2H group in every case increases the acidic strength and that the change thus produced is in the same direction as that produced by the CO_2H group in fumaric and maleic acids. Thus the observation of R., H. and P. is invalid. The behavior of substituted BzOH is also discussed; it is possible to observe a close analogy between the effect of *o*-substitution and *cis*-substitution. C. J. W.

Effect of the spatial position of substituent groups on acidic strength. BERNHARD FLÜRSCHHEIM. *J. Chem. Soc.* 1928, 3039–40.—F. claims the arguments of Hey (preceding abstr.) are the same as he used in earlier publications. C. J. WEST

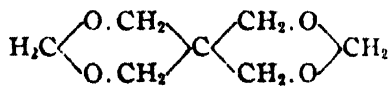
Cyclic acetals. I. RUDOLF DWORZAK AND THERESIA M. LASCH. Univ. Wien. *Monatsh.* 51, 59–72(1929).— $\text{MeEtC}(\text{CH}_2\text{OH})_2$ (5 g.), 5 g. 40% HCHO and 5 g. concd. HCl , satd. with HCl at room temp. and then heated, give 30% of the formal, $\text{MeEtC}(\text{CH}_2\text{O})_2\text{CH}_2$, b . 150–2°; *acetal*, b . 156–60° (30% yield). The formal of dimethyltrimethyleneglycol, b . 124–7° (28% yield); *isobutyral*, b . 159–61° (67% yield), intense camphor-like odor; *enanthal*, b . 234–9° (78% yield). *Isobutyral* of 2-methylpentane-1,3-diol, b_{12} 69–70° (69% yield); of *butane-1,3-diol*, b_{10} 42.5–3° (63% yield), camphor odor; of 2,4-dimethylpentane-2,4-diol, b_{11} 67–73° (25% yield); of 2,3-dimethylbutane-2,3-diol, b_{11} 59° (68% yield); of 3,4-dimethylhexane-3,4-diol, b_{10} 81–3° (66% yield). Definite products could not be isolated from pentane-1,4-diol, octane-1,8-diol, nonane-1,9-diol and decane-1,10-diol.

C. J. WEST

Remarks on the communication of J. Böeseken and B. B. C. Felix: Configuration of pentaerythritol. II. The optically active dipyrucic acid-pentaerythritols. J. KENNER. Municipal Coll. Tech., Manchester. *Ber.* 61B, 2470-1(1928).—B. and F. (*C. A.* 23, 99) believe that the resolution of dipyrucic acid-pentaerythritol (I) into optically active components proves the tetrahedral configuration of pentaerythritol (II), at least in alc. soln., and that it is unnecessary to assume pyramidal, along with tetrahedral, mols. as long as no cyclic *cis-trans*-isomeric dialdehydic or diketonic ethers have been isolated. According to Weissenberg the pyramidal configuration of II is conditioned by the endeavor of the mol. to maintain the equivalence of the 4 CH_2OH groups. In a pyramidal mol. of I, then, the CH_2O groups 1 and 3 would be equiv. to each other but different from groups 2 and 4, which are likewise equiv. to each other. This also holds for the hypothetical compd. III but in this the equivalence would be attained by a tetrahedral configuration and such a configuration would therefore be required for III according to the W. view. From this standpoint, *cis-trans*-isomerism would be expected for I. Although it seems justifiable to assume a conversion of a possibly existing pyramidal into a tetrahedral configuration before rather than after the condensation of the II with AcCO_2H and therefore the existence of tetrahedral mols. of II may be deduced from B. and F.'s expts., it is also possible that these constitute only a small % of the total no. The W. principle can therefore not be tested by chem. methods such as that of B. and F. Apparently this can be done only by the röntgenographic and other phys. methods applied to II and similar compds. of the type Ca_4 but unfortunately there is at present no agreement as to the interpretation of results obtained in this way. K. emphasizes that this is not a defense of or attack on either configuration but only intended to point out an interesting limitation of the chem. methods.



(I)



(III)

C. A. R

Reduction of the secondary hydroxyl group in ricinoleic acid. FRITZ SIGMUND AND FRITZ HAAS. Univ. Wien. *Monatsh.* 50, 357-68(1928).—Reduction of Et ricinoleate by Na and AmOH yields essentially oleyl alc. (I) and only a trace of the expected glycol (μ -hydroxyoleyl alc.). I b_{10} 206-7° and yields an Ac deriv., b_{12} 215-8°; reduction gives stearyl alc., b_{12} 197-201°, m. 58.5°, whose Ac deriv. b_{12} 205-8°, m. 34.5°. The reduction of the HO group not vicinal to the double bond is anomalous but was found also to occur in the reduction of ricinoleic acid (II) or its derivs. by H in the presence of Löw's Pt black. Com. II contains only about 85% of free acid; it was purified by heating with NaOH and sepn. of the Ba salt. Reduction of II in AcOH yields stearic acid or a mixt. of II and stearic acid when hydrogenation is incomplete. Similarly the Me ester (III) of II yields Me stearate under all conditions tried. The action of AcCl on III yields the Ac deriv. of 84% purity, which could not be further purified by repeated fractionation; reduction gives an impure Me acetoxystearate, b_{17} 239-44° (cor.), from which λ -hydroxystearic acid was obtained by hydrolysis, this acid resisted catalytic reduction and in the reduction of II the HO group must, therefore, be reduced before the double bond.

C. J. WEST

Some β -disubstituted chlorohydrin acids. ERIK TROELL. Univ. Lund. *Ber.* 61B, 2497-503(1928).— α -Hydroxy- β -chloro- β -methylbutyric (I), α -hydroxy- β -chloro- β -phenylbutyric (II) and α -hydroxy- β -chloro- β , β -diphenylpropionic acid (III) were prepd by addn. of HCl to the corresponding β -disubstituted glycidic acids. NaNH_2 is a much more satisfactory condensing agent than NaOEt . The decompn. of I in alk. soln. is not a simple bimol. reaction. All attempts to prep. salts of these acids failed; instead of the Na, Cu or Ag salt of the acid are obtained the metal chloride and an evil smelling product which reacts neutral but gradually uses up alkali. In the condensation of Ph_2CO with $\text{ClCH}_2\text{CO}_2\text{Et}$ there is obtained after distn. an ester, b_{12} 202° (IV), thought by Pointet to be Et diphenylglycidate (V) but which is really the ketonic ester $\text{Ph}_2\text{CHCOCO}_2\text{Et}$ formed by rearrangement from the glycidate during the distn.; only when distn. at a high temp. is avoided can the glycidate be obtained. I, m. 80.6-1.3°, easily sol. in but rapidly decompd. by H_2O , stable in dry form and can be kept *in vacuo* over H_2SO_4 . The velocity of its decompn. in H_2O cannot be followed with alkalis, as it does not give a sharp end point, but it is stable in concd. HNO_3 and its decompn. by alkalis can be followed by titrating the liberated Cl by the Volhard method. The

velocity const. increases with decreasing initial concn. (k at 0°, 4.4, 6.7, 8.1 with initial concns. of 0.00585, 0.00309, 0.00158, resp.); in buffered solns. k is 0.0119 and 0.0118 at pH 7.0 and 5.4, resp. II, m. 82° (decompn.), rapidly decomps. in the air. The Na salt corresponding to IV, treated in the usual way with dry HCl did not give a chlorohydrin acid but β,β -diphenylpyruvic acid, m. 116° (VI), very stable in H_2O (in which its soly. is 1.11 g. per l.), dissociation const. 1.3×10^{-2} , gives Ph_2CHCO_2H when heated at 150°, forms a phenylhydrazone, m. 189° (decompn.). After repeated distn. *in vacuo* IV showed d. 1.1344, n_D 1.45638. If, instead of distg. the condensation product of $ClCH_2CO_2Et$ and Ph_2CO , it is treated directly with $NaOEt$ (after removing the Et_2O under atm. pressure and the $ClCH_2CO_2Et$ *in vacuo*), the sirupy acid obtained from the resulting salt is different from VI, yields an aldehyde on distn. and with HCl in Et_2O gives a sirupy acid contg. Cl which is probably III. C. A. R.

Synthesis of ζ -aminoheptylic acid. R. TAKAMOTO. Tokyo Imp. Univ. *J. Pharm. Soc. Japan* 48, 872-6(1928).— ϵ -Bromoamylamine (which was obtained by catalytic reduction of furylethylamine and subsequent bromination) and $BzCl$ gave benzoyl-bromoamylamine(I), m. 54-5°. I, $CH_2(CO_2Et)_2$ and Na gave Ethyl benzoylamino-amylmalonate which on boiling with 4 vols. of concd. HCl gave ζ -aminoheptylic acid-HCl(II), m. 97-9°. II and moist Ag_2O gave the free acid (III), m. 186-7°. Heating of III in vacuum at 180-90°, gave the lactam. It is claimed that the above method is less expensive and simpler than the older ones. NAO UYEI

Physicochemical investigation of amino acids. GAKUJI TAKAHASHI AND TOKUZO YAGINUMA. Nihon Daigaku, Tokio. *Proc. Imp. Acad.* 4, 561-4(1928).— l -Leucine-HCl forms a monohydrate. The Et ester of l -leucine-HCl exists in 2 isomeric forms, 1 m. 119° and a 2nd, which seps. from a hot satd. $EtOH$ -HCl soln. and appears to be metastable at room temp., easily changing to the stable form, m. 119°. The following data are given as curves: b. p. curve for the Et ester; soly. of l -leucine in H_2O (cryohydric point, 0.2° and 2.21% leucine); data for the system: l -leucine-HCl- H_2O at 15° and 30°; optical activity and dispersion of solns. of l -leucine in HCl- H_2O . C. J. WEST

Catalytic racemization of amino acids and peptides. MAX BERGMANN AND LEONIDAS ZORVAS. Kaiser Wilhelm-Inst. fur Lederforschung, Dresden. *Biochem. Z.* 203, 280-92(1928).—In the acetylation of amino acids 3 phases are distinguished. In the 1st phase, when not more than 1 mol. Ac_2O is used, there is an acetylation on the N, with retention of the optical activity. In the 2nd phase, on further reaction with a mol. of Ac_2O , the amino acid becomes completely racemized but not altered in compn. With much larger amts. of the anhydride (several mols.) the acetylated racemized amino acid loses water. The 2nd phase proceeds with unusual velocity, the Ac_2O acting catalytically. The catalysis can also be produced with CO_2 or Bz_2O . S. M.

The amino acid methionine; constitution and synthesis. GEORGE BARGER AND FREDERICK PHILIP COYNE. Univ. Edinburgh. *Biochem. J.* 22, 1417-25(1928).—In 1923 Mueller isolated from caseinogen a new amino acid, $C_5H_{11}O_2NS$ (see C. A. 17, 2400). By applying Kirpal and Buhn's method for the detn. of MeS groups (see C. A. 8, 2163), B. and C. found one to be present. This result restricted the possible formulas to derivs. of butyric and isobutyric acids. Since the cleavage products of proteins are α -amino acids, only 4 formulas remained: α -, β -, and γ -methylthiolbutyric acids (I III) and methylthiolisobutyric acid (IV). $EtC(NH_2)(SMe)CO_2H$ (I), $MeCH(SMe)CH(NH_2)CO_2H$ (II), $MeSCH_2CH_2CH(NH_2)CO_2H$ (III), $MeSCH_2CMe(NH_2)CO_2H$ (IV). III seemed the most probable since it was related to cheirolin, $MeSOCH_2CH_2CH_2N:C:S$, the sulfone of a mustard oil. B. and C. synthesised III (the *dl* substance) and found it to be identical with Mueller's acid, except for optical activity (see C. A. 23, 170). III is γ -methylthiol- α -aminobutyric acid and B. and C. suggest the name "methionine" for it. *Prepn. of III*: 2700 g. casein was hydrolyzed with H_2SO_4 and the filtrate, neutralized with $NaOH$, was divided into halves. To one was added 1350 g. $HgSO_4$ in 7% H_2SO_4 . The ppt. (A) was filtered after 24 hrs. The filtrate was half-neutralized, causing a ppt. (B) 4-5 times as bulky as (A). By neutralizing the filtrate to Congo red a still larger ppt. (C) was obtained. The 2nd half of the hydrolyzate was treated with only $1/3$ of the reagent added to this 1st half; the resulting ppt. (D) was filtered off, an additional third of the reagent was added, giving ppt. (E), and to its filtrate the 3rd instalment of the reagent, giving (F). All 6 ppts. were washed twice by decantation, and twice by filtration, and extd. 5 times, with 1 l. of 2% $Ba(OH)_2$ each time. The 5 combined exts. were freed from $Ba(OH)_2$ by H_2SO_4 from Hg by H_2S , and the filtrate and washings were evapd. to 500 cc. A boiling satd. soln. of 20-50 g. $HgCl_2$ was added. The $HgCl_2$ ppt. was freed from Hg by H_2S , the filtrate was evapd. *in vacuo*, dissolved in the min. quantity of boiling water and mixed with 5-10 cc. pyridine (to remove HCl) and 3 vols. boiling alc. The following

yields were obtained: (A) 2 g. histidine with traces of **III**; (B) 0.05 g. **III**; (C) was lost by accident; (D), (E) and (F), resp., 0.5, 0.5 and 0.6 g. **III**. *Synthesis of III by Strecker's method*: $\text{MeSCH}_2\text{CH}_2\text{CH}(\text{OEt})_2$, (**V**) was prepd. by passing 2 mols. MeSH into 1 mol. alc. NaOEt and dropping 1 mol. $\text{ClCH}_2\text{CH}_2\text{CH}(\text{OEt})_2$ into it. The MeSH was prepd. by hydrolysis of $\text{MeSC}(\text{:NH})\text{NH}_2$. $\text{MeSCH}_2\text{CH}_2\text{CHO}$, (**VI**) was obtained by boiling **V** for 0.5 hr. with 2 vols. water contg. 1–2 cc. dil. HCl . The aldehyde sep'd. on cooling and was extd. with ether. $\text{MeSCH}_2\text{CH}_2\text{CH}(\text{NH}_2)\text{CN}$, (**VII**) was prepd. by adding 1 equiv. of KCN in the min. quantity of water to a well-cooled mixt. of **VI** in ether and 1 equiv. of concd. aq. NH_4Cl ; 2–3 g. NH_4Cl was then added and the mixt. shaken for 6 hrs. The Et_2O layer was sep'd. and the aq. layer extd. with ether. The total ether ext. was dried over Na_2SO_4 and dry HCl passed into the well cooled soln. **III** was obtained from **VII** by pouring off the ether, adding 2 vols. concd. HCl and boiling for 2 hrs. The HCl was removed as much as possible by vacuum distn. and the residue dissolved in the min. amt. of boiling water. Ten cc. pyridine was added to remove free HCl . The addn. of 3 vols. boiling alc. caused the amino acid to sep. in clusters of narrow platelets. Recrystd. from alc., it m. 281° without decompn. Analysis 5.91 mg. gave 0.551 mg. N (micro-Kjeldahl); 9.38 mg. gave 14.5 mg. BaSO_4 (micro-Carius). Found: 9.3% N, 21.3% S; calcd., 9.4% N and 21.5% S. B. H.

Polypeptide-*N*-carboxylic acids. F. WESSELY, E. KEMM AND J. MAYER. Univ. Wien. *Z. physiol. Chem.* 180, 64–74 (1929); cf. C. A. 22, 1757.—*N*- CO_2H acids of dipeptides are unstable, losing CO_2 when the free acids are liberated from their salts. Esters of such acids, however, yield stable products when sapond. This is because of a rearrangement which occurs, yielding isomers of the *N*- CO_2H acids in which the NH_2 groups of the 2 component amino acids are joined through CO . The products may be regarded as carbonylbispeptides or sym. disubstituted ureas. The rearrangement is believed to occur *via* ring closure to an intermediate hydantoin with loss of alc., the hydantoin then opening up by hydrolysis with formation of the carbonylbispeptide. According to this view the urea linkage is formed before rupture of the peptide linkage occurs. Direct evidence by isolation of the intermediate hydantoin has not yet been obtained, but indirect evidence is now at hand from a study of the *N*-carbalkoxyl derivs. of isomeric pairs of dipeptides. *E. g.*, the intermediate hydantoin from the *N*- CO_2Me derivs. of alanylglycine and glycylalanine should be isomeric, but both of them should yield the same carbonylbispeptide on hydrolysis. Two such pairs of isomeric dipeptides were converted into their *N*- CO_2Me derivs. and subjected to the sapon. treatment. Each pair actually yielded one and the same di- CO_2H acid—the expected carbonylbispeptide—in conformity to the theory. *Carbomethoxyalanylglycine*, a difficultly crystallizable oil, was prepd. in the usual way from *dl*-alanylglycine and ClCO_2Me , and without purification it was sapond. by warming with *N* NaOH . By evapn. of the reaction mixt. and extn. with EtOH , *alaninecarbonylglycine*, m. $180\text{--}2^\circ$, was isolated and identified; its *di*-*Me* ester, m. $105\text{--}6^\circ$, was prepd. by treatment with CH_2N_2 . *Carbomethoxyglycylalanine*, m. $169\text{--}70^\circ$, was prepd. in the same way from the isomeric dipeptide. Sapon. yielded the same carbonylbispeptide. Both products gave the same m. p., as did also their *Me* esters, and mixed m. ps. showed no depression. *Et carbomethoxyglycyl- β -aminobutyrate* and its isomer *carbomethoxy- β -aminobutyrylglycine Et ester* were prepd. by the method of Leuchs and sapond. by *N* NaOH . The reaction mixts. were acidified, evapd. to dryness and esterified by 3% alc. HCl . The products obtained in several sep. expts. melted $97.5\text{--}8.0^\circ$, 96.5° , $102\text{--}3^\circ$, $103\text{--}4^\circ$. Despite these discrepancies, mixed m. ps. showed no depression, thus establishing the identity of the sapon. products from the 2 dipeptides. Analysis agreed with that calcd. for *glycinecarbonyl- β -aminobutyric acid di-Et ester*. With NH_3 in the β -position the intermediate heterocyclic compd. would here be a hydouracil instead of a hydantoin, but the reaction is entirely analogous. *Carbomethoxyphenylalanylphenylalanine*, m. 179.5° , was prepd. from the dipeptide and ClCO_2Me and sapond. as above. Here the reaction is more complicated since there are 2 possible forms of the resulting carbonylbis[phenylalanine]. Both forms, m. 203° and 176° , resp., were isolated from the reaction mixt., and their *Et* esters, m. $142\text{--}3^\circ$ and 138° , resp. A. W. DEX

The behavior of polypeptides containing *dl*- α -aminovaleric acid towards normal alkali, erepsin and trypsin-kinase. EMIL ABDERHALDEN, PETER SAH AND ERNST SCHWAB. Univ. Halle. *Fermentforschung* 10, 264–73 (1928).—One dipeptide and 2 tripeptides contg. *dl*-valine, and several of their derivs. were prepd. *dl*- α -Bromoisovaleryl-glycine, m. $136\text{--}8^\circ$, was obtained from *dl*- $\text{Me}_2\text{CHCHBrCOBr}$ and glycine, and by treatment with 25% NH_4OH was converted into *dl*-valyl-glycine, m. 248° ; *Cu salt*, amorphous, by boiling the dipeptide soln. with freshly pptd. CuO ; *PhNCO deriv.*, m. $188\text{--}90^\circ$; β - $\text{C}_{10}\text{H}_7\text{SO}_2$ deriv., m. 195° . *dl*- α -Bromoisovaleryl-glycyl-glycine, m. $145\text{--}6^\circ$,

was obtained from $dl\text{-Me}_2\text{CHCHBrCOBr}$ and glycine anhydride in N NaOH, and aminated to $dl\text{-valylglycylglycine}$, m. 240° ; Cu salt, violet-blue crystals; Bz deriv., m. 155° ; PhNCO deriv., m. $216\text{--}7^\circ$; $\beta\text{-C}_{10}\text{H}_7\text{SO}_2$ deriv., m. 190° . $dl\text{-Valylglycine}$ and ClCH_2COCl were coupled in the usual way to $chloroacetyl\text{-}dl\text{-valylglycine}$, m. 141° , and the product aminated to $glycyl\text{-}dl\text{-valylglycine}$, m. 239° ; PhNCO deriv., m. $197\text{--}8^\circ$; $\beta\text{-C}_{10}\text{H}_7\text{SO}_2$ deriv., m. 148° . Only those peptides in which the glycyl component carries the free NH_2 are hydrolyzed by N NaOH at 37° . Thus, $dl\text{-valylglycine}$ remains unaltered, while the isomeric $glycyl\text{-}dl\text{-valine}$ slowly undergoes hydrolysis. Likewise, $dl\text{-valylglycylglycine}$ is resistant, while $glycyl\text{-}dl\text{-valylglycine}$ breaks up into glycine and $valylglycine$. All of the PhNCO derivs. undergo hydrolysis. In contrast to the $\beta\text{-C}_{10}\text{H}_7\text{SO}_2$ derivs. of other peptides, which are less readily attacked by alkali than the free peptides, those of all 3 valyl peptides are hydrolyzed. The PhNCO derivs. described here conform to the general rule that such derivs. are more rapidly hydrolyzed than the unsubstituted peptides. Erepsin hydrolyzes all 3 of the above peptides, but all 3 are resistant to trypsin-kinase. On the other hand, the PhNCO deriv. of $valylglycylglycine$ is resistant to erepsin but not to trypsin-kinase. A. W. Dox

The behavior of $dl\text{-}\alpha,\epsilon\text{-dileucyl}\text{-}dl\text{-lysine}$ towards normal sodium hydroxide, erepsin and trypsin-kinase. EMIL ABDERHALDEN AND HANS SICKEL. Univ. Halle. *Fermentforschung* 10, 302-4(1928); cf. *C. A.* 23, 1114.— $dl\text{-Lysine}$ was prepd. from benzoyl-piperidine by the v. Braun synthesis (*C. A.* 3, 1273), and converted into 70% $\alpha,\epsilon\text{-di-[}dl\text{-}\alpha\text{-bromoisocaproyl]-}dl\text{-lysine}$, amorphous scales, by treatment of the di-HCl salt with $dl\text{-Me}_2\text{CHCH}_2\text{CHBrCOCl}$ and purification of the product by pptg. the Et_2O soln. with petroleum ether. The Br deriv. was aminated by heating 2 hrs. under pressure with 10 parts of 25% NH_4OH , yielding $\alpha,\epsilon\text{-di-[}dl\text{-leucyl]-}dl\text{-lysine}$, and the $\text{NH}_4\text{-Br}$ removed by the $\text{Ag}_2\text{SO}_4\text{-Ba(OH)}_2$ procedure. The tripeptide is amorphous and decomp. 160° (foaming). The aq. soln. is alk. to litmus, gives ppts. with picric and phosphotungstic acids and shows positive biuret and ninhydrin reactions. It is hydrolyzed by N NaOH, also by erepsin but more rapidly by trypsin-kinase. A. W. D.

Behavior of polypeptides constructed of $d\text{-alanine}$ towards normal alkali, erepsin and trypsin-kinase. EMIL ABDERHALDEN AND JUAN J. DELGADO Y MIER. Univ. Halle. *Fermentforschung* 10, 251-5(1928).—Polypeptides built up from a single amino acid, with the exception of glycine, have thus far proved to be more resistant to hydrolysis by alkali than those contg. 2 or more different amino acids. The di- and tripeptide of d alanine were prepd. and examd. with respect to resistance towards hydrolyzing agents. $d\text{-Alanyl-}d\text{-alanine}$ has been previously described; PhNCO deriv., m. 176° ; $\beta\text{-C}_{10}\text{H}_7\text{SO}_2$ deriv., m. $158\text{--}9^\circ$. $d\text{-}\alpha\text{-Bromopropionyl-}d\text{-alanyl-}d\text{-alanine}$, m. 148° , was obtained by alk. hydrolysis of $d\text{-alanine}$ anhydride and coupling with MeCHBrCOCl in the usual way. By treatment of this with 25% NH_4OH it was aminated to $d\text{-alanyl-}d\text{-alanyl-}d\text{-alanine}$, amorphous, m. 245° , $[\alpha]_D^{20} -15.1^\circ$. Both di- and tripeptide are hydrolyzed by N alkali at 37° , the latter more readily than the former. The PhNCO deriv. of the dipeptide is completely hydrolyzed in 3 hrs. to $d\text{-alanine}$ and the PhNCO deriv. of $d\text{-alanine}$, but the $\beta\text{-C}_{10}\text{H}_7\text{SO}_2$ deriv. is quite resistant. Erepsin hydrolyzes both peptides, the di- more readily than the tripeptide. Neither one is attacked by trypsin-kinase. A. W. Dox

The relation of chemical structure to the rate of hydrolysis of peptides. IV. Enzyme hydrolysis of dipeptides. P. A. LEVENE, LAWRENCE W. BASS AND ROBERT E. STEIGER. Rockefeller Inst. *J. Biol. Chem.* 81, 221-30(1929); cf. *C. A.* 21, 100.—In the hydrolysis of dipeptides by erepsin the reaction follows the course of a monomol reaction. In concns. of the substrate from 0.025 to 0.50 M the rate of hydrolysis is approx. proportional to the concn. of the enzyme. When a peptide composed of glycine and a $dl\text{-acid}$ is compared with one composed of glycine and a naturally occurring amino acid in regard to their rates of hydrolysis, the concns. of the 2 substances should be in the ratio of 2:1; if 1 peptide is composed of 2 $dl\text{-acids}$ and the other of 2 optically active naturally occurring acids, the ratio should be 4:1. The rates of hydrolysis of $glycylglycine$, $glycyl\text{-}d\text{-valine}$, and $glycyl\text{-}l\text{-valine}$ are of the same order of magnitude at the same concn. With peptides contg. $d\text{-alanine}$ an exceptional behavior (not explainable) was observed: hydrolysis of $d\text{-alanyl-}d\text{-alanine}$ occurred most rapidly; next in order was $dl\text{-alanylglycine}$; the lowest rate was found for $glycyl\text{-}dl\text{-alanine}$. Peptides contg. 1 amino acid enantiomorphous to that occurring naturally are not hydrolyzed by erepsin; on digestion of $dl\text{-alanylglycine}$ and similarly constituted peptides, the form contg. the amino acid enantiomorphous to that occurring naturally remains intact. $Glycyl\text{-}d\text{-isovaline}$ is not hydrolyzed by erepsin even though isovaline is configurationally related to the amino acids occurring in proteins. $Glycyl\text{-}l\text{-valine}$, $[\alpha]_D^{25} 20.3^\circ$ in H_2O .

A. P. LOTHROP

The alkaline decomposition of cystine. JAMES C. ANDREWS. Univ. of Penna. School of Med. *J. Biol. Chem.* 80, 191-210(1928).—The alk. decompn. of cystine is a complicated process involving a rapid decrease in the optical activity of the cystine, formation of sulfide ion and of cysteine and evolution of NH_3 . One of the most outstanding features of the decompn. is the marked and sp. effect of Pb on these various reactions. The rate of loss of cystine and of deaminization is greatly increased by the presence of amts. of Pb sufficient to ppt. all the S as PbS . While the initial formation of cystine is very little affected by the presence of Pb, the latter causes its decompn. to set in more rapidly than otherwise would be the case. This specificity of Pb in cystine chemistry leads to interesting speculations as to any possible connection with its very sp. properties as a poison. The speed of racemization of cystine in alkali is much greater than the speed of decompn. The optical configuration of the cystine is without influence on the rate of loss of NH_3 . Most of the reactions were carried out at approx. room temp. as heating so accelerates the reactions as to make an individual scrutiny of them impossible.

A. P. LOTHROP

Stereochemical studies. XVII. Optical resolution and configuration. BROR HOLMBERG. *Z. physik. Chem., Abt. A.*, 137, 18-28(1928); cf. *C. A.* 22, 386.—The principle of Winther, which states that 2 acids which are pptd. by the same base must possess analogous configurations, has been established by H. in the case of 22 racemic acids with active EtPhNH . Contradictory data were found, however, which limit the value of this principle as a means of detg. configuration. **XVIII. Nitromalic acid.** *Ber.* 61B, 1885-93(1928).—Optically inactive nitromalic acid (I) and the *l*(-)-acid (II) were prepd. from the corresponding malic acids and $\text{H}_2\text{SO}_4\text{-HNO}_3$. Attempts to isolate an active form from I by treatment with EtPhNH were not successful. II, m. 114-5° (decompn.), $[\alpha]_D -38.6^\circ$ (in acetone), -36.8° (in alc), -42.8° (AcOEt), -23.1° (water); acid Na salt in water -26.7° , neutral Na salt -10.5° . Nitration of Et malate gives the *Et ester* of II, d_4^{20} 1.202, $[\alpha]_D^{20} -30.55^\circ$. Reduction of II with Na-Hg or H_2S gives *l*(-)-malic acid. Analogous to the behavior of monohalogen succinic acid, II with alkali gives fumaric acid. (-)-Bromosuccinic acid (III) with AgOAc gives II. According to H.'s picture of org. cations with positively ladened

C (see *C. A.* 20, 3281; 22, 386) $\begin{array}{c} \text{a} \\ \diagup \\ \text{b} \text{---} \text{C}^+ \\ \diagdown \\ \text{c} \end{array} + \bar{\text{O}}.\text{NO}_2 = \begin{array}{c} \text{a} \\ \diagup \\ \text{b} \text{---} \text{C}.\text{O}.\text{NO}_2 \\ \diagdown \\ \text{c} \end{array}$ III belongs

to the *l*-series. If the nitrate ion is formulated as $\bar{\text{NO}}_3$ or $[\text{NO}_3]^-$, the relation may be different, depending on reaction distances (see *C. A.* 20, 1600). **XIX. The diazotization of aspartic acid and its ethyl ester.** *Ibid* 1893-1905.—In view of the various contradictory results on the diazotization of aspartic acid (I) and its Et ester, H. has repeated these expts. under various conditions, and showed in what manner the optical activity of the resulting malic acid (II) was influenced by the acid content of the diazotization mixt. The effects of various concns. of HNO_3 , and various acids were studied. In each case the $\text{UO}_2\text{-}[\alpha]_D$ of the resulting II was detd. With sufficient H-ion concn. *l*-II predominates, while with lower concns. there is formed some (+) or racemic II. Excess NaNO_2 causes the formation of β -nitronitrosopropionic acid. NaNO_2 with HNO_3 gives a small amount of *l*(-)-nitromalic acid; NaCl , (-)-chlorosuccinic acid. Diazotization of the Et ester of I gives inactive II. With increase of the mineral acid, however, the resulting II becomes weakly *d*-rotary. Diazotization of this ester in the presence of neutral salts gives corresponding esters of nitro-, chloro-, and bromosuccinic acid. The various results are discussed in the light of H.'s theory. The hydroxy-, nitroxy-, and halogensuccinic acids formed in the diazotization of I and its Et ester are of the same configuration. The (+)-halogensuccinic acid and the (-)-hydroxy acid, as well as natural I or the (+)-form, possess *l*-configuration

FREDERICK C. HAHN

Chemical constitution and rotatory power. III. S. BERLINGOZZI. *Atti accad. Lincei* 7, 925-9(1928); cf. *C. A.* 22, 1758.—In order to arrive ultimately at a relation between the chem. constitution and rotatory power, the rotation of acyl derivs. $\text{H}_2\text{NCOCH}_2\text{CH}(\text{NHR})\text{CO}_2\text{H}$ ($\text{R} = \text{Acyl}$) of *l*-asparagine were measured: Below are given, in order, the acyl group R, $[\text{M}]_D^{20}$, K and the m. p. of the compd.: anisoyl, 40.2, 0.0032, —; cuminoyl, 43.9, 0.0050, 158-9°; *p*-toluyl, 43.2, 0.0051, 192°; *p*-chlorobenzoyl, 41.2, 0.0093, 181°; *p*-nitrobenzoyl, 30.8, 0.0040, —; *m*-toluyl, 49.0, 0.0051, 162°; *m*-nitrobenzoyl, 35.3, 0.0345, —; *o*-chlorobenzoyl, 20.5, 0.1320, 171°; *o*-bromobenzoyl, 13.4, 0.1450, 163°; *p*-toluenesulfonyl, 19.5, 2.100, —; 1-nitro-2-toluene-4-sulfonyl-, 85.6, —, 174°.

A. W. CONTIERI

Derivative of *dl*-asparagine. S. BERLINGOZZI. *Atti accad. Lincei* 7, 1037-40

(1928).—It is known that when an equimol. mixt. of *d*- and *l*-asparagine is evapd the *dl*-form is not obtained but rather an intimate mixt. of the 2 forms which can be sepd. The same result obtains when most acyl derivs. are used. However, mixt. of the *d* and *l*-forms of *m*-nitrobenzoylasparagine and *d*- and *l*-1-nitro-2-toluene-4-sulfonylasparagine give the *dl*-product; the former m. 191° (the *d*- and *l*-forms m. 176°), and the latter m. 190° (*d*- and *l*-forms m. 174°).

A. W. CONTIERI

Centenary of Wöhler's synthesis of urea (1828–1928). FREDERICK G. HOPKINS. Biochem. Lab., Cambridge. *Biochem. J.* 22, 1341–8(1928).—Critical review of the significance of Wöhler's discovery.

BENJAMIN HARROW

The reaction between guanidine and amino acid esters. III. EMIL ABDERHALDEN AND HANS SICKEL. Univ. Halle. *Z. physiol. Chem.* 180, 75–89(1929); cf. *C. A.* 22, 1330, 1958.—The reaction whereby guanidine and esters of α -amino acids condense to form guanidino derivs. with liberation of NH_3 , e. g., the formation of creatinine from guanidine and sarcosine ester, was extended to include esters of diamino acids. Evidence in support of the assumption that the NH_3 liberated comes from the guanidine and not from the amino acid is the fact that $\text{H}_2\text{NC}(\text{:NH})\text{NHMe}$ and $\text{H}_2\text{NC}(\text{:NH})\text{-NMe}_2$ also react with amino acid esters although less readily, i. e., the guanidine must contain an unsubstituted amino group, but an alkyl or acyl substitution in the amino acid does not interfere. *Di-Me α,α' -diaminosuberate di-HCl salt*, which foams 212° and decomp. 270°, was obtained by passing HCl into the acid in MeOH. The failure of Neuberg and Neimann to obtain the Et ester by this method was not due, as they supposed, to the size of the mol. but to the insol. of the amino acid-HCl in EtOH. The free base, liberated by addn. of alkali, was extd. with Et_2O and the ext. treated with an excess of guanidine. The temp. rose from 0° to 70° with copious evolution of NH_3 . The condensation product, which darkens 260° and m. to a brown liquid 305°, is almost neutral to litmus and gives a strong Jaffé reaction. Its N content corresponds to that calcd. for the salt of 5,5'-tetramethylene- α,δ -di[2-imino-4-ketotetrahydroimidazole] with 5-[ϵ -carboxy- α -aminomethyl]-2-imino-4-ketotetrahydroimidazole. Lack of material prevented further identification. The ester of the analogous diaminovaleric acid (ornithine) cannot be obtained because of its immediate ring closure to an amino-piperidone, hence the stable Bz deriv. was employed. δ -Benzoylornithine was esterified to *Me dl- α -amino- δ -benzoylaminovalerate-HCl*, m. 128–30°, decomp. 162°. The base was liberated by alkali and extd. with CHCl_3 , the solvent evapd. and the residue mixed with guanidine. No reaction occurred at 0°, but at 15° there was evolution of NH_3 and spontaneous warming. The product, 5- γ -benzoylamino-propyl 2-imino-4-ketotetrahydroimidazole, m. 198°, gives the Jaffé and nitroprusside reactions and forms a *picrate* which decomp. 220°. Refluxing 7 hrs. with concd. HCl split off the Bz without opening the cyamidine ring. The free base remaining after extrn. of the BzOH with Et_2O and removal of HCl by $\text{Ag}_2\text{SO}_4\text{-Ba(OH)}_2$ could not be crystd. but was converted into a cryst. *dipicrate*, m. 230° (decompn.). By alkali hydrolysis the ring was opened up and the product, which no longer gave the Jaffé reaction, was converted into a cryst. *picrate* (decomp. 212° and again 305°), from which the free base *isoarginine* (α -guanidino- δ -aminovaleric acid) was liberated by Ag_2SO_4 and Ba(OH)_2 . This isomer of arginine, after neutralizing to pH 6.6 with H_2SO_4 , was treated with press juice of dog liver previously tested for the enzyme arginase. No cleavage occurred in 16 hrs., as shown by the absence of any increase in amino N as detd. by the Van Slyke method. The reaction between asym. dimethylguanidine and glycine ester was accompanied by a rise in temp. to 70°, but very little NH_3 was liberated and the yield of cyamidine, although sufficient to give the Jaffé reaction, was too small for isolation and analysis. Most of the guanidine was recovered unchanged, also some Curtius biuret base and a small amt. of glycine anhydride. The rise in temp. was evidently due to an acceleration of the ester condensation through the influence of the guanidine deriv. Monomethylguanidine reacted in the same way with glycine ester, but to a somewhat greater extent as shown by the evolution of more NH_3 and a more intense Jaffé reaction. The greater part of the original guanidine was recovered unchanged, along with some biuret base and glycine anhydride. Iso-amylguanidine, α -naphthylguanidine and acetylguanidine did not react sufficiently with glycine ester to give the Jaffé reaction, and only with the 1st of these could a trace of NH_3 be detected. Et hippurate and guanidine gave a small yield of *hippuryl-guanidine*, m. 183°. *picrate*, decomp. above 320°. No cyamidine was obtained as shown by a negative Jaffé reaction. Substituted guanidines are thus less reactive than guanidine itself toward amino acid esters. Acetylglycine Et ester and guanidine reacted with rise in temp., but yielded only the *guanidonium salt of acetylglycine*, m. 105–10°.

A. W. DOX

Ammonium picrate and its possible use in the preparation of creatinine. ISIDOR GREENWALD. Harriman Research Lab., Roosevelt Hosp., N. Y. *J. Biol. Chem.* 81, 73-5(1929).— NH_4 creatinine picrate apparently has a real existence as a compd. but on account of its ready dissociation into its components it is difficult to obtain in a pure condition. The formation of this compd. may be used to advantage in increasing the yield of creatinine obtained from creatine. Nearly all of the 20% of the calcd. yield that is lost in the usual method of prepn. can be recovered by the technic which is described.

A. P. LOTHROP

Mercury compounds of purine derivatives. I. ROSENTHALER. Univ. Bern *Arch. Pharm.* 266, 694-6(1929).—A hot soln. of caffeine and $\text{Hg}(\text{OAc})_2$ in hot dil. AcOH yield after a period of 2-3 days *acetatomercuricaffeine*, $\text{C}_8\text{H}_7\text{N}_4\text{O}_2\text{HgOAc}$, needles softening 255° , decomp. somewhat about 280° , but not m. up to 300° , sol. in 900 parts cold H_2O , more readily in hot H_2O , difficultly sol. in alc., sol. in caustic alkali, aq. NH_3 , carbonates and bicarbonates of the alkali metals. From the aq. soln. KI ppts. *mercuricaffeine*, $(\text{C}_8\text{H}_7\text{N}_4\text{O}_2)_2\text{Hg}_2$, needles not m. up to 340° , difficultly sol. in both cold and hot H_2O .

W. O. F.

Action of trimethylamine and other bases on acetobromocellobiose. GÉZA ZEMPLÉN AND ZOLTÁN BRUCKNER. Tech. Hochschule Budapest. *Ber.* 61B, 2481-6(1928), cf. *C. A.* 22, 2742.—After reading the earlier paper of Z. and B., Ohle informed them that from the products of the reaction of PhNMe_2 with acetobromoglucose he had isolated Me_3PhNBr , i. e., that MeBr is split off in the reaction. In view of the possibility that a similar process might have occurred in their own reaction they studied the latter more thoroughly and found that the earlier preps. on decompn. with alkalis and distn. gave NHMe_2 and not NMe_3 , and furthermore that the end product is obtained in much better yield by working at room temp. in CHCl_3 instead of at higher temps. in alc. and that under these conditions Me_4NBr can be isolated as a by-product. Finally, NHMe_2 gives with acetobromocellobiose (I) the same base as does NMe_3 and $\text{Me}_3\text{NH.HBr}$ can be isolated from the mother liquors. These results show that MeBr is in fact split off in the reaction between NMe_3 and I and that the product is a *heptaacetylcellobiosidodimethylamine* (II) having the structure given in the earlier paper except that NMe_2 should be substituted for NMe_3 . From the reaction mixt. of I with NEt_3 in CHCl_3 at room temp. could be isolated only quite impure heptaacetylcellobiose and the mother liquors contained only NEt_3 with no NHEt_2 , showing that in this case no alkyl bromide is split off. With NHEt_2 was obtained a cryst. N free substance (III) which absorbs two Br atoms in CHCl_3 . Piperidine gives *heptaacetylcellobiosidopiperidine* (IV) which seems to take up 2 atoms of Br from CHCl_3 but when the reaction mixt. is worked up the cryst. *end product* (V) contains only 1 atom of Br, showing that substitution of a H atom and not addn. has taken place; the HBr formed was detected in prepg. V. II (3-4 g. from 10 g. I), m. $198-9^\circ$ (decompn.), $[\alpha]_D^{20} -10.51^\circ$ (CHCl_3). Hexaacylcellobiosene (III) (2.5-3 g. from 10 g. I), m. 125.6° , $[\alpha]_D^{20} -19.78^\circ$ (CHCl_3). IV (1.5-2 g. from 5 g. I), m. $215-20^\circ$ (decompn.), $[\alpha]_D^{18} -15.28^\circ$ (CHCl_3). V, m. $132-3^\circ$ (decompn.).

C. A. R.

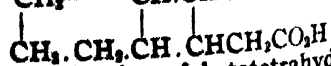
Sulfuric esters of carbohydrates. ERICH GEBAUER-FÜLNEGG, WM. H. STEVENS AND ERNST KRUG. Univ. of Princeton and Univ. Wien. *Monatsh.* 50, 324-7(1928).—Cotton, treated with ClSO_3H in the cold and kept 24 hrs., gives chloroglucose tetrasulfate, hygroscopic crystals (cf. Claesson, *J. prakt. Chem.* 20, 18(1879)). If the reaction mixt. is slowly added to Ac_2O , α -pentaacetyl-*D*-glucose may be sepd. by pptn. with NaCl or AcONa . Dextrose, similarly treated, gives the same product. AcCl or AcBr , however, gives β -acetochloroglucose, while AcI is decompd. If the reaction of cotton and ClSO_3H is interrupted after 2 or 5 hrs., small quantities of octaacetylcellobiose or tetraacetylglucose, resp., can be sepd.

C. J. WEST

Highly polymerized compounds. XIV. Constitution of dicyclopentadienes. H. STAUDINGER. Univ. Freiburg i. B. *Ann.* 467, 73-5(1928); cf. *C. A.* 23, 822.—A theoretical introduction to the following abstr. and polemical against Diels and Alder (*C. A.* 22, 1144).

C. J. WEST

Constitution of dicyclopentadienes. FRANZ BERGEL AND ERNST WIDMANN. *Ann.* 467, 76-91(1928).—Evidence is offered which is considered to render untenable the structures suggested by Diels and Alder (*C. A.* 22, 1144) for dicyclopentadiene derivs. and to confirm the 1,2-addn. structures suggested by Staudinger (*C. A.* 20, 2091). The interconversion of the 2 isomeric acids $\text{CH}_2=\text{CH}.\text{CHCO}_2\text{H}$ (I), m.



200° (decompn.), and (II), m. 133.5° , obtained by the oxidation of ketotetrahydro-

dicyclopentadiene (III) and dihydrodicyclopentadiene glycol, resp., with HNO_3 (Wieland and Bergel, *C. A.* 20, 384), has been investigated by the method of Hückel and Goth (*C. A.* 19, 1857). CH_3N_3 converts I into its *di-Me ester*, m. $72.5-3^\circ$, which by hydrolysis with MeOH-MeONa yields a product, m. 170° , from which petr. ether, b. $90-115^\circ$, exts. an acid identical with II; the residue, m. 178° , gives an ester, b. 120° , which yields only resinous products on hydrolysis. II is obtained in 70–80% yields by oxidation of dihydrodicyclopentadiene with a slight excess of KMnO_4 in Me_2CO ; CH_3N_3 gives a *di-Me ester*, b. 134° , which with MeONa gives a compd., m. 110° . Oxidation of III with KMnO_4 in dil. NaOH gives an acid, m. 232° (60% yield); *di-Me ester*, m. $77.5-8^\circ$; with MeONa this gives the acid $\text{C}_{10}\text{H}_{14}\text{O}_4$, m. 178° . Mild hydration of tetrahydrodicyclopentadiene dioxide by boiling with very dil. HCl converts it into the hygroscopic sirupy glycol, $\text{CH}(\text{OH})\cdot\text{CH}_2\cdot\text{CH}\cdot\text{CH}_2\cdot\text{CH}_2\cdot\text{CHOH}$, which does

$\text{CH}(\text{OH})-\text{CH}\cdot\text{CH}-\text{CHOH}$

not react with BzCl , $p\text{-O}_2\text{NC}_6\text{H}_4\text{COCl}$, etc. BzO_2H in CHCl_3 transforms ketodihydrodicyclopentadiene into *ketotetrahydrodicyclopentadiene oxide*, b. 145° , m. 115° (80–90% yield); dil. HCl gives the glycol, yellow sirup. Oxidation of these products and their parent substances under various conditions yields amorphous acids, the composition of which agrees moderately well with that of the expected tetra- CO_2H acid. Catalytic reduction of cyclopentadienebenzoquinone gives the *tetrahydro deriv.*, m. 246° ; *tetrahydrodicyclopentadienebenzoquinone*, m. 251° ; *monoxime*, m. 247° . C. J. WEST

New theories of organic structure, the study of high polymer compounds. KURT H. MEYER. *Naturwissenschaften* 16, 781–93(1928); *Z. angew. Chem.* 41, 935–46(1928).

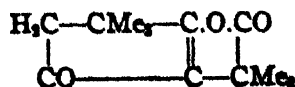
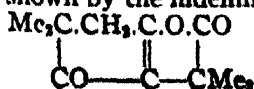
A review.

B. J. C. VAN DER HOEVEN

Tetra-araban and its relation to tetragalacturonic acid, the chief component of pectin. FELIX EHRLICH AND FRIEDRICH SCHUBERT. *Univ. Breslau. Biochem. Z.* 203, 343–50(1928).—Tetra-araban can be derived from tetragalacturonic acid by the loss of 4 mols of CO_2 : $\text{C}_{24}\text{H}_{32}\text{O}_{24} = \text{C}_{20}\text{H}_{32}\text{O}_{16} + 4\text{CO}_2$. Since *d*-galacturonic acid and *l*-arabinose are very similar stereochemically it seems probable that in the plant the araban component of pectin is formed enzymatically through the splitting off of CO_2 from the 4 free CO_2H groups. S. MORGULIS

The relation between humic acids and lignin. W. FUCHS. *Brennstoff-Chem.* 9, 298–302(1928).—Lignin from various sources and humic acid as well are subjected to the action of various reagents to det. if their chem. behavior is similar. Products of nitration with 5 N HNO_3 , in particular, are compared and found to be very similar compds. "They are evidently isonitrosoketohydroxycarbonic acids of high mol. wt. and apparently have cyclic structure." Differences between lignin and humic acid nitro derivs. lie principally in the manner of N linkage. The N content of the lignin derivs. is highest and the reason is not entirely clear. The mol. wt. detd. in acetone ranged from 1410 to 1765 for fully methylated nitro derivs. of lignin and that for the corresponding humic acid compd. was 1535. MeO , $\text{C}=\text{O}$, HO and CO_2H groups are detd. J. D. DAVIS

Ring-closure of the γ -ketodicarboxylic acid esters. I. Condensation of phoronic acid ester. N. J. TOIVONEN. *Ann. acad. sci. Fennicae A28*, 12 pp.—Heating phoronic acid ($\alpha,\alpha,\alpha',\alpha'$ -tetramethyl- γ -ketopimelic acid) (I) 0.5 hr. at $200-250^\circ$ gave the dilactone. The di-Et ester m. 33° (cf. Pinner, *Ann.* 247, 110(1888), 125°). The mono-Me ester made by heating the dilactone with MeONa in MeOH , addn. of H_2O and pptn. with HCl , m. $105-6^\circ$. To 1 mole of I di-Me ester (II) in Et_2O was added 2–5 moles of MeOH -free MeONa , let stand 1 hr., heated 1 hr. on a water bath and finally for 1 hr. at $140-50^\circ$. The residue was extd. with dil. H_2SO_4 , filtered, dried and washed with Et_2O . Soln. in Na_2CO_3 and pptn. with acid gives 1,1-dimethylcyclopentane-3,5-dione-4-isobutyric acid (III); yield 70%. As an alternative procedure II was dissolved in abs. MeOH with 1.5 moles MeONa . After 10 hrs. refluxing the solvent was distd. at 105° . The residue was dissolved in H_2O , extd. with Et_2O and the ester pptd. with HCl . The yield of III methyl ester (IV), m. 172° , was 75%. By sapon. of IV in alc. NaOH , III was obtained. Condensation of I di-Et ester was also carried out but the product was not purified. III from 60% AcOH sublimes 120° , m. 252° (decompn.). By titration in 50% alc. with NaOH III is almost completely and IV completely enolized. III is not changed by boiling with strong KOH or HCl . III did not form a semicarbazone, oxime or phenylhydrazone. IV boiled in 5 parts Ac_2O for 4 hrs. followed by distn. of the Ac_2O gave the enol-lactone (V) b. $151-2^\circ$, m. $75-80^\circ$. V is apparently a mixt. of 2 forms as shown by the indefinite m. p.



It takes up H_2O readily to form **III**, sublimes easily and dists. with steam to give **III**. T. finds that another γ -ketonic acid ester than the β,β -dialkylated type can form a condensation product (cf. C. A. 18, 967), probably because this takes place more quickly than lactone formation.

FOSTER DEE SNELL

A new spiro- β -lactone: The β -lactone of 1,1-dimethylcyclopentane-3,5-dione-4-hydroxy-4-isobutyric acid. N. J. TOIVONEN. *Ann. acad. sci. Fennicae* A28, 9 pp.—In 10 g. of dimethylcyclopentanedioneisobutyric acid (cf. preceding abstr.) in 25 cc. AcOH was suspended 9.7 g. AcOK and 7.75 g. of Br_2 in 30 cc. of AcOH added drop by drop. In the absence of AcOK more Br_2 will react. Careful addn. of H_2O pptd the β -lactone of 1,1-dimethylcyclopentane-3,5-dione-4-hydroxy-4-isobutyric acid (**I**). Filtered, washed (yield 7–9 g.) and crystd. from AcOH it m. $133-4^\circ$ (decomph.). In titration 1 mole of NaOH reacts readily, a 2nd only slowly. This product of reaction of 1 mole of NaOH could not be isolated for a detn. of which ring was more readily opened. To 10 g. of **I** suspended in 20 cc. of H_2O was added 100 cc. of 5% NaOH with cooling, probably forming a hydroxyketonic acid. After standing overnight the soln. was acidified with HCl, pptg. the hydroxydilactone (**II**), m. $155-6^\circ$ (yield 4.4 g.) Also 4.2 g. of an impure mixt. of isomers (**III**), m. $136-40^\circ$, having the same compn was recovered. The behavior toward NaOH titration is similar to **I**. **II** or **III** in AcOCl after standing overnight and vacuum evapn. of the excess reagent gave the *Ac deriv.*, m. $128-9^\circ$. The Me ester is oxidized in the same way as the acid but is difficult to purify. **I** heated to its m. p. or treated with $CH_2(CH_2)_4NH$ liberates CO_2 .

This new type of β -lactone is most closely related to that of 4-diphenylcarboxymethyl-quinol (cf. Staudinger, C. A. 2, 2224; 5, 2625).

FOSTER DEE SNELL

Pyrogenic decomposition of 1,1-dimethylcyclopentane-3,5-dione-4-isobutyric acid and its 4-hydroxy- β -lactone. A. Effect of heat on dimethylcyclopentanedioneisobutyric acid. N. J. TOIVONEN. *Ann. acad. sci. Fennicae* A28, 15 pp.; cf. preceding abstr.—On heating 1,1-dimethylcyclopentane-3,5-dione-4-isobutyric acid reaction starts at $250-60^\circ$ and then falls to 220° at which temp. the principal reaction takes place. It was finally heated at $240-50^\circ$ until evolution of gas had ceased. One mole gives the following yields in moles: $0.94-1.23 H_2O$, $1.01-1.06 CO$, $0.2-0.3 Me_2CO$, $0.01-0.04 CO_2$. The reaction suggested is $2C_{11}H_{16}O_4 = 2H_2O + 2CO + Me_2CO + C_{17}H_{22}O_3$ (**I**). The residue contains 2 isomers. The enol-lactone (cf. 2nd preceding abstr.) was also isolated. By boiling the residue with NaOH soln. these are hydrolyzed to acetone and 1,1-dimethylcyclopentane-3,5-dione (**II**). By fractional crystn. of **I** were obtained the isomers, prisms, m. $213-4^\circ$ and flakes, m. $233-4^\circ$. Oxidation of **II** with NaOCl gave $HO_2CCMe_2CH_2CO_2H$. Boiling the isomers from **I** in alc. MeONa gives isopropylidenebisdimethylcyclopentanedione (**III**) (cf. Vorländer, *Ann.* 309, 348(1899)). **III** in cold alc. acidified with HCl on addn. of H_2O gives the isomers of **I**. B. Effect of heat on the β -lactone. *Ibid* 12 pp.—The β -lactone of 1,1-dimethylcyclopentane-3,5-dione-4-hydroxy-4-isobutyric acid (**I**) is easily decompd. by heat, ultra-violet light or secondary amines. When heated to $130-5^\circ$ the heat of reaction may raise the temp. to about 230° . It was finally held at 140° for 3 hrs. From 1 mole there was obtained approx. 1 mole of CO_2 and 1 of residue (**II**), $C_{20}H_{28}O_4$, with 0.068 mole of H_2O . **II** titrated with alkali as a monobasic acid, m. $144-6^\circ$. Dissolved in NaOH soln. and pptd. by AcOH, $C_{16}H_{20}O_6$ (**III**) was obtained, monobasic. **II** in alc pptd. by H_2O gave **III**. The H_2O is lost at $80-90^\circ$ to give **II**. Persistent boiling with alkali decomp. **II** or **III** to 1,1-dimethylcyclopentane-3,5-dione (**IV**) and acetone. **I** heated at 230° formed much $C_{17}H_{22}O_3$. **II** heated at 230° goes partially to $C_{17}H_{22}O_3$ and **III** goes completely. (Of the enolic forms of **II**, $CO.CMe_2.CH_2.CO.CHCMe_2C(CMe_2(OH)).CO.CH_2.CMe_2.CO$ (**A**) \rightleftharpoons

$CO.CMe_2.CH_2.C(OH).CH.CMe_2.C.CO.CH_2.CMe_2.CO$ (**B**), the ease of removal of water

and lack of color with $FeCl_3$ point to **B**. Decolorization of $KMnO_4$ and Br_2 is to be expected with this formula as well as hydrolysis to **IV** and Me_2CO and decompn. to $C_{17}H_{22}O_3$.

FOSTER DEE SNELL

The course of ester condensations of cyclopropane-1-carboxylic-2-acetic acid esters. I. Condensation of α -tanacetonedicarboxylic acid esters. N. J. TOIVONEN. *Ann. acad. sci. Fennicae* A28, 25 pp.—Di-Me α -tanacetonedicarboxylate (**I**) was prepd. from α -thujaketonic acid with NaOCl. **I** condensed in MeOH with 1.1–1.2 mols. of NaOMe (cf. C. A. 6, 1595; 13, 424) gave the Na deriv. of Me 1-isopropyl-1-cyclopentene-3-one-4-carboxylate (**II**). The vacuum dried crude **II** in 15 parts of H_2O at 0° by addn. of AcOH and PhN_2Cl gave quant. the *hydrazone*, yellow, m. $179-80^\circ$. The cold soln.

f II without evapn. was mixed with 3 moles of cold MeI, and refluxed 5–10 hrs. to disappearance of the alk. reaction. After distn. of the excess MeI, cold H₂O was added, the oil dissolved in ether, washed with NaHSO₄ and Na₂CO₃ soln. and dried with CaCl₂. By distn. at 14 mm. the first fractions show unchanged I and β -tanacetonedicarboxylic acid ester (III). The acid by-product extd. is mainly III. The 142–3° fraction is *Me 4-methyl-1-isopropyl-1-cyclopentene-3-one-4-carboxylate* (IV), d_4^{20} 1.0415, n_D^{20} 1.4764, M_D 53.15. IV was shaken with 8% NaOH, the soln. satd. with CO₂ and the neutral part extd. with Et₂O. The acid was pptd. at 0° by HCl, dried and washed with C₆H₆; heated quickly, it m. 86–87° (decompn.). IV in alc. in the presence of Pt sponge is reduced by H₂ in 10–15 hrs. to *Me 4-methyl-1-isopropyl-3-cyclopentanone-4-carboxylate* (V). The reduction is easier in the presence of colloidal Pt. It b₁₂ 119–21°, m. 152–3°, d_4^{20} 1.0165, n_D^{18} 1.4528, M_D 52.60. Sapon. of V in the same way as IV gave the acid, m. 94° (decompn.). IV was shaken with NaOH soln., acidified with H₂SO₄, refluxed and distd. with steam. Et₂O extn. of the distillate gave *4-methyl-1-isopropyl-1-cyclopentene-3-one (methyltanacetophorone)*. (VI), b₁₇ 99–101°, b. 216–20°. VI is better pptd. from the steam distillate as the semicarbazone (VII), crystallized and converted to VI by boiling with concd. (CO₂H)₂. VII, m. 151°. By the same treatment of V or hydrogenation of VI in the presence of colloidal Pt is obtained *4-methyl-1-isopropyl-3-cyclopentanone* (VIII), b₁₄₈ 135–6°, b₇₄₇ 192–3°, d_4^{20} 0.8862, $n_D^{19.0}$ 1.4413, M_D 41.74. Semicarbazone, m. 175–6°. Oxime, m. 93–4°. Oxidation of VIII with KMnO₄ to the keto acid followed by NaOCl gave β -isopropylglutaric acid (IX), isolated as the Ag salt. This was decompd. with H₂SO₄ and extd. with Et₂O. Oxidation of VIII with CrO₃ in AcOH gave β -isopropyl- γ -acetylbutyric acid identified as the oxime and semicarbazone. Further oxidation with NaOCl gave IX. From 64.2 g. of I by MeONa condensation, methylation, sapon., decarboxylation in H₂SO₄ and hydrogenation in the presence of colloidal Pt, there were obtained 25 g. of VI, 22 g. of VIII, 2.2 g. of an unidentified undistillable product and 11.4 g. of an acid mixt., mainly III. I heated at 250° shows a reduction in polarization (100-mm. tube) from 144.9° to 2.8° in 24 hrs. Sapon. with NaOH gave the acid from III, m. 117–9°. This was converted to III, b₁₄ 140°, $d_4^{20.9}$ 1.0351, $n_D^{22.2}$ 1.4602, M_D 56.75. III was condensed with MeONa in the same way as the α -ester, reaction taking place less readily, and converted to the same phenylhydrazone as the α -ester. III with MeI gave an ester which when sapond. gave an acid identical with that from IV. By decarboxylation VI resulted. The conclusion is reached that II is $\text{H}_2\text{C}.\text{C}(\text{C}_2\text{H}_5).\text{CH}.\text{CO}.\text{CHCO}_2\text{Me}$ and

the theory advanced that the usual ester of III is *trans* and of I *cis*. F. D. S.

X-ray investigation of polymerized cyclopentadienes. J. HENGSTENBERG. *Ann.* 467, 91–94(1928); cf. *C. A.* 22, 4289.—Debye-Scherrer diagrams of tri-, tetra- and polycyclopentadienes have been obtained and the distances between the planes for about 9 lines are tabulated. In every case the distance between the strongest reflecting planes is the same (5.3 A. U.). The largest values for tri- and tetracyclopentadienes are 7.7 and 10.5 A. U., resp., the difference, 2.8 A. U., being the size of the cyclopentadiene ring without double linkings, whence the value 2.45 A. U. is obtained for each of the other rings. By sublimation of tetracyclopentadiene small (0.1 mm.) laminas are obtained from which by x-ray and optical examn. it is deduced that the crystal is orthogonal and either hexagonal or pseudohexagonal. With an assumed unit cell and the known d., 1.23 g./cc., it is found that the unit cell contains 2 mols. Thus, although the tri-, tetra- and polycyclopentadienes have different lattices, the mols. are all the same size (2.8 A. U.) in 1 direction, in agreement with the structure suggested by Staudinger. C. J. WEST

Reduction of cyclohexanone isoxime (α -keto-hexamethylenimine). ADOLF MÜLLER AND PAUL BLEIER. *Univ. Wien. Monatsh.* 50, 399–402(1928).—Wallach (*Ann.* 324, 292(1902)) stated that the reduction of $\text{CH}_2(\text{CH}_2)_4\text{CO.NH}$ gave $(\text{CH}_2)_6\text{NH}$; later

(*Ann.* 343, 45(1905)) he stated that the reduction product was $\text{C}_6\text{H}_{11}\text{NH}_2$. Repetition of the work, using 30 g. oxime, 1500 g. abs. EtOH and 150 g. Na gives 6.7 g. (18%) of $(\text{CH}_2)_6\text{NH}$, identified as the HCl salt, m. 236–7° (cor.), and the *p*-MeC₆H₄SO₃ deriv., m. 76.5° (cor.). C. J. WEST

Carbohydrates. VI. Derivatives of 1-aminoglucose. PERCY BRIGL AND HELMUT SPLEER. *Landw. Hochschule Hohenheim. Z. physiol. Chem.* 180, 38–63(1929); *C. A.* 21, 418.—Analogues of disaccharides, with the 2 hexose components joined through N instead of O, may be obtained from 1-aminohexoses. For the reactions here described the starting point was 1-aminoglucose prepd. according to Ling and

Nanji (*C. A.* 17, 1433). Acetylation of this aminoglucose by treatment in the cold with Ac_2O and pyridine, addn. of CHCl_3 to the reaction mixt. and shaking with aq. NaHCO_3 , yielded a cryst. mixt. which, by redissolving in CHCl_3 and addn. of ligroin, was sepd. into the main product, *1-aminoglucose pentaacetate* (I), m. $159-60^\circ$, $[\alpha]$ 16° , and a small amt. of *α -diglucosylamine octaacetate* (II), m. $216-7^\circ$, $[\alpha]$ 87° . Treatment of I in AcOH with NaNO_2 effected no change, but anhyd. ZnCl_2 in Ac_2O converted it into *diglucosylamine nonaacetate* (III), m. 192° , $[\alpha]$ -9.2° . Sapon. by NH_3 in MeOH removed 4 Ac groups from I, leaving *1-aminoglucose monoacetate* (IV), which begins to darken at 230° and decomp. 257° , $[\alpha]$ -23° . During a 5-6 hr. warming at $75-80^\circ$ in pyridine I condensed with anhyd. glucose, and addn. of Ac_2O to the mixt. with careful exclusion of moisture then caused a gradual sepn. of II, the sepn. finally being facilitated by exposure to atm. moisture. By sapon. with NH_3 in MeOH 3-4 hrs. at room temp. and concn. of the soln. over H_2SO_4 , II was converted into *α -diglucosylamine* (V), which after crystn. from MeOH-McAc decomp. $167-8^\circ$, $[\alpha]$ 85.1° . On reacetylation by Ac_2O in pyridine V reverted to II. Isomeric with V is *β -diglucosylamine* (VI), which crystals with 2 H_2O and m. $102-3^\circ$, with decompn. at 125.6° , $[\alpha]$ 20° . This was obtained by refluxing aminoglucose with abs. MeOH whereby 2 mols. condense with liberation of NH_3 , and pptn. of the product with Et_2O . Hydrolysis by 0.5 *N* acid splits it quant. into NH_3 and glucose. Acetylation by Ac_2O in pyridine at 0° , followed by treatment with NaHCO_3 and evapn. of the CHCl_3 soln. converted it into *β -diglucosylamine octaacetate* (VII), amorphous, softens $135-40^\circ$, solidifies and m. $190-2^\circ$, $[\alpha]$ 7.6° . This has an intensely bitter taste. By sapon. with NH_3 in MeOH it reverted to VI. Both II and VII when heated with Ac_2O and ZnCl_2 yielded III, the 9th Ac group replacing the H of the NH. When dry N_2O_3 was passed into an Et_2O suspension of II, *α -diglucosylnitrosamine octaacetate*, m. $204-5^\circ$ (gas evolution), $[\alpha]$ 80.4° , was obtained. This gave an intense blue color with Ph_2NH in 50% H_2SO_4 . Treatment with hot EtOH removed the NO, and sapon. with NH_3 in MeOH at room temp. removed Ac; the free nitrosamine, however, could not be obtained cryst., but it was readily reacetylated to the octaacetate without rearrangement to the β -isomer. Sapon. of the acetate followed by benzoylation with BzCl and 15% NaOH converted it into *α -diglucosylnitrosamine octabenzoate*, which sinters 198° and m. 202.3° (gas evolution), $[\alpha]$ 81.1° . Both the Ac and Bz derivs. when heated with Ac_2O and ZnCl_2 gave off N gas and yielded, resp., *α -pentaacetylglucose* and *1-acetyl-2,3,4,6-tetraacetylglucose*, m. $159-60^\circ$, $[\alpha]$ 78.9° . The isomeric *β -diglucosylnitrosamine octaacetate*, m. $218-20^\circ$ (gas), $[\alpha]$ 12.5° , may be obtained by treatment of VII with N_2O_3 , or from the α -deriv. (II) by treatment with AcOH and NaNO_2 . The α - and β -amines (V and VI) are mutually convertible, their aq. solns. showing strong mutarotation, which, however, reaches its final equil. only very slowly. The same phenomenon is observed with the α - and β -acetates (II and VII) in CHCl_3 in the presence of AcOH or an org. acid. Like wise, the double m. p. of the β -acetate (VII) indicates a rearrangement to the α form.

A. W. Dorr

The benzene theory. HEINRICH LOEWEN. *Z. Elektrochem.* 34, 760 (1928) -- A structural formula for benzene must satisfy a great no. of distinctly different variables simultaneously, such as the electronic nature of the chem. bond; the fact that increasing the no. of bonds between C atoms does not increase the stability of the union; that when C is triple bonded and holds H, this H will be replaceable by metals; that *o*-, *m*-, and *p*-disubstituted benzenes are physically and chemically different; that C_6H_6 is composed of 6 CH groups which are equiv. The formula must indicate the differences between aliphatic and aromatic properties and show why alicyclic compds. do not have aromatic properties, and indicate the ready conversion of quinoid to benzoic forms and the reverse change. A thoroughly satisfactory formula must account for the lack of optical activity in the *o*-, and *m*-disubstituted benzenes and must show that 3 and only 3 disubstituted products of any given sort are possible. The formula must satisfy the known relationships between C_{10}H_8 and larger mols. with condensed rings, and C_6H_6 , and must explain the differences in the behavior of the rings in the monosubstituted naphthalenes, where one ring functions aromatically and the other shows aliphatic characteristics. L. presents Bragg's space formula for benzene (*C. A.* 17, 1172) and prefers one with 4 of the ring C atoms in 1 plane; a 5th above this plane, and the 6th, para to the one just mentioned, below the ring plane. This does not conflict with x-ray measurements. That C_6H_6 gives maleic anhydride, L. does not regard as insurmountable, contradictory evidence, feeling that the detn. of the configuration of *cis-trans* isomers rests on a none too secure basis. A favored configuration, existent in $(\text{CH}_3\text{CO}_2\text{H})_2$, absent in malonic and glutaric acids, and not the mere proximity of CO_2H groups, is necessary for the formation of a cyclic anhydride.

The elucidation of conjugated unsatn. is considered the real key to the C_6H_6 problem. A conjugated system of C atoms approximates a cyclobutene, and may be regarded as approx. $\frac{2}{3}$ of a hexagonal ring. The plane projection of L.'s formula is the simple hexagon, which is still the best representation of C_6H_6 . G. ALBERT HILL

Diphenylamine from chlorobenzene and aniline. P. P. KARPUKHIN. Kharkov Tech. Inst. *J. Chem. Ind. (Moscow)* 5, 1106-7(1928).— Ph_2NH can be prepd. according to the equation $PhCl + PhNH_2 = Ph_2NH + HCl$, using NaOH to bind the HCl formed. 46.5 g. aniline, 66 g. PhCl and 40 g. soda-lime are heated in a steel autoclave 7 hrs. at 300° , after which the mass is dild. with 800-cc. water, neutralized by HCl, whereupon aniline dissolves and Ph_2NH seps. as an oil which solidifies overnight and can be filtered off. The yield is 10.5 g. Ph_2NH , viz., 12.3% of the theoretical. When operating with 37 g. aniline, 44 g. PhCl and 40 g. soda-lime, the Ph_2NH yield is 23.1-25.3% of the theoretical after heating under pressure at 320° , 32% at 360° , 41% after heating 34 hrs. at $360-370^\circ$ in a steel autoclave. Thus, the higher the reaction temp. the greater the Ph_2NH yield, but the quantity of aniline lost by decompn. also increases with the temp. The same relationship, but to a considerably lesser extent, is observed by prolonging the duration of heating. As the presence of metals has a detrimental effect on the reaction, some expts. were tried in sealed glass tubes, instead of autoclaves, and in this case the yields obtained were 60% of the theoretical after heating at 300° , and 72% after heating at 320° , the decompd. quantity of aniline being considerably lowered. There is every reason to believe that, when operating with stirring, the yields would be greater still, but in absence of an autoclave provided with a stirrer, such expts. were not made by K. BERNARD NELSON

Identification of the reduction products of azodyes. IV. Classification and identification of compounds belonging to group B. SHIGEZO UENO. *Bull. Inst. Phys. Chem. Research (Tokyo)* 7, 467-505(1928), *Abstracts* 1, 43-5; cf. *C. A.* 23, 1339.—Class XVII. A drop of $FeCl_3$ in a suspension or very dil. aq. soln. gives a color reaction changing transitionally through red, violet and blue. The soln. contg. $CaCO_3$ gives a color on filter paper which turns blue when spotted with dil. HCl: 7-diamino-8-naphthol-4-sulfonic acid, 2,7-diamino-8-naphthol-6-sulfonic acid, 1,7-diamino-8-naphtholdisulfonic acids ($SO_3H.SO_3H = 2:4, 3:6$ or $4:6$), 2,7-diamino-8-naphthol-3,6-disulfonic acid. Class XVIII. A suspension in water or a very dil. soln. assumes 1 or 2 colors among violet, blue and green. The soln. contg. $CaCO_3$ gives a color on filter paper, by air oxidation, it turns green on spotting with HCl: 2-ethylamino and 2-dimethylamino-7-amino-8-naphthol-6-sulfonic acids, 2-phenylamino-5-naphthol-7-sulfonic acid, 2-phenylamino-7-amino-8-naphthol-6-sulfonic acid, 6,6'-diamino-5,5'-dihydroxy-2,2'-dinaphthylamine-7,7'-disulfonic acid. Class XIX. A suspension in water or a very dil. soln. assumes soon a blue color caused by oxidation by O dissolved in the water: 1,2,7-triamino-8-naphthol-4-sulfonic acid, 1,2,7-triamino-8-naphthol-6-sulfonic acids ($SO_3H.SO_3H = 3:5, 3:6$, or $4:6$), 2,7-diamino-1,8-dihydroxynaphthamene-3,6-disulfonic acid. Class XX. The free acids are difficultly sol. in H_2O . A suspension in H_2O or very dil. soln. assumes a pale brown color on adding $FeCl_3$. Add a small quantity of any compd. of this class in H_2O , add an excess of $NaNO_2$ soln. to it in the presence of ice, and a diazo compd. is formed, when this is added to an ice-cold NW acid or H acid contg. Na_2CO_3 , a red dye is produced: 2-[m- and p-amino-phenyl]amino-6-amino-5-naphthol-7-sulfonic acids. Class XXI. The free acids are difficultly sol. in hot or cold H_2O . Addn. of $FeCl_3$ to a suspension causes a dark brown color turning brown quickly. The suspension in water becomes immediately brownish black on adding HCl and $NaNO_2$ solns.: 6,6'-diamino-5,5'-dihydroxy-2,2'-dinaphthylurea-7,7'-disulfonic acid, 7,7'-disulfo-6,6'-diamino-5,5'-dihydroxynaphthamene-2,2'-diaminocarbonyl-2,6-diaminotoluene-4-sulfonic acid. Class XXII. The HCl salts are easily sol. in water slightly acidified with HCl. On adding the HCl salts to water, the free acids sep. out, spontaneously or on NaOAc soln. addn.: 1,3,6-triaminobenzene-4-sulfonic acid, 2,6-diaminophenol-4-sulfonic acid, 6-amino-1,3-dihydroxybenzene-4-carboxylic acid. Class XXIII. The HCl salts are easily sol. in H_2O . A very dil. soln. of the HCl salts becomes red with $FeCl_3$; this color does not change instantly, even by boiling: 1,3,4-triaminobenzene, 2,4,6-triaminotoluene, 2,4-diaminophenol-4,6-diaminoresorcinol. Class XXIV. The HCl salts are easily sol. in water. A very dil. soln. of the HCl salts gives immediately a blue color on adding $FeCl_3$. In most cases the color changes rapidly: 3,6-diamino-4-hydroxytoluene-4-aminoresorcinol-2,4,6-triaminophenol-2,4-diaminoresorcinol-4-aminopyrogallol. Class XXV. The HCl salts are easily sol. in H_2O . A very dil. soln. of the HCl salts assumes a brown color on adding $FeCl_3$: 2,4-diaminoanisole, 2-hydroxy-1,4-diaminobenzene, 1,2,4,5-tetraaminobenzene, 2,3,4,5-tetraaminotoluene, 2-amino-1-naphthol. Class

XXVI. The compds. which do not belong to any of the above mentioned classes 4-amino-1-naphthol-7-sulfonic acid, 2,6-diamino-5-naphthol-7-sulfonic acid, 2-amino-8-chloro-1-naphthol-3,6-disulfonic acid. ALBERT L. HENNE

Several sulfonic derivatives of non-saturated compounds. A. QUILICO AND E. FLEISCHNER. *Atti accad. Lincei* 7, 1050-6(1928).—In a previous paper (C. A. 22 1965), Q. found that aromatic compds. with an unsatd. side chain may be sulfonated by the use of $\text{NH}_4\text{SO}_3\text{H}$. In this way derivs. of styrene and isosafrole have been prepd. $\text{PhCH:CHSO}_3\text{H}$ is prepd. by heating 10 g. PhCH:CH_2 with 8 g. $\text{NH}_4\text{SO}_3\text{H}$ at 150° for 1 hr., when the whole solidifies. Excess PhCH:CH_2 is extd. with C_6H_6 and Et_2O , then the NH_4 salt is dissolved in H_2O , the NH_3 is neutralized, the small amt. of resins formed are extd. with Et_2O , and the product crystd. by cong. The $\text{PhCH:CHSO}_3\text{NH}_4$ chars $265-70^\circ$. The Na and Ba salts are also sol. in H_2O ; adding the calcd. amt. of dil H_2SO_4 to the Ba salt gives the free acid, m. $55-65^\circ$, chars 130° . $\text{PhCH:CHSO}_3\text{Cl}$, obtained quant. by adding PCl_5 to the dry Na salt, m. 85° . Heating this with NH_4Cl gives the amide, m. 140° . Oxidation with alk. KMnO_4 and then adding HCl gives BzOH . Fusion with HCO_2Na gives $\text{PhCH:CHCO}_2\text{H}$, which with KMnO_4 gives the odor of BzH . $\text{CH}_2\text{O}_2\text{C}_6\text{H}_4\text{CH:CMesO}_3\text{H}$ is prepd. by heating 16 g. of isosafrole with 5 g. $\text{NH}_4\text{SO}_3\text{H}$ as with the styrene deriv., (yield 8 g. of the NH_4 salt, chars 240°). The Na and Ba salts are formed as with styrene, as well as the free acid, m. $81-2^\circ$. The chloride, m. 86° , the amide, m. 180° ; oxidized with KMnO_4 it gives $\text{CH}_2\text{O}_2\text{C}_6\text{H}_4\text{C(=O)OH}$, m. 227° . $\text{CH}_2\text{O}_2\text{C}_6\text{H(OMe)}_2\text{CH:CMesO}_3\text{H}$ is prepd. similarly by heating 6 g. isosafrole with 2 g. $\text{NH}_4\text{SO}_3\text{H}$; yield 3 g. of NH_4 salt, very sol. in H_2O , as is the Na salt. The latter with PCl_5 gives the chloride as a colorless oil, and this with NH_4EtOH gives the amide, m. $179-80^\circ$. KMnO_4 (NaOH soln.) gives an acid slightly sol. in H_2O , m. 174° , identical with the apiolic acid of Ciamician and Silber. A. W. CONTIERI

Constitution of the *m*-xylenesulfonic acids. JAKOB POLLAK AND FRANZ V. MEISSNER. Univ. Wien. *Monatsh.* 50, 237-50(1928).—Previous work on the *m*-xylene sulfonic acids is critically reviewed. In combination with the work now described, it is concluded that the acid obtained by direct sulfonation of *m*- $\text{C}_6\text{H}_4\text{Me}_2$ (chloride, m. $128-31^\circ$; amide, m. $248-9^\circ$) is the 4,6-di- SO_3H (I), while the acid with a liquid chloride (amide, m. $223-4^\circ$), which accompanies the former in small quantity in the prepn. by certain indirect methods, is the 2,4-di- SO_3H acid (II). The recognition of II has been obscured by its ready transformation during the prepn. of the chloride into the chloride of I. The constitution of I is proved by its prepn. from 1,3,4,6- $\text{Me}_2(\text{HO})_2\text{C}_6\text{H}_2\text{NH}_2$ through the diazo compd. and by earlier work of P. It is now also confirmed by the formation of 1,3,4,6- $\text{Me}_2\text{C}_6\text{H}_2\text{Br}_2$ in small quantity by treatment of I with Br in H_2O at 60° and by the failure to brominate the chloride. When the chloride of I was treated with Br in Et_2O at room temp., the substance was recovered unchanged, accompanied only by a little 4,6-dibromo-*m*-xylene-2-sulfonyl chloride, formed possibly by displacement and migration of the SO_3H group, or, more probably, derived from 1,3,2- $\text{Me}_2\text{C}_6\text{H}_3\text{SO}_2\text{Cl}$ present as an impurity. Wischin's proof (*Ber.* 23, 3113(1890)) of the constitution by conversion into the 2,4- Cl_2 and 2,4-($\text{HO})_2$ derivs. of *m*- $\text{C}_6\text{H}_4\text{Me}_2$ is vitiated by the drastic nature of the reactions. The prepn. of the same acid by Pfannenstill (*Diss. Lund.* 1894) from both 1,3,2- and 1,3,4- $\text{Me}_2\text{C}_6\text{H}_3\text{SO}_3\text{H}$ is to be explained by migration of the SO_3H group in the former case. The possibility of such a migration, already demonstrated by Moody (*Proc. Chem. Soc.* 1888, 77), is now confirmed by the sepn. of 1,3,4- $\text{Me}_2\text{C}_6\text{H}_3\text{SO}_3\text{NH}_2$, m. $136-7^\circ$, as a by-product in the prepn. of 1,3,2- $\text{Me}_2\text{C}_6\text{H}_3\text{SO}_3\text{NH}_2$, m. $112-3^\circ$, through the chloride, from the 2- SO_3H acid, even when the latter has been regenerated from the purified amide. 1,3,2- $\text{Me}_2\text{C}_6\text{H}_3\text{SO}_3\text{H}$, of the constitution of which there is no doubt, was prepd. by debromination of the 4,6- Br_2 deriv.; it was also sepd. from the mother liquors of the 4- SO_3H acid prepd. by sulfonation of *m*- $\text{C}_6\text{H}_4\text{Me}_2$ by concd. H_2SO_4 at room temp. Further, Pfannenstill's liquid 2,5-($\text{SO}_2\text{Cl})_2$ deriv. (obtained solid, m. 85° , with difficulty) must be the 2,4-deriv., while his conclusion that the di- SO_3H acid which he prepd. by way of the 6-amino 4-sulfuric acid was a new acid appears to be erroneous, since his supposed 2 series of compds. Wischin's

HCl at 150° and, therefore, no migration has occurred in the 1st step. Debromination yielded a material which gave a mixt. of solid 4,6- and liquid 2,4-di- SO_2Cl derivs. which were sepd. and converted into the amides. 1,3,2,4- $\text{Me}_2\text{C}_6\text{H}_2(\text{SO}_2\text{Cl})_2$ was prepd. in best yield by treatment of 1,3,2- $\text{Me}_2\text{C}_6\text{H}_3\text{SO}_3\text{Na}$ with ClSO_3H at $89-90^\circ$ for 4 hrs. and the elimination of the 4,6-deriv. by crystn. from Et_2O . Reaction at 150° yielded the 4,6-deriv. only. The 2,4-deriv. yielded an amide, m. $223-4^\circ$, and its constitution was

proved by converting it into 1,3,2,4-Me₂C₆H₂Br₂ by bromination of the acid in H₂O at 70–80°. The occurrence of migration during prepn. of the chloride was confirmed by treating the acid obtained from the pure 2,4-di-SO₂NH₂ with PCl₅; fractionation of the product yielded the 4,6-di-SO₂Cl deriv.

C. J. WEST

Thermal decomposition of phenol. YOSABURO KOSAKA. Imperial Univ. Tokyo. *J. Fuel Soc. (Japan)* 7, 1219–39(1928).—Thermal decompn. of phenol was carried out in the same way as in the case of benzene (*C. A.* 23, 597), using silica and coke granules as catalysts. The decompn. products were examd. in a similar way except that the condensation products were fractionated after extg. the acid constituents with dil. alkali. The examn. of the decompn. products shows the existence of benzene, C₁₀H₈, anthracene, phenanthrene and undecompd. phenol. K. also considers that certain quantities of Ph₂ and C₆H₄Ph₂ would presumably be present. However, they were difficult to isolate and identify because of their small quantity. The free C was also examd. in the same way as in the case of benzene. The principle constituents of the gas were CO and H₂. The mechanism of the thermal decompn. of phenol is thoroughly discussed. Summary: Both catalysts gave similar results. The rate of decompn. is proportional to the temp., 6%, 52% and 90% of the sample was decompd. at the temp. of 700°, 800° and 850°, resp. The principle decompn. products were benzene, C₁₀H₈, anthracene, phenanthrene and small amount of water and probably Ph₂ and C₆H₄Ph₂ in small quantity. The amount of gas produced increased with rise in temp. The amount of free C also increased with rise in temp. The principle reactions which took place during the thermal decompn. between the temp. 700–850° can be shown by following equations: (1) 2PhOH = C₁₀H₈ + 2CO + 2H₂; (2) PhOH +

H. C₆H₆ + H₂O; (3) 3PhOH = C₆H₄ $\begin{pmatrix} \text{CH} \\ | \\ \text{CH} \end{pmatrix}$ C₆H₄ (or $\begin{pmatrix} \text{C}_6\text{H}_4 \cdot \text{CH} \\ | \\ \text{C}_6\text{H}_4 \cdot \text{CH} \end{pmatrix}$) + 3CO + CH₄ + 2H₂; (4) PhOH = CO + 3H₂ + 5C; (5) 2PhOH = 2CO + 3C₂H₄ + 4C; (6) 2PhOH = 2CO + 3CH₄ + 7C. The results of calcn. according to the above 6 equations show a good agreement with the exptl. figures observed.

F. I. N.

Oxidation products of 4,4'-dichloro-2,2'-dinitrodiphenyl sulfide and disulfide. EUGEN RIESZ, A. LORENZ, CH. MYSCHALOW AND O. STRAKOSCH. Univ. Wien. *Monatsh.* 50, 263 8(1928).—Oxidation of [4,2-Cl(O₂N)C₆H₃]₂S₂ with 20 parts fuming HNO₃ 3 hrs. at 150° gives the sulfone(I), m. 176° (Blanksma, *Rec. trav. chim.* 20, 131(1901)). Oxidation of the sulfide in the same way gives the sulfoxide(II), yellow, m. 236°, which gives I on further oxidation. II is also obtained from the sulfide by oxidation with Cl in CHCl₃ or AcOH. While treatment of the disulfide with Cl in CHCl₃ yields 4,2-Cl(O₂N)C₆H₃SO₂Cl, in AcOH there results 4,2-Cl(O₂N)C₆H₃SO₂H, identified as the *amide* m. 138°, and the *amide*, m. 104°. The reaction of (PhNH)₂ with the chloride in equimol proportions yields (p-H₂NC₆H₄)₂HCl, (PhN:)₂, 4,2-Cl(O₂N)C₆H₃SO₂H, m. 108°, and unchanged chloride. The intermediate formation of a compd. of the type R'NHNR'(SO₂R) is assumed in this and the analogous reaction with 4,2-Cl(O₂N)C₆H₃SO₂Cl.

C. J. WEST

Derivatives of phenacyl sulfide. A. CHRZASZCZEWSKA AND S. CHWALIŃSKI. *Roczniki Chem.* 8, 432–43; French 443–4(1928).—*p*-Methoxyphenacyl sulfide, (p-Me-C₆H₄COCH₂)₂S, m. 88.8–9.3° (*dioxime*, m. 158–9° (decompn.)), is prepd. by adding warm alc. Na₂S (39 g. Na₂S.9H₂O in 250 cc. alc.), to boiling alc. p-MeC₆H₄COCH₂Cl (55 g. chloride in 150 cc. alc.) on a water bath during 2 hrs., boiling for 1 hr. more and sucking off the NaCl formed. The yellow filtrate gives on cooling and recrystn. colorless, odorless crystals insol. in water, hardly sol. in boiling ether, sol. in boiling alc., in toluene and acetone (73.5% yield). The *dioxime* forms small, colorless crystals, insol. in water, hardly sol. in cold toluene, sol. in ether, alc., boiling toluene and most easily in acetone. *p*-Bromophenacyl sulfide, m. 142.2–3.1°, is prepd. in an analogous way. The *dioxime*, m. 180–1.5° (decompn.). *p*-Chlorophenacyl sulfide *dioxime*, m. 150–0.5° (decompn.); *diphenylhydrazone*, yellow, m. 127–8° (decompn.).

JAROSLAV KUČERA

3,5-Dichlorophenetidine. G. BARGELLINI AND P. LEONE. *Atti accad. Lincei* 8, 399–404(1928).—Jaeger in 1875 found that nitrosophenol in Et₂O when treated with HCl gas, gave C₆H₃Cl₂(OH)NH₂ and that in MeOH and EtOH 2 substances not having phenolic properties were formed probably dichloroanisidine and dichlorophenetidine, resp., but did not specify the position of Cl atoms. B. and L. conclude that the formula must be 3,5,4-Cl₂(H₂N)C₆H₃OEt (I) because the product will not condense with aldehydes or give reactions typical of the NH₂ group. This is explainable by the stereointerference of the two *o*-Cl atoms, as the *m*-deriv., 2,6,4-Cl₂(H₂N)C₆H₃OEt (described in a later paper), gives these reactions. The following derivs. of I were prepd.: The Ac deriv., prepd. by adding 10 cc. of Ac₂O to 3 cc. I and recrystg. from MeOH, m. 130°. The di-

Ac deriv., obtained if the above mixt. is heated., m. 86-88°. Heating with NH_4OH reconverts it to the mono deriv.; while heating with 50% HCl or 25% KOH gives I again. With BzCl and I in Et_2O , is formed the *Bz deriv.*, m. 188°. Heated with $\text{C}_6\text{H}_4(\text{CO})_2\text{O}$, I gives a condensation product, m. 193-4°. With $(\text{CH}_2\text{CO})_2\text{O}$ a similar condensation product, m. 137°, is formed. I can be readily diazotized by cold NaNO_2 . This product condenses readily with phenols and arylamines. However, it will not condense with $\text{C}_6\text{H}_4\text{N}_2\text{Cl}$ aryl aldehydes, KSCN and CS_2 . A. W. CONTIERI

2,6-Dichlorophenetidine. G. BARGELLINI. *Atti accad. Lincei* 8, 505-11(1928).—In a previous paper (cf. preceding abstr.), the formula of the dichlorophenetidine of Jaeger was given as the 3,5- Cl_2 compd. but in order to prove that the 2,6- Cl_2 structure cannot be right the latter compd. was prepd. in a way which made its structure clear. *p*- $\text{O}_2\text{NC}_6\text{H}_4\text{OH}$ was chlorinated, the Cl going into the *o*-position to the OH , and *m* to the NO_2 group, thus giving 2,6,4- $\text{Cl}_2(\text{O}_2\text{N})\text{C}_6\text{H}_2\text{OH}$ (I); this was treated with EtI and KOH to give the *Et deriv.* and then reduced to the amine. This compd. must be 2,6,4- $\text{Cl}_2(\text{H}_2\text{N})\text{C}_6\text{H}_2\text{OEt}$, and as this is different from Jaeger's compd., the latter must be the 3,5- Cl_2 form. Three g. of the I with 5 g. CS_2 in EtOH when heated on the water bath 5 hrs., and then the CS_2 excess and EtOH distd. off, give the condensation product, $[\text{3,5,4-Cl}_2(\text{EtO})\text{C}_6\text{H}_2\text{NH}]_2\text{CS}$, softens 200° and m. 210°. With PhNCS is obtained a similar product, 3,5,4- $\text{Cl}_2(\text{EtO})\text{C}_6\text{H}_2\text{NHCSNHPh}$, m. 138-40°; with 2,4- $(\text{O}_2\text{N})_2\text{C}_6\text{H}_3\text{Cl}$ the product, $\text{Cl}_2(\text{EtO})\text{C}_6\text{H}_2\text{NHC}_6\text{H}_3(\text{NO}_2)_2$, m. 208-10°, with BzH the product $\text{Cl}_2(\text{HO})\text{C}_6\text{H}_2\text{N}:\text{CHPh}$, m. 99-101°. 3,5,4- $\text{Cl}_2(\text{EtO})\text{C}_6\text{H}_2\text{NH}_2$ with Ac_2O gives $\text{Cl}_2(\text{EtO})\text{C}_6\text{H}_2\text{NHAc}$, m. 176-8°. The azo compd. is readily formed and combines with arylamines, *i. e.*, with β -naphthol giving a bright red ppt., m. 171-3°. With piperonal the product, $\text{Cl}_2(\text{EtO})\text{C}_6\text{H}_2\text{N}:\text{CHC}_6\text{H}_3\text{O}_2\text{CH}_2$, is formed as light yellow crystals, m. 133-5°; with 2,4- $(\text{O}_2\text{N})_2\text{C}_6\text{H}_3\text{Cl}$ the product, $\text{Cl}_2(\text{EtO})\text{C}_6\text{H}_2\text{NHC}_6\text{H}_3(\text{NO}_2)_2$, as golden yellow crystals, m. 160-2°. A. W. CONTIERI

Phenol and cresolsulfonyl chlorides. EUGEN RIESZ, FRITZ BERNDT AND GEORG HIRSCHMANN. *Univ. Wien. Monatsh.* 50, 328-34(1928).—The previously prepd phenol and cresolsulfonyl chlorides have been converted into anilides and, by the action of PCl_5 and a trace of POCl_3 at 120-40°, into the corresponding Cl derivs. 2,4- $(\text{ClO}_2\text{S})_2\text{C}_6\text{H}_2\text{OH}$ gives an *anilide*, m. 205°, and 2,4- $(\text{ClO}_2\text{S})_2\text{C}_6\text{H}_3\text{Cl}$, m. 88°. 2,4,6- $(\text{ClO}_2\text{S})_3\text{C}_6\text{H}_2\text{OH}$ yields the *anilide*, m. 247°, and 2,4,6- $(\text{ClO}_2\text{S})_3\text{C}_6\text{H}_3\text{Cl}$, m. 170-1°. 2,3,5- $\text{HO}(\text{ClO}_2\text{S})_2\text{C}_6\text{H}_2\text{Me}$ yields an *anilide*, m. 154°, and 2,3,5- $\text{Cl}(\text{ClO}_2\text{S})_2\text{C}_6\text{H}_2\text{Me}$, m. 78°, whose *anilide*, m. 183° (Wynne and Bruce, *J. Chem. Soc.* 73, 731(1898) give 85° and 183°). 3,4,6- $\text{HO}(\text{ClO}_2\text{S})_2\text{C}_6\text{H}_2\text{Me}$ gives an *anilide*, m. 185°, and 3-chlorotoluene-4,6-disulfonyl chloride, m. 125°. 3,2,4,6- $\text{HO}(\text{ClO}_2\text{S})_3\text{C}_6\text{HMe}$ gives an *anilide*, m. 235°, and 3-chlorotoluene-2,4,6-trisulfonyl chloride, m. 161°. Toluene-3,4-sulfonyl-6,6'-disulfonyl chloride yields, with $(\text{NH}_4)_2\text{CO}_3$ and NH_3 , the *diamide*, decomps. 300°, while heating with PhNH_2 opens the ring to give the *anilide* of 3,4,6- $\text{HO}(\text{ClO}_2\text{S})_2\text{C}_6\text{H}_2\text{Me}$. 4,3,5- $\text{HO}(\text{ClO}_2\text{S})_2\text{C}_6\text{H}_2\text{Me}$ gives an *anilide*, m. 129° (Anschütz and Cürten, *C. A.* 21, 3897, give 231°), and 3,4,5-trichlorobenzylidene chloride, m. 196°, which, on standing, isomerizes to *eso*-pentachlorotoluene, m. 218°. C. J. WEST

Constitution of cresol-disulfonyl chlorides. EUGEN RIESZ AND FRANZ PILPEL. *Univ. Wien. Monatsh.* 50, 335-40(1928).—The constitutions of the $\text{HO}(\text{ClO}_2\text{S})_2\text{C}_6\text{H}_2\text{Me}$ previously described (Pollak, Gebauer-Fülneegg and Riesz, *C. A.* 20, 1395) have now been verified. 2,3,5- $\text{HO}(\text{ClO}_2\text{S})_2\text{C}_6\text{H}_2\text{Me}$ is hydrolyzed with 30% EtOH and then heated with 2 *N* HNO_3 , giving 2,3,5- $\text{HO}(\text{NO}_2)_2\text{C}_6\text{H}_2\text{Me}$. 3,4,6- $\text{HO}(\text{ClO}_2\text{S})_2\text{C}_6\text{H}_2\text{Me}$ under the same conditions yields 3,2,4,6- $\text{HO}(\text{O}_2\text{N})_2\text{C}_6\text{HMe}$, but nitration with fuming HNO_3 gives 2-nitro-*m*-cresol-4,6-disulfonyl chloride, m. 183° (*anilide*, m. 212-5° (decompn.)), converted by heating with HCl at 160° into 3,2- $\text{HO}(\text{O}_2\text{N})\text{C}_6\text{H}_2\text{Me}$, b.p. 60-8°, m. 36°. Nitration in the 2-position is explicable only on the assumption that the SO_2Cl groups are initially in positions 4 and 6. 4,3,5- $\text{HO}(\text{ClO}_2\text{S})_2\text{C}_6\text{H}_2\text{Me}$ yields on hydrolysis the di- SO_2H acid, m. 115°, converted by successive treatment with Ac_2O and PCl_5 into 4,3,5- $\text{AcO}(\text{ClO}_2\text{S})_2\text{C}_6\text{H}_2\text{Me}$, m. 121°. The same acetate is obtained directly from 4,3,5- $\text{HO}(\text{ClO}_2\text{S})_2\text{C}_6\text{H}_2\text{Me}$. When heated with PhNH_2 it yields the *anilide* of 4,3,5- $\text{HO}(\text{ClO}_2\text{S})_2\text{C}_6\text{H}_2\text{Me}$, m. 129°, whose *Ac deriv.*, m. 105-10°. The constitution of 4,3,5- $\text{HO}(\text{ClO}_2\text{S})_2\text{C}_6\text{H}_2\text{Me}$ is sufficiently proved by its conversion into 4,3,5- $\text{HO}(\text{O}_2\text{N})_2\text{C}_6\text{H}_2\text{Me}$ by the usual method and the m. p. 231° observed by Anschütz and Cürten (*C. A.* 21, 3897) for the *anilide* is unexplained. C. J. WEST

The action of hydrogen peroxide on phenol and anisole. O. YU. MAGIDSON AND N. A. PREOBRAZHENSKII. *Trans. Sci. Chem.-Pharm. Inst. (Moscow)* 1926, No. 16, 65-8.—Continuing the work reported (*C. A.* 22, 3884) the authors used H_2O_2 in place of Na_2O_2 . The yield of $\text{C}_6\text{H}_4(\text{OH})_2$ was 38.6% when FeSO_4 was used as a catalyzer. The yield of guaiacol from the oxidation of anisole was meager—8-9%. There is a lot

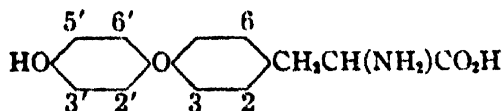
of resinous material formed apparently from the condensation of guaiacol under the influence of the oxidizing agent. No Me ether of hydroquinone was detected.

J. S. JOFFE

Oxidation of toluene to benzoic acid by chromic mixture. O. YU. MAGIDSON AND V. I. MAKSIMOV. *J. Chem. Ind. (Moscow)* 5, 1102-6(1928).—A series of systematic expts. were carried out to det. the conditions increasing the yield (calcd. on the $K_2Cr_2O_7$ used up, rather than on PhMe) of BzOH in the reaction: $PhMe + K_2Cr_2O_7 + 4H_2SO_4 = BzOH + K_2SO_4 + Cr_2(SO_4)_3 + 5H_2O$. The app. consisted of a 1500 cc. Wulf flask, 2 necks being used for a stirrer and a thermometer, and one for the introduction of dichromate. The app. was immersed in a water bath maintained at 15-20°, which is below the temp. of the reaction inside the flask. *Operation:* Each expt. was effected by first placing in the flask 92 g. PhMe, then the corresponding quantity of H_2SO_4 and finally, with stirring, 300 g. finely powd. dichromate. Whenever catalyzers were used, they were previously mixed with the dichromate. After the last addn. of dichromate, the temp. was raised and the stirring was continued for another 1.5-2 hrs. to complete the reaction. The thick product of reaction was poured hot into a round-bottomed flask, steam-distd. for the removal of unchanged PhMe; after cooling, the BzOH was filtered from the alum soln., washed with water, dried and weighed, it usually was of 92-97% purity. The steam-distd. PhMe usually contained 3-5% BzOH. It was found that at the beginning the product of reaction is chiefly BzOH; later on the latter is partly destroyed to CO_2 . The drop in the yield at the end of the reaction is probably due to increased viscosity which interferes with efficient stirring. The reaction temp. has no great influence on the oxidation process, the slight increase of yield with the temp. apparently being due to the decrease of viscosity; however, the increase of temp. increases the speed of reaction. An excess of H_2SO_4 over the theoretically required quantity (70% H_2SO_4 being used) always increases the yield of BzOH, but it is apparently useless to operate with an excess of over 75%. The favorable influence of the excess of H_2SO_4 is probably due to the circumstance that it decreases the viscosity of the mass and thus facilitates stirring. If the H_2SO_4 used is of less than 65% concn., the reaction is exceedingly slow; if it is 80% or above, the BzOH obtained is partly resinified. Whereas the yield of BzOH (calcd. on the dichromate) is about 25% when operating with 60% H_2SO_4 , it reaches 37% with 65% H_2SO_4 , 50% with 70% H_2SO_4 ; for H_2SO_4 concns. above 70%, the yields begin to drop. As to the influence of an excess of toluene, only a considerable excess (100%) has some effect, raising the yield to 58%. *Catalyzers:* NaCl has no essential influence if introduced in very small quantities; larger quantities of it effect the complete destruction of PhMe to CO_2 . Fluorides, salts of Ni or Mn, Cr alum, infusorial earth, even in larger quantities, have but little influence on the nature of the reaction, and the same can be said of the voltaic arc. However, all these catalyzers increase the speed of the reaction. Fe salts were particularly efficient in this latter respect, Ni salts holding the 2nd place. *Conclusion:* The best yields obtainable are sufficiently high to make this process of toluene oxidation commercially profitable.

BERNARD NELSON

Resolution of *dl*-thyroxine. CHARLES ROBERT HARRINGTON. University College, London. *Biochem. J.* 22, 1429-35(1928).—H. proposes to call desiodothyroxine, "thyronine," the positions being numbered



so that thyroxine would be 3,5,3',5'-tetraiodothyronine. Formyl-3,5-diiodothyronine (I) was prepd. by warming 15 g. *dl*-3,5-diiodothyronine on the water bath for 3 hrs. with 100 cc 99% HCO_2H , evapg. under diminished pressure and warming the residual sirup for 3 hrs. with 50 cc. HCO_2H . The process was repeated, distn. of the HCO_2H leaving a cryst. residue. The latter was extd. with warm abs. alc., filtered, the filtrate boiled with charcoal, filtered and poured into an excess of hot water. The I crystd. out on slow cooling. It m. 207°; found, I 46.0, N 2.4; calcd. 45.9, N 2.5%. I now combined with *l*-phenylethylamine, the acid was then recovered from this salt combination, the HCO group removed by hydrolysis with HBr and the resulting optically active diiodothyronine iodinated. The *l*-thyroxine is about 3 times as active physiol. as the *d*-compd.

BENJAMIN HARROW

Some derivatives of thyroxine. JULIUS NICHOLSON ASHLEY AND CHARLES ROBERT HARRINGTON. University College, London. *Biochem. J.* 22, 1436-45(1928). The prepn. of the following are given: 3,5-Diiodothyronine Me ester-HCl; 3,5-diiodothyro-

nine Me ester; chloroacetyl-3,5-diiodothyronine Me ester; chloroacetyl-3,5-diiodothyronine; glycyl-3,5-diiodothyronine; glycylthyroxine; α -bromopropionyl-3,5-diiodothyronine Me ester; α -bromopropionyl-3,5-diiodothyronine; *dl*-alanyl-3,5-diiodothyronine; thyroxine Me ester-HCl; thyroxine Me ester; chloroacetylthyroxine Me ester; chloroacetylthyroxine; glycylthyroxine; α -bromopropionylthyroxine Me ester; α -bromopropionylthyroxine, alanylthyroxine; *N*-acetylalanylthyroxine Me ester; *N*-lactylthyroxine; 3,5-diiodothyronamine.

BENJAMIN HARROW

Preparation of aminosalicylic acid from nitrososalicylic acid. V. G. GULINOV. *J. Chem. Ind. (Moscow)* 5, 1019-21(1928); cf. *C. A.* 22, 3648.—The Cu-nitroso salt of salicylic acid may be used for the prepn. of aminosalicylic acid either by direct reduction with Na_2SO_3 , or by first transforming it into free nitrososalicylic acid or its Na salt, and then reducing it. The objection to the latter method is that it requires the installation of special app., the consumption of NaOH and H_2SO_4 , and also a certain length of time. As to the method of direct reduction, it has hitherto been considered impracticable, as it leads to formation of a mixt. of 2,4,5-HO(H_2N)(HO_2S) $\text{C}_6\text{H}_2\text{CHO}$ and 2,4,3,5-HO(H_2N)(HO_2S) $\text{C}_6\text{H}_2\text{CHO}$, which it is difficult to sep. from one another. However, G. found that, by using a very large excess of Na_2SO_3 , the reduction of the Cu-nitroso salt can be made to yield only the disulfo deriv., and the method thus becomes very practical. 22.9 g. Cu-nitroso salt of salicylic acid is introduced into 60-70 g. anhyd. Na_2SO_3 (or the equiv. quantity of crystd. Na_2SO_3) in 300-350 cc. water and the mixt. is heated on a water bath till the disappearance of the Cu salt. (Prolonged heating of the reaction mixt. after the disappearance of the nitroso salt, or raising the temp. of reaction, lead to the formation of dihydroxydisulfobenzoic acid and to a decrease of the amino compd. yield.) As a result of the side-reactions: $\text{OC}_6\text{H}_3(\text{NO})(\text{CO}_2\text{Cu})$

+ $\text{Na}_2\text{SO}_3 = \text{C}_6\text{H}_3(\text{NO})(\text{ONa})(\text{CO}_2\text{Na}) + \text{CuSO}_3$; $\text{CuSO}_3 + \text{H}_2\text{O} = \text{Cu}(\text{OH})_2 + \text{SO}_2$; $2\text{Cu}(\text{OH})_2 + \text{Na}_2\text{SO}_3 = \text{Cu}_2\text{O} + \text{Na}_2\text{SO}_4 + \text{H}_2\text{O}$, all the Cu is recovered. The yield of the dissolved aminodisulfo compd. reaches 95% of the theoretical, but it is difficult to sep. the amino acid from the products of the reaction, and much of it always remains in soln. The latter circumstance, however, is not important, as the soln. of aminodisulfobenzoic acid can directly be used for the prepn. of azo dyestuffs, which is done as follows: The soln. is acidified by HCl, freed by ebullition from SO_2 , dild. to 1 l. and diazotized for 15 mins. at a temp. not exceeding 10° with a 20% soln. of 7 g. NaNO_2 . Then the weakly acid soln. of the diazonium salt is added to a soln. of the azo component (for which purpose phenol, cresols, resorcinol and β -naphthol can be used). The monoazo dyestuffs obtained are very fast, if applied by the use of Cr mordant.

BERNARD NELSON

Lichen substances. VI. Synthesis of divaric acid. ADOLF SONN (with J. BURKARD). *Univ. Königsberg i. Pr. Ber.* 61B, 2479-81(1928); cf. *C. A.* 22, 2746.—That divaric acid has the structure 2,4,6-Pr(HO) $\text{C}_6\text{H}_2\text{CO}_2\text{H}$ (I) has been confirmed by a synthesis analogous to that of orsellinic acid. Me α,β -hexene- α -carboxylate, NaOEt and $\text{AcCH}_2\text{CO}_2\text{Et}$ refluxed in alc. yield *Et propyldihydroresorcinolcarboxylate*, m. $85-7^\circ$, gradually decamps. on long standing; the fresh product with Br in AcOH gives *Et dibromopropylresorcinolcarboxylate*, 2,3,5,4,6-PrBr $_2$ (HO) $\text{C}_6\text{CO}_2\text{Et}$, m. $77-8^\circ$, and the free acid (from the ester in concd. H_2SO_4 at room temp.), m. $158-60^\circ$ (gas evolution), in excess of NaOH with H and Pd- CaCO_3 yields I, identical with the natural product.

C. A. R.

Monoacyl derivatives of quinic acid. III. Synthesis of 4-*p*-hydroxybenzoylquinic acid. KARL JOSEPHSON. *Univ. Stockholm. Ann.* 467, 287-94(1928) cf. *C. A.* 22, 2557.—Condensation of *p*- $\text{AcOC}_6\text{H}_4\text{COCl}$ and acetonequinide in CHCl_3 with $\text{C}_6\text{H}_5\text{N}$ gives 4-*p*-acetoxybenzoylacetonequinide, m. $166-7^\circ$, $[\alpha]_{\text{H}_2\text{O}}^{20}$ 11.9° (0.1940 g. in 5 cc. CHCl_3); sapon. with $\text{Me}_2\text{CO-HCl}$ gives 54% of 4-*p*-hydroxybenzoylquinic acid, m. $108-12^\circ$; $[\alpha]_{\text{H}_2\text{O}}^{20}$ -9.4° (0.2028 g. in 5 cc. H_2O). The Me_2CO deriv., m. $191-2^\circ$ (Karrer and Link, *C. A.* 22, 773, give $179-80^\circ$).

C. J. WEST

Condensation of benzohydrol with phenol and the cresols. PAUL SHORIGIN. *Tech. Hochschule Moskau. Ber.* 61B, 2516-9(1928).—It had been the action of Ph_2COH on *p*-cresol in $\text{AcOH-H}_2\text{SO}_4$ the Ph_2COH is reduced to PhCHO and the cresol simultaneously oxidized, probably to quinomethane. To det. whether the presence of 3 aryl groups is necessary for such a reduction of the carbinol, S. tested the behavior of Ph_2CHOH on *p*-cresol and found that the reaction proceeds quite smoothly but in another direction, 2 Ph_2CH residues entering the cresol nucleus, probably in the *o,o'*-positions to the HO group. Into PhOH three Ph_2CH groups are introduced, into *c*-cresol only 1, probably in the *o*-position to the HO group. *Dibenzohydryl-p*-

cresol (about 8 g. from 10 g. Ph_2CHOH and 6 g. *p*-*cresol*), m. 189–90°. *Benzohydryl-o-cresol* (about 20 g. from 15 g. Ph_2CHOH and 4.5 g. *o*-*cresol*), m. 139°. *Tribenzohydryl-phenol* (about 18 g. from 15 g. Ph_2CHOH and 3.75 g. PhOH), m. 166°. C. A. R.

2-Iodofluorene. A. KORCZYNSKI. *Bull. soc. chim.* 43, 346(1928).—Polemical against P. Chanussot (*C. A.* 22, 434).

BEN H. NICOLET

The closing of the fluorene ring in the di- α -naphthylmethane series. O. YU. MAGIDSON. *Trans. Sci. Chem.-Pharm. Inst.* (Moscow) 1926, No. 16, 33–50.—The reaction between $(\alpha\text{-C}_{10}\text{H}_7)_2\text{CHOH}$ (I) and cryst. H_3PO_4 is represented as follows: $2\text{I} \rightarrow [(\text{C}_{10}\text{H}_7)_2\text{CH}]_2\text{O} \rightarrow [(\text{C}_{10}\text{H}_7)_2\text{C}]_2$ (II) $\rightarrow 2(\text{C}_{10}\text{H}_6)_2\text{CH}_2$ (III). The speeds of the sep. phases of the reaction differ very little and as a result a mixt. of products is obtained: 65% III, 10% II and 25% of a difficultly separable mixt. of the two. When the reaction takes place *in vacuo* the II comprises the main product and III the by-product. This is substantiated by the fact that by boiling the II in glacial AcOH with Zn dust in the presence of HCl III is obtained. By heating it with H_3PO_4 in a combustion tube at 235–45° the reaction becomes more complicated: $4\text{III} + \text{II} = 2[(\text{C}_{10}\text{H}_6)_2\text{CH}]_2$ (IV) + $2(\text{C}_{10}\text{H}_7)_2\text{CH}_2$. The bisdinaphthofluorenyl (IV) is a very stable substance. This was also obtained by the reaction of Cu powder on $(\text{C}_{10}\text{H}_6)_2\text{CHBr}$ as well as by the action of I on $(\text{C}_{10}\text{H}_6)_2\text{CHMgBr}$. Ring closure is effected in $(\alpha\text{-C}_{10}\text{H}_7)_2\text{CO}$ as follows: $(\alpha\text{-C}_{10}\text{H}_7)_2\text{CO} + \text{PCl}_5 = (\text{C}_{10}\text{H}_7)_2\text{CCl}_2 + \text{POCl}_3$; $(\text{C}_{10}\text{H}_7)_2\text{CCl}_2 + \text{PCl}_5 = (\text{C}_{10}\text{H}_6)_2\text{CCl}_2$ (V) + $\text{PCl}_3 + 2\text{HCl}$. Also, $(\text{C}_{10}\text{H}_7)_2\text{CO} + 2(\text{COCl})_2 = \text{V} + 4\text{CO} + 2\text{HCl}$. The dinaphthofluorenone chloride (V) gives up its Cl for O by boiling it with AuOH in the presence of H_2SO_4 : $\text{V} + \text{H}_2\text{O} = (\text{C}_{10}\text{H}_6)_2\text{CO} + 2\text{HCl}$. The reaction with H_3PO_4 may be represented as follows: from 2 mols. of hydrol 1 mol. of ketone (xanthone) and 1 mol. of methane (xanthane) are formed: $2\text{R}_2\text{CHOH} = \text{R}_2\text{CO} + \text{R}_2\text{CH}_2$. In the case of Ph_2CHOH a small amount of $(\text{Ph}_2\text{C})_2$ is obtained. II, which is the analog of $(\text{Ph}_2\text{C})_2$ shows no characteristic properties of the double bond; it does not add Br or Cl. The same difference is apparent when PCl_5 acts on both hydrocarbons. $(\text{Ph}_2\text{C})_2$ gives Ph_2CCl_2 while II undergoes a new transformation into the dinaphthochlorofluorene: (1) $\text{II} + 2\text{PCl}_5 = 2\text{V} + 2\text{PCl}_3$; (2) $\text{V} \rightarrow (\text{C}_{10}\text{H}_6)_2\text{CHCl}$ (VI) + HCl . Fluorene ring formation also takes place when an attempt is made to det. the mol. wt. of II in camphor, whereby IV is formed at the expense of the camphor (which is reduced): $\text{II} \rightarrow 2\text{III}$; $2\text{III} + \text{O} \rightarrow \text{IV} + \text{H}_2\text{O}$. From V a green hydrocarbon, bisdinaphthofluorenylene (VII), was obtained with the aid of Cu. The reaction of $(\text{C}_{10}\text{H}_6)_2\text{CHMgBr}$ with xanthone does not give the corresponding tertiary alc., but IV: $2(\text{C}_{10}\text{H}_6)_2\text{CHC}(\text{OH})(\text{C}_6\text{H}_5)_2\text{O} + \text{O} = \text{IV} + \text{H}_2\text{O} + 2\text{CO}(\text{C}_6\text{H}_5)_2\text{O}$. IV, m. 338–43°, is difficultly sol. in boiling PhMe and xylene, insol. in alc., ether, acetone and C_6H_6 . V, yellow needles, m. 256–8°, easily sol. in CHCl_3 , hot C_6H_6 and PhMe. VII is a green powder, m. 308–10°, easily sol. in CHCl_3 , C_6H_6 , insol. in ether, alc. and benzene, sol. in concd. H_2SO_4 with cherry-red color. By treating V with Cu, $(\text{C}_{10}\text{H}_6)_2\text{CO}$ is obtained. With Br VII gives easily the di-Br substitution product $\text{C}_{20}\text{H}_{12}\text{Br}_2$. Spectroscopic analyses of VII were also made.

J. S. JOFFE

Derivatives of diphenyldiphenylene methane. JOSEF TURSKI and JULIAN DALINSKI. *Roczniki Chem.* 8, 281–9; French 289(1928).—By condensation of benzidine with HCHO tetraminodiphenyldiphenylenemethane, m. 159°, sol. in CHCl_3 , MeOH, PhNMe₂, PhNO₂ and pyridine, was obtained which could be hexazotized without forming an octazo linking. This new base proved to be of no use as an intermediate product for prepn. of azo dyes; however, its application for the prepn. of derivs. of triphenylmethane is possible.

JAROSLAV KUČERA

Triphenylmethyl *p*-tolyl ether. PAUL SHORIGIN and I. MAKAROV-SEMIJANSKII. *Mendeleev Inst. Moskau. Ber.* 61B, 2519–21(1928).—The ether had been obtained in prisms, m. 114°, from Ph_2CCl and *p*- $\text{MeC}_6\text{H}_4\text{ONa}$, while van Alphen, who prepd. it from Ph_2CCl and *p*-*cresol* in $\text{C}_6\text{H}_5\text{N}$ (*C. A.* 22, 1770), states that it exists in 2 forms, m. 81° and 95°, resp. The compd. has been prepd. anew by both methods (in a different lab. to avoid the possibility of inoculation by germs of the older prepn. which might still be present) and in no case was any other than the 114° form obtained. Only when insufficiently purified Ph_2CCl and not completely dry $\text{C}_6\text{H}_5\text{N}$ were used were products of lower m. p. obtained, probably because of the presence of Ph_2COH . That fusion with anhyd. ZnCl_2 gives Ph_2CH was confirmed but the quantity formed is much smaller than stated by v. A., being only 0.4–0.45 g., together with 3.5–4 g. Ph_2COH , from 6 g. of the ether, whereas according to v. A.'s equation, $3\text{MeC}_6\text{H}_4\text{OCPh}_2 \rightarrow 3\text{Ph}_2\text{CH} + \text{O}:\text{C}_6\text{H}_4:\text{C}(\text{C}_6\text{H}_5\text{MeOH})_2$, the yield of Ph_2CH should be about 70% of the ether used.

C. A. R.

Coupling reactions. JAKOB POLLAK and ERICH GEBAUER-FÜLNEGG. *Univ. Wien Monatsh.* 50, 310–23(1928).—Previous work on the coupling of diazonium

compds. with *o*-substituted PhOH, particularly 1-substituted β -C₁₀H₇OH, is reviewed. (With WILHELM SPECHT and KURT WINTER.) The coupling of *p*-O₂NC₆H₄N₂X with 1,2-Br₂C₁₀H₆OH or 1,2-ClC₁₀H₆OH does not immediately produce para-red by displacement of the halogen atom. The substances formed are brown in color and contain 85-90% of the amt. of halogen calcd. for the formula C₁₀H₁₀O₂N₂X (X = Br or Cl). The substances may be formed on cotton by the usual method and the browner shades produced are stable except to alkali. The substances are decompd. when recrystn. is attempted and para-red is probably sepd. ultimately. Similar results are obtained with 1,6,2-Br₂C₁₀H₆OH (on cotton only), 1,2,3-Br(HO)C₆H₄CO₂H and 1-bromo-2-hydroxy-3-naphthamide, m. 164°. The constitution of these products is uncertain but it is possible that both diazo-oxides and β -naphthoquinone derivs. are formed. 1,2-O₂NC₁₀H₆OH yields an unstable product which decomp. at the ordinary temp. No coupling takes place with the NO deriv. 1,2-MeC₁₀H₆OH couples readily. (2-HOC₁₀H₆)₂CH₂ couples slowly with *o*-O₂NC₆H₄N₂X on cotton, giving a shade different from para-red. In this and other cases the "abnormal" product of coupling seems to be stabilized on the fiber. (With RICHARD MICHEL and PAUL POLLAK.) Diazotized amines couple with thiol derivs. to form unstable diazo-sulfides (NO₂C₆H₄N₂SR) exclusively. These substances lose their diazo-N completely on attempting to recryst. them but are stabilized on the fiber. The diazo-sulfides obtained by coupling *o*-O₂NC₆H₄N₂X, PhN₂X and *p*-HO₂SC₆H₄N₂X with *m*-C₆H₄(SH)₂ and *p*-O₂NC₆H₄N₂X with 2,4-(HS)₂C₆H₃OH, 3,4,6-HO(HS)₂C₆H₂Me, 2-C₁₀H₇SH and 1,5-C₁₀H₆(SH)₂ are described. (With P. POLLAK and FRIEDRICH BECKER.) 1,5-C₁₀H₆(SH)₂, m. 119°, is prepd. by reduction of 1,5-C₁₀H₆(SO₂Cl)₂ with Zn and H₂SO₄ and sepd. by steam distn. Ac deriv., m. 187-9°; *di-Bz* deriv., m. 232°; *di-Me ether*, m. 150°. C. J. W.

α -Phenylcoumarin. G. BARGELLINI AND LYDIA MONTI. *Atti accad. Lincei* 8, 395-9(1928).—The following derivs. have been prepd. α -[4-Methoxyphenyl]coumarin, C₈H₄CH:C(C₆H₄OMe)COO, prepd. by heating together 5 g. *o*-HOC₆H₄CHO and

8 g. of *p*-MeOC₆H₄CH₂CO₂Na together with 50 cc. of (CH₂.CO)₂O for 30 hrs., and then dilg. with H₂O, faintly yellow, m. 142-4°, insol. in H₂O. α -[3,4-Methylenedioxyphenyl]coumarin, prepd. by heating 7 g. of *o*-HOC₆H₄CHO with CH₂O₂C₆H₃CH₂CO₂Na and 50 cc. (CH₂.CO)₂O, m. 170-2°, insol. in H₂O, shows a blue fluorescence in C₆H₆ and an intense olive-green color in H₂SO₄. The hydroxycoumarin prepd. by using 2,4-(HO)₂C₆H₃CHO in place of the *o*-HOC₆H₄CHO as above, m. 191 2°, sol. in C₆H₆ without color but with blue fluorescence. Satg. the Ac deriv. in EtOH with NH₃ (gas) and distg. off the EtOH gives the hydroxycoumarin, m. 238-9°, sol. in NaOH and NH₄OH, the latter soln. showing an intense green fluorescence; also sol. in C₆H₆ with blue fluorescence. The 4,6-dihydroxycoumarin is prepd. by heating 2,4,6-(HO)₃C₆H₂CHO with CH₂O₂C₆H₃CH₂CO₂Na in (CH₂.CO)₂O. *Di-Ac* deriv., m. 199°, gives with NH₃ the di-HO compd., m. 260° (decompn.). A. W. C.

Electrolytic reduction of cyclic acid imides to hydrogenated cyclic bases. ERNST SPÄTH AND FRITZ BREUSCH. Univ. Wien. *Monatsh.* 50, 349-56(1928). In the reduction of the imides according to Tafel, pure Pb must be used; the dimensions of the app. used are given. Usually 10 g. of the imide were suspended in 300 cc. 50% (by wt.) H₂SO₄ and reduced with 45 amps. for 4 hrs. at 18-20° and then 2 hrs. at 60°. The anode liquid was 200 cc. of 50% H₂SO₄. 3-Methylsuccinimide gives 32% of 3-methylpyrrolidine; the 3-Ph deriv. gives 40.3% of 3-phenylpyrrolidine, b₁₂ 120 2°; HCl salt, hygroscopic; picrate, m. 166°; the 3,4-diphenyl deriv., m. 198°, gives 1.2% of 3,4-diphenylpyrrolidine, b₁₄ 195-200°. Phthalimide gives 32% of dihydroisoindole, homophthalimide gives 15% of tetrahydroisoquinoline. Isatin gives 4% of dihydroindole. Naphthalic imide gives 15% of hydrobenzisoquinoline, m. 70°; picrate, m. 200° (decompn.). Quinolic imide, diphenic imide and malonic diamide could not be reduced. C. J. WEST

Syntheses by means of magnesylpyrroles. Series II. Note XII. Indophthalein. BERNARDO ODDO. Reale Univ. Pavia. *Gazz. chim. ital.* 58, 569-73(1928), cf. O. and Albanese, *C. A.* 22, 1775.—The reaction between 2-methylindylmagnesium bromide and *o*-C₆H₄(COCl)₂ (I) already described (cf. *C. A.* 19, 2823; 21, 241) was carried out between magnesylindole and I. I (2.5 g.) in anhyd. Et₂O added to a mixt. prepd. from Mg (0.6 g.), EtBr (2.8 g.) and indole (2.7 g.) in Et₂O, ppts. a cherry-red substance, which heated 0.5 hr., cooled and decompd. with ice, yields (1) an aq. layer with acid reaction; (2) a brown colored Et₂O layer, and (3) a dark red part insol. in water and in Et₂O. The aq. layer was extd. with Et₂O and the ext. added to the Et₂O layer. (2) *Et₂O* layer.—Evapn. of the Et₂O, extn. of the residual pitch with boiling ligroin, purification of the residue by repeated pptn. from its MeOH, EtOH or AcMe soln. by petr.

ether, and then by soln. in a min. of 10% NaOH, filtration and pptn. by acidification of the filtrate with dil. H_2SO_4 , yields *indolyndolidenephénylmethane-o-carboxylic acid*, $\text{C}_6\text{H}_4\cdot\text{NH}\cdot\text{CH}:\text{C}(\text{C}_6\text{H}_4\text{CO}_2\text{H})\cdot\text{C}:\text{CH}:\text{N}\cdot\text{C}_6\text{H}_4$ (II), dark red, m. 145° , sol. in aq.

alk. hydroxides and carbonates, and gives a violet soln. in concd. HCl. This latter soln. is decolorized by Zn dust because of the formation of the *leuco deriv.*, the color being restored by mild oxidizing agents, such as FeCl_3 . *Mono-HCl salt*, by treatment of II in anhyd. Et_2O with gaseous HCl. *NH_4 salt* of II, hydrolyzed by evapn. *Pb salt* of II, amorphous, by addn. of $\text{Pb}(\text{OAc})_2$ to the aq. NH_4 salt. No other metallic salts give ppts. Aq. AgNO_3 contg. NH_3 added to dil. alc. II ppts. an orange *compd.*, which gives a yellow soln. in a large excess of NH_4OH . PhN_2Cl added to II in aq. NaOH ppts a *coupled compd.*, brick-red. (3) *Insol. portion*.—Repeated crystns. from hot EtOH with water failed to yield a product with a const. m. p. (reached 226°). It was a brick-red powder, partially sol. in cold 10% alk. hydroxides. By means of the latter, there was obtained by filtration (1) an insol. substance (III) which composed the greater part, and (2) a soln., which acidified with dil. H_2SO_4 , pptd. II. III crystd. from C_6H_4 contg. a little EtOH , yields *indophthalen*, *i. e.*, the *lactoid form* of II, $[\text{C}_6\text{H}_4\cdot\text{NH}\cdot\text{CH}:\text{C}-]_2\text{C}\cdot\text{C}_6\text{H}_4\cdot\text{CO}\cdot\text{O}$ (IV), brown-yellow. It is also obtained in

the same way by crystn. of the insol. product from the treatment of impure II with NaOH (*loc. cit.*). No *compd.* corresponding to methylketole yellow (cf. C. A. 21, 241) could be obtained from IV. C. C. DAVIS

Hydrogenation of α -methylindole. M. HADANO AND T. MATSUNO. *J. Pharm. Soc. Japan* 48, 904-19 (1924).—2-Methylindole, Pt black, glacial AcOH and H_2 gave as a main product *bz-tetrahydro-2-methylindole* (I), b_7 $103-4^\circ$, b_{764} $222-3^\circ$, d_4^{30} 1.0056; *picrate*, m. 141° ; *chloroplatinate*, decomp. $187-8^\circ$; *methiodide*, decomp. 195° ; *benzene-sulfonate*, m. $86-91^\circ$; HgCl_2 salt, m. $153-4^\circ$. *Octahydro-2-methylindole* was isolated as a by-product. Alk. reduction of I with Na and AmOH gave *2,3,4,5,6,7-hexahydro-2-methylindole* (II), b_5 90° , $b_{764.5}$ $220-1^\circ$, d_4^{20} 1.0144; *HCl salt*, hygroscopic; *picrate*, m. $150-1^\circ$; *chloroplatinate*, decomp. 196° ; *methiodide*, decomp. $196-7^\circ$; *benzene-sulfonate*, m. $90-1^\circ$; HgCl_2 salt, m. 152° . Further reduction of II, using Pt black or colloidal Pd as a catalyzer, was unsuccessful. The acid reduction of I with HI and P gave *2,3-dihydro-2-methylindole*, which on further reduction gave, as a result of ring rupture, *o-propylaniline*. NAO UYEI

Condensation of 2- or 3-methylindole and their hydro derivatives with aldehydes. M. HADANO. *J. Pharm. Soc. Japan* 48, 919-28 (1928).—Condensation of 1 mol. 2,3-dihydro 2-methylindole and 1.1 mol. Me_2CHCHO with dry HCl gave a *yellow oil* (I), b_5 $100-5^\circ$ (*oxalate*, m. 99° ; *picrate*, decomp. 147° ; *chloroplatinate*, decomp. $180-1^\circ$). Crystn. of I from dil. HCl gave an *orange-yellow compd.* (II) $(\text{C}_{13}\text{H}_{17}\text{N}\cdot\text{HCl})\cdot\text{PtCl}_2\cdot 7\text{H}_2\text{O}$ and a small amt. of a *yellow substance* (III) $(\text{C}_{13}\text{H}_{17}\text{N}\cdot\text{HCl})_2\cdot\text{PtCl}_4(?)$, decomp. $180-1^\circ$. Due to the small amt. of products obtained a further study was impossible, but II is probably the *3-isobutylidene-2,3-dihydro-2-methylindole chloroplatinate* of Liebermann and Paal (*Ber.* 16, 529) and I probably *isobutylidene-2,3-dihydro-2-methylindole*. Heating of 1 mol. *bz-tetrahydro-2-methylindole*, 1.7 mol. $(\text{MeCHO})_3$ and NaOEt gave a *yellow compd.*, b_{10} 93° , which is probably *ethylidenebis-bz-tetrahydro-2-methylindole*. Condensation of 3-methylindole and BzH was exactly carried out according to the method of Wenzing (*Ann.* 239, 241), *i. e.*, in presence of ZnCl_2 . Instead of W.'s *benzylidenediskatole*, m. $140-2^\circ$, a *bright yellow compd.* (IV), $\text{C}_{18}\text{H}_{15}\text{ON}$, m. 151° , which is probably 3-*phenylhydroxyethylindole*, was obtained. Heating of 2 mols. 2,3-dihydro-3-methylindole and 1.3 mols. BzH first at 140° for 0.5 hr. and then at 160° for 1 hr. gave 3-styryl 2,3-dihydroindole, m. $120-4^\circ$. NAO UYEI

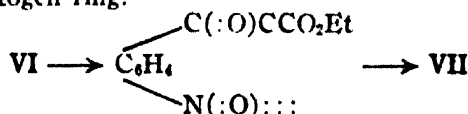
Reactions of nitroso derivatives and unsaturated compounds. VI. Catalytic action of nitroso derivatives on *o*-nitro-substituted acetylenes. Behavior of *p*-nitroso-anisole. L. ALESSANDRI. Reale Univ. Perugia. *Gazz. chim. ital.* 58, 551-60 (1928); cf. C. 21, 2127.—In previous work it was shown that the reaction of PhNO (I) and *o*- $\text{O}_2\text{NC}_6\text{H}_4\text{C}:\text{CH}$ (II) leads to $\text{HN}\cdot\text{C}_6\text{H}_4\cdot\text{C}(\text{O})\cdot\text{C}:\text{N}(\text{O})\text{Ph}$ (III) and

$\text{HON}\cdot\text{C}_6\text{H}_4\cdot\text{C}(\text{O})\cdot\text{CO}$ (IV), but the mechanism of the reactions was left unexplained (cf. C. A. 21, 2127). With the object of throwing further light on these obviously complicated reactions, the reaction of aryl nitroso derivs. and *o*- $\text{O}_2\text{NC}_6\text{H}_4\text{C}:\text{CCO}_2\text{H}$ (V) was studied. The present paper describes in a general way this further research, without, however, exptl. data. With I and V, the reaction products included a trace

of III, a larger quantity of isatin and considerable IV, *i. e.*, the same products which were obtained from I and II. A considerable quantity of azoxybenzene was also obtained. Part of the V remained unaltered. The readiness with which V loses CO₂ with formation of II explains the identity of the products in the 2 cases. Therefore esters of V were studied. Independent of the solvent, I and *o*-O₂NC₆H₄C : CO₂Et (VI) react in a different manner from I and V, isomerization taking place with formation of C₆H₄C(:O).C(CO₂Et):NO (VII), the I acting as a catalyst and being recovered wholly

unaltered. The same isomerization has been noted with H₂SO₄ (cf. *Ber.* 14, 1741 (1881); 15, 780(1882)) and with C₆H₅N (cf. *C. A.* 10, 1334) as catalysts. Repeating the expts. with C₆H₅N, it was found that the yields are smaller than with I, and further more, with the latter there was isolated a hitherto unknown secondary *compd.* VIII, m. 121°, the highest yield of which was 15%. A similar result was obtained with I and *o*-O₂NC₆H₄C : CCO₂Me, the transformation being for the greater part into C₆H₄.C(:O).C(CO₂Me):NO, with a small proportion of a hitherto unknown

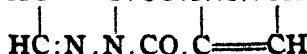
compd., m. 139°. Further expts. were made with VI and other NO *compds.*, including *p*-MeOC₆H₄NO (IX) and *p*-Me₂NC₆H₄NO (X). Both IX and X acted as catalysts with the same results as before, giving good yields of VII, with small proportions of VIII. Analysis of VIII corresponded to VI and VII in % *compn.* Since this secondary product was formed in all 3 cases, it does not contain residues of any of the 3 reagents. Since moreover I, IX and X also behave the same, the catalytic action probably resides in the NO group. Further expts. show that a good yield of VIII is formed from *p*-HOC₆H₄NO and VI, and its constitution is being studied. When VII in Et₂O is exposed to diffuse light at room temp. it is slowly transformed into a *compd.* different from VIII. This may bear some relation to the isomers of isatogen derivs. described by Ruggli (*C. A.* 13, 1473; 17, 3024) and Heller (*C. A.* 16, 2686). The possible *mechanism* of the catalysis and isomerization is discussed, attention being called in particular to the analogy between these reactions and those discussed by Pfeiffer (cf. *C. A.* 10, 1334). Under the catalytic influence of various reagents and of light, a NO₂ group in the *o* position to a lateral chain in a C₆H₄ nucleus changes readily to a NO group, oxidizing at the same time the lateral chain (cf. *Ber.* 34, 2041(1901); 35, 2715(1902)); Tanasescu, (*C. A.* 21, 533, 1110, 3901) and, therefore, by the action of C₆H₅N or of NO *compds.* an O atom in the NO₂ group of VI passes to the acetylenic C on the nucleus, leaving 2 valences of the other acetylenic C free, which are then satd with the latent valences of the NO, closing the isatogen ring:



The exptl. details of the research are to be published later, including further expts with other *compds.*

C. C. DAVIS

Pyrazole derivatives of the type of diketopiperazines. K. v. AUWERS AND E. CAUER. Marburg, Chem. Inst. *Ber.* 61B, 2402-11(1928).—In general, pyrazole-carboxylic acids (I) split off CO₂ above their m. ps. and change smoothly into the corresponding pyrazoles but in certain cases it was found that the reaction is not homogeneous, amorphous, high-melting substances being formed to a greater or lesser extent along with the pyrazoles; under certain conditions they are the sole products. These same *compds.* were likewise unexpectedly obtained in attempts to acylate certain I on the N. Their *compn.* and properties leave hardly any doubt that they are derived from a diketopiperazine-like mother substance HC≡C.CO.N.N:CH.



which they are formed depends in a remarkable way both on the structure of the original acid and on the nature of the reagent. According to the data in the literature, the simpler I show no tendency to form piperazines at high temps. but merely split off CO₂, although not so smoothly as the *N*-alkyl derivs. of the α-NH₂ acids, for on distn. there generally remains a small residue. The nature and position of the substituents seem to have but little influence; nucleus-methylated and -phenylated I of different structures seem to behave much the same. But whereas the introduction of an acyl radical into the α-NH₂ acids hardly changes the behavior of the latter, an acyl radical on 1 of the N atoms of a I generally greatly increases the tendency to piperazine formation. Below are the % yields of piperazine (piperazine + acylpyrazole = 100%) obtained from various substituted pyrazole-3-carboxylic acids having an acyl radical

(R) on 1 of the N atoms: 4-Me (R = EtO₂C) 20; 4-Me (R = *o*-O₂NC₆H₄CO) 60; 5-Me (R = *o*-O₂NC₆H₄CO) 90; 5-Me (R = Ac) 100; 4-bromo-5-methyl (R = Ac) 100; 4,5-Me₂ (R = EtO₂C) 50; 4-Ph (R = Ac) 100. The piperazines are obtained not only by superheating the preformed acylpyrazolonecarboxylic acids but often in the attempt to prep. the latter compds., and in general it makes but little difference if it is attempted to effect the acylation by heating with the appropriate acid chloride or by bringing the acid and chloride together in C₆H₅N. The structure of the pyrazole deriv. and the nature of the acyl residue are of even greater influence than the heating of the acylated acids. Below are given, resp., the substituent in the pyrazole-3-carboxylic acid, the acid chloride used and the yield of piperazine obtained by heating and in C₆H₅N: no substituent, O₂NC₆H₄COCl, little, 50; 4-Me, ClCO₂Et, 0, —; 4-Me, AcCl, 0, 0; 4-Me, O₂NC₆H₄COCl, 0, 5; 5-Me, AcCl, 5, 10; 5-Me, O₂NC₆H₄COCl, 95, 100; 4,5-Me₂, ClCO₂Et, — (by-product of unknown nature and 80% acyl deriv.), 4,5-Me₂, AcCl, 10, —; 4,5-Me₂, O₂NC₆H₄COCl, 100, 100; 4-chloro-5-methyl, O₂NC₆H₄COCl, 100, —; 4-bromo-5-methyl, AcCl, 10, —; 4-bromo-5-methyl, O₂NC₆H₄COCl, 100, 100; 4-Ph, AcCl, 0, —; 4-Ph, O₂NC₆H₄COCl, 100, 100; 5-Ph, O₂NC₆H₄COCl, 100, 100; tetrahydroindazolecarboxylic acid, O₂NC₆H₄COCl, 0, —. The last acid is also not anhydridized by SOCl₂ while the non-hydrogenated indazolecarboxylic acid is smoothly converted into a diketopiperazine by SOCl₂. Of all the chlorides hitherto used, SOCl₂ has proved best adapted to convert the I into diketopiperazines. There is nothing in the literature on the conversion of aliphatic α -NH₂ acids into diketopiperazines by acid chlorides. Glycocol with *o*-O₂NC₆H₄COCl at 135° vigorously evolved HCl and the product was completely sol. in Na₂CO₃, *i. e.* contained no piperazine. The reaction could not be carried out in C₆H₅N because of the insoly. of the glycocol. Boiling 3–4 hrs. with SOCl₂ also produced no change. Unlike the α -NH₂ acids, the I are chiefly acylated by boiling Ac₂O. Also, the esters of the I are completely stable at room temp. and on heating split off CO₂ without forming anhydrides. Et 3,5-methylpyrazolecarboxylate heated a long time at 180° gives no piperazine but some 1-ethyl-5-methylpyrazole, the Et group in part migrating to the N. In the pyrazole series diketopiperazines cannot be obtained from the *N*-ClCH₂CO derivs. of the esters with NH₂, the *N*-acyl derivs. being too easily saponified. Chem., the diketopiperazines derived from the I resemble those obtained from aliphatic NH₂ acids, alkalies split them even more readily than the aliphatic compds., 2–3 mins. boiling generally sufficing to decomp. them completely into the original I. In phys. properties they differ from the aliphatic diketopiperazines in their much smaller soly. and their very high m. p. *N*-[*o*-Nitrobenzoyl]-3(5)-pyrazolecarboxylic acid, sandy powder, m. 195–6°; diketopiperazine, light yellow. Et *N*-chloroacetyl-3,5-methylpyrazolecarboxylate, m. 127.5–9.5°; when heated at 180° it gives, along with 1-ethyl-5-methylpyrazole (picrate, m. 139–41°), a product whose picrate m. 126–8°; it is not 3,5-methyl-ethylpyrazole b₁₂ 118°, which was synthesized from AcCH₂COEt and N₂H₄, and forms a picrate, lemon-yellow, m. 137.5–9°. In another expt. was obtained 3(5)-methylpyrazole (picrate, m. 139–41°). As, in the decompn. of the above ester, 3(5)-methyl-4-ethylpyrazole might possibly be formed, an expt. was made to det. whether this last compd. is formed, along with 3(5)-propylpyrazole, by treating with N₂H₄ the crude product of the condensation of MeCOPr and HCO₂Et, but only the Pr deriv., b₁₂ 117° (picrate, m. 150–2°) was obtained. Diketopiperazine from 3,4(4,5)-dimethylpyrazole-5(3)-carboxylic acid and *o*-O₂NC₆H₄COCl, light brown, m. 285–6°. *N*-Acetyl-4-phenylpyrazole 3(5)-carboxylic acid, m. 162.5–4.5°. C. A. R.

Relative firmness of attachment of alkyls to nitrogen. K. v. AUWERS and W. MAUSS. Marburg, Chem. Inst. Ber. 61B, 2411 20(1928); cf. C. A. 22, 1355.—In the dialkylindazolium salts (I) used in the 2 earlier investigations the two N atoms are not equiv. and the course of the thermal decompn. of these salts depends not only on the nature of the *N*-alkyl substituents but also on their position. In the benzimidazolium salts, however, the N atoms, according to present views, are equiv. and the decompn. of such salts should depend only on the nature of the substituent. The mixed dialkylbenzimidazolium iodides (II) in general decomp. less easily than the corresponding I; a considerable part of the material generally resinifies and in the distillate there is regularly found, along with the cleavage products, more or less of the unchanged original substance which distills over unchanged or after transitor dissociation. For this reason the cleavage of these salts is not well adapted to detns. and only a few exploratory expts. were carried out. The methylethyl (III), methylbenzyl (IV), ethylpropyl (V) and ethylbenzyl derivs. (VI) were used. III gives pure ethylbenzimidazole exclusively or almost exclusively methylbenzimidazole (VIII) (in only 1 case was a little benzylimidazole (IX) also obtained), V pure propylbenzimid-

azole (X) and VI a mixt. of about 6 parts VII and 1 part IX. As found in the earlier work, and also by v. Braun by the BrCN and PCl₅ method, the firmness of attachment increases in the order PhCH₂ → Me → Et → Pr. Of *N,N*-dialkylimidazolium iodides, the methylethyl deriv. (XI) gives only ethylimidazole (XII), the methylpropyl deriv. (XIII) only propylimidazole (XIV), the ethylpropyl deriv. (XV) only XII (which was unexpected), while the ethylbutyl (XVI) and propylbutyl derivs. (XVII) decompd. in 2 directions, splitting off BuI as well as EtI and PrI, resp.; with XVI, the BuI split off predominated over the EtI, with XVII about equal quantities of BuI and MeI were split off. The deviation of XVI and XVII from the v. Braun rule may be due to the fact that with increasing wt. of the alkyl groups and with increasing temp. the difference in firmness of attachment decreases; at room temp. the difference is still large enough to be detected by the BrCN method but at higher temps. both radicals are so loosened that the decompn. can proceed in both directions. The behavior of XV, however, is contrary not only to the v. Braun rule but also to the results obtained with V in the II series, which was heated to about the same temp. That the relative ease with which homologous alkyl groups are split off from N does not always follow the same order is shown by the results by Lossen and by Collie and Schryver with the tetraalkylammonium chlorides, and v. A. and M. have also found that Et₃PrNI yields Et₂NPr and EtI while Pr₃EtNI gives Pr₂NEt and PrI; Et₃Pr₂NI decompd. to about the same extent in each direction. *1,3-Diethylbenzimidazolium iodide*, from benzimidazole and 3 mols. EtI in MeOH at 150–60°, m. 225–7°; *picrate*, yellow, m. 254–7°. VII, b₁₂ 160–2°; *picrate*, yellow powder, m. 219°. III, from VII and MeI or from VIII and EtI, m. 192–3°. IX, prepd. by H. DÜSTERDIEK from dibenzylbenzimidazolium chloride heated a long time *in vacuo* in a current of air 20° above its m. p., m. 115–5.5°; *pyrate*, yellow, m. 161–5°. IV, m. 158°. *1,3-Dipropylbenzimidazolium iodide*, m. 202–3° X, b₁₄ 170–2°; *picrate*, yellow, m. 204–6°. V, m. 171.5–2°. VI, m. 173.5–4.5° *1-Butylimidazole*, b₁₁ 114–6°; *picrate*, yellow, m. 79.5–81.5°. *Triethylpropylammonium iodide* (6.5 g. from 5 g. Et₃N and 1 mol. PrI on the H₂O bath), very hygroscopic, m. 255–6°. *Diethyldipropylammonium iodide*, m. 238–40°. C. A. R.

The stability of the double bond in dixanthylene. O. YU. MAGIDSON AND V. I. DAMASKINA. *Trans. Sci. Chem.-Pharm. Inst. (Moscow)* 1926, No. 16, 51–3. From a previous investigation (cf. preceding abstract) it was shown that (Ph₂C:)₂ under the influence of PCl₅ breaks its double bond. The reaction is more complicated with [(C₁₀H₇)₂C:]₂, as shown. From this it was thought interesting to try the effect of PCl₅ on dixanthylene when a similar reaction would be expected:



This was proven to be the case by actual expt. The dixanthylene when treated with glacial AcOH at 200° gives xanthone. J. S. JOFFE

Some glyoxaline compounds. BERNARDO ODDO AND QUINTINO MINGOIA. *Reale Univ. Pavia. Gazz. chim. ital.* 58, 584–97(1928).—Pure MeI (28.4 g.) added to magnesylglyoxaline (I) (from 5.5 g. EtBr, 1.2 g. Mg and 3 g. glyoxaline after evapn. of the Et₂O), heated 20 hrs. on a water bath, cooled, decompd. with ice, satd. with CO₂, extd. with Et₂O, the ext. concd., hot satd. picric acid in Et₂O added, and the ppt. recrystd. from boiling water, yields *N*-μ-dimethylglyoxaline picrate (cf. Sieg, C. A. 18, 3059). In a similar way EtI and I yield, after fractional distn. of the evapd. Et₂O ext., *N*-μ-diethylglyoxaline, b. 218–20° (cf. Ber. 16, 490(1883)). Pure dry CO₂ passed into I heated 4 hrs., on a water bath, cooled, decompd. with ice, satd. with CO₂ until the basic Mg salt is dissolved, and extd. repeatedly with Et₂O or CHCl₃, failed to yield a CO₂H acid, only unaltered I being recovered. AcCl in Et₂O heated 20 hrs. on a water bath with I, cooled, decompd. with ice, the aq. layer sepd., neutralized with NaHCO₃, extd. with Et₂O, and the Et₂O liquors evapd., yielded no product, unaltered I being recovered from the aq. layer. Neither did Ac₂O nor AcOEt react with I under the same conditions, so that no Ac deriv. of glyoxaline could be obtained. This inability of glyoxaline to react with Ac compds. is attributed to a *mesohydric structure*. I (from 5.5 g. EtBr as before) heated 24 hrs. on a water bath with freshly distd. ClCO₂Et (5.4 g.) in anhyd. Et₂O, cooled, decompd. with ice, satd. with CO₂, the Et₂O and aq. layers sepd., the latter extd. with Et₂O, the Et₂O evapd. and the oil distd. *in vacuo*, yields *Et imidazolecarboxylate*, C₈H₈O₂N₂ (II), b₁₀ 135–8°. The structure is probably CH:CH. NH. C(CO₂Et):N, the reaction being analogous to that of magnesylpyrroles

and ClCO₂Et (cf. O., C. A. 19, 2492). *Picrate*, C₁₂H₁₁O₆N₃, from II in C₆H₆ and hot

satd. picric acid in C_6H_6 and crystn. from EtOH, light yellow, m. 182° . I (same quantity as before) and $COCl_2$ (2.5 g.) in C_6H_6 heated 24 hrs. on a water bath, cooled, decompd. with ice, satd. with CO_2 , the aq. and Et_2O layers sepd., the former extd. with Et_2O , the Et_2O liquors evapd., satd. picric acid in C_6H_6 added to the residual oil, and the ppt. recrystd. from EtOH, yields *diimidazolyl ketone picrate* $[NH:CH:CH:N:C]_2-$

$CO\ C_6H_5(OH)(NO_2)_2$. The free *ketone* is a thick brown-yellow oil. I (same quantity as before) and heated 24 hrs. on a water bath with freshly distd. $ClOCCO_2Et$ (III) (6.8 g.) and treated as before, with distn. *in vacuo*, yields *diethyloxalyldiaminoethylene*, $[EtO_2C:CONHCH:]_2$ (IV), lemon-yellow oil, $b_{82}\ 115-7^\circ$. $I + 2III + 2H_2O \longrightarrow IV + MgBrCl + HCl + HCO_2H$. Its picrate could not be obtained. No compd. with open chain could be isolated from the mother liquors. I (as before) heated 24 hrs. on a water bath with $ClOCCCH_2CO_2Et$ (V) (15 g.), cooled, decompd. with ice and satd. with CO_2 , yields (1) an intense red aq. portion and (2) an insol. dark red magma. *Insol. magma*.—Dissolved in EtOH, the EtOH evapd. and the residue fractionally distd. *in vacuo*, it yields *diethylmalonyldiaminoethylene*, $C_{12}H_{18}O_6N_2$, yellowish oil, $b_{101}\ 270^\circ$. *Water-sol. portion*.—Extn. with Et_2O , acidification with dil. H_2SO_4 of the residue, and steam-distn., yields a little HCO_2H . Evapn. of the Et_2O ext. leaves an oil which, fractionally distd. *in vacuo*, yields 2 fractions, (1) $b_{60}\ 105-7^\circ$, and (2) $b_{60}\ 107-10^\circ$. The $\%N$ of neither fraction, viz., 4.81–5.10%, corresponds to any compd. which could have been foreseen in the reaction. The reaction of I with III and V is not therefore analogous to the action of III and V with magnesylypyrroles or magnesylyndoles (cf. O., C. A. 6, 3125, 22, 1775). C. C. DAVIS

Opening of the glyoxalinic nucleus. II. BERNARDO ODDO AND QUINTINO MINGOIA. Reale Univ. Pavia. *Gazz. chim. ital.* 58, 573–84 (1928); cf. C. A. 21, 1263.—Further expts show that $BzCl$ is not peculiar in its ability to open a glyoxaline nucleus, a similar action being manifest with other acid chlorides, though not by all. $AcCl$ (as well as Ac_2O and $AcOEt$) was without action on magnesylyglyoxaline under the various conditions studied, including changes of temp. and of solvent. With magnesylyglyoxaline $ClCO_2Et$ and $COCl_2$ form compds. with closed nuclei, viz., $CH:CH:NH:C(CO_2Et):N$

and $[NH:CH:CH:N:C-]_2CO$, resp. On the other hand $ClOCCO_2Et$ and $ClOC-$

$CH:CO_2Et$ react with magnesylyglyoxaline to form open-chain compds., viz., $[EtO_2C:CONHCH:]_2$ and $[EtO_2CCH_2CONHCH:]_2$, resp. The product with the compn. $C_{10}H_{14}ON_2$ already described (cf. C. A. 21, 1263) was studied further. It m. $202-3^\circ$. It cannot be of the urethan type, for then it would be sapond. by alkalis, whereas it is not attacked even by boiling 0.5 N KOH, indicating a ketonic structure and a closed nucleus. Boiling 50% KOH does, however, decomp. it, with evolution of NH_3 . It is also formed from glyoxaline, $BzCl$ and NaOH (cf. *Ann.* 273, 352 (1893)). Heated in anhyd. Et_2O with Br, the ppt. washed with very dil. Na_2CO_3 , then with water and recrystd. from AcMe, it yields the compd. $C_{10}H_{14}ON_2Br_2$ (corresponding to the monobenzoylglyoxaline dibromide, $BrC:CBz:NH:OBz:N$), m. 255° . This bromination

leaves little or no doubt of the constitution of the benzoylated deriv. of magnesylyglyoxaline. C. C. DAVIS

Basicity of imidazole-4,5-dicarboxylic acid and its derivatives. Y. TAMAMUSHI. Tokyo Imp. Univ. *J. Pharm. Soc. Japan* 48, 851–63 (1928).—*Imidazole-4,5-dicarboxylic acid* (I), *methyl-* and *phenylimidazole-4,5-dicarboxylic acid* (II and III, resp.) as well as their acid and neutral Na salts were prepd. and their basicity was detd. by titration with 0.1 N NaOH using phenolphthalein as an indicator. The av. value of the titration was 72.35% of the calcd. value for I, 62.22% for II and 63.65% for III, showing that the 3 compds. are weakly basic in spite of their being dibasic acids. The equiv. cond. of a 0.5% soln. of the neutral Na salt of II was, $\Lambda = 60.33$, while its acid salt had $\Lambda = 23.88$. NAO UYEI

Behavior of triazoles towards mustard oils. PAUL FANTL AND HEINRICH SILBERMANN. *Ann.* 467, 274–87 (1928).—3-Methyl-5-amino-1,2,4-triazole and $PhNCS$ in 96% EtOH in the cold give 3-methyl-5-amino-1,2,4-triazole-2-phenylthiourea, which m. 137° , then solidifies and again m. $197-9^\circ$; if the reaction is carried out in boiling AmOH there results 3-methyl-1,2,4-triazole-5-phenylthiourea, m. $197-9^\circ$; the 1st isomer yields a *picrate*, golden yellow, m. 217° . 3-Methyl-1,2,4-triazole-5-allylthiourea, m. 125° , results in either hot or cold soln. $H_2NC(:NH)NHNH_2$, HCO_2 and $PhNCS$ in EtOH, heated on the water bath, evolve CO_2 , H_2S and NH_3 and yield 3-thio-4-phenyl-5-amino-1,2,4-triazole, m. 264° , which crysts. in octahedra or plates; *benzyl deriv.*, m. 172° ,

dibenzyl deriv., yellow, m. 137°; *tribenzoate*, m. 138°; none of these compds. react with PhNCS or $\text{CH}_2\text{:CHCH}_2\text{NCS}$. 3-Thiomethyl-4-phenyl-5-amino-1,2,4-triazole does not react with $\text{CH}_2\text{:CHCH}_2\text{NCS}$ but with PhNCS there results the compd. $\text{C}_{11}\text{H}_{12}\text{N}_4\text{S}$, m. 204°. PhNHC(:NH)NH₂·HCl and PhNCS in EtOH-KOH give phenylaminoguanidinphenylthiourea, m. 167°; the corresponding *allyl deriv.* (I), m. 128°; as a by-product of the latter there was isolated the compd. $\text{C}_{11}\text{H}_{12}\text{N}_4\text{S}$, pale red, m. 204° (decompn.); I, boiled with dil. EtOH-KOH for 2 hrs. gives 2-phenyl-3-allylamino-5-amino-1,2,4-triazole, m. 74°; with PhNCS there results 2-phenyl-3-allylamino-1,2,4-triazole-5-phenylthiourea, m. 192°; the corresponding *allyl deriv.*, m. 120°. 1-Phenyl-1,2,4-triazole-5-phenylthiourea, m. 128°. 2-Phenyl-3-methyl-1,2,4-triazole-5-phenylthiourea, m. 181°; *allyl deriv.*, m. 158°.

C. J. WEST

Remarkable formation of 2-aminopyridine. GEORG KOLLER AND HILDEGARDE RUPPERSBERG. Univ. Wien. *Monatsh.* 50, 436-8(1928).—Heating 6 g. 2-chloropyridine and 4.2 g. $\text{C}_6\text{H}_5\text{N}$ 7 hrs. at 200° gives 1.8 g. 2-aminopyridine; similarly 1.86 g. 3-methylpyridine and 2.26 g. 2-chloropyridine give 0.2 g. 2-aminopyridine. C. J. W.

Iodization of α -aminopyridine. O. YU. MAGIDSON AND G. P. MENSHIKOV. *Trans. Sci. Chem.-Pharm. Inst.* (Moscow) 1926, No. 16, 23-31.—By a prolonged treatment of *N*-methyl- α -acetamidopyridinium iodide with HI, *N*-methyl- α -pyridonimine-HI and black crystals, m. 144-6°, with a 72.6% I content, are obtained. Considering the latter as a periodide of an iodized deriv. of pyridine it was thought possible to iodize α - $\text{C}_5\text{H}_4\text{NNH}_2$ either with H_2O_2 in HI or with I in KI. At first a periodide is formed, which upon treatment with alkali gives an iodide. Its constitution was proven to be β -iodo- α -aminopyridine. The compd. is very stable, does not react with metals (Cu) and Ag salts (AgNO_3); it m. 129°. It was not possible to introduce a 2nd atom of I. β -Iodo- α -pyridyl nitramine (m. 189°) was obtained by working with mixt. of H_2SO_4 (90%) and HNO_3 (d 1.4). It was impossible to isomerize the nitramine to the C.H.N. (NH_2) NO_2 because of its property of decomp. The iodo- α -pyridone (m. 183-9°) was obtained by diazotizing the amino compd. in 20% H_2SO_4 . It is sol. in a weak alkali, in strong acids, alc. and soda. The β -iodo- α -chloropyridine may be obtained by diazotizing aminoiodopyridine in HCl (d. 1.19); it m. 99°, is easily sol. in alc. and ether, insol. in acids, does not give any picrates and has a strong odor resembling BzH . The direct iodization of α -pyridone leads to β -iodopyridone. Iodo- α -methoxypyridine is obtained by the reaction of NaOMe on α,β - $\text{C}_5\text{H}_2\text{NCl}_2$. The liquid, b. 231° (picrate, m. 147°), possesses a pleasant odor and is a weak base. The β -nitro- α -methoxypyridine is made from α -Ag- β -nitro pyridonate and contains MeI. It m. 110°, is slightly sol. in alc. and ether, has a pleasant iris smell. The β -amino- α -methoxypyridine is made from α,β - $\text{C}_5\text{H}_2\text{N}(\text{OMe})\text{NO}_2$ by reduction with Sn and HCl. By diazotizing and decomp. with KI β -iodo- α -methoxypyridine is obtained. All the steps in the procedure are described in detail.

J. S. JOFFE

Pyridine arylimines. II. Cleavage and migration of the aryl nitrogen complex. WILHELM SCHNEIDER AND KURT WEISS. Univ. Jena. *Ber.* 61B, 2445-51(1928), cf. C. A. 18, 3381.—For the deeply colored anhydro bases from aryl-substituted *N*-phenylaminopyridinium compds. had been established the structure of pyridine *N*-phenylimines, 1,2,4,6- $\text{C}_5\text{H}_2\text{N}(\text{:NPh})\text{R}_2$. The 2-methyl-4,6-diphenyl deriv. (I), it was shown, reacts with PhNCO, PhNCS and CS_2 in the desmotropic methylenedihydropyridine form, whereas its intense indigo-blue color would indicate a structure analogous to that of the 2,4,6- Ph_3 deriv. (II) for which a desmotropic formulation is not possible. II with PhNCO only forms a loose mol. compd. which easily dissociates with regeneration of the blue II. PhNCS and CS_2 , on the other hand, slowly react with II with non-reversible decolorization and formation, as has now been found, of 2,4,6- $\text{C}_5\text{H}_2\text{NPh}_3$; what becomes of the $\text{PhN} =$ radical split off has not as yet been established; only once with PhNCS were there obtained red needles, m. 152°. The PhN residue is more smoothly split off from II with H and Pt sponge or with Zn dust and NaOH, the products being $\text{C}_5\text{H}_2\text{NPh}_3$ and PhNH_2 . This easy reductive cleavage, which can also be effected with I, may be considered decisive proof of the pyridine imine structure of the I and II. Unlike the quite stable II, I in soln., especially on heating, undergoes change and is decolorized; from the colorless alc. soln. S. and W. have now isolated a cryst. colorless isomer (III) of markedly less pronounced basic nature, having the properties of a primary aromatic base (forms normal monoacyl derivs. and is diazotizable with HNO_2) and at the same time contg. the tertiary pyridine N atom, for it adds 2 mols. MeI and the resulting salt (IV) crysts. only with a very firmly held mol. of CHCl_3 and, from its ability to form a nitrosamine, must be a *methiodide-hydroiodide* of a methylated secondary aromatic pyridine, i. e., in the isomerization there is a further rearrangement of the methylene

form in equil. with I, the PhNH residue migrating from the pyridine N atom to the methylene C atom. As the NO deriv. of the Bz compd. of III changes into an indazole (V) with boiling C_6H_6 , the PhNH residue must be bound to the methylene C atom through the o-C atom to the NH₂ group and III must be 2-o-aminobenzyl-4,6-diphenylpyridine. It seps. in rhombic tables, m. 144°, and is best obtained by refluxing I. MeI in alc. with periodic addns. of NaOH until the blue-violet color at first produced disappears permanently, and then heating with Zn dust until the dark brown soln. has become a light yellow-brown; yield of crude product, about 50%. It is sol. in very dil HCl but not in concd. HCl (apparently because of the formation of a difficultly sol HCl salt). *Mono-HCl salt*, from III in C_6H_6 with dry HCl or concd. aq. HCl, cryst. powder, m. 256°, practically insol. in H₂O but sol. in the presence of a little HCl, converted by concd. HCl into a resinous mass which crystals on rubbing and dissolves on diln with much H₂O. *Picrate*, m. 202°. The diazotized soln. couples with PhOH to an orange-red, with R and G salts to red and light red, with α - and β -naphthols to dark red and brick-red azo dyes; with NaOH it gives pink flocks which give a negative Liebermann nitrosamine test. IV, $C_{27}H_{27}N_2Cl_3I_2$, yellow, m. 158° (decompn.), insol. in boiling $CHCl_3$ when it has once sepd., decompd. by hot MeOH, EtOH or H₂O, does not lose its $CHCl_3$ in vacuo at 110°; when diazotized in concd. HCl, pptd. with NaOH and taken up in Et₂O it gives a positive Liebermann test. *Ac deriv.* of III, m. 172°. *B-deriv.*, m. 123°. V, $C_{24}H_{17}N_3$, yellow, m. 228°. The micro-analyses were done by A. Schotte.

C. A. R.

Derivatives of pyridine and quinoline. A. BINZ AND C. RÄTH. III. New Synthesis of 2-aminonicotinic acid and its behavior towards nitric acid. C. RÄTH AND G. PRANGE. Landw. Hochschule Berlin. *Ann.* 467, 1-10(1928); cf. C. A. 21, 2902. —Directions are given for 2 methods of prepn. of 2,5-diaminopyridine; the action of CuCN on the diazo soln. gives 50% of 2-amino-5-cyanopyridine, b₁₅ 240-50°, m. 163-4°, which is hydrolyzed by boiling with 3 parts of HCl in a sealed tube 5 hrs. at 160° to 2-aminopyridine-5-carboxylic acid (I) which crystals with 2 H₂O; *nitrate*, light brown, m. 242° (decompn.). I (20 g.) in 100 g. H₂SO₄, shaken until soln. results and then treated with cooling with the calcd. amt. of HNO₃ in an equal vol. of H₂SO₄, gives 25 g. 2-nitroaminopyridine-5-carboxylic acid (II), decomp. 233° (explosive); *Na salt*. Reduction of II with Sn and HCl gives I. Heating 25 g. II in 125 g. concd. H₂SO₄ 1-1.5 hrs. at 100° gives 15.2 g. 2-amino-3-nitropyridine-5-carboxylic acid (III), m. 300-1° (decompn.); it also results from the nitrate of I by heating 2 hrs. at 105°; reduction with Sn and 30% HCl gives 50% of 2,3-diaminopyridine-5-carboxylic acid, which crystals with 1 H₂O. I (4 g.) in 20 g. concd. H₂SO₄, nitrated with 3.5 cc. HNO₃ (d. 1.35) and the reaction product warmed 2 hrs. at 100°, gives 2.5 g. 2-hydroxypyridine-5-carboxylic acid, m. 302°. Heating this in Na₂CO₃ with I and KI gives 2-hydroxy-3,5-diiodopyridine, m. 261-2°. Warming 2 g. III with 40 cc. 10% NaOH for 15-20 mins. gives 1.6 g. of the *Na salt*, reddish brown of 2-hydroxy-3-nitropyridine-5-carboxylic acid, m. 277° (decompn.). I and KI transform this into 2-hydroxy-3-nitro-5-iodopyridine, yellow, m. 247-8°. IV. Pyridine-3-arsonic acid. A. BINZ, C. RÄTH AND J. GANTE. *Ibid* 11-16. 2-Chloropyridine-5-arsonic acid and N₂H₄. H₂O in H₂O, refluxed for 3.5 hrs., give 76% of 2-hydrazinopyridine-5-arsonic acid (I), pale yellow, does not m. 240°; with AcCH₂CO₂Et in H₂O there results pyridine-5-arsonic acid-2-[3'-methyl-5'-pyrazolone]. I and p-O₂NC₆H₄CHO in EtOH contg. a little HCl give p-nitrobenzaldehyde-2-pyridylhydrazone-5-arsonic acid; p-NH₂ deriv., yellow; the last 3 compds. have no m. p. Oxidation of I in 5% HCl with 10% H₂O₂ gives 11-2% of pyridine-3-arsonic acid (II), m. 112-3°; *Cu salt*, bluish green, amorphous. Reduction with SO₂ in concd. HCl gives 20% of pyridine-3-arsine dichloride, pale yellow, begins to decomp. 137°; reduction in SO₂ gives the oxide, amorphous, begins to decomp. at 187°. Oxidation of I with H₂O₂ and reduction with H₃PO₂ gives 3,3'-arsenopyridine, light yellow, does not melt. Reduction of II with Zn gives pyridine-5-arsine, light brown, begins to decomp. 102°.

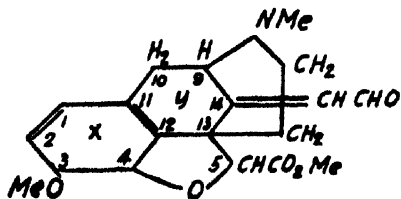
C. J. WEST

Asymmetric nitrogen atom. LVI. Rearrangement velocities of stereoisomers which contain at the same time asymmetric nitrogen and carbon atoms, a parallel to true auto-racemization of nitrogen-active ammonium salts. E. WEDEKIND AND G. L. MAISER. Forstl. Hochschule Hann.-Münden. *Ber.* 61B, 2471-9(1928); cf. C. A. 22, 4527. The 1-menthyl N-alkyltetrahydroisoquinolinium iodide-acetates had been isolated in 2 stereoisomeric forms (+ - and - -). The initial member (N-Me) of the series was obtained in only 1 form (because of the great lability of the Me group the isomer is exceedingly unstable); the 2 N-Et and N-Pr isomers are about equally stable and no rearrangement was observed, but in the iso-Pr series distinct stability differences appear and are more or less marked in the higher homologs (Bu, iso-Bu,

iso-Am, etc.). Branching of the chain or marked increase in mol. wt. materially decreases the stability of I form, and the velocity of rearrangement into the stable form depends on the nature of the solvent. Hitherto no exact kinetic measurements have been made and no general relationship between the rearrangement velocities and the nature of the medium had been established. The object of the present investigation was to obtain such information, the labile *N*-iso-Pr compd. (I), m. 146–8°, being used for this purpose (contrary to the statement in W. and Ney's paper it is the more easily sol. and reactive or α -form which m. 146–8°, the 161° or β -form being the more difficultly sol. one). The rearrangement was effected in MeOH and EtOH; H₂O could not be used because of the low soly. of the I, and in Me₂CO and CHCl₃ no rearrangement occurs. It had recently been found that active *N*-methylallyltetrahydroquinolinium iodide (II) also does not auto-racemize in Me₂CO and it would seem that the auto-racemization in CHCl₃, which had been shown to be due to spontaneous decomph., cannot be produced by a simple stereochem. transformation. The rearrangement of β -I in MeOH at 25° is strictly monomol. and *k* (av. value 0.0050) shows no drift; the velocity of the rearrangement is about 10 times smaller and the temp. coeff. (2.31 for 25–35°) only slightly higher than for the auto-racemization of II. The nitrates (III) corresponding to the I undergo no rearrangement in any solvent, showing, in analogy with the optical behavior of II, that the presence of a halogen as anion is necessary for rearrangement. Both the rearrangement of the I and the racemization of the II are reactions which proceed spontaneously with liberation of energy; the influence of the different solvents is exerted exclusively on the velocity of these reactions and can therefore be included in the large class of contact or catalytic processes. As the individual salts (even those belonging in a homologous series) show a sp. behavior towards I and the same medium, no generalization as to the action of the solvent can, as a rule, be deduced. The betaines obtained from menthyl *N*-alkyltetrahydroquinolinium iodide acetates by a kind of auto-sapon., whereby the menthyl group is split off, leaving a betaine with a + or – rotation depending on whether the original substance was of the type (N + C –) or (N – C –), lose this rotation even in Me₂CO but markedly less rapidly than in alc.; they are the only N-active compds. which undergo racemization without contg. halogen. β -I, $[\alpha]_D$ –18.45° (Me₂CO), does not change in MeOH. α -I, $[\alpha]_D$ –39.25° (Me₂CO), changes in MeOH to about the value for β -I, and on evapn. the residue, m. 161°. Mol. wt. of α -I in freezing *p*-toluidine 480.0, of β -I, 529.0. β -III, m. 153–5°, $[\alpha]_D$ –20.3° (MeOH); α -III, m. 125–7°, $[\alpha]_D$ –66.0° (C. A. R.

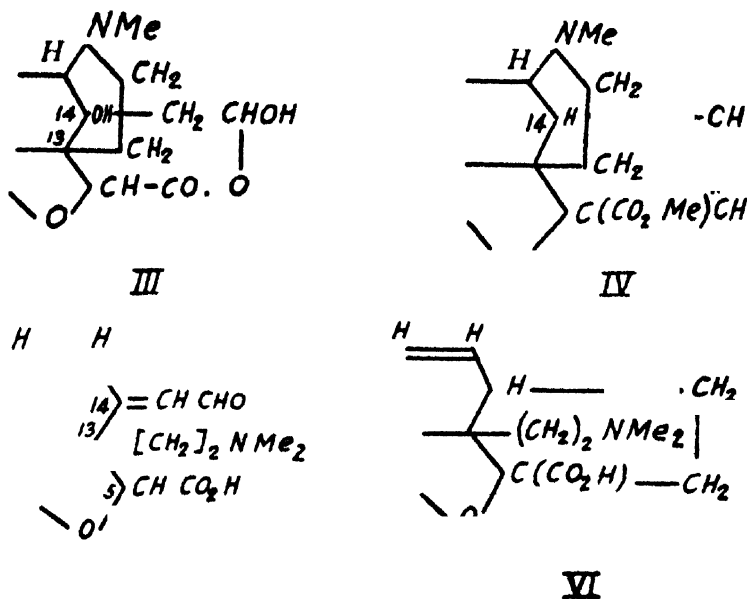
Mercury derivative of isoquinoline. II. T. UKAI. Kumamoto Pharm. Coll. *J. Pharm. Soc. Japan* 48, 877–8(1928).—In paper II (C. A. 22, 3166), it was stated that the chloromercuriisoquinoline (I) obtained by the action of Hg(OAc)₂ on isoquinoline probably has its –HgCl group in position 5 or 8. A further study, however, showed that this is not the case. I and a calcd. amt. of Br, gave a monobromoisoquinoline (II), which was isolated as the HNO₃ salt, m. 179°. The free base, m. 40°. II was proven to be the *py*-bromoisoquinoline of Edinger and Bossing (*J. prakt. chem.* 43, 191) showing that the –HgCl group is on the pyridine nucleus. NAO UYEI

Morphine alkaloids. VI. Thebaizone and other product of ozonolysis. HEINRICH WIELAND AND LYNDON F. SMALL. Bayr. Akad. der Wissenschaften, Munchen. *Ann.* 467, 17–52(1928).— α -Thebaizone (I), obtained by the ozonolysis of thebaine has formula I if the Schopf-Robinson formula for thebaine is accepted; concd. H₂SO₄

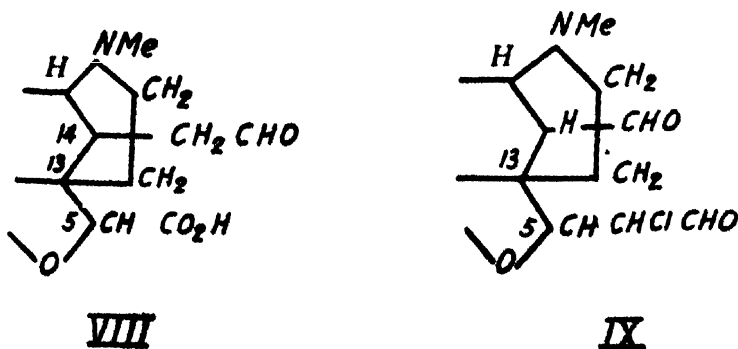


produces a deep red halochromism; the color disappears on diln. with H₂O; in HCl, I reacts with *p*-O₂NC₆H₄NHNH₂, giving an amorphous yellow ppt., sol. in NaOH with a red color. The neutral soln. of I in dil. HCl or a suspn. of I in H₂O is colored with fuchsin-H₂SO₄ but no color reaction occurs in a slight excess of HCl; the color is destroyed by addn. of 0.1 N NaOH and by excess of I. I also reduces NH₄OH-AgNO₃ in the cold. NH₂OH gives an amorphous ppt., sol. in H₂O and giving a color reaction with FeCl₃, which appears to be a hydroxamic acid. The III salt of I, m. 185–7°; the HCl salt ppts. from a 4 N HCl soln. I and Br in dil. HCl give a yellow perbromide, converted by excess Na₂CO₃ into the Br deriv. of I, m. 147°, the Br probably entering the ring x. I and 30% H₂O₂ in AcOH, 48 hrs. in the cold, give thebaizonedicarboxylic acid, m. 189–90° (decomph.), the ester group being hydrolyzed. Hydrolysis of I with 0.334 N Ba(OH)₂ in the cold gives 50% of thebaizonic acid (II), decomps. 235°; this shows the usual aldehyde reactions with fuchsin-H₂SO₄ and

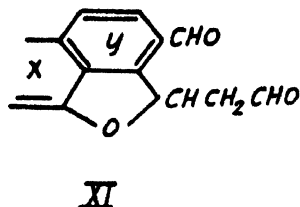
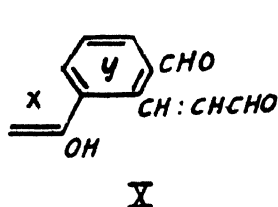
$\text{AgNO}_3\text{-NH}_4\text{OH}$; reduction with Al-Hg gives an amorphous product which shows neither acid nor aldehyde reactions. CH_3N_3 reacts with the acid but not with regeneration of I. I and concd. HCl , heated 1 hr. at $95\text{--}8^\circ$, give the HCl salt, m. 210° (decompn.) (also obtained by the action of excess N HCl on II), of *hydroxydihydrothebaizonic acid* (III), decomp. $230\text{--}40^\circ$, the free acid being liberated by MeOH-MeONa , while TIOH gives the compd. $\text{C}_{18}\text{H}_{23}\text{O}_7\text{N}$, decomp. $231\text{--}5^\circ$, contg. an addnl. mol. of HCl and yielding an HCl salt, decomp. 260° . Catalytic reduction of I with Pt oxide in MeOH opens the O bridge, leaving the 8-14 double linking unattacked, and yields the phenolic deriv. *dihydrothebaizone*, m. about 140° , giving a brown color with FeCl_3 and the aldehyde reaction with fuchsin- H_2SO_3 ; the *methiodide*, m. $239\text{--}40^\circ$ (decompn.), whose *Ac* deriv. decomp. 250° . Reduction of I with Al-Hg in moist Et_2O gives 67% of *desoxythebaizone* (IV), m. 147° (decompn.) (also obtained in poor yield with Zn and HCl), which retains the O bridge but has no aldehydic properties. IV is reduced catalytically after hydrolysis with N HCl to *dihydrodesoxythebaizonic acid*, m. $163\text{--}5^\circ$ (decompn.), isolated as the HCl salt, m. $236\text{--}7^\circ$ (decompn.). The Hofmann degradation of the methiodides of these various compds. has been investigated. I yields a *methiodide*, decomp. $250\text{--}5^\circ$; TIOH gives *des-N-methylthebaizonic acid* (V), amorphous, whose *methiodide* decomp. $250\text{--}5^\circ$ and HCl salt m. 270° (decompn.). The *methiodide* of III, m. 163° (decompn.), eliminates only MeOH on treatment with alkali, since treatment with MeI gives the original methiodide. Reduction of IV with Pt oxide in MeOH gives a yellow oil; MeI gives *dihydrodesoxythebaizone-MeI*, m. $175\text{--}7^\circ$, crystallizes from H_2O with 1 H_2O ,



m. $148\text{--}52^\circ$; with TIOH this yields *des-N-methyldihydrodesoxythebaizonic acid* (VI), m. $195\text{--}7^\circ$ (decompn.), which crystallizes with 2 H_2O and yields a *methiodide*, crystg. with 1 H_2O and m. $156\text{--}8^\circ$. Dihydroxydesoxythebaizonic acid, heated with MeI , gives a compd., $\text{C}_{37}\text{H}_{48}\text{O}_8\text{N}_2\text{I}\cdot\text{H}_2\text{O}$, m. $217\text{--}8^\circ$ (decompn.), which, by decompn. with TIOH and further treatment with MeI , yields the simple *methiodide*, m. $167\text{--}8^\circ$ (decompn.). By short heating at 200° , I is converted into β -thebaizone (VII), m. 151° (probably stereoisomeric about the 8-14 double linking), which yields the same IV by



reduction with Al-Hg but by reactions similar to those applied to I it yields *hydroxy-dihydro-β-thebaizonic acid*, m. 230° (decompn.), whose HCl salt decomp. 280°; *EtH ester*, decomp. 220°. The action of O₂ upon VII in dil. HCl yields *isodihydrothebaizonic acid* (VIII), m. 248-9° (decompn.) (HCl salt, decomp. 130°; *methiodide*, m. 179-80°), and *isodihydrothebaizone*, m. 103-5° (*methiodide*, m. 147-8° (decompn.)). Reduction of VIII with H and Pt oxide in H₂O gives the *tetrahydro deriv.*, m. 230-5° (decompn.). The action of O₂ on chlorocodide yields *chlorocodizone* (IX), m. 104°, whose HCl salt m. 212° (decompn.) and whose *methiodide* is oily; reduction with Zn and AcOH gives *deoxycodizone*, m. 161°; HCl salt, m. 223-4° (decompn.). The action of hot MeOH-KOH on IX for 15 min. yields *anhydrocodizone*, m. 110°; longer treatment (1 hr.) yields 2 N-free substances, C₁₅H₁₂O₄, m. 88° and 159°, for which the structures X and XI are suggested, the phenol yielding a *Me ether*, m. 105-8°. Alc. AcOK converts IX into a substance C₂₈H₁₉O₂N, m. 189°.



C. J. WEST

Synthesis of berberine-like bases from compounds of the type of tetrahydropapaverine. ERNST SPATH AND ERICH KRUTA. Univ. Wien. *Monatsh.* 50, 341 (1928). —Condensation of tetrahydropapaverine with methylal and HCl according to Picot and Chou (C. A. 10, 1191) yields 46% of norcoralydine (I), m. 151.5-2.5° (P and C give 80-5% yield and a m. p. of 157-8°); using twice the calcd. amt. of HCHO there results 69% of I. Tetrahydropapaveroline and HCHO give a product, which, after treatment with CH₂N₂ in MeOH, yields 15% of a mixt. of about equal amts of I and tetrahydropalmatine.

C. J. WEST

Chemistry of natural resins and resin acids. FR. BALÁŠ. Charles' Univ., Prague. *Časopis Československého Lékárnictva* 7, 320-38 (1927); 8, 6-8, 27-31, 47-50 (1928). —The following compds. were isolated from the oleoresin of *Pinus palustris*: cryst. C₂₁H₃₄ (probably heptacosane) in 0.7% yield, m. 60°, b₁₂ 270°, b_{0.4} 197.5°, d₄²⁰ 0.7729, [α]_D 0; a tricyclic diterpene, C₂₀H₃₂, b₁₂ 192-5°, n_D¹⁸ 1.5106, [α]_D 8.4° (in 0.6% CHCl₃ soln.); a diterpene alc., C₂₀H₃₄O; a resene, a fragile, amorphous mass, m. 117°, [α]_D +16.1° (in 2% CHCl₃ soln.), mol. wt. 798-830; *d*-pimaric acid (I), m. 213°, [α]_D 79.3° (in 0.57% EtOH soln.); *l*-pimaric acid (II), m. 150°, [α]_D -280.4° (in 1% EtOH soln.); amorphous acids ("sapin acids"), m. about 100°, [α]_D -10.7° (in 1% EtOH soln.). From the oleoresin of *Pinus maritima* the following compds. were isolated, cryst. C₂₁H₃₄, m. 68.5° (probably hentriacontane); a bicyclic sesquiterpene, C₁₅H₁₄, b₁₂ 120-3°, n_D¹⁷ 1.5011, [α]_D 8.8° (from this were prepd. a nitrosochloride, m. 166.7° (decompn.), and a nitrosate, m. 165°); a bicyclic sesquiterpene alc., C₁₅H₂₀O, b₁₂ 133-8, d₄^{19.6} 0.9695, n_D^{19.6} 1.5071; a tricyclic diterpene, C₂₀H₃₂, b₁₂ 188-92°, d₄^{21.6} 0.9576, n_D^{21.6} 1.5252; a diterpene alc., C₂₀H₃₄O; resene, m. 112°, [α]_D 5.2° (in 2% CHCl₃ soln.), mol. wt. approx. 825. I adds 1 mol. of Br₂; on further bromination it yields HBr. I yields a nitrosite, C₂₀H₃₀O₂N₂, m. 79-80° (decompn.), and an alc., *d*-pimarol, C₁₅H₂₀CH₂OH, m. 93°, [α]_D 96.5°; the latter on hydrogenation yields dihydro-*d*-pimarol, C₁₅H₂₂CH₂OH. Dry HCl acting on I in glacial AcOH causes no isomerization but yields 3 well defined mono-HCl salts, m. (decompn.) 232°, 184° and 125°, resp. Oxidation of I with alk. KMnO₄ yields chiefly 2 isomeric dihydroxy-*d*-pimaric acids, C₂₀H₂₈(OH)₂CO₂H, m. (decompn.) 239° and 224° resp.; the latter yields diacetate, m. 235°. The "oleosylvic acid" isolated by Schulz from the oleoresin of *Pinus palustris* consists of a mixt. of I and abietic acid (III). Mixts. of I and III may be separated (1) by fractional crystn., (2) by means of their NH₄ salts, (3) by fractional (4) by fractional crystn. of the salts formed with org. bases. Contrary to reports, II is easily oxidized by atm. O₂ in daylight. A dibromide, m. 108°, was obtained from II, but this may be a deriv. of III, formed by isomerization. II Me ester, m. 64° [α]_D -233.5° (in 4.5% MeOH soln.), d₄²² 1.0387, n_D²² 1.5243; Et ester, b_{0.4} 182-4°, d₄^{18.6} 1.0189, n_D^{18.6} 1.5196; iso-Pr ester, b_{0.4} 202-3°, d₄²⁰ 1.0242, n_D²⁰ 1.5239; iso-Am ester, b_{0.4} 205-6° d₄²¹ 1.0066, n_D²¹ 1.5195. I Et ester, m. 53°, [α]_D 60.25° (in 2% in 1

EtOH soln.), $d_4^{18.5}$ 1.0149, $n_D^{18.5}$ 1.5134. III Me ester, $b_{0.2}$ 167–9°, d_4^{22} 1.0370, n_D^{22} 1.5263; Et ester, $b_{0.2}$ 170–4°, d_4^{20} 1.0223, n_D^{20} 1.5250. Me dihydro-*l*-pimarate, m. 88°, $[\alpha]_D$ 30.80° (in 1.2% MeOH soln.). Dihydroabietic acid; Me ester, $b_{0.1}$ 180°, $d_4^{17.5}$ 1.0314, $n_D^{17.5}$ 1.5169. Tetrahydro-*l*-pimaric acid; Me ester, m. 99°, $[\alpha]_D$ 13.45° (in 0.8% MeOH soln.); Et ester, $b_{0.2}$ 168–70°, $[\alpha]_D$ 10.85° (in 1.3% EtOH soln.), d_4^{19} 1.0029, n_D^{19} 1.5002. Tetrahydroabietic acid; Et ester, $b_{0.4}$ 178–80°, $[\alpha]_D$ 14.31° (in 1.0% EtOH soln.), d_4^{19} 1.0001, n_D^{19} 1.5002. The refractivities of the non-hydrogenated acids indicate the presence of 2 double bonds; hydrogenation causes considerable depression of the mol. refractivities. The action of glacial AcOH satd. with HCl upon dihydroabietic acid (m. 145°) at room temp. yields no HCl salt, but does yield an isomeric acid, m. 180°, $[\alpha]_D$ 120.6°, which shows satn. toward Br₂ and KMnO₄ and does not yield retene on dehydrogenation with S. The cryst. acid, C₂₀H₃₀O₂, of sandarac (called sandaracopimaric acid by Tschirch and Wolff) is optically active ($[\alpha]_D$ –18.8° in 1.6% EtOH soln.).

WILLIAM J. HUSA

Phlorhizin and quercitrin. GÉZA ZEMPLÉN, ZOLTÁN CSÜRÖS, ÁRPÁD GERECs AND STEFAN ACZÉL. Tech. Hochschule Budapest. *Ber.* 61B, 2486–97(1928).—From the work of many investigators phlorhizin (I) has been assigned the structure 3,5,2-(HO)-*p*-HOC₆H₄CH₂CH₂CO)C₆H₄OC₆H₁₁O₆, only the position of the glucose residue being arbitrary; no proof has as yet been brought forward that this residue is in the *o*- and not the *p*-position to the C:O group. Fischer and Nouri synthesized the aglycone, phloretin (II), from phloretinic nitrile, *p*-HOC₆H₄CH₂CH₂CN (III), and phloroglucinol (IV), but the yield was poor and moreover they used, to obtain the III, a phloretinic acid (V) prepd. by the cleavage of I with Ba(OH)₂. Wishing to synthesize I from materials not derived from I itself, the authors attempted to *p*-nitrate PhCH₂CH₂CO₂H (VI) directly but found it considerably more practical to convert VI into the nitrile by the Ph(CNS)₂ method, nitrate this to *p*-nitrophenylpropionitrile (VII), reduce VII with Sn and HCl to the amino compd. (VIII) and decomp. the diazonium salt of VIII. The resulting III was treated with IV and dry HCl and the ketimide-HCl thus obtained was decompd. with H₂O, giving II. All attempts to condense III in the same way with tetraacetylphlorin (IX) or II with acetobromoglucose (X) failed. In the last case the isolation of a glucoside is rendered difficult by the fact that the X has 3 free HO groups in II with which it can react so that several isomers may be formed and thus interfere with the crystn. of the products. On treating heptaacetylphlorhizin (XI) with AcOH HBr at room temp., however, it is decompd. into X and triacetylphloretin (XII), which has only 1 free HO group, presumably at the same position where the glucose residue was previously attached, but all attempts to condense XII and X, with elimination of HBr, failed; the rotatory power of the reaction mixts. pointed, to be sure, to the presence of a *l*-rotatory substance but in no case could I be isolated. Heptaacetylquercitrin (XIII) with HBr-AcOH gave acetobromorhamnose and a tetraacetylquercetin (XIV) which with X in the presence of quinoline and Ag₂O yielded an acetylated quercetin glucoside XV; this from its synthesis should be identical with the Ac deriv. of isoquercitrin but it has not yet been possible to isolate the free glucoside. Ph-CH₂CH₂CN (1.8 g. from 10 g. VI), b. 132–5°; 13.1 g. slowly added to cold HNO₃ (d. 1.48) gives 10.2 g. VII, m. 79.5°. VIII (6.9 g. from 88 g. VII), yellowish oil, 6 g of which gives 1.4 g. III. XI (about 16 g. from 10 g. I with Ac₂O and NaOAc or C₆H₅N), colorless powder, $[\alpha]_D$ –41.33° (CHCl₃), –35.86° (alc.), reducing power after sapon. with alc. alkali and hydrolysis with boiling 5% HCl = 18.22% glucose. XII (6 g. from 18 g. XI), m. 188.9°. XIII (155 g. from 100 g. quercitrin with Ac₂O-NaOAc), powder, $[\alpha]_D^{24}$ 165.6° (CHCl₃), reducing power after hydrolysis = 23.5% glucose. XV (7 g. from 6.2 g. XIV), $[\alpha]_D$ –30.1° (alc.), reducing power before hydrolysis = 19%, after hydrolysis 35.79% glucose (another prepn., extd. with boiling H₂O and pptd. from AcOH with H₂O had a reducing power = 10.87% glucose before hydrolysis and showed $[\alpha]_D$ –28.3° (alc.), –38.5° (CHCl₃)).

C. A. R.

Chrysanthemin and asterin. ROBERT ROBINSON AND RICHARD WILLSTÄTTER. *Ber.* 61B, 2503–4(1928).—The chrysanthemin and asterin which had been isolated from *Chrysanthemum indicum* L. and *Aster chinenensis* L., resp., differed somewhat in properties (dy. in alc. and in dil. acids, cryst. form, etc.) but, as has been found in numerous cases, traces of impurities suffice to materially influence the soly. relations and cryst. forms of anthocyan derivs. R. and W. have now been able to obtain asterin in purer form than before and they find it is identical in all respects with chrysanthemin.

C. A. R.

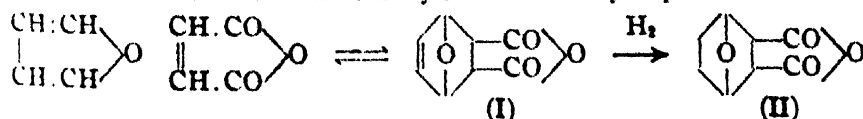
Remarks on the communication of T. Malkin and M. Nierenstein. "Cyanidin."

groups undergo change to the lactam structure. The failure of ring III to rearrange is a property common to numerous other bile acids, in some of which ring I has been opened up by oxidation. It is now shown that those derivs. with an oxime group on ring III give a blue color with HNO_3 , while those without an oxime in this position give only a yellow or brown color. Furthermore, the failure of the oxime in ring III to rearrange is shown by the fact that NH_2OH can be split off by hydrolysis, whereas the lactam structures in rings I and II of the isoximes yield no NH_2OH . A. W. DOX

Amyrins. I. Dehydrogenation of amyrin. OTTO BRUNNER. Univ. Wien. *Monatsh.* **50**, 284-90(1928).—The mixt. of the 2 isomers was used, since isomerism probably disappears on dehydrogenation. When heated with S a violent reaction takes place with foaming and carbonization; dehydrogenation takes place smoothly by heating with Pd charcoal at 290° for 100 hrs. and finally at 320° for 24 hrs. The fraction, b_{12} $120-50^\circ$, yields a picrate, m. $131-2^\circ$, of an oily hydrocarbon (C 91.43, H 9.20, mol. wt. 179); the fraction, b_{12} $150-90^\circ$, yields a picrate of a hydrocarbon, m. 87° (C 90.97, H 10.36, mol. wt. 197). The higher-boiling fractions yielded no cryst. compd. C. J. WEST

Ergosterol of yeast. III. FRITZ REINDEL. Tech. Hochschule, München. *Ann.* **466**, 131-47(1928); cf. *C. A.* **22**, 1593.—(With H. WASENEGGER.) The Bz deriv. of α -ergosterol (I) m. $118-20^\circ$ (not $130-1^\circ$ as previously reported). Oxidation with CrO_3 in AcOH at 70° gives 1.1 g. α -ergosterone (II) from 2 g. I; II, m. $131-3^\circ$, $[\alpha]_D^{25}$ 38.8° (c 6.2, CHCl_3); the phenylhydrazone, m. $127-8^\circ$ (decompn.), and oxime are difficult to cryst.; II is best characterized by the ketazine, m. 225° . A by-product of II is the compd., $\text{C}_{28}\text{H}_{48}\text{O}_3$, m. $219-21^\circ$ (see below), benzylidene deriv. of II, m. 162° . Reduction of II in Et_2O or AcOH with H and Pt gives I. Passing dry HCl into II in CHCl_3 for 0.5 hr. gives β -ergosterone, m. $149-51^\circ$, $[\alpha]_D^{25}$ 37.1° (CHCl_3 , c 1.051); oxime, m. $214-6^\circ$; no condensation product was obtained from BzH. (With A. DETZEL.) Oxidation of allo- α -ergostanol (III) in AcOH with CrO_3 at 90° gives 34% of allo- α -ergostanone (IV) and 26% of a dicarboxylic acid, $\text{C}_{27}\text{H}_{48}\text{O}_4$, m. $217-9^\circ$, α_D 22.8° (CHCl_3 , c 1.754); di-Me ester, m. $81-3^\circ$. Heating the acid at 265° for 3 hrs. gives 71% of a ketone, $\text{C}_{27}\text{H}_{48}\text{O}$, m. $125-6^\circ$, $[\alpha]_D^{25}$ 107.7° (CHCl_3 , c 2.91); oxime, m. $215-6^\circ$. Reduction of IV with Pt and H gives a mixt. of III and a sterol, $\text{C}_{27}\text{H}_{48}\text{O}$, m. $206-7^\circ$, not pptd. by digitonin, $[\alpha]_D^{25}$ 4.04° (CHCl_3 , c 4.21); Ac deriv., m. $144-5^\circ$. (With A. FRÖHLICH.) Oxidation of I in hexahydrotholuene with KMnO_4 gives the compd., $\text{C}_{28}\text{H}_{48}\text{O}_4$ or $\text{C}_{28}\text{H}_{46}\text{O}_4$ (V), m. $199-201^\circ$, $[\alpha]_D^{25}$ -24.4° (CHCl_3 , c 2.088), which contains 3 active H; di-Ac deriv., m. $148-52^\circ$, α_D 5.46° (CHCl_3 , c 2.382), which contains 1 active H. Di-*p*-nitrobenzoyl deriv., m. 197° (decompn.); on sapon. this gives the compd., $\text{C}_{28}\text{H}_{40}\text{O}_3$ or $\text{C}_{28}\text{H}_{38}\text{O}_3$, m. $217-8^\circ$, catalytically reduced to a compd., m. $131-2^\circ$ (4H_2). Catalytic reduction of V gives the compd., $\text{C}_{28}\text{H}_{48}\text{O}_3$ or $\text{C}_{28}\text{H}_{46}\text{O}_3$, m. $235-8^\circ$, whose di-*p*-nitrobenzoyl deriv., m. 212° (decompn.), from which the original compd. is regenerated on sapon. Oxidation of the acetate of I gives the compd., $\text{C}_{27}\text{H}_{44}\text{O}_4\text{Ac}$, m. $174-5^\circ$. C. J. WEST

Constitution of cantharidin. F. V. BRUCHHAUSEN AND H. W. BERSCH. Univ. Münster. *Arch. Pharm.* **266**, 697-702(1929).—After reference to Gadamer's work on the constitution of cantharidin, expts. are described looking to the synthesis of this compd. and a clearer view of its constitutional make-up. Taking advantage of some recent work by Diels and Adler (cf. *C. A.* **21**, 1813) relative to the condensation between conjugated double-bonded compds. and those possessing a single double bond, the authors condensed furan with maleic anhydride to a dehydropotocantharidin:



which on reduction with Pd charcoal in a special app. under pressure yielded a product (II) standing in close genetic relationship to cantharidin, since it is shown that the latter on heating at about 280° with Pd asbestos decomps. in part into furan and maleic anhydride. The product (dehydropotocantharidin) Δ -4-3,6-endoxotetrahydrophthalic anhydride, $\text{C}_8\text{H}_6\text{O}_4$, m. 118° , is obtained quant. by the above indicated condensation. While crystallizable from both AcMe and alc., long heating with the latter is inadvisable owing to the possibility of ester formation. On continued fusion at 130° furan escapes, finally leaving a residue of maleic anhydride. Reduction with H under pressure leads to the formation of 3,6-endohexahydrophthalic acid, $\text{C}_8\text{H}_{10}\text{O}_6$, m. $117-20^\circ$ (loss of H_2O and formation of the anhydride, $\text{C}_8\text{H}_8\text{O}_4$). W. O. E.

Cleavage of phenolsulfonic acids and the purification of phenols by the sulfonic acid separation method (BRÜCKNER) **21**. Complex compounds of Au with mercaptanic

radicals. II. Residual affinities of chlorauric acid (RAY, BOSE-RAY) 6. Bismuth in pharmacy and chemistry. III. Organic Bi compounds (DYSON) 17. Theory of partial polarity of the ethylene bond and the existence of electro-isomerism (KHARASCH, DARKIS) 2. Optical properties of As (GRYSZKIEWICZ-TROCHIMOWSKI, SIKORSKI) 2. Concentrated solutions theory. VI. Application of thermic analysis to the determination of freezing curves of binary mixtures of organic compounds melting at low temperature (TIMMERMANS) 2. Effect of neutral salts on the rotary power of tartaric acid and of the tartrates (DARMOIS) 2. Equilibrium of the esterification reaction in the liquid phase (POZNANSKI) 2. Autoxidation of BzH (KUHN, MEYER) 2. Reactions of alkaline molybdates on malic and tartaric esters (DARMOIS) 6. Pseudo halogens. III. Tricyanomethyl and Br tricyanomethylide (BIRKENBACH, HUTTNER) 6. Essential oils (SCHIMMEL & Co.) 17. Action of x-rays on CHCl_3 and similar compounds (GÜNTHER, *et al.*) 3. Electrochemical preparation of anthranilic acid (ALVAREZ) 4.

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KEHRMANN, F.: Gesammelte Abhandlungen. Vol. V. Leipzig: Georg Thieme 321 pp. Unbound. M. 30. Reviewed in *J. Am. Chem. Soc.* 51, 644(1929).

WILLIAMS, ROGER J., and BREWSTER, RAY Q. A Laboratory Manual of Organic Chemistry. New York: D. Van Nostrand Co., Inc. 156 pp.

Sodium potassium bismuth tartrate. CHEMISCH-PHARMAZEUTISCHE A.-G. BAD HOMBURG. Ger. 469,554, July 26, 1923. A complex tartrate of the formula $\text{C}_{12}\text{H}_8\text{O}_{20}\text{Na}_2\text{K}_2\text{Bi}_2$ is prep'd. by dissolving 2 mols. of freshly pptd. $\text{Bi}(\text{OH})_3$ in a conc'd aq. soln. contg. 1 mol. each of Na and K bitartrates and Na K tartrate. The product is crystd. out or pptd. by addn. of org. solvents.

Hydrocarbon synthesis. I. G. FARBERIND. A.-G. Brit. 293,572, July 13, 1927. Mixts. comprising C oxides and H, preferably under pressure, at elevated temps., are passed over a catalyst contg. Fe or Co, at a velocity less than that required for producing liquid hydrocarbons; olefinic gases may thus be formed. Examples are given of the use of Ni-Cr and Fe-Ag alloys as catalysts.

Polymerizing olefins. F. HOFMANN and M. OTTO. Brit. 293,487, April 8, 1927. See Fr. 632,768 (*C. A.* 22, 3417).

Alkylene oxides. T. GOLDSCHMIDT A.-G. Brit. 293,763, July 11, 1927. A chlorohydrin soln. and an alkali or alk. earth soln. or suspension are passed continuously through a still along a path of considerable length which may be provided by baffles in the still. An app. is described.

Reduction of oxides of carbon. I. G. FARBERIND. A.-G. Fr. 643,784, Nov. 12, 1927. Org. O compds., alone or mixed with hydrocarbons, are obtained by reducing oxides of C under reduced, ordinary or slightly raised pressure at a temp. below 300° and using as catalyst Fe to which small quantities of alkalis or alk. earths or their compds. are added. Examples are given in which Fe oxide wetted with KOH or NaOH soln. is reduced with H, and a mixt. of CO and H contg. 40% of H is passed over it at 200° . A brownish yellow oily liquid contg. 10% of O and an aq. soln. having an acid reaction are obtained.

Monocyclic ketones. LEOPOLD RUZICKA (to M. Naef & Co.). U. S. 1,702,842, Feb. 19. In the prepn. of monocyclic ketones having more than 9 ring members, such as 3-methylcyclopentadecanone, Zr salts of polymethylene dicarboxylic acids, having more than 10 C atoms in a normal chain, the COOH groups of which are linked to the end C atoms, such as 3-methyltetradecane-1,14-dicarboxylic acid, are heated (suitably *in vacuo* at $300-500^\circ$). U. S. 1,702,844 specifies the use, instead of Zr salts, of salts of metals such as Al belonging to the third group of the periodic system. U. S. 1,702,843 specifies heating Ti salts. U. S. 1,702,845 specifies similar use of Yt salts. U. S. 1,702,846 specifies use of La salts. U. S. 1,702,847 specifies use of didymium salts. U. S. 1,702,848 specifies similar use of salts of rare earth metals such as those of erbium and Ce. U. S. 1,702,849 specifies uranyl salts. U. S. 1,702,850 specifies prepn. of alkyl derivs. of like monocyclic ketones by heating the Th salts of alkyl derivs. of the polymethylene dicarboxylic acids. U. S. 1,702,851 specifies like use of salts of metals belonging to the fourth group of the periodic system such as salts of Ce. U. S. 1,702,852 specifies heating Ce salts of the dicarboxylic acids to form the monocyclic ketones.

Solid diazo compounds. I. G. FARBERIND. A.-G. Fr. 644,563, Oct. 4, 1927. Monodiaz compds., obtained from *p*-aminoazo compds. not contg. sulfonic or car-

boxylic groups, but contg. an alkyloxy, aralkyloxy, or aryloxy group in the position *o*- to the amino group, are sepd. in the solid form as halides, sulfates, or metallic or arylsulfonic double salts. In examples, NaCl is added to the diazonium chloride obtained by diazotizing *p*-nitrobenzeneazo-3-amino-4-methoxy-1-methylbenzene. The diazonium chloride isolated in cryst. form is washed and dried. KBr is added to diazotized *o*-chlorobenzeneazo-2-amino-1,4-dimethoxybenzene. The diazonium bromide is obtained. Several other examples are given. Cf. C. A. 23, 614.

Alcoholates. CORNELIS DELSMAN. Dutch 18,941, Nov. 15, 1928. Multivalent alcoholates of alkali metals (glycolates, etc., no sucates) are prepd. by evapn. at reduced pressure of the aq. soln. of alc. and the alkali metal hydroxide.

Aminophenol derivatives. WILHELM TRAUBE and EMIL HELLRIEGEL. Fr. 643,724, Nov. 10, 1927. *N*-alkylated aminophenols are prepd. by desulfurizing thioureas of aminophenols, transforming the hydroxyarylcyanamides obtained or their alkali metal salts, either alone or in the presence of solvents with alkylating agents, and sepg. in known manner the cyanogen group from the hydroxyarylalkylcyanamides obtained. In examples, *p*-aminophenol hydrochloride is heated in aq. soln. with KCNS in excess, whereby *p*-thiocarbamidophenol is produced, which is dissolved in KOH soln. and heated with lead acetate. PbS is pptd., and *p*-hydroxyphenylcyanamide, m. 265° is pptd. on neutralization. This compd. is alkylated by CH₃I or Me₂SO₄, the Me group becoming attached to the N. The CN group is removed by heating with 10–20% H₂SO₄ or HCl. The Et compd. is prepd. similarly. *m*-Hydroxyphenylthiourea is desulfurized with oxide of Pb, giving *m*-hydroxyphenylcyanamide, m. 137°, which is further treated as described above. Cf. C. A. 22, 3170.

Guanidine derivatives. SCHERING-KAHLBAUM A.-G. Ger. 466,879, Aug. 5, 1925. Addn. to 463,576. It is found that the method of Ger. 463,576 (C. A. 22, 4130) for the manuf. of aminoguanidines yields alkylene diguanidines when applied to the higher diamines. Examples are given describing the prepn. of (1) hexa- and deca-methylenediguanidine sulfate from methylisothiourea sulfate and NH₂(CH₂)₆NH₂ and NH₂(CH₂)₁₀NH₂, resp., and (2) *N,N'*-diethylethylenediguanidine from *S*-methylisothiourea hydrochloride and EtNHCH₂CH₂NHEt.

Diisopropyl derivatives. I. G. FARBENIND. A.-G. Brit. 293,703, July 7, 1927. Diisopropylbenzaldehyde is made by treating diisopropylbenzene with CO₂ in the presence of AlCl₃ and Cu₂Cl₂, with or without gaseous HCl; or by treating cuminic aldehyde with isopropyl chloride dissolved in CS₂ in the presence of AlCl₃; or by treating cuminol with CO₂ in the presence of AlCl₃ and Cu₂Cl₂. Reference is also made to the production of diisopropylacetophenone and isopropyl hydratropic aldehyde. Diisopropylbenzalacetone is made by alk. condensation of acetone with isopropylbenzaldehyde. Diisopropylbenzoic acid is made by oxidizing the corresponding aldehyde and its esters also may be prepd. Diisopropylbenzyl alc. is made by "chemical or catalytic" reduction of the aldehyde and its acetate is made by acetylation. Diisopropyl cinnamic aldehyde and its homologs are made by condensing diisopropyl benzaldehyde with acetaldehyde and its homologs and the corresponding hydrocinnamic aldehydes also may be made. Various of these products may be used as *perfumes*.

Derivatives of arsine oxides. ÉTABLISSEMENTS POULENC FRÈRES, and CARL OETSCHLIN. Fr. 643,911, Apr. 15, 1927. Org. arsine oxides are treated with S. compds. in which the S is joined directly to a C atom. In examples, aminophenylarsine oxide in NaOH soln. is mixed with an NH₃ soln. of thioglycolamide. The compd. obtained on neutralizing is NH₂C₆H₄As(SCH₂CONH₂)₂. If thioethanol is used, NH₂C₆H₄As(SCH₂CH₂OH)₂ is obtained. If K xanthogenate is used, NH₂C₆H₄As(SSCOC₂H₅)₂, m. 85°, is obtained. Hydroxyaminophenylarsine oxide and thioglycolamide give *m*-NH₂*p*-OHC₆H₃As(SCH₂CONH₂)₂. *p*-Hydroxy-*m*-acetylaminophenylarsine oxide and glycerol-monothiol give CH₃CONH(OH)C₆H₃As(SCH₂CH(OH)CH₂OH)₂. *p*-Hydroxy-*m*-acetylaminophenylarsine oxide and K-xanthogenate give *m*-CH₃CONH(*p*-OH)C₆H₃As(SCSOC₂H₅)₂, m. 115°. Hydroxypropyldiarsine acid is reduced with SO₂ in the cold and monothioglycerol is added, giving (CH₂OHCH(OH)CH₂S)₂AsCH₂CH(OH)CH₂As(SCH₂CH(OH)CH₂OH)₂.

Derivatives of 2,3-hydroxynaphthoic arylides. BRITISH DYESTUFFS CORPORATION, LTD. (Joseph B. Payman and Harry Wignall). Fr. 643,954, Sept. 13, 1927. See U. S. 1,663,725 (C. A. 22, 1597).

Chlorine derivatives of 4-nitro-1,3-xylene. I. G. FARBENIND. A.-G. Fr. 644,573, Oct. 10, 1927. 2,6-Dichloro-4-nitro-1,3-xylene and the 2- and 6-monochloro compds. are obtained by treating 4-nitro-1,3-xylene with the required amt. of Cl in the presence or not of a solvent and a catalyst. In an example Cl is passed into 4-nitro-1,3-xylene contg. SbCl₅ or FeCl₃. The product which crystallizes first consists mainly of the 2-

chloro compd. and it may be sepd. from the 6-chloro compd. by fractional crystn. If the chlorination is continued the 2,6-dichloro compd. is obtained.

Furfuryl mercaptans. INTERNATIONALE NAHRUNGS-U. GENUSSMITTEL AKT. GES. Fr. 644,137, Nov. 17, 1927. See Brit. 286,152 (C. A. 23, 154).

Arseno compounds of the pyridine series. ARTHUR BINZ and CURT RÄTH. U. S. 1,702,334, Feb. 19. Therapeutic compds. are obtained by causing an As-contg. substance such as Na arsenite to react with the pyridine diazo compd. such as that of α -hydroxy- β '-amino-pyridine. The arsonic acid derived from the latter compd. forms colorless needles and decomposes at about 215° with foaming and charring. Purification may be effected in the case of the arsonic acids by reducing them to arseno compds. and then reoxidizing (suitably with H_2O_2). Cf. C. A. 22, 3668.

Hydrogenated naphthostyryls. I. G. FARBENIND. A.-G. Fr. 644,486, Nov. 25, 1927. Tetrahydronaphthostyryls are obtained by treating naphthostyryl, its homologs or substitution products, with H under pressure in the presence of a metallic catalyst. In an example 1,8-naphthostyryl in decahydronaphthalene is heated with H under 20 atm. in the presence of Ni. Large colorless crystals, m. 157°, are obtained, and by a second crystn. another compd., m. 164°, is obtained. The first compd. contains the addnl. H atoms in the 1, 2, 3 and 4 positions of the $C_{10}H_8$ nucleus where the CO is in the 1 position, and the second contains them in the 5, 6, 7 and 8 positions.

Aroylations and dye production. BRITISH DYESTUFFS CORP., LTD., H. M. RUMBURY and A. SHEPHERDSON. Brit. 293,924, April 26, 1927. Solns. for aroylating aromatic amino compds. are prepd. by interaction, in the presence of inert solvents of high b. p. such as $PhNO_2$, of an aromatic carboxylic acid such as benzoic acid with a compd. of the benzotrichloride type which forms the acid by hydrolysis. Examples are given of the production of benzoyl chloride, dibenzoyl-1,4-diaminoanthraquinone, dibenzoyl-4,4'-diamino-1,1'-dianthrime, and mono-benzoyl-1,4-diaminoanthraquinone.

Oxidizing aldoses to the corresponding monocarboxylic acids. CHEMISCHE FABRIK VORM. SANDOZ. Brit. 293,322, July 2, 1927. Oxidation of aldoses is effected by use of Cl and a small quantity of a Br or I compd. such as NaI or NaBr in the presence of aq. Na_2CO_3 and while maintaining the soln. just slightly alk. during the reaction. Examples are given of the treatment of lactose and glucose; the products may be sepd. as Ca lactobionate (double salt with $CaCl_2$) and Ca gluconate. Cf. C. A. 23, 606.

Arylthioglycolic acids. I. G. FARBENIND. A.-G. Fr. 644,319, Nov. 21, 1927. See Brit. 281,290 (C. A. 22, 3417).

Lactic acid. WILHELM KLAPPROTH. Fr. 644,314, Nov. 21, 1927. See Brit. 280,969 (C. A. 22, 3417).

Sulfonic acids. BRITISH DYESTUFFS CORP., LTD. and A. J. HAILWOOD. Brit. 293,781, April 12, 1927. *N,N*-Diarylsulfonylarylaminesulfonic acids are made by condensing arylsulfonic halides (2 mols.) with a sulfonated primary arylamine (1 mol.) or by condensing the *N*-monoarylsulfonylarylaminesulfonic acid with an equimol. proportion of an arylsulfonic halide. Examples are given of the condensation of Na sulfanilate with *p*-toluenesulfonic chloride in the presence of Na_2CO_3 and of the similar condensation of Na metanilate with *p*-toluenesulfonic chloride. The products may be used as *tanning agents* and as assistants in the prepn. of *dyes* and *pigments* in finely divided form.

Sulfonic acids. I. G. FARBENIND. A.-G. (Gerhard Balle and Karl Daimler, inventors). Ger. 469,482, Mar. 28, 1928. Addn. to 449,114. See Brit. 268,375 (C. A. 22, 1164).

Phthalic anhydride. ALPHONS O. JAEGER and FRANK A. CANON (to Selden Co.). U. S. 1,702,871, Feb. 19. The impurities in "oxidation phthalic anhydride" are selectively halogenated (suitably by use of MnO_2 and Cl) and the phthalic anhydride is then vaporized. Cf. C. A. 22, 4539.

Formaldehyde. I. G. FARBENIND. A.-G. Brit. 293,203, July 13, 1927. In making CH_2O from MeOH and air, the reagents are preheated separately by regeneration and then mixed at a temp. below the temp. of reaction. An app. is described. Cf. C. A. 23, 1142.

Acetaldehyde. HOLZVERKOHLLUNGS-INDUSTRIE A.-G. and O. FUCHS. Brit. 294,037, Nov. 14, 1927. In the catalytic oxidation of EtOH to produce acetaldehyde, the reaction products are dehydrated by cooling and then treated with an anhydrous (or substantially anhydrous) solvent for the acetaldehyde, e. g., EtOH which produces a mixt. which by adding a little inorg. acid and distg. yields diethyl acetal. Various other details and modifications are also described.

Hydrogen peroxide. OESTERREICHISCHE CHEMISCHE WERKE GES. Brit. 293,755, July 11, 1927. In concg. H_2O_2 soln. or distg. H_2O_2 from solns. of persulfuric acid or its

salts, the parts of the app. in contact with the heated liquid are formed of acid-resistant iron or similar metal and the parts in contact with the vapors are formed of ceramic materials, glass or silica. Various structural details of the app. are described.

Catalysts for the production of methanol, etc. THE IMPERIAL CHEMICAL INDUSTRIES LIMITED. Fr. 644,189, Nov. 21, 1927. Catalysts for the production of CH_3OH and other alcs. are prepd. by heating a mixt. of basic Zn and Cr carbonates. The mixt. may be obtained by pptn. of a soln. of Zn and Cr salts. The catalyst is preferably used as pellets. If alkali salts are present in the catalyst they are useful for the production of higher alcs. Cf. C. A. 23, 1227.

Thymol. RHEINISCHE KAMPFER-FABRIK GES. Brit. 293,753, July 11, 1927. *m*-Cresol is heated with propylene under pressure at a temp. below the decompn. temp. of thymol.

Thymol and menthol. SCHERING-KAHLBAUM A.-G. Brit. 293,874, July 15, 1927. See Can. 283,943 (C. A. 23, 611).

Chlorohydrins. T. GOLDSCHMIDT A.-G. Brit. 293,754, July 11, 1927. Olefins are converted into chlorohydrins by absorption in a stream of Cl water, preferably under pressure. An app. is described.

Benzonitrile and similar compounds. RALF B. TRUSLER (to Roessler & Hasselacher Chemical Co.). U. S. 1,702,711, Feb. 19. In the production of aryl cyanides, bromobenzene or other aryl halide whose substituent groups are inactive in the presence of the reaction materials under the prevailing conditions of the reaction, are reacted on with a metal cyanide such as AgCN in the presence of a catalyst comprising a bromide of Cu, Ni or Co.

Hydroxyaminobenzenes. I. G. FARBENIND. A.-G. Brit. 293,792, July 11, 1927. 4-Amino-1-hydroxybenzene and *N*-alkyl or hydroxyalkyl derivs. are formed by treating 4-amino-1-alkoxybenzene or the corresponding *N*-deriv. with H_2SO_4 . Examples are given of the treatment of 4-mono- and bishydroxyethylamino-1-ethoxybenzene, 4-amino-1-ethoxy- and methoxybenzene and 4-methylamino-1-ethoxybenzene. Cf. C. A. 23, 1143.

Oxyanthraquinones. H. W. HERWARD, J. THOMAS and SCOTTISH DYES, LTD. Brit. 293,328, Dec. 29, 1926. Aq. solns. of caustic alkalies are caused to act on β -alkyl- or β -carboxyanthraquinone, with or without an oxidizing agent such as NaClO_2 . Examples are given of the production of alizarin from β -carboxyanthraquinone and from β -methylantraquinone.

6,6'-Isopropylidenebis-*m*-cresol. SCHERING-KAHLBAUM A.-G. Brit. 293,863, July 14, 1927. 4,4'-Dimethyl-2,2'-dihydroxydiphenyldimethylmethane (which is obtained by condensation of *m*-cresol and acetone) is depolymerized by heating to about 250° or passing the heated vapor over a surface catalyst. The product may be fractionally distd. under reduced pressure.

Hexahydroaniline. I. G. FARBENIND. A.-G. Fr. 644,366, Nov. 22, 1927. See Can. 283,752 (C. A. 22, 4540).

***N*-Acetylarylsulfonamides.** I. G. FARBENIND. A.-G. (Wilhelm Hoch, inventor.) Ger. 466,519, Jan. 25, 1925. *N*-Acetylarylsulfonamides are prepd. by treating aryl-sulfonamides with Ac_2O . The prepn. of acetyl-*p*-toluenesulfonamide, *m.* 139° , is described by way of example. The products are useful as addns. to cellulose acetate.

1,3-Diamino-2-hydroxyanthraquinone. THE NEWPORT CO. Fr. 643,800, Nov. 12, 1927. The above is prepd. by nitrating 4-hydroxy-*o*-benzoylbenzoic acid to obtain 3,5-dinitro-4-hydroxy-*o*-benzoylbenzoic acid, which is reduced to the corresponding diamine, and the ring is closed with elimination of water by means of conc. H_2SO_4 .

2-*Bz*-1'-Dibenzanthronyl and its derivatives. I. G. FARBENIND. A.-G. (Arthur Luttringhaus, Heinrich Neresheimer, and Hugo Wolff, inventors). Ger. 468,475, Feb. 22, 1925. 2-*Bz*-1'-Dibenzanthronyl and its derivs. are prepd. by treating a mixt. of a *Bz*-1-halobenzanthrone and a benzanthrone not substituted in the 2-position with an alk. condensing agent under such mild conditions that further condensation leading to the production of dyes (isodibenzanthrones) is minimized or avoided. In the examples, (1) a mixt. of *Bz*-1-chlorobenzanthrone and benzanthrone is treated at $0-12^\circ$ in an atm. of N with PhNHNa in PhNH_2 suspension, 2-*Bz*-1'-dibenzanthronyl, *m.* 396° , is obtained; (2) 6- or 7-chlorobenzanthrone is substituted for benzanthrone in (1), 6- or 7-chloro-2-*Bz*-1'-dibenzanthronyl, *m.* above 360° and about 360° , resp., being obtained; (3) 6-methylbenzanthrone is substituted for benzanthrone in (1), 6-methyl-2-*Bz*-1'-dibenzanthronyl, *m.* above 360° , being obtained; (4) a mixt. of *Bz*-1-chlorobenzanthrone and benzanthrone is treated at $10-15^\circ$ in an atmosphere of N with KOH suspended in toluene; 2-*Bz*-1'-dibenzanthronyl is again obtained. Cf. Brit. 255,277.

Perylene. COMPAGNIE NATIONALE DE MATIÈRES COLORANTES ET DE PRODUITS CHIMIQUES. Ger. 469,553, Dec. 19, 1923. See Brit. 208,721 (C. A. 18, 1504).

Tetraglucosan. JOHANNES KERB. Ger. 468,454, Nov. 21, 1924. See Brit. 243,348 (C. A. 20, 3697).

Trimethylamineglycol monoborate. K. LÜDECKE. Brit. 293,438, July 8, 1927. This compd. is prepd. by adding H_3BO_3 to an aq. soln. of trimethylamineglycol, concg. *in vacuo* and treating the sirupy product with solvents in which it is insol. such as acetone or dissolving in alc. and then adding acetone; alc. also may be included in the reaction mixt. and acetone afterward added.

Sodium calcium lactate. ERNST RUPPIN. Ger. 467,937, May 8, 1924. A stable solid product is prepd. by neutralizing a soln. of $CH_3CH(OH)COOH$ with eqtiv. amts. of NaOH and $Ca(OH)_2$, or with a small excess of $Ca(OH)_2$, and evapg. the soln. until the product contains about 27% H_2O , at which point it sets to a solid crumbling mass.

11—BIOLOGICAL CHEMISTRY

PAUL E. HOWE

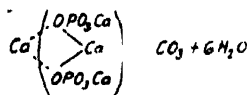
A--GENERAL

FRANK P. UNDERHILL

Combinations of lecithin with amino acids. L. GUERCI. *Ann. chim. ap.* 18, 495-503(1928).—When lecithin from eggs was added to pancreatic ext., whether in water or EtOH soln., and the mix. kept in a thermostat at 37° an increase in acidity was noted. This was not due to fermentation as even boiled pancreatic ext. showed the same effect. Apparently, there is a combination of lecithin with the NH group in the amino acid present in the pancreatic juice with consequent increase in acidity. Lecithin is known to form adsorption compds. with many substances such as I, Br, hematin, glucose, Cd, Mo, Hg, FeI_2 and $FeBr_2$, as well as with citric and glycerophosphoric acids. A similar adsorption compd. may be formed with amino acids.

A. W. CONTERI

Synthetic preparation of the main constituent of bones and teeth. TH. GASSMANN. *Z. physiol. Chem.* 178, 62-6(1928).—The main constituent of bones and teeth is a phosphatocalcium carbonate of the formula



Synthetically it may be prepd. through the action of sunlight in the presence of natural ice water which contains small amts. of P in sol. oxide form. The method consisted in covering 1 g. dry CaO from marble with 10 cc. filtered natural ice water, allowing the mixt. to evap. in sunlight, exposing the residue 3 days to atm. CO_2 , adding 1.5 g. CaO and 3 g. Na_2HPO_4 dissolved in 15 cc. natural ice water, evapg. as before, boiling with distd. H_2O and filtering. The residue after drying at 110-20° is heated on the water bath with 15 cc. glacial AcOH, evapg. and washed with abs. EtOH. The CO_3 in the above formula may be replaced by Cl_2 by heating with $BaCl_2$, yielding the mineral apatite. The natural and artificial phosphatocalcium carbonate are apparently identical in compn. and properties. A study of its combining power with org. substances should throw some light on Ca metabolism and bone diseases.

A. W. DOX

Uricolysis. I. K. FELIX, FR. SCHEEL AND W. SCHULER. Univ. München. *Z. physiol. Chem.* 180, 90-106(1929).—All mammals except man and anthropoid apes break down uric acid into allantoin and CO_2 . The reaction occurs in several successive stages, probably oxidation, hydration and loss of CO_2 . The enzymes responsible for this process are present in the liver. In the expts. here described, a dry powder obtained by dehydration of fresh hog liver with MeAc and Et_2O was used in the proportion of 1 g. per 100 mg. uric acid. At 37° and pH 9.9 the reaction is complete in 5 hrs. The activity of the prepn. is destroyed by boiling, and the reaction greatly retarded by cooling the mixt. to 23°. For the destruction of uric acid there are 2 pH optima at 8.9 and 9.9-10.0, resp., and for the splitting off of CO_2 the optimum is 9.9. The uricolytic enzymes thus manifest their greatest activity in the region of strong alk., a characteristic they possess in common with another hepatic enzyme, arginase. It is not likely, however, that such high alk. occurs in the living cell, where physicochem. conditions

probably displace the optimum toward the neutral side. In the region of the 1st optimum the uric acid disappears completely, as shown by a neg. test with the Folin reagent, while only 20% of the theoretical amt. of CO_2 is liberated. Each mol. of uric acid consumes 1 atom of O. This O consumption in the presence of liver prepn. is so readily detd. that it might be made the basis of a method for detg. uric acid. After the oxidation stage the production of CO_2 at p_H 9.9 is independent of the presence of O, since it readily occurs in an atm. of N. Oxidation and loss of CO_2 are thus shown to be 2 sep. processes. Regarding the 3rd process, the taking up of H_2O , no data are yet available. The similarity of the biol. oxidation of uric acid to that by alk. KMnO_4 suggests that both probably proceed via the same intermediate product, uroxic acid. However, it was found that liver powder does not liberate any appreciable quantity of CO_2 from the K salt of uroxic acid at various p_H values. A partial sepn. of the oxidizing and decarboxylating components of the enzyme system was effected by extg. the liver powder at p_H 8.9, whereby an ext. rich in the oxidase and relatively poor in the decarboxylase was obtained. For measurement of O consumption an app. similar to the app. for catalytic hydrogenation was used. A. W. DOX

The enzymes of leucocytes. I. Proteases of the gastric mucosa. RICHARD WILSTÄTTER AND EUGEN BAMANN. Bayer Acad. München. *Z. physiol. Chem.* 180, 127-133(1929).—The gastric mucosa contains 2 enzymes which are not secreted with the gastric juice, viz., erepsin and a proteinase whose optimum activity is at p_H 3.5-4.0. Both are less easily extd. than the pepsin. For the proteinase which is active at slightly acid reaction the name *cathepsin* is proposed. It is believed that cathepsin and erepsin occur as leucocyte enzymes in the gastric and intestinal mucosae, an assumption which is in agreement with histological observations on the accumulation of leucocytes in these tissues. The liberation of cathepsin from dried prepn. of mucosa is favored by slightly alk. reaction. Glycerol exts. of fresh mucosa show greater activity toward gelatin at p_H 4 than at p_H 2, i. e., a preponderance of cathepsin over pepsin. For the erepsin the optimum p_H is 8.0, and at p_H 5.0 the activity is completely suppressed. The increase in amino N observed at p_H 4 is therefore not due to peptone formation by pepsin and subsequent peptide cleavage by erepsin. Tests for trypsin were negative. Direct drying of the mucosa leads to complete destruction of the erepsin, but if the tissue is dehydrated by org. solvents an ext. may be prepd. several months later fully as active as the fresh material. Gastric erepsin in aq. soln. is very unstable, especially with acid or alk. reaction, but the addn. of glycerol to the neutral soln. renders it quite stable. Examn. of normal gastric juice revealed no trace of erepsin. Specimens of neutral gastric juice, on the other hand, from hospital patients, showed considerable ereptic activity. These abnormal specimens had only feeble peptic activity but strong tryptic action, due probably to contamination with pancreatic and intestinal secretion and the presence of cells. A. W. DOX

The red pigment of heart and skeletal muscle. RUDOLF SCHÖNHEIMER. Univ. Freiburg. *Z. physiol. Chem.* 180, 144-8(1929).—Uroporphyrin and coproporphyrin cannot be obtained by chem. treatment of the blood pigment. They belong to another series of porphyrins and are characterized by their wider distribution in nature, not only in human urine and feces and more especially under certain pathological conditions, but also normally in bird feathers, yeast, etc. Since the identity of the blood pigment with muscle pigment has not been established, the latter was examd. as a possible source of uro- and coproporphyrin. By the Mörner procedure hemin was prepd. from beef hearts in a yield of 100 mg. per kg. With N_2H_4 or $(\text{NH}_4)_2\text{SO}_4$ it gave the hemochromogen spectrum, and the Takayama reagent yielded hemochromogen crystals. By treatment with AcOH , HI and red P it was converted into mesoporphyrin. This porphyrin was identical with mesoporphyrin prepd. from blood hemin, as shown by m. ps. of the Et and Me esters and mixed m. ps. with the corresponding prepn. from blood. Hemin prepd. from the skeletal muscles of a dog yielded a mesoporphyrin whose Et ester was also identical with that from blood. Other hemins are not known to occur in the animal organism, and at any rate are probably not present in sufficient amt. to account for the formation of uro- and coproporphyrins. These porphyrins are probably formed by direct synthesis and not from the breakdown of hemin. A. W. DOX

Actinic measurement of solar ultra-violet light and some correlations with the erythema dose. FRED O. TONNEY, PAUL P. SOMERS AND WILLIAM C. MARTI. Dept. of Health Labs., Chicago. *J. Preventive Med.* 2, 493-511(1928).—By the use of the Anderson and Robinson method (*C. A.* 19, 2453) originally designed for standardizing Hg quartz arc lamps, findings are reported in mg. of $\text{H}_2\text{C}_2\text{O}_4$ decomposed by the actinic effect of sunshine and also in % of the climatic max. for the Chicago district. This method gives highly consistent results in analysis of sunshine and does not require any

elaborate app. It is particularly well suited for field work and gave data which correlated approx. with the erythema reaction of the skin following exposure to the sun's rays. The position on the actinic scale at which definite erythema regularly began was in a narrow zone between the readings of 3.52 and 3.72 mg. of $C_3H_2O_4$ decomposed, or at about 50% of the max. climatic reading for the Chicago district. C. R. F.

Muscle phosphorus. II. The acid hydrolysis of lactacidogen. H. A. DAVENPORT AND JACOB SACKS. Northwestern Univ. *J. Biol. Chem.* 81, 469-77 (1929).—Hydrolysis of muscle by NH_4SO_4 at 100° for 1 hr. liberated an amt. of phosphate corresponding approx. to that liberated by enzymic hydrolysis. In stimulated muscles in which recovery had not taken place, the acid hydrolytic value was 20 to 30 mg. % lower than the enzymic. Lactacidogen is considered as made up of 2 P-contg. compds., only one of which is affected by stimulation of the muscle. Fresh CCl_3COOH muscle filtrates gave neg. color reactions for pyrophosphate. ARTHUR GROLLMAN

Biochemical studies on unknown unsaponifiable substance. I. The distribution of unsaponifiable substance in the animal body. EIKICHI IGARASHI. Tokyo Jikei-kwai Med. College. *Sci-I-Kwai-Med. J.* 47, No. 9, Eng. abstr., 1-2 (1928).—Detns. were made of the contents of fatty acid, cholesterol and unknown unsaponifiable substance of various tissues and organs of the rabbit. The unknown unsaponifiable substance was found present in greatest concns. in the nervous system and endocrine organs. Voluntary muscle contained less cholesterol and more unknown unsaponifiable substance than involuntary muscle. The ratios of fatty acid to cholesterol or to the unknown unsaponifiable substance are const. in organs of different animals. ARTHUR GROLLMAN

Phosphatases of mammalian tissues. II. Pyrophosphatase. HERBERT D. KAY. London Hospital. *Biochem. J.* 22, 1446-8 (1928).—The distribution of pyrophosphatase is similar to that of the orthophosphoric esterase (*C. A.* 22, 4543), but its zone of optical activity is p_H 7.2-7.8, as against p_H 8.8-9.3 for the latter enzyme. BENJAMIN HARROW

Ultra-violet absorption spectra of uric acid and of the ultra-filtrate of serum. FRANK C. SMITH. London Hospital Med. School. *Biochem. J.* 22, 1449-503 (1928).—Uric acid when dissolved in water shows 2 sharp bands, but when dissolved in Na carbonate, only one band is visible. This possibly indicates a tautomeric change in the mol. The selective absorption shown by serum ultra-filtrates is probably due to uric acid. A filtrate obtained from a pathol. case showed marked general absorption, differing from the filtrates of normal sera. BENJAMIN HARROW

Phosphate content and hydrogen ion concentration of the surface water of the English Channel and Southern North Sea, June 18-22, 1928. H. R. SEIWELL. *Nature* 122, 921-2 (1928).—For the English Channel, the av. phosphate content is 8.64 mg. P_2O_5 per m^3 and the av. p_H (cor.) is 8.03. The corresponding values for the southern North Sea are 3.44 and 8.11, resp., and for the Straits of Dover, 3.65 and 8.05. There appears to have been a greater photosynthetic activity in the surface water of the Southern North Sea than in that of the English Channel. ALBERT L. HENNE

Dehydrogenation of lactic acid. AMANDUS HAHN, E. FISCHBACH AND W. HAARMANN. Institut München. *Z. Biol.* 88, 89-90 (1928).—A mixt. of finely ground beef muscle, lithium lactate, semicarbazide, phosphate buffer and methylene blue was incubated at 38° for 2.5 hrs. Coagulable protein was sepd. by boiling and the filtrate evapd. to dryness on a water bath. The residue contained the semicarbazone of pyro-racemic acid. This was digested with 50% H_2SO_4 for $1\frac{1}{2}$ hr. at 50° , and the whole treated with anhydrous Na_2SO_4 , producing a dry powder which was extd. with ether for 3 hrs. Then the ether was evapd. in vacuum at 25° , the residue taken up with water and mixed with an HCl soln. of phenylhydrazine. After 24 hrs. in the ice chest the phenylhydrazine crystals of pyroracemic acid were collected and weighed. The presence of the lactate increased the yield from 8 to 87 mg. FRANCES KRASNOW

The carbon dioxide dissociation curve of nerve and muscle. WALLACE O. FENN. Univ. Rochester School Med. and Dentistry. *Am. J. Physiol.* 85, 207-23 (1928). The rate at which CO_2 diffused into nerves and muscles agreed with Fick's law of diffusion and is: for nerves 7.1×10^{-5} $cm.^3/min.$ and for muscle 11.7×10^{-5} $cm.^3/min.$ J. F. LYMAN

Simultaneous study of the constituents of the sweat, urine and blood; also gastric acidity and other manifestations resulting from sweating. VII. Amino acids. C. O. HAUGEN AND G. A. TALBERT. Univ. N. Dakota. *Am. J. Physiol.* 85, 224-8 (1928).—Sweat contained 1.57 to 4.76 mg. of amino acid N per 100 cc., or 15 to 50% as much as in the urine. There was no correlation between amino acid N of sweat, blood and urine. J. F. LYMAN

The viscosity of gum acacia solutions together with a determination of the viscosity constant of such solutions according to the formula of Arrhenius, $\log \eta = \theta C$. STEPHEN

WENT. Harvard School Pub. Health. *Am. J. Physiol.* **85**, 458-67(1928).—The viscosity of pure and impure gum acacia solns. (1 to 6%) at various p_H values and with the electrolytes of blood absent or present could be calcd. satisfactorily by the formula of Arrhenius, $\log \eta = \theta C$, where η = the viscosity of a H_2O soln., C = concn. of dissolved particles and θ = viscosity const. The law of Arrhenius could be applied to mixts. of plasma proteins and acacia and to human blood and acacia, but not to mixts. of human erythrocytes and acacia. In the presence of acacia colloids the dispersion of human erythrocytes was charged, but this change was prevented by the presence of human plasma. J. F. LYMAN

The toxic factor in bile. O. H. HARRALL AND A. J. CARLSON. Univ. Chicago. *Am. J. Physiol.* **85**, 591-606(1928).—Bile injected intraperitoneally was toxic, causing the death of animals within 24 hrs. when injected in sufficient amt. The toxic substance was not modified by boiling or freezing. It is diffusible. Bilirubin was not toxic, but sodium glycocholate and sodium taurocholate were toxic. The toxicity of bile salts probably depends on their destructive action on cell membranes. J. F. L.

The penetration of ultra-violet rays into live animal tissue. WILLIAM T. ANDERSON, JR. AND DAVID I. MACHT. Hanovia Chemical and Mfg. Co., Newark, N. J., and Westcott and Dunning, Baltimore, Md. *Am. J. Physiol.* **86**, 320-30(1928).—Live rabbit skin 12 mm. thick showed a transmission of 6 to 10% for wave lengths from 2537 to 3000 A. U. Dead skin was practically opaque to ultra-violet ray shorter than 3660 A. U. J. F. LYMAN

Action of carbon monoxide on hematin catalyses according to M. Dixon. H. A. KREBS. Kaiser Wilhelm-Inst. für Biol., Berlin-Dahlem. *Biochem. Z.* **201**, 489(1928); cf. *C. A.* **22**, 2581.—Reply to Dixon's criticism (*C. A.* **23**, 162) that CO represses catalysis by hematin only when this is aged. K. maintains that this inhibition occurs even in freshly crystd. hemin which was obtained in a state of extreme purity from pyridine- $CHCl_3$ -AcOH. S. MORGULIS

Inhibition of ferrocysteine catalysis by carbon monoxide. WERNER CREMER. Kaiser Wilhelm-Inst. für Biol., Berlin-Dahlem. *Biochem. Z.* **201**, 490(1928); cf. *C. A.* **22**, 2582.—Reply to Dixon's statement (*C. A.* **23**, 162) that CO does not inhibit the catalysis by ferrocysteine. It is pointed out that this inhibition depends on the ratio of the partial pressure of CO and O_2 , and does not occur until this ratio reaches a certain value. S. MORGULIS

Autocatalysis and growth. P. R. v. D. R. COREMAN. Div. of Chemistry, Cape Town, S. Africa. *Ann. Appl. Biol.* **15**, 613-22(1928).—The autocatalysis equation in the form, $\log x/(a-x) = K(t-t_1)$, expresses closely the changes that occur during the growth of the human infant, the cotton plant, and several varieties of grapes. The const k derived from $K = ka$ is not independent of environmental conditions. The equation $dx/dt = (k_1 + k_2x)(a-x)$ more suitably expresses changes in growth, in which k_1 is dependent upon external conditions and k_2 is a measure of the internal factors governing the growth processes. C. H. RICHARDSON

Studies on permeability of membranes. VI. Mensuration of the dried collodion membrane (calculation of dimensions and of relations to certain biological membranes). A. A. WEECH AND L. MICHAELIS. Johns Hopkins Univ. *J. Gen. Physiol.* **12**, 221-30(1928); cf. *C. A.* **22**, 4329.—The flat type of dried collodion membrane (Michaelis, Ellsworth and Weech, *C. A.* **21**, 3008) used in this study had a functioning area of about 30 cm.², a thickness of about 0.1 mm., and a volume of 87% collodion and 13% of pores (av.) The calcd. values for total pore area present evidence to show that a smaller mol. (acetone) probably utilizes in diffusing a much larger % of the total pore area than does a larger mol. (glycerol). Comparisons are made between the dried collodion membrane as a model for certain biol. membranes and the membrane of the red blood cell. The importance of small electromotive forces and very slight permeabilities are greatly exaggerated with such extremely thin membranes as those of red blood cells. C. H. RICHARDSON

Preparing the double salt of lecithin and cadmium chloride. ANGELO CONTARDI AND PIA LATZER. *Rend. istit. Lombardo sci.* 1927, 847-9.—From eggs: 25 yolks were extd. with acetone; the residue was treated with 95% alc. and a cold satd. alc. $CdCl_2$ soln. was added until complete pptn. The double salt prepd. was collected, vacuum dried at ordinary temp., extd. with ether for sepg. the satd. double lecithin fatty acid salt from the non-satd. fatty acid salt not sol. in ether, 36 g. of lecithin Cd salt (22.37% $CdCl_2$) being obtained. 1 no. of Cd lecithin was 45.68; 1 no. of the fatty acids prepd. with warm dil. HCl from the double salt 65.34. From pancreas: 500 g. of horse pancreas were cold-extd. with 95% alc., distg., reextg. with alc. and cold-pptg. with satd. alc.

CdCl_2 soln., filtering, washing and vacuum drying over H_2SO_4 . The Cd salt sometimes caused hemolysis of blood, contg. fatty acids, P and choline; in other cases it was not lytic and real lecithin was present. To the cold-extd. pancreas residue was added 95% alc., which was kept for 24 hrs. at 37° . From the alc. ext. was pptd. the double salt of CdCl_2 as indicated which was or was not hemolytic. The cold-prepd. Cd lecithin was entirely sol. in ether, while the warm-prepd. was only partly sol. The ether ext. was evapd. and the residue was dried in a vacuum under H_2SO_4 . I no. of Cd lecithin sol. in ether was 47.35; I no. of cold-extd. Cd lecithin 16/22; I no. warm-extd. Cd lecithin 16.67; I no. of lecithin fatty acids from the Cd lecithin sol. in ether warm-extd. 59.82, cold-extd. 39.83. From the brain: The lecithin was extd. from dry, pulverized, horse brains purified in acetone, with 95% alc., adding the cold satd. CdCl_2 soln., filtering, washing with alc. and ether and drying in a vacuum under H_2SO_4 . A double salt is prepd. with 21.1% CdCl_2 . I no. Cd lecithin 48, sapond. 68. R. SANSONI.

Action of the Ricinus lipase (castor oil enzyme) on cadmium lecithins and cadmium lysocytins. ANGELO CONTARDI AND PIA LATZER. *Rend. ist. Lombardo sci* 1927, 857.—The action of small quantities of the ricinus enzyme on Cd lecithins in physiol. soln. (1:100) has been studied at $36-7^\circ$. The reaction could only be suspended once when lysocytin was present, a test giving the hemolysis of blood. Other tests on Cd lecithin or egg yolk did not confirm the action of the ricinus lipase, that frees lecithin from the fatty acids. Operating on the Cd lysocytin the same result was obtained, but part of the soln. was decomposed as fatty acids were liberated, the soln. remaining always hemolytic even after several days. The ricinus lipase was without action on glycerophosphates and on phytin. R. SANSONI.

The influence of chemical reagents, especially of metallic salts, upon the tyrosinase reaction. SHIGEO TAKAOKA. Keio Univ. *Keio J. Med.* 8, 165-90(1928).—T. examd. the reaction of tyrosinase filtrate from potato juice and of the soln. obtained by removing starch from the potato juice, satg. with $(\text{NH}_4)_2\text{SO}_4$, and dialyzing the resulting ppt. The change in coloration differs greatly with p_{H} , so that the coloration alone cannot be made a criterion for estimating the power of tyrosinase. The first coloration (red) appears best at p_{H} 6.5, the second (black) at p_{H} 8; and when these p_{H} values are taken into consideration either the first or second color reaction gives no great difference in estimating the oxidizing action of tyrosinase. T. next examd. the effect of metallic salts upon the tyrosinase reaction. BaCl_2 and vegetable ash have no action. Among LiCl , NaCl , KCl , CsCl , MgCl_2 , CaCl_2 , $\text{Sr}(\text{NO}_3)_2$, CdCl_2 , ZnCl_2 , MnSO_4 , $\text{Ni}(\text{NO}_3)_2$, CoCl_2 , FeSO_4 , only ZnCl_2 accelerates the action. Of salts that shift the p_{H} value to the acidic side, e. g., BeSO_4 , HgCl_2 , CeCl_3 , AlCl_3 , FeCl_3 , the action is on the whole inhibited as the p_{H} value is changed from 6.5 to 8.0. Salts that shift the p_{H} value to the alk. side e. g., Na_2HPO_4 , NaHCO_3 , Na_2CO_3 , generally accelerate the second reaction of forming a black substance in the suitable range of p_{H} . The concn. of ash in the potato juice seems to have no direct effect upon the fermenting action. With oxidizing (KClO_3 , NaClO) and reducing (SnCl_2 , KCN , $\text{N}_2\text{H}_4\cdot\text{HCl}$ and $\text{NH}_2\text{OH}\cdot\text{HCl}$) agents, the dil. soln. of the former accelerates only the first coloration, while concd. soln. inhibits; the latter has a marked inhibiting action; alcs. are generally inhibiting; mono-amines show no accelerating or inhibiting action, while diamines, *m*-tolylidenediamine and *p*-phenylenediamine inhibit independently of p_{H} . Of the alkaloids, pylocarpine accelerates and brucine sulfate inhibits the first coloration, while morphine hydrochloride, quinine hydrochloride and *strychnine nitrate* accelerate the second reaction. T. concludes that there is no apparent connection between the chem. constitution of the reagents and their inhibiting or accelerating action upon the tyrosinase reaction. K. SOMEYA.

Disinfectants for preserving the amylase solution of *Aspergillus oryzae*. KOKICHI OSHIMA. Hokkaido Imp. Univ. *J. Soc. Chem. Ind. (Japan)* 31, 750-3; *Supplemental Binding* 31, 180-3B(1928).—The following kinds and quantities of antiseptics proved to be suitable for preserving the amylase soln. of *A. oryzae*: cresol (0.15-0.40%), lysol (0.5-2.0%), phenol (0.4-1.5%), thymol (0.05-0.20%), phenol + cresol (0.3% P + 0.1% C ~ 1.0% P + 0.2% C). Y. TOMODA.

Activation of Ricinus lipase by acids. SANNOJU MUKAI. Kyushu Imp. Univ. (Japan). *J. Soc. Chem. Ind. (Japan)*, 31, 759-65; *Supplemental Binding* 31, 182B(1928).—There is a Mg compd. in castor beans which inhibits the activity of lipase; acids used for the activation of lipase dissolve this Mg compd. The activated lipase, which had been previously treated with 0.05 N H_2SO_4 , showed nearly the same activity at p_{H} 3.5 and 6.8. Y. TOMODA.

Recent progress in the study of enzymes. M. SCHOEN. *Ann. brasserie et dist.* 1928, 21, 27 and 49; *Brewers' J.* 64, 491-2, 557-8 and 627-8.—A review of the results by absorption methods which have made possible a differentiation between the proper-

ties of the enzyme proper, and the accessory substances accompanying it. Purely chem. investigations have so far failed to reveal the mechanism of enzyme action.

PETER J. F. WEBER

The occurrence of complex carbohydrates in the blood. ERICH GABBE. *Verhandl. Physik.-Med. Ges. Würzburg* 52, 67-72(1927); *Ber. ges. Physiol. expil. Pharmacol.* 45, 652.—Ege contradicted the work of Lepine in which there was reported a complex carbohydrate in the blood, but he did not consider the p_H of the deposit in his study of emulsin. Therefore, emulsin was purified according to Willstätter, takadiastase added and the whole tested upon the addn. of acetate buffer mixts. When $p_H = 5.3$ there regularly appears an increase in the reduction power amounting to 30-40% of the initial value, the increase in the blood corpuscles alone amounting to as much as 100%. Dische and Popper's indole reaction is increased in the same degree. The substance which is split from the blood by takadiastase is pptd. by baryta water in 5-8% ethyl alc. or by 90% alc. alone. It is sol. in pyridine to which alkali or strong acid has been added and is hydrolyzed by 30% KOH. It has not yet been obtained free of protein. Its amt. is irregularly influenced by insulin and is not related to the sugar in the plasma. It appears to be related to the free sugar of the erythrocytes. The amt. of the substance is reduced by adrenaline.

R. C. WILLSON

The glycogen content of the blood. E. GABBE. *Verhandl. Physik.-Med. Ges., Würzburg* 52, 126-9(1927); *Ber. ges. Physiol. expil. Pharmacol.* 45, 653.—The estns. of the blood glycogen range from 0.1 to 9.0 mg. %. The reduction power of the blood is increased when the p_H is favorable for the activity of its amylase. With $p_H = 6.5$ and a 20 times diln. of the blood, the increase amounts to 20% of the initial value; in the erythrocytes it is twice as large and in the plasma smaller than in the whole blood. At the same time the Dische-Popper indole- H_2SO_4 reaction is increased in intensity. The blood amylase acts within 30 mins. against 12-15 hrs. in takadiastase. Similar differences were found in the action of different enzymes on liver glycogen. After a previous sepn. of the blood pigment by HCl, the glycogen can be isolated from the blood by means of the Pflüger method. The amt. is much larger than has hitherto been found, being 18-30 mg. %. In normal plasma a smaller amt. was found, about 20 mg. %; in pathological conditions, as diabetes, the proportion is inverse. The glycogen content of the blood is reduced only a little after heating for several hrs. to 37°; it appears to be present in a protective form, perhaps in the blood platelets. It is possible that protein-glycogen compds. play a role in the erythrocytes. R. C. WILLSON

The influence of ultra-violet irradiation on serum irradiated outside the organism. G. FRONTALI. *Riv. clin. pediatr.* 25, 661-8(1927); *Ber. ges. Physiol. expil. Pharmacol.* 45, 588.—Blood serum in air-tight quartz containers was irradiated for 15-60 mins. with a mercury-vapor arc lamp. Serum so treated showed an increase in the inorganic P and a decrease in the p_H .

R. C. WILLSON

Odor and constitution among the mustard oils (DYSON) 17. The mutual influence of cholesterol and cholesterol esters in colloidal solution (STERN) 2. The general chemistry of colloid-colloid reactions. I. Experiments with dye sols and proteins (PAULI, WEISS) 2. Electromotive relations of artificial membranes consisting of surface areas selectively permeable to cations and areas selectively permeable to anions (HÖBER, HOFFMANN) 2. Resolution of *dl*-thyroxine (HARRINGTON) 10. Bufodesoxycholic acid (OKAMURA) 10. Behavior of polypeptides containing *dl*- α -aminovaleric acid toward normal alkali, erepsin and trypsin-kinase (ABDERHALDEN, *et al.*) 10. Behavior of *dl*- α , ϵ -dileucyl-*dl*-lysine toward normal NaOH, erepsin and trypsin-kinase (ABDERHALDEN, SICKEL) 10. Behavior of polypeptides constructed of *d*-alanine toward normal alkali, erepsin and trypsin-kinase (ABDERHALDEN, DELGADO y MIER) 10. Relation of chemical structure to the rate of hydrolysis of peptides IV. Enzyme hydrolysis of dipeptides (LEVENE, *et al.*) 10. NH_4 picrate and its possible use in the preparation of creatinine (GREENWALD) 10. Alkaline decomposition of cystine (ANDREWS) 10. The amino acid methionine; constitution and synthesis (BARGER, COYNE) 10.

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B—METHODS AND APPARATUS

STANLEY R. BENEDICT

Detection of bile pigment in urine. L. VAN ITALLIE. Univ. Leiden. *Pharm. Weekblad* 66, 13-4(1929).—A simplification of the Huppert-Salkowski-Steensma test for bile pigment in urine consists in adsorption of the pigment on talc instead of pptd. CaCO_3 obtained by addn. of Na_2CO_3 and CaCl_2 to the urine. To 100-500 cc. of urine add 0.5-1.0 g. of talc and shake, then filter through cotton or paper. If the talc is not colored yellow the test is neg. If a yellow color appears, the test is confirmed by extg the talc with EtOH contg. HCl and treating the ext. with NaNO_2 , whereupon the green color of biliverdin appears.

A. W. DOX

Clarification and decolorization of urine. FISCHER AND HORKHEIMER. *Pharm. Ztg.* 74, 45-6(1929).—For purposes of polarization the authors recommend the use of relatively small quantities of animal charcoal (Carbo animalis Merck pro analysis), as 0.7 g. per 25 cc. of urine, whereby little or no perceptible loss of sugar will result.

W. O. E.

Method and apparatus for the demonstration of alcohol in urine. PAUL LIEBESNY. *Klin. Wochschr.* 7, 1959(1928).—The alc. is distd. from 1 cc. of urine into 5 cc. of a 0.04 N $\text{K}_2\text{Cr}_2\text{O}_7$ soln. in 50% H_2SO_4 . A special app. is used. This is described. The dichromate is reduced and a color change is obtained. The color is compared with that of a series of standards. The standards keep indefinitely. The ingestion of 0.5 cc. of alc. per kg. body wt. leads to the excretion of alc. so that 1 cc. urine contains about 1 mg. alc. after 1 hr. and 1.5 mg. after 2 hrs. A pos. reaction can still be obtained after 6 hrs. The ingestion of 0.25 cc. alc. per kg. body wt. cannot be detected by this method.

MILTON HANKE

Measurement of the p_{H} of urine under vital conditions. A. BECK AND H. J. LAUBER. *Klin. Wochschr.* 7, 2241-2(1928).—Detns. of p_{H} , as they are usually carried out on samples of urine, do not give accurate values because of the loss of CO_2 . Accurate values can be obtained if the urine is drawn from the bladder into a syringe through a catheter.

MILTON HANKE

Note on the extraction of an iron-containing pyrophosphate from muscles. O. MEYERHOF AND K. LOHMANN. Kaiser Wilhelm-Inst., Berlin-Dahlem. *Biochem. Z.* 203, 208-11(1928).—Muscle is extd. with a HgCl_2 -HCl mixt. After removal of Hg and then of the H_2S the ext. is neutralized with Fe-free NH_4OH and pptd. with the calcd. amt. of Ba acetate. The pptd. phosphates are dissolved in a few cc. 0.5 N HCl. One portion (1 cc.) is heated with N HCl in a fused tube at 100° for 10 mins. whereby all the pyrophosphate is hydrolyzed. The same is done with a second portion from which the Ba was removed with Na_2SO_4 . These samples were used for detg. P. The original soln. was analyzed for Fe before and after hydrolysis. The amt. of Fe found constituted 1-2% of the equiv. quantity of the pptd. pyrophosphate. S. MORGULIS

A new microchemical method for the determination of blood sugar. IWAO OGAWA AND KEIZO KODAMA. Aichi Med. Coll., Nagoya. *J. Biochem. (Japan)* 10, 1-4(1928). Blood is deproteinized with acetic acid and $\text{K}_3\text{Fe}(\text{CN})_6$, then boiled in the presence of Na_2CO_3 . In this process $\text{K}_3\text{Fe}(\text{CN})_6$ is reduced to $\text{K}_4\text{Fe}(\text{CN})_6$ in an amt. proportional to the sugar present. To the cooled soln. FeCl_3 acidulated with AcOH is added, producing a blue color (Prussian blue) which is compared to that formed in a standard. Solns. required: (1) 0.3% acetic acid; (2) 0.005 N $\text{K}_3\text{Fe}(\text{CN})_6$ made by dissolving 1.046 g. of the salt in one l. H_2O ; (3) 10% Na_2CO_3 ; (4) FeCl_3 made by dissolving 1.65 g. in a l. of 30% AcOH; (5) standard glucose (stock) made by dissolving a g. of pure glucose in 100 cc. satd. NaCl soln. Five drops of blood is collected in a small porcelain crucible contg. a trace of $\text{K}_2\text{C}_2\text{O}_4$ from which 0.05 or 0.10 cc. are measured with a pipet into a test tube contg. 5 cc. 0.3% AcOH, and the vol. is made up to 6 cc. with H_2O . One cc. of dild. (1:100) sugar standard is likewise measured into 5 cc. 0.3% AcOH. To both tubes after boiling for 3 min. in a water bath and cooling in running water 3 cc. of the $\text{K}_4\text{Fe}(\text{CN})_6$ soln. are added, and the deproteinized blood is now filtered. Five cc. of the clear filtrate and of the standard are now pipetted into clear tubes, made alk. by the addn. of 1 cc. Na_2CO_3 , and boiled in the water bath for 6 min. Upon cooling 1 cc. of the FeCl_3 soln. is added to each. In matching the colors in a colorimeter it is recommended to use the brown color screens. The calcn. is very simple, the reading of the standard reading of the unknown $0.1 = \text{g. glucose per 100 cc. when 0.1 cc. is used for the analysis.}$

S. MORGULIS

Studies on the behavior of cholesterol within the animal body. I. A method recommendable for cholesterol estimation in any kind of tissue. JINYE ONIZAWA. *Biochem. Inst., Tokyo Imp. Univ. J. Biochem. (Japan)* 10, 45-61(1928).—The method

is made up of 2 steps: the extn. of cholesterol from the tissue and its detn. in the ext. The first step is carried out by an improved Fex method. The tissue studied is finely minced and left standing for several hrs. with twice its vol. of 2% NaOH. The mixt. is now boiled on the water bath 30–60 min. until it is almost completely dissolved. On cooling this is transferred to a 250 cc. separatory funnel, and the beaker rinsed several times with small quantities of H₂O. Finally it is washed with 20 cc. acetone which is also poured into the funnel and its contents are thoroughly shaken. The beaker is now again washed with 100 cc. ether which is transferred to the funnel. After vigorous shaking to ext. the cholesterol the sepn. is allowed to proceed for 15–30 min. The lower layer is carefully drawn into another funnel while the ether is transferred to a larger separatory funnel, to which are also added the ether washings of the first funnel. The funnel is now once more rinsed with 100 cc. of ether which is poured into the funnel, to which the tissue liquid was transferred and the extn. of cholesterol is repeated. The process must be done twice, so that 300 cc. ether altogether is used for the extn. The combined ether exts. are washed with 5–10 cc. alk. H₂O in a separatory funnel and the funnel itself is rinsed with H₂O until a neutral reaction is obtained. After evapg. the ether, the residue is dried on a water bath and finally in an oven at 80°. This is now redissolved in pure ether and filtered through a Kumagawa-Suto asbestos filter. The residue left from the evapd. ether ext. while still warm is treated with about 10 cc acetone and after standing 4 hrs. is again passed through the asbestos filter. The soln. is again evapd. and the residue taken up in CHCl₃ or ether. This is a soln. of pure cholesterol and its esters which is made up to a definite vol. and is used in the next step for detn. This is made by pptg. the cholesterol (1–3 mg.) with a 1% digitonin soln. in 80% alc. After leaving this overnight the mixt. is transferred to a centrifuge tube with 80% acetone, kept 5–10 min. at 40–50° and, after centrifuging, the supernatant liquid is poured through a Szent-Györgyi asbestos filter. After washing twice with the 80% acetone the ppt. is stirred up with pure acetone and completely transferred to the asbestos filter, which is now washed 3 times with 5 cc. ether, then with acetone and several times with water and dried *in vacuo* at 105° to const. wt. The ppt. is then weighed on a microbalance. One mg. cholesterol is detd. with an error not exceeding 3%. To det. also the cholesterol esters the ext. is sapond. by heating this with satd. alc. NaOH for 6 hrs. on a water bath under a reflux condenser, at least 10 times the required amt. of alkali being used. The sapond. soln. is transferred with 100 cc. ether and the total cholesterol extd. by the procedure already described. Since the sapon. entails a loss of 2–3% the digitonin cholesterolide is multiplied by 0.25 (instead of 0.2431) to obtain the total cholesterol.

S. MORGULIS

A microchemical method for studying the chlorides in blood and cerebrospinal fluid. D. S. SCHEFER. State Univ., Rostov o/D. *Zhurnal expl. Biol. Med.* 10, 261–5 (1928).—One-tenth of a cc. of blood is measured with a pipet into a centrifuge tube contg. 3 cc. of a 1:3 diln. HNO₃. To this is now added 1 cc. H₂O₂. The tube is heated in a water bath to coagulate the proteins, and centrifuged. The liquid is poured off, and the residue is again treated with 2 cc. HNO₃. After centrifuging the supernatant liquid is added to the first. To the combined fluids are added 2 cc. 0.01 N AgNO₃; this is well mixed and again centrifuged. The supernatant fluid is poured off and is titrated with 0.01 N NH₄SCN. In analysis of cerebrospinal fluid the H₂O is omitted.

S. MORGULIS

How to make pharmacological experiments with very unstable colloids. L. SABBATANI. Univ. Padua. *Biochim. terap. sper.* 15, 150–5 (1928).—An app. is devised with the help of which very unstable colloids may be injected intravenously within a few sec. It consists of 2 burets contg. the solns. by the interaction of which the colloid is formed. The burets, which are of the same caliber, are connected with each other by a Y-tube whose 3rd arm serves as the mixing chamber. In order to procure thorough mixing a small elec. stirrer is provided. The soln. leaving the Y-tube enters the vein of the animal by a canule. With this app. it is possible to inject definite amts. of the colloid at a definite velocity. Expts. with colloidal Mn phosphate prepd. from MnCl₂ and Na₃PO₄ showed the usefulness of the device.

G. SCHWOCH

The proteolytic activity of the intestinal flora and its influence in regard to the diagnostic evaluation of the tryptic power of the feces. ITALO BETTONI. Ospedale Maggiore, Milan. *Biochim. terap. sper.* 15, 193–231 (1928).—An investigation to decide the question whether the clinical test for trypsin in the feces is influenced by the activity of the intestinal flora. Capri's method based on the liquefaction of gelatin was employed for detg. the proteolytic power of the specimen. In contrast to Alessandri, who had found that HCl present in a concn. of 0.18% at 38° inactivated the trypsin in 15 min., B. observed that in 1% solns. of different com. trypsin and pancreatin prepsns.,

the activity decreased at 38° in 2½ hrs. by not more than 2 tryptic units; in feces exts., no deviation from the original values was seen. When HCl in a concn. of 1.8% was allowed to act on trypsin solns. and feces exts. for 2½ hrs. at 38°, the no. of tryptic units originally present was reduced by 10-20 units. Contrary to Franke and Sabatowski, who found that by filtering feces exts. through Berkefeld filters the proteolytic activity disappeared, B. noticed that by centrifuging the exts. and then filtering them through Berkefeld filters, the activity was reduced, but did not vanish. When Chamberland filters were employed, the activity was not lessened though the filtrate obtained was sterile. The proteolytic ability of the exts. was not reduced after the majority of the bacteria had been removed by prolonged centrifuging. From expts. conducted to compare feces exts. greatly deprived of bacteria by means of prolonged centrifuging with exts. enriched in bacteria by the addn. of large nos. of bacteria that had been isolated from the same feces and grown on agar, B. concludes that within 2½ hrs. at a thermostat temp. of 38°, the presence of intestinal bacteria does not modify the proteolytic power of the feces. This power may reach a considerable degree, if cultures of bacteria are allowed to react on gelatin for at least 10-12 hrs. This activity cannot be dissocd. from the bacteria, because it is coupled with their propagation. In filtrates from these bacteria cultures, a small quantity of enzymes of bacterial origin is present. The proteolytic effect of these enzymes is negligible. G. SCHWACH

A microchemical method for determining urea in blood and other body fluids. V. PIOVANO. *Nat. Med. Pharmacol. Inst. "Serrano." Rass. clin. terap. sci. affini* 27, 458-66(1928).—P. discusses the methods in use for the blood-urea detn. and rejects all of them including Marshall's method, Folin's modification of the latter and the methods based on nesslerization. In the new method developed by him conversion of urea into $(\text{NH}_4)_2\text{CO}_3$ by means of urease takes place in a Van Slyke app. The $(\text{NH}_4)_2\text{CO}_3$ formed is decompd. and the CO_2 liberated is measured volumetrically. One to 2 cc. of the soln. to be examd., which may contain 0.5-2 mg. of urea, is adjusted to p_{H} 7; with blood, no adjustment is necessary. Then are added in succession: 1 cc. of 0.1 N $\text{MeHCOHCO}_2\text{H}$ in order to eliminate the preformed CO_2 ; 1 drop of bromothymol blue soln.; about 11 drops of 0.25 M Na_2PO_4 in order to readjust the p_{H} to 7, and 1 cc. of a special urease soln. After 15-20 mins., 2 or 3 drops of concd. $\text{MeHCOHCO}_2\text{H}$ soln. are added and the liberated CO_2 is detd. with the usual technic. The no. of cc. found are reduced for 0° and 760 mm. and the vol. obtained is multiplied by 2.005, which gives the mg. of urea present in the specimen. The urease soln. is prepd. by extg. 12.5 g. of defatted meal of soy beans with 100 cc. of 50% glycerol soln. and filtering. $(\text{NH}_2)_2\text{C:NH}$ in satd. solns. of a p_{H} ranging between 5 and 9 is not decompd. by urease. G. SCHWACH

Determination of I in org. combination, especially in thyroid gland (SMITH) 7.

KAHN, R. L.: **The Kahn Test.** Baltimore: Williams & Wilkins Co. 201 pp \$4.

TODD, JAMES CAMPBELL AND SANFORD, ARTHUR HAWLEY; **Clinical Diagnosis by Laboratory Methods.** Philadelphia: W. B. Saunders Co. 6th ed., revised and enlarged. 748 pp. \$6.

C—BACTERIOLOGY

CHARLES B. MORREY

Bacteriophage in agriculture and the fermentation industry. G. RUSCHMANN. *Deut. Essigind.* 32, 434-8, 445-9, 456-9(1929).—A discussion of the subject from the time of its conception by d'Herelle down to the present, notably in its relation to medicine, fermentation and agricultural bacteriology or mycology. W. O. E.

Japanese tea enzyme. E. ARAUNER. Kitzingen a/M. *Deut. Essigind.* 33, 11-2(1929).—The nature of this enzyme (symbiotic combination of *B. xylinum* with *Pombe* yeast) is discussed and explained in connection with directions for prepg. a palatable beverage from infusions of tea. W. O. E.

Microbiological relations in aqueous solutions. KNUD C. BERTHESEN. *Statens Seruminst. Copenhagen. Pharm. Zentralhalle* 70, 37-44(1929).—A study of colony growth among the lower organisms (fungi, bacteria, etc.) in solns. of H_2BO_3 , NaBr, $\text{Na}_2\text{B}_4\text{O}_7$, and H_3PO_4 in connection with a special technic of infection and pure culture. Through numerous examples the extreme difficulties are emphasized which are encountered in attempts to identify individual types in colonial aggregates owing to the complete degeneration in the culture media studied. Culture expts. were carried out in various media, the most suitable being partially liquefied aq. agar with glucose, which

permitted direct microscopic and photomicrographic examn. The causes and effects of the appearance of the various colonies observed are discussed. W. O. E.

Bacterial oxidations by molecular oxygen. I. The aerobic oxidation of glucose and its fermentation products in its relation to the viability of the organism. ROBERT F. COOK and MARJARY STEPHENSON. *Biochem. J.* 22, 1368-86(1928).—*B. coli* oxidizes (using mol. O) glucose and some of its products of fermentation (lactate, pyruvate, acetate and formate). EtOH and AcH are not oxidized. *B. alkaligenes* does not oxidize glucose but oxidizes the products of fermentation. *B. sporogenes* does not oxidize either glucose or the products of fermentation. Oxidations by *B. coli* do not depend on living cells.

BENJAMIN HARROW

The splitting products and the dissemination of the fermentation sarcines (Sarc. ventriculi Goodsir, and Sarc. maxima Lindner). JAN SMIT. *Proc. Acad. Sci. Amsterdam* 31, 421-32(1928).—See *C. A.* 22, 2960.

E. H.

How can the fermentation test of Eykman be improved? A. J. VAN HOYTEMA. *Nederland. Tydschr. Hyg., Microbiol. en Serol.* 3, No. 2, 165-78(1928).—With the Eykman test there are also spore formers and streptococci grown; chiefly the latter spoil the test. On the addn. of secondary phosphate the quantity of gas formed increases with the amt. of phosphate and reaches a max. at about 1%; the max. amt. of gas is considerably greater than the amt. obtained in the normal Eykman liquid used as control, the sensitiveness of a 1% glucose, 1% peptone soln. contg. 0.1-2% K_2HPO_4 is almost as great as the ordinary Eykman soln., as the further dilns. were all negative; the fermentations with the addn. of 0.1 of about 1% phosphate apparently give a clear picture of the quality of the water the next morning, after being put in the night before. Expts. on the velocity of formation of acid and of gas by a fermenting pure culture of fecal coli in liquids contg. 1% glucose and 1% peptone Poulenc to which were added 0, 0.1, 0.5 and 1% secondary phosphate, and in the normal Eykman liquid show further that with 0.07% peptone the streptococci begin to interfere, whereas below 0.03% the lack of N nourishment begins to be felt. In order to improve the Eykman test, it is recommended to use a very small amt. of good peptone.

J. C. JURRJEES

Living bacteria as oxygen indicators. G. KOSTKA. *Mikrokosmos* 22, 6-11, 27-30 (1928).—The detection of the presence of free O_2 in very small amounts by chemical means is difficult and such methods are of little value for biol. work because they are either lacking in sensitivity or have a harmful effect upon the process under investigation. The reaction of living cells can be used for this purpose because of the property of positive or negative chemotaxis, especially the aerotaxis or oxygenotaxis of obligative aerobes and facultative anaerobes. A fresh brown bean (I) (*Phaseolus vulgaris* var nanus) or seed of other papilionaceous or fabaceous plants is placed in a test tube, filled with distd. H_2O , allowed to stand quietly at room temp. (fairly const. temp. to avoid convection currents in the liquid); after a short time the respiratory activity of I causes a rapid absorption of O_2 dissolved in the H_2O ; sol. products (*viz.* sugars and phosphates) begin to diffuse through the H_2O ; the motile bacteria (II) (*B. perlibratus*) which were naturally present on I begin to multiply, producing a turbidity surrounding I. The O_2 consumption of I after 24 hrs. at 20° causes II to move to a more favorable O_2 environment; the test tube now has a clear liquid at the top and immediately surrounding I; II will have formed a very thin layer which appears as a fine, white transverse line about 2-3 cm. from I after 48 hrs. Another method for detecting small amts. or the absence of O_2 depends upon the luminescent property of certain bacteria which can be obtained easily from fresh fish or meat and which luminesce in a concentration of O_2 as low as 0.0007%; the medium for their growth is a slightly alk. fish bouillon with 0.5% glycerol, 0.5% peptone and 3% NaCl; the culture is placed in small tubes with tight, ground stoppers and observations are made in the dark. N. A. LANGE

Schizosaccharomyces hominis non sp., the first fission saccharomyces pathogenic for man. T. BENEDEK. *Centr. Bakt. Parasitenk.*, I Abt., 104, 291-303(1927).—Three infections in the human subject with a peculiar fungus called the fission yeast of Lindner were studied. They can be demonstrated from the lesions by 40% KOH, and appear as oval, refractile, spore-like bodies. They grow on 8% glucose agar, where they are pleomorphic, appearing as oval yeast-like cells, elongated forms in chains, and filaments. They stain best with toluidine blue, methylene blue being too intense and neutral red too faint. They are killed at 90° in 15 mins. They lived for 22 months dried in a tube of agar. In culture they produce a very marked odor of butyric acid. They form no gas but much acid from glycerol, mannitol, glucose, levulose, galactose, sucrose, maltose, lactose, dextrin, inulin, or starch. Neither gas nor acid forms from dulcitol. No glycogen can be demonstrated in the cells at any stage.

JOHN T. MYERS

Atypical strains and variant occurrence in the paratyphoid group. LEONHARDT.

Der Hyg. Bakt. Lab. der Stadt Bochum. *Centr. Bakt. Parasitenk.*, I Abt., 104, 334-8 (1927).—No evidence of change of type of paratyphoid strains was found. The rhamnose reaction, toxicity for mice, and slime formation on walls of tubes were constant findings.

JOHN T. MYERS

The metabolic regulation of bacteria. ERWIN ZIMMERMANN. Univ. Freiburg. *Centr. Bakt. Parasitenk.*, I Abt., 104, 451-6 (1927).—In cultures of *B. coli*, *B. typhi murium*, and *B. suispestifer* in artificial media, the intensity of metabolism depends on the nature of the food. When growing, the organisms can utilize glucose, maltose or lactose, so long as the respective sugar is present in excess, and the rate of metabolism is independent of the concn. The osmotic tension of the sugar makes no difference. The amt. of sugar not used by the organisms was measured by the method of Aflihn. It is not possible to det. whether passive adsorption by the cells, or active storing of sugar introduced errors; or to measure the metabolism of resting cells.

JOHN T. MYERS

The production of modifications through "specific" means as a method of species characterization. E. KLIENEBERGER. Stadt Hyg. Univ.-Inst. Frankfurt a M. *Centr. Bakt. Parasitenk.*, I Abt., 104, 456-9 (1927).—Thirty-six strains of "paracolon" bacilli were isolated from feces and urine, which fermented dextrose but not lactose. Of these, 27 acquired lactose-splitting powers when repeatedly transferred on 1% lactose agar. This procedure will aid in distinguishing organisms from the bacteria which can never split lactose. These modifiable forms form a sep. group and are not degenerated colon bacilli.

JOHN T. MYERS

The antagonism of colon bacilli to anthrax bacilli. M. GUNDEL. Univ. Kiel. *Centr. Bakt. Parasitenk.*, I Abt., 104, 463-73 (1927).—Anthrax bacilli are antagonized by *B. coli* in artificial media both liquid and solid, the anthrax being killed. The antagonism can also be demonstrated *in vitro*. The mechanism is unknown. It may be due to chemical products of *B. coli*.

JOHN T. MYERS

The cultivation of the tubercle bacillus from various body products with the help of prior treatment with acid. H. SEELEMAN AND H. KLINGMÜLLER. Inst. der Preussischen Versuchs- und Forschungsanstalt für Milchwirtschaft in Keil. *Centr. Bakt. Parasitenk.*, I Abt., 104, 482-92 (1927).—Lubenau's egg medium is satisfactory after treatment with 10 to 15% HCl or H₂SO₄. However, animal inoculation gives a higher percentage of positives.

JOHN T. MYERS

A contribution to the cultural differentiation of Pfeiffer's pseudotuberculosis from similar bacteria of avian origin (*Bact. avicidum* and *Bact. gallinarum*). H. HAUPT. Univ. Leipzig. *Centr. Bakt. Parasitenk.*, I Abt., 109, 1-8 (1928). *Bact. pseudotuberculosis rodentium* forms acid from adonitol, which differentiates it from *Bact. avicidum* and *Bact. gallinarum*. Most strains also form acid from salicin. Its ability to ferment arabinose, adonitol, and salicin, and inability to ferment lactose, saccharose, or dulcitol distinguishes a rodent from a turkey or canary strain.

JOHN T. MYERS

The metabolism of paratyphosus B bacilli. O. HARTOCH, P. BENEVOLENSKII AND A. SMORODINTZEV. *Centr. Bakt. Parasitenk.*, I Abt., 110, 9-17 (1929). Some strains of *B. paratyphosus* B lack the power to assimilate NH₄ salts (sulfate, lactate, chloride, oxalate, and molybdate). This is of interest in studying metabolism and in tracing epidemiological relationships. These deficient strains, when grown on meat ext. media, produce some cells capable of utilizing NH₄, suggesting that such strains are adaptations. Attempts to restore this power to defective strains by mouse passage have failed thus far.

JOHN T. MYERS

Carbohydrate splitting by anaerobic bacilli. J. ZEISSLER AND L. RASSFELD. Bact. Untersuchungsamt der Stadt. Altona Elbe. *Centr. Bakt. Parasitenk.*, I Abt., 110, 24-44 (1929).—A detailed report is given of the fermentation changes caused by 200 different strains of 19 species of anaerobic bacilli for the following substances: glycerol, mannitol, dulcitol, isodulcitol, glucose, galactose, levulose, sucrose, lactose, maltose, inulin, and salicin. The reactions are valuable in differential diagnosis.

J. T. M.

The disinfecting powers of certain alkylphenols. I. Butylresorcinol. LEO F. RETTER, GEORGE VALLEY AND WAYNE N. PLASTRIDGE. Yale Univ. *Centr. Bakt. Parasitenk.*, I Abt., 110, 80-92 (1929).—The phenol coeff. of butylresorcinol lies between 19 and 25, depending on the purity of the preps. A 1:2000 soln. in nutrient broth destroyed *B. typhosum*, *B. paratyphosum* A, *B. coli*, *Streptococcus pyogenes*, and *B. aerogenes* (3 strains) within 3 min. exposure. The bacteriostatic limit for all Gram-negative organisms studied (except *V. cholerae*) was 1:2500, for the Gram-positive coccus forms 1:12000, for the Gram-positive rods 1:20000, and for *V. cholerae* 1:30000. Solns. of butylresorcinol adjusted to pH between 3.0 and 9.0 lost very little of their germicidal power on standing 28 days at room temp. On standing 16 months at room temp. the solns. more alk. than pH 7.0 showed more deterioration than those with a pH between 3.0 and

5.0. CaCO_3 did not materially affect the germicidal power on standing 30 days at room temp., but after 16 months deterioration was marked. The germicidal power was retained in the presence of alc. or glycerol for 277 days at 8°, 20° and 37°. It lost about 50% of its action in the presence of soap, but very little further change occurred after the initial drop. It lost practically all of its power in the presence of commercial peptone, gelatin, or 1% blood serum. In the presence of 10% serum there was a drop of 43%, but it retained a high degree of efficiency. It is non-toxic to rats in amts. up to 0.3 g. per day. Oral administration caused a rapid decrease of the aciduric bacteria from the intestine of the white rat. On continued administration an organism resembling *B. aerogenes* became rapidly predominant, and at times almost crowded out all other forms.

JOHN T. MYERS

The study of "resting" or non-proliferating bacteria. J. H. QUASTEL, Cambridge Univ. *J. Hyg.* 28, 139-46(1928).—If a suspension of *B. coli* is shaken with toluene or ether it is no longer capable of reproduction in the ordinary nutrient media and is apparently dead. However, it can give rise to a number of activations as the activation of formic, lactic, or fumaric acids rendering them capable of reacting with methylene blue, at rates not markedly different from those due to untreated organisms. There is no evidence as yet to prove that the reactions of the cell depend on its survival as a living unit. Lactic and α -hydroxybutyric acids behave as though one enzyme was activating both, whereas lactic and succinic acids behave as though there is a distinct enzyme for each. If *B. coli* is treated with toluene, the lactic acid enzyme which is as active as before to lactic acid has no effect on glycolic acid. This is explicable on the "active center theory." Toluene may act in one of 2 ways: a particular grouping may be destroyed, or the surface structure may be modified.

JOHN T. MYERS

The influence of temperature on bactericidal action. A. E. COOPER AND R. B. HAINES. Univ. of Birmingham, England. *J. Hyg.* 28, 163-71(1928).—Germicides may be divided into 3 main groups according to the influence of temp. on them. (1). Those unaffected by a temp. rise, chiefly chem. substances having reducing powers. (2). Those approximately doubled by a rise in temp. from 20° to 37°, phenol and alc. (3). Those increased by 10 to 20 fold by the same temp. rise, oxidizing agents. The effect of temp. on bactericidal action is different for *B. coli* and *B. fluorescens*, causing complex changes in selective action. The temp. coeff. for the process of protein pptn. by phenol is 2.2 per 10° rise in temp., and hence similar in magnitude to the coeff. for disinfection by phenol. This supports the view that the germicidal action of phenol is associated with its denaturing effect on the cell proteins. The temp. coeff. of the reaction between benzoquinone and glycine is the normal one, 2 for 10°, for chem. action, though its germicidal action may increase 20 times from 20° to 37°. The presence of certain inorg. cell constituents accelerates the velocity of reaction between quinone and glycine, but does not increase the temp. coeff. The bactericidal power of picric acid and KMnO_4 is greatly increased by temp. rise, and there would appear to be some other factor common to all these disinfectants associated with their high-temp. coeff.

JOHN T. MYERS

B. proteus infections. JOHN F. TAYLOR St. Thomas' Hosp., London. *J. Path. Bact.* 31, 897-915(1928).—The name *B. proteus* should be restricted to a well-defined group of organisms. They are non-spore-forming Gram-negative, pleomorphic bacilli which produce a spreading or creeping growth on solid media. They are proteolytic and hemolytic. They do not ferment mannitol, lactose, or dulcitol, but ferment dextrose and sucrose and occasionally maltose. True indole may or may not be formed from peptone water. In milk, a transient clot is formed which is very rapidly peptonized. *B. proteus* X 19 of Felix is distinct serologically but otherwise resembles closely the 53 strains studied.

JOHN T. MYERS

Specific effects of salt, nitrate and nitrite in inhibiting the growth of putrefactive anaerobes (MOULTON) 12. Studies in flax retting (TREVETHICK, et al.) 25.

TANNER, FRED W.: *Bacteriology, a Text-book of Microorganisms*. New York: J. Wiley & Sons, Inc. London: Chapman & Hall, Ltd. 548 pp. \$4.50.

WHITE, JEAN M.: *Applied Bacteriology for Nurses*. New York: The Macmillan Co. 200 pp.

D—BOTANY

THOMAS G. PHILLIPS

The chemical composition of spruce and fir wood at different seasons. ERNST GÄUMANN. *Flora* 123, 344-85(1928).—The chem. compn. of the wood of *Picea excelsa* and *Abies pectinata* was detd. every month for the period of one year. Specimens 50 to 60 cm. in diam. were selected each time. Sections ha-

tween 4 and 8 meters above the stump were used as the samples. These were sepd into heart wood and sap wood, the latter being carefully freed from bast. The heart wood and sap wood samples were analyzed separately. Numerous tables and graphs are included, showing the monthly variations in water, ash, protein, hexosans, xylans, methylpentosans, lignin, cellulose, fatty substances, resins and wax, water-sol. materials, and humin, expressed as percents of the fresh wt. pH values for the samples, also are given. The above components are discussed separately. The mature wood of these trees does not play the passive roll often ascribed to it but is affected by the general life rhythm of the tree; with the trunks of 120-year-old trees, growing under the climatic conditions of those examd. (Switzerland), the conception of a winter rest is correct only to a very limited degree; the living tree and especially its trunk must be regarded as more of a biological unit than one is often accustomed to think of it.

R. C. BURRELL.

Introduction to botanical microchemistry. I. FRANZ BUXBAUM. *Mikrokosmos* 22, 57-60(1929).—A general article of an elementary nature describing pptn. and color reactions, purity of reagents, appliances for microchem. work and a few of the more common microchem. tests.

L. T. FAIRHALL.

Hydrocyanic acid in Lotus. PAUL GUÉRIN. *Compt. rend.* 187, 1158-60(1928).—Of the 60 species of *Lotus* in France, some are eaten by cattle and because of the reported HCN content, particularly from arid countries, there may be danger from poisoning. *L. conimbricensis* Brot., *L. hispidus* Desf., *L. uliginosus* Schk., *L. villosus*, *L. siliquosus* Roth and *L. tetragonolobus* L. were entirely free from HCN. *L. corniculatus* contained 0.2 mg. per kg. There does not appear to be grave danger from *Lotus* poisoning in France. The work is being continued.

C. R. FELLERS.

Tyrosinase of *Beta vulgaris*. R. WEIDENHAGEN AND F. HEINRICH. *Z. Ver. deut. Zuckerind.* 1928, 499-538.—A modification of the Raper and Wormald method of tyrosinase detn. is used, which requires only one filtration, due to the high salt concn., and gives a water white soln. The values obtained by the modified method are in all cases higher than that of R. and W.'s. It is found that the tyrosine conversion by beet tyrosinase is not a reaction of the first order. The max. activity of tyrosinase was between pH 5 and 7 and for temp. between 20° and 30°. Buffer concn. should not exceed $M/6$ for phosphate solns. The lower the substrate concn. the greater the reaction velocity. Methods of purification are discussed. A complete bibliography is given.

E. A. FLETCHER.

Some preliminary observations on the coloring matter of citrus juices. M. B. MATLACK. *Am. J. Pharm.* 100, 243-6(1928).—The juice of the orange is contained in small juice sacs cellular in structure, contg. chromoplasts as is the case of the fruits with colored pulp. Those with colorless pulp (or almost colorless pulp) contain that which appears like groups of oily droplets or possibly elaidoplasts. The pulp of the common round orange or sweet orange is nearly a pure yellow as is also that of the 3 varieties of kumquat (marumi, magami and micwa). That of the satsuma, tangerine, mandarin (slightly lighter), calamondin, rangpur lime, and Sampson tangelo is deep orange red. The Indian red pummelo has red pulp and the pink grape fruit has pink pulp. The pulp of the following is practically colorless: lime, lemon, bitter orange, grape fruit, Siamese pummelo and citron. The chromoplasts all give the usual carotinoid reactions and bleach readily on exposure to air or more quickly by the use of H_2O_2 . They are colored by carotinoid pigments. On subjecting the Indian red pummelo and the pink grape fruit to the Molisch (*Ber. deut. bot. Ges.* 14, 18-29(1896)) microcryst. method it appears from results of observations that the principal pigment is lycopin. Similarly the king mandarin gave crystals which appeared very much like those usually ascribed to carotin. The satsuma gave spherites and filaments appearing very much like osazone crystals of the sugars. It appears that the pigments of the orange and the tangerine are carotin and xanthophyll. The ratio of the 2 pigments to each other detn. the color which the pulp presents. This is probably also true of other members of the *Citrus* genus which have like colored pulp.

W. G. GAESSLER.

Dynamics of the waxy gene in maize. II. The nature of waxy starch. R. A. BRINK. *Univ. Wisconsin. Biochem. J.* 22, 1349-61(1928).—The waxy (A) and non-waxy maize starches contain nearly equal proportions of α - and β -amylase. With malt amylase, (A) produce maltose. Malt amylase hydrolyzes common maize starch more quickly than (A). During the conversion to maltose with malt amylase, (A) forms intermediate products of a lower sp. rotatory power than does common maize starch. The latter, when highly purified, contains more than 12 times as much org. P as does (A) prepd. in the same way.

* BENJAMIN HARROW.

The clover tree (*Goodia lotifolia*) found to be poisonous. ANON. *Agr. Gaz.*

N. S. Wales 39, 885(1928).—The fresh plants contain 0.23% HCN. Loss of HCN occurs when the plants are dried. K. D. JACOB

An experimental examination of the evidence for the presence of phosphatides in the limiting surface of the living protoplast. F. C. STEWARD. Univ. of Leeds. *Brit. J. Exptl. Biol.* 6, 32-41(1928); cf. *C. A.* 22, 2185.—The evidence that phosphatides are present in the surface of the protoplast and can thence diffuse from the living tissue into distd. water is reviewed. Earlier expts. were repeated by leaching slices of seed potatoes in distd. water. These expts. were treated with basic $(\text{AcO})_2\text{Pb}$. No Et_2O -sol. unsapon. matter was present in the ppt. Leaching expts. in which the exts. were kept sterile developed no turbidity. Red beet roots and sugar beets were extd. under sterile conditions. The ppts. obtained with $(\text{AcO})_2\text{Pb}$ were freed from Pb and hydrolyzed but yielded no choline, glycerophosphoric acid or glycerol. Betaine was obtained in appreciable amts. from the filtrate. S. concludes that "phosphatides do not diffuse out into distd. water from healthy parenchymatous tissues." C. M. MCKAY

Ecology of germinating beets with respect to disease. V. STEHLIK AND F. NEUWIRTH. *Listy Cukrovar.* 47, 139-45(1928); cf. *C. A.* 23, 539.—*Phoma betae* infects from 97 to 100% of all beets seeds, but neither *Phoma betae* nor the remaining fungi are considered as the primary cause of disease (blight). Seeds soaked in a H_2SO_4 soln. do not resist the disease any better than seeds which were not treated at all or with distd. H_2O only. Sulfuric acid treatment is recommended for special cases only. Microorganisms are not considered the primary cause of disease in young beets for: (1) the organisms alone are not able to harm healthy beets, and (2) the same disease can be incurred by making unfavorable vegetative conditions in sterile media. The microorganisms are considered as facultative parasites whose virulence varies with internal plant changes which affects their sociology. The organisms attack weak beets, their virulence is increased by a saprophytic evolution, or a removal of one type of organism allows others to multiply more rapidly. The saprophyte or facultative organism may attack a beet in the infected state. *Phoma betae* attacks only the pathological cells; it produces a toxin which enters the cell by osmosis and reduces the resistance, and then enters the cell through extending fibers. The CO_2 content of soil is another important item, especially in poorly ventilated soils. FRANK MARESH

The growth of tobacco and brown root rot of tobacco as affected by timothy infusions of different ages. WM. L. DORAN. Mass. Agr. Expt. Sta. *J. Agr. Research* 36, 281-7(1928).—Evidence is presented in support of the hypothesis that brown root rot is the expression of injurious effects produced by chem. substances formed during the decompn. of org. matter, particularly the residues of slowly decomposing crops such as timothy. A. L. MEHRING

Mean summer or "optimum" temperatures in relation to chemical composition in the apple. JOSEPH S. CALDWELL. Bureau of Plant Industry, Washington, D. C. *J. Agr. Research* 36, 367-89(1928).—Ninety-eight varieties of apples belonging to 16 groups having supposed temp. optima of 52-67° F., grown under controlled conditions at the Arlington Expt. Farm near Wash., D. C., were studied over a period of 6 years. The contents of reducing sugar, sucrose, malic acid, tannin, non-tannin astringents and total solids were detd. in fruit produced during from two to six seasons for nearly all of these varieties. The compn. of the fruit was studied in connection with the climatic conditions of the years concerned. Mean summer temp. as a separate factor was found to have little influence in detg. the compn. The chem. characters of the crops of the low-temp. groups in the warmest and coldest years were exactly the opposite of expectation based on the assumption that temp. is the dominant factor in detg. compn. Years of closely identical mean summer temps. show considerable differences in the chem. character of the fruit. The compn. of the fruit of all varieties shows considerable variations from year to year. The direction and extent of these variations are detd. by the photosynthetic activity during the season. Climatic conditions favoring the attainment of high quality as measured by total sugar, sucrose, acid and astringency content in one group favor the same in all groups regardless of their supposed temp. adaptations and *vice versa*. All of the varieties showed a high degree of uniformity in their behavior. The compn. of the fruit showed no indications that any of the varieties were out of adjustment with the environment. A. L. MEHRING

Phosphorus distribution in grains. J. E. WEBSTER. Okla. Agr. Expt. Sta. *J. Agr. Research* 37, 123-5(1928).—Wheat, barley, yellow corn and oats contain H_2O , 8.68, 8.08, 8.48 and 8.23; fat, 2.33, 2.39, 5.25 and 4.94; ash, 1.77, 2.96, 1.50 and 3.99; total P, 0.43, 0.39, 0.35 and 0.35; phytin P, 0.30, 0.18, 0.29 and 0.19; lipid P, 0.028, 0.022, 0.035 and 0.029; and inorg. P, 0.021, 0.022, 0.012 and 0.015%, resp. Similar analyses are given for mung bean, soy bean, cowpea, kafir, white corn, darso and rye. No

relation was found between the total P and that of any of the P fractions, the phospholipin and fat contents nor the inorg. P and ash. In most cases the phytin P constituted more than half of the total P.

A. L. MEHRING

The influence of oxygen and carbon dioxide on the growth of *Ophiobolus graminis* in pure culture. HURLEY FELLOWS. Bureau of Plant Industry, Wash., D. C. *J. Agr. Research* 37, 349-55(1928).—The fungus causing take-all of wheat was grown on liquid and solid potato-dextrose media. In the liquid medium, growth diminished as the O concn. decreased. On the solid medium marked diminution occurred only when the O content was below 6%. A very small percentage of O greatly reduced growth but the organism grew in all concns. tried. It grew well in all concns. of CO₂ used but at 18% CO₂ some diminution occurred. The variations of CO₂ and O in arable soils are not great enough materially to affect this fungus.

A. L. MEHRING

The chemical composition of some species of pollen with special reference to constituents valuable as nutrients for bees. E. ELSER. *Tech. Ind. Schweizer Chem. Ztg.* 1928, 181-5, 197-200.—E. reviews the literature on the chemistry of pollen and gives the results of his own analyses made by microchem. methods. The pollen from Canterbury bell and spruce fir was analyzed and also various samples obtained from the baskets of bees. Pollen is relatively high in protein and fat. In attempting to find a substitute for pollen as a food for bees, it is necessary to consider physiol. factors as well as the chem. compn.

LAWRENCE P. MILLER

The electromotive forces in plants in potassium chloride solutions of different concentrations. KURT STERN and ERWIN BUNNING. Univ. Frankfurt a. M. *Biochem. Z.* 203, 400-8(1928).—In symmetrical cond. expts. the stimulated side of leaves is always galvanometrically negative whether the soln. is more or less concd. (0.1 N 0.01 N KCl) than the cell juice. Under conditions of asymmetry the stimulated region frequently tends to become galvanometrically positive, which, however, is only apparent, both leads being neg., with the one furthest away from the stimulated spot being more so than the other.

S. MORGULIS

Internal versus external toxicity in *Valonia*. A. G. JACQUES and W. J. V. OSTERHOUT. Rockefeller Inst. *J. Gen. Physiol.* 12, 209-19(1928).—Cells of *Valonia macrophysa*, which have been injected with MnCl₂ dissolved in cell sap, live only half as long as cells in which the same concn. of MnCl₂ is applied to the exterior. This is due to toxic action and not to injury accompanying injection of the cells. The simplest explanation of the results is that the inner cell layer is more sensitive than the outer, and as soon as the inner layer is sufficiently altered to become permeable to MnCl₂, the compd. diffuses out and attacks the outer layer. Another assumption is that the outer layer is permeable to MnCl₂ whereas the inner layer is not, and that the permeable layer is not injured by it. When the compd. is injected the inner layer is attacked at once.

C. H. RICHARDSON

The injection of sulfates into *Valonia*. L. R. BLINKS. Rockefeller Inst. *J. Gen. Physiol.* 12, 207-8(1928).—KCl and K₂SO₄ solns. were injected into the vacuole, *Valonia macrophysa*. The surviving cells tolerate the presence of these solns. SO₄ is not rapidly eliminated after introduction into the cell. The SO₄ occasionally found in apparently normal cells may have entered after temporary injury.

C. H. R.

Cotton wilt: a pathological and physiological investigation. D. C. NEAL. Mississippi Agr. Exp. Sta., *Tech. Bull.* 16, 3-51(1928). See C. A. 23, 412.

J. J. S.

The nitrogen content of growing cultures of *Mycoderma* and of *Saccharomyces cerevisiae*. LEO. M. CHRISTENSEN. Iowa State College. *Plant Physiology* 3, 61-9(1928).—The N content of cultures of *Mycoderma* and of *Saccharomyces cerevisiae* in molasses at various values of p_H was followed by 2 methods of analysis, the regular Kjeldahl and a modified Kjeldahl previously described (C. A. 23, 407). The modified method magnifies both the losses and gains in N. The max. losses and max. gains are not in all cases at the same p_H by both methods. Following the max. gain there is a loss in N. The N content of the cultures is dependent, therefore, upon p_H , time and method of analysis. The results indicate that neither method gives all the N at any given p_H or time interval. Conclusion: Results on N fixation are more likely to err on the neg. than on the pos., that is, there probably is more fixation than any available method indicates.

WALTER THOMAS

Germinative energy of lots of coniferous-tree seed, as related to incubation temperature and to duration of incubation. FERDINAND W. HASSIS. Johns Hopkins Univ. *Plant Physiology* 3, 365-412(1928).—The results of a comprehensive study on the germinative energy of pitch pine (*Pinus rigida* Mill.) and other coniferous seeds are presented. Seed lots may be classified in groups or categories, according to the different proportions of its individuals that are capable of germination under the influence of different

sets of temp. and duration conditions. For example, one lot of pitch pine seeds examd. may be considered as consisting of at least 3 different physiol. forms or types: (A) seeds capable of germination in 14 days or less at a temp. about 25° but not at a temp. about 43°, (A') seeds capable of germination at both these maintained temps. within 14 days or less, and (B) the rest of the lot not capable of germination in 14 days at any temp. These 3 categories appear to represent, resp., 65, 25 and 10% of this particular lot of seeds. Seeds of category (A) were permanently injured when incubated for a day or two at about 43° and failed to germinate subsequently when transferred to a temp. of about 25°. Seeds of category (A') germinated very quickly at about 43° but produced unhealthy seedlings, which grew but slowly even after being transferred to a temp. about 25°. The high temp. optimum is thus seen to favor quick germination of seeds of category (A') but apparently at the expense of subsequent vitality in the seedlings produced.

WALTER THOMAS

Osmotic pressure, osmotic value, and suction tension. WILLIAM A. BECK. Univ. of Dayton, Ohio. *Plant Physiology* 3, 413-40(1928).—Widely divergent views exist regarding the nature of osmotic pressure. *Osmotic pressure* is defined as the difference of pressure on soln. and solvent which produces a condition of equil., such that there is no tendency of the solvent to flow in either direction. The *osmotic value* of a given cell sap is the molal concn. of an agent which is in dynamic equil. with the cell sap. The osmotic value at incipient plasmolysis is symbolized by O_p , at normal by O_n , and at satn. by O_s . It is convenient to append the formula for the agent employed, e. g., $O_p(C_{12}H_{22}O_{11})$. For each osmotic value there is an equiv. *suction tension* of the cell sap. The *osmotic coeff.* of a salt is the ratio of the osmotic value of the cell sap, in terms of cane sugar, to the osmotic value of the same, in terms of the given salt. Thus, $i = \frac{O_p(C_{12}H_{22}O_{11})}{O_p(KNO_3)}$. The osmotic value of a cell may change under the influence of external factors. The osmotic value of neighboring cells need not be the same, even though they belong to the same tissue. The av. value for a given tissue is characteristic for that tissue. No regular gradient of O_p could be established in the direction of the streaming of the water in the plant. The *suction tension* (which is preferable to the term "suction force") represents the positive or negative pressure which causes the influx of water into the cell. The use of the term does not imply that the hydrostatic theory is adhered to. Its numerical value is given by the expression $S_s = S_c - W$, where S_c is the suction force of the contents of the cell and W the wall pressure. The suction tension of plants depends on the habitat.

WALTER THOMAS

Plant nutrition studies in relation to the triangular system of water cultures. HARRY F. CLEMENTS. Mich. State Coll. *Plant Physiology* 3, 441-58(1928); cf. C. A. 22, 1422. Scotch Beauty field peas were grown in the triangular system of water cultures as used by Shive (C. A. 9, 2396) and having an osmotic pressure of 1 atm. In two of the series of expts., the peas were grown under a long light exposure and in a third series under normal conditions of light. *Conclusion.*—Such criteria as length of plants, green and dry wts., highest ash content, highest nitrate content, and also their content of sol. carbohydrates, do not provide an adequate idea of the best balance of salts for the growth of plants. High nitrogen and high carbohydrate plants were found in areas at opposite sides of the triangle; but the best plants were found in the intervening area of the triangle. Shorter exposure to light changes the position occupied by the best cultures.

WALTER THOMAS

Anatomical material for the study of growth differentiation in higher plants. RAY BOUILLENNE. Univ. of Liege, Belgium. *Plant Physiology* 3, 459-71(1928).—B.'s studies on the "stilt" roots of the palm, *Iriarte exorrhiza* Mart., establish between 2 vegetative organs (roots and stems) anatomical correlations which appear to be due in part to the ontogenetic evolution of the plant. When both these organs are formed at the same time from connected meristems, the parallel variations of structure may be explained by the modifications of the physiol. conditions which surround the meristem in the course of development.

WALTER THOMAS

Action of Th X upon the active principle content of certain medicinal plants (AVERSENQ, et al.) 17. Zinc content of food vegetables (BERTRAND, BENZON) 12. Lichen substances. VI. Synthesis of divaric acid (SONN, BURKARD) 10. Chrysanthemin and asterin (ROBINSON, WILLSTÄTTER) 10. Phlorhizin and quercitrin (ZEMPLÉN, et al.) 10. Tetra-araban and its relation to tetragalacturonic acid, the chief component of pectin (ERLICH, SCHUBERT) 10.

E—NUTRITION

PHILIP B. HAWK

The tissue glutathione in experimental beriberi. PIETRO DI MATTEI. Univ. Rome. *Biochim. terap. sper.* 15, 366-75(1928).—The glutathione content of various organs of pigeons in different stages of beriberi was examd. The pigeons were kept on a diet of 25 g. polished rice and 0.90-1.30 g. shelled sunflower seeds per day, on which diet, as had been established in previous expts., they do not lose wt. and do not show any other symptoms than paresis and paralysis. The glutathione detns., carried out in the liver, heart, blood, kidneys, and the pectoral and limb muscles, were made according to Tunncliffe's method (cf. *C. A.* 19, 2217). It was found that the av. glutathione content of 8 pigeons killed in the state of paresis and 8 pigeons killed in the state of paralysis did not differ materially from that of 8 normal animals. I believes that the opposite results obtained by Randoin and Fabre (*C. A.* 21, 3657) are due to the fact that their pigeons were kept on a diet that led to undernutrition. G. SCHWACH

Fats of high vitamin content (Brit. pat. 293,777) 27. Vitamin-containing foods (Brit. pat. 293,735) 12. Treating oils, fats or emulsions with ultra-violet rays to produce vitamins or enzymes (Brit. pat. 293,255) 12.

F—PHYSIOLOGY

E. K. MARSHALL, JR.

Calcium content of bone cartilage. A. POLICARD. *Compt. rend.* 186, 1380-2 (1928).—Descriptions are given of the ash obtained by micro-incineration of the various layers of cartilage during the ossification of certain regions of the tibia. The probable sequence of the modifications which take place is discussed. B. C. A.

Calcium, inorganic phosphorus, and alkaline reserve of the blood of horses which have undergone various endurance tests. N. A. FEDOROV. *J. med.-biol.* 4, 84-92 (1928).—The blood-Ca of horses during fatigue (after trotting, galloping, or doing hard work) is subnormal but independent of the alk. reserve. The variations in Ca and P show an inverse relationship. B. C. A.

The heme compounds in nature and biological oxidations. M. L. ANSON AND A. E. MIRSKY. *Science* 68, 647-8(1928); cf. *C. A.* 23, 1428.—Heme is the Fe pyrrole complex which is joined to the protein, globin, in hemoglobin and may be prepd from its cryst. chloride, hemin. Heme is present not only here and there as a constituent of hemoglobin, but in the O-consuming tissues of animals and plants generally, and the heme compds. in nature are intimately concerned with the catalysts of biol. oxidations. Hemoglobin is to be regarded as a specialized and occasional deriv. of the universal heme. The equil.: hemochromogen \rightleftharpoons heme + nitrogenous substance, always occurs. If there is added to a hemochromogen contg. the unknown nitrogenous substance X, the known nitrogenous substance pyridine which has great affinity for heme, there results: X hemochromogen + pyridine \rightleftharpoons pyridine hemochromogen + X. By the addn. of enough pyridine, X is displaced and the reaction is driven to the right. Yeast contains heme. The study of the catalysis of biol. oxidations is now approached from the standpoint of the Fe-pyrrole complexes. Heme pigments have well defined spectra and their compds. with CO are sensitive to light. Hemoglobin is a specialized deriv. of the universal heme. C. R. FELLERS

Seasonal variations in the iodine and thyroxine content of the thyroid gland. EDWARD C. KENDALL AND D. G. SIMONSEN. Mayo Foundation, Rochester. *Minn. J. Biol. Chem.* 80, 357-77(1928).—Thyroid material, after alk. hydrolysis, may be sepd into acid-sol. and acid-insol. fractions. Of the I present in the latter fraction only 20 to 30% exists as thyroxine. There are many I compds. other than thyroxine, present in the thyroid, but no inorg. iodides except in goiters removed after administration of iodides. There is a 300% seasonal variation in the total I content of the thyroid. Of the I present in fresh hog thyroid, only 0.0 to 14% exists as thyroxine. Desiccated thyroid or iodothylin may contain no thyroxine. It is suggested that thyroxine must be converted to another form before it can exert its physiological activity. A. G.

Distribution of unsaturated fatty acids in tissues. III. Vital organs of beef. W. R. BLOOR. Univ. of Rochester. *J. Biol. Chem.* 80, 443-54(1928); cf. *C. A.* 21, 2021.—The lipide content of the organs of cattle varied greatly both for the same and for different organs. The phospholipide varied least, ranging within 30% of the av. value. The wts. of lecithin and cephalin in various samples of all tissues indicated an equimol. equil., or combination between these 2 substances. Their av. I nos. were also similar. The I nos. of the phospholipides of various organs were likewise very

similar. The mixt. of fatty acids obtained on saponification of the various fractions consisted of $1/2$ liquid, $1/4$ solid acids and $1/4$ unaccounted for. The unsatd. acids contained large amts. of a 4-bond acid but little 3-bond acid. The quantity of the 4-bond acid was greatest in brain tissue.

ARTHUR GROLLMAN

The highly unsaturated fatty acid of liver lipides. The preparation of arachidonic acid. J. B. BROWN. *J. Biol. Chem.* 80, 455-60(1928).—Arachidonic acid was the only highly unsaturated fatty acid present in appreciable quantities in the lipides of pig liver. It occurred to the extent of 2.0 to 7.7% of the total fatty acids, depending on the mode of calcn. Methyl octabromoarachidate, methyl arachidonate and arachidonic acid were prepd. and their properties described.

ARTHUR GROLLMAN

Blood urobilin. The urobilin content of normal human blood. Description of a method. M. A. BLANKENHORN. Western Reserve Univ. and Lakeside Hosp., Cleveland. *J. Biol. Chem.* 80, 477-85(1928).—By examn. in a dark room with an intense beam of light urobilin could be detected in all specimens of human blood examd. For detn. the fluorescence is matched against a soln. of neutral acriflavine of known concn.

ARTHUR GROLLMAN

Quantitative studies of β -oxidation. II. The metabolism of phenylvaleric acid, phenyl- α,β -pentic acid, phenyl- β,γ -pentic acid, mandelic acid, phenyl- β -hydroxypropionic acid and acetophenone in dogs. ARMAND J. QUICK. Cornell Univ. Med. College, N. Y. *J. Biol. Chem.* 80, 515-26(1928); cf. *C. A.* 22, 2970.—Phenylvaleric, phenyl- α,β -pentic and phenyl- β,γ -pentic acids when fed to dogs yield only BzOH conjugated with glucuronic acid and glycine in the ratio of 2:1. Mandelic acid is neither oxidized nor conjugated by the dog, but is excreted unchanged. Phenyl- β -hydroxypropionic acid is excreted largely unchanged but about 25% is oxidized to BzOH which is conjugated with glucuronic acid and glycine in the ratio of 1:1. Acetophenone, administered by mouth, is partially reduced to phenylmethylcarbinol which appears conjugated with glucuronic acid and partially oxidized to BzOH which is excreted as hippuric acid. **III.** The fate of phenylbutyric acid in depancreatized dogs. J. E. SWEET AND ARMAND J. QUICK. *Ibid* 527-34.—The depancreatized dog can oxidize $\text{PHCH}_2\text{CH}_2\text{CH}_2\text{COOH}$ to PHCH_2COOH and can conjugate the latter with glycine and glucuronic acid. This finding suggests the possibility that the diabetic organism can still oxidize a small amt. of $\text{CH}_3\text{CH}_2\text{CH}_2\text{COOH}$. It is suggested, therefore, that this acid is combined with a carbohydrate group which prevents this oxidation. **IV.** The metabolism of conjugated glucuronic acids. ARMAND J. QUICK. *Ibid* 535-51.—Glucuronic acid does not alleviate insulin convulsions in mice. Menthol or mentholglucuronic acid, fed to dogs, is oxidized in great amt. Borneol and borneolglucuronic acid are similarly destroyed but to a less extent. Glucuronic acid monobenzoate, ingested by man, is excreted as hippuric acid in the urine. Ingested by dogs, it is partly excreted unchanged and partly oxidized. These results indicate that in the dog all the BzOH is first conjugated with glucuronic acid and that hippuric acid is secondarily formed.

ARTHUR GROLLMAN

Clinical calorimetry. XLIII. A comparison of the thresholds of ketosis in diabetes, epilepsy, and obesity. WALTER S. MCCLELLAN, HENRY J. SPENCER, EMIL A. FALK AND EUGENE F. DU BOIS. *J. Biol. Chem.* 80, 639-52(1928).—The threshold of ketosis was detd. on 6 men, 3 of whom received exclusive meat diets and the others very little carbohydrate. This threshold when calcd. for periods was found at the FA:G ratio of approx. 1.5 except for the obese subject for whom it was 2.4. This difference in the case of the obese subject is attributed to a greater efficiency in the utilization of fat. **XLIV.** Changes in the rate of excretion of acetone bodies during the twenty-four hours. WALTER S. MCCLELLAN AND VINCENT TOSCANI. *Ibid* 653-8.—Observations on the rate of excretion of acetone bodies were made on 3 men on an exclusive meat diet. The highest excretion occurred during the late afternoon and night while the lowest rate was in the forenoon.

ARTHUR GROLLMAN

The nature of blood sugar. OTTO FOLIN. Harvard Univ. *J. Biol. Chem.* 81, 377-9(1929); cf. *C. A.* 22, 2762.—A criticism of the methods and conclusions of Somogyi and Kramer (*C. A.* 23, 872).

ARTHUR GROLLMAN

The hydrogen-ion concentration of the blood of the mother and child during birth. HEINZ SIEDENTOPF AND WALTHER EISSNER. Universität-Frauenklinik, Leipzig. *Deut. med. Wochschr.* 54, 2145-7(1928).—At the time of birth, the p_H of the maternal blood is normal while that of the fetus is slightly acid, owing to the presence of org. acids other than CO_2 .

ARTHUR GROLLMAN

Studies of urea excretion. II. The relationship between urine volume and the rate of urea excretion by normal adults. EGGERT MÖLLER, J. F. MCINTOSH AND D. VAN SLYKE. *J. Clin. Investigation* 6, 427-65(1928).—**III.** The influence of

body size on urea output. J. F. McINTOSH, E. MÖLLER AND D. D. VAN SLYKE. *Ibid* 467-83.

Note on volatile sulfide from muscle. WM. ALEX. OSBORNE. Univ. Melbourne. *Biochem. J.* 22, 1312(1928).—If the muscle from a well-fed guinea pig was boiled immediately after killing, no volatile sulfide could be detected. When some hours elapsed between killing and removal of muscles, sulfide was detected. If the guinea pig was first starved for 48 hours and then the muscle immediately removed after killing, sulfide was detected.

ARTHUR GROLLMAN
BENJAMIN HARROW

Studies on colostrum. A. L. PROVAN. Univ. Coll., Aberystwyth. *Welsh J. Agr.* 4, 141-7(1928).—The av. compn. of colostrum from the second and third milkings, 12 and 24 hrs. after calving, of shorthorn cows as compared with the av. compn. of 185 samples of normal milk from cows of the same herd was as follows: total solids, 20.65, 16.68, and 12.63; fat, 3.31, 3.50, and 3.69; solids-not-fat, 18.26, 13.18, and 8.94; protein, 13.05, 8.15, and 3.41; ash, 0.937, 0.817, and 0.708; CaO, 0.2011, 0.1864, and 0.1646; P₂O₅, 0.3390, 0.3269, and 0.2324; K₂O, 0.1902, 0.2005, and 0.1952; and Cl, 0.1323, 0.1135, and 0.0962%, resp. The individual samples of colostrum from both the second and third milkings varied widely in compn., the greatest variations being in total solids, fat, solids-not-fat and protein. In general, the compn. of colostrum varied more than that of individual samples of normal milk from cows in the same herd. Analyses of colostrum at different periods after calving showed that there was a rapid diminution in the protein and chloride content while the percentages of CaO and P₂O₅ decreased more slowly. The large excesses of protein and chloride in colostrum from the first milkings are probably due to abnormalities in the milk gland and have no great significance in so far as the growth of the calf is concerned. The surplus of CaO and P₂O₅ on the other hand is probably connected with the needs of the growing calf and does not disappear as rapidly as does the surplus of the protein and chloride. The fat content of colostrum decreased with increase in age of the cow. The percentages of protein and of solids-not-fat were high after the first calf, decreased to a low level after the second and third calves, and increased to const. values for later calves. The percentages of ash and P₂O₅ reached a max. after the fourth and fifth calf. The CaO content increased with successive calves, while the chloride remained almost const. The colostrum of the Jersey cow contained more CaO, P₂O₅, and solids-not-fat than that of other breeds. The colostrum of Welsh Black cows was lower in protein and solids-not-fat than that of other breeds.

K. D. JACOB

Experiments on "acetone bodies." J. WEGIERKO. *Med. Doswiadczenia i Spoeczna* 8, 1-40 (Polish), 41-2 (French)(1928).—The hepatic glycogen has no influence on the accumulation of "acetone bodies." The resorption of albuminoid food by the depancreatized dogs was satisfactory and amounted to 29-74%; the resorption of fats, however, varied greatly (between 8 and 61%). No acetonuria was found in 9 dogs who had glucosuria and succumbed in 2-3 days. In one dog the quantity of acetone bodies in the urine increased on administration of fatty and amino acids. Dogs submitted to fasting and phlorhizinized had more marked acetonuria before than after pancreatectomy.

JAROSLAV. KUČERA

Influence of fatigue in the mountains and in the plain on the exchange of water in the organism. JERZY KAULBERSZ. *Med. Doswiadczenia i Spoeczna* 8, 315-34 (Polish), 335-6 (French)(1928).—The fatigue was brought about by marches and runs up and down stairs in high mountains (2865 m.) and in the plain. After the runs for some hrs. in the mountains the blood was always found diluted. The quantity of hemoglobin, red corpuscles, solid matter, proteins in serum and the density of blood were diminished. The relation solid matter/density remained unchanged in the whole blood and diminished in the serum. After one hr. of phys. strain the blood was found more concd. The quantity of hemoglobin, red corpuscles, proteins and the relation solid matter/density was higher. The loss of wt. was 1 kg. The quantity of fibrinogen was under normal and the secretion of urine diminished; its density increased. After 1-2 hrs. the concn. of blood again diminished and was diluted (secondary diln.). However, the quantity of proteins of the serum was found to be higher. It is assumed that this is due to the passage of proteins from the tissue into the blood. The considerations of Barbour that the primary and secondary diln. of blood during phys. march is a regulating function of the heat of the organism are confirmed.

JAROSLAV. KUČERA

Animal calorimetry. XXXVIII. The specific dynamic action of meat in hypophysectomized dogs. OLIVER H. GAEBLER. Cornell Univ. Med. College, N. Y. *J. Biol. Chem.* 81, 41-7(1929).—No marked change in specific dynamic action of protein was observed in a dog after the removal of the pituitary gland. The basal respiratory quotients did not indicate any change in oxidation of carbohydrate. The height

of specific dynamic action at a variable time after protein ingestion bore no quant. relationship to the concn. of the amino acids circulating in the blood. A. P. LOTHROP

Interfacial adsorption as a factor in the clotting of blood plasma. J. M. JOHLIN. Marine Biol. Lab., Woods Hole and Vanderbilt Univ. Med. School. *J. Biol. Chem.* 81, 99-113(1929).—"Clotting expts. which were carried out with the plasma of dog-fish and sand sharks showed that clotting can be induced by the contact of the plasma with substances which produce an adsorbing interface between the plasma and these substances. Such induced clotting was found to take place where the interface had been formed between plasma on the one hand, and air, Et_2O , CHCl_3 , BaSO_4 , kaolin, powd. soft glass, and powd. Pyrex glass on the other. No appreciable adsorption was found to take place at the interface between plasma and paraffin oil, and in these instances clotting could not be induced by the emulsification of plasma with paraffin oil. Following the emulsification of ether with plasma, the ether was found to contain a substance which retarded the clotting of plasma by cephalin. The different types of interfaces are not equally effective as adsorbing surfaces nor does the plasma of different individuals of the same species behave in a like manner. The action described in these expts. appears to be primarily that of the interfacial adsorption of a substance of the nature of an antiprothrombin, the removal of which leaves free in the plasma a substance which induces clotting. This point of view appears in harmony with Howell's explanation of blood clotting."

A. P. LOTHROP

Is there a relationship between the spleen and calcium metabolism? FRANK P. UNDERHILL AND ERWIN G. GROSS. Yale Univ. *J. Biol. Chem.* 81, 163-5(1929). -- An attempt was made to repeat the expts. of Hall and Ablahadian (*Cal. and Western Med.* 23, 289(1925)) upon the effect of splenectomy on Ca metabolism. Their results were not confirmed, due possibly to the fact that the expts. may not have been duplicated since the details of the work of Hall and Ablahadian are only incompletely described. Under the exptl. conditions employed removal of the spleen did not influence the level of serum Ca in rabbits and the serum Ca was not notably affected by intravenous injections of spleen nucleoprotein.

A. P. LOTHROP

The constancy of sugar in the sweat of a normal individual. G. A. TALBERT AND S. H. SILVERS. Proc. Am. Physiol. Soc., *Am. J. Physiol.* 81, 509(1927).—Sweat contained from 5.6 to 40 mg. sugar per 100 cc. In 20 cases there was a fall in blood sugar during sweating, in 6 an increase and in one no change.

J. F. LYMAN

The distribution of phosphorus compounds in the blood of certain mammals. HERBERT D. KAY. London Hospital. *J. Physiol.* 65, 374-80(1928).—The acid-sol. ester phosphate per 100 cc. corpuscles (phosphorus index) varies widely from one species to another; but is remarkably constant in health among individuals of a species. The values in mg. of P are: pig 97, rabbit 86, rat 73, guinea pig 63, man 53, dog 51, horse 49, cat 22, sheep 13.5, ox 10.5 and goat 10.3.

J. F. LYMAN

The identical source of work and heat in muscular contraction. W. HARTREE. Cambridge. *J. Physiol.* 65, 385-8(1928).—In the frog sartorius muscle (1) contracting isometrically and (2) doing work, the recovery heat was the same fraction of the initial energy in both cases. Conclusion: Both heat and work probably come from the same reaction, viz., the formation of lactate from its precursor.

J. F. LYMAN

The concentration and diffusion of inorganic phosphate in the living muscle. G. STELLA. Univ. College, London. *J. Physiol.* 66, 19-31(1928).—When frog's legs were placed in Ringer's solns. to which varying amts. of phosphate had been added inorganic phosphate diffused freely into or out of the muscle until equil. was established according to the ordinary diffusion laws. There was no evidence of a change in the permeability of the muscle fibers to phosphate. The inorganic phosphate concn. in resting muscle was in equil. with 8 or 9 mg. per 100 cc. of phosphate in the lymph, or in the Ringer soln. with which the muscle was in contact. In the fatigued muscle equil. occurred at 18 mg. per 100 cc., and in rigor muscle at 130 mg. per 100 cc. Because of possible membrane equil., adsorption or reversible combination part of the inorganic phosphate inside the muscle fibers may be incapable of diffusion.

J. F. LYMAN

The effects of breathing carbon dioxide and oxygen mixtures upon the carbon dioxide and oxygen tensions in the tissues. J. ARGVLL CAMPBELL. Proc. Physiol. Soc., *J. Physiol.* 66, i-ii(1928).—When O_2 contg. CO_2 was rebreathed by rabbits the presence of the CO_2 in no way prevented the entry of O_2 into the tissues. J. F. L.

Pituitrin and the chloride concentrating power of the kidneys. J. B. S. HALDANE. Proc. Physiol. Soc., *J. Physiol.* 66, x(1928).—Pituitrin in amts. sufficient to inhibit diuresis due to drinking water had no effect on the vol. of urine secreted after drinking 200 to 400 cc. of an 8 to 10% NaCl soln. Also the Cl content of the urine secreted after pitui-

trin injection and salt ingestion was not significantly different from that secreted after salt but without pituitrin.

J. F. LYMAN

Analysis of the acid-base equilibrium in urine. FRITZ MAINZER AND ANNA JOFFE. Städt. Krankenhaus Altona, Elbe. *Biochem. Z.* 203, 50-87(1928).—Expts. are reported which show that it is not justified to connect an increased NH_3 and acid excretion with the presence of an acidosis. The increased NH_3 and acid excretion in the urine is more a sign of the organism's tendency to save alkali observed under different conditions. The alkali-sparing tendency, measured by the quotient: $100 (\text{NH}_3 + \text{titratable acid bicarbonate}) / \text{total N}$ is considered the only true expression of the factual metabolic direction, is opposed to the alkali-sparing effect measured by the quotient $100(\text{NH}_3 + \text{titratable acid bicarbonate}) / \text{total base}$, all values being given in milliequivalents. The theoretical significance of the quotient of the sparing effect is discussed. The quotient permits a quant. comparison of urines of the same titrational acidity but of different p_{H} . In expts. with NH_4Cl and NaHCO_3 administration the practical value of the application of this quotient in the analysis of the acid-base balance is indicated. The bicarbonate in the urine received especial consideration as a factor in the acid-sparing and even in urines more acid than blood this sparing action already appears. The simultaneous variation in the elimination of a volatile base, NH_3 , and of a volatile acid, bound CO_2 , enable the organism to regulate the acid-base equil. through the kidney independently of the acid for excreting various substances, and in this connection the urinary p_{H} gains its importance. The method for calcg. the bound CO_2 in urine, and its dependence upon the urinary concn. are critically discussed, and a procedure is developed for the setting up of a complete balance of anions and cations in the urine. For this purpose the distribution of primary and secondary phosphate is calcd. with the aid of the 2nd dissozn. const. and a detn. of the equiv. base bound by the org. acid. It is suggested that the urine must contain not inappreciable amts. of unknown org. acids.

S. MORGENTHAU

Cerebral innervation of respiration. II. Periodic respiration and apnea. ROBERT SCHOEN. Med. Univ.-Klin. zu Leipzig. *Arch. expul. Path. Pharm.* 138, 339-71(1928).—Periodic respiration may be due to one of 3 causes: to disturbances in coordination of the respiratory center assocd. with injury to the brain stem; to the action of poisons which cause an initial paralysis and lead to a changed irritability of the respiratory center; and to influences, such as morphine intoxication and lack of O_2 , acting upon the cerebrum and thalamus.

G. H. S.

The relationship of carbon dioxide in the blood to asphyxia and the activity of the respiratory center: general considerations and observations on the new-born infant. HAROLD M. TRUSLER, ARTHUR E. GUEDEL AND JAMES D. GEORGE. *Anesthesia and Analgesia* 7, 303-8(1928).—The anoxemia of asphyxia at first stimulates and then depresses the respiratory center. O is a stimulant to the extent that it relieves the depression. Expts. show that the Van Slyke CO_2 detn. bears no direct relationship to the activity of the respiratory center. This exptl. work was confirmed clinically with mothers and new-born infants.

R. C. WILLSON

The influence of acetic acid on the gastric secretion. WLADIMIR FILINSKI AND VENCESLAS MERKERT. Univ. Varsovie. *Arch. mal. appar. dig. et mal. natrl.* 17, 990-1011(1927); *Ber. ges. Physiol. expul. Pharmacol.* 44, 655.—The influence of AcOH on the gastric secretion is manifest in 2 periods. In the first there is a reduced HCl secretion and an increase in the thin secretion so that the first samples removed from the stomach show a reduction in the gastric acidity. The copiously secreted mucous also plays a part in the diln. of the secretion. In the second period the AcOH stimulates the secretion of HCl . The secretion of pepsin which is first stimulated in the first period increases constantly to the end of the digestion period. The back-flow of duodenal juice into the stomach was not observed sufficiently often to ascribe any significance to it. AcOH given at meal time was well tolerated. A bitter fermentation (ascribed by Janowski to the back-flow of bile) was rarely observed. Copious salivary excretion was often observed, even when the AcOH was admitted directly into the stomach with a stomach tube. The authors assume that the salivary flow is to be attributed to the same type of reflex as is the secretion of the dilid gastric juice and that the AcOH exerts a similar influence on the whole digestive tract. This may also account for the appetite of patients with achylia or achlorhydria after they have received a small amt. of acid at meal time.

R. C. WILLSON

The secretion of kinase in an isolated loop of intestine. E. BOGDANOVA. *Russkij fisiol. zhurnal.* 9, 373-81(1927); *Ber. ges. Physiol. expul. Pharmacol.* 44, 657.—The studies show that the isolated loop of intestine is truly capable of regularly producing

kinase and that the central nervous system plays only a subordinate role in this production. The kinase was detd. according to the Sawic method. R. C. WILLSON

The serum content of the blood. BROCC-ROUSSEU AND G. ROUSSEL. *Sang* 2, 29-34(1928); *Ber. ges. Physiol. exptl. Pharmacol.* 45, 646.—The av. of several thousand detns. was about 60 cc. serum per 100 cc. of horse blood. R. C. WILLSON

G—PATHOLOGY

H. GIDEON WELLS

The behavior of the plasma chlorides in obstructive jaundice. I. S. RAVDIN AND M. E. MORRISON. *Arch. Internal Med.* 42, 490-9(1928).—Neither removal of the gall bladder nor ligation of the common duct affected the plasma chlorides, but a combination of both operations resulted in a reduction of the plasma chlorides.

J. B. BROWN

The parathyroid glands. Their relationship to the thyroid with special reference to hyperthyroidism. E. P. McCULLAGH. *Arch. Internal Med.* 42, 546-59(1928).—Mostly a review. Data are given showing blood Ca levels in hypo- and hyperthyroidism.

J. B. BROWN

Pancreatic function. II. The pancreatic activity in diabetes mellitus. S. OKADA, T. IMAZU, K. KURAMUCHI, K. HORIUCHI AND T. TZUKAHARA. *Arch. Internal Med.* 42, 560-75(1928).—The activities of pancreatic lipase, and amylase and trypsin were followed in 21 cases of diabetes. Seventy % of the cases showed a diminution of one or more of these enzymes. In 24% of the cases the activity of all 3 enzymes was abnormally low. However, the degree of disturbance in the external secretion and the severity of the diabetes are not necessarily parallel.

J. B. BROWN

A new clinical test for tissue thirst. WILLIAM A. THOMAS AND EDMUND ANDREWS. *Arch. Internal Med.* 42, 776-9(1928).—Normal human and dog serums when dialyzed against 0.01 N HCl swell 1-2%, 8% being the max. Serums from nephritic and edematous cases give a much greater swelling, due either to the presence in the blood of some foreign protein or to some change in the colloidal dispersion of the normal blood proteins. An app. is described for conveniently dialyzing a serum against the acid and reading the amt. of swelling.

J. B. BROWN

Atopy. Blood calcium and gastric analysis. LEO H. CRIEP AND WILLIAM S. McELROY. *Arch. Internal Med.* 42, 865-71(1928).—Blood Ca in various atopic conditions (asthma, hay fever, atopic rhinitis) is normal. Ca therapy in these cases produces no permanent increase in blood Ca. Gastric analysis shows frequent achlorhydria and hypoacidity.

J. B. BROWN

The resorcinol flocculation test for activity in tuberculosis. ADELAIDE B. BAYLIS AND WARD J. MACNEAL. *New York Post-Graduate Med. School and Columbia Univ. Am. Rev. Tuberculosis* 18, 843-7(1928).—The resorcinol test is without any claim to specificity in a bacteriological sense, but it offers some help in detg. activity or arrest of the tuberculous process. In the known tuberculous person it is a convenient and reasonably reliable method of measuring the state of activity of the tuberculous process, and it is in such cases that it would seem to have its greatest promise of usefulness. The simple test of Baylis is described and results with its use are recorded. It obviates the use of the expensive photometer of the Vernes test. 0.5 cc. of the 1.25% resorcinol soln. is gently poured on to 0.15 cc. of the patient's serum in a small tube, the mixt. is then rapidly passed from one tube to another and then back again, the container closed with a rubber stopper and allowed to remain in the room 4 hrs., and in the refrigerator overnight. In the morning it is again placed in the room without shaking and allowed to rest until the water of condensation has disappeared from the exterior of the tube. Reading by the naked eye is recorded as —, ±, to ++++ or atypical according to the quantity and quality of the sediment.

H. J. CORPER

The testicular allergic response (spermatocyte reaction) in guinea pigs for the diagnosis of tuberculous fluids. J. J. WIENER, JOHN E. BLAIR AND HENRY L. JAFFE. *Hosp. for Joint Diseases, New York City. Am. Rev. Tuberculosis* 19, 55-73(1929).—An attempt was made to apply Long's "Spermatocyte reaction" (testicular tuberculin reaction) to the diagnosis of body fluids suspected of coming from tuberculous foci. The test consists of the injection of 0.1 to 0.3 cc. of the suspected fluid into the testis of a tuberculous guinea pig, autopsy of the animal after 5 to 7 days, and histological examn. of the testis for a characteristic degeneration. The diagnostic value of the test is impaired by the fact that rarely a tuberculous fluid failed to give the typical reaction, and about 35% of non-tuberculous fluids (particularly fluids from cases of

malignant tumor) gave a reaction which was histologically indistinguishable from that given by a tuberculous fluid. Data obtained show that this is a toxic effect, which apparently cannot be eliminated by reducing the amt. of fluid injected. However with the exception of spinal fluids, if 0.1 to 0.2 cc. of the fluid from a suspected tuberculous focus, upon inoculation into the testis of a tuberculous guinea pig, produces no reaction as above described, the possibility of tuberculosis of that focus may be definitely ruled out.

The phenomenon of flocculation in syphilis and tuberculosis. ARTHUR VERNES. Inst. Prophylactique, Paris. *Brit. J. Tuberculosis* 22, 165-9(1928).—Sero-flocculation the study of which is based on the examn. of more than 23,000 sera, is for tuberculosis as for syphilis, the interpretation of an alteration of the blood, which is in direct relation with the degree and evolution of infection. The curve of the photometric readings descends after an artificial pneumothorax or after sanatorium treatment, and it rises with every exacerbation of the disease. These oscillations contrast with the non-variability of the cutaneous reaction. An illustration of the Vernes-Bricq-Yvon photometer is given and the technic of the serum reaction with resorcin detailed. H. J. CORPER

Considerations on the Abderhalden reaction based on 10,000 cases. V. KAFKA. Univ. Friedrichsberg in Hamburg. *Fermentforschung* 10, 256-63(1928).—More uniformly consistent results are obtained when the Abderhalden reaction is performed by the dialysis method than by the optical, refractometric, interferometric or other modifications. An experienced technician always obtains better results than one with less experience although with apparently flawless technic. A slight modification recommended consists in shaking each tube with 3 cc. of a mixt. of AmOH and CHCl₃ after adding the ninhydrin reagent and noting the occurrence of yellow color at the end of 0.5 hr. The term "Abbau" has been applied not only to the reaction between serum and substrate but also to the process in the organism whereby the serum is altered. It has been assumed that the organ which gives a pos. reaction is actually "abgebaut" in the organism. This is by no means certain, and it is therefore preferable to speak merely of pos. and neg. reaction. In interpreting a diagnosis on the basis of a pos. reaction, the possibility must be borne in mind that an organ which reacts may represent only a secondary factor, an object of least resistance toward metabolic products of abnormal constitution. In psychiatry and neurology the diagnosis is especially difficult because of lack of control tests before the abnormality developed. In the diagnosis of pregnancy it has been impossible to arrive at any est. of percentage accuracy because in a great many cases no records of the patients' subsequent history were available. Endocrine disturbances as diagnosed by the Abderhalden reaction cannot always be referred to a single organ, since the reaction produced by a given gland may represent a disturbed correlation of several glands. Then again it is difficult to distinguish between a process actually occurring and a mere constitutional abnormality. In epilepsy there is almost invariably a pos. reaction with brain cortex and thyroid, almost never with hypophysis or suprarenals, but frequently with sex glands. Interesting correlations are pointed out also in other types of disturbances. In general the Abderhalden reaction does not indicate a disintegration but rather a functional disturbance of an organ. A. W. DOX

Serum therapy. RUD. KRAUS. *Pharm. Monatshefte* 10, 4-6(1929).—An address briefly descriptive of present-day curative sera of established repute. W. O. E.

Crystals and pigments in living tissue. A. J. F. OUDENDAL. Med. School Weltevreden. *Mededeel. Dienst. Volksgezondheid Nederland.-Indie*, Pt. 1, 1-20(1925).—Various crystals usually in or in proximity of necrotic or diseased tissue are considered. *Cholesterol* and cholesterol esters were recovered in large quantities from spleen and thyroid tissue. They are especially abundant in the enlarged spleens of native Javans and are probably connected with blood destruction and lipid formation. The frequent occurrence of crystals and of yellowish brown pigments (Fe deposition) shows further that the origin of the crystals is in the blood. Giant cells often entirely surround the masses of crystals. The Fe-stains and pigments are often present in the liver and spleen and are associated with pathological processes. Crystals of *albumin* were found in the liver of a tuberculous native woman. These are identical to the so-called Charcot-Leyden crystals. Their genesis is likewise considered to be in the blood cells. *Malaria* appears to play a considerable part in the deposition of the various ferruginous pigments in the body and it is known that malarial patients often void ferruginous urine. Eosinophile-like cells contg. much Fe are present in large nos. in the spleen, intestinal walls, in sarcomas and abscesses of the liver. These are the cells from which the Fe cryst. deposits are probably pptd;—A series of 23 colored plates greatly enhances the value of the article. C. R. FELLERS

Effect of administration of alcohol upon the result of the Wassermann test in yaws monkeys. B. TANABE. Imp. Jap. Army and Bur. Sci. Manila. *Philippine J. Sci.* 37, 247-50(1928).—EtOH, administered either subcutaneously or by mouth in monkeys afflicted with yaws, caused a normally positive Wassermann reaction to become negative. When the test was repeated in from 24 to 48 hrs., positive results were again obtained. In several cases double plus reactions became entirely negative after the administration of 3 cc. of 95% EtOH. It is concluded that humans should not be examd. for the Wassermann test if alcoholic liquors have been recently ingested. Further proof is presented showing that the monkey with yaws reacts similarly to the human syphilitic and is a very suitable exptl. animal for research on this disease.

C. R. F.

Iodine metabolism in cases of primary thyreotoxicosis. (Primary Basedow's disease.) JOHAN HOLST, GULBRAND LUNDE, KARL CLOSS AND O. CHR. PEDERSEN. Univ. Oslo, Norway. *Klin. Wochschr.* 7, 2287-90(1928).—Normal blood contains from 0.011 to 0.016 mg. I per 100 cc. By extn. with alc., this can be divided into 2 fractions, namely: A, an alc.-sol. fraction (largely inorg.) equal to 0.007 to 0.012 mg. % and B, an alc.-insol. fraction equal to 0.001 to 0.004 mg. %. The alc.-insol. fraction contains the active principle of the thyroid gland. In primary Basedow's disease, the basal metabolic rate is increased, the I content of fraction B is increased and the thyroid contains but little I and colloid. Administration of I as Lugol's soln. leads to an enormous increase in the inorg. I content of the blood, a decrease in the I content of fraction B, and an increase in the I and colloid content of the thyroid. The basal metabolic rate is decreased.

MILTON HANKE

Is it possible, in general practice, to draw the same conclusions from a creatinine determination that one can draw from a determination of the residual nitrogen? A study of 1000 cases. FRITZ LICKINT. *Klin. Wochschr.* 7, 2341-2(1928).—The concn. of creatinine in the serum does not, in individual cases, parallel the residual N concn.

MILTON HANKE

The bactericidal power of cerebrospinal fluid and inflammatory and non-inflammatory exudates and transudates from the chest and abdominal cavity. PAUL V. GARA. Univ. Greifswald. *Klin. Wochschr.* 7, 2386-7(1928).—The cerebrospinal fluid does not usually contain substances that are bactericidal to Gram-pos. micro-organisms. This fluid was bactericidal in 2 cases, one of idiocy and one of imbecility. There is no relationship between bactericidal properties of the cerebrospinal fluid and the Wassermann reaction. Pleural and abdominal exudates of inflammatory origin are strongly bactericidal; transudates are not bactericidal.

M. H.

Supposed effect of tumor extracts on glucolysis. JOHN BROOKS AND MAURICE JOWETT. Univ. Liverpool. *Biochem. J.* 22, 1413-16(1928).—In contradistinction to Waterman (*C. A.* 20, 1664), the authors employing Warburg's methods (*C. A.* 22, 4644) have been unable to find any effect of tumor ext. on glucolysis.

B. H.

Metabolism in scurvy. II. The nitrogen absorption and retention of guinea pigs. HENRY L. SHIPP AND SYLVESTER S. ZILVA. Lister Inst., London. *Biochem. J.* 22, 1449-60(1928); cf. *C. A.* 22, 2771.—There is no disturbed absorption or retention of N during the early stages of the development of scurvy in growing guinea pigs.

BENJAMIN HARROW

Essential pentosuria. JULIUS A. ROSSEN. *Arch. Pediatrics* 46, 46-50(1929).—The urine of a male, age 13 years, contained 0.17 to 0.37% of non-fermentable sugar, and yielded a phenylosazone, m. 150°. Polyuria and its assocd. thirst were absent. The blood sugar, the sugar tolerance, and the basal metabolic rate (+3%) were normal.

JOSEPH S. HEPBURN

The pathogenesis of nutritional disturbances in infancy. XII. Experimental dehydration and glutathione. E. SCHIFF AND M. FUKUYAMA. *Jahrb. Kinderheilk.* 121, 1-6(1928).—The SH-contg. complex of biological importance is supposed to be glutathione, a dipeptide of glutamic acid and cysteine. In living tissues, at neutral or slightly alk. reactions, there is a continuous oxidation of the SH group, and as long as the tissue supplies H, a continuous reduction from S-S to SH. The Tunncliffe method for detg. the SH group was used to show the differences in glutathione content of the body tissues of normal young mice and of mice fed dry milk with a min. quantity of water. The amt. of SH in the liver is greatly reduced by dehydration. Parenteral injection of peptone, histamine, tyramine and killed bacteria was without effect on normal animals, but caused a still greater decrease of SH in dehydrated mice. The results indicate that in acute dehydration, the autooxidative processes of the body are diminished.

ELEANOR M. HUMPHREYS

Gaseous exchange studied on recovery after exercise in healthy and ill children. HILDE BRUCH. *Jahrb. Kinderheilk.* 121, 7-28(1928).—Four types of response to successive brief periods of alternate activity and rest were observed. (1) equal values of air-vol. and O use in successive periods of work, (2) recovery from the O deficit incurred in the first work period only after rest following the second work period, (3) progressive exhaustion with a step-like increase of the respiratory quotient in the following work periods, (4) excessively deep inspiration during the first work period, which preserves an O reserve for the next work period. ELEANOR M. HUMPHREYS

The mineral content and the acid-base equilibrium of the serum of infants. A NITSCHKE AND G. MEYER ZU HÖRSTE. *Jahrb. Kinderheilk.* 121, 111-22(1928).—The authors detd. the Ca, P, HCO_3 , Cl, Na, K and combined base in the serum of healthy and ill infants. The serum of normal infants contains less org. acid than does normal adult serum. In nutritional disturbances there often is a readjustment of the various acid-base factors which compensates for the depletion of the alkali reserve. In florid rickets there are no consistent changes. Some rachitic children have an org. acidosis, others an inorg. acidosis, while with others no abnormality is observed. The findings in tetany do not support the theory of a hyper-ventilation alkalosis, but in some cases an org. acidosis is present. Infants with rickets and tetany, treated with irradiated ergosterol, develop a distinct alkalosis due to a decrease of org. acids. The authors emphasize the fact that observations on changes of the alkali reserve alone give only an incomplete picture of the acid-base equil. ELEANOR M. HUMPHREYS

Alcoholic intoxication and oxygen. P. M. VAN WULFFTEN PALTHE. *Geneeskund Tijdschr. Nederland. Indië* 68, 597-611(1928).—Inhalation of O reacts favorably on acute alc. intoxication of man and animal. With very large amts. of alc. the effect is not so clearly demonstrable. In some cases it was possible, notwithstanding a fatal dose, to keep the animal alive. Difference between inhalation of pure O with O mixed with CO_2 could be detected with human beings but not with animals. Stopping the O treatment in the acute stage causes the return of the toxic condition to the same degree. Although it must not be concluded that alc. intoxication is caused by a lack of O, it is pointed out that in expts. with caisson workers, mountain sickness and flying, the lack of O causes conditions, which are quite similar to alc. intoxication. It is possible that there is a lack of O in the tissue cells, causing some conditions of alc. intoxication, but what causes this deficiency is hard to tell. J. C. JURRJENS

Serum albumin and antibodies. G. KAPSENBERG. *Nederland. Tijdschr. Hyg., Microbiol. en Serol.* 3, No. 2, 128-64(1928); cf. C. A. 22, 4169.—Results of investigations by K. and his co-workers have shown that the antibodies are linked to the globulin, and a new presentation is made of the constellation of the serum albumin. The opinion is defended, that the Wassermann- and the Sachs-Georgi reaction is an antigen-antibody one. A new theory is developed in relation to the origin of specific antibodies, produced after the parenteral administering of antigen. The antigens are broken down in the circulation. Parts of them enter the body cells. Here is the origin of a particular amino acid chain, called the primary antibody chain. This chain helps in forming the secondary antibody chains, which enter the circulation. K. gives 10 points in which he explains the advantages of the new theory over the side-chain theory of Ehrlich. J. C. JURRJENS

Studies on the behavior of the lactic acid of the blood. II. GIOVANNI MARGRETH. *Boll. soc. ital. biol. sper.* 3, 519-20(1928); cf. C. A. 23, 434.—Lactic acid was detd. in 23 cases of pneumonia. The values found were about equal to the normal when the disease took a regular course; when the disease was very grave followed by death, the lactic acid was above the normal. **III. Hepatic affliction.** *Ibid* 521-2.—Patients were fasted for 12 hours, the lactic acid was detd. and then 10 g. lactic acid administered by mouth. Lactic acid was again detd. at hour intervals. In all the patients including the controls there was an increase of lactic acid but this increase was more marked in patients with hepatic disorders. **IV. Cardiac diseases.** *Ibid* 522-3.—Lactic acid was detd. in 14 cardiac patients. In cases of minor involvement the content was about equal to the normal, but in severe cases with dyspnea there was a definite increase. **V. Tumors.** *Ibid* 523-4.—Fourteen cases of neoplasia of the digestive apparatus were studied. In 10, there was some increase, in 2, a fair increase, and in the other 2, a marked increase of lactic acid. PETER MASUCCI

Protein metabolism of normal and malignant tissues in vitro. FRITZ DEMUTH AND ILSEVON RIESEN. Kaiser Wilhelm-Inst. für Biologie, Berlin-Dahlem. *Biochem. Z.* 203, 22-49(1928).—Cultures of chicken sarcoma liquefy, very rapidly, the chicken plasma coagulum, which is changed thereby from a gel to a sol condition, and the fibrin network dissolves. Serum becomes freed from the fibrin threads. Cleavage products

unprecipitable by tungstic acid* are not formed in greater amts., but the question of the formation of higher cleavage products still needs elucidation. The liquefaction is an enzyme action. The enzymes of the embryo ext. or of the plasma can produce a similar result though only very slightly and very slowly. This reaction is greatly activated by substances present in small concn. in normal tissues but in comparably larger amts. in sarcoma tissue. These activators are heat stable and to a certain extent ultrafiltrable. The liquefaction produced by sarcoma tissue is not specific to sarcoma. Stomach and intestine epithelium, liver and spleen as well as fibroblastic cultures which have been in some manner injured produce liquefaction and also yield a boiled extract with liquefaction action. The liquefaction is associated with the death of cells. * Sarcoma cells are short-lived, and the ones which die and undergo autolysis liberate the heat-stable activator of fibrinolytic enzymes present in the embryonic extract and plasma. The activated enzymic process is stimulated by H, acetate and lactate ions, while Ca ions have an inhibitory effect. S. MORGULIS

Studies on the chemical nature of allergens. L. FARMER LOEB. Universitätsklinik, Charité, Berlin. *Biochem. Z.* 203, 226-36(1928); cf. *C. A.* 22, 4616.—Guinea pigs were sensitized specifically against aq. exts. of geese feathers. The exts. contained on an av. 0.4 mg. N per cc., of which about $\frac{1}{2}$ could be pptd. by colloidal Fe; they likewise contained substances which reduced Hagerdorn-Jensen's reagent; and gave pos. tests with sulfosalicylic acid, ninhydrin or Molisch's reagent. On adding abs. alc. the aq. ext. produced a ppt. which likewise produced a sp. sensitization. This alc. ppt. contained only colloidal N (precipitable by colloidal Fe) and only a trace of reducing substance; the sulfosalicylic reaction was pos. but the ninhydrin was neg. The filtrate has no sensitizing action. This filtrate gave a pos. Molisch reaction, contg. appreciable amts. of reducing substance; the sulfosalicylic reaction is neg. but the ninhydrin is pos. because all the N is in the form of mol. dispersed material. Guinea pigs were also sensitized against aq. exts. or ordinary pine pollen, or against its alc. precipitable fraction. S. MORGULIS

Physical chemistry of the cerebrospinal fluid and serum diagnosis by the Lange gold sol reaction. G. ERTSCH AND O. EINSTEIN. Kaiser Wilhelm-Inst. für phys. Chemie, Berlin-Dahlem. *Biochem. Z.* 203, 389-93(1928).—In the gold sol reaction of cerebrospinal fluid there are 3 components: the fluid whose action is unknown; the gold sol which is not clearly defined, and the NaCl soln. Such systems are characterized by lack of exactness and the dependence of the coagulation upon H-ion concn. This is thought to be the cause of irregularities in the practical application of the Lange's reaction so that it is possible to produce with normal cerebrospinal fluid flocculation curves observed only in progressive paralysis by the use of the proper gold sol, i. e., one which has been given the max. possible acidity; and by alkalinizing the sol flocculation will not appear even in a definite instance of paralysis. It is shown that a AuCl soln. can successfully be substituted for the gold sol. S. MORGULIS

The pathological physiology of the fat metabolism after splenectomy. S. LEITES. Inst. of Med. Ukrnauka, Charkow. *Zhurnal expil. Biol. Med.* 10, 285-91(1928); cf. 1. 22, 4616.—Following splenectomy the hydrolysis of neutral fats in the liver is disturbed, resulting in an increased alimentary lipemia. The hydrolysis of neutral fat in splenectomized dogs is partly transferred from the liver to the lungs. The destruction of "acetone bodies" is interfered with. Loading with fat, even when glucose is given simultaneously, leads to acetonemia in the splenectomized animals. The administration of glucose also calls forth a rise in cholesterol. S. MORGULIS

The application of the law of adsorption to phenomena of sensitization of erythrocytes to hemolytic sera. A. P. KONIKOV AND A. S. IZRALIMSKII. Chem.-Bacteriol. Inst., Tula. *Zhurnal expil. Biol. Med.* 10, 350-6(1928).—The combination of erythrocytes with amboceptor follows the law of physical adsorption only in the presence of high hemolysin concn. The exponent of the isotherm is between 0.22 and 0.35. In low concns. of hemolysin the purely chem. reaction between stroma and amboceptor predominates. It is suggested that the value of α in the adsorption equation ($C_1 = \alpha C_2^n$) may serve as a measure of the acidity of various sera. S. MORGULIS

The chemistry of sensitization of erythrocytes by amboceptors of specific sera. A. P. KONIKOV. Chem.-Bacteriol. Inst., Tula. *Zhurnal expil. Biol. Med.* 10, 357-66(1928).—The combination of erythrocytes with amboceptor depends upon the H-ion concn., the optimum being at pH 6.0-6.7. The combination occurs only in the presence of some electrolyte. The salt concn. is of importance and also shows a definite optimum. The nature of the salt is of less significance, but similarly active concns. are approx. equiv. The conditions existing in the process of sensitization are best interpreted on the assumption of an ionic reaction with the formation of a complex combina-

tion, schematically conceived as follows: stroma[®] + amboceptor[®] + MeR \rightleftharpoons

stroma $\xrightarrow{\quad R \quad}$ amboceptor—Me, where R is the anion of the salt.

S. MORGULIS

Electroosmosis as the principal factor in specific hemolysis. A. P. KONIKOV. Chem.-Bacteriol. Inst., Tula. *Zhurnal ekspl. Biol. Med.* 10, 368-83(1928).—The hemolysis of sensitized erythrocytes under the influence of complement occurs only in the presence of salts whose effective concns. are directly dependent upon their equivalence. This leads to the conclusion that the combination between complement and salt is purely chem. Osmotic pressure does not play a part in the sp. hemolysis. The optimum H-ion concn. for hemolysis is at $p_H = 7.0$. The relationship between hemolysis, H-ion concn., the nature and concn. of salt can be explained on the assumption that the complement concentrates on the surface of the erythrocytes where it forms a thick protein layer of an isoelec. point of $p_H = 4.7$. This creates between the cell contents and the surrounding complement layer, in accordance with Donnan's law, a potential difference and an elec. field. Water is driven electroosmotically through the stroma pores along the lines of force, causing a drop in the osmotic pressure within the erythrocytes and then hemolysis. This condition can be reproduced by means of a model. Partly dialyzed hemoglobin in a collodion bag is placed in a concd. isotonic serum albumin soln., whereupon water flows into the bag in spite of the isotonicity of the inner and outer soln.

S. MORGULIS

The hemopoietic effect of nuclear extractives in human anemias. N. W. JONES, B. I. PHILLIPS, OLAF LARSELL, AND H. T. NOKES. Univ. of Oregon. *Ann. Internal Med.* 2, 603-21(1929).—It is tentatively concluded that the hemopoietic stimulant, unknown as yet in compn., is an integral part of the cell nucleus. Hence the effect on blood production of various animal tissues depends on the amt. of nuclear substance. Liver is a better stimulant than pancreas or thymus but not as good as spleen. Washed nuclei of fowl erythrocytes is the best of all those tried. Kidney, sweetbreads, and spleen may be alternated with liver in the treatment of anemia.

JOHN T. MYERS

The dietetic treatment of diabetes mellitus. A restatement of the fundamental principles. L. H. NEWBURGH. Univ. of Mich. *Ann. Internal Med.* 2, 645-9(1929).—Some believe that diabetic arteriosclerosis bears a casual relationship to the diet of the patient. The evidence is insufficient either to prove or to disprove this. If there is a relationship, the fault lies in an excess of calories. The vascular disease is not caused by the metabolic products of fat except in so far as they may be a source of calories.

JOHN T. MYERS

Albuminuria and nephritis following injection of toxin-antitoxin, with a report of two cases. C. D. MERCER. *Ann. Internal Med.* 2, 667-8(1929).—Ten per cent of 125 apparently healthy children had albuminuria. Administration of toxin-antitoxin doubled the percentage in 125 school children. Urine examn. should precede immunization in all cases, and it should be given with caution at present.

J. T. M.

The biochemical relations of the diphtheria bacillus to the proteins of the animal body. (The question of the virulence factor and the partial antigens of the diphtheria bacillus.) V. N. KRISHANOVSKII. Volkskommissariat für Gesundheitspflege der Baschkirenrepublik in Ufa. *Centr. Bakt. Parasitenk.*, I Abt., 110, 1-9(1929).—Each protein fraction of blood serum which is pptd. by definite concns. of $(NH_4)_2SO_4$ is definite and reacts specifically with certain substances of the diphtheria bacillus both *in vivo* and *in vitro*. Albumin and fibrinogen react with certain substances and produce toxins. Albumin reacts with the toxigenic factor (Protoxin of Walbum), and fibrinogen with the virulence factor. The globulins react with other parts of the diphtheria bacillus, yielding substances which neutralize the toxins. The chemical affinity of diphtheria bacillus substances is stronger for globulins than for albumin.

JOHN T. MYERS

A new method for obtaining a specific high titer precipitating anthrax serum for diagnostic use. RAHEL ROSENBERG AND D. ROMANOW. Inst. f. wissenschaftl. und prakt. Veterinarkunde, Ukraina-Charkow. *Centr. Bakt. Parasitenk.*, I Abt., 110, 102-11(1929).—A safe diagnosis of anthrax can be made with the help of a pptg. serum of great specificity and high titer. A modification of Fudjiwar's antigen made as follows was used as the precipitinogen. Wash off a 12-hr. agar growth at 33-4° in 10 cc. of isotonic NaCl soln. Add 100 cc. of distd. water, 20 cc. of satd. NaCl soln., and 6 or 7 drops of 50% AcOH. Heat this mixt. for 20 to 30 min. in steam. Filter, wash the coagulum in alc. and dry it. Grind it thoroughly in a mortar with 2 cc. of isotonic NaCl soln., let stand about 10 min. and inject the supernatant liquid intravenously. Serum with a titer of 1:100,000 against organ or skin exts. can be obtained. It has no therapeutic value.

JOHN T. MYERS

A study of non-specific complement fixation with particular reference to the interaction of normal serum and certain non-antigenic substances. T. J. MACKIE AND M. H. FINKELSTEIN. Univ. of Edinburgh. *J. Hyg.* 28, 172-97(1928).—When a soln. of com. peptone is substituted for antigen in a complement-fixation test with the unheated normal serum of man, ox, sheep, horse, rabbit, and white rat, a definite fixation occurs both at 37° and at 0°. In the ox, sheep, horse and rabbit this property is partially stable at 55° but not with human or white rat. The property resides mainly in the carbonic-acid-insol. globulins of the serum. The same results follow when alc. dild. with several vols. of isotonic NaCl soln. is substituted for antigen. Marked complement fixation effects are obtained with the heated normal serum of the rabbit, ox, sheep or horse plus cholesterol suspensions, and particularly cholesterol-peptone, these effects occurring in parallel with those produced with serum plus alc.-saline, peptone solus., and the Wassermann antigens. Heated normal serum of the pig, white rat, guinea pig and human do not thus react. These results are closely related to the Wassermann reactions of normal animals. This reacting property is absent from rabbits for the first 2 to 3 weeks of life, and develops progressively thereafter. Certain alcs., Na oleate, tissue proteins, Na nucleinate and alc.-purified commercial peptone also fix complement in the presence of normal sera. Cholesterolization may increase the action of the agents beyond the summation effect.

JOHN T. MYERS

Observations on the reaction of the skin to oils and tars. C. C. TWORT AND J. M. TWORT. *J. Hyg.* 28, 219-27(1928).—A variety of carcinogenic substances were applied to the skin of mice. The resulting hyperplastic epithelium may, when the irritant is removed, recede or eventually become the site of a malignancy, although microscopically similar. Two agents may have equal power to produce acute hyperplasia but the tendency toward subsequent malignancy may be quite different. When a weak tumor producer is concd. by alc. or methyl sulfit, tumors are numerous but rarely malignant. Epithelial cells may acquire a certain tolerance. On the contrary they may be made hypersensitive to tar at certain stages. No sarcomas were observed.

JOHN T. MYERS

Tumors of the skin and mammary gland caused by pyrogenous products of cholesterol. E. L. KENNAWAY AND BASIL SAMPSON. Cancer Hosp. Research Inst., London. *J. Path. Bact.* 31, 609-12(1928).—The products obtained by heating cholesterol to about 800° caused epithelioma after repeated application to the skin of mice. An adenopapilloma of the mammary gland was induced in a rabbit. J. T. M.

The in vitro titration of *B. welchii* antitoxin by its antihemolytic power. J. H. MASON AND A. T. GLENNY. Wellcome Physiol. Research Lab. Beckenham, Kent, Eng. *J. Path. Bact.* 31, 629-32(1928).—Identical results are obtained for *B. welchii* antitoxin by antihemolytic titration *in vitro* and by antitoxic titration *in vivo* by intravenous injection into mice. The neutralization of hemolysin and of toxin by antitoxin is parallel.

JOHN T. MYERS

Histamine and infection. G. MARSHALL FINDLAY. *J. Path. Bact.* 31, 633-44 (1928).—It is suggested that the well-known relationship between injury and the localization of organisms in injured tissue is due to the liberation of histamine or a histamine-like substance which causes dilatation of the capillaries and increased permeability of the capillary endothelium allowing the local escape of organisms into the surrounding tissues. A 0.5% soln. of histamine acid phosphate was made in isotonic NaCl soln. and the p_H brought to 7.2 with NaOH, making the concn. of histamine base about 1:600. A control of phosphate buffer soln. of the same p_H was used. Rabbits were inoculated intravenously with 1 cc. of a 24 hour broth culture of *Staphylococcus aureus*. Immediately afterward 0.02 cc. of the histamine soln. was injected into the skin of the right flank and the same amt. of control into the left flank. Typical abscesses formed where the histamine was injected, from which staphylococci could always be isolated. Similar results were obtained with *Streptococcus hemolyticus* and the pneumococcus, the virus as of vaccinia, Rous sarcoma and fowl pox. Positive results were not obtained with tyramine or choline. It is not yet known whether the rupture of the defence mechanism by such substances as sol. Ca salts or Si can be correlated with the action of histamine on capillary endothelium. JOHN T. MYERS

The relation of agglutination by specific serum to agglutination by acid. J. A. ARKWRIGHT. Lister Inst., London. *J. Path. Bact.* 31, 665-70(1928).—There are 2 agglutinable substances in a culture of motile bacteria of the typhosus-salmonella group which are responsible for agglutination by acid at different zones of H-ion concn. These are probably identical with the flagellar and somatic antigens, resp., which react with the I and O agglutinating sera. The apparent affinity between otherwise dissimilar

species shown by serum agglutinations is confirmed by finding a similar resemblance as regards acid agglutination. In one phase of a certain type of salmonella the flagellar antigen, which appears in its behavior to serum to be identical with another species, shows the same identity when tested by the acid technic. Rough colonies are associated with a wide zone of acid agglutination. Supposed changes of *B. paratyphosus* to *enteritidis* may be thus explained by a change from smooth to rough colony form. The inagglutinability by serum of some strains of *B. typhosus* which was formerly attributed to a change in a single agglutinable substance, described as the loss of the ergophore group in the receptor, is better interpreted as the absence or poverty of the flagellar antigen and is associated with absence of motility. The absence of agglutination by serum postulates a more advanced suppression of the flagellar apparatus than is shown by failure to clump with acid.

JOHN T. MYERS

The action of immune serum on vaccinia and virus III in vitro. C. H. ANDREWS. Natl. Inst. for Med. Research, Hampstead, London. *J. Path. Bact.* 31, 671-98(1928).—The potency of antivaccinal serum as indicated by the number of minimal infective doses neutralized in the rabbit's skin could only be measured approximately, different titers being obtained on different animals. This was also true for virus III. Where in skin tests, neutralization of vaccinia occurred, there was no strict proportionality between the amts. of virus and antibody involved. Neutralization of vaccinia occurs readily in the skin, but cannot be satisfactorily demonstrated when intratesticular, intracerebral or intravenous inoculation is used. No *in vitro* absorption of vaccinia antibody by antigen was shown, since by filtration through an L2 candle, antibody could be recovered quantitatively from a mixt. of immune serum and an excess of virus, even after 24 hours contact, and the same was true for virus III. Active vaccine virus could be recovered from an incubated mixt. of virus and immune serum by absorbing the virus on kaolin or euglobulin. An inactive serum virus mixt. could be reactive by simple diln. with Ringer's soln. or normal rabbit serum, but this did not hold for virus III.

JOHN T. MYERS

Capillary permeability in acute uranium nephritis. CAROLINE WHITNEY. Washington Univ., St. Louis. *J. Path. Bact.* 31, 699-704(1928).—Capillary permeability can be tested by measuring the rate at which antibodies passively introduced reach the tissue fluids. The agglutinin titer of liver lymph may reach 50% of that of the blood in 10 mins. In the leg, the max. concn. of about 83% is not reached for 10 to 12 hrs. In U poisoning the rate of penetration of agglutinins into body lymph is greatly decreased, indicating decreased capillary permeability. This change occurs within 18 to 24 hrs., hence it is due to a direct effect on the capillaries and not to a secondary effect of kidney degeneration. The state of decreased permeability persists during the period in which it is possible to produce edema by the administration of excess fluid.

JOHN T. MYERS

Further experiments on the production of hyperplasia in the alveolar epithelium of the lung of the rabbit. J. S. YOUNG. Univ. of Leeds. *J. Path. Bact.* 31, 705-20 (1928).—Active manifestations of proliferation in the epithelial cells lining the marginal alveoli of the lungs of the rabbit can be produced by the intrapleural injection of an emulsion of liquid paraffin and bile salts, whereas liquid paraffin alone is ineffective. Similar changes follow the injection of 25 cc. of 4.3% NaCl, or 12.5 cc. of 2% CaCl₂, or 5 cc. of 9.94% SrCl₂, or 5 cc. of 3.3% AlCl₃ (0.75 N solns.). The epithelial reaction increases with the valency of the cation. The action of Ca ions is not inhibited by Na ions. The hyperplasia is transient, disappearing in 6 to 8 days. The hyperplasia occurs in marginal alveoli without evidence of trauma or necrosis. (Trauma or necrosis alone will cause hyperplasia.)

JOHN T. MYERS

The appearance of doubly refracting substances in formalin-fixed rabbit tissues. J. B. DUGUID AND J. MILLS. Welsh Natl. School of Med. *J. Path. Bact.* 31, 721-34(1928).—Doubly refracting substances appear in certain organs, notably the liver, of the human, rabbit and mouse. Fixation in HCHO delays and limits their appearance, but does not permanently prevent it. They do not develop in tissues fixed with perchloride of Hg, or in osmic acid, or in K₂Cr₂O₇. There is a slight development in mixts. of K₂Cr₂O₇ and HCHO. The development is dependent on the tissues being placed in an acid medium after fixation. The substances are considered to be fatty acids formed by hydrolysis of tissue lipoids. They have not been stained. Their distribution alters according to the treatment to which the piece of tissue has been subjected. The anisotropic substances of the suprarenal and of the liver are similar in their chemical reactions and are probably due to postmortem changes. Injections of cholesterol into the blood stream of rabbits did not affect the appearance or the amt. of the doubly refracting substances. Since these substances so readily develop after death they are probably of little importance as evidence of the state of affairs during life.

JOHN T. MYERS

The oxygen tension necessary for the mitosis of certain embryonic and neoplastic cells. G. PAYLING WRIGHT. Univ. College Hosp. Med. School, London. *J. Path. Bact.* 31, 735-52(1928).—In tissue cultures the lowest O tensions at which cell division takes place are: for chicken heart myoblasts, about 12 mm. of Hg; for Jensen rat sarcoma cells, about 6 mm.; and for mouse carcinoma "2146" cells about 3 mm. This corresponds to 1.6, 0.8 and 0.4% of O at atmospheric pressure. Sarcoma cells are not killed by many hours of complete deprivation of O. These expts. do not oppose the conclusions of Warburg on the glucolytic metabolism of neoplastic and other growing cells, but they indicate that this form of metabolism is incapable of completely replacing oxidative metabolism, being supplementary so far as growth is concerned, certain cell reactions requiring free O. There is a good bibliography. JOHN T. MYERS

The relationship between the bactericidal power of normal guinea pig serum and complement activity. JOHN GORDON AND ARTHUR WORMALL. Univ. Leeds. *J. Path. Bact.* 31, 753-68(1928).—Small amts. of NH_3 destroy the bactericidal power of normal guinea pig serum against *B. dysenteriae* (Flexner) and this loss is parallel with the destruction of hemolytic complement. This action is not due to any pH effects. Neutral NH_4 salts are without significant effects. When suitable amts. of *B. dysenteriae* are heated for 1 hr., added to normal guinea pig serum and the mixt. is incubated for 2 hrs. at 37°, loss of bactericidal power occurs with no appreciable decrease in hemolytic complement. This is attributed to the loss of an immune body present in the normal serum which can be restored by the addn. of serum that has been heated to 56° for 30 mins. NH_3 -treated serum and serum treated with dead bacteria, both of which have no bactericidal power separately, have full activity when combined; hence the two sera are deficient in different respects. When larger quantities of dead bacteria are used for absorption, all hemolytic as well as bactericidal power is lost by the serum, and it cannot be reactivated by 56° heated serum. The immune body concerned in the bactericidal process is not affected by the small quantities of NH_3 necessary to inactivate complement. Hemolytic complement and bactericidal complement have a similar chem. constitution and are probably identical. JOHN T. MYERS

Fixation of complement by *B. typhosus* and normal guinea pig serum: a contribution to the study of natural antibodies. ERNEST M. DUNLOP. Univ. and Western Infirmary, Glasgow. *J. Path. Bact.* 31, 769-95(1928).—Guinea-pig serum shows zonal fixation of its hemolytic complement in the presence of most strains of *B. typhosus* in isotonic NaCl soln. Different strains vary in this respect and 2 out of 22 strains did not show the phenomenon. It is explicable by the presence of a natural antibody in the serum, which resembles immune antibody in its ability to sensitize the organisms so that they can fix complement, but differs in its thermolability and comparative lack of specificity. It is sometimes more labile than complement. It can be removed by other organisms or by such agents as coal dust, charcoal, or powd. glass.

JOHN T. MYERS

Observations on the acid-base equilibrium in its relation to the cutaneous apparatus: the alkali reserve. FRANCO FLARER. Univ. Pavia. *Biochim. terap. sper.* 15, 232-54(1928).—The question whether a correlation exists between the acid-base equil. in the blood and the condition of the cutaneous app. was investigated. In about 60 patients suffering from various kinds of skin diseases the alkali reserve was detd. in the plasma according to Van Slyke. In 10 cases of acne and 9 cases of eczema, the av values for the CO_2 liberated were normal (61.5 and 61.3, resp.). In 16 cases of psoriasis, the av. value was slightly subnormal (52.4); some of these patients had previously received a treatment with an ointment contg. 5% *o*- $\text{HOC}_6\text{H}_4\text{CO}_2\text{H}$ for 1 or 2 days. In 30 other cases of various skin diseases the values found for CO_2 were normal, with a few exceptions. Application of *o*- $\text{HOC}_6\text{H}_4\text{CO}_2\text{H}$ in form of the ointment mentioned lowered the alkali reserve, the decrease being particularly marked in psoriasis. Irradiation by ultra-violet rays to the extent that erythema was produced caused a definite increase in the alkali reserve. Very numerous references. G. SCHWOCH

Chemical nature of the substances required for cell multiplication. II. Action of glutathione, hemoglobin and ash of liver on the growth of fibroblasts. LILLIAN E. BAKER. Rockefeller Inst. for Med. Research. *J. Expul. Med.* 49, 163-82(1929); cf. *C. A.* 20, 3707.—The ash of liver, hemoglobin and glutathione each exert a very slight beneficial effect on the growth of sarcomatous fibroblasts of the rat, or on the condition of their cells when cultivated in a synthetic medium. The addn. of all 3 of these substances, or of only glutathione and hemoglobin, to a mixt. of casein digest, glyceroll and nucleic acid gives a medium in which sarcomatous fibroblasts of the rat proliferate for a considerable time as rapidly as in embryo juice. The mixt. is not as adequate a nutritive medium as embryo juice, for after a time dead cells are found

surrounding the central fragment of the culture. It is suggested that glutathione and hemoglobin may function not only by regulating the respiration and oxidation-reduction reactions within the cell but also by regulating the oxidation-reduction potential of the medium. The growth of normal fibroblasts of the rat is also increased by the addn. of the above-mentioned substances to a synthetic medium.

C. J. WEST

Anaphylaxis with the type-specific carbohydrates of pneumococcus. OSWALD T. AVERY AND WM. S. TILLET. Rockefeller Inst. Med. Research. *J. Exptl. Med.* 49, 251-66(1929).—The type-sp. carbohydrates haptens of pneumococcus types I, II and III, when isolated in protein-free form, are devoid of the property of inducing active anaphylactic sensitization in guinea pigs. The bacterial carbohydrates of pneumococcus, of which the Type II and III substances are N-free, produce rapid and fatal anaphylactic shock in guinea pigs passively sensitized with the pptg. serum of rabbits immunized with pneumococci of the homologous type; the reactions induced are type-sp. In contrast to the pos. results with immune rabbit serum, there is a complete absence of anaphylactic response to pneumococcus carbohydrate in guinea pigs passively sensitized with antipneumococcus horse serum.

C. J. WEST

Study of pneumococcus autolysis. WALTHER F. GOEBEL AND OSWALD T. AVERY. Rockefeller Inst. Med. Research. *J. Exptl. Med.* 49, 267-86(1929).—Autolysis of pneumococcus is accompanied by proteolysis, which results in an increase in NH_2 and non-coagulable N, and by lipolysis, during which there is a liberation of Et_2O -sol. fatty acids. When exts. contg. the active intracellular enzymes are added to heat-killed pneumococci, lysis of the cells occurs and there is an increase in the non-coagulable and NH_2 N, comparable to the changes accompanying spontaneous autolysis. When these exts. are added to emulsions of the EtOH -sol. lipoids extd. from pneumococci an increase in Et_2O -sol. fatty acids occurs. Na desoxycholate in excess inhibits the action of pneumococcus protease; it does not inhibit the action of the lipase. When suspensions of pneumococci are cooled to 0° , a temp. at which the rate of enzyme action is greatly retarded, the organisms go into soln. rapidly when Na desoxycholate is added, but this process is not accompanied by lipolysis or proteolysis. It does not seem probable, therefore, that the "bile" soln. of pneumococcus is identical with the phenomenon of autolysis as ordinarily understood and measured. The relation of enzyme action to antigenic disoccn. is discussed.

C. J. WEST

A study of phosphorus absorption in normal and rachitic children. GEORGINA MURDOCH. Royal Hosp. for Sick Children, Glasgow. *Arch. Diseases in Childhood* 2, 285-301(1927).—The addn. of different amts. of acid Na phosphate to a Ca-poor diet effected in 8 rachitic and 3 normal children a definite increase in the serum phosphate. If Ca lactate were added to this high-phosphate diet the increased serum phosphate was reduced, particularly in the rachitic children. M. believes this reduction to be related to the pptn. of the PO_4 ions by Ca in the intestinal lumen. The phosphate absorption was further measured in 5 normal, 4 florid rachitic and 3 children recovering from rickets. NaH_2PO_4 was administered orally in 4 g. doses and the serum phosphate detd. at 30-60 min. intervals. The increase in the serum phosphate in both the normal and florid rachitic children moved within the normal limits. In the children recovering from rickets the serum phosphate was especially high.

R. C. WILLSON

Studies of the amino acids in the urine and blood, particularly in diabetes and Basedow's disease; role of the kidney. J. GOFFIN, RAHIER AND REGNIER. Hop. Basle. The hypoxelles. *Arch. mal. appar. dig. nutrit.* 17, 961-89(1927); *Ber. ges. Physiol.* Saint-Jean, Br. original 44, 772. Folin's colorimetric method was used. The values agree exptl. *Pharmakol.* Hyperamino acids 57-1122 mg. %; quotient amino N: total N, 0.5-1.64:100; in the blood, 41.5:100. It appears doubtful if a hyperaminoaciduria appears during liver insufficiency. In cachectic individuals the authors in contrast to many other authors observed a decrease in the values. The same contrast exists in the values found for pancreatic diabetic dogs, insulin reduces the amino acid elimination both in authors found normal values. In diabetes, the values are normal.

R. C. WILLSON

Métabolisme cellulaire et métabolisme des tumeurs. Tome I et Tome II. Edited by AUBEL and L. GENEVOIS. Paris: Félix Alcan. by OTTO WARBURG. Translated by E. F. 30. Reviewed in *J. Am. Med. Assoc.* 92, 257(1929).

Goiter and Thyroid Protection. Philadelphia: F. A. Davis Co. 327 pp. \$3.50. Reviewed in *Am. J. Public Health* 19, 128(1929).

H—PHARMACOLOGY

A. N. RICHARDS

A chemical and pharmacological classification of iron preparations. F. STARKENSTEIN. *Časopis Československého Lékárnictva* 8, 95-102(1928); cf. C. A. 22, 4644.—The therapeutic action of Fe is manifested only in simple ferrous compds. The Fe in complex compds. is also active but in a manner different from the sp. action of Fe. Ferric compds. are practically without therapeutic action. A stable FeCl_2 has been obtained in the prepn. "Ferrostabil."

WILLIAM J. HUSA

Continued administration of iodine and other salts. Comparative effects on weight and growth of the body. P. J. HANZLIK, E. P. TALBOT AND E. E. GIBSON. *Arch. Internal Med.* 42, 579-89(1928).—The administration of 1 mg. NaI daily to rats over 7' of the life span showed definite increases in weight and growth of the body on complete and deficient diets. CNS^- , Br^- , AsO_3^- , Ti^{++} and Mn^{++} in every case reduced body weight and growth.

J. B. BROWN

Effect of administration of medicinal iron on the iron reserve. C. S. WILLIAMSON AND P. EWING. *Arch. Internal Med.* 42, 600-6(1928).—Rats fed on a standard diet plus ferric citrate showed no increase in hemoglobin concn., and, after bleeding, did not recover any more quickly than the controls. Fe administered in this form cannot build up an Fe reserve capable of being converted into hemoglobin.

J. B. BROWN

Secretin not a hematopoietic stimulant. J. T. KING. *Arch. Internal Med.* 42, 763-75(1928).—Subcutaneous injections of secretin in rabbits cause a rapid and transient rise in red cell count. The rise is due to a concn. of the blood rather than to cell regeneration.

J. B. BROWN

Experimental uremia-uremic enteritis. M. H. STREICHER. *Arch. Internal Med.* 42, 835-45(1928).—Intravenous injections of large doses of urea into dogs produce all of the clinical features of uremia-uremic enteritis. The findings are: progressive acidosis, fall in protein of the blood, increased urine Cl, disturbance in the Ca/K ratio in the blood, rise in blood urea and albuminuria. The blood pressure rises to 200 mm. The kidneys show little histologic change.

J. B. BROWN

Changes in the alkali reserve in nicotine poisoning. S. W. WOLTER. *Odessaer Abt. des Ukrainischen Staatsinst. für Arbeitshyg. und Arbeitspathol. Arbeitsphysiologie* 1, 258-70(1928).—Dogs injected subcutaneously with 1% aq. soln. of nicotine gave from 7 to 26% lowering in the alkali reserve in $\frac{1}{2}$ to 1 hr. detd. by the Van Slyke app. Three of 4 women workers in a tobacco factory showed a decrease in the course of 3 hrs. work. In 2 men who smoked 5 and 7 cigarettes (inhaling), resp., in $\frac{1}{2}$ hr. there was a fall after 20 mins. The effects of the nicotine are ascribed to an increased formation of acid intermediary products.

T. M. CARPENTER

Variation of ionic equilibrium as a factor in pharmacological action. II. Calcium and convulsive drugs. L. SEREMIN. *Atti accad. Lincei* 7, 1056-61(1928); cf. C. A. 22, 631.—Rabbits were injected (in the auricular vein) with doses sufficient to produce convulsion of strychnine, nicotine, thebaine, cocaine, narcotine, hydrastine, laudanine, esotone, caffeine, pyramidone, and hydroquinone together with increasing amts. of CaCl_2 till the convulsive action was counteracted.

Substance	G. equiv. $\times 10^4$ /kg. rabbit used	CaCl_2 to prevent convulsion
Strychnine	51	1,270
Nicotine	722	> 163,000
Thebaine	1,340	4,000
Cocaine	2,100	> 344,000
Narcotine	5,890	25,000
Esotone	6,100	4,000
Hydrastine	6,400	75,000
Laudanine	24,500	4,320
Caffeine	39,100	5,300
Pyramidone	43,000	1,000
Hydroquinone	72,700	150,000

300,000 equivs. as above of CaCl_2 will produce death on intravenous injection quickly.

A. W. CONTIERI

Histophysiological and quantitative investigations on guinea pigs and rabbits on injection of lipoidal mixtures. A. BARCHIESI. *Atti accad. Lincei* 8, 419-3(1928).—Rabbits and guinea pigs were given injections for 15 days of totals of 1.5 g. lecithin and 0.6 g. lutein and cholesterol ethers in 37.5 g. serum and the change in wt. of various

organs was measured (comparing with controls of the same age, wt., etc.). The following changes in wt. were noted: liver —18.62, testicles +5.51, kidneys +6.21, stomach —2.12, lungs —5.63, heart +0.37, pancreas +0.76, gall bladder +1.06, brain +4.15, suprarenal glands +21.5%. B. believes that these lipoids from their special chem. nature (biol. catalysts) promote multiple and complex reactions. A. W. CONTIERI

Parenteral quinine therapy with observations on its effect in pulmonary tuberculosis. HARLAN F. NEWTON AND KURT HEINE. Eppendorf Hosp., Hamburg, Ger. *Am. Rev. Tuberculosis* 18, 563-9(1928).—Solvochin (pH 7.2-7.3) is a 25% aq. soln. of quinine in stable form, non-crystd. in the cold, and alk. to litmus. It is rapidly absorbed and eliminated, but it has practically no effect on chronic inflammatory disease of the lungs and bronchi. Transpulmin is a sterile soln. of basic quinine and camphor in ethereal oils, 1 cc. contg. 0.03 grain anhyd. basic quinine and 0.025 grain of camphor. One to 2 cc. may be given daily intramuscularly for 3 to 5 weeks. Parenteral therapy with Transpulmin was tried on 40 selected cases of pulmonary tuberculosis, excluding exudative cases in young and cavity cases. In 28 cases favorable effects resulted with Transpulmin alone and in the remaining 12 combined with tuberculin therapy. Quinine administered parenterally in large amts. is not excreted in clear pleural effusions complicating pulmonary tuberculosis. H. J. CORPER

A study of the adrenaline reaction in tuberculosis patients. W. F. PETERSEN AND S. A. LEVINSON. Univ. of Ill. and Munic. Tuberculosis Sanatorium, Chicago. *Am. Rev. Tuberculosis* 18, 616-25(1928). H. J. CORPER

Composite curves of cardiovascular reactions following adrenaline injections in tuberculosis patients. GEORGE E. DETRANA AND JOHN G. HILLEBRAND. Univ. of Ill. and Munic. Tuberculosis Sanatorium, Chicago. *Am. Rev. Tuberculosis* 18, 626-9(1928). H. J. CORPER

The treatment of pulmonary tuberculosis by antimony. PERCY MOXEY *Brit. J. Tuberculosis* 22, 173-9(1928).—"Collosol Antimonium (Crooke's)" was used in 30,000 intramuscular injections without ill effects. One cc. is given twice weekly. In pulmonary tuberculosis a gain in wt. results and other beneficial results are noted. H. J. CORPER

Increase in novasurol (salyrgan) diuresis by ammonium chloride. PAUL SAXL AND OTTO ERLSBACHER. Med. Univ.-klinik in Wien. *Wiener klin. Wochschr.* 42, 36-7(1929); cf. C. A. 20, 451, 3042; 21, 132.—The use of NH_4Cl is important when novasurol alone is ineffective. D. B. DILL

Pharmacological synergism of stereoisomers. DAVID I. MACHT. *Proc. Natl. Acad. Sci.* 15, 63-70(1929).—This is a preliminary account of expts. on plants and animals with the *dl*- and the *d*- or *l*- stereoisomer showing the synergistic effect of such mixts. The toxic or other effect from a selected dose of the mixed substances was approx. the same as that from an equal dose of the more active isomer. The substances tested include nicotine, epinephrine, camphor, hyoscyamine, hyoscine and the 2 pairs of optical isomers, quinine and quinidine, cinchonine and cinchonidine. Tests were made on cats, rats, rabbits, gold fish and *Lupinus albus* for the toxicity or blood pressure. H. C. HAMILTON

The experimental and clinical action of dodecamethyleneguanidine (Synthalin B). E. FRANK, M. NOTHMANN AND A. WAGNER. Univ. Breslau. *Klin. Wochschr.* 7, 1996-2000(1928).—Synthalin is decamethyleneguanidine. Synthalin B contains more methylene groups in its aliphatic chain than does synthalin. Sugar utilization in diabetics is enhanced about equally by either prepn. Synthalin B is, however, less toxic than synthalin. It is tolerated in cases where synthalin is not tolerated. The first dose of synthalin B usually has no effect upon sugar utilization. Its action is slow and the prepn. increases in effectiveness with repeated administration. The av. dose is 10 mg., 3 times daily. Synthalin B is omitted every fourth day. This dosage leads to the utilization of 30 to 50 g. sugar per day. Ill effects are seldom observed. In all other respects, this prepn. behaves exactly like synthalin. MILTON HANKE

Treatment of gonorrhea with gonoflavine. E. A. BURMEISTER. *Klin. Wochschr.* 7, 2051-2(1928).—Gonoflavine (diaminomethylacridinium chloride) is valuable in the treatment of severe cases of gonorrhea. MILTON HANKE

Changes in the titration acidity of urine after the peroral administration of strontium salts. RUDOLF HUMMEL. *Klin. Wochschr.* 7, 2053-4(1928).—The titration acidity of the urine is increased after the ingestion (human) of 3 to 6 g. $SrCl_2$ or $SrBr_2$. MILTON HANKE

Comparative experiments on the action of insulin and synthalin on the glycogen content of liver and muscle. P. RUBINO, B. VARELA AND I. A. COLLAZO. Montevideo. *S. A. Klin. Wochschr.* 7, 2186-90(1928).—See C. A. 22, 3702. MILTON HANKE

Colonic anesthesia with avertin. WILLIAM F. HONAN AND AUGUST SPIEGEL. *J. Am. Inst. Homeopathy* 22, 7-11(1929).—The narcotic (anesthetic) dose of avertin, $\text{CBr}_3\text{CH}_2\text{OH}$, is 0.1 to 0.15 g. per kg. of body wt., dissolved at a temp. of 40° in sufficient sterile water to make a 3% soln. and administered through a rectal tube into the lower colon. A 5 cc. portion of the soln. must give an orange-red color with 2 drops of Congo red soln.; a blue color indicates decompn. into HBr and CHBr_3CHO . The latter has a severe irritant action on the colonic mucosa. Anesthesia occurs in 5 mins. without a stage of excitement; complete relaxation usually develops in 15 to 20 mins. Otherwise it may be produced by increasing the dose by 0.025 g. or by a few drops of Et_2O . Anesthesia lasts 2 or 3 hrs.; the patient then awakes but usually immediately falls into a sound sleep lasting for 2 to 4 hrs. Slight cyanosis may occur, and the respiration drop to 16 or 18 per min. with a compensating increase in the respiratory vol. The blood pressure is influenced but little. Avertin is eliminated through the kidneys as its glucuronate, and, in traces, in the perspiration, but not in the feces or exhaled air. Overdoses produce marked decreases in blood pressure and even collapse. In animals, the lethal dose is twice the narcotic dose. JOSEPH S. HEPBURN

The use of plasmochine in malaria. A. LICHTENSTEIN. *Geneeskund. Tijdschr. Nederland-Indië* 68, 1002-9(1928).—Plasmochine can successfully combat tertian schizonts, tertian agametes and tropical agametes. In using quinine as well as plasmochine, the patient does not get rid of the fever simultaneously with the parasites. The fever leaves in most cases during the first 2 days, the parasites after 3 or 4 days. I. found that his patients got rid of fever sooner with quinine than plasmochine. Cyanosis caused by plasmochine was only observed with tertian cases. For combating malaria epulmones, plasmochine is not as yet to be recommended. J. C. JURRIJENS

Potassium cyanide poisoning. R. STÖRMER. *Deut. Z. ges. ger. Med.* 12, 251-8(1928). FRANCES KRASNOW

Chloroform illness associated with other diseases. HEINRICH TÖBBEN. *Deut. Z. ges. ger. Med.* 12, 285-91(1928). FRANCES KRASNOW

Softening of both eye lenses due to morphine poisoning. WALDEMAR WEIMANN AND FRH. V. MARENHOLTZ. *Deut. Z. ges. ger. Med.* 12, 297-308(1928).—Case report. FRANCES KRASNOW

Carbon dioxide neuritis. HEINZ KOCKEL. Univ. Leipzig. *Deut. Z. ges. ger. Med.* 12, 402-12(1928).—Case report. FRANCES KRASNOW

Fatal sublimate poisoning during supposed pregnancy. DURLACHER. *Deut. Z. ges. ger. Med.* 12, 475-82(1928).—Case report. FRANCES KRASNOW

Fatal trional poisoning. H. KRISCHNER. *Deut. Z. ges. ger. Med.* 12, 483-6(1928).—Case report. FRANCES KRASNOW

Pharmacological observations on ferrous phosphate. MARIANO MESSINI. *Boll. soc. ital. biol. sper.* 3, 568-71(1928); cf. *C. A.* 22, 4135; 23, 891.—Colloidal $\text{Fe}_3(\text{PO}_4)_2$ was prepared by allowing FeSO_4 to react with Na_3PO_4 and stabilizing with gelatin; the concns. were 0.05 g. colloidal $\text{Fe}_3(\text{PO}_4)_2$ and 10 g. gelatin per l. The salt was injected intravenously into rabbits. The immediate m. l. d. was 0.0048 g. per kg.; the delayed m. l. d. was 0.0008 g. per kg. The symptoms were similar to those observed on injecting FeSO_4 . FeSO_4 was injected into the right jugular vein and Na_3PO_4 was injected simultaneously into the left jugular vein in stoichiometrical proportions. The results were similar to the injection of colloidal $\text{Fe}_3(\text{PO}_4)_2$. Satg. the soln. of Na_3PO_4 with CO_2 before injecting increased slightly the toxicity. The injection of Na_2HPO_4 followed at various intervals by FeSO_4 influenced the toxicity; at 0 time the toxicity was the highest; after 35 mins. it was reduced to the toxicity of FeSO_4 itself. FeSO_4 in small amts. was injected subcutaneously into guinea pigs. After varying periods of time the animals were killed, and H_2S was passed over the tissue at the site of inoculation. FeS was demonstrated. The tissue at site of inoculation was removed and dialyzed. P was demonstrated in the dialyzed tissue. Thus $\text{Fe}_3(\text{PO}_4)_2$ was formed at the site of injection. The results show that Fe salts when injected into the organism form $\text{Fe}_3(\text{PO}_4)_2$. PETER MASUCCI

Acridine derivatives in the treatment of diabetes. OTTO JUL NIELSEN. Staats-hospital, Sønderborg. *Acta med. Scand.* 69, 482-536(1928); cf. *C. A.* 23, 195.—The expts. were undertaken with the view that at least some conditions of diabetes may be of infectious origin. Trypaflavine and then septacrol (an acridine deriv. contg. 22.3% Ag) were used and in some diabetics this chemotherapeutic treatment seems indicated, but not as an adjuvant to other therapeutic measures. S. MORGULIS

Explanation of oligodynamic action. H. FREUNDLICH AND K. SÖLLNER. Kaiser Wilhelm-Inst., Berlin-Dahlem. *Biochem. Z.* 203, 1-13(1928).—A silver plate suspended in cond. water for several days goes into soln., as much as 2×10^{-4} g. per l. being dis-

solved from a piece 40 sq. cm. suspended in 100 cc. H_2O for 3 days. Algae take up Ag from such water, displaying thereby oligodynamic injury. A g. of dry algae contains 5×10^{-1} g. Ag. The effect is due to the presence of Ag ions, exactly as in a soln of $AgNO_3$. Ag ions are adsorbed by the walls of glass containers and may be given up again, for instance, to algae. Quartz does not have this effect on Ag. solns. S. M.

Biochemical properties of pyridine and quinoline derivatives. A. BINZ AND C. RÄTH. Landw. Hochschule, Berlin. *Biochem. Z.* 203, 218-22(1928).—Several arsenic derivs. of pyridine or quinoline were prepd. which manifest the relationship between chem. constitution and biol. action. A 2-hydroxypyridine-5-arsonic acid, in the form of its sol. di-Na salt, has good healing power but its max. dose is remarkably large. The max. tolerated dose is 30 times as great as that of atoxyl or 2.7 times as great as of trypanamide for mice. A 2-hydroxy-5-iodopyridine is another drug with a remarkably high tolerant dose, which unlike the previous prepn. has no effect on trypanosomes but is effective against staphylococci and streptococci. Other preps. were made wherein the OH group was replaced by a halogen (Cl, Br, I) which had no trypanocidal action but high toxicity. On the contrary, where the OH group remained in its position but the halogen was introduced in the ortho position the parasitotropic action increased with the atomic wt. of the halogen. Similar results were obtained with quinoline derivs. Unsubstituted quinoline-5-arsonic acid compds. had no chemotherapeutic action but the carbostyrylarsonic acid derivs. were markedly parasitotropic. S. M.

The effect of various heavy metals on the basal metabolism of guinea pigs. GREGGARD SOSTBERZ AND M. STEUBER. Landw. Hochschule, Berlin. *Biochem. Z.* 203, 385-8(1928).—Venesection and injection of Ringer soln. have no effect upon the basal metabolism. Injection of "Electroferrol" had no influence, but that of Collargol produced a definite rise in basal metabolism of 12% and that of Solganal of 20%. S. M.

Studies on phosphorus poisoning in rabbits. ATUSI HIRUYA. Med. Coll., Nagata J. *Biochem. (Japan)* 10, 63-95(1928).—In cases of mild intoxication the excretion of nitrogenous matter in the urine is somewhat increased, but as the intoxication progresses this decreases, and in very severe cases the total urinary N (after deproteinization) is reduced to one-half. The urea % of total N always decreases and that of NH₃ increases with the degree of intoxication. The non-urea N + ammonia N makes up more than 30% of the total N in the intoxicated animals. Following P injection the S excretion is always increased. In cases of severe intoxication the total S excretion is about normal but the neutral S fraction is greatly increased. The O consumption of the P-poisoned animals is decreased depending upon the degree of injury to the liver. With the progress of the intoxication the non-protein N of the liver increases parallel to the development of its hydropic condition, which is also paralleled by the increase in fatty substance. This, of course, is due to autolytic changes which cause a breaking up of the protein mol. into smaller fragments with the resulting rise in osmotic pressure of the liver cells and attraction of H_2O . The increase in fat content is due to a stagnation of fat mols. coming into the liver cells where their normal transformation is much retarded by the intoxication. The increase in cholesterol and cholesterol esters is likewise ascribed to a stagnation in the poisoned liver. The products of liver autolysis flood the blood stream, but the fat content of the blood remains within normal limits. When the kidney likewise is severely affected by the intoxication the non-protein N of the blood rises to very high values, while the blood sulfate, especially the ethereal sulfate, shows a greater and earlier increase. When the kidney damage is already present the excretion of N in the urine is greatly diminished. The functional damage to the liver is shown by the diminished percentage of urea N. Exptl. evidence is also offered to show that oxidation is more influenced in the qual. than in the quant. aspect.

S. MORGULIS

The inhibiting effect of splanchnectomy on the atropine glucemia. SHIN-ICHI KAWASHIMA AND YOSHIO IWANAGA. Imp. Univ., Tokyo. *J. Biochem. (Japan)* 10, 97-9(1928).—Hyperglucemia induced by atropine is definitely hindered by double splanchnectomy. This fact indicates that the hyperglucemia must be due to central irritation of the sympathetic nerves.

S. MORGULIS

Influence of ergotamine on the blood sugar content. GENTICHIRO EDA. Imp. Univ., Tokyo. *J. Biochem. (Japan)* 10, 101-14(1928).—In persons with a normal carbohydrate metabolism an injection of 0.25 mg. ergotamine never causes a definite lowering of the fasting blood sugar level. In expts. on dogs the injection of larger doses of the drug produces a lowering of the blood sugar 2-3 hrs. after the injection. However, even here the change was not sufficient to justify the conclusion that ergotamine is hypoglucemic in its action. On the contrary, in hyperglucemic diabetics or in depancreatized dogs ergotamine produced a marked lowering of the sugar level.

but it is suggested that this effect was really due to inanition. Alimentary hyperglucemia in non-diabetics is often inhibited after the injection of 0.25 ergotamine. In diabetics 0.3–0.5 mg. ergotamine inhibits more or less definitely the alimentary hyperglucemia. This effect, however, is frequently assocd. with unpleasant reactions. It is doubted if ergotamine should be considered an antidiabetic drug. S. M.

Studies in comparative biochemistry. IV. Behavior of aminobenzoic acid in the body of low animals. TERUMI KAMEI. Med. Coll., Nagasaki. *J. Biochem. (Japan)* 10, 189–95(1928).—In frogs feeding of 3 isomers of aminobenzoic acid regularly leads to the excretion of 20% of the unaltered acid in the urine. All attempts to find uraminobenzoic or aminohippuric acid were futile. In turtles the *o*-compd. is easily transformed and only 3% appear unchanged in the urine, while the *m*- and *p*-compds. behave just as in the frog. It is yet to be detd. whether the *o*-compd. forms a glucuronate in the turtle. S. MORGULIS

The combined action of potassium and bromine on the central nervous system of cold-blooded animals. A. A. LJUBUSCHIN. 2nd State Univ., Moscow. *Zhurnal ekspl. Biol. Med.* 10, 255–60(1928).—CaBr₂ has a greater inhibitory effect on the central nervous system than KBr or NaBr but is not as active as CaCl₂. S. MORGULIS

Influence of the actual reaction on the action of certain poisons. A. A. LJUBUSCHIN. 2nd State Univ., Moscow. *Zhurnal ekspl. Biol. Med.* 10, 277–83(1928).—The effect of strychnine on the central nervous system increases with alk., whereas a shift toward the acid side slows down the convulsions. A Ringer soln. of *pH* 7.8 contracts and of *pH* 6.4 dilates the vessels. The vasodilator action of caffeine is increased at *pH* 6.4 and diminishes at *pH* 7.8. Ringer soln. of *pH* 7.8 stimulates and of *pH* 6.4 inhibits the isolated frog heart. Strophanthin acts more strongly in the alk. than in the acid soln. S. MORGULIS

Action of sinigrin. C. MLADOVEANU. *Compt. rend. soc. biol.* 99, 747–9(1928).—Sinigrin (sinigroside, K myronate) is a hypertensive and non-toxic substance. L. W. RIGGS

Absorption rate of cocaine hydrochloride when injected subcutaneously into rabbits. HAKAN SANDQVIST AND WALDEMAR HÖK. *Svensk. Farm. Tid.* 32, 649–55(1928).—The animal was killed after a stated time (0–120 mins.) and the tissues adjacent to the points of injection (2) were removed and macerated. These samples were soaked in 96% EtOH for 12 hrs. and extd. 4 times with fresh alc., the residue being sepd. each time by centrifugation at 3000 r. p. m. The alc. was distd. at reduced pressure and the ext. taken up with 5 *N* HCl. The protein (and some fatty matter) was pptd. by adding 2 g. (NH₄)₂SO₄. The clear deproteinized fluid was extd. with CHCl₃, then neutralized with 2 *N* NaOH and the free alkaloid extd. with CHCl₃. When the cocaine was recovered in this way it came to 112–120% of the amts. known to be present when weighed but if the ext. was taken up with standard acid and titrated with 0.01 *N* NaOH [Me red + Me blue indicator] the recovery was 96–102%. The resorption of cocaine injected subcutaneously into rabbits is essentially a diffusion phenomenon, a monomol. reaction, and the rate is directly proportional to the concn. of the alkaloid in the solns. injected. A. R. ROSE

The behavior of sodium salicylate in the organism of the horse. ALESSANDRO BALDONI. Univ. Bari. *Biochim. terap. sper.* 15, 293–8(1928).—Twenty-five g. of *o*-HOOC₆H₄CO₂Na were given to each of 4 horses. The urine eliminated during the first 24 hrs. was collected, concd. and after acidification with H₂SO₄, its content of *o*-HOOC₆H₄CO₂H (I) and salicylic acid (II) was detd. quantitatively. The sepn. of the 2 acids was performed with the method used in former expts. (C. A. 9, 214). The amts. of II expressed in terms of I were more than twice as high as the amts. of I excreted as such. G. SCHWOCH

Emetic action of tervalent and quinquivalent antimony. ROSSARIO SATULLO. Pharmacol. Inst., Palermo. *Biochim. terap. sper.* 15, 338–51(1928).—The prepn. of OSbO₃CCHOHCHOHCO₂K (I) (cf. E. Meneghetti, *Minerva Medica* 8, 107 (1928)) has made possible a really exact comparison of the emetic action of Sb⁺⁺⁺ and Sb⁺⁺⁺, on account of the very similar structure of I and OSbO₃CCHOHCHOHCO₂K (II). Dogs were used. II has an emetic action about 50–100 times as strong as that of I. In further expts. S. showed that this effect is not due to a specific influence of Sb⁺⁺⁺. A soln. of II does not ppt. ox serum, while a soln. of I, which is more acid, gives a ppt. Solns. of II slightly acidified with HCl pptd. the serum and so did solns. of II adjusted by addn. of KOH to approx. the same *pH* as had the solns. of II contg. HCl. S. concludes from these expts. that solns. of I and II having the same *pH* also have the same pptg. action on proteins. This does not explain the difference in the emetic effect of I and II. Since in contrast to Sb⁺⁺⁺, a soln. of Sb⁺⁺⁺ gives a ppt. (SbOCl) upon

adding HCl to a concn. equal to that present in the dog stomach, and SbOCl administered to dogs produces vomiting. S. explains the different behaviors in the following way: Sb^{+++} when introduced into the stomach is pptd. as SbOCl, which is deposited on the gastric walls. In the immediate vicinity of these deposits, a strong Sb^{+++} concn. is created, which together with a strong H-ion concn. produces in the proteins of the gastric walls the chem. and physico-chem. changes that by irritation of the nerve-endings induce vomiting.

G. SCHWOCH

A case of poisoning produced by a shoe polish. ALESSANDRO JELMONI. Ospedale Maggiore, Novara. *Giorn. farm. chim.* 78, 10, 13-4(1929).—A 6 months' old child fell ill, showing symptoms of poisoning. The polish used for the child's shoes was found to contain EtOH denatured with MeOH, $PhNH_2$, tar and tar coloring matter. It is assumed that $PhNH_2$ was the cause of the poisoning.

G. SCHWOCH

Composition of the blood and cholesterol therapy. ENRICO DI POGGIO. Hosp. "Gustavo Morvillo" Naples. *Rass. clin. terap. sci. affini* 27, 323-40(1928).—In pernicious and other kinds of anemia, good results were obtained with the cholesterol therapy. When injecting *Coleolo Sero*, which is cholesterol oleate, for a longer period of time, the no. of erythrocytes and the hemoglobin increased, and the other constituents returned more or less to the normal level. The general condition of the patients was much improved.

G. SCHWOCH

The graphic method in studying the healing of wounds. A. CHIASSERINI AND L. FERRETTI. Univ. Rome. *Rass. clin. terap. sci. affini* 27, 384-407(1928).—A new, brief method for detg. the area of wounds is described. Periarterial sympathectomy of the femoralis did not accelerate the healing of wounds in the corresponding limbs of dogs and rabbits. Insulin when applied as an ointment of the compn. 0.25 g. ZnO, 7.50 g. lanolin, 15 g. vaseline and 5 cc. of insulin accelerated the healing; *Oncobasi* (Sero) had a similar effect.

G. SCHWOCH

Effect of parenterally introduced stimulating agents. I. Intravital decomposition of protein in the liver of the sensitized animal. R. WIGAND. Med. Klin. Königsberg. *Arch. expil. Path. Pharmacol.* 132, 1-17(1928).—Sources of error inherent in the method render it of questionable value for the purpose indicated. II. Biological action of parenterally introduced amino acids. *Ibid* 18-27.—Of the 11 amino acids tested tyrosine manifested a biol. action, in character resembling that assocd. with digestion products of *B. typhosus*. Apparently activity is related to the presence of the benzene ring although the latter is not solely and directly responsible. III. Histological changes in the liver. *Ibid* 28-30.—Following the subcutaneous injection of horse serum into specifically sensitized guinea pigs the liver parenchyma contained an abundance of cells undergoing mitosis.

G. H. S.

Treatment of acute intoxication by morphine. ERNST JOEL. Städt. Krankenhäuser Moabit, Berlin. *Arch. expil. Path. Pharmacol.* 132, 63-76(1928).—Atropine is of questionable value in the treatment of morphine intoxication, but lobeline exerts an effect upon the respiratory app. which shows the antagonism between morphine and lobeline.

G. H. S.

Protracted intravenous infusion of mice, rats and rabbits. HEINRICH K. KUNSTMANN. Univ. Würzburg. *Arch. expil. Path. Pharmacol.* 132, 77-83(1928).—With the app. described 2% gum arabic-Ringer solns. have been perfused, without the development of edema, for as long as 15 days.

G. H. S.

Effect of experimental phosphorus poisoning upon the digestive enzymes of the blood. M. FRHR. V. FALKENHAUSEN. Univ. Breslau. *Arch. expil. Path. Pharmacol.* 132, 106-17(1928).—Following P poisoning there is a very marked increase in the diastatic action of blood serum, a change in no way referable to an altered activating mechanism, to interference with urinary excretion, or to the appearance of bile in the blood stream. Since P poisoning exerts a like effect in depancreatized dogs, the pancreas is obviously not involved. It would seem that the liver is the organ concerned in the increased elaboration of diastase. The lipolytic action of the serum diminishes during P poisoning.

G. H. S.

Changes induced in the purine metabolism by insulin and synthalin. GERT TAUBMANN. Univ. Breslau. *Arch. expil. Path. Pharmacol.* 132, 124-8(1928).—Dogs given large doses of insulin exhibit an increased excretion of purines, which is quite independent of the changes in total N. By synthalin administration the allantoin is markedly increased.

G. H. S.

Combinations of soporifics. KARI, STEINMETZER. Univ. Wien. *Arch. expil. Path. Pharmacol.* 132, 172-92(1928).—A somewhat enhanced effectiveness was exhibited by mixts. of paraldehyde, chloral hydrate, veronal, chlorotone and luminal. Combi-

nations of agents acting upon the brain stem with those acting on the cortex showed a diminished toxicity.

Pharmacology of hydrocyanic acid in cold-blooded animals. I. Role of the pulmonary and skin respiration in changes in color of the venous blood after hydrocyanic acid intoxication. VLAD. M. KARASSIK. Leningrader Med. Inst. *Arch. expul. Path. Pharmacol.* 132, 193-204(1928).—The effect of injected NaCN upon the color of the blood is markedly influenced by the facilities for respiration. With functioning pulmonary respiration small doses of NaCN act effectively and promptly; with the pulmonary respiration excluded much larger doses are necessary to cause a comparable effect, and the change occurs more slowly. II. Influence of some physical and pharmacological factors on oxidation processes in hydrocyanic acid intoxication. *Ibid* 205-13.—Temp. modifies the reaction.

Pharmacology of narcosis: Narcotic breadth. L. LENDLE. Univ. Leipzig. *Arch. expul. Path. Pharmacol.* 132, 214-45(1928).—The higher alcs. are eliminated most quickly, and with them death takes place more promptly than with those alcs. which are eliminated more slowly. With the higher alcs. death is due to a primary toxicity, with the lower to secondary injurious effects. With the more slowly eliminated alcs. the quotient expressing the breadth of narcosis is greater than with the higher forms. In the alc. series primary toxicity increases with the length of the C chain. With mixts. of alcs. the quotient is not materially changed. With most of the alcs. the quotient of breadth of narcosis was 1.8, with propyl alc. 2.2, with avertin by either intraperitoneal or rectal administration about 1.7.

Effect of morphine upon blood vessels, in particular upon those of the lungs. A. LUISADA. Univ. Wien. *Arch. expul. Path. Pharmacol.* 132, 296-312(1928).—See C 1 22, 3231.

Pathogenesis and therapy of pulmonary edema and of asthma cardiale. A. LUISADA. Univ. Wien. *Arch. expul. Path. Pharmacol.* 132, 313-29(1928).—Adrenaline injected intravenously into rabbits produces an exptl. pulmonary edema, but this effect can be modified by treatment with substances which exert an effect upon the respiratory center. Thus, morphine is inhibitory; cardiazole, narcotine and caffeine favor the development of edema. Other substances, such as chloral hydrate, chloretone, papaverine, luminal, paraldehyde and pituitrin are also inhibitory. Further evidence of the influence of nervous mechanisms upon the production of pulmonary edema is afforded by the fact that section of the cervical cord is inhibitory. Substances, such as hypertonic sugar solns. and CaCl₂, which alter the permeability of the capillaries tend to aggravate the edema.

Mechanism of purine diuresis in dogs and its relation to water and salt exchange. A. M. PREOBRAZHENSKII. Veterinär-Inst. Charkow. *Arch. expul. Path. Pharmacol.* 132, 330-48(1928).—When the intake of fluid is reduced the administration of caffeine or theobromine modifies somewhat the excretory equil., both as to total amt. of urine excreted and the abs. amt. of NaCl excreted. Increased excretion induced by caffeine is not uniform or regular, but with theobromine diuresis is a const. effect and NaCl is increased. With a high fluid intake caffeine and theobromine exert effects detd. by the nature of the fluid ingested. With distd. water caffeine always increases urine output and Cl excretion, and the Cl of the blood is increased. Under like circumstances the effect of theobromine is less uniform and although Cl excretion is increased the blood Cl remains within normal limits. With isotonic solns. ingested caffeine causes a very prompt increased urine excretion with augmented NaCl content. NaCl in the blood is below normal. Similar, though less pronounced, changes follow the injection of theobromine. If the fluid intake is a hypertonic soln. the total output of urine is less than when distd. water is given, but the NaCl of the blood and urine are higher than under the other conditions.

Effect of thyroid upon the action of vegetative poisons. ERWIN SCHLIEPHAKE. d. Klin. Jena. *Arch. expul. Path. Pharmacol.* 132, 349-64(1928).—Simultaneous records of blood pressure and electrocardiograms showed that changes in the irritability of the vegetative organs were induced by choline and suprarenine. In dogs deprived of thyroid suprarenine reduced the irritability of the sympathetic, while the effects of choline were definitely increased, as was evidenced by its effect on the respiratory center. Normal conditions were in a measure restored by prolonged feeding of thyroid preps.

Pharmacology of some pyridylpyrroles and some compounds of 2-aminopyridine. ELIZABETH DINGEMANSE AND J. P. WIRAUT. Univ. Amsterdam. *Arch. expul. Path. Pharmacol.* 132, 365-81(1928).—The toxic action of 2-aminopyridine is outspoken, invariably causing convulsions when large doses are given. Prior to the onset of the

convulsive attacks manifestations of paralysis and loss in reflexes occur. In spinal cats the blood pressure is increased. The Ac deriv. causes similar effects in frogs, and large doses induce a cataleptic condition. Urethan and dibenzoyl combinations are less active, while pyridylpyrrole and the corresponding nicotyrine are effective much as is 2-aminopyridine. All of the pyridylpyrroles are anesthetizing, being more effective than cocaine. The effect on blood pressure is variable. 2-Aminopyridine always increases the blood pressure. Differences are manifest between the effects of the isomers of C-(2-pyridyl)-pyrroles, while the differences between the C compds. and its corresponding N-(2-pyridyl)-pyrrole are not marked. The N-methyl compds., the so-called nicotyrine, behave like the C-pyrroles. The action of 2-aminopyridine is weakened by the introduction of an acetyl or urethan group. 3-Aminopyridine affects frogs much as does the 2-compd. β -Nicotyrine or 3-pyridyl-N-methyl-2-pyrrole reduces blood pressure in cats, causes convulsions, and in large doses cardiac arrest. G. H. S.

Influence of pituitary (posterior lobe) substance on urine formation. KANEKI KISHI. Tokyo Imp. Univ. *Proc. Imp. Acad. (Japan)* 4, 244-7(1928).—The changes in urine output caused by the injection of pituitary (subcutaneous as well as intravenous) shows 4 stages: Antidiuretic and diuretic (which are of vascular nature) and the same 2 stages repeated. The total output of urine throughout the 4 stages is less than the original amt., i. e., an inhibition of the function of the kidney. The intrinsic and essential action of pituitary substances on the urine formation displays its real role in the 3rd stage (antidiuretic) due to the rise of a "H₂O-threshold" in the glomerular membrane. Urethan obscures the 3rd stage more than chloralose. The nature or mechanism of the 4th stage (diuretic) cannot be detd., whether it is due to the direct action of the prepn. or simply to the relaxation of the diuretic action of the 3rd stage. The pituitary substances possibly contain more than 1 active principle. C. J. W.

Studies of the pharmacological reaction of the veins. II. FUMIO SETA. Univ. Kyoto. *Folia pharmacol. japon.* 6, 205-21(1927); *Ber. ges. Physiol. exptl. Pharmacol.* 44, 839.—Continuing earlier work, S. studied the effect of 0.01 and 0.1% solns. of various pharmaceuticals on the marginal vein of the rabbit (Auitischkow's method) and the abdominal vein of the frog (S.'s method). Pilocarpine had no dilating action on both these veins, atropine practically none and scopolamine only a very slight action. Acetylcholine caused a rather marked constriction and physostigmine an even more intense constriction of the same two veins. Antipyrine, acetanilide, quinine and aconitine markedly dilated the veins; Na salicylate caused only a slight contraction in the rabbit's vein. Cocaine, eucaine-B, novocaine and alypine, all members of the cocaine group, relaxed the tonus of the veins; tropacocaine had no action. Chloral hydrate, veronal, sulfonal and neuronal widened both veins. Ethyl urethan provoked a vasodilation which was clear only in the vein of the frog. R. C. WILLSON

The pharmacological reaction of the gall bladder. JUNKICHI TOYOSHIMA AND TSURUMAKI RYUTARO. Imperial Univ., Kyoto. *Folia pharmacol. japon.* 6, 222-31(1927); *Ber. ges. Physiol. exptl. Pharmacol.* 44, 835.—When strips of the gall bladder of the calf are suspended in Locke soln. contg. serum of the calf, they show spontaneous movements after a certain time. Pilocarpine and acetylcholine always exert an exciting action on the strips, while atropine apparently has no effect. The action of adrenaline is not uniform, being partly exciting, partly paralyzing. Ba always excites, while papaverine and pituitrin always paralyze. Morphine at best has only a very slight exciting action. R. C. WILLSON

The cardiac action of ergotoxine. YOSHIO ODA. *Folia pharmacol. japon.* 6, 263-70(1928); *Ber. ges. Physiol. exptl. Pharmacol.* 45, 137.—Small amts. of ergotoxine (0.0001-0.0005%) produce an insignificant increase in the contraction of pieces of frog heart. Larger quantities of ergotoxine effect a reduction in contraction. Strophanthin is an antagonist to this action, but adrenaline is inactive. Acetylcholine and pilocarpine are synergists. R. C. WILLSON

The influence of opium on the carbohydrate metabolism. ARATA NOMA AND SASAI SHOICHI. Univ. Okayama. *Okayama-Igakkai-Zasshi* 39, 1092-100 (1927); *Ber. ges. Physiol. exptl. Pharmacol.* 45, 69.—The action of several alkaloids on the sugar of normal rabbits was studied. Tincture of opium in subcutaneous doses of 0.5 cc. per kg. daily for 4 days caused a slight hyperglucemia in many animals on the first day; later the increase in the blood sugar varied and the hyperglucemia produced by the oral or rectal administration of sugar was clearly reduced. The sensitivity of the animal to insulin was reduced by opium. Liver glycogen decreased. Larger doses of opium (0.75-1.0 cc.) caused a definite hyperglucemia. Atropine had no effect on the blood sugar. Gynergen alone or in combination with atropine reduced the blood sugar somewhat. Gynergen suppressed the hyperglucemia produced by adrenaline. R. C. WILLSON

The peripheral action of yohimbine. MASASHI YAMAUCHI. Univ. Okayama. *Okayama-Igakkai-Zasshi* 39, 1789-1803(1927); *Ber. ges. Physiol. exptl. Pharmacol.* 45, 141.—Yohimbine in small amts. has a vaso-constricting action on the isolated uterus, the tubes, round ligament, vaginal wall and urinary bladder. In certain organs and in different proportions in the different organs, yohimbine and adrenaline are antagonistic. The action of adrenaline is in certain organs either reversed or allayed by yohimbine. Pilocarpine and Ba were not altered in their action by yohimbine. R. C. W.

Experimental studies of the conduct of the leucocytes against different artificially applied irritants. IV. **Studies with different inorganic substances.** Y. MATSUNAMI. Univ. Okayama. *Okayama-Igakkai-Zasshi* 39, 1890-1901(1927); *Ber. ges. Physiol. exptl. Pharmacol.* 45, 215.—Continuing earlier studies M. shows that the leucocytes react quite strongly against chem. irritants and that after the injection of metals (Au, Ag, Cu, Fe, Pb) the neutrophiles and eosinophiles increase to a greater extent than do the lymphocytes. The blood cells also react against alkalies, particularly the neutrophiles and eosinophiles. Against acids the lymphocyte reaction is strongest; against salts, the eosinophile one. R. C. WILLSON

Studies of the active constituent of Rhododendron hymenanthus Makino, "Rhodotoxin." I. **Chemical investigation and general pharmacological action.** MAKATO MAKINO. Univ. Okayama. *Okayama-Igakkai-Zasshi* 39, 2099-2112(1927); *Ber. ges. Physiol. exptl. Pharmacol.* 44, 720.—From the leaves of this plant M. isolated a cryst., neutral, N-free substance, rhodotoxin, $C_{31}H_{51}O_{10}$, m. 245° . It is very toxic. In frogs, mice and rabbits the toxin produces a depression and motor paresis. In cats and dogs nausea, vomiting and diarrhea appear. Finally in all the animals there are signs of poisoning and death follows through respiratory paralysis. R. C. WILLSON

The toxic action of ethyl alcohol on the blood vessels. V. GRABOVSKAJA-SCERBOVA. *Russ. Fisiol. Zhurnal* 9, 223-40(1926); *Ber. ges. Physiol. exptl. Pharmacol.* 44, 833.—The studies were made on the ears of freshly killed healthy rabbits. The ears were perfused at room temp. for 1-4 hrs. with Ringer's soln. under a pressure of 57 cm. H_2O and then the reaction of the vessels to adrenaline soln. (1:5-10 million) was detd. Then the ears were treated with alc. of a known concn. for a definite time and thereafter the adrenaline reaction was again detd. The studies showed that alc. concns. which can circulate in man are without influence on the ability of the vessels to contract under the action of adrenaline even though the procedure be of long duration. Only very long treatment with high concns. of alc. (8-12%) annuls the action of adrenaline. Alc. contg. small quantities of formalin has a much more toxic action than pure alc. No specific toxic effect on the smooth musculature and the sympathetic nerve endings in the blood vessels need be ascribed to alc. R. C. WILLSON

Narcosis with avertin (E 107) and its influence on the serum-calcium in the dog. HANS STIASNY. Tierartzl. Hochschule, Berlin. *Tierartzl. Rundschau*, 33, 871-5(1928); *Ber. ges. Physiol. exptl. Pharmacol.* 44, 714-5.—A rectal dose of avertin (tribromoethyl alc.) (0.8 g. per kg. and later 0.2 g. per kg., in olive oil) produces a good narcosis. In this condition, the serum Ca, detd. according to the method of Waard, decreases 7-13%. This is in accordance with the action of other anesthetics of the fatty series, as shown by Cloetta. Intraperitoneal administration of avertin was not studied. R. C. WILLSON

The influence of urotropine on autolysis. A. TRUFANOV. *Zhurnal exptl. Biol. Med.* 8, 582-90(1928); *Ber. ges. Physiol. exptl. Pharmacol.* 45, 114.—The checking of autolysis observed after urotropine administration in acid reactions is assigned to the action of $HCHO$ formed by disocn. In alk. reactions certain concns. (0.025%) of urotropine increase the intensity of the autolysis, while higher and lower concns. have an inhibiting effect. After the administration of urotropine the post-mortem autolysis of the liver in alk. reaction increases in comparison to the controls. R. C. WILLSON

Biochemical studies on pityrol (KOMATSU) 10. Review of pharmaceutical and pharmacological chemistry (BERLINGOZZI) 17.

12—FOODS

F. C. BLANCK AND H. A. LEPPER

The determination of formaldehyde in foods. F. CHERICI. *Ann. chim. applicata* 18, 504-8(1928).— CH_2O can be detected in foods as follows: Place 10 cc. H_2SO_4 (pure) in a test tube and add the substance under examn. (decolorize wine, etc., with bone black and take 20 cc.; take beer as it is; for meat, butter, sirups, jellies, etc., ext.

about 20 g. with boiling water, filter and use in the test). Then add 0.2 cc. EtOH (5%) soln. of gallic acid and partially mix the liquid. In the presence of CH_2O there results an emerald green band at the border of the liquids, with a blue band below it. This reaction will detect 1 part in $1/2$ million of CH_2O whereas $1/10,000$ is necessary as a preservative. None of the other preservatives gives a similar reaction, and while sugars give a light green band with a warm soln., when cooled they do not give any coloration. This is, therefore, a characteristic reaction.

A. W. CONTIERI

Report on cereal products to the association of Official Agricultural Chemists. J. A. LÉCLERC. Bur. Chemistry and Soils, U. S. Dept. of Agr. *Cereal Chemistry* 6, 78-83(1929).—This report includes the recommendations of the Referee and the action of the Association on Cereal Products including flour, baked cereal products and alimentary pastes.

L. H. BAILEY

Chemical composition and fertilizer needs of Italian rice. L. BORASIO. *Giorn. Riscultura* 18, 10(1928); *La Chim.* 4, 23-4(1928); cf. *C. A.* 22, 829, 1633.—Analysis of several Italian rices gave: humidity 11.40-15.08%, raw fat 1.42-2.13%, raw proteins 6.80-8.20%, ash 3.20-4.87%, raw cellulose 7.40-9.84%, non-N extractive substances 62.85-68.31%; the ash contains SiO_2 2.10-3.44, K_2O 0.25-0.32, Na_2O 0.09-0.13, MgO 0.15-0.23, sulfuric anhydride 0.04-0.07, phosphoric anhydride 0.58-0.71, CaO 0.04-0.09 for 100 parts rice. A good cultivation yields 7500 kg. of rice per hectare and 7500 kg. rice straw, extg. 122.25 kg. N, 75 kg. phosphoric anhydride, 93.75 kg. K_2O , 62.25 kg. CaO and 36 kg. MgO , requiring theoretically 596 kg. $(\text{NH}_4)_2\text{SO}_4$ (20.5% N), 500 kg. perphosphate (15% P_2O_5), 234 kg. K_2SO_4 (40% K_2O) and 62 kg. CaO . Less of the 1st is necessary as the grounds are rich in N (1.10-1.55 per 1000); the irrigation waters contain N, and cow dung is used, with strengthening cultivations. The quantity of K and phosphoric anhydride is not excessive as the irrigation waters are poor. The CaO is below the real need. The rice fields are acid, and must be neutralized, an excess of CaO being used for favoring the life of microorganisms, for the decompn. of org. substances and for the reduction of org. N into NH_3 , for eliminating harmful salts and for liberating K from clay. For satg. acidity 800-1000 kg. CaO are needed per hectare every 3-4 years; with argillous earths more.

R. SANSONE

Moisture in combined wheat. A. DAANE. Okla. Agr. Expt. Sta., *Bull.* 183, 1-15(1928).—Moisture is the most important single factor in the grade and condition of wheat. Excessive H_2O content may be due to immaturity, low places in the field, thick stands, lodged grain, rain and dew, high atm. humidity and weeds. Wheat contg. over 14 to 14.5% H_2O is likely to give trouble during storage.

C. R. F

The peptization of wheat-flour proteins by inorganic salt solutions. R. A. GORTNER, W. F. HOFFMAN AND W. B. SINCLAIR. Univ. of Minnesota. *Cereal Chemistry* 6, 1-17(1929).—There is a great variability in the amt. of protein that can be extd. from a given wheat flour by various solns. of equiv. ionic concn. There is an equally striking variability of the proteins of individual flours toward a single salt soln. The amt. of protein peptized by a single salt soln. will vary 100% in the extreme ranges for the various flours studied. These differences are not dependent upon the H-ion concn. but are detd. by (1) the ease of peptization of the proteins in a particular flour and (2) the specific properties of the particular anions and cations present in the salt soln. used. The salt-sol. protein fraction does not represent a mixt. of albumin and globulin, nor does it represent the non-gluten proteins. Some salts ext. only a part of the non-gluten proteins, whereas others ext. very appreciable amts. of the gluten proteins. Thus, 1.0 N KF exts. an av. of 69% of the non-gluten proteins, whereas an equiv. concn. of KI exts. 340%. The peptization of the wheat-flour proteins by inorg. salt solns. reveals the same sort of differences as does peptization with acid or alk. solns. It is believed that these differences are assocd. with the colloidal properties of the wheat-flour proteins which in turn are dependent upon heritable differences of the wheat varieties and upon environmental conditions under which the wheat was grown or that are involved in the subsequent harvesting and storage of the grain.

L. H. B

Relation of quantity of sodium sulfate to time of digestion in protein determination. C. G. HARREL AND J. H. LANNING. Bakeries Service Corporation, Jamaica, N. Y. *Cereal Chemistry* 6, 72-8(1929).—The weight of Na sulfate used in the protein detn. is a vital factor. For a given heat source, the time required for complete digestion can be varied by changing the ratio of Na sulfate to acid. Low-protein detns. can often be explained by failure to use sufficient sulfate when digesting with a given heat source and time interval. Data from a large no. of analyses prove the desirability of using a larger quantity of Na sulfate if Cu is the catalytic agent than if Hg is used.

L. H. BAILEY

Flour color tests. D. W. KENT-JONES AND C. W. HERD. Messrs. Woodlands,

Ltd., Charlton Green, Dover, England. *Cereal Chemistry* 6, 33-50(1929).—The observation of Visser't Hooft and de Leeuw that the Kent-Jones and Herd numerical method for the estn. of the color of flour gives results not in agreement with the Duboscq colorimeter was confirmed by the authors. The suggestion of Visser't Hooft and de Leeuw that this was due to a change of H-ion concn. of the soln. used for comparison because of the varying amts. of standard soln. used was found to be wrong; it is suggested that the discrepancy may be due to certain absorption effects of red and yellow light. To obviate the possible varying absorption caused by the Cochromate mixt., it is suggested that an acid chromate soln. be used, as apparently the absorption effects of chromate and dichromate ions are more nearly similar. For practical purposes, however, it is suggested that the numerical standard given by Kent-Jones and Herd (1927) is more useful. Little confirmation could be found of the criticism advanced by Visser't Hooft and de Leeuw concerning the extn. method employed in obtaining the alk. MeOH exts. Confirmation was obtained of the Visser't Hooft and de Leeuw statement that the colorimeter designed by Kent-Jones and Herd is less tiring to the eye than the Duboscq, and that this results in a closer agreement being obtained by various observers with this colorimeter than with the Duboscq.

L. H. BAILEY

Relation of hydrogen-ion concentration and buffer value to the baking quality of flour. I. E. A. FISHER AND P. HALTON. Research Assoc. of British Flour-Millers, St Albans, England. *Cereal Chemistry* 6, 18-33(1929).—With the two flours studied, a patent well known to English bakers, and a straight (72% extn.) imported from Canada, H-ion concn. was a factor of little importance in bread making and contributed little or nothing to loaf quality. With the patent flour, the fermentation was slightly hastened by the increased H-ion concn. of the dough, but this effect was not observed with the straight-run flour. The effects noticed as directly due to increased H-ion concn. were on dough toughness and on loaf flavor (taste), and even these effects were only pronounced with large increases, e. g., a fall of 0.80 in p_H . Acid solns. are produced during fermentation; after prolonged fermentation the smell of the dough or of the loaf is very "strong" and typically "acidic" in character. The observed ill effects on dough and on loaf quality cannot, however, in the light of the expts. described above, be due either directly or indirectly to the small increase in H-ion concn. actually observed. Many other chem. and colloid changes go on in a fermenting dough and all of them doubtless contribute something to the final product. Many of these changes must be of far greater importance as regards their effects on dough and loaf quality than any small change of H ion could ever be.

L. H. BAILEY

Effect of dry skim milk on the fermentation and hydrogen-ion concentration of doughs. J. L. ST. JOHN AND C. H. BAILEY. Agr. Biochemistry, Univ. Farm, St. Paul, Minn. *Cereal Chemistry* 6, 51-9(1929).—Production of total gaseous CO_2 in yeast-leavened doughs was increased when dry skim milk was superimposed upon the control formula. In this particular, its effect was greater than that of the fluid skim milk with which it was compared. Loss of gaseous CO_2 from such doughs was increased somewhat when dry skim milk was included in the formula. Rate of increase in the vol. or displacement of yeast-leavened doughs was practically the same, whether or not dry skim milk was included in the formula. Buffer action of dry skim milk was appreciable, as shown both by the initial H-ion concn. of the freshly mixed doughs and by the relative rate of change (in p_H) of control and milk-contg. doughs. In view of the observed accelerated fermentation rate in the presence of dry skim milk, it is possible that the greater stability of doughs contg. this material may be the consequence of the lower change in H-ion concn.

L. H. BAILEY

A method of measuring color in bread. EMILY GREWE. Bur. Dairy Industry, U. S. Dept. of Agr., W. K. Marshall, City Baking Co., Baltimore, Md., C. G. Harrell Baking Service Corp., Jamaica, N. Y. *Cereal Chemistry* 6, 60-8(1929).—A psychological method devised by A. H. Munsell, by which color is measured directly by the eye, is applied to testing the color of bread. The 3 attributes, hue, brilliance and chroma, are the basis of this system. The color of an object is measured by spinning 2 or more disks on a motor shaft at a high enough speed to resolve the colors of the disks into a single color. When the disks are placed on the shaft, they are overlapped by means of a slit so that parts of each disk are exposed at the surface. The proportion of the different colors of the visible portion may be adjusted until there is a perfect match between the object under test and the rotating disk. Color of crust and crumb of bread may be measured by means of this system.

L. H. BAILEY

A practical method of photographing bread. W. L. HEALD. The Larabee Flour Mills Co. Lab., Kansas City, Mo. *Cereal Chemistry* 6, 69-71(1929).—The app. con-

sists of a Sept camera mounted in a fixed position, two 9-in. Al reflectors, which focus the light from two 400-watt lamps upon the loaf, giving the same intensity of light each day regardless of natural light. The machine uses 35 millimeter neg. films with 250 exposures to the roll (17 feet of film) operating on a strong spring, and takes individual pictures. The cost of the roll ready to put into the camera is \$1.00. The developing and printing cost is \$4.20, making a total of \$5.20, or about 2 cents per print. An enlarger has been used in connection with the camera and exceptional results were obtained. The grain structure and general appearance are magnified to about the true size of the loaf. This brings out everything except the crumb color.

L. H. BAILEY

The inorganic constituents of milk. NORMAN C. WRIGHT, Hannah Dairy Res. Inst., Scotland, AND JACOB PAPISH, Cornell Univ. *Science* 69, 78(1929).—Spectrographic analysis of samples of cow milk from various parts of the U. S. and of Great Britain were made. The samples were milked into glass bottles, evapd. to dryness either in SiO₂ or Pt dishes and ashed at low temps. in a muffle furnace. Spectrograms of the ash were prep'd. with the aid of a quartz spectrograph by placing the ash in an arc between 2 pure graphite electrodes. Examns. were made between λ 2400 and 4600 Å. U. "Elements not previously identified but now found to be present in small but definite traces" were Si, B, Ti, V, Rb, Li and Sr. More than the usual amt. of Cu was found in a sample of dried milk. More than the usual amt. of Zn was found in a sample obtained from cows pasturing in the neighborhood of Zn smelters. J. A. K.

The treatment of milk by the process of V. V. Winter. V. V. WINTER, *Casopis Československého Lékárnicka* 8, 126-30(1928).—W. discusses the changes in compn. of milk brought about by partial or complete freezing. By fractional melting of frozen milk or by the addn. of lactose to certain portions of frozen milk, cow milk can be made to approach the compn. of human milk.

WILLIAM J. HUNSA

Methylene blue for the milk reductase test. D. W. STEUART, *Analyst* 53, 532 (1928); cf. *C. A.* 23, 215.—The use of a 0.02% soln. of pure methylene blue is advocated

W. T. H.

Relations of temperature and time of forewarming of milk to the heat stability of its evaporated product. E. F. DEYSHER, B. H. WEBB AND GEORGE E. HOLM, Bur. of Dairy Industry, U. S. Dept. Agr. *J. Dairy Sci.* 12, 80-9(1929).—Temps. up to 70° applied for 10 mins. decrease the heat stability of evapd. milk, while higher temps. increase it, if the milk is of good quality. Longer periods of forewarming at 95° also increase stability of good milk. Either process affects the body of the milk, making it impracticable. Homogenization of evapd. milk at pressures up to 4000 lb. per sq. in. has little effect. Heat stability was det'd. by the time required for coagulation at 120°.

AMY LEVESCONTE

Heat-resistant and heat-loving bacteria in their relation to the pasteurization of milk. ROBERT S. BREED, N. Y. Agr. Expt. Sta., *Bull.* 559, 1-19(1928).—About 20 species of thermophilic bacteria occurred in abundance in pasteurized milk. Their source is dust and dirt, dirty milk cans and animal hair and manure. During the pasteurization process the non-spore-forming, heat-resistant types largely survive, making it difficult to obtain a satisfactory % reduction in the no. of living bacteria present in the milk. On the other hand, the heat-loving bacteria find pasteurization temps. favorable for their growth and rapidly increase in no. While 30 min. is not long enough to permit small no. of thermophilic bacteria to increase noticeably, yet they find opportunity to grow in foam, milk-stone, dead ends and about gaskets until they may occur by the millions per cc. in the pasteurized milk where equipment is continuously operated for 3 or more hrs. Notable increases or decreases in total acidity may be produced as well as undesirable flavors. There is no evidence connecting these heat-resistant species with pathogenic conditions in man.

C. R. F.

Use of citric acid and sodium citrate in starter cultures. HUGH L. TEMPLETON AND H. H. SOMMER, Wis. Univ. *J. Dairy Sci.* 12, 21-36(1929).—Under ordinary conditions citric acid disappears from milk in 2 to 4 days. If the milk is allowed to stand longer, a new compd. forms giving the citric acid test. Addition of 0.2% citric acid or equiv. amt. of Na citrate to milk increases about 50% the volatile acidity produced with com. starters. It increases the total acidity only 10%. The flavor of cultures was improved by the treatment.

AMY LEVESCONTE

The production and grading of cream. W. DEMPSTER, *New Zealand J. Agr.* 37, 378-85(1928).—This is a general discussion with particular reference to the causes and prevention of undesirable odors and flavors that may occur in cream. K. D. JACOB

A study of gelatins and their effect on ice cream. P. S. LUCAS AND E. C. SCOTT, Mich. Agr. Expt. Sta., *Tech. Bull.* 94, 1-24(1928).—Viscosity of mix and of gelatin

sols, as detd. by the Bloom pipet, is not a reliable index of the effect of gelatin as a binder in ice cream. Jelly strength, as measured by the Hall gelometer, is a fair measure of gelatin value. If it were more sensitive, and if the technic were so perfected as to make checks on duplicate samples possible, this test could be recommended for practical uses. Jelly-strength tests of gelatin, as detd. by the Bloom gelometer, are very accurate indications of the effect of gelatin in preventing the melting of ice cream. Ice cream manufacturers should purchase and use amts. of gelatin in the mix in accordance with its jelly strength as detd. by the Bloom test. C. R. F.

Chemical control in the butter factory. Determination of the moisture and salt content of butter. A. A. RAMSAY. *Agr. Gaz. N. S. Wales* 39, 909-18(1928).

K. D. JACOB

The manufacture of margarine. P. S. ARUP. *Food Manuf.* 3, 544, 545(1928); 4, 29-31, 34(1929); cf. *C. A.* 22, 2626.—A. discusses the raw materials employed in the industry, the characteristics of the various kinds of fats and fat mixts., the control of cleanliness of the milk, the methods of using starters, the various questions arising out of the use of milk powders and coloring matters, the particulars of churning and dry cooling processes, water cooling, after-treatment of the cooled emulsion, and problems of the margarine emulsion.

J. A. KENNEDY

Slow development of acidity in cheese making. G. F. V. MORGAN AND J. CURLE. *New Zealand J. Agr.* 37, 305-8(1928).—Rapid development of acidity is desirable in the manuf. of cheese, slow-working curds usually yielding a product of poor quality. Investigation of a factory having trouble with slow-working curds showed that this was due to bacterial contamination after the milk had been pasteurized, and the fault was traced to the presence of *B. subtilis* in the vats.

K. D. JACOB

Temperature of wax for coating cheese. J. MURRAY. *New Zealand J. Agr.* 37, 375(1928).—When cheeses are immersed in wax at a temp. of 295-305° F. the wax becomes an integral part of the cheese which offers greater resistance to rough handling; the min. amt. of wax is used. Cheese waxed at lower temps. shows rupture of the wax when local pressure is applied. This is more noticeable when the waxing is done at 240° F. or less.

K. D. JACOB

The casein-splitting ability of dairy acids. CHR. BARTHEL AND W. SADLER. *Medd. Centralanstalt. forsoksvasendet jordbruks.* No. 343, Bakteriöl. avdel No. 49, 2-9 (1928). (Swedish with English Summary).—Commercial and other starters in chalked sterile milk during 2 months at room temp. did not form more sol. N than did pure cultures of strains of lactococci from such starters. But the former split off more amino acids than the latter. B. and S. emphasize the importance of lactococci in cheese ripening as it is in the form of starters that lactic-acid bacteria are added to the cheese milk.

O. A. NELSON

Effectiveness of sodium hypochlorite in sterilizing creamery equipment. E. L. FORTS. Okla. Agr. Expt. Station. *J. Dairy Sci.* 12, 51-9(1929).—The use of steam is expensive for sterilizing equipment, and chem. substances usually flavor the milk. NaClO is inexpensive and does not flavor the milk. A study was made of the effectiveness of washing the pump, pipes, filters and cooler with a brush and hot alkali, compared with the same treatment followed by brushing the equipment with a commercial NaClO prepn. Pasteurized milk, passed through the equipment with no NaClO treatment, showed an increase of 74.8% in bacterial count. The average increase was less than 10% when the NaClO treatment was given. Four different commercial brands were used, and the NaClO soln. was prepd. as directed on each package.

AMY LEVESCONTE

The mayonnaise emulsion. D. M. GRAY AND C. A. SOUTHWICK, JR. Hazel-Atlas Glass Co., Wheeling. *Glass Packer* 2, 17-41, 77-81(1929).—A mobilometer for the detn. of body or consistency of mayonnaise is described. The time in sec. required for the 500-g. plunger to fall the distance between 2 reference marks (18 cm.) on the plunger rod at 60°F. is taken as the consistency. The value increases considerably with temp. increase. Other factors remaining const., consistency decreases rapidly with increase in H₂O content of the mayonnaise. Cottonseed oil and glycerol of definite sp. gr. are used for checking results and comparing instruments. Stability of an emulsion has little, if any, relation to stability against freezing temps. but it should correspond with the ability of the emulsion to resist breakdown due to handling, transportation, or elevated temps. As consistency is decreased by repeated plunges by the mobilometer, the oil particles increase in size until a const. is reached. The no. of plunges required to reach this const. is a measure of the stability of the emulsion. Stability decreases somewhat with age, the rate of decrease becoming less until it approaches a const. value after approx. 72 hrs. This decrease is more pronounced at

37° than at 30° or at even lower temps. The use of the mobilometer will allow closer standardization of mayonnaise emulsions than has been heretofore possible. The figures are figured 28 emulsion photomicrographs.

C. R. F.

The zinc content of food vegetables. GABRIEL BERTRAND AND ROJE BENZON. *Compt. rend.* 187, 1098-1101; *Compt. rend. acad. agr. France* 14, 1303-7(1928).—Zn plays an important physiol. role, comparable to that of Fe, in living organisms. The Zn content of different plants as well as different parts of the same plant is extremely variable. E. g., peach mesocarp or beet leaves contained from 0 to 0.2 mg. per kg., bean seeds and pine nuts approx. 50, and hemp seed 82. In general there is less than 1 mg. per kg. of Zn in the pulpy portion of peaches, plums, apricots, mandarin oranges, strawberries, melons and in etiolated leaves; from 1 to 2 mg. per kg. in parenchymous roots such as carrot, turnip, radish, the flesh of orange, lemon juice, leaves of low chlorophyll content such as escarole, cabbage, romaine, in figs, raisins and chestnut; 2 to 3 mg. per kg. in celery, banana, cauliflower, salsify, sweet potato, tomato and Jerusalem artichoke; 3 to 4 mg. per kg. in rutabaga, asparagus, Japanese artichoke, date and forage beet. As the chlorophyll content increases, the Zn increases also. In carrot leaves and alfalfa, 4 mg.; radish leaves, 4.5; head lettuce, 4.7; cress, 5.6; spinach, 6.2; dandelions, 9.7; matured white potato, 4; mushrooms, 5.1-5.3; truffles, 2.8; vicia, 12.4; garlic, 10; onion, 13.1 in the watery tissues and 50 in the seed. In the grains, barley, sorghum, wheat, millet and rye contain 12-19 mg.; soy beans, 20; vetch, 23; lentils, 24.5; peas, 44.5; beans, 52.5; buckwheat, coconut and fresh almonds, 10; peanuts, 16; sunflower seed, 17; dried almonds, 18; dried nuts, 20; pine nuts, 55; hemp seed, 82.6; polished rice, 2; rice bran, 30; white wheat flour, 6-7; whole wheat flour, 10-15.

C. R. F.

Sampling apples in the orchard for the determination of arsenical spray residue. J. W. BARNES. *Ind. Eng. Chem.* 21, 172-4(1929).—As present in the arsenical residue on apples after treatment with PbHAsO_4 was detd. by the Gutzeit method. Total As was calcd. to grains, and wt. of apple to lbs., results being expressed in grains per lb. Relative areas were also given this consideration. Mathematical formulae are given for calcg. the area in terms of vol., and for detg. the relation between the probable error of the mean, the standard deviation, and the no. of individual fruit. As residue on apples ranged from 0.001 to 0.031 grains As per individual, and from 0.05 to 1.30 grains per 100 sq. in. of area of fruit.

FREDERICK G. GERMUTH

Preserving fruits and vegetables in the home. Results from experiments in canning, pickling and preserving. ETHEL W. HAMILTON. Can. Dept. Agr. Central Exptl. Farm, Ottawa. *Can. Dept. Agr., Bull.* 77, 1-54(1928).—A comparison is made of the comparative value for canning purposes of the 17 varieties of green beans, 11 sweet corn, 28 tomatoes, 7 asparagus, 15 peas and 18 plums. Similar comparisons are made in the value for apple sauce, jam, jellies and preserves of many varieties of black and red currants, crab apples, plums, grapes and berries. A score card is used for product evaluation.

C. R. F.

Studies in home canning. III. Heat penetration in meats and vegetables processed in glass containers. GAIL M. REDFIELD, P. MABEL NELSON AND GERTRUDE SUNDERLIN. Iowa State Coll. *Iowa State Coll. J. Sci.* 3, 7-28(1928).—Expts. were conducted on: beef round, beef suet, pork loin, pork sausage, green beans, spinach, asparagus, sweet corn and tomatoes in glass jars of quart size and of pint size, processed in hot water, in pressure cookers at 15 lbs. pressure and in an autoclave heated by high-pressure steam. Temps. were detd. by means of thermocouples sealed through the lids of the jars so that the junctions were at the center of the jar. Variation of water, bone, fat and lean meat and pre-cooking have but little effect on heat penetration into cans of meat. Larger size of jar, closeness of pack and high viscosity decrease the rate of penetration. Quart jars should be processed longer than pint jars as follows: tomatoes 10 mins., beans, asparagus and spinach 10-20 mins., beef 30 mins., pork 50 mins., and sweet corn 60 mins. Unless all air is allowed to escape from pressure cookers, the temp. may be below that indicated by the gage. Temps. below those indicated by the pressure gage were recorded by the thermocouple unless the petcock of the pressure cooker was left open for 7 mins. after the appearance of steam. A review of former work and 29 references are included.

F. E. BROWN

Food gelatin values relative to concentrations. M. BRIEFER AND J. H. COHEN. *Ind. Eng. Chem.* 21, 264-5(1929).—Exptl. data where a Bloom gelometer with 2 different sized plungers was employed are shown in curves. Within a certain range the jelly strength is a linear function of the concn., but as com. products do not contain food gelatin in these concns., the results have no value unless a relation can be shown to the useful concns. The straight-line portion of the curves begins at different concns.

with different grades. The higher the grade, the lower the concn. included in the straight-line part of the curve. Results indicate a better approximation of gelatin values at a 3% concn. basis than at the usual 6.67% basis. At concns. of 3% or less the p_H effect is marked. The present methods of gelatin testing should be brought out so that all grades are within the straight-line period or entirely out of it. The use of a 16 mm. plunger and 3-4% concns. causes the relative values of all grades closely to approx. the actual values assigned to them by experience and practical application.

W. H. BOYNTON

Artificial sausage skins. WALTER OBST. Altona-Bahrenfeld. *Kunststoffe* 18, 176(1928).—The author discusses the production of artificial sausage skins, and reviews patented processes for carrying out the manufacture of these articles. The articles are produced from ground intestinal scraps which are dissolved by organic acids to produce viscous solutions, which are either sprayed under pneumatic pressure into molds, or rotary forms are dipped into the mass, from which the dried skins are removed. The skins are hardened by formaldehyde, alum, tannin, etc. Care must be used in coloring the skins so that the colors employed will be absolutely fast and also will not color the contents of the skin when the sausage is cooked or smoked. B. HAMILTON

Iodine content of Pacific Coast sea-foods. NORMAN D. JARVIS. Univ. of Wash., Seattle. *Univ. of Wash. Publ. in Fisheries* 1, 239-50(1928); cf. *C. A.* 20, 1872.—Tiesler and Wells' modification (*C. A.* 18, 3438) of the Fellenberg technic was used to det. I in 42 species of edible Pacific Coast fish, shellfish and crustaceans. Shellfish contained the largest amts. of I, the range for abalone, clams, oysters and scallops being 3621 to 6875 p. p. m. dry basis. Crustaceans contained from 445 to 1456 p. p. m., marine fish from 515 to 1972, anadromous fish 698 to 1539 and fresh water fish from 35 to 158 p. p. m. All of the marine products form acceptable foods for I prophylaxis. Herring, shad or salmon roe was from 2.5 to 5 times as rich in I as the flesh. Salmon which had been canned, baked, boiled or fried retained substantially all of its original I content. The wider use of salmon and other marine foods in the human diet is advocated. C. R. F.

Specific effects of salt, nitrate and nitrite in inhibiting the growth of putrefactive anaerobes. C. R. MOULTON. Inst. of Am. Meat Packers, Chicago. *Glass Packer* 2, 86(1928).—Both NaCl and NaNO₂ tend to inhibit the growth and action of certain putrefactive anaerobes which cause meat spoilage. NaNO₂ is more effective than NaCl in preventing decompn. Especially in the case of canned meats and hams the treatment with nitrates may account for the successful preservation of the product which is given a heat treatment not likely to destroy all of the microorganisms which may be present. C. R. F.

Prevention of mold formation of soy by various organic reagents. KIYOSHI OTA. *J. Fermentation* 5, 914-26(1928).—Soy (100 cc.) was kept in a thermostat at 28-29° and the reagent to be tested was added; when no mold formed within 30 days, the agent was considered to be effective. C₆H₆ and naphthalene are very effective, but because of their odor cannot be used practically. Among other effective substances are aliphatic and aromatic acids, amines and alcohols, also quinones. Monobasic acids are generally effective, except formic acid, which is easily oxidized. If the above compds. are substituted with halogen, OH, NH₂, COOH, NO₂ or SO₃H, the reagent becomes ineffective. Esterification of acids makes them ineffective. K. SOMIYA

Mineral content of pasture. Phosphorus deficiency in some Wairarapa soils and pastures. B. C. ASTON. *New Zealand J. Agr.* 37, 242-4; *Trans. Proc. New Zealand Inst.* 59, 650-7(1928); cf. *C. A.* 23, 462.—Unfertilized pastures in this district were markedly deficient in P₂O₅, the percentage varying from 0.19 to 0.26 on the dry matter. The soils in this area also had a low P₂O₅ content. The pastures were not deficient in the other elements usually considered essential in animal nutrition. K. D. JACOB

Milk weed (*Euphorbia drummondii*) proved poisonous to sheep. H. R. SEDDON. *Agr. Gaz. N. S. Wales* 39, 777-82(1928).—H₂O exts. of as little as 1 lb. of air-dried milk-weed grown in the Brewarrina district, N. S. Wales, were fatal to sheep, postmortem exams indicating HCN poisoning. The dried plants were found to contain 0.085% HCN. Supplies of the plant from certain other localities were not toxic when tested in a similar manner and gave negative HCN tests. The dry plants, from which the toxic exts. were obtained, did not produce any ill effects when chopped and mixed with other dry food, 2 sheep consuming 22.5 lb. of the plants in 6 days. The conditions governing the production of the cyanogenetic glucoside in milk weed have not yet been detd. K. D. JACOB

The economic possibilities of rice grass (*Spartina townsendii*). III. Composition and nutritive value. FRANK KNOWLES. East Anglian Inst. of Agr. *J. Ministry Agr.*

35, 934-9(1929).—A poor grade of *Spartina* hay is similar in compn., apart from mineral matter, to poor meadow hay and is fully as digestible. The former contains no toxic substances. Feeding expts. were conducted on 12-months' old Border-Leicester Suffolk wether sheep, and a record was made of the quantities of feces and urine voided during this period. The animals were maintained in perfect health throughout a feeding period of two months. Comparative chem. analyses of *Spartina townsendii* and various grades of meadow grass are furnished. It might be worth while to consider making *Spartina* silage, for this would probably be better suited for stock than either the green plant or the hay, as a large portion of salt (the mineral compn. of this plant differs materially from that of meadow grass) would doubtless be expelled during the ensiling process.

FREDERICK G. GERMUTH

Carcass comparisons of mature and immature steers. M. T. FOSTER. Mo. Agr. Expt. Sta., *Research Bull.* 117, 1-28(1928).—Carcass studies of a 9-yr.-old steer and a 1-yr.-old steer included detailed comparisons of wholesale and retail cuts, cutting tests and a sepn. of the various cuts into lean fat and bone. The immature carcass contained a higher % of protein and H_2O and a lower % of fat than the mature carcass.

C. R. F.

Chlorination as a factor of safety in shellfish production (WELLS) 14. Sodium aluminate as a coagulant in chemical treatment of cannery waste waters (HOLMES, FINK) 14. HCN in *Lotus* (GUÉRIN) 11D. Japanese tea enzyme (ARAUNER) 11C. Extraction apparatus for fruit, etc. (Fr. pat. 643,763) 1. Sterilizing by action of metals and alloys (Brit. pat. 293,385) 13. Utilization of the stones from plums (SALOMONE) 13.

Experiences de laboratoires de moulins. Paris: Tripette & Renaud fils. 48 pp. HAMMER, BERNARD W.: *Dairy Bacteriology*. New York: J. Wiley & Sons, Inc. 473 pp. \$5.

RUSSELL, HARRY L., AND HASTINGS, E. G. *Outlines of Dairy Bacteriology*. Madison, Wis.: H. L. Russell. 238 pp.

Vitamin-containing foods. VITAMIN FOOD CO. Brit. 293,735, April 11, 1927. Dried yeast and cod-liver oil may be mixed with a substance such as Karaya gum in aq. soln. and the product slowly dried to form an air-excluding coating on the particles of the material, which is in granular form.

Treating oils, fats or emulsions with ultra-violet rays to produce vitamins or enzymes. T. D. KELLY. Brit. 293,255, Nov. 28, 1927. Oils, fats or emulsions for food or for external use are treated with β -rays and also with ultra-violet rays (preferably after the addn. of 5% or more of protein or amyloid products).

Food product from distillery yeast. ALBERT KAHN (to Soc. française des produits alimentaires azotes). U. S. 1,702,303, Feb. 19. Distillery yeast, with an addn. of 5-20% NaCl, and contg. no alc., is allowed to autolyze for 1-5 days at a temp. between 40° and that at which enzymes would be destroyed. The product may be coned and dried.

Apparatus for aerating or beating foods, etc. DALE G. STEELY (to W. F. Schrafft & Sons Corp.). U. S. 1,702,526, Feb. 19.

Preserving flour, grain, grain by-products, etc. RENE A. LEGENDRE. U. S. 1,702,735, Feb. 19. An alk. substance such as NH_3 or Na_2CO_3 is added so that the moisture in the material has a p_H of 7 to 10.

Vertical tube apparatus (heated by a water bath) for heat-treating flour, grain, etc. C. W. CHITTY, D. W. KENT-JONES and WOODLANDS, LTD. Brit. 294,001, April 26, 1927. Various structural features are described of an app., the tubes of which may be formed from or lined with Monel metal or Al or other non-corrodible material.

"Yeast-saving" composition for use in bread making. CHARLES B. HILL and MAURICE H. GIVENS (to Northwestern Yeast Co.). U. S. 1,702,259, Feb. 19. $(NH_4)_2SO_4$, $CaSO_4$ and $Ca_3(PO_4)_2$ are used together.

Cake and pudding mixtures. T. FANCETT. Brit. 293,752, July 11, 1927. Desiccated ingredients for making a cake or pudding are packaged in air-tight enclosures so that they may be prepd. for use by merely adding water. Examples are given.

Preserving egg whites or yolks separately or in mixture. M. D. C. MICHAUD and COMPAGNIE OLIVIER. Brit. 293,794, July 12, 1927. NaCl or sucrose (or both) are added, with or without addn. of lactic acid, and the product is evapd. until its water content is reduced to 10-30%. The product may be packaged in an atm. of N or CO_2 . Various details and auxiliary treatments are described.

Retort and system for cooking meat or other foods under pressure. EDMOND M. SIMONDS (to E. M. Simonds Devices Co.). U. S. 1,702,854, Feb. 19. The material is subjected to heat and pressure in satd. steam and heated by radiation from the retort walls.

Use of steam in sterile packaging of meat, fruit, etc., in glass containers. GUNTHER, FREIHERR ZU PUTLITZ. Brit. 293,809, July 12, 1927. An app. is described.

Preserving fruits and vegetables. H. G. ZELLNER. Brit. 293,341, April 4, 1927. Citrous fruits may be washed with NaOH soln. and with small quantities of CuSO_4 and KMnO_4 , rinsed and further treated with a soln. such as NaOH and Na_2S_2 together with small quantities of Na_2CO_3 and NaHCO_3 , CuSO_4 and KMnO_4 . An app. is described. • Cf. C. A. 23, 916.

Dehydrating vegetable substances. SUGAR BEET AND CROP DRIERS, LTD. Fr. 643,987, Oct. 28, 1927. Vegetable substances particularly root crops such as sugar-beet are dried in stationary or moving columns of relatively small thickness by passing air repeatedly through the substance, the pressure, vol. and temp. of the air being regulated to give the most efficient drying.

Apparatus for concentrating fruit juices. MIHIRAN K. SERAILIAN. Fr. 644,180, Nov. 21, 1927. The aromas are collected in an app. sep. from the coneg. app.

Chocolate. W. M. BROWNELL (to Schreiber Products Corp.). Brit. 293,718, Feb. 24, 1927. In the manuf. of chocolate or of chocolate-coated foods, melting of the chocolate and floating of the contained cacao butter to the surface are prevented or retarded by addition of a small proportion of malt extract powder.

Beverage from maté leaves. C. HORIX. Brit. 294,003, Aug. 25, 1927. An aq. infusion of maté leaves is filtered and cooled and passed through a vacuum chamber to remove the air, then carbonated and bottled, with or without adding a flavoringrup.

Food material from grasses, reeds, etc. V. P. H. I. W. D'OBRY. Brit. 293,779, April 11, 1927. Straw, cereal stalks, grasses, reeds, etc., are steamed under 5–6 atm. pressure for 2–4 hrs. "without addn. of water or chemicals" and the sepd. liquid product may be used as a *stock food* or "in the manuf. of sugar or spirits." The solid residue may be used for making *paper* or *cardboard*, or the entire admixed liquid and solid product may be used as a cattle food.

Food for animals. A. B. SCHREIBER. Brit. 293,989, July 27, 1927. Cereal by-products such as bran or chaff, screenings and alfalfa meal are finely ground and mixed with about 5% of cottonseed meal and then satd. with molasses in heated condition, formed into strings and cut to lengths and coated with addnl. cottonseed meal. Various details and modifications are described.

Stock feed. ARMAND F. PATIN. Fr. 644,232, April 26, 1927. Stock feed particularly for calves is made up of manioc flour 60, barley flour 20, oat flour 10, linseed oil cake flour 5, and bone flour 5 parts.

13—GENERAL INDUSTRIAL CHEMISTRY

HARLAN S. MINER

The significance of the chemical industry for the political and world economy. HERMANN HUMMEL. *Chem.-Ztg.* 53, 2(1929). E. C. M.

The protection of scientific property. R. BRIGHTMAN. *Ind. Chemist* 5, 21–4 (1929). Interest in the protection of "scientific (or intellectual) property" has received much attention since the World War, and a draft convention prepd. for the League of Nations is now before various governments for consideration. Present copyright and patent laws do not protect theoretical or purely scientific discoveries. The present convention declares that authors of scientific discoveries should share in the material profits derived from the exploitation of such discoveries; to confer this right of participation in profits, such discoveries must be capable of practical utilization, and must give rise to new means of production, or to the adaption of known means to fresh purposes. This new right is not to be a right to monopoly of exploitation, but to free exploitation subject to payment of consideration. The relationship of research workers in a corporation to their employer and to each other comes in for attention. "Obviously the Convention constitutes a break with the habit of considering scientific property as a public well from which any one can draw at will."

W. C. EBAUGH

Accurate measurement of liquid in tanks. J. M. BRENNAN. *Chem. Met. Eng.* 35, 696–7(1928). —The pressure head of a liquid in a tank is measured by immersing an

open-end tube to the bottom of the tank. The top of the tube is connected to a manometer, and air is introduced to fill the tube and balance the head of the liquid. The manometer then indicates the head. A simple Hg-sealed compressor to force air into the tube is described; also Hg seals for the bottom of the air tube in the tank to overcome the difficulties encountered with viscous liquids, clogging of the air line, etc.

M. W. SKYMOUR

Use of rotating tubes for crystallization and evaporation. H. BARKHOLT. *Chem. Fabrik* 1928, 431-3.—The small crystals obtained in mech. crystallizers suffer commercially from the fact that adulteration is not so readily detectable by the eye as with large crystals. The crystal size obtained depends on the speed of rotation. Crystal forms of borax, Na_2S , and other salts so made are described and illustrated and costs discussed. An analogous app. forms an economical evaporator for the concn. of Na_2S soln., caustic soda, and the like, the thermal efficiency being very good. The two steps have been successfully combined in one tube with Na_2SO_4 and FeSO_4 .

B. C. A

High-temperature heating by circulation. ANON. *Apparatebau* 41, 13-7(1929).—Description, with 9 cuts, of the "Daqua" system of heating with H_2O up to 165° .

J. H. MOORE

The flow of gases through beds of broken solids. C. C. FURNAS. *Bur. Mines, Repts. of Investigations* No. 2904, 20 pp.(1928).—A brief summary of the exptl. work on this problem done at the North Central Expt. Sta. of the U. S. Bureau of Mines. Simple equations for first approximates are given, also complete and more complicated equations and numerous curves.

W. H. BOYNTON

Measurement and calculation of the pressure losses particularly in the Siemens-Martin furnace. WERNER HEIL. *Arch. Eisenhüttenw.* 1, 729-40(1928).—The measured and calcd. pressure losses in flue pipes and in Siemens-Martin furnaces are compared.

The equation (derived in part) used is: $\Sigma h = \Sigma \alpha \cdot \gamma^0 \cdot \frac{W^{1.924}}{d^{1.281}} \cdot l + \Sigma \gamma \cdot H^2 \cdot \gamma + \Sigma \frac{W^3}{2g} \cdot \gamma \left(\frac{F^2}{F_1^2} - 1 \right)^2 + \Sigma \frac{W^2}{2g} \cdot \gamma \left(\frac{l_1 + 273}{l + 273} - 1 \right)^2 + \Sigma H(\gamma_L - \gamma_0)mmWS$ ($\alpha = 100$

(for metallic flues), γ = sp. gr. of gas (kg./m.^3), w = gas velocity (m./sec.), d = flue diam. (mm.), l = gas flue length (m.), F = flow path cross-section (m.^2), H = height difference (m.), and γ_L outside air and γ_0 flowing material sp. grs (kg./m.^3). The γ -values for various passages in the furnaces are given, and approx. Blaschke figure of 0.5 for a 45° direction change. In technical flues the measured and calcd. pressure losses agree completely. In the furnaces investigated the deviation is considerable; it lies in friction and collision loss calcs. These losses are influenced by length of operation of the furnace. Fusion of the flow paths causes large deviation between the calcd. and pressure losses, especially in the hot furnace crown. The influence of viscosity is slight as compared to other furnace resistances. The total losses from the exchange flues to the hearth are (1) in the supply portion of the furnace 10-15% friction, 60-65% individual resistances, 25-30% acceleration, and (2) in the escaping portion 5-10% friction, 55-60% individual resistances, 30-35% sinking. A fan is recommended for introducing the combustion air, also dampers back of the air and gas chambers (for regulating the distribution of waste gases between the two). A survey of the literature is appended.

J. BALOZIAN

The detection of tar pitch in cable couplings and accessories. E. KENDSCHER AND PH. LEDERER. *Staatlichen Material-prüfungsamt, Berlin-Dahlem. Chem.-Ztg.* 52, 1014(1928).—The presence of coal-tar pitch in cable couplings and accessories is forbidden. The usual directions for detecting it call for the addition of diazobenzene chloride soln. to an ext. made by boiling 5 g. of the material with 20 cc. of N NaOH for 10 min. and then filtering. If pitch is present, a red color forms. Although rosin gives a negative test when treated as above, its oxidation products react differently. Therefore the following test is recommended: a 10 g. sample boiled with 40 cc. N NaOH soln., under a reflux condenser, for 15 min., cooled and filtered, yields a soln. a small portion of which is tested as above. If a positive result is obtained, the main portion is then treated with an excess of H_2SO_4 , the sepd. acids and phenols are extd. with Et_2O , and the free mineral acid is washed out with H_2O . The Et_2O is then evapd. and the residue boiled with 5-10 cc. of 10% NaOH soln. in a test tube until CO_2 is no longer evolved. The alk. soln. is extd. with Et_2O in a separatory funnel, the ethereal layer washed twice with H_2O , and then evapd. on the water bath. The residue is dissolved in a little cold N NaOH and then filtered. The filtrate is tested with diazobenzene chloride soln. and the appearance of a red coloration or a red ppt. indicates

the presence of tar pitch in the sample. The method was tested out on mixts. of asphaltum, rosin, and various kinds of coal-tar pitch, and showed that a tar-pitch content of 5% could be detected with certainty. W. C. EBAUGH

The utilization of the stones from plums. G. SALOMONE. *Giorn. de chim.* 22, 211(1928).—The large amount of plum stones collected in jam works has encouraged their utilization. From the internal portion is extd. a light yellow oil, with a smell and taste resembling that of peach kernels, and with a d. 0.915–0.921, sapon. value 180–198.5, I value 101–21 and thermic degree (Tortelli) 44–5. The oil is edible and can replace almond oil. The dry shells are a good combustible and their ash is rich in K. R. SANSONE

Industrial bromomethyl poisoning. ERHARD GLASER. Univ. Wien. *Deut. Z. gericht. Med.* 12, 470–4(1928).—Discussion and case report. FRANCES KRASNOW

Breakdown of solid insulators. W. WERNER. *Ann. Physik* [iv] 86, 95–128(1928).—A method is described for investigating the breakdown potential of various insulators. The substances used were mica, glass, rock salt, S, celluloid, etc. The breakdown potential was detd. for several thicknesses of each substance, except in the case of celluloid, when only one thickness was used. The expts. were carried out in oil at room temp. and in liquid air and liquid H. In general, the breakdown potential is considerably less in liquid air than in oil. Exceptions, however, are noted. The results when plotted on a graph between breakdown voltage and thickness give, for expts. in oil and in liquid air, straight lines, of which the equation is $U = ad + b$, where U is the breakdown voltage, d is the thickness of the dielectric, and a and b are constns. The discharge takes place first through the medium. Breakdown never occurs between the points of contact of the electrodes with the dielectric, although the field strength is greatest here. It is due not to the presence of ions in the insulator but to the fact that all substances contain gases. There is a good deal of evidence to show that the discharge is a gas discharge. At low temps. all substances become brittle, and it is considered that this brittleness has some connection with the lower breakdown voltage at the temp. of liquid air. The photographs of mica pierced by the discharge show the same lines as are obtained when a sheet of mica is gently punctured by means of a needle. Expts. were also carried out with dielectrics in a high vacuum. Previous results on the breakdown voltage of insulators are too low for dielectrics free from gases. B. C. A.

Electrical insulating materials from a chemical standpoint. W. H. NUTTALL. *Chemistry and Industry* 47, 1359–68(1928).—A review. J. BALOZIAN

Witadressbuch der chemischen Industrie. Vol. II. Die ausserdeutschen Länder. 5th ed. Berlin: Union Deutsche Verlagsgesellschaft. 928 pp. Reviewed in *Chem. et industrie* 20, 1010–1(1928); cf. *C. A.* 23, 919.

BARNES, HOWARD T. **Ice Engineering.** Montreal: Renouf Publishing Co. Cloth. 364 pp. \$5. Reviewed in *Eng. News-Record* 101, 928(1928).

DREWS, K.: **Verdichtete und verflüssigte Gase.** Halle (Saale): Wilhelm Knapp. 317 pp., bound, M. 23.50, paper, M. 21.50. Reviewed in *Chimie et industrie* 20, 1009(1928).

TOULMIN, H. A., JR.: **Patent Law for the Inventor and Executive.** New York: Harper & Bros. 288 pp. Cloth, \$4. Reviewed in *Eng. News-Record* 101, 743(1928).

WILKICH, W. R. **Handbook of Refrigerating Engineering.** New York: D Van Nostrand Co., Inc. 331 pp. \$4. Reviewed in *Ind. Eng. Chem.* 21, 293(1929).

Exothermic chemical reactions. SOCIÉTÉ CHIMIQUE DE LA GRANDE-PAROISSE (AZOTE ET PRODUITS CHIMIQUES). Fr. 33,339, Dec. 24, 1926. Addn. to 626,491. A quantity of gas greater than that which will react in contact with the catalyst is caused to circulate in the app. contg. the catalyst tube, and the excess is carried outside the app.

Catalytic reactions. SOCIÉTÉ CHIMIQUE DE LA GRANDE-PAROISSE (AZOTE ET PRODUITS CHIMIQUES). Fr. 644,266, Apr. 30, 1927. In exothermic catalytic reactions in which the gases are heated indirectly before reaction by the catalyst, the gases are made to pass along 2 or more distinct heating surfaces and the heat transmitted may be varied by varying the path of the gases.

Contact gas reactions. METALLBANK UND METALLURGISCHE GESELLSCHAFT AKT.-GES. Fr. 644,181, Nov. 21, 1927. In the prepn. of H_2SO_4 , HNO_3 and other compds. by contact reactions of gases, the gases are brought into contact with the contact substances by means of silent elec. discharges. The gases may be led across or against electrodes furnished with or composed of the contact substances.

Separating dust from gases. ASSOCIATED LEAD MANUFACTURERS, LTD. Fr. 644,083, Nov. 18, 1927. Dust is sepd. from gases by tubular filtering sacks disposed vertically and forming a conical surface narrowing toward the top, where they are held by a counterweight.

Liquefied gases. STUDIEN-GESELLSCHAFT FÜR GAS INDUSTRIE M. B. H. Fr. 644,367, Nov. 22, 1927. Gels, such as SiO_2 gel, are used for absorbing gas, *e. g.*, air which remains in transport reservoirs of liquefied air. The gel is cooled to the b. p. of the gas to be absorbed.

Increasing the oxygen content of air. ALFRED LOWITSCH. Fr. 643,823, Nov. 11, 1927. Air is passed through an annular space over a series of magnetic fields of fixed formation. The air is brought by a whirling motion into contact with the field. The enriched air may be used for industrial or health purposes.

Apparatus (with an auxiliary oxygen supply) for supplying oxygen for respiration by action of exhaled air on peroxides. HANSEATISCHE APPARATEBAU GES. VORM. L. VON BREMEN & Co. and DEUTSCHE GOLD- UND SILBER-SCHNEIDANSTALT VORM. ROSSLER. Brit. 293,832, July 13, 1927. Anhyd. Na perborate may be used as the source of the auxiliary O.

Fireproofing absorbent carbon, etc. N. C. DEAN. Brit. 293,962, June 18, 1927. Coke, vegetable C or other carbonaceous absorbent material for use in respirators, gas masks and the like is rendered fireproof by treatment with a soln. of an alkali metal tungstate to which an alkali metal phosphate is also preferably added. After drying, the material may be dipped in fused caustic alkali to make it absorbent of CO_2 .

Suppressing evaporation losses and fire hazards in storage tanks for volatile inflammable liquids. H. DOLLARD. Belg. 346,966, Jan. 31, 1928. Air is excluded from the storage tank, the pressure in which is kept above atm. pressure and is produced by the vapors from the stored liquid and by a gas which does not support combustion.

Introducing or eliminating substances from artificial products. SOCIÉTÉ ANON. POUR L'INDUSTRIE CHIMIQUE À BAËLE. Fr. 644,077, Nov. 18, 1927. Substances for chem. reactions are introduced or eliminated from artificial solid or liquid products with the aid of an elec. current. The process may be applied to the removal of catalysts from artificial resins, etc.

Reducing dyes or other substances to a state of fine subdivision. BRITISH DYE-STUFFS CORP., LTD., A. J. HAILWOOD and A. SHEPHERDSON. Brit. 293,896, April 11, 1927. Various substances such as indigo, indanthrone, 1-amino-2-methylantraquinone, wood charcoal and pyranthrone, are reduced to fine subdivision by stirring them in a liquid suspension (preferably of somewhat viscous consistency) with a powder of a harder material such as Fe, Zn, Cu or sand, suitably with the addn. also of a dispersing agent such as the product obtained by the "moderated oxidation" of sulfite cellulose lye with HNO_3 or Na lysalbinat or the alk. soln. of amidated sulfite cellulose pitch described in Brit. 286,808 (C. A. 23, 513).

Sterilizing by the action of metals and alloys. G. A. KRAUSE. Brit. 293,385, July 5, 1927. Metals such as Ag, Cd and Pd, which have sterilizing properties, are used in non-colloidal amorphous form, or mixed amorphous-cryst. form, or mixed amorphous-micro-cryst. form, for sterilizing *solids, liquids and gases* and for *medical purposes*. The action of the metals may be aided by employing heating and cooling devices, by the use of an elec. current, by exposure to rays and by imparting an intermittent or continuous motion to the substances. Various details and examples are given, among which is the *treatment of foods*.

Mercury boiler operation. A. J. NERAD (to British Thomson-Houston Co., Ltd.). Brit. 293,756, July 11, 1927. An admixture of Hg such as an amalgam with Pb is used to economize Hg. Structural features of the boiler are described.

Refrigerator. CHICAGO PNEUMATIC TOOL COMPANY. Fr. 643,754, Nov. 10, 1927.

Refrigerators. SOCIÉTÉ ANON. DES ATELIERS DE CONSTRUCTIONS MÉCANIQUES ESCHER WYSS & CIE. Fr. 33,319, Apr. 11, 1927. Addn. to 574,741. Me_2O is used as refrigerating material, and a mineral oil used for lubricating.

Absorption refrigerating machine. LUDWIG HIRSCH. Ger. 470,589, Mar. 12, 1924. Water is led continuously through a pipe traversing, in turn, the absorber and the evaporator.

Refrigerating apparatus of the absorption type. KARL A. WESSBLAD (to Electrolux Servel Corp.). U. S. 1,702,754, Feb. 19.

Refrigerating apparatus of the absorption type. S. K. D. M. VAN LIER. Brit. 293,525-6, May 18, 1927. Structural features.

Refrigerating plant of the reversing absorption type. JENS O. BOVING. Ger. 470,688, Aug. 11, 1927. See Brit. 276,088 (C. A. 22, 2420).

Refrigerating apparatus of the compression type. C. STEENSTRUP (to British Thomson-Houston Co., Ltd.). Brit. 293,394, July 5, 1927.

Refrigerating apparatus of the compression type. C. STEENSTRUP (to British Thomson-Houston Co., Ltd.). Brit. 293,772-3, May 18, 1926. Brit. 293,774 also relates to a gas compressor.

Refrigerating mixture. O. HANNACH. Brit. 293,581, Aug. 4, 1927. NH_4Cl 2, Na_2CO_3 3 and water 6 parts.

Vacuum refrigerating apparatus suitable for use with methanol as the refrigerant. A. EINSTEIN (to L. Szilard). Brit. 293,865, July 14, 1927. Structural features.

Heat-insulating material. CHARLES E. HITE (to Universal Gypsum & Lime Co.). U. S. 1,702,729, Feb. 19. A material suitable for use on pipes, boilers, etc., is prepd. from a hydroamylaceous paste such as aq. cornstarch paste and an acid such as H_2SO_4 , together with comminuted calcined gypsum contg. an impurity, e. g., a carbonate or silicate, which reacts with a portion of the acid for producing a "nascent salt" which facilitates setting of the compn. An app. is described. U. S. 1,702,730 specifies the manuf. of slabs, panels, blocks, etc., from similar ingredients, and also describes the app.

Heat and electric insulation. P. E. BASSET. Brit. 293,436, July 8, 1927. Phenols, cresols, guaiacol, thymol creosote and like compds. are caused to react on proteic residues such as those of breweries, distilleries or starch works in the presence of substances such as camphor, soda, potash, lime, H_2SO_4 , CaCl_2 , AlCl_3 , ZnCl_2 or $\text{Zn}(\text{OH})_2$, which may serve as catalysts; an example given also includes the use of formol.

Electric insulation. ELEKTRA-LACK-WERKE GES. SYSTEM KRONSTEIN. Brit. 293,293, July 2, 1927. Insulators are prepd. by applying liquid insulating compns. to a solid carrier of transparent viscose-like cellulose compd., substantially free from fibers, and drying and solidifying the coating (which may be formed from a rubber soln., varnish contg. linocyn or celluloid or a nitrocellulose compn.).

Insulating electric cables. RICHARD APT. U. S. 1,702,332, Feb. 19. Structural features of Pb and rubber coatings, etc., are specified.

Insulating electric cables, etc. SIDNEY G. BROWN (one-half to Telegraph Condenser Co., Ltd.). U. S. 1,702,993, Feb. 19. Layers of paper are used with interposed finely divided C.

14—WATER, SEWAGE AND SANITATION

EDWARD BARTOW

Water consumption by cities and future needs. PAUL LHEUREUX. Dept. Pub. Wks., Besançon. *Science ind.* 12, No. 175, 69-73(1928).—Based upon data obtained from many cities and villages in France, cities of over 60,000 inhabitants have a mean per capita daily water consumption of 232 l., peak consumption 418 l.; future requirements (30 yrs.) are estd. to be 412 l. with peak consumption of 742 l. For cities with a population of 15,000-60,000 the consumption will be generally less (180 l., peak 324 l. per capita per day). In small villages contg. less than 3000 inhabitants the consumption is 135 l., peak consumption 190 l. C. R. F.

Factors contributing to quality of public water supplies. H. E. JORDAN. *Ind. Eng. Chem.* 21, 152-6(1929).—An unpublished rating distributes 100 possible points that a public water supply might have as follows: 30 to quality, 24 to continuity of surface and pressure, 11 to adequacy of fire pressure, 8 to adequacy of reserve capacity and the balance to small items relative to efficiency and good-will. After a discussion of the uses of public water supplies, standards of quality, etc., the 30 points of the total are divided as follows: on a 100% basis, 51% of quality can be assigned to safety, 20% to taste, 20% to chem. balance, 5% to appearance, and 2% to temp. E. B.

Water at central steam plants. Condensation and feed water. M. MARCHEIX. *Science ind.* 12, No. 175, 103-8(1928).—Automatic systems for operating distn., feed water heater, and condensation equipment are advocated. Workable and economical steam plant hook-ups are presented. No new data. C. R. F.

Treatment of water supplies for generators. P. DROVIN. *Science ind.* 12, No. 175, 100-2(1928).—The incrustation of pipes and boiler tubes by Ca and Mg salts in water is very serious in France. These are removed by distn. and base-exchange methods. Preheating to remove dissolved gases is also desirable. When hard water is used for steam generation an effective and economical procedure is the installation of com. distn. equipment. C. R. F.

Fresh water studies. I. Relative temperature, oxygen content, alkali reserve, carbon dioxide tension and p_{H} of the waters of certain mountain streams at different

altitudes in the Smoky Mountain National Park. EDWIN B. POWERS. Univ. of Tenn. *Ecology* 10, 97-111(1929).—It was found in field work done over a period of 4 years that the O contents increase and CO_2 tensions decrease with increasing altitude. The temp., p_{H} , and alkali reserve of the waters of mountain streams decrease with increasing altitude. Without aeration, perhaps, the actual CO_2 content increases; the alkali reserve increases and O contents decrease with aging—a process which is accelerated by direct sunlight. Floods or swells at higher altitudes cause high altitude water conditions to occur at lower altitudes during and following such disturbances. Rainbow trout inhabit the lower reaches of the streams, usually to the edges of the cut-over areas, while the brook trout prefer the upper reaches. These 2 species are affected in their distribution by the presence or absence of org. substances in soln. in the waters, and by the actual CO_2 tension which is increased by the liberation of CO_2 from the org. substances in soln. which takes place more rapidly in the sunlight than in the dark. C. R. F.

Surface and sub-surface waters of the Yakima and Klamath reclamation projects. C. C. WRIGHT. Bur. of Plant Ind. Wash. Agr. Expt. Sta., *Bull.* No. 228(1928).—The examn. of the 175 samples from the Sunnyside division and 25 from the Wapato division showed that in the great majority of cases neither the drainage water nor the ground water contained appreciably large quantities of dissolved salts, and that in every case where soil of alkali areas was sampled it was found to contain large quantities of sol. salts, especially in its surface layers. The drainage and underground water from normal productive land is equally as salty, if not more so, than that which came from distinctly alkali areas. The soil soln., in so far as it is represented by surface pools, varies widely with respect to its concn. in the alkali areas from which samples were collected. The range of salt content in the 25 samples from these salty localities is from 180 to 640 p. p. m. while the range in the 48 samples coming from normal areas is from 120 to 500 p. p. m. Most of the samples in both groups run between 250 and 500 p. p. m. C. R. F.

Conservation and control of ground water. CHARLES C. BROWN. *Municipal and Water Works* 75, 317-8(1928).—Most of the water supplies of the cities either on the Atlantic or Gulf coast of Florida are obtained from surface sources or deep wells tapping limestone substrata. Some of the surface water in the state is drained by sink holes which are probably the source of the water in the lower strata of limestone. The development of the country is adding to the pollution of the surface water. Conservation and protection of the underground and surface water sources in the state have therefore become an important problem. C. C. RUCHHOFF

Water supply from the Mulde Valley. HERZNER. *Gas u. Wasserfach* 71, 116-6, 1185-90, 1213-8(1928).—The water supply of a large number of German communities is obtained from the Mulde Valley. This system was partly completed in June 1926, and now supplies an av. of 100 l. per sec. and as high as 200 l. per sec. Details of the distribution system and computations of pipe size are given. The purification system removes the yellow color due to humins by means of an addn. of 30 g. per l. of alumina impregnated with H_2SO_4 , after which 18 g. soda ash per l. is added, whereupon 50% of all impurities are pptd. After settling, the water is filtered through a quartz sand filter (grain size 1.5 mm.) and then through a marble filter to remove CO_2 . R. W. RYAN

Variable Duty Water Works, Edmonton, Alberta. ANON. *Can. Eng.* 55, 777-82(1928).—The filtration plant has a capacity of 8 million g. p. d. The raw water obtained from the North Saskatchewan River is clear and has a max. hardness of 300 p. p. m. during the winter, and is softer but has a very high turbidity (max. 10,000) during the summer. The plant includes a Dorr clarifier and 4 agitator tanks for mixing the soda and lime. During the summer months the Dorr clarifier is used to remove the heavier suspended matter before the application of the coagulant. During the winter months when the Dorr clarifier is not used for pre-sedimentation it is used to remove the sludge resulting from the water-softening process. C. C. RUCHHOFF

Water purification and softening plant at Piqua, Ohio. J. M. MONTGOMERY. *Munic. News and Water Works* 75, 135-9; *Public Works* 59, 341-5(1928).—See C. A. 22, 3247. C. C. RUCHHOFF

Control and the degree of reliability of the chlorination process of drinking water, in connection with the chloramine procedure and the chlorination of ammoniacal water. I. K. HOLWERDA. *Mededeel. Dienst Volksgezondheid Nederland-Indië* 17, Pt. II, 251-97(1928).—From H.'s expts. it is evident that at a rising p_{H} beyond 7 the disinfection by chlorination decreases considerably; the influence at p_{H} 9 and 9.5 is very great. The disinfection period for a definite hypochlorite dose appears to be longer

as the p_H is higher. For a $p_H < 7$ this influence is not so great. At a $p_H = 7$, 69.7% of the hypochlorite added is present in the form of HClO ; at $p_H = 8$, only 18.7%; and so on lower as the p_H becomes higher. Below $p_H = 6$, almost the entire amt. of hypochlorite is present as HClO . The conclusion is drawn that the disinfection by means of a Cl gas soln., as well as by hypochlorites for the same amt. of active Cl , independent of the form in which it is added, is entirely detd. by the p_H which develops after the addn. For a $p_H < 8$ the following min. contact periods are noted at the concns. of active Cl mentioned.

Concn.	Contact period.
0.2 Mg. Cl_2 as hypochlorite	About 3 mins.
0.15 Mg. Cl_2 as hypochlorite	About 5 mins.
0.10 Mg. Cl_2 as hypochlorite	About 10 mins.
0.05 Mg. Cl_2 as hypochlorite	About 30 mins.

It is inaccurate to consider the disinfecting power of chloramine greater than Cl . Less chloramine is fixed by the org. constituents present in the water and a smaller Cl dose of chloramine will sometimes suffice in case of a long contact period. Therefore the disinfecting power of chloramine is only apparently greater. RUSSELL C. ERB

Superchlorination and subsequent dechlorination over carbon of water for municipal supply. ERNST WATZL. *Ind. Eng. Chem.* 21, 156-8(1929).—Increased org. content of water may use up Cl and prevent destruction of harmful bacteria. The use of an excess of Cl regulated by automatic control and the subsequent removal of the excess by special granular charcoal guarantee safety and palatability. EDWARD BARTOW

Chlorination as a factor of safety in shellfish production. WM. F. WELLS. *Am. J. Public Health* 19, 72-9(1929).—The polluting materials do not enter the body of the oyster but are discharged with other matter excreted. Treating of oysters in chlorinated sea water has been shown both experimentally and in a com. plant, to purify oyster and to safeguard them from transmitting disease. EDWARD BARTOW

The chlorination of industrial water, especially tannery water. MARTIN AUERBACH. *Ledertech. Rundschau* 20, 189-91(1928) I. D. C.

Calculus and the construction of filtering basins in water-bearing strata. PAUL LIEBERMANN. Pub. Wks. Dept., Besançon. *Science ind.* 12, No. 175, 75-87(1928).—Calcs. and derivation of engineering formulas are given bearing upon the location and building of filter basins in alluvial strata contg. H_2O , near wells, rivers, in gravels and under other conditions. C. R. F.

The filtration and sterilization of water for potable supplies. HENRI CHABAL. *Science ind.* 12, No. 175, 64-8(1928).—An historical and descriptive résumé of modern filtration methods. The village of Pan showed an av. typhoid rate of 30 cases before 1910. Upon installation of the Peuch-Chabal filtration system, there was but 1 case in 2 years. The fractional filtration method is favored. C. R. F.

The Sandfields filtration installation . . . chemical and bacteriological observations. ARNOLD W. BURTT. *Water & Water Eng.* 30, 557-65(1928).—A rapid gravity system followed by chlorination converts a doubtful quality water into one of high quality. The purification consists in addn. of alumino-ferric, continuous flow sedimentation, filtration followed immediately by chlorination, passage through a clear water tank and finally dechlorination if necessary. The max. load for which the plant was designed is 4 million gal. per 24 hrs. By means of dyes, the water flow through the pptn. tanks was detd. to be 1% after 1 hr., 20% after 2 hrs., 65% after 4 hrs. and 94% after 7 hrs. In order to avoid contamination, the filtered water flows in closed channels only. The filters are of the air-cleaned type. Contrary to prevalent ideas, the filtrate is of as good quality just after starting the filter as after 10 or more min. It is unnecessary to by-pass the filtrate at all. The dose of alumino-ferric is from 0 to 1.0 g. per gal. Al does not play any part in the removal of N in the form of NH_3 from the raw water. Even with regular removal of the sludge from the tanks, bacteria multiply slightly in the pptn. tanks but when sedimentation is encouraged by the use of Al , the reduction in nos. due to sedimentation predominates. Samples of sand taken at depths of 3, 6, and 9 in., resp., from the filter contained 0.77, 0.65 and 0.59% of org. matter, thus indicating that adsorption occurred at all depths but was greatest near the surface. Cl is used regularly at a rate of 0.2 p. p. m. The rate of filtration is 2,750,000 gal. per day. Coarse suspended matter, such as the larger particles of Al floc, are undoubtedly removed by a simple straining action at the surface of the filter bed, but the view is taken that bacteria and colloidal org. matter are removed not by passage through a film on top of the bed only, but by the gelatinous coating surrounding the

individual sand grains throughout the filter. The breaking up of the surface of the filters with a hand rake did not affect the phys. or bacterial purity of the filtrate providing the filter was in good working condition and not clogged. The frothing of water in the pure water tanks was shown to be due to lowering of the surface tension of the water due to colloidal org. matter present in small quantities. C. R. F.

A quickened slow sand filtration in the tropics. K. HOLWERDA. *Mededeel. Dienst Volksgezondheid. Nederland-Indië* 17, Pt. II, 383-92(1928).—After the usual alum treatment the water is run through a preliminary filter of 2.3 sq. m. surface. Sand in this filter has been replaced with coarse gravel to prevent clogging. Behind this filter is a compartment where chemicals, cultures, etc., may be added to the water. Const. level is maintained by an equil. ball valve. The slow filter has a surface of 10 sq. m., the bottom being made of porous stones, on which the filtering sand (grains about 2 mm.) is placed. The initial height of the sand was 90 cm. and the initial speed 4.2 cm. per hr. After operation for about a month, samples incubated 2 days at 37°, gave a variation of the glucose and lactose-titers from 1 to 10 cc.; the germ figure was fairly regular between 200 and 300 and was higher than the original water. *B. coli*, the infecting agent, passed through in significant amts. a month and a half later. Resistance increased a little after 2 months and the speed was changed to 6 cm. per hr. The germ figure < 100 was attained after 70 days only. A month later a resistance of 100 cm. was reached, the germ figure was sufficiently low, but a lactose titer < 50 cc. could not yet be registered. The filter film was removed and the speed set at 10 cm. per hr. The germ figures remained low but the lactose-titers gave poor results. After 4 months still less than 50 cc. of water gave positive fermentation with lactose bouillon. The results did not become worse upon raising the speed to 17 cm. per hr. Detailed tables give the exptl. data. RUSSELL C. FERRIS.

Composition and use of ferric hydroxide as a coagulant. EDWARD S. HOPKINS. Bur. of Water Supply, Baltimore, Md. *Ind. Eng. Chem.* 21, 58-60(1929). It gives practical operating data governing the use of $\text{Fe}(\text{OH})_3$ floc as a coagulant and the max. removal of turbidity by it, as well as a discussion of its theoretical composition. J. A. KENNEDY.

Coagulation processes during the purification of river water. I. C. P. MOM. Expt. Sta. for Water Purif., Manggarai. *Mededeel. Dienst. Volksgezondheid Nederland-Indië* Pt. I, 27-71(1925).—(In English.) The Tjiliwong river in Batavia is fed by rain water and natural springs and because of excessive rainfall, the water carries a great deal of color, org. matter and colloidal clay and has a low mineral content. Coagulation by the addn. of 10 mg. per l. of $\text{Al}_2(\text{SO}_4)_3$, keeping the pH at 5 to 6, gave excellent results. The colloidal clay had the following chem. compn.: Fe_2O_3 3 to 10%, Al_2O_3 29.2 to 44.7%, SiO_2 26.4 to 39.5%, and loss on ignition 10.2 to 23.8%. The addn. of H_2SO_4 or alkali to adjust the pH of the water was found to be necessary. The theoretical considerations underlying coagulation of colloidal silt from water are considered in great detail. C. R. F.

Preparation of a serviceable boiler-feed water for high- and super-pressure steam boilers. W. KÄRSTEN. *Chem. Fabrik* 1929, 27-9.—Sol. reaction products from treated waters have a harmful effect on the evaporators, on the boiler itself, and even on super-heater and turbines. Condensate and distillate can be considered almost pure water. A water with low salt content, free from CO_2 and O, is obtained by a thermochem. system (Balcke). Carbonates are removed on plates or as sludge by settling after heating the water at atm. pressure. The water obtained is gas free. SiO_2 with some CaO is harmful. Soda is added to make sol. Na silicate. The boiler is blown down to prevent high concn. The treated water is kept in a special closed reservoir with an atm. of steam or N to prevent access of O or CO_2 . E. B.

The determination of the number of colon bacilli in water. A. MASSINK. *Nederl. Tydschr. Hyg., Microbiol. en Serol.* 3, No. 2, 103-27(1928).—A review is given first of the older, simpler and theoretically less exact methods of calcg. the no. of *B. coli* in water, as well as of the gradual improvements. Since the modern considerations as to the field of examn. have been and are being applied especially in the U. S., various American papers are discussed and partially cited. Some applications to important problems on water pollution, in relation to rivers as sources of water supply, are briefly discussed. J. C. JÜRRIJENS.

Experiments on the changes in the bacterial flora of stored polluted surface water, especially with a view to Clemesha's method for ascertaining the recency of a pollution. K. HOLWERDA. *Mededeel. Dienst Volksgezondheid Nederland-Indië* 17, Pt. II, 298-356(1928).—In the expts. in open reservoirs hardly any difference of the titers appeared although a higher, Eykman titer was general. A difference between the glucose and

actose titers did not appear in samples obtained in Nov. and Dec., whereas it did appear in May, June and July, when sunlight is more profuse. In advanced purification, spore-forming, fermenting organisms often became prevalent and gave rise to irregular fermentation figures. With sodium taurocholate in the fermentation tubes most of these spore-formers do not develop. This was verified by isolation of the organisms in pure culture. In the expt. in the reservoir, covered with a glass plate, fermentation figures were obtained but no difference of the titers was observed. This expt. was conducted in the rainy season of Jan. Expts. with water kept in the dark showed no general titer difference with but a slight Eykman-titer difference. H. concludes that a difference in glucose and lactose titers on storage waters in open reservoirs is no general phenomenon. Numerous analytical tables are given. R. C. E.

Chemical and biological correlations in a polluted stream. WILLEM RUDOLFS. *Ind. Eng. Chem.* 21, 256-8(1929).—Water of the Raritan River system in New Jersey is in its natural condition suitable for potable and industrial purposes. The lower section of the river is heavily polluted. There is an apparent direct relation between the amt. of NH_3 present, the bacteria, plankton, and the biochem. O demand of the river water. The O depletion was greater in summer than in winter. The no. of *B. coli* was so high that it was recommended that bathing be not allowed. Two low dams increased the dissolved O to a considerable extent. EDWARD BARTOW

Stream-pollution control activities in Wisconsin. L. F. WARRICK. *Ind. Eng. Chem.* 21, 261-3(1929).—A water pollution comm. has been organized with the state sanitary engineer as administrative officer. Elimination of objectionable stream pollution is the ultimate goal. Chem. and biological stream surveys have been made and with the cooperation of canners, paper mill operators, and others, exptl. plants have been run and conditions are being improved. EDWARD BARTOW

Sewage treatment abroad. WILLEM RUDOLFS. *Public Works* 59, 366-9(1928); cf. *C. A.* 22, 4090.—The effect of design, operation, character of sewage, climate and other local conditions in the results obtained from sewage treatment plants in the U. S. and the Ruhr District of Germany are compared. R. concludes that it is not probable that the climatic conditions or digestion capacity of the plants is important in the difference in the behavior in the plants of these countries. He believes that the most important factors are: (1) the low volatile matter content of the sewage in the Ruhr District; (2) the type of trade waste received in a no. of the German plants; and (3) the age (or freshness) of the sewage arriving at the plants. C. C. R.

The economic side of sewage disposal. N. T. VEATCH. *Munic. News and Water Works* 75, 161-2(1928).—A review of the economic reasons for sewage disposal plants, the increase in the no. of plants and a discussion of sources of revenue from some plants. C. C. RUCHHOFF

Successful sewage plant operation. C. H. CURRIE. *Can. Eng.* 54, 551-2(1928).—The main requirements for successful sewage plant operation are: a properly designed and constructed plant, the owner's appreciation of the importance of proper operation, sufficient operating finances and sufficient knowledge and zeal on the part of the operator. C. C. RUCHHOFF

Odorless operation of a two-story sewage treatment plant. CHARLES C. BROWN. *Munic. News and Water Works* 75, 293-5(1928).—The two-story circular treatment plant, which is described at Plant City, Florida had received no attention since it was built and was producing a nuisance during much of the year. The plant did not include a grit chamber or screens. Examin. showed that sludge and sand filled the tank to the slots in the settling chamber and could not be pumped out. The plant was completely cleaned out, a grit chamber and screen were added, and an operator was hired and given detailed instruction for satisfactory operation of the plant. Since then the plant has operated satisfactorily. C. C. RUCHHOFF

Separate sludge digestion experience. ANTHONY J. FISCHER. *Public Works* 59, 382-7(1928); cf. *C. A.* 22, 3250.—The operation of sludge digestion plants at Hartford, Kiel, Sheboygan, and Antigo, Wisconsin, Ridgewood, N. J., Storm Lake, Iowa, and Sioux Falls, S. Dak., after 2 years of observation are discussed. The capacities of these plants are compared on the basis of cu. ft. per lb. dry solids added per day. Difficulties were encountered with all plants started at the beginning of cold weather. Ripe manure was of a doubtful value as a seed. Reaction adjustment with lime was beneficial but also caused foaming. It is recommended that when a tank is started in the fall and acid sludge accumulates until spring the sludge be pumped out and the tank started anew. Removal of all scum, adjustment of reaction and circulation of the ripe sludge from the bottom to the top of a tank are suggested as remedies for foaming. C. C. RUCHHOFF

Effect of pressure upon sludge digestion. MELVILLE C. WHIPPLE, GORDON M. FAIR AND LOUIS KLEIN. *Ind. Eng. Chem.* 21, 254-6(1929).—There seems to be a slight acceleration of digestion of sludge under reduced pressure and a retardation under increased pressure. However, measured in terms of total gas production and total methane production, there seems to be but little difference in the digestion under various conditions. Devices to establish pressures unusual in practice would presumably not shorten digestion time. The use of deep tanks for digestion may have certain advantages in operation, and they would probably have no disadvantage on the ground of increased pressures at which digestion must proceed. EDWARD BARTOW

Sludge digestion and p_H control. H. W. CLARK AND GEORGE O. ADAMS. *Ind. Eng. Chem.* 21, 258-60(1929).—Sludge from different municipalities was digested under identical conditions. The p_H necessary for the best digestion of each sludge may vary because of difference in the org. and mineral content of each. Raising the p_H by the addn. of Ca carbonate is sometimes helpful but in some sludges the available alk. is sufficient so that the addn. is unnecessary. Org. acids resulting from decompn. of sludge may, while causing low p_H , be beneficial to digestion. EDWARD BARTOW

Capacity of sludge digestion tanks. KARL IMHOFF. *Can. Eng.* 55, 239-40(1928); cf. *C. A.* 22, 4688.—Temp., mixing or seeding, and souring of sludge greatly influence the rate of digestion and the digestion capacity allowance. For a mean annual temp. of 15°, 1 cu. ft. per capita should be used in two-story and sep. sludge digestion tanks. This capacity is based on an effective period of digestion of 2 months with a decrease in org. matter of 50%. C. C. RUCHHOFF

Experimenting with sludge lagooning at Waco, Texas. V. M. EHLERS AND CHESTER COHEN. *Public Works* 59, 380-1(1928).—Sewage solids from preliminary settling tanks mixed with activated sludge could not be lagooned without nuisance. Removal of 85% of the settleable solids in preliminary settling tanks did not produce as good results in the activated sludge tanks as a 60% removal in the pre-sedimentation tanks. C. C. RUCHHOFF

Putting Imhoff tanks into service. WELLINGTON DONALDSON AND P. N. DANIELS. *Public Works* 59, 362-3(1928).—Abstracts of paper before the New Jersey Sewage Works Assoc. Experiences with Imhoff tank operation at Newcastle, Pa., and Trenton, N. J., resp., are given. Neither of these plants was seeded with ripe sludge when they were put into operation. At Newcastle after the first 6 months of operation without lime the sludge had a p_H of 5.2 to 6.8 in various tanks. During the next 6 months a large quantity of lime was added, the p_H was maintained at 7.5 and the gas production was increased from 100 to a max. of 25,000 ft. of gas daily. At Trenton the plant was started by adding about 15 lbs. per million gal. but the amt. of lime was steadily increased until a dose of 750 lbs. per million gal. was added to stop foaming. Thereafter the dose was reduced to 110 lbs. per million gal. and the p_H was maintained at 7.3. C. C. RUCHHOFF

Contract aeration at Rochester, N. Y. JOHN F. SKINNER. *Public Works* 59, 369-70(1928).—A contact aerator 24 ft. square with a max. depth of 11 ft. was built into the settling chamber of an Imhoff tank. The bottom of the aerator consists of 2 × 4 in. pine set on edge with 3/4-in. slots between. The aerators include 2 headers with lateral distributors of 1/2 in. Cu pipe placed at 1 ft. intervals. Two 1/8-in. holes are placed at 1 ft. intervals on the lower quarters of the laterals. The aerator is filled with coke of nut size. C. C. RUCHHOFF

Hygiene of public swimming baths. A. L. THOMSON. *Can. Eng.* 55, 721-2(1928).—A discussion of the filtration and disinfection of swimming pools presented before the Royal Assoc. of Scotland is given. The Sanitary Code of the American Public Health Assoc. is suggested as a standard until a better standard can be detd. and adopted. C. C. RUCHHOFF

Chlorination of swimming pool water. R. F. HEATH. *Can. Eng.* 55, 257-62(1928).—The bacteriol. results obtained and the residual Cl present in swimming pools at various intervals after chlorination in pools using Ca hypochlorite without o-tolidine control, Ca hypochlorite with o-tolidine control and liquid Cl with o-tolidine control are presented. The comparison shows that the pools using the third method maintain a more regular residual Cl content together with low bacterial counts and absence of the colon group than the other methods. C. C. RUCHHOFF

Disinfection of swimming baths in the tropics with chlorine and chloramine. K. HOLWERDA. *Mededeel. Dienst Volksgezondheid Nederland-Indië* 17, Pt. II, 357-82(1928).—Disinfection with hypochlorite gave good bactericidal results in spite of certain difficulties. The catalytic action of sunlight decomposes the hypochlorite, making it impossible to keep the quantity of active Cl at a fixed min. Sunlight decompn.

of NH_2Cl is much less, so this is preferred in principle. Because of its weaker disinfecting power, a sufficiently great min. quantity of NH_2Cl is needed. This may be brought to 2 mg. "active Cl" per l. Good results were obtained with a concn. of 0.4 mg. active Cl (as NH_2Cl) per l. The simplest way of applying chloramine is by adding NH_3 or NH_4Cl to the chlorinated water (either with gas or hypochlorites). A great loss of active Cl takes place by the application of both chloramine and hypochlorites at the same time. Every other method where NH_3 is added to water and where the ratio, $\text{Cl}_2:\text{NH}_3::4.2:1$, is surpassed is not to be recommended for use in swimming tanks.

RUSSELL C. ERB

Effluents of factories and cities. J. P. LAURENT. *Science ind.* 12, No. 175, 109-15 (1928).—A general description of the well-known systems of effluent purification. Sugar-house and distillery wastes can be satisfactorily purified by means of double filtrations and the use of moderate sized sludge beds. Preliminary screening and sedimentation for eliminating the coarsest particles in suspension are desirable. Dye plants present special difficulties because the highly dyed effluents must be decolorized as well as purified. Filtration followed by treatment with CaO , then passing over log-wood or activated C beds, is recommended. The C may be recovered and used again by means of a second filtration. Abattoir effluents after screening and pptn. by chem. agents are run into Imhoff tanks for biol. purification. Satisfactory results are not always obtained. In every case the sludge is suitable for fertilizer purposes.

C. R. F.

Sodium aluminate as a coagulant in chemical treatment of cannery waste waters. J. A. HOLMES AND G. J. FINK. *Ind. Eng. Chem.* 21, 150-1 (1929).—The liquid waste after removal of the solid matter by cyclones is passed through screens and settling tanks. Enough chemical is added to insure a clear effluent with a p_H of 10 or above. An av. of 2.5 lb. $\text{Ca}(\text{OH})_2$ and 0.4 lbs. Na aluminate per 1000 gals. of waste is used. Unconsumed tests show a reduction of 81%. There is no turbidity or odors in the rule of open ditch through which it flows.

EDWARD BARTOW

Disposal of packing house waste by irrigation at Laredo, Texas. CHESTER COHEN. *Public Works* 59, 377-8 (1928).—The combined sewage flow from a packing plant was discharged daily into a sufficient no. of furrows about 6 in. deep that were plowed across the land. The discharge was rotated from day to day into adjacent furrows or channels, while the first are allowed to dry. This rotation is continued and as the first channels are dried they are plowed in. If the land is used only for irrigation 6000 gals. of waste per acre per day can be disposed of.

C. C. RUCHHOFF

Treatment of industrial wastes from paper mills and tannery on Neponset River. ALMON L. FALES. *Ind. Eng. Chem.* 21, 216-21 (1929).—The Hollingsworth & Vose Co. make pulp and rope manilla paper. There is some re-use of water. One million gals. of the dirtier washer waste pass through settling tanks and 6 coke or cinder filters of 22 acres area and 3.5 ft. deep. Beater wastes 2.5 to 3.5 m. g. d. are treated by sedimentation and one acre of cinder filters. Bird & Son, Inc., make heavy paper for shipping cases, etc. The waste is of 3 kinds: (1) Boiler wastes from boiling of cotton and lump starch with lye. 4000 to 5000 gals. daily are disposed of on waste land. (2) Washer wastes, 350,000 gals. per day, treated by sedimentation throughout the year. Sand filtration is addnl. in summer. (3) Machine wastes 5.4 m. g. d. treated by chem. pptn. with $\text{Al}_2(\text{SO}_4)_3$, 5.6 gr. per gal. and sometimes H_2SO_4 if waste is extremely alk. Winslow Bros. & Smith Co. tannery and wool-scouring. (1) Rinse wastes from wool department, 250,000 gals. per day are screened only. (2) Wool scouring wastes, 25,000 gals. per day settled, are cooled, acidified with H_2SO_4 , grease and oil removed and refined. Clarified liquor is added to tannery wastes. (3) Combined wastes from tannery and degreasing plant, 400,000 to 600,000 gals. per day are treated by sedimentation, chem. pptn. with $\text{Al}_2(\text{SO}_4)_3$ at p_H of 5.2, sand filtration and dila. The treatment at all plants is varied with the condition of the river. If the treatment becomes insufficient NaNO_2 is added. The companies and the town of Norwood all participate in the treatment with Na nitrate.

EDWARD BARTOW

Domestic smoke problem. CHARLES R. DARLING. *Colliery Guardian* 138, No. 3552, 348 (1929).

A. WHITE

The ionic theory and its applications (CAMPBELL) 25. Actinic measurement of solar ultra-violet light and some correlations with the erythema dose (TONNEY, et al.) 11A. Increasing the O content of air (Fr. pat. 643,823) 13.

BARRITT, HAROLD E. *Sewerage and Sewage Treatment*. London: Chapman & Hall, Ltd. 3rd ed., enlarged. 545 pp. \$5. Reviewed in *J. Western Soc. Eng.* 34, 71 (1929).

GERSHENFELD, LOUIS. **Bacteriology and Sanitary Science for Students in Pharmacy, Chemistry and Allied Sciences.** Philadelphia: Lea & Febiger. 432 pp.

GROSS, IRWIN: **Handbuch der Wasserversorgung.** Munich and Berlin: R. Oldenbourg. Cloth: 427 pp. M. 22. Reviewed in *Eng. News-Record* 101, 595 (1928)

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VAN HORN, ROBERT B.: **Sanitary Engineering Laboratory Manual.** Seattle Univ. of Washington Book Store. 22 pp.

Electric device for purifying water. THOMAS J. CURTIS. U. S. 1,702,767, Feb. 19 The device has a thermostatic regulator and is suitable for purifying water for drinking

Water-softening apparatus. WALTER H. GREEN (to General Zeolite Co.). U. S. 1,702,256, Feb. 19. U. S. 1,702,257 specifies intermixing a lime-soda soln. with a body of hard water which has been set into rotary motion, causing the mixt. to ascend (in an app. which is described) and at the same time continually slowing down the rotary movement without disturbing or baffling it.

Apparatus (utilizing compressed air) for gravity separation of oily substances from sewage. KARL IMHOFF. U. S. 1,703,041, Feb. 19.

Treating sewage sludge. M. PRÜSS. Brit. 293,274, Jan. 16, 1928. Decompos. of sludge in digestion chambers is promoted by repeatedly mixing the whole of the digesting sludge with fresh sludge at short intervals, as by the use of high-speed centrifugal pumps. The sludge digestion chamber may be heated to 25° and gases given off during the digestion may be utilized in connection with the heating.

15—SOILS, FERTILIZERS AND AGRICULTURAL POISONS

J. J. SKINNER

Titration curves and buffer actions of soils. F. TERLIKOWSKI AND T. WŁOCZYSKI. *Rocz. Nauk Rolniczych Lesnych* 13, 602-3(1925) The buffering properties of 15 soils, including various horizons of those soils, were examd. on the ground that such properties vary in significance according to the horizon. The reaction of these soils with HCl and H₂SO₄ was detd. at C₁ values ranging from 2.5×10^{-4} to 2.25×10^{-3} g./l. The reaction with superphosphate contg. free acid in quantities equiv. to the pure acid solns. and also similar to those used in agr. practice was also investigated. Ten g. of soil was mixed with 20 cc. of acid and maintained at 18° for 48-96 hrs.; the p_H value was then detd. potentiometrically. There were examd. 7 humus horizons of partially podsolized, podsol and meadow soils; 3 eluvial horizons; 3 illuvial horizons of the same soil; and also 2 C-horizons of sandy forest soils. The chief findings were as follows: All soils, independent of their initial reaction, showed buffer action, even pure sand formations. As a measure of the buffering properties can be taken the area, bounded on the one side by the theoretical titration curve and on the other by the exptl. titration curve, the initial reaction being taken into account. In the soil profile, the least buffer action is found in the eluvial horizon; this is explained by the soil-building process in this horizon. In this connection are often found significant buffering properties in illuvial horizons, which are produced therein by the products of leaching of the A₁- and A₂-horizons. The A₂-horizon particularly has the highest buffer action, indicating therein the role of humic substances. No distinction in buffering properties could be drawn between forest and arable soils. Greater buffer action is displayed by soils toward free acids than toward superphosphate. The use of the latter in quantities corresponding to those used in agr. practice caused little or no alteration in soil reaction.

Wiessmann's method for determining the nutrient content of soils by pot experiments. K. MAIWALD. *Z. Pflanzenernähr. Düngung* 7B, 370-81(1928). The Wiessmann method (C. A. 22, 2425) is examd. The physiol. effects of the mixing of soil and sand on plant growth are not fully considered in the original method. The growth curves in sand and on soil diluted with sand are not strictly comparable for the purpose of calcg. the correction factor. The nutrient contents of the soil necessitate a different point of origin for the soil-sand growth curve. Further, the effect of the fertil. salts on the phys. and chem. conditions of different soil types may be such as to make comparison of the growth curves of little value.

Determination of the lime requirement of soils. GAY, P. MÜLLER AND O. ROOS. *Z. Pflanzenernähr. Düngung* 7B, 393-434(1928).—The various existing methods for detg

lime requirement of soils are compared from the point of view of their limitations and the differences between exptl. results and those of field trials. Results of numerous comparative tests are recorded and a form of group classification is adopted. The best representation of the "lime condition" of a soil is obtained from a consideration of the analytical figures for chalk, exchangeable Ca, and hydrolytic and exchange acidities. All 4 values are necessary in order completely to specify the soil condition. Detns. of pH values, though not necessary, serve to amplify the above results when used in conjunction with the titrimetric acidity detns. The *Azotobacter* reaction in its present form is not trustworthy. B. C. A.

Comparison of the Neubauer seedling method and the Lemmermann citrate method (for determining the phosphate requirement of soils) with field trials at Aschersleben. G. SCHULZ. *Z. Pflanzenernähr. Düngung*, **7B**, 297-301(1928).—Extensive comparative expts. are recorded. Good general agreement is shown among the 3 methods for cereals, but results diverge considerably with sugar beet. By increasing the limiting figure for phosphate in the Lemmermann process from 20 to 25 mg., slightly better agreement is shown. B. C. A.

Liming (of soils). A. GEHRING. *Z. Pflanzenernähr. Düngung*, **7B**, 249-64(1928); cf. C. A. **22**, 295.—Important points in liming practice are discussed. The form of lime used, the manner and period of application in the crop rotation, and the addnl. use of fertilizers are considered. B. C. A.

Theory of growth factors (of soils). E. A. MITSCHERLICH. *Z. Pflanzenernähr. Düngung*, **7B**, 345-52(1928). O. LEMMERMANN AND P. HASSE. *Ibid* 352-61.—Adverse criticism of the theory (notably that of Gerlach and of Lemmermann) is discussed and the constancy of growth factors reaffirmed. The technic of the Mitscherlich method is criticized. The diln. of the soil with sand introduces secondary factors with the system, and results are vitiated as the addnl. factors are not wholly incorporated in the calculn. Evidence is put forward to discredit the constancy of the growth factors. B. C. A.

Assimilation of biogenic elements by the roots of crops. J. STOKLASA. *Vestn. Českoslov. Akad. Zemedelske* **3**, 242-55(1927).—Difficultly sol. substances in the soil are brought into soln. by acid excretions from plant roots, org. acids and H_2CO_3 , both being excreted. The CO_2 produced by microbiol. action also plays an important part in rendering insol. materials sol. B. C. A.

A reconnaissance of some Australian tobacco soils, with reference to reaction and mechanical analysis. E. P. BAINBRIDGE. *J. Council Sci. Ind. Res. (Australia)* **1**, 341-53(1928).—The pH values and mech. analyses of 42 Australian soils are tabulated. A. L. MEHRING

A preliminary note on the rice crop in the United Provinces. R. L. SETHI. *Agr. Research Inst., Pusa Bull.* **186**, 22 pp.(1928).—Analyses of irrigation waters and soils used for growing rice in the United Provinces of India are tabulated. In expts. with various fertilizers for rice the best results were obtained by green manuring with sannai (*Crotalaria juncea*). K. D. JACOB

Development of the production and use of nitrogenous fertilizers. H. WARMBOLD. *Chem. Ztg.* **53**, 3(1929). E. C. M.

History and technic of the superphosphate industry. IV. The superphosphate industry in Denmark. ANON. *Superphosphate* **2**, 28-30(1929); cf. C. A. **23**, 663.—This is a brief illustrated paper on the Danish superphosphate industry. K. D. J.

Action of nitrogenous fertilizers on the quality of potatoes for "seed" and on the composition of potatoes grown on four different soils. E. KRÜGER. *Z. wiss. Landw.* **66**, 781-843(1927).—The quality of seed potatoes was distinctly influenced by the application of different nitrogenous fertilizers in increasing amts. The soils themselves were an important factor also, moorland soils giving the best and heavy calcareous soils the worst types of seed potatoes. The heavier nitrogenous dressings gave increased yields on the moorland and sandy soils without diminution in quality, but the increase in yield on the heavier soils was accompanied by a lowering of quality. $(NH_4)_2SO_4$ Analyses and in the

... during the winter resting ... is an indication of good seed quality. B. C. A.

The estimation of the fertilizer needs of soils by spontaneous cultures of *Azotobacter*. (Application to the plum tree soils of L'Agenais.) G. GUITTONNEAU. *Compt. rend. acad. agr. France* **15**, 83-8(1929).—In the soil types examd., the *Azotobacter* method shows a need for assimilable phosphoric acid. The *Azotobacter* method has confirmed the cultural indications which have been directly obtained on the spot. It has also confirmed the knowledge already laboriously obtained by chem. studies. Similar tests

were made by replacing sodium phosphate with either potassium phosphate, superphosphate, slag, disintegrated phosphate or pptd. phosphate. The results obtained have always been in agreement. But for each soil, the *Azotobacter* cultures were more or less luxuriant according to the nature of the phosphatic fertilizer employed.

E. F. SNYDER

Influence of potash fertilizing with increasing nitrogen dressings on the yield and quality of barley in 1927. H. WIESSMANN AND E. SCHRAMM. *Z. Pflanzenernähr. Dungung* 7B, 314-22(1928).—Potash fertilizing alone does not increase the protein content of barley, but a small increase results from an addnl. fairly heavy dressing of N. The "wt. per thousand grains" was not affected by potash salts, but the addnl. use of nitrate tended slightly to increase the proportion of small grains at the expense of the large ones

B. C. A.

Fertilization of paddy in lower Burma. DAVID HENDRY. *Agr. J. India* 23, 357-68 (1928).—Preliminary pot expts. indicated that the best N-P₂O₅ ratio for paddy soils in lower Burma is about 1 to 2. Both the 20-20 and 13-48 grades of *ammophos* increased the yield of paddy 67 to 100% over the control plots when applied at the rate of 200 lb. per acre. The residual effects of the 13-48 grade were greater than those of the 20-20 grade due to the higher P₂O₅ content of the former.

K. D. JACOB

Turnip-fertilizing investigations. A. W. HUDSON. *New Zealand J. Agr.* 37 245-51(1928).—In expts. over a period of 4 yrs., superphosphate applied at the rate of 100 lb. per acre increased the yield of turnips 0.8 to 8.2 tons per acre over the yield obtained with the same wt. of *Ephos basic phosphate*. Raw Nauru phosphate gave poor results. Mixts. of equal wts. of superphosphate and *Ephos basic phosphate* gave almost as good results as the same wt. of superphosphate alone. The percentage germination of turnip seed decreased with increasing applications of superphosphate while *Ephos basic phosphate* and Nauru phosphate had no deleterious effect. Germination injury was considerably reduced by applying the superphosphate a day or two before drilling the seed. Mixts. of equal wts. of superphosphate and ground limestone gave better yields than when the superphosphate was used alone and increased the germination of the seed by 50%.

K. D. JACOB

Factors determining the availability to plants of difficultly soluble calcium phosphates. V. V. BUTKEVICH. *Z. wiss. Landw.* 66, 947-92(1927).—The type of culture vessel used in this work consisted essentially of a large glass cylinder in which was placed a narrower glass cylinder. In the outer compartment was a complete nutrient soln. omitting phosphate. The inner cylinder contained sand resting on a porous plate, leaving a small space below. A siphon and air tube reached this space. Seedlings germinated in pure water were placed with their roots partially in the sand and partially in the nutrient soln. In order to study the behavior of various phosphates, these were mixed with the sand. The effect of various solns. percolating the sand on the soly. of the phosphates could be estd. by withdrawing the percolated soln. through the siphon. It was shown that the availability of the insol. Ca phosphates depended in the first place on the properties of the soil soln., particularly on the concns. of Ca bicarbonate and H ions. The utilization of these phosphates by plants did not depend entirely on their soly., and was influenced by the buffer system in the soil soln. The sep. and combined influences of various ions on the soly. of the phosphates and on their utilization by plants were described.

B. C. A.

Increase of iodine content of plants. E. HILTNER. *Forts. Landw.* 3, 1(1928). In an expt. on meadowland using KI as a source of I, the values obtained for the I content of the dry matter were: untreated, 0.146; fertilized with KI, 0.797. Sprayed with KI soln., 2.351 mg./kg.

B. C. A.

Cyanides used for fumigation. A. A. RAMSAY. *Agr. Gas. N. S. Wales* 39, 783-6 (1928).—Analyses of 3 samples of alkali cyanides sold in N. S. Wales are tabulated.

K. D. JACOB

Laboratory experiments with non-arsenical insecticides for biting insects. C. T. GIMMINGHAM AND F. TATTERSFIELD. Rothamsted Expt. Sta., Harpenden, England. *Ann. Appl. Biol.* 15, 649-58(1928).—Fluosilicates of Na, K, Al and Ca applied as liquid sprays were toxic to lepidopterous larvae of the following species: *Selenia tetralunaria*, *Orgyia antiqua*, *Abraxas grossulariata* and *Cheimatobia brumata*. Resistance to the poisons varied with the species and age of the insect, younger larvae being most susceptible. Considerable but irregular injury to plant foliage was produced by these compounds. Plant foliage sprayed with exts. of certain tropical plants (*Tephrosia* sp., *Lonchocarpus* sp.) repelled young lepidopterous larvae.

C. H. RICHARDSON

The action of sulfur as a fungicide and as an ascaricide. I. WM. GOODWIN AND H. MARTIN. S.-E. Agr. College, Wye, Kent, England. *Ann. Appl. Biol.* 15, 623-38

(1928).—The various theories advanced to account for the fungicidal action of S when it is applied to a heated surface have been examd. by the use of chem. methods. Conclusions: The toxic agent is gaseous since it passes through glass wool maintained at the temp. of the heated surface. Removal of the volatile agent by passage through a cooled glass-wool filter furnishes proof that it is neither SO_2 nor H_2S but elementary S.

C. H. RICHARDSON

Some experiments with calcium cyanide as a control for plant parasitic nematodes. W. E. H. HODSON, Seale-Hayne Agr. College, Devon, AND GORDON W. GIBSON, Isles of Scilly Expt. Sta., England. *Ann. Appl. Biol.* 15, 639-48(1928).—Expts. to control *Heterodera radicum* in tomato and *Tylenchus dipsaci* in narcissus with Ca cyanide were only partially successful, requiring very heavy doses.

C. H. RICHARDSON

Peach aphid and leaf curl. Spraying experiments. A. A. HAMMOND. *J. Dept. Agr. Victoria* 26, 728-30(1928).—In expts. with oil-Bordeaux mixts. for control of aphid on peach trees ordinary fuel oil gave slightly better results than lubricating oil and a patent oil emulsion known as "Klecnup." Addn. of nicotine sulfate did not increase the efficiency of the sprays.

K. D. JACOB

Tests for blowfly baits and repellents during 1926. D. C. PARMAN, E. W. LAAKE, F. C. BISHOP AND R. C. ROARK. U. S. Dept. Agr., *Tech. Bull.* 80, 1-14(1928).—A method of detg. the repellent value of a substance consists in smearing 5 cc. of the sample upon a 113-g. cube of fresh beef liver placed on 2.5 cm. of clean, dry sand in an ordinary pint Mason jar, and counting the no. of flies within the jar at stated time intervals. Comparison is made with the no. of flies visiting similar jars contg. untreated meat and placed 1.2 m. from either side of the treated jar. The % ratio of flies visiting the treated jar, compared with the av. no. visiting the adjacent check jars, expresses the repellent value of the material under study. Pine-tar oil, pyrethrum, Cu stearate and Cu resinate gave the most promising results. The work indicates that future progress in the employment of repellents lies in the use of materials which will absorb, adsorb, chemically alter or prevent the formation of volatile compds. attractive to insects rather than the use of masking odors such as those of essential oils or of irritants similar to tear gases.

C. R. F.

Manufacture of superphosphate at Birkenhead, South Australia (ANON.) 18. Chemical composition and fertilizer needs of Italian rice (BORASIO) 12. Sublimation of S between 25° and 50° (TUCKER) 2. Sampling apples in the orchard for the determination of arsenical spray residue (BARNES) 12. Mineral content of pastures (ASTON) 12. A quantitatively correct colorimetric method of determining the phosphoric acid of the type Mo blue (LEVITZKII) 7. Relation between humic acids and lignin (FUCHS) 10. Bacteriophage in agriculture (RUSCHMANN) 11C. Protecting plants from insects and fungi (Brit. pat. 293,908) 20.

FRED, EDWIN B., AND WAKSMAN, SELMAN A.: *Laboratory Manual of General Microbiology*, with special reference to the microorganisms of the soil. New York: McGraw-Hill Book Co., Inc. 145 pp. \$2.

Fertilizers. FRANS G. LILJENROTH. Fr. 643,968, Oct. 10, 1927. See Brit. 290,518 (C. A. 23, 927).

Fertilizers. RHENANIA-KUNHEIM VEREIN CHEMISCHER FABRIKEN A.-G. Fr. 643,782, Nov. 12, 1927. Mixed fertilizers are made by mixing calcined phosphates, such as Thomas slag, Rhenania phosphate, Wolter's phosphate, etc., with NH_4 salts and removing the alkalinity by acids or acid salts. Cf. C. A. 23, 1208.

Phosphatic fertilizer. J. VAN DER PLAAS. Brit. 293,837, July 13, 1927. A finely divided mixt. of raw phosphate, Mn ore or other manganic material and siliceous material such as the sand waste from glass works and an alk. substance such as Na_2CO_3 or K_2CO_3 , with addn. of lime if necessary, is heated to the sintering temp. or higher so as to form a product contg. a silico-phosphate of the formula $\text{P}_2\text{O}_5 \cdot \text{SiO}_2 \cdot 4\text{CaO} \cdot \text{Na}_2\text{O}$ and in which the Al and Fe present are in the form of spinels, $\text{Al}_2\text{O}_3 \cdot \text{MnO}$ and $\text{Fe}_2\text{O}_3 \cdot \text{MnO}$. The mixt. may be moistened or rendered plastic by addn. of water before being heated.

Dicalcium phosphate and ammonium sulfate. E. R. STACKABLE. Brit. 293,942, May 19, 1927. Materials suitable for use as fertilizers are obtained by treating a mixt. of H_3PO_4 or its Ca acid salts and CaSO_4 with NH_3 , preferably in the presence of a little water. Not more than 2 mol. proportions of NH_3 and 1 mol. proportion of CaSO_4 are used for each mol. proportion of H_3PO_4 , to prevent formation of tri-Ca phosphate. Various details are given.

Copper solution. MARCEL LAVRARD. Fr. 644,188, Nov. 21, 1927. CuSO_4 68.4, Na_2CO_3 26.2, and KMnO_4 6.4% are used in water for *agr. purposes*.

16—THE FERMENTATION INDUSTRIES

C. N. FREY

Industrial mold fermentations. ORVILLE E. MAY. *Hexagon of Alpha Chi Sigma* 19, 125-30(1928).—The following fermentations are briefly discussed: gallic acid from tannin by species of *Aspergillus*; the production of phenols from quinic acid; the fermentation of carbohydrate by molds with the production of alc., as high as 24% concn. of alc. having been reported; production of org. acids, such as citric, from sugar by molds, chiefly *Aspergillus* species. Gluconic acid has been produced by the Color and Farm Waste Division, U. S. Dept. of Agr., from glucose by the organism *Penicillium luteum purpurogenum*. Fred and Peterson have studied the fermentation of xylose. Recently, the fermentation of cellulose has received attention in Europe.

C. N. FREY

Industrial distillation of azeotropic mixtures. Absolute alcohol. Compressed vapor and predistilling apparatus. G. DUROIS. *Bull. Feder. Ind. Chim. Belg.* 7, 501-14(1928).—Description of the industrial manuf. of abs. alcohol by distu with C_6H_6 under pressure.

ALBERT L. HENNE

Saccharification of amylaceous substances and manufacture of ethyl alcohol and dextrose in an antiseptic medium by means of oriental bio-enzymes. G. MEZZADPOLL. *Zymologica* 3, 37-9(1928).—If a sample removed from an aseptic saccharification vessel is passed through a filter, and the filtrate, treated with a few drops of toluene, xylene, thymol, CH_3O , fluoride, etc., is kept at the same temp. as the original vessel, the formation of sugar proceeds *pari passu* with that in the vessel. The mucor (amylolytic) process may, therefore, be modified as follows: The grain, broken into three or four, is placed in a bath at 50-60° contg. about 8 parts per 1000 of HCl (d. 1.16), left for about 2 hrs., and heated in a cooker, preferably horizontal, for 40-60 min. at 4 kg. pressure. When the liquor begins to filter well through filter paper, the mass is discharged into a closed, aseptic vessel, cooled and aerated with sterile air, and at 40° seeded with a flask of sporulating mucor 105. After 15-18 hrs. from the time of seeding the mycelia begin to appear and soon assume their normal appearance; when saccharification has produced 30-50 g. of sugar per l., toluene or fluoride is added in sufficient amt. and the mash is discharged into open vats. When the sugar reaches 50-80 g. per l., yeast acclimatized to the antiseptic is introduced. The claims for this procedure are cheaper plant, lower coal consumption, acceleration of the various operations, and diminished chances of failure.

R. C. A.

Improved alcoholometer for the receiver of stills for high-percentage spirits. ANON. *Apparatebau* 40, 291-2(1928).

J. H. MOORE

Combination of high-pressure vessel and foremashing vat in distilleries. E. LÜHDER. *Apparatebau* 40, 289-91(1928).—Description of app. covered by Ger. Pat. 462,886.

J. H. MOORE

Cause of the formation of aldehydes in beverage. V. SHOICHI YAMADA. *Bull. Exptl. Lab. Fermentation* 100, 95-105(1928).—Lactic acid or its aq. soln. partly decomposes, giving CH_3CHO on heating. When a mixt. consisting of alanine and an equal or twice the quantity of glucose, fructose, sucrose, galactose, lactose or arabinose is distd. with steam, melanoidin and CH_3CHO are formed. CH_3CHO is also formed by the reaction between the sugars and Na aspartate, asparagine, Na glutamate or casein as well as alanine. Leucine and the sugars form *iso-valeraldehyde*. When phenylalanine is used, phenylacetaldehyde is formed. In the reaction between glycocoll and sugars, no formation of CH_3O is recognizable. The furfurole-like substance formed during the above reactions between sugars and amino acids is understood to have come from the direct decompn. of sugars on heating. These results explain the formation of aldehydes in saké or soy ext.

K. SOMEYA

Preparation of banana vinegar. HARRY VON IORSECKE. United Fruit Co., Boston. *Ind. Eng. Chem.* 21, 175-6(1929).—The banana mash consisting of the pulp and peel of ripe fruit contained an av. of 16% fermentable sugars. By fermentation with *Sacch. ellipsoideus* the cider yield was 56% of the wt. of fruit and the EtOH content varied from 6.55 to 10.12%. An av. of 6 lots which underwent acetic fermentation gave 5.72% AcOH . The Orleans process gave higher yields than the generator process. The high alk. of the sol. ash (120 cc. 0.1 N HCl) differentiated banana vinegar

from ordinary fruit vinegars. The color was amber and the taste and aroma were more agreeable. Persistent cloudiness was an objectionable factor. C. R. F.

Chemical studies on the brewing barley. YUKIHIKO NAKAMURA. *J. Faculty Agr. Hokkaido Imp. Univ.* 23, Pt. 2, 29-86(1928).—Analyses were made of the protein and total N of Chevalier, Hokudai No. 1 and Golden Melon. The protein and N content was greatest in Chevalier, medium in Hokudai and lowest in Golden Melon. The fats and starches in these species of barley were also investigated. Golden Melon has the highest n and the lowest sapon. value, I value and Reichert-Meißl no. The distribution of the 4 kinds of sol. N was detd. The ash content was highest in Hokudai and second in Chevalier. The decompn. of proteins by enzymes follows the equation $k = 1/\mu^k \times x/a(a - x)$. The p_H value of the isoelec. point of the 10% NaCl-soln.-sol.-protein is highest in Golden Melon, lower in Chevalier and lowest in Hokudai No. 1. For hordein it decreases in the following order: Chevalier, Hokudai No. 1, Golden Melon. The 0.2% NaOH-soln.-sol.-protein decreases in the following order: Chevalier, Golden Melon, Hokudai No. 1. The p_H values of the isoelec. points and the values of k of the above equation varied with the fractions studied and the types of barley investigated. The viscosities of the starch solns., the adsorptive power, the acetylation and the chlorination of the acetylated starches were carried out. Conclusion: The mol. wt. of Chevalier starch is greatest and most loosely bound; the smallest and hardest is Hokudai No. 1, Golden Melon having an intermediate position.

C. N. FREY

Palmitic acid as a constituent of fusel oil. K. KINO. Kyoto Imp. Univ. *J. Soc. Chem. Ind. (Japan)* 31, 749; *Supplemental Binding* 31, 180B(1928). When the fusel oil obtained from *kaoliang* was treated with KOH, K palmitate crystd. out in a nearly pure state. Y. TOMODA

Operation of high-percentage distilling app. (LÜDGER, KILP) 1. Bacteriophage in fermentation industry (RUSCHMANN) 11C. Food material from grasses, reeds, etc. (Brit. pat. 293,779) 12.

LARSEN, JOSUA E.: *Studier over Alkohol*. Copenhagen: Det Schønbergske Forlag 144 pp. Reviewed in *Chimie et industrie* 20, 1010(1928).

WEICHHERZ, JOSEF *Die Malzextrakte*. Berlin: Julius Springer. 388 pp. M 32 Reviewed in *Ind. Eng. Chem.* 21, 294(1929)

Absolute alcohol. ELWOOD L. CLAPP (to U. S. Industrial Alcohol Co.). U. S. 1,702,495, Feb. 19. An app. is described for distg. weak alc. contg. water and impurities including materials of lower b. p.; after preliminary obtainment of aq. liquid alc. of high strength contg. lower b.-p. impurities, purification is effected to eliminate heads; dehydration is then effected by distn. with a third liquid such as C_6H_6 adapted to form an azeotropic mixt. with the alc. and water. Cf. *C. A.* 22, 3259.

Alcohol. SOCIÉTÉ ANONYME DES DISTILLERIES DES DEUX-SÈVRES. Fr. 644,202, April 21, 1927. See Brit. 289,051 (*C. A.* 23, 666).

Alcohol and acetone from straw, grasses and like materials. A. C. THAYSEN, I. D. GALLOWAY and W. E. BAKES. Brit. 293,514, April 30, 1927. The material is subjected to a preliminary hydrolysis with dil. acid, excess acid is removed and the material is steamed at atm. pressure. The mash is neutralized and inoculated with pentose fermenting microorganisms such as *Bacillus acetoethylicus* (Northrup) and the volatile products are collected by distn. An app. is described.

Vinegar. HEINRICH FRINGS. Fr. 643,996, Nov. 2, 1927. An acetification plant is provided with an exhaust air duct which runs the length of a battery of generators and acts through a siphon arrangement above each generator as a charging means for the generators.

Vinegar. FRIEDRICH SCHRANK. Ger. 470,639, Aug. 12, 1927. The cooling of the vats in the quick vinegar process is improved, and the process expedited, by introducing the raw spirit as a spray directed against the sides of the vat. The vats may have external cooling ribs.

Vinegar generator (with pump and connections for liquor circulation). H. FOX. Brit. 293,539, May 30, 1927.

Controlling temperature in malt kilns and the like. COMPAGNIE INDUSTRIELLE DE CONSTRUCTION DE BRASSERIES. Ger. 470,638, Apr. 21, 1925. A mixt. of furnace gases and air passes into a chamber beneath the malt, etc., part of the mixt. ascending and the remainder passing through a conduit leading back to the furnace grate. A

valve operated by the sp. gr. of the gas mixt. is located in the conduit, the arrangement being such that the supply of air to the furnace decreases if the mixt. is too hot.

17—PHARMACEUTICAL CHEMISTRY

W. O. EMERY

Essential oils. SCHIMMEL & Co. *Ber. Schimmel* 1927, 4-5, 25-6, 53, 60-1, 66-7 78, 85-6, 86; cf. *C. A.* 22, 4716.—*Araucaria oil*.—The West Australian oil is a granular mass of a pleasant balsamic odor, m. 30° , d_{15} 0.9764, $\alpha_D + 14^{\circ} 25'$, n_D^{20} 1.50928, acid value 3.7, ester value 21.5, ester value after acetylation 173.6 (= 79.1% $C_{15}H_{26}O$) and is sol. in 3.5 vols. of 70% alc. From the fresh wood a yield of 10.5% of araucaria wood oil having d_{15} 0.9756, $\alpha_D + 4^{\circ} 10'$, n_D^{20} 1.51139, acid value 10.2, ester value 243 ester value after acetylation 177.3 (= 81.1% $C_{15}H_{26}O$) is obtained. From the weathered wood 11.7% of oil having d_{15} 0.9742, $\alpha_D + 8^{\circ} 5'$, n_D^{20} 1.51520, acid value 8.4, ester value 46.7, ester value after acetylation 186.7 (= 86.0% $C_{15}H_{26}O$) is obtained. Both wood oils are sol. in 1.1 vols. of 80% alc. *Dill-plant oil*.—Isomyristicin (m. 44°) and myristicin have been identified in dill-plant oil. By oxidation of isomyristicin with ozone, myristicin aldehyde (m. 131°) has been obtained. *Indian geranium oil*.—A South Indian oil had d_{15} 0.9148, $\alpha_D - 8^{\circ} 31'$, n_D^{20} 1.47524, acid value 5.6, ester value 77.5 (32.6% of esters as geranyl tiglate), ester value after acetylation 210 (total geraniol 68.5%), soly. in 70% alc. 1 in 2.5 vols.; after rectification with steam the oil had d_{15} 0.9105 and n_D^{20} 1.47407. Oil from *Laurelia serrata* ("Huahuan").—The leaf oil of *L. serrata* grown in Chile had d_{15} 0.9469, $\alpha_D - 11^{\circ} 25'$, n_D^{20} 1.48731, acid value 0.8, ester value 8.4, soly. in 70% alc. 1 in 2 vols. Oil from the bark had d_{15} 1.0426, $\alpha_D - 2^{\circ} 5'$, n_D^{20} 1.52482, acid value nil, ester value 6.5, soly. in 90% alc. 1 in 0.5 vol. The characteristic constituent of both oils was saffrole, the bark oil contg. the most. *Mexican linaloe oil*.—Steam distn. of linaloe wood from Mexico gave 8.1% of oil having d_{15} 0.8781, $\alpha_D + 8^{\circ} 15'$, n_D^{20} 1.46072, acid value 1.5, ester value 47.5, soly. in 60% alc. 1 in 4.5 vols., and consisted largely of *d*-linalool (75%). *Mexican petitgrain oil*.—Leaf oil from sweet oranges had d_{15} 0.8675, $\alpha_D + 41^{\circ} 40'$, n_D^{20} 1.47407, acid value 2.4, ester value 12.1, and leaf oil from bitter oranges had d_{15} 0.8578, $\alpha_D + 42^{\circ} 55'$, n_D^{20} 1.47299, acid value 1.2, ester value 10.3. Both oils were sol. in 0.4 vol. of 90% alc., but not completely so in 10 vols. of 80% alc. The odor of both oils was stupefying and they did not appear to be suitable for use in perfumery. *Peppermint oil from Palestine*.—Oil from the shade dried plant had d_{15} 0.9096, $\alpha_D - 22^{\circ}$, n_D^{20} 1.46261, acid value 0.8, ester value 13.1 (menthol esters 3.6%), ester value after acetylation 154.9 (total menthol 48.8%), soly. in 70% alc. 1 in 2.6 vols. (solin. opalescent). Oil from sun-dried plant had d_{15} 0.9084, $\alpha_D - 21^{\circ} 17'$, n_D^{20} 1.46340, acid value 0.4, ester value 14.0, menthol esters 3.9%, ester value after acetylation 139.1, total menthol 43.3%, soly. in 70% alc. 1 in 2.9 vols. (solin. opalescent). Shade drying appears to be advantageous. *Pichurim bean oil*. From Brazilian Pichurim beans 2.1% of oil having d_{15} 1.0538, $\alpha_D - 3^{\circ} 30'$, n_D^{20} 1.52076, acid value 9.7, ester value 4.6, ester value after acetylation 44.8, soly. in 90% alc. 1 in 0.5, was obtained. The oil had a sassafras odor. Oil from *Geranium macrorrhizum*.—The oil m. $25-35^{\circ}$, d_{15} 0.9431-0.9638, $\alpha_D - 5^{\circ} 45'$ to $-7^{\circ} 38'$, n_D^{20} 1.50642-1.51538, acid value 1.2-1.5, ester value 5.6-14.9, ester value after acetylation 33.6-35.5, soly. in 80% alc. 1 in 6-7 vols. (slight turbidity), in 90% alc. 1 in 1 vol. The oil has a soft, cryst. consistency and after sepn. of the solid constituent (about 50%, m. $54-55^{\circ}$) has d_{15} 0.9460, $\alpha_D - 8^{\circ} 10'$, n_D^{20} 1.50698, ester value after acetylation 54.1. *Castoreum*.—Steam distn. of Canadian castoreum gave 2.1% of oil, about half of which consisted of phenols. *o*-Cresol and a phenol, $C_{10}H_{10}O$, were detected, and in the phenol-free oil, acetophenone, benzyl alc. and *l*-borneol.

Determination of morphine. L. DÁVID. *Ber. ungar. pharm. Ges.* 2, 103-11 (1926).—Debourdeaux' method, which is preferred, has a constant error of -1.5%. Other methods give too low results.

Manganese content of plants affording officinal drugs. O. WILLMANN. *Ber. ungar. pharm. Ges.* 3, 29-53 (1927).—The Mn content of a large no. of drugs of the Hungarian Pharmacopeia (3rd ed.) has been detd. Aquatic plants contain more than others; young plants contain more than old, and the aerial more than the subterranean portions. The Mn is present chiefly in the cell plasma.

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Determination of morphine with barium hydroxide. G. P. SCHOLTZ. *Ber. ungar. pharm. Ges.* 3, 435-7(1927).—In the Debourdeaux' method $\text{Ca}(\text{OH})_2$ is preferably replaced by $\text{Ba}(\text{OH})_2$, the Ba being removed with NH_4 oxalate or sulfate. B. C. A.

Constituents of Indian essential oils. XXIV. Essential oil from rhizomes of *Curcuma zedoaria*, Roscoe. B. SANJIVA RAO, VISHNU P. SHINTRE AND JOHN LIONEL SIMONSEN. *J. Soc. Chem. Ind.* 47, 171-2T(1928).—Distn. in steam of the rhizomes of *C. zedoaria* yielded 0.94% of oil, of which approx. one third was heavier than water; it had d_{20}^{30} 0.9724, n_D^{30} 1.5002, acid value 1.3, sapon. value 3.0, sapon. value after acetylation 66.6. The oil was shown to have the following compn.: *d*- α -pinene 1.5, *d*-camphene 3.5, cineole 9.6, *d*-camphor 4.2, *d*-borneol 1.5, unidentified alcohols trace, sesquiterpenes 10.0, sesquiterpene alcohols 48, residue (probably mainly sesquiterpene alcohols) 21%. B. C. A.

Essential oils of the *Thuja* species from the Crimea. B. RUTOVSKII AND S. BUSSE. *Trans. Sci. Chem.-Pharm. Inst. (Moscow)* 10, 6-18(1924); cf. C. A. 21, 4020; 22, 4716.—The oils were obtained from the twigs and leaves. *Thuja gigantea* Nutt. gave 1.12% of oil having d_{20}^{30} 0.9125, α_D -1.50° , n_D^{20} 1.4550, acid value 0.38, ester value 12.79, ester value after acetylation 33.02, carbonyl no. (Walter) 261.3, soly. in 80% alc. 1 in 1 vol. The oil contained sabinene, α -thujone thujyl alc. and an aldehyde, which on oxidation gave an alc. (diphenylurethan, m. 52°). α -Pinene and fenchone could not be detected. *Thuja occidentalis*, L. gave 0.082% of oil having d_{20}^{30} 0.89934, α_D $+15.59^\circ$, n_D^{20} 1.4810, acid value 0.54, ester value 23.26, ester value after acetylation 49.55, carbonyl no. 43.7, soly. in 90% alc. 1 in 4.5 vols., and contained *d*- α -pinene and thujone. *Thuja orientalis*, L. gave 0.12% of oil having d_{20}^{30} 0.87955, α_D $+13.78^\circ$, n_D^{20} 1.4792, acid value 0.31, ester value 15.14, ester value after acetylation 37.2, carbonyl no. nil, soly. in 90% alc. 1 in 8.5 vols. The oil contained *d*- α -pinene, a sesquiterpene alc. and probably carophyllene. B. C. A.

Hyssop oil from the Crimea. B. N. RUTOVSKII AND I. V. VINOGRADOVA. *Trans. Sci. Chem.-Pharm. Inst. (Moscow)* 10, 22-3(1924).—*Hyssopus officinalis*, L. gave an oil having d_4^{20} 0.9573, α_D -19.29° , n_D 1.4805, acid value 4.03, ester value 35.86, ester value after acetylation 98.02, soly. in 90% alc. 1 in 0.4 vol. The following compds. were identified in the oil: α - and β -pinene, *l*-pinocamphone (tribromopinocamphone, m. 93-95°), *l*-pinocampeol (m. 56-57°, d_4^{20} 0.9509, α_D -45.63° , n_D^{20} 1.4888), an aldehyde (d_4^{20} 0.9446, α_D -13.0° , semicarbazone, m. 201.5-203°), and acetic acid. Cineole could not be detected. B. C. A.

Essential oils from the berries of *Juniperus excelsa*, MB. B. N. RUTOVSKII AND I. V. VINOGRADOVA. *Trans. sci. chem.-pharm. Inst. (Moscow)* 10, 51-61(1924).—11% of oil was obtained from the berries of *J. excelsa* MB. from the Crimea. It contained α -pinene, borneol, isborneol and acetic acid. β -Pinene could not be detected. B. C. A.

Constants of some Crimean and Caucasian essential oils. B. N. RUTOVSKII AND I. V. VINOGRADOVA. *Trans. sci. chem.-pharm. Inst. (Moscow)* 10, 88-9(1924); cf. C. A. 19, 2726; 21, 4020.—The consts. of oils distilled in 1923 are tabulated. B. C. A.

Alkaloids of tobacco. A. SHMUK. U. S. S. R. State Inst. Tobacco Invest., *Bull.* 44, 47 pp(1928).—A summary is given of the chemistry and transformations of the alkaloids of tobacco, together with a critical review of the methods suggested for the detn. of nicotine in tobacco. B. C. A.

Review of pharmaceutical and pharmacological chemistry. S. BERLINGOZZI. *Gior. chim. ind. applicata* 10, 555-7(1928).—A review of recent progress in these branches of chemistry, particularly on the relation between chem. constitution of physiol. properties and analyses of pharmaceutical products. A. W. CONTIERI

***p*-Dimethylaminobenzaldehyde as a reagent for organic drugs.** H. W. VAN URK. *Pharm. Weekblad* 66, 101-8(1929).—A large no. (135) of org. substances, mostly medicinal products, were tested for color reactions with *p*- $\text{Me}_2\text{NC}_6\text{H}_4\text{CHO}$. The test may be performed by adding to a small amt. of the substance in a porcelain dish 5-10 drops of a 1% soln. of the reagent in dil. EtOH and sufficient 12% H_2SO_4 to give an acid concn. of about 2% by vol., and evapg. The residue is taken up in a little H_2O and the color of the soln. noted. Or, the test may be performed as a ring reaction by carefully adding concd. H_2SO_4 to an alc. soln. of the substance and reagent. A color is thus obtained with a surprisingly large no. of substances of altogether different chem. constitution. In general, primary amino deriva. give a yellow or orange color, except amino acids where the CO_2H is on the α . C. Phenols react, especially those of high mol. wt.

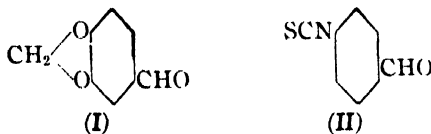
and those contg. more than 1 OH. Pyrrole and indole derivs. react but not pyridine derivs. Most alkaloids give a color reaction, especially the morphine group, but not thebaine, papaverine, etc. Santonin gives a blue color, terpin hydrate a blood red ring reaction, thymol a fiery red color. α - and β -Naphthol may be distinguished by the green color obtained with the former and the violet color with the latter. The test is negative with purines. The substances tested and the colors obtained therewith are presented in a table.

A. W. DOX

Commercial civet. C. T. BENNETT AND W. M. SEABER. *Perfumery Essential Oil Record* 20, 14-5(1929).—The results obtained in the analysis of 19 different com samples of civet have been tabulated. The usual limits for the values of the MeAc ext. of commercially "genuine" civets are: acid no. 85-115, sapon. no. 130-155, m. p. 40-5°.

W. O. F.

Odor and constitution among the mustard oils. V. Blending of mustard oils. G. MALCOLM DYSON. *Perfumery Essential Oil Record* 20, 3-5(1929); cf. C. A. 22, 4136.—Expts. on the aromatic mustard oils have been continued along 2 lines, namely, the production of mustard oils of a new type, and the blending of known examples with other perfumery substances. In the first direction an example of an entirely novel series of mustard oils has been produced, possessing certain attractive qualities. The new substance termed "thiotrope base" is chemically *p*-thiocarbimide benzaldehyde, it forms white crystals, m. 32°, and is obtained by the interaction of *p*-aminobenzaldehyde and CSCl_2 . It possesses a strong odor intensely resembling that of heliotropine. On comparing the structures of heliotropine (I) and the new substance (II) it is evident that in each case the CHO group is the seat of the osmic activity. According to the theory



of osmic vibrations it appears that in either case the vibrations assocd. with the CHO group are those responsible for odor sensation, and therefore, that it is through the CHO group that adsorption on to the osmic processes takes place. Attempts to utilize the thiotrope base in the production of floral oils of the pansy type were unsuccessful. With oils of the mezereon type, however, an improvement was observed when the heliotropine was substituted with thiotrope base in connection with other minor adjustments. In soap perfuming neither mesityl mustard oil nor thiotrope base proved of any value.

W. O. F.

Chemistry of curare. ERNST SPÄTH. Univ. Wien. *Pharm. Monatsh* 10, 114 (1929).—An address dealing with recent investigations of this poison.

W. O. F.

Popular plant drugs of Curacao. W. ILIS. Univ. Utrecht. *Pharm. Monatsh* 10, 7-9(1929).—A botanical study of *Croton niveus* Jacq.

W. O. F.

Coffee oil. L. v. NOEL. Hygien. Staatsinst. Hamburg. *Pharm. Zentralhalle* 70, 69-77(1929).—The compn. and constants of this oil as reported by former investigators are presented in tabulated form in connection with a discussion of certain marked differences in the values obtained. A detailed account is given of the methods followed in extg. the oil, in detg. the unsaponifiable constituents and in arriving at the proportions of fatty acids. The limits of constants observed in examg. 6 samples of oil are d. 0.9288-0.9453, n_D^{40} 68.4-69.5, acidity per 100 g. in terms of 0.1 N alkali 3.8-11.4, sapon. no. 176.1-179.15, I no. 87.1-92.45, R.-M. no. 0.52-0.66, Polenske no. 0.20-0.25, $[\alpha]$ 17.6-19.4, unsaponifiable 6.53-13.49 ($[\alpha]$ of same 149.6-159.4), phytosterol 0.58-0.89 (m. p. of the acetate 139.0-141.0°, m. p. of the sterol 133.2-137°, $[\alpha]$ 32.0-32.5). The approx. compn. of the oil with respect to fatty acids is found to be palmitic 29, daturic 3, carnaubic 14, oleic 2, linoleic 50%. It further develops from the present study that coffee oil is unusually rich in unsaponifiable material, that the chief carrier of rotation is not a sterol but some easily decomposable constituent of the unsaponifiable material, that the fatty acids suffer little change during the roasting process. Further study of the unsaponifiable constituents of coffee oil is contemplated.

W. O. F.

Rapid preparation of dermatol and its probable constitution. I. S. TELETOV. *J. Applied Chem.* (Russia) 1, No. 2, 115-7(1928).—Dermatol is prepd. directly from gallic acid and BiONO_2 in a single operation. BiONO_2 (200 g.) is mixed with 200 cc. of distd. H_2O and a few drops of HNO_3 (d. 1.41) is added. The mixt. is warmed on the water bath and 125 to 130 g. of gallic acid added gradually (the theoretical quantity

122 g.), water being added steadily to replace the loss through evapn. Samples of the product are tested with a 5% soln. of NaOH, which if dissolved indicates the end of the reaction. The sediment is then dild., washed and filtered and dried first at room temp. and finally at 60–70°, giving a yield in dermatol of 98.5%, complying with the requirements of the pharmacopoeia. Analysis of the dermatol so prepd. gives it the formula $C_6H_2(OH)_3COOBi(OH)_2 \cdot H_2O$.

C. FABIAN

Determination of novocaine and codeine in the presence of each other. E. SCHULEK and G. VASTAGH. *Magyar Gyógy. Társaság Értesítője* 4, 188–91(1928); cf. C. A. 3, 472. Alkaloids are extd. by $CHCl_3$ from the ammoniacal soln. The $CHCl_3$ is evapd., and the residue dissolved in alc. Acidimetric detn. of this alc. soln. is made in the usual way. Now an alk. soln. is added which is equiv. to twice the quantity of acid necessary to neutralize the bases. Novocaine is further sapond. on the water bath for $\frac{1}{2}$ hr., codeine is shaken out with $CHCl_3$. The soln. is evapd. and an air current is lead through for 1 hr. Then the residue is dissolved in alc. and codeine is titrated in this soln.

S. S. DE FINÁLY

Gravimetric determination of colocynthis in Extractum Colocynthidis. P. RÓZSA. *Magyar Gyógy. Társaság Értesítője* 4, 196–207(1928).—One g. of the ext. is washed out two times with 5 cc. ether and dissolved in 20 cc. abs. alc. The soln. is boiled on the water bath after addn. of 2 g. Carbo animalis. Then the cooled soln. is filtered and coned. to sirup density, and shaken with 50 cc. $CHCl_3$. $CHCl_3$ should be evapd. after filtration. The residue is dissolved in 20 cc. distd. water, 0.5 g. $BaSO_4$ is added and the mixt. filtered into a weighed porcelain cup. The liquor is evapd. and the residue dried at 50–60° to const. wt. The wt. of the colocynthis should not exceed 0.06 g.

S. S. DE FINÁLY

Review for 1928 of therapeutic novelties including specialties and secret remedies. S. RABOW. *Chem.-Ztg.* 53, No. 11, *Fortschrittsber.* No. 1, 33–7(1929). E. H.

Experiences with coramine. M. SCHNAASE. Städtischen Krankenhaus, Charlottenburg, Germany. *Deut. med. Wochschr.* 54, 1887(1928).—Coramine, a com. prepn. of N,N-diethylnicotinamide, was found to be a valuable analeptic, superior in its properties to camphor.

ARTHUR GROLLMAN

Collargol, its production and properties. A. F. GERASIMOV. *Trans. Sci. Chem.-Pharm. Inst. (Moscow)* 1926, No. 16, 69–108.—Egg whites were passed through a linen cloth, $\frac{1}{40}$ by weight of NaOH was added and the mixt. was heated on a water bath. The mixt. was yellowish red with a strong NH_3 odor. Upon standing a ppt. settled out. The hot liquid was filtered through a filter paper and the filtrate was used as the reducing agent. The Ag oxide was thoroughly washed before adding the reducing soln. The collargol thus obtained was treated with AcOH in the presence of various electrolytes, which may be divided into 2 groups with respect to their action on the collargol. The NH_4Cl , NH_4CNS , KI, KBr, $CaCl_2$ and $FeCl_3$ hindered the coagulation when in low concns.; they induced coagulation in high concns. The other group— $KClO_4$, KNO_3 , Na_2SO_4 , $(NH_4)_2SO_4$, $MgSO_4$ —supported coagulation in any concn. The addn. of these electrolytes to the colloidal Ag in the presence of those electrolytes which are a part of the colloidal soln. had no influence on the qual. character of this action. Thus NH_4CNS , irrespective of the presence or absence of NaCl or KNO_3 , at first increased the stability of the collargol but after a while it gradually decreased it. The studies were conducted on both dialyzed and undialyzed colloids. The peptizing and protective influences of NaCl and other halogens may be explained as follows: First a chem. reaction takes place between the colloidal Ag and the reagents forming ustic alkali and colloidal Ag according to the equation: $2Ag + H_2O + O + 2NaCl \rightarrow AgCl + 2NaOH$. The Ag halide is adsorbed by the colloid and serves as a protective colloid. With a high concn. of the halogen salt the usual coagulation effect takes place. The compn. of the coagulated colloid when AcOH has been used changes little upon dilg. the reagent. The influence of electrolytes on the coagulant varies: NaCl influences it greatly; $(NH_4)_2SO_4$ affects it slightly. The keeping qualities of the repn. depend on the moisture content; the less the better.

J. S. JOFFE

The production of salol. O. YU. MAGIDSON and V. M. KROL. *Trans. Sci. Chem.-Pharm. Inst. (Moscow)* 1926, No. 16, 54–64.—The success in obtaining a good yield of salol by etherification with PCl_5 depends on a low temp. at the time of adding the PCl_5 to the mixt. of phenol and salycilic acid. Sixty deg. was the min. at which it was possible to work. The temp. should never go beyond 120°. Only 78% yield of the theoretical was obtained. With $POCl_3$ a 90% yield was obtained. J. S. JOFFE

The oil from ziziphora clinopodioides L. B. N. RUTOVSKII and I. V. VINOGRADOVA. *Trans. Sci. Chem.-Pharm. Inst. (Moscow)* 1927, No. 17, 7–14.—Two samples of oil from Turkistan and Altai were analyzed. Two hundred g. of the Turkistan oil upon

fractionation in a vacuum gave 4 fractions. From fraction I of the Turkestan oil nitrosochloride (m. 99°) was obtained, which upon oxidation gave pinonic acid (semicarbazone, m. 202–203°). This indicates the presence of α -pinene. From fraction II two semicarbazones were obtained of which one (m. 138–140°) corresponds to an aldehyde. The second semicarbazone (m. 169–171°) corresponds to a ketone obtained from fractions III and IV upon treatment with bisulfite. It was identified as a pulegone (semicarbazone, m. 169–170°; oxime, m. 118–119°; oxidized to β -methyladipinonic acid, m. 83–85°; reduced to menthol, m. 38–40°). With phthalic anhydride an alcohol, $C_{10}H_{18}O$, was sepd., the consts. of which are not given in the literature. Upon recrystg. from EtOH shining needle-like crystals were obtained, m. 77–78°, $[\alpha]_D + 26.51^\circ$. In fraction I of the Altai oil α -pinene was demonstrated (nitrosochloride, m. 99°, pinonic acid-semicarbazone, m. 202–203°). The fractions II and III upon shaking for 20 days with bisulfite soln. gave ketones with the following consts.: $d_{20}^{20} 0.9362$, $[\alpha]_D + 26.0$, $n_D^{20} 1.4768$. The oil after the bisulfite treatment was worked over with semicarbazide-HCl. The semicarbazones obtained were not pure, but upon fractional recrystn. from alc. one of them m. 176–178°, the other m. 168–170°. By decomg. the first with oxalic acid there was sepd. a ketone, $d_{20}^{20} 0.9011$, $[\alpha] 22.5^\circ$, $n_D^{20} 1.4525$. By treating the ketone with HCl and NH_2OH a liquid amine was obtained which gradually crystd., m. 50°. No aldehyde was found in this sample of oil. Menthol was obtained.

J. S. JOFFE

The ethereal oil from *Artemisia annua* L. B. N. RUTOVSKII AND I. V. VINOGRADOVA. *Trans. Sci. Chem.-Pharm. Inst. (Moscow)* 1927, No. 17, 15–24. For samples of oil taken at different growth stages were investigated: before blooming in full bloom, after blooming and after ripening of the seeds. After fractional distn. in fraction I α -pinene was demonstrated through the formation of nitrosochloride at oxidation to pinonic acid (semicarbazone, m. 208°), but no β -pinene was found. From fraction II cineole was sepd. with resorcinol compds. This was converted to isoborneol by treating with AcOH and H_2SO_4 . Fraction IV consisted exclusively of artemisia and isoartemisia ketone (semicarbazones, m. 94–96° and 68–71°, resp.). The first had $d_{20}^{20} 0.8755$; $[\alpha]_D - 2.04^\circ$, $n_D^{20} 1.4702$. Upon bromination no cryst. product was obtained. From the residue a camphor was isolated, m. 175–177°, $[\alpha]_D - 44.52^\circ$. Fraction V and VI contained besides the above-mentioned ketones some borneol, m. 200–202°. From fraction VII a nitrosochloride and a nitrosate, m. 158°, were obtained. Upon sapon. of this fraction in H_2O soln., the presence of acetic and butyric acids was demonstrated. The oil from the sample taken after blooming upon treatment with bisulfite soln. gave an aldehyde, which in turn gave cumaldehyde from a 5% NaOH soln. After removing the aldehydes, the residue was treated with semicarbazide and semicarbazone, m. 231°, camphor, m. 175°, artemisia and isoartemisia ketones were obtained. After sepg. the ketones the oil was saponified and the H_2O soln. gave an appreciable quantity of a phenol, which was not investigated more closely. With $FeCl_3$ it showed a green coloration and had an odor of eugenol. Acetic and butyric acids were present. From the saponified oil borneol was obtained by treating with phthalic anhydride. The residues were distd. over metallic Na and two fractions obtained; the first contained cineole, α -pinene and camphene; the second gave nitrosochloride and nitrosate.

J. S. JOFFE

Essential oils of leaves and stems of camphor of Sukhum district. B. N. RUTOVSKII AND I. V. VINOGRADOVA. *Trans. Sci. Chem.-Pharm. Inst. (Moscow)* 1927, No. 17, 25–38.—A sample of oil was fractionated. Fraction Ia gave *d*- and *dl* α -pinene (nitrosochloride, m. 99–100°; cryst. pinonic acid, m. 103–104°; semicarbazone, m. 202–203°; liquid pinonic acid). β -Pinene could not be demonstrated. From fraction Ib isoborneol was obtained (m. 207–210°; phenylurethan, m. 138°) by treatment with glacial acetic acid and H_2SO_4 . Fraction Ic contained cineole, limonene and dipentene. Fraction II treated with phthalic anhydride gave *d*-camphor (m. 174–175° + 43.77°; semicarbazone, m. 236–237°). On saponifying the phthalic acid ester, borneol (m. 202°; phenylurethan, m. 138°) sepd. as a well crystd. product. From fraction III some phenols (not studied in detail) were sepd. It also contained borneol and camphene. The odor of citronellol was apparent, but it could not be demonstrated. No safrol was isolated from either of the fractions. The sesquiterpene fraction gave no nitrosochloride. Raw camphor obtained from the condenser from the distn. of leaves m. 170–172°, $[\alpha]_D + 41.25^\circ$ at $c = 80.25$ in alc. By simple purification consts. were: m. 174–175°, $[\alpha]_D + 45.06^\circ$ at $c = 21.75$ in alcohol. Upon sublimation the m. p. was 176–177°, $[\alpha]_D = 44.6^\circ$ at $c = 19.47$.

J. S. JOFFE

Components of the ethereal oils from Caucasian Citrus species. B. N. RUTOVSKII

ND I. V. VINOGRADOVA. *Trans. Sci. Chem.-Pharm. Inst. (Moscow)* 1927, No. 17, 1-85.—A sample of oil from the fresh leaves of *Citrus bigardia* Risso was analyzed. The saponified oil was steam distd. into various fractions. Fraction I contained camphene. Tetrabromide, m. 116–120°, was obtained, which upon closer examn. was found to be a mixt. of limonene and dipentene tetrabromide. By oxidation limonene trite, m. 191–192°, was obtained. From fraction IV a nitrosochloride, m. 110–112°, was obtained, which indicates the presence of α -terpineol. Fraction V and the residue were treated with CaCl_2 and gave geraniol (diphenylurethan, m. 81.5–82°). Further treatment of these fractions gave tetrabromonerol, m. 116–117°. The oil from the leaves of a Japanese orange, "Unshiu," showed an entirely different compn. From fraction I pinene nitrosochloride, m. 99–100°, and by KMnO_4 oxidation pinonic acid semicarbazone, m. 202–203° were obtained. Fraction II gave traces of isoborneol by the acetic acid- H_2SO_4 treatment. This fraction was very resinous. Fraction III gave no solid bromides and by strong oxidation *p*-hydroxyisopropylbenzoic acid was obtained; this indicates the presence of *p*-cymene. Fraction IV is made up of 54% of *p*-cymene.

J. S. JOFFE

Essential oils of Crimean salvias. B. N. RUTOVSKII AND I. V. VINOGRADOVA. *Trans. Sci. Chem.-Pharm. Inst. (Moscow)* 1927, No. 17, 109–18.—The oil from *Salvia grandiflora* Ettl. was fractionally distd. In fraction I α -pinene could be demonstrated. A cryst. acid, m. 124–126°, was found which indicates the presence of β -pinene. By hydration with acetic acid- H_2SO_4 mixt. isoborneol was obtained, which is to be ascribed to the presence of camphene. No cineole, resorcinol, or iodol compds. could be demonstrated. Fraction III had a distinct odor of camphor and gave a semicarbazone, m. 230–232°. This fraction also gave the solid *d*-camphor, m. 174–176°. From fraction IV nitrosochloride, m. 165–170°, and nitrosate, m. 158°, were obtained, which indicates presence of caryophyllene.

J. S. JOFFE

Essential oils of *Heracleum villosum* Fisch. B. N. RUTOVSKII AND I. V. VINOGRADOVA. *Trans. Sci. Chem.-Pharm. Inst. (Moscow)* 1927, No. 17, 119–26.—The oil from the different parts of the plant gave practically the same constns. With the ripening of the fruit the aldehydes disappear and alcs. appear. Fractionation of the sapon. showed that the chief component was octyl alcohol, which upon oxidation gave octaldehyde and caprylic acid. The acids produced by the sapon. were acetic and myric.

J. S. JOFFE

Borneol values of the Siberian pine oil of Altai. B. N. RUTOVSKII AND I. V. VINOGRADOVA. *Trans. Sci. Chem.-Pharm. Inst. (Moscow)* 1927, No. 17, 127–30.—A sample of oil had d_{20}^{20} 0.9581, $[\alpha]_D$ –39.59°, n_D^{20} 1.4748, acid no. 9.67, ester no. 139.21, ester number after acetylation 190.84. Upon sapon. 18% of borneol in solid form could be recovered. By steam distg., 2% more borneol could be obtained. With phthalic anhydride 20% more could be sep'd. out. α -Pinene and camphene also were found.

J. S. JOFFE

Essential oils of *Abies nordmanniana* Spach and *Abies cephalonica* Link. B. N. RUTOVSKII AND I. V. VINOGRADOVA. *Trans. Sci. Chem.-Pharm. Inst. (Moscow)* 1927, No. 17, 131–41.—The oil of *Abies nordmanniana* Spach investigated had d_{20}^{20} 0.8816, n_D^{20} 1.4775, acid no. 1.08, ester number 28.24 (ester content 9.89%), ester number after acetylation 48.53 (corresponds to 13.84% total alcs.), sol. in 3.9 vol. 90% alc., insol. in 80% alc. By fractional distn. various fractions were sep'd. Fraction I contained α -pinene. Fraction II gave a mixt. of borneol and isoborneol upon treatment with acetic and H_2SO_4 , showing the presence of camphene. By oxidizing it with KMnO_4 a cryst. acid was obtained, m. 118–122°, indicating the presence of pinionic acid, which in turn shows the presence of β -pinene in this oil. By saponifying fraction III borneol was obtained. Terpeneol could not be demonstrated. The sesquiterpene fraction gave no nitrosochloride nor hydrochloride. The oil of *Abies cephalonica* Link had d_{20}^{20} 0.8995, $[\alpha]_D$ –20.00, n_D^{20} 1.4773, acid number 3.29, ester number 48.14, ester number after acetylation 73.3, sol. in 8.8 vol. of 90% alc. After fractional distn., in fraction I α -pinene and *dl*- α -pinene were demonstrated. In fraction II a mixt. of borneol and isoborneol was obtained upon treating it with acetic acid and H_2SO_4 , showing the presence of camphene. β -Pinene could not be demonstrated. The saponified fraction IV borneol was obtained. Fraction V gave small amounts of nitrosochloride.

J. S. JOFFE

Essential oils of Crimean junipers. B. N. RUTOVSKII AND I. V. VINOGRADOVA. *Trans. Sci. Chem.-Pharm. Inst. (Moscow)* 1927, No. 17, 142–50.—Twigs and needles of *Juniperus excelsa* MB gave upon steam distn. an oil with the following constns.: d_{20}^{20} 0.812, $[\alpha]_D$ +31.5, n_D^{20} 1.4769, acid number 2.52, ester number 5.52, ester number

after acetylation 28.49, sol. in 2.5 vol. 90% alc. By fractional distn. 5 fractions were obtained, the consts. of which are presented in table 1 (German summary). Fraction I gave nitroschloride, m. 98°, with a good yield of crystalline pinonic acid (m. 104-105°, $[\alpha]_D = 0^\circ$); semicarbazone, m. 202-203°. This shows the presence of α -pinene. Fraction II upon repeated distn. over Na gave the following consts.: d_4^{20} 0.8506, $[\alpha]_D$ 52.5, n_D^{20} 1.4695. No cryst. nitroschloride or bromide could be obtained, neither could camphene be demonstrated. In fractions III and IV an aldehyde could be demonstrated, but it could not be sepd. Fraction IV consisted primarily of a hydrocarbon with the following consts.: d_4^{20} 0.9286, $[\alpha]_D$ - 6.75°, n_D^{20} 1.500. Oxidizing it with KMnO_4 gave diketones, m. 232-233°, and keto acid (semicarbazone, m. 240°), this indicates the presence of cedrene. The cryst. compd. from fraction V proved to be a cedrol, m. 82-84°, $[\alpha]_D$ +9.8.

J. S. JOFFE

Essential oils of *Hyssopus officinalis* from Moscow district. L. P. GUSEVA *Trans. Sci. Chem.-Pharm. Inst. (Moscow)* 1927, No. 17, 159-67.—The oil was fractionated. A summary of the consts. of the fractions is presented in a table. Fractions Ia, Ib and II were distd. over Na. In I pinene was demonstrated, but the bulk was α -pinene. Fraction III contained *l*-pinocamphone (dibromide, m. 91-93°; semicarbazone, m. 227°) and an aldehyde. From fraction IV *l*-pinocamphone and 5% alics were isolated. The alics. isolated as phthalic acid ester showed: $[\alpha]_D$ 62°, and by oxidation gave only traces of aldehyde and pinocamphone. From fractions VII and VIII a sesquiterpene was isolated which gave a nitrosate. By treating the oil with bisulfite an aldehyde was isolated (semicarbazone, m. 202-203°). By warming the saponified oil left after the sepn. of the aldehyde with phthalic anhydride the primary and secondary alcohols were split off.

J. S. JOFFE

Essential oils of peppermint from the government of Poltava. V. A. KUZ'MIN *Trans. Sci. Chem.-Pharm. Inst. (Moscow)* 1927, No. 17, 168-82.—In tables (German summary) are given the yield of oil from the various parts of the plants of black and white mint and the consts. of the various samples.

J. S. JOFFE

The mutual relation between the size of the grain and the yield of essential oil from coriander. V. I. VARENTZOV. *Trans. Sci. Chem.-Pharm. Inst. (Moscow)* 1927, No. 17, 183-6.—The smaller grains gave more oil than the larger.

J. S. JOFFE

Making pollen extracts for the treatment of hay-fever. EDGAR B. CARTER. SWAN MYERS CO., Philadelphia, Pa. *J. Chem. Education* 6, 9-19(1929).

J. A. KENNEDY

Indian varieties of aconite: Their chemical composition and biological assay. R. N. CHOPRA, J. C. GUPTA AND N. N. GHOSH. Calcutta School of Tropical Med. *Indian J. Med. Research* 15, 873-82(1928). The alkaloid content of the so-called ferox form (*A. deinorrhizum* and *A. balfoureyi* combined) is double that of the European variety of *A. napellus* official in the pharmacopeia and is 10 times that of the Indian *napellus* variety (*A. chasmanthum*). The ether-sol. alkaloid (pseudoaconitine) of the ferox form is 1.5 times stronger than aconitine obtained from the European variety. The root of ferox is 3 times stronger than the European root, and the root of Indian *napellus* (*A. chasmanthum*) is 7 times stronger.

FRANCES KRASNOW

Ephedrine from the Indian varieties of Ephedra. R. N. CHOPRA, S. GHOSH AND A. T. DUTT. Calcutta School of Tropical Med. *Indian J. Med. Research* 15, 889-94(1928).—A no. of varieties of ephedra grow in India. Specimens of *E. vulgaris* and *E. pachyclada* or *E. intermedia* were obtained. The yield of total alkaloids from the former was 0.92% and from the latter 1.16%. 71.25% of the total alkaloids in *E. vulgaris* was ephedrine, the residue mostly pseudo-ephedrine. The green twigs showed a higher alkaloid content than the stem. Physiol. and clinical tests were like those given by the alkaloid from Chinese ephedra.

FRANCES KRASNOW

A one-hundred year chemical-pharmaceutical industry in Germany. W. MERCK. *Chem.-Ztg.* 53, 3(1929).

E. C. M.

Straub's method for testing digitalis. T. W. HAMNER. *Svensk Farm Tids* 32, 497-500, 513-6(1928); cf. *C. A.* 4, 1627; 5, 1791.—A cannula is inserted into the frog's heart via an opening in the aorta. The blood is washed out of the heart with saline; the heart is filled with saline, clamped, carefully removed and suspended by the cannula in such manner that the apex can be connected with a cinematograph. Solutions to be tested are introduced through the cannula; they are always of the same vol. The excised heart responds to much smaller doses than does the heart *in situ*. Species do not react the same way and *R. esculenta* is preferred to all others; the frog should not weigh less than 30 g. The time factor of the reaction is not a satisfactory quant. measure although it is very pos. for minute quantities of the drug: e. g., 0.004 mg. gives a time spread of 6 mins. between the av. of 2 series but the stronger prepn. series

ranges from 1.4 to 5.1 mins. The most satisfactory criteria are the cc. to which 1 cc. of the solns. must be dild. in order to show no reactions in 45–60 mins. A. R. ROSE

Bromometric determinations in testing medicines. HUGO WASTENSON. *Svensk Farm. Tid.* 32, 685–7, 701–5, 717–21(1928).—A review. A. R. ROSE

Extractum digitalis—fluidum and spissum. J. W. HAMNER. *Svensk Farm. Tid.* 32, 734–6(1928).—Only digitalis tincture meets the requirements. Neither fluidexts. nor thick exts. can be recommended. A. R. ROSE

Camphor-leaf oil. KINZO KAFUKU AND RYO KATO. Centr. Research Inst. Government, Formosa. *Bull. Ind. Centr. Res. Inst. Government Formosa* 24, 35–40(1928).—The properties of the camphor-leaf oil obtained from the south of Formosa are: $[\alpha]_D^{25}$ 43.20°, sp. viscosity, 3.83, Br no. 79.30, acid value 0.47, sapon. value 7.34, turbidity point (10 cc.) glacial AcOH, 7.34, EtOH, 7.00, acetone 2.50, aldehyde content 0.4%, camphor content 43.97%. From 4500 kg. of the leaf oil was sepd. camphor, which was fractionated and distd. at ordinary or reduced pressure, yield 1440 kg. of oil besides crude camphor. The oil was sepd. into terpenes and sesquiterpenes which were further fractionated into 9 and 15 fractions, resp., the fractions having b.-p. differences of 5°. Pinene is the chief constituent of fractions I and II. Camphene was detected as isoborneol by the Bestrand-Wahlbaum methods; when the same fraction is treated with glacial AcOH and $Hg(OAc)_2$, a substance whose semicarbazone m. at 142° was obtained, but this did not coincide with dihydroxypinene semicarbazone, m. 180°. Phelandrene was detected as β,β -phelandrenebis-nitrite by the Wallach-Gildemeister method in fraction I. Cineole was detd. by shaking IV with 50% resorcinol; yield 28%. By brominating fraction IV after sepn. of cineole, crystals, m. 116°, were obtained, which seemed to be a mixt. of limonene tetrabromide and dipentene dibromide. By treating fractions VII, VIII and IX with Na, and distg., 3 fractions of sesquiterpene were obtained. Fraction II b., 100–5°, d_4^{23} 0.9127, d_{20}^{23} 1.4080, $[\alpha]_D^{23}$ 6.0°, M_D 65.54 (for $C_{15}H_{24}$ $\frac{1}{4}$ = 66.15). Elementary analysis agrees with the formula $C_{15}H_{24}$ and shows it belongs to bicyclic sesquiterpene. An unknown alc. with a characteristic odor is contained in the leaf oil, which vanishes on treating with Na or K. The leaf oil does not differ much from ordinary camphor oil which yields a small quantity of "red" distillate and much "white" distillate. K. SOMEYA

The action of thorium X upon the active-principle content of certain medicinal plants. AVERSENQ, JALOUSTRE AND MAURIN. *Compt. rend.* 188, 345–7(1929).—It is well known that radioactive substances are capable of influencing biological phenomena. A study was made to det. the role played by thorium X in the formation of certain glucosides, alkaloids and other substances used therapeutically. The following plants were selected and their roots sprinkled with H_2O contg. the Th: grenadin, *Datura stramonium*, black mustard, rhubarb and ricin. The plants were harvested at the regular time and the medicinal content was detd. by standard methods. In every case the active-principle content was increased by the thorium X treatment. The alkaloid content of grenadin was almost doubled by the treatment. Conclusion: Radioactivity plays a very important role in the active-principle content of medicinal plants. M. H. SOULE

Bismuth in pharmacy and chemistry. I. History and occurrence of the element. G. MALCOLM DYSON. *Pharm. J.* 120, 242–4(1928).—A detailed crit. account of the history of Bi, the occurrence of its ores and their treatment in the prepn. of the metal and the salts is given. **II. The metal and its inorganic derivatives.** *Ibid.* 348–9.—The mode of obtaining the metal from its oxide and sulfide is given, also the compn. and methods of purification of crude Bi, its properties and technical uses in alloys of low m. p., and the prepn. and uses of its inorg. salts. Barchusen, as early as 1718 (*Elementa Chemicæ*), refers to the medicinal use of "magisterium" of Bi (probably the basic nitrate) in the treatment of venereal disease. **III. The organic bismuth compounds.** *Ibid.* 582–4.—These and their medicinal properties are reviewed under the heads: (1) preps. for the relief of gastro-intestinal disorders (e. g., Bi gallate, Bi NH_4 citrate, bismutose (C. A. 2, 1328) etc.), (2) astringent-antiseptic preps. for external application (e. g., *ibid.* (Bi oxyiodotannate), *airal* (Bi oxyiodogallate) and Bi phenol compds. (e. g., Bi resoremol, etc.)), (3) preps. for the treatment of syphilis. They are of 4 types: (a) suspensions of finely divided or colloidal Bi in an aq., saline or oily medium (e. g., neotropol (C. A. 21, 611)); (b) solns. of a true organo-Bi compd. in an org. medium; only a few examples are known, e. g., *embial* (compn. not disclosed); (c) H_2O -sol. Bi compds., especially the Bi alkali tartrates; (d) suspensions of H_2O -insol. compds. in aq. or oily media (e. g., Bi quinine iodide). Structural formulas are given for 18 of the more typical medicinal org. Bi compds. S. WALDBOTT

Double bonds present in vaseline (POGGI) 22. Determination of I in organic combination, especially in thyroid gland (SMITH) 7. 'Electrochemical synthesis of anesthine (ALVAREZ) 4. A chemical and pharmacological classification of iron preparations (STARKENSTEIN) 11H. Use of iron reagents in the detection and differentiation of phenols (WARE) 7. Diisopropyl derivatives (Brit. pat. 293,703) 10. Extraction apparatus for wood, bark, etc. (Fr. pat. 643,763) 1. Treating oils, fats or emulsions with ultra-violet rays (Brit. pat. 293,255) 12. Sterilizing by the action of metals and alloys (Brit. pat. 293,385) 13. Iodine (Brit. pat. 293,504) 18. Phenol ketone condensation products (Ger. pat. 467,728) 18.

The Chemists' and Druggists' Year-Book and Directory for Scotland, 1929. Edited by J. B. McVittae. Glasgow: Munroe & Co. 2s. 6d. Reviewed in *Pharm. J.* 122, 10(1929).

MAYRHOFER, ADOLF: *Mikrochemie der Arznei-mittel und Gifte. II. Drugs of Organic Nature.* Berlin: Urban & Schwarzenberg. 270 pp. M. 16. Reviewed in *J. Am. Pharm. Assoc.* 18, 93; *Pharm. J.* 122, 10(1929).

MOSBACHER, E.: *Die neuesten Arzneimittel.* Charlottenburg: L. Altherthum 43 pp. M. 5. Reviewed in *Chimie et industrie* 20, 1012(1928).

Synthetic drugs. A. G. GREEN. Brit. 293,617, Nov. 2, 1927. ω -Sulfonic derivs. of aminoacridines and acridinium salts having an antiseptic and bactericidal action are obtained by the action of aldehydes together with bisulfites, or of aldehyde-bisulfites, upon aminoacridines or amino-acridinium salts or their leuco compds. Examples are given of the condensation of 3,6-diaminoacridine and 3,6-diamino-10-methylacridinium chloride with 2 mol. proportions of $\text{CH}_3\text{O-NaHSO}_3$ and of 3,6-diaminoacridine with 2 mol. proportions of acetaldehyde- NaHSO_3 . Use of crotonaldehyde and glyoxal is also mentioned.

Synthetic drugs. I. G. FARBENIND. A.-G. (Fritz Mayer, inventor). Ger. 466,518, July 25, 1924. Nitriles of *o*-methylolarylcarboxylic acids are prepd. by converting the NH_2 group of *o*-aminoarylcarbinols by way of the diazo compd. into the CN group. The nitriles so prepd. may be sapond. to lactones. Examples are given describing the prepn. of nitriles and lactones from *o*-aminobenzyl alcohol and 2-amino-3-methylol naphthalene. The products have anthelmintic properties.

Therapeutic metallic compounds of thiocarbohydrates. CHEMISCHE FABRIK AUF AKTIEN VORM. E. SCHERING. Brit. 293,363, Feb. 2, 1927. Examples are given of the prepn. of 1-aurothioglucose, 3-aurothioglucose, Bi 1-thioglucose and Cd 1-thioglucose by treating the thioglucose with K auribromide, Bi chloride or Cd chloride.

Bismuth lactate solutions. BYK-GULDENWERKE CHEM. FAB. A.-G. (Georg A. Becker and Agathe Wolff, inventors). Ger. 469,516, Apr. 24, 1923. Stable aq. solns. of Bi lactate suitable for medical use are prepd. by treating an aq. soln. contg. Bi lactate and an alkali lactate with sufficient alkali to render it neutral or alk. Alternatively, Bi_2O_3 may be dissolved in alkali soln. in the presence of glycerol and the soln. treated with $\text{CH}_3\text{CH}(\text{OH})\text{COOH}$ until it is neutral or only feebly alk.

Separation of lysozyme from protein. NAAMLOOZE VENOOTSCAP "ORGANON" Dutch 19,339, Jan. 15, 1929. Lysozyme (Fleming, *Proc. Roy. Soc. (London)* B93, 306) is prepd. by the treating of dil. egg albumin (100 g. + 900 g. 0.9% salt soln.) with colloidal Fe or Al hydroxide (400 cc. 5% $\text{Fe}(\text{OH})_3$), centrifugation, evapn. (below 40°), dialysis (2 days) and finally pptn. with acetone. The process is repeated until the soln. is free from protein and salt. Of the final product 0.01 cc. is as active as 1 cc. egg albumin in dissolving *Micrococcus lysodeikticus*.

Immunizing preparations from pathogenic microorganisms. PARKE, DAVIS & Co. Brit. 293,401, Jan. 31, 1927. Organisms such as typhoid bacilli, gonococci, streptococci and pneumococci are shaken with a solvent such as alc. and centrifuged to sep. the liquid from the organisms. A preservative may be added. By regulating the time of action of the solvent, antigens may be selectively extd.

Mouthwashes; dentifrices. FRIEDRICH BRÄUNLICH. Ger. 470,505, Sept. 14, 1926. Sulfonated fats and fatty acids, or their alkali or NH_4 salts, are used as ingredients of mouthwashes and dentifrices.

Farnesol. M. NAEF & Co. Ger. 469,555, Mar. 14, 1924. See Brit. 213,251 (C. A. 18, 2225).

Tobacco. ZIGARETTEN-FABRIK LESMONA GMBH. and S. ROSENHOCH (known as F. Rosenhoch). Brit. 293,760, July 11, 1927. To "refine" and improve the keeping qualities of tobacco, the rib ends of the leaves are brushed and moistened with sterilized

water, left for several hrs., sepd., and the leaves further moistened, the moisture is allowed to penetrate for 10–16 hrs. and the material then treated with ozone in regulated accord with the nicotine content of the tobacco.

18—ACIDS, ALKALIES, SALTS AND SUNDRIES

E. M. SYMMES

Manufacture of sulfuric acid and superphosphate at Birkenhead, South Australia. ANON. *Chem. Eng. Mining Rev.* 21, 99–104(1928).—A detailed description of the Wallaroo-Mount Lyell Fertilizer plant.

E. M. SYMMES

Intensive production of 60°Bé. sulfuric acid. GEORGE A. PERLEY. *Ind. Eng. Chem.* 21, 202–5(1929).—A high reaction rate is secured by utilizing a liquid phase oxidation. Recovery of NO_2 as HNO_3 rather than as nitrous vitriol makes possible high inter recovery. Complete oxidation of SO_2 is rapid. In the lab. less than 0.01 cu. ft. of sulfurous oxidation tower space per lb. of S oxidized per 24 hrs. is required. This is about $1/1500$ part of the lead chamber plant space for like capacity. High reaction velocity and small equipment space mean low installation and maintenance charges. Ability to govern reaction temp. by control of acid circulation rate gives positive control. More acid circulation and cooling, and 15–20% larger NO_2 recovery system than in normal chamber plants are the essential points of difference as compared to the chamber method.

E. M. SYMMES

The reaction mechanism in the contact sulfuric acid process and the method of action of activators. BERNHARD NEUMANN. *Z. Elektrochem.* 35, 42–51(1929); cf. (1) 23, 934, 1210.—After considering the various hypotheses, the view that all noble metals act in the same way as contact agents in H_2SO_4 catalysis, i. e., that only adsorption catalysis comes into play, is favored. Ag, so little effective, is a strong activating agent in V_2O_5 catalysis. In the Fe_2O_3 process FeSO_4 probably plays the most important role. With V_2O_5 , VOSO_4 is formed, and the reactions are probably: $2\text{VO} \cdot \text{SO}_3 = \text{V}_2\text{O}_5 + \text{SO}_3 + \text{SO}_2$; $\text{V}_2\text{O}_5 + \text{SO}_2 = \text{V}_2\text{O}_4 + \text{SO}_3$; $2\text{SO}_2 + \text{O}_2 + \text{V}_2\text{O}_4 = 2\text{VOSO}_4$. SO_3 can also be formed by adsorption. With TiO_2 , TiOSO_4 is formed: $4\text{TiOSO}_4 + 2\text{SO}_2 = 2\text{Ti}(\text{SO}_4)_3$; $2\text{Ti}(\text{SO}_4)_3 + \text{O}_2 = 4\text{TiOSO}_4 + 2\text{SO}_3$. When using WO_3 there is a change of valence, since after use it is green, caused by the presence of blue dioxide in yellow WO_3 . In mixed catalysts pure V_2O_5 is a moderately good agent, Ag is a very poor one, and AgVO_4 or a mixt. of Ag and V_2O_5 , is a very good one, where the action is adsorption. SnO_2 activates a mixt. of $\text{Fe}_2\text{O}_3 + \text{Cr}_2\text{O}_3$ but alone only works poorly at high temp. SnO_2 probably forms SnO , which favors formation of FeSO_4 and CrSO_4 . A catalyst contg. 80% Cr_2O_3 and 20% Ag_2O was not as effective as Cr_2O_3 alone. Differing from Ag_2O , SnO_2 has no influence upon the catalytic effect of V_2O_5 . Activators facilitate a partial reaction.

E. M. SYMMES

Manufacture of zinc chloride and sulfate from whiting. I. E. ADADUROV AND K. V. ZEPONOVICH. Kharkov Inst. Appl. Chem. *J. Chem. Ind. (Moscow)* 5, 1018–19(1928).—Russian whiting, consisting of ZnCO_3 , ZnS , ZnO , Na_2CO_3 , $\text{Na}_2\text{S}_2\text{O}_3$ and Na_2SO_4 contained, when air-dry, Zn 38.8, Na 9.2, SO_4 17.2, CO_2 15.95, SiO_2 0.63, H_2S 20.2, moisture 17.72. Expts. show that on extn. with H_2O in a continuous app., it can be freed of all Na salts in 2 hrs. at ordinary temp., or in 75 mins. at 40° , leaving behind a residue contg. all the Zn compds. The residue, contg. 46.8% Zn, when stirred for 20 mins. at ordinary temp. with 30% HCl or with 30% H_2SO_4 , is entirely converted into high grade ZnCl_2 or ZnSO_4 .

BERNARD NELSON

Providing Germany with sulfur during the war time. F. RAMSER. *Tech. Ind. Schwen. Chem.-Ztg.* No. 7–8, 64–6(1927).—A review.

J. BALOZIAN

Asbestos. ANON. *Mining J.*, Annual Review No. 1929, 14.—The mineralogical varieties of asbestos are discussed. Production figures from 1925 to 1927 show the British Empire meeting 90% or more of the world's needs. Uses are listed. A. H. E.

Rhodesian asbestos. ANON. *Mining J.*, Annual Review No. 1929, 73.—Rhodesia is now the second largest asbestos producer. The properties of the Mapeke Asbestos Mines and the Asbestos and General Trust are briefly described. ALDEN H. EMERY

Asbestos in Western Australia. ANON. *Mining J.*, Annual Review No. 1929, 74.—Western Australia is rapidly becoming an important producer of high-grade asbestos. ALDEN H. EMERY

Problems in drying fuller's earth. MACLEAN HOUSTON. *United Refg. Co. Oil & Gas J.* 27, No. 29, 242, 257(1928).—The use of an eight-hearth 16-ft. Nichols Herreshoff furnace in roasting 80/60 mesh fuller's earth is described. M. B. HART

Lampblack. FRED GROVE-PALMER. *Chemistry & Industry* 48, 60-1(1929).—A summarized description of the prepn. and uses of lampblack. G. CALINGAERT

Evaluation of carbon blacks (CRANOR, BRAENDLE) 30. Crystal growth in aqueous solutions. I. Theory (McCABE) 2. Apparatus for drying clay, chalk, etc. (Brit. pat. 293,765) 1. Amalgams (Fr. pat. 644,412) 9. Contact gas reactions (Fr. pat. 644,181) 13. Hydrogenation of coal, etc. (Fr. pat. 644,148) 21. Utilization of the stones from plums (SALOMONE) 13. Photometric determination of the blackness of various types of C black (HOCK) 30.

BUEB, J.: Stickstoffwirtschaft; Rückblick und Ausblick. Berlin, etc.: Stickstoff-Syndikat. 47 pp. Text in German, English and French.

Hydrocyanic acid. MORTIMER J. BROWN (to Pacific R & H Chemical Corp.) U. S. 1,702,761, Feb. 19. In producing HCN continuously from H_2SO_4 and a cyanide soln., the ingredients are mixed in such a manner that the mixed liquids leave the point of mixing quickly and are continuously heated so that no portion of the liquid can mix with other portions that have been subjected to either more or less heating; HCN is recovered from the effluent which is continuously discharged. An app. is described. Cf. C. A. 22, 3743.

Nitric acid. SAMUEL RUBEN. U. S. 1,702,950, Feb. 19. N under pressure is brought into a soln. of an alk. metal hydrate such as LiOH in proximity to the surface of an electrode immersed in the soln., H is liberated electrolytically and the gases are combined by the action of disruptive d. c. and the gaseous product thus formed is led into contact with a heated catalyst such as a Pt catalyst. An app. is described and may be applied to use in other similar reaction between gases.

Nitric acid. NORSK HYDRO-ELECTRISK KVAELSTOFAKTIESELSKAB. Fr. 644,171, Nov. 21, 1927. HNO_3 is concd. by boiling under vacuum in several stages, the vapor from the most concd. acid being led to an app. placed in front contg. less concd. boiling acid, and so on, while the concd. acid flows in the opposite direction. Cf. C. A. 22, 3496.

Concentrating nitric acid. STOCKHOLMS SUPERFOSFAT FAB. AKT. Ger. 470,430 Mar. 11, 1928. In concg. HNO_3 by means of P_2O_5 , the latter is used in briquet form.

Sulfuric acid. ERICH ROTHAMMEL. Ger. 467,587, Jan. 11, 1928. Addn. to 453,508. Part of the gases issuing from the Glover tower is returned to the tower and another part to a conduit connecting a NO-producer with a denitrating app. The burner gases may flow to the Glover tower directly or by way of the NO producer and the denitrating app., means being provided for regulating the flow along either path.

Sulfur trioxide. METALLBANK UND METALLURGISCHE GES. A.-G. Brit. 293,450, July 7, 1927. Gases for use in H_2SO_4 manuf. by the contact process are purified and dried by passing them first through an app. in which they are sprayed with H_2SO_4 of increasing concn. in different sprays, and then through an elec. pptn. app. which is surrounded by a cooling jacket. The app. used is described.

Absorption tower for sulfur dioxide. O. K. GILLER-BOMBIN. Russ. 3557, Sept. 15, 1924. Mechanical features.

Acid containers. ADOLPHE ROCCA. Fr. 643,848, Nov. 15, 1927. Acid containers are made by molding under pressure a mass made from slate, asbestos or rubber, and K_2SiO_3 or Na_2SiO_3 and other secondary ingredients to obtain cohesion. The ingredients are ground and malaxed to obtain a homogeneous mass.

Synthesis of ammonia. I. G. FARBENIND. A.-G. Fr. 643,855, Nov. 15, 1927. Mixts. of N and H suitable for the synthesis of NH_3 are obtained by submitting solid, liquid or gaseous carbonaceous material mixed with air or O and with or without steam, to a treatment in a voltaic arc, freeing the gaseous mixt. obtained from CO formed and CO_2 and other impurities eventually present. In an example, coke-oven gas mixed with $\frac{1}{2}$ its vol. of air is passed through an elec. arc. The resulting gas is freed from CO by treatment with steam and CO_2 is eliminated, giving a mixt. of N and H in the proportion of 1:3.

Drying gases for ammonia synthesis. GASVERARBEITUNGS GES. Brit. 293,361, July 4, 1927. Before contact with the catalyst (which may contain ferric carbides), the gases are preliminarily dried by chem. reagents and freezing and are subjected to a final drying in the presence of NH_3 at a temp. of -25° to -70° so that the residual moisture is absorbed by the liquefied NH_3 .

Nitrates from ammonia. KARL A. HOFFMANN. Ger. 460,432, Jan. 1, 1926.

Nitrates are obtained directly by the catalytic combustion of mixts. of NH_3 with air or O at a temp. not exceeding 450° in the presence of strongly basic substances other than HgO . As catalysts there are used metals or oxides which do not form higher acid oxides under the reaction conditions, *e. g.*, Ni, Co, Ag, Cu, or Fe or their oxides. The basic substance or a mixt. of basic substance with a metal oxide, *e. g.*, NiO , may be arranged between nets of metal, *e. g.*, Ni, and the gas mixt. passed through the structure.

Alkali metal nitrates from nitrites. I. G. FARBENIND. A.-G. Brit. 293,495, April 2, 1927. Nitrites are converted to nitrates with air or O at temps. of $300\text{--}500^\circ$ by use of a catalyst such as an alkali hydroxide, an alk. earth oxide or a eutectic mixt. of KOH and NaOH which m. 180° . Either the catalyst or the nitrite used is liquefied and the O or air bubbled through the material contg. the other component in suspension.

Alkali sulfates; hydrochloric acid. THEODOR LICHTENBERGER and LUDWIG KAISER. Ger. 470,539, Apr. 13, 1926. The manuf. of alkali sulfates and HCl by treating a fused mixt. of alkali chlorides and alk. earth sulfates with steam or a mixt. of steam and air is improved by addn. of SiO_2 to the melt. Instead of steam and air there may be used mixts. of H and air, or sep. streams of the gases may be blown through the melt.

Anhydrous metal chlorides. MAX JAEGER, WILHELM MOSCHEL and ROBERT SUCHY (to I. G. Farbenind. A.-G.) U. S. 1,702,301, Feb. 19. See Can. 277,353 (C. A. 22, 2815).

Purifying aluminates, etc. J. SEAILLES. Brit. 293,392, July 5, 1927. In the manuf. of alumina as described in Brit. 277,697 (C. A. 22, 2142) and Brit. 283,509 (C. A. 22, 4211) from non-halogenated Al ores, the proportion of silica in the alk. earth aluminate obtained by the use of an autoclave, and capable of dissolving on the subsequent treatment with Na_2CO_3 (thus forming an undesirable impurity) may be reduced by regulating the temp., pressure and duration of heating in the autoclave, without reducing the quantity of aluminate extd. from the bauxite by an excessive amount. When lime is used for treating bauxite, the process is further improved by use of catalysts forming sol. compds. with lime, which are decomposed by alumina, *e. g.*, benzenesulfonic acid or sulfo-ricinoleic acid. The bauxite may be treated in a colloid mill before extn. Many details are given.

Chlorides of calcium, magnesium, cerium, lithium and zinc, etc. I. G. FARBENIND. A. G. Brit. 293,410, April 6, 1927. Oxides such as MgO , in suspension in fused metal chlorides such as MgCl_2 , are caused to flow down a heated irrigation tower in countercurrent to an ascending current of a gaseous chlorinating agent such as HCl or phosgene, so that anhydrous chlorides free from oxides are produced. Hydrated chlorides or partially dehydrated chlorides also may be employed and charcoal or coke may be added and Cl then used as the chlorinating agent. In using hydrated salts, the chlorinating agent may be passed in cyclic circulation through a dehydrator. An electrically heated coke mass may be used for facilitating the reaction.

Aluminum and its compounds. CLAY REDUCTION CO. Fr. 643,981, Oct. 24, 1927. Materials contg. Al, Si, K, Ti, etc., are transformed into complex mixts. of $(\text{NH}_4)_2\text{SiF}_6$ and other metallic fluorides by the action of F or $(\text{NH}_4)\text{HF}_2$. The fluorosilicates of NH_4 , V and Ti are isolated by heating, leaving fluorides of Al and K. The $(\text{NH}_4)_2\text{SiF}_6$ is treated with water and NH_3 to obtain SiO_2 gel and NH_4F . The metallic fluorides are converted into chlorides by treatment with gaseous HCl and NH_3 . The NH_4F and AlCl_3 are volatilized and the AlCl_3 is converted into Al_2O_3 by water. If the primary material contains oxides of Al they may be reduced.

Iron oxides. CLARENCE L. DELACHAUX. U. S. 1,702,250, Feb. 19. A product comprising Fe oxides richer in O than ferrosiferrous oxide wherein the ratio between ferrous Fe and ferric Fe is smaller than $1/2$ (the proportion of FeO being less than 31.03% when no allowance is made for impurities) is obtained by regulated oxidation of forge and mill scale. This product is suitable for use in aluminothermic processes.

Chromium oxide. I. G. FARBENIND. A.-G. Brit. 293,494, April 12, 1927. See Fr. 633,956 (C. A. 22, 3745).

Ammonium sulfate. H. HELIN. Belg. 347,042, Jan. 31, 1928. Synthetic NH_3 is absorbed in dil. H_2SO_4 , and the steam generated by the heat of the reaction is passed through an injector and into a distg. column to which is fed aq. NH_3 . The NH_3 evolved is mixed with the synthetic NH_3 going to the neutralizer.

Potassium and ammonium fluorides. I. G. FARBENIND. A.-G. (Curt Röhre and Walter Rüdelsberger, inventors). Ger. 469,515, Mar. 13, 1927. NH_4F and KF are sepd. from aq. solns. contg. both salts by evapg. the soln. to satn. point, pptg. NH_4F , *e. g.*, by passing NH_3 into the soln., dilg. the soln., and finally cooling it strongly to sep. KF . An example is given.

Cleaning and disinfecting composition for use in sweeping floors, etc. S. A. JAGO, W. A. CROFTS and P. W. HANCOCK. Brit. 293,892, April 11, 1927. A "body substance" such as sawdust, sand, wood pulp or paper is mixed with CH_2O soln., paraffin and paraffin oil and various other substances may be added such as essential oils, hygroscopic salts, creosote and coloring substances.

Vermin-destroying compositions. I. G. FARHENIND. A.-G. Ger. 470,513, Jan. 11, 1922. Addn. to 443,391. *N*-Aldehydopiperidines or their tannates, resinsates or other salts are used alone or in suitable admixture for the destruction of animal pests, such as grubs and worms. 2-Methyl-5-ethylpiperidoacetaldehyde, prep'd. by oxidation of the reaction product of $\text{CH}_2\text{ClCH}_2\text{OH}$ and 2-methyl-5-ethylpiperidine, is particularly effective.

Vermin-destroying compositions. I. G. FARHENIND. A.-G. (Adolf Steindorff, Robert Voss, Paul Igler and Otto Weickert, inventors). Ger. 470,514, Feb. 1, 1922. Addn. to 443,391. *N*-Nitrosopiperidines, alone or in suitable admixture, are used for the destruction of animal pests, such as worms. The nitroso comp'd. of 2-methyl-5-ethylpiperidine is particularly effective.

Decorative coating. FOBER & PALM. Belg. 347,193, Jan. 31, 1928. The coating consists of a mixt. of BaSO_4 , BaCO_3 , K or Na silicate, Pb oxide and H_2O .

Composition for targets. L. I. FAVORSKII and G. P. ELAGIN. Russ. 5034, Sept. 15, 1924. Targets are prep'd. from a mixt. of coal-tar pitch, m. not below 60° , and finely ground kaolin or alabaster by heating to about 300° until water is completely expelled, and continuing the heating for 1-2 hrs. until the more or less volatile hydrocarbons are evap'd.

Printing-plates. I. G. FARHENIND. A.-G. Brit. 293,834, July 13, 1927. Grained plates for lithographic offset printing are prep'd. by etching plates of Mg (or alloys of Mg such as those with Al and Si). The etching may be effected with very dil. HNO_3 , which is allowed to act on the plates for 10-100 sec. while they are rapidly moving.

Forming plates from mica flakes. LOUIS T. FREDERICK (to Chicago Mica Co.) U. S. 1,702,896, Feb. 19.

Ornamental articles formed by dipping a form in fluent "marble cement." JOSEPH TORR (to Petrolignum Co., Ltd.). U. S. 1,702,623, Feb. 19.

Polishing creams. I. G. FARHENIND. A.-G. Fr. 644,149, Nov. 18, 1927. Montan wax, refined by treating with oxidizing agents other than HNO_3 , particularly chromic acid in the presence of glacial AcOH , is used instead of Carnauba wax in the making of creams for boots, floors, etc.

Cigaret tips of Japanese tissue paper treated with gelatin, bismuth oxide and collodion, successively applied. W. A. BEARE. Brit. 294,038, Nov. 14, 1927.

19—GLASS, CLAY PRODUCTS, REFRACTORIES AND ENAMELED METALS

G. E. BARTON, C. H. KERR

Collapsing temperature of various kinds of laboratory glass tubing. A. W. LAUDEN-GAYER. *Ind. Eng. Chem.* 21, 174(1929). Tubes with a bore of 13 mm. and a wall thickness of 1.8 mm. were used. Tests were of 2 types: (1) A tube open at both ends was heated in an elec. furnace; the temp. was quickly raised to 300° and then at the rate of 3° per min. until the tube collapsed. (2) A tube was sealed at one end, evacuated to 3-mm. pressure, and heated until the tube collapsed. Results were as follows:

Glass	Collapsing temp	
	Open tube	Evacuated tube
Soft soda-lime (Greiner-Friedrichs)	700	585
"R" (resistance glass, G. and F.)	750	635
Pyrex	820	670
Jena combustion tubing	860	720
Bohemian combustion tubing	860	740
Moncrieff combustion tubing	820	770

A. J. MONACK

Perkin medal award--The many sidedness of glass. EUGENE C. SULLIVAN. *Ind. Eng. Chem.* 21, 177-80(1929).--The first part of the article gives a brief biography of Eugene C. Sullivan, the recipient of the Perkin Medal for 1929. A list of previous medalists is included. The latter part is the lecture given by S. First research on

low-expansion glasses, glass for baking dishes, lab. glassware, other applications of low-expansion glasses, phys. properties of glasses, and unsolved problems is discussed.

A. J. MONACK

Study of the coloring of glass. KITSUZO FUHA. Research Lab. Tokyo Elec. Co. *J. Mazda Research Lab.* 3, 21-49(1928).—(1) *Coloring with Mo.*— $(\text{NH}_4)_6\text{Mo}_7\text{O}_{24} \cdot 4\text{H}_2\text{O}$ is used in F.'s expt. Mo gives no special color to glass, but the glass contg. Mo according to compn. sometimes presents opalescence on reheating. Above certain limits Mo cannot enter into glass, the remainder either floating on the surface of the melt or sinking to the bottom. (2) *Coloration with W.*— Na_2WO_4 , WO_3 , metallic W powder, Na_2WO_4 + oxidizing agents, and Na_2WO_4 + As_2O_3 are used; WO_3 and its salts give no special color to glass. Metallic W partly suspends in the glass to color the latter gray. When WO_3 and Na_2WO_4 are added, opalescent glass is formed. Above a certain quantity, W cannot enter into glass, the remainder floating on the surface or sinking to the bottom in the form of a H_2O -sol. salt. Na_2WO_4 with an oxidizing agent or with As_2O_3 produces no special coloration. (3) *Coloration with U.*—U. is used for making yellow glass, and the recent observation that the glass absorbs ultra-violet rays opened a wide field for its application. Na uranate, $\text{UO}_2(\text{OAc})_2$, Na uranate + an oxidizing agent, Na uranate + As_2O_3 were tested. The use of WO_2 or Na uranate causes no great difference with phosphorescence, but the luster is best with Na uranate. 1-2% UO_2 salt gives a greenish yellow color; with 5%, deep yellow or orange to brown color is produced in some glass, the coloration being different with the kinds of glasses. Glass contg. Na uranate fluoresces in diff. degrees, K glass more strongly than Na glass. If the glass contains boric acid, it has a strong fluorescence. K-Mg glass and K-Zn-B SiO₂ glasses have always a beautiful fluorescence. The addn. of As_2O_3 to Na uranate has no influence.

K. SOMEYA

Shrinkage of glass threads during heating. I. SAWAI AND O. MORISAWA. *Z. anorg. allgem. Chem.* 173, 361-72(1928).—The behavior of threads of lead borate glass when heated under varying loads has been detd. With small loads of the order of 50-500 g./mm.² the initial expansion is followed by a contraction beginning at 180-190° and ending at 395-360° according to the load. Then follows a small range during which no change in length takes place, and finally rapid expansion ensues, due to the great decrease in the viscosity as the softening point is approached. The shrinkage is shown to be due to release of the longitudinal strains in the thread produced in its formation by rapidly drawing it out from a molten mass of the glass. When the viscosity of the glass decreases sufficiently to make these strains greater than the sum of the load and the viscosity, shrinkage takes place. With loads of about 1 kg./mm.² shrinkage occurs, but the length of the thread remains constant between 200° and 400°. With higher loads the load is greater than the sum of the viscosity and the internal stresses, therefore no shrinkage takes place on heating.

B. C. A.

Notes on the brick industry. ALBERTO PELLACINI. *Corriere ceram.* 9, 503, 505 (1928)

G. SCHWOCH

Refractory materials in the non-ferrous metal industry (SEARLE) 9. Electric furnace for the firing of ceramic ware (KORACH) 4. Destruction of brick by CO (DIEPSCHLAG, FEIST) 9. Destruction of blast-furnace building materials, particularly fire bricks (DIEPSCHLAG, FEIST) 9. Apparatus for drying clay, chalk, etc. (Brit. pat. 203,765) 1.

Glass. SOC. ANON. DES MANUFACTURES DES GLACES ET PRODUITS CHIMIQUES DE ST. GOBAIN, CHAUNY, ET CIREY. Brit. 293,310, July 2, 1927. Violet colored glass is made by adding Ti oxide to a batch having a base of P_2O_5 (with or without B oxide) without use of silica. A deeper coloration is obtained by also adding a reducing agent such as C. A light filter, which is a true gray with a transparency nearly constant for all the rays within the visible spectrum, can be formed of such as violet tinted glass and a chate glass colored green by Fe oxide.

Apparatus for drawing glass sheets having bulb edges. RENE J. DOGNAUX (to Blackford Window Glass Co.). U. S. 1,702,501, Feb. 19.

Apparatus for producing a continuous strip of glass. PILKINGTON BROS., LTD. Ger. 470,664, Oct. 2, 1924. See Brit. 228,627.

Uniting glass sheets. E. GEISEL. Brit. 293,671, March 27, 1928. Composite transparent sheets are formed by uniting sheets of glass to a polymerization product of the ethyl or methyl ester of acrylic acid or a mixt. of these.

Uniting glass sheets with intervening material. H. LEV. LAWRENCE and KENILWORTH MFG. Co., LTD. Brit. 293,666, March 1, 1928. Preliminary to uniting glass

sheets with an intervening sheet such as celluloid or mica, the glass is cleaned and polished and then coated with a soln. of nitrocellulose together with the gums elemi and mastic and the celluloid or other intervening sheet material is coated with a soln. contg. the gums elemi and benzoin. Dyes may be added to the solns. Proportions and other details are given.

Glass-rolling apparatus. JOHN H. FOX (to Pittsburgh Plate Glass Co.). U. S. 1,702,504, Feb. 19.

Apparatus for trimming glass sheets. WILLIAM OWEN (to Pittsburgh Plate Glass Co.). U. S. 1,702,522, Feb. 19.

Forming glassware. RICHARD LA FRANCE (to Owens Bottle Co.). U. S. 1,702,262, Feb. 19. Mech. features.

Apparatus for annealing glassware. JOTHAM F. BLACK (to Hartford-Empire Co.). U. S. 1,703,073, Feb. 19.

Rotary glass-blowing apparatus. C. A. BROWN, C. W. CRAIG and F. B. VANSICKLE (to British Thomson-Houston Co., Ltd.). Brit. 293,456, July 8, 1927.

Tilttable mold bottom construction for use in forming glass articles. ALBERT N. CRAMER (to Owens Bottle Co.). U. S. 1,702,498, Feb. 19.

Glass-making furnaces. ROBERT L. FRINK. Fr. 644,561, Oct. 4, 1927.

Ceramic glazes. DEUTSCHE GOLD- UND SILBER-SCHNEIDANSTALT VORM. ROESSLER. Brit. 293,317, July 1, 1927. Glazes are used contg. water-insol. borates such as borate of Ca or Mg, together with other usual constituents such as Pb oxides, silicic acid marble and kaolin, etc.

Decolorizing ceramic materials, white pigments, etc. I. G. FARBENIND A.-G. Fr. 644,547, Sept. 13, 1927. Metals such as Fe, Co, Mn and others which color glazed earthenware, ceramic products and the crude materials such as kaolin, feldspar, quartz and white inorg. pigments are removed by heating the materials to redness or higher in a current of gas contg. Cl.

Refractory material. STAHLWERKE RÖCHLING BRUDERUS A.-G. and ALFRED KROPP. Ger. 469,433, Dec. 19, 1926. Ta powder, which may contain up to 10% of impurity, is mixed with graphite in the proportions 3:2 with the use of a binder, e. g., pitch or molasses. The mixt. is molded under pressure, dried at 300-500°, and then heated at 2000-3000°. The molded piece may be given a coating of graphite before heating. The products may be used as elec.-resistance heaters or for making crucibles, furnace linings, etc.

Refractory materials. ROBERT L. FRINK. Fr. 644,540, Sept. 8, 1927. A refractory material for vats or basins used in industry is composed of sillimanite or like substance not readily fusible, bound with a substance of vitreous nature which may be a siliceous material combined with B, alkalis, $MgCl_2$, MgO or oxides of rare earth metals.

Treating refractory material such as in reclaiming bonded abrasives. EARL L. HAUMAN (to Exolon Co.). U. S. 1,702,942, Feb. 19. In effecting the reclaiming of granular material, the surfaces of the material are progressively exposed and heated to form a "uniformly reacted" mass which may be formed into a homogeneous pig.

Refractory porous bricks. IVAR SETTERBERG. Fr. 643,764, Nov. 10, 1927. See Brit. 281,254 (C. A. 22, 3505).

Grading bonded refractory particles. EARL L. HAUMAN (to Exolon Co.). U. S. 1,703,065, Feb. 19. Bonded particles such as material of used refractory linings or retorts are graded by particle size, the included C is driven off and the material is subjected to gravity sepn.

Enameling metals. ELECTRICAL RESEARCH PRODUCTS, INC. Fr. 644,496, Nov. 25, 1927. Means are described for regulating the temp. of the enameling furnace to control the hardness of the enamel.

20—CEMENT AND OTHER BUILDING MATERIALS

J. C. WITT

The setting of cement. II. HERMANN GESSNER. *Kolloid Z.* 47, 65-76(1929); cf. C. A. 23, 1237.—An exptl. method is described for measuring the viscosity of cement and water mixts. The results showed a gradual increase in viscosity with time. Stirring or shaking reduced the viscosity. The elec. cond. increased to the end of the first hr., decreased gradually to a low figure in about 40-60 hrs., and approached zero at the end of 150-200 days. The vol. of a cement decreased as much as 5-7.5% over a period of 3-5 days.
L. F. MAREK

Heat transfer in the rotary kiln burning portland cement clinker. ROBERT D. PIKE. Pike and West, Emeryville, Calif. *Ind. Eng. Chem.* 21, 230-4(1929); cf. *C. A.* 23, 255.—The derivation of equations for calcg. temp. in different parts of the kiln is given with an example showing the close agreement of calcd. value with exptl. value. Approx. values of heat-transfer numbers are calcd. from existing data and compared with values obtained if heat is assumed to be transferred only by conduction and convection. Large differences between the values are observed; radiation from the hot gases can account for the discrepancies. Some further discussion of the heat-transfer numbers in the calcining and clinking zones is given. Many indeterminate variables are to be taken account of in designing rotary kilns. M. C. ROGERS

Light porous concrete. J. MEYER. *Chem. Fabrik* 1928, 433-5, 449-50.—To produce a porous concrete, 0.1-0.5% of an alloy of Ca is added to the cement mixt. before addn. of water. Molds are only filled to the extent of 70-80% and the evolution of gas can be regulated to require 30-45 mins. or 3-4 hrs. The concrete can, if desired, be made lighter than water, the apparent sp. gr. varying, of course, with the proportions of the usual ingredients. The relation of compression strength to apparent sp. gr. is given by curves. The two diminish together, so that the lightest forms are only suitable for filling material, etc. A further addn. of the Ca alloy results in a part of the gas evolved being lost. With a proper mixt. the gas pores are very uniform, and heat cond. measurements show that the porous concrete is a very good insulating material. It can be structurally combined with iron in the same way as ordinary concrete. B. C. A.

Bituminous fillers for cracks in concrete pavements. C. E. SLAUGHTER. Michigan Eng. Expt. Station, *Bull.* No. 11, 3-24(1927).—Field tests were made on crack fillers for concrete pavements on a three-mile section of Trunk Line No. 16 near East Lansing, Michigan. Crack fillers failed in five characteristic ways: raveling, spreading, cracking, picking up by traffic, wearing. The tar fillers as a class failed by wearing away. The highly blown asphalts as a class had good wearing qualities but lacked adhesion to the concrete and failed by picking up when under traffic. The straight-distilled oil asphalts tended to spread out during hot weather and become brittle and chip during cold weather. Two out of three cut back materials tested gave excellent results. The advantages incident to their use appeared to be long life, no heating required during application, thorough penetration of material into the crack. The disadvantages were large quantities of sand required, tracking likely to occur during the first day or two after application and higher cost of materials. The life of tar-crack fillers tested seemed to depend on consistency, those m. 30-35° were most satisfactory for summer use. Many of the asphalt fillers gave better service than did the tars. The expts. suggest that a slightly blown asphalt of 35-50 penetration for summer use followed by very soft or liquid unblown asphalt during winter would give good results. Other things being equal, a filler of greater adhesion will have longer life. A sand covering seems to be necessary for tars and soft asphalts to prevent tracking; if tracking does not occur, a sand covering does not add materially to the life of the filler. L. B. MILLER

Development of the rotary kiln. N. C. KYRIACOU. *Zement* 17, 973-5(1928); cf. *C. A.* 22, 3276. H. F. K.

Processes used for road silication. G. LOPPENS AND L. NYS. *Athénée de Liege. Bull. soc. chim. Belg.* 37, 263-6(1928).—The material used for road silication is a mixt. of limestone and Na silicates. In order to be able to make up the mixt. several days in advance, without danger of its setting, silicates should be used with a $\text{SiO}_2/\text{Na}_2\text{O}$ ratio approaching 2.42 instead of 3.20 as is customary. ALBERT L. HENNE

Asphalt emulsions (LEEMANS) 22. Solubility of CaSO_4 from 0° to 200° (PART-
RIDGE, WHITE) 2. Apparatus for testing the transverse strength of concrete blocks,
etc. (U. S. pat. 1,702,803) 1. Various products from coal, lignite, shale, peat, etc.
(Brit. pat. 203,578) 21. Resinous compositions (Ger. pat. 468,587) 26.

BATES, EDWARD E. **Plain Concrete.** New York: McGraw-Hill Book Co., Inc.
346 pp. \$1. Reviewed in *J. Western Soc. Eng.* 34, 72(1929).
TAYLOR, FREDERICK W., THOMPSON, SANFORD E., AND SMULSKI, EDWARD: **Con-
crete, Plain and Reinforced.** Vol. II. 4th ed. New York: John Wiley & Sons.
8 pp. Cloth, \$7.50. Reviewed in *Eng. News-Record* 101, 927.

Cement. ARTHUR C. DAVIS. *Fr.* 644,452, Nov. 24, 1927. Mixts. for making
cement are forced in one or more jets upwardly through the combustion zone of a verti-

cal furnace and allowed to descend. A current of air may be introduced to agitate the particles.

Rotary cement kiln. O. BOUZIN. Belg. 346,967, Jan. 31, 1928. Improvement to Belg. 331,427. The refractory lining of the kiln is provided with an inwardly projecting ring back of the high-temp. zone to retard the progress of the charge through this zone; the cooler is provided with a similar ring to retard the progress of the clinkers.

Cellular products from cement mixtures. G. B. HINTON. Brit. 294,041, Nov. 21, 1927. See U. S. 1,687,067 (*C. A.* 22, 4757).

Material for expansion joints of concrete, etc. THOMAS E. MCSHAFFREY. U. S. 1,702,788, Feb. 19. Pieces of compressible material such as cork of different sizes are each coated with stone dust and embedded in a bituminous binder.

Treating low-grade gypsum. ROBERT E. HAIRE. U. S. 1,702,940, Feb. 19. In treating low-grade gypsum rock for producing as a by-product a sanded base for sanded hard wall plaster, the mass of harder and coarser particles constituting the residue is subjected to further grinding to produce a product which contains a quantity of released gypsum with the impurities from the rock in finely divided state.

Bituminous paving material. O. H. BERGER. Brit. 293,830, July 13, 1927. See U. S. 1,672,361 (*C. A.* 22, 2650).

Bituminous emulsions. FERNAND-G. E. CHAMPILOU. Fr. 644,199, April 21, 1927. Aq. emulsions of bitumen or tar for roads, etc., are used hot, and only slightly dild. with water. Fr. 644,200 describes an *app* for making bituminous emulsions.

Plastic composition for structural uses. JOSEPH F. HAGGERTY (to National Gypsum Co.). U. S. 1,702,965, Feb. 19. A flocculent mass comprising fibers such as wood fiber satd. with a liquid such as water is admixed with plaster of Paris to form a paste and the latter is shaped into desired form. About 12 times as much (or more) of the plaster of Paris is used than of the fibrous material. U. S. 1,702,966 specifies wall board formed of gypsum and contg. not over 2% of wood fibers.

Artificial marble. KAREL STICHA, JOHANN KNEIFL and JOSEF HUBACEK. Fr. 644,286, Sept. 16, 1927. A compn. contg. Na_2SO_4 2, CaCl_2 5, deep black dye 10, red dye 2, sol. glass 16, water contg. a little NH_4Cl 28 parts is applied to a smooth surface and dried during 6 hrs. to give a surface resembling marble. The color may be varied.

Composition floor "tiles." J. B. METZLER. Brit. 293,700, July 7, 1927. A wood veneer is secured to a thicker base which may be formed of an agglomerate of sawdust, wood shavings, cork waste, asbestos, or like materials and a binder.

Floor-covering materials manufactured in long lengths. A. LANNOVE. Brit. 293,778, April 11, 1927. Mech. features of coating and impregnating felt or the like with bituminous and natural or artificial resinous compns. An *app.* is described.

Printing wood graining, etc. R. KOCH and O. KIENZLE (trading as Koch & Kienzle). Brit. 293,873, July 14, 1927. The surface of the wood or other material is provided with a protective coating such as electrodeposited metal, to prevent penetration and adhesion of the ink; the coated material is used as an intaglio printing surface and the ink is transferred from it to the article to be printed by a transfer roller, or the metal coating may be made sufficiently thick that it can be removed from the material and used independently as a printing block or as a mold for the production of relief electrotypes.

Fireproofing and preserving wood. FERNANDO S. VIVAS (to International Fireproof Products Corp.). U. S. 1,702,285, Feb. 19. See Brit. 286,725 (*C. A.* 23, 498).

Preserving wood and protecting plants from insects and fungi. L. P. CURTIN. Brit. 293,908, April 19, 1927. See Can. 277,103 (*C. A.* 22, 2651).

Preserving wood. PAUL WACK. Fr. 644,004, Nov. 9, 1927. Wood is impregnated with anhydrous phenols, cresols, etc., which absorb the water contained in the wood.

Impregnating wood. HERBERT RENNER. Ger. 470,458, May 5, 1926. The impregnating agent is a fused mixt. of an odoriferous insecticide, *e. g.*, camphor, a terpene, or C_{10}H_8 , with a diluent, *e. g.*, a hydrocarbon, wax, resin, resin acid, or the like.

21—FUELS, GAS, TAR AND COKE

A. C. FIELDNER

Recent work on motor fuels. I. SINGER. *Petroleum Z.* 25, 152-3(1929).—Comprehensive review with 31 references to original papers.

Foreign trend in new motor fuels. I. H. NELSON. *Oil & Gas J.* 27, No. 27, 148, 164(1928).—Various expts. which are being conducted in France and England are discussed on the use of heavy oils, alc. and gases as motor fuels.

M. B. HART

Fusibility and chemical composition of ash from a number of Russian fuels. N. G. PATZUKOV AND V. I. UVAROV. *Izvestiya Teplotekh. Inst. (Trans. of the Thermo-Tech. Inst. (Russia))* 1926, No. 8, 26-37.—Samples of fuel were pulverized, sieved and burned to ash. The ignited ash was formed into a cone, which after drying was heated to the fusion temperature in a modified Meker's gas furnace. The combustion of gases was carried out in a semi-reducing flame; the products of combustion were composed of 50% $H_2O + CO_2$ and 50% of $CO + H_2 + CH_4 + C_2H_4$. The test cones were heated to 800° and kept at this temperature for one hour to facilitate the reaction $Fe_2O_3 + CO \rightleftharpoons 2FeO + CO_2$ in order to reduce the Fe_2O_3 present to FeO which lowers the melting temperature of the cone. The equilibrium of CO , CO_2 , Fe, FeO and Fe_2O_3 depending on the proportions of CO and CO_2 in the surrounding medium is explained in the U. S. Bureau of Mines, *Bull.*, No. 129. The following table shows the chemical compns. of some ashes from anthracite culm and their behavior at various temperatures:

	SiO ₂	Al ₂ O ₃	Fe ₂ O ₃	CaO	MgO	Na ₂ O + K ₂ O	SO ₂
Bokovo-Khrustalskoye, mine No. 4	53.70%	26.70%	15.54%	3.03%	1.02%	0.44%	0.48%
Same, sample II	50.51%	27.89%	16.62%	3.35%	0.62%	0.70%	0.53%
Same, mine No. 7/8	47.34%	22.62%	17.31%	8.28%	1.94%	0.91%	2.21%
Donetzko-Grushevs-koye, mine No. 2	53.62%	23.88%	16.94%	3.52%	1.00%	0.26%	1.12%
Bokovskoye, mine No. 22	55.04%	19.48%	20.74%	3.31%	0.97%	0.33%	0.49%
Same, mine No. 15	48.00%	23.51%	18.01%	7.44%	1.15%	1.12%	0.92%
Vlasovskoye, mine "Artem"	51.10%	23.63%	17.51%		0.97%	1.09%	2.59%

The fusibility of the above ashes in a semi-reducing gas atmosphere and in completely burned gases.

	Initial deformation atmosphere		Softening temperature atmosphere	
	Semi reduc	Complete combustion	Semi-reduc.	Complete combustion
Bokovo-Khrustalskoye, mine No. 4	1200°	1320°	>1280°	>1400°
Same, sample II	1180°	1310°	>1310°	>1400°
Same, mine No. 7/8	1180°	1250°	1240°	1280°
Donetzko Grushevskoye, mine No. 2	1085°	1250°	1215°	1380°
Bokovskoye, mine No. 22	1110°	1300°	1210°	1370°
Same, mine No. 15	1110°	1280°	1210°	1320°
Vlasovskoye, mine "Artem"	1110°	1280°	1215°	1335°

Comprehensive data are given on technical analysis and combustion characteristics of various coals, peat, shale, corn-stalks and straw.

A. A. BOEHTLINGK

Tests and standards adopted by the Fourth All-Russian Thermo-Technical Meeting. A. P. SHAKHNO AND A. N. SHCHUKAREV. *Izvestiya Teplotekh. Inst. (Trans. Thermo Tech. Inst. (Russia))* 1927, No. 6, 65-82. —Standards are given for the use of the adiabatic calorimeter, detn. of the calorific value of fuels in a simplified calorimeter and correction for radiation in calorimetric expts.

A. A. BOEHTLINGK

Automatic combustion control for boiler furnaces. ANON. *Ind. Chemist* 5, 27-8 (1929). A description (illustrated) of the Hagan system of regulation for boilers, which controls the fuel and air supply in accordance with demands for steam and its pressure. The master regulator comprises (a) the demand detector and (b) the mechanism carrying out the control movement. The former is said to be sensitive to changes of pressure of a couple of ounces per sq. in., and the latter to be very simple in operation.

W. C. EBAUGH

Some results with the Hagan automatic combustion control system. T. R. ALEXANDER. *Ind. Chemist* 5, 29-31(1929); cf. preceding abstr.—Tests conducted on an installation of 4 Babcock land-type boilers, each of 13,000 lbs. per hr. capacity, equipped with chain grate stokers driven by a steam engine through line shafting, at a plant of the British Xylonite Co., Ltd., are reported. The control app. proved itself mechanically perfect during the 7 months it was in operation, setting the controls even when the variation in pressure was insufficient to show on the pressure gage, and maintaining pressure within 2 lbs./sq. in. when the steam demand fluctuated 25%. Steadiness of CO_2 showed an overall improvement of 1%, and the av. increase of boiler efficiency,

2.7%. Total savings amount to £285 per annum on a coal consumption of 6000 tons at £1 per ton, thus showing a good return on the cost of the app. W. C. EBAUGH.

The control of calorific value. J. G. STEWART. *Gas J.* 184, 259-63(1928).—The mechanism, operation and performance, in actual use, of recently developed app for the automatic maintenance of a uniform calorific value of gas during manuf. is described, illustrated and discussed. Such app. is operated by a recording calorimeter and comprises a relay valve in which the fluctuating calorific value produces a corresponding fluctuation of gas pressure which, in turn, actuates either a water valve, controlled by a diaphragm, which loads, with water, the governor controlling, through the exhaustor, the vacuum in the retort system, or a valve supplying diluting gas, *e. g.*, air or water gas, to the main gas. The relay valve is operated by a lever moved by the hot expansion tube of the calorimeter. This valve releases gas from a chamber which is fed through an orifice from a supply of constant pressure. Such an app. is in use at the works of the Weston-Super-Mare Gas Co. The performance is satisfactory.

F. S. GRANGER

The control of firing with the Ados apparatus. O. KALLABIS. *Apparaturen* 40, 303-5(1928).—A calcn. of heat losses at 6% CO₂ in flue gas, and of fuel saved by Ados control at 14% CO₂.

J. H. MOORE

Coal in 1928. G. L. EVANS. *Mining J.*, Annual Review No. 1929, 18.—A review of the economic difficulties through which the industry passed in 1928, particularly in England.

ALDEN H. EMERY

Classification of North American coals. A. C. FIELDNER. *Bur. Mines, Cir. No.* 6094, 13 pp.(1929).

E. H.

The rational utilization of coal. Coal used in its raw state. W. J. DRUMMOND. *Colliery Guardian* 138, 233-4(1929).—Discussion of the economic utilization of coal available in Great Britain by putting it into a form specially suited to the need of the individual consumer.

A. WHITE

The rational utilization of coal. Fuels obtained by the treatment of coal. W. K. BRAUNHOLTZ. *Colliery Guardian* 138, 341-3(1929).—General discussion of carbonization and hydrogenation of solid fuels and synthesis of liquid fuels from water gas as a means of obtaining more suitable fuels from coal.

A. WHITE

Tkvisbulskii Caucasian coal. A. P. SHAKHNO AND I. B. RAPOPORT. *Trudy Teplekhn. Inst. (Trans. Thermo-Tech. Inst. (Russia))* 1927, No. 6, 52-7.—All 3 samples investigated belong to the class I according to Gruner's classification. The combustible parts, being composed of the 2nd, 3rd and 4th layers, resp., contained C 79.12, 79.33, 79.07; H 4.45, 4.56, 4.67; N 2.21, 2.24, 2.06; O 13.92, 13.87, 14.20% 71.3, 5.0 and 69% semi-coke were obtained at 550°, also 8.05, 8.47 and 11.0% primary tar and 0.3, 0.3 and 0.85% gasoline. The semi-coke contained 85% C, 3.7% H, 0.8% S. A metric ton yielded 42.6 cu. m. gas recalc. to 0° and 760 mm. which had a calorific value of 7200-11000 Cal. per cu. m.

A. A. BOEHLINGK

Relation between caking and moisture-absorbing power of some Japanese coals. SADA O IRI. *Ind. Eng. Chem.* 21, 239-41(1928).—Moisture-absorbing power decreases with increase of caking power probably because the chief caking constituent of coal, gamma, has the least moisture-absorbing power and the strongest absorbing constituent is ulmin.

A. WHITE

Coal dust firing for boilers and industrial furnaces. H. BERG AND ERICH VOGT. *Colliery Guardian* 138, 344-5(1929).—A discussion of storage, drying and pulverization of hard coal, and the design of combustion chambers for firing coal dust. The removal of incombustible constituents in the coal by turning the flame through an angle of 90° or larger is suggested.

A. WHITE

Conveying coal dust by means of coal-dust pumps. A. WIPPRECHT. *Chem. Fabrik* 1929, 25-7.—Methods for conveying coal dust (powdered coal) are outlined, with special attention to the Fuller-Kinyon system.

W. C. EBAUGH

Theory of coal washing. A. FRANCE. *Colliery Guardian* 138, 431-3(1929).

E. H.

Liquefaction of coal. SHIGERU KOMATSU. *J. Fuel Soc. (Japan)* 7, 1240-50 (1928).—Two methods of liquefaction of coal are considered: (1) gasification of the coal, and then liquefaction of the gases, and (2) direct liquefaction. K. discusses the latter method. Since boiling and melting points of matter are functions of pressure, the chemical, and not the physical properties of coal are the dominant factors in the liquefaction of coal. Two methods of direct liquefaction of coal may be expected from a study of the compn. of coal and petroleum, that is (1) removing the oxygen from the coal, or (2) adding hydrogen to the coal, for coal is a compd. consisting of C, H and O, while petroleum consists of C and H. The first reaction takes place in the course of formation of coal, while the second takes place in the Bergius process.

F. I. NAKAMURA

Drying coal with coke and its advantages. H. VOSS. *Brennstoff- Wärmewirt.* 11, 8(1929).—An economic discussion. F. S. GRANGER

Ammonia recovery from steamed vertical retort gas. C. SINGLETON AND J. E. FANIER. *Gas World* 90, 57-8(1929).—A general discussion. Cf. C. A. 23, 262.

F. S. GRANGER

Separation of sulfur and ammonia from coal gas and generator gas. Zs. GALÓCSY. *üzéstechn.* 1, No. 2, 8-11(1928).—A review of German methods. S. S. DE FINÁLY

The composition of gas as related to its production method. D. J. ADRIAANSE. *Hel Gas* 49, 13-20(1929).—If normal values are assumed for coal gas, coke gas (blue gas) and flue gas as to calorific value, d., etc., sets of curves can be constructed to give the heating value for known d., and various percentage compns. of the gas. Examples of such curve families are given. Other lines of interest in these diagrams are those of const. calorific value/ $\sqrt{d.}$, the "normal lines." B. J. C. VAN DER HOEVEN

The central gas supply of Limburg and Noord-Brabant with coke-oven gas. CL. DRIESSEN AND R. C. A. FRANKEN. *Hel Gas* 49, 5-12(1929).—A description of the plans for long-distance transmission of coke-oven gas in the Netherlands. The coke ovens at Treebeek and Geleen (Emma and Maurits) of the Dutch State Mines will supply 4 towns with an initial yearly consumption of 20 million cu. m. gas (700 million cu. m. yearly available). A map shows the course of the pipe line; it is mostly of 300-mm. size, with a max. pressure of 6.5 atm. Part of the gas distributed in the future will be residual gases of the synthetic N plant; they have a 5800 Cal. per cu. m. heating value (mostly CH_4). The chem. specifications for the gas are: less than 15% inerts; 0.7% O_2 , 100 mg. S per cu. m.; 0.5 density, no NH_3 , naphthalene, H_2S or HCN; 4200 ± 200 Cal. per cu. m. The sliding scale of prices runs from 2.8 cents (Dutch) per cu. m. for the first million down to 1.9 cents per cu. m. for more than 7 million per year. These prices are related to a "normal" coal price of 10 guilders per ton at the mine and will vary with this coal price. For the pipe line seamless steel tubes with acetylene-welded joints will be used; in the mine region expansion joints are provided every 75 to 100 m. and the welds are protected by "Escout & Meuse" special couplings. B. J. C. v. d. H.

Coke-oven or gas-plant gas. F. K. TH. VAN IJERSON. *Hel Gas* 49, 34-6(1929).—The quantities of coke-oven gas are discussed. B. J. C. VAN DER HOEVEN

Control of dust in water-gas sets. W. I. BATTIN. *Am. Gas J.* 130, 49-50(1929).—As a dust catcher between generator and carburettor in water-gas sets adds greatly to the efficiency of the plant, the U. G. I. Contracting Co. Division of United Engineers and Constructors, Inc., experimented with some 17 types of dust catchers. Weighed quantities of dust of the character carried over from a generator were fed through them, the amt. being supplied in measured quantities from a large fan with regulated velocity. The amt. of dust trapped by each type of dust catcher was weighed and the efficiency of the app. detd. A modified cyclone-type dust catcher was evolved having an efficiency of 95% and a pressure-drop no greater than that through a "standard" dust catcher. Dust catchers of the new design installed on two 10.5 ft. generator sets have shown that from a practical standpoint an efficiency of approx. 100% is attained. It is anticipated that economies from using this dust catcher will pay for the installation in less than 1 year. W. C. EBAUGH

Spherical gas holders. W. J. A. DUYNSTER. *Hel Gas* 49, 36-9(1929).—It is shown that spherical (const. vol.) gas holders are unsuitable for use in ordinary gas plants on account of the cost of compression of the gas. B. J. C. VAN DER HOEVEN

Spherical gas holders. A. C. KOPPEJAN. *Hel Gas* 49, 39-40(1929).—High-compression cost makes the use of spherical gas holders impractical. B. J. C. v. d. H.

Natural gas as source of benzene attracts commercial notice. G. A. BURRELL. *Natl. Petroleum News* 21, No. 2, 79-80(1929).—A review of the methods for producing benzene from CH_4 . M. B. HART

Chemical analysis of alcohol-benzene-gasoline mixtures. JOSEF ŠTÄSTNÝ, IVO KEME AND ROBERT BRODINA. *Chem. Obsor* 4, 1-3(1929).—Of the various methods (colorimetric, refractometric) for analysis of dynalkol (C. A. 22, 3513) the sulfonation method proved to be the most satisfactory on account of various raw materials used for prepn. of dynalkol. Alc. is sepd. from the mixt. 12 hrs. after addn. of NaCl and the amt. of unsatd. hydrocarbons and unsatd. hydrocarbons + benzene is detd. by adding sulfuric acid (96%) and (100%), resp. To 25 cc. of gasoline + benzene mixt. 60-70 cc. of 100% H_2SO_4 is added. The increase of the amt. of the lower layer before and after sulfonation of benzene corresponds to the amt. of benzene; the difference between this and 25 cc. is gasoline. JAROSLAV KUČERA

The thermodynamic diagram of the system of Rochefort. J. AUCLAIR AND J.

VILLEY. *Compt. rend.* 187, 699-701(1928).—The ideal indicator diagram of the cycle of a Rochefort internal-combustion engine is described. F. R. BICHOWSKY

Composition of tar from low-temperature carbonization of Utah coal. RALPH L. BROWN AND ROBERT N. POLLOCK. *Ind. Eng. Chem.* 21, 234-8(1929).—The third of a series of studies of the compn. of tars obtained from Utah coal when carbonized with steam superheated to about 700°. The tar was collected in 2 parts, one lighter than the aq. condensate and the other heavier than water. The composite total tar contained 3.5% insol. material—dust, coal, coke, etc.—2.15% carboxylic acids, 26.9% phenolic material, 2.1% tar bases, and 63.3% neutral portion (working loss 2.2%) made up as follows: resin 9.4, wax 10.8 and oil 42.8. The oil was approx. 35% unsatd., 30% naphthenic, 20% aromatic and 15% paraffin hydrocarbons. An outstanding fact is the large paraffin-wax content of the tar. The importance of the wax content arises from the potential increase it offers in economic return from the by-products of low temp. carbonization. A. WHITE

Recent work on the constituents of brown-coal tar and the tar builders in brown-coal. S. RUHEMANN. Tech. Hochschule, Berlin. *Erdöl u. Teer* 4, 629-32(1928); 5, 10-2(1929).—Most of the paper is a review of previous published work, mainly by R. and his associates. New work, now in progress, to be published in full later, is also mentioned. This is concerned with the cracking of phenol. Decompn., to a practical extent, begins at 630°, in contact with pumice, into CO + a residue which in turn breaks up into C₂H₄, C₂H₂, CH₄ and finally C and H, C₂H₂ only in traces. Butadiene is always found. At 750° liquid and solid products begin to appear, formed presumably from C₂H₂. Up to 900° benzene, naphthalene, anthracene, phenanthrene and chrysene can be detected. At about 850° the type of decompn. changes to H₂O + residue. Catalysts are divided into 3 classes, dehydrogenating, e. g., Ni; dehydrating, e. g., Al and Th oxides; and, third, activated C. Activity of Ni begins at 300° but is soon disturbed by deposited C. Up to 450° clean decompn. to CO, C, H and CH₄ occurs. Active C, at 650°, yields at first principally H₂O, C, H and CH₄, but later, because of weakening of the activity by deposited C, CO appears. Reduction to C₆H₆ + H₂ by the H₂ also occurs. Equil. const. are calcd. from the Nernst heat theorem.

F. S. GRANGER

The cleavage of phenolsulfonic acids and the purification of phenols by the sulfonic acid separation method. HORST BRÜCKNER. Tech. Hochschule Dresden *Z. anal. Chem.* 75, 289-92(1928).—In the working up of coal tar, it is possible to obtain pure phenol and *o*-cresol from the middle fraction by using a sufficiently tall fractionating column. Some phenols, such as *m*- and *p*-cresols, cannot be sep'd. by fractionation. The best method of sepg. them is to form sulfonic acids and decompose these with steam. This method of sepg. has been carried out successfully on the large scale but for working with small quantities of substance the literature does not provide correct details. Appropriate temps. for the decompn. with steam were det'd. for *p*-phenolsulfonic acid (123-5°); 4-hydroxy-*m*-toluenesulfonic acid (133-5°); 4-hydroxy-*o*-toluenesulfonic acid (116-9°); 6-hydroxy-*m*-toluenesulfonic acid (133-6°); 4-hydroxy-2,3-xylenesulfonic acid (115-8°); 6-hydroxy-3,4-xylenesulfonic acid (107-11°); 4-hydroxy-3,5-xylenesulfonic acid (124-8°); 2-hydroxy-3,5-xylenesulfonic acid (121-5°) and 1-hydroxy-2,5-xylenesulfonic acid (115-8°). One phenol only, 3,5-xenol, was found which did not sulfonate with concd. H₂SO₄ and can be blown over with steam at a temp. below 100°. A convenient way of carrying out the sulfonation is as follows: Mix 100 g. of the phenol with an equal wt. of concd. H₂SO₄ and stir with a glass rod until no more streaking is noticeable. Heat 3 hrs. in a closet at 103-5°. Dil. carefully with 200-300 cc. of water, heat to the boiling point (103°) and introduce steam until the unsulfonated phenol is all removed. Cool and dissolve out the resin with ether. In this way a soln. of the pure, sulfonated product is obtained. To recover the phenol, evaporate off the water until the b. p. of the liquid reaches the decompn. point of the sulfonic acid in question and introduce steam at this temp. Working in this way, about 80 g. of pure *m*-cresol can be obtained from 100 g. of the 97-8% commercial product.

W. T. H.

By-product coke plant of The Steel Company of Canada at Hamilton, Ontario. J. F. SLER. *Iron & Steel Can.* 12, 40-44(1929). E. H.

Dry coke extinguisher, Sulzer system. R. W. MÜLLER. *Chem. Fabrik* 1928, 727-8.—The coke is cooled in a chamber and the heat utilized for generating low-pressure steam. J. H. MOORE

Microscopic observations on graphites and cokes. PAUL RAMDOHR. *Arch. Eisenhüttenw.* 1, 669-72(1928).—The behavior of graphite in the ore microscope is discussed, its most important optical characteristic being the extraordinary reflex pleochroism.

ism shown when an immersion system is used. As compared to other minerals, the anisotropic effect with graphite is unusually strong. By microscopic expts., properties of coke may be explained which have not been explained by Röntgenographic methods. Cokes prepd. by R. from bituminous and anthracite coals, retort graphite and tech. cokes are studied under the microscope. The cokes from bituminous coal consist principally of graphite, showing large variation in grain size; those from anthracite coal consist of 0-13% graphite and show fine grains, due to both the short time and temp. of formation. The coarse-grained crust of retort graphite is made up of the finest portions. The tech. cokes are porous throughout, the size of the graphite plates varying considerably. The membranes surrounding the pores are shown to be of graphite. Reflex pleochroism can be detected in these. Small amts. of carbohydrates are found, mostly in the larger grains. The tech. cokes show low reflecting power in air, this disappearing entirely in oil. Twenty structural photographs of the various substances are given. J. BALOZIAN

Synthetic rubber from coal (HOFMANN) 30. Determination of the S content of gases from coke ovens (HEINRICH, PETZOLD) 7. Applicability of coke-oven gas to the iron industry (BULLE) 9. Intermediate products of the combustion of CH_4 (RIESEN-FELD, GURIAN) 2. Relation between humic acids and lignin (FUCHS) 10. Gas washer (Brit. pat. 293,807) 1. Apparatus for measuring the mechanical strength of asphalt, tar, pitch, etc. (Russ. pat. 4990) 1. Purification of benzine and cracking oils (Fr. pat. 644,281) 22. Sugar from peat (Fr. pat. 644,440) 28.

CONDAMINE, CH. DE LA: *Recueil de constantes de l'office central de chauffe.* Paris: Chaleur et industrie. Reviewed in *Rev. métal.* 25, 708(1928).

Agglomeration of fuels. AURÉLE L. J. VOINCHET and ACHILLE A. LERCIU. Fr. 644,225, Apr. 25, 1927. Fuels are agglomerated with cellulose derivs. prepd. by treating cellulose with a caustic alkali and then with CS_2 or compds. forming the latter. Fr. 644,226 describes the agglomeration of fuels by means of alkali or alk. earth silicates or compds. forming these and kaolin or alk. earth hydrate.

Agglomerating powdered fuel. W. E. TRENT (to Trent Process Corp.). Brit. 293,451, July 7, 1927. In agitating wet powdered fuel with oil to agglomerate C particles and exclude ash and water, as described in Brit. 151,236 (*C. A.* 15, 592) and Brit. 183,430, agglomerates of predetd. size are formed by controlling the temp. and degree of diln. of the liquid, and continuing the agitation. The quantity of oil used exceeds 14% that of the solid fuel and the bath may be heated to about 50° . An app. is described. Cf. *C. A.* 23, 1250.

Briquetting fuels. FRANCIS M. CROSSMAN. Ger. 470,477, Sept. 29, 1925. A binder for fuel briquets is prepd. by adding a small amt. of NaNO_3 or other oxidizing agent to a soln. of starch, boiling, and then adding, in turn, sulfite cellulose lye and a heavy oil residue in considerable amts. The sulfite cellulose lye may be replaced, wholly or in part, by furfural or like products obtained by distg. corn husks.

Controlling flow of fuel oil to burners by use of an intermixture of gas such as flue gas, steam or air. CLIVE M. ALEXANDER. U. S. 1,702,373, Feb. 19. An app. is described.

Motor fuel. I. G. FARBENIND. A.-G. Fr. 643,785, Nov. 12, 1927. See Brit. 281,247 (*C. A.* 22, 3517).

Producing high temperatures by combustion of fuels such as coal, oil or gas. HERBERT A. HYMER. U. S. 1,702,731, Feb. 19. Fuel and a combustion-supporting medium such as air are introduced in explosive proportions into a mixing chamber and the mixed charge is passed longitudinally into one end of an elongated combustion chamber open at the other end and burned in the chamber while laterally confined.

Drying and grinding coal, etc. EMIL BARTHELMUSS. U. S. 1,702,333, Feb. 19. Mech. features.

Hydrogenation of coal, etc. I. G. FARBENIND. A.-G. Fr. 644,148, Nov. 18, 1927. Gaseous hydrocarbons obtained as by-products in the hydrogenation of coal, etc., are transformed in any manner into H which is used for the synthesis of NH_3 . Cf. *C. A.* 23, 265.

Hydrocarbons by destructive hydrogenation and dehydrogenation. I. G. FARBENIND. A. G. Brit. 293,887, March 10, 1927. A product contg. mainly aromatic hydrocarbons is obtained by heating, with a dehydrogenating catalyst, the liquid hydrocarbons obtained by destructive hydrogenation of carbonaceous materials or extn.

products of these hydrocarbons. As catalysts, there may be used oxides of metals of the 6th group, with or without oxides of elements of the 3rd and 4th groups, or Ag, Cu, Cr or Ni alloys, Al, Fe sponge, porous C, ZnS, Al_2O_3 , pumice, CdS, Zn chromate or Pd. Oxide catalysts are preferably preliminarily treated with H at an elevated temp. Cf. C. A. 22, 2817.

Destructive hydrogenation of coal, etc. A. POTT and H. BROCHE. Brit. 293,808, July 12, 1927. Before treatment of coal or the like with H under pressure to produce "benzines, etc.," the solid material is disintegrated with solvents such as "tetraline" or oils under pressure and preferably in stages in which the temp. of each stage is near the decompn. point of the residual material.

Destructive hydrogenation of coal, oils, etc. I. G. FARBERIND. A.-G. Brit. 293,719, Aug. 7, 1926. In processes such as are described in Brit. 275,663 (C. A. 22, 2463), catalysts are used comprising (a) elements of the 4th-8th groups of the periodic system (especially those of the 6th group), together with (b) small proportions (less than 10%) of elements of the 4th-7th groups. An example is given of the use of molybdic acid with 10% of Cr oxide for producing a high yield of "benzines" by the action of H on a mixt. of crude petroleum and alderwood charcoal at 420° under a pressure of over 200 atm. Brit. 293,720, specifies catalysts contg. elements of the 4th-8th groups or their compds. together with Cu or Au or their compds., e. g., molybdic acid and Cu Cf. C. A. 23, 503.

Hydrogenating oil together with de-ashed carbonaceous material such as coal. FRANK A. HOWARD (to Standard Oil Development Co.). U. S. 1,702,899, Feb. 19. Finely ground material such as coal is treated with a hydrocarbon oil and an aq. liquid to effect sepn. of most of the ash with the aq. liquid, and the purified carbonaceous material and assocd. oil are hydrogenated under the action of high pressure and heat with H, to produce motor fuel.

Various products from coal, lignite, shale, peat or like materials. T. D. KELLY. Brit. 293,578, July 29, 1927. See Fr. 642,310 (C. A. 23, 1249).

Transformation of coal into liquid fuel. JOSEPH BETHENOD. Fr. 643,927, April 20, 1927. Powdered coal or the gaseous products therefrom is passed in a current of H through an elec. arc, which may be established between C electrodes taking part in the reaction.

Carbonizing plant for wood or coal. G. MERTURI-MERTURI (to Carbonisation soc. generale d'exploitation des carbones). Brit. 293,321, June 30, 1927.

Treating lignite. MASCHINENFABRIK HARTMANN A.-G. Ger. 470,626, May 3, 1925. Air preheated by the vapors evolved from the drier is drawn through the lignite as it passes from the drier to the place of use.

Separating gases by liquefaction. GES. FÜR LINDE'S EISMASCHINEN A.-G. (Paul Schufftan, inventor). Ger. 470,429, July 28, 1927. The fraction first liquefied is further cooled and used to wash further constituents from the unliquefied residue. The treatment of coke-oven gas is described by way of example, together with suitable app., and it is stated also that water gas may be washed with liquid CO, a mixt. of CO and H being obtained. Cf. C. A. 22, 4678.

Purifying gases. M. AURIG and G. BRÜCKLMAYR. Brit. 293,592, Aug. 24, 1927. In sepg. H_2S and CO_2 from gases by washing with an alk. soln. the latter is regenerated by treating with an Fe compd. such as $\text{Fe}(\text{OH})_3$ to ppt. sulfide and with lime to ppt. CaCO_3 . The Fe sulfide may be treated with air to reform $\text{Fe}(\text{OH})_3$ and the process thus carried on in a continuous manner.

Purifying coal gas. FIRM OF C. STILL. Brit. 293,702, July 8, 1927. Benzoid hydrocarbons are extd. from coal gas by washing with oil contg. C_{10}H_8 in such proportion that practically no C_{10}H_8 is absorbed by the gas.

Purifying coke-oven gases or like gases. GEORGES CLAUDE (to Lazote, Inc.) U. S. 1,702,683, Feb. 19. Gases contg. H, such as coal gas or coke-oven gas, intended to be subjected to partial liquefaction, after drying and freeing from CO_2 , S compds and benzene, and before final sepn., is passed in heat exchange relation with a cooling medium in such a manner that the liquids which are successively formed are allowed to intermingle and flow towards progressively colder regions; the liquids are separately collected and withdrawn under substantially the same pressure as that of the compressed mixt. of gases and independently of the residual unliquefied portion of the gases, and are reheated by heat derived from the entering gases in order to effect further fractionation. An app. is described.

Coke-oven gas. GESKILLSCHAFT FÜR LINDE'S EISMASCHINEN A.-G. Fr. 643,839, Nov. 14, 1927. NH_3 is recovered from coke-oven gas by submitting the gas under pressure to cooling with the condensation products which it contains until these products

are nearly saturated with $(\text{NH}_4)_2\text{CO}_3$, and is, after sepn. of the condensation products, submitted to a further cooling with the introduction of a small quantity of fresh water, which flows counter to the gas. C_6H_6 and C_{10}H_8 are recovered in the second cooling. Cf. C. A. 23, 693.

Means for using the sensible heat of coke-oven or like gases for raising steam. HEINRICH GRONO. Ger. 470,551, Oct. 13, 1927.

Gas production. DESSAUER VERTIKAL-OFEN GESELLSCHAFT M. B. H. Fr. 643,965, Oct. 7, 1927. A gas mixt. contg. coal distn. gas and water gas is obtained by introducing coal into a retort exteriorly heated and into another retort also exteriorly heated or the top portion of the same retort, fuel of a lower quality (small coke), the distn. gases from the coal being caused to pass through the coke, and steam being passed into the coke when it reaches redness.

Gas producer. I. G. FARBEIND. A.-G. Brit. 293,413, April 2, 1927. The process described in Brit. 214,544 (C. A. 18, 2802) is carried out in a producer having a horizontal fuel support formed with very small vertical openings through which the gasifying agent passes upwardly into the fuel. Details of construction are described.

Gas producer. FERDINAND DEBOUCK. Fr. 644,491, Nov. 25, 1927. Construction of hearth.

Gas producers. KLAS A. WIDEGREN and EMIL H. WIDEGREN. Fr. 643,816, Nov. 14, 1927.

Gas producer using solid fuel. PAUL LAFONT. Fr. 643,867, Nov. 15, 1927.

Gas producer using peat and crude lignite. JEAN M. LARGE. Fr. 643,792, Nov. 12, 1927.

Water-gas producer for continuous gasification of granular or powdered fuels. JULIUS PINTSCH A.-G. Ger. 470,653, Aug. 20, 1927. The fuel descends a central tube in a downward current of hot gas and steam. Regenerators surround the tube and are worked alternately.

Water-gas plant. SEMET-SOLVAY ENGINEERING CORP. Brit. 293,284, March 1, 1928. The air for the blowing period is supplied by the use of a comparatively small volume of air under high pressure, and this air draws in atm. air by an injector action. Various details of construction of the plant are given.

Treating exhaust gases. CHARLES E. THOMPSON. Ger. 470,389, Sept. 6, 1925. Exhaust gases such as those from internal-combustion engines are freed from noxious gases by mixing them with an oxidizing agent and subjecting the mixt. to combustion. The combustion is initiated by an external source of heat and is maintained catalytically. Suitable app. is described.

Exhaust gases from motors. I. G. FARBEIND. A.-G. Fr. 644,146, Nov. 18, 1927. Exhaust gases from motors driven with heavy oils, such as Diesel motors, are rendered inoffensive by passing them over catalyst such as Fe, Cu, Ag or difficultly reducible metallic oxides.

Montan wax. I. G. FARBEIND. A.-G. Fr. 644,461, Nov. 25, 1927. Crude or desulfurized montan wax is purified by submitting it in soln. or suspension in the presence of electrolytes and oxidizing agents to the anodic action of an elec. current.

Tar-distillation apparatus. KOKSOFENBAU & GASVERWERTUNG A.-G. and TOBIAS F. WEICKEL. Ger. 470,419, Jan. 30, 1924. The app. is of the kind comprising two superposed vessels, of which the lower one has internal heating means and is connected with the upper by ascension and descension pipes.

Extraction of phenols from tar. GEORGES HÜBSCH and EUGÈNE KÁRPÁTI. Fr. 643,765, Nov. 10, 1927. Phenols are recovered from tar or tar oils, by mixing the tar under pressure of 1.5 to 6 atm. and at a temp. above 100° with aq. solns. of solvents for phenols, such as dil. solns. of MeOH, EtOH, Me₂O, etc., and allowing the mixt. to sep. into 2 layers while cooling and lowering the pressure.

Vertical coking oven for continuous operation. JOHANN LÜTZ. U. S. 1,702,699, Feb. 19.

Regenerative coking oven. HINSELMANN, KOKSOFENBAU G. M. B. H. Ger. 470,214, April 2, 1927. Addn. to 469,480 (C. A. 23, 1254).

Portable arrangement for opening and shutting coke-oven doors. RUDOLF WILHELM. Ger. 470,574, Jan. 24, 1926.

Drawer for coke ovens with horizontal chambers. C. OTTO & CO. G. M. B. H. Fr. 643,797, Nov. 12, 1927.

22—PETROLEUM, LUBRICANTS, ASPHALT AND WOOD PRODUCTS

F. M. ROGERS

Technical questions and manufacturing methods in the petroleum industry. MICHAEL FREUND. *Petroleum Z.* **24**, 1269-76(1928).—A brief résumé of modern refinery methods. M. B. HART

Natural and synthetic petroleum. A. V. WEINBERG. *Petroleum Z.* **25**, 147-51 (1929).—A historical review of the theories on the origin of mineral oil is given. W favors the theory of oil formation from coal, supporting it by the results obtained in berginizing and hydrogenating coal and similar products. A. A. BOEHTLINGER

Progress and research in the petroleum industry during 1927. R. KISSLING. *Petroleum Z.* **24**, 1314-8(1928); cf. *C. A.* **23**, 694. A survey of progress in refining, utilization, testing and research during 1927. M. B. HART

Hydrocarbons of Peruvian petroleum having boiling points below 150°. W. F. SEYER AND A. F. REES. Univ. of British Columbia, Can. *Trans. Roy. Soc. Can.* [3], **22**, III, 359-60(1928); cf. *C. A.* **20**, 23, 2407. —B. p., mol. wt., and d. are given for the following hydrocarbons, isolated and identified from a sample of petroleum taken from the Lobitos oil fields of Peru: C_6H_{14} 62.5-63.5, 90, 0.6683; C_7H_{16} 98.5-101.0, 106, 0.7419; C_8H_{18} 114.5-117.0, 109, 0.7526; C_9H_{20} 136.5-131.5, 124, 0.7731. J. W. S.

Desulfurizing petroleum products. A. E. DUNSTAN. Anglo-Persian Oil Co. *Oil & Gas J.* **27**, No. 30, 138-9(1928).—Gasoline having no elemental S, H_2S or mercaptans may have a high S content with no bad effects. H_2S should be removed first by soda or alkali washing in the condenser or immediately thereafter. Hypochlorite will sweeten mercaptans and lower odoriferous sulfides from 0.1 to 0.035% S. Kerosene is decolorized with 8 lbs. to the gal. of freshly roasted bauxite. The bauxite is not efficient when roasted in pure air. The Edlecanu process followed by 4-5% of bauxite is the present practice in Persia. Phys. rather than chem. means for treating petroleum products is to be preferred. An adaptation of the Claus process has been used for the desulfurization of gases contg. up to 14% H_2S . M. B. HART

Studies in the fractional distillation of crude petroleum. M. B. COOKE AND H. P. RUE. Bur. Mines, *Tech. Paper* **431**, 54 pp.(1928).—Expts with the pipe still bubble tower combination as applied to the continuous distn. of crude petroleum by the Bur. of Mines have led the authors to recommend the adoption of this type of app. because of its economy, simplicity, flexibility and effectiveness. Preliminary sepn. of the crude oil is recommended before final sepn. in the bubble tower app. D. F. BROWN

Refining cracked distillates by means of hypochlorite. STANLEY F. BIRCH AND WOODFORD S. G. P. NORRIS. Anglo-Persian Oil Co. *Refiner Natural Gasolin. Mtr* **7**, No. 7, 94, 96, 98(1928).—Expts on the action of hypochlorite solns. on petroleum solns. of pure S compds. have led to the following conclusions: H_2S is oxidized to elementary S with the simultaneous formation of a small quantity of H_2SO_4 , an org. sulfide is oxidized to a sulfone which is neutral; a mercaptan is oxidized in 2 stages, first merely to the disulfide and then to the sulfonic acid; increased alky. decreases the oxidation, desulfurization being obtained when only enough alkali is used to prevent spontaneous decompn., but sweetening should be possible when enough free alkali is present to prevent the oxidation of disulfides. The application of the hypochlorite process is analogous to refining by means of Na plumbite and elementary S. Exptl. data are given for various distillates. M. B. HART

Pipe stills in vacuum distillation. A. E. HARNSBERGER. Pure Oil Co. *Oil & Gas J.* **27**, No. 29, 116, 286(1928).—Pipe-still vacuum units have a wide application operating on a continuous basis resulting in max. efficiency and low maintenance. Principle of operation are described. M. B. HART

Edlecanu process for refining mineral oils. G. CATTANEO. *Petroleum Z.* **24**, 1634-41(1928).—A general article on the Edlecanu SO_2 process for treating mineral oils. The continuous process has several advantages over the batch process, particularly with respect to steam consumption. The process is equally applicable to the refining of lubricating oils and kerosene distillates. M. B. HART

The oil industry of the U. S. S. R. in 1927-28. V. LEONTIEV. *Mining J., Annual Review* No. 1929, 15-8.—A statistical survey of the oil industry in the different Russian oil fields is given under the following headings: total production, gusher output, output per well, gas production, amt. of oil raised by different methods, amt. and methods of drilling, exploration, fuel consumption by the industry, oil refining, sales, export and new equipment. ALDEN H. EMERY

Oil in 1928. ANON. *Mining J.*, Annual Review No. 1929, 14.—The estd. world production of oil for 1928 is 1,285,200,000 bbls. A brief statistical analysis of the sources of this oil is given. ALDEN H. EMERY

Refining of Pecos County crude oil. SIDNEY BORN. *Transcontinental Oil Co. Oil & Gas J.* 27, No. 29, 224(1928).—Crude oil from Yates pool, Pecos County, Texas, has a gravity of 29.6° Bé. and S content 1.55%. The crude oil is refined by skimming to remove 25% of 437° end-point blending naphtha, the topped crude being cracked directly to produce 45.4% cracked gasoline, 9.5% pressure distillate bottoms and 18.1% coke and gas. When recycling pressure distillate bottoms a total of 49.4% gasoline is obtained. On cracking a heavy fuel oil the following yields were obtained: blending naphtha 25, cracked gasoline 41.5, pressure distillate bottoms 3.7, Bunker "C" fuel oil 20.2 and loss 9.6%. In running to lubricants, approx. 28% gas oil is produced which can be cracked to give about 45% gasoline. The lubricant fractions are treated with acid and clay and resemble paraffin-base oils in viscosity. M. B. HART

Latent heat of vaporization of fractions from Russian crude oils. OBRVADCHIKOV. *Azerbejdjanskoye Neftyanoe Khozyaistvo* 1928, No. 8/9, 78-80. Latent heat of vaporization was detd. for various fractions of Grozny paraffinic and non-paraffinic crude oils also from Balakhanui, Binagadui and Kirmaki crude-oil fractions, by Trouton's equation and Sakhanov and Vasiliev's method. A. A. BOEHLINGK

Analyzing crude-oil emulsions. S. VUISHETRAVSKII. *Azerbejdjanskoye Neftyanoe Khozyaistvo* 1928, No. 11, 75-6. A rapid graphical method is described for the detn. of the proportion of crude oil in oil-water emulsions, where the character of the crude oil and the compn. of the oil-well water are known. On a chart a curve is constructed which indicates the sp. gr. of the crude oil and the bore hole water in various and known proportions. To det. the oil in an emulsion obtained from the same bore hole only a sp. gr. detn. is needed, the proportion being interpolated from the curve. A. A. B.

Six main causes of refinery halitosis. DAVID E. DAY. *Oil & Gas J.* 27, No. 29, 114(1928). The 6 main sources of refinery odors are fumes from acid hydrolyzers, fumes from acid precipitators, caustic wash water, vapors from lubricating oil vacuum stills, fixed vapors from oxidizing asphalt stills and fixed vapors from cracking stills. Fumes from the sludge acid hydrolyzers are collected in lead pipes and mixed with the fixed gases from the fixed vapors from the vacuum stills and asphalt stills and burned in a Dutch oven type furnace. A complete vapor recovery system at the cracking plant eliminates such gases as the dry gases are burned. Fumes from acid precipitators may be burned. Caustic wash waters are treated with hot flue gas. M. B. HART

Method of utilizing plant sludge. EUGENE P. KIEHL. *Atlantic Refg. Co. Oil & Gas J.* 27, No. 30, 139(1928). A burner and a boiler for the combustion of sludge are described. M. B. HART

Making acid sludge fit for plant fuel. L. W. BARBOUR. *Pierce Petroleum Co. Oil & Gas J.* 27, No. 29, 242, 257-8(1928). At the Pierce Petroleum Company's Sand Spring refinery acid sludge from 180-230 viscosity steam refined stock is treated by fluxing with an equal quantity of 13-15 gravity fuel oil with air or steam agitation at 180-200° F. and the product fed by gravity to injector-type burners. M. B. HART

Metal viscometers for simultaneous testing of three oils. D. HOLDE. *Tech. Hochschule, Berlin. Petroleum Z.* 24, 1412-6(1928). The development of the viscometer and comparative results obtained with a simple and triple Holde metal app. and the Engler and Vogel-Ossag app. are described. M. B. HART

Shortening of viscosity determination by the Engler and Holde viscometer. W. BLEYBERG. *Tech. Hochschule, Berlin. Petroleum Z.* 24, 1416-7(1928).—The conversion factors are given for changing Engler and Holde values for viscous oils when small samples are used. The formula for the Engler viscometer is $f = 200/v = 0.2486/[2.6617 - \log(458.9 - V)]$ and for the Holde app. $f = 100/v = 0.4470/[2.1920 - \log(155.6 - V)]$. M. B. HART

Developments in refinery technology. E. W. ISOM. *Oil & Gas J.* 27, No. 29, 137, 258-260(1928). A brief review of recent developments in atm. distn., vacuum distn., pressure cracking distn., vapor phase cracking, fractionation, treating, etc. M. B. HART

Remove sulfur from refinery gas. D. L. JACOBSON. *Koppers Co. Oil & Gas J.* 27, No. 36, 151, 169-70, 172(1929).—The Seaboard process of liquid gas purification is briefly outlined and various installations are described. M. B. HART

Sulfur content not stressed by users in many countries. G. EGLOFF. *Oil & Gas J.* 27, No. 32, 150(1928).—Evidence obtained from various sources indicates that there is no reason for setting a limit on the S content of motor fuels. Diesel fuels contg. up to 2.5% S are marketed in Europe. Engines have been run on fuels contg. 0.35%.

0.4% and 0.6% S without corrosion. There is no S specification for motor fuels in England, fuels contg. up to 0.7% S being sold. Germany also has no S specification, fuels running from 0.2 to 2.0% being used.

Accelerated protective coating tests. C. T. LANGFORD. *Oil & Gas J.* 27, No. 29, 121, 265-6(1928); Am. Petroleum Inst. *Bull.* 10, No. 2, 93-9(1929).—Report of the Am. Petroleum Inst. Comm. on Corrosion regarding accelerated tests on pipe line and interior tank coatings.

Permian corrosion problems persist. L. G. E. BIGNELL. *Oil & Gas J.* 27, No. 31, 30, 159-60, 162, 164, 166(1928).—Added costs for replacing equipment for handling high-S crude oils when it has been destroyed by corrosion are distributed as follows: lease equipment 5 cents per bbl. crude; casinghead plant 12 cents per bbl. gasoline produced; refineries 17 cents per bbl. oil treated. Various methods of combating the corrosion problem include removing the H_2S as soon as the oil is produced, the use of small diam. pipe lines, and pumping under pressure. Scale from the damaged section of a gas-gathering line has been shown to consist largely of $FeSO_4$ contg. a small quantity of $Fe_2(SO_4)_3$. Since effective protective coatings must be applied to clean surfaces it is suggested that such coatings be applied at the factory when the pipe is built. Corrosion at the bottom of the well which is probably due to FeS scale may be reduced by running a string of "Macaroni" tubing in after the tools and forcing air in.

The determination of aromatic hydrocarbons in benzines. K. R. DIETRICH. *Auto-Technik* 16, No. 12, 13-4; *Chem. Zentr.* 1927, II, 889.—The anti-knock ability of the benzines, which is especially essential for high-compression motors, depends much on the relation between the unsatd. aromatic and naphthalene hydrocarbons, and the paraffins which cause knocks. The exact detn. of the different groups was carried out according to Riesenfeld and Bandte. D. detd. the crit. soln. temp. of a ternary mixt. of 7 parts benzine and 3 parts alc.- H_2O , 96% alc. being used for the latter binary system. The soln. temp. declines with increasing content of the benzine on aromatic and unsatd. hydrocarbons; this is demonstrated in tables for a series of various benzines. The relation of this "spirit value" to the anti-knock ability of the benzines is to be further elucidated.

The determination of the aromatic hydrocarbons in benzines by means of the "spirit value." K. R. DIETRICH. *Auto-Technik* 16, No. 18, 7-9; *Chem. Zentr.* 1927, II, 2528 (cf. preceding abstr.).—The spirit value (i. e., the crit. soln. temp. of a mixt. of 7 parts by wt. of benzine and 3 parts by wt. of 96% alc.) enables one to inform himself quickly on the content in a benzine of aromatic compds., with an accuracy sufficient for the practice. The content of unsatd. hydrocarbons seldom interferes, if it remains within narrow limits as in straight-run benzines. The "spirit curve" enables one to conclude whether a benzine is rich or poor in naphthalenes. The spirit curve and the spirit value included in it give an approx. image of the compn. of the benzine. The method cannot be employed for benzines with an extraordinary high content of unsatd. compds. There is a relationship between anti-knock ability and spirit value of benzines not exceedingly rich in unsatd. substances, though it is not strictly conformable to a law.

Quality of fuel supremely important. G. G. BROWN. Univ. of Michigan. *Oil & Gas J.* 27, No. 36, 75(1929); cf. *C. A.* 23, 965.—Aviation fuel properties are discussed. The most successful aviation fuel possesses high total volatility combined with a relatively low vapor pressure and high-knock rating. The 10% point should never be below 100° F. to insure freedom from vapor lock.

Report of the vapor pressure committee of the California Natural Gasoline Association. ANON. *Petroleum World* (Los Angeles) 13, No. 12, 105-9, 130(1928).—A consistent vapor-pressure test must show the total vapor pressure of everything in the liquid including dissolved air or gas. Five testing methods, the Bur. of Explosives, Beistle-Prather, Reid, Gard and Wade-Campbell, are compared with each other and the absolute standards. The reference methods include the analysis of the liquid and calcn. of the true vapor pressure from the analysis; and the use of an extremely large bomb with a negligible vapor space.

Gas analyses in plant operation. GAS ANALYSIS COMMITTEE OF THE CALIFORNIA NATURAL GASOLINE ASSOC. *Oil & Gas J.* 27, No. 36, 151, 160, 162, 164, 166, 169(1929).—Fundamental analysis of natural gas and gasoline may be used for the accurate and absolute detn. of potential production of products from a wet gas, to det. plant and equipment efficiency. The development of analytical methods is reviewed and applications of fundamental analysis are presented. The further application of both fundamental analysis and calcn. of compn. changes is advised.

Method of natural gasoline analyses. WALTER J. PODBIELNIAK. *Oil & Gas J.* 27, No. 35, 38, 144, 146(1929).—The improved fractional distn. app. is described and the method of operation discussed in detail. M. B. HART

Dew point data on gasoline. OSCAR C. BRIDGEMAN. Bur. of Standards. *J. Soc. Automotive Eng.* 23, 478-90(1928); cf. *C. A.* 22, 3520.—The detn. of the volatility of gasoline has been extended from the 10-90% range to 100% evapd. The Sligh equil. air distn. app. has been used with 21 gasolines. For each temp. the dew-point temps. were found to be related to the 90% Am. Soc. Testing Materials distn. points by a simple ratio of abs. temps. Similar results were obtained with the Stevenson and Babor app. Corroborative evidence was obtained from measurements of the equil. soln. temps. of 5 gasolines. An equation was obtained for the ratios between the absolute temps. of the dew-points and the dew-points of the various air-fuel mixts. in terms of the mixt. ratio as the independent variable, and values computed from this equation were in good agreement with the work of other investigators. Mol. wt. detns. were made on 24 gasolines and an approx. relation to density was deduced. With mol. wt. values, the temp. ratios were expressed analytically in terms of partial pressures of the fuel in the mixts. The dew-point of any mixt. of com. gasolines can be calcd. from the 90% Am. Soc. Testing Materials distn. point. M. B. HART

Casinghead gasoline from recycled gas in Ramanui. G. SARKISYANTZ. *Azerbejdzhanskoye Neftyanoe Khozyaistvo* 1928, No. 8/9, 61-77.—Gas from gas lift wells is led through individual gas traps into cylindrical gas purifiers with baffles, and into gas driers filled with steel shavings, is then compressed to 4-5 atm., sent to another separator, to an oil-spray condenser, through gas traps to sep. the condensate, through a set of absorbers, to another trap and finally to the storage container, to be recompressed and used again in wells in a new gas lift operation. The same oil is used for all gasoline absorption operations and is finally freed from gasoline by distn. A. A. BORHTLINGK

Factors entering into the design and operation of natural gasoline absorption plants. A. J. L. HURCHINSON. Research and Equipment Co. *Petroleum World* (Los Angeles) 13, No. 8, 110-1(1928); cf. *C. A.* 22, 3769.—A brief review is given of the progress. M. B. HART

Accuracy in measuring detonation. NEIL MACCOULL. Texas Co. *Oil & Gas J.* 27, No. 29, 146, 205, 206(1928); cf. *C. A.* 22, 2658.—Mech. variables in engines which must be considered in measuring detonation are discussed with 5 diagrams. M. B. H.

Relation of anti-knock value and distillation range shown. A. L. DAVIS. Empire Oil and Refining Co. *Oil & Gas J.* 27, No. 34, 120(1929).—A graph drawn for each type of crude run shows the relation between anti-knock value, yield, gravity and distn. range of different com. end point gasolines. Directions for prepg. the graph are given in detail. M. B. HART

Study on the double bonds present in vaseline, with special reference to vaselines sed in smokeless powder. R. POGGI. *Giorn. chim. ind. applicata* 10, 601-5(1928).—no. of unsatd. substances were examd. for unsatn.; the Hanus method was used, and the results were compared with the Rosenmund method. In the latter, the reagent prep'd by dissolving separately 8 g. C_6H_5N , 10 g. H_2SO_4 (concd.) and 8 g. Br_2 , each in 20 cc. of glacial $AcOH$, mixing the first 2 carefully and then adding the third, and dilg. to 1000 cc. with $AcOH$. The product, $C_6H_5N.H_2SO_4.Br_2$, yields its Br_2 to double bonds by addn. without giving any substitution reaction. The soln. is titrated with 0.1 N As_2O_3 , methyl orange being used. A comparison of results follows:

	Br addn. calcd. %	Br % found Rosenmund	Br % found Hanus
Amylene	228	230.8	252.8
Allyl alc.	275.3	265.8	229.7
Undecylenic acid	86.9	82.9	80.1
Oleic acid	56.6	36.7	45.6
Methyheptenone	126.7	152.3	113.1
Cinnamic acid	107.9	20.7	18.5
Anethole	107.9	97.9	67.9
Safrole	98.7	96.7	34.4
Dihydrocarvone	105.0	100.8	—
Terpineol	103.7	100.2	70.9

Apparently, the Rosenmund value is much closer to the theoretical. Using this, various vaselines were examd., giving Br% addn. as follows: vaseline = 0.7, white vaseline = 8.1, oil of vaseline = 4.9, medicinal white vaseline 18.8, natural vaseline 58.1, yellow = 95.0, gray = 120.3, rubber 1225.8. A. W. CONTIERI

The physical principles of lubrication, in particular for the explosion engine. S. KYROPOULOS. *Z. tech. Physik* 10, 2-18(1929).—The basic principle of lubrication, keeping up of liquid friction instead of dry friction, is derived from the resistance of oil against its removal due to (1) viscosity, (2) molecular forces, (3) adhesion to the walls (monomol. film formation), (4) dielec. const. and mol. size of oil by their influence on the mol. forces. Viscosity and capillary const. of a lubricating oil should be low to prevent overheating. Besides the thermal condition of the engine, oil combustion, etc., the elec. condition is of importance due to elec. effects on the oil. Elec. charges in an engine may be set up by friction of the piston, exhaust gas electricity and less frequently by ignition charges. They cause self-purification of the oil, i. e., deposition of solids on the electrodes, also improved lubrication by attraction of dipoles (in dipole oils) on the rubbing faces. In road tests there were used 3 oil types, Valvoline H and XRM and a mixed oil, Castrol XL. The viscosity curves of 30 different oils between 20° and 150° were detd. (Coulombs method by damping of torsion pendulum); the friction coeff. (b from differential equation) is tabulated. The temp. dependence of the castor oil viscosity is not different from that of some other oils, contrary to current opinion; only a few mineral oils of high dielec. constant show considerable viscosity decrease between 100° and 150°. The curves of the viscosity of mixts. of mineral oils and castor oil are not in any way abnormal. For four paraffin oils the viscosity curves could be made to coincide by a shift along the t axis; their viscosity increases with the length of the chain and increases with drop in temp. faster than that of liquids like castor oil, glycerol or water. The stretched shape of the molecules is held responsible for the ability to form mol. felt-like complexes which cause high viscosity at low temps. At higher temp. this resistance disappears gradually to make place for mol. friction along the sides of the individual mols., which is approx. equal for all and independent of the chain length, thus explaining the identity in the shape of the curves. The orientational effect of these long chains accounts for their comparatively slow drop in viscosity with rising temp. It is evident that for oils with branched chains, unsatd. or asymmetric character the viscosity will drop relatively faster at high temp. (cf. Vorlander and Walter, *C. A.* 20, 539). For the study of the mol. forces the capillary const. α of numerous oils was measured in the Lenard manner (*C. A.* 18, 2827) with their d ; the data are tabulated. For castor oil α is max. (3.60 mg. per mm. at 15°), from 3.0 to 3.3 for av. oils, highest for heavy oils, lowest for short-chain paraffin oils. Less symmetric hydrocarbons have a little higher const.; the total range of the α values is only 15%. For oil mixts. (paraffin oil + castor oil) the α curve is a little above the straight line; the α - t line is largely identical and linear for all oils. The dielec. const. of oils is an expression of their dipole content; it is high for castor oil (4.65 at 18°) and low for satd. paraffins (2.2). Its detn. allows a classification of oils and is an easy means of identification for admixts. either of castor oil or of asphaltic oils. The same identification is possible by means of the $\text{KMnO}_4\text{-Na}_2\text{CO}_3$ reaction: class (a) of high dielec. const. ($D > 2.36$) and high d . (> 0.93) discolors this soln. in 4 weeks completely; class (c) of low dielec. const. ($D = 2.24$) and d around 0.88 has very little effect on the soln. As expected D drops with increasing t for castor oil by dissoen. of complexes. D of castor oil-mineral oil mixts. is slightly below linear. Slight addns. of castor oil to mineral oil will give considerable oil saving in combustion engines; this is attributed mostly to a decrease in vapor pressure of the mineral oil with consequently less oil combustion. The elec. fields occurring in an engine were studied. The elec. cond. of oils is low and increases by self-purification, thus permitting an actual elec. orientation effect of the dipole mols. and improving lubrication. The subjective test for "oiliness" test does not necessarily indicate a high castor oil content; pure mineral oil can feel just as "oily." "Oiliness," $O = \log(d\alpha\eta_{16.7}/d\eta \cdot dt)$, in which η = viscosity and t = temp.; the lubrication value of an oil is, however, not in any way directly related to O . Highly viscous oils give higher running temp. and increased oil combustion. The best temp. is obtained with medium viscosity and additional certainty of lubrication can better be obtained by admixture of dipole oil (stearic acid, castor oil) than by using heavier oil. For practical purposes when the running temp. is known an oil should be chosen which has at that temp. a friction factor b of about 0.14.

B. J. C. VAN DER HORVEN

Rapid determination of specific gravity of semi-solid bituminous substances. S. E. BERKENBLIT. *Ind. Eng. Chem., Analytical Ed.* 1, 39-40(1929).—A detailed description of the app. and procedure used for a rapid and accurate detn. of the sp. gr. of bitumens (asphalts and tar pitches). The water displacement method is used.

A. WHITE

Asphalt emulsions. E. T. LEEMANS. *Chem. Weekblad* 26, 2-6(1929).—A review

of the literature, especially patents, from 1907 to 1928. Asphalt emulsions are used for road building principally, but also for waterproofing paper, concrete, etc. The problems involved are the formation, stabilization and breaking of the emulsion. The literature covered discusses all these points and studies the effects of the properties of the asphalt and of addition agents on the qualities of the emulsions obtained. G. C.

Catalytic decomposition of turpentine. A. MAILHE. *J. usines gaz* 53, 30-2 (1929).—Catalysis with com. activated C, instead of Cu, the activity of which is soon impaired by deposited C, is affected at the same temp., namely around 600°, and gives the same products, but in different proportions. Instead of benzene and toluene, fractions from 130° to 170° predominated, from which, by nitration, etc., derivs., identified as those of *m*-xylene, *m*-methylethylbenzene and *m*-cymene, were obtained.

F. S. GRANGER

Rubber solvent gasoline (DODD) 30. Contemporary tube still (TREGUBOV) 1. Calculation of rectification columns (TREGUBOV) 1. Cholesterol as the mother substance of petroleum (SREINKOPF) 8. Solidification point and viscosity (BAADER, GRUBER) 2. Dielectrics at high voltage. II. Impregnating oils. Insulating properties of some high-tension cables (SETOH, MIYATA) 2. Asphaltite from the Philippine Islands (HODGE) 8. The waxes of industry (SANDERSON) 27. Sampling and coring in prospecting for oil and gas (CLOUD) 8. Apparatus for measuring the mechanical strength of asphalt, tar, pitch, etc. (Russ. pat. 4990) 1. Apparatus for separating oil from water, etc. (U. S. pat. 1,702,612) 1. Oil filter (U. S. pat. 1,702,489) 1. Receptacles for gasoline, etc. (U. S. pat. 1,702,631) 1. Electrical treatment of hydrocarbons and fatty oils (Ger. pat. 466,813) 4. Suppressing evaporation losses and fire hazards in storage tanks for volatile inflammable liquids (Belg. pat. 346,966) 13. Carbonizing plant for wood or coal (Brit. pat. 293,321) 21. Products from coal, lignite, shale, peat, etc. (Brit. pat. 293,578) 21. Destructive hydrogenation of coal, oils, etc. (Brit. pat. 293,719) 21.

Notice critique sur l'essai de résistance à l'altération des huiles pour transformateurs. Gand: Maison d'édition et d'impression, Anciennement A. D. Hoste, S. A. 12 pp. Reviewed in *Chimie et industrie* 20, 1010(1928).

Technische Entwicklung auf dem Gebeite der Kohlenwasserstofföle und Fette. Band I. **Leichte Kohlenwasserstofföle.** An Hand der Internationalen Patentliteratur. Edited by Fritz W. Croner and Max Naphtali. Berlin: M. Krayn.

LIDGETT, ALBERT: **Petroleum.** London, New York: Sir I. Pitman & Sons, Ltd. 3d ed., revised and enlarged. 160 pp.

Petroleum and bitumen from rocks, etc. PAUL VEROLA. Fr. 33,334, Dec. 22, 1926. Addn. to 637,619. Before the bitumen is extd. with water as in 637,619 (C. A. 22, 508) the rocks are broken in contact with an oil which can dissolve bitumen.

Fractionating tower suitable for distilling petroleum oils. WILLIAM H. BAHLEKE (to Standard Oil Co. of Ind.). U. S. 1,702,805, Feb. 19.

Combustion of hydrocarbons. JAMES L. BRESE, JR. (to Oil Devices Corp.). U. S. 1,702,929, Feb. 19. A gaseous hydrocarbon is hydroxylated while maintaining it substantially throughout at a temp. below that of active combustion, a secondary O supply is admitted to envelop the hydroxylated mixt. and the latter is then burned.

Dehydrogenating hydrocarbons. I. G. FARBENIND. A.-G. Brit. 293,906, March 10, 1927. Hydrocarbons obtained by cracking processes or those of any origin contg. cyclo-paraffins or naphthenes are dehydrogenated by use of catalysts comprising oxides of metals of the 6th group, preferably with addn. of oxides of metals of the 3rd or 4th groups or active charcoal. Temps. of 450-600° are suitable and the process may be effected with or without the presence of H, water vapor or inert gases. An example is given of the treatment of cyclohexane to produce C₆H₆.

Catalytic decomposition of hydrocarbon oils. ERIC T. HESSLE. U. S. 1,702,540, Feb. 19. The oil is directed against a counter-current stream of a hydrocarbon vapor under sufficient pressure to form a "true fog" of highly dispersed liquid oil suspended in the vapor, and this fog is passed through a decompn. catalyst such as Sn contg. some Sb to produce hydrocarbons of lower b. p. An app. is described.

Purifying hydrocarbon distillates. H. PRASS (to Gray Processes Corp.). Brit. 293,440, July 7, 1927. The material, preferably in vapor form, is passed through solid adsorptive material such as fuller's earth and the latter is revived at intervals by materially reducing the pressure applied to the effluent fluid below that applied to the entering fluid. An app. including a cracking plant is described. Cf. C. A. 23, 273.

"Cracking" hydrocarbons. JEAN F. P. DE LA RIBOISIÈRE. Fr. 644,615, Nov. 8, 1927. The vapors liberated are caused to pass through an extended zone in which the temp. is kept constant by the introduction of water or C_2H_6 . The space may be filled with Rashig or like rings.

Cracking oils. C. J. PRATT. Brit. 293,829, July 13, 1927. Heavy oils are first heated at relatively low temp. and then at higher temps. under atm. pressure and the vapors are blended and fractionated. A system of app. is described.

Cracking oils. ANGLO-PERSIAN OIL CO., LTD., E. S. L. BEALE, G. H. COXON and A. E. DUNSTAN. Brit. 293,889, March 15, 1927. Turbulence is imparted to a stream of oil flowing through a cracking coil by causing the stream to move in surges generated by a reciprocating pump. An app. is described in which the oil is pumped through a coil by a pump under a pressure of 1000 lbs. per sq. in., the temp. being gradually increased from 380° to 450° and then lowered to 400° and the products finally passed through a cooler at 250° .

Vertical retort and associated apparatus for distillation and depolymerization of liquid or liquefiable hydrocarbons. ADOLPHE A. F. M. SEIGLE. U. S. 1,702,275, Feb. 19.

Apparatus for distilling and cracking oils, tars, etc. R. FEIGE (to Kohlenveredlung A.-G.). Brit. 293,430, July 6, 1927. Material to be distd. or cracked is fed onto rotating disks mounted on a vertical shaft and spaced between fixed baffle plates. Hydrogenating gases and catalysts also may be used in connection with the process and various structural details are described.

Rotating still for continuous distillation of bitumen and hydrocarbons contained in sand and sandstone. AUGUSTE DRIEZ. Fr. 641,543, July 20, 1926.

Purification of benzine and cracking oils. COMPAGNIE GÉNÉRALE INDUSTRIELLE. Fr. 644,281, May 3, 1927. Benzine from the pyrogenation of coal or middle oils from tar, or "cracking" oils from petroleum, etc., are purified from substances forming gums when they are used as motor fuel, by the action of H in the presence of a metal catalyst such as Ni kept in suspension in the liquid by agitation. The temp. is kept at about 80° at first and afterwards increased to 180° .

Refining mineral oils with acid. ALEXANDER S. RAMAGE (to Gyro Process Co.) U. S. 1,702,313, Feb. 19. A mixt. of measured quantities of oil and acid is delivered into the lower portion of a slowly moving body of material from which the sludge is allowed to settle out; the clear acid oil overflows into contact with a NaOH soln and is agitated with the latter and the mixt. thus produced is delivered into the lower portion of a slowly moving body of material, and this is allowed similarly to overflow and wash. An arrangement of app. is described.

Treatment of acid sludges from the refining of mineral oils. J. CORNER. Belg. 347,671, Jan. 31, 1928. Small portions of the sludge are distd., in a closed chamber, at progressively increasing temps. The treatment is carried out in a continuous cycle. The distd. gases are passed through a scrubber, and the SO_2 is liquefied. The pitch can be used for the production of illuminating gas and of a pure coke.

Oil filter (suitable for use with internal-combustion engines). STEVE KRALJEVICH. U. S. 1,702,348, Feb. 19.

Oxidation products of paraffin wax, etc. I. G. FARBENIND. A.-G. (Wilhelm Pungs, inventor). Ger. 467,930, Aug. 30, 1922. The oxygenated products obtained by oxidizing solid hydrocarbons, e. g., paraffin wax, with gaseous oxidants are sep'd from unaltered hydrocarbon by careful warming so that the oxidation products sep. in liquid form from the solid hydrocarbon. An example is given.

Filter for lubricating oil (suitable for use with internal-combustion engines). J. W. JONES and C. W. MCKINLEY (to General Motors Corp.). Brit. 293,745, July 11, 1927.

"Self-lubricating" material for bearings. FRED K. BEZZENBERGER (to Cleveland Graphite Bronze Co.). U. S. 1,702,927, Feb. 19. A soln. of a salt of a bearing metal such as $CuSO_4$, also contg. a small quantity of a finely divided lubricant such as graphite is treated with an elec. current to effect deposition of the bearing metal and lubricant together in a uniform deposit.

Artificial asphalt. GEORGES HÜBSCH and EUGÈNE KÁRPÁTI. Fr. 643,766, Nov. 10, 1927. Substances resembling asphalt, bitumen and pitch are prepd. by the action of phenols on cellulosic or ligneous substances, particularly sawdust. An acid such as HCl or H_2SO_4 may be added to hasten the reaction. The app. usually employed for making artificial resins may be used.

23—CELLULOSE AND PAPER

CARLETON E. CURRAN

Fire hazard in plants producing celluloid and celluloid articles and fire extinguishing systems. A. BAHL. *Kunststoffe* 18, 174(1928).—There are set forth factors which tend to accentuate the fire hazard inevitably existent in the mfg. plants producing celluloid and celluloid articles. Fire-combating systems, both valve operated and automatically operated, for combating fires are described. These systems are in the nature of sprinkler systems, and are situated at strategic points. The automatic systems are set in operation through the action of the heat of the fire. These automatic systems have the advantage of localizing the water spray, thereby reducing the extent of water damage, a disadvantage which is attendant upon valve-operated systems unless these be specially constructed. The author also points out the fact that hand extinguishers are widely employed and that the use of froth-producing extinguishers is increasing. B. HAMILTON

Equipment for burning wood waste. H. A. HATFIELD. *Pulp Paper Mag. Can.* 27, 3 8(1928); cf. *C. A.* 23, 951.—A description of some of the modern equipment available for the cleaning of wood and for the prepn. and burning of wastes in pulp and paper mills. A. PAPINEAU-COUTURE

Recovery of the precipitant in the manufacture of viscose. A. HILLRINGHAUS. *Silk J.* 5, No. 51, 57(1928).—A plant for the recovery of Na_2SO_4 is described. C. E. M.

Making rayon from cellulose acetate. JOSEPH ROSSMAN. *Rayon* 7, No. 10, 20 1, 37, No. 11, 16–18(1928).—A review of the U. S. patent literature upon the spinning of cellulose acetate into rayon. CHAS. E. MULLIN

Treatment of industrial wastes from paper mills (FALES) 14. Velocity of the acid hydrolysis of cotton cellulose by HCl, alone and in the presence of alkali chlorides (HUNTER) 2. Relation between atmospheric humidity and breaking strengths and extensibilities of [brown paper] before and after weathering (TURNER) 25. Relation between humic acids and lignin (FUCHS) 10. Apparatus for preparing carbon paper, color pastes, etc. (U. S. pat. 1,702,380) 1. Lixivating apparatus (Fr. pat. 643,883) 1. Food material from grasses, reeds, etc. (Brit. pat. 293,779) 12.

ROMMEL, GEORGE MCC.: **Farm Products in Industry.** New York: Rae D. Henkle Co., Inc. 318 pp. \$3.50; also special limited ed., \$7.50. Reviewed in *Ind. Eng. Chem.* 21, 292(1929).

WEST, CLARENCE J.: **Reading List on Papermaking Materials.** 2nd ed., revised. New York: Lockwood Trade J. Co. 239 pp. \$3. Reviewed in *Ind. Eng. Chem.* 21, 195(1929).

WEST, CLARENCE J. **Bibliography of Pulp and Paper Making, 1900–1928.** New York: Lockwood Trade J. Co., 1929. 982 pp. \$10.

Cellulose esters of higher fatty acids. I. G. FARBENIND. A.-G. Fr. 644,480, Nov. 25, 1927. Chlorides of higher fatty acids in the presence of pyridine, quinoline or the like are caused to react on cellulose not previously treated at a temp. above 100° till the desired soly. of the cellulose ester is reached. In examples, pyridine and cellulose are added to stearyl chloride and xylene and heated to $135\text{--}140^\circ$. A sol. distearate of cellulose is obtained by pptn. in alc. A dilaurate sol. in aromatic hydrocarbons and in chlorinated aliphatic hydrocarbons is obtained in a similar manner. Cf. *C. A.* 23, 1504

Coloring cellulose esters such as nitrocellulose. I. G. FARBENIND. A.-G. Brit. 293,485, April 8, 1927. The process described in Brit. 247,288 (*C. A.* 21, 649) is modified by the incorporation of large quantities of coloring substances (suitably 25% or more) with compns. of cellulose esters or ethers. Examples are given of nitrocellulose compns.

Plasticizers for cellulose esters. PATHÉ CINÉMA (ANCIENS ÉTABLISSEMENTS PATHÉ FRÈRES). Fr. 643,884, Apr. 18, 1927. A plasticizer for cellulose esters or ethers is composed of a mixt. of triphenylphosphate 12–18, and tricresylphosphate 15–19 parts, preferably 15 of the first to 12 of the second.

Plasticizing cellulose esters and ethers. HANDS and SPICERS, LTD. Brit. 294,008, Aug. 27, 1927. Diphenylmonocresyl- and monophenyldicresyl-phosphate are used as plasticizers with compns. contg. cellulose acetate or other cellulose esters or ethers, in making films, artificial silk, or other products.

Carbohydrate esters. I. G. FARBENIND. A.-G. Brit. 293,757, July 11, 1927. Air is removed from cellulose, starch or other carbohydrates before esterification by treatment as described in Brit. 293,316 (cf. following abstract) with a gas or vapor which is absorbed by the acylating liquid. A vacuum is also preferably employed and among the gases and vapors which may be used are: pyridine, NH_3 , CH_3O , HOAc and H_2O vapor. Examples are given of the treatment of linters with H_2O vapor before nitration and of cellulose pulp with NH_3 before acetylation.

Carbohydrate esters and ethers. I. G. FARBENIND. A.-G. Brit. 293,316, June 30, 1927. In forming esters and ethers, such as those of cellulose or starch, the carbohydrate is first converted into alkali carbohydrate with exclusion of air as by use of a gas or vapor which reacts with the alkali used, such as CO_2 , formic acid, HOAc or CH_3O . Removal of the air may also be assisted by a vacuum. An example is given of the treatment of cellulose in a vacuum chamber with CO_2 and acetaldehyde vapor, and then with NaOH soln. before etherification.

Cellulose acetates. H. J. MALLABAR and NON-INFLAMMABLE FILM Co., Ltd. Brit. 293,724, April 6, 1927. ZnCl_2 and HCl are used for acetylation and, by the addn of small quantities of HCl when using ZnCl_2 as condensing agent, the acetylation may be carried out without heating. The acetate produced may be rendered sol. in acetone by treatment, after pptn., with dil. inorg. acids and heating.

Cellulose acetate compositions. GUSTAV LEYSIEFFER. Ger. 470,579, Nov. 4, 1924. Hard elastic masses are prepd. from cellulose acetate without the addn of fillers by using acetate previously softened with water and incorporating it with a plastifier. In the example, a mixt. of cellulose acetate, water and triacetin is kneaded and then rolled hot.

Decorative sheet material comprising nitrocellulose or cellulose acetate. Soc. DES BREVETS J. PAISSEAU. Brit. 293,391, July 5, 1927. A sheet such as celluloid or cellulose acetate compn. is treated with a cold compn. comprising a volatile solvent such as Et lactate, MeOH and EtOAc , which will cause the compn. to adhere to the sheet and which may also contain pigments and material such as nitrocellulose or cellulose acetate corresponding to the material of which the sheet to be decorated is composed.

Nitrocellulose. J. B. WISEL (to Hercules Powder Co.). Brit. 293,291, July 1, 1927. Nitrocellulose is dehydrated by percolation with secondary butyl alc., and excess alc. is removed by centrifuging or pressing, leaving 20-40% of the alc. in the mass.

Residual oils in cellulose manufacture. OEL UND FETT-CHEMIE G. M B H. Fr. 643,853, Nov. 15, 1927. The oils are sepd. into their 2 principal constituents of fatty acids and resin acids by distn. under a high vacuum (4 mm.) until the resin acids begin to distil.

Decorating celluloid with opaque colored lacquers, etc. JAMES S. MOTTER (to O'Neil Duro Co.). U. S. 1,702,663, Feb. 19.

Viscose. CHEMISCHE FABRIK POTT & CO. Fr. 644,514, Nov. 26, 1927. Aromatic sulfonic acids are added at one or more phases of the manuf. of viscose, preferably during the manuf. of the alk. cellulose. Salts of di- or tri-sulfonic acids of C_{10}H_8 alkylated in the ring or of hydroaromatic compds. of the anthracene or phenanthrene series may be used.

Desulfurizing artificial silk or other products made from viscose. I. G. FARBENIND. A.-G. Brit. 293,833, July 13, 1927. Desulfurization is effected by the use of a soln. contg. impurities extd. from crude viscose, e. g., there may be used a soln. formed by treating the crude viscose with aq. MeOH .

Artificial silk, etc. JACQUES M. BERNARD. Fr. 33,357, April 13, 1927. Addn. to 631,721. The process of 631,721 in which cellulose is treated in a closed rotating cylinder with CS_2 and NaOH soln. is afterward added and the CS_2 recovered under vacuum is applied to celluloses previously treated with soda and washed. Cf. C. A. 22, 1854.

Artificial silk. SOCIÉTÉ POUR LA FABRIKATION DE LA SOIE RHODIASETA. Fr. 33,364, Apr. 14, 1927. Addn. to 598,081. In the manuf. of artificial filaments by dry spinning solns. of cellulose derivs. in an atm. rich in the solvent vapors, a gaseous exchange is effected between the atm. of a heated cell in which spinning takes place and a cooled condenser where the solvent condenses by a single large opening, the condenser being connected to the cell by this opening. Cf. C. A. 22, 1474.

Artificial silk, films, etc. I. G. FARBENIND. A.-G. Brit. 293,350, July 4, 1927. The strength and elasticity of artificial silk, films or other articles made from viscose or from solns. of cellulose esters or ethers are increased by incorporating in the soln. used or in the finished product a cementing substance, such as linseed oil, or a synthetic resin, or reactive substances such as $(\text{CH}_3)_2\text{N}_2$ and urea. A bright yellow film suitable for use as a filter in photography may be formed from cellulose ethyl ether to which is added

the aldehyde resin produced from acetaldehyde and NaOH soln. (after washing with water and dil. HOAc soln.).

Artificial threads, films, etc. COURTAULDS LIMITED. Fr. 644,485, Nov. 25, 1927. Threads, films, etc., of cellulose or compds. thereof contg. one or more finely divided solids or liquids equally distributed therein are obtained by filtering and eliminating air from the spinning soln., adding more of the solid or liquid, mixing without introduction of air and spinning the soln. obtained.

Spinning bowls for artificial silk. NAAMLooZE VENNOOTSCHAP NEDERLANDSCHE KUNSTZIJDEFABRIEK (to J. C. Hensing). Brit. 293,871, July 15, 1927. The bowl shell is made of drawn Al so that an ebonite covering is not necessary and the foot may be made of an acid-resisting alloy such as an alloy of Al and Si. Various structural features are described.

Spinning nozzles; filtering. CHARLES L. WALKER. Fr. 644,453, Nov. 24, 1927. Spinning nozzles for artificial silk are made of pierced disks of precious metal, such as Pt, fixed in a support across an opening made in the support. The necessary parallel little holes in the disks may be made by putting a relatively sol. metal in holes made in a metal such as Pt and drawing, putting the drawn metal in holes made in another piece of Pt and again drawing, which operation may be repeated. When the desired fineness is reached, the drawn metal is cut into disks and the relatively sol. metal is dissolved out chemically. The method may also be used for making a filter with microscopic holes for sepg. a solid in suspension from a liquid.

Apparatus for supplying regulated quantities of artificial-silk-spinning-solution to spinning jets, etc. BRITISH CELANESE, LTD., and E. KINSELLA. Brit. 293,325, Dec. 23, 1926.

Use of "sintered glass" for filtering solutions used for making artificial silk. H. KINDERMANN. Brit. 293,816, April 12, 1927. A filtering disk may be used of varying permeability in different portions. A filtering device is described.

Die for making artificial filaments by extrusion of cellulose ester or other solutions, etc. R. A. J. THENOZ and H. L. BARTHELEMY (to Ruth-Aldo Co.). Brit. 293,416, July 6, 1927. The die is provided with a conduit for circulation of a temp.-controlling fluid. Structural details are described.

Apparatus for spinning artificial-silk. HARBENS (VISCOSE SILK MANUFACTURERS) LTD., and W. E. SHARPLES. Brit. 293,596, Sept. 3, 1927. Structural features.

Apparatus for making artificial-silk filaments by the stretch-spinning process. BRYSLKA, LTD., and F. W. SCHUBERT. Brit. 293,977, July 15, 1927. The spinning vessel contg. the coagulating liquor or the superposed coagulating liquors is provided with a volute taper funnel through which the thread passes, and the suction thus created draws in liquor as required.

Apparatus (with an adjustable orifice) for making artificial-silk filaments by the dry spinning process. M. KLEIN (to Ruth-Aldo Co.). Brit. 293,424, July 6, 1927.

Rayon-filament manufacture. ISAAC B. MERRIMAN (to Manville Jenckes Co.). U. S. 1,702,837, Feb. 19. Mech. features.

Treating residual liquor from sulfite-pulp manufacture. LINN BRADLEY and EDWARD P. MCKEEFE (to Bradley-McKeeffe Corp.). U. S. 1,702,586, Feb. 19. Liquor from cooking pulp with Na sulfite with or without the use of NaOH is evapd. to dryness and calcined to drive off S compds. The residue left is high in Na_2CO_3 and also contains Na_2SO_3 ; it may be leached and sulfited. U. S. 1,702,587 specifies calcining under conditions which avoid oxidation or reduction of the Na_2SO_3 . U. S. 1,702,588 specifies producing carbonate from the sulfite in the evapn. and calcination. U. S. 1,702,589 specifies producing caustic alkali by calcining the evapd. liquor, heating the residue in an elec. furnace to produce a product contg. alkali metal carbide and treating this product with water.

Pulp-wood digester. REX W. HOVEY. U. S. 1,702,347, Feb. 19. Structural

Roll construction for "ref. engines" for treating paper pulp. FRANK G. FEELEY (to E. D. Jones & Sons, Co.). U. S. 1,702,633, Feb. 19.

Suction box for pulp and paper machines. GEORGE J. MANSON. U. S. 1,703,010, Feb. 19.

Paper drying apparatus. WILLIAM A. LORENZ (to Otaka Fabric Co.). U. S. 1,702,907, Feb. 19.

Carbon paper for manifolding. LAURENCE E. LENTZ (to Elliott-Fisher Co.). U. S. 1,702,834, Feb. 19. In a manifolding assembly, sheets are used, the C coatings of which are of graduated relative hardness so that the transferring capacity increases relatively through the assembly.

Wrapping paper. ÉTABLISSEMENTS A. POLL & CIE. Belg. 347,099, Jan. 31, 1928. Certain portions of the surface of the paper are waterproofed by means of paraffin, or otherwise, while other portions are not waterproofed so as to allow certain ventilation of the wrapped goods.

Fixing metallic sheets on paper, etc. ALUMINIUM-WALZWERKE SINGEN, LAUBER NEHER Co. G. M. B. H. Fr. 644,333, Nov. 22, 1927. Metallic sheets are fixed on paper or other support by a glue or adhesive insol. in water and not softening with heat, and which requires no evapn. of a solvent, or admission of air, or lowering of temp. in order to harden. Solns. of cellulose esters, of resin or rubber, of metallic soaps or bakelite varnishes may be used. Cf. C. A. 22, 2057.

24—EXPLOSIVES AND EXPLOSIONS

C. E. MUNROE

The explosives industry in the years 1924-1927. ALFRED STETTbacher. *Chem. Ztg.* 53, No. 11, *Fortschrittsber.* No. 1, 1-32(1929). E. H.

Developments in the explosives industry in England and Italy in 1926. JOHN WEIR. *Z. ges. Schiess-Sprengstoffw.* 23, 78-9(1928).—In England, PbN_3 is becoming a serious competitor with $Hg(ONC)_2$ in detonators. This explosive must be loaded in Al shells instead of the usual Cu ones. Such detonators have, therefore, been forbidden in fiery mines, as the Al increases the probability of gas ignition. Ethylene glycol dinitrate is being rapidly introduced in low-freezing dynamites as a partial substitute for nitroglycerin, instead of nitro substitution compds., etc. Considerable work is being done in the development of *flashless, non-hygroscopic smokeless powders*. TNT with setting point of 80.5-80.6° is now being produced without the use of a volatile solvent. FRANCO GROTANELLI. *Ibid* 79-80.—In Italy, blasting explosives in which surplus war explosives are utilized are largely employed for agricultural purposes. C. G. STORM

Explosibility of suspensions of soap dust in air. DAVID F. SMITH AND F. A. HARTGEN. *Bur. Mines, Repts. of Investigations* No. 2905, 3 pp.(1928).—Mixts. of quite pure soap dust with air when tested in Clement-Frazier app. devised for detg. the explosibility of mixts. of coal dust with air, and by it the soap suspensions, were shown not only to be explosive but notwithstanding that the particles of the soap were much larger than the coal, the soap suspension gave the higher pressures, indicating a greater violence than the coal. Suspensions of this soap dust become dangerous when the concn. of soap dust is greater than about 0.1 g. of dust per l. C. E. M.

Double bonds present in vaselines used in smokeless powder (POGGI) 22. Device for C and H analysis of explosive organic liquids (SEVAG) 1.

Explosive mixtures. OSKAR MATTER. Fr. 644,505, Nov. 26, 1927. An explosive mixt. contains pentaerythritol tetranitrate and trinitrotoluene and (or) tetrametromethyl-aniline, *e. g.*, 80 parts of the 1st with 20 of the 2nd or 3rd.

Blasting fuses. J. FRITZSCHE. Brit. 293,478, April 6, 1927. Fuses which are tarred or otherwise impregnated with an adhesive material are externally coated with a protective layer of opaque finely divided pigment such as Al or bronze powder, red lead, hydrated Fe oxide, ultramarine, zinc white, graphite and talcum. Brit. 293,479 relates to drying fuses with hot air, etc.

Smokeless powder. EUGÈNE BAZYLEWICZ-KNIAZYKOWSKI and CASIMIR PARTYKA. Fr. 643,857, Nov. 15, 1927. Smokeless sporting and gun powder is made in the ordinary machines used for making carbine powder by degelatinizing the threads of powder immediately after leaving the press by means of water or steam.

25—DYES AND TEXTILE CHEMISTRY

L. A. OLNEY

Dyes and their application: Recent technical progress—technical developments in 1928. L. J. HOOLEY. *Chem. Age* (London) 20; *Dyestuffs Monthly Supplement* 3-5, 14-15(1929). E. H.

The German dye industry. FRITZ MAYER. *Chem.-Ztg.* 53, 4(1929). E. C. M.

Textbooks on dyeing. C. B. HOUGH. *Dyer, Calico Printer* 59, 74-5, 106-7, 120 1, 148-9, 161(1928).—Discussing the need of authoritative books on dyeing and the subjects they should cover. CHAS. E. MULLIN

Present and possible future applications of electricity to jig dyeing. RAFFAELE SANSONE. *Textile World* 75, 487-91, 1413-7(1929). RUBY K. WORNER

The fastness to sulfur dioxide of fabric dyed with azo dyestuffs. A. T. KING. *Wool Record* 34, 1053-5; *Dyer, Calico Printer* 60, 192-3; *Textile Recorder* 46, No. 548, 83 5(1928).—See C. A. 23, 986. RUBY K. WORNER

Fastness properties of wool dyestuffs. J. STEPHEN HEUTHWAITE. *Can. Colorist Textile Processor* 8, 154-6(1928); cf. C. A. 23, 518.—General. CHAS. E. MULLIN

Defects in dyeing woolen tweeds. GEO. RICE. *Can. Colorist Textile Processor* 8, 158(1928).—General. CHAS. E. MULLIN

Recent developments in dyeing, printing and finishing the rayons. CHAS. E. MULLIN. *Textile School of Clemson College. Rayon* 8, No. 1, 20, 58-61(1929).—A review and discussion of the recent developments in rayon oils and their removal, *ph* in scouring and dyeing, special rayon dyes, and the dyeing of two-shade or two-color effects on all viscose piece goods, special effects on acetate silk, tin-weighted acetate silk, embossed effects, rubberized celanese, metallized effects, mercerization in the presence of viscose or acetate silks, and the Richard "denierometer." C. E. M

Effects of tension on the dyeing of viscose and cellulose acetate silks. VISKEX. *Silk J* 5, No. 52, 59-60(1928).—While viscose yarn stretched prior to dyeing, or under tension during the dyeing, tends to give lighter shades than the unstretched yarn with most dyestuffs, acetate silk does not show nearly as much difference in shade, with and without tension, as the viscose silk. This may to some extent explain the preference of knitters for acetate silk. Certain dyestuffs, particularly those recommended by Whittaker, give more level colors on combinations of stretched and unstretched viscose than the ordinary dyestuffs. CHAS. E. MULLIN

Dyeing mixtures of natural silk and viscose. WM. BENNETT. *Silk J.* 4, No. 46, 45(1928), cf. C. A. 23, 281.—Two-color and solid effects are discussed. C. E. M.

Care of the iron bath in silk dyeing. FRED. GROVE-PALMER. *Can. Colorist Textile Processor* 8, 124-6(1928); cf. C. A. 22, 2469.—The use of Fe baths in silk dyeing is discussed. CHAS. E. MULLIN

Dyeing silk piece-goods with acid colors. G. RUDOLPH. *Silk J.* 5, No. 55, 52-3(1928).—General, with suggestions as to dyestuffs. CHAS. E. MULLIN

Printing of cellulose acetates (acetate silks). WM. BENNETT. *Silk J.* 5, No. 50, 59 60(1928).—Formulas are given for printing with the direct, S. R. A., Setacyl, Iona-mme, Duranol and vat dyestuffs on acetate silk. CHAS. E. MULLIN

The effect of printing, discharging and stripping agents on muslin. IV. The destruction of wool by the hyposulfite group. H. UDAKA. *J. Soc. Chem. Ind. (Japan)* 31, Suppl. Binding 107-8B(1928); cf. C. A. 23, 519.—The effects of various decompn. products of the S_2O_4 group and Zn salts were examined. $ZnSO_4$, $Na_2S_2O_3$, and $NaHSO_4$ had little influence on wool fiber; $NaHSO_4$ had a more serious influence. Allworden's reaction was observed by treating S Wool fibers with H_2SO_4 ; U. considers that this reaction is caused by the hydrolysis of wool protein. Y. TOMODA

The ionic theory and its applications. F. H. CAMPBELL. *Textile J. of Australia* 3, 24, 87 8, 153-4, 219-20, 278-9, 342(1928).—An elementary discussion of the theory of ionization and its applications in the softening of water, theory of dyeing, prepn. of salt-free water and waterproofing of woollens. CHAS. E. MULLIN

Review of outstanding American textile machinery developments of 1928. EDWIN D. FOWLE. *Textile World* 75, 1287-9, 1315(1929). RUBY K. WORNER

Relation between atmospheric humidity and breaking strengths and extensibilities of textile fabrics before and after weathering. A. J. TURNER. *J. Text. Inst.* 19, 101-68T(1928).—Doped and undoped flax and cotton fabrics, ramie and jute fabrics, brown paper, cotton sheet, cellulose acetate film and pigmented nitrocellulose varnish film were tested in an Avery machine at various relative humidities from 30% to satn., before and after weathering for different periods. The warp of cotton fabrics is more affected by humidity changes than the woof, and so are coarser than fine fabrics, while mercerized cotton fabrics are less sensitive to such changes than unmercerized. Phys. difference...

...in terms of the strength at 70% R. H.), but chem. treatments, such as the mercerization of cotton or the cuprammonium or bitumen proofing of flax fabrics, cause considerable changes in this factor. The effect of doping depends largely on the ex-

tensibility of the material treated, while the effect of humidity on doped fabric corresponds roughly to the sum of its sep. effects on the fabric and on the dope. The humidity-strength coeffs. of all classes of fabrics are greatly changed as a result of weathering, the strength and extensibility of the weathered fabric decreasing with increasing humidity.

What constitutes good fulling practice. A. W. DAVIDSON. *Can. Colorist Textil. Processor* 8, 92-4(1928).—Perfect results cannot be obtained on faulty fabrics.

CHAS. E. MULLIN

Studies in flax retting. I. Aerobic spore-bearing bacteria isolated from retted flax fiber. ANTOINETTE TREVETHICK, B. B. ROBINSON AND R. M. SNYDER. Mich. Agr. Expt. Sta., *Tech. Bull.* 95, 1-26(1928).—The predominating organisms found on flax fiber were Gram-positive, sporulating rods. Some coccus forms were also present. The subtilis, mycoides and mesentericus-like organisms predominated. All attack the common carbohydrates and may attack starch as well. Clostridium-shaped bacteria similar to *Cl. butyricum* were considered the principal flax retters. II. Pure-culture flax retting. *Ibid* 24-37.—Retting is defined as a biol. process by which the pectic substance or binding material in the flax straw is dissolved or removed from the fiber bundles, thus permitting the sepn. of the fiber bundles from the rest of the flax stem. Flax straw was sterilized by heating for 3 hrs. on 3 successive days in hot air at 145-160°. By means of pure-culture tests, 3 organisms of the mesentericus-megatherium group were found to ret flax. It is not commercially feasible to heat or sterilize flax straw for retting because the fibers become harsh and discolored, and the natural retting bacteria are destroyed. Molds discolor the fiber and cling tenaciously to them. Molds may be controlled by complete submersion of the flax. The optimum retting temp. is 30°. Org. substances, coloring matter and the by-products from a previous ret should be removed to prevent retarding the next ret and discoloring the fiber. The retted straw should be thoroughly washed before drying. III. Acidity in retting flax. *Ibid* 38-49.—The work shows that the acidity which develops in a ret plays an important role. Numerous H-ion tests prove that the retting of flax in H₂O proceeds faster at neutrality than in an acid or an alk. medium. The speed of the retting depends upon the temp. and with high temp., 25° or more, the difference in time between retting at p_H 7 and p_H 5 or a p_H 10 might be only a few hrs. but at 22° retting at p_H 7 will be several days faster. This acceleration in speed of retting would make it practical in medium warm H₂O rets to control the p_H of the retting soln. especially if the retting H₂O was free of mineral salts. If the retting H₂O contains mineral salts in soln., they will tend to prevent the p_H from going low. The quality of the fiber of a p_H 7 ret was better, or, in no case poorer, than the fiber from more acid or alk. rets. Retting with buffers requires a smaller addn. of alkali and gives a faster ret than without the buffer. The fiber from the rets where the buffer was added was considerably stronger for the same degree of retting. The passing of air through a retting soln. keeps the acidity from becoming very low. Rets conducted in this manner showed a slightly higher % of fiber than the stagnant-water retting but this may have been due to lack of the same degree of retting. Retting done where the H₂O circulates tends to become acid unless the addn. of fresh water is sufficient to replace the old H₂O at least once in 6 hrs. This makes the entire control of acidity impracticable. However, the replacing of the old H₂O once in 24 hrs. is better than every 6 hrs. as it produces a fiber that indicates better quality, but one which hackles a smaller % of line fiber. A bibliography of 34 references is appended.

C. R. F.

Finding width in reed and length of warp for woolen and worsted fabric. A. S. MARK. *Textile World* 75, 1407-11(1929).—These can be determined quickly with a nomographic chart.

RUBY K. WORNER

Customs classification of woolen and worsted yarns and fabrics. EBER MIDGLEY. Technical College, Bradford. *Wool Record* 35, 227-31(1929).

RUBY K. WORNER

Oils for wool. CHAS. E. MULLIN. Clemson College Textile School. *Textile Colorist* 50, 670-3(1929); cf. C. A. 23, 1275.—The following subjects are discussed: the oils used on wool, their properties, blending and emulsification for application to the wool; the surface area of the wool fiber and its effects upon changes in the oil on the fiber; heating and ignition on the fiber; oxidation of olive oils on heating and the temp. rise of wool oils; catalysts and stabilizers; hygroscopic properties of oils and soaps; scouring properties of the oils and their removal from the goods; emulsifying bases and the p_H of emulsions; p_H in scouring, and a review of the patents and literature.

CHAS. E. MULLIN

Process for distinguishing between viscose and Schreiber and W. A. Hamm. *Melliand Textilber.* 9,

rayon. W. T.

ation of

impurities in viscose rayon such as Na thiocarbonate, alkali sulfides and similar S compounds, which liberate H_2S , distinguishes viscose rayon from cuprammonium. For detecting a small quantity of H_2S , an app. has been devised which consists of a round-bottom flask, the mouth of which is covered with a piece of filter paper moistened with 10% $Pb(C_2H_3O_2)_2$ soln. This "diaphragm" is held firmly in place by a glass with a flange similar to the mouth of the flask, to which it is fastened with rubber bands. An illustration of the device is given. Five g. of unknown rayon with 100 cc. distd. water and 3 cc. concd. H_2SO_4 are placed in the app. and heated on the water bath for 4 hrs. Darkening of the paper shows the presence of viscose rayon. Attempts to detect it by the liberation of CS_2 from the impurities were successful in only a few cases.

RUBY K. WORNER

Distinguishing between viscose and cuprammonium rayon. ISMAR GINSBERG. *Textile Colorist* 51, 107-9(1929); cf. preceding abstr.

RUBY K. WORNER

Quality characteristics of viscose artificial silk. VISKEX. *Silk J.* 5, No. 51, 58-9(1928).—A brief discussion of a few of the many factors in manufg. which affect the quality of viscose silk.

CHAS. MULLIN

Increasing the tensile strength of artificial silk. S. R. TROTMAN. *Silk J.* 5, No. 53, 68-9(1928).—A review of the patents covering the various methods of increasing the tensile strength of rayon.

CHAS. E. MULLIN

Mercerization of materials containing artificial silk. VISKEX. *Silk J.* 5, No. 55, 61-3(1928).—A review and discussion of the patents covering the mercerization of cotton in the presence of the rayons.

CHAS. E. MULLIN

A rapid and practical method for preparing cross sections of rayon. EDWARD R. SCHWARZ. *Textile World* 75, 1171-2(1929).—A short piece of rayon yarn tied securely at each end is dipped into a test tube containing paraffin just at the cloudy stage, and then cooled in ice water. The process is repeated until a small paraffin candle of suitable diam. is built up. Cross-sections for routine purposes may be cut with a razor blade and fixed on a glass slide by warming the slide just enough to soften the paraffin without melting it.

RUBY K. WORNER

Effects of alkali in the boiling-off of silk. ANON. *Silk J.* 5, No. 51, 49(1928).—A ple is given showing that on boiling-off a $19/20$ denier Italian organzine silk in a soap th at 90° , the elasticity is reduced when more than 0.12% of free NaOH is present, ile the strength is impaired with more than 0.15% of free NaOH. The higher alkali moves the gum quicker and gives a whiter fiber.

CHAS. E. MULLIN

Weighting silk with tin. FRED. GROVE-PALMER. *Silk J.* 5, No. 54, 48-9(1928). c C A 22, 4829.

CHAS. E. MULLIN

Silk degumming. III. Trouble shooting in the boil-off. PROCTOR & GAMBLE. *lk Degumming, Bull.* No. 4, 16 pp.(1929); cf. C. A. 22, 3303.—A detailed discussion given, under the following headings, of the trouble, causes and remedies thereof, that av occur in subsequent treatments of silk due to unsatisfactory degumming in the il-off: incomplete degumming, too severe degumming, chafe marks, accidents to ie weave, soap specking, oil spots, incomplete rinsing. Defects acquired previous o the boil-off—warp or filling streaks, set tints, rotted silk—are discussed.

F. C. H.

Loss of strength [tendering] of cotton exposed to light. P. W. CUNLIFFE AND D. FARROW. **Effect of structure and of bleaching on the strength of cotton yarns.** W. CUNLIFFE AND E. MIDGLEY. *J. Textile Inst.* 19, 169-88T(1928).—Comparison made between the strength of cotton in the form of hairs, yarn, or cloth after exposure o Hg-vapor lamps, the C arc, and to sunlight, in England and abroad and that of imilar unexposed materials. Cotton hairs exposed to the quartz Hg-vapor lamp lose trength at a const. rate until the tendering amounts to about 40%; the rate then dimin-shes. Over a small range the rate of tendering is proportional to the intensity of the light. There are sp. differences between the susceptibilities to light tendering of cotton hairs f different origin, and destruction proceeds more rapidly in the presence of O, water, r CO_2 than in H, N, or *in vacuo*. The proportional loss of strength of yarns is about alf that of hairs fully exposed under the same conditions, the hairs in the yarns being tendered to the same extent as the yarns themselves. Fine yarns are more rapidly tendered than coarse, and soft twisted than hard, both for bleached and raw cotton. Bleached cotton is more rapidly tendered than raw, and material dyed chrome-green is much more resistant to destruction than the undyed, scoured material. $Fe(OH)_3$ has a slight protective action, while cloth dyed mineral-khaki is as resistant as the chrome dyed material, the effect being such as to extend the life of fabric subject to strong illumination to as much as 5 or 6 times that of untreated material. Org. dyes modify the rate of tendering of cotton by light, some unfavorably, others favorably, the effects

never being so large as those found with Cr hydroxide. In an appendix it is observed that when the results of breaking tests on yarns of different counts are made comparable by expressing them in terms of the strength of equal wts. of cotton in a standard length, for the same twist constant, coarse yarns are inherently stronger than fine, and doubled yarns are stronger than the 2 singles from which they are spun, but weaker than a single yarn equal in actual counts to the doubled. Bleached yarns are weaker than raw, the work done in breaking a standard strip of cloth being taken as a measure of its strength, bleached cloth is weaker than unbleached.

Bleaching drills for the white shoe and painted awning trade. GEO. RICE. *Can Colorist Textile Processor* 8, 12(1928).—General.

B. C. A.

CHAS. E. MULLIN

Use of emulsions in fur industries (AUERBACH) 29. Treatment of industrial waste [wool-scouring] (FALES) 14. Coupling reactions (POLLAK, GEBAUER-FÜLNEGG) 10. Identification of the reduction products of azo dyes (UENO) 10. Sulfonic acids (Brit. pat. 293,781) 10. Aroylations and dye production (Brit. pat. 293,924) 10. Reducing dyes or other substances to a state of fine subdivision (Brit. pat. 293,896) 13. Phenol ketone condensation products (Ger. pat. 467,728) 18. Sulfonated oils (Brit. pat. 293,806) 27. Recovering cotton or other fiber from rubber fabrics (Brit. pat. 293,419) 30.

Raw Materials of Commerce. [Fibers.] Complete in 24 fortnightly parts. London: Sir Isaac Pitman & Sons, Ltd. 32 pp. 1s. 3d., net each part. Reviewed in *Pharm. J.* 122, 76(1929).

Dyes. FÉLICE BÉNSA. Fr. 644,024, Nov. 15, 1927. Chloroperylene quinones are prepd. by treating highly chlorinated perylenes with fuming H_2SO_4 . In an example dodecachloroperylene is heated to 150–160° with H_2SO_4 contg. 25% SO_3 . The product is sepd. by pouring into water. It gives a vat dye which dyes cotton a dark olive green. An after-treatment with alum or Cr changes the color to a red approaching violet.

Dyes. FÉLICE BÉNSA. Ger. 470,160, Oct. 29, 1926. Halogen substituted methyl- or ethyl-perylenediketone is heated with metal cyanide in the presence of an org. solvent such as pyridine or quinoline, with or without pressure. Thus, diacetylchloroperylene is heated with $CuCN$ in quinoline. The dye seps. out as a blue powder. Other examples are given with a method of prepg. the perylene diketone employed.

Dyes. I. G. FARBENIND. A.-G. Brit. 293,352, July 4, 1927. Monazo dyes contg. an acetoacetyl chloride residue are caused to react with an arylamine sulfonic acid or a deriv., preferably in a solvent such as pyridine or quinoline capable of neutralizing the HCl produced. The products dye wool clear even shades fast to fulling and to light and when pptd. as lakes and used as size colors yield clear yellow orange to shades fast to light and water. Examples are given.

Dyes. I. G. FARBENIND. A.-G. Brit. 293,768, July 11, 1927. Cyche ketones and quinones (some of which are vat dyes) are prepd. by heating an aromatic mono or poly-ketone, contg. at least one free peri-position to the ketone carbonyl, with AlCl₃ and an alkali chloride such as NaCl in the presence of O or a gas contg. O and suitably also with accompanying use of an addnl. oxidizing agent such as MnO_2 , $NaNO_2$, PhO_2 , or $CuCl_2$. Examples are given of the prepn. of 2-chlorobenzanthrone, 2-cyanobenzanthrone, benzanthrone-2-carboxylic acid, 3,4,9,10-dibenzopyrene-3,10-quinone, 3,4,8,9-dibenzopyrene-5,10-quinone, 3(2),4(1)-naphtho-8,9-benzopyrene-5,10-quinone and 2-Bz 1-benzanthrone-dicarboxylic anhydride.

Dyes. I. G. FARBENIND. A.-G. Fr. 644,150, Nov. 18, 1927. Yellow shades are produced on animal, vegetable or artificial fibers by vat dyes obtained by treating 1-hydroxyanthraquinone or its derivs. with caustic alkalis in the presence of org. solvents or diluents such as alc. or $PhNH_2$, preferably in the absence of O. Examples are given of the treatment of 1-hydroxyanthraquinone with KOH and alc. or $PhNH_2$ to produce 1,1'-dihydroxy-2'-dianthraquinonyl, and of 1-hydroxy-4-amino- and 1-hydroxy-4-methoxy-anthraquinone to produce the corresponding derivs.

Dyes. SOC. ANON. POUR L'IND. CHIM. À BALM. Brit. 293,795, July 12, 1927. Mixts. of isoviolanthrone and dichlorisoviolanthrone are prepd. by mech. admixt. or by oxidation of mixed solns. of their leuco compds. The mixt. may be converted into its leuco compd. or leuco ester and used for dyeing or printing.

Azo dyes. I. G. FARBENIND. A.-G. (Eugen Glistenberg and August Sigwart, inventors). Ger. 470,661, Dec. 4, 1926. Insol. azo dyes are prepd. by diazotizing a

compd. of the formula $\text{NH}_2\text{C}:\text{CHCH}:\text{C}(\text{OR})\text{CH}:\text{CH}$, in which R is an aliphatic or an aromatic radical, and coupling with PhNHAc . The diazo component may contain other nuclear substituents, e. g., Cl, NH_2 , or OCH_3 , and instead of PhNHAc its N-substituted derivs. may be used. Examples describe the prepn. of dyes from (1) 4-aminoacetophenone and PhNHAc ; (2) 4-amino-3-nitroacetophenone and PhNClAc ; (3) 4-aminobenzophenone and PhNHAc . The products are yellow.

Azo dyes. I. G. FARBENIND. A.-G. (Richard Stüsser, inventor). Ger. 470,652, Jan. 27, 1927. Substantive dyes are prepd. by coupling a diazotized aminothiazolemonosulfonic acid with a sulfonated acetoacetic arylide, or alternatively by sulfonating the dyes prepd. from a diazotized aminothiazolemonosulfonic acid and an acetoacetic arylide. The examples describe the prepn. of dyes (1) from dehydrothiotoluidine-*o*-monosulfonic acid (prepd. from dehydrothiotoluidine sulfate by baking) and acetoacet-*o*-anisidinesulfonic acid and (2) by sulfonating the dye prepd. from dehydrothiotoluidinemonosulfonic acid and acetoacet-*o*-chloranilide. The products dye cotton yellow. Cf. C. A. 23, 1281.

Azo dyes. SOC. ANON. POUR L'IND. CHIM. À BAËLE. Fr. 644,153, Nov. 19, 1927. New azo dyes of the general formula $\text{acidyl}-\text{NH}-\text{R}-\text{N}=\text{N}-\text{P}$, in which R represents a ring of the C_6H_5 series contg. a sulfo group *o*- to the azo chromophore and the group NH acidyl *m*- to the same chromophore and P the residue of a 1-aryl-5-pyrazolone, are prepd. by coupling diazo compds. of the general formula $\text{acidyl}-\text{NH}-\text{R}-\text{N}=\text{N}-\text{OH}$ with aryl-5-pyrazolones. In examples, 1-*p*-sulfo-phenyl-5-pyrazolone-3-carboxylic acid is diazotized and coupled with 4-acetylamino-2-amino-1-benzenesulfonic acid. The product dyes wool in a H_2SO_4 bath fast shades resembling those from tartrazine. If 1-(4'-sulfo-2'-methyl)-phenyl-5-pyrazolone-3-carboxylic acid is used a greenish yellow dyeing is obtained, and a greener dyeing if 1-(4'-sulfo-2'-methyl-6-halogen)phenyl-5-pyrazolone-3-carboxylic acid is used. A greenish yellow dye is also obtained if 4-acetylamino-2-amino-1-benzenesulfonic acid is coupled with 1-(5'-sulfo-2'-chloro)phenyl-3-methyl-5-pyrazolone.

Monoazo dyes from naphthylaminocarboxylic acids. LEOPOLD LASKA and FRITZ WEBER (to Grasselli Dyestuff Corp.). U. S. 1,702,832, Feb. 19. Dyes suitable for dyeing "acetate silk" contain as one constituent a naphthylaminocarboxylic acid (suitably 2,3-naphthylaminocarboxylic acid) together with another component such as resorcinol, β -naphthol, β -naphthylamine, ethyl- β -naphthylamine, 2,3-aminonaphthoic acid, dimethyl-*m*-toluidine, phenylmethylpyrazolone, *m*-phenylenediamine, *m*-toluylenediamine, 1,5-naphthylenediamine, α -naphthylamine, dimethylaniline, *o*-anisidine, *p*-aminacetanilide, *p*-phenylenediamine, *p*-nitroaniline, *p*-nitro-*o*-anisidine, *p*-cresidine, 2,4-dinitroaniline, aminohydroquinone-dimethyl ether, aniline, *o*-toluidine, *o*-chloroaniline, 2,5-dichloroaniline, *m*-chloroaniline or *p*-nitroaniline. The various dyes described give strong yellow and red to blue-violet shades on "acetate silk."

Isodibenzanthrone dyes. I. G. FARBENIND. A.-G. (Arthur Lüttringhaus, Hugo Wöhl, and Heinrich Neresheimer, inventors). Ger. 470,500, Mar. 24, 1925. Addn. to 409,689. 2-*Bz*-1'-Dibenzanthronyl or its derivs. is treated with alk. or acid condensing agents. The initial material may be a mixt. of a *Bz*-1'-halogenbenzanthrone and a benzanthrone not substituted in the 2-position, which mixt. may be treated with an alk. condensing agent at a low temp. to produce a 2-*Bz*-1'-dibenzanthronyl, and then warmed to complete the reaction. In the examples, (1) 2-*Bz*-1'-dibenzanthronyl is treated with Na anilide at 150° ; (2) 2-*Bz*-1'-dibenzanthronyl is treated with alc. KOH at 135° ; (3) 6-methyl-2-*Bz*-1'-dibenzanthronyl is treated as in (2), a product which dyes cotton blue being obtained; (4) 6-chloro-2-*Bz*-1'-dibenzanthronyl is treated as in (2); (5) 2-*Bz*-1'-dibenzanthronyl is fused at 250° with a mixt. of FeCl_3 and NaCl; a product which contains Cl and gives blue-violet shades from blue vats is obtained. If AlCl_3 replaces FeCl_3 in (5), isodibenzanthrone is obtained, and the same dye is obtained by treating 2-*Bz*-1'-dibenzanthronyl with 80% H_2SO_4 in the presence of Hg salts. The prepn. of the initial materials of the examples is described in Ger. 468,475. See Brit. 255,277.

Vat dyes. I. G. FARBENIND. A.-G. (Heinrich Neresheimer, inventor). Ger. 470,502, Dec. 24, 1926. *Bz*,*Bz*'-Diarylpyranthrones are treated with oxidizing or condensing agents. When oxidizing agents are not used, the hydro deriv. of the dye is first obtained. In the examples, (1) *Bz*,*Bz*'-diphenylpyranthrone in H_2SO_4 soln. is treated with MnO_2 , and (2) the same initial material is treated with a fused mixt. of AlCl_3 and NaCl, the oxidation of the resulting hydro compd. being completed by aeration. Cf. Brit. 282,620 (C. A. 22, 3785).

Vat dyes. I. G. FARBENIND. A.-G. (Heinz Scheyer, inventor). Ger. 470,501,

Oct. 1, 1926. The condensation products prep'd. from anthrone or its derivs. and glyoxal are treated with alk. condensing agents. In the examples, dyes are prep'd. by treating with alc. KOH the condensation products from glyoxal and anthrone, 2-phenylanthrone, 2-chloranthrone and 1-chloranthrone. The dyes give red to violet shades and are only sparingly sol. in org. solvents.

Dye intermediates. I. G. FARBENIND. A.-G. (Hugo Jaesschin, inventor). Ger. 469,654, Dec. 3, 1925. Urea derivs. of 2-hydroxynaphthalene-3-carboxylic acid, useful in developing azo dyes on the fiber, are prep'd. by treating 2-hydroxynaphthalene-3-carboxylic acid aminoarylamides with COCl_2 , or by treating 2-hydroxynaphthalene-3-carboxylic acid with diaminodiarylureas in an indifferent medium in the presence of a water-binding substance. Examples are given describing the prepn. of urea derivs. from (1) 2-hydroxynaphthalene-3-carboxylic acid, 3'-aminophenylamide and COCl_2 and (2) 2-hydroxynaphthalene-3-carboxylic acid and 4,4'-diaminodiphenylurea.

Derivatives of anthanthrone. I. G. FARBENIND. A.-G. Fr. 644,577, Oct. 12, 1927. Hydroxy and alkoxy derivs. of anthanthrone are prep'd. by transforming the sulfonic acids or alkoxy derivs. of the anhydride of 1-aminonaphthalene-8-carboxylic acid (naphthostyryl) by alk. sapon. agents into the corresponding derivs. of 1-amino-naphthalene-8-carboxylic acid, treating their diazo compds. with reducing agents and transforming the derivs. of 1,1'-dinaphthyl-8,8'-dicarboxylic acid, while still contg. the sulfo groups into the corresponding hydroxy derivs. by alk. fusion, and finally submitting the hydroxy or alkoxy derivs. thus obtained to the action of condensing agents such as H_2SO_4 or ZnCl_2 . The hydroxy derivs. obtained may be subsequently alkylated. In examples, 5-methoxynaphthostyryl is sapond. with NaOH lye, diazotized and reduced with ammoniacal- Cu_2O to 5,5'-dimethoxy-1,1'-dinaphthyl-8,8'-dicarboxylic acid. This acid is introduced while cooling into concd. H_2SO_4 and afterwards poured into water. The dimethoxyanthanthrone obtained dyes cotton violet shades from the vat which turn to an orange-red on exposure to air or sapon. Dihydroxyanthanthrone is obtained by sulfonating naphthostyryl, and heating with NaOH lye to obtain 1-amino-4-sulfo-naphthalene-8-carboxylic acid, which by diazotizing and reducing is converted to 1,1'-dinaphthyl-4,4'-disulfo-8,8'-dicarboxylic acid. This acid is converted by fusion with KOH into 4,4'-dihydroxy-1,1'-dinaphthyl-8,8'-dicarboxylic acid and this is heated under reflux with Ac_2O and ZnCl_2 . The dihydroxyanthanthrone may be methylated with the Me ester of toluenesulfonic acid.

Naphthoquinone derivatives. I. G. FARBENIND. A.-G. (Josef Stock, inventor). Ger. 468,507, Mar. 28, 1925. See U. S. 1,681,599 (C. A. 22, 3996).

Naphthalene derivatives. I. G. FARBENIND. A.-G. Fr. 643,795, Nov. 12, 1927. Derivs. of 2-hydroxynaphthalene-3-carboxylic acid amide which are of importance in dyeing are obtained by heating 2-hydroxynaphthalene-3-carboxylic acid with mustard oils. An example is given of the prepn. of the phenylamide of 2-hydroxynaphthalene-3-carboxylic acid by heating the acid with phenyl mustard oil till evolution of CO_2 ceases. Other esters of isothiocyanic acid may also be used. Cf. C. A. 23, 1139.

Sulfur derivatives of phenol and homologs. NAAMLOOZE VENNOOTSCHAP FABRIEK VAN CHEMISCHE PRODUCTEN. Dutch 19,063, Dec. 15, 1928. Sulfur derivs. of phenol, useful for fixation of basic dyes on cotton, are prep'd. by heating dry alkali phenolates either suspended in solvent naphtha or dissolved in excess phenol (at least $\frac{1}{2}$ phenolate) with S at high temp. Twenty kg. NaOH and 188 kg. phenol are heated to 180° to remove reaction H_2O . The mixt. is cooled to 125°C , S is added and the mixt. heated to 180° for 24 hrs., H_2S escaping. The mass is cooled and ground.

Dyeing. I. G. FARBENIND. A. G. Brit. 293,813, April 6, 1927. Cotton is dyed by treating it with a urea deriv. of an azo or disazo dye contg. one or more carboxyl groups (other than a salicylic acid grouping) and contg. a free amino group in the coupling component, and then treating the material with a Cr salt. The urea derivs. used may be obtained by the action of phosgene on the *p*-aminoazo or *p*-aminodisazo compds. The process is especially applicable to batik dyeing. Several examples are given.

Dyeing. I. G. FARBENIND. A.-G. Fr. 644,436, Nov. 24, 1927. Animal fibers are treated with sulfonated derivs. of 1,4-diaminobenzene or of 1,4-di-(4-aminophenyl-amine) benzene, which carry in the 2 amino groups a naphthyl group substituted or not, or one amino group may have a naphthyl group and the other amino group may or may not be substituted, or with diaminonaphthalenes in which one or both amino groups have an aryl group. Subsequent oxidation of the fibers gives valuable colors. In examples, wool is dyed a full black by 4-aminosulfo-phenyl-2-naphthylamine and subsequent oxidation with $\text{K}_2\text{Cr}_2\text{O}_7$ and H_2SO_4 . A deep black is also obtained with 1,4-di-(6-sulfo-2-naphthylamine) benzene. Other examples are given.

Dyeing. SOC. ANON. POUR L'IND. CHIM. A BALG. Fr. 644,385, Nov. 23, 1927.

Dyes of the formula $\text{NH}_2\text{R}^1\text{N}=\text{N}\cdot\text{R}^2\text{NH}_2$, in which R^1 and R^2 represent 2 aromatic rings of the C_6H_5 series are diazotized on the fiber and coupled with β -hydroxynaphthoic acid or β -naphthol in acid or neutral medium. In an example, acetate silk is dyed in a bath contg. a dispersing agent and the dye obtained by sapon. the product from diazotized *p*-aminoacetaniline and cresidine. The dye is then diazotized on the fiber and coupled with β -hydroxynaphthoic acid or β -naphthol in AcOH or $\text{H}\cdot\text{COOH}$ soln. The dispersing agent may be delimed sulfite cellulose lye or condensation products of CH_2O and sulfonic acids.

Dyeing and printing with ester derivatives of leuco vat dyes. STANDFAST DYERS & PRINTERS, LTD., J. I. M. JONES and W. KILBY. Brit. 293,890, March 15, 1927. In dyeing and printing with ester derivs. of various leuco vat dyes, the color is developed in dil. aq. acid solns. in the presence of a cupric salt such as CuSO_4 or CuCl_2 , preferably at the b. p. Several examples are given.

Dyeing "acetate silk" or other cellulose esters or ethers. I. G. FARBENIND. A.-G. Brit. 293,766, July 11, 1927. The process described in Brit. 215,783 (C. A. 18, 3481) is modified by replacing the hydrogenated pyridine or the aliphatic base or deriv. by a hydrogenated isocyclic base or salt of such a base preferably in a slightly alk. bath. Hexahydroaniline, its substitution products such as hexahydromethyl-aniline and hexahydroethylaniline and homologues, such as hexahydroethyl-*o*-toluidine and similar compds., may be used. Examples are given.

Dyeing vegetable fibers. I. G. FARBENIND. A.-G. (Leopold Iaska and Arthur Zitscher, inventors). Ger. 470,537, Jan. 1, 1927. The goods are impregnated with an ether of 2,3-hydroxynaphthoyl-2-amino-3-naphthol and the color is developed with suitable diazo, tetrazo or diazoazo compds. In the examples, cotton is impregnated with 2,3-hydroxynaphthoyl-2-amino-3-naphthol methyl ether and the color developed with the diazo solns. from 4-nitro-1,2-anisidine and 5-chloro-1,2-toluidine, resp.

Dyeing furs, etc. I. G. FARBENIND. A.-G. Fr. 644,349, Nov. 22, 1927. Fur, hair, feathers, etc., are dyed by treating them with an aq. soln. of salts of those derivs. of C_{10}H_8 which contain at least one 3-aminoarylamino group of the C_6H_5 series and with an acid soln. of nitrite. In an example fur is dyed in a bath contg. 2-(3'-amino-phenylamine)naphthalenehydrochloride, a little alc. and HCl and afterwards treated in a bath contg. NaNO_2 and AcOH . The color varies from yellow to rose. Other examples are given.

Dyeing fur, hair, etc. I. G. FARBENIND. A.-G. Fr. 644,190, Nov. 21, 1927. Fur, hair, feathers, etc., are dyed in fast shades from violet-red to blue-black or greenish gray by treating them with aq. solns. of those derivs. of C_{10}H_8 which contain at least one aminoarylamino group of the C_6H_5 series and oxidizing. In an example mordanted fur is dyed in a bath contg. 2-(4'-aminophenylamino)-naphthalene hydrochloride, a little alc. and HCl , and afterwards rinsed in a $\text{K}_2\text{Cr}_2\text{O}_7$ bath, to give a gray-blue shade. Other examples are given.

Dyeing apparatus. SOCIÉTÉ KARPELÈS FRÈRES. Fr. 644,138, Nov. 17, 1927. Centrifugal force is used to drive the dye through one or more thicknesses of cloth.

Vat and associated apparatus for treating textile materials with dye solutions or other liquids. CHARLES P. COLE, SR. U. S. 1,702,535, Feb. 19.

Mordanting. HENRY DREYFUS. Fr. 644,565, Oct. 5, 1927. Mordanting of threads, fabrics, etc., of or contg. cellulose esters, particularly the acetate, is expedited by the use of solns. of the thiocyanates of metallic mordants, in which the concn. of the thiocyanate radical is in excess of that chem. equiv. to the mordant metal. The excess may be obtained by the addn. of a thiocyanate of a non-mordanting metal, e. g., NH_4 , K or Na . The thiocyanate is afterwards hydrolyzed with Na_2CO_3 .

Printing fabrics. I. G. FARBENIND. A.-G. (Alwin Schneevoigt, inventor). Ger. 470,538, Feb. 11, 1927. In printing with azo dyes to be developed on the fiber, a soln. of the base and the coupling component in a solvent such as thiodiglycol, cyclohexyldiethanolamine, or triethanolamine is mixed with a thickener and printed on, the color being developed in an acid bath with the addn. of nitrite either to the printing paste or to the bath. The process is particularly applicable to the printing of acetate silk. Examples are given. Cf. C. A. 22, 3051.

Fibrous materials. BRITISH DYESTUFFS CORP., LTD. Fr. 643,742, Nov. 10, 1927. Wool, silk, fur or other fibrous material of animal origin is protected against the action of alk. or acid agents, by adding to the agents a sol. condensation product of urea and an aldehyde, suitable products being mono- and di-methylolurea.

Vegetable wool. JEAN M. A. FAUSSEMAGNE. Fr. 644,241, April 27, 1927. A fiber resembling wool is prepd. by boiling wood fiber in an autoclave for 2 hrs., allowing it to remain in a bath contg. 2 1/2% NaOH for 2 hrs., then for 6 mins. in a bath contg.

KOH, then in a 3rd bath contg. 1% HNO_3 , and finally in a bath contg. soap 3 kg., Na_2CO_3 250 g, Na_2BO_3 1 kg. and glycerol $1\frac{1}{2}$ kg. in 100 l. of water.

Machine for damping and chilling cloth. PETER W. CÜSTERS. Fr. 643,768, Nov. 10, 1927.

Device for treating fabrics with liquids. FLORENT HINNEKENS. U. S. 1,702,770, Feb. 19.

Liquid treatment for finishing fabrics. H. T. BÖHME A.-G. Brit. 293,746, July 11, 1927. Finishing agents such as a soln. of MgSO_4 and dextrin are used with an added luster-producing agent such as paraffin or stearic acid which may be emulsified with an aromatic sulfo-acid or highly sulfonated oil.

Washing, bleaching, etc., cakes of artificial silk while covered with fabric. E. K. GLADDING (to duPont Rayon Co.). Brit. 293,767, July 11, 1927. Mech. features.

Bleaching material for making hats. H. GOLDBEITER. Brit. 293,828, July 11, 1927. Materials such as rabbit hair treated with Hg salts, Zn nitrate or Sn nitrate are bleached as described in Brit. 291,743 (C. A. 23, 1290) by use of H_2O_2 (preferably in alk. soln.) in the presence of catalysts such as $\text{K}_2\text{FeC}_6\text{N}_8$ which accelerate decomposition of the peroxide.

Felt hats. JESSE MEYER. U. S. 1,702,658, Feb. 19. The felt hat body is treated with coconut oil, shaped into hat form, superficially treated with "coconut butter" and subjected to pressure, in order to give a rain-proof smooth and glossy finish.

Dry cleaning, laundry washing or scouring wool. A. E. HATFIELD, E. A. ALBERT and ACHILLE SERRE, LTD. Brit. 293,886, Feb. 15, 1927. In processes of this character, in which a filter aid such as that described in Brit. 266,850 (C. A. 22, 876) is added to soiled liquid from a washing machine and the suspension thus obtained is filtered and the filtrate returned to the washing machine (preferably in a continuous cyclic manner), soaps of high soly. and emulsifying power and with little tendency to disintegrate are used in the washing machine to prevent clogging of the filter press. Soaps such as described in Brit. 289,582 (C. A. 23, 727) are suitable for this purpose. Various details are given.

Pleating fabrics containing thermoplastic cellulose derivatives. C. DREYER (to British Celanese, Ltd.). Brit. 293,857, July 15, 1927. Permanent pleating is effected by heat and pressure, preferably after treatment of the fabric (such as one comprising cellulose acetate) with a solvent, softening agent or swelling agent (of which several examples are given).

Metallization. ANTOINE BORENSZTEDT. Fr. 644,429, Nov. 24, 1927. Substances such as threads and ribbons to be metallized are passed through a cupro ammoniacal bath contg. about 5% AgNO_3 , then into a coagulating bath contg., e. g., MeOH 60, Me_2O 25, AgNO_3 5, HNO_3 10 parts and is then reduced with H_2S before passing to the electrolytic bath.

26—PAINTS, VARNISHES AND RESINS

A. H. SABIN

Practical methods of paint-making control. GEORGE SUTHERLAND. *Paint, Oil, Chem. Rev.* 87, No. 8, 10-1, 16(1929).—The various methods of testing color, sp. gr., yield value and fineness of grind for paints are discussed and methods which have proven most practical for production are suggested.

Recent advances in the protection of engineering products with paints. HANS WOLFF. *Farbe u. Lack* 1929, 38-9, 51.—W. reviews briefly the drying of oils, cause and prevention of corrosion, use of accelerated tests, structure of paint films, etc.

Zinc oxide paints. C. P. VAN HOEK. *Farben-Ztg.* 33, 2789-90(1928). Straight ZnO -linseed oil paints are considered by many users to be deficient in flowing out proper ties, opacity, adhesion and elasticity. This is attributable in part to the flocculating tendency of the weakly positively charged pigment, badly flowing masses that retain considerable amts. of oil being formed. The extra oil necessarily added leads to poor opacity, to poor adhesion on wood (owing to absorption of "free" oil), and to poor flow of such paints used as primings. Further, the formation of Zn soaps causes loss and lack of elasticity of the film. The addn. of 5-10% of stand oil in the grinding process corrects the above faults to some extent.

Modern methods of testing paints, etc., for weathering and rust-preventive properties. R. KEMPF. *Farben-Ztg.* 33, 2359-61(1928).—Accelerated weathering tests are discussed generally and a bibliography of published work on the subject is given. An alternative to the intensive-cycle procedure is furnished by refined method of detecting

failures in normal exposure tests. Factors influencing outdoor exposure tests are noted and suggestions are offered for controlling these variables so as to increase the value of an outdoor exposure by giving it the reproducibility of a lab.-accelerated test without the errors inherently induced by the artificial nature of the latter. B. C. A.

Loss of material of paints by weathering. H. A. MÖLLER. *Farben-Ztg.* 33, 2484-6(1928).—Quantitative expts. on the weathering of white lead paints spread on sheet iron were made and the "half-life periods" of the coatings calcd. for comparison. Gray-white lead paints proved notably more resistant than white, the weathering varying according to the nature of the black pigment incorporated. Sulfate white lead paints preserved the surface gloss longer, collected less dirt, and had a longer life than those contg. carbonate white lead. In all cases loss of material was less for those paints having a red lead undercoat. B. C. A.

Yellowing of white enamels. H. MUNZERT. *Farben-Ztg.* 33, 2849-51(1928).—Previous German work on the yellowing of enamel vehicles with age is summarized. A series of comparable enamels was prepd., using equal bulks of ZnS ("sachtolith"), titania, ZnO and white lead, all in a high state of purity, with each of the following vehicles (white spirit being the solvent): 60% soln. of lime-hardened rosin, 60% soln. of ester gum, 70% soln. of pale linseed oil stand oil, and 60% soln. of a tung oil-linseed oil stand oil. The 16 enamels were brushed on tin plate, and dried for 4 days in diffused daylight. The films were then half-covered by black paper and exposed to direct sunlight for 14 days, after which the degree of yellowing was noted in comparison with freshly prepd. films of the stored enamels and with films of similar freshly prepd. enamels. The covered films were found to yellow more than the exposed ones, while of the pigments white lead caused most yellowing, followed by ZnO, titania and ZnS in descending order. Yellowing is attributed in the main to dark-colored oxidized acids which rapidly undergo further degradation in the light to form gaseous or colorless compds. This degradation is, however, delayed in the dark and to a greater degree still by salt formation with pigments, the "fixing" of the yellowing being proportional to the basic nature of the pigment. B. C. A.

Temperature-humidity control cabinet for testing paint, varnish and lacquer films. G. G. SWARD. *Am. Paint Varnish Mfrs. Assoc. Circ.* No. 345, 91-8(1929).—A const.-temp.-humidity room is described in detail, together with its operation and erection costs. R. J. MOORE

Titanium offers new possibilities as a pigment. A. W. HIXSON AND W. W. PLECHNER. *Chem. Met. Eng.* 36, 76-8(1929).—Ti pigments are reviewed and their characteristics compared with other paint pigments. Tables are given to show that while Ti pigments are higher priced per lb. they are relatively cheap per sq. ft. of painted surface because of their high tinting strength and obscuring power. R. J. MOORE

Cellulose ester solvents. II. H. WOLFF, G. ZRIDLER AND W. TOELDT. *Farben-Ztg.* 33, 2668-72(1928).—Solvents of the glycol type (cf. C. A. 23, 1292) were further investigated from the practical point of view. The conditions under which a tendency to irregularity appears in the films of lacquers contg. these solvents and varying amts. of diluents, and the correction of the irregularity by the addn. of BuOH and plasticizers are described. The use of the glycol solvents, particularly "ethyl glycol," in lacquers induces good "insulation" from oil undercoats, while improving the rubbing qualities and elasticity of the lacquer film. The whitening effect produced by "methyl glycol" may be counteracted by suitable solvent mixts. or alternatively may be made use of to obtain opacity with a smaller concn. of pigment than would otherwise be necessary. The mech. properties of such films are in no way inferior to those of corresponding films contg. Bu acetate as solvent. B. C. A.

Tung oil. D. HOLDE, W. BLEYBERG AND M. A. AZIZ. *Farben-Ztg.* 33, 2480-4(1928).—The I value (Hanus) of tung oil has been found to rise markedly with increasing time of reaction from $\frac{1}{4}$ hr. to 2 hrs., and afterwards to remain steady at 230-240, corresponding to satn. of the 3 double linkings of the eleostearic acid present. A 0.2 N soln. of I bromide in CCl₄ gave a similar result in 3 hrs. Since with other vegetable oils a constant I value is obtained after $\frac{1}{4}$ hr., it is suggested that the presence of tung oil in linseed oil might be recognized quantitatively by observation of an I value increasing with the time of reaction and *vice versa*. In the case of β -eleostearic acid, the I value rose from 176 to 279 during $\frac{1}{2}$ -2 hrs.' treatment (45% excess of I bromide); 60% excess of the reagent gave I values up to 300, and, in a few cases, values up to 350 (equiv. to 4 double linkings) were attained, resulting possibly from the occurrence of substitution or of traces of water in the glacial acetic acid, etc. Solns. of I or Br alone were less reactive than was I bromide. B. C. A.

Recent developments in manipulating wood oil. FERDINAND RIEMANN. *Farbe u.*

Lack 1929, 6.—This is a short review of recent German patents for incorporating wood oil into varnishes. Instead of cooking the resin with the oil from the beginning, the oil, heated to a temp. of 220–250°, is added to the resin which has been heated to a temp. of 320–340°. Cooling and thinning are carried out in the usual manner. G. G. S

The importance of white oil (refined mineral oil) in the varnish industry. EWALD PYHÄLÄ. *Farben-Ztg.* 34, 783–4(1928).—As much as 55% of white oil may be incorporated into tung oil which has been heated with Mn borate to the consistency of honey. A brief description of the refining of white oil is given. G. G. SWARD

Floor varnishes. H. KÖLLN. *Farbe u. Lack* 1929, 52–3.—Many complaints of inferior floor varnishes are due to improper prepn. of the floor or to an insufficient period of drying. When time permits, an excellent finish is obtained with a zinc oxide-stand oil enamel. Tung oil in small quantities may be added to accelerate the drying. G. G. SWARD

Lifting of varnishes by lacquer solvents. Harry F. HOFMANN AND E. W. REID. *Ind. Eng. Chem.* 21, 247–9(1929).—The "lifting" of oil base coatings by the application of brushing lacquers is discussed and the various contributing factors are analyzed. The expts. cover lifting tests by different solvents or combinations of solvents on many types of varnishes and enamel aged for various periods. The single solvents arranged in order of increasing tendency to "lift" are as follows: (1) petroleum hydrocarbons; (2) coal-tar hydrocarbons; (3) alcs.; (4) esters and glycol ethers. Typical 2 and 3 component mixts. are then listed in regard to lifting tendencies. Various factors in the varnish which influence lifting are outlined. The most suitable solvent combination of the 40 mixts. tested with respect to lifting was: kemsolene T 40, C. D. alc. No. 1 20, Et acetate 20, butyl cellosolve 20%. R. J. MOORE

Combination lacquers. MATTH. LUSCHIN. *Farbe u. Lack* 1929, 27–8.—Combination lacquers possess properties intermediate between varnishes and lacquers and should therefore be useful in the industry. Four general methods of prepg. them are (1) mixing the finished lacquer and varnish, (2) adding a portion of the lacquer solvents and thinners to the varnish before mixing them, (3) adding to the varnish in the mixing vessel the cotton, the solvents and the thinners in the order named, (4) mixing the lacquer with drying oils. Number 2 is the best. G. G. SWARD

Relation of composition to properties of lacquer solvents. ROBERT CALVERT. *Ind. Eng. Chem.* 21, 213–5(1929).—The required properties of lacquer solvents are discussed and certain generalities stated which will be helpful in predicting whether a given substance will dissolve nitrocellulose and resins, and resist hydrolysis. In several series of solvents studied there is a decrease in solvency for nitrocellulose as the percentage of O becomes farther from that in pyroxylin. But within certain limits, an increase in the percentage of O within a homologous series increases the solvent power for pyroxylin and decreases the compatibility with certain resins. A method is given for measuring the rate of hydrolysis of ester solvents. This rate varies as the strength of the acid whose radical is contained in the ester. R. J. MOORE

Nature and constitution of shellac. I. Preliminary investigation of the action of organic solvents. WM. HOWLETT GARDNER AND WILLET F. WHITMORE. *Ind. Eng. Chem.* 21, 226–9(1929).—The solvent action of 84 org. solvents for stick-lac, T. N. shellac and dry-bleached shellac is tabulated. Alcs., org. acids and ketones are the best solvents. The connection between soly. and chem. relationship between solvent and solute, and the colloidal aspects are discussed. R. J. MOORE

Light-colored condensation resin. H. A. GARDNER, C. A. KNAUSS AND A. W. VAN HENCHEROTH. *Ind. Eng. Chem.* 21, 57(1929).—A soft liquid resin of the glyptal type was prepd. from triethylene glycol, phthalic anhydride and tartaric acid. This gave a durable nitrocellulose lacquer without using a plasticizer. If heating at about 200° is prolonged a darker variety is formed, incompatible with nitrocellulose but compatible with the acetate of cellulose. R. J. MOORE

Resin from *Pinus silvestris*. II. Solid constituents. B. ARBUZOV. *J. Russ. Phys. Chem. Soc.* 60, 707–19(1928); cf. C. A. 22, 2069.—The cryst. solid, m 118–130° (33–35% of the total), which separates from the raw resin on keeping has $[\alpha]_D^{20} -102.23^\circ$ to -60.47° in alc. (in benzene about 20° less). The dispersion was almost const., $[\alpha]_F/[\alpha]_C = 2.37-2.39$, closely similar to that of the solid from the resin of *Pinus maritima*. Fractional crystn. from acetone yielded a solid, m. 132–134°, $[\alpha]_D -112.20^\circ$ to -111.08° , which on keeping became yellow, and the rotation changed slowly, in benzene from -41.69° to $+12.9^\circ$ in 365 days, and in alc. from -60.47° to $+4.5^\circ$ in 430 days, while the m. p. fell to 90°. This was due to atm. oxidation. The solid (colorphony) obtained by distg. the liquid resin had $[\alpha]_D +31.65^\circ$ to -21.82° in benzene and 0° to -74.79° in alc., depending on the conditions of distn. and dispersion. B. C. A.

Glyptal and coumarone resins. J. H. FRYDLENDER. *Kunststoffe* 18, 182.—See C. A. 22, 2474.

B. HAMILTON

A new process for the production of inlaid linoleum. FELIX FRITZ. *Kunststoffe* 18, 173(1928).—The process described is for the manuf. of two-color inlaid linoleum and it depends upon the property of pigments used in the coloring of linoleum of changing color when heated. The colored linoleum stock is passed between a heated pair of rolls, the temperature of which is maintained at about 140°, the surfaces of the rolls being in the form of the pattern to be imparted to the linoleum so that the pattern is formed in relief as the linoleum stock passes between the rolls. The portions of the linoleum which make contact with the heated parts is penetrated by the heat and the color of the areas of contact of the linoleum is changed. The process is very simple and cheap. A historical résumé of the development and manuf. of inlaid linoleum is also given.

B. HAMILTON

Weight buret (ITABASHI) 1. Determination of color number of oils, lacquers, and similar products (STOCK) 27. Asphaltite from the Philippine Islands (HODGE) 8. Chemistry of natural resins and resin acids (BALAŠ) 10. Introducing or eliminating substances from artificial products (Fr. pat. 644,077) 13. Decolorizing ceramic materials, white pigments, etc. (Fr. pat. 644,547) 19. Printing wood graining, etc. (Brit. pat. 293,873) 20. Various products from coal, lignite, shale, peat, etc. (Brit. 293,578) 21. Decorating celluloid with opaque colored lacquers, etc. (U. S. pat. 1,702,663) 23. Sulfonated oils (Brit. pat. 293,806) 27.

Paint. FRANCISCO LANDRINI. Fr. 644,211, April 22, 1927. A paint giving a surface resembling stone contains casein 2.76, water 18.50, NH₃ 0.35, paint from gum lac and linseed oil 3.50, vaseline oil 0.08, stand oil 0.19, Spanish white 25, linseed oil 3, Zn white 6.50, mineral oil 1.40, salt 0.08, fish glue 0.10, prussic acid 0.03, drier 0.10, sand or ground stone 38.5 parts.

Paint. KARL NITTINGER. Fr. 643,772, Nov. 10, 1927. A paint for Fe, wood, etc., is made by mixing 80% of finely ground soot with 20% finely ground electropositive Zn, and adding a binder or varnish.

Cellulose paints. H. WOLFF and R. SINGER. Brit. 293,732, April 11, 1927. Non-thickening paints such as those of nitro- and acetyl-cellulose contain lead pigments and org. compds. having 2 or more C atoms in their mol. and which react as weak acids such as carboxylic acids, hydrocarboxylic acids, aldehydes and nitrohydroxy compds. such as picric acid. Dispersions of red lead oxides are preferred, such as may be obtained from Pb vapor. Numerous examples are given.

White pigment. L. WILLIAMS. Brit. 293,661, Feb. 13, 1928. See U. S. 1,662,625 (C. A. 22, 1486).

Preventing "livering" of coatings. J. D. MCBURNEY and E. H. NOLLAU (to E. I. Du Pont de Nemours & Co.). Brit. 294,029, July 22, 1926. See Can. 284,964 (C. A. 23, 999).

Coating compositions containing nitrated carbohydrates. G. H. PETERS (to Hercules Powder Co.). Brit. 293,434, July 8, 1927. See Can. 283,058 (C. A. 22, 4262).

Ink or other coloring substance. BRUNO KALISCHER. Fr. 644,086, Nov. 18, 1927. Esters of alcs., such as esters of glycol or acetic esters of glycerol, are added to ink or other coloring substance to increase the speed of drying on paper.

Colored varnishes. SOC. ANON. POUR L'IND. CHIM. A BALE. Brit. 293,358, July 4, 1927. Cr or Cu compds. of *o*-oxyazo dyes are used for coloring varnishes or lacquers such as those contg. nitrocellulose. Examples are given of compns. of intense fast orange color, suitable for use on surfaces of different character. Cf. C. A. 22, 4844.

Inlaid linoleum manufacture. ARTHUR E. CLARKE (to Congoleum-Nairn). U. S. 1,702,630, Feb. 19.

Resinous compositions. ÖSTERREICHISCHE-ALPINE MONTANGES. Ger. 468,587, Aug. 24, 1927. Resinous compns. are prepd. by treating sulfite cellulose lye with a soln. of water glass and drying the gelatinous ppt. so obtained. Fillers may be mixed with the ppt., the addn. of blast furnace slag, for example, giving a product suitable for use as a *building or road-making material*.

Synthetic resins. V. H. TURKINGTON (to Bakelite Corp.). Brit. 293,453, July 7, 1927. A phenol is caused to react with a fatty oil such as tung oil and the product is combined with a CH₃-contg. hardening agent such as CH₃O or (CH₃)₃N, and with a sufficient proportion of a non-phenolic resin (either natural or synthetic) to act as a

blending agent and prevent sepn. of insol. products. Small proportions of H_3PO_4 and NH_3 , etc., may be used. The products may be liquid when hot and non-tacky solids when cold and may be used with solvents in prepg. *varnishes*, etc.

Synthetic resin. LA FIBRE DIAMOND. Fr. 644,075, Nov. 18, 1927. A synthetic resin is made by reaction of an amine and an aldehyde such as $PhNH_2$ and CH_2O , and distg. under vacuum in the presence or not of a phenolic substance to recover the constituents not acted upon. The resin obtained is heated in the presence of a hardening agent such as $(CH_3)_6N_4$.

Synthetic resins. I. G. FARBERIND. A.-G. Fr. 644,015, Nov. 15, 1927. Synthetic resins are made by treating crude solvent naphtha while adding phenols or their homologs with $FeCl_3$. Examples are given.

Synthetic resins. G. S. PETROV and K. I. TARASOV. Russ. 5145, April 30, 1928. The usual method of condensing phenols with AcH or CH_2O and acids is applied in the presence of sulfonic acids from petroleum products and the product so obtained is washed with water and neutralized with caustic.

27—FATS, FATTY OILS, WAXES AND SOAPS

E. SCHERUBEL

Committee No. 1 on fats and oils. (Intern. Soc. Leather Trades' Chem.) Bibliography of oils, fats and waxes. I. D. BURTON AND G. F. ROBERTSHAW. *J. Intern. Soc. Leather Trades' Chem.* 12, 490-505(1928).—A bibliography is given of about 300 titles arranged under the following heads: (A) books, (B) constitution, (C) oil and fats with reference to leather manuf., (D) analysis, (E) sulfonated oils—prepn., properties and uses, (F) sulfonated oils—analysis, (G) emulsions. H. B. MERRILL

Trial to remove hydrogen from higher fatty acids. T. SUZUKI AND T. KURITA. *Sci. Papers Inst. Phys. Chem. Research, (Tokyo) Supplement* 9, 5-6(1928). Dehydrogenation without decompn. of higher fatty acids and their esters has been tried by using several catalysts, very reduced pressure, and temps. ranging from 0° to 200° . Not much success has been achieved. ALBERT L. HENNE

New contributions to the theory of the drying of fatty oils. JOHANNES SCHEIBER. *Farbe u. Lack* 1928, 518-20.—To test the theory that the drying of oils is due to the formation of a solid continuous phase and that the nature of the disperse phase is of secondary importance, S. prepd. the triglyceride of octadecadienic (9, 11) acid (1). This synthetic glyceride, although homogeneous, dried with a wrinkled film similarly to raw wood oil, triglyceride of octadecatrienic (9, 11, 13) acid (1). S. rejects the isomerization and wrinkle theories as incomplete. The drying of wood oil proceeds as follows: polymerization, due to an autocatalytic agent, takes place on the surface of the film. This is followed by coagulation, the formation of a solvated phase several molecules thick. This phase tends to form itself into a single layer which causes wrinkles. G. C. SWARD

Vegetable-oil storage methods. ALAN P. LEE. *Oil & Fat Ind.* 6, 15-9(1929)

Daily growth and oil content of flaxseeds. A. C. DILLMAN. Bureau of Plant Industry, Wash., D. C. *J. Agr. Research* 37, 357-77(1928).—The total oil content of the seeds increases with the dry wt. Rapid formation of oil begins on the 7th day after flowering and continues from 15 to 18 days. The max. oil content is attained from 6 to 9 days before the seeds are ripe. The coloring substance, thought to be a form of tannin, appears on drying seeds harvested before maturity. A. L. MEHRING

Neat's-foot oil and its adulteration. MARTIN AUERBACH. *Ledertech. Rundschau* 20, 195-7, 270-1(1928).—Adulteration of neat's-foot oil is often so cleverly done that only an experienced chemist can detect it; the I and sapon. nos. alone are not sufficient. A product contg. wool grease is described. I. D. C.

Determination of color number of oils, lacquers and similar products. E. STROCK. *Farben-Ztg.* 33, 2967-9(1928).—An improved tintometer ("Komparator nach Hellige-Strock") is proposed which is simple, rapid in use, and gives accurate reproducible results; it is suitable for quant. colorimetric analysis and for the detn. of pH by the Walpole method. B. C. A.

Comparative observations on the Wijs and Hanus methods of determining the iodine values of oils. A. D. STEWART AND N. L. BANERJEA. Calcutta School of Tropical Medicine. *Indian J. Med. Research* 15, 687-94(1928).—The Hanus method is better because there is no chance for higher values and the soln. is more easily prepd. FRANCES KRASNOW

The determination of the iodine number. I. V. KUBELKA, J. WAGNER AND S. ZURAVLEV. *Collegium* 1929, 17-30.—A comparison was made of the methods of Hanus, of Rosenmund and Kuhnhehn (*C. A.* 18, 477), and of Margosches (*C. A.* 18, 2436). Results by the 3 methods agreed if the I no. was less than 100, but differed greatly if the I no. was greater than 100. A rapid method must be volumetric. It must not be too sensitive to slight errors in technic, principally to slight deviations from the prescribed time or quantity of sample. Results with 9 oils showed that the prescribed quantity of sample could not be exceeded in the Margosches method if the I no. was over 20, nor in Rosenmund's method if the I no. was over 100. Results by Hanus method with any oil and by Rosenmund's method with oils having an I no. below 100 were the same even with a 100% excess of sample.

I. D. CLARKE

Polymerization of linolenic acid and herring oil by heating. T. MAZUME AND G. SHIBAYASHI. Kyoto Imp. Univ. *J. Soc. Chem. Ind. (Japan)* 31, 746-8; *Supplemental Binding* 31, 179-80B(1928).—Me linolenate was heated at 300° in an atm. of H₂, and the changes in I no., n and mol. wt. were traced. On heating during 6-10 hrs. the mol. wt. was doubled and the I no. was lowered almost to half of the original no. These facts indicated that polymerization of 2 mols. had occurred. Similar expts. on herring oil showed that the decrease of I no. did not exactly correspond to the increase of mol. wt., and it had been thought that an extra-molecular polymerization occurred in this case.

Y. TOMODA

The waxes of industry. JAMES R. SANDERSON. *Chem. Markets* 24, 141-4(1929).

E. H.

The American method of soap boiling. K. LÖFFL. *Seifensieder Ztg.* 55, 159-61 (1928). On the basis of Schuck's account of the American method of soap boiling (*C. A.* 21, 2074) L. calculates a loss in glycerol and in time. *Ibid* 166-8.—L. gives the detailed calcn. for the consumption of Cals. by steam (36.100 kg. steam) and coal (4.104 tons) and the total cost (\$4718.12) for boiling 30 tons of soap contg. 60% fatty acids. P. E.

"Physiol" and soap. H. DORNER. *Seifensieder Ztg.* 55, 222-3, 241-2(1928).—Analyses and expts. with "Physiol A," "Physiol C" and "Physiol B I" from the Polydynwerke at Prague give the following results, resp.: H₂O 92.43, 49.75, 67.70; ash 1.92, —, —; org. substance 5.65, —, —; fat, vaseline-like —, 46.62, 27.50; polysaccharides —, 3.63, 4.80; CaCl₂ 1.48, —, —. Albuminoids and starch are absent, sugar (after HCl inversion) is present. These results indicate the probable presence of bassorin (gum tragacanth). The presence of Ca yields insol. Ca soaps and is the cause of an increased amt. of "dirt" in the wash water. A mixt. of 90% soap and 10% "Physiol" (both on a dry basis) produces optimum conditions for cleansing, viz., lather no. 23.3 cc. (increased from 11.4) and foam vol. 550 (decreased from 700). Soap treated with "Physiol" dries the same as soap without it, provided the conditions are identical.

P. ESCHER

Determination of water and crude fat in substances rich in fat (PRYANISHNIKOV, TELNOV) 7. **Oils for wool** (MULLIN) 25. **Dielectrics at high voltage.** II. **Impregnating oils.** **Insulating properties of some high-tension cables** (SETOH, MIYATA) 2. **Oil filter** (U. S. pat. 1,702,489) 1. **Apparatus for separating oil from water, etc.** (U. S. pat. 1,702,612) 1. **Electrical treatment of hydrocarbons and fatty oils** (Ger. pat. 466,813) 4. **Residual oils in cellulose manufacture** (Fr. pat. 643,853) 23. **Utilization of the stones from plums** (SALOMONE) 13.

Fats of high vitamin content. J. LYONS & Co., LTD, L. H. LAMPITT and J. H. BUSNELL. Brit. 293,777, April 5, 1927. Fats of high vitamin-A content are extd. from viscera or the like by freezing and pulverizing the material, thawing and treating with NaOH or other suitable alk. soln., heating to about 40° and, after mixing, allowing it to stand and then sepg. the fat after the protein has dissolved. The crude fat is purified with NaCl and neutralized with HCl and may be centrifuged and further purified with hot water and Na₂CO₃.

Sulfonating fatty compounds. NAAMLIOOZE VENNOOTSCHAP-CHEMISCHE FABRIEK SERVO and M. D. ROZENBROEK. Brit. 293,690, July 9, 1927. Sulfonation of castor oil or other fatty materials or derivs. is effected by the use of H₂SO₄ together with a dehydrating agent such as oxides, chlorides, oxychloride or acids of P. Chlorosulfonic acid also may be used and the reaction products may be rendered less viscous by the use of HOAc or Ac₂O.

Sulfonated oils. CHEMISCHE FABRIK MILCH A.-G. (to Oranienburger Chemische

Fabrik A.-G.). Brit. 293,806, July 12, 1927. Linseed oil is mixed with oleic acid or with a fatty material contg. glycerol oleate and the mixt. is sulfonated (suitably with H_2SO_4 monohydrate at a temp. not exceeding 35°). The product is suitable for oiling, smoothing, or varnishing in the *textile and leather industries* and may be used with linseed oil or as a substitute for the latter. Cf. C. A. 23, 536.

Sulfonating oils, etc. CHEMISCHE FABRIK STOCKHAUSEN ET CIE. Brit. 293,717, April 6, 1927. Sulfonation of castor oil or other animal or vegetable oils, fats or fatty acids is effected with concd. H_2SO_4 in excess of 35% added as quickly as possible and with intensive cooling to keep the temp. below 15° ; the product is washed and neutralized immediately. Cf. C. A. 22, 3548.

Sulfonating oils, etc. CHEMISCHE FABRIK STOCKHAUSEN ET CIE. Brit. 293,480, April 6, 1927. After sulfonating oils, fats or fatty acids and removing the resulting dil. acid, the resulting product is mixed with water or dil. acids and allowed to stand until no further sepn. occurs. By adding a neutral or "indifferent" solvent such as C_6HCl_3 (either before, during or after the sulfonation), 2 layers are obtained, one contg. the unattacked or slightly attacked component and the other the sulfuric acid esters. An example is given of the treatment of castor oil. Cf. C. A. 22, 3548.

Solidifying materials containing oils for transportation, etc. A. NYROP. Brit. 293,342, April 4, 1927. Raw vegetable oil-bearing materials such as copra or the pericarp of oil palm are converted into a non-meltable paste or powder by treatment in water with a film-forming material such as a carbohydrate or albuminate (which may be added in an emulsifier or homogenizer) and then spray drying the material.

Edulcorating oils and fats. MME. BRUGAROLAS (née Élisabeth Canals). Fr. 643,958, Sept. 20, 1927. Mineral or animal oils or fats are edulcorated by mixing therewith a neutral vegetable oil such as castor oil to which saccharine has been added. The saccharine is dissolved in the castor oil by slow heating to $110-150^\circ$.

28—SUGAR, STARCH AND GUMS

F. W. ZERBAN

Progress in beet-sugar manufacture in 1928. EDMUND O. VON LIPPMANN. *Chem.-Ztg.* 53, No. 11, *Fortschrittsber.* No. 1, 37-40 (1929). E. H.

Temperature, time of treatment and acid concentration to be utilized in cleaning the effects. J. ZAMARON. *Bull. assoc. chim. suc. dist.* 45, 583-7 (1928). Corrosion of bolts by acids of different concns. was studied so as to obtain an idea of the action of acids on the evaporator cells. The following conclusions are given. To keep the app. in good condition, the acid concn. should not exceed 3 to 4% at a temp. not over $140-158^\circ F.$ for 40-45 mins. This applies to the 1st cell. For the other cells, which are partly covered with scale, the danger of corrosion is reduced because of the insulating effect of the scale. The acid concn. used may be approx. 5 to 6% using the same temp. and time. The regular routine of boiling out for 1 or 2 hrs. with 20° to $30^\circ Be$ NaOH followed by acid may be used. E. A. FIEGER

Sodium light for polarimetry (THUNBERG) 1. Tyrosinase of *Beta vulgaris* (WEIDENHAGEN, HEINRICH) 11D. Food material from grasses, reeds, etc. (Brit. pat. 293,779) 12. Dehydrating vegetable substances (Fr. pat. 643,987) 12. Purification of lime (Fr. pat. 644,493) 18.

EYNON, LEWIS, AND LANE, J. HENRY: Starch: Its Chemistry, - uses. Cambridge: W. Heffer & Sons, Ltd. 12s. 6d. Reviewed in *Intern. Sugar J.* 31, 39 (1929).

Extracting sugar from molasses. A. I. VOSTOKOV. *Russ.* 4,801, Mar. 31, 1928. Molasses is filtered rapidly (on centrifuges) through fresh sugar pressings to free the molasses from the mineral admixts. and a second time slowly to ext. the sugar, after which the second portion of pressings is treated, the usual sugar-extn. method being applied.

Sugar. GASTON A. DURET. Fr. 643,894, April 14, 1927. An app. is described for converting solns. such as sugar solns. into a fine dust by spraying the soln. centrifugally against a surface along with heated gases or superheated steam.

Sugar from beets. SUGAR BEET & CROP DRIERS, LTD., W. K. MELROSE and J. C.

STEAD. Brit. 293,946, May 24, 1927. Sliced or disintegrated dried beets are diffused in water at a temp. of 50–70°, the raw sirup is limed at the same temp. and then clarified (suitably by centrifuging). Prior to a final filtration, the clarified sirup is preferably mixed with melted low-grade sugar and decolorized with activated C. A second strike of white sugar is obtained and a low-grade product for mixing is made by boiling the remaining green sirup.

Sugar from peat. PAUL DUTOIT and LOUIS FRIDERICH. Fr. 644,440, Nov. 24, 1927. Crude peat contg. about 15% of dry material is treated in a mixer with sprayed concd. H_2SO_4 and heated under pressure. The sugar juice is centrifuged or pressed out, and the residue is washed and made into briquets.

Removal of protein from sucrose-containing liquids, including molasses. JACOB POHLMANN and JACOBUS R. F. RASSERS. Dutch 19,211, Dec. 15, 1928. Enzyme proteins present in the sugar juice are not pptd. by the usual processes but remain in molasses. They are removed by tannic acid in neutral or weak acid medium at room temp. 100 kg. molasses is dild. with 3 times its vol. of water, 1 l. of 25% H_3PO_4 is added and 1.75 kg. tannic acid (excess) dissolved in water. After filtration, the excess of the latter is removed with CaO and CO_2 .

Screening, settling, filtering and partially recirculating effluent liquids of beet-sugar factories, etc. R. H. L. PENNELL and F. W. BRACKETT. Brit. 293,927, April 29, 1927. An app. is described.

Fluid starch. SOCIÉTÉ DES PRODUITS DU MAÏS (S. A.). Fr. 643,740, Nov. 10, 1927. Starch, particularly maize starch, is made fluid for use as paste or glue by treating it with mineral acid to 50–80° and neutralizing with a carbonate.

29—LEATHER AND GLUE

ALLEN ROGERS

Chandler Lecture, 1928. Chemistry and leather. JOHN A. WILSON. A. F. Gallun & Sons Corp., Milwaukee. *Ind. Eng. Chem.* 21, 180 90(1929).—An address.

H. B. MERRILL

Properties of leather—committee report (A. L. C. A.) 1927–8. JOHN ARTHUR WILSON, *et al.* *J. Am. Leather Chem. Assoc.* 24, 2 21(1929).—Each committee member analyzed and measured the properties of his own leather. All measurements were repeated by the Bur. of Standards. Analyses of all leathers are given. Data are presented on the following subjects: tensile strength, recovery, tear, and cracking of oak belting leather; sp. gr., strength, stretch, stitch tear, and resilience of vegetable-tanned side leather; sp. gr., "pile-up," and H_2O absorption (as a function of location on the piece) of vegetable sole leather; sp. gr., stitch tear, strength, stretch, resilience, and H_2O absorption of miscellaneous Cr leathers; tensile strength and stretch of vegetable-, Cr-, and combination-tanned belting leathers; stretch and strength of Cr- and vegetable-tanned sheet leathers; stretch and strength of vegetable and Cr calf leathers.

H. B. MERRILL

Specific gravity, per cent voids, and "pile-up" of leather. R. E. PORTER. Ashland Leather Co., Ashland, Ky. *J. Am. Leather Chem. Assoc.* 24, 37–42(1929).—Pile-up is defined as "the no. of pieces 1 ft. sq. and 8 irons thickness to make 100 lbs. of leather." Pile-up = $115.5 / \text{apparent sp. gr. } (H_2O = 12\%)$. Apparent sp. gr. ($H_2O = 12\%$) = $\text{apparent sp. gr. } (H_2O = x\%) + 0.008 (12-x)$. The const. 0.008 has been detd. empirically. Actual sp. gr. is detd. by kerosene displacement. Apparent sp. gr. is detd. by kerosene displacement of leather previously satd. with kerosene. Per cent voids is detd. by difference. Data are given for sole leather at 4 stages of manuf., and for 10 finished leathers. The app. used for detg. sp. gr. by kerosene displacement is illustrated.

H. B. MERRILL

Determination of fat in leather. D. WOODROFFE. *J. Intern. Soc. Leather Trades' Chem.* 12, 569–72(1928).— H_2O cannot be removed quantitatively from fat residues by drying at 100°. Consequently the detn. of fat by extn. of moist leather with gasoline will give high results. At 105° H_2O is removed, but such oils as cod are appreciably decomposed. A vacuum oven for drying fat residues, or, better, for drying of the leather before extn., is recommended. Data are presented showing that exactly the same results are obtained when the leather is dried at 105° extracted, and the residue dried at 105° than when the undried leather is extd. and the residue dried at 105°. This refutes the claim that the lower results obtained when leather is previously dried are due to fixation of the oil during drying.

H. B. MERRILL

Effect of heat on wetted vegetable-tanned leather. W. J. CHATER. Northampton Tech. Col., Northampton, Eng. *J. Intern. Soc. Leather Trades' Chem.* 12, 544-58 (1928).—Strips of sole leather immersed in water at different temps. for 5-30 mins. and subsequently dried were little altered up to 70°. At temps. greater than 70°, there was a rapid destruction of characteristic leather properties. The temp. at which rapid shrinkage begins was detd. for numerous leathers. The best results were obtained with an app. in which a strip of leather is supported vertically under water, one end being clamped and the other attached by a hook and cord passing over a pulley to an indicator free to move vertically along a scale. As the water is heated, there is a slight expansion until the temp. reaches about 75°, when rapid shrinking occurs. Pelt, under-tanned leathers, leathers stripped with borax, and other abnormal leathers shrink at much lower temps. Examn. of splits showed that grain and flesh shrink much more than center split, although the temp. at which shrinking occurs is the same for all

H. B. MERRILL

Water penetration tests for sole leather. F. O. SPRAGUE. Deford Co., Luray, Va. *J. Am. Leather Chem. Assoc.* 24, 87-8(1929).—The time required for penetration under a column of H₂O is measured by means of a Kilp machine so modified that the first drop of water that penetrates stops a clock, thus permitting measurements to be made without any attention and at night.

H. B. MERRILL

Resistance to wear of sole leather. U. J. THUAAU. *J. Intern. Soc. Leather Trades' Chem.* 12, 505-20(1928).—Previous work is reviewed and several wear test machines are described. The author's machine is the same in principle as that of Hart and Bowker.

H. B. MERRILL

Production, marketing and use of vegetable tanning materials in world commerce. CARL STEYER. *Ledertech. Rundschau* 20, 261-6, 274-80(1928); 21, 1-6(1929) — Statistical.

I. D. C.

Darmstadt apparatus for tannin analysis. J. GORDON PARKER. London Leather Ind. Lab., London, Eng. *J. Intern. Soc. Leather Trades' Chem.* 12, 520-4(1928).—Comparative analyses of 24 samples of 12 tanning materials (a) by the official method and (b) using the Darmstadt app. gave results for non-tans that agreed within 0.3%. A dry chromed hide powder prep'd. by the Freiburg leather research station was used for analysis of 11 samples of 6 materials by the official method and also with the Darmstadt app.; concordant results were obtained. The use of the Darmstadt app. is advocated.

H. B. MERRILL

Tanning properties of methylene dinaphthol. G. GRASSER AND K. HIROSE. *J. Faculty Agr. Hokkaido Imp. Univ.* 24, No. 1, 17-24(1928). (In German).—Naphthol treated with HCHO yield insol. methylene dinaphthols which have tanning properties. α - or β -Naphthol was treated with HCHO in H₂O, MeOH, EtOH or (Me)₂CO. The product was isolated by filtration from H₂O and by evapn. of the other solvents. The several preps. were dissolved in EtOH, MeOH or Me₂CO, and used for tanning strips of skin previously dehydrated with EtOH. With α -naphthol derivs., the tanned skin was white turning to yellow; with β -naphthol derivs. it was permanently cream-colored. Tannage was gaged by resistance of specimens to boiling water. After 8-24 hrs. the leathers were completely hydrolyzed except grain, which was hydrolyzed only by Na₂S.

H. B. MERRILL

Smoke tannage. L. S. TS'AI AND E. O. WILSON. Yenching Univ., Peking, China. *J. Am. Leather Chem. Assoc.* 24, 21-36(1929).—Smoke tannage is widely used in China. After unhairing and bating in the usual way, the skins are exposed to smoke from green straw for 3-4 days. Vegetable tanning sometimes follows. Smoke-tanned leather is yellow-brown, soft and pliable, rather harsh-grained, withstands hot H₂O up to about 70°, is imputrescible, unaltered by dil. acid, but rapidly destroyed by dil. alkali. The effect of smoke tannage of hide powder on subsequent fixation of vegetable tannin, of Cr and of OH⁻ was studied as a means of detg. what groups are active in smoke tannage. Moist hide powder was treated with pine-sawdust smoke at 20-30° for 4 days. The product was dark brown. Series were run in duplicate with smoked and ordinary hide powder, employing (a) a liquor contg. 28% basic Cr sulfate, (b) myrobalans ext. and (c) NaOH. Concn. of Cr₂O₃ varied from 0.14 to 60 g. Cr₂O₃ per l.; pH value, 3.6-2.88; time, 48 hrs. The usual convex concn.-fixation curve was obtained with both smoked and unsmoked hide powder, but the fixation by smoked powder was only about 50% of the fixation by unsmoked hide powder. Fixation was detd. by analysis of tanned powder. The concn. of myrobalans liquor was 1.67-15.74% total solids; pH value, 3.47-3.33. Smoked hide powder fixed considerably less tannin than unsmoked, particularly at higher tannin concns. Smoked hide powder fixed more alkali than ordinary hide powder. The results are similar to those obtained with aldehyde-

tanned hide powder, which indicates that aldehydic substances in the smoke may be the tanning agents, and that combination occurs through the amino groups of collagen, the carboxyl groups thus being rendered more active.

H. B. MERRILL

Russian tannin barks. C. H. PETERS. *Ledertech. Rundschau* 20, 225-6(1928).—Willow bark has an av. compn. of 10% tannin and 5-8% non-tannin. It gives a soft, elastic leather and so is good for producing upper leather. A purer ext. can be obtained by a double cold-hot extn.; the most favorable temp. for extg. the tannin is 64-70° and for the non-tannin 70-80°. Oak bark contains 10% tannin and 6.5-9% non-tannin. Pine (*Pinna excelsa*) is very abundant. The bark contains 10-11% tannin and 8-10% non-tannin and considerable sugar.

I. D. CLARKE

Tanning value of so-called "Takaout" galls of *Tamarix articulata*. F. AND M. HEIM DE BALSAC AND A. DEFORGE. *J. Intern. Soc. Leather Trades' Chem.* 12, 559-64(1928); cf. C. A. 22, 4866-7.—This plant, a typical desert species, bears a profusion of galls, which are used locally, and to some extent in France, for tanning. Analyses of 4 specimens from different localities showed: H₂O 11.7-13.1, insol. matter 21.5-28, tannin 41.6-56.3, sol. non-tannin 11.4-17.1%. Extn. is easily effected at comparatively low temp., and the resulting ext. is almost clear. The tannin is almost entirely of the pyrogallol type. Sheep skins tanned with "takaout" possess a light cream color. The material seems especially suited to light fancy leathers. The bark of *Tamarix articulata* contains enough tannin to be utilizable (about 10%), but the wood and leaves contain very little.

H. B. MERRILL

Gambier. TH. KORNER. *Ledertech. Rundschau* 20, 191-5, 228-32, 244-7(1928); cf. C. A. 22, 4867.

I. D. C.

The determination of non-tannin. L. KEIGUELOUKIS. *Collegium* 1929, 30-3; cf. C. A. 22, 4865-6.—The hide powder is washed, chromed and shaken with the tannin soln. in a 200-cc. glass cylinder closed with a stopper. A filter candle with a porcelain head attached to a suction line is used to remove wash water or non-tannin soln. By pressing the candle against the powder the moisture content of the latter can be reduced sufficiently; with the Paessler app. this is not always possible. The non-tannin soln. does not need to be refiltered.

I. D. CLARKE

Russian hide powder. V. S. SADIKOV. *Collegium* 1929, 33; cf. C. A. 22, 4865.—The method for prep. hide powder given by Tatarskii is the same as that in German patent 459,428.

I. D. CLARKE

Methods for analysis of beamhouse liquors. JOHN H. HIGHBERGER AND E. KENNETH MOORE. Dept. Leather Research, Cincinnati Univ. *J. Am. Leather Chem. Assoc.* 24, 68-76(1929).—The methods given are those employed in the Tanners' Council Foundation Lab. (1) *Total N* is detd. by the Kjeldahl-Gunning method. (2) *Protein N* is detd. as follows: Filter the liquor through cotton. Measure 50 cc. and render the lime liquors just alkaline to phenolphthalein with 2 N HCl. Add rapidly with stirring 150 cc. of a soln. contg. 50 g. CCl₃COOH and 66 g. NaCl per l. The final salt concn. must not exceed 5%; if the liquor contains NaCl, the NaCl concn. of the reagent must be reduced proportionately. Let stand overnight. Filter and wash 6 or 7 times by decantation with 15 cc. of a wash soln. contg. 1 part H₂O to 3 of reagent, bring the ppt. on a filter and wash with 100 cc. of the wash soln. Determine N in the ppt. as usual. (3) *Non-protein N* is detd. by difference. (4) *Heat-coagulable protein N* is detd. as follows: Measure 100 cc. into a flask and weigh to 0.1 g. Make the lime liquors just acid to phenolphthalein with 99% HAcO. Add 2 cc. of 99% HAcO to the soak or to the acidified lime liquors. Boil 5 mins., reweigh and make to original with H₂O, mix, and filter. Determine N as usual in 25 cc. of the filtrate. Calculate the coagulable protein N by difference. (5) *Volatile bases*.—(a) *total volatile N*: Add excess CaO and distil in a vacuum at 60-70° into excess standard acid, and back-titrate. Van Slyke's app. is recommended. (b) *Seprn. of amines and NH₃*.—Transfer the titrated distillate from (a) to a 500-cc. flask, make up to about 480 cc., add 10 cc. of soln. contg. 100 g. NaOH and 150 g. Na₂CO₃ per l., and make up to 500 cc. Place in a 700-800 cc. brown bottle 0.1 g. yellow HgO per cc. of 0.1 N acid consumed by volatile bases in (a). Add the whole soln., cover with a black cloth, and shake 1 hr. Let stand overnight. Filter through cotton by air pressure (app. described). Distil 400 cc. of the filtrate into standard acid and back-titrate. Calculate amines from titration and NH₃ by difference from (a). (6) *Chlorides*.—Determine by modified Volhard method.

H. B. MERRILL

Lecithin. BRUNO REWALD. *Ledertech. Rundschau* 20, 268-70(1928).—Lecithin, now extd. from soy beans, is an excellent, cheap material for fat liquors; it always produces uniform liquors.

I. D. C.

The badan question. TH. KORNER. *Ledertech. Rundschau* 20, 249-54(1928).—A review. I. D. C.

The use of emulsions in the leather and fur industries. RUDOLF AUERBACH. *Ledertech. Rundschau* 20, 215-7(1928).—A brief description of a machine for producing emulsions. I. D. CLARKE

Some applications of rubber to leather. FINI G. A. ENNA. *J. Intern. Soc. Leather Trades' Chem.* 12, 464-84(1928).—Rubber is employed in the jointing of footwear or belting. Thin coats of rubber are applied to leather and subsequently vulcanized as a water-proofing material and as a bottom coat for patent leather. The chemistry of rubber is discussed. H. B. MERRILL

A contribution to the preparation of standard gelatin. J. HAROLD HUDSON AND S. E. SHEPPARD. *Ind. Eng. Chem.* 21, 263-4(1929).—Seven tentative specifications are given for a standard gelatin possessing as nearly as possible definite chem. compn. and phys. properties similar to those of the highest grade of gelatin now obtainable. W. H. BOYNTON

Specifications for standard gelatin. CLARKE E. DAVIS, S. E. SHEPPARD AND M. BRIEFER. *Ind. Eng. Chem., Analytical Ed.* 1, 56(1929).—Ten tentative specifications for standard gelatin for physico-chem. purposes are listed in a rept. of the comm. of standard gelatin of the Division of Leather and Gelatin Chemistry. This standard is established from the scientific rather than from the commercial standpoint. W. H. BOYNTON

Chlorination of tannery water (AUERBACH) 14. Treatment of industrial wastes from tannery (FALES) 14. Reduction of dichromate to basic chromic salts (GRASSER, NAGAHAMA) 6. Extraction apparatus for wood, bark, etc. (Fr. pat. 643,763) 1. Sulfonic acids (Brit. pat. 293,781) 10. Coating compositions containing nitrated carbohydrates (Brit. pat. 293,434) 26. Sulfonated oils (Brit. pat. 293,806) 27.

Tanning. ALEXANDER T. HOUGH. Fr. 644,238, April 26, 1927. Hexamethylenetetramine is used for pptg. tannin in leather, preferably with the addn. of an acid and a metallic salt, e. g., oxalic acid and a sol. salt of Sb.

Impregnating leather. OTTO RÖHM. Ger. 470,552, Dec. 20, 1924. Depilated hides tanned in the known manner are treated with a soln. of a water-insol. substance, e. g., natural or artificial resin, in a solvent miscible with water, and are then treated with water.

30—RUBBER AND ALLIED SUBSTANCES

C. C. DAVIS

Modern rubber research laboratory. ANON. *India Rubber World* 79, No 3, 65-6 (1928).—An illustrated description of the labs. of the N. J. Zinc Co. at Palmerton, Pa. C. C. DAVIS

Manufacturing rubber goods from latex by electrodeposition. PAUL KLEIN. Hungarian Rubber Works, Budapest. *Rubber Age* (N. Y.) 24, 319-21(1928).—See C. A. 22, 4877; 23, 1305. C. C. DAVIS

Determination of the rubber content in latex preserved with trisodium phosphate and formalin. W. SPOON AND N. BEUMÉ-NEUWLAND. *Arch. Rubbercultuur* 12, 659-71(1928), (Summarized in English 672-4).—In developing a method for detg. the rubber latex preserved with 0.2% Na_3PO_4 and 0.2% HCHO , the influence of various factors had to be ascertained. *Weighing the latex.*—The most satisfactory way was to weigh 200 g., since adding latex drop by drop at the end requires no more time than weighing an arbitrary portion. *Coagulation with acid of various concns.*—As with fresh latex and latex preserved with NH_3 , the yields of rubber from latex preserved with $\text{Na}_3\text{PO}_4 + \text{HCHO}$ increased with increase in the concn. of acid. Much smaller increases occurred when the quantity of acid was increased. As a standard for coagulation, 15 cc. of 10% AcOH per 100 cc. of latex was adopted. *Age of latex.*—With the foregoing quantity and concn. of AcOH , coagulation was complete regardless of the time of standing previously. *Comparison of latex contg. NH_3 and that contg. $\text{Na}_3\text{PO}_4 + \text{HCHO}$.*—With the foregoing quantity and concn. of AcOH , the results were exactly the same as with latex contg. NH_3 dild. with an equal vol. of water and treated with 25 cc. of 20% AcOH (per 100 cc. of original latex). *Addn. of a fixed or variable quantity of acid.*—

Addn. of 10% acid until thickening begins while stirring leads to variable results. *Influence of the quantity of HCHO.*—Excess inhibits coagulation, AcOH thickening the latex but failing to produce a coherent clot. When the HCHO eventually evapns., a clot usually forms. *Influence of time between coagulation and milling.*—With increase in the time from coagulation to milling, the wt. increases. *Influence of drying.*—Prolonged drying *in vacuo* has no effect on the final wt. *Procedure for the detn.*—Shake the sample, thoroughly weigh exactly 200 g. in an Al bowl, add 300 cc. of 10% AcOH or 5% HCO_2H with continuous stirring, cover and let stand 2–3 hrs., knead and crepe the coagulum under standardized conditions, dry in the air overnight, roll in paper, dry *in vacuo* for 2 hrs., place in a desiccator over CaO and weigh the next day (to centigrams).

C. C. DAVIS

Coagulation phenomena in Hevea latex. VIII. Rubber obtained by freezing the latex. G. DE VRIES AND N. BEUMÉE-NIEUWLAND. Proefstation voor Rubber, Buit-zorg (Java). *Arch. Rubbercultuur* 12, 675–82(1928), (Summarized in English 683–5); (cf. *C. A.* 23, 304).—Coagulation takes place only considerably below 0° . Even at -15° coagulation is complete only after about 5 days. The coagulum obtained by freezing has a peculiar structure. The surface layer is a coherent film as in ordinary coagulation, but beneath it is a network of thick and thin white threads with ice crystals between. When sufficiently cold, the mass is hard and brittle, but when the ice melts the threads of rubber bind together to form a coherent coagulum from which clear serum is exuded. The properties of this coagulum do not differ from those of ordinary coagulum except that it is yellower. The serum is a clear yellow color, with a p_H value of 6.2. Boiling does not form a ppt., but on addn. of a trace of AcOH and further boiling a ppt. appears. Addn. of 2.5% AcOH to the serum forms a flocculent ppt., which gives the biuret and Millon reactions for proteins. The serum also forms ppts. with NaCl, MgSO_4 and $(\text{NH}_4)_2\text{SO}_4$ solns., and with dil. alkali a ppt. which redissolves in excess. The serum coalesces B-mixt., whereas the ppt. obtained by acidifying the serum has no coalescing power. Furthermore, in ordinary coagulation this coalescing agent is adsorbed by the coagulum (cf. *C. A.* 19, 419; 22, 698). The following data give the analytical results on coagula obtained by coagulation by AcOH and by freezing, resp.: % ash, 0.22, 0.23; % acetone ext., 3.3, 3.3; % N, 0.39, 0.31; viscosity, 31, 33; viscosity (after acidification), 16, 17; plasticity (d_{30}), 1.47, 1.54; tensile strength, 1.46, 1.51, time of cure, 108, 100; slope, 36, 35.5. The % N shows that with frozen rubber a considerable part of the proteins remain in the serum. Nevertheless, rubber from frozen latex vulcanizes more rapidly than that from acid coagulation. Prolonged freezing of latex does not materially affect the plasticity. Even after being frozen 7 months, the plasticity changes but little, while the viscosity remains the same. C. C. D.

The determination of inorganic matter in soft rubber goods. S. MINATOYA, H. OKUHARA AND S. OHKI. *Res. Electrochem. Lab.* (Japan) No. 234, 42 pp.(1928). (In Japanese, with synopsis in English.)—The method uses solid paraffin as a disintegrating agent. Heat 1 g. of finely divided sample with 10 g. of paraffin at 180° until completely dispersed and the mineral substances are settled out, while still warm add 70 cc. of petroleum benzine, keep warm for 15 mins., centrifuge (2500 r. p. m.), decant, add fresh benzine, centrifuge again, decant, add to the residue a mixt. of acetone and CHCl_3 (equal wts.), boil, decant or siphon, repeat 3 times, dry and weigh. The acetone- CHCl_3 is particularly effective in removing decompn. products of rubber, and there is no fear of high results.

C. C. DAVIS

The solubility of sulfur in rubber. HEINRICH LOEWEN. *Kautschuk* 4, 243–9 (1928).—A review and discussion of the literature, with photomicrographs of droplets of supercooled S in rubber, rhombic crystals of S in rubber, monoclinic crystals of S in rubber accompanied and unaccompanied by droplets of S, the boundary between rhombic and monoclinic crystals both newly formed and after 7 hrs., sepn. of S induced by light both newly formed and after 7 yrs., and the diffusion of S into the interior of rubber during vulcanization in a S bath. A gradual disappearance of cryst. S in the micro-sections during the years is ascribed to "after-vulcanization," which consumes part of the S in soln. and therefore allows some of the crystd. S to pass into soln. All evidence points to the fact that S dissolves in the mol. state in rubber, the mol. probably being S_8 . There is no evidence of the existence of "thiozone" or "thiozonides." When a rubber-S mixt. is alternately heated and cooled above and below the m. p. range of S, there is no sharply defined "soln. point," but rather an interval. Soln. of the rubber-S mixt. in C_6H_6 , with subsequent evapn. of the solvent, allows the prepn. of mixts. particularly suitable for such a study. When a rubber-S mixt. is heated to 120° to fuse the S and dissolve it, and is then cooled, droplets of S appear at a certain temp. range (depending upon the proportion of S) and the mixt. becomes microscopically turbid. Because of super-

cooling, this temp. does not coincide exactly with the soly. of S, but is lower. If the mixt. is then warmed slowly, it again becomes clear, but not uniformly, some portions remaining turbid longer than others. There is accordingly no sharp "soln. point," but only an interval. The same phenomenon is evident when the rubber-S mixt is dissolved in C_6H_6 and the latter is then evapd. at 60–80°, the resulting clear mixt. being particularly suitable for quant. measurements of the soly. of S in unvulcanized rubber. Through observations of the temp. at which turbidity appears on cooling, and the temp. at which the mixt. becomes clear on heating, the soly. of liquid S in unvulcanized rubber was found to be 5% at 53°; 7.5% at 86–7° and 10% around 108°. C. C. DAVIS

The photometric determination of the blackness of various types of carbon black. LOTHAR HOCK. Univ. Giessen. *Kautschuk* 4, 266–8(1928).—With the photometric method for detg. blackness which is described, it was found that there is a close relationship between the sp. surface, i. e., the surface of a definite wt. of C black, and the blackness of the latter, the greater the sp. surface the more intense the blackness. Accordingly, the quality of a C black may in an approx. way be judged by its blackness. The sp. surfaces were measured indirectly by detg. the heats of wetting (cf. H. and Bostrom, *C. A.* 21, 1335; Bostrom *C. A.* 22, 4271). A series of blacks was chosen with heats of wetting ranging from 0.45 to 5.23 Cals., i. e., from a gray colored one to an intense black one. The blacks were then mixed (1) with 100 parts of lithopone and (2) into rubber-ZnO mixts., and each mixt. was compared with pure lithopone or with rubber-ZnO by measuring the relative intensities of reflection of light by means of a Marten polarization photometer for measuring blackness (cf. Weigert, *Optische Methoden der Chemie*, *C. A.* 22, 536), or better by means of a recently developed leucometer (manufactured by Schmidt and Haensch as a modification of the unimeter of Bloch, *C. A.* 22, 3089). The following data give the heats of wetting (g.-Cals.), photometric angles for the lithopone mixts., leucometric reflections (as % of the reflection of pure lithopone) and the leucometric reflections (as % of the reflection of rubber-ZnO), resp. for 6 blacks: (1) 0.45, 35.6, 50.5, 9.3; (2) 1.32, 31.9, 39.0, 4.2; (3) 2.71, 26.2, 24.1, 2.1, (4) 2.86, 26.5, 24.8, 2.0; (5) 4.08, 28.1, 28.5, 2.0; (6) 5.23, 25.5, 22.7, 2.5. The method is also applicable to the quant. measurement of the color imparted by other pigments to rubber mixts. C. C. DAVIS

The evaluation of carbon blacks. D. F. CRANOR AND H. A. BRAENDLE. Binney & Smith Co., New York City. *India Rubber World* 79, No. 4, 67–8(1929).—The conclusions are based on exptl. data, rubber-S-PbO-C black mixts. being used, because with such mixts. the rate of vulcanization is not greatly influenced by the C blacks. The blacks tested included a reinforcing black of standard quality, a moderately reinforcing high yield black, a soft high yield black, and 2 exptl. blacks. The ΔA values (energy capacities) were 100, 64, 35, 64 and 21, resp. In general the results show that the ΔA function as defined by Wiegand (cf. *C. A.* 19, 3386) can be utilized to judge the relative merits of C blacks in practical rubber compounding. It will indicate not only the quality at the optimum concn. of C black but also the range of concn. over which the C black is effective. When C blacks of similar type are concerned, it is important to supplement the information gained from the ΔA function by other stress-strain data and by performance tests in the lab. and in service. C. C. DAVIS

An improved oxygen bomb. ANON. *India Rubber World* 79, No. 5, 75–6(1929).—A new type of O-bomb and accessories (cf. Bierer and Davis, *C. A.* 18, 2617; 19, 3172), which has been designed at Du Pont de Nemours & Co., is described and illustrated. A battery of bombs is heated in a water bath. Each bomb has a Ni safety disk for a max. of 475 lb. per sq. in. pressure, and a thermometer well to detect differences between the internal temp. and that of the water. The water is heated in a const.-temp. tank by steam coils, with control of temp. at 70° \pm 0.5°, and is circulated through the bath. Various other features are described, including the method of charging and discharging O. A max. of 8% of the internal capacity of a bomb should be occupied by rubber samples. C. C. DAVIS

Note on the evaluation of antioxidants. T. L. GARNER. *India Rubber J.* 77, 31 (1929); cf. *C. A.* 22, 3804.—When an antioxidant is tested in an unaccelerated mixt. the time of vulcanization must often be adjusted to counteract the accelerating or retarding effect of the antioxidant, and it is much better to use an accelerated mixt. where the effect of the antioxidant is masked by sufficient acceleration by an accelerator. Expts. with various mixts. led to the adoption of the mixt.: rubber 100, S 3.5, diphenylguanidine 1, ZnO 3, antioxidant 0.5–1, as a standard for testing antioxidants. The antioxidant properties of the various substances were judged by the aging of the mixts. in the Geer oven at 70°. In the mixt. above, the order of merit of various antioxidants depended upon the state of cure of the mixts., an antioxidant which gave the best pro-

tection in badly overcured mixts. not giving the best results in normally cured mixts. In general the beneficial effect of antioxidants was relatively great in overcured mixts. Only 1 among 9 antioxidants failed to discolor a white mixt., and most of them showed a tendency to stain, bad stains being made on wood pulp. The colors imparted by antioxidants to white mixts. vary greatly in ultra-violet light, and these colors change gradually on continued exposure, so that the color combinations on immediate and prolonged exposure offer a means for the identification of individual antioxidants. C. C. D.

The stickiness of unvulcanized rubber. R. W. GRIFFITHS AND MALDWIN JONES. *Trans. Inst. Rubber Industry* 4, 235-46(1928).—The great importance in present mfg. processes of the property of stickiness in vulcanized rubber mixts. suggested the need of a *quant. method* of testing this property. In the test which has been developed by G and J., the force required to sep. 2 surfaces which have been in contact under a definite load for a definite time is measured. With the *app.* which is described and illustrated, the adhesion between rubber sheets and their linings can be measured at different temps. By this means it was shown that stickiness increases with the time of mastication, and that under the same condition of mastication, washed rubber is less sticky than unwashed rubber. The tackiness of calendered sheets depends upon the temp. of the calender, speed of calender, and subsequent cooling before entering the lining. Mixts. apparently unsatisfactory can be rendered usable by regulating the calendering conditions. Sudden chilling, *e. g.*, by a cold bottom roll, destroys the desired tackiness by inducing a S bloom. The new *app.* will reveal differences in tackiness between the 2 sides of a calendered sheet. When a calendered mixt. is wrapped in lining, its stickiness several days later is distinctly higher than the stickiness of the same sheet left exposed to the air. The results show the need of cooling processed mixts. under controlled conditions before they enter linings, *e. g.*, by air jets or atomized water sprays. To prevent blooming, it is necessary at times to graduate the temp. of the cooling drums in such a way that the hot fabric does not first come in contact with too cool a drum. A general discussion follows. C. C. DAVIS

A new physical test for vulcanized rubber. D. D. WRIGHT. Hood Rubber Co., Watertown, Mass. *Ind. Eng. Chem., Analytical Ed.* 1, 17-20(1929).—Vulcanized rubber must often withstand torsion, tearing and bending as well as compression, stress and shear, and, furthermore, on aging the resistance to tearing and shearing often diminishes faster than does the resistance to simple stress. These facts were sufficient to warrant the development of a new test, in which a new design of test sample permits subjecting the sample to a combination of tensile and shearing stresses, which shear the predominant stress. This new "*longue shear*" test, so named from the shape of the test piece, is described in detail and illustrated. It is of special value (1) in revealing "shortness," inner tubes being found to deteriorate relatively sooner as judged by this test than by tensile strength or stress-strain curve measurements; (2) as an unusually sensitive means of detecting the deterioration which takes place during artificial aging and (3) in detecting the beginning of overcuring, the test indicating poor resistance to sudden stress, low resistance to shear and exceedingly poor tearing quality in tubes which judged by tensile strength tests may appear to be of satisfactory quality. C. C. DAVIS

Effect of temperature on the stress-strain properties of vulcanized rubber. A. A. SOMERVILLE AND W. H. COPE. R. T. Vanderbilt Co., New York City. *Trans. Inst. Rubber Industry* 4, 263-80(1928).—To ascertain to what extent in general the quality of rubber products depends upon their temp., the following relations were studied: (1) differences in the stress-strain curves of a typical tire at different temps. from 0° to 100°; (2) differences in the stress at different elongations at different temps. from 0° to 100°; (3) differences in the stress-strain curves of different cured rubbers; (4) the effect of the time of cure and the effect of overcure on the stress-strain curves at different temps.; (5) the effect of the % S and the % accelerator on the stress-strain curves at different temps.; (6) the effect of antioxidants on the stress-strain curves at different temps.; (7) the effect of fatigue on the stress-strain curves at 0° and 100°; (8) the effect of the permanent set at 0° and 100°; and (9) differences in stripping tests at 0° and 100°. For *app.*, an ordinary testing machine, was equipped with a glass-windowed chamber contg. water at the required temp., through which the sample was stretched. With increase in temp. the stress-strain curves of the tire tread (rubber-S-accelerator-antioxidant-softener-ZnO-C black) approached the elongation axis, *i. e.*, for a given elongation the stress became progressively smaller with increase of temp. The difference between 0° and 100° was very great, at 400% elongation the stresses being approx. 27(0) and 600 lbs. per sq. in., resp. The relative changes at different elongations were not const., the higher the elongation the greater being the proportional de-

crease in stress for a given increase in temp. The effect of an increase in temp. on the stress-strain curve differed for different rubbers, e. g., guayule mixts. showing greater changes than fine para, smoked sheet or crêpe mixts. The state of cure of a mixt. had a great influence on the changes in its stress-strain curves with changes of temp., the stresses at 400% elongation both at 0° and at 100° increasing with increase in the time of cure. In tests where the % S was varied over a wide range, the min. difference between the stress-strain curves at 0° and 100° occurred with 2-3% S (based on the rubber). Hence for the ordinary type of rubber mixt. which must withstand elevated temps., 2-3% S is the best proportion to use for curing. At the optimum cure, the proportion of accelerator had less influence on the sensitivity of the stress-strain curves to temp. than did the S. However, with high acceleration, a reduction of S from 4 to 2% diminished the sensitivity of the stress-strain curves to temp. When samples were repeatedly elongated 400% and immediately released, the stress-strain curves both at 0° and 100° approached a const. position which differed greatly from the initial curve. When the samples were stretched in a similar way but were held 5 min. each time before release, there was a still greater difference between the initial and final curves, both at 0° and at 100°. In stripping tests of rubberized fabric belting at 0°, 25° and 100°, the friction stress at 100° was about 0.5 that at 0°. In an overcured mixt., the stress-strain curve at 0° may not reveal an overcure, and yet the curve at 100° may show an exceedingly "short" condition. Some mixts. have a much wider range than others over which they may be cured without suffering an overcure, but an overcured state can always be detected at 100° with a readiness which has not been possible with any previous test. It is, therefore, very important not to overcure products which must withstand elevated temps. Tests at 0° and at 100° of mixts., with and without antioxidants, in different states of cure, and which had been aged in air at 70°, showed that deterioration is not in this case a result of overcuring, for the stress-strain curves both at 0° and 100° changed in the same general manner. In this test, the longer the cure the faster the rate of deterioration. Addn. of an antioxidant retarded the rate of deterioration, particularly with overcured mixts., but it did not alter the relations between the stress-strain curves at 0° and 100°. In conjunction with earlier expts by van Rossem and van der Meijden (*C. A.* 22, 1059) and others, the results show how much poorer in quality rubber mixts. are when hot than when cold, particularly when they are overcured. Also in *India Rubber World* 79, 64-71 (1928) and *Rubber Chemistry and Technology* 2, 1-20 (1929).

C. C. DAVIS

Some new laboratory work on rubber. A. A. SOMERVILLE AND J. M. BALL. R T Vanderbilt Co., New York City. *Rubber Age* (N. Y.) 24, 490-4 (1929).—With most rubber mixts. there is a wide difference between the stress-strain curves at 0° and at 100°, the mixts. becoming relatively weak, particularly when overcured (cf. preceding abstr.). There are, however, 3 types of mixts., the stress-strain curves of which at 0° and at 100° cross in such a way that at low elongations the stresses at 100° are higher than those at 0°, while at higher elongations (up to the breaking point) the stresses at 100° are lower than those at 0°, viz., rubber cured with (1) 1-1.5% S and a high % of accelerator; (2) tetramethylthiuramdisulfide and neither S nor other accelerator, and (3) a low % of S, an org. accelerator and Se. With this 3rd type of mixt., the elongation at which the stress-strain curves cross depends not only upon the ingredients and their proportions but also upon the state of cure, the higher the latter the higher the crit elongation. Stripping tests of rubberized fabric belts show strikingly the effects of overcure, for at 0° the "friction" values of belts correctly cured and overcured may be virtually the same, and yet at 100° the friction of the overcured belts may be perhaps only 0.5 that of the correctly cured belts. Furthermore such belts show just as strikingly the effect of Se, for, where without Se the friction values diminish progressively with increase of temp., addn. of Se results in progressive increases of friction strengths with increase of temp., so that the values are not only higher at room temp. but become proportionately still higher at 100°. The results are obtained with Se when the belts are judged by means of flexing tests. The use of Se in mixts. used in the construction of automobile fan belts has proved to be of great value in lengthening the span of life of the belts. Discussion. J. M. BIERER. *Ibid* 493.—Replacement of part of the S by Se in a belt friction mixt. resulted in twice the resistance to flexing. EVERETT MORSE. *Ibid* 493-4.—A brief history of the development of the use of Se by Boggs is given (cf. B. and Follansbee, *C. A.* 21, 1566). GLIDDEN. *Ibid* 494.—Replacement of part of the S by Se in a tire-tread mixt. shortened the time of optimum cure, increased the tensile strength and hardness and slightly improved the aging. SCHILDHAUER. *Ibid* 494.—Replacement of part of the S by Se in belt friction mixts. resulted in increases of flexing tests from 30,000-85,000 to 150,000-200,000 cycles. JOHN T. BLAKE. *Ibid*

494.—The expts. of Somerville (*loc cit.*) suggest that Se increases the range of cure over which a mixt. does not overcure. At ordinary vulcanizing temps. about 0.5% Se dissolves in rubber, but no reaction takes place (even up to and above the m. p. of Se) unless an accelerator is added. The soly. explains, however, why Se is active as a vulcanizing agent far below its m. p. All attempts to make hard rubber with Se alone have failed. Soft rubber and hard rubber are different substances. Hard rubber is a plastic which is sensitive to temp. changes, whereas true soft rubber is elastic and is relatively insensitive to temp. changes, so that when rubber is cured with Se and insufficient S to endanger overcuring, the resulting vulcanizate is relatively insensitive to temp. changes. A. A. SOMERVILLE. *Ibid* 494.—Results indicate that when a mixt. contains not over 2% S (based on the rubber) and not over 1% Se, there is little or no tendency to bloom. C. C. DAVIS

Synthetic rubber from coal. FRITZ HOFMANN. *Rubber Age* (N. Y.) 24, 322-3 (1928).—An address, dealing with past work. C. C. DAVIS

Rubber solvent gasoline. BRUCE C. DODD. Anderson-Prichard Oil Corp., Oklahoma City. *India Rubber World* 79, No. 3, 68(1928).—A brief review of the development of gasoline solvents for use in the rubber industry, with a description of the com. solvents termed "Rub-Sol" and "Dip-Sol." These have distn. ranges of 40-145° and 98-145° resp., but give cements which dry in about the same length of time. The latter is particularly useful for dipped goods. C. C. DAVIS

Complete recovery of scrap rubber. F. ROUXVILLE. *Rev. gén. caoutchouc* 6, No. 48, 15 6(1929).—On the assumption that vulcanized rubber is not plastic because the viscous phase of raw rubber has been modified by S, it should be possible to reclaim vulcanized rubber by restoring to it a viscous phase and as a result its plasticity. Terebenthene may be polymerized by catalysts with the formation of a viscous *terpene* of the compn. $(C_{10}H_{16})_n$, the phys. and chem. properties of which are similar to those of the viscous phase of raw rubber. It dissolves raw and vulcanized rubber, it vulcanizes in a mixt. with raw rubber and it does not influence the quality. Scrap rubber is finely ground, mixed with 5-10% of the polymerized terpene, the ordinary proportion of S is added and the mixt. is vulcanized in the ordinary way. The polymerized terpene has an antioxidant effect. Because of its consistency it is better than rubber for impregnating cotton, jute, cork, etc. Various other applications are suggested. C. C. DAVIS

Band tires. T. S. GARDNER. Dunlop Rubber Co. *Trans. Inst. Rubber Industry* 4, 247 62(1928).—An illustrated review and discussion of present methods of manuf., of band (solid) tires, including the best compn. for the steel band, designs of bands, the character of the hard rubber base, methods of forming and attaching the tread, molding, vulcanizing and electrolytic cleaning of molds. Tests to det. the detrimental effect on the adhesion between bands and hard rubber of oil showed that no trouble is likely to arise from the use of a sol. oil in machining. A general discussion follows the paper. C. C. DAVIS

A simple tread-cracking test. A. H. NELLEN. Lee Tire & Rubber Co., Conshohocken, Pa. *Rubber Age* (N. Y.) 24, 373-4(1928).—The machine described and illustrated is the first app. to measure the relative tendencies of different designs of treads to crack in service. A tire tread and carcass (with sidewalls and beads removed) runs as a belt at the speed desired over pulleys so arranged that multiple and exaggerated flexing takes place. Besides results of a mech. nature which were obtained, it was found that resistance to cracking may be enhanced by the use of special compounding ingredients, many of the most effective agents being powerful antioxidants. On the other hand, not all antioxidants inhibit cracking; in fact, there is probably no relation between antioxidant power and ability to improve resistance to cracking. C. C. D.

American practice in the manufacture of rubber-insulated conductors. RICHARD APR. *Kautschuk* 4, 268-70(1928). C. C. DAVIS

Organic accelerators. WEBSTER NORRIS. *India Rubber World* 79, 53-7(1929).—A review dealing with the development of org. accelerators of vulcanization, their classification according to the systems of Dinsmore and Vogt (C. A. 22, 4273) and of Bloc (C. A. 22, 4870), the phys. properties and the accelerating characteristics and peculiarities of 58 com. aldehyde-amines, thio acids, thiuramsulfides, thiazoles, thioureas, guanidines and miscellaneous org. salts, and finally recommendations for the use of particular accelerators for various types of rubber goods. C. C. DAVIS

The influence of zinc oxide on the coefficient of vulcanization. S. A. BRAZIER AND L. R. RIDGWAY. *J. Soc. Chem. Ind.* 47, 351-6T(1928).—The present paper shows that erroneous values are often obtained when the coeff. of vulcanization is calcd. as the ratio of the difference between the total and free S and the rubber content. When

ZnO and org. accelerators are present, there is more ZnS formed than has hitherto been supposed, in fact enough to render useless the ordinary method of calcn. of the coeff of vulcanization. The expts. described deal with the effects on the extent of formation of ZnS and ZnSO₄ of: (1) increasing proportions of ZnO, for a const. rubber-S ratio; (2) various org. accelerators; (3) the time and temp. of vulcanization; (4) the addn. of fatty acids and of basic compds., *e. g.*, stearic acid, MgO and CdO; (5) the type of rubber; and (6) the rubber-S ratio. The exptl. mixts. contained rubber 100, S 5, org. accelerator 0-1, ZnO 0-45. In unaccelerated mixts., the quantity of ZnS was very small, its quantity increasing both with the time and with the temp. of vulcanization. With diphenylguanidine but no ZnO, the max. coeff. obtained was 4.9, but with ZnO the max. coeff. was only 3.8. With diphenylguanidine the proportion of ZnS was in all cases 3-4 times as great as in the corresponding unaccelerated mixts. In general the ZnS increased both with the time and the temp. of vulcanization, and decreased with reduction in the S/ZnO ratio. Addn. of 1 part of MgO to rubber-S-diphenylguanidine-ZnO mixts. increased the rate of combination of rubber and S, and suppressed almost wholly the formation of ZnS. Aldehyde-ammonia behaved somewhat like diphenylguanidine, though without ZnO, combination of rubber and S was more rapid, and in some cases the free S was higher with ZnO than without it. In conjunction with the formation of appreciable quantities of ZnS, this showed that ZnO retards the chem. part of vulcanization. With tetraethylthiuramdisulfide, ZnO increased greatly the combination of rubber and S, with formation of only traces of ZnS. Zn isopropylxanthate acted like tetraethylthiuramdisulfide. It was decompd. during vulcanization the Zn combining with the S, which conforms to the theory of Bruni and Romani that dioxanthogen is formed and functions as the accelerator. The behavior of mercapto benzothiazole was intermediate between that of the ultra-accelerators and the mild ones. Though it is supposed to be superior in an acid medium, the addn. of 0.5 part of stearic acid caused no appreciable change in the proportion of ZnS formed. Oleic acid did not influence the formation of ZnS except at high vulcanizing temps., where it reduced it. Preliminary expts. with CdO indicated that its behavior is similar to that of ZnO, though in unaccelerated mixts. higher coeffs. were obtained, owing to a greater rate of combination of rubber and S. Analytical data on several technical mixts. are tabulated to show the errors encountered in detg. the coeffs. of vulcanization by calcn. from the free S only, instead of taking into account the sulfide-S. The older methods of detg. inorg. S compds. are not so reliable as that of Stevens (*J. Soc. Chem. Ind.* 34, 244(1915); *cf. C. A.* 9, 2466), particularly the PhNO₂ and paraffin disintegration methods. In some cases not all the rubber is removed by PhNO₂ and the insol. part contg. combined S remains with the inorg. S compds. Some transference of S from rubber to ZnO is possible during the heating with PhNO₂ or paraffin, a similar effect occurring in prolonged overcuring of mixts. vulcanized at high temps. In unaccelerated mixts. the ZnS is small enough to be ignored in calcg. the coeff. of vulcanization from the free and total S, but with some org. accelerators it upsets the results. The quantity of ZnS depends upon the % ZnO, the % S, the accelerator and other ingredients, and no general correction is possible. A small quantity, not over 0.1% of ZnSO₄ was also formed. The results are of importance in relation to specifications which restrict the coeff. of vulcanization but allow the use of org. accelerators and ZnO.

C. C. DAVIS

Retardation and prevention of oxidation (RHODIN) 2. Lampblack (GROVE PALMER) 18. Some applications of rubber to leather (ENNA) 29. Products from coal, lignite, shale, peat, etc. (Brit. pat. 293,578) 21.

Rubber. New York: Henderson Rubber Reports, Inc. Reviewed in *Rubber Age* 24, 525(1929).

Accelerator of vulcanization. JAN TEPPEMA (to The Goodyear Tire and Rubber Co.). Can. 286,103, Jan. 1, 1929. Reaction products of certain aromatic aldehydes, particularly the aldehydes having a hydroxyl group substituted in the aromatic nucleus, and amines, such as aniline or toluidine, when incorporated in a rubber compd. materially accelerate the rate of vulcanization and impart desirable characteristics to the product. An example of such reaction product is obtained by the interaction of β -hydroxynaphthaldehyde and aniline. One method of prepg. this product is to intermix mol. quantities of β -hydroxynaphthaldehyde and aniline, and heat under a reflux condenser for several hrs. A yellow cryst. compd. is obtained which upon being heated

gives off an oil and leaves a resinous mass. The latter material is a desirable accelerator, whereas the yellow cryst. product has little, if any, accelerating properties.

Rubber. THE ANODE RUBBER COMPANY, LTD. Fr. 643,762, Nov. 10, 1927. Added ingredients and stabilizing agents are added to latex before or during concn. by evapn., and accelerators and vulcanizing agents are added afterward. The stabilizing agents may include colloids such as glue, gelatin, casein, vegetable gums, dextrin or soap, Na_2SiO_3 or viscose. In an example ZnO 8, S 25, lampblack 1, talc 20, whiting 15, emulsified paraffin wax 2 and finely ground mineral rubber 1, are mixed with 100 parts of water contg. KOH 0.1, oleic acid 0.3 and casein 0.3 part. Preserved latex contg. 60 parts rubber is added and the whole mixed and concd. After concn. NH_3 and an accelerator such as 0.3 part diethylammonium diethyldithiocarbamate are added during cooling, the mixing being continued until both are uniformly distributed. Other examples are given, in one of which S and piperidine piperidylcarbothionolate are added during the latter part of the concn.

Rubber latex. RUBBER LATEX RESEARCH CORP. Fr. 644,605, Nov. 3, 1927. Latex is stabilized by adding blood or hemoglobin in quantity representing 5-25% of its content of rubber.

Concentrating latex. METALLBANK UND METALLURGISCHE GES. A.-G. (to K. D. P., Ltd.) Brit. 293,771, July 11, 1927. According to an example, there is added to fresh tapped latex 0.5% K salicylate or 0.25% KF and 0.25% KOH and the mixt. is inspissated. Other similar substances may be also used.

Treating latex. GENERAL RUBBER CO. Brit. 294,002, Aug. 25, 1927. Rubber latex is treated with a creaming agent such as NH_4 alginate and allowed to stand until it seps. into an uncoagulated rubber-contg. upper layer and a lower layer contg. sol. non-rubber constituents; the upper layer is then removed and the rubber is either used directly in manuf. or is spray dried or otherwise suitably treated. The latex may be subjected to 2 or more successive creaming treatments. Cf. C. A. 22, 3551.

Rubber compositions. DUNLOP RUBBER CO., LTD., AND D. F. TWISS. Brit. 293,702, April 19, 1927. Viscous liquid or semi-solid accelerators, "anti-ageing" substances or softeners, *e. g.*, oleic acid, aldol- α -naphthalene or crotonaldehydeaniline are mixed with colophony before they are added to the rubber. Solvents may be used or the substances may be melted together.

Rolls for masticating or mixing rubber, etc. DUNLOP RUBBER CO., LTD., and D. F. TWISS. Brit. 293,519, May 11, 1927. Direct water-cooling of the rolls is made more efficient by rust prevention, by placing wear-resisting material such as balls or cylinders of iron, stone or rubber inside the rolls.

Forming rubber tubing on a fusible core. DUNLOP RUBBER CO., LTD., and A. W. T. HYDE. Brit. 293,535, May 26, 1927. An aq. rubber dispersion is deposited on a core or mandrel such as Wood's alloy (either electrophoretically or by dipping) and the core is removed by fusion. Various details and modifications are described.

Product for making tires puncture-proof. COLONIAL RUBBER. Belg. 347,420, Jan. 31, 1928. Rubber, glycerol or glucose in which is suspended powdered cork or vegetable fibers is mixed hot with a mineral pulverulent constituent such as talc, mica or MgCO_3 .

Product for making tires puncture-proof. G. L. HUYSMANS. Belg. 347,557, Jan. 31, 1928. The product consists of an aq. soln. of animal gelatin, glucose, glycerol and nitrobenzene, or similar products, contg. non-decomposable pulverulent or fibrous mineral matter.

Deposition of rubber. W. A. WILLIAMS. Brit. 293,815, April 8, 1927. See Fr. 638,630 (C. A. 23, 547).

Rubber deposition by electrophoresis. DUNLOP RUBBER CO., LTD., and F. H. LANE. Brit. 293,343, April 6, 1927. In order to det. the c. d. necessary for the electrophoretic deposition of rubber of desired character, a test anode is used which is mounted so as to bear a varying c. d. along its length and therefore a deposit of varying character. A scale may indicate the c. d. at each point of the anode. Various structural and manipulative details are given.

Rubber sheets by electrodeposition. JOHN PORTER. U. S. 1,702,705, Feb. 19. Deposition from latex is effected on the surface of a bi-polar electrode of readily oxidizable metal such as Pb while at the same time oxidizing the metal and reducing the metallic oxide, as by electrolytic action. An app. is described.

Rubber floor covering composition. CYRUS F. WILLARD. U. S. 1,702,678, Feb. 19. Vulcanized sheets are formed of a compn. comprising mixed rubber and fiber 65, S 3, thiocarbanilide 0.5, $\text{Ca}(\text{OH})_2$ 2.5, petrolatum 4, Fe_2O_3 8, paraffin 2 and wood flour 17 parts.

Machine for reducing waste rubber to a fine powder. VICTOR D. LLOP. FR. 644,296, Oct. 29, 1927.

Recovering cotton or other fiber from rubber fabrics. D. F. WILHELM (to Naamlooze Vennootschap Vereenigde Nederlandsche Rubberfabrieken). Brit. 293,419, July 6, 1927. Material such as that of old tires, while it may be held by feed rolls and immersed in water or subjected to water jets or sprays, is combed or torn asunder and the liberated fibers are afterward sep'd. from the water. Various details of operation and of the app. used are described.

Vulcanizing rubber. OSKAR FISCHER. Ger. 467,863, Dec. 9, 1925. The known method in which a mixt. of rubber with S and a mixt. of rubber with a vulcanization accelerator are mixed together prior to vulcanization is modified by mixing the mixts continuously and in small amts. at a time.

Apparatus for repairing rubber articles by vulcanization. MAXIMIN MOMPIOT. Fr. 643,866, Nov. 15, 1927. The platform on which the article rests is indirectly heated by hot gases.

CHEMICAL ABSTRACTS

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1—APPARATUS AND PLANT EQUIPMENT

W. L. BADGER

Small laboratory table. LUDWIG KAUFMANN. *Chem. Fabrik* 1929, No. 4, 40.—Description of a small rectangular table mounted on rollers with handles for convenient transportation of larger pieces of app. and fitted with set screws for attachment to the main table. S. L. B. ETHERTON

Colorimeter in the laboratory and the factory. HUGO FREUND. *Quim. ind.* 5, 8(1928).—The colorimeter is now used in the Fe and steel industries for the detn. of Cr, Ni, Co, Ti, V and Mo; in the Cu and Pb industries for Co, Bi, etc.; in the mic lab. for small quantities of Ti, Fe and Mn; in the textile industry for waters Cu, in the fertilizer industry for phosphates, nitrates and K; in the food industry milk, gelatin, preservatives, etc., F. discusses, simply, inversion colorimeters, particularly of the compensated type and the universal type. S. L. B. ETHERTON

A new drying apparatus. FRITZ FRIEDRICHS. *Chem.-Ztg.* 52, 601(1928).—A modification of Abderhalden's drying app. is described and illustrated. It permits drying in any given gas or in a vacuum. W. C. EBAUGH

Stirrer from windshield wiper. A. V. MOTSINGER. *Ind. Eng. Chem.* 21, 192 (1929). The mech. suction part of a windshield wiper, with stirring rod attached, makes an ideal stirrer as the speed and stroke can be adjusted readily. It can be used wherever there is a suction line. W. C. EBAUGH

A new sampling instrument for viscous and lard-like substances. LOUIS EISEN. *Chem. Umschau, Fette, Oele, Wachse u. Harze* 35, 228(1928)—Illus. P. ESCHER

Manometer for the determination of gases in vapors. D. F. OTHMER. Univ. Michigan. *Ind. Eng. Chem., Anal. Ed.* 1, 46-7(1929).—To measure the amt. of air steam a manometer was constructed combining the characteristics of a gas thermometer with those of a vapor-pressure thermometer. Readings to 0.5 mm. on an ordinary scale give an accuracy of 1 part in 2000 when the steam is slightly above atm. pressure. W. C. EBAUGH

Specifications for Engler's viscometer. PASCHEN. Phys.-Tech. Reichsanstalt, Berlin-Charlottenburg. *Chem. Fabrik* 1928, No. 52, 726.—Supplementary specifications are given concerning thermometers and measuring flasks for use with Engler's viscometers. W. C. EBAUGH

Improved apparatus for vapor-pressure determinations. O. A. PICKETT. Hercules Powder Co., Kenil, N. J. *Ind. Eng. Chem., Anal. Ed.* 1, 36-8(1929).—Ramsay and Young's app. (cf. *J. Chem. Soc.* 47, 45(1885)) was modified so as to cause any distillate from the condenser to return to the boiling tube (by making the condenser slope upward from the tube) at a slow uniform rate such as would not exert any disturbing influence on the vapor-liquid equilibrium in the said tube. Check detns. on vapor pressure of H₂O and on satd. NaCl solns. show close agreement with results accepted standards. W. C. EBAUGH

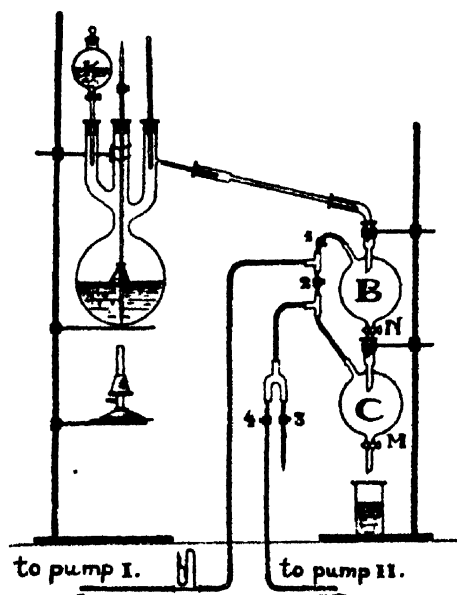
Simple apparatus for measuring vapor pressure of volatile liquids. ALFRED W. RANCIS. Arthur D. Little, Inc., Cambridge, Mass. *Ind. Eng. Chem., Anal. Ed.* 1, 8-9(1929). A small long-stem dropping funnel, supported preferably by a split ring, connected by a rubber pressure tube with a gas-analysis leveling bottle contg. Hg. The funnel is lowered until Hg flows into it, the stopcock closed, and the funnel raised until Hg falls away from the stopcock. The height of Hg is read with a meter rod. A few cc. of the volatile liquid, e. g., gasoline, is poured into the funnel, the latter lowered, the liquid admitted so that it is on both sides of the stopcock; the funnel is then raised again and the Hg column measured. The difference in the 2 readings gives the vapor pressure at the surrounding temp. W. C. EBAUGH

Simple device for pipetting obnoxious liquids. LEOPOLD SCHEFLAN. Syracuse Univ. *J. Chem. Education* 6, 114(1929).—A flask is provided with a 2-hole rubber

stopper carrying an inlet tube through one of them and a pipet through the other; an atomizer bulb on the inlet tube forces the liquid up into the pipet, and a piece of rubber tubing with a screw clamp on it attached to the pipet enables the operator to fill and empty the pipet.

A practical aspirator. ORRO RÖDG. *Chem.-Ztg.* 52, 601(1929).—Two large bottles have fitted to them rubber stoppers with 2 holes; through one hole of each passes a tube to a point just within the stopper, and a 3-way stopcock closes the other end. Through the other hole a glass tube extends to the bottom of the bottle; these similar tubes are connected by rubber tubing. The bottles can be used alternately as the upper and lower parts of an aspirator.

Laboratory apparatus for vacuum distillation. V. M. SEMENOV. *J. Chem. Ind. (Moscow)* 5, 722(1928).—An app. for fractionation *in vacuo* which has the advantages of enabling (1) to conduct uninterrupted distns. and (2) quickly to attain the needed



air rarefaction when dealing with small volumes has been designed by S. The distn. flask A (see fig.) is provided with a capillary tube, which regulates the access of air so as to avoid bumping, with a separatory funnel for the introduction of the liquid to be fractionated, and with a thermometer. The receivers B and C have 2 upper outlets, one of which is connected with a vacuum and the other one serving as a connecting link; the lower outlets are provided with well-ground stopcocks M and N. 1, 2, 3 and 4 are clamps. The running-water pump I gives the system the needed vacuum on condition that 1, 3 and 4 are tightened, 2 is unscrewed, M is closed and N open. When a vacuum is obtained and the distn. begins, the first fraction is collected in C; by tightening 1 the entry of the liquid into C is facilitated. When the second fraction begins to distil, N is closed, 1 is unscrewed and 2 is tightened, while air is admitted into C through 3, and the first fraction is evacuated through M. Then M is closed, 3 is tightened and 4 is unscrewed to open communication with the pump II which

gives vacuum to C. Then 4 and 1 are tightened, 2 is unscrewed and N is opened (turned on) to permit the passage of the contents of B into C, and so on. New quantities of the substance to be distd. can constantly be introduced through K without interrupting the distn.

Distillation columns and flasks with Hücke's dropping neck. ANON. *Chem.-Ztg.* 52, 601(1928).—To prevent the contamination of the distillate by pieces of cork or stopper the return tube is directed to the side and the lower end is cut off diagonally.

Modified distillation apparatus for the chemical engineering laboratory. W. L. BEUSCHLEIN. Univ. of Wash., Seattle, Wash. *Ind. Eng. Chem., Anal. Ed.* 1, 43-4 (1929).—A simple layout for still, condenser and accessory app. is described. W. C. EBAUGH

Simple pressure regulator for vacuum distillations. HENRY L. COX. Mellon Inst. of Industrial Research. *Ind. Eng. Chem., Anal. Ed.* 1, 7-8(1929).—A closed arm Hg manometer contg. a sealed-in contact and an adjustable contact is connected in series with a relay and a battery; the armature of the relay is connected to a motor which drives the vacuum pump. The app. is automatic, requires little attention, and maintains any desired pressure constantly within ± 0.1 mm. of Hg. W. C. E.

A separator for continuous fractional distillation under reduced pressure. R. DELABY AND R. CHARONNAT. *Bull. soc. chim.* 43, 1287-8(1928).—A device made of Pyrex glass, which allows a sepn. of fractions without interrupting distn., is described. The bulbs, in which the fractions are collected, are connected by means of stopcocks.

A modified Pirani gage for use in corrosive systems. GERHARD K. ROLLATSON. *J. Am. Chem. Soc.* 51, 804(1929).

Orsat apparatus for complete gas analysis. ANON. *Gasinstitut. Gas u. Wasserfack* 72, 59-60(1929).—The Thermal Lab. of the Gasinstitut has developed a new

portable type of Orsat app. for complete gas analyses and N detns., which is especially adapted to the analysis of water gas and producer gas and other gases free from heavy hydrocarbons. Methods of analysis are given, a novelty being the use of 50% glycerol solns. as the retaining liquid for gas to be subjected to slow combustion. R. W. R.

Intermittent injection of gas in gas-lift installations. MORGAN WALKER. *Am. Inst. of Mining and Met. Eng., Tech. Publ. No. 146*, 11 pp.(1928).—General discussion.

HANS C. DUUS

Apparatus for the determination of the breakdown point of adsorbing systems. ANTON MACKERT. *Chem. Fabrik* 1929, No. 4, 39-40.—The breakdown point is the point at which the adsorbent is satd. with the adsorbed substance, so that the adsorbable medium is no longer removed by the adsorbent. Pieces of adsorbent carbon are tied upon metal wires suspended from a light metal ring. This ring hangs from a bent steel spring, one end of which can complete an electric circuit through mercury contact. Exit gases from the main adsorbing chamber pass over the carbon which increases in wt. when the gases contain adsorbable material. The metal spring is thus depressed, and on reaching the mercury the elec. circuit is completed and a bell rings. By adjusting the length of the spring, the app. is made to be sensitive and can be arranged to give the alarm at a detd. increase in the wt. of the carbon. The app. is thus automatic and does not require continual watching.

S. L. B. ETHERTON

Zambelli's vacuum evaporator. R. GIORDANO. *Rev. centro estudiantes farm. buquim.* 16, 596-601(1927).

H. L. D.

Aging phenomena in thermoelements. HEINRICH LENT AND FRANZ KOFLER. *Arch. Eisenhüttenw.* 2, 173-6(1928).—Expts. are made to det. which one of the thermocouples, chrom (83.7% Ni, 14.7% Cr), I-constantin, I-V2A (8.0% Ni, 15.7% Cr)-steel, I-NCT3 (17.5% Ni, 37.6% Cr, 0.48% Mn), I-cekas (59.7% Ni, 11.2% Cr, 2% Mn) and I-Ni, has the longest life and shows the smallest change in thermoelec. force when heated in coke or blast-furnace gas atms. at 850-900°. The I-Ni element is chosen as the most satisfactory since it does not age and has a straight-line temp.-voltage curve, although its durability is less than that of other elements and the Ni wire has a coarse cryst. structure after 13 days' heating. The thermoelec. force of this the I-Ni couple is const. up to breaking. The coke gases have a greater effect on the thermoelectric force than do the throat gases. The I-constantin element cannot be used because of aging, although its thermoforce is satisfactory. In a coke-gas atm. the I-V2A and I-NCT3 elements cannot be used, while in blast-furnace gas a change of the thermoelec. force is shown after 16 hrs. Above 700° the thermoforce of the I-cekas element increases; therefore, this is not a suitable couple. Aging is defined as a decrease in thermoelec. force due to increased use of the element, and is not caused by a change in its resistivity.

J. BALOZIAN

Furnace system for carrying out chemical reactions at high temperatures. FRANZ MEYER. *Chem.-Ztg.* 52, 599-600(1928).—A furnace system suitable for the production of Na₂S, etc., is shown. It consists of 2 reverberatory furnaces built end to end, with a flue connection from one to the other, with fire boxes at the opposite ends, and with flue openings from the lateral walls, near the fire bridges of each, controlled by dampers, leading to the common chimney. While one furnace is operating, the other one is being charged and brought up to heat by waste gases from the first; later, the operation is reversed.

W. C. EBAUGH

Apparatus of porous glass prepared from sintered glass powder. G. F. HÜTTIG. *École technique allemande de Prague. Chimie et industrie* 20, 1034-8(1928).—A review of their phys. and chem. properties and of their possible uses, particularly in analytical work, with bibliography of 82 references.

A. PAPINEAU-COUTURE

Comparison from a practical standpoint of washing towers packed with Raschig rings and of rotary washers. A. DZIURZYNOWSKI. *Gas Woda* 8, 130-3(1928); *Chimie et industrie* 21, 38-9(1929).—From a discussion of the relative merits of the 2 types of gas washers, particularly in view of present conditions in Poland, towers packed with Raschig rings are considered both cheaper and more efficient.

A. P.-C.

The suitability of Monel metal for tower packing. G. WEISSENBERGER AND L. PIATTI. *Chem. Fabrik* 1928, 703-4.—Spiral rings of light, resistant metals may replace, in some cases, heavy, voluminous, ceramic packing. Tests show Monel metal to be especially suitable for tower packing which is to be exposed to gases contg. H₂SO₄ or HCl. Comparative data are given for Monel and Al.

DAVID GORDON

Discharge coefficients of square-edged orifices for measuring the flow of air. H. S. BEAN, E. BUCKINGHAM AND P. S. MURPHY. *Bur. Standards J. Research* 2, 561-658(1929).

E. J. C.

Further research on pipe bends. W. HØVGAARD. *J. Math. Phys., Mass. Inst.*

Tech. 7, 239-97(1928).—Exptl. material and analysis are presented to assist in developing a simple criterion for the strength of pipe bends. A theory is developed that the longitudinal stresses, particularly those in the middle surface, determine the point of breakdown of pipe bends.

T. P. KELLER

Handbook of Cast Iron Pipe for Water, Gas, Steam, Air, Chemicals and Abrasives. Chicago: Cast Iron Pipe Research Assoc. 336 pp.; \$3.

Filter. HERMANN FRISCHER. Fr. 645,136, Dec. 3, 1927. An app. for dissolving, filtering and washing substances comprises a rotating cylinder forming the filter and carrying on its outer circumference agitating blades.

Dust filters. EDUARD W. STRAUS. Fr. 644,940, Nov. 30, 1927. Dust filters in the form of flexible tubes are maintained in position by a frame of metallic wires so that they may be cleaned by pressure on the top and sudden release.

Centrifugal device for separating dust from air. A. C. SPARK PLUG CO. Brit. 294,135, Jan. 18, 1927.

Apparatus (suitable for use with cigaret-making machines) for removing dust from air. F. F. RUAAU and MOLINS MACHINE CO., LTD. Brit. 294,501, April 23, 1927. Structural details of a bag-filter device are described.

Drum construction for rotary cell filters. HEINRICH NOTZ (to Maschinenfabrik Buckau R. Wolf A.-G.). U. S. 1,705,226, March 12.

Flat-bottomed filtering cup and funnel. ALFRED KÖNIG and GERHARD MÜLLER (to Staatliche Porzellan Manufaktur). U. S. 1,704,330, March 5. Structural features

Apparatus for sorting and separating various different mixed materials by their different actions on a photoelectric cell or like device. H. KOLITSCH. Brit. 294,575, July 26, 1927.

Evaporator for sea water, etc. FREDERICK W. SIEVERT. U. S. 1,704,064, March 5. Liquid to be evapd. is passed through the perforations of a perforated rotating drum onto heating tubes within the drum. Various structural features are described.

Röntgen-ray apparatus. F. S. SMITH. Brit. 294,408-9, Oct. 27, 1927.

Röntgen-ray apparatus. NAAMLOOZE VENNOOTSCHAP PHILIPS' GLOEILAMPEN-FABRIEKEN. Brit. 295,028, Aug. 5, 1927. Structural features.

Röntgen tube. FRITZ ECKERT (to the Firm Sendlinger Glaswerke G. m. b. H.). U. S. 1,703,391, Feb. 26. Röntgen tubes are made of glass contg. a rare earth, such as Ce oxide, as one constituent of the glass and having a relatively low m. p. so that it is easily worked.

X-ray apparatus. FRANKLIN S. SMITH. Fr. 644,807, 644,808, 644,809, Oct. 21, 1927.

X-ray apparatus for taking pictures of objects in motion. SAM KATZMAN. U. S. 1,704,974, March 12.

Apparatus for x-ray control. MOSES JACOBSON (one-half to Louis S. Aronson). U. S. 1,704,477, March 5.

X-ray tube construction. CLAYTON T. ULREY (to Westinghouse Lamp Co.). U. S. 1,704,267, March 5.

Liquid-circulating system for cooling electrodes of x-ray tubes or similar apparatus. FRANKLIN S. SMITH (to Products Protection Corp.). U. S. 1,705,033, March 12.

Luminous tube containing a conductive gaseous atmosphere and partly coated with fluorescent material. RENÉ GRANDJEAN (to Rainbow Light, Inc.). U. S. 1,703,524, Feb. 26. A device is provided for periodically interrupting the elec. current supplied to the tube so that the fluorescent material will serve as a secondary intermittent source of illumination. Cf. C. A. 23, 1533.

Luminescent tubes. PAUL F. J. LEBRUN. U. S. 1,704,981, March 12. See Can. 248,156 (C. A. 23, 570).

Apparatus for irradiation of substances with ultra-violet or other rays. QUARZ-LAMPEN-GES. Brit. 295,023, Aug. 4, 1927.

Thermionic valves. COMPAGNIE FRANÇAISE POUR L'EXPLOITATION DES PROCÉDÉS THOMSON-HOUSTON. Fr. 645,670, Dec. 14, 1927.

Gas-filled thermionic rectifier tube. ALLGEMEINE ELEKTRICITÄTS-GES. (to International General Electric Co.). Brit. 294,665, July 28, 1927. Anodes are made from or coated with materials having a low-electron emission at operating temps. The metals of the anodes may be purified by heating to their m. p. in a high vacuum or they may be coated with low-emission materials such as Cr or Cr oxide. Various structural features are described.

Thermionic devices with cathodes coated with oxides of high emissivity. A.

SCHEIDT (to British Thomson-Houston Co., Ltd.). Brit. 294,168, July 19, 1927. Various structural features are specified.

"Frame" cathode for electron emission lamps. LA RADIOTECHNIQUE. Fr. 644,759, Mar. 16, 1927.

Heat-exchange apparatus suitable for heating air. LEWIS GRAFFLIN (to The Two Season Process, Inc.). U. S. 1,704,535, March 5. Structural features.

Heat-exchange device with layers of nested tubes. POWERGAS CORP., LTD., and N. E. RAMBUSH. Brit. 294,836, Dec. 19, 1927. Structural features.

Heat-exchanger construction suitable for use with laundry liquids. WALDRON C BEEKLEY and ALFRED D. MARTENS (to Whitlock Coil Pipe Co.). U. S. 1,703,655, Feb. 26.

Gas-burner construction. MAX KRAVITZ. U. S. 1,705,368, March 12.

Gas-burner construction. CHARLES FISLER. U. S. 1,704,359, March 5.

Gas-burner construction. HERBERT M. REEVES (to Ironton Stove & Mfg. Co.). U. S. 1,703,597, Feb. 26.

Bunsen burners. HERMANN GUHL. Fr. 644,723, Nov. 29, 1927. "Lighting-back" is prevented by imparting vibrations to the gas entering the mixing chamber.

Burners for powdered fuel. RILEY STOKER CORP. Fr. 644,891, Nov. 29, 1927.

Furnace. CARL LUBER & SOHN (Johann Vokac, inventor). Austrian 112,100, Dec. 15, 1927. Improvements are described in a furnace of the kind in which the fuel is stacked in a shaft over a grate and so is degasified before it is burnt, the gases from the degasification and the combustion gases being drawn off together and burnt.

Furnaces. SOC. FRANÇAISE DES CONSTRUCTIONS BABCOCK & WILCOX. Fr. 645,818, Dec. 16, 1927. Construction of walls contg. cooling pipes for furnaces burning powd. fuel.

Annealing furnaces. AKT.-GES. BROWN, BOVERI & CIE. Swiss 128,083, Sept. 2, 1927. An electrically heated sealed annealing furnace is provided with means for accelerating the cooling of the charge within the furnace. The furnace cover carries a bell which is raised during the cooling period, without breaking the seal, to an extent dependent on the cooling time required. Inert gases may be passed through the charge at the same time. Cf. C. A. 23, 1066.

Continuous-working annealing furnace. "ILVA" ALTI FORNI & ACCIAIERIE D'ITALIA. Fr. 645,310, Dec. 1, 1927.

Muffle furnace. CHARLES MUSIOL. Fr. 33,467, May 16, 1927. Addn. to 625,122. Methods of uniting the parts.

Cupola furnace with superposed series of nozzles operable in groups from one place. OTTO WEICHEL. Ger. 470,766, June 3, 1926.

Bakery furnace. ÉMILE ROUGIER. Fr. 645,836, Dec. 17, 1927.

Bridge wall and open-hearth furnace construction. THOMAS T. SCOTT (to Scott Furnace Co.). U. S. 1,703,460, Feb. 26. Structural features.

Furnace grate. SCHIFF & STERN. Austrian 112,103, July 15, 1927. The bars of a trough shaped grate are made of different widths, the center bar being the narrowest and the edge bars the widest.

Inclined furnace grate for brown coal. FIRMA K. H. PAUL LUDWIG. Ger. 470,793, Nov. 19, 1926.

Driving means for traveling grates. VEREINIGTE KESSELWERKE A.-G. DÜSSELDORF and HANS RENKER. Ger. 470,761, Aug. 2, 1927.

Boiler grate adapted for burning difficultly combustible and coking coals. MASCHINENFABRIK UND EISENGIESSEREI A.-G. "SOPIANA." Austrian 112,223, Sept. 15, 1928.

Furnace charger. CAMMELL, LAIRD & CO., LTD., JAMES MCN. ALLAN and HENRY C. LOVING. Ger. 468,898, Oct. 28, 1926. See Brit. 268,207 (C. A. 22, 1129).

Furnace charger for damp, pasty or plastic fuels. VESUVIO FEUERUNGSBAU, G. M. B. H. Ger. 470,764, Apr. 23, 1927.

Apparatus for feeding fuel to tunnel furnaces. JEAN B. MONNIER. Fr. 645,703, Nov. 30, 1927.

Furnace-draft regulator. CHARLES H. SMOOT. Fr. 644,796, Oct. 13, 1927.

Maintaining furnace tops, etc. ANSON G. BETTS. U. S. 1,703,656, Feb. 26. A furnace roof or other structural part is moved toward the heating chamber and its reverse surface is rebuilt with an unconsolidated refractory mixt. such as ground fire-brick or chrome ore, etc.

"Blast stoves" and regenerators, etc. BOLCKOW, VAUGHAN & CO., LTD., and M. A. McLEAN. Brit. 295,075, May 16, 1927. Structural features.

Apparatus for effecting physical or chemical processes. JUVÉNAL MAXIMOFF

and MARIA S. DE COSTA NEÉ VINCENT. Ger. 470,748, Sept. 29, 1926. Phys. processes, such as the fusion of quartz, and chem. processes, such as combustion processes are effected in an app. comprising a rotatable electrically heated crucible made of magnesite, zircon, or the like and contg. a fusible substance, *e. g.*, Cu, Pb, Mn, or other metal. The crucible is heated and rotated so that the metal fuses and assumes a paraboloidal surface. The materials to be treated are then fed in, and when the process is complete the speed of rotation is increased so that the fused metal is forced entirely to the sides of the crucible, the desired product being then run off through a removable plug in the bottom. Constructional details are given.

Apparatus for effecting chemical reactions between fluids. MARIA CASALE-SACCHI. Swiss 128,001, June 7, 1927. The app. comprises a reaction space surrounded by a heat exchanger composed of two series of annular passages for the reagents and the reaction products, resp. The parts of the app. are independent and easily separable and are arranged so that each is free to expand.

Distilling or extracting apparatus. GEORG FRITZ. Ger. 470,584, Feb. 13, 1926. Improvements are described in app. of the kind comprising a heated vessel with a cooled dome fitting over its neck.

Calorimeter for flowing liquids. MAX BAREISS. Ger. 470,963, Nov. 21, 1926.

Delivering measured quantities of liquid. NAAMLOOZE VENNOOTSCHAP MAATSCHAPPIJ VOOR UITVINDINGEN VAN DIKKERS & BARGEBOER. Ger. 470,774, Apr. 15, 1927. Constructional improvements are described in an app. of the kind in which 2 measuring vessels are provided and the distributing cock is operated by a float when 1 of the vessels is completely empty.

Volumetric flask (with a side tube to facilitate reading of the liquid meniscus). H. M. HAYNES. Brit. 295,083, May 24, 1927.

Mixing apparatus for liquids. FIRMA SNIA-Viscosa. Ger. 470,930, Oct. 26, 1927. Improvements are described in connection with the structure of an agitating shaft driven from below.

Mixing or emulsifying apparatus. FRANKFURTER DAMPFKESSEL-FABRIK GARTHE & Co., VORM. JUSTUS GARTHE. Ger. 470,802, Nov. 25, 1927. A rotating vane is arranged in a compartment at the bottom of a mixing vat so that the liquid is propelled by the vane back into the vat through a narrow annular slit.

Means for removing liquids from containers. KARL KIESER. Swiss 128,053, May 28, 1927. Improvements are described in an app. of the kind in which a member covering the whole surface of the liquid and carrying an outlet tube is pressed down onto the liquid.

Removing foam from centrifuged liquids. RAMESOHL & SCHMIDT A.-G. Ger. 470,724, Dec. 5, 1924. The centrifuge outlet pipe is bent to form a liquid seal, and a suction pipe is attached to the upper side of the outlet pipe between the seal and the centrifuge.

Spiral stirring device for use in hydrogenation of liquids. SCHERING-KAHLBAUM A.-G. Brit. 294,155, July 18, 1927.

Expressing water from sheets of material. RICHARD PRÜCKNER. Austrian 112,276, Oct. 15, 1928. In removing water from sheets of material, *e. g.*, paper pulp, by pressing, a pressing device with a projecting surface is used so that pressure is applied from the center outward.

Apparatus for drying under pressure. FRITZ BINSWANGER. Ger. 470,932, Sept. 15, 1926. Structural improvements are described in an app. of the kind in which granular material, *e. g.*, NH_4 salts, descends a series of tables in a vessel contg. warm air under pressure.

Apparatus for dehydrating materials on superposed trays. MARTHA E. BUSSLER. U. S. 1,704,912, March 12. Structural features.

Apparatus for drying powdered substances with a gas. INDUSTRIAL SPRAY-DRYING CORP. Fr. 645,757, Dec. 15, 1927.

Apparatus for drying air by refrigeration (for use in blast furnaces or for other purposes). M. FRÄNKEL. Brit. 294,354, June 22, 1927.

Apparatus for evaporating diluents from lubricating oils or other materials while spread in a thin film. CHARLES VAN BRUNT (to General Electric Co.). U. S. 1,703,643, Feb. 26.

Apparatus for gravity separation of foreign matter from lubricating oils or other liquids. ISAAC A. HILLS and GORDON B. HOOTON (Hills to Hooton). U. S. 1,705,329, March 12. Structural features.

Absorption tower suitable for treating oils. JULIAN A. CAMPBELL. U. S. 1,703,571, Feb. 26. Structural features.

Grinder for ores, cereals, etc. ADOLF STEINBRUCKNER. Fr. 645,385, Dec. 8, 1927.

Apparatus for washing coal and other minerals. ERNEST HODELIGE. Fr. 645,630, Dec. 13, 1927.

Slime classifier. KALI-IND. A.-G. and EBERHARD KAYSER. Ger. 470,734, Aug. 21, 1923. Structural improvements are described in an app. of the kind comprising a vertical column of zig-zag contour up which a stream of water flows and about the middle of which the slime is introduced.

Apparatus (with riffles and a pervious air cushion deck) for separating mineral materials. HENRY M. SUTTON, WALTER L. STEELE and EDWIN G. STEELE. U. S. 1,705,342, March 12.

Apparatus for simultaneously coating the inner and outer surfaces of long tubes. AUGUST PAHL. Ger. 471,055, Jan. 7, 1926.

Apparatus for covering metal or other threads with a liquid substance. BAYKOGARN, G. M. B. H. Fr. 645,469, Dec. 9, 1927. The threads are led through a horizontal cylinder contg. the liquid, transversely to its longitudinal axis, passing over rotating agitators which serve as guides for the threads.

Apparatus for the production of solid blocks of carbon dioxide. DRYICE CORP. OF AMERICA. Fr. 645,020, Nov. 29, 1927.

Apparatus for compacting carbon dioxide "snow." W. HESSLING. Brit. 294,584 and Brit. 294,614, July 26 and July 27, 1927. Mech. features.

Device for electric control of carbon dioxide or other gas supply. CHARLES S. JOHANN (to CO₂ Fire Equipment Co.). U. S. 1,704,944, March 12. Mech. features.

Vertical column scrubber suitable for extracting ammonia from gas. WALTER F. SLATER (to Kirkham Hulett & Chandler, Ltd.). U. S. 1,704,518, March 5. U. S. 1,704,519 relates to a rotative spraying device suitable for use in similar app.

Container for gases under pressure. P. BENKWITZ. Brit. 294,943, Aug. 1, 1927. A plurality of chambers are arranged one within another, and successively lower pressures are maintained in the outer than in the inner chambers. Various structural features are described.

Gas safety valve for cut-off of supply at low pressures. EDWARD E. BORCK. U. S. 1,703,570, Feb. 26.

Apparatus for the catalytic transformation of gases. SOCIÉTÉ ANON. D'OUGRÉE-MARIHAYE. Belg. 350,349, May 31, 1928. The app. comprises a gas preheater, a catalysis chamber and a recuperator for recovering particles of catalyst entrained by the gases, the preheater being heated by the catalyzed gases.

Apparatus for separation and liquefaction of gases. WILLIAM S. BOWEN. U. S. 1,704,649, March 5.

Apparatus for aerating and revivifying gas-purification liquids or other liquids. FREDERICK W. SPERR, JR. (to Koppers Co.). U. S. 1,703,967, March 5.

Molding press and method of operating the same. JOSEF POLÁK and HEINRICH TALLA. Swiss 128,049, Sept. 2, 1927.

Vibrating molding machine. WILFRED LEWIS. Ger. 468,711, June 3, 1927.

Apparatus for disinfecting and deodorizing by emanations. SOC. ANON. ITALIANA EVANS. Fr. 645,754, Dec. 15, 1927.

Funnel and vent-tube construction. PETER ROVANO. U. S. 1,705,312, March 12. Various structural details are specified.

Crucibles of tungsten. CHARLES F. LORENZ (to Westinghouse Lamp Co.). U. S. 1,704,256, March 5. Crucibles are formed of W powder sintered to W wool. Mo also may be used.

Tunnel kiln with vaulted cooling zone and channelled side walls. HEIMSOHN & VOLLMER, G. M. B. H. Ger. 470,834, Dec. 24, 1926.

Self-cleaning vibrating sieve. INGENIEUR MÜLLER & Co., G. M. B. H. Ger. 470,735, Aug. 14, 1927.

Apparatus for heating molten type metal or other materials and treating them with gaseous or liquid hydrocarbons, etc. C. F. HAMMOND and W. SHACKLETON. Brit. 294,697, Feb. 2, 1927. An app. is described in which circulation is effected by an "air lift" action.

Oxyhydrogen and oxyacetylene blow-pipes. JEAN B. BARGE. Fr. 644,713, Nov. 29, 1927.

Temperature alarms. FRANZ BUKESCH. Austrian 111,997, Aug. 15, 1928. The sensitiveness of temp. alarms actuated when an elec. circuit is closed by the Hg in a thermometer is increased by surrounding the thermometer with an adsorbent conductive mass. A suitable mass comprises a mixt. of a non-volatile org. acid, e. g., tartaric

or citric acid, with FeCl_3 and a porous material, *e. g.*, pumice or asbestos wool, impregnated with a soln. of a Pt salt.

Electrically operated mixer (suitable for clamping to a tank wall). FREDERICK L. CRADDOCK. U. S. 1,703,099, Feb. 26.

Mercury-vapor lamp for producing ultra-violet rays. G. J. BLAKE and G. D. G. LEADBETTER. Brit. 294,288, April 23, 1927. Structural features.

Metallic-vapor lamps using cadmium amalgam. H. STAMMBEICH. Brit. 294,172, July 19, 1927. A condenser is connected to the arc tube for collecting metal distd. from the latter.

Mercury-vapor tubes containing argon. RAINBOW LIGHT, INC. Fr. 644,800, Oct. 15, 1927.

Mercury-vapor rectifier with tilt start. ALLGEMEINE ELEKTRICITÄTS-GES. (Gustav Müller, inventor). Ger. 470,842, Nov. 22, 1921. Addn. to 462,140.

Mercury boiler construction. B. L. NEWKIRK (to British Thomson-Houston Co., Ltd.). Brit. 295,021, Aug. 4, 1927.

Recording apparatus for indicating boiler efficiency (by temperatures and carbon dioxide percentages). REPUBLIC FLOW METERS CO. (Electroflo Meters Co., Ltd.). Brit. 294,812, Nov. 4, 1927.

Device for automatically cutting off the gas supply when a gas-burner flame becomes extinguished. R. LANGER. Brit. 295,181, Jan. 5, 1928.

Thermostatic electric switch. PIERRE BLOCH and ATANASIO NUNEZ U. S. 1,705,391, March 12.

Thermostatic electric switch. GLENN MUFFLY. U. S. 1,704,141, March 5.

Thermostatic electric switch. LOUIS A. M. PHILAN (to Absolute Con-Tac Tor Corp.). U. S. 1,704,370, March 5 U. S. 1,704,371 (Phelan to Time-O Stat Corp.) also relates to an elec. switch construction.

Thermostatic electric switch. CARL T. PENTON. U. S. 1,704,406. March 7.

Thermostatic control for electric circuits. GEORGE D. KINGSLAND and PHILIP S. RUSSEL. U. S. 1,703,134, Feb. 26.

Thermostatic control for electric circuits. AUSTIN H. OSGOOD. U. S. 1,703,357, Feb. 26.

Thermostatic fuel-control device for gas burners. HENRY W. O'DOWD (to Standard Gas Equipment Corp.). U. S. 1,704,512, March 5.

Thermostatic control system for maintaining different temperatures in different containers. CHARLES L. BASTIAN and RALPH L. FARNHAM (to Bastian-Blessing Co.) U. S. 1,705,106, March 12.

Thermostatic control devices for vents of kilns such as those used for drying lumber. HOWARD M. CONE (to Long-Bell Lumber Co.). U. S. 1,705,176, March 12. Structural features.

Thermostatic device for control of air conditioning apparatus, etc. JOHN M. LARSON (to National Regulator Co.). U. S. 1,704,008, March 5. Structural features.

Thermostat for controlling flow of water in cooling systems, etc. EDWARD J. LEVY (to Bishop & Babcock Mfg. Co.). U. S. reissue 17,228, March 5. Reissue of original pat. No. 1,644,533 issued Oct. 4, 1927 (C. A. 21, 3772).

2—GENERAL AND PHYSICAL CHEMISTRY

FREDERICK L. BROWNE

Philip Edward Chazal (1857-1924). G. F. MITCHELL. *J. Assoc. Official Agr. Chem.* 12, No. 1, i-iv (Feb. 15, 1929).—An obituary with portrait. A. P.-C.

Winthrop Carver Durfee. LOUIS A. OLNEY. *Ind. Eng. Chem.* 21, 390 (1929).—Biographical note with portrait. E. C. M.

W. H. Keesom, 25 years doctor. J. E. VERSCHAFFELT. *Physica* 9, 1-4 (1929).—Short biography with portrait. B. J. C. VAN DER HOEVEN

Ivan Plotnikov, on his 50th birthday. VLADIMIR NJEGOVAN. *Arh. hem. farm.* 3, 1-5 (1929).—A brief biography with portrait. JAROSLAV KUČERA

Differentiation of chemistry course for variations of learning capacities of pupils. RUFUS D. REED, CLARENCE SALTER, CHARLES J. KLUCKHOLM and T. P. GIES. *J. Chem. Education* 6, 327-31 (1929). E. H.

The sense of physical theories. M. BORN. *Naturwissenschaften* 17, 109-18 (1929).—A review. B. J. C. VAN DER HOEVEN

Physical chemistry for premedical students. EARL C. H. DAVIES. *J. Chem. Education* 6, 280-3(1929). E. H.

Physical chemistry at the Pennsylvania State College. WHEELER P. DAVEY AND MARTIN W. LISSE. *J. Chem. Education* 6, 272-9(1929). E. H.

The problem method of teaching physical chemistry. MILES S. SHERRILL. *J. Chem. Education* 6, 260-2(1929). E. H.

Aims and viewpoints in teaching physicochemical principles. Their place in the curriculum. VICTOR K. LAMER. *J. Chem. Education* 6, 263-71(1929). E. H.

The teaching of atomic structure to physical chemists: round-table discussion. H. C. UREY. *J. Chem. Education* 6, 284-5(1929). E. H.

Mathematical requirements for physical chemistry. FARRINGTON DANIELS. *J. Chem. Education* 6, 254-8(1929). E. H.

Mathematical requirements for physical chemistry. Discussion. H. C. UREY. *J. Chem. Education* 6, 258-9(1929). E. H.

Valency. XI. Molecular conductivities and extinction coefficients of derivatives of cyclotelluropentane. FRANK L. GILBERT AND THOMAS M. LOWRY. *J. Chem. Soc.* 1928, 2658-67; cf. *C. A.* 22, 4396.—The extinction coeffs. in dry alc. and the conductivities in H_2O of the dihalides of the following series have been measured: (a) $C_5H_{10}TeX_2$, (b) $C_5H_{10}TeXCH_2(CH_2)_3CH_2X$, and (c) $C_5H_{10}TeXCH_2(CH_2)_3CH_2TeX:C_5H_{10}$. The following compds. have also been prep'd. and exam'd.: monocyclic base $C_5H_{10}Te(OH)_2$, hydroxy halides $C_5H_{10}Te(OH)X$, tetraiodide $C_5H_{10}TeI_4$, dicyclic base $(C_5H_{10})_2Te_2(OH)_2$ and its derivs., bistribromide and bistriiodide $(C_5H_{10})_2Te_2I_6$. The dihalides of b and c behave as binary and ternary electrolytes, resp., but those of a give anomalous values due to hydrolysis, forming hydroxy halides. The monocyclic diiodide resemble α dimethyltelluronium diiodide rather than the isomeric β -diiodide in its absorptions spectrum and its behavior toward iodides and alkalis. This resemblance is further borne out in the cond. of the monocyclic base and the form of the curve obtained by potentiometric titration. The curve obtained by the latter method for the dicyclic compds is anomalous.

ALBERT L. HENNE

The constants of elasticity and their relation to the periodic system of the elements. M. KAHANOVICZ. *Atti accad. Lincei* 8, 584-90(1928). Contrary to most other physical properties, which are periodic, elasticity is related to the atomic number of the element. In fact the elasticity of form (c), volume (μ), and stretch (E) are related by simple proportions, so that for each group of elements the product of the modulus by the at. no. is a no. characteristic of the group. For example, for the group Zn, Cd, Sn, Bi, $c/Z = 10^2 \times 10^{-8}$ (C. G. S. units); $\mu Z = 10^5 \times 10^{-6}$; and $E Z = 2.6 \times 10^5 \times 10^{-8}$ in which $Z =$ at. no. From the above, Poisson's coefficient (σ) may be deduced $\mu = E/2.6 = E/2(1 + 0.3) = E/2(1 + \sigma)$ or $\sigma = 0.3$, which agrees well with the exptl. value.

A. W. CONTIERI

Density of boric oxide glass and the atomic weight of boron. ARNOLD COUSEN AND WILLIAM ERNEST STEPHEN TURNER. *J. Chem. Soc.* 1928, 2654-7.—The d. of B_2O_3 glass prep'd. by fusing H_3BO_3 at 1400° and annealing the product thoroughly was det'd. both by the sp. gr. bottle and the flotation methods; between 18 and 25° , $d. = 1.844$. Inadequate annealing or fusion of the H_3BO_3 at too low temp. gives a glass with lower d.; this explains the low values of Briscoe, Robinson and Stephenson, *C. A.* 20, 1733 and 3606. Since the variation in the d. of B_2O_3 glass from 6 terrestrial sources observed by these authors may be ascribed to varying degrees of strain, it is not evidence of variation in the at. wt. of B.

ALBERT L. HENNE

Atomic distance in metals. V. M. GOLDSCHMIDT. Oslo Univ. *Z. physik. Chem.* 133, 397-419(1928).—Lothar Meyer propounded the law that the at. vols. of solid elements are periodic functions of their at. wts. (or better, of the ordinal no.). H. Schröder, H. Kopp and W. Biltz propounded views as to mol. vols. of compds. But the at. vols. of different elements are not directly comparable. Hence the differences between the crystal forms of the elements cannot be placed upon an exact relationship, particularly where the element has more than one crystal form, e. g., C or Zn. W. L. Bragg discarded at. vols. for at. radii. The distances between at. centers of gravity in the elements are hardly ever directly comparable. In cases like gray and white Zn, γ and δ Fe, etc., the variation in at. distance is related to the crystal structure. Every atom is bounded by a definite number of neighboring atoms, this number being the coordination no. At. distance and coordination number are related; thus a diminution of the coordination no. from 12 to 8 involves a simultaneous reduction in the at. distance of about 3%. Hence to compare two different substances care must be taken that the substances are in comparable state and particularly that the coordination numbers are the same. The crystal structures of elements in a comparative condition must be

the same or commensurable. In regular plane-centered crystals the coordination no. is 12 and $d = (a/2)\sqrt{2}$ where a is the lattice const. In hexagonally packed crystals every atom has 12 neighbors and if a be the length of the horizontal edge and c that of the vertical edge then $e = \sqrt{(a^2/3) + (c^2/4)}$. If $(c:a = 1.633$ then a and c are also large. In the following only such crystals are considered where $c:a$ varies from 1.55–1.633. G. used a Debye-Scherrer camera with a diameter of 58 mm. The substances investigated were mixed with salt whose lattice distance, 5.628 A. U., served as a comparison. The calcn. of at. distance of elements is simple, but for mixed crystals the formula $L^*M = xL^*A + (x-1)L^*B$ was used, where L^*M, L^*A, L^*B are the at. distances of the mixed crystals and of the components A and B, x or $(1-x)$ are the consns. of the species A and B and are fractions of unity, and n is an exponent whose value is yet to be detd. Mixed crystals were used whose pure components have the smallest possible difference of at. distance. The at. distances of Ru, Rh, Pd and Ag have already been detd. G. used AgCd_4 and AgCd_2 , obtaining values for $c:a$ and for e . The at. radius of Cd [12] is 1.534 A. U. From Ag_3In the at. radius In [12] = 1.569 A. U. and Sn [12] = 1.582 A. U. From Ag_3Sb the radius Sb [12] = 1.614 A. U. Thus in the series Ru to Sb there is a regular increase in at. radius when the elements have a coordination no. of 12. From Ag to Hg, Hg [12] = 1.545 A. U., Tl [12] = 1.707 A. U. and there are two more modifications, Pb [12] = 1.747 A. U., Bi [12] = 1.82 A. U. Thus there is a steady increase in atomic radius. For the series Mn, Fe, Co, Ni, Cu, Zn, Ge, the resp. dimensions are 1.36, 1.27, 1.257, 1.244, 1.276, 1.374, 1.39. When the coordination no. falls from 12 to 8 the at. distance falls about 3.4%; this figure was obtained from various alloys. For the transition 12 to 6, the contraction is 4.1%; for 12 to 4 the contraction is about 11.5%.
S. L. B. ETHERTON

Physicochemical researches on peroxides. II. G. PONZIO AND M. MILONE. *Atti accad. sci. Torino* 63, 335–48(1928); cf. C. A. 22, 4120.—Cryoscopic measurements with an Eysckmann depressimeter have been made in various solns. of the 2 oxides resulting from the dehydrogenation of the β -glyoximes, $\text{CH}_3\text{C}(\text{NOH})\text{C}(\text{NOH})\text{Ar}$ of

the 2 forms possible for the higher- and lower-boiling, resp., I, $\text{CH}_3\text{C}:\text{N}(\text{O})\text{O}:\text{N}:\text{CAr}$,

and II, $\text{CH}_3\text{C}:\text{N}:\text{O}:\text{O}:\text{N}:\text{CAr}$, only I would be expected to form a solid soln. with

furazan derivs. (III, $\text{CH}_3\text{C}:\text{N}:\text{O}:\text{N}:\text{CAr}$) as it has a similar constitution, and this has been found to be true. Conversely, II cannot have the other possible structure IV,

$\text{CH}_3\text{C}:\text{N}:\text{O}:\text{N}(\text{O}):\text{CAr}$, as it does not form a solid soln. with III. Various substitution products were also studied, by detg. their mol. wts. in various solvents. Thus the following V (I, Ar = Ph), VI (I, Ar = $\text{C}_6\text{H}_4\text{OMe}$), VII (II, Ar = Ph) and VIII (II, Ar = $\text{C}_6\text{H}_4\text{OMe}$) were found to have normal mol. wt. in HOAc , C_6H_6 and $\text{C}_6\text{H}_5\text{OH}$. The following derivs. were also studied: IX (I, Ar = $\text{C}_6\text{H}_4\text{Br}$), X (III, Ar = $\text{C}_6\text{H}_4\text{OMe}$), XI (II, Ar = $\text{C}_6\text{H}_4\text{Br}$), XII (III, Ar = Ph), XIII (I, Ar = $\text{C}_6\text{H}_4\text{Br}(\text{OMe})$), XIV (I, Ar = $\text{C}_6\text{H}_4(\text{NO}_2)(\text{OMe})$), XV (II, Ar = $\text{C}_6\text{H}_4\text{Br}(\text{OMe})$), XVI (II, Ar = $\text{C}_6\text{H}_4(\text{NO}_2)(\text{OMe})$), XVII (III, Ar = $\text{C}_6\text{H}_4(\text{OMe})\text{Br}$), XVIII (III, Ar = $\text{C}_6\text{H}_4(\text{NO}_2)(\text{OMe})$). In benzol as solvent, mol. wt. of V = 76.79, VI = 98.2, VII = 78.2, VIII = 99.9, X = 86.6, XVII = 115.8, XVIII = 128.3. In naphthalene, mol. wt. of V = 76.51, VI = 97.72, VII = 78.5, VIII = 99.7, X = 86, XVII = 116.62, of XVIII = 128.5. In X as solvent, mol. wt. of V = 287, VI = 800, VIII = 346, IX = 305, XI = 274, XIII = 304, XIV = 279, XV = 292, XVI = 265. Lastly the mol. wt. of X in the following solvents, in V = 265, in VI = 715, in VII = 210, in VIII = 230. The mol. wt. of XIII in XVII = 295; and of XIV in XVIII = 274.
A. W. CONTERI

The dynamical allotropic states of selenium. GÜNTHER BRIGLER. *Chem. Inst., Kiel. Naturwissenschaften* 17, 51(1929).—X-ray examn., absorption spectrography and an extn. process have shown the binary state of all phases of Se. In the fused state two types are in temp. equil. as shown by CS_2 extn. of the properly chilled melt; their rate of soln. is quite different; not so much their soly. In CS_2 solns. of Se the two modifications are in equil. which varies with concn. (spectrographic evidence) in other solns. the Se is dissolved colloiddally. Marcs' Se modifications in hexagonal Se were also found in partly blackened monoclinic Se. X-ray photographs showed the identity of black, non-conductive Se A and black, metallic, Se B, both being hexagonal of the same lattice type and dimensions. The difference in cond. is attributed to grain size, incomplete crystn. or impurity. All modifications of Se could be well represented in a T - x diagrams (Smits type) for the pseudo-binary solids and pseudo-ternary soln

The modifications are (1) amorphous Se (glassy or red), (2) monoclinic metalloid Se, (3) hexagonal metallic Se.

Changes in the specific gravity of copper and silver [after heat treatment]. R. RUTER AND J. KUSCHMANN. *Z. anorg. allgem. Chem.* 173, 262-7(1928).—Repeated heating of Ag and Cu alternately in a vacuum and in H causes a rapid and progressive decrease in the value of d ; with Cu a decrease of 6% was obtained after several repetitions of this treatment. This phenomenon is attributed to adsorption of H, followed by expulsion of the adsorbed gas on subsequent heating in a vacuum with consequent swelling of the metal and the formation of internal voids.

Iron-containing rings of smaller effective permeability. U. RETZOW. *Physik. Z.* 29, 534-8(1928).—The order of magnitude of the effective max. permeability for alloys, wires and "mass cores" has been detd. as follows: Fe-Ni alloys (Cu and Mn as minor constituents), $\chi \times 10^4$; Elmen bronzes (Ni, Co, Fe, Mn), $\chi \times 10^3$; Heusler bronzes (Cu, Al, Mn), $\chi \times 10^1 - \chi \times 10^2$; ring wire cores of Fe and steel wires, $\chi \times 10^2$; "mass cores" of pressed powdered Fe enclosed by an insulating material, $\chi \times 10^{-1} - \chi \times 10^2$; Fe and steel wires, $\chi \times 10^1$.

Coördination combination and the electronic theory of valence. N. V. SIDGWICK. *Z. Elektrochem.* 34, 445-50(1928).—On the ground of "effective atomic numbers," S. gives a general account of the covalence rule, the valence groups and the distinction between electrovalent and covalent combinations. From the results obtained by Debye (see following abstract) it seems that the capacity of an acceptor to enter into a coordinative combination depends on the existence of a dipole in which it is positive. Association in the liquid state is to be regarded as a coördination phenomenon.

Electric moment of molecules and the intermolecular forces. PAUL DEBYE. *Z. Elektrochem.* 34, 450-3(1928).—The mol.-refraction method of measuring dipole moments eliminates that part of the moment which is due to orientation and measures only the deformation polarization. Intermol. forces are likewise made up of two parts. D. discusses the relation existing between the constitution and the dissymmetry of compds. as characterized by the dipole moments, and gives examples. It is possible to base the formulation of compds. on conclusions reached from the dielec. method.

Stoichiometric considerations. RUDOLF SCHARIZER. *Min.-petr. Institut Graz. Neues Jahrb. Min. Geol., Abt. A. Beil.-Bd.* 57, 57-62(1928).—A series of theoretical structural formulas of silicates is presented.

Rate of vibration and molecular packing of organic compounds. W. HERZ. *Z. anorg. allgem. Chem.* 173, 358-60(1928).—If ν is the rate of vibration and z the no. of mols. in unit vol. just above the m. p., it is shown for about 30 org. liquids that the ratio ν^2/z is a const. which is approx. 3. For the hydrocarbons ethane to decane the results recorded vary from 3.02 to 3.75, for the corresponding primary alcs. from 2.90 to 3.08, and for various fatty acids and aromatic hydrocarbons from 2.77 to 3.28. HCN, however, gives a value of 1.82 and iodobenzene 4.14.

Theory of forced double refraction (photoelasticity). K. F. HERZFELD. *J. Optical Soc. Am.* 17, 26-36(1928).—Mathematical. The double refraction of crystals is discussed, and it is pointed out that it may be due to (a) the anisotropy of the ions taken separately, (b) the anisotropic arrangement of the ions in the lattice which results in an anisotropic force even if the ions are undisturbed, or (c) an anisotropic "Lorentz-Lorenz force" due to the anisotropic arrangement of the ions. Calcns. are made to det. the magnitude of (c) in cubic crystals of rock salt and sylvine under stress (forced double refraction, photo-elasticity), and it is concluded that the double refraction cannot be explained entirely by this means. It is also shown how the Lorentz-Lorenz force is built up in the unstrained crystal.

Rotation polarization of electromagnetic waves due to tetrahedral molecule models. K. F. LINDMAN. *Acta Acad. Åboensis Math. phys.* 4, No. 1, 1-22(1927).—Expts. were carried out with isotopic three-dimensional systems of numerous small tetrahedral mol. models and waves of length greater than those of the resonators and the dimensions of the angle models. In accord with Biot's corresponding law for optical activity, the rotation of the plane of polarization of the electromagnetic waves is proportional to the no. of mol. models in their path, i. e., to the cross-section of the active substance.

Absorption of light by iron pentacarbonyl. J. DRECHSLER. *Z. Elektrochem.* 34, 320-3(1928).—The absorption of visible light by $\text{Fe}(\text{CO})_5$ in various solvents follows Beers' law at all concns. between 99 and 0.5%, and is independent of the solvents employed (Me_2CO , CHCl_3 , CCl_4 , C_6H_6 , $\text{C}_6\text{H}_5\text{Me}$, *o*- and *m*-xylene). Qual. expts. show,

however, that the rate of decompn. of the carbonyl is influenced by the solvent. No connection could be observed between the dielec. const. of the solvent and the rate of decompn.

The question of space lattices. H. TERTSCH. *Neues Jahrb. Min. Geol., Abt. A, Beil.-Bd. 57*, 63-88(1928).—A lengthy discussion of the probable division of space between the elements and ions in the crystal structures of NaCl, CsCl and similar salts.

Space-filling forms in crystal lattices. H. TERTSCH. *Fortsch. Min. Kryst. Petr.* 12, 89-90(1927).—The alkali halides exhibit two types, cubic and octahedral; NaCl belongs to the former, and CsCl to the latter type, while RbCl is partly intermediate. Metal ions do not vary from their type, as do neg. ions. The change from cubic to octahedral type is considered to be assocd. with the no. and distribution of the electronic orbits.

What forces direct the structural development of crystals? F. STÖBER. *Neues Jahrb. Min. Geol., Abt. A, Beil.-Bd. 57*, 139-62(1928).—A theoretical discussion of the mechanics of crystal structure.

The crystal structure of glaserite and potassium sulfate. B. GOSSNER. *Univ. München. Neues Jahrb. Min. Geol., Abt. A, Beil.-Bd. 57*, 89-116(1928).—Crystals of apthitalite (glaserite) gave by the rotating-crystal method $a = 5.65$ A. U., $c = 7.29$ A. U., the cell having a rhombic base containing one mol. of $\text{NaK}_3(\text{SO}_4)_2$. The Laue diagram indicates trigonal symmetry and the space group is D_{3d}^3 . K_2SO_4 (usual a and b axes interchanged) gave: $a = 10.06$, $b = 5.85$, $c = 8.33$ A. U., with 4 mols. of K_2SO_4 in the cell; it belongs to space group V_{h3}^1 .

Deformation of fibers. R. O. HERZOG AND W. JANCKE. *Z. Physik* 52, 755-8 (1928).—Röntgen photographs of deformed fibers of mercerized cellulose and natural silk show that these fibers can be put into class four of anisotropy by rolling or pressing.

The influence of pressure on the friction along the gliding planes of crystals. G. TAMMANN AND W. SALGE. *Inst. Phys.-Chem. Göttingen. Neues Jahrb. Min. Geol. Abt. A, Beil.-Bd. 57*, 117-40(1928).—Crystals of ice and NaCl were studied under pressure and data obtained on the ease of deformation by slipping along certain of the gliding planes.

Crystal structures of the compounds ruthenium sulfide, osmium sulfide, manganese telluride and gold antimonide. I. OFTEDAL. *Z. physik. Chem.* 135, 201-9 (1928).—Powder photographs show that the compds. RuS_2 , OsS_2 , MnTe_2 , and AuSb_2 exhibit the pyrites structure. Parameters of about $1/2$ are found. The following lattice consts. are given: pyrites (Kongsberg) $a = 5.414$ (± 0.003) A. U. MnTe_2 , $a = 6.943$ (± 0.002) A. U.; AuSb_2 , $a = 6.636$ (± 0.010) A. U.

Crystal structure of tetramethylammonium iodide. WM. H. ZACHARIASEN. *Norsk geol. Tidsskr.* 10, No. 1, 9 pp.(1927).—The edge of the unit cell of tetragonal Me_4NI is 5.76, and $a = 8.03$ A. U. The unit cell contains two mols. Alternative positions of the N atoms in the space-group D_{4h}^2 are possible, but cannot be differentiated by consideration of the intensity of reflection, although chem. relationships indicate one. Vegard's results (*C. A.* 11, 2986) are criticized. The NH_4 ion is considered to possess spherical symmetry, whereas the symmetry of the PH_4 , Me_3NH and Me_3PH ions is considered to deviate from spherical.

The crystal structure of sesquioxides and compounds of the type ABO_3 . WM. H. ZACHARIASEN. *Skrifter Norske Videnskaps-Akad. Oslo. I, Matemat. Natur. Klasse* 1928, 7-165.—The crystal structure of sesquioxides and compds. of the type ABO_3 is detd. by several methods: the Laue method using a Coolidge tube and W anticathode with plate-to-crystal interval of 5 cm., 69 or 80 kv. and a current of 2 milliamp.; the rotating method with Cu or Fe anticathode, 30 to 35 kv., 10 milliamp.; the powder method using the modified Hadding-Siegbahn tube. Of the sesquioxides the structural types examd. are the corundum structure, C-type structure, A-type structure and *irsen-like* modifications, while of ABO_3 compds. the types examd. are calcite, aragonite, AgNO_3 , RbNO_3 , KClO_3 , KBrO_3 , HIO_3 , NaIO_3 , *perovskite*, KNO_3 , AgClO_3 , AgBrO_3 , MgTiO_3 and LiCBO_3 . With compds. of the corundum type structure r , the edge length of the elementary rhomboid, and α , the rhomboidal angle, are given as follows: for Al_2O_3 $r = 5.13 \pm 0.02$ A. U., $\alpha = 55^\circ 16' \pm 5'$; for Ti_2O_3 $r = 5.42 \pm 0.01$, $\alpha = 56^\circ 50' \pm 5'$; for V_2O_3 $r = 5.45 \pm 0.03$, $\alpha = 53^\circ 49' \pm 8'$; for Cr_2O_3 $r = 5.33 \pm 0.03$, $\alpha = 55^\circ 0' \pm 8'$; for Fe_2O_3 $r = 5.42 \pm 0.02$, $\alpha = 55^\circ 14' \pm 5'$; for Ga_2O_3 $r = 5.31 \pm 0.02$, $\alpha = 55^\circ 50' \pm 5'$; for Rh_2O_3 $r = 5.45 \pm 0.03$, $\alpha = 55^\circ 43' \pm 8'$. The av. interval between atoms is as follows: Al-O = 1.92 A. U., Ti-O = 2.04 A. U., V-O = 2.00 A. U., Cr-

O = 1.99 A. U., Fe-O = 2.02 A. U., Ga-O = 1.99 A. U., Rh-O = 2.03 A. U. The parameters u and v are 0.10 ± 0.01 and 0.30 . Z , the no. of mols. in the elementary cell = 2, Rgr , the space grouping = D_{3d}^6 , and the coordination nos. are 6 and 4. In compds. of the C -type structure $Z = 16$, $Rgr = T^6$, the parameters t , u and v are 0.25 , 0.021 ± 0.007 and 0.542 ± 0.014 , and the coordination nos. are 6 and 4. In this group the compds. examd. are Sc_2O_3 , Mn_2O_3 , Y_2O_3 , In_2O_3 , Sm_2O_3 , Eu_2O_3 , Gd_2O_3 , Th_2O_3 , Dy_2O_3 , Ho_2O_3 , Er_2O_3 , Tm_2O_3 , Yb_2O_3 , Cp_2O_3 and Tl_2O_3 and a varies from 9.79 ± 0.03 A. U. for Sc_2O_3 to 10.85 ± 0.02 A. U. for Sm_2O_3 . The av. interval between atoms is as follows: Sc-O = 2.18 A. U., Mn-O = 2.10 A. U., Y-O = 2.36 A. U., In-O = 2.25 A. U., Sm-O = 2.42 A. U., Eu-O = 2.42 A. U., Gd-O = 2.41 A. U., Tb-O = 2.39 A. U., Dy-O = 2.37 A. U., Ho-O = 2.36 A. U., Er-O = 2.35 A. U., Tm-O = 2.34 A. U., Yb-O = 2.31 A. U., Cp-O = 2.31 A. U., and Tl-O = 2.36 A. U. *Bixbyite*, $(Fe, Mn)_2O_3$, crystallizes in the C -type. In this type of structure the particle intervals are about 2% greater than in the corundum type. Calcite structures show $Z = 2$, $Rgr = D_{3d}^6$. $LiNO_3$ gives $r = 5.74 \pm 0.02$ A. U., $\alpha = 48^\circ 3' \pm 10'$, $d = 2.38$, $u = 0.264 \pm 0.006$, Li-O = 2.15 A. U., and N-O = 1.25 ± 0.03 A. U. $CdCO_3$ gives $r = 6.112 \pm 0.006$ A. U., $\alpha = 37^\circ 24' \pm 5'$, $d = 5.02$, $u = 0.25$, the interval Cd-O = 2.31 A. U. and C-O = 1.23 A. U. The aragonite structure is possessed by $SrCO_3$, $BaCO_3$ and $PbCO_3$. In this type $Z = 4$, $Rgr = V_h^{16}$. In all 3 compds. the parameter $u_1 = 0$. For V , $SrCO_3$ gives 0.403 ± 0.006 , $BaCO_3$ 0.417 ± 0.010 , and $PbCO_3$ 0.422 ± 0.010 . The coordination nos. about the ions A and B are 9 or 3. In the case of $AgNO_3$, $Z = 8$, Rgr is either V_h^{16} , V_h^{12} , V_h^{10} or V_h^8 , $a = 6.97 \pm 0.05$ A. U., $b = 7.34 \pm 0.05$ A. U. and $c = 10.14 \pm 0.08$ A. U. $RbNO_3$ shows $Z = 4$, $Rgr = C_{3v}^5$, $r = 7.36 \pm 0.04$ A. U. and $\alpha = 109^\circ 28' \pm 15'$. The Rb atom forms a face-centered lattice ($u_1 \sim 1/2$, $v_1 \sim 0$) as does also the N atom ($t \sim 1/2$, $u \sim 0$, $v \sim 1/2$). $KClO_3$ gives $Z = 2$, $Rgr = C_{2v}^2$, $a = 4.66 \pm 0.03$ A. U., $b = 5.59 \pm 0.03$ A. U., $c = 7.11 \pm 0.05$ A. U. A close relationship with calcite is evident. $KBrO_3$ gives $Z = 4$, $Rgr = C_{3v}^5$, $r = 4.403 \pm 0.005$ A. U., $\alpha = 86^\circ 0' \pm 5'$, $t = 0.500 \pm 0.015$, $u = 0.58 \pm 0.03$, $v = 0.125 \pm 0.030$, the interval K-O = 2.67 A. U. and 3.11 A. U. and Br-O = 1.68 A. U. In HfO_2 $Z = 4$, parameter no. = 15, $a = 5.53 \pm 0.05$ A. U., $b = 5.92 \pm 0.05$ A. U., $c = 7.75 \pm 0.05$ A. U. In $NaIO_3$ $Z = 2$, $Rgr = V_h^{19}$, $a = 5.75 \pm 0.01$ A. U., $b = 6.37 \pm 0.01$ A. U., $c = 4.05 \pm 0.01$ A. U., the interval Na-O = 2.15 A. U. and I-O = 2.87, 2.95 and 3.18 A. U. This is an *anti-perovskite* structure. The perovskite structures include $CsIO_3$, $SrZrO_3$ and $CdTiO_3$, and in these $Z = 1$, $Rgr = C_{3v}^5$. The interval A-O is 3.926 and B-O is 2.331 for $CsIO_3$, for $SrZrO_3$ these values are 2.891 and 2.047, and for $CdTiO_3$ 2.65 and 1.88. In KNO_3 $Z = 4$, $Rgr = V_h^{16}$, isomorphous with aragonite, $a = 5.40 \pm 0.04$ A. U., $b = 9.14 \pm 0.07$ A. U., $c = 6.41 \pm 0.40$ A. U. In $AgClO_3$ $Z = 8$, $Rgr = V_h^{11}$, $a = 8.475 \pm 0.004$ A. U., $c = 7.90 \pm 0.01$ A. U. For $MgTiO_3$ and $LiCBO_3$ $Z = 2$ and $Rgr = C_{3v}^5$. For these 2 compds. $r = 5.40 \pm 0.02$ A. U. and 5.47 ± 0.03 A. U., while $\alpha = 55^\circ 1' \pm 8'$ and $55^\circ 43' \pm 10'$. The investigation shows that the stability of the various types of lattice in binary compds. A_mX_n depends upon the radius relation R_A/R_X . In ternary compds. the stability depends upon several such quotients and upon polarization properties. Thus the morphotropic transition between 2 such types as rutile and fluorite is conditioned by variation in the quotient R_A/R_X . The transition from MgF_2 to $Mg(OH)_2$ is an example of the type made possible by an alteration in polarization properties. The polarizing effect of an ion is found to decrease with rising temp. The quotient $R_A/R_B = 1$ corresponds to the sesquioxides. By increasing the value of the quotient R_B/R_O , the corundum type is obtained first, then the C -type, the B -type and the A -type. The change from the sesquioxides to the types ABO_3 coincides with an increase in R_A/R_B . In all types of structure the ion B possesses exactly the coordination no. which one would expect from the quotient R_B/R_O , while the coordination no. about the ion A cannot always be derived from the value of the quotient R_A/R_O . The smallest cations, therefore, influence the coordination no. about the larger ions A, while the reverse has in no case been observed. The stability of the arsenolith type and the A -types depend upon the polarization of ions B. The structure of mols. of NH_3 , H_2O , is very similar to the structure of $(ClO_3)^-$, $(BrO_3)^-$ and $(AsO_3)^{3-}$. In compds. ABO_3 the stability zone is characterized by the quotients R_A/R_O and R_B/R_O falling within certain limits as well as the polarization. Isomorphism between 2 compds. ABO_3 is only to be expected if these quotients and polarization properties are so similar that they lie within the limits of the region of stability of these types. The difference in energy of 2 structural types is smallest at the border line between the zones of stability of the 2 types. This

explains polymorphism. At this border line the energy difference is smaller than that produced by a change in thermodynamic factors. CaCO_3 and KNO_3 can crystallize in both the calcite and aragonite forms, depending upon conditions of formation. MgCO_3 and BaCO_3 , however, lie too far from the border line and crystallize in only the calcite or aragonite modification. H. STOERTZ

Existence of two magnetic rotatory powers for a uniaxial crystal along and normal to the axis. J. BECQUEREL. *Compt. rend.* 187, 215-7; *J. phys. radium* 9, 337-45(1928).—The magnetic rotatory power of tysonite, the birefringence of which is very small, has been investigated for the green Hg line 5460.7 Å. U. The rotatory power in the direction of the axis is different from that normal to it. A formula is deduced on theoretical grounds which is in agreement with the results. B. C. A.

The electromotive behavior of single metal crystals. PAUL A. ANDERSON, Yen ching Univ., Peking. *Nature* 123, 49(1929).—The electrode potential of the primary cleavage face (basal pinacoid) of a Zn crystal is const. and reproducible, and is probably a max. G. CALINGBERT

Van der Waals' equation and the principles of thermodynamics; the Maxwell-Clausius relation and the Clapeyron formula deduced from this equation. VASILESCO-KARPEN. *Compt. rend.* 187, 1039-42(1928).—The Maxwell-Clausius and Clapeyron relationships are derived independently of Carnot's principle. H. G. VAN DEN BOSCHE

The thermodynamic equilibrium in the universe. P. ZWICKY, Norman Bridge Lab. of Physics, Pasadena. *Proc. Nat. Acad. Sci.* 14, 502-7(1928).—The actual universe is far from a state of equil. and is running towards a state of higher entropy. By assuming, however, a postulate of thermodynamic equil. special conclusions may be deduced. On this basis, Stern concluded that for all possible temps. matter would disappear into radiation. Lenz, accounting for the change in vol. of an Einstein universe concluded that the radiation would equal the matter. Tolman showed Lenz's error, and concluded that the ratio of H to He was of the order of $e^{10^{10}/T}$, a result not in agreement with their concn. in known stars. Z. classes the different agglomerations of mass as species of mols.; e. g., S_2 , S_8 , etc. For the higher types of agglomerations there is a resemblance to swarms of mols.; this class includes gaseous nebulae, star clusters, and galactic systems. Assume the following equil.: Radiation \rightleftharpoons Protons electrons \rightleftharpoons Higher mols. \rightleftharpoons Dust particles \rightleftharpoons Gaseous nebulae \rightleftharpoons Stars \rightleftharpoons Galactic systems. From a consideration of this equil. Z. deduces equations to account for the relative emptiness of space and the existence of stars of certain size only. High temp. of stars is not in contradiction to av. low temp. of universe. The statistical treatment could be improved by the use of free energies. If the existence of dust particles be treated as evapn., the equil. equation shows that matter is present in considerable amounts below 1000°. The postulate is not justified by facts in the universe. Consistent statistical treatment of the equil. on the basis of the postulate promises to furnish results in agreement with the facts. ARTHUR FLEISCHER

The refraction of carbon monoxide, nitrogen, and nitrous oxide and its dependence on pressures of less than one atmosphere. FR. SCHACHERL. *Spisy Vydavane Prirodovedeckou Fakultou Masarykovy Univ.* No. 99, 29 pp.(1928).—The following values for the refractions were found at 760 mm. and 0°: $\text{CO} = 336.89 \times 10^{-6}$; $\text{N}_2 = 302.83 \times 10^{-6}$; $\text{N}_2\text{O} = 507.79 \times 10^{-6}$ (for $\lambda = 5462.3$ Å. U.). The sp. refraction for these gases is not const. but increases with rise in pressure, at pressures less than 1 atm. E. G. VAN DEN BOSCHE

Refraction of helium and argon and its dependence on pressures of less than one atmosphere. FR. SCHACHERL. *Spisy Vydavane Prirodovedeckou Fakultou Masarykovy Univ.* No. 98, 15 pp.(1928).—The refraction of A at 760 mm. and 0° was found to be 282.70×10^{-6} for $\lambda = 5462.3$ Å. U. The sp. refraction ($r_1 = (n-1)d$) for A, as well as for other monat. gases, increases with rise in pressure, at pressures less than 1 atm.; r_1 for O_2 increases with pressure twice as fast as r_1 for A. No conclusion was reached on the effect of pressure on r_1 for He. E. G. VAN DEN BOSCHE

Control of a new method for the measurement of the temperature of a gas. MARCEL CHOPIN. *Compt. rend.* 187, 935-7(1928); cf. *C. A.* 22, 3340.—C. uses his aerodynamic method to calc. the temp. of a current of air between 350 and 650°. The calcd. value exceeds by 2.9° that indicated by a thermocouple placed 6 mm. away from the orifice and is about 3.5° below that indicated by the thermocouple when it is 20-80 mm. from the orifice. Successive detns. at 600° are consistent within one degree. ALBERT L. HENNE

Ignition of detonating gas by hydrogen atoms. F. HABER AND H. D. VON SCHWEINITZ. *Kaiser Wilhelm Inst. Sitzb. preuss. Akad. Wiss.* 1928, 490-506.—H., at reduced pressure is passed through an arc to obtain a gas rich in at. H (Langmuir method).

This gas is brought into contact with O_2 . Immediate explosion occurs, detected by the sound or by atomizing NaCl in the reaction vessel to color the flame. It is proved that the ignition is caused by H atoms, not by any other agent. Marshall (*C. A.* 20, 3615) failed to obtain similar results because he used too low a concn. of H atoms. The reaction is regarded as a 30-member chain reaction.

Correction to my paper: optical measurement of small degrees of dissociation of metal salt vapors. I. WYNEKEN. *Z. physik. Chem., Abt. A*, 140, 78–80(1929); cf. *C. A.* 23, 1326.—An erroneous heat of reaction was used in comparing the exptl. and calcd. values. The correct one does not accord with the calcd. value. The discrepancy is to be attributed to the presence of Hg_2Cl_2 . A. L. HENNE

Investigation with the Geiger counter of the influence of cathode material on the sparking potential. O. KLEMPERER. *Univ. Kiel. Physik Z.* 29, 947–8(1928); cf. *C. A.* 23, 562.—In contradiction to accepted views, the sparking potential is affected by the metal composing the electrode (here the tip of the Geiger counter). The following variations in limiting potential were observed: in CO_2 , no appreciable difference, V_0 varying between 600 and 650 v., in air, Pt, Au, Ag, Cu and steel (heated or dipped in HNO_3), all gave $V_0 = 600$, untreated steel 580, Al 500; in H a more appreciable variation between metals: Pt, Au 500, Ag, Cu 490, Al 450, steel untreated 570, heated 630, dipped in HNO_3 600. In A great differences are apparent, but they cannot be compared with the above, because the relationship of sparking potential vs. electrode diam. is not rectilinear, and the lines for various pressures do not show a common intersection on the ordinate axis. Thus, Cu and Pt show voltages of 200 and 210 at 10 mm. Hg pressure and 400 and 570 at 75 mm. G. CALINGAERT

Dielectric properties of liquid crystals in electric and magnetic fields. M. JEZEWSKI. *Z. Physik* 52, 878–81(1928); cf. *C. A.* 23, 1031.—The capacity of a condenser filled with *p*-azoxyanisole and *p*-azoxyphenetole is detd. in simultaneously applied elec. and magnetic fields. An elec. field greater than 400 v./cm. causes an increase when the nematic liquid is also in a parallel magnetic field and a decrease when in a perpendicular magnetic field. GEORGE GLOCKLER

Dissociation of liquid crystals. A. MLODZIEVSKII. *Z. physik. Chem.* 135, 429–46(1928).—Liquid crystals having upper and lower disson. temps. have been obtained in which the only stable state of aggregation over a certain temp. range must be the liquid crystal state. Mixts. of cholesterol and cetyl alc. form liquid crystals yielding two solid phases at the lower disson. temp. and a liquid and a solid phase at the upper temp. Liquid crystals formed from cholesterol-glycerol mixts. yield a solid and a liquid phase, and two liquid phases at the lower and upper disson. temps., resp. The possible diagrams corresponding with the above phenomena have been constructed on thermodynamic principles, and from the theoretical data the diagram corresponding with the cholesterol-glycerol system has been identified. The advantages of combining microthermal analysis with the thermodynamic deduction of diagrams in orienting work of the above type are discussed. B. C. A.

The determination of the density of liquids. JOHN GRINDLEY. *Univ. Coll. of Wales. J. Chem. Soc.* 1928, 3297–8; cf. Hartley and Barrett, *C. A.* 5, 2996.—The method of H. and B. will not be accurate to ≈ 0.000005 if variations of temp. exceed 5° or if liquids having large coeffs. of expansion are being weighed. This is due to the fact that the vol. of air displaced is increased enough to make the error appreciable. When the change in d. is small by reason of a small change of temp. or when the change in d. is the same as that of the water used in calibrating the pycnometer, the correction suggested by G. becomes negligible. Hartley corrects the original paper, *C. A.* 5, 2996. In line 13, page 1074, W should read ($W_p - W_0$). F. E. BROWN

Vapor pressures in the systems: diethyl phthalate with ethyl alcohol and with methanol. H. W. FOOTE AND J. K. DIXON. *Yale Univ. Am. J. Sci.* 17, 146–52 (1929).—The vapor pressure-composition curves for diethyl phthalate with EtOH and MeOH have been detd. by the static method. The app. used was described by Zsigmondy (*C. A.* 6, 2565) and Bachmann (*C. A.* 12, 1610). Both binary mixts. exhibit approx. the same deviation from an ideal soln. The 2 systems furnish data for obtaining definite partial pressures of pure alc. vapor at 25° . O. A. NELSON

Methods to determine vapor pressure. VAPOR PRESSURE COMMITTEE, CALIFORNIA NATURAL GASOLINE ASSOCN. *Oil & Gas J.* 27, 186, 188, 190, 209, 210, 212, 214(1929). Five methods for detg. vapor pressures are compared. It is concluded that the most consistent of the methods in general use is that of the Bureau of Explosives. The principle of allowing only negligible evapn. as embodied in the Gard and Wade-Campbell bombs is believed to be correct and may be developed further.

M. B. HART

Saturated vapor pressure and latent heat of vaporization of liquids. M. LEVAT. EZERSKII. *J. Russ. Phys. Chem. Soc.* **60**, 743-63(1928).—For all liquids the relation between satd. vapor pressure and temp. may be expressed by the equation (i); $p = p_0 \times 10^{\alpha\tau}$, where p_0 is the vapor pressure at the f. p. of the soln., α is a const., characteristic of the given liquid, and $\tau = \delta/T$, where δ is the temp. above the m. p. and T is the abs. temp. The value of α can be calcd. from the equation $\alpha = (\log p_2 - \log p_1)/(\tau_2 - \tau_1)$. Equation (i) may be substituted in the Clapeyron-Clausius equation, $d \log p / dT = \lambda/RT^2$, from which the equation $\lambda = m\alpha RT_0$ is derived, m being the conversion factor to natural logarithms, α the above const., and T_0 the f. p. of the given liquid. Values of λ calcd. from this equation are in good agreement with expt., except in those cases where the vapor contains assoc. mols. B, C A

Measurement of the viscosity of fluids. R. O. BOSWALL. *J. Mun. Coll. Loh. Manchester* **13**, 10-21(1928).—A description of a robust viscometer giving continuous readings of the viscosity of fluids under viscous flow. The fluid under examn. passes through a special nozzle from one reservoir to another, vertically below it, through a narrow tube of uniform bore. These reservoirs are fitted with pressure gages and the viscosity of the fluid is obtained from readings of the pressures in the reservoirs, and by making reference to exptl. calibration charts on which the viscosity is expressed as a function of the ratio of the pressures in the reservoirs and of the d. of the fluid B, C A

Equal viscosities. II. W. HERZ. *Z. anorg. allgem. Chem.* **173**, 411-2(1928), cf. C. A. **19**, 3392.—It is shown for 18 liquids that the ratio of the d. at the temp. at which the viscosity is 0.0040 c. g. s. unit to the d. at the critical temp. is approx. a const. The recorded ratios vary from 2.739 to 2.967. B, C A

The Joule-Thomson effect and internal friction of fluids. MARIE KOSINSKA. *Compt. rend.* **187**, 1037-9(1928).—When a fluid moves under pressure, η (the coeff. of internal friction) is increased by the factor $(2 - T\alpha)$ due to the heat of the Joule-Thomson effect, where α is the expansion coeff. at const. vol. E. G. VAN DEN BOSCH

Internal friction of highly viscous substances. H. LEY AND U. KIRCHNER. *Z. anorg. allgem. Chem.* **173**, 395-410(1928).—Closely concordant results for the viscosity of glycerol have been obtained by the transpiration method and by measuring the rate of fall of glass beads through a column of the liquid in a specially constructed app. The mean value of η at 0° is 120.38 and at 20° 14.56 c. g. s. units. In order to det. the effect of mol. configuration on the internal friction (viscosity) of liquids, the value of η for various stilbene derivs. has been detd. at temps. below the true m. p. i. e., in the supercooled viscous state. In the homologous series of α -alkoxyphenylstilbenes the viscosity decreases logarithmically with rise of temp. and increases in the order butoxy-, propoxy-, methoxy-, ethoxy-phenylstilbene, indicating that the side chain of the higher homologs is oriented in the direction of the main groups and thus allows the mols. more readily to slide over one another. The introduction of a second methoxyl group into the mol. of the methoxy compd. to give α -(*p*-methoxyphenyl)-4-methoxystilbene causes a large increase in the viscosity owing to the enlargement of the mol. in two directions. This compd. crystallizes only with great difficulty and readily forms a thick sirup. The α -alkoxyphenylstilbenes are readily obtained by heating with concd. formic acid the phenylbenzyl-*p*-alkoxyphenylcarbinol produced by treating Mg benzyl chloride with the corresponding *p*-alkoxybenzophenone. The following derivs. of α -phenylstilbene are described: α -*p*-methoxyphenylstilbene, b. 240-242°/14 mm., d_4^{25} 1.1015, n_D^{25} 1.6060; α -*p*-ethoxyphenylstilbene, m. 76°, b. 242-244°/14 mm., d_4^{25} 1.0829, n_D^{25} 1.6536; α -*p*-propoxyphenylstilbene, m. 69°, b. 248-250°/14 mm., d_4^{25} 1.0676, n_D^{25} 1.6437; α -*p*-butoxyphenylstilbene, m. 82-83°, b. 259-260°/14 mm., d_4^{25} 1.0551, n_D^{25} 1.6333; α -*p*-methoxyphenyl-4-methoxystilbene, m. 64°, b. 260-262°/14 mm., d_4^{25} 1.1269, n_D^{25} 1.6641. α -Phenylstilbene has d_4^{25} 1.0719 and n_D^{25} 1.6678. B, C A

Viscosity and orientation of flow. S. KYROPOULOS. *Physik Z.* **29**, 942 (1928). The technically refined lubricating oils, "Valvoline oils," are assumed to be composed of straight-chain paraffin hydrocarbons. Their typical viscosity-temp. curves are explained on the following assumptions: (1) The long-chain mols. of non-polar hydrocarbons have their elec. fields spread along the chain. They tend therefore to make felt-like mol. aggregates, which explains the viscosity of the heavier oils. (2) The surfaces of the solid bodies against which the oils flow in a viscosity measurement exert an orienting action on the mols. which is more pronounced as the chain increases in length. This effect decreases with temp. so that at high temps., the viscosities of long and short-chain hydrocarbons become nearly equal. G. CALINGBERT

Current standard of uranium oxide. R. JAEGER. *Z. Physik* **52**, 627-36(1928).—

An air condenser containing V_2O_5 will furnish a const. satn. current, which can be varied from zero to 5×10^{-10} amps. by means of a diaphragm. The standard is especially adapted to the use of compensation methods. GEORGE GLOCKLER

Hall effect in the experiments of Corbino. W. W. SLEATOR. *Physik Z.* 29, 584 5(1928); cf. *Ibid* 12, 561(1911).—Corbino's exptl. results are theoretically examined in the light of Sommerfeld's electron theory of metallic conduction. *Ibid* 628-9.—A theoretical investigation of the work of Corbino on the action on a disk carrying a current of a perpendicular magnetic field. It is shown that this arrangement with a circular plate gives the same value for the Hall const. as is obtained by the usual rectangular foil method. The question is attacked both by the classical method and by Fermi's statistics, and equations are derived which are in agreement with those of Sommerfeld (cf. *C. A.* 22, 1538). B. C. A.

The relation between dielectric constant of technical insulating material and frequency. PAUL BÖNING. Tech. Hochschule, Woosung, China. *Z. tech. Physik* 10, 20 3(1929).—In a previous article (*C. A.* 22, 3572) an equation $\epsilon' = \epsilon + (A/U) - (A/U)e^{-U}$ was developed. By assuming that the "supplementary ions," ions from the dielec. medium, travel over a distance d' during each a. c. period with d' a fraction of d the electrode distance, d'/d being proportional to $fEdt$ over half a period, it is now called that ϵ' , the dielec. const., is $\epsilon + (A/\omega) - (B/\omega^2)$ (ω is the frequency of a. c.). Up to the value $\omega = -(2B/A)$, ϵ' will be const. and equal to ϵ the d. c. value, because $d' = d$, from there on ϵ' drops. Exptl. results of other authors seem to agree with the equation. ϵ' always drops with rising frequency. B. J. C. VAN DER HOEVEN

Study of Faraday effect. J. BECQUEREL AND W. J. DE HAAS. *Z. Physik* 52, 678-94, *J. phys. radium* 9, [vi], 346-56(1928). Former investigations (*C. A.* 2, 1778) have shown that certain minerals of the rare earth group have a large rotatory power of paramagnetic origin. The law connecting rotatory power and field was studied. It was to be expected that at very low temps. rotatory power would no longer be proportional to the field. This was the case with the mineral tysonite; at the temp. of liquid He the following law was found: $\rho = \rho_\infty \tan [(S_\infty H)/(RT)]$, where ρ = rotatory power, ρ_∞ = satn. value of rotatory power, S_∞ Bohr magneton, H = magnetic field in gaussess, R = gas const., T = abs. temp. The satn. value ρ_∞ of the rotatory power is a function of the wave length (rotatory dispersion) and also of temp. The above law is complete proof of the existence of a paramagnetic rotatory power. The form of the law is in accord with theories of Lenz and Ehrenfest (*C. A.* 15, 628, 2782). G. G.

Crystallization of mesomorphic substances in the magnetic field. Obtaining a solid with oriented molecules. G. FOEX. *Compt. rend.* 187, 822-3(1928).—The mol. orientation of the solid, prepd. by almost completely melting *p*-azoxyanisolephenetole in a magnetic field and allowing it to cool, is the same as that of the oriented nematic phase produced as a result of fusion. Crystn. of the smectic phase of ethyl *p*-azoxybenzoate in a magnetic field also gives an anisotropic solid, but the diamagnetism is stronger in the direction of the orientation field than perpendicular to the field. ALBERT L. HENNE

Experiments on a ferromagnetic compound of manganese and arsenic. L. F. BATES. University College, London. *Phil. Mag.* [7], 6, 593-7(1928).—Expts. are described which show the behavior of the p. d. between a ferromagnetic substance, consisting of equal parts of Mn and As, and a soln. contg. a Mn ion. Pronounced changes occur as the substance passes through its magnetic critical temp. (cf. *C. A.* 22, 1267). I. H. REYERSON

The temperature coefficient of the magnetic susceptibility of glass. W. GERLACH AND N. LITTLE. Univ. Tübingen. *Z. Physik* 52, 464-5(1928).—Various glasses (Thüringer, Hartglass, Pyrex and colored glasses) have large temp. coeffs. of susceptibility, which must depend upon the paramagnetic susceptibility of the materials, since their diamagnetic susceptibility is independent of temp. GEORGE GLOCKLER

Capacity measurements by means of piezoelectric oscillators and resonators. G. A. KRANDSKII. *Z. Physik* 52, 743 5(1928).—The circuits are described and the necessary equations given. GEORGE GLOCKLER

Measurement of the reflective power of opaque minerals and of very refringent transparent minerals. J. ORCEL. *Compt. rend.* 187, 1055-7(1928).—Since the absolute reflective power of several metals and isotropic minerals is known O. proposes to use some of them, e. g., diamond and Pt, as standards, using the photo-electric battery previously proposed by O. Values for stionite and molybdenite are given. S. L. B. E.

Linear thermal expansion of calcite. SHUKUSUKE KOZU AND KOICHI MANI. Tohoku Imp. Univ. *The Earth*, 10, 172-8(1928).—The thermal expansion of calcite in the directions parallel to the principal and transverse axes was measured with a differ-

ential dilatometer at temps. up to 1000°. Dissocn. of calcite begins at 800°. The axial ratio detd. from the linear thermal expansion agrees with that measured with a reflection goniometer up to the 4th decimal place.

Calcite and aragonite. CHARLES H. SAYLOR. *J. Phys. Chem.* 32, 1441-60(1928); cf. *C. A.* 22, 4302. E. J. C.

Blue rock salt. F. C. GUTHRIE. Univ. of Liverpool. *Nature* 123, 130(1929) — Blue rock salt, natural or artificial, appears from its heat of soln. to have a slightly greater energy content than the colorless variety. The difference is too small to be measured quant. On heating the blue salt to 350°, a distinct glow was observed, after which the salt was colorless. The colorless salt shows no glow under the same conditions. In dissolving the blue salt, no light or radiation could be detected by a panchromatic plate. On purifying NaCl an alkaline product was always obtained when the salt was fused in air in a Pt crucible, contrary to statements in the literature.

G. CALINGAERT
Diffusion and membrane potentials. IV. A comparison of anion and cation effects. E. B. R. PRIDEAUX. *Trans. Faraday Soc.* 25, 20-3(1929); cf. *C. A.* 21, 3792.—A parchment paper membrane was interposed between solns. of the same weak org. acid, base, or a salt of one of them, in two different concns. The p. d. between the solns. differed in general from the diffusion potential. The ratios, E_m/E_d , of the membrane potentials and the diffusion potentials for 0.1 *N* and 0.01 *N* solns. of the electrolytes investigated are as follows: K benzoate 1.68, K phenylacetate 1.53, piperidine-HCl 0.32, AcOH 1.20, piperidine (hydroxide) 1.10. Since the membrane increases the potential with a salt with a relatively slow anion, and decreases the potential with a salt with a relatively slow cation, the membrane retards the anion more than the cation in both salts. This supports the view that parchment is negative. With AcOH, only a slight increase in potential is effected, probably because the H⁺ discharge slightly the neg. charge on the membrane. With piperidine, a diminution was expected, since the neg. charge should be increased by the OH⁻, and these ions should be retarded more than the cations. Instead, a slight increase was found. M. W. SYMONS

Supermolecular state of polymerized substances in relation to thin films and interfaces. S. E. SHEPPARD, A. H. NIETZ AND R. L. KEENAN. Eastman Kodak Co. *Ind. Eng. Chem.* 21, 126-7(1928).—The mol. condition of rubber, cellulose nitrate, cellulose triacetate, cellulose diacetate, and gelatin was studied. Each was dispersed in a suitable suspension medium, petr. ether, acetone, CHCl₃ or H₂O. A drop of the suspension was permitted to spread on a clean Hg surface. When the dispersing liquid had evapd. the area covered by the dispersed substance was measured and its thickness calcd. The limiting thicknesses in A. U. were: rubber 1.5, cellulose nitrate 2.50-5.00, cellulose triacetate 9.85, cellulose diacetate 3.8-4.2, gelatin 7.0. The behavior of these substances agrees with Staudinger's conception of extended chains of atoms held by homopolar primary valences. The chains may be bound together by forces varying from those of van der Waals to those of electrostatic constraints. Solvents may bring about incipient dissocn.

F. E. BROWN
The electric charge of colloidal carbon. H. R. KRUYT AND G. S. DEKADT. Univ. Utrecht. *Kolloid Z.* 47, 44(1929).—Adsorptive charcoal, even when ash free, may show a pos. or a neg. elec. charge. Heated to 1000° in CO₂ or *in vacuo* C becomes pos. in H₂O and shows little tendency to adsorb NaOH. Heated to 400° in O₂, it becomes neg. and adsorbs NaOH. It is suggested that this is due to the formation of a C-O complex on the surface, preliminary to the formation of mellitic acid. G. C.

The area of the internal surface of charcoal as determined by the adsorption of normal aliphatic alcohols from aqueous solution. W. E. GARNER AND F. L. T. KINGMAN. *Trans. Faraday Soc.* 25, 24-9(1929); cf. *C. A.* 21, 2208. In a previous paper, the adsorption was detd. by measuring the concn. of alc. in the soln. from the surface tension (bubble method). On the basis of a break in the adsorption isotherm at 0.0005 g. mols. of adsorbed alc. per g. of charcoal, certain deductions were made regarding the internal surface of the charcoal. In the present paper, analyses of the solns. were made with the Zeiss interferometer, and no breaks were found in the adsorption isotherms for butyl alc. The discrepancy probably has to do with ash content of the charcoal, and the authors distrust their results at low concns. by the surface-tension method. In the interferometer measurements, corrections were made for the error due to dissolved salt. Both evacuation and admitting air at high temps. increased the adsorption of the charcoal used (Norite, 0.2% ash after purification). A photomicrograph shows the porous structure of charcoal. The total computed pores is obviously much less than the total area of the charcoal. M. V.

The kinetic theory of absorption. THADÉE PĄCZALSKI. *Compt. rend.*

(1928).—For the absorption which takes place when a porous substance is placed in a gas the following equation is developed: $T/T_0 \leq \{l_0/4r[1 - (r/l_0)]\}^{(\gamma-1)/\gamma}$, where l_0 = mean free path of gas mols., r = radius of the porous tube, and γ = the ratio of the sp. heats.

E. G. VAN DEN BOSCHE

The adsorption of fluoride ions. BUN-ICHI TAMAMUSHI. Kaiser Wilhelm Inst., Berlin. *Kolloid Z.* 47, 58-60(1929).—The adsorption of F^- and Cl^- from KF and KCl and from HF and HCl solns. by sugar C is compared. In spite of the greater hydration of the F^- , it is more strongly adsorbed than Cl^- . This is explained by a displacement of the equil. at the surface of the coal, favoring the formation of complexes in the HF soln.

G. CALINGAERT

Measurements of the albedo of artificial mists. ERICH REGENER. Tech. Hochschule, Stuttgart. *Z. physik. Chem., Abt. A*, 139, 416-24(1928).—Measurements are described of the diffuse reflective power of mists of SO_3 , paraffin oil and NH_4Cl produced in the presence of CO_2 . A Martens polarisation photometer was used, a gypsum plate, whose albedo was assumed as 1, being taken as standard. The diffuse reflective power of these mists for sunlight incident at angles of $30-60^\circ$ increases with the concn. of particles, attaining a max. for very dense mists at which the reflective power is nearly equal to that of gypsum. The appearance of a layer of smaller concn. over the dense mist surface immediately reduces the albedo. Dense SO_3 mist overlaid with a more diffuse layer shows an albedo similar to that of natural clouds. W. WEST

So-called rhythmic crystallization. F. BERNAUER. *Neues Jahrb. Min. Geol., Abt. A, Beil.-Bd.*, 56, 342-56(1927-8); cf. *C. A.* 22, 4293.—Rhythmic crystn. phenomena were studied in melts of benzophenone, benzoic acid, benzoin, hippuric acid, santonin, salicylic acid, sulfonal, malonamide, antipyrine, benzonaphthol, asparagine salts, diamionaphthalene, and *m*-diethylaminophenol. The causes for the phenomena are presented in a series of drawings of growing crystals.

J. F. SCHAIER

Combining power of chromic oxide sol with acids and bases. R. WINTGEN AND H. WEISBECKER. *Z. physik. Chem.* 135, 182-98(1928).—The fact that acids and bases have affinity for chromic oxide sol may be due to adsorption or salt formation. The exptl. data agree within the limits of error with equations based on hydrolysis. The conception of chromic oxide sol as a colloidal soln. of an amphoteric electrolyte is confirmed by the fact that the isoelec. point observed agrees with that calcd. from the dissociation consts. of acid and bases. The adsorption isotherm allows results to be obtained which are in tolerably good agreement with exptl. values.

B. C. A.

Action of α -particles on colloidal solutions of gold. J. E. MAISIN. *Ann. soc. sci. Bruxelles* 48B, 48-53(1928).—The flocculation of a Au sol, contg. 0.014 g./l. and prepd. by the method of Zsigmondy, by the α -particles from Rn has been followed by observations of the Tyndall effect in a specially designed app., which is described. The curve obtained by plotting the relative lowering of the Tyndall effect against the quantity of Rn used for coagulation rises somewhat to an arrest and then steeply, indicating a period of induction followed by coagulation proper.

B. C. A.

Electric moment of colloidal particles of vanadic anhydride. J. ERRERA. *J. phys. radium* [6], 9, 307-9(1928).—The elec. moment of V_2O_5 is 415×10^{-18} , a value much higher than that of many other mols.

L. D. ROBERTS

Colloidal chemistry in the system: colloidal ferric hydroxide-hydrochloric acid-water. I. ERICH HEYMANN. Univ. Frankfurt. *Kolloid Z.* 47, 48(1929).—The aging of $FeCl_3$ solns. corresponds to hydrolysis. After long standing, a true equil. is reached between $Fe(OH)_3$, HCl and $FeCl_3$, accompanied by adsorption of HCl on the colloidal $Fe(OH)_3$. The colloidal particles formed when $FeCl_3$ is dissolved in H_2O are dispersions of oxychlorides high in Cl. On aging, they unite to similar products lower in Cl, under the influence of the equil. of the primary hydrolysis. If $Fe(OH)_3$ behaves as a sep. phase the ratio $[HCl]^2/[FeCl_3]$ must be const. This is the case only approx., an increased concn. of $Fe(OH)_3$ corresponding to an increased $FeCl_3$ concn. Particle size also affects the equil., the large particles corresponding to lower $FeCl_3$ concns. Systems which have attained equil. by ageing of $FeCl_3$ solns. show more Cl in the $Fe(OH)_3$ than systems prepd. by mixing $Fe(OH)_3$ with HCl. The addn. of $Fe(OH)_3$ to $FeCl_3$ solns. greatly accelerate the rate of slow hydrolysis.

G. CALINGAERT

A new method of preparation of colloidal copper. SHINJIRO ISHII. *Kyoto Imp. Univ. J. Phys. Chem.* 2, 65-73(1928).—When Cu_2O obtained by reducing Fehling soln with glucose is suspended in aq. gelatin soln. and treated with H_2SO_4 in an atm. of H_2 , a violet colloidal soln. is obtained. When HNO_3 is used instead of H_2SO_4 the soln. is brownish red. The qual. examn. shows the product to be Cu, not Cu_2O . The radii of the particles, detd. by ultramicroscopic count and from measurement of the velocity

of sedimentation, ranged from 9 to $8 \times 10 \mu\mu$. The Cu content of the soln. was measured by oxidizing the colloid and detg. the Cu concn. colorimetrically; the original soln. contained 2×10^{-4} g. Cu per cc.

K. SOMERVA

Study of the quantity and nature of the protecting action of colloids. SUN OGATA. Hokkaido Imp. Univ. *Hokkaido J. Med.* 6, 251-8(1928).—To det. the min. quantity of NaCl, BaCl₂ and FeCl₃ which is necessary to ppt. colloidal Au, solns. of a definite quantity of the salts in varying quantities of H₂O were added to 1 cc. of colloidal Au. The Au pptd. when the concn. of NaCl was greater than 0.032 N, of BaCl₂ greater than 0.001 N; and of FeCl₃ greater than 0.00124 N. Then in order to det. the quantity of glue necessary to protect the sol, a mixt. contg. various quantities of 0.0001% glue soln. and H₂O and a slightly larger quantity of the salts than the threshold value was added to 1 cc. of the colloidal Au soln., the total vol. being 10 cc. Protection was observed when the concn. of glue was greater than 0.00004% for both the NaCl and BaCl₂ soln., and greater than 0.00029% for FeCl₃. But when the same expt. was repeated with acetate or with a phosphate buffer, it was observed that for all 3 salts the threshold value of the glue soln. was the same. Hence O. concludes that the larger threshold value of the glue soln. obtained with the FeCl₃ soln. is due to hydrolysis of FeCl₃, and that when this is prevented, the same amt. of the glue soln. is required, irrespective of the kind of salts. This conclusion was also supported by a similar expts. made with the colloidal Cu ferrocyanide and mastics, the salts used being NaCl and FeCl₃.

K. SOMERVA

Critical potential in the coagulation of colloids by electrolytes. J. N. MUKHERJEE AND S. P. RAICHOU DHURI. *Nature* 122, 960(1928).—If rates of cataphoresis for As₂S₃ sols are plotted against concn. of added electrolyte, curves are obtained which are not in accord with the current view of the coagulation of hydrophobic colloids when the potential of the elec. double layer is decreased. This potential is directly proportional to the cataphoretic speed. Two types of curves are found for sols prepd. in different ways. In one, the cataphoretic speed diminishes regularly with increasing concn. of electrolyte, but in the other type may show either a min., or speeds increasing continuously with concn. These observations show definitely that there is no crit. potential at which coagulation takes place.

W. WEST

Pseudomorphism of gels. M. KRÖGER AND K. FISCHER. Univ. Leipzig *Kolloid Z.* 47, 5-10(1929).—Gels of any metal hydroxide can be prepd. by a suitable technic. Mg(OH)₂ gels are prepd. by adding a small amt. of H₂O to a satd. (3%) soln. of Mg(OMe)₂ in MeOH. The rate of formation of the gel is increased by alkalis. The gel is stabilized with glycerol, glycol or similar compds. Its consistency can be varied by varying the amt. of glycerol added. Pseudomorphic gels contg. the hydroxides of the following metals can be obtained by causing pptn. in the presence of the corresponding nitrates: Cd, Zn, Ni, Al, Co, Pb, Hg, Cu, Mn, Fe. Similar gels are also prepd. from Ca(NO₃)₂ and Ba(NO₃)₂ alone. The limit of absorption of the gels in the ultra-violet varies from 2300 Å. U. to 3100 from pure Hg gel to Mg + Fe, the various metals ranging themselves in the order given above.

G. CALINGAERT

The elastic properties of acid and alkaline silicic acid gels and their internal structure. M. KRÖGER AND K. FISCHER. Univ. Leipzig *Kolloid Z.* 47, 10-4(1929).—The elasticity and plasticity of acid, neutral and alk. SiO₂ gels are measured by bending sticks of the gels. For samples of the same age, the elastic properties of the various gels are very similar. The plasticity and shrinkage increase continuously from the acid to the alk. gels.

G. CALINGAERT

The plastic properties of gels, their temperature coefficient and the method of making lenses of gels. M. KRÖGER AND K. FISCHER. Univ. Leipzig *Kolloid Z.* 47, 14-9(1929).

G. CALINGAERT

Consistency of animal glue. DON BROUSE. *Ind. Eng. Chem.* 21, 242-7(1929).—The consistency of solns. of animal glue was studied with respect to the influence of temp., concn. and glue grade within the range of wood-working practice. The viscosity of the solns. tested is a hyperbolic function of temp. As the grade of the glue tested or the concn. is changed the position of the viscosity-temp. curve changes with respect to the axes but its shape remains the same. Within a very small range of temp. solns. of animal glue change from viscous to plastic. The change is a unique property of the gelatin point and provides a satisfactory means of defining and measuring the gelation point independently of the app. used and the judgment of the operator. The findings provide fundamental principles for glue-room technic.

DON BROUSE

The effect of velocity on the viscosity of dispersoids. G. W. SCOTT BLAIR. Soils Physics Dept. Harpenden, England. *Kolloid Z.* 47, 76-81(1929).—When a dispersoid flows through a capillary, the curve of pressure applied vs. rate of flow is a parabola

An equation derived from theoretical considerations fits well the existing data.

G. CALINGAERT

Viscosity of agar and gelatin solutions in presence of alcohols and salts. A. JANEK AND B. JIRGENSONS. *Latvijas Farm. Zurn.* 1927, No. 3, 9 pp.; cf. *C. A.* 21, 3516; 22, 3564.—Addn. of an alc. increases the viscosity of agar solns.; addn. of a salt reduces it whether alc. is present or not. Gelatin behaves similarly, but the viscosity of alc. gelatin soln. is lowered by KBr, and raised by K_2SO_4 or K tartrate. B. C. A.

Photometric and electrometric measurements of gelatin behavior. M. BRIEFER. *Ind. Eng. Chem.* 21, 266–70 (1929).—By investigating the relation of the isoelec. point of 1% gelatin solns. to their turbidity and jelly consistency, it is found that the characteristics of the gelatin vary with the previous chem. treatment of the raw material and not with its biological source. Any raw stock if originally conditioned with lime will yield a gelatin with max. turbidity on the acid side of the p_H scale. If the same raw materials are originally conditioned with acid the isoelec. point of the gelatin will be on the alk. side. After the original acid or alkali treatment, the ionic state of the animal skins is not changed with respect to the isoelec. point by subsequent treatment with electrolytes. In mixts., the basic gelatinate predominates in reference to turbidity and the isoelec. point and the acid gelatinate with respect to jelly consistency. Gelatin with its isoelec. point in the alk. region may be de-ashed just as can be done with gelatin with the isoelec. point in the acid region. D. B.

A lecture or laboratory demonstration of colloid cataphoresis. WILLARD H. MADSON AND FRANCIS C. KRAUSKOPF. *J. Chem. Education* 6, 334–5 (1929). E. H.

Studies in the qualitative reaction of proteins. III. Study of the ionic series. SUN OGATA, Hokkaido Imp. Univ. *Hokkaido J. Med.* 6, 425–36 (1928); cf. *C. A.* 23, 1147. The quantity of the neutral salts $(NH_4)_2SO_4$, NaCl, KCl, NH_4Cl , $BaCl_2$ and $CaCl_2$ necessary to ppt. gelatin, and the effect of other salts upon the above quantity were detd. The activity of Cl^- in the clear supernatant soln. after pptg. mixts. of gelatin and the above salts with AcOH was measured. Next the effect of these salts upon the soly. of NH_4Cl , and their soly. in alc. were examd. and from the exptl. data it was concluded that the effect of these salts upon the pptn. of gelatin is in contrast with their effect upon the soly. of NH_4Cl . The pptn. of proteins by neutral salts therefore depends upon their electrolytic nature. K. SOMEYA

Mineral "trees." Their formation and significance. MAURICE COPISAROW. Univ. Manchester, England. *Kolloid Z.* 47, 60–5 (1929). The tree-like appearance of slowly formed ppts. is not limited to the well-known cases. The following compds. gave "trees": $CaCO_3$, $CaSO_4$, Ca oxalate, $Ca_3(PO_4)_2$, $BaCO_3$, $BaSO_4$, $BaCrO_4$, BaC_2O_4 , $SrCO_3$, $SrSO_4$, SrC_2O_4 , $Cu_3(AsO_4)_2$, $Co_2(AsO_4)_2$, $Cu_2(AsO_4)_2$, $Mg_3(AsO_4)_2$, Cu, Co and Mg stannates, Ag_2CrO_4 and $CoCO_3$. Many other salts should also be able to give trees. Their formation may bear some relation to that of ivory, mother of pearl, etc. G. CALINGAERT

Solution and hydration velocities of kieserite. B. UEHLER. *Mitt. Kali-Forschungs-Anst.* 1927, 45 69.—The velocity of soln. of a particular specimen of kieserite is increased by diminution of grain size only down to the natural fineness. Generally, kieserite dissolves the more rapidly the purer it is; anhydrite, however, has no marked effect. The soln. velocity in a soln. unsatd. with respect to $MgSO_4$ increases with rise of temp.; the hydration velocity in a soln. satd. with respect to $MgSO_4$ becomes maximal at about 40°, and then falls to zero at 68°. In connection with the effect on the velocity of soln. of the presence of various salts in the solvent, 3 groups are differentiated, (a) dil. solns. of alkali chlorides and sulfates, in which the velocity is greater than in water, (b) concd. solns. of alkali chlorides and sulfates, $MgCl_2$, and satd. $MgSO_4$ solns., in which the velocity is smaller than in water, (c) equil. solns. and concd. $MgCl_2$ solns. in which the velocity is smaller than the velocity of hydration in satd. $MgSO_4$ soln. For the evaluation of a kieserite (a) the apportionment between various grades of fineness, and (b) the content of impurities (particularly sludge-forming) are important. In 4 cases grinding increased the soln. velocity by 20–400%. The tech. significance of the results is discussed. B. C. A.

Azeotropy in the binary systems alcohols-hydrocarbons. M. LECAT. *Ann. soc. sci. Bruxelles* 48B, ii, 105–18 (1928); cf. *C. A.* 22, 1712.—Azeotropic data are given for the 344 systems formed by 29 alcs. and 39 hydrocarbons. Equations of the type $\delta = a - b\Delta + c\Delta^2 - d\Delta^3$, where δ is the azeotropic lowering, Δ the difference in b. p. of constituents, and a , b , c and d are consts., are given for the various alcs. studied. The value of δ decreases rapidly for an equal interval Δ as a series of monohydric alcs. is ascended. B. C. A.

Azeotropy in binary alcohol-ester mixtures. M. LECAT. *Ann. soc. sci. Bruxelles*

48B, ii, 1-16(1928); cf. *C. A.* 22, 1712.—The relation between the azeotropic lowering of b. p. and the difference in b. p. of the constituents for binary alc.-ester mixts. is discussed. For systems contg. MeOH the relation is $\delta = 9 - 0.88 \Delta + 0.033 \Delta^2 - 0.000485 \Delta^3$, and similar expressions hold for other alcs. The azeotropic lowering diminishes as the mol. wt. of the alc. increases. Isomeric alcs. have the same δ/Δ relationship. Esters of mineral acids show greater azeotropic lowering than org. esters. Acetates give smaller lowering than formates and carbonates. Many of the systems show chem. reactivity, particularly at the b. p. B. C. A.

Binary azeotropes. X. M. LECAR. *Ann. soc. sci. Bruxelles* 48B, i, 13-22(1928); cf. *C. A.* 22, 2722.—A further list is given of the properties of mixts. comprising 117 pos. azeotropes (the b. p. of the azeotrope is lower than that of either component), neg. azeotropes, 4 eutectics, 57 nonazeotropic systems, and 4 systems where combination takes place. In each of the neg. azeotropes a phenol is present. Acetamide is a constituent of the mixts. which show the greatest azeotropic lowering of b. p. It is pointed out that in mixts. of an ester of a mineral acid and an alc., double decompn. takes place, and the reaction proceeds in the direction of production of the more volatile ester. XI. *Ibid* 54-62.—The data for 257 binary systems, azeotropic (pos.), eutectic, and euzotropic are tabulated. B. C. A.

Elevation in boiling point of saturated solutions at different atmospheric pressures. A. MITTENBERG. *Ukraine Chem. J.* 3, Sci. Part 119-23(1928).—The elevation of b. p., ΔU_1 , of satd. NaCl solns. at pressures of from 0.04-0.8 atm. is calcd. from the formula $\Delta U_0/\Delta U_1 = U_0^2 C_0 L_1/U_1^2 C_1 L_0$, where ΔU_0 is the elevation at 1 atm., U_0 and U_1 are the b. p. of the pure solvent at 1 atm. and at the given pressure, C_0 and C_1 the concns. of salt, and L_0 and L_1 the corresponding latent heats of vaporization. The calcd. results are in satisfactory agreement with those found by expt. B. C. A.

Determination of molecular weights by the Barger-Rast method. A. FRIEDRICH. *Mikrochem.* 6, 97-102(1928).—The original method of Barger (*J. Chem. Soc.* 86, 286(1904)) is shown to give more satisfactory results than the modification proposed by Rast (*C. A.* 16, 519). An alternative procedure is to use a tube drawn out to a capillary at both ends; this is half filled with the standard soln. by suction, a small air bubble is admitted, and the remainder of the tube is filled with the test soln. by continuing the suction. Both capillary ends are then sealed and the observation of the movement of the bubble is carried out as usual. Various precautions for obtaining accurate results are described and sources of error in the 3 modifications are discussed. B. C. A.

Ebullioscopic determination of molecular weights on small quantities of material. ALFRED RIECHE AND FRANZ QUERBERITZ. *Chem.-Ztg.* 52, 923-4(1928).—R.'s app. (*C. A.* 21, 2) is compared critically with that of Suchardo and Bobranski (*C. A.* 21, 3143). Directions are given for using the Rieche app. so as to improve the constancy of the b. p. obtainable with difficult types of solvents. For solvents of high b. p., such as AcOH, PhCl and pyridine, the app. should be protected by a heat insulating wrapping. When CHCl₃ is the solvent, it should be protected from light. Heating is best done by a bath having a temp. 30-40° higher than the b. p. of the solvent, and kept const. within 0.5°. The use of a heating bath minimizes the decompn. of easily decomposable solvents on the hot walls of the app. Cooling water should flow at a uniform rate. By using proper precautions, b. ps. const. to within 0.003° over a period of about 2 hrs. were observed with solvents of widely differing properties. R. H. LOMBARD.

Some methods of determining Avogadro's number. ARTHUR A. SUNDER. *J. Chem. Education* 6, 299-307(1929). E. H.

Influence of glycoll upon the freezing-point depression. KAORU OGURA, TEI-ICHIRO SHITO AND SEISEI YAMANO. *Hokkaido Imp. Univ. Hokkaido J. Med.* 6, 421-4(1928).—When 0.25 to 0.0625 *M* solns. of AcOH, H₂C₄O₄, or cane sugar are made 0.1 *N* with respect to KCl the f. p. of the soln. is depressed by 0.35-0.37°, which is the f. p. depression of 0.1 *N* KCl in pure water. But when H₂BO₃ or glycoll solns. are made 0.1 *N* with respect to KCl the f. p. of the soln. is depressed by only 0.32-0.33°. Combination between KCl and H₂BO₃ or glycoll is assumed. K. SOMEYA.

Calculation of the fugacities of a solution. G. VAN LERBERGHE. *Bull. sci. acad. roy. Belg.* [v], 14, 349-71(1928).—Mathematical. The formula for the fugacities of a soln. previously deduced (*Compt. rend.* 181, 851(1925)) may be derived by a simpler method. Analogous formulas applicable to special cases of soln. are derived by the asymptotic method of Donder (*C. A.* 19, 3044) and the application of these to the systems: CS₂-methylal, EtI-AcOEt, H₂O-H₂SO₄ are considered. B. C. A.

Thermodynamic activity and biologic action. The disinfectant power of the mercury ion and its activity. A. BENEDETTI AND G. B. BONINO. *Arch. sci. biol.*

(Italy) 12, 401-6(1928).—In a previous paper the authors showed that the concn. and activity of ions are two distinct quantities (cf. *C. A.* 22, 1082). Therefore, a given biologic action does not depend on the no. of ions or concn. alone but on their effective mass or activity. Paul and Krönig (*Z. physik. Chem.* 21, 414) concluded that the disinfectant power of a soln. of HgCl_2 is proportional to the no. of ions present, tacitly assuming that each ion has the same activity even though under different physico-chem. environment. The conclusion is erroneous because there exist in soln. ionic aggregates in which the interionic distances and forces vary in size and strength. The av. activity of Hg^{++} ions may be calcd. by Debye's statistical method. From cryoscopic measurements of HgCl_2 solns. of equal concn. but contg. different amts. of NaCl (which altered the interionic action and the activity of the Hg^{++} ion), an av. value of x was obtained from which may be calcd. approx. by means of Debye's formula: $\log_{10} f_{\pm} = -z^2 0.354 \sqrt{\gamma \phi(x)}$, the av. activity of Hg^{++} ions in soln. The results showed that the av. activity of Hg^{++} diminishes as the concn. of NaCl increases. The disinfectant properties of the Hg^{++} ion should diminish likewise. Paul and Kronig, who worked with solns. of similar compn., found that this is true. The no. of colonies of *B. anthracis* developed after 6 mins. exposure to the solns. is given below:

Concn.	No. of colonies	Activity of Hg^{++} ion
1 mol. HgCl_2 in 16 l. H_2O	8	3.4287×10^{-3}
1 HgCl_2 + 1 NaCl in 16 l. H_2O	32	1.9187×10^{-3}
1 HgCl_2 + 2 NaCl in 16 l. H_2O	124	1.2050×10^{-3}
1 HgCl_2 + 3 NaCl in 16 l. H_2O	228	0.9531×10^{-3}
1 HgCl_2 + 6 NaCl in 16 l. H_2O	803	0.4959×10^{-3}
1 HgCl_2 + 10 NaCl in 16 l. H_2O	1087	0.2755×10^{-3}

PETER MASUCCI

Affinity between asymmetric ions. I. S. W. BERGMAN. *Arkiv Kemi, Min. Geol.* 9, No. 34, 1-21(1926); cf. *C. A.* 22, 3083.—Cond. measurements at $18.0 \pm 0.2^\circ$ have been made with solns. of cinchonine *d*- and *l*-mandelates, cinchonine *d*- and *l*-tartrates, and quinine *d*- and *l*-camphorsulfonates. The values for Λ for each pair of diastereoisomeric salts were approx. equal. Measurements of $[\alpha]_{D_{250}}^{25}$ for cinchonine *d*-, *l*-, and *dl*-mandelates show that the values $[\alpha]_d - [\alpha]_l$ are about the same as $[\alpha]_l - [\alpha]_d$, and $[\alpha]_{D_{250}}^{25}$ the same as for NH_4 *l*-mandelate. There is thus no difference in affinity between optically active acids and bases (cf. Marekwald and Chwollies, *Ber.* 31, 783-90(1898)). The difference in solv. of diastereoisomeric salts is explicable in terms of the energy content of the crystal lattice, and the Bjerrum dissocn. theory affords a satisfactory explanation of the results. B. C. A.

Electromotive forces of uni-univalent halides in concentrated aqueous solutions. HERBERT S. HARNED. Yale Univ. *J. Am. Chem. Soc.* 51, 416-27(1929).—Measurements at 25° of cells of the type $\text{Ag} | \text{AgX} | \text{MX}(m) | \text{M}_2\text{Hg} | \text{MX}(0.1) | \text{AgX} | \text{Ag}$ contg. NaCl , NaBr , KCl and KBr were made. Activity coeffs. are calcd. from the e. m. f. results. E. G. VAN DEN BOSCHE

Influence of pressure on the potential of electrodes charged with hydrogen and on the current-potential curves. G. TAMMANN AND E. JENCKEL. *Z. anorg. allgem. Chem.* 173, 337-57(1928).—In the cell $(\text{Pd})\text{H}_2 | 2 \text{ N } \text{H}_2\text{SO}_4 | \text{CdSO}_4 | \text{Cd}$ the value of $\Delta E/p$ decreases slightly with increasing pressure, the rate of decrease being the smaller the higher is the temp. Similar results are obtained with the cell $(\text{Pt})\text{H}_2, 0.1 \text{ N } \text{HCl} | \text{CdCl}_2 | \text{Cd}$. The effect of pressure on the potential of Pt electrodes in oxidizing and reducing solns. has been measured; the curves are in all cases approx. straight lines. In FeCl_3 and FeCl_2 solns., pyrogallol, and quinhydrone the potential becomes less noble with increase of pressure and in K ferro- and ferri-cyanide solns. more noble. The potential of the quinhydrone electrode becomes more pos. with addn. of neutral salts, LiCl having the most pronounced effect; this effect, however, is relatively small. The potential of Pd feebly charged with H becomes more noble on keeping in consequence of diffusion of the surface H into the body of the metal. The effect of pressure on the current-e. m. f. curves of the cells $\text{Ni} | \text{KOH} | \text{Ni}, \text{Hg} | \text{H}_2\text{SO}_4 | \text{Pt}, \text{Pb} | \text{KOH} | \text{Pt}, \text{Pb} | \text{H}_2\text{SO}_4 | \text{Pt}$ and $\text{Pt} | \text{ZnSO}_4 | \text{Pt}$ is shown in a series of curves; in all cases increase of pressure gives a higher e. m. f. for the same current. B. C. A.

Overpotentials produced by films of hydrogen less than one molecule thick. A. L. MCAULAY AND D. P. MELLOR. *Nature* 122, 170-1(1928).—With a Hg cathode, NH_4SO_4 as electrolyte, and currents of the order of 1 micro-amp./sq. cm., overpotentials of 0.3-0.4 v. were produced when less than one eighth of a unimol. layer of H had been deposited. Complete elimination of O was essential.

Oxidation-reduction potentials. I. The ferric-ferrous electrode. STEPHEN POPOFF AND ADOLF H. KUNZ. Univ. of Iowa. *J. Am. Chem. Soc.* 51, 382-94(1929).—Measurements were made of the cell $Pt, H_2 | HCl | HCl + FeCl_3 + FeCl_2 | Pt$. A method for the reduction of liquid junction potential errors to a min. is given. The normal oxidation-reduction potential of the ferric-ferrous electrode was found to be -0.7476 v. ≈ 0.5 mv.

Derivation of reference values for the calomel electrode used in p_H measurements. D. H. CAMERON. Elk Tanning Co., Ridgway, Pa. *J. Am. Leather Chem. Assoc.* 24, 80-7(1929).—The "true" half-cell e. m. f. is the e. m. f. at any specified temp. measured relative to an arbitrary zero. The "reference" half-cell e. m. f. is used only when the electrode replaces a H electrode in a H concn. cell. The reference e. m. f. is such that when it is subtracted from the total e. m. f. of a cell consisting of the calomel electrode and a H electrode, the difference is the total e. m. f. that would be observed if the H electrode were combined with the normal H electrode at the temp. in question. This explains the statement that the e. m. f. of the normal H electrode is 0 at all temps. In calcg. the reference e. m. f. of the calomel half cell at different temps. it is assumed (1) that the e. m. f. of the normal H electrode is zero at 25°, (2) that H ion concn. of 0.1 N HCl is 0.0816 at 25° and (3) is const. over the range 15-30°. Reference values for the satd. KCl-calomel half cell are calcd. on these assumptions from the data of Fales and Mudge.

Hydrogen-ion determination by modified colorimetric method. D. H. CAMERON. Elk Tanning Co., Ridgway, Pa. *J. Am. Leather Chem. Assoc.* 24, 76-80(1929). To avoid the labor of prepg. the numerous and not very permanent color standards, C. proceeds as follows: First det. the approx. p_H value of the soln. by spotting. Then to 50 cc. in a Nessler tube, add exactly 1 cc. of a 1:5 diln. of the indicator stock soln. Place 25 cc. of the appropriate buffer soln. (0.1 M K H phthalate, 0.1 M KH_2PO_4 , or 0.1 M boric acid) in a second tube of exactly the same diam., add the same quantity of indicator, and titrate with CO_2 -free NaOH until an approx. match is obtained, then dil. nearly to 50 cc. and titrate to an exact match. The vol. of the standard need not be exactly 50 cc. if the 2 tubes are of the same diam. and the solns. are viewed vertically. Obtain the p_H value corresponding to the vol. of alkali added from tables (Clarke). As described, the method is limited to water-white solns. of p_H value 4-10 but is capable of extension to lower p_H values by the use of other buffers than those mentioned.

Revision of the theory of transfer resistance. E. NEWBURY. *Proc. Roy. Soc. (London)* A119, 686-9(1928).—A no. of expts. have been made with a new type of electrolytic cell, designed to eliminate the disturbing effect of the fall of potential through the electrolyte obtained with the type of cell used in previous work. The table showing the relation between transfer resistance and the concn. of the electrolyte, previously recorded (*Ibid* A111, 188(1926)), is found to be incorrect. It is now found that transfer resistance occurs only when a gas is being liberated at an electrode. It is independent of the concn. of the electrolyte and increases with rise of temp. The highest values are obtained with very low c. ds.; at high c. ds., transfer resistances become very small. The theory of the effect is discussed. It is suggested that transfer resistance is the elec. resistance of a film of gas over the electrode surface.

Dispersion of conductivity. H. SACK. *Physik. Z.* 29, 627-8(1928). A method is described for the detn. of the change of cond. of a soln. with the frequency of the current traversing it (cf. Debye and Falkenhagen, *C. A.* 22, 2705). The method depends on the fact that in a tuned circuit consisting of a self-inductance and a capacity with parallel resistance (in this case a condenser with a conducting liquid), any change in the resistance will produce a change in the current strength at resonance which can be measured. The results obtained are of the order of magnitude required by the theory.

The electrical conductivities of some uni-univalent salts in benzonitrile. Evidences for the incomplete dissociation of strong electrolytes and the applicability of the law of mass action to their dissociation. AUSTIN R. MARTIN. *J. Chem. Soc.* 1928, 3270-93.—The solutes were KI, NaI, LiI, LiBr and $AgNO_3$. The concns. varied from about 0.01 M to about 0.000015 M . The temps. were 0°, 25°, 40°, 55° and 70° with some observations at 40° and at 80°. More than 160 observed con-

ductivities are reported. The data agree fairly well with the equation $\Lambda_0 = \Lambda + XC^{0.5}$ and quite well with the equation $\Lambda_0 = \Lambda + AC^N$. In PhCN as well as in H₂O and MeOH, the values of Λ_0 for the iodides of the alkali metals increase with increasing at wt. and vol. The viscosity (η) of PhCN $\times 10^4$ was found to be: 194 at 0°; 124 at 25°; 100 at 40°; 87.6 at 50°; 82.6 at 55°; and 66.6 at 70°. $\Delta\eta$ is a const. for these solns. The ionic mobilities vary from Li, 17.8, to I, 29.5. By assuming (1) that the only resistance to the motion of ions at infinite diln. is the drag of the solvent and (2) that the magnitude of this drag is given by Stokes' law, the mean ionic radii (b) were calcd. The values of $b \times 10^8$ are: KI 2.57, NaI 2.88, LiI 2.96, LiBr 3.63, AgNO₃ 2.58. These values are between 0.5 and 0.08, the corresponding values calcd. from the theory of Debye and Hückel. The divergence increases in the order of mention. In Ostwald's diln. law ($K = \alpha^2/(1 - \alpha)v$), when v varies from 100 l. to 20000 l., the mean values of K are: KI 11, NaI 14, LiI 8, LiBr 0.32, AgNO₃ 0.40. The whole of the cond.-concn. curve can be described by a dissocn. governed by the law of mass action, the mobility of the resulting ions varying with their concns. because of the Coulomb forces between them, in the manner predicted by the Debye-Hückel-Onsager theory. In extremely dil. solns., dissocn. is complete.

F. E. BROWN

Chain reactions. MAX BODENSTEIN. Univ. Berlin. *Sitzb. preuss. Akad. Wiss.* 1928, 490-7.—A review.

ALBERT L. HENNE

Velocity coefficient of a homogeneous bimolecular gas reaction. R. G. W. NORRISH. *Nature* 122, 923-4 (1928).—The critical increment of the thermal reaction $2\text{NO}_2 \rightarrow 2\text{NO} + \text{O}_2$ is 33,200 when calcd. by Hinshelwood's method, and 32,000 when it is derived from the temp. coeff. The satisfactory agreement confirms the theory of kinetic activation.

ALBERT L. HENNE

The decomposition of ammonia on iron. A. MITTASCH, E. KUSS AND O. EMERT. I. G. Farbenindustrie A.-G. *Z. Elektrochem.* 34, 829-40 (1928).—The decompn. of NH₃ on Fe(CO)₅ and on Fe activated with K₂O and Al₂O₃ was studied below 400°. At the lowest temp. at which the reaction starts nitrides are formed and H is liberated. At a higher temp., the gas evolved contains also N in the proportion N:3H. On activated Fe, the formation of nitride and the evolution of the N + 3H mixt. are observed at lower temps. than with ordinary Fe. The reaction velocity was measured by the amt. of N liberated from Fe nitride formed as intermediate product. The decompn. of NH₃ is regarded as a two-step process: (1) metallic Fe and NH₃ give H and Fe nitride, (2) the latter decomposes into N and Fe. The second step is the slower one, and, consequently, it detcs. the velocity of the whole decompn. This second step is affected decidedly by temp. and by the presence of activators. Decompn. occurs almost exclusively on metallic Fe. Pure Fe, coarse Fe carbide and mixts. of Fe with various substances were tested as catalyzers. The active part of the catalyst is always Fe-Fe carbide (coarse or very fine, as obtained from Fe cyanide by reduction) never acts as a catalyst for the decompn. of NH₃. A method is described for detg. the active portion of a catalyst contg. Fe. A new gasometer was devised for the analysis and storage of gases in which the gases come in contact only with glass, porcelain and Hg. This gasometer is specially suitable for the analysis of very pure gases. A. L. H.

Autoxidation and antioxygenic action. XXXIII. Catalytic properties of antimony, bismuth and their derivatives, and some derivatives of vanadium. CHARLES MOUREL, CHARLES DUFRAISSE AND MARIUS BADOCHIE. *Compt. rend.* 187, 1092-6 (1928), cf. *C. A.* 23, 1561.—The metal, Sb and its O compds. have only slight activity in retarding the oxidation of C₆H₅CHO. Sb₂O₃ retards the oxidation of C₆H₅CHO, but accelerates the oxidation of styrene slightly. The halogen derivatives of Sb are usually very active. The chloride and bromide are good antioxygens for PrOH, acrolein, C₆H₅CHO, furfural and turpentine. The iodide has a similar action on all these compds., except turpentine, where it exerts prooxygenic influence. The oxidation of styrene is accelerated by the iodide (2 times), bromide (15 times), chloride (20 times). All halides of Sb are antioxygenic toward Na₂SO₃ in alk. soln. and prooxygenic in a slightly acid medium. (C₆H₅)₃SbCl is a good antioxygen for furfural, and a fair one for the oxidation of C₆H₅CHO, but has slight activity for Na₂SO₃; after an inactive induction period it is prooxygenic toward styrene, and prooxygenic toward Na₂SO₃ in acid soln. (C₆H₅)₃SbCl₂ is very effective in retarding the oxidation of furfural and either acid or alk. Na₂SO₃. but at a certain point of concentration it accelerates the oxidation

retards the oxidation of styrene but is of slight action with Na₂SO₃ in alk. soln. Bi₂O₃ greatly retards the oxidation of styrene, but that of turpentine and of Na₂SO₃ in alk. soln. weakly. The Bi(NO₃)₃, after an induction period, greatly retards

the oxidation of furfural as well as that of alk. and acid solns. of Na_2SO_3 , but is strongly proöxygenic toward styrene. BiCl_3 and BiBr_3 possess little or no activity in general although the chloride is strongly antioxygenic toward Na_2SO_3 in alk. soln., and is a first proöxygenic but finally antioxygenic in acid soln. BiBr_3 retards the oxidation of Na_2SO_3 in alk. soln. but greatly accelerates that of styrene. The iodide is generally very active and is a good antioxygen for $\text{C}_6\text{H}_5\text{CHO}$, furfural and PrOH ; with acrolein it exerts a good antioxygenic effect for the first few days, and then a rapid acceleration occurs; with styrene there is a rapid acceleration; the oxidation of Na_2SO_3 in alk. soln. is strongly retarded. $\text{Bi}(\text{C}_2\text{H}_5)_3$ effectively retards the oxidation of $\text{C}_6\text{H}_5\text{CHO}$, furfural, $\text{C}_3\text{H}_7\text{CHO}$ and alk. soln. of Na_2SO_3 ; it accelerates that of styrene, turpentine and acid soln. of Na_2SO_3 . $\text{Bi}(\text{C}_3\text{H}_7)_3$ and $\text{Bi}(\text{C}_4\text{H}_9)_3$ have about the same effects except that the latter is antioxygenic to styrene while the former is proöxygenic. $\text{Bi}(\text{C}_6\text{H}_5)_3$ is a good antioxygen for acrolein and furfural but only fair for $\text{C}_6\text{H}_5\text{CHO}$. It effectively retards the oxidation of styrene and accelerates that of turpentine after periods of initial activity. V_2O_3 , V_2O_5 , NH_4VO_3 and the VOCl retard the oxidation of Na_2SO_3 in alk. and acid solns. V_2O_5 accelerates the oxidation of $\text{C}_6\text{H}_5\text{CHO}$, turpentine and styrene and is also very effective for furfural and $\text{C}_3\text{H}_7\text{CHO}$. V_2O_5 and NH_4VO_3 are proöxygenic to $\text{C}_6\text{H}_5\text{CHO}$, $\text{C}_3\text{H}_7\text{CHO}$, furfural and styrene. The anhydride is effective for acrolein and turpentine but NH_4VO_3 is without action on turpentine. The oxychloride is antioxygenic to $\text{C}_6\text{H}_5\text{CHO}$, furfural, the alk. and acid solns. of Na_2SO_3 and, after a period of inactivity, to turpentine. It accelerates the oxidation of acrolein and styrene.

J. H. PERRY

A suggestion with regard to antioxygenic action. KENNETH C. BAILEY, Trinity College, Dublin. *Chemistry and Industry* 48, 35-6(1929).—The inhibition of oxidation of PhCHO by S or hydroquinone presents a similarity to the retarding effect of pyridine on the esterification of EtOH by AcOH (*C. A.* 22, 2919). This suggests that the auto-oxidation chain reaction takes place mostly on the walls of the vessel and on the surface of the liquid. The inhibitor is very active because it is coned. at those boundaries.

G. CALINGHEFT

The velocity constant of kinetic processes in heterogeneous systems as a function of temperature and intensity of agitation. WITALI HELLER. *Rozniki Chem.* 8, 465-73(473-4 French) (1928).—The study of solution of Sn and Cd in an aq. soln. of FeCl_3 , and of Mg in an aq. soln. of NH_4Cl showed that the velocity constant of these processes, calcd. according to the equation $K = (2.303 \nu/S \cdot \Delta t) \log [(a - x_1)/(a - x_2)]$, is a linear function of velocity of rotation of agitator (n revolutions/min.) at const. temp. At const. n (n varied from 200 to 600, t from 0° to 35°) K is a linear function of temp. The temp. coeff. is, therefore, independent of the velocity of agitation. The relation between K and temp. can be predicted on the basis of Nernst's diffusion theory and by supposing that the thickness δ of the adhesive layer is independent of temp. if n is const. The agreement of theory with expt. favors the diffusion theory. These relationships can be combined in the expression: $K = (An + C_0)(t - \tau)$, where the parameters C_0 and τ are characteristic for the processes independent of app. used. A depending on the app. and process. A can be also made independent of the app. by introducing the idea of a normal agitator, by comparison with which the effect of agitation for a given process in any app. can be defined. A method is described for establishing a normal scale of intensity of agitation, thus allowing systematic comparison of all kinetic processes in heterogeneous systems, independently of the app. used.

JAROSLAV KRČERA

Calculation of theoretical flame temperature. P. DROSSBACH. *Z. Elektrochem.* 34, 783(1928).—A correction is made of errors in the paper abstracted in *C. A.* 21, 3533. These errors were due to the assumption that certain temps. taken from the literature were Centigrade, whereas they really were abs.

F. R. B.

Velocity of thermal decomposition of malonic acid. J. LASKIN. *Trans. Siberian Acad. Agr. Forestry* 6, No. 1, 7 pp.(1926).—The thermal decomposition of malonic acid is unimol.; the velocity coeff. at 138° is 0.021.

B. C. A.

Calorimetric examinations. II. Benzoic acid as a standardizing material for combustion calorimeters. P. E. VERKADE. *Chem. Weekblad* 25, 666-7(1928).—The heat of combustion of $\text{C}_6\text{H}_5\text{COOH}$ —6319 cals.—(adopted as international standard) is found to be sufficiently accurate and can well be used until a more accurate analysis is made possible.

M. ACHTERHOF

Heat of mixing of molten metals. IV. MASUO KAWAKAMI. Sendai Higher Tech. School. *J. Study of Metals* 5, 346-8(1928); cf. *C. A.* 22, 718. (1) The heat of mixing of solids. K. has deduced thermodynamically the following theoretical formula using the idea of fugacity: $\Delta H = \Delta H' + RT[y \ln(x/y) + (1 - y) \ln(1 - x)]$.

$(1 - y) + yQ_A(T_{0A} - T)/T_{0A} + (1 - y)Q_B(T_{0B} - T)/T_{0B}$, where $\Delta H' = yH'_A + (1 - y)H'_B$ and ΔH , the heat of mixing evolved when the 2 components, A and B , are mixed in the proportion of the mol. fraction of y : $1 - y$ in their solid states to form a solid soln.; R , the gas const., T , abs. temp.; y and x , mol. fractions of A in equil. at T ; Q_A and Q_B , heats of fusion of A and B ; T_{0A} and T_{0B} , m. ps. of A and B ; H'_A , the heat evolved when one mol. of the liquid A is mixed with an infinitely large quantity of the liquid mixt. consisting of x and $(1 - x)$ mol. fraction of A and B , H'_B , the heat evolved when B is mixed with an infinitely large quantity of the above mixt. K. found $\Delta H'$ for the 4 following metals from his own previous measurements of the heat of mixing and calcd. ΔH , finding that in all cases there was a heat absorption (+ in ble means endothermic).

Solute Solvent	Bi Zn	Pb Cd	Pb Sn	Sn Cd
	0.990	0.990	0.990	0.990
	0.970	0.971	0.985	0.959
$T_{0A} - T$	4.4	11.72	2.6	9.2
Q_A	2930	1140	1140	1684
Q_B	1542	1452	1684	1152
$\Delta H'$	+11.6	+15.4	+10.5	+12.3
ΔH	+28.6	+27.3	+12.2	+27.7

(2) *Relation between soly. and the heat of mixing of liquids.* Putting $y = 1$ in the above formula, gives: $RT \ln x + Q_A(T_{0A} - T)/T_{0A} + \Delta H'_A = 0$ which applies to the binary system having no solid soly. Here x designates the soly. of A in B . K. SOMEYA

Constitution and thermochemistry. ALBERT GOSSELIN AND MARCEL GOSSELIN. *Compt. rend.* **187**, 1050 (1928).—Values are given for heats of linkage of 17 at. groups (such as $C-H_2$, $C-NH$, $C-Cl$, etc.) calcd. from known heats of formation of various mpds. in which they occur. From these values heats of formation of other compds. can be calcd. Thus for urea the heat of formation in the gaseous state = $CO + NH_2 + NH + C-NH_2 + C-NH = 26.1 + 12.2 + (64 - 2[N]) + 17 - (47 - 2[N]) = 72.3$ k. E. G. VAN DEN BOSCHE

Colloid technical review (LIESEGANG) **19**. Dependence of alkaline and acid condition of glasses on the concentration of H ions (BOTVINKIN, TANCHILEVICH) **19**. Attitude of the O layer (McLENNAN, *et al.*) **3**. Refractive index for electrons and diamagnetism (ROSENFELD) **3**. Reaction of chloroacetic acids with Zn (DOUGHTY, LASS) **10**. The dipole moment of a few aliphatic ketones (WOLF, LEDERLE) **10**.

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3—SUBATOMIC PHENOMENA AND RADIOCHEMISTRY

S. C. LIND

Elementary treatment of the hydrogen atom in wave mechanics generalized for the moving nucleus. J. K. L. MACDONALD. McGill Univ., Can. *Trans. Roy. Soc. Can.* [3], 22, III, 417-22(1928).—A purely mathematical treatment in wave mechanics from which the Rydberg-Ritz formula is shown to follow from the considerations dealt with.

"Packing fractions" of the atoms and their interpretation. ALAN C. BURTON. Univ. of Toronto. *Trans. Roy. Soc. Can.* [3], 22, III, 379-95(1928).—Burton recalculated the at. mass of the atoms, using 1.00778 as the factor for the mass no. 1H, from this and not from the nearest whole number that the actual mass found should be subtracted. The result gives the total loss in mass of the nucleus due to packing. A table showing this quantity as recalculated from Aston's results accompanies the paper. Since the loss in mass due to "packing" of the electrons and protons in a single particle is 0.290 one would expect the loss to be greater if several α particles are bound together. The additional "packing" losses observed are explained on the basis of Rutherford's "neutrons," to each of which a "packing" loss of 0.007-0.008 is assigned. As a consequence of this, the masses of the isotopes of the heavy elements, though not themselves whole numbers, should differ by integers. The negative "packing" effect of those elements not built up of α particles is attributed to the kinetic energy increase in mass of protons rotating in orbits being greater than the loss in mass due to packing.

J. W. SHIPLEY

Atomic syntheses accompanying atomic fission and the theory of the building up of atoms from hydrogen and helium. W. D. HARKINS AND H. A. SHADDOCK. Chicago Univ. *Z. Physik* 50, 97-122(1928); cf. *C. A.* 17, 3131, 3449. Harkins and Ryan worked out a process in 1923 which established disintegrative syntheses of light elements. They showed that a doubly charged He atom (α -particle) combined with the nucleus of the N atom of mass 14 and a positive charge of 7 and assumed that the F atom of mass 18 and positive charge 9 was thus formed which immediately exploded with the expulsion of a proton or H^+ . The process may be represented thus $N_7^{14} + He_2^4 \rightarrow O_8^{17} + H_1^1$. Rutherford also showed that light atoms can be disrupted by bombardment with α -particles and H-particles are ejected. In the development of the photographic method of fog tracks the source of the α -rays was of the utmost importance. Po contg. Th C or Ra C which gave fast rays was chosen. A Shimizu-Wilson fog track app. was used and 24000 photographs were taken. The sieve plate method for measuring the tracks of α -particles is a new method. The app. for this is described in the paper. Particles with velocity of 1.6×10^9 cm./sec. were found, i. e., a little greater than the starting velocity of α -particles from Po; hence it would seem that Po could be used as a source of α particles. To do this a photographic

method must be adopted and Holubek's method is doubtful. The direct addn. of an α particle to the nucleus of a N atom enhances the evidence published in 1915-7 relating to the theory of atom evolution from H and He. It is not a necessary requirement of the theory that in every case the He multiples of the nuclei of light atoms are built up of α particles. More often the claims of the theory are satisfied when it is established that every multiple shows a relatively high stability and abundance and they may be composed of neutrons (pe) or $(pe)_2$, half- α -particles (p_2e) or of other groups or even of protons and electrons. As always, the proof of the direct addn. of a He nucleus to the nucleus of a light atom affords one of the best supports of the theory up to the present. Other supports are given, just as weighty, but not so direct. The law discovered is that the stability and abundance of the occurrence of atoms to a large extent is governed by the oddness or evenness of the no. of nuclear electrons, the $+$ charge no. of the nuclei (ordinal no.), the no. of protons (at. wt.) and the no. of isotopes. When all 4 of these values are high, stability and even nos. are connected. The object of the discussion that follows is to show that the new work on the disruption of at. nuclei, on the isotope formation of elements and on the packing effect confirm the law. 1. (a) Elements of even ordinal no. are more plentiful than those with uneven no. (b) The no. of isotopes is generally much higher for elements with even than with odd ordinal no. That atoms of even ordinal no. are more stable is also supported by Rutherford and Chadwick. 2. (a) Almost all at. nuclei contain an even no. (N) of negative electrons. (b) The no. of neg. nuclear electrons is even for almost all isotopes. About 130 are known of which 111 possess an even no. (N). 3. Excluding H, no isotope is known for which the ratio of negative electrons (N) to positive nuclear electrons is less than $1/4$. 4. About 90% of all atoms of meteorites and 85% of those in the earth's crust have an at. wt. divisible by 4, i. e., by the at. wt. of He. 5. The species of radioactive decompn. can be reproduced by successive α -rays and several β -rays. 6. The isotopic no. has a periodicity of 4. 7. The isotopic no. also has a periodicity of 2. The law of whole nos. or the law of approx. equiv. constancy of the packing effect is explainable only when the protons are proportionately far apart and the neg. electrons are very close. 20000 photographs of the bombardment of an A nucleus were taken and in no case did a disruption yield an α -particle or H-particle. The magnitude of the packing effect from He to A is 0.12%. It is possible that a particle of high velocity may combine with the A nucleus. There are many types of at. stability,

cut from the various types of at. fission. A certain atom, quite unstable because of its composition may become stable upon ejection of a β particle. The abundance of isotopes is conditioned by the ease of attachment of α particles. It is difficult to understand how an α particle which is not ejected from a heavier at. nucleus can attain enough velocity to combine with a particle of a higher positive charge. The number

He groups (neutral α -particles) may be taken as 13 in the heaviest atoms. Data supporting the H and He theory are significant for the history of the earth, as is illustrated in the diagrams of abundance and no. of isotopes. The earth is not considered to have originated from meteors or from smaller planets. S. L. B. ETHERTON

Quantum mechanics of radioactive nuclei. G. GAMOW AND F. G. HOUTERMANS. *Physik* 52, 496-509(1928).—The decay consts. of radioactive elements giving off α -particles are calcd. on the basis of the quantum-mech. theory of α ray disintegration given by G. The energy of the α -particles from expt., the at. no. of the element and certain characteristic nuclear radii are used in the calcn. For one of the elements of a radioactive series the nuclear radius is made to fit the experimentally known decay const. from the decay consts. of the other members are calcd. without making any special assumptions regarding the force field near the nucleus. The calcd. values agree fairly well with expt. GEORGE GLOCKLER

Quantum theory of atomic disintegration. G. GAMOW. *Z. Physik* 52, 510-5 (1928).—On the basis of classical mechanics only very fast α -particles (e. g., from Th C' with A) can penetrate close enough into the nucleus to cause its disintegration. However, on the view of quantum mechanics there always exists some probability that a given α particle may penetrate into the nucleus, which process is the exact reverse of the process described (in the preceding abstr.) as at disintegration. With this fundamental notion a theory of at. disintegration is built up. It is important to notice that the incoming α -particle may have less kinetic energy than corresponds to the potential maximum of the nuclear field. There is found generally good agreement between expt. and theory. GEORGE GLOCKLER

Constitution of germanium. F. W. ASTON. *Nature* 122, 167(1928).—Expts. with Ge tetraethyl and tetrafluoride indicate that Ge has the following isotopes, in order of descending intensity: 74, 72, 70, 73, 75, 76, 71, 77. It is unlikely that any

of these lines is due to H compds., but the intensity of Ge^{76} is in doubt. Of these mass numbers only 72 and 73 are peculiar to Ge.

Isobaric elements. H. HERSZFINKEL. Radiol. Lab. Warsch. Wissensch. Ges. Warschau. *Naturwissenschaften* 17, 50-1(1929).—Meitner has shown that the radioactivity of K and Rb may be related to the isobars of neighboring elements, A and Ca or Kr and Sr. The same holds for the atoms surrounding Br and I and it should be easy to detect traces of the noble gases Kr or Xe formed in the disintegration of the halogen. It is estd. that in minerals 10^7 years old, on the assumption of a radioactivity of Br or I of $1/100$ that of K, about 10^{-5} to 10^{-6} mg. Kr or Xe is to be expected per g.

The average life period of an atom. HAROLD JEFFREYS. St. Johns Collge, Cambridge. *Nature* 123, 87(1929).—J. answers Poole (cf. following abstract). That portion of the heat radiated by the earth which is not accounted for by radioactivity is a relic of the earth's primitive fluid state. The upward concn. of radioactive matter is assumed in order to coordinate the facts of the temp. gradient in the earth's crust, the radioactivity of surface rocks and the law of heat conduction. The cooling of the earth follows as a consequence.

Average life period of an atom. J. H. J. POOLE. Trinity Coll., Dublin. *Nature* 122, 960-1(1928).—In connection with Jean's view of the possibility of spontaneous disintegration of all atoms, P. points out that the av. life of a terrestrial atom must be at least 4×10^{10} years or about 8 times the probable age of the existing universe.

Average life period of an atom. J. H. JEANS. *Nature* 122, 961(1928).—cf. preceding abstract.—J. agrees with the above, and points out he had previously discussed the question.

Diffraction of cathode rays by mica. SEISHI KIKUCHI. Inst. Phys. Chem. Research, Tokyo. *Japan J. Physics* 5, 83-96(1928).—A more complete account of results covered by C. A. 22, 4052-3; 23, 1567.

The loss in velocity of α -rays in passing through metal foils. S. ROSENBLUM. Radium Inst., Paris. *Physik. Z.* 29, 737-9(1928).—According to Bohr the decrease in velocity of the α - and β -rays in penetrating metal foils is conditioned chiefly by the charge of these corpuscles. This is in agreement with the exptl. facts of R.

Ranges of β -rays. B. W. SARGENT. Queen's Univ., Kingston, Ont. *Trans. Roy. Soc. Can.* [3], 22, III, 179-90(1928); cf. C. A. 22, 1272.—The ranges of β -rays having initial energies up to 1,363,000 equiv. v. have been calcd. from data respecting the loss of energy suffered by β -rays in passing through matter. The quality of the rays issuing from Pb and passing through paper were detd. By plotting transmission against thickness of Pb foil it was found that the curve passed through a max. This is explained on the assumption that β -rays of Ra E are sorted out by the Pb, the softer rays being absorbed or scattered back on the side of incidence, and the issuing β radiation was on the av. more penetrating. As the thickness of the foil was increased, multiple scattering between layers of atoms became more effective. The simultaneous loss of energy and scattering effect compensates for the filtering out of the soft rays and results in a flattening of the curve near the max. which occurs at 0.0764 g./sq. cm. of Pb foil. At this point the issuing rays are apparently more penetrating than the incident rays. Calcs. over the intervals 156,000-209,700 and 209,700-256,300 equiv. v. indicated that the range increased 0.03 g./sq. cm. when β -radiation passed through Al. At 156,000 equiv. v. initial energy the range is 0.0512 g./sq. cm. correct to 10%. Expts. with Ra E indicate that for β -rays passing through Pb the ratio of the stopping power of an atom to its at. no. decreases slowly with increasing at. no.

The rate of flow of heat of β - and γ -radiation. ALICJA DORABIALSKA. *Rozzniki Chem.* 8, 475-85(485 French)(1928).—The energy of β - and γ -radiation of Ra was measured in the radioactive equil. with its decompn. products by an adiabatic microcalorimeter of special construction (C. A. 22, 514). The inner calorimeter was a metallic cylinder divided into two parts, by means of which the absorption of the calorific system could be changed. The measurement was performed either in the whole calorimeter or in one-half, or in one-half with addn. of a metallic screen. The following rates of flow of heat were measured: $Q_1 = q\alpha + q\beta + q\gamma$; $Q_2 = q\alpha + 1/2q\beta + 1/2q\gamma$; $Q_3 = q\alpha + q\beta + 1/2q\gamma$. The system absorbed either the sum of α -, β - and γ -radiation or $\alpha + (\beta + \gamma)/2$ or $\alpha + \beta + (\gamma/2)$. From the numerical results thus obtained it was concluded that the heat of β -radiation in equil. with the decompn. products (Ra D, Ra E, Ra F) constitutes 9.5% of the calorific effect of α -radiation, while that of γ -radiation of the same substance is equal to 12.4% of the same heat effect, the absorbing mass of calorim.

eter being 37.85 g. per sq. cm. The results are in agreement with the theoretical calcs. of L. Meitner.

Pyrex glass as a radium container. S. C. LIND *Science* 68, 643-4(1928).—Results of Curtiss (C. A. 21, 3820) are confirmed. L. placed in a Pyrex system 265 mg of Ra (RaCl₂ soln.) for collection of Rn. Both longitudinal and transverse cracks developed in 1 year in the upper half of the 250-cc. flask. The flask was half full of RaCl₂ soln. Conclusion: The cracks were due to the relief of preëxisting strains, by expanding under α -radiation. Scaling accompanied by interference colors is indicated. Contraction is possibly caused by α -particle bombardment. Glass of high silica content resembles fused silica in becoming cracked by α -radiation. L. D. ROBERTS

Change of resistance of lead by the action of radium. K. PRASAD AND S. BASU. *Nature* 112, 610(1928).—A temporary change in the resistance of Pb takes place when a thin plate of the metal is exposed to the action of β -particles and γ -rays from Ra.

B. C. A.

General relativity quantum theory of the electron. H. TETRODE. *Z. Physik* 50, 333-46(1928); cf. *Ibid* 49, 858-64(1928).—Dirac's theory is extended from the point of view of the general theory of relativity. A direct derivation of the impulse-energy principle is obtained.

B. C. A.

The charge of an electron. A. S. EDDINGTON. *Proc. Roy. Soc. (London)* A122, 358-69(1929).—The exptl. value of $hc/2\pi e$ is 137.1 (Millikan's data). According to the theory proposed by E., it should be the integer 136. Although the discrepancy is about three times the probable error attributed to the exptl. value, the fault does not seem to be with the theory. The basis for this argument is the Exclusion Principle in the form given by Fermi and Dirac, that the ψ -functions pertaining to a pair of electrons must be anti-symmetrical. Combined with the theory of relativity, this appears to lead in an unforced manner to the value 136, i. e., the no. of symmetrical terms in a array of 16 rows and columns.

FRANK V. JOHNSON JR.

The motion of electrons in an electron tube with the production of short-wave oscillations of the Barkhausen and Kurz type. N. KAPZOV. *Physik Inst. I. Staatl. Univ., Moskau. Z. Physik* 49, 395-427(1928); cf. C. A. 14, 1780.—The influence of a variable field, resulting from potential variations of the anode and grid of an electron tube, on the motion of electrons is discussed. In a special case numerical integration of the equations of motion is undertaken. The variable grid and anode potentials lead to periodic irregularities in the electron streams between the filament, grid and anode. These irregularities explain the origin of the oscillations of the Barkhausen and Kurz type.

J. E. SNYDER

Critical potentials of light elements for simultaneous transitions. B. B. RAY AND P. C. MAJUMDER. *Univ. Coll. of Science, Calcutta. Nature* 123, 49(1929).—Critical potentials have been detd. for the elements Cr to Cu between 40 and 200 e.v.

Eight out of 10 can be explained on the assumption that 1 cathode particle can simultaneously eject 2 electrons, either from the same or from different energy levels.

G. CALINGAERT

Suitable gas mixtures for various Wilson cloud experiments. LISE MEITNER. *Physik. Chem. Abt. A*, 130, 717-21(1928).—An analysis of the conditions for the production of clouds by the Wilson method. For a given vapor in a given gas the expansion ratio depends only on the ratio k of the mean sp. heats for the mixt. If the k 's of the components of the vapor-gas mixt. are different, the min. expansion ratio varies with the pressure of the mixt. Since water vapor and CO₂ have nearly the same k , these form a mixt. which has the same expansion ratio at diff. pressures. For at. disintegration expts. where it is advisable to avoid the use of H. compds., CCl₄ vapor has been successfully used; if this is mixed with air, the min. expansion ratio is large, but it can be reduced by substituting argon for air.

W. WEST

Cathode evaporation of the mercury arc. J. VON ISSENDORFF. *Physik. Z.* 29, 857-64(1928).—An app. is described which makes it possible to measure separately the amts. of Hg evapd. and ejected at the cathode of a Hg vacuum arc, at different surface temps. Evapn. depends greatly on the temp., and only slightly on the current. The entire cathode surface is involved. For the evapn. in the bright spot and its immediate neighborhood, limiting values of +1.3 mg./amp. sec. and -0.3 mg./amp. sec. were found. This indicates a minute loss at the cathode, possibly even a gain by incoming ions. The amt. of Hg ejected in droplets increases faster than the current. A critical discussion involving the energy balance follows.

FRANK URBAN

The refractive index for electrons and diamagnetism. L. ROSENFELD. *Inst. theoret. Physik., Göttingen. Naturwissenschaften* 17, 49-50(1929).—Bethe (C. A. 23, 332) has calcd. the lattice potential (external exit work) V_0 causing the n for electron

waves by $V_0 = (2\pi/3)\nu\theta$, ν being the no. of atoms per cc., $\theta = \int_0^\infty \rho(r)r^2dr$ for $\rho(r)$ the d. of charge (in wave mech. terms) of the electrons of the individual atoms. The same "moment of inertia" θ of the charge, however, is closely related to the diamagnetic susceptibility χ_d of the material by $\chi_d = e/6mc^2\nu\theta$; therefore, $\chi_d = (e\nu_0/4\pi mc^2)$ (approx.). R. gives exptl. material to check this relation taking the exptl. χ_{exp} as equal to $\chi_p - \chi_d$ (para- and diamagnetic susceptibility) with χ_p dependent on the spin of the (π) cond. electrons and equal to $(n.606)/a^{1/2} \cdot 0.221 \cdot 10^{-8}$ (Pauli) for a the at. vol. For Cu, Ag, Au and Pb the χ_{exp} and $\chi_p - \chi_d$ check very satisfactorily; for Al and Cr the agreement is not so good.

B. J. C. VAN DER HOEVEN

The influence of positive ions on the electron space charge between two parallel plates. H. COHN. *Ann. Physik* 87, 543-69(1928).—The decrease in space charge due to positive ions is proportional to no. of gas mols., and their mass is inversely proportional to the absorption of electrons. For small pressures the voltage necessary for neutralization of space charge is greater than the ionization voltage. It depends on the electron current. Pressure has an inverse effect. Space charge neutralization does not depend on cathode satn. current. For gases of the same ionizing potential space charge neutralization depends on the mass. Introduction of K^+ decreases space charge.

F. R. BICHOWSKY

Positive ion currents in the positive column of the glow discharge in the noble gases. W. UYTERHOEVEN. Princeton Univ. *Proc. Nat. Acad. Sci.* 15, 32-7(1929).

C. L. READ

The cuprous iodide detector. ERICH HABANN. *Z. tech. Physik* 10, 25-8(1929).—Pressed CuI powder against a Cu wire of 0.1 to 0.2 mm. diam. (loose contact) proved to be an excellent detector-rectifier; its optimum lies at 0.26 v. Electrolytic conduction (of Cu^+ and I^- ions) through the salt does not play a role; the conduction is mainly by electrons, partly also by the positive CuI⁺ residue. CuI pressed in a Cu tube with a Cu wire along the axis, wire negative, wall positive, will give a concn. of CuI near the wire and consequently a resistance decreasing with time. Actually when the potential was more than 3 v., the current increased from 45 to 57 milliamps. in one min. The opposite effect occurs (45 to 9.7 milliamps.) for a positive wire potential. If in the detector the wire is not loosely in touch with the CuI but applied with force the current-potential characteristic no longer shows the considerable rectifier curvature but instead a steady rise. It is assumed that for loose contact (wire negative) the CuI ions are discharged at and concentrate around the contact point, building up; this explains why after some time (4 hrs.) with steady current (0.3 milliamps.) flowing the characteristic of the detector changes and becomes linear. The detector effect is detd. by the min. potential required to liberate electrons from the wire. Those metal wires that seem to have no adhesion to CuI, as Cu, Pb, Al and Zn, give good detector action, those that appear to stick to the CuI, good adhesion. Mo, W and Pt give a linear characteristic, no detector effect. For Al wire the rise in the characteristic starts at 0.42 v., for Pb wire at 0.46 v. The results are considered to confirm Schottky's theory of the contact detector.

B. J. C. VAN DER HOEVEN

Photoelectric effect with submicroscopic drops. K. SCHARF. *Z. Physik* 49, 827-57(1928).—The photoelec. properties of Hg, Bi, Se and S particles, produced by vaporization of the element in an atm. of pure Ni have been investigated by Ehrenhaft's condenser method. These substances show a predominant normal photoelec. effect. Inverse charging appears only rarely in single particles, but to a much greater extent in the clouds of very small particles produced by strong heating of the substance. The no. of negatively charged particles in a cloud was inversely proportional to the normal sensitivity of the element, which decreases with the different elements in the order given above.

B. C. A.

The saturation of photoelectric current. J. A. BECKER. Bell Telephone Lab. N. Y. *Naturwissenschaften* 17, 12(1929).—Regarding a recent controversy of Suhrmann and Gudden (*C. A.* 22, 2512, 3830, 3831), B. assumes that his theory (*C. A.* 22, 1535), is applicable to the case. It explains why the photoelec. current for long waves increases with applied potential and is almost satd. for short waves; also why an atomic film of K radiates differently from compact K. The surface elec. fields are used for the qual. explanation. The case of K is compared with that of adsorbed Th, which has been shown to exhibit additional surface forces.

B. J. C. VAN DER HOEVEN

Photoelectric effect at low temperatures. J. C. MCLENNAN, L. A. MATHIESON AND C. D. NIVEN. Univ. of Toronto, Can. *Trans. Roy. Soc. Can.* [3], 22, III, 279-87(1928).—The change in the photoelec. effect of a K photoelec. cell with changing temp. was observed for low temps., light filters being used to obtain the effect for various

wave lengths. The K was purified by successive distn. *in vacuo* and finally into the evacuated cell. The source of light was a 21-c. p., 6-v., N_2 -filled bulb operated from a storage battery of high capacity. This made it possible to obtain const. voltage across the lamp filament. The photoelec. current was measured by a Lindemann electrometer provided with resistance leaks. Current-voltage curves were taken at 300° K., 80° K. and 21° K. The current for each band of the spectrum decreased with the temp. For longer wave lengths the variation is greater. With the deep red the current stopped at 21° K. Low temps. were obtained by liquid air and liquid H_2 . The spectral distribution of sensitivity was quite altered by the cooling. With a new filter one of the cells used gave a gradual decrease in the emission, but between 80° K. and 21° K. the emission increased even above that at room temp. From the results obtained, an intimate relation appears to exist between the coeff. of extinction of light in a substance and the photoelec. threshold. Below the point where the light quantum of energy exceeds the energy necessary to eject totally an electron from the metal, a photoelec. absorption band sets in. Light is not photoelectrically absorbed until the electron can be totally ejected from the metal. Other theories explanatory of photoelec. phenomena are discussed by the authors.

J. W. SHIPLEY

Photoelectricity of water and aqueous solutions. L. COYNSON AND A. MOLLE. *ib. sci. phys. nat.* 10, 231-42(1928).—An app. is described for studying the photoelec. t. Distd. H_2O is photoelec. towards light between 2000 and 1300 Å. U.; this property is not due to impurities on the surface. Concd. solns. of halides are less photo- than H_2O ; salts contg. O are more so. It seems then that the source of emitted electrons may be O atoms.

E. G. VAN DEN BOSCHE

Laue photograph taken with convergent x-rays. T. FUJIWARA. *Mem. Coll. Sci. Imp. Univ.* 11, 283-301(1928).—Some of the spots in the Laue pattern from a W crystal, obtained by using white radiation from a Mo target, show the spectrum of the K radiation of Mo, from which the orientation of the crystal can be detd. By using a convergent beam of white x-rays the sharpness of the Laue spots is destroyed but the chance of obtaining the spectrum lines is increased. The method is developed for detg. the reflecting planes and orientation of the crystal.

B. C. A.

Hemihedry of zinc blende and x-ray reflection. SHOJI NISHIKAWA AND KYUZI MATSUKAWA. *Inst. Phys. Chem. Research, Tokyo. Proc. Imp. Acad. (Japan)* 4, 96-7(1928).—Friedel's law that hemihedrism due to lack of a center of symmetry cannot be revealed by the x-ray diffraction method was tested in zinc blende. Tungsten L radiation, the spectral lines of which cover the range including the K crit. absorption limit for Zn atoms, was reflected from (111) and ($\bar{1}\bar{1}\bar{1}$) polished surfaces. Differences in the intensity of the lines were noted; these might, however, be due to difference in the degree of polish. Preliminary expts., with a cleavage plane, also showed differences in the relative intensities.

C. J. WEST

Absolute intensity of x-rays. T. E. AURÉN. *Medd. K. Vetens. Nobel Inst.* 6, No. 13(1927). The abs. intensity of x-rays has been measured by the heat excited in metals on absorption of the rays. No difference in the energy measurements was found on using plates of Cu, Ag and Pb. Up to 100 kv., the intensity is exactly proportional to the current through the tube. The relationship between the total intensity of the energy radiated as x-rays and the voltage applied to the tube has been detd. The effect of an Al filter also was studied. The energy necessary to produce a pair of ions is not found to increase with decreasing wave length.

B. C. A.

Raman effect with liquid oxygen and with liquid nitrogen. J. C. McLENNAN AND I. M. McLEOD. Univ. of Toronto, Can. *Trans. Roy. Soc. Can.* [3], 22, III, 413-16(1928). *Nature* 123, 160(1929).—The "Raman Effect" was studied from photographs taken of the spectrum of scattered light emitted from the surface of liquid air, liquid O_2 , and liquid N_2 . Six sharply defined lines $\lambda\lambda$ 4317.7 Å. U., 4674.3 Å. U., 5026.5 Å. U., 4468.1 Å. U., 4849.3 Å. U. and 4980.3 Å. U. were observed for liquid air. Liquid O_2 gave only the first 3 lines, and liquid N_2 the last 3. Two Raman lines are found with each liquid. These are examples of homopolar mols. endowed with power to absorb light having frequencies equal to that of fundamental vibrations of their nuclei.

J. W. SHIPLEY

Ultra-violet Raman spectrum of water. I. RAMAKRISHNA RAO. *King's Coll., London. Nature* 123, 87(1929); cf. *C. A.* 23, 338.—Using an all-quartz app., R. obtained the Raman effect for water in the ultra-violet region in 2 hrs. Eleven bands are clearly noticeable, corresponding to every bright line in the Hg spectrum. Measurements of the wave lengths of the bands show that water has an absorption band at $2.97 \pm 0.05 \mu$, in close agreement with the values of 2.95 to 3.06 reported previously from infra red absorption measurements.

F. CALINGAERT

The Raman effect in alcohols. S. VENKATESWARAN AND A. KARL. *Z. physik. Chem., Abt. B*, 1, 466-74(1928); cf. *C. A.* 23, 337.—The Raman effect was detd. for H₂O, MeOH, EtOH, Am alc. and allyl alc. Water gives a broad band, which is narrowed in Me and Et alc., while allyl and Am alc. give sharp lines. An examn. of the spectrum of the Am alc. soln. with a Nicol prism showed that the modified, unmodified and continuous spectra were polarized.

WALLACE R. BRODE

The Raman effect of quartz. M. CZERNY. Univ. Berlin. *Naturwissenschaften* 17, 12-3(1929).—A table gives the results of 4 authors on the Raman effect of quartz. The principal μ values of characteristic wave lengths are approx. 8.6, 12.5, 14.2, 21.5, 24.7, 38.2, 48.0, 80, 94, 118. The occurrence of values over 30 μ is surprising in view of the fact that for waves longer than 30 μ quartz is supposed to be transparent (Rubens). C. examd. quartz with a grid spectrometer in the long-wave infra-red range and found absorption effects around 38 and 78 μ , no absorption more than the exptl. error was found at 48 μ . Measurements beyond 80 μ were omitted because of exptl. difficulties. Whereas, according to Pringsheim and Rosen (*C. A.* 23, 39), the 80 and 48 μ Raman lines are equally strong, the 38 μ line considerably weaker, it was here found that the 38 μ line is more intense than the 80 μ line; the 48 μ line is too weak to be measured.

B. J. C. VAN DER HOEVEN

Raman effect in x-ray scattering. K. S. KRISHNAN. *Nature* 122, 961-2(1928).—In addn. to the Compton effect, assocd. with a free electron, in which the wave-length shift depends on the direction of observation, a Raman effect should exist for x-rays in which the scattering electron shifts from a level E_K to a level E_L within the atom, the frequency of the scattered radiations being given by $\mu^1 = \mu - \frac{E_L - E_K}{h}$ and being

independent of direction of observation. Observations of Davis and Mitchell (*C. A.* 23, 765) may be regarded as a demonstration of its existence. Three new lines are found in the scattered radiation from graphite excited by MoK α , corresponding to changes of energy level of the scattering electron by 279, 57 and 34 v. The first and last may be identified with the transition of a K and an L electron, resp., to a level of very loose binding within the C atom, while the 57 v. shift may be identified with the case in which both L electrons are shifted outwards.

W. WEST

The significance of spectroscopy for modern physics. G. H. DIEKE. *Physica* 9, 15-32(1929).—A lecture.

B. J. C. VAN DER HOEVEN

Wave length measurements in the vacuum spark spectrum of lead from 220 A. U. to 5000 A. U. STANLEY SMITH. Univ. of Alberta, Can. *Trans. Roy. Soc. Can.* [3], 22, III, 331-6(1928).—Measurements of the vacuum spark spectra of Pb by means of a grating with 15,000 rulings to the in. were taken at intervals where 2600 A. U., 3600 A. U. and 4600 A. U. were at the center of the spectrograms. This allowed for considerable overlapping of the plates. Lines from a superposed Fe arc spectrum were used as standards. Tables of wave lengths with intensities accompany the paper, from which assistance in detg. the structure of the spectra of Pb III and Pb IV may be derived.

J. W. SHIPLEY

Temperature of the under-water spark as computed from distribution of intensity in OH absorption bands. E. D. WILSON. *J. Optical Soc. Am.* 17, 37-46(1928).—Measurements of the wave lengths of the OH bands absorbed in the under-water spark show that the bands at λ 2811, 2875, 3064, and 3126 are developed nearly as completely as in emission. Measurement of intensity in branches of the bands at λ 3064 gives a max. at about $m = 10.2$ and from this the effective temp. of the under-water spark has been calcd. From Birge's formula this is found to be 5115° under the conditions of the expt. Details are given of the exptl. methods: the elec. circuits employed, the spectrographic and photometric procedure, and the measurement of the wave lengths.

B. C. A.

Spectra excited by active nitrogen. JOHN H. FINDLAY. Queen's Univ., Kingston, Can. *Trans. Roy. Soc. Can.* [3], 22, III, 341-51(1928).—An attempt was made to det. whether the spectra excited by active N are due to chemiluminescence. An electrodeless discharge through purified N₂ in the presence of Ca, Hg and In was observed by means of spectrograms. No Ca lines were observed in the after-glow spectrum, probably because of the formation of stable nitrides of Ca, but Na and K lines appeared. The excitation of the spectrum of Hg by active N gave the highest energy level as 43 D, which corresponds to an excitation potential of 9.51 v. This agrees with the observations of Okubo and Hanrada, but differs from those of Ruark. The vapor pressure of Hg when the blue glow appears does not preclude the possibility of chemiluminescence as being the origin of spectra excited by active N₂. No lines were obtained when an

attempt was made to excite the spectrum of In by active N_2 . Probably In does not form a nitride under these conditions.

First spark spectrum of thallium, Tl II. J. C. McLENNAN, A. B. McLAY AND M. F. CRAWFORD. Univ. of Toronto, Can. *Trans. Roy. Soc. Can.* [3], 22, III, 241-5(1928).—The spectrum of the Tl spark with and without inductance was photographed with a quartz spectrograph, and in H_2 at atm. pressure with a fluorite prism spectrograph. Al and Zn spark wave lengths were used as standards. The lines photographed are classified in tables of their frequency, intensity and term combinations. Evidence of a group of terms expected was found lacking and this constitutes an anomaly similar to that found in the spectra of Hg I.

Second spark spectrum of mercury, Hg III. J. C. McLENNAN, A. B. McLAY AND M. F. CRAWFORD. Univ. of Toronto, Can. *Trans. Roy. Soc. Can.* [3], 22, III, 247-51(1928).—A re-investigation of the extreme ultra-violet spectrum of a Hg spark in H_2 with a fluorite-prism instrument was made and lines between λ 1935 A. U. and λ 1350 A. U. were recorded and classified. The spectrum of an a. c. discharge through Hg vapor in vacuum also was studied, a one-meter vacuum grating spectrograph being used. An inductance in series reduced the no. of lines between λ 1750 A. U. and λ 700 A. U. from about 500 to about 100 and those lines are attributed to the Hg^{++} spectrum rather than to spectra of more highly ionized Hg atoms. Classified tables of wave lengths accompany the paper.

Light scattering and the hydrogen spectrum. H. S. ALLEN. St. Andrews Univ., Scotland. *Nature* 123, 127(1929).—The H radiations of the Balmer series are partially scattered by the surrounding H_2 mols., giving the typical Raman effect. This explains the secondary spectrum of the Balmer lines. Examm. of this spectrum for the 5 lines from H_α to H_ϵ shows differences between the primary and secondary radiations of approx. 13, 26, 34 and 52 A. U., which must correspond to the infra-red rotation spectrum. The direct spectrum shows also intermediate lines every 6.5 A. U., the first one, however, being displaced to 7.0 A. U.

Intensities of the light of the oxygen green line of the night sky. J. C. McLENNAN, J. H. McLEOD AND H. J. C. IRETON. Univ. of Toronto. *Trans. Roy. Soc. Can.* [3], 22, III, 397-412(1928); cf. *C. A.* 21, 1225, 1756.—Night-sky photographs were made to det. the intensity of blackening produced by a narrow band, including wave lengths of the green line radiation. Comparison of the intensities of the auroral green spectral line as recorded on spectrograms taken during different portions of a night was also obtained. Exposures were made at Toronto, Ont., Esterhazy, Sask., and Flagstaff, Ariz. Most of the exposures were obtained at the Lowell Observatory at Flagstaff, between April 15th to 24th. The intensity of the auroral green radiation was found to increase to a max. about 1 hr. after midnight, and then to fall off with the lapse of time to sunrise. The variation in intensity of the radiation was not the same on successive nights. The explanation of the max. intensity in the depth of shadow may be due to the effect of wave lengths less than 2070 A. U. upon the O in the upper atm. The O_2 passes into the at. state from which the spontaneous transitions take place that give rise to the auroral green line. If it is assumed that the origin of the radiation is from beams of sunlight just grazing the earth's atm., the greatest intensity would be expected at the zenith of the earth's shadow.

The spectrum of doubly ionized fluorine (F III). HERBERT DINGLE. *Proc. Roy. Soc. (London)* A122, 144-61(1929).—When discharges of gradually increasing intensity are passed through a vacuum tube contg. SiF_4 , the lines attributable to F appear successively in 4 compact groups. Between the first 3 of these groups it is possible, by careful control of the conditions of discharge to make a clear sepn.: the fourth, though distinguishable from the third, is less easily isolated. The first group has already been identified as the spectrum F I of the neutral atom of F. It is probable therefore, that the others are assignable to F II, F III, and F IV, resp. The present paper contains an account of the F III spectrum in which the wave lengths of 314 lines extending from 2206.94 A. U. to 3267.202 A. U. have been measured and tabulated. The spectrum has 1 partially analyzed into quartet and doublet systems of terms, which have been correlated with the terms to be expected on the Heisenberg-Hund theory, and 82 lines have been classified. The resemblance between this spectrum and that of singly ionized O, which has the same electron structure as doubly ionized F, confirms the assignment of the former to F^{++} .

The arc spectrum of chlorine. K. MAJUMDAR. Univ. of Allahabad, India. *Nature* 123, 131(1929).—By means of a special Cl_2 tube, the infra-red lines of the spectrum were photographed on a neocyanine plate. They correspond exactly to the transition $4M_2(N_1 \leftarrow O_2)$. The ionization potential of Cl_2 is estd. at about 13 v. The infra-

red lines observed seem to be identical with some of the unidentified lines in the solar spectrum.

Broadening of spectral lines by the Doppler effect. G. POLVANI. *Nuovo cimento* 4, 365-70 (1927).—At the abs. zero spectral lines should have a finite width. B. C. A.

Rotation dispersion and circular dichroism of caryophyllene nitrosite. STOTHERD MITCHELL. Univ. Glasgow. *J. Chem. Soc.* 1928, 3258-60.—The rotation dispersion curve of caryophyllene nitrosite has a max. of approx. 2200° at 6250 A. U. becomes zero at 6800 A. U. and is thereafter neg. The max. of its absorption band is at about 6800 A. U. The soln. shows the cotton effect, left-handed circularly polarized light being absorbed more than right-handed circularly polarized light. W. R. B.

Pleochroism of tourmaline. P. LE ROUX. *J. phys. radium* [vi], 9, 142-52 (1928). Absorption measurements on two sections of tourmaline cut parallel and perpendicular to the optical axis have been made for the Hg arc lines 5790-3655 A. U. with a photo. elec. cell and quadrant electrometer. When absorption is no longer small, the coeff. of absorption varies with the direction of propagation of the light, the value being less in the direction parallel than in that perpendicular to the axis of the crystal. This has been confirmed with a second sample of yellow tourmaline. The different values obtained in this case for the coeff. of absorption indicate that the coloration of tourmaline is due to an impurity. B. C. A.

Ground-terms in the spectrum of nickel II and proposed standard wave lengths in the Schumann region. A. C. MENZIES. *Proc. Roy. Soc. (London)* A122, 131-43 (1929).—The method of the fuse-spectrum devised by M. (C. A. 22, 728) is particularly suited to the investigation of ground-terms, and is here applied to the elucidation of those belonging to Ni II. Many lines obviously connected on account of their length and strength belong to the hitherto unknown ground-terms 1D_2 and 3D_2 of Ni II. These levels are -8392.9 and 6886.0 cm^{-1} lower than the 4F_3 level, which was the zero level of Shenstone's table of terms (cf. C. A. 21, 2845). Since the combining middle terms are known with accuracy a detn. of the values of 1D_2 and 3D_2 allows the calcn. of conveniently spaced lines, which can be used as standards in the Schumann region. A list of 100 lines ranging from 1164.5 A. U. to 1965.35 A. U. is published; the term combinations are given for about half of them. W. F. MEGGERS.

Intensity measurements in the secondary spectrum of hydrogen. II. W. KAPUSCINSKI AND J. G. EYLLERS. *Proc. Roy. Soc. (London)* A122, 58-68 (1929).—In an earlier paper (C. A. 22, 2716) intensity measurements of a portion (4500-4900 A. U.) of the secondary spectrum of H_2 were given. The same exptl. methods are used to extend the measurements to longer and shorter waves. Relative intensities of 1448 lines ranging in wave length from 3652.46 to 6441.50 A. U. are given; the theoretical discussion will be submitted later. W. F. MEGGERS.

Absorption in excited helium. J. C. McLENNAN, R. RUEDY AND ELIZABETH ALLIN. Univ. of Toronto, Can. *Trans. Roy. Soc. Can.* [3], 22, 273-7 (1928).—The absorption spectrum of He excited by d. c. discharge from Mg electrodes in a capillary Geissler tube was observed through an observing column 30 cm. long and 2 cm. diam. also provided with Mg electrodes and d. c. discharge. Exposures with and without filters and with varying discharge conditions were made. Absorption of 4713 A. U. and 4121 A. U. was too small to be observed. Lines 4922 A. U. and 3905 A. U. gave about 5% absorption. Absorption of the infra-red line 10830 A. U. was about 95%. The fall in the strength of absorption is comparable with the rate of decrease in intensity in the Balmer series. J. W. SHIPLEY.

Absorption of ultra-violet light by metastable atoms. W. DE GROOT. N. V. Philips Gloeilampenfabrieken, Eindhoven. *Naturwissenschaften* 17, 13 (1929).—For ionization of metastable atoms of Ne and A, resp., 4.9 and 4.2 v. are required, corresponding to 2550 and 2950 A. U. light. It was calcd. from the work of several authors that in an absorption tube of Pyrex glass, 40 mm. wide, with quartz windows, 90 cm. light path, 5 mm. Ne or A filling, the most ideal conditions would give a max. yield of metastable atoms, i. e., about 10^{13} per cc., which should give an absorption coeff. of around 10^{-2} (10% decrease in light intensity over 100 cm.). The light of a W spiral at 3400° abs. (3500° color temp.) in a quartz balloon was sent through the absorption tube, the spectrum was photographed for dark absorption tube and for the absorption tube lighted by a 2-amp. current. No trace of absorption in either Ne or A was found. The $2s$ to $2p$ lines showed intensive absorption even at 50 milliamps. current. It is concluded that at the most a 10^{-4} fraction (10^{-4} is the upper limit of the absorption coeff.) of the energy used in the tube serves to ionize metastable atoms, actually the fraction is probably 0.01 as large as this, if it is assumed that this energy comes from

short-wave resonance radiation of the gases (1000 A. U. in A, 700 in Ne); it corresponds to 10^{-7} watt per sq. cm. or a 10^{-3} μ amp. electron current. B. J. C. VAN DER HOEVEN

Device for measuring spectrum photographs. R. FRISCH. *Z. Physik* 49, 608 (1928).—A simple device is described suitable for the rapid detn. of distances segg. lines in a spectrum photograph with an accuracy of 0.01 mm. B. C. A.

Absorption of ultra-violet rays by the hydrolytic products of sucrose. L. KWIECINSKI AND L. MARCHLEWSKI. *Biochem. Z.* 204, 192-6(1929).—The absorption bands in the ultra-violet range due to products of inversion of sucrose by 0.5 N HCl do not coincide with the absorption bands of levulose from the point of view of either the intensity or the position of the maxima. It is suggested, therefore, that glucose and levulose are probably not the only products. S. MORGULIS

Structure and stages of excitation of the molecules of some nitriles determined from the ultra-violet absorption spectra of the vapors. (FRL.) H. E. ACLY. *Z. physik. Chem.* 135, 251-90(1928).—The absorption spectra of benzonitrile and *o*-, *m*-, and *p*-toluonitriles have been studied for the vapors, and the data interpreted according to the methods of Henri. In each case the absorption is of 2 kinds, a banded structure and a region of continuous absorption. Equations are given which cover the data with considerable accuracy and show the occurrence of doublet series throughout. Comparison of these with earlier analyses of the spectra of benzene and benzene derivs. discloses the dominance of the benzene ring, a conclusion which is confirmed by the investigation of the absorption spectrum of cyanogen. The latter is a vibration-rotation spectrum situated in the far ultra-violet, and the oscillation periods are different from those of the nitriles and from the bands shown in the emission spectrum of N and the C arc. From the data on nitriles it is shown that the mol. exhibit high deformability, indeed the distances between oscillating atoms are increased by about 3% on excitation. The moment of inertia of benzonitrile is approx. $I = 38.8 \times 10^{-40}$ from the structure of the bands. The predissocn. phenomena (Henri) occur with the toluonitriles after the first excitation and with benzonitrile after the second. Two electron states of activation have been ascertained for each of the substances studied, one deduced from the banded spectrum and the other from the continuous absorption. Numerical values for the different states are calcd. B. C. A.

Penetration of ultra-violet light into pure water and sea-water. F. O. HULBURT. *J. Optical Soc. Am.* 17, 15-22(1928).—An app. consisting of a quartz spectrograph, a Na hydride quartz photoelec. cell and a quadrant electrometer is described. With this arrangement measurements have been made of the mol. absorption coeff. of sea-water and aq. solns. of the principal salts in the sea. The coeff. A is defined by $(\alpha - \alpha_0)/C$, where α is the absorption coeff. of the soln., α_0 that of the pure solvent (water), and C is the concn. in g.-mol. per l. of soln. Measurements were made in the region λ 4000-2500, and the salts investigated were KCl, NaCl, $MgCl_2$, $MgSO_4$ and $CaSO_4$. It was found that the transparency decreases rapidly with decreasing wave length in the ultra violet and becomes quite small below λ 3000; that from λ 3400 to 3000 $CaSO_4$ contributes about one-half to the absorption of sea-water, water about one-quarter and the other salts the rest. From λ 3000 to 2500 $MgCl_2$, $CaSO_4$ and water each contribute roughly one third, the other salts giving but little absorption. A close analogy is traced between the decrease of the transparency of the sea with decreasing wave length in the ultra violet and the special energy curve of sunlight. A possible function of the part played by the actinic effects of sunlight on the concn. of the sea and the air is suggested by these facts. B. C. A.

Absorption of light by solid and dissolved salts and absorption by ions. H. LEY AND W. HEIDBRINK. *Z. anorg. allgem. Chem.* 173, 287-96(1928); cf. *C. A.* 22, 738.—The absorptive power of $CuSO_4$ solns. for ultra violet light between 0.30 and 0.25 μ deviates appreciably from Beers' law; a similar result is obtained with concd. solns. of Cu perchlorate. The absorptive power of the solid pentahydrate is appreciably less than that of the soln., showing that the hydrated ion $[Cu4H_2O]^{2+}$ is present in the crystal lattice and that this forms a more normal and more optically satd. system than does the soln., the deviations in the absorptive power of which are ascribed to the formation of complex anions. The change in the color of solns. of $NiSO_4$ and $CuSO_4$ produced by the addn. of H_2SO_4 is shown by examn. of the absorption spectrum to be due to dehydration of the colored cation. B. C. A.

Structure of the violet bands of silicon nitride. FRANCIS A. JENKINS AND HENRY DE LASZLO. *Proc. Roy. Soc. (London)* A122, 103-21(1929).—The violet SiN band spectrum excited by active N has been photographed in the second order of a 21-ft. concave grating, and measurements of the structure lines of the 10 strongest bands are tabulated. These include 4 bands in which the vibrational quantum no. decreases

by one during the emission, (3,2) to (6,5), and 6 in which it is unchanged, (0,0) to (5,5) they include practically all the lines of any intensity in this spectrum between 4000 and 4300 Å. U. Each band has a doublet *P* and a doublet *R* branch, and there is one missing line, in complete accord with the theoretical predications for a band system of $^2S \rightarrow ^2S$ type. Several perturbations are found in the rotational terms of the initial state. The combination relations between *P* and *R* lines are applied to find the term differences, from which the rotational consts. are evaluated. The isotope effect is well marked for $Si^{28}N$ $Si^{29}N$ and $Si^{30}N$ and from this effect in 3 bands of the strongest sequence, quant. evidence is adduced in support of the quantum mechanics expression for the vibrational energy, which is developed in powers of $(n + 1/2)$, i. e., half quantum numbers.

W. F. MEGGERS

Band spectrum of chlorine or hydrogen chloride. E. B. LUDLAM. Univ. of Edinburgh. *Nature* 123, 86-7(1929).— Cl_2 burning in H_2 at a quartz jet gives a band spectrum from about 2600 to 4800, with a max. of intensity around 3850 Å. U. These bands are produced in the outer zone of the flame, and are, therefore, ascribed to HCl

G. CALINGAERT

A new band system of carbon monoxide. RANGA K. ASUNDI. King's College, London. *Nature* 123, 47-8(1929)—Four new bands, 3681.1, 3893.2, 4125.0 and 4380.3, have been obtained and completely resolved for CO on a 21-foot concave grating. The first is mixed with a spurious band of unknown structure, the second is completely isolated and the two others are mixed with 2 known spurious bands. The last three have been analyzed. Each consists of a *P*, a *Q* and an *R* branch.

G. CALINGAERT

Energy distribution in band spectra, especially in nitrogen bands. G. HERZBERG. *Z. Physik* 49, 761-73(1928).—The parabolic energy distribution in a band spectrum required by Condon's theory (*C. A.* 21, 1062) is attained only when the distribution of the mols. over the various vibration states in the initial condition is uniform. Generally this is not the case. From the theory developed by Franck (*C. A.* 20, 548) considerable deviations would be expected, although at great activations approximations to the Condon distribution law can be attained. This has been shown experimentally with the N bands. This fact is explained by supposing that in the case of collisions between high-velocity electrons, Franck's rule is broken and vibrations of higher quantum no. can be stimulated to a greater extent.

B. C. A.

The band spectra of the alkaline earth halides. I. CaF , SrF . R. C. JOHNSON. *Proc. Roy. Soc. (London)* A122, 161-88(1929).—A complete quantum analysis of the whole of the band spectra of the mols. CaF and SrF has been made. Formulas which express them have been obtained by the method of least squares. For this purpose a remeasurement of some 250 band heads has been made from first order plates taken with a 21-ft. Rowland grating. The mols. give rise to at least 3 band systems each, which are analogous in almost every respect. These are assigned to the electron transitions $3^2S \rightarrow 1^2S$, $2^2S \rightarrow 1^2S$ and $2^2P \rightarrow 1^2S$. Although these mols. have features common to all those of the one-valence electron type, there exist several exceptional features such as (a) the occurrence of strong *Q* branches in $^2S \rightarrow ^2S$ transitions and (b) a definite discrepancy in $\langle n'' \rangle$ as evaluated from the $^2S \rightarrow ^1S$ and $^2P \rightarrow ^2S$ systems. These point to some unusual feature in the 2S states of all these mols. The energy of dissocn. of the CaF mol. is approx. 3.36 v., and that of SrF is of the same order. In the former mol. the sudden termination of a sequence at the 20th member has been satisfactorily explained on the basis of this value for the energy of dissocn. **II. BaF , MgF .** *Ibid* 189-200.—In part I (above) an analysis of the gross structure of the band spectra of the CaF and SrF mols. was given. The second paper deals with the spectra of 2 mols. of precisely the same external character but one is simpler and the other more complex in its internal structure. MgF has one shell of 8 electrons less than CaF , while BaF has a shell of 18 electrons more than SrF . A complete quantum analysis of the gross structure of the band spectra of the BaF and MgF mols. is presented. BaF bands in the green region are believed to constitute 2 systems, attributed to electron transitions $2^2S \rightarrow 1^2S$ and $3^2D \rightarrow 1^2S$. The suggested transitions of the type $^2D \rightarrow ^2S$ are believed to be new to band spectra. The absence of the $2^2P \rightarrow 1^2S$ transition in BaF is remarkable. The recorded emission bands of MgF constitute a $2^2P \rightarrow 1^2S$ system and definite evidence of the vibrational isotope effect occurs in some faint heads which are assocd. with a D_1 sequence. The observed value of the isotopic coeff. agrees within the limits of error with that calculated on the basis of 2 isotopes of Mg of masses 24 and 25.

W. F. MEGGERS

The band spectra associated with zinc, cadmium and mercury. J. M. WALTER AND S. BARRATT. *Proc. Roy. Soc. (London)* A122, 201-10(1929).—The band spectra of the alkali metals are now well known, and it has been established that they are due

to a small proportion of diatomic mols. which are normally present in the vapors of these metals. It is as yet uncertain how many other metals, with vapors which, by ordinary methods of measurement appear to be monatomic, give similar spectroscopic proof of assocn. Throughout a large no. of expts. with the satd. vapors of the alk. earth elements, up to 1200° , no evidence of band spectra which can be attributed to diatomic mols. has been found. The elements of group II b of the periodic table are much more interesting in this respect, and expts. on the absorption spectra of these have led to the following conclusions: The majority of the supposed band absorption spectra of Zn and Cd, and one band system previously attributed to Hg, appear to be oxide and chloride spectra. The only bands which can be attributed to Zn and Cd themselves are 2 weak and diffuse bands, one for each metal. They occur at 3050 A. U. for Zn, and at 2212 A. U. for Cd. The absorption spectrum of Hg is much richer and there is no doubt that Hg vapor contains diatomic mols. The bromides of the 3 metals, together with the iodide of Cd, all yield absorption bands analogous to the chloride bands.

W. F. MEGGERS

Observations in connection with the band systems of the fluorides of beryllium and magnesium. W. JEVONS. *Proc. Roy. Soc. (London)* **A122**, 211-27(1929).—Until quite recently only 2 band systems had been attributed to compds. of Be, BeF being the emitter of one system, which occurs in the ultra-violet, and BeO of the other system, which lies in the visible region. A modified interpretation of the BeF band heads is suggested, and new bands due either to BeF₂ or to an oxide of Be are described. No bands due to BeCl and no further bands of BeF were found. With MgF₂ in the C arc in air the outer flame develops, in addn. to the previously known MgF doublet system, a new ultra-violet system of 3 sequences of apparently single-headed bands. This new system is also due to MgF₂; it may have for its final state the initial state of the doublet system.

W. F. MEGGERS

Kinetics of absorption of ultra-sonic waves. D. G. BOURGIN. *Nature* **122**, 227-28(1928). The attenuation of ultra-sonic waves in passing through CO₂, H or He and the accompanying frequency variation of velocity are correlated with the mechanisms of collisions of the first and second kinds.

B. C. A.

Fluorescence of resins to filtered ultra-violet light. G. T. DRAGONE. *Attitud. Lincei* **8**, 602-4(1928).—The fluorescence of resins from many coniferous plants was studied by means of the Hanan lamp and "Uviol" filter. Blue fluorescence was noted from resins of *Podocarpus macrophylla*, *Sequoia gigantea*, etc.; violet from *Cupressus obtusa*, green from *Pinus excelsa*; yellow from *Cedrus deodara*, etc. A. W. C.

The excitation of luminescence by the agitation of mercury in glass and transparent fused-silica tubes and vessels. W. L. LEMCKE. *Science* **69**, 75-8(1929).

J. A. KENNEDY

Nitrogen afterglow. J. C. McLENNAN, R. RUDY AND J. M. ANDERSON. Univ. of Toronto. *Trans. Roy. Soc. Can.* [3], **22**, III, 303-21(1928); cf. *C. A.* **21**, 20, 3313; 22, 2325. The spectrum of the afterglow of N₂ prepd. by the Br₂-NH₃ method was found under different conditions of discharge and in the presence of the inert gases. N₂ was not found to be excited when mixed with active N₂, although the energy necessary was less than that required for spectral lines by metallic vapors when acted upon by active N₂. The character of the afterglow was affected in the same way by each of the inert gases when present in high percentages. If the afterglow is to be accounted for by the simple transfer of energy, the kinetics of the process leads to conclusions not in agreement with the exptl. evidence. The bands observed in the afterglow when the N₂ was mixed with inert gases can be explained by the theory of the intensity distribution in a band system, and was applied by the authors to their exptl. results.

J. W. SHIPLEY

Wave-length shifts in scattered light. W. H. MARTIN. *Nature* **122**, 506-7(1928).

H. L. D.

Fluorescence excited in oxygen and nitrogen by ultra-violet light of short wave length. J. C. McLENNAN, R. RUDY AND F. H. CLEMENTS. Univ. of Toronto. *Trans. Roy. Soc. Can.* [3], **22**, III, 253-5(1928); cf. *C. A.* **22**, 4066. —Ultra-violet radiation was discharged through a quartz capillary into a small metal chamber contg. the gas. Short Al rods were used as electrodes and ten Leyden jars put in parallel with the transformer, and a spark gap was introduced in series with the main discharge. O₂ gas was obtained by heating KMnO₄ and the pressure of the gas reduced at will by a diffusion pump backed by its oil pump. A faint greenish cone of light proceeded from the opening illuminated by the spark discharge. The N₂ spectrum showed up strongly in fluorescence, indicating that the O₂ was not free from N₂. A Geissler tube filled with the same gas did not indicate any N₂. Mol. N₂ bands appeared but no mol. O₂ bands. At. O₂

lines at $\lambda 8422$ A. U., $\lambda 772$ A. U. and $\lambda 6171$ A. U. were quite intense and the Balmer lines appeared together with a strong line or band at $\lambda 4780$ A. U. The auroral green line did not show up. The observations confirmed the relatively greater stability of the N_2 mol. as compared with the mol. of O_2 . J. W. SHIPLEY

Action of light and x-rays on ammonium thiocyanate. C. G. PATTEN AND H. D. SMITH. Univ. British Columbia, Can. *Trans. Roy. Soc. Can.* [3], 22, III, 221-4 (1928).—Concd. aq. solns. of NH_4CNS on exposure to light turn bright red but the color disappears again in the dark. This action was found to be due to the presence of traces of Fe in the salt which became oxidized in the light and was reduced in the dark. The oxidized Fe formed the red ferric thiocyanate. On recrystg. the purest NH_4CNS available the red coloration was more marked in material recovered from the mother liquors than in the purified crystals. To one of two solns. to which 0.001% of ferrous Fe was added as sulfate, the red coloration on exposure to light was more marked than in the soln. to which no Fe was added. H_2O_2 produced the red coloration in a soln. and $SnCl_2$ removed it. Metallic Fe prevented the formation of the red color in the presence of light but on the removal of the Fe the soln. became deeply colored. In the dark the solns. became colorless. Wave lengths less than 5400 A. U. produced the coloration and those between 4000 A. U. and 4300 A. U. were most effective. X-rays brought about the same coloration as sunlight. Photooxidation of traces of impurities by x-ray radiation may help to explain the coloration produced in glass by x-rays and the variation in optical transparency of glass exposed to intense ultra violet light may have a similar explanation. J. W. SHIPLEY

Light, its possible use in the Congo for chemical syntheses. J. VAN HOUT. *Ing. chim.* 16, 182-91 (1928).—H. illustrates by well-known examples the influence of light on chem. reactions and proposes the further study of this subject with the object of utilizing the strong African sun for industrial purposes. P. THOMASSET

Optical excitation and dissociation of metallic halides. K. BUTKOV AND A. TERNIN. *Z. Physik* 49, 865-84 (1928).—In continuation of previous work (*C. A.* 20, 2788, 21, 3833) the optical dissocn. of the CsI, TlBr and TlCl and CuI mols. into the excited metallic atom and neutral halogen atom has been investigated. The limiting frequencies at which the lines characteristic of the metallic atom are emitted when the vapor of the halide is irradiated with an intense beam of short ultra-violet light were detd. and the heat of dissocn. of the mols. so deduced was found to be in satisfactory agreement with those calcd. from thermochem. data. In the case of TlI vapor, optical excitation causes the emission of a band spectrum of the TlI mol. besides the atomic lines. From this, the various dissocn. processes are related with the energy levels in the mols. The data obtained are compared with those found previously. B. C. A.

Photochemical cell containing potassium ferrocyanide solution. S. IMORI. *Sci. Papers Inst. Phys. Chem. Res. Tokyo* 8, Suppl. 11-3 (1928).—A cell contg. $K_4Fe(CN)_6$ soln. and having Pt electrodes in the 2 compartments, which are sepd. although not completely, by a porcelain diaphragm, yields at a time t after commencement of illumination of one of the compartments a p. d. $\pi = \lambda (1 - e^{-\delta \sqrt{t}})$, while on discontinuing the illumination $\pi = \lambda (1 - \gamma t) / (1 + \delta \sqrt{t})$, where λ is the equil. potential, and γ , δ and k are consts. The e. m. f. is due to displacement to the right of the equil. $[Fe(CN)_6]^{4-} + 2H_2O \rightleftharpoons [Fe(CN)_6H_2O]^{2-} + OH^- + HCN$ (cf. *C. A.* 22, 551). The displacement is dependent only on the light intensity, and does not obey the law of mass action. The photochem. effect is greatest at 440-450 μ . B. C. A.

Photochemical cells with complex cyanides of nickel or platinum. S. IMORI. *Sci. Papers Inst. Phys. Chem. Res. Tokyo* 8, Suppl. 14-5 (1928); cf. preceding abstract. A cell contg. K nickelocyanide or platinumocyanide yields an e. m. f. expressed by $\pi = \lambda (1 - e^{-kt})$ during illumination and $\pi = \lambda e^{-kt}$ when the illumination is stopped. The e. m. f. may be due to the temporary formation of some kind of concn. cell by a change of complex dissocn. or by polymerization of complex ions or mols. B. C. A.

Structure and activation of the formaldehyde molecule: analysis from the point of view of the ultra-violet absorption spectrum of the vapor. V. HENRI AND S. A. SCHOU. *Z. Physik* 49, 774-826 (1928); cf. *C. A.* 22, 2325.—The ultra-violet absorption spectrum of CH_2O vapor has been investigated and 35-40 bands have been located between 3700 and 2500 A. U. The absorption max. is at 2935, as for other aldehydes. The bands can be divided into 11 groups, the first 7 groups contg. rotation bands, while the other groups are indefinite and continuous and are attributed to the pre-dissocd. mol. A double fine structure was found in the first 7 bands and is explained by assuming a doubly-quantised rotation of the mol. corresponding with 2 moments of inertia J and K , the former about the C—O axis of the mol. and the latter at right angles to it. The values deduced for the moments of inertia of the normal mol. are $J_0 = 1.38 \times$

10^{-10} , $K_0 = 23 \times 10^{-40}$. From this the configuration of the mol. is deduced as of γ -form with the following inter-atomic distances: $H-H = 1.38 \times 10^{-8}$ cm.; $C-O = 1.09 \times 10^{-8}$; $C-H = 1.3 \times 10^{-8}$ cm. Similarly, there are 2 vibration numbers α and β , corresponding with $C-O$ vibrations and $H-H$ vibrations, resp. For the normal mol. $\alpha_0 = 1572.3$ and $\beta_0 = 441$ cm.^{-1} , while for the excited mol. $\alpha' = 1231.3$ and $\beta' = 398$ cm.^{-1} . The band structure shows a triplet system, and the lines in each band can be arranged very exactly according to 9 parabolas. The sepn. of the bands in these triplets is independent of the state of vibration of the atoms and is almost equal to the value calcd. from the emission spectrum of the CO mol. The CO mol. is supposed to exist normally in the 1S state, from which it was predicted that it would have a new absorption band at 2060.6 arising from the $^1S + ^3P$ change. This was found at 2060.8 \AA . The deductions are drawn that the CH_2O mol. exists normally in the 3P state and passes through 7 successive stages of vibrational activation into a pre-dissocd. substance. At higher temps. the latter condition appears at lower degrees of excitation than at normal temps. Observations of the absorption spectrum of CH_2O in soln. showed that in water the CH_2O mol. is completely hydrated, while in hexane at -70° it remains in the unimol. state.

B. C. A.

Altitude of the ozone layer. J. C. McLENNAN, R. RUEDY AND MRS. V. KROTKOV. Univ. of Toronto *Trans. Roy. Soc. Can.* [3], 22, III, 293-301(1928); cf. C. A. 21, 13, 2097. —The O_3 layer in the atm. lies at altitudes beyond the possibility of sampling, but cannot extend indefinitely since there must be a sufficient density of O_2 mols. being dissociated by ultra-violet radiation and of O atoms colliding with O_2 mols. to form O_3 . The thickness of the O_3 layer can be calcd. from absorption coeffs. of ultra-violet radiation. A series of spectrograms of the zenith of a clear sky were taken with a Hilger quartz spectrograph in the time of about one and a half hours, following sunrise and preceding sunset. The time of exposure was 10 mins. The d. of the ultra-violet part cont., the Huggins bands was measured and from these measurements the altitude of the O_3 layer above Toronto was detd. as 47-57 kilometers on Sept. 5 and 6, 1927. The results of the calcs. on the O_3 layer in the atm. are not in accordance with what would be expected from the $2\text{O}_3 \rightleftharpoons 3\text{O}_2$ equil. observed under lab. conditions. There is too high a concn. of O_3 in the atm. Traces of org. dust in the upper atm. would vitiate the results of absorption measurements.

J. W. SHIPLEY

Lattice energies and photochemical decomposition of the silver halides. S. E. SHEPPARD AND W. VANSELOW. *J. Phys. Chem.* 33, 250-73(1929).—Consideration of the energy steps in the Born cycle for calcg. the lattice energies of Ag halides leads to the following conclusions: (1) The photolysis of solid Ag halide might occur directly to give halogen and metallic Ag. This requires only a quantum at 800 $\text{m}\mu$ or longer, equal to the heat of formation of the halides from the elements. (2) This photolysis must occur indirectly, by way of sepn. of electrons from halide ions, followed by acceptance of the electrons by Ag ions. This course would require (a) a quantum at $\lambda = 130$ $\text{m}\mu$, or beyond, to disrupt the lattice, then a quantum at $\lambda = 300$ $\text{m}\mu$, or beyond, to liberate electrons. In subsequent reactions of electron acceptance, etc., energy might be freed, either as radiation quanta or by radiationless collisions, so that the final difference of energy equals the heat of formation. In this case (b) primary absorption of 2 quanta appears necessary at thresholds much higher than those known to be operative in the photochem. decompn. of Ag halides. The contradiction might be dismissed by abandoning the view that the photolysis involves the intermediate liberation of photoelectrons from halide ions—a hypothesis suggested independently by K. Fajans and S. E. Sheppard. The phenomena of photoelec. conductance definitely point to a relative freeing of photoelectrons. F. C. Toy has shown that the discrepancy between the photoelec. conductance absorption spectrum of Ag halides and the spectrum photographically active is removed by consideration of the thickness factor. The authors have recently obtained independent evidence of the liberation of photoelectrons, concomitant with the production of free halogen, in a study of the photoelec. potentials of Ag—Ag halide electrodes in electrolytes. The difficulty of the energy quanta required cannot be dismissed. The exptl. evidence obtained with these cells led to a modified theory of the inner photoelec. effect which is consistent with Sheppard's orientation theory of photographic sensitivity and latent-image formation. By considering that both the lattice energy and electron affinity are lowered at interfaces, particularly at true interfaces with conductors, it seems possible for the inner photoelec. effect to occur at the lower wave lengths in question.

S. E. SHEPPARD

Rate of photochemical combination of chlorine and hydrogen in glass capillary tubes. DAVID L. CHAPMAN AND PHILIP P. GRIGG. *J. Chem. Soc.* 1928, 3233-5.—The catalytic union of H and Cl seems to be due to an ephemeral catalyst formed by

the action of light (cf. *C. A.* 22, 4378 for Br + H). The detns. were carried out in a U-tube, of which one limb had a bore of 1 mm., and the other limb had a bore of 2.5 cm. The fraction of the H and Cl which united under equal exposure was larger in the larger tube. The catalyst is destroyed by contact with glass or water. F. E. B

Quantum yield in the photochemical decomposition of light-sensitive diazo compounds. J. EGGERT. *Z. Elektrochem.* 34, 602-5(1928).—The photochem. decompn. of the diazo compds. of 2,1-aminonaphthol-4-sulfonic acid and of *p*-aminodiphenylamine sulfate, followed by measuring the evolution of N₂ in a microeudiometer, showed the following characteristics. In aq. soln. there is an induction period, followed by a range in which N₂ is evolved linearly with time. The gas evolution, once started by exposure to light, does not cease immediately on stopping the illumination, but continues for a considerable time at a gradually diminishing rate. The quantum efficiency in aq. soln. is 0.36. This value is independent of light intensity, within the range 0.4 to 5 Hefner candles of λ within range 436 and 365 μ , of the temp. between 20° and 40° and of the concn. of the soln. The solid decomposes on exposure to light with the same quantum yield. X-rays do not cause the evolution of N₂, but produce some other, unknown change in the substance. W. WEST

Photochemistry of iron carbonyl compounds and the absolute absorption spectrum of respiration enzyme. OTTO WARBURG. *Naturwissenschaften* 16, 856-61 (1928).—The action of light has recently been studied on 3 complex Fe carbonyl compds. CO-pyridine-hemin with Fe on the tetrapyrrole nitrogen in an FeCO group, CO-ferrocystine with Fe on the S atom of an amino acid in an Fe(CO)₂ group, CO compd. of respiration enzyme with an FeCO group. For the first 2 quant. work was possible, they decomp. with light intensities of 1/10,000 sunlight; for the third compd. an indirect respiration method was used for measurements. It was found that the Einstein law of equivalence holds; 6 different wave lengths were used (366, 405, 436, 492, 546 and 578). From the relation $\gamma_1/\gamma_2 = \lambda_1/\lambda_2$ the relative absorption spectrum of the compds can be detd.; the absorption coeff. β follows from $\beta_1/\beta_2 = (i_2\lambda_2)/(i_1\lambda_1)$ for i_1 and i_2 intensities of equal action. By intermittent periodical irradiation with light of known intensity, i , the rate of the photochem. reaction can be detd. and from it follows, since $h\nu$ is equiv. to 2 atoms Fe, the abs. absorption coeff. by $-(1/c)(dc/dt) = 2(i\lambda\beta/h\nu)$. For the respiration enzyme the irradiation period was varied from 1 to 6000 per min. β was found to be 10⁸ sq. cm. per g. atom Fe. A curve of the $\beta - \lambda$ relation is given, it is over about 20 μ shifted from the CO-hemin curve. From comparison with the spectrum of CO-ferrocystine and Fe(CO)₅ it is evident that these spectra depend largely on the carrier mol.; it is entirely different for the latter 2 compds. The typical Fe-carrying group in the respiration enzyme is therefrom concluded to be a tetrapyrrole group. It was found that for cleavage of Fe(CO)₅ again one quantum per 2Fe atoms was required. B. J. C. VAN DER HOEVEN

The influence of deformation on the internal photoelectric effect of rock salt crystals. M. N. PODASHEVSKII. *Phys. Inst., Odessa. Naturwissenschaften* 16, 653(1928).—It was found that plastic deformation (slip over cleavage planes) influences considerably the photoelectric effect of rock salt crystals, colored by x rays. The current drops rapidly under load, approaching an asymptotic value sometimes zero. Increasing the load causes this value to drop to a lower limit. The original effect can be reestablished to a certain extent by repeated x ray irradiation. B. J. C. v. H.

The normal photoelectric effect. P. LUKIRSKII AND S. PRIEZAIEV. Technical Institute, Leningrad. *Z. Physik* 49, 236-58(1928).—The metals Al, Zn, Sn, Ni, Ag, Cd, Pb, Cu and Pt have been studied under radiation of Hg lines of $\lambda = 2302, 2400, 2537, 2653, 2802, 2967, 3022$ and 3130 Å. U. in a spherical condenser. From the max. electron velocity an av. value for Planck's const. h of 6.543×10^{-27} erg. secs was detd., and the $h\nu_0$ of the Einstein equation and the contact potential found to be the same for sprayed films down to 10⁻⁶ cm. in thickness as for massive metals. The av. velocity of the photo-electrons approaches closer to the max. the thinner the film. From this and a study of emission from active through thin films of less active metals the authors conclude that the photo-electrons are identical with the conductivity electrons and that the distribution in velocity is caused by work expended in getting to the surface. GREGG M. EVANS

Change in the optical transparency of certain ultra-violet transmitting glasses after exposure to x-rays and ultra-violet light (SHRUM, et al.) 19. Stability of isomers according to their absorption spectra. Intramolecular rearrangements in the 1-arvl-2-phenyl-2-ethyl-1-butanol series (RAMART-LUCAS, ANAGNOSTOPOULOS) 10. Space-filling forms in crystal lattices (TERTSCH) 2. Molecular refraction and non-polar

bonds (SAMUEL) 10. Dynamic isomerism. XXVIII. Absorption spectra of the ketonic and enolic forms of an α -diketone (LOWRY, *et al.*) 10. Carbocyanine dyes with substituents attached to the 3-C chain (HAMER) 10. Material for projection screens (Brit. pat. 294,671) 18.

EMELÉUS, K. G.: *The Conduction of Electricity through Gases*. London: Methuen and Co., Ltd. 2s. 6d. net.

PLINT, H. T.: *Wave Mechanics*. London: Methuen and Co., Ltd. 3s. 6d. net.

PLOTNIKOV, J.: *Photochemische Versuchstechnik*. Leipzig: Akademische Verlagsgesellschaft m. b. H. 454 pp. Paper, M. 20; bound, M. 21.60.

PRESTON, THOMAS: *The Theory of Light*. New York: Macmillan and Co. 5th ed., edited by A. W. Porter. 643 pp. \$8. Reviewed in *Phys. Rev.* 33, 459(1929).

WEYL, HERMANN: *Gruppentheorie und Quantenmechanik*. Leipzig: Verlag S. Huzel. 281 pp. Paper, M. 20; linen, M. 22. Reviewed in *Phys. Rev.* 33, 460 (1929).

Fluorescent screens. L. A. LEVY and D. W. WEST. Brit. 295,078, May 19, 1927. A non-fluorescent or but feebly fluorescent dye or pigment is added to or used with a fluorescent substance in order to modify the color of the fluorescence. ZnCd sulfide mixed with vermilion oil paint gives a scarlet fluorescence, or if mixed with a dope or varnish such as nitrocellulose lacquer, which has been dyed with rhodamine or magenta, gives a crimson-scarlet fluorescence. Other examples also are given.

4—ELECTROCHEMISTRY

COLIN G. FINK

Manganese-steel production in the electric furnace. J. TRANTIN, JR. *Foundry* 57, 32 5(1929); cf. *C. A.* 23, 1354. The usual heat treatment for Mn-steel castings is to quench from 1010°. If the C content is greater than 1%, higher temp. must be used. Phys. tests on castings contg. 1.24% C and 12.20% Mn showed that the best properties were obtained by quenching from 1024° to 1066°. Micrographs confirm the phys. tests, showing more uniform structure for material quenched from the range noted. *Ibid.* 128-31. Reheating Mn-steel castings, as in shrinking on liners, or in welding, will lead to the pptn. of carbide if the temp. goes over 482°. This impairs the phys. properties and wear resistance, as shown by tests and micrographs. If it is necessary to reheat to the danger point, it is advisable to carry the heating to 1038° and then quench.

BENJAMIN MILLER

Electric melting of alloy steels. H. M. GERMAN. *Blast Furnace Steel Plant* 17, 274 6(1929). Three methods of making steel from a cold charge in an elec. furnace are briefly outlined, viz., melting with complete oxidation, melting with partial oxidation, and melting with little or no oxidation. Compn. of the refining slag, the proper manipulation of the bath and the correct tapping temp. of the metal are important factors in the production of steel of good quality.

DOWNES SCHAAF

Manufacture of hollow drill steel in the electric furnace. THOMAS M. PUGSLEY. *Chem. Eng. Mining Rev.* 21, 131 2(1929). Sound ingots are secured by using a feeding head 38 cm. high, and pouring in metal repeatedly until the head is full. The ingots are worked to billets 51 cm. long and 11.4 cm. in diam. A smooth hole, 3.8 cm. in diam., is bored through the billet, and a graphite-covered Cu bar inserted. The composite billet is rolled to the desired size, and then the Cu may easily be removed. B. M.

Electrometallurgy of gold. W. GRAFLICH. *Chem. Fabrik* 1928, 678-80.—The current, electrode spacing, voltage, electrolyte impoverishment, pulling-time for electrodes, and interest-charges are calcd. for a Au refinery, assuming appropriate values for anode compn., c. d., no. and size of cells and electrodes, electrolyte compn. and resistance, etc. The method of calcg. cell voltage is novel: the potential drop in the soln. is calcd. in the regular way from the sp. resistance of the electrolyte, the c. d. and the spacing, 50% of this voltage is added to allow for contact drops; the decompn. potential of auric chloride is calcd. from the heat of formation, and this is added as the cathode voltage; the decompn. potentials of the chlorides of the metals found in the anode are calcd. in the same way, and each is multiplied by the weight percentage of the metal in the anode, the sum of the values found being subtracted at the anode voltage. The compn. given is Au 66.2, Ag 6.4, Cu 6.0, Zn 12.1, Fe 1.8, Ni 1.5 and Pb 6.0%.

BENJAMIN MILLER

Method of electrolytic gold refining adopted by the Hitachi Copper Works. TAISEI KIMATA AND TEIICHI YAMAMOTO. Hitachi Copper Mining Works. *Japan J. Mining* 44, 785-814(1928).—In recovering Au and Ag from the electrolysis of crude Cu, the slime contg. Au and Ag has formerly been treated by HNO_3 and H_2SO_4 to obtain pure Au. When the metal contains Pt-group metals it has been found difficult to make the standard Au grade higher than 99.8%, the addnl. disadvantage being that the color of the refined product makes it liable to be mistaken for a low-grade gold. Hence K. and T. studied the applicability of the Wohlwill electrolytic method. Impure Au contg. Ag and Pt-group metals is used as anode. They succeeded in producing a pure Au, recovering at the same time all of the Pt-group metals. The greatest difficulty was found in preventing the anode showing a passive state when the c. d. exceeded a certain limit. They studied to what extent the c. d. might be increased by the addn. of HCl , by the elevation of bath temp. and also by the combined use of a. c. and d. c. When the temp. is raised the luster and the crystal appearance of the deposited Au become better, but the rate of deposition decreases, at the same time increasing the amt. of slime. The best results were obtained by working at 70° . The increase in the HCl concn. has a similar effect as that of raising the bath temp., but above a certain limit the effect is not remarkable, 5% of HCl being the best. The use of a. c. superimposed permits of a much larger increase in c. d.; the deposited Au becomes very fine and almost all of the Au adheres firmly to the electrode. When an a. c. is used, which is 1.3 times larger than the d. c., the highest c. d. at the anode can be used, and the amt. of slime is considerably lessened. (In practice about 12 amp./sq. dm. is used.) The authors then describe the details of operation for 108 kg. of anodes, electrolyzed for 20 hrs., and noted some of the characteristics of the Au produced (99.97-99.99% grade). In electrolysis, all of the Pt-group elements enter into soln. while such insol. metals, as Ir, enter the slime and are easily sepd. Economically speaking, this method has the disadvantage that the amt. of Au which has to be "tied up" for the electrolysis must be larger than in the HNO_3 method. But this disadvantage may be offset by the lower cost of refining and the higher price of the product obtained, the added advantage being the recovery of the Pt-group metals. In addn. the operation is simple and sanitary, and the initial cost of the plant is small.

K. SOMIYA

Investigations on the electrolytic precipitation of metals. K. ARNDT *Ber.* 62B, 80-4(1929); cf. C. 4, 17, 931.—In continuation of the work on throwing power, expts. were conducted with a pierced celluloid sheet between the anode and the cathode. The celluloid sheet was 10 mm. from the anode and 2 mm. from the cathode, and the hole was 1 mm. in diam. A silvered Cu cathode was used, in a soln. of 150 g. $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$, 50 g. H_2SO_4 , and 50 g. $\text{C}_2\text{H}_5\text{OH}$ per l. A current of 22 milliamp. was passed for 20 min. The deposit consisted of a dark circle, surrounded by 5 concentric rings, alternately light and dark. The outside diam. of the outermost ring was 16 mm. Under the microscope the circle showed fungiform structure buds pressed together. This structure appeared also in the second zone, where the c. d. was somewhat less. Under the microscope the boundary of the outermost ring consisted of single crystals, with the Ag background showing. Individual crystals appeared outside the ring system, getting scarcer as the distance from the center increased. If the plate be sighted on from different angles, the illumination being kept vertical, the appearance changes, and zones which appear light on vertical examn. appear dark on oblique examn. and vice versa. A suggests that the crystals tend to deposit with their bright faces parallel to the current lines. As the distance from the center increases, the direction of the current lines becomes ever more oblique. The ability of the crystals to follow the current line influence is limited, so that they remain oriented in one direction until the obliquity reaches a limiting value, and then suddenly assume a new orientation. All crystals were about the same size, 0.005 mm. The crystal nuclei, which deposit in favorable places, grow at the expense of their neighbors. The mechanism suggested is that the unfavorably-placed nuclei react with cupric ions to form cuprous ions, and that the reverse reaction deposits Cu on the favorably placed nuclei. In another series of expts. the effects of c. d., temp. and concn. on the no. and size of the crystals in the deposit were detd. A silvered Cu plate 4 cm. square was used as cathode between 2 anodes in the soln. mentioned above. A current of 8 milliamp. was passed for 5 min., at about 18° . Other deposits were made under similar conditions, but with the current strength ranging from 4 milliamp. to 20 milliamp. Another series of deposits was made at the 8 milliamp. rate, at 0° and at 35° . A third series at 18° and at the 8 milliamp. rate was made with the soln. diluted tenfold. The deposits were examd. under 500 diam. magnification, a counting chamber being used to get the no. of crystals per unit area and the approx. dimensions. The smallest av. diam. observed was 0.5 μ ; the largest, 5 μ . High

c. d., cooling and diln. favored the formation of many small crystals, while low c. d. and warming favored the formation of few and large crystals. The addn. of 0.1% of gelatin made the crystals too small to be seen under the microscope. B. M.

Variation of the resistivity of thin coats of platinum with respect to the thickness. A. FÉRY. *Compt. rend.* 187, 819-21(1928).—Pt films 287 mu thick are produced by cathodic sputtering; their resistivity is 4.19×10^{-4} . These films are considered to be composed of massive Pt. They differ from ordinary Pt, but will transform into the latter form by adequate heating. By sputtering at 340° , ordinary Pt is obtained. The thin films have strong catalytic properties. The change in catalytic properties and in resistance properties leads to the conclusion that many intermediate steps exist in the transformation of Pt black into bright Pt.

ALBERT L. HENNE

The rate of evaporation of tungsten in the presence of salt vapors. H. ALTER-TIM M. *Z. tech. Physik* 9, 285-8(1928).—The rate of evapn. of W was measured by the Langmuir method (C. A. 8, 870) with filaments of 50 mu, 70 cm. long, previously ignited in N_2 with some H_2 to remove impurities. They were weighed on microbalances. Different salts were sprayed on the filaments in 10% aq. soln. or in aq. suspension. With proper precautions and corrections for cold ends, etc., the decrease in wt. was found to be for pure W 1.83×10^{-8} g. per sq. cm. per sec. at 2685° , 4.63 at 2770° , 19 at 2875° . At 2770° addn. of P gave 6.66, of NaCl 6.9, of KBr 10.6, of CaF_2 6.7, of Na_2SiF_6 4.8, of Na_2PF_6 6.7, of K_2AlF_6 7.0, of BPO_4 $4.5 \cdot 10^{-8}$ g. per sq. cm. per sec. evapn. Similar increases were found at other exptl. temps. The results on pure W are in good agreement with those of Forsythe and of Zwicker. All halogen salts apparently attack the W, increasing the evapn. rate by 40 to 50%. Decrease in blackening of the walls of incandescent lamps containing these salts must therefore be attributed to reactions on the walls, not to diminished evapn.

B. J. C. VAN DER HOEVEN

Chromium plating on a printing surface. I. The condition of electrolysis with a mixture of chromic oxide and chromic sulfate. MASATAKA NAGANO AND ASAJIRO ANICHI. Research Lab. Printing Bureau of Government. *Bull. Research Lab. Printing Bureau Government* 19, 23-53(1928). (In English).—N. and A. Cr-plated printing surfaces having a fine pattern on them, and studied the most satisfactory conditions for obtaining the best current efficiency, the effect of the compn. of the bath, the effect of temp., c. d., duration of electrolysis, ratio of the area of the 2 electrodes, the current efficiency as affected by different electrodes, the surface luster of the deposit, and finally the brittleness of the deposit. **Results** (1) The bath must contain the right quantity of CrO_3 and acid. The best results were obtained when the ratio of $CrO_3/Cr_2(SO_4)_3$ was 0.15, a good plating surface being obtained when this ratio was reduced to a certain extent by actual electrolysis. The following results were obtained with the electrolyzing soln. contg. 10% CrO_3 :1% $Cr_2(SO_4)_3$. (2) With the rise of temp. the current efficiency increases, but there is a temp. for each electrolyzing soln. A good plate with a beautiful surface luster is obtained at $35-45^\circ$. (3) The current efficiency and the c. d. increase or decrease proportionally with each other, the best result being obtained at 0.08-0.1 amp./cc. (4) The effects of the duration of electrolysis, the ratio of electrode surface and the kind of the electrode metal upon the current efficiency are not great, but the appearance of the plated surface is influenced very largely by these factors. Thus, with the increase in the duration of electrolysis, or that of the electrode surface, a large crystal grain grows at the edges of the plated surface and the power of covering at an equal depth decreases. In regard to the choice of electrode material, the anode metal has no influence, but the kind of the cathode metal has a profound influence upon the plated surface. Best plating results were obtained up to the 7 hrs. as the duration of electrolysis when the ratio of the area of the electrodes was 1:12 (anode area/cathode area). For anode metal Fe and Pb and for cathode metal Fe, Ni, Cu and Sn were found to be suitable.

K. SOMEYA

Production of chromium surfaces for retarding the corrosion of nickel at high temperatures. G. F. SAGER. *Diss., Rensselaer Polytech. Inst.* [20], 31 pp.(1927).—For Cr plating Ni articles the surface is first cleaned by cathodic electrolysis in a bath contg. 50 g. of Na_2CO_3 , 15 g. of NaOH and 5 g. of KCN per l., a c. d. of 20 amp./sq. dm. being used for 15 min. Cr is then deposited in a bath contg. 250 g. of CrO_3 , 3 g. of chromic sulfate and 7 g. of chromic carbonate per l., a c. d. of 340 amp./sq. dm. being used. The initial voltage of 5.8-6.2 drops to 3.3-3.7 v. within a few hrs.; the current efficiency for continuous work is about 10% and the rate of increase of thickness of the deposit is 0.018 mm./hr. With a coating of half this thickness the metal remains unaffected for 30 min. in SO_2 at 800° . Attempts to deposit a Ni-Cr alloy from sulfate and chloride baths yields coatings which contain no Cr. Prolonged annealing of Cr-plated Ni wires in H and *in vacuo* at $1100-1300^\circ$ results in only slight interpenetration of the 2 metals.

and the resistance to corrosion by SO_2 at a high temp. is somewhat reduced. "Chromising" Ni in a mixt. of Al_2O_3 and powdered Cr at $1050\text{--}1150^\circ$ produces a highly resistant alloy layer which is unaffected by subsequent cold work. B. C. A.

Electrolytic precipitation of a glass-like film of alumina on aluminum and aluminum alloys. V. P. IL'INSKII AND N. P. LAPIN. *J. Applied Chem. (Russia)* 1, 112-4(1928).—Expts. carried out by I. and L. lead to the following conclusions. Al and its alloys can be protected against corrosion when in contact with ordinary water or moist air by an electrolytic pptn. of an Al_2O_3 film, which does not protect the Al when other more noble metals are in contact or when the film is damaged. The best films are obtained through an anodic polarization in a soln. of $1/2$ to 3% CrO_3 and an applied e. m. f. of 40-50 v. followed by a high-excess voltage. C. FABIAN.

Removing carbon dioxide from air by electrolytic transport. ERICH MÜLLER, HANS MARKERT AND FR. HEINRICH. *Z. Elektrochem.* 35, 3-13(1929).—The object of the investigation was the development of an app. for the removal of CO_2 from the air with the continuous regeneration of the KOH used for absorption. In the scheme adopted, a soln. 10.5 N in K_2CO_3 and 1.06 N in KOH flows by gravity from the cathode chamber of a 2-compartment cell to the air-inlet chamber of an air-lift pump. The air to be treated is used to lift this soln. to an overhead chamber from which it can flow back to the cell. All of the CO_2 is absorbed by the soln., which, as a result, has its hydroxide concn. reduced to some lower value dependent on the rate of air supply and CO_2 content. In the cathode compartment of the cell H is discharged by the current, regenerating the OH. The current is adjusted to the value required to keep the carbonate-hydroxide ratio approx. 10, as expt. showed that 90% current efficiency would be obtained with this ratio. In the anode compartment is a soln. 0.245 N in K_2CO_3 and 2.055 N in KHCO_3 . This soln. was found by expt. to be in equil.; that is, CO_2 is discharged at the anode at the same rate that it enters the compartment by electrolytic transport. Water is added to maintain const. level, so that the only net result is the transfer of K_2CO_3 from the anode compartment to the cathode compartment, because of the migration of K ions. The catholyte is practically satd. with K_2CO_3 , so that the excess crystallizes out, and the crystals fall into a settling chamber from which they are periodically removed to the anode compartment. K salts are used rather than Na salts because of their greater soly.; if Na salts were used the anode would be coated with crystals. Several metals were tried for electrodes, but it was found that Fe was perfectly satisfactory if the chloride content of the K_2CO_3 was kept below 0.05%. The capacity of the lab. app. could not be detd., as the pump available could not supply air at a rate high enough for a severe test. BENJAMIN MILLER.

The Cottrell-Moeller process. PIERRE VER ECKE. *Bull. fédération ind. chim. Belg.* 7, 293-305, 341-64, 389-402(1928).—Gas is purified electrically. A. L. HENNF.

Electrolysis of cyanogen halides. R. H. CLARK AND H. R. L. STREIGHT. Univ. of British Columbia, Can. *Trans. Roy. Soc. Can.* [3], 22, III, 323-9(1928). Cyanogen halides, ClCN , BrCN and ICN , were prepd. in a pure condition and electrolyzed, with various solvents, in order to det. whether the halide might be deposited on the cathode. Twenty-one org. solvents were used and in only one case was a deposit of a halogen on the cathode noted. ICN dissolved in pyridine gave AgI on Ag cathode. In all the other cases the halide traveled to the anode. The authors believe that ICN behaves

as an electromer, $\text{ICN}^+ \rightleftharpoons \text{ICN}^-$, the I reacting entirely positive when pyridine is the solvent. J. W. SHIPLEY.

The operation of radio receiving-tube filaments on alternating current. I. K. H. KINGDON AND H. M. MOTT-SMITH, JR. *Gen. Elec. Rev.* 32, 139-48(1929). Inherent disturbances in using a. c. to heat the filament of a triode vacuum tube are (1) fluctuating potential drop along the filament, (2) fluctuating magnetic field around the filament and (3) fluctuation in filament temp., which causes corresponding disturbances in the plate current-primary potential, magnetic and temp. ripples. In addn., if a tube is used as a detector with grid leak, there are similar grid-current disturbances—secondary potential, magnetic and temp. ripples. Quant. theories of the above types of ripple are developed and compared with exptl. measurements on com. radio tubes. "201-A" tube is an example of practically pure primary potential ripple; a tube with heavily coated Cs filament was used for magnetic ripple test; in "226" tube, potential and magnetic ripples are of equal importance; "199" supplies a good example of temp. ripple. M. McMAHON.

The manufacture of barium oxide filaments. B. HODSON, L. S. HARTLEY AND O. S. PRATT. *Electrician* 102, 160-1(1929).—Four methods of prepg. oxide-coated

filaments for radio tubes are described: (1) melting or fusing a Ba compd. to the core wire, (2) application to the wire of resinous or paraffin paste contg. a Ba compd., (3) evapn. of the soln. of the Ba salt painted on the wire and (4) depositions of Ba on the filament from the vapor. Precautions for the use of each process are outlined. Process (4), which is the newest, is considered in some detail. Core wire is first oxidized before evacuating the bulb, a piece of Ba metal is attached to the side of the anode towards the filament and, when a good vacuum is reached, the anode is heated by high-frequency induction, Ba evaps. and surrounds the filament, reducing WO_3 and forming a layer of BaO. A second vapor method uses BaN_3 in soln. which is painted on the anode and decompd. at about 225° into Ba and N. Advantages claimed for process (4) are more rapid formation of the filament and a better control of the thickness of the layer. M. McMAHON

Light sensitivity of commercial selenium cells. G. P. BARNARD. *Proc. Phys. Soc. (London)* **40**, 240-8(1928); cf. *C. A.* **23**, 1062.-For com. Se cells the change in conductance C due to an intensity of illumination I is given by $C \propto I^x$, where x varies from cell to cell, depending on the construction. A sensitivity curve for a Fournier d'Albe type of cell is given. The change in conductance of Se cells is shown to depend on the amt. of radiant energy received, and not on the no. of foot candles incident on the cell. For equal radiant energy the action of the infra-red is relatively much weaker than that of some shorter waves. The light sensitivity of Se is attributed to changes in cryst. structure. B. C. A.

Some practical applications of quartz resonators. G. W. N. COBBOLD AND A. E. UNDERDOWN. *J. Inst. Elec. Eng. (London)* **66**, 855-71(1928).—A wide field of usefulness for the application of quartz resonators is found in wireless work, particularly when they are employed as frequency stabilizers, and as reference standards in checking wave meters. The temp. coeff. is less than 18 parts per million per degree for longitudinal resonators in which the length is several times as great as either of the other dimensions. This coeff. increases as the length is reduced and may exceed 60 parts when the 3 dimensions are of the same order. The effect of variations in the air gap between the quartz crystal and the electrodes is studied. Thus with an air gap of 0.05 mm. the frequency of oscillation is 144.144 kilocycles/sec., with a gap of 0.50 mm. it is 144.408 kilocycles/sec., and with a gap of 1.20 mm. it is 144.500 kilocycles/sec. Above this gap the valve ceases to oscillate. To obtain the greatest possible constancy, the crystal should be mounted in a vacuum. Practical applications in connection with wave meters are described. H. STOERTZ

Piezoelectric frequency control. R. E. HITCHCOCK. Westinghouse Elec. & Mfg. Co. *Elec. J.* **25**, 503(1928).—When used under the proper conditions, quartz-crystal oscillators are now recognized to be one of the most reliable means for controlling radio broadcast-station frequencies, where a precision better than 0.1% is desired. Frequency precision as good as 0.001% has been attained in lab. oscillators. Under the more severe conditions of const. use and with less care than is usual in a lab. a radio station affords a good test of the reliability of a quartz-crystal oscillator. H. reports results of measurements made of KDKA's 950 kc. frequency for a period of six months. C. G. F.

Brief personal recollections in connection with the jubilee of the invention of the carbon incandescent electric lamp by Sir Joseph Wilson Swan in 1878. J. A. FLEMING. *J. Inst. Elec. Eng. (London)* **67**, 293-5(1929).—1928 marks the centenary of the birth of Swan as well as the jubilee of the public exhibition of his C incandescent elec. lamp at Newcastle on Tyne. F. reviews Swan's professional career. W. H. BOYNTON

Making rubber goods of latex by electrodeposition (KLEIN) 30. The relation between dielectric constant of technical insulating material and frequency (BÖNING) 2. The preparation of Fe electrodes in corrosion experiments (VAN WULLEN-SCHOLTEN) 9. Electrochemical oxidation of α -methyl-naphthalene (FICHTER, HERSZBEIN) 10. Apparatus for electrophoretic deposition of rubber (Brit. pat. 294,153) 30. Treating tin ores, etc. (Brit. pat. 294,703) 9. Heat resisting alloy of Al and Cr [for electric resistors](U. S. pat. 1,704,733) 9. Deposition of rubber (Fr. pat. 645,779) 30. Resistor guds (U. S. pat. 1,703,707) 9.

Comp. A. MORTIMER: **Primary Cells.** London: Sir Isaac Pitman and Sons, Ltd. 124 pp. 5s. net.

Electric battery. N. K. CHANEY (to National Carbon Co.). Brit. 294,476, July 23, 1927. Gases liberated in a battery are conducted to the atm. through a porous

cathode, which may be formed of C prep'd. by satg. it with a soln. of lubricating oil or other suitable non-volatile substance in a volatile solvent such as CCl_4 or naphtha. Various structural details of the battery are described.

Electric batteries. GEORGE ANTONOFF. Fr. 644,709, Nov. 29, 1927. Leclanché cells contain an electrolyte which is gelatinized with starch so that in use it becomes transformed into a porous mass resembling cheese, allowing aeration. The Zn used is of a very high degree of purity. Cf. C. A. 22, 4389.

Dry cell. THEOFIL HOLUB. Austrian 112,020, June 15, 1928. A dry cell of the kind in which the container forms the pos. electrode is constructed with an easily ruptured, preferably transparent, closure, e. g., of mica, through which the neg. electrode is introduced immediately before use. The neg. electrode may have a rim at the top engaging an annular channel at the top of the cell.

Dry cell, to be subsequently filled. L. DESMÉT. Belg. 349,587, April 30, 1928. The metal tube constituting the neg. electrode is provided with a water-absorbent lining impregnated with exciting salts. An auxiliary wall is soldered outside the tube to form a side chamber. The tube is filled with a depolarizer and introduced inside the positive electrode. The assembled cell is covered with an insulator, leaving only 2 openings in the side chamber. It keeps indefinitely when dry; when required for use, the side chamber is filled with water. A battery can be made by omitting the side chamber and placing a no. of elements, connected in parallel, in a suitable container, which is filled with water just before use.

Photoelectric cell of the selenium type. H. J. KÜCHENMEISTER. Brit. 294,108, July 16, 1927. Structural features.

Selenium cell of the condenser type. HANS THIRRING. U. S. 1,703,798, Feb. 26. Metal plates are used which are formed of metal such as Cu, which is capable of being wetted by liquid Se, and these plates are sep'd. by insulating plates which may be formed of mica.

Dichromate cell. RICHARD SCHUSTER. Ger. 470,945, Dec. 1, 1923. Addn. to 453,204. The electrolyte is converted by addn. of silicates to a solid or gelatinous form and is enclosed in paraffined asbestos paper, porous cells or Pb tubes, preferably in cartridge form so as to facilitate replacement.

Storage battery. JOHN M. LEA. U. S. 1,705,021, March 12. Structural features.

Storage battery with perforated celluloid separators. CONCORDIA ELEKTRIK-FÄRS.-A.-G. and W. GOSMANN. Brit. 294,458, March 19, 1928. Structural features.

Gas-actuated float device for indicating the charging state of storage batteries. ALFRED B. HALL and JAMES H. QUILHOT. U. S. 1,703,233, Feb. 26.

Electric rectifier plates. SIEMENS-SCHUCKERTWERKE AKT.-GES. Fr. 614,821, Oct. 29, 1927. Plates for elec. rectifiers are made by heating Cu plates to a temp. between 1040° and the m. p. of Cu, and plunging them in hot water. The temp. of the water varies from 40° to 70° according to the size of the plates, a higher temp. being used for the smaller plates.

Electric rectifier elements from copper blanks. PAUL H. GEIGER and WARREN S. BROWN (to Union Switch & Signal Co.). U. S. 1,704,734, March 12. A Cu blank is heated to form a coating of Cu_2O , which is thicker on one side of the blank than on the other side, and an outer coating of CuO ; the blank is then treated with an alkali metal cyanide soln. to dissolve the CuO from the entire blank and to dissolve all the Cu_2O from the side having the thinner coating, leaving a layer of Cu_2O on the other side.

Hermetic seal for mercury-vapor rectifiers, etc. E. B. SHAND and I. SWEDE (to Metropolitan-Vickers Electrical Co., Ltd.). Brit. 294,880, July 30, 1927. A seal between metal and ceramic parts is formed by applying a ceramic glaze to the ceramic material and superposing a metallic glaze on this and then soldering the metal part to the metallic glaze. Details and compns. are described.

Resistances for protecting electric-supply systems against overloads. K. KIPPERS. Brit. 294,549, July 25, 1927. Supply systems have connected in circuit ohmic resistances having a high temp. coeff. such as Fe, Ni or W wires which may be contained in evacuated spaces or spaces filled with inert gases. Artificial cooling may keep the resistance value low at normal loads.

Electric heating resistances. B. CHIABERGE and O. BIGLIA. Brit. 295,159, Nov. 18, 1927. A compn. for embedding metallic elec. resistances is formed of Al_2O_3 and retort charcoal, which may be made into a paste with water and steatite, spread in place and then baked at 400 – 500° . A second layer contg. water glass as an addnl. ingredient may then be applied and the materials further baked together at about 800° . Kaolin may be added to the compns.

Electric-resistance heater for water-heaters, cooking utensils, etc. E. FRENOT and M. GRONIER. Brit. 294,884, Aug. 3, 1927. Structural features.

Electric water-heater. CHARLES F. ROGERS (to Electromatic Mfg. Co.). U. S. 1,705,417, March 12.

Hydrogen peroxide. I. G. FARBENIND. A.-G. Brit. 295,137, Feb. 16, 1927. See Fr. 636,330 (C. A. 23, 47).

Protecting electric motors against acids. GABRIEL ZWICKY. Fr. 644,817, Oct. 28, 1927. The windings of elec. motors, particularly those used in a *refrigerating plant*, are protected against acids by a coating of a double silicate of K and Na in which powdered glass is incorporated while still damp.

Over-tension indicator for electrical precipitators. METALLGES. A.-G. (Paul Antrup, inventor). Ger. 470,728, Mar. 7, 1926. Visual indication of the melting of the fuse is given by 2 pith balls tied to, and normally repelled by, 1 of 2 electrodes arranged in a glass case and forming a disruptive discharge circuit in parallel with the electrode held.

Mercury-vapor lamps. F. W. GILLARD and D. L. WEST. Brit. 294,949, April 1, 1927. That part of the lamp vessel through which emission occurs is made of a material transparent to ultra-violet rays and opaque to visible rays; the end bulbs through which the electrodes pass are made of lead glass. The emissive glass may be formed from SiO_2 50, K_2O 16, BaO 25 and Ni oxide 9%, and a small quantity of Cu oxide may be added to reduce any transparency to red rays. An intermediate glass may contain a higher proportion of BaO.

Electric incandescent lamp bulbs. PATENT-TREUGAND-GESELLSCHAFT FÜR ELEKTRISCHE GLÜHLAMPEN (to General Electric Co., Ltd.) Brit. 294,212, July 21, 1927. Vacuum lamp bulbs are aged by passing a current through the filament to heat it to incandescence and passing an elec.-gas discharge through the glass of the bulb (which is heated to render it conductive unless of cond. glass such as Mg glass) by applying a high potential to an electrode placed on its exterior. Cf. C. A. 23, 1578.

Electric incandescent lamps. SIEMENS ELECTRIC LAMPS & SUPPLIES, LTD., and P. D. OAKLEY. Brit. 295,072, May 13, 1927. Gas-filled W filament lamps, in addition to the usual gas filling, contain also Cl substitution products of aliphatic hydrocarbons such as MeCl , CH_2Cl , CHCl_2 or CCl_4 (which may be formed in the bulb from a hydrocarbon and Cl or HCl).

Antimony by electrodeposition. NORDDEUTSCHE AFFINERIE. Brit. 294,143, July 18, 1927. Pure Sb is deposited from an electrolyte comprising a soln. of SbF_3 contg. 100-600 g. H_2SO_4 per l. and contg. a small quantity of free HF . Alkali metal fluorides and bisulfites also may be used in the electrolyte and various details of the process are given. Anodes of crude Sb contg. up to 5% Pb and 8% Sn may be used.

Plating non-metallic surfaces with metal. HARRY C. FISHER (to Richardson Co.). U. S. 1,704,125, March 5. A bituminous coating is applied to a surface such as *sheet roofing or metal* and is rendered tacky by means of a solvent; the product is then brought into contact with a film of finely divided metal supported on a body of water by surface tension and the surface is subsequently electroplated to unite the metal particles picked up by the tacky surface. An app. is described.

Chromium plating on other metals. H. LEISER. Brit. 294,484, July 21, 1927. Bright coatings are produced on articles such as knives, forks, or spoons of iron, steel or Al, by coating with Cr after preliminarily applying intermediate coatings of other metals such as Sn and brass. The Cr is deposited electrolytically but the underlying coatings may be applied in molten form.

Nickel plating. LOUIS F. NELISSEN. Fr. 645,155, Dec. 5, 1927. See Brit. 282,748 (C. A. 22, 3847).

Forming thin sheets of metal such as copper on rotating cathodes. HERBERT C. HARRISON. U. S. 1,704,247, March 5. An app. is described in which a porous partition serves to space the sol. anode material uniformly away from the surface of the cathode; the metal sheet formed is continuously stripped from the cathode and the stripping serves to cause the rotation of the cathode.

Electrolysis. JOSEPH L. WOODBRIDGE. Fr. 644,970, Dec. 1, 1927. Means for keeping the electrode elements sep. are described.

Preparing alumina for electrolysis. CONWAY VON GISEWALD, HANS SIEGENS and MARTIN MARSCHNER (to Metallgesellschaft A.-G.). U. S. 1,704,599, March 5. Discrete cryst. particles of alumina of small size are prepd. by quenching atomized fused alumina. An app. is described.

Coloring aluminum surfaces. PLATEN-MUNTERS REFRIGERATING SYSTEM AKTIE-GESELLSCHAFT (to Electrolux, Ltd.). Brit. 294,237, July 22, 1927. Al articles are subjected

to anodic treatment in a bath contg. a fluoride such as NaF, KF or NH_4F , and the color produced may be varied by adding an acid or alkali. Various details of procedure are given.

Improving objects of aluminum or its alloys. BOHUMIL JIROTKA. Ger. 471,053 and 471,054, June 18, 1926. Addns. to 469,534. The method of Ger. 469,534 (C. A. 23, 1104) is modified by connecting the object during its immersion in the acid bath with C or metals so that a closed elec. circuit is formed. The walls of the vessel contg. the bath may act as electrodes (471,053). The acid treatment may be preceded by treatment in alk. baths contg. metal salts, e. g., CuSO_4 , and may be followed by a usual electroplating process (471,054).

Apparatus for the electrolytic production of caustic soda. THE JESSUP & MOORE PAPER Co. Fr. 645,312, Dec. 3, 1927.

Electrolytic condenser. HARRY N. MILLER (to Fansteel Products Co.). U. S. 1,703,680, Feb. 26. An electrolyte comprising a substantially dry soln. of an ionogen such as NaHCO_3 and LiOH in glycerol is used with a filmed Al electrode and a cond electrode such as iron. Various structural features are described.

Electrolytic apparatus (with rotating cathodes) for the manufacture of metal sheets and tubes. E. KELSEN. Brit. 294,541, July 25, 1927.

Automatic control for electrolytic gas-generator. SIEMENS & HALSKE A.-G. (Karl Wiesenthal and Hans Klimitz, inventors) Ger. 470,931, May 13, 1928. A float in a tank surrounding the cell operates a switch so that the current is cut off when the liquid level is too high or too low.

Controlling electric furnaces. AKT.-GES. BROWN, BOVERI, & CIE. Swiss 127,396, June 17, 1927. App. is described for automatically regulating the energy supplied to an elec. furnace when the surface of the charge reaches a predetd. temp.

Tubular electric furnace for annealing wire, bars, tubes, etc. ÖSTERREICHISCHE SIEMENS-SCHUCKERT-WERKE. (Franz Berger, inventor.) Australian 112,116, Sept. 15, 1928.

Acetylene and other products in the electric furnace. I. G. FARBENIND. A. G. Brit. 294,494, Jan. 24, 1927. In the treatment of gases, such as in the production of C_2H_2 from H and CH_4 , in a furnace having a central electrode and an annular or tubular electrode through which the gases pass, an insulating mantle is arranged between the electrodes to prevent the arc taking the shortest path and to bring it to the length most favorable for the reaction. Various details of the app. used are described. H₂ is added from the gases leaving the reaction zone, mixed with addnl. CH_4 and again passed through the furnace, or the H may be caused to react with CO to form CH_4 for continuing the process. The yield of C_2H_2 is increased by the addn. of C_2H_6 , C_2H_4 , or oil gas. CH_2 and HCN may be obtained from the residual gases obtained in the synthesis of NH_3 from the gases obtained in the destructive hydrogenation of coal, tar or mineral oils, or coke-oven gas; in the latter instance the CO in the gas is first converted to CH_4 or C_2H_6 .

Electrodes for electric furnaces. V. C. DOERSCHUK (to Carborundum Co.) Brit. 294,176, July 19, 1927. Molding of electrode material is effected by sintering it in a mold. Manuf. of electrodes from a mixt. of coarse petroleum coke 35, fine petroleum coke 43, ground electrodes 10, pitch 9 and tar 3% and from other compns. is described, as is also an app. C linings for metallurgical furnaces may be similarly formed.

Electrode mounting for electric furnaces. SOC. ELECTRO-METALLURGIQUE DE MONTRICHER. Brit. 294,837, Oct. 13, 1927. Structural features.

Flame protectors for the electrodes of electric furnaces. COMPAGNIE DES FORGES ET ACIÉRIES DE LA MARINE ET D'HOMÉCOURT. Fr. 645,756, Dec. 15, 1927.

Electrodes. I. G. FARBENIND. A.-G. Fr. 644,966, Dec. 1, 1927. Electrodes for Edison storage batteries are made from metallic powder or flakes obtained by the decompn. of the corresponding metal carbonyls. Examples are given of the prepn. of Fe and Ni electrodes.

5—PHOTOGRAPHY

C. E. K. MEES

Photochemistry of silver halide. I. H. H. SCHMIDT AND F. PRETSCHNER. Z. wiss. Phot. 25, 293-307 (1928).—S. and P. have worked out a special quant. gravimetric method for the investigation of large quantities of photographic emulsions, in all cases investigated there is not an exact equiv. between Ag and halogen, but there is always a slight excess of Ag, although the emulsion is made with excess of halogen salt. This excess of Ag is relatively high with AgCl and extremely low with AgI . No rela-

tionship has yet been found between the excess of Ag and speed, ripening, and method of prepn. AgCl and AgI having approx. equal sensitivity contain different quantities of excess Ag. In their investigations of the equivalence law, Eggert, Noddack and Leszynski have overlooked the presence of this excess of Ag in photographic emulsions so that the equivalence law is not yet established. Weigert and Lühr have published a titrimetric method for the detn. of excess Ag. They do not seem to have considered the amt. of halogen salts in com. photographic plates. Correction appears necessary for their values. II. Decomposition of photographic layers with neutral acid, and with alkaline hydrogen peroxide and with ammoniacal ammonium sulfide. *Ibid* 354-62. —Decompn. with H_2O_2 is a function of the H-ion concn. Disintegration with H_2O_2 occurs in acid soln., the action taking place just as with acid alone. H_2O_2 assists only the action of the acid, so that the concn. can be lowered considerably. Neutral H_2O_2 decomposes the gelatin very quickly and the Ag halide ppts. The decompn. products of gelatin partly reduce the Ag halide. Alk. H_2O_2 reduces Ag halide to metallic Ag with or without gelatin. This process takes place quantitatively with AgCl and AgBr and reaches an equil. with AgI. The disintegration of photographic layers with H_2O_2 is not a function of the reduction potential of the alk. H_2O_2 but depends on the sensitivity of the photographic layer.

A. P. H. TRIVELLI

Problem of determination of the silver nucleus of ripening. H. KIESER. *Z. wiss. Phot.* 26, 305-10(1929).—A criticism of the publications of H. H. Schmidt and F. Pretschner (cf. preceding abstract).

A. P. H. TRIVELLI

Solarization with silver bromide. LÜPPO-CRAMER. *Z. wiss. Phot.* 25, 224-9 (1928).—A quant. investigation on the solarization and the action of some Br absorbers used with various photographic plates to prevent solarization.

A. P. H. TRIVELLI

Optical sensitization of silver iodide. K. BAUKLOH. *Z. wiss. Phot.* 25, 233-62 (1928).—Pure AgI can be made color sensitive by various dyes. The color sensitivity is about equal over the whole visible spectrum. The hypothesis of Wiener and Scholl, that for the max. sensitivity of a daguerreotype plate the anti-node of a stationary wave for yellow light has to lie at the surface of the AgI layer, could be supported by investigations with yellow sensitized plates. AgI-gelatin emulsions can be made color sensitive with the same dyes used for color sensitizing pure AgI layers. Old AgBr, gelatin plates become highly color sensitive when changed into AgI-gelatin plates. The sensitivity reaches to the extreme red. Increased color sensitivity was shown to be caused by Hg vapor.

A. P. H. TRIVELLI

Spectral distribution of the internal photoelectric effect in the silver halides. E. A. KIRILLOW. *Z. wiss. Phot.* 26, 235-48(1929).—A study of the photoelec. cond. of AgI, AgBr and AgCl over the entire visible spectrum, with exposures ranging from a few min. to several hours, shows that the max. photoelec. cond. corresponds with the greatest photochem. sensitivity. With AgI the photoelec. effect is always reversible after exposure. A nearly total regeneration of AgI takes place. With AgBr the effect is different. In the beginning the photoelec. cond. increases with shorter wave-length exposure until a decrease occurs, going over from a zero effect into a neg. effect. This neg. effect is irreversible. This was investigated further in relation to the pos. effect. AgCl reacts similarly to AgBr. An explanation of the phenomena is offered on the basis of the hypotheses of Trivelli Sheppard and Fajans.

A. P. H. TRIVELLI

Contribution to the study of the photolysis of silver bromide. (Bromine determination.) E. MUTTER. *Z. wiss. Phot.* 26, 193-233(1929).—It has been detd. by both qual. and quant. methods that the photolysis of AgBr in the presence of H_2O liberates Br which is finally present as a Br ion. A modification of Volhard's halogen detn. is a satisfactory titration method for this investigation. Soln. expts. show that HNO_3 reacts only in a very small degree on the photolytically formed Ag and that the degree of regression is a function of time and concn. of the reacting soln. H ions in concn. quantity and free O are formed. The much stronger photochem. decompn. of AgBr in the presence of nitrite than in the presence of H_2O is explained as a halogen absorption effect. A relation is detd. between the relative sensitivity of AgBr and the concn. of the soln. from which it is pptd. The process of photolysis with measured energies shows that the quantum equiv. of AgBr with nitrite is about one. The same relation is also found for Ag salts. No relation is found between the amt. of liberated Br and the density of the photochemically formed Ag.

A. P. H. T.

Formation of the photographic latent image. S. E. SHEPPARD. *Phot. J.* 68, 397-413(1928).—An introductory portion reviews latent image and sensitivity theories. It is pointed out that the balance of evidence leads to the conclusion that the latent image consists of development centers composed chiefly of colloidal Ag. These centers are formed by photochem. reduction of preëxisting sensitivity nuclei. These nuclei

sensitize for light but not for x-rays, and are furnished by gelatin. They consist probably of Ag_2S or Ag , or both, in specks too small to induce developability. The crystal character of the Ag halide grain implies a certain lattice energy. It is shown that this enters into the initial energy required to shift an electron. This initial energy quantum is much greater than that of photographically active light. Consequently, if the primary photochem. change is $\text{Br}^- + h\nu = \text{Br} + \ominus$, or $\text{Ag}^+ + \ominus \longrightarrow \text{Ag}(\text{met.})$, then the AgBr first reduced cannot be under normal lattice constraints. Investigations (with Vanselow) of the photoelec. potential of $\text{Ag}:\text{AgBr}$ electrodes in KBr solns. demonstrate that electrons and Br are released together by light acting on AgBr . The potential change consists of an initial inertia-less negativization passing over into a positivization. The positive potential rise can be reduced or eliminated by Br acceptors, or replaced by Br diffusion. It is concluded that the inner photoelectric effect occurs at sensitizing interfaces where the Ag halide is disoriented. The formation of the latent image may be interpreted as a concn. effect, because of the orientation of sensitizing specks and Ag halide at the interfaces. It is shown that the orientation hypothesis is adequate to explain the transition between general and optimum sensitizing by Ag_2S , Ag , or similar nuclei. As the no. of nuclei per grain increases, and their size diminishes, the general sensitizing (concn. effect) decreases, the optical sensitizing (wave-length shift) increases. The special features of reciprocity failure and incomplete summation are also accounted for. Thus the existence of threshold intensities is deducible from deficiency of nucleus concn. for poorly sensitized grains. The existence of an optimum intensity is also explained by dispersity considerations. As the light intensity is increased, i. e., the quantum density, so is the chance of formation of new independent nuclei competing with preëxistent ones in latent-image concn. At very high intensities, therefore, the grain behaves more as with x-rays, where preëxistent nuclei are ineffective.

S. E. SHEPPARD

Use of chloramine to remove traces of sodium thiosulfate from photographic plates and papers. J. M. EDER. *Phot. Ind.* 26, 347-8(1928); *Z. wiss. Phot.* 25, 401-2.—A 0.2% aq. soln. of chloramine is recommended for removing the last traces of $\text{Na}_2\text{S}_2\text{O}_3$ from plates and papers.

C. E. MEULENDYKE

Economic preparation of silver gelatino-bromide plates, and the duration of their sensitivity. HERVÉ. *Bull. soc. franç. phot.* 15, 70-4(1928).—H. has used gelatino-bromide plates and papers which he had prepd. in the years 1881-9. The emulsions ripened in NH_4OH had become useless, but the emulsions ripened by cooking still gave excellent results with an exposure 3 or 4 times longer than with a new plate. Some films exposed in 1889 and not developed had not kept their latent image but could be exposed again and gave excellent negatives. The com. emulsions of the same age were deteriorated greatly.

C. E. IVES

Development after fixation of photographic plates reversed by solarization. H. BELLIOU. *Compt. rend.* 187, 1289-92(1928); cf. *C. A.* 22, 921.—The theory proposed in the preceding paper has been used to explain the effect of phys. development, after fixation, on a plate part of which has been reversed and solarized. Some of the results conform with the previous hypothesis. One of the results is not in harmony with it, and shows that the hypothesis is not yet sufficient. It is now considered that the $\text{Na}_2\text{S}_2\text{O}_3$ extends the reduction to the metallic state of active mols. to a small no. of those surrounding them, thus behaving as a feeble and slow developer. The threshold of solarization is remote, but not infinitely so, as it would have to be according to the previous hypothesis.

E. P. WIGHTMAN

Use of tartrates and borotartrates as restrainers. L. LOBEL. *Bull. soc. franç. phot.* 70, 167-9(1928).—Boric or borotartaric acid when added to an elon-hydroquinone carbonate developer was found to produce an effect similar to that caused by the addn. of alkali bromide.

C. E. I.

Dye toning with single solutions. J. I. CRABTREE AND C. E. IVES. *Am. Phot.*

of these formulas has been satisfactory. A bath has been devised which contains a heavy metal, but only $\text{K}_3\text{Fe}(\text{CN})_6$, AcOH , a basic dye and acetone. Acetone is a necessary solvent to maintain the dye in soln. Nearly 200 basic dyes were examined and 10 were chosen as suitable for use in this bath. The optimum dye concn. varies with the dye used. A typical formula follows: Victoria green, 0.4 g.; acetone, 100 cc.; $\text{K}_3\text{Fe}(\text{CN})_6$, 1.0 g.; AcOH (glacial), 5.0 cc.; H_2O , to make 1 l. The time of toning varies from 5 to 15 min. at 70°F ., according to the depth of tone desired. The image

does not intensify appreciably during toning so that it is possible to commence toning with images of normal photographic quality. This process of toning seems to have a less propensity to produce rack marks when toning by the rack and tank systems than the usual 2-soln. dye-toning method. Intermediate tones can be obtained by using a suitable mixt. of the dyes.

C. E. IVES

Dyes in photographic reduction and oxidation processes. A. STEIGMANN. *Z. wiss. Phot.* 26, 299-304(1929).—A general discussion of the subject. Various chem. reactions are compared.

A. P. H. TRIVELLI

Short wave-length limit of the Herschel effect. E. MAUZ. *Z. wiss. Phot.* 26, 289-91(1929).—The short wave-length limit of the Herschel effect on Satrox paper was detd. to be about 600m μ .

A. P. H. TRIVELLI

Further investigations on the Herschel effect. LÜPPO-CRAMER. *Z. wiss. Phot.* 26, 249-59(1929); cf. *C. A.* 22, 3361; 23, 1069, 1070, 1359.—Further investigations on the Herschel effect in blue light indicated that this phenomenon is doubtful on account of infra-red transparency of the blue filters used. Eleven new dyes were investigated as sensitizers of the Herschel effect on Satrox paper in the presence of Br ions. It was found that this paper contains Cu salts which are sensitizers for the Herschel effect.

A. P. H. TRIVELLI

Lattice energies and photochemical decomposition of the Ag halides (SHEPPARD, JANSLOW) 3. **Carbocyanine dyes with substituents attached to the 3-C chain** (HAMER) 0. **Printing plates** (U. S. pat. 1,704,523) 18.

The **British Journal Photographic Almanac, 1929**. London: Henry Greenwood & Co., Ltd. Edited by George E. Brown. 800 pp. Paper, 2s., net; bound, 3s., net. Reviewed in *Chem. News* 138, 94(1929).

Color photography. SPLENDICOLOR. (Soc. anon.). Fr. 644,804, Oct. 19, 1927. Optical and constructional details of app.

Diaphragm filter for use in color photography. SOC. FRANÇAISE CINECHROMATIQUE (procédés R. Berthon). Brit. 294,493, July 22, 1927.

Optical system for color photography on embossed films. SOC. FRANÇAISE CINECHROMATIQUE (procédés R. Berthon). Brit. 294,579, July 26, 1927.

Photographic film. HAMILTON BRADSHAW (to E. I. duPont de Nemours & Co.). U. S. 1,703,470, Feb. 26. A backing comprising cellulose carbamate and which may contain other cellulose derivs. is used on sensitized films, such as those formed of a cellulose nitrate compn., in order to render them "non-static."

Photographic reversal films. I. G. FARBENIND. A.-G. Fr. 645,543, Dec. 10, 1927. See Ger. 469,968 (*C. A.* 23, 1359).

Cinematographic films. PALMIRE H. NICOLIC and MAURICE J. E. CLAUDE. Fr. 635,187, Jan. 12, 1927. Addn. to 635,828 (*C. A.* 23, 1359). C or other non-metallic substance of sufficient elec. cond. may be used for forming a conducting layer on films.

Cinematographic films. SOC. INDUSTRIELLE D'APPLICATIONS PHOTOGRAPHIQUES (S. A.). Fr. 645,357, Dec. 7, 1927. Thin films less than 0.06 mm. thick sensitized throughout or through part of the mass are used. Films from 0.02 to 0.06 mm. may be sensitized in the mass by the usual processes, or by the oxalid process by means of diazo compds. and phenol, development being effected with NH₃ or other vapor. The films may be sensitized during manuf.

Cinematographic and other films. SOC. INDUSTRIELLE D'APPLICATIONS PHOTOGRAPHIQUES (S. A.). Fr. 645,358, Dec. 7, 1927. Films of regenerated cellulose are made non-inflammable by aq. solns. of incombustible products used in such proportions that no discolorance or other injurious action takes place. The film may be impregnated with the soln. during manuf. before the first drying. A 10% soln. of NH₄ phosphate, with or without glycerol, may be used, or 8% solns. of (NH₄)₂SO₄ or NH₄Cl may be used. The film may be sensitized with diazo compds. and phenol and developed with NH₃ or other vapor.

Color films. SPLENDICOLOR (Soc. anon.). Fr. 644,803, Oct. 19, 1927. A cinematographic film in 3 colors is obtained from 3 monochrome negatives. The pos. film has on one side a layer of gelatinobromide and on the other a layer of pure gelatin. The blue image is obtained by toning the image due to the development of the gelatinobromide. The yellow and red images are obtained by dichromating the 2 layers, by simultaneous exposure of the 2 faces behind the red-orange and green positives, and by simultaneous dyeing of the 2 layers by contact with 2 gelatinized bands impregnated with yellow and red dyes, resp.

Photographic emulsions. I. G. FARBENIND. A.-G. Fr. 645,104, Dec. 3, 1927. Photographic emulsions of Ag salts are made with substances obtained by treating gelatin or other albuminoid material with S or S-contg. compds., which, by themselves, are not capable of increasing the sensitivity, *e. g.*, alkali or alk. earth sulfides or CS₂. Thus, in making a gelatin emulsion, 1 part of Na₂S is added to 500,000 parts of gelatin soln. An excess of Na₂S may be neutralized by a cautious oxidation with perchloric acid. Cf. C. A. 23, 1360.

Photographic emulsions. I. G. FARBENIND. A.-G. Fr. 645,471, Dec. 9, 1927. Org. substances which contain one or more atoms of S in simple combination, in neighboring position or not, and which, decomposing to form difficultly sol. compds. of Ag or in reaction with Ag salts, have the effect of increasing sensitivity, are added to photographic emulsions of Ag salts. Suitable substances are: (1) org. bisulfides of acid character, such as dithiobiscetic acid, and α, α' -dithiobispropionic acid; (2) org. sulfhydryls or their salts, such as thiomalic acid; (3) org. ring S compds. such as the bisulfide of β -mercaptothiocinnamic acid, and phenylthiobiazoline sulphydrate.

Photographic emulsions. MARIO ZYPPERMAYR. Fr. 644,666, Nov. 28, 1927. Colloids, particularly photographic emulsions, are hardened by heating them at the fusion temp. with simultaneous evacuation of the solvent vapors formed so that the fusion of the layer does not take place.

Photographic diazotype process. F. VAN DER GRINTEN and CHEMISCHE FABRIK L. VAN DER GRINTEN. Brit. 294,972, May 3, 1927. In a process in which layers, containing diazo compds., which are decomposed by light, are exposed under a transparent organic layer and then developed, discoloration of the background of the finished print is avoided by adding a reducing agent, such as an aldehyde, a compd. of CH₂O and NH₃, or a polyhydroxy compd., either to the sensitive layer or during or after development of the print. A stable layer, which is developable with alkali only, is obtained by adding the diazo compd. and to the reducing agent a noncoupling compd. which is converted into an azo-coupling component when the print is developed with an alkali. Numerous examples and details and modifications are described.

Photographic diazotype processes. KALLE & Co. A.-G. Brit. 294,247, Feb. 16, 1927. Premature coupling in light-sensitive layers contg. a diazo compd. and an azo dye coupling component is prevented by including in the layer H₂SO₄ together with an org. acid such as an hydroxycarboxylic acid as described in Brit. 210,822 (18, 1619) and Brit. 234,818 (C. A. 20, 716). An example is given of the use of the double salt of the SnCl₄ double salt of 4-diazo-1-dimethylaminobenzene, phloroglucinol and tartaric acid. Similar layers also may be used, which contain diazo compds. that couple with their own decompn. products when the latter are produced by light.

Photographic sensitive material. I. G. FARBENIND. A.-G. Brit. 294,161, Feb. 16, 1927. In prepg. antihalation supports for sensitive photographic layers, dyes are incorporated uniformly in one or more layers of the support 2 or more distinct absorption gaps such that the gap of one corresponds with a maximum absorption of one or more of the others; *e. g.*, malachite green may be used together with magenta or MnO₂ and washing blue may be used together. Gelatin, cellulose, or resins may be used as carriers of the dyes. Cf. C. A. 23, 781.

Sensitized photographic line-print sheet. WALTER N. BAKER and ARTHUR BAKER. U. S. 1,704,356, March 5. A flexible material such as cloth or paper is sensitized with a collodion or lacquer compn. and with an overlying coating comprising 28-35 oz., a pigment 1-5 oz., glue 5-9 oz., K₂Cr₂O₇ 75-100 grains and a light sensitive dichromate such as (NH₄)₂Cr₂O₇ 375-425 grains.

Light-sensitive resist for photographic etching. ALEX. B. DAVIS (to Watch Case Co.). U. S. 1,703,512, Feb. 26. Animal glue is used with an monohydroxy aldehyde such as hydroxybutyric aldehyde. U. S. 1,703,513, Feb. 26. A resist comprising a protein material such as animal glue, an alkali dichromate, and hydroxybutyric aldehyde.

Steel etching plates. JOHN C. JAMES (to T. V. Allen Co.). U. S. 1,703,512, March 12. A backward positive image is formed on a film; the surface of the film to be etched is sensitized, and the film is applied to the sensitized surface. After exposure and development, the unexposed parts being removed so that the image is etched; it is then treated with acid for etching.

Pictures visible by reflected or transmitted light. A. BLUMENHEIM. Brit. 294,161, Feb. 16, 1927. Pictures are produced on a transparent support such as glass, the transparency of which is reduced by means of an emulsion of a light sensitive material opaque.

6—INORGANIC CHEMISTRY

A. R. MIDDLETON

Nomenclature of inorganic compounds. ANON. *Ann. chim. applicata* 18, 557-65 (1928).—A review of the report of the Intern. Union of Pure and Applied Chemists the nomenclature of inorg. compds.

A. W. CONTIERI

Microscopic characteristics of the oxides of manganese and natural manganites. ORCEL AND S. PAVLOVITCH. *Compt. rend.* 187, 1295-7 (1928).—The oxides and manganites studied are: polianite, manganite, hausmannite, hollandite, romanechite, manganite, chalcophanite, hetaerolite, crednerite, sitaparite, manganosite, cesarolite and psilomelane. A table of optical characteristics and behavior towards etching reagents is given.

E. G. VAN DEN BOSCHE

Oxygen compounds of rhenium. I. AND W. NODDACK. *Naturwissenschaften* 16, 4 (1929).—A short review of recently detd. data on Re. The oxides of this metal are: (1) White oxide, Re_2O_8 , formed by continuous oxidation of Re or other oxides in O_2 below 150° . It m. 150° , going over into yellow oxide; it is sol. in water, and in ether and insol. in ether. The aq. soln. is weakly acid; it has peroxide qualities (discolors Ti and V solns., discolors KMnO_4). (2) Yellow oxide, Re_2O_7 , from metal and above 150° , yellow hexagonal crystals, m. 200° , is sublimable, b. 450° , is undecomposed (in O_2 or N_2), is water sol., hygroscopic, forming a strong acid, perrhenic acid.

The latter were analyzed (Na, NH_4 and Ba), the Na salt m. 300° undecomposed; the NH_4 or Na salt in H_2 at 400° gives black ReO_2 . $\text{Ba}(\text{ReO}_4)_2$ is sol., 30 g. in water. Aq. solns. of Re_2O_7 are easily reduced by Zn, HPO_2 , or SO_2 with yellow color to (3) red oxide, ReO_3 . A soln. of black ReO_2 in dil. HNO_3 gives a yellow solution, yellow with NaOH , from which $\text{Ca}(\text{OH})_2$ or $\text{Ba}(\text{OH})_2$ ppts. bright yellow precipitates, stable only in alk. soln. ReO_3 in soln. goes over on standing or heating to Re_2O_7 . (4) Violet and blue oxides formed by the action of SO_2 on dry or Re_2O_8 ; their compn. is variable and around Re_3O_8 ; they are assumed to be Re_3O_8 with ReO_3 or Re_2O_7 . (5) Black oxide, ReO_2 , formed from NaReO_4 heating in H_2 ; it is reducible in H_2 (800°) to metal.

B. J. C. v. D. H.

Studies on the higher oxides of some rare earth elements. H. ARMIN PAGEL AND H. M. P. BRINTON. Univ. of Minn. *J. Am. Chem. Soc.* 51, 42-56 (1929).—Generally accepted that the sesquioxides are the normal oxides of the rare earth elements. There is much uncertainty and contradiction in the literature on higher oxides.

For the methods of purification of La, Pr, Nd, Sm and Gd compds. cf. C. A. JONES. The compn. of the oxide of Pr obtained by ignition in air varies with the conditions of ignition and cooling, but with a given set of conditions reasonably constant oxides are obtained. PrO_2 of 99.2% purity was prepared by heating lower oxides in pure oxygen at high pressures. No definite explanation for not reaching a higher purity is given. The stability of PrO_2 at different temps. and pressures are presented. The effect of ceria in promoting formation of higher oxide by Pr is negligible at ordinary pressures, but is marked in high concns. of O_2 .

H. C. JOYNER

Action of bromine on phosphorus trichloride. T. MILOBEDZKI AND S. KRAKOWSKI. *Roczniki Chem.* 8, 563-7 (567 French) (1928).—The Br could not be combined with PCl_3 to form PCl_2Br_2 . The products of the action of Br on PCl_3 are yellow crystals of PCl_2Br formed according to the reaction: $2 \text{PCl}_3 + \text{Br}_2 \rightarrow \text{PCl}_2\text{BrCl}_2 + \text{PCl}_2\text{Br}$. Only free Br but also PBr_3 acts on PCl_3 in an analogous manner. BrCl derives PCl_2Br_n and PCl_2Br_n , where $n = 2-10$, seem to be derivs. of PCl_2Br and PCl_2Br , $\text{PCl}_2\text{Br}_7 + \text{PCl}_2\text{Br} = \text{PCl}_2\text{Br}_8$, $\text{P}_2\text{Cl}_4 + \text{Br}_2 = \text{PCl}_2\text{Br} + \text{PCl}_2\text{Br}_2 + \text{Br}_2$, etc.

J. K.

The action of bromine on strontium oxide and its hydrates. HORACE B. DUNN, HARNAM DAS SURI AND KISHEN LAL MALHOTRA. *J. Chem. Soc.* 1928, 3106-11.—The action of Br both as a vapor and in soln. in CCl_4 on anhyd. SrO (I), $\text{Sr}(\text{OH})_2 \cdot \text{H}_2\text{O}$ (II) and $\text{Sr}(\text{OH})_2 \cdot 8\text{H}_2\text{O}$ (III) has been studied. In neither case is there any chem. reaction between Br and I. II (prepd. from III by extrn. with alc.) reacts with Br vapor to give a substance contg. bromide (IV) and hypobromite (V). This substance on exposure to air contains only IV and bromate (VI). With Br in CCl_4 , II gives an appreciable amount of V. III reacts quantitatively with Br vapor to give IV and VI (no V); when dissolved in CCl_4 , crystals of IV appear after several weeks (their formation is retarded by isolation). Studies on the rate of this latter reaction show that there is an initial rapid chem. reaction followed by a slower one (apparently unimol.). The effect of the concn. of the Br soln. has been studied. Conclusion: VI is formed and almost immediately, but, up to 2 hrs., the rate of formation exceeds the rate of disappearance. At the end of the reaction, V is negligible or absent. The results show

that in the presence of sufficient water, the excess of Br oxidizes some of V to VI directly. Rama Krishna Bahl made similar expts. with iodine. There is no action with I, and small interaction with II, while the reaction of 5% iodine in CCl_4 with III is slow and not quant. Iodide and iodate are the main products with traces of hypiodite. The latter probably arises by the reaction of absorbed I on free $\text{Sr}(\text{OH})_2$ in soln.

W. C. F.

Action of water on tricalcium silicate and β dicalcium silicate. T. THORVALDSON AND V. A. VIGFUSSEN. Chem. Lab., Univ. of Saskatchewan, Can. *Trans. Roy. Soc. Can.* [3], 22, III, 423-31(1928); cf. C. A. 21, 3259.—The ratio of hydrolysis of tricalcium silicate and β -dicalcium silicate was studied to det. the chem. compn. of the products formed. The silicates were prepd. from marble and flint; after purification they were ground to pass a 200-mesh sieve and then treated with water in steel tubes until no evidence of unhydrolyzed particles could be obtained. Checks were made using gold tubes in place of the steel tubes. Tricalcium silicate hydrolyzed much more rapidly than the dicalcium silicate, and the rate of the latter after falling off increases again very rapidly. There was no indication of the existence of a stable hydrated dicalcium silicate. From comparisons of the lime-silica ratio the product of hydrolysis highest in lime which can exist in equil. with a soln. of $\text{Ca}(\text{OH})_2$ below satn. has approx. the compn. $3\text{CaO} \cdot 2\text{SiO}_2$. An inflection of the curve of hydrolysis at a point where the lime-silica ratio is about 1:1 indicates the formation of a hydrated monocalcium silicate. The products of hydrolysis of the 2 silicates examd. were identical.

J. W. SHIPLEY

Some new reactions of fusible and infusible white precipitates of mercury and their constitution. PRIYADARANJAN RAY AND PARESCHANDRA BANERJI. Univ. Coll. of Science, Calcutta. *J. Indian Chem. Soc.* 5, 715-9(1928).—According to Franklin's view (*J. Am. Chem. Soc.* 27, 820(1905); 29, 35(1907)) the infusible white ppt (I) of Hg is regarded as an ammonobasic compd., $\text{H}_2\text{N} \cdot \text{HgCl}$ (II) and the fusible white ppt (III) as $\text{HgCl}_2 \cdot 2\text{NH}_3$. To test this theory certain reactions of I and III were studied. Dry I heated on the water bath with EtSH in EtOH gave NH_3 , $\text{Hg}(\text{SEt})_2$, EtS HgCl and NH_4Cl . These results indicate that I acts both as II and as $[\text{H}_2\text{N} = \text{Hg}] \cdot \text{Cl}$ (IV). With $\text{SC}(\text{NH}_2)_2$ in EtOH or H_2O I gave NH_3 , NH_4Cl , H_2NCN , HgS and $\text{HgCl}_2 \cdot \text{SC}(\text{NH}_2)_2$. Here I acts both as II and as IV. With $\text{SC}(\text{NHPh})_2$ in EtOH I gave HgS and $\text{ClH}_2\text{N} = \text{C}(\text{NHPh})_2$. In this case I acts as IV. In each of the above cases the reactions of III were very similar to those of I. I is evidently an equil. mixt. of II and IV.

LOUISE KELLEY

Decomposition of alkaline earth sulfates. IV. J. ZAWADZKI, I. KOWALCZAKSKI AND S. ZEROMSKI. *Roczniki Chem.* 8, 359-68(1928); cf. C. A. 21, 2232.—Gypsum passes irreversibly and with considerable velocity into anhydrite at temps. above 1000° . Measurements of the decompn. pressures of gypsum indicate that the influence of the irreversible subsidiary reaction increases with rise in temp. The decompn. pressures of anhydrite between 1100° and 1220° are considerably lower than for gypsum, and are equal to those given by gypsum after long heating. The thermal decompn. of anhydrite is reversible, anhydrite being obtained by the action of SO_2 on a mixt. of 6 parts of CaO with 1 part of sulfate. Anhydrite decomposes to form the basic sulfate, $2\text{CaO} \cdot \text{SO}_3$, the heat of reaction being -109.36 g.-cal. The pressures of gas in equil. with basic sulfate at temps. up to 1200° are lower than those found for anhydrite, and the same pressures have been attained by the partial satn. of CaO with SO_3 .

B. C. A.

The decomposition of thiosulfates by hydrochloric acid. ORTWIN VON DRINES. Univ. Berlin. *Z. anorg. allgem. Chem.* 177, 13-16(1928).—About 80-90% of the salt is decompd. in accordance with the reaction $\text{Na}_2\text{S}_2\text{O}_3 + 2\text{HCl} = \text{SO}_2 + \text{S} + 2\text{NaCl} + \text{H}_2\text{O}$, but at the same time there are formed polythionic acids by parallel reactions. Various explanations are quoted to account for the facts, but D. advocates the following (I) $\text{H}_2\text{S}_2\text{O}_3 = \text{S} + \text{SO}_2 + \text{H}_2\text{O}$; (II) $\text{H}_2\text{S}_2\text{O}_3 = \text{SO} + \text{H}_2\text{SO}_3$; and from (II) are formed H_2S_x , H_2S and S, which interact with SO_2 to yield pentathionic acid and polythionates.

W. C. EBAUGH

Ion exchange of zeolite silicates with hydrolytically dissociated salts. II. Experiments with natural silicates. H. KAPFEN AND B. FISCHER. Landwirt. Hochschule Bonn-Poppelsdorf. *Z. Pflanzenernähr., Düngung u. Bodenk.* 12A, 8-37(1928); cf. C. A. 22, 200.—The naturally occurring zeolites, chabazite, stilbite (desmine), natrolite and apophyllite together with serpentine, wollastonite and talc were treated with solns. of hydrolytically dissocd. salts of Fe, Al, Cu and Zn. The "exchange acidity" developed in the minerals by this treatment was detd. by a subsequent handling with KCl. Chabazite and stilbite (desmine) showed the greatest tendency to exchange their cations for the cations of hydrolytically dissocd. salts. The titratable acidity

developed upon the subsequent handling with KCl soln. of the minerals which had previously been heated with the hydrolytically dissocd. salts was equiv. to that developed by the metallic ion which had exchanged with the K of KCl. The especial constitution of these silicates (*i. e.*, aluminosilicate nature of the combinations) substantiates the ideas of Gausson upon the relationship between the mol. proportion of SiO_2 , Al_2O_3 , bases and the acidity. Fe^{++} ions did not form a product with these minerals by the exchange reaction; the Fe^{++} was pptd. as $\text{Fe}(\text{OH})_2$ in the mineral powder. The entrance of cations, Fe^{++} , Al, Cu and Zn into the cryst. zeolites by the ion exchange reaction was not nearly so complete as their entrance in permutites and soil zeolites. The exchange acidity of these cryst. zeolites in which the action had been replaced by Fe^{++} , Al, Cu, or Zn was low at room temp., but increased at higher temps. The time required for the system to reach equil. was 24 hours or more. In soils and permutites, decreasing the size of the particles did not have an influence on the ion exchange, while with the natural silicates, decreasing the size of the particles increased the ion exchange greatly—*i. e.*, by increasing the surface exposed. An exchange acidity was developed in these natural zeolites by treating with acids. The more recent conceptions of Wiegner on the exchange reaction are discussed. The amts. of replaceable H ions in permutites and zeolites is very small in comparison with the other cations. The exchange reaction of other cations with the H ion probably does not take place until a relatively high concn. of H ion is present in the zeolites or permutites. The cations, especially Al, which give hydrolytically dissocd. salts are more responsible for the so called exchange acidity.

R. M. BARNETTE

New salts of tervalent iodine cations. FR. FICHTER AND SALOMON STERN. *Helv. Chim. Acta* 11, 1256-64 (1928).—Earlier research on tervalent I has expanded, supplying 7 new I salts. Iodine phosphate (IPO_4) is prepd. from a mixt. of I, H_3PO_4 and Ac_2O oxidized with fuming HNO_3 . Methods of prepn. of the following salts of tervalent I are given: trichloroacetate and its double salt with iodine iodate, monochloroacetate, dichloroacetate, monobromoacetate and methanesulfonate. The role of tervalent I as a cation was proved by its sepn. from a soln. of 5 g. iodine acetate in 35 cc. of Ac_2O by electrolysis.

C. SCOTT

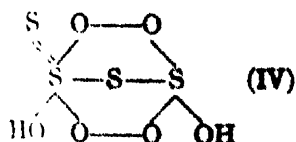
Dehydration and density of magnesium nitrate. L. LE BOUCHER. *Annales soc. espagn. fis. quim.* 26, 223-7 (1928).— $\text{Mg}(\text{NO}_3)_2 \cdot 6\text{H}_2\text{O}$ was dehydrated at atm. pressure over H_2SO_4 , giving stable $\text{Mg}(\text{NO}_3)_2 \cdot 2\text{H}_2\text{O}$ without loss of HNO_3 . $\text{Mg}(\text{NO}_3)_2 \cdot 6\text{H}_2\text{O}$ and $\text{Mg}(\text{NO}_3)_2 \cdot 2\text{H}_2\text{O}$ m. 89° and 120° to 125° , resp., and have a d. 1.6363 and 2.0256, resp. The d. of the hexahydrate given in the literature is incorrect. The course of desiccation for 164 days is shown in a table.

E. M. SYMMES

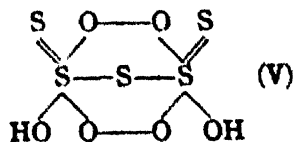
Comment on the note by L. Boucher. VII. Note on the law of additivity of volumes. E. MOLES. *Annales soc. espagn. fis. quim.* 26, 228-33 (1928); cf. preceding abstr. The results obtained by Boucher for $\text{Mg}(\text{NO}_3)_2 \cdot 6\text{H}_2\text{O}$, as well as those obtained by M. for nitrates of Ni, Co, Mn and Zn eliminate anomalies shown previously (C. A. 20, 1343, 22, 1919) in mol. vols. of nitrate salts of rare earths. For these the law of additivity of vol. holds true if the general formula $[\text{M}^{++}(\text{H}_2\text{O})_6(\text{NO}_3)_3]_3 \cdot [\text{M}^{+++}(\text{NO}_3)_2(\text{H}_2\text{O})_2]_2$ is assumed. The systematic lowering of mol. vol. with increasing at. wt. from the central atom is remarkable and suggests errors in the values of the d. of the nitrates.

E. M. S.

Constitution of several compounds analogous to the polythionic acids. J. A. CHRISTIANSEN. *Z. Elektrochem.* 34, 638-40 (1928); *Nord Kemistmölet (Finland)* 1928, 177-9. The tri-, tetra-, penta- and hexa-thio compds. of thionic acid, contg. *p*-toluyl as the substituted group, were prepd. to answer the question as to whether I and II or IV and V are more probable for the acids: (I) $\text{HO}_2\text{S-S-S-SO}_3\text{H}$ and (II) $\text{HO}_2\text{S-S-S-S-SO}_3\text{H}$ or (IV)



and



The prepn. of a new isomeride of the penta- compd., m. 160° , and the absence of the expected increase in dipolar moments from the tetra- to the hexa-compds. argue in favor of formulas IV and V. The K-absorption x-ray spectra are given for 8 compds.

MARY E. LEAR

The preparation and study of two ammonium molybdotellurates. V. W. MELOCHE AND WILLARD WOODSTOCK. Univ. of Wis. *J. Am. Chem. Soc.* 51, 171-4 (1929).—The object of this expt. was to see if the possible combinations between telluric and

molybdic acids might furnish a basis for the *detn. of a small amt. of Te* in a procedure similar to that used for the small amts. of P. It was found not possible. An NH_4 molybdotellurate was prepd. when an aq. soln. contg. equimolar portions of telluric acid and molybdic acid was treated with sufficient NH_3 to satisfy 3 of the H atoms of H_6TeO_6 . Clear white crystals sepd. upon evapn. and cooling. Analysis indicated the formula $3(\text{NH}_4)_2\text{O} \cdot 2\text{TeO}_3 \cdot 6\text{MoO}_3 \cdot 10\text{H}_2\text{O}$. When the soln. contained 1 mol. of telluric acid to 4 mols. of molybdic acid and enough NH_3 to satisfy the telluric acid, evapn. and cooling yielded white crystals of the compn. $3(\text{NH}_4)_2\text{O} \cdot \text{TeO}_3 \cdot 6\text{MoO}_3 \cdot 7\text{H}_2\text{O}$. Both compds. decompose upon heating at 550° , giving a residue of TeO_2 and a small amt. of MoO_3 .
H. C. JOYNER

Some derivatives of trimethylethylstannane (BULLARD, VINGER) 10.

GILMAN, ALBERT F., JR.: *Inorganic Reactions. A Dictionary of Chemical Equations.* Chicago: The Eclectic Publishers. 269 pp.

ORTOLEVA, GIOVANNI: *Nozioni di chimica inorganica ad uso delle scuole medie.* Milan: C. Tamburini. 6th ed. 366 pp.

7—ANALYTICAL CHEMISTRY

W. T. HALL

Microanalysis. Methods of dealing with small quantities of materials. W. GARNER. *Ind. Chemist* 4, 287-90, 332-5(1928). --A review. E H

Inorganic microanalysis. I. W. GARNER. *Ind. Chemist* 4, 357-62(1928).--The identification of inorg. compds. by the microscope differs from identification by the usual qual. methods in 3 main respects: (1) the most usual reagents used in the former produce double salts, the solv. of which is low, but not too low. Too low solv. results in an amorphous ppt. or in very minute crystals; (2) the double salts are usually formed independently of the other elements that may be present. Thus, when Cu and Cd are both present, $\text{KCNS Hg}(\text{CNS})_2$ would give immediate and definite evidence of both elements; (3) microchem. methods are more rapid. Detailed instructions for carrying out pptn. methods are given. The double thiocyanate reaction is very important for Zn, Cu, Cd and Co and of some importance for Ag, Pb, Au, Mn, Ni and Fe. The procedure for each is described. CsCl double salts are formed with the chlorides of Mg, Cu, Bi, Cd, Mn, Ni, Co, Zn, Sn, Pb, Sb and Hg. The reagent is chiefly of value for the last 4 of these. Cs_2SO_4 is of value in detecting Al and Cr. NH_4F gives double salts with Al, Cr, Ti, Fe and V; KNO_3 with Co; $\text{UO}_2(\text{C}_2\text{H}_3\text{O}_2)_2$ with Mg, Na and K; Na_2HPO_4 or $(\text{NH}_4)_2\text{HPO}_4$ with Mg, Mn, Ni and Co; $\text{Bi}_2(\text{SO}_4)_3$ with Na, K, NH_4 and Bi (with Na_2SO_4); H_2PtCl_6 with K, NH_4 and Na. The functions of the reagents KI , NH_4OH and HCl are also given. Eight photomicrographs are included. **II.** *Ibid* 410-14(1928) --G discusses the reagents H_2SO_4 (for Ca, Sr, Ba, Hg, Bi, Ag), oxalic acid (for Ca, Sr, Ba, Xn, Cd, Mn), HClO_4 , K_2CrO_4 (for Mn), Na bismuthate for Mn, dimethylglyoxime (for Ni), $\text{K}_4\text{Fe}(\text{CN})_6$ (for Fe, Cu, Ca, Sr, Ba, Mg), $(\text{NH}_4)_2\text{Cr}_2\text{O}_7$ (for Ag, Pb, Hg, Bi, Ca, Sr, Ba), Na_2CO_3 (for Zn, Ca, Sr, Ba), Na nitroprusside (for Zn, Cd, Mn, Cu, Ni, Co, Fe, Hg(ous)) and metallic Zn (for trees with numerous metals). A systematic scheme for the detection of the common inorg. and org. acids is given which is too lengthy and detailed to abstract. Eleven photomicrographs are included.
E. G. R. ARDAGH

Quantitative analysis depending on change in density. A. ZHESKOV. *J. Chem. Ind. (Russia)* 4, 762-3(1927). --The quantity of solid pptd. or gas evolved in a reaction is detd. by measurement of the d. change of the solns. The method can be applied to oxidation reactions by pptn. of an ionic product of the reaction. B. C. A.

Fajans' method of titration. H. A. J. PIETERS. *Chem. Weekblad* 26, 6-9(1929). --P. has extended the application of Fajans' method to several ions other than Ag, and investigated the suitability of many other dyes as indicators. Cl^- and I^- ions can be titrated in the same solution, with diiodofluoresce in (I) and eosin (II) as indicator for I^- , and fluorescein for $\text{I}^- + \text{Cl}^-$. In acid solns., NaCl can be titrated in the presence of Victoria violet (III), chromium green (IV) and tetrahydroxyanthraquinone, and KI in the presence of I, III, or IV. $\text{Pb}(\text{NO}_3)_2$ can be titrated with $\text{K}_4\text{Fe}(\text{CN})_6$ (standardized against KMnO_4) with the following indicators: Na alizarinsulfonate (V) (pink to yellow), bromocresol purple (VI) (yellow to peach), methyl red (red to yellow), rosolic acid (yellow to pink), bromothymol blue (VIII) (yellow to blue), cochineal (blue to

pink), or **III** (red to salmon). The results are about 1% high, making it necessary to standardize the $K_4Fe(CN)_6$ against Pb. These indicators are sensitive to free acid, making it necessary to neutralize the Pb solns. with 0.1N NaOH, using nitrophenol as indicator. $Pb(NO_3)_2$ can also be titrated with Na oxalate, using phenol red, brilliant yellow, **II**, **VI** or **VII**, or with $Na_2NH_4PO_4$ using **V** or **VIII**. G. CALINGAERT

New indicators. N. A. ZAITZEV. *J. Chem. Ind. (Moscow)* 5, 722-3(1928).—Azo derivs. of *N*-arylnaphthylamine-8-sulfonic acids often represent dyestuffs more or less sensitive to acids and to alkalis. Thus diazotized benzidine with 2 mols. of *N*-phenyl-1-naphthylamine-8-sulfonic acid (phenyl peri-acid) presents an indicator (**I**), [5,5'-*p*-biphenylenedisazobis(8-anilino-1-naphthalenesulfonic acid)]. A paper satd. with a soln. of the NH_4 salt of this indicator is pink; acids turn it to blue. On combining diazotized acetyl-*p*-phenylenediamine with phenyl peri-acid an indicator (**II**), [5-(*p*-acetamidophenylazo)-8-anilino-1-naphthalenesulfonic acid], is obtained, which is less sensitive to acids (not sensitive to acids like benzoic, salicylic, etc.) and, on account of its lack of sensitivity to $PhNH_2 \cdot HCl$, is *very suitable for $PhNH_2$ titrations* by HCl . A paper satd. with the NH_4 salt of this indicator (1:1000) was used for $PhNH_2$ titrations; it is red-orange in alk. soln., and blue in acid soln. When combining naphthalene acid with phenyl peri acid, an indicator (**III**), [5-(4-sulfo-1-naphthylazo)-8-anilino-1-naphthalenesulfonic acid], is obtained, which is less sensitive to acids but can be used for titrating OH^- -acid combined with phenyl or tolyl peri-acid (sulfonic blue R or B) gives an indicator (**IV**), [4-(4-anilino-5-sulfo-1-naphthylazo)-5-hydroxy-2,7-naphthalenedisulfonic acid], suitable for titrating free alkali. A paper permeated by a soln. of this dyestuff is blue, but changes to red by the action of alkalis, ammonia and $Ca(OH)_2$; the red changes back to blue by the action of atmospheric CO_2 . BERNARD NELSON

An examination of possible indicators to determine the pH of alkaline solutions. I. R. MCCRUMB AND W. R. KENNY. LaMotte Chemical Products Co., Baltimore, Md. *Ind. Eng. Chem., Anal. Ed.* 1, 44-6(1929).—The pH control by colorimetric methods for values above pH 10 was studied on buffer mixts. at about 0.2 pH intervals up to pH 14 over 30 dyes being used as indicators, but most of the said dyes proved to be decidedly unsatisfactory for the purpose. W. C. EBAUGH

Use of ammoniacal salts of mercury in quantitative analysis. I. A new method for the quantitative separation of aluminum from nickel. BOGDAN SOLAJA. *Archiv. Hist. Exptl.* 2, 136-41(1928) (141-2 French).—As CH_3NH_2 could not be used for the quant. sepn. of Al^{+++} from Ni^{++} in the presence of an excess of Cl^- (*C. I.* 22, 1238), the action of $Cl_2Hg(NH_3)_2$ on the cations of the third group has been studied systematically. The procedure is the same as the pptn. with CH_3NH_2 . $Cl_2Hg(NH_3)_2$ is added to the soln. in the form of a fine aq. suspension; $Al(OH)_3$ is pptd., however, in the presence of $(NH_4)_2SO_4$ and not in the presence of NH_4Cl , if the chloride ion is present, it must be expelled by means of concd. H_2SO_4 and the excess of H_2SO_4 neutralized by NH_4OH . The results obtained show a max. error of ± 0.6 mg. Al and ± 0.8 mg. Ni. The mechanism of the reactions involved and the application of this method for the sepn. of Al from Co and of Cr and Fe from Ni, Co and Zn is the object of further study. JAROSLAV KUČERA

Use of oxalic acid in microchemical analysis. K. I. MALJAROV. *Mikrochemie* 6, 92-6(1928).—The property of oxalic acid of expelling volatile acids from their salts affords a useful method of sepg. alkalis from alk. earths and both these groups from the heavy metals. Thus, if a chloride or nitrate soln. is evapd. with an excess of oxalic acid and the residue is heated until the excess is expelled, the alk. earths are converted into insol. carbonates and the alkalis into sol. carbonates. To sepg. alk. earths from magnesia the oxalate residue is ignited to obtain the oxides, from which the alk. earths may be extd. with water free from CO_2 . Zn, Cu and Mn are dissolved from the admixt. with Fe and Al by extg. the ignited oxalate residue with dil. HCl . Cr and Mn solns. are freed from chlorides by evapn. with oxalic acid and by ignition of the residue. B. C. A.

Uncombined iodotannic reagent. Iodotannic value of waters. G. CARPENTIER AND J. FRECHON. *Union pharmaceutique* 60, 259-61(1928); *Chimie et industrie* 20, 1071-2(1928).—Combined iodotannic soln. prepd. by warming 0.4% tannic acid soln. with 0.2% I does not give any color with distd., spring or river water. Uncombined reagent prepd. by adding 30 g. of Codex tincture of I (contg. $1/15$ of its wt. of I) to 1 l. of 0.4% tannic acid gives no color with distd. water; with natural waters it gives a carmine rose color which gradually changes to yellowish on adding excess of reagent. The no. of drops of reagent required to color 10 cc. of water and then render it colorless or yellowish depends on the compn. of the water, and can be used to det. it. It is sug-

gested that this be called the iodotannic no. The reaction is due to the presence of neutral and alk. salts which, in dil. soln., have a p_H value appreciably higher than 7. The reagent therefore constitutes a very sensitive indicator in alk. soln. The nature of the I complex formed has not been detd.

A. PAPINEAU-COUTURE

Determination of cadmium as metal in the analysis of organic and inorganic substances. H. TER MEULEN AND M. L. H. J. RAVENSWAAY. *Rec. trav. chim.* 48, 198-200(1929).—By heating 0.1-0.5 g. of an org. substance in a stream of pure H_2 , any Cd present is reduced to metal which can be deposited in a weighed tube. If the substance contains halogen or S, it is necessary to mix some NH_3 with the H_2 and some $CaCO_3$ with the substance. This method can be applied to Cd compds., even alloys. An attempt to apply the same procedure to the detn. of Zn, which is also quite volatile, was not entirely successful.

W. T. F.

Determination of minute quantities of lead by electrolysis. A. SEISER, A. NECKE AND H. MÜLLER. *Z. angew. Chem.* 42, 96-8(1929).—The method is suitable for detg. Pb in blood, etc. For the destruction of org. matter it is recommended to mix the substance with 5% by vol. of concd. H_2SO_4 and heat in a muffle at about 500° . There is no loss of Pb if the temp. does not exceed 500° . After the heating, there are likely to be some particles of C which can be removed by digestion with H_2SO_4 in a Kjeldahl flask, with occasional dropwise addn. of concd. HNO_3 . Cool, dil. to 100 cc., boil, neutralize with NH_4OH ; from a dil. H_2SO_4 soln., filter off the $PbSO_4$, taking the usual precautions. Dissolve the $PbSO_4$ in hot 20% HNO_3 , evap. the soln. to dryness, add 1-1.5 cc. of HNO_3 (which is free from nitrous acid), add 5 cc. of 1% $CuSO_4$ soln., and electrolyze with a current of 2 amp. at 3.3 v. Pt-gauze electrodes are recommended. After 45 mins. remove the anode, wash with water, shake off as much of the water as possible, and dip it into a soln. of tetramethyldiaminodiphenylmethane in AcOH. Compare the blue color with that similarly developed with PbO_2 obtained by the electrolysis of $Pb(NO_3)_2$ solns. of known concn.

W. T. H.

Sensitive color reactions for magnesium. H. D. BARNES. *J. S. African Chem. Inst.* 11, 67-8(1928).—A neutral Mg-salt soln. contg. 0.5 mg. of metal/l. yields a definite orange color when 10 cc. of the soln. is treated with 0.2 cc. of a 0.1% soln. of Clayton yellow and 0.5 cc. of 4N-NaOH soln. With more concd. solns. of Mg salts (5 mg./l.) a brick-red color is obtained. Ca in concns. not exceeding 300 mg./l. does not interfere, but larger amts. produce opalescent solns. with the alkali.

B. C. A.

Volumetric determination of potassium. G. JANDER AND O. PFUNDT. *Chem. Fabrik* 1928, 435-6, 446-8.—An account of work already published (*C. A.* 21, 3852), with a description of modified apparatus.

B. C. A.

Microchemical determination of sodium. E. DI BENEDETTO AND A. D. MARENZI. *Rev. centro. estudiantes farm. bioquim.* 16, 592-5(1927).—In Nau's modification of Blanchetière's method, the uranyl Mg Na acetate is pptd., sepd., and washed in the centrifuge tube.

B. C. A.

Nitrogen determination in ammonium sulfate and ammonia liquor. J. H. SRIJNS. Gasfabriek "Keilehaven," Rotterdam. *Het Gas* 48, 540-3(1928).—The NH detn. by the aldehyde method is described; it has been used in plant practice satisfactorily for over 5 years. The method of Sander (*C. A.* 16, 1057) consists in uniting NH_3 with formaldehyde and titrating the liberated acid. For the sulfate detn. 25 cc. of the aq. soln. (0.1 to 0.2 g. salt) is neutralized with 0.1 N NaOH, methyl orange being used as indicator. From 5 to 10 cc. of com. formaldehyde dild. with 20 cc. of water is neutralized to phenolphthalein with 0.1 N NaOH and then added to the above soln. The mixt. is then titrated with 0.1 N NaOH, phenolphthalein being used as indicator. In ammonia liquor, 10 cc. in an Erlenmeyer flask is diluted with water, and the volatile NH_3 detd. by titration with 0.1 N H_2SO_4 (methyl orange). The soln. is then boiled for 5 mins., the flask corked and cooled. To it is added 10 cc. of neutralized formaldehyde soln. and the mixt. is titrated with 0.1 N NaOH to a permanent pink.

B. J. C. VAN DER HOEVEN

Sulfur determination. N. DE VOOGD. *Het Gas* 49, 50(1929).—Time is saved over the Eschka method with the following procedure (Parr): Mix 0.5 g. coal with 14 g. Na_2O_2 and 1 g. $KClO_3$ and ignite in a Ni or V. A. steel bomb. Wash into a 250-cc. beaker, filter, dil. to 250 cc., make acid with HCl, boil and add 20 cc. of 10% $BaCl_2$ soln.

B. J. C. VAN DER HOEVEN

Spectrographs for the analysis of metals. EWALD. *Chem. Fabrik* 1928, 501-3.—A description of a no. of com. types.

H. G.

Determination and separation of rare metals from other metals. XII. Separation of lithium from potassium, sodium and magnesium. LUDWIG MOSER AND KARL SCHURR. *Tech. Hochschule, Wien. Monatsh.* 51, 23-42(1929).—Of all the methods

ested, the best results were obtained in the sepn. of Li from Na and K by a modified procedure similar to that recommended by L. W. Winkler, which depends upon the fact that anhyd. KCl and NaCl are insol. in isobutyl alc. It is necessary, however, to make sure that both the chlorides and the alc. are absolutely anhyd. Detailed directions are given for carrying out the sepn., using 3 extns. each with 10 cc. of isobutyl alc. (dissolving the residual chlorides and dehydrating between the extns.). Then, by ignition with a mixt. of 3 parts NH_4Cl and 1 part $(\text{NH}_4)_2\text{SO}_4$, both the Li and the K-Na mixt. can be weighed as sulfates. It is necessary to deduct 0.5 mg. from the wt. of Li_2SO_4 and to add the same value to the wt. of $\text{Na}_2\text{SO}_4 + \text{K}_2\text{SO}_4$. Sepn. methods based on (1) treatment with concd. HCl, (2) pptn. with H_2SiF_6 , (3) treatment with anhyd. pyridine and (4) treatment of the perchlorates with butyl alc. and EtOAc proved unsatisfactory. For the sepn. of Mg from Li, heating with HgO and treatment with NH_4 carbonate and alc. proved unsuccessful, but excellent results were obtained by pptg. Mg with *o*-hydroxyquinoline. For the analysis of a mixt. of Mg, Li, Na and K, therefore, it is recommended to ppt. first the Mg with the above reagent in the presence of NH_4OH and NH_4Cl , then remove NH_4 salts and treat the anhyd. chlorides with isobutyl alc., eventually weighing the 3 alkali metals as sulfates. W. T. H.

Direct detection and determination of alkali sulfate in certain other metal sulfates. ALFRED WÖHLK. *Dansk Tids. Farm.* 2, 315-9(1928).—Dissolve 1 g. of the sulfate in 100-150 cc. H_2O and ppt. with an excess of $\text{Ba}(\text{OH})_2$ (0.25 N or approx. 4%). Boil for at least 10 mins. in an open dish, adding H_2O to make up for loss by vaporization. Filter while hot. To the filtrate add 0.5 cc. 1% phenolphthalein indicator, and then pass in CO_2 until the red color disappears. In a large dish boil the soln. until excess CO_2 is driven off and the bicarbonate is partly or completely changed to carbonate. Cool and filter. Using methyl red as indicator, titrate the filtrate with 0.1 N HCl from red (from phenolphthalein) over yellow and to red. Blank expts. with $\text{MgSO}_4 \cdot 7\text{H}_2\text{O}$ gave less than 1 cc. 0.1 N HCl. With K_2SO_4 100% was recovered. O. A. N.

Analysis of calcium citrate. BENIAMINO MELIS. *Rivista ital. essenze profumi* 9, 32-40(1927).—Warrington's method is not recommendable for detg. Ca citrate without extractive substances because of the slight soly. and the difficulty in calcining. By modifying the method, the calcining is avoided by redissolving the Ca citrate in HCl, neutralizing with NaOH, pptg. CaCO_3 in the cold with a Na_2CO_3 soln. and titrating in the usual manner, after washing. A more speedy method is as follows: Decompose the still moist citrate with dil. H_2SO_4 , boil, cool and add more dil. H_2SO_4 , dil. with H_2O and titrate with 0.1 N KMnO_4 . The citric acid equiv. is obtained on the assumption that 1 mol. of acid is oxidized by 9 atoms of O. R. SANSONE

Determination of potassium cyanate. Application of the method to the detection and determination of cyanate formed by the action of copper sulfate on an alkali cyanide. J. LEBOTCO. Faculté Pharm., Paris. *Ann. fals.* 21, 595-600(1928).—See C. A. 21, 3154; 22, 364. A. PAPINEAU-COUTURE

Estimation of potassium as perchlorate. A. TORSTENSEN DALSGAARD. V. Stein's Laboratory, Copenhagen. *Dansk Tids. Farm.* 2, 258-73(1928).—Detailed directions for carrying out the analysis are given; they differ only slightly from those usually followed. O. A. NELSON

Volumetric determination of potassium and sodium ferrocyanides by means of zinc sulfate solution. ANON. *Przemysl Chem.* 13, 65-6(1929).—This method is applicable to the analysis of industrial salts, and compares well with the electrometric method. The soln. is titrated with 0.2 N ZnSO_4 . The end point is reached when no blue color is produced at the meeting of the spreading drops of the soln. titrated and of a ferrous ammonium sulfate soln. both placed on ash-free and Fe-free filter paper. The ZnSO_4 soln. must be standardized against that alkali ferrocyanide for the analysis of whose salts it will be used later. This method can be used also for the detn. of ZnSO_4 . The moisture in the ferrocyanides can best be detd. by drying the salt at 125° and later correcting for the water of crystn. A. C. ZACHLIN

Standard method for the examination of potassium ferrocyanide. H. MOLL. *Chem. Weekblad* 25, 657-8(1928).—Three usual methods are mentioned, namely, (1) conversion to HCN by acids and collecting over KOH, (2) oxidation with KMnO_4 , (3) pptn. with sol. salts of metals such as Zn or Cu. Only the last method using ZnSO_4 gives consistent and satisfactory results. An unknown soln. is acidified slightly and titrated with 0.2 N ZnSO_4 soln., Fe^{+++} being used as an outside indicator. Lack of a blue color indicates that the end point is reached. M. ACHTERHOF

Stability of ferrous sulfate solutions and their use in standardizing permanganate. JOHN A. N. FRIEND AND ERIC G. K. PRITCHETT. *J. Chem. Soc.* 1928, 3, 27-32.—The use of a trap contg. NaHCO_3 soln. can be avoided in the standardization of KMnO_4 .

by Fe if the Fe is dissolved in a flask with a vertical tube as reflux condenser. The following directions are recommended: Dissolve 1.4 g. of Fe in 150–200 cc. of 4 N H_2SO_4 in a 500-cc. flask fitted with a stopper carrying a 20-in. tube of 0.2 in. diam. Heat on the water bath until the Fe is dissolved, cool rapidly, make up to 250 cc., mix and use 25 cc. for the titration. F. E. BROWN

Titration of bleaching powder with nitrite solution. Z. KERTÉSZ. *Z. anal. Chem.* **74**, 105–8(1928).—K. has already published a method for titrating hypochlorite solns. with NaNO_2 soln. (*C. A.* **18**, 797, 2301). The method succeeds with normal bleaching powders or those which have weakened by standing in the air. If, on the other hand, the sample is high in lime, it is necessary to add some NaHCO_3 . In the analysis of NaClO and KClO solns. a little H_3BO_3 should be added. W. T. H

The detection of chloramine-T and its differentiation from hypochlorites. H. VAN URK. *Chem. Weekblad* **26**, 9–10(1929).—Chloramine-T is used extensively as a substitute for hypochlorites. It is similar to NaOCl in many reactions, particularly in liberating I from KI. The following table gives reactions which will differentiate between the two:

Reducing agent	Chloramine	NaOCl
thalleoquinine reaction	negative	positive, green coloring
guaiacol tincture	neg. at room temp. decolorized by boiling	immediate decolorization
resorcinol	green, then yellow; red by heating	purple-red, immediately
naphthol	colorless, yellow by boiling	blue-green
reduced indigo-carmin solution	blue	decolorizes the blue solution
alkaline pyrogallol	reddish brown	dark reddish brown
MnCl_2	negative	brown

Also the presence of sulfate can be ascertained in the ash of chloramine. G. C.

Conductometric titration of phosphoric acid with caustic soda. MISS J. C. LANE AND L. J. VAN DER WOLK. *Rec. trav. chim.* **48**, 83–92(1929). (In English.) The conductometric expts. here described show that H_3PO_4 can be titrated with accuracy by this method only when NaOH free from carbonate is used, when the cell is kept 25° out of contact with air contg. CO_2 and when the titration is stopped at the inflection point corresponding to the neutralization of 1 H in the H_3PO_4 mol. W. T. H

Fatal thallium poisoning, and determination of thallium in cadavers as thallous iodide. R. FRIDL. *Ber. ungar. pharm. Ges.* **4**, 43–9(1928).—The Tl was detd. titrimetrically with 0.1 N KI soln. Of 2.5 g. of Tl acetate taken *per os*, there were found 3.3 mg. in 100 g. of liver, 1.6 mg. in 98 g. of kidney, 5.0 mg. in 100 g. of urine, the greater part having already been eliminated in the urine. B. C. A

The detection of thallium in the organs of small animals which have been poisoned with "Zelioweizen." JOSEF SCHNEE. *Tierärztl. Hochschule, Vienna. Beitr. ges. Med.* **7**, 14–31(1928); *Ber. ges. Physiol. exptl. Pharmacol.* **45**, 732.—The organs are ashed with ClO_3^- and HCl , the resulting soln. is neutralized with NH_4OH and pptd. with H_2SO_4 . The sulfides are ignited so that the aq. insol. Fe_2O_3 can be sepd. from the sol. Ti_2SO_4 . For further detn. of Tl, the method of Browning and Palmer is used. In poisoned animals (5 rats, 1 dog) 60 mg. Ti_2SO_4 per 100 g. was found in the organs. The musculature contained only a small amt., the brain and blood only a trace. R. C. WILLSON

Sources of error in organic elementary microanalysis. I. Determination of nitrogen by Dumas' method. F. BÖCK AND K. BEAUCOURT. *Mikrochemie* **6**, 69–8(1928).—The occasional slightly high results obtained in Pregl's microchem. method of detg. N are attributed to incomplete removal of adsorbed gases in the CuO packing in the tube by a cold current of CO_2 . This source of error is avoided by carrying out a blank analysis at the beginning of a series of tests and using the same coarse CuO for a no. of tests, changing only the fine CuO with every test. There is no advantage in arranging the Cu column at the end of the tube as recommended by Duhskev, for Pregl's original arrangement of this column between two columns of CuO is equally satisfactory. B. C. A.

Analysis of acetic anhydride in the presence of strong acids by thermometric titration. TAKAYUKI SOMIYA. Tokyo Imp. Univ. *Proc. Imp. Acad. (Japan)* **5**, 34–7(1929); cf. *C. A.* **21**, 3030.—The analysis depends on the fact that PhNH_2 combines

immediately with Ac_2O , liberating considerable heat. As standard solns. 2.780 N Ac_2O (150 cc. 20% Ac_2O , 100 cc. 93% Ac_2O , and 200 cc. C_2Cl_4 or 100 cc. 100% AcOH , 120 cc. 93% Ac_2O and 200 cc. C_2Cl_4) and 2.743 N PhNH_2 (100 cc. PhNH_2 and 300 cc. C_2Cl_4) were used. Strong acids retard the velocity of acetylation of PhNH_2 ; addn. of $\text{C}_6\text{H}_5\text{N}$ helps to overcome this difficulty, but the amt. of $\text{C}_6\text{H}_5\text{N}$ added should be less than that of AcOH in the soln. to be titrated. Details are given of the app. used and of the method.

C. J. WEST

Determination of small quantities of carbon monoxide and methane in mixtures of nitrogen and hydrogen. K. KELLER AND W. KLEMP. *Ber. ges. Kohlentech.* **2**, 246 (1927).—The gas mixt. is passed successively through a porcelain tube contg. CuO at $500\text{--}520^\circ$ whereby H and CO are oxidized, through CO_2 absorption app. contg. Ba(OH)_2 soln. (1 cc. = 1 cc. CO_2 at 20° and 760 mm.), through a CuO tube at 850° to oxidize the CH_4 , through a second CO_2 absorption app., and into a buret in which the N is collected and measured over water.

B. C. A.

A new reaction of urea. F. PISANI. *Ann. chim. applicata* **18**, 555-6 (1928).—A new reaction for the identification of urea depends on the action of hypobromite in alk. soln. oxidizing urea to hydrazine as follows: $\text{NH}_2\text{CONH}_2 + \text{NaOBr} = \text{NH}_2\text{C(ONa)NBr} + \text{H}_2\text{O}$; $\text{NH}_2\text{C(ONa)NBr} = \text{NH}_2\text{N.C(ONa)Br}$; $\text{NH}_2\text{N.C(ONa)Br} + \text{NaOH} = \text{NH}_2\text{NHCOONa} + \text{NaBr}$; $\text{NH}_2\text{NHCOONa} + \text{H}_2\text{O} = \text{NaHCO}_3 + \text{NH}_2\text{NH}_2$. The hydrazine is readily identifiable. The reaction is effected by adding NaOBr drop by drop to the alk. soln. of $\text{CO(NH}_2)_2$, one drop being enough for 2-3 mg. urea. Then 5% H_2Cl soln. is added in slight excess, and the soln. is filtered. Four cc. of 50% NaOH soln. is then added to the filtrate, when the Hg^{++} is reduced to the metal. This is a characteristic reaction, as it is not shown by NH_4 salts, ureides, etc. It is not obtained by using other oxidizing agents as KMnO_4 and H_2O_2 . It is a very sensitive reaction, 2-3 mg. urea being sufficient.

A. W. CONTIERI

Method for determining total nitrogen in urea-nitrate mixtures. R. LUCAS AND W. HIRSCHBERGER. *Z. angew. Chem.* **42**, 99-100 (1929).—A mixt. of urea and nitrate offers difficulties in the ordinary Kjeldahl detn. because of the 2 states of oxidation of the N . The following procedure overcomes the difficulties and serves to give correct N values even in a mixt. of urea, NaNO_3 and CaCN_2 . Dissolve 10 g. of the mixt. in water and dil. to 1 l. Take 50 cc. of the well-mixed soln. in a Kjeldahl flask, add 5 g. of Fe powder and 50 cc. of 9 N H_2SO_4 . Place a funnel in the neck of the flask and allow the reaction to take place at room temp., cooling if it becomes violent. When no more H_2 is being evolved, evap. till FeSO_4 begins to sep. Cool, add 25 cc. of concd. H_2SO_4 and evap. to fumes. Cool, dil., neutralize and distil off the NH_3 as in the usual Kjeldahl method.

W. T. H.

Two new methods for the determination of phenol in waste liquors. H. DERE. *Unt. Inst. of Food Chemistry, Frankfurt.* (*Chem.-Ztg.* **52**, 983-5 (1928).—(Method 1.) To 20 cc. of well shaken, waste liquor, add 10 cc. of satd. Zn(OAc)_2 soln., 40 cc. of a 1% NaNO_2 soln. (or more if necessary), 10 cc. of dil. H_2SO_4 (1:3) and shake for 3-5 hrs. Filter, acidify the filtrate with dil. H_2SO_4 , add a few drops of H_2O_2 and distil with steam until the distillate no longer gives a positive test for phenol with Millon's reagent and FeCl_3 . Make the distillate alk. with NaOH and evap. Transfer the residue to a 100 cc. volumetric flask and fill to the mark. Mix 10 cc. of this soln. (or more if phenolic content is low) with H_2O and warm to $50\text{--}60^\circ$. Add 15 cc. of 0.1 N I soln. (more if phenolic content is high), let cool, acidify with dil. H_2SO_4 and titrate back with 0.1 N thiosulfate soln. (Method 2.) Mix 55-60 cc. of the soln. (in the 100 cc. flask) with a knife-point full of baryta. Shake and allow to stand a few mins. Filter and mix 25 cc. of the filtrate with about 10 drops of dil. H_2SO_4 . Filter off the BaSO_4 and wash the filter 2-3 times with the least possible CO_2 -free H_2O . Add exactly 0.2 cc. of a 0.1% alizarin yellow soln., and first with strong NaOH and dil. H_2SO_4 and then with 0.1 N alkali and acid, run, to a pH 11.04 with the aid of a suitable buffer soln. Then add about 0.1 cc. of 1% phenolphthalein and titrate with 0.1 N H_2SO_4 to pH 8.4, again using a buffer. From 0.1 cc. of 0.1 N acid used, the correction for pure H_2O is subtracted. One cc. of 0.1 N acid is equiv. to 9.4 mg. phenol. Under normal conditions the no. of cc. of 0.1 N acid used multiplied by the factor 2.09 gives g. of phenol per l. R. C. E.

A new metallic nitrosophenylhydroxylamine internal complex and its application to microchemical analysis. ARDINO MARTINI. *Anales asocn. quim. Argentina* **16**, 117-24 (1928).—Cupferron is a very sensitive specific reagent for U and Ba , and can be used for the detection of Cu , Cd , Ca and Sr . To differentiate between Cd and Ca , or Sr , after ppt. the three cations by cupferron, NaBr and brucine acetate are added; as a result, characteristic crystals can be seen under the microscope (*C. A.* **21**, 3327). By repeating the test, but adding to the ppt. a drop of a satd. Na_2SeO_3 soln., lenticular

crystals of CaSeO_3 are obtained (*Rev. Universidad Nacional Cordoba* 12, No. 10-2(1925)). In these tests the original solns. must first be neutralized with alkali or NaOAc .
E. M. SYMMES

The fatty acids and component glycerides of some New Zealand butters (HIL-DITCH, JONES) 12. The preparation and study of two NH_4 molybdotellurates (ME-LOCHE, WOODSTOCK) 6. The I content of Norwegian fish and fish products (LUNDE, *et al.*) 12. The effect of Sn on the nature, notably on the rolling characteristics, of Siemens-Martin ingot steel (KELLER) 9.

Standard Methods of Analysis. Analysis of Aluminum and Aluminum Alloys. New Kensington, Pa.: Aluminum Co. of America. 25 pp.

BERRY, A. J.: Volumetric Analysis. Cambridge, Eng.: Univ. Press. 4th revised. 154 pp. 6s. Reviewed in *Chem. News* 138, 93(1929).

8—MINERALOGICAL AND GEOLOGICAL CHEMISTRY

EDGAR T. WHERRY AND J. F. SCHAIRER

List of publications on the geology of Illinois. M. M. LEIGHTON. *Ill. Dept. Registration and Education, Division State Geol. Survey, January 1929*, 3-71. E. H.

Crystal structure of cinnabar and covellite. B. GOSSNER AND F. MUSSGANG. *Centr. Min. Geol.* 1927A, 410-13.—Cinnabar has a 4.17, c 9.50 A. U.; space-group D_3^4 or D_2^6 . Covellite, CuS , has a 3.81, c 16.46 A. U.; space-group D_{6h}^4 , with 6 mols in the unit cell. B. C. A.

Formula and crystal structure of tetrahedrite. F. MACHATSCHKI. *Norsk geol. Tidsskr.* 10, No. 1, 10 pp.(1928).—Debye-Scherrer diagrams for tetrahedrite are very similar to those for sphalerite; the bivalent metals are supposed to be present as admixed isomorphous sulfides, and the ratio $\text{R}^{\text{I}}:\text{R}^{\text{III}}:\text{S}$ is 3:1:3. Silver fahl ore from Colquechaca, Bolivia, has a_0 10.41 A. U., and fahl-ore from Felsöbanya has a_0 10.29 A. U. The unit cell contains 8 mols. $\text{R}_3^{\text{I}}\text{R}^{\text{III}}\text{S}_2$ (56 atoms), while in a ZnS cell 64 atoms are present. The following ds. are computed: Cu_3SbS_2 4.88, Cu_3AsS_2 4.31, $75\text{CuSbS}_2 + 25\text{Ag}_3\text{SbS}_2$ 5.28, $75\text{Cu}_3\text{AsS}_2 + 25\text{Ag}_3\text{AsS}_2$ 4.74. Tetrahedrite is hexakis-tetrahedral, space-group T_2^3 ; distance $\text{Sb}-\text{S}$ 2.45 A. U., $\text{Cu}-\text{S}$ 2.24 A. U.; shortest distance $\text{Cu}-\text{Sb}$ 3.25 A. U., $\text{Cu}-\text{Cu}$ 3.65 A. U. B. C. A.

Synthetic spinel. F. RINNE. *Fortschritte Mineral. Kryst. Petrog* 12, 68⁹ (1927).—Skeletal formation is responsible for a recognizable gleam. At the lower end of a crystal the form of octahedra lacking upper octahedral faces may be noticed. Icositetrahedral faces form at the bottom of the pear instead of at the top. These phenomena are explained by differences in temp. between the top and bottom of the same crystal. Using a melt of KHSO_4 , compds. acting as solvents may be obtained from the synthetic spinels. When there is an excess of $\text{MgO}.\text{Al}_2\text{O}_3$ and the spinel is exposed to 1000° , crystals of corundum are formed. A large series of artificial spinels with an excess of Al_2O_3 is available so that optical properties and chem. compn. can be correlated, and there is a regular connection between compn. and n . S. L. B. E.

Arrangement of microcrystals in the banded "supposed aragonite (Arareishi)." H. FUKUSHIMA. *Mem. Coll. Sci. Kyōtō Imp. Univ.* 11, 223-7(1928).—X-ray analysis shows that the banded mineral "arareishi," previously supposed to be aragonite, consists of calcite crystals, the principal axes of which are perpendicular to the surfaces of the layers. B. C. A.

Olivine of Linosa (Pelagic Islands). G. CAROBBI. *Atti accad. Lincei* [vi], 7, 654-60(1928).—Crystallographic and analytical data are given for 2 specimens of transparent olivine, one greenish yellow (d 3.410), the other reddish yellow (d 3.402). These contained, resp.: FeO 12.43, 11.06, NiO 0.12, 0.18, CoO 0.13, 0.10%; and, more noteworthy, PbO 0.20, 0.26%. It is suggested that the Pb occurs as the result of an isomorphous substitution of Mg. The 2 compds. $(\text{Fe}, \text{Co}, \text{Ni}, \text{Mn})_2\text{SiO}_4$ and $(\text{Mg}, \text{Ca}, \text{Pb})_2\text{SiO}_4$ constitute 77.5% and 22.5%, resp., of the specimens analyzed. B. C. A.

Dumortierite. S. F. GLINKA. *Min. Resources and Tech., Moscow* 1927, No. 3, 189-91. H. L. D.

Julenite. A. SCHÖEP. *Natuurwetensch. Tijds.* 10, 58-9(1928).—Blue microscopic needles, forming a thin layer on a white talcose schist at Chamibumba, near Katanga,

having n_s of 1.645 parallel to and 1.556 perpendicular to the elongation, resp., and readily sol. in cold water, appear to consist of a hydrated Co chloronitrate.

B. C. A.

Chemical and spectrographic studies on Tasmanian crocoite and wulfenite from Bleiberg. G. CAROBBI. *Ann. chim. applicata* 18, 485-94 (1928).—The wulfenite was found to contain, besides W, many rare earths with La predominating, and considerable Ce. The crocoite was also found to contain these rare earths, La again predominating. Traces of many others, such as Ga, Eu, Nd and Y were noted.

A. W. CONTIERI

The Duchesne meteorite: An undescribed find from Duchesne County, Utah. H. H. NININGER. *J. Geology* 37, 83-7 (1929).—The meteorite, which is an octahedrite, originally weighed 50 lbs. and is roughly lens shaped. An analysis shows: Fe 89.26, Ni 9.20, Co 0.41, Cu 0.08, Cr trace, Mg trace, P 0.21, S 0.01, SiO_2 0.15, C 0.07, O 0.44%. Nodules encountered, which analyzed Fe 62.96 and S 36.25 and were thought to be troilite, were found, however, to be difficultly sol. in HNO_3 .

W. F. HUNT

A new meteorite from Ballinger, Texas. H. H. NININGER. *J. Geology* 37, 88-90 (1929).—The total wt. was about $2\frac{1}{4}$ lbs., and externally it resembles a typical octahedrite. When cut and etched the surface showed intragranular Neuman lines. A few thin plates of schreibersite and several irregular masses of troilite were observed. An analysis shows: Fe 91.48, Ni 6.54, Co 0.48, Cu 0.07, Cr trace, Mg trace, P 0.26, S 0.01, SiO_2 0.12, C 0.09, O 1.03%. Pt was present to the extent of 0.19 oz. per ton.

W. F. HUNT

The iron ores of South Africa. E. KRENKEL. *Naturwissenschaften* 17, 57-63 (1929).—The South African republic has around 122 million tons of high-quality Fe ore, the total amt. of ore being about $10\frac{1}{2}$ billion tons; good coking coals, Mn ore, limestone and CaF_2 are also present. The occurrences are subdivided in groups: (1) the magmatic ores, (2) sedimentary ores, (3) metasomatic ores, and (4) surface formations. In group (1) the Bushveld complex in Transvaal consists of 1-20 ft. layers of magnetite, maghemite and hematite, accompanied by ilmenite, contg. 52 to 60% Fe, 13 to 20% Ti, 0.4 to 3.3% Si, no P or S, occasionally up to 1% V. The Kromdraai ores of contact metasomatic origin are mostly layers of specularite and hematite, up to 13 ft. thick, 67.8% Fe (94.0% ferric), 1.82% Al_2O_3 , 0.118% P_2O_5 , 0.07% S; about 4 million tons of high-quality ore is available. The "banded ironstones" of Witwatersrand and Swaziland in up to 800 ft. layers are partly siliceous, partly ferrous (mostly hematite) and of quality, Fe of 15 to 44%; around 20 billion tons are present. The most important Fe ores is the Pretoria series, a conglomeration of ores of the same type with separate Transvaal and West Griqualand facies. As described in detail, it has 41 to 54% Fe, 14.5 to 30% SiO_2 , up to 5.8% Fe^{++} , 0.01 to 0.06% S. The magnetite-quartzite is easy to recover, about $2\frac{1}{4}$ billion tons being present of which 100 million are close to the surface. Of the metasomatic occurrences the hematite of the Crocodile River (little magnetite) is of great purity (Bessemer iron): 69.5% Fe, 6.32% SiO_2 , 0.84% P_2O_5 , 0.39% S, and easily recoverable, 10 billion tons being present. The same type of ore, the Blink Klip brekzie of West Griqualand, has: 64.5% Fe, 3.10% SiO_2 , traces TiO_2 , 0.20% P_2O_5 , 0.30% S, too much P for Bessemer use; about 16 million tons are present in 1000 feet depth.

B. J. C. VAN DER HOEVEN

Bentonite. Its properties, mining, preparation and utilization. C. W. DAVIS AND H. C. VACHER. *Bur. Mines, Tech. Paper* 438, 51 pp. (1928).—Pulverized bentonite (hereafter abbreviated to B.) is fine grained, light colored, dark or black. After firing, the color is white, buff or brown. Fracture may be conchoidal, platy or shale-like or none at all. Its affinity for H_2O is strong, it being able to absorb up to 10 times its vol. with consequent increase in bulk. It presumably represents a volcanic ash or lava altered to a hydrous silica-alumina complex. Much of the substance of B. has not progressed beyond colloidal state as fully $\frac{1}{2}$ of the particles in certain samples were of ultra-microscopic size. Other investigators state that the natural product contains no real colloids but is composed of montmorillonite, $(\text{Mg}, \text{Ca})\text{O} \cdot \text{Al}_2\text{O}_3 \cdot 5\text{SiO}_2 \cdot n\text{H}_2\text{O}$, (n = approx. 8) and sometimes beidellite, $\text{Al}_2\text{O}_3 \cdot 3\text{SiO}_2 \cdot x\text{H}_2\text{O}$, (x = 4 approx.). Colloidal properties are attributed to felted texture and micaceous structure in which the crystals have appreciable size in 2 dimensions but thickness of colloidal magnitude. Four types of B. were studied. The relative amt. of swelling in H_2O was found to be a rough method of classifying B.; swelling may be controlled by the addn. of NaCl, other salts also affecting the swelling, as does p_H . Heat destroys the colloidal properties of the mineral. Regulated heat treatment differentiates B. in the same order as does swelling in H_2O . This order was also followed in the adsorption of dyes and the temporary osmotic pressures developed. Com. B. was classified as (1) Alk.-B.: contg. easily

replaceable alk. bases, and having original properties not permanently destroyed with H_2SO_4 . (2) Alk. sub.-B.: same as (1) except having original properties permanently destroyed with H_2SO_4 . (3) Alk. earth-B.: same as (1) except for contg. alk. earth instead of alk. bases. (4) Alk. earth sub.-B.: Same as (2) except contg. alk. earth instead of alk. bases. Three tests and a scheme for classifying B. are given. Mining B. is mostly done by stripping the overburden and breaking up the beds with plows, although in some sections where the overburden is 50-100 ft. the main haulage ways are timbered. Under the present and proposed uses for B., D. and V. discuss the value of the product as a filler in manufacture of paper, oilcloth, linoleum, rubber, ceramics, portland cement, road building materials, greases, putty, foundries, phonograph records, elec. insulation, paste, glue, size, etc. B. may be used as adsorbent, emulsifier or peptizer, in soaps and detergents. It is also used in refining of oils and fats, sprays, insecticides and fungicides, roofing materials, waterproofing, desiccating agents, manuf. of dynamite, drugs, cosmetics, etc. O. A. NELSON

Microchemistry of lignite. II. KAMETARO OHARA. Trade High School, Nagoya, Japan. *Braunkohle* 28, 1-8(1929); cf. C. A. 20, 811.—A Japanese lignite, which showed various wood fragments, was studied, a piece of *Sequoia sempervirens* being used for comparison. It was found that Ru colored chemically altered cellulose or oxy-cellulose red, and so is not a satisfactory reagent for pectins. This was demonstrated on oxidized cotton and ramie. For the detection of lignin, the Maule and acid-fuchsinsulphuric-acid reactions were used effectively. The latter was better adapted for its detection in the tracheid walls. The aldehyde reactions, with Schiff's reagent, Fehling's soln. and ammoniacal Ag soln., were not conclusive for showing the distribution of membrane substances in the tracheid walls, since the reactions occur with various materials. The participation of lignin in these reactions was shown after removal of the cellulose by ammoniacal Cu soln. The lignite sections yielded osazone crystals on long treatment with phenylhydrazine acetate, indicating the presence of sugar. After removal of the undecomposed portion of the tissue, by acetyl bromide, this reaction was still distinct, showing that the sugar may come from the decomposed portion. Lignin was detected in the middle lamella of every portion of the lignite. It gave a brown color in Maule's reaction and was completely dissolved by 6% perhydrol and ammonia. Ru always gave a red coloration with wood but not with lignite. Of the 3 lamellas of the tracheid walls, the secondary lamella of the early wood in the outer part of the lignite was altered to the greatest extent. It consisted principally of lignin, being colored yellow by $ZnCl_2 \cdot I_2$ and dissolved by oxidation with 6% perhydrol and NH_3 . Frequently lamellas were found which showed partly lignin and partly cellulose reactions. In contrast to the early wood, the secondary lamellas of the late tracheids, on oxidation, always remained undissolved, owing to the presence of much cellulose. These lamellas, after oxidation, dissolved completely in ammoniacal Cu soln. and were colored indigo blue by $ZnCl_2 \cdot I_2$. The primary and tertiary membranes remain almost unaltered during coal formation, appearing as a double ring, in the cross section, after oxidation. Chemically considered, both lignin and cellulose undergo extensive alteration during coal formation, so that they do not occur as such in lignite. Chem. alteration does not occur to the same extent in all tissues during the coal-forming process. F. S. G.

The origin of the fossil rubber in middle German brown-coal. K. A. JURASKY. Bergakademie, Freiberg. *Braunkohle* 27, 1130-2(1928).—This material, long known as "monkey hair," was identified by Gothan, in 1925, as the fossilized latex of rubber trees existing in middle Europe during the tropical climate of the Eocene period, but attempts to identify the particular tree, from the bark remains, in which the material principally occurs, have proved fruitless up to the present. J., studying the leaf remains, however, which also contain it, finds the definite characteristics of the *Urostigma* section of *Ficus*, especially *Ficus multinervis* of Tertiary Europe and *Ficus elastica* of modern tropical Asia, the familiar household rubber plant, which also furnishes a considerable portion of the rubber of commerce. F. S. GRANGER

Salt domes and petroleum reservoirs. A. BENTZ. *Petroleum Z.* 24, 1157-61 (1928).—The potential oil supply of Germany is discussed as shown by the presence of salt domes. The geology and oil reservoirs of various parts of northern Germany, the Texas-Gulf region and southern Rumania are discussed. Literature references for each section are cited. M. B. HART

Occurrence of hydrocarbons in volcanic rocks. J. FRIEDLÄNDER AND E. SALVATORE. *Z. Vulkanol.* 8, 73-83(1924-5).—Extn. of 0-0.007% of hydrocarbons and 0.002-0.028% S is reported. B. C. A.

Mount Monadnock, Vermont—a syenite hill. JOHN E. WOLFF. *J. Geology* 37, 1-16(1929).—Mount Monadnock is a stock of quartz-nordmarkite with an interior

core of essexite and assoc. dikes of bostonite and camptonite. New chem. analyses are given of hornblende, syenite and essexite. The optical properties of hornblende are $\alpha = 1.693$; $\beta = 1.711$; $\gamma = 1.713$; $\gamma - \alpha = 0.020$; $2V = 43\frac{1}{2}^\circ$. γ = deep grass green, β = deep olivine-green, α = light yellow. $c:\gamma = 20-21^\circ$. W. F. HUNT

Colloid substances formed by abrasion. P. MARSHALL. *Trans. Proc. New Zealand Inst.* 59, 609-13(1928).—Abrasion of greywacke gravel yields a small amount of colloidal matter. The consequences of this fact in geological processes are discussed.

ALBERT L. HENNE

Zeolites as fossilizing substances. H. UDLUFT. *Amer. Kemi Mineral Geol.* 9, No. 33, 15 pp.(1926).—Fossilized wood from the basaltic tufa on the lower slopes of Mt Elgon in British East Africa was found to contain crystals of natrolite, mesolite and apophyllite, while calcite had apparently played a part in building up the structure and a certain amt. of the original org. wood substance was still present. It is suggested that the wood was dehydrated above 150° in the tufa beds and then subjected to the action of hydrothermal epimagmatic solns. which deposited in succession natrolite, apophyllite and calcite. The mineralization appeared to have been affected by the original structure of the wood in that the mineral crystals were elongated in the direction of the circulation along the wood fibers and the wood cells seemed to be filled first

B. C. A.

Pozzuoli solfataras gases. E. SALVATORE. *Z. Vulkanol.* 7, 149-54(1923).—The gases contain CO_2 99.19, H_2S 0.47, CH_4 0.0086, H_2 0.0682, N_2 and rare gases 2.620, $\text{A} + \text{He}$ 0.0021%. .

B. C. A.

Determination of steam in the fumarole exhalations of Pozzuoli solfataras. E. SALVATORE. *Z. Vulkanol.* 7, 215-7(1923 4).—The av. steam content was 91.03% for 937% CO_2 .

B. C. A.

Shell beds on the Skagerack. ERNST ANTEVS. *Geol. Foren. Forh.* 50, 479-750 (1928) (In English).—This is a very comprehensive study of the shell deposits in the Skagerack. The formation, movement and compn of the different beds are treated in minute detail. Numerous tables and lists accompany the paper. The role played by the temp. of the water is studied, with the conclusion that the compn. of the fauna of a shell bed may be taken as a measure of the water temp. at the time of formation.

W. SEGERBLÖM

The geochemistry of iodine. II. GULBRAND LUNDE. *Gerlands Beitr. Geophysik* (reprint) 10, 99-103(1928); cf. *C. A.* 22, 1785.—It is possible that I occurs in the Fe kernel of the earth since it has been found in all Fe products examd. The atmophile characteristics of I are more pronounced than the lithophile and chalcophile ones. I is found in all spheres of the earth, the concn increasing from kernel to crust. During the magmatic differentiation of rocks, I becomes enriched in the residual solns. Pyrometallurgical minerals show a relatively high I. The low I content of mineral salts is explained by the fact that the easily sol. iodides, enriched in the mother liquors, are broken down by photooxidation and escape into the air.

RUSSELL C. ERB

Illinois coal. A non-technical account of its occurrence, production and preparation (BEMENT) 21. So-called rhythmic crystallization (BERNAUER) 2. Pleochroism of tourmaline (LE ROUX) 3. Blue rock salt (GUTHRIE) 2. The crystal structure of glaserite and K_2SO_4 (GOSSNER) 2. The influence of pressure on the friction along the sliding planes of crystals (TAMMANN, SALGE) 2. The question of space lattices (TERTSCH) 2. Measurement of the reflective power of opaque minerals and of very refrangible transparent minerals (ORCEL) 2. What forces direct the structural development of crystals? (STRÖBER) 2. Stoichiometric considerations (SCHARIZER) 2.

The Mineral Industry, Its Statistics, Technology and Trade During 1927. New York: McGraw-Hill Book Co. Edited by G. A. Roush. 766 pp. \$12. Reviewed in *Chem. Met. Eng.* 35, 691(1928).

9—METALLURGY AND METALLOGRAPHY

D. J. DEMOREST, R. H. ABORN

The concentration of the ores of Western Quebec. J. S. GODARD. *Bull. Am. Zinc Inst.* 11, No. 11-2, 1-9(1928).—Methods have been developed for the concn. into marketable products of the ores of this district, which are primarily mixts. of base-

metal sulfides carrying values in the precious metals. The data of various flotation concn. and amalgamation tests are given: T. P. KELLER

Use of Ganelin's method in the treatment of Altai lead ores. N. N. EFREMOV AND E. M. YAKIMETZ. *J. Chem. Ind. (Moscow)* 4, 662-4(1927).—Preliminary expts have been made on the practicability of applying Ganelin's method (cf. description of Ganelin's method in Liebig's book "Zink und Cadmium" and in the following 2 German patents: 97,943, year 1897; 124,846, year 1899) to the treatment of Altai Pb concentrates which contain Pb 45.3, Zn 12.70, Cu 0.77%, a little of Ag and Au. The method consists in treating Pb, or Pb-Zn ore by ZnCl_2 and afterwards reducing the PbCl_2 formed by Zn: $\text{ZnCl}_2 + \text{PbS} = \text{ZnS} + \text{PbCl}_2$; $\text{PbCl}_2 + \text{Zn} = \text{ZnCl}_2 + \text{Pb}$. When Cu, As, Sb and Ag are present in the ore they are sep'd. with the Pb and therefore larger amts. of ZnCl_2 are required. The expts. were carried out by melting ZnCl_2 in a graphite crucible, adding the finely pulverized PbS ore and letting the ingredients react for 1½ hrs. at various temps.; after the reaction the mass was boiled with a large quantity of water and filtered hot to sep. PbCl_2 . When operating with theoretical amts. of ZnCl_2 at 280° (near the m. p. of ZnCl_2) only 9.3% Pb reacted, at 330° (near the m. p. of Pb) 14.7% of Pb was transformed into PbCl_2 , and at 450° (temp. of noticeable volatilization of ZnCl_2) 23.85% of Pb entered into reaction; the reacting mass was so viscous that it was impossible to stir it, and the product of reaction, on being reduced with metallic Zn, was so viscous that Pb could not sep. and settle at the bottom. When operating with treble amts. of ZnCl_2 the yields in reacted Pb were as follows: at 280° 10.2%, at 330° 16.09%, at 450° 31.70%, the reaction mass being liquid enough to permit some stirring; after reduction with Zn the Pb obtained was less embroiled in the mass than in the previous cases. Finally, when operating for the same length of time with the theoretical amt. of ZnCl_2 in the presence of an equiv. amt. of NaCl the reaction mass was very fluid, easy to stir and gave the following yields in reacted Pb: at 280° 16.1%, at 330° 19.21%, at 450° 42.06% (ZnCl_2 non-volatilizing in presence of NaCl). BERNARD NELSON

Flotation process in the Moctezuma Copper Company, Nacoar, Sonora, Mexico. C. BRUCHHOLD. *Z. Ver. deut. Ing.* 73, 26-8(1929).—The ore treated is a mixt. of quartz and Cu and Fe pyrites with 2.5 to 3.0% Cu, 30 g. Ag and 0.075 g. Au per ton. Crushing is effected in ball mills, with rod mills for fine grinding, after which the material is sent through the flotation circuit. The pH value is very accurately maintained at 8.5 by means of automatic electrometric indicators. Xanthate and 80% o-toluidine and 20% thiocarbanilide are the reagents used. The concentrate contains 26% Cu and only 7% moisture. HANS C. DUES

Experimental demonstration of the refining of metals by oxidation. JAMES SILBERSTEIN. *Ind. Eng. Chem.* 21, 172(1929).—A lab.-scale expt. is described to illustrate clearly the procedure of the refining of metals on a practical basis. T. P. K.

The agglomerating of unfused, pulverulent substances and its causes, as the kind of heating, material, degree of pressing and chemical reactions. J. ARVID HEDVALL AND E. HELIN. *Jernkontorets Annaler* 1927, 265-342; *Chem. Zentr.* 1927, II, 2098-9.—In continuation of their former studies (cf. *C. A.* 21, 2620, 3293), which they discuss thoroughly in the preface of the present paper. H. and H. investigated the changes brought about by various factors on briquet-shaped, pulverulent substances in regard to their strength. H. and H. intended to find a method of forming briquets of red iron ore by heating it in a reducing atmosphere, e. g., in the blast furnace, without reducing it to metallic Fe. The cooling of the briquets in air and the mild reoxidation involved in this stage should cause increased strength of the briquets. The expts. were made on lozenges of Fe_2O_3 and Fe_3O_4 (diam. 10.2 mm), and on samples as pure as possible of iron glance, magnetite, hematite and limonite. The compressive strength was tested before and after the treatment with the aid of a special lab. app.; thus no absolute but comparable relative results were obtained. In the various preps., the influence of the following factors was studied: temp., period of heating, size and shape of particles, initial strength, compn. of the reducing gas and the influence of chem. reactions. The substances were heated in an elec. "shot" furnace, the reducing gas consisted of a mixt. of CO_2 and CO. The "after-oxidation" was accomplished by cooling the prepn. in air. In the original paper, the complete detailed results are recorded in curves and tables. Generally, it may be said that on heating the vol. decreases, while simultaneously the strength increases. The contraction and the recrystn. occurring in the heating process are discussed thoroughly, and the break in the curve representing the increasing strength is explained. Prolonged heating gives increased strength. The smaller the size of the particles of the lozenge material, the more durable the lozenges. At higher temps., the values for the strength of the

finer and coarser powders become more similar to each other. As to the shape of the particles, the intimate contact of the particles has an important influence on the strength, e. g., Fe_2O_3 prep'd. from $\text{Fe}_2(\text{SO}_4)_3$ has greater strength than Fe_2O_3 made from Fe oxalate, the tendency toward agglomeration being greater in the case of the "sulfate oxide" than in that of the "oxalate oxide." Lozenges having a greater initial strength still show it after the treatment, though the effect is not additive, but only relative. In studying the effects of chemicals, the effect of a reducing and oxidizing atmosphere, in which the lozenges were heated, was exam'd.; further on, the effect of adding CaO and SiO_2 was studied. Gas mixts. of 10% CO + 90% CO_2 , 15% CO + 85% CO_2 , and 25% CO + 75% CO_2 were employed. The reduction of Fe_2O_3 to Fe_3O_4 was more intensive with gases contg. CO and in connection with this, a stronger agglomeration of the lozenges resulted. Reduction to FeO and Fe only occurred to a certain degree at temps. exceeding 887° . A greater velocity of the current of the reducing gas also caused increased strength. After cooling the Fe_2O_3 - Fe_3O_4 lozenges in air, those lozenges which were exposed to the air at the highest temps. show the greatest strength, thus making possible an effective after-oxidation. With iron glance, similar conditions arise. The heating curves of pure Fe_3O_4 and magnetic lozenges are normal, while, if the oxidation progresses too quickly, the lozenges obtained are brittle on account of recrystn. processes. Thus, in order to obtain the max. strength, the velocity of oxidation has to be kept within certain limits. Adding 4.3% SiO_2 to Fe_2O_3 helps to increase the strength; with pptd. silicic acid, this action already starts at 887° , while with vitreous silicic acid, it starts at 1039° . Small quantities of CaO do not increase the strength. No difference exists between lozenges contg. 4.3% SiO_2 + 0.17% CaO, and lozenges to which only SiO_2 had been added. Adding SiO_2 to Fe_3O_4 also causes an increase in strength, while CaO reacts with the Fe_3O_4 at 520° , causing the formation of an agglomerating mass. Addn. of 5% CaO produces an increase in strength. Synchronous addn. of 5% SiO_2 and 5% CaO does not result in getting higher strength values. Expts. with hematite showed that by heating lozenges having the strength 0 kg./sq. cm. at 1265° for 30 mins. in a gas current contg. 15% CO and 85% CO_2 , and by subsequent cooling in air, the strength may be raised to about 185 kg./sq. cm. A value of 409 kg./sq. cm. may be obtained, if the heating is done in a gas current of 25% CO + 75% CO_2 , and the lozenges are not allowed to cool quickly, but with mild heating (after-oxidation). Also in expts. with technical limonite, the view that oxidation of Fe_3O_4 to Fe_2O_3 is important for prep'g. durable briquets, was confirmed by the expt.

G. SCHWOCH

Recent investigation methods for determining the structure of slags. OTTO GLAUFER. *Archiv. Eisenhüttenw.* 2, 73-9(1928).—A review of the customary methods for detg. the viscosities, m. ps., heat contents and transformation points of slags. The systems $\text{CaO-Al}_2\text{O}_3\text{-SiO}_2$, $\text{MnO (FeO)-Al}_2\text{O}_3\text{-SiO}_2$, CaS(MnS)-SiO_2 and $\text{CaO-MgO-Al}_2\text{O}_3\text{-SiO}_2$ are discussed, 2 diagrams being given.

J. BALOZIAN

Contribution to the question of the citric acid solubility and hardness of Thomas slags. HELMUT WEISS. *Archiv. Eisenhüttenw.* 2, 81-5(1928).—The factors influencing the citric acid soly. of Thomas slags (I) are investigated. A plot of about 300 analyses shows that I increases rapidly with the silicizing factor ($\text{SiO}_2/\text{P}_2\text{O}_5$) to a max., const. between 0.12 and 0.45. The silicizing factor in the slag should approx. 0.423 as nearly as possible. If this cannot be done by increasing the Si or decreasing the P in the crude Fe, sand must be added. To study the influence of the fine powder content of the slag on I, 200 analyses having silicizing factors of 0.42-0.55 (to exclude variations in I due to it) are plotted. The straight line slope obtained indicates a 0.33% increase in I for each percent increase in fine powdering. Charges blasted with a good, SiO_2 -poor CaO give a larger portion of total P and, in spite of a smaller silicizing factor, a higher I due to a more exact calcn. of the CaO. A good soft CaO, in not too great an excess, and a clear hot slag increase I. The influence of cooling on I is slight, decreasing I and hardening the slag when sharp. Expts., covering a 2-month period, show that hard slags occur mostly when the crude Fe is very hot and Si-rich. Hard slags always contain much FeO and little Fe_2O_3 , besides higher Si and Mn. The unfavorable influence of slag hardness on I is largely mech.

J. BALOZIAN

The use and properties of slag wool. ARTHUR GUTTMANN. *Stahl u. Eisen* 49, 97-101(1929).—Among the products obtained from blast-furnace slag, slag wool is the most important. Only 2 of the plants in Germany are mixing the slag before blowing; the rest of the plants obtain it during granulation. For the manuf. of slag wool, a long thinly liquid slag, with high SiO_2 content and low S content, is best. Five samples of different sources were investigated; the color ranges from white to brown; 3 of the samples consisted of large balls like cotton wadding; 2 consisted of small lumps.

Automatic blast-gate control for cupolas. H. V. CRAWFORD. *Foundry Trade J.* 40, 91-3(1928). See C. A. 23, 1373. E. H.

New experiments in the preparation of synthetic forms from metal powder. E. SAUERWALD. *Z. Metallkunde* 21, 22-3(1929).—Improved phys. characteristics are obtained if, in the manuf. of objects by pressing metal powder, the pressing operation is carried out at elevated temps. rather than pressing at room temp. followed by heat treatment. With a pressure of 3600 atm., followed by heat treatment at 610°, a tensile strength of 14.2 kg./sq. mm. is obtained with Cu; at 715° 13.2 kg./sq. mm. is obtained with Cu and 6.6 kg./sq. mm. with Fe; at 810°, 10.3 with Cu and 11.5 with Fe and at 920°, 14.7 kg./sq. mm. with Fe. When the heat treatment is coincident with the pressure, the values for tensile strength obtained with Cu and Fe, resp., are at 610°, 26.3 and 19.7 kg./sq. mm.; at 715°, 24.1 and 29.3 and at 810°, 23.5 and 39.8. H. S.

Physical-chemical basis of soldering. L. ROSTOSKY AND E. LÜDER. *Z. Metallkunde* 21, 24-6(1929).—A discussion of the processes of soldering. Three different types of diffusion are encountered: the solder and the soldered object form mixed crystals, a purely phys. diffusion; the solder and soldered object form intermediate compds., a chem. diffusion; the solder dissolves in the soldered object only when molten, decomposes into its constituents when chilled. A still different type occurs when the solder and soldered object do not mix even in a molten condition. Such a joint is weak. H. S.

Sherardizing. MASAO KURODA. *Bull. Inst. Phys. Chem. Research* 8, 12-8(1929); *Abstracts* 2, 1.—The influences of time and temp. upon sherardizing have been studied. When sherardizing is conducted statically, the oxidation is harmless both to the powder and to the product. The layer of powder is sintered to a depth of only a few mm., beyond which the oxidation does not proceed, the product bearing a brilliant silver luster. The best method is to apply heat at 370-80° during 30 min. The tensile strength, elongation, hardness and toughness do not decrease considerably by this heating. ALBERT L. HENNE

Technological significance of gases in metals. E. H. SCHULZ. *Z. Metallkunde* 21, 7-11(1929).—A discussion of the nature and form of gas absorption by metals, including the effects upon the properties of the metals and some methods of overcoming the defects produced by the gas. Where bubbles are formed in the interior with no cracks leading to the surface, rolling frequently closes the bubbles satisfactorily. Access of air or O₂ to the interior, however, would produce oxidation upon the surface of the bubbles and cementation would not result on rolling. Addns. of Si, Al and Ti to steels are very effective in reducing gas bubbles, the action of Ti being very marked since it takes up N₂ as well as O₂ to form a high-melting compd. The improvement in mech. characteristics on addn. of Ti is due to this removal of gas rather than to the formation of a Ti-Fe alloy. O₂ reduces the elec. cond. of Cu from about 59 to about 57 with 0.16% O and 56 with 0.28% O. H. STOERTZ

Technical properties of metals melted in a vacuum. W. ROHN. *Z. Metallkunde* 21, 12-8(1929).—A discussion of the value of melting and casting metals and alloys under vacuum, and the application of such vacuum-melted alloys. The large vol. of gases evolved is explained as due to chem. reaction initiated by the disturbance of equil. produced by the reduced pressure, rather than to the liberation of physically or chemically dissolved gases. Thus C will react with oxides present to produce CO. Vacuum melting has made possible the close control of the compn. of such alloys as the ternary Cr-Ni-Co alloy used in thermoelements. Improved mech. properties are also obtained as shown by the notch test values obtained on a Cr-Ni alloy in a Charpy machine (10 × 10 × 60 mm.). Melted in the ordinary way the sample as cast gave a value of 3.4 mkg./sq. cm., while rolled from 200 to 15 mm. it gave 11.0 mkg./sq. cm. Vacuum melted, the same alloy gave for the cast specimen 10.4 slowly cooled and 13.9 quickly cooled, while for the rolled material the values obtained were 22 and 26. H. STOERTZ

Solubility and diffusion of hydrogen in metals. G. BORELIUS. *Metallwirtschaft* 8, 105-8(1929).—H dissolves in the following metals, given in the order of increasing soly.: Ag, Pt, Cu, Fe, Ni, Pd, V, Ta, Ti, Zr, Th and Ce. From Pd on, H-rich phases are obtained which are probably metallic hydrides. In general the concn. (*c*) of H in soln. in the metal is given by the expression $c = \text{const.} \sqrt{p}$, in which *p* is the pressure of H₂ in the gas phase. Curves are given in which log *c* is plotted against 1/*T* for different metals (*T* = abs. temp.), while in another set of curves *g*, atoms H/g. atoms metal is plotted against temp. These curves show that for Th, over 3 atoms of H per atom of Th can be taken up at atm. pressure. The relation between the concn. of H in the metal *c* to that of monatomic H in the gas phase *γ* is given by the equation $c/\gamma = Ae^{-b/T}$, in which *A* and *b* are consts. The quantity of H per

sq. cm. per sec. (M), which diffuses into a metal, is given by the expression $M = \eta/d(c_1 - c_2)$, in which d is the thickness of the metal, c_1 and c_2 are the H concns. on each side of the metal, and η is the diffusion const. If the H_2 supply at the metal surface is more rapid than the diffusion into the metal, then c_1 and c_2 equal the equil. concns.

at the partial pressures p_1 and p_2 and the expression reads $M = \text{const.} \frac{\sqrt{p_1} - \sqrt{p_2}}{d}$.

Deviations from this are found with Fe and Ni at low temps. For $p_2 = 0$, the diffusion of H increases with \sqrt{p} in a linear manner but is not proportional to it. The relations are qualitatively the same as in the diffusion of gas through a porous substance. Where H is liberated electrolytically or by chem. action at the surface of a metal, enormous quantities can be absorbed. In electrolysis the concn. of H taken up by the metal is proportional to a const. $\times \sqrt{I}$, where I is the c. d. Calcn. of the pressure equiv. of c. d. shows that for Fe in 2% NaOH with a c. d. of 1 amp./sq. cm. the pressure equiv. is 17,000 atm., and for Pd in 0.2 N H_2SO_4 at 90° and 1 amp./sq. cm. the pressure equiv. is 12,000 atm., illustrating the enormous effectiveness of this manner of loading metals with H. Fe contg. C deviates considerably from both the \sqrt{I} and \sqrt{p} laws. H. S.

The stability of metals at elevated temperatures. CLAUDE L. CLARK AND ALBERT F. WHITE. Univ. of Mich., *Eng. Research Bull.* No. 11, 7-122(1928).—The objects of this investigation were to correlate the results of short-time tensile tests with service under stress at high temp., and to explain the effects of alloying elements on such service. The literature of this subject is reviewed, with special attention to the effect of time, or rate of testing. For correlating the results of long- and short-time tests, 2 plain steels contg. 0.13 and 0.38% C, resp., and an alloy steel contg. 0.09% C and 16.7% Cr were tested. High-temp. tensile tests were made in the usual way, and expansion tests were made by heating tubes contg. N gas under const. pressure. The app. and methods are described in detail, and all results tabulated. The 0.38% C steel gave the highest strength at all temps. used (room temp. to 816°), but the high-Cr steel gave the highest proportional limit at all temps. above 21°. The expansion tests were run at various pressures, giving stresses up to 23,000 lbs. per sq. in., for each of several temps. from 482 to 816°, and continued until marked deformation occurred. At the higher temps. oxidation interfered with the reliability of results on the plain C steels. The high-Cr steel resisted oxidation well, and at 677° withstood 4 times the stress causing failure at 816°. Mathematical analysis of the results showed that the curve plotted from stress and time-for-rupture values did not approach a limiting value above zero stress, but was of the form $y = a x^b$, a and b being consts., for temps. above the equil. cohesive temp. At lower temps., the limiting creep stress is at or above the proportional limit. Logarithmic plotting of creep results gave straight lines, nearly parallel to the time axis at room temp., and with increasing neg. slope at higher temps. At temps. from 530 to 820°, the proportional limit as detd. by short-time tests was roughly similar to the safe working stress, at which failure would not be expected within 10,000 hrs. The expansion tests, however, showed that above 540° there was some continuous creep, and the metals tested did not have true proportional limits. This was because of flow in the amorphous material between the crystals. Slip-interference and increase of amorphous intergranular material by decreased grain-size are effective in improving load-carrying ability only below the equi-cohesive temp. The 0.38% C steel showed better load-carrying ability at high temp. than the 0.13% C steel, and the high Cr steel was still better. The presence of carbide probably strengthened the amorphous intercryst. layers in the 0.38% C steel as compared with the 0.13% C steel; and the same explanation was assumed to hold for the high-Cr steel, Cr being recognized as a carbide-forming element. Ni in steel did not cause an improvement in strength at high temp. because by decreasing the grain-size, more amorphous metal is formed and hence there is easier flow under load. Ni, however, is of value in reducing oxidation. W, Mo, V and Mn were shown to benefit the strength at high temp., similarly to Cr. Short-time tensile tests of various alloy steels at temps. up to 850° are reported in support of these deductions and are discussed in an appendix. A list of references to the literature is also given.

GEORGE F. COMSTOCK

Annealing metals. LÉON GUILLET AND ALBERT ROUX. *Rev. métal.* 26, 1-11 (1929); cf. C. A. 21, 1085, 1953 —A more detailed account. A. P.-C.

Annealing of metals by a new sensitive differential dilatometer. SAKUICHI TOGINO AND KEIJI YAMAGUCHI. *Bull. Inst. Phys. Chem. Research* 8, 34-43(1929); *Abstracts* 2, 3. For soft metals without any transition point, the usual differential dilatometer cannot be of much service, on account of insufficient sensibility as well as susceptibility toward deformation due to the spring. In the new differential dilatometer, the spring

is dispensed with, and a component of gravity acting on a pendulum is used. The pressure sustained by the test piece is reduced to the order of 0.3 g./mm.², so that for such a soft metal as Al, measurements can be made near the m. p. When the specimen is 10 cm. in length, the rod to be rotated by the difference of dilatation is 1 mm. in diam., and the scale is 120 cm. from the plane mirror. Thus the difference in the change of the length per cm. of specimen can be magnified 24,000 times for reading. The relations of the differential dilatation as taken from its curve when cold worked Al and Cu wires are heated, the changes in hardness occurring at the same time, and those in the internal structure, as shown by Laue photographs, are discussed.

ALBERT L. HENNE

Influence of various gases upon the graphitization of cast iron. HIROSHI SAWAMURA. Kyoto Imp. Univ. *Iron and Steel* 14, 741-55(1928).—S. devised an app. for measuring the thermal expansion of white cast iron in a stream of gas and examd. the influence of various gases at 1 atm. pressure upon the graphitization of cast iron. The sample used contained 2.4% C, 1.02% Si, with small amts. of other impurities; the gases used were H₂, NH₃, CH₄, N₂, O₂, CO, CO₂, and air. H₂, NH₃ and CH₄ retard the graphitization remarkably, CO and CO₂ moderately, others being indifferent. The time required for completing the first step of graphitization in these gases is shortest with CO₂, then air, N₂, O₂ and CO in order; it is longest with CH₄, NH₃ and H₂. The same method was then applied to the annealing of a sample having the compn. of malleable cast iron at 895°, 935°, and 978° and the relation between the annealing temp. and the time of the completion of the first step of graphitization was investigated. The graphitization proceeds most rapidly in CO₂, while it is retarded remarkably in H₂, NH₃ and CH₄ gases. In these cases N₂ influences graphitization. Similar expts were made with mixts. of some of the above gases.

K. SOMEYA

Production of malleable castings. F. H. HURREN. *Foundry Trade J.* 40, 33-6 (1929).—In the production of malleable castings, the following subjects are considered in some detail: (1) the compn. and class of Fe charged into the cupola; (2) liquid metal shrinkage in mold, and contraction allowance on patterns; (3) feeding and gating the casting; and, (4) annealing process.

DOWNES SCHAAF

Design of engineering castings in relation to tests. J. G. PEARCE. *Foundry Trade J.* 40, 67-71(1929).—In order to rationalize gray Fe casting design, the author gives figures and curves showing the variations in tensile, compression, torsion, and transverse strength with cross-section (cast diam.). The relationship between chem. compn., Brinell hardness, and shear strength, with tensile strength, are also shown by curves. The following conclusions are drawn: (1) in gray cast iron there is a continuous increase in strength as cast section diminishes for tensile, compressive, torsion and transverse tests; (2) the relationship between compression and transverse tests to tensile tests may be taken as 1.8 to 2 for $\frac{\text{transverse}}{\text{tensile}}$ and as 4 for $\frac{\text{compression}}{\text{tensile}}$; (3)

the change in strength with section can conveniently be followed by transverse testing of bars of different diams. from the same melt; (4) if a series of size-strength curves is prepd. for different mixts., it becomes possible to chart the connection between strength and those elements of compn. which usually vary as between different mixts in the same foundry.

DOWNES SCHAAF

The importance of the Brackelsberg furnace for iron foundries, especially for the production of high-grade cast iron. P. BARDENHEUER. Kaiser-Wilhelm Inst., Düsseldorf. *Die Giesserei* 15, 1169-73(1928).—A lecture.

J. BALOZIAN

Heat treatment and properties of cast iron. P. SCHOENMAKER. *Blast Furnace & Steel Plant* 17, 283-6(1929).—The mech. properties of annealed, hardened, and tempered cast Fe were studied on test bars for tensile, transverse, bending, compression, and repeated impact tests. Hardness detns. were made for the same series of irons with Brinell and Rockwell machines.

DOWNES SCHAAF

The growth of cast iron. E. PIWOWARSKY AND H. ESSER. *Die Giesserei* 15, 1265-70(1928).—A brief survey of the literature, 41 references being given.

J. B.

Variables affecting ferrite growth. C. A. EDWARDS AND TAKETO YOKOYAMA. *Heat Treating and Forging* 14, 1294-301, 1351(1928).—See C. A. 22, 4437.

J. B.

Centrifugally cast pipe (metal-mold process) versus sand-cast pipe. F. N. MENEFEE AND A. E. WHITE. Univ. Michigan, *Eng. Research Bull., Reprint Series* No. 4, 37 pp.; *Proc. Am. Soc. Testing Materials* 28, Part II, 221-57(1928).—Physical, chemical and metallographic tests were made on 48 piece. of cast-Fe pipe, some having been cast in stationary sand molds, and the others in rotating steel molds. The centrifugally cast pipe requires annealing. Both 6-in. and 8-in. pipes were tested. The wall-thickness variation in the centrifugally cast pipe was less than 1/3 that found in

the sand-cast pipe. The tensile strength of the former was over 50% greater than that of the latter, and the bursting strength, based on min. wall thickness, of the former was also superior. The factors of safety for the 2 kinds of pipe, based on the usual catalog pressures for the different classes, all lay on the same smooth curve. Impact tests on the Izod and Olsen machines gave better results for the centrifugally cast pipe only when unnotched specimens were used. With notched specimens, the sand-cast pipe showed better impact resistance. The impact resistance of centrifugally cast pipe was improved by annealing. Radial compression on 1-ft. samples showed that the sand-cast pipe withstood on the av. a slightly heavier load than the centrifugally cast-pipe, but deflected less. The results of transverse tests were similar. Centrifugally cast pipe, being necessarily annealed, should have less internal strains, and they were found smoother on the inside. The graphite was finer, and the combined C less, in the centrifugally cast samples, and they were slightly harder. Tensile strength, variation in thickness, freedom from strain, impact resistance and radial compressive strength are considered of primary importance, and the 2 kinds of pipe are of about equal value on these 5 points in general. Conclusion: The centrifugally cast pipe would be favored if it cost less. In discussion, J. T. MacKenzie emphasized the effect of the greater wall thickness of the sand-cast samples on the results, and claimed that annealing centrifugally cast pipe does not remove all internal strains. Some of the methods of testing were also criticized in the discussion.

G. F. C.

Examination and estimation of case-hardening materials. P. WILHELM DÖHMER. (*Chem. Ztg.* 52, 1006-7(1928).—A discussion of F. Hebler's article (*C. A.* 23, 805).

RUSSELL C. ERB

Examination and estimation of case-hardening materials. F. HEBLER. (*Chem.-Ztg.* 52, 1007(1928).—A reply to the above.

R. C. ERB

The cementation test of Ehn. R. WASMUTH AND P. OBERHOFFER. (*Stahl u. Eisen* 49, 74-7(1929). The well-known cementation test developed by Ehn (cf. *C. A.* 16, 2241) was used to det. the quality of low- and high-C steel, Cr steel and dynamo plates. The cementation test did not give definite information on the mech. (working) characteristics of the steel samples tested. Besides the C content, the grade of decarburization, enclosures, grain size and other factors are influencing the results of the test.

J. A. SZILARD

Effect of temperature on stainless iron. R. SERGESON. (*Central Alloy Steel Corp. Heat Treating and Forging* 15, 55-9(1929).—The effect of temp. on the phys. properties of a stainless Fe (*Enduro*, with 18% Cr and 8% Ni) was studied. A quenching cycle (substantiated by tensile and impact tests) shows that heat treating does not increase the hardness and strength of *Enduro*. Only on cold working is there an increase in these properties, but a continued decrease in the ductility and impact strength. When used above 1200° F. there is no advantage in cold drawing, as shown by "short time" tests. The strength previously gained by cold drawing is lost by reheating to 1450°. With increase in normalizing temp. the tensile strength decreases slowly, the elongation and reduction in area increasing correspondingly. The changes are negligible from 1850° to 2200° F. Photomicrographs show that only at and above 1850° F. is the effect of cold work removed. Reheating below 1000° F. does not reduce the hardness of cold-drawn stock, while above this the hardness varies with the temp. and the time. The impact strengths of "hot-rolled" and cold-drawn bars reheated to 1200° F., only, are different, those of the latter being lower. At 700° F. the impact resistance is max., falling off at 900° F. The max. temp. for using *Enduro* continuously is 1800° F.

J. BALOZIAN

The recrystallization (of ingot steel) during hot rolling. W. TAFEL, H. HANEMANN AND A. SCHNEIDER. (*Stahl u. Eisen* 49, 7-12(1929).—The work of Hanemann and Lucke (cf. *C. A.* 20, 1582) is reviewed; in it a space diagram was developed, representing the grain size of small steel and electrolytic Cu cylinders, compressed at various temps., as a function of the temp. and the rate of deformation. The development of a similar space diagram for the evaluation of the hot rolling of ingot steel was undertaken by T., H. and S., in order to det. which rates of deformation during hot rolling cause a coarsening of the grain and corresponding decrease in the quality of the steel. The grain size was detd. in the center line of the test pieces according to the method of Jeffries. Owing to the difficulty of rolling accurately to a definite rate of reduction detn. of the grain size was not only carried out on test pieces after rolling, but also "in transition" (obtained when the rolls are stopped before the test pieces leave them); for such an interruption of the rolling the Techn. Hochschule in Breslau, where part of these expts. were carried out, has a special exptl. rolling mill). Preliminary expts. showed that at a given rate of reduction, the recrystn. and the final grain size of the

test piece are not influenced by the grain size before rolling but are detd. by the pressure and temp. of the last pass. Above 900° the grain size of the rolled bars is the same in both longitudinal and cross sections. Below 900° the grain size is larger in the longitudinal section. A mild (Krupp; 0.03% C, 0.03% Si, 0.08% Mn, 0.01% P, 0.012% S) ingot steel was used; bars were rolled at 680°, 700°, 750°, 850°, 925°, 1000°, 1100° and 1200°. The results are given in a diagram for each temp., the grain size being plotted in μ^2 against the rate of reduction in %. These diagrams are used in the construction of a space diagram, which shows that the danger of large grain size for mild steel is between 750° and 850°, where at 15% reduction the grain size is 12,000–17,000 μ^2 . At 900° the values for the grain size are between 400 and 1200 μ^2 for reductions up to 50%, which is practically the limit during rolling. If the amt. of reduction during the last pass is 16%, the corresponding grain sizes for 750°, 850°, and 925° are 13,500, 11,000 and 825 μ^2 , which indicates that the temp. of rolling should not go below a certain limit, which for the mild steel used in these tests is 925°.

J. A. SZILARD

Troostite. A. E. CAMERON AND I. F. MORRISON. Univ. of Alberta, Can. *Trans. Roy. Soc. Can.* [3], 22, III, 289-91(1928).—Heat treatment carried out on a low-carbon (0.1% C) steel, a medium-carbon (0.5% C) steel, and a high-carbon (0.8% C) steel, with quenching operations up to 1000° followed by tempering and drawing at 100°, 200°, 300°, 400° and 500°, and accompanied with photomicrographic observations before and after each treatment, indicated that globular troostite is not a decomposition product of martensite, but a primary decomposition product of austenite. Globular troostite is not formed by reheating quenched steel, but rather the troostite-like structures developed by tempering operations are fine-grained sorbite. The observations suggest that martensite tends to granulate or sorbitize as soon as re-heating is applied. Granulation of the troostite depends upon the C content. In the medium C steel troostite remained unchanged until tempered at 300°, while the high-C steel, the globular troostite was observed to granulate appreciably at 200°. Several photomicrographs accompany the paper.

J. W. SHIPLEY

Annealing processes in hardened steel and the influence of silicon and nickel. HANS BERNBAUM. *Archiv. Eisenhüttenw.* 2, 41-7(1928).—The effects of Si and N on the linear contraction occurring at 100° (I) and at 300° (II) on annealing hardened steels are studied. With Si I occurs at 80–150°; it is of influence only in displacing the temp. of II (the temp. of appearance of II increasing with the Si content). With N steels, the temp. of appearance of II and the amt. of I is due to the Si and C contents resp. From further investigations on the decrease of hardness of steels on annealing and of the influence of C on the annealing processes in hardened steel, it is concluded that the phases in martensite are: (1) the ϵ -phase of Hanemann and Schrader (a solid soln. of C or cementite in α -Fe, on annealing, cementite sepg. out without vol. change, contg. 0–0.115% C; (2) that contg. 0.115–0.33% C (only II being detd., this increasing with the C content); (3) that contg. over 0.33% C; (4) γ -Fe. In the steels investigated, the decrease in hardness accompanying I is first noticeable at 140°, that accompanying II being indefinite. The C concerned in I goes over first into a form corresponding to the ϵ -phase, and on further annealing sepg. out as cementite. The shortening at 180° is a decomposition of the martensite phase, the C concn. of which is greater than 0.33%. The expansion at 220° is due to a conversion of austenite into an end-product corresponding to that of I. The explanation given by Hanemann and Traeger for the changes taking place during annealing, and the theory of Honda for the changes on quenching of steel, could not be confirmed.

J. BALOZIAN

The influence of phosphorus on the mechanical properties of metals. S. S. NEKRUT. *Messageur russe ind. métaux* 35-42(Sept., 1927); *Rev. métal* 26 (Extraits), 11-2 (1929).—Comparative tests on 2 sets of samples of malleable Fe having the same compn. (C 0.99, Si 0.47, Mn 0.17, S 0.12%) except for P content (0.14, 0.70%, resp.) showed that the Fe with higher P content had better mech. properties than the one with lower P content. N. considers that the prevailing idea that P is a harmful impurity is unfounded, and he is inclined to think that, within certain limits, P can improve the quality of Fe and steel. It is only on account of the lack of systematic investigations of the effects of P on Fe-C alloys that metallurgists must put up with the cost of dephosphorization instead of taking advantage of the qualities of P. A. PAPINEAU-COUTURE

The effect of tin on the nature, notably on the rolling characteristics, of Siemens-Martin ingot steel. W. KELLER. *Stahl u. Eisen* 49, 138-40(1929).—The effect of Sn on the quality of the Siemens-Martin steel is of importance, where scrap Fe is being used in the manuf. The following analytical method was developed to det. the Sn in steel samples. Dissolve 2-5 g. of borings in 70 cc. in 1:1 HCl, in a CO_2 atm., cool and titrate with 0.1 N I soln., using a starch soln. as indicator. For routine tests the values

so obtained are sufficiently accurate. If, however, greater accuracy is desired, ppt. Cu and Sn with H_2S , filter, ignite the residue, dissolve Cu with HCl , fuse the residue with MnO_2 , dissolve in HCl , reduce with purest Fe and titrate as above. Melts of mild and hard steel were prepd. with 0.2-2.2% Sn, analyzed, and tensile strength, elongation, welding qualities, and tendency to develop fissures during rolling were detd. Steel with 0.6-0.7% Sn could be rolled without the formation of fissures. It is in welding that Sn has the most undesirable effect. Cold bending tests gave satisfactory results up to a Sn content of 0.6%. The malleability was decreased, if the Sn was above 0.8%. No difference in the effect of Sn, on mild and hard steel, could be observed. It seems, that in general the injurious effect of Sn has been somewhat exaggerated.

J. A. SZILARD

The influence of nitrogen upon special steel and a method of surface hardening by means of nitrogen. SHUN'ICHI SATO. *Iron and Steel* 14, 683-93(1928).—S. gives the results of expts. of the influence of N on the hardness of the alloys of Fe contg. Al, Ti, Mn, that of various Cr steels, and that of special steels made by adding to a steel contg. 0.1-0.2% C and 1-2% Cr, various quantities of Al, Ti, Mn, Zr, Mo, W and U, and then of alloy steels contg. B, Mg, Cu and Ce. NH_3 gas was passed for 4.5 hrs. over the above samples heated to 580° or for 15 hrs. upon the samples heated at 560° and the Brinell hardness measured before and after the expt. The increase of C and Cr increases the hardness; Cr forms the nitride of Cr and gives very satisfactory results. In Cr-Al steels max. hardness is shown with a certain quantity of Al, while in Cr-Ti steel the hardness increases with the Ti content. The other steels mentioned increase the hardness to different degrees. Expts. with 5-15 hrs. heating in the atm. of NH_3 shows that for the first 5 hrs. the increase in the hardness is remarkable, but not considerable with longer hrs. of heating. By coating the electrodes used for elec. arc welding with Ni the N₂ content in the welded Fe is decreased. K. SOMEYA

Repeated stress, structure, and damping (of special steels). W. HEROLD. *Arch. Eisenhüttenw.* 2, 23-39(1928-9).—The structure of a pearlitic steel at the point of fracture by fatigue under repeated stress shows that the cementite has been forced toward the grain boundaries, while lamellar pearlite has been crushed and converted into granular pearlite giving the metal a very coarse-grained structure. In martensitic steels the hard η phase becomes crushed into small particles which are forced through the softer α phase toward the grain boundaries. In some austenitic steels after fracture by fatigue, cementite may be observed at the grain boundaries, although the presence of this constituent is not visible in the original structure; in other cases the fatigued metal has a nodular structure which cannot further be resolved. Generally, steels which have been hardened and tempered lose their capacity for damping (*i. e.*, for converting energy into heat by internal friction) after subjection to repeated stress sufficient to produce failure by fatigue. B. C. A.

Magnetic characteristics of tungsten steel. K. G. BRECHT, R. SCHERER AND H. HASSELMAN. *Stahl u. Eisen* 49, 41-2(1929).—The effect of heat treatment on the magnetic, mechanical and metallographic characteristics of W steel (0.67% C, 0.26% Si, 0.25% Mn, 0.01% P, 0.011% S, 0.40% Cr and 6.62% W) was investigated. Tests were carried out by annealing samples between 550° and 800° , in steps of 50° , for 2 hrs., followed by slow cooling in the furnace. With increasing temp. of annealing, the coercive force increases and in the same ratio, the martensite structure is gradually decomposed with the sepn. of cementite. The min. value of the coercive force was obtained at an annealing temp. of 750° , slightly below the A_{c3} point, which for this W steel was found to be at 765° . At 800° there is a small increase of the coercive force. The assumption is made that the austenite \rightarrow pearlite transformation, which normally is completed below the A_{c1} point, is being hindered by W. The best annealing temp. for shearing was 650° . In order to det. the best hardening temp. samples were heated between 780° and 920° , in 20° intervals, then quenched in water and oil. The best magnetic properties were obtained after quenching from 820° in water. The test pieces annealed at various temps. were all quenched from 820° in water. Plotting the coercive force as a function of the annealing temp., the curve so obtained shows that the former decreases with increasing annealing temp.; the min. value is at 750° , followed by a slight increase at 800° . The more the cementite is dissolved before hardening the better are the magnetic qualities of the steel. In general it is advisable so to regulate the temp. and time of the annealing and hardening, that the separation of cementite is suppressed as far as possible. Two carbides, the double carbide $4Fe_3C.WC$ of Honda (*cf. C. A.* 11, 2766; 12, 1753) and Fe_3W_2C of Hultgren (*cf. "A Metallographic Study on Tungsten Steels," C. A.* 16, 3462), were observed on the specimen etched with Nipicrate. The large double carbides are dark colored. The very hard WC is not at-

tacked by etching, and the crystals stand out of the surface of the specimen in relief, showing dark edges.

A process for obtaining a clear sulfur print. SOJI MAEDA. Japan Steel Works *Iron and Steel* 14, 705-8(1928).—M. examd. the Baumann method of obtaining a S print. Expts. made on samples of different S contents, with various concns. of H_2SO_4 , various kinds of dry films, degree of removal of the printing liquids, time required for printing, showed that the best conditions are obtained by polishing well, with "Peacock B" as printing paper, the paper being wiped lightly with flannel cloth after dipping it in 1% H_2SO_4 , and sticking the surface to be examd. on the printing paper for 3 mins.

J. A. SZILARD

Equilibrium diagram of the iron-vanadium system. SHÔKICHI OYA. Tohoku Imp. Univ. *J. Study of Metals* 5, 349-56(1928).—O. first studied the prepn. of metallic V by the thermite process. NH_4VO_3 was heated to 200-300° in a muffle furnace to obtain V_2O_5 , Na_2CO_3 being used as the flux. By reducing the quantity of metallic Al powder for reduction, replacing it by Na_2CO_3 and suitably adjusting the proportion of $\text{Na}_2\text{CO}_3 + \text{Al}$, metallic V of 98.5% purity was obtained. To avoid the difficulty of ignition caused by the addn. of Na_2CO_3 a mixt. of 40 parts of KClO_4 , 7 parts of BaO_2 and 10 parts of Al powder was used to start ignition. Next the changes in the solid phase of the Fe-V alloys were studied by means of thermal analysis, magnetic analysis and microscopic examn to det. the equil. diagram. The result agrees with that of Vogel and Tamman (cf. *C. A.* 2, 2367) in that the alloys of the system form a solid soln. for all ranges of compn. The A_1 point of Fe is rapidly lowered with the addn. of V, while the A_2 point rises rapidly to unite and form a loop at 2.5% V. The A_2 point of Fe at first rises gradually, becomes a max. at 15% V is lowered very slowly at about 20%, and with more V is lowered rapidly to room temp. at 35% V.

K. SOMEYA

Transformations of the β -phase in the copper-zinc system. P. SALDAR AND J. SCHMIDT. *Z. anorg. allgem. Chem.* 173, 273-86(1928).—The boundaries of the β phase in Cu-Zn alloys have been detd. by tempering at various temps. for 81 days followed by quenching and examn. of the microstructure. Below 600° no decomposition into $\alpha + \gamma$ was observed. Below 440° the limiting compn. of β is 55.01-51.39 at-% Cu in cast alloys and 54.63-49 at-% Cu in tempered alloys. At 480° the field of pure β in tempered alloys extends from 56.01 at-% Cu to 51.39 at-% Cu, above 480° the field broadens on both sides. In the temp. interval 440-480° a discontinuity occurs in the equil. diagram indicating the existence of two modifications of β , β_1 and β_2 , stable below 440°, and β , stable only above 480°. The discrepancies found by previous workers in the limiting compns. of the β -field are ascribed to insufficient time of annealing to obtain complete equil. being used in their work.

B. C. A.

Anomalies of annealing copper and brass after cold-hardening. F. EUGENE. *Rev. métal* 25, 685-706(1928); 26, 29-42(1929); cf. *C. A.* 23, 586. Micrographic examn. seems to show that the last particles of the cold-hardened phase disappear at A_2 and that the intercryst. tensions should disappear when the cold-hardened crystals have been sufficiently isolated from one another by the recrystn. products. The d. of Cu is appreciably affected by annealing: the differential d. curve of cold hardened and annealed Cu shows that the material undergoes a "reabsorption" at A_1 and A_2 , and the discontinuity in the mech. properties seems to follow from this "absorption." The tests with the Chevenard differential dilatometer indicate that the phenomenon of annealing is quite different in Cu and in brasses: with Cu the metal undergoes a contraction both in the direction of rolling and at right angles thereto; addn. of Zn results in a contraction of the metal at right angles to the direction of rolling and expansion in the direction of rolling, which increases with the Zn content. Accurate thermal analysis showed that the recrystn. of cold-hardened Cu and brasses takes place without absorption or evolution of heat, either at A_1 or A_2 or in the "germination zone" proper. This can apparently be explained by the fact that Cu and brasses have the same sp. heat in the annealed and cold-hardened states. The anomalies A_1 and A_2 resist a change of state and their intensity increases with the initial degree of cold-hardening, and they are more or less affected according to the temp. and time of annealing, thus apparently following the law of displacement of equil. This interpretation would facilitate the acceptance of the amorphous phase theory which has proved so fruitful in explaining the phenomenon of crystn.

A. PAPINEAU-COUTURE

The effect of aluminum on brasses. JAMES SILBERSTEIN. *Metal Ind.* (London) 34, 5-6(1929).—S. explains the behavior of Al in brasses and bronzes and indicates when its addn. is desirable and when undesirable. Al, in solid and in molten condition, is covered with a thin, tenacious film of oxide, a property imparted to brasses and bronzes in the molten state when Al is added to them. Traces of Al are detectable by observing

the appearance of the surface of ingots. The larger the rough areas in comparison to the smooth areas the smaller is the Al content. Al as small as 0.001–0.003% can be so detected. Al bronzes (contg. Zn) are well fitted for permanent mold castings, while Al improves the mech. properties of Cu-base alloys. The phys. properties of several alloys are given. Al causes segregation in leaded bronzes and bronzes. It is difficult to secure good metal from borings, drillings, floor spillings, and other scrap material contg. Al. Also, the alloys are likely to be porous. W. H. BOYNTON

Age-hardening of silver-copper-cadmium alloys. W. FRAENKEL AND L. NOWACK. *Z. Metallkunde* 20, 243(1928); cf. *C. A.* 22, 3874.—With up to 20% Cd, Ag does not harden on quenching from 700° to 800° and annealing at 280°. The addn. of Cd to Ag-Cu alloys considerably retards the age-hardening at 280° and reduces the max. hardness obtainable; thus, for the alloy with 8% Cu and 12% Cd, max. hardness is obtained only after 10 hrs. at 280°. B. C. A.

Destruction of single crystals of aluminum by rolling. T. SAKAO. *Mem. Coll. Sci. Kyōto Imp. Univ.* 11, 279–82(1928).—Single crystal sheets of Al were reduced 10% in thickness by rolling in small steps, and Laue patterns obtained after each pass. From the progressive distortion of the Laue spots it appears that a rotation of the crystal fragments takes place about an axis parallel to the direction of rolling, irrespective of the orientation of the original crystal. B. C. A.

Recrystallization of aluminum. K. TANAKA. *Mem. Coll. Sci. Kyōto Imp. Univ.* 11, 229–32(1928).—The orientations of 192 single crystals of Al were detd. and the crystals then extended 4–20% and annealed for 5 hrs. at 600°. No relation between the orientation of the grains formed on recrystn. and that of the original crystal could be found. B. C. A.

Investigations regarding the effects of remelting, rolling and annealing on aluminum. II. Influence of rolling and annealing. E. MAASS AND W. WIEDERHOLT. *Korrosion Metallschutz* 4, 272–7(1928).—Rolled and annealed aluminum were examd. for various properties (*C. A.* 23, 1094). Al annealed after rolling was found to be more resistant to acids. No appreciable difference was noticed in any of the other media. B. E. ROETHELI

New investigation of refinable aluminum alloys. W. FRAENKEL AND L. MARX. Frankfurt a. Main. *Z. Metallkunde* 21, 2–6(1929).—Five alloys having the following compn. were examd.: (A) — Al + 4% Cu; (B) — Al + 4% Cu + 0.5% Mg; (C) — Al + 8% Zn; (D) — Al + 8% Zn + 0.5% Mg; (E) — Al + 8% Zn + 0.2% Li. The alloys were heated to 500°, quenched in H₂O and hardened at room temp., 50°, 100° and 150°, with a special hardening also in boiling water for varying time intervals followed by aging at room temp. The course of the hardening was followed by Brinell hardness, tensile strength and elec. cond. measurements, and the results are as follows: Hardened at 100°, hardness of A rises from about 36 to about 78 in 80 hrs.; B rises from about 60 to 90 in 20 hrs. and to about 92 in 80 hrs.; C stays const. at about 26; D rises from about 36 to about 79 in 20 hrs. and to 85 in 80 hrs.; E rises from about 35 to about 44 in 80 hrs. Hardened at 150° A has a hardness of about 88, B 115, and E 44 in 80 hrs., while D rises sharply to 78 in 20 hrs. and then falls gradually to about 73 in 80 hrs. With hardening at 50°, sp. elec. cond. of C rises from 26.0 to 26.6 in 80 hrs., while for E it rises from about 23.4 to 23.6 in 80 hrs. At 100° A rises from 24.0 to 24.3, B from 21.8 to 22.2, C from 26.0 to 26.8, D from 24.9 to 25.2 and E from 22.8 to 24.2 in 80 hrs. Hardened at 150°, B rises from 22.4 to 23.8 and D from 25.0 to 27.0 in 80 hrs. With alloy B, the effect of the temp. of heat treatment upon tensile strength was studied. Heated at 450°, the tensile strength quenched was 22.4 kg. per sq. mm., and aged 7 days 32.3 kg./sq. mm. At 500°, tensile strength quenched was 26.2, aged 7 days 36.6; at 530° these values were 26.8 and 37.9 and at 560°, 20.8 and 26.5. H. STOERTZ

Aluminum-silicon alloys: their properties and some applications. I. Properties. R. B. DECLEVY. *Foundry Trade J.* 40, 29–32, 49–51; *Metal Ind.* (London) 34, 75–8, 103–6 (1929).—The effect of the modifying treatment on com. Al-Si alloys contg. from 9 to 14% Si and of varying Fe content is shown by photomicrographs and mech. properties. The various theories advanced to explain the mechanism of modification are discussed. The superior foundry properties of the alloy are attributed to the fact that it is an all-eutectic alloy. Mech. properties are given for the 12% Si modified alloy for both chill and sand cast bars. The Si alloy behaves very much like Al in corrosion tests. DOWNS SCHAAP

Duralumin, its properties and usefulness in airplane construction. GUNNAR STÅHL. *Tek. Föreningens Finland Förhandlingar* 49, 1–9(1929).—A general discussion. HANS C. DUUS

Corrosion of metals by industrial benzene. SRI FUJIO. Naval Fuel Store-house. *Bull. Naval Fuel Store-house Lab.* 2, 65-85(1928).—F. found by analysis that industrial C_6H_6 contained 0.14% of CS_2 and 0.10% of C_6H_5S . Samples of steel, Cu and Al were suspended in the benzene and were allowed to stand in a sealed bottle for 50 days, the change of the color of the soln. and the microscopic examn. of the degree of corrosion then being made; C_6H_6 contg. CS_2 corrodes most strongly; C_6H_6 contg. C_6H_5S not so strongly. Al and steel have a strong resistivity toward corrosion. No appreciable corrosion takes place with C_6H_6 completely freed from CS_2 , H_2O and CS_2 so that the corrosion of metals by industrial C_6H_6 is attributed to the presence of these compds. Expts. made with the mixt. of other S compds. with C_6H_6 show that the degree of corrosion of metals increases in the order of free S, mercaptan, $(C_2H_5)_2S$ and CS_2 . When H_2O is present or when the temp. is raised, the corrosion is accelerated. CS_2 and C_6H_5S cannot be removed by simple boiling in the presence of metallic Na. K. SOMEYA

Corrosion of steel in dilute acids. HIKOZÔ ENDO AND KIYOSHI NAKAWAGA. Tohoku Imp. Univ. *J. Study of Metals* 5, 301-13(1928).—The effects of various special elements and of heat treatment of steel upon corrosion were studied. The acids used were 5% H_2SO_4 , HCl and HNO_3 . The specimen was turned into a round rod 4 mm. diam., 20 mm long, and was dipped in 500 cc. of the above acids. First the effect of C content was examd. by using the sample made from normalized steels of 0 to 1.3% C. For examg. the influence of special elements, CO, Ni, Cr, Mn, Mo, V, W, Cu, Ti, P, Si and S were added to 0.3 and 0.6% C Swedish steel. The steel used contained 0.09% Si, 0.024% P, 0.08% Mn and 0.065% S as impurities. CO, Ni, Mo, V, P and a large quantity of Si increase the resistance to acid, while C, Mn and S decrease this resistance. Cr and Ti increase the resistance to corrosion, especially by HNO_3 . For examg. the influence of quenching and annealing of ordinary C steel, 0.5% and 0.9% C steels were selected, and after heating them to 900° for 45 hrs. they were quenched in H_2O at 0° . The various samples, one as quenched, and the others annealed after the above quenching at 100° , 200° , 250° , 300° , 350° , 400° , 450° , 500° , 550° , 600° and 700° for 1 hr., resp., were allowed to stand in 1% H_2SO_4 for 24, 48, 72 and 120 hrs. and the wt. decrease was detd. with each of the samples. The relation between the annealing temp. and the wt. decrease shows that up to 100° the curves for the two steels are almost identical, a slight decrease in corrosion being apparent. Beyond 100° , loss in wt. increases, reaching a max. at 400° ; the increase occurs in 2 steps. At 450° to 550° corrosion again rapidly decreases, practically no change occurring between 550° and 700° . These phenomena were explained on the basis of Honda's theory of quenching. K. SOMEYA

Corrosion of chemical lead. D. W. JONES. *J. Soc. Chem. Ind.* 47, 161-7T(1928).—Sb is regarded as a very injurious impurity, and Cu is one of the few metals which can practically be introduced into Pb with any hope of beneficial results. Chem. lead is examd. by immersion in either plain H_2SO_4 (d. 1.72) or nitrous vitriol (2.5% N_2O) of d. 1.72. The general behavior and loss in wt. are recorded. $PbSO_4$ has an important bearing on corrosion, and the method can give a value to this form of protection. Addn. of 0.027% Cu to Pb contg. 0.008% Bi has the effect of correcting a loss. In plain H_2SO_4 pure Pb can show a "protective coating value" of over 100%. A second immersion of pure Pb after cleaning and exposing a fresh surface had the effect of reducing corrosion losses, possibly due to a state of passivity, or a measure of passivity, having been brought about in the lead. When HNO_3 or HNO_2 is involved, a great decline is shown in the figure which represents the "protective coating value;" the average for all leads in plain acid was 70, whereas in nitrous vitriol it was only 3. Of the 4 leads which lost most by corrosion, 3 contained Cu, while the fourth, a pure lead, failed to pass the "flash" test. There was no evidence to prove that selective action had proceeded with respect to the soln. of Cu in any Pb. Over longer periods the "protective coating value" of coppered Pb in plain H_2SO_4 can exceed 100%, and this type of Pb resists plain H_2SO_4 at atm. temp. rather better than pure lead. The latter over long periods of immersion resists corrosion in nitrous vitriol to a greater degree than a coppered lead. A high standard of purity in Pb (99.99%) is essential—except for Cu, which is permitted in some cases to the max. extent of 0.05%. Casting previous to rolling sheet must be conducted so that no "cold setting" takes place, and there must be no excessive shrinkage in the cast block which would show cleavage of Pb crystals at those places which solidify last of all. Too much reliance is sometimes placed on the self-annealing characteristic of lead with the result that it may be subjected to excessive working. Rupture has been brought about by severely straining cold-worked lead. Aspects of corrosion related to users of chem. Pb are: (1) Pitting, which is attributed in some cases to a too liberal use of niter. (2) The necessity of properly supporting lead wherever

applied because under stress or strain with or without the aid of a corrosive agent intercryst. failure is induced. A grave danger lies in the introduction of Cu to mask a fault, and uniformity in the final product may be lacking. B. C. A.

Corrosion and residual current. I. The importance of residual currents in metal solution. F. TÖDT. *Z. Elektrochem.* 34, 586-91(1928); cf. *C. A.* 23, 588.—(I.) Various metallic couples were immersed in 0.1 N HCl and 0.1 N standard acetate solns. The current flowing was measured both when the soln. was quiescent and agitated. C. d. increased with agitation and the current fell off with time. C. d. varied with the area of the noble metal and was independent of the area of the anode. Introduction of air and O_2 or oxidizing agents increased the c. d. When distd. H_2O was used as the liquid medium the current did not change upon agitation. The loss in weight checked values calcd. from Faraday's law. Auto-soln. only took place in Zn-Pt couples. These facts show that the function of noble metals coupled to others is to provide a larger area for O depolarization rather than to a change in the e. m. f. of the cell. The currents developed are likened to residual currents except that the O_2 comes from the air rather than the anode and hence the current is independent of the e. m. f. The elements investigated were Cu, Pb, Pt, As, Cd and C. II. The importance of residual currents in metal deposition. *Ibid* 591-5.—Cd deposits on Pt were immersed in solns. and the e. m. f. was measured. Thin layers of Cd caused the Pt to exhibit the Cd potentials. After a time the Pt potential was again obtained. The Cd dissolved and the rate of reversion to Pt potential was dependent upon the time of deposition and the c. d. at which it was deposited. The deposition and soln. of the Cd are influenced primarily by the residual current. A layer of Cd melted on Pt on immersion gave a much more sudden reversion of potential to that of Pt. Voltages were measured by means of an especially constructed vacuum tube voltmeter. B. E. ROETHELI

Investigation on the corrosion of a galvanized iron hot-water cylinder. H. F. RICHARDS. *Iron and Steel Ind.* 2, 45-6(1928).—A galvanized-Fe hot-water cylinder failed by perforation after two years. The H_2O was high in CO_2 and $Ca(HCO_3)_2$ and contained Cl^- and NO_3^- . The presence of basic Zn carbonate in the corrosion products showed the Zn to be attacked by the hot H_2O . The tendency for Zn to go into soln. is augmented by the irregularity of the Zn-Fe alloy layers which causes the partial exposure of alloys having different potentials causing electrolytic corrosion. B. E. R.

The preparation of iron electrodes in corrosion experiments. W. VAN WÜLLEN-SCHOLTEN. *Korrosion u. Metallschutz* 4, 205-72(1928).—The potential of iron was found to change according to the preliminary treatment of the electrode. Coarsely and finely polished iron electrodes were connected in a NaCl soln. The finely polished metal became anodic, while washing the polished electrode in alc. caused the current to flow in the opposite direction. E. m. f. measurements were made on corroded Fe; on Fe with corrosion products removed by normal cleaning (H_2O + sand) and on the same after polishing with emery and after filing. The e. m. f. increased with treatment in the order named. The e. m. f. decreased with time upon allowing the electrodes to remain in air prior to immersion. The phenomena observed are attributed to one or more of three things: change in Fe potential, change in O_2 potential or changes in the ionization const. B. E. ROETHELI

Intercrystalline corrosion of nickel. W. KÖRNER. *Z. Metallkunde* 21, 19-21(1929).—Flexure tests of 1 mm. thick Ni plate heated in O_2 and in SO_2 show that brittleness is produced by absorption of S rather than O_2 . The no. of flexures to produce fracture in O_2 remains const. at about 17 up to 700° , and then only falls slightly, being still about 15 at 900° . In SO_2 , however, the no. of flexures to break falls from 17 to about 14 at 600° and then falls very rapidly, being about 10 at 700° and only about 1 at 800° . Identical specimens heated in N_2 and SO_2 showed marked difference in appearance, those in SO_2 being obviously very brittle. Microscopic action shows the attack to be intercryst., and diffusion into the inner part of the specimen to be slow. Heating at 1000° to 1100° in an inert atm. partly remedies the defects produced by S attack, the sulfide inclusions being driven away from the grain boundaries and distributed through the crystals. Heating in H_2S produces harmful attack more quickly than in SO_2 . The no. of flexures to fracture for a wire heated 1 hr. at 800° in scale, iron rust and other S-contg. materials shows the effect of S as follows. It falls from 33 with no S to 30 with a S content of 0.015%, to 14 with 0.41% S and to only 8 with 0.49% S. H. S.

Corrosion of metals in water distribution systems (SPELLER, CHAPPEL.) 14. Permeability to gases of SiO_2 bricks, mortar joints and masonry in the Siemens-Martin furnace (BANSSEN) 19. Changes in the specific gravity of Cu and Ag after heat treat-

ment (RUER, KUSCHMANN) 2. The automatic formation of a protective film from cold water in Fe pipes (TILLMANS, *et al.*) 14. Iron-containing rings of smaller effective permeability (RETZOW) 2. Aging phenomena in thermoelements (LÉNT, KOFLER) 1. Hartmann spiral bricks (TORNBLAD, MITCHELL) 19. "Blast stoves" and regenerators, etc. (Brit. pat. 295,075) 1. Slime classifier (Ger. pat. 470,734) 1. Apparatus for separating mineral materials (U. S. pat. 1,705,342) 1. Roasting ores, etc. (Brit. pat. 294,194) 20. Apparatus for heating molten type metal or other materials and treating them with gaseous or liquid hydrocarbons, etc. (Brit. pat. 294,697) 1. Sintering granular refractory material for hearths, heating rings or the like of metallurgical furnaces, etc. (U. S. pat. 1,704,902) 19. Refractory bricks (Brit. pat. 295,051) 19. Grinder for ores, etc. (Fr. pat. 645,385) 1. Determining ash in coal, etc. (Fr. pat. 645,665) 21. Apparatus for drying air by refrigeration (for use in blast furnaces, etc.) (Brit. pat. 294,354) 1. Apparatus for washing coal and other minerals (Fr. pat. 645,630) 1.

A. S. S. T. Handbook. Cleveland: American Soc. Steel Treating. 660 pp. \$7.50; \$5 to Inst. of Metals members. Reviewed in *Mining Met.* 9, 519(1928); *Chem. Met. Eng.* 35, 692(1928).

Standard and Tentatively Adopted Methods of Testing and Grading Foundry Sands. Chicago: Am. Foundrymen's Assoc. 94 pp. \$3. Reviewed in *Metal Ind.* (N. Y.) 27, 33(1929).

Zinc and Its Corrosion Resistance. New York: Am. Zinc Inst. 82 pp. \$1. Reviewed in *Mining Met.* 10, 103(1929).

HORN, HANS. *Die Schweissung des Kupfers und seiner Legierungen Messing und Bronze.* Berlin: Julius Springer. 102 pp. M. 4.80. Reviewed in *Rev. metal.* 26, 44(1929).

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PREUSS, E. *Die praktische Nutzenanwendung der Prüfung des Eisens durch Ätzverfahren und mit Hilfe des Mikroskopes, für Ingenieure, insbesondere Betriebsbeamte.* Berlin: Julius Springer. Edited by G. Berndt and M. von Schwarz. 3rd ed., revised and enlarged. 198 pp. Paper, M. 7.20; bound, M. 9.20.

Apparatus (operating under suction or pressure) for sintering or roasting ores. COMPAGNIE DES METAUX OVERPELTLOMMELE. Brit. 294,197 and Brit. 294,198, July 20, 1927.

Grate for ore sintering apparatus. JOHN E. GREENAWALT. U. S. 1,704,681, March 5.

Briquetting ores. E. A. A. GRÖNWALL. Brit. 294,470, July 23, 1927. Ores such as those of Fe or Mn are briquetted with powdered granulated iron (which may be prepd. by pouring molten iron into water while stirring and afterward crushing), powdered C and water, with or without addn. of an acid or salt or a slag-forming ingredient such as lime or CaCO_3 . For producing alloy steels the briquets may also contain ferro-Si, ferro-Cr, ferro-Ni, ferro-V, etc.

Purifying solutions resulting from leaching ores. ARCHER E. WHEELER. U. S. 1,703,435, Feb. 26. A soln. such as that formed from Cu ore and H_2SO_4 contg. pptd. impurities such as those contg. Fe and Al is treated with ore particles slightly larger than the particles of the pptd. impurities and the coarser ore particles are then sep'd from the assoc. pptd. impurities and are further treated, *e. g.*, for Cu recovery.

Leaching copper ores. MINERALS SEPARATION, LTD. Brit. 294,921, April 1, 1927. Ores such as oxidized Cu ores which have been treated by processes such as those described in Brit. 185,242 (C. A. 17, 53), Brit. 190,246 (C. A. 17, 2860), Brit. 233,029 (C. A. 20, 574) and Brit. 237,964 (C. A. 20, 1781) are treated to sep. the slimes, either before or after heat-treatment, the slimes are conc'd. by flotation and the flotation concentrates are leached either separately or together with the coarser material. In the flotation operation reducing gases such as producer gas may be used instead of air.

Treating ores containing copper or lead in oxidized form. FERDINAND DIETZSCH. U. S. 1,703,763, Feb. 26. Ores such as oxidized Cu ores are treated with SO_2 and water and an aq. thiosulfate soln.

Copper from ores. ANGLO AMERICAN CORP. OF SOUTH AFRICA, LTD. Brit. 294,868, Dec. 7, 1927. Cu is extd. from ores with an ammoniacal solvent such as a soln. of $(\text{NH}_4)_2\text{CO}_3$ in an app. of compact form without exposure of the solvent soln. or undue diln. of the soln. Numerous details of procedure are given.

Treating tin ores, etc. F. L. WILDER, E. MORRIS, E. SCHIFF and R. S. KING. Brit. 294,703, Feb. 6, 1928. Sn-bearing materials such as ores or slimes, preferably after drying and preheating, are heated to about 200–300° in S vapor or a sulfuretted gas. The solid products or residues are passed into an alk. polysulfide soln. and the dissolved Sn is recovered by electrolysis; any Sn sulfide volatilized with excess S vapor is condensed in an alkali soln. (preferably $(\text{NH}_4)_2\text{CO}_3$) and the sludge thus obtained is washed free from carbonate and treated with a polysulfide soln. An app. and various details of procedure are described.

Treating zinc-bearing ores or like materials. CONRAD MATZEL (to Fried. Krupp Gusenwerk. A.-G.). U. S. 1,705,128, March 12. The material mixed with C is subjected to a retort distn. until the Zn content of the charge is reduced to 10–20%, and the C-contg. residue is then subjected to a continuous volatilizing treatment in a heated rotary furnace in which (during the continued rolling over of the charge) the Zn is reduced within the layer of material and driven out as vapor and then oxidized by the oxidizing atn. maintained in the furnace and the ZnO is recovered. An arrangement of app. is described.

Distilling zinc. NEW JERSEY ZINC CO. Brit. 295,115, July 8, 1927. See Fr. 385,619 (C. A. 23, 368).

Distilling zinc in a vertical muffle furnace. A. ROITZHEIM and W. REMY. Brit. 294,127, April 6, 1927. In the operation of an externally and internally heated vertical muffle, any ZnO formed is sepd. from the Zn vapors before the latter are condensed (suitably by condensation of the oxide in a mass of coke). The app. used is described.

Precious metals from sea water. H. BARDT. Brit. 294,655, July 29, 1927. For the purpose of recovery of precious metals such as Au and Ag and halogens such as Br and I, sea water is treated, successively or simultaneously, with reducing agents such as SO_2 or sulfite lye, and a mixt. of activated C with metal powder such as Cu, Al, Fe or Zn.

Apparatus for separating gold from a pulp comprising gold-bearing sand and water. GEORGE KETTLE. U. S. 1,704,746, March 12. The pulp is agitated in contact with the bottom of a box formed of or covered with rough bark. Various structural features are described.

Apparatus for concentrating gold ore, etc. JOSEPH STEPHAN. U. S. 1,704,265, March 5.

Device for agitating molten babbitt metal, etc. SALEM SMITH (to Federal Mogul Corp.). U. S. 1,703,966, March 5.

Granulating molten slags or converting them into porous products with water or air. P. OHRT (to T. Giller). Brit. 294,175, July 19, 1927. Mech. features. An app. is described.

Smelting manganese. ANSON G. BETTS. U. S. 1,703,657, Feb. 26. An ore or similar material contg. Mn and silica is smelted with the addn. of a sulfide such as iron pyrite to produce fused Mn sulfide, fused metallic Fe and fused siliceous slag; the Mn sulfide is converted to Mn oxide and the latter is reduced to Mn.

Dephosphorizing iron in the converter. P. RIES and F. BICHEROUX. Belg. 30,809, May 31, 1928. Powdered CaO is injected continuously during the decarburization period. The CaO may be introduced either toward the middle of the converter by means of a compressed inert gas, or else at the bottom with the air blast.

Reducing metals such as copper and nickel from their oxides or other compounds. VACUUM-SCHMELZE GES., H. GRUBER, W. ROHN and O. H. WEBER. Brit. 294,795, Sept. 22, 1927. Compds., such as oxides and sulfides, which are capable of being dissociated at elevated temps. are subjected, in a solid or fused condition, to a vacuum exceeding the dissociation tension corresponding to the temp. of the compds. until dissocn. into solid or molten metal and volatile metalloids is completed. Molybdic acid contained in tungstic acid can be removed at a temp. of redness prior to dissocn. of the tungstic acid to produce W free from Mo. Various details and examples of the process are given.

Metals free from carbon. THE INTERNATIONAL NICKEL CO. Fr. 645,406, Dec. 8, 1927. Molten metal such as Ni is given an oxidizing treatment to remove C and the gases formed, and then to a reducing treatment with a substance which does not form gas, e. g., Si or Mg.

Casting iron. R. MAYER and L. MAYER. Belg. 349,546, May 31, 1928. The mold is provided with a vent-hole at the bottom so that the first portion of metal poured does not stay in the mold and carries off any dirt present. Sand cores are replaced by solid or hollow metal cores, coated so that they may be withdrawn from the casting. The hardness of the casting may be varied by varying the thickness of the core.

Casting magnesium and its alloys. JOHN A. GANN and JOHN E. HOY (to Dow

Chemical Co.). U. S. 1,704,384, March 5. An app. is specified comprising separable mold parts, one of which is provided with a chamber in which a nonoxidizing gas may be generated (suitably by combustion of S) in a chamber which is sealed off by the other mold part except for a vent into the mold cavity.

Metal-casting plant. FELIX MÜLLER. Ger. 470,863, July 11, 1925. Plan is described for the continuous manuf. of metal castings of various forms with the use of a no. of corresponding molding boards serially arranged, a single sand-distributor and a single press.

Apparatus for melting and casting metals and for preparing the molds so used. W. A. LOTH. Brit. 294,239, July 21, 1927.

Mold for casting metals. L. E. INGENBLEEK. Belg. 348,247, Feb. 29, 1928. The mold is made of asbestos, or of a material having an asbestos base; or it is lined with asbestos sheet or with asbestos-base pulp.

Molds for die-casting from metal, gypsum, etc., coated with iron. KUNO WELSCHER. Ger. 470,862, Feb. 26, 1926.

Ingot mold. HERAEUS-VACUUMSCHMELZE A.-G. Ger. 471,044, Dec. 10, 1927. Addn. to 442,446.

Ingot mold. DAVID J. GILES (to Latrobe Electric Steel Co.). U. S. 1,703,442, Feb. 26. Molds for casting steel ingots are formed of a cast-iron alloy containing 0.25-3.00% (the remainder of the alloy being principally cast iron).

Header for ingot molds. ANDREW FORREST (to Interstate Iron and Steel Co.). U. S. 1,703,523, Feb. 26. Structural features.

Steel ingots. D. WILLIAMS. Brit. 294,440, Jan. 18, 1928. Steel which evolves considerable gas when cast into ingots is improved by adding a small quantity of fluor-spar or the like to the metal, in the ladle or in the mold. Use of baking powder, chrome ore, roll scale and NaCl is also mentioned.

Conveyor band for castings and used sand. VEREINIGTE SCHMIRGEL- UND MASCHINEN-FAB. A.-G. VORM S. OPPENHEIM & CO. UND SCHLESINGER & CO. Ger. 470,957, Mar. 3, 1928.

Apparatus for blending molding sand for foundry use. GEORGE F. ROYER. U. S. 1,703,956, March 5.

Apparatus for regenerating foundry sand. WILLARD J. BELL. Fr. 645,053, Dec. 2, 1927.

Furnaces. SIDNEY E. MAJOR and EMRYS F. BAKER. Australia 12,464, Mar. 23, 1928. In a metal-melting furnace a lower or flame chamber is provided with a tangential flame inlet and the crucible is so placed in the chamber that the width of the space between the wall and the crucible gradually diminishes from the inlet.

Construction of furnace walls, especially metallurgical furnace walls. ÉTABLISSEMENTS F. LABESSE. Ger. 470,811, June 26, 1925.

Metallurgical cupola furnace with a movable inclined bottom. DANIEL CUSHING. U. S. 1,703,337, Feb. 26.

Cupola furnace construction. FREIER GRUNDER EISEN- UND METALLWERKE GKS. Brit. 294,234, July 21, 1927. Slag and metal are discharged through a single aperture into an open separator from which the 2 substances are continuously discharged at different levels.

Ore-roasting furnace. ANTON APOLD and HANS FLEISSNER. Fr. 645,212, Dec. 6, 1927.

Furnace suitable for calcining and reducing ores. EDWIN B. THORNHILL (to Thornhill-Anderson Co.). U. S. 1,705,039, March 12.

Shaft type furnace for reducing ores of zinc or other metals. THADDEUS F. BAILY. U. S. 1,704,029, March 5. A reaction chamber is surrounded by a combustion chamber and an aerating pump is provided for feeding materials such as air carrying ore in suspension to the reaction chamber; gaseous products are removed from the latter and are conducted to the combustion chamber.

Blast-furnaces. BROKEN HILL PROPRIETARY CO., LTD. Fr. 645,473, Dec. 9, 1927. Constructional details.

Blast furnace construction. JAMES P. DOVEL. U. S. 1,703,517, Feb. 26. U. S. 1,703,518-9-20 also specifies various details of blast-furnace construction.

Distributor for blast furnaces. HARRY L. WEATHERS (to Freyn Engineering Co.). U. S. 1,704,715, March 12.

Furnace for melting or agglomerating finely divided materials such as blast-furnace dust. A. DAWANS. Brit. 294,639, July 29, 1927.

Induction furnace. HERAEUS-VACUUMSCHMELZE A.-G. and WILHELM ROHN.

U. S. 1,703,859, Feb. 28, 1925. In an induction furnace for melting metals and alloys, the receptacle for the metal is made of a Cr-Fe alloy rich in Cr.

Furnace for heating metal blanks. SVEN T. NELSON (to Sullivan Machinery Co.). U. S. 1,703,776, Feb. 26.

Furnace for heating packs of metal sheets. LEIF LEE. U. S. 1,703,676, Feb. 26. Structural features.

Continuous furnace for heating and "normalizing" thin sheets of metal. FORREST MANKER (to Surface Combustion Co.). U. S. 1,703,943, March 5.

Furnace for annealing or heat treating wire or similar materials. FRANK T. COPE (to Electric Furnace Co.). U. S. 1,704,036, March 5. The wire is passed through a vertically sealed tube and fluid conductors such as baths of lead are provided for passing elec. current through the wire and tube.

Liquid seals for annealing furnaces for wire, etc. FRITZ GIESECKE. Ger. 470,939, pr. 15, 1927.

Furnace practice. FIRMA CARL STILL. Ger. 469,426, Dec. 21, 1923. The thermal capacity of air for furnaces, particularly of the blast of blast furnaces, is improved by suitable addns., e. g., of CO₂ or hydrocarbons.

Process and apparatus for iron manufacture. SOCIÉTÉ ANONYME D'OUGRÉE-JARHAYE. Belg. 347,746, Feb. 28, 1928. A fluid or finely pulverized solid is introduced into the blast furnace at a point approx. $\frac{1}{4}$ of the total height above the tuyères. Solid material is introduced by means of a mixt. of compressed hot and cold air.

Malleable iron. NATIONAL MALLEABLE AND STEEL CASTINGS CO. Fr. 645,859, Dec. 17, 1927. See Brit. 282,671 (C. A. 22, 3622).

Malleable iron having a black fracture. C. E. KLUIJTMANS. Belg. 348,616, March 31, 1928. In order to maintain the compn. const., progressive doses of Fe-Si and Fe-Mn are used according to the diam. and the temp. of the lining of the cupola during melting. A small quantity of fresh ore is added during annealing to reduce the C content. The time of annealing is reduced as the Si content increases.

Spongy iron. HÖGANÄS-BILLESOLMS AKTIEBOLAG. Fr. 645,328, Dec. 7, 1927. Spongy Fe is prepd. by adding lime or MgO and C, the latter in excess of the quantity required for reduction, to the ore and reducing in the absence of air at a temp. below fusion and finally cooling the mass; this cooling may be accelerated.

Heat treatment and working of iron and steel. VEREINIGTE STAHLWERKE A.-G. Brit. 294,216, July 21, 1927. Iron or steel contg. at least 0.1% of Al or Si, Mn, Ti, Mg, Zr or a similarly acting metal or one of these metals in addn. to Al is worked at temps. below the A3 or the Al point and then annealed at above the A3 point. Examples are given, and the metal may also contain Cu, Cr, Mo or like metals.

Iron and steel. VEREINIGTE STAHLWERKE A.-G. Brit. 295,022, Aug. 6, 1927. By suitable compn. of the charge used and highly accelerated melting the metal-forming bath is kept as low in O as possible during the smelting and is purified in several stages by different purifying media. The smelting may be effected in a basic hearth furnace and the charge may be formed of iron as low as possible in O such as iron or iron shavings free from rust and the purifying materials may be Mn, Si, Ti (successively added in the order mentioned). The metal thus produced may be rendered, by suitable working and heat treatment, non-sensitive to cold brittleness, etc.

Steel. ROBERT A. HADFIELD. U. S. 1,704,385, March 5. See Brit. 273,855 (C. A. 22, 1946).

Lathe tools made of tungsten containing over three per cent carbon. O. DIENER. Brit. 294,086, Feb. 15, 1928. B up to 0.2%, Si up to 1.5% (or both B and Si in any proportion up to 1.5%) may be present and the material may be prepd. from W powder contg. the desired C, under high temp. and pressure.

Treating materials comprising tin, lead, copper and antimony in a shaft furnace. HETTENWERK NIEDERSCHÖNWEIDE A.-G. Brit. 294,487, July 21, 1927. A deep layer of the material is smelted in a shaft furnace heated from above, so that there is obtained at the bottom first an alloy consisting mainly of Sn and Pb with small proportions of Cu and Sb. The temp. may then be raised to obtain an intermediate alloy which is subsequently added to a fresh charge, and the residue is finally drawn off at a still higher temp.

Pulverizing metals. EMIL PODSZUS (to Hartstoff Metall A.-G. (Hametag)) U. S. 1,703,634, Feb. 26. In pulverizing Cu, Al, Sn or other metals in the dry state, the metal particles are caused repeatedly to impinge upon each other by the action of opposed fluid currents such as gas eddies continually circulating within an enclosed space and about 2% of a fatty substance such as olive oil or stearin or paraffin is added to the metal particles to coat them with a thin film and maintain them in dry condition.

Heating and rolling metal sheets. JOHN B. TYRUS (to American Rolling Mill Co.). U. S. 1,704,640, March 5. Mech. features. An arrangement of app. is described.

Apparatus for quenching metals after heat treatment. EDWARD F. KENNEY and LOUIS H. WINKLER (to Bethlehem Steel Co.). U. S. 1,704,327, March 5.

Torch (with a plurality of heating and chilling nozzles) for use in "torch hardening" the surfaces of metal articles. G. H. FLETCHER, C. L. SUMPTER and METROPOLITAN-VICKERS ELECTRICAL Co., LTD. Brit. 294,709, May 3, 1927. Structural features.

"Antifatigue alloy." VICTOR N. HYBINETTE (to Hybinette Patents Corp.). U. S. 1,704,251, March 5. An alloy comprises at least 95% Al, metals of the Cr group less than 1%, Ni less than 2% and less than 0.5% each of Cu, Mg and Si; the alloy is quenched at about 480° and aged at 90-205°.

Heat-resisting alloy of aluminum and chromium. FRANK A. FAHRENWALD. U. S. 1,704,733, March 12. An alloy which is suitable for use in making crucibles or elec. resistors comprises Al 3-20 and Cr 97-80%.

Heat-resistant alloys containing chromium, nickel and iron. NOAK V. HYBINETTE. U. S. 1,704,087, March 5. Cr 10-15, Ni 30-35 and Fe 50-60% are smelted together in an open-hearth reverberatory furnace, and the C content of the alloy is regulated so that it is about 0.50-0.75% in the finished product. Alloys thus prepd. are suitable for making malleablizing boxes or other app. used at high temps.

Aluminum alloy. PIERRE BERTHELEMY and HENRY DE MONTBY. Fr. 33,500, Jan. 20, 1927. A light highly resistant alloy of Al is made by melting Cu 42, Mn 2, Fe-Si 5.35, W 1 g., adding Al 9.65 and incorporating the whole in Al 840 g. with stirring and finally adding an alloy contg. Al 58, Mg 20, Cd 22 g.

Aluminum alloy resistant to corrosion. VICTOR N. HYBINETTE (to Hybinette Patents Corp.). U. S. 1,704,252, March 5. An alloy which is suitable for plumbing fixtures or ship propellers contains Al together with less than 2% Ni, less than 1% of metals of the Cr groups and between 0.2% and 0.5% each of Cu and Mg, and is quenched at about 480° and aged at 90-205°. Cf. C. A. 23, 1104.

Highly plastic strong aluminum alloy. VICTOR N. HYBINETTE (to Hybinette Patents Corp.). U. S. 1,704,253, March 5. In making an alloy which is suitable for rivets, piston rods, sheets, etc., Al is first alloyed with less than 2.5% of heavy metals such as Ni, Cr, W, Mo, Mn, Fe and Zn and less than 0.5% Cu and 0.5% Mg to make the resulting alloy only slightly responsive to heat treatment, and the strength and plasticity are developed by working the metal after it is quenched and before it is fully aged, in intermittent periods of aging and working.

Copper-nickel-tin alloys. A. B. DAVIS (to Barber Asphalt Co.). Brit. 204,233, July 21, 1927. Alloys are described which contain Cu 80-90, Ni 2-10 and Sn 1-8% and which are modified by the addn. of one or more of the elements Si, Cr Sb and Mn (usually within the proportions of Cr 0.1-3.0, Sb 0.5-3.0 and Mn 0.2-5.0% and Si sufficient to give substantial satn.)

Lead alloy. JOHN V. O. PALM (to Cleveland Graphite Bronze Co.). U. S. 1,704,208, March 5. An alloy which is suitable for bearings comprises Pb 82, Sn 9, Sb 4, Zn 3, Cu 1.5 and Al 0.5%.

Lead alloys. LE MATÉRIEL TÉLÉPHONIQUE (SOC. ANON.). Fr. 645,745, Dec. 15, 1927. A small % of Cu is added to an alloy of Pb and Sb used for making tubes for elec. cables. An example contains Pb 98.92, Sb 1, and Cu 0.08%, the Cu being alloyed with the Sb before addn. to the Pb.

Tungsten alloy. HEINRICH FALKENBERG. U. S. 1,703,577, Feb. 26. Metallic W is melted with approx. an equal quantity of an alloy of Pb and Sb in the presence of small quantities of Fe, the mixt. is dild. by the addn. of further quantities of Pb-Sb alloy and the resulting mixt. is fused with a mixt. of metals contg. Pb and a metal such as Sn, Sb and Cu of higher m. p. than Pb. The resulting alloy is suitable for bearings or ammunition.

Separating copper from nickel. ISRAEL W. WILENCHIK. U. S. 1,703,329, Feb. 26. An alloy contg. Cu and Ni is melted together with a mixt. of S, Na₂SO₄, CaSO₄ and coke and the molten mass is poured into a settler so that on cooling the sulfides of Cu and Ni sep. by gravity and may be sepd. and converted successively into oxides and metals.

"Antifriction metal." ROBERT J. SHOEMAKER (to S. & T. Metal Co.). U. S. 1,703,212, Feb. 26. An alloy suitable for bearings, bushings, etc., comprises Pb together with Sn 1-5, Ca 0.1-1.0, Mg 0.02-0.3 and Al 0.02-0.1%.

Refractory metals such as uranium and thorium. JOHN W. MARDEN, THOM

P. THOMAS and JOHN E. CONLEY (to Westinghouse Lamp Co.). U. S. 1,704,257, March 5. In order to obtain metals such as U or Th from their difficultly reducible oxides, the latter are heated to a reacting temp. with Ca or other alk. earth metal and an alk. earth metal halide such as CaCl_2 .

Apparatus for mixing the ingredients of type metal. B. D. WARNE and S. CALVER. Brit. 294,276, April 21, 1927.

Material for marine cables. SIEMENS-SCHUCKERTWERKE A.-G. Brit. 294,464, July 23, 1927. A marine telephone cable with coil loading is made with nonmagnetic armoring over the coil pieces. A metal may be used comprising Fe 75-85, Ni 9-15, Cr 3-5 and Mn 3-5%.

Telephone-cable armor. ERNST BRANDUS. U. S. 1,705,057, March 12. In order to form a telephone-cable armor capable of excluding magnetic stray fields from the cable strands, Pb alloy for the cable is finely comminuted and intimately intermixed with finely comminuted Fe particles and the mixt. is molded under high pressure in forming the cable. An app. is described.

Resistor grids. VERA B. BROWNE. U. S. 1,703,707, Feb. 26. Resistor grids are formed of strip material composed of an Fe-Cr-Al alloy which is heated to above 37° but below hot working temp. and then bent and coiled into the form desired for the grid.

Composite material suitable for safe and vault walls. JOSEPH G. DONALDSON and HENRY L. COLES (to Guardian Metals Co.). U. S. 1,703,661, Feb. 26. A core of material such as ZrO_2 , Zr silicate and graphite which is refractory and highly resistant to drilling and to local high heat is surrounded by a metal of higher heat conductivity such as steel, a portion of which impregnates the core to greater than a weld depth and is chemically combined with at least one of the constituents of the core. U. S. 1,703,662 specifies mixing ZrO_2 and SiO_2 , adding graphite in greater quantity than is absorbed by the mixt., heating the mixt. to fusion, cooling, preheating, and pouring molten metal such as steel around the preheated material so that the metal unites with it.

Composite metal walls for safes and vaults. JOSEPH G. DONALDSON (to Guardian Metals Co.) U. S. 1,703,416, Feb. 26. A casing of metal such as Mn steel contains a core of substances such as Zr or its compds or mixts. which are poor conductors of heat when cold but become good conductors when locally highly heated.

Composite safe and vault walls. JOSEPH G. DONALDSON (to Guardian Metals Co.) U. S. 1,703,417, Feb. 26. A core comprising Zr oxide together with Zr silicate and graphite is fused, cooled and heat treated and then surrounded while hot by a casing of metal such as iron which is applied while molten.

Composite laminated metal stock of gold and platinum layers suitable for jewelry. FRANK B. FRY (to H. A. Wilson Co.) U. S. 1,704,126, March 5.

Making metal tubes by extrusion of pierced metal blanks. F. SINGER. Brit. 291,198, March 24, 1927. Mech. features. An app. is described.

Cutlery of rust-proof metal. G. HAMMESFAHR (trading as the firm of G. Hammesfahr). Brit. 294,573, July 26, 1927. Articles such as knives and scissors are forged and ground to shape, then hardened in a salt bath furnace, and polished.

Preserving metals. THE GOODYEAR TIRE & RUBBER CO. Fr. 644,988, Dec. 1, 1927. The corrosive action of acids on Fe and steel is prevented by treating the metal with an acid soln. contg. the product of reaction of an aldehyde with H_2S or an alkali metal sulfide. Suitable substances include methylene mercaptan, thiodimethylene mercaptan, dithiotrimethylenemercaptan, methylene bisulfide and trithioaldehyde.

Protecting metals. SOC. ANON. DES HAUTS FOURNEAUX ET FONDERIES DE PONT-A-MOUSSON. Fr. 645,095, Dec. 3, 1927. Fe metals are protected against corrosion and rust by submitting them to the action of a warm soln. of carbolic acid or phenols to form a very adherent and resistant corrosion film. Strong acids or their ferrous salts may be added, and the soln. may be used as an electrolyte; the metal to be treated forms the anode and Fe or other metal the cathode.

Coating metals with lead. OSKAR SPENGLER. Ger. 470,904, Apr. 2, 1925. The base metal is smeared with a soln. of a halogenide of Zn contg. a small amt. of a halogenide of Sn, and heated to the m. p. of Pb; molten Pb is then poured over it.

Device for protecting the interior of iron and steel pipes from corrosion. RONALD V. MILLS (to Peter Q. Nyce). U. S. 1,705,197, March 12. A removable coupling located intermediate adjacent lengths of the pipe is formed with an outer steel shell and an interior casting of Zn, of substantial thickness, the steel shell being of about the same thickness as the pipe and the interior diam. of the coupling being about the same as that of the pipe.

Surfaces of aluminum. SPRENGER CORP. M. B. H. Fr. 645,341, Dec. 7, 1927. The surface of Al or its alloys is protected against the action of air and moisture by a treatment with HNO_3 . An iridescent surface may be obtained by adding salts of Cr, Cu, Co, Ni or Zn to the bath. The above treatment also facilitates the plating of Al with Ni, Cu or Co, or a coating of resin, celluloid, varnish, etc., may be applied to the treated surface.

Branning apparatus for cleaning tin plate. SAMUEL E. DIESCHER (to S. Diescher & Sons). U. S. 1,705,177, March 12.

Cleaning and annealing metals. NOAK V. HYBINETTE. U. S. 1,704,086, March 5. Ni or its alloys, metals contg. Cr and the like are freed from oxide by the action of a molten slag capable of dissolving the oxide and which contains boric acid together with other ingredients such as soda, Na_2SO_4 and Na silicate which give a slag which is elastic while hot but brittle when cold. This treatment may serve for simultaneous deoxidation and annealing.

Annealing sheet steel. HARRY M. NAUGLE and ARTHUR J. TOWNSEND (to Columbia Steel Co.). U. S. 1,704,015, March 5. The steel is uniformly and quickly heated to annealing temp., maintained at this temp. only until the microstructure of the steel is corrected, and then quickly cooled to avoid grain growth.

Annealing sheet steel. PAUL A. MEEHAN (to American Dressler Tunnel Kolls, Inc.). U. S. 1,703,630, Feb. 26. In annealing in layers, diatomaceous earth is placed between each pair of sheets.

Welding steel rail joints. CURT STEDEFELD. U. S. 1,704,410, March 5. See Brit. 273,326 (C. A. 22, 1948).

Solder. WILHELM REUSS. Fr. 645,549, Dec. 10, 1927. See U. S. 1,675,664 (C. A. 22, 3129).

Applying solder. JOHN KARMAZIN. U. S. 1,704,539, March 5. Joints of automobile radiators or other materials to be soldered are covered with a suspension of soldering flux such as ZnCl_2 and pulverized solder, and, after removal from the suspension, heated to melt the solder.

Soldering salt. A. GILLESSEN and A. CUGINI. Belg. 348,710, March 31, 1928. The salt consists of NH_4Cl and ZnCl_2 prep'd. by dissolving Zn in HCl to neutrality, adding a wt. of NH_4Cl equal to that of the Zn, and crystg. the mixed salt.

10—ORGANIC CHEMISTRY

CHAS. A. ROUILLER AND CLARENCE J. WEST

Theory of the meso-structure of organic compounds. I. KOTČKOV. *Bull. Siberian Inst. Tech.* 48, No. 1, 35 pp. (1927).—The strength of linkings is considered to change quite gradually in the series CH_4 , C_2H_2 , C_2H_4 , C_2H_6 , the stronger the affinity claim of one C atom for others, the smaller is the affinity remaining for the neighboring H atom. If the C-H linking is weak, the H possesses a residual affinity called "meso valency." The view is applied to the explanation of *cis-trans*-isomerism, ease of hydrolysis, polymorphism, etc.

Thermal decomposition of methane. TOKISHIGE KUSAMA and UNO YUKIO. *Bull. Inst. Phys. Chem. Research* 8, 1-11 (1929); *Abstracts* 2, 1.—Methane has been pyrolyzed on several catalyzers: (a) pure Ni, (b) Ni + Kieselguhr, (c) same as (b) but deprived of its activity by being used to reduce C_2H_4 , and (d) reduced Fe; (b) and (c) are equally suitable. X-ray spectrograms show that C thus obtained is graphite, which was also proved by the graphitic acid method. This graphite has catalytic properties which are due to the presence of small amounts of Ni from the catalyzer. By detg. the S content of the catalyzer before and after a run, it was ascertained that natural gas contains a certain quantity of S, but only a negligible amount. HCl is better than HNO_3 to recover the catalyst, and a new catalyzer produced by the reduction of NiCl_2 is as active as one obtained from $\text{Ni}(\text{NO}_3)_2$. H obtained by the pyrolysis of CH_4 always contained some CH_4 , that could not be removed, but the mixt. can be used very satisfactorily to reduce C_2H_4 .
ALBERT L. HENNE

Slow combustion of triacontane. LANDA STANISLAS. *Compt. rend.* 187, 948-9 (1928).—Slow combustion of triacontane yields aliphatic acids (formic, butyric and valeric), aldehydes (hex- and heptaldehyde), small amounts of unsat'd. hydrocarbons and C oxides, but no alcs. nor ketones. This agrees with the theory that the last named products arise only from branched-chain hydrocarbons.

Production of gaseous, liquid, and solid hydrocarbons from methane. I. Thermal

Composition of methane. H. M. STANLEY AND A. W. NASH. *J. Soc. Chem. Ind.* 48, T(1929).—The use of comparatively long heating periods causes CH_4 to decomp. C and H, the decompn. being increased by the use of large heating surfaces and by catalysts such as Fe and Ni, but not affected appreciably by porcelain, silica, or beryllia. Short heating periods (as low as 0.4 sec.) at 1000–1200° result in numerous products, among which were identified C_2H_2 , C_2H_4 , C_2H_6 , a higher olefin, C_4H_6 , and higher aromatic hydrocarbons, the formation of C and H being almost negligible. % conversion of CH_4 into higher hydrocarbons increases rapidly with increasing rate and rapidly reaches a max. at a given temp. A further increase in rate results first in a rapid, and later a more gradual, decline in yield of higher hydrocarbons. Increase in temp. increases the optimum velocity for max. yield. The ratio of C_2H_2 to C_2H_4 increases with the gas velocity, attaining a sharp max., and then declining rapidly. The accumulation of C in the reaction tube lowers the yields of higher compds. The presence of steam does not influence the course of the reaction. At 1150°, gas flow of 13.8 ls./hr., using 12 cm. silica tube (5 mm. bore), corresponding to a heating period of 0.6 sec., the yield of light oil and tar based on the CH_4 used was 11.0%, C_2H_2 and C_2H_4 8.8%, H(C) 6%. The theories of the mechanism of the formation of the higher hydrocarbons from CH_4 are discussed.

FREDERICK C. HAHN

The action of atomic hydrogen on hydrocarbons. H. V. WARTENBERG AND G. MÜLTZE. *Techn. Hochschule, Danzig. Z. physik. Chem., Abt. B* 2, 1–9(1929).—attempting to measure the heat of reaction when atomic H reacts with inorg. substances, i. e., Cl, it was found that the H attacked the reaction product of the primary action. The latter reaction was not expected to occur with hydrocarbons. The hydrocarbons and the atomic H were mixed in a U-tube in a Dewar flask which served as a calorimeter. The reaction products were frozen out for analysis at –189° to –193°. Of the hydrocarbons studied, only C_2H_4 was hydrogenated. Besides C_2H_6 , C_2H_2 , H_2 , and unchanged C_2H_4 were the reaction products. Four expts. give the following values for the reaction $\text{H} + \text{H} = \text{H}_2$; 2.4×10^5 cal, 1.7, 5.3 and 4.9. The value found by other methods of measurement is 1×10^5 . C_2H_2 and C_2H_4 in the presence of atomic H give a greater heat development than N_2 or CH_4 . The former cause combination of the atomic H without being changed themselves. In the cases of C_2H_4 , C_2H_2 and H_2 , spectroscopic examn. of the blue gas near the U tube showed $-\text{C} \equiv \text{C}-$ and $-\text{CH}$ bonds at 430μ . The illumination from CH_4 and N_2 was very weak. The following mechanism is suggested for the ethane-hydrogen reaction: $\text{C}_2\text{H}_6 + \text{H} = \text{C}_2\text{H}_5 + \text{H}_2$; $\text{C}_2\text{H}_5 + \text{H} = \text{C}_2\text{H}_6$.

ARTHUR FLEISCHER

Principles of polymerization. J. SCHEIBER. *Chem. Umschau* 35, 181–90(1928).—various examples of polymerization (simple and complex) are considered in an endeavor to derive general principles of the mechanism. The presence of an unsatd. grouping is recognized as the activating factor in polymerization, the degree of which depends on external conditions (temp., catalysts, etc.) as well as on the state of aggregation. The effect on polymerizing power of substituent groups in the mol. is discussed and general rules for their action are derived.

B. C. A.

A study of the synthesis of methanol. E. AUDIBERT. *Soc. nationale de recherches sur le traitement des combustibles. Chimie et industrie* 20, 1015–22(1928).—See A. and Rameau, *C. A.* 22, 4461.

A. PAPINEAU-COUTURE

Formation of allyl alcohol. Pyrolysis of glyceryl formates. RAYMOND DELABY AND PIERRE DUBOIS. *Compt. rend.* 187, 949–51(1928); cf. *C. A.* 23, 1107.—Glyceryl monoformate has been obtained by glycerol esterification: 1 mol. decomps. smoothly at 235° to yield C oxides (22.4 g.), H, satd. hydrocarbons, and 57% allyl alc., partly as allyl formate. Glyceryl monoformate contg. 72% of the α -ester decomp. suddenly below 220°, yielding only 4% allyl alc. Hence the esterification product must consist mainly of the β -ester. Similarly, 1 mol. of α,γ - and α,β -diformates yields 44.8 g. of C oxides, and 43 and 48 g., resp., of allyl alc. at 255–310°. The diformate obtained by esterification contains probably a preponderance of the α,β -ester.

A. L. H.

Catalytic reductions of geraniol and citronellal by means of nickel. KANJI SUZUKI. *Bull. Inst. Phys. Chem. Research* 3, 44–51(1929), Abstracts 2, 3.—The rates of catalytic hydrogenation of geraniol and of citronellal have been observed under certain conditions. In all cases, the 1st mol. of H was attached much more rapidly on citronellal than on geraniol, while the 2nd mol. reacted only very slowly. A minute addn. of FeSO_4 causes a fall of velocity in the case of geraniol, but has little effect upon citronellal. The exptl. conditions were: 5 g. of substance in 25–100 cc. of 70–81% alc., 2–6 g. of catalyst, temp. 25–8°, 1.1 atm. H pressure. After exactly 1 mol. H_2 had been absorbed, the reduction products had the following properties: from geraniol: b_D^{20} 101.5–102.5°, d_4^{20} 0.8523, n_D^{20} 1.4542, $[\alpha]_D^{20}$ 1.17°. from citronellal: b_D 104–6,

d_4^{21} 0.8545, n_D^{22} 1.4541, $[\alpha]_D^{22}$ 4.59°. It is concluded that both products are impure citronellol contg. a certain amount of dehydrocitronellol.

ALBERT L. HENNE

Affinity of hydrocarbon radicals for oxygen. II. RAGNAR LYDÉN. *Finska Kemistisamfundets Medd.* 37, 53-71(1928); cf. *C. A.* 22, 3880.—Equimol. quantities of 2 ethers and AcBr are caused to react in a sealed glass vessel and the resulting mixt is analyzed. The hydrocarbon radical which forms the larger quantity of Br-substituted hydrocarbon and whose bond with the ether O is therefore more easily broken is less strongly bound by O than the other ether hydrocarbon radical. The result of this and the previous paper are summarized in a table in which are given the ratio of the mols. of Br-substituted hydrocarbon formed by the 2 ethers. Et₂O (I) (iso Am)₂O (II), 1:0.456; I:PhOEt (III), 1:1; II:III, 1:0.094; I:iso-AmOPh (IV), 1:0.011 III:IV, 1:0.335; II:IV, 1:0.528; iso-AmOEt (V):IV, 1:0.182; V:III, 1:0.852; Et₂O:PrOPh, 1:0.753; Bu₂O:BuOPh, 1:0.610.

HANS C. DREYER

Isomorphism in oxonium compounds. D. McINTOSH. Dalhousie Univ., Halifax, N. S. *Proc. & Trans. Nova Scotian Inst. Sci.* 17, Pt. 2, 8-9(1928); cf. *C. A.* 22, 2308. The 2 classes of oxonium compds. formed from halogen or halogen hydrides and org substances contg. O₂ differ much in their properties. In order to prove that these 2 classes have different chem. constitutions M. made use of the fact that isomorphism and chem. constitution are sometimes related. A supercooled melt may crystallize if a crystal of an isomorphous compd. is added. M. examd. the following systems: Et₂O with HCl, HBr and HI; EtOH, Me₂CO and AcOEt with HBr; Et₂O, EtOH, Me₂CO and AcOEt with Br and I; Me₂O with HBr and HI. Supercooled Et₂O-HCl (I) crystd. upon addn. of I, Et₂O-HBr, or Et₂O-HI; the effect of the latter was not immediate. Addn. of other compds. had no influence. Et₂O-2HCl (II) was pptd by crystals of II or Et₂O-2HBr. Et₂O-5HCl was brought to crystn. only by low temps. M. concludes that compds. of each class made with the same org. substances are probably isomorphous.

G. SCHWACH

Tetraethylphosphonium nitrite. PRAFULLA C. RAY AND NIRMALENDU SAHU RAY. Univ. College of Science, Calcutta. *J. Indian Chem. Soc.* 5, 733-4(1928). Treatment of Et₄PI (I) with an excess of Ag₂O gave the hydroxide, which was then neutralized with dil. H₂SO₄. The sulfate, when treated with the requisite quantity of pure Ba(NO₃)₂, gave Et₄PNO₂ (II), light yellow, very deliquescent. An attempt to prep II from I and AgNO₃ gave a low yield.

LOUISE KELLEY

Some incidental factors affecting the starting of Grignard reagents. HENRY GILMAN AND R. J. VANDERKWAAL. Iowa State College, Ames. *Rec. Trav. chim.* 48, 160-2(1929).—A study has been made of the effect of negative catalysts in the formation of Grignard compds as well as of some incidental factors in connection with the reaction. The study on negative catalysis is to be published shortly, while in the present paper an account is presented of the influence of some incidental factors. The technique used consists essentially in measuring the time required for 2 cc. of BuBr and 0.5 g. of Mg turnings in 5 cc. of dry ether to give the positive color test described by Gilman and Schulze (*C. A.* 19, 2473; 22, 942). The av. time for such a test, in the absence of a catalyst, is 7.25 mins. at 26°. On replacing 0.5 cc. of the anhyd. ether by ether satd. with water, the time was 33 mins.; with 50% of the dry ether replaced in this way, 2 hrs., and with 5 drops of water satd. with ether, there was no reaction at all. Com. dry ether without any treatment, required 20 mins., but after standing for a few days with Na wire, again 7.25 mins. Powd. glass and globules of Hg are without effect, while the only effect of the residue from BuMgBr that had been allowed to undergo atm. decompn. was to use up part of the Grignard reagent, as it was formed, because of the active H, present in such a decompd. reagent. Seasoned rubber or rubber cut from the inside of a rubber stopper was also found to be without effect, but outside slices of new rubber stoppers were found to delay the reaction to 17 mins. Accordingly, it is recommended that new rubber stoppers be cleaned by scraping or by alkali treatment prior to use. Dry N and air freed of CO₂ are without effect, but satn. of the ether with dry O gave a retardation to 11 mins. CO₂ also had a slight negative effect, probably due to the formation of the compd. RCO₂MgBr while HCl showed a more retarding effect than CO₂. Benzene and petroleum ether, b. 43-86°, exercised a significant retarding effect, while MgBr₂-etherate acted as a positive catalyst, the av. time being 4.3 mins. In the latter case the usual turbidity, which just precedes the formation of most Grignard compds., was absent. At 0-5° the normal time was 24 mins., at 17° 11.9 mins. and at 26° 7.25 mins., thus showing that there is no harm in allowing the ether soln. to reflux during the entire prepn. of the reagent.

C. F. VAN DUIN

The reaction between organomagnesium halides and some salts. HENRY GILMAN

ND JAMES E. KIRBY. Iowa State College, Ames. *Rec. trav. chim.* **48**, 155-9 (1929); *C. A.* **22**, 4504.—The general expression for the reaction between organomagnesium halides and salts is: $MX_n + mRMgX \rightarrow MR_mX_{n-m} + mMgX_2$ (I), either new organometallic halides or simpler organometallic compds. of the type MR_n being formed. Secondly, the reaction may take place to give a product formed by coupling such as $R-R:MX_2 + 2RMgX \rightarrow R-R + MX$ (or M) + MgX_2 (II); this reaction may be preceded by I, such as in the reaction between $PhMgBr$ and $AgBr$, where $AgPh$ is first formed according to reaction I, and then decomps. with the formation of Ph_2 and metallic Ag (*C. A.* **22**, 217, 760). In the present investigation G. and Kirby studied the possibility of the addn. of a $RMgX$ compd. to a functional group, like the CN group, attached to a metal; if the Grignard reagent would add to the CN group, the formation of a $C:O$ compd. was to be expected, but such compds. never were obtained. Instead, a significant coupling reaction took place in accordance with the scheme II, although in a few reactions pronounced qual. evidence was obtained that reaction I took place also. In the reaction between $Cu_2(CN)_2$ and $PhMgBr$ the yield of Ph_2 is greatly dependent on the solvent used; with ether, 6.5%, with benzene, 64% and with toluene a quant. yield of Ph_2 being obtained; with $AgCN$ and $PhMgBr$ and $PhCH_2MgCl$ Ph_2 and dibenzyl were obtained in good yields, 36-89% and 74-78%, resp., while the interaction of $Hg(CN)_2$ and $Ni(CN)_2$ with $PhMgBr$ only gave a trace of Ph_2 , but a good yield of $PhHgBr$, m. 273° , in the former case. With $PhMgBr$, $AgCNO$ gave 73%, $CuCNS$ 70% and $AgCNS$ 52% Ph_2 , no other compds. being isolated. $Hg(OAc)_2$ and $PhCH_2MgCl$ did not give dibenzyl, but $PhCH_2HgCl$; Ag_2CO_3 and $PhMgBr$, 71% of Ph_2 , Ag_2CrO_4 , 26%; Ag_3PO_4 , 19%; and Ag citrate only a trace of Ph_2 when acted upon by $PhMgBr$. Unless another solvent is mentioned, ether was the solvent used throughout this investigation.

C. F. VAN DUIN

A miscellany of quantitative studies involving organomagnesium halides. HENRY GILMAN AND J. MERRIAM PETERSON. Iowa State College, Ames. *Rec. trav. chim.* **48**, 247-50 (1929). This paper presents the results of the expts. on the effect of heat and light on $EtMgBr$, the absence of reaction with N_2O , Ph_3CH and some compds. contg. an active H atom, the reaction with Ph_3CCl , Ph_3PO and Ph allyl ether, and the non-addn. of several Grignard compds. to the ethylenic linkage of $Ph_2C:CH_2$. In these expts. the Grignard reagent was estimated quant. according to the procedure of G. and his co-workers (*C. A.* **17**, 530; **20**, 2473). On heating $EtMgBr$ at various temps. during 1 hr. the following decompn. was noticed: at 100° and 150° , none; at 200° , 6.7%; at 300° , 14.3%; at 300° for 2 hrs., 17.8%. On refluxing $EtMgBr$ during 45 mins. with *p*-cymene after removal of the ether, there was no change in the quantity of the Grignard reagent. On direct exposure of $EtMgBr$ to sunlight of the summer during several weeks or to the rays of a Hg arc lamp for 24-36 hrs., an essential loss of the Grignard compd. could not be observed (analysis by the "gas method"). There is practically no reaction when Ph_3CH_2 is refluxed with $EtMgBr$ for 30 mins.; with Ph_3CH , there is a slight reaction (2%) and with Ph_3CCl the reaction is complete. The same reagent showed no reaction with pure $NaHCO_3$, with *p*- $MeC_6H_4As[CH(OH)Ph]_3$, with Ph allyl ether a 5% reaction and with Ph_3PO a 10% reaction (reaction time 30 mins.), while neither a reaction, nor chemiluminescence was observed on bubbling a stream of dry, pure N_2O for 20 mins. through a boiling soln. of $EtMgBr$. $PhC:CH_2$ did not react with $PhCH_2MgCl$ (5 hrs.); *p*- BrC_6H_4MgBr (12 hrs.); $Ph-CaI$ (10 hrs.) and $EtMgCl$ (10 hrs.); for the technic of these expts. (cf. *C. A.* **20**, 1605; **22**, 1963).

C. F. VAN DUIN

Further observations on the qualitative color test for reactive organometallic compounds. HENRY GILMAN AND LLOYD L. HECK. Iowa State College, Ames. *Rec. trav. chim.* **48**, 193-7 (1929).—The qual. color test of G. and Schulze (*C. A.* **19**, 2473; **22**, 942) makes it possible to avoid a great deal of arbitrary and frequently useless operations; i. e., in Grignard reactions the test is only shown when the MgX group is attached to C and accordingly, when equiv. quantities of $RMgX$ compd. and another reactant are brought into reaction, an easy way to control the course of the reaction is to make the color test with a small sample (0.5-1.0 cc.) of the reaction mixt. In this way unpublished results of G. and H. have shown that many of the more commonly used compds. react quite rapidly with Grignard reagents. Secondly, the color test gives information as to the no. of equivs. of Grignard reagent necessary for the completion of certain reactions (cf. *C. A.* **21**, 1800). Again, the color test may be used to detect whether an organometallic compd. is formed from a metal and an RX compd. In the present paper expts. are described which have been carried out with the view to reducing the time and quantity of reaction mixt. required for making the test and to increase its sensitiveness. A method with test papers, a spot-plate method, and a test-

tube method with 1 drop of soln. were tried but all these were inferior to the test-tube method with 1 cc. of soln., used originally, which gives reliable results with concns. as low as, and in some cases lower than 0.03 *M*. The sensitiveness of the test is given in the original paper for 14 Grignard compds., *sec*-BuMgBr being the most sensitive compd. (0.01–0.02 *M*). The sensitiveness of the test increases with the use of a hot, satd. soln. of the Michler's ketone in benzene and the test is obtained with larger quantities if 1 cc. does not give a test or gives only a poor test. For details, concerning the several tests, the original paper must be consulted.

C. F. VAN DUIN

The (independent) preparation of allylmagnesium bromide. HENRY GILMAN AND J. H. McGLUMPHY. Iowa State Coll. *Bull. soc. chim.* 43, 1322–8(1928).—Attempts to prep. C_3H_5MgBr (I) by the usual methods give $C_3H_7C_3H_5$. Using the app. of G. and Meyers (*C. A.* 17, 531), 90.3% of I was obtained when 0.5 mol. of C_3H_5Br in 285 cc. of Et_2O was added to 3 equivs. of 30-mesh Mg in 100 cc. of Et_2O with rapid agitation during a period of 2 hrs. The yield was materially decreased by a decrease in the quantity of Et_2O ; when Mg turnings were used the yield was 79%. Increasing the period of addn. of the bromide to 3 hrs. gave 91.9% and 4 hrs. gave 93.6%. I was treated with $PhCH_2Cl$ giving 90.5% of 1-phenyl-3-butene; with Ph_3CO , 74.9% of allyldiphenylcarbinol, b. 165–70°, was obtained; and with $PhCOAc$, 80.2% of allylmethylphenylcarbinol resulted. Poor yields (21.7%) of vinylacetic acid are obtained from treatment of I with CO_2 , owing to side reaction.

A. S. CARTER

Some derivatives of trimethylethylstannane. RALPH H. BULLARD AND RAYMOND A. VINGER. Hobart College. *J. Am. Chem. Soc.* 51, 892–4(1929).— Me_3EtSn is obtained in 80% yield from Me_3SnBr , Na and $EtBr$ in liquid NH_3 ; Br in CCl_4 gives the dimethylethylstannyl bromide, b. 175–80°, which gives an unstable NH_3 complex, converted into the Na salt and treated with NH_4Br , there results dimethylethylstannane, b. 90°, which is oxidized by the air to the hydroxide, very hygroscopic needles, also obtained from the bromide and 30% NaOH.

C. J. WEST

Improvements in the method for the preparation of mercury dialkyls from organo-magnesium halides. HENRY GILMAN AND ROBERT E. BROWN. Iowa State College, Ames. *J. Am. Chem. Soc.* 51, 928–30(1929).—Improvements in the prepn. of HgX_2 by the method of Marvel and Gould (*C. A.* 16, 1561) consist in the use of a Soxhlet extractor for the $HgCl_2$, thus avoiding the fine powdering, in extending the time of heating from 10–12 to 20–24 hrs. and in the use of a larger vol. of Et_2O . $HgEt_2$ was obtained in 86–89% and $HgBu_2$ in 66% yields.

C. J. WEST

Organic mercuric hydroxides and their salts. K. H. SLOTTA AND K. R. JACOBI Univ. Breslau. *J. prakt. Chem.* 120, 249–300(1929).— $RHgBr$ may be obtained in good yield by reacting $RMgBr$ with $HgBr_2$; from this the Cl and I derivs. were obtained by reacting with KOH in $EtOH-H_2O$ and then with HCl or HI. In this way the following new compds. were prepd. Methylmercuric bromide, m. 172° (94% yield); ethylmercuric iodide, m. 186°; butylmercuric chloride, m. 130°; amylmercuric chloride, m. 110°; iodide, m. 110°; hexylmercuric chloride, m. 125°; iodide, m. 110°; heptylmercuric chloride, m. 119.5°; iodide, m. 103°; cetylmercuric bromide, m. 101.5° (90% yield); chloride, m. 102°; iodide, m. 82°. The following soly. detns. are reported for $EtOH$ at 18° and 78°, $CHCl_3$ at 18° and H_2O at 18° and 100° (g. per 100 g. solvent; the values for H_2O are to be multiplied by 10^{-4}): $MeHgBr$, 3.16, 12.7, 2.6, 0.72, 1.25; $MeHgCl$ (m. 167°), 4.2, 15.8, 3.7, 1.4, 10.0; $MeHgI$ (m. 152°), 1.27, 8.3, 1.9, 2.0, 3.3; $EtHgBr$ (m. 198°), 0.7, 2.1, 1.55, 0.6, 1.0; $EtHgCl$ (m. 192°), 0.75, 3.5, 2.6, 1.4, 2.5; $EtHgI$, 0.5, 0.6, 0.5, 0.4, 0.6; $PrHgBr$ (m. 140°), 1.58, 8.3, 7.4, 0.7, 1.1; $PrHgCl$ (m. 147°), 2.3, 10.5, 11.2, 2.0, 3.3; $PrHgI$ (m. 113°), 2.2, 7.0, 16.8, 0.5, 0.7; $BuHgBr$ (m. 136°), 1.05, 5.1, 4.2, 0.3, 0.5; $BuHgCl$, 1.5, 9.0, 5.6, 1.4, 3.3; $BuHgI$ (m. 117°), 1.5, 3.2, 9.6, 0.2, 0.4; $AmHgBr$ (m. 127°), 1.27, 7.5, 7.5, 0.4, 0.6; $AmHgCl$, 1.65, 11.5, 11.2, 0.8, 1.4; $AmHgI$, 1.65, 6.35, 22.2, 0.2, 0.4; $C_6H_{13}HgBr$ (m. 127.5°), 0.9, 6.04, 3.7, 0.2, 0.3; $C_6H_{13}HgCl$, 0.89, 5.1, 4.2, 0.7, 1.2; $C_6H_{13}HgI$, 1.3, 4.3, 16.8, 0.1, 0.2; $C_7H_{15}HgBr$ (m. 118.5°), 0.94, 10.5, 4.8, 0.2, 0.4; $C_7H_{15}HgCl$, 1.0, 10.5, 5.6, 0.4, 0.6; $C_7H_{15}HgI$, 1.4, 7.9, 22.2, 0.1, 0.3; $C_8H_{17}HgBr$, $EtOH$, 18°, 1.9; $CHCl_3$, 18°, 0.9; $C_8H_{17}HgCl$, 2.5, 0.74; $C_8H_{17}HgI$, 1.4, 2.5. $MeHgOH$, m. 137°, is obtained in 68% yield by treating 30 g. $MeHgBr$, moistened with 30 g. $MeOH$, with 100 cc. 40% $MeOH-KOH$, heating 0.5 hr., filtering while warm, treating with 20 cc. H_2O and concg. at 60° and 17 mm. and extg. the residue with 40 cc. C_6H_5N at 80°; soly. in H_2O at 18°, 2.5; at 100°, 25. Using the same general method the following homologs were prepd.: *Et*, m. 37° (54.5% yield), soly. 2.5 and 5.0; *Pr*, m. 78° (73% yield), soly. 1.4 and 3.3; *Bu*, m. 68° (55% yield), soly. 2.2 and 4.0; *Am*, m. 50° (54% yield), soly. 2.0 and 3.3; *hexyl*, m. 54.5° (45% yield), soly. 0.4 and 2.0; *heptyl*, m. 54° (57.5% yield), soly. 0.1 and 0.7; *cetyl*, m. 78° (46.3% yield); *α-naphthyl*, m. 228°. Values are given for the mol. cond. of

these bases in H_2O and $MeOH$ at 25° . Neutralization of the base with HCN in $MeOH$ and removal of the $MeOH$ and H_2O in *vacuo* over $CaCl_2$ gave the following *mercuric cyanides*.—*Me*, m. 93° ; *Et*, m. 77° ; *Pr*, m. 28° ; *Bu*, m. 42° ; *Am*, m. 39° ; *hexyl*, m. 38° ; *heptyl*, m. 53° . The following *mercuric acetates* were similarly prepd.: *Me*, m. 101° (Otto, *Ann.* 154, 198(1870) gives $142-3^\circ$); *Et*, m. 54° (Otto gives 178°); *Pr*, m. 56° ; *Am*, m. 52° ; *hexyl*, m. 50° ; *heptyl*, m. 54° . *Mercuric nitrates*.—*Me*, sinters 100° , turns green at 135° and decomps. 168° ; *Et*, m. 56° ; *Pr*, m. 75° ; *Bu*, pale yellow, m. 75° ; *Am*, yellow, m. 78° ; *hexyl*, pale yellow, m. 75° ; *heptyl*, m. 66° . *Mercuric sulfates*.—*Me*, decomps. 255° ; *Et*, decomps. 199° ; *Pr*, decomps. 196° ; *Bu*, m. 183° (decompn.); *Am*, decomps. 188° ; *hexyl*, m. 173° ; *heptyl*, m. 180° (decompn.). An attempt to prep. isomeric cyanides failed.

C. J. WEST

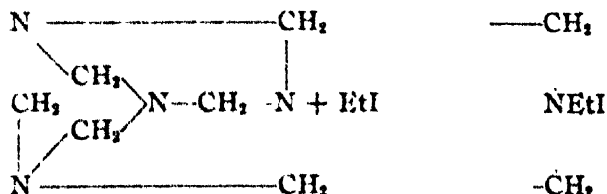
Heintz's aldol and its preparation. F. ADAMANIS. *Roczniki Chem.* 8, 349-57(1928). Heintz's aldol is prepd. by shaking acetone with $NaOH$ for 30 hrs., and is converted by the action of $MeMgBr$ into β,δ -dimethylpentane- β,δ -diol, which on dehydration yields β,δ -dimethyl- Δ^2 -penten- δ -ol.

B. C. A.

Higher aldehydes. SCHIMMEL & CO. *Ber. Schimmel* 1927, 131.—The aldehydes known in commerce as aldehydes C_{14} , C_{16} , C_{18} and C_{20} belong, in their chem. nature, to lactones and esters, and they do not correspond in C content with their names.

B. C. A.

Synthesis of iodoformal. JOSÉ UTHOFF AND GABRIEL F. MORAGAS. *Quim. Ind.* 5, 283-7(1928).—(a) The method of Schmidt (*Pharm. Chem.*, p. 354) for hexamethylenetetramine was thrice tested. U. and M. conclude that the formal and NH_3 can be mixed at once. If the temp. of evapn. be low, the yield may be quant. Heat in drying produces color, which can be removed by Et_2O . (b) The elec. method for CHI_3 gives the best yield, but, based on Schmidt's instructions, U. and M. have drawn up recommendations for CHI_3 . If $Me_2CO + 12I + H_2O = 2CHI_3 + 6HI$ represents the reaction then U. and M. claim their process gives an improved yield. (c) U. and M. obtain 96.8% yield Etl by following Schmidt's directions. (d) They obtain 100% yield hexamethylenetetramine- Etl , "Iodalin," by heating theoretical amounts of tetramine and Etl in a sealed glass tube for 20 hrs. at 40° . The reaction is addn.



The product is recrystd. from boiling alc. (e) U. and M. obtained 76% of iodoformal ($CH_3N_4EtI CHI_3$) by dissolving crude (d) in boiling abs. $EtOH$, and by dissolving a theoretical portion of crude CHI_3 in $CHCl_3$ and mixing hot. The yellow needles are dried in an air oven at 40° . U. and M. expect over 85-90% with the purified products.

S. L. B. ETHERTON

Some formals and mixed carbonic esters. S. SABETAY AND P. SCHVING. Houbigant Lab. *Bull. soc. chim.* 43, 1341-5(1928).—A mixt. of 35 g. of trioxymethylene (I) and 115 g. of PhC_6H_4OH (II) was cooled in ice and satd. with HCl . After sepg. and drying the oil with P_2O_5 , it was heated below its b. p. in *vacuo* to remove excess I, giving upon distn. the *chloromethyl ether* (III) of II, b_{14} $119-21.5^\circ$, n_D^{20} 1.5227. The corresponding ethers of the following alcs. were prepd.: *benzyl*, b_{14} $102-2.5^\circ$, n_D^{20} 1.5270; *phenylpropyl*, b_{13} 130.5° , $n_D^{18.5}$ 1.5190. From *cyclohexanol*, was obtained the *methylal*, b_{14} $139-41^\circ$, n_D^{21} 1.4702, d_{21} 0.9741. A PhH suspension of $NaOMe$ with III gave *phenethylmethylmethylal*, b_{13} $102-3^\circ$, n_D^{19} 1.4951, d_{19} 1.002. Boiling III with Ac_2O and $AcONa$ gave *phenethylacetylmethylal*, $AcOCH_2OC_6H_4Ph$, b_{13} $136-7^\circ$, n_D^{20} 1.4950; in like manner the *phenethylmethylals* of the following were prepd.: *iso-Bu*, b_{14} $131-2^\circ$, n_D^{21} 1.4793, d_{21} 0.9504; *Ph*, b_{14} $181-2^\circ$, n_D^{18} 1.5501, d_{18} 1.074; *Et*, b_{14} $113-3.5^\circ$, n_D^{21} 1.4846, d_{21} 0.9757; *tolyl*, b_{14} 190° , n_D^{21} 1.5472, d_{21} 1.061; *1,3,4-xylyl*, b_{17} $203-4^\circ$, d_{21} 1.045; α -*naphthyl*, b_{12} $213-5^\circ$; *guaiacyl*, b_{13} 207° , n_D^{18} 1.5502; *linalyl*, b_{11} $108-0^\circ$, n_D^{18} 1.5120; *benzyl*, b_{14} $192-4^\circ$, n_D^{20} 1.5436, d_{20} 1.012; and in like manner, *phenylpropylphenylmethylal*, b_{14} 172° , n_D^{21} 1.5560, d_{21} 1.090; and *benzylmethylmethylal*, b_{13} $95-7^\circ$, n_D^{20} 1.4941, d_{20} 1.013, from the corresponding chloromethyl ethers. In the presence of C_6H_5N , $ClCO_2C_6H_4Ph$ and $PhOH$ in $CHCl_3$

gave *phenethylphenyl carbonate*, b_{14} 203°, m. 89°; similarly, ClCO_2Et and PhCHOHEt gave *Et α -phenylpropyl carbonate*, $\text{PhCHEtOCO}_2\text{Et}$, b_{14} 131-3°, n_D^{21} 1.4858. Heating a mixt. of $\text{PhC}_2\text{H}_4\text{Br}$ with PhOH and KOH in the presence of ground Cu at 160° gave *phenethyl Ph ether*, b_{14} 162-3°, n_D^{16} 1.5706, d_{16} 1.054.

A. S. CARTER

The dipole moment of a few aliphatic ketones. K. L. WOLF AND E. LEDERLE. *Physik. Z.* 29, 948-50(1928).—The dipole moments are detd. by the classical method for the following aliphatic ketones: Me_2CO , MeCOEt , MeCOPr , MeCOBu , $\text{MeCO-C}_6\text{H}_{11}$, $\text{MeCOC}_6\text{H}_{13}$, Et_2CO , pinacolin, Pr_2CO , $(\text{tert-Bu})_2\text{CO}$. The dipole moment for all, irrespective of the length of the chain = $2.75 (\pm 0.05) \cdot 10^{-18}$. In the CO mol. which has a momentum of $0.108 \cdot 10^{-18}$, 8 of the 10 electrons are in a closed shell, the 2 others being similar to the valence electrons of alk. earths. In the ketones, the momentum is raised because these 2 valence electrons are taken into the octets of the neighboring C atoms.

G. CALINGAERT

Preparation of pentadecic acid. S. LANDA. *Chem. Listy* 22, 361-2(1928). Good yields of pentadecic acid are obtained by the oxidation of cctene, by means of hot 1% KMnO_4 .

B. C. A

Production and origin of acetic acid and other organic volatile constituents of pyroigneous distillate. C. PADOVANI AND J. BURRAL. *École Royale Polytechnique de Milan. Chimie et industrie* 21, 20-31(1929).—The present status of our knowledge and the various theories suggested to account for the formation and origin of AcOH and other org. volatile compds. in the pyrogenation of vegetable matter are reviewed. Expts. were carried out on Lybian esparto: the material was treated in the cold with NaOH of increasing concn. (1-7.5%), with H_2O at 100°, 130° and 170°, and with 2.5% NaOH at atm. pressure and at 170°, the loss in wt. of the material and the AcOH in the ext. were detd., the OMe was detd. in the residue and the latter was pyrogenated and the AcOH yield detd. Dil. NaOH (2.5%) exts. in the cold practically as much AcOH as is obtained on pyrogenation, and the amt. is not appreciably increased on increasing the NaOH concn. to 7.5% though the loss in wt. of the esparto increases considerably. The max. easily-hydrolyzable AcOH can also be obtained by treating with H_2O under pressure (170°); but for a given % AcOH the total loss in wt. of the material is greater on treatment with H_2O under pressure than with NaOH in the cold. The extn. of AcOH is considerably increased on treating with NaOH under pressure, owing to decompn. of the cellulose. In the residues from which the max. AcOH had been extd. by NaOH in the cold or by H_2O under pressure, pyrogenation yielded a practically const. amt. of AcOH (approx. 1/4 of the extd. AcOH). These results can be explained by assuming that, in the direct pyrogenation, part of the preformed AcOH is not liberated or is destroyed, and that the preliminary NaOH treatment acts in some as yet unknown manner on the cellulose complex so that on subsequent pyrogenation it gives off AcOH . The attack of esparto by NaOH is considered to take place in 3 stages: (1) Sapon. of the preformed Ac groups in the non-cellulose constituents, the lignin being degraded, but not completely solubilized; (2) after the Ac groups have been completely sapond., the lignin gradually passes into soln., but the cellulose remains unacted upon; (3) the cellulose is progressively attacked. Hydrolysis with 2.5% H_2SO_4 according to Schorger (*C. A.* 11, 2218) exts. considerably more AcOH than cold alkali, presumably owing to attack of the cellulose.

A. P.-C

The process of hydrogenation of highly unsaturated methyl esters by means of platinum catalysts. YOSHIYUKI TOYAMA AND TOMOTARO TSUCHIYA. Tokyo Inst. Ind. Research. *Bull. Tokyo Inst. Ind. Research* [5], 23, 1-13(1928).—T. and T. previously recognized as the most remarkable phenomenon observed in the hydrogenation by means of a Ni catalyst, that no appreciable quantity of solid acid is formed until the highly unsatd. acid capable of forming an Et_2O -insol. Br_2 addn. compd. is almost eliminated, and that when the latter is nearly eliminated, the quantity of the solid acid rapidly increases. But in the case of the Pt catalysts (the expt. being carried out at ordinary temp. and pressure, and with EtOH as solvent) the solid acid gradually increases from the beginning of the hydrogenation, so that at the stage where the highly unsatd. acid capable of forming an Et_2O -insol. Br_2 addn. compd. is almost eliminated, an appreciable quantity of a solid acid is already present. Comparing, at a stage where the highly unsatd. acid still remains, the samples which have been reduced to the same I no., it is found that the reduction product obtained by means of the Pt catalyst contains a larger quantity of a solid acid as well as the highly unsatd. acid than in the case of the product obtained by means of the Ni catalyst. Thus, in the reaction (A) of eliminating the unsatd. acid and (B) of forming a solid acid, (A) and (B) proceed simultaneously with the Pt catalyst, while in the case of the Ni catalyst

(A) proceeds almost exclusively before (B) begins. The expt. was conducted by using the Me ester of the highly unsatd. acid obtained from sardine. K. SOMEYA

Polymerization of a highly unsaturated acid. YOSHIYUKI TOYAMA AND TOMOTARO TSUCHIYA. Tokyo Inst. Ind. Research. *Bull. Tokyo Inst. Ind. Research* [5], 23, 15 28(1928).—T. and T. heated the highly unsatd. acid obtained from sardine at 240°, 280° and 320° in a CO₂ current and measured various properties of the resulting product, comparing them with those of the original acid. Original sample: d_{40}^{20} 0.9289, n_D^{20} 1.4965, sp. viscosity (20°) 3.8, neutralization value 177, sapon. value 178, I no. 351, unsaponifiable matter 1.4%. It forms a Br₂ addn. compd. insol. in Et₂O (the bromine addn. compd. was made with the fatty acid obtained by removing the unsaponifiable matter). The change of these properties with heating is as follows: (1) the d., n and sp. viscosity increases and the I no. decreases, the increase of the d. and n being roughly proportional to the decrease of the I no., and the sp. viscosity increasing rapidly with the decrease of the I no.; (2) the neutralization and the sapon. values decrease, a difference of the 2 values also resulting. The unsaponifiable matter increases on heating. E. g., the sample heated at 320° for 1 hr. has the neutralization value 121, sapon. value 149, the unsaponifiable matter being 8.5%; (3) the yield of Et₂O-insol. Br₂ addn. compd. decreases, becoming zero for the sample having the I no. 198. The Br content of the Et₂O-insol. Br₂ addn. compd. obtained from various polymerization products is 69.89% when it is smallest; (4) the mol. wt. increases, the highest being nearly twice that of the original. The relation between the mol. wt. and the yield of Et₂O-insol. Br₂ addn. compd. of the polymerization product shows that at the beginning of the polymerization process an intramol. change (probably ring formation) chiefly takes place. The effect of the temp. on the change of the above various properties is profound, the degree of change occurring on heating for 10 min. at 320° being much greater than that occurring on heating for 8 hrs. at 240°. Heating causes a slight decompn. of the original sample. E. g., the sample heated at 320° for 3 hrs. shows a decrease of 11% of its wt. The viscous polymerization product treated with petroleum ether yields a resinous solid, m. 69–70°. On heating for 2 hrs. at 320° the whole mass becomes resinous. K. SOMEYA

Polymerization of the methyl ester of a highly unsaturated acid. YOSHIYUKI TOYAMA AND TOMOTARO TSUCHIYA. Tokyo Inst. Ind. Research. *Bull. Tokyo Inst. Ind. Research* [5], 23, 29 42(1928).—The Me ester of a highly unsatd. acid obtained from sardine was heated at 200°, 240°, 280°, 320° in a CO₂ current and comparison was made of the properties of the resulting polymerization product with those of the original sample. The original sample: d_{40}^{20} 0.9155, n_D^{20} 1.4880, sp. viscosity (20°) 3.85, acid no. 16, sapon. no. 170, I no. 338, unsaponifiable matter 1.3%. The changes of these properties on heating are as follows: (1) The d., n and sp. viscosity increase and the I no. decreases, the increase of d. and n being roughly proportional to the decrease of the I no., while the increase of the sp. viscosity becomes more rapid as the I no. decreases. When the I no. falls to 170, the increase of the sp. viscosity becomes large even with a slight decrease in the I no. (2) The acid no. slightly decreases when there is a considerable lowering of the I no. E. g., for the sample subjected to heating at 320° for 2 hrs. the I no. is 138, acid no. 3.0, sapon. no. 158, unsaponifiable matter 2.9%. (3) The mol. wt. increases, the highest being nearly twice the original. Next, the polymerized acid was sep'd. from the heated product and its properties were compared with those of the original; (1) with the lowering of the I no. of the polymerized acid, the neutralization value and the sapon. value slightly decrease, the sapon. value being greater than the neutralization value with the product whose I no. is considerably lowered, (2) with the lowering of the I no. of the polymerized acid the quantity of the Br₂ addn. compd. insol. in Et₂O decreases, no Br₂ addn. compd. being formed with the polymerized acid whose I no. has been lowered down to 210. The lowest Br content of the addn. compd. is 66.65%. The relation between the mol. wt. of the polymerization product (Me ester) and the Br₂ addn. compd. shows that at the 1st stage of polymerization an intramol. change (probably a ring formation) takes place chiefly rather than the condensation between mols. The effect of the temp. upon the above various properties is very profound, the degree of change being much more remarkable in the sample heated to 320° for 10 mins. than in the one heated for 8 hrs. at 240°. Heating causes a slight decompn. of the original material. E. g., the sample heated for 2 hrs. at 320° shows a decrease of about 6% in wt. The viscous polymerization product, was sapon'd., the acid produced being treated with petroleum ether, whereby a resinous solid, m. 69–70°, insol. in petroleum ether, was obtained. K. SOMEYA

Tetrabromide of eleostearic acid. O. MERZ. *Farben-Ztg.* 33, 2423–4(1928).—

A review of published work on the bromination of the eleostearic acids. Expts. on the m. p. of mixts. of the tetrabromides of α - and β -eleostearic acids support the view of Rollett (*C. A.* 5, 1741) that isomerization from the α - to the β -form occurs on bromination, the β -form remaining unaffected. B. C. A.

Reaction of chloroacetic acids with zinc. HOWARD W. DOUGHTY AND DONALD A. LACOSS. Amherst College. *J. Am. Chem. Soc.* 51, 852-5(1929).—When $\text{Cl}_3\text{CHCO}_2\text{H}$ reacts with Zn in H_2O , a neutral soln. of ZnCl_2 and $(\text{Cl}_2\text{CHCO}_2)_2\text{Zn}$ is obtained there is no evolution of H; the reaction is strongly exothermic. With $\text{Cl}_2\text{CHCO}_2\text{H}$ the corresponding reaction with Zn is much less exothermic, much slower and H is evolved to approx. 10% of the amt. required by the equation $2\text{HX} + \text{Zn} = \text{H}_2 + \text{ZnX}_2$. With $\text{ClCH}_2\text{CO}_2\text{H}$ the reaction is very slow and is to quite a large extent in accordance with the reaction just stated. The reaction is similar to that in the case of $\text{Cl}_3\text{CCO}_2\text{H}$ and Cu and an explanation of the mechanism is suggested. C. J. W.

Molecular refraction and non-polar bonds. R. SAMUEL. *Naturwissenschaften* 17 13-4(1929); cf. *C. A.* 22, 3575.—If a pos. or neg. character is assigned to several org groups like Me and Et in mols., depending on their location in the mol., and if $s + p +$ or $-$ group refractions are used in the computation of the mol. refraction for these mols., it is found that the customary anomalies of the summation of refractions disappear. With only one at. refraction value for N (either in primary, secondary or tertiary amines), no exaltations or depressions for double bonds are necessary to give the correct total value, which is in even better agreement with the exptl. one than usual. The difference in function of the partners of a nonpolar bond is thus found to be essential. An example of the polarization assumed is $\text{Me}^{(-)} - \text{C}^{(4+)} = \text{O}^{(2-)} - \text{Me}^{(+)}$ for MeOAc



B. J. C. VAN DER HOEVEN

The diaminobutanes. ERICH STRACK AND HELLMUTH FANSELOW. Univ. Greifswald. *Z. physiol. Chem.* 180, 153-60(1929).—The 6 isomeric diaminobutanes described in the literature are not sufficiently well characterized for purposes of identification. One of these isomers is of biol. importance as a decompn. product of spermin. In prepg. these bases several of the methods previously described were found unsatisfactory and new and improved methods were therefore devised. The $m\text{-O}_2\text{NC}_6\text{H}_4\text{CO}$ derivs. are especially useful for the isolation and identification of the bases. They were prepd. by shaking the soln. in 5% NaOH with $m\text{-O}_2\text{NC}_6\text{H}_4\text{COCl}$, washing the ppt. with cold EtOH, and recrystg. by addn. of H_2O or EtOH to the pyridine soln., or in the case of the more sol. isomers by recrystn. from hot EtOH. 1,4-Di[m -nitrobenzoylamino]butane ($m\text{-O}_2\text{NC}_6\text{H}_4\text{CO}$ deriv. of putrescine), m. 246° . 2,3-Di[m -nitrobenzoylamino]butane, prepd. by reduction of diacetyl dioxime and acylation, yielded 2 fractions, the 1st of which was sol. in MeOH and m. 238° ; the 2nd, which m. 320° , was insol. in MeOH but sol. in pyridine and pptd. cryst. by addn. of H_2O . 1,2-Di[m -nitrobenzoylamino]butane, m. 197° , was prepd. from $\text{MeCH}_2\text{CHBrCH}_2\text{Br}$ and NH_3 in MeOH, also in better yield by treatment of $\text{MeCH}_2\text{CH}(\text{OH})\text{CN}$ with alc. NH_3 and reduction of the $\text{MeCH}_2\text{CH}(\text{NH}_2)\text{CN}$ thus formed with Na, followed by acylation. 1,3-Di[m -nitrobenzoylamino]butane, m. 199° , was obtained by reduction of 4-methyluracil in EtOH with Na, and acylation. 1,3-Di[m -nitrobenzoylamino]-2-methylpropane, m. 182° , by dehydration of $\text{MeCH}(\text{CONH}_2)_2$ with P_2O_5 to $\text{MeCH}(\text{CN})_2$ and reduction of the nitrile with Na and EtOH, followed by acylation. 1,2-Di[m -nitrobenzoylamino]-2-methylpropane, prepd. by treatment of $\text{Me}_2\text{C}(\text{OH})\text{CN}$ with alc. NH_3 and reduction of the resulting $\text{Me}_2\text{C}(\text{NH}_2)\text{CN}$ in EtOH with Na, and acylation, yielded 2 isomers, m. 145° and 174° , resp. Boiling with EtOH converts the 1st into the 2nd, but the rearrangement could not be reversed. A. W. DEX.

Basis for the physiological activity of -onium compounds. VIII. Phosphoric acid ester derivatives of choline. R. R. RENSHAW AND C. Y. HOPKINS. New York Univ. *J. Am. Chem. Soc.* 51, 953-4(1929); cf. *C. A.* 20, 3688.— $\text{HOCH}_2\text{CH}_2\text{Cl}$ and POCl_3 in CCl_4 , heated 3 hrs. on the H_2O bath, give 46-7% of β -chloroethylphosphoryl dichloride, b. $108-10^\circ$; this condenses readily with Me_3N to give a very hygroscopic product; MeOH in CCl_4 , refluxed until HCl evolution ceases, gives 25% of di-Me β -chloroethylphosphate, b. $95-6^\circ$; Me_3N in PhMe gives dimethylphosphatetriethylmethylammonium chloride, very hygroscopic, m. $136.5-7^\circ$ (cor.); this choline deriv. has little muscarine action but a powerful stimulating nicotine action. C. J. W.

Cyclic acetals. J. D. VAN ROON. Weesp, Lab. of C. J. van Houten and Son. *Rec. trav. chim.* 48, 178-190(1929).—In previous investigations on acetaldehyde, glycerols (Harnitzky and Menshutkin, *Ann.* 136, 126(1865); Nef, *Ann.* 336, 216(1904)) these compds. were discussed as if only 1 cyclic acetal is produced, yet the

α,β - (I) and the α,α' -compd. (II) are possible, both capable of existing in *cis*- and *trans*-modifications. Later, Hill and Hibbert (C. A. 18, 1987) assuming that the reaction product formed according to Nieuwland's method (C. A. 16, 235; 17, 2413) was a single substance, came to the conclusion that only a 6-ring is produced. van R. prepd. acetaldehyde-glycerol, b_{760} 183–96°, by Hibbert's method at 45° in 60% yield, but could not sep. the components quant. even by repeated fractional distn., both fractions thus obtained and b_{760} 183.5–4° and 194–4.5°, contg. an appreciable amount of each other (most probably the use of a Widmer fractionating column would be successful in this case; (ABSTRACTOR)). On benzylation according to Fischer's method (C. A. 15, 684) the lower boiling fraction furnished a benzyolated product which was mostly, but not entirely, solid, but from which, by crystn. from ether, pure α,α' -acetaldehyde-glycerol β -benzoate (III), m. 84.8°, b_{20} 183° could be obtained. The higher boiling component, however, gave an oily α,β -acetaldehyde-glycerol α' -benzoate (IV), b_{20} 173°, d_4^{25} 1.1663, n_D^{25} 1.5100. On hydrolysis with aq. KOH and continuous extrn. with ether, both acetaldehyde-glycerols were prepd. from the benzoates, I, b_{760} 187°, and II, b_{760} 176°. With PhNCO and a splinter of Na I and II were converted into α,α' -acetaldehyde-glycerol- β -phenylurethan, m. 134°, and α,β -acetaldehyde-glycerol- α' -phenylurethan, m. 129°. The constitution of the benzoates could not be elucidated by splitting off the AcH group with HCl in acetone in both cases glycerol α -monobenzoate being formed by migration of the acyl group in one case. Their constitution was therefore proved by independent syntheses: α -benzoylglycerol (12 g.) was acetalized with 92% yield by means of paraldehyde (80 g.) and HCl (1%) during an hr. at room temp. product being obtained which was identical with the liquid benzoate mentioned above (IV), and showing b_{20} 173°, d_4^{25} 1.1660, n_D^{25} 1.5093. A migration of the Bz group is not probable in this case since Fischer was able to acetalize α -benzoylglycerol with acetone in this way without migration of the Bz group. The solid acetal benzoate (III) could be synthesized from α,α' -di(triphenylmethyl)glycerol, prepd. according to Helferich's method (C. A. 17, 2574; 22, 59), on dissolving this compd. (15 g.) at 0° in 5 cc. paraldehyde contg. the theoretical quantity of HBr for the removal of both the Ph₃C groups and after standing for 24 hrs. at room temp., the free acid was neutralized with K₂CO₃. The acet- and paraldehyde were removed by distn. in a vacuum, sublimation of the residue gave 2.9 g. pure III, m. 85°; yield 85%. The acetaldehyde glycerols are very sensitive to traces of HCl; with mixts. contg. HCl in the ratio 1:20,000 occurs, a rise of the d. which, in most cases, has already reached a max. within an hr. Most probably in equil. occurs between the isomerides but the high d. shows that other changes must occur simultaneously and van R. thinks it probable that compds. from 2 mols. of glycerol and 1 mol. of AcH are also formed in this process. In order to investigate the equil. between I and II an arbitrary mixt. was treated with 1% dry HCl and kept at a definite temp. for some time, after which it was benzyolated with BzCl and quinoline. The mixt. of the benzoates III and IV was detd. off in a vacuum in order to get rid of the higher condensation products and then subjected to thermal analysis, the following setting points found with various t_c of III being detd.: 100, 84.82°; 90.18, 84.26°; 97.74, 83.57°; 96.03, 82.76°; 93.81, 81.76°; 90.92, 80.32°; 89.00, 79.52°; 85.02, 77.63°; 80.28, 75.01°; 75.22, 72.50°; 69.70, 69.99°; 66.62, 68.78°. Thus, at 179° no solid ester was obtained; at 135° only a trace; at 117°, 15.5%; at 100°, 16.3%; at 61°, 25.4%; at 43°, 32.5%; at 18°, 38.4% and at 0°, 44% of the solid benzoate, and it appears that at all these temps. the α,α' -acetaldehyde-glycerol is present to a smaller extent than the corresponding 5-ring compd., the quantity of the latter increasing rapidly with rising temp. and the best yield of the 6-ring being obtained at low temp. The case of formalglycerol is simpler than the one discussed above, since *cis*- and *trans*-isomerism is excluded. Moreover, Schulz and Tollens (Ann. 289, 29(1896)) had already demonstrated that in the prepn. of this compd. 2 isomers are formed, one giving a liquid benzoate and the 2nd giving a solid benzoate, m. 71°. van R. obtained a 50% yield of formalglycerol, b_{760} 193–4°, from glycerol and

ether liquor, until the phys. consts. did not change any more, α,β -formaldehyde- α' -benzoylglycerol (VI) was obtained as an oil, b_{20} 173°, d_4^{25} 1.2011, n_D^{25} 1.5194. On alk. hydrolysis V yielded α,α' -formaldehyde-glycerol (VII), b_{760} 193.8°, b_{20} 94°, d_4^{25} 1.2200, n_D^{25} 1.4527, and VI gave α,β -formaldehyde-glycerol (VIII), b_{760} 192.5°, b_{20} 93°, d_4^{25} 1.2008, n_D^{25} 1.4469. From VII α,α' -formaldehyde-glycerol β -phenylurethan, m. 133°,

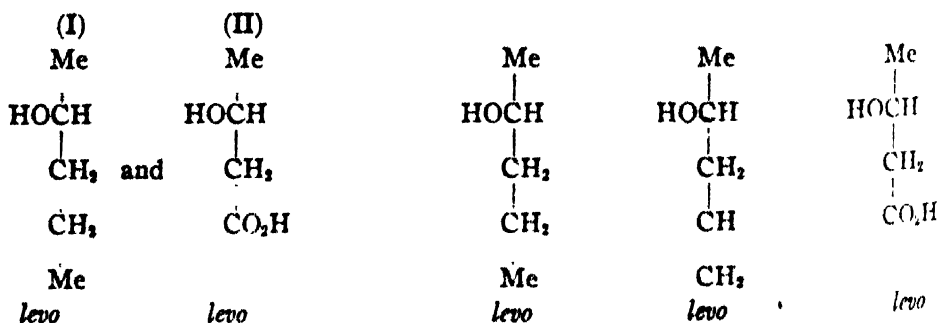
and from VIII α,β -formaldehyde-glycerol α' -phenylurethan, m. 72° , were prepd. in the way described above for the corresponding AcH derivs. The interaction of α -benzoylglycerol, HCHO and HCl at 100° gave VI, but a better yield and a purer product are obtained starting from acetoneglycerol- α -benzoate, thus showing that VI and VIII possess a 5-ring structure. Since there are no other possibilities, V and VII must have a 6-ring structure. Although the formalglycerols are much more stable compds. than the acetaldehyde-glycerols, they are affected by acids at low temp., not only interconversion of the isomers occurring, but also formation of by-products, which are formed to a much greater extent than in the case of the acetaldehyde-glycerols (up to 40%).

C. F. VAN DUIN

Synthetic glycerides. I. Preparation and melting points of glycerides of known constitution. H. P. AVERILL, J. N. ROCHE AND C. G. KING. Univ. of Pittsburgh *J. Am. Chem. Soc.* **51**, 866-72(1929).—After consideration of various methods, Fischer's (*C. A.* **21**, 687) is chosen for the prepn. of pure glycerides of known constitution. In the prepn. of α -monoglycerides acetoneglycerol and quinoline (or C_8H_5N) were treated with the acid chloride, the base removed with 0.5 N H_2SO_4 and the acetone complex hydrolyzed by HCl or H_2SO_4 (full details given for α -monomyristin); the following were prepd. in this manner: α -monoacetin; α -monocaprin, m. 51.4° ; α -monolaurin, m. 63.0° ; α -monomyristin, m. 67.3° ; α -monopalmitin, m. 77.0° ; α -monostearin, m. 81.0° . References are given to other m. ps. recorded in the literature for these and other compds. mentioned below. α,α -Diglycerides were prepd. by reacting α iodo-hydrin and the acid chloride with quinoline and removing the I by refluxing with $AgNO_3$ in EtOH and H_2O for 1 hr. (full details are given for α,α -dilaurin); the following were prepd.: α,α -dilaurin, m. 56.6° ; α,α -distearin, m. 79.1° ; α,α -dipalmitin, m. 69.5° ; α,α -dimyristin, m. $63.8-64.4^\circ$. In the prepn. of triglycerides the monoglyceride is treated with 2 mols. of the acid chloride and quinoline or the diglyceride is treated with 1 mol. acid chloride; the following were prepd.: β -stearo- α,α -dilaurin, m. 45.6° ; α -stearo- α,β -dilaurin, m. 50.9° ; β -lauro- α,α -dimyristin, m. $49.2-49.5^\circ$; α -lauro- α,β -dimyristin, m. 48.5° ; β -palmito- α,α -dimyristin, m. $59.8-60^\circ$; α -palmito- α,β -dimyristin, m. 53.0° ; β -stearo- α,α -dipalmitin, m. 64.8° ; α -stearo- α,β -dipalmitin, m. 62.6° ; β -aceto- α,α -dipalmitin, m. 54.0° ; α -aceto- α,β -dipalmitin, m. 51.2° ; β -capro- α,α -dipalmitin, m. 66° ; α -capro- α,β -dipalmitin, m. 60.0° ; β -lauro- α,α -dipalmitin, m. $63.5-4^\circ$; α -lauro- α,β -dipalmitin, m. 54.5° ; β -myristo- α,α -dipalmitin, m. $58.5-9^\circ$; α -myristo- α,β -dipalmitin, m. 55.5° ; β -aceto- α,α -distearin, m. 62.7° ; α -aceto- α,β -distearin, m. 56.6° ; α -lauro- α,β -distearin, m. 50.9° . α -Iodo- α,β -dilaurin, m. 25.5° . The sym. isomer in each of 9 sets of isomeric triglycerides had a higher m. p. than that of the unsym. isomer.

C. J. WEST

The configurational relationship of 3-hydroxybutyric and 3-chlorobutyric acids. With a further note on the configurational relationship of 3-hydroxybutyric acid and methylpropylcarbinol. P. A. LEVENE AND H. L. HALLER. Rockefeller Inst., N. Y. *J. Biol. Chem.* **81**, 425-33(1929); cf. *C. A.* **23**, 1388.—The configurational relationship of I and II was confirmed by the following set of reactions:



The following compds. were prepd. and described: Δ^1 -4-pentenol-(4), α -naphthylurethan of *l*- Δ^1 -4-pentenol, *d*- Δ^1 -4-chloropentene, *d*-3-chlorobutyric acid, *l*-2-pentanol, its α -naphthylurethan and *l*-3-hydroxybutyric acid.

A. G.

Nitrogen trichloride and unsaturated acids. GEORGE H. COLEMAN AND GEORGE M. MULLINS. Univ. of Iowa. *J. Am. Chem. Soc.* **51**, 937-40(1929); cf. *C. A.* **22**, 4459.— CCl_4 reacts with $MeCH:CHCO_2H$ in CCl_4 to form, among other products, α -chloro- β -dichloroaminobutyric acid, which is changed by HCl to β -amino α -chlorobutyric acid, m. $161-1.5^\circ$, isolated as the HCl salt; *Bs deriv.*, m. $174-4.5^\circ$. The structure of the acid was established by reduction to the corresponding NH_2 acid. Similarly

$\text{PhCH:CHCO}_2\text{H}$ and NCl_3 give β -amino- α -chloro- β -phenylpropionic acid, m. 199–200°; HCl salt, m. 228–30°; *Bz* deriv., m. 194–5°. C. J. WEST

Preparation of symmetrical methylisopropylhydrazine and methylisopropylidimide. HERMAN C. RAMSPERGER. Stanford Univ. *J. Am. Chem. Soc.* 51, 918–21 (1929).— BzNHNbZCHMe_2 , Me_2SO_4 and NaOH give 70% of BzMeNnbZCHMe_2 , m. 76.25–6.75°; hydrolysis with 5 parts concd. HCl on the H_2O bath gives 50% of methylisopropylhydrazine, isolated from the acid soln. by adding concd. NaOH in a N atm. and drying with Al-Hg , b_76 100.2° \pm 0.5°, d. 0.7959 \pm 0.0005, heat of vaporization 9150 cal. per mol. Oxidation with 30% H_2O_2 at 0° in a N atm. gives 25% of methylisopropylidimide, b. 46.0° \pm 0.5°, heat of vaporization 7350 cal. per mol. Preliminary measurements on its decompn. show that it decomp. in a homogeneous, unimol. manner, giving about 2 mols. for each mol. of azo compd. It decomp. at about the same rate at 300° as the di-Me deriv. does at 320° and the diiso-Pr deriv. at 280°. It deviates from the unimol. rate const. only at pressures below several mm. C. J. WEST

The dissociation constants of certain amino acids. PAUL L. KIRK AND CARL I. A. SCHMIDT. Univ. of Calif. *J. Biol. Chem.* 81, 237–48 (1929).—Titration curves of serine, norleucine, isoleucine, valine, hydroxyproline, glutamic acid and β -hydroxyglutamic acid are given and their dissocn. consts. detd. ARTHUR GROLLMAN

The dissociation constants of ornithine. WERNER SCHMIDT, PAUL L. KIRK AND CARL I. A. SCHMIDT. Univ. Calif. *J. Biol. Chem.* 81, 249–50 (1929).—Titration curves of ornithine are given and its dissocn. consts. calcd. ARTHUR GROLLMAN

Residual affinity and coordination. XXXI. Molybdenyl bis- β -diketones. GILBERT T. MORGAN AND REGINALD A. S. CASTELL. Univ. of Birmingham, England. *J. Chem. Soc.* 1928, 3252–6; cf. *C. A.* 22, 1294.—M. and C. have found that molybdous acetylacetone, $\text{Mo}(\text{C}_5\text{H}_7\text{O}_2)_2$, described by Gach (*Monatsh.* 21, 112 (1900)) is identical with molybdenyl bisacetylacetone, $\text{MoO}_2(\text{C}_5\text{H}_7\text{O}_2)_2$ (I), described by Rosenheim and Berthelm (*Z. anorg. Chem.* 34, 439 (1903)). M. and C. have prepd. I as follows: by leaving MoO_3 (II) and CH_3Ac (III) in a closed vessel for 4 days; by heating II and III in EtOH in a stream of CO_2 ; by heating $\text{MoO}_3 \cdot 2\text{H}_2\text{O}$ with III in EtOH . The product in every case was I. I m. 175° and decomp. above 230°. Gach's results were probably due to the presence of a small quantity of Mo_2O_3 . The following molybdenyl compds. were prepd.: bispropionylacetone, recrystd. from EtOH , was brown and m. 185°, recrystd. from CHCl_3 was green and m. 130°; bisdiisopropylmethane, brown, m. 78°, bis-3-ethylacetylacetone, brown; bisbenzoylacetone, brown, m. 98°; bisdibenzoylmethane, brown, m. 112°. When $\text{MoOCl}_4 \cdot 4\text{H}_2\text{O}$ was heated with III in EtOH for several hrs., the product was molybdenyl acetylacetone, $\text{MoO}(\text{C}_5\text{H}_7\text{O}_2) \cdot 2.5\text{H}_2\text{O}$ (IV). IV decomp. at about 150°. Heated in air at 120° IV gave a green residue which decompd. at 150°. Analyses of this residue indicated a deriv. of quinquivalent Mo. L. K.

Properties and chemical constitution of glucic acid. E. K. NELSON AND C. A. BROWN. U. S. Dept. Agr. *J. Am. Chem. Soc.* 51, 830–6 (1929).—The unstable Ca salt of an acid, originally described by Winter under the name of glucic acid (*Z. Ver. Rubenzucker Ind.* 44, 1049 (1894)), was prepd. by the action of $\text{Ca}(\text{OH})_2$ upon dextrose in H_2O at 67° in the absence of air. The pptd. Ca compd. absorbed O rapidly from the air with decompn. and evolution of heat. The Ca salt, after decompn. with H_2SO_4 and extrn. with Et_2O , yielded a small amt. of cryst. unsatd. acid, corresponding to the formula $\text{C}_6\text{H}_8\text{O}_6$, which, from its strong reducing power, I absorption and other properties is in all probability the enolic form of $\text{HO}_2\text{CCH}_2\text{CHO}$. The cryst. acid can be partially sublimed without decompn. but undergoes upon heating a considerable degree of polymerization. It yields HCO_2H and $(\text{CO}_2\text{H})_2$ upon oxidation and is exceedingly unstable in the presence of org. impurities. C. J. WEST

Hydrogen peroxide as an oxidizing agent in acid solution. IX. The oxidation of keto acids. W. B. HATCHER AND A. C. HILL. McGill Univ., Montreal. *Trans. Roy. Soc. Can.* [3], 22, III, 211–20 (1928); cf. *C. A.* 22, 1136.—1. Pyruvic acid. Purified AcCO_2H was prepd. and exptl. analyses indicated that oxidation by peroxide and acid KMnO_4 were the only reliable methods for estg. this acid. Further expts. with peroxide showed that HCl retards the oxidation, that AcCO_2Na is more rapidly oxidized than the acid and the latter was about 12 times as reactive toward H_2O_2 as glyoxylic acid. Increasing the concn. of H_2O_2 increased the rate of oxidation of the acid. The mechanism of the oxidation implies the formation of a complex $\text{AcCO}_2\text{H} \cdot \text{H}_2\text{O}_2$ which breaks down rapidly to AcOH and CO_2 . 2. Mesoxalic acid. Aq. solns. of the acid were prepd. from the purified Ba salt and H_2SO_4 . The rate of oxidation by acid (H_2SO_4) KMnO_4 increased as the concn. of mineral acid was increased, but not so rapidly as with AcCO_2H . Oxidation of mesoxalic acid by H_2O_2

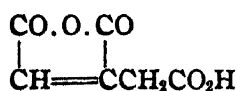
was found to be retarded by mineral acids, to increase with the concn. of H_2O_2 and with rise in temp. The Na salt resembled in its reactions those of formic and oxalic acids. Mesoxalic acid is about 0.2 as reactive toward H_2O_2 as is AcCO_2H . Calcg. the reaction as monomol. the value of K for the reaction H_2O_2 -mesoxalic acid is 9.5×10^4 .

Supposed α,β,β -trimethylglutaric acid of Noyes and Skinner. FRANCIS EARL RAY. Grinnell College. *J. Am. Chem. Soc.* 51, 930-2(1929); cf. *C. A.* 22, 945; Noyes and Skinner, *C. A.* 12, 478.—The explanation given by N. and S. for the formation of the unsatd. acid obtained by the decompn. of isoaminocamphononic acid with HNO_2 is shown to be based on an erroneous interpretation of the anal. data. No member of the trimethylglutaric acid series is formed on oxidation of this unsatd. acid. The decompn. of α,β,β -trimethyl- α -carboxyglutaric acid proceeds normally, giving α,β,β -trimethylglutaric acid whether decompn. is effected by heat alone or by heating the ester with HCl in a sealed tube at 200° .

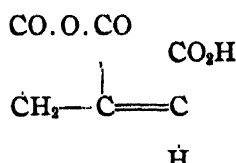
The dehydrogenation of malic acid. AMANDUS HAHN AND W. HAARMANN. Inst. München. *Z. Biol.* 88, 91-2(1928); cf. *C. A.* 22, 3420.—After a mixt. of muscle, oxalacetic acid, semicarbazide and methylene blue was boiled to remove protein, it was filtered and the filtrate evapd. to dryness on a water bath. The semicarbazone contained in the residue was freed by digesting the latter with 50% H_2SO_4 at 50° for 0.5 hr. The resulting soln. was treated with anhyd. Na_2SO_4 , and the fine powder obtained was extd. with ether for 3 hrs. The ext. was evap. *in vacuo* at 25° and the residue in H_2O treated in the cold with $\text{PhNHNH}_2\cdot\text{HCl}$. Crystals of pyroracemic acid phenylhydrazone sepd. after a short time. In the presence of malic acid much more of this phenylhydrazone is obtained than without it. In the 3 instances given 95 mg., 95 mg. and 141 mg. were obtained as compared with 17, 28 and 30 mg.

Aconitic acids. I. Stereochemistry of the aconitic acids. R. MALACHOWSKI AND M. MASLOWSKI. Tech. Hochschule Warschau. *Ber.* 61B, 2521-5(1928). The work of M. and M. confirms the view of Feist that the isomerism of the aconitic acids is geometrical; the ordinary acid, m. $194-5^\circ$, is the more stable *trans* form (I), and the hitherto unknown *cis*-form (II) has now been prepd. by hydrolysis of the first known anhydride, the so-called "anhydro acid" (III). II m. 125° and is readily transformed into I either by fusion or by moderate heating in H_2O . It adds Br much more easily than I and its salts differ from those of I. With dehydrating agents it gives III exclusively; the isomeric "hydroxyanhydro acid" (IV), which is readily detected by its FeCl_3 reaction, is not formed even transitorily. This, together with the method of formation of II, shows conclusively that III is the true anhydride of II. As regards Thorpe's "labile" acid, m. 173° , M. and M. believe that it should be stricken from the literature as a chem. individual. Numerous attempts to repeat the work of Bland and Thorpe on the hydrolysis of IV always gave a somewhat impure and, therefore, low melting I; moreover, the alleged "labile" acid differs surprisingly little from I in its properties as described by B. and T. IV, which can be obtained only from I and regenerates I on hydration, must be the true anhydride of I. Aconitic acid is, therefore, not sym. and that substitution of a Me group in either the α - or β -position gives the same methylaconitic acid is readily explained by the assumption of a secondary rearrangement, under the conditions of the expt., of the less stable form. III seps from C_6H_6 with 0.5 mol. solvent which it loses in dry air and then m. 78.85° (cor.) **Dibromide of II** (not obtained pure; found, 46.23% Br), m. $117-20^\circ$. **Na salt of II**, glassy film, slowly drying to a white powder; **Ba salt**, flocculent ppt. still contg. 2 H_2O after drying at 105° ; **Cu salt**, changes at 70° in soln. into the blue-green salt of I. **II. Constitution and method of formation of the aconitic anhydrides.** R. MALACHOWSKI, M. GIEDROYC AND Z. JERZMANOWSKA. *Ibid* 2525-38.—Pfeiffer and Bottler have shown that maleic anhydride and its derivs. form deeply colored, quinhydrone-like addn. products with many aromatic compds., and as the authors found that the *cis*-aconitic anhydride (III) at once gives with PhNMe_2 a deep red, with hydroquinone in Et_2O a yellow color similar in appearance and intensity to the colors produced by citraconic anhydride, they conclude that of the 2 possible formulas (V and VI) for III, V is the correct one, as had already been assumed by Easterfield and Sell. The choice between formulas VII and VIII for the *trans*-compd. (IV) is more difficult. There are theoretically possible 6 isomeric mono-Me aconitatu., all 6 of which have been prepd. The α -*cis*-ester (IX) was obtained by methylating III with CH_3N , to the anhydro ester (X) and hydrolyzing the latter; the resulting IX readily regenerates X. Addn. of MeOH to III gave an ester mixt. sepd. by means of Et_2O into an ester (XI) and a smaller quantity of an isomer (XII) less sol. in Et_2O . With Ac_2O , XI gave no product which

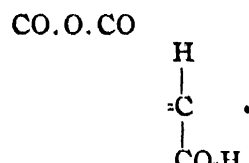
the calcd. quantity of diazotized PhNH_2 , yellow, m. $172-2.5^\circ$, gives no color with FeCl_3 . *Me 6-hydroxy- α -pyrone-4-carboxylate* (XVI), m. $90-1^\circ$, forms a greenish yellow soln. in H_2O , gives an emerald-green color with FeCl_3 and a red-orange lignin reaction, at once forms XVII with diazotized PhNH_2 . *Me 6-methoxy- α -pyrone-4-carboxylate* (XIX) (yield, 60%), m. $77-8^\circ$. XX (4.7 g. from 3 g. IV), flocks (still impure; found 18.82, 0.83, 60.04% C, H, Br, resp.) from C_6H_6 , m. 122° , gives in H_2O with IV an intense red color; the Br cannot be removed even in part with Cu bronze or Ag.



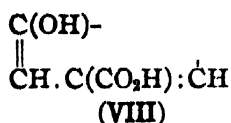
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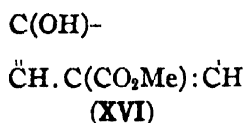
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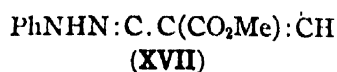
(VII)



(VIII)



(XVI)



(XVII)

C. A. R.

The formation of cyanogen by oxidation of hydrocyanic acid. B. RICCA AND F. PIRONE. *Ann. chim. applicata* 18, 550-5(1928).—The oxidation of HCN in acid ($\text{N H}_2\text{SO}_4$) soln., yielded some $(\text{CN})_2$ with many oxidants: $2\text{HCN} \xrightarrow{\text{O}_2} \text{H}_2\text{O} + (\text{CN})_2$. With HCN, KCN, $\text{K}_4\text{Fe(CN)}_6$ and $\text{K}_3\text{Fe(CN)}_6$ as the source of cyanide, various oxidizing agents were added and the extent of the oxidation reaction was measured by detg. the ratio of $\text{HCN}/(\text{CN})_2$ in the product.

Ratios of $\text{HCN}/(\text{CN})_2$ using

Oxidant	HCN	KCN	$\text{K}_4\text{Fe(CN)}_6$	$\text{K}_3\text{Fe(CN)}_6$
$\text{Na}_2\text{S}_2\text{O}_8$	9.39	1.95	0.65	0.13
H_2O_2	—	7.17	0.97	0.96
KMnO_4	(no $(\text{CN})_2$ formed)	10.57	5.06	0.19
$\text{K}_2\text{Cr}_2\text{O}_7$	180.8	20.70	8.82	(trace $(\text{CN})_2$ formed)
MnO_2	13.14	13.34	1.75	1.49
PbO_2	5.59	0.78	0.90	0.73
SnO_2	8.10	8.00	5.75	2.66

Temp. and the concn. of the reagents are very important in detg. the equil. conditions, i. e., increasing concn. of H_2SO_4 favors formation of $(\text{CN})_2$ as when PbO_2 acts on $\text{K}_4\text{Fe(CN)}_6$ (with 1:1 H_2SO_4) the ratio $\text{HCN}-(\text{CN})_2 = 0.16$ compared with 0.73 above.

A. W. CONTIERI

Synthetic carbamide from ammonia and carbon dioxide. G. A. YAKOVKIN. *J. Applied Chem. (Russia)* 1, 70-7(1928).—Urea was obtained from liquid NH_3 satd. with CO_2 under pressure without supercooling, followed by heating to $160-170^\circ$ (to convert the carbamate into carbamide) and increase of pressure up to 75-80 atm. A yield of 40% was obtained under the above conditions; various catalysts did not affect the result. The autoclave had to be made of Krupp's V4A steel to decrease the corrosion effect.

G. FABIAN

The reaction of carbon disulfide with some diamines and guanidines. FRICH STRACK. *Univ. Greifswald. Z. physiol. Chem.* 180, 198-211(1929).—Aliphatic diamines add CS_2 to 1 NH_2 group to form dithiocarbamic acids of the type $\text{H}_2\text{N}(\text{CH}_2)_x\text{NHCS}_2\text{H}$. These acids form an inner salt between the CS_2H and the remaining NH_2 group, analogous to the salts of the dithiocarbamic acids of monoamines with a 2nd mol. of the amine. When heated there is a tendency to ring closure by loss of H_2S , provided the resulting ring does not contain more than 7 members. The diguanides, which are analogous to the diamines, form only trithiocarbonates of the base. δ -Aminobutyl-N-dithiocarbamic acid, m. 173° (evolution of H_2S), was obtained by warming putrescine in EtOH with CS_2 and recrystg. the ppt. from hot H_2C . Heated 10 hrs. in alc. suspension at 100° it yielded tetramethylenethiourea, m. 177° , and H_2S . ϵ -Amino-*amyl-N-dithiocarbamic acid* was obtained in the same manner from cadaverine and CS_2 but could not be crystd. It formed a cryst. Ba salt which was not analyzed. The

diguanides were prepd. by adding the free diamine to $\text{H}_2\text{NC}(\text{:NH})\text{SEt.HBr}$ in alc., allowing the mixt. to stand 5 days, then acidifying with HBr and evapg. *in vacuo*. The products are best isolated through the sulfates by treatment of the HBr salts with Ag_2SO_4 , removing the Ag from the filtrate by H_2S and evapg. to crystn. To prep. the free bases the sulfates are treated with $\text{Ba}(\text{OH})_2$. 1-Guanido-3-aminopropane-2HBr, m. 116° ; sulfate, m. 265° ; free base is a hygroscopic sirup. 1,3-Diguanidopropane-2HBr, m. 218° ; sulfate, sinters 260° and m. 270° ; free base, m. 135° . 1,4-Diguanidobutane-2HBr, sinters 205° and m. 212° ; sulfate, m. 297° ; free base, m. 190° , is hygroscopic. 1-Guanido-5-aminopentane-2HBr, m. 105° ; sulfate, m. 284° ; free base did not cryst. 1,5-Diguanidopentane-2HBr, sinters 212° and m. 217° ; sulfate, m. 317° ; free base, m. 173° (foaming). By heating the free bases with CS_2 2 hrs. at 100° , their trithiocarbonates, all yellow or orange cryst. products, are obtained. Guanidine H_2CS_3 salt, sinters 125° and m. $133-5^\circ$. It is decompd. by dil. acids, including CO_2 , with liberation of 1 mol. H_2S . $\text{Pb}(\text{OAc})_2$ gives a red ppt. of PbCS_3 . 1,3-Diguanidopropane H_2CS_3 salt, m. 95° (decompn.); 1,4-diguanidobutane H_2CS_3 salt, m. 193° (decompn.); 1,5-diguanidopentane H_2CS_3 salt, m. 190° (decompn.). The monoguanides under the same treatment yield inner salts of dithiocarbamic acids; δ -guanidobutyl *N*-dithiocarbamic acid sinters 200° and m. 210° (foaming); ϵ -guanidoamyl-*N*-dithiocarbamic acid, m. 201° . These are sol. in dil. acid and alkali and pptd. cryst. from acid soln. by NH_4OH . A. W. DOX

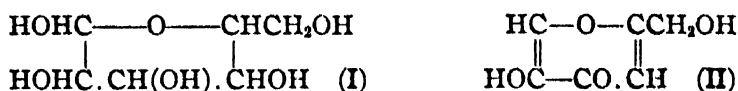
Glucosides. I. Formation of glucosides from 3,4,6-triacetylglucose 1,2-anhydride. WILFRED J. HICKINBOTTOM. Birmingham Univ. *J. Chem. Soc.* 1928, 3110-7; cf. Brigl, *C. A.* 17, 1432. —Dry NH_3 was passed through 3,4,6-triacetylglucosyl chloride suspended in 8-10 parts of PhH for 3 hrs. After 15 hrs. the NH_4Cl was filtered off and the soln. freed of NH_3 *in vacuo* over H_2SO_4 ; PhH was partially evapd. and 3,4,6-triacetylglucose 1,2-anhydride (I), m. $57-8^\circ$, was pptd. by petroleum ether. I was treated with alcs. to form the following 3,4,6-triacetyl- β -alkylglucosides: Me, m. $95-7^\circ$, $[\alpha]_D^{20} 19^\circ$; Et (II), m. 121° , $[\alpha]_D^{20} 14.4^\circ$ in EtOH; *iso-Pr*, —; benzyl, —; *n*-butyl, m. 144° , $[\alpha]_D^{20} -10.6^\circ$ in PhH; Ph, —. Acetylation of these in $\text{C}_6\text{H}_5\text{N}$ with Ac_2O gave the corresponding 2,3,4,6-tetraacetyl- β -alkylglucosides: Me, m. $101-3^\circ$; Et, m. $105-6^\circ$; *iso-Pr*, m. $134-5^\circ$, $[\alpha]_D^{20} -23.4^\circ$ in EtOH; benzyl, m. $98-9^\circ$, $[\alpha]_D^{20} -44^\circ$ in EtOH; Ph, m. 112° , $[\alpha]_D^{20} 162^\circ$ in EtOH. II (0.76 g.) was dissolved in 18 g. of MeI and heated for 30 hrs. under a reflux with addn. of AgO; 10 g. of MeI was added and the heating continued for 10 hrs. Dilsn. with Et_2O , filtration and evapn. *in vacuo* gave a sirup which crystd. from alc. and proved to be the 2-Me deriv. of II. When treated with alc. NH_3 , this gave 2-methyl- β -ethylglucoside which was hydrolyzed with 0.7 *N* HCl to yield α - and β -2-methyl glucose (phenylhydrazone, m. $175-6^\circ$). Similar treatment with NH_3 gave β -benzyl glucoside, m. 119° , $[\alpha]_D^{20} -49^\circ$; β -menthylglucoside; and α -Ph glucoside hydrate, m. $155-60^\circ$, $[\alpha]_D^{20} 157^\circ$ in EtOH. A. S. CARTER

Determination of the structure of carbohydrates. WALTER N. HAWORTH. Birmingham Univ. *Bull. soc. chim.* 45, 1-21 (1929). —A lecture, Feb. 28, 1928, before the Strasbourg-Mulhouse section of La Société chimique de France. See *C. A.* 22, 2742. A. S. CARTER

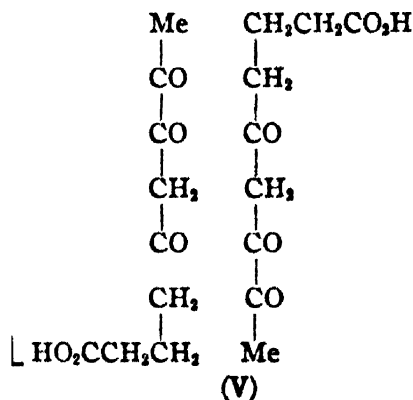
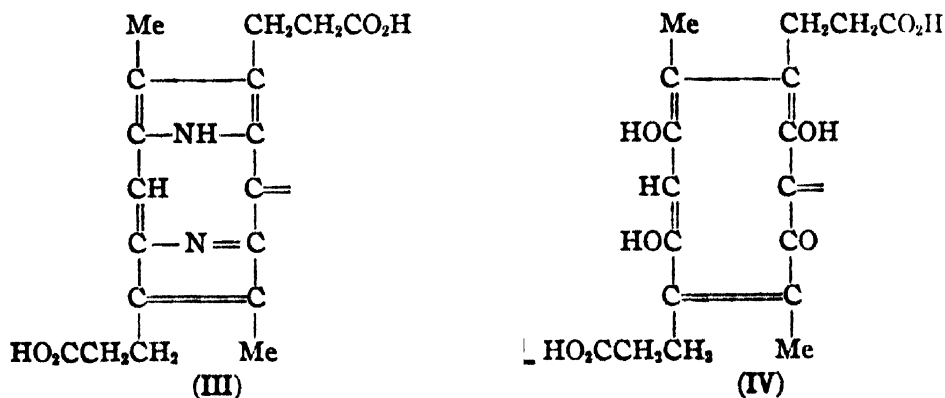
Structure of normal monosaccharides. V. Lyxose. EDMUND L. HIRST AND JAMES A. B. SMITH. Birmingham Univ. *J. Chem. Soc.* 1928, 3147-54; cf. *C. A.* 22, 330, 3142 — α -Me lyxoside (7.2 g.) in 20 cc. of MeI was treated with 35 g. Ag_2O , giving 8.7 g. of trimethylmethyllyxoside (I), $b_{0.05} 70^\circ$, $n_D^{14} 1.4460$, $[\alpha]_D^{20} 10^\circ$ in H_2O , 37.3° in EtOH, largely the α -form. Heating 4 g. of I with 120 cc. of 6% HCl, neutralizing with BaCO_3 and extg. with CHCl_3 , gave 85% of trimethyllyxose (II), $b_{0.05} 90^\circ$, m. 79° , $n_D^{14} 1.4629$, $[\alpha]_D^{20} -22^\circ$ in H_2O . Ten g. of lyxose in H_2O was treated with 76 cc. of Me_2SO_4 and 140 cc. of 50% NaOH. The product was methylated with MeI, giving 10.6 g. of I, $[\alpha]_D^{20} -6^\circ$, hence contg. an excess of the β -form. Nine g. of II in 60 cc. of H_2O was treated with 8-10 cc. of Br at 35° , neutralized with Ag_2O ; the Ag pptd. as AgCl and the H_2O evapd. under reduced pressure. After heating at 100° (12 mm.), distn. gave 8 g. of trimethyl- δ -lyxonolactone (III), $b_{0.05} 105^\circ$, $n_D^{18} 1.4620$, $[\alpha]_D^{19} 35.5^\circ$ (initial), -9.3° (equil.); with PhNHNH_2 it gave 2,3,4-trimethyllyxononic phenylhydrazide, m. $180-1^\circ$. III was oxidized with HNO_3 (d. 1.42) at 90° ; HNO_3 was removed by distn. and the residue was boiled with 3% HCl in MeOH. Neutralizing with Ag_2O and distg. gave 76% of Me trimethoxyglutarate (IV), $b_{0.1} 100^\circ$, $n_D^{21} 1.4353$, $[\alpha]_D^{20} -39^\circ$ in MeOH, -31° in H_2O , which gave with NH_3 in MeOH trimethoxyglutaramide, m. 230° (decompn.), $[\alpha]_D^{20} -49^\circ$ in H_2O . MeNH_2 instead of NH_3 gave the meth. lamide, m. $171-2^\circ$. By similar oxidation, 1.6 g. of I gave 1.7 g. of IV. These products of

oxidation are evidence in support of the pyranose structure for α -Me lyxoside, for this method of oxidation has never been known to cause MeO migration. A. S. C.

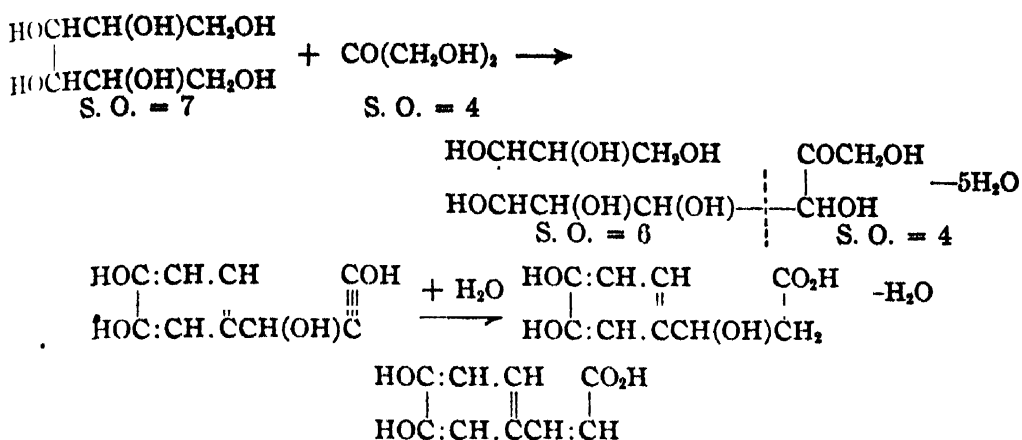
The relationship of some complex natural products to the simple and amino acids. ROBERT ROBINSON. *Proc. Univ. Durham Phil. Soc.* 8, Part 1, 14-59(1927-1928).—While many natural products undoubtedly arise from formaldehyde units, it is probable that other unit structures are employed, and the application of the isoprene unit is now so well established that a new terpene structure will not meet with approval unless it can be derived by a fusion of isoprene mols. Animal and plant products can be classified according to the length and state of oxidation (which will be represented by S. O.) of the C chains. The hexose C_6 group is prevalent and often associates with a triose C_3 group which probably arises from glycerol. The S. O. is the no. of OH groups present in the satd. open-chain formula of the substance, the satn. and ring fission being brought by H_2O addn. Thus the S. O. of the $C:O$ group, the CO_2H group and C_6H_5 are 2, 3 and 4, resp., while the S. O. of a simple carbohydrate is $n + 1$, where n is the no. of C atoms in the mol. The conversion of dextrose (I) into kojic acid (II) by the action of various species of *Aspergillus* involves an increase in the S. O. from 7 to 8



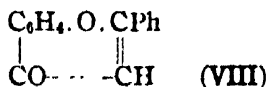
As for the structures of chlorophyll and hemin, the substance III can be regarded as the progenitor, from which etioporphyrin and chlorophyll are derived by the loss of 4 and 2 mols. CO_2 , resp. By abstracting NH_3 from III, structure IV is obtained, which, by the addn. of 2 H_2O , leads to structure V, consisting of 4 chains of 9 C atoms each, whose S. O. is 9. This suggests that chlorophyll is derived from 4 mols. NH_3 , 4 mols. hexose, 4 mols. triose and 1 mol. MgO .



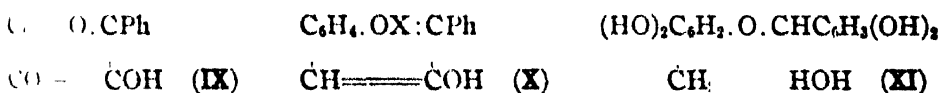
The natural products provide many cases of the assocn. of hexose and triose units, cinnamic acid, caffeic acid, coumarin, tyrosine and eugenol being examples of the C_6-C_3 models. This assocn. is probably the result of an aldol polymerization. In this polymerization, the S. O. of the mol. to which addn. occurs is reduced by 1 unit, while the S. O. of the addendum remains unchanged. In the formation of the C_6-C_3 model, the triose mol. attaches itself to the hexose and the S. O. of the hexose portion is reduced to 6. The following formula indicates the process of polymerization:



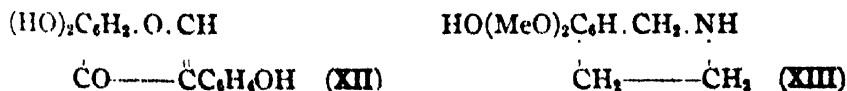
As a rule the triose fragment is present as a normal chain, but in a few compds., *e. g.*, tropic acid, $\text{PhCH(CO}_2\text{H)CH}_2\text{OH}$ (VI), the triose fragment occurs as a branched chain in the $\text{C}_6\text{—C}_3$ complex.



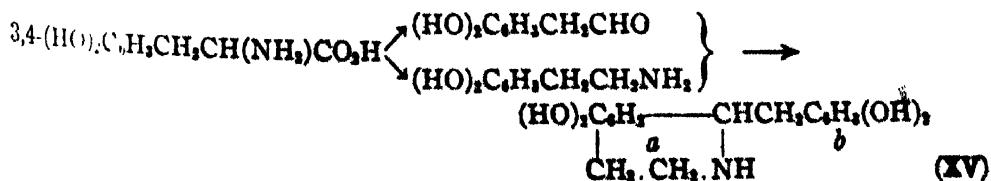
The flavones, the flavonols, the anthocyanins, also butein, phloretin and catechol are based on the $\text{C}_6\text{—C}_3\text{—C}_6$ model. As the hexose portion of the $\text{C}_6\text{—C}_3$ complex is incapable of further addn., it is probable that the $\text{C}_6\text{—C}_3\text{—C}_6$ model is derived by the addn. of another hexose mol. to the triose end of the $\text{C}_6\text{—C}_3$ model, in which case the S. O. of the triose portion will be reduced to 3. Such types are very common in nature and the groups occur in various S. O., the non-aromatic C_3 group exhibiting the greatest variation in this respect. Thus it is normal in butein, 2,4-(HO) $_2\text{C}_6\text{H}_3\text{COCH:CHC}_6\text{H}_3\text{(OH)(3,4)}$ (VII), oxidized in the flavones, flavonols and anthocyanidins of the general formulas VIII, IX and X and reduced in catechol (XI).

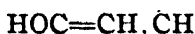
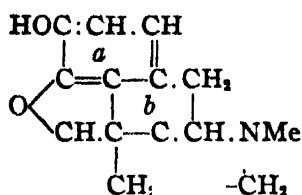


Prunetol (XII) and iridin contain a branched triose chain in their $\text{C}_6\text{—C}_3\text{—C}_3$ structure. In a similar manner the alkaloids appear to be derived from the amino acids of the C_6 and $\text{C}_6\text{—C}_3$ models. The occurrence of simple tetrahydroisoquinoline alkaloids such as anhalanine (XIII), alongside the corresponding phenylethylamine deriv. mezealme, 3,4,5-(MeO) $_3\text{C}_6\text{H}_2\text{CH}_2\text{CH}_2\text{NH}_2$ (XIV), suggests that the former arises from the action of HCHO on the latter and this process has been performed experimentally. The phenylethylamine derivs. and the more complex alkaloids probably arise from amino acid of the $\text{C}_6\text{—C}_3$ type and the norlaudanosine structure (XV) can be derived as follows:

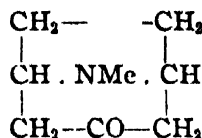


The structure of papaverine, laudanosine, narcotine, hydrastine, berberine and the phenanthrene alkaloids can be derived from XV, while a polymerization of the 2 aromatic nuclei *a* and *b* will lead to structure XVI which has recently been proposed for morphine. Other alkaloids can be derived from the amino acids ornithine, $\text{H}_2\text{N(CH}_2\text{)}_3\text{CH(NH}_2\text{)CO}_2\text{H}$ (XVII), and lysine, $\text{H}_2\text{N(CH}_2\text{)}_4\text{CH(NH}_2\text{)CO}_2\text{H}$ (XVIII), and the formation of tropinone (XIX), hygrine (XX) and pelletierine (XXI) by the scheme suggested below has been partially imitated in the laboratory



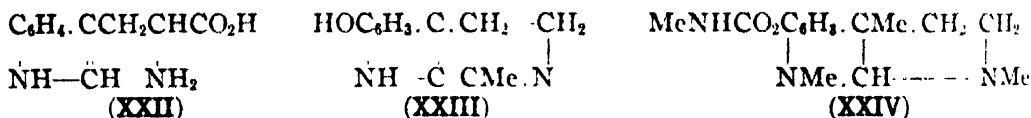
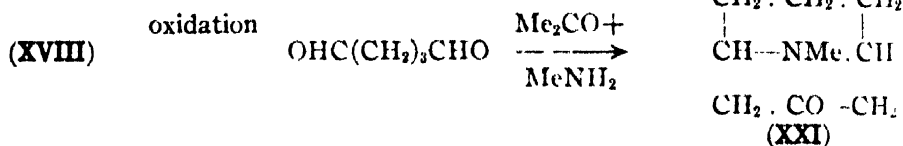
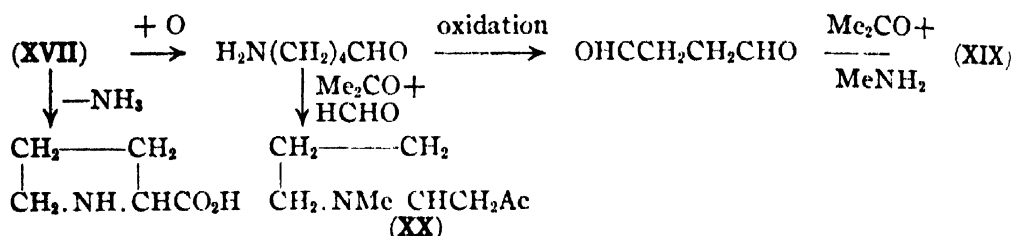


(XVI)



(XIX)

The ornithine skeleton is also present in histidine, the lysine skeleton occurs in quinine, while nicotine contains both lysine and ornithine skeletons. Harmaline (XXIII) and physostigmine (XXIV) can both be derived from the amino acid tryptophan (XXII). The foregoing principles are a very valuable aid for diagnosing structures to be confirmed finally by synthesis.



ALBERT L. HENNE

The carbonyl number of some humic acids. H. LEOPOLD. *Brennstoff-Chem.* 9, 215-7(1928).—Carbonyl O₂ is detd. in 3 different samples of humic acids: (1) Merck's acid, (2) acid prepd. from starch and (3) Eller's acid, prepd. from hydroquinone. Two methods are used; one was based (Strache) on treatment with PhNHNH₂·HCl, forming a hydrazone with the CO groups, decompn. of excess PhNHNH₂ with Fehling's soln. and detg. N₂ evolved. In another method (Hoepner) NH₂OH·HCl was allowed to act on the CO groups liberating HCl which could be titrated. The first method gave 1.27, 2.31 and 2.16% carbonyl O₂ resp. for the above acids; the second method gave 0.22, 0.40 and 0.35%. Such lack of agreement of methods is often observed when they are applied to the more complex org. compds. Probably all the CO groups were not attacked in the latter method.

J. D. DAVIS

Oxidation of methylpentonic acids by nitrous acid, and the reduction products of 5-ketorhamnolactone. E. VOTOČEK AND L. BENEŠ. *Prague Polytech. Bull. soc. chim.* 43, 1328-41(1928).—Finely powd. *ramnolactone* (I) (20 g.) was oxidized by adding it to 9.4 g. of N₂O₃ dissolved in 18 g. of cold H₂O; crystn. from this soln. and washing with EtOH and H₂O gave 61-71% of 5-keto-*l*-ramnolactone (II), m. 196°, [α]_D -24.7°, identical with Kiliani's (*C. A.* 17, 985). Mixing equiv. amts. of a 1:20 soln. of *p*-O₂NC₆H₄NHNH₂·HCl and II gave a yellow cryst. *p*-nitrophenylhydrazone of II, m. 176°. II was dissolved in 0.2 N NaOH, cooled and satd. with CO₂, at the same time adding 3% Na-Hg until reduced as indicated by a test with Fehling's soln. After acidifying with H₂SO₄ and concg. to a sirup, the soln. was extd. with EtOH which was then concd. *in vacuo* at 30-5° to give 4 fractions of crystals. Following the work of K., the fraction with the highest sp. rotation was reduced to the corresponding methylpentose, which proved to be *l*-ramnose and not *gulomethylse* as believed by K. Studying these fractions by repeated crystn. from 85% EtOH and Me₂CO, they were resolved into the following: (A) m. 186-9°, [α]_D -66.2°, 1.7 g.; (B) m. 144°, [α]_D -48.4°, 6 g.; (C) m. 156°, [α]_D -56.0°, 4.6 g.; (D) m. 138°, [α]_D -48.4°, 2.5 g. These were converted into phenylhydrazides. B was crystd. from EtOH giving

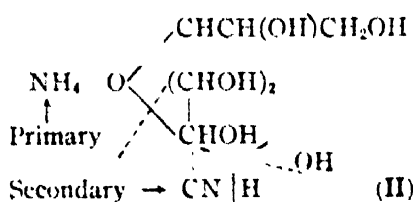
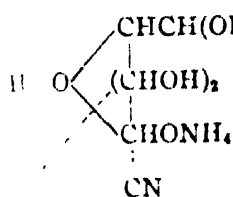
hydrazide of I, m. 195°, insol., and a sol. product which was combined with A, C and D and again sepd. from any remaining I. This was boiled with Ba(OH)₂ for 10 hrs., PhNHNH₂ was removed in Et₂O and the Ba pptd. with dil. H₂SO₄, giving upon evapn. and crystn. from 95% EtOH, a lactone, m. 153°, whose initial $[\alpha]_D$ -58.3° became -38.3° upon standing. Reduction of this with Na-Hg gave *d*-gulomethylose, $[\alpha]_D$ -17.1°; phenylosazone, m. 140-2°, $[\alpha]_D$ -0.23°.

A. S. CARTER

The "normal" structure of aldoses and ketoses. H. KILIANI. *Z. angew. Chem.* 42, 16-7(1929).—The results of oxidation of dextrose or levulose with Br or the addn. of HCN (cf. *Ann.* 205, 180(1880)) and subsequent reduction with HI of both reaction products shows that it is immaterial whether the lactone linking is on carbon atom 4, 5

or 6 in the formulas: $\overset{6}{\text{CH}_2(\text{OH})}\overset{5}{\text{CH}(\text{OH})}\overset{4}{\text{CH}}.\text{CH}(\text{OH}).\text{CH}(\text{OH}).\text{CHOH}$ and $\overset{6}{\text{CH}_2(\text{OH})}\overset{5}{\text{CH}}.\overset{4}{\text{CH}(\text{OH})}.\text{CH}(\text{OH}).\text{C}(\text{OH})\text{CH}_2\text{OH}$; in view of the generally accepted

lactone formulas it is now necessary to speak of the aldehyde C or ketone C rather than the aldehyde O or ketone O. The cyanohydrin formation is accelerated by the addn. of small amts. of NH₃ (cf. *Ber.* 21, 916(1888); *C. A.* 7, 476); this does not result



in the formation of an addn. compd. of the type RCH(OH)NH₂ since none of the addn. compds. of monoses and HCN contain the group :CHNH₂; it is believed that an NH₃ alcoholate is formed on the aldehyde C (I) or on the lactone C (II) which accelerates the HCN addn.; I is given preference.

N. A. LANGE

Hexosemonophosphate (Robison). P. A. LEVENE AND ALBERT L. RAYMOND. Rockefeller Inst., N. Y. *J. Biol. Chem.* 81, 279-83(1929).—"On the basis of the rate of hydrolysis of the Me glucoside of the Robison monophosphate it is concluded that the substance has the γ -lactal structure." Since it is also an aldose deriv., the H₃PO₄ radical must be attached to C atom 5.

ARTHUR GROLLMAN

Lignosulfonic acid obtained from spruce wood by the action of sulfurous acid in the presence of ammonia. CHARLES DORÉ and EUSTACE C. BARTON-WRIGHT. *J. Soc. Chem. Ind.* 48, 9-12T(1929); cf. *C. A.* 19, 2742. —A lignosulfonic acid (I), C₁₀H₄O₉, 2H₂SO₄, is obtained in the form of its NH₄ salt by the action of H₂SO₄ on spruce wood in the presence of 0.1-0.5% NH₃ on the liquor present. I was purified by dialysis, conversion to the β -C₁₀H₇NH₂ deriv., and subsequent resolution of this deriv. with pyridine. Analysis of I, and its reactions with BzCl and PhNHNH₂, showed it to contain the following groupings: C₁₀H₁₂O₂(SO₃H)₂(CHOH)(OH)₂(CO)(OMe)₂. Oxidation of I with 5% HNO₃ gives a nitro compd. (II), C₁₀H₁₀O₁₀N₂, contg. 2 CO and 2 NO₂ groups. Reduction of II with Mg replaces the NO₂ groups with CO groups.

FREDERICK C. HAHN

Highly polymerized compounds. XI. H. STAUDINGER AND R. SIGNER. Univ. Freiburg, B. *Helv. Chim. Acta* 11, 1047-51(1928).—The structure proposed by Ott (cf. *C. A.* 22, 1879), is correct for low mol. formaldehyde-diacetates, but it is not admissible that the highly polymerized insol. polyhydroxymethylenes be built of (CH₂O)₄ units, since such a unit should boil at about 100-50°. Moreover, x-ray investigations by Mie and Hengstenberg (cf. following abstr.), show that the mols. of such compds. are long fibers, whose elements are bonded together by ordinary valences. If the elementary cell of the lattice is (CH₂O)₄, the elementary mols. are longer than the elementary cells: the av. mol. wt. is about (CH₂O)₁₀₀, and the shorter mol. is not smaller than (CH₂O)₂₀.

ALBERT L. HENNE

Röntgenometric investigation of highly polymerized organic substances. G. MIE AND J. HENGSTENBERG. Univ. Freiburg, B. *Helv. Chim. Acta* 11, 1052(1928); cf. preceding abstr.—Criticism of the results published by E. Ott (cf. *C. A.* 22, 1879); the criticism is based on previously published work (Staudinger, *et al.*, *C. A.* 21, 2794 and II, *C. A.* 22, 728). The discussion refers chiefly to the appearance of a face 001 which the present authors believe to be an illusion. Highly polymerized hydroxy-

methylenes should be long fiber-like mols., possibly wound on helixes. The elementary unit is larger than $(CH_2O)_n$. ALBERT L. HENNE

Acetylation of beech wood. OTTO HORN. Kaiser Wilhelm-Inst. f. Kohlen-Forschung, Mülheim-Ruhr. *Ber.* 61B, 2542-5(1928).—When under the conditions employed by Fuchs in the acetylation of pine wood (*C. A.* 22, 2744) red beech wood sawdust is slowly added to Ac_2O and 0.25% H_2SO_4 there can be obtained without difficulty almost 150% of an acetylated wood retaining the wood structure unchanged and, except for a lighter color, identical in appearance with the original wood but which gives no color reactions with the usual reagents for detecting lignin. No appreciable quantity of any substance or substances can be removed from the product by simple extrn. with org. solvents. By a single acetylation of wood with an av. Ac content of 5.1% can be obtained an acetylwood with 42.2% Ac. The lignin content of the original wood is 25.6%, of the acetylwood 15.9%. The so-called hemicelluloses are probably in great part removed in the acetylation. The MeO content is not changed (6% in the original, 4% (instead of the expected 4.1%) in the acetylated wood). The original wood contained 67.4% cellulose as detd. by the Cross and Bevan method. In attempting to make the same detn. on the acetylwood there was obtained after 4 alternate treatments with Cl and Na_2SO_3 and 1 short bleaching with $KMnO_4$ 76% of a snow-white prepn. still having an almost unchanged wood structure. The same prepn. was obtained by the Schmidt ClO_2 method. The suspicion that only the lignin acetate is removed while the cellulose acetate remains was confirmed by analysis of the prepn., the results corresponding to an almost pure triacetylcellulose with 42.75% Ac, in the usual cellulose solvents this acetate was appreciably sol. (about 60%) only in $CHCl_3$ and $AcOH$. Comparison of these results with those obtained with pine wood shows no difference between the 2 woods (cf. the contrary findings of Suida and Titsch, *C. A.* 22, 4807). C. A. R

Decahydroquinoline and its derivatives. V. Synthesis of *trans-o*-dimethylamino-propylcyclohexane. SHIN-ICHIRO FUJISE. *Bull. Inst. Phys. Chem. Research* 8, 27-33 (1929), *Abstracts* 2, 2; cf. *C. A.* 23, 144.—*o*-Propylcyclohexanone oxime is reduced and methylated, giving *trans-o*-dimethylaminopropylcyclohexane. Δ^1 -Propylcyclohexene is obtained by dehydration of *o*-propylcyclohexanol. Also in *Sci. Papers Inst. Phys. Chem. Research* (Tokyo) 10, 83-9(1929). ALBERT L. HENNE

The use of iodine-iron for chlorine transfer. H. F. FIERZ-DAVID. Tech. Hochschule, Zürich. *Naturwissenschaften* 17, 13(1929).—I combined with Fe is a most powerful catalyzer for chlorination of org. compds. One % Fe in any form and 0.1% I induce rapid chlorination at low temp. of compds. that otherwise act slowly at high temp. $p-ClC_6H_4NO_2$, *o*- and $p-MeC_6H_4NO_2$, $PhNO_2$ and paraffin are chlorinated at 40° to 50° with considerable heat effect, necessitating external cooling. The products obtained are unusually pure; other combinations I-Ni, I-Co, I-Sb, I-Sn, I-P, I-Zn, etc., did not give favorable results. The I-Fe combination dissolves rapidly with deep brown color and no I escapes with the HCl evolved. The action is comparable to that of other modern mixed catalyzers. B. J. C. VAN DER HOEVEN

The existence of steric hindrance in the sense of Victor Meyer. S. C. J. OLIVIER. Chem. Dept. of the Agr. Univ., Wageningen. *Rec. trav. chim.* 48, 227-36(1929).—Previous investigations of O. (*C. A.* 20, 2485, 3161) have shown that the ratio of the velocities of the hydrolysis of the *o*- and *p*-halogenated benzyl chlorides is the same for the Cl, Br and I compds. and from this fact it had been concluded that in this reaction a purely mech. steric hindrance in the sense of Victor Meyer does not occur. The same conclusion was also drawn (*loc. cit.*) from the investigation of 2,4-, 3,5-, and 2,6- $Br_2C_6H_3CH_2Cl$, the effect of both substituents being about the product of the sep. influences. These investigations had been carried out with 50% aq. alc. as the solvent (which may lead to erroneous results, alcoholysis taking place simultaneously with the hydrolysis. ABTRACTOR) and have now been repeated with 50% aq. acetone, with the following results, showing that the conclusions, drawn previously, need not be changed. At 60° the monomol. reaction consts. are: $PhCH_2Cl$, 0.00046; *p*-Br compd., 0.000234; *o*-Br compd., 0.000129; *m*-Br compd., 0.000093; 2,4- Br_2 compd., 0.000095; 2,6- Br_2 compds., 0.000055; 3,5- Br_2 compd., 0.000032. The present paper, however, principally deals with the hydrolysis of the mono- and dibromobenzoyl chlorides in 50% aq. acetone at 0°, the following monomol. reaction consts. being obtained (cf. also *C. A.* 21, 3356): $BzCl$, 0.026; *o*-Br compd., 0.035; *m*-Br compd., 0.044; *p*-Br compd., 0.024; 2,6- Br_2 compd., 0.00029; 2,4- Br_2 compd., 0.057; 3,5- Br_2 compd., 0.35. The fact that one Br atom in the *o*-position accelerates while two Br atoms in this position retard the reaction considerably clearly proves that we are dealing here with a pronounced case of steric hindrance in the sense of Victor Meyer. The large difference

in this respect between 2,6-dibromobenzyl and -benzoyl chloride is explained by O. as follows: the hydrolysis of benzyl chlorides takes place the more easily, the more easily the Cl atom in the side chain passes into the ionic state, whereas the hydrolysis of the benzoyl chlorides proceeds the more quickly the more easily a mol. of water is added to the C:O group (cf. *C. A.* 21, 3356) and the latter reaction will be hindered far more by 2 substituents in the *o*-positions than the first mentioned one. 2,6-Dibromobenzoyl chloride, prepd. from 2,6-Br₂C₆H₃CO₂H (*C. A.* 19, 1259) in the usual way, m. 47–8°; 3,5-dibromobenzoyl chloride was obtained from 3,5-Br₂C₆H₃Me (cf. *C. A.* 20, 2485), 5 g. of which in 85 cc. boiling AcOH were oxidized with 12 g. CrO₃ to 3,5-Br₂C₆H₃CO₂H, m. 218.5–9.5°, which was converted into the chloride, m. 42.5–43°, by means of PCl₅. The prepn. of 2,4-Br₂C₆H₃CO₂H is to be published later; with PCl₅ 2,4-dibromobenzoyl chloride, m. 50–1°, was obtained. C. F. VAN DUIN

The replaceability of the methoxy group in 1-methyl-3-methoxy-4,6-dinitrobenzene. J. G. KERKHOF. Leiden, The University. *Rec. trav. chim.* 48, 251–3 (1929).—The nitration of benzene derivs. may be accompanied by a replacement of a hydrocarbon group by a nitro group; e. g., 2-nitro-*p*-cymene on nitration yields a mixt. of 2,6-dinitro-*p*-cymene and 2,4-dinitrotoluene (Alfthan, *C. A.* 14, 2490). According to Barbier (*C. A.* 22, 1339) the nitration of 3,2-Me(Me₃C)C₆H₃OMe (I) yields 3,2,4-Me(O₂N)₂C₆H₂OMe (II), m. 101°, along with 3,2,4,6-Me(Me₃C)(O₂N)₂C₆HOMe (III). De Capeller, however, has replaced the MeO group in II by NH₂ (*C. A.* 22, 2935) and obtained 3,4,6-H₂N(O₂N)₂C₆H₂Me, m. 193°; thus probably Barbier's formula I is incorrect and to be replaced by 3,6-Me(Me₃C)C₆H₃OMe (IV), so that the nitration products are 3,4,6-Me(O₂N)₂C₆H₂OMe (V) and 3,6,2,4-Me(Me₃C)(O₂N)₂C₆HOMe (VI). The following facts indicate that the correct formula has been assigned to V by de Capeller: *a*: on heating V with alc. NH₃ at 100°, K. obtained 1-methyl-3-amino-4,6-dinitrobenzene, m. 195°; *Ac deriv.*, m. 102°; *b*: the same expt. with MeNH₂ gave 1-methyl-3-methylamino-4,6-dinitrobenzene, m. 173° (cf. Braky and Gibson, *C. A.* 15, 1280); *c*: with N₂H₄ V yields 1-methyl-3-hydrazino-4,6-dinitrobenzene, m. 195° (cf. Giua, *C. A.* 14, 1532). This hydrazine gives a benzal compd., m. 225°, and an acetone deriv., m. 142° (cf. Giua, *C. A.* 18, 1479). C. F. VAN DUIN

Configuration of the tervalent nitrogen atom. FRÈREJACQUE. *Compt. rend.* 187, 894 G (1928).—Various amines have been condensed with camphor- α -sulfonyl chloride, m. 88°, (amide, m. 143°, [α]_D²⁰ + 94° in H₂O), and thus are obtained the camphorsulfonyl derivs. of PhNH₂, m. 124°, [α]_D²⁰ –42.5° in EtOH; *o*-toluidine, m. 117°, [α]_D²⁰ –49.5° in EtOH; *p*-toluidine, m. 197°, [α]_D²⁰ –52.5° in EtOH; ethylaniline, m. 89°, [α]_D²⁰ –68° in C₆H₆. In neutral solvents, these derivs. are strongly *l*-rotatory, while the SO₂H acid, its Me ester, amide and chloride are *d*-rotatory, but in alk. soln. the anilides are *d* rotatory: this is explained by a conversion of the camphor part of the mol. into an enolic form. The rotation of the anilides increases proportionally to the amt. of alc. EtOH added until an equimol. proportion has been added, and then remains const. All attempts to isolate enantiomorphous forms of these compds. of tervalent N were unsuccessful, the rotation remaining unchanged after fusion for several hrs., or after repptn. by acids from their soln. in dil. alkalies. ALBERT L. HENNE

Reaction between aromatic nitro compounds and organomagnesium halides. HENRY GILMAN AND ROY MCCrackEN. Iowa State College. *J. Am. Chem. Soc.* 51, 821 30R (1929).—The products obtained in the reaction between aryl NO₂ compds. and RMgX vary markedly with exptl. conditions. Under the conditions of the expts. described in the present paper, the following general reaction takes place: PhNO₂ + 4PhMgBr \rightarrow Ph₂NH + PhOH + Ph₃. With alkylmagnesium halides, tetrasubstituted hydrazines are among the reaction products. EtMgBr and PhNO₂, e. g., give PhEt-NNEtPh. The formation of alkylanilines in this reaction is due in part to the decompn. of such hydrazines. The original should be consulted for the details of the expts. reported. C. J. WEST

Some of the reactions of 3-hydroxy-6-aminotoluene and certain of its derivatives. MARSHALL T. BOGERT AND GEO. H. CONNITT. Columbia Univ. *J. Am. Chem. Soc.* 51, 900–15G (1929).—3,6-HO(H₂N)C₆H₃Me.HCl (I) darkens above 250° and decompn. 290°. With BzH and AcONa there results nearly quant. 3-hydroxy-6-benzalamino-toluene, m. 135.5° (all m. ps. cor.); fusion with S gave a resin from which no thiazole could be isolated. The *salicylal deriv.*, red, m. 92.5°, with EtOH of crystn., or 111–1.5° likewise did not yield a thiazole deriv. The 6-Ac deriv., m. 125°; the *chloroacetyl deriv.*, pale brown, m. 133–3.5° (15% yield). 3,6-HO(H₂N)C₆H₃Me (II). C₆H₅(CO)₂ and C₆H₅, refluxed 1 hr., give 33% of *phthal-p*-hydroxy-*o*-tolil, m. 204°. Refluxing II with glacial AcOH, AcONa and Ac₂O gives 75% of 3-acetoxy-6-acetylamino-toluene, m. 127.5–8°. The action of Ca(ClO)₂ upon II in glacial AcOH gives 25% of

2,4-dichlorotoluquinone-6-acetamide, yellow, m. 159-9.5°, oxidized by dil. CrO_3 to 2,4-dichlorotoluquinone and reduced by SO_2 in EtOH to **2,4-dichloro-3-hydroxy-6-acetylaminotoluene**, m. 212-2.5°. **3-Hydroxy-5-nitro-6-acetylaminotoluene**, greenish yellow, m. 188.5° (62% yield on hydrolysis of the acetate with K_2CO_3); *Ac deriv.*, pale tan, m. 190-90.5°, results in 93% yield with fuming HNO_3 and Ac_2O , together with some 2,4-di- NO_2 deriv. **3-Hydroxy-2,4-dinitro-6-aminotoluene**, analyzed as the *HCl salt*, pale yellow, decomp. 200°; the free base, m. 166.5-7.5°; *Ac deriv.*, orange-yellow, m. 231° (decompn.); *acetate*, yellowish green, m. 170-70.5°. **3-Ethoxy-6-aminotoluene**, pale yellow oil, b. 253-5° (83% yield); *HCl salt*, m. 212°; *benzal deriv.*, bright yellow oil, b. 212-7° (80% yield); *salicyl deriv.*, yellow, b. 237-8°, m. 48.5°; *Ac deriv.*, m. 118.5°; soly. in 100 parts H_2O at 25°, 0.28 part; this could not be oxidized by KMnO_4 nor converted into the corresponding aldehyde. **6-Chloroacetyl deriv.**, m. 140.5-1°. **3-Ethoxy-6-salicylaminotoluene**, m. 153.4-4°. **Oxal-p-ethoxy-o-toluidide**, m. 205° (72% yield). **Phthal-p-ethoxy-o-tolil**, m. 140.5° (75% yield). **Et 2-methyl-4-ethoxyphenylacetyl-glycinate**, b. 210-2.5° (60% yield); this could not be converted into an indoxyl deriv. **2,4-Dichloro-3-ethoxy-6-aminotoluene**, m. 83°; *HCl salt*, m. 244°; 6-Ac deriv., m. 162.5-3° (75% yield by the action of HOCl on 3,6-EtO(AcNH)- $\text{C}_6\text{H}_3\text{Me}$). **3-Ethoxy-4-nitro-6-aminotoluene**, dark red, m. 86-7°; *HCl salt*, decomp. 249°; *Ac deriv.*, yellow, m. 192.5-3°. **3-Ethoxy-5-nitro-6-aminotoluene**, orange-red, m. 101-1.5°; *HCl salt*, decomp. 240°; *Ac deriv.*, yellow, m. 160°. **3-Ethoxy-2,4-dinitro-6-aminotoluene**, yellow, m. 96-7°; *HCl salt*, pale yellow, decomp. 195-7°; *Ac deriv.*, pale yellow, m. 167-7.5°. **3-Ethoxy-4,5-dinitro-6-acetylaminotoluene**, pale yellow, m. 257-8°. **3-Ethoxy-4,6-diacetylaminotoluene**, m. 200-200.5°. **3-Ethoxy-3'-hydroxy-6,6'-azotoluene**, brown, m. 132.5° (60% yield); the 3,3'-di-EtO deriv., yellow, m. 149-9.5° (62% yield). **3-Hydroxyethoxy-6-acetylaminotoluene**, m. 117.75°; **3-acetoxyethoxy-6-diacetylaminotoluene**, m. 117°. C. J. WEST

Alkylaryllead compounds. Anti-knock studies. HENRY GILMAN, O. R. SWEENEY AND J. E. KIRBY. Iowa State Coll. *Iowa State Coll. J. Sci.* 3, 1-4 (1928).—Four butyltriphenylleads have been prepd. from the appropriate Grignard reagent and Ph_3PbBr . **Butyltriphenyllead (I)**, **isobutyltriphenyllead (II)** and **sec-butyltriphenyllead (III)** were prepd. by refluxing the appropriate mixts. for about 90 mins. and then hydrolyzing by means of iced NH_4Cl soln. After evapn. of the ether and recrystn. of the residue from EtOH, I was obtained as a white cryst. substance, m. sharply 47°, II, fine needles, m. sharply 68-8.5°, and III, m. 84°. The yields were: 66.5, 80.6 and 64.4%, resp. **Tertbutyltriphenyllead (IV)** was prepd. in the same way. At first the Ph_3PbBr was added to the Grignard reagent. The ether ext. gave a yellow solid, m. about 95°. After recrystn. from EtOH and C_6H_6 the m. p. was 150°. From the mother liquor by diln. with EtOH were obtained crystals which agreed in properties and analysis with **triphenyllead, Ph₃Pb**. Second, the Grignard reagent was added to an excess of the Ph_3PbBr . The insol. solid resulting from hydrolysis was extd. with hot EtOH and repeatedly recrystd. from EtOH. In this manner IV was obtained as white crystals, m. 150-0.55°. The yellow solid which resulted from the evapn. of the ether was unstable in hot EtOH. IV is the first reported organolead compd. having a tertiary radical attached directly to the Pb. F. E. BROWN

Organo-antimony compounds. III. SUDHIR CHANDRA NIVOGY. Univ. Coll. of Science, Calcutta. *J. Indian Chem. Soc.* 5, 753-7 (1928); cf. C. A. 22, 4112. This work was undertaken to det. the constitution of Brahmachari's "urcastibamine" (I). A mixt. of 4- $\text{H}_2\text{NC}_6\text{H}_4\text{SbO}_3\text{H}_2$ (II) and urea in H_2O was heated on a water bath 3-4 hrs. and left to stand overnight. The solids present were removed by filtration, and from the soln. was obtained $\text{H}_2\text{NCONHC}_6\text{H}_4\text{SbO}_3\text{HNH}_2$ (III), which is the carbamino deriv. of the NH_4 salt of II. III was also obtained by the action of the Na salt of II with KOCN in H_2O contg. a small quantity of AcOH . III is identical in chem. and physiol. properties with I. The Na and K salts corresponding to III were also prepd., and unlike III were found to have no marked action on the kala-azar parasites. LOUISE KELLEY

Action of bases on certain mercurated anilines. FRANK C. WHITMORE, E. R. HANSON AND F. L. CARNAHAN. Northwestern Univ. *J. Am. Chem. Soc.* 51, 894-900 (1929).—*p*- $\text{AcOHgC}_6\text{H}_4\text{NH}_2$ (5 g.) and 2 g. NaBr in 1500 cc. H_2O , refluxed 3 hrs., give 1.8 g. *p*-bromomercurianiline, m. 181°; the *p*-I deriv., m. 165°. Refluxing 1 mol. *p*- $\text{AcOHgC}_6\text{H}_4\text{NH}_2$, 32 mols. KOH , 100 mols. EtOH and 100 mols. H_2O 30 min. gives a yellow ppt., which is not the Hg bis-compd.; its true formula is unknown. By mercurating the *N*-disubstituted anilines with $\text{Hg}(\text{OAc})_2$ in H_2O , EtOH and AcOH , the following *p*-acetoxymercurialkylanilines were prepd.: *di*-Me, m. 165°, 82% yield; *di*-Et, m. 105°, 51%; *di*-Pr, m. 99°, 90%; *di*-Bu, m. 89-90°, 91%; *MeEt*, m. 92-3°.

85%; *benzylethyl*, m. 92–4°, 72%. Refluxing these compds. with CaCl_2 and NaBr in EtOH or treating with NaI in cold Me_2CO , gives the following derivs.: *Cl compds.*: *di-Pr*, m. 170–2°; *di-Bu*, m. 162–3°; *MeEt*, m. 162–6°; *benzylethyl*, m. 150–1°; *Br compds.*: *di-Et*, m. 158°; *di-Pr*, m. 165–7°; *di-Bu*, m. 164–5°; *MeEt*, m. 154–5°; *benzylethyl*, m. 155°. *I compds.*: *di-Et*, m. 120–1°; *di-Pr*, m. 159°; *di-Bu*, m. 151°; *MeEt*, m. 137–8°; *benzylethyl*, m. 132–4°. *Hg-bis compds.*, $(\text{R}_2\text{NC}_6\text{H}_4)_2\text{Hg}$, were prepd. from the *Ac* derivs. by the action of alc., KOH , NaI (excess) in cold Me_2CO and $\text{Na}_2\text{S}_2\text{O}_3$ in cold concd. aq. soln. The following m. ps. are recorded: *di-Me*, 168–9°; *di-Et*, 160–1°; *di-Pr*, 86°; *di-Bu*, 80–1°; *MeEt*, 133–5°; *benzylethyl*, 125–6°. In the reaction the HgO is partly converted to Hg_2O or Hg and partly to the very slightly sol. ethane hexamer carbide.

C. J. WEST

The relationship between constitution and taste among some derivatives of urea. H. THATE. Leiden, The University. *Rec. trav. chim.* 48, 116–20(1929).—Several asymm. ureas have a sweet taste, e. g., dulcin (cf. Thomson, *Z. angew. Chem.* 37, 810 (1924)), α -dimethylurea (*Rec. trav. chim.* 2, 121(1883); 3, 223(1884)), etc. Further it has already been shown that the introduction of a *Me* group intensifies the sweetness of the taste, α -methyl- α -phenylurea being sweeter than dulcin (Bergmann, Camacho and Dreyer, *C. A.* 17, 996). In order to investigate the latter subject more fully, T. has prepd. phenylurea, α -methyl- α -phenylurea, 4-methylphenylurea and α -methyl- α -4-methylphenylurea and it was found that generally the introduction of a *Me* group intensifies the sweetness of the taste. While phenylurea itself is not sweet, but bitter, PhNMeCONH_2 is sweet, $p\text{-MeC}_6\text{H}_4\text{NHCONH}_2$ is quite sweet and $p\text{-MeC}_6\text{H}_4\text{NMeCONH}_2$ is very sweet. α -Methyl- α -phenylurea, prepd. from PhNHMe.HCl and KCNO (cf. *Ber.* 17, 2095(1884)), m. 82°, a small amount of α -methyl- α -phenylbiuret, m. 156°, being formed at the same time. 4-Methylphenylurea, obtained in a similar way from $p\text{-MeC}_6\text{H}_4\text{NH}_2\text{.HCl}$ and KCNO , m. 176°, while the interaction of $\text{MeC}_6\text{H}_4\text{NHMe.HCl}$ and KCNO gave α -methyl- α -4-methylphenylurea, m. 103°, together with some α -methyl- α -4-methylphenylbiuret, m. 167°. The $p\text{-MeC}_6\text{H}_4\text{NHMe}$, b. 208–11°, required for this investigation, was obtained by first prep. the *Na* deriv. of $p\text{-MeC}_6\text{H}_4\text{NHAc}$ from the components in boiling xylene, followed by treatment with MeI and sapon; yield 10 g. from 25 g. of $\text{MeC}_6\text{H}_4\text{NHAc}$, 7 g. of *Na* and 28 g. of MeI (cf. *Ber.* 10, 327(1877); 21, 1103(1888)). In agreement with Schiff's observations upon aromatic derivs. of biuret (*Ann.* 299, 253(1897); *C. A.* 1, 1700), neither α -methyl- α -phenylbiuret, nor α -methyl- α -4-methylphenylbiuret give the biuret reaction.

C. F. VAN DUIN

Synthetic preparation of dulcin (*p*-phenetylurea). JOSÉ UHTHOFF AND GABRIEL MORAGAS. *Quim. Ind.* 5, 207–10(1928).— EtBr is made either from Br_2 and EtOH or from EtOSO_3H and NaBr by the usual method. Anhyd. $\text{K}_4\text{Fe(CN)}_6$ is heated with K_2CO_3 and Ph_2O_4 is then added. The mixt. is fused, cooled, broken up, dissolved in water and filtered. The KOCN soln. is heated with Am_2SO_4 , the K_2SO_4 removed, the liquid evaporated and the residue extd. with abs. EtOH and the urea crystd. Yield 44%. Urea nitrate is obtained preferably with pure concd. HNO_3 and is preserved well dried, as it is deliquescent. Phenetidine is acetylated with glacial AcOH , the *Ac* deriv. is purified from boiling H_2O contg. NaOH , NaHSO_3 and Zn dust. The whitest phenacetin is obtained from boiling PhMe ; yield 86–93%, depending upon the purity of the AcOH . U. and M. consider the use of Ac_2O to be advantageous. Fresh and anhyd. phenetidine is boiled with a soln. of urea nitrate (following D. R. P. 76,596) and dulcin ppts. The impure product is heated with NaOH , NaHSO_3 and Zn dust and let crystallize. The product, if colored, is recrystd. from boiling water. Yield 76%.

S. L. B. ETHERTON

2,5-Dichlorophenetidine. G. BARGELLINI AND L. MONTI. *Atti accad. Lincei* 8, 590–4(1928).—Having established the constitution of 3,5- and 2,6-dichlorophenetidine (cf. *C. A.* 23, 1629) the constitution of the di-*Cl* deriv. first prepd. by Reverdin and During (*Ber.* 32, 154(1899)) was detd. by transforming it first to the phenol, then to the known 2,5-dichloroquinone, therefore establishing the constitution of the R. and D. compd as $2,5,4\text{-Cl}_2(\text{EtO})\text{C}_6\text{H}_3\text{NH}_2$.

A. W. CONTIERI

Ring disruption of dihydroxymethylene ethers by means of the Grignard reagent. KINZO KAFUKU, NOBUTOSHI ISHIKAWA AND RYO KATO. Research Inst. Government of Formosa. *Bull. Ind. Research Government of Formosa* 24, 1–24(1928).—The writers have previously obtained monoethers of the bivalent phenols by the action of Grignard reagents upon *safrole* and *isosafrole* and established their constitution. They also mentioned that the same reagent acts similarly with dihydroxymethylene ethers, such as piperonal, apiole, isoapiole, myristin and isomyristin. Constitution of *safrole* and *isosafrologeneol*: The authors previously showed that *safrole* is either $3,4\text{-CH}_2\text{O}$ -

$C_6H_5CH:CHMe$ (I) or 4,3-HO(EtO) $C_6H_3CH:CHMe$ (II) and hence they tried to decide between these by synthesizing *isoeugenol Et ether*, 3,4-MeO(EtO) $C_6H_3CH:CHMe$ (V) and *isobutenylphenol Et ether* and comparing them. *Isosafroegenol Me ether* (III), m. 62–63.5°; V, m. 59–60°; 4,3-MeO(EtO) $C_6H_3CH:CNHMe$ (VI), m. 50°; all are different from each other. After repeated crystn. V m. 62–63°. If *eugenol Et ether* is isomerized, it m. 62–63°, and since the phys. const. of *safroegenol Me ether* and of *eugenol Et ether* coincide with each other it was established that *safroegenol* and *isosafroegenol* belong to the type I. Expt. *Eugenol Et ether*, obtained by fractionation under reduced pressure of the oil obtained from cloves and ethylation with KOH and EtI, b_4 132.5°, d_4^{19} 1.0948, n_D^{18} 1.53300. *Safroegenol Me ether*, from *safroegenol* methylated by MeI and KOH, b_5 136–9°, d_4^{20} 1.0943, n_D^{20} 1.5324. *Safroegenol phenylurethan*, m. 57.5–59°. *Isosafroegenol phenylurethan*, m. 121–3°. *Safroegenol dibromide*, m. 52°. *Hydrosafroegenol*, obtained by a similar reaction of the Grignard reagent upon *hydrosafrole*, decomps., b_3 114.3–5.4°, n_D^{19} 1.5172, d_4^{25} 1.0095, crystals on standing, m. 41.2–2.5°, and is identical with the compd. obtained by hydrogenating *safroegenol* with Pt black and H_2 or *isosafroegenol* with Na and EtOH. *Phenylurethan*, m. 79–81°. *Ac deriv.*, b_{11} 153–4°, d_4^{18} 1.0174, n_D^{19} 1.4980. Formation of 1-vinyl-3-hydroxy-4-ethoxybenzene from *piperonal*. The Grignard reagent is made to act upon the aldehyde group of *piperonal*, the reaction being carried out at a higher temp. to obtain 1-vinyl-3-hydroxy-4-ethoxybenzene. *Vinylcatechol methylene ether*, b_{15} 109–11°. 1-Vinyl-3-hydroxy-4-ethoxybenzene, m. 64°. *Brominated compd.*, m. 69–71°. *Phenylurethan*, m. 96°; when this is oxidized by O_3 at 0–5° in $CHCl_3$, *safrovanillin*, m. 124–5°, is obtained. Formation of *apiolol* and *isoapiolol* from *apiole* and *isoapiole*. *Apiolol*, made similarly from *apiole*, b_7 105–7.5°, d_4^{17} 1.1067, n_D^{17} 1.5264; *Ac deriv.*, m. 42–3°; *Bz deriv.*, m. 86.7° *Me ether*, obtained by heating in MeOH with MeI and KOH at 140–60° in a sealed tube for 4 hrs., b_{11} 168–70°, d_4^{22} 1.653, n_D^{23} 1.5227. When this is oxidized by $KMnO_4$, there is obtained an acid, b_7 230–2°, d_4^{22} 1.2020, n_D^{23} 1.5287. *Isoapiolol*, obtained similarly from *isoapiole* which is made by isomerizing *apiole*, b_7 175°, d_4^{17} 1.1428, n_D^{17} 1.5506; *Ac deriv.*, m. 73–4°; *Bz deriv.*, m. 98–9°; *Me ether*, b_{32} 180–2°, d_4^{18} 1.0759, n_D^{18} 1.5300. Formation of *myristinol* and *isomyristinol* from *myristin* and *isomyristin*. *Myristinol*, b_8 153–6°, d_4^{33} 1.0818, n_D^{32} 1.5287; *Ac deriv.*, b_8 175, d_4^{25} 1.0667, n_D^{25} 1.5126; *Bz deriv.*, m. 57.8°; *Me ether*, b_3 120–2°, d_4^{25} 1.0030, n_D^{25} 1.5202. When oxidized with $KMnO_4$ an acid, m. 91°, is obtained. *Isomyristinol*, m. 34–5°, is made similarly from *isomyristin*, or by isomerizing *myristinol*.

K. SOMEYA

Reactivity of some carbinols. With a note on the Walden Inversion. P. A. LEVENE AND ALEXANDRE ROTHEN. Rockefeller Inst., N. Y. *J. Biol. Chem.* 81, 359–68(1929).—The reaction times of a no. of primary, secondary and aromatic carbinols with HBr at 79.7° were detd. The relation of reactivity to Walden inversion is discussed.

ARTHUR GROLLMAN

Trichloro- and tetrabromonitrobenzaldehydes, hexachloro- and octabromindigo. C. VAN DE BUNT. Leiden, The University. *Rec. trav. chim.* 48, 121–46(1929).—Continuing the investigations of van der Lee (*C. A.* 20, 912; 21, 399) the author has prepd. halogeno- ω ,2-dinitrostyrenes with the intention of reducing them to the corresponding halogenoindoles (cf. van der Lee, *C. A.* 20, 912; Nenitzescu, *C. A.* 19, 2666), but the reduction gave unsatisfactory results and, therefore, the investigation was continued further in the direction of synthesizing the halogenoindigos (cf. Jansz, *C. A.* 15, 3817). 3,4,5-Tribromocinnamic acid (I), m. 215–6° is obtained by boiling during 7 hrs. 30 g.; 3,4,5-Br $_3$ C $_6$ H $_2$ CHO (cf. *C. A.* 15, 3817), 30 g. freshly fused AcONa and 225 cc. Ac $_2$ O, yield 53%. 2-Nitro-3,4,5-tribromocinnamic acid (II), prepd. from 3,4,5,2-Br $_4$ (O $_2$ N)C $_6$ HCHO (*C. A.* 15, 3817), m. 264–5°; yield 68%. ω ,2-Dinitro-3,4,5-tribromostyrene (III), obtained from both these compds. on dissolving the cinnamic acid g.) in 15 cc. ice cold abs. HNO $_3$ and heating slowly to 55°, yellow, m. 228–30°. Reduction of III by means of Fe powder in alc. AcOH at 85–90° did not give a halogenoindole. The nitration of 3,4,5-Br $_3$ C $_6$ H $_2$ CHO with abs. HNO $_3$ as well as with a mixt. of HNO $_3$ and H $_2$ SO $_4$ at low temp. gives the mononitro compd., but at 100° nitration and oxidation occur simultaneously with the formation of 2,6-dinitro-3,4,5-tribromobenzoic acid (IV), m. 245–8°. On recrystn. from alc. IV splits off CO $_2$ with the formation of 2,6-dinitro-3,4,5-tribromobenzene, m. 150–1°. For the prepn. as follows: Cl $_3$ C $_6$ H $_2$ CHO, 4-amino-3,5-dichlorobenzaldehyde (V) had to be prepd. as follows: 15 g. of *p*-ClH $_2$ NC $_6$ H $_4$ CHO was dissolved in a mixt. of 250 cc. water and 750 cc. AcOH; after filtering this soln. was chlorinated in 200 cc. portions with the Cl obtained

from concd. HCl and 2.5 g. KMnO_4 . Then a small amt. of NaHSO_3 was added and the soln. poured into 750 cc. of water, a yellow ppt. being formed, from which V, which is very volatile with steam, could be obtained by refluxing with a large amount of water. In this way was obtained 7 g. of V, m. 144° . The chlorination may also be carried out in aq. alc., but with poorer results. Further chlorination of V yields $2,4,6\text{-Cl}_3\text{C}_6\text{H}_2\text{NH}_2$, thus showing that in V the Cl atoms occupy the positions 3 and 5. By means of the Sandmeyer reaction V was converted into 3,4,5-trichlorobenzaldehyde (VI), m. $90\text{--}1^\circ$, which, on oxidation with an alk. KMnO_4 gave 3,4,5-trichlorobenzoic acid, m. $210\text{--}0.5^\circ$. The nitration of VI (3 g.) with abs. HNO_3 , first at 0° , and then during 3 mins. at 50° , gives 2-nitro-3,4,5-trichlorobenzaldehyde, m. $118.5\text{--}9^\circ$ (VII), which again, on oxidation with KMnO_4 , gave 2-nitro-3,4,5-trichlorobenzoic acid (VIII), m. $181\text{--}1.5^\circ$. Nitration of VII with a mixt. of HNO_3 and H_2SO_4 acids at higher temp. gave 2,6-dinitro-3,4,5-trichlorobenzoic acid (IX), m. $219\text{--}21.5^\circ$, which, on boiling in alc., splits off CO_2 with the formation of 2,6-dinitro-3,4,5-trichlorobenzene, m. 94° . On further nitration of VIII with $\text{HNO}_3\text{--H}_2\text{SO}_4$, again IX was obtained. By means of the usual methods the following compds. were prepd.: 4-Amino-3,5-dichlorobenzaldehyde phenylhydrazone, m. $156\text{--}7^\circ$; 3,4,5-trichlorobenzaldehyde phenylhydrazone, m. 147° ; 2-nitro-3,4,5-trichlorobenzaldehyde phenylhydrazone, m. 229° . This compd. was obtained in 2 modifications, a red one, m. 229° , and a yellow one, which is easily obtained on recrystg the red modification from benzene. The yellow modification also m. 229° , having passed before melting into the red modification. 4-Amino-3,5-dichlorobenzaldehyde p-nitrophenylhydrazone, m. $288\text{--}9^\circ$; 3,4,5-trichlorobenzaldehyde p-nitrophenylhydrazone, m. 342° ; 2-nitro-3,4,5-trichlorobenzaldehyde p-nitrophenylhydrazone, m. $293\text{--}4^\circ$; 4-amino-3,5-dichlorobenzaldehyde semicarbazone, m. $248\text{--}50^\circ$; 3,4,5-trichlorobenzaldehyde semicarbazone, m. $252\text{--}4^\circ$; at the m. p. both these semicarbazones pass into the corresponding azines, m. $281\text{--}2^\circ$ and $284\text{--}5^\circ$, resp. 2-Nitro-3,4,5-trichlorobenzaldehyde semicarbazone, m. $278\text{--}9^\circ$; 4-amino-3,5-dichlorobenzaldehyde semioxamazone, m. $269\text{--}70^\circ$; 3,4,5-trichlorobenzaldehyde semioxamazone, m. $297\text{--}8^\circ$; 2-nitro-3,4,5-trichlorobenzaldehyde semioxamazone, m. $303\text{--}4^\circ$; 4,4'-diamino-3,3',5,5'-tetrachlorobenzaldehyde azine, m. $285\text{--}6^\circ$; 3,3',4,4',5,5'-hexachlorobenzaldehyde azine, m. $289\text{--}9.5^\circ$; 2,2'-dinitro-3,3',4,4',5,5'-hexachlorobenzaldehyde azine, m. $287\text{--}8^\circ$. 2,3,4,5-Tetrabromobenzaldehyde was prepd. in the following way: o-toluidine \rightarrow 4-nitro-2-aminotoluene \rightarrow 4-nitro-2-bromotoluene (*Chem. Weekblad* 6, 906(1909)) \rightarrow 2,4-Br $(\text{H}_2\text{N})\text{C}_6\text{H}_3\text{CHO}$ (*Chem. Weekblad* 6, 907(1909)) \rightarrow 2,3,5,4-Br $(\text{H}_2\text{N})\text{C}_6\text{HCHO}$ (C. A. 7, 769) \rightarrow 2,3,4,5-Br $(\text{H}_2\text{N})\text{C}_6\text{HCHO}$ (X). On nitration of X with abs. HNO_3 at $50\text{--}60^\circ$, 2-nitro-3,4,5,6-tetrabromobenzaldehyde (XI), m. $225\text{--}7^\circ$, was produced. On oxidation with boiling dil KMnO_4 , X passes into 2,3,4,5-tetrabromobenzoic acid, m. 234° , which on nitration yields 2-nitro-3,4,5,6-tetrabromobenzoic acid, m. $238\text{--}40^\circ$, which does not split off CO_2 on boiling in alc. 2-Nitro-4,6-dichloro-3,5-dibromobenzaldehyde (XII) was prepd. as follows: 4-nitro-2-chlorotoluene \rightarrow 2,4-Cl $(\text{H}_2\text{N})\text{C}_6\text{H}_3\text{CHO}$ (*Chem. Weekblad* 6, 903(1909)) \rightarrow 2,3,5,4-ClBr $(\text{H}_2\text{N})\text{C}_6\text{HCHO}$ (C. A. 7, 769), this compound was converted by the Sandmeyer reaction into 2,4-dichloro-3,5-dibromobenzaldehyde, m. $110\text{--}1^\circ$. Nitration of the latter compd. with a large excess of HNO_3 and some H_2SO_4 at 50° during 15 mins., gives XII, m. $198\text{--}9^\circ$. From VII, XI and XII, 5,5',6,6',7,7'-hexachloroindigo, 4,4',5,5',6,6',7,7'-octabromoindigo and 4,4',6,6'-tetrachloro-5,5',7,7'-tetrabromoindigo were prepd. according to Baeyer and Drewsen's method (*Ber* 15, 2856(1882); 16, 2205(1883)) by means of acetone and dil. alkali. C. F. VAN D.

Dynamic isomerism. XXVIII. Absorption spectra of the ketonic and enolic forms of an α -diketone. THOMAS M. LOWRY, HENRI MOUREU and ALEXANDER H. MACCONKEY. Cambridge, Eng. *J. Chem. Soc.* 1928, 3167-79.—A continuation of work (C. A. 22, 3158) on the isomerides of benzoylcamphor. Other enol-keto isomers are studied, in particular benzylmethylglyoxal. This latter compd. (C. A. 22, 2548) could be isolated in pure enol and keto forms, both of which were relatively stable. In accordance with their previous results the authors found a band with an extinction of $\log \epsilon = 1.5$ at 4300 A. U. and a step out or indication of a band at 3000 A. U., for the keto isomeride, $\text{PhCH}_2\text{COCOMe}$. The enolic isomeride, PhCH:C(OH)COMe , gave a strong absorption band in the ultra-violet with an extinction of $\log \epsilon = 4.3$ at 3100 A. U. The results are contrary to those of Morton and Rosney (C. A. 20, 1788) who assumed that the keto and enol forms should have absorption bands at the same frequency.

WALLACE R. BRODE

Stability of isomers according to their absorption spectra. Intramolecular rearrangements in the 1-aryl-2-phenyl-2-ethyl-1-butanol series. (MME.) RAMART-LUCAS and ANAGNOSTOPOULOS. *Bull. soc. chim.* 43, 1345-61(1928).—See C. A. 22, 3154, and R. and Salmon-Legagneur, C. A. 22, 4521.

A. S. CARTER

The elimination of amino groups from tertiary amino alcohols. V. Semipinalin-deamination and Walden inversion. ALEX. MCKENZIE AND ARTHUR K. MILLS. St. Andrews Univ. *Ber.* 62B, 284-8(1929); cf. *C. A.* 21, 1977.—*d*-2-Phenyl-2-amino-1,1-dibenzyl-1-ethanol was prepd. by the action of *l*-ClH.H₂NCHPhCO₂Et (I) on PhCH₂MgCl. It is slightly sol. in EtOH, m. 144-5°, and gives a yellow color with concd. H₂SO₄. By the action of HNO₂ this compd. was converted to *d*-α,γ-diphenyl-γ-benzylacetone and *d*-2-phenyl-2-hydroxy-1,1-dibenzyl-1-ethanol. The latter compds. were identical with those prepd. by Roger and McKenzie (*Ber.* 62, 272(1929)). *Conclusion:* No configurational change occurs either in the conversion of *d*-PhCH(NH₂).CO₂H to *l*-PhCH(OH)CO₂H or of *d*-PhCH(NH₂)C(CH₂Ph)₂OH to *d*-PhCH(OH)C(CHPh)₂OH. VI. The action of nitrous acid on the amino alcohols of *l*-phenylaminoacetic acid. ALEX. MCKENZIE AND MARY STEPHEN LESSLIE. *Ibid* 288-95.—By the application of the Grignard reaction, the following compds. were prepd.: *l*-Et₂C(OH)CH(OH)Ph, *l*-Et₂C(OH)CH(NH₂.HCl)Ph (I), *dl*-Me₂C(OH)CH(NH₂)Ph (II), *dl*-Pr₂C(OH)CH(NH₂.HCl)Ph (III), *d*-Pr₂C(OH)CH(OH)Ph and *l*-Pr₂C(OH)CH(NH₂)Ph (IV). Deamination of I, II, III and IV by HNO₂ gave only the corresponding *dl*-glycols. ARTHUR GROLLMAN

Bromination of *p*-aminobenzoic acid and its ethyl and butyl esters. A. LEULIER AND J. DINET. *J. pharm. chim.* 8, 57-61(1928).—The reaction $2\text{HBr} + \text{H}_2\text{O}_2 \rightarrow 2\text{Br} + 2\text{H}_2\text{O}$ permits substitution of Br or Br₂ in the mol. of *p*-H₂NC₆H₄CO₂H (I) and of Br in its Et and Bu esters. To prep. the compd. C₆H₄Br(NH₂)CO₂H (II), mix 0.8 g. I with 6 cc. H₂O₂ soln. and 2 cc. of 48% HBr. The mixt. clears, then II is pptd.; yield 60%; after recrystn. from EtOH, it m. 225°. To prep. the compd. C₆H₄Br₂(NH₂)CO₂H, mix 6.5 g. I with 3.5 cc. HBr (65° Bé.) and 50 cc. H₂O₂ soln.; after 1 hr. add another 3.5 cc. HBr, then crystn. begins. The yield is 57%. It m. 320° (330° (decompn.)), Koopal, *C. A.* 9, 2645; decompn. without melting 260-70°, Sudborough, *Ber.* 27, 513(1894)). To act with Br on the Et ester of I ("anesthesine," benzocaine) (III) and on the Bu ester of I ("scluroforme," butesine) (IV), use in each case 5 g. of III or IV, 30 cc. of H₂O₂, 3 cc. HBr (65° Bé.) for III and 2.5 cc. HBr (48%) for IV. Crystn. begins after 15 mins. Allow to stand for 24 hrs., collect the crystals and remove all HBr by washing. The yield of compd. C₆H₁₀O₂NBr, m. 92°, is 80%, that of the compd. C₁₁H₁₄O₂NBr, m. 63°, is 90%. The Br products of III and IV also exhibit anesthetic properties (cf. *C. A.* 14, 1157, 18, 2944), but are more easily sol. and show no increased toxicity. S. WALDBOTT

Synthesis of β-aryl-β-aminoethane-α,α-dicarboxylic acids. The mechanism of Knoevenagel's synthesis of cinnamic acid. V. M. RODIONOV. Technical Collg., Moscow. *J. Am. Chem. Soc.* 51, 847-52(1929).—On heating a mixt. of 22 g. piperonal, 70 cc. 11% EtOH-EtNH₂ and 18 g. CH₂(CO₂H)₂ until the EtOH is distd. off, there results 26% of β-piperonyl-β-ethylaminopropionic acid, m. 198-200°; nitrosamine, m. 136-8°. Similarly, Me₂NH gives 2-3% of the HCl salt of the β-dimethylamino deriv. When a mixt. of BzH, 6% EtOH-NH₃ and CH₂(CO₂H)₂ are mixed and allowed to stand in ice H₂O for 12 hrs., there results 76% of β-phenyl-β-aminoethane-α,α-dicarboxylic acid, m. 148°; on heating at 150° CO₂ and NH₃ are evolved and PhCH:CHCO₂H results, but on heating with HCl there results 40% of the acid and 50% of PhCH₂(NH₂)CH₂CO₂H. β-Phenyl-β-piperidylethane-α,α-dicarboxylic acid, m. 163-4° (decompn.) (91% yield); heating with HCl gives only PhCH:CHCO₂H. β-Piperonyl-β-piperidylethane-α,α-dicarboxylic acid, m. 150-2° (decompn.) (87% yield); in the case of the last 2 compds., only 1 CO₂H group reacts with NaOH. BzH, EtNH₂ and CH₂(CO₂H)₂ give β-phenyl-β-ethylaminoethane-α,α-dicarboxylic acid, m. 163-4° (decompn.) (68.8% yield); the corresponding β-piperonyl deriv., m. 155-7° (decompn.) (58% yield). The mechanism of the Knoevenagel reaction is discussed. C. J. WEST

Mechanism of formation of β-aryl-β-amino fatty acids by the condensation of aromatic aldehydes with malonic acid and its derivatives. V. M. RODIONOV AND E. A. POSTOVSKII. 2. State Univ., Moscow. *J. Am. Chem. Soc.* 51, 841-7(1929).—In order to confirm certain suppositions regarding the mechanism of the Knoevenagel reaction, the following compds. were prepd. *Di*-Et β-phenyl-β-amino-α-methylethane-α,α-dicarboxylate-HCl, m. 158°, results in 51.7% yield by heating 10 g. MeCH(CO₂Et)₂, 6 g. BzH and 15 cc. EtOH-NH₃ in a sealed tube 7 hrs. in the H₂O bath; using piperonal, there results 38.2% of the β-piperonyl deriv., m. 125-7°. BzH and EtCH(CO₂Et)₂ give 17% of *di*-Et β-phenyl-β-amino-α-ethylethane-α,α-dicarboxylate-HCl, m. 166°; β-piperonyl deriv., m. 157° (6% yield). Heating 5 g. MeCH(CO₂H)₂, 4.5 g. BzH and 15 cc. 10% EtOH-NH₃ in the H₂O bath until CO₂ evolution ceases gives 60.4% of β-phenyl-β-amino-α-benzylpropionic acid-HCl, m. 225°; β-piperonyl deriv., 77% yield. β-Phenyl-β-amino-α-ethylpropionic acid-HCl, m. 249° (23.7% yield); β-piperonyl deriv.,

m 215° (13.4% yield). $\text{PhCH}_2\text{CH}(\text{CO}_2\text{H})$, BzH and $\text{EtOH}\cdot\text{NH}_3$ give 34.6% of β -phenyl- β -amino- α -benzylpropionic acid-HCl, m. 222°; β -piperonyl deriv., m. 203–5° (20.3% yield). These results indicate that the first reaction is the condensation of RCHO and NH_3 to give $\text{RCH}(\text{OH})\text{NH}_3$, which then condenses with $\text{CH}_2(\text{CO}_2\text{H})_2$ to give $\text{RCH}(\text{NH}_3)\text{CH}(\text{CO}_2\text{H})_2$, and this then loses CO_2 to give $\text{RCH}(\text{NH}_3)\text{CH}_2\text{CO}_2\text{H}$.

C. J. WEST

Symmetrical diphenyltetra-*tert*-butylethynylethane. S. S. ROSSANDER AND C. S. MARVEL. Univ. of Illinois. *J. Am. Chem. Soc.* 51, 932–6 (1929).—Phenyldi-*tert*-butylethynylcarbinol (I), b_p 135–9°, m. 46–7°, results in 55–64% yields from the Grignard reagent with $\text{Me}_3\text{CC}:\text{CH}$ and PhCO_2Et . Boiling with concd. H_2SO_4 in AcOH converts I into the α,β -unsatd. ketone, $\text{C}_{19}\text{H}_{24}\text{O}$, m. 108–10°. I and PBr_3 in Et_2O at 0° give the bromide, m. 58–9° (60% yield), which, shaken with Ag for 24 hrs., gives 40–50% of sym-diphenyltetra-*tert*-butylethynylethane (II), m. 98–9°. II in PhBr , shaken in an O atm. for 6 hrs. at 100°, showed no absorption of O. When a soln. of II is heated, color develops and this color does not disappear when the soln. is cooled. II is changed by heat but apparently does not rearrange to a solid stable compd. as does hexa-*tert*-butylethynylethane. II reacts with 40% Na-Hg and with liquid Na-K alloy to give the alkali metal deriv. of phenyldi-*tert*-butylethynylmethyl, whose structure was established by converting it into phenyldi-*tert*-butylethynylacetic acid, m. 154–6°, which was also prepd. from the bromide and CO_2 . II does not react with 1% Na-Hg. The reaction of the bromide and Ag in the presence of O does not give II but only tarry products; the amt. of O absorbed is greater than would be needed for the formation of a peroxide.

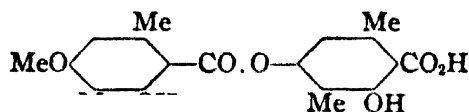
C. J. WEST

Nitration of 4-halo-2-hydroxy- and 2-halo-4-hydroxybenzaldehydes. HERBERT H. HODGSON AND THOMAS A. JENKINSON. Tech. College, Huddersfield. *J. Chem. Soc.* 1928, 2272–80.—4,2-Cl(HO)C₆H₃CHO (I) (2 g.) in 5 cc. AcOH , treated at 18° with 0.5 cc. fuming HNO_3 and kept 8 hrs. at 60°, gives 0.3 g. 5- NO_2 deriv., pale yellow, m. 116°; phenylhydrazone, orange-yellow, m. 188° (decompn.); *p*-nitrophenylhydrazone, bright yellow, m. 294° (decompn.); semicarbazone, very pale yellow, decomp. above 300°. I (0.75 g.) in 8 cc. AcOH , added to 8 cc. 91% HNO_3 , warmed to 100° for 5 mins. and kept 15 mins., gives 1 g. 3,5-di- NO_2 deriv., pale golden yellow, m. 153°; phenylhydrazone, light brown, m. 219°; *p*-nitrophenylhydrazone, light brown, m. 286° (decompn.); semicarbazone, light yellow, m. 225° (decompn.). 2,4-Cl(HO)C₆H₃CHO yields a 5- NO_2 deriv., m. 125° (phenylhydrazone, dark purple, m. 166° (slight decompn.); *p*-nitrophenylhydrazone, deep orange, m. 266° (decompn.); semicarbazone, light orange, m. 266° (decompn.)), and a 3,5-di- NO_2 deriv., pale yellow, m. 93° (phenylhydrazone, brownish purple, m. 210° (decompn.); *p*-nitrophenylhydrazone, reddish brown, m. 267° (decompn.); semicarbazone, light brown, m. 192° (decompn.)). By means of the Reimer-Tiemann reaction, there were prepd. 4-chloro-3-bromo-2-hydroxybenzaldehyde (II), m. 124° (phenylhydrazone, m. 204°; *p*-nitrophenylhydrazone, orange, m. 298° (decompn.)) 3-chloro-2-bromo-4-hydroxybenzaldehyde (III), m. 177°, very slightly volatile with steam (*p*-nitrophenylhydrazone, dark crimson, m. 253° (decompn.)); 3,4-dibromo-2-hydroxybenzaldehyde (IV), m. 129° (*p*-nitrophenylhydrazone, orange, decomp. above 220°); 2,3-dibromo-4-hydroxybenzaldehyde (V), m. 192°, very slightly volatile with steam (*p*-nitrophenylhydrazone, vermilion-red, m. 254° (decompn.)). Nitration of II gives the 5- NO_2 deriv., yellow, m. 137° (phenylhydrazone, bright yellow, m. 229° (decompn.)). The same NO_2 deriv. was obtained by bromination of 4,5,2-Cl(O₂N)(HO)C₆H₃CHO. 4-Chloro-5-bromo-2-hydroxybenzaldehyde, m. 125° (phenylhydrazone, m. 200°; *p*-nitrophenylhydrazone, light brown, m. 280° (decompn.)); 3- NO_2 deriv., pale yellow, m. 116° (Na salt, bright red; phenylhydrazone, orange, m. 241°). Nitration of 2,3,4-ClBr(HO)C₆H₃CHO gives the 5- NO_2 deriv., golden yellow, m. 140° (phenylhydrazone, very deep purple, m. 205° (decompn.)). Nitration of 4,2-Br(HO)C₆H₃CHO gives the 5- NO_2 deriv., very pale yellow, m. 128° (phenylhydrazone, orange, m. 189°; *p*-nitrophenylhydrazone, yellow, m. 301° (decompn.); semicarbazone, pale yellow, decomp. above 210°); 3,5-di- NO_2 deriv., m. 143° (phenylhydrazone, orange, m. 209° (decompn.); *p*-nitrophenylhydrazone, orange, m. 250° (decompn.); semicarbazone, light yellow, m. 224° (decompn.)). 2,4-Br(HO)C₆H₃CHO gives a 5- NO_2 deriv., pale yellow, m. 131° (Ag salt, orange-red; Cu salt, bright green; phenylhydrazone, purple, m. 181° (decompn.); *p*-nitrophenylhydrazone, orange, m. 265° (decompn.); semicarbazone, light orange, m. 267° (decompn.)); 3,5-di- NO_2 deriv., pale yellow, m. 110° (phenylhydrazone, dark purple, m. 186° (decompn.); *p*-nitrophenylhydrazone, brown, m. 248° (decompn.); semicarbazone, orange, m. 188° (decompn.)). Nitration of V gives the 5- NO_2 deriv., m. 155° (phenylhydrazone, deep purple, m. 204° (decompn.)); the same product was obtained by brominating the NO_2 deriv. Likewise, IV gives a 5- NO_2 deriv., pale

yellow, m. 114°. 4,5-Dibromo-2-hydroxybenzaldehyde, m. 132° (Ag salt, yellow; *p*-nitrophenylhydrazone, deep orange-brown, m. 266° (decompn.)); 3-NO₂ deriv., pale yellow, m. 118° (Ag salt, deep orange; phenylhydrazone, orange, m. 236° (decompn.)). 4,2-I(HO)C₆H₃CHO yields a 5-NO₂ deriv., golden yellow, m. 118° (Ag salt, yellow; phenylhydrazone, old gold, m. 177° (decompn.)); *p*-nitrophenylhydrazone, bright yellow, m. 297° (decompn.); semicarbazone, pale yellow, decompn. 230–40°; 3-Br deriv., pale yellow, m. 145°; 3,5-di-NO₂ deriv., brown, m. 160° (Ag salt, light orange; phenylhydrazone, brown, m. 229° (decompn.)); *p*-nitrophenylhydrazone, brownish orange, m. 257° (decompn.); semicarbazone, light brownish yellow, decompn. on heating). 5-Bromo-4-iodo-2-hydroxybenzaldehyde, very pale yellow, m. 117° (Ag salt, yellow; Na salt, golden; phenylhydrazone, pale yellow, m. 151°; *p*-nitrophenylhydrazone, orange, m. 266° (decompn.)); 3-NO₂ deriv., golden yellow, m. 153° (Ag salt, orange; phenylhydrazone, deep orange, m. 245° (decompn.)). 2,4-I(HO)C₆H₃CHO yields a 5-NO₂ deriv., m. 162° (Ag salt, orange; phenylhydrazone, very dark purple, m. 204° (decompn.); *p*-nitrophenylhydrazone, reddish brown, m. 273°; semicarbazone, light brown, m. 211° (decompn.)); 3,5-di-NO₂ deriv., yellow, m. 162° (Ag salt, canary-yellow; Cu salt, bright green; phenylhydrazone, deep brownish purple, m. 197° (decompn.); *p*-nitrophenylhydrazone, dark red, m. 240° (decompn.); semicarbazone, orange, m. 205° (decompn.)). 3-Bromo-2-iodo-4-hydroxybenzaldehyde, pale yellow, m. 204°.

C. J. WEST

Constituents of lichens. II. Constitution of barbatic acid. A. S. PFAU. *Helv. Chim. Acta* 11, 864–76(1928); cf. Stenhouse and Groves, *Ann.* 203, 285(1880); Hesse, *J. prakt. Chem.* 68, 1–71(1903).—Steam-distn. of the alc. ext. from 35 kg. of the lichen *Evernia prunastri* L. Ach., gives 2.5 g. of rhizonic acid (now shown to be 3,6,2,4-Me₂(HO)(MeO)C₆HCO₂H, m. 233–5° [Me ester (I), m. 95°; Et ester (II), m. 82°], obtained also by the hydrolysis of barbatic acid (annexed formula), m. 191°, with Ba(OH)₂



soln. The prolonged action of hot alc. on barbatic acid affords II. Methylation of Me β -orcinolcarboxylate (cf. *C. A.* 21, 1289) yields I together with Me 2,4-dimethoxy-3,6-dimethylbenzoate, b₁₀ 161–3° (free acid, m. 104.5°). Treatment of a mixt. of β -orcinol and HCONHPh with POCl₃ in abs. ether and decompn. of the resulting product with NaOH gives 2,4-dihydroxy-3,6-dimethylbenzaldehyde, m. 163–4° [oxime, m. 224.5°; semicarbazone, m. 285° (decompn.)], methylated to 2-hydroxy-4-methoxy-3,6-dimethylbenzaldehyde (III), m. 136° (cf. Sonn, *C. A.* 11, 2673) (oxime, m. 188–9°). When rhizonic acid is heated with Cu powder at 200° β -orcinol mono-Me ether, b₁₀ 135–8°, m. 67.5–8° (lit. 118–21°), is obtained. The action of HCONHPh and POCl₃ on this ether is to give III. Treatment of the O-Ac deriv. of III with Zn and BrCH₂CO₂Et in presence of benzene and subsequent hydrolysis of the product with alc. KOH gives 5,8-dimethylumbelliferone Me ether, m. 128–9°, thus demonstrating that in III the HO and CHO groups are in the *o*-position (cf. Sonn, *loc. cit.*). The isorhizonic acid from the lichen *Ramalina dilacerata* Hoffm. (Nakao, *C. A.* 17, 3184), and the rhizonic acids from *Evernia prunastri* and *Usnea ceratina* (Hesse, *loc. cit.*) are identical. [With A. OFNER.] β -Orcinol mono-Me ether undergoes the Gattermann reaction using Zn(CN)₂, yielding a mixt. of 94% of III and 6% of 4-hydroxy-2-methoxy-3,6-dimethylbenzaldehyde, m. 150–0.5°, while orcinol mono-Me ether gives evernaldehyde (26%), m. 64°, and isoevernaldehyde (74%), m. 194–5° (lit. 188°).

B. C. A.

Dimethylhydroresorcinol as a reagent for aldehydes and the assimilation of carbon. D. VORLÄNDER. *Z. angew. Chem.* 42, 46–7(1929).—Dimethylhydroresorcinol, which is also known as methon (I), is a reagent for aldehydes (cf. *C. A.* 20, 1385) which does not react with ketones in aq. or alc. solns. This reagent has been employed recently by several investigators in biochemistry who have found it useful and have given it various names, viz., Erdmann's reagent, Neuberg and Reinfurth's dimedon reagent (cf. Rosenthaler, *Der Nachweis organischer Verbindungen*, 2 Aufl, 1923, page 118; *C. A.* 14, 3257). Some investigators in biol. chemistry take a known chem. reaction and finding that it likewise can be employed in their work proceed to describe it as something original, giving it a new name which reflects credit to themselves. An objection is made to this practice. G. Klein (cf. *C. A.* 20, 2519) and co-workers have used I in the study of C assimilation and have concluded that HCHO is present as an intermediate in CO₂ assimilation. This may be a false conclusion since the HCHO may have come from the oxidation of I, which is known to form HCHO under oxidizing conditions.

N. A. LANGE

Occurrence of d - β -pinene. B. N. RUTOVSKII AND I. V. VINOGRADOVA. Staatlichen Chemopharm. Forschungsinst., Moskau. *J. prakt. Chem.* 120, 41-8(1928).—Full details are given of the examn. of the ethereal oil from *Ferula Badra-Kema* (*F. galbaniflua*), from which were isolated 30% of d - β -pinene, 40% of dl - α - and β -pinene, 1.5% of d -limonene, about 3% of an undefined alc. and 1% of a ketone. C. J. W.

Action of aromatic sulfonyl chlorides on tertiary bases. A. WAHL. *Rev. gén. mat. color* 32, 176-7(1928); cf. *Ber.* 35, 2768-74(1902); *Compt. rend.* 140, 248-50(1905); *C. A.* 22, 4112.—Toluene-*o*-, *p*- and probably *m*-sulfonyl chlorides react with PhNMe_3 , giving crystal violet in small yield, $(\text{Me}_2\text{NC}_6\text{H}_4)_2\text{CH}$, and probably 4'-dimethylamino-4-methyldiphenyl sulfone. Me violet is not produced (cf. *Ber.* 12, 1275-6; Michler and Meyer, *Ber.* 12, 1791-3(1880)). Similarly, PhNEt_3 and Ph_2NMe yield violet and blue dyes, resp. B. C. A.

Some mercury derivatives of halogen compounds of resorcinolsulfonephthalein. FITZGERALD DUNNING AND LARKIN H. FARINHOLT. Hynson, Wescott and Dunning *J. Am. Chem. Soc.* 51, 804-8(1929).—Chlorination of resorcinolsulfonephthalein (I) with chloramine-T gives 65% of the *di-Cl deriv.* Condensation of tetrachloro-, tetrabromo- and tetraiodo-*o*-sulfobenzoic anhydrides with *m*- $\text{C}_6\text{H}_4(\text{OH})_2$ gives *resorcinoltetrachloro-*, *tetrabromo-* (both in poor yields) and *tetraiodosulfonephthalein* (80% yield). Using known methods of mercururation, the *mono-* and *dihydroxymercuri derivs.* of these compds., and also of I and its *di-Br* and *di-I* derivs. were prepd. These show 2 color changes corresponding to the formation of the *mono-* and then the *di-Na* salts; they cannot be used as indicators, however, as they exhibit to a marked degree the phenomenon of dichromatism. A method for the analysis of Hg in the presence of I is included. C. J. WEST

Action of phthalyl chloride on *p*-cresol methyl ether and *p*-thiocresol methyl ether. RICHARD WEISS AND WALTER KNAPP. Univ. Wien. *Monatsh.* 50, 392-8(1928); cf. *C. A.* 22, 3651.—*p*- $\text{MeC}_6\text{H}_4\text{OMe}$ (24 g.) and 20 g. *o*- $\text{C}_6\text{H}_4(\text{COCl})_2$ in 80 cc. CS_2 , treated with 25 g. AlCl_3 and heated 3 hrs. at 40-50°, give 60% of *p*-cresolphthalein *di-Me ether* (I), light yellow, m. 170°; cold concd. H_2SO_4 colors it bluish green and on standing causes decompn. Reduction of I with 3% Na-Hg in boiling EtOH gives nearly quant. *p*-cresolphthalin *di-Me ether*, m. 213-4°, which is oxidized by KMnO_4 in dil. KOH to *anisic acid phthalin*, m. 317-20° (decompn.) (90% yield). The latter on standing 12 hrs. with 25 parts of concd. H_2SO_4 gives 30% of 2,2'-dimethoxy-9-phenylanthrone-5,5'-dicarboxylic acid, m. 340° (decompn.); the intermediate anthranol could not be isolated. *p*- $\text{MeC}_6\text{H}_4\text{SMe}$, *o*- $\text{C}_6\text{H}_4(\text{COCl})_2$, AlCl_3 and CS_2 give 55% of 2',7'-dimethyl-1-thiofluoran, m. 228-30°; concd. H_2SO_4 gives a red soln. with a marked light brown fluorescence, which is stable at 120° but decomps. at 150°; reduction with 3% Na-Hg in boiling EtOH gives nearly quant. 2',7'-dimethyl-1-thiohydrofluoranic acid, m. 192-5°, which, when dehydrated with P_2O_5 in C_6H_6 , gives 20% of 2,7-dimethyl-coerithione, gray, m. 188-90° (decompn.); the concd. H_2SO_4 soln. is red, changing to emerald-green on heating. C. J. WEST

Action of *o*-tolylmagnesium bromide upon the dilactone of benzophenone-*o*-dicarboxylic acid. RICHARD WEISS AND SZASSA R. KRATZ. Univ. Wien. *Monatsh.* 50, 429-35(1928).—Benzophenone-2,2'-dicarboxylic lactone in cold C_6H_6 , treated with *o*- $\text{MeC}_6\text{H}_4\text{MgBr}$ in Et_2O , gives nearly quant. 2'-*o*-tolylbenzophenone-2-carboxylic acid (I), m. 188-92°; if the reaction is carried out in boiling C_6H_6 , 2-toluphenon-2'-phthalide (II), m. 170-4°, is obtained nearly quant. Reduction of I with HI and red P gives 2-methylbenzohydrol-2'-phthalide, m. 145-7°. Oxidation of I with KMnO_4 in dil. KOH gives 50% of *o*-phenylene-*di-o*-phthaloylic acid dilactone (III), m. 280-2°, also obtained by oxidizing II with CrO_3 in AcOH . III and $\text{NH}_2\text{OH} \cdot \text{H}_2\text{O}$ give *o*-phenylene-4',4''-dihydroxydiphthalazine, m. 350°. Heating III and AlCl_3 at 200° for 3 hrs. gives 30% of anthraquinone-1-*o*-phthaloylic acid, blue. Reduction of III with HI and red P gives *o*-phenylenediphthalide, m. 198-200°, reduced by EtOH and Na to *o*-phenylenedi-*o*, ω -toluylic acid, m. 235-7°. C. J. WEST

Electrochemical oxidation of α -methylnaphthalene. FR. FIEHTER AND SAMUEL HERSZBEIN. *Helv. Chim. Acta* 11, 1264-7(1928).—Electrolytic oxidation of α -methylnaphthalene (I) in *N* H_2SO_4 at 20°, with 0.018 amp./cm.², gives 10.5% 1,1'-dimethyl-4,4'-dinaphthyl (II), m. 147°, 36.6% of a resin, and 38.7% I, while 14.2% is lost in strong oxidation. II and Br in CCl_4 give a *di-Br deriv.*, m. 243°. Nitration of II gives a mixt. of dinitro derivs., decomp. 125-30°. FREDERICK C. HAHN

α -Chloronaphthalene. III. Sulfonation. P. FERRERO AND C. BOLLIGER. *Helv. Chim. Acta* 11, 1144-51(1928).—F. and B. have studied the effect of various conditions in the monosulfonation of α - $\text{C}_{10}\text{H}_7\text{Cl}$ (I). The 1,4- (II), 1,5- (III), and 1,6-chloronaphthalenesulfonic (IV) acids were prepd. in pure form according to Sandmeyer's

reaction from naphthionic, Laurent's and Cleve's acids, resp. The acid chlorides, sulfonamides, sulfonanilides of II and III, and the corresponding dichloronaphthalenes obtained by treating II or III with PCl_5 , were prepd. and m. ps. detd., resp., as follows—(II) 94–5°, 185°, 145–6°, 65–6°; (III) 95–6°, 226°, 138°, 105–7°. Soly. of Na, K, Ca, Ba, Pb salts, resp., in 100 cc. water at 18°—(II) 1.79, 0.73, 0.19, 0.08, 0.28 g.; (III) 4.37, 3.12, 0.98, 0.64, 0.29; Na, K, Ca, Ba salts, resp., at 98°—(II) 40, 40, 0.84, 0.46; (III) 45, 45, 5.39, 4.33. Using the foregoing information in the sepn. and identification of the products, I has been sulfonated with concd. H_2SO_4 at various temps. At 56°, 78°, 98°, 70, 57 and 31%, resp., of II were obtained. At 140–50° it was not possible to isolate an acid by crystn. At 160° was obtained a mixt. of isomers in which IV was identified. III was not isolated in any case. Sulfonation of I with ClSO_3H gives II.

FREDERICK C. HAHN

Halogen derivatives of 2-hydroxynaphthalene not substituted in the 1-position. CHARLES MARSCHALK. Kuhlmann, Villers-St. Paul. *Bull. soc. chim.* 43, 1361–7 (1928).—During 1 hr. 100 g. of Br in HOAc was added to 100 g. of 1-nitroso- β -naphthol (I) in 300 cc. of CHCl_3 (cold). After filtering, washing with CHCl_3 and drying, the ppt was dissolved in 48 g. of NaOH in 5 l. of H_2O and repptd. with HCl to eliminate HBr. With agitation, this was suspended in 1250 cc. of H_2O , 200 g. of $\text{Na}_2\text{S}_2\text{O}_4$ added and in 40 mins. filtration gave a paste of 1-amino-3-bromo- β -naphthol (II). II was dild. with 1250 cc. of H_2O and a soln. contg. 51.2 g. of NaNO_2 and 74 g. of CuSO_4 added. Agitation for 1 hr. and heating for 10 mins. at 50° gave a suspension of 3-bromonaphthalene 1,2-diazoöxide, pure samples of which were obtained by crystn. from hot H_2O . To the suspension was added 150 g. of SnCl_2 in NaOH soln. which was then heated to 75–80° until N_2 evolution ceased. The ppt. which formed upon cooling was dried and recrystd. from ligroin by evapn., giving 41.5 g. of 3-bromo- β -naphthol, m. 84–5°. Slow addn. of 50 g. of SO_2Cl_2 to 50 g. of I in 200 g. of $\text{C}_2\text{H}_2\text{Cl}_4$ which was then held at 15–20° for 12 hrs. gave 49 g. of 3-chloro-1-nitroso- β -naphthol, m. 168° after recrystn. from HOAc. In a manner similar to the above, this was converted into the 3-chloro-1-amino deriv. and 3-chloronaphthalene 1,2-diazoöxide which gave 15.3 g. of 3-chloro- β -naphthol, m. 90°, by treatment with SnCl_2 . The same procedure when applied to the 3,4-di-Cl deriv. of I gave 1-amino-3,4-dichloro- β -naphthol, 3,4-dichloronaphthalene 1,2-diazoöxide and 3,4-dichloro- β -naphthol.

A. S. CARTER

Preparation of perylene. CHARLES MARSCHALK. Kuhlmann, Villers-St. Paul. *Bull. soc. chim.* 43, 1388–1402 (1928).—See patents (C. A. 19, 1284, 3272; 20, 3170; 21, 3204, 22, 4539). Distg. 35 g. of 1,1'-di-2-naphthol (I), 50 g. of ZnCl_2 , 60 g. powd. Zn and 17 cc. of H_2O gave perylene (II), m. 265°, after washing with 1% NaOH and crystg. from PhMe. Evapn. of the PhMe liquor gave dinaphthalene oxide, m. 154° after crystn. from HOAc. Using FeCl_3 or AlCl_3 instead of ZnCl_2 also gave II. With agitation, 150 g. of I and 160 g. of POCl_3 were heated at 95–100° under CO_2 or N_2 while 105 g. of powd. Zn was slowly added. Increasing the temp. to 200° until the reaction was complete, then distg. (500–600°) gave II. Studying the course of this reaction the intermediate 1,1'-di[2-naphthyl]chlorophosphate, $\text{C}_{10}\text{H}_6\text{O} \cdot \text{PO}_2\text{ClC}_{10}\text{H}_6$, was prepd. which when distd. gave 12% of II; distd. with powd. Zn it gave 16% of II; with ZnCl_2 , 24% of II; with ZnCl_2 and powd. Zn together, 36% of II. Using PCl_5 instead of POCl_3 , the corresponding chlorophosphorous ester resulted.

A. S. C.

Alkaline fusion of anthracenemonosulfonic acids. P. FERRERO AND A. CONZETTI. *Helv. Chim. Acta* 11, 1152–9 (1928).—F. and C. have studied the effect of various conditions on the alk. fusion of α - and β -anthracenesulfonic acids. The optimum conditions for conducting the fusion in an autoclave with the α -deriv. were 1 part KOH, 2 water, 230°, 7 hrs., or 1 part NaOH, 2 water, 240°, 10 hrs.; β -deriv., 3 parts KOH, 3 water, 270°, 4 hrs., or 3 parts NaOH, 3 water, 290°, 4.5 hrs. (yields 95–8%). As with corresponding naphthalenesulfonic acids, the β -deriv. is more stable toward alkali.

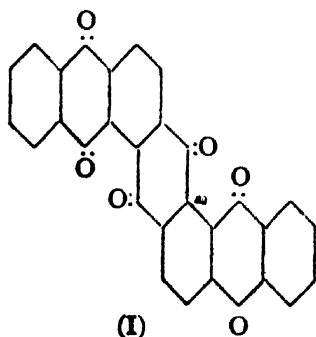
FREDERICK C. HAHN

Munjistin. I. PRAFULLA CHANDRA MITTER AND ASOKE KUMAR SEN. Univ. Coll. of Sci., Calcutta. *J. Indian Chem. Soc.* 5, 631–8 (1928).—M. and S. believe munjistin to be 1,3-dihydroxy-2-carboxyanthraquinone, an oxidation product of rubiadin (1,3-dihydroxy-2-methylantraquinone) (C. A. 22, 587, 2562; cf. Adams, C. A. 21, 3053) and not 1,3-dihydroxy-4-carboxyanthraquinone, the only other possible isomer. Compds. prepd. were: from *o*-cresol (50 g.) and phthalic acid (50 g.) with AlCl_3 , after crystn. from glacial AcOH, 34 g. of 3-methyl-4-hydroxybenzoyl-*o*-benzoic acid (I) (m. 223°) and 5 g. of 2-methyl-1-hydroxybenzoyl-*o*-benzoic acid, m. 196°, were obtained. I in concd. H_2SO_4 gave 1-methyl-2-hydroxyanthraquinone, m. 111–2°; Ac deriv., m. 125°. I on treatment with KOH and Me_2SO , gave 3-methyl-4-methoxy-

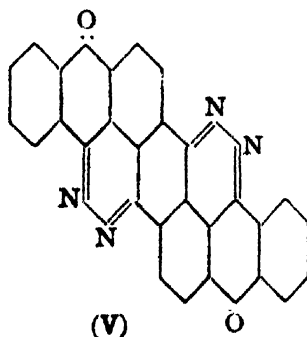
benzoyl-*o*-benzoic acid (II), m. 176°, which on treatment with concd. H_2SO_4 at 155° for 30 mins. gave 3-hydroxy-2-methylantraquinone (III), m. 299° (Ac deriv. m. 176°), and 3-methoxy-2-methylantraquinone, m. 184°. III on heating with Zn and H gave β -methylanthrane, m. 201°. III on heating with 50% KOH gave 3-methylalizarin (IV), m. 245-6°; Ac deriv. m. 262°. IV on oxidation with MnO_2 in H_2SO_4 gave 3-methylpurpurin, m. 234°, Ac deriv., m. 287°.

WALLACE R. BRODE

Indoquinonanthrene (*trans*-bisang- or 1,2,5,6-diphthalylantraquinone). ROLAND SCHOLL AND H. KURT MEYER. Techn. Hochschule, Dresden. *Ber.* 61B, 2550-5 (1928).—Isoviolanthrone in boiling AcOH with CrO_3 gives about 6% of *trans*-bisang- or 1,2,5,6-diphthalylantraquinone (I) for which, because of its indanthrene-like linking, is suggested the name *indoquinonanthrene*. It is very easily converted into a vat dye, even in cold Na_2CO_3 , by $\text{Na}_2\text{S}_2\text{O}_4$. The red vat contains a *hexahydro deriv.* (II) pptd. by acids which, both in the alk. vat and in free form, is converted in the air (in the free form also by heating, as by adding it to boiling $\text{C}_6\text{H}_5\text{Cl}_3$) into a dark *quinhydrone* (III) quite stable in the air and insol. in aq. alkalies; its compn. corresponds to a compd. consisting of 1 mol. each of I and II. The possibility (which cannot be entirely excluded by the anal. results) that it is not a quinhydrone but a dihydro deriv. of I is rendered remote by the insoly. of III in aq. alkalies and its stability in the air. I is especially well adapted to synthetical purposes by reason of the two 1,4-diketo groups which it contains. Thus, with $\text{N}_2\text{H}_4 \cdot \text{H}_2\text{O}$ in hot quinoline it gives at once a *hydro deriv.* (IV), quite stable in the air, of the *di-o-diazine* (V) into which IV is readily converted by all kinds of oxidizing agents. A similar condensation product has been obtained with MeNH_2 . I, light yellow, does not m. 345°, sublimes in CO_2 under 20 mm. at 380-400° (considerable decompn.) in orange-yellow needles, dissolves in about 150 parts boiling and 1500 parts cold PhNO_2 and about 10,000 parts boiling AcOH, easily in concd. H_2SO_4 with yellow color changing to red on long standing. II, light yellow ppt.; *O*-hexa-*p*-bromobenzoyl deriv. (85% from the $\text{NaOH-Na}_2\text{S}_2\text{O}_4$ vat of I with $\text{BrC}_6\text{H}_4\text{COCl}$ in Et_2O), yellow, relatively easily sol. in org. solvents with yellow color and strong green fluorescence, insol. in cold concd. H_2SO_4 , not saponified by boiling 10% NaOH but converted by hot alc. KOH into a blue substance. III, blue-black crystals, blue-green in transmitted light, sol. in hot PhNO_2 with green color rapidly changing to the yellow of I. IV, dark blue needles; the olive-brown soln. in concd. H_2SO_4 changes after some time (rapidly on heating) to red and on addn. of H_2O yields V, red-brown, sublimes in CO_2 under 20 mm. at 460-80° (for the most part with carbonization) in red needles, practically insol. in org. solvents; the yellowish red soln. in concd. H_2SO_4 shows red fluorescence in concd. H_2SO_4 ; it is at once converted into IV by alk. $\text{Na}_2\text{S}_2\text{O}_4$. (The microanalyses were made by MAX BOETIUS.)



(I)



(V)

C. A. R.
FRANK WHITMORE AND

Mercuration

F. L.

Hg salt

off CO_2 and gives annyaro-1-nyaroxymercurianintraquinone-2-carboxylic acid, yellow, decompn. on heating above 300°, whose constitution was established by the prepn. of $2\text{-C}_6\text{H}_4(\text{CO})_2\text{C}_6\text{H}_4\text{CO}_2\text{H}$ by heating with acid. Replacement of the Hg in I by heating with KI and I in H_2O at 70° gives $1,2\text{-C}_6\text{H}_4(\text{CO})_2\text{C}_6\text{H}_4\text{ICO}_2\text{H}$, while Br in NaBr gives 1-bromoanthraquinone-2-carboxylic acid, yellow, m. 267-8°. Heating I with NaOH soln. and then making acid with HCl gives the 1-chloromercuri deriv., light yellow. A new method is described for the prepn. of $2,3\text{-C}_6\text{H}_4(\text{CO})_2\text{C}_6\text{H}_4(\text{CO}_2\text{H})_2$ whose *Hg* salt, light yellow, on heating to 210-5° evolves CO_2 , giving anhydro-3-hydroxy-mercurianintraquinone-2-carboxylic acid, bright yellow. Treated as I, there results

3-iodoanthraquinone-2-carboxylic acid, bright yellow, m. 289–90°, and the *3-chloro-mercuri deriv.*, light yellow.

C. J. WEST

Benzanthrone from phenanthrene. J. S. TURSKI AND R. PRAGIEROWA. Warsaw Polytech. *Przemysl Chem.* 13, 33–5(1929).—About 58% of benzanthrone was obtained by the condensation of *phenanthraquinone* in 70 parts of 70% H_2SO_4 as the medium with 10 parts of anhyd. $FeSO_4$ maintaining the glycerol relation used in prepg. benzanthrone from anthraquinone. The reaction proceeds in 2 stages, one at 100°, and the other at 150–5°. For good yields the temp. should not be raised too rapidly to 150°. The product was pptd. with H_2O and recrystd. whereupon it showed color reactions identical with those of benzanthrone obtained from anthraquinone. Elementary analysis, b.-p. detns., and spectrum analyses further established its identity. Benzanthrone by condensation of phenanthrene with glycerol and acrolein in H_2SO_4 was obtained only in traces sufficient for identification.

A. C. ZACHLIN

Some derivatives of 3,4-phenanthrenequinone. LOUIS F. FIESER. Bryn Mawr College. *J. Am. Chem. Soc.* 51, 940–52(1929).—Details are given of the prepn. of, 4-amino-3-phenanthrol and its HCl salt; its oxidation is best accomplished by adding aq. ClO_2 to a suspension of the salt in glacial AcOH, giving 87% of 3,4-phenanthrenequinone (I), brilliant red, m. 133° (decompn.); I in concd. H_2SO_4 gives a Prussian-blue color, changing in a few min. to a clear, chrome-green. I is reduced by SO_2 or $NaHSO_3$ to morphol, while Zn, AcONa and Ac_2O give the di-Ac deriv. I dissolves in satd. $NaHSO_3$ and after time has been allowed for the rearrangement, 3,4-dihydroxyphenanthrene-1-sulfonic acid (II) is isolated as the NH_4 salt, dark red plates, very hygroscopic, or the *p-toluidine* salt, decomp. 182°. Heating the NH_4 salt of II and *p-MeC₆H₄NH₂* a short time gives 1-[*p-toluidino*]-3,4-phenanthrenequinone, dark red, decomp. 260°; reductive acetylation gives 1-[*p-toluidino*]-3,4-diacetoxyphenanthrene, m. 208°. Oxidation of II, which need not be isolated, with air, or better, H_2O_2 , in alk. soln. gives 3-hydroxy-1,4-phenanthrenequinone (III), orange-yellow, m. 230° (decompn.); the NH_4 salt of II and MeOH with concd. H_2SO_4 give the *Me ether*, light yellow, m. 170°, reductively acetylated to 3-methoxy-1,4-diacetoxyphenanthrene, m. 168.5. The Ag salt of III, dark red, with $CH_2:CHCH_2Br$ gives 1-allyloxy-3,4-phenanthrenequinone, brilliant orange, m. 161° (63%), and 2-allyl-3-hydroxy-1,4-phenanthrenequinone, orange, m. 155° (17%); with concd. H_2SO_4 there results 1-methyl-5,6-[1,2-naphtho]-3,4-quinone, brilliant red, m. 198–9°. Boiling III with dil. alkali for about 4 hrs. gives 82% of 2-aceto-1-naphthylglyoxylic acid (IV), m. 196° (evolution of CO_2); *Me ester*, m. 181°. Oxidation of IV in alk. soln. gives 1,2- $C_{10}H_6(CO_2H)_2$, while in acid solution there results 1,2-naphthindandione, m. 174–5°. IV and $PhNH_2$ give 2-aceto-1-naphthalaniline, yellow, m. 202°, whose concd. H_2SO_4 soln. has an intense green-yellow fluorescence.

C. J. WEST

γ -Pyrrolidino- and γ -pyrrolinopropyl benzoates. LESLIE H. ANDREWS AND S. M. McELVAIN. Univ. of Wisconsin. *J. Am. Chem. Soc.* 51, 887–92(1929).—Pyrrole, twice distd. over Na, is catalytically reduced (Pt oxide-Pt black), giving 63% of pyrrolidine (I). Details are also given of the reduction with Zn and 20% HCl, which gives 56% of pyrrolidine (II). Methylpyrroles and α -carbethoxypyrrole could not be similarly reduced. I (20 g.) and 28 g. $ClCH_2CH_2CH_2CO_2Ph$, heated on the steam bath for 15 hrs., give 14 g. γ -pyrrolidinopropyl benzoate HCl (III), m. 125–6°. Similarly, 10 g. II and 14 g. $ClCH_2CH_2CH_2CO_2Ph$ give 3.5 g. γ -pyrrolinopropyl benzoate-HCl (IV), m. 136–8°. III is a much more efficient anesthetic than γ -piperidinopropyl benzoate HCl. The presence of the double bond in IV greatly reduces its anesthetic activity.

C. J. WEST

A theory of color on the basis of molecular strain. VI. Effect of sulfur on color. AMARENDRA NATH DEY AND SIKHIBHUSAN DUTT. Allahabad Univ. *J. Indian Chem. Soc.* 5, 639–41 (1928); cf. *C. A.* 22, 3891.—Substitution of S for C in dyes obtained by the condensation of glutaric acid with phenols or anilines causes a deepening of the color. Ninety-five g. $ClCH_2CO_2H$ is added slowly to 145 g. Na_2CO_3 in a min. amt. of water. Forty-five g. NaOH is dissolved in 100 cc. H_2O , 50 cc. of which is satd. with H_2S and all of the NaOH soln. is added with stirring to the $ClCH_2CO_2H$ sol. After 3 hrs. 100 g. concd. H_2SO_4 is added and the hot soln. filtered. Thiodiglycolic acid seps. out on cooling and after recrystn. from H_2O , m. 129°. Resorcinol, phloroglucinol, phenol, *m*- $Et_2NC_6H_4OH$ and *m*- $C_6H_4(NH_2)_2$ were condensed with $S(CH_2CO_2H)_2$ to form the corresponding thiodiglycoleins.

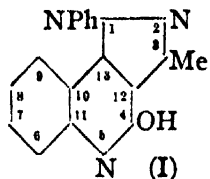
WALLACE R. BRODS

Oxidation. II. Action of ferric chloride and hydrogen peroxide on symmetrical and unsymmetrical disubstituted thiocarbamides and synthesis of thiodiazoles. FARINIKANTA CHAKRABARTI AND SATISH CHANDRA DE. Dacca Univ. *J. Indian Chem. Soc.* 5, 661–4(1928); cf. *C. A.* 22, 4123.—By the action of H_2O_2 on sym. or unsym.

diarylthiocarbamides in warm or hot EtOH the following 1,3,4-thiodiazoles were prepd.: 2,5-di-phenylimido-3,4-diphenyl, m. 228–30°; 2,5-di-*p*-tolylimido-3,4-di-*p*-tolyl, m. 261°; 2,5-di-*o*-tolylimido-3,4-di-*o*-tolyl, m. 249°; 2,5-di-*m*-xylylimino-3,4-di-*m*-xylyl, m. 247°; 2,5-di- α -naphthylimino-3,4-di- α -naphthyl, m. 285°; 2,5-di- β -naphthylimino-3,4-di- β -naphthyl, m. 288°; 2,5-di[phenylmethylamino], m. 94°; 2,5-di[phenylethylamino], m. 107–9°; 2,5-di[diphenylamino], m. 155°. The action of FeCl₃ on diarylthiocarbamides did not result in the formation of thiodiazoles.

LOUISE KELLEY

Condensation of *o*-aminobenzaldehyde with 1-phenyl-3-methyl-5-pyrazolone and with 1-*o*-chlorophenyl-3-methyl-5-pyrazolone. A. MUSIEROWSKI, S. NIEMENTOWSKI AND Z. TOMASIK. *Roczniki Chem.* 8, 325–44(1928).—Fusion in equimol. quantities at 140° of *o*-H₂NC₆H₄CHO with 1-phenyl-3-methyl-5-pyrazolone produces the phenyl hydrazone of 2-hydroxy-3-quinolyl Me ketone, m. 236°, which when heated with BzH yields 2-hydroxy-3-quinolyl styryl ketone, m. 269°. Among the prod-



ucts of the original condensation (carried out at 265°) is 4-hydroxy-1-phenyl-3-methylquinpyrazole (I), m. 273° (HCl salt, m. 273°; methiodide, m. 273°), together with 2'-hydroxy-2,3'-diquinolyl, m. 313° [nitrate, m. 325°; sulfate, m. 299°; HCl salt, m. 256° (decompn.); methiodide, m. 295°]. Fusion at 150° with 1-*o*-chlorophenyl-3-methyl-5-pyrazolone yields the *o*-chlorophenylhydrazone of 2,4-dihydroxy-3,4-dihydro-3-quinolyl Me ketone, m. 280° (*O*-Ac deriv., m. 262°; *N*-Ac deriv., m. 236°; monobromide, m. 230°; dibromide, m. 236°; monobromide, m. 230°; dibromide, m. 208°), and 4-hydroxy-1-*o*-chlorophenyl-3-methylquinpyrazole, m. 281°.

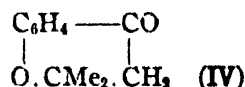
B. C. A.

Remarks on the work of W. König: "A simplified process for obtaining substituted μ -methylbenzothiazoles and their transformation into new heterocyclopoly-methine dyestuffs." (Preliminary communication.) ROBERT SCHULOFF, RUDOLF POLLAK AND EUGEN RIESZ (with MARTIN HOPMAYER). *Bundeslehr- u. Versuchsanstalt f. chem. Industrie, Wien. Ber.* 61B, 2538–41(1928).—The authors report some of the results of an unfinished investigation covering in part the same field as König's work (*C. A.* 23, 389). The object of this investigation is the condensation not only of thiazolium but also of quinolinium and other cyclammonium compds. with different substituted aldehydes to det. the influence of substituents on the photodynamic effect and other properties, especially the dyestuff character, of the resulting products. Among the aldehydes already studied are PhCH:CHCHO, *o*- and *p*-MeOC₆H₄CHO, *o*-HOC₆H₄CHO and *m*-O₂NC₆H₄CHO. In this paper are given only the results touching directly on K.'s work. Of benzothiazoles with reactive Me groups were used 5-chloro-2-methyl- (I), 6-chloro-2,4-dimethyl- (II) and 6-ethoxy-2-methylbenzothiazole (III). I, described by K. as being new, had been prepd. by Gebauer-Fulnegg and Riesz (*C. A.* 21, 905) and the reductive acetylation of [4,2-Cl(O₂N)C₆H₄]₂S₂ employed by K. was recently described by Pollak, Riesz and Kahane (*C. A.* 22, 3658). For the present work I, II and III were prepd., with very satisfactory yields, from aromatic *o*-amino Zn mercaptides and AcCl or AcOH-P chlorides. In general, not only the alkyl halides but also the alkyl sulfates and toluenesulfonates of the thiazoles were used for the condensations. Diminishing the basicity of the thiazolium compds. by the introduction of acid substituents (*e. g.*, Cl) renders more difficult the condensation with aldehydes, especially if they also contain acid substituents (HO, MeO, etc.); on the other hand, strongly basic aldehydes, like *p*-Me₂NC₆H₄CHO, facilitate the condensation. I, m. 68° (as found before although given by mistake as 78° in the earlier paper); *di*-Me sulfate, m. 217°, gives with *p*-Me₂NC₆H₄CHO in MeOH and piperidine a blue-violet cryst. polymethine dye, m. 245°. III, m. 56°; ethiodide, m. 156°; amiodide, m. 232°. Polymethine dye from the ethiodide with anisaldehyde, faintly reddish yellow, m. 231°; with *o*-methoxybenzaldehyde, reddish yellow, m. 231–2°; with *p*-dimethylaminobenzaldehyde, red-violet, m. 257°; with cinnamaldehyde, reddish, m. 219–20°; with *m*-nitrobenzaldehyde, yellowish, m. 211°.

C. A. R.

The supposed *o*-(β , β -dimethylacroyl)phenol of S. Skraup. K. v. AUWERS AND W. MAUSS. *Marburg, Chem. Inst. Ber.* 61B, 2545–9(1928).—The sample of the compd. in question (I) supplied by Skraup (*cf. C. A.* 23, 96) was compared with *o*-[β , β -dimethylacroyl]-*p*-cresol (II). While II is vigorously attacked by KMnO₄, at once absorbs 1 mol. Br₂ in CS₂ without evolving a trace of HBr, gives with FeCl₃ a dirty green color and dissolves in NaOH with yellow color but at once begins to change into 2,2,6-trimethylchromanone, I is stable toward cold KMnO₄, adds no Br, gives no color with FeCl₃ and is neither sol. in nor acted upon by NaOH. These properties exclude the structure of an unsatd. ketone for I. Presumably a compd. of the structure ascribed by S. to I is formed as an intermediate product in his reaction (super-

heating of $\text{Me}_2\text{C}:\text{CHCO}_2\text{Ph}$) but at once rearranges. The investigations in v. A.'s lab indicate that such a compd. might rearrange into a coumaranone (III), chromanone (IV) or hydroxyhydrindone. I, from its properties, cannot be a hydroxyhydrindone. IV seemed the more probable formula and it became a question of proving the presence in I of a CH_2 next to the $\text{C}:\text{O}$ group. Chromanones in general condense with aldehydes but it was feared that the adjacent *gem*- Me_2 group would prevent such a condensation and as a matter of fact the homologous 2,2,3-trimethylchromanone (V) could not be made to condense with BzH . I was therefore treated in cold CS_2 with Br ; like V, it did not at first take up the Br but after some time there was a vigorous evolution of HBr and 2 mols. Br_2 were consumed; as the Br enters the hetero-ring exclusively, the presence of a CH_2 group is proved and the 2,2-dimethyl-4-chromanone structure (IV) of I is established. This is further confirmed by the formation of a normal monohydrazone with excess of hot $p\text{-O}_2\text{NC}_6\text{H}_4\text{NHNH}_2\cdot\text{HCl}$ and by the greenish yellow color of dil. and golden yellow color of more concd. solns. of I in concd. H_2SO_4 . The formation of $o\text{-HOC}_6\text{H}_4\text{COMe}$ from I with boiling alc. KOH is no proof of the structure assigned by S. to I, for 2,2,6-triphenylchromanone yields 5,2- $\text{Me}(\text{HO})\text{C}_6\text{H}_3\text{COMe}$ under the same conditions. Attempts to synthesize I failed because of the too great lability of the Br in the necessary $\text{Me}_2\text{CBrCH}_2\text{CO}_2\text{H}$ or its derivs., resulting in elimination of HBr instead of reaction in the desired direction. 2,2-Dimethyl-3,3-dibromo-4-chromanone, from I and 2 mols. Br_2 in CS_2 at room temp., m. $95\text{--}6^\circ$. *p*-Nitrophenyl-*hydr* of I, yellow-red, m. $193\text{--}4^\circ$. *Et* β -bromoisovalerate (45% from the acid) d to stand 6 hrs. in EtOH satd. cold with HBr , or 8 g. from the chloride (from 1 g. of the acid) in 2 mols. EtOH , b_{16} $78\text{--}80^\circ$.



C. A. R.

Hydroxy derivatives of thioxanthone dioxide. WM. B. PRICE AND SAMUEL SMILES. Kluwer's Coll., London. *J. Chem. Soc.* 1928, 3154-60.—Equiv. quantities of quinone and 2-sulfonobenzoic acid (I) with 100 cc. of H_2O per 2 g. of reagents gave 2,5-dihydroxy-2'-carboxydiphenyl sulfone (II), m. 235° (*di-Ac* deriv., m. 188°), which was treated with 5 mols. of Me_2SO_4 in 6 mols. of NaOH , giving almost 100% of 2,5-dimethoxy-2'-carboxymethoxydiphenyl sulfone (III), $\text{MeO}_2\text{CC}_6\text{H}_4\text{SO}_2\text{C}_6\text{H}_3(\text{OMe})_2$, m. 195° , which hydrolyzed to yield the free 2'-carboxy deriv., m. 223° . In a similar manner *p*-toluquinone gave the *Me* deriv. of II, m. 203° ; chloroquinone gave the *Cl* deriv., m. 210° ; and quinizarin in HOAc gave 2-carboxyphenyl-2'-quinizarin sulfone, m. 263° . These compds may also be prepd. by H_2O_2 oxidation of sulfides, but this sometimes fails (cf. A 23, 827), thus 2,4-dihydroxy-2'-carboxydiphenyl sulfide gave the sulfoxide, m. 204° . Heating II at 100° in H_2SO_4 gave 1,4-dihydroxythioxanthone dioxide (IV), $\text{C}_6\text{H}_4(\text{O} \text{ --- } \text{SO}_2 \text{ --- } \text{C}_6\text{H}_4 \text{ CO})$, m. 224° (*di-Ac* deriv., m. 174°); the other sulfones gave

the corresponding derivs.: *Me*, m. 175° ; *Cl*, m. 230° . A paste of IV was ground with 2 parts of $\text{Ph}(\text{OAc})_4$ and after 4 days gave thioxanthone dioxide 1,4-quinone, m. 185° . III by similar treatment gave the *di-MeO* deriv. of IV, m. 193° . Phenol was heated in H_2SO_4 with the dichloride of I, giving 2-hydroxythioxanthone (V) which was oxidized to the sulfone, m. 259° , by H_2O_2 in HOAc at 100° ; this was methylated to 2-methoxythioxanthone dioxide (VI), m. 204° . In the same manner, pyrocatechol gave the *di-HO* deriv., the sulfone (m. 203°) and the 2,3-*di-MeO* deriv. (m. 241°) corresponding to V and VI. From naphthoquinone and I, by an abnormal reaction, was prepd. 1,2-naphthoquinone-2'-carboxyphenyl sulfoxide, $\text{C}_{10}\text{H}_6\text{O}_2\cdot\text{SO}\cdot\text{C}_6\text{H}_4\text{CO}_2\text{H}$, m. 236° (phenylhydrazone, m. 251° ; quinoxaline deriv., m. $292\text{--}3^\circ$). An Ac_2O soln. of 1 g. of this naphthoquinone sulfoxide and 5 g. of NaOAc was boiled for 3 hrs., giving 3,4-naphthothioxanthone 1,2-quinone, $\text{S}\cdot\text{C}_6\text{H}_4\cdot\text{CO}\cdot\text{C}_{10}\text{H}_4\text{O}_2$, m. $244\text{--}5^\circ$. This abnormal

condensation is unexplained.

A. S. CARTER

Bromination of pyridine. S. MARY ELIZABETH ENGLERT AND S. M. McELVAIN. Univ. of Wis. *J. Am. Chem. Soc.* 51, 863-6(1929).— $\text{C}_5\text{H}_5\text{N}\cdot\text{HBr}$ (160 g.) in 240 g. glacial AcOH at $60\text{--}5^\circ$, treated with 160 g. Br in 160 g. AcOH , gives 300-10 g. of perbromide, $\text{C}_5\text{H}_5\text{N}\cdot\text{HBr}\cdot\text{Br}_2$ (47% perbromide Br), orange-red, m. $132\text{--}4^\circ$. With 80 g. Br there results a perbromide with 39.7% perbromide Br , m. $101\text{--}3^\circ$ (av. yield, 205 g.). Heating the latter at $230\text{--}50^\circ$, there results about 36-38% 3- Br and 30-6% of the 3,5- Br_2 deriv. of $\text{C}_5\text{H}_5\text{N}$. Under similar conditions the higher perbromide yields 40% of the *di Br* deriv. but no 3- Br deriv.; if 1 mol. of this perbromide and 2 mols. $\text{C}_5\text{H}_5\text{N}$.

HBr are heated together there results 10% of the 3-Br and 30% of the 3,5-Br₂ derivs.
C. J. WEST

The quaternary pyridine bases. O. YU. MAGIDSON AND G. P. MEN'SHIKOV. *Trans. Sci. Chem.-Pharm. Inst. (Moscow)* 1926, No. 16, 7-22.—The authors prepd the methiodide, ethiodide, allyl iodide, benzyl chloride, propyl iodide and isoamyl iodide of pyridine, tested the elec. cond., dissocn. consts. and the physiol. effects on frog as apparent from an induced paralysis. The strongest effect was found in the benzyl chloride (25 times weaker than curare); the methiodide and amyl iodide were also strong in their paralyzing power (100 times weaker than curare). The least effective were the ethiodide and allyl iodide. The prepn. which show strong paralyzing effects show a low cond. and low dissocn. const.
J. S. JOFFE

Pentadecoyllutidine and pentadecoyllupetidine, a higher homolog of coniine. S. GOTTFRIED AND F. ULZER. *Wiss. Mitt. Oesterr. Heilmittelstelle* 1926, No. 1, 1-3, No. 2, 1-4; 1927, No. 3, 1-3, No. 4, 1-4.—A mixt. of monomeric and trimeric palmitaldehyde, b_s 170-2°, b₁₀₀ 240-1° (corr.), m. 57.5-8.5°, was obtained from Ba palmitate, formate, and carbonate; treatment with NH₂OH in 80% alc. yields palmitaldoxime, m. 87.5-8, and leaves the trimeric aldehyde, m. 72.5°. The monomeric aldehyde m. 33.5-4° (confirming Le Sueur's observation). The mixt., m. 58°, cannot be depolymerized by simple distn.; it was heated at 150°, 1-2 mg. of ZnCl₂ was added and the mixt was rapidly distd. in a vacuum. When heated with AcOEt and alc. NH₃, the monomeric aldehyde affords *Et 4-pentadecoyl-2,6-dimethyl-1,4-dihydropyridine-3,5-dicarboxylate*, m. 50.5-1°. The crude product is treated with N₂O₃, followed by treatment with HCl and then NaOH, yielding *Et 4-pentadecoyl-2,6-dimethylpyridine-3,5-dicarboxylate*, b₁₀ 267-9° (*HCl salt*, m. 88-9°; *chloroplatinate*, m. 119-20.5°). The free acid m. 61° [*HCl salt*, m. 123-4° (decompn.); Pb, Ag and Cu salts]. Distn. of the HCl salt with soda-lime affords pentadecoyllutidine [*4-pentadecoyl-2,6-dimethylpyridine*], b₁₀ 240-2° (*HCl salt*, m. 78-9°; *chloroplatinate*, m. 107-8°; *picrate*, m. 71°), which with Na and alc. gives pentadecoyllupetidine [*4-pentadecoyl-2,6-dimethylpiperidine*], an oil [*HCl salt*, m. 126° (decompn.); *chloroplatinate*, m. 145.5-6.5°].
B. C. A

Local anesthetics derived from 2-(β-hydroxyethyl)piperidine. C. S. MARVEL AND R. S. SHELTON. Univ. of Illinois. *J. Am. Chem. Soc.* 51, 915-7 (1929).—With MeI, EtBr or PrBr, the following *N-alkyl derivs.* of 2-[β-hydroxyethyl]piperidine were prepd.: Me, b₂₅₋₄₀ 175-8°, d₄²⁰ 0.9840, n_D²⁰ 1.4872; Et, b₂₇₋₂₈ 136, d₄²⁰ 0.9739, n_D²⁰ 1.4885; Pr, b₂₇ 139-41°, d₄²⁰ 0.9657, n_D²⁰ 1.4905. With *p*-O₂NC₆H₄COCl, the corresponding *p-nitrobenzoate HCl salts* were prepd. in 55-60% yields: Me, m. 181-2°; Et, m. 198.9°, Pr, m. 124-6°. Catalytic reduction gives the corresponding *p-aminobenzoate HCl salts*: Me, could not be crystd.; Et, m. 238.6-9°; Pr, m. 175-6°. With 1% solns of the 2 HCl salts, the following pharmacol. data were obtained: Av. onset, min., 3 and 2.25-2.5; av. duration of anesthesia, min., 15-20, 35-40; M. F. D., mg per kg. of body wt., not detd., 14-15.
C. J. WEST

Piperidine derivatives. VII. 1-Alkyl-4-piperidyl benzoates and *p*-aminobenzoates. N. W. BOLDYARD AND S. M. McELVAIN. Univ. of Wisconsin. *J. Am. Chem. Soc.* 51, 922-8 (1929); cf. C. A. 20, 3010; 23, 601.—1-Alkyl-3-carbethoxy-4-piperidone HCl salts were heated with 20% HCl, which causes hydrolysis and decarboxylation, giving the following *1-alkyl-4-piperidone HCl salts*: Me, m. 94-5° (all m. ps. cor.), 84% yield; Et, m. 105-6°, 70%; Pr, m. 117-8°, 70%; Bu, m. 178-80°, 70%; *iso-Am*, m. 183-5°, 70%; *phenylethyl*, m. 182-4°, 92%. These compds. were then catalytically reduced and heated with BzCl, giving the following *1-alkyl-4-piperidyl benzoate HCl salts*: Me, m. 219-20°, 64% yield; Et, m. 204-5°, 74%; Pr, m. 210-1°, 83%; Bu, m. 223-4°, 73%; *iso-Am*, m. 199-200°, 50%; *phenylethyl*, m. 236-8°, 82%. The corresponding *p-nitrobenzoates* were also prepd.: Me, m. 197-9°, 40%; Et, m. 204-6°, 53%; Pr, m. 219-20°, 48%; Bu, m. 242-3°, 48%; *iso-Am*, m. 243-5°, 52%; *phenylethyl*, m. 242-4°, 55%. Catalytic reduction of these gives the corresponding *p-aminobenzoates*: Me, m. 231-3°, 73%; Et, m. 183-4°, 83%; Pr, m. 201-3°, 94%; Bu, m. 234-6°, 82%; *iso-Am*, m. 233-5°, 94%; *phenylethyl*, m. 238-40°, 88%. Complete pharmacol. data are given for the 2 series of compds. These members of these series are local anesthetics and show the same relationship between the size of the alkyl group and pharmacol. action of the compd. as was found to exist in the 1-alkyl-3-carbethoxy-4-piperidyl benzoates and *p*-aminobenzoates. *Phenylethyl-4 piperidyl benzoate* is a very potent local anesthetic, possessing about 7 times the anesthetic power of cocaine and considerably less toxicity. The relationship between physiol. action and certain types of structure is discussed.
C. J. WEST

The catechol problem. M. NIERENSTEIN. *Chem. Age (London)* 19, 291 (1928).—

A criticism of Mason's article (cf. *C. A.* 23, 1403). The constitution of cyanidin is regarded as being *sub judice*. B. C. A.

The catechol problem. R. ROBINSON. *Chem. Age* (London) 19, 337(1928).—A reply to Nierenstein (preceding abstr.). In view of the 2 recorded syntheses (Willstätter; Robinson) of cyanidin, the constitution of the latter substance is satisfactorily established. B. C. A.

Carbocyanine dyes with substituents attached to the three-carbon chain. FRANCES MARY HAMER. *J. Chem. Soc.* 1928, 3160-3.—An unsuccessful attempt was made to prep. a carbocyanine dye possessing the chain ($:\text{CH}:\text{CMe}:\text{CH}:$), by the interaction of quaternary salts contg. active Me groups with $\text{MeC}(\text{OEt})_3$. This reaction did work, however, in the prepn. of thiocarbocyanines. By condensing 1-methylbenzothiazole alkyl halides with $\text{MeC}(\text{OEt})_3$ in the presence of pyridine 3 new dyes were obtained, all of them being powerful photographic sensitizers. 8-Methyl-2,2'-diethylthiocarbocyanine iodide, m. 290° (decomps. 280°), has a strong absorption band at 5400 A. U. and a weaker band at 5100 A. U. 2,2,8-Trimethylthiocarbocyanine iodide, m. 298° (decompn.), has the principal absorption max. at 5400 A. U. in alc. 8-Methyl-2,2-diallylthiocarbocyanine bromide, m. 260° (decompn.), has an absorption band at 5450 A. U. (cf. *C. A.* 22, 784). WALLACE R. BRODE

The preparation of 5- and 8-aminoquinolines. R. P. DIKSHOORN. Leiden Univ. *Rec. trav. chim.* 48, 147-54(1929).—When quinoline is nitrated with a mixt. of HNO_3 and fuming H_2SO_4 at a low temp. the main product is a mixt. of 5- and 8-nitroquinolines which can be sepd. into its components quite easily, since the nitrate of 5-nitroquinoline is only slightly sol. in dil. HNO_3 , while the nitrate of the 8-nitro deriv. is readily sol. (cf. *J. Chem. Soc.* 61, 783(1892)). The reduction of these nitro compds. has been carried out by several investigators with various reducing agents, but as the results are not in agreement with one another, the subject was investigated anew and it was found that in every case the presence of HCl is to be avoided. On carrying out the reduction with SnCl_2 and HCl according to Meigen (*C. A.* 2, 2558), satisfactory results were obtained with 5-nitroquinoline, the m. p. of 5-aminoquinoline being found at $105-6^\circ$, instead of 110° , as given in the literature. With 8-nitroquinoline, however, was obtained a mixt. of two chloroaminoquinolines, namely, 5-chloro-8-aminoquinoline, m. $70-2^\circ$, and an isomer, m. 85° , to which D. has given the formula of 3-chloro-8-aminoquinoline, since the m. p. does not agree with the m. ps. of 5-, 6- or 7-chloro-8-aminoquinolines given in the literature. With 8-nitroquinoline the reduction thus proceeds in the same way as with various benzene derivs., the chloro-amino compds. being formed from the chloroamines, which are formed as an intermediate product by the interaction of the hydroxyamino compd., formed in the 1st step of the reduction, and the HCl (cf. *Rec. trav. chim.* 25, 365(1906)). Both the chloroaminoquinolines, mentioned above, could be sepd. by means of a distn. with steam. From both 5- and 8-nitroquinoline the amino compd. could be obtained by reduction of 20 g. of the nitro compd. in 200 cc. warm 50% AcOH with 16 g. of Fe powder, the aminoquinolines being obtained with yields of 58% and 75%, resp., and the 8-amino quinoline showing the m. p. 65° . C. F. VAN DUIN

Derivatives of 5-aminoquinoline. R. P. DIKSHOORN. Leiden Univ. *Rec. trav. chim.* 48, 237-46(1929); cf. preceding abstr.—According to the investigations of Kniphorst (*C. A.* 20, 586) and Lorang (*C. A.* 22, 230) α -aryl- β -ethylureas are readily nitrated. The PhNHCONH^t easily affords 2,4-(O_2N) $_2$ $\text{C}_6\text{H}_3\text{NHCON}(\text{NO}_2)\text{Et}$ which is easily decompd. by water, giving 2,4-(O_2N) $_2$ $\text{C}_6\text{H}_3\text{NH}_2$, CO_2 and EtNHNO_2 . In the present paper the prepn. and nitration of several *N*-substituted derivs. of 5-aminoquinoline are described. 1. α -5-Quinolyl- β -ethylurea (I), prepd. on heating 5-aminoquinoline (7 g.), EtNCO (5 cc.) and 200 cc. ether in a sealed flask at 100° during 6 hrs. (yield 7 g.), m. $219-20^\circ$; soon after the substance has melted it solidifies, sublimes 260° and m. again at 306° , probably *sym*-di-5-quinolylurea being formed together with diethylurea. 2. *Me* quinolyl-5-carbamate (II), formed on dissolving 5 g. 5-aminoquinoline in 30 cc. AcOH , adding 5 cc. ClCO_2Me in 10 cc. AcOH and 2.5 g. EtONa in small quantities at a time, m. 134° ; yield 3 g. In an analogous way the *Et* ester (III), m. 137° , was prepd. while 5-quinolylurea (IV) was obtained on adding 1 g. KCNO in 10 cc. water to 1 g. 5-aminoquinoline in 25 cc. 20% aq. AcOH . On heating IV underwent a change at 224° , decompd. apparently and then m. again 280° . In this prepn. a small quantity of a biuret deriv., $\text{C}_6\text{H}_3\text{NNHCONHCONH}_2$, m. 305° , is formed simultaneously. On nitration with abs. HNO_3 I yields α -8-nitro-5-quinolyl- β -ethylnitrourea (V), m. 173° (violent decompn.); the position of the nitro group in the quinoline nucleus was not proved, however. On heating V with water or alc. NH_3 at 100° in a sealed tube, 8-nitro-5-aminoquinoline (VI), m. 280° , was obtained, again the position of the nitro group

being uncertain. Nitration of I with $\text{HNO}_3\text{-H}_2\text{SO}_4$ gives 6,8-dinitro-5-aminoquinoline (VII), m. 273-7°, when the reaction mixt. is poured out on ice, the α -dinitro-5-quinolyl- β -nitroethylurea, which is first formed, being unstable in the presence of water. In VII the position of neither of the nitro groups has been proved. Nitration of II with abs. HNO_3 gives a mixt. of *Me mono-* and *dinitroquinoline-5-carbamates*, m. 180° and 195°, resp.; without proof the positions 8 and 6, 8, resp., are assigned to the nitro groups in these compds. On hydrolysis at 105° with concd. H_2SO_4 these compds. yield VI and VII, described above. The nitration of III with abs. HNO_3 gave an *Et nitroquinolyl-5-carbamate*, m. 156°, which, on hydrolysis with concd. H_2SO_4 , affords VI. With $\text{HNO}_3\text{-H}_2\text{SO}_4$ III gives an *Et dinitroquinolyl-5-carbamate*, m. 180-3°, which is converted into VII by concd. H_2SO_4 at 105°. IV could not be nitrated; even on careful nitration with well-cooled abs. HNO_3 it decomps. C. F. VAN DUIN.

Synthesis of certain acridine compounds. KONOMU MATSUMURA. Kitasato Inst. *J. Am. Chem. Soc.* 51, 816-20(1929); cf. *C. A.* 21, 1461.—Details are given for the prepn. of [2,4-(O_2N) $_2\text{C}_6\text{H}_3$] $_2\text{CH}_2$, m. 173°, of [2,4-(O_2N) $_2\text{C}_6\text{H}_3$] $_2\text{CO}$, m. 232°, and of 3,6-diaminoacridone, does not m. 320°; 12 g. of the latter, 50 cc. H_2O and 40 g. concd. H_2SO_4 , heated 6 hrs. at 195°, give 85% of 3,6-dihydroxyacridone, does not m. 320°; the concd. H_2SO_4 soln. has a pure blue fluorescence; *di-Me ether*, does not m. 320° (77% yield); with PCl_5 in PhMe 5.1 g. of the latter yields 5 g. of the 9-*Cl deriv.*, light yellow, m. 184°, which gives an intense green fluorescence in concd. H_2SO_4 . Heating with satd. alc. NH_3 and $\text{Cu}(\text{OAc})_2$ at 140° for 8 hrs. transforms this into the 9- NH_2 deriv., deep yellow, m. 268°; the concd. H_2SO_4 soln. has a green fluorescence, becoming violet-blue on diln.; the EtOH soln. shows a green fluorescence, changing to pure blue on diln. with EtOH ; *HCl salt*, light yellow, m. 315° (decompn.); *picrate*, yellow, m. 285° (decompn.); *Ac deriv.*, light yellow, m. 277-8°. The *methiodide* of the *Ac deriv.*, yellow, m. 310° (decompn.); the *Me p-toluenesulfonate* is light yellow and m. 280°; with HCl this gives the *methochloride*, yellow, m. 315°, which has a deep blue fluorescence in H_2O , violet-blue in hot EtOH and weak green in concd. H_2SO_4 . The slight soly. of the methiodide makes it unsuitable for physiol. study. C. J. W.

1,3,4-Oxidazines. III. J. VAN ALPHEN. Leiden Univ. *Rec. trav. chim.* 48, 163-72(1929); cf. *C. A.* 22, 2566; 23, 145.—In this investigation compds. derived from Δ^2 -4-phenyl-5-keto-1,3,4-oxidiazine, $\text{O.CH:N.NPh.CO.CH}_2$ (I), are described

together with their hydrolysis by means of 10% boiling H_2SO_4 . *dl- α -[α -Bromopropionyl]- β -acetylphenylhydrazine* was prepd. from MeCHBrCOBr (23 g.) and PhNH.NHAc (16 g.) in benzene (40 cc.), as a sirup, which could not be induced to crystallize; on heating in acetone with anhyd. K_2CO_3 , *dl- Δ^2 -2,6-dimethyl-4-phenyl-5-keto-1,3,4-oxidiazine* (II) was obtained as a pale yellow liquid, b_{15} 165-70°, n_D^{15} 1.5583. On boiling for an hr. with the 20 parts of 10% aq. alc. H_2SO_4 , II is completely hydrolyzed with the formation of PhNHNH_2 . Again, from EtCHBrCOBr and PhNHNHAc *dl- α -[α -bromobutyryl]- β -acetylphenylhydrazine* was obtained as a non-crystallizable liquid, which was converted in the way described above for I into *dl- Δ^2 -2-methyl-6-ethyl-4-phenyl-5-keto-1,3,4-oxidiazine* (III), b_{15} 146-8°; n_D^{15} 1.5512. Under the same conditions mentioned above for II, III also is completely hydrolyzed. Starting with $\text{Me}_2\text{CBrCOBr}$, *Δ^2 -2,6,6-trimethyl-4-phenyl-5-keto-1,3,4-oxidiazine* (IV) was obtained, b_{15} 150-3° (slight decompn.), n_D^{15} 1.5423. Under the conditions which provoke complete hydrolysis for II and III, IV is only hydrolyzed to a small extent. On refluxing PhNHNHAc (7.5 g.) and $\text{Ph}_2\text{CClCOCl}$ in 100 cc. benzene during 12 hrs., *Δ^2 -2-methyl-4,6,6-triphenyl-5-keto-1,3,4-oxidiazine* (V), m. 156°, is produced at once, the hydrazine deriv. which is formed as an intermediate product being converted spontaneously into the oxidiazine, which is not surprising in view of the great reactivity of the Cl atom in $\text{Ph}_2\text{CClCO}_2\text{H}$. Under the conditions, mentioned above for II, III and IV, V is not hydrolyzed at all, but completely recovered unchanged. PhCHClCOCl and PhNHNHPh in benzene gave *dl- α -[α -phenylchloroacetyl]- β -benzoylphenylhydrazine*, m. 136°, which, on heating in acetone with K_2CO_3 , yields *dl- Δ^2 -2,4,6-triphenyl-5-keto-1,3,4-oxidiazine* (VI), m. 141°, which is not hydrolyzed by boiling 10% H_2SO_4 , but on boiling with alc. NaOH dissolves with conversion into the enolic form. In accordance with this fact, *Δ^2 -2,4,6-tetra-phenyl-5-keto-1,3,4-oxidiazine* (VII) does not dissolve in alc. NaOH , the formation of an enolic form being impossible in this case. VII, prepd. from $\text{Ph}_2\text{CClCOCl}$ and PhNH.NHPh in the usual way, m. 151°, with 10% aq. alc. H_2SO_4 hydrolysis does not take place. From $\text{PhCH}_2\text{CH}_2\text{CONHNHPh}$ (*Ber.* 36, 1101(1903)) and ClCH_2COCl was prepd. a sirupy hydrazine which, on heating with K_2CO_3 in acetone, was converted into *Δ^2 -2-[β -phenylethyl]-4-phenyl-5-keto-1,3,4-oxidiazine* (VIII), m. 79°, which is hydrolyzed

completely with 10% H_2SO_4 , with the formation of $\text{PhCH}_2\text{CH}_2\text{CONHNHPh}$. Starting with the $\text{PhCH}:\text{CHCONHNHPh}$, is formed Δ^1 -2-[β -phenylvinyl]-4-phenyl-5-keto-1,3,4-oxdiazine (IX), pale yellow, m. 128° , which is not hydrolyzed by hot aq. alc. 10% H_2SO_4 . These results and those recorded previously (C. A. 23, 145) show that the hydrolysis of the oxidiazines is not hindered by a Me group, an iso-Pr group, two Me groups or one Me and one Et group. On the other hand, three Me groups inhibit ring opening to a marked extent, while one Ph group inhibits it altogether. This is not simply a consequence of the size of the group, since the PhCH_2CH_2 group does not inhibit ring opening; the unsatd. character of the Ph group must play an important role, since the $\text{PhCH}:\text{CH}$ group inhibits ring opening completely. Although these results are in agreement with Hjelt's rule on the introduction of hydrocarbon radicals on the stability of lactone rings, the nature of the group plays a more important role in the case of the oxidiazines.

C. F. VAN DUIN

Pyrimidines. CIV. Isouracil and its derivatives. Preliminary study of the methods of synthesis. TREAT B. JOHNSON AND W. T. CALDWELL. Yale Univ. *J. Am. Chem. Soc.* 51, 873-80(1929); cf. C. A. 20, 206.—While the ultimate object of this work is the structure of orotic acid, which may be isouracilcarboxylic acid, the present paper is confined to the study of 2 different methods for synthesizing CO_2H derivs. of isouracil; neither have led to practical results. $\text{CS}(\text{NH}_2)_2$ and $\text{EtOCH}_2\text{COCH}(\text{OEt})\text{CO}_2\text{Et}$ are condensed by EtONa to 2-thio-4-ethoxymethyl-5-ethoxy-6-ketopyrimidine, m. 178° , sol. in about 100 parts boiling H_2O ; heating with $\text{ClCH}_2\text{CO}_2\text{H}$ gives 82% of the corresponding 2-keto deriv., m. 168° ; heating with concd. HCl at $120-40^\circ$ for 2 hrs. removes the EtO groups, giving 93% of 2-keto-4-hydroxymethyl-5-hydroxy-6-ketopyrimidine, yellow, does not m. 320° . With $\text{H}_2\text{NC}(\text{SEt})\text{NH}$ there results 2-ethylmercapto-4-ethoxymethyl-5-ethoxy-6-ketopyrimidine, m. 123° ; with PCl_5 there is formed the 6-Cl deriv., light yellow oil, $b_{10} 165-6^\circ$, which is reduced by Zn in $\text{EtOH-H}_2\text{O}$ to 2-ethylmercapto-4-ethoxymethyl-5-ethoxypyrimidine, m. 167° ; hydrolysis with HCl causes the evolution of EtSH , but the amt. of material did not permit the continuation of the work. $\text{EtO}_2\text{CCOCH}(\text{OEt})\text{CO}_2\text{Et}$ and $\text{H}_2\text{NC}(\text{SEt})\text{NH}$ condense to give a small amt. of 2-ethylmercapto-4-carbethoxy-5-ethoxy-6-ketopyrimidine, m. 82.3° ; the 2-keto deriv. m. 230° , and 2-keto-4-carboxy-5-ethoxy-6-ketopyrimidine m. 260° , heating the latter at 110° with concd. HCl gives isobarbituric acid.

C. J. WEST

The dehydrogenation of yohimbine (preliminary communication). F. MENDLIK AND J. P. WITBAUT. Univ. Amsterdam. *Rec. trav. chim.* 48, 191-2(1929).—Up to the present time expts. to dehydrogenate yohimbine have not been undertaken; M and W. have now carried out this expt. according to the method of Diels (C. A. 22, 132) by means of Se. A mixt. of 20 g. yohimbine and 15 g. pulverized Se was heated during 3 hrs. at $300-10^\circ$; after cooling in a CO_2 atm., the reaction mixt. was pulverized mixed with the same vol. of sand and extd. for 2 hrs. with boiling benzene. A white substance, $\text{C}_{18}\text{H}_{18}\text{N}_2$, m. $212-3^\circ$, dissolves in the benzene and crystallizes on cooling (4.5 g.), it sublimes without decompn., dissolves in dil. acids with a blue fluorescence and shows several alkaloid reactions, e. g., gives a ppt. with picric acid, I-KI and Nessler's reagent. Extn. of the residue of the benzene extn. with alc. gives a yellow substance, m. 326° , which, however, still contains a small quantity of Se and could not be obtained in an analytically pure condition.

C. F. VAN DUIN

Polarized light and cocaine decomposition. H. T. DAILEY AND H. C. BENEDICT. Northwestern Univ. Dental School. *J. Am. Chem. Soc.* 51, 808-16(1929).—A study of the relative effect of polarized and non-polarized light on the decompn. of cocaine has been made, in which several concns. of cocaine-HCl were used; 2 methods of obtaining a polarized radiation were used; the times of irradiation ranged from 1 to 12 hrs.; the effect was tested on goldfish and *Lupinus albus*. The conclusion is drawn that polarized radiations have no selective action in the decompn. of cocaine-HCl. Cocaine is slowly decompd. by light. Obvious sources of error which have been eliminated, as far as possible, are the variability of individual goldfish, the tolerance that goldfish develop to cocaine and the effect of traces of impurity in the H_2O .

C. J. WEST

The anhydride of abietic acid. W. NAGEL. Res. Lab. Siemens Corp. *Chem. Umschau Fette, Oele, Wachse Harze* 36, 33-4(1929).—When rosin is acetylated it becomes anhyd and Fonrobert and Pallaut (*Farben. Ztg.* 31, 1849(1926)) have isolated the anhydride. Dupont's assertion (*Chem. et Ind.* 1927, 1691; cf. C. A. 22, 423) that the anhydride is simply the hydrated acid less H_2O of crystn. was disproved by a reexamn. which characterized the product as an anhydride by its acid no. at 0° , m. $148-50^\circ$, and its correct value of the sapon. no. Details of the methods are given. For prep.

abietic anhydride in the wet way, the rosin was first ground with malonic ester and crystd. several times; recrystn. was finally made with low mol. solvents like acetone.

P. ESCHER

Constitution of carthamin. CHIKA KURODA. Inst. Phys. Chem. Research, Tokyo. *Proc. Imp. Acad. (Japan)* 5, 32-3(1929).—Crude carthamin paste (from safflower), treated with cold dil. HCl and dried, gives *isocarthamin*, yellow, crystg. with $2H_2O$, m. 228° , which is very unstable and passes into a red amorphous product when exposed to the air; C_6H_5N gives red carthamin, $C_{21}H_{22}O_{11}$, which, dried at 100° , loses $1H_2O$. Heating with dil. mineral acids gives glucose.

C. J. WEST

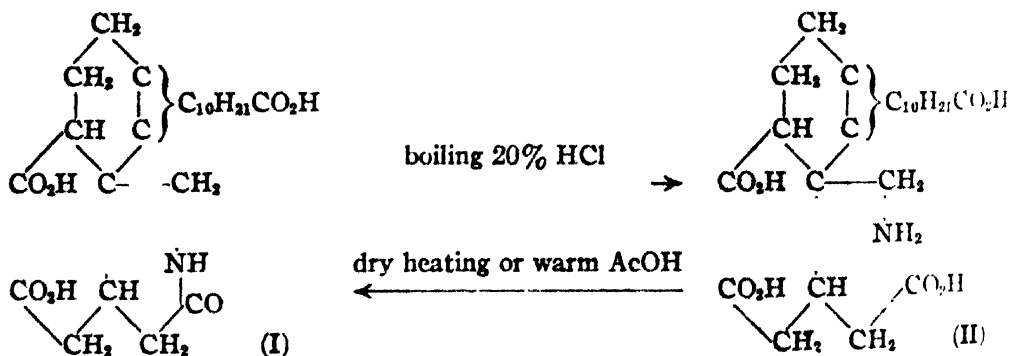
Rate of hydrolysis of casein in acid solutions as measured by the formation of amino nitrogen. E. S. NASSET AND DAVID M. GREENBERG. Univ. of California. *J. Am. Chem. Soc.* 51, 836-41(1929).—The rate of hydrolysis of casein by acids as measured by the increase in NH_2 N conforms to the equation for a 2nd order reaction. As was previously found for other proteins, the catalytic effect of acids on casein hydrolysis is proportional to the H-ion activity of the acids. The change of rate of hydrolysis with temp. is expressed by the relation $\log Ka = 0.0307 T - 5.61$.

C. J. WEST

The molecule binding power of bile acids and sterols. I. Desoxycholic acid and apocholic acid. HEINRICH RHEINBOLDT WITH ELSE FLUME AND OTTO KÖNIG. Univ. Bonn. *Z. physiol. Chem.* 180, 180-6(1929).—Thawing p. and m. p. curves were plotted for the following binary mixts.: palmitic acid and desoxycholic acid, stearic acid and desoxycholic acid, cetyl alc. and desoxycholic acid, palmitic acid and apocholic acid, stearic acid and apocholic acid, cetyl alc. and apocholic acid. Cryst. compds. were prepd. from cetyl alc. and desoxycholic acid, and from cetyl alc. and apocholic acid. Detns. of the neutralization equiv. showed both compds. to consist of 1 part of alc. to 8 parts of acid.

A. W. DOX

Oxime rearrangements in the group of bile acids. M. SCHENCK. *Z. anorg. Chem.* 42, 61-5(1929).—Oximes of satd. cyclic ketones can be converted to isoximes or lactams by a Beckmann-Wallach rearrangement and these can then be hydrolyzed to the corresponding amino acids (cf. Wallach, *Ann.* 312, 171(1900)). Similar rearrangements and hydrolyses can be carried out with ketoxime acids in the group of bile acids. Desoxybiliaric acid (cf. C. A. 14, 1811) and NH_2OH form an oxime which on warming with concd. H_2SO_4 is converted to the isoxime I; when I is boiled with 20% HCl it is converted to the amino acid II.



In a similar manner isodesoxybiliaric acid can be rearranged to the isoxime and the amino acid obtained from this by hydrolysis can be converted to the lactam. A comprehensive review and discussion of these reactions, the exptl. data of which have been published previously, is given (cf. C. A. 21, 1991, 2477, 3903).

N. A. LANGE

The higher carbon ring compounds. L. RUZICKA. *Chem. Weekblad* 25, 614-7 (1928).—Civetone, obtained from civet, was one of the first compds. found to have 17 C atoms in ring formation. Mol. refraction as well as reduction to the dihydro product yields a di- CO_2H acid which is identical with pentadecane-1,15-dicarboxylic acid. Dihydrocivetone is cycloheptadecanone. Belonging to the same class are musk and muscone ($C_{15}H_{26}O$). Muscone is 3-methylcyclopentadecan-1-one. Some of the higher ketonic substances can be prepd. by heating the Ca salts of the polymethylene dicarboxylic acids. Cyclic ketones contg. from 9-29 C atoms are thus made known. These ketones up to 19 C atoms have a characteristic odor. Kerchbaum attributes this to lactones of ω -HO acids. The stability of these ketonic compds. is remarkable and does not appear to be in agreement with the Baeyer strain theory. Information

on this has appeared along 4 lines: (1) the mol. vol. of a CH_2 group has the same value as in straight chain compds.; (2) similar "spacings" between CH_2 groups are found in aliphatic compds.; (3) the same is also brought out with Röntgen rays; (4) it has been found that from 13 C atoms up, these substances form monomol. layers on water.

M. ACHTERHOF

Tung oil (HOLDE, *et al.*) 26. A new tetramethylbutadiene (MACALLUM, WHITBY) 30. Affinity between asymmetric ions (BERGMAN) 2. Structure and stages of excitation of the molecules of some nitriles, determined from the ultra-violet absorption spectra of the vapors (ACLY) 3. Chemistry of the red and blue pigments of flowers and fruits (HUNTRESS) 11D. Structure and activation of the CH_2O molecule: analysis from the point of view of the ultra-violet absorption spectrum of the vapor (HENRI, SCHOU) 3. Rate of vibration and molecular packing of organic compounds (HERZ) 2. Valency. XI. Molecular conductivities and extinction coefficients of derivatives of cyclotelluropentane (GILBERT, LOWRY) 2. Velocity of thermal decomposition of malonic acid (LASKIN) 2. Absorption of ultra-violet rays by the hydrolytic products of sucrose (KWIECINSKI, MARCHLEWSKI) 3. Rotation dispersion and circular dichroism of carophyllene nitrosite (MITCHELL) 3. Crystal structure of tetramethylammonium iodide (ZACHARIASEN) 2. Internal friction of highly viscous substances (LEV, KIRCHNER) 2. Sesamin and sesamolin (ADRIANI) 27. Autoxidation and antioxygenic action. XXXIII. Catalytic properties of Sb, Bi and their derivatives, and some derivatives of V (MOUREU, *et al.*) 2. Physicochemical researches on peroxides (PONZIO, MILONE) 2.

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Separation of components of oily mixtures produced by the catalytic hydrogenation of carbon oxides. MARTIN LUTHER and HERMANN JOCHHEIM (to I. G. Farbenind. A. G.) U. S. 1,704,751, March 12. Alcs. may be readily isolated from the mixts. by converting them into aldehydes by dehydrogenation, sepg. the aldehydes by distn. or combination with bisulfite and thereafter reconverting them into alcs. Or the alcs. may be oxidized to acids and sepn. of the acids effected. Alternatively, the material may be treated with partially or wholly dehydrated hydrate-forming salts such as MgCl_2 , $\text{Ca}(\text{NO}_3)_2$ or CaCl_2 whereby, on cooling, preferably with addn. of a pptg. agent such as benzene, mol. compds. sep. which are subsequently decomposed by addn. of water. Products are thus obtained which are of lighter color, lower b. p. and more agreeable odor than the original material. Inorg. acids may be used for recovery of ketones in the oily mixts. under treatment, suitably by washing on the counter-current plan. Several examples with details of procedure are given.

Hydrogenating aromatic bases. I. G. FARBENIND. A.-G. Brit. 295,033, Aug. 6, 1927. Catalytic hydrogenation of aromatic bases is facilitated by use of an alkali or alk. earth, e. g., Na_2CO_3 may be added to assist in the hydrogenation of ethylaniline in the presence of Ni oxide to produce hexahydroethylaniline, or CaO and Co oxide may be used together in hydrogenation of *o*-toluidine.

Arsenating organic compounds. EMIL SCHELLER (to Deutsche Gold & Silber Scheideanstalt, vorm. Roessler). U. S. 1,704,106, March 5. In forming products such as α -hydroxy- β -pyridinearsonic acid, a diazo compd. such as that of α -hydroxy- β -pyridine in HOAc is caused to react with AsCl_3 or other suitable halogen compd. of As and the reaction product is decomposed and the product purified (suitably by heating, use of Na hydrosulfite, H_2O_2 and subsequent reprecipn. Cu compds. are used as catalysts. Cf. C. A. 23, 1136.

Organic copper compounds. I. G. FARBENIND. A.-G. Fr. 645,219, Dec. 6, 1927. Complex azo compds. of Cu are prepd. by coupling diazo, diazoazo, and tetraazo compds., resp., in which in the *o*-position with respect to one or more azo or diazo groups are carboxy, hydroxy or carbonyl groups, with any coupling components in the presence of complex compds. of Cu contg. N and sol. in water. In examples, diazotized 2-amino-naphthalene-3-carboxylic acid is added to an aq. soln. of 5,5'-dihydroxy-2,2'-dinaphthyl-

urea-7,7'-disulfonic acid, Na_2CO_3 and an aq. soln. of $[\text{Cu}(\text{NH}_3)_4]\text{SO}_4$, whereon coupling and formation of the Cu compd. takes place. Other complex compds. are obtained if $[\text{Cu}(\text{NMe}_2)_4]\text{SO}_4$ or $[\text{CuPy}_4]\text{SO}_4$ are used. 2-Aminobenzoic acid is diazotized and coupled with 5,5'-dihydroxy-2,2'-dinaphthylamino-7,7'-disulfonic acid in the presence of Na_2CO_3 and $[\text{Cu en}_2(\text{H}_2\text{O})_2]\text{SO}_4$ or di-aquo-di-en-cuprisulfate of glycolol cupri-diamine, in which "en" represents ethylenediamine. Other examples are given.

Benzanthrone derivatives. I. G. FARBENIND. A.-G. (Julius Müller, inventor). Ger. 471,021, Nov. 29, 1925. It is found that the usual methods of prepg. benzanthrone from anthraquinone, when applied to 2,6-dihaloanthraquinones, yield 2,6-dihaloanthrones free from isomers. The prepn. of 2,6-dichlorobenzanthrone, m. 236° , is described in an example and 2,6-dibromobenzanthrone, m. 221° , is also mentioned.

Esters. W. CLAASEN. Brit. 294,947, Feb. 2, 1927. See Fr. 32,991 (C. A. 23, 846).

Vinyl ester. FREDERICK W. SKIRROW (to The Canadian Electro Products Co., Ltd.). Can. 287,496, Feb. 26, 1929. Inactive vinyl esters of unsatd. alcs. and hypothetical alcs. made by interaction of an acetylene and a carboxylic acid, are rendered active and capable of polymerization and of reaction with aldehydes and acetals by treating the vinyl esters with oxygen in presence of natural or artificial light.

Vinyl ester. FREDERICK W. SKIRROW AND GEORGE O. MORRISON (to The Canadian Electro Products Co., Ltd.). Can. 287,494, Feb. 26, 1929. Vinyl esters are made from the corresponding carboxylic acids by passing acetylene into said acids in presence of a Hg orthophosphate formed *in situ* by interaction of H_3PO_4 on a Hg oxide dissolved in the carboxylic acid.

Alkamine esters of *o*-aminobenzoic acids. OTTO EISLER (to Winthrop Chemical Co.). U. S. 1,704,660, March 5. Compds. of greater power than cocaine in producing local anesthesia are formed by esterifying *o*-*N*-alkyl- or *o*-*N*-alkoxyalkylaminobenzoic acid with an amino alc. or by treating an alkamine ester of *o*-aminobenzoic acid with alkylating or alkoxyalkylating agents. In an example which is given, the mono-hydrochloride of methoxyethylanthranilic acid piperidinoethyl ester is first obtained as an oil but soon solidifies and when recrystd. from AcOEt forms a colorless cryst. powder, m. 118° .

Diazo compounds. KALLE & Co., A.-G. Brit. 294,248, July 21, 1927. Solid stable compds. are obtained by treating soln. of diazo compds. with a salt of Cd such as CdCl_2 . Examples are given.

Oxidizing aldehydes to monocarboxylic acids. ARTHUR STOLL and WALTER KUSMAUL (to Chemische Fabrik vorm. Sandoz). U. S. 1,703,755, Feb. 26. See Brit. 293,322 (C. A. 23, 1650).

Alkylphenols. SCHERING-KAHLBAUM A.-G. Brit. 294,238, July 21, 1927. Alkylphenols are produced by heating an alkyl ether of a phenol under pressure and preferably in the presence of a catalyst such as silica gel or fullers earth and with stirring or agitation. Polyalkylphenols may be formed as by-products. Examples are given of the transformation of phenol Et ether into ethylphenol together with some diethylphenols of phenol cyclohexyl ether into cyclohexylphenol and of the isopropyl ether of *m*-cresol into a mixt. of thymol and 3-methyl-4-isopropylphenol.

Aminophenol ethers. JOSEPH TCHERNIAC. Fr. 644,989, Dec. 1, 1927. *o*-Aminophenol ethers are prepd. by heating in an alk. soln. the product of reaction of an alkoxyarylcarboxylic acid amide and a hypochlorite. In an example, methylsalicylamide is stirred up with a soln. of NaOCl and NaOH . The mixt. is kept at about 20° for several hrs. and then heated to boiling. Steam distn. gives 80% practically pure anisidine.

Aromatic hydroxyaldehydes. I. G. FARBENIND. A.-G. Brit. 294,889, July 30, 1927. Hydroxyarylamines are boiled with dil. alkali in the presence of isatin or a suitable deriv. By introducing air or other gaseous oxidizing agent the quantity of isatin or the like required may be reduced below the usual requirement of 2 mol. proportions. By boiling *o*-hydroxybenzylamine and vanillylamine-HCl with K isatin-5-sulfonate in alk. soln., salicylaldehyde and vanillin are formed. Another example is given of the production of vanillin and 5-aldehyde-1,2,3-*o*-cresotinic acid from vanillylamine and 5-(ω -aminomethyl)-1,2,3-*o*-cresotinic acid by oxidation with air and use of K isatin-5-sulfonate as catalyst.

Cyclohexyl compounds. ROGER ADAMS (to Abbott Laboratories). U. S. 1,703,186, Feb. 26. Various compds. which are *bactericidal against acid-fast bacteria* such as *B. leprae* and *B. tuberculosis* have the general formula $\text{C}_6\text{H}_{11}(\text{CH}_2)_y\text{CHRCOOZ}$ in which y may be zero or more, R represents an alkyl or alkylene group, and Z represents H, a metal, or an alkyl group. Acids of this type are made by condensation of a

haloalkylcyclohexane with a properly substituted malonic ester or by condensation of an ω -cyclohexylmalonic ester with an alkyl halide followed by sapon. and elimination of CO_2 . Examples are given. Cf. *C. A.* 22, 227, 2147; 23, 848.

Tetrazoles. C. H. BOHRINGER SOHN. Fr. 645,265, Nov. 5, 1927. Tetrazoles are prepd. by the action of azides or free hydrazoic acid on esters of oximes, particularly the sulfonic esters, or the Beckmann transformation products of these esters, or the components necessary for ester formation may be used. The esters may be treated in the presence of HN_3 with substances such as thionyl chloride, POCl_3 or PCl_5 which effect the transformation. Tetrazoles are also produced by the action of HN_3 or azides on amido or imido chlorides. In examples (1) 1,5-dimethyl-1,2,3,4-tetrazole is prepd. from the benzene sulfonic ester of acetoxime and Na azide; (2) $\alpha\beta$ -cyclopentamethylenetetrazole from cyclohexanone, PhSO_3H and NaN_3 , some 2-leucine lactam is produced at the same time; (3) 1-phenyl-5-amino-1,2,3,4-tetrazole by esterifying benzoylamidoxime with PhSO_2Cl in NaOH soln. and boiling the ester with NaN_3 ; (4) 1,5 diphenyltetrazole by treating a mixt. of benzophenoneoxime and HN_3 in CHCl_3 with thionyl chloride; (5) tetrazole from ϵ -leucine lactam in CHCl_3 with POCl_3 and NaN_3 ; (6) $\alpha\beta$ -cyclopentamethylenetetrazole by esterifying ϵ -leucine lactam with PhSO_2Cl and treating with NaN_3 .

Quaternary ammonium compounds. SOC. ANON. POUR L'IND. CHIM. A BAË. Brit. 294,582, July 26, 1927. Quaternary ammonium compds. are prepd. by reaction of an alkylating or aralkylating agent upon monoacylated or unsymmetrically diacylated diamines such as those described in Brit. 219,304 (*C. A.* 19, 523). Examples are given of the treatment of oleyldiethylethylenediamine with MeI , oleyldiethylethylenediamine with Me_2SO_4 and water and stearyldiethylethylenediamine, in melted condition, with Me_2SO_4 .

Sulfurized compounds. I. G. FARBENIND., A.-G. Fr. 645,820, Dec. 16, 1927. See Can. 284,056 (*C. A.* 23, 608).

Sulfuro-anhydride derivatives of tertiary organic bases. E. G. BECKETT, J. E. G. HARRIS, B. WYLAM, J. THOMAS AND SCOTTISH DYES, LTD. Brit. 294,507, Feb. 25, 1927. Bases such as pyridine or dimethylaniline are caused to react with SO_3 or with a substance capable of forming a sulfuro-anhydride deriv. with the base, in the form of vapors, gases, mists or sprays. An equimol. proportion of SO_3 is suitable but if chlorosulfonic acid or an alkyl ester is used approx. 2 mol. proportions of the base are used and the product in such case is a mixt. of the sulfuro-anhydride and hydrochloride or alkyl chloride of the base. The product is obtained in the form of a fine powder or snow and may be used in the prepn. of esters of vat dyes and for sulfonation of various hydrocarbons. Various details and modifications are described.

Alkali metal xanthates. WILHELM HIRSCHKIND (to Great Western Electro Chemical Co.). U. S. 1,704,249, March 5. Caustic alkali, alc. and CS_2 are caused to react at a temp. below 35° (suitably about 20°). The CS_2 is added last. Cf. *C. A.* 23, 1481.

Ammonium benzoate. JOSEPH A. SPINA (to Hooker Electrochemical Co.). U. S. 1,704,636, March 5. Reaction between NH_3 and benzoic acid is effected while both are in substantially anhydrous condition, *e. g.*, by contact of NH_3 with vaporized benzoic acid.

Formates. I. G. FARBENIND. A.-G. Brit. 294,396, Sept. 19, 1927. See U. S. 1,698,573 (*C. A.* 23, 1138).

Vinyl acetate. GEORGE O. MORRISON (to The Canadian Electro Products Co., Ltd.). Can. 287,495, Feb. 26, 1929. In a continuous process, an oxide of mercury is dissolved in AcOH ; the soln. is treated with H_3PO_4 ; C_2H_2 is passed into the liquor until the reaction slackens, through exhaustion of the catalyst; H_3PO_4 is made to react on a fresh AcOH soln. of Hg oxide; C_2H_2 is passed into the fresh acid and phosphate until vinyl acetate formation commences; and the fresh catalyst is substituted for that which has been exhausted.

Acetic acid. HENRY DREYFUS. U. S. 1,704,965, March 12. A mixt. comprising CH_4 and CO_2 is passed under pressure in contact with heated catalytic material such as carbonates of Ni or Fe at a temp. between about 120° and 300° . Cf. *C. A.* 23, 1141.

Concentrating acetic acid. HERMANN SUIDA. U. S. 1,703,020, Feb. 19. Extn. of HOAc from a dil. soln. in vaporized state is effected with a mixt. of an extn. medium such as tar cresol having a high b. p. as compared to HOAc together with a solvent (such as C_2HCl_3) for the extn. medium. An arrangement of app. is described. Cf. *C. A.* 23, 608.

Concentrating acetic acid. I. G. FARBENIND. A.-G. Brit. 294,636, July 29, 1927. In a process of effecting concn. of HOAc by adding an alkyl acetate and distg., as described in Brit. 284,688 (*C. A.* 22, 4539), the alkyl acetate, such as EtOAc is used

in mixt. with a hydrocarbon or Cl deriv. of a hydrocarbon such as C_6H_6 or ethylene chloride. Cf. C. A. 22, 3669.

Acetic acid from acetylene. J. KARPATY and M. G. HÜBSCH. Brit. 294,226, July 21, 1927. In a reaction vessel there is placed 98% HOAc contg. $HgSO_4$ and 0.1% of cellulose which has been activated by heating in a current of N. The app. is evacuated and C_2H_2 and O are then supplied alternately and the liquid is circulated in the app. (various details of which are described). An alk. wash-liquor serves to absorb CO_2 and any entrained acetic acid and aldehyde. The activated cellulose may be prepd. from sawdust or shavings heated in N at 200° to produce only a slight superficial carbonization. Colloidal substances in HOAc soln., such as collodion and cellulose acetate, and colloidal PbO_2 , V_2O_5 and the like which are stable in HOAc in the presence of Hg salts also may be used, and the reaction may be promoted by adding 0.1–0.2% H_2SO_4 to the HOAc.

Acetaldehyde from acetylene. J. KARPATY and M. G. HÜBSCH. Brit. 294,227, July 21, 1927. In the oxidation of C_2H_2 , the latter and the acid absorption medium (comprising H_2SO_4 or HOAc or both) are separately maintained in circulation systems (of an app. which is described) having in common a reaction chamber in which the absorption medium falls in coherent thin streams. $HgSO_4$ may be used as a catalyst and various details are described. A temp. of 70° is suitable and the acetaldehyde formed may be of such strength that it can be sepd. from soln. by salting out.

Acetaldehyde or acetic acid. I. G. FARBENIND. A.-G. Fr. 645,967, Dec. 1, 1927. AcH or AcOH is prepd. by passing C_2H_2 over contact substance, such as salts of Hg, Ag, Sn or Cu preferably contg. V in the acid radical, in the presence of H and an oxidizing gas or substance liberating O. In examples, a gaseous mixt. contg. much AcH is obtained by passing H, N, C_2H_2 and O at 110° over mercuric phosphate. A gas contg. 30–35% AcOH is obtained by passing H, C_2H_2 , and O at 250° over Ag vanadate. Sn vanadate is also used.

Metaldehyde. ELEKTRIZITÄTSWERKE IONZA and CHEM. FAB. A.-G. Ger 470,851, June 24, 1924. See Brit. 235,867 (C. A. 20, 917).

Methanol. COMMERCIAL SOLVENTS CORPORATION. Fr. 644,525, June 20, 1927. A catalyst composed of one or more difficultly reducible oxides and a metal halide is used in the production of CH_3OH from H and CO. In examples a mixt. of (1) Cr_2O_3 and $ZnCl_2$ or $MgCl_2$; (2) Cr_2O_3 , ZnO or MgO and $ZnCl_2$; (3) WO_3 , ZnO and $ZnBr_2$, and (4) oxide of U and $ZnCl_2$ are used.

Ethylene from acetylene and hydrogen. I. G. FARBENIND. A.-G. Brit. 291,787, Aug. 27, 1927. C_2H_2 and H in a finely distributed condition and at an elevated temp. are passed through an inert liquid such as a hydrocarbon, contg. a catalyst in suspension. An example is given of the use of decahydronaphthalene carrying in suspension Pd deposited on kieselguhr at a temp. of 150 – 60° . Another example refers to Ni as a catalyst.

Hydrogen peroxide. P. ASKENASY. Brit. 294,265, July 21, 1927. See Fr 638,090 (C. A. 23, 245).

Menthol. KARL SCHÖLLKOPF (to Rheinische Kampfer-Fabrik, G.m.b.H.). U. S. 1,704,630, March 5. In the manuf. of inactive menthol, thymol is heated with H under pressure in the presence of hydrogenation catalysts, inactive menthol is sepd. from the mixt. of liquid menthols, and the latter is converted by dehydrogenation into a mixt. contg. menthones and this mixt. is heated with H under pressure in the presence of hydrogenation catalysts. Cf. C. A. 23, 611.

Pinacol. HENRY BERLIN (to International Patents Development Co.). U. S. 1,703,220, Feb. 26. Acetone or a homolog is caused to react in the presence of Al and a Hg salt such as $HgCl_2$ sol. in the ketone and decomposable by the Al while CCl_4 is introduced intermittently in such manner as to avoid violence of the reaction; the soln. of pinacol is sepd. after decomposing the reaction product.

1-Methyl-5-chlorobenzene-2-carboxamino-3-thioglycolic acid. ERWIN HOFFA, JENS MÜLLER and FRITZ MÜLLER (to Grasselli Dyestuff Corp.). U. S. 1,703,145, Feb. 26. 1-Methyl-5-chloro-2-cyanobenzene-3-thioglycolic acid is treated with H_2SO_4 until the corresponding 2-carboxamino compd. is formed and the reaction is then stopped by diln.

1-Propenyl-3-ethoxy-4-hydroxybenzene. FRIEDRICH BOEDECKER. U. S. 1,704,494, March 5. *i*-Chavibetol is ethylated, the resulting 3-ethyl 4-methyl ether is subjected to the action of an alk. medium such as aq. NaOH soln. and the resulting 1-propenyl-3-ethoxy-4-hydroxybenzene is sepd. from the 4-methoxy compd. by recrystn.

Sulfo salt of 3,3'-dichlorodiphenylmethane-4,4'-di(trimethylammonium hy-

dioxide). GEORG. KALISCHER and KARL KELLER (to Grasselli Dyestuff Corp.). U. S. 1,703,150, Feb. 26. This compd. may be obtained by the action of Me_2SO_4 upon 3,3'-dichloro-4,4'-bis(dimethylamino)diphenylmethane and is a cryst. compd. easily sol in water and m. at about 218° with evolution of gas.

Lactone of tetradecane-14-hydroxy-1-carboxylic acid. SOC. ANON. M. NAEF ET CIE. Brit. 294,602, July 27, 1927. This compd. is made by heating cyclopentadecanone with persulfuric acid. On acidification it yields the acid and the latter, by oxidation with chromic acid, gives tridecane-1,13-dicarboxylic acid.

Styrene. IVAN OSTROMISLENSKII (to Naugatuck Chemical Co.). U. S. 1,703,950, March 5. In obtaining purified styrene from mixts. of styrene and ethylbenzene, the styrene is sepd. from the mixt. by polymerizing the styrene content for 16-48 hrs. at 180 - 140° to form easily pulverized resinous polymerized styrene, distg. off the ethylbenzene, heating the resinous polymer at 350 - 500° to form unpolymerized styrene and distyrene, and sepg. the styrene by distn. Cf. C. A. 23, 156.

Colored polymerized styrenes. IVAN OSTROMISLENSKII (to Naugatuck Chemical Co.). U. S. 1,705,264, March 12. Colloidal solns. of inorg. coloring substances are formed in styrene, e. g., by use of Au or Ag compds., and the styrene is then polymerized to the solid state to obtain a colored polymerized product. Cf. C. A. 22, 3893.

Condensation products of ethanol. CONSORTIUM FÜR ELEKTROCHEMISCHE INDUSTRIE, G. M. B. H. Fr. 645,169, Dec. 5, 1927. EtOH is passed at high temps. over catalysts such as oxides, carbonates or alcoholates of Mn, Mg, Zn, V, Fe, Ba, Sr, Ca and Cu for the production of BuOH, acetone and acetic ester with simultaneous production of AcH. In examples, EtOH is passed at 420 - 430° over MgO supported on wood charcoal, a mixt. of BuOH, AcOEt and AcH being obtained. EtOH is passed at about 450° over MnCO_3 or ZnO on wood charcoal, a mixt. of BuOH and AcH being obtained in each case.

Condensation product of *m*-cresol and acetone. SCHERING-KAHLBAUM, A.-G. Fr. 645,271, Nov. 8, 1927. A new condensation product of *m*-cresol and acetone probably of the formula $[4,2\text{-Me}(\text{OH})\text{C}_6\text{H}_3]_2\text{CMe}_2$, m. 131 - 132° , is obtained by condensing of the ordinary or reduced temp. so as to avoid any spontaneous heating. Examples are given using HCl as condensing agent, with or without the addn. of dehydrating agents. Cf. C. A. 23, 1139.

Condensation products of the "benzodiazine" series. I. G. FARBENIND. A.-G. Fr. 645,585, Dec. 12, 1927. Condensation products of the "benzodiazine" series are prepd. by condensing 2,4-dihaloquinazolines with 2 mols. of a compd. which carries for one atom of N, S or O one or more atoms of H capable of reacting with the exception of water, NH_3 , alkali sulfhydrates and univalent aliphatic alcs. In examples, 2,4-dichloroquinazoline is dissolved in Me_2O , heated to 65° and poured drop by drop into a soln. of 1-amino-8-hydroxynaphthalene-3,6-disulfonic acid and AcONa in water. A condensation product is obtained in which 2 mols. of the disulfonic acid becomes attached through the amino group to the C atoms next to the N atoms in the ring. Other aminohydroxysulfonic acids may be used in the same manner. If 4-nitro-1-aminobenzene-3-sulfonic acid is used, 2 mols. become attached in the same manner through the amino group. If thio-*p*-cresol is used, 2 mols. become attached in the same manner through the SH group, and 2 mols. of phenol become attached through the OH group. Other examples are given.

11—BIOLOGICAL CHEMISTRY

PAUL E. HOWE

A—GENERAL

FRANK P. UNDERHILL

Ionic equilibrium, phagocytosis, and age of colloids. V. KULIKOV. *Compt. rend. soc. biol.* 97, 1335-6(1927); cf. C. A. 22, 98, 113. H. L. D.

Action of mixed reagents on the viscosity of protoplasm. H. TIMMEL. *Protoplasma* 3, 197-212(1927).—Centrifuge expts. were carried out with the chloroplast of various plants and single or mixed salts, particularly K, and org. compds. B. C. A.

Influence of structure on the kinetics of desmolases. I. Uricase. System: uricase, uric acid, active and inactive charcoal and protein. Sr. J. v. PŁYŃECKI. Univ. Warsaw. *Z. physiol. Chem.* 178, 19-38(1928).—The action of purified uricase obtained from ox kidney and frog liver was studied both in homogeneous medium and

in the presence of adsorbents. A neutral substance (charcoal without metal) which does not act on the substance but adsorbs uric acid and uricase inhibits the enzyme by diminishing the uric acid concn. PrOH and BuOH which are eluents only for the adsorbed uric acid and not for the adsorbed enzyme accelerate the decompn. of uric acid by increasing its concn. An active adsorbent (Fe-contg. charcoal) which decomposes uric acid in the presence of O behaves in the same way. The total uric acid decompn. in the system: C-Fe, uric acid, uricase, is greater than in the system: uric acid, uricase. Uricase action alone in the system with C-Fe is feebler than in a homogeneous medium. In the system: C-Fe, uric acid, uricase, the uric acid decompn. is the sum of the sep. uricase and C-Fe actions. Both catalysts act independently of each other, the uricase action depending on the uric acid concn. and the C-Fe action on the quantity of uric acid adsorbed on the oxidizing surfaces. Similar relationships were observed with different O concns. In the system with C-Fe the alcs. accelerate the uricase action by their power of elution, but retard the uric acid decompn. under the influence of the C-Fe contact. An adsorbent (coagulated protein), which adsorbs mainly the enzyme but the substrate only slightly, inhibits uricase action only to a small extent. The same adsorbent in soln. (sol. egg albumin) inhibits the reaction still less.

A. W. DOX

Plasmalogen. I. Properties of plasmalogen, preparation and nature of plasmal. R. FEULGEN, K. IMHÄUSER AND M. BEHRENS. Univ. Giessen. *Z. physiol. Chem.* 180, 161-79(1929); cf. *C. A.* 22, 2602.—Plasmal, a substance characterized by its lipid nature and aldehyde reactions, has been obtained from a great variety of animal tissues. It does not occur as such in the fresh tissue, but is present as a complex with some unknown substance, probably joined through the aldehyde group, since the complex plasmalogen does not give the ordinary aldehyde reactions. The liberation of plasmal from plasmalogen by the action of 0.1 N HCl at 37° is complete in 3 hrs., but HgCl_2 brings about this cleavage instantaneously. If the tissue is given a preliminary extn. with H_2O , then extd. with EtOH and the EtOH evapd., an emulsion consisting largely of phosphatides remains which is very rich in plasmalogen. Pptn. from Et₂O by MeAc or from EtOH by CaCl_2 does not effect a sepn. However, the plasmalogen, although persistently accompanying the phosphatides through various purification procedures, is not a phosphatide, since none of the phosphatide components gives the plasmal reaction (blue color with fuchsin- SO_2), and since lecithin from egg yolk gives only a very faint reaction. Plasmal, on the other hand, can be sepd. from other substances by steam distn., or better, by sapon. of the phosphatides, acidifying and extg. with Et₂O, and finally removing the fatty acids from the Et₂O by dil. NaOH. The crude plasmal obtained by distn. in an atm. of CO_2 seps. as a greasy skin-like mass with m. p. about 25°. It forms a thiosemicarbazone which can be sepd. into 2 fractions. The fraction difficultly sol. in EtOH was recrystd. 15 times until it showed a const. m. p. of 107-7.5°. Ten kg. of horse meat yielded 1-2 g. of this product. Analysis showed the absence of O and a % compn. between the values calcd. for the thiosemicarbazones of stearic and palmitic aldehydes. Now the thiosemicarbazone of stearic aldehyde m. 111° and that of palmitic aldehyde m. 109°. Mixed m. ps. of these 2 derivs. were then detd. and the curve was plotted. The mixts. 77:23 and 10:90 both m. 107°. With the 1st mixt. the addn. of plasmal thiosemicarbazone depressed the m. p. below 100°; with the 2nd mixt. no depression occurred. The 2 known thiosemicarbazones react at different rates with fuchsin- SO_2 . Of the 2 mixts. m. 107° only the 2nd gave the same rate of reaction as the plasmal deriv. Crystallographic comparisons also showed the same agreement. Plasmal is, therefore, a mixt. of higher fatty aldehydes. Oleic aldehyde was not identified, but its thiosemicarbazone might reasonably be expected to occur in the fraction more easily sol. in EtOH. Other aldehydes are probably present as indicated by a peculiar odor of the crude plasmal which disappears on oxidation with Ag- NH_4OH or formation of the thiosemicarbazone. Plasmalogen is probably a complex mixt. and as difficult to sep. as the individual constituents comprising a natural fat.

A. W. DOX

The protease content of the pylorus secretion. OTTO KESTNER, RICHARD WILSTÄTTER AND EUGEN BAMANN. Bayer Akad., München. *Z. physiol. Chem.* 180, 187-91(1929).—By the Pavlov operation on a dog, a blind sack of about 4.5 cc. capacity was formed in the antrum pylori and the secretion collected through a fistula. After diln. with 2-3 vols. of H_2O and centrifuging to remove leucocytes, the secretion was tested for digestive action on albumin at pH 2 and 4.8, on casein at pH 8.9 and on dl-leucylglycine at pH 7.8. The increase in amino N was in each case either nil or negligible. The enzymes, pepsin, 2nd protease (cathepsin), trypsin and crepsin, were therefore absent. The leucocyte sediment showed a distinct ereptic activity.

A. W. DOX

Insulin. III. Remarks on the measurement of insulin. KARL FREUDENBERG AND WILHELM DIRSCHERL. Univ. Heidelberg. *Z. physiol. Chem.* 180, 212–6(1929); cf. *C. A.* 22, 2206.—A discussion of the method described in the previous paper. The method is based on the decrease in blood sugar of a 2 kg. rabbit to the "convulsion limit," where the reducing power of the blood corresponds to 0.045% glucose. About 1/2 of this residual value, however, represents reducing substances other than sugar. β 's arbitrary unit is equiv. to 1.8 international standard units. Abel's cryst. insulin is believed to be a protein which carries the hormone as a prosthetic group. Removal or breakdown of the protein should give a more active but less stable hormone prepn.

IV. The action of pepsin on insulin and its acetyl derivatives. WILHELM DIRSCHERL. *Ibid* 217–31.—The "acetylinsulin," prepd. by treatment of insulin with Ac_2O and pyridine, and the "regenerate" obtained therefrom by subsequent treatment with dil. alkali (NaOH) and possessing 1/3 the original activity, were compared to insulin with respect to their behavior toward pepsin. The destruction of insulin by pepsin is irreversible, and is unmistakably a proteolysis, since the effect increases with rise in temp., amt. of enzyme and duration of the expt. The action is greater at p_{H} 1.8 than at 2.2 or 1.1. It is not yet known whether the inactivation is due to digestion of a protein-like adsorbent whose presence is necessary for insulin action or whether the insulin itself is a protein with or without a prosthetic group and undergoes peptic digestion. The regenerate of acetylinsulin, whether in suspension or in soln. obtained by acidifying the alk. soln., also becomes inactivated by pepsin. This acetyl deriv. is hardly comparable to that of Jensen and Geiling (*C. A.* 22, 4653), since a different insulin was employed and pyridine was used in the acetylation. Formal titration by the Sørensen method showed in the insulin prepn. a ratio of amino to total N of 10%, in the regenerate about half this value, and in the acetylinsulin no amino N. All 3 prepn. gave a final value of 18% amino to total N after peptic digestion. The initial and final values of the regenerate correspond to those of ovalbumin. At p_{H} 7 insulin is inactivated by CH_3O . By warming with 0.1 N HCl 25% of its original activity is then restored but the active portion ppts. out. Insulin itself behaves in a similar manner when heated with HCl. A portion of the substance seps. out in pellicles with great activity but slight stability.

A. W. Dox

Porphyryns. XVIII. The chemism of porphyrin formation from β -hemins. WILLIAM KÜSTER AND W. V. DEGENFELD. Tech. Hochschule Stuttgart. *Z. physiol. Chem.* 180, 259–69(1929); cf. *C. A.* 23, 844.—By adding HBr to hemin obtained from horse blood and decomg. the product with H_2O , 2 fractions were obtained. The portion sol. in H_2O was shown to be Nencki's hematoporphyrin which is strongly basic and goes into soln. as the HBr salt. The insol. portion was a less basic EtOH-sol. porphyrin evidently formed by hydrolysis of a HBr salt originally present. When the CHCl_3 sol. monoethylated β -hemin was treated in this way the yield of insol. porphyrin was 50%, whereas the unesterified CHCl_3 -insol. β -hemin yielded only 25%. Crude hemin contains 20% of the mono-Et deriv., and hence the yield of weakly basic porphyrin therefrom is 30%. Analysis gave values corresponding to a β -bromo- α,α' -dihydroxymesoporphyrin. This could result from addn. of 2 HBr to the acetylene and 1 HBr to the vinyl group, followed by replacement of 2 Br by OH. The feebly basic character of this porphyrin, identified as such by the formation of complex salts, is due to its Br content and the α -position of OH on the acetylene side chain. Its HCl salt is completely hydrolyzed by H_2O , but the removal of Br requires treatment with hot NaOH. The fact that both porphyrins, Nencki's hematoporphyrin and the mesoporphyrin deriv., are obtained from monoethylhemin would indicate that the latter is a mixt. of 2 isomers or else both forms are present in a double mol. Fleischmann's monoethylhemin (*C. A.* 22, 526) added only 2Cl; hence only 1 of the isomers could have been present in his prepn. Removal of Br from the unesterified hemin-HBr addn. product by H_2O instead of MeOH, both of the above porphyrins being obtained thereby, would indicate a partial liberation of the acetylene grouping during the hydrolysis. Replacement of the 2 Br by OH instead of OMe decreases the basic properties of the resulting mesoporphyrin deriv. and facilitates its sepn. from the hematoporphyrin. From the bromodihydroxymesoporphyrin the Cu, Zn and Fe complex salts were prepd., and by treatment with HBr-AcOH followed by digestion with MeOH, the di-Me ester of the expected dimethoxyporphyrin was obtained.

XIX. The chemism of porphyrin cleavage in substituted hemins and the constitution of hemin. WM. KÜSTER AND KARL SCHAYER. *Ibid* 270–85.—When dichlorodimethylhemin is boiled 12–5 hours with abs. MeOH, an insol. residue of 10% remains, and the filtrate on treatment with dil. NaOAc yields a ppt. of monochloromonomethoxydimethylhemin (I) from which the unchanged dichloro deriv. is removed by extrn. with pentane. Treatment of I with HBr-AcOH

followed by esterification with MeOH converts it into monochlorohematoporphyrin di-Me ether (II). From the latter the complex Zn salt is obtained as a red ppt. by addn. of $\text{Zn}(\text{OAc})_2$ to the MeOH soln., but when the mixt. is boiled the ppt. consists of the Zn salt of the Zn complex. The complex Cu salt is obtained by treating the porphyrin in AcOH with $\text{Cu}(\text{OAc})_2$, and the complex Fe chloride salt by warming in AcOH satd. with NaCl with $\text{Fe}(\text{OAc})_2$. The Me ester of I was prepd. by boiling with MeOH contg. 1% HCl and pptg. with NaOAc, and this yielded a Fe chloride complex analogous to the above. Oxidation of I in 30% H_2SO_4 with CrO_3 converted it into hematic acid, and methylchloromethoxyethylmaleic imide. A second product from the prepn. of II was sepd. from the MeOH-Et₂O soln. by addn. of H_2O . This contained Fe and both Cl and Br. It was given a 2nd HBr-AcOH treatment and the portion then sol. in MeOH and pptd. by H_2O was identified as chlorobromodimethoxymesoporphyrin. The esterification, however, was not complete since a MeO detn. indicated the presence of 25% of the mono-Me ether. The insol. portion still contained Fe and was evidently a hemin. If the removal of Fe and the addn. of HBr are parallel reactions, a linkage of the Fe to the acetylene grouping would explain this stability. Boiling 3 hrs. with 7% KOH in MeOH removed the Br completely, the Cl and Me only partially. A further treatment with HBr-AcOH gave only an insignificant yield of Et₂O-sol. porphyrin. The insol. residue obtained in the prepn. of I was not altered by further boiling with MeOH. The porphyrin cleavage yielded chlorobromodimethoxymesoporphyrin, identified by the prepn. of its ester. By treatment of I with AcOH-HBr, evapn. of the solvent and extrn. with 1% HBr, a complete sapon. of MeO was effected without loss of Cl and Br. Treatment of the insol. residue with 5% Na_2HPO_4 removed Br and yielded a Cl-substituted hematoporphyrin. It was esterified with MeOH and HCl, and complex Zn, Cu and Fe salts prepd. from the ester.

A. W. DOX

The preparation of protoporphyrin. A. HAMSÍK. Univ. Brünn. *Z. physiol. Chem.* 180, 308-18(1929).—In the prepn. of protoporphyrin by various methods the yield depends on the quality of the chlorohemin or hydroxyhemin employed. The α -preps. afford the best yield, while the β - and especially the pseudo-preps. give smaller yields and correspondingly greater amts. of by-product. The by-product, a red-green-brown porphyrin, has to be sepd. from the protoporphyrin. This may be done through the Na salt and by crystn. from pyridine- H_2O . The protoporphyrin is pptd. as the Na salt by concd. NaOH while the other porphyrin remains for the most part in soln. The latter is similar to the porphyrins obtained by the action of aq. HCl or concd. H_2SO_4 and probably contg. Nencki's altered hematoporphyrin. The most satisfactory method of prepg. protoporphyrin is that with HCO_2H and Fe powder, where a yield of 40% may be obtained. It is best to add first the Fe to the HCO_2H , then the hydroxyhemin, and heat for only a short time. Other methods, viz., $\text{AcOH} + \text{N}_2\text{H}_4\cdot\text{H}_2\text{O}$, $\text{HCO}_2\text{H} + \text{N}_2\text{H}_4\cdot\text{H}_2\text{O}$, $\text{EtOH} + \text{N}_2\text{H}_4\cdot\text{H}_2\text{O} + \text{HCl}$, $\text{MeAc} + \text{SnCl}_2 + \text{HCl}$, $\text{SnCl}_2 + \text{HCl}$ and $\text{SnCl}_2 + \text{AcOH} + \text{HCl}$, with various modifications in technique, are discussed, but these methods are less convenient and give poorer yields. Protoporphyrin is altered by treatment with acids or acids and reducing agents. The complex Sn salt in alk. or AcOH soln. becomes altered on standing in the air, with change of color and spectrum.

A. W. DOX

Investigations on the biological actions of light. ALBERT EIDINOW. Natl. Inst. Med. Research, Hampstead. *J. Roy. San. Inst.* 49, 431(1929).—Ultra-violet irradiation of the skin causes the shed defibrinated blood tested *in vitro* to have bactericidal properties.

A. L. E.

A new phospho-organic constituent of red blood corpuscles. S. POSTERNAK. *Compt. rend.* 187, 1165-7(1928).—From the blood of the horse P. believes he has isolated a new phospho-organic principle, which he believes to be an α -ketotrihydroxyadipic acid diphosphate; the positions of the phosphate groups have not been detd. The highest rotation observed is 8.88° , and after neutralization with AmOH it is 15.04° . Except for a certain soly. in satd. solns. of alk. earth salts, the properties of the compd. and of its salts resemble those of *l*-glyceric diphosphate. To hydrolyze completely the free acid about 100 hrs. at 125 - 130° in an autoclave is required. The compd. is perhaps an intermediate in the formation of lactic acid in the muscle and other tissues.

S. L. B. FETHERTON

The chemistry of hemoglobin. III. R. M. FERRY AND ARDA A. GREEN. Harvard Medical School. *J. Biol. Chem.* 81, 175-203(1929); cf. C. A. 18, 2536. An improved method for the prepn. of hemoglobin is described. This depends on repeated crystns. of oxyhemoglobin from a cold concd. soln. after complete oxygenation and adjustment of the p_{H} to a point slightly more acid than p_{H} 6.8. Buffered solns. of hemoglobin of given p_{H} were made by the addn. of water, phosphate or borate buffers, to-

gether with enough alkali to change the p_H of reduced hemoglobin to the same value. These solns. were equilibrated with known gas mixts. and analyzed by the methods of Van Slyke. O dissoen. curves were constructed from the data so obtained and show the familiar S-shape and the decrease of percentage satn. with increasing acidity up to p_H 6.55. At higher H-ion activities the percentage satn. again rises. The affinity of hemoglobin solns. for O passes through a min. between p_H 6 and 7, apparently at 6.55. It is impossible to describe these data in terms of the simple mass law equation. More variables than have been commonly used must be employed. The equil. between O and hemoglobin solns. may be described by means of a simple empirical equation of the form: $[Hb] [pO_2]/[HbO_2] = 0.5 [H^+] (\log \% HbO_2 - 2.015)/0.013 (7.4 \times 10^{-8} + [H^+])$. These exptl. findings may also be expressed in terms of equations in which it is assumed that hemoglobin behaves as though it were a mixt. of substances, each obeying the general form of the mass law equation, where n is an integer. These data are also described in terms of the theory of intermediate compd. formation by the equation: % satn. =

$$\frac{0.25 K'_1 O_2 + 0.5 \times 0.32 (K'_1 [O_2])^2 + 0.75 \times 0.256 (K'_1 [O_2])^3 + 2.7 (K'_1 [O_2])^4}{1 + K' [O_2] + 0.32 (K' [O_2])^2 + 0.256 (K' [O_2])^3 + 2.7 (K' [O_2])^4}$$

If the theory of intermediate compd. formation be assumed, the change in position of O dissoen. curves with changing p_H , over the range 6.55 to 8.88, may be explained on the assumption that the salt and acid forms of hemoglobin have different affinities for O. A theoretical expression of the form $K'_1 = \frac{K'_R K'_S + K'_a [H^+]^2}{[H^+]^2 + K'_R}$

will explain the phenomenon. Because of the large no. of assumptions involved, any theory that may at present be advanced must await further investigation for its verification.

ALBERT L. HENNE

Enzyme studies in the placenta. WEHEFRITZ AND E. GIERHAKKE. *Arch. Gynäkol.* 135, 212-22 (1928).—Placentas of different ages contain the enzyme arginase. The activity of the enzyme arginase in splitting a 2% soln. of arginine nitrate varied from 24.4 to 71.2%. No mutual relation could be made out between the intensity of action of the arginase and the age of the placenta. A further splitting of urea to CO_2 and NH_3 by the enzyme urease did not take place in the placenta. H. F. H.

The use of electrolysis in biochemistry. A. WERNER KEIL AND HANS G. SCHIECK. *Univ. Wurzburg. Z. Biol.* 88, 153-6 (1928).—Electrolysis of bile yielded crystals of glycocholic acid. With Liebig ext. not only the salts were sepd. by this procedure but also creatinine.

FRANCES KRASNOW

Photochemistry in the service of therapy and biology. IVAN PLOTNIKOV. *Archiv. Hom. Farm.* 3, 5-18 (18-19 French) (1929).—An address. JAROSLAV KUČERA

Physicochemical studies of bioluminescence. VI. The mechanism of luminescence in Cypridina luciferin and luciferase suggested. S. KANDA. *Sci. Papers Inst. Phys. and Chem. Res.* (Tokyo) 9, 265-9 (1928).—*Cypridina hilgendorffii* was crushed, the shells were removed, and the bodies extd. with petroleum ether and then with Et_2O . The dry residue was then extd. with MeOH (40 cc. per g. substance), to remove luciferin, and with H_2O (100 cc. per g. substance) to remove luciferase. When equal vols. of each ext. were mixed there was no development of light. Upon addn. of 10 cc. H_2O to the mixt., light was produced; and upon addn. of 35-40 cc. H_2O , the max. amount of light was noted. The production of light may be caused by a rearrangement of the surface films of solvent around the particles of luciferin and luciferase when water is added.

W. D. LANGLEY

Regarding certain observations of P. and G. P. Eggleton on phosphagen. V. SIRACUSA. *Boll. soc. ital. biol. sper.* 3, 834-41 (1928); cf. *C. A.* 22, 3421.—According to Eggleton the process of phosphagen formation in muscle is represented by the following scheme: (a) phosphagen \rightarrow lactic acid + phosphoric acid; (b) phosphoric acid + glycogen \rightarrow lactacidogen; (c) lactacidogen \rightarrow phosphagen. In the presence of NaF the phosphagen is diminished but there is not a corresponding increase in inorg. phosphoric acid. These results led Eggleton to make the statement "fluoride completely inhibits reaction (c) in our scheme." The purpose of this investigation was to det. whether the diminution of phosphagen by NaF was due to some inhibition of the process of synthesis or whether it was due to some interfering action in detg. the P by Briggs colorimetric method. The results obtained are briefly summarized: (1) In strong concns. of NaF $M/2.5$ to $M/5$, solus. of inorg. P are either not colored at all by the Briggs reagents in 30 min. or are colored less intensely than the corresponding standard contg. the same amt. of phosphate. The addn. of trichloroacetic acid intensifies the phenomenon. (2) In weak concns. 0.1 M to 0.01 M the intensity of color after

30 mins. was equal to the standard. (3) In concns. of NaF where the color in 30 mins. is equal to the standard, the appearance of the color is nevertheless markedly retarded. (4) If NaF is allowed to act for a sufficient time directly on the muscle, there is always a diminution of phosphagen and inorg. P. Conclusions: Eggleton's results have been confirmed but the action of NaF is not due to any inhibition of the synthetic process giving rise to phosphagen, but is due to some interfering action in Briggs colorimetric method for detg. P.

PETER MASUCCI

New studies on protein denaturation. I. Alcohol denaturation. MONA SPIEGEL-ADOLF. Univ. Wien. *Biochem. Z.* 204, 1-13(1929).—The conditions under which electrolyte-free serum or ovalbumin and pseudo-globulin are pptd. by alc. were investigated as well as the properties of the ppts. Unlike serum, pseudo-globulin pptd. by heat from aq. soln. regains its soly. in H₂O only partly following treatment with alkali. Even when strong alc. concns. are employed (88%) over a very long time (6 weeks) only 60-70% of the treated serum is insol. in water. But through treatment with definite amts. of alkali and then removing this through electrodialysis this fraction regains its water soly. and typical properties of serum. Under similar exptl. conditions the soly. in water of the alc.-pptd. ovalbumin is very slight under alkali treatment. Pseudo-globulin in this respect is intermediate between serum and ovalbumin. The presence of definite concns. of acid can double the quantity of the fraction of the serum which remains water sol. after alc. pptn. On the other hand, the presence of neutral salt in the alc. pptn. just as in the heat pptn. practically completely prevents the returns of water soly. on treatment with alkali of the alc.-pptd. serum. The similarity in the denaturation caused by alc. or by heat indicates certain changes in the protein mol.

S. MORGULIS

Physicochemical studies on radiated proteins. V. The alterations in serum under the influence of penetrating radium rays and their relation to heat and light coagulation. A. FERNAU AND M. SPIEGEL-ADOLF. Univ. Wien. *Biochem. Z.* 204, 14-27(1929).—The behavior of electrolyte-free serum and in the presence of acids alkali or neutral salt was studied under the influence of penetrating Ra rays. This was compared with the results obtained under the influence of higher temp. or of ultraviolet rays under similar conditions. Furthermore, the properties of these coagula were compared with those of coagula produced by H₂O₂. It was found that serum freshly electrodialyzed and preserved with toluene loses its ability of being pptd. by Ra radiation unless it is preserved in the ice box. NH₃ can be demonstrated in this serum in such amts. that, when added to freshly electrodialyzed serum it would deprive it of its ability to coagulate under the influence of Ra rays. It is also shown that to prevent the visible changes by Ra rays much smaller acid and alkali (NH₃, KOH) quantities are required than for heat coagulation. Furthermore, Ra rays, unlike the heat, cause almost complete denaturation of the serum even when through addn. of HCl no visible changes are produced by the rays. The time required for coagulation by Ra rays is very largely independent of the concn. of the serum soln. except in the very concd. solns. The pptn. can be prevented through increased concn. of neutral salt. Contrary to the pptn. products formed by heat and in agreement with the coagula of serum produced by light the coagula formed by the Ra rays do not regain their soly. in water through treatment with alkali. The ppts. formed when serum is acted upon by electrolyte-free H₂O₂ show the same behavior as those formed by Ra rays upon treatment with alkali.

S. MORGULIS

A new titration method for studying lipase. LAJOS GÓZONY, JÁNOS GSELL AND FERENCZ HOFFENREICH. Königl. ungar. Pázmány-Péter-Univ., Budapest. *Biochem. Z.* 204, 126-39(1929).—When an aq. soln. of butyric acid is added to serum fatty acids are set free through lipase action which cause the pptn. of casein dissolved in NaOH at p_H 5.6. The amt. of ppt. or of turbidity depends upon the quantity of casein which becomes insol. A series of 10 tubes is prepd. contg. serum in dilns. of 1:2, 4, 8, 16, 32, 64, 128, 256, 512 and 1024, and to these a soln. of casein is added, the reaction of which had been previously adjusted to p_H 5.6. Ca stimulates the lipase reaction but in the concn. found in serum the effect is slight. PO₄ and K are somewhat inhibitory while CO₂ inhibits the reaction strongly. Serum increases greatly the serum lipase action but ovalbumin inhibits this. Also the amino acids, asparagine and glycocoll. have a strong stimulating effect. Urea at first stimulates and then depresses the lipase reaction. Glucose has no action. Lecithin inhibits even when it is not much increased while cholesterol even in very minute quantities stimulates. MnSO₄ stimulates the lipase reaction very little but CaCl₂ may double the effect while Na taurocholate causes strong inhibition. An exposure of serum to a temp. of 45° for 1/2 hr. has practically no effect on the lipase; at 50° only rat serum showed considerable loss of lipase activity;

at 56° rat and human sera lose their lipase activity while at 59° all sera lipases become inactivated. KCN in a 0.1% soln. has no effect while in a 1% soln. it causes serious damage to the serum lipase; quinine inhibits the lipase action markedly even in 0.1% concn.; NaF inhibits in a 0.2% concn. while atoxyl is the strongest lipase poison, even a 0.02% soln. causing complete inactivation.

S. MORGULIS

Stereochemical specificity of liver and pancreatic lipase. HANS H. WEBER AND R. AMMON. Univ. Berlin. *Biochem. Z.* 204, 197-207(1929).—The dissocn. const. of the combination of liver lipase with *d*-mandelic acid methyl ester is $10^{-3.76}$ and with the *l*-ester $10^{-2.9}$. The ratio of the hydrolysis const. of both combinations is 1:1.75. The dissocn. const. of the same combinations with pancreatic lipase are similar, $10^{-1.8}$, and the ratio between the hydrolysis const. is 1:1.7.

S. MORGULIS

The independence of its ionization of the hydration of protein. HANS H. WEBER AND D. NACHMANN-SOHN. Univ. Berlin. *Biochem. Z.* 204, 214-52(1929).—The "non-dissolving space" of ionized or electrically neutral protein may under certain circumstances be a measure of the hydration vols. of both systems. This "non-dissolving space" is entirely independent of the degree of ionization of the protein and is always 1 cc. per g. albumin and 1.3 cc. per g. globulin. Simultaneous detns. of osmotic pressure and viscosity in the same series show the remarkable dependence of these upon the ionization (pH). If a viscosity curve of an albumin prepn. is construed under conditions permitting the calcn. of the albumin vol. as a disperse phase, it is found that 1 g. albumin has a viscosity vol. which increases from 2.0 cc. at the isoelec. point to 15 cc. at the max. acid swelling. This extraordinary rise in the viscosity vol. with ionization and the corresponding change in osmotic pressure must depend upon the taking of H_2O in accordance with the Donnan law. The ionization of different proteins and amino acids does not produce a contraction of vol., as might be expected where there is a considerable rise in hydration, but a vol. expansion. In ionization with an equiv. of acid this is 7-9 cc. or in ionization with alkali 16-22 cc. according to the nature of the ampholyte. When the ionized ampholyte is again changed to the unionized state through neutralization of the acid or alkali the vol. expansion for one cycle becomes 22 cc., which under the special exptl. conditions corresponds to the formation of one mol. H_2O from H and OH ions. If the heat production in the ionization of protein is regarded, as would seem probable, as the heat liberated in the chem. reaction of ionization, there is no excess heat left to account for hydration heat assocd. with ionization. But according to Katz the hydration heat serves as a measure of the hydration energy in lyophile colloids. If, on the other hand, all the ionization heat is considered as hydration heat, the increase in hydration energy due to ionization is only 3% of the hydration energy of electrically neutral protein even where the ionization is maximal. The measurements do not sustain the assumption of a specific connection between protein hydration and ionization.

S. MORGULIS

The effect of ptyalin on starch. I. J. R. BROEZE. Reichsuniv., Leiden. *Biochem. Z.* 204, 286-302(1929).—The hydrolysis of starch by saliva has been studied by measuring the changes in the viscosity which gives very good results. The velocity of the hydrolysis is proportional to the concn. of the enzyme. The enzyme does not decrease under the influence of the starch. The temp. coeff. of the reaction velocity between 20° and 30° is 2. The heated enzyme cannot be regenerated.

S. M.

The influence of carbon monoxide and hydrogen cyanide on hematin catalysis. HANS A. KREHS. Kaiser Wilhelm-Inst., Berlin-Dahlem. *Biochem. Z.* 204, 322-42 (1929), cf. *C. A.* 23, 1655.—Hemin compds. show the same characteristic properties as the respiratory enzyme, and of these the pyridine compd. of hematin comes closest to the latter from the point of view of behavior toward CO or HCN. At 20° 1 mg. Fe of this compd. transfers 100,000 cu. mm. O_2 per hr. to cysteine, and the tervalent Fe of pyridine hematin is reduced to pyridine-hemochromogen while the bivalent Fe of the hemochromogen is again reoxidized by mol. O_2 . The tervalent Fe of pyridine-hematin does not react at all or reacts very slowly with the H_2 of the SH-groups of cysteine, this substance not being markedly oxidized. Such marked oxidation is observed only when the soln. contains an Fe compd. of cysteine. This is demonstrated schematically $(Fe^{+3})_H + (Fe^{+2})_C \rightarrow (Fe^{+2})_H + (Fe^{+3})_C$, where $(Fe)_C$ and $(Fe)_H$ designate ferrocytosteine and hematin, resp. The catalysis of this reaction is reversibly inhibited by CO, being produced by light. In the dark, the CO combines with the Fe^{+2} of hemochromogen and prevents its reaction with O_2 . Under the influence of light the CO-hemochromogen again dissociates into its components, this response to light being of the same magnitude as that of the respiratory enzyme. HCN similarly inhibits reversibly the catalysis of both. The HCN compd. is not reduced by ferrocytosteine to which factor the inhibition of catalysis is attributed. The mechanism of the 2 reactions

is thus entirely different, CO reacts with Fe^{++} of hemochromogen and HCN with Fe of higher valence. Although pyridine-hematin catalysis and respiration of living cells both show the same behavior towards CO and HCN the hematin catalysis cannot be inhibited by H_2S as respiration is.

S. MORGULIS

The action in the dark of fluorescent dyes on diastase. G. CLAUS. *Tech. Hochschule, München. Biochem. Z.* 204, 456-66(1929).—Seeds treated with eosin upon germination give rootlets with an abnormal geotropic growth and with a stronger diastase action than normal rootlets. Dyes of the fluorescein series or phenosafranine added to a starch-diastase mixt. cause an acceleration of the starch hydrolysis. Eosin and phenosafranine give 2 to 3; rose bengal, phloxin and erythrosin give about 2 times as much sugar formation as normally present. This acceleration is found only outside the opt. p_{H} range. Dilns. still effective were 1:1000 for erythrosin and 1:400,000 for eosin. This accelerating effect fails to appear when pure enzyme preps. are employed (Merck's diastase abs. and Maltin). These dyes produce a similar influence on the salivary diastase but with takadiastase the results are neg.

S. M.

Two cholesterol reactions. E. BAHL. *Univ. Königsberg i. Pr. Biochem. Z.* 204, 474(1929).—An acetic acid (glacial) soln. of benzidine gives a yellow-brown color with cholesterol. A soln. of rosaniline in CHCl_3 which is a light rose color becomes intensely red with cholesterol.

S. MORGULIS

The enzymic formation of l-malonic from fumaric acid. NILS ALWALL. *Univ. Lund. Skand. Arch. Physiol.* 55, 91-3(1929).—The enzymic formation of l-malonic acid from fumaric acid under the influence of muscle fumarase has been studied polarimetrically.

S. MORGULIS

Thermolability of glycerinophosphodehydrogenase. NILS ALWALL. *Univ. Lund. Skand. Arch. Physiol.* 55, 100-3(1929).—The glycerinophosphodehydrogenase has the same thermolability as succinodehydrogenase, so that these 2 enzymes cannot be thus differentiated.

S. MORGULIS

Globin and denatured globin. HENRY F. HOLDEN AND MAVIS FREEMAN. *Walter and Eliza Hall Inst. Australian J. Exptl. Biol. Med. Sci.* 5, [3], 213-22(1928). The chem. equiv. of globin is the same as that of globin in natural oxyhemoglobin. The sp. rotations of horse and of ox globins differ from those of the corresponding denatured globins. Denatured globin freshly prepd. by the Schultz method often contained a small amt. of globin. The combination between denatured globin and reduced hematin is discussed.

L. W. RIGGS

Affinity problems. V. HANS VON EULER AND RAGNAR NILSSON. *Arkiv kem. Mineral Geol.* 10A, No. 4, 7 pp.; cf. *C. A.* 22, 789.—The properties of enzymes depend on their degree of sepn. from the natural substrate. Dried bottom yeast invertase is partially removable by thorough washing. Phenol poisoning expts. were undertaken with a yeast prepn. freed from the fraction removable by washing. In one case this yeast prepn. was treated with phenol and then freed from phenol before cane sugar inversion; in a second expt. inversion took place in the presence of phenol. The inversion const. decreased by 16 and 17.5%, resp., indicating an irreversible reaction of phenol with substrate. Phenol decreased the inversion const. of a sol. invertase prepn. 18.6%. The inhibition of the action of mutase on acetaldehyde by phenol in various concns is shown.

F. U

Separation of the soluble proteins of rabbit muscle. WALTER S. RITCHIE AND ALBERT G. HOGAN. *Univ. of Missouri. J. Am. Chem. Soc.* 51, 880-6(1929).—A 10% soln. of NaCl has been used to ext. the sol. proteins of muscle tissue. If the ext. is kept near the f. p. the soly. of the proteins changes very slowly. When the ext. is satd. with NaCl, irradiated with a quartz Hg arc or dialyzed, a portion is pptd., to approx. the same extent by each method. It is assumed that this ppt. is a globulin fraction. The results indicate that this ext. contains about 2.5 times as much globulin as albumin.

C. J. WEST

The influence of Röntgen rays on the nitrogen and chlorine metabolism. ANNA JUGENBERG. *Vestnik rentgenol. i radiol.* 4, 291-304(1926); *Ber. ges. Physiol. exptl. Pharmakol.* 46, 159.—Guinea pigs (56) were irradiated (Coolidge tube) at a distance of 40 cm. with 200 kv., 3 milliamp. and through 0.5 Zn + 3.0 Al filter. The dose was $\frac{1}{2}$ H. E. D. for 36 animals while 12 received $\frac{1}{10}$ H. E. D. From 10 to 12 days after the irradiation 33 of the animals that had received $\frac{1}{2}$ H. E. D. showed signs of hemorrhagic pneumonia, pericarditis, pleurisy and gastric ulcer. The animals which had received $\frac{1}{10}$ H. E. D. stood the dose well. The body wt., amt. of nourishment and amt. of urine and feces were recorded in each instance. N was detd. according to Kjeldahl and NaCl according to Volhard. In the animals which had received $\frac{1}{2}$ H. E. D. there was a decided reduction in the N elimination. Further testing showed that the

N retention occurred chiefly in the internal organs, as the liver, spleen, kidneys and cardiac muscle. The N content of the blood (after $1\frac{1}{2}$ H. E. D.) was less than in unirradiated animals. On the other hand, the N content of the animals receiving $1\frac{1}{10}$ H. E. D. was larger than that of the controls (not irradiated). After $1\frac{1}{10}$ H. E. D. the N content in the organs was larger than normal also. Increased diuresis with high NaCl values in the urine followed $1\frac{1}{2}$ H. E. D. The N retention was highest in the liver. The body wt. decreased some.

R. C. WILLSON

Photochemistry of Fe carbonyl compounds and the absolute absorption spectrum of respiration enzyme (WARBURG) 3. Studies in the qualitative reaction of proteins. III. Study of the ionic series (OGATA) 2. Thermodynamic activity and biologic action. The disinfectant power of the Hg ion and its activity (BENEDICENTI, BONINO) 2. The geochemistry of I (LUNDE) 8. Oxime rearrangements in the group of bile acids (SCHENCK) 10. Rate of hydrolysis of casein in acid solutions as measured by the formation of amino N (NASSET, GREENBERG) 10.

Handbook der gesamten Strahlenheilkunde, Biologie, Pathologie und Therapie. Vol. I. Munich: J. F. Bergman. Edited by Paul Lazarus. 825 pp. M. 28. Reviewed in *Brit. J. Actinotherapy* 3, 230(1929).

COLE, S. W.: *Practical Physiological Chemistry*. Cambridge, Eng.: W. Heffer & Sons, Ltd. 8th ed., revised and enlarged. 16s. net.

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B—METHODS AND APPARATUS

STANLEY R. BENEDICT

Histological use of formaldehyde as a preservative. J. MILLOT AND A. GIBERTON. *Compt. rend. soc. biol.* 97, 1674-5(1928).—Formaldehyde does not inhibit changes in fat, which take place after 3 weeks, with disappearance of lipins and production of fatty acids. The rapidity of the change varies with the origin; fish liver changes most rapidly. The decompn. is attributed to a lipase which is active in the presence of formaldehyde, and is more rapid at 35-40° than at the ordinary temp.

B. C. A.

Determination of iron (in organic substances). G. DOMINICI. *Folia Clinica* 3, 65-82(1928).—A critical review of the methods for detg. Fe in blood, urine, etc. The most satisfactory method with regard to rapidity and accuracy of results is considered to be the colorimetric method using thiocyanate.

B. C. A.

Detection of sugar in urine. J. SCHMID AND E. GLORIUS. *Süddeut. Apoth.-Ztg.* 68, 98-9(1928).—In Schmidt and Rubner's reaction the mixt. of urine, NH_3 and Pb acetate is preferably heated at 85° at one point, or immersed in water at 40-50°, when the development of a salmon-pink color will detect 0.05%; under these conditions lactose does not react similarly.

B. C. A.

An improved method of preparing urea from urine. S. KANNEGIETER. *Univ. Amsterdam. Pharm. Weekblad* 66, 129-31(1929).—Add 2-3 g. of norite per 100 cc. of urine and filter after 5 min. This treatment completely removes all color and odor. Evap. the filtrate on the water bath to a sirupy consistency (about $\frac{1}{6}$ the original vol.) and cool in ice water. While still cooling add an excess of concd. HNO_3 with stirring. Filter off the crystals of urea nitrate through asbestos and press between filter papers. Mix the urea nitrate with an excess of BaCO_3 and add EtOH until a pasty mass is formed. Treat this with warm EtOH and filter off the $\text{Ba}(\text{NO}_3)_2$ and excess of BaCO_3 . Evap. the filtrate to crystn. The urea thus obtained is colorless and odorless. The use of norite not only eliminates the unpleasant odor evolved when urine is evapd. directly, but also increases the yield of urea by removing org. substances which reduce HNO_3 to HNO_2 , which in turn decomp. the urea.

A. W. DOX

New technic of the colorimetric resorcinol-hydrochloric acid microchemical method of blood-sugar determination and comparison of the same with the Hagedorn-Jensen method. B. GLASSMAN AND MME. A. ZWILLING. *Z. physiol. Chem.* 180, 124-6(1929); cf. C. 1, 20, 437; 21, 751.—By the following modification the method is adapted to sugar detn. by color comparison at ordinary temp. instead of 60°, using the Duboscq colorimeter. Place 0.1 cc. of the blood or serum on a piece of blotting paper, allow the latter to dry 10-5 mins. in the air and insert in a test tube. Add 5 cc. of aldehyde-free EtOH and allow 15 mins. for extn. Transfer the alc. sugar soln. to a 2nd test tube, rinsing the paper with 2 cc. EtOH. Evap. the EtOH by immersing the tube in a boiling water bath.

To the residue add 2 cc. of 1% resorcinol and 4 cc. of 25% HCl, heat 1 hr. in a boiling water bath, filter hot into a 3rd test tube bearing a 6 cc. mark, cool, dil. to the mark if necessary and add 5 cc. EtOH. The EtOH redissolves any resorcinol-sugar condensation product that may sep. The standard soln. for color comparison is prepd. from 0.1 cc. of 0.1% glucose, 2 cc. resorcinol soln. and 4 cc. HCl by the same treatment, dild. to the 6 cc. mark and 5 cc. EtOH added. The difference between the 2 colorimeter readings, a and b , added to the higher reading, a , gives the corresponding sugar value in mm. of the colorimeter. The % of sugar, x , is then calcd. by the inverse ratio: $a + (a - b) : b = x : 0.1$. A no. of detns. by this method agreed with parallel detns. by the Hagedorn-Jensen method within the permissible limits of error. A. W. DOX

The occurrence of methylguanidine in the animal organism. I. Detection of methylguanidine in the muscles of a dog. I. A. SMORODINTZEV AND A. N. ADOVA. Univ. Moscow. *Z. physiol. Chem.* **180**, 192-7(1929).—Methylguanidine had previously been isolated by S. from muscle exts. of various animals by the $\text{AgNO}_3\text{-Ba(OH)}_2$ pptn. method. Ewins (*C. A.* **10**, 1872) subsequently questioned the reliability of this method and pointed out the fact that warming with Ba(OH)_2 hydrolyzes creatinine into methylguanidine. To meet this objection S. undertook the isolation of methylguanidine from dog muscle by another method in which the possibility of creatinine cleavage is largely obviated. The concd. ext. of muscle was treated with HgCl_2 and NaOAc and the ppt. decompd. by HCl and H_2S . The filtrate from the HgS was evapd., extd. with MeOH, evapd. and this treatment repeated several times with EtOH. The final ext. was pptd. with PtCl_4 , the Pt removed by H_2S and the base pptd. from the filtrate by picric acid. Fractional crystn. of the picrate yielded pure methylguanidine picrate, corresponding to 0.06% of the base from the fresh muscle. This is practically the same yield as that previously obtained by the Ag-Ba method. Direct pptn. from the alc. ext. by picric acid without the Pt pptn. diminishes the yield to $\frac{1}{3}$. A. W. D

The histochemical detection of adrenaline. S. BAGINSKI. *Bull. histol. tech. micr.* **5**, 129(1928); *Stain Tech.* **4**, 29.—The reagent-fixative soln. consists of the following: 2% $(\text{NH}_4)_2\text{CrO}_4$, 30 cc.; 1.25% AgNO_3 , 20 cc. and NH_3 (sp. gr. 0.912), 0.2-0.3 cc. Natural adrenaline, 0.1 p.p.m., when treated with this reagent gives a fine black ppt. C. R. F.

The use of mixed stains in histological technic. EMILIE HOUCKE. *Rev. Hyg. med. prev.* **51**, 154-60(1923).—Formulas are given for several stains. A mixt. of 1:100 aq. solns. of acid fuchsin and toluidine blue in the ratio of 5:11, or acid fuchsin and methylene blue in the ratio of 14:22, makes very good histological stains. C. R. F.

The atmospheric oxidation or dealkylation, of aqueous solutions of methylene blue. W. C. HOLMES AND E. F. SNYDER. U. S. Dept. Agr. *Stain Tech.* **4**, 7-10 (1929).—At approx. 25°, dil. aq. solns. of representative samples of methylene blue are stable below p_{H} 9.5. Oxidation, or dealkylation, begins between p_{H} 9.5 and 9.8 and increases in both rate and degree with increasing alky. Below p_{H} 11 the rate is slow and the total oxidation relatively limited. At p_{H} 12, however, oxidation is rapid and goes to practical completion in a few days. Trimethylthionine is decidedly less stable to atm. oxidation than is methylene blue and undergoes appreciable dealkylation at moderate alkalinities which do not affect the latter dye. C. R. F.

Elastic tissue staining. R. W. FRENCH. Army Med. Museum, Wash. *Stain Tech.* **4**, 11-12(1929).—The addn. of dextrin to samples of crystal violet and basic fuchsin employed in the prepn. of the elastic tissue stain using the Weigert technic insures better results. Crystal violet alone affords a bright greenish yellow elastin while the addn. of basic fuchsin gives a darker stain shading into dark blue as the proportion of basic fuchsin is increased. C. R. F.

Double staining of mitochondria and bacteria in plant tissues. J. DUFRENOY. Station centrale de phytopath. parasitologie, Paris. *Stain Tech.* **4**, 13(1929).—A technic is given for differential staining of mitochondria and bacteria in the root nodules of legumes. C. R. F.

The determination of the digestibility of protein by Bergeim's method. WILLIS D. GALLUP. Okla. Agr. Expt. Sta., Stillwater. *J. Biol. Chem.* **81**, 321-4(1929); cf. *C. A.* **22**, 800.—Silica may be substituted for the Fe_2O_3 used in Bergeim's method for detg. the digestibility of protein. ARTHUR GROLLMAN

A microchemical method for the estimation of total creatinine in muscle. SEVERO OCHOA AND JOSÉ G. VALDECASAS. Univ. of Madrid, Spain. *J. Biol. Chem.* **81**, 381-7(1929); cf. *C. A.* **22**, 3899.—A method is described for the estm. of total creatinine in quantities as small as 5 to 100 mg. of muscle. The muscle creatine is extd. and converted into creatinine by HCl in the autoclave. The proteins are pptd. by picric acid

and the creatinine is estd. colorimetrically in the filtrate by Folin's method. The accuracy of the method is 0.5 to 2%.

ARTHUR GROLLMAN

The determination of copper in biological materials. C. A. ELVEHJEM AND W. C. LINDOW. Univ. of Wis. *J. Biol. Chem.* **81**, 435-43(1929).—The method of Biazzo (*C.* **1**, 20, 2029) was modified for the detn. of Cu in biological material. Samples contg. as little as 0.02 mg. of Cu can be analyzed with accuracy.

ARTHUR GROLLMAN

Electrolytic determination of lead in urine. T. COOKSEY AND S. G. WALTON. *Analyst* **54**, 97-9(1929).—By titration with methyl red as indicator, det. the acidity of the urine and calc. how much AcOH must be added to 500 cc. to make it contain the equiv. of 3 g. of AcOH. Electrolyze with 0.3-0.4 amp., using a Pt cone as cathode and a Pt spiral as anode. A narrow beaker about 11 cm. high and 500 cc. content is recommended. When the electrolysis is finished (16-17 hrs.) a small quantity of phosphate is sometimes found adhering to the cathode. Carefully remove the beaker contg. the urine while the current is still passing and replace with a similar beaker contg. 250 cc. of water and 1 cc. of concd. HCl. Electrolyze for 2 hrs. longer. Then all the phosphate will have disappeared from the cathode. Next electrolyze half an hr. with 250 cc. of pure water as electrolyte. Wash the cathode with alc., dry and dissolve off the deposit with 4 cc. of hot HNO₃. Rinse with 10 cc. of 1.5 N HNO₃ and with 5 cc. of hot water. Evap. on the water bath to dryness, add 1 cc. of concd. HCl and again evap. to dryness. Warm the residue with 3 drops of HCl and a few drops of water, add 4 cc. of water to the soln. and heat on the water bath to make sure that the PbCl₂ is all dissolved. Transfer to a graduated cylinder and make up to 6 cc. Mix and pour out 3 cc. into a small test tube. Into similar comparison tubes, introduce standard Pb soln. in quantities representing 0.000, 0.005, 0.010, 0.015, 0.020, 0.025 and 0.030 mg. of Pb together with HCl and water as in the test, making 3 cc. in each case. Add to each tube 2 cc. of freshly prepd. K₂S₂O₈ soln., mix, allow to stand 1-2 hrs. and compare the turbidities. Normal urine analyzed by this method contains 0.4 mg. of Pb per l.

W. T. H.

A single electrometric comparator for the determination of hydrogen-ion concentrations. C. G. POPE. *Brit. J. Exptl. Path.* **9**, 225-31(1928).—A simple app. for the electrometric detn. of p_H is described, in which the e. m. f. to be measured is applied to a condenser which is subsequently discharged through a ballistic galvanometer. For a given temp. a scale giving direct readings of p_H values may be constructed, or for more accurate work the scale may be calibrated to read directly in millivolts. With the app. p_H values may be detd. with an error of 0.02 p_H unit or less on material unsuitable for colorimetric methods, the time required being less than that of the colorimetric method. The app. is suitable for use with electrode systems of high internal resistance, e. g. for detg. the p_H of solns. of low electrolyte content. Attempts to use glass electrodes with this app. have, however, proved unsuccessful because of their extremely high internal resistance (50,000,000-100,000,000 ohms). A simple form of quinhydrone electrode is described.

HARRIET F. HOLMES

Detection and determination of oxygen in the lungs and intestinal gases of the cadaver and its application to the forensic determination of breathing in the new-born. F. DYRENFURTH. Univ. Berlin. *Deut. Z. ges. ger. Med.* **12**, 23-9(1928).—Gas app. is described for O detn. by means of NaHSO₃.

FRANCES KRASNOW

Increase in the intensity of the benzidine reaction. FRITZ SCHWARZ. *Deut. Z. ges. ger. Med.* **12**, 216-8(1928).—Addn. of quinoline to the ordinary benzidine reagent for blood testing greatly intensified the reaction.

FRANCES KRASNOW

A simple device for the recognition of carbon monoxide blood. W. SCHWARZACHER. Univ. Heidelberg. *Deut. Z. ges. ger. Med.* **12**, 510-4(1928).—There are 3 tubes contg., resp. CO blood dild. 1-200 with water, normal blood, and an 0.2% Cu NH₄ sulfate. These are arranged so that the CO-blood is superimposed upon the Cu soln. (blue against a light background) with the control blood at the left (yellow against a light background). If observed so that the control blood is superimposed upon the Cu soln., it appears green and the CO-blood directly to the right of it is red.

FRANCES KRASNOW

A microchemical modification of the Keith-Rowntree plasma-dye method for the estimation of blood volume in the rat. GEORGE F. CARTLAND AND F. C. KOCH. Univ. Chicago. *Am. J. Physiol.* **85**, 540-5(1928).—This is a modification of the plasma dye method of Keith, Rowntree and Geraghty (*C. A.* **9**, 3261) for the extn. of blood vol., applicable to the white rat, and capable of repeated use on the same animal with an error not to exceed 4%.

J. F. LYMAN

Biochemical studies on the occurrence of small quantities of iodine and fluorine in organisms. V. A. MAYRHOFER AND A. WASITZKY. Univ. Wien. *Biochem. Z.* **204**, 62-77(1929).—Various important methods for the analysis of small quantities

of I, or F have been tested. For the detn. of small quantities of F an etching method is described.

S. MORGULIS

The separation and determination of blood components through the use of selective adsorption. B. SJOLLEMA AND A. EMMERIE. Lab. Veterinärchem., Reichsuniv., Utrecht. *Biochem. Z.* 204, 275-85(1929).—Two adsorbents (carbon from purest sugar and $\text{Al}(\text{OH})_3$) were prepd. entirely free from S, N or P, by means of which certain components of the blood could be sepd. Both thiasine and glutathione can be detd in blood filtrate by this procedure.

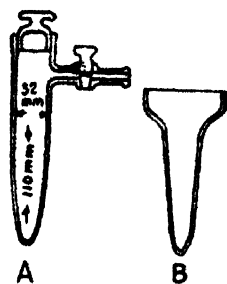
S. MORGULIS

A method for the preparation of chondroitinsulfuric acid. E. JORPES. Karolinsches Inst., Stockholm. *Biochem. Z.* 204, 354-60(1929).—The substance was prepd from the tracheal cartilages, carefully freed from connective tissue and preserved in alc.; they were cut in thin slices, and after drying in the air were ground to a fine powder. The best conditions for extn. of the chondroitinsulfuric acid from the mucoid was a 2% NaOH soln. acting 8-10 hrs. at 3°. To remove the protein the ext. was neutralized and slightly acidified with AcOH, then mixed with kaolin to a thick mass and filtered in the cold. The filtrate was biuret neg. On adding 2 vols. alc. a biuret-free Ca-Na salt of chondroitinsulfuric acid pptd. out. This method yielded about 50 g. of air-dry substance contg. about 4.5% S. To facilitate, however, the pptn. with alc. Jorpes recommends a preliminary extn. in the cold by shaking 1 kg. dry cartilage powder with 10 l. 10% NaCl for 12 hrs. To this enough AcOH is added to give a 1-1½% soln., which is filtered, treated with kaolin and once more filtered. This was pptd. with 2 vols. alc. The material was now reextd. with 1-2% NaOH, and after acidifying with AcOH to about 1-1½% the ext. was again mixed with kaolin and then filtered. The filtrate thus obtained was finally pptd. with 2 vols. alc. In 3 preps. the S:N ratio ranged from 1.5 to 1.95, probably because of some admixt. of protein. Although this method does not yield pure preps. they are distinctly better than previous preps. S. M.

The method for catalase determination in barley and malt. I. M. O. CHARMANDARIAN. Agr. Expt. Inst., Charkow. *Biochem. Z.* 204, 389-96(1929).—Protracted extn. diminishes the ability of the malt to decomp. H_2O_2 . This is not assocd with a change in the H-ion concn. of the medium. It is suggested that the increased or diminished enzyme activity is due to changes in colloidal dispersion. S. MORGULIS

A new characteristic color reaction for thymonucleic acid. ZACHARIAS DISCHE. Physiol. Inst., Univ. Wien. *Biochem. Z.* 204, 431-2(1929).—When to a 0.25% soln of thymonucleic acid enough HCl is added to make its concn. 0.5%, then 0.1-0.2 cc 1% alc. and the mixt. is heated in the boiling water bath 5 min. it acquires an intense orange coloration. On cooling the soln. becomes turbid, and on shaking with CHCl_3 it assumes a yellow-brown color. If a weaker HCl is employed (0.1%) the time of heating must be prolonged (15 min.). The color reaction cannot be obtained with plant nucleic acid and is apparently due to the carbohydrate component. S. MORGULIS

Ultrafiltration as a method for the determination of amino nitrogen and non-protein nitrogen in blood. B. A. VILENSKII. Biochem. Inst., Moscow. *Biochem. Z.* 204, 430-8(1929).—The app. used for the ultrafiltration consists of 2 glass tubes, of which A is provided



with a side armature for evacuation and is made of porous glass. It is covered with a layer of 4% ether-alc. soln. of collodion. The tube A is fitted into tube B which has the capacity of about 20 cc. At a vacuum of 15 mm. Hg within tube A 1 cc. of protein free filtrate can be obtained per min. from blood or plasma dild 1:10. The ultrafiltration of undild. plasma is also possible, but of course it is not so rapid. Very good results were obtained in the analysis of NH_3 , N or non-protein N. The tubes are made by the Ernst Leitz Firm.

S. MORGULIS

A method for determining the respiration of bacteria, tissue cultures and surviving cells. F. SILBERSTEIN AND F. RAPPAPORT. Inst. für Pathol., Univ. Wien. *Biochem. Z.* 204, 439-47(1929).—The method presents 2 essential features: The micro-organisms or cells are cultured in a soln. of hemoglobin which acts both as a plentiful source of O_2 and as an efficient buffer for absorbing CO_2 ; the change in CO_2 and O_2 of the solns. is detd. by means of gas analysis by Van Slyke's const.-vol. app. The hemoglobin soln. is prepd. from blood drawn aseptically into Na citrate and quickly centrifuged. The cells are washed with a NaCl-Na citrate soln. and hemolyzed through freezing with CO_2 snow and thawing off which is done twice, and the stromata are removed by centrifuging. The clear hemoglobin soln. so obtained is tested for sterility and should not change its CO_2 and O_2 content. Expts. were made with a pure culture of cholera vibrios, and a corresponding correction is introduced. The amt. of O_2 used

up or of CO_2 produced in the same time and under the same exptl. conditions by the same quantity of bacteria is independent of the amt. of hemoglobin soln. used provided the initial quantity is sufficient to supply the needs of the organisms. Likewise, similar results are obtained with variable amts. of living cells. Furthermore, the O_2 utilization and CO_2 production are proportional to the length of the exptl. time. S. M.

Preparation of silver salts of hexose-monophosphoric ester. FRITZ WEINMANN. Kaiser Wilhelm Inst. Berlin-Dahlem. *Biochem. Z.* 204, 493-4(1929).—Twenty g. of the Ba salt of carefully prep'd. hexose-monophosphate are dissolved in 50 cc. H_2O and treated with 12.47 g. $\text{MgSO}_4 \cdot 7\text{H}_2\text{O}$. The pptd. BaSO_4 is centrifuged off, and the soln., which must be free from Ba or SO_4 ions, cooled to the temp. of ice is mixed with an ice cold soln. of 20 g. AgNO_3 in 50 cc. H_2O and at once filtered. This is now poured with const. stirring into 4 vols. of abs. alc. when the Ag salt ppts. The ppt. is freed of all water with abs. alc. and is dried in an amber-colored vacuum desiccator over P_2O_5 and NaOH. The salt is easily sol. in H_2O , and is not affected by light. S. M.

Determination of value of thyroid preparations. J. R. MØRCH. *Dansk. Tids. Farm.* 2, 281-306(1928).—A standard method for the detn. of the value of thyroid preps. has been worked out on the basis of expts. on the CO_2 production on white mice, partly on normal conditions and partly on administration of glandula thyroidea sec. The optimal conditions found were: temp., 23° ; exptl. period, 24 hrs.; the standard diet was a mixt. of crushed barley, corn and milk powder. A table is given showing the accuracy of CO_2 production under these conditions. The CO_2 production changes with the weight of the animal and often changes during exptl. time. From the results obtained it was found that the CO_2 production increases proportionally to the area of the surface of the animal when the mouse gains weight, but decreases proportionally to the wt. of the animal when the mouse is losing wt. A table is given showing the area of mice weighing from 15 to 22 g. Feeding the same daily dose of glandula thyroidea to white mice causes an increase of the CO_2 production which reaches its max. at the earliest in 10 days (large dose) and the least in 3 weeks; to any given daily dose corresponds a definite increase in metabolism; when the increase maximal for the dose given is attained this level is maintained as long as the thyroid feeding is continued. To det. the metabolism increasing effect it is only necessary to est. the CO_2 production before the thyroid feeding and after 3 weeks' administration. It is practicable to distinguish with certainty between the effect of one dose and the effect of one 33% larger. The most accurate results in detg. the increase of CO_2 production are obtained by doses of thyroid giving 0-35% increase. It was therefore decided to compare diff. preps. on the basis of that dose which caused a 15% increase in CO_2 production. One thyroid unit is defined as: that amt. (wt.) of thyroid prep'n. which when given by mouth to white mice daily for 3 weeks and calcd. per 1000 g. of mouse is sufficient to cause a 15% increase in the CO_2 production. Tables and curves are given showing the necessity for detg. the value of thyroid preps. Hunt's and Seidell's acetonitrile method and C. O. Jensen's exolötl method are discussed and criticized. M. recommends the above method because of reliability and simplicity. O. A. NELSON

A simple method for the determination of the hydrogen-ion concentration in surgery. I. General and method. ERICH SIMENAUER. Stadt.-Kranken. am Urban, Berlin. *Arch. klin. Chir.* 150, 193-201(1928); *Ber. ges. Physiol. exptl. Pharmacol.* 46, 10. The p_{H} was measured in very small quantities of biol. fluids by means of various indicator papers, as bromocresol purple, bromothymol blue, cresol red, methyl red, phenol red and thymol blue. The method is being checked by the Wulff colorimetric method. R. C. WILLSON

Method for the microchemical determination of combined sugar. NAOHICO IZUKA. *Kyoto-Ikadaigaku-Zasshi* 2, 83 90(1928); *Ber. ges. Physiol. exptl. Pharmacol.* 46, 87. The combined sugar in the blood plasma (Bierry calls it the protein sugar) can be detected with an exactness up to 0.004 mg. % in 2-3 cc. blood. The free sugar is detd. by the Hagedorn-Jensen method after deproteinizing. In another sample the total sugar is detd. by the same method after hydrolysis with warm dil. H_2SO_4 and subsequent deproteinization. The difference between the results in the 2 tests represents the combined sugar. R. C. WILLSON

The velocity of the reaction of tributyrinolytic lipase in relation to the temperature. ELIO IANIERA. *Riv. patol. sper.* 2, 370-81(1927); *Ber. ges. Physiol. exptl. Pharmacol.* 46, 261. To 1 cc. of serum there was added a mixt. of 1 cc. $\text{NaH}_2\text{PO}_4 + 7$ cc. K_2HPO_4 (N/3) and then 12.5 cc. of a satd. soln. of tributyrin. In testing the quinine-resistant fraction there was also added 0.5 cc. of a 0.2% soln. of quinine-HCl. In temps. between 37° and 45° the reaction is completed in 2-2.5 hrs.; at 47° it is incomplete after 3 hrs. while at 50° it apparently does not proceed to the end. The reaction velocity

is greatest at 45° and decreases gradually at temps. of 40°, 47°, 50° and 37°. At 37° and 25° the reaction is completed after longer periods of time, while at 13° and 5° it appears not to be completed. The addn. of quinine retards the reaction; it remains practically incomplete. Quinine hinders the reaction of the quinine-resistant lipase

R. C. WILLSON

Determination of minute quantities of Pb by electrolysis (SEISER, *et al.*) 7. Method for determining total N in urea-nitrate mixtures (LUCAS, HIRSCHBERGER) 7.

C—BACTERIOLOGY

CHARLES B. MORREY

The fermentation of cornstalks and their constituents. I. Studies on the pectin-fermenting bacteria. LLOYD A. BURKEY. Iowa State Coll. *Iowa State Coll. J. Sci.* 3, 57-100(1928).—The pectin-fermenting bacteria isolated belonged to the genera *Aerobacter*, *Bacillus* and *Clostridium*. Of *Aerobacter*, 29 cultures were studied and in tables, 101 results are reported for each culture. These include: characteristics of the bacteria, sources of the cultures, effects on milk and broth, effects on about 30 org. compds., mostly carbohydrates, with respect to the formation of gas and acid, effects on potato, carrot, parsnip and apple, and whether indole, acetylmethylcarbinol and uric acid are formed. In a similar manner reports are made on 4 members of the genus *Bacillus*. A bacteriological description of each organism is given and a bibliography of 55 references is appended.

F. E. BROWN

The preparation of *d*-tyrosine from racemic tyrosine by means of *Oidium lactis*. M. CHIKANO. Med. Acad. Osaka. *Z. physiol. Chem.* 180, 149-52(1929). Sterile culture media contg. sucrose, inorg. salts and *dl*-tyrosine were inoculated with *Oidium lactis* and the fungus was allowed to grow 20-5 days at 18° with occasional shaking. The mixt. was then boiled, filtered and evapd. *d*-Tyrosine crystd. out in yields of 40-60%. In 4% HCl it showed a sp. rotation of 10°. *d*-Hydroxyphenyllactic acid was recovered from the filtrate by acidifying with H₂SO₄ and extg. with Et₂O. A. W. D.

Oxidations by means of *Bacterium xylinum*. II. The formation of gluconic and 5-ketogluconic acid. K. BERNHAUER AND K. SCHÖN. German Univ. Prague. *Z. physiol. Chem.* 180, 232-40(1929); cf. *C. A.* 22, 3901.—On a sterile medium contg. 5% glucose, 0.5% yeast ext., and an acid to inhibit fungus growth, *B. xylinum* produces gluconic and ketogluconic acids, the max. yield being obtained in about 30 days at room temp. Addn. of butyric acid (0.02-0.01 *N*) to the medium gives a better yield than the same concn. of AcOH or CH₃CO₂. With or without the addn. of CaCO₃, as much as 80% of the glucose is thus converted into gluconic acid. This subsequently undergoes further oxidation to ketogluconic acid, especially in a slightly alk. medium. In the presence of CaCO₃ and *N*/150 butyric acid, glucose yields as much as 65% Ca ketogluconate in 20 days, but in the absence of butyric acid only 44%. A table is given for the detn. of ketogluconic acid by the Cu reduction method. A. W. DOX

A study of coliform organisms in samples of certified milk. C. H. CHALMERS. *J. Hyg.* 27, 294-305(1928).—British regulations require that certified milk contain no coliform bacilli in 0.1 cc. samples. Although the usual presumptive test for *B. coli* was negative in the case of 32 certified milk samples, upon culturing these same samples on bile salt agar, plates all proved positive and 268 coliform bacteria were isolated. Of these, 65.7% were true *B. coli* and 18.6% fell in the X and Y groups of Stewart. The presumptive test cannot be relied upon to give a true indication of the presence of coliform bacilli in milk. The inaccuracy is attributed in part to the faulty construction of Durham's fermentation tubes which fail to ensure collection of the gas produced.

C. R. F.

Staining methods for bacteria and yeasts. W. E. MANEVAL. Dept. Botany, Univ. Mo., Columbia. *Stain Tech.* 4, 21-5(1929).—Actively motile organisms 20-24 hrs. old were best for flagella staining. The bacteria were allowed to diffuse in sterile water for 20-30 min. and transfer droplets made to scrupulously clean slides. The following technic was adopted as very satisfactory: Treat 2-4 min. with a mordant consisting of tannic acid 10 or 20%, 50 cc.; FeCl₃ 5%, 10-15 cc.; carbolfuchsin (Ziehl-Nielson), 5 cc.; H₂O₂ 3%, 6-8 cc. Wash and stain 2-3 min. with a mixt. of satd. alc. basic fuchsin, 10 cc.; distd. water, 30 cc.; AcOH, 4%, 1 cc. Wash thoroughly with water and exam. For improving the staining properties of bacterial spores, a 10 min. boiling period in water is used.

C. R. F.

An adaptation of Bergeim's fecal indole method for the determination of indole in bacterial cultures. H. B. PIERCE AND R. B. KILBORN. Univ. of Rochester and

Pa. State Coll. *J. Biol. Chem.* 81, 381-7(1929).—Bergeim's method (*C. A.* 12, 45) for the detn. of fecal indole was adapted to the estn. of indole in bacterial cultures.

Alcoholic fermentation by *Aspergillus flavus*, Brefeld. JOHN L. YUILL. *Biochem. J.* 22, 1504-7(1928).—No kojic acid (cf. *C. A.* 18, 1665) was produced by a typical strain of *A. flavus*, but considerable alc. was obtained. Under the same conditions, *A. oryzae* produced no alc.

The purification and concentration of scarlet fever toxin. P. HARTLEY. *Brit. J. Exptl. Path.* 9, 259-75(1928).—Crude scarlet fever toxin, being the filtrate from cultures on tryptic digest broth of the Dochez strain of *Streptococcus scarlatinae*, has been purified and concd. by Walpole's method (*C. A.* 9, 3253). During the process over 99% of the nitrogenous constituents of the original crude toxin were removed and the vol was greatly reduced. The soln. of the purified toxin is greenish yellow to greenish brown, faintly opalescent, and almost free from visible particles. The soln. contains relatively small quantities of N. It is highly toxic for rabbits on intravenous injection. The toxin is apparently completely destroyed by heating to 100° for 1 hr., and is considerably weakened by heating to 56° for 1 hr. The toxin is neutralized by scarlet fever antitoxin. Two samples of puerperal streptococcus antitoxin also neutralized the concd. toxin. Three anti-streptococcus serums, known to have been prepd. by the injection of emulsions of streptococci, made from strains other than the *Streptococcus scarlatinae*, exhibited no protective or neutralizing action against the toxin. Normal horse serum was similarly inactive. The soln. of purified and concd. toxin can be reduced to dryness without loss of specific properties; simple addition of H₂O or NaCl soln. to the dry prepn. yields a soln. indistinguishable, as regards appearance and biol. properties, from the original soln. The dry prepn. retained its specific properties unchanged and unimpaired for at least 4 months. Comparative tests, carried out with a 20,000 fold diln. of concd. scarlet fever toxin and a 1000-fold diln. of ordinary crude toxin, gave identical skin reactions in 14 out of 15 human beings examd.; the group included both immune and susceptible individuals.

The experimental transformation of the intestinal flora. R. C. RUICKSHANK. *Brit. J. Exptl. Path.* 9, 318-26(1928).—A diet with a high carbohydrate content produced a simplified flora in the intestines of rats but failed to effect a radical transformation to an aciduric flora. Lactose and dextrin when added to a diet of bread, meat and oats quickly changed the intestinal flora to aciduric type. Sucrose had a much less marked effect: maltose, glucose, galactose and levulose produced no change. Acidophilus milk caused a transformation from normal to an aciduric flora in a comparatively short time. In combination with lactose the change was even more rapid and complete. The effectiveness of acidophilus milk is due not to its bulk or its acidity but to the combination of the living organism with the unfermented lactose in the milk. Under the foregoing conditions, *B. acidophilus* becomes established as the predominant organism in the intestine, probably because of its acid-resistant property. Lactose and dextrin are slowly absorbed from the intestine and the attack on available carbohydrate by the intestinal bacteria in the lower bowel produces a degree of acidity which is inimical to all save the acid-tolerant group.

Colony variants in hemolytic streptococci. G. H. EAGLES. *Brit. J. Exptl. Path.* 9, 350-6(1928).—"Rough" or very coarsely granular colonies and "smooth" or finely granular colonies have been identified by selective subculture of individual stock strains of hemolytic streptococci. Intermediate variants have also been described. Colony appearance is not a reliable indication of virulence in hemolytic streptococci in as much as the property of enhanced virulence in one strain is related to the "rough" and in the other strain to the "smooth" variety. In a toxin-producing strain "rough" and "smooth" variants have been found to produce apparently equal amounts of toxin.

A comparison of the prophylactic values of the H, O and R antigens of *Salmonella aertrycke*, together with some observations on the toxicity of its smooth and rough variants. H. M. IBRAHIM AND H. SCHÜTZ. *Brit. J. Exptl. Path.* 9, 353-60(1928).—The object of this research was to establish, if possible, the comparative prophylactic values of the various antigens that may be present in a bacterial vaccine. The microbe employed was *S. aertrycke* "Glasgow." The antigens considered were the H and O of the smooth salt-stable variant and the H and R of the rough salt-sensitive variant, H being the thermolabile antigen associated with the flagellar substance and a flocculent agglutination ppt., O and R being the thermostable antigens associated with the somatic substance and a granular agglutination ppt.; the exptl. animal was the mouse. The rough variant of *S. aertrycke* "Glasgow" possesses about 1/4 of the toxicity of its smooth counterpart. Heating to 100° lowers the toxicity of the smooth variant by about 1/4.

but the toxins of the rough variant do not appear to be so labile. Repeated washings with saline, undertaken with the view to removing the outer flagellar portion of the bacterium, do not lower the toxicity of the smooth variant. Only vaccine contg. agglutinogenically active H and O antigens in combination has been shown to be effective. Vaccines contg. only O antigen did not give prolonged protection, though they delayed death very definitely. Vaccines contg. only R or H + R antigens may be regarded as ineffective. That is to say, a vaccine not heated above 60° and derived from a smooth variant culture of *S. aertrycke* is capable of conferring good and lasting immunity against infection with the living homologous strain, whereas a similar vaccine heated to 100° for the most part merely delays death, while a vaccine derived from a rough variant culture of the same microbe, whether heated to 100° or merely to 60°, is incapable of immunizing. This failure may be due to the lack of combined H and O antigen in these O, R and H + R vaccines, or the fact that heating smooth variant culture to 100° in order to destroy the thermolabile H antigen coincidentally damages it as an immunizing agent.

HARRIET F. HOLMES

The conditions of amine formation by *Bacillus coli*. GEORG ROSKE. *Jahrb. Kinderheilk.* 120, 186-95(1928).—The production of amines by *B. coli* in artificial media was detd. by the biol. method. *B. coli* forms no demonstrable amines in peptone broth, which becomes strongly alk. on incubation. Large quantities of amines are formed in dextrose broth, which becomes more acid on incubation. Buffering this culture medium to prevent an increase of acidity prevents the formation of amines.

ELEANOR M. HUMPHREYS

Colloid biological studies on thrush. F. V. v. HAIN AND HERMANN JUNKER. *Jahrb. Kinderheilk.* 121, 85-100(1928).—The fungus which causes thrush in infants is a pleomorphic organism, growing at times with the formation of small yeast-like buds, at times with larger mycelial threads. The ability to form mycelia explains the power of the fungus to invade the body tissues. The authors studied the effects of numerous chemicals on the type of growth in culture media. The substances which act to depress the surface tension favor the formation of mycelia. This may be due to an alteration of the cell membrane which makes it more permeable to colloids, permitting an increase of the cytoplasmic mass. This "vitaminoid" effect recalls the observation that, in culture media which contain water-sol. B, the depression of the surface tension parallels the vitamin content. This raises a question as to whether water-sol. B exists, or is merely an expression of surface activity.

ELEANOR M. HUMPHREYS

The bactericidal action of some organic compounds of mercury on *Bacillus pestis*. J. F. CAIUS, S. A. KAMAT AND B. P. B. NAIDU. Haffkine Inst. Parel, Bombay. *Indian J. Med. Research* 15, 327-32(1927).—Aromatic mercurials are many times more active than the compds. from which they are derived. The general bactericidal power is proportional to the amt. of Hg present and little change is brought about by modification in chem. constitution. The compds. studied were: *o*- and *p*-diacetoxymercuriphenol, *p*- and *o*-chloromercuriphenol, *o*- and *p*-dichloromercuriphenol, the mono-, di-, tri-, beta-, penta, hexa-, hepta- and octo-acetoxy mercuri derivs. of trypan blue and trypan red and the mono-, di-, and tri-acetoxy mercuri derivs. of acid fuchsin and mercurochrome-220-sol.

FRANCES KRASNOW

The production of alkalinity by *B. pestis* in broth and the effect of this alkalinity on the toxicity and potency of the prophylactic. B. P. B. NAIDU AND JEMADAR SHAM-SHER JANG. Haffkine Inst., Parel, Bombay. *Indian J. Med. Research* 15, 335-41(1927).—The amt. of alky. present in the vaccine has no apparent effect either on toxicity or on the potency as estd. on rats.

FRANCES KRASNOW

The chemical study of bacteria. XXIV. A proximate chemical analysis of the timothy bacillus. ROBERT D. COGHILL AND ORSON D. BIRD. Med. Research Lab., Parke, Davis and Co. *J. Biol. Chem.* 81, 115-22(1929); cf. *C. A.* 21, 434.—The study was made to see what chem. differences could be found between the non-pathogenic timothy hay bacillus (*Mycobacterium phlei* (Moeller)) and the tubercle bacillus, (2 organisms so closely related biologically but differing so widely in their pathogenicity). Samples of the carbohydrates, proteins, fats, and the nucleic acid of the cell were also prepd. and are available for biol. comparison with the corresponding fractions of the tubercle bacillus. It is hoped that these comparisons will indicate which fraction or fractions of the bacteria are important from the biol. and therapeutic point of view. Enough gross chem. differences in compn. were found to differentiate between the 2 organisms in the chem. lab. The protein and N distribution in % of total N in the timothy and tubercle bacillus was, resp.: H₂O-sol. N, 13.2 and 35.7; H₂O-sol. protein N, 3.5 and 0.7; alkali-sol. N, 15.8 and 44.7; alkali-sol. protein N, 6.0 and 33.2. There is also a marked difference in the fat fractions.

A. P. LOTHROP

Acid formation by different species of *Penicillium*. T. CHRZASZCZ AND D. TRUKOW. Univ. Poznafi. *Biochem. Z.* 204, 106-24 (1929).—All species of *Penicillium* produce acids in sugar-contg. media. The amt. of acid varies depending first of all on the species; age and quantity of mycelium have no influence, though an extensive development of the mold membrane is unfavorable to the acid production. The acidity is due to citric, oxalic and such acids whose Ca salts are water-sol. Citric acid production is a normal phenomenon in the metabolism of all species of *Penicillium*, the degree of accumulation in the nutritive medium being dependent upon the species while the age or quantity of the mold has no effect. In fact, the changes in acidity are really a function of the changes in citric acid concn. Oxalic acid is produced irregularly and in very small amts., this depending upon external conditions. Acids whose Ca salts are water-sol. arise regularly, and this depends upon inner circumstances, being the result of an enzymic process. Some species of *Penicillium* can form ester or fat-like substances which combine with the acids. The amt. of acid produced, the kind of acid or its accumulation or diminution are in no wise associated with the botanical qualifications of the separate *Penicillium* species. S. MORGULIS

The biochemistry of *Penicillium glaucum*. A contribution to the problem of methyl ketone formation from triglycerides or fatty acids in the metabolism of molds. OSKAR ACKLIN. Tech. Hochschule, Zürich. *Biochem. Z.* 204, 253-74 (1929); cf. C. A. 23, 1151.—All normal monocarboxylic acids of the hydrocarbon series are changed to the corresponding methyl ketone in the metabolism of *Penicillium glaucum*, with the exception of butyric and valeric acids. The reason for this is to be found in the special mechanism of methyl ketone formation, the β -hydroxy form of the fatty acid not being a step in the formation of the ketone. The catabolism of caproic acid is always ketone-positive, which is not the case when the β -hydroxycapric acid is concerned, the caproic acid being directly changed to the keto acid and then through loss of CO_2 to methyl propyl ketone. The catabolism of butyric acid under all circumstances is always ketone-neg. as is also the case when β -hydroxybutyric acid is metabolized, and acetone cannot be demonstrated. The metabolism of propionic and of hydroxypropionic acids gives rise to the keto acid only as a transient product undergoing quick decompn. to CO_2 and H_2O . Thus, β -hydroxy acids cannot be attacked by *Penicillium*, making the appearance of acetoacetic acid and acetone impossible. The metabolism is thought to proceed from the fatty acid to the keto acid, then to the methyl ketone and the corresponding carbinol. In favor of this conception of the mechanism is offered the fact that carbinol frequently occurs alongside the methyl ketone, as in the coconut endosperm, in ripe fruit or in certain cheeses. A detailed study of the influence of the concn. of capric acid, as well as the concn. of the nutritive medium or of H-ions, on the methyl propyl ketone formation is included. S. MORGULIS

Note on the paper "The chemical constituents of the spores of *Aspergillus oryzae*." MIJIZUHO SUMI. Inst. phys. and chem. Research, Tokio. *Biochem. Z.* 204, 412-13 (1929); cf. C. A. 22, 4569.—The sterol previously isolated from spores of *Aspergillus oryzae* had an empirical formula, $\text{C}_{28}\text{H}_{48}\text{O}$. A purer prepn. was made which, however, has the empirical compn., $\text{C}_{27}\text{H}_{42}\text{O}$. It gives typical reactions and is considered to be an ergosterol. It has a behavior identical with that of ergosterol obtained from the edible Japanese mushroom, "*Cortinellus shiitake*." S. MORGULIS

Studies on the existence of a streptococcus antiviral as postulated by Besredka. N. LOUVROS AND E. GAESSLER. Staatlichen Frauenklinik, Dresden. *Centr. Bakt. Parasitenk.* I Abt., 104, 356-65 (1927); cf. C. A. 22, 805.—The growth-inhibiting property of Besredka's streptococcus filtrates is due to the action of acids and is not specific. Its immunizing power is the general effect of a foreign protein. Its poisonous action is due to a true toxin, which, however, is resistant to boiling or long standing. This is in accord with the chem. properties of streptococcus toxins. The technic of Besredka is an ingenious method of obtaining therapeutically useful acid protein complexes. It is not an antiviral in the sense of Besredka. JOHN T. MYERS

Observations on the individual characteristics of typhoid bacilli in homologous immune serum. K. HASHIMOTO. Univ. Sendai. *Centr. Bakt. Parasitenk.* I Abt., 110, 17-24 (1929).—The individuality of strains of *B. typhosus* is important. Strains vary in their reactions under different conditions. When grown in homologous immune serum with a high titer, 6 different colony forms were observed. Some strains became spontaneously agglutinable; some became less easily agglutinable, and some remain unchanged. There must be individual peculiarities in pathogenic properties and antigenic powers as well. This should be considered in making vaccines and immune sera. JOHN T. MYERS

Antiseptic power of disodium dibromohydroxymercurifluorescein. A. SILVEIRA

RAMOS. *Compt. rend. soc. biol.* 99, 1537-8(1928).—The antiseptic properties of mercurochrome 220 are doubtful in dilns. greater than 1 to 1000. In certain dilns. it shows no action to prevent the development of *Staphylococcus aureus*. In doses of 5 mg. per kg. of body wt. its concn. in the blood is not greater than 1 in 8000. L. W. RIGGS

Action of chloroform on development of yeast. M. N. MEISSEL. *Wochschr. Brau.* 45, 488-90(1928).—Young colonies of yeast grown on wort-agar showed more narcosis and death when exposed to CHCl_3 vapors than older colonies. In some cases CHCl_3 produced modified cell forms and colonies which were transmitted through successive cultures. A. SCHULTZ

Sporulation of yeast. HELEN STANTIAL. Univ. of Toronto, Can. *Trans. Roy. Soc. Can.* [3], 22, III, 257-61(1928).—Grapefruit juice was found to contain an active principle which caused yeast cells to produce spores. A grapefruit prepn. contg. 25,000,000 cells of yeast per cc. of juice gave the optimum sporulation. The time for spore formation was found to differ from cell to cell. The active principle is not bios I nor bios II, nor citric acid and is not pptd. by basic lead acetate nor removed by charcoal. It is not injured by NH_4OH , by evapn. to dryness and heating to 110° , or by short boiling with dil. H_2SO_4 . It can be extd. by org. solvents. Apparently nutrition is not the only factor affecting the sporulation of yeast cells. J. W. SHIPLEY

Persistence of acclimatization to fluoride after sporulation of the yeast. HELEN STANTIAL. Univ. of Toronto. *Trans. Roy. Soc. Can.* [3], 22, III, 263-5(1928).—Tolerance of fluoride appears to be an inherited characteristic for yeast cells. Expts. on the progeny of cells produced from spores arising from yeast growing in wort contg. NH_4F showed that these were much more resistant to fluoride poisoning than the progeny from yeast cells grown in wort contg. no fluoride. J. W. SHIPLEY

Isolation and identification of bios I; its absorption by and recovery from yeast. EDNA V. EASTCOTT. Univ. of Toronto. *Can. Trans. Roy. Soc. Can.* [3], 22, III, 267(1928); cf. *C. A.* 22, 20, 3897.—Pure bios I identical with inactive inositol was prepd. from tea dust. Curves showing the rate of reproduction of yeast in solns. contg. salts, sugar, inositol, and bios II agree in form with those produced with solns. of sugar, salts and wort. Inositol taken up by yeast cells can be recovered quantitatively, each cell takes up and yields 1.2×10^{-13} g. of inositol. Yeast grown in solns. of sugar and salts alone also yields inositol on hydrolysis, but in less amount. J. W. SHIPLEY

Giant yeast cells. MARY HOLT. Univ. of Toronto, Can. *Trans. Roy. Soc. Can.* [3], 22, III, 269-70(1928).—Expts. indicate that the formation of giant yeast cells was due to amino acids. Four effective chemicals were found in aspartic acid, glutamic acid, glycine and alanine, while arginine, asparagine, histidine, leucine, isoleucine, malic acid, phenylalanine, succinic acid, succinamide, succinimide, tryptophan, valine, and isovaline were without effect. The first large cells appear after 2-4 days, depending on the acid used. Aspartic acid produces as high as 60% yield of giant cells in 6 days. The production of giant cells may be peculiar to certain races of yeast. J. W. SHIPLEY

Chemical derivations of bios II. E. M. SPARLING. Univ. of Toronto, Can. *Trans. Roy. Soc. Can.* [3], 22, III, 271(1928).—Bios II can be purified by converting it into an inactive deriv. by heating with AcOH , Ac_2O , or AcCl , the product of such treatment being sol. in CHCl_3 . Fractional distn. of the CHCl_3 soln. seps. the CHCl_3 . At the temp. of boiling nitrobenzene, a non-activable acid comes over; at the temp. of boiling acetanilide an oil; and at that of boiling anthraquinone, an oil which deposits crystals on cooling. The last two distillates can be activated by treatment with NaOH . Large-scale operations for obtaining a chemically pure material are being continued. J. W. SHIPLEY

Production of monochromatic x-rays of long wave length. The quantic action on microbes. F. HOLWECK. *Compt. rend.* 188, 197-9(1929).—The K ray of Al (8 A. U.) and the L ray of Ag (4 A. U.) were produced in a Coolidge tube with a Ag anode and a window of Ag 5μ thick. Cultures of *B. pyocyaneus* were exposed to these rays. Knowing the intensity of the rays the coeff. of absorption in the microbic substance, the distance of the organism from the window and the angle of the rays one is able to calc. the quanta per sec. that are absorbed by each unit vol. The 4 A. U. rays are more germicidal than the 8 A. U. rays. M. H. SOULE

The study of the curve of probability relative to the action of x-rays upon bacteria. MME. P. CURIE. *Compt. rend.* 188, 202-4(1929).—A mathematical consideration. M. H. SOULE

Bacterial enzymes. VII. Lactase and lipase of the colon bacillus. LOUIS LOWENSTEIN, WM. L. FLEMING AND JAMES M. NEILL. Vanderbilt Univ. Med. School. *J. Exptl. Med.* 49, 475-9(1929); cf. *C. A.* 21, 3082.—Colon bacilli possess endocellular

heat-labile lactase and lipase enzymes which remain operative in sterile filtered solns. of the intracellular substances obtained through phys. disintegration of the bacillary bodies. The demonstration of the lactase and detection of the hexose products of its action constitute exptl. evidence that hydrolysis of the disaccharide is the 1st step in the fermentation of lactose by colon bacilli. C. J. WEST

Oxidation-reduction properties of sterile bacteriological media. RENÉ DUBOS. Rockefeller Inst. for Medical Research. *J. Exptl. Med.* **49**, 507-23(1929).—Sterile plain broth contains an active oxidation-reduction system. Under vaseline seal, the lot of broth used in these expts. reaches a reduction potential corresponding to reduced indigo disulfonate ($r_H = 10$). All the indicators with a more positive E'_0 are reduced; the others are not affected. It seems probable that fresh broth, which has not undergone oxidation by mol. O, would have a higher reduction potential. The max. amts. of different indicators that can be reduced correspond to equimol. concns. This seems to indicate either (a) that the broth does not contain several "independent" reducing systems (at least in appreciable amts.) or (b) that these hypothetical "independent" systems all have about the same reduction potential. The different indicators of oxidation-reduction potentials are reduced in the order of the electromotive series. The system seems to be reversible (this not excluding the possibility of irreversible autoxidations) and does not appear to be of the nature of a sugar. C. J. WEST

Comparison of numbers of *B. coli* in iced and uniced samples of water (ELLISON, *et al.*) **14**.

MACKIE, T. J., AND MCCARTNEY, J. E.: **An Introduction to Practical Bacteriology.** New York: Wm. Wood. 2nd ed., revised and enlarged. 390 pp. \$3.50. Reviewed in *Am. J. Pub. Health* **19**, 243(1929).

D—BOTANY

THOMAS G. PHILLIPS

Composition and metabolism of the tobacco leaf at different stages of growth of the plant. A. SMIRNOV, *et al.* *Ber. Centr. Inst. Tabakforsch. Krasnodar* **29**, (1926).—A complete account of the distribution of org. substances in the leaves is given for 4 stages in the life of the plant, *viz.*, at planting, at the stage of 8-10 leaves, in full bloom, and at the technically ripe state of the leaf. B. C. A.

Mucilage of the rhizome of *Polygonatum officinale* All. B. GAAL. *Ber. ungar. pharmac. Ges.* **3**, 133-9(1927).—Arabinose, dextrose and *d*-levulose (81.7%) are present. When oxidized by Tollens' method the mucilage did not afford mucic acid. B. C. A.

Occurrence of manganese in trees. M. KLEINSTUCK. *Chem.-Ztg.* **52**, 598-9 (1928).—The Mn content of different parts of various trees growing in the valley of the Elbe is recorded. The bark and leaves have in general a higher Mn content than the wood, and the Mn content of the leaves increases rapidly during the season. It is suggested that the Mn acts as a catalyst in the organs of assimilation and that its catalytic activity is destroyed by SO_2 ; this would explain the serious effect of SO_2 on vegetation. B. C. A.

Maintenance of seeds in a medium deprived of oxygen as a means of prolonging their germinative faculty. A. GUILLAUMIN. *Compt. rend.* **187**, 571-2(1928).—An atm. from which O has been removed is as efficient as a vacuum for the purpose of prolonging the germinative faculty of seeds (soy). B. C. A.

Pigment of elderberry (*Sambucus nigra* L.). T. J. NOLAN AND M. T. CASEY. *Proc. Roy. Irish Acad.* **38**, 93-9(1928); cf. Karrer and Widmer (*C. A.* **21**, 1652).—The coloring matter of elderberry skins was extd. by alc. HCl. The *anthocyanin chloride* (*picrate*) so obtained is a brown powder (cf. *loc. cit.*), readily sol. in water (orange-red), MeOH (violet red), and dil. mineral acids. When hydrolyzed with hot HCl it yields an *anthocyanidin chloride* (*sulfate*; *picrate*) which is almost insol. in cold water, is transformed by the action of warm water into an insol., violet product and does not contain methoxyl. Color reactions of the anthocyanin and anthocyanidin chlorides with several reagents are given. B. C. A.

Catalase and oxidase of the tomato as influenced by the soil reaction. E. S. HABER. Iowa State Coll. *Iowa State College J. Sci.* **3**, No. 1, 29-39(1928); cf. *C. A.* **23**, 1459. Tomato plants were grown in 3 soil plots in a green house. The significant difference in the soils was the acidity. The p_H values were 8.5-9.0, 6.5-7.0, and 4.0-4.5. The neutral plot gave the highest yield (dry wt.). The catalase activity was least for the product of the neutral soil. Soil reaction had no effect on oxidase activity. Oxidase activity was greater in ripe fruits than in green fruit. Catalase activity was greatest in green mature fruits. F. E. BROWN

The glutamine and allantoin content of sugar beets. C. RAVENNA AND R. NUCORINI. *Ann. chim. applicata* 18, 509-12(1928).—The glutamine content of beets was found to increase in the growing plant and then decrease until it disappeared and then allantoin was found. This indicates that glutamine has its origin in the metabolism of purines, and that its gradual disappearance is due to its gradual oxidation. A. W. C.

Beneficial action of potassium iodide on iodovolatilization. PIERRE DANGHARD. *Compt. rend.* 187, 1156-8(1928).—KI acts on the iodogenous layer, and probably furnished the cells which absorb the material for the production of free I. Thus if a fresh stipe of *Laminaria flexicaulis* is kept in a test tube of sea water contg. 1:1000 KI and the water be decanted and shaken with benzene, free I will be demonstrated. Algae poor in I, e. g., *Saccorhiza bulbosa* or *Himanthalia lorea*, do not show this behavior; neither does *L. flexicaulis* if it has been previously treated with either CHCl_3 or ether long enough to destroy the epidermis. Algae naturally little active, such as *Pelvetia*, *Ascophyllum*, and *Fucus*, also showed increased I volatilization under treatment but inactive algae, e. g., *Fucus platycarpus*, *Saccorhiza*, *Himanthalia*, *Chorda filum*, *Bifucaria*, *Halysdris*, etc., are not affected. Most of the Floridæ give no result, but *Gracilaria multipartita*, *G. confervoides*, *Colliblepharis jubata* and *Chondrus crispus* do respond. The method can be used for researches in algae I activity, where it will augment the phenomenon of I volatilization. S. L. B. ETHEERTON

Methods of collecting and preserving pollen. JAMES W. KELLY. Bur. Plant Ind., U. S. Dept. Agr., *Circ.* 46, 1-9(1928).—Pollen for the prepn. of exts. for hay fever diagnosis and treatment are best collected by cutting the plants when in bloom, wrapping up the stems in moist burlap and placing at an angle in a tank so that the flowers droop over the edge. By shaking gently daily the pollen falls on glazed paper where it can be recovered, sifted, dried and preserved. The yield of pollen for ragweed and timothy varies from 0.125 to 0.525% of the wt. of the air-dry plants. C. R. F.

Natural color preserved in sectioned green plant tissue. E. A. JIROUCH. Western Res. Univ., Cleveland. *Stain Tech.* 4, 17-9(1929).—The chloroplasts retain their natural colors and appearance by first fixing in Keefe's fluid (C. A. 21, 943) and freezing in a 20% gum arabic soln. The sections are then stained with Delafield's hematoxylin which brings out the nucleus without altering the green color of the chloroplasts. C. R. F.

The isolation of protocathechuic acid from pigmented onion scales and its significance in relation to disease resistance in onions. KARL P. LINK, H. R. ANGELL AND J. C. WALKER. Univ. of Wisconsin and U. S. Dept. Agr. Field Lab., Madison. *J. Biol. Chem.* 81, 369-75(1929).—Protocatechuic acid was isolated from pigmented onion scales. This acid appears to be of a group, the presence of which enables the onion to resist the inroads of the fungus, *Colletotrichum circinans*, responsible for onion smudge. ARTHUR GROLLMAN

Constituents of *Ginkgo biloba* L. leaves. I. SHU FURUKAWA. *Bull. Inst. Phys. Chem. Research Tokyo* 8, 62-74(1929); *Abstracts* 2, 5-7.—The maidenhair tree, *Ginkgo biloba* L., was investigated with a view to obtain components with insecticidal properties and yellow coloring matters from the leaves. The powder obtained from air-dried leaves was extd. with boiling alc. The alc. soln. was boiled, and the remaining resinous matter extracted as follows, yielding 5 components called A, B, C, D and E.

alc. extract

↓ H ₂ O sol.	Et ₂ O sol.	H ₂ O insol.	Et ₂ O insol.
Et ₂ O sol.	Et ₂ O insol.	alkali carbonate sol.	Alkali sol.
↓	↓	↓	↓
A. 0.01%	B. 0.04%	C. 0.2%	D. 0.02%

Substance A, $\text{C}_{11}\text{H}_{12}\text{O}_4 \cdot 2\text{H}_2\text{O}$, seps. from EtOH in colorless plates, m. 325° (decompn.); Ac deriv., m. 290-2° (from C_6H_6). When treated with a MeOH soln. of diazomethane, it gave a monomethyl ether, which was not further investigated. A hydroxy acid, whose Ag salt and Ac deriv. were confirmed by analysis, was obtained by heating the compd. with an excess of KOH on the water-bath. This fact shows that the compd. has evidently a lactone ring. Substance B, $\text{C}_{16}\text{H}_{18}\text{O}_4 \cdot \frac{1}{2}\text{H}_2\text{O}$, m. 240° (from MeOH). When reduced with Mg and HCl in EtOH soln. in the presence of Hg, it gives a red coloration and is, therefore, considered as a homolog of flavone or flaconol. The tri-Ac deriv. m. 170-1°; di-Me deriv., m. 224-6° When fused with excess KOH, it gives *p*-hydroxybenzoic acid and a substance that to be a monomethyl ester of tri-

hydroxybenzoic acid. C is regarded as a secondary alc., $C_{27}H_{36}O$, m. 80–80.5°; Ac deriv., m. 43.5–44°; ketone m. 73–4° and ketoxime, m. 49–50°. It is probably identical with ginnol, which was obtained from the fruitage of the plant. D, after recrystn. from EtOH, m. 240–1°. An AcOH soln. of this substance gives a blue coloration by the Liebermann reaction. E, $C_{29}H_{40}O_4$, m. 296° (decompn.); di-Ac deriv., m. 169–70°, crystallizes from EtOH with a silky luster.

ALBERT L. HENNE

A leaf spot and blight disease of onions caused by *Alternaria palandui* nov. sp. C. RANGASWAMI AYYANGAR. Agr. Research Inst., Pusa, Bull. 179, 14 pp.(1928).—A new fungus causing leaf spot and blight of onions is given the name *Alternaria palandui*. It grows luxuriantly with profuse spore formation on a large variety of agar media. Growth in agar media contg. 1–3% sucrose, lactose or maltose was directly proportional to the concn. of sugar present, the kind of sugar having no noticeable effect. Best growth was obtained at acidities between +5 and –10 on Fuller's scale. The spores were found to be incapable of germination after steeping in $CuSO_4$ and germisan solns. of 0.05% and higher concns. for 30 min.

K. D. JACOB

Chemistry of the red and blue pigments of flowers and fruits. III. ERNEST H. HUNTRESS. Mass. Inst. Technology. J. Chem. Education 6, 52–8(1929); cf. C. A. 23, 1433.—The 28 anthocyanins known have been found to be derived from 5 substances—pelargonidin, cyanidin, delphinidin, and the 2 methylated anthocyanidins, peonidin and syringidin. The way in which the anthocyanidin and carbohydrate mols. combine to form an anthocyanin is not yet definitely known. LOUISE KELLEY

Studies on plant colloids. XXIII. Soluble starch obtained by oxidation reactions. M. SAMEC. Kolloidchem. Beihefte 29, 155–66(1929).—By the action of oxidizing substances, as they are used for the production of sol. starch, the starch is peptized while undergoing more or less oxidation during which acid groups are formed which are not found in the native starch. The P content generally remains const. L. F. M.

The capillary structure of softwoods. ALFRED J. STAMM. U. S. Forest Service, Madison, Wis. J. Agr. Research 38, 23–67(1929).—Physical and physical-chemical studies were made on the structure of wood. Values of endosmotic flow through the capillaries of several species of wood corresponded closely to the readiness with which the same woods take up preservatives. The contact potential between wood and H_2O varied from 0.0131 to 0.0144, av. 0.0136 v. Elec. cond. of wood satd. with H_2O is a surface phenomenon. The pressure required to overcome the surface tension of C_6H_6 was on the av. 40.7% of that required to overcome the surface tension of H_2O in the capillaries. Wood sections are somewhat permeable to colloidal Hg and India-ink sols, but they also act as partial ultrafilters. 37 references are given. A. L. MEHRING

River myall or sally wattle. A plant proved poisonous to stock. H. R. SEDDON AND H. C. WHITE. N. S. W. Dept. Agr., Glenfield. J. Council Sci. Ind. Res. (Australia) 1, 328–30(1928).—*Acacia glaucescens* was shown to be highly toxic to farm animals. The stomachs of animals which had died after eating it contained HCN. The leaves of the plant contain a cyanogenetic glucoside but no emulsin. A. L. M.

Dissection of wood fibrils by chemical means. GEORGE J. RITTER. U. S. Forest Products Lab., Madison, Wis. Ind. Eng. Chem. 21, 289–90(1929); cf. C. A. 22, 4149.—When delignified spruce and elm fibers are treated with 68–77% of H_2PO_4 at 60–65° for 15–20 min. the fibrils produced further sep. into spindle-like bodies, designated as "fusiform bodies." Various stages in the process are illustrated by photomicrographs.

LAWRENCE P. MILLER

Hexylresorcinol and phenylethylresorcinol as agents against plant pathogenic fungi. J. HOUBEN AND H. W. WOLLENWEBER. Biol. Reichsanstalt für Land- und Forstwirtschaft, Berlin-Dahlem. Biochem. Z. 204, 448–55(1929).—Prepn. of hexylresorcinol. 17 g. resorcinol, 15 g. capronitrile and 10 g. $ZnCl_2$ in 50 cc. abs. ether are satd. with HCl. After 2 days, an equal vol. ether is added and decanted; this process is repeated twice. Upon the addn. of ice, and removal of the last traces of ether there is obtained a mass of yellow crystals of the condensation product, $AmC(:NH)C_6H_4(OH)_2 \cdot HCl$. The ketone derived from this product is reduced to hexylresorcinol. The phenylethylresorcinol is produced by forming first a condensation of $C_6H_5(OH)_2$ with benzyl cyanide, which is hydrolyzed to a ketone and this is reduced. Hexylresorcinol 67.5–59°, b_D^{20} 1.198–1.199°, b_D^{25} 1.333–1.335°, at 18° gives in H_2O a 0.05% soln. Phenylethyl 132–134°, b_D^{25} 1.250° (decompn.) and gives at 18° a 0.041% soln. Much stronger concns. can be secured in colloidal soln. A number of fungi pathogenic to plants were tested. Hexylresorcinol killed these organisms in concns. of 0.01% and even 0.005%. The concns. which were inhibitory to the growth of fungi are summed up as follows: *Penicillium glaucum*, 0.0025 to 0.005%; *Nectria galligena*, 0.0025 to 0.005%; *Fusarium aurantiacum*, 0.005 to 0.01%; *F. l.*, 0.01 to 0.02%; *Gleospirium fructigenum*, 0.0025

to 0.005%; *Polystictus versicolor*, 0.03 to 0.04%; *Nonilia fructigena*, less than 0.0025%; *Calonectria graninicola*, less than 0.0025%. Good results were also obtained with phenylethyldresorcinol.

S. MORGULIS

Determination of small quantities of nitrogen in plant materials. J. T. SULLIVAN AND L. E. HORAT. Purdue Univ. Agr. Expt. Sta., Lafayette, Ind. *J. Assoc. Official Agr. Chem.* 12, 133-5(1929).—Two methods are suggested for plant materials high in org. matter but low in N, giving as accurate results as the regular Kjeldahl method, but with much smaller samples (2-10 mg.). For perfectly dry material a method similar to that of Folin and Farmer (*C. A.* 7, 1208) was found to be successful, digestion being carried out in a test tube and hastened by using superoxol. Exts. are evapd. to dryness and digested in a small Kjeldahl flask and then transferred to a test tube for aeration of the NH_3 in the Van Slyke-Cullen urea app. (*J. Biol. Chem.* 19, 211 (1914))

A. PAPINEAU-COUTURE

Chemical and biochemical researches on the *Magnolia grandiflora*. L. GIUSEPPE TOMMASI. *Ann. staz. chim. agraria sper. Roma* 10, 29-41, 53-8, 69-81, 83-96(1929).—This plant has persistent long coreaceous leaves, reaching 30 cm. in length and 12 in width, green in the upper portion and brown in the lower; white intensely perfumed flowers. Every 100 parts wet magnolia leaves dried at 105° gave 18, 44 moisture, 3.04-3.73 fat, 6.12-7.50 N substances, 10.40-12.75 raw cellulose, 5.55-6.81 ash, 56.45-69.21 non-N extractive substances; 100 parts ash contg. 12.48 K_2O , 24.28 CaO , 1.96 MgO , 12.65 Na_2O , 1.44 Fe_2O_3 , 2.47 P_2O_5 , 0.47 SO_3 , traces of Cl, 43.50 of SiO_2 and 0.02 of Mn. Two lots collected in April gave 1.2 per 1000 of oleous, slightly green, unpleasantly smelling essence, that became thick and sticky in the air. d_{15}^{20} 0.915-0.916, rotary power $+1^\circ 20'$ to $+1^\circ 30'$, refraction index n_D^{20} , 1.5014-1.5004; f. p., -16° ; b. p., 170° - 265° ; completely sol. in 95° alc., 1:30 in 90° alc., 1:90 in 80° alc.; acid value, 2.1-2.3, Et index, 28.14-26.90; ethers %, 9.85-9.42; Et index after acetylation, 51.0, total alc. % ($\text{C}_{10}\text{H}_{18}\text{O}$), 13.45; free alc., % 5.71. Colors Schiff's reagent. 100 parts of the flowers, with no moisture, contained 5.55 parts fat, 8.86 N substances, 15.50 raw cellulose, 7.15 ash, 62.94 non-N extractive substances, 7.85 reducing sugars, 3.15 hydrolyzable sugars, 10.90 total sugars, 15.00 pentosans, and 100 parts of ash 54.44 K_2O , 11.33 CaO , 5.92 MgO , 3.87 Na_2O , 2.03 Fe_2O_3 , 3.68 Al_2O_3 , 0.04 Mn, 5.46 P_2O_5 , 4.89 SO_3 , 2.12 Cl, 6.22 SiO_2 . The flowers have 0.4 per 1000 parts of a slightly yellow essence with the same smell as that from the leaves; d_{15}^{20} , 0.902; sp. rotation (α_D^{20}) $+3^\circ 20'$; rotation after acetylation $+6^\circ 50'$; refractive index n_D^{20} , 1.5250; solidification point, 16, b. p., 155-260°; soly. in 90° alc., small; acid value, 1.20; Et value, 54.20; acetyl sapon value, 75.50. Microchem. investigations were made for localizing the essence in the plant with Sudan III; this was found more abundant in the leaf lamina and also in the epidermis and hypodermis.

R. SANSONE

Synthesis of coproporphyrin by dried yeast. H. FINK AND K. WEBER. *Wochschr. Brau.* 45, 478-80(1928).—The coproporphyrin content of yeast can be increased by cultivating the yeast in an artificial nutrient soln. rich in sugar and by autolysis. Dried yeast was fermented at various p_{H} values in a soln. of 10% cane sugar, 0.04% MgSO_4 , 0.05% CaCl_2 and 0.1% carbamide. After 8-13 days the largest amount of porphyrin, approx. 0.147 mg. per 5 g. dried yeast, was present in the p_{H} 4-4.5 soln. It is not known what part the living cells in the dried yeast played in the synthesis of coproporphyrin.

A. SCHULTZ

Physicochemical investigation of proteins contained in soy bean. TETSUTARO TADOKORO AND KOKUJI TOSHIMURA. Hokkaido Univ. *Hokkaido J. Agr.* 20, 355-62(1928).—T. and T. sep'd. and purified H_2O -sol. glycinin A, legumelin, 10% NaCl soln. of sol. glycinin B, 0.2% NaOH soln. of sol. glutelin from the soy bean from Manchuria and Hokkaido. The ash and P contents of these proteins decrease in the order legumelin, glycinin, glutelin, while the N content increases in the same order. The p_{H} value of the isoelec. point is highest in glycinin and lowest in legumelin. The sp. rotatory power of the alk. soln. of each protein and the amt. of HCl which combines with each protein is highest in glycinin. The free amide N is greatest in glycinin, next in glutelin, and smallest in legumelin. The melanin N in glycinin is much larger than in others while the histidine N in legumelin and lysine N in glutelin are much larger than in others. The glycinin of soy bean seems from its chemical properties to be a much more highly condensed compd. than other proteins in soy bean, and is very different from oryzinin in rice.

K. SOMEYA

Some special constituents in the soy bean. SHUNSUKE MURAMATSU. Morioka Agr. Coll., *Memorial Publication Morioka Agr. Coll.* 1928, 1-15; cf. *C. A.* 19, 742.—M. has now isolated a new hydroxy acid, $\text{C}_{10}\text{H}_{16}\text{O}_4$, m. 240° , which forms many salts.

In the soln. obtained by digesting the degreased soy bean with 80% EtOH in the Soxhlet app. lecithin is present; the quantity of lecithin as calcd. from the P_2O_5 content of the fatty oil extd. by the ordinary digestion method at ordinary temp. does not give the total lecithin content. The amt. obtained from the fatty oil, from skin and cotyledons is 0.64%; that obtained from the degreased residue by EtOH extn., skin 0.07%, cotyledons 0.78%. A new sterol was isolated in the alc. ext. and its content detd. In this case also a part of it remains in the residue from Et_2O digestion and is extd. by warm EtOH. The alc. ext. also contains a new Et_2O -sol. easily crystallizable substance, $C_{21}H_{40}O_8$, m. 235° , which is a higher alc. Its content is almost negligible in the skin, but amounts to 0.62% in the cotyledons.

K. SOMEYA

The transformation of the chlorophyll in a green alga. A. PERRIER. *Compt. rend* 188, 339 41(1929).—A monocellular green alga belonging to the family of Protococci was cultured on the following medium: bean broth plus agar, KH_2PO_4 , $MgSO_4$, NaCl, $FeSO_4$, $MnSO_4$ and $(NH_4)_2SO_4$. To sep. 100-cc. portions of this basic medium 3 parts of the following substances were added: MeOH, EtOH, glycerol, mannitol, arabinose, glucose, levulose, galactose, sucrose, lactose, maltose and starch. These media were placed in tubes and two series were inoculated with the alga. One set was placed in diffuse light and the other in the dark. After 8 days an excellent growth was present in the tubes kept in the light. The arabinose, mannitol and glycerol media supported the poorest growth. The organisms grew fairly well in the dark and produced some chlorophyll. If the media contained only NH_3 nitrogen, the amts. of chlorophyll were very small. The power to produce the pigment was quickly regained when the cells were transferred to a favorable medium. H_2O also aided in chlorophyll production.

M. H. SOULE

The influence of one ion on the accumulation of another by plant cells with special reference to experiments with *Nitella*. D. R. HOAGLAND, A. R. DAVIS AND P. L. HUBBARD. Univ. of Calif. *Plant Physiology* 3, 473-86(1928).—The halogen content of *Nitella* cells was detd. under the known conditions leading to favorable accumulation of these ions (C. A. 18, 1003; 21, 942). The relation between Br ion concns. in the culture medium and in the cell sap was of a logarithmic type (C. A. 13, 1331). Hence, the factor obtained by dividing internal by external concns. has a much higher value for external solns. of low concn. than for those of high concn. The accumulation of Br in the cell sap was retarded by Cl or I ions in the culture medium, but not by SO_4 , NO_3 or PO_4 ions. Anions which themselves are incapable of rapid accumulation (e. g., SO_4) are also incapable of having marked influence on the accumulation of other anions. These anion and cation effects occur in very dil. solns. With the exception of the higher concns. of I, no injury resulted. The accumulation of Br ions was definitely influenced by the nature of the cation, being most rapid with solns. of KBr and RbBr and least rapid with solns. of LiBr, CaBr₂ and $MgBr_2$. Relative to the effect of H-ion concn., it was found that large accumulation of Br took place between p_H 5-8. All the observations are explicable on the assumption that ionic processes are involved. W. T.

The preparation of chlorophyll. F. M. SCHERTZ. U. S. Dept. of Agr. *Plant Physiology* 3, 487-97(1928); cf. C. A. 5, 2623; 6, 2934.—In response to repeated requests for information regarding the prepn. of pure chlorophyll, a detailed description of the method used by S. for the extn. and purification of chlorophyll ($\alpha + \beta$) from dry nettle leaves (C. A. 22, 3683) is given. S. recommends the purification of the chlorophyll by pptn. with acetone in preference to the petroleum ether method of Willstätter and Stoll. Samples thus purified had an av. ash content of 3.98%. This compares with 4.5% obtained by Willstätter and Hug (C. A. 5, 2623). Two samples of ash analyzed 92 and 100%, resp., of MgO. Tests used to det. the purity of chlorophyll are described.

WALTER THOMAS

Cumyl volatile oils and stearoptens as fungicides (KINGERY, ADKISSON) 17. Dimethylhydroresorcinol as a reagent for aldehydes and the assimilation of C (VORLANDER) 10. Constituents of lichens. II. Constitution of barbatic acid (PRAU) 10.

MACINTOSH, THOMAS P.: **The Potato: Its History, Varieties, Culture and Diseases.** London and Edinburgh: Gurney and Jackson. 264 pp. 12s. 6d. net. Reviewed in *Nature* 123, 15(1929).

E—NUTRITION

PHILIP B. HAWK

Does commercial insulin contain what has hitherto been called vitamin B? CHARLES I. STUCKY. *Arch. Internal Med.* 42, 780-3(1928).—A com. insulin prepn., fed to young white rats, did not support growth or cure polyneuritis. J. B. BROWN

Production of renal injury in the white rat by the protein of the diet. Dependence of the injury on the duration of feeding, and on the amount and kind of protein. I. H. NEWBURGH AND A. C. CURTIS. *Arch. Internal Med.* 42, 801-21(1928).—In answer to criticisms of the authors' previous work (*C. A.* 13, 3229; 18, 705) white rats were fed over varying periods of time diets contg. increasing amts. of casein, beef muscle, beef liver and vegetable proteins. In one expt. protein N was replaced with an equiv. amt. of urea. The test for renal injury was based upon albuminuria and especially on the appearance of casts. It was found that the degree of injury was detd. principally by the type of protein, and, to a lesser extent by its concn. and the duration of feeding. Diets contg. 75% of dried liver produced a granular kidney in less than a year, but the same amt. of casein fed 16 months caused only a moderate tubular injury. The effect of beef muscle was intermediate. Urea was not a factor in producing renal injury. J. B. B.

A comparison of the effects of general diets and of standardized diets on tolerance for dextrose. J. SHIRLEY SWEENEY. *Arch. Internal Med.* 42, 872-6(1928).—The use of standardized diets over a period of several days did not affect the great individual variations in the dextrose tolerance test (blood-sugar curves) on young men. J. B. BROWN

Photochemistry of ergosterol. STANISLAW K. KON. *Nature* 122, 276-7(1928) Correction to *C. A.* 23, 422.—The last sentence should read: The results showed that the quantum efficiency of the formation of vitamin D is low even for monochromatic radiation, most of the energy being dissipated as heat or used to elicit complicated reactions leading to the formation of new products other than vitamin D. I. C.

The influence of dextrose on alimentary galactosuria. OSKAR WELTMANN. Med Univ.-klinik in Wien. *Wiener klin. Wochschr.* 42, 8-10(1929).—The ingestion of 40 g of galactose with 50 to 100 g. of glucose resulted in less galactose excretion than when the galactose was taken alone. The difference was significant in normal subjects but especially striking in liver diseases. This phenomenon indicates that dextrose increases the rate of absorption of galactose by the liver. D. B. DILL

The significance of plant sterols for the animal organism. RUDOLF SCHÖNHEIMER. Univ. Freiburg. *Z. physiol. Chem.* 180, 1-37(1929).—The expts. were designed to det the fate of the vegetable sterols contained in the food consumed by animals, the mode of synthesis of the sterol structure by the animal organism, and the possibility of pathogenic action of vegetable sterols as compared to cholesterol. It is known that the feeding of large amts. of cholesterol leads to deposition of cholesterol in certain organs, a phenomenon analogous to atherosclerosis in man. If, as is commonly supposed, a transformation of plant sterols into cholesterol is easily effected, the importance of these sterols from the nutritional standpoint has been underestd. The expts. here described were performed with rabbits, rats, mice, cats and dogs. The control animals were fed a ration contg. an abundance of fat (lard), while the exptl. animals received the same ration plus sitosterol and cholesterol, resp. After daily doses of 0.3 g. for periods ranging from 49 to 280 days the entire rabbits were analyzed for sterol content after removal of the brain and pelt. A large increase was found in the cholesterol animals, while the sitosterol animals showed the same sterol content as the controls. In the rat, mouse and cat expts. the liver was analyzed, and in all cases the cholesterol animals showed a large increase but the sitosterol animals showed none at all. Characteristic anisotropic fat-like globules were observed only in animals that had received cholesterol. Considering the variety of animals tested and the uniformity of results obtained, the conclusion is obvious that sitosterol feeding does not lead to a sterol deposition in higher animals. The sterol obtained in normal amt. from the sitosterol rabbits was examd further by detg. the m. p. of its acetate. Cholesterol acetate m. 114.5° and sitosterol acetate m. 125.6-137°; a mixt. in the proportions 100:1 m. 116°. The acetate obtained from the sterol of the sitosterol rabbits in no case melted above 114.5°; hence sitosterol was not present in appreciable amt. To det. whether the sitosterol is disposed of through the agency of an esterase, expts. were performed in which crystals of cholesterol and sitosterol, resp., were implanted under the skin of dogs. The cholesterol "pocket" after 11 days showed evidence of esterification, viz., rounding off of the corners and edges of the crystals, doubly refractive droplets and staining by Sudan dye, while chem. anal. showed that 10% had actually been esterified. The sitosterol crystals, on the other hand, showed no alteration whatever and the mere trace of ester found was within the limit of exptl. error. A sterol mixt. obtained from Calabar beans and coprosterol gave neg. sitosterol and 20% stigmasterol, also preps. of ergosterol and coprosterol gave neg. results when subjected to this treatment and tested for esterification. Of these various sterols cholesterol alone undergoes esterification in the subcutaneous connective tissue.

The others behave like foreign bodies in general. Expts. with rabbits were also performed to det. the sterol balance. After feeding 0.2 g. of cholesterol, 45-54% was recovered in the feces, while the same amt. of sitosterol gave a 94-99% recovery. Sitosterol is apparently not absorbed from the alimentary tract. The fecal sterol obtained after sitosterol feeding was purified and compared with the original substance. The optical rotation of the digitonide from each was practically the same, and the m. ps. of their acetates and benzoates were the same, as were also the mixed m. ps. Sitosterol evidently traverses the alimentary tract without alteration and is not converted into an analog of coprosterol. A. W. DOX

The mineral metabolism of the beef steer. E. B. FORBES, R. B. FRENCH AND T. V. LETONOFF. Inst. Animal Nutrition, Pa. State College. *J. Nutrition* 1, 201-8 (1929).—A series of 10 nutritive balances of the Ca, Mg, P and N of normal feeds at 4 planes of nutrition, with each of two 2-year old steers, was detd. in exptl. periods mostly 18 days in length. The planes of nutrition studied were, (a) half of the energy-maintenance requirement, (b) maintenance, or energy equil., (c) half more than maintenance, and (d) twice maintenance. A ration of corn meal and alfalfa hay, in equal wts., was fed at each of the 4 planes of nutrition; and in addn. a ration of alfalfa hay alone was fed at the energy-maintenance level, with each steer. The mineral metabolism of the steers was found to be of the normal character for growing animals, and not to be characterized by the peculiarities of the mineral metabolism of the milk-producing cow. The balance data signify that with the mixed ration of corn meal and alfalfa hay, at planes of twice maintenance, half more than maintenance and maintenance, the intake of Ca, Mg, P and N was adequate; that at the plane of half of the energy-maintenance requirement the intake of Mg was adequate, of Ca was at about the point of equil., and of P and N was definitely insufficient; while with the ration of alfalfa hay alone at the maintenance level the intake of all elements studied was adequate. It is concluded that 18-day balances of mineral elements such as Ca and P, which are utilized to the extent of considerable proportions of their usual intake, are of value as indicating the inadequacy of the quantities present to serve the nutritive requirements of the animal; but balances of mineral nutrients such as magnesium, which are utilized in small proportions of the usual intake, are of much less certain significance, and cannot be closely interpreted because of the great complication of factors, other than the quantity present, which enter into the detn. of the balance of intake to outgo. C. R. F.

A study of the utilization of the iron of meats as compared with other protein foods. R. C. MILLER, E. B. FORBES AND C. V. SMYTHE. Inst. Animal Nutrition, Pa. State Coll. *J. Nutrition* 1, 217-32 (1929).—This is a progress report of an investigation of the utilization of the Fe of protein foods for growth and other normal functions of albino rats, the especial purpose of which was the development of evidence as to the sp. value of meats as a source of Fe in human nutrition. Seventy-four individuals were fed for 5 weeks after which Fe was detd. in the entire body exclusive of the digestive tract. Comparisons were made on skim and whole milk powders, beef muscle, kidney, brain and liver, navy beans, peanuts and hen eggs. Fe was detd. by a modification of the colorimetric thiocyanate method. The growth from diets in which the sole source of protein and Fe was skim milk powder or whole milk powder was excellent, but after 5 weeks' feeding the Fe content of the bodies of the rats was reduced to approx. 50% of the N. After feeding for 7 months on the diet in which skim milk constituted the sole source of protein and Fe, female rats were unable to rear their young. The growth from the egg diets was excellent; from the muscle, liver and kidney diets was fair; and from the brain, bean and peanut diets were poor. The Fe content of the rats which received the meat foods was apparently normal in each case; the Fe content of the rats which received egg was much lower, the Fe content of egg apparently being less efficiently utilized than that of the meats; and the Fe content of the rats which received peanuts being the lowest of all, the Fe content of peanuts being especially low. Each of the 7 protein foods studied, other than milk, was much superior to milk as a source of dietary Fe for growing rats. C. R. F.

The absorption of glucose from the alimentary tract of rats deprived of the vitamin-B complex. H. B. PIERCE, H. S. OSGOOD AND J. B. POLANSKY. Pa. State Coll. and Univ. of Rochester, N. Y. *J. Nutrition* 1, 247-69 (1929).—The Cori method (C. A. 20, 3721) for detg. the glucose absorption by the whole alimentary tract was used. Results using 3 races of rats do not correspond closely and the absorption was extremely variable. The % of glucose absorbed during 1-, 2- and 3-hr. periods appeared to be dependent upon the amt. of glucose remaining unabsorbed in the alimentary tract. Two of the races of rats fed on vitamin B-deficient diets absorbed a lower % of the glu-

cose fed than did the normal animals. The Pa. State colony of rats showed no differences. In general, the work of Cori (*C. A.* 22, 1623) is confirmed. C. R. F.

The physiological effects of protein. HAROLD H. MITCHELL. Univ. of Ill. *J. Nutrition* 1, 271-92(1929).—A review of investigations, their correlation and interpretation. C. R. F.

Hygienic feeding and food deficiencies. E. LESNÉ. *Progrès méd.* No. 15, 615-20(1928); *Rev. Hyg.* 50, 938.—The calcul. of calcs. is no longer the basis of hygienic diets. Not only quantity but quality of food is becoming increasingly important. Deficiencies in H₂O, cellulose, proteins, certain amino acids, carbohydrates, fats, minerals and vitamins have all been shown to be important in the daily nutrition of the human body. Likewise a proper temp., purity of air and sunlight are equally as important as the food itself. The increasing emphasis being placed on deficiency diseases is a step in the right direction. C. R. F.

The meaning of vitamin A. HENRY C. SHERMAN. Columbia Univ., New York *Science* 68, 619-20(1928).—Exception is taken to the article by Jones (*C. A.* 23, 1166) suggesting a new set of provisional names, each to be distinguished by a prefix in accordance with the disease for which it is preventive. S. points out that the present admittedly colorless and non-descriptive alphabetical designations are probably desirable in view of the uncertain compn. of these substances and because knowledge concerning them may expand in all directions without danger of inconsistencies in nomenclature. With vitamin A, the development of an ophthalmia is only 1 of the manifestations of a lack of this vitamin. Probably this is not even its most important property. E. g., decreased resistance to respiratory disease is of greater actual significance than the ophthalmia, but cannot be as clearly demonstrated. Emphasis could readily be misplaced if a designation such as "antiophthalmic vitamin" were to be substituted for the broader term. C. R. F.

Preliminary studies of the Rosenheim-Drummond color tests of vitamin A in cod-liver oil. E. C. TOWLE AND E. C. MERRILL. *Am. J. Pharm.* 100, 601-2(1928).—The Rosenheim-Drummond colorimetric test for vitamin A in cod-liver oil makes no provision for temp. control using the Sb chloride method. The authors have found that (1) the speed of reaction is influenced very materially by the temp. of the reaction mixt., (2) the blue color formed by the Sb chloride addn. may be very definitely controlled by depressing the temp.; for instance, reaction commences to fade at 30°, within 1 min., but at 2° maintains for over an hr.; (3) the reaction appears to consist of 2 stages (a) development of blue color, (b) development of red color; (4) the speed of reaction may be increased by addn. of a small quantity of alc.; (5) the blue color of reaction may be brought back after fading has taken place by addn. of small quantities of distd water. The subject is worthy of further study with the opportunity of standardizing temp. control in order to assure a uniformity of results as well as to permit more accurate readings of the color by the Lovibond tintometer method. W. G. GAESSLER

Experimental studies on vitamin C. IV. The carbohydrate and nitrogen metabolism of experimental scurvy in guinea pigs fed on an exclusive oat diet. KOZO TOMITA. Tokyo Jikeikai Med. College. *Sci.-I-Kwai Med. J.* 47, No. 9, Eng. abs., 6-7(1928).—Guinea pigs maintained on an oats diet showed a progressive increase in the sugar content of the blood and in the amt. of urinary N excreted. The glycogen content of the liver did not decrease until just before the death of the animals. The excretion of creatinine, Ca and uric acid decreased with the development of scurvy while the rate of excretion of creatine increased. ARTHUR GROLLMAN

The vitamin B content of cancer. HENRY JACKSON, JR. AND CLEMENT I. KRANTZ. Huntington Memorial and Boston City Hospitals, Boston. *J. Clin. Investigation* 6, 609-12(1929).—Malignant tissue contains less vitamin B than normal liver and hence the hypothesis relating malignancy to excessive vitamin B content is not substantiated. ARTHUR GROLLMAN

The vitamin content of the nutrient preparation promonta. LUDWIG BITTER AND FRITZ WEIGMANN. *Klin. Wochschr.* 7, 1329-30(1928).—The presence of vitamins C and D in the nutrient preps. *maiztropolon*, *eisentropon*, *promonta* and *somatusc* could not be demonstrated. The vitamins originally contained in these preps. might have been destroyed by bacteria. One gram of the above preps. contained, respectively, 2100, 1900, 380,000 and 300 bacteria. MILTON HANKE

The significance of vitamins in early life. E. VOGT. *Klin. Wochschr.* 7, 1941-4(1928).—The vitamin requirements of the young are exceptionally great. The new born are fortified with a large vitamin reserve which has been taken from the mother. The vitamin content of colostrum is greater than that of milk. The colostrum and milk intake help to maintain a vitamin reserve during the first few months of life.

Mothers that are nourished on vitamin-deficient diets are apt to have improperly developed or dead babies. Addn. of cod-liver oil to the diets of mothers enhances the intra-uterine development of the child and reduces the intra-uterine or delivery death rate. Administration of irradiated ergosterol or of yeast preps. has a similar beneficial effect.

MILTON HANKE

Influence of irradiated ergosterol (Vigantol) on the cholesterol and calcium content of blood serum in adults. FRITZ LASCH. *Klin. Wochschr.* 7, 2148-50(1928).—Administration of Vigantol leads fairly regularly to an increase in the Ca and cholesterol content of the serum. This treatment proved to be beneficial in 2 cases of osteomalacia senilis.

MILTON HANKE

Lipoid metabolism studies on starving animals. H. WENDT. *Klin. Wochschr.* 7, 2183-5(1928).—The lipoid P and cholesterol content of the peripheral blood are increased during the first few days of starvation and are then decreased. The ratio of free cholesterol to its esters is about 1:1 at all times. Ingestion of triolein leads, normally, to a rise in lipoid P and in cholesterol esters. The same result is obtained, in an exaggerated form, in starving animals.

MILTON HANKE

Studies on the antineuritic vitamin. II. The properties of the "curative" substance. JOHN LEWIS ROSEDALE AND CHRISTOPHER JOSEPH OLIVEIRO. King Edward VII College of Medicine, Singapore. *Biochem. J.* 22, 1362-7(1928); cf. *C. A.* 22, 974. The antineuritic vitamin of an ext. of rice polishings is destroyed by fermentation and by sterilization. The potent curative ext. contains invertase and a lipolytic enzyme. In cases of "dry" beriberi, the pancreas shows no lipolytic and tryptic digestion.

BENJAMIN HARROW

Biological inertness of irradiated mycosterols other than ergosterol. OTTO ROSENHEIM AND THOMAS A. WEBSTER. National Inst. for Medical Research, London. *Biochem. J.* 22, 1426-8(1928).—Mycosterols, accompanying ergosterol in ergot, are biologically inactive after irradiation.

BENJAMIN HARROW

"Hypervitaminosis" and "vitamin balance." LESLIE J. HARRIS AND THOMAS MOORE. Nutritional Lab., Cambridge. *Biochem. J.* 22, 1461-77(1928).—Irradiated ergosterol, cod-liver oil and cod-liver oil concentrate are all harmful in excess, the degree of toxicity being proportional to the quantity of vitamin D present. Crystalline ergosterol, over-irradiated ergosterol and ergosterol resinized by heating are harmless when consumed for the same periods at levels lethal in the case of irradiated ergosterol. Rats receiving the normal allowance of marmite (B vitamins) suffered from no marked symptoms of vitamin-B deficiency when irradiated ergosterol was given at a rate 1000 times the minimal physiological dose. Normal gestation always failed in rats receiving a diet containing 15% cod-liver oil.

BENJAMIN HARROW

Fluorescence of some vitamin-A-containing fats. RONALD S. MORGAN AND KENNETH MACLENNAN. Food Research Laboratories, Lever Bros., Port Sunlight, England. *Biochem. J.* 22, 1514-22(1928).—When a beam of light from a quartz Hg vapor lamp, completely enclosed so that only light emitted has to pass through a filter cutting out nearly the whole of the visible portion of the spectrum, is allowed to fall upon any object in a darkened room, a characteristic fluorescence is observed. A method has been devised by which the actual brightness of the fluorescence of a solid fat, illuminated by ultra-violet light (filtered free from visible light), may be detd. and the color expressed in terms of 3 additive primaries: red, green and blue. Butter and margarine show dissimilar fluorescence: the former shows a fairly bright yellow color, whereas margarine is blue. This difference cannot be accounted for by difference in vitamin content.

BENJAMIN HARROW

Changes in the nuclear-plasmic ratio of mammals during hunger. ANTHONY DMOCHOWSKI. Warsaw Univ. *Biochem. J.* 22, 1555-61(1928).—The results confirm those of Truszkowski (*C. A.* 22, 615), who found that the nuclear-plasmic ratio of mammalian skeletal muscle remains const. throughout starvation.

BENJAMIN HARROW

The synthesis of 4(or 5)-glyoxalineethylmethylcarbinol and its behavior towards the polyneuritis of pigeons. YOSHIKAZU SAHASHI. *Bull. Inst. Phys. Chem. Research (Japan)* 7, 1191-5(1928); *Abstracts* 1, 114-5.— $\text{N:CHNHCH:CCH}_2\text{CH}_2\text{CMeOH}$ has

been prepd. It temporarily cures the severe spasmodic form of polyneuritis of pigeons. The animals never live longer than 7-10 days after the first appearance of the spasms. The curative power of this compd. is thus nearly equal to that of 2,6-dihydroxyquinoline derived from the β -acid obtained by hydrolysis of crude oryzanin.

A. L. LENNE

Has alcoholic extract of polished rice any noxious effect upon pigeons? YOSHIKAZU SAHASHI, TARO NOGUCHI AND NABETARO HASHIMOTO. *Bull. Inst. Phys. Chem. Research (Japan)* 7, 1196-1201(1928); *Abstracts* 1, 115-6.—Recently, it has been

stated that polyneuritis in birds is produced by a toxic substance in the alc. ext. of polished rice, but not by the deficiency of vitamin B. In order to prove this statement, 2 groups of pigeons have been fed, one group on rations consisting of well-washed polished rice and McCollum's salts, the other on a large quantity of alc. ext. of powd. polished rice daily besides the above diet. The pigeons of the second group lived somewhat longer than those of the first group, thus showing that the alc. ext. is not noxious. Polyneuritis appeared earlier in the group fed with extd. rice. ALBERT L. HENNE

Observations on the use of irradiated ergosterol in active rickets. JACOB SOBEL AND IRVING CLAMAN. *Arch. Pediatrics* 46, 1-16(1929).—A series of 9 rachitic children showed a normal blood Ca (9.5 to 11.6 mg. per 100 cc.) and a low blood inorg. P (2.1 to 4.1 mg. per 100 cc.). They received daily 1 to 4 mg. (at times 4 to 12 mg.) of ergosterol which had been irradiated with a Hg vapor lamp for 30 min. at a distance of 1 ft., then dissolved in oil to a 1% soln. Under this treatment, in a period of 1 to 10 weeks, according to the severity of the symptoms, the inorg. P of the blood attained normal values (5.4 to 6.9 mg. per 100 cc.) in all but 1 case. Hypercalcemia did not occur. Improvement was noted in such conditions as the calcification of the epiphyses, the rickety rosary, the open anterior fontanel, and craniotabes. Urinary examn demonstrated that the kidneys were not disturbed. The optimum daily dose of irradiated ergosterol is: for children under 1 year of age 1 to 2 mg. in divided doses, for children over 1 year old 3 to 4 mg. (in divided doses 2 or 3 times a day), for premature infants and as a preventive 0.4 to 0.8 mg. After its use for 3 to 6 weeks, frequently the dose may be reduced or the administration discontinued. JOSEPH S. HEPBURN

The physiology of vitamins. V. Cutaneous manifestations related to a deficiency of the vitamin B complex. G. R. COWGILL, C. J. STUCKY AND W. B. ROSE. *Arch. Path.* 7, 197-203(1929); cf. *C. A.* 20, 3488.—Lesions of the skin, frequently symmetrical, were observed in 6 dogs subsisting for long periods on artificial diets except for the vitamin-B complex. In 2 animals, the administration of a prepn. rich in vitamin B was followed by a definite healing of these sores without any other treatment. Animal 3, after a period of rest on an excellent diet, was again placed on the diet deficient in vitamin B, and 39 days later it again exhibited the sores. The administration of the vitamin corrected the partial anorexia and checked the further development of the lesions. The remaining 3 animals died suddenly of deficiency of vitamin B before treatment with the vitamin was effective. The relation of the individual components of the vitamin-B complex (heat-labile antineuritic fraction or heat-stable growth promoting substance) to such lesions of the skin remains to be detd. These observations may be of clinical value. As is well known chronic invalids subsisting on a "hospital" diet are particularly prone to develop decubital ulcers, which are discouragingly resistant to treatment by the usual methods employed. It is suggested that more attention should be paid to the content of vitamin B in the diets used in such cases. H F H

The influence of fat on the nutritional value of infants' foods. F. THOENES *Jahrb. Kinderheilk.* 120, 1-38(1928).—Carefully controlled metabolic studies contradict the prevalent belief that infants on a high-fat diet require an increased food intake. The energy quotient of infants on a butter-meat mixt. is no higher than on fat poor skim milk. Ca and P seem to be retained less well on a high-fat diet. F. M. H

Stone formation as a result of avitaminosis in man. SAMPOERNO. *Geneeskund. Tijdschr. Nederland. Indië* 68, 579-87(1928).—In a 6 months old child S. found clinical and pathological-anatomical phenomena, which are also observed in animals, caused by a lack of vitamin A. The expected combination of keratomalacia and stone formation in the urinal ducts, according to the latest researches in exptl. avitaminosis, is here established for the first time in man. J. C. JURRJENS

A particular case of disturbance of carbohydrate metabolism during infancy. S. VAN CREVELD. *Nederland. Maandschr. Geneeskunde* 15, 349-59(1928).—This case refers to a boy 7 years old. Several times in the morning a very strong hypoglycemia was found, from 0.03 to 0.046%. After giving a dose of 30-50 g. glucose, levulose or galactose, sugar was never found in the urine, not even if the same dose was given after a few hours. The sugar assimilation, however, proved to be very abnormal. One hr. after the levulose dose a high concn. of levulose (0.018%) was found in the capillary blood. The conversion of levulose to glycogen apparently was not normal. After the glucose dose the blood sugar curve was biphasic, showing a serious disturbance in the sugar assimilation. Other sugars apparently are not as well assimilated. After fructose there is acidosis for hours, while there is practically no rise in the respiratory quotient during the first 4 hrs. Adrenaline injections increased the acidosis. Insulin produced after 1 hr. serious symptoms of hypoglycemia, which disappeared after giving

the patient sugar and milk. Small doses of thyroxine over a long period had no effect on the blood sugar % and acidosis. J. C. JURRIJENS

The influence of irrigation on the nutritive value of rice. R. MCCARRISON. Pasteur Inst., Coonoor, S. India. *Indian J. Med. Research* 15, 915-20(1928).—The lower nutritive value of rice grown under wet conditions is due, in part at least, to its lower content of vitamins of the water-soluble-B class. The conditions of cultivation of rice, especially in regard to water supply during the growth of the crop, are factors of importance in detg. the endemicity of beriberi. FRANCES KRASNOW

Is infantile beriberi disappearing? Facts on infantile beriberi during the last thirteen years. JOSE ALBERT AND ALBINO M. OCAMPO. Univ. of the Philippines. *J. Philippine Islands Med. Assocn.* 8, 221-5(1928).—A gradual disappearance is noted. FRANCES KRASNOW

A guide to artificial feeding of infants. EUSEBIO B. SALUD. *J. Philippine Islands Med. Assocn.* 8, 307-11(1928). FRANCES KRASNOW

Photochemistry of vitamin D. STANISLAW K. KON. *Roczniki Chem.* 8, 502-17 (1928) (518 English).—Repeated boiling of cholesterol soln. in acetone with KMnO_4 removes completely the provitamin from cholesterol, which, purified in this way and irradiated, is antirachitically inactive, even in large doses. The photochem. formation of vitamin D under the influence of monochromatic ultra-violet light has been studied quantitatively for different lines. The quantity of radiant energy necessary to form an amt. of vitamin D sufficient to cause a demonstrable deposition of Ca in the bones of a rachitic rat has been found to be const. over a wide range of radiations, 700-1000 m μ being necessary for the 256, 265, 280 and 293 m μ lines. The quantum efficiency is independent of the state in which ergosterol is irradiated, the results being the same for irradiation of the solid or of solns. in alc. of varying concns. The quantum efficiency was the same for ergosterol acetate as that for ergosterol. The hydroxyl group plays no role in the process of activation. An application of the thermopile to the direct study of photochem. processes is described. It is shown that the formation of vitamin D from ergosterol is in all probability a complicated process with a low quantum efficiency even when monochromatic ultra-violet light is used. J. K.

Antirachitic factor in burbot-liver oil. BERTHA CLOW AND ABBY MARLATT. *Wise Univ. Ind. Eng. Chem.* 21, 281-2(1929).—Burbot, a fresh-water relative of the cod, is abundant in the Great Lakes and streams near them. The antirachitic potency of oil from burbot liver was studied by the healing of rachitic rats in 10 days as detd. by Stenbock's method. Tests showed 2% cod-liver oil equal to 0.125% burbot-liver oil, or 0.06% cod-liver oil equal to 0.007% burbot-liver oil. Since different samples of cod liver oil vary much in effectiveness, the superiority shown by the burbot-liver oil in this one test may be misleading. AMY LEVESCONTE

Nutritive value of milk. I. Production of nutritional anemia in albino rats through exclusive whole milk diets. W. E. KRAUSS. Ohio Agr. Expt. Sta. *J. Dairy Sci.* 12, 749(1929).—An exclusive whole milk diet fed to weaning rats from normal females produces severe anemia in 4 to 6 weeks. The preventive or curative power of different substances can be detd. by supplementing the milk diet with them. Substances which gave the best results in preventing anemia were a specially prepd. yeast, hog liver and solns. of Fe and Cu fed simultaneously. AMY LEVESCONTE

Nutritional value of copper in powdered whole milk. R. W. TITUS AND J. S. HUGHES. Kansas State Agr. Coll. *J. Dairy Sci.* 12, 90-3(1929).—The Cu content of whole milk powder resulting from the solvent action of milk on the Cu vacuum pans may tend to destroy vitamins. It may also help to prevent anemia. Rats fed on a daily ration of 8 g. milk powder, contg. about 0.05% Cu, supplemented only with 0.5 mg. Fe, showed excellent growth and hemoglobin production. No exptl. work with Cu has been done on human subjects. AMY LEVESCONTE

Comparison of the antirachitic potency of ergosterol irradiated by ultra-violet light and by exposure to cathode rays. ARTHUR KNUDSON AND CHESTER N. MOORE. Albany Med. Coll. and the Research Lab. of the General Elec. Co. *J. Biol. Chem.* 81, 49-61(1929); cf. *C. A.* 22, 2770.—Exposure to cathode rays with a tube operating at 180,000 to 200,000 v. does not render ergosterol as potent (0.0005 mg. per day) as when it is irradiated with ultra-violet light (0.00002 mg.). Exposure to ultra-violet light for 15 secs. renders ergosterol more potent than a 30 sec. exposure. The changes in the absorption spectra produced by cathode rays and by ultra-violet light are similar. The manner in which cathode rays produce their antirachitic action does not seem to be due to the production of ultra-violet light as they produce no activation through a quartz plate. A. P. LOTHROP

The tetany of fasting in experimental rickets. T. S. WILDER. Harvard Med.

School and Children's Hosp., Boston. *J. Biol. Chem.* **81**, 65-72(1929).—"Fasting of rachitic rats produces in the 1st 24-36 hrs. a marked elevation of the inorg. phosphate of the blood, accompanied by severe tetany. A moderate depression of Ca is also found. A study of the partition of P in the plasma and in the red cells before and during fasting demonstrates that increase of plasma inorg. phosphate is not derived from the other P factors of the blood. Measurements, however, of N in the urine indicate a destruction of body protoplasm to an extent easily sufficient to account for the observed rise in plasma phosphate. Comparison of the N:P ratio found in the urine with that for muscle tissue indicates an extensive retention of phosphate released by tissue destruction and no doubt deposited in healing bone. Measurements of blood sugar demonstrate that the convulsions, occurring in fasting rachitic rats, cannot be referred to hypoglycemia. Normal rats do not develop tetany when fasted. They do not show the elevation of blood phosphate seen in rachitic animals and their survival period is several times as long. A. P. LOTHROP

Cod-liver oil for reproduction. V. E. NELSON, ESTHER OHRBECK, R. L. JONES AND M. W. TAYLOR. Iowa State Coll. *Am. J. Physiol.* **85**, 476-81(1928).—Diets contg. casein 18, salt mixt. 3.7, yeast 12, cod-liver oil 1-10 and dextrin sufficient to make 100% were adequate for satisfactory growth, reproduction and rearing of the young of white rats. Conclusion: vitamin E was present in the particular cod-liver oil used. J. F. LYMAN

The influence of vitamin D deficiency on gaseous exchange in chicks. F. M. BALDWIN, V. E. NELSON AND C. H. McDONALD. Iowa State College. *Am. J. Physiol.* **85**, 482-8(1928).—The respiratory quotient of chicks fed normal diets varied from 0.94 to 1.00. After acute rachitic symptoms had developed, about 21 days after beginning the deficient diets, the respiratory quotient fell to about 0.70. Treatment of the rachitic chicks with ultra-violet light or with cod-liver oil resulted in a rapid rise in the respiratory quotient. J. F. LYMAN

Basal metabolism data on normal men and women (Series II) with some considerations on the use of prediction standards. FRANCIS G. BENEDICT. Carnegie Inst., Washington. *Am. J. Physiol.* **85**, 607-20(1928).—Basal metabolism was detd. for 27 normal men, 21 to 89 years of age and 33 normal women, 18 to 58 years of age. The actually measured metabolism of the men differed from that predicted by the Harris-Benedict, Aub-Du Bois and Dreyer standards, resp., by -1.8 (extremes +26.2 to -17.1), -4.4 (extremes +17.8 to -19.4), and -0.4 (extremes +13.6 to -11.3). Variations for the women from the three standards, respectively, were: -4.2 (extremes +10.9 to -16.7), -7.3 (extremes +11.3 to -19.3) and -4.0 (extremes +9.7 to -19.3). The widest discrepancies were with individuals of unusual configuration. If predicted values for basal metabolism are to be used as criteria for detg. medical or surgical treatment, a more critical consideration of the prevailing methods of prediction is imperative, especially as concerns the obese individual, those suffering from endocrine disturbances and those of unusual configuration. J. F. LYMAN

The basal metabolism of some browns and blacks in Jamaica. MORRIS STEGERDA AND F. G. BENEDICT. Carnegie Inst., Washington. *Am. J. Physiol.* **85**, 621-33(1928).—The av. deviation from that predicted by the Harris-Benedict standard for basal heat production for 37 male browns in Jamaica was -5.4%; for 5 female browns -3.4%; for 8 male blacks -2.0%. Climate and diet in Jamaica probably have no pronounced effect upon heat production. J. F. LYMAN

The basal metabolism of Mayas in Yucatan. GEORGE D. WILLIAMS AND FRANCIS G. BENEDICT. Harvard Univ. and Carnegie Inst., Washington. *Am. J. Physiol.* **85**, 634-49(1928).—The av. deviation from that predicted by the Harris-Benedict standard for 32 male Mayas in Yucatan was +5.2%. The av. mouth temp. was 97.2° F. Difference in configuration, the type of occupation or the state of nutrition cannot account for the high metabolism; presumably the difference is racial. J. F. L.

Age and basal metabolism in adults. FRANCIS G. BENEDICT. Carnegie Inst. *Am. J. Physiol.* **85**, 650-64(1928).—Basal metabolism values for one woman and 3 men (members of lab. staff) extending over 12-20 years are given. With 2 of the men subjects a distinct decrease in metabolism was noted as age increased. Basal metabolism may have great significance in indicating the relative physical fitness, the level of vital activity, or the physical powers of the individuals. J. F. LYMAN

Basal metabolism before and after a summer vacation. FRANCIS G. BENEDICT AND MARY D. FINN. Carnegie Inst. *Am. J. Physiol.* **85**, 665-71(1928).—The basal metabolisms of 20 members of the Nutrition Lab. staff have been detd. before and after a one month's summer vacation over a period of 17 years. On the whole there was no measurable effect; but in two cases basal metabolism was 21 and 32%, resp., higher

after the vacation. The results show a fixity of basal metabolism in the individual which should be strongly emphasized.

J. F. LYMAN

The absence of convulsive phenomenon in the experimental beriberi of the pigeon. G. AMANTEA. *Boll. soc. ital. biol. sper.* 3, 826-8(1928).—From numerous observations made on pigeons of both sexes, A. makes the assertion that if the symptoms are very carefully studied, the animals do not show any characteristic convulsions. This is true in typical beriberi with nervous phenomena and also when the disease is complicated by gastrointestinal toxic factors. The neuromuscular symptoms noted are not convulsions but excessive general agitation.

PETER MASUCCI

The relative utilization of different calcium compounds by hens in the production of eggs. G. D. BUCKNER, J. H. MARTIN AND A. M. PETER. Ky. Agr. Expt. Sta. *J. Agr. Research* 36, 263-8(1928).—A study was made of the comparative effectiveness of CaCO_3 , CaSO_4 , $\text{Ca}_3(\text{PO}_4)_2$, CaCl_2 and calcium lactate in the production of eggs when fed to hens as supplements to a wheat, corn and skim milk ration. CaCO_3 was most effective as judged by the degree to which it was utilized in the production of eggs, its influence on the wt. of egg contents and shells and the quantity consumed. CaSO_4 was readily eaten by the hens but produced fewer and lighter eggs. The lactate was apparently well utilized but the intake was small. CaCl_2 was not voluntarily consumed. Its addition to the basal ration caused only a small increase in egg production. The phosphate serves as a source of Ca but not as well as the carbonate.

A. L. M.

Dietary requirements for fertility and lactation. XVII. A dietary sterility associated with vitamin A deficiency. BARNETT SURE. Ark. Agr. Coll. *J. Agr. Research* 37, 87-92(1928); cf. *C. A.* 22, 4584.—Sterility characterized by resorption of the fetus during gestation, and assocd. with vitamin A deficiency, was produced in rats on a skim-milk diet contg. an abundance of vitamin E. Thirteen references are cited. XVIII. **The vitamin A content of wheat oil.** *Ibid* 93-9.—Sufficient vitamin A for excellent growth of rats during 16 weeks was obtained from 0.05 cc. of wheat oil per animal per day. This quantity of wheat oil per day serves as a potent remedy for severe eye lesions produced by previous lack of vitamin A. Depletion of vitamin A is accompanied by inanition.

A. L. MEHRING

The problem of standardizing vitamin D in butter and in vitamin-containing margarine. FERDINAND FLURY. Pharmacol. Inst., Univ. Würzburg. *Biochem. Z.* 203, 14-21(1928).—The antirachitic effect of margarine to which various quantities of irradiated ergosterol were added has been studied on rats. No rachitic changes were observed in rats which received in their otherwise vitamin D-free diet a daily addn. of 0.1-0.2 g. of this vitaminized margarine (0.9-1.8 antirachitic units or 9,000,000 units per ton). The control rats received a similar quantity of the best grade of butter, but have all developed rickets. These rats showed definite signs of bone healing in 10 days when 0.2 g. of the vitaminized margarine was added.

S. MORGULIS

Vitamin A action of lipochrome. BETH V. EULER, HANS V. EULER AND HARRY HELSTROM. Univ., Stockholm. *Biochem. Z.* 203, 370-84(1928).—Pure carotin and pure lycopin give the colorimetric reaction with SbCl_3 and CHCl_3 which is regarded as characteristic for vitamin A. Other carotinoids likewise give this reaction. The spectra of the resulting blue solns. and the shifting of the absorption maxima through fats were detd. spectrophotometrically. The carotin from carrots acts upon growth in the same characteristic manner as does vitamin A, great increase in wt. being secured with less than 0.005 mg. carotin per day. The vitamin A (SbCl_3) reaction of blood serum or of butter is due to the carotinoid content, and in blood serum the vitamin A plays obviously a large role through its oxidation-reduction activity.

S. M.

Experimental studies on the behavior of the blood sugar level following the ingestion of yeast. A. BICKEL AND G. NIGMANN. Pathol. Inst., Univ. Berlin. *Biochem. Z.* 203, 421-8(1928).—In rabbits which fasted 24 hrs. the ingestion of 5 g. dried yeast causes generally a marked fall in the blood sugar which attains a max. 4-6 hrs. after the feeding. These results were so far obtained with a specially prepd. yeast powder Levurinost.

S. MORGULIS

Contribution to the biochemistry of avitaminosis. XII. The creatinephosphoric acid content of white and red muscles in experimental scurvy and in polyneuritis. ALEXANDER PALLADIN AND S. EPELBAUM. Ukraina Biochem. Inst., Charkow. *Biochem. Z.* 204, 140-9(1929); cf. *C. A.* 23, 160.—The effect of scurvy and polyneuritis has been studied on the content of creatinephosphoric acid, creatine and lactacidogen in the red and white muscled of guinea pigs and pigeons. The animals were killed in the final stage of scurvy when they had lost much wt. The muscles of the legs of the guinea pigs under those conditions contained less creatinephosphoric acid than normally, and this was especially marked in the red muscles. Lactacidogen, on the contrary,

was higher than in the normal muscle. In the heart muscle of guinea pigs sick with scurvy no creatinephosphoric acid could be found at all, and the lactacidogen content likewise was considerably diminished. Chronic and acute polyneuritis differ materially from each other in the way they affect the creatinephosphoric acid as well as lactacidogen content of the muscles. In the chronic form of the disease the creatinephosphoric acid content of the muscle is much lower than normally while that of lactacidogen is higher. In the acute polyneuritis the creatinephosphoric acid is increased and the lactacidogen is diminished. In scurvy the creatinephosphoric acid content of the red muscles is more affected than in the white muscle although normally the red muscle contains less creatinephosphoric acid than the white muscle. Avitaminosis expts., as well as expts. with P or with tetrahydro- β -naphthylamine, show that in red and white muscle which possess different functions, the changes in creatinephosphoric acid are not similar, so that creatinephosphoric acid metabolism must be assoc. somehow with these different functions.

S. MORGULIS

The effect of starvation on the creatine content of muscles and on the creatine-creatinine excretion of cats. ALEXANDER PALLADIN AND S. EPILBAUM. *Ukraina Biochem. Inst., Charkow. Biochem. Z.* 204, 150-64(1929).—In fasting cats creatine in the urine appears on the fourth to sixth day of fasting. The creatinuria becomes progressively greater during the fast until in the end stage of starvation a much greater percent of the total excreted N is in the form of creatine than at the beginning. The creatinine elimination becomes on the contrary gradually less during starvation but the curve of the total creatine + creatinine excretion is continuously rising and especially in the final stage when also the creatine and creatinine curves cross. The creatine content of the muscles increases in cats during the early stage of starvation and this increase persists until the third fasting phase when it commences to decrease. In the end or fourth period of fasting the muscle contains less creatine than during the first period but nevertheless its creatine content is still higher than in the normal.

S. MORGULIS

Contribution to the problem of the simplicity of vitamin B. ERNST SCHMITZ AND ERICH GEORGE. *Univ. Breslau. Biochem. Z.* 204, 165-78(1929).—The attempt was made to produce in pigeons the purely neurotropic disease syndrome of B-avitaminosis by feeding rice and sunflower seeds. The observations seem to indicate with much certainty that the sunflower seeds possess distinct protective action also against the neuritic component of the B-avitaminosis in pigeons. When this neuritic disturbance does occur it is accompanied by a disturbance in body wt. which is not remedied even when the neuritic effects of the disease have disappeared.

S. M.

Experimental hypervitaminosis in rats through large doses of irradiated ergosterol. J. A. COLLAZO, P. RUBINO AND B. VARELA. *Biochem. Z.* 204, 347-53(1929).—With 5-mg. doses of antirachitic vitamin D (Vigantol) per rat there is produced a condition of cachetia loss in wt., arrest of growth, hypothermy and finally death. This condition is designated as vitaminismus. This dose of vitamin D is 5000 to 50,000 times greater than the active amt. present in the McCollum rachitic diet No. 3143; *i. e.*, the difference between the useful and lethal dose is extraordinarily large and impossible to reach in human therapy, though of course one must bear in mind the possibility of producing such hypervitaminosis in the humans. The effect of the overdose is thought to be due to some connection with a stabilization of the Ca in tissue metabolism by vitamin D.

S. MORGULIS

Vitamin action and surface tension activity. I. Utilization of capillary active vitamin-like substances in the avitaminosis of guinea pigs. N. E. SHEPILVSKII. *Nutrition Inst., Publ. Health Commissariat, Moscow. Biochem. Z.* 204, 371-88(1928).—Phenolphthalein, $MgSO_4$, alc. or kaolin have neither prophylactic nor therapeutic action in exptl. scurvy in guinea pigs. Expts. with a 0.015% Na oleate, which has no antiscorbutic effect, indicate that this substance does somewhat retard the loss in body wt. Greater concns. of Na oleate (0.03-0.05%) gave neg. results.

S. M.

Ergosterol isolated from the edible Japanese mushroom, "Cortinellus shiitake." Midzuho Sumi *Inst. phys. and chem. Research, Tokyo. Biochem. Z.* 204, 396-411(1929); *cf. C. A.* 22, 4595.—Ergosterol isolated from *C. shiitake* acquires antirachitic activity after 30 min. of ultra-violet radiation. Amts. of 0.0001 mg. of this radiated substance administered to rats weighing 35-45 g. produce healing. A longer radiation has no effect on the antirachitic activity provided this is not too protracted and causes actual destruction of the ergosterol. Its action is practically the same as that of Merck's Vigantol. The alc. group of the ergosterol has no relation to its antirachitic effect since the radiation of its various esters (acetate, benzoate, palmitate) has the same result. On the other hand, the presence of the double bond is most important for its

therapeutic value. Even the change in position of the double bond, as in iso-ergosterol, causes a loss of this property. It is evident that hydrogenation of the ergosterol inactivates it. Apart from the absorption bands already reported in previous works, a new absorption band has been found at 250μ . S. MORGULIS

Studies in experimental scurvy. II. The carbohydrate metabolism of the animal fed on a vitamin-C-free diet. TAKEYOSHI NAGAYAMA, HIKOSABURO MACHIDA AND YOSHIO TAKEDA. Jikei-Kwai Med. Coll., Tokyo. *J. Biochem. (Japan)* 10, 17-26 (1928).—The av. blood sugar content of a normal guinea pig is 0.109%. No noteworthy change was observed in animals on a vitamin-C-free diet, but in some animals there was an increase in the blood sugar level shortly before death. It is still doubtful whether the moderate reduction in the liver glycogen at the end of scurvy is an inanition or a vitamin-C-deficiency effect. The carbohydrate metabolism during scurvy is not appreciably disturbed. **III. The nitrogen metabolism of the animal fed on a vitamin-C-free diet.** TAKEYOSHI NAGAYAMA AND NOBORU SATO. *Ibid* 27-44.—In exptl. scurvy the urinary excretion of creatine increases and the creatinine coeff. also rises. The creatine content of the muscle remains practically the same as normally. The uric acid excretion generally does not differ from that found normally though toward the end of scurvy it may decrease. The NH_3 excretion, on the contrary, is somewhat greater than normally. The increased creatine excretion and the rise in creatinine coeff. are observed also in starved guinea pigs, but the creatine content of their muscles is less than that in the control animals. S. MORGULIS

Studies on experimental rickets. II. The influence of ultra-violet irradiation on the antirachitic value of soy-bean oil. SEIICHI IZUME, YOSHINORI YOSHIMARU AND ISAO KOMATSUBARA. Central Lab., So. Manchuria Railway Co., Dairen, Manchuria. *J. Biochem. (Japan)* 10, 177-82(1928).—Among the soy-bean oils the one produced by means of the hydraulic press was the highest, and the one prepd. by alc. extraction the lowest in antirachitic value, while the oil obtained by benzine extraction was intermediate in its effect. By the usual processes of refining the antirachitic vitamin of the crude oil was not appreciably destroyed. The antirachitic potency of the oil was much increased by ultra-violet irradiation. Phytosterol isolated from the unsaponifiable fraction of the oil was rendered antirachitic by irradiation and exhibited the well-defined ergosterol absorption bands in the ultra-violet spectrum. S. M.

Increased irritability of the heart vagus in rats suffering from deficiency in fat-soluble vitamins in the diet. BERTELON BONSDORFF AND RAGNAR GRANIT. Universit. Helsingfors. *Skand. Arch. Physiol.* 55, 30-40(1929).—In rats on a vitamin-free diet vagus stimulation of the heart occurs with a strength of current which has no effect on the control animal. S. MORGULIS

Fat-soluble vitamin E and reproduction in mammals. HERBERT MCLEAN EVANS. Univ. of Calif. *Bull. soc. hyg. aliment* 16, 382-97(1928).—An address describing E.'s work on the subject. A. PAPINEAU-COUTURE

Cause and treatment of nutritional disturbances after extensive resection of the intestine. I. Effect of diets rich in vitamin and lipid. HUBERT KUNZ AND HANS MOLLER. Univ. Wien. *Arch. exptl. Path. Pharmacol.* 132, 50-62(1928).—Diets rich in vitamin and lipid permit dogs to remain alive after resections which normally would invariably lead to death. G. H. S.

Lipoid-free diets. R. JAFFÉ. Pathol. Inst. Krankenhauses Moabit., Berlin. *Arch. exptl. Path. Pharmacol.* 132, 84-105(1928).—Mice cannot be maintained upon a lipoid-free diet indefinitely. When upon such a diet an initial period of apparent well-being with a slight gain in wt. is followed by a sudden loss in wt. and death. Animals upon a diet lacking lipoids exhibit an increased susceptibility to unfavorable environmental conditions, including infection. Apparently lipoid in the diet is also essential to proper function of the female sex glands. G. H. S.

Effect of unphysiological diets upon the composition of organs and changes in metabolism. I. Excessive intake of fats. W. BICKENBACH AND P. JUNKERSDORF. Univ. Bonn. *Arch. exptl. Path. Pharmacol.* 132, 129-44(1928).—When dogs were fed fat in excessive amts. after a period of hunger a considerable hypoglycemia developed shortly after the feeding. This was followed by an abrupt increase in the blood sugar. Analyses of the organs indicated that the sugar-regulating function of the liver was impaired because of the extensive infiltration of fat. G. H. S.

The difference between bios and vitamin B. The study of the growth of yeast. HIROSHI IIDA. Taiwan Hospital of Formosa. *Taiwan J. Med.* 279, 635-69(1928).—The degree of yeast growth, as measured by the volumetric method or the gas-volumetric method with the fermentation gas, gives almost the same results, i. e., it increases with the bios content, up to certain limits, beyond which it decreases. The substance

which inhibits the yeast growth above a certain limit is not a salt nor a sugar-like substance but is the bios itself. From these exptl. results the resistance of bios to heat and alkali was examd.; it is greater than that of vitamin B. Thus the strength of the bios begins to decrease gradually at the 5th hr. of heating at 100°, being halved by 21 hrs.' heating. The decompn. in a 3% NaOH soln. is 67.7%. In the case of vitamin B complete decompn. results on heating for 3 hrs. at 100°, and also in a 1% NaOH soln. Hence I. concludes that vitamin B always accompanies bios and that every vitamin B prepn. examd. by I. contained bios, although the concentrations of the two substances were not always parallel; so that it is also concluded that vitamin B and bios are not the same thing. Consequently I. also agrees with Funk's theory of vitamin D and remarks that the vitamin, as detd. by means of yeast, is not B, but D.

K. SOMEYA

Spectrographic verification of the activation of ergosterol by ultra-violet irradiation. GEORGE TIXIER. *Compt. rend.* **188**, 206-8(1929).--Ergosterol irradiated under certain conditions acquires antirachitic properties. To det. the amt. of this acquired power it is necessary to use rats that have been fed on a deficiency diet. This biological method is slow and expensive in addn.; the irradiated ergosterol loses its antirachitic power and may be valueless when the assay is completed. It is known that the transmission of irradiated ergosterol is increased in the zone 2400-2950 Å. U. This property was utilized to measure the activation of the product. Samples of ergosterol were irradiated at various intervals of time and it was found that the optimum antirachitic power did not coincide with the max. spectrographic change. It was possible to det. the change in optical transmission which corresponded to the max. antirachitic action by placing a soln. of the ergosterol in a quartz cup of variable thickness. The light was obtained from a Hg arc and the only variable was the thickness of the soln. In practice the spectrographic examns were made at the same time that the material was being irradiated.

M. H. SOULE

The action of cholesterol obtained from cod-liver oil upon photographic plates. L. HUGOUNENQ AND E. COUTURE. *Compt. rend.* **188**, 349-50(1929). Cholesterol obtained from biliary calculi, beef brains and cod-liver oil was placed on Lumière (Opta and Sigma) plates for intervals varying from 3 to 15 days. When the plates were developed black spots were always found where the cholesterol from the cod-liver oil had been in contact with them. The plates were unaffected by exposure to the other cholesterol. To det. whether this was a phys. or chem. reaction small quantities of the cholesterol from cod-liver oil were placed on pieces of quartz and glass and then exposed to the Lumière plates. The plates were acted upon by the cholesterol supported by the quartz and unaffected by the material supported by the glass. This demonstrates that the action is a phys. one. The authors call attention to the importance of this work in connection with the antirachitic action of cholesterol from cod-liver oil.

M. H. SOULE

Vitamins and tumor growth. II. Preliminary note on the non-consumption of vitamin B by growing chicken sarcoma. WARO NAKAHARA AND EIICHI SOMEKAWA. Inst. Phys. Chem. Research, Tokyo. *Proc. Imp. Acad. (Japan)* **5**, 55 6(1929), cf. *C. A.* **2**, 4595.--In spite of the extreme complexity of the problem, it may be reasonably concluded tentatively that vitamin B, which is essential for the growth of normal tissues, may be non-essential for the growth of the chicken sarcoma.

C. J. WEST

Studies of the changes in the blood constituents during avitaminosis. T. Muro. Univ. Fukuoka. *Fukuoka-Ikwadaigaku-Zasshi* **20**, 1269 79(1927); *Ber. ges. Physiol. exptl. Pharmakol.* **45**, 340. The erythrocyte count, hemoglobin content and sp. gr. are increased in various degrees during avitaminosis. Through disturbance of the carbohydrate metabolism and increase in the protein metabolism, the blood sugar and residual N are generally increased. The acetone bodies and lactic acid show a tendency toward the increase, but it is not intense. There is an increase in the total fatty acids and in the cholesterol. The PO₄ of the blood is reduced. Acetaldehyde is normally present in very small amts. if at all, but in rice-fed chickens the amt. is very much increased. In both fasting and rice-fed chickens the sp. gr., viscosity, residual N, acetone and β-hydroxybutyric acid all show a slight increase. In the fasting chickens the erythrocyte count and the hemoglobin content were reduced, in contrast to the rice-fed ones.

R. C. WILLSON

Irradiating foods, etc. (Brit. pat. 294,502) 12. Radiating foods with filtered and concentrated rays from the sun (U. S. pat. 1,704,173) 12.

F—PHYSIOLOGY

E. K. MARSHALL, JR.

The significance of adenylic acid for the muscle function. II. Deamination of adenylic acid by muscle pulp and ammonia formation in muscle contraction. G. EMBDEN, C. RIEBELING AND G. E. SELTER. Univ. Frankfurt. *Z. physiol. Chem.* 79, 149 60(1928); cf. *C. A.* 21, 3076.—When very fresh rabbit or frog muscle is finely minced and allowed to stand in contact with 2% NaHCO_3 at $38-40^\circ$ there is a liberation of NH_3 which reaches its max. in 3–4 hrs. Addn. of urea does not increase the amt. of NH_3 , but adenosinephosphoric acid causes a considerable increase, representing 50% of the NH_2 group present therein. If isolated frog muscles are stimulated by induction strokes until a certain degree of fatigue sets in, the stimulated muscles show a much higher NH_3 content than the resting muscles, and after severe fatigue the increase in NH_3 is a high multiple of the control value. A brief tetanic stimulation of 2–3 seconds also results in a distinct liberation of NH_3 . In the great majority of ppt. a noticeable increase was brought about by tetany of less than 1 sec. duration. Contrary to the prevalent views, the breakdown of a nitrogenous substance is one of the regular phenomena accompanying muscle contraction. The often observed increase in N excretion by man after strenuous muscular work may well be due only in part to increased protein breakdown and in part also to NH_3 formation from adenosinephosphoric acid in the muscle. The view expressed by Burian more than 20 years previously, that endogenous purine metabolism is intimately assocd. with muscular work is thus supported. III. The behavior of ammonia formation in muscular work under various biological conditions. G. EMBDEN AND H. WASSERMAYER. *Ibid* 14, 185.—The lively esculenta frogs in May show a much higher content of NH_3 -forming substance than in winter and than is observed in the sluggish summer frogs. After considerable jumping these frogs show a high NH_3 content in their muscles, and this is much further increased by 100 induction stimuli. Under similar conditions the increase brought about by stimulation is far greater in *Rana esculenta* than in *R. temporaria*. This observation fits in with the well-known fact that the muscles of the latter are more easily fatigued. After subsequent resting the high NH_3 content disappears. The same decrease in NH_3 is observed when the May frogs are kept in the lab. As their liveliness diminishes toward the end of May and in June, the amt. of NH_3 -forming substance, the NH_3 of the resting muscles and that developed by 100 induction gradually decrease. When the sluggish autumn temporaria frogs are kept several days at $26-27^\circ$ their liveliness increases, as also the amt. of NH_3 -forming substance, and the NH_3 both before and after stimulation. Frogs poisoned by P, which is not fattened in the ordinary sense, although their mobility is greatly impaired, show an increase in NH_3 before and after stimulation. The ratio of lactic acid to NH_3 in isolated gastrocnemii after stimulation is not const. but is subject to wide variations. IV. Cleavage and resynthesis of the ammonia-forming substance in muscular activity. G. EMBDEN, M. CARSTENSEN AND H. SCHUMACHER. *Ibid* 18, 225.—The liberation of NH_3 during contraction of frog muscle is a reversible process. The rate of disappearance of the liberated NH_3 after a brief tetany varies with the liveliness of the frogs as detd. by the season of the year. The reversibility of the process is not diminished in winter, but on the contrary it is intensified to such an extent that to demonstrate the liberation of NH_3 a longer tetany is required. The muscles thus injured so that a resynthesis no longer occurs or at least does not occur during the 1st min. of relaxation. With equal no. of stimuli, equal intensity and equal but the liberation of NH_3 varies with the stimulation frequency. With high frequency, i. e., shortening of the rest intervals, the NH_3 formation is most apparent, while with low frequency it may be so slight as to escape observation. The resynthesis or reformation thus occurs during the intervals between individual stimuli. The fact that 100 or more maximal contractions can occur without any evidence of NH_3 formation while considerable lactic acid is formed shows that the ratio between NH_3 and lactic acid formed during work may be infinitely small, and confirms the authors' previous inference that no const. or even approx. const. relationship exists between these 2 substances produced during muscular work. The variation in reversibility of NH_3 formation also precludes any such proportionality. V. The source of the ammonia formed in contraction. G. EMBDEN AND H. WASSERMAYER. *Ibid* 226–37.—On the assumption that only adenosinephosphoric acid serves as the source of NH_3 , and that only this substance and its decompn. products are pptd. by $\text{CuSO}_4 + \text{Ca(OH)}_2$, a definite relationship should exist between the NH_3 formed and the N content of the ppt. Of the 5 N atoms in adenosinephosphoric acid only 1 is present as NH_3 and capable

of yielding NH_3 by deamination. The increase in NH_3 N resulting from 4 hr. contact at 40° of the powder prepd. by means of liquid air from frog and rabbit muscle is actually $\frac{1}{3}$ of the N in the Cu-Ca ppt. obtained from the same material. Adenine, guanosinephosphoric acid, guanosine and guanine do not yield NH_3 under these conditions. Adenosinephosphoric acid, on the other hand, when mixed with muscle pulp or treated with enzyme solns. prepd. from muscle, liberated $\frac{1}{3}$ of its N as NH_3 . No other substance is known to yield NH_3 in this ratio and under these conditions, with the exception of adenosine which has not been identified as a muscle constituent.

A. W. DOX

Ional effects on aging in muscle press juice, especially the influence of hydrogen-ion concentration. II. WASSERMEYER. Univ. Frankfurt. *Z. physiol. Chem.* 170, 283-311(1928).—Press juice from rabbit muscle, in contrast to muscle pulp, retains for a considerable time its power of synthesizing org. P derivs. from glycogen and H_3PO_4 . The synthesis occurs most readily when an acid reaction is maintained. Addn. of alkali diminishes it in proportion to the resulting decrease in H-ion concn. until at neutral or alk. reaction the synthesis is strongly inhibited. The effect of NaHCO_3 is greater than that of NaOH or NH_4OH at the same p_{H} ; hence there must be an ional effect in addn. to that of H-ion concn. With NaOH and especially with NH_4OH there is even a favorable effect on synthesis provided the added alkali is not sufficient to raise the p_{H} value materially. That the inhibition by NaHCO_3 is due in part to CO_2 is shown by the fact that satn. of the press juice with CO_2 gas inhibits synthesis without altering the p_{H} , and subsequent removal of the CO_2 by aeration restores it. Loss of synthesizing power is a characteristic of aging and of ultimate rigor mortis of muscle. This is known to be accompanied by a decrease instead of an increase in acidity as was formerly supposed, and to be accelerated by CO_2 . Addn. of 0.01 N lactic acid to the press juice has a favorable effect on synthesis. This harmonizes with the recent evidence that muscular fatigue and rigor mortis are not due to lactic acid formation but rather to the decrease in H-ion concn. caused by liberation of NH_3 and to the formation of CO_2 . The reaction is accompanied by an alteration in the colloidal state of the proteins which occurs even in the press juice where the cell structure has been destroyed.

A. W. DOX

Studies on the blood of birds. I. The corpuscles of the pigeon. WALTER P. KENNEDY AND DAVID R. CLIMENKO. Edinburgh Univ. *Quart. J. Exptl. Physiol.* 19, 43-9(1928).

FRANCES KRASNOW

The amide nitrogen of blood. III. Muscular exercise: the role of ammonia in the neutralization of lactic acid. SIMPLY BLISS. McGill Univ. *J. Biol. Chem.* 81, 137-58(1929); cf. *C. A.* 23, 1149.—"Tissues possess the function of detoxifying NH_3 by the synthesis of amides of the blood proteins. This is shown by the fact that after a dog has recovered from the poisoning caused by the intravenous injection of $(\text{NH}_4)_2\text{CO}_3$ solns., it can receive a similar amt. of the solu. via the femoral artery without any toxic symptoms, and in both instances there is a rise in the amide N content of the blood. The order of injection is immaterial. Dogs with normal kidneys quickly reduce the higher level of blood amide N that is caused by the injection. It has been demonstrated that the tissues of the leg of the dog possess the power of rapidly synthesizing amides from injected NH_3 . Short periods of muscular exercise are followed at 20 min. by a moderate lowering of the amide N content of arterial blood with a return to normal within an hr. This lowering is considered to be caused in part by the excretion of extra NH_3 at this time and also by the relative alk. plethora which follows the resynthesis of the lactic acid precursor in muscle. Comparison of simultaneous samples of blood taken from the femoral artery and the femoral vein before and after exercise shows that after exercise the venous blood contains more amide N than the arterial blood. The increase in amide N content is as high as 76% with a method shown to be accurate to within less than 1%. The results are in harmony with the view that NH_3 plays a part in the neutralization of acids formed in muscular exercise, the NH_3 , so used, appearing in the blood of the femoral vein not as an NH_4 salt, but as an amide of blood protein."

A. P. LOTHROP

Avitaminosis. II. The inorganic phosphorus content (A), lactacidogen, and glycogen of the pectoral muscles of normal, fasting, and avitaminosis pigeons. A. PUGLIESE. *Arch. sci. biol.* (Italy) 12, 251-61(1928); cf. *C. A.* 22, 4605. The phosphorus A, and lactacidogen of the pectoral muscles of fasting pigeons showed a small decrease in contrast to the homologous muscles of normal animals. In pigeons fed with polished rice, there was a noticeable increase in lactacidogen, and an enormous increase in phosphorus A. If the amt. of phosphorus A found in the pectoral muscles of normal pigeons is given a value of 100, then for fasting animals it is 91, and for the

avitaminosis 270. The accumulation of inorganic P in pigeons which have become polyneuritic following an exclusive diet of polished rice constitutes an important manifestation of avitaminosis. PETER MASUCCI

Respiration across resistances. I. A standard resistance scale. GINO SIMONELLI. *Boll. soc. ital. biol. sper.* 3, 672-5(1928).—The scope of these general studies was to investigate from many points of view the effects produced in the organism by the interposition of resistances which obstruct the free passage of the respiratory current. To accomplish this a well-defined standardized series of resistances was necessary. An app. was constructed by means of which a const. supply of air was obtained at variable velocities. The construction of the resistance scale consisted of a brass tube 1.5 mm. external diam. and 0.75 mm. internal diam. The tube was cut into segments 72 mm. long and grouped into bundles which were placed into another concentric tube. By varying the no. of tubes in each bundle it was possible to obtain 6 different resistances. The characteristics of each resistance showing the pressure in mm. H₂O and the vol. in l. of air per min. are given in tabular form. II. **The influence of inspiratory resistance upon the pulmonary ventilation of man at rest.** *Ibid* 676-7.—The results but not the details of the method are given. Pulmonary ventilation across inspiratory resistances was always diminished in contrast to that without resistance in the corresponding period of time. The same subject did not always present the same diminution with the same resistance: at times strong resistances produced min. variations, and weak resistances max. variations. The interposition of inspiratory resistances in man at rest gives rise to a const. reduction in the vol. of air ventilated per unit time. As resistance increases the organism may act in 2 ways: (1) by lowering gradually the pulmonary ventilation; (2) by increasing the inspiratory force to keep the ventilation value at a level slightly below the normal. After the removal of the resistance there is no compensatory increase in ventilation. III. **Considerations of and studies on certain methods for determining oxygen consumed.** G. SIMONELLI AND G. FERRI. *Ibid* 678-9.—The variations in the thoracic capacity and their effect on the results obtained by Krogh's method for detg. O₂ consumed were investigated. O₂ consumed was measured by Krogh's app. and by Haldane's app. Spirometric detns. were made relative to the air expired, complementary air, reserved air and vital capacity. Thus it appeared that there are modifications in the av. thoracic capacity of such a degree that they do not change in a practical way the general results obtained on O₂ consumed by Krogh's method and that there is no quant. relationship between the modifications and O₂ consumed. IV. **Modifications in oxygen consumed caused by inspiratory resistances in man at rest.** G. FERRI. *Ibid* 680-2.—The 6 series of resistances previously mentioned and Krogh's app. were used on 5 healthy men. The subject was allowed to rest for 30 min., 15 min. of which he was in a supine position. Two detns. were then made, one in which the subject simply breathed across the app., and the other by interposing one of the 6 resistances. The results obtained from 89 expts. are as follows: every inspiratory resistance, even slight, causes in the organism at rest a diminution of O₂ consumed. This assumes different values according to the subject. The diminution varies directly as the degree of resistance. P. M.

The imbibition of iron salts by the walls of the cerebral capillaries in proximity to old hemorrhagic foci. L. PICCHI. *Boll. soc. ital. biol. sper.* 3, 699-701(1928).—P. touches upon the histological and biological significance of the hemosiderin reaction. PETER MASUCCI

The absorption capacity of red blood cells for levulose. GEORG EISNER AND FRITZ LEWY. *Biochem. Lab. Krankenhaus Moabit, Berlin. Biochem. Z.* 202, 91-8 (1928).—Glucose is taken up by red blood cells as was shown by Loewi, but they take up none or only very little levulose. As for the influence of insulin, the results with glucose are extremely variable, but on the whole it seems that the insulin does not increase the acidity of the red cells either for glucose or for levulose. S. M.

The causation of "mitogenetic" radiation. WERNER W. SIEBERT. *Med. Universit.-klinik, Berlin. Biochem. Z.* 202, 123-30(1928); cf. *C. A.* 23, 855.—Stimulated muscle, bone marrow and tumor tissue exert an action at a distance which is detected by an increased budding process in a special yeast culture. The various metabolic products (lactic acid, H₃PO₄, choline) when added to the resting muscle fail to impart to it this inductor capacity. It was, however, found possible to do this when lactic acid was added to resting muscle and exposing this to a stream of O₂. O₂ alone failed to activate the resting muscle. The fact that the activation may be assocd. with an oxidative process is further corroborated by exptl. evidence showing that even without the O₂ stream this effect can be produced when a trace of CuSO₄ soln. is added (expts. with peroxidases and oxidases gave neg. results). The idea that the activation

of the radiation is bound up with the process of oxidation received strong support from the observation that Warburg's oxidation models ($C_2O_4H_2$ + charcoal + O_2 + levulose + phosphate buffer + O_2) or Willstätter's model (pyrogallol + peroxidase + H_2O_2) all acted just like faradized muscle. Besides, if in Warburg's second model a phosphate buffer of p_H 6.0 instead of 8.0 was used when the levulose is scarcely oxidized, or when the oxidations were suppressed with HCN, the distant effect upon the yeast culture disappeared. This was found to be the case also when HCN was added to the faradized muscle pulp.

S. MORGULIS

Carbohydrate metabolism of white mice with and without insulin. IV. E. J. LESSER AND R. AMMON. Städt. Krankenanstalt, Mannheim. *Biochem. Z.* 202, 294-8(1928).—Eight expts were performed in each of which 3 pairs of mice were used. One pair received an intraperitoneal injection of 45-50 mg. glucose and was killed 3 hrs. later. The second pair received another injection at the end of 3 hrs. and was killed an hr. later. The third pair received an injection of glucose together with 0.45 insulin units per 100 g. and was also killed an hr. later. 'The animals were frozen with CO_2 snow, and were rubbed up in 95% alc cooled to -20° . Glucose and glycogen detns. were made on all of them. On the av. the animals of the first group had 59 mg. glucose and 172 mg. glycogen. When the glucose injection was repeated and the animals were examd. an hr. later the amt. of glucose increased to 140 mg. and the glycogen to 205 mg. In other words, in the course of an hr 13.7% of the glucose was changed to glycogen and 33.6% was in the tissues, the rest having disappeared. But in the animals treated also with the insulin the glycogen diminished now to 148 mg., so that glycogen was actually destroyed, and the injected glucose had almost disappeared as only 88 mg. were found. Insulin has therefore stimulated the utilization of the glucose through oxidation, since 84% of the injected glucose was consumed and in addn. also 24 mg. glycogen.

S. MORGULIS

Studies on the relation between cholesterol metabolism and the formation of bile acids. YORISADA HORIYE. Univ. Bern. *Biochem. Z.* 202, 409-20(1928).—An attempt has been made to study the endogenous cholesterol metabolism of the liver with the view of detg. its relationship to the formation of bile acids, but the results entirely exclude such a relationship. Oral administration of decholin increases the cholesterol content of the liver. This indicates a storing of cholesterol in the liver which can be partly made available through stimulation.

S. MORGULIS

Structure of the hemoglobin molecule. I. The nitrogen distribution in the hemoglobin molecule of horse blood. A. POLYAKOV. State Univ., Kasan. *Biochem. Z.* 204, 88-96(1929).—The melanin ppt. in hemoglobin hydrolyzates comes almost entirely from hematin, which makes up 4.5% of the blood. The melanin N constitutes about 6% of the total hemoglobin N. The analytical values are as follows: total N in hemoglobin of horse blood 17.22, melanin N 1.05, NH_3 N 0.19, diamino N 7.02, and monoamino N 9.09%. These values agree better with the results of Harnum than with those of Abderhalden. Of the basic acids P. found arginine 6.25%, histidine 13.78, lysine 5.76 and cystine 1.2%. The cystine constitutes 63% of the total S, which is in good agreement with Osborn's findings. **II. The nitrogen distribution in the globin molecule of horse hemoglobin.** *Ibid* 97 105(1929).—The analytical values are total N in globin 16.4, melanin N 0.066, total NH_2 N 16.34, NH_3 N 0.18, total monoamino acid N 9.2, NH_2 N of monoamino acids 8.01, imide N 1.22, total diamino acid N 7.04, NH_2 N of diamino acids 3.04, nonamino N 4.00, arginine N 2.0, histidine N 3.61, cystine N 0.142, and lysine N 1.17%.

S. MORGULIS

The significance of serum colloids for cardiac activity. N. NIELSEN AND D. PALM. Univ. Upsala. *Skand. Arch. Physiol* 55, 41-8(1929).—A frog heart which upon perfusion with a salt soln. of the proper compn. loses its strength cannot be invigorated when perfusion is continued with an ultrafiltrate of serum. On the contrary, perfusion of the weakened heart with serum causes considerable gain in strength which is thus attributed to the colloidal components of the serum.

S. MORGULIS

Kidney function. Relation between the action of urea, diuresis and mineral metabolism. ROBERT E. MARK. Univ. Würzburg. *Arch. exptl. Path. Pharmacol* 137, 143-67(1928).—The effect of urea upon normal animals differs from that upon animals which have undergone the extirpation of one kidney and a partial ligation of the arterial circulation of the other. Normally the amt. of K eliminated per g. of urea excreted varies but little, but in animals with a kidney insufficiency the administration of urea increases the K output. Unlike K, Ca and NaCl excretion is not modified by urea. The relation of urea to water excretion also differs in the 2 types of animals, in that under normal conditions urea causes a prompt diuresis, while in the animal deprived of kidney diuresis is delayed.

C. H. S.

The heart-lung-adrenal preparation. S. V. ANICHKOV AND A. I. KUZNETZOV. Militär-Med. Akad. Leningrad. *Arch. expil. Path. Pharmacol* 137, 168-79(1928).—With the heart-lung-adrenal prepn. properly adjusted the fluid passing through the adrenal receives adrenaline, the amt. of which is materially increased by direct elec. stimulation or by nicotine. G. H. S.

Effect of the ingestion of water and of salt solution upon kidney function. M. M. LOMIKOVSKII. Ukrainischen Inst. Psychoneurologie. *Arch. expil. Path. Pharmacol.* 137, 348-61(1928).—Detns. made upon dogs with a ureteral fistula showed that under normal conditions the amt. of urine after the first hr. gradually diminished, and the % of NaCl also decreased while the abs. amt. diminished to a less extent than did the amt. of urine. When distd. water or saline was given by mouth changed relationships as regards excretion resulted, the nature of the change being detd. by the fluid ingested. With isotonic saline the max. fluid output took place within the first hr., the greatest abs. amt. of NaCl was excreted during the second hr. With hypertonic saline the max. urine secretion occurred in the second hr. When water was ingested max. excretion was in the first hr., while the abs. amt. of NaCl excreted throughout the whole period was but 86% of the normal value. G. H. S.

Absolute reaction of the contents of different sections of the intestinal tract in horses and cattle. RUDOLF DANNINGER, KARL PERAGNER AND HANS SCHULTES. Tierarztl. Hochschule, Wien. *Arch. ges. Physiol* (Pflüger's) 220, 430-3(1928).—The contents of the cecum of horses and cattle had an av. p_H of 8.125 (horses); 8.224 (cattle). Material in the ileum of horses gave 7.088, of cattle 8.208; while the contents of the jejunum in cattle had a p_H of 8.416. In horses the duodenal contents had an av. p_H of 6.722, in cattle 6.678. G. H. S.

Shortening reflex of the intestine. ALFRED FLEISCH. Univ. Tartu-Dorpat. *Arch. ges. Physiol* (Pflüger's) 220, 512-23(1928).—Mech. stimuli applied to the guinea pig intestine induce a shortening reflex, both the ileum and jejunum acting in the same way. The period of contraction lasts from 5 to 30 secs., and the shortening varies between 5 and 40%. The segment involved reaches from the point of stimulation to 9 cm. in the oral, to 28 cm. in the anal direction. Nicotine in a diln. of 1 to 2 million causes a complete blockade, which is reversible. In dilns. between 1:15 and 1:30 million acetylcholine intensifies the reaction in some instances; ergotamine is without obvious effect, and adrenaline (1:10 million) regularly causes a reversible blockade. G. H. S.

Fate of the thyroid hormone in the body of the hyperthyroidized mammal. G. ASIMOV AND M. LAPINER. Swerdlov-Univ., Moskau. *Arch. ges. Physiol* (Pflüger's) 220, 588-92(1928); cf. *C. A.* 22, 982.—Thyroid hormone is excreted from mammals more promptly than from birds, for after 24 hrs. it can no longer be detected in the hyperthyroidized mammal. After feeding upon thyroid the greatest amt. to be found in the blood is present after 8-14 hrs. Excretion by way of the urine is at its max. between the 6th and 18th hrs. after the ingestion. It seems that by the repeated ingestion of large amts. of thyroid the capacity of the body for destroying the hormone is increased. G. H. S.

Schlesinger's fluorescence in the veins of the internal organs. YU. DUMSHITZ AND GEORGE FRYNCKELL. Leningrader Med. Inst. *Arch. ges. Physiol* (Pflüger's) 220, 627-27(1928).—Under normal conditions cat blood, both peripheral and organ, contains substances which cause fluorescence in the presence of Zn acetate, the amt. present varying with the organ. Blood leaving the liver has the highest content. Apparently the amt. to be found is unrelated to intestinal fermentation or to the output of bile. G. H. S.

Contraction of muscle. VII. Role of potassium in contraction. F. ERNST AND J. SCHIEFFER. Univ. Pécs. *Arch. ges. Physiol* (Pflüger's) 220, 655-71(1928); cf. *C. A.* 22, 2606.—In the frog gastrocnemius the normal content of K is about 1.7% of the dry substance, while if the muscle is perfused with normal Ringer soln. for 5-6 hrs. there is a 6% loss in the amt. of K; if perfused with K-free Ringer soln. this loss is 15%. Direct stimulation causes a loss of K; amounting to from 30 to 50%. In stimulated muscle the Na content increases more than does the Cl content. VIII. **Water transport in contraction; osmotic theory of contraction.** F. ERNST. *Ibid* 672-90. Contraction is due to a change in the water relationships consequent to ionization. G. H. S.

LEBRUN, R., AND PÉLICARD, A.: **The Normal and Pathological Physiology of Bone.** St. Louis: C. V. Mosby Co. Translated from French by Sherwood Moore and J. Albert Key. 246 pp. Reviewed in *Science* 69, 223(1929).

VAN SLYKE, DONALD D.: **Factors Affecting the Distribution of Electrolytes, Water,**

and Gases in the Animal Body. Philadelphia and London: J. B. Lippincott Co. Monograph on Experimental Biology. 62 pp. 10s. 6d., net. Reviewed in *Nature* 123, 200(1929).

G—PATHOLOGY

H. GIDEON WELLS

Value of the diazo test on blood. S. M. ROBSON AND L. JACOBS. *Arch. Intern. Med.* 42, 386-9(1928).—Evidence is cited against the use of the diazo test on blood as a specific means of differentiation between uremic coma and that of other origin. A high creatinine content of the blood usually accompanies a pos. diazo test, although no definite creatinine value can be established as the point at which the pos. diazo test appears.

The urea tolerance test. S. EDWARD KING. *Arch. Internal Med.* 42, 877-92 (1928).—The normal blood-urea curve following oral ingestion of 1 g. of urea per 10 lb. body wt. was detd. The blood urea returned to the control level in 14 hrs. after a sharp rise in 1 hr. Under similar conditions a radically different curve was obtained in cases of definitely impaired kidney function and even in the early stages of renal impairment. In such cases blood urea did not return to the normal rest level at the end of 14 hrs. Early degrees of renal impairment were frequently indicated by marked polyuria, although the blood-urea curve remained normal. A simple test of kidney function is described.

Ingested creatine. Its utilization and rate of excretion by arthritic and normal subjects. F. A. CAJORI, L. M. WRIGHT AND ELEANOR STILZ. *Arch. Internal Med.* 42, 901-8(1928).—Single 10-g. doses of creatine were given by mouth to 7 normal and 7 arthritic subjects. The rate of excretion of creatine was studied. Considerable individual variations were found in the amt. of creatine utilized. Both groups of subjects were equally efficient in retaining creatine, when the differences in creatinine coefficients were considered. The rate of excretion of the excess creatine was slower in the arthritic patients, and creatinuria persisted longer. The delay in excretion of creatine may be comparable to a similar delay in dextrose excretion in arthritis.

The effects of serums from normal and from anemic persons on the growth of seedlings. LOVE B. UPJOHN, RAPHAEL ISAACS AND FELIX G. GUSTAFSON. *Arch. Internal Med.* 42, 910-5(1928).—Seedlings of *Lupinus albus* grown in Shive's nutrient saline soln. and contg. 1% serum from normal persons showed an av. rate of growth of 76% of the rate of growth in Shive's soln. alone. Growth in serum from anemic persons was not appreciably different, nor was there any correlation between the coeff. of growth and the clinical condition of the patient such as illness, red cell count, hemoglobin, bilirubin.

Bile acids in jaundice. ICHIRO KATAYAMA. *Arch. Internal Med.* 42, 916-30 (1928).—Normal blood serum contains 5-12 mg. of bile acids, estd. as Na glycocholate, the av. being 7 mg. Normal urine is free from bile acids. Patients with cholecystitis, disease of the liver, catarrhal jaundice, obstructive jaundice, cardiac decompensation and duodenitis showed a marked increase in the bile acids of the blood serum and urine, the excretion in the urine being small and variable. There is no correlation between bile acids and bilirubin in the blood. Bile acids appear in the urine when their concn. in the serum exceeds 20 mg. per 100 cc. In obstructive jaundice of long standing there is continuous excretion of bile acids through the kidney, causing depletion of the total amt. in the body.

Distribution of blood sugar between corpuscles and plasma in diabetic and in alimentary hyperglucemia. MICHAEL SOMOGYI. *Arch. Internal Med.* 42, 931-8(1928).—By the fermentation method normal human blood gives an av. of 0.77 for the ratio true corpuscle sugar

true plasma sugar In a series of selected specimens ranging from 9 to 438 mg of true blood sugar per 100 cc. the above ratio gave an av. of 0.75. In these same specimens the apparent sugar varied from 33 to 462 mg. per 100 cc., and the ratio apparent corpuscle sugar

apparent plasma sugar gave widely differing results from 2.64 to 0.82. The lower the blood-sugar concn. the more pronounced is the discrepancy between the 2 ratios. The relative sugar content of the corpuscles is the same in the blood of diabetic and nondiabetic subjects, disproving the conclusion that sugar fixation by corpuscles is inhibited in diabetes. The distribution of sugar is unaffected by changes in the blood-sugar level caused by alimentary factors.

The chemistry of the bone marrow in experimental anemia. H. JASTROWITZ. Univ. Halle. *Z. ges. expit. Med.* 55, 523-46(1927). F. L. DUNN

Blood regeneration in severe anemia. XV. Liver fractions and potent factors. WARREN M. SPERRY, C. A. ELDEN, FRIEDA S. ROBSCHT-ROBBINS AND G. H. WHIPPLE. Univ. of Rochester. *J. Biol. Chem.* 81, 251-65(1929).—Practically all fractions and residues prep'd. from beef liver were found to contain materials of use in blood regeneration by the dog. The view is supported that a number of factors (organic and inorg.) are concerned in the liver effect in simple expit. anemia. ARTHUR GROLLMAN

The metabolism of sulfur. XIV. A metabolic study of a case of cystinuria. HOWARD B. LEWIS AND S. ALLAN LOUGH. Univ. of Mich. *J. Biol. Chem.* 81, 285-97(1929).—The excretion of cystine in a case of cystinuria was found to be independent of the cystine content of the diet, but varied with the total N excretion. The patient could oxidize 2 or 3 g. of ingested cystine. An endogenous origin of the cystine excreted in cystinuria is, therefore, suggested. ARTHUR GROLLMAN

Microscopic and x-ray investigations on the calcification of tissue. NELSON W. TAYLOR AND CHARLES SHEARD. Mayo Foundation, Rochester, Minn. *J. Biol. Chem.* 81, 479-93(1929).—An optical study was made of several types of calcification, including bone, dental enamel, dentine, rachitic bone, salivary calculus and a calcified lung. *Conclusion.*—The solid inorg. phase in these materials consists essentially of very small crystals of apatite minerals of the general formula, $3\text{Ca}_3(\text{PO}_4)_2 \cdot \text{CaX}$, where X represents CO_3 , F_2 , $(\text{OH})_2$, O or SO_4 . The n serves as a measure of the degree of calcification of dried tissues, being low for bones and high for dental enamel or in certain pathological depositions. Similarity of the diffraction patterns of x-rays were obtained by the powder method for apatite, dental enamel, normal bone, salivary calculus, pulmonary calcification and synthetic $\text{Ca}_3(\text{PO}_4)_2$. ARTHUR GROLLMAN

Total acid-base equilibrium in health and disease. X. The acidosis of nephritis. JOHN P. PETERS, A. M. WAKEMAN, ANNA J. EISENMAN AND CARTER LEE. Yale Univ. and New Haven Hospital. *J. Clin. Investigation* 6, 517-49(1929).—An extreme variability of almost every electrolyte component of the serum occurs in nephritis. HCO_3^- is low while SO_4^{--} and org. acids are less important in detg. acidosis than has been supposed. Undetd. acid is usually high only in the presence of carbohydrate starvation. B^- and Cl^- are more often low than high. In some cases true HCO_3^- deficiency occurs. **XI. Hypochloremia and total salt deficiency in nephritis.** J. P. PETERS, A. M. WAKEMAN AND C. LEE. *Ibid* 551-75. —The hypochloremia and base deficiency observed in advanced nephritis result from (1) an abnormal loss of these constituents in the urine, (2) by vomiting which produces some Cl^- loss and an interference in the salt intake and (3) by loss of Cl^- in the feces in certain cases. The therapeutic implications of these findings are discussed. **XII. A study of renal edema.** J. P. PETERS, A. M. WAKEMAN, A. J. EISENMAN AND CARTER LEE. *Ibid* 577-96. —The concn. of base, protein, HCO_3^- , Cl^- and inorg. P in the serum, and the N and Cl^- metabolism of patients with nephrosis and nephrotic types of chronic glomerular nephritis were detd. The serum protein deficiency was the only abnormality definitely related to the presence or absence of edema. ARTHUR GROLLMAN

Goiter and iodine metabolism. GULBRAND LUNDE. Royal Frederick Univ., Oslo, Norway. *Proc. Staff Meetings Mayo Clinic* Aug. 22, 1928; cf. *C. A.* 22, 1370, 1785, 23, 101. —An address summarizing the findings and conclusions of L. and his co-workers regarding the I content of the blood, and its relation to thyroxine and goiter. ARTHUR GROLLMAN

The influence of alcohol taken by mouth or other routes upon the Wassermann and Sachs-Gyorgi reactions. MASAO NISHIO. Tokyo Jikeikai Med. College. *Sei-I-Kwai Med. J.* 47, No. 9, Eng. Abs. 5(1928).—Oral or intravenous administration of alc. reduced the degree of the Wassermann and Sachs-Gyorgi reactions. ARTHUR GROLLMAN

The residual nitrogen fraction of the secretion of the vagina in leucorrhoea. E. RAAB. *h. Gynakol.* 134, 519-45(1928).—The secretion of the vagina in leucorrhoea has a protein content of 2-7%. The N of the secretion is divided between protein N and residual N. The protein is broken down by the cell enzymes and all stages are found, both mol. proteins, peptones, polypeptides and amino acids. Tyrosine, histidine and arginine are found but not tryptophan. From 60 to 90 mg. tyrosine are found in 100 g. of the secretion. The H-ion concn. is between p_H 4.2 and 6.4 and the amt. of amino acids increases with increasing p_H . The proteases of the tissues, which are set free on the death of the cells, are responsible for the proteolysis, the enzymes of bacteria present playing a subordinate role. In acid p_H the proteolysis resembles the action of pepsin (little amino N, no NH_2) and in alk. p_H resembles a peptidase reaction

(much amino N, trace of NH_3). The lactic acid present in the vagina is a necessary factor for the occurrence of an intensive proteolysis. From 90 to 95% of the secretion is H_2O and it passes through the epithelium as a transudate carrying urea with it.

HARRIET F. HOLMES

Ovarian function and lipid metabolism. I. The relations between cholesterol metabolism and ovarian function. C. KAUFMANN AND O. MÜHLBOCK. *Arch. Gynäkol.* 134, 603-25(1928).—Four hundred fifty-four detns. were made in a study of the relation between ovarian function and lipid metabolism. In healthy women with normal ovarian function the av. cholesterol content is 125 mg. for 100 cc. blood serum. At the time of menstruation there is usually a fall in cholesterol content of 40% in the pregravid phase of the cycle there is often a rise in cholesterol content to 50-5%. In women with disturbed ovarian function there is no rhythmic effect on the cholesterol content nor is there such an effect when the ovarian function is normal but the cholesterol metabolism deranged, as in lues. There is no marked change in cholesterol content of the serum with cessation of ovarian function. In only one case was there a marked rise in cholesterol content after the menopause in a woman who gave no sign of illness.

HARRIET F. HOLMES

The effect of the menstrual cycle on water metabolism. H. EUTINGER AND R. SPIEGLER. *Arch. Gynäkol.* 135, 223-31(1928).—The onset of menstruation in many cases brings about an easily detected chemicophys. change in the colloids of the body which theoretically might cause changes in the H_2O metabolism of the organism. Clinically, by use of the Kauffmann diuresis test, it was possible in a series of cases to detect in 47% of all cases in women with a normal circulatory system an increased tendency to edema in the pre-menstrual period and during menstruation as compared with the intermenstrual period.

HARRIET F. HOLMES

The value of the pyrimidone test in the diagnosis of interrupted tubal pregnancy. S. M. KLEIN. *Arch. Gynäkol.* 135, 256-61(1928).—Jegeroff's modification of the pyrimidone test was used in testing the sera in 68 gynecological cases. To a test of 3 cc. of a 5% alc. pyrimidone soln., 8 drops 3% H_2O_2 and 8 drops 50% AcOH 1 drop of the serum to be tested was added. An amethyst blue color indicated the presence of hematin. In 90% of the cases of disturbed ectopic pregnancy (21 cases) and which were confirmed by operation, a pos. result was obtained. The only other pos. results were in 2 cases of apoplexia ovarii and in 5 cases of intermenses. The test is easily carried out and should be of help in diagnosing interrupted tubal pregnancy.

H. F. H.

Basal metabolism in circulatory disturbances. E. ROSENBLUTH AND H. UBERALL. *Wien. Arch. inn. Med.* 16, 38-50(1928).—Basal metabolism was detd. in 32 cases of circulatory disturbance with defective heart valves or arterial high pressure and was often found increased over the normal. Cases with decompensated hearts showed greater increase in basal metabolism and usually the increase was in proportion to the degree of decompensation. The increase in basal metabolism cannot be accounted for wholly by factors such as increased activity of the heart, dyspnea with increased activity of the respiratory musculature or increased destruction of lactic acid following deficient resynthesis of glycogen. It is possible that the thyroid gland plays a role as it is frequently increased in size in such cases through active or passive hyperemia.

HARRIET F. HOLMES

A hyperglucemic reaction in diseases of the joints and in sciatica. R. LOEBL. *Wien. Arch. inn. Med.* 16, 107-18(1928).—Fifty-one cases of joint disease were examined for alimentary hyperglucemia. Alimentary hyperglucemia was found almost always in acute articular rheumatism and gout, often in infectious rheumatoid and arthritis deformans and less often in primary chronic polyarthritis while 4 cases of the relatively rare morbus Bechterew gave an almost normal reaction. No relation could be made out between the type of blood sugar curve and the clinical course of the disease. A case of acute polyarthritis showed in the acute stage a markedly lowered tolerance and in convalescence an almost normal curve. In 5 of 8 cases with severe sciatica there was alimentary hyperglucemia which disappeared with convalescence.

HARRIET F. HOLMES

Splenic atrophy with calcium and iron incrustations (nodular splenic atrophy). Report of a case. G. A. BENNETT. *Arch. Path.* 7, 71-7(1929).—The interesting features of the spleen described in this paper are its extreme smallness, and the presence of Fe and Ca incrustations in the walls of the blood vessels and in fibrous and elastic tissue of the trabeculae. Lesions of a similar nature could not be found, nor was there evidence of similar changes in the blood vessels elsewhere in the body. It is probable that because of Fe in isolated fibers and in areas of considerable size without the presence of Ca, the Fe was of primary importance. It also seems that there was some etiologic

actor, either in hemorrhage or in necrosis, or possibly in both, to cause the deposition of such a large amt. of Fe. It is interesting that both this case and a similar case reported by Goldberg occurred in young negroes whose blood gave pos. reactions in Wassermann tests.

HARRIET F. HOLMES

Migration of leucocytes in blood clots. I. The influence of phosphates of sodium and potassium. HOWARD T. KARSNER AND ALICE T. MERRILL. *Arch. Path.* 7, 11 (1929).—Wright's method (*Lancet* 1, 129(1928)) for studying the migration of leucocytes was used with slight modification. Diffusion of phosphates from agar into H_2O , and presumably into blood clot in the agar cells, occurs promptly. The migration of leucocytes to the walls of the cells is a true migration influenced little by gassing. Since the largest no. of leucocytes adherent to the slide is different with different concns. of the Na and K phosphates, adhesion is probably not detd. entirely by H-ion concn. or salt concn. When the p_H of the agar is altered by the addn. of $Na_2HPO_4 \cdot 2H_2O$ the greatest migration of leucocytes occurs in the most alk. p_H in a range between about p_H 6.8 and p_H 8.2. If K_2HPO_4 is employed instead of $Na_2HPO_4 \cdot 2H_2O$, the greatest migration is in the medial p_H , namely about p_H 7.5. Thus, the H-ion concn. is not the sole or even the principal factor governing migration and adhesion. Where $NaHPO_4 \cdot 2H_2O$ and $K_2H_2PO_4$ are mixed so as to maintain a fairly const. p_H with approx. the same ratio of Na to phosphate as in $Na_2HPO_4 \cdot 2H_2O$, the addn. of increasing quantities of the mixed salts leads to a marked increase in migration of leucocytes. Thus the concn. of salt in the agar and presumably in the blood clot is of greater significance for migration of leucocytes than is the H-ion concn. within the ranges studied.

HARRIET F. HOLMES

The stability of glycerinated antisheep hemolysin. R. A. KILBUFFE AND B. SHEFMAN. *Arch. Path.* 7, 113(1929).—Glycerinated antisheep amboceptor that had been kept partly at room and summer temps., and partly in the ice box, was titered 7 and 12 years after its original prepn. (1916). The original titer of Kolmer's method, using 0.3 cc. of complement in the diln. of 1:30, was 1:20,000. After 7 years, the titer was 1:16,000. The present titer, after preservation for 12 years, is 1:10,000 with 0.3 cc. of complement in diln. of 1:30.

HARRIET F. HOLMES

Chromaffin cell tumor of the suprarenal medulla (Pheochromocytoma). C. B. RABIN. *Arch. Path.* 7, 228-43(1929).—A case of pheochromocytoma of the suprarenal medulla assocd. with hypertension is reported. The hyaline droplets found in the cells of the tumor as well as those of the normal suprarenal medulla are differentiated from the hyaline droplets of degeneration by the staining reactions. The droplets probably represent an intermediary state of the secretion of adrenaline. The tumor is actively secretory. Quant. examn. shows that it contains a total amt. of adrenaline much in excess of that which is found in normal suprarenal glands at autopsy. A large percentage of the cases reported in the literature presented clinical symptoms that might well be explained as due to the absorption of excessive amts. of adrenaline. Chem. proof of the causal relationship between the clinical states and the tumor would consist in the demonstration of an increased concn. of adrenaline in the blood. H. F. H.

The division of cells under varying tensions of carbon dioxide. J. C. MOTTRAM. *Brit. J. Exptl. Path.* 9, 240-4(1928).—When normal cells are cultivated *in vitro* under varying tensions of CO_2 , mitoses are observed to be most abundant at a CO_2 tension approximating to that of normal living tissues, which is 40 mm. Mitoses occur over a wide range of CO_2 tension, from 0 to 200 mm. Under high CO_2 tensions abnormal mitoses occur, the abnormality consisting of an irregular migration of the chromatin to the centrosomes. The abnormal mitoses occurring in assocn. with high CO_2 tensions suggest that somatic mutations might be caused in the tissues by an interference with blood supply, so that the hypothesis of somatic mutations as an explanation of cancer could cover a wide field and not be confined to cancer following radiation (Mottram, *C. A.* 22, 2003).

HARRIET F. HOLMES

A dilution phenomenon observed in the titration of the serum of fowls immunized against the virus of fowl plague. C. TODD. *Brit. J. Exptl. Path.* 9, 244-52(1928).—A mixt. of fowl plague virus with the corresponding immune serum, so prepd. as to be just non-virulent when injected intramuscularly into a fowl, is rendered virulent by simple diln. with saline. This diln. phenomenon takes place even after the undiluted mixt. has been kept at 37° for 4 hrs., showing that the action of the immune serum is

strong enough immune serum to render the mixt. harmless to fowls when injected intramuscularly on intravenous injection gives rise to acute fowl plague, although the fowl is apparently not more susceptible to intravenous than to intramuscular in-

jection of the virus. This behavior of mixts. of the virus with its immune serum resembles the behavior of toxin-antitoxin mixts. observed in tetanus, diphtheria and certain other toxins. The diln. phenomenon is of practical importance in the titration of immune sera against the corresponding viruses as the degree of diln. of the infected mixt. may, within certain limits, influence the result of the injection. H. F. H.

The concentration and purification of streptococcal toxin. R. J. V. PULVERTAFT. *Brit. J. Exptl. Path.* 9, 276-82(1928).—Filtrates from cultures of the Dochez strain of *Streptococcus scarlatinae* have been prepd. which are fatal to rabbits in doses of 2.5 cc. to 10 cc. Breeds of rabbits vary in their susceptibility to this toxin; Chinchilla rabbits are uniformly susceptible. By means of pptn. of whole cultures with ice-cold abs. alc., concn. and purification of toxin may be effected. Such a concd. toxin is sometimes lethal in doses as small as 0.1 cc. Complete protection is afforded to rabbits against large doses of toxin by streptococcal antitoxic sera. Tetanus and diphtheria antitoxins and normal horse serum are without effect. By means of this toxin the strength of antitoxic sera may be estd., the rabbit being used as test animal. H. F. H.

A comparison between the antigenic properties of whole and lipid-free sera. S. H. C. ROBINSON. *Brit. J. Exptl. Path.* 9, 299-300(1928).—Expts. were carried out with lipid-free horse and ox sera to det. whether they differed from unextd. sera in antigenic property. The findings confirmed the observation of Scimone and Torn (C. A. 18, 553) that the use of a lipid-free serum as an antigen gives an antiserum which differs from one prepared with an unextracted serum in being more specific in its action. HARRIET F. HOLMES

A study of the bactericidal power of "whole" blood by the method of culture in slide-cells. J. M. ALSTON. *Brit. J. Exptl. Path.* 9, 300-17(1928).—The slide-cell method of testing the bactericidal power of whole blood is a reliable exptl. method, and the results obtained are consistent within fairly appreciable limits. The bactericidal power of healthy persons and animals exhibits diurnal variations. The apparent changes produced in the bactericidal power of the blood of man and animals by certain agents are transient. In man such changes are not of much greater extent than the normal diurnal changes. In animals more marked alterations, often greater than the usual diurnal variations, followed exposure to ultra-violet radiation and the intravenous injection of bacteriologic bouillon, Na nucleinate, colloidal Mn and normal ox serum. The processes involved in the bactericidal action of the whole blood are probably of more complex nature than can be explained in terms of phagocytosis, opsonin and bactericidal complement. No work was done in regard to the enzymes of the blood but the possibility of their participation in producing changes in the bactericidal power of the blood must be kept in mind. HARRIET F. HOLMES

The phagocytosis of hemolytic streptococci of high and low virulence by the blood of patients infected with that organism. R. HARE. *Brit. J. Exptl. Path.* 9, 337-52(1928).—The leucocytes in the defibrinated blood of patients infected with hemolytic streptococci have a stronger phagocytic action on virulent strains of hemolytic streptococci than do the leucocytes of normal persons. This is shown to be due for the most part to a high opsonic power in the serum. This opsonic power is heat-stable, resisting 55° for 30 min. When small quantities of such serum containing heat-stable opsonins are added to normal defibrinated blood, the rate of growth of hemolytic streptococci in that blood is materially reduced. This is shown to be due to increased phagocytosis of the microbes by the leucocytes. HARRIET F. HOLMES

Physico-chemical theory of cancerization. C. LAVILLE. *Néoplasmes* 7, 257-65(1928).—The precancerous state which precedes the formation of tumors is marked by a break-down in the acid-base equil. of the cells in the direction of an alkalosis. Cancer originates in predisposed cells whenever pos. charges of electricity are communicated to the cells with an intensity or a frequency that does not permit the re-establishment of their normal electrostatic equil. Treatment should be directed toward bringing about a condition of "negativation" and toward restoring the normal acid-base equil. of the cells. HARRIET F. HOLMES

Water storage in infancy in connection with the exudative diathesis. RELLA BECK. *Jahrb. Kinderheilk.* 120, 108-11(1928).—Studies were made on the rate of resorption of 0.8% NaCl, injected intradermally. No significant differences were observed between the rate in normal infants and in infants with the symptoms of the exudative diathesis. However, in both groups, the rate is markedly accelerated as compared with the rate observed with normal adults. This is in accord with other observations on the important role of the skin and subcutaneous tissues in water storage in infancy. ELEANOR M. H. MATHREYS

The role of amines in dyspepsia and intoxication. H. RÖTHLER. *Jahrb. Kinder-*

heilk 120, 162-85(1928).—R. compared the effect of histamine and of exts. of feces and urine in producing contraction of smooth muscle. Conclusion: Amines are formed in the intestines of both normal and dyspeptic children. In the former, the large bowel is the chief site of amine formation; in the latter, the small bowel. In dyspepsia, there is a large increase of amines in the stool, and in some cases of severe intoxication amines are also present in the urine in large amts. The possibility of primary enterogenous poisoning by amines must be considered. F. M. H.

Metabolic studies in cirrhosis of the liver in children. HANS KNAUER AND KURT FRIEDLÄNDER. *Jahrb. Kinderheilk.* 120, 292-305(1928).—Repeated observations of the blood lipoids of a child with cirrhosis of the liver gave the following data. The phosphatides gradually rose to abnormally high levels during the course of the disease, but decreased shortly before death. Cholesterol decreased from an initial high normal to a subnormal value. The fatty acid content was normal. As the lipoids decreased in the blood they increased in the ascitic fluid. The blood bilirubin increased but not sufficiently to cause jaundice. A lowered tolerance for ingested levulose and galactose, and the protracted curve of the blood sugar after administering dextrose, indicate a lessened ability of the liver to form and store glycogen. Tetraiodophenolphthalein was secreted at the normal rate, a fact which emphasizes the error in applying conclusions drawn from one functional test to the function of an organ as a whole.

ELEANOR M. HUMPHREYS

Icterus neonatorum, a sequel of the phenomenon of isoagglutination. GEORG LENART. *Jahrb. Kinderheilk.* 121, 134-55(1928).—Isoagglutination and isolysis of the red blood corpuscles lead to an increased formation of bilirubin. The extent of the process after birth is detd. by the relationship of the maternal isoagglutinins and the fetal isoagglutinogens during intrauterine life. According to the amt. of bilirubin formed, there may be a simple hyperbilirubinemia, icterus neonatorum of the common type, or icterus gravis.

ELEANOR M. HUMPHREYS

Dissociation of neutral vaccine virus-immune serum mixtures. PERRIN H. LONG AND PETER K. OLITSKY. Rockefeller Inst. for Med. Res., New York. *Science* 69, 72(1929).—It has been shown that the mixt. of a virus and its sp. anti-serum which is innocuous when introduced into the animal organism becomes disease-producing after diln. with appropriate amts. of Ringer soln. Certain aspects of this reaction have led to the conclusion that the diln. phenomenon resembles the hydrolysis of the salt of a weak acid and weak base, and that the observed dissocn. probably follows the law of mass action. This is indicated by results obtained from qual. studies of the degree of dissocn. following diln. of neutral and over-neutralized mixts. of vaccine virus and immune serum, from cataphoresis expts. and from the observation that the dissocn. is reversible.

J. A. KENNEDY

Isolation by cataphoresis of virus from vaccinia-recovered rabbits. PETER K. OLITSKY AND PERRIN H. LONG. Rockefeller Inst., N. Y. *Science* 69, 170(1929).—The conditions of cataphoresis were: time 3 hrs., millamp. 2 to 4.8, drop in potential 1.2 v., 1/2 of the suspension (100 cc.) of the tissue 6.9 to 7.8. Active vaccine virus in suspensions of testicles from rabbits which had recovered from exptl. cutaneous vaccinia was isolated by this method. The animals were injected intracutaneously with neurovaccine virus from 12 to 56 days prior to the expt. At the time their testicles were removed for examn. the animals were wholly recovered from the cutaneous vaccine lesions and were apparently normal. The isolation of the virus from animals wholly recovered from infection and in healthy condition, and the failure thus far to obtain immunity in the case of filterable viruses unless living virus is used should be considered in relation to the possibility that immunity in virus diseases is linked with the presence in the body of living virus.

J. A. KENNEDY

Japanese literature on isohemagglutination. 1916-1928. ANON. *Japan Med. World* 8, 321-2(1928).—This is a complete bibliography of the subject. N. KOPELOFF

Can the Abderhalden reaction in early pregnancy be employed in forensic medicine for the recognition of abortion? M. KERNBACH AND D. BERARIU. Univ. Cluj. *Deut. Z. ges. ger. Med.* 12, 487-95(1928).—The reaction is not diagnostic in abortion. However, it is helpful. The Abderhalden reaction is positive throughout pregnancy and menstruation.

FRANCES KRASNOW

The possibility of using corpse blood for the production of isohemagglutinin standard sera. P. SEREBRIANIKOV AND M. LEICHICK. Inst. für ger. med., etc., Odessa. *Deut. Z. ges. ger. Med.* 12, 496-505(1928).

FRANCES KRASNOW

Investigations on precipitin. J. OLBRYCHT AND S. SNIEZKO. Univ. Krakau. *Deut. Z. ges. ger. Med.* 12, 515-48(1928).

FRANCES KRASNOW

Carbohydrate tolerance in two cases of muscular dystrophy. T. A. HUGHES

AND D. L. SHRIVASTAVA. King Edward Medical College, India. *Indian J. Med. Research* 15, 437-43(1927).—Both cases showed a high fasting blood sugar and a defective power to store glucose. Nitrate and phosphates were administered to the patient. There was an improvement in the glucose tolerance and in the general condition.

FRANCES KRASNOW

The Wasserman reaction. I. The effect of an excess of the hemolytic amboceptor on the minimum hemolytic dose of the complement. S. D. S. GREVAL. Central Research Inst., Kasauli. *Indian J. Med. Research* 15, 523-8(1927). F K

Liver function in sprue. S. S. SOKHEY, S. K. GOKHALE, M. A. MALANDKAR AND H. S. BILLIMORIA. Haffkine Inst., Bombay. *Indian J. Med. Research* 15, 553-63(1928).—Liver function is not impaired.

FRANCES KRASNOW

The hemolysis of red blood corpuscles by bile salts and the inhibiting action of normal serum and egg albumin, with reference to the permeability change of the stroma. K. C. SEN AND S. K. BASU. *Indian J. Med. Research* 15, 581-7(1928).—Glycocholate is a much stronger hemolytic agent than taurocholate. Blood serum inhibits this effect by increasing the coagulability of the stroma.

FRANCES KRASNOW

Notes on the cholesterol content of Indian blood in health and in leprosy. T. C. BOYD AND A. C. ROY. Medical College, Calcutta. *Indian J. Med. Research* 15, 643-51(1928).—The normal cholesterol ranged from 0.082 to 0.181 g. per 100 cc. whole blood. Early cases of leprosy ranged from 0.080 to 0.130 g. and advanced cases from 0.070 to 0.109. In advanced treated cases the blood cholesterol does not return to normal.

FRANCES KRASNOW

The experimental production of stone-in-the-bladder. IV. R. MCCARPSON. *Indian J. Med. Research* 15, 801-6(1928); cf. C. A. 22, 103.—The disease in rats is due to the insufficiency in the exptl. diet of a substance or substances (probably vitamin A) which whole milk of good quality provides in abundance. This substance is not present in sufficient quantity in certain of the vegetable oils (linseed and sesame) in common use in India.

FRANCES KRASNOW

The hydrogen-ion content of vaccine lymph and its relation to the potency and keeping properties of lymph prepared under tropical conditions. J. CUNNINGHAM AND K. S. MHASKAR. *Indian J. Med. Research* 15, 819-26(1928).—In 25 freshly prepd. batches of lymph the p_H varied between 7.2 and 8.0, the majority lying between 7.4 and 7.8. There is a tendency in most lymphs in the tropics to become more acid on storage and exposure, and, as the formation of acid has a deleterious action on the vaccine virus, it is recommended that each batch should be carefully adjusted to a p_H between 7.6 and 7.8.

FRANCES KRASNOW

Studies on the physical properties of different blood sera. I. Isoelectric points of blood sera and their significance in the antimony test for kala-azar. R. H. CHOPRA AND S. G. CHAUDHURI. Calcutta School of Tropical Med. *Indian J. Med. Research* 15, 895-905(1928).—The isoelec. points of globulin and albumin in normal and pathol. sera are 5.5 and 3.8, resp. In some lepers and kala-azar cases, the isoelec. point of albumin is 4.0. The ppt. formed by the addn. of a soln. of urea-stibamine is mainly euglobulin.

FRANCES KRASNOW

Pancreatic function in sprue. S. S. SOKHEY AND M. A. MALANDKAR. Haffkine Inst., Bombay. *Indian J. Med. Research* 15, 921-33(1928).—The pancreas as far as the external secretion is concerned functions normally in sprue.

F K

Blood calcium in leprosy. M. C. CRUZ, C. B. JARA AND E. M. PARAS. Cullion Leper Colony. *J. Philippine Islands Med. Assoc.* 8, 216-21(1928).—Seventy cases were studied. Serum Ca in leprosy is usually within normal limits and the type, advancement, duration of the disease, antileprosy treatment and the presence of bone changes have no influence on the serum Ca level.

FRANCES KRASNOW

The effect of colectomy on the incidence of parathyroid tetany and blood calcium. ERIC OLDBERG AND E. L. WALSH. Northwestern Univ. Med. School. *Am. J. Physiol.* 85, 531-9(1928).—The removal of the colon prior to the removal of the parathyroids in meat-fed dogs had an ameliorating effect on the incidence of tetany, and removal of the colon of the normal dog caused a rise in the blood Ca of from 1 to 3 mg. per 100 cc. over its former level, in the course of a week. The theory is supported that parathyroid tetany is due to Ca deficiency.

J. F. LYMAN

Further studies on the metabolism of fatty substance in pathological conditions. The action of India ink on the infiltrative liposis of arsenic. G. TRIMARCHI. *Boll. soc. ital. biol. sper.* 3, 828-29(1928); cf. C. A. 23, 637.—India ink was dild. with 0.9% NaCl in the proportion of 1:3 and administered intraperitoneally to white rats. The As in the form of As_2O_3 was given subcutaneously. The materials were administered simultaneously on 4 successive days, on alternate days, or the As_2O_3 was given for 4

days and then followed by the ink for 4 days. Twenty-four hrs. after the last treatment the rats were killed and the organs examd. histologically. In the rats treated with As_2O_3 alone, there was a marked liposis in the hepatic cells; the Kupfer cells were free from fat. In the rats treated with ink, the As not only prevented infiltrative liposis but the hepatic cells showed no degenerative changes. PETER MASUCCI

The behavior of the digestive leucocyte reaction following splenectomy. GRU-SEPPE SOLARINO. *Boll. soc. ital. bio. sper.* 3, 842-5(1928).—Splenectomy in itself produces in dogs a distinct and const. leucocytosis which generally disappears 25-40 days after the operation when the no. of leucocytes becomes normal again. This is followed by a period in which the leucocyte titer is lower than that previous to splenectomy. The digestive leucocyte reaction presents a variable behavior depending on the length of time after splenectomy. Immediately after the operation, HCl, peptone, and meat produce a marked leucocytosis in comparison to the normal; 20-30 days afterward the same substances have no effect. This period is followed by one in which leucocytosis is again marked and equal in intensity to that before the operation. P. M.

The behavior of digestive and alimentary hyperglucemia following splenectomy. GRUSEPPE SOLARINO. *Boll. soc. ital. bio. sper.* 3, 846-9(1928).—In splenectomized dogs there is no variation of the glucemic titer compared to that before the operation. In general, splenectomy produces a slight digestive hyperglucemia. With regard to the sugar tolerance, this varies according to the time elapsed since the splenectomy. Glucose increases the hyperglucemia if administered shortly after the operation; but decreases the hyperglucemia if administered at a later period. PETER MASUCCI

Neutrality regulation in patients with and without epileptic fits. JOHNS. NORVIG. Aarhøvskeanstalt, Birkerød, Denmark. *Acta med. scand.* 70, 50-96(1929).—Individuals with no organic disease and manifesting no epileptic fits show ortho-regulation on a full diet, as well as on a pure meat, milk or vegetable diet contg. 1500-2000 cal. Under exactly similar conditions patients with no other disease except epilepsy exhibit dysregulation. The probability is suggested that the total N plays an important part in preserving the relation between the NH_4 value and the pH . It is shown that it is not possible to explain dysregulation as a result of variations in the blood pH . S. MORGULIS

Experiments on the concentration of antibody sera by means of physico-chemical methods (electrodialysis and adsorption). M. FISLER AND M. SPIEGEL-ADOLF. Staatliche therapeutisches Inst., Wien. *Biochem. Z.* 204, 28-45(1929).—An attempt to concentrate the active principles in immune sera through fractionation of the serum protein. Through electrodialysis under repeated addn. of acid all the fractions contg. the antibodies are pptd. from a typhus bacilli agglutinating serum. On soln. in neutral salt the activity is apparently unaffected. The protein content of this soln. corresponds to the 1/2 satn. with $(NH_4)_2SO_4$ fraction. A process is also described to adsorb on the ppt. of $Al(OH)_3$ formed in the soln., the active portions from horse serum contg. typhus bacilli agglutinins, from horse, rabbit or goat hematin toxic sera or from diphtheria antitoxin horse serum. The adsorbed substance can then be leached out with various reagents. By repeating this process it is possible to reduce the protein of the agglutinating serum to 1/6 its original concn. but retaining the greatest portion of the agglutinin. In antitoxic sera only the albumin fraction could be eliminated. Control expts. with electrolyte-free protein fractions show a striking parallelism in the behavior of immune bodies and of those true serum protein fractions which like the first manifest the same property of salting out. S. MORGULIS

Comment on Ottensooser and Strauss article "Immunochemical studies on globin and globin derivatives." LUDVIG HEKTOEN AND KAMIL SCHULHOFF. *Biochem. Z.* 204, 1250(1929), cf. *C. A.* 22, 2784. S. MORGULIS

The Millon reaction of the urine of insane patients. E. SCHEINER. Univ. Florence. *Biochem. Z.* 204, 361-70(1929).—The urine of patients in conditions resembling dementia gives a strongly pos. Millon reaction without preliminary hydrolysis, which is often found even when the urine had been dild. 100 times. Attempts at fractionation of the urine lead to the conclusion that the substance giving the Millon reaction is present in the "Histidin fraction" (Weiss) and betrays many similarities to imidazole derivs. in chem. behavior (pptd. by phosphotungstic acid, by $AgNO_3$ in $Ba(OH)_2$ and pos. diazo reaction). The hydrolysis of this "histidin fraction" with HCl showed unmistakably the presence of a phenol nucleus. The substance responsible for the Millon reaction can be adsorbed by C from which it can be quantitatively recovered by means of acetone. Upon purifying the acetone ext. the substance could be obtained in beautiful needle-shaped crystals. The hygroscopic needles m. 40° and b. 70° , and yield very little ash in which no test for Fe could be obtained. An aq. soln. of

these crystals gave also the Folin-Denis phenol reaction and, besides, reactions with aromatic aldehydes. The red coloring matter resulting from Ehrlich's reaction could be crystd. out in alk. solns. According to its soly. and spectroscopic characteristics this isolated chromogen is regarded as the mother substance of the pigment obtained from urine with Ehrlich's and Hári's reagent.

S. MORGULIS

Is the aerobic glucolysis specific for tumors? OTTO WARBURG. *Biochem. Z.* **204**, 482-3(1929).—The following is a list of conditions where aerobic glucolysis occurred: reversible inhibition of embryonic respiration by HCN; irreversible inhibition of embryonic respiration by O_2 want; loss of nucleus in erythrocytes; irreversible suppression of Pasteur's reaction in embryos by Ringer soln.; reversible suppression of Pasteur's reaction in embryos by the Et ester of HCN; spontaneous depression of respiration and its final disappearance in the embryonic lense as the epithelium is transformed into connective tissue; the irreversible suppression of respiration in white bone-marrow cells by Ringer soln.; suppression of Pasteur's reaction and of respiration in the retina through heat. In other words, aerobic glucolysis is not specific for tumors. But whereas normal cells are destroyed while glucolyzing aerobically, aerobically glucolyzing tumor cells live and actually grow unrestrained under such conditions. The presence or absence of the respiratory function or the extent of that function is no longer regarded as a good basis for tissue classification. Tumor cells possess extensive aerobic glucolysis whether their respiration is great or small. However, in either case the respiratory function is damaged because it is unable to suppress fermentation. Evidently both forms of damage of the respiratory formation (its intensity or its effect) occur in tumor cells.

S. MORGULIS

Pepsin-acidity curve. TAKASHI MURAYAMA. *Okayama Med. Coll. Okayama J. Med.* **40**, 520-30(1928).—The stomach of a hungry healthy man just after early rising contains about 50 cc. of gastric juice, free acid value 6, total acid value 27.5. It also contains pepsin, and frequently bile, and some viscous liquid, but no food residue. M. next examd. the gastric juice obtained from stomachs of men with various stomach diseases and of habitual alc. drinkers. The acidity is generally lower than in the case of Boas' artificial food supply, which is probably due to back streaming of the duodenal juice. The curves obtained with the patients having various stomach diseases are to a certain extent characteristic, so that the secretion curve is of diagnostic significance.

K. SOMIYA

The formation locally of antitoxins in the cerebrospinal fluid. M. S. MITTER MILCH AND MILE. E. SALAMON. *Compt. rend.* **188**, 205-6(1929).—Tetanus anatoxin and diphtheria anatoxin were injected into rabbits. One group received the anatoxin (2 cc.) intraperitoneally, the others received the anatoxin (2 cc.) intraoccipitally. The injections were repeated 4 times at 8-day intervals. After each inoculation a sample of blood and one of spinal fluid were taken and tested for antitoxin content. The antitoxin content of the spinal fluid was very small following the intraperitoneal injections. The introduction of the anatoxin directly into the meningeal cavity elicited a very high antitoxin titer in the spinal fluid. The authors conclude that the antitoxin formed in the blood due to intraperitoneal injections of anatoxin is unable to diffuse through the vasculo-meningeal system. The appearance of antitoxin in the spinal fluid following intrameningeal injections of anatoxin is due to the production of antitoxin by local cells of unknown nature.

M. H. SÖPHE

Outlying acidosis due to functional ischemia. PEYTON ROUS AND DOUGLAS R. DRURY. Rockefeller Inst. for Med. Research. *J. Exptl. Med.* **49**, 435-60(1929).—In various functional conditions involving peripheral vasoconstriction a more or less widespread change toward acidity takes place within certain tissues. The change is frequently independent of any in the blood; indeed, the blood can become more alk. while the tissue acidosis is developing. When the blood vol. is diminished abruptly but not too greatly, by hemorrhage or by anhydremia, the acidosis which develops in the superficial connective tissue and in the skeletal muscles is patchy in distribution, being limited to areas of local ischemia which are the result of a compensatory vasoconstriction which affects certain regions only. There is a 2nd type of patchy ischemia (and of acidosis) which occurs under circumstances of moderate depletion and is referable to local pressure differences that are so slight as to be ineffective under normal circumstances. A generalized acidosis throughout to superficial tissues develops when depletion is extreme. All these are outlying acidoses, since they lie without the influence of the blood. In the viscera no such acidoses have been found. C. J. WEST

Nature of the hyperglucemia associated with anaphylactic shock in the dog. ISOLDE T. ZECKWER AND J. ERNEST NADLER. Univ. of Pennsylvania Med. School. *J. Exptl. Med.* **49**, 481-95(1929).—Nine unoperated dogs showed a rise in blood sugar

during anaphylactic shock; in 6 of these dogs the rise was 60 mg. or over. Six dogs in which 1 adrenal had long previously been extirpated and the opposite splanchnic nerve cut, show a low preliminary level of blood sugar and a relative rise of blood sugar during anaphylaxis, but of less degree than in the unoperated animals; in no case was the rise greater than 52 mg. Anoxemia did not appear to be a complicating factor, as evidenced by detn. of the O content of the arterial blood before and during shock. The rise in blood sugar, which occurs in spite of the loss of adrenal activity, is probably due to the venous stasis of the liver seen in anaphylaxis in the dog, because this rise in blood sugar can be simulated in a normal non-sensitized dog by mechanically constricting the hepatic veins for a brief interval. There are, therefore, probably 2 factors responsible for the hyperglucemia assocd. with anaphylaxis in the dog, sympathetic stimulation by way of the splanchnic nerves involving the activity of the adrenals and glycogenolysis resulting from venous stasis of the liver. C. J. WEST

Toxicity of human serum for the guinea pig. SUSAN G. RAMSDELL AND I. DAVIDSON. Research Inst. of Cutaneous Medicine, Philadelphia. *J. Exptl. Med.* **49**, 507-508(1929).—All fresh human serum appears to be toxic for the guinea pig; this toxicity tends to disappear 48 hrs. after bleeding and its manifestations are strikingly similar to those of the heterophilic antibody in immune rabbit serum. There is an increased toxicity in the serum of antisera-treated human cases; this is usually coincident with the production of other antibodies; it tends likewise to disappear in time after treatment; differential absorption expts. indicate that its character is heterophilic and its manifestations differ from those of anaphylaxis in that certain circulatory effects—hemorrhage and increased edema in the lungs and distention of the right heart—are added to the usual findings in true anaphylactic deaths. C. J. WEST

The influence of cholesterol blood content on the growth of tumors in the mouse. Preliminary communication. VLADIMIR MORAVEK. *Arch. Clin. Cancer Research* **3**, 99-100(1927); *Ber. ges. Physiol. exptl. Pharmakol.* **46**, 43.—The growth of transplantable sarcomata was accelerated by the intravenous administration of cholesterol and retarded by lecithin. The growth of carcinoma cannot be influenced by intravenous injections of cholesterol; on the other hand the growth of tumors was raised for a short time by the administration of lecithin to which a small quantity of cholesterol had been added. R. C. WILLSON

The metabolism in surgical diseases in connection with the appearance of post-operative ketonuria. M. A. AWDEJEW, E. L. THAL AND E. L. PROWATOROWA. *Arch. Clin. Cancer* **149**, 649-651(1928); *Ber. ges. Physiol. exptl. Pharmakol.* **45**, 632.—It is now known that ketonuria and acidosis can appear entirely independently of each other. Similarly the acidosis after an "acid-forming diet" is not attended by a ketonuria. Under the influence of a carbohydrate deficiency a ketonuria can develop without alteration of the CO_2 tension of the blood. The authors' studies show that there is no direct relation between postoperative ketonuria and the carbohydrate metabolism. The use of glucose brings about a rapid removal of the acetone bodies in all cases. The antiketogenic action of sugar cannot depend on an equalization of the carbohydrate metabolism. R. C. WILLSON

The action of indole on the development of embryomata. MARIO IAPIDARI. *Bull. soc. med.-chir., Pavia* **2**, 763-65(1927); *Ber. ges. Physiol. exptl. Pharmakol.* **46**, 42; cf. *C. A.* **22**, 3230.—In white rats repeated injections of indole are not able to convert an embryoma into a malignant growing tumor; furthermore, they are not able to influence the growth of the embryoma. In chickens simultaneous injection of embryoma broth and a 1:5000 soln. of indole can lead to the development of an enclosed teratoma. These tumors are always malignant, cannot be transplanted into other animals and are not filtrable through the Berkefeld filter. R. C. W.

The aromatic substances of the blood in relation to the function of the kidney. MATTE. MONTEGUTI. *Bull. sci. med., Bologna* **5**, 437-43(1927); *Ber. ges. Physiol. exptl. Pharmakol.* **45**, 520.—Becher has detd. that in individuals suffering with kidney diseases the amt. of ether-sol. aromatic substances in the blood is increased to a remarkable degree. This detn. is made by means of the xanthoprotein reaction, the color intensity of which is compared with that of a $\text{K}_2\text{Cr}_2\text{O}_7$ soln. in an Autenrieth colorimeter. M. extended these studies to persons ill with other diseases. In normals the results showed a colorimetric difference of 15-25 units. In nephritics without exception higher values were found, the highest values being found in persons suffering with uremia or renal tuberculosis. In prostatic hypertrophy the aromatic substances in the serum were increased. Definite relations to the retention of urea were not found regularly. No important increases were found in diseases of the other organs. R. C. WILLSON

The I content of Norwegian fish and fish products (LUNDE, *et al.*) 12.

FOWWEATHER, FRANK S.: **A Handbook of Clinical Chemical Pathology.** Philadelphia: P. Blackiston's Son & Co. 216 pp.

H—PHARMACOLOGY

A. N. RICHARDS

An arrow poison with a heart action from the New World. C. G. SANTESSON, Karolinisches Inst., Stockholm. *Skand. Arch. Physiol.* 55, 230-57(1929).—See C. A. 22, 4649. S. MORGULIS

Localization of the action of nicotine on the adrenal. S. V. ANICHKOV AND A. I. KUZNETZOV. Militar-Med. Akad., Leningrad. *Arch. exptl. Path. Pharmacol.* 137, 180-6(1928).—After exposure to nicotine the chromaffin tissues of the adrenal exhibit an increased sensitivity to direct elec. stimulation. In this, the effect of nicotine is reversible. Nicotine acts directly on the chromaffin cells. G. H. S.

Comparative study of the susceptibility to drugs of the ureter of non-gravid and gravid animals. J. SANO. Imperial Univ., Kyoto. *Japan J. Obstet. & Gynecol.* 10, 41(1927); *Ber. ges. Physiol. exptl. Pharmacol.* 44, 836.—Rabbits and guinea pigs were studied. Adrenaline and pituitrin paralyze the action of the ureter while pilocarpine and Ba stimulate it in both gravid and non-gravid animals. The minimal dose is larger in the gravid animals. With the ureters of freshly killed guinea pigs the results were the same except that in rare instances small doses of adrenaline and pituitrin had a stimulating action in pregnant animals. The minimal dose of adrenaline and Ba was larger in pregnant animals, while there was no difference in that of pilocarpine and pituitrin. Conclusion: During pregnancy the sensitivity of the ureter is reduced which is a good basis for the pyelitis of pregnancy. R. C. WILSON

The action of some poisons on the function and blood vessels of the suprarenal capsule. A. KUZNETZOV. *Russ. Fisiol. Zhurnal* 9, 172-3(1926); *Ber. ges. Physiol. exptl. Pharmacol.* 44, 836.—The studies were made on isolated suprarenal capsules according to the method of Skaveria and Kuznetsov and the concn. of adrenaline was detd. according to Folin's method or by detg. the degree of contraction of the blood vessels in the ear of a rabbit. Results: Strychnine nitrate in concns. of 1:2,000,000 to 1:10,000 increases the secretion of adrenaline; stronger solns. are inactive. Curare in small doses increases the secretion while large doses stop it. Picrotoxin increases the secretion. Quinine in doses of 1:1000 stops the secretion, while smaller doses are inactive. Morphine has no influence on the secretion. HgCl₂ in doses of 1:100,000 decreases the secretion and small doses increase it. R. C. WILSON

Fatal TI poisoning, and determination of TI in cadavers as TII (FRIDEL) 7. The quaternary pyridine bases (MAGIDSON, MENSHIKOV) 10. The detection of TI in the organs of small animals which have been poisoned with "Zelioweizen" (SCHER) 7. Local anesthetics derived from 2-[β -hydroxyethyl]piperidine (MARVEL, SHELTON) 10. Polarized light and cocaine decomposition (DAILEY, BENEDICT) 10. γ -Pyrrolidino- and γ -pyrrolinopropyl benzoates (ANDREWS, McELVAIN) 10. Basis for the physiological activity of -onium compounds. VIII. H₂PO₄ ester derivatives of choline (RENSHAW, HOPKINS) 10. Organo-Sb compounds (NIVOGY) 10. Bromination of *p*-amino-benzoic acid and its ethyl and butyl esters (LEULIER, DINET) 10. Piperidine derivatives. VII. 1-Alkyl-4-piperidyl benzoates and *p*-aminobenzoates (BOLYARD, McELVAIN) 10.

I—ZOOLOGY

R. A. GORTNER

Influence of certain water conditions, especially dissolved gases, on trout. JAMES S. GUTSELL. U. S. Bur. Fisheries, Beaufort, N. C. *Ecology* 1, 77-96(1929).—Exptl. data on brook, brown and rainbow trouts obtained at the Cornell Univ. hatchery showed that a marked increase in % of CO₂ and decrease in O content in spring and brook water took place as the warm season advanced. This change is attributed to the increased rate of activity of the soil bacteria and if the O content fell below approx. 1.3 p. p. m., death always occurred. The *p*_H and temp. of the water were shown not to vary greatly and were not considered vital factors. Trout gradually accustomed to reduced O survived O contents considerably below those which were fatal to trout from well oxygenated water. By means of numerous transfer expts. from water rich in O to water poor in O, trout were asphyxiated in every case when the O content fell below 1.3 p. p. m. Partial asphyxiation and sluggishness often occurred at O concns.

of from 2.5 to 1.3 p. p. m. though some fish survived several days. Above 2.5 p. p. m. of O, trout usually were normal. If partially asphyxiated trout were removed from the low O water to an oxygenated water, recovery occurred in as low O concns. as 2.67 p. p. m. Limited data indicate that brook trout are able to survive lower O tensions than brown or rainbow trout. CO₂ up to 28 p. p. m. was not markedly harmful and in amounts up to 39 p. p. m. did not increase the ill effects of reduced O tension. Trout inhabit both acidic and basic waters and, providing the O content is sufficient, are hardly to considerable variation in H-ion concn. C. R. F.

Studies in comparative hematology. I. Camelidae. ERIC PONDER, J. FRANKLIN YEAGER AND H. A. CHARIPPER. New York Univ. and the New York Zoological Soc. *Quart. J. Exptl. Physiol.* 19, 115-26(1928). II. Primates. *Ibid* 181-95.

FRANCES KRASNOW

The action of isotonic salt solutions on the unfertilized eggs of *Thalassema neptuni*. A. D. HOBSON. Univ. of Edinburgh. *Brit. J. Exptl. Biol.* 6, 65-78(1928).—Isotonic salt solutions induce artificial parthenogenesis in the eggs of *Thalassema neptuni*. At the H-ion concn. of sea water CaCl₂ is an efficient activating agent while NaCl, LiCl and KCl fail. Solns. of CaCl₂ with alk. metal chlorides in certain proportions cause parthenogenesis. Two maxima are obtained in K-Ca solns., one with a high and one a low concn. of Ca. Two optimal exposure times have also been found, 6-9 mins. and 30 mins. C. M. M.

A study of the effect of surgical shock on insects. WM. ROBINSON. Univ. of Minn. Agr. Expt. Sta. *J. Agr. Research* 37, 743-8(1928).—Injury produces effects in insects that may be analogous to surgical shock in mammals. This was shown by a considerable drop in the percentage of bound H₂O and rise in the f. p. of pupae of *Telea polydorus* being produced by piercing with a needle or by crushing. Since detn. of the pH of body fluids, temp., f. p., etc., of insects as sometimes made involves injury to the insect, the data may not represent the actual conditions in normal individuals.

A. L. MEHRING

Effect of cyanide on the protoplasm of Amoeba. FLOYD J. BRINLEY. Univ. Penn. *Gen. Physiol.* 12, 201-6(1928).—This paper deals with the effects of HCN and KCN upon the viscosity of the protoplasm of a species of *Amoeba* belonging to the *proleus* group. The toxicity of these compds. to *Amoeba* results from their effect on the cell membrane and not upon the internal protoplasm. Immersion in concd. solns. (0.1 N-0.001 N) of HCN or KCN produces an initial increase in viscosity of the protoplasm followed by liquefaction and disintegration of the cell. Immersion in dil. solns. produces a decrease in the viscosity of the protoplasm. Injection of HCN or KCN into *Amoeba* brings about a reversible decrease in viscosity of the protoplasm. C. H. R.

The brightness of the light of the West Indian elaterid beetle, *Pyrophorus*. E. NEWTON HARVEY AND KENNETH P. STEVENS. Princeton Univ. *J. Gen. Physiol.* 12, 261-72(1928).—The prothoracic light organs of an unnamed species of *Pyrophorus*, measured at Princeton, N. J., gave a max. brightness of 0.045 lambert, or 0.045 lumen per sq. cm. at 20°, corresponding to 0.0002 candle for one organ or 0.0004 candle for the pair of organs. C. H. RICHARDSON

Ionic antagonism in the regeneration of the hydra. M. KOSACK. Med. Inst., Odessa. *Zhurnal exptl. Biol. Med.* 8, 515-24(1928); *Ber. ges. Physiol. exptl. Pharmacol.* 44, 747. A toxic concn. of NaCl can be detoxified by the addn. of CaCl₂. A toxic concn. of KCl can be detoxified by the addn. of CaCl₂ or NaCl. The upper limit of the concn. of KCl is 0.024 M KCl, beyond which detoxification is not possible. Toxic concns. below the upper limit are not only neutralized by the necessary minimal quantities of CaCl₂ or NaCl, but also by the half of each of these quantities when both antagonists of the KCl are used together. Toxic concns. of NaCl and KCl can be detoxified at the same time by the addn. of CaCl₂. R. C. WILLSON

Studies of the chromatophores of the frog. II. Influence of pharmaceuticals. EIKIZO KOBAYASHI. Univ. Kyoto. *Folia pharmacol. Japan* 6, 280-4(1928); *Ber. ges. Physiol. exptl. Pharmacol.* 45, 135.—Adrenaline, pilocarpine, tyramine and acetylcholine cause clumping of the chromatophores and thereby make the frog light colored. The action of acetylcholine was far below that of the other pharmaceuticals. Pituitrin has an expanding effect and thereby makes the frog dark colored. R. C. W.

Hatching of eggs and stimulus thereto in the yellow fever stegomyia (ROUNAUD) 14. The composition of water and mosquito breeding (RUDOLFS, LACKEV) 14.

DOFFLEIN, FRANZ: *Lehrbuch der Protozoenkunde*. Eine Darstellung der Naturgeschichte der Protozoen, mit besonderer Berücksichtigung der parasitischen und pathogenen Formen. Teil. 1. Allgemeine Naturgeschichte der Protozoen. Teil. 2.

Spezielle Naturgeschichte der Protozoen. Hälfte 1. Mastigophoren und Rhizopoden. Jena: Gustav Fischer. 5th ed., revised and edited by Eduard Reichenow. Teil 1, 436 pp., M. 21. Teil 2, 426 pp.; M. 22. Reviewed in *Nature* 123, 81(1929).

12—FOODS

F. C. BLANCK AND H. A. LEPPER

Comparison of the Monier-Williams and the Association of Official Agricultural Chemists methods for the determination of sulfurous acid in food products. J. FIFELSON. U. S. Food, Drug and Insecticide Administration, Philadelphia, Pa. *J. Assoc. Official Agr. Chem.* 12, 120-9(1929).—The use of Cu salts as a wash trap to remove sulfides from the distillate of the official Assoc. Official Agr. Chem. SO_2 detn. produces inaccuracies. Brining of onions reduces the proportion of volatile S compds. and does not produce SO_2 in the onions in any appreciable quantity. The accuracy and reliability of the Monier-Williams method for detg. SO_2 in the presence of volatile S compds. (cf. *C. A.* 21, 2510, 2742; distg. through a reflux condenser in a current of CO_2 , absorbing in cold neutral H_2O_2 and detg. H_2SO_4 by titration or by pptn. with BaCl_2 in the cold) was verified. The results of a series of comparative detns. of SO_2 in various food products by both the official Assoc. Official Agr. Chem. distn. method and the Monier-Williams method emphasized the advisability of using a more accurate method than the present official one for detg. SO_2 in food products contg. volatile S compds.

A. PAPINEAU-COUTURE

The chemical laboratory of the Feeding Research Station of the Société d'hygiène alimentaire annexed to the Institute of Agronomic Research. M. JAVILLIER. *Bull. soc. hyg. aliment.* 16, 398-411(1928).—A description of its activities during the period 1923-28.

A. PAPINEAU-COUTURE

A new volumetric method for the determination of tin in preserves and foodstuffs. B. GLASSMANN AND S. BARSUTSKII. Betriebslab. des Nahrungsmitteltrasts, Odessa. *Z. Untersuch. Lebensm.* 56, 208-12(1928).—A 50-g. well-mixed sample is dried, ignited and the ash extd. with 30 cc. of dil. HNO_3 (1:2) to remove Fe, Cu and Pb, after filtration the residue and filter are reignited. The Sn is reduced to the metallic form by fusion at low red heat using 1 g. KCN. The mass is extd. with 150 cc. of H_2O , filtered and the residue including the filter is digested with 25 cc. of concd. HCl in a flask fitted with a Bunsen valve. In order to complete the reduction, 1 g. of Zn is added, the soln. cooled in CO_2 and titrated with 0.02 N soln. of $\text{K}_2\text{Cr}_2\text{O}_7$, using KI and starch. The dichromate soln. should be prepd. by standardization against pure Sn similarly treated. About 6 hrs. is required to make the detn. With fish products, a max. error of -7 mg. in 50 mg., or -2.5 mg. in 10 mg. was observed. A sample of canned *Gobius*, 32 months old, gave 154.6 mg. per kg. of Sn, while after it had been opened for 12 days, the Sn content had increased to 420 mg. per kg. The samples of canned fish contained from 17.5 to 154.6 mg. per kg. of Sn.

C. R. F

Analysis of dietary products, gluten and almond breads. R. LECOQ. *J. pharm. chim.* 7, 539-48(1928).—Conclusions: (1) The total results of a % analysis of dietary products as usually conducted and calcd. cannot sum up to 100%, unless cellulose has also been detd. (2) While the ratio of N to pure gluten is about 1:7, the factor 6.25 is preferable for the calcn. of the proteins; the results agree better with the av. compn. of the N-bearing vegetable or animal components liable to enter into the formulas of dietary breads. (3) Expressing gluten in terms of av. proteins, and sugars in terms of starch causes the sum total to be less than 100, the deviation increasing with the sugar or the gluten entering into the prepn. of the products. (4) In employing the usual methods for the detn. of fats, the value found for fats is probably too low, especially with breads or biscuits rich in fatty matters. (5) On the basis of the analysis of simple products prepd. solely from the flour of gluten or of almonds, it is possible to arrive by trial or by calcn. at an approx. detn. of these components; with fresh breads, it is well previously to calc. the results of the analysis to a basis of about 10% H_2O . (6) Most frequently the figures thus found cannot be abs., as it is impossible to be exactly informed as to the nature of the primary materials and the substitutes eventually used.

S. WALDBOTT

The chemical composition of some Ceylon paddies, rices, and milling products. A. W. R. JOACHIM AND S. KANDIAH. Ceylon Dept. Agr. Peradeniya. *Trop. Agr. (Ceylon)* 70, 195-206(1928).—Thirty-five samples of rice products, typical of Ceylon, were analyzed and the results are presented in 11 tables. The av. compns of Ceylon

paddies, hand-husked rice, polished rice, bran and husks were as follows: moisture 12.01, 11.64, 12.21, 12.51, 11.35%; protein 6.69, 9.10, 7.64, 13.17, 3.90%; fat 1.91, 2.42, 1.00, 10.12, 1.26%; fiber 10.40, 0.65, 0.33, 14.05, 40.22%; carbohydrate 63.84, 74.79, 77.90, 38.72, 25.83%; ash 5.26, 1.41, 1.00, 11.44, 17.43%; N 1.04, 1.46, 1.22, 1.71, 0.62%; P_2O_5 0.54, 0.71, 0.43, 2.93, 0.50%; and CaO 0.078, 0.064, 0.043, 0.280, 0.27%, resp. Ceylon paddies and hand-husked rices appear to be richer in protein and minerals than those of other countries. Hill paddies are poorer in minerals than irrigated paddies. Polishing rice causes a marked decrease in the fat, H_3PO_4 , fiber and protein contents. This is greater with machine polishing than with the so-called village method of pounding. The aleurone layer contains the more valuable nutritive constituents. Parboiling does not affect the compn. of rice products, except slightly to lower the fat content.

A. L. MEHRING

• **Determination of chlorides in milk.** G. RODILLON. *Ann. fals.* **26**, 576-8(1928).—A reply to the criticisms of Raquet and Kerlevoe (*C. A.* **22**, 1194) of R.'s method (defecation by means of CCl_3CO_2H), which is claimed to be simple, rapid and accurate.

A. PAPINEAU-COUTURE

Influence of freezing of milk on its acid fermentation. V. W. WINTER. *Chem. Indst.* **22**, 357-61(1928).—The solid fraction of partly frozen milk has a lower sp. gr. and a higher acidity than the original milk, while the contrary is the case with the liquid fraction. Both fractions on incubation at the ordinary temp. for 2-3 weeks exhibit a lower acidity than milk not previously frozen.

B. C. A.

Physicochemical studies of cow milk and preparations made from it. MASAMI NAKAYAMA. *Med. Akad., Kyoto. Kyoto-Ikadaigaku-Zasshi.* **2**, 537-48(1928); *Ber. ges. Physiol. exptl. Pharmacol.* **46**, 36.—At 25° the milk has a pH of 6.37 (standard deviation 0.09% and deviation coeff. 1.41%). The pH increases with rise in temp. At 25° the milk can buffer $N/640$ HCl and $N/1280$ NaOH. The pH of milk powder varies between 6.00 and 7.00. "Kintars," "Dry Milk" and "Lactogen" can buffer $N/640$ HCl, "Eagle Brand" and "Bear Brand," $N/1280$ HCl, and all these preps. can buffer $N/2560$ NaOH. The buffer curves against alkali are the same for the first 3 preps. The curves against alkali are very different.

R. C. WILLSON

The fatty acids and component glycerides of some New Zealand butters. T. P. HILDITCH AND EVELINE E. JONES. *Analyst* **54**, 75-96(1929).—In a study of New Zealand butter, methods were developed for detg. the ratios of the fatty acids present, and a semi-quant. method was developed for detg. the manner in which the acids are combined to form the component glycerides of the natural fat. The compn. of the mixed fatty acids was detd. (1) by removing as much as possible of the lower acids by prolonged distn. with steam, the distillate being fractionated, and (2) by sepg. the non-volatile acids into 2 groups by the Pb salt and alc. method, followed by conversion of the acids of the sol. and insol. Pb salts into methyl esters, which were fractionated at low pressure in the usual manner. The approx. compn. of the acids was found to be butyric 3, caproic 2, caprylic 1, capric 2, lauric 4, myristic 11, palmitic 28, stearic 9, oleic 33.5 and linoleic 4.5%. There is consistent evidence of the presence of a small percentage of acids less satd. than oleic acid. The procedure adopted for the study of the component glycerides consisted in oxidizing the butter fat under conditions in which all the unsatd. components were transformed into acid products, while glycerides contg. only satd. acids were unaltered. The resulting data showed that the butter fat contained about 30% of fully satd. glycerides contg. the same fatty acids as are found in the whole fat and in about the same proportions. There appears, however, to be somewhat less volatile acids in the fully satd. part and a correspondingly slight concn. of the higher satd. acids in this group of the glycerides. Probably all of these glycerides are of the complex mixed type. The remaining 70% of the fat consists of mixed glycerides of satd. and unsatd. acids in the ratio of 104:100. At least 36% of the original fat consists of mono-oleo-disatd. glycerides, and there cannot be more than 18% of triolein (or 36% of di-oleo-mono-satd. glycerides). It is, in fact, probable that but little triolein is present. The approx. compn. of the fat is, therefore, 30% of mixed, fully satd. glycerides, 36% of mixed, mono-oleo-disatd. glycerides and 34% of mixed di-oleo-mono-satd. glycerides.

W. T. H.

Detection of margarine in butter. H. P. STADLE. *Z. Untersuch. Lebensm.* **55**, 404-5(1928).—The Litterscheid pocket polarization microscope was found useful in detecting adulteration by observing the presence of starch grains and fat crystals. Pure butter fluoresces faintly yellow or not at all, while margarine shows a blue luminescence. An ether soln. of the sample is prepd., and microscopic examn. of the insol. residue is made. An addn. of 15% margarine to pure butter can be detected readily.

B. C. A.

The iodine content of Norwegian fish and fish products. GULBRAND LUNDE, KARL CLOSS, HELMER HAALAND AND SIGURD O. MADSEN. *Aarsberetning vedkommende Norges Fiskerier* 1928, No. IV, 3-41; cf. *C. A.* 23, 1443.—Reference is made to the observation that endemic goiter appears most frequently in those inland mountain districts where the concn. of I in the surroundings is extremely low. It is proposed that the I deficiency be overcome through the use of foods contg. a relatively high concn. of I such as fish and fish products. The I in org. combination is more suitable for this purpose than that in inorg. iodides. Several tables and graphs are given to show the I content in various kinds of fresh and dried fish, fish oil, fish and herring meal. Although the av. I content in fish is small (from 0.26 to 6.33 mg. per kg. for fresh fish and 0.50 to 29.34 mg. per kg. on the dry basis) it is amply sufficient to furnish the needed I. According to analysis the ordinary non-marine foods have a low I content, usually less than 0.05 mg. per kg. Fish varieties rich in fat show a lower % of I than those that are lean. The Norwegian fish products are richer in I than all other foods that have been examd. A detailed description of the method of *detg. small quantities of I* is given. The method consists in decompng., sapong. and dissolving a weighed amt. of the material by heating in a 10-25% soln. of KOH to which EtOH has been added. An aliquot portion of the soln. is evapd. to dryness, the residue is ashed, the ash is extd. with EtOH, the ext. is evapd. and the resulting residue is gently ignited. This process is repeated. The final residue is dissolved in 0.3 cc. H₂O, transferred to a small tube, 0.015 to 0.04 cc. of CHCl₃ and a drop of a dil. soln. of a mixt. of KNO₃ and H₂SO₄ added, and the tube shaken. The liberated I imparts a rose red color to the CHCl₃. The amt. of I is detd. colorimetrically by comparing with standards. If the amt. of I is sufficiently great, the residue is dissolved in H₂O and oxidized to KIO₃; the latter is allowed to act on an excess of KI, the liberated I being titrated with a 0.004 N soln. of Na₂S₂O₃.

E. O. ELLINGSON

Complex technic of meat packing yields to science. E. B. WILSON. *Inst. Am Meat Packers*, Chicago. *Food Ind.* 1, 196-9(1929) — The function of the chem and bacteriol. lab. in the technical control of packing-house products is outlined.

C. R. F.

The determination of cacao germ in cacao products. W. SCHMIDT. Stat. lichen chem. Untersuchungsamt für die Auslands fleischbeschau, Cleve. *Z. Untersuch. Lebensm.* 56, 198-9(1928). After boiling the sample with 25% HCl, followed by 5% KOH, the microscopic prepn. is stained with safranine to facilitate examn.

C. R. F.

Coffee from Mauritius, Sierra Leone and Sudan. ANON. *Bull. Imp. Ind.* 26, 418-23(1928).—Liberian coffee grown in Mauritius had the following compn.: H₂O 10.7, crude proteins 12.2, caffeine 1.4, fat 10.4, N-free ext. 50.6, crude fiber 10.9, ash 3.8, hot-water ext. 30.6%. Robusta coffee grown in Sierra Leone had the following compn.: H₂O 10.4, caffeine 1.3, crude proteins 10.3, fat 10.1, N free ext. 48.6, crude fiber 15.7, ash 3.6, hot-water ext. 29.0%. A sample of Abyssinian coffee from Sudan was slightly below the usual standard of Abyssinian coffee.

A. P. C.

The microscopic detection of Durian and Nillu fruits (Salpamisri). An addendum to an article on "Lukutate" fruits. C. GRIEBEL. Govt. Food Research Lab., Berlin. *Z. Untersuch. Lebensm.* 55, 453-9(1928); cf. *C. A.* 22, 2798. —The dextrin grains of the Durian seeds are characteristic as to shape and size especially when treated with I. Their surface is irregular. By heating, the arillus cells are likewise characteristic. In the case of Nillu (Salpamisri), the parenchyma cells are flattened out and, together with the peculiar secretion cells, may be used for identification. Ten figures are given.

C. R. F.

Removal of spray residue from apples and pears in the Pacific Northwest. H. C. DIEHL, et al. U. S. Dept. Agr., *Circ.* 59, 1-19(1929).—A summary of spray-removal investigations in Wash. and Ore. Concns. of HCl from 0.3 to 1.2% have given satisfactory results in As and Pb spray removal. If not too heavily sprayed a 2% Na₂CO₃ soln. was also effective. The use of disinfectants such as CH₂O in the washing soln. is not recommended. The cleansing process of acid or alkali does not hasten ripening or injure the keeping quality of the fruit.

C. R. F.

Chemical basis for industrial citriculture in Paraguay. I. JOÃO SCHRODER. *Bol. ministerio agr. ind. com.* 17, 376-408(1928).—The orange contains 84.3% The

40.93; Na₂O 2.84, 2.29; 2.13, 2.02, CaO 2.11, 1.87; 8.71; MgO 5.72, 4.26; 5.15, 4.45; Fe₂O₃ 1.36, 1.42; 0.77, 2.57; P₂O₅ 12.63, 5.66; 13.532; SO₃ 5.14, 2.69; 3.08, 2.00; SiO₂ 1.28, —; 0.75, 0.91; CO₂ —, 29.73; —

28.78; Mn_2O_4 0.40, 0.45, Cl 0.81, 1.12; 0.48, 0.96. One hundred kg. of fresh citrus fruit contains about 60 g. phosphoric acid, 230 g. K_2O , 16 g. N, 140 g. CaO , and 60 g. MgO . A crop of 20,000 kg. per hectare will impoverish the ground by 12 kg. P_2O_5 , 46 kg. K_2O , 36 kg. N, 28 kg. CaO , and 12 kg. MgO ; these should be returned to the soil. The compns. of the fruit, trunk, branches and foliage are given, arranged on similar lines. S. considers the sour orange as the most important of the citrus, medicinally and commercially. Fruits which were analyzed contained 86 g. pulp, 47 g. rind and 2 g. seed in a weight of 135 g. fruit. Whole fruit and pulp contain, resp: water 82.8, 88.0; dry matter 17.2, 12.0; invert sugar 3.2, 4.2; sucrose 0.8, 1.6; citric acid 2.8, 3.6; proteins 0.9, 0.9; fats 0.4, —; cellulose —, 2.3; ash 10.07. These values for pulp agree fairly well with the results of König and of Puig. The compns. of sweet oranges, leaves, fresh seed, air-dried seed, seed dried for oil extn., and of the residue are given and also the yield. Similarly the *Citrus madurensis* Lour, *C. limonium* Risso, *C. decumana* Wild, or the common grapefruit, *C. medica* L., *C. limetta* Risso, *C. bergamia* Risso and Port, *C. trifoliata* L. are also dealt with. S. L. B. E.

Banana pectin (a preliminary report). HARRY VON LOESECKE. United Fruit Co., Boston, Mass. *Fruit Products J. and Am. Vinegar Ind.* 8, No. 6, 14-16; 30(1929).—The object of this investigation is to det. the feasibility of extg. pectin from banana peel. Results indicate that pectin can be extd. from the peel of bananas, the pectin obtained thus far being lower in jellying power than com. apple pectin. Both the dried banana pectin and the pectin concentrate have poor keeping qualities at the present state of the work. Further work is in progress to include both the peel and the entire fruit. J. A. KENNEDY

The use of successive generations of yeast in the preservation of fruit-juice beverages. S. C. VANDECAVEYE. Wash. Agr. Expt. Sta., Pullman, Wash. *Fruit Products J. and Am. Vinegar Ind.* 8, No. 6, 24-6(1929); cf. C. A. 23, 1988.—This method produces a very attractive beverage which will retain the delicate flavors and aromas of the freshly pressed and cleared juice. J. A. KENNEDY

Sugar, the master preserver. STROUD JORDAN. Henry Heide, Inc., N. Y. *Food Industries* 1, 207(1929).—Although invert sugar has an apparent soly. of 85%, a concd. sirup is not stable. Dextrose crystallizes out upon long standing or exposure to low temp. To offset this condition mixts. of sucrose and invert sugar are used. The com. applications of the use of *invertase* in candy making are pointed out. C. R. F.

Hungarian honeys of 1927. JEAN STITZ. Roy. Hong. Sta. Exp. Agronomique. *Bes. Ann. fuly.* 21, 572-6(1928); cf. C. A. 23, 914.—Analyses of 20 samples of known purity are tabulated. A. PAPINEAU-COUTURE

Quantitative determination of hydroxymethylfuraldehyde in honey. J. FIENE. Preusschen Hyg.-Inst. Landsberg a. W. *Z. Untersuch. Lebensm.* 56, 200-3(1928).—In the Troje reaction (C. A. 20, 3753), an ext. of honey in anhyd. Et acetate is evapd. *in vacuo* at 45° and the residue oxidized by an alk. soln. of I, the excess of I being back-titrated with $Na_2S_2O_3$ standard soln. F. shows that the results obtained by Troje's method are affected by the presence of org. acids, sugars, aromatic compds. and coloring substances present in honey. High values for hydroxymethylfuraldehyde are obtained even in the entire absence of this substance. C. R. F.

The effect of exhausting on the formation of hydrogen swells in canned-ready-to-serve prunes. E. M. AND P. H. RICHERT. Univ. of Cal. *Fruit Products J. and Am. Vinegar Ind.* 8, No. 6, 17-9(1929); cf. C. A. 23, 1182.—Variations in the time, temp. and method of exhausting had a marked effect on the rate of formation of H swells in canned prunes. The rate of formation of H swells is least in canned prunes exhausted for 10 mins. at 210° F.—apparently optimum exhaust under the conditions. Spoilage was more pronounced at all other exhausts used. At temps. below 210° F., the rate of spoiling decreased with increase in time of exhausting. At 210° F. this occurred only up to 10 mins. The rate of H formation in canned prunes exhausted for 20 and 40 mins. was slightly faster than for only 10 mins. The rate of formation of H swells decreased when the temp. at which the canned prunes were exhausted was increased to 210° F. The rate of formation under steam pressure was faster than in those exhausted at 210° F. for 10 mins. Evacuation prior to exhausting was without effect. To avoid loss of sirup during exhausting, allowance must be made for expansion in heating. Some head space is necessary and the cans should not be refilled before sealing. J. A. KENNEDY

Detection and estimation of carbon bisulfide in fumigated almonds. GEORGE MARSH AND W. V. CRUESS. Univ. of Cal. *Fruit Products J. and Am. Vinegar Ind.* 8, No. 6, 31, 34(1929).—This is a modification of the method proposed by Huff (cf.

C. A. 20, 561) for use in small gas vol. For solid samples such as almonds it is necessary to volatilize the CS_2 from the sample and collect in alc. KOH. A tentative method is given in detail. J. A. KENNEDY

Detection of rice flour in pepper powder. M. WAGENAAR. *Nahr-Untersuchungsamte*, Rotterdam. *Z. Untersuch. Lebensm.* 56, 205-8(1928); cf. C. A. 22, 1811.—The fuchsin staining method followed by microscopic examn. is not applicable to mixts. of rice flour and pepper powder. The characteristic fine network structure of the rice aleurone layer is best brought out by staining with a soln. of carmine in NH_3 and glycerol. C. R. F.

Table to be used in the determination of nitrogen and proteins in stock feeds. GUNNER JORGENSEN. *Ann. fals.* 21, 601-4(1928).—A table is given for finding directly the % N and crude proteins ($\text{N} \times 6.25$) from the cc. 0.1 N acid required per g. of sample. A. PAPINEAU-COUTURE

Phosphorus deficiency in forage feeds of range cattle. SAMUEL G. SCOTT. Mont. Agr. Expt. Sta. *J. Agr. Research* 38, 113-30(1929).—Many Montana-grown forage crops contain much Ca but very little P in proportion. This condition produces a P deficiency and Ca excess in the metabolism of cattle fed upon them and gives rise to physiol. disorders. Forage crops from areas where cattle show bone-chewing proclivities were analyzed and found to contain less P and more Ca than corresponding proclivities were unaffected areas. Soil samples from affected areas were high in Ca but apparently normal in P content. Since the crops grown on them are P-deficient the soil P is believed to be practically unavailable for plant assimilation. Drinking water from the affected areas contained only a trace of P but an av. of 56 p.p.m. of Ca. Mg does not appear to have any significant effect in causing the disorders studied. Twenty-two references are given. A. L. MEHRING

The feeding value of grass for milk production. HAROLD T. CRANFIELD. Midland Agr. and Dairy Coll. *Fertiliser, Feeding Stuffs and Farm Supplies J.* 14, 103-5(1929).—This is a general discussion summarizing the results of recent expts. to det. the relation between the stage of growth of pasture grass and its compn. and value as a food for dairy cows. K. D. JACOB

Dried grass cakes. Possibilities for conserving young, leafy pasturage. H. E. WOODMAN. *Fertiliser, Feeding Stuffs and Farm Supplies J.* 14, 105-6(1929).—Cattk. food contg. 8% H_2O and 25% protein was prepd. by drying young, leafy pasture grass and compressing it into cakes of such density that 25 cu. ft. weigh 1 ton. The product closely resembles newly mown pasture grass as regards odor and appearance. It swells and disintegrates when placed in water. Feeding expts. indicated that the product can satisfactorily replace oil cakes in the winter rations of fattening bullocks and dairy cows. The possibilities for the com. production of dried grass cake are discussed. K. D. JACOB

Determination of hoof meal. W. F. STERLING. Food, Drug and Insecticide Administration, Washington, D. C. *J. Assoc. Official Agr. Chem.* 12, 129-32(1929).—A method has been devised consisting essentially in grinding to pass a 40 mesh sieve, treating in a separatory funnel with sufficient CHCl_3 or CCl_4 to float the meaty portion, treating the washed and dried bone portion with 50 cc. 0.1 N HCl contg. 0.1 g. U. S. P. pepsin at 37-40° for 48 hrs., neutralizing with normal NaOH, washing repeatedly by decantation (preferably with centrifuging), and finally filtering, washing, drying and weighing. The wt. of residue times 1.54 = hoof meal. The method gives fairly satisfactory results when no vegetable tissue is present. A microscopic examn. of the final weighed residue should be made, and when vegetable tissue is found a correction should be applied if it is possible to est. approx. the quantity present. Efforts are being made to eliminate the interference of vegetable tissues. A. P.-C.

A study of coliform organisms in samples of certified milk (CHALMERS) 11C. Analysis of maple products (FOWLER, SNELL) 28. The problem of the arsenical spray residue (AMBRUSTER) 15. Annual report of the agricultural chemist [preservation of lemon juice] (LANDER) 15. Physicochemical investigation of proteins contained in soy bean (TADOKORO, TOSHIMURA) 11D. Some special constituents in the soy bean (MURAMATSU) 11D. Luminescence in oils and fats (VAN RAALTE) 27. River myall or sally wattle. A plant proved poisonous to stock (SEDDON, WHITE) 11D. Grinder for cereals, etc. (Fr. pat. 645,385) 1. Bakery furnace (Fr. pat. 645,836) 1.

CARLOS, ARTHUR S.: **Feeding Stuffs.** London: Chapman & Hall, Ltd. 152 pp. 5s. Reviewed in *Bull. Imp. Inst.* 26, 517-8(1928).

LARSON, CARL W.: *Dairy Cattle Feeding and Management*. London: Chapman & Hall, Ltd. 2nd ed., revised by H. O. Henderson. 450 pp. 20s. net. Reviewed in *J. Ministry Agr.* 35, 1091(1929).

Food. **SHIRLEY A. McDUGALL** (to Dextora Co.). U. S. 1,705,332, March 12. Malted milk 85 and sucrose 15% are mixed together and then with about 10% of their quantity of liquid such as water, and the mixt. is subjected to a steam pressure of about 10 lbs. per sq. in. and, after the steam is shut off, subjected to a vacuum which is gradually increased to about 27 in. in 5 mins. and continued at this reduced pressure for 15 min.

Food from wheat. **WALLACE D. SMITH and BONEITA A. SMITH.** U. S. 1,705,034, March 12. Wheat grains submerged in water are cooked under 15 lbs. pressure until the starch is hydrolyzed, cold water is added until the kernels are fully swelled, excess water is then sepd. by centrifuging and the temp. of the grain is raised to substantially the l. p.; the material is then submerged in a vegetable oil such as coconut oil at a temp. of about 205° until moisture is expelled and the grains are browned, and excess oil is sepd. by centrifuging.

Irradiating foods, etc. **G. BROWN.** Brit. 294,502, July 22, 1927. In exposure of foods to sunlight, ultra-violet or other active rays, liquids are treated in the form of a film or spray and preferably in a state of turbulence such as is obtained by passing over plates with an undulated or other suitably irregular surface. Solids are treated in thin layers on surfaces transparent to the rays used, so that the material may be radiated on both sides. The irradiation may be accompanied by elec. treatment and may be effected under pressure, *in vacuo* or in a deoxidizing atm.

Radiating foods with filtered and concentrated rays from the sun. **JACQUES W. D. CHESNEY** (to Solar Research Corp.). U. S. 1,704,173, March 5. An app. is described designed for filtering out from sunlight rays other than those between 2900 and 3700 Å. U. and concg. the rays between these limits by use of a lens or reflector for use on foods in developing the antirachitic principle.

Preserving food. **HENRY WILLIS.** Australian 10,250, Nov. 7, 1927. Eggs, fruit and vegetables are preserved by spraying them with a viscous fluid made of Irish moss or agar-agar dissolved in boiling water to which a small amt. of acriflavine or gentian violet dissolved in alc. is added.

Preserving food. **EDWARD J. R. HALLETT.** Australian 10,682, Dec. 2, 1927. Food, such as fish, is gradually cooled before being placed in cold storage by passing it through a refrigerating chamber on a conveyor upon the under side of which refrigerant is sprayed.

Apparatus for sterilizing air used in food preservation, etc. **W. S. LEECH and A. E. SHERMAN.** Brit. 294,586, Jan. 27, 1927. The air may be passed through a spray contg. nascent O formed from freshly admixed solns. of HCl and KMnO₄.

Preventing fermentation in dough prior to baking. **ADALBERT JARABEK.** Austrian 112,123, Sept. 15, 1928. The dough, prepd. for baking, is placed in an airtight container and subjected to a sufficient pressure, *e. g.*, by forcing in CO₂, to prevent evolution of gas from the dough.

Preserving milk, etc. **G. PARCUS** (to F. Seidel and A. Giani). Brit. 294,903, July 28, 1927. Sterilization of milk or other nutrient liquids is effected at a raised but non-injurious temp. (suitably below 66° with milk) under vacuum by elec. treatment and the liquid is then cooled and hermetically sealed in containers. An app. is described.

Cheese. **JOSEPH R. BREHM.** U. S. 1,704,458, March 5. A hydrolyzed protein decomposition product such as one prepd. from casein or yeast is mixed with a milk material inoculated with a pure culture of *Lactobacillus acidophilus* in the proportions of 100 times as much milk as of original dried protein, max. growth of the added culture is established at a temp. of about 37° and inoculation to a new medium is effected each time the milk is coagulated (or once a day if the coagulation period is shorter than a day), and the prepd. bacterial cultures thus obtained are used as starters in fermenting milk to produce cheese.

Apparatus for drying fish flour or similar material. **E. L. RICHARDSON and W. WEST.** Brit. 294,914, April 29, 1927.

Apparatus for curing meat by smoking. **LEO BRAND.** U. S. 1,704,650, March 5. **Fatty acids.** **HERMANN WEYLAND and STANISLAUS DEICHSEL** (to Winthrop Chemical Co.). U. S. 1,703,129, Feb. 26. The fatty acids contained in the fraction of the raw coemic acids, b₁₀ 163–80°, is converted into the corresponding methyl ketones (suitably mixing with glacial HOAc and passing at 450° over thoriated pumice),

the ketones thus obtained are treated with an oxidizing agent such as $\text{Na}_2\text{Cr}_2\text{O}_7$ and H_2SO_4 and the resulting mixts. may be converted into the polybasic alc. esters by reaction with glycerol. The products may be used as *foods by diabetic persons*.

Chocolate. A. NYROP. Brit. 294,790, Sept. 14, 1927. The initial materials, instead of being subjected to intensive grinding, are liquefied and atomized into heated air or other suitable gas; the powder thus obtained may be pressed into molds. Various details of prep. the materials, etc., are given.

Chocolate-treating apparatus. BAKER, PERKINS, LTD., and SOC. ANON. DES ANCIENS ÉTABLISSEMENTS A. SAVY, JEANJEAN ET CIE. Fr. 645,767, Dec. 15, 1927.

Apparatus for producing refined cacao juice. BAKER, PERKINS, LTD. and SOC. ANON. DES ANCIENS ÉTABLISSEMENTS A. SAVY, JEANJEAN ET CIE. Fr. 645,838, Dec. 17, 1927.

Apparatus for continuous expelling and clarifying of fruit juices. FRED W. MANING. U. S. 1,703,535, Feb. 26.

Preserved fruits and preserves. CHARLES FRAISSE. U. S. 1,703,730, Feb. 26. Fruit is placed in sirup the progressive increase in density of which is effected by diffusion of the denser sirup placed under pressure toward a weaker bath, through a wall which is provided with fine perforations. An app. is described.

Preserving figs. THOMAS C. MOORE (to Mor-Pak Preserving Corp.). U. S. 1,704,367, March 5. Figs are perforated and placed in a lye bath to remove milk draining from the perforated figs and to soften the skins, and then placed in hot water and agitated to remove the skins and wash the figs.

Apparatus for brushing fruit and treating it with paraffin or the like. ALBERT HAWORTH (to Brogdex Co.). U. S. 1,703,144, Feb. 26.

Treating fresh fruits to prevent decay. WILLIAM R. BARGER (to the Government and people of the U. S.). U. S. 1,704,456, March 5. In treating citrous fruits to prevent decay such as that caused by *Penicillium digitatum* and *Penicillium italicum* an aq. soln. is used contg. 0.5-4% of CdSO_4 and contg. also CdCl_2 0.5-4%.

Treating citrous fruits to prevent decay. WILLIAM R. BARGER (to the Government and people of the U. S.). U. S. 1,704,072, March 5. Fresh fruits such as citrous fruits are treated with a 0.5-4.0% CdSO_4 soln. to prevent decay such as that caused by *Penicillium digitatum* and *Penicillium italicum*. U. S. 1,704,073 specifies the similar use of a CdCl_2 soln. of 0.5-4.0% strength.

Beverages. HERMANN HOFER-MASSARD. Fr. 645,120, Dec. 5, 1927. A beverage or sirup which will keep indefinitely is prepd. by mixing milk with ground fruits, e. g., almonds, fruit juices or parts of plants, sepg., condensing and sterilizing the liquid which then contains the fatty, mineral and aromatic substances of the fruit. The product may also be used as a *cosmetic* for the care of the skin.

Animal food. CHRISTIAN N. KJAERGAARD. Fr. 644,732, Nov. 29, 1927. An animal food contains dregs of dried barley 40, sugar-beet parings 20, wheat bran 10, barley flour 10, molasses 7, dry yeast 5, powd. blood 4, malt germ 2 and salt 2%.

Preserving green food materials. KARL SCHMIDT. U. S. 1,703,782, Feb. 26. Part of the air and other gases are withdrawn from material such as grass or other green fodder while at the same time the material is subjected to pressure and a bactericidal gas such as CS_2 vapor is introduced into it. U. S. 1,703,783 also relates to app. for similar purposes.

13—GENERAL INDUSTRIAL CHEMISTRY

HARLAN S. MINER

Chemical engineering memoranda. VIII. Flue gases and waste heat in drying and calcining practice. CHARLES H. BUTCHER. *Ind. Chemist* 5, No. 48, 25 (1929) — B. continues his series of calcns. using the lb.-mol. system. Calcns. are given to show a convenient method of computing certain data which will be useful in the design of oil-fired drying and calcining plants.

Chemical engineering building at Iowa State College. LIONEL K. ARNOLD. *J. Chem. Education* 6, 292-8(1929).

Fellowships and graduate work in chemical engineering at the University of Michigan. EDWIN M. BAKER. *Ind. Eng. Chem., News Ed.* 7, No. 5, 6-7(1929).

Engineering development and research. L. A. HAWKINS. *Gen. Elec. Rev.* 32, 86-94(1929).

E. J. C.
E. H.
M. C. ROGERS
C. G. F.

Our foreign trade in chemicals and related products in 1928. OTTO WILSON. *Ind. Eng. Chem.* **21**, 300-4 (1929). E. H.

The possibilities of developing new industrial markets for farm products. RUDOLF A. CLEMEN. Armour and Co., Chicago, Ill. Agr. Expt. Sta., *Circ.* **339**, 1-24 (1928). Chem. utilization of waste and unused farm products is recommended. Corn sugar from corn, fructose from Jerusalem artichokes, casein from milk, furfural and paper from straw, corncobs and cornstalks, and new uses for cotton are advocated. C. R. F.

Patentability of broad claims based on an inadequate disclosure denied. LLOYN V. LOREN. *Ind. Eng. Chem., News Ed.* **7**, No. 5, 2 (1929). E. J. C.

The application of pH control. W. A. TAYLOR. La Motte Chemical Products Co., Baltimore, Md. *J. Chem. Education* **6**, 36-43 (1929); cf. *C. A.* **22**, 4192.—Control of pH is discussed in relation to water purification, corrosion, sewage digestion, treatment of textile wastes and wool-washing liquors, sizing paper and recovery of valuable material from white water of paper mills, making dyes and pigments, manuf. of various salts, analytical seps, electroplating, fermentation, jelly making, canning foods and soil management. W. C. EBAUGH

Solvent recovery. JOSE VIDAL. *Quim. e. ind.* **6**, 1-4 (1929).—Et₂O and EtOH are recovered in the varnish, paint, plastic, dye, cellulose, explosive, Chardonnnet silk, peramoid and artificial leather and perfume industries. Benzine is recovered in the rubber, artificial leather, paint, varnish and fatty-acid industries. (CH₃)₂CO, CS₂, amyl acetate, CCl₄ and MeOH are also recovered. V. gives a graph showing the amts. of Et₂O, EtOH and CS₂/satd. cu. m. of air, and considers recovery by (a) condensation over cold surfaces, (b) condensation by expansion and (c) soln. with subsequent evap. with 3 line layouts. S. L. B. ETHERTON

Quantitative relations of the counter-current washing process. SMITH D. TURNER. Humble Oil and Refining Co., Baytown, Texas. *Ind. Eng. Chem.* **21**, 190 (1929).—A simplification of the equations suggested by Silberstein (*C. A.* **22**, 3938) is offered to apply to cases when a system of N tanks is considered, $\tau/L = W(A^{N+1} - A)/(A^N - 1)$, where L = wt. of solute recovered, W = wt. of solute fed, N = number of tanks and τ = wt. of liquor transferred as liquid/wt. of liquor transferred adhering to solid. W. C. EBAUGH

A comparative study of World War casualties from gas and other weapons. HARRY L. GREENGLASS. *Separate* 51 pp (1928). F. H.

Electrical insulating materials from the chemical standpoint. W. H. NUTTALL. *Trans. I. & Rubber Industry* **4**, 313-35 (1928); cf. *C. A.* **23**, 1701.—A crit. review and discussion of the subject, dealing with dielec. strength (breakdown voltage), dielec. const., insulation resistance, the insulating properties of various substances, sp. inductive capacity and the relation between dielec. const. and chem. constitution. Graphs and tabulated data show the variation of breakdown voltage with the thickness of dielectric, decrease of breakdown voltage with the temp. (varnished cloth, paper, mica, Muller board, mica and varnished paper), the effect of heat-conducting electrodes on the time of breakdown, the effect of water in oil on the breakdown voltage, water absorbed by varnished films in water, the insulation resistance of moist, and varnished cotton, the variation of capacity with temp. of the impregnating oil, the relation between dielec. const. and the combined S. Also in *India Rubber* **77**, 227-30, 263-8 (1929). C. C. D.

The possible use in the Congo for chemical syntheses (VAN HOUT) **3**. Metallic complexes of nitrocellulose (DUCLAUX) **23**. Coatings for boilers, refrigerating apparatus, etc. *Bull. Int.* 294, 240) **26**. Building or heat insulating material (Ger. pat. 470,846) **20**. Protecting electric motors against acids [in refrigerating apparatus] (Fr. pat. 448,114) **4**.

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VILLAVECCHIA, G. V.: **Dizionario di merceologia et di chimica applicata.** Vol. I. Milan: Ulrico Hoepli, Editor libraio della real casa. 5th ed. 1223 pp. L. 60. Reviewed in *Chem. Trade J.* 84, 102(1929).

Air purifying. OSCAR MURY, MARC PELET and SOC. D'ENTREPRISE ET D'EXPLOITATION ATELIERS D'ARLOD. Fr. 33,416, Apr. 30, 1927. Addn. to 620,108. In a centrifuge for sepn. of dust, etc., from air or gases, the series of flat plates of the prior case are replaced by superimposed cones which may be curved inwardly at the inner outer edges.

Gas-liquefaction plant. STUDIENGESellschaft FÜR GASINDUSTRIE M. B. H. Fr. 645,168, Dec. 5, 1927.

Separating gaseous mixtures. IMPERIAL CHEMICAL INDUSTRIES, LTD. Fr. 645,564, Dec. 12, 1927. Gaseous constituents of different density in a mixt are sepd in a centrifugal app. the rotor of which has a peripheral speed of at least 600 m. per sec.

"Cold accumulators" or recuperators for use in separating gases by liquefaction. M. FRÄNKL. Brit. 204,944, Aug. 1, 1927. Structural features.

Rectification system for separating oxygen and nitrogen or other gases by liquefaction. W. L. DE BAUFRE (to S. G. Allen). Brit. 204,994, Jan. 3, 1927.

Recovering adsorbed gases. METALLGES. A.-G. (Georg Müller, inventor). Ger. 470,727, Feb. 7, 1924. In recovering gases or vapors adsorbed in media such as C. or silica gel by external heating, with or without internal heating, of a vessel contg the medium, a part of the used heating gas is mixed with fresh heating gas so as to avoid the application of too high a temp. The heating gas is preferably free from O so that part can be diverted and used for sweeping out the vessel. App. in which the heating gas is used in a cycle is described.

Rectification of gaseous mixtures. SAMUEL G. ALLEN. Fr. 645,259, Oct. 29, 1927. An app. is described for rectifying air, etc., by liquefaction in which both trays and tubes are used in the column, heat exchange taking place only in the tubular portion. More gas is compressed than is rectified and an external cycle gives auxiliary cooling. Fr. 645,260 describes an app. for the same purpose in which more gas than is to be rectified is compressed to a pressure just sufficient to ensure its liquefaction by the cooling effect of the gas being rectified.

Desulfurizing gases. WALTER RAFFLOER. Ger. 470,844, June 3, 1927. Desulfurization is effected by passing the gas through layers of finely divided purifying material at such a velocity that the material is whirled in the gas stream. The treated gas traverses a cyclone separator from which the purifying material is returned for re-use.

Use of gases such as ammonia in a boiler and turbine to generate power. ALLGEMEINE ELECTRICITÄTS GES. (to International General Electric Co.). Brit. 204,882, July 30, 1927. An app. is described.

Crystallization. CHEMISCHE FABRIK GROSS-WEISSANDT. G. M. B. H. Fr. 645,365, Dec. 7, 1927. See Ger. 467,233 (*C. A.* 23, 655).

Crystallization. APPAREILS ET ÉVAPORATEURS KESTNER. Fr. 645,080, Dec. 2, 1927. Substances which liberate heat on crystn., such as NH_4NO_3 , are crystd. by submitting a warm satd. soln. of the substance to energetic stirring and exposure to an air circulation sufficient to remove moisture liberated by evapn. caused by crystn.

Colloidal solutions. ODERBERGER CHEM. WERKE A.-G. Ger. 470,837, May 30, 1922. Colloidal solns. of high concn. are prepd. by intensive mech. disintegration in the presence of the dispersion medium, a protective colloid, and an electrolyte, e. g., NaCl, preferably in an amt. normally sufficient or nearly sufficient to effect flocculation. The prepn. of colloidal solns. of S and Fe_2O_3 is described by way of an example.

Filtering material. MAX LEHMANN. Fr. 645,610, Dec. 13, 1927. Silk in the wild state is used as a filtering material for warm, acid or alk. gases or liquids.

Refrigerating liquid. A. L. FABER & Co. G. M. B. H. and GEORG REINHART, JR. Fr. 645,054, Dec. 2, 1927. A refrigerating liquid of low f. p. is obtained by mixing an aq. soln. of $MgCl_2$ and an aq. soln. of KCl or NH_4Cl .

Refrigerant. FRANK C. MALIN and ALFRED E. GEORGE. Australian 9902, Oct. 7, 1927. A refrigerant which will function at low pressures and which will gradually gasify when allowed to expand contains CH_2Cl 80-94, SO_2 6-3, Br 4-1, CCl_4 10-2%.

Refrigerators. FRANK C. MALIN and ALFRED E. GEORGE. Australian 10,140, Oct. 31, 1927.

Refrigerators. FABRIQUE D'APPAREILS ÉLECTRIQUES FR. SAUTER S. A. Fr. 645,366, Dec. 7, 1927.

Absorption refrigerator. SULZER FRÈRES (S. A.). Fr. 645,368, Dec. 7, 1927.

Refrigerating apparatus. PLATEN-MUNTERS REFRIGERATING SYSTEM AKTIEBOLAG. Ger. 471,028, July 27, 1926. Absorption refrigerating machines in which an inert gas passes through the evaporator and the absorber are constructed so that the cold must from the evaporator cools the inert gas passing back from the absorber to the evaporator and also the unevapd. refrigerant passing to the evaporator from a second evapng. chamber serving to cool the rectifier or water-separator.

Refrigerating system of the absorption type. NAAMLOOZE VENNOOTSCHAP KODOWA REFRIGERATOR CO. Brit. 294,999, Aug. 4, 1927.

Refrigerating system of the reversing absorption type. SULZER FRÈRES SOC. ANON. Brit. 295,009, Aug. 6, 1927.

Refrigerating system of the automatic circulation type. CLYDE E. MOLESWORTH, JOHN DUDMAN and CARL G. ZOKELT. U. S. 1,703,351, Feb. 26.

Thermostatic control system for refrigerating apparatus. ALFRED M. THOMSON (to Leop. Mercadante). U. S. 1,704,352, March 5.

Thermostatic and pressure control of refrigerating systems. THOMAS SHIPLEY (to York Ice Machinery Corp.). U. S. 1,703,965, March 5.

Thermostatic- and pressure-actuated control devices for refrigerating systems. GEORGE M. TROUP (to Frigidaire Corp.). U. S. 1,704,522, March 5.

Insulating material. I. G. FARBENIND. A. G. Fr. 645,621, Dec. 13, 1927. Waterproofing substances such as natural or artificial resins, asphalts, paraffins or waxes are added to impermeable and insulating materials made from nitrocellulose varnishes and triethyl phosphates.

Heat- and sound-insulating masses. REMED G. M. B. H. Ger. 471,047, Feb. 5, 1924. Waste cellulosic products, e. g., cork waste, are treated with $NaOH$ and CS_2 in a known manner so as to effect superficial conversion into viscose, and the product is molded without the application of high pressure. The masses so obtained are dried at a temp. not exceeding 50° .

Vacuum jackets for heat insulation. I. G. FARBENIND. A.-G. Brit. 294,170, July 19, 1927. Residual gases are absorbed from the vacuum jackets of vessels for holding liquid air, etc., by use of materials such as dehydrated chabasite or alumina or silica gels or similar materials.

Electric and thermal insulation. ANDRÉ A. SAMUEL. U. S. 1,704,629, March 5. S. chloride is caused to react on a condensation product of a phenol and a reactive CH_2 compound such as CH_2O to obtain a product which may be worked like wood.

Electric insulation. J. E. G. LAHOUSSE. Brit. 294,931, Aug. 1, 1927. In prepg. insulating paper impregnated with metal resinsates such as described in Brit. 275,958 (C. J. 22, 2121), the paper during manuf. is admixed with a metal oxide such as ZnO and then impregnated with resin (suitably at a temp. of $120-200^\circ$) to form the resinate.

14.—WATER, SEWAGE AND SANITATION

EDWARD BARTOW

A century of the Pittsburgh waterworks. E. E. LANPHER. *Proc. Eng. Soc. West. Penn.* 44, 331-46(1929). E. H.

Water supply of Berlin. KÜHNE. *Gas u. Wasserfach* 72, 11-16(1929).—A de- R. W. R.

Iodine in the public water supplies of Massachusetts. H. W. CLARK. *J. New Eng. Water Works Assoc.* 42, 132-6(1928); *Pub. Health Eng. Abs.* E-711, 4.—Very wide variations occurred among the 97 water samples analyzed for I. The usual range

was from 0 to 4.3 p. p. b. The very diverse soil and rock characteristics are considered as contributing factors in I distribution in the water of Mass. C. R. F.

Potable-water supply. E. FOURNIER. Faculté Sci. Besançon. *L'Eau* 21, 179-80 (1928).—In limestone areas, ground waters should be the subject of the closest scrutiny, because of the danger of remote contamination. The use of fluorescein in the detection of polluted sources is advocated. C. R. F.

Water and its hygienic role. H. LABBE. Faculté Med. Paris. *L'Eau* 21, 181 (1928). C. R. F.

Are your wells and reservoirs contaminated? HARRY F. FERGUSON AND CLARENCE W. KLASSEN. *J. Am. Water Works Assoc.* 21, 50-65(1929); cf. *C. A.* 22, 4680. D. K. FRENCH

The underground water from the oil field of Akita. ITSURO MIKAWA. *Tôhoku Imp. Univ. (In Japanese.) J. Jap. Min. Ind.* 44, 563-70; *J. Geol. (Japan)* 35, 110-11(1928).—The notable thing in the underground water from the oil field of Akita is that the sulfate content is small and the Na and Cl contents are large. Ca and Mg are not present in large quantities. Carbonate, high in foreign waters of this kind, is low. This confirms the theory that this is a kind of remanent sea water, left at the time of sedimentary rock formation. K. SOMEYA

Ground-water volume as related to measurable precipitation. CHR. MEZGER. *Gas u. Wasserfach* 72, 25-31(1929). R. W. RYAN

Comments on methods for determination of residual chlorine. LINN H. LINDSEY. *Md. Water and Sewerage Assoc.*, Apr. 1928, 39-49; *Pub. Health Eng. Abs.* E-711A, 13.—In applying the *o*-tolidine test for the detection of residual Cl in highly buffered waters, sewage, and trade wastes, 0.5 cc. of the reagent contg. 18-20% HCl should be used to each 15-20 cc. of sample. When interfering substances are present in the water or sewage the result may be corrected by collecting samples just before and after the Cl soln. is applied. *o*-Tolidine is added to both samples and the results are caused by the interfering substances compensated for. Fe does not interfere with the *o*-tolidine-HCl test. Manganic compds. render the test useless. C. R. F.

False results of the *o*-tolidine test for residual chlorine. LEROY FORMAN. *Pub. Health News* 13, 282(1928); *Pub. Health Eng. Abs.* E-699C, 94.—Because of high residual Cl found in a chlorinated surface water supply by the *o*-tolidine method, an investigation was made to find the interfering substances. The trouble was found to be due to Mn. It is known that manganic salts interfere with the test but expts. showed that when manganous salts are converted to the hydrate with NaOH, oxidation takes place rapidly and hydrous oxides give the color reaction with *o*-tolidine. It is suggested that a residual-Cl test be made on the unchlorinated as well as on the chlorinated water in order to correct for interfering substances. C. R. F.

Algae control by chlorination at Kansas City, Kansas. L. B. MANGUN. *J. Am. Water Works Assoc.* 21, 44-9(1929).—The reservoir in question was a 13 million gal. part of the distribution system. During a five-month period annually algal growth was luxuriant. CuSO_4 could not satisfactorily be applied in the large distribution reservoir. Chlorination was tried and found most successful. The concn. of Cl in the inflowing water where treatment was applied averaged 5 p. p. m. D. K. F.

The sterilization of sea water by ozone. Application of the method to purification of contaminated shellfish. H. VIOLE. Univ. Marseille. *Rev. hyg. méd. publ.* 51, 42-6 (1929).—Ozone is a powerful disinfectant for sea water. Sea water, seeded heavily with each, *B. typhosus*, *B. coli*, *B. proteus*, *V. cholerae*, *B. pyocyaneus* and *B. dysenteriae*, in Wood flasks became sterile after 7-8 mins. of ozonization. Ordinary surface sea water contains I only in org. combinations in which form the I is unaffected by ozone. To prove that the sea water contained no bactericidal substance, ozone was bubbled through sea water for 15 mins. and after aeration for a few sec., bacterial suspensions were added. After 18 hrs. incubation, samples were withdrawn into broth. All showed active growth. Lab. expts. using contaminated oysters were made. The ozone was twice the concn. necessary to sterilize the sea water. The water was changed twice daily. The oysters were sterile after 5-6 days but 15 days is considered the max. time necessary to purify oysters by ozone. The appearance, vitality and flavor of ozone-treated oysters were normal. C. R. F.

The diurnal variation of the gaseous constituents of river waters. IV. ROGER W. BUTCHER, FREDERICK T. K. PENTELow AND JAMES W. A. WOODLEY. Government Lab., Strand, London. *Biochem. J.* 22, 1478-80(1928); cf. *C. A.* 23, 458.—The factors governing the dissolved O content of river water are the time of day in connection with the processes of photosynthesis and respiration; the season of the year; the prevailing actinic conditions; the phys. characters of the river; temp. variations; the

ln. of O from the air; and the degree and nature of the pollution. Throughout the run the pH curves were very similar in structure to those of satn. of O. The concn. CO_2 is roughly inversely proportional to that of O_2 . BENJAMIN HARROW

Report of the water-softening and purification works for year 1927. CHARLES HOOVER. Ann. Rept. Div. of Water and Sewage Disposal, (Columbus, Ohio). *Supplement to City Bull.* 1927, 52-9; cf. *C. A.* 23, 656.—An av. of 28.5 million gals. of water softened and filtered each day. The per capita usage per day is 98 gals. To reduce the hardness of the water from an av. of 230 to 87 p. p. m., 25.4 tons of soda ash and 215 tons of CaO are required. The cost of CaO , soda ash, alum and Cl per million gals. is \$14.00. The treatment reduces the turbidity from 121 p. p. m. to 0. An av. flow of 21 p. p. m. is reduced to 1. A carbonation plant was built consisting of gas holder, burner, return tubular boiler, steam driver, air compressor, diffuser, and a carbonation scrubber and dryer. Coke is used as the fuel. An av. of 261 lbs. CO_2 added per million gals. of water. This requires 87 lbs. of coke, the av. for 4 months in 1927. C. R. F.

Concentration control provides good quality boiler-feed water. LUCIUS A. FRITZ. In ELWOOD W. SCARRIT. Elgin Softener Corp., Elgin, Ill. *Power* 69, 346-9(1929).—Boiler water is circulated through a settling tank which may be inside or outside the boiler. Flocculent solids rise; heavy, scale forming solids settle, and clarified water returned to the boiler from near the center of the tank. From 25 to 150% of the boiler capacity may be treated, the proportion depending on conditions.

Phosphate in boiler-water conditioning. R. E. HALL, et al. *J. Am. Water Works Assoc.* 21, 79-100(1929).—The disadvantages of soda ash, previously suggested for boiler water conditioning, are outlined, and phosphate, which possesses none of them, is recommended. A discussion of foaming follows, which stresses the importance of dissolved solids as a producing factor and of alk. salts of tannic and other org. acids, as well as the Ca ion, as preventives. Many water-insol. materials with foam-resisting characteristics are mentioned. D. K. FRENCH

A non-chemical method for the prevention of scale accumulation in boilers, Diesel engines, and water circulating systems in general. A. T. RIBOUT. *Domestic Eng.* London, 48, 163-5(1928). The system described utilizes colloids in feed water. The starch is extracted in a colloidal form from linseed without extn. of the oil by steam treatment of the seed in a cast steel receptacle with a perforated canister. The carbonates are infused in a colloidal condition. The oil is not extd., because no crush-mechanism is brought about. The starches are extd. in about 24 hrs. and 1 lb. (453.6 g.) of seed is sufficient for 2000 gals. (7570 l.) of feed water. The cost of up-keep is low; the cost of installation and the difference in space occupied as against a water softener are small. Acid attack of the boiler and galvanic action have been arrested. It is noted that salt water feed is possible. Bare plates are impossible, because the colloid is deposited at the junction of the water and the plates. This results in the formation of a thin film of protective scale, which is easily removable. W. H. BOYNTON

Corrosion of metals in water-distribution systems. F. N. SPELLER and E. L. CHAPMAN. *J. Am. Water Works Assoc.* 21, 40-3(1929).—Corrosion is principally due to dissolved O in water. The results are either choking up with rust or penetration. The former condition can sometimes be overcome. Deaeration, chem. treatment, and the application of pipe coatings or linings all have value as preventives. D. K. FRENCH

The automatic formation of a protective film from cold water in iron pipes. (1). The adsorption of carbon dioxide by ferric hydroxide. J. TILLMANS, P. HIRSCH and P. SCHMIDT. *Gas u. Wasserfach* 72, 49-53, 78-82(1929).—Quant. evidence is given for the adsorption of CO_2 by $Fe(OH)_3$. The $Fe(OH)_3$ formed in the rusting process in water containing lime and aggressive CO_2 adsorbs CO_2 from the interface, and if the excess of CO_2 is small, may upset the lime- CO_2 equil., so that the water becomes supersaturated with respect to $CaCO_3$, which is then deposited, restoring the equil. As the water now contains less free and bound CO_2 , the $Fe(OH)_3$ - CO_2 equil. is disturbed and CO_2 given up to the soln., so that the water becomes aggressive again. Once formed, the $CaCO_3$ crystals are built up by successive repetitions of the above cycle until they touch and form a protective coating with the aid of the $Fe(OH)_3$, which protects the iron from further corrosion. R. W. RYAN

The determination of dissolved oxygen with the micro-Winkler apparatus of Thompson and Miller. A. W. SNOKE. Univ. of Wash., Seattle. *Ecology* 10, 163-4(1929); cf. *C. A.* 22, 3319.—The app. has been found useful not only for the detn. of dissolved O where small samples (10 cc.) were necessary, but also in many cases where

the original macrochem. method would normally be used. Data on 3 samples show as great accuracy for the microchem. method as for the macrochem. method, and the former's convenience and accuracy recommend it for field work. C. R. F.

The composition of water and mosquito breeding. WILLEM RUDOLFS AND JAMES B. LACKEY. *Am. J. Hyg.* 9, 160-80(1929).—Data are furnished correlating the chem. compn. of H_2O and biol. growth in it with the abundance of mosquito breeding. Larvae are killed within 24 hrs. when the p_H of natural H_2O is changed rapidly, while a gradual change in reaction fails appreciably to affect the death rate. It is possible that under certain conditions waters with low p_H values are more favorable to mosquito breeding than those with medium or high p_H values, and *vice versa*. Breeding of *Culex* occurs in liquid contg. from 15 to 120 p. p. m. free NH_3 . Apparently, albuminoid N_2 present in quantities ranging from 0.4 to 9.6 p. p. m. does not affect breeding. Breeding of *C. pipiens* in liquid contg. 42 p. p. m. of N_2 in this form has been observed, and interesting data are given describing the employment of various compounds in artificially changing the reaction of waters in which larvae were introduced. The relation between the no. of microscopic animals and plants with mosquito breeding is stressed. Tables and graphs illustrating the salient facts presented are furnished, and a bibliography is appended. FREDERICK G. GERMUTH

Comparison of numbers of *B. coli* in iced and uniced samples of water. G. ELLISON, H. W. HACKLER AND W. A. BUICE. *Southern Med. J.* 21, 948-9(1928); *Pub. Health Eng. Abs.* E-699C, 96.—Duplicate samples of water (1 iced and 1 uniced) were collected and shipped to the lab. for analysis. The time required for shipment prior to planting was 20 to 72 hrs. Sixty samples were examd. from 12 sources and the examn. was in accordance with Standard Methods, Am. Public Health Assoc. Seventeen of the uniced samples showed more *B. coli* than the iced duplicates. Thirty-eight samples were in agreement with their duplicates. Of the iced samples 62% gave pos. tests for fecal coli. In uniced duplicates, 67% gave pos. tests for fecal coli. In all cases ice was completely melted when the samples were received. In all instances but one, the iced samples were cooler than the uniced when received. C. R. F.

Pollution and natural purification of the Illinois river. T. C. SCHAEZLE. *J. Am. Water Works Assoc.* 18, 753-6(1927).—An abstract of Public Health Bulletin No. 171 dealing largely with the effect of Chicago's diluted sewage and waste on the river. D. K. FRENCH

Use of chlorine in sewage treatment. A. L. FRICK. *Ariz. State Bd. Health, Bull.* July, 1928, 29-31.—Cl absorption by sewage effluents is extremely rapid, the reactions being completed in 10 mins. It is necessary thoroughly and rapidly to mix the Cl with the sewage. Dosage of Cl varied considerably, but 5-15 p. p. m. gave the best results. The dosage must be varied according to conditions to reduce the costs to a minimum. C. R. F.

Tests (of sewage) at Davis, Porterville and Livermore, Calif. E. A. REINKE. *Sewage Works J.* 1, 61-3(1928).—A Cl dosage of 10 p. p. m. was necessary to control odors in Imhoff tanks. Smaller quantities of Cl were helpful in reducing H_2S , but were not considered satisfactory. CaO , which raises the p_H of the sewage from 6.6 to 7.4, proved to be of little value. C. R. F.

Composition and decomposition of fresh sewage solids collected from different parts of a settling tank. H. HEUKLEKIAN. *Sewage Works J.* 1, 19-30(1928); cf. C. A. 22, 1205; 23, 459.—Fresh solids were collected in suspended pails from the Plainfield, N. J., Imhoff tanks and incubated in bottles at 15.5-20°. Fat and N detns. were made on the dried samples obtained from both seeded and unseeded fresh sludges. Both the fat and the content of solids collected from the inlet of the tanks were uniformly lower than those from the outlet. In the unseeded samples the time of digestion was lowest for the outlet samples, presumably because of the high % of cellulose in the material at the inlet. When the fresh solids were seeded with ripe sludge in the ratio of 2:1, the rate of gas production of outlet samples was highest in 1 expt., but when repeated was lowest. Likewise the total yield of gas in the first expt. was highest for the outlet sludge, and in the second test was lowest. The conclusion is that the total yield of gas is not correlated with the fat content of the sludge. C. R. F.

Effect of age of sewage solids upon their digestibility. GORDON M. FAIR AND LOUIS KLEIN. *Sewage Works J.* 1, 14-9(1928); cf. C. A. 22, 1203. Expts. to det. the effect of age upon the Imhoff digestion process were conducted at 2 plants: 1 at Fitchburg, Mass., treating a domestic sewage, and the other at Brockton, Mass., where considerable leather-working wastes are present. Sewage solids were collected in pails suspended in the settling tanks, and after standing for definite intervals of time were mixed with well-digested sludge in the ratio of 2 to 1. These mixts. were then

placed in sealed glass bottles, where the gas formation and p_H could be observed. The results were not entirely consistent. There is seemingly no regular and progressive deterioration of the digestibility of fresh sewage solids that are left unseeded. Their behavior is different during various intervals of time. In the absence of interfering industrial wastes, however, it seems desirable that the settling solids reach the digestion tanks as soon as possible, even though at certain periods of decompn., unseeded material will digest very readily. In the presence of certain trade wastes or other modifying factors, digestion may proceed better if the solids remain unseeded for a limited number of days. C. R. F.

Deterioration of materials caused by the action of sewage and sewage gases. H. A. WOOD. *Australian Munic. J.* Aug. 31, 1928; *Pub. Health Eng. Abs.* E-711B, 5.—A central pumping station at Sydney pumps the sewage 2.7 miles to the head of the outfall sewer, which is connected by gravity flow to the sewage farm 16 miles away. H₂S is present in large amts. The total solids average 2600 p. p. m. and suspended solids 250 p. p. m. The H₂S causes profound deterioration of concrete, mortar, metals and cement walls. An impermeable surface was obtained with vitrified tile closely joined so as to produce a minimum of exposed permeable material. C. R. F.

Sewage filters. F. H. WARING. *J. N. Carolina Sect. Am. Water Works Assoc., Proc. 7th Ann. Meeting* 5, 191-200(1927).—A discussion of trickling-filter operation including the necessity of such lab. tests as the methylene blue, dissolved O, biochem. O demand and nitrate detus. C. R. F.

The control of foaming and odors of Imhoff tanks. CHESTER COHEN. *Sewage Works J.* 1, 58-61(1928).—Expts. carried on in Texas for 90-day periods showed that when Cl was applied to crude sewage in a dosage of 20 p. p. m., no residual Cl could be detected in the tank effluent. A Cl dosage of 3 p. p. m. from 8 A.M. to 5 P.M. was sufficient to control foaming but continuous addn. of the Cl was necessary to prevent objectionable odors. CaO also was used to condition the sludge in an attempt to control foaming and odor but with unsuccessful results. C. R. F.

The activated-sludge process. A. KUFFERATH. Berlin. *Z. angew. Chem.* 42, 65-7(1929).—Berlin with 4 million people has to treat 160 l. of sewage per capita per day. The purification process is described. The optimum p_H value for the process is 7.2. The addn. of small amts. of FeCl₃ or FeSO₄ proved beneficial. The sludge analyzed 63% H₂O, 0.77% N and 0.28% P₂O₅. The cost per 100 kg. is approx. 3 M. C. R. F.

Activated-sludge progress and problems. A. J. MARTIN. *Proc. 10th Tex. Water Works School* 1928, 266-72; *Pub. Health Eng. Abstracts* E-676B, 65. C. R. F.

Bacteriological isolation and study of the filamentous organisms in the activated sludge of the Des Plaines River sewage-treatment works. C. C. RUCHHOFT AND J. H. WATKINS. *Sewage Works J.* 1, 52-8(1928).—A species of *Sphaerotilus* occurs in great abundance. Dextrose is required for optimum growth in lab. media. Expts. indicate that 500 p. p. m. of CaO dissolves or disintegrates the filaments in a short time. Amts. under 100 p.p.m. have little effect on the sludge in which the organism occurs. C. R. FELLERS

Carbohydrate wastes stimulate growth of undesirable filamentous organisms in activated sludge. R. H. MORGAN AND A. J. BECK. *Sewage Works J.* 1, 46-51(1928).—The illicit distg. and fermentation industries of certain Chicago areas seriously affect the operation of the activated-sludge plant on the Des Plaines River. Dextrose was present at times to the extent of 10,400 p. p. m. or 12,800 lbs. per day, thus enormously increasing the biochem. O demand. The regular treatment became ineffective. Bulking of the sludge occurred due to *Sphaerotilus* growth encouraged by the presence of carbohydrates. Expts. with various chemicals, except CaO proved, negative. CaO greatly improved the condition but complete relief was obtained only after diversion of the sugar sewage. C. R. FELLERS

Sanitation of bathing beaches. WARREN J. SCOTT. *Conn. Health Bull.* 42, 166-72(1928); *Pub. Health Eng. Abs.* E-711C, 1.—A pollution standard of an av. of not over 1 *B. coli* per cc., with a max. of not over 10 per cc., is suggested for bathing beaches. C. R. FELLERS

The treatment of organic wastes. W. WEAVER. Birmingham Corp. Salvage Dept. *J. Roy. San. Inst.* 49, 479(1929); cf. *C. A.* 23, 227.—Substances that would produce obnoxious odors are burned. Grease is extd. with benzene. The Iwel Fry Rendering Process has been adopted. Vegetable refuse treatment consists in de-watering of the waste. A. L. E.

The treatment of industrial wastes. EDGAR WHEDBEE. *Proc. 10th Tex. Water Works School* 1928, 273-83; *Pub. Health Eng. Abs.* E-676B, 65. C. R. FELLERS

Disposal of industrial wastes. F. W. MOHLMAN AND A. J. BECK. *Ind. Eng. Chem.* **21**, 205-10(1929); cf. C. A. **20**, 3765.—Steepwater is concd. and used with other parts of the corn in stock food. Escape of gluten and starch by overflow is prevented. Loss of sol. matter is prevented by recirculation and evapn. These changes reduce a potential population equiv. of 400,000 to 50,000—75,000. Vapors from evapn. of steepwater contain volatile acids, 50% propionic, and alcs., mainly ethyl. Some entrainment losses occur. Since 80% of the O-demand substances distil in the first 15% of distillate, by stripping this it should be possible to eliminate treatment of the balance of the steepwater distillate, reducing the population equiv. by about 32,000. Refinery wash water cannot be handled by activated sludge but a trickling filter at 1.5 m. g. d. per acre reduces the O demand over 90% and would reduce the population equiv. to about 13,000. It may be possible to reduce the population equiv. of the plant to 20,000. Waste from a paint plant reduced the efficiency of the Calumet Treatment Works, cutting activated-sludge tanks from 2 m. g. d. to 1 m. g. d. each and increasing the air required by 200%. The waste made the sewage more acid, decreased dissolved O, increased the O demand and decreased bacterial action. The principal wastes were H_2SO_4 waste from *p*-nitroaniline, Cu and As from Paris green and sodium sulfite waste from the manuf. of β -naphthol. The total vol. including miscellaneous wastes was 2.0 m. g. d. in a total for the Calumet plant of about 40 m. g. d. Neutralization of the acid waste is possible with CaO or $CaCO_3$. For the present it is to be equalized by an 18,000-gal. tank which will bring the av. pH to 6.4 or higher. A plant is to be installed to ppt. Cu by Fe filings, arsenic is not to be removed, since it occurs less than 1.0 p. p. m. Sulfite wastes may be used for neutralizing acid sulfonation liquors, and the SO_2 can be absorbed in alkali or discharged through a stack. Treatment of these 3 wastes amounting to 60,000 gals. will probably eliminate the necessity of treating the balance.

FOSTER DEE SNELL

Purification of (sugar house) waste waters. G. A. PARK ROSS AND L. FORTIER. *REAUX DE FROBERVILLE. Suppl. circ. hebdom. centr. fabr. sucre France* No. 2011, May 27, 1928; *Chimie et industrie* **20**, 1067(1928).—A survey was made of the processes of waste-water disposal in use in Scotch distilleries and in beet-sugar factories of Northern France, to suggest a waste-water treatment suitable for the cane-sugar factories of Natal. It is recommended that all the waste waters be combined and treated either by carbonation (make alk. with milk of lime, heat to 50–52°, neutralize with CO_2 , ppt. $CaCO_3$, by heating to 90–95° and decant) or by chem. pptn. (treat with Fe sulfate and CaO , allow the ppt. to settle and decant). The sludge obtained in either process can be dried and used as fertilizer.

A. PAPINEAU COLLEGE

Experiments on the purification of beet-sugar wastes by stream flow aeration. MAX LEVINE AND A. H. NELSON. *Sewage Works J.* **1**, 40–5(1928).—A stream flow aeration process was used. The waste was forced over a series of cleats in a thin stream into a trough, thus increasing aeration. The storage tank was 80' emptied each hr. Examn. of the effluent was made after 6 and 22 hrs'. aeration. Av. results on 3 runs in p. p. m. of the raw waste and % reduction obtained by the treatment follow: Total solids, 2557, were reduced 44% in 6 hrs. and 61.4% in 22 hrs.; suspended solids, 545, were reduced 76.6 and 79.2%; org. N, 38.1, was reduced 49.2 and 65.2%; while the 5-day biochem. O demand, 1120, was increased from 67.2% in 6 hrs. to 89.6% in 22 hrs.

C. R. FELLERS

Improvements in the operation of a textile wastes treatment plant. STUART E. COBURN. *Sewage Works J.* **1**, 77–9(1928).—The wastes consist principally of spent dye liquor, washer wastes and rinse waters, and are highly colored and turbid. There is also considerable soap, dirt, wool fiber and oils. The waste flows by gravity to 5 sedimentation tanks, to the sludge-drying beds and intermittent sand filter. H_2SO_4 is used to increase the H-ion concn. to pH 6 before the addn. of alum. A clear, stable, and practically colorless effluent is obtained. The filters are cleaned but twice a yr.

C. R. FELLERS

Chemical treatment of trade wastes. V. Waste from wool washing. FOSTER DEE SNELL. *Ind. Eng. Chem.* **21**, 210–3(1929); cf. C. A. **22**, 1204. A combination of acid cracking and $Al_2(SO_4)_3$ coagulation gives an effluent suitable for discharge into a stream or for reuse. By recovery of wool grease and Al a small profit is obtained. The process is grit settlement, $Al_2(SO_4)_3$ coagulation, mech. filtration, decompn. of filter cake for Al recovery and treatment of the sepd. fat. Nitrogenous fertilizer material and potash may be, but are not necessarily by-products.

FOSTER DEE SNELL

Treatment of laundry wastes. L. E. SAKERS AND F. M. ZIMMERMAN. Mid Water and Sewerage Assoc. *Proc. Second Ann. Conference* 70–3(1928).—Wastes from a large laundry consisted of soapy H_2O , dyes, grease and dirt. Exptl. work showed that the

addn of Fe and CaO with agitation was beneficial. After settling in tanks, the settled wastes flowed through a baffled ditch to a cinder bed. Ten lbs. of CaO and 2.5 lbs. of FeSO_4 were added to each 1000 gals. of waste H_2O at a cost of approx. 12.3¢ per 1000 gals. Sludge from the tanks was removed and dried on a small drying bed. The dry substance contained 2.6% grease and 1% N. Approx. 60 cu. ft. of sludge was removed each week. Chem. tests of the raw and treated wastes for turbidity, color, total solids, suspended solids and O consumed showed improvements of 92.9, 64.4, 65.5, 96.7 and 89%, resp., between raw and treated wastes. C. R. FELLERS

Purification of the atmosphere and the struggle against smoke. CHALUMEAU. *Tech. sanit. munic.* 23, 300-9(1928).—Committee report. The following measures are recommended as aids in smoke nuisance amelioration: electricity in place of steam, the use of gas generators, the mixing of combustible vaporized liquid or pulverized solid fuels with the correct amt. of air and the use of coal dust in conjunction with non-bituminous oils and coke with special care being taken to provide for the pptn. of the unburned dust. Flue-gas analysis, increasing the temp. of the furnace, improvement and better management of draughts, water sprays and elec. pptn. of soot are also useful means of smoke elimination. For private dwellings, fuel should be limited to coke and non-bituminous oils. The use of fuel oils high in volatile matter should be suppressed. The exhaust gases of automobiles contained an av. of 7% CO, the limits being 0.5-14%. The max. % of CO in air which is not harmful to human health was 0.4 p. p. m. This max. should never be exceeded in garages or tunnels. Germinated dust is probably the cause of many respiratory diseases, anemias and lesser indispositions. C. R. FELLERS

Report on smokes from private dwellings. FRESSON. Office tech. Chauffage, Paris. *Tech. sanit. munic.* 23, 310-14(1928).—Domestic fuels should be limited to such non-smoky fuels as coke, semi-coke, gas and mazout. The burning of green vegetation, hay, etc., is an important cause of smoke during the spring and autumn. C. R. FELLERS

Report on the smokes and dusts of barges, boats and railroad locomotives. F. BORDAS. Services d'hygiene de la prefecture de Police, Paris. *Tech. sanit. munic.* 23, 314-20(1928). The human body requires about 6 times as much air per day as the total wts. of solids and liquids. The heavy smokes from barges and locomotives can be diminished largely by careful stoking, better draught control, higher temps. in the air boxes, and a more appropriate choice of fuels. C. R. FELLERS

Refuse incineration at Louisville. J. L. ESCHRICH. *The Am. City* 38, 127-8 (1928). *U. S. Pub. Health Repts.* 43, 3436.—The new Heenan type incinerator has a 10-ton capacity for 10 hrs. No addnl. fuel other than the garbage collected is required. The cost is approx. \$100 a ton. No objectionable odors are evolved. C. R. F.

Collection and disposal of refuse in Chicago. LORAN D. GAYTON. *J. Western Soc. Eng.* 34, 102-16(1929).—Both incineration and reduction methods of disposal are used. The former method is favored because of low cost and efficiency. For the reduction plant, garbage is sepd. by the householder from all other refuse, hauled to the plant in iron box trucks, crushed and dried. The 6 driers are of the cylindrical, direct heat type, rotating at a speed of 9 r. p. m. A temp. of 1080° is obtained by the use of fuel oil. The H_2O content is reduced from 65 to 30%. A second drier removes all but 10% of the H_2O from the garbage. Grease is then extd. by percolation with naphtha, the naphtha being recovered by means of steam distn. and subsequent condensation. The grease is obtained by evapn. The residual degreased garbage contg. 25% H_2O is passed through rotary screens and dried on mill driers to a H_2O content of 10%, in which condition it is suitable for fertilizer. Approx. 6 million lbs. of garbage grease are manufd. per year. The net cost of disposal is from \$3 to \$6 per ton of raw garbage. The new incinerator plant on Goose Island has a capacity of 600 tons per 24 hr. Rubbish is used as fuel to assist in burning the relatively moist garbage. Forced draughts, specially designed grates, well-lined chimneys and air preheaters are necessary for efficient service in an incinerator. The water-jacketed type of incinerator is unsatisfactory and inefficient. Incineration of garbage is an inoffensive, economical and convenient method of disposal. C. R. F.

Comparison of Paris green and paraffin oil as larvicides. H. DE ROCK AND N. H. SWELLEN-RABEEL. *Bull. soc. path. expt.; Rev. hyg. méd. prév.* 51, 73.—Although costing 5 times as much, oil is preferred to Paris green in N. Holland, where the expts. were conducted. Paris green was found useful only in treating the larger canals. C. R. FELLERS

Hatching of eggs and stimulus thereto in the yellow-fever *Stegomyia*. E. ROUBAUD. *Trop. Dis. Bull.* 25, 810(1928); *Pub. Health Eng. Abs.* E-711C, 2.—Dormant eggs of

Aedes mosquitoes were made to hatch under the influence of weak NaOH solns. In the case of yellow-fever epidemics it is recommended to treat the breeding areas first with NaOH to hatch the eggs, followed by 0.1% NaOCl for larval destruction.
C. R. FELLERS

Annual report of the agricultural chemist [of Punjab] (LANDER) 15. The mineral content of waters of S. Carolina (MITCHELL, *et al.*) 12. Sewage as a fertilizer (JAREO) 15. How good water is secured for a blast-furnace plant (ISS) 9. Uncombined iodo-tannic reagent. Iodotannic value of waters (CARPENTIER, FERCOCQ) 7. Two new methods for the determination of phenol in waste liquors (DEUE) 7. Apparatus for disinfecting and deodorizing by emanations (Fr. pat. 645,754) 1.

THOMSON, A. L.: *Modern Public Cleansing Practice*. London: The Sanitary Publishing Co. 259 pp. 10s. 6d. Reviewed in *J. State Med.* 37, 124(1929).

PRÜSS, MAX: *Fortschritte in der Ausfäulung von Abwasserschläm*. Munich: R. OLDENBOURG. 35 pp. M. 6. Reviewed in *Eng. News-Record* 102, 111(1929).

Apparatus for softening water with zeolitic material. LYNN G. LINDSAY (to Trupar Mfg. Co.). U. S. 1,704,982, March 12.

Apparatus for softening water by use of zeolitic material. EDWIN A. ROBERTSON (to Permutit Co.). U. S. 1,704,925, March 12.

Apparatus for softening water with base-exchange materials. CHESTER T. MCGILL (to Elgin Softener Corp.). U. S. 1,703,451, Feb. 26. A salt pot is connected with the water, softening tank; raw water is filtered in the salt pot before passing into the tank and softened water passing from the tank is also filtered in the salt pot. Various structural details are described.

Apparatus for softening water with base-exchange materials. CHESTER T. MCGILL (to Elgin Softener Corp.). U. S. 1,704,051, March 5.

Apparatus (suitable for domestic use) for softening water with base-exchange material. M. J. H. BRUCE and ELECTROLUX, LTD. Brit. 294,359, June 28, 1927.

Domestic water vessels containing base-exchange material for softening water placed in them. ÉTABLISSEMENTS PHILLIPS ET PAIN. Brit. 295,004, Aug. 5, 1927. Jugs, pails, decanters, watering cans and the like contain bodies of base-exchange substances through which the water passes as the vessel is filled.

Treating alkaline waters. ELEKTRO-OSMOSE A.-G. (Graf Schwerin Ges.). Ger. 470,739, Feb. 25, 1926. Alk. waters are freed from alkali by an electroosmotic process in which the water to be treated flows through the anode space of a 2-part diaphragm cell, the cathode space of which is filled with crude or distd. water. The application of the method to *brewery waters* is mentioned.

Superposed tray system for purifying feed water for boilers. KORNEL PECZ and KARL REJTO (to Nathan Mfg. Co.). U. S. 1,705,095, March 12.

Preventing incrustation in boilers. BORIS KITCHIN (to Filtrators Co.). U. S. 1,704,390, March 5. A device is described in which vegetable material such as flaxseed is placed, to which steam is supplied, and from which condensate is led to the boiler water.

Preventing incrustation in boilers. H. BARDT. Brit. 294,656, July 29, 1927. Scale deposition in steam boilers is prevented by use of a mixt. of activated C and a metal powder such as Cu which is electroneg. to Fe.

Preventing incrustation in boilers. W. LAZARUS. Brit. 294,224, July 21, 1927. The process described in Brit. 283,517 (C. A. 22, 4193) is modified by the use of alk. earths such as BaCO₃ or Ba(OH)₂ instead of alkali or alkali metal carbonate for treating the hardness remaining after boiling.

Treating polluted waste water. JOHN T. TRAVERS (to Travers-Lewis Process Corp.). U. S. 1,703,373, Feb. 26. Tannery or strawboard waste or similar polluted liquid of alk. reaction, which contains org. matter, is treated with about 1% of a soln. comprising H₂SO₄ 1 and water 100 parts admixed with clay 9 parts, which serves to render it suitable for discharge into natural streams.

Rotary apparatus for distributing sewage or other liquids on filter beds. J. T. ARGENT and ADAMS-HYDRAULICS, LTD. Brit. 294,461, May 17, 1928.

Portable apparatus for disinfecting air, etc. F. C. ANDREW. Brit. 295,070, May 12, 1927. An app. is described in which fans may cause air to pass in contact with absorbent blocks or the like carrying germicidal substances.

15—SOILS, FERTILIZERS AND AGRICULTURAL POISONS

J. J. SKINNER

Annual report of the agricultural chemist. P. F. LANDER. *Rept. Operations Dept. Agr. Punjab, Year Ending June 30, 1926*, 1, pt. 2, 47–66(1928).—The simple flooding of soils to remove toxic salts had no beneficial effect on certain Punjab soils which contained excessive quantities of Na_2CO_3 , NaHCO_3 , NaCl and Na_2SO_4 . On the contrary, heavy irrigation with canal water added, in some cases, as much as 3.5 tons of salts to the acre of soil irrigated. Treatment of soils with gypsum tended to diminish the concn. of O_2 in the soil gases. This may prove of importance in combating the cotton root rot disease as it has been found that the % of O_2 in the soil gases increases at the beginning of the root rot season and then diminishes as the season progresses. Tables are given showing the no. of *N-fixing organisms* and total no. of bacteria in raw canal water, and the amts. of N fixed by these organisms in synthetic media. Examin. of the Lyallpur city drinking water showed a high bacterial content resulting from too great a rate of flow of water through the filter beds. Higher counts of bacteria in water were obtained by plating on ordinary nutrient agar than on synthetic media. Preservation of lemon juice; Growth of organisms in lemon juice was prevented by steam sterilization at 70° for 10 mins. but the natural aroma and taste of the juice were seriously affected by the treatment. Preliminary expts. indicated that a satisfactory product could be obtained by adding the freshly extd. juice to a thick sirup contg. citric and boric acids. The thick cloudy ppt. forming on storage may be removed and the liquid can be safely used as a beverage.

K. D. JACOB

The soils of Prince Edward Island: Their nature and composition. FRANK T. SMITH. Canada Dept. Agr., *Bull.* 100, 20 pp.(1928).—Mech. and chem. analyses are tabulated for 25 cultivated surface soils and their corresponding subsoils from 17 localities in Prince Edward Island. The results indicate that in general the soils of Prince Edward Island are somewhat below the av. for good Canadian soils in their content of N, P_2O_5 , K_2O and CaO . The surface soils were higher in N and CaO , and lower in P_2O_5 , MgO and K_2O , than the corresponding subsoils. In all cases the content of MgO greatly exceeded that of CaO in both the surface soils and subsoils.

K. D. JACOB

Reaction studies on Delaware soils. C. R. RUNK. Del. Agr. Expt. Sta., *Bull.* 155, 1–17(1928); cf. *C. A.* 22, 3479.—The lime requirement of 264 Delaware soils was detd. by the Comber, Truog and Na tests and in each case compared with the p_{H} value. Approx. 90% of the soils had a p_{H} value between 5.5 and 6.5. There was very poor correlation among the lime requirement results. The buffer capacity of 23 soil types was detd. on moist samples. The titration curves show great differences in the capacities to resist changes in reaction. It is therefore desirable to det. the buffer capacity of a soil before adding lime to it. Some soils resist changes in H-ion concn. while others have a very low buffer capacity.

C. R. F.

Mechanical analysis [of soils]: national and international. B. A. KEEN. Rothamsted Expt. Sta., England. *Proc. Int. Soc. Soil Sci.* (Supp.) 1, 43–9(1928).—The British Official Method now differs from the Intern. Method only in that the former retains the detn. of air-dry moisture content and the expression of results on the air-dry basis. The results reported by the British Method are therefore: (1) moisture in air-dry soil; (2) carbonates, (3) loss by soln. in HCl and H_2O_2 treatment; (4) coarse sand, passing 2 mm. sieve and retained by 0.2 mm. sieve; (5) fine sand, by sedimentation, critical velocity greater than 10 cm. in 4 min. 48 sec.; (6) silt, by pipet sampling, critical velocity, 10 cm. in 4 min. 48 sec.; (7) clay, by pipet sampling, critical velocity, 10 cm. in 8 hrs.; (8) difference—org. matter removed by H_2O_2 and errors of expt. Total 100.

I. A. DENISON

Soil adsorption. D. J. HISSINK, J. VAN DER SPEK, A. DEKKER, M. DEKKER AND H. OOSTERVELD. *Proc. Int. Soc. Soil Sci.* (Supp.) 1, 4–42(1928).—Comparison is made of various methods for measuring soil adsorption. These methods may be divided into 2 classes: (1) Methods for detg. the amt. of exchangeable bases, that is, the so-called value S. To this class belong the methods of Kelley, Hissink, Kelley (NH_4 absorbed) and Bobko-Askinasi; (2) methods for detg. the amt. of CaO or BaO absorbed by the soil under certain conditions, either from a soln. of a neutral salt (Gedroiz BaCl_2) or from a soln. of a salt of a weak acid (Hutchinson, CaHCO_3 ; Kappen Ca acetate), or from a soln. of $\text{Ca}(\text{OH})_2$ (Gehring; titration curves) or $\text{Ba}(\text{OH})_2$ (Hissink). With the aid of the S-value and the amt. of CaO or BaO adsorbed, the degree of satn. of the original soil according to each method can be calcd. Also from the potential adsorption a degree of satn. can be calcd. The data given show wide variation in the values for

degree of satn. calcd. according to the different methods. The relation between the various methods and detns. of p_H and lime requirement of soils are discussed.

I. A. DENISON

The correlation between the soil salinity and flowering date in cotton. J. ARTHUR HARRIS. Univ. of Minn. *J. Agr. Research* 38, 109-12(1929); cf. *C. A.* 23, 1460. — Soil salinity was measured in terms of elec. resistance. In every case a low neg. correlation was obtained between soil resistance and the no. of days between planting and flowering of 3 varieties of cotton. This indicates a delay in flowering due to increased percentages of sol. salt in the soil soln.

A. L. MEHRING

Methods for determining the hydrogen-ion concentration of soils. E. F. SNYDER. Bur. of Chem. and Soils, Wash. D. C. U. S. Dept. Agr., *Circular* 56, 1-29(1928); cf. *C. A.* 22, 835. — Electrometric and colorimetric methods for the detn. of the p_H of soils are described in detail. The H, quinhydrone and Sb electrodes and Gillespie's drop-ratio method are given particular attention. Factors affecting the H-ion concn of soils are discussed and helpful suggestions for its detn. are given. Sixty-eight references are appended.

A. L. MEHRING

The determination and application of the electric resistance and p_H value in irrigation soil surveys. ARTHUR STEAD. Division of Chem., Pretoria. *S. African J. Sci.* 25, 149-55(1929). — The methods used in the field operation are described. They are substantially the same as those recommended by the U. S. Bur. of Soils. Emphasis is brought on the false impression conveyed by surface indications.

A. L. H

Base exchange in orthoclase. J. F. BREAZEALE AND O. C. MAGISTAD. Ariz. Agr. Expt. Sta., *Tech. Bull.* 24, 609-29(1928). — The attempt was made to det. the nature of certain colloidal complexes in orthoclase from which K may be dissolved, and to correlate the reactions of these complexes with those of the hydrated Al silicates (zeolites) of the soil. The soly. in H_2O of the K in orthoclase varies with the origin of the sample, fineness of subdivision, and the ratio of solid to liquid. Investigators have found the soly. to vary from 0 to about 300 p. p. m. of K. A small % of K in orthoclase hydrolyzes in H_2O , forming KOH, most of which, in turn, reacts with Al_2O_3 to form $AlKO_2$. All samples of orthoclase examd. showed properties of base exchange. Treatment with alk. salt solns. increased, while acid solns. decreased, the base-exchange capacity of finely ground orthoclase. The base-exchange properties of orthoclase may be destroyed by ignition. Digestion of ignited orthoclase with alk. solns. sometimes cause a build-up of the base-exchange capacity beyond that of the non-ignited. When solid orthoclase occurs in the soil in the presence of Ca, Mg or Na zeolites, an equil. will exist between the K in soln. and the zeolites. The plant very probably feeds largely upon hydrolyzed, zeolitic K. The zeolites of Ca, Mg, and Na may act as stabilizers in that they fix much of the sol. K during periods of little plant growth, and slowly liberate this K as rapidly as it is absorbed by plants. A theoretical discussion of base exchange and a bibliography are appended.

C. R. F.

Soil zeolites and plant growth. J. F. BREAZEALE. Ariz. Agr. Expt. Sta., *Tech. Bull.* 21, 499-520(1928). — K zeolite supplies most of the K that is readily available to plants and exists in the soil as hydrated, K Al silicate. This zeolite hydrolyzes and ionizes; the K ion is split off and it is upon this ion that the plant largely depends for its supply of K. The concn. of K in soil solns. is always very low and cannot exceed the sum of the solubilities of the K in the zeolite and in the orthoclase. This explains why a heavy application of a K salt as a fertilizer does not increase proportionately the concn. of the soil ext., although it may affect decidedly the crop yield. It also explains why K is not readily leached away by irrigation and rain waters. The K that occurs in soil zeolites is readily available to plants. The presence of other salts with replaceable bases, particularly nitrates, stimulates the absorption of K from solns. contg. K zeolites. When the K is absorbed from a zeolite by plants, a residue is left that is not acid and has no replacement capacity. This residue may be the broken-down components of the zeolite, Al_2O_3 and SiO_2 , existing either in a colloidal state or held together in some way. The broken-down residue of the zeolite may be built up into a zeolite at a suitable p_H by the addn. of a salt soln. that carries a replaceable base. Ignited and acid-treated soils that have lost their property of base replacement are partially restored by treatment with salt solns. that have a neutral or alk. reaction.

C. R. F.

The hydrolysis of sodium and potassium zeolites with particular reference to potassium in the soil solution. O. C. MAGISTAD. Ariz. Agr. Expt. Sta., *Tech. Bull.* 22, 521-47(1928). — With artificially prepd. Na and K zeolites, the amt. of hydrolysis at any diln. is a function of the no. of H ions present in the total vol. of H_2O at the start

and can be mathematically expressed. Na zeolite on hydrolysis gave NaOH which in turn reacted with Al_2O_3 to produce NaAlO_2 . The amt. of Al_2O_3 present in soln. as NaAlO_2 is a logarithmic function of the p_{H} value of the soln. In a similar way, K zeolite hydrolyzes to form KOH which in turn reacts to form KAlO_2 . K zeolite at equal dilns. hydrolyzes less than does Na zeolite. Ca zeolite depresses the hydrolysis of K zeolite. In solns. charged with CO_2 this depression appears to be less. Na zeolite and K zeolite in mixts. mutually depress the hydrolysis of the other. This may be caused by the common OH ion produced and the competition of both bases for a common aluminate ion. By means of the equation " K " in p. p. m. = $501.2 Y^{0.537}$, where Y = cc. of H_2O per milli-equiv. of exchangeable base, the concn. of K in p. p. m. at 1 diln. of soil to H_2O , the concn. at all other dilns. can be calcd. The agreement between values so calcd. and values obtained by different investigators at various dilns. is exceptionally good. If the amt. of replaceable K per 100 g. of soil is known, the amt. of K in the soil soln. at all dilns. can be calcd. The agreement with experimentally detd. values is good. The importance of the amt. of replaceable K and its rate of hydrolysis to plant feeding are discussed. If 2 p. p. m. of K, constantly maintained, are necessary to grow a crop, some replaceable K is necessary because minerals very probably cannot furnish K to the soil soln. at a rate sufficient to maintain this concn. for a continued period. A bibliography of 28 references is appended. C. R. F.

Relation of water-soluble potash, the replaceable, and acid-soluble potash to the potash removed by crops in pot experiments. G. S. FRAPS. Texas Agr. Expt. Sta., *Bull.* 391, 18 pp. (1929).—The water-sol K in the soil, the K in 12% HCl, and the replaceable K in the soil are all related to the K removed by crops in pot expts. and to the active K of the soils. The water-sol K lost from the soil by cropping and the replaceable K lost by cropping are related to the amt. of K taken up by the crop grown on the soils and to the active K lost by cropping. The amt. of K taken up by 2 crops usually averages 5 to 6 times the water-sol. K in the soil and about $\frac{1}{2}$ the replaceable K in the soil. The amt. of K removed by the crops from the soil is usually 8 to 16 times the water-sol. K lost in cropping and about twice the replaceable K lost in cropping. The loss of replaceable K in cropping is greater than the loss of active K by cropping. The difference in the amts. of K removed by a first and second extn. of soils with 0.2 N HNO_3 becomes greater as the K taken up by the crops in the pot expts. increase. When a soil neutralizes 85% or less of the acid used, the interpretations of the results are more closely in accordance with the results of the pot expts. when the correction is not made for the neutralization of the acid, than when it is made. When the soils neutralize more than 85% of the acid, the interpretation of the results varies a little less from the actual results when correction is made for acid consumed than when it is not, but in both cases the deviation is more than that for less basic soils. It appears better not to correct for neutralization but to take the highly calcareous nature of the soil into consideration in making the interpretation of the results. J. J. SKINNER

Growth studies with potash salts on acid soils. H. KAPPEN. *Ernähr. Pflanze* 25, 6-10, 25-31 (1929).—Expts. with potash salts on various limed and acid soils indicate that these salts are not physiologically acid in soil cultures. Potash salts will cause a change in p_{H} whether or not a crop is grown. This change is due to activation of the exchange acidity in acid soils and to an increase in OH-ion adsorption in neutral and alk. soils. LAWRENCE P. MILLER

The principal agrogeological properties of Java cane soils and the identification by a standard formula. G. BOBERG. *Arch. Sukkerind.* 36, II, 1023-33 (1928).—A system is described, worked out by the Expt. Sta. for detg. phys. properties of the soil and the results are given in a formula. Thousands of soil samples from the whole island were examined by the Atterberg test and classified. Ten types from coarse sand to very heavy clay cover all degrees of texture. Atterberg's test will show important differences in soils of the same genetic type, and results from soils of different parts of Java may be compared reliably. The color of the soil was detd. also and is given in 20 different shades. The other phys. properties of the soil are given as usual. It is pointed out that the new formula does not change the description of the soil properties used so far but is an addn. in order to have a genetic-geological classification. P. R. P.

Are ultravisible organisms active in arable soil? CHR. BARTHEL AND N. BENGTSSON. *Medd. Centralanstalt försöksväsendet jordbruks.* No. 341, *Bakteriol. avdel.* No. 47, 14 pp (1928). (Swedish with English summary).—The object of the expts. was to prove the occurrence of ultravisible organisms in soil. Sterilized soil contg. $(\text{NH}_4)_2\text{SO}_4$, urea or cellulose was inoculated with soil ext. filtered through a Pukall filter. No nitrification, urea fermentation or cellulose decompn. took place. If ultravisible organisms do exist they must be parasites on bacteria and not free living (saprophytes). Ultra-

visible organisms very probably do not take part in biochem. metabolism occurring in soil.

Rapid determination of the phosphoric ion in soils and fertilizers by the cerulean molybdate colorimetric methods. GEORGES DENIGES. *Ann. fals.* 22, 27-8(1929).—See C. A. 22, 2426.

The role of the rarer elements in soils, foods and drugs. OSWALD SCHREINER. Bureau of Chemistry and Soils, Washington, D. C. *J. Assoc. Official Agr. Chem.* 12, 16-30(1929).—An address.

Experiments with fertilizers on rotated and non-rotated crops. E. F. REYNOLDS. Tex. Agr. Expt. Sta., *Bull.* 390, 1-39(1928).—Expts. were conducted over a period of 14 yrs. to study the effect of fertilizers, manure, removal of crop residues, and rotation on the yield of crops. The fertilizer treatments included superphosphate; superphosphate and manure; superphosphate and cottonseed meal; manure; rock phosphate, and rock phosphate and manure. Cotton and corn were grown continuously on the same land and in rotation with oats and cowpeas. The soil responded more readily to nitrogenous than to phosphate fertilizers, indicating a deficiency of N. The increases in yield, however, resulting from the fertilizer treatments were not in general very profitable. Manure was the most profitable treatment on cotton, giving an av. yearly profit of \$6.36 per acre. None of the fertilizer treatments applied to corn was very profitable, rock phosphate gave the largest profit, which was only 88¢ per acre a yr. Superphosphate and rock phosphate were equally effective in increasing yields, but the rock phosphate was the more profitable because it was less expensive than superphosphate. The removal of crop residues over a period of 14 yrs. produced a slight but not significant, decline in the productiveness of the soil. Rotation produced significant increases in the yield of cotton and corn. The yield of cotton was increased 14% and the yield of corn 47.5% in comparison with the yield of continuous cotton and corn, resp. Rotation produced larger increases in yield than fertilizer, but the largest yields were obtained where rotation and fertilizer were used together. In fact, the increase in yield resulting from the combined use of rotation and fertilizer was greater than the sum of the increases produced by rotation and fertilizer when used separately.

Further experiments on the nitrification of manures and fertilizers and of tea prunings. A. W. R. JOACHIM AND D. G. PANDITSEKERE. Ceylon. Dept. Agr. Peradeniya. *Trop. Agr. (Ceylon)* 71, 131-40(1928).—The nitrate content of the soil in both pot and field expts. was detd. fortnightly for 5 months after adding urea, guano, castor pomace, animal tankage, fish scrap and ammo-phos. In all cases 2 periods of nitrification were observed. The maxima occurred in about the 7th and 13th weeks. Nitrification percentages ranged from 85 to 114. The high values may have been due to mineralization of some of the soil humus or to a partial failure of the modified phenol-disulfonic acid method for nitrates. Drying of tea prunings prevents decompn. and nitrification. Green tea prunings turned under gave a max. nitrification of only 10%. Pots to which tea prunings were added lost more N than the control pots, the loss in total N amounting to from 12.5 to 16.4% of that originally present.

Losses of nitrogen from green manures and tea prunings through drying under field conditions. A. W. R. JOACHIM. Ceylon Dept. Agr. *Tropical Agr. (Ceylon)* 71, 348-51(1928).—*Gliricidia* leaves lost 2.5 and 10.1% of the org. matter and 1.12 and 43.7% of the N originally present when dried and decompd., resp., on the surface of the field. The loss of N from partly decompd. *dadap*, *tea* and *grevillea* leaves was 37.6, 34.5 and 12.1% of that originally present. It is therefore recommended that such material be turned under while green.

Synthetic organic manure. F. HARDY. Imperial Coll. Trop. Agr. St. Augustine *Trop. Agr. (Trinidad)* 5, 172-3(1928).—A review. Eleven references are given.

Adco manure. Its composition in Trinidad. F. HARDY AND G. RODRIGUEZ. Imperial Coll. Trop. Agr. St. Augustine. *Trop. Agr. (Trinidad)* 5, 144-6(1928).—Analyses are given of sugar cane trash, megass and bamboo grass both before and after decompn. in cattle pens and after being composted with "adco." Some of the synthetic compost compared favorably with the natural manure. However, megass did not decompose very well with adco and probably needs special treatment to humify it.

The comparative effect of different nitrogen fertilizers on bearing apple trees low in vigor. A. L. SCHRADER AND E. C. AUCHTER. Univ. of Maryland. *Proc. Am. Soc. Hort. Sci.* 1927, 229-34.—In comparing the effect of NaNO_3 and $(\text{NH}_4)_2\text{SO}_4$ on apple trees it was found NaNO_3 caused a greater terminal spur and trunk circumference growth. There was a greater amt. of total and sol. N in spurs of trees that received NaNO_3 .

Starch content of the spur in June was higher when $(\text{NH}_4)_2\text{SO}_4$ was used. The yield was in favor of NaNO_3 . J. J. SKINNER

Preparation and properties of the ammonium phosphates. WM. H. ROSS, ALBERT R. MERZ AND K. D. JACOB. Bur. of Chemistry and Soils, Washington, D. C. *Ind. Eng. Chem.* **21**, 286-9(1929).—The prepn. and properties of the meta-, pyro-, and ortho-phosphates of NH_4 are discussed with particular reference to methods proposed and in use for the manuf. of the NH_4 orthophosphates. The soly. of $\text{NH}_4\text{H}_2\text{PO}_4$ increases from 19.9 g. per 100 g. of H_2O at 0° to 177.2 g. at 100° . 0.1 M solns. of $\text{NH}_4\text{H}_2\text{PO}_4$, $(\text{NH}_4)_2\text{HPO}_4$, and $(\text{NH}_4)_3\text{PO}_4$ are, resp., alk. to Mc orange but acid to Me red; neutral to cresol red; and neutral to thymol blue in alk. range, the p_H values being 4.4, 8.0, and 9.4. Possible difficulties in the continuous production of $\text{NH}_4\text{H}_2\text{PO}_4$ by saturator methods are pointed out. K. D. JACOB

Sewage as a fertilizer. J. W. JAREO. *The Am. City* **39**, No. 2, 111-2(1928); *U. S. Pub. Health Repts.* **44**, 14-5.—After 6 months, digestion in the settling tanks, the sludge from the Madison, Wis. Sewerage Works, is dried from 1 to 3 weeks and sold at 50¢ a cu. yd. for fertilizer. It is odorless and based on P, K and N analyses is valued at 86.25 per ton. Approx. 50% of org. matter is present, making the sludge a valuable soil amendment. Av. analyses show the dry sludge to contain 2-3% P, 0.1-0.5% K and 2.5-3.5% N. Fertilizer tests show that for corn, potatoes, tobacco and celery, marked yield increases were obtained. C. R. F.

Chlorosis of crops on land treated with sewage; its cause and remedy. P. MAZE AND P. EVENS. *Compt. rend.* **188**, 191-3(1929).—Garden crops grown on land treated with sewage develop a chlorosis in areas of low elevation. This is not due to a specific parasite. The sewage is rich in CaCO_3 which coats the soil particles, depriving the plant roots of Fe salts. The only plants that can thrive on this soil are those whose roots have an acid excretion to dissolve the CaCO_3 . Addn. of Fe compds. to the soil or to the leaves is sufficient treatment. A. LEVESCONTE

Potash fertilization as a protection against yellow rusts. F. VON MEER. *Landw. Hochsch. Bonn-Poppelsdorf. Ernähr. Pflanze* **25**, 73-7(1929).—The chloride is much more effective than the sulfate. LAWRENCE P. MILLER

Determination of the toxic substance in insecticides. IV. Volumetric determination of mercury in seed preservatives. J. BODNAR, L. E. ROTH AND I. TERGINA. *Z. anal. Chem.* **74**, 81-105(1928).—To 0.2 g. of material in a 200 cc. Erlenmeyer flask, add 5 cc. of concd. H_2SO_4 and 1-2 cc. of perhydrol. Heat under a reflux condenser until all of the org. matter is destroyed. There will be no loss of Hg with a 40 cm. condenser unless chloride is present. To the strongly acid soln. add NaOH until alk. and 15 cc. of 10% formaldehyde soln. After an hr. at room temp., filter off the pptd. Hg, dissolve it in 10 cc. of HNO_3 and add enough 5% KMnO_4 to give a distinct color to the soln. After the KMnO_4 has been fully decolorized and all of the Hg is dissolved add ferric alum soln. and titrate with 0.04 N NH_4CNS . W. T. H.

Fumigation. II. HAROLD E. BOX. *Rev. ind. agr. Tucumán*, No. 3-4, 110-4 (1928). CS_2 is one of the cheapest and most effective substances that can be used to fumigate cereals, legumes, etc. Because of its low b. p., it does not require heat for its volatilization. The vapors are heavier than air and are of great penetrability; they are very poisonous to all forms of insect life, thus destroying the plague, whether as egg, larva, pupa or adult both within the seed or grain or outside it. In using it, light should be guarded against, but otherwise it is no more dangerous to use than gasoline. Dose: 1 kg./10 cu. m. for 48 hrs. at 21° or for 15 cu. m. at $30-35^\circ$. Below 21° , CS_2 is not advisable. For small packages 50 gr./cu. m. is preferable. S. L. B. E.

Formaldehyde dust for the control of oat smut. J. D. SAYRE. Ohio Expt. Sta., *Bimonthly Bull.* **14**, 9-11(1929); cf. *C. A.* **22**, 1011.—Field and exptl. plot tests showed perfect control of oat smut by the use of 4-6% CH_2O . The treated oats showed approx. 0.1% smut as against 13.1% in the untreated controls. The dust is thoroughly mixed with the seed and allowed to stand 12 hrs. before sowing. C. R. F.

The problem of the arsenical spray residue. HOWARD W. AMBRUSTER. *J. Franklin Inst.* **206**, 597-604(1928).—The problem of As spray residues on fruits and vegetables intended for human consumption is complicated by the following conditions: need for research on the human tolerance for As and Pb as most of the As is applied to fruits and vegetables in the form of Pb arsenate; need for a legal tolerance as the so-called British tolerance and the U. S. official standard of tolerance are not officially recognized in either country. The entomologist is vitally interested because As substitutes will be threatened by the same ban that affects As compds. The insecticide manufacturer is interested because he fears to extend existing industries or develop new

ones on account of the unknown factor of spray tolerance. Shippers of fruit and vegetables fear official seizure and public reaction against their products. C. H. RICHARDSON

Sulfuric acid spray: A practical means for the control of weeds. J. G. BROWN AND R. B. STREETS. *Ariz. Agr. Expt. Sta., Bull.* 128, 299-316(1928).— H_2SO_4 from smelters is commercially available in Ariz. at low cost. Expts. on the use of H_2SO_4 as a weed spray showed that a 2% soln. will destroy puncture weed, careless weed, field mustard, ground cherry and prostrate pig weed; 3.5% will destroy lamb's quarters, knot weed, yellow sour clover and croton; 5% destroys sow thistle, dodder, horse nettle and rayless golden rod; 8% kills bindweed, stink grass, bermuda grass, green foxtail, and barnyard grass, while 10-15% kills Johnson grass and nut grass. Any type of sprayer is satisfactory though a pressure of 150 lbs. per sq. in. is desirable. If metal spray equipment is coated with cylinder oil or cup grease, little or no corrosion occurs. C. R. F.

"Rose lizard" (*Pectinophora gossypiella*, Saunders) of the cotton plant. HAROLD E. BOX. *Rev. ind. agr. Tucumán* 19, 106-10(1928).—B. gives photographs of various stages of this plague together with large drawings of the insect. After discussing the existence and growth and difficulty of control, B. recommends fumigation of the cotton with CS_2 . S. L. B. ETHERTON

P deficiency in forage feeds of range cattle (SCOTT) 12. Collection and disposal of refuse in Chicago (GAYTON) 14. Hexylresorcinol and phenylethylresorcinol as reagents against plant pathogenic fungi (HOUBEN, WOLLENWEBER) 11D. Citric acid solubility and hardness of Thomas slags (WEISS) 9. The carbonyl number of some humic acids (LEOPOLD) 10. Apparatus for drying fish flour, etc. (Brit. pat. 294,914) 12.

EMERSON, FREDERICK V.: **Agricultural Geology.** New York: John Wiley & Sons, Inc. 377 pp. 16s. Reviewed in *Bull. Imp. Inst.* 26, 536(1928).

Fertilizer. FRITZ ROTHE and HANS BRENEK (to Rhenania Verein Chemiker A.-G.). U. S. 1,704,218, March 5. A mixt. is formed contg. mineral phosphates and contg. also for every mol. proportion of P_2O_5 about one mol. proportion of alkali metal oxide in the form of a salt such as K_2SO_4 and at least one mol. proportion of silica, together with sufficient lime to provide for the production of Ca orthosilicate in addition to alkali Ca phosphate; this mixt. is heated to at least 900° in the presence of steam. Cf. C. A. 23, 1208.

Fertilizer. GEORGE P. WALTON and ROBERT F. GARDINER (to the Government and people of the United States). U. S. 1,703,504, Feb. 26. Perishable org. material such as slaughter house offal is intimately mixed with a quantity of an acid salt such as $Ca(HPO_4)_2$ sufficient to develop in the mixt. a degree of acidity which will preserve it, and the mixt. is stored under conditions permitting natural or spontaneous air drying. Gypsum, peat, etc., may be added.

Fertilizer. ELEKTRICITÄTSWERK LONZA. Brit. 294,117, July 14, 1927. A mixt. of Ca nitrate and phosphate which does not readily become damp is prepd. by reacting upon crude phosphate with HNO_3 of such concn. (suitably about 60%) that the product contains less water than the normal content of water of crystn. A small proportion of urea may be added which serves to prevent subsequent formation of N oxides.

Fertilizer. I. G. FARBENIND. A.-G. Brit. 294,654, July 29, 1927. In prep. a mixed fertilizer, NH_4NO_3 is caused to react in aq. soln. with a mixt. of NaCl and KCl and the mixt. of salts obtained is sepd. from the liquor. NH_4Cl may be added. Cf. C. A. 23, 1208, 1462.

Fertilizers. GUILLAUME BARODY and RENÉ GILLES. Fr. 645,166, Dec. 5, 1927. An oxidizing and antiseptic agent such as $KMnO_4$ is added to $(NH_4)_2SO_4$, NH_4Cl , $CaCN_2$ and other fertilizers.

Fertilizers. CORRADO LUMIA. Fr. 644,694, Nov. 29, 1927. Fertilizers sol. in water are prepd. by treating powdered phosphorites or natural phosphates and degelatinized bones with H_2SO_4 , then with a mixt. in equimol. quantities of $(NH_4)_2SO_4$ and H_2SO_4 , the treatment being completed by decanting, filtering and crystn. The product may be treated with NH_3 before drying.

Fertilizers. GEORGES TRUFFAUT. Fr. 645,533, Dec. 10, 1927. Malt dust or yeast contg. vitamin B_2 and org. Fe, and anaerobic bacteria are added to fertilizers.

Fertilizers. SOC. D'ÉTUDES CHIM. POUR L'INDUSTRIE. Swiss 128,015, Dec. 24, 1926. The product obtained by treating insol. $Ca_3(PO_4)_2$ with HCl is treated with K_2SO_4 so as to remove $CaCl_2$ by double decompn. Instead of HCl, the soln. resulting from the decompn. of $CNNH_2$ with HCl may be used.

Stimulating germination of seeds. METHODI POPOFF (to Bayerische Stickstoff Werke A.-G.). U. S. 1,703,362, Feb. 26. Separate portions of a batch of seeds such as rye, wheat, oats or barley are treated with different stimulating materials such as $MgCl_2$ and $MgSO_4$ and KBr or $MnSO_4$, and the different portions are mixed before planting them.

Insecticides. E. VON AMMON and K. SZOMBATHY. Brit. 294,646, July 29, 1927. Lupanin is used instead of nicotine in plant washes, or together with nicotine, and such insecticides may be rendered effective against caterpillars by admixture with AmOH, EtOH or MeOH; alkalis and soap may also be included in mixts. which are described. Brit. 294,647 also specifies insecticides contg. lupanin or nicotine together with a wax solvent such as resinic acid or its salts, for destroying insects such as *Schizoneura lanigera* which are protected by a waxy coating.

Fungicide. I. G. FARBENIND. A.-G. Fr. 645,643. A fungicide and bactericide for seeds consists of compds. of PhOH and Hg mixed with an inert colloidal substance and an alk. substance. An example contains mercuric chlorophenolsulfate 6, mercuric nitrophenolsulfate 2, Na_2CO_3 1.5, colloidal clay 90.5%. Cf. C. A. 23, 928.

Borer's gum. LUTHER E. SMITH. U. S. 1,705,100, March 12. A plastic mixt. suitable for coating fruit trees to prevent damage by borers and which is impervious to air and to moisture comprises a resinous material such as rosin 12, beeswax 1.5, soap 1.5 lbs. and pine tar 1 qt.

16—THE FERMENTATION INDUSTRIES

C. N. FREY

Determination of alcohol by distillation. K. AMBERGER. Z. *Untersuch. Lebensm.* 55, 447-53(1928).—In order to avoid loss of EtOH in distn., the still wine to be analyzed should be dild. so that the distillate contains less than 30% EtOH. App. and precautions are detailed. C. R. F.

Refractometric rapid analysis of alcoholic spirits and distilled liquors. R. SAAR. Nahr.-Untersuchungsamt, Halle a. d. S. Z. *Untersuch. Lebensm.* 56, 144-58(1928).—By means of the sp. gr. and n , the EtOH and ext. content of liquors (25-40% EtOH) are calcd. with nearly as great accuracy as by the distn. method. The refractometric method is inapplicable to sweetened liquors or wines. C. R. F.

Studies on hydrogen-ion concentration and its significance in spirit distillation. II. W. DIEMAIR and K. SICHERT. Hochschule Weihenstephan. *Biochem. Z.* 204, 414-59(1929), cf. C. A. 22, 4710.—A knowledge of H-ion concn. and buffering is very essential in the fermentation of corn in connection with the work of spirit distilleries. Corn mash differs from potato mash very considerably in the matter of acidity and N, and these peculiarities appear also during the fermentation process, the potato mash possessing a lower p_H max. (4.7). S. MORGULIS

Open and closed fermentation vessels. F. W. WINDISCH. *Wochschr. Brau.* 45, 517-73(1928).—Fermentation in closed vessels from which the CO_2 was collected improved the quality of the yeast and also that of the beer (cf. C. A. 22, 3483). The CO_2 recovery plant netted a profit of 25% in the brewery in question. A. S.

Closed tank fermentation. WILLY BELGEONNE. *Bull. assoc. elevs. inst. sup. fermentation Gand* 30, 27-35(1929).—A description of the process and discussion of its merits. A. PAPINEAU-COUTURE

Hydrogen sulfide in fermentation carbon dioxide. WANDERSCHNECK. *Wochschr. Brau.* 45, 441-6, 463-8(1928).—The H_2S liberated by yeast during fermentation is detd. by passing through a $Pb(NO_3)_2$ soln., dissolving the ppt. with aqua regia and detg. the Pb colorimetrically as PbS . High alternated yeasts produce more H_2S than yeasts of low alternating power. The S-contg. proteins of barley and malt furnish most of the gas. Gypsum is also a source while SO_2 , sulfured hops and free S give off larger amts. Low-temp. fermentations such as 6-8° diminish the amt. of H_2S evolved. The flavor of the beer is seldom affected because most of the gas is carried out of the beer by the CO_2 . A. SCHULTZ

Formol titration. P. KOLBACH. *Wochschr. Brau.* 45, 446-51(1928).—Lüers' procedure of Sørensen's formol titration method was used. More concordant results were obtained by titrating to an end point of p_H 9.00 as given by an alkaline-borate buffer than to the more variable end point (p_H 9.18) of a M/15 solution of Na_2HPO_4 . A. SCHULTZ

Algerian musts of the 1928 vintage. POUGET and BONNIER. *Ann. fals.* 21,

582-94(1928).—Analyses of 90 samples are tabulated and briefly commented.

A. PAPINEAU-COUTURE

Cold and warm malting. H. LÜERS. *Wochschr. Brau.* 45, 569-74(1928).—A Pilsener type malt grown at 14° was superior to one grown at 23° while in the Munich malt the opposite was the result.

A. SCHULTZ

(Troubles encountered with) new malts (of 1928). P. PETIT. *École de Brasserie de Nancy. Brasserie et malterie* 18, 289-92(1928); 305-8(1929).—The 2 chief troubles encountered in practice have been slow saccharification and dense and compact spent grain which slowed up filtration. These troubles are attributed to the climatic conditions which prevailed during the growing season, which was drier than usual and increased evapn. in the grain. As a result, the substances enveloping the starch granules are more resistant and retard saccharification because a higher temp. is required to burst open the starch granules. The compactness and slow-filtering properties of the spent grain are attributed to the fact that the albuminoid N (hordein) of malt increases in a dry season, while the sol. N remains the same as in normal season, so that the spent grain contains more viscous, glutinous nitrogenous matter, and this is further increased when the acidity of the wort is low.

A. PAPINEAU-COUTURE

Troubles encountered in brewing with raw grain. J. RAUX. *École de brasserie de Nancy. Brasserie et malterie* 18, 308-13, 325-30(1929).—A brief discussion of the troubles which may be encountered in the use of raw grain and of the methods of overcoming them.

A. PAPINEAU-COUTURE

Kilning of malt. R. SCHLENK. *Wochschr. Brau.* 45, 415-8, 426-30, 436-40, 451-6(1928).—A mathematical treatise of kilning conditions with diagrams showing the relations of air at different temps. and moisture on malt temps. and moisture contents.

A. SCHULTZ

Objective determination of color of malt worts. F. DUCHÁČEK. *Wochschr. Brau.* 45, 359-62, 369-73(1928).—Sandera's "universal objective photometer" was used. This measures the intensities of light by means of the current produced at the surface of metallic K in a photoelec. cell. With 100 cc. of wort color differences of 0.015 cc. of 0.1 N I can be distinguished.

A. SCHULTZ

Photometric determination of the color of malt worts. F. MĚSTAN. *Wochschr. Brau.* 45, 373-7(1928); cf. *C. A.* 23, 1322.—An improved form of the Zeiss "step photometer" is described which replaces Ostwalds gray filters by Aubert's adjustable apertures. An accuracy of 4% is claimed on the color of malt worts for color differences corresponding to 0.01 cc. of 0.1 N I.

A. SCHULTZ

Influence of artificial acidification of mash or wort on the composition of the resulting worts and beers. W. WINDISCH, P. KOLBACH AND W. BANHOLZER. *Wochschr. Brau.* 45, 523-8, 535-9, 553-8(1928).—The max. amt. of ext. was obtained with the final p_H of the wort at 5.0-5.2 while the max. for fermentable ext. was from 5.3 to 5.7. The optimum for proteolysis is about p_H 4.8. Acidification of the mash increased the buffer value over the phosphate and protein ranges so that even though the initial p_H values of the worts were lower than that of normal worts the p_H of the final beers was unaffected. Acidification of normal worts did not change the buffer value and the p_H of the beers was lower than normal.

A. SCHULTZ

Comparative determinations of hydrogen-ion concentration of worts and beers by the hydrogen and quinhydrone electrodes. F. STOCKHAUSEN AND E. F. ROTHENBACH. *Wochschr. Brau.* 45, 459-62(1928).—The H electrode of Michaelis and Luers gave results that agreed closely. The results of the quinhydrone electrodes of Luers and Trénel were usually more acid, sometimes as much as 0.15 p_H . The quinhydrone electrodes are accurate enough for routine purposes.

A. SCHULTZ

Darkening of worts during the preparation of pale beers. H. STADLER. *Wochschr. Brau.* 45, 579-82(1928).—The color of the beer depends a great deal on the chem. compn. of the brew water and the quality of the barley and hops. Raising the p_H of the brewing liquor by addn. of gypsum exts. less of the red coloring matter from the hops. During spraying the color and p_H increase as the amt. of solids decreases.

A. S.

Nitrogenous constituents of wort assimilable by yeast. W. WINDISCH, P. KOLBACH AND E. HENNECKE. *Wochschr. Brau.* 45, 389-93, 399-400, 409-15, 421-6, 431-5(1928).—The decrease of amino N during fermentation of a wort accounts for about 60% of the N assimilated by the yeast. Polypeptides and amino acids are assimilated while the more complex proteins and peptones are not.

A. SCHULTZ

Determination of the fusel oil content of brandy by Rose's method. B. LAMPE AND W. KILP. *Z. Spiritusind.* 51, 199-200(1928).—A simple method is described which is based on the fact that alc. contg. fused oil when extd. with $CHCl_3$ causes a greater vol. increase of the $CHCl_3$ than pure alc.

A. SCHULTZ

De-odorization of brandies by activated charcoal. J. CAFFRE. *Viti-Viniculture* (July, 1927) 241; *Ann. fals.* 21, 604(1928).—A non-potable brandy which was not amenable to treatment by other absorbents was treated with 500 g. of activated charcoal per hectoliter, which eliminated the bad taste and reduced the non-als. by 26.5%. A similar treatment applied to a com. brandy caused a decrease of 26% in acidity, 6% in aldehydes, 27% in furfural, 46% in esters, no change in higher alcs. and reduced the alc. by vol. by 0.6%; the brandy lost most of its organoleptic qualities and is similar to a dil. rectified alc.

A. PAPINEAU-COUTURE

Characteristics of Polish fruit wines. WACŁAW IWANOWSKI. Warsaw Polytech. *Chem.* 11, 521-8(1927).—In the production of Polish fruit wines the tendency toward white and strong table wines. It is usually the economic factors which impair the quality, but usually the product is of the highest grade.

A. C. ZACHLIN

Influence of acidity in the preparation and conservation of wines. JULES VENTRE. *Chim. ind.* 38, 2-8(1929).—A titration of the total acidity means nothing because the presence of several acids having different p_H values. Too great an acidity will prevent the proper fermentation; if too low, the wine is without resistance against the development of pathogenic bacteria. In general, a wine with a p_H of 3 will conserve itself well. The addn. of plaster, tartaric acid and SO_2 is justified by the resulting higher p_H . Phosphate salts are harmful for they form salts of lower p_H than the original salts. The NH_4 salt is especially bad because of the formation of N which helps the growth of disease germs. Diseases affect the acidity. Anaerobic bacteria decrease the p_H by decompn. of a strong acid, tartaric, into weak acids, propionic and acetic. SO_2 decreases the acidity because of oxidation and the slow decompn. of malic acid.

P. THOMASSET

Determination of acetic acid in beer: application of the Duclaux method for volatile acids. J. STEENBERGHEM. Univ. de Louvain. *Bull. trimest. élèves è ole sup. brasserie* (November 28, 1928) 161-72(1928).—According to Duclaux, on distg. a dil. (not over 2%) soln. of a volatile acid and titrating successive fractions of the distillate, any given acid gives a characteristic curve, by which the nature of the acid can be identified if it is alone, and if 2 acids are present each one behaves as though it were alone. If the nature of the volatile acid is known, the amt. can be detd. by distg. a given portion of the liquid under specified conditions, titrating and referring to the distn. curve. S. detd. the distn. curve of AcOH by measuring 110 cc. of soln. in a 250-cc flask, distg. 100 cc. in 10-15 mins., and titrating every 10 cc. fraction; the proportion of AcOH distd., expressed as % of the total AcOH taken and as % of the total AcOH, resp., was:

Distillat. (in cc.)	10	20	30	40	50	60	70	80	90	100
% of total AcOH	5.9	12.2	18.7	25.6	32.7	40.4	48.7	57.5	67.5	80
% of AcOH distd.	7.4	15.2	23.4	32.0	40.9	50.5	60.6	71.9	84.4	100

In applying the method to the detn. of AcOH in beer, the latter is prepd. as follows: remove CO_2 by shaking 15-20 mins.; neutralize 200 cc. to a p_H value of 7.2-7.4 (e. g., by titrating with NaOH using α -naphtholphthalein, or else titrating in presence of phenolphthalein to a pale pink and then adding 1-1.5 cc. $N H_2SO_4$); evap. to 50-33% of the original vol.; add $N H_2SO_4$ equal to the NaOH originally added + 4 cc.; dil. to exactly 200 cc., and distil and titrate 110 cc. as described above for detg. the distn. curve of AcOH. It is preferable to distil only 80 cc. instead of 100 cc. The results obtained with different types of beer showed that the only volatile acid is AcOH, that the presence of lactic acid (0.5% added) does not interfere, and that the method is more accurate and much more rapid than steam distn.

A. PAPINEAU-COUTURE

Determination of glycerol in beer. H. LACROIX AND S. KROPACSY. *Wochschr. Brau.* 45, 490-1(1928).—Zeisel and Fanto's method with slight modifications is more rapid and gives better results than the lime or dichromate methods.

A. SCHULTZ

Silicic acid in beer. H. NETSCHER. *Wochschr. Brau.* 45, 582-5(1928).—Silicic acid is present in all brewing materials and is not entirely pptd. during the process. In 5 beers 0.012-.020 g. of silica per 100 cc. was found. Those with the highest amt. of silicic acid developed the most haze. Conclusion: Silicic acid is a factor in the colloidal system of beer.

A. SCHULTZ

"Bacteriophage," a new formic acid anti-ferment. R. MARCILLE. Lab. des services administratifs et la de répression des fraudes de la régence de Tunis. *Ann. fals.* 22, 19-22(1929).—The prepn. was essentially a 150-g. per l. soln. of formic acid. It was claimed to be effective for sterilizing musts, etc., 14-20 cl. per hl., being sufficient but the amt. required was found to be 4-5 times as great.

A. PAPINEAU-COUTURE

The effect of successive generations of yeast on the alcoholic fermentation of cider. S. C. VAN DECAVEYRE. Wash. Agr. Expt. Sta. *J. Agr. Research* 37, 43-54(1928); cf.

C. A. 23, 1965.—The N and P contents of cider are low. All but traces are readily removed by coagulation at a temp. of 45°. Qual. analyses indicated the absence of NO₃ and NO₂ ions and the presence of PO₄ and NH₄ ions in small quantities in all samples. Clear cider, contg. 0.53% C₂H₅OH, and possessing a natural flavor, was obtained in an unfermentable form by growth of yeast, heating to 45°, re-inoculating with yeast and again heating. The temporary unfermentability was due to lack of N and PO₄ and not to the presence of toxic products or disease of the yeast. A. I. M.

The supposed separation of methylglyoxal in alcoholic fermentation. CARL NEWBERG AND MARIA KOBEL. *Biochem. Z.* 191, 472-7(1927).—Methylglyoxal cannot be isolated by means of semicarbazide. The isolated, poorly sol. substance was s-hydrazinedicarboxylamide, a product of decompn. of the semicarbazide. S. M.

"Activator Z." IV. A specific accelerator of fresh yeast fermentation. HANS V. EULER, EDVARD BRUNIUS AND STIG PROFFE. *Univ. Stockholm. Z. physiol. Chem.* 178, 202-8(1928); cf. *C. A.* 22, 3172.—Attempts were made to purify "activator Z" the diffusible, EtOH-sol. substance in boiled yeast ext. which accelerates fermentation of fresh yeast. Since the fermentation curve here is not a straight line, the activation cannot be expressed by the ratio, cc. CO₂ per hr. : g. activator prepn. The measure of activity is therefore taken as the no. of mg. of prepn. required to activate the fermentation to half its max. velocity. For boiled yeast ext. this value is 3.3, for the yeast nutrient "marmite" 2.8, and for other materials it is much higher, i. e., the activity is lower. The following purification treatments of the boiled yeast ext. gave increased activities in the filtrate in the order named: Ba(OH)₂ pptn., Pb pptn., phosphotungstic acid pptn., dialysis, UO₂(OAc)₂ pptn., Ag pptn., Hg pptn. The most active prepn. was obtained by successive dialysis, Pb(OAc)₂ pptn. and Hg(NO₃)₂ pptn., the final filtrate being 8 times as active as the initial ext. A. W. DEX.

Brewers' pitch. F. KUTTER. *Wochschr. Brau.* 45, 473-8, 483-7, 493-7, 503-4 517-21(1928).—A discussion of lab. tests which are designed to differentiate between various kinds of brewers' pitch. A. SCHULTZ

Yeast extract, a new and satisfactory pill mass excipient (SCHNELLBACH 17. Briquetting carbon, coal, etc. [with recovery of acetone, AcH, EtOH, glycerol, etc.] (Brit. pat. 294,879) 21. Treating alkaline waters [from breweries] (Ger. pat. 7039) 14.

Oeuvres de Pasteur. Tome V. "Études sur la bière." Paris: Masson & Co. F. 120. Reviewed in *Brasserie et malterie* 18, 350-1(1929).

Dujardin-Salleron, père et fils: Notice sur les instruments de précision appliqués à l'oenologie et à la brasserie. 6th ed. Paris: Dujardin-Salleron. 1100 pp. Domestic F. 50., foreign F. 54. Reviewed in *Ann. fals.* 22, 43(1929).

Apparatus (with three distilling columns) for continuous production of absolute alcohol. ELOI RICARD (to U. S. Industrial Alcohol Co.). U. S. 1,704,213, March 5. A plant is described suitable for distg. aq. alc. after the addn. of a substance forming an azeotropic mixt.

Diastases. AUGUSTE BODIN and JEAN EFFRONT. Ger. 470,710, July 4, 1923. See Brit. 221,860 (*C. A.* 19, 1028).

Enanthic perfumes. ÉMILE A. BARBET. Fr. 33,499, Jan. 20, 1927. Addn to 623,459. An app. is described for the total extn. of the perfumes produced by the fermentation of wine.

Cover for vinegar vats. ARTHUR STEINMETZ. Ger. 470,741, Aug. 5, 1927. A cover for the vats used in the quick vinegar process is made of stone, is conical in shape, and has an internal peripheral channel in which condensed liquid accumulates and from which liquid can be withdrawn. The cover is also channelled externally so that cooling liquid sprayed on to it can be conveniently run off.

Vinegar and yeast. M. J. J. BOUTTEAUX. Brit. 294,209, July 20, 1927. Vinegar is produced by oxidation of the wort sepd. from the beer yeast discharged from fermenting vats. Alc. obtained from distn. of a part of the wort may be added. The yeast is strained, washed, bleached with (NH₄)₂CO₃ and decanted to remove the sound cells, which are dried.

Yeast cultivation in treated waste sulfite liquor. GUSTAF O. W. HEIKENSJÖLL (to Aktiebolaget Båsta). U. S. 1,703,272, Feb. 26. The liquor is rendered alk., suitably by the addn. of CaCO₃, "mesa" or NH₃, pptd. material is removed and the treated liquor is then added to yeast propagating wort and the character of the latter is regulated so that it is alk. at the end of the process. An app. is described. Cf. *C. A.* 22, 3778.

Yeast. S. SAK. Brit. 294,123, Jan. 14, 1927. During yeast propagation, yeast-contg. wort is withdrawn and centrifuged, and fresh wort or solns. of nutrient substances, centrifuged wort or water are usually simultaneously added. A portion of the centrifuged yeast is returned to the propagating vat in regulated manner with the purpose of maintaining during a desired time a certain wt. of yeast per unit volume of wort in the fermenting vat. The withdrawn wort may be completely fermented and may or may not contain alc. Various details and modifications are described, among which is the "rejuvenation" of the yeast by adding fresh yeast, and the passage of the centrifuged yeast, before its return, through auxiliary vats contg. nutrients such as sugar in the same mutual concn.

Yeast. S. SAK. Brit. 294,131, Jan. 14, 1927. In the production of seed yeast and contg. yeast by a process in which yeast-contg. wort is withdrawn during the process and in which suitable addns. to the wort may be made, a constant wt. of yeast per unit volume of the liquid in the propagating vat is maintained during a suitable period of the process by controlled addns. of yeast from an extraneous source. The process may be so regulated that the wort withdrawn either contains alc. or is free from alc. Brit. 294,132 relates to a similar process in which fresh wort, centrifuged wort, or other suitable solu. or water is continuously added. Brit. 294,133 specifies a continuous process in which wort withdrawn is centrifuged and transferred to a distn. app. where it is wholly or partly freed from alc. and continuously returned to the yeast propagation vat. Distn. may be effected at a temp. of 70° under reduced pressure and the wort cooled before return to the propagation vat. Brit. 294,134 specifies withdrawal and centrifuging of a portion of the wort and transfer of the centrifuged yeast to another vat contg. nutrient liquid, the concn. of which in respect to certain nutrients is higher than that of the first vat; the yeast may be passed through several vats before being returned to the first vat. Various details are described.

17—PHARMACEUTICAL CHEMISTRY

W. O. EMERY

Stability and value of chlorine water. GYULA MIKÓ. *Ber. ungar. pharm. Ges.* 2, 374(1926).—The directions of the Hungarian Pharmacopeia are criticized.

B. C. A.

Bromometric examination of ointments and fats. O. ANDRISKA. *Ber. ungar. pharm. Ges.* 3, 140 3(1927).—The Br-I values of numerous oils, fats and ointments of the Hungarian Pharmacopeia (3rd ed.) have been detd. The bromoacetic acid method is preferred to the K bromate process.

B. C. A.

Evaluation of ergot of rye. B. GAAL. *Ber. ungar. pharm. Ges.* 4, 32-42(1928).—The origin of which was not discovered, was obtained when the ethereal acid of physiologically inactive samples was rendered alk.

B. C. A.

Microchemistry of theophylline (1,3-dimethylxanthine). M. WAGENAAR. *Pharm. Weekblad* 66, 131 3(1929).—The reactions discussed are sublimation, pptn. by addn. of $(\text{NH}_4)_2\text{SO}_4$ to the alk. soln., and pptn. as complex salts by HgCl_2 , AuCl_3 , $\text{KI} + \text{I}$, $\text{SbBr}_3 + \text{Br}$, $\text{KI} + \text{BiI}_3$ and $\text{KI} + \text{SbI}_3$. For purposes of microchem. identification the HgCl_2 reaction is the most useful, then the I and Br reactions. The others are about equally sensitive.

A. W. DOX

Simplified estimation of cresol in cresol soap in preparations. GREGOR KOGAN. *Pharm. Zentralhalle* 69, 536-7(1928).—Into a 500-cc. distg. flask introduce 20-25 g. of the sample, add 50 cc. 10% BaCl_2 soln., then distil off the cresols with steam, stopping the operation after 1 hr. Now add 10 g. NaOH to the distillate and remove the hydrocarbons by extn. with benzine, petr. ether or Et_2O . On treating the aq. soln. with NaCl and HCl to acid reaction the cresols are pptd. and extd. with petr. ether. After drying over anhyd. Na_2SO_4 , filter the petr. ether soln., wash the salt and filter with 5 cc. addnl. petr. ether, evap. the solvent, dry $1\frac{1}{2}$ hr. at 100° and weigh.

W. O. E.

Certain volatile oils and stearoptens as fungicides. L. B. KINGERY AND A. ADRISSON. *Arch. Dermatol. Syphilis* 17, 499(1928); cf. *Rcv. hyg. médic. prév.* 51, 153.—The essential oils of clove, cinnamon, thyme, lemon, eucalyptus and peppermint as well as menthol, S, camphor and benzoic acid were used in studies with *Epidermophyton*, *Trichophyton*, *Microsporon*, *Achorion*, *Sporotrichium* and other fungi. Aq. solns. of the oils were used in several concns. The most active were *thymol* and the oils of cinnamon and clove. The possible clinical use of these substances in combating fungus pathogens is indicated.

C. R. F.

Quinine valerate. O. WILLMANN. *Magyar Gyógy. Tarsasag Ért.* 4, 130(1928).—When cryst. quinine valerate is ground in porcelain or glass gallipots there is observed a characteristic light emission. This can be seen in daylight, or better in a dark room when a striking violet color appears. After the salt is ground to a dust, no further light emission was observed. Other quinine salts and zinc valerate failed to emit light. Hence this is a qualitative reaction for cryst. quinine valerate. S. S. DE FINÁLY

Color reactions of ethereal oils. L. EKKERT. *Magyar Gyógy. Tarsasag Ért.* 4, 203-312(1928).—Color reactions of ethereal oils with phenol, thymol, carvacrol, pyrocatechol, resorcinol, hydroquinone, orcinol, phloroglucinol, pyrogallol, β -naphthol, α -naphthol and eugenol are described. S. S. DE FINÁLY

The iodine content and biologic activity of different thyroid preparations. A. STASIAK. *Magyar Gyógy. Tarsasag Ért.* 4, 385-91(1928).—The I content of various thyroid tablets, detd. as described in C. A. 22, 1437, 3953, varied greatly. Also several aq. thyroid exts. were found to contain only traces of I (some thousandth mg. per cc). None of the examd. aq. exts. could increase the acetonitrile-resistance of white mice. Thus such aq. thyroid exts. have no physiologic activity and should not be treated as drugs. Only thyroid powders or tablets should be approved as drugs which are signed and labeled to show their exact I content. Such preps. could be standardized. S. S. DE FINÁLY

Neutralization of ethyl acetate used for the estimation of opium preparations. Gy. MIKÓ. *Magyar Gyógy. Tarsasag Ért.* 4, 392-6(1928).—AcOEt having an acid reaction is shaken with lime water until neutral. S. S. DE FINÁLY

Reactions of holocaine. L. EKKERT. *Magyar Gyógy. Tarsasag Ért.* 5, 19-20(1929).—A mixt. of 0.01 g. holocaine-HCl, 0.01 g. resorcinol and 0.5-1.0 cc. concd. H_2SO_4 , on heating, shows continually darkening red colors, varying from wine-red to raspberry red. Holocaine can thus be distinguished from novocaine, alpine, stovaine, cocaine and tropacocaine. Novocaine-HCl, alpine and stovaine yield green to greenish black colors; cocaine shows wine-red; tropacocaine gives an onion-red to violet color on the above mentioned treatment. Also in *Pharm. Zentralhalle* 70, 120(1929). S. S. DE FINÁLY

Reactions of morphine. L. EKKERT. *Magyar Gyógy. Tarsasag Ért.* 5, 21-4(1929). cf. C. A. 22, 1828.—Several drops of an approx. 5% alc. soln. of anisaldehyde are added to 1 or 2 cg. morphine. The mixt. shows various colors on addition of a few drops of concd. H_2SO_4 . The colors change during warming. Also codeine, ethylmorphine, heroine, peronine, paracodine, apomorphine, narcophine and narcotine show similar colors. S. S. DE FINÁLY

Determination of camphor in Oleum camphoratum. L. DÁVID. *Magyar Gyógy. Tarsasag Ért.* 5, 25-7(1929).—Mix 4 g. Oleum camphoratum and 5 g. freshly made $Ca(OH)_2$ with 110-120 g. water, boil up, and distil. To 60 cc. of the distillate in a cylinder add 20 g. NaCl and ether to make the shaken-out mixt. up to 60 cc. Pour about half into a glass of known wt., dry on the steam-bath and weigh. The camphor content in percent can be calcd. by $(KE^*/E)(100/4)$, in which K is the camphor content part of the distillate evapd., E^* is the vol. of the original ethereal soln. in the cylinder, and E the vol. of the ethereal soln. poured out. S. S. DE FINÁLY

Determination of alkaloid content of Herba and Tinctura Lobeliae. L. DÁVID. *Magyar Gyógy. Tarsasag Ért.* 5, 28-32(1929).—After the materials have been prepd for analysis, they are treated with NaOH and $Ca(OH)_2$ and shaken out with ether. The ethereal soln., contg. all alkaloids, is purified by adding tragacanth dust moistened with a little water. As lobeline decomposes on heating, the ether should be evapd. partly on the steam-bath and partly in a desiccator contg. $CaCl_2$ or H_2SO_4 . S. S. DE FINÁLY

Determination of the saponin content of Hungarian Gypsophila paniculata L. G. MATOLCSY. *Magyar Gyógy. Tarsasag Ért.* 5, 33-42(1929).—Lather no detns. can only be made with material freed from mucilaginous impurities. The method is as follows: Purify an aq. soln. of saponin, cool to 4°, pour into a calibrated cylinder, produce a lather in a shaking machine, cool the lather to 4°, add $CHCl_3$ and read the vol. of lather after 15 min. Viscosity of saponin solns. at const. temp. increases with the concn. and at const. concn. decreases with rise of temp. Three methods were found useful for saponin detn.: (1) quinine-HCl was added to the soln. and the resulting ppt. was weighed. (2) The drug was extd. with 75% MeOH and the ext. was poured into acetone (d. 0.80). Then the pptd. saponin was dried and weighed. (3) The volumetric method can be used instead of weighing. Saponin is pptd. in the above-described manner and acetone is added from a buret until the soln. becomes opalescent. The concns. corresponding to opalescence are given in a table. The fish-index was detd. according

to L. Kofler with saponin of *Gypsophila paniculata* L.; it is 1500 for gold fish and 680 for carp.

S. S. DE FINÁLY

Determination of iodoform content of iodoform gauzes. E. SCHULEK AND G. VASTAGH. *Magyar Gyógy. Tarsaság Ért.* 5, 43-7(1929).—The gauze is covered with alc. in an Erlenmeyer flask, and the iodoform is sapond. on steam bath with reflux condenser. Then the cooled soln. is poured into a 1-l. measuring flask, the gauze washed out with water and the soln. made up with distd. water to 1 l. Ten cc. of this soln. is evapd. in a Ni crucible on the steam bath, the residue is melted with powd. KOH, and the molten mixt. filtered through cotton and dild. to about 90 cc. Fifty% H_2SO_4 soln. is added to neutralization, then 1 cc. N HCl added, iodides are oxidized to iodates by means of Cl water, and after boiling Cl off, I is detd. in the form of iodate. The content of iodoform is not influenced by the various fixatives used (glycerol, paraffin oil, colophony). Iodoform gauzes have a const. iodoform content, even if kept for several weeks in a lab. at 28-30°. Iodoform losses can result only from the drying of the gauzes; therefore drying should be very carefully done. Also in *Pharm. Zentralhalle* 70, 117-9 (1929).

S. S. DE FINÁLY

Herba Centaurii. B. GAAL. *Magyar Gyógy. Tarsaság Ért.* 5, 58-72(1929).—Five kg. of the drug was extd. with petr. ether. Free fatty acid content was 13.01%, sapon. no. 101.54-101.63, mol. wt. of fatty acids 314. Satd. acids included cerotic, palmitic and stearic acids.

S. S. DE FINÁLY

Preparation and determination of fluid extract of Hydrastis canadensis. Z. CSIPKE. *Magyar Gyógy. Tarsaság Ért.* 5, 73-85(1929).—Perfect extn. results by using 20-22 times as much alc. as of the material to be extd. The end of percolation can be detd. by Gluksman's berberine reaction. The gravimetric hydrastine detns. of the pharmacopoeias of different countries yield various results. The volumetric method of the Swedish Pharm. X, with a mixed indicator consisting of Me red and methylene blue is the most exact and simplest. This will be accepted by the Hungarian Pharm. IV, now under prepn.

S. S. DE FINÁLY

Alkaloid content of chlorophyll produced from leaves of Datura stramonium. M. JANICSEK. *Magyar Gyógy. Tarsaság Ért.* 5, 86-95(1929).—Chlorophyll was extd. from leaves of *Datura stramonium* by the technical alc.-benzene method. To det. the alkaloids, the chlorophyll was boiled with water contg. a little H_2SO_4 , the excess acid was neutralized with $BaCO_3$, an aliquot part of the soln. was evapd. and then the procedure of Pharm. Helv. IV for alkaloids was followed. Toxic alkaloids are contained in the chlorophyll. Hence the leaves of toxic plants should be used for chlorophyll production or perhaps the product should be washed with a slightly acid water to remove toxic alkaloids.

S. S. DE FINÁLY

Yeast extract, a new and satisfactory pill mass excipient. WOLFGANG SCHNELLENBACH. *Am. J. Pharm.* 101, 137-40(1929).—Dried and powd. beer yeast and also yeast ext. (an ext. of yeast albumins) as suggested by Heinz (Erlangen, Germany) are both efficient excipients equal to or better than older and well-known substances and in addn. have a therapeutic advantage. The dry cells of yeast absorb H_2O and swell, making the pills absorbable by the stomach. They also stimulate gastric secretions. The German Pharm. recognizes 2 kinds of medicinal yeast: "Faex medicinalis" which is bottom beer yeast washed, deprived of bitterness, dried at a temp. of at least 40° reduced to moderately fine powder and still retains the ability to ferment. A second form called "Extractum Faecis" (yeast ext.) is prepd. from bottom beer yeast, freshly taken from fermenting tubes, washed frequently with H_2O in a decanting vessel at a low temp., sifted through a sieve having openings of approx. 0.15 mm. diam., deprived of bitterness by treatment with a 1% soln. of Na_2CO_3 , washed until the H_2O no longer shows an alk. reaction to litmus paper and is clear and colorless, the adhering H_2O removed from this purified yeast by pressure; 20 parts of this yeast mixt. with 10 parts H_2O , 1 part HCl is allowed to autoferment for 12 hrs. at 40° to 50°, the product is heated for a short time on a water bath and the liquid removed by straining; the residue is again heated with 10 parts H_2O on a water bath and the liquid removed by straining; the combined liquids are filtered and concd. under vacuum to a thin ext., and this ext. is mixed with 25 times its wt. of medicinal yeast which has previously been dried for 2 hrs. in a drying oven at 100° to destroy the activity of the yeast cells; the mixt. is heated to dryness under vacuum. Yeast ext. is a brown powder (should not be black-brown) having a spicy taste (not a bitter or an empyreumatic taste); its soln. in H_2O is turbid. Only the yeast ext. is used as an excipient for pills and is recommended with sufficient of a mixt. of equal amts. of H_2O and glycerol in case there is only a small portion of ingredients to be combined. If there is a large amt. of dry powders to be amassed it is recommended that the "Ex-

tractum Faecis Spissum" be used, unless some other vegetable ext. is present. This highly concd. yeast ext. and another prepn. on the market in Germany, a dry powd. yeast ext., are recommended and frequently used by pharmacists as excipients for the prepn. of pills. Powd. digitalis leaves and quinine-HCl are ingredients which are especially difficult to form into a mass. Very often they are prescribed in an amt. which does not permit the addn. of much massing material without making the size prohibitive. It has been found that 10% of the official ext. of yeast is sufficient to form these into a very satisfactory pill mass. In pill preps. calling for large amts. of liquid constituents such as volatile oils, balsams, creosote, etc., dry yeast ext. or the official yeast ext. also yielded good results.

W. G. GAESSLER

The quinic acid content of young shoots of *Picea excelsa* and a method for its extraction. ALEX. KIESEL. *Planta Abt. E, Z. wiss. Biol.* 6, 519-25(1928).—Young shoots of *Picea excelsa* yielded 10% quinic acid on a dry wt. basis. Isolating quinic acid as the Cu salt is not regarded as entirely quant. The procedure for extn. is: air dry material is ground and extd. first with benzene, the benzene evapd. off, and then extd. 3 times with hot H₂O; all liquid possible is pressed from the residue; Pb acetate is added to the combined exts. and the soln. evapd. to 1/2 vol. on H₂O bath; excess Pb is removed with H₂SO₄, the soln. filtered and the filtrate evapd. to a sirup in a vacuum, repeated treatment with cold and hot alc. causes a viscous mass to sep. out; after cooling transparent crystals of quinic acid form on the sides of the container, the first crystals appearing in regions adjacent to the viscous material. Phys. and chem. properties of the cryst. material agree very closely with those for C₇H₁₂O₆, indicating that the method of extn. probably gives a pure quinic acid. It is believed that the simplicity of this method will encourage a more intensive study of the origin and function of quinic acid especially in the higher plants.

A. E. HITCHCOCK

The nitrate content of tobacco and the sources of error in the present methods for its determination. THALES ANDREADIS. Kaiser Wilhelm Inst., Berlin Dahlem *Biochem. Z.* 204, 484-92(1929).—The usual procedure for detg. nitrate in tobacco consists in the reduction of HNO₃ to NO by means of HCl contg. FeCl₂, and measuring the NO gasometrically. But this gas is contaminated with CO₂, which it is shown arises from the pectins contained in the tobacco. The pectin is a condensation of galacturonic acid, and like this yields with HCl furfurole, CO₂ and H₂O. The same source of error of course, exists in the nitrate detns. in other plant preps. contg. pectins, gums, mucilages, etc. Dry tobacco powder is refluxed for 1 hr. with a 40% AcOH to which dil NaOH was added until slightly alk. The ext. was cleared by centrifuging. An aliquote portion was treated with the HCl-FeCl₂ reagent with the usual precautions and the gas collected under H₂O. After the vol. was detd. KOH was admitted into the tube and the contracted vol. again measured.

S. MORGULIS

Studies on the stability of solutions of cocaine and pseudococaine. ERIK SÄDOLIN. *Dansk. Tids. Farm.* 2, 309-15(1928).—S. demonstrated that when a soln. of cocaine-HCl is kept at room temp. less than 10% is hydrolyzed in a month, and no further hydrolysis takes place during a year. By means of tables and curves it is shown that cocaine is more stable than pseudococaine. In 0.1 N NaOH cocaine is completely hydrolyzed in 9 hrs. while pseudococaine requires only 5 hrs. In the expts with NaHCO₃ solns. are hydrolyzed 20 and 30% resp. after the corresponding periods. In 1 hr. 15 and 20%, resp., are hydrolyzed.

O. A. NELSON

Liquor Aluminii Acetici. ALFRED WØHLK. *Dansk. Tids. Farm.* 2, 320-3(1928).—Since Al₂(SO₄)₃·18H₂O of commerce seldom contains 18 mols. H₂O and since CaCO₃ is hardly ever pure, W. suggests analyzing these compds. previous to prepg. liquor aluminii acetici from them. In Al₂(SO₄)₃·18H₂O, det. SO₄⁼⁼ with BaCl₂ soln. and for CaCO₃ dissolve the sample in slight excess standard HCl, boil off CO₂ and titrate back with standard NaOH using methyl red as indicator. Prepn. of c. p. liq. aluminii acetici now becomes easy.

O. A. NELSON

The determination of pilocarpine. P. BOURCET. Faculté de Pharmacie de Paris *Ann. fals.* 22, 23-4(1929).—The following method is recommended as having given satisfactory results for many yrs.: moisten 25 g. of jaborandi leaves (ground to pass a 30-mesh sieve) with 200 cc. of 10% Na₂CO₃ soln., ext. in a Soxhlet app. for 2 hrs. with hot C₆H₆, cool the ext., shake immediately with 30, 20, 20 and 10 cc. 1% H₂SO₄, filter the ext., neutralize (using Congo red indicator) with NH₄OH, oxidize with 1% KMnO₄ soln. (a stronger soln. might ppt. pilocarpine permanganate), add excess NH₄OH, ext. with 10 × 5-6 cc. CHCl₃, filter through anhyd. Na₂CO₃, exactly neutralize with 1:50 HNO₃, evap. to dryness on the water bath, take up with cold Me₂CO, filter through a Gooch crucible, dry below 100° and weigh. The m. p. of the pilocarpine nitrate is 174-5°, and should not fall below 165°. With certain batches of jaborandi leaves,

it has been observed that if the C_6H_6 soln. of the alkaloids is allowed to stand 24–48 hrs before converting into sulfate, the pilocarpine content found is over 50% lower than if the C_6H_6 soln. is immediately extd. with H_2SO_4 . This can be prevented by extg. the leaves with petr. ether or C_6H_6 before moistening with Na_2CO_3 soln. The phenomenon is being studied.

A. PAPINEAU-COUTURE

The terpinol and terpineol industry. L. DESALBRES. *Bull. inst. pin* No. 56, 10–4 (Jan., 1929).—A brief description of the prepn. and purification of terpinol and of the prepn., uses and by-products of terpineol.

A. PAPINEAU-COUTURE

Perfumes obtained from spirits of turpentine. M. MOURIER. *Bull. inst. pin* No. 56, 14–5 (Jan. 1929).—A brief review of the products derived from spirits of turpentine which are used as raw materials for perfumery.

A. PAPINEAU-COUTURE

Utilization in medicine of oil and of liquid tar of *Cedrus atlantica*. R. MASSY. *Publ. inst. pin* No. 56, 30–1 (Jan. 1929).—The liquid tar obtained by destructive distn. of the wood of *Cedrus atlantica* is stated to be superior to the best oil of cade, and its recognition in the French Codex is recommended. In 1899 Gémey found that the oil obtained by steam distn. of the wood of *C. atlantica* was at least as efficient as sandalwood oil for the treatment of blennorrhoea and was better tolerated by the organism. The properties of the oil are: sol. in less than 10 vol. of 90% alc. at 20°, d_{20}^4 0.939–0.945, α_D^{20} (100 mm. tube) +45° to +55°, acid no. not more than 1, Ac no. about 20 or more. The properties of the liquid tar are: d_{20}^4 less than 1.05, H_2O less than 3%, residue on distg. to 300° at atm. pressure less than 30%, sol. acidity (as AcOH) less than 1 g. per 100 cc., α_D^{20} of oil obtained by steam distn. (100 mm. tube) over +20°, Hirschsohn-Papan reaction ($Cu(OAc)_2$ -petr. ether) color varying from light yellow to brownish yellow.

A. PAPINEAU-COUTURE

Composition of oil of spike lavender (*Lavandula spica*). B. N. RUTOVSKII AND N. N. MAKAROVA-SEMILYANSKAJA. *Riechstoffind* 3, No. 4, 28–9 (Feb. 15, 1928); *Chimie et industrie* 21, 110–11 (1929).—Seven samples of oil prepd. by distn. of different portions of plants grown in Caucasia gave the following results on analysis: yield 0.13–24%, d_{20}^{25} 0.9067–0.9263, α_D^{20} 0.72–11.52°, n_{20} 1.4660–1.4756, acid no. 0.88–2.71, sapon no. 3.0–19.06, Ac no. 49.0–108.2, camphore 12.46–25.5%, cineole 27.5–64.3%. Fractional distn. over Na of one of the samples gave:

Fraction	Pressure	B. p.	Yield %	d_{20}^{25}	$[\alpha]_D^{20}$	n_{20}
Ia	760 mm.	162.4°	5.3	0.8940	+7.9°	1.4612
IIa	760	164.70°	16.6	0.9147	+3.96°	1.4593
IV	20	88–96°	33.3	0.9130	+4.8°	1.4613
V	20	96–102°	12	0.9061	+4.59°	1.4639
VI	20	102–20°	4	0.9061	+5.43°	1.4661
VII	20	120–50°	3.3	0.9332	+9.4°	1.4831

Cineole and α -pinene were identified in Ia and IIa; linalool in IV, *d*-camphor, linalool and a small quantity of borneol in IV, V and VI. Five samples of oil prepd. by distn. of different portions of plant grown in Crimea gave the following results on analysis: yield 0.22–0.93%, d_{20}^{25} 0.9024–0.9349 (a value 0.9802 is given, but is probably a misprint), α_D^{20} –2.05° to +9.8°, n_{20} 1.4658–1.4863, acid no. 0.85–2.21, ester no. 11.51–14.84, Ac no. 45.07–105.57.

A. PAPINEAU-COUTURE

Use of the quartz lamp for the analysis of essential oils. A. MULLER. *Riechstoffind* 3, No. 4, 29 (Feb. 15, 1928); *Chimie et industrie* 21, 111 (1929).—Attempts to detect adulteration of essential oils by examn. of the fluorescence did not give any characteristic results.

A. PAPINEAU-COUTURE

Citronellol and rhodinol. J. DORVILLE. Science Thesis, Lyon, 1928; *Chimie et industrie* 21, 112–3 (1929).—See Grignard and D., *C. A.* 22, 3879, 4104. A. P.-C.

Bioassay of commercial pituitary powders. W. T. McCLOSKEY AND J. C. MUNCH. Food, Drug and Insecticide Administration, Washington, D. C. *J. Assoc. Official Agr. Chem.* 12, 135–6 (1929).—The activities of com. samples representing current output (obtained directly from the mfrs.) were studied. Com. whole pituitary powders showed a ratio of activity of 1 part of posterior substance in 8 parts of the whole body when assayed by the U. S. P. X method on the isolated guinea pig uterus, standard posterior powder being used as a basis for comparison. The exts., which were made according to the U. S. P. directions for liquor pituitarii, contained the activity of 10 mg. of powder per 1 cc. of soln. Com. anterior pituitary powders were uniformly inactive. Com. posterior pituitary powders showed activities varying from 30 to 50% of the standard posterior pituitary powder, U. S. P. X. The following standards for physiol. activity are suggested: (1) Pituitarium, U. S. P.—50% of the activity of the U. S. P. X official

standard posterior pituitary powder; (2) desiccated whole pituitary powder—5% of the activity of the U. S. P. X official standard posterior pituitary powder. A. P. C.

The destructive action of heat on aqueous solutions of insulin. E. TROCELLO. *Nat. Med. Pharmacol. Inst. "Seroni."* *Rass. clin. terap. sci. affini* 27, 504-5(1928).—Citing the researches of Krogh and Hemmingsen and the expts. carried out by himself and Cruto (*C. A.* 19, 1903; 20, 1130) T. points out that insulin intended to be shipped to warm countries should be sent as a dry powder, which is stable, while the solns. are easily affected by an elevated temp.

G. SCHWOCH

A new series of double salts of alkaloids, the iodozincates. R. DANET. *J. pharm. chim.* 7, 548-50(1928).—Iodozincates of codeine, $ZnI_2 \cdot 2(\text{Codeine-III})$, and of quinine, $ZnI_2 \cdot \text{Quinine-2HI}$ have been prepd. Mix warm solns. of ZnI_2 and the HI salt of the alkaloid acidulated with HI; allow to cool very slowly (for 48 hrs. in a "thermos" bottle kept in sawdust). Addn. of some $NaHSO_3$ prevents formation of I. Quickly dry the sepd. crystals on paper, then expose these to the air for several days, finally remove traces of H_2O and HI by keeping the crystals over solid NaOH in a desiccator.

S. WALDBORT

Some salts of pelletierine. G. TANRET. *J. pharm. chim.* 8, 112-20(1928).—The present com. salts of pelletierine differ much in compn. and activity from the standards for these salts in the French Codex of 1884 and 1908, in which pelletierine (A) and isopelletierine (B) alone are specified, in 1884 as tannates, in 1908 as sulfates. U. S. P. IX and other foreign pharmacopeias define the drug as a mixt. of the tannates of the 4 chief alkaloids of pomegranate. A com. (German) sample contained 31.28% of sulfate of pseudopelletierine (C) and 36.14% of sulfate of B. A com. tannate sample (of the same source) contained 17.25% total alkaloids consisting of C 46.5% and B 53.5%; A was totally absent in both cases. In the prepn. of tannate of C, $C_9H_{15}NO \cdot 2C_{11}H_{19}O_6$ (19.20% C), and the tannate of A, $C_8H_{15}NO \cdot 2C_{14}H_{19}O_9$ (17.96% A), a study is made of the loss of product by dissocn. through diln. and washing with H_2O . From the sulfates (1 g.) in concd. solns. (1:5) set free the alkaloids by adding the calcd. quantity of NaOH (0.17 g. NaOH for C, 0.21 g. for A), then add soln. of tannin (3.1 g. in 30 cc. H_2O) drop by drop, which yields a white ppt. easily washed out. The tannate of C thus prepd. contained 16.57% C, or 14.47% when a much more dil. tannin soln. was used (4 g. in 300 cc.). The tannate of A similarly contained 17.38% A, or 12.22% (3.1 g. tannin in 300 cc.). Petit's method of prepn. (Codex 1884; add tannin to the sulfate, then neutralize with NH_4OH) is unsatisfactory. To det. the alkaloids in these tannates, dissolve 3 g. tannate in 10 cc. cold 15% NaOH, ext. with 100 and then with 25 cc. $CHCl_3$, filter the united solns., shake out with 20 cc. 0.2 N H_2SO_4 and titrate back with 0.2 N NaOH adding 2 drops of 0.02% nitrophenol as indicator. The no. of mg. acid consumed $\times 0.3122$ gives the wt. of C, $\times 0.2877$ the wt. of A in the tannate employed. The frequent failure of the com. drug as a teniafuge is caused not only by faulty manuf., but also by incorrect dosage directed in pharmacopeias; the doses given in Brit. Pharm. and U. S. P. should be 10 times stronger.

S. WALDBORT

Organo-Sb compounds (NIVOGY) 10. Apparatus for disinfecting and deodorizing by emanations (Fr. pat. 645,754) 1. Preserving mixtures of iodides with NaCl (Austrian pat. 112,104) 18. Detergent composition (U. S. pat. 1,703,602) 27. Alkamine esters of o-aminobenzoic acids (U. S. pat. 1,704,660) 10. Beverages (and cosmetic) (Fr. pat. 645,120) 12. Cyclohexyl compounds (bactericidal against acid-fast bacteria) (U. S. pat. 1,703,186) 10. Dispersing agents for use in dyeing cellulose esters and for other purposes (antiseptic soaps) (Brit. pat. 295,024) 25.

Kraemer's Scientific and Applied Pharmacognosy. New York: John Wiley & Sons, Inc. 3rd ed., revised by F. L. Newcomb, L. K. Darbaker, E. B. Fisher and J. C. Gathercoal. 893 pp. \$7.50. Reviewed in *J. Am. Pharm. Assoc.* 18, 202(1929).
FURST, KURT: *Grundriss der Arzneimittellehre für die Behandlung von Hautkrankheiten*. Leipzig: George Thieme. 142 pp. Reviewed in *J. Am. Pharm. Assoc.* 18, 203(1929).

WAGNER, ALFRED: *Die Parfümerieindustrie*. Halle (Saale): Wilhelm Knapp. 596 pp. M. 29. Reviewed in *Perfumery Essent. Oil Record* 20, 18(1929).

Therapeutic molecular compound of butylchloralhydrate and 4-dimethylamino-1-phenyl-2,3-dimethyl-5-pyrazolone. SOC. CHIMIQUE DES USINES DU RHÔNE and J. ALRWEGG. *Brit.* 294,092, May 16, 1928. This compd. is stabilized by adding a small proportion of magnesia.

Therapeutic thiosemicarbazones of arsenophenolaldehydes and ketones. I. G. FARBENIND. A.-G. Brit. 294,263, July 21, 1927. A hydroxyaldehyde-arsenic acid or an hydroxyketone-arsenic acid is treated with thiosemicarbazide before or after its reduction to the arseno compd. An example is given of the production of 4,4'-arseno-3,3'-dihydroxybenzaldehyde thiosemicarbazone from 3-hydroxybenzaldehyde-4-arsenic acid by using hypophosphorous acid and HI as reducing agents; the product forms a Na compd. with NaOH.

Therapeutic mercury compounds. AUGUST ALBERT and JOHANNES PFLEGER (to Winthrop Chemical Co.). U. S. 1,704,694, March 12. By heating *p*-acetophenone-carboxylic acid with 1.5 times its wt. of $\text{Hg}(\text{OAc})_2$ on an oil bath at 130–40° for about 15–25 min. a new compd., sol. in Na_2CO_3 and caustic alkali, is produced; by using a large proportion of $\text{Hg}(\text{OAc})_2$ there is formed a di-Hg compd., probably $\text{AcOHgCHCO}-$
 $\text{C}_6\text{H}_5\text{CO}_2\text{Hg}$. Similarly, *p*- $\text{ClC}_6\text{H}_4\text{Ac}$ yields $\text{ClC}_6\text{H}_4\text{COCH}_2\text{HgOAc}$, m. above 270°,

and *p*- $\text{HOOC}_6\text{H}_4\text{Ac}$ yields the corresponding OH compd., which decomposes at about 175°. *p*- $\text{H}_2\text{NC}_6\text{H}_4\text{Ac}$ heated with $\text{Hg}(\text{OAc})_2$ above 100° forms a dark brown melt, which decomposes after purification at about 215°. $\text{Ac}(\text{HO})\text{C}_6\text{H}_3\text{CO}_2\text{H}$ and $\text{Hg}(\text{OAc})_2$ form a product of the probable formula $\text{Ac}(\text{HO})\text{C}_6\text{H}_3\text{COCH}_2\text{HgOAc}$ and *p*- $\text{H}_2\text{O}_3\text{AsC}_6\text{H}_4\text{CMc}-\text{NNHCONH}_2$, dissolved in NaOH and treated with pptd. HgO , forms $\text{Na}_2\text{O}_3\text{AsC}_6\text{H}_4\text{C}(\text{CH}_2\text{HgOH})\text{NNHCONH}_2$.

Complex antimony compounds. HANS HAHN (to Winthrop Chemical Co.). U. S. 1,703,732, Feb. 26. *Trypanocidal compds.* are derived from the reaction of starting materials such as pyrocatecholdisulfonic acid and antimonyl pyrocatechol. Cf. C. A. 23, 1216, 1474.

Organo tin compounds. C. T. J. VAUTIN and C. V. STEPHENS. Brit. 294,287, April 22, 1927. Methylstannic triiodide is obtained in water-sol. form suitable for therapeutic uses by first forming methylstannoxylic acid by interaction of MeI and an alk. stannous soln. in the presence of alc. at a temp. of 30–40° and then heating it with HI. Various details and modifications are described.

Derivatives of substituted quinolinecarboxylic acids. SOC. ANON. POUR L'IND. CHIM. À BAILE. Brit. 294,118, July 15, 1927. Therapeutic compds. are made by causing a 2- or 4-hydroxy- or dihydroketoquinolinecarboxylic acid or a deriv. or a quinolinecarboxylic acid halogenated in the 2- or 4-position to react with an amino alc. or an ester or alkali compd. of such an alc. and if necessary hydrolyzing the product or treating with an alcoholate. Examples are given of the production of 2-hydroxy-4-quinolinecarboxylic acid diethylaminoethyl ester, 2-chloro-4-quinolinecarboxylic acid diethylaminoethyl ester, 2-ethoxy- and 2-methoxy-4-quinolinecarboxylic acid diethylaminoethyl esters, 1-methyl-2-ketodihydro-4-quinolinecarboxylic acid diethylaminoethyl ester, 2-diethylaminoethoxy-4-quinolinecarboxylic acid diethylaminoethyl ester, and 2-diethylaminoethoxy-4-quinolinecarboxylic acid Et ester. The properties of the bases and their salts obtained from 2-chloro-4-quinolinecarboxylic acid diethylaminoethyl ester and Me, Pr, allyl, isoamyl, *n*-heptyl, *n*-octyl, cyclohexyl and benzyl alcoholates are described. Cf. C. A. 23, 1217.

Aromatic esters of the α,α' -dimethyl- γ -hydroxypiperidine- β -carboxylic acid esters. FRIEDRICH STOLZ and WALTER KROHS (to I. G. Farbenind. A.-G.). U. S. 1,703,121, Feb. 26. These compds. are *local anesthetics* less toxic than cocaine and more effective than *p*-aminobenzoyldiethylaminoethanol. Production of the benzoic acid ester is described. Its hydrochloride m. 206°.

Compound from trichlorobutyl alcohol and 4-dimethylamino-1-phenyl-2,3-dimethyl-5-pyrazolone. JÜRGEN CALLSEN (to Winthrop Chemical Co.). U. S. 1,703,922, March 5. A homogeneous *analgetic compd.* is obtained by the reaction together of equimol proportions of 2,2,3-trichlorobutyl alc. and 1-phenyl-2,3-dimethyl-4-dimethylamino-5-pyrazolone either by melting the components together or by mixing their solns. and evapg. and crystg. The product is an almost colorless cryst. powder, easily sol. in acetone, alc. and C_6H_6 , less readily sol. in ligroin and m. 61–3°.

6-Alkoxy-8-aminoquinolines. WERNER SCHULEMANN, FRITZ SCHÖNHÖFER and FRITZ MEITZSCH (to Winthrop Chemical Co.). U. S. 1,703,365, Feb. 26. These compds. are generally whitish cryst. powders forming sol. salts with HCl and having *antipyretic properties* and a strong action against blood parasites. The 6-methoxy-8-aminoquinoline b. 137–8° and forms an orange-colored cryst. dihydrochloride. The corresponding 6-ethoxy compd. b. 144–5°. These compds. are yellow oils which solidify and then m. 41° and 60°, resp.

Lecithin preparations. CHEM. FAB. GRÜNAU LANDSHOFF & MEYER A.-G. (Israel

Magat, inventor). Ger. 470,954, Oct. 24, 1924. Emulsions of lecithin in aq. glycerol, such as are used for subcutaneous and intravenous injection, are rendered more stable and less viscous by addn. of a small amt. of a mixt. of electrolytes. An addn. of 0.6% of a mixt. of NaCl with KCl or CaCl_2 , with or without Na_2CO_3 or NaHCO_3 , is suitable.

Quinine preparations. CHEMISCH-PHARMAZEUTISCHE A.-G. BAD HOMBURG. Ger. 470,955, Mar. 6, 1927. See Brit. 291,565 (C. A. 23, 1215).

Eugenol salts. V. H. KIRKHAM and L. W. RAYMOND. Brit. 294,735, May 24, 1927. Ca and Mg salts of eugenol and isoeugenol are made by treating eugenol or isoeugenol with the corresponding metal oxide or hydroxide in solid form. Oil of cloves may be prepd. for transport by mixing with its chem. equiv. of slaked lime; a fine powder is formed from which the volatile constituents of the oil soon evap. or are removed by washing with "methylated spirit."

Alkaloids. GEORG W. F. F. KNOTH. Fr. 644,692, Nov. 20, 1927. See U. S. 1,686,866 (C. A. 22, 4537).

Preparation of a glucoside from Adonis vernalis L. PRODUITS ROCHE. Belg. 348,223, Feb. 29, 1928. The glucoside is extd. from the material by means of a suitable solvent. The residue obtained on evapn. of the solvent is extd. with H_2O and Et_2O , the residual oil is redissolved, and the glucoside is pptd. by adding a liquid which is miscible with the solvent but in which the glucoside is insol. The glucoside is then purified by the usual processes.

Generating chlorine. KARL CONNELL. U. S. 1,701,727, March 12. A Cl-liberating material such as KClO_3 , having a portion of its surface coated with paraffin or other suitable material and another substantial portion of its surface uncoated, is caused to react with the inorg. acid such as HCl so that both an immediate and a further gradual and prolonged evolution of Cl occurs. The method is adapted for liberating Cl for therapeutic purposes.

Hormones. SCHIERING-KAHLBAUM A.-G. Brit. 294,650, July 29, 1927. In the prepn. from vegetable materials (such as ground wheat, residue of an ethereal ext. of wheat, or yeast) of substances similar to sexual hormones obtained from animal organs, the material is treated with an alk. earth such as $\text{Ca}(\text{OH})_2$ in suspension in water or in an org. solvent dild. with water. An inert binding agent such as kaolin or silica gel may be present. Several examples are given. Brit. 294,651 specifies a modification of the process for obtaining hormones described in Brit. 291,006 (C. A. 23, 1218) by treating the finely divided animal organs used with alk. earths without making a preliminary ext., e. g., placentas, testicles or prostate glands are finely divided and digested at a temp. of 60° with a mixt. of $\text{Ca}(\text{OH})_2$, silica gel and 40% MeOH, the material is filtered, the filtrate evapd. and the residue taken up in water and extd. with ether. Cf. C. A. 23, 483.

Surgical ligatures made from fresh muscular tissue. PAUL BOST. U. S. 1,703,385, Feb. 26.

Condenser construction suitable for peppermint stills. WALTER S. SHENEFIELD. U. S. 1,703,366, Feb. 26.

Anthelmintic. CARLISLE N. ANDERSON (to Parke, Davis & Co.). U. S. 1,703,377, Feb. 26. For use as an anthelmintic in veterinary practice, tetrachloroethylene is enclosed in gelatin capsules which are colored with an oil-sol. red dye or other suitable substance which protects the contents of the capsule from actinic light.

Cosmetics and soaps containing sorbitol and its derivatives. I. Q. FARBENIND. A.-G. Brit. 294,130, March 16, 1927. Sorbitol or its dehydration products or esterification or etherification products are used in various cosmetic or soap mixts., with or without the addn. of other polyhydric alcs. or of Na lactate.

Medicine for external treatment of foot-rot or similar animal diseases. W. EVANS. Brit. 294,734, May 23, 1927. Na thiosulfate and HCl (or HOAc) are used in a vehicle of sugar sirup, or treacle, with or without lard.

Apparatus for casing and preserving the natural color of leaf tobacco. RAMON FEBLES (one-third each to James Y. Brown and G. P. Gill). U. S. 1,704,597, March 5.

Sterilizing cut tobacco with ozone. UNIVERSELLE CIGARETTENMASCHINEN-FABRIK J. C. MÜLLER & Co. Brit. 294,537, July 25, 1927. Cut tobacco is pneumatically fed to a loosening and dust-removing plant by a stream of air contg. ozone. An app. is described.

18—ACIDS, ALKALIES, SALTS AND SUNDRIES

E. M. SYMMES

Liquid-phase operation of sulfuric acid chambers gains significance in Europe. PERCY PARRISH. *Chem. Met. Eng.* 36, (68-72(1929)).—By atomization of suitable strengths of nitrous vitriol in the first 2 tower chambers the activity of the last 2 as acid producers is reduced to a negligible quantity. It is possible to work the first 2 chambers at a rate of 40 kg. of 52° Bé. acid per cu. m. per 24 hrs., or a chamber space of 1.75 cu. ft. per lb. of S per 24 hrs.

E. M. SYMMES

Volumetric and thermal study of ammonia and its synthesis. R. NITZSCHMANN. *Chem. Listy* 22, 169-77, 199-202, 241-4(1928).—The relations between pressure, temp. and compn. of mixts. of N and H are detd. and, together with thermal exchanges and liquefaction after production of NH_3 , are expressed in a no. of equations and graphs, from which may be calcd., among other data, the optimum dimensions for the surface of exchange under given conditions. The values obtained for the calorific exchange are of a very high order.

B. C. A.

Barium chloride. ANON. *U. S. Tariff Commission*, Feb. 7, 1929, 21 pp.—A preliminary statement of information obtained for use in a hearing before the U. S. Tariff Commission, to det. rates of duty. It includes description and uses of BaCl_2 , raw materials and sources, domestic and foreign production, imports, exports, prices, costs of production, rates of exchange, marketing and transportation, and a comparison of domestic and foreign costs.

W. C. EBAUGH

Potassium permanganate. THOMAS O. MARVIN, *et al.* *Rept. of the U. S. Tariff Commission to the President of the U. S.* 1928, 14 pp.—A report on the costs of production of KMnO_4 in the U. S. and in the principal competing countries. It is shown that Germany is the principal competing country; the present duty of 4 cts. per lb. on KMnO_4 (tariff act of 1922) does not equalize the difference in costs of production in the U. S. and in the competing country; a duty of 6 cts. per lb. would equalize such costs of production.

W. C. EBAUGH

The manufacture of saltpeter from sodium nitrate and potassium chloride. F. CHEMNITZ. *Chem.-Ztg.* 53, 85-6(1929).—Operating details of the usual method are given.

E. M. SYMMES

Talc and soapstone in 1927. ANON. *Bur. Mines, Mineral Resources of the U. S.*, 1927, Pt. II, 181-6 (preprint No. 18 published January 10, 1929).

E. H.

Economical lime burning. B. VÉCSEI. *Tüzelétech.* 1, 3-5(1928).—A considerable part of the heat content of flue gases is lost in lime kilns. The max. ideal utilization of fuel is about 65%. A heat exchanger would give a saving of 16-20% in fuel.

S. S. DE FINÁLY

Lime kilns heated with powdered coal. L. NASZÁLYI. *Tüzelétech.* 1, 7-8(1928).—Description of a special kiln in a French carbide factory for heating with powd. coal (Tarentaise coal). Much saving resulted from the use of this coal mined in the neighborhood, as compared with heating by Lyon gas coke.

S. S. DE FINÁLY

Catalysts for the reaction $\text{CO} + \text{H}_2\text{O} \rightleftharpoons \text{CO}_2 + \text{H}_2$. WALENTY DOMINIK. Warsaw Agricultural High School. *Przemysł Chem.* 11, 557-62(1927); cf. *C. A.* 22, 4334.—The process of prep. the catalyst was based on the equation: $3\text{FeCO}_3 + \text{HNO}_3 + 4\text{H}_2\text{O} = 3\text{Fe}(\text{OH})_3 + \text{NO} + 3\text{CO}_2$. Its activity was still great at a temp. as low as 390° working with a gas composed of CO_2 7.5, CO 17 and H_2 55%. The hypothesis was substantiated that only metal which possesses the least alk. properties, and the sulfide of which is readily hydrolyzed by water vapor, can be a permanent activator in presence of S gases. Thus, it was possible to reactivate the Fe catalyst with Cr or Al, but not with Co or Mn.

A. C. ZACHLIN

Testing of sealing wax. R. NITSCH. *Farben-Ztg.* 33, 2794-6(1928).—Sealing waxes are graded by examn. of their combustibility, degree of non-adhesion to the seal, adhesion to paper and "flow" and "drop" points (Ubbelohde). Standard methods of testing and specifications for 3 grades are detailed.

B. C. A.

Cl and cellulose (POMILIO) 23. The decomposition of NH_3 on Fe (MITTASCH, *et al.*) 2. Vertical column scrubber suitable for extracting NH_3 from gas (U. S. pat. 1,704,518) 1.

Boric acid. W. E. BURKE and H. DE ROPP (to American Potash & Chemical Corp.). *Brit.* 294,236, July 22, 1927. In a cyclic process, borax (which may be partly or wholly dehydrated) is treated with H_2SO_4 , and H_3BO_3 is sepd. by crystn. Borax and water

are added to the mother liquor and the latter is cooled to sep. Na_2SO_4 . The residual liquor is further mixed with borax and H_2SO_4 .

Hydrocyanic acid. ALBERT R. FRANK and NICODEM CARO. Fr. 645,760, Dec. 15, 1927. See Brit. 282,379 (C. A. 22, 3743).

Nitric acid. HERMANN FRISCHER. Fr. 644,691, Nov. 29, 1927. See Brit. 281,691 (C. A. 22, 3744).

Nitric acid. HARRY PAULING. Fr. 645,269, Nov. 7, 1927. See Brit. 292,830 (C. A. 23, 1479).

Sulfuric acid. A. O. JABGER (to Selden Co.). Brit. 294,975, Aug. 3, 1927. A catalyst for oxidizing SO_2 to SO_3 contains at least one catalytically active non-siliceous base-exchange material in which at least one catalytically active component (such as V) is chemically combined in exchangeable or non-exchangeable form, with or without stabilizers or stabilizer promoters chemically or physically assocd. with the base-exchange material. A large no. of examples and details of prepg. the catalysts are described. Cf. C. A. 23, 936.

Sulfuric acid. SOC. GÉNÉRALE MÉTALLURGIQUE DE HOBOKEN. Fr. 645,373, Dec. 7, 1927. H_2SO_4 of 54–63° Bé and contg. oxides of N are injected into the usual Pb chambers from nozzles. The amt. of acid injected is such that the acid collecting at the bottom of the chamber still contains nitrous products and the acid in the last chamber contains more than that in the 1st. A regulating tower as described in Ger. 208,028, rinsed with nitrosylsulfuric acid, may be inserted before the Gay-Lussac tower.

Process for the manufacture of hydrochloric acid and resultant products. E. CONNERADE and G. LIEVENS. Belg. 348,137, Feb. 29, 1928. By-product Cl is made to react with CH_4 hydrocarbons with the formation of C or of chlorinated derivs.

Silicic acid sols. I. G. FARBENIND. A.-G. Brit. 294,264, July 21, 1927. A purified silicic acid gel is treated with a small proportion of NH_3 (which may be in dil. aq. soln. or in gaseous form) and then heated for 24–48 hrs., evapn. being avoided. Sols contg. up to 15% of silica may be thus obtained.

Carbon dioxide. DRYICE CO. OF AMERICA. Fr. 644,697, Nov. 29, 1927. The amt. of liquid CO_2 in cylinders is controlled by adding the CO_2 in the solid state and allowing it to liquefy after closing the cylinders.

Ammonia synthesis. RALPH S. RICHARDSON (to Nitrogen Engineering Corp.). U. S. 1,704,214, March 5. In passing a gaseous mixt. of H and N over a catalyst mass at high temps. under pressures below 400 atm., the gas mixt. is first passed through a sepd. portion of the catalyst mass and the cooler, H N mixt. is then introduced into the outgoing mixt. and the combined gas mixt. thus prepd. is passed through another sepd. portion of the catalyst of greater content than the first-mentioned portion; a substantially uniform pressure is maintained in both of these stages. An app. is described Cf. C. A. 23, 487.

Ammonia from gas. FRED OSBORNE (to Semet-Solvay Co.). U. S. 1,703,405, Feb. 26. Gas contg. NH_3 together with water and other condensable substances is (a) cooled by heat exchange with gases from step "b" of the process; (b) passed through an elec. pptn. app. and then cooled and freed from condensate; (c) passed in heat exchange with the incoming gas in step "a"; and then passed to a saturator for removing NH_3 . An app. is described.

Recovery of salt by evaporation. METALLWERKE VORM. J. ADERS AKT. Fr. 644,895, Nov. 30, 1927. See Brit. 281,726 (C. A. 22, 3746).

Alkali solutions of high concentration. FRANZ BENCKER (to I. G. Farbenind. A.-G.). U. S. 1,704,909, March 12. An amalgam such as that of Na is decomposed with water in the presence of an org. nitro compd. such as PhNO_2 which serves to facilitate production of solns. of high concn.

Alkali cyanides. I. G. FARBENIND. A.-G. Fr. 644,778, Sept. 21, 1927. Alkali cyanides are prepd. by causing CO and NH_3 to react with oxides, hydrates or salts of alkali metals at temps. between 400° and 800°. Indifferent diluents or catalysts may be added. In examples, a mixt. contg. NH_3 35 and CO 65% by vol. is passed over a mixt. of MgO and NaOH at 500°, and a mixt. of equal parts of NH_3 and CO is passed over a mixt. of NaCN and Na_2CO_3 whereby the Na_2CO_3 is transformed to NaCN with liberation of H.

Metallic chlorides. I. G. FARBENIND. A.-G. Fr. 645,335, Dec. 7, 1927. Anhyd. metallic chlorides, e. g., AlCl_3 , are obtained by treating the primary materials contg. the metal as oxide, such as clay, with CO and Cl or COCl_2 in a heat-insulated vessel and using only the heat of reaction to maintain the temp. once the reaction has started. COCl_2 may be formed by passing CO and Cl over a catalyst. A preliminary rapid treatment with COCl_2 to remove Fe and Ti may be given. Cf. C. A. 22, 3497.

Potassium and other salts. I. G. FARBENIND. A.-G. Fr. 645,620, Dec. 13, 1927. Crude K salts, etc., are treated with steam instead of liquid solvents to recover KCl, etc. In examples sylvinitic carnallite, artificial carnallite and crude saltpeter are so treated.

Purifying solutions of zinc chloride or other metallic salts. I. G. FARBENIND. A.-G. Brit. 294,259, July 21, 1927. Solns. such as those of $ZnCl_2$ obtained in the manuf. of parchment paper or vulcanized fiber are purified by treatment with O or an O-contg. gas (suitably under 20 atm. pressure and at a temp. of 200°).

Preserving mixtures of iodides with sodium chloride. FRANZ MENTER. Austrian 112,104, June 15, 1926. Mixts. of iodides with NaCl, such as are used for treating goiter or as bath salts, are protected against loss of I by addn. of $MgCO_3$.

Alumina. JEAN C. SEAILLES. Fr. 33,485, Jan. 11, 1927. See Brit. 283,509 (C. A. 22, 4211).

Alumina and calcium sulfide. METALLBANK UND METALLURGISCHE GES. A.-G. and CONWAY, BARON VON GIRSEWALD. Brit. 294,079, Jan. 27, 1928. Al sulfide or a mixt. contg. it, such as results from an electrothermic process for extg. alumina from aluminiferous materials, is caused to react with CaO or a Ca compd. such as $CaCO_3$ to produce Al_2O_3 and the Ca sulfide formed is leached out (suitably with dil. acid). The Al sulfide and CaO may be heated to about $800-900^\circ$ and stirred and the reaction allowed to complete itself by the heat thus developed. Other modifications of procedure also are described.

Calcium nitrate. APPAREILS ET ÉVAPORATEURS KESTNER. Fr. 33,438, May 6, 1927. See Brit. 289,370 (C. A. 23, 674).

Precipitating ammonium nitrate or other substances from solutions. FINN JEREMIASSEN (to Aktieselskabet Krystal). U. S. 1,704,611, March 5. A cooled supersatd. soln. of a substance such as NH_4NO_3 of substantially uniform temp. is passed through a mass of granules of the substance, a portion of the soln. is discarded, and there is added and mixed with the remainder of the soln. passing through the granules a soln. of the substance having a higher temp. and concn., the mixed solns. are cooled to the first-mentioned uniform temp. and reintroduced into the mass of granules in a cyclic system of operation.

Silica and titanium oxide. P. SPENCE & SONS, LTD., T. J. I. CRAIG and A. KIRKHAM. Brit. 294,681, April 28, 1927. Siliceous residues obtained in the acid treatment of silicates decomposable by inorg. acids with removal of alumina, Fe oxide, alkalies and alk. earths are dissolved in Na_2CO_3 or K_2CO_3 soln., at about 160° and 80 lbs. per sq. in. pressure if the carbonate and silica are about in equimol. proportions and at lower temps. and pressures if the carbonate is in excess. Ti oxide, if present, remains in the residue. The silicate soln. formed may be decomposed with CO_2 or bicarbonate to ppt. flocculent silica.

Hydrogen. R. BATTIG. Brit. 294,113, July 16, 1927. The methane fraction obtained in the fractionation of coke-furnace gas is converted, with steam or O or both, into CO_2 and H. CO_2 is sepd. from this mixt. by washing with water under pressure, and the gas is then cooled to -70° to remove the water and then further cooled by use of liquid N or by evapn. of constituents of the gas itself, to effect fractionation. The H fraction thus obtained is treated directly with liquid N to remove the last traces of CH_4 , O and CO, and by suitably controlling the pressure and temp. while scrubbing with liquid N, a mixt. of H and N suitable for NH_3 synthesis may be obtained.

Hydrogen. GASVERARBEITUNGS GES. Brit. 294,580, July 26, 1927. H obtained from CH_4 or from CH_4 -contg. gases is, after removal of CO_2 , treated with liquid N (preferably under pressure) to remove other impurities such as CH_4 , CO, CS_2 , As compds., O and A. The H obtained contains N and the proportion of H and N may be adjusted for use in NH_3 synthesis.

Hydrogen. KOKUKENKYUJO. Brit. 294,958, Aug. 2, 1927. Inflammability of H and risk of its explosion in admixture with air are diminished by adding a small quantity of a gas or vapor having a higher theoretical flame propagation temp. than H, e. g., C_6H_6 , toluene, MeOH, EtOH or other alic., ether, paraffin hydrocarbons, methyl cyclohexane, dimethyl or diethyl selenide and other org. Se compds., or Et_4Sn , Et_4Pb or other org. Sn or Pb compds. CO_2 , N, He or other inert gases also may be added. The H may be used in aircraft, in NH_3 synthesis or in "oil hardening" or other industrial processes.

Hydrogen. OXYHYDRIQUE FRANÇAISE. Brit. 294,150, July 18, 1927. Caustic alkali soln. is caused to react with Si or Si compds. such as ferro-Si, under pressure, in a closed generator (the construction of which is described).

Carbon from carbon monoxide and carbonyls. CASSEL CYANIDE CO., LTD., and

T. EWAN. Brit. 294,759, July 5, 1927. Decompn. of CO is effected in the presence of massive catalysts such as Fe, Ni, Co or their oxides (preferably iron or mild steel in sheet form). The steel may be activated by dipping in fused NaCN, washing in water, reducing in CO or H and prolonged heating at 500–700° in CO, or by repeated oxidation and reduction in CO at 600–700°. The C is removed from the catalytic metal by scrapers which do not touch the surface, and when Fe is used as a catalyst the C may contain 3–13% Fe. Fe carbonyl may be formed in or added during the process and other carbonyls also may be used. Numerous details and modifications of the process are described.

Activated carbon. EMIL F. SCHELLER. U. S. 1,704,765, March 12. By the interaction of carbonaceous material such as wood charcoal with Na₂O (suitably by heating), an activated C is obtained 0.1 g. of which will produce a decolorization of 60% in 100 cc. of standard molasses soln. according to a test method which is described.

Active carbon. SOC. ANON. DES CHARBONS ACTIFS E. URBAIN. Brit. 294,214, July 20, 1927. Vegetable materials such as box wood or coconut shell, preferably carbonized at a temp. below 600°, or used active C such as that employed in benzene recovery is treated at 500–700° with vaporized P and the P retained in the material is oxidized to phosphoric acid and removed by washing. Superheated steam may be used for the P vaporization and supply and HCl may be added to decompose the H₃P formed.

Active carbon. JOHANNÈS VAN LOON. Fr. 645,602, Dec. 12, 1927. Active C is prepd. by grinding charcoal at a raised temp. and at ordinary or increased pressure in the presence of a liquid. Thus, charcoal is ground with steel balls in a rotating drum in water at 90°, and bone charcoal is ground in water heated to 150–180° under pressure. Mixts. of water and alc., or water and C₆H₆ may also be used. Cf. C. A. 23, 1482.

Catalytic hydrogenation of carbon oxides. AUGUST EISENHUT and ALBERT AUERHAHN (to I. G. Farbenind. A.-G.). U. S. 1,704,732, March 12. The oily liquid obtained by the catalytic hydrogenation of C oxides under pressure, and contg. oxygenated org. compds. of a higher order than MeOH, is sepd. into fractions and the fractions are treated with condensing agents to obtain *motor fuels, solvents for cellulose esters or for natural or artificial resins, use as detergents*, etc. The residue from the fractionation may be purified and used as a *resin for lacquers and varnishes*.

Condensation products of formaldehyde and urea. LEONARD SMIDTH (to Edward G. Budd Mfg. Co.). U. S. 1,704,347, March 5. After reaction between urea and CH₂O at a relatively low temp. (suitably about 25–35°), thiourea is added and water is distd. from the reaction product at a higher temp. U. S. 1,704,348 also relates to condensation products of CH₂O and urea to which thiourea and an acid substance are added.

Urea-formaldehyde condensation products. L. SMIDTH (to E. G. Budd Mfg. Co.). Brit. 294,253, July 21, 1927. See U. S. 1,704,348 (preceding abstract). Brit. 294,254 also relates to similar processes.

Impregnating substances and adhesives. I. G. FARBENIND. A.-G. Fr. 644,965, Dec. 1, 1927. Impregnating substances and adhesives of excellent quality are obtained by heating residues from stearin or the like with animal or vegetable oils which may be oxidized or polymerized, and with S or substances yielding it, with the addn. before, during or after this treatment, of substances extd. from tar by suitable solvents, e. g., alc., and finally, natural or artificial asphalts, tar, pitch or resins. In an example stearin residues, wood oil, whale oil and S are heated to 160°, an ext. with alc. from lignite tar is added and the heating continued until the desired degree of viscosity is reached.

Plates, molded articles, etc., of fibrous material and binders. F. A. W. KÜHN. Brit. 294,515, April 25, 1927. Shreds or flakes of paper or woven material up to 50 sq. cm. in area are mixed with an excess of a binder such as a rubber, resin or glue compn. and allowed to stratify by gravity, drained and pressed, with or without heating. Fillers, coloring substances, etc., also may be added.

Materials for the working surfaces of ginning rollers. SOC. ALSACIENNE DE CONSTRUCTIONS MÉCANIQUES. Brit. 295,020, Aug. 5, 1927. Rollers are faced with material such as used in friction clutch disks and which may comprise textile fibers, either woven or unwoven, agglomerated and indurated with natural or synthetic resins, rubber, etc.

Vegetable glue. LAWRENCE BRADSHAW and HENRY V. DUNHAM. U. S. 1,703,133, Feb. 26. A wood-working glue is formed from a seed meal rich in protein such as peanut meal together with added starch and an alkali. U. S. 1,703,134 specifies the use together of seed meal rich in protein, starch, casein and sufficient alkali to serve as a liquefying agent for the starch and proteins when water is added.

Strong, cohesive, acid-resistant and insulating product. J. A. PICHON. Belg. 349,232, March 31, 1928. One part of coal-tar pitch is mixed hot with 0.5–1 part of very finely powdered mica.

Emulsifying agents. SOC. ROL, LISTER ET CIE. Fr. 645,044, Dec. 2, 1927. An emulsifying agent for tar, bitumen and the like is obtained by heating a mixt. of amylaceous and saponifiable substances with an alk. substance to obtain peptonization and sapon. Thus, residual vegetable oil from paper manuf. 4, maize starch 1 and water 25 parts are heated to 50° with stirring. A 7% soln. of NaOH (17 parts) is added, and the mixt. heated nearly to boiling. A clear resin and maize starch with or without grease from soap manuf. may also be used.

Porous material. SOC. ANON. POUR L'IND. CHIM. A BÂLE. Fr. 644,648, Nov. 28, 1927. Artificial porous material is prepd. by transforming solns. of the condensation products of carbamides and aldehydes, particularly of urea and CH_2O , of which the first phase of condensation, *i. e.*, that including the formation of methylols, has been passed, in the presence of catalysts into solid, insol. polymerization products, which, after elimination of the catalysts, are given a final treatment under pressure. In an example, a neutral soln. of urea and 40% CH_2O is heated until a sample does not become turbid. H_2SO_4 is added to the product which is then poured into molds and allowed to harden. It is taken out of the mold and put into dil. NaOH to neutralize the H_2SO_4 and washed to eliminate electrolytes. After drying an absolutely white porous mass is obtained. Other examples are given.

Adsorption agents. METALLBANK UND METALLURGISCHE GESELLSCHAFT AKTIENGESELLSCHAFT. Fr. 644,810, Oct. 26, 1927. Solid adsorption agents are directly heated before washing by a current of hot air, gas, etc., acting in a cycle through the adsorption layer. The gas used may be that in the free vol. of the adsorber after termination of the adsorption period.

Process and kiln for pulverulent material such as limestone, cement, etc. J. BELLAY. Belg. 350,355, May 31, 1928. The powdered rock, etc., is fed continuously into an annular vertical chamber surrounding another annular chamber containing the fuel. Below the fuel chamber is a grate, and at the top of the central space is a steam boiler, the steam from which is sent under the grate. Gas burners using producer gas generated in the fuel chamber are provided to heat the fuel chamber internally and the outer rock chamber externally.

Thermoplastic substances. CAMILLE DREYFUS. Fr. 644,935, Nov. 30, 1927. See Can. 285,231 (C. A. 23, 912).

Plagioclases. FÉLIX SINGER. Fr. 645,562, Dec. 12, 1927. Artificial plagioclases are made by mixing O compds. of bivalent metals (Mg, Ca, Sr) or of bivalent Ba, Zn or Fe, either singly or together, with Al_2O_3 and SiO_2 or appropriate compds. of Al_2O_3 and SiO_2 and heating the mixt. to a temp. below fusion. An example contains MgO 10–20, Al_2O_3 33–43 and SiO_2 40–50%. Cf. C. A. 22, 3745.

Wetting agents for animal and vegetable materials. SOC. ANON. POUR L'IND. CHIM. A BÂLE. Brit. 294,890, July 28, 1927. Wetting and penetrating effect of acid liquids such as those used in carbonizing, fulling, in hat-making, for bleaching and washing, dyeing and chrome tanning is improved by addn. of monoacylated diamines and the un-*sym* diacylated diamines such as those described in Brit. 219,304 (C. A. 19, 523) and the corresponding quaternary ammonium compds. An example is given of the use of a small proportion of oleyldiethylenediamine.

Coatings for "carbon papers" and the like. R. D. BAIN, F. G. NIXON and LAMSON PARAGON SUPPLY CO., LTD. Brit. 295,118, July 18, 1927. Color compns. suitable for transfer purposes comprise coloring substances together with artificial resins or cellulose products of sol. character (which are used instead of the usual oils, waxes and fatty substances commonly included in similar compns.). Various examples are given. Brit. 295,119 relates to "carbon papers," typewriter ribbons, etc., made by the application, without heating, of similar compns. on paper or other fabric used.

Projection screens. M. HARPER. Brit. 294,850, Jan. 26, 1928. Projection screens are colored with a mixt. in equal proportions of transparent red, yellow and blue dyes or pigments to give them a deep neutral tint; they may be formed of frosted glass, celluloid, hardened gelatin or translucent textile fabrics which have been treated with varnish, gelatin or the like. Aniline dyes are suitable and may be sprayed on the screen surface or embedded in the screen.

Material for projection screens. TELEVISION, LTD., and J. L. BAIRD. Brit. 294,671, Jan. 26, 1927. Screens suitable for the projection of images by use of invisible rays (either ultra-violet or infra-red) may be covered with quinine sulfate, BaS or Ba

cyanoplatinite, or may consist of a fluorescent liquid such as paraffin oil in a container transparent to the invisible rays used, or may consist of a fluorescent vapor such as Na vapor which may be used as a free cloud or in a container.

Preventing obscuration of transparent glass plates by moisture. OMER DEMARET. U. S. 1,705,453, March 12. See Brit. 267,428 (*C. A.* 22, 1220).

Paper drinking cup impregnated with a mixture of paraffin and carnauba wax. JAMES D. REIFSNYDER (to Tulip Cup Corp.). U. S. 1,703,638, Feb. 26.

Polishing and grinding composition. BERTRAND SZILARD. U. S. 1,704,308, March 5. A compn. suitable for use in grinding and polishing materials such as *metals, wood, glass*, etc., is prepd. by mixing TiO_2 and a Ti salt (both in unroasted condition), prepg. a colloidal soln. from this mixt. and producing a fine ppt. from the soln.

Prepared wadding for polishing metals. J. JACQUES. Belg. 547,590, Jan. 31, 1928. The wadding is soaked in a liquid contg. products such as NH_3 , olein, $\text{K}_2\text{C}_2\text{O}_4$, CaCO_3 and petroleum.

Composition suitable for sealing joints exposed to gasoline. RALPH H. REITER (to Cleveland Trust Co.). U. S. 1,704,446, March 5. Starch is mixed with about 8 times its wt. of glycerol; starch is used which is at least partially hydrolyzed, and a homogeneous mixt. of jelly-like consistency is obtained.

Sheet material containing synthetic resin. GORDON E. WIGHTMAN (to Bakelite Corp.). U. S. 1,703,414, Feb. 26. Sheets are formed from a mixt. of fibrous material suspended in water with a reactive resin, and after draining excess water from the sheet it is further dried by moving it through a zone of reduced pressure while heating sufficiently to expel moisture without effecting reaction of the resin or lessening its plasticity.

Printing plates. MAX ULLMANN (to F. Ullman G. m. b. H.). U. S. 1,704,523, March 5. See Brit. 282,474 (*C. A.* 22, 3748).

Magnetic materials in finely divided form. JOHN W. ANDREWS (to Western Electric Co.). U. S. 1,703,287, Feb. 26. In prepg. material suitable for cores of loading coils of telephone circuits, Ni 80 and Fe 20 parts are melted in the presence of O, the molten material is boiled until oxidized, allowed to solidify and then rolled while hot until it has reached a temp. below its temp. of recrystn. and is then reduced to finely divided particles. Cf. *C. A.* 23, 1105.

Dynamo brush composition. NELSON R. HAAS (to Delco-Remy Corp.). U. S. 1,703,191, Feb. 26. Brushes are formed of a mixt. comprising graphite, artificial resin and a rubber vulcanization accelerating compd., molded under heat and pressure; the accelerating compd. serves to increase the hardness and durability of the product.

Shoe polish. A. MARLIER. Belg. 347,831, Feb. 29, 1928. Shoe polish is composed of AmOAc , Me_2CO , CHCl_3 , shellac, MeOH , castor oil, cellulose acetate, celluloid, coloring matter in powdered form and Fe_2O_3 .

Shoe-bottom filler. ANDREW THOMA (to North American Chemical Co.). U. S. 1,704,547, March 5. Granulated cork is used with wax tailings tempered with Lima oil, sulfite pitch and powdered mica. Cf. *C. A.* 23, 1231.

Chewing gums. B. ARKELL. Brit. 294,299, May 2, 1927. MgO or $\text{Mg}(\text{OH})_2$ is added to chewing gums to neutralize acids in the mouth. Various chewing-gum compns. are described.

Dental and other amalgams. DEUTSCHE GOLD- UND SILBER-SCHNEIDANSTALT VORM. ROESSLER and F. SCHOENBECK. Brit. 295,163, Nov. 29, 1927. The whole of the Hg is mixed with a portion of other metals such as Au, Ag, Cu or their alloys and subsequent mixing is effected with the remainder of the metal to be used.

Cartridge for fumigating with hydrocyanic acid. HARRY W. HOUGHTON (to Safety Fumigant Co.). U. S. 1,704,607, March 5. A mixt. of a cyanide such as NaCN and bleaching powder is used in such proportions as to produce cyanogen chloride when acted on by moist air. Various structural features of the cartridge are described. Cf. *C. A.* 22, 1643.

Rat poison. ADAM REMPEL. Ger. 470,777, Mar. 16, 1927. Castor oil treated with cresol soap soln. is mixed with fern ext. and NaHCO_3 dissolved in wine-vinegar. Meal or fat may be added to make the compn. pasty.

Fire-extinguishing compositions. MINIMAX A.-G. and J. HAUSEN. Brit. 294,616, July 27, 1927. Substances such as CCl_4 are admixed with other substances such as NH_3 compds. to prevent formation of phosgene or like injurious gases, and also with a moisture absorbing material such as dehydrated crystal hydrates to prevent decompn.

19—GLASS, CLAY PRODUCTS, REFRACTORIES AND ENAMELED METALS

G. E. BARTON AND C. H. KERR

Fractionated crystallization of technically pure glass. H. JERSEN-MARWEDDL. *Naturwissenschaften* 17, 84(1929).—Most technical glass has a compn. close to 72% SiO_2 , 14% CaO , 14% Na_2O (Morey and Bowen), *i. e.*, in the ternary diagram it lies in the field of primary crystn. of β -wollastonite at 1100°. If crystn. takes place, the glass surrounding the crystal will become richer in SiO_2 ; in this case diffusion is too slow and cristobalite crystals will be formed as soon as the SiO_2 field is reached. This again may cause excess of base and wollastonite sepn. until finally, after repeated alternation of both crystal species, the eutectic mixt. at 725° is reached. From microscopic observations, 4 drawings being given, this is confirmed; the paragenesis of β -wollastonite and cristobalite gives needles of the former more or less surrounded by a felt of the latter, which often appears as an efflorescence.

B. J. C. VAN DER HOEVEN

Dependence of alkaline and acid condition of glasses on the concentration of hydrogen ions. O. K. BOTVINKIN AND A. M. TANCHILEVICH. *Z. anorg. allgem. Chem.* 168, 356–60(1928).—Two samples of glass were crushed to 20–30 mesh and treated with HCl and KOH solns. The p_{H} of the glass after treatment changed with the concn. of the reagent used.

H. F. K.

Change in the optical transparency of certain ultra-violet transmitting glasses after exposure to x-rays and ultra-violet light. G. M. SHRUM, C. G. PATTEN AND H. D. SMITH. Physics Lab. Univ. of British Columbia, Can. *Trans. Roy. Soc. Can.* [3], 22, 433–6(1928).—Samples of com. glasses said to be transparent to short-wave lengths were treated to ultra-violet and to x-ray radiation and the solarization and coloration examd. Heat treatment at 300° removed the ability to luminesce from glasses exposed to quartz Hg-arc radiation. Similar heat treatment was equally efficient with luminescence following exposure to x-ray radiation. The disappearance of the thermoluminescence was marked by the complete recovery of the glass optically to transmit all wave lengths equally as well as when new. Coloration observed in the glasses exposed to x-ray radiation faded when the glasses were maintained for a time at 100°. The coloration and decoloration are assumed to be due to oxidation followed by reduction of certain constituents in the glass.

J. W. SHIPLEY

Colloid technical review. I. Glass. RAPHAEL ED. LIESEGANG. *Kolloid-Z.* 44, 251–8(1928).—The phases reviewed are the dispersoid chemistry of the glassy state, polymerization, gel formation, devitrification during the mfg. process, and later, chem. activity, dye-stuff adsorption, frosted and opaque glasses, colored glasses, viscosity and surface tension.

H. F. K.

Brown silica bricks. V. E. GRUM-GRZHIMAILO. *Feuerfest* 4, 105–6(1928).—In the manuf. of SiO_2 bricks, the inversion of quartz to tridymite is not readily attained if pure, coarsely ground quartzites are used. The formation of tridymite is facilitated if a bearing material, such as furnace slag, is added to the brick mixt., together with a reducing agent (coal, coke, etc.). The slags provide the necessary lime-Fe flux "ready-made," and the addn. of powdered charcoal, coke, etc., ensures the formation of FeO and not Fe_2O_3 , the former having better solvent properties. The addn. of H_3PO_4 promises special advantages, but this awaits confirmation. Bricks were made in the usual way, but with the addn. to the quartzite of 2.5% of basic slag from a Martin furnace (grain size below 1 mm.), powdered wood charcoal and 2% of milk of lime. The bricks obtained were of a chocolate color; under the microscope the ground mass appeared as a network of interlocking crystals, only the coarser quartz grains being shattered and unconverted. The bricks showed no expansion or cracking in service in a Martin furnace; they proved much more durable than ordinary SiO_2 bricks, and were much stronger mechanically. The chem. compn. was: 93.68% SiO_2 , 0.19% Al_2O_3 , 2.31% Fe_2O_3 , 3.21% CaO , 0.25% MgO , 0.38% MnO (P_2O_5 not detd.). Similar experience was obtained with bricks made with the addn. of 2–4% of reheating furnace slag, 1.5% of clay, 1.5% of coke dust and 1–1.5% of milk of lime.

B. C. A.

(Quartz) inversion phenomena in silica bricks in the crowns of Martin furnaces. V. E. GRUM-GRZHIMAILO. *Feuerfest* 4, 125(1928).— SiO_2 bricks taken from the crown of a Martin furnace consist of 4 zones, and analysis of these zones shows a considerable accumulation of CaO in the third (brown) zone from the hot face. Before use, a SiO_2 brick contains colloidal tridymite in which quartz grains are embedded; these grains are, so to speak, "moistened" with the glassy $\text{CaO-Fe}_2\text{O}_3\text{-Al}_2\text{O}_3$ matrix. The colloidal tridymite constitutes the solid cement, binding the brick together. The quartz is con-

verted by the glass into colloidal tridymite, which subsequently changes into the cryst. form. The more fusible the glassy matrix, the more readily does quartz inversion take place. FeO in the furnace gases is absorbed by the bricks, and this increases the fusibility of the fluxes in the bricks. If Fe is absorbed in sufficient quantity to form the eutectic compd. $3\text{FeO} \cdot \text{SiO}_2 \cdot \text{CaO} \cdot \text{SiO}_3$, the glass has a softening point of 1030° , and its capacity to penetrate the brick by capillary action in an upward direction reaches a max. Ferrous silicate, on the other hand, has a softening point of 1190° , so that a glass of this compn. remains in the lower portion of the brick. This explains the accumulation of CaO in the upper portion. It is suggested that FeO and CaO should be added in the form of Martin-furnace or Thomas slag to the SiO_2 -brick mixt., together with a certain quantity of coke or coal dust, in order to ensure the formation of ferrous silicate.

B. C. A.

Permeability to gases of silica bricks, mortar joints and masonry in the Siemens-Martin furnace. HUGO BANSSEN. *Archiv Eisenhüttenw.* 1, 687-92(1928).—The permeability nos. for silica bricks vary between 0.11 and 0.27 and for dry mortar joints without cracks, between 7.48 and 12.8. The permeability no. is expressed by $v l / a t p$, in which v = vol. of gas in cu. m., l = thickness of material tested, a = cross section in sq. m., t = time in hrs., and p = pressure in mm. of water column. The quality of brick is of considerable influence on its permeability to gases, as is also the presence of fine cracks in the mortar joints. With silica bricks permeability changes linearly with the pressure, while it does not in mortar joints. With and without mortar joints the permeability nos. of masonry lose their significance. For a masonry wall 115 mm. thick, and a total joint length of 20 m. and crack breadth of 3 m. the permeability no. is calcd. to be 1, while for the same wall the exptl. value is detd. as 17.5. The difference is due to cracks in the joints. Polished stone, without mortar joints, gives 3 times the loss as shown by masonry with such joints. The gas loss in the gas and air passages is detd. from the CO_2 content of the air shortly before its entrance to the heating chamber.

J. BALOZIAN.

Hartmann spiral bricks. J. TORNBLAD AND W. B. MITCHELL. *J. West. Steel Iron Steel Inst.* 36, Pt. II, 28-34(1928).—The advantages of Hartmann spiral bricks installed in hot blast stoves, regenerator chambers, etc., over the ordinary checker bricks are pointed out.

G. SCHWOCH.

Fire resistance of hollow load-bearing wall tile. S. H. INGBERG AND H. D. FOSTER. *Bur. Standards J. Research* 2, 1-333(1929).—The work reported consists chiefly of a series of fire tests of wall construction built of hollow load-bearing tile of representative designs and clay materials. The first tests were made on wall sections 1 ft. wide and 6 ft. high that were subjected to fire on one side while working under load, the main object being to det. how fire exposure affects the individual tile units. This was found to vary with the type of clay used, with hardness of burning and design of units, from minor cracking of a few of the units in the specimen to failure under load a little after 2 hrs. The second group of tests was with wall specimens 4 ft. wide and 4 ft. high; they were tested when exposed to fire on one side, under load or restrained within the contg. frame, and were made to study the effect of changes in design of unit, and in the constituents and prepn. of the clay. Addn. of up to 2% of ground burned clay (grog) to the raw clay was found to be without effect, but higher % increased the fire damage, apparently because of initial shrinkage cracks radiating from the grog particles. Addn. of up to 15% by vol. of sawdust to the raw clay decreased the tendency to cracking when exposed to fire without seriously decreasing the normal strength of the tile. Finer grinding and increased pugging of the raw clay increased the strength of the tile and consequently its load-carrying ability when exposed to fire. Of modifications in the design of the unit, one with double outside shells improved the fire resistance for all but very dense tile in confining the cracking mainly to an outer thin shell. Increased shell thickness was also found to decrease the fire effects, as also fillets up to $\frac{3}{4}$ -in. radius at the junctions of shells and webs. The final series consisted of 167 fire endurance tests and four fire and water tests of typical wall constructions, 71 of which were made with walls between 10 and 11 ft. high and 8 and 16 ft. wide. The thickness ranged from 8 to 16 in., and plaster, stucco or brick facings were applied on a number of the walls. The walls were subjected to const. applied loads of 70 to 120 lbs./sq. in. during the fire tests, were restrained within contg. frames, or were tested unrestrained, the latter being representative of walls in low buildings or the upper story walls of higher buildings. The results are summarized as fire-resistant periods, which are detd. by the time the walls sustained loads under fire exposure and prevented av. temp. rise on the unexposed side from exceeding 139° or the max. rise at any point where temp. measurements are taken from exceeding 180.6° . Freedom from cracks or openings large enough to transmit flame to ignite

combustible materials is also required both in fire-endurance tests and fire and water tests. The final grouping of test results is, in 3 classes, detd. by the design of the tile. Fire-resistance periods are given for 8-, 12- and 16-in. walls in each class, the values varying with the thickness and design from $1\frac{3}{4}$ to 11 hrs. for unplastered walls and from 4 to 15 hrs. for walls plastered on both sides. Periods are also given for walls assumed to have combustible members projecting into them 4 in. from the exposed sides, these being detd. by the time required for temps. high enough to ignite wood to be obtained at the given depth in the wall. Fire-resistance periods for this condition ranges from 1 hr. with 8-in. unplastered walls to 10 hrs. with 16-in. plastered walls built of tile of the designs giving the highest results. The article contains a large number of tables, several pages of photographs and about 140 graphs.

O. A. NELSON

The relation between rigidity and temperature of refractories. H. HIRSCH. Chem. Lab. Tonind., Berlin. *Tonind.-Ztg.* 53, 2(1929).—Cylindrical test pieces 50 mm. in diam. and 45 mm. high were heated in a C resistance furnace. Load was applied by means of a screw. The app. is described in detail. The furnace was brought to a definite temp. and the crushing strength detd. Data were collected over the range 200° to 1400° for 6 fire-brick and for SiO_2 , MgCO_3 , chrome and Al_2O_3 refractories. The effects of the addn. of quartzite, CaO , MgO , TiO_2 and feldspar were also investigated. Clay brick reached a max. crushing strength between 1000° and 1200°. The max. appears to depend on the glass content of the mass. Fluxes lower the max. strength. The method of manuf. and burning also affects the shape of the curves. R. F. F.

Plasticity. V. Plastic masses of various inorganic substances and their ceramic utilization. O. RUFF AND A. RIEBETH. *Z. anorg. allgem. Chem.* 173, 373-94(1928); *J. C. I.* 22, 4031. All solids which are wetted by a suitable liquid which does not dissolve them will form a plastic mass of the second order with that liquid if they are in a sufficiently finely divided form. Silica, WO_3 and red phosphorus give good plastic masses with water alone; other solids require an acid electrolyte, and the strength usually increases with decrease of p_H . The formation of these masses is due to electrolytic disson of an adsorption complex with the generation of an elec. charge on the surface of the solid and the formation of liquid shells around the solid particles. Al_2O_3 when stirred in 0.05-0.1 N HCl forms a slip which, when cast in plaster molds, air-dried, and burnt at 900°, then at 1600°, yields dense, hard and strong ware. For making zirconia crucibles the pure oxide is fired at 1200° and ground for 20 hrs. in water; HCl is stirred in to 0.2 N, the supernatant liquor removed after 2 days' settling, the plastic mass dried at 120° to 25%, moisture and pressed into shape under 1000 atm. The shapes after burning at 2200° form a fine porcelain-like mass which will not fracture when quenched from a white heat. Good results are obtained from a zirconia slip made from oxide which has been calcined at 1400° and ground in 0.2 N HCl; the slip is cast in plaster, and the shapes are slowly dried, preheated at 1000°, brought slowly up to 1200-1500°, and finally fired at 1700°. Ceria and titania crucibles are made similarly, using V HCl and burning temps. of 1500° and 1400°, resp. Carborundum gives good results when ground with N HCl and the castings are fired at 1500°, but magnesia shapes obtained by any of the above procedures usually break on firing.

B. C. A.

Problems of the Institute for Mineralogy on the Polytechnicum at Aachen. HERMANN SALMANG. *Stahl u. Eisen* 48, 1209-12(1928).—Outline of ceramic research work.

J. A. S.

Kieselguhr and its importance. M. BERGER. *Tonind.-Ztg.* 53, 25(1929).—Mention is made of the various com. applications of the diatomaceous earths. R. F. F.

Rontgen tube of glass (U. S. pat. 1,703,391) 1. Mercury-vapor lamps (Brit. pat. 949) 4.

NIEDERLEUTHNER, RUDOLF. **Unbildsame rohstoffe keramischer Massen.** Berlin: John Springer. 592 pp. M. 39. Reviewed in *Ceramic Abstracts* 8, 233(1929).

Sheet-glass manufacture. DOMINIC F. CANNON (to Pittsburgh Plate Glass Co.). U. S. 1,704,552, March 5. A blast of gas such as air is used for holding up the advance edge of a plastic sheet of glass as it passes from a forming roll onto a runway. An app. is described.

Apparatus for making sheets of glass. JEAN H. LEMAIRE. Fr. 644,874, Nov. 25, 1927.

Compound transparent sheets. HERBERT J. MALLABAR. Fr. 645,111, Dec. 3,

1927. Composite sheets of glass and cellulose acetate are formed by coating the surfaces to be united with a layer of gelatin, which when dry is softened with a dil. soln. of gelatin in volatile solvents; the sheets are then pressed together. The gelatin is treated with a soln. of water glass or a soln. of gelatin to which is added a small amt. of chrome alum neutralized with Na_2CO_3 to make it adhere to the glass, and the cellulose acetate is treated with ether before coating with gelatin. The sheets may be tinted as desired.

Vertical drawing of glass rod or tubing. R. SALOMON. Brit. 204,216, July 20, 1927. An app. and various mech. features of operation are described.

Glass-blowing apparatus. LEONARD D. SOUBIER (to Owens Bottle Co.). U. S. 1,705,341, March 12.

Annealing glassware substantially without loss of heat from the molding operation and while spaced apart in a single line. ROBERT L. FRINK. U. S. 1,704,502, March 5. An app. is described.

Oven and associated mechanical features for annealing glass plates. NAAMLOOZE VENNOOTSCHAP MAATSCHAPPIJ TOT BEHEER EN EXPLOIT VAN OCTROOIEN. Brit. 294,258, July 22, 1927. Various structural features are specified.

Glass-annealing leer (heated by liquid fuel and thermostatically controlled). HARTFORD-EMPIRE Co. (to British Hartford-Fairmont Syndicate, Ltd.). Brit. 294,775, Aug. 4, 1927.

Furnace for annealing glass and the like. THE UNITED GLASS BOTTLE MANUFACTURERS, LTD. Fr. 645,005, Oct. 27, 1927.

Glass-making furnace. THE GENERAL ELECTRIC CO., LTD. Fr. 645,157, Dec. 5, 1927.

Crucible for the melting and refining of glass. L. BRUHIÈRE. Belg. 350,091, April 30, 1928. The crucible comprises two open melting compartments, partially superposed and communicating with each other; also two completely covered refining chambers, one on each side of the lower melting chamber, with which they are connected by means of openings in the bottom of the sepg. walls. By this arrangement either of the melting chambers can be used, and the same or different temps. can be maintained in the two refining chambers.

Preventing clouding of glass by weathering. K. KAMITA and ASAHI GARASEI KABUSHIKI KAISHA. Brit. 294,391, Aug. 25, 1927. Clouding of glass by atm. influences is prevented by treating the glass, at about the annealing temp., with an acid gas such as air or furnace gas contg. SO_2 , SO_3 or HCl . The surface of the glass becomes covered with a white powder which is wiped off after the glass has cooled.

Apparatus for classifying clays or other materials by elutriation. LEONARD ANDREWS. U. S. 1,705,351, March 12.

Bricks and tiles. J. DUNLEVY and R. JOHNSON. Brit. 294,760, July 5, 1927. A plastic mixt. for making bricks and tiles is formed from glassmakers' waste sand 60, brickmakers' clay 35 and limestone 5%.

Sagger for supporting tiles to be burnt. ROBERT E. ANDERSON and DANIEL P. FORST (to Robertson Art Tile Co.). U. S. 1,704,070, March 5. Structural features.

Molding plastic substances. WILLIAM J. MILLER. Fr. 645,064, Dec. 2, 1927. A method of delivering the plastic substances by means of an Archimedean screw to molds in pottery manuf. is described.

Fuel charger for brick kilns. ERNST SCHOEPKE. Austrian 112,228, Sept. 15, 1928.

Charging and discharging ceramic furnaces automatically. SOC. D'EXPLOITATION DES PROCÉDÉS HIDOUX. Fr. 645,266, Nov. 5, 1927.

Apparatus for preparing and molding ceramic slip. THOMAS S. CURTIS (to Vitrefrax Corp.). U. S. 1,703,871, March 5.

Ceramic substances. FÉLIX SINGER. Fr. 645,614, Dec. 13, 1927. The coeff. of expansion of steatite or other compds. of Mg and products made therefrom is reduced by adding compds. of Al and heating until the formation of 3 phases. The first phase is a glass, n 1.53–1.555; the other 2 are crystallites, crystals of the sillimanite and crystd. silicates of alk. earths of the enstatite or forsterite type.

Ceramic products. FÉLIX SINGER. Fr. 645,726, Dec. 14, 1927. To prevent the aging of ceramic products, compds. (particularly the oxides) of Ce, Zr, Cr, Mn, P, W or V are added to the usual constituents.

Refractory materials. I. G. FARBENIND. A.-G. Brit. 294,552, July 25, 1927. Refractory materials of high thermal cond. suitable for lining vessels are prepd. with a high proportion of Si ("pure or ferrous"); e. g., finely ground Si 95 parts is mixed with milk of lime 5 parts and the mixt. is burnt. Sand, clay or fluxes such as cryolite, feldspar or waterglass may be added. By the use of a suitable binder and flux an acid-proof product

is obtained, and by burning at a temp. above 1200° the material may be rendered alkali-proof.

Refractory products from bauxite. SOC. ANON. DES MANUFACTURES DES GLACES ET PRODUITS CHIMIQUES DE ST.-GOBAIN, CHAUNY, ET CIREY. Brit. 294,179, July 19, 1927. Raw bauxite mixed with 0.5–2.0% of a fluoride or fluosilicate of an alkali or alk. earth metal is calcined and ground and further mixed, while moistened, with addnl. bauxite or refractory clay and an equiv. quantity of fluoride or fluosilicate. The final mixt. is molded and burned.

Refractory bricks. SOC. LORRAINE DES ACIERIES DE ROMBAS. Brit. 295,051, Aug. 6, 1926. Bricks for use in metallurgical furnaces are made from a dampened mixt. of blast-furnace mouth dust, coke dust and ferrous flux by pressing and then firing in a kiln such as is used for clay bricks. The flux may be ashes contg. ferrous oxide.

Apparatus (heated by electric arcs) for melting and casting highly refractory materials. HENRY L. COLES and JOSEPH G. DONALDSON (to Guardian Metals Co.). U. S. 1,703,658, Feb. 26.

Sintering granular refractory material for hearths, heating rings or the like of metallurgical furnaces, etc. WILHELM ROHN (to Vacuum-Schmelze G. m. b. H.). U. S. 1,704,902, March 12. Mech. features.

Enameled steel. WESLEY J. BECK and JAMES A. AUPPERLE (to American Rolling Mill Co.). U. S. 1,704,586, March 5. In forming enameled articles, steel is used which, except for Si, comes within the "mild steel" range and contains in addn. such quantity of Si (suitably about 0.15%) as to give a good bond with the enamel but not sufficient to spoil the deep drawing and spinning property in the steel prior to enameling.

20—CEMENT AND OTHER BUILDING MATERIALS

J. C. WITT

Cement in 1927. B. W. BAGLEY. Bur. Mines, *Mineral Resources of the U. S.* 1927, Pt. II, 269–98 (preprint No. 24, published January 23, 1929). E. H.

Mechanism of the setting and hardening of cement. TUTOMU MAEDA. *Chimie et industrie* 21, 35–6(1929).—See C. A. 22, 3505. A PAPINEAU-COUTURE

The heating of rotary cement furnaces by individual apparatus using pulverized coal. L. MORIN. *Chaleur ind.* 9, 146–9(1928).—M. describes an arrangement and gives two photographs and one line diagram of the layout. A hopper receives the coal which is distributed, crushed, dried and injected. A few m. from the point of injection is the clinkerization zone where the temp. is about 1400–1500°. The clinker falls into a cooler where it gives up its heat to the air used for combustion. In most cases the coal is dried to below 1% moisture and then crushed in a ball or tube mill insufficiently ventilated. After being crushed the coal may pass through an air selector and it is then stocked in the feed hopper, the whole forming an individual piece of app., a kind of condensed central pulverization plant. A fan is added to supply air for combustion. This air as well as that for the grinder comes from the clinker box at about 200–250°. In this system power consumption is reduced, cost is less than in a central pulverizing station, the general working of the rotary furnace is not interrupted and poor coal and semi-lignite can be used. S. L. B. ETHERTON

Effect of temperature on the strength of concrete. C. C. WILEY. Univ. of Illinois. *Eng. News-Record* 102, 179–81(1929).—The effect of temp. on the strength of concrete was detd.; 6 × 12 in. cylinders were used and the results shown graphically.

One series specimens were stored at the following approx. temps.: 5, 35, 70, 100 and 205° F. Conclusions: (1) At 100° the same strength is obtained in approx. half the time required at 70°. (2) At 35° somewhat more than twice the time is required to reach the same strength as at 70°. (3) At all ages between 3 and 28 days the difference in strength is practically 30 lb. per sq. in. per degree F. (4) Frozen concrete shows practically no gain in strength. (5) Curing in satd. steam vapor (203–208°) has a deleterious effect, a slight increase in strength during the first few days being followed by a decided retrogression. Cylinders broken while still frozen at the age of 7 days had strength greater than that obtained at 28 days with normal curing at 70°. A 2nd series of cylinders was stored in a moist room at 70°, groups being removed and placed in a refrigerator at 5° for 4 days at the ages of 1, 3, 5, 7 and 10 days, then thawed and returned to the moist room. Conclusions: (1) Frozen concrete when thawed out again begins to gain strength. (2) Both the rate and magnitude of the gain in strength depend on the age at which the concrete is frozen and are materially less for

the early ages. (3) Concrete frozen before a certain age, which may be termed the critical age, suffers permanent damage. (4) The critical age is apparently that at which the cement paste has developed sufficient strength and adhesion to the aggregate that free water cannot collect around the rock particles and in freezing break the bond with the cement. (5) For the mix and materials used in the expts., the critical age appears to be between 7 and 10 days. The critical age is probably longer for leaner mixes and with coarser aggregate. (6) The strength of concrete frozen at the age of 1 day is less than half of that of unfrozen concrete. That frozen at 3 5 days has an indicated permanent loss in strength of 15-20%. The loss in strength at 7 days is small, if any, and at 10 days no ultimate loss occurs, but the rate of gain in strength is distinctly retarded. It is recommended that all concrete be protected from freezing for at least 1 week at a temp. of 70° F., or twice as long at 35°. R. E. THOMPSON

Automatic measuring and charging tank for calcium chloride. HARRY D. WELLS. *Eng. News-Record* 102, 193(1929).—A brief description of a device for automatically charging a measured amt. of CaCl_2 soln. into the drum of a concrete mixer.

R. E. THOMPSON

Aggregate moisture determination by specific gravity. W. M. DUNAGAN. *Eng. News-Record* 102, 285(1929).—Further discussion in reply to criticism of McCall (cf. C. A. 23, 1489). D. states that detn. of both free moisture and absorption by the sp. gr. principle has been thoroughly checked with the flame method and give results usually within 0.1%. This is well within the accuracy of the relations establishing the water-cement ratio curves.

R. E. THOMPSON

Action of water on tri-Ca silicate and β di Ca silicate (THORVALDSON, VIGFUSSON) 6. Fire resistance of hollow load-bearing wall tile (INGBERG, FOSTER) 19. The capillary structure of soft woods (STAMM) 11D. Plating non-metallic surfaces with metal (U. S. pat. 1,704,125) 4. Composite rubber flooring manufacture (U. S. pat. 1,703,312) 30. Process and kiln for pulverulent material such as limestone, cement, etc. (Belg. pat. 350,355) 18.

Handbuch der Holzkonservierung. Berlin: J. Springer. Edited by Ernst Troschel. 434 pp.

Cement. E. GOFFART. Brit. 294,111, July 16, 1927. A slow setting cement having high initial strength is formed by increasing the alumina content of portland cement and adding a protective colloid such as albumin, casein, gelatin, gum, algae or starch. Bauxite may be added to the raw materials or calcic aluminates may be added to the fired materials during or after grinding. The colloid may be added dry or may be added with the gaging water.

Cement. GERALD N. WHITE and SCOTTISH DYES, LTD. Fr. 644,842, Nov. 10, 1927. Incrustations on cement are prevented and the setting properties are improved by the addn. of substances, preferably sol. in water, such as $(\text{NH}_4)_2\text{CO}_3$, $(\text{NH}_4)\text{HCO}_3$, boric acid, ammonium phosphate, urea or a slightly sol. or insol. substance such as a salt of Ca, which will neutralize the lime and give insol. compds. Thus, 5% of $(\text{NH}_4)_2\text{CO}_3$ may be added. In cement washes the amt. may be 25-50%. The cement may be colored by an anthraquinone vat dye.

Forming mottled colored cement blocks. MARTIN HOFFMAN. U. S. 1,704,193, March 5. Mech. features of successively depositing differently colored materials in a mold are specified.

Burning cement material, roasting ores, etc. M. GENSBAUR. Brit. 294,191, July 20, 1927. Various mech. features and a rotary kiln construction are described.

Faced cement sheets or plates. P. LANGGUTH. Brit. 294,843, Jan. 12, 1928. Concrete sheets or plates formed with hydraulic cement are coated on both sides with a layer formed of equal parts of disintegrated wood and magnesite cement with which asbestos and talcum also may be mixed.

Apparatus and system for percolating sand with water before its admixture with cement. WILLIAM M. VENABLE (to Blaw-Knox Co.). U. S. 1,704,268, March 5.

Cementitious coating composition. LOUIS G. MAUER. U. S. 1,704,622, March 5. In prepg. a material suitable for coating buildings, etc., a cementitious and a siliceous material such as portland cement and finely divided silica are mixed with an excess of water contg. alum and an org. colloid such as glue and Japanese vegetable wax and an oil such as tung oil is homogeneously mixed with the materials; the mixt. is permitted to set sufficiently to give it a self-sustaining non-fluent form, agitated to release excess water, and, after removing the liberated water, the mixt. is dispersed in addnl. oil.

Treating concrete, etc., prior to enameling. P. RICHIR. Belg. 350,780, May 31,

1928. The surface to be treated is impregnated with a soln. of a nitrate or fluoride, e. g., $\text{Mg}(\text{NO}_3)_2$ or MgF_2 , and the enamel is then applied directly to the surface thus treated. A non-volatile mineral oil soap may be added to the water used in mixing the mortar.

Bituminous cement aggregate mixtures suitable for paving, roofing, etc. EUGENE H. HENLEY. U. S. 1,703,999, March 5. Preheated dry aggregate is mixed in a sealed receptacle with molten bituminous material and sufficient water is introduced into the hot materials to generate a desired steam pressure. An app. is described.

Admixing bituminous material with mineral aggregates. CRAIG R. ARNOLD. U. S. 1,703,864, March 5. An app. is described in which hot mixing is effected *in vacuo*, for prep. compns. for *paving, roofing* or other purposes.

Paving material. CHARLES A. MULLEN (to Amiesite Asphalt Co. of America). U. S. 1,705,333, March 12. Irregularly shaped particles such as those of broken rock are first treated with a liquid diffusion agent such as water which is not miscible with the liquefier subsequently used, then mixed with a liquefier such as kerosene and with an asphalt cement. Cf. C. A. 22, 3972.

Pavement. EUGENE V. SPENCE. U. S. 1,704,771, March 12. Structural features are specified of a pavement comprising graded layers of mud shell, fine mineral filler and an asphaltic binder.

Pavements. SAMUEL S. SADTLER (to Amiesite Foundation Co.). U. S. 1,705,066, March 12. A foundation course composed of clayey soil mixed with hydrated lime and water to form a compact cement-like compn. is overlaid with a sheet of fibrous material such as tarred paper and a superposed sheet of reticulated metal, these sheets are covered with a liquid asphaltic compn. and with a surface layer such as "Amiesite." U. S. 1,705,067 specifies a roadway with a foundation of compacted sandy soil, sheets of tarred paper over this with their edges overlapping to shed water, strips of metal fabric over this and coated with liquid asphaltic material and a surface course of stone aggregate coated with and bonded by the asphaltic material. U. S. 1,705,068 specifies a foundation course of sand wetted and compacted with a mixt. formed from Na silicate, H_2SO_4 and water, coarse woven textile material impregnated with liquid asphalt over the foundation, an overlying layer of open-mesh metal fabric and a surface course of stone aggregate, the stones of which are coated and bound with asphaltic material. The stones adjacent the metal fabric are larger than the mesh of this fabric.

Concrete pavements. PERCY A. HIPPLE. U. S. 1,705,088, March 12. In finishing concrete pavement slabs, fine particles of cement are forcibly introduced into the pores formed in the surface of the slabs by the rising water mixed with the material for effecting hydration of the cement, by directing against the surface of the material a fine spray of a fluid such as water not chemically deterrent to the setting of the concrete.

Rubber-surfaced pavement or flooring. MERWYN C. TEAGUE (to Naugatuck Chemical Co.). U. S. 1,705,273, March 12. A rigid base is formed of plastic material such as concrete, a comminuted binding material such as ground slate or cork is embedded in the base while it is still plastic, the base is hardened, and there is then applied to it an aq. dispersion of rubber contg. a sulfonated oil.

Roofing material. ANDREW H. IRVING (to The Paraffine Companies). • U. S. 1,705,015, March 12. A layer of asphalt-satd. felt is faced on its upper side with a coating of asphalt and is coated with coal-tar pitch on its lower side, and is used with an underlying layer of rosin-sized paper faced on the upper side with coal-tar pitch.

Plaster. JULIUS E. UNDERWOOD and CHARLES A. CABELL (to National Lime Association). U. S. 1,703,125, Feb. 26. A compn. suitable for use as a plaster, mortar or building block compn. comprises hydrated lime, hydrated Ca aluminate, a carbonate such as CaCO_3 , a sulfate such as $\text{Al}_2(\text{SO}_4)_3$, and sugar or other suitable retarder.

"Artificial plaster." LOUIS E. CHASSEVENT. U. S. 1,703,097, Feb. 26. A mixt. of plaster and water is subjected to such a high pressure that the quantity of water in the compressed plaster will be substantially that corresponding to the transformation of the plaster into gypsum.

Wall-coating composition. EDWARD E. STAHLHUT. U. S. 1,705,074, March 12. See Can. 283,881 (C. A. 23, 687).

Building or heat-insulating material. RHEINHOLD & Co., VEREINIGTE KIESEL-GEHR UND KORKSTREINGES. Ger. 470,846, Aug. 25, 1926. Fillers of any suitable kind are mixed with a plastic binder, e. g., a mixt. of bitumen with a solvent.

Composition board. GUSTAVE KLINKENSTEIN and GUSTAVE D. MAGNUS (to Maas & Waldstein Co.). U. S. 1,705,090, March 12. In order to render porous composition board such as that formed from cement and fiber mixts. impervious to water, it is heated to remove moisture and expel air from the interstices and then im-

parallel to the bedding plane, the coal must be mounted parallel to one side of the box to within 5°. Otherwise a stepped appearance very troublesome to remove will be obtained in cutting. If durain bands are comparatively rare and the box is not over 6-7" high, a band saw with 14 teeth to the inch will cut satisfactorily. For sections up to 12" a reciprocating saw can be used. When brittle, the coal is washed several times in a soln. of shellac in MeOH. A suitable milling cutter, at slow speed, will give a perfectly smooth surface. If the coal is very brittle and dry, an emery wheel is better than a milling cutter. The milling process gives a section about 1/8" thick. The radiographic technic is described by K. in *Trans. Inst. Mining Eng.* 67 (1924). Relatively, coal substance is, and inorg. substance is not, transparent. Nevertheless, areas are present where no differentiation can be detected. It is improbable that differences in compn. of the coal substance can be detected by ordinary radiographic methods. Six large plates are shown and there are 25 references. S. L. B. ETHERTON

New views on the chemical utilization of coal. CHARLES BERTHELOT. *Bull. soc. encour. ind. nat.* 1928, 822-54; cf. *C. A.* 22, 3759, 4225.—A general review of the coal question, the following being briefly considered. (a) General methods for the chem. utilization of coal including high- and low-temp. carbonization, hydrogenation, reduction of CO with Badische Anilin- und Soda Fabrik patents of 1913-4, synthesis of MeOH, Patart's patent, Fischer's synthol, Fischer's and Tropsch's hydrocarbons, Kling and Florentin's process, Bergius process, (b) N₂ question including prepn. of (NH₄)₂SO₄ from gypsum, mixed fertilizers, (NH₄)₂HPO₄, Claude's "potazote," (c) the general organization for fuel and synthetic ammonia manufacture, with some Norwegian, Italian, German and French financial data. S. L. B. ETHERTON

Drying of coal under pressure. B. DE MORY. *Chem. Rundschau* (Budapest) 5, 65-7(1928).—Lignites of low calorific value can be made more valuable by drying. The material falls to pieces if dried too rapidly. Temp. and pressure influence the drying. Expts. showed Hungarian lignites of 2000-3000 cal. could be dried successfully at 8-15 atm. pressure by steam and an undisintegrated product of about 4700-5000 cal. and 12-15% water content could be obtained. S. S. DE FINÁLY

Investigation on the ignition of coal—the ignition of pure carbon. L. DUNOVER. *Chaleur ind.* 9, 43-53(1928).—The slow combustion of graphite starts much below 650°, the temp. given by Moissan. The particle warms up and radiates heat and if the walls heat up slowly enough the particle may be completely transformed into CO or CO₂ without any incandescence. Grain size has no influence. D. describes his app. for controlling the temp. of a very small amt. of powd. C and gives 2 sketches. He worked with ashless Acheson graphite and found that the ignition point of graphite is 767° for particles 0.05 mm. Moissan had given the ignition point as about 700°. D. claims a degree of accuracy for his method equal to that for the m. p. under analogous conditions and checks up with KI. S. L. B. ETHERTON

Washability of low-grade bituminous coal. KICHIRO YAMAGUCHI AND YUJI SUGINO. *Imp. Fuel Research Inst. J. Fuel Soc. (Japan)* (English section) 7, 95-101 (1928).—By a modified Henry Tube method the authors carried out the expt. on several Japanese low-grade bituminous coals. The results of tests are tabulated and also illustrated by means of curves. The yield of washed coal with various ash contents, say 10, 15 and 25%, is summarized in the table which is directly obtained from the washability curves. F. I. NAKAMURA

Briquetting of coal powder without the use of binder. W. SWIENTOSLAWSKI, B. ROGA AND M. CHORAZY. *Research Inst. (Poland). Przemysl Chem.* 13, 2-12, 40-9 (1929).—When a binder is used the properties of briquets depend principally on the binder, but when no binder is used their properties depend on those of the raw material, e. g., plasticity, baking qualities, etc., and also on certain phys. factors in manuf. The raw materials were analyzed and then made up into 25 g. briquets under varied but well controlled conditions of temp., pressure, time of heating and fineness. These were then tested for resistance to grinding and to mech. shock by falling. Coking and non-coking coals from Upper Silesia and Dabrowa were studied. Briquets made of coking coals show low endurance to the mech. tests while non-coking coals show good endurance in these tests. The addn. of up to 30% of coking coals in non-coking coals improves briquets made without a binder. For 8 non-coking coals the optimum temp. was found to be 400-420°, which is considerably higher than that recommended in patent literature. Under the best conditions of temp. the min. pressure required is 400 kg./sq. cm. Usually the time of baking ranges from 30 to 45 min. and the best fineness is 0-2 mm. grains. It is shown that briquets without binder are useful in many respects as a new fuel material. Mechanically they are strong, and their fuel value is equal to that of technical briquets, and higher than that of the raw material. They have low

ignition temp. (cf. Swientoslawski and Roga, *C. A.* 22, 2047) and burn down without crumbling away to fine particles which might clog up the grate. In burning they produce less smoke than briquets with binder or coal. They are not hygroscopic and are not subject to the action of atm. factors. Numerous graphs illustrate the data. A patent review and bibliography are given.

Briquetting. JEAN BING. *Chaleur ind.* 9, 21-9(1928).—Coal for briquetting should not contain over 3% moisture; hence washery residues require preliminary drying. Rotary furnaces with one floor are generally used for this and if the coal contains over 10% moisture the furnace may contain several floors. The coal is turned over by radial arms and leaves at the center. The pitch requires fine grinding and the results depend on the fineness. The Carr grinder is very good, is robust, and does not lend itself to gluing of the pitch. The pitch is then incorporated with the fuel in an externally heated app. The material is then formed into briquets upon a horizontal plate and then pressed vertically at about 20 kg./cm.² The analysis of briquets comprises fusion pt., free C, insol. in various solvents, volatile matter and ash. B. discusses the method of Goutal, Taylor, Kraemer and Spilker, the cube method, Kraemer and Sarnow, and the American method for testing the strength of briquets. He then considers pitch substitutes, autoagglomeration, the future of briquetting and the briquetting of lignites and semi-coke. He adds production statistics for France, Germany, Belgium, Gt. Britain, Spain, Holland, Poland, Czechoslovakia and Hungary. A short discussion is appended.

Economics of powdered-coal firing for steam boilers. FR. SCHULTE. *Gas u. Wasserfach* 72, 33-9(1929).—An analysis is made of the cost of steam generation for various types of German coals.

Note on boiler heating with pulverized coal. WEISS AND MUNIER. *Chaleur ind.* 9, 105-16(1928).—The removal of ash in the molten state often means rapid deterioration of furnace walls and moreover with coals of high m. p. is rather troublesome. The method of the collection of pulverulent ash is costly because of the equipment required and other causes. With an air current of 25m./sec. complete combustion is obtained within 7-8 m. and with the preliminary furnace in the form of a tunnel the injected pulverized coal lights easily, all sorts of coal can be used and most of the ash falls into the lower portion of the furnace. To assist in the cooling of the ash, tube screens are used. A description of the pulverized coal installation is given together with 10 figures and photographs.

Boiler heating with powdered coal in France. N. SCHWERESCHEWSKY. *Chaleur ind.* 9, 85-98(1928).—Statistics show the extent of the use of powdered coal for heating boilers in France, especially in central power stations, in cement and metallurgical industries, and in marine and locomotive boilers. Coal fineness used is 100-200, sometimes 250, and more rarely 300. With the spread of powdered coal the vol. of the combustion chamber increases. The use of water screens is also increasing and more recently Murray tubes are being adopted; 34% of the total use preheated air. A table shows the disposition of the ash formed (a) in the combustion chamber, (b) in the economizer, and (c) through the chimney. German and U. S. data for powdered coal also are added.

Coal distillation in the scheme of fuel economy. G. CANTIENY. *Chaleur ind.* 9, 178-92(1928).—The paper is chiefly an account of the Kohlenscheidungs Gesellschaft process (KSG) at Karnap. The retort is an inclined rotary annular metal drum. The coal enters at the low end of the inner drum, travels upward by virtue of a helical screw and receives a preliminary heating. Distn. proper at 700-800° occurs in the outer drum in which the coal descends by gravity, emerging at the same end at which it enters. Vapors, etc., are withdrawn at the top of the drum; hence the solid and gas have a min. period of contact. Superheated steam is injected in the outer cylinder; this improves the quality of the tar. Gas heating is used and to keep the temp. down, cold inert gas is circulated. The emergent coke is dry-cooled and the fines are sepd. The original coal contained 3% moisture, 25% volatile matter, 14.8% ash, lower calorific value 6418 cal., upper calorific value 6671 cal.; in Fischer's Al retort the coal gave 8.4% tar, 83% coke, 82 cu. m. gas per ton (standard temp. and pressure), and in the plant it gave 82% coke, 5.3% primary tar of which 0.8% was benzene, and 83 cu. m. rich gas per ton dry coal. The resulting coke gave 18.6% ash, 74% C, 2.8% H₂, 1.35% N₂, 1.44% total S, 1.77% O₂, lower calorific value 6410 cal., upper calorific value 6563 cal., apparent sp. wt. (lumps) 400 kg./cu.m. (fines) 600 kg./cu.m. The primary tar gave 0.5-2.5% dust, 60% oil, sp. wt. 1.04-1.05, 5% moisture, upper calorific value 9530 cal. The debenzinated gas gave 6500-7500 cal., d. (air = 1) 0.75-0.78. C. gives brief accounts of installations at S. Met. Gas. Co. of London, Piscataway plant

of N. Brunswick (N. J.), Pont à Vendin, and the Barcelona plant, and then discusses economic and commercial factors. A discussion is appended. S. L. B. E.

Characteristics of various kinds of coal and nomenclature of brown coals. W. GOTHAN, K. PIETSCH AND W. PETRASCHKE. *Braunkohle* 26, 669-74(1927).—The distinguishing characteristics are enumerated. With the exception of the higher cellulose content of peat, chem. means of distinction are not applicable. F. S. G.

Hungarian brown coals. L. SÜMEGI. *Magyar Mérnök Építészegylet Közlönye* 72, 85-7(1928).—Expts. have been made on the behavior of S in brown coals during dry distn. at various temps. The data given show that nearly all of the Hungarian brown coals examd. behaved in the same way; the apparent differences have been caused by high ash content. The best method of detg. combustible S is to subtract the S in the ash from the total S content detd. by the Eschka method. No reliable data can be had when oxidizing S with Na_2O_2 ; this method can only be used for rapid control analysis. S. S. DE FINÁLY

The rapid determination of moisture in brown coal. H. HEZT. *Braunkohle* 28, 101-10(1929).—A review of known methods. F. S. GRANGER

Supplementary firing with brown coal dust. J. OELSCHLAGER. *Gutersloh-Westphalia. Chem. Fabrik* 1929, No. 4, 40-2.—Brown coal dust firing is suited to step and chain grates and gives better results than lump brown coal. The no. of burners, their arrangement and the furnace construction are important. A sketch shows the extra attachment for brown coal firing in augmenting the boiler output for step grates. Two sketches show the arrangement as applied to a chain grate installation. The dust flame because of its radiant heat assists in the combustion of the volatile constituents of the lump coal used. Excess air for combustion is reduced. A rise in temp. of the furnace may occur which may produce difficulties in a brown coal with an easily fusible ash; at the same time the burning coal in the furnace assists the combustion of the coal dust; hence dust of a lower calorific value can be used and the difficulties occurring with pure coal dust can be avoided. The increase in boiler output depends on the ratio of dust (S) to coal (R) and is approx. $S/R = 0.15-0.25$ or some 25-35%. The flexibility of the combination is very marked, some installations showing an increase in boiler pressure of 50% in 2 mins. and in other cases, of over 200%. S. L. B. ETHERTON

Peat as fuel. FERNAND LE MONNIER. *Chaleur ind.* 9, 54-62(1928).—M. considers general economic factors, particularly as they apply to France. Peat may contain some 90% water, and the economical removal of this is the crux of the situation. Under suitable conditions much of this water can be removed by suitable air drying. Various methods for doing this are described and M. refers to the processes of Eckenburg, Madruck, Kerrine and Roux. Owing to its great affinity for O_2 , peat helps the combustion of difficultly ignitable coals. In its natural state peat cannot stand distant transportation and it is preferable to consume it near the peateries. In Sweden, locomotives are run on powd. peat and in Canada peat is the fuel at some central power stations. In France peat briquets with 40% moisture and calorific value about 2800 are used. M. describes Norron's machine for peat utilization. Peat is considered a good fuel for producers. M. gives a schematic layout for peat consumption and adds a thermal balance. In the discussion that followed it transpired that 2 of the largest peat fields in Italy have stopped working. S. L. B. ETHERTON

Auto-agglomeration of French lignite. A. MOREAU. *Chaleur ind.* 9, 30-3(1928).—Dehydration and rehydration curves of Nouty and Laluque lignites are given. Treatment with HNO_3 , water, or benzene did not yield interesting results. Some lignites appear to suffer chem. changes when under pressure. The proportion of hygrometric water has no influence. Non-agglomerating lignites contain little O_2 while pressure plays a preponderating and temp. a secondary part. S. L. B. ETHERTON

Report on the Fischer process. HENRY OSCAR ASKEW. *New Zealand J. Sci. Tech.* 10, 101-10, 154-63(1928).—Review of the literature through 1927 covering 51 references on the catalytic reduction of CO when present in water, gas or similar mixts. A. S. CARTER

The efficiency of continuous vertical retorts. T. A. HARVEY. *Gas World* 90, 129-32(1929).—A description of construction, operation and results of the Woodall-Duckham continuous vertical retort plant at Birmingham. F. S. GRANGER

The working life of retort settings. R. L. GREAVES. *Shrewsbury Gas Light Co. Gas J.* 185, 225-8(1929).—A discussion of causes and effects based on 7 years' experience with Dempster-Toogood continuous verticals. Also in *Gas World* 90, 153-6(1929). F. S. GRANGER

Report of the Committee of the Privy Council for Scientific and Industrial Research for 1927-8. ANON. *Gas J.* 185, 410-11(1929).—The scope of the investigations on

low-temp. carbonization, high-pressure gas reactions, gas industry, hydrogenation of coal and illumination is briefly reviewed. Tar yields, as high as 20 gallons per ton, were obtained from vertical retorts using weakly or medium caking coals with no fines, whereas the highest yield from horizontals was about 14 gallons. Concerning hydrogenation, it is found that by a less drastic process than is necessary for the liquefaction of coal, a partial hydrogenation takes place which greatly increases the caking properties of the coal. Cellulose, oak sawdust, peat and a no. of coals, including anthracite, have been treated, and the resulting material in every case will yield a coherent coke on carbonization.

F. S. GRANGER

Influence of inorganic constituents in the carbonization and gasification of coal.

II. Liberation of sulfur. J. J. PRIESTLEY AND J. W. COBB. *Gas J.* 182, 951-4(1928).—Coal heated to 1000° in N₂ lost 42% of its S, mostly at about 500°, and, in H₂, 68%, largely at higher temps., as H₂S. Addn. of 5% Fe oxide to the coal reduced the S loss 9% in N₂ but in H₂ 64% was liberated, rapid decompn. setting in above 800°. With CaO, less than 3% was lost in either N₂ or H₂, while with Na₂CO₃ increased liberation occurred, up to 600°, the limit of the expt. because of formation of Na₂O. F. S. G.

Carbonization. III. Temperature, size of coal, blending with coke and inorganic compounds. ANON. 20th Rept. of Research Sub. Comm. of Gas Investigation Comm., Inst. Gas Eng. *Gas J.* 182, 883-8(1928).—Carbonization expts. showed no effect of grading on yields at temps. below 820°. At higher temps. larger coal gave higher tar yields and lower gas calorific value. The gas yield was not much affected by size but a longer carbonization time was required with small coal. 2.5 hrs. at 915° produced the same effect as 10 hrs. at 630° or 20 hrs. at 525°. Gas therms per ton fell from 75.8 at 979° to 4.8 at 344°. The CO₂ content decreases while H₂ and CO increase with rising temp. Unsatsd. hydrocarbons reach a max. at about 450°. Blending with coke showed no beneficial results. Addn. of Na₂CO₃, CaCO₃ or iron oxide, above 815°, increased the gas thermal and NH₃ yields. Lowering the carbonization temp. increased the reactivity and decreased the mech. strength of the coke but did not affect the ignition temp., unless inorg. oxides had been added. F. S. GRANGER

The carbonization of Ohio coals. D. J. DEMOREST. Ohio State Univ. Studies, *Eng. Expt. Sta. Bull.* 46, 54 pp.(1928).—Ohio coals were carbonized in an exptl. vertical one-ton retort; the products were collected and analyzed. Tests on Elkhorn coal were run for comparison. Conclusions: The coke produced is good for domestic or water-gas use; high ash (9 to 10%) and S (up to 4%) content of the coals may necessitate previous washing. The volatile content of the coal (35 to 40%) insures a good gas yield.

B. J. C. VAN DER HOEVEN

Low-temperature carbonization. PAUL DVORKOVITZ. *Chaleur ind.* 9, 193-200 (1928).—A description of the D. process and of the exptl. plant at Slough, Eng. There are two double vertical steel retorts, capacity 5½ tons each, the upper portion holding 2½ tons, each retort having an Archimedean spiral in the top portion. The gas is taken off at the bottom of each section. A 1918 table of yield is given, this being an extract from Guiselin "Combustibles liquids;" one photograph and two cuts of the retorts at Slough are appended.

S. L. B. ETHERTON

Low-temperature carbonization. C. H. LANDER. Fuel Research Board. *Gas World* 90, 133-4(1929).—A brief review dealing particularly with hydrogenation of coal.

F. S. GRANGER

Low-temperature carbonization of coal from the South-Muscovite field. A. CHAKHNO. Inst. thermotech. de Moscou. *Chimie et industrie* 21, 32-4(1929).—Analyses of 2 grades (so-called "kournoi" and "boghead") of coal from this field are given, together with the results of low-temp. carbonization tests, including the compn. of the cokes, the yields of the various products, the compn. of the tar and the calorific values of the products obtained. The "boghead" gave 45% of primary tar which could be either sepd. into various useful constituents (not specified) or used as fuel after sepn. of the benzine, the sepn. of the paraffin being uneconomical. The semi-coke has a high ash content and a relatively low calorific value, and is pulverulent and friable. The ammoniacal liquor contains too little NH₃ and is too highly contaminated with H₂S and other impurities to be of value. The gas has a very high calorific value and after purification (which causes a shrinkage of 10-20%) can be used for lighting, heating or enriching lean gases.

A. PAPINEAU-COUTURE

Design of the "K. S. G." low-temperature carbonization plant at New Brunswick, New Jersey. R. P. SOULE. Intern. Coal Carbonization Co., N. Y. *Can. Chem. Met.* 13, 45-7(1929).—This installation, which is to carbonize 650 tons per day, comprises 8 K. S. G. retorts, each constructed of 2 steel drums, 10' X 72' and 5.5' X 85', inclined slightly to the horizontal, with provision for external heating and rotation of 0.75 r. p. m.

Coal is continuously fed into the lower end of the inner drum and is carried up by helical flanges to the end, where it falls and returns in the outer drum by gravity; time of passage in the retort is 2 hrs. The double drum reduces the time the coal is in a plastic state, for it is below its softening point in the inner drum. The sudden temp. change upon entering the outer drum causes a hard cake to form on the outside of the lump, decreasing agglomeration when the inside becomes plastic. Steam injection cuts down caking on the walls and adhering C is removed by longitudinal chains. Stack gas is circulated for heating, the temp. being maintained at 1200° F. and 1350° F. at the lower and upper ends, resp., by introducing combustion chamber gas at intervals in the helical course of the hot gas along the drum. Hot gas passes out into the steam superheater. This plant produces gas of 800 B.t.u. which will be blended with blue gas to give 8000 cu. ft. of mixed gas per ton of coal carbonized, with an av. B.t. u. of 535. The min. production will be 3,000,000 cu. ft. of mixed gas, 15,000 gals. of tar and 1800 gals. of light oil per day. Operation details are given. A. S. CARTER

High-temperature carbonization. LANGROGNE AND BOULIN. *Chaleur ind.* 9, 153-9(1928).—To extend the range of coking coals experiments showed that a mixt. of gas coal and lean coal gave a utilizable coke without addition of coking coal, but a mixt. of the three coals gave better results. Mixing then becomes very important and requires special care. The coals should be crushed, measured, carefully mixed and then pulverized. The best proportions require careful exptl. investigation; indeed, lab. results are only of approx. value and it is desirable to use a test plant. Mixts. of very fat coals with lean coal give improved results with rapid heating and compression of the charge. The Sarre mines use a fat coal with a lean coal, the lean coal being the product of the low-temp. distn. of the fat coal; the resulting coke is very good. A general account is given of a modern cokery and the relation between a coking plant and gas lighting. S. L. B. ETHERTON

Oil production from coal. HARALD NIELSON. Sensible Heat Distn. Ltd. *Gas J.* 185, 286(1929).—It is shown that, although the oil quality is improved by using a large vol. of gas as the distg. medium, the improvement is not sufficient to justify the increased cost. F. S. GRANGER

The mechanical removal of ash from steam boilers. MICHEL SOHM. *Chaleur ind.* 9, 133-45(1928).—S. discusses methods as follows: (1) increasing the stokeholes, which he criticizes; (2) dry removal mechanically, which he considers to require much hand labor and to involve considerable plant deterioration; (3) removal by immersed mechanism, which he does not advocate, particularly if any pyritic material is present; (4) pneumatic removers, which he considers generally to absorb too much power and require excessive upkeep; (5) steam removal, as on board ship, a process rarely adopted on land; (6) hydraulic transportation, which he considers most desirable and gives reasons. The latter method was tried at Buray Mines and an account is given with many sketches and curves, of that experience. He discusses (a) the slope of the removal canal, (b) the form of the canal, (c) wear of canal floor, (d) vol. of water in circulation, (e) the form of the canal, (f) coeff. of dilution, (g) decantation from cinders, (h) effect of the addn. of lime. The layout of the Bruay arrangement is given for dealing with 2500-4000 tons of ash per hr. and drawings of important mech. details are shown. S. claims low cost of ash removal and after an experience of 2 yrs. advocates hydraulic removal giving as addnl. reasons, the improved hygiene and comfort of the personnel. The discussion that followed corroborated in general the claims made in the paper. S. L. B. ETHERTON

Determination of sulfur in benzene. W. B. DAVIDSON. *Gas J.* 185, 95-6(1929). A rather simple app. is described. Twenty cc. of benzene are diluted to 100 cc. with MeOH. Ten. cc. of this soln. are placed in the lamp which consists of a small flask in which a fine quartz tube is inserted as a wick, and burned smokelessly in the app. This consists of an inverted U tube under one widened end of which the lamp is placed. The other end delivers the combustion products into a wash bottle contg. neutralized H₂O₂ soln. The chimney end is closed under the lamp with an inlet for air, freed from SO₂ by passing through a scrubber contg. glass packing moistened with NaOH soln. The air is aspirated through the app. as the lamp burns, after ignition either before introduction into the app. or afterward through a hole in the side of the chimney. The S is then titrated as H₂SO₄. F. S. GRANGER

Natural gas in 1927. G. R. HOPKINS AND H. EACKUS. Bur. Mines. *Mineral Resources of the U. S. 1927*, Pt. II, 129-37 (preprint No. 14 published December 17, 1928). E. H.

Some applications of chemistry in gas making. H. HOLLINGS. Gas Light and Coke Co. *Gas J.* 182, 924-35(1928).—The free C content of tar is a good neg. index

of tar quality and yield, which improve, along with other economies, with increasing retort charge and also with decreasing unit retort size, within practical limits. This is attributed, in the former case, to shorter heating of tar vapors because of the higher gas velocity resulting from less free space in the retort as well as from the larger quantity of coal undergoing carbonization. A parallel effect is also seen in the higher % of hydrocarbons, other than benzene, in the light spirit stripped from the gas, as shown in its distn. curve. Analysis of this spirit as an index of carbonizing conditions is shown strikingly in comparing horizontal with continuous vertical retort products. Less than 20.5% CO₂ in the waste gases, leaving the combustion chambers of retort settings, after deduction of excess air, is an indication of leakage from the retort into the combustion chamber. The leakage, so measured, can be calcd. as therms per ton of coal carbonized, and is periodical, being greatest after charging. This should be met by a corresponding control of pressure conditions in the retorts individually, *e. g.*, by a sep. governor, or an adjustable overflow weir or dip pipe in the hydraulic main, for each retort. A device of the third type is described. Temp. differences, etc., being known, the vol. of waste gas can be calcd. from the steam produced in the waste heat boiler, which thus acts as a waste gas meter. Comparison with the fuel consumption of the producer gives another measure of retort leakage and a means of distinguishing between coal-gas and water-gas leakage. Sample calcns. are given. The calcn. of the portions of the total therm yield due, resp., to coal gas and to water gas, from steamed verticals, which is important in any analysis of results, is facilitated by means of a monogram or slide rule. $T_c = (T_m H_c (H_m - 320)) / (H_m (H_c - 320))$ or $\log (T_c/2) + \log (1 - (320/H_c)) = \log (T_m/2) + \log (1 - (320/H_m))$, where *c* denotes coal gas and *m* mixed gas, both on an inert-free basis. Thus the scale of therms, *T*, is $\log (T/2)$ and that of calorific values, *H*, is $\log (1 - (320/H))$. Inverting one scale, in the slide rule, and placing the therm yield of mixed gas opposite its detd. calorific value, the therms due to coal gas alone are read opposite the calcd. or assumed calorific value of the coal gas. Equil. concns. of NH₃ in gas and liquor at various temps. have been detd. and plotted. From these it is found, *e. g.*, that 4.5 gallons of water, per ton of coal, are theoretically sufficient, at 60° F., for complete extn. of the NH₃ from gas contg. 100 grains per cu. ft., whereas 17 gallons are required at 90° F. The efficiency of NH₃ extn. is improved by fractional condensation. Such a plant is described. The calcn. of the enrichment effect from the gain in thermal yield of carburetted water gas, above that assumed for blue water gas, is explained. By this means, the efficiency of oil cracking has been studied. The thermal yield of gas, per gallon of oil, decreases as the rate of oil injection is increased.

F. S. GRANGER

Rational mixed gas production with respect to complete gasification. E. LANGTHALER. *Gas. Wasserfach* 72, 31-3(1929).—An analysis of the possible cases for prep'g mixed gas from coal gas diluted with flue gas, generator gas, water gas and straight and carburetted complete gasification gas.

R. W. RYAN

Chemical control of gas producers. G. LOOSE. *Ing. chim.* 16, 142-69(1928).—The nature of the coal is one of the most important factor in the running of a producer. L. gives the formulas used for the calcn. of the producer's yield. The phys. and chem. characteristics of different coals are studied in regard to their effect on the working of the producer. The influence of the O content on the compn. of the gas is given in a table; two others show the effect of the volatile matters on the calorific power of the coal. L. gives a procedure to det. the causes of abnormal running. A detailed table shows the influence of temp., air pressure, compn. of the coal, draught, cleanliness of the producer on the compn. of the gas.

P. THOMASSET

Removal of sulfur from illuminating gas by activated carbon. E. W. TODD. Dalhousie Univ., Halifax, N. S. *Proc. & Trans. Nova Scotian Inst. Sci.* 17, Pt. 2, 12-3 (1928).—When illuminating gas at 16.7° and 76.2 cm. pressure was passed over rotite or norit, the S in the gas was reduced to about 1/4 or 1/5, resp., of its original value. When an excess of gas was used, the activity of C was considerably lessened. The activity could be partially restored by heating the C in open Fe crucibles over a Bunsen burner for about 2 hrs.; the "revivified" C was able to reduce the S in the gas to about 1/4 to 1/5.

G. SCHWOCH

Products of combustion from typical gas appliances. III. Appliances using free-burning flames. ANON. 19th Rept. of Research Sub-Comm. of Gas Investigation Comm. Inst. Gas Eng. *Gas J.* 132, 880-2(1928).—The CO produced by various burners was detd. by the I₂O₅ method, after removal of N oxides, which interfere. These were condensed out by liquid air, since the CO₂ absorbents did not remove them completely. Parts of CO produced, per 10,000 of gas burned, at the rates given in cu. ft. per hr., were as follows. Argand burner, 0.5 at 6.1, and 0.1 at 8.3. Union jet

flat flame, 1.1 at 2.7 and 0.6 at 6.4. Geyser flat flame, 2.5 at 0.6 and 1.0 at 6.8. Meker (air/gas = 2.6), 0.8 at 8.8. Lab. Bunsen, 0.9 with a 2.48 air-gas ratio, and 2.1 with air shut off, both at 5.3. Domestic appliances. Flueless heater with Argand burner, 0.1 at 6 or at 8, and 0.5 when overloaded at 10. Water heater with 4 geyser burners, 2.0 at 2.0, and 0.1 at 18.3. Geyser with 36 burners, with 5 ft. of flue pipe below the baffle, 0.1, and, with 1 ft., 101, both at 136. Junkers calorimeter with Bunsen burner, 0.6 at 6.7. Gas oven, 2.7 at 10, and 0.2 at 40. Gas fire with 9 radiants, 74.9 at 79% of normal gas rate (air/gas = 1.13), 73.3 at normal rate (air/gas = 1.42), 27.2 with flames shortened by increasing the proportion of water gas, and 6.2 parts at 82% of normal rate, with radiants removed.

F. S. GRANGER

Radiation of heat from gas-lighting burners. H. J. HODSMAN. *Gas J.* 184, 794-6 (1928).—Ninety-nine % of the energy of a gas-lighting burner is dissipated as heat. The portions radiated downward were found to be, for a bat-wing burner, 7.1%; incandescent burner, upright, without chimney, 19.7%; inverted, without globe, 25.9%; with globe, 16.2%; with reflector, 37%.

F. S. GRANGER

Steam boilers heated with gas. Zs. VITÉZ GÁLÓCSY. *Magyar Mérnök Építészegylet Közönye* 62, 5-9(1928).—A discussion of the relative merits of burning raw coal and gases from coal.

S. S. DE FINLAY

Disposal of liquor effluents from gas works. ANON. 2d Rept. Inst. Gas Eng. Liquor Effluents Research Comm. *Gas J.* 182, 1016-8(1928).—In a vertical retort plant at Hinckley, the content of higher phenols in the effluent was reduced by introduction of a tar extractor in the foul main. Thiocyanate and thiosulfate contents in the liquor were greatly increased by contact with air in storage or at the condenser inlets. The final effluent of the NH_4 sulfate plant was about 1% of the total dry weather sewage and could probably be reduced $\frac{1}{2}$ by balancing tanks. Carefully controlled disposal of effluent into sewage is considered satisfactory and can be further improved by sep. disposal of devil liquor, by chimney spraying, etc.

F. S. GRANGER

Improvement of the calorific value of coke-oven gas. R. SCHÖNFELDER, W. RIESI AND W. KLEMP. *Ber. Ges. Kohlentech.* 2, 250-8(1927).—The gas is passed successively over catalytic material at 700° comprising Ni pptd. on magnesite to destroy org. S compds. and to break down heavy hydrocarbons, and, after removal of H_2S , over pieces of clay contg. reduced Ni at 420° to reduce CO and CO_2 to CH_4 and water by means of the H in the gas. The calorific value is raised, *e. g.*, from 4136 to 5368 thermal units.

B. C. A

Modifying coking and gasification processes to low-temperature carbonization. J. SAINTE-CLAIRE DEVILLE. *Chaleur ind* 9, 173-7(1928).—With internal heating by inert gases or steam at 500 - 600° the thermal yield is good but there is a loss of light products and gas. External heating may be used with a rotary or mixing furnace. With 10% moisture the coal will require 50% more heat to be added when carbonizing at 525° ; hence all processes involve an independent drier. Low-temp. tar is very different from by-product tar and the author gives some of its properties and constituents. Only 50-70 cu.m./ton of gas is obtained and it has about 6000 cal./cu.m. The author gives some methods of treatment and states that the gas contains much S and smells strongly.

S. L. B. ETHERTON

Hydrogenation of coal tars. G. HUGEL. *Can. Chem. Met.* 13, 5-7(1929). Hydrides of alkali and alk. earth metals are used as catalysts in the hydrogenation of coal tar. The activities of these are unaffected by the usual poisons, though to some extent they disappeared in consequence of reaction with the impurities. The catalytic activities were comparable to that of Ni. C_{10}H_8 was reduced to tetralin (I) over NaH at 230 - 50° and 10-20 kg. pressure in 2-3 hrs. The catalyst was prepd. by heating Na with H_2 under pressure to 270° ; at 100 kg. over 1.8 atoms of H_2 were absorbed. $\text{C}_{14}\text{H}_{10}$ was hydrogenated to 9,10-dihydroanthracene, which was further reduced to 1,2,3,4-tetrahydro-, then hexahydro-, and finally octahydroanthracene. C_6H_6 cannot be reduced. If the hydrides are formed directly in the reduction mixt. the products are different, thus decalin is formed in small quantities from C_{10}H_8 as well as I. With 7-10% of catalyst, coal tar was hydrogenated at 80 - 100° kg. and 300° to give 30% of green fluorescent oil (II) and a black solid. By preventing flocculation, 80% yields can be obtained. At lower temps. (250°) the first product is a benzene-insol. "hydrotar," $d_{15} 1.16$, flash point 130° , fire point 215° , viscosity (Engler) 3.5 at 50° . The final stage represents the absorption of very little more H_2 with cracking to give II, $d_{15} 1.06$, flash point 64° , fire point 84° , viscosity 10.4 at 20° , 2.5 at 50° , 1.3 at 100° . This contains I and polyaromatics such as chrysene, picene, etc., which throw some light upon the colloidal structure of coal tar.

A. S. CARTER

Preparation of high-quality coke. ERNST SCHUMACHER. *Gas Wasserfach* 72,

97-102(1929).—Methods are discussed of increasing coke quality such as grinding the coal, blending, careful handling of the coke and adaptation of coke to specific uses.

R. W. RYAN

Modern coke plants in the Ruhr territory. WALTER GOLLMER. *Stahl Eisen* 49, 129-38(1929).—Technical improvements are reviewed.

J. A. SZILARD

Alternative methods of coke-oven heating. ERNST WEISE. *Gas Wasserfach* 72, 73-8(1929).—Theoretical flame temps. and the combustion temps. corrected for dissocn. are given for coke-oven gas, blast-furnace gas and various mixts. of the 2 with air in ratios from 1 to 1.3 with the air preheated at several temps. up to 900°, and the percentage of useful heat calcd. for each case. It is not economical to secure temps. over 2000° with blast-furnace gas unless its cost is extremely low but such gas is good for heating coke ovens and releases an equiv. amt. of coke-oven gas for super-gas systems and high-temp. heating.

R. W. RYAN

Heat insulation of the coke oven and the regenerator with Sterchamol. ARTHUR KILLING AND KLAUS THEIS. *Stahl Eisen* 49, 65-73(1929).—Sterchamol, a naturally occurring infusorial earth in Denmark, was first used to insulate the coke ovens and regenerators of the Vereinigte Stahlwerke A. G. Division Hörderverein in 1926. Sterchamol can be obtained in the form of bricks, with 12-120 kg./sq. cm. resistance to compression. From the operating experiences gained during the last 2 years the following conclusions are deducted: The insulation of the back walls of coke ovens with half-sized Sterchamol bricks resulted in a decrease of the heat losses of 48%; with full sized bricks, the decrease was 68%. The insulation of the upper part of the oven, undertaken in 3 different ways, was not satisfactory, because of the high temp. of the Fe armatures, built in the brick work; furthermore the doors show considerable heat losses. The heat balance of a plant with the coke ovens insulated showed an efficiency of 65%, as compared with a plant where the ovens were not insulated, showing an efficiency of 60%. The insulation of the regenerators was carried out in 2 ways. First, one layer of Sterchamol bricks and one layer of Sterchamol mass were used. The heat losses by radiation decreased from 6 to 2%, increasing the yield of useful heat from 83 to 87%. The amt. of fuel gas saved paid for the cost of insulation in 8 months. The use of Sterchamol filling mass instead of bricks is less expensive, though its insulating effect is lower; on regenerators so insulated temps. observed on the dome ranged from 50 to 60° and on the side shaft from 35 to 40°.

J. A. SZILARD

The new Brooklyn by-product coke-oven plant. J. J. GARLAND. *Brooklyn Union Gas Co. Gas Age-Record* 63, 272-4, 276(1929).

E. H.

The properties of coke coals and the processes of their coking. PAUL DAMM. *Archiv Eisenhüttenw.* 2, 59-72(1928); cf. C. A. 23, 1495. —The coking power of coals (Backfähigkeit) (I) and the pressure required to suppress the free expansion of the coal while changing into coke (Treibdruck) (II) are of special importance in the coking of coals. From I a measurement of those constituents of the coal, which when soft do not unite with the nonfusible, are obtained; while from II, conclusions are obtained on the pressures which the molten coal experiences due to the gases in the degasifying zone. The idea that II is undesirable in coking is shown to be false. According to their content in volatile matter, 3 zones are differentiated during the degasification in the coke oven, before, in and after the softening. The first 2 zones are important for estimating the power of a coal to coke and the coking process, while the last gives conclusions on the nature of the coke produced. The steeper the degasification curves, the greater the loss of the semi-coke formed during the resolidification of the fused coal. The influence of the properties of coking coal on the coke produced is studied, exptl. curves obtained showing that the less the reactivity of the coke the stronger the degasification of the coal and the greater its II. The results of the investigations are applied to large-scale production

J. BALOZIAN

Coke selection for the blast furnace (EVANS) 9. **The heating of a continuous furnace with a mixture of blast-furnace gas and powdered coal** (REY) 9. **Orsat apparatus for complete gas analysis** (ANON) 1. **Fish oils** (JULIA-SAURI) 27. **Two new methods for the determination of phenol in waste liquors** (DEHE) 7. **The origin of the fossil rubber in middle German brown-coal** (JURASKY) 8. **Microchemistry of lignite** (OHARA) 8. **Aging phenomena in thermoelements** (LENT, KOFLER) 1. **Production of gaseous, liquid and solid hydrocarbons from CH₄**. I. **Thermal decomposition of CH₄** (STANLEY, NASH) 10. **Thermal decomposition of CH₄** (KUSAMA, YUKIO) 10. **N detn. in (NH₄)₂SO₄ and NH₃ liquor** (STIJNS) 7. **Hartmann spiral bricks** (TORNBLAD, MITCHELL) 19. **Apparatus for aerating and revivifying gas purification liquids or other liquids** (U. S. pat. 1,703,967) 1. **Vertical column scrubber suitable for extracting NH₃ from**

gas (U. S. pat. 1,704,518) 1. Distilling crude petroleum, coal tar, etc. (Belg. pat. 350,953) 22. Apparatus for washing coal and other minerals (Fr. pat. 645,630) 1. Acetylene and other products in the electric furnace (Brit. pat. 294,494) 4. Desulfurizing gases (Ger. pat. 470,844) 13.

STUART, MURRAY. *Low-Temperature Carbonization Explained*. London: Mining Publications, Ltd. 4s. net.

Briquetting fuel. MASCHINENBAU A.-G. VORM. BREITFELD, DANEK & Co. and GEORG PLOCHMANN. Ger. 470,928, May 8, 1925. Water-resistant briquets are prepd. by treating dried fuels with fuel distn. gases or vapors at a temp. not exceeding 80° and then pressing the fuels, if necessary, after addn. of a binder.

Fuel briquets. SOC. DE RECHERCHES ET DE PERFECTIONNEMENTS INDUSTRIELS. Fr. 645,226, Sept. 10, 1927. In making briquets by heating powd. coal mixed with oil coming from a Trent purification, a certain quantity of anthracite or other powd. nonbituminous coal is incorporated with the mass of coal and oil before heating. Cf. C. A. 23, 959.

Carbonizing fuel briquets. E. GEVERS-ORBAN and J. PIETERS. Brit. 294,581, July 26, 1927. Sticking together of briquets during carbonization is prevented by embedding them in a dust which may either be that of the raw fuel or of coke breeze from a previous distn.

Ovens for drying fuel, briquets, etc. ERNEST W. BOWEN. Fr. 645,685, Oct. 28, 1927.

Manufacture of powdered fuel. WALTHER & CIE. A.-G., WILHELM OTTE and MAX BIRKNER. Ger. 471,010, May 6, 1925. Addn. to 443,111. Ger. 443,111 describes the manuf. of powd. fuel by grinding it, in the absence of air, immediately after a complete or partial destructive distn. This method is now modified by grinding only the smaller pieces.

Combustion system for utilizing pulverized fuel. JAY G. COUTANT (to Furnace Engineering Co.). U. S. 1,703,814, Feb. 26.

Gaseous and liquid fuel. SOC. D'ÉTUDES ET D'EXPLOITATION DES MATIÈRES ORGANIQUES. Fr. 645,724, Dec. 14, 1927. To increase their calorific value or to prep. liquid fuel, natural or industrial gases contg. H, CH₄, and CO are submitted to incomplete combustion by passing them, mixed with insufficient O, through a catalyst of Pt black, oxides of Fe, Cu, Ni, Cr, V, Ag, Co, Ce, etc., for the production of unsatd. hydrocarbons.

Fuel for internal-combustion engines. C. J. SIMS. Brit. 294,129, April 14, 1927. Fuel oils for use in "compression-ignition" engines have added to them a small proportion of a primer which will explode on rapid heating at a temp. below the ignition temp. of the untreated oil. Among the substances which may be used are: trinitroresorcinol, nitrous and nitric esters such as Me nitrate or Am nitrite, azo compds. such as diazoaminomethane, halogen compds. such as CHI₃, chlorates and perchlorates such as hydrazine diperchlorate, acetylenic compds. such as Cu acetylide, superoxides such as benzene ozonide, nitroamines such as picramide, Hg fulminate, phenylnitramine and phenylselenious acid. Five per cent of Me nitrate may be used.

Liquid hydrocarbons suitable for use as power fuels. C. EPNER. Brit. 294,100, July 16, 1927. Gases contg. hydrocarbons are subjected to the action of dark or silent elec. discharges, preferably of high tension and periodicity. The reaction is effected at a sufficiently high temp. that the products are removed in vapor form and may be condensed or absorbed in active C or in a wash oil. The unsatd. products may be hydrogenated by use of a catalyst.

Filter for liquid fuels for internal-combustion engines. R. J. O'CLAREY and SOLEX, LTD. Brit. 294,706, May 2, 1927. Structural features.

Automatic mixing apparatus for gas-producer fuel. PORTER, G. M. B. H. Fr. 33,408, April 27, 1927. Addn. to 625,570.

Briquetting powdered substances. ALFRED UELMANN. Fr. 645,541, Dec. 10, 1927. Powd. substances such as coal, coke, etc., are briquetted by damping and submitting them to a high-frequency field of force.

Briquetting coal. EDOUARD GOUTAL and HENRI HENNEBUTTE. Ger. 470,746, Nov. 6, 1924. A binder for coal briquets is prepd. by mixing an oxygenated tar, e. g., tar from wood, brown coal or peat, or tar oxidized at a moderate temp., with a non-oxygenated tar, e. g., ordinary coal tar or petroleum tar, and heating the mixt. at 180-250°, in presence or absence of an oxidizing gas, so that copious amts. of steam are evolved, the product still retaining, however, the phys. properties of tar. Examples are given.

Briquetting carbon, coal, etc. F. L. SCHMIDT. Brit. 294,879, July 30, 1927. In briquetting with a binder of molasses or cellulose pitch, the sugar substances in the binder are removed at least partially by fermentation and the residue is concd. by evapn. at a temp. above 100° until a test portion sets on cooling. Acetone, acetaldehyde, alc., glycerol, etc., may be obtained by the fermentation.

Drying coal. ČESKA OBEHODNI SPOLEČNOST, APOLLO RUŽICKA and BŘETISLAV ŠIMEK. Fr. 645,073, Dec. 2, 1927. Coal such as lignite is heated with water to 150–200° under pressure to destroy its colloidal properties, and the water allowed to run off. The remaining moisture becomes evapd.

Drying coal. ČESKA OBEHODNI SPOLEČNOST. Fr. 645,972, Dec. 2, 1927. Coal such as lignite in lumps is dried in a container by passing in superheated water under pressure and evacuating after the coal becomes sufficiently heated, and the heat retained is sufficient to vaporize the water in the coal.

Apparatus and gas-circulation and heat-exchange system for drying peat or other materials. O. SODERLUND, T. GRAN and TECHNOCHEMICAL LABORATORIES, LTD. Brit. 294,289, April 23, 1927.

Apparatus for continuous drying or distillation of brown coal or other materials in fine, granular form. LUDWIG HONIGMANN. U. S. 1,704,796, March 12. The material is treated in a horizontal drum and heat-transfer plates mounted on a rotating shaft extend into the material and during their rotation are heated by hot gas or other heating medium in pockets surrounding the upper portion of the heat-transfer plates.

Low-temperature distillation of coal, lignite, etc. SOC. DE RECHERCHES ET DE PERFECTIONNEMENTS INDUSTRIELS. Brit. 294,568, July 26, 1927. Previous to distn. fuel contg. about 26–38% volatiles is agglomerated with an oil such as anthracene oil, petroleum or coal tar, which give little or no pitch on distn., at about 500°. The residue may be subjected to further distn. at a higher temp. (suitably 700–1000°) to produce a *metallurgical coke*.

Distillation of coal. HENRI DUPUY. Fr. 33,409, April 27, 1927. Addn. to 552,349. In the app. of the prior case the circulation of the steam is produced by a vapor pump.

Regenerative vertical retort battery for distilling coal. JOSEPH VAN ACKEREN (to Koppers Co.). U. S. 1,704,685–6–7. March 5.

Rotary horizontal tapering retort suitable for coal, shale, wood, etc. THOMAS A. W. DWYER (in part to Hans O. Schundler, Willis H. Botsford and Archimedes J. James). U. S. 1,703,418, Feb. 26. U. S. 1,703,419 also relates to the use of a similar still for distilling coal, wood, shale, etc., in such manner that different volatile products are evolved successively at different points along the length of the still while vapors stratify in the upper portion of the still and are led off to a suitable recovery app.

Apparatus (with helical fuel feeding devices) for distillation of coal or other carbonaceous materials. FREDERICK D. MARSHALL. U. S. 1,704,092, March 5. Various structural details are specified. U. S. 1,704,093 also describes an app. for simultaneous production of gas and coke.

Determining ash in coal, etc. KARL KEGEL. Fr. 645,665, Dec. 14, 1927. See Brit 290,913 (C. A. 23, 959).

Apparatus for cooling dried brown coal prior to pressing. PHILIPP FASSBENDER. Ger. 470,929, May 28, 1926. The cooler comprises a column fitted with plates so that the coal travels from side to side as it descends the column. Suction pipes are arranged at convenient points in the column.

Carbonization of coal. ČESKA OBEHODNI SPOLEČNOST. Fr. 645,071, Dec. 2, 1927. Coal, particularly of more recent geological formation, is carbonized by the direct action of superheated steam at a temp. and pressure at which carbonization will take place.

Carbonizing coal. TRENT PROCESS CORP. Fr. 645,227, Sept. 14, 1927. Finely powd coal is heated slowly before its fusion temp., the heating being continued for a time sufficient to obtain a max. initial volatilization before the fusion temp. is reached and afterwards raising the temp. above this point without causing an agglomeration of the carbonized particles. Cf C. A. 23, 1250.

Vertical retort apparatus for carbonizing coal. RICHARD L. RODGERS (to Charcolite Corp.). U. S. 1,704,103, March 5. Vertical retort chambers are surrounded by annular heating chambers contg. a fusible salt-heating-medium comprising CaCl₂ 75 and NaCl 25%.

Process and apparatus for fractionating the distillation products of organic matter as they are evolved from the still. J. GONZE and J. GRAY. Belg. 350,914, May 31, 1928. Fractionation is obtained by means of superheated steam, which is produced

in the distg. app. and superheated by the heat imparted to it by the distn. products. After the fractionation, the sepd. steam is sent back in counter-current flow to the mixt. to be fractionated, whereby it is superheated, and again mixed with the fresh distn. products. The app. comprises a scrubber, a pitch separator, 2 oil separators, a heat exchanger, and a vertical tube condenser.

Extracting carbonaceous material. JOSEPH W. H. AINSWORTH. Australian 10,517, Nov. 22, 1927. Vaporizable oils are extd. from oil shales, coal and other carbonaceous material by conveying the material in a continuous stream through a long retort, applying heat so as to grade the temp. from a min. at the entering end to a max. at the outlet, the gaseous products being led off at intervals of its length by vents in the retort wall.

Destructive hydrogenation of coal, oils, etc. ARNO DEBO (to Internationale Bergin-Compagnie voor Olie en Kolen-Chemie). U. S. 1,704,792, March 12. In order to maintain a definite liquid level in an app. (which is described) for effecting destructive hydrogenation under high pressure, the materials are converted into a paste-like mass which is subjected to a pressure of a "few atm." and then forced into the high-pressure chamber, and subsequently the gaseous, liquid and solid reaction products of the reaction are drawn off at a point somewhat below the top of the reaction chamber. Various details of the app. are described.

Destructive distillation and hydrogenation of bituminous materials. KOHLENVEREDLUNG A.-G. Ger. 470,726, Mar. 18, 1924. Finely divided bituminous materials are treated with a stream of heating gas so as to become suspended therein, and H or a substance generating H is passed in. The process may be combined with water-gas generation, the water gas serving for both heating and hydrogenation. The process is preferably carried out at superatm. pressures. Cf. C. A. 23, 1251.

Burning liquid fuel. AUTOCOMBUSTORE. Fr. 644,816, Oct. 27, 1927. The fuel is atomized by steam, the app. being arranged to act as automatically as possible.

Gas producer. COMPOUND GAS POWER CO., LTD. Fr. 645,632, Dec. 13, 1927.

Double-effect gas producer. A. H. R. J. BOISSIÈRE. Belg. 349,383, April 30, 1928. The hearth is divided into 2 portions in which combustion and gasification take place successively, and also purification by combustion of the heavy tarry products. The hearth is surrounded by a jacket, which may serve for the generation of steam, and is surmounted by a fuel tank, which closes hermetically and from which it can be isolated. The clinkers are discharged through a 2-seat valve; and devices are provided for rotating the producer, raising the central portion of the hearth and operating the 2-seat valve of the ash-pit, the 3 operations being carried out simultaneously if desired.

Gas producer construction. W. I. BATTIN and C. S. CHRISMAN (to Humphreys & Glasgow, Ltd.). Brit. 294,523, July 25, 1927.

Gas producer operation. AKTIESELSKAPET NORSK STAAL ELEKTRISK-GAS REDUKTION and E. EDWIN. Brit. 294,838, Dec. 20, 1927. CO₂ and water vapor in gases contg. them are converted into CO and H by heating in a high tension elec. arc and passed at a temp. of at least 1400° through a layer of incandescent coke or like material. Molten slag which is obtained may be used as "ciment fondu" if bauxite, Al silicates and lime or limestone are added to the fuel layer. An app. and details are described.

Down-draft gas producer (suitable for use on vehicles). R. M. A. E. CEZANNE and SOC. D'APPLICATION DU GAZ AUX MOTEURS S. A. G. A. M. Brit. 294,773, Aug. 3, 1927. Numerous structural features are described.

Down-draft gas producer for use with wood, lignite or other fuels of high volatile content. D. J. SMITH. Brit. 294,373, July 20, 1927. Structural features.

Electrically heated producer for manufacturing combustible gas from hydrocarbon materials such as crude oil. WILLIS S. YARD and EARL N. PERCY. U. S. 1,703,566, Feb. 26.

Gas production. I. G. FARBENIND. A.-G. Fr. 33,382, Apr. 2, 1927. Addn. to 631,948. In the production of gas from powdered fuel in which gasifying agents such as air or steam are passed in such a way as to keep the fuel in motion, part of the air or steam is directed with great speed on to the surface of the fuel. Cf. C. A. 23, 1252.

Gas production. THE H. H. GAS PLANT SYNDICATE, LTD. Fr. 645,572, Dec. 12, 1927. Powd. or liquid fuel is injected along with air into a combustion chamber where it is submitted to a partial combustion in the presence of a metal in a fine state of division. Steel filings are particularly suitable, but brass may also be used.

Gas manufacture. HUMPHREYS AND GLASGOW, LTD. Ger. 470,654, Aug. 4, 1925. See Brit. 242,226 (C. A. 20, 1316).

System for controlling admixture of different gases to obtain a gas of definite desired heating value. CLARENCE S. PINKERTON (to Cutler-Hammer Mfg. Co.). U. S.

1,704,101, March 5. Admixture is controlled in accord with calorimetric tests. An app. is described.

Heat exchange system for separating gases by liquefaction. GES. FÜR LINDE'S EISMASCHINEN A.-G. Brit. 204,611, July 27, 1927. Sepn. of constituents of coke-oven gas is described. Water gas may be washed with liquid CO to produce a quant. mixt. of H and CO. An app. is described.

Use of liquefied air, peroxides, etc., in supplying gases to internal-combustion engines of submarines, etc. H. O. DRAGER. Brit. 294,169, July 19, 1927.

Desulfurizing gases. FIRMA CARL STILL. Ger. 471,043, Mar. 6, 1927. In removing H_2S from gases by a cyclic process in which a neutral aq. suspension of Fe-O compds. is used to wash the gases and is then regenerated by treatment with air or O, the regenerated soln. passing back to the washer is treated with an amt. of free alkali sufficient or nearly sufficient to neutralize the acid produced in the regeneration.

Gas purification. UNION CHIMIQUE BELGE. Belg. 349,321, April 30, 1928. A practically satd. $(NH_4)_2SO_4$ soln. is fed at the top of the scrubber, the gas to be purified is introduced near the bottom, and free NH_3 is introduced at a pt. slightly below the gas inlet. The free NH_3 ppts. $(NH_4)_2SO_4$, which is washed once with the original soln. The soln. drawn off near the bottom of the scrubber is triturated with powdered gypsum, the ppt. is filtered off, and the filtrate is distd. to liberate volatile acids and recover free NH_3 . Belg. 349,820, April 30, 1928. The $(NH_4)_2SO_4$ is pptd. from its almost satd. cold soln. by passing in NH_3 ; the soln. decanted from the ppt. is put through a distg. column to remove free NH_3 which is re-used; the neutral soln. is cooled and sent to the gas scrubber through which it is passed in counter-current flow to a mixt. of the gas and NH_3 ; the liquor from the scrubber is triturated with powdered gypsum, filtered, put through a distg. column to remove free NH_3 and finally evapd. Belg. 350,558, May 31, 1928. Ammoniacal liquor having already been used for gas purification is sulfated with gypsum; free NH_3 is added to complete pptn. of the $(NH_4)_2SO_4$; the soln. is decanted from the ppt. and the free NH_3 distd. off; an amt. of liquid equal to the H_2O in the gypsum + the wash water is withdrawn from the distg. column and treated with $Ca(OH)_2$ aq. to recover NH_3 ; the rest of the liquid from the distg. column is cooled and utilized again for scrubbing the gas.

Purifying gases. SOC. ANON. HOLLANDO-BELGE POUR LA FABRICATION DU COKE (Theodoris P. L. Petit, inventor). Ger. 471,042, July 4, 1928. In removing H_2S and HCN from gases by treatment with an alkali carbonate soln., expelling the gases from the soln. with CO_2 , and heating the bicarbonate soln. so obtained to recover the CO_2 , the CO_2 present in the expelled mixt. of gases, after removing H_2S , is re-used. Preferably, the CO_2 from the expelled gas mixt. is re-used to treat only the upper layers of the soln., the lower layers being treated with the CO_2 recovered by heating the bicarbonate soln. Suitable app. is described.

Purifying coal gas and recovering by-products. S. P. MILLER (to Barrett Co.). Brit. 204,106, July 16, 1927. The gas is cooled to 200–250°, according to the desired m. p. of the pitch, and the heavy tar and pitch particles in suspension are pptd., creosote oil vapors are condensed, NH_3 is extd., and the light oils and benzene are removed. An app. and various details of procedure are described.

Mixed oil gas and producer gas. WILLIS S. YARD and EARL N. PERCY. U. S. 1,703,506, Feb. 26. A deep bed of fuel is maintained at incandescence in a producer by admission of air; oil is introduced periodically and successively into the producer at different fixed points above the fuel bed to replenish the latter in different portions by deposition of C formed by the cracking and distn. of the oil in producing oil vapor and gas and this replenishment is controlled so as to render it uniform over the fuel bed and maintain an optimum temp. in the producer. An app. is described.

Production of steam for water-gas generator. FRANZ SCHÜSSL. Fr. 645,057, Dec. 2, 1927. Constructional details of heat interchanger.

Carburetted water-gas plant. HUMPHREYS & GLASGOW, LIMITED. Fr. 644,969, Dec. 1, 1927.

Lighting and heating gas plant. SYDNEY J. B. TULLY and OLIVER E. YEO. Fr. 645,090, Dec. 3, 1927.

Burning explosive gaseous mixtures. SIDNEY P. VAUGHN (to Surface Combustion Co.) U. S. 1,704,875, March 12. The mixt. is driven with a velocity greater than the rate of propagation of flame through the mixt. against the surface of a corrugated combustion bed and parallel with the corrugations, so that in the grooves of the corrugations the velocity is reduced by friction to the rate of flame propagation and combustion is effected in the grooves of the corrugations.

Apparatus for distilling tar. THE BARRETT CO. Fr. 645,156, Dec. 5, 1927.

Coke with a distinctive flame coloration. ALLISON A. KOHR (to Koppers Co.). U. S. 1,705,020, March 12. In prepg. coke which is to have a distinctive flame coloration (intended to indicate its manuf. or origin), the freshly made hot coke is quenched with water contg. and serving to deposit on the coke flame-coloring substances, *e. g.*, compds. of Cu, Ba, Li, Sr, Mg, Hg, K or Na.

Coke adapted for being heated by preheated lean gas. E. COPPEE ET CIE. Brit. 294,561, July 26, 1927. Structural features.

Apparatus for cooling coke (by circulation of air or an inert gas through the coke and a steam generator). S. PEARCE and A. R. M. B. COBBART. Brit. 294,516, April 25, 1927.

Gas and coke plant. FREDERICK D. MARSHALL. U. S. 1,704,094, March 5. Various details of construction are specified.

Regenerative heating system for coke ovens, etc. JOSEPH VAN ACKEREN (to Koppers Co.). U. S. 1,704,229, March 5.

Recovering waste heat from coke ovens. H. E. G. J. J. HELIN. Belg. 350,907, May 31, 1928. The air is preheated in a heat exchanger by means of the gases coming from the oven; and the combustion gases after passing through the regenerator are used to heat a steam generator.

Fuel-gas-distributing system for coke ovens. JOSEPH BECKER (to Koppers Co.). U. S. 1,704,239, March 5.

Coke oven. HEINRICH SCHWARZ. Fr. 645,045, Dec. 2, 1927. A method of charging so as to prevent disintegration of the coal blocks is described.

Coke-oven construction. C. OTTO & Co., Ggs. and C. OTTO. Brit. 294,992, Aug 3, 1927.

Coke-oven construction. AUGUST PUTSCH (to Koppers Co.). U. S. 1,705,029, March 12.

Coke-oven-valve construction. NATHANIEL G. PARRY (to Koppers Co.). U. S. 1,704,209, March 5.

Coke-oven battery. JOSEPH BECKER (to Koppers Co.). U. S. reissue 17,224, Feb. 26. See original patent No. 1,556,749, issued Oct. 13, 1925 (*C. A.* 20, 106).

22—PETROLEUM, LUBRICANTS, ASPHALT AND WOOD PRODUCTS

W. F. FARAGHER

The bearing of base exchange on the genesis of petroleum. E. MCKENZIE TAYLOR. *J. Inst. Petroleum Tech.* 14, 825-40(1928).—T. shows that the origin of petroleum is due to the bacterial decompn. of org. matter, probably oils and fats, under anaerobic conditions which exist under shales contg. sodium clay hydrolyzed in fresh water. The original calcium clay in the presence of fresh water is converted into sodium clay. Sodium clay in water yields NaOH which neutralizes the toxic acidic products of bacterial action. The hydrolyzed sodium clay layer is impermeable and the bacterial decompn. forms reduction products, the gases being retained under pressure. Ten Rumanian and West Indies shales were alk., the sodium base predominating over the calcium base clay in each case. Glycerol, the oils and fats tested, and sugar and starches under a sodium clay layer yielded practically pure methane. LEONA MARSH

Crystallization of paraffin. I. Crystal forms of paraffin from shale oil. YOSHIO TANAKA, RYONOSUKE KOBAYASHI AND SADAYUKI. *J. Faculty Eng. Tokyo Imp. Univ.* 17, 275-82(1928).—Crude shale paraffin from Fushun oil shale was purified by washing with cold alc.-ether soln. and fractionated by sweating. Well-defined crystal forms were obtained from each fraction and their physical properties detd. Most of the shale paraffin melts at 57-64° and consists of normal hydrocarbons. The interlaced needle crystals were generally produced from alc.-ether soln. at high concn. and high cooling velocity, while the plate crystals were obtained at lower concn. and cooling velocity. The plate arrangement is thought to be more stable. Viscosity of the solvent medium is important in crystal formation. Low viscosity favors plate crystals while high viscosity favors needles. The viscosity of the paraffin distillate used was extremely low and the crystals obtained were, therefore, laminar. Mutual transformation of the two types of crystals can be easily effected by controlling the viscosity of the paraffin distillate, or by the cooling velocity. Typical photographs of the crystals are given. II. Crystal system of paraffin from shale oil. *Ibid* 283-8.—The fundamental form of the crystals is a rhombic plate, having angles of 110° and 70°. They

exhibit double refraction and parallel extinction. All plate crystal forms of shale paraffin are produced by parallel growths of the fundamental rhomb. Needle crystals are formed by successive growths of the orthorhomb parallel to the direction of the 70° angle. Needle crystals of paraffin belong to the rhombic system. III. Crystal forms and system of petroleum paraffin. YOSHIO TANAKA AND RYONOSUKE KOBAYASHI. *Ibid* 289-92.—Petroleum paraffins crystallize as needles with few exceptions. Formosa petroleum yields plate crystals of paraffin. The difference depends largely on the viscosity of the distillates and not on the chem. nature of the paraffins. Increasing viscosity favors needle-crystal formation. The cryst. form of the paraffin gives an indication of the suitability of the pressed oil for lubricating purposes. Results of examn. of petroleum paraffin crystd. from alc. soln. were similar to those obtained with shale petroleum.

D. F. BROWN

A study of the less volatile oils in Salt Creek (Wyo.) crude. H. M. SMITH. Bur. of Mines, *Tech. Paper* No. 428, 28 pp. (1928).—Carefully sampled Salt Creek crude oil was distd. in a current of natural gas at 100° to remove gasoline (33.8%). The residue was dissolved in acetone at 50°, poured into more acetone at 5-10° and filtered, the ppt. being reëxtd. twice more in the same manner and then discarded (21.5% of original crude). The acetone was removed from the filtrates and the remaining oil (44.7% of original crude) distd. with superheated steam, an electrically heated fractionating column being used. Four cuts were made, the column temps. being 174°, 195°, 213°, and 257°, resp. Cut I, which was chiefly kerosene and gas oil, was not investigated nor was the residue (16.9 and 9.6% of original crude, resp.). Cuts II, III and IV were considered to contain all the lubricating stock and amounted to 8.8, 4.8, and 4.6% of the original crude, resp. These were individually treated with successive portions of acetone at 0° which were removed from the residues by decantation. The sol. fractions were examd. separately after removal of acetone, while the insol. residues were fractionally distd. at 40 mm. pressure and the various cuts including the residues examd. Viscosity, density, n , Menzies-Wright mol. wt. detns., and C, H and S analyses were made on all fractions. C:H ratios, empirical and series formulas were calcd. from the ultimate analyses and the mol. wt. detns. The fractions from each of the steam distn. cuts arranged themselves into 2 very distinct groups. The acetone-insol. portion in each case had a low viscosity-gravity ratio and a low C:H ratio (*i. e.*, relatively low unsatn.) while the acetone-sol. portion had a high viscosity-gravity ratio and a high C:H ratio (*i. e.*, relatively high unsatn.). The following table gives the average of the properties of these 2 groups for the 3 steam distn. cuts combined (acetone-insol. total = 10.16% and acetone-sol. total = 34.5% of original crude):

	Viscosity centipoises	Sp. gr.	C:H ratio	Mol. wt.	n_D^{20}	Formula	Series
Acetone sol.	43.2	0.934	0.639	247	1.5280	$C_{18.5}H_{38.5}$	$C_nH_{2n-7.9}$
Acetone insol.	12.2	0.858	0.523	261	1.4740	$C_{18.5}H_{36.9}$	$C_nH_{2n-1.7}$

These values were compared with Cabin Creek petroleum, a Penn. oil, and Sour Lake crude. The acetone-insol. fraction corresponds very closely in almost every respect to the Penn. oil while the acetone-sol. fraction corresponds very closely to the Sour Lake oil.

ELLIOTT J. ROBERTS

Natural gasoline in 1927. G. R. HOPKINS. Bur. Mines, *Mineral Resources of the U. S. 1927*, Pt. II, 199-208 (preprint No. 20, published January 10, 1929). E. H.

Studies on characteristics and classification of gasoline. TADEUSZ NOWOSIELSKI. Libusza Refinery Standard-Nobel in Poland. *Przemysl Chem.* 13, 16-23, 66-78 (1929).—After considering the normal Engler-Ubbelohde method of distn. N. concludes that corresponding to the American method 13 points have to be stated, namely the temps. of initial boiling, and end points, those at 5 and 95% as control points, and for each 40% of the distillate. Instead of stating the "dry point," which is never certain, the temp. at which 98% distils is to be considered as the end point. The application of the "average b. p." has been useful to N. in detg. and comparing different sorts of gasoline. There does not exist any near relation between the sp. gr. of gasolines and the limits of their b.-p. temps. Expts. prove that sp. gr. of gasoline fractions is a function of their quant. and qual. compn. and that for gasolines of different origins, obtained under the same conditions of fractioning, it generally represents different values, and is, therefore, of small importance. N. exams. a large vol. of exptl. material on rectified gasoline collected by himself in control work of rectifying app. in different manufactories and during a prolonged period and concludes that sp. gr. is entirely useless for detg. the quality of gasoline, which should be evaluated exclusively from the characteristic qualities of the b.-p. curves. He shows that the "av. b. p." of a mixt. can be

calcd. from the av. of the b. ps. of its components on the basis of the rule of mixts. He proposes the following form for obtaining a short characteristic of a gasoline:

% distg. at av. b. p. $\frac{\text{"av. b. p."}}{\text{distn. range}}$. The application of this formula presents the

following advantages: (1) Not taking into account, the sp. gr. one is free to make use of gasolines of different origins and is not restrained as to the method of their production. Moreover, the wrong method of detg. the volatility of gasolines on the basis of their sp. gr. practiced until now is thus eliminated. (2) The relation of parts of smaller volatility to those of greater volatility in gasolines of the same av. b. p. is const. It is, therefore, the measure of the av. volatility of gasolines, and as such it is their real and essential characteristic. (3) The prepn. of a blend of a certain b. p. from gasolines of known qualities can be calcd. beforehand and presents no difficulties. (4) The av. b. p. together with the initial b. p. and end-point dets. the position of the boiling curve and its character with an exactness possible to attain in every manufactory and from every raw material. This exactness is likewise necessary and sufficient for qualifying a given brand of gasoline for a certain purpose. Finally N. briefly describes the methods of gasoline classification practiced until now and shows their defects. Conclusion: The classification of gasoline ought to be effected from the standpoint of its application and based on an objective and uniform method of characterization of its sorts

A. C. Z.

Irregular mode of spherical propagation of flame. TORAHIKO TERADA AND KIYOHiko YUMOTO. *Proc. Imp. Acad. (Japan)* **4**, 98-101(1928).—The corrugated surface of the nearly spherical flame front previously observed when mixts. of H and O were ignited by a spark is attributed to shrinkage of the gas because of conduction of H₂O vapor. The presence of antiknock materials in the gas reduced the effect

C. J. WEST

Lubricating oils. I. Specifications. ANTONY SETON. *Chemistry & Industry* **47**, 1142-3(1928). **II. Lubricants for medium- and high-speed bearings.** *Ibid* 1143-5. **III. For special purposes.** *Ibid* **48**, 54-8(1929).—A discussion of the lubrication of cylinders of steam engines, gas engines, crankcases, pneumatic and refrigerating machinery, air compressors, O compressors, hydraulic machinery, cutting lubricants, roller chains and roller bearings. S. gives a table of suggested specifications for each type. **IV. The gumming of lubricating oils.** *Ibid* 81-2.—Oils are thickened by metallic soaps and by "gumming" because of oxidation or perhaps polymerization. In mineral oils the readily oxidized portion is insol. in ether, is highly colored and consists of asphaltenes formed from the asphalt resins present more or less in all crude oils.

EUGENE C. BINGHAM

Treatment of bitumens with sulfosil. V. TOKMANOV. *Neftyanoe Khozyaistvo* **15**, 73-4(1928); cf. *C. A.* **22**, 4786.—Unsatd. compds. and aromatics, tars and asphalts are sepd. from mazout by treatment with sulfosil (activated silica gel) at elevated temps. Pitches and asphalts are mixed with gasoline and sulfosil and heated in an Erlenmeyer flask with a reflux condenser on a water bath for 1 hr. followed by a Soxhlet extn. of the unsulfonated residue. Comparison is made between this method and the pure adsorption method with silica gel and fuller's earth, the last giving some polymerization products from high-mol. oils and tars. An analytical method is proposed which consists in using silica gel for the detn. of neutral tars and soft asphalts followed by a treatment with sulfosil, whereby the unsatd. compds. and aromatics are extd., leaving paraffins and naphthenes. The reaction of sulfosil has been checked with the method of Lach-Holde on montan wax; it gives identical values. A. A. B.

Investigation of wood tar. I. YA. POSTOVSKII AND B. G. PERETZ. *J. Chem. Ind (Moscow)* **5**, 625-8(1928); cf. *C. A.* **22**, 4787.—1,150,000 tons of wood are yearly carbonized for the production of charcoal required for the manuf. of cast iron in the Ural area. This wood yields on the av. 3% of tar as a by-product which has hitherto found no utilization. The tar produced in a Russian wood gas generator where 64% of the wood subjected to distn. was pine, the rest being chiefly aspen, was examd. by P. and P. The tar presented a black substance of the consistency of honey and had a weak odor of creosote. Freed from water the tar gave, by elementary analysis, 79.95% C, 6.23% H, 13.82% O, the N content being insignificant. 300 g. of the tar were treated with ether; the latter dissolved 86% of the substance, leaving behind a residue consisting chiefly of charcoal dust. The ethereal soln. was first washed with Na₂CO₃ soln. to remove fatty acids; the latter consisted of a mixt. of formic, acetic, propionic, butyric and valeric acids. The total fatty acids content is negligible (2.1%). The ethereal soln. of the tar was further washed with aq. NaOH soln. to ext.

the *phenols*, and the phenolates obtained were acidified and subjected to fractional distn. The total amount of phenols was 30% of the tar, 6% being liquid (phenol, cresol, creosote, etc.) and 24% solid. Only the liquid phenols are valuable as chemicals, the solid phenols being highly polymerized asphalt-like products for which no utilization can be found. After the removal of the acids and of the phenols the ethereal soln. of the wood tar was washed with dil. H_2SO_4 to ext. the *pyridines*. The pyridine content of the tar, however, was insignificant (0.1%). The ethereal soln., which after these treatments contained only *neutral substances*, was evapd. and steam-distd. Only 5% of the neutral substances passed with steam, the remainder consisting of high mol. wt. products of hydroaromatic character which could not be distd., even *in vacuo*, at 300° . The portion which distd. with steam was apparently a *fulvene*, probably naphthylfulvene, $C_{18}H_{12}$. About half of the wood tar consisted of *water* (48.8-55%); *inorg. substances* (ash) were contained in the tar to the extent of 0.1-0.3%. The fact that the tar contains only 6% of liquid phenols excludes the possibility of its utilization as a sterilizing material, nor in the manuf. of bakelite. Neither can it be used as liquid fuel for internal-combustion motors, nor as raw material for obtaining chemical products. The most logical utilization is for *fuel*. Its calorific value is only 3970 cal. on account of its large water content; when, however, this water is removed by heating, the calorific value increases to 7550 cal.

BERNARD NELSON

Emulsions of fats and hydrocarbons and their industrial applications (MEUNIER) 27. The underground water from the oil field of Akita (MIKAWA) 14. Effect of high-frequency current on mineral oils (RABEK) 27. Salt domes and petroleum reservoirs (BENTZ) 8. Methods to determine vapor pressure (VAPOR PRESSURE COMM.) 2. Acetylation of beech wood (HORN) 10. Production and origin of AcOH and other organic volatile constituents of pyrolygneous distillate (PADOVANI, BURRAI) 10. Alkylaryllead compounds. Antiknock studies (GILMAN, *et al*) 10. Mineral-oil sulfonates (U. S. pat. 1,703,838) 27. Apparatus for gravity separation of foreign matter from lubricating oils or other liquids (U. S. pat. 1,705,329) 1. Emulsifying agents (Fr. pat. 645,044) 18. Extracting carbonaceous material (Australian pat. 10,517) 21. Absorption tower suitable for treating oils (U. S. pat. 1,703,571) 1. Rubber-like substance from mineral oils (U. S. pat. 1,704,194) 30. Composition suitable for sealing joints exposed to gasoline (U. S. pat. 1,704,446) 18. Apparatus for evaporating diluents from lubricating oils or other materials while spread in a thin film (U. S. pat. 1,703,613) 1. Penetrometer suitable for use with soaps, cup greases, etc. (U. S. pat. 1,703,270) 27.

Cracking emulsified petroleum oil. GUSTAV EGLOFF and HARRY P. BENNER (to Universal Oil Products Co.). U. S. 1,703,103, Feb. 26. The oil is heated to a conversion temp., evolved vapors are passed to a dephlegmator and reflux condensate is subjected to further treatment at a temp. above the b. p. of water; dephlegmated vapors are subjected to an initial condensing action at a temp. above the b. p. of water, water vapors and light hydrocarbon vapors are united, sepd. from the reflux condensate and from the vapors undergoing initial condensation, and these mingled vapors are subjected to a further condensing action. An app. is described. Cf. C. A. 22, 498.

Treating "pressure distillate" from petroleum oil cracking. RALPH A. HALLORAN (to Universal Oil Products Co.). U. S. 1,704,246, March 5. Pressure distillate contg. over 0.2% S is washed with water directly after condensation without releasing the distillate from the pressure evolved in the cracking distn. operation substantially below the degree of pressure reduction requisite for evolution of the wet gases from the pressure distillate, and then, without substantial release of pressure, is treated with an alkali soln. An arrangement of app. is described.

Distilling petroleum oil. JOHN C. BLACK (to Pan American Petroleum Co.). U. S. 1,704,588, March 5. In prepg. a crude petroleum for distn., a crude oil contg. emulsified water and corrosive metallic salts is mixed with an aq. soln. of an alkali such as NaOH or Na_2CO_3 in sufficient quantity to convert the corrosive metallic salts into noncorrosive compds., the mixt. is heated to facilitate this conversion, most of the water and noncorrosive compds. formed are sepd. under pressure from the heated oil, and the latter is mingled with hotter residual oil in quantities sufficient to raise the temp. of the mixed oils above the b. p. of water at the pressure employed, and water and hydrocarbons of low b. p. are vaporized and condensed. An app. is described.

Distilling crude petroleum, coal tar, etc. A. ALEXANDRE. Belg. 350,953, May 31, 1928. The liquid is passed successively downward through a series of superposed elements, each consisting of a pan, through which project a number of pipes extending

to a height greater than the level of the liquid. At the bottom is a suitable source of heat, and the different elements are heated by the ascending vapors. Part of the vapors is condensed in each element and may be either withdrawn therefrom or refluxed back.

Refining petroleum oils. OTTO DIECKMANN. U. S. 1,703,615, Feb. 26. Topped crude oil is washed with concd. H_2SO_4 and the acid sludge formed is sepd. and washed with refined petroleum oil, the oil thus used is mixed with the main body of acidulated oil, and the latter is then neutralized and fractionated.

Refining petroleum oils. THE SHARPLES SPECIALTY CO. Fr. 644,840, Nov. 9, 1927. The proportion of cryst. paraffin in the oil is regulated so that on cooling the mixt. the paraffin obtained as a ppt. is sufficiently plastic or amorphous and has a sp. gr. sufficiently high to sep. from the oil by centrifuging. Amorphous paraffin is added to the oil thus treated so that on cooling a ppt. is obtained which may be centrifuged. It is advantageous to retain or add substances generally sepd. from the oil (other than hard asphalt) by treatment with acid or clay, so that the substances are present during the centrifuging. The paraffin obtained by the centrifuging may be used in industry. The process is particularly applicable to the prepn. of lubricating oils.

Apparatus for dehydrating petroleum emulsions by electric treatment. JAN H. C. DE BREY. U. S. 1,704,463, March 5. Various structural features are described.

Cracking hydrocarbon oils. GUSTAV EGLOFF (to Universal Oil Products Co.). U. S. 1,703,617, Feb. 26. Oil is heated in a plurality of independent units, the evolved vapors are dephlegmated and reflux condensate is continuously returned to each unit for retreatment; vapors from the dephlegmation are condensed and the resulting distillate is collected and uncondensed gases produced in each unit are passed to a common header from which they are not permitted to return to any of the units. The gases are compressed in the header and returned in regulated quantities to the raw oil treated in each unit. The app. used is described. Cf. C. A. 23, 273.

Cracking hydrocarbon oils. EUGENE C. HERTHEL and HARRY L. PELZER (to Sinclair Refining Co.). U. S. 1,703,528, Feb. 26. In the operation of a pressure-still cracking system in which the charge of oil is circulated from a bulk supply tank through an externally heated tubular heater and back to the bulk supply tank, a bed of material contg. uncombined metallic oxides such as oxides of Fe and Cu is maintained in the bulk supply tank submerged in, directly exposed to, and extending across the charge of oil and so carried on a support as to permit free passage of the still charge; oil is supplied to the heating tubes from below this bed of material and discharged from the heating tubes above it. The app. is described in detail. U. S. 1,703,529 specifies a similar cracking system and app. in which a body of fuller's earth is placed in the pressure still so as to extend across the charge of oil. Operation of the app. is continued until the pitch content of the still charge builds up at least to satn. Cf. C. A. 22, 1468, 3288.

Cracking hydrocarbon oils. GEORGE H. TABER, JR. (to Sinclair Refining Co.). U. S. 1,705,077, March 12. Gas-vapor mixt. from a cracking operation is fractionated and the remaining gas and vapor are passed to a condenser; gas and vapor still remaining uncondensed are scrubbed with a relatively high b. p. oil from the fractionation, and the oil with its absorbed constituents is reintroduced into the fractionating operation. An arrangement of app. is described.

Cracking hydrocarbon oils. I. G. FARBERIND. A.-G. Brit. 294,557, April 21, 1927. Vapors of hydrocarbons to be cracked are passed over a heating device which is arranged in a single plane and of relatively small dimensions in the direction of flow of the vapors (suitably Ni-Cr tubes heated to about 700° by passing hot gases through them). Partially decomposed products are condensed, maintained at 100° and returned for further treatment, and "light benzines" are condensed in a final condenser. An app. is described which may comprise an enameled still, and the heating elements may also be formed of C, Si carbide or graphite, electrically heated and protected from splashing of liquid oil by a baffle.

Apparatus for cracking hydrocarbon oils. WILLIS F. SIMS (to Universal Oil Products Co.). U. S. 1,703,550, Feb. 26. In operation of an app. comprising a heating coil, reacting chamber and dephlegmator, arranged in series, vapors from the dephlegmator are condensed and the resulting distillate is collected, regulated quantities of the distillate are returned to the dephlegmator and subjected to redistn. but out of contact with vapors undergoing dephlegmation; incoming charging oil is supplied to the dephlegmator (the temp. of which is controlled); unvaporized oil is withdrawn from the reaction chamber, and a lower pressure is maintained on the distillate undergoing redistn. in the dephlegmator than on the vapors undergoing dephlegmation.

Thermal decomposition of hydrocarbons. STANLEY M. NORWOOD (to Electro

Metallurgical Co.). U. S. 1,703,949, March 5. Decompn. of hydrocarbon material is effected in contact with an Fe alloy contg. Cr 15-40, Ni 2-15, Si 0.7-3.0, Mn 0.7-3.0, and C not more than 1.0%, which is readily worked and resistant to corrosion.

Hydrocarbon oil conversion. GUSTAV EGLOFF (to Universal Oil Products Co.). U. S. 1,705,181, March 12. Materials such as fuel oil and kerosene are separately heated and then discharged into an expansion zone common to both, vapors are removed from the expansion zone and dephlegmated; reflux condensate is passed to a sep. heater and then returned to the common expansion zone, and superatm. pressure is maintained on the oil and vapors under treatment. An app. is described.

"Converting" hydrocarbon oils. CARBON P. DUBBS (to Universal Oil Products Co.). U. S. 1,703,100, Feb. 26. Oil is subjected to cracking temp. and pressure in a heating zone (such as a pipe coil in a furnace) and evolved vapors are passed to a dephlegmating zone into which refractory distillate is also introduced of such a character that it will almost completely vaporize without much cracking under the conditions prevailing in the dephlegmating zone; dephlegmation is further assisted by passing a less refractory oil in a closed circuit through the dephlegmating zone and thence to the heating zone. An app. is described. Cf. C. A. 22, 4788.

Catalytic "conversion" of hydrocarbon oil. GUSTAV EGLOFF and JACQUE C. MORRELL (to Universal Oil Products Co.). U. S. 1,705,180, March 12. After oil is heated to a cracking temp., there is injected into it regulated quantities of HCl, and the heated oil and HCl are passed into an enlarged zone contg. disintegrated Al; vapors are led off from this enlarged zone for condensation and collection, and the conversion of the oil is effected under superatm. pressure. An app. is described.

Distilling hydrocarbon oils. JAMES M. MCCLAVE (to Conservo Co.). U. S. 1,703,158, Feb. 26. Mn oxide and HCl are added to oils such as natural oils or waste crank case oils, etc., before or at the time of distn., in order to facilitate distn. and sepn. of light products from sludge, etc.

Apparatus for distilling hydrocarbon oils. MAX F. DE BAJLIGETHY. U. S. reissue 17,233, March 12. Reissue of original pat. No. 1,542,864 (C. A. 19, 2410).

Apparatus for distilling hydrocarbon oils. CHARLES B. BELKNAP. U. S. 1,704,277, March 5. Liquid oil is subjected to pressure by a pump and heated under this pressure while temporarily preventing liberation of vapors; it is subsequently allowed to liberate vapors and the latter are condensed, *e. g.*, to obtain gasoline.

Apparatus for refining hydrocarbon oils with acids and alkalis and centrifugal separation of the reagents from the oil. AKTIEBOLAGET SEPARATOR-NOBEL. Brit. 294,539, July 25, 1927.

Arrangement of stills and fractionating columns in a series for distilling hydrocarbon oils. STANDARD DEVELOPMENT CO. Brit. 295,142, Sept. 8, 1927. Structural features.

Safety device (including a fusible plug) for oil-cracking apparatus. LYMAN C. HUFF and ARTHUR G. BOGARDUS (to Universal Oil Products Co.). U. S. 1,703,624, Feb. 26.

Treating residual oil from oil-cracking processes. JACQUE C. MORRELL (to Universal Oil Products Co.). U. S. 1,705,199, March 12. Highly heated residual oil is withdrawn from a conversion zone of an oil-cracking process, agitated with an acid pptg. agent such as H_2SO_4 , and the mixed oil and acid are then transferred to a settling zone where pitch-like C-forming particles coalesce and ppt. as a homogeneous pitch-like mass. An arrangement of app. is described.

Treating oil-soaked carbon from oil-cracking processes. GUSTAV EGLOFF and HARRY P. BENNER (to Universal Oil Products Co.). U. S. 1,705,179, March 12. Oil-soaked C is heated sufficiently in a still to distil off liquid constituents, by heat radiated from the central portion of the still, while continuously agitated. An app. is described.

Purification of oil. RUDOLF WISCHN. Fr. 644,647, Nov. 28, 1927. Oils used in internal-combustion engines are purified by mixing cold with concd. H_2SO_4 , heating gradually to obtain 50-60° after several hours, passing through a mud separator, filtering with kaolin or the like and finally passing through them superheated steam.

Distilling oil shale. MILTON J. TRUMBLE. U. S. 1,704,956, March 12. Raw shale is preheated by indirect heat-exchange with hot spent shale and distd. by contact with highly superheated steam; volatile products are recovered and residual C is burned from the spent shale during the preheating heat-exchange mentioned and resulting products of combustion are passed through the raw shale. An app. is described. Cf. C. A. 22, 2836.

Distilling oil shale. CLAYTON O. WHITE. U. S. 1,703,413, Feb. 26. A retort is described in which the shale passes by gravity from one section to another of a series

of sections having inclined bottoms offset from each other so that the velocity of descent of the material is checked somewhat as it passes from one section to another.

Digestion and distillation of products from bituminous shale. WILLIAM H. HAMPTON. U. S. 1,703,192, Feb. 26. After digestion in an NH_3 -liberating base such as lime and with a mineral oil such as "Congo cylinder oil," at a temp. not substantially above 370° , the volatilized products are recovered. An app. is described.

Device (with flexible metal elements) for removing carbon deposits from the interior of oil stills. LYMAN C. HUFF (to Universal Oil Products Co.). U. S. 1,703,623, Feb. 26. Structural features.

Reclaiming crude oil. HARRY V. MEATHERS. U. S. 1,705,370, March 12. Structural details are described of an app. which is suitable for heating and washing basic sediment oil.

Treating mineral oils containing acids. S. P. COLEMAN (to Standard Oil Development Co.). Brit. 294,892, July 30, 1927. Oils contg. acids naturally or artificially produced are treated with alkali to convert the acids to salts, and the oil is distd. and the acids are recovered from the salt residue. An example is given of the production of naphthenic acids from Gulf Coast oil or like oil and an app. and numerous details are described.

Desulfurizing mineral oils. GUSTAV EGLOFF (to Universal Oil Products Co.). U. S. 1,703,616, Feb. 26. Cracked distillates are mixed with a drying oil such as tung oil and the mixt. is heated sufficiently (suitably at a temp. of about 260 – 315°) to cause a rapid combination between the drying oil and the S compds. present; the mixt. is then distd. under pressure and the overhead product formed during the distn. is recovered.

Gasoline from natural gas and hydrocarbon oil. LESTER S. WORTHINGTON (to C. L. Thompson). U. S. 1,705,348, March 12. Oil supply to a combined feeding and mixing chamber is controlled to leave a vapor space in the chamber, oil is passed from the chamber and heated to vaporize at least a portion of the oil, atomized and mixed with a hydrocarbon gas such as natural or casing-head gas and the mixt. thus formed is then introduced into the vapor space above the oil in the feeding and mixing chamber to permit condensates to fall into the oil in the chamber; gas and vapors from the vapor space are led to a condenser. An arrangement of app. is described. Catalysts such as V, Ti, U or Mo may be used.

Filter for gasoline. ABRAHAM BABITCH (to A C Spark Plug Co.). U. S. 1,705,042, March 12.

Filter for gasoline. JOSEPH W. JONES (to General Motors Corp.). U. S. 1,705,019, March 12.

Filter for gasoline. FRANK A. STRUCK. U. S. 1,704,847, March 12. Structural features.

Lubricating oil. KENNETH G. MACKENZIE and RAYMOND HASKELL (to The Texas Co.). U. S. 1,705,298, March 12. A hydrocarbon oil is used with a small admixt. of oxidized paraffin of neutral saponifiable character.

Acid treatment of lubricating oils. GEORGE F. OLSEN (to General Petroleum Corp. of Calif.). U. S. 1,704,206, March 5. An annular stream of acid is brought into contact with a confined stream of oil by means of an injector nozzle device which is described.

Synthesizing hydrocarbon lubricating oils. C. EPNER. Brit. 294,099, July 16, 1927. Methane or gases rich in CH_4 , gases obtained in cracking hydrocarbons or C_2H_6 or C_2H_4 from coke-oven gases are subjected to the action of an a. c. elec. field, preferably of high frequency and high voltage. The products may be hydrogenated.

Rectifier for the oil of internal-combustion engines. CHARLES L. STOKES. U. S. 1,705,317, March 12. The operation of the app. is controlled by the pressure of the oil.

Device for heating and refining oil in circulating lubricating systems of internal-combustion engines. FRED E. ASeltine (to General Motors Research Corp.). U. S. 1,705,041, March 12.

Purifying used lubricating oil. CHARLES VAN BRUNT and PHILIP S. MILLER (to General Electric Co.). U. S. 1,703,648, Feb. 26. The oil is caused to flow downwardly as a fine network of small streams over a vertical evaporator having numerous capillary spaces while progressively heated from 120° at the top to 150° at the bottom and a current of air is passed upwardly over the oil film to carry away vapors of lower b. p. materials. An app. is described which is suitable for reclaiming crankcase oil.

Device for reclaiming crankcase oil. CHARLES VAN BRUNT and PHILIP S. MILLER (to General Electric Co.). U. S. 1,703,644, Feb. 26. The oil is passed in constant regulated flow over a plate-shaped evaporator having a reticulate surface, in order to evap. admixtures of low b. p.

Treating used crankcase oil. CHARLES VAN BRUNT (to General Electric Co.). U. S. 1,703,645, Feb. 26. In order to facilitate removal of solid matter from used crankcase oil by the employment of an aq. water glass soln., rosin is dissolved in the oil previous to the treatment. An app. is described. U. S. 1,703,646 specifies adding an oil-sol. heavy metal resinates such as Cu, Zn or Pb resinates and then treating the oil with an aq. soln. of an alk. agglomerating agent such as water glass. An app. is described. U. S. 1,703,647 also relates to the use of an aq. alkali metal silicate soln. and describes app.

Hardening paraffins, wax, etc. I. G. FARBERIND. A.-G. Fr. 644,651, Nov. 28, 1927. See Can. 284,971 (C. A. 23, 969).

Asphalt-mixing plant. F. H. CUMMER. Brit. 295,073, May 13, 1927. Structural features.

Apparatus for carbonizing and distilling wood, etc. ANDRÉ COLSON. Fr. 645,706, Dec. 5, 1927.

Portable apparatus for the manufacture of charcoal. LA CARBONISATION INDUSTRIELLE. Fr. 33,289, Mar. 30, 1927. Addn. to 615,926.

23—CELLULOSE AND PAPER

CARLETON E. CURRAN

Chlorine and cellulose. Some theoretical and industrial aspects of the problems of production. Possibilities of introducing the industry into Argentine. HUMBERTO POMILIO *Anales asocn. quim. Argentina* 16, 75-116(1928). E. M. SYMMES

The constitution of nitrated cellulose. F. D. MILES AND J. CRAIK. Nobel Research Labs., Ardeer. *Nature* 123, 82(1929).—M. and C. prepd. a complete range of samples of nitrated ramie (I) using different mixed acids, and the corresponding denitrated products, all of which were examd. by x-ray diffraction methods. The fiber diagrams of the nitrates are frequently lacking in definition and are difficult to interpret, but whenever measurements were possible they have been found to afford only the slightest basis for the theory of Herzog and Naray-Szabo (cf. C. A. 22, 3043, 4244). The diagram of I contg. less than 7.5% N shows the same spacings as are shown by corresponding denitrated products, but different relative intensities; it is much weaker. The spacings remain const. with increasing degree of nitration. The diagram (type B) resembles that of fully mercerized cellulose, but is sharper. The diffractions characteristic of the trinitrate do not appear, although from a mixt. of unnitrated ramie with comparatively little of the highly nitrated fiber it is easy to produce them. In I contg. 7.5-10.5% N the fiber structure is more or less lost; diffuse diffraction rings appear, but the denitrated product still gives sharp lines. With I contg. higher than 10.5% N, nitration with acids of technical compn. always results in diffuse spots, the higher HNO₃ content giving better definition. As the N content falls to 11%, certain spots from planes parallel to the fiber axis are altered in spacing through small ranges in which confusion with diffractions of remanent cellulose of either type is not possible. The denitration product from highly nitrated ramie is practically indistinguishable from that of pure cellulose (type A diagram), but as the N content decreases to about 12%, the denitrated ramie shows diagram B. It appears, therefore, that by the action of the mixed acid, the cellulose residue is converted to type B for all but the highest degrees of nitration, and that the lines obtained in the range, 10-12% N, do not coincide with those given by the trinitrate or by cellulose of either type.

FREDERICK C. HAHN

Metallic complexes of nitrocellulose. J. DUCLAUX. *Rev. gén. colloïdes* 6, 222-4 (1928).—A study was made of industrial filters of nitrocellulose in which inefficient filtration takes place. Analysis of the material on the filter shows the presence of heavy metals. It is believed these form complexes with the nitrocellulose, thus giving a mucilaginous substance which clogs the filter. A high percentage of Pb present, mostly in the insol. part of the material on the filter, is believed to cause most of the trouble. This concn. is inexplicable by entrainment of leady mineral compds.

RAYMOND H. LAMBERT

Nitrocellulose diffusion experiments. R. O. HERZOG AND D. KRÜGER. Kaiser-Wilhelm Institut für Faserstoffchemie. *J. Phys. Chem.* 33, 179-89(1929).—Diffusion coeffs. for nitrocelluloses from celluloses of various botanical origins in various solvents were detd. The nitrates were prepd. by 3 hrs. of nitration at 0° with 71.7% H₂SO₄, 18.65% HNO₃ and 9.63% H₂O. The coeffs. at different temps. for solns. in acetone,

Me Et ketone, Et formate and methanol are equal when calcd. to the coeff. at 20° in H₂O (D_{w20}). The coeffs., D_{w20} , lie between 0.015 and 0.021 for the nitrated natural fibers. The values for the nitrated alkali cellulose (ripened 28 days) are not different from those of nitrated viscose silk, which indicates that the decrease in particle size in the manuf. of artificial silk occurs chiefly in the "preripening" process. The coeffs. vary with conditions of nitration, e. g., D_{w20} for nitrated cotton increases from 0.016 (above conditions) to 0.028 when nitration is at 20° with 61.5% H₂SO₄, 20% HNO₃, and 18.5% H₂O. The nitrate from α -cellulose has a smaller diffusion coeff. than that from β -cellulose. Mech. treatment (Hollander mill) increases the coeff. Most of the detns. display deviations from Fick's law of diffusion. The conditions upon which the validity of the law is based, i. e., that the soln. is homodisperse and that the coeff. is independent of the concn., are not fulfilled. Disaggregation during diffusion is indicated. The nitrocellulose soln. in contact with the solvent does not swell. The particle sizes of the nitrocelluloses calcd. from the diffusion coeffs. are approx. equal to those of natural and nitrated cellulose obtained from the width of x-ray interferences

J. E. SNYDER

Viscosity and cellulose acetates. MAURICE DESCHIENS. *Chimie et industrie* 20 1023-33(1928).—The various types of viscometers are described, together with the viscosity tests for cellulose acetate, which are official in France and in Great Britain. Results are given showing the variation in viscosity with variations in the nature and proportions of the solvents and diluents used; the practical deductions which can be drawn from the measurement of the viscosity of cellulose-acetate solns. are briefly discussed.

A. PAPINEAU-COUTURE

The Canadian Pulp and Paper Institute, Montreal. A. PAPINEAU-COUTURE *Ind. Eng. Chem., News Ed.* 7, No. 5, 4-5(1929).

E. J. C

Measurement of sizing strength of paper. B. SCHAPIRA. *Papier-Fabr.* 26, 608 17(1928).—Methods of detg. the sizing strength of paper are collected, described and classified according to the factor on which the method depends, thus, (1) absorption of ink, (2) absorption of interacting liquids, e. g., FeCl₃ and tannin solns., (3) electrolytic cond., and (4) the action of water, e. g., in capillary rise or in causing the curling up of floating specimens of the paper. Distinction is made between surface and interior sizing strength; the methods of detg. the latter are criticized. The best relative values are given by the dry indicator method of the Bur. of Standards, although, with few exceptions, good agreement is obtained between the results of this method and of the curling method. The method of Stöckigt gives fairly uniform results, but its error increases in magnitude with increasing sizing strength on account of selective adsorption. The electrolytic and ink-floating methods are too unreliable.

B. C. A.

The desizing of cotton goods (MULLIN) 25. Deformation of fibers (HERZOG, JANCKE) 2. Yeast cultivation in treated waste sulfite liquor (U. S. pat. 1,703,272) 16. Treating polluted waste water (U. S. pat. 1,703,373) 14. Purifying solutions of ZnCl₂ or other metallic salts (Brit. pat. 294,259) 18. Expressing water from sheets of material (Austrian pat. 112,276) 1.

Manufacture of Pulp and Paper. New York: McGraw-Hill Book Co. Vol 4, 2nd ed. Edited by J. N. Stephenson. 260 pp. \$6. Reviewed in *Mech. Eng.* 51, 170(1929); *Chem. Met. Eng.* 36, 97(1929).

ÖMAN, ERIK: *Massanalytische Verfahren und deren Anwendung in Zellstoff-fabriken*. Berlin: Carl Hofmann, G. m. b. H. Translated from the Swedish into German by W. Schmidt. 119 pp. Bound, M. 5. Reviewed in *Chem. Trade J.* 84, 101(1929).

Cellulose. OTTO C. STRECKER. U. S. 1,705,424, March 12. Vegetable fibers such as those of resinous wood, straw, or bamboo are decomposed by boiling in a soln. of a metallic compd. of a sol. hydroxy compd. of the isocyclic series, such as Na cresolate, naphthols, cyclohexanol, or oxysulfones. Cf. C. A. 22, 4815.

Cellulose. BéLA DORNER. Fr. 644,599, Oct. 28, 1927. See Can. 284,755 (C. A. 23, 979).

Hydrating cellulose fibers in a "Jordan engine." JUDSON A. DeCraw (to Process Engineers, Inc.). U. S. 1,704,533, March 5. See Can. 282,228 (C. A. 22, 3528).

Threads and films of cellulose esters and ethers. I. G. FARBENIND. A.-G. Brit. 294,485, July 23, 1927. The process for improving the strength of threads, films and other products made from cellulose esters and ethers, described in Brit. 293,350 (C. A. 23, 1780), is modified by incorporating the resin or the intermediate material from

which the resin is formed, with the cellulose ester or ether, before the latter is converted into the threads, films, or other desired products. An example is given of the use of cellulose ethyl ether with a cresol- CH_2O condensation product or with urea and $(\text{CH}_2)_6\text{N}_4$ for thread or film manuf.

Drying cellulose films or filaments. E. MÜLLER. Brit. 294,676, April 25, 1927. See Swiss 127,275 (C. A. 23, 1268).

Drying cellulosic films, filaments and like materials by passing over internally heated driven rollers. E. MÜLLER. Brit. 294,675, April 23, 1927. An app. is described in which heated rollers are arranged in a series without any free spaces between them.

Treating regenerated cellulose. I. G. FARBENIND. A.-G. Brit. 294,551, July 25, 1927. • The process of diminishing the tendency to swell shown by hydrated cellulose, as described in Brit. 278,684 (C. A. 22, 2663), is modified by conducting the treatment of the hydrated cellulose in a feebly acid soln., preferably with the use of a buffer mixt. Various solvents, softening or wetting agents may be added to the aq. soln. of the condensation product used. Examples are given of the treatment of "viscose silk" and of "cuprammonia silk."

Cellulose ethers. HELENE SESSLER (to C. F. Boehringer & Soehne, G. m. b. H.). U. S. 1,704,304, March 5. Cellulose, which may be in the form of mercerized cotton, is subjected to the action of a vapor stream of an ether-forming reagent such as Me_2SO , in the presence of a mercerizing reagent or other suitable basic substance.

Cellulose esters. HERBERT J. MALLABAR. Fr. 645,110, Dec. 3, 1927. A blue-violet dye such as methylviolet extra B is added to cellulose esters in proportion sufficient to neutralize the natural yellow thereof. The same effect may be obtained by applying to one face of a film a prepn. contg. a red dye and to the other face a prepn. contg. a blue dye.

Cellulose esters. I. G. FARBENIND. A.-G. Fr. 644,636, Nov. 26, 1927. Cellulose esters of higher fatty acids are made sol. in org. solvents by heating them in a liquid medium to a high temp. with acids, acid anhydrides, or salts of strong acids with feeble bases or mixts. of these. In examples, cellulose tristearate in tetrachloroethane is heated to 145° with the addn. of trichloroacetic acid or in toluene with FeCl_3 to 90 – 100° . The product is sol. in C_6H_6 , CHCl_3 and tetrachloroethane. Cellulose trilaurate is heated in tetrachloroethane with the addn. of the HCl compd. of pyridine. Cellulose dipalmitate is heated in C_6H_6 with the addn. of AlCl_3 , ZnCl_2 , or a salt of H_2SO_4 or of benzenesulfonic acid. Cf. C. A. 23, 1749.

Soluble cellulose esters containing phthalic groups. RAY L. STINCHFIELD (to Eastman Kodak Co.). U. S. 1,704,306, March 5. An ester sol. in org. solvents such as acetone, CHCl_3 and C_6H_6 , and suitable for films, filaments, etc., comprises phthalic and cellulosic groups and may be formed by a process, the details of which are described.

Mixed organic esters of cellulose. HANS T. CLARKE and CARL J. MALM (to Eastman Kodak Co.). U. S. 1,704,282, March 5. Mixed esters sol. in acetone and in C_6H_6 and which are suitable for making films and filaments contain, for every 24 C atoms of the cellulose mol., less than 4 (but more than one-third of one) acyl groups from the higher aliphatic acids such as lauric, myristic, palmitic and stearic acids having more than 8 C atoms, the remaining acyls being acetyl groups. U. S. 1,704,283 specifies halogen-substituted-cellulosic org. acid esters, such as those of *o*-chlorobenzoic acid contg. 1-3 acid groups for each 6 C atoms of the cellulosic group, which are sol. in a neutral volatile solvent such as CHCl_3 and acetone, and suitable for films, etc.

Cellulose acetate. G. W. MORDEN. Brit. 294,415, Nov. 25, 1927. Cellulose is treated with sulfuryl chloride, glacial HOAc and Ac_2O ; the acetylation is subsequently finished in a second stage by treatment with Ac_2O , glacial HOAc and H_2SO_4 . The cellulose acetate formed is hydrolyzed to render it easily sol. in acetone; it is suitable for making films.

Molding compositions containing cellulose acetate. G. TRÜMLER. Brit. 294,251, July 21, 1927. Cellulose acetate (which may be mixed with resins and softening agents) is made into a paste, suspension, or soln. with a volatile liquid such as spirit; the product is heated in boiling water, in salt soln., or by superheated steam to drive off the volatile liquid and to leave a brittle loose mass, which is dried and pulverized; it can then be formed by hot molding or extrusion. Fillers, coloring agents, etc., also may be added.

Covering articles with celluloid. J. M. HALBY. Brit. 294,969, Nov. 16, 1927. A strip or sheet of celluloid is rendered pliable by treatment with a softening medium such as a mixt. of acetone and water or of acetone, "methylated spirit" and benzene,

in this condition it is applied to automobile steering wheels or to other articles to be covered, and is stretched into place, allowed to dry, and then polished.

Nitrocellulose coating composition. HAMILTON BRADSHAW, EDGAR H. NOLLAU and RICHARD G. WOODBRIDGE (to E. I. Du Pont de Nemours & Co.). U. S. 1,703,415, Feb. 26. A nitrocellulose of over 12.4% N content is colloided (suitably by use of denatured alc.); the colloided material is comminuted, seasoned for about 2-4 weeks at a temp. of about 60°, further seasoned at atm. temp. until a standard testing soln. made from it shows a viscosity of less than 200 sec. (when measured by a method which is described) and then dissolved in a solvent such as alc., C_6H_6 and EtOAc. The soln. thus formed is suitable for *coating fabrics*. Di-Bu phthalate, castor oil and pigments may be added.

Sulfuric derivatives of carbohydrates. W. TRAUBE. Brit. 294,572, July 26, 1927. Products adapted for use as protective colloids or as intermediates in the manuf. of cellulose acetates and nitrates are made by treating dry cellulose with SO_3 ; wood, straw, and other carbohydrates such as starch may be similarly treated. Either gaseous SO_3 or fuming sulfuric acid may be used and various details and modifications are described.

Viscose. WERNER CHATELAIN. Fr. 645,790, Dec. 16, 1927. A construction of a distributor of viscose to the pistons in the manuf. of artificial silk is described.

Viscose distributors in artificial-silk manufacture. EMILE-HIPPOLYTE-JÉRÔME REBSOMEN. Fr. 33,218, Mar. 23, 1927. Addn. to 596,314. Constructional details

Artificial silk and films from viscose. COURTAULDS, LTD., and J. H. TAYLOR. Brit. 294,805, Oct. 10, 1927. Liquid petroleum material of high b. p. or petroleum jelly added to viscose to reduce the luster of threads, films or the like formed from it is emulsified with the viscose by the use of cyclohexanol, with or without the addn. of other substances such as oleic acid.

Artificial silk. CAMILLE DREYFUS. Fr. 644,985, Dec. 1, 1927. Delustering of material consisting of or contg. cellulose acetate, etc., is prevented by adding to a bath in which delustering might occur a salt of the formula $RCNS$, in which R is NH_4 , an alkali or alk. earth metal. Thus, between 1 and 10% of $Ca(CNS)_2$ may be used.

Artificial silk. NAAMLOOZE VENNOOTSCHAP NEDERLANDSCHE KUNSTZIJDEFABRIEK. Fr. 644,673, Nov. 28, 1927. Artificial threads of greater solidity are obtained by passing them for a distance of at least 50 cm. under the surface of the spinning bath before a long path in the air.

Artificial silk. SOCIÉTÉ CHIMIQUE DES USINES DU RHONE. Brit. 294,623, July 29, 1927. See Fr. 638,448 (C. A. 23, 278).

Pump for artificial-silk manufacture. FA. ALEX. FRIEDMANN. Austrian 112,240, May 15, 1928.

Pump for artificial-silk manufacture. HENRY DREYFUS. Fr. 644,597, Oct. 26, 1927. A pump for the delivery of spinning solus. to the spinning nozzles is described.

Wood-pulp digestion. EINAR MORTERUD. U. S. 1,703,745, Feb. 26. In order to reduce the pressure in a digester immediately before discharging, at the termination of the digesting process, the digesting liquid is conducted from the digester to a sep. gas- and steam-liberating vessel, which is under a reduced pressure; the liquid is then returned to the digester after sepn. of steam and gas. An app. is described.

Apparatus for forming sheets of fibrous pulp. JESSE B. HAWLEY (to Arvey Mfg Co.). U. S. 1,704,706, March 12.

Dewatering paper pulp and the like by pressing. RICHARD KASTNER and HERBERT SCHMOLKA. Austrian 112,259, Oct. 15, 1928. The operation is conducted at a temp. of about 60°.

Paper-making apparatus. LELAND S. ROSENER and DAVID H. PATTERSON, JR. (to The Paraffine Companies). U. S. 1,704,216, March 5.

Paper manufacture. JUDSON A. DECEW. U. S. 1,704,728, March 12. Gases are removed from the solid and liquid materials constituting paper stock (suitably by a vacuum pump) before the stock is converted into paper. An arrangement of an app. is described.

Reworking used paper. JOSEPH O. PEIRCE and WARREN T. REDDISH (to Twitchell Process Co.). U. S. 1,703,830, Feb. 26. Used paper is repulped, foreign matter is sepd. by use of a mineral-oil sulfonic reagent, the pulp is washed and then used for making new paper.

Paper having a glossy surface of regenerated cellulose. ALBRECHT SCHMIDT, GERHARD BALLE and KUNO FRANZ (to I. G. Farbenind. A.-G.). U. S. 1,703,961, March 5. A film of regenerated cellulose is united with a paper web during manuf.

Paper (suitable for cigaret mouthpieces). WICKEL & Co., KOMMANDIT-GES. Brit. 294,492, July 23, 1927. Paper such as thin tissue paper is treated with a water-insol. material such as a natural or synthetic resin or cellulose deriv., which may serve as a carrier for a metal-reflective iridescent face.

Transparent wrapping material. F. K. WICKEL. Brit. 294,463, July 23, 1927. Material such as thin sheets of cellulose derivs. or paper rendered transparent by the use of resin is treated with a mirror-forming substance, e. g., rubbed with BiOCl. The mirror effect may be preserved and interference effects produced by coating with a dil. soln. of resin.

Metal-coated paper. H. GLOOTZ. Brit. 294,154, July 18, 1927. Mech. features of manuf.

Cardboard. G. E. HEYL and HYCOLITE LIQUID WALLPAPER MFG. CO., LTD. Brit. 294,442, Jan. 26, 1928. Paper such as waste paper or fibrous pulp is finely subdivided in a dry condition by a high-speed disintegrator; it is then mixed into a stiff paste or dough with water and a binder such as dextrin or resin glue, treated in a colloid mill, and then formed into sheets by passing between rolls and dried.

Storing half-stuff, whole stuff, or the like. RICHARD AIGNER. Austrian 112,270, Oct. 15, 1928. The half-stuff, etc., on leaving the rollers of a dewatering machine is craped and piled up while still damp.

24—EXPLOSIVES AND EXPLOSIONS

CHARLES E. MUNROE

Value of the methyl violet, zinc iodide-starch and Abel tests in comparison with other methods for determining the stability of smokeless powder. F. LENZE AND L. MERTZ. Chem.-Tech. Reichsanstalt, Berlin. *Z. ges. Schiess-Sprengstoffw.* 23, 340-3, 381-4, 428-31 (1928).—Nine samples of smokeless powders made with and without stabilizers, widely varying in age and in stability, were tested by various stability tests, including the methyl violet test at 134.5°, ZnI-starch test at 80°, Abel test at 76.7°, German test at 132°, storage tests at 100° and 75°, Bergmann-Junk test at 132°, and Hansen's H-ion test at 110°. Conclusion: The methyl violet, ZnI, and Abel tests do not give reliable indications of actual stability. They indicate only the first traces of decompn. and are influenced by various factors, such as light and weather conditions. The Bergmann-Junk test is regarded as giving the most reliable measure of stability. The storage tests give good agreement with the Bergmann-Junk test, although the time required for the 75° test excludes it as a practical factory test. A further study of the H-ion method is to be undertaken. C. G. S.

The velocity of ignition of inflammable substances in air. HEINRICH MACHE. *Sitzb. Akad. Wiss. Wien., Abt. IIa*, 137, No. 7, 455-62 (1928).—Expts. were made on the velocity of ignition over a liquid surface. The temp. of liquid surface was detd. by a Pt thermometer. Atm. pressure and moisture were recorded. The velocity of ignition is given for toluene (15.8-26.9°), alc. 99% (8.7-30.3°), alc.-water mixt. at 18.5° a benzene-CCl₄ mixt. at 10.8°, for benzene (3.5-28.5°), benzene (6.2-25.8°), ether (3.3-18.9°), acetone (4.2-25.5°), pentane (2.9-16.6°). FRANK URBAN

Colored light compositions. H. HENKEL. *Z. ges. Schiess-Sprengstoffw.* 23, 388-9 (1928).—Formulas are given for various compns. suitable for producing flame of various colors in *pyrotechnics*. The functions of the different ingredients are discussed and equations of combustion given. S used must be powd. brimstone, not "flowers" of S, because of traces of H₂SO₄ in the latter. Compns. contg. Mg or Al must be thoroughly dried and not stored in a warm place, in order to avoid oxidation. C. G. STORM

A safe apparatus for crimping blasting caps to fuse. ANON. *Z. ges. Schiess-Sprengstoffw.* 23, 378-80 (1928).—A description is given, with illustrations, of an app. for protecting workers from accidental explosion of blasting caps in the crimping operation and for producing a crimp that is watertight. C. G. STORM

A new testing station. ANON. *Z. ges. Schiess-Sprengstoffw.* 23, 427-8 (1928).—A brief description is given of a new exptl. testing gallery at Freiberg for detg. the safety of coal mining explosives. C. G. STORM

Highlights in electrifying a powder mill. FRED A. L. SCHMIDT. *Chem. Met. Eng.* 36, 79-81 (1929).—Installation details due to special hazards are given. E. M. S.

Tungsten alloy [for ammunition] (U. S. pat. 1,703,577) 9.

Explosives. ADOLPHE SEGAY. Fr. 645,566, Dec. 12, 1927. Antifiredamp explosives contain (1) NH_4NO_3 59, NaCl 18, trinitronaphthalene 13, KCl 10% NH_4NO_3 60, NaCl 20, trinitronaphthalene 10, gelatinized nitroglycerin 10% NH_4NO_3 59, NaCl 20, trinitronaphthalene 8, trinitrotoluene 5, KClO_4 10%.

Storing explosive gases. SVENSKA AKTIEBOLAGET GASACCUMULATOR. Fr. 644,695, Nov. 29, 1927. Inorg. porous material such as pumice stone, clay or infusorial earth, used for storing explosive gases, is satd. with a soln. of one or more inorg. salts and dried. Suitable salts are ZnCl_2 , or NH_4 or B salts.

Storing gases. AUTOGEN GASACCUMULATOR A.-G. Ger. 470,794, Dec. 5, 1926. Inorg. granular porous fillings for use in storing explosive gases, e. g., C_2H_2 , are improved by depositing thereon finely divided inorg. substances, e. g., by treatment with solns. of CaCl_2 and Na_2SiO_3 or with solns. of Zn or Cu salts. Cf. C. A. 23, 708.

Trinitrotoluene. AKTIEN-GESELLSCHAFT LIGNOSE. Brit. 294,625, July 29, 1927. Fused dinitrotoluene at a temp. of $80-95^\circ$ is added to nitrating acid at 80° while stirring, and cooling if desired, and the reaction is regulated by regulating the rate of addn. of the dinitrotoluene.

Electrically ignited detonating or blasting cap. ALFONS G. SCHURICHT and JOSEPH D. McNUTT (to Western Cartridge Co.). U. S. 1,704,222, March 5. A priming or igniting charge which is used comprises a granular brisant material such as Hg fulminate crystals, the grains of which are coated with PbO or other suitable deterrent.

Blasting cartridge for use with liquid or solid carbon dioxide. HARRY S. HART. U. S. 1,705,248, March 12. An auxiliary explosive charge is mounted within the cartridge for raising the temp. of the CO_2 to above the crit. temp. and the cartridge is constructed so as to rupture transversely at a definite point in the wall of the casing and permit escape of gaseous CO_2 at a predetd. pressure.

Fuses for exploding bombs to be dropped into water. P. SCHWENKE. Brit. 294,077, Jan. 23, 1928. When the bomb is dropped into water, heat is generated by the action of the water on a substance such as CaC_2 or Na which in turn serves to burst a tube contg. an acid such as H_2SO_4 so that the latter can react with a charge of KClO_4 or the like and the latter action fires a charge of gunpowder in the bomb. Various structural features are described.

25—DYES AND TEXTILE CHEMISTRY

L. A. OLNEY

Emile Bronnert. ARNOLD H. HARD. *Silk J.* 5, No. 54, 69-70(1928).—Obituary. CHAS. E. MULLIN

To the memory of Moritz von Gallois. (August, 1859-December, 1928.) An obituary and a contribution to the history of the chemistry of azo dyes. ANON. *Z. angew. Chem.* 42, 169-70(1929). E. H.

Effects of after-treatments on the degree of aggregation, location, shade, and fastness properties of insoluble azo colors on the fiber. F. M. ROWE. *Chemistry and Industry* 48, 77-8(1929); cf. C. A. 20, 825.—R. discusses previous publications on this subject in connection with his own work. The effects (degree of aggregation and location, shade, fastness to light, rubbing and bleeding) of several after-treatments of graded severity in water, soap, Na_2CO_3 and NaOH solns. for various lengths of time and temps. were studied on various fibers (gray, bleached, mercerized and bleached cottons, rayon) dyed with 30 combinations of diazotized bases and members of the naphthol AS series. Microscopic comparison must be made only between fibers of similar structure. Hot after-treatments influence the state of aggregation and location of azoic colors in the fiber in varying degrees according to the nature of the dyed fiber, the constitution of the azo compd., and the depth of the shade. The presence of moisture is essential; a trace, however, is sufficient. The particles increase in size, but growth in the swollen cell cannot proceed indefinitely without rupturing the fiber. Consequently, the particles migrate to the free surface where growth can continue more readily. Severe treatments, which promote swelling of the fiber, facilitate migration. In solid fibers like viscose rayon migration is always outward, the center of the fiber becoming colorless. Aggregation continues at the outer surface from which the crystals are easily removed, finally leaving the fiber colorless. With hollow fibers, such as cotton, the dye particles migrate inward to the lumen and also outward to the cuticle, and eventually after severe after-treatment, the color is left only in the lumen. This led Kayser (cf. C. A. 20, 2249) erroneously to conclude that migration

of the pigment in cotton is wholly inward. Aggregation and migration occur more readily in viscose rayon than in cotton. Examns. of dyeings kept 20–40 yrs. showed that these processes proceed very slowly at normal temp. and humidity. Hot soap solns. (Na_2CO_3 , NaOH) produce an effect similar to but more rapid than that of water. Aggregation and migration of azoic colors in the fiber are accompanied by changes in hue and brightness of the dyed material, and by changes in fastness to light, rubbing and bleeding. The ease of aggregation and migration of the coloring material is a reliable guide in searching for azo combinations resistant to kier boiling. Fastness to light increases with increase in size of particles. FREDERICK C. HAHN

Chemical notes (2). Annatto. A. W. R. JOACHIM. Ceylon Dept. Agr. Peradeniya. *Trop. Agr.* (Ceylon) 71, 148–50(1928).—Some methods of obtaining the dye from annatto seeds were tested. The amt. of dye obtained by the usual method of fermenting was 5% of the wt. of the seed. By extg. fresh seed with Na_2CO_3 soln. 4% of dye was obtained. Other methods are briefly discussed. Five references are given. A. L. MEHRING

Process for the correction of viscose unevenly dyed with direct cotton dyestuffs. COURTAULDS, LTD. *Chemistry and Industry* 48, 192(1929).—See C. A. 23, 1508. E. H.

Production of multicolored effects (in wool goods). J. STEPHEN HEUTHWAITE. *Can. Colorist Textile Processor* 8, 120–2(1928).—Various methods of obtaining multi-color effects in wool materials are discussed. CHAS. E. MULLIN

Indigo extract. Laboratory control of market goods. D. N. POPOV. *Trans. Sci. Chem.-Pharm. Inst.* (Moscow), No. 9, 64–80(1924).—P. presents data on the analysis of the dye properties of natural indigo extract. J. S. JOFFE

Reduction and sulfonation of *p*-nitroaniline and para red by acid sodium sulfate. J. S. TURSKI, Z. PULAWSKI, B. HILLEBRAND and H. BORTNOWSKA. Warsaw Polytech. *Przemysl Chem.* 11, 562–8(1927).—A review. A. C. Z.

Half century of intermediates. M. L. CROSSLEY. Calco Chemical Co., Bound Brook, N. J. *Textile Colorist*, 50th Anniversary (1879–1928), 42–3, 121–2.—A review. RUBY K. WORNER

Half century of dyeing. LOUIS J. MATOS. *Textile Colorist*, 50th Anniversary (1879–1928), 48, 123.—A review. RUBY K. WORNER

Half century of dyeing theories. ALBERT P. SACHS. *Textile Colorist*, 50th Anniversary (1879–1928), 44–7, 122; cf. C. A. 22, 1239.—A review. RUBY K. WORNER

Half century of the United States dye industry. AUGUST MERZ. The Heller & Merz Co. *Textile Colorist*, 50th Anniversary (1879–1928), 27–33.—A review. RUBY K. WORNER

Half century of the Italian dye industry. E. HUMES. *Textile Colorist*, 50th Anniversary (1879–1928), 41.—A review. RUBY K. WORNER

Half century of influence of the dye industry upon the development of the textile industry. C. M. RITTINGHAUSEN. *Textile Colorist*, 50th Anniversary (1879–1928), 57, 123.—A review. RUBY K. WORNER

Theory of basic dyeing. S. M. LIPATOV, O. S. YAMENKOVA and H. V. LIPATOVA. *Melhand Textilber.* 10, 51–4(1929).—A survey of mill practice showed many inconsistencies and uneconomical mixts. for the best results. The max. fixation of basic dye occurs at pH 7. The addn. of HOAc is therefore undesirable. EtOH hinders dissoen. and retards dyeing. $\text{Zn}(\text{C}_2\text{H}_3\text{O}_2)_2$ is a desirable salt addn. E. R. CLARK

Waterproof dyeing. KRIJI ODA. *Mem. Coll. Eng. Kyushu Imp. Univ.* 5, 71–92 (1928).—A study is made of waterproof dyeing of silk, cotton and rayon with urushi acid (from Japan lack) (I), stearic (II), or palmitic (III), acid or gelatin (IV) in conjunction with mordants. The textile or fibers are immersed in an aq. emulsion (soln. in the case of IV) of one of the foregoing materials, and then treated with an Fe, Al, or Cr mordant. The emulsion is prepd. by adding an alc. soln. of the material to water. Detailed procedures are given for dyeing in this manner. This method of waterproof dyeing has the following advantages in dyeing viscose rayon: (1) gives gloss similar to that of real silk; (2) improves the feel; (3) increases water resistance; (4) increases dry and wet tenacity; (5) decreases inflammability to a minimum. The dry and wet tenacities of viscose rayon resulting from the treatments are, resp.: untreated, 365.7, 116.9 g.; treated with I, 396.2, 195.6; with II, 393.2, 204.6; with III, 395.8, 232.0; with IV, 421.9, 138.5. F. C. H.

Half century of the development of dyeing machinery. HARRY S. DRUM and L. P. KLOPP. *Textile Colorist*, 50th Anniversary (1879–1928), 49–53.—A review. RUBY K. WORNER

Materials used for sizing and finishing (textiles). MAURICE DE KEGHEL. *Tibe*

4, 517-23, 657-63, 933-7, 1199-1207, 1457-63(1926); 5, 161-9, 319-23(1927).—A review of the properties and uses in textile finishing of gum tragacanth and similar products, gummo-mucilaginous substances (hyacinth gum, carob-seed gum, bark gums), mosses, algae and lichens, and starches.

Use of zinc dust in discharge printing (textiles). LEO KOLLMANN. *Melliand Textilber.* 9, 1008-12(1928).—In the use of zinc dust for discharge styles attention must naturally be given to the effect on the ground color. Many dyes which discharge well with Rongalit are not suitable for use with zinc dust. The difference is particularly noticeable in the printing of wool and silk. In the use of zinc dust a browning of the white due to ZnS formation is not to be feared as it is when S compds. are used. Zn discharges are somewhat sensitive to steam carrying air. It is believed that Zn dust has a distinct field in hand printing.

E. R. CLARK

Thickeners for (textile) printing. R. HALLER. *Melliand Textilber.* 9, 586-90, 771-2, 850-2, 931-2, 997-1000(1928).—The effort was made to relate the fine structure of thickened dye solns., as seen in microscopic examn. of slides prepd. with EtOH, to practical working directions based on experience. Several photographs are reproduced. In most cases indication of ordered structure was found. None of these was of such a nature as to indicate the correctness of Bütschli's honeycomb arrangement of particles in dispersions of this type. It appears that a rather gross arrangement visible with 150x magnification, governs the behavior of these thickened dye solns.

E. R. CLARK

Half century of peroxide bleaching. GEO. W. KUCHLER. Roessler & Hasslacher Chemical Co. *Textile Colorist*, 50th Anniversary (1879-1928), 84, 124.—A review.

RUBY K. WORNER

Identification of rayon. WM. D. GRIER. *Ind. Eng. Chem.* 21, 168-71(1929).—After examn. of authentic samples of practically all the leading types of rayon now on the market, G. concludes that their characteristics as exhibited under the microscope are sufficiently const. to afford a reasonably certain means of identification. The various characteristics of acetate, nitro, viscose, and cuprammonium rayons are discussed, and illustrative photomicrographs are given. The method of examn., the app. required, and the prepn. of cross sections of the fibers are described.

F. C. H.

Half century of rayon. CHAS. E. MULLIN AND ROSS STRIBLING. Clemson Coll., S. C. *Textile Colorist*, 50th Anniversary (1879-1928), 75-81, 124.—A review.

RUBY K. WORNER

Half century of the United States silk industry. RAMSAY PRUGNET. Silk Assoc. of America, Inc. *Textile Colorist*, 50th Anniversary (1879-1928), 71-4.—A review.

RUBY K. WORNER

The desizing of cotton goods. CHAS. E. MULLIN. Clemson Coll. Textile School *Textile Colorist* 50, 159-61, 238-41; *Textile Recorder* 46, No. 549, 68-9(1928); No. 551, 61-3(1929).—A complete discussion is given of the various factors involved in the desizing of cotton goods by means of acids, enzyme products, aktivin and other oxidizing agents, etc., with a review of the literature, recent patents, etc. In enzyme desizing both the pH and temp. factors are highly important. When the acid steeping process is used, much better results are obtained by the use of high temps. for a very short time than of lower temps. for longer periods.

CHAS. E. MULLIN

Half century of United States cotton growing. W. M. McLAURINE. American Cotton Manufacturers Assoc. *Textile Colorist*, 50th Anniversary (1879-1928), 58-62, 123-4.—A review.

RUBY K. WORNER

Half century of United States cotton manufacturing. W. M. McLAURINE. American Cotton Manufacturers Assoc. *Textile Colorist*, 50th Anniversary (1879-1928), 63-70.—A review.

RUBY K. WORNER

Microbiology of wool. R. BURGESS. *J. Textile Inst.* 19, 315-22T(1928).—The essential properties of an efficient antiseptic for the prevention of mildew in woollen goods are described. While many substances such as NaF, chloramine-T, chlorinated phenols, etc., do not inhibit the growth of fungi and bacilli, others such as HgCl₂, salicylic acid, Ti carbonate, etc., and notably Na fluosilicate, give better protection. The protective effect of dyes is discussed, and chrome dyeing is found to afford considerable protection. The conditions of testing antiseptics, the effect of the alk. or acidity of the cloth under examn., and methods of detecting damaged fibers by staining tests are discussed.

B. C. A.

Contribution to the study of wool. GEORGES REY. Univ. de Lyon. *Tiba* 6, 417-25, 649, 651, 763, 765, 869-77, 1001-9, 1229-39(1928); 7, 7-13(1929); cf. Meunier and R., C. A. 21, 499, 1552; 22, 1047.—After a review of the properties and constitution

of wool and of the previously published investigations on the action of light on wool, the work previously reported is described in much greater detail. A. P.-C.

Use of enzymes for degreasing. M. A. E. DELROISSE. *Tiba* 7, 37-41(1929).—"Pâte Léna" consists of a soap contg. a lipolytic enzyme prepd. by sapon. of oils contg. lipase in the presence of a catalyzer; it may be considered as a biologically activated soap. Its merits in the washing of wool are briefly discussed. A. PAPINEAU-COUTURE

Deformation of fibers (HERZOG, JANCKE) 2. Dyes in photographic reduction and oxidation processes (STEIGMANN) 5. Improvements in the operation of a textile wastes treatment plant (COBURN) 14. Chemical treatment of trade waste. V. Waste from wool washing (SNELL) 14. Indoquinonanthrene (SCHOLL, MEYER) 10. Munjistin (MITTER, SEN) 10. Derivatives of fluorindine and triphenodioxazine (KEHRMANN, COLLAUD) 10. A theory of color on the basis of molecular strain. VI. Effect of S on color (DEY, DUTT) 10. Carbocyanine dyes with substituents attached to the 3-C chain (HAMER) 10. A simplified process for obtaining substituted μ -methylbenzothiazoles and their transformation into new heterocyclopolyimethine dyestuffs (SCHULOFF, *et al.*) 10. Wetting agents for animal and vegetable materials (Brit. pat. 294,890) 18. Cr compounds for dyeing (Brit. pat. 294,965) 29. Sulfuro-anhydride derivatives of tertiary organic bases (Brit. pat. 294,507) 10. Heat-exchanger construction suitable for use with laundry liquids (U. S. pat. 1,703,655) 1. Nitrocellulose coating composition (U. S. pat. 1,703,415) 23.

FOSTER, L. E.: **The Cleaning and Dyeing of Rayon and Celanese.** York, Nebr.: S2 50. Reviewed in *Am. Dyestuff Repr.* 18, 133(1929).

HOTTENROTH, VALENTIN: **Artificial Silk.** New York and London: Isaac Pitman & Sons. Translated from German by Ernst Fyleman. 421 pp. \$8.50. Reviewed in *Mech. Eng.* 51, 246(1929).

JOHNSON, GEORGE H.: **Textile Fabrics.** New York and London: Harper Bros. 385 pp. 16s. Reviewed in *J. Textile Inst.* 20, 20(1929).

LEHNE, ADOLF: **Textilchemische Erfindungen. Lieferung III.** January 1 to June 30, 1928. Wittenberg: A. Ziemsen. M. 6. Reviewed in *Chem. News* 138, 93(1929); *Textile Colorist* 51, 124(1929).

Dyes. BRITISH DYESTUFFS CORP., LTD., J. BADDILEY, P. CHORLEY and R. BRIGHTMAN. Brit. 294,922, April 28, 1927. Disazo dyes are formed by coupling tetrazotized 2-nitro- or 2,2'-dinitrobenzidine with 2 mol. proportions of a 2,8-aminonaphtholsulfonic acid or deriv., or with 1 mol. proportion of such an acid or deriv. and 1 mol. proportion of another coupling component. Numerous examples are given, some of which involve products suitable for use on regenerated cellulose "silk" and some suitable for use on wool.

Dyes. BRITISH DYESTUFFS CORPORATION, LIMITED. Fr. 644,737, Nov. 30, 1927. Vat dyes are made into a paste with dispersing and wetting agents and dried. As dispersing agents, the condensation product of HCOOH and naphthalenesulfonic acid, sulfite-cellulose resin, ligninsulfonic acid or the product obtained by treating this with HNO₃ or with alkalis or NH₃ may be used. Wetting agents include alkyl-naphthalenesulfonic acids and sulfonated oils.

Dyes. COMPAGNIE NATIONALE DE MATIÈRES COLORANTES ET MANUFACTURES DE PRODUITS CHIMIQUES DU NORD RÉUNIS ÉTABLISSEMENTS KUHLMANN. Brit. 295,050, Aug. 5, 1927. 4-Chloro-6-sulfobenzediazo oxide is made by the action of NaOAc on diazotized 2-nitro-4-chloro-6-sulfo-1-aminobenzene and may be coupled with azo components to form mordant dyes dyeing wool directly in an acid bath and producing very fast dyeings when after-chromed or coppered. Several examples are given.

Dyes. J. R. GRIGY A.-G. Brit. 295,032, Aug. 6, 1927. Strongly basic azo dyes are obtained by treating an unsulfonated aminoazo dye successively with chloroacetyl chloride and a tertiary or secondary aromatic base or a di- or tri-alkylamine of the aliphatic series, or by treating one or more of the components successively with the chloroacetyl chloride and the base and subsequently coupling to produce the dye. The products form sol. hydrochlorides and on tannin-mordanted cotton give dyeings fast to light, washing, acids and alkalis. Numerous examples are given.

Dyes. Soc. ANON POUR L'IND. CHIM. A BAIE. Brit. 294,481, July 21, 1927. Chlorinated violanthrones are made by chlorinating violanthrone with such a proportion of FeCl₃ that the product dyes cotton, from the vat, blue tints fast to water. The chlorinated product may also be used for printing, or may be converted to a leuco

deriv. or leuco-ester salt, and the latter employed for dyeing or printing. The treatment with FeCl_3 may be effected in trichlorobenzene at a temp. of $140-150^\circ$.

Dyes. SOC. ANON. POUR L'IND. CHIM. À BAËLE. Brit. 294,583, July 26, 1927. Azo dyes are obtained by coupling diazo, diazoazo or tetrazo compds. with the pyrazolones formed by the condensation of oxalacetic acid esters with hydrazine. Various of the products (a large number of examples of which are given) are suitable for use as acid dyes, *varnish colors*, direct cotton dyes, mordant dyes, or for combination with metals such as Cu or Cr.

Dyes. I. G. FARBENIND. A.-G. Brit. 294,291, April 26, 1927. Violet monoazo dyes are produced in substance or on the fiber by coupling diazotized aminonaphthol ethers with arylides of 2,3-hydroxynaphthoic acid; e. g., diazotized 7-methoxy-1-aminonaphthalene may be coupled with 2,3-hydroxynaphthoic- β -naphthylamine; which gives a product dyeing reddish violet fast to Cl and to light and boiling.

Dyes. I. G. FARBENIND. A.-G. Brit. 294,360, May 4, 1927. Condensation products of the benzanthrone series are made by using NH_3 instead of an amine or amide in processes such as those described in Brit. 249,891 (C. A. 21, 1016). Various details and examples are given.

Dyes. I. G. FARBENIND. A.-G. Brit. 294,550, July 25, 1927. 3,4,8,9-Dibenzopyrene-5,10-quinones are prepd. by condensation of α -benzoylnaphthalene or one of its derivs. having the 4, 5 and 8 positions of the naphthalene nucleus free, with an aroyl chloride or anhydride, such as benzoyl chloride or benzoic anhydride, by the use of AlCl_3 or a similar condensing agent in the presence of O or a gas contg. O. The condensation may be effected in a single process or in stages.

Dyes. I. G. FARBENIND. A.-G. Fr. 644,782, Sept. 27, 1927. Vat dyes of the $\text{C}_{14}\text{H}_{10}$ series are prepd. by treating with alk. agents the condensation products of anthrone or its derivs. and glyoxal or its higher homologs or bisulfite compds. or sulfure esters of other compds. yielding dialdehydes. In examples, the condensation product of anthrone and glyoxal is heated with KOH-EtOH . On pouring into water a dye is pptd., which dyes cotton bordeaux-red shades from the vat. If anthrone is replaced by 2-phenylanthrone, violet shades are obtained. The condensation products of 2-chloroanthrone and glyoxal sulfate, and of 1-chloroanthrone and glyoxal on treatment give similar shades.

Dyes. I. G. FARBENIND. A.-G. Fr. 645,548, Dec. 10, 1927. Acid wool dyes are prepd. by treating 1-amino-4-bromoanthraquinone-2-sulfonic acid (I) with a *p* amino-acetanilide contg. an alkyl group in the acetyl amino radical. In an example the Na salt of I is heated in water to $60-70^\circ$ with *p*-aminomethylacetanilide, Na_2CO_3 and CuSO_4 .

Dyes. I. G. FARBENIND. A.-G. Fr. 645,586, Dec. 12, 1927. New azo dyes are obtained by treating *o*-hydroxyazo dyes with ClSO_3H or its salts. In examples, 4-chloro-2-aminophenolazo- β -naphthol is heated to $60-70^\circ$ in PhCl and pyridine with ClSO_3H . The product dyes wool orange turning to a fast brown-red by chroming. 5-Nitro-2-aminophenolazo-2-naphthol-3-carboxylic acid is treated as in the 1st example; the product is reduced with Na_2S and transformed into a symmetrical urea by COCl_2 . * 5-Nitro-2-amino-1-phenolazo-*N*-phenyl-3-methyl-5-pyrazolone is treated as in the 2nd example, giving a product that dyes cotton orange which may be coppered. 5-Nitro-2-aminophenolazo-2-aminobenzoyl-5-naphthol-7-sulfonic acid and 5-nitro-2-amino-1-phenolazo-2-benzoylamino-8-naphthol-6-sulfonic acid are treated as in the 2nd example, giving a blue-red and a violet-red, resp., on cotton.

Dyes. I. G. FARBENIND. A.-G. Fr. 645,588, Dec. 12, 1927. Azo dyes are obtained by coupling with coupling components diazotized arylamines contg. in the aromatic ring a CN group with or without other substituents. In examples, cotton is treated in a bath contg. the 4-chloro-2-anisidide of 2,3-hydroxynaphthoic acid, which is coupled on the fiber with 5-cyano-2-toluidine. A brilliant red of excellent fastness is obtained. Similarly, the α -naphthylamide of 2,5-hydroxynaphthoic acid is coupled on the fiber with diazotized 1-amino-3-cyano-6-methylbenzene, giving a bluish red, and 4-cyano-2-amino-1-benzoic acid is diazotized and coupled with 1-hydroxynaphthalene-4-sulfonic acid giving a product which dyes wool orange from an acid bath; this turns to violet-red on chroming. A list of components and the colors produced therewith is given.

Dyes. I. G. FARBENIND. A.-G. Fr. 645,753, Dec. 15, 1927. Blue dyes of the diaminotriphenylmethane series are prepd. by condensing benzaldehydedisulfonic acids with arylamines contg. a Pr or higher group. Thus, benzaldehyde-2,4-disulfonic acid is condensed in H_2SO_4 with 2-mono-1-methylpropylamino-1-toluene. The leuco-compd. is oxidized in a known manner, and by adding NaCl a dye is pptd. which dyes

wool and silk. The 2,5-disulfonic acid and the 2-isopropylamino-1-toluene may also be condensed. The *arylamines* are obtained cheaply from 2-chloropropane or butane.

Dyes. I. G. FARBENIND. A.-G. Fr. 645,771, Dec. 15, 1927. New azo dyes are prep'd. by combining diazo, tetrazo, or diazoazo compds. in substance or on the fiber with 2,3-hydroxynaphthoyl-2-amino-3-naphthol ethers. The azo group probably enters the 1-position of the hydroxynaphthoyl radical. In examples, 4-nitro-2-amino-1-anisole is diazotized and coupled with 2,3-hydroxynaphthoyl-2-amino-3-naphthol methyl ether. A product is obtained giving a fast bluish red dyeing on cotton. Cotton is impregnated with 2,3-hydroxynaphthoyl-2-amino-3-naphthol methyl ether soln., which is developed with diazotized 5-chloro-2-amino-1-toluene soln. contg. $\text{Al}_2(\text{SO}_4)_3$. A fast bluish red color is obtained. A list of components which may be coupled with the Me and Et ethers, and the colors obtained is given.

Azo dyes. BRITISH DYE STUFFS CORP., LTD., and R. BRIGHTMAN. Brit. 294,284, April 22, 1927. Diazotized 4-nitro-4'-aminodiphenyl sulfide is used for producing monoazo dyes by coupling with an amine or phenol of the benzene series or naphthalene series, or with a sulfonic or a carboxylic acid deriv. of such a component; it may also be used to produce secondary disazo dyes by similar coupling, re-diazotization and further coupling with a suitable component. The sulfonated monoazo dyes yield on wool dyeings fast to milling; the disazo dyes are suitable for use on regenerated cellulosic materials. Dyes of either type contg. not more than 1 sulfonic group are suitable for use on cellulose esters. Several examples are given of dyes producing various orange, red, yellow and brown shades.

Azo dyes. BRITISH DYE STUFFS CORP., LTD. Fr. 645,199, Dec. 6, 1927. New trisazo dyes capable of being diazotized and developed on the fiber are prep'd. by combining a diazotized nitroarylamine or acyldiamine, with or without other substituents, with a *peri*-aminonaphtholsulfonic acid in an acid medium, then coupling in an alk. medium with a tetrazotized diamine of the benzidine series, and again coupling the resulting product with α -naphthylamine or its 6- or 7-sulfonic acids, the nitro group being reduced or the acetyl group being removed by hydrolysis. In examples, (1) *p*-nitroaniline is diazotized and coupled with H-acid, then with tetrazotized benzidine, and then with α -naphthylamine, the nitro group being reduced with Na_2S either after the first coupling or finally; (2) *p*-aminoacetanilide is diazotized and coupled with the same substances in the same order, the acetyl group being finally removed by alk. hydrolysis. Cotton is dyed with the above dyes, which are diazotized on the fiber and coupled with *m*-tolylenediamine, giving a fast deep black shade. Dyes may also be obtained from the following: *p*-nitroaniline-*o*-sulfonic acid, 5-nitro-2-anisidine, *o*-chloro-*p*-nitroaniline (or *m*-nitroaniline), H-acid benzidine and α -naphthylamine; *p*-nitroaniline, H-acid, benzidine and Cleve's acid; *p*-nitroaniline, 1,8-aminonaphthol-1-sulfonic acid, benzidine and α -naphthylamine; and *p*-nitroaniline, H-acid, dianisidine and α -naphthylamine.

Azo dyes. I. G. FARBENIND. A.-G. (Richard Stüsser, inventor.) Ger. 471,038, July 30, 1926. Two mols. of a product obtained by carefully reducing, under alk. conditions, a dye prep'd. from diazotized 5-nitro-2-aminobenzoic acid and a suitable component are coupled together through their azo or azoxy groups, disazo or polyazo dyes being obtained, which can be further diazotized and coupled in substance or on the fiber. In 1 example, diazotized 5-nitro-2-aminobenzoic acid is coupled with 2-amino-8-hydroxynaphthalene-6-sulfonic acid; reduction is effected with glucose and NaOH, and the product salted out. The diaminoazo dye so obtained is tetrazotized and coupled with 2,4-diaminoacetanilide, giving a product which dyes cotton in black shades; these can be improved by treating the dyed fiber with metal salts. In another example, the coupling component is 2-amino-5-hydroxynaphthalene-7-sulfonic acid, and the product obtained after reduction dyes cotton in violet shades. If the product is diazotized on the fiber, coupled with β -naphthol, and treated with CuSO_4 , fast blue-black shades are obtained. Other examples are given in which the initial materials are the dyes prep'd. by coupling diazotized 5-nitro-2-aminobenzoic acid with 2-phenylamino-5-hydroxynaphthalene-7-sulfonic acid, acetyl-amino-5-hydroxynaphthalene-7-sulfonic acid, and 1-8-naphthyl-3-methyl-5-pyrazolone-6-sulfonic acid. Cf. C. A. 23, 1757.

Azo dyes. I. G. FARBENIND. A.-G. Fr. 645,066, Dec. 2, 1927. Insol. azo dyes are prep'd. by coupling 4-aminoacetophenone or 4-aminobenzophenone and their substitution products with acetoacetic arylamides. In examples, 4-aminoacetophenone is diazotized and coupled with acetoacetic anilide in AcOH soln. 4-Amino-3-nitroacetophenone is diazotized and coupled with acetoacetic chloroanilide. 4-Aminobenzophenone is diazotized and coupled with acetoacetic anilide. The dyes made as oil colors and distemper colors fill a blank in the known colors of the green side of the spectrum.

Chromium compound of an azo dye. SOC. ANON. POUR L'IND. CHIM. A BÂLE. Swiss 128,006, Apr. 23, 1927. The prepn. is described of the Cr compd. of the dye prep'd. from diazotized 5-nitro-2-amino-1-phenol and 2-phenylamino-5-naphthol-7-sulfonic acid. The product dyes cotton blue. Cf. Brit. 289,094 (C. A. 23, 717).

Chromium compounds of monoazo dyes. I. G. FARBENIND. A.-G. Brit. 294,743, June 10, 1927. The dye obtained by coupling diazotized metanilic acid with salicylic acid is treated with a Cr compd. (suitably warmed with a Cr formate paste). The product dyes wool fast greenish yellow and may also be used for calico printing and for the production of Batik goods. Cf. C. A. 22, 1481.

Vat dyes. I. G. FARBENIND. A.-G. (Max A. Kunz and Karl Köberle, inventors). Ger. 470,948, Feb. 18, 1927. Addn. to 457,493. Vat dyes giving red shades on cotton are prep'd. by introducing a plurality of different halogen atoms into *allo-ms-naphthodanthrone* or its derivs. The initial material may be treated simultaneously or successively with different halogenating agents, or a halogenated *allo-ms-naphthodanthrone* may be treated with a halogen other than that already present. Solvents, diluents, and (or) halogen-carriers may be present. The prepn. of dichlorodibromo-*allo-ms-naphthodanthrone* is described by way of example.

Vat dyes. I. G. FARBENIND. A.-G. (Max A. Kunz and Karl Köberle, inventors). Ger. 470,949, Jan. 29, 1927. Vat dyes dyeing cotton in brown to violet shades are prep'd. by treating a neg. substituted *ms-anthradianthrone* with a compd. contg. a reactive NH or NH₂ group. Solvents, diluents, and (or) catalysts may be present. Examples are given describing the prepn. of dyes from (1) dibromo-*ms-anthradianthrone* and α -aminoanthraquinone, (2) chloro-*ms-anthradianthrone* and β -aminoanthraquinone, (3) dibromo-*ms-anthradianthrone* and 1-amino-4-methoxyanthraquinone, and (4) tetrabromo-*ms-anthradianthrone* and *p*-toluenesulfonamide. The prepn. of the initial materials of examples 1-3 is described in Ger. 468,988.

Vat dyes. I. G. FARBENIND. A.-G. (Max A. Kunz and Karl Köberle, inventors). Ger. 471,039, Jan. 15, 1927. Vat dyes dyeing cotton reddish brown to bluish black shades are prep'd. by treating a halogenated *ms-benzodanthrone* with a N-contg. compd. in which at least 1 reactive H atom is attached to N. Solvents, catalysts, and (or) acid-binding substances may be present. Examples are given describing the prepn. of dyes from (1) tetrabromo-*ms-benzodanthrone* and α -aminoanthraquinone, (2) tribromo-*ms-benzodanthrone* and α - or β -aminoanthraquinone, 1-amino-4-methoxyanthraquinone, or *p*-aminophenol, (3) trichloro-*ms-benzodanthrone* and α -aminoanthraquinone, (4) 4,4'-dichloro-2,2'-dimethyl-*ms-benzodanthrone* and α -aminoanthraquinone or *p*-toluenesulfonamide.

Vat dyes. I. G. FARBENIND. A.-G. (Max A. Kunz and Karl Köberle, inventors). Ger. 471,040, Feb. 19, 1927. See Brit. 285,502 (C. A. 22, 4831).

Vat dyes. LEOPOLD CASSELLA & CO. G. M. B. H. (Richard Herz and Werner Zerweck, inventors). Ger. 470,947, Oct. 19, 1926. Addn. to 458,598. See Brit. 287,020 (C. A. 23, 524).

Vat dye. SOC. ANON. POUR L'IND. CHIM. A BÂLE. Swiss 128,007, April 1, 1927. The trichloropyranthrone prep'd. according to example 3 of Ger. 218,162 is condensed with PhOH in the presence of alkali carbonate. The product dyes cotton in red shades.

Vat dyes of the 1,9-anthra-thiazole series. RALPH N. LULEK (to E. I. duPont de Nemours & Co.). U. S. 1,705,023, March 12. One mol. proportion of 1,9-anthra-thiazole-2-carboxylic acid chloride is condensed with 1 mol. proportion of a mono-aminoanthraquinone or with a diaminoanthraquinone in which 1 amino group is substituted by a benzoyl group, or 2 mol. proportions of the 1,9-anthra-thiazolecarboxylic chloride may be condensed with 1 mol. proportion of a diaminoanthraquinone, to produce vat dyes dyeing cotton from greenish yellow to brown shades. The products are of the type formula, A-CO-NH-A', in which A is always the residue of 1,9-anthra-thiazole (-CO in the 2-position) and A' may be either an anthraquinone residue in which 1 H may be replaced by halogen or a diaminoanthraquinone residue in which one amino group may be substituted by a benzoyl group. In most instances, the dyes thus produced discharge with "sulphoxite Cl" and are suitable for printing. Several examples with details of procedure are given.

Vat dyes of the pyranthrone series. HEINRICH NERESHEIMER (to Grasselli Dye-stuff Corp.). U. S. 1,703,948, March 5. *Bz, Bz'*-Diarylpyranthrone such as those described in German patent 278,424 are treated with acid condensing agents and either simultaneously or subsequently with oxidizing agents. If oxidizing agents such as MnO₂ are used simultaneously with the condensing agents, the final product is directly produced, but if acid condensing agents such as AlCl₃ are used alone, the product is first formed as a reduction product and readily oxidized to the dye even by the action of the

air. The products differ from the *Bz*, *Bz'*-diarylpyranthrones in generally possessing a more reddish color. Details of procedure are given.

Dyes of the anthracene series. I. G. FARBENIND. A.-G. (Karl Schirmacher, Wilhelm Schaich and Arthur Wolfram, inventors). Ger. 470,809, June 16, 1926. The 9,10-disulfuric esters, or their salts, of such leucoanthraquinones as have 1 or more NH_2 groups or *N*-substituted NH_2 groups in the β -position are treated in alk. soln. with oxidizing agents. Products of the acid-wool-dye type are obtained on acidification, and these products, on further oxidation under acid conditions, give vat dyes free from H_2SO_4 residues. In the example, β -aminoleucoanthraquinone-9,10-disulfonate is treated with alk. KMnO_4 . After filtering, a red-violet powder of the acid-wool-dye type is obtained by acidification. This product, when heated in aq. soln. with NaNO_2 , yields a difficultly sol. compd. which gives blue vats with alk. $\text{Na}_2\text{S}_2\text{O}_4$ from which cotton is dyed in blue shades. The intermediate product need not be isolated.

Anthraquinone dyes. I. G. FARBENIND. A.-G. Brit. 294,986, Aug. 3, 1927. Acid wool dyes are formed by condensing 1-amino-4-bromoanthraquinone-2-sulfonic acid with 4-aminoformanilide having an alkyl group such as Me or Et, or a benzyl group, in the formylamino group. The condensation may be effected by heating in the presence of water and CuSO_4 .

Indigoid dyes. I. G. FARBENIND. A.-G. (Josef Haller, inventor.) Ger. 470,759, Jan. 8, 1926. See Brit. 286,359 (*C. A.* 23, 285).

Sulfurized dyes. I. G. FARBENIND. A.-G. Fr. 645,519, Dec. 10, 1927. Pastes of sulfurized dyes of no matter what thickness, with or without the addn. of Na_2S , are made by adding to the compressed cakes a carbohydrate capable of swelling under the action of alkalis—*e. g.*, starch—in such quantity that a homogeneous paste is produced from which neither water nor crystals sep. Substances such as cresol may be added to prevent mold formation and to make the starch sol. Hygroscopic agents may also be added.

Triarylmethane dyes. BRITISH DYESTUFFS CORP., LTD. Fr. 645,351, Dec. 7, 1927. In the prepn. of Lissamine green V (Color Index No. 735) from tetraethyldiaminobenzohydrol and 2,7-naphthalenedisulfonic acid, the hydrol is isolated as its 2,7-naphthalenedisulfonate. In an example, tetraethyldiaminodiphenylmethane is oxidized with PbO_2 to form the hydrol, and after removing the Pb, Na 2,7-naphthalenedisulfonate is added and the liquid acidified with H_2SO_4 . The pptd. disulfonate is washed and dissolved in H_2SO_4 , the leuco dyestuff obtained by heating and pouring into water being oxidized with PbO_2 in the usual manner.

Dyes of the benzanthrone series. ARTHUR LÜTTINGHAUS, HEINRICH NERESHEIMER and HUGO WOLFF (to Grasselli Dyestuff Corp). U. S. 1,704,983, March 12. The intermediate product of an incomplete alk. condensation of about equimol. proportions of a benzanthrone compd. with free 2- and *Bz*-1-positions and a *Bz*-1-halogen-benzanthrone with free 2-position (the intermediate product itself still having free *Bz*-1'- and 2-positions) is subjected to further alk. condensation until a vat dye is obtained. Several examples with details of procedure are given. Cf. *C. A.* 23, 1757.

Dyes and intermediates. L. J. HOOLEY, J. THOMAS and SCOTTISH DYES, LTD. Brit. 294,672, Jan. 29, 1927. Dyes or intermediates for dye manuf. are formed by sulfonating either (a) leuco compds. of anthraquinone or vat dyes derived from anthraquinone, *e. g.*, dibenzanthrone, and their derivs. contg. acyclic substituents such as OH, NH_2 , or alkylamino groups, or (b) leuco compds. of indigoid dyes. Several examples are given of the production of dyes of various colors.

Dye intermediates. COMPAGNIE NATIONALE DE MATIERES COLORANTES ET MANUFACTURES DE PRODUITS CHIMIQUES DU NORD REUNIES, ETABLISSEMENTS KUHLMANN. Brit. 294,462, July 23, 1927. Halogenated aromatic carbocyclic and heterocyclic bases are obtained by halogenation of the corresponding sulfoamido derivs. derived from aryl sulfonic acids, and subsequent hydrolysis of the halogenated sulfonamide obtained. Nitro groups or other substituents may be introduced before or after halogenation (chlorination), and substituents already present in the chlorinated sulfonamides may be replaced by others, *e. g.*, by reducing NO_2 groups. Several examples are given. Arylsulfonamides of aromatic carbocyclic and heterocyclic bases may be made by condensation of the corresponding bases with aryl sulfonylchlorides as benzene-, *o*- and *p*-toluene-, *o*-nitro-*p*-toluenesulfonyl chlorides or with the mono- or poly-sulfonylchlorides of naphthalene, or by condensation of aryl sulfonamides with aromatic compds. contg. a mobile substituent in the nucleus. Various examples are given.

Alkylisorosindulinesulfonic acids. PAUL LUGER (to J. R. Geigy, S. A.). U. S. 1,703,772, Feb. 26. By the treatment of a 1-chloro-3-dialkylisorosinduline deriv. in an org. solvent such as alc. with a sulfite soln., and subsequent oxidation, dialkyliso-

rosinduline-1,6-disulfonic acids are obtained, which are blue dyes sol. in water, dyeing wool blue in an acid bath, and which are suitable for use as *intermediates* for making naphthosafranine dyes.

***o*-Aminodiaryl ethers.** ARTHUR ZITSCHER (to Grasselli Dyestuff Corp.). U. S. 1,703,915, March 5. 5,2',5'-Trichloro-2-aminodiphenyl ether is made by reacting with an alkali metal salt of 2,5-dichlorophenol on 3,4-dinitro-1-chlorobenzene and treating the *o*-nitrodiaryl ether thus formed with a reducing agent. It m. 74-5° (not corrected). The corresponding nitro compd., m. 97-8°. This and other related compds. similarly formed may be used as *dye intermediates*.

2,3- and 2,5-Dichloro-4-amino-1-methylbenzene. I. G. FARBERIND. A.-G. Brit. 294,078, Jan. 24, 1928. 2-Chloro-4-acetamido-1-methylbenzene is treated with Cl in the presence of a mixt. of HOAc and water with cooling; 2,5-dichloro-4-acetamido-1-methylbenzene is pptd. in a substantially pure state and 2,3-dichloro-4-acetamido-1-methylbenzene is pptd. from the mother liquor by use of water; these compds. are treated with a saponifying agent. The products may be used as *intermediates* for making azo dyes.

Quinone anilides. I. G. FARBERIND. A.-G. (Maximilian P. Schmidt and Eberhard Elbel, inventors). Ger. 470,760, July 22, 1926. Quinone anilides are prepd. by heating *p*-hydroxyazo dyes in aq. soln. or suspension in the presence of acid substances. In an example, an AcOH soln. of the dye from diazotized metanilic acid and α -naphthol is boiled for 10 hrs., Na 1,4-naphthoquinone-2-anilido-*m*-sulfonate being obtained on salting out. 1,4-naphthoquinone-2-*p*-anilidosulfonic acid can be prepd. similarly from orange 1 (*p*-sulfobenzeneazo- α -naphthol).

Derivatives of arylaminonaphthalenes. I. G. FARBERIND. A.-G. Fr. 645,150, Dec. 5, 1927. Derivs. of arylaminonaphthalenes are prepd. by treating at high temps with or without pressure, amino- or hydroxy-naphthalenes, excepting their sulfonic or carboxylic acids or 1,8-diaminodihydroxy or aminohydroxy derivs., with amino benzene derivs., which are substituted with an amino or hydroxy group and which may contain other substituents. Instead of the aminobenzene the corresponding nitrobenzene may be used, and the nitro group reduced by the addn. of HCOOH during the condensation. The products are *intermediates* for dyes. They impregnate animal fiber and by subsequent oxidation form fast dyes. In examples, (1) 2'-aminophenol-2-aminonaphthalene, m. 96-97°, is prepd. by heating 2-hydroxynaphthalene and 1,2-diaminobenzene with Na₂SO₃ soln.; (2) 2-(4-aminophenylamino)-7-hydroxynaphthalene is formed from 1,4-diaminobenzene and 2,7-dihydroxynaphthalene; (3) 2-naphthyl-4,4'-diaminodiphenylaminosulfonic acid is formed from 2-hydroxynaphthalene and 4,4'-diaminodiphenylamino-2-sulfonic acid; (4) (4-hydroxyphenyl)-1-aminonaphthalene, m. 91°, is formed from 1-aminonaphthalene and 1-amino-4-hydroxybenzene; (5) (4-hydroxy-3-methylphenyl)-2-aminonaphthalene, m. 127-128°, is formed from 2-hydroxynaphthalene and 4-amino-1-hydroxy-2-methylbenzene; (6) (4-hydroxyphenyl)-2-carboxy-2-aminonaphthalene, m. 172-174°, is formed from 2-aminonaphthalene and 4-amino-1-hydroxy-2-carboxybenzene; (7) 2,7-di-(*p*-hydroxyphenylamino)-naphthalene, m. 249-250°, is formed from 2,7-dihydroxynaphthalene and 4-amino-1-hydroxybenzene; (8) 1,5-di-(*p*-hydroxyphenylamine)naphthalene is formed from 1,5-dihydroxynaphthalene and 4-amino-1-hydroxybenzene. A list of other constituents which may be used is given.

Pyrazolanthrone derivatives. I. G. FARBERIND. A.-G. Fr. 644,589, Oct. 21, 1927. Derivs. of pyrazolanthrone (I) which are of value in the *dyeing* industry are prepd. by treating (I), in which the H of the NH group may be replaced by a metal, or homologs, derivs., or substitution products of (I) by halogen derivs. of the C₆H₅, C₁₀H₇, etc., series or of the anthraquinone series, with or without diluents and a catalyst such as Cu or a salt thereof. In examples, equal parts of (I) and PhBr and K₂CO₃ are heated in PhNO₂ under reflux in the presence of Cu. A phenylpyrazoleanthrone in which the phenyl group replaces the H of the NH group is obtained. Phenylpyrazoleanthrone-*o*-carboxylic acid is obtained from (I) and *o*-bromobenzoic acid. Naphthylpyrazoleanthrone-*o*-carboxylic acid, m. 277-279°, is obtained from (I) and 2-chloro-3-naphthoic acid. Other examples are given using (I) and *o*-chloronitrobenzene, *Bs*-1-bromobenzanthrone, *Bs*-1-chloro-*Bs*-2-phenylbenzanthrone, *Bs*-1-bromobenzanthrone nitrated at 202°, 2-chlorobenzanthrone, α -chloroanthraquinone and α -bromonaphthalene, in each case a condensation between the 2 substances taking place with elimination of HBr or HCl. An example is given of the condensation of dipyrazoleanthrone with *Bs*-1-bromobenzanthrone, in which one radical of the latter becomes attached to each of the pyrazole rings, and of the condensation of (I) with 1,5-dichloro-2,4-dinitrobenzene, in which case each of the Cl atoms becomes replaced by a radical of (I). 4-Methylpyrazoleanthrone may be used instead of (I).

Condensation products of naphthostyryls. I. G. FARBENIND. A.-G. Fr. 644,947, Nov. 30, 1927. Naphthostyryl or one of its substitution products is condensed by means of acid condensing agents with an aromatic compd. contg. at least one nuclear H atom capable of reacting, particularly a uni- or multivalent phenol, or with a tertiary amine, in which one of the C atoms linked to the N forms part of an aromatic ring; the products are *dyes*. Sulfonation of the condensation products gives *acid dyes for wool*. In examples, naphthostyryl, PhNMe_2 and POCl_3 are stirred at the ordinary temp. in the absence of moisture and afterward heated to 100° . The mass is made alk. and distd. with steam. The product dyes mordanted cotton or wool a violet-blue shade. PhNMe_2 may be replaced by *m*-diethylaminophenetole or *m*-chlorodimethyl (or ethyl)aniline or PhCl or tetramethyl-*o* (or *p*)-phenylenediamine or *N,N*-dimethyl-1,2,3,4-tetrahydroquinoxaline. The dye obtained by using the last-mentioned substance is sulfonated with oleum, giving a product which dyes wool in blue shades. The condensation product of pyrogallol and naphthostyryl, when sulfonated, dyes wool yellow; this turns brown on washing and a brilliant orange-red on chroming.

Dye for leather. JEAN DESCOMBES. Fr. 644,637, Nov. 26, 1927. Stearate or oleate is used as a dye for leather.

Fixing basic dyes. I. G. FARBENIND A.-G. Brit. 294,286, April 22, 1927. The fastness to light of dyeings with basic dyes is improved by treating the dyed material with reduction products of the complex phospho-molybdo-tungsten compds. described in Brit. 292,253 (C. A. 23, 1512.)

Sulfonated fatty acids. I. G. FARBENIND. A.-G. Fr. 645,221, Dec. 6, 1927. Products which are used principally in *dyeing* in place of Turkey-red oils are prepd. by treating unsatd. fatty acids with oleum with the addn. of a lower fatty acid or its anhydride or esters. Thus, to a mixt. of castor oil and glacial AcOH fuming H_2SO_4 (27%) and Ac_2O are added at about 0° . The product is poured into ice water contg. Na_2SO_4 . Chloroacetic acid or AcOMe may also be used.

Dyeing. J. G. KERN and C. J. SALA (to E. I. Du Pont de Nemours & Co.). Brit. 205,025, Aug. 4, 1927. Aliphatic amines contg. 1 or more hydroxyalkyl or dihydroxy-alkyl groups (such as hydroxyethyl or hydroxybutyl groups) attached to the N atom are used as assistants in vat dyeing, either by incorporation in the dye pastes or by addn. to the vats; more even dyeings are obtained especially by padding methods. Several examples of the process are given.

Dyeing. I. G. FARBENIND. A.-G. Fr. 645,667, Dec. 2, 1927. The absorptive capacity of wool and silk for acid or neutral colors is reduced by a pretreatment of the fibers with products obtained by sulfonating resins or by adding these products to the dye bath. Examples are given of the use of colophansulfonic acid in dyeing mixed fibers.

Dyeing. HERMINGHAUS & CO., G. M. B. H. Fr. 645,031, Dec. 1, 1927. To prevent parts of cloth contg. cellulose absorbing certain dyes, the cloth, previously dampened or treated with alkali, is treated with POCl_3 . The POCl_3 may be ins. oln. in CCl_4 or as a gas or in a current of moist air.

Dyeing cloth. HENRI J. ALET. Fr. 645,808, Dec. 16, 1927. Cloth is dyed by passing it under tension over the narrowed top of a dye bath, the dye being absorbed into the cloth by capillary attraction; it is collected in a warm, damp atm.

Dyeing silk. BRITISH DYE STUFFS CORP., LTD. Fr. 645,384, Dec. 8, 1927. Regenerated cellulose silks are dyed by the known secondary disazo dyes obtained by coupling diazotized *p*-nitroaniline-*o*-sulfonic acid with a middle component, re-diazotizing and coupling in acid or alk. soln. with 2-amino-5-naphthol-7-sulfonic acid or its *N*-alkyl, *N*-aryl, or *N*-acyl derivs. As middle components, α -naphthylamine and *m*-amino-*p*-cresol methyl ether, and as end components, the 2,5,7-acid itself or its *N*-ethyl, *N*-phenyl, or *N*-acetyl derivs. are used. Cf. C. A. 23, 528.

Dyeing and printing acetate silk. I. G. FARBENIND. A.-G. (Oskar Spengler, Paul Vreck and Rudolf Weidenhagen, inventors.) Ger. 470,849, Dec. 4, 1924. Acetate silk is dyed or printed by treating it, in the presence of NH_3 or an aliphatic amine and in the presence or absence of an oxidizing agent, with such arylamines or their derivs. as form colored compds. under the conditions specified. The arylamines may be mixed with amino- or hydroxy-aryl compds., which form colored compds. under the conditions specified. Examples are given describing the use of 4,4'-dihydroxydiphenylamine, 3',5'-dichloro-4'-amino-4-hydroxydiphenylamine, 4'-amino-4-hydroxydiphenylamine, 4'-dimethylamino-4-hydroxydiphenylamine, *p*-phenylenediamine alone and with PhOH and PhNMe_2 , 4-aminodiphenylamine, 2-*p*-hydroxyphenylaminonaphthalene, and PhNMe_2 with *p*-aminophenol.

Dyeing vegetable fibers. FRITZ STRAUB (to Soc. anon. pour l'ind. chim. à Bâle).

U. S. 1,704,637, March 5. Fast dyeings are obtained by use of dyeing baths prepd. with Cr compds. of azo dyes prepd. from diazo compds., which contain, in the *o*-position to the diazo group, a group adapted to the formation of lakes. Numerous examples are given.

Dyeing vegetable fibers with aniline black. K. SCHMIDT. Brit. 294,554, Jan. 24, 1927. In dyeing by the use of a padding liquor or printing paste contg. aniline salts, oxidizing agents, metallic catalysts, org. catalysts and salts of weak or easily oxidizable acids which protect the fiber, the ratio of the latter to the aniline salt is at least 2:5. Examples are given. Cf. C. A. 23, 1513.

Dispersing agents for use in dyeing cellulose esters and for other purposes. J. G. KERN and C. J. SALA (to E. I. Du Pont de Nemours & Co.). Brit. 295,024, Aug. 4, 1927. Soap-like products are obtained by the interaction of aliphatic acids or their derivs., such as their glycerides or sulfonic acids, with hydroxyalkylamines; *e. g.*, oleic acid may be treated with a mixt. of di- and tri-ethanolamine, 1-amino-2,3-dihydroxypropane or monomethyldihydroxyethylamine; or stearic acid may be treated with triethanolamine. The products are solvents and detergents and have greater dissolving and dispersing powers than ordinary soaps or sulfonated oils. They are suitable for use with metallic oxides or hydroxides, etc., in forming *antiseptic soaps*. Examples are given of their use for prepg. dispersions suitable for dyeing cellulose esters.

Apparatus for dyeing yarn, especially warp yarn in hanks. THOMAS MCCONNELL. Ger. 470,920, Sept. 19, 1925.

Apparatus for dyeing warps or fabrics wound on perforated holders in graduated shades. ALBERT HERZOG and HEINRICH KÜNZEL. Ger. 470,919, Dec. 11, 1925.

Means for squeezing hanks after dyeing. MARIE P. L. A. ROUEN. Ger. 470,924, Nov. 21, 1925.

Hanging device for use in the wet treatment of textiles, particularly in dyeing stockings. FRIEDRICH G. GNÜCHTEL. Ger. 471,016, Mar. 9, 1926.

Apparatus for the wet treatment of hanks. THE NUERA ART-SILK CO., LTD. Ger. 471,017, Feb. 8, 1927.

Apparatus for applying colors in sequence for dyeing yarn on a reel. J. BRANDWOOD. Brit. 294,504, Jan. 22, 1927.

Coloring cellulose esters and ethers. SOC. CHIMIQUE DES USINES DU RHONE and M. J. THEUMANN. Brit. 294,137, April 12, 1927. The process described in Brit. 275,553 (C. A. 22, 2279) is used for the dispersion in the cellulose esters or ethers of lakes of org. coloring substances. An example is given of the coloring of cellulose acetate in acetone soln. by the use of eosin and an aq. soln. of Pb acetate.

Apparatus for dyeing and bleaching textile goods. ZITTAUER MASCHINENFABRIK A.-G. (Julius Ernestus, inventor). Ger. 470,799, Oct. 20, 1926. Improvements are described in an app. of the kind comprising an open partitioned tank having liquid-circulating means.

Pressure regulator for circulatory dyeing apparatus. BRATKÍ JOKLOVÉ, TUCHFABRIK. Ger. 470,921, June 4, 1926.

Apparatus for treating cakes of artificial silk with washing, dyeing, soaping or other liquids. * COURTAULDS, LTD., H. J. HEGAN and E. HAZELEY. Brit. 294,279, April 21, 1927.

Mordanting. HENRY DREYFUS. Fr. 644,936, Nov. 30, 1927. Material consisting of, or contg. esters of cellulose, *e. g.*, cellulose acetate, are mordanted before dyeing with relatively concd. (20-40% or more) solns. of mordanting salts, such as salts of Al, Cr, or Sn. If the temp. used is such as would cause delustering, agents preventing delustering are added. Fr. 644,937 describes a process of mordanting in which aliphatic acid salts of the metals such as acetates, lactates, glycolates or citrates of Al or Ca are used, the concn. being 15% or more. Cf. C. A. 23, 1759.

Textiles. GEORG DIETRICH. Fr. 645,848, Dec. 17, 1927. Artificial silk threads are mixed with "wild African silk," particularly that known as "Anaphé," and spun.

Finishing textile fabrics. J. J. LAMBRECHT. Brit. 294,101, July 16, 1927. See Fr. 637,772 (C. A. 23, 529).

Finishing fabrics comprising thermoplastic derivatives of cellulose. C. DREYFUS and C. W. PALMER (to British Celanese, Ltd.). Brit. 295,035, Aug. 4, 1927. Fabrics contg. thermoplastic cellulose derivs., either alone or together with cotton, silk, or wool, are ironed or calendered while dry at a temp. of 100° or higher, to effect smoothing without increase of luster. Delustering and low-temp. drying may precede this treatment.

Finishing fabrics containing thermoplastic cellulose derivatives. C. DREYFUS (to British Celanese, Ltd.). Brit. 295,043, Aug. 4, 1927. Delustered fabrics, or threads

contg. substances such as cellulose acetate, formate, propionate or butyrate, or methyl or ethyl cellulose, either alone or mixed with silk, cotton, or wool, have their luster restored by ironing or calendering them while damp. Mottled effects may be produced by dampening only portions of the materials.

Mercerizing mixed fabrics. BLEACHERS' ASSOCIATION, LTD., W. KERSHAW, F. L. BARRETT, C. J. WHITELEGG and G. D. SUTTON. Brit. 295,062, May 9, 1927. Mixed fabrics of cotton and regenerated cellulose such as viscose or cuprammonium "silk" are mercerized under tension with alkali in the usual manner, and the mercerizing liquor is washed off at a controlled temp. above 50°. The luster of the viscose product is thus but slightly affected while the cotton fibers are "leveled up."

Treating mercerized fabrics. C. A. GRUSCHWITZ A.-G. Ger. 470,922, Sept. 17, 1926. An app. is described whereby the selvages on both sides of a fabric which has left the mercerizing bath and is not under tension are squeezed and then pressed hot. The usual treatment of the whole fabric follows.

A new cloth. VICTOR GREIDENBERG. Fr. 644,899, Nov. 30, 1927. Shreds of ostrich feathers are combined with metallic threads, silk, hemp, or straw to make a cloth.

Washing and other liquid treatments of artificial silk. I. G. FARBENIND. A.-G. Brit. 294,657, July 29, 1927. In the "bobbin system" of manuf., permeable spools are used; the body of each spool has a cushion of rubber or other material such as a permanent layer of threads, or both; this prevents damage from shrinkage of the inner layers of the threads treated on the spools.

Washing and other liquid treatments of artificial threads wound on spools, etc. I. G. FARBENIND. A.-G. Brit. 294,547, July 25, 1927. Spools used may be formed of iron or Ni, and the spools or assoc. devices may be handled by an electromagnetic lifting device. Brit. 294,548 also describes an app. for washing artificial silk on spools.

Device for dampening silk or similar filaments for use on textile machines. HERMANN J. SCHWABE. U. S. 1,705,212, March 12.

"Artificial wool" from vegetable fibers. GINO M. ROSSATI and GIUSEPPE DE BLASIO. U. S. 1,703,693, Feb. 26. Fibers such as jute are immersed in a clear lime water and then treated with SO₂, NaOH soln., a bleaching agent and a sulfonated fatty acid.

Wetting, cleansing and emulsifying agents. I. G. FARBENIND. A.-G. Fr. 645,395, Dec. 8, 1927. Salts formed by the combination of org. N bases with sulfonic acids or org. compds., or with fatty acids or naphthene acids, or with sulfonic acids of the nature of Turkey-red oils are used as wetting agents or as cleansing and emulsifying agents. In examples, equiv. quantities of NaOH and pyridine are added to sulfonated oleic acid, and pyridine is added to dibutyl-naphthalenesulfonic acid; in both cases the products have excellent wetting properties toward fibers. The corresponding salts of isobutylamine, PhNH₂, PhNMe₂, and triethanolamine may be prepd.

Bleaching rags, etc. F. W. BINNS (to Virginia Smelting Co.). Brit. 295,007, Aug. 6, 1927. Rags, yarns, or wastes of wool, cotton, rayon, silk, etc., are bleached and prepd. for dyeing or re-dyeing by treatment with a soln. obtained by treating Zn dust 28 lbs. in water 42 gals. with SO₂ 40 lbs., with or without addn. of CH₂O 1.5 lbs. The materials may be preliminarily boiled in two successive baths of dil. aq. NH₃ soln.

Waterproofing and preserving composition for fabrics and leather. RUDOLF KOLLER. Austrian 112,121, Sept. 15, 1928. The preferred compn. comprises Para rubber 1, dammar resin 3, beeswax 2, camphor 2 and a solvent, e. g., toluene, 92 parts.

Chlorination of animal fiber. ERICH BÖHM. Fr. 644,946, Nov. 30, 1927. Hair or wool or substances made therefrom are chlorinated by means of a soln. contg. about 3% HCl and 1% of a chlorate, with the object of improving their appearance or to allow them to be milled or felted. Oxalic or tartaric acid may also be added.

Treating felt and felt-hat bodies. ERICH BÖHM. U. S. 1,705,437, March 12. An aq. soln. of an org. tanning agent such as "neradole" is applied to the material in order to improve its luster and firmness.

Detergent. J. J. LEWIS. Brit. 294,767, July 20, 1927. A compn. suitable for use in washing clothes is prepd. by boiling together rock lime 1 lb., "common soda" 1 lb. and water 1 gal., and filtering. The product is dild. with water and used with soap.

Purifying solvents used for "dry cleaning." ARTHUR E. HAYFIELD (one-half to Achille Serre, Ltd.). U. S. 1,704,604, March 5. See Brit. 266,850 (C. A. 23, 876).

26—PAINTS, VARNISHES AND RESINS

A. H. SABIN

Specifications for paints and methods of testing employed by the German Imperial Railway Company (Deutschen Reichsbahn-Gesellschaft). M. SCHULZ. *Z. angew. Chem.* 41, 760-7(1928).—A lecture outlining the materials specified for use in various kinds of paints employed by a very large railway system, and the results obtained from weathering tests conducted with these substances. W. C. EBAUGH

Experiments on protective coatings in sea water. CARL BÄRENFÄNGER. *Korrosion u. Metallschutz* 4, 193-200(1928).—Porcelain plates were coated with various paints and placed in the waters of the Kiel canal. Conclusion: There is no good paint for lock gates, although bituminous coatings seem best. B. E. ROETHELT

Nitrocellulose paints and varnishes and the Landes forests. MAURICE DESCHIENS. *Bull. inst. pin* No. 56, 32-40(Jan., 1929).—A review of the raw materials used and of their properties, and of the compn. and prepn. of nitrocellulose varnishes and paints. A. PAPINEAU-COUTURE

Apparatus for the observation of changes in electrical conductivity of immersed paint films. G. H. STANLEY. Univ. of the Witwatersrand, Johannesburg. *S. African J. Sci.* 25, 111-5(1929).—The app. consists of a tin plate, the interior of which is painted with the paint under examn. and partly filled with the water in regard to which the tests are made. The plate constitutes the cathode. The other electrode is formed of a piece of stiff Pt wire, the lower end of which is bent into a loop after having threaded upon it a no. of small pieces of glass tubing; the plane of the loop is at right angles to the length of the wire. The loop rests on the paint surface but does not exert any pressure on it. All the paints tested showed violent fluctuation of cond. during the first few days, or hrs. of immersion. Thereafter there is a general irregular rise tending to a limit. With oil paints, the cond. rose continually till the paint cracked and stripped off. The cond. of bituminous or enamel paints increases slowly to a max., then decreases. Cellulose lacquer shows a continuous increase. An acid-proof paint broke down completely. ALBERT L. HENNE

Testing paint films. E. RITTER. *Kali* 23, 10-12, 26-7(1929).—The comparative value of paint films from the standpoint of resistance to attack by alkalis and salt solns. is detd. by measurement of elec. cond. when partially immersed in the solns., which act as electrolytes. The film is painted upon a metal strip which serves as one electrode, a C rod being the other. A machine is also described in detail which subjects test specimens to accelerated weather-exposure conditions, ultra-violet rays being used in conjunction with variation in humidity and temp. as well as the action of alkalis. Results are obtained in 32 to 64 hrs. A new method for detecting and measuring the attack on paint films is described as follows: Glass plates are coated with a Ag_2CrO_4 gelatin emulsion, and the film to be tested is painted on this. If the chloride solns. attack the film, AgCl is pptd. in the emulsion, is easily detected and the extent of the action measured. If the attack is by some other agent or by weather conditions, the test pieces can be dipped in chloride solns. at intervals and even slight attack easily detected. H. STOERTZ

The aging of paint films. A. V. BLOM. *Farben-Ztg.* 34, 892-5(1929).—The aging of films is an irreversible process involving an increase in particle size. Therefore any influence which tends to increase particle size tends to age the film. Temp. change is probably the most important factor. Aging manifests itself by increase in brittleness, and decrease both in tensile strength and in adhesion. B. outlines a method of test in which films prepd. on annealed iron test pieces $170 \times 25 \times 1$ mm. are subjected to elongation tests. The film is observed under a lens while undergoing the test, which is discontinued upon the appearance of fractures. Photomicrographs of typical specimens are given and interpreted. G. G. SWARD

The behavior of white pigments toward ultra-violet light. C. P. VAN HORCK. *Farben-Ztg.* 34, 833-4, 895-6, 954-6, 1006-9(1929).—H. has extensively reviewed the literature and cites 88 references. G. G. SWARD

Specific gravity of linseed oil. F. FRITZ. *Farben-Ztg.* 34, 24-8(1928); cf. *C. A.* 23, 531.—An exhaustive review of the published values for the sp. gr. (and temp. coeff.) of linseed oil. B. C. A.

Polish linseed oil compared with that from La Plata. Z. LEPPERT. *Przemysl Chem.* 13, 23-5(1929).—Linseed oils from La Plata are compared with those of Polish and Lithuanian origin on the basis of the usual consts., which are, resp.: congealing temp. -12° to -16° vs. -25° to -27° ; acidity no. 4 to 5 vs. 2 to 3; I_2 value (Hubl)

176 to 179 vs. 181 to 190. These differences are reflected in various industrial applications and manuf.; e. g., the Polish oils dry far better than those from La Plata. The com. interests have been so eager to absorb the Polish production of linseed oil that some Polish factories are obliged to substitute inferior imported oil for domestic product, which is exported.

A. C. ZACHLIN

Tung oil. II. D. HOLDE, W. BLEYBERG AND M. A. AZIZ. *Farben-Ztg.* 33, 3141-4(1928); cf. C. A. 23, 1761.—The I value (Hanus) obtained for eleostearic acid is influenced by the time of reaction (*loc. cit.*), the presence of light, and the mode of prepn. of the I-Br reagent. Attempts were made to det. the extent of halogen substitution or secondary dehalogenation by detg. the halogen acids in the reaction mixt. after titration with thiosulfate. Only one-fourth to one-fifth of the I apparently absorbed could be accounted for by the halogen retained by eleostearic acid; the remainder was recoverable from the aq. soln. and appeared to be due, at least in part, to a secondary elimination of halogen acid. It could not be ascertained at what stage in the Hanus test this sepn. occurred, but it is suggested that there is a tendency for the 6-membered chain constituting the triple conjugated linkings to close, by the addn. of halogen to the terminal C atoms and subsequent elimination of halogen hydride, leaving hydroaromatic or aromatic derivs.

B. C. A.

Manufacture of cellulose-ester varnishes. O. PRAGER. *Chem. Techn. Fabr.* 26, 15 8(1929).

B. C. A.

Lacquer diluents. A. NOLL. *Farben-Ztg.* 33, 3260-5(1928).—The analysis of various mixts. of aliphatic and aromatic hydrocarbons and alc. solvents is described. Qualitatively, EtOH is detected by formation of its benzoate, benzene by formation of nitro compds. and color reactions, and petroleum hydrocarbons by insoly. on nitration or sulfonation. Examn. of a series of exptl. mixts. demonstrates that "total benzol" content can be obtained with sufficient accuracy for the present purpose either by nitration or sulfonation. In the complete scheme of analysis propounded alc. constituents are detd. by absorption by CaCl₂ soln., the alc. in the aq. layer being obtained, if desired, by distn. methods, and hence the water by difference. The hydrocarbon residue is then nitrated or sulfonated, giving the aromatic content directly and the aliphatic by difference. Typical test reports are quoted, the results of which are to be considered as complementary to such tests as rate of evapn., distn. range, etc.

B. C. A.

Injury to health caused by lacquer solvents. G. SIEBERT. *Z. angew. Chem.* 42, 17-9(1929).—The use of hydrocarbons and their halogen derivs. instead of turpentine in lacquers is often attended with danger. This is due to their action as fat solvents and consequent effect upon cell structure. Tetrachloroethane (now used but little) is one of the most poisonous. Trichloroethylene is essentially harmless. CCl₄ does not have a great physiol. action. Chloroacetone is sometimes developed in the lacquer itself; although not a solvent it adds danger to such materials, as when acetone and Cl derivs. are used together in lacquer manuf. C₆H₅Cl has also been replaced largely by less dangerous solvents. C₆H₆ is much more poisonous than its homologs. Benzene seems to be in about the same class as turpentine.

W. C. EBAUGH

Manufacture of lacquers, varnishes and driers. F. S. SCHMITT. *Mal. grösSES* 20, 8287-9, 8372-3(1928), 8397(1929); cf. C. A. 22, 3999.—A review of the manuf., properties and uses of these products.

P. THOMASSET

United States Government Master Specification for shellac. ANON. *Separate*, 7 pp.

E. H.

Fluorescence of resins to filtered ultra-violet light (DRAGONE) 3. Dyes [varnish colors] (Brit. pat. 294,583) 25. Sheet material containing synthetic resin (U. S. pat. 1,703,414) 18. Cr compounds [for rust-proof paints] (Brit. pat. 294,965) 29.

MATTHISON, A. L.: **Stoving Finishes for Tin Plate Decorators and Tin Box Manufacturers.** Birmingham, Eng.: Silk and Terry, Ltd. 112 pp. 10s. 6d.

SMITH, STANLEY: **The Cellulose Lacquers.** New York and London: Isaac Pitman & Sons. 145 pp. \$2.25. Reviewed in *Bull. Imp. Inst.* 26, 526-7(1928).

Paint. JOHN C. CARROLL. Fr. 645,440, Dec. 8, 1927. An anti-corrosive paint resistant to heat comprises a powd. ore of Ti and a suitable liquid carrier. Thus, ilmenite is powd. and freed from moisture, ground up in crude linseed oil, then cleared with a mixt. of thick oil, ordinary varnish oil and alc.

Paints and pigments. E. ASSER. Brit. 294,436, Jan. 9, 1928. Permanent pastes contg. red oxide of Pb and a liquid binder such as linseed oil are prepd. by the addn. of a neutral or basic, resinic or fatty acid salt of Al which has undergone colloidal swelling, or infusorial earth, or both. Siccatives may be added and also oils and solvents to form paints and varnishes.

Rotary furnace for calcining lithopone. WILLIAM J. LINDSAY (to E. I. duPont de Nemours & Co.). U. S. 1,704,482, March 5. A furnace is described suitable for use in a calcining process specified in U. S. 1,704,483, according to which the lithopone is passed through the furnace in contact with a nonreactive gas such as water gas, which is heated to above the necessary calcining temp. so that it may supply all the heat necessary for the calcination. Sufficient gas pressure may be maintained within the app. to prevent undesired leakage into it from the exterior.

Drying color prints. KARL H. SCHWIMMER. Fr. 645,595, Dec. 12, 1927. Monochrome and polychrome printed copies contg. dyes mixed with drying oils are dried by means of rays from a quartz or like lamp.

Coating for boilers, refrigerating apparatus, etc. ALLGEMEINE ELEKTRICITÄTSGES. (to International General Electric Co.). Brit. 294,240, July 22, 1927. Coatings are applied comprising reaction products of multivalent aces. and polybasic acids with the addn. of substances which may catalytically aid the reaction, and with or without fillers such as kaolin, quartz, barites, mica or asbestos. Metal oxides may serve as catalysts and drying oils also may be added.

Varnishes. I. G. FARBENIND. A.-G. Brit. 294,911, April 29, 1927. Hard resins such as copals are incorporated with cellulose ester lacquers by use of softening agents (other than fixed oils) such as camphor, triaryl phosphates and neutral Et, Pr, Bu or Am phthalates. Various solvents and other substances may also be used and several examples with proportions of ingredients are given. Cf. C. A. 23, 532.

Varnishes for printing plates, etc. J. R. GUERARD. Brit. 294,987, Aug. 3, 1927. In prepg. printing plates or decorating articles, a support is coated with a varnish permeable to water, sufficiently friable to permit a design to be cut through it to expose the support but convertible by moderate heating into a hard and impermeable layer without melting. A mixt. formed from a soln. of a cellulose ester or ether in acetone and an alc.-ether soln. of gum resins may be used. In treating supports of metals such as Zn, Al or Cu, the metal may preliminarily be given a dark coating as by dipping into a bath formed of KMnO_4 and HCl.

Preserving flowers, leaves, fruits, etc. E. ELÖD and W. BLÜCHEL. Brit. 295,052, Aug. 6, 1927. "Cellulose varnishes," contg. plastifiers, or oil or resin varnishes or various mixts. of these may be applied by dipping, spraying, etc.

Compositions containing cellulose esters or ethers. G. TRÜMLER. Brit. 294,262, July 21, 1927. A "knifing" compn. is prepd. by adding a metal powder such as a Cu bronze powder or Al or iron to a cellulose ester resin lacquer or the like to which other fillers such as kieselguhr, mica or lithopone also may be added.

Cellulose ester lacquers. G. TRÜMLER. Brit. 294,261, July 21, 1927. Lacquers such as those contg. cellulose nitrate or acetate are formed with a "fairly high b. p." solvent such as diacetone alc., miscible with water, together with one or more water-miscible non-solvents or poor solvents such as EtOH and may also include other substances such as toluene, BuOAc, fillers, softeners, xylene, coloring agents, etc.

Colored cellulosic lacquers. I. G. FARBENIND. A.-G. Brit. 294,912, April 29, 1927. Colored cellulose deriv. compns. such as those described in Brit. 247,288 (C. A. 21, 649) and Brit. 293,485 (C. A. 23, 1749) are dissolved in mixts. contg. a butyl or amyl ester and benzene hydrocarbons or their halogen derivs. with a b. p. above 100° preferably with the addn. also of an aliphatic alc. contg. 4 or more C atoms in the mol. Other substances also may be added and an example is given.

Colored pyroxylin lacquers, etc. I. G. FARBENIND. A.-G. Brit. 294,158, April 19, 1927. Colored cellulose deriv. compns. such as are described in Brit. 247,288 (C. A. 21, 649) or Brit. 293,485 (C. A. 23, 1749) are dissolved in glycol monoalkyl ethers or their esters or in glycol dialkyl ethers, or derivs. or mixts. of such substances. Other substances such as benzene, toluene, xylene or their mono-chloro derivs. tetrahydronaphthalene, turpentine oil, natural or artificial resins, plasticizing agents, etc., may be added.

Pyroxylin lacquer solvent. JOHN P. TRICKEY (to Quaker Oats Co.). U. S. 1,703,697, Feb. 26. Tetrahydrofurfuryl alc. is used with a resin such as shellac and with di-Bu phthalate, BuOH, EtOAc or other suitable solvents, softeners, etc.

Purifying rosin. I. GUBELMANN and C. E. HENKE (to Newport Co.). Brit. 294,526, July 25, 1927. In order to purify and decolorize rosin, it is dissolved in a vola-

tile hydrocarbon material such as petroleum naphtha, gasoline or turpentine, treated with resorcinol at an elevated temp. and then cooled, so that the resorcinol together with impurities and coloring matter seps. The resorcinol may be recovered for reuse. Various details are described.

Artificial resins. BAKELITE, G. M. B. H. Fr. 645,713, Dec. 13, 1927. Resins sol. in fatty oils are obtained by combining with heat condensation products of phenols and aldehydes with phenols contg. more than one benzene ring or with polyhydric phenols having one or more rings. Examples are given in which condensation products of phenols and aldehydes, such as "Bakelite," are heated with β -naphthol, resorcinol or diphenol with or without a catalyst such as, MnO_2 or Pb oxide. Natural resins dissolved in oils or varnishes may be added to the artificial resin. Cf. C. A. 23, 1294.

27—FATS, FATTY OILS, WAXES AND SOAPS

E. SCHERUBEL

Absorption spectra and fluorescence of fats. H. P. KAUFMANN. *Chem. Umschau Fette, Öle, Wachse Harze* 36, 34-5(1929).—The prize problem of detecting foreign fats and extd. cacao butter in pressed cacao butter, issued by the German Chocolate Mfrs. Union in January, 1927, caused K.'s work on the absorption spectra, but the latter were unsuited for solving this problem. The fluorescence spectrum yielded more success and quant. results have been obtained with the aid of Pulfrich's step-photometer; 8 references to the literature are appended. P. ESCHER

The wood-oil theory in practice. R. BURSTENBINDER. *Chem. Umschau Fette, Öle, Wachse Harze* 36, 35-8(1929).—Polymerization is only one factor in the coagulation of wood oil; reesterification and condensation are the other factors. The various colloidal phases corresponding to these factors have different phys. characteristics and solubilities. Reagents which are added to hasten or prevent coagulation of wood oil act by depolymerizing, by esterifying or by the formation of mixed glycerides. Depolymerization of the coagulated oil may also occur by reesterification, by hydrolysis or by syneresis. P. ESCHER

Determination of the emulsion-forming capacity of fats by means of a "capillary electrode." L. PRICK. *Chem. obzor.* 3, 202-3(1928).—Two Cu plates are kept apart by 2 pieces of glass of about 0.2 mm. thickness within a rubber band around the whole. The breaking of an emulsion is indicated by the glowing of an elec. lamp of 50 c. p. with a c. of 120 v. and 50 cycles passing through the electrodes and the emulsion at 40-45°. The efficiency of various methods of prepn. of emulsions and emulsifying agents is shown by different stabilities of the emulsions. JAR. KUČERA

Physical bleaching of fats for soapmaking. E. RICHARDSON. *Am. Perfumer* 23, 511-2, 571-2(1928).—A review. E. H.

New saponifier--emulsifier for fats. I. S. KIZBER. *J. Chem. Ind. (Moscow)* 5, 1176-81(1928).—When stearic acid is distd., some of the non-decompd. fats remain as a vaseline like residue which is a black, thick oil sol. in ether and petroleum ether. This residue is sulfonated thus: 100 g. of the residue is treated by a mixt. of 50 g. oleum and 50 g. H_2SO_4 (sp. gr. 1.84) which is added in small portions in the course of 20-30 mins., the temp. being kept at 38-40°, and the product is left standing overnight. The action of this emulsifier was compared with that of Twitchell's and Petrov's reagents, the latter being obtained by sulfonating certain naphthenic fractions of petroleum distillates. In equal quantities the new emulsifier does not act as efficiently as Petrov's contact catalyzer, but on operating with a larger quantity of emulsifier and water, an equal effect is obtained. The fatty acids obtained by the use of the new emulsifier are somewhat darker than usual, but the glycerol is, on the contrary, lighter. B. N.

The thiocyanate method for fats containing linolenic acid; analysis of linseed oil. X. H. P. KAUFMANN AND M. KELLER. *Z. angew. Chem.* 42, 20-3(1929).—After reviewing the methods by which the constitution of linseed oil had been detd. heretofore, K. and K. use the thiocyanate method and I no. to det. the liquid acids and Bertram's method (C. A. 21, 2391) for the satd. acids. Bertram's method showed 9-11% solid acids against 7-9% by Twitchell's lead salt alc. method. P. ESCHER

A double source of error. BRUNO REWALD. *Chem.-Ztg.* 52, 1013(1928).—The regular Soxhlet method of fat extn. from seeds and animal feeds does not obtain all of the fat, inasmuch as there are lipoids or nitrogenous substances present which contain fat that cannot be extd. The following method will ext. these substances: The material is dried and extd. in the regular manner, after which it is ground and extd. twice

again with 96% alc. followed by an extn. with a mixt. of 20 parts alc. and 80 parts benzene. The latter ext. must be taken up with ether or benzene in vegetable products to avoid the error caused by dissolved sugars. E. SCHERUBEL

International status of standardization of methods of analysis in the domain of fats and fat products. H. STADLINGER. Charlottenburg "Wissoff" session. *Chem. Umschau Fette, Oele, Wachse Harze* 36, 5-10(1929).—S. gives a summary of the extent of official methods for the analysis of fats, oils and related products in force in Germany, U. S. A., Italy, Holland, Great Britain, Russia, and Austria. There is not sufficient coöperation between analytical commissions and health authorities, custom house officials and industrial assocns. The first vol. of "Einheitsmethoden" is to be revised shortly and a 2nd vol. is to follow on waxes, Turkey-red oils, etc., after publication of the proposed methods for discussion. International standards are required for the detn. of percent of fat in oil seeds, water and total fat in crude fats; also for certain fat constns and for the analysis of glycerol. P. ESCHER

Removal of acids from oils and fatty acid distillation. Conclusion. C. H. KEUTGEN. *Seifensieder Ztg.* 56, 19-20(1929).—One unit of the Wecker App. handles 800-1000 kg. oil per hr., passing it in 5-6 min. with a residual acid content of 0.3-0.5%. The treatment precedes the ordinary treatment and recovers the bulk of free acids as a light-colored oil. P. ESCHER

Wetting agents and emulsifiers. A. NOLL. *Chem. Tech. Fabrikant* 25, 103-4 (1928); cf. C. A. 23, 1290.—A tabulated survey of the behavior of com. emulsifiers when in soln. of a solvent and mixed with water. P. ESCHER

The method for studying and identifying fats and fat mixtures. II. Turbidity point and solidification curves. B. LUSTIG AND G. BOTSTIBER. *Chem. Lab. Rudolfstiftung, Wien III. Biochem. Z.* 204, 46-61(1929); cf. C. A. 23, 1002.—A sample of fat to be analyzed is examd. in a thin layer under the microscope and under a Hanauer analysis lamp. This is compared with a sample of known fat. Only when the comparison reveals some discrepancy, pointing to an admixt. or adulteration, the unknown sample is submitted to a study of its turbidity and solidification curve whereby the fat can be identified or impurities proved. The temp. of the appearance of turbidity for various fats is given, together with many curves of solidification of many different fats. S. MORGULIS

Emulsions of fats and hydrocarbons and their industrial applications. LOUIS MEUNIER. Faculté des sciences de Lyon. *Chimie et industrie* 21, 3-19(1929). A review of their prepn. and industrial application. A. PAPINEAU-COUTURE

Luminescence in oils and fats. A. VAN RAALTE. *Nahr.-Untersuchungsanstalt, Amsterdam. Z. Untersuch. Lebensm.* 56, 195-8(1928); cf. C. A. 23, 1002.—A further discussion of the theory that the appearance of luminescence in refined oils and fats is due to *vitamin removal*. Crude oils usually lack luminescence. Vitamins may be formed in certain fats and oils by simply exposing to sunlight. The luminescence of such irradiated oils disappears. The work of Feder and Roth (C. A. 22, 1863) attributing fluorescence in crude and unpurified oils, particularly lard, to small amts. of paraffin and other impurities, is criticised. C. R. F.

Determination of the iodine number. J. J. A. WIJS. *Chimie et industrie* 20, 1043-4(1928); cf. C. A. 23, 1518.—Nielsen's statement that in carrying out the I no. detn. *via* Wijs there is substitution as well as addn. of I is refuted. Weisser and Donath's statement that it does not give theoretical results with pure unsatd. acids was due to defective technic on their part, as they prepd. their soln. with a large excess of ICl_3 . The prepn. of Wijs' soln. is described in detail. A. PAPINEAU-COUTURE

Catalytic polymerization of fatty oils. J. MARCUSSEN. *Materialprüfungsamt Berlin-Dahlem. Chem. Umschau Fette, Oele, Wachse Harze* 36, 58-9(1929).—By the use of a 5% soln. of anhyd. SnCl_4 in CS_2 , M. was able to polymerize wood oil in CS_2 soln. to a jelly at room temp. overnight; there was a 56% yield of an acetone-insol. gel. By using $\frac{1}{2}$ the quantity of SnCl_4 (0.5%) but applying heat for 1 hr. under reflux, the same jelly formed, yielding 77% of a solid acetone-insol. gel. The acid liberated from this gel is a light yellow resin of 183 acid no., 109 sapon. no., 72 I no. and a mol. wt. of 1011 (Rast's camphor method), which dropped to 590 when dried in vacuum instead of at 105° . Linseed oil could be polymerized by adding 50% anhyd. SnCl_4 directly to the oil and heating for 4 hrs. on the water bath. After removal of SnCl_4 a thick oil was obtained of 32 I no., sol. in acetone. Its acid had a mol. wt. of 430, which on purification was increased to 494. A medicinal cod-liver oil of 153 I no. also yielded with SnCl_4 a thickened oil of 41.7 I no. and a mol. wt. of 1006. P. ESCHER

Optical methods in the examination of oils. C. VAURABOURG. *Recherches in-*

ventions 9, 442-4(1928); cf. C. A. 22, 3553.—The use of Fery's refracto-dispersometer is described.

P. THOMASSET

Degree of sulfonation of soluble oils. W. HERBIG. *Melliand's Textilber.* 10, 47 (1929).—Calc'n. of the degree of sulfonation of sulfonated castor oil, etc., from the wt. of SO_3 obtained in the ordinary course of analysis is misleading. Completely sulfonated castor oil contains but 21.1% organically combined SO_3 , yet much higher values are commonly reported for com. preps. A 50% sulfonated castor oil of commerce ought to contain some 36-8% total fatty acids.

E. R. CLARK

Effect of high-frequency current on mineral and vegetable oils. VII. T. RABEK. Chem. Research Inst. (Poland). *Przemysl Chem.* 12, 240-9(1928); cf. C. A. 22, 2460.—Increased frequency of the elec. current to which a vegetable or animal oil is subjected decreases the time necessary to bring about a given change of viscosity of that oil. R. succeeded in reducing this time down to a few hrs. and in devising an app. for continuous operation by employing currents of radio frequency. Under these conditions polymerization takes place exclusively at the vapor-liquid boundary. Three designs of app. tried are described. The most successful of these effected a large surface of the liquid by producing a very thin film of it on rapidly revolving tilted shields to which it dripped from alternate shelves. A 2-kva. unit giving single-phase current of 100 v. and 7600 cycles/sec. was used. One hundred % increase in viscosity in a 10% vegetable oil has been obtained.

A. C. ZACHLIN

Fish oils. A. JULIÁ-SAURI. *Quim. ind.* 5, 257-61(1928).—Fish oils may be classified as drying oils. Paints with oils from fish of good quality resist sea air and heat. Squalene isolated from fish oils has flash pt. 195° , ignition pt. 245° , b_{10} 270° , n_{20} 1.4960, I no. 375, Engler viscosity at 25° 2.4, calorific value 10773 (petroleum = 10500-11000). Thus fish oils make good liquid fuels. The compn. of fish oils is related to ordinary oils since from the former, petroleum, gasoline and petroleum ether have been obtained. For cracking the catalyst is 50% Al_2O_3 or kaolin, or MgO (dehydrating) and 50% electrolytic Cu (dehydrogenating) at 550 - 650° . The cracked products are hydrogenated over Ni. In Diesel-Hind motors of 4 h. p. and 10 h. p., fish oil worked as well as fuel oil; rather less was consumed in relation to the power produced and the flexibility was better than with "gas-oil." Lubricating oils have a higher viscosity than fish oils. The viscosity of the latter can be increased by oxidation, volatilization or by high-tension elec. current. Fish oils are now hydrogenated, eliminating the strong odor. Their emulsifying power as soap is very great.

S. L. B. ETHERTON

Pumping, piping and heating. THOMAS ANDREWS. *Oil and Fat Ind.* 6, No. 1, 15 8, 41, 43(1929).—This is a discussion of equipment and process methods for the fatty oil plant.

E. SCHERUBEL

Virgin olive oil What does it mean? SIDNEY MUSER. *Oil and Fat Ind.* 6, No. 1, 25-6, 33(1929).—A virgin olive oil is one extd. by cold pressure from mature selected olives, without heat or treatment of any kind except filtration or settling. Flavor and color make the quality, as refined oils possess neither. The nutritional value of untreated olive oil is also enhanced by the presence of enzymes which are destroyed in heat or chemically treated oils. A virgin oil will also keep 4 times as long as a refined oil, and the presence of vitamins in the former gives it a distinct advantage.

E. SCHERUBEL

Use of the refractometric method in determination of oil in avocados. B. E. LESLEY AND A. W. CHRISTIE. *Ind. Eng. Chem., Anal. Ed.* 1, 24(1929).—Weigh 5 g. of avocado paste on a watch glass, transfer to a warm mortar with soft filter paper and pipet 5 ml. of Halowax oil into the mortar. Grind 5 min., sep. a drop of the oil mixt. and det. n , observing temp. Grind 1 min. more and repeat the n detn. Continue grinding and reading until a const. value is obtained. Correct the reading to 25° by adding 0.0004 for every degree above 25° or subtracting the same for every degree below 25° . The following formula is considered correct: $(a - 0.0032 - b)/d = c$, in which c = % oil in sample, a = n of Halowax oil at 25° , b = n of mixt. oil at 25° and d = change in n per % of oil in sample.

E. SCHERUBEL

Oil of Althea rosea Col. Its constants. J. PIERAERTS. *Mal. grasses* 20, 8363-6 (1928).—The analysis from the fresh fruits grown in Austria gives these results: Moisture 9%, ash 8.57%, dry matter 91%. Oil extd. by petroleum ether: cold 7.71%, hot 7.91%; ext. with dry ether after extn. with petroleum ether: cold 0.59%, hot 1.02%; ext. directly with ether: cold 8.25%, hot 8.41%. Consts. of oil extd. with ether: $d_{4.4}$ 0.9293, $n_D^{25.6}$ 1.4725, acid no. 69.76, expressed as oleic acid 34.88%, sapon. index 196.9, I no. 124.6, Crismer index (dissolves at ordinary temp.), Halphen reaction positive, Hehner index 94.61%; acids dried in vacuum, m. 27 - 31° ; neutralization index, 175;

sapon. index, 205.6. These consts. are very different from those obtained from fruits growing in India.

P. THOMASSET

Two new methods for determining the oil content of olives. SOCRATES A. KALOYERAS, W. V. CRUESS AND B. E. LESLY. Univ. of Cal. *J. Pharm. chim.* [viii] 8, 407-15(1928); *Fruit Products J. and Am. Vinegar Ind.* 8, No. 5, 20-2; No. 6, 27-30 (1929).—Besides describing the results of their investigations, the authors have reviewed the work of other investigators. "Two simple, rapid and reasonably accurate methods were developed." (1) The first method is based upon the n : when Halowax oil is mixed with olive oil the n of Halowax oil changes according to the amt. of olive oil dissolved. From the change in n the amt. of olive oil dissolved can be calcd. (2) The second method is based on the change in sp. gr. of Halowax oil in contact with undried olive flesh or on the change in sp. gr. of trichloroethylene in contact with a sample dried with anhyd. Na_2SO_4 . The sp. gr. method is not as accurate as the n method but is simpler and does not require such expensive app. and also no correction for the variation of sp. gr. of the different olive oils is necessary as in the n . Olive oil dissolved in Halowax oil changes in sp. gr. by an amt. which can be calcd. Complete details for these methods are given. Expts. were made to ascertain whether the oil in olives could be detd. by sapon. with strong NaOH with subsequent acidification, liberation and estn. of the fatty acids by elec. resistance.

J. A. KENNEDY

A few reactions of soy-bean oil. A. RICHARD. *Ann. fals.* 21, 579-82(1928).—Soy-bean oil is known to have been used for the adulteration of olive and peanut oils. It is best distinguished therefrom by means of its I no.; and if a given oil is known to be a peanut-soy-bean mixt. or an olive-soy-bean mixt., the approx. soy-bean oil content can be calcd. from the I no. The elaidin test (shake 10 cc. oil with 1 cc. HNO_3 and immerse in a boiling water bath) gives a yellow color with more or less complete solidification (practically complete after 24 hrs.) with olive and peanut oils, while soy bean oil turns a dark reddish brown and remains a viscous liquid without trace of solidification. Addn. of 10% soy-bean oil to olive or peanut oil is easily detected, especially by comparing with pure peanut or olive oil.

A. PAPINEAU COUTURE

Sclarea sage. GUIDO ROVESTI. *Riv. ital. essenze profumi* 10, 122-5(1928).—*Salvia sclarea* L. is a biennial. The oil from it contains linalyl acetate, salvene, pinene, sclareol, linalool, eucalyptol, borneol and resins. It has d_{20}^{20} 0.8658-0.813, $[\alpha]_D^{20}$ $-9^\circ 31'$ — $-34^\circ 43'$, n 1.4692-1.4818, acid no. 0.4-0.19, sapon. no. 98.93-163.10, sapon. no. after acetylation 169.86-218.8, free alcs. 4.34-23.48%, combined 27.20-43.12%, total 17.69-61.46%, soly. in alc. at 80° 0.8-1.1.

R. SANSONE

Composition of California walnut oil. GEORGE S. JAMIESON AND ROBERT S. MCKINNEY. *Oil and Fat Ind.* 6, No. 11, 21-3(1929).—The consts. found were d_{20}^{20} 0.9235, n_{20}^{20} 1.4751, acid value 5.11, I no. Hanus, 158.5, Wijs 161.7, sapon. no. 191.5, acetyl no. 6.09, R. M. no. 0.11, Polenske no. 0.19, % hexabromide 8.88, unsapon. 0.51%, satd. acids 5.34, unsatd. acids 89.74%, I no. of unsatd. acids 166.7. The compn. of the sample showed the following %: olein 17.6, linolein 72.8, linolein 3.2, myristin trace, palmitin 4.6, stearin 0.9, arachidin trace, unsapon. 0.5.

E. SCHERUBEL

Method for wool oil unsaponifiables. LESLIE HART. *Oil and Fat Ind.* 6, No. 11, 29(1929).—If the sample is a soap emulsion, weigh enough to give 10 cc. of unsaponified oils, ext. twice with 50 and 30 cc. of ether adding 1 to 2 cc. of 50% NaOH . Wash the ext. with 10% alc. and 2% NaOH soln. until free of soaps. Wash the combined alk. and alc. layers successively with 2 portions of ether of 50 cc. each. Combine the ether exts., evap. and weigh the residue and det. the sp. gr. If sample is a grease, weigh as above, saponify in the usual way with alc. KOH , evap. the alc., add 100 cc. H_2O and evap. to 50 cc. Cool the soln. and transfer to a separatory funnel. Rinse sapon. flask with 25 cc. ether and add to funnel. From this point proceed as in the directions for soap emulsions. A close approximation of the amt. of hydrocarbon oils is made by treating 10 cc. of the extd. oils with a mixt. of part amyl alc. and 2 parts EtOH using 40 cc. from a buret. Place the mixt. in a cylinder reading to 0.1 cc. and shake. The alcs. dissolve and the hydrocarbons sep. Note the amt. and det. sp. gr. and b. p. and calc. % by wt. based on original sample.

E. SCHERUBEL

Sesamin and sesamolin. W. ADRIANI. Dordrecht. *Z. Untersuch. Lebensm.* 56, 187-94(1928).—The constituents of sesame oil have been confused in the literature (C. A. 20, 786). Sesamin, $\text{C}_{20}\text{H}_{32}\text{O}_4$ (?) to the extent of approx. 1% was isolated from sesame oil, by crystn. from EtOH as long colorless needles, m. 122.5° , $[\alpha]_D^{20}$ $+68.23^\circ$ (CHCl_3), sparingly sol. in Et_2O or petroleum ether but readily sol. in acetone or CHCl_3 . Unlike phytosterol, it gives Bömer's reaction, a green color turning to red and finally to reddish blue when shaken with equal parts of concd. H_2SO_4 and acetic anhydride, and a cherry-red color turning to blue when a soln. in CHCl_3 is shaken with 1 drop of

concd. H_2SO_4 . It gives a negative Baudouin test. Sesamolin, $\text{C}_{20}\text{H}_{38}\text{O}_7$, m. 93.6° , $[\alpha]_D^{20} + 218.4^\circ$ (CHCl_3), and gives Baudouin's test because HCl converts it into *sesamol*, $\text{C}_7\text{H}_6\text{O}_3$, a phenolic substance, and *samin*, $\text{C}_{13}\text{H}_{14}\text{O}_5$. The sesamolin content of sesame oil is approx. 0.3%. Samin, occurred as long, colorless needles, m. 103° , $[\alpha]_D^{20} + 103^\circ$ (CHCl_3), and failed to give the Baudouin reaction with furfuraldehyde and HCl . Samin is isolated here for the first time.

C. R. F.

Some Mackey tests on cottonseed oil. HERMAN ASPEGREN. *Oil and Fat Ind.* 6, No. 1, 19–24 (1929).—A no. of detns. were made to show how the changes in cottonseed oil during hydrogenation would influence the Mackey test. It was shown that the heating curves gradually flatten out and the tendency to heat had nearly disappeared when the process had advanced so far as to reduce the linoleic acid content to 16%. With linoleic acid gone, but with 83% of isoleic and oleic acid, the fat did not show any tendency to spontaneous heating during the Mackey test. Other tests indicate that the same percent of glycerides of linoleic acid which have not been exposed to the hydrogenation process would have a tendency to develop a steeper heat curve than the same percent of these glycerides which have been exposed to the hydrogenation process. Crude cottonseed oil showed practically no tendency toward heating during the Mackey test. Possibly impurities may have a retarding catalytic influence. Heating curves of refined cottonseed, corn, sesame, olive, peanut and coconut oil indicate that with decreased percent of linoleic acid, the Mackey test heating curves flatten, and evidently are principally affected by the percent of linoleic acid and to a much less extent by the percent of oleic acid.

E. SCHERUBEL

Oil from the seeds of *Adenanthera pavonina*. A source of lignoceric acid. S. M. MUDHIDRI, P. RAMASWAMI AYYAR AND H. E. WATSON. *J. Indian Inst. Sci.* 11A, Pt. 14, 173–80 (1928).—*Adenanthera pavonina* is a moderate-sized deciduous tree belonging to the order Leguminosae and is found in the Eastern sub-Himalayan tract, the Western Ghats, Sylhet, the Andamans and Burma. The kernel and husks are nearly equal in wt and difficult to sep. The husk yields a trace of oil, while the whole seed yields 14% and the kernel 28%. The av. wt of the seed is 0.24 g. Consts. of the oil are $d_{15.6}^{20} 0.9168$, $n_D^{20} 1.4570$, acid value 0.56. I no. 87.9, sapon. no. 181.4, unsapon. 1.4%, viscosity (Redwood) 128 sec., acetyl no. 3.4, Reichert-Polenske no. 122, Polenske no. 0.24. Consts. of the mixed fatty acids: titer 58.4° , $n_D^{20} 1.4541$, mean mol. wt. 301, unsatd. acids 64%, mean mol. wt. of unsatd. acids 286, of satd. acids 36%, mean mol. wt. of satd. acids 328, I no. of unsatd. acids 111, Helmer no. 95.5. The compn. of the acids is: myristic 0.4, palmitic 9.0, stearic 1.1, lignoceric 25.5, oleic 49.3 and linoleic 14.7%. The amt. of lignoceric acid is greater than any recorded in an oil. E. S.

Oil seeds from British Guiana. ANON. *Bull. Imp. Inst.* 26, 411–6 (1928).—Crabwood (*Carapa guianensis*) oil prepd. in Brit. Guiana and extd. from the kernels with petr. ether at the Imp. Inst. had the following consts.: $d_{15}^{100} 0.8689$, 0.8572 ; $n_{40} 1.4590$, 1.4560 ; solidifying pt. of fatty acids, 37.8° , 35.8° ; acid value, 36.9, 75.8; sapon. value, 198.5, 197.4; I no. (Hübl, 17 hrs.), 57.3%, 64.5%; unsaponifiable matter, 1.1%, 0.7%, resp.; these are normal values. Oil extd. with petroleic ether from the pericarp and from the kernels of Awarra palm (*Astrocaryum jauari*, Mart.) fruit had the following consts.: $d_{15}^{100} 0.8573$, 0.8660 ; m. p., —, 30.8° ; $n_{40} 1.458$, 1.4505 ; acid value, 38.4, 0.4; sapon. value, 195.8, 241.9; I no. (Hübl, 17 hrs.), 68.0, 14.6%; unsaponifiable matter, 0.5, 0.5%; sol. volatile acids, 0.4, 2.4; insol. volatile acid, 0.2, 6.8; solidifying pt. of fatty acids, 36.7° , 27.0° . The consts. of the kernel oil agree with previously published values, except that the solidifying pt. of the fatty acids is higher (27.0° instead of 23.5°). The oil from the pericarp would be suitable for the same purposes as palm oil from the African oil palm.

A. PAPINEAU-COUTURE

A new oil seed from Brazil. ANON. *Bull. Imp. Inst.* 26, 416–8 (1928).—On extrn. with petr. ether the kernels of nuts of *Joannesia heveoides* from Brazil (known locally as "castanha de arara") yielded 57.3% (61.0% on dry basis) of oil having the following consts.: $d_{15}^{16} 0.9239$, $n_D^{20} 1.467$, acid value 2.1, sapon. value 188.5, I no. (Hübl, 17 hrs.) 129.8%, unsaponifiable matter 0.48%. The residual meal has a faintly bitter taste and an odor somewhat resembling that of castor oil. It contained: H_2O 8.0, crude proteins 47.4, fat 0.7, N-free ext. 25.1, crude fiber 6.5, ash 12.3%, nutrient ratio 1:0.56, food units 145; it contained a substance or substances of an alkaloidal nature. The oil is suitable for soap-making; it has semi-drying properties and might possibly be of use, after "boiling," for paint manuf. in admixt. with linseed oil. Physiol. tests would be necessary before pronouncing on the suitability of the oil and meal for edible purposes.

A. PAPINEAU-COUTURE

Jute seeds—Corchorus capsularis. II. Composition of oil Corchorus. NIRMAL-KUMAR SEN. *Dacca Univ. J. Indian Chem. Soc.* 5, 759-67(1928); cf. *C. A.* 21, 3647.—Refined jute-seed oil had the following characteristics: d_{20}^4 0.923, n_D^{20} 1.4615, solidifying point -20° , I value (Hübl's) 102.6, sapon. value 184.6, acid value 1.5, Ac value 27.3, Reichert-Meissl value 0.16, unsapon. matter 2.25%, sol. acids (% of $C_{18}H_{34}O_2$) 0.32, insol. acids 94.1%, glycerol 9.2%. The oil contains 39.18% glycerides of oleic acid, 44.63% glycerides of linolic acid, 0.169% of "crude arachidic acid," and small quantities of palmitic and stearic acids. From the unsapon. portion of the oil a very small quantity (0.6145%) of a phytosterol was obtained.

LOUISE KELLEY

Soaps from organic bases. R. B. TRUSLER. *Soap* 4, No. 6, 33-7(1929); cf. *C. A.* 23, 1004.—There are 3 ethanolamines, mono-, di- and tri-, from which soaps are made. They are synthesized from NH_3 and differ slightly in their phys. and chem. properties. They are miscible in all proportions with H_2O , alcs., acetone and its homologs, glycerol, glycol, ethylene and propylene chlorohydrin and many oxygenated org. compds. Exceptions are Et_2O and some of the aldehydes in which ethanolamines are scarcely sol. One mol. wt. of any of these is equiv. to 1 mol. wt. of $NaOH$ in combining with an acid. For technical purposes a mixt. consisting of 75 to 80% tri-, 20 to 25% of di- and 0 to 5% of monoethanolamine has a price advantage and is offered under the name of Enthanolamine. In order to prep. any of the soaps it is best to det. the basicity by titration in H_2O against a standard acid and then use weighed amts. of both ingredients. The liquid fatty acids such as oleic best serve the purpose. No external heat is required. To combine solid fatty acids with ethanolamines 2 procedures are available: The fatty acid may be heated to 60° and the correct amt. of ethanolamine stirred in; or the fatty acid may be dissolved in denatured alc. and the ethanolamine stirred in. The soap is recovered by evapg. the solvent.

E. SCHERUBEL

Manufacture of dry and powdered soaps. PEDRO BOSCH. *Quim. ind.* 5, 288-9 (1928).—Soap powders contain some 5 to 50% fatty acid, most powders being mixtures of soap and crystals of soda. Some may contain Na silicate, phosphate and decolorants. Domestic soap powders are never perfumed and but rarely colored, although a little ultramarine blue may be added so that the washed articles may appear whiter. Colophony is never used in these soaps. The color and compn. of the soaps should be const. All powders should be as fine as possible upon evaporation, so as to avoid agglomeration. The addn. of 0.25% $NaHCO_3$ helps in this respect. B. gives 7 methods for the manuf. of dry soaps and makes sundry observations as their application. He concludes with general considerations upon trituration and incorporating plant employed in these processes.

S. L. B. ETHERTON

The use of rosin in soap making. R. BREDON. *Bull. inst. pin* No. 56, 42-4(Jan., 1929).—A discussion of the precautions which must be taken to obtain a high grade product in making soaps contg. up to 15-20% rosin.

A. PAPINEAU-COUTURE

Rosin soaps. BIGORIE. *Bull. inst. pin* No. 56, 40-1(Jan. 1929).—Brief outline of the merits of properly prepd. rosin soaps and of their uses.

A. P. C.

The salt-rubin number of soaps. L. ZAKARIAS. *Z. phys. chem. Seifenforsch.* 2, 4(1929).—Beyrodt and Zakarias' salt-rubin method for soaps did not respond with a color change when fresh Congo rubin "Agfa" was employed; the published results had been obtained with a 10-yr.-old dye.

P. ESCHER

Determination of the detergent value of washing compounds. L. E. LEDERER. *Seifensieder-Ztg.* 56, 33(1929).—In Löffl's equation (*C. A.* 23, 1519) for the detergent value of soaps cond. (mho) cannot be added to surface tension (dyne/cm), etc., nor are cond., inner friction and lathering no. proportional or reciprocal to surface tension. In order to det. the cleansing value of a soap, something must be cleaned with the soap; the proposed method of the A. O. C. A. in the U. S. A. are more suitable from that viewpoint than Löffl's proposal.

P. ESCHER

Determination of the detergent value of washing compounds. K. LÖFFL. *Seifensieder-Ztg.* 56, 49(1929).—An answer to Lederer's criticism (preceding abstr.) The meaning of "washing compds." must be defined, and the components that make up the cleansing effect and the degree of fiber damage must be detd., and each given its proper factor for calcn.; an evaluation is then possible by comparing detergent value with price of soap.

P. ESCHER

Discoloration and rancidity. O. F. SREVER. *Am. Perfumer* 23, 771, 775(1929).—Milled soaps are exposed to all possible reactions and in consequence of the presence of foreign substances there may result ill-smelling reactions. These may be due to hydrolytically split off alkali or acid soaps; and this does not preclude the passing into acid combinations of the hydrolytically sepd. alkali with certain perfumes. The greater the amts. of alkali and fatty acid split off by hydrolysis, the more sensitive become the

toilet soaps in the presence of the various admixts. as well as contact with metals and air.

Some general considerations on oil soaps. S. J. MILLER. *Am. Perfumer* 23, 337-8, 453-4, 457, 631-3 (1928).

Evaluation of washing compounds by means of surface tension. BRUNO WALTHER. *Z. angew. Chem.* 41, 1083-9 (1928).—By means of the Traube stalagmometer, which passed through a water bath, the no. of drops were counted with soap solns. of different concns. and temps. delivered in a given time, and by means of Traube's stalagmometer formula these values were converted into ergs surface tension. Analytical data of the fats and soaps are given, together with the stalagmometer measurements. The soaps which contain only one kind of oil were made in the lab.

Surface tension in ergs of soap solns. contg. 0.3% fatty acids:									
Temp.	Lux	Sunlight	Na oleate	Thompson	Persil	Rosin soap	Palm kernel	Palm oil	Coco-nut
20°	4125.8	2751.4	2652.7	—	—	3936.9	2566.0	2483.5	3967.0
30°	3024.1	2715.4	2654.6	3336.7	4879.7	3891.0	2419.3	2416.4	2497.0
40°	2601.1	2623.2	2670.6	3287.8	3145.6	3868.8	2419.3	2283.5	2373.0
50°	2354.0	2595.1	2661.8	3160.0	3082.9	3798.0	2340.0	2251.4	2397.6
Temp.	Soy bean	Olive oil	Lard	Beef tallow	Neatsfoot oil				
20°	2600.2	2469.0	3500.0	—	2783.3				
30°	2553.0	2436.8	2796.0	3718.0	2664.0				
40°	2521.5	2416.1	2284.3	2317.0	2546.2				
50°	2486.6	2394.5	2264.5	2279.0	2481.0				

P. ESCHER

Bromometric examination of fats (ANDRISKA) 17. Use of enzymes for degreasing (DELROISSE) 25. Chemical treatment of trade waste. V. Waste from wool washing (SNELL) 14. Some special constituents in the soy bean (MURAMATSU) 11D. The anhydride of abietic acid (NAGEL) 10. Dispersing agents for use in dyeing cellulose esters and for other purposes [antiseptic soaps] (Brit. pat. 295,024) 25. Absorption tower suitable for treating oils (U. S. pat. 1,703,571) 1. Soaps containing sorbitol and its derivatives (Brit. pat. 294,130) 17.

Ubbelohde's *Handbuch der Chemie und Technologie der Öle und Fette*. Leipzig: S Hirzel. Edited by Dr Hans Heller. 791 pp. M. 75.

Fats and oils. KARL F. WILHELM. Fr. 33,425, May 3, 1927. Addn. to 577,037. Fatty acids, resins and bitter and mucilaginous substance are extd. from fats and oils by treating with equal parts of a solvent for the fatty acids and a solvent for the oils, which solvents do not mix, such as alc. and C_2H_5Cl , CH_2Cl_2 , benzine or the like. About 1% of Glauber salts may be added.

Oils and fats. I. G. FARBENIND. A.-G. Fr. 645,497, Dec. 9, 1927. C_2H_5Cl with or without another solvent is used for extg. oil and fats of vegetable or animal origin.

Sulfonated fatty acids. I. G. FARBENIND. A.-G. Fr. 645,819, Dec. 16, 1927. Fatty acids of suint are made sol. in water by mixing them with PhOH and treating with H_2SO_4 or $ClSO_3H$.

Sulfonating oils. ERBA A.-G. Brit. 294,621, July 28, 1927. Colorless products are obtained by the sulfonation of castor oil or a similar fatty oil in the presence of reducing bleaching agents (such as sulfites, hyposulfites or the compds. of CH_2O with CH_2O with alkali hyposulfite or alkali sulfoxylates) or of oxidizing bleaching agents (such as peroxides, per-acids or per-salts) in a quantity in excess of that required for catalyzing the sulfonation. Also, the oil used may be preliminarily bleached or the sulfonated product may be subjected to an after-bleaching. Cf. C. A. 23, 1520.

Mineral oil sulfonates. CHARLES FISCHER, JR., and WARREN T. REDDISH (to Twitchell Process Co.). U. S. 1,703,838, Feb. 26. "Mahogany soap" is mixed with an aq. alc. solvent of over 75% strength which is supersatd. with Na_2CO_3 , in order to sep. oil from sulfonated components.

Washing powdered material. EMILIO SILVANO and VINCENZO L. CERRI. Fr. 645,710, Dec. 8, 1927. See Brit. 282,446 (C. A. 22, 3795).

Soap-like products. I. G. FARBENIND. A.-G. Fr. 33,435, May 6, 1927. Addn. to 619,650. Products whose aq. solns. have wetting cleansing and emulsifying proper-

ties in acid baths or in hard water consist of a sulfonic acid or its salt and materials having soap-like properties in a colloidal state. An org. solvent may be added. Fatty acids, resins, paraffin wax, naphthenic acids, decompn. products of wool, etc., may be used with substituted aromatic sulfonic acids. In an example, olein in MeOH is mixed with isopropyl-naphthalenesulfonic acid or its Na salt, and a soln. in water may be used as a substitute for soap. Na butyl-naphthalenesulfonate is dissolved in water and a soln. of an oil formed by the hydrogenation of oxides of C is added and an artificial resin produced by heating cyclohexanone with an alkali metal methylate.

Toilet and detergent composition. BORIS N. SOKOLOFF. U. S. 1,703,602, Feb. 26. A solid, stable homogeneous detergent compn. suitable for use on the skin or textile fabrics comprises soap 12, borax 2, petroleum jelly 5 and water 20 parts.

Penetrometer suitable for use with soaps, cup greases, etc. WINFRED R. GODDARD and CHARLES K. HEWES. U. S. 1,703,270, Feb. 26. Structural features are specified of a device comprising a freely falling tapered and pointed body.

28—SUGAR, STARCH AND GUMS

F. W. ZERBAN

A study of the refining qualities of Philippine raw sugar. PEDRO SENGSON. *Sugar News* 9, 807-11(1928).—The study was made in 6 different Negros centrals and covers a period of 4 years beginning with the 1924-1925 crop. The samples used in the tests represent a total of 360,874 tons of sugar a yr. Data for each yr. and graphs are given from which S. makes the following conclusions: (1) the polarization remained practically the same; (2) the moisture content of sugar was reduced considerably, and its keeping qualities were improved; (3) the ash remained practically the same; (4) there was no appreciable change in filtration rate, although there was a marked increase in clarity; (5) the color of the original sugar was reduced, but the color within the crystals was increased; (6) the amt. of insol. matter was diminished; (7) the size of grain was increased considerably. S. recommends: (1) that no attempt should be made to raise polarization above 97° unless the refiners would be willing to pay for polarization above this; (2) that the % ash should be kept as low as possible; (3) that sugar colloids should be further eliminated by well controlled clarification and a system of sugar boiling that will minimize the circulation of the impurities within the boiling house; (4) that low-grade sugar should be used for "seed," and boiling should not be carried out at too high a temp.; (5) that insol. matter may further be reduced by straining the juices and sirups through fine-mesh Monel metal; (6) and that no effort should be made to make sugar of "large" grains as this kind will delay the entire factory operation.

V. G. LAVA

Technical method of using the mercury arc to obtain data at wave length 560 mμ in the spectrophotometric analysis of sugar products. H. H. PETERS and F. P. PHELPS. *Bur. Standards J. Research* 2, 335-42(1929).—Previous investigations (C. A. 21, 2813) showed that the detn. of the sp. absorptive index at wave length 560 mμ affords a measure of the quantity of coloring matter in sugar products. Ordinarily a spectrometer is required to produce monochromatic light of this wave length. But instead of this a Hg vapor lamp may be used, and measurements of transmittancy made at wave lengths 546 and 578 mμ, spectrally purified by means of special filters. Then the sp. absorptive index at 560 mμ may be calcd. within 1% of its actual value by deducting 48% of the difference between the sp. absorptive indices at 546 and 578 mμ from that at 546 mμ. This rule holds for all the numerous cane products and also for the few beet products examd., but only under the condition that asbestos-filtered solns. are used.

F. W. ZERBAN

The verification of the 100° point of the Ventzke sugar scale. Introduction. C. A. BROWNE. *Bur. of Chemistry and Soils. J. Assoc. Official Agr. Chem.* 12, 100-7 (1929).—A brief outline of the reasons leading to a study of the problem by the Bur. of Chemistry and Soils and the N. Y. Sugar Trade Lab., under the auspices of the Assoc. of Official Agr. Chem. I. R. T. BALCH and H. C. HILL. *Bur. of Chemistry and Soils. Ibid* 108-15.—The polarization of a soln. contg. 26 g. of sucrose per 100 cc. at 20° was found to be 99.907° Ventzke, which agrees well with the value detd. by Bates and Jackson of the U. S. Bur. of Standards (1916), and which disagrees with the values found by European investigators. The accuracy of this value was substantiated by detg. the polarization of a soln. contg. 26.026 g. per 100 cc. at 20°. The av. value for the new normal wt. was found to be 100.008° Ventzke. This soln. contained 23.724%

sucrose and had d. 1.09965. II. F. W. ZERBAN, C. A. GAMBLE AND G. H. HARDIN. N. Y. Sugar Trade Lab. *Ibid* 115-20.—The av. saccharimetric reading for the normal wt. (26 g. per 100 cc.) of sucrose (after correcting for H₂O, ash and reducing sugar) was found to be 99.912° Ventzke, old scale, which checks the results of Balch and Hill within 0.007% and those of Bates and Jackson within 0.017°. The true saccharimetric value of the normal wt. of soln. of sucrose should be very close to the av. value of 99.904%, which may be rounded off to 99.90° Ventzke, Herzfeld-Schonrock scale.

A. PAPINEAU-COUTURE

Studies of foaming during saturation. VI. STANĚK AND J. VONDRÁK. *Listy Cukrovar.* 47, 17-32(1928).—Eleven liquors from sugar mills and some which had not been treated with lime were observed. A vertical glass tube 80 × 5 cm. has a steel capillary tube in the lower end through which air satd. with CO₂ (28%) was blown at the rate of 47 l. per hr. The juices (250 cc.) were mixed at 85° with 25 cc. of a 2% CaO soln. After 5 mins. of clarifying the mixt. was poured into the tube. The foam reached a max. height in 1-3 mins.; the whole detn. required less than 5 mins. The max. is reached at the beginning of a run, agreeing with industrial observation; only one max. is reached during a run regardless of the length of run. A result of 20 runs shows a reproducibility of 23-26 cm. (94-106%) foam. The foaming increased with the concn. of the juices, a lowered temp. (85°) of clarifying, a decrease in the concn. of the CO₂ in the bubbled air, decreased rate of flow of the gas. The factors: satn. temp., amt. of CaO and time of clarification have an effect, but the various juices responded to them individually. A small quantity of fat had the most effect (0.05 mg. to 250 cc. of juice); an excess of fat increased the foaming above the min. The following order existed for various antifoaming agents: rape oil (column attained 49% of the height of the same untreated juice), mineral oil 53%, ricin 53%, lanolin 53%, olein 73% and hexalin 100% (no effect); the order was different for different juices. Rape oil was applied as a 0.1-5% emulsion in a 2% soap soln. and gives the same effect as the free oil. The advantage is in economizing the rape oil. Further industrial observations are promised.

FRANK MARESH

Illumination of evaporating bodies and the observation of the cloudiness of juices during their preparation. VIKTOR KORAN. *Listy Cukrovar.* 47, 240-1(1929).—K. passes a beam of light across a tank and observes the intensity of this beam through a window at right angles to the course of the beam. The intensity of the light beam gives some knowledge as to the opacity of the soln. being evapd. in a sugar mill. F. M.

Mechanical cane unloaders, system Schippers-Cordesius. W. W. SCHIPPERS. *Arch. Suikerind.* 36, II, 1097-1102(1928); cf. *C. A.* 22, 181. —In comparison with other mech. cane unloaders, the cane dumper should be preferred. This system gives more capacity, and is lower in initial cost and in upkeep than other systems. P. R. P.

Separate grinding of each variety of cane. TH. J. D. ERLER. *Arch. Suikerind.* 36, II, 815-35, 843-74, 888-904(1928). To get a better insight into the real results of the mill work it is recommended to grind the cane of different varieties separately. At Ketegan this was done during the crop of 1925 and 1926 with satisfactory results. The sources of error in the different detns. are discussed. The av. error for sucrose % cane is 0.056, and for fiber % cane 0.24. The results of the expts. are given in tables and graphs. It is pointed out that mill results calcd. on sucrose figures and on Brix figures are of the same order. The figure for sucrose extn. % cane is of no value for judging mill work. The relation between fiber % cane and lost juice % cane was the same as that calcd. by Bolk. The relation between yield and yield factor is due to the sucrose lost in bagasse % cane, influenced by the fiber % cane. P. R. P.

Comparisons of (cane variety) H-109 with Luzon White under different conditions in the Laguna-Cavite district. MANUEL L. ROXAS. *Sugar News* 9, 829-33(1928).—The Luzon White (native) is more resistant to drought than H-109. This is to be expected as the selection of H-109 was made in irrigated districts. If H-109 could be made to give as good a stand as Luzon White, its optimum no. of stools per hectare would be around 23,000. V. G. LAVA

Some remarks on the sampling of cane for the mill control, referring to the paper: "Determination of available sugar in cane," by C. Sylmans. TH. J. D. ERLER. *Arch. Suikerind.* 36, II, 1045-61(1928). —Discussing the paper of Sylmans (*C. A.* 22, 2677) E. calls attention to the fact that it is almost impossible to det. the unknown losses from the field to the mill and from the mill to the juice weighing tanks separately, while for detn. of the last-mentioned loss the taking of an av. sample of the cane at the moment of grinding is required. Therefore, it is suggested to det. the total loss from the field to the juice weighing tanks by taking a sample of the cane in the field. A method for cane sampling in the field is described. P. R. P.

The glucose content of cane molasses. H. S. WATERMAN AND J. A. V. D. LINDE. *Arch. Suikerind.* 36, II, 1151-5(1928).—A no. of final molasses from Java mills using different clarification systems were analyzed, and in comparison with them a no. of European molasses. The results show that the Java molasses contain from 7 to 8% glucose and European molasses 1%. The formation of glucose is favored by high temp. and high p_H . It will be investigated if the original cane juice in Java contains glucose.

P. R. P.

The control of yield, based on purification, and on the purity of the molasses. RENÉ GILLET. *Sucr. Belge* 48, 1-8(1928).—The interpretation of purity figures in the control of clarification of juice and of exhaustion of molasses is thoroughly reviewed.

E. A. FIEGHR

The results of the Djombang method at Ketegan. TH. J. D. ERLEE. *Arch. Suikerind.* 36, II, 1155-64(1928).—A survey is given of the results with the Djombang method at Ketegan during 3 yrs. It is pointed out that this is the only method which gives accurate results for the yield of every field separately, without the use of the yield factor and the wt. of the cane. The relative value of different varieties can also be detd. by the method and several practical questions may be resolved. The method showed that the fiber of lodged cane is not necessarily lower than the fiber of standing cane.

P. R. P.

Determining the value of beet seed. K. DOMBROWSKI. *Bull. Assoc. Polish Beet Sugar Manufacturers* No. 1521, 897-904(1927); *Facts About Sugar* 23, 400-2(1928); cf. *C. A.* 21, 3478.—A formula has been derived for estg. the cost of sugar manuf. in relation to the sugar content of beets. With the extn. ratio and the tonnage const. an increase of 0.10% in the sugar content of the beets would decrease the cost of sugar by 6 cents a quintal at the Wlostow factory in Poland. The same decrease in cost of sugar would be obtained by increasing the yield of beets by 3.72% equiv. to 186.7 quintals a hectare or 600 lbs. an acre, keeping the sugar content of the beets and the extn. ratio const. Applying this computation to the results obtained in the competitive trials of varieties of beets in 1926 by the Assocn. of Polish Beet Sugar Mfrs. indicates that a factory using the variety giving the highest yield of beets would lose 27 cents a bag (of 100 lbs.) compared with what it would have made by using the variety with the highest sugar content. It is concluded that the quality of beet seed should be detd. on the basis of the cost of producing sugar from it; and that variety trial plots should be planted at every factory and the results made public for the guidance of seed producer, grower, manufacturer and all others concerned.

M. J. PROFFITT

The commercial value of sugar beet seed. E. ZALESKI AND J. NEYMAN. *Facts About Sugar* 23, 1144-6(1928); cf. *C. A.* 21, 3478.—Dombrowski's formula (cf. preceding abstr.) is considered faulty and a formula (still not perfect) is worked out for similar use. It takes into account those considerations not taken care of by D.'s formula.

M. J. PROFFITT

The Komers-Cuker process at Tavikovice and at Krumsin, its value for small agricultural establishments and for large factories. ARNOLD KUHNER. *Oesterr. Chem.-Ztg.* 32, 14-5(1929); cf. *C. A.* 22, 2075, 4269.—This process can be worked on a small scale and, with its saving in freight charges and other items, makes the beet farmer independent of the central factory. It makes it possible to produce one grade of sugar and a high-grade stock feed, without making molasses; no lime kiln is needed. The diffusion battery consists of 5 open vessels with agitators, and with transport helixes between them. They are arranged so that the cosettes come in contact with air as much as possible. The sirups are returned to the 2nd diffuser. The diffusion juice is limed with 0.25% Ca(OH)_2 , and a little acid phosphate is added. The ppt. is removed in Sharples centrifuges. The juice is then carbonated down to 0.01% CaO , with CO_2 produced from coke, and sent through presses. The thin juice is evapd., generally in vacuum effects, or in large factories perhaps by pressure evapn. The thick juice is filtered and then boiled to grain, the run-offs being drawn into the pan, occasionally a low-grade boiling may be necessary in large factories. The beet wash waters may be returned when water is scarce. It is claimed that the total sugar losses are smaller than in the usual process; part of the sugar gained goes into the raw sugar and part into the dried chips. The cost of labor, materials and operation is greatly reduced, and technical supervision is reduced to a min. There are no waste waters to pollute streams.

F. W. ZERBAN

Factory control of sugar entering in beets compared to sugar in diffusion juice plus diffusion losses. J. ZAMARON. *Bull. assoc. chim. suc. dist.* 45, 580-2(1928). The vol. of juice as measured on leaving the diffusion battery is slightly too great because of suspended gas bubbles and high temp. A table is given to convert the observed

vols. to true vols. at lower temps. Vol. corrections based on the water table give the amt. of sugar in diffusion juice plus sugar in losses to be greater than sugar in beets entering the factory. The table was worked out experimentally. Calcns. by this table gave the amt. of sugar in diffusion juice plus the sugar in diffusion losses to be slightly less than the amt. of sugar in beets entering the factory. This is in accord with the view that there is a slight destruction of sugar in the battery. E. A. F.

The saturation of sugar-lime solutions. III. A. H. W. ATEN, P. J. H. VAN GINNEKEN AND E. VERWEY. *Rec. trav. chim.* 48, 93-115(1929); cf. C. A. 22, 2867.—Solns. which are about 0.35 *M* in sucrose and *N* in CaO absorb CO₂ rapidly. With a ratio (*R*) between CO₂ and CaO of 0.5 to 0.6, the ppt. contains CaCO₃·Ca(OH)₂ and sucrose. The ratio between lime and sucrose in these solns. is approx. const., around 1.5; the ratio between CaCO₃ and CaO increases with *R*, and at const. *R* with increasing sucrose concn. When *R* is smaller than 0.5, no ppt. appears. If the sucrose concn. is 0.35 *M*, but that of CaO is smaller than *N*, the value of *R* which produces a ppt. becomes smaller, and the ppt. is less basic. As the CaO concn. is further diminished, the solns. behave more and more like sucrose-free solns. If the sucrose concn. is increased at const. CaO concn. a smaller quantity of CO₂ is required to produce a ppt. At 90° those solns. which do not give a ppt. at room temp. produce a basic ppt. which redissolves on cooling. Solns. 0.7 *M* in sucrose and 1.7 *N* in CaO give besides the ppt. already mentioned another ppt. at *R* = 0.1 to 0.3 which dissolves upon the further addn. of CO₂. In the latter ppt. the ratio between total lime and sucrose is 2; the ratio between total lime and CaO varies from 6:1 to 6:2. At 90° this ppt. dissolves. With solns. molar in sucrose and 2.3 *N* in CaO, a ppt. is obtained only if *R* is very high; with *R* around 0.77, the soln. gels; with *R* = 0.67 the soln. remains liquid at room temp. but gels at higher temps. The viscosity-temp. curve shows a decided min. The basic ppt. mentioned at the beginning changes upon shaking to CaCO₃·6H₂O, while the free lime and a part of the CaCO₃ go into soln; upon standing this CaCO₃ ppts. again slowly until the soln. is satd. in CaCO₃·6H₂O. The soln. still contains a considerable quantity of CaCO₃ which is the greater, the greater the concn. of CaO and the smaller the sucrose concn. The conversion of the basic ppt. into CaCO₃·6H₂O is reversed by increasing the temp. The elec. cond. of the solns. diminishes sharply when CO₂ is absorbed by them, no matter whether a ppt. is formed or not. This fall in the cond. is much greater than could be caused by the formation of undissocd. CaCO₃. It follows that free lime disappears. The same conclusion is reached by *p_H* detns. When the CaCO₃ crystallizes out the lime is liberated again, and the cond. rises. The cond. permits an approx. calcn. of the compn. of the complexes present in the soln. This varies from 2CaCO₃·Ca(OH)₂ to CaCO₃·2Ca(OH)₂, and perhaps within even wider limits. A part of the OH is substituted by sucrose. When CaCO₃·6H₂O crystallizes out, 1CaO is liberated for every 3CaCO₃. The presence of the complexes was confirmed by ultrafiltration expts. and by ultramicroscopic observations. F. W. ZERBAN

The question of what manner of liming is to be preferred. H. CLAASSEN. *Z. Ver. deut. Zuckerind.* 78, 543-8(1928).—In the liming of beet juices, whether the use of dry lime or of milk of lime is to be preferred is still an open question. Claims for both methods are equally pointed. Lab. expts. cannot be carried out to reproduce factory conditions, as bulk plays an important role. Therefore, C. examd. the molasses. The properties of molasses depend on the nature of the juice, on the mode of extn., and on the precautions in treating the juice. By examg. a large no. of molasses samples from factories not too far apart, useful comparative figures can be obtained. Results calcd. on the basis of 100 parts of non-sugars show (1) that as regards ash and org. non-sugars, no essential difference exists between molasses obtained from factories using the dry lime process or the milk of lime process for liming the beet juice; (2) that a very noticeable difference exists in the lime salts, total N, and color, and for these 3 figures, to the disadvantage of the milk of lime process. The color figures are especially striking. The conclusion is that in the dry liming process, neither is more sugar destroyed, nor are the juices more highly colored than in the milk of lime process. On the contrary the dry liming method seems to favor the production of light-colored juices, if reasonable contrivances are provided. E. A. FIEGER

Inversion of sucrose in beet-house sirups. R. J. BROWN AND H. W. DAHLBERG. *Ind. Eng. Chem.* 21, 282-5(1929).—The purpose of this study was to det. the approx. rate of sucrose destruction under factory conditions. Because of the location of the lab. at high altitude, invert sugar was detd. by the method of Quisumbing and Thomas (C. A. 16, 37), in which a temp. of 80° is used. The sirup soln. was clarified with neutral Pb(AcO)₂ soln., and then decalc'd with a mixt. of Na oxalate and Na₂HPO₄ (Cook and McAllep, *Facts about Sugar* 23, 280(1928)). Summary of conclusions: "The in-

vert sugar content of low-purity beet products cannot be taken as a measure of previous inversion of sucrose, because of the destruction of invert sugar in such products. In the range of 6 to 9 p_H the rate of destruction of invert sugar depends on the concn. of impurities, the p_H showing no measurable effect. Decreasing the p_H of the sirup from 8 to 6 increased the rate of loss of sucrose about 10 times. Decreasing the purity from 100 to 60% decreased the rate of loss of sucrose about 40%. A 10° temp. rise increased the rate from 2 to 3 times. Variation in concn. of solns., in the range of 10 to 80% dry substance, produced no marked effect on the rate. The rate of loss of sucrose in beet sirups from different sources was found to be const. under const. conditions. The rate of loss of sucrose in sirups of 90% purity at 6 p_H and 80% dry substance heated at 80° was almost double that calcd. by Spengler and Toedt on the basis of the inversion const. of sucrose in HCl found by Jackson and Gillis." F. W. ZERBAN

Analysis of maple products. X. Study and modification of the Canadian lead method. D. E. FOWLER AND J. F. SNELL. McDonald Coll., McGill Univ. Toronto. *Ind. Eng. Chem., Anal. Ed.* 1, 8-12(1929); cf. C. A. 21, 1204.—Using the Assoc. Official Agr. Chem. method as a basis for the detn. of Pb value, numerous modifications were studied with the object of detg. the cause of the inconsistent results often obtained by the use of this technic. Large exptl errors resulted from the formation of fissures in the ppt. on the filter and consequent irregularities in the solvent action of hot wash H_2O . If the washing is done by centrifuge and decantation, this error is eliminated. The quantity of ppt. increased with the temp. at which pptn occurred. The Pb ppt. is sol. in an excess of the basic acetate soln. and in sucrose soln. as well. Modifications of the existing method including the use of cold wash H_2O are proposed. XI. *Ibid* 12-3.—Analysis of 3 maple sirup samples showed that the total Pb content varies inversely as the Canadian Pb value. The increase varied from 72.64 to 67.58%. The malic acid as detd. polarimetrically in a composite ppt. from 20 sirups constitutes 97% of the acids liberated by H_2S . The ppts. contained from 11.1 to 12.2% C and 1.46 to 1.15% H, i. e., substances much more carbonaceous than Pb malate are present. The flavoring and coloring matters appear to be pptd. by basic acetate. C. R. F.

The installation of electrical machinery in sugar mills from the safety standpoint. G. JOBSIS. *Arch. Suikerind.* 36, II, 963-75, 989-1008, 1063-75, 1085-97, 1105-16, 1131-9(1928). P. R. P.

Studies on filter cloths in sugar mills. K. ŠANDERA. Exptl. Inst. Czechoslovakian Sugar Ind. Prague. *Listy Cukrovar.* 47, 227-33(1929).—A statistical study of filter cloth based on reports from 64 sugar mills. The lasting quality of filter cloths is not affected by high temp. or continuous usage. Most solns. are used at 70-95° and rarely below 60°. Satd. solns. have no definite effect upon the economy of satn. The filtering area which is at the disposal of filtering juices after first satn. is not a governing factor for economical filtration and ranges from 25 to 35 sq. m. per 1,000 kg. of beets. The amt. of CaO added showed no connection with economic filtration. The time for changing filter cloths varied from 3 to 39 days. Thirty-six % of the mills changed the cloths before 8 days of use; 39% changed them after 8-19 days, and 25% used them for more than 19 days. Fourteen % of the mills used the cloths for over a month (30-39 days). The reasons for frequent changing of cloths were given as: decreased flow, cloudy filtrate, tears and disintegration. The clogging of filter cloth was most frequently due to the previous treatments and processes as: oversatn., low satn. and low temp. A maintenance of correct diffusion temp. and heating the liquor before the addn. of lime is considered necessary for good filtration; a low temp. disintegrates the cloths because of lime deposits. Most mills consider frequent washing injurious to the cloth. The most frequent range for length of duration showed 20-40 days for cotton, 14-20 (sometimes 35) for jute. Cotton-linen cloths endure 2-5 washings and last 12-35 days, linen is similar. Post-war conditions introduced 40 grades of cloths; 54% are cotton, and 31% are a cotton-jute combination; 15% are linen, cotton and jute combinations. Before the war, 80% of the mills used one brand of cloth. FRANK MARESH

Studies on filter cloths in sugar mills. K. ŠANDERA. Exptl. Inst. Czechoslovakian Sugar Industry. Prague. *Listy Cukrovar.* 47, 235-40(1929).—Samples of filter cloths were obtained from the makers as strips cut along wool and warp and observed for tensile strength. The humidity of the room showed an av. of 58.5% (relative), and the room temp. remained at 19-20°. A microscopic analysis of raw fibers showed uniform fibers and yielded no information as to their analysis; a microscopic picture of the woven fabric yielded a significant classification. Ash, by igniting 1-g. samples, showed cotton to contain 1.1-2, linen 1.2, and jute 1.1-2.5%. Extractable minerals, since they influence the polarity of adsorption, were extd. by boiling water for 2 hrs. Cotton contains more sol. salts than jute (200% more), but the abs. quantities are insignificant.

The rate of removing adsorbed electrolytes (0.002 *N* HCl and 0.01 *N* Na₂CO₃) showed that cotton retains the acid much longer than the alkali. This difference of selective adsorption is not observed for linen-cotton and jute fibers. Tables of the hygroscopicity, mesh, and phys. properties of all brands tested are given. FRANK MARESH

The volume of the bagasse in the mill and its influence on mill settings. G. L. VAN WELIE. *Arch. Suikerind.* 36, II, 926-37, 939-53 (1928).—Instead of using the wts. of cane, juice, and bagasse for mill control, a method is worked out and applied at several mills to control the work with the figures for vol. of bagasse and juice expressed per unit of time. The vol. of the bagasse at the smallest opening in the mill can be considered to be air free, as the air will be dissolved in the juice. Therefore the vol. of bagasse is the total of the vol. of juice in bagasse and the vol. of the fiber in bagasse. The vol. of the juice can be calcd. from the Brix, and the vol. of the fiber is calcd. from the sp. gr. of the fiber, which averages 1.6. The vol. of bagasse passed per unit of time has not the same value as the vol. of the opening of the mill passed at the same time. This difference is due to the slipping of the rollers and reabsorption of juice, and from the proportion of these 2 vols. it follows that at the inlet no slipping and reabsorption occurs; but at the outlet slipping and reabsorption are considerable, the latter being the largest and amounting to 30%. It is pointed out that the place where the maceration water is applied is immaterial, because the mixing of water and bagasse does not take place until they enter the mill. The expansion of bagasse on the turnplate, because of included air, follows a line parallel to the circumference of the top roller and this line might be calcd. from the fiber % bagasse and the vol. of the fiber per revolution. The construction of the turnplates used at the mills where the expts. were made corresponded very closely to the theoretical curve calcd. by V. It is pointed out that just as the success of the mill work depends for a large part on the first unit of the train, so the work of 1 sep. mill depends largely on the extn. at the entrance. van W. has calcd. the proportion of the extn. of the inlet and the outlet from the Brix of the juice from the cane roller, the Brix of the juice of the bagasse roller and the Brix of both juices mixed. By increasing this proportion practical results are obtained at different factories. The best mill work will be obtained when the power used is equally divided over the entrance and the outlet. van W. has calcd. from the vols. of bagasse and juice theoretical openings for the mills, and the results proved to be identical with practical mill settings if, for the outlet, 30% reabsorption was taken into consideration. P. R. P.

Bagasse analysis and mill work. II. HETER. *Arch. Suikerind.* 36, II, 691-729 (1928).—The difference in the results of Khainovsky's warm and cold methods for analyzing bagasse was used by H. to study the mill work exclusive of the effect of maceration. The results of the cold method are lower than those of the warm method, the difference being due to the undild. juice present in unopened cells. Detn. of the no. of unopened cells in the bagasse of each mill was made possible by this method. The app. of Khainovsky was also used for detn. of the vol. of the bagasse. It is pointed out that the purities of the last mill juice and the juice in bagasse are not equal. In order to calc. the purity of juice in bagasse the detn. of the Brix of the extd. liquid was necessary, after it was proved that no material not belonging to the juice was dissolved. The vol. of bagasse extd. by each mill was calcd. from the circumference of the rollers and the revolutions of the engine. The results of the tests at 4 factories, all working with 4 mills each, are given in tables and graphs. It is pointed out that only $\frac{2}{3}$ of the undild. juice in bagasse is available for diln. The amt. of juice remaining in bagasse depends largely on the difference in velocity of the fiber and the expressed juice. Increasing the pressure in the mills does not necessarily result in drier bagasse, this being limited by the phys. condition of the bagasse and the undild. juice in unopened cells. Detns. of the sp. gr. of bagasse should be made frequently in order to know the relation between vol. of fiber and vol. of expressed bagasse; thus the setting and regulating of the mill work can be made more efficient. An app. for detn. of the vol. of bagasse was designed by H. Deep grooves in the cane roller alone are not sufficient to insure high extn.; the bagasse roller must also be provided with deep grooves. The purity of the juice in opened cells in bagasse is always a little lower than that of the mill juice, and that of the juice in unopened cells is considerably lower. At the 4th mill the purity of the juice in bagasse was 15 points lower than that of the mill juice. P. R. P.

The efficiency of a fifth mill. L. W. HOFLAND. *Arch. Suikerind.* 36, II, 911-25 (1928).—Contrary to Emmen (following abstr.) H. concludes that a 5th mill will be profitable at most factories. In a new installation a 5th mill will always pay and for an existing installation the profit will depend on local conditions. P. R. P.

The utility of the 5th mill. Q. A. D. EMMEN. *Arch. Suikerind.* 36, II, 1075-9 (1928).—An answer to the article of Hofland (preceding abstr.). E. still adheres to

his conclusions not to be too optimistic about the financial results of a 5th mill. P. R. P.

The coagulation of active chars. O. SPENGLER AND E. LANDT. *Z. Ver. deut. Zuckerind.* 78, 549-65(1928).—An exptl. study was made of the relation between adsorption and coagulation. Qual. tests were made of coagulating power by the addn. of increasing vols. of salt soln. to a definite wt. of char in H_2O , so that the total vol. was the same in all cases. The cc. of salt soln. which just gave a clear filtrate was a measure of the coagulating power of the salt. The ratio of the molar quantity of these salts required to produce a clear filtrate is $ZnSO_4 : CaCl_2 : NH_4Cl : NaCl$ as 1:2:20:30. Where the char was peptized with $NaOH$, larger quantities of the salts were necessary. That salts at low concns. peptize chars, as does $NaOH$, has not yet been detd., but high concns. of salts bring about coagulation. The polarization photometer was used in making quant. expts., H_2O being used in one chamber and the char suspension in the other. By noting the change of angular rotation per min. required to give fields of equal brightness a measure is obtained of the rate of sedimentation of the char. The results show that the order of coagulating power is (1) methylene blue $> H > K > NH_4 > Li$; (2) $Cu > Pb > Zn$; $Ba > Sr$; $Ca > Mg > H$; (3) $(C_2H_5)_3NH- > (C_2H_5)_2NH_2- > (C_2H_5)NH_2- > NH_4$; also that $NaOH$ has a smaller effect than KCl . The expts. show that chars suspended in water act as negatively charged lyophobic colloids. The work of Freundlich is confirmed, that strongly adsorbed ions have a high flocculating power. E. A. FIEGER

The axial thrust in centrifugal pumps. E. CORDI. *Sucr. Belge* 48, 21-35(1928).—Theoretical aspects are reviewed. The various types of centrifugal pumps and their places in beet-sugar factories are discussed. The importance of giving proper attention to the devices used to overcome axial thrust is well emphasized. E. A. F.

Statistical methods in agronomic experiments. V. G. LAVA. *Sugar News* 9, 812-6, 884-92(1928).—L. mentions 3 general sources of error which affect agronomic expts.: the weather effect, the genetic factor and the soil factor. To minimize the weather effect, expts. must be of long period duration. The use of pure strains and the discarding of yields on the border of each plot will partially eliminate the genetic factor. The soil effect may be minimized by the use of large plots repeated many times, but for small institutions, the use of the Latin Square method or the Beaven's method of laying out plots should be preferred. In the calcn. of the significance of the difference between paired expts., the Besel formula applied to the difference between the yields, or Student's formula should be used; in case there are only a few pairs of observation, Student's formula should be preferred. The calcns. used for illustration are made on data published in *Sugar News* and *The Philippine Agriculturist*. V. G. L.

Value of p_H control in gur refining. K. C. BANERJI. *Intern. Sugar J.* 30, 211(1928).—By using bromothymol blue for continuous p_H tests throughout different stages of refining gur, together with temp. control, it was possible to reduce the unknown loss from about 9 to about 1.6%. Further, the quality of the sugar improved, and although the molasses was twice treated in the pans, no difficulty was experienced in boiling. B. C. A.

Quantitative separation of dextrans from gum arabic. ANDRÉ HAMY. *Station Agronomique de Châteauroux. Ann. fals* 22, 24-6(1929).—In aq. soln. Pb subacetate ppts. gum arabic; the ppt. is redissolved in the presence of sufficient glucose or sucrose, but the solvent action of these sugars can be inhibited or reduced by addn. of alc. In the absence of sugars but in the presence of dextrin, addn. of alc. causes considerable pptn. of the latter, which can be prevented by adding sufficient sugar. The following method has been devised, based on the above observations: to 20 cc. of susp. (contg. about 40 g. dextrin per l.) add 23 cc. of 95% alc. and dil. to 55 cc., let stand a few hrs., filter through a fairly close paper; to 50 cc. of filtrate add 90 cc. of a soln. contg. 5 g. glucose and 8 g. sucrose, then 42 cc. of 95% alc. and 15 cc. of Pb subacetate, shake, let stand overnight, divide into 2 tubes, centrifuge, wash with 50 cc. of 5% Pb subacetate to remove the excess of dextrans and alc., triturate the residue in each tube with 4.3 cc. of 75% sugar soln., add 35 cc. of a mixt. of alc.-Pb subacetate- H_2O (120:27:160), centrifuge, dissolve the ppt. in 4% $AcOH$, ppt. the gum arabic with 10 vols. of alc., let stand overnight, filter through a Gooch crucible, dry at 110° , weigh, ignite, and obtain the wt. of gum by difference. A. PAPINEAU-COUTURE

The principal agrogeological properties of Java cane soils (BOONERO) 15. Sugar, the master preserver (JORDAN) 12. Purification of beet-sugar wastes by stream flow aeration (LEVINE, NELSON) 14. Purification of (sugar house) waste waters (ROSS,

FOUGUEREUX DE FROBERVILLE) 14. The glutamine and allantoin content of sugar beets (RAVENNA, NUCCORINI) 11D. Sulfuric derivatives of carbohydrates (Brit. pat. 294,572) 23. Activated carbon (U. S. pat. 1,704,765) 18.

Extracting sugar from beets. R. G. W. FARNELL. Brit. 294,520, Feb. 23, 1927. Beet in the form of cossetts or other divided state is dried before extrn. at a temp. of 100° or lower and at atm. pressure, and while the material is heated the pressure is suddenly reduced to facilitate subsequent diffusion. Cf. C. A. 23, 1523.

Extracting sugar from sirups and molasses. RAFFINERIE TIRLEMONTTOISE. Belg. 348,898; March 31, 1928. The sirup or molasses is mixed with crystals of pure sugar or is spread in a thin layer on crystals of pure sugar.

Refining sugar. B. H. VARNAU and T. B. WAYNE. Brit. 294,800, Sept. 29, 1927. See Fr. 642,854 (C. A. 23, 1522).

Sugar juice. FRITZ BLANKE. Fr. 644,974, Dec. 1, 1927. See Brit. 283,202 (C. A. 22, 4001).

Apparatus for clarifying and thickening "sugar lime" mixtures in the Steffens process or other materials. HENRY G. SCHWARZ. U. S. 1,704,993, March 12.

Dextrose. CHARLES EBERT, WILLIAM B. NEWKIRK and MEYER MOSKOWITZ (to International Patents Development Co.). U. S. 1,704,037, March 5. In order to increase the dextrose content of hydrol, the soln. is subjected to a hydrolyzing operation in the presence of sufficient acid to give the liquor an acidity corresponding to a pH of 2.0 or lower.

Modified starch. C. BERGQUIST (to International Patents Development Co.). Brit. 294,979, Aug. 3, 1927. Various products ranging from boiling starch of low water solv. to dextrin of high soly. are made by heating starch in the presence of Cl. The starch is preliminarily dried so as to contain not more than about 2% moisture and the treatment with Cl may be for 2 hrs. at a temp. of 115–135° and by use of 0.03% to 0.12% Cl depending on the character of product desired. An app. is described.

Calcium halide-starch preparations. HENKEL ET CIE GES. Brit. 294,235, July 21, 1927. The process described in Brit. 244,708 (C. A. 21, 339) is modified by adding, instead of borax, Ca borates or H₂BO₃ compds. adapted to form in the Ca halide starch masses difficultly sol. Ca borates. Examples are given.

29—LEATHER AND GLUE

ALLEN ROGERS

Leather preparation. H. VAN DER WAERDEN. *Chem. Weekblad* 26, 82–91(1929).—An address dealing mostly with Cr and aldehyde tanning. The phys. and the chem. explanations of tanning are developed.

Synthetic tanning materials. A. BLOEMEN. *Chem. Weekblad* 26, 34–42(1929).—A critical survey of the patent literature up to July, 1928. The importance of leather and exts. analysis is emphasized.

The Tacaout gallnuts of Tripolis. G. A. BRAVO. R. Istituto Nazionale Industrie CROIO TORINO. *Boll. ufficiale staz. sper. ind. pelli mat. concianti* 6, 195–9(1928); cf. C. A. 22, 4867.—The Tacaout gallnuts produced by *Eriophyes laiae* Trab on *Tamarix articulata* Vahl. were examd. in respect to their tannin content. The gallnuts possess an approx. spherical shape and a wrinkled surface. They measure 30–80 mm. in diameter, and are of gray, greenish or red-brown color. The quant. analysis yields 36.77–43.91% of tannins and 9.68–16.76% of sol. non-tannins. The aq. ext. gives the following reactions: A soln. of Fe alum produces a dark violet color, and concd. H₂SO₄ first a yellow, then a brown color. With limewater, a brown ppt., and with NH₄CuSO₄ soln., a yellow ppt. is obtained. Expts. conducted on a small scale to exam. the tanning properties of the ext. yielded leather of high quality.

Modern manufacture of leather colors and finishes. J. PERRETT. *Quim. ind.* 5, 234(1928).—The basis of modern leather colors is a powdered pigment suspended in solns. of soap, rubber, casein, albumin, etc. A good pigment should have large covering power, should resist light, be free from Pb, resist H₂S, be inert, smooth, insol. in water and free from vegetable org. matter. Fe oxides and sienna earths are used, English oxide being the best because of its uniformity; however, it is more expensive. Ti and Zn oxides are the white pigments. To produce finishes, lac gums may be used; the method is given for handling the gums. Casein adds brilliancy to leather, the best casein coming from milk. Blood or egg albumin gives five finishes. Waxes increase the covering

power and brilliancy but also fill up the pores. Waxes are often adulterated with the materials indicated; an examination for these is mentioned. Agar and gelatin impart smoothness to leather; different gelatins are available for different leathers. Irish-moss mucilage also is useful.

S. L. B. ETHERTON

Photometric and electrometric measurements of gelatin behavior (BRIEFER) 2. Consistency of animal glue (BROUSE) 2. Wetting agents for animal and vegetable materials [for chrome tanning] (Brit. pat. 294,890) 18. Treating polluted waste water (U. S. pat. 1,703,373) 14. Waterproofing and preserving composition for leather (Austrian pat. 112,121) 25. Dye for leather (Fr. pat. 644,637) 25.

Unhairing skins. SOCIÉTÉ INDUSTRIELLE DES APPLICATIONS CHIMIQUES. Belg. 348,488, Feb. 29, 1928. The skin is soaked, freed of its coarse impurities while exposing it to a temp. which can affect the phys. condition of the pores, and is allowed to stand in unhairing baths consisting of refined Na_2S or refined Na_3AsS_3 . In this way the hair or wool is uninjured.

Dressing fur skins. E. AUTISSIER and R. STASSART. Belg. 350,564, May 31, 1928. The skins are treated in a fulling engine, or other closed agitating machine, with a soln. contg. Cr, *e. g.*, a 4–6° Bé. soln. contg. Cr hydroxide, HCl and KOH.

Tanning hides. J. G. KÄSTNER and C. H. TRÖGER. Brit. 294,996, Aug. 3, 1927. Penetration of hides by tanning liquors is facilitated by the use of various substances such as bates, bacterial cultures, gases such as CO_2 and N, electronic radiations from radioactive substances or tubes, filtered spectrum radiations, alternate applications of a vacuum and elec. current or of vacuum and pressure. Colloids such as a carob bean ext. also may be used; the addns. and treatments mentioned may be used also to facilitate oiling or greasing of chrome leather. Cf. C. A. 22, 4869.

Tanning hides. C. H. TRÖGER and J. G. KÄSTNER. Brit. 294,997, Aug. 3, 1927. A colloid consisting of an ext. of carob beans or similar material is added to tanning liquors; their penetration is improved by the use of bates, fermenting substances such as yeasts, cultures of bacteria, gases or radiations from radioactive substances or electronic tubes. An elec. current and alternations of pressure and vacuum may also be used to facilitate penetration of the tanning liquor.

Chromium compounds for tanning or dyeing. E. BAUMGARTNER. Brit. 294,965, Aug. 2, 1927. Chromic compds. suitable for use in tanning and dyeing or rust-proof paints are formed by the reaction of a soln. of Cr sulfate of a basicity corresponding to the formula $\text{Cr}_2\text{O}_3 \cdot \text{SO}_3$ and a concn. of about 20% Cr_2O_3 , with an alkali, neutral salt, or salt of a "feeble acid," *e. g.*, with NaOH, Na_2CO_3 , NaHCO_3 , Na_2SO_4 , Na formate, NaOAc, Na monochromate or NH_3 .

Rotatable wooden tanning and washing drum. MARCEL BRETON and PIERRE JACOUT. Ger. 470,658, Feb. 23, 1927.

Treating leather. AMBROSE H. ROSENTHAL. U. S. 1,705,311, March 12. In order to give a metallic appearance, leather is treated with a coating of Bi oxychloride in soln., a coating of nitrocellulose soln., a coloring medium such as an alc.-sol. color, a second Bi oxychloride soln., and a flexible varnish.

Moistening, oiling and embossing leather. ALFRED O. T. BEARDMORE. U. S. 1,704,718, March 12. A tanned hide is caused to absorb 20–25% of its wt. of water, kept in a closed room at ordinary atm. temp. until the moisture has become distributed throughout the material of the hide, air currents being avoided, sprayed with a mixt. of vegetable and mineral oils heated to about 60°, rough rolled and then embossed.

Decorating unfinished leather. WINTHROP S. LAWRENCE (to Kaumagraph Co.). U. S. 1,703,675, Feb. 26. Leather is connected to a mount such as cardboard by the use of an adhesive contg. a drying oil such as a lithographic varnish and cobalt drier, the adhesive is caused to set without permitting it to enter the pores of the leather sufficiently to stiffen it; the exposed surface of the leather is then printed on before the leather is sepd. from the mount.

30—RUBBER AND ALLIED SUBSTANCES

C. C. DAVIS

Rubber patents in relation to the patents and designs acts. H. DOUGLAS ELKINGTON. *Trans. Inst. Rubber Industry* 4, 336–42(1928).—The discussion refers to English law.

C. C. DAVIS

Practical method for obtaining dry air for humidity control in a rubber laboratory.

F. S. CONOVER. N. J. Zinc Co., Palmerton, Pa. *Ind. Eng. Chem.* 21, 162-4(1929).—Air previously dried by passage through silica gel is blown through the storage chambers. With 2 silica dehydrators, continuous drying is possible, the air being forced through one dehydrator while the other is being reactivated by treatment with air at 155-70°. Cooling and heating systems complete the equipment.

The mercury-vapor arc lamp. Its uses in a rubber factory. P. G. NAGLE. *Rubber Chemistry & Technology* 1, 284-7(1928).—See *C. A.* 22, 1251.

Researches on the structure of rubber. PAUL BARY AND ERNST A. HAUSER. *Rubber Chemistry & Technology* 1, 401-9(1928).—See *C. A.* 22, 4005.

The preparation of pure rubber from latex by means of alkali and its separation into sol-rubber and gel-rubber. RUDOLF PUMMERER AND HANS PAHL. Univs. of Erlangen und Greifswald. *Rubber Chemistry & Technology* 1, 167-76(1928).—See *C. A.* 22, 885.

Preliminary report on the coagulation phenomena and hydrogen-ion concentration in the latex of *Hevea brasiliensis*. N. H. VAN HARPEN. Algemeen Proefstation der A. V. R. O. S., Medan (Nederlandsch-Indië). *Arch. Rubbercultuur* 13, 44-60(1929); (In English 61-77).—The lack of general agreement among theories explaining the nature of coagulation in *Hevea* latex led to a study by a different method in which the part played by the p_H value was particularly investigated. The H-ion concns. at the different stages of coagulation were measured by phys.-chem. methods by aid of the quinhydrone electrode. With this method, the irregular transition points of the coagulation process could be detd. with great precision. The transition point from the 2nd liquid zone to the 2nd coagulation zone appeared to occur at a p_H value of 0.80, and the transition point from the 2nd liquid zone to the 1st coagulation zone at a p_H value of 3.49. The transition from the 1st liquid zone to the 1st coagulation zone could not be fixed at a definite p_H value, for it varied between p_H 5.05 and p_H 4.77, depending upon the diln. of the latex. By the use of buffer solns. at the transition between the 1st liquid zone and the 1st coagulation zone, the existence of a flocculation zone with dild. latex was proved. This zone began at a p_H value of 5.05 and terminated at a p_H value of 4.77, beyond which point the flocculates coalesced to form a coagulum. When prepd. from fresh latex contg. no preservative, B liquid behaved abnormally in the 1st coagulation zone, in that no coagulation took place between p_H values of 4.77 and 3.49. On the other hand, with fresh latex, with latex preserved with NH_3 and with B liquid from ammoniated latex, coagulation took place in the normal manner between p_H values of 4.77 and 3.49. The occurrence of flocculation between the limits of p_H 4.77 and 3.49 with this B liquid prepd. from fresh latex cannot be explained by the absence of an enzyme (the coalse) but more probably can be explained by the inactivation of some unorganized chem. substance which normally causes flocculation at a p_H value of 4.77 and acts as a coalescing agent. It appears that a resinous substance in NH_4OH soln. not only causes flocculation at a p_H value of 4.78, but also begins its coalescing action at the same p_H value, and that very small quantities of this substance are sufficient to coagulate large quantities of latex. The supposition that the resinous substances which are present in latex, either as resins or otherwise, are responsible for coalescence is very probable and further investigations on coagulation phenomena should be directed into new fields on the basis of this hypothesis. When used a coagulant Na_2SiF_6 behaved in an unusual way, the p_H values being almost the same (3.25) at different concns., and the solns. acting like buffer solns. On titration Na_2SiF_6 behaved as if it had 4 available H ions, and therefore it can be considered as a combination of $2NaF + SiF_4$, the latter hydrolyzing to $Si(OH)_4$ and $4HF$. If so, a buffer soln. would form from the combination $2NaF.4HF$. To prove this, the dissocn. of HF at various concns. at 26° was detd. The solns. were buffered with NaF . It was found that the concn. relationship in the buffer soln., i. e., the ratios of the HF and NaF components, was 1. A test soln. contg. equal mol. concns. of HF and NaF was found to be a buffer soln. with a p_H value of 3.25. Na_2SiF_6 is dissocd. in water like a buffer soln. contg. 1 mol. of NaF and 1 mol. of HF . The strongly acid reaction resulting from the hydrolysis of Na_2SiF_6 can perhaps be best explained by the reaction: $Na_2SiF_6 + nH_2O \rightleftharpoons 2(NaF.HF) + SiOF_2(n-1)H_2O$.

Making rubber goods of latex by electrodeposition. PAUL KLEIN. *Trans. Inst. Rubber Industry* 4, 343-51(1928); cf. *C. A.* 23, 1305.—App. and graphs are given showing the rate of deposition, deposition as a function of the c. d., the cond. and concn. of latex and stress-strain curves of the deposited product.

Latex contaminated with copper compounds as a source of danger of fire. J. G. FOL AND W. DE VISSER. *Rubber Chemistry & Technology* 1, 288-90(1928).—See *C. A.* 22, 2078.

The effect of heat on raw rubber in the presence and absence of air. J. D. FRY AND B. D. PORRITT. *Rubber Chemistry & Technology* 1, 299-306(1928).—See C. A. 22, 4870. C. C. DAVIS

Plasticity determinations in crude rubber. Influence of different factors on the changes in plasticity when keeping the rubber. O. DE VRIES. *Rubberproefstation in Nederlandsch-Indië. Rubber Chemistry & Technology* 1, 291-8(1928).—See C. A. 22, 3316. C. C. DAVIS

Plasticity and elasticity of rubber. A. VAN ROSSEM AND H. VAN DER MEIJDEN. *Rubber Chemistry & Technology* 1, 393-400(1928).—See C. A. 22, 3063. C. C. DAVIS

Color reactions of rubber. H. PAULY. *Rubber Chemistry & Technology* 1, 361-3(1928).—See C. A. 22, 1703. C. C. DAVIS

Color reactions of rubber and gutta-percha. F. KIRCHHOF. *Rubber Age* (N. Y.) 24, 555-6(1929).—English version of C. A. 23, 544. C. C. DAVIS

Organic rubber colors. W. J. S. NAUNTON. *Rubber Chemistry & Technology* 2, 99-107(1929).—See C. A. 22, 4875. C. C. DAVIS

The effect of sunlight on the color of cured and of uncured accelerated mixes. R. DEFRIES AND W. J. S. NAUNTON. *Trans. Inst. Rubber Industry* 4, 298-300(1928).—Rubber mixts. contg. crepe 100, ZnO 10, BaSO₄ 100 and S and accelerator (diphenylguanidine, di-*o*-tolylguanidine, triphenylguanidine, mercaptobenzothiazole, thiocarbanilide, aldehyde-ammonia, tetraethylthiuramdisulfide and Zn diethyldithiocarbamate) were exposed to ultra-violet light (1) before curing but not afterwards, (2) only after curing, and (3) both before and after curing. These series of exposures were made independently in N and in O. With all accelerators, exposure before curing gave no visible effect, but after curing the samples so exposed were much darker than the unexposed samples. Furthermore exposure of the cured samples lightened those which had not been exposed before curing, but failed to lighten those which had been exposed before curing. The discoloration was proportional to the time of exposure and varied with the accelerators. When the samples were irradiated in O before curing, the discoloration was only slightly more in O than on those irradiated in N before curing, while subsequent bleaching in O was far greater than in N. Ultra-violet light induces oxidation of the vulcanizates, which was supported by the fact that bleaching was also effected by H₂O₂. When the samples were undercured, the 2nd exposure to light intensified the darkening. The results indicate that (1) exposure of uncured samples causes a surface vulcanization; (2) the discoloration is an effect of a surface overcure produced by normal vulcanization superimposed on an already slightly vulcanized surface and (3) bleaching of vulcanizates by light results from oxidation, since it can be minimized by exposure in an inert gas and can be produced by oxidizing agents. When, however, there is an excess of vulcanizing agents to permit after-vulcanization, the subsequent exposure induces further darkening instead of bleaching. These effects also take place in sunlight, and it was their prevalence in technical mixts which led to the more systematic expts. with ultra-violet light. C. C. DAVIS

The mechanism of the reinforcement of rubber by pigments. HARLAN A. DEFEW. N. J. Zinc Co., Palmerton, Pa. *Rubber Age* (N. Y.) 24, 378-81(1929).—In a recent paper on pigment reinforcement as a function of resistance to tearing and resistance to cutting (cf. C. A. 22, 3064), it was reserved for the present paper to explain the mechanism of this reinforcement. Pigments may exist in rubber as: (1) soft pellets of undisintegrated pigment; (2) agglomerates of adherent massed particles; (3) dispersed particles and (4) flocculated particles. (1) and (2) have no reinforcing effect; in fact they are in effect the same as porosity. If a fine pigment is not easily wet by rubber, there is a tendency to flocculate. The contrast between flocculation and dispersion (complete wetting) is illustrated by the familiar expt. of liquefying a stiff paste of ZnO and kerosene with a suitable agent (cf. Breyer, *Rubber Division, Am. Chem. Soc.*, Pittsburgh, 1922; Bierer and Davis, C. A. 22, 883). During the early stage of hot vulcanization rubber is semi-fluid and the ultimate distribution of the pigment is influenced greatly by this condition, both dispersion and flocculation proceeding during this stage of vulcanization. Flocculated pigment increases the hardness of rubber and therefore the resistance to cutting, while dispersed pigment increases the resistance to tear. Resistance to tear is increased by dispersed pigments because they act as obstacles in the path of the tear, so that the component of the force in the direction of tear is diminished. Accordingly with a fine pigment it is possible to increase the resistance to tear even when the bond between rubber and pigment is much weaker than the rubber itself. Hardness caused by flocculation is explained on the theory that the pigment assumes a rigid structure. When rubber is elongated, flocculated pigment and large particles cause uneven stresses which lower the reinforcing

effect below that otherwise obtainable. ZnO is so easily wet by rubber that there is little tendency to flocculate regardless of the particle size. It does not, therefore, increase hardness, but tests show that the resistance to abrasion and to tear of mixts. contg. ZnO increases with decrease in the particle size of the ZnO. C. C. DAVIS

Specifications for rubber goods and the value of performance tests. J. M. BIERER AND C. C. DAVIS. *Rubber Chemistry & Technology* 1, 146-62(1928).—See C. A. 22, 883. C. C. DAVIS

The direct molding of soft rubber scrap and the manufacture of soles. L. GRAFFE. *India Rubber J.* 77, 222(1929).—English version of C. A. 23, 545. C. C. DAVIS

New points of view in the analysis and classification of reclaimed rubbers. EUGENIO LINDMAYER. *Kautschuk* 4, 278-80(1928).—In conjunction with the rubber content of a reclaim, its CHCl_3 ext. (after extn. with acetone) is a measure of the degree of "devulcanization" of the rubber. According to the theory of vulcanization already enunciated by L. (cf. C. A. 20, 3837), the chief reactions of devulcanization are: $(\text{C}_6\text{H}_5)_3\text{S}(\text{C}_6\text{H}_5)_3 \rightarrow (\text{C}_6\text{H}_5)_3\text{S}(\text{C}_6\text{H}_5)_2 + 2(\text{C}_6\text{H}_5)_2\text{S}$ and $2(\text{C}_6\text{H}_5)_2\text{S} \rightarrow (\text{C}_6\text{H}_5)_4\text{S}_2$. From this, 51.65% of the originally sulfurated rubber would remain insol. in CHCl_3 , while 48.35% would become sol. in CHCl_3 . Though side reactions take place, this reaction is predominant enough so that the degree of devulcanization can be judged by the approach to this theoretical value of 48.35%. Examn. of 40 samples of reclaimed rubber of various types and from various sources showed a wide variation in this value. In no case did it exceed the theoretical 48.35% (which is termed "100% degree of devulcanization") while the nearest approach was a sample with a rubber content of 64.21%, which had a 94.59% degree of devulcanization. Detns. of the degree of devulcanization, i. e., the relation between the CHCl_3 ext. and the rubber content, are useful in controlling reclaiming processes and in adapting a process to a particular type of raw material. In connection with the detn. of the rubber content, the C black content must also be detd., and no general method has been available. A procedure for detg. C black is described which is claimed to give excellent results. Finely divide the sample, ext. successively with acetone, concd. KOH and concd. HCl, wash with water, dry and incinerate in a combustion tube 80 cm. long (contg. PbCrO_4) in a Bunsen-Erlenmeyer furnace, as in regular org. analysis. From the quantities of CO_2 and H_2O , the C black may be estd. The C corresponding to C_6H_5 is considered to be the C in the rubber component, and therefore the C in excess of that corresponding to C_6H_5 is regarded as C black, and is calcd. merely by subtracting from the total C that contained in the C_6H_5 value. An idea of the proportion of bituminous substances may be had by a colorimetric examn. of the CHCl_3 ext. C. C. DAVIS

The history of "mineral rubber." WERNER ESCH. *Kautschuk* 4, 252(1928); *Caoutchouc & gutta-percha* 25, 14233(1928).—Further comments on the origin of the term "mineral rubber" (cf. Luttringer, C. A. 22, 4870). C. C. DAVIS

The history of "mineral rubber." A. D. LUTTRINGER. *Kautschuk* 4, 277(1928).—Comments on an article by Esch (cf. preceding abstr.). There is uncontrovertible evidence that the term "mineral rubber" was in common use in England a century ago to designate the natural product of Derbyshire. C. C. DAVIS

Methods for the purification of rubber hydrocarbons. RUDOLF PUMMEER AND HERMANN MIEDEL. Univ. Erlangen. *Rubber Chemistry & Technology* 1, 163-6 (1928).—See C. A. 22, 885. C. C. DAVIS

New derivatives of rubber. GIUSEPPE BRUNI AND E. GEIGER. Royal Polytech. Inst. Milan. *Rubber Chemistry & Technology* 1, 177-81(1928).—See C. A. 21, 4092. C. C. DAVIS

A new tetramethylbutadiene. A. D. MACALLUM AND G. S. WHITBY. McGill Univ., Montreal. *Rubber Chemistry & Technology* 1, 341-5(1928).—See C. A. 22, 2080. C. C. DAVIS

The gelatination of Vultex (appendix to the communication entitled "Dispersoidological investigations of latex"). P. P. VON VEIMARN. Imp. Tech. Res. Inst. Osaka (Japan). *Kolloid-Z.* 46, 223-5(1928).—As was to be expected from the fact that the particles of vulcanized latex are less plastic than those of raw latex, the jelly obtained from vulcanized latex by a dispersator like Lili soln. is less adhesive and coherent than the corresponding jelly from raw latex. Expts. show, however, that under sufficiently great pressure the jelly from vulcanized latex acquires great elasticity and strength. When a film is obtained by evapn., capillary forces residing in the non-rubber components have the same effect as artificial pressure, the rubber contents of the particles combine, and the film shows a high elasticity. The view that the coherency depends upon the adhesion of the surface layers of non-rubber components is considered erroneous (cf. Hauser, *Latex*, 130). The plastic, strong films which surround latex particles

consist of a mixt. of protein, resin and rubber and have no more influence on the phys. properties of the rubber obtained by gelatination or coagulation than "active" fillers. The less the fibril structure of a coagulum is destroyed, the greater the elasticity of the coagulum. The plastic shells of latex particles become gelatinous and soft with dispersators of proteins and disintegrate on application of slight pressure. Therefore in ordinary coagula which have undergone mech. treatment, the particles do not retain their individuality but disrupt, the rubber contents flowing together, and a fibril structure being acquired when the coagulum is stretched under suitable conditions. These fibrils in films or jellies from latex show a characteristic behavior, such as a tendency to form spiral masses when ruptured, and such great elasticity that they can be elongated to a point where they become invisible in the ultra-microscope. Six photomicrographs are included.

C. C. DAVIS

A scheme for accelerator classification. R. P. DINSMORE AND W. W. VOGT. Goodyear Tire & Rubber Co., Akron. *Rubber Chemistry & Technology* 1, 410-21 (1928).—See C. A. 22, 4273.

C. C. DAVIS

The reactions of aniline and its homologs as accelerators of vulcanization. TAKEO KIMISHIMA. *Rubber Chemistry & Technology* 1, 307-40 (1928).—See C. A. 22, 1496.

C. C. DAVIS

Problems of vulcanization. J. DUGUÉ. *Rev. gén. caoutchouc* 5, No. 47, 9-12 (1928); cf. C. A. 22, 2682, 3316.—Comments on articles by Bacon (cf. C. A. 22, 3804) and by Bary (cf. C. A. 23, 546). The point of view is taken that below its m. p., S can only be disseminated or dispersed in rubber and that none dissolves. Furthermore it is considered that S is not the vulcanizing agent, for it occurs in the same proportion in the phase of a vulcanizate which is sol. in C_6H_6 and in the phase which is insol. Vulcanized rubber is a mixt. of hard rubber ($C_{10}H_{16}S_2$) and raw rubber. Other features are discussed briefly.

C. C. DAVIS

Some observations relative to the article of Dugué. PAUL BARY. *Rev. gén. caoutchouc* 5, No. 47, 12-3 (1928); cf. preceding abstr.—There is no exptl. evidence against and considerable evidence in favor of the soln. of S in rubber, and the chem. combination of S with rubber.

C. C. DAVIS

The vulcanization of rubber. NICHOLAS BACON. Cornell Univ. *Rubber Chemistry & Technology* 2, 138-60 (1928).—See C. A. 22, 3804.

C. C. DAVIS

A new apparatus for vulcanization. E. A. HAUSER AND M. HUENEMOERDER. *Rev. gén. caoutchouc* 5, No. 47, 16-7 (1928).—See C. A. 22, 4876.

C. C. DAVIS

Temperature control in vulcanizers. C. B. MITCHELL. Republic Rubber Co. *Rubber Age* (N. Y.) 24, 547-8 (1928).—A review and discussion.

C. C. DAVIS

The influence of zinc oxide on the coefficient of vulcanization. S. A. BRAZIER AND L. R. RIDGWAY. *Trans. Inst. Rubber Industry* 4, 301-12 (1928).—See C. A. 23, 1775.

C. C. DAVIS

A comparison of the rate of combination of sulfur with rubber and the rate of vulcanization. E. R. BRIDGWATER. Du Pont de Nemours & Co. *Rubber Age* (N. Y.) 24, 439-41 (1929).—The object of the expts. was to ascertain why rubber cured with an org. accelerator to the optimum phys. state has a lower coeff. of vulcanization than rubber cured without such an accelerator, and why at the optimum phys. state the coeff. also varies with the org. accelerator. The problem was studied by curing to different extents rubber-ZnO-stearic acid mixts. with different proportions of S and of accelerators and detg. the combined S, the stress-strain curves and the power to absorb C_6H_6 . The results admit of several conclusions. The low combined S at optimum cure which is characteristic of mixts. with a high rate of vulcanization is ascribed to the combined effects of a stiffening or polymerizing action of the accelerator and the relatively small heat degradation in the short cures. With "Vulcanol" the rate of combination of rubber and S is slower and the rate of stiffening of the rubber mixt., i. e., the progress of phys. vulcanization, is more rapid than with mercapto-benzothiazole. This difference can be explained only by the fact that some accelerators have a greater phys. stiffening or polymerizing effect than do others. Under the same conditions otherwise, accelerators differ in the influence which they have on the tendency of a rubber mixt. to absorb C_6H_6 . Neither the stress-strain curve nor the combined S gives any information about this tendency to absorb C_6H_6 . At any particular state of cure, the power to absorb C_6H_6 depends more upon the rate of vulcanization than upon the accelerator, and the higher the proportion of the latter the smaller is the absorption of C_6H_6 . The small tendency of mixts. cured with a high proportion of S to swell in C_6H_6 is probably related to the high rate of vulcanization, for such mixts. with little tendency to absorb C_6H_6 have a low combined S content. In no case in the expts. did curing beyond the point of max. stiffness (judged by the stress-strain curve)

diminish the power of absorbing C_6H_6 . This absorptive power depends nearly as much upon the rate of vulcanization as upon the state of cure, a fact which is of importance in the formulation of *rubber mixts. to resist oil*. Such oil resisting mixts. should be highly accelerated but not overcured.

C. C. DAVIS

Some features of sulfur in rubber manufacture. DOUGLAS F. TWISS. *Rubber Chemistry & Technology* 1, 346-55(1928).—See *C. A.* 22, 2491.

C. C. DAVIS

Devulcanization of rubber by formation of hexamethylenetetramine within the rubber. ANDRÉ DUBOSC. *Rev. gén. caoutchouc* 5, No. 47, 14-5(1928).—An account of earlier expts.

C. C. DAVIS

Devulcanization of rubber by accelerators or vitalizers. ANDRÉ DUBOSC. *Rev. gén. caoutchouc* 5, No. 47, 13(1928).—An account of earlier expts.

C. C. DAVIS

• Electrical insulating materials from the chemical standpoint (NUTTALL) 13. The origin of the fossil rubber in middle German brown-coal (JURASKY) 8. Purifying solutions of $ZnCl_2$ or other metallic salts (Brit. pat. 294,259) 18. Rubber-surfaced pavement or flooring (U. S. pat. 1,705,273) 20.

EATON, B. J.: *Guide to the Preparation of Plantation Rubber*. Kuala Lumpur: Rubber Research Inst. of Malaya. Planting Manual No. 1. 54 pp. \$2. Reviewed in *Trans. Inst. Rubber Industry* 4, 352(1928).

GHOSH, H. H.: *The Realm of Rubber*. Calcutta: J. B. Daymond. Reviewed in *Rubber Age* 9, 463(1929).

THUROW, WILLY H.: *Englisch-deutsches und deutsch-englisches Wörterbuch der Chemie mit besonderer Berücksichtigung des Kautschuks*. Berlin: A. Tetzlaff Verlagsbuchhandlung. In 2 parts. About 350 pp. in each part. M. 13 for each part.

Treating rubber latex. I. G. FARBENIND. A.-G. Brit. 294,804, Oct. 10, 1927. A viscous paste which can be readily redispersed by use of aq. NH_3 is prepd. by quickly mixing with latex sufficient acid to give a p_H less than 2 and then (suitably after about 24 hrs.) filtering off the serum. Fillers, protective colloids, S, etc., also may be added.

Treating latex. I. G. FARBENIND. A.-G. Brit. 294,412, Nov. 12, 1927. Latex is preserved by the addn. of small quantities (suitably 2-5%) of sol. salts of sulfonic acids possessing soap-like properties. The addn. improves the penetration when the latex is used for impregnating paper or other materials and the materials in such processes may also be treated with salts such as are admixed with the latex. Several examples are given.

Variegated rubber. C. MACINTOSH & CO., LTD. and S. A. BRAZIER. Brit. 295,080, May 21, 1927. Pieces of rubber of the same or different colors are coated with a rubber soln. of a contrasting color, dried and agglomerated into a mass which has a variegated surface.

Synthetic rubber. I. G. FARBENIND. A.-G. Brit. 294,661, July 28, 1927. Polymerization of hydrocarbons such as butadiene, isoprene, dimethylbutadiene or their analogs by means of O or a substance yielding O, or both, in an aq. medium as described in Brit. 283,840 (*C. A.* 22, 4274), is effected in the presence of a metal salt of an inorg. or org. acid such as salts of Co, Pb, Mn, Cr, Ni or Ag. Several examples are given. Cf. *C. A.* 23, 310.

Synthetic rubber. I. G. FARBENIND. A.-G. Brit. 294,963, Aug. 2, 1927. Polymerization of butadiene, isoprene or similar hydrocarbons is effected in the presence of water by a substance which exerts a hydrotropic action, such as a salt of an org. sulfonic or carboxylic acid or a substitution product of such an acid or an acid obtained from the degradation of albumin or an acid amide. The substance can either be added as such or can be produced *in situ* by adding an alkali, metal oxide or metal carbonate or acid of suitable character. O or O carriers may be present during the process. Examples are given of the treatment of isoprene and butadiene with water at a temp. of about 60° in the presence of casein and K cinnamate, blood albumin and Na tetrahydronaphthalene sulfonate, Mg isobutyl-naphthalene sulfonate and O, and egg albumin and Na stearate.

Rubber-like substance from mineral oils. EDGAR W. HULTMAN (one-fourth each to Francis P. Duncklee, Joseph Monteleone and Walter R. Simons). U. S. 1,704,194, March 5. A mineral oil material such as "Dubbs pressure distillate," topped Calif. crude oil or other similar oil or fraction, substantially free from constituents b. below 200°, is partially polymerized (suitably by use of oxides of Ce or Sn at a temp. of about 95°), then cooled and treated with an activated reducing gas such as CO or CH_4 in

the presence of Ni, Pd or other catalyst at a temp. below that used in the polymerizing reaction (suitably at a temp. of about 32°), treated with a halogenating reagent such as Cl, Br or B fluoride, to produce a soft rubbery product in the resulting oily material, and sepn. is then effected.

Preserving rubber articles. A. FORNER. Brit. 294,632, July 29, 1927. The surface of articles such as tires is treated with a mixt. of French chalk and a gum solu with or without a soln. of "cellulose." The mixt. may be thinned with "benzole or benzene."

Molding hollow rubber balls. K. KUROKAWA. Brit. 295,175, Dec. 19, 1927. An app. is described.

Core for single-tube tires. SCHUYLER C. HATFIELD. U. S. 1,704,538, March 5. Cores are formed with a filling of comminuted material such as sand surrounded by a thin casing of sol. material such as glue, shellac or rosin which can readily be removed from the tube by washing.

Traveling band filter suitable for filtration of aqueous rubber dispersions. A. SZEGVARI and C. M. SPENCER (to Anode Rubber Co., Ltd.). Brit. 294,215, July 20, 1927. Metal parts of the app. are preferably made of stainless steel and various structural features are described.

Rubber solution for coating wood, metal or other materials. CHARLES E. BRADLEY and WILLIS A. GIBBONS (to Naugatuck Chemical Co.). U. S. 1,703,920, March 5. Halogenated rubber treated with S chloride is dissolved in benzene and solvent naphtha. Boiled linseed oil, etc., may be added.

Apparatus for coating, impregnating or electrophoretic deposition of rubber. A. SZEGVARI (to Anode Rubber Co., Ltd.). Brit. 294,153, July 18, 1927. An app. is described in which the homogeneity of an aq. dispersion such as rubber is maintained by circulating the dispersion through a tank or chamber in a continuous stream and filtering it during circulation to remove particles above a certain desired size.

Deposition of rubber. THE ANODE RUBBER CO., LTD. Fr. 645,779, Dec. 15, 1927. Org. material, particularly rubber, is deposited electrophoretically on supports which are cooled below the temp. of the bath so as to remove the heat caused by the current, or sep. cooling means may be employed.

Composite rubber flooring manufacture. JOHN B. LOSEY and WALTER R. STONE. U. S. 1,703,312, Feb. 26. Mech. features.

Adhesive. MARY A. F. ALLEN. Australian 10,707, Dec. 3, 1927. An adhesive consists of 2 co-acting fluids, the first rubber latex or rubber emulsion and the second a soln. of raw or unvulcanized rubber in CCl_4 or C_6H_6 . Na_2SiO_3 may be added to the latex to reduce its viscosity.

Polymerized vinyl compounds of rubber-like character. I. G. FARBENIND. A. G. Brit. 294,474, July 23, 1927. Polymerization of substances such as vinyl esters or ethers is effected in the presence of substances imparting improved elasticity to the product such as proteids or their degradation products such as peptones, peptides, diketopiperazines and amino acids and other N compds. preferably of high mol wt. Examples are given of the use of casein with vinyl acetate, albumin with vinyl acetate, glyccoll with vinyl acetate and naphthalene with vinyl acetate. The products may be vulcanized, with or without accelerators, fillers and plastifiers.

Vulcanizing rubber. WINFIELD SCOTT (to Rubber Service Laboratories Co.) U. S. 1,703,902, March 5. Vulcanization with S is accelerated by use of a reaction product of diphenylguanidine with 1-keto-2-methyl-4-thio-3,5-benzenedithiol. Cf. C. A. 23, 732.

Apparatus for vulcanizing small objects such as dental plates. MAXIME PAULMIR. Fr. 644,748, Nov. 30, 1927.

CHEMICAL ABSTRACTS

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No. 9

1—APPARATUS AND PLANT EQUIPMENT

W. L. BADGER

The importance of the German machinery industry for manufacturing chemical apparatus for use at home and abroad. ERNST BLAU. *Chem.-Ztg.* 53, 6-8(1929).—A classification of app. used in the chem. industry and available from German manufacturers. W. C. EBAUGH

Methods and apparatus used in the cryogenic laboratory. XX. High-vacuum pump of large capacity. W. GAEDE AND W. H. KEESOM. *Proc. Acad. Sci. Amsterdam* 31, 985-8(1928).—See *C. A.* 23, 1311. E. C. M.

Conserving hydrogen sulfide gas in the laboratory. G. N. QUAM. *Chemist-Analyst* 18, No. 2, 14-6(1929).—A scheme is recommended for restricting the flow of H_2S from individual taps by placing capillary tubing in front of each tap. W. T. H.

Inexpensive filter for milk of lime. M. G. BUICKOVSKI. *Bull. Sakharotresta (Bull. of the Sugar Trust)* 1928, No. 9, 37-8.—Description and drawing of a rotatory filter for preventing the passage of sand with the milk of lime into the carbonation tank. V. E. BAIKOW

Experiments on filtering crucibles with porous bottom plates. S. GERICKER. *Chem.-Ztg.* 53, 119(1929).—Comparative tests made by using crucibles "HB" and "O" made of porcelain and glazed only on the outer walls for detg. 6-8 constituents gravimetrically and others qualitatively, showed them to be suitable only for the filtration and ignition of Fe_2O_3 . It is suggested that if the inner wall, as well as the outer, were glazed, the results would probably be better. W. C. EBAUGH

Method for filtering colloidal substances. YVES A. FISSIAULT. *Chemist-Analyst* 18, No. 2, 17(1929).—A suction filter composed of a glass funnel contg. a Ni cone, a layer of cotton and a layer of sand is recommended. W. T. H.

Apparatus to prevent creeping of solvents in evaporation vessels. ARTHUR B. KNOBEL. *Chemist-Analyst* 18, No. 2, 17-8(1929).—Suspend an inverted funnel over the dish and apply suction. The funnel should be smaller in diam than the dish. The evapn. is more rapid and practically all of the residue is left at the bottom of the dish instead of on the side walls. W. T. H.

The pycnometer. LEO G. DAKE. *Chemist-Analyst* 18, No. 2, 14(1929).—The making of a suitable tare is described. W. T. H.

Modification of the Hempel gas pipet. GEO. H. W. LUCAS. *Toronto Univ. Ind. Eng. Chem., Anal. Ed.* 1, 79(1929).—A 0.5-cc. bulb in the capillary of the pipet prevents droplets of the absorbent from being forced back into the tubing and the gas buret. A. S. CARTER

The "thermoplanktometer." R. KOLKWITZ. *Ber. deut. botan. Ges.* 47, 64-7 (1929).—This is an apparatus designed to det. the sp. gr. of sea water with an accuracy of 1 part in 10,000. With the aid of a thermometer graduated to $1/10$ of a degree the temp. at which a suitable float will remain suspended is detd. and the sp. gr. calcd. LAWRENCE P. MILLER

Drayton M. S. differential humidity regulator. THE DRAYTON REGULATOR AND INSTRUMENT CO., LTD. *Textile Recorder* 47, No. 550, 44(1929).—This instrument, which is operated from the wet-bulb temp., is provided with a device for varying the setting of the regulator in proportion to the rise in the dry-bulb temp., thus maintaining a fixed relative humidity at varying temperature. The app. is described and illustrated. RURY K. WORTNER

An air separator for determining the grain size of dust. H. W. GONELL. *Tonind.-Ztg.* 53, 247(1929).—A detailed description is given of an app. for the quant. segregation of dust particles according to grain size. Sepn. is made with an air blast through a hollow cylinder. Sizing smaller than that possible with sieves can be made. This method is preferable to elutriation for materials affected by water. The process is not influenced

by the usual variations in room temp. Calcns. are based on Stoke's law, which is applicable only to particles approximating a spherical or cubical form, and is not valid for particles in the form of thin plates or small threads.

R. F. F.

Complete sludge-washing plant in a single unit. A. ANABLE. The Dorr Co. *Ind. Eng. Chem.* 21, 223-6(1929).—A tray-type thickener is used as a washing thickener, but the trays operate in series, not in parallel. Its application to recausticizing and sepn. of Fe cyanide soln. from a ppt. is described.

L. A. PRIDGEON

The construction of various new steam-regulating devices for pipe-lines. H. WINKELMANN. *Apparatebau* 41, 40 2(1929).—Descriptions, with 6 cuts, of Borsig valves.

J. H. MOORE

Construction and standardization of an interferometer pressure gage. J. J. MANLEY. *Proc. Phys. Soc. London* 40, 57-61(1928); *Science Abstracts* 31A, 418. This paper deals with the application of a Michelson interferometer to the detn. of gas pressures ranging from 0.0001 to 20 mm. of Hg. The construction of the instrument is fully described, as are also the methods used for standardizing the registering micrometer screw and its graduated head. The gage can be instantaneously set and the pressure which obtained at the moment of setting measured at leisure.

H. L. D.

A simple way for removing condensate. HANS RICHTER. *Chem.-Ztg.* 53, 32 (1929).—The new Gestra app. (Gustav Gerdts, Bremen), a labyrinth canal or passage way without moving parts, is praised for its economy and efficiency in removing condensate.

W. C. EBAUGH

Technical and economic aspects of machinery for the production of the colloidal state. FELIX HEBLER. *Farben-Ztg.* 34, 834-6(1929); cf. *C. A.* 23, 4. —Compared with a ball mill, a colloid mill (Plauson's) was more rapid qualitatively but required more power. The ball mill reduced 50% of a charge of 200 kg. solids to colloidal dimensions in 200 hrs. with an expenditure of 140 kw hrs. Operating on charges of 5 kg., the colloid mill was able to reduce but 26-31% to colloidal dimensions. For a total of 200 kg., the time required was equiv. to 10 8-30 hrs. with an expenditure of 150-550 kw hrs.

G. G. SWARD

Crushing, pulverizing and grinding machinery. W. BULLOCK. Fraser and Chalmers' Eng. Works, Sir John Cass Tech. Inst. *Chem. Age* (London) 19, 477-81(1928). —Methods of crushing, pulverizing and grinding both wet and dry with available machinery are described.

L. A. PRIDGEON

Furnace arches. D. J. DELMOTTE. *Chaleur Ind.* 9, 232-4(1929).—Chem. corrosion of the arch by fuel or ash may be diminished by judicious choice of the refractory. Mech. erosion by the flame can be avoided by modifying the position of the arch with regard to the gaseous circuit. Once a cavity starts, destruction of the arch is accelerated. It is not advisable to increase arch thickness to avoid collapse. The only practical solution is to reduce the temp. of the intrados by increasing the degree of heat transmission. A "suspended arch" construction is preferable, avoiding joints parallel to the direction of the flame; the thickness of the arch should not exceed 250 mm.

S. L. B. ETHERTON

The heat capacities of organic compounds at low temperatures. II. A low-temperature thermostat. Thousandth degree copper-constantan thermocouple reference tables from 85° to 310° K. JOHN C. SOUTHARD AND DONALD H. ANDREWS. Bartol Research Foundation. *J. Franklin Inst.* 207, 323-39(1929).—A low-temp thermostat, const. to 0.001°, is constructed of a cylindrical Cu vessel, which contains pentane and which is wound on the outside with a heating coil; this is placed inside a vacuum flask which in turn is placed inside another vacuum flask that contains liquid air. A photoelec. cell, sensitive to the light reflected from a galvanometer mirror, regulates the relay in the thermostat heater circuit. Formation of an explosive mixt. of air and pentane through fracture of the smaller vacuum flask is prevented by the use of the Cu container. A change of the thermostat temp. can be made in 1 hr. or less, and the consumption of liquid air is about 2 l. per day. Four Cu-constantan thermocouples were calibrated against standard Pt-resistance thermometers at intervals of 10° between 90° and 180° K inclusive. The equation, $E = E_0 - 0.447 T^{1.009}$, with a deviation curve, was used to calc. the values in the standard reference tables, which give the abs. temp. at intervals of 20 microvolts between 273° and 310° K. and of 10 microvolts between 85° and 273° K.

F. D. ROSSINI

Thermostat for polarimetry. L. RAMBERG AND J. F. HEUBERGER. *Svensk Kem. Tid.* 40, 227-9(1928). (In German).—An electrically heated thermostat is provided with a support for holding a polariscope tube between 2 glass windows. The temp. is controlled by a Ramberg regulator (cf. *C. A.* 18, 3297).

A. R. ROSS

Measuring thermal expansion of pottery body [dilatometer] (YOSHIOKA) 19.
Applications of centrifugal machines to various problems in gas transport (FARAGGI) 21.

HAUSBRAND, E.: *Evaporating, Condensing and Cooling Apparatus*. London: Ernest Benn, Ltd. 4th ed., revised and enlarged. 32s. 6d., net.

MÜLLER-LÜBECK, KURT E.: *Der Quecksilberdampf-Gleichrichter*. Band I. *Theoretische Grundlagen*. 217 pp. Bound, M. 15. Band II. *Konstruktive Grundlagen*. 350 pp. Bound, M. 42. Berlin: Hirschwaldsche Buchhandlung.

Laboratory mill suitable for comminuting drugs, fertilizers, feedstuffs, etc. SAMUEL W. WILEY. U. S. 1,706,643, March 26. Structural features.

Apparatus for grinding ores, coal, etc., and separating the finer particles by the action of a fan. P. L. CROWE. Brit. 295,430, May 11, 1927.

Sorting machine for ore and similar material. N. N. ZHUKOVSKII. Russ. 5268, Sept. 15, 1924.

Electrical thermometer. G. P. KULBUSCH and A. M. KALININ. Russ. 5253, Apr. 30, 1928. Two plates of mica, inserted cross-wise in a metallic holder, have grooves on their edges, which hold the resistance wire in the desired position.

Illuminated thermometer with colored segments to indicate different temperature ranges. R. S. WHIPPLE and CAMBRIDGE INSTRUMENT CO., LTD. Brit. 295,893, Jan. 9, 1928. Structural features.

Apparatus for measuring temperatures with an electric-resistance thermometer. G. P. KULBUSCH and A. M. KALININ. Russ. 5254, Apr. 30, 1928. A modified Wheatstone bridge is specified.

Temperature-control system for condensers. CHARLES L. WARE. U. S. 1,706,719, March 26.

Thermopile. WILLIAM H. THORPE. U. S. 1,706,419, March 26. A portion of the wire forming a plurality of turns of Cu wire is protected by cement and the exposed portion of the wire is then subjected to a reagent such as S vapor, which will form a product of altered elec. conductivity.

Filters. ERNST DIEPSCHLAG. Fr. 645,895, Dec. 19, 1927. Filters of metallic gauze with fine pores are made by applying mechanically or electrolytically to the gauze a metallic ppt. in the form of extended crystals.

Testing filters. AC SPARK PLUG CO. Fr. 646,067, Dec. 22, 1927. A pipe offering a greater resistance to the flow of liquid than the filter when properly working leads to a measuring instrument whereby the pressure applied to the liquid entering the pipe is compared with the resistance offered by the filter to the flow of liquid.

Rotating drum filter. JEAN B. VERNAY. Fr. 646,913, Jan. 10, 1928.

Gravity oil filter. WILLIAM S. HARDEN and ROY D. DULEY. U. S. 1,706,228, March 19. Structural features.

Filter for beverages, etc. JOHN PALMER. U. S. 1,706,250, March 19. Structural details of a fabric filter of the siphoning type are described.

Air-filtering device suitable for use on tanks holding gasoline, etc. EARTHEN H. CAMFIELD. U. S. 1,706,772, March 26. Structural features.

Device for separating moisture from air. JENS A. PAASCHE. U. S. 1,706,676, March 26. Structural features. The air is passed through a mass of small stones or pebbles.

Apparatus (with tubular filter elements) for filtering solutions from ore slimes or other liquids. RANDOLPH W. DIAMOND (to Genter Thickener Co.). U. S. 1,706,400, March 26. Structural features.

Apparatus for separating oil and water or other liquids by gravity. BERNARD D. COMYN. U. S. 1,707,077, March 26. Structural features.

Apparatus for effecting separation of oil, gas and water by gravity and centrifugal action. JULIUS E. KOBERNIK (to Newton Process Mfg. Co.). U. S. 1,705,669, March 19. Structural features.

Magnetic separator. A. DAVIES. Brit. 295,417, May 5, 1927. Structural details.

Filter plates, rings, etc. "HANSA" FILTERWERKE M. B. H. Ger. 471,305, Apr. 10, 1926. In prepg. thin filter plates, rings, etc., from materials such as kieselguhr, a series of superposed plates or rings is molded from the damp material, each being sepd. from that above or below by a sheet of combustible material, e. g., paper or fabric, and the bottom one resting on a refractory base, e. g., chamotte. The structure is then calcined.

Cathode discharge tubes. NAAMLÖÖZE VENNOOTSCHAP PHILIPS' GLOEILAMPEN-FABRIEKEN. Fr. 646,662 and 646,663, Dec. 31, 1927.

Covering the cathode in cathode tubes with a layer of active material. ELECTRO-TECHNICAL TRUST OF WEAK CURRENTS. Russ. 4666, Feb. 29, 1928. The metallic base of the cathode is covered electrolytically with a layer of a porous metal like that of the cathode without using a binder. Then the electrode is impregnated with active material.

Electric vacuum-tube discharge-device. A. W. HULL (to British Thomson-Houston Co., Ltd.). Brit. 295,702, Aug. 19, 1927. Flow of electrons between a cathode and an anode is controlled by subjecting to a varying degree of illumination an insulated control electrode carrying a layer of light-sensitive material, which may comprise a helix of quartz or optical glass coated with Cs. The filament cathode is of W coated with Cs. At least part of the inner surface of the container is coated with alkali metal, or, instead of alkali metal, there may be used substances such as Mg or Ca sensitive only to ultra-violet light, or substances such as BaO or compds. of S sensitive to infra-red light. Various structural details are described. Cf. C. A. 22, 3810.

Thermionic valves or vacuum tubes. LOEWE-AUDION GES. and B. WIENECKE. Brit. 296,005, Aug. 22, 1927. Electrode supports and other glass parts which are exposed to high temps. are made of glass such as Jena-instrument glass, which is a good insulator at such temps. Various structural details are described.

High-emission lamps. SIEGMUND LOEWE. Fr. 646,813, Jan. 7, 1928. Deposition of Mg on the elements is prevented by an arrangement of screens.

Selenium light-sensitive cell. S. M. MOSHKOVICH. Russ. 5295, May 31, 1928. One or more mol. layers of Se with alternate layers of another metal are pptd. by sublimation between two ring-shaped electrodes on the inner walls of an evacuated glass container covered previously with a semitransparent layer of a metal.

Air cooler for drying chambers. N. I. KOSTROMIN. Russ. 5466, May 31, 1928.

Apparatus for drying granular materials such as coal. LUDWIG HONIGMANN and FRIEDRICH BARTLING. U. S. 1,705,617, March 19. The material is dried by a current of heated gas.

Apparatus for drying paints, "chemicals" or other materials in currents of heated air. DAVID S. BAKER. U. S. 1,706,993, March 26.

Air-circulating system for drying paints, varnishes, etc., in a tunnel kiln. KARL A. WEBER (to Weber Showcase & Fixture Co.). U. S. 1,706,554, March 26.

Apparatus for spray desiccation of milk, etc., or for mixing substances by circulation and spraying in a mixing tank. ERNEST E. LINDSEY. U. S. 1,705,822, March 19.

Apparatus for mixing different liquids in desired proportions. HERMANN KAUFERTZ. U. S. 1,707,058, March 26.

Apparatus for mixing various liquid and solid materials. PAUL LENART. U. S. 1,706,176, March 19.

Gas generator. GUSTAV SCHÖNBAUM. Fr. 646,307, Dec. 3, 1927. The necessary steam is taken from a water jacket surrounding the generator, and the mixt. of air and steam is heated in the space between the generator and the lower part of the jacket.

Apparatus for gas analysis. SOCIÉTÉ L'AIR LIQUIDE (SOC. ANON. POUR L'ÉTUDE ET L'EXPLOITATION DES PROCÉDÉS G. CLAUDE). Fr. 646,236, May 11, 1927. An app. is described in which gas to be analyzed is passed from a buret to an absorption vessel and back again by automatic cam devices operated by a motor; the amt. of gas absorbed is recorded by a float on the liquid in a vessel connected to the absorption vessel, an indicator making a trace on a rotating cylinder.

Apparatus (with fixed and rotary annular perforated disks and radial liquid jet nozzles) for cooling and purifying gases. FRANCIS G. INGLIS. U. S. 1,707,163, March 26. Structural features.

Valves and valve-control devices for gas purifiers. H. H. HOLLIS. Brit. 295,269, April 8, 1927. Structural features.

Gas washer of the spray wheel type. E. M. BASSLER. Brit. 296,159, June 28, 1927.

Apparatus for atomizing liquids for washing gases, etc. WILHELM A. BODAMER and OSCAR E. RAMUZ. Fr. 645,983 and 645,984, Dec. 21, 1927.

Propeller-blade device for atomizing liquids with gases in reaction chambers. H. PETERSEN. Brit. 295,856, Oct. 10, 1927.

Apparatus for subjecting gases, liquids, etc., to dark electric discharges. C. EPNER. Brit. 296,019, Aug. 23, 1927. The electrodes consist of liquids boiling above 100° and the liquids may be circulated and used for maintaining the substance under treatment at desired temp. The vessels contg. the electrode liquids are preferably made

from or coated with a material, the dielectric, properties of which are not affected by temp. changes, *e. g.*, quartz.

Gaseous conduction device of the point-to-plate discharge type. WILLIAM B. GERO (to Westinghouse Lamp Co.). U. S. 1,707,002, March 26. The anode is formed at least in part of porous misch metal.

Apparatus for mixing gases in regulated proportions. I. G. FARBERIND. A.-G. Brit. 296,063, Aug. 24, 1927.

Electromagnetic gas-pressure regulator. ALLGEMEINE VERGASUNGS G. M. B. H. Fr. 646,931, Jan. 10, 1928.

Adsorption apparatus for separating gases and vapors. A. GODEL. Brit. 295,504, July 25, 1927. An app. is described suitable for sepg. gases and vapors by selective absorption and for treatment of the absorbent. This app. is a modification of that described in Brit. 267,369 (C. A. 22, 1221).

Apparatus for treating solids with gases. AKTIESELSKAPET NORSK STAAL (ELEKTRISK-GAS-REDUKTION) and E. EDWIN. Brit. 295,999, Aug. 22, 1927. An app. is described suitable for use in roasting operations, for reduction by means of gases and for the treatment of gas mixts. by solid catalysts. It comprises a shaft-like chamber formed with superposed compartments through which the gas is passed from top to bottom of the app. The app. is mounted so that it can be raised and lowered in such a manner as to allow replacement of one of the compartments (which are detachable from each other) with another freshly charged compartment as desired for continuation of the process.

Continuous annealing furnace. AKTIEN GESELLSCHAFT BROWN, BOVERI ET CIE. Fr. 646,352, Dec. 26, 1927.

Induction furnace for fusing or annealing. EMILE F. RUSS. Fr. 646,828, Jan. 7, 1928.

Crucible furnace. WILHELM RITTERSHAUSEN. Ger. 471,280, Feb. 13, 1926. Improvements are described in a furnace of the kind in which the crucible is tiltable and remains heated while discharging its contents.

Bakery furnace. HENRI VEAUGEOIS. Fr. 645,944, Dec. 20, 1927.

Regulator for air and gas in gas furnaces. SOC. DES GRILLES ET GAZOGÈNES SAUVAGEOT. Fr. 646,072, Dec. 22, 1927.

Coal-dust burner. STEIN- UND THON-IND.-GES. "BROHLTHAL." Ger. 471,330, Apr. 20, 1927. The burner is of the kind in which the fuel forms a whirling conical cloud in the combustion chamber.

Burner for powdered fuel. CHRISTA RUHE GEB. FRANKE, GERTRUD FRANKE GEB. MOHNICKE and WOLFGANG FRANKE. Ger. 471,404, Apr. 15, 1925. The fuel and air are drawn together through tubes into the combustion space.

Gas burner. CARL E. METHUDY (to Methudy Automatic Lighter Co.). U. S. 1,706,070, March 19. Structural details.

Gas burner. C. OLIVIER. Brit. 295,738, May 18, 1927. Structural features.

Gas-burner regulating device. STOVES, LTD., and W. J. CHARLES. Brit. 296,142, June 7, 1927.

Automatic cut-off for gas-burner valves operating when the flame becomes extinguished. R. LANGER. Brit. 295,207, March 29, 1928.

Oil burner. PHILIPP SCHEFFEL. Ger. 471,326, Apr. 7, 1927. The fuel trickles down rods, which pass loosely through the bottom of a superposed fuel container and so are easily cleaned. The air for combustion passes round the rods.

Oil burner with automatic cut-off operative on failure of the air supply. G. KINSMAN (to Caloril Burner Corp.). Brit. 295,707, Aug. 18, 1927. Brit. 295,708 also relates to oil-burner construction.

Mechanical oil burner. A. D. SEKRETOV. Russ. 5523, May 31, 1928. A modified Gordeyev-type oil burner.

Mechanical oil burner. M. A. TREIER. Russ. 5289, Sept. 15, 1924. Mechanical features.

Apparatus for burning crude oil under steam boilers. T. B. LETTER. Russ. 5403, May 31, 1928.

Oil-burner control. WILLIAMS OIL-O-MATIC HEATING CORP. Ger. 471,097, June 10, 1926. The pump supplying the fuel is automatically adjusted in accordance with the pressure or the temp. in a boiler heated by the burner. Corresponds to Brit. 273,458.

Safety controls for oil burners. WILLIAMS OIL-O-MATIC HEATING CORP. Ger. 471,098, June 6, 1926, 471,099, Aug. 14, 1926 and 471,100 Mar. 11, 1927. The motor supplying the fuel is automatically controlled by temp.-sensitive devices. Corresponds to Brit. 276,095, 277,785 and 280,771 (C. A. 22, 3071), resp.

Safety control for oil-heated boiler. WILLIAMS OIL-O-MATIC HEATING CORP. Ger. 471,198, Oct. 17, 1926. A float arranged in a chamber communicating with the water space actuates a switch controlling the elec. circuit to the burner when the water falls below a predetd. level. Corresponds to Brit. 268,670.

Safety system for burning fuel oil under pressure. ROSS M. G. PHILLIPS (to Harry V. Whipple). U. S. 1,706,704, March 26. Numerous mech. details are specified.

Safety device for mazout burner. SOC. ANON. DES CHANTIERS ET ATELIERS DE SAINT-NAZAIRE (PENHOËT). Fr. 646,361, Dec. 26, 1927.

Air distributor for mazout burner. SOC. ANON. DES CHANTIERS ET ATELIERS DE SAINT-NAZAIRE (PENHOËT). Fr. 646,151, Dec. 24, 1927.

Attachment for a "Primus" kerosene-vapor burner to widen and direct the flame. V. A. TRAVNIKOV. Russ. 5376, May 31, 1928.

Heat exchanger, especially for preheating air for combustion. AKTIEBOLAGET LJUNGSTRÖMS AANGTURBIN (Fredrik Ljungstrom, inventor). Ger. 471,199, Nov. 25, 1925.

Concentric tube heat-exchange apparatus. ROYLES, LTD., and A. G. ROYLE. Brit. 295,245, May 6, 1927.

Multiple chamber continuous kiln. A. L. GELDENS. Brit. 295,867, Nov. 2, 1927.

Heaters for oil refining. A. O. SMITH CORP. Fr. 646,642 and 646,643, Dec. 31, 1927.

Plate-surface air heater. MAURICE LEVRON. Ger. 471,426, Jan. 3, 1926.

Furnace-roof construction. GUSTAV KARREBERG. Fr. 646,125, Dec. 23, 1927.

Means for feeding liquid fuel to burners. FRIEDRICH DECKEL, PRAZISIONS MECHANIK UND MASCHINENBAU. Ger. 471,423, Mar. 26, 1925.

Inclined grate with alternate stationary and moving parts. L. & C. STEINMÜLLER. Ger. 471,424, Feb. 16, 1926. Addn. to 456,005.

Inclined grate with alternate stationary and reciprocating parts. OTTO SCHENK. Ger. 471,402, Apr. 4, 1924. Addn. to 353,154.

Reversing means for regenerative ovens. MORGAN CONSTRUCTION CO. Ger. 471,327, Dec. 15, 1926.

Stone packing material to produce spiral movement in gas-stream passing tubes. BERTHOLD GRÖNHAGEN. Ger. 471,403, Sept. 12, 1925.

Fillers for towers. FRITZ GRAUPNER and REINHOLD KRÜGER. Ger. 471,232, Aug. 25, 1927. Absorption or reaction towers are filled haphazardly with spherical, cube-shaped, cylindrical, etc., fillers, each of which is bored through several times so that each boring intersects other borings at different points within the filler.

Apparatus for the vaporization and concentration of liquids. KARL FRIED. Fr. 646,894, Jan. 9, 1928.

Apparatus for measuring liquid flowing through pipes. V. M. VOLOKHVYANSKI. Russ. 5429, May 31, 1928.

Arrangement for directing the flow of cooling media in reaction coils, transformers and similar apparatus. I. A. KRAVTZOV. Russ. 5386, May 31, 1928.

Scales for automatic weighing of liquids. N. E. BEREZOVSKII. Russ. 5425, May 31, 1928.

Apparatus for extracting oil from solids used in its purification. PHILIP L. FAUTH. Fr. 646,750, Jan. 6, 1928.

Apparatus for centrifugal treatment of hydrocarbon oils or other liquids. HANS O. LINDGREN (to DeLaval Separator Co.). U. S. 1,705,934, March 19. An app. is described in which materials such as petroleum oils are discharged from a centrifugal app. in finely divided form into a collecting vessel where they may be subjected to a vacuum to sep. any entrained gas.

Apparatus for preparing extracts by steeping. W. BUSS. Brit. 295,869, Nov. 9, 1927.

Apparatus (with a screw conveyor) for feeding and measuring granular or pulverulent materials. ARTHUR W. HEYMAN. U. S. 1,706,292, March 19.

Gas-tight bearing suitable for use in motor-driven gas compressors, etc. CHARLES P. EISENHAEUER (to The Duro Co.). U. S. 1,706,776, March 26. Structural features.

Catalytic apparatus. COMPAGNIE NATIONALE DE MATIÈRES COLORANTES ET MANUF. DE PRODUITS CHIM. DU NORD RÉUNIES ÉTABLISSEMENTS KUHLMANN. Fr. 646,264, May 13, 1927. An app. is described for the catalytic oxidation of org. compds., particularly aromatic hydrocarbons, in which the catalyst is spread in a thin layer on a good conductor of heat, e. g., Al, with which the gases come in contact before entering the catalyst chamber.

Alcohol-recovery apparatus for baking ovens. OTTO HELLER. Ger. 471,086, Feb. 26, 1926.

"Steam storer" or "heat accumulator" comprising a pipe coil embedded in concrete. GOTTLIEB HOLTHAUS (to Siemens-Schuckertwerke A.-G.). U. S. 1,705,975, March 19. A device is specified suitable for utilizing waste heat of blast-furnace gas for generating steam at a pressure above 225 atm.

Apparatus for applying lead sheathings to cables. SIEMENS BROS. & CO., LTD., and E. R. HUBBARD. Brit. 295,416, April 13, 1927.

Acid-proof container. JOSEF GLATZ. Swiss 127,776, July 13, 1927. An acid-proof reinforced-concrete container has a protecting covering; it also has plates with freedom for expansion due to hot liquids.

Alarm device for indicating heating of oil-insulated electric transformers, etc. GEORGE D. CLARK (to Westinghouse Elec. & Mfg. Co.). U. S. 1,705,715, March 19.

Thermal cut-out device to prevent overheating of electrically heated apparatus. W. EDWARDS. Brit. 295,796, June 24, 1927.

Thermostat. S. P. SHOROKHOV. Russ. 5520, May 31, 1928.

Thermostatic valve. K. AIRD and R. & A. MAIN, LTD. Brit. 296,129, May 27, 1927. Structural features.

Thermostatic control device for electric circuits. ABRAHAM J. KUSEL and GEORGE W. GAIL (to Kulair Corp.). U. S. 1,706,890, March 26. Structural features.

Thermostatic device for controlling electric circuits. ALFRED W. BURKE (to Burke Controller Corp.). U. S. 1,707,185, March 26.

Thermostatic device for control of electric circuits. EDWARD M. CLAYTOR (to Westinghouse Elec. & Mfg. Co.). U. S. 1,705,716, March 19.

Thermostatic device for control of electric circuits. VIRGIL E. DUEMLER and GEORGE R. KOELN (to Electrol, Inc.). U. S. 1,706,057, March 19. Structural features.

Thermostatic regulator for electric ovens, etc. HAROLD E. WHITE (to Westinghouse Elec. & Mfg. Co.). U. S. 1,705,694, March 19.

Thermostatic gas regulator for water heaters. FRANK W. SHUELL, ELMER E. LEDBETTER and THOMAS J. TOBEY (to Everhot Heater Co.). U. S. 1,705,787, March 19.

Thermostatic control device for valves of gas burners. RADIATION, LTD., and H. J. YATES. Brit. 295,823, Aug. 2, 1927.

Thermostatic combustion-control apparatus. LOUIS HOEDT. U. S. 1,707,012, March 26.

Thermostatic alarm device suitable for use as a fire alarm. G. ROWAN. U. S. 1,705,837, March 19. Structural features.

Thermostatic valve for controlling flow of liquid in engine cooling systems. NELSON J. QUINN. U. S. 1,705,498, March 19. Structural features.

Thermostatic device for control of air conditioning systems. JOHN M. LARSON (to National Regulator Co.). U. S. 1,705,527, March 19. Structural features.

Thermostatically controlled apparatus for mixing liquids such as water at different temperatures to attain a mixture of desired temperature. ROBERT S. BLAIR. U. S. 1,707,109, March 26.

2—GENERAL AND PHYSICAL CHEMISTRY

FREDERICK L. BROWNE

Christian Friedrich Schönbein. I. Life and character. RALPH E. OESPER. Univ. of Cincinnati. *J. Chem. Education* 6, 432-40(1929). E. H.

High-school chemistry and the student's record in college chemistry. IRA D. GARARD and THALIA B. GATES. *J. Chem. Education* 6, 514-7(1929). E. H.

The one college chemistry course for freshmen. C. A. BUEHLER. Univ. Tenn. *J. Chem. Education* 6, 510-3(1929).—A study of the grades made by all students taking one general chemistry course at the University of Tennessee shows that: (1) Students with high-school chemistry make a better record during the first part of the work and they always stand a better chance of getting an A or B. (2) Students with no high-school chemistry have the better record during the latter portion of the work. Several suggestions are given to account for this superiority on the part of the untrained students. E. H.

The story of copper. J. W. HOWARD. *J. Chem. Education* 6, 413-31(1929).—A review especially of the metallurgy of Cu, with a brief account of its history, occurrence, properties and uses. E. H.

Some illogical ideas that persist in elementary chemistry. CECIL V. KING. Washington Square College, N. Y. *J. Chem. Education* 6, 65-71(1929).—Exception is taken to the treatment often accorded to the terms (a) burn, combustion, support combustion; (b) oxidation and reduction; (c) classification of chem. reactions; (d) nascent gases.

W. C. EBAUGH

Multiplicative properties. M. TRAUTZ. Univ. Heidelberg. *Z. angew. Chem.* 42, 89-94(1929).—A lecture discussing additive and multiplicative properties of homogeneous systems of 2 or more components. A *multiplicative property* is a property whose magnitude is a product of corresponding magnitudes for the separate components of the system or for the separate reactants in a chemical reaction. The laws of mass action are based on multiplicative properties.

W. C. EBAUGH

The physical chemist in search of purity in an impure world. ERNST COHEN. Messel Memorial Contribution. *Proc. Roy. Inst. Gr. Britain* 25, Pt. III, 417(1928); *J. Soc. Chem. Ind.* 48, 162-8(1929).—A discussion of metastable forms in terms of white and gray Sn, "explosive Sb," Majorana's effect, thallous picrate, AgI, CdI₂, and sugar. Physical as well as chem. purity is essential for the detn. of physical consts. The powder röntgenograph detn. of d. is probably the most reliable method of insuring physical purity. Const. d. is suggested as another indication.

FOSTER DEE SNELL

Effect of ozone on the temperature of the upper atmosphere. E. H. GOWAN. *Proc. Roy. Soc. (London)* A120, 655-69(1928).—From the abnormally high values obtained for the d. of the atm. calcd. from observations of meteors, Lindemann and Dobson (*Ibid* A102, 411(1922)) concluded that the temp. above 60 km. is of the order of 300° abs. Whipple (*Nature*, 111, 187(1923)), from observations of the zones of audibility occurring at some distance round big explosions, found that near 60 km. a temp. of about 280° abs. was to be expected. A theoretical consideration of the radiative equil. of the upper atm., taking into account the effects with selective absorption, of water vapor and ozone, leads to a region of high temp. in the neighborhood of, and above, 60 km. The equation of equil., considering only vertical radiation, for any layer of air in a non-convective region is $\int R_{\lambda T} d\lambda = \int (X_{\lambda}' + I_{\lambda}' + E_{\lambda}' + S_{\lambda}') d\lambda$, where $R_{\lambda T}$ is the radiation from any layer at temp. T , X_{λ}' and I_{λ}' are the absorbed portions of the atm. radiations from above and below the layer, and E_{λ}' and S_{λ}' are the portions of the terrestrial and solar radiations absorbed in the layer. An analytical soln. of this equation can be found when the coeff. of absorption does not vary with the wave length. When selective absorption is used a graphical soln. is possible, and has been obtained by successive approximation. The results, as regards both temp. and height of the warm region, agree well with those of indirect observations.

B. C. A.

Colorimetric measurements. HANS EGNÉR. *Svensk Kem. Tids.* 40, 197-205(1928).—A survey of appliances for colorimetry with 12 references.

A. R. ROSE

Simplification of laboratory procedure for low-pressure distillation. W. JEZIESKI. *Przemysl Chem.* 11, 528(1927).—When bumping is avoided by slow inlet of air into a liquid being distd. under low pressure the usual screw clamp regulation of the rate of inflow of air may be dispensed with by putting into the rubber tube at the wide end of the capillary another glass tube drawn to a capillary in such a manner that the rubber tube is connected to the wide ends of both capillaries.

A. C. ZACHLIN

Thirty-fifth annual report of the committee on atomic weights. Determinations published during 1928. GREGORY P. BAXTER. *J. Am. Chem. Soc.* 51, 647-54(1929). The work done during 1928 on K, Ti, Cu, Ca, Ba, Ag, Ce, Er, Re, Pb and U is reviewed. The table of at. wts. for 1929 is given in which changes from the 1928 table are made for H, P, S, Ba, Ce, Er, K, Ra, Th and U.

E. SCHOTTE

The specific heat of tungsten between 90° and 2600° abs. C. ZWIKKER AND G. SCHMIDT. *Natuurk. Lab. N. V. Philips Gloeilampenfabrieken, Eindhoven.* *Physica* 8, 329-46; *Z. Physik* 52, 668-77(1928).—The principle of the method used at low temp. is Eucken's (*C. A.* 3, 2898). A Pt wire (60 μ , 0.112 g.) is coiled around a W block (17.457 g.), insulated from it by paraffin paper. Around the Pt another layer of paper is held together by W wire closely wound so as to enclose all Pt in W (paper wt. 0.062 g., W total 18.802 g.). The Pt serves both as resistance thermometer and as heating element. The whole unit was inserted in a vacuum bulb cooled outside by liquid O. After the temp. of the W has decreased slowly to that of the cooling medium the bulb is pumped out. The temp. of the metal then rises slowly from conduction of heat through the lead-in wires. This rise is observed for some time; then a heating current is sent through the Pt and the slow rise again followed. From the rise in temp. and the energy used the desired sp. heat is calcd. The values found were 3.6 cal. per g. atom (C_p) at 92° abs. to 4.6 at 140° abs., 5.9 at 290° abs.; they can fairly well be represented by a Debye curve with $\theta = 310$ (the exptl. values near 300° are too high). For C_p at

higher temp. two methods were used. The first one consists in raising at a time t_0 the current through an incandescent W wire at const. temp. Temp. and voltage of the wire increase and the time t_1 is observed when a certain predetd. voltage is reached.

From $I^2R = W + C(dT/dt)$ (W is radiation) it follows that $t_1 - t_0 = c \int_T^{T+\Delta T} \frac{dT}{(I^2R - W)}$.

I^2R and W are known from previous work as functions of T (T itself is found from the voltage), so that C may be evaluated by graphical integration. The time was registered automatically by a relay system and band recorder. For the measurements wires of 863μ (1460° to 2200°) and 300μ (600° to 1400°) were used. The exptl. values are averages between measurements with increased and decreased currents. The results for C_p were 6.57 at 600° abs., slowly rising to 6.9 at 1225° , 7.5 at 2055° , and 7.9 at 2220° abs. The second high temp. method is the one of variation in electron emission. The amplitude of the variation in temp. of an incandescent filament fed by a. c. $\theta = \frac{2V\eta}{C_p d \nu}$ (V is at. vol., η radiation per sq. cm., d diam. of wire, ν frequency of current). As well as other temp. functions the electron emission shows a similar variation which can be easily measured. For the purpose between 1600° and 1800° abs. the W was coated with Th, between 1200° and 1400° abs. with Ba and between 2220° and 2600° abs. the W was left bare. A special generator for pure sinusoid low-frequency a. c. was constructed. Several corrections in the calcns. due to time lag are discussed and were applied; also for asymmetry of the amplitude and for temp. difference in and outside the wire. Below a 100μ diam. the latter effect is negligible. The results were (40μ wire, frequency 50) C_p from 8.0 to 8.35 between 2210° and 2521° abs., from (119μ wire, 7.3 to 12.8 frequency) 7.4 to 7.6 between 1610° and 1873° abs., from (51.7μ wire, 975 to 13.9 frequency) 7.0 to 7.2 between 1150° and 1333° abs. The final table gives for C_p in cal. per g. atom at abs. temps. of 100, 200, 300, 600, 900, 1200, 1500, 1800, 2100, 2400, 2700 and 3000: 3.77, 5.32, 5.90, 6.23, 6.57, 6.90, 7.23, 7.56, 7.89, 8.22, 8.56, 8.89, for C_v (the χ , compressibility, used is Bridgman's at low temps, Geiss' elasticity-temp. relation at high temp.) 3.77, 5.30, 5.87, 6.15, 6.44, 6.71, 6.96, 7.18, 7.36, 7.50, 7.62, 7.70. At high temps. C_v seems to approach a value of 8 and does not run up at increasing rate as was expected.

B. J. C. VAN DER HOEVEN

Absorption of ultra-violet light by liquid carbon dioxide. G. HARIG. Leipzig Univ. *Physik. Z.* 30, 8-20(1929).—H. develops a method to det. quantitatively the absorption by thin layers of gases in the liquid state under high temp. and pressure. The light source is a Cd arc, which is especially suited to ultra-violet work. A large quartz spectrograph by Hilger, London, is used. The method for measuring pressures is described in detail. H. found oil to dissolve in liquid CO_2 and describes his method of obtaining very pure CO_2 by distn. Liquid CO_2 in ultra-violet light absorbs 1000 times more strongly than gas at the same pressure. This strong absorption also remains in the supercritical state but disappears quickly with rise in temp. in the region of the inflection points of supercritical isotherms and isobars. The absorption coeff. is calcd. at $\lambda = 2552 - 2195$ A. U. The absorption may be considered as due to a broad band at $\lambda = 2265$ A. U. and to a second band, more compact, whose max. is about $\lambda = 2435$ A. U.

S. L. B. ETHERTON

Dielectric constants and absorption indices of several alcohols for short electric waves. SAN-ICHIRO MIZUSHIMA. Tokyo Imp. Univ. *Proc. Imp. Acad.* 5, 15-6 (1929); cf. *C. A.* 22, 4348.—Dielec. consts. and absorption indices of the following alcs. are reported for the λ indicated, at 20° intervals of temp. from 60 to -60° , MeOH, $\lambda 58.0$ cm.; PrOH, iso-BuOH, AmOH, $\text{C}_2\text{H}_5(\text{OH})_2$, $\lambda 57.8$ cm. The region of anomalous dispersion is shifted toward longer wave lengths when the temp. is lowered, as well as when a mol. becomes more complicated for a homologous series; this agrees with Debye's dipole theory of anomalous dispersion. The results for $\text{C}_2\text{H}_5(\text{OH})_2$ are not in accord with the dipole theory.

C. J. WEST

Electric dipole moments of organic molecules. II. J. ESTERMANN. *Phys. Chem. Inst., Hamburg Univ. Z. physik. Chem., Abt B*, 1, 422-6(1928); cf. *C. A.* 23, 317-8.—Measurements of μ (dipole moment) of certain org. comds. seem to indicate that *o* or *p* substitution does not necessarily affect the dipole moment to a marked degree; likewise the length of the side-chain does not radically affect this quantity. For methyl benzoate $\mu \times 10^{18} = 1.8$; dimethyl phthalate, 2.3; dimethyl terephthalate, 2.2; ethyl benzoate, 1.8; diethyl phthalate, 2.4; diethyl terephthalate, 2.3. $\mu = 0.5 \times 10^{-18}$ for diphenyl ethylene while $\mu = 2.5 \times 10^{-18}$ for benzophenone. W. E. V.

Pyro- and piezo-electricity. A. MEISSNER. *Naturwissenschaften* 17, 25-31 (1929); cf. C. A. 22, 3573.—A review of recent work on this subject, especially on quartz and theories of the structure of the latter. X-ray work has shown the quartz unit cell to consist of 3 SiO_2 mols., the distance a between Si and Si in one plane being 4.89 A. U.; in different planes $c = 5.37$ A. U. From the acoustic vibrations in a disk of quartz cut perpendicular to an elementary axis set up by a high-frequency current applied by 2 electrodes on opposite faces it was found that the proper frequency of the quartz lay at $\lambda = 1160$ and 1665 m. (15 mm. thick). The vibrations are specially strong in 2 directions (causing air currents by rectification effects (C. A. 21, 3825)) at a 46° angle with the optical axis. The wave lengths correspond to max. sound velocities of 7700 and 5400 m. per sec. It is assumed that the 2 planes perpendicular to the disk face at $\alpha = 46^\circ$ are those of largest atom density (Si planes). The same effect is found for all 3 elementary axes. It gives a structure of almost cubical shape for the Si planes with the optical axis along the cube diagonal, the cube being slightly compressed along this axis. This agrees with the 2 dielec. consts. of 4.46 and 4.38 along and perpendicular to the optical axis. From $d = 2.65$ and Avogadro's no. the distance between 2 Si atoms is 3.336 A. U. The distances a and c calcd. for this structure, assuming a 46° angle between optical axis and Si planes, are 4.9 and 5.44 A. U. Between each 2 Si atoms is the center of gravity of two O atoms. The unit cell has 3 SiO_2 . By assuming the same elementary qualities for the unit cell as for the macro-crystal it is shown that the 3 elementary axes are along the diagonals of hexagons of alternate Si and two O (one a little above, the other one below the plane). These hexagon cells of Si_2O_4 are the source of the pyro- and piezo-effects. In disks perpendicular to an elementary axis, i. e. also to the hexagon plane, pressure will push one Si and one O toward the inside, induction of charges on the electrodes will result by the approach of the other two Si and O groups to the opposite electrodes (+ on the side where Si is pushed in, - on the other side). No effect occurs when the electrodes are orientated parallel to an elementary axis. Stress gives the opposite elementary effects. The pyro-effect is explained by outward displacement of the atoms; the electrode on the heated side will become negative if it had a positive piezo-effect (one Si next to it); on cooling it will be positive. An additional assumption made here is that the displacement of Si under the influence of heat is larger than that of two O but smaller than double the two O displacement. The locations of Si and O are const. for each temp. Any no. of times + and - charges can be taken from the electrodes; the moment remains unchanged. About 10 mins. after cooling the pyro-moment will go to reverse values, reaching a max. and coming back to zero after several hrs. It indicates a slow recovery of a distorted state. Heating over 160° causes the pyro-moment to decrease with time to zero, the cond. of the quartz is then high enough to cause the moment to be compensated by electrons from the electrodes, cooling will give a considerable reverse moment, which may last for days in the cold. Of individual quartz pieces the pyro-moment varied in ratio 1:6, of the piezo-moment 1:1.5. Other expts. were made with various materials to obtain non-crystalline piezo-elec. material (C. A. 23, 1546).

New superconductors. W. J. DE HAAS. Kryogen. Inst., Leiden. *Naturwissenschaften* 17, 85-6 (1929).—The suggestion has been made previously that superconductivity (*J. physique* 9, 9 (1928)) is due not only to the electron configuration of the atoms but also to their at. wt. and zero points of energy. Several more metals and their compds. were recently examd. Cu, Ag and Sb, which are not superconductive, with the superconductive Sn, also Bi with Tl. Sb + Sn alloys and Bi + Tl alloys are superconductive. The resistance of Ag_3Sn decreases from 3.4° to 1.3° abs. without super effect. The eutectic alloy of Au and Bi (Bi being below and Au above the 3 superconductive metals Hg, Tl and Pb in at. wt.) was examd. It is superconductive although neither component is superconductive. The alloy has at 2.2° abs. a resistance 0.7 times that at room temp.; at a temp. $1/20$ degree lower the resistance has completely disappeared. The level from which the resistance drops to zero in the Au-Bi alloy is 350 times higher than the corresponding level for Hg, 1000 times higher than that of Pb. At 1.5° abs. neither Au nor Bi shows any sign of superconductivity.

The transfer of matter in the iron arc. H. SCHMICK AND R. SEELIGER. *Physik. Z.* 29, No. 23, 864 (1928).—The decrease in wt. of an Fe cathode is not proportional to the current alone. It depends also on the cooling of the cathode. The whole surface adjacent to the bright spot contributes to the loss which is caused not only by evaporation but also by ejection of droplets.

The behavior of solutions of chromium trioxide upon electrolysis. D. T. EWING, J. O. HARDESTY AND TE HSIA KAO. *Mich. State Col. Mich. Eng. Expt. Sta. Bull.* No. 19, 3-13 (1928).—Solns. contg. 250 g. per l. of Cr_2O_3 were electrolyzed to det. the

effects of temp. and c. d. on the amts. of current used in the deposition of Cr and in the generation of H_2 . The percentage of current expended in the deposition of Cr increased with increased temp. and c. d. while the percentage of current used in generating H_2 decreased.

C. L. READ

Examination of the microcrystals of calcium carbonate in molluscan shells by means of x-rays. I. J. TSUTSUMI. *Mem. Coll. Sci. Kyoto Imp. Univ.* 11, 217-21 (1928).—The shell of *Atrina japonica* consists of 3 layers, the middle or prismatic one having a columnar structure. This layer is shown by x-ray analysis to consist of calcite crystals the principal axes of which coincide with those of the columns. B. C. A.

Fibrous structure in metals deposited by the difference of electrolytic solution pressures. S. TSUBOI. *Mem. Coll. Sci. Kyoto Imp. Univ.* 11, 271-7 (1928).—Ag deposited on Cu from $AgNO_3$ solns. forms flat, acicular crystals which have a fibrous structure. The fiber axis lies in the [110] direction, and makes an angle of 30° with the acicular axis, the direction of growth being nearly parallel to the [112] direction. The [111] plane is nearly parallel to the flat surface of the crystal in most of the fibers.

B. C. A.

Remarks concerning the work of W. Dilthey and E. Hölderhoff: Silicic acids. H. STAUDINGER. *Ber.* 62B, No. 2, 442 (1929).—S. claims priority for certain theories of structure of fibrous substances, attributed by D. and H. (*C. A.* 23, 1585) to K. H. Meyer.

T. P. KELLER

The crystal structure of potassium chloroplatinate. F. J. EWING AND LINUS PAULING. *Calif. Inst. of Tech. Z. Krist.* 68, 223-30 (1928). (In English.)—Spectral and Laue photographs show K_2PtCl_6 to have the K_2SnCl_6 type of structure with $a = 9.73$ A. U. and $u = 0.240 \pm 0.005$. The value of $u = 0.16$ reported by Scherrer and Stoll (*C. A.* 16, 3239) is incorrect.

L. S. RAMSDELL

The crystal structure of ethylammonium chlorostannate. R. W. G. WYCKOFF. *Z. Krist.* 68, 231-8 (1928). (In English.)—Laue and spectral photographs of crystals of $(NH_4C_2H_5)_2SnCl_6$ and $(NH_4C_2H_5)_2PtCl_6$ show that each has a hexagonal unit cell contg. 1 mol. For the first, $a = 7.24$ and $c = 8.41$ A. U.; less accurate values for the second are $a = 7.13$ and $c = 8.53$ A. U. The at. arrangement is from space group $3D_2-3$, with Sn (Pt) at 000; Cl at $u\bar{u}v$, $2\bar{u}\bar{u}v$, $u2u$, $u\bar{u}v$, $2u\bar{u}v$, $\bar{u}2\bar{u}v$; N at $2/3, 1/3, \bar{v}$; and C at $1/3, 2/3, \bar{v}$, $2/3, 1/3, v$, $1/3, 2/3, v$, $2/3, 1/3, \bar{v}$. For the chlorostannate u and v have the values 0.16 and 0.17.

L. S. RAMSDELL

Structure of triclinic-pinacoidal crystals and racemate formation. A. REIS. *Z. Krist.* 66, 417-20 (1928).

H. G.

The crystal lattice of Fe₃N. RUDOLF BRILL. *Z. Krist.* 68, 379-84 (1928).—See *C. A.* 22, 4019.

L. S. RAMSDELL

Atomic distances in mixed crystals of gold and copper. A. E. VAN ARKEL AND J. BASART. *Z. Krist.* 68, 475-6 (1928).—Interat. distances are detd. for a series of mixed crystals of Au and Cu, and compared with theoretical values.

L. S. RAMSDELL

The crystal structure of *cis*-ethylene oxide-dicarboxylic acid. A. REIS AND W. SCHNEIDER. *Z. Krist.* 68, 586-94 (1928).—This compd. is monoclinic prismatic, with the axial ratio 3.118:1:0.998; $\beta = 91^\circ 10'$. The symmetry is that of space group C_{2h}^6 , and there are 8 mols. of $C_4H_4O_6$ in the unit cell, which has the dimensions $a = 21.50$, $b = 6.90$ and $c = 6.89$ A. U.

L. S. RAMSDELL

The crystal structures of indigo and fumaric acid. A. REIS AND W. SCHNEIDER. *Tech. Hochschule Karlsruhe. Z. Krist.* 68, 543-66 (1928).—Indigo is monoclinic prismatic and crystallizes in needles elongated parallel to the b axis. The axial ratio is 1.897:1:1.741, $\beta = 107^\circ 30'$. The space group is C_{2h}^5 and there are 2 mols. of $C_{16}H_{10}O_2N_2$ in the unit cell with the dimensions $a = 11.00$, $b = 5.8$ and $c = 10.09$ A. U. Fumaric acid is monoclinic prismatic, with axial ratio 0.503:1:0.438; $\beta = 111^\circ 5'$. The space group is also C_{2h}^5 , and there are 6 mols. of $C_4H_4O_4$ in the unit cell in which $a = 7.60$, $b = 15.11$ and $c = 6.61$ A. U.

L. S. RAMSDELL

The crystal structure of pentaerythritol tetraacetate. H. MÖLLER AND A. REIS. *Z. Krist.* 68, 385-6 (1928).—A new interpretation of the results (cf. *C. A.* 22, 2089) leads to a revised structure in agreement with that of Knaggs (cf. *C. A.* 22, 3073).

L. S. RAMSDELL

The crystal structure of the butyl-, amyl-, hexyl- and heptyl-ammonium halides. STERLING B. HENDRICKS. *Z. Krist.* 68, 189-203 (1928). (In English.)—The crystal structures of the chlorides, bromides and iodides of the above compds. were detd. The space group is $4D-2$, $4d-3$, $4Di-7$, $4c-1$, $4e-1$ or $4C-1$. The structures are all similar to that of NH_4MeI (cf. *C. A.* 22, 2861). At. positions and parameters are given. The C atoms

of the hydrocarbon groups have a colinear configuration, which suggests modification of the present accepted interpretation for long-chain aliphatic compds. L. S. RAMSDALL

An investigation into the structure of cesium and ammonium sulfates. WM. TAYLOR AND T. BOYER. *Mem. Proc. Manchester Lit. Phil. Soc.* 72, 125-37(1927-8).—The space group of the isomorphous sulfates of Cs and NH_4 was detd. by x-ray investigation to be V_h^{16} . The dimensions of the unit cell are for Cs_2SO_4 — $a = 6.24$ A. U., $b = 10.92$ A. U., $c = 8.22$ A. U. and for $(\text{NH}_4)_2\text{SO}_4$ — $a = 5.98$ A. U., $b = 10.62$ A. U., $c = 7.78$ A. U. Four mols. are contained in the unit cell. From a study of the intensities of x-rays reflected from the crystals, positions are assigned to the constituent atoms which appear to give the best general agreement between observed and calcd. values of the sum of the scattered amplitudes. Crystals of the 2 compds. have very similar structures.

H. STORRTZ

The form of the central carbon atom in pentaerythritol tetraacetate as shown by x-ray crystal analysis. I. ELLIE KNAGGS. *Proc. Roy. Soc. (London)* A122, 69-76 (1929); cf. C. A. 22, 3073.—Pentaerythritol tetraacetate crystallizes in the tetragonal bipyramidal class; the crystals are built on the Bravais lattice Γ , and the space group C_{4h}^4 ; there are 2 mols. per unit cell, which has the dimensions 11.98×5.47 A. U. The mols. possess a 4-fold alternating axis of symmetry. A probable structure is suggested from which it follows that the symmetry of the central C atom may be tetrahedral although some slight departure from tetrahedral symmetry is possible.

J. B. AUSTIN

Melting curve of hydrogen to 245 kg./sq. cm. W. GULIK AND W. H. KEESOM. *Proc. Acad. Sci. Amsterdam* 31, 1059-60(1928).—See C. A. 23, 1537. In the abstract referred to g. is incorrectly used instead of kg.

F. C. M

The production and uses of tantalum. G. MALCOLM DYSON. *Chem. Age (London)* (Monthly Met. Section), 20, 18-9(1929).

E. H

X-ray studies of the binary systems of iron with phosphorus, arsenic, antimony and bismuth. GUNNAR HÄGG. Univ. Stockholm. *Z. Krist.* 68, 470-2(1928).— Fe_3P has a body-centered tetragonal lattice, with $a = 9.090$ and $c = 4.446$ A. U. The space group is probably S_4^2 . There are 8 mols. in the unit cell. Fe_3P is hexagonal, with symmetry D_{3h} as shown by Laue photographs. The unit cell contains 3 mols. and has the dimensions $a = 5.852$ and $c = 3.453$ A. U. Additional P introduces new lines, probably corresponding to FeP , but no structure was detd. for this compd. Displacement of the Fe lines indicates that about 5% of As is sol. in α -Fe at room temp. The results with Fe_3As may indicate a tetragonal cell, containing 4 mols., with $a = 5.129$ and $c = 5.973$ A. U., but this is questionable. FeAs is orthorhombic, and 4 mols. are in a cell with $a = 3.366$, $b = 6.016$, and $c = 5.428$ A. U. FeAs has a modified NiAs structure. Repeated trials gave no evidence of a compd. Fe_3As_2 . The x-ray pattern indicates that about 7% of Sb is sol. in α -Fe at room temp. Compns. from Sb 63.5 to 65.5% are homogeneous, with a NiAs type of structure, but FeSb corresponds to 59.25% Sb. FeSb is orthorhombic. The unit cell contains 2 mols. and has $a = 3.189$, $b = 5.819$ and $c = 6.520$ A. U. The space group is V_h^{12} and the structure is analogous to that of marcasite, FeS_2 , with Fe atoms at 000 and $\frac{1}{2}, \frac{1}{2}, \frac{1}{2}$, and Sb at $ou\bar{v}$; $ou\bar{v}$; $\frac{1}{2}, u + \frac{1}{2}, v + \frac{1}{2}$; $\frac{1}{2}, \frac{1}{2} - u, \frac{1}{2} - v$, where $u = 0.177$ and $v = 0.354$. In the system Fe-Bi no solid soln and no compds. were found.

L. S. RAMSDALL

The vapor density of steam. C. S. MARTIN, J. E. DAY AND W. L. EVANS. *J. Chem. Education* 6, 107-8(1929); cf. C. A. 18, 3137.—Improvements in manipulative details, better insulation with asbestos to prevent condensation, etc., are suggested in order to enable a student to det. the mol. wt. of H_2O with greater accuracy. W. C. E

Measurement of the time of adherence by entrainment experiments. P. CLAUSSING. *Natuurk. Lab. N. V. Philips Gloeilampenfabrieken, Eindhoven. Physica* 8, 289-304 (1928); cf. *Dissertation, Leiden*, 1928.—Previous expts. were improved (Holst and C. A. 20, 1737) and a new method was devised to measure the time during which a mol. adheres to a wall after impact. The same method allowed measurement of the coeff. of accommodation of metal vapors on walls. The adherence period τ is the reverse of the probability w of evapn. of the adsorbed mol.; at a time t , reasonably long, the no. of molecules adsorbed per sq. cm. is $a = \nu\tau$ for ν the d. of incidence. For small ν (i. e. low pressure) this equation represents an adsorption isotherm. From Frenkel's theory (C. A. 18, 3302) is derived an estimate of τ as dependent on temp. $\tau = 2.84 \times 10^{-13} \cdot 10^{10}/RT$ for Cd mols. on a layer of picein. For Cd on Ag the expts. of Estermann give (C. A. 19, 3211) at $T = 200$, $\tau = 3.7 \times 10^{-11}$ whereas a value of 2.9×10^{-11} is derived from comparison with the previous results on picein. The very poor agreement is evidence of the imperfection of the present theory. A beam of metal vapor from a furnace orifice

(0.2 cm.) enters a tube drilled in one side of a large metal body and terminating after a path of 3.2 cm. in a narrow opening (0.030 cm.). The beam impinges on the surface of a revolving plate which moves rapidly over the opening. Mols. evapg. from the plate condense again on the face of the metal body (plate and face are parallel; the metal body, brass, is well cooled). The entire app. is *in vacuo*. For a shift δ of the ppt. on the brass away from the narrow exit opening due to momentum of the molecules the relation is derived $\tau = (\Delta - \delta)/Z.2\pi q$ in which Δ is the measured distance between center of gravity of the ppt. and the center of the orifice, Z the no. of revolutions of the plate per sec., q the distance (1.90 cm.) of the orifice to the center of rotation of the plate. Under the exptl. conditions the accuracy in τ was 0.4×10^{-6} sec. For the revolution of the plate a magnetic field of 500 cycles was used, the metal was cooled by liquid oxygen, T detd. by thermocouples. The temp. of the plate could be varied by irradiation from a heating element in back of it; the surface was coated with various exptl. materials. The tracks of the mols. on the metal were rather diffuse round spots, never stretched in one direction, as at first expected. From the exptl. data with densities of incidence of $\nu = 0.52 \times 10^{17}$ ($T_{\text{furnace}} = 570^\circ$) and 1.13×10^{17} ($T_f = 589$) was found for Cd on picein, on mica and on copper at temps. of more than 193° , 186° and 176° , resp. (actually about 200° abs.), τ smaller than 10^{-6} sec. The fact that Δ and δ agree well if for calcn. of δ the plate temp. T_p is used (not the furnace temp. T_f) makes it obvious that there must be a measurable time of adherence larger than the proper vibration period of the mols.; therefore 10^{-12} sec. $< \tau < 10^{-6}$ sec. Also the accommodation coeff. (fraction of mols. assuming speed and energy of wall) is near unity. The results are not in agreement with those of Chariton and Semenov (*C. A.* 18, 3299), τ being considerably shorter. An objection to the method used is the imperfect gas removal (10^{-5} mm. Hg vacuum), which might have left gas adsorbed on the plate, although its surroundings were all at a 100° lower temp. The same objection, however, can be made to the work of C. and S.

B. J. C. VAN DER HOEVEN

Osmosis of ternary liquids—general considerations. VII. F. A. H. SCHREINMAKERS. *Proc. Acad. Sci. Amsterdam* 31, 923–30 (1928).—See *C. A.* 23, 1536.

E. C. M.

Densities of propyl and isobutyl alcohols at low temperatures. SHINROKU MITSUKURI AND YOSHIO KITANO. *Tohoku Imp. Univ. Proc. Imp. Acad. (Japan)* 5, 21–2 (1929).—Values of d for PrOH from -24.7° to -112.0° and for iso-BuOH from -14.7° to -110.8° are reported; the equations are: PrOH , $D = 0.8193 - 0.00008749t + 0.000001351t^2$; iso-BuOH , $D = 0.8169 - 0.0007055t + 0.000000684t^2$. C. J. WEST

An experiment demonstrating the slow miscibility of two liquids of different densities. THOMAS G. THOMPSON. *Univ. Washington. J. Chem. Education* 6, 523 (1929).

F. H.

Viscosities of ethyl, propyl and isobutyl alcohols at low temperatures. SHINROKU MITSUKURI AND TOKUZO TONOMURA. *Tohoku Imp. Univ. Proc. Imp. Acad. (Japan)* 5, 23–6 (1929).—Values for d and η are given for EtOH from -0.3° to -98.11° ; for PrOH from -0.30° to -70.61° ; and for iso-BuOH from -0.25° to -38.83° . These results are expressed by the equation $\log \eta = -A + [B/(T - C)]$; the values for A , B and C are: Et_2O , 3.3330, 163.30, 70.14; Me_2CO , 3.3686, 208.92, 58.05; MeOH , 3.3079, 245.01, 74.70; EtOH , 3.5144, 396.84, 51.27; PrOH , 3.8913, 552.60, 50.45; iso-BuOH , 3.8524, 498.28, 93.43.

C. J. WEST

Mixture of ethyl and amyl alcohols and water. B. LAMPE AND W. KILP. *Z. Spiritusind.* 51, 250 (1928).—The expansion in vol. and cooling resulting when amyl alc. is mixed with aq. EtOH are due to the affinity of the former for the EtOH . Density detns. of mixts. of Et and Am alcs. by an alcoholometer give the correct proportion of water because amyl alc. has the same effect on the d as EtOH .

A. SCHULTZ

The anisotropic liquids: facts and theories. C. W. OSEEN. *Univ. Upsala. Fortschr. Chem., Physik physik. Chem.* 20B, 87 pp. (1929).—This monograph gives a brief historical résumé, and a description of the phenomena of anisotropic liquids. Born's theory (cf. *Sitzungsber. k. preuss. Akad. Wissenschaften* 1916, p. 614) is based on the assumption that the mols. of a dielectric under the influence of the elec. field of the neighboring mols. are polarized so as to become elec. dipoles. Oseen's theory (for complete mathematical treatment cf. *K. Svenska Vetenskapsakademiens Handlingar* 61, 1921) considers the mols. as rigid bodies exerting forces on each other which are in part attractive, acting on the center of gravity, and partly torsional, tending to orient the mols. At sufficiently low temps. these forces cause the mols. to unite to form aggregates that explain adequately the properties of cryst. liquids (cf. Bose, *C. A.* 1, 2662).

A. P. SACHS

Determination by x-rays of density and axial ratio of hexagonal silver iodide.

N. H. KOLMEIJER, W. J. D. VAN DOBBENBURGH AND H. A. BOEKENOOGEN. *Proc. Acad. Sci. Amsterdam* 31, 1014-27(1928).—See C. A. 22, 3811. E. H.

Reactions between ferrous oxide and carbon and between carbon monoxide and iron. V. FALCKE. *Z. Elektrochem.* 34, 393-8(1928).—Polemical. A criticism of the work of Schenck (C. A. 21, 1743). J. H. REEDY

First stages in the development of our views concerning the equilibrium system iron-carbon-oxygen. RUDOLPH SCHENCK. *Z. Elektrochem.* 34, 399-403(1928).—A reply to Falcke's criticisms (cf. preceding abstr.). J. H. REEDY

The resistance to bending of easily deformable materials, especially of vulcanized rubber. R. ARIANO. *India Rubber J.* 77, 136(1929).—A correction of equation 15 in the paper abstracted in C. A. 23, 747. C. C. DAVIS

Current conduction in extremely high resistance and solid insulators. FRITZ REGLER. *Physik. Z.* 29, 869-73(1928).—A theory of the mechanism of conduction in substances of high resistance and solid insulating materials is presented and compared with existing data. A great part of the resistance is assumed to exist in the transition regions between microcrystals. Change of resistance as a function of potential is due to changes in the size of unit cells. On the basis of these assumptions Ohm's law is no longer valid. FRANK URBAN

A method of simultaneous determination of plasticity and elasticity. E. C. BINGHAM AND J. W. ROBERTSON. Lafayette Coll., Easton, Pa. *Kolloid-Z.* 47, 1-5(1929)

Elastic deformation is independent of the time the force acts, while permanent deformation (plastic) is proportional to this time. The method measures the deformation during small unequal time intervals, and the results allow calcs. of the instantaneous deformation. Pressure is applied alternately to each end of a capillary contg. the material (43% ammonium oleate soln.); the period of application is governed by the speed of the compressing piston. An embedded particle is used to follow the deformation. The elastic and plastic components of the total deformation are calcd. G. CALINGAERT

The ditartrates of the alkali metals potassium, rubidium and cesium and of ammonium and thallium. MARY W. PORTER. *Z. Krist.* 68, 531-42(1928). (In English); cf. C. A. 22, 2089.—A crystallographic and optical study was made of this series of isomorphous orthorhombic compds. Densities, mol. vols., axial ratios, refractive indices, optical character, optical angles and dispersions are given. L. S. RAMSDELL

The solubility of Reinsch antimony films in water. S. G. CLARKE. *Analyst* 54, 99-101(1929).—The results of 6 tests of the soly. of Sb deposited on Cu show that it is not necessary to use "boiled out" water for washing the Reinsch coils but the washing should be done promptly and rapidly. W. T. H.

Surface oxidation of aluminum, tungsten and molybdenum. LEONARD C. BANISTER. Univ. of Liverpool. *J. Chem. Soc.* 1928, 3163-6.—Films of varying thickness were formed on the surfaces of Al, W and Mo strips by anodic oxidation. In all cases the results indicated that the films were oxides which cause interference of light in the visible region of the spectrum and so produce color. The color varies with the voltage and the no. of coulombs used in depositing the film. H. F. JOHNSTONE

Oxide films responsible for the tints on heated copper. ULICK R. EVANS. Univ. of Cambridge. *Nature* 123, 16(1929); cf. C. A. 22, 523.—Films of CuO formed on Cu are isolated by dissolving the Cu electrolytically in concd. K_2SO_4 soln. The oxide films peel off in curling flakes, which retain the grooves and ridges left by the abrasive treatment used to clean the Cu before oxidation. Thick films can also be removed mechanically. The tints of heated Cu are due to Cu_2O . In a too severe treatment, CuO is also formed, but it obscures the colors of the film. A flame of pure alcohol is suitable for obtaining a film of Cu_2O . ALBERT L. HENNE

Studies of salt coloration caused by pressure. K. PRZIBRAM. *Sitzb. Akad. Wiss. Wien, Abt. IIa*, 137, 409-421(1928); cf. C. A. 23, 331.—Previous observations of the influence of pressure on the discoloration of rock salt were confirmed. Crystals obtained from a melt do not show increased discoloration under moderate pressure. Under strong pressure the blue pressure coloration appears. The repression of the blue coloration by very high pressure is a function of the duration of the pressure. Ultramicroscopic observations show that the blue compressed salt is nearly optically void. It may be regarded as an intermediate stage between the yellow state and one colored blue by ultramicroscopy. The measurements of W. Ottmer on alkali halogens compds. (C. A. 22, 1277) confirm the author's "rule of the diagonal" as well as the relation between stability of coloration and electron linkage. FRANK URBAN

Absorption of carbonic acid by iron hydroxide. J. TILLMANS, P. HIRSCH AND K. SCHILLING. *Kolloid-Z.* 47, 98-101(1929); cf. C. A. 23, 1973.—Corrosion expts. led to the belief that dissolved H_2CO_3 was adsorbed by the $Fe(OH)_3$. Subsequent

work showed this to be true. The relation between free and bound H_2CO_3 was found and the probable mechanism described.

L. F. MAREK

Adsorption of arsenious anhydride by ferric hydroxide. A. BOUTARIC AND M. LLE. G. PERREAU. *J. pharm. chim.* **8**, 211-21(1928); cf. *C. A.* **22**, 2502.—A quant. study of the adsorption of As_2O_3 in soln. by $\text{Fe}(\text{OH})_3$ shows that this adsorption is practically instantaneous. Other conditions being equal, the quantity of As_2O_3 adsorbed increases (1) with the concn. of the As_2O_3 solns. in equal vols. taken; (2) with the vol. of the solns. of As_2O_3 having equal concn.; (3) with the quantity of $\text{Fe}(\text{OH})_3$ employed. Aging of the $\text{Fe}(\text{OH})_3$ and temp. have no appreciable influence. Expts. made with hydroxides of other metals (Al, Cr, Cd, Zn, Mn) show that $\text{Fe}(\text{OH})_3$ is far from being the best adsorbent for As_2O_3 ; the most active hydroxides are those of Zn and Mn.

S. WALDBOTT

Adsorption of gases by solid sodium chloride and in its water solution. FELIX DURAU. *Ann. Physik* **87**, 307-84(1928).—Adsorption by salt with and without heat treatment was measured. Adsorption isotherms at 480° were made with N_2 , H_2 , CO_2 , NO_2 , CH_4 , C_2H_6 , C_3H_8 , N_2O and SO_2 . Adsorption of N_2 by 2 samples of NaCl agreed. Equal results only were obtained for water vapor, since an aq. soln. forms about each single crystal of the salt, preventing accurate measurements. Adsorption of O_2 in the soln. takes place irreversibly because of the low vapor pressure of H_2O above such a soln. Of all gases studied besides H_2O vapor, SO_2 is the only one giving a complete monomol. layer on the surface, H_2 giving only about 1% of such a layer. This signifies pure adsorption. The gases appear to diffuse into the NaCl. Below 0.4 mm. pressure only SO_2 shows detectable adsorption. Adsorption increases with the b. p. of the material adsorbed. The dipole character of CO causes "super-adsorption." Adsorption is due to internal pressure and is influenced by any factor affecting the crystal lattice. This is evidenced by heat treatment. Pretreatment of NaCl with gases does not show noticeable effects on the adsorption isotherms.

RAYMOND H. LAMBERT

Method of determining the absolute magnitude of surfaces. O. HAHN AND F. BOBEK. *Ann.* **462**, 174-85(1928).—An extension of previous work (*C. A.* **19**, 1090). The methods already described have been applied to the detn. of the specific surfaces of two Th salts, with U X as the radioactive indicator. Th oxalate, pptd. from a hot soln. of Th nitrate by means of oxalic acid and then kept under the supernatant liquid for 2 $\frac{1}{2}$ hrs. at 100° , had a sp. surface (defined as g. of substance in surface per 1 g. of substance) of 0.0205%, while for Th oxalate pptd. in the cold the corresponding figure was 0.136%. Th hypophosphate, obtained by pptn. of a boiling soln. of the nitrate with hypophosphate, gave the figure 9.35%. The abs. surfaces of the 3 specimens are, therefore, 0.12, 0.78 and 52 sq. cm., resp., since the abs. surface = $p\sqrt{N/Ms^2}$, where M = mol. wt., N is Loschmidt's number, p is the specific surface, and s is the density of the substance under examn.

B. C. A.

An optical method of determination of particle size in suspensions. G. I. POKROVSKII. *Kolloid-Z.* **47**, 55-8(1929).—Description of an "opaloscope" or spectrophotometer for giving the av. size of colloidal particles from the Mie effect of the scattering of transmitted light. It is suggested for use in the examn. of flames and sprays.

G. CALINGAERT

Magnetic field and Brownian movement. A. TURPAIN AND BONY DE LAVERGNE. *Compt. rend.* **187**, 1280-2(1928).—Dispersions of Prussian blue, gamboge, $\text{Fe}(\text{OH})_3$, chrome yellow, Venetian red and vermilion are not affected by a magnetic field. Particles of Fe, Ni, Co or Cr, placed in the dispersions under the influence of the field, do not affect gamboge or vermilion, but coagulation takes place in the other dispersions by an agglomeration about the added particles of metal.

F. G. VANDEN BOSCHE

The discharge of colloid membranes in alkaloid solutions. N. K. HARKEVICH. *Kolloid-Z.* **47**, 101-4(1929).—An app. is described for the detn. of the charge on colloid membranes and the results of expts. using HCl solns. and solns. of various alkaloid salts with membranes of cellulose, collodion, pyroxylin and agar-agar are given.

L. F. MAREK

The reciprocal action of ions in diffusion. VL. S. BUTKEVICH AND V. V. BUTKEVICH. *Landwirtschaftliche Akad., Moscow. Biochem. Z.* **204**, 303-21(1929).—From the equation of Donnan's membrane equil. it follows that the diffusion velocity of a dissolved electrolyte depends not only on the nature and concn. of the electrolyte but on other electrolytes in the soln. as well. Furthermore, the velocity with increasing concn. of the electrolyte does not change in proportion to the total concn. but more nearly as the relative no. of undissocd. mols. These deductions were approx. verified by diffusion expts. using colloidion membranes. Expts. with variable concns. of KNO_3 showed that the equiv. diffusion is not const., but increases with rising concn., the increase being in direct proportion to the increase in relative no. of undissocd. mols. With limited concns.

the ratio $\Delta D/\Delta(1-a)$ is almost const. HNO_3 and its alkali salts within the concn. of 0.01 to 0.001 *N* give the same $\Delta D/\Delta(1-a)$ as KNO_3 . In the case of $\text{Ca}(\text{NO}_3)_2$ this ratio is $2/3$ to $1/2$ that for KNO_3 . The differences in diffusion rate of various electrolytes are also ascribed to difference in ion mobility, which is especially noted in case of acids with the very mobile H ion. From an NH_4NO_3 soln. the 2 components diffuse through a collodion membrane in equiv. amts. only at p_H 3; at lower p_H the velocity of diffusion of NH_4 ion increases while that of NO_3 ion decreases; at the neutral point the diffusion of NH_4 ion by far exceeds that of NO_3 ion. Diffusion of the Na salts of H_3PO_4 also depends upon the acidity, that for free H_3PO_4 being 3 times as great as for Na_3PO_4 . Any electrolyte when added to the soln. of another electrolyte must promote its diffusion.

S. MORGULIS

Theory of emulsions. WO. OSTWALD. *Kolloid-Z.* 47, 131-2(1929).—"Phase-volume-theories" of emulsions as reported in the literature refer explicitly to pure, 2-phase, unprotected, and therefore mono-disperse systems. The expansion of these considerations into a theory for the existence and stability of practical, polydisperse, protected emulsions is based on a misunderstanding which has been introduced into the literature by W. Clayton ("Theorie der Emulsionen," Berlin, 1924) and Bancroft (*C. A.* 6, 2026).

L. F. MAREK

Preparation of negatively charged sols by means of tartaric acid. II. The colloidal nature of Fehling solution. A. DUMANSKII AND A. A. CHALISEV. *Kolloid-Z.* 47, 121-31(1928); cf. *C. A.* 22, 4308.—Observations reported in the literature on the colloidal nature of Cu tartrate solns. generally postulate reactions in stoichiometric proportions. Expts. tend to show that this is not true. The $\text{Cu}(\text{OH})_2$ sol in the alk. Fehling soln. is a strong oxidizing and catalytic agent because of its highly dispersed nature. This colloidal nature accounts for: aging of the soln., oxidation of sugars, production of Cu_2O sols., evidence of catalytic reactions, some of the difficulties entering into quant. sugar detns., etc.

L. F. MAREK

The preparation of pure silicic acid solutions by means of electrodialysis. I. Electrodialysis. SHUMPEI OKA. Tokyo Imperial Univ. *Chem. News* 138, 67(1929)

Pure $\text{Na}_2\text{SiO}_3 \cdot 9\text{H}_2\text{O}$ crystals were used to prepare the solns. Electrodialysis was performed in a 2-compartment cell, with a parchment-paper diaphragm; purification was completed in a 3-compartment cell. The voltage (10 to 100 v.) was regulated to maintain a uniform c. d. (usually 4 amps.). When the total resistance became too large, a constant voltage (150 v.) was applied. The NaOH soln. in the cathodic compartment was siphoned every 30 minutes, titrated, and replaced by distd. H_2O . From the titration the apparent current efficiency was calcd. After about 1000 mins., pure H_2SiO_3 solns. were obtained, whose concns. ranged between 1.39 and 4.46%. The current efficiency decreased with the Na concn. in the silicate soln. The total loss of H_2SiO_3 ranged from 5 to 60% of the original silicate: it was due to coagulation on the anode surface, and also to slight diffusion through the diaphragm. The loss by coagulation was lessened by suitable control of c. d., agitation and large diln. of the soln. A. L. H.

Stabilization of colloids. V. KULIKOV. *Compt. rend. soc. biol.* 97, 1337-9 (1927).—A series of substances has been prepared which permit the formation of a colloidal soln. from two mutually insol. substances. B. C. A.

Colloidal solutions of carbon. H. LACHS AND KAROLINA GESTEL. *Z. physik. Chem.* 137, 193-200(1928).—Colloidal solns. of C were prepd. according to the method of Sabbatani (*C. A.* 8, 1690) except that dialysis was continued for 8-10 days. The solns. are reproducible, may be concd. by evapn. and will keep for weeks. With the paraboloid and immersion ultramicroscopes small, isolated sparkling particles and barely visible submicrons are seen in this sol. The sol does not change appreciably with time even at 90° and after coag. Since double refraction is absent the sol is considered entirely amorphous. Coagulation values for various electrolytes are given. Among those studied only Th salts coagulated the sol completely, leaving a colorless soln. The particles probably are not uniform in size. Ultrafiltration indicated that 75% of the C is dispersed in particles less than 140.8μ in diameter. Depolarization of the Tyndall light increases with concn. when the dispersion medium is very pure distd. water but it decreases when the medium is ordinary distd. water. RAYMOND H. LAMBERT

The stability of "submicrons." Decomposition and formation of crystals. Formation of emulsions. J. TRAUBE. Tech. Hochschule, Berlin. *Kolloid-Z.* 47, 45-7 (1929).—Ultramicroscopic observation of crystals of moderately sol. compds. of complicated structure indicates that the crystal walls resolve into large numbers of submicroscopic particles, which may have a "life" of one or more mins. In the formation of certain crystals the linking up of chains of such particles was observed. Observations on a $\text{CHCl}_3\text{-H}_2\text{O}$ emulsion are included. G. CALINGAERT

The state of solution of copper and iron in alkaline media in the presence of organic substances containing hydroxyl groups. WILHELM BACHMANN, PAUL GOLDSCHMIDT AND ERICH WEINGART. *Kolloid-Z.* 47, 49-55(1929).—Preliminary report of a comprehensive investigation, by dialysis, ultramicroscopy, ultrafiltration, and electrolysis, of the colloidal state of solns. of CuSO_4 and FeCl_3 with NaOH and addns. of glycol, glycerol, mannitol, dextrose, sucrose, inulin, dextrin and starch. The soln. character ranges from crystalloid (mol. complex) through colloid to suspension, depending on the proportions of alkali, org. addn. and added water.

G. CALINGAERT

Plasticity. H. A. J. PIETERS. *Chem. Weekblad* 26, 18-24(1929).—A review of plasticity, its detn. (direct and indirect) and of theories of the causes of plasticity with particular reference to clay. At least part of the confusion in matters of plasticity is due to the frequent use of clay as a test object where a homogeneous substance would allow more sharply defined conclusions. The plasticity of "clay" is that of a mixt. of a non-plastic substance and water; it depends on the clay species, the amt. of water, on electrolytes or org. substances present, etc. A very elaborate bibliography is given in footnotes.

B. J. C. VAN DER HOEVEN

The absorption of light in colloidal systems as a function of the thickness of strata. EDUARDO GALVEZ. *Kolloidchem. Beihefte* 28, 148-54(1929).—Consideration of the distribution of micelles in colloids and of the mechanism of light absorption, suggests a wave-like character for the curve for light absorption as a function of the strata. Application of this function to detg. the size of the micelle is considered. L. F. MAREK

Effect of temperature on the viscosity and ease of precipitation of sols of cellulose acetate and rubber. G. S. WHITBY AND W. GALLAY. McGill Univ., Montreal. *Trans. Roy. Soc. Can.* (preprint), [3], 23, 1(1929); cf. C. A. 22, 2079.—A rubber sol in C_6H_6 showed only a small temp. coeff. of change in relative viscosity. Small temp. coeffs. were also found for sols of cellulose acetate in phenylethyl alc., benzyl alc., acetone and cyclohexanone. The temp. coeff. of the relative viscosity was not found higher in the case of gelatinizing than in non-gelatinizing sols but if anything the reverse. The addn. of a non-solvent pptg. agent showed that a larger quantity of the pptg. agent was required as the temp. rose and the ease of pptn. was affected by temp. change much more than was the relative viscosity. The authors conclude that pptn. by a non-swelling agent is not a reliable method for comparing the degree of solvation at different temps.

J. W. SHIPLEY

Figures produced on drying colloidal solutions. PAUL BARY. *Rev. gén. colloïdes* 6, 209-21(1928).—On slow drying of colloidal Fe_2O_3 formed from FeCl_3 , parallel lines are shown, one region of which is much more basic than the other. Pectograms of colloidal Sb_2S_3 , Au, tannin, S, MoS_3 , Congo red, fuchsin, rubber in benzene, Cu oleate as well as Fe_2O_3 are shown and the method of prep. them is explained. Such pectograms give a new method for studying the structure of colloidal solns. of various kinds.

RAYMOND H. LAMBERT

The effect of electrolytes on organic iso-colloidal systems. LÁSZLÓ AUER. *Kolloid-Z.* 47, 38-43(1929).—When salts are dissolved in fatty oils (linseed, castor, sunflower) by heating, the oils increase in viscosity without the further prolonged heating which is usually necessary. There are distinct differences in viscosity produced by different anions and cations. The explanation is offered that oils are two-phase (iso-colloid) systems, the effect of the salt being to change the proportions of the phases.

G. CALINGAERT

The condition of the micelles in starch. M. SAMEC. *Kolloid-Z.* 47, 81-2(1929); cf. C. A. 22, 4309.—S. finds his views not in opposition to the complex theory of Malottiano.

G. CALINGAERT

The precipitation of gelatin by inorganic colloids. R. WINTGEN AND H. ENGELMANN. *Kolloid-Z.* 47, 104-21(1929).—Corresponding to the detn. of the equiv. wt. of colloidal Cr_2O_3 with stannic acid sols, the equiv. wt. of colloidal Al_2O_3 was detd. by coagulation and neutralization with colloidal stannic acid at the max. pptn. point. By pptn. with colloidal Cr_2O_3 and Fe_2O_3 sols the equiv. aggregate wt. of gelatin was detd. as 32,000, which agrees with the value obtained by osmotic pressure methods. By using colloidal Al_2O_3 the equiv. wt. was detd. as 19,700, presumably because all the charges on the oxide particle had not been neutralized. In acid soln. and with aging the gelatin showed an equiv. wt. very much greater passing through a max. when plotted against time of standing.

L. F. MAREK

Structure of clear sodium oleate gels and the particle count in these gels. R. ZSIGMONDY. *Kolloid-Z.* 47, 97-8(1929).—Contrary to the findings of McBain and Laing, Thiessen has shown a fine thread-like structure in clear, highly viscous sodium oleate

gels. For the same concn. the gel may be made either clear or contg. nuclei by changing the degree of undercooling.

L. F. MAREK

Transition temperatures of gel-forming systems. SAKAE TSUDA. *Kolloid-Z.* 47, 28-36(1929).—Gelatin sols at high temps. show neither viscosity of structure nor aging. Both properties appear simultaneously below a definite temp., which is 33-35° for solns. of 2 to 8% gelatin, and corresponds to the crit. temp. of gelatinization. Hg sulfosalicylate up to 100° shows no such transition temp. Salts or EtOH affects this temp. only slightly in the case of gelatin. Sols of agar behave differently from gelatin. The fact that the temp. of liquefaction is much higher than the temp. of solidification shows that, when it is heated, the previously cooled sol tends to retain its viscosity of structure.

G. CALINGAERT

Syneresis and hydration. The theory of syneresis. S. LIPATOV. *Kolloid-Z.* 47, 21-8(1929); cf. *C. A.* 22, 4314.—Further report of expts. with geranin, on velocity of syneresis and gelation in relation to concn. of geranin and degree of hydration. I. concludes that these are reversible processes governed by temp. and pressure, in contrast to irreversible, corresponding phenomena in SiO₂ gelation, for which some results are given.

G. CALINGAERT

Studies of surface tensions of solutions. I. The effect of salts upon the surface tension of aqueous urethan solutions: the measurements. SVEN PALITZSCH. *Tech. Hochschule, Copenhagen. Z. physik. Chem., Abt. A*, 138, 379-98(1928).—A critical review of the literature on surface tension and allied phenomena in salt-contg. solns. of "capillary-active" substances is given. P. has observed with considerable accuracy and care the influence of dissolved salts on the surface tension of aq. urethan solns. by use of the drop-weight method in air at 25°. He has measured the surface tension of pure urethan solns. of varying concn. and the effect of varied concns. of salts (NaCl, KCl, LiCl, CaCl₂·6H₂O, BaCl₂, HgCl₂, AlCl₃·6H₂O, KBr, KI, KNO₃, Na₂SO₄, (NH₄)₂SO₄, MgSO₄·5H₂O, MnSO₄, ZnSO₄·7H₂O, CuSO₄·5H₂O, K₂CrO₄, Na₂S₂O₃·5H₂O, KH₂PO₄, Na₂HPO₄·2H₂O, KClO₃, KBrO₃, K₃Fe(CN)₆ and K₄Fe(CN)₆·3H₂O) upon different aq. solns. of this material. The work is considered to be accurate to 0.2%. **II. The determination of surface tension by drop-weights.** *Ibid* 399-410.—P. gives a discussion of the use of the drop method, beginning with the simple equation of Tate. He explains Moran's manner of using the drop method and dwells on Harkins' treatment of the problem by the latter's introduction of the empirical correction factor, $f(r)/(V^{1/3})$; thus, $\gamma = (wG)/(2\pi f)(r/V^{1/3})$. P. agrees fully with Harkins and has developed a slightly modified treatment of the subject in direct accord with H.'s views. P. further shows that Iredale's (cf. *C. A.* 17, 2664) method and equation are mathematically derivable from H.'s formulas, the two considerations being of like principle. P. disagrees with Goard and Rudal (cf. *C. A.* 19, 3405) in their criticism of H.'s equation. **III. The effect of salts upon the surface tension of aqueous urethan solutions: discussion of results.** *Ibid* 411-31.—The results of P.'s measurements are treated in two ways, (1) variation of surface tension with urethan concn. at const. salt concn., and (2) change of surface tension with salt concn. at const. urethan concn. Consequently many plots are presented. For low concns. of urethan, the surface tension falls off less rapidly (even increasing in some cases) with rising salt concn. than for the higher concns. of urethan. Little theoretical treatment can be given.

WILLIAM E. VAUGHAN

The rotatory power of tartrates of organic bases. Study of strong electrolytes. E. DARMOIS. *Compt. rend.* 188, 388-90(1929).—Detn. of $[\alpha]_D$ as function of mol. concn. of tartrate ion (T²⁻) in solns. of tartrates of certain org. bases stronger than NH₃, gives decreasing $[\alpha]$ in following order: NH₄, NH₃Et, NH₂Et₂, NHEt₃, NEt₄, while benzyl amine gives considerable increase in $[\alpha]$ over NH₄. If the complete dissoen. of the Debye-Hückel theory is admitted, C₇H₁₀N⁺ and NEt₄⁺ act in contrary sense on T²⁻, but these two ions, judged by their mobilities, have nearly equal radii and their deformation of T²⁻ must be of same order. Only their hydration can be different. As C₇H₁₀N⁺ is probably not hydrated, NEt₄⁺ must be strongly hydrated. Methylammonium tartrates also give the same order for $[\alpha]$, which is in increasing order of hydration of ions as detd. independently. Diminution in $[\alpha]$ is attributable to dehydration; increase in $[\alpha]$, to deformation of T²⁻ provided no undissocd. mols. are present. A. P. SACHS

Liquid ammonia as a solvent and the ammonia system of compounds. III. The properties of solutions of metals in liquid ammonia. WARREN C. JOHNSON AND W. CONARD FERNELIUS. *J. Chem. Education* 6, 20-35(1929); cf. *C. A.* 22, 3082, 3365-6. A résumé of the work of Kraus and co-workers on liquid NH₃ soln. of the alkali metals. The nature of the reactions and of the elec. cond. of dil. solns. of these metals shows that they are ionized into ordinary alkali metal ions (positive ions) and solvated electrons (negative ions). Concd. solns. of the alkali metals exhibit metallic conductance. The

alkali metals do not form addn. compds. with NH_3 and the so-called "metal ammoniums" do not exist. When Na is dissolved in liquid NH_3 there is a remarkable decrease in the d. of the soln.

W. C. FERNELIUS

Solubility and solution velocity of solid compounds. E. N. GAPON. Chem. Lab. des Inst. für Volksbildung, Charkow. *Z. Elektrochem.* **34**, 803-5(1928).—The soln. of a solid compd. in a liquid solvent is regarded as a process analogous to vaporization. A relation between the velocity of soln., the heat of soln., and the soly. of the compd. is calcd.

ALBERT L. HENNE

Dielectric constants of some organic solvents. YOSHIKATSU MATSUIKE. Tohoku Imp. Univ. *Proc. Imp. Acad.* (Japan) **5**, 29-31(1929).—Dielec. consts. for C_6H_6 , PhMe, CS_2 , CCl_4 , Et_2O and CHCl_3 are reported for various temps. between the b. p. and f. p. For C_6H_6 and PhMe the values were calcd. from the equation $c = Dc_0 + k$, where c_0 is the elec. capacity of the cell without the liquid sample and c that of the same cell with the solvent. For the other liquids the equation $D = (D_0 - 1)[(c - c_0)/(c_s - c_0)] + 1$, where c_s is the elec. capacity of the cell filled with the reference liquid, C_6H_6 or PhMe, whose dielec. const. is D_0 . Full results will be published in *J. Chem. Soc. Japan*.

C. J. WEST

Selective solvent action. VII. Solubilities in mixed solvents. NORA GREGG-WILSON AND ROBERT WRIGHT. Glasgow Univ. *J. Chem. Soc.* **1928**, 3111-5; cf. *C. I.* **21**, 3296.—The soly. of PhNHAc in aq. acls., benzene-alc. solns., and in mixed acls. and the soly. of phenanthrene in aq. alc. solns. were studied. The results agree with the idea of selective influence of the different groups of the solvent mols. on the soly. of the solute.

H. F. JOHNSTONE

Improvements in the methods of refractivity measurements in solutions. W. GEFFCKEN AND H. KOHNER. Chem. Lab. Bayer. Akad. Wiss., Physikal. Chem. Abt. *Z. physik. Chem., Abt. B*, **1**, 456-65(1928).—In order to increase the convenience and accuracy of refraction measurements improvements in the detn. of refractive index and d. were devised. The Pulfrich refractometer was provided with a reading microscope and a more finely divided scale. A He tube was used instead of Na light as source of illumination. The cell was so altered as to permit of continuous change of samples and to prevent evapn. Provision was made for observing corrosive materials or those sensitive to air. The n of soln. and water were read directly after each other to eliminate error of varying zero-point corrections. The pycnometer was arranged to prevent evapn. during filling. The detns. of concn. by evapn. were improved to prevent spattering and loss of dry particles by air currents.

A. P. SACHS

The dependence of equivalent refractivity on the concentration of strong electrolytes in solution. H. KOHNER. Chem. Lab. Bayer. Akad. Wiss., Physikal. Chem. Abt. *Z. physik. Chem., Abt. B*, **1**, 427-55(1928).—Equiv. refractivity of solns. of LiCl , BaCl_2 , AlCl_3 , NaBr , Li_2SO_4 , Na_2SO_4 , $(\text{NH}_4)_2\text{SO}_4$, $\text{Al}_2(\text{SO}_4)_3$, NaClO_4 and $\text{Ba}(\text{ClO}_4)_2$ was detd. at 25° in concns. from 2 equiv. per kg. H_2O to satn. and was found to be dependent on concn., increasing or decreasing at varying rates with increasing concns. for the various salts. The equiv. refractivity at infinite diln. detd. by linear extrapolation gives values correct within the limit of error of direct detn. The equiv. dispersion is const. within limits of error.

A. P. SACHS

A new method of measuring osmotic pressure. ROBERT V. TOWNEND. *J. Chem. Education* **6**, 98-104(1929).—The method depends upon (a) the change in vapor pressure of a liquid with curvature of the surface; and (b) the fact that liquids will support a tension in virtue of the cohesive force between the mols. It is especially well adapted to the study of dil. solns.

W. C. EBAUGH

Correlation of freezing points and vapor pressures of aqueous solutions by Dühring's rule. CARL C. MONRAD. Univ. Michigan. *Ind. Eng. Chem.* **21**, 139-42(1929).—Dühring's rule states that if the temp. of one substance is plotted against the temp. at which another substance has the same vapor pressure, the curve produced is a straight line, i. e., $(T_1 - T_2)/(\theta_1 - \theta_2) = K$, and 2 points are sufficient to det. the line completely. Data for solns. of NaNO_3 , NaOH , KOH , CaCl_2 and NaCl show close agreement of observed and calcd. values of the slope of the Dühring line.

W. C. EBAUGH

Nernst's principle. A. CARRELLI. *Nuovo cimento* [N. S.] **5**, 341-6(1928).—Mathematical objection to Nernst's third law of thermodynamics.

L. T. F.

Hydrogen overvoltage with alloys. M. G. RAEDER AND D. EFJESTAD. Norges tekniske Høiskole, Trondhjem. *Z. physik. Chem., Abt. A*, **140**, 124-32(1928).—The H overvoltage was detd. by means of the c. d.-potential curves in the cases of the following alloys: Sn-Sb, Pb-Tl, Hg-Cd, Cu-Sn, Ag-Zn and Mg-Sn. Results previously published, (R. and Brun, *C. A.* **22**, 2133) are corrected. When mixed crystals are formed, the overvoltage curve may lie between those for each constituent separately (Hg-Cd), or it may

lie above that for either constituent (Sn-Pb, Cu-Sn, Ag-Zn). Eutectics seem to have little influence on the overvoltage: in the case of the Sn-Pb eutectic the value is intermediate between those for Pb and Sn. Compds. between the constituent do not affect the overvoltage measurably.

Reactions in liquid hydrogen sulfide. V. Reaction with furfural. R. E. MEINTS AND J. A. WILKINSON. Iowa State Coll. *J. Am. Chem. Soc.* 51, 803(1929); cf. C. A. 22, 3567.—Furfural and liquid H_2S were sealed in a glass tube and allowed to warm up to room temp. Reaction took place in which the O of the CHO group was replaced by S giving yellow crystals, m. 95–8°, corresponding to Baumann and Fromm's $C_5H_6O_2S_2$ (*Ber.* 24, 3591(1891)).

A. S. CARTER

The action of iodine on phosphoric acid and sodium phosphate. A. BERTHOUD AND W. E. BERGER. *J. chim. phys.* 25, 568–80(1928).—The rate of reaction between I and Na_3PO_4 is proportional to the concn. of I; it increases slightly more rapidly than the phosphite concn.; it is retarded by KI to a variable degree always less than unity; and it is retarded by H^+ to the order of about –1.3. The thermal coeff. varies from 4.81 to 4.01 between 0° and 30°. The rate of oxidation of H_3PO_4 by I is proportional to the I concn. and to non-dissocd. H_3PO_4 ; it is independent of the KI concn.; and it is slightly accelerated by H^+ . Its thermal coeff. is about 3.8 between 25° and 45°. Light does not sensibly affect either reaction.

R. H. LAMBERT

Experimental study of the transformation of chromates into dichromates. F. CARRIERE AND P. CASTEL. *Compt. rend.* 187, 1292–4(1928).—The equil. of the reaction $2CrO_4^{--} + 2H^+ \rightleftharpoons Cr_2O_7^{--} + H_2O$ was studied. $BaCrO_4$ was converted into the sol $BaCr_2O_7$ by addn. of HCl. Exptl. and calcd. values for the concn. of HCl with varying amts. of $BaCrO_4$ are given and found to agree for low concns. of $BaCr_2O_7$. The equil. const. is calcd. as follows: $K = [CrO_4]^2[H]^2/[Cr_2O_7] = [4.5 \times 10^{-8}]^2/[0.00165] = 3 \times 10^{-16}$.

E. G. VANDEN BOSCH

The influence of nonelectrolytes on the velocity of ionic reactions. A. VON KISS AND FR. L. HATZ. *Rec. trav. chim.* 48, 7–17(1929).—The influence of nonelectrolytes and of mixts. of electrolytes and nonelectrolytes on the rate of reaction of dil. I and thiosulfate solns. was detd. The rate of reaction increases with the concn. of sucrose or urea, but decreases with that of glycerol, MeOH, or EtOH. The rate of reaction in a 0.05 N aq. soln. of electrolyte contg. also 3 mols. per l. of EtOH was compared to the rate in the alc.-water soln. without the electrolyte; it was found that (1) the rate is always higher when electrolyte is present; (2) the order of decreasing effect, KNO_3 , K_2SO_4 , $Al_2(SO_4)_3$, NH_4NO_3 , $MgSO_4$, HCl and LiCl for the aq. soln. is also that for the alc. soln. with $Al_2(SO_4)_3$ and NH_4NO_3 reversed and (3) the relative increase in reaction rate is greater in the case of the alc. than aq. solns. in all cases except LiCl and $MgSO_4$. Expts. in which the concn. of NH_4NO_3 was varied first in an aq. soln. and then in a molar EtOH-water soln. and expts. in which LiCl was similarly varied showed that the accelerating activity in the aq. soln. is for LiCl greater and for NH_4NO_3 smaller than in the alc.-water soln. In some expts. 3 different concns. of reacting components were used. Such expts. lead to the conclusion that in the case of MeOH and EtOH, though the abs. rates in the alc.-water solns. are always less than for aq. solns., still the percentage increase in reaction rate with concn. of reactants is greater in the water-alc. than in the aq. solns. Furthermore, with increasing concns. of the nonelectrolyte, this percentage increase in reaction rate becomes more pronounced. For the most part, explanations for the above facts are not at present offered by the authors. In the case of the nonelectrolytes no simple relationship between the dielec. const. of the soln. medium and the reaction rate is found.

P. H. EMMETT

The velocity of combination of atomic hydrogen atoms. Z. BAY AND W. STEINER. Chem. Inst. of Berlin Univ. *Z. physik. Chem., Abt. B*, 2, 146–7(1929).—At H produced by discharge was drawn at a const. velocity through a tube 3 m. long and 2.5 cm. wide. At 3 places Wrede diffusion plugs for measuring the concn. of at. H were inserted. The distance between I and II was 51 cm., between II and III 95 cm. The mean of 6–8 measurements was taken for each datum. The catalytic influence of the walls was minimized by adding water vapor. By plotting time vs. concn. of at. H a straight line is obtained at 0.1 mm. pressure and a highly curved line at 0.2 mm. At a pressure of 0.2 mm. and at 35% H concn. the half period is 1 sec., a value agreeing with Bonhoeffer's (*Ergebn. d. exact Naturwiss.* 6, 215(1927)).

A. FLEISCHER

The laws of periodicity. P. PETRENKO-KRITCHENKO. Chem. Technikum Odessa. *Ukrainskii Khim. Zhurnal* 1, 304–6, also *J. prakt. Chem.* 120, 225–37(1929); cf. C. A. 19, 3053; 20, 369; 21, 1581; 22, 3574.—A review of the previous work on the velocity of reaction of aliphatic halides with KOH, Me₂NOH, Et₂NOH, Ba(OH)₂, TiOH, EtONa, Ag, NH₃, piperidine, H₂O, EtOH, AgNO₃, CH₃COOK and KCNS and of the periodicity

of optical properties in relation to unsatn. of hydrocarbons. As the number of halogen atoms increases, the reaction rate alternately falls and rises. In general, the mono- and tri-halogen compds. are more reactive than the di- or tetra-halogen compds. A. F.

Oxygen-compound formation with acetaldehyde at low temperature. D. L&B. COOPER. Dalhousi Univ., Halifax, N. S. *Proc. and Trans. Nova Scotian Inst. Sci.* 17, Pt. 2, 32-3(1928); cf. *C. A.* 22, 531.—A mixt. of powd. $(\text{AcO})_2\text{Mn}$ and a small amt. of AcH was placed in a bubbling tube. The tube was immersed in a $\text{CO}_2\text{-Et}_2\text{O}$ bath, and O_2 dried with P_2O_5 was circulated through the mixt. After about 12 hrs. approx. 20 cc. of O_2 was absorbed; the resulting soln. was of dark pink color. In an expt., in which 7 cc. O_2 were consumed, the final mixt. was titrated with NaOH. It was found that the entire amt. of O_2 absorbed had served for the formation of AcOH, though this formation may have taken place on warming the soln. to room temp. It is possible that the quantity of O_2 absorbed represents only the soly. of O_2 in AcH at low temp. No peroxide stable at room temp. was formed. G. SCHWOCH

The equilibrium constant of the esterification reaction in the gaseous phase. W. ŚWIĘTOSŁAWSKI AND S. POZNANSKI. *Roczniki Chem.* 8, 527-41(541 French)(1928).

The equil. const. K_g of the reaction between HOAc and EtOH in the gaseous phase was detd. The modified ebullioscope of Swietoslawski (*C. A.* 22, 514, 4012) was used and the compns. of the vapors formed in the equil. state were detd. The equil. const. was independent of temp. The mean value of K_g from 10 detns. was 59, the mean exptl. error being $\pm 10\%$. The value found by Edgar and Schuyler (*C. A.* 18, 777) is 7 times as large, but the exptl. error of the present detn. is $\frac{2}{3}$ as large as that made by E. and S. JAROSLAV KUČERA

Inhibition of chemical reactions. II. Mechanism of the inhibition of esterification by alkaline substances. KENNETH C. BAILEY. Trinity College, Dublin. *J. Chem. Soc.* 1928, 3256-8; cf. *C. A.* 22, 2917.—It is shown that the reaction between EtOH and AcOH occurs in two ways: (a) in the body of the liquid, and (b) on the surface of the containing vessel. The (b) type of reaction is inhibited by the following bases in the following order of increasing effectiveness: quinoline, pyridine, NaOH, NH_3 , piperidine. HCl catalyzes the reaction, while benzyl chloride, *m*-cresol, C_6H_6 , and CHCl_3 have no effect or a slightly accelerating one. DAVID DAVIDSON

Remarks on the thermodynamic theory of catalysis. R. DUBRISAY. *J. chim. phys.* 25, 581-6(1928). RAYMOND H. LAMBERT

Acid and salt effect in catalyzed reactions. XVIII. The dynamics of autocatalyzed ester hydrolysis. HARRY M. DAWSON AND WILLIAM LOWSON. *J. Chem. Soc.* 1928, 3218-27; cf. *C. A.* 23, 1337.—The rate of the autocatalytic hydrolysis of ethyl acetate was studied, over a variation in concn. of the acid catalyst of 0.0002 to 0.2 mols. per l. A fused-silica reaction vessel was used to avoid the retarding effect of traces of dissolved alkali noticeable almost invariably when glass vessels were used. "The reaction may be divided into 2 stages in the first of which the velocity is detd. by the joint catalytic action of the H and OH ions, and in the second by the catalytic activity of the H ion." Equations are derived from which the time required to reach any given point may be readily calcd. The velocities of the uncatalyzed reaction and of that due to the catalytic effect of water mols. are considered too small to influence the course of the reaction measurably. The kinetics of the reaction are worked out for that region of concns. in which the rate of the back reaction may be neglected. P. H. EMMETT

Surface chemistry of contact catalysis. GEORG M. SCHWAB AND ERICH PIETSCH. *Z. physik. Chem., Abt. B*, 1, 385-408(1928).—On the assumption that catalytic reactions between gases take place as a result of collisions in the 2-dimensional monomol. gas on the catalyst surface or in the 1-dimensional line of mols. at the interface of the surfaces of 2 solid phases, a new set of kinetic equations is developed differing from the usual treatment of the subject. *Adsorption isotherm* equations analogous to Langmuir's adsorption isotherm equation are derived and defined as expressing the quantity of gas going from the 2-dimensional adsorbed gas layer into the interface boundary line sepg. 2 surface phases. Both ideal and "unideal" 3-dimensional, 2-dimensional and 1-dimensional gases are considered. Langmuir's adsorption isotherm is derived thermodynamically. The kinetic equations obtained are identical with those developed from the theories of Langmuir, Hinshelwood and others, in the case of single reacting gases. In the case of 2 reacting gases, there are differences but the exptl. data available do not suffice for choosing between the 2 methods of development. Well-known interfacial surface phenomena and Taylor's "active spot" theory are explained satisfactorily by the point of view herein presented. P. H. EMMETT

The effect of heavy metals on the autoxidation of alkali sulfides and of hydrogen sulfide. HANS A. KRAUS. Kaiser Wilhelm-Inst., Berlin-Dahlem. *Biochem. Z.* 204,

343-6(1929).—The velocity of absorption of O_2 by various sulfides (Na_2S , $NaHS$, $(NH_4)_2S$, and H_2S) was measured in the presence or absence of heavy metals (Mn , Ni , Co , Fe , Cu). In the presence of the metal catalysts the O_2 consumption is practically doubled.

S. MORGULIS

Making preparations through the use of catalysts in organic chemistry instruction. STEFAN GOLDSCHMIDT AND LUDWIG ORTHNER. Tech. Hochschule, Karlsruhe, Germany. *Z. angew. Chem.* 42, 40-2(1929).—An app. consisting of an elec. tube furnace contg. a tube serving as reaction chamber, a thermocouple, and control devices for input and output, is described. Examples of processes used include (1) Me_2CO from glacial $AcOH$; (2) $AcOEt$; (3) $C_6H_5NH_2$; (4) AcH ; (5) ketene from $(Me)_2CO$; and (6) C_2H_4 .

W. C. EBAUGH

Study of the action of iron catalysts on mixtures of carbon monoxide and hydrogen. ETIENNE AUDIBERT AND ANDRÉ RAINEAU. Société nationale de recherches sur le traitement des combustibles. *Rev. ind. min.* 1928, No. 182, 286-314.— Fe , Ni and Co exert a catalytic action on mixts. of CO and H_2 and this study was to det. if these metals when in contact with gaseous mixts. would give liquid org. products. A study was made of different mixts. with a hydrated Fe_2O_3 base consisting of 98 parts anhyd. Fe_2O_3 and 2 parts of the following: Na_2CO_3 , Li_2CO_3 , $CaCO_3$, $SrCO_3$, $BaCO_3$, $MgCO_3$, $ZnCO_3$, $MnCO_3$, $CuCO_3$, Ag_2CO_3 , Al_2O_3 , Mo_2O_3 , TiO_2 or SiO_2 ; of these 15 mixts. those contg. an alkali carbonate (Na_2CO_3 or Li_2CO_3) formed org. liquids with gas of compn. $CO + 5H_2$ under 150 atm. pressure and a flow of 3000 cu. m. All the others gave CH_4 , CO_2 , slightly acid H_2O and finally C . There were then studied 5 mixts. with a ferric hydrate base, consisting of 98 parts Fe_2O_3 and 2 parts of the following: K_2SO_4 , K_3PO_4 , KNO_3 and K_2S . No oil was formed by the K_2S catalyzer but the other catalysts produced 11 cc. per cu. m. of gas from the sulfate; 9 cc. per cu. m. of gas from the phosphate, 13 cc. per cu. m. of gas from the borate; and 19 cc. per cu. m. of gas from the nitrate, with gas ($CO + 5H_2$) under 150 atm. pressure and a flow of 3000 cu. m. Mixts. were then prepd. by pptg. mixt. of Cu nitrate and Fe nitrate with an alk., adding to the ppt. K_2CO_3 in proportion to the Fe content and after drying, submitting the compd. obtained to the action of H_2 under atm. pressure at 200° for 4 hrs. and at 300° for 14 hrs., in such a manner as to reduce only the CuO but not the Fe_2O_3 . It was shown that the presence of Cu increased the catalytic action of the Fe_2O_3 - K_2CO_3 couple; the compn. of the catalyzer after reduction at 300° was Fe_2O_3 49.5, Cu 49.5, K_2CO_3 1.0%. With this compd. there were extd. from the $CO + 5H_2$ mixt. a mixt. of water and different org. liquid products in the following proportions: (1) Light carburetants (55-180° fractions of oil) 28.8%, light oil from activated charcoal 5.0%, alc. in soln. 29.0%, or a total of 62.8%; and (2) clear oil, 180-250°, 14.0%; (3) heavy oil, 250-330°, 10.0%; (4) paraffin 7.1%; (5) tar, 2.7%; (6) fatty acids distg. at 110° to 140° (weak acetic, propionic and butyric, 3.1%. With the Cu - Fe_2O_3 - K_2CO_3 catalyzer, it is not possible to lower the temp. and still be assured of regularity of the phenomena of transformation of the mixt. of CO and H_2 .

C. W. OWINGS

Autoxidation and antioxygenic action. Catalytic properties of silicon, boron and their derivatives. CHARLES MOUREU, CHARLES DUFRAISSE AND PIERRE LAPLAGNE. *Compt. rend.* 187, 1266-9(1928); cf. *C. A.* 22, 1265.—The catalytic effects of Si , B and their derivs. on the oxidation of various compds. studied are listed below (ox. = oxygenic)

	C_6H_5CHO	Na_2SO_3 (alk.)	Na_2SO_3 (acid)	C_3H_7CHO	Styrolene	Turpentine	Acrolein	Furfural
Si	retards	retards	hastens	hastens	.....	.....	.....	pro ox.
SiO_2	no action	anti-ox.	no action	.....	anti-ox.	no action	.....	anti ox.
$SiCl_4$	anti-ox.	anti-ox.	hastens	anti-ox.	pro-ox.	pro-ox.	.....	anti ox.
$SiBr_4$	anti-ox.	anti-ox.	hastens	.....	pro-ox.	pro-ox.	.....	anti ox.
SiI_4	anti-ox.	anti-ox.	retards	.....	pro-ox.	pro-ox.	retards then pro ox.	pro ox. anti ox.
$SiHCl_3$	anti-ox.	.....	anti-ox.	anti-ox.	hastens	hastens	.....	anti ox.
$SiCl_3CH_3-C_6H_5$	anti-ox.	.....	anti-ox.	.....	hastens	hastens	.....	.....
$Si(C_2H_5)_4$	hastens	.....	retards	.....	retards	hastens	.....	.....
$Si(OC_2H_5)_4$	.....	retards	retards	.....	retards	retards	.....	retards
$Si(C_6H_5)_4$	.....	hastens	hastens	hastens	.....	hastens	hastens	pro ox. then anti ox.
B	.....	retards	.....	hastens	hastens	hastens	.....	.....
BCl_3	anti-ox.	.....	.....	.....	hastens	.....	.....	.....
BBr_3	anti-ox.	retards	.....	anti-ox.	hastens	hastens	prevents then hastens	.....

As catalysts H_3BO_3 , $Na_2B_4O_7$ and $(C_2H_5)_2B_2O_7$ were weak or ineffective.

E. G. VANDEN BOSCHE

Experiments with carefully dried substances. D. McINTOSH. Dalhousie Univ., Halifax, N. S. *Proc. and Trans. Nova Scotian Inst. Sci.* 17, Pt. 2, 34-40(1928).—A mixt. of 2 mols. CO and 1 mol. O₂ is not ignited by the elec. spark, if the gases have been dried with freshly distd. P₂O₅. If the drying is performed by cooling the lower part of a Dewar flask in a CO₂-Et₂O-bath, the mixt. usually does not explode. On warming the Dewar flask explosion occurs when the bath temp. reaches -50° to -60°. A mixt. of CO and NO dried by cooling to -80° always explodes. Finely ground Na sulfate, in which all crystals have been destroyed by thorough air-drying, is not rendered inactive for bringing about crystn. of a supersatd. soln. of Na sulfate; on the contrary, crystn. takes place promptly. The same result is obtained when a side tube, which can be filled with P₂O₅ or immersed in liquid air, is attached to the app. used. Immediate crystn. is also observed when instead of the Na sulfate powder, glass hairs that have been rubbed gently over a Na sulfate crystal are introduced into the app. The pptg. action is due to the decahydrate, since no pptn. occurs when the tubes of the app. are heated to 45° before cooling them and introducing the Na sulfate. Expts were conducted to investigate whether carefully dried Hg and Cl will react with each other. In the app. used the vapors given off by Cl at -180° do not react with Hg; when, however, the tension of the Cl vapors is allowed to rise by warming the bath, a reaction can be noted. Vapors of HBr and NH₃ liberated from the resp. liquids at -80° react with each other as seen by the appearance of NH₄Br clouds on opening the app. after 24 hrs. The b. p. of Et₂O is not affected by distg. it several times at -80°. Attempts made to dry Et₂O with P₂O₅ under special precautions were unsuccessful. G. SCHWOCH

The kinetics of the reaction between metallic calcium and nitrogen. A. VON ANTROPOFF AND E. GERMANN. *Z. physik Chem* 137, 209-37(1928).—The object of this expt. was to det. the activity and passivity of metallic Ca when acted upon by N₂. The app. is described. Technical Ca obtained from magnesia works was analyzed for impurities. Three forms were isolated for study as follows: 1 always active, 2 sometimes active and again passive and 3 always passive. 1 and 3 showed traces of Na, Mg, Al, Fe, SiO₂, Ca₃N₂ and CaCl₂. At 350° 1 was converted quickly and completely into Ca₃N₂; 2 was sometimes converted completely and sometimes barely attacked; 3 was inert even after 7 days in the gas at 400°. Ca₃N₂ does not catalyze the reaction. At 400-440°, the reaction between pure Ca and pure N₂ takes place in three stages: a, a fast reaction involving only atoms of Ca on the surfaces of crystals, b, a very slow reaction involving atoms beneath the thin skin of Ca₃N₂ and c, a second fast reaction after the skin of nitride has reached a definite thickness. O₂ prevents N₂ from reacting with a fresh surface of Ca but a skin of Ca₃N₂ once having formed the metal is protected against O₂ and the N₂ action proceeds. Li, Na, K and probably also Rb and Cs influence the reaction greatly not as catalyzers but rather as "reaction excitors." They probably change the state of the nitride. RAYMOND H. LAMBERT

A contribution to molecular-statistical thermodynamics. ERIK SVENSON. *Ann. Physik* 87, 424-60(1928).—A statistical treatment of thermodynamics is given in which the Boltzmann principle for entropy is involved. RAYMOND H. LAMBERT

Specific heats of acetone, methyl, ethyl and propyl alcohols at low temperatures. SHIROKUKU MITSUKURI AND KENJI HARA. Tohoku Imp. Univ. *Proc. Imp. Acad. (Japan)* 5, 27-8(1929).—The sp. heat of Me₂CO from 200° to 260° abs. is 0.470 to 0.511, of MeOH from 190° to 270° abs. 0.533 to 0.583, of EtOH from 190° to 270° abs. 0.476 to 0.552 and of PrOH from 170° to 270° abs. 0.432 to 0.541. Details of the calorimeter and method used will be published in *J. Chem. Soc. (Japan)*. C. J. WEST

Calorimetric investigations. XV. Thermochemical study of cycloparaffins and their derivatives. 1. Experimental data for five- and six-membered cyclic diols. P. E. VERKADE, J. COOPS, JR., CHR. J. MAAN AND A. VERKADE-SANDBERGEN. *Niederl. Handels-Hochschule in Rotterdam. Ann.* 467, 217-39(1928); cf. *C. A.* 22, 571.—The following values are based on the international value for BzOH (6324 cal.₁₈ per g (const. vol., 19.5°); the 2 values for each compd. are Q_v and Q_p in 15° cal. Cyclopentane-*cis*-1,2-diol, 695.2, 696.0; cyclopentane-*trans*-1,2-diol, 693.3, 694.1; 1-methylcyclopentane-1,2-diol: *cis*, 846.5, 847.6; *trans*, 844.2, 845.3; 1-phenylcyclopentane-1,2-diol: *cis*, 1412.6, 1414.1; hydrindene-1,2-diol: *cis*, 1097.5, 1098.4; labile form, 1098.6, 1099.5; *trans*, 1095.8, 1096.7; 1,2,3,4-tetrahydronaphthalene-1,2-diol: *cis*, 1249.6, 1250.8; *trans*, 1248.3, 1249.5; 1,2,3,4-tetrahydronaphthalene-2,3-diol: *cis*, 1249.7, 1250.8; *trans*, 1248.4, 1249.5; *cis* + *trans*, 1247.7, 1248.9; cyclohexane-1,2-diol: *cis*, 840.4, 841.6; *trans*, 841.4, 842.6; 1-methylcyclohexane-1,2-diol: *cis*, 991.1, 992.6; *trans*, 993.6, 995.1; 1-phenylcyclohexane-1,2-diol: *cis*, 1561.4, 1563.1; *trans*, 1562.3, 1564.0. The data from which these figures are deduced are given in detail. C. J. W.

Action of acetates and of formates on $\text{Bi}(\text{NO}_3)_3$ (KHARMANDAR'YAN) 6. Complex chemical behavior of Li. I. The systems Li halide, mono-, di- and tri-methylamine (SIMON, GLAUNER) 6. Structure of some ternary alloys of Cu, Zn and Al (BRADLEY, GREGORY) 9.

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3—SUBATOMIC PHENOMENA AND RADIOCHEMISTRY

S. C. LIND

Band spectra and their chemical significance. R. MECKE. *Fortschritte Chem. Physik physik. Chem.* 20, No. 3, 87 pp.(1929).—See C. A. 22, 3840.

Abnormal "g" values in the spectrum of ionized A (A II). C. J. BAKKER. *Proc. Acad. Sci. Amsterdam* 31, 1041-5(1928).—See C. A. 23, 1567. E. C. M.

Properties of saline compounds and atomic structure. II. Influence of deformation of the electron sheaths. K. FAJANS. *Z. Krist.* 66, 321-54(1928); cf. C. A. 19, 2150. H. G.

Chemical rays. H. PLAUSON. *Chem.-Ztg.* 52, 996-7(1928); cf. C. A. 23, 40.

ALBERT L. HENNE

Extraction coefficients of mixtures of mercuric chloride and organic acids in the ultra-violet as experimental evidence in favor of the formation of unstable intermediate compounds. III. J. C. GHOSH AND T. L. KASTURI RANGACHARYA. *Univ. Dacca. J. Indian Chem. Soc.* 5, 569-78(1928); cf. C. A. 22, 1899.—Data are presented on the absorption spectra of mixts. of HgCl_2 and aliphatic acids. Evidence is given for the existence of an intermediate compd. The amt. of this intermediate compd. decreases with the addn. of CH_3 groups in a homologous series, but decreases with the addn. of COOH or OH groups. WALLACE R. BRODE

The absorption of penetrating radiation. L. H. GRAY. Trinity College, Cambridge. *Proc. Roy. Soc. (London)* A122, 647-67(1929).—A theoretical investigation of the absorption of penetrating radiation of the γ -ray type by the atm. C. C. K.

The spectrum of H_2 : The bands analogous to the ortho-helium line spectrum. O. W. RICHARDSON AND K. DAS. King's College, London. *Proc. Roy. Soc. (London)* A122, 688-718(1929).—The new wave-length data of Gale, Monk and Lee (C. A. 22, 1737) have been used to confirm the extensive series of Q branches previously reported (C. A. 21, 705) and to work out the associated P and R branches. This enables the rotational structure of these bands to be detd. Since they are analogous to the principal series of orthohelium they are designated as the $2^3\text{S} - m^1\text{P}$ bands. Comprehensive tables present the details. In addition to these bands another system designated as the $2^3\text{S} - 3^3\text{S}$ bands has been worked out. They lie in the red and infra-red and are characterized by the presence of P and R branches and the absence of Q branches. A table is given contg. the mol. consta. (including moments of inertia and nuclear sepns.) for the various excited states. C. C. KISS

A band absorption spectrum of iodine in an extreme ultra-violet region. MASA-MICHI KIMURA AND MICHIO MIYANISHI. *Sci. Papers Inst. Phys. and Chem. Research (Japan)* 10, 32-42(1929). (In English).—The continuous light of a H discharge tube was passed through a quartz tube containing I vapor at various temps. and was photographed with a quartz spectrograph. The absorption spectrum of I thus obtained was found to consist of a no. of bands having their edges on the violet side and nearly equally spaced. At a temp. of about 35° the bands extend from 2064 to 1950 Å. U., but with increasing temp. these bands fade away and are replaced with a new set, which at 120° extend from 2145 to 2066 Å. U. The wave lengths of the bands have been measured and are tabulated. These bands have been arranged into several series sepd. by about 210 cm.⁻¹ which are represented by the formula $\nu = 52,800 + 78n' - n'^2 - 210n$ in which n represents the vibrational levels of the normal state of the mol. and n' those of the excited states. C. C. KRESS

The symmetry of protonic wave functions. BENEDICT CASSEN. Calif. Inst. Technology, Pasadena. *Proc. Natl. Acad. Sci.* 15, 29-31(1929).—Mathematical treatment of the symmetry properties of a H₂ mol. indicates that the total protonic wave function is symmetric. This result is independent of whether the protons themselves have spins. If wave functions are symmetric for protons, then similar particles, atoms or mols., contg. an even no. of electrons, will satisfy the Einstein-Bose statistics, while those contg. an odd no. of electrons will satisfy the Fermi-Dirac statistics. R. J. H.

The dispersion electrons of lithium. J. HARGREAVES. Univ. Cambridge. *Proc. Cambridge Phil. Soc.* 25, No. 1, 75-96(1929).—The method initiated by Hartree (*C. A.* 22, 1269) for the numerical soln. of the Schrödinger wave equation for an atom with a non-Coulomb field of force is used to est. the no. of dispersion electrons (f) corresponding to the lines of the principal series of the optical spectrum of Li, and also to the continuous spectrum at the head of the series. For the continuous spectrum $\Sigma f = 1$ is found to a good approximation in agreement with the assumption of Sugiura (*C. A.* 21, 3817). MARIE FARNSWORTH

Luminescence caused by α -particles and its relation to the particle energy. BERTA KARLIK AND ELIZABETH KARA-MICHAILOVA. *Sitzb. Akad. Wiss. Wien, Abt. IIa*, 137, No. 7, 363-80.—The intensity of scintillation is closely connected with the energy and ionizing power of α -particles. The luminescence of ZnS caused by α -radiation was measured by means of the charge of a Wulf electrometer due to a Rb photoelec. cell. The ZnS was a de Haën prepn. of 30 to 40 μ particle size. Screen fatigue could not be observed even after 15 mins. irradiation. The arrangement made it possible to compare the luminescence for samples of 20-3000 e. s. u. The photoelec. currents measured on the same day were found to be a linear function of the no. of colliding particles and the luminescence. An app. for the detn. of the luminescence as a function of the velocity of α particles is described. For certain "good" scintillating substances the light intensity is proportional to the energy given off by the α -particles. For poorly scintillating ZnS samples the luminescence is proportional to the remaining range, up to a satn. value coinciding with complete penetration of the particle. These results are in satisfactory agreement with older measurements carried out on single scintillations. FRANK URBAN

Photographic intensity measurements of polonium preparations. MARIETTA BLAU. Radium Inst., Wien. *Sitzb. Akad. Wiss. Wien, Abt. IIa*, 137, 259-68(1928).—It is shown that the α -intensity of Po preps. can be measured by a simple photographic method. A comparison of the photographic method with the values obtained from ionization methods for preps. of equal size gives a good confirmation of the Bunsen-Foscoe law. Equal blackening is obtained with continuous or with intermittent raying with α -particles. MARIE FARNSWORTH

The passage of β -rays through matter. C. E. EDDY. Univ. Cambridge. *Proc. Cambridge Phil. Soc.* 25, No. 1, 50-61(1929).—The form of the absorption curves of homogeneous β -rays in Al is investigated by means of a Geiger counter. It is found that the main portion of the curve is linear, with pronounced initial and final flattenings. Similar initial flattenings are found for Cu and Ag, but not for Au. The range of β -rays emergent at different angles is detd., and it appears that the loss of range is due to the increased path consequent upon scattering. Some evidence is obtained of the angular distribution of plurally scattered particles, and of the existence of a most probable angle of scattering, similar to that found for α -rays by Geiger. M. F.

Potassium and rubidium rays. MARIE KUBAN. Radium Inst. Wien. *Sitzb. Akad. Wiss. Wien, Abt. IIa*, 137, 241-57(1928).—From ionization and photographic methods and making corrections for scattering from thick layers, the absorption coeff. for the β -rays of K in Al is 28 cm.⁻¹ and for Rb, 173 cm.⁻¹. Assuming that an isotope

of K of at. wt. 41 is responsible for the activity a half-life $T = 1.31 \times 10^{10}$ yrs. can be calcd.

MARIE FARNSWORTH

The quantum mechanics of an electron or other particle. F. H. KENNARD. Cornell Univ. *J. Franklin Inst.* 207, 47-78(1929).—K. points out that the new quantum mechanics cannot yet be considered as a coherent and completed theory. The parts which rest upon the firmest exptl. basis are probably the ones that deal with at. and mol. energies and the treatment of electron and photon beams by means of a probability amplitude propagated according to a wave equation. According to theory, protons also should exhibit wave properties but as yet exptl. proof of this is lacking. The new Fermi-Dirac statistics find a basis in quantum mechanics but the only application of it which has met with convincing success is again one to electrons, namely, the new form given to the theory of metallic conduction by Sommerfeld. MARIE FARNSWORTH

Ionizing potentials and far ultra-violet lines of light atoms. LOUIS A. TURNER. Princeton Univ. *Phys. Rev.* 32, 727-36(1928).—By an interpolation the ionizing potentials of F and F^+ are found to be 17.4 and 34.5 v. These new values improve the regularity of the relationships of the values of $(\nu/R)^{1/2}$ corresponding to the ionizing potentials of the atoms of the first short period where ν is the frequency and R is Rydberg's const. The energy necessary for the removal of a 2 s electron from each of many of the atoms and ions of these elements (L_{II} levels for an atom) is calcd. by the use of $s^2p^{n-1} - sp^n$ lines. The effect of the removal of a 2 s electron upon the subsequent removal of a 2 p electron is found for B, F and Ne to be an increase of $(\nu/R)^{1/2}$ by about 0.45. This is used to obtain a prediction of the wave length of missing $s^2p^{n-1} - sp^n$ lines of C, N, N^+ and O. New identifications of the far ultra-violet lines of Mg are proposed and the third ionizing potential is found to be 80.4 ± 1 v. A pair of lines of F are tentatively identified as the $2s^22p^{5/2}P - 2s2p^6^2S$ lines. BERNARD LEWIS

Ionization by collisions of the second kind in mixtures of oxygen with the rare gases. H. D. SMYTH AND E. C. G. STUECKELBERG. Princeton Univ. *Phys. Rev.* 32, 779-83(1928).—Harnwell's expts (*C. A.* 21, 2098, 2427) on ionization by collisions of the second kind have been continued. Mixts. of O with A, Ne, He and incidental effects of H_2O vapor have been studied. Evidence of the following collisions of the 2nd kind was obtained. $A^+ + O_2 \rightarrow O_2^+ + A$; $A^+ + H_2O \rightarrow H_2O^+ + A$ (very strong); $H_2O^+ + O_2 \rightarrow O_2^+ + H_2O$; $Ne^+ + O_2 \rightarrow O^+ + O + Ne$; $He^+ + O_2 \rightarrow O^+ + O + He$; The expts. confirm the conclusions of Hogness and Lunn (*C. A.* 20, 2946) as to the process of ionization in O_2 but leave the exact value of the first ionizing potential uncertain. BERNARD LEWIS

The effect of water vapor on the mobility of gaseous ions in air. HENRY A. ERIKSON. Univ. of Minnesota. *Phys. Rev.* 32, 791-4(1928).—Addnl. results are given in this communication which indicate that a H_2O mol. gives up an electron to the final pos. air ion and thus forms a H_2O^+ ion of greater mobility. Results are also presented showing that the reciprocal of the mobility bears a linear relationship to the humidity. BERNARD LEWIS

The ionization processes of iodine interpreted by the mass spectrograph. T. R. HOGNESS AND R. W. HARKNESS. Univ. of Cal., Berkeley. *Phys. Rev.* 32, 784-90 (1928).—With an app. in which positive ions, formed by electrons of definite energy are accelerated and then deflected magnetically around a semicircle into a Faraday cylinder, the relative nos. of the ions I^+ , I_2^+ and I_3^+ were measured as a function of pressure from 2×10^{-5} to 4×10^{-3} mm.¹ In the primary process of electron collision I^+ and I_2^+ were both formed. I_2^+ was also formed in secondary collision from I^+ by the process $I^+ + I_2 = I_2^+ + I$ and I_3^+ was formed from I^+ by the process $I_2^+ + I_2 = I_3^+ + I$. Evidence and arguments against other possibilities are given. The disappearing potentials of I^+ and I_2^+ were found to be identical, 9.3 v. Three neg. ions, I^- , I_2^- and I_3^- , were found to exist in quantities comparable with those of pos. ions. Pressure-intensity relationships of these ions were also detd. I^- is formed both near the filament and in the ionization chamber according to the equation $I_2 + E^- = I^- + I$. I_2^- and I_3^- are not formed by collisions with free electrons but as a result of secondary collisions of I^- and I_2^- , resp., with I_2 mols.; $I^- + I_2 = I_2^- + I$; $I_2^- + I_2 = I_3^- + I$. B. L.

Efficiency of ionization in hydrogen by positive-ion impact at 7000 volts. RONALD W. BURNBY. Princeton Univ. *Phys. Rev.* 32, 795-8(1928).— H_2 at low pressure was bombarded with K pos. ions of 7000 v. energy in a tube attached to a pos.-ray box. Any H ions and scattered K ions passing into the latter are distinguished by mass analysis. The applicability of this method for measuring the efficiency of ionization is dis-

cussed. If the H_2 mols. receive kinetic energy from the 7000 v. which ionize them, they will be scattered in all directions, and only those which happen to be projected toward the slit will enter the pos.-ray box. If ionization is unaccompanied by transfer of kinetic energy, the method is competent to compare the ionization efficiency with that of electron impact. With small pos.-ion emissions no ionization was detected, with larger emissions a violent discharge took place through the tube. Conclusion: Either the ionizing efficiency is less than $1/150$ of that of 50-v. electrons, or less ionization is accompanied by transfer of kinetic energy.

BERNARD LEWIS

Polarization of canal rays in a weak electric field. II. The extinction coefficient of $H\beta$ in various field arrangements. E. RUPP. *Ann. Physik* 87, 285-97(1928); cf. *C. A.* 22, 727.—The arrangement of the app. in which the elec. field may be changed is given in which a Babinet-Soleil compensator is used and the ratio of beam intensity parallel to the ray to that perpendicular to the ray is measured. The potential was varied from 2600 to 10,000 v. while the field strength of the condenser was varied from 75 to 600 v. Several canal arrangements also were studied. Both cross-sectional and longitudinal as well as non-homogeneous fields were examd. Graphs and tables are given of the results.

RAYMOND H. LAMBERT

Character of the photoelectric cells of alkali metals. SOICHIRO ASAO. Tokyo Elec. Co. *Mazda* 3, 155-65(1928).—A photoelec. cell was made in which the anode was a glass bulb on the inner wall of which was deposited metallic Na, K or their hydrides, a metallic ring being used as cathode. Although the results obtained with cells of various sizes and various methods of prepn. were not reproducible, the anode current-anode voltage curve, anode foot-candle power-anode current curves were detd. with a few representative cells made. Na was found to be superior as a pure metal, while the hydride increased the sensitivity several times. When instead of making the bulb vacuum, A was filled in it, the anode current increased considerably on account of discharge as well as by virtue of the photoelec. current. Similar expts. were made with a cell made by silvering the wall of the bulb and placing a Ni plate at its center to serve as a cathode.

K. SOMEYA

Hall effect and magnetic induction in a bar of electrolytic iron. EMERSON M. PUGH. Univ. of Pittsburgh. *Phys. Rev.* 32, 824-8(1928).—The Hall effect was measured in a bar of electrolytic Fe in contrast to the usual method of measuring it in thin sheets of the material. Direct measurements were taken at the same time of the magnetic induction B and of the Hall e. m. f., E . The E -vs.- B curve is a straight line up to $B = 12,000$ gauss at which point its slope starts to decrease. The curve of permeability vs. B has its max. at this same value of B . Measurements taken at points on a "hysteresis loop" indicate that E is also proportional to B when the magnetizing force has been removed and only the residual B remains. The Hall coeff. for this bar is found to be only 20% lower than that found by A. W. Smith (*Phys. Rev.* 30, 1(1910)) for electrolytic Fe, if in its calcn. the value of B is substituted for H in the usual formula.

BERNARD LEWIS

The dielectric cohesion of rare gases. MAURICE CURIE AND ADOLPHE LÉPAPE. *Compt. rend.* 187, 1283-5(1928).—A continuation of the work of Bouty (cf. *C. A.* 7, 1658). A method is given for measuring the dielec. cohesion, γ , of gases. The following values are given for γ at 17° : He = 19.8; Ne = 6.3; A = 18; Kr = 41.4; Xe = 131.2, air = 398. Values for the resonance and ionization potentials of the gases are also given.

E. G. VAN DEN BOSCHE

Total reflection of x-rays from nickel films of various thicknesses. HIRAM W. EDWARDS. Univ. of Cal. at Los Angeles. *Phys. Rev.* 32, 712-4(1928).—The total reflection of x-rays ($\lambda = 0.707$ A. U.) is obtained from mirrors of sputtered Ni films having thicknesses from 0 to 3.3×10^{-8} cm. The measured crit. angles varied from a min. value of 0.0016 radians, that of blank glass, to a max. value of 0.00339 radians which was obtained from the thickest Ni film. A satisfactory agreement between the max. exptl. value of the crit. angle and that calcd. by the Lorentz dispersion formula in which the d. of Ni was placed at 8.75 g./cc., is used as evidence for concluding that the d. of Ni is entirely normal and also that the thickness of sputtered metal films which are to be used in x-ray reflection phenomena must be sufficiently large or misleading results may be obtained. The crit. angle from a thick Ag sputtered mirror was found to be identical with that obtained from a chemically prepd. Ag mirror which indicates that the d. of Ag is independent of the method of deposition.

BERNARD LEWIS

X-ray analysis of solid carbon disulfide. J. DE SMEDT. *Physica* 9, 5-8(1929).—Using a previously described app. for detn. of x-ray diagrams of solids at low temp. (*C. A.* 19, 1816) two sharp Debye-Scherrer crystallograms were obtained of solid CS_2 .

at -185° with $\text{CuK}\alpha$ light. The distance of film to crystal tube was 27.3 mm., the radius of the crystal cylinder 1 mm. For a tetragonal structure $a = b = 8.12$ A. U., $c = 3.77$ A. U. within the limits of error for intensities; with 3 mols. per unit cell, d . (calcd.) = 1.51 as compared with d . (measured) of 1.55 at the m. p. The C atoms are placed at 0, 0, 0; $\frac{1}{2}a$, 0, $\frac{1}{2}c$; 0, $\frac{1}{2}a$, $\frac{1}{2}c$, the S atoms are at p , p , 0; $-p$, 0; $\frac{1}{2}a + p$, $-p$, $\frac{1}{2}c$; $\frac{1}{2}a - p$, p , $\frac{1}{2}c$; p , $\frac{1}{2}a - p$, $\frac{1}{2}c$; $-p$, $\frac{1}{2}a + p$, $\frac{1}{2}c$. The parameter, p , distance of C and S was found to be $0.157a$; this means close packing.

B. J. C. VAN DER HOEVEN

The metals iron, cobalt, nickel and copper used as diffraction gratings of corresponding x-radiations. S. PASTORELLO. *Nuovo cimento* [N. S.] 5, 284-9(1928).—P. finds that by photographing, one of the elements Fe, Co, Ni or Cu by using as a anticathode the immediately preceding element in the order of at. no. always showed clearly the characteristic lines of its own cryst. structure without sensible fogging through diffuse radiation. By using the element immediately succeeding that photographed as anticathode good results were also obtained. Cu used as anticathode for Fe gives rise to diffuse radiation and fogging so as to obscure the characteristic lines of the element photographed.

L. T. FAIRHALL

A determination of the wave length of the $\text{K}\alpha$ line of carbon. B. B. WEATHERBY. Univ. of Pa. *Phys. Rev.* 32, 707-11(1928).—A simplified type of vacuum spectrometer utilizing a plane glass grating with 250 lines per mm. was used to measure the wave length of the $\text{K}\alpha$ line of C. A water-cooled metal x-ray tube with W cathode was connected directly with the spectrometer without the interposition of any absorbing screen in the x-ray beam. The measurements were made under varying conditions. The angle of incidence being varied from 20° to 50° and the distance from grating to plate from 50 cm. to 80 cm. A weighted mean of all detns. gives the wave length of the $\text{K}\alpha$ line of C as 45.4 A. U.

BERNARD LEWIS

Visible radiation characteristics of incandescent oxides. MARCELLA L. PHILLIPS. General Elec. Co. Research Lab. Cleveland, O. *Phys. Rev.* 32, 832-9(1928).—Energy radiated in the visible part of the spectrum of various oxides and their mixts. when heated to red brightness, between 1400° and 2000° K., by means of cathode ray bombardment, and gas-air and oxy-gas flames, was measured by an optical pyrometric method. The oxides investigated were of the elements U, Ce, La, Nd, Er, Yt, Zr, Th, Al, Be, Mg and mixts. of thoria with 1% ceria (the Welsbach mantle mixt.), 1% and less of urania, 1% neodymia and 1% MgO . These were either pressed or fused to ensure good surface conditions. In general linear relations were found between the logarithm of the red-blue intensity ratio and the reciprocal of the brightness temp., and between the logarithm of the candles emitted per unit surface area and the logarithm of the brightness temp. Different modes of heating gave different radiation curves for the same oxide. Tables are given of the candles per sq. cm. and the relative blue brightness for red brightness temps. of 1400° , 1500° , 1600° , 1700° , 1800° , 1900° and 2000° K.

BERNARD LEWIS

The spark doublets in the K series. V. DOLEŽALSKÝ AND MILE. D. ENGLMANN. *Compt. rend.* 188, 318-20(1929).—It has been shown that for light elements (up to at. no. = 12) the spark doublets $\text{K}_{\alpha 3} - \text{K}_{\alpha 4}$ and $\text{K}_{\alpha 5} - \text{K}_{\alpha 6}$ are irregular doublets analogous to those of the arc, the frequency differences being const. and expressed by $\Delta\sqrt{\nu/R} = 0.007$ (for $\text{K}_{\alpha 3} - \text{K}_{\alpha 4}$) and 0.011 (for $\text{K}_{\alpha 5} - \text{K}_{\alpha 6}$). Measurements are now extended to heavier elements (at. no. = 23 to 30). The mean value of the new measurements is $\Delta\sqrt{\nu/R} = 0.0074$ in perfect accord with that obtained for the light elements.

W. F. MEGGERS

Spark spectra in liquids, the ultra-violet region. A. CAMPETTI. *Nuovo cimento* [N. S.] 5, 291-306(1928).—Spark spectra of Zn, Mg, Ca, Cu, Ag, Au, Al, Pb, Sn, Bi and Sb were measured in water and in a few cases in vaseline and CCl_4 . There are indications that the number of inverted lines increases successively with advance into the ultra-violet region. As a rule those lines are strongly inverted which correspond to the first or second resonance potential of the element. The probable assignment of the line 4226.73 not to a neutral Mg atom, but to a group contg. hydrogen is pointed out; similarly, the assignment to a group contg. oxygen for the Pb line 4057.97.

L. T. FAIRHALL

The continuous spectrum and the spectrum of the bromine arc. N. SIRACUSANO. *Nuovo cimento* [N. S.] 5, 273-83(1928); cf. C. A. 23, 767.—The Br spectrum obtained by discharge without electrodes was examd. in the region 3000-2100 A. U. By operating under controlled conditions in an atm. of very pure Br, S. was able to produce a totally continuous spectrum. The continuous band 2930 A. U. (Fowler and Strutt)

undergoes an evolution with variation in excitation corresponding to a lower level of energy than that of this band.

L. T. FAIRHALL

The continuous spectrum of mercury vapor. H. VOLKRINGER. *Compt. rend.* 188, 321-3(1929).—Heated Hg vapor may be excited in various ways and near 240° gives a continuous spectrum extending from the red region to the line at 2537 Å. U. where it terminates abruptly. Expts. with Hg at different temps. lead to the conclusion that the continuous spectrum is not due to a single carrier passing from one state to another.

W. F. MEGGERS

The spectra of doubly ionized arsenic, antimony and bismuth ($As_{II}, Sb_{II}, Bi_{II}$). R. J. LANG. Univ. of Alberta Edmonton, Canada. *Phys. Rev.* 32, 737-45(1928).—The spectra of As_{II}, Sb_{II} and Bi_{II} have been partially analyzed by the use of the irregular doublet law and the Moseley law and the published data for the two preceding elements of each isoelectronic sequence. In As_{II} and Bi_{II} ns^2np , ns^2nd , $ns^2(n+1)s$ have been located and with the exception of the quartet P term, those from the $nsnp^2$ configuration (n is equal to 4 for As_{II} , 5 for Sb_{II} and 6 for Bi_{II}). In As_{II} alone the 2P term of the np^3 configuration was found. The terms of Sb_{II} located consist of some of those for the first 3 configurations only.

BERNARD LEWIS

A study of the energy relations in the helium spectrum. I. CLYDE CORNOG. Univ. of Pa. *Phys. Rev.* 32, 746-52(1928).—Photographs of the He spectrum produced in an equipotential space with an equipotential cathode have been studied photometrically in order to det. the variation of line intensities on passing the various crit. potentials. The results here reported cover the 54.2-v. point, at which double ionization is first possible. Spectra were taken at suitable values between 50 and 60 v., often at intervals of 0.1 v. The plates show a marked max. of intensity near 54.2 v. for all lines measured.

BERNARD LEWIS

The fine structure of the sharp series triplets $2^3P_{1,1,2} - 2^3S_1$, of optically excited mercury radiation. E. HOBART COLLINS. Univ. of Iowa. *Phys. Rev.* 32, 753-60 (1928).—Measurements on the fine structure of the sharp series triplets, lines of wave lengths $\lambda\lambda 5461, 4358$ and 4047 were made with two Lummer-Gehrcke plates under two conditions of optical excitation. The first condition of optical excitation was obtained by having Hg vapor only in the resonance tube, giving excitation by absorption of $\lambda 4358$, the second by having Hg vapor with N_2 present at a pressure of 2 to 4 mm, giving excitation by absorption of both $\lambda 4358$ and $\lambda 4047$. For the first condition of excitation the wave-length differences in milli-angstroms are for $\lambda 5461$, $d\lambda 0$; for $\lambda 4358$, $d\lambda -157, -107, -20, 0, +30, +46, +183$; for $\lambda 4047$, $d\lambda -116, -62, -52, 0$. For the second condition the wave-length differences are for $\lambda 5461$, $d\lambda -235, 0$; for $\lambda 4358$, $d\lambda -107, -20, 0, +30, +183$; for $\lambda 4047$, $d\lambda -110, -62, -53, 0$. Certain fine structure energy differences of interest in the construction of energy diagrams are pointed out but it was not found possible with the data available to construct a complete energy diagram of the triplet. A comparison of the fine structure observed under the two conditions of optical excitation with one another and with the fine structure of the arc shows striking differences which make it evident that differences in fine structure exist which depend on the method of excitation.

BERNARD LEWIS

The assignment of quantum numbers for electrons in molecules. II. Correlation of molecular and atomic electron states. ROBERT S. MULLIKEN. New York Univ. *Phys. Rev.* 32, 761-72(1928); cf. *C. A.* 23, 26.—A few revisions, suggested by recent results of Herzberg of N_2^+ , were made in Part I for N_2^+ , CN and O_2^+ . These revisions involve dissocn. of unexcited mols. to give one excited atom or ion. With these revisions and a revised heat of dissocn. of N_2 , the quantum no. assignments previously made are found to be all consistent with Hund's rule of $\sigma\lambda$ and sums, and, except for one or two states of F_2 , with the $\sigma\lambda\tau$ conservation rule given in Part I. These results give needed support to the latter rule. The probable at. dissociation products are detd. for most of the mol. states given in Part I. In the case of N_2 and N_2^+ , the probable dissociation products and energies are given in tabular form in the present paper. An interpretation is given of the dissocn. processes involved in Hogness and Iunn's NO ionization potentials at 21 and 22 v., and of their 24 v. N_2^+ potential. Evidence is presented for a revision of Birge and Sponer's values of the heats of dissociation for the normal states of several mols., in particular N_2 . The suggested new or revised values are, in v., N_2 , 9.5; N_2^+ , 7.1, NO, 7.3; CO^+ , 8.3; NO^+ , 11.2. The alkali and hydrogen halides are briefly discussed, with reference to their electronic states and dissocn. products.

BERNARD LEWIS

The near infra-red vibration spectrum of the carbonates. HAROLD H. NIELSEN.

Univ. of Michigan. *Phys. Rev.* **32**, 773-8(1928).—An attempt has been made to solve theoretically the problem of the frequencies and intensities of the near infra-red absorption regions of the carbonate group. The assumption, that in the normal state the O_3 nuclei are located at the vertices of an equilateral triangle while the C nucleus lies at the center seems justified by the x-ray investigations of the crystal structure of the group. By using a general potential energy function with 3 consts. under the assumption that the fields of force surrounding the nuclei are central, the normal modes of infinitesimal vibration are detd., yielding 4 independent frequencies, $\nu_1, \nu_2, \nu_3, \nu_4$ of which ν_4 is optically inactive. Through the 3 disposable consts., ν_1, ν_2, ν_3 may be made to coincide with the 3 fundamental absorption regions found exptly. by Schaefer and Schubert (*C. A.* **11**, 913) and it is found that the optically inactive frequency ν_4 agrees closely with the predicted value. From a consideration of the change of elec. moment, the theoretical intensities are detd. It is found that the relative intensities obtained theoretically agree well with the values detd. by Schaefer and Schubert. B. J.

The spectra of mercury above the ionization potential. L. R. MAXWELL. Franklin Inst. *Phys. Rev.* **32**, 715-20(1928).—Electrons in Hg vapor with velocities greater than the ionization potential were confined to a beam by a magnetic field. The light produced was projected on the slit of a spectroscope with the direction of the beam at right angles to the slit. Perpendicular to the beam an elec. field withdrew positive ions before they recombined. The intensity of the arc lines was found to be independent of the elec. field; this indicates that recombination contributes very little to the formation of these lines. These results are contrary to the previously accepted explanation given for the complete arc spectrum appearing above the ionization potential. Consequently in addn. to simple excitation the arc spectrum can be explained in the following two ways, (1) as being due to the return to the $1S_0$ state by an electron which has been displaced from an inner energy level to a virtual orbit while simultaneously one of the electrons of the valency group falls in to fill the vacated level; (2) as due to a special type of recombination, which is called initial recombination. Spark lines due to singly and doubly charged ions show a variation of intensity along their length in such a manner that it is possible to distinguish them from the arc lines. It is also possible to differentiate between the lines of the first and the second spark spectrum. BERNARD LEWIS

The determination of the mean life for the 4797 A. U. spark line of doubly ionized mercury. L. R. MAXWELL. Franklin Inst. *Phys. Rev.* **32**, 721-6(1928).—With the method described in the preceding abstract, the spark line 4797 A. U. due to ions moving in a particular direction through a beam of electrons was obtained by the author showing a peculiar variation of intensity. Calculs. are made to det. how the intensity of the line should vary with respect to its position across the beam and for different c. d. of the beam. Cases are worked out for both uniform and non-uniform electron c. d. of the beam. On comparison with the exptl. results, it can be shown that the line is produced at a single electron impact, and that the av. life of the excited state is 4×10^{-7} sec. Although the mean life for the first-order spark lines could not be measured, it is estd. that it is less than 1×10^{-7} sec. BERNARD LEWIS

Voltage-intensity relations of 29 lines of the mercury spectrum. PAUL B. TAYLOR. *J. Franklin Inst.* **207**, 95-106(1929).—The variation of intensity of 29 prominent Hg arc lines as a function of the voltage across the arc is studied by a method of photographic photometry. The current through the arc was maintained at 4 amps; the voltage was varied from 23 to 118 v. The results are presented in tables and graphs which show that although considerable variation in the relative brightnesses of the lines occurs for a gradient below 1.5 v. per cm., above this value all lines increase in intensity in the same ratio. No explanation of these relations is attempted as the conditions of operation of the com. arc which was used were not sufficiently simple to warrant it. W. F. MEGGERS

Ultra-red arc spectra. H. AUERBACH. *Naturwissenschaften* **17**, 84-5(1929).—A table is given of band edges in the arc spectrum of La between 7876 and 8638 A. U. B. J. C. VAN DER HOEVEN

The influence of pressure and the presence of foreign gases on the absorption of excited neon. L. ECKSTEIN. *Ann. Physik* **87**, 1003-34(1928).—The intensity of absorption of several red Ne lines arising from the metastable S_1 and S_2 terms has been investigated by means of a photoelec. cell. Intensity curves giving absorption as a function of gas pressure show a max. for each wave length at 1.2 mm. Hg pressure. The addn. of He reduces the intensity slowly. H_2O , N_2 and A produce much greater diminutions. J. B. AUSTIN

The absorption spectra of praseodymium compounds at various temperatures

and different states of aggregation. RITA BRUNETTI. *Nuovo cimento* [N. S.] 5, 391-403(1928).—The absorption spectrum of compds. of Pr in dil. aq. soln., or as solids, is made up of 4 more or less wide bands distributed in the visible region from 6000 to 4000 A. U. Solns. at low temps. and equal concns. of different compds. present no great spectral differences. The relation and intensity distribution of the solid salt show no great differences in liquid air from that at room temp. The absorption spectrum of the solns. indicate the mean position of the radiation characteristic for the ion Pr^{+++} . When the concns. of the solns. is increased the wide bands which constitute their spectrum tend to take up the position at exactly those points where radiations exist in the spectrum of the crystals. L. T. FAIRHALL

Band spectra of lanthanum oxide. R. MECKE. *Naturwissenschaften* 17, 86-7 (1929).—The band spectrum of La was measured with large dispersion (3- and 6-m. concave grating) between λ 9000 and 3500 A. U. Seven band systems were found at 4372, 4418, 5600, 7380, 7403, 7877 and 7910, all are oxide spectra; they were classified. All bands are shaded toward the red. Systems 3, 5 and 7 have a common final state, also 1 and 2. The final state of 4 and 6 seems to be the initial state of 1 and 2. B. J. C. VAN DER HOEVEN

New bands of mercury hydride in the ultra-violet. HENRYK JEZEWSKI. *Bull. intern. acad. Polonaise*, Nos. 4-5A, 143-62(1928).—See C. A. 23, 1570. C. C. K.

The band absorption spectrum of cadmium vapor. ALEKSANDER JABLONSKI. University of Warsaw, Poland. *Bull. intern. acad. Polonaise* Nos. 4-5A, 163-70(1928); cf. C. A. 23, 730.—The ultra-violet absorption spectrum of Cd vapor at temps. ranging from 580° to 1020° was observed to consist of a system of bands between 2825 A. U. and 2590 A. U. The wave lengths of these new bands are listed in a table which gives for comparison the Cd bands observed in low temp. fluorescent vapor, and shows many coincidences which would indicate that these bands are connected with the dissociation of the mol. Cd_2 and the activation of one of the atoms to the 2^3P_0 state. The absorption bands appear to converge to a point near 2561 A. U., which corresponds to an energy of 4.82 v. The energy of excitation of the 2^3P_0 state is 3.78 v., which gives 1.04 v. as the dissociation energy of the Cd mol. C. C. KIESS

The origin of the band λ 2476.3- λ 2482.7 in the spectrum of mercury. ST. PIENKOWSKI. Univ. of Warsaw, Poland. *Bull. intern. acad. Polonaise* Nos. 4-5A, 171-9(1928).—The Hg band at 2476-2482 A. U. has been resolved into a system of closely spaced doublets, the wave lengths of which have been measured. These have been arranged into two branches, of which the members are separated by $\Delta\nu = 15.13 \text{ cm}^{-1}$. The sepn. of the branches is $\Delta\nu = 6.18 \text{ cm}^{-1}$. From the usual band formula a value of $3.66 \times 10^{-40} \text{ g. cm}^2$ is derived for the moment of inertia of the emitting mol. which, it is concluded, is a compd. of Hg and H. C. C. KIESS

Structure of the third-order spectrum of sulfur (S III). J. GILLES. *Compt. rend.* 188, 320-1(1929).—Continuing previous work (C. A. 23, 1570) the present note gives the classification of about 30 lines of S III lying in the ultra-violet between 2998 A. U. and 2442 A. U. They result from combinations of triplet *P* and *D* terms coming from the 4d and 5s electrons, with the triplet *S*, *P* and *D* terms coming from the 4p electron. C. C. KIESS

A contribution to the theory of ferromagnetic crystals. G. S. MAHAJANI. St. John's Coll., Cambridge. *Trans. Roy. Soc. (London)* 228A, 63-114(1929). C. C. KIESS

The triplets of helium. J. A. GAUNT. Trinity Coll., Cambridge. *Trans. Roy. Soc. (London)* 228A, 151-96; *Proc. Roy. Soc. (London)* A122, 513-32(1929).—Theoretical. C. C. KIESS

The infra-red emission spectra of flames in nitrous oxide. CHARLES R. BAILEY AND KUN-HOU LIH. Sir Wm. Ramsay Labs., Univ. Coll., London. *J. Chem. Soc.* 1929, 51-6.—A const.-deviation spectrometer with rock-salt prism was used in conjunction with a thermopile-galvanometer combination to observe the infra-red emission spectra of flames due to the combustion of H, CO, and coal gas mixed with N_2O , and of the same gases burning in an atm. of N_2O . For CO and coal gas the mode of combustion had no apparent effect on the spectrum, the spectra consisting of the emission bands of CO_2 and H_2O vapor. For H, however, when premixed with N_2O only the normal emission spectrum of H_2O was obtained. But when H alone was burned in an atm. of N_2O a new spectrum was obtained which appeared to be a combination of the H_2O emission bands with the emission analogs of those previously observed for N_2O only in absorption. C. C. KIESS

The analysis of the first spark spectrum of sulfur. D. K. BHATTACHARYYA.

Science College, Patna, India. *Proc. Roy. Soc. (London)* A122, 416-29(1929); cf. *C. A.* 22, 4064.—About 60 lines of S II, between 5646 A. U., and 3842 A. U. have been classified as members of the quartet system. To furnish data for working out the doublets new observations have been made which extend the spectrum out to 7715 A. U. in the deep red. Among these new lines are some which appear to represent inter-system combinations of the doublets with the quartets. This work led also to the discovery of a system of bands between 7574 A. U. and 7057 A. U., which closely resemble the *A*, *B*, α , α' , and α'' bands of O. The classification here given is in agreement with that of Ingram (*C. A.* 23, 36). C. C. KIESS

The ultra-violet spectrum of magnesium hydride. I. The band at λ 2430. R. W. B. PEARSE. Imperial College of Science and Technology, South Kensington *Proc. Roy. Soc. (London)* A122, 442-55(1929).—A high-dispersion quartz spectrograph was used to photograph the MgH band at 2430 A. U. The source was a Mg arc burning in H at low pressure. The band resembles closely the one at 5211 A. U. and like it has been analyzed into *P*, *Q* and *R* branches. The rotational analysis shows that the final states of both bands are the same, 2S . Both have initial states of the same type, 2P . The two systems of bands therefore result from transitions similar to those which give the first and second members of the principal series of Na, $^2P \rightarrow ^2S$. The details of the analysis are presented in comprehensive tables. C. C. KIESS

Effect of combined electric and magnetic fields on the helium spectrum. J. STUART FOSTER. McGill University. *Proc. Roy. Soc. (London)* A122, 599-603(1929).—The combined effect of parallel elec. and magnetic fields was observed for He lines belonging to the principal and sharp series of both the singlet and triplet systems and also for "forbidden" lines which appear only with a strong field. The results are in agreement with the quantum-theoretical requirement that each parallel Stark component is unaffected by the magnetic field while each perpendicular Stark component is split symmetrically into two components of equal intensity. C. C. KIESS

Secondary radiation observed by the molecular diffusion of light (Raman effect). PIERRE DAURE. *Compt. rend.* 187, 940-1(1928); cf. *C. A.* 23, 1571.—D. measures the Raman spectra of PCl_3 , $AsCl_3$, $SbCl_3$, $BiCl_3$, CCl_4 , $SiCl_4$, $TiCl_4$, $SnCl_4$ and PBr_3 ; $SbCl_3$ is measured at 100° , and $BiCl_3$ is measured in HCl soln. The Raman spectra consist generally of 4 principal lines, *a*, *b*, *c* and *d*. In the cases of PCl_3 and CCl_4 , several additional lines of smaller intensity are detectable. The characteristic frequencies decrease with the at. wt of the element linked to the halogen, but this relation cannot be expressed simply. Regarding the intensity comparison, only the negative lines are considered. In each case, the lines *a* and *c* have equal intensity. In the *P* series, *b* is about $1/4$ as intense as *a* and *c*; in the *C* series (with the exception of Ti) the intensity of the 3 lines is about equal. The intensity of *d* is variable, in general smaller than that of *c*; with $BiCl_3$, *d* is exceptionally strong. ALBERT L. HENNE

The Raman spectra of certain substances. MASAMICHI KIMURA AND YOICHI UCHIDA. *Japan J. Phys.* 5, 97-101(1928).—Preliminary data are presented on *calcite*, *water*, *neodymium ammonium nitrate*, and an untreated sample of commercial *xylene*. A fair correlation with the corresponding infra-red frequencies is obtained. Impurities in the samples are shown to give Raman lines. J. B. AUSTIN

The excitation of solid compounds by slow electrons. STANISLAW ZIEMECKI. State Technical School, Warsaw. *Bull. intern. acad. Polonaise* 1928, 367-75.—In the case of 5 substances, having especially brilliant cathode luminescence, it is experimentally found that, contrarily to accepted opinion, the excitation potential of solids by electrons is of the same order of magnitude as the excitation potential of gases. The explanation of the phenomenon is to be sought in the quantum theory. The values (in v.) actually observed were Sm 41, willemite 41, CaS 44, ZrO_2 71 and CaO 40.5. ALBERT L. HENNE

Fluorescence of mercury vapor under low excitation. LORD RAYLEIGH. *Nature* 123, 127(1929); cf. *C. A.* 23, 1058.—The Hg fluorescence has been studied by means of longer effective exciting wave lengths. The source was a Ni arc, with a filter of salicylic acid, which cuts off completely all waves shorter than 3360 A. U. The spectrum consists of the 2 well-known broad maxima, the green fluorescence and the ultra violet 3130 to 3650. The latter, which has never been resolved, was not yet resolved by the present excitation applied near the middle of the band. The continuous fluorescent spectrum extends about 300 A. U. beyond the limit of the exciting spectrum, a set by the sharp cut of the filter. G. CALINGAERT

Connections between the photochemical reaction velocities and the fluorescent of organic compounds. G. KÖCKE. *Z. wiss. Phot.* 26, 311-9(1929).—The fluorescent

of aromatic compds. with complete closed rings is the indication of a potential photochem. light sensitivity; with the derivs. of satd. aliphatic and aliphatic-aromatic compds. it is a sign of actual photochem. light sensitivity. A. P. H. TRIVELLI

Induction period and after-effect in photochemical reactions. RUKMINI MOHAN PURKAYASTHA. Dacca Univ. *J. Indian Chem. Soc.* 5, 721-32(1928); cf. *C. A.* 20, 870, 1953; 22, 1151 4379.—Bromination of cinnamic acid (I) and stilbene (II) in both CS_2 and CCl_4 in green light at 30° or 40° shows an induction period which is diminished by an increase in temp. or in the intensity and frequency of the incident radiation. In the oxidation of tartaric acid (III) by Br_2 , the induction period increases with increase in the concn. of III; with increase in the concn. of Br_2 , it increases to a max. and then diminishes. In the oxidation of mandelic acid (IV) and of β -phenyllactic acid (V) by Br_2 at 25° there is no induction period in the dark; in light there is a period of induction and also an after-effect when the source of light is withdrawn. If KBr in a concn. 8 to 10 times that of the Br_2 is added to mixts. of III or IV and Br_2 before exposure to light, the induction period completely disappears or is considerably reduced. P explains the results as follows. In the bromination of I and II the induction period is due mainly to the formation of intermediate complexes; in the oxidation of III by Br_2 it is due to photo-inhibitors and to the hydrated state of the Br_2 mols.; in the oxidation of IV and V, it is due to the hydrated Br_2 mols. LOUISE KELLEY

Theoretical speculations on photolysis of silver halide with regard to the quantum theory and the photoelectric effect. H. KIESER. *Z. wiss. Phot.* 26, 275-87(1929).—In connection with the detn. of the quantum absorption for the photolysis of the pure AgBr and the new theories of Fajans the chem. reaction caused by the photoelec. effect is discussed. A characteristic result of this investigation is the hypothesis that the photolysis of the Ag halides concerns a system that gives sep., scattered, halogen atoms. The chem. reaction is discussed and a scheme is built up for the photolysis of pure AgBr , for AgBr in H_2O , in NaNO_2 soln., in AgNO_3 soln., and in gelatin. By means of this theory it is possible to explain regression, coagulation, Becquerel effect, and photo-mechanical disintegration. A. P. H. TRIVELLI

Surface layers on tungsten and the activation of nitrogen by electron impact. CARL KENTY AND LOUIS A. TURNER. Princeton Univ. *Phys. Rev.* 32, 799-811(1928).—A fine W filament at 400° in active N_2 is quickly covered with a layer which produces a lowering of the resistance of the filament. This lowering of the resistance is apparently the result of a lowering of the temp. of the filament because heat is more readily conducted away from the coated filament by the gas than from the clean filament. At a given temp. 15-20% more heat is conducted away by the gas with the layer present. The same effect is produced by activating the N_2 by electron bombardment. In a tube with a large Ni anode the production of the active agent could be detected down to 10.8 ± 0.5 v. In a tube with a hot W spiral anode of small area the effect could be detected down to the ionization potential, 16.3 v. Traces of O_2 cause the spontaneous formation of a layer which renders the filament insensitive to active N_2 . Traces of H_2 prevent the formation of the N_2 layer and remove it if already present. Expts. with a tube of small vol. contg. Ni disks of large area show that the amt. of N_2 absorbed is of the order of magnitude of the quantity required to produce a layer of single atoms. Activation of a stream of N_2 reduces the thermionic emission from a W filament in the stream. Similarly, the striking of an arc in N_2 under suitable conditions gives a momentary slight increase of current followed by a great decrease, the emission apparently being cut down by the active form of N_2 produced in the arc. Upon subsequently breaking off the same arc by reducing the anode voltage the current drops and then quickly rises to its much higher former value, at that voltage. With an interrupted arc in pure N_2 , and in A contg. a small percentage of N_2 , an emission of the D lines persists for several hundredths of a sec. after the extinction of the arc. The Na is evapd. from an oxide-coated filament and excited by some active form of N_2 produced in the arc, presumably at N. BERNARD LEWIS

The measurement of the life of excited sodium atoms from the brightness of the sodium flame and the degree of dissociation of sodium salts in the flame. R. LADENBURG AND R. MINKOWSKI. *Ann. Physik* 87, 298-306(1928).—Measurements previously made on the life period of activated Na atoms by dispersion did not agree with results obtained by others from a study of the Na flame. This was believed due to the assumption that Na atoms in the flame were totally activated. Assuming that Na from any salt such as NaCl or Na_2CO_3 passes through the stage of NaOH in a flame, L and M. show from data on NaOH that results on the life of excited Na atoms were actually about those previously obtained by them from dispersion measurements. Therefore not all the Na is in an excited state in a flame. RAYMOND H. LAMBERT

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Special carbon arc apparatus for producing ultra-violet rays. HARMAN B. WOERNER. U. S. 1,705,798, March 19. Structural features.

Treating liquids with ultra-violet rays. HERMANN SCHOLL. Fr. 646,792, Dec. 28, 1927. Liquids to be treated with ultra-violet rays are freed from air, to prevent formation of ozone, by passing a gas through the liquid which will displace the air. Cf. C. A. 22, 4015.

Treating galena crystals for detectors. A. S. ZATEISHCHIKOV. Russ. 5411, May 31, 1928. The galena crystal placed in a spoon is first wetted with 20° Bé. H_2SO_4 , then sprayed with $K_2Cr_2O_7$ powder and heated until this is melted and until the development of oxygen has ceased. Then the crystal is cooled and the crust removed.

4—ELECTROCHEMISTRY

COLIN G. FINK

The energy losses of a seven-ton Héroult furnace with special reference to the heat-storing features. N. WARK. *Arch. Eisenhüttenw.* 2, 145-50(1928).—Investigations to det. the thermal cond. and accumulation of heat in the brick work of a 7 ton Héroult furnace, having graphite electrodes 250 mm. in diam. and fed from a 2000 kv. amp. transformer; 180 v. during fusion and 104 v. during finishing were used. When better scrap is used, or the condition of the brick work is better, or the time of charging is smaller, there is less cooling off of the furnace and therefore smaller heat-cond. and radiation losses. The accumulation of heat begins during the refining period and reaches a max. in the middle of the finishing period, decreasing from this point on. During the fusion period the brick work aids the heat supply; afterward the accumulated heat accelerates the melting. The heat balance of the furnace is detd. J. BALOZIAN

The energy losses of a fifteen-ton Héroult furnace with special reference to the life of the roof. H. KLINAR, O. REINHOLD AND N. WARK. *Arch. Eisenhüttenw.* 2, 151-3(1928).—The heat balance and the effect of the wearing away of the roof on the energy losses of a 15-ton Héroult furnace are detd. Graphite electrodes 350 mm. in diam., a 5000 kv. amp. transformer, 183 v. during fusion and 104 v. during finishing were used. The radiation losses of the roof are 8% higher toward the end of the melt than at the beginning. The heat accumulated in the roof brick confirms data detd. for the 7-ton furnace (see preceding abstract). Fusions are made using liquid Siemens-Martin steel (freshly tapped) to det. the exact energy losses in the 15-ton furnace. The ratio *heat in steel/total heat input during fusion* is greater with the liquid than with the solid charge. About 6% of the heat introduced by the elec. current is used for raising the steel temp., the remainder being consumed in the formation of the slag and in radiation and conduction losses. Of the total heat expended, 4.5% is used for the slag and about 13% for the combined cond. and radiation losses. J. BALOZIAN

An electrolytic refining process for nickel. B. BOGIRCH. *Compt. rend.* 188, 328-9(1929).—Anodes contg. about 10% of Cu, Fe, C, S, As and O yield cathodes contg. 99.9% of Ni plus Co. A two-compartment cell is used. The electrolyte, a soln. of $NiCl_2$ of sp. gr. 1.2, flows from the cathode chamber to the anode chamber, and thence to a purification tank, where $Ni(OH)_2$ is added to ppt. Fe, As, Co, etc. The temp. is kept at 65°. Some of the Cu remains with the anode mud, but the bulk must be removed by a special (undescribed) electrolytic process. The deposit peels from plane starting sheets, but satisfactory results are obtained by plating on pure nickel wire 0.5 mm. in diam. The cathodes are removed in the form of bars 50-60 cm. long and 15-20 mm. in diam. After a softening annealing they are cut into small cylinders. The Ni salt held by the filter cake is used to prepare the nickelic hydroxide. The

method of prepn. is not given, nor are the c. d., energy consumption, materials of construction, treatment of anode mud, etc.

BENJAMIN MILLER

Electrolytic zinc refining. II. The influence of foreign elements upon the hydrogen overvoltage. HIROTA SETO. Akita Higher Tech. School. *Hokko* 24, 1-22(1928).—S. has already examd. the influence of addn. agents on the deposition of Zn from its H_2SO_4 soln. The current efficiency of the anode then studied is now investigated. The method of measurement was a direct one, working at 25° , 1-100 milliamp./cm.². As a preliminary expt. the relation between the overvoltage of Pt, Cu, Fe, Pb, Zn, Cd, Ni and Co in 2 N H_2SO_4 and their surface condition was examd. Bright and platinized Pt was used, and the other metals were plated in turn on the Pt electrode. The result shows that there is no great difference in the overvoltage when the plated surface is smooth or cryst., while the overvoltage obtained with spongy Pt, spongy Ni and platinized Pt is very much smaller, which fact is attributed by S. to the differences in adsorption capacities. To exam. the influence of the added reagent upon the H_2 overvoltage 2 kinds of expts. were made. In the first, the influence of added reagent upon the soln., or the "direct" influence was studied, and in the second, its influence upon the phys. properties of deposited Zn, or the "indirect" influence. In the first expt. it was found that gelatin and cinchonine (addn. agents) function to make the H_2 overvoltage larger. To see whether there is some close relation between the effect of making the overvoltage larger and the surface tension, gelatin, dextrose-cinchonine, AcOH and $MgSO_4$ were added to the soln., but no conclusive results were obtained. To exam. the "indirect" influence, 0.01, 0.16, 0.32% of gelatin, dextrose and tannin were added to the soln. contg. 188 g. of $ZnSO_4$ per l. The overvoltage obtained at the surface of Zn deposited from the above soln. was always found to be smaller than when measured with pure Zn, the difference being most marked when gelatin was added. Since the crystal growth in the deposited surface is not very good, S. supposes that the gas adsorption on the surface is small, hence the small overvoltage. Between the "direct" and "indirect" influence, the latter influence is the greater. K. S.

Electrolytic preparation of "distilled" water. OSWALD GERTH. *Chem.-Ztg.* 53, 52-3(1929).—One or many electrolytic cells, divided into 3 compartments by porous diaphragms, provided with anodes and cathodes in their outer compartments and fed with raw water in the middle compartment, cause the impurities to gather in the outer compartments and purer water to be left in the middle one. By suitable arrangement continuous purification is possible; plants have been built to give 3 to 250 l. of purified water per hr. The current used is about 3-4 kw. hr. per 100 l. W. C. EBAUGH

The electrochemical manufacture of hydrogen peroxide. LEO LÖWENSTEIN. *Z. Elektrochem.* 34, 784-6(1928).—Correction to C. A. 23, 1061. "In the other process a soln. of NH_4HSO_4 [not NH_4HSO_3] is electrolyzed. The $(NH_4)_2S_2O_8$ soln. formed is treated with $KHSO_4$ [not $KHSO_3$], which ppts $K_2S_2O_8$ and regenerates the NH_4 salt. The ppt. is charged into a stone-ware still contg. H_2SO_4 , and superheated steam is blown through the mass. H_2O_2 vaporizes and $KHSO_4$ [not $KHSO_3$] is regenerated."

BENJAMIN MILLER

The control of current density in plating baths. W. PFANHAUSER. *Chem.-Ztg.* 53, 129-30(1929).—The thickness of the deposit is almost always specified in present-day plating practice. Since thickness depends on c. d. and time, a knowledge of the current density is essential to proper plating. But when work of complicated shape is being done, or when various articles are being plated at the same time, it is difficult or impossible to get the current density from the ammeter reading and from the measured cathode surface. Actually, the current density and the deposit thickness vary from point to point on the cathode surface. But the work must be done so that no part gets less than the specified thickness. To meet this situation the Langbein-Pfauhauser Company has introduced the c.-d. meter. This consists of two circular disk electrodes, each about 0.5 dm.² in area, mounted in a hard-rubber case with their plane faces parallel, and insulated from each other except for wires leading to a small meter in the handle. When the instrument is placed in the bath with the side marked A facing the anode and the side marked K facing the cathode, it reads directly in amperes per square decimeter. The meter must be calibrated for the soln. in which it is to be used. It may be moved from place to place in the bath, and shows the current density which obtains in each region. The scale may be calibrated in minutes to get a certain thickness, say 0.025 mm. for nickel baths. In addition to its use in controlling thickness, the instrument warns of excessive current densities, which may cause harmful hydrogen evolution. It is also helpful in keeping within a current-density range which gives desirable surface effects, such as the bright plate range for Cr. BENJAMIN MILLER

The calculation of the theoretical potential of potassium and sodium. P. DROSS-

BACH. *Z. Elektrochem.* 35, 95-6(1929); cf. *C. A.* 23, 42.—By correcting his former calcs. of the theoretical potentials for the degree of dissociation as detd. by cond. methods, D. obtains the following values $\epsilon_K = -2.97$ or -2.96 v.; $\epsilon_{Na} = -2.72$ v.

MALCOLM DOLE

New electrochemical processes. JOHANNES BECKER. *Chem. Fabrik* 1929, 49-51.—The Siemens and Halske system for removing salts from water electrically is briefly described (cf. *C. A.* 23, 459). App. for the production of ozone is now available in sizes up to 300 kw., with capacities up to 10-12 kg. of O_3 per hr. Concns. of 2-4 g. of O_3 per cu. m. can be obtained in air or oxygen, with an energy consumption of 25-35 kw. hrs. per kg. of O_3 . A new use for O_3 is in the accelerated aging of liquor. Treatment of liquor with O_3 gives a mellowing effect in a short time which requires months or years of storage. Analysis shows decreased aldehyde content and increased ester content. The ozonized liquor is more bland. For liquor treatment a special 50-watt ozonizer is furnished, with a capacity of 100 l. per hr. Now that Ta can be obtained in large pieces, it has been found useful for many chem. purposes.

BENJAMIN MILLER

Mercury-arc rectifier. New design of the glass container. W. HOEPP. *A. E. G. Mitteilungen* 1929, 75-83.

C. G. I.

Present status of the mercury-arc rectifier (iron container). CH. KRAEMER. *A. E. G. Mitteilungen* 1929, 85-7.

C. G. F.

Mercury-arc rectifier equipment for charging storage batteries. O. GRAMMICH. *Elektrotech. Maschinenbau* 47, 201-2(1929).—Five figs.

C. G. F.

Metallurgy of Al (FERRERI) 9. Electricity and the chemical industries (GIBB) 13. The transfer of matter in the Fe arc (SCHMICK, SEELIGER) 2. The influence of size on insulator strength (ROWLAND) 19. Electric furnace for melting glass (Brit. pat. 295,713) 19. Tin (Brit. pat. 295,805) 9. Alarm device for indicating heating of oil-insulated electric transformers, etc. (U. S. pat. 1,705,715) 1. Cu_2O on Cu (U. S. pat. 646,408) 9. Ornamental effects on metal surfaces (Brit. pat. 295,889) 9.

Electric battery. A. M. CODD. Brit. 295,743, May 18, 1927. Structural features are specified relating to a battery with a Zn electrode and with an electrolyte of $FeCl_3$ the cond. of which may be increased by the addn. of NaCl, KCl, or NH_4Cl .

Electric battery. OLDHAM & SONS, LTD., and W. D. WILDE. Brit. 295,746, Sept. 1, 1927. Structural features.

Electric batteries. A. HELBRONNER and E. DUTT. Brit. 295,589, Aug. 11, 1927. An insol. ferrocyanide, such as the ferrocyanide of Zn, Cu, or Ag, is used as a depolarizer in wet- or dry-cell batteries, alone or mixed with "carbon, coke, or graphite."

Electric batteries. WILLIAM E. KERSHAW and JOSEPH L. WOODBRIDGE. U. S. 645,935, Dec. 20, 1927. An element adapted to exercise a counter e. m. f. comprises electrodes of Ni in an electrolyte consisting of a soln. of an alkali hydroxide and a sol. chromate.

Primary electric-battery. MARTIN L. MARTUS, EDMUND H. BECKER and JAMES G. ROSS. U. S. 1,706,895, March 26. Structural features.

Centrifugal production of primary electric-battery elements. J. S. CROSLLEY. Brit. 295,219, April 4, 1927. Plastic material (which may comprise C, graphite and a binder such as molasses, flour, oil, tar, an alc. resin soln. or the like) is placed in a rotating mold, which may form a part of the electrode or may be of an easily destructible material such as paraffined cardboard. A cylindrical Cu electrode may have deposited on its inner surface a layer of Cu oxide, graphite and a binder such as whiting or Na silicate. $MgCl_2$ or $FeCl_3$ may be added to the Cu oxide, and the mixt. heated to form an oxychloride. Various structural features of the battery are described.

Dry batteries. ELECTROCHIMIQUE PHOSBUS. Fr. 646,460 and 646,461, May 18, 1927. Constructional details.

Dry-cell electric batteries. BATTERIEN- UND ELEMENTE-FABRIK SYSTEM ZEILER A.-G. Brit. 295,841, Sept. 7, 1927. Structural features.

Storage battery. F. STAME. Brit. 295,584, Aug. 13, 1927. In a battery having a neg. electrode, which on charging receives a deposit of Zn, Ni, Ag or the like, the electrode is enclosed in a bag of fabric or other porous material to prevent short-circuiting due to the formation of metallic burrs or projections. Various structural details are specified.

Storage batteries. J. S. CROSLLEY. Brit. 295,220, April 4, 1927. Centrifugal action is used to effect deposition or shaping of materials used in storage-battery construction. Separators comprising asbestos or pulp may be shaped by centrifugal de-

position, or the separators may be formed of asbestos sheeting soaked in Na silicate soln. and then dipped in acid such as H_2SO_4 to ppt. silica. The paste deposited on the plates may be formed from pptd. Pb mixed with PbO or Pb_2O_3 and Pb wool, or of other compns. suitable for use with grids of Pb, Zn and Pb, Cu and Pb, Cu and Zn, Ni and Fe, or other materials. Various structural details are described.

Storage batteries. ADOLFO POUCHAIN. Fr. 645,924, Dec. 19, 1927. Construction of neg. electrode.

Storage batteries. JACQUES DELPECH and EUGÈNE VACHERON. Fr. 645,933, Dec. 20, 1927.

Storage battery suitable for use with miners' lamps. CONCORDIA ELEKTRIZITÄTS-A.-G. and W. GOSMAN. Brit. 295,561, March 19, 1928. Structural features.

Galvanic cell. K. I. CHETIRKIN. Russ. 5459, May 31, 1928. A cell of the Feri type, with air depolarization and with a zinc electrode located horizontally on the bottom of the container, is characterized by a cylindrical carbon electrode open on both ends to have free access of air which is led through the bottom and the cover of the container.

Dry galvanic cell. K. I. CHETIRKIN. Russ. 5460, May 31, 1928. In a dry cell the Zn electrode is on the bottom and the plate-shaped carbon electrode forms the cover to increase the contact with the air.

Battery of galvanic cells. G. M. REZNIKOV. Russ. 5456, May 31, 1928. An arrangement is specified for filling and discharging all cells simultaneously with a liquid electrolyte.

Rectifiers. FANSTEEL PRODUCTS CO., INC. Fr. 646,749, Jan. 6, 1928. An electrolyte used in electrolytic rectifiers contains a small amt. of a Co salt, e. g., $CoSO_4$ in dil. H_2SO_4 .

Electric rectifiers with copper disks and cuprous oxide coatings. P. H. GEIGER (to Westinghouse Brake & Saxby Signal Co., Ltd.). Brit. 296,077, Aug. 25, 1927. Structural features.

Materials for alternating-current rectifiers. L. ST. C. BROUGHALL. Brit. 295,194, Feb. 17, 1928. An oxide layer is formed on Cu by heating it in an atm. of N_2O . The heat ng is regulated to avoid CuO production and is continued until the layer of Cu_2O formed is in a cryst. state; cooling is effected in 2 stages, first slowly to avoid cracking off of the oxide layer and then more rapidly (suitably in water or oil). Any small particles of CuO are removed chemically or mechanically before the rectifier elements are assembled.

Electrolytic rectifier. GLEN D. BAGLEY and FRED T. BOWDITCH (to National Carbon Co.). U. S. 1,706,950, March 26. An electrolyte contg. citric acid or a citrate is used with electrodes, one of which is formed of Al and the other with a conductive solid metal oxide such as PbO_2 .

Electrolytic rectifier. RAYMOND C. BENNER (to National Carbon Co.). U. S. 1,706,951, March 26. An electrolyte comprising H_2SO_4 (suitably of 1.25 sp. gr.) is used with electrodes, one of which comprises Ta and the other graphite coated with PbO_2 .

Apparatus for electrodeposition of thin layers of metals on rotating cathodes. E. KELSEN. Brit. 296,060, Aug. 24, 1927.

Electrodeposition of metal in manufacture of sound records. GRAMOPHONE CO., LTD., and S. WHYTE. Brit. 295,767, May 24, 1927. A pos. or neg. matrix for use in the manuf. of sound records is prepd. by electrodeposition on a metal matrix of opposite character, which has been covered with a film of Ag or other metal by a replacement process to render the subsequent deposit readily detachable; e. g., a Cu pos. is immersed in a soln. formed of $AgNO_3$, NaCN and water; a soln. of $HgCl_2$, NaCN and water may be used instead of the Ag soln.

Electrodeposition of chromium. RUDOLF AUERBACH (to Chromeplate, Inc.). U. S. 1,705,954, March 19. Freshly formed silicic acid is added to an electrolyte contg. chromic acid in order to permit a greater range in the c. d. which may be satisfactorily used.

Electroplating apparatus. RICHARD BLASBERG. Ger. 471,259, Nov. 25, 1926. Improvements are described in an app. of the kind in which supporting bars for the goods and the anode are reciprocated longitudinally over bath.

Rotating barrel apparatus for electroplating small articles. W. CANNING & CO., LTD., and G. A. POPE. Brit. 295,791, June 18, 1927. Structural features.

Electrogalvanizing apparatus. PETER JEPSEN (to American Steel and Wire Co. of N. J.). U. S. 1,706,520, March 26. Structural features of an app. suitable for electrogalvanizing wire.

Electrolytic cell. ELEK. A.-G. VORMALS SCHUCKERT & Co. and FRANZ PETZ. Ger. 469,328 and 469,329 of Nov. 25, 1927 and 469,300 of Dec. 4, 1927; addns. to Ger. 410,772. The cell is made of reinforced concrete and in the inner walls between the electrodes, hollows are formed for the admission of a cooling medium. A cooling jacket may also be added. The bottom and side walls are reinforced by U-shaped struts with the interstices packed by asphalt, paraffin wax, pitch, or similar substance. The cell is split up by porous diaphragms into chambers, each of which contains a pos. plate. The neg. plates embedded in the base are connected in pairs by a conductor on each side of the center pos. plate.

Apparatus for electrolytic mass production. LANGBEIN-PFANNHAUSER-WERKE A.-G. Ger. 471,260, Feb. 21, 1926. Means are described for conveying articles through a series of plating, rinsing, etc., baths.

Electrolytic precipitation of iodine from solutions. S. V. KONSTANTOV and G. G. URAZOV. Russ. 5305, May 31, 1928. Copper electrodes are used.

A bath for an electrical precipitation of tin. G. F. KOMOVSKII. Russ. 5367, May 31, 1928. Tin chloride is heated with phenol in the presence of HCl, and the complex compd. formed is dissolved in water.

Maleic and succinic acids. FIRMA ZAIDAN HOJIN RIKAGAKU KENKYUJO. Ger. 469,234, May 18, 1926. These acids are prepd. by the electrolytic oxidation of furfural in a soln. of acid or salt or in the powd. form. Pb electrodes are used.

Electric resistances. T. D. PARKIN. Brit. 295,444, May 13, 1927. Various structural details of resistances for rheostats, etc., are given. The molded portions may be formed of a phenolaldehyde product, and the conducting material may be graphite, preferably the kind known as "Dag" suspended in a liquid, which is brushed or sprayed on a metal plate. To give a very high resistance the graphite may be suspended in an insulating varnish or mixed with colloidal clay. Metallic films of Ag or Pt deposited on a pressure plate may be used and the latter may be faced with silica, glass, or mica.

Electric-resistance heating units for cooking plates or similar apparatus. EDWIN L. WIEGAND (to Edwin L. Wiegand Co.). U. S. 1,706,015-16-17, March 19. Structural features.

Electric-resistance heater for immersion in liquids. EARL S. NEAL. U. S. 1,705,835, March 19. Structural features.

Electric furnaces, resistance heaters and ovens. JAMES C. WOODSON (to Westinghouse Elec. & Mfg. Co.). U. S. 1,705,696-7-8, March 19. Structural features.

Electric-resistance furnace. ORA A. COLBY (to Westinghouse Elec. & Mfg. Co.). U. S. 1,705,717, March 19. Structural features.

Electric-resistance furnace. ROBERT J. WALKER. U. S. 1,706,010, March 19. Structural features.

Electric-resistance furnace. H. WIGGIN & Co., LTD., and A. G. LOBLEY. Brit. 295,299, April 8, 1927. A construction is described in which the resistances are supported by hooks detachably mounted in insulators on a metal frame. Cf. C. 1 22,432.

Electric-resistance furnace. GOTTFRIED TRÖMLER. Swiss 128,314, May 1, 1927. The outer wall is built up of several coaxial tubular sections fitting round the heating element, which contains the electrodes and closed rings. Inside the heating element is a rotary metallic drum for the ore with insulated bearings.

High-frequency electric furnaces. RENÉ DUFOUR. Fr. 646,524, Dec. 20, 1927.

Electrically actuated furnace control operating in accordance with the composition of the flue gases. SIEMENS & HALSKER A.-G. (Wilhelm Liesegang, inventor). Ger. 471,379, Dec. 22, 1926.

Automatic regulator for electric furnaces. DONALD F. CAMPBELL, GEORGE E. TAYLOR and ELECTRIC FURNACE Co., LTD. Fr. 645,962, Dec. 20, 1927.

Furnace electrodes. GEBRÜDER SIEMENS & Co. Fr. 646,143, Dec. 24, 1927. The electrode mass is compressed by shaking in a metallic sleeve.

Furnace electrodes. NORSKE AKTIESELSKAB FOR ELEKTROKEMISK IND. Fr. 646,310, Dec. 7, 1927. A non-metallic casing, such as one made from graphite and oil, is used for the production of electrodes which are burned during use in the elec. furnace.

Cleaning electrodes such as those of electrolytic condensers. HUMPHREYS O. SIGMUND (to Western Elec. Co.). U. S. 1,705,944, March 19. Electrodes are immersed in an unsatd. KOH soln., rinsed with water, immersed in a bath of dil. HNO₃ and HF, and again rinsed with water, in order to facilitate rapid formation of a dielectric film of good resistance on the electrodes.

Assembling sheets of electrical condensers. GREENLEAF W. PICKARD (to Wire-less Specialty Apparatus Co.). U. S. 1,706,816, March 26. In assembling non-porous dielectric sheets of materials such as mica with metal sheets, the surfaces of the former

are preliminarily coated with a dielectric detergent liquid such as hot paraffin which, when the sheets are assembled and pressed together, serves to force out air and moisture.

Electric spark-gap oscillation generator. J. E. SCHEEL and W. H. BULL. Brit. 296,067, Aug. 24, 1927. Various details are given of an app., the main electrodes of which are preferably formed of Cu coated with W on the inner faces, with an auxiliary electrode of wire, net, or point construction.

Hydrometer with spaced concentric tubes. FREDERICK C. JEWELL and HENRY S. JEWELL. U. S. 1,706,234, March 19. Structural features of a hydrometer suitable for testing the electrolyte of storage batteries.

Temperature indicator for electrical apparatus such as transformers. SAMUEL HORELICK (to Pittsburgh Transformer Co.). U. S. 1,706,609, March 26. A thermometer is formed with a bulb of insulating refractory material such as glass; a section of tubing of about the same coeff. of expansion as the refractory material is imbedded in the thermometer to form an airtight joint, and a metal tube such as Pt is secured at the outer end of the tubing.

Electric liquid heaters. WILFRED Y. NEWLAND. Fr. 646,740, Jan. 6, 1928.

Electrothermal reduction. SOC. ÉLECTROMÉTALLURGIQUE DE MONTRICHER (Soc. anon.). Fr. 646,874, Jan. 9, 1928. The electrothermal reduction process of Fr. 606,428 is extended to Si alloys, particularly Si-Al alloys, the metallic Fe in the conducting part of the fusion beds being replaced by oxidized Fe, pure or mixed. Cf. C. A. 23, 1578.

Steel. FONDERIA MILANESE DI ACCIAIO. Fr. 646,726, Jan. 5, 1928. Steel is produced in an elec. furnace into which is charged molten cast iron obtained by fusion of waste iron, etc., in a suitable cupola furnace. The no. of furnaces is arranged so that the whole functions without interruption.

Removing cupric oxide. HANOVIA CHEM. & MANUF. CO. Fr. 646,410, Dec. 27, 1927. CuO is removed from a surface of Cu or Cu₂O by placing the surface in a bath contg. dil. H₂SO₄ and an acid sulfate, and passing a direct or alternating current through it. The CuO may afterward be washed off with water.

Conductive cuprous oxide. SIEMENS-SCHUCKERTWERKE. A.-G. Fr. 646,427, Dec. 28, 1927. Cu₂O is formed on metal to produce Cu-Cu₂O rectifiers by heating the latter in an atm. in which the partial pressure of the O is reduced to an amt. which does not exceed the dissocn. pressure of the oxide at the reaction temp. The temp. used is considerably below the f. p. of the metal.

Treating substances with ozone. EDMOND BÉGOT. Fr. 646,776, May 20, 1927. Liquids or powders to be treated with ozone are caused to circulate in the elec. discharge itself which produces the ozone.

Nickel alloys. W. S. SMITH, H. J. GARNETT and J. A. HOLDEN. Brit. 296,112, April 25, 1927. In refining alloys contg. over 50% Ni the furnace charge is melted in the presence of a slag and H or other reducing atm. to avoid the presence of S. The alloys may contain Fe, Cr, W, V, Mo, Si, Al, Cu, Co, Ti or Zr, and the slag may be formed of lime and silica with a small quantity of fluorspar or CaCl₂. The refining is preferably effected in an elec. furnace of the induction type. Finishing agents such as Mg may be added, various details of procedure are described.

Vibrating electrode in electrical dust precipitation apparatus. LODGE-COTTRELL, LTD. (Metallbank und Metallurgische Ges. A.-G.). Brit. 295,890, Dec. 22, 1927.

Electric gas-purification plant with large-surface precipitation electrodes. SIEMENS-SCHUCKERTWERKE. A.-G. Fr. 646,736, Jan. 6, 1928.

5—PHOTOGRAPHY

C. E. K. MEES

Some properties of photographic films. F. WEIGERT and F. LÜHR. Z. Elektrochem. 34, 605-10(1928).—W. and L. have studied the effect of chemically reduced Ag caused by gelatin and of photosilver on light sensitivity of photographic films. Ag concn. is measured by electrometric titration by the differential method for which an accuracy of 0.003 mg. Ag in a gelatin-soln. medium is claimed. The original Ag (chemically reduced) increases with time of digestion. Photosil-er shows autosensitizing with digestion. Comparisons were made of films treated with K₂S₂O₈ and others treated with H₂O₂; it was found that light sensitivity increased with increase of original Ag. Increase in original Ag with time of digestion is dependent on the Ag halide, increasing in the order, iodide, bromide, chloride. The nature of the sensitizing depends greatly on the disperse condition of the system, and the suggestion is made that addns. such as dyes

may entirely change the property of emulsions contg. a given amt. of original Ag.

R. H. LAMBERT

Developing properties of the meta derivatives. A. LUMIÈRE, L. LUMIÈRE AND A. SEYEWETZ. *Sci. Ind. Phot.* 8A, 37(1928); *Bull. soc. franç. Phot.* 15, 90-2(1928) — The meta derivatives of the di-phenols have been considered as having no developing properties. This conception has been based largely on the fact that compounds such as resorcinol, orcinol, metaphenylenediamine and metaaminophenol possess no developing properties while the ortho and para compds. are developing agents. Homolka has proposed a theory to explain in the case of resorcinol the absence of developing properties by indicating the ease with which resorcinol undergoes tautomerism under the influence of alkali to form a di-acetone. By substituting methyl groups adjacent to the hydroxy groups to prevent tautomerism the resulting compd., mesoresorcinol, becomes a developer. The Lumières and Seyewetz have attempted to apply Homolka's theory to the behavior of dimethyl metaaminophenol and to dimethyl metaphenylene diamine, but were unsuccessful. When methyl groups are substituted in these compds. adjacent to the hydroxy or amino groups, the resulting compds. are not developers. Although the authors have confirmed that mesoresorcinol is a developer, they are at a loss to explain by Homolka's theory the action of metaaminophenol and diaminophenol.

C. E. K. M.

Intermediate regression. LÜPPO-CRAMER. *Z. wiss. Phot.* 26, 295-9(1929) — A photographic plate exposed under an Eder-Hecht scale until solarization occurs shows an intermediate Herschel effect under the red filter, which can be isolated if the plate is treated with NaNO_2 before exposure. Then all solarization is eliminated. The red rays serve as a protective medium for the Herschel effect. To explain this effect, L. C. refers to the possibility of an intermediate regression as proposed by S. E. Sheppard and A. P. H. Trivelli (*Phot. Korrr.* 64, 145(1928)).

A. P. H. TRIVELLI

BULLOCK, EDMUND R.: Chemical Reactions of the Photographic Latent Image. New York: D. Van Nostrand Co., Rochester, N. Y.: Eastman Kodak Co. 178 pp.

CLARK, WALTER: Données numériques de photographie. A Chapter from Vol. VI of *Données numériques*. Paris: Gauthier-Villars et Cie. 36 pp. Stitched, F 20. bound, F 36. Reviewed in *J. Sci. Instruments* 6, 80(1929).

WHEELER, OWEN: Colour Photography. New York and London: I. Pitman & Sons, Ltd. 138 pp.

Theoretical speculations on photolysis of Ag halide with regard to the quantum theory and the photoelectric effect (KIESER) 3.

Photographic processes. KALLÉ & Co. A.-G. *Brit.* 296,008, Aug. 22, 1927. Tanned colloid images are produced by exposing to light, under a negative or diapositive, a diazo compd. coated upon a base, and subjecting the colloid layer, in the presence of the image thus formed, to the action of a chromate or other oxidizing agent such as NH_4 hypobromite, or of a diazo compd. of great coupling capacity. Numerous details, examples and modifications of procedure are described.

Photographic transfer process. J. LAGENDYK. *Brit.* 295,345, May 9, 1927. In order to transfer a photograph printed on an emulsion layer from a paper support to a deed, passport, or other document so that reading matter of the document may show clearly through the photograph when the temporary paper support is stripped off, the wet photograph is placed face down on the document, pressed under heavy pressure after removing air bubbles, and treated with steam to facilitate stripping of the paper support and union of the picture with the document. A hardening bath may be used to permit rapid drying.

Photographic diazotype process. F. VAN DER GRINTEN (trading as Chemische Fabriek L. van der Grinten). *Brit.* 295,993, Aug. 22, 1927. Diazotype prints are developed by applying a suitable alk. developer in a very thin uniform layer simultaneously over the whole width of the image to be developed. An app. is described and numerous details of procedure and formulas of solns. used are given. Cf. C. A. 23, 1832.

Photographic films. NIKOLAUS LEDENKO. *Fr.* 646,484, Dec. 28, 1927. Films of gelatin, etc., are sensitized by solns. such as dichromate used more concd. than usual, e. g. 6%, after which the film while still damp is dipped for a short time in pure water or in a 2% dichromate soln., whereby formation of crystals at the surface is prevented.

Photographic films. I. G. FARBERND. A.-G. *Fr.* 646,157, Dec. 24, 1927. Films are rolled with 2 sep. protecting papers, e. g., a red and a black.

Photographic films, etc. SOC. CIVILE POUR L'ÉTUDE DE LA PHOTOGRAPHIE ET DE LA CINÉMATOGRAPHIE EN COULEURS. Fr. 646,202, May 6, 1927. A sensitive film or plate for color photography of the kind reticulated on one of its faces is formed of a layer of material sensitized within its mass, which may be used alone or have a support of celluloid, etc. The sensitized layer may be dichromated gelatin, which, after exposure, is treated with a black dye to color the unexposed parts of the layer, or it may be of cellophane impregnated with a mixt. of sensitive diazo compds. and phenols, which, after exposure, is treated with an alk. bath or NH_3 vapor. The films or plates may be used in printing machines for reproducing embossed films.

Inscriptions on photographic film. I. G. FARBENIND. A.-G. Brit. 295,578, Aug. 13, 1927. Inscriptions on a film produced as described in Brit. 287,124 (C. A. 23, 349) by the use of a soln. of a dye in a slowly evapg. solvent are protected from injury during subsequent liquid treatment of the film (as in the polishing operation) by coating them with a colloid (such as benzyl cellulose dissolved in a mixt. of acetone and benzene), which is insol. in any of the solvents to be used in the film treatment and which does not affect the dye used for the inscription.

Cinematographic films. "SIRIUS" KLEUREN-FILM-MAATSCHAPPIJ. Fr. 646,693, Jan. 3, 1928. See Brit. 283,548 (C. A. 22, 4073).

Film for motion pictures in color. RODOLPHE BERTHON. U. S. 1,707,157, March 26. A backing has formed on its face microscopic refracting elements over which is placed a coating of transparent material such as bakelite, varnish, or gelatin; on the latter a coating of suitable sensitized emulsion is spread.

Dye solutions for printing inscriptions on photographic films. I. G. FARBENIND. A. G. Brit. 295,383, Aug. 12, 1927. Dye solns. such as a soln. or suspension of cerasin red or soot in glycol acetate are mixed with a soln. of a colloid such as cellulose acetate (for use on nitrocellulose film) insol. in the liquids which may be subsequently applied to the film after printing; finely dispersed pigments may also be used.

Photographic color prints. JOSEPH C. CARTER. U. S. 1,706,107, March 19. Positives are formed from color sepn. negatives on collodion emulsion plates; the positives are transformed into desired color positives, stripped from their supports and superposed to form color prints.

Optical features of screens for use in the lenticular film process of color photography. M. W. SKYMOUR (to Kodak, Ltd.). Brit. 295,995, Aug. 22, 1927.

Photographic developer. I. G. FARBENIND. A.-G. Brit. 295,939, Aug. 18, 1927. 2-Hydroxyethylamino-1-hydroxybenzene (suitably in the form of its sulfate) is used as a developer, together with Na_2SO_4 and K_2CO_3 . Cf. C. A. 23, 572.

Printing surfaces of celluloid or similar material. E. SAUER. Brit. 296,065, Aug. 24, 1927. A photographic gelatin relief is freed from all water by treatment with AmOAc , AmOH , or the like, and by the action of a blower or suction device. A celluloid surface is treated with a solvent and brought into contact with the treated gelatin relief.

6—INORGANIC CHEMISTRY

A. R. MIDDLETON

Valency. XII. FRANK L. GILBERT AND THOMAS M. LOWRY. *J. Chem. Soc.* 1928, 3179-89.—The α -base obtained from α -diethyltelluronium diiodide, m. 57° , is converted into a β -phase when its aq. soln. is evapd. to dryness at 100° , under 15-mm. pressure in a N atm. The corresponding α -tetraiodide m. 98° , β -diiodide m. 42° , β -dibromide m. -12° and β -dichloride m. -10° . With aq. NH_4OH , the α -diiodide gives an α -monoxoiodide, $[\text{O}(\text{TeEt}_2)_2]_2\text{I}_2$, m. $104-6^\circ$; the β -diiodide gives a triethyltelluronium iodide. The α -diiodide reacts with Ph_2Hg in CHCl_3 , and yields $(\text{TeEt}_2\text{I}_2)_2\text{HgPh}_2$, m. 94° , but it does not react with mercury-di-*p*-tolyl, nor does the latter react with α -dimethyltelluronium diiodide. The absorption spectra of the iodides in cyclohexane exhibit the twin maxima of the "iodoform band"; the bromides show a step-out. The β -base has a higher cond. than the α -base. Potentiometric titrations show that the β -base is stronger than the α -one during the first half of the neutralization, but is weaker during the second half, as is shown by the fact that the neutralization curves cross. ALBERT L. HENNE

Pure carbon monoxide for experimental purposes. J. G. THOMPSON. *Bur. Chemistry, Wash., D. C. Ind. Eng. Chem.* 21, 300-301 (1929).—An electrically heated app. is described (with diagram) for the continuous production of CO from HCOOH , using 85% P_2O_5 at 170° as dehydrating agent. The CO and steam from the reaction are sepd. by condensation and the CO is passed upward through a scrubbing tower contg. NaOH

soln. The dried gas is 99.9% pure. About 92% of the HCOOH is cracked to CO and H_2O . Only HCOOH and electricity are consumed and the H_2PO_4 baths can be used indefinitely. Two 10-l. Pyrex flasks served as generators, and the combined production was 200 cu ft. of CO in 7 hrs.

J. W. SHIPLEY

Preparation of chemically pure ammonium dichromate. YA. T. GERASIMOV. *Trans. Inst. Pure Chem. Reagents* (Moscow) 1927, No. 6, 22-6.—Attempts to prep. the pure substance by the double exchange between $\text{Na}_2\text{Cr}_2\text{O}_7$ and NH_4Cl in aq. soln. failed, the substance contg. too little NH_3 . NH_4 dichromate is slightly decompd. on boiling in aq. soln., a ppt. being formed which contains chromic oxide and chromic anhydride in varying ratios. The pure substance can be conveniently prepd. by neutralizing chromic anhydride with NH_3 in unsatd. soln. and evapg. at 50° .

G. B. KISTIAKOWSKY

A new method for the preparation of cuprous sulfate. J. G. F. DRUCE AND G. FOWLES. *Chem. News* 137, 385-6(1928).— Cu turnings are dropped into concd. H_2SO_4 at 200° , and when the reaction has stopped, the green soln. is decanted from any anhydrous CuSO_4 through an asbestos filter into a mixt. of 50% anhydrous alc. and 50% ether, or into MeOH . Cu_2SO_4 seps. in white crystals. It rapidly decomposes in moist air into Cu and CuSO_4 .

ALBERT L. HENNE

Preparation and conductivity of hydrogen fluoride. KARL FREDENHAGEN AND GUSTAV CADENBACH. *Chem. Inst., Greifswald. Z. anorg. allgem. Chem.* 178, 280-99 (1929).—If KHF_2 is slowly heated, the first third of its HF content is given off with gradually increasing temp., but the remainder is given off at a const. temp. (504°). H_2O in the bifluoride alters the course of the temp. curve, a const. value being reached only when nearly all the HF is driven off. The sp. cond. of the distillate obtained from moist KHF_2 is considerably greater than when dry material is used. Thus, the ninth distillate from dry KHF_2 gives for $\text{K} \cdot 10^{-6}$, 640 and from moist KHF_2 , 980. Still lower values are obtained for cond. if the HF is condensed in an intermediate vessel and redistd. from this, the cond. being measured only on fractions collected after the point of const. temp. in the heating of KHF_2 is attained. The lowest value obtained in this manner for the sp. cond. of HF is 14×10^{-6} , but the authors believe that this is still higher than the true value. Washing with KOH soln. followed by treatment with MgO paste or MgSO_4 soln. is recommended for HF burns.

H. STOERZ

Bromine chloride. S. BARRATT AND C. P. STEIN. Univ. College, London. *Proc. Roy. Soc. (London)* A122, 582-8(1929).—In spectrophotometric measurements of solns. of Br and Cl in CCl_4 the Br band in the visible spectrum was taken as a measure of the uncombined Br . Similar quant. observations for Cl in the ultra-violet were unsuccessful because of lapping of spectra. K of the mass action law varies least for a compd. BrCl . In equimol. mixts. combined Br is formed to approx. 50% of that present. A new absorption band, ascribed to BrCl , is also obtained in gaseous mixts. and aq. solns. The max. lies at 3700 A. U. In Et_2O and CHCl_3 the reaction takes place instantaneously at -78° . In CCl_4 diminution of color occurs for several seconds. There is no time lag in aq. solns. A lag in the gaseous state is suspected. The vol. change in mixing Cl and Br as gases is small or non-existent, which confirms the formula, BrCl .

FOSTER DEE SNELL

The hydroxides of ter- and quadrivalent elements. FRANZ ADICKES. *Z. anorg. Chem.* 41, 1333-6(1928).—A general article emphasizing the various degrees of hydration of SiO_2 and Al_2O_3 .

ALBERT L. HENNE

Compounds of alkali phosphates with hydrogen peroxide. HEINRICH MENZEL AND CURT GÄBLER. Tech. Hochschule, Dresden. *Z. anorg. allgem. Chem.* 177, 187-214(1928); cf. *C. A.* 22, 1923.—The solubilities of KH_2PO_4 , of $\text{Na}_2\text{HPO}_4 \cdot 12\text{H}_2\text{O}$ and of $\text{Na}_4\text{P}_2\text{O}_7 \cdot 10\text{H}_2\text{O}$ in H_2O were detd.

Temp.	KH_2PO_4	G. anhyd. salt in 1000 g. H_2O Na_2HPO_4	$\text{Na}_4\text{P}_2\text{O}_7$
0°	142.6	16.31	22.36
15°	201.7		
18°	215.5	63.67	51.47
25°	251.2	121.44	66.18

The solubilities of these salts in H_2O_2 solns. at 0° were also detd. The increase in their solubilities with addn. of H_2O_2 indicates union of H_2O_2 with the dissolved phosphates. By the evapn. of phosphate- H_2O_2 solns. at room temp. in a stream of dry air the compds. $\text{Na}_2\text{HPO}_4 \cdot 2\text{H}_2\text{O}_2$ (I), $\text{K}_2\text{HPO}_4 \cdot 2.5\text{H}_2\text{O}_2$ and $\text{KH}_2\text{PO}_4 \cdot \text{H}_2\text{O}_2$ or $\text{KH}_2\text{PO}_4 \cdot 1.25\text{H}_2\text{O}_2$ were obtained. The first 2 are rather stable; the third is not. By adding EtOH to a $\text{Na}_2\text{HPO}_4 \cdot 2\text{H}_2\text{O}_2$ soln. an oily lower layer having approx. the compn. $\text{Na}_2\text{HPO}_4 \cdot 2\text{H}_2\text{O}_2 \cdot 10\text{H}_2\text{O}$ was obtained. This could not be obtained in solid form; on evapn. in dry air it gave I.

I and $\text{Na}_4\text{P}_2\text{O}_7 \cdot 3\text{H}_2\text{O}$, when shaken with Et_2O , gave up H_2O_2 to the Et_2O ; warmed *in vacuo* they were scarcely attacked at 70° , but at 130° they were completely decompd. with removal of H_2O_2 into the anhyd. mother salts. In these compds. the H_2O_2 appears to be H_2O_2 of crystn.

LOUISE KELLEY

Behavior of hydrogen peroxide in aqueous alkali phosphate solutions. SVED HUSAIN. Tech. Hochschule, Dresden. *Z. anorg. allgem. Chem.* 177, 215-26(1928); cf. preceding abstr.—The salts used were the primary and secondary orthophosphates and the pyrophosphates of Na and K. Cryoscopic measurements were made on solns. of these salts contg. H_2O_2 and the distribution of H_2O_2 between solns. of these phosphates and AmOH was studied. The results showed that the capacity of the salts to bind H_2O_2 increases in this order: primary phosphate, secondary phosphate, pyrophosphate—and that within each salt type the K phosphate solns. add H_2O_2 more firmly than do solns. of the corresponding Na salts.

LOUISE KELLEY

Acid phosphates of thorium. J. D'ANS AND W. DAWIDL. *Z. anorg. allgem. Chem.* 178, 252-6(1929).—If $\text{Th}_3(\text{PO}_4)_4$ is stirred into H_3PO_4 contg. at least 40% P_2O_5 and the mixt. is allowed to stand, long crystals of the acid phosphate, $\text{Th}(\text{HPO}_4)_2 \cdot (\text{H}_2\text{PO}_4)_2 \cdot 2\text{H}_2\text{O}$ (I), gradually sep. Soly. detns. show that the transition from $\text{Th}_3(\text{PO}_4)_4$ to $\text{Th}(\text{HPO}_4)_2 \cdot \text{H}_2\text{O}$ occurs at about 20% P_2O_5 and 0.5% ThO_2 , while the transition to I occurs with about 30% P_2O_5 and 5% ThO_2 . If increasing quantities of H_2SO_4 are added to a soln. of $\text{Th}_3(\text{PO}_4)_4$ in H_3PO_4 , a very viscous soln. is obtained, from which, after standing several weeks at about 10° , a well-crystd. substance is obtained having the compn.:

$\text{Th} \begin{cases} (\text{H}_2\text{PO}_4)_2 \\ \text{SO}_4 \cdot 8\text{H}_2\text{O} \end{cases}$ It crystallizes in fine needles which are extremely sensitive to moisture.

Another acid phosphate occurs having the compn. $\text{Th} \begin{cases} \text{HPO}_4 \\ \text{SO}_4 \end{cases} \cdot 4\text{H}_2\text{O}$; it is likewise decompd. by H_2O . Soly. detns. show that this salt exists only below 44.5° . A phase diagram at 20° is shown, the points given being detd. only qualitatively. Analogous salts of Ce are indicated.

H. STORRTZ

The constitution of sodium plumbate. A. SIMON. *Z. anorg. allgem. Chem.* 177, 109-15(1928).—The decompn. of Na plumbate by heating was measured in a tensiometer. No evidence was found for a break in the isobar for 10-mm. pressure when 2 mols. of H_2O had been liberated. This leads to the conclusion that the formula for the salt is $\text{Na}_2\text{PbO}_3 \cdot 3\text{H}_2\text{O}$ rather than $\text{Na}_2[\text{Pb}(\text{OH})_6]$ (cf. Bellucci and Parravano, *Z. anorg. Chem.* 50, 111(1906), and Grube, *C. A.* 16, 3274). The anhydrous salt begins to decompose into Na_2O and PbO_2 at 750° . The latter liberates O_2 and passes over to PbO at this temp.

H. F. JOHNSTONE

Hydrates of calcium oxalate. W. F. JAKÓB AND E. LUCZAK. *Roczniki Chem.* 9, 41-8(1929).—The new hydrates of Ca oxalate, $\text{CaC}_2\text{O}_4 \cdot 2\frac{1}{2}\text{H}_2\text{O}$ and $\text{CaC}_2\text{O}_4 \cdot 3\text{H}_2\text{O}$, were prepd. by pptg. Ca oxalate in the presence of Na citrate under definite conditions and it has been found that they are unstable at ordinary temp., their transition points being far below 0° . The water of crystn. of both hydrates exhibits totally different properties. The trihydrate loses 2 mols. of H_2O at 40° , the hydrate, $\text{CaC}_2\text{O}_4 \cdot 2\frac{1}{2}\text{H}_2\text{O}$, however, gives off $\frac{1}{4}$ mol. of H_2O at 80° and one more mol. of H_2O at 100° . The soly. tables and photographs of hydrates are added.

JAROSLAV KUČERA

Reflex furnace reduction of oxides. R. SAXON. *Chem. Age* (London) 19, No. 484; *Monthly Met. Sect.* 19, 27(1928).—The furnace has a modified inlet for the reducing gases which gives them a higher temp. than in the customary devices. Thin crucibles are to be used, preferably made of calcined clay. The pores of the crucible should be closed by coating with shellac, resin or aluminum paint and roasting.

A. L. H.

The thermal decomposition of ammonia, with particular reference to the existence of active and inactive phases of ammonia. WM. A. STRINGFELLOW. *J. Chem. Soc.* 1929, 1-8.—The work of Baly and Duncan (cf. *C. A.* 16, 3273) on the catalytic decompn. of NH_3 on Pt filaments was repeated. S. finds that, contrary to the conclusions of B. and D., neither a variation in the rate of evapn. of NH_3 from the liquid phase nor drying of the NH_3 by CaO effects its rate of decompn. Conclusion: The effect observed by B. and D. was dependent upon factors not explicitly defined in their paper and did not result from the reported existence of 2 different types of gaseous NH_3 .

P. H. EMMETT

A new type of alum. W. R. C. CURJEL. *Nature* 123, 206(1929).—By allowing an aq. soln. contg. equimol. amts. of K_2BeF_6 and $\text{Al}_2(\text{SO}_4)_3$ to crystallize at room temp., cubic crystals having the compn. $\text{K}_2\text{BeF}_6 \cdot \text{Al}_2(\text{SO}_4)_3 \cdot 24\text{H}_2\text{O}$ were obtained. These normally crystallize as octahedra and readily form true overgrowths on the common alums.

A similar alum was obtained in which K_2ZnCl_4 is substituted for K_2BeF_4 . Rb_2BeF_4 crystals are isomorphous with K_2BeF_4 . Pseudo-hexagonal interpenetration triplets are frequently formed as thin flakes.

W. W. STIFLER

Equilibrium relations in the reduction, oxidation and carbonization of iron. VII. 8. Cobalt in a methane-hydrogen atmosphere. RUDOLF SCHENCK AND HEINRICH KLAS. Univ. Münster i. W. *Z. anorg. allgem. Chem.* 178, 146-56(1929); cf. *C. A.* 21, 3334, 3799.—Two reactions are possible, one in which Co acts purely as a contact substance, expressed by the equation $CH_4 \rightleftharpoons C + 2H_2$; and one in which the formation of carbide occurs: $nCo + CH_4 \rightleftharpoons Co_nC + 2H_2$. The system is investigated in the range 680-900°, and the compn. of the gas phase is varied between 0 and 100% for both H_2 and CH_4 , with small additions of CO and N_2 . The presence of Co-Co carbide mixed crystals follows from the gradual increase in % CH_4 . At first more dil. mixed crystals are formed which are in equil. with low CH_4 concns. With carbide increase in the solid soln., CH_4 concn. increases, reaching its max. when satn. with carbide is attained, and the occurrence of the pure carbide phase begins. This satn. concn. of CH_4 is about 18% at 680°, 15% at 700°, 14% at 720°, 10% at 760°, 7.5% at 800° and 3.7% at 900°. Co carbide is found to be more stable than Fe carbide. Complete decarbonization is not obtained with less than 97% H_2 in the gas phase. Phase diagrams are given which show the limits of the mixed crystal field.

H. STOERTZ

A ferric oxalate and a ferric oxalate perchlorate. R. WEINLAND AND KARL REIN. Univ. Würzburg. *Z. anorg. allgem. Chem.* 178, 219-24(1929).—Four g. of $Fe(NO_3)_3 \cdot 9H_2O$ and 2.6 g. of finely pulverized $H_2C_2O_4$ are dissolved in 30 g. concd. HNO_3 , the temp. is kept below 25° and the yellow soln. obtained is evapd. over H_2SO_4 . After a few hrs. a canary-yellow powder begins to sep., but complete sepn. requires 1 day. It is filtered out and washed with ice-cold H_2O . Analysis is in good agreement with the formula, $Fe_2(C_2O_4)_3 \cdot 5H_2O$, but its exact constitutional formula is not detd. Cond. measurements in H_2O soln. (0.004 *N*) at 18° give $\mu = 137$. This salt slowly dissolves in H_2O to form a yellow soln. acid to litmus. After standing a few hrs., H_2O solns. give Fe^{++} reactions, while after a few days an oxalate of Fe^{++} seps. $CaCl_2$ gives no ppt. at ordinary temps. even on long standing; with long heating a reddish yellow turbidity is formed. On addn. of $AcONa + CaCl_2$ to a soln. of the oxalate, a red ppt. is formed consisting of CaC_2O_4 and basic ferric acetate. To prep. ferric-oxalate-perchlorate, 5.4 g. of $FeCl_3 \cdot 6H_2O$ and 7.6 g. $H_2C_2O_4$ are dissolved in 120 g. of 50% $HClO_4$. The mixt. is heated at 100° until a bright green powder seps. It is filtered and washed with coned H_2O and dried over H_2SO_4 with alternate application of vacuum and dry air. The bright green crystals are very hygroscopic, analysis indicating the compn.: $Fe_2(C_2O_4)_3(C_2O_4H)_2(ClO_4)_2 \cdot 14H_2O$. Six mols. of H_2O are given up in a vacuum over H_2SO_4 . In spite of the high ClO_4^- content, this compd. is non-explosive, probably because of the high H_2O content. NH_4OH ppt. $Fe(OH)_3$ from its solns. but $CaCl_2$ gives no ppt. except when accompanied by $AcONa$. KCl gives a ppt. of $KClO_4$. Its constitutional formula is not detd.

H. STOERTZ

Mixed oxalate-fluoro-anions of tervalent chromium, iron, antimony and bismuth. R. WEINLAND AND WILHELM HÜBNER. Univ. Würzburg. *Z. anorg. allgem. Chem.* 178, 275-88(1929); cf. *C. A.* 15, 3256.—The C_2O_4 group shows great facility in forming one member of mixed anions of tervalent metals. Other acid constituents of the mixed anions are usually Cl , F , NO_3 or SO_4 . The possibility of numerous isomeric combinations of the members of the anions is indicated but not observed, although it is believed that the pyridine base may be divided between anion and cation. **Pyridine tri-oxalate trinitrate dichromate**, $[Cr_2(C_2O_4)_3(NO_3)_3(H_2O)_3]H_3Py_4$ is prepd. by dissolving 4 g. of $Cr(NO_3)_3 \cdot 9H_2O$ and 1.3 g. $H_2C_2O_4$ in 20 cc. of warm H_2O , and adding drop by drop with slight heating and stirring 2.4 g. of pyridine. The dark violet soln. is evapd. at 100° to about half its vol. and then evapd. over H_2SO_4 . Another method is intimately to mix CrO_3 and $H_2C_2O_4$ and add a little H_2O . To this mixt. is added $Cr(NO_3)_3 \cdot 9H_2O$, the mixt. warmed on a H_2O bath and pyridine added drop by drop. In either case the crystals which sep. are washed with acetone and dried over $CaCl_2$. They are dark violet plates, very sol. in H_2O and pyridine, insol. in Et_2O and acetone, and lose no H_2O in a vacuum over H_2SO_4 . In prepg. the quinoline compd. the base is combined with $H_2C_2O_4$ first and this added slowly to the nitrate soln. The crystals are rose violet, easily sol. in H_2O and quinoline, insol. in alc., Et_2O and acetone, and cannot be recrystd. from H_2O . The compn. is represented by $[Cr_2(C_2O_4)_3(NO_3)_3(H_2O)_3]H_3quin_7$. **Pyridine di-oxalate trifluorodichromate**, $[Cr_2(C_2O_4)_2F_3]H_3Py_3 \cdot 7H_2O$ is prepd. by grinding CrO_3 and $H_2C_2O_4$ in a mortar, covering with H_2O in a beaker and adding a soln. of pyridine hydrofluoride contg. an excess of pyridine. The mixt. is evapd. partly on a water bath and then allowed to stand in the air. The crystals are washed with alc. and dried over

CaCl_2 . They are green, easily sol. in H_2O with acid reaction, insol. in alc., Et_2O and acetone. The dry substance does not attack glass, nor does CaCl_2 give a ppt. from its soln. in H_2O . H_2O is not lost in a vacuum over H_2SO_4 . *Pyridine dioxalate pentafluorodichromate*, $[\text{Cr}_2(\text{C}_2\text{O}_4)_2\text{F}_5]\text{H}_3\text{Py}_2 \cdot 5\text{H}_2\text{O}$, is produced when pyridine is added slowly to a mixt. of $\text{CrF}_3 \cdot 3.5\text{H}_2\text{O}$ and $\text{H}_2\text{C}_2\text{O}_4$, followed by boiling for a few mins. and evapn. in the air. It is a bright green powder, similar in properties to trifluoride. *Pyridine oxalate difluorodiaoquerrate*, $[\text{Fe}(\text{C}_2\text{O}_4)\text{F}_2(\text{H}_2\text{O})_2]\text{H.Py}$, is prepd. by treatment of $\text{Fe}(\text{OH})_3$ with 40% HF, and adding to the soln. produced $\text{H}_2\text{C}_2\text{O}_4$, followed by pyridine. On standing in the air, fine white crystals sep., which are easily sol. in H_2O to a yellowish green soln. and are insol. in alc. and Et_2O . *Pyridine oxalate difluoroantimoniate*, $[\text{Sb}(\text{C}_2\text{O}_4)_2\text{F}_2]\text{H.Py}$, is prepd. by dissolving Sb_2O_3 in HF, followed by addition of a soln. of $\text{H}_2\text{C}_2\text{O}_4$ and then pyridine. It crystallizes in the form of large 4-sided colorless prisms, sol. in warm H_2O and dil. acids, insol. in alc. and Et_2O . On dissolving Sb_2O_3 in HCl followed by addition of $\text{H}_2\text{C}_2\text{O}_4$ and pyridine, a variety of products can be obtained depending upon the condition. If the excess acid is neutralized with pyridine, a white Cl-free salt is obtained. If more than double the calcd. quantity of HCl is used, an oxalate-free salt is obtained in the form of beautiful needles. The oxalate-chloro salt, $[\text{Sb}_4(\text{C}_2\text{O}_4)_3\text{Cl}_{12}]\text{H}_{10}\text{Py}_8$, is decomposed by H_2O with sepn. of SbOCl_3 , and is sol. in warm dil. HCl from which an oxalate-free salt seps. *Bismuth oxalate chloropyridine* salts are prepd. in a similar manner. $[\text{Bi}_3(\text{C}_2\text{O}_4)_4\text{Cl}_6]\text{H}_3\text{Py}_4 \cdot 10\text{H}_2\text{O}$ is colorless, cryst. (prismatic), sol. in dil. HCl and HNO_3 , decomposed by H_2O with sepn. of oxychloride.

H. STOERTZ

The degradation of quaternary ammonium salts. I. THOMAS S. STEVENS, ELTON M. CREIGHTON, ALEXANDER B. GORDON AND MALCOLM MACNICOL. *J. Chem. Soc.* 1928, 3193-7.—Quaternary phenacetylammmonium salts have been prepd. by refluxing the base with bromoacetophenone in C_6H_6 or EtOH , and isolating the resulting bromide or converting it into the iodide. The purpose of the work was to protect a secondary amino group with a more easily removable radical than benzyl. The following compds. were prepd.: phenacetylphenyldiethylammmonium iodide, m. 133° , phenacetyl- β -phenylethyldimethylammmonium bromide, m. 191° , diphenylacetyldimethylpiperazinium dibromide, m. $222-5^\circ$ (decompn.), hydrohydrastinine phenacetyl iodide, m. 190° . All the above compds. readily lose the phenacetyl radical on reduction in aq. soln. with Na amalgam. Phenylacetylbenzylidimethylammmonium bromide (I), m. $167-8^\circ$, gives on reduction with Zn and H_2SO_4 a crude base whose picrate m. $173-4^\circ$ and was identified with benzyltrimethylammmonium picrate, whose m. p. is given as $168-9^\circ$ in the literature. On reduction with Na amalgam, I gives a base, $\text{C}_{17}\text{H}_{19}\text{ON}$ (II), which is identical with the product obtained by the action of NaOH. This base is not obtained from I by the loss of a Me group, since its methobromide is not identical with I, but gives phenylstyrylketone when it is treated with hot alkali. By synthesis from ω -bromo- ω -benzylacetophenone and dimethylamine hydrochloride in the presence of NaOMe, it is shown to be ω -dimethylamino- ω -benzylacetophenone, m. $77-9^\circ$, whose picrate m. $147-9^\circ$ and methobromide + 0.5 EtOH m. $195-7^\circ$. ALBERT L. HENNE

Action of acetates and of formates on bismuth nitrate. M. O. KHARMANDAR'YAN. Kharkov Rural Econ. Inst. *J. Russ. Phys.-Chem. Soc.* 60, 1477-85(1928).—While it is known that by interaction of boiling concd solns. of $\text{NaC}_2\text{H}_3\text{O}_2$ and $\text{Bi}(\text{NO}_3)_3$, a white ppt. of easily hydrolyzable $\text{Bi}(\text{C}_2\text{H}_3\text{O}_2)_3$ is produced, the interaction of the 2 salts in lesser concns., as well as the equil. of the reactions at ordinary temp., have now been studied by K. The $\text{Bi}(\text{NO}_3)_3$ soln. used contained 0.014145 g.-mol. Bi_2O_3 and 0.037 g.-mol. N_2O_5 per l. of H_2O . By adding $\text{Bi}(\text{C}_2\text{H}_3\text{O}_2)_3$ solns., ppts. were obtained of hydrolysis products which consisted of basic salts, the compn. of which depended on the quantity of the acetate added. With small quantities of acetate $\text{Bi}_2\text{O}_3 \cdot \text{N}_2\text{O}_5$ was pptd. which, on further addn. of the acetate, became transformed into $2\text{Bi}_2\text{O}_3 \cdot \text{N}_2\text{O}_5$. With still greater concns. of the acetate there was, at first, a pptn. of $\text{Bi}_2\text{O}_3 \cdot \text{N}_2\text{O}_5$ which gradually hydrolyzed and turned to $\text{BiO} \cdot \text{C}_2\text{H}_3\text{O}_2$. The salt $2\text{Bi}_2\text{O}_3 \cdot \text{N}_2\text{O}_5$ differs from $\text{Bi}_2\text{O}_3 \cdot \text{N}_2\text{O}_5$ by not being sol. in an excess of the acetate with formation of $\text{BiO} \cdot \text{C}_2\text{H}_3\text{O}_2$. The quantity of $\text{Bi}_2\text{O}_3 \cdot \text{N}_2\text{O}_5$ increases with the increase of the quantity of the acetate, whereas the quantity of $\text{BiO} \cdot \text{C}_2\text{H}_3\text{O}_2$ decreases and tends to disappear in the presence of very great concns. of the acetate. The acetates of K, Ca, Ba, Co, Zn, Cu, etc., act like $\text{Na}(\text{C}_2\text{H}_3\text{O}_2)_3$, and so do the formates, but not the oxalates. A curve of the equil. of the reaction is given. The study of the kinetics of the reactions shows that, within 6 months, they were not yet ended, some of them still showing a slow increase of $\text{Bi}_2\text{O}_3 \cdot \text{N}_2\text{O}_5$ pptn., while in other cases a gradual resoln. of this was taking place, after reaching a definite max.

BERNARD NELSON

Compounds of oxygenated halogen acids with benzidine. A. E. KRETOV. *J.*

Russ. Phys.-Chem. Soc. 60, 1427-33(1928).—A group of new compds. was obtained by combining oxygenated halogen acids with benzidine. HClO , HBrO and HIO oxidize benzidine instead of combining with it. The most insol. and easily separable salt of this group was obtained with HIO_3 ; it is formed in the presence of either HCl or AcOH , and the hydrochloride as well as the acetate of benzidine can be used in concns. of 5-50 g. per l. If the hydrochloride is used, the salt, $\text{H} \cdot \text{O}_2\text{NH}_2\text{H}_2\text{C}_6\text{H}_4\text{NH}_2\text{HIO}_3$, is pptd. in the form of silvery leaves which sometimes contain a small quantity of free benzidine. With benzidine acetate this salt ppts. in the form of a cryst. powder. The ppt. does not decomp. on being kept at room temp., even under direct action of sunlight, although it darkens. Its sepn. from solns. of HIO_3 or of iodates being complete, and its soly. in water being insignificant (about 0.03 g. per l.), the reaction may be used for the detn. of HIO_3 or of iodates by a new method which does not involve I titrations. For the quant. sepn. of HIO_3 it is best to use benzidine acetate, and not the hydrochloride, although the latter gives a ppt. which filters faster; the reason is that in the presence of the slightest excess of free HCl benzidine iodate partly decomp. with I formation. The reagent needed for the quant. operation is prepd. by carefully triturating 50 g. benzidine with 80% AcOH , washing the pasty mass into a 1 l. volumetric flask and filling with H_2O to the mark. To ppt. 0.2 g. of KIO_3 , or of NaIO_3 dissolved in 50 cc. water, 10 cc. of the above reagent are used, which may be dild. with 10 times as much H_2O ; the mixt. is left standing 30 mins. and then filtered, the ppt. being washed, dried and detd. either by weighing, or by means of a Kjeldahl N analysis. This method of HIO_3 detn. is lengthy and less exact than the usual methods. The HBrO_3 salt of benzidine is more sol. than the HIO_3 deriv. It is prepd. by pptn. of a freshly prepd. 20-30% aq. soln. of HBrO_3 made by decomp. $\text{Ba}(\text{IO}_3)_2$ with diluted H_2SO_4 and evapg. *in vacuo* with a satd. soln. of benzidine in EtOH . HClO_3 , which is prepd. in the same manner as HBrO_3 , gives with benzidine in alc. soln. 2 combinations: when benzidine is in excess, $\text{C}_6\text{H}_4\text{NH}_2(\text{C}_6\text{H}_4)_2\text{NH}_2\text{HClO}_4$ is obtained, whereas $\text{HClO}_2\text{NH}_2(\text{C}_6\text{H}_4)_2\text{NH}_2\text{HClO}_4$ is formed in the presence of an excess of the acid; the first of these could not be obtained in a perfectly pure state, in spite of having been washed with EtOH . Benzidine salts of HBrO and HClO are, like that of HIO_3 , very stable at room temp.; on prolonged keeping their coloration changes, but not their compn. On being quickly heated they detonate somewhat, particularly in the presence of H_2SO_4 ; a real explosion occurs with the HClO_3 salt in the presence of a very insignificant quantity of HNO_3 . These salts can be exactly titrated with phenolphthalein as indicator. A soln. of 0.02 g. HClO_4 in 10 cc. H_2O gave with a dil. soln. of benzidine- HCl (4 g. per l.) a yellowish green coloration which, on boiling, turned to cobalt-pink. The reaction is more distinct with stronger solns. However, the derivs. of HClO_4 and benzidine are obtained in alc., not in aq. soln. When an alc. soln. of benzidine is gradually added to an alc. soln. of HClO_4 , sp. gr. 1.2, the blue ppt. at first obtained becomes gray when benzidine is in excess. The dark blue powder obtained decomp. on being heated to 100° . Its compn. is $\text{HClO}_2\text{NH}_2\text{C}_6\text{H}_4\text{C}_6\text{H}_4\text{NH}_2$. If an excess of HClO_4 is added to an alc. soln. of benzidine, a white ppt. of a different compn. is formed; the latter cannot be titrated exactly in the presence of phenolphthalein.

BERNARD NELSON

Complex chemical behavior of lithium. I. The systems lithium halide, mono-, di- and tri-methylamine. A. SIMON AND R. GLAUNER. *Stuttgart Tech. Hochschule Z. anorg. allgem. Chem.* 178, 177-201(1929).—Li halides react with the 3 methylamines to form addn. products as follows: LiCl forms addn. compds. with 1, 2, 3 and 4 mols. of CH_3NH_2 , decomp. at 16° , 0° , -19° and -47° , resp.; with 1, 2 and 3 mols. of $(\text{CH}_3)_2\text{NH}$, decomp. at 3° , -15° and -36° , resp.; and with 1 and 2 mols. of $(\text{CH}_3)_3\text{N}$, decomp. at -15° and -41° , resp. LiBr forms addn. compds. with 1, 2, 3, 4 and 5 mols. of CH_3NH_2 , decomp. at 63° , 35° , 28° , -32° and -57° , resp.; with $1/4$, 1, 2, 3, 4 and 5 mols. of $(\text{CH}_3)_2\text{NH}$ decomp. at 59° , 44° , 30° , -18° , -30° and -61° , resp.; and with 1 and 2 mols. of $(\text{CH}_3)_3\text{N}$, decomp. at 23° and -15° , resp. With LiI these addn. products are not so sharply defined, adjacent compds. having a strong tendency to form mixed crystals with one another. This obscures the transition from one compd. to the next containing one less mol. of amine. With LiI , addn. compds. with 3.5, 3, 2.5, 2 and 1 mols. of CH_3NH_2 are pretty well established, and compds. with $1/4$, $1/2$, and 1.5 mols. are also indicated, if not very definitely. With 1, 2 and 3 mols. of the amine the decompn. temp. is 100° , 40° and -3° , resp. LiI forms compds. with $1/4$, 1, 1.5, 2, 3 and 5 mols. of $(\text{CH}_3)_2\text{NH}$, the 1, 2, 3 and 5 mol. compds., decomp. at 90° , 20° , 5° and -72° . LiI definitely forms compds. with 1.5 and 2 mols. of $(\text{CH}_3)_3\text{N}$, decomp. at 30° and -16° , resp., while only indications are given of similar compds. with $1/4$ and 1 mol. of $(\text{CH}_3)_3\text{N}$. All the LiCl compds. are white and very voluminous, but as the mol. wt. increases, they become less voluminous and more cryst.; the LiI compds. are all quite cryst. The structure of these compds. is

discussed in detail, and thermochem. data give the following values for the "conventional chem. const." C . For CH_3NH_2 , $C = 3.35$; for $(\text{CH}_3)_2\text{NH}$, $C = 3.6$; for $(\text{CH}_3)_3\text{N}$, $C = 3.1$. The heat of reaction Q in the formation of addn. products between Li halides and the amines is given as follows: For LiCl with 1 mol. of mono-, di- and tri-amine, $Q = 12.2$, 8.72 and 6.9 cal., resp.; for LiBr these values are 14.49, 9.87 and 7.75 cal.; and for LiI 16.33, 11.5 and 9.5 cal.

H. STOERTZ

A study of molybdates, nitrophosphomolybdates, tungstates and phosphotungstates and their reactions. TEÓFILO GASPÁR Y ÁRNAL. *Anales soc. españ. fís. quim.* 26, 435-45(1928).—Reactions of these compds. with Li, Na, NH_4 , K, Cu^{++} , Rb, Ag, Cs, Be, Mg, Ca, Zn, Sr, Cd, Ba, Hg^+ , Hg^{++} , Al, Ti^+ , Pb^{++} , Th, Bi, UO^{++} , Mn^{++} , Fe^{+++} , Ni^{++} and Co^{++} , useful in analysis, are tabulated.

E. M. SYMMES

Thorium formates. HANS REIHLEN AND MAX DEBUS. Karlsruhe Techn. Hochschule. *Z. anorg. allgem. Chem.* 178, 157-76(1929).—If alkali salts react with Th formate, well-crystd. compds. are formed which contain 3 Th atoms, 6 HCOO residues and 1 mineral residue, as well as 5 OH groups. From these, many complex Th compds. can be built up. If 8 g. KCNS react with a soln. of 10 g. of $[\text{Th}_3(\text{HCOO})_6(\text{OH})_5] \cdot 10\text{H}_2\text{O}$ (I), the result is *potassium trithorium hexaformate oxy-tetrahydroxythiocyanate*, $\text{K}[\text{SCN}(\text{OH})_4\text{O}(\text{HCOO})_6\text{Th}_3] \cdot 7\text{H}_2\text{O}$ (II). The crystals are sol. and lose 7 mols. of H_2O at 18° and 1-2 mm. pressure. On heating at 61° and 1-2 mm., 8 mols. of H_2O are given off to form the trioxy compd., $[\text{Th}_3(\text{HCOO})_6\text{O}(\text{SCN})]\text{K}$. To a soln. of 86.5 g. of KSCN in H_2O at 35° , an excess of $[\text{Th}_3(\text{HCOO})_6\text{O}(\text{OH})_5]$ (III) is added, the soln. is filtered and held at 0° for 8 days, after which 9 g. more of III are added at room temp. On cooling to 0° , *dipotassium trithorium hexaformate dioxidyhydroxydithiocyanate*, $\text{K}_2[(\text{SCN})_2(\text{OH})_5\text{O}_2(\text{HCOO})_6\text{Th}_3]$, is formed; it is mixed with $\frac{3}{2}$ mols. of II. If III is added to a soln. of NaNO_3 , the resultant product is *sodium trithorium hexaformate tetrahydroxyoxynitrate*, $\text{Na}[\text{Th}_3(\text{HCOO})_6\text{O}(\text{OH})_4\text{NO}_3] \cdot 10.5\text{H}_2\text{O}$ (IV). If NaNO_3 reacts with $[\text{Th}_3(\text{HCOO})_{10}(\text{OH})_5] \cdot 7\text{H}_2\text{O}$ (V), a mixed compd. of 1 mol. of IV and 1 mol. of $[\text{NO}_3(\text{OH})_4(\text{HCOO})_6\text{Th}_3]$ is formed. The analogous K compd. is formed in a similar manner and crystallizes with 30 mols. of H_2O . NaClO_4 reacts with V to produce *sodium trithorium hexaformate tetrahydroxyoxychlorate*, $\text{Na}[\text{ClO}_4(\text{OH})_4\text{O}(\text{HCOO})_6\text{Th}_3] \cdot 13\text{H}_2\text{O}$ (VI), easily sol. in H_2O and concd. NaClO_3 soln. The K compd. can only be prepd. mixed with 2 mols. of III. The perchlorate of the Na compd. (VII) is prepd. by reaction of NaClO_4 with I. This salt is very hygroscopic when dried. If $\text{Th}(\text{OH})_4$ is dissolved in H_2O and the soln. heated with 40% HCOOH the *dodeca-trithorium formate* $[\text{Th}_3(\text{HCOO})_{12}] \cdot 9\text{H}_2\text{O}$ (VIII) is produced. If this is treated at 100° with 100% HCOOH , it loses H_2O and forms $[\text{Th}_3(\text{HCOO})_{12}] \cdot 3.5\text{H}_2\text{O}$. If neutral Th formate is dissolved in cold H_2O and heated at 100° , a compd. crystallizes out which must be filtered hot and washed with boiling H_2O ; it is probably $[\text{Th}_3(\text{HCOO})_6(\text{OH})_6] \cdot 4\text{H}_2\text{O}$ (IX). The mol. cond. of a g.-mol. dissolved in 64 l. of H_2O is given for some of these compds. as follows: for IV, 68; for II, 63; for VI, 78 in 256 l.; for VII, 56; for VIII, 52.5, for IX, 14. The structure of these compds. is discussed in detail.

H. STOERTZ

7—ANALYTICAL CHEMISTRY

W. T. HALL

Progress of electroanalysis. A. SCHLEICHER. Tech. Hochschule Aachen. *Z. angew. Chem.* 42, 146-8(1929).—A discussion of the progress made since the World War.

W. T. H.

Some comparative colorimetric determinations. R. WASMUTH. Tech. Hochschule Aachen. *Z. angew. Chem.* 42, 133-4(1929).—Comparative studies with the immersion colorimeter showed that 3.6-4.9 mg. of Fe could be detd. by the KCNS reaction with an accuracy of 10% of the actual Fe content and Mn can be detd. by the PbO_2 - HNO_3 oxidation to MnO_4^- within 5% of the actual Mn content. Results with the persulfate oxidation method were not so good as the shade developed was often quite different from that of pure MnO_4^- .

W. T. H.

Organic microanalysis. W. GARNER. *Ind. Chemist* 5, 58-61(1929).—A discussion of typical methods to use for the identification of an unknown org. substance.

W. T. H.

Use of ultra-violet light in volumetric analysis. J. EISENBRAND. *Pharm. Ztg.* 74, 249-52(1929).—The importance of fluorescence in connection with p_H is emphasized. It is shown that indicator characteristics (not only change of fluorescence with p_H , but also sharper transition point) of fluorescing substances are not at all uncommon, being

frequently met with in material of very simple character. Aside from the well-known indicators, quinine and umbelliferone, the naphthols (particularly β -naphthol) are recommended as acids of the simplest constitution and indicators possessing equal fluorescent intensity. The many-sided applicability of quinine, inadequately explained in previous publications, is now shown by a series of examples. A provisional scale of fluorescing indicators is given. The possibility of detg. the dissociation constants of fluorescent substances by means of the fluorescent transition point is pointed out. W. O. E.

Immersion colorimetry. R. WASMUHT. *Chem. Fabrik* 1929, 37-8.—This method has been developed for the estn. of small quantities of metal oxides in Fe and steel residues. A modified Dubosq instrument is used adopting the Bürker principle to obtain optical symmetry it is now called the "Universal Colorimeter." The instrument can be used for microcolorimetry. S. L. B. ETHERTON

Systematic study of indicators. XV. Phenolphthalein and some of its homologs. A. THIEL AND L. JUNGFER. Univ. Marburg. *Z. anorg. allgem. Chem.* 178, 49-72(1929).—Previous work has shown that phenolphthalein and similar compds. contg. substituent groups can form colored quinoidal anions and colorless lactoidal anions. It seems more and more probable that the bleaching effect of the OH ion is due to the formation of such lactoidal secondary anions. To investigate this further the following phthaleins were prepd. and studied: phenol-*m*-cresolphthalein or 2'-methylphenolphthalein; *m*-cresolphthalein or 2',2''-dimethylphenolphthalein; dimethylfluoran; *o*-cresolphthalein or 3',3''-dimethylphenolphthalein; *p*-xylenolphthalein or 2',5',2'',5''-tetramethylphenolphthalein. Extinction measurements were made in the visible spectra by means of the spectrophotometer. The values obtained agreed with those obtained by other investigators and with previous measurements of T. and J. The intervals of color change and of bleaching were measured in terms of $pH^{1/2}$. The *p*-xylenolphthalein proved very stable to OH⁻. It was shown long ago that the decoloration by strong alkali is due to the formation of a tertiary salt of phenolphthalein (carbinolcarbonate). It is probable that the OH ion attacks the lactoidal or colorless form of the secondary anion but it has been doubtful whether H₂O first is taken up with the formation of carbinolcarbonic acid and then by dissocn. the tertiary anion results or whether the OH ion is taken up directly, breaking the lactone bridge. The present work seems to confirm the latter view. It is interesting also to note that rise of temp. favors the formation of the colored anion during the range of color change. W. T. H.

Improved directions for preparing a universal indicator which gives the colors of the spectrum over a pH range of 2-12. H. W. VAN URK. *Pharm. Weekblad* 66, 157-62(1929); cf. *C. A.* 23, 752.—Dissolve 70 mg. tropeolin OO, 100 mg. methyl orange, 80 mg. methyl red, 400 mg. bromothymol blue, 500 mg. naphtholphthalein, 400 mg. cresolphthalein, 500 mg. phenolphthalein and 150 mg. alizarin yellow R in 100 cc. dil. EtOH. One drop of this soln. dild. to 10 cc. gives the following colors—at pH 2 orange-red, 3 red-orange, 4 orange, 5 yellow-orange, 6 orange-yellow, 6.5 yellow, 6 green-yellow, 8 green, 8.5 blue-green, 9 green-blue, 9.5 violet-blue to blue-violet, 10 violet, 11 violet to violet-red, 12 violet-red. This indicator covers a wider pH range and gives sharper color changes than the one previously recommended (*C. A.* 23, 752). The use of a color chart is helpful but not essential. A table gives color comparisons of the author's 2 indicators and the indicators proposed by Kolthoff. A. W. DOX

Titration curves of some liquids titrated with phenolphthalein. VLADIMIR MAYER. Exptl. Inst. Cz. Sugar Ind., Prague. *Listy Cukrovar.* 47, 211-4(1928).—Ten cc. of alk. solns. such as are obtained in sugar control work were titrated with 0.1 N HCl. phenolphthalein being used as indicator. Then, when the color had just disappeared, the pH of the colorless soln. was detd. colorimetrically with bromothymol blue and bromocresol purple. Finally, a drop more of acid was added and the pH again detd. In the presence of aspartic acid, the color of phenolphthalein disappears when the $pH = 7.4$. In a soln. contg. saccharose and lime, the phenolphthalein color disappears at $pH = 7.0$. Fresh diffusion liquor gives the phenolphthalein end point at $pH = 7.7$ but chilled liquors obtained at the end of the season give a phenolphthalein end point at $pH = 8.0$. 8.2. A mixt. of invert sugar, lime and aspartic acid or pectins shows a pronounced effect of hydrolysis which is not shown by the decompn. products of invert sugar alone. FRANK MARESH

New method for making up molybdic acid solution for use in phosphoric acid determinations. J. F. BREAZEALE. *Chemist-Analyst* 18, No. 2, 4(1929).—The order of adding the chemicals is changed somewhat. W. T. H.

Notes on the determination of bismuth. GEORGE J. HOUGH. *Chemist Analyst* 18, No. 2, 3-4(1929).—Treat 0.5 g. of ore with HNO₃ and evap. nearly to dryness. Add 2-3 cc. more of HNO₃ to prevent hydrolysis, warm and filter, keeping the total vol.

to about 50 cc. Neutralize with NH_4OH to faint opalescence, add 1 cc. of 6 N HCl and 200 cc. of cold water. Stir well and allow to stand several hrs. in the cold or 1 hr. on the steam bath. Decant through a filter and wash the BiOCl ppt. by decantation with hot water. To the ppt. in the beaker, add 5 g. of NH_4Cl , 25 cc. of hot water and 1 cc. of 7.5 N H_2SO_4 . Pour through the filter. Wash the beaker with 0.75 g. of NH_4Cl , hot water and a few drops of H_2SO_4 . Wash the filter thoroughly, bringing the total vol. of soln. to 150–200 cc. Insert a small square of Al foil and boil gently for 30 mins. to ppt. the Bi. Remove the Al, allow the ppt. to settle and decant off the liquid. Wash the Bi twice by decantation with hot water. Dissolve the Bi in 10–15 cc. of satd. FeCl_3 soln., gently heating. Add 200 cc. of cold water and 5 cc. of sirupy H_3PO_4 ; titrate the reduced Fe with KMnO_4 . W. T. H.

Detection and estimation of calcium, barium and strontium. W. SINGLETON. *Ind. Chemist* 5, 71–3(1929).—A review of well-known methods. W. T. H.

Potentiometric titration of gallium. SUNAO ATO. *Sci. Papers Inst. Phys.-Chem. Research (Tokyo)* 10, 1–5(1929).— GaCl_3 can be titrated potentiometrically against $\text{K}_4\text{Fe}(\text{CN})_6$. When the HCl concn. lies within 0.005–0.0025, $\text{Ga}_3(\text{Fe}(\text{CN})_6)_3$ is formed; otherwise the ppt. does not correspond to this formula. It is recommended, therefore, to titrate with this acidity at 40–50°. W. T. H.

Lead in white arsenic. H. W. JONES. *Chemist-Analyst* 18, No. 2, 11(1929).—Boil 20 g. of As_2O_3 with 500 cc. of HCl until only 100 cc. remains. Add 500 cc. more of acid and boil down to 50 cc. This will serve to volatilize practically all of the As as AsCl_3 . Add 250 cc. of water, neutralize to litmus with NaOH , add 5 cc. of 10% Na_2S and heat to boiling. Filter off the PbS , dissolve in HNO_3 and ppt. as PbSO_4 in the usual way. Dissolve the ppt. in hot AcONH_4 , ppt. PbCrO_4 by adding $\text{K}_2\text{Cr}_2\text{O}_7$ and weigh after drying. W. T. H.

Determination of aluminum in steel. A. T. KITTREDGE. *Analyst* 54, 141–4(1929).—The usual method for detg. Al in steel is unreliable. Take 10 g. of steel and dissolve in 100 cc. of concd. HCl . Oxidize with a min. quantity of HNO_3 , evap. to small vol. and carry out the Rothe ether sepn. to remove the greater part of the Fe. Evap. with H_2SO_4 and electrolyze with a cathode of Hg to remove the remainder of the Fe and other interfering ions. After the electrolysis, remove traces of Hg with H_2S , conc. by evapn., add 5 g. of NH_4Cl and ppt. the Al as $\text{Al}(\text{OH})_3$ by the addition of concd. NH_4OH , using methyl red as indicator. Ignite carefully and weigh. Run a blank test on all the reagents. If the wt. of the ppt. is less than 5 mg. it is hardly worth while to correct for P_2O_5 , Fe_2O_3 , Mn_2O_3 and Cr_2O_3 . In this case the Al should be detd. colorimetrically with aurin-tricarboxylic acid as described by Lundell and Knowles. In either case, fuse with $\text{K}_2\text{S}_2\text{O}_7$ and extract with water. If V or Ti is present, det. the quantity colorimetrically by treatment with H_2O_2 . Det. Fe by nearly neutralizing with NH_4OH , adding H_2SO_4 , boiling off excess and titrating with KMnO_4 . Det. Mn colorimetrically by the persulfate and AgNO_3 method, allowing for the KMnO_4 added in the foregoing titration. Det. Cr colorimetrically. Det. P_2O_5 by adding a nitric acid soln. of 0.1 g. of electrolytic Fe, pptg. with NH_4OH and from the HNO_3 soln. of this ppt. det. P by the usual molybdate pptn. followed by alkalimetric titration. In the analysis of 5 steels, from 0.01 to 0.22% of Al was found. The uncorrected values ranged from 0.02 to 0.25%. W. T. H.

Rapid method for determining vanadium in ferro-vanadium. JAMES SILBERSTEIN. *Chemist-Analyst* 18, No. 2, 11(1929).—The method depends upon the fact that III reduces V only to the valence of 4 when H_3PO_4 is present. Fuse 1 g. of material in a Ni crucible with 10 g. NaOH for 20 mins. Leach with water and filter into a 500-cc. measuring flask. Take 50 cc., add 75 cc. of H_3PO_4 (d. 1.7) cool and add KI. After 5 mins. titrate with 0.05 N $\text{Na}_2\text{S}_2\text{O}_8$. W. T. H.

Determination of oxygen in steel and iron. ST. REINER. *Z. angew. Chem.* 42, 159–60(1929). OSKAR MEYER. *Ibid.*—Meyer (*C. A.* 23, 1078) has described methods now being used for detg. O in Fe and steel but neglected to mention the improvement in Oberhoffer's app. which was suggested by R. To this M. replies that the method referred to is out of date. W. T. H.

Iodometric estimation of iron. EGBERTON C. GREY. *J. Chem. Soc.* 1929, 35–9.—The iodometric method for detg. Fe is accurate down to 0.05 mg. of Fe. A considerable excess of KI and of HCl should be used for the reduction. The reduction is complete in 3 mins. if the soln. is N in HCl . Sometimes the blue color returns after the end point is reached with $\text{Na}_2\text{S}_2\text{O}_3$ and in many cases this is due to the presence of a small quantity of Cu. To det. Fe in plants, therefore, it is advisable to leach the ash with concd. HCl and ppt. Fe with NH_4OH . Dissolve the $\text{Fe}(\text{OH})_3$ ppt. in HCl and in the final soln. have at least 0.4 cc. of HCl in 10 cc. of soln. To this add 0.33 g. of KI dissolved in not over

5 cc. of water. After 3 mins. dil. somewhat, add NaOAc if desired, and titrate with $\text{Na}_2\text{S}_2\text{O}_3$. W. T. H.

Quantitative electrolytic reductions. I. Reduction of tervalent iron to the bivalent state. EDGAR NIETZ. Univ. Leipzig. *J. prakt. Chem.* 121, 1-26(1929).—The electrolytic reductions took place in an 80-cc. beaker, the diam. of which was about 5 mm. wider than that of the Pt cathode used. In the middle of the beaker was placed an anode cell of clay or of collodium, the upper edge of the cell being above the level of the liquid in the beaker. From 40 to 50 cc. of dil. H_2SO_4 was placed in the cell and it was placed in the beaker after elec. connections had been made and the current turned on. A current of 1 amp. served to reduce 0.1394 g. of Fe^{+++} in about 40 mins. The max. yield of Fe^{++} under the conditions of the expt. was 99.7% of the total Fe present. There was a tendency for a little of the Fe soln. to diffuse into the anode compartment and for Fe to be absorbed by the walls of the inner cell. Moreover, probably a little oxidizer, perhaps $\text{S}_2\text{O}_8^{--}$, diffuses into the cathode compartment and serves to oxidize some of the Fe. **II. Reduction of nitric acid.** *Ibid.* 27-55.—The expts. were performed with quantities of KNO_3 varying from 0.1 to 0.7 g. The KNO_3 was assumed to be pure, the results obtained by the Pelouze-Fresenius method of analysis varying $\pm 0.3\%$. Most of the expts. took place with a Pt-gauze cathode covered with a spongy deposit of Cu and a spiral anode making about 300 r. p. m. The e. m. f. between the electrodes was 5.5 v. and the current did not exceed 2 amps. All the results were 0.3-0.5% too low. The following errors account for the low results: (1) a little N escapes as N_2 and it was not possible to prevent this error entirely. (2) Unless the soln. is neutralized at the end of the electrolysis there is danger of some Cu being dissolved by the H_2SO_4 (the electrolyte contained 0.3-20 cc. of 0.4 N H_2SO_4). If the soln. was neutralized before removing the cathode and washing it, this error became insignificant. (3) The reduction of the nitrate yields NH_4^+ chiefly, but besides a little N_2 some NH_4OH salt is often formed, particularly when the cathode surface is not sufficiently rough and when the current lines are not symmetrical so that the cathode c. d. is not uniform and when the cathode is too near the sides of the beaker. Potential measurements showed that the reduction of the nitrate caused a marked increase of the depolarization of the spongy Cu electrode, that the depolarizing effect of NO_3^- is related to a min. concn. which is lower for spongy Cu than for bright Cu; that abundant hydroxylamine formation takes place only when the cathode potential exceeds a certain neg. value; and that a marked H polarization takes place with spongy Cu cathodes after the reduction of the NO_3^- is complete. Conditions are stated under which these phenomena take place and also those under which no reduction of NO_3^- is accomplished. W. T. H.

Rapid method for determining tin in lead base alloys containing antimony. T. B. DIANA. *Chemist-Analyst* 18, No. 2, 8(1929).—To 0.5 g. of filings add 0.3 g. of pure Sn to make the Sn content at least 3 times that of the Sb. Heat with 15 cc. of 7.5 N HNO_3 until the metal is all attacked. Boil off excess acid and add 40 cc. of hot water, while stirring. Filter and wash alternately for 10 times with hot water and 1.5 N HNO_3 . Ignite carefully and weigh the SnO_2 and Sb_2O_3 . Subtract the wt. of Sb_2O_3 corresponding to a value obtained in another sample by titration and the weight of SnO_2 corresponding to the added Sn. Some Pb is usually present but can be neglected in routine work. W. T. H.

Rapid method for determining tin in tin plate. W. A. MASEL. *Chem.-Ztr.* 53, 108(1929).—The method depends upon the fact that the Sn coating can be removed very quickly by the action of a soln. of Cl_2 in SnCl_4 without dissolving the underlying Fe. Make a fine opening in the bottom of a stout test tube and provide an Fe handle for the tube. Weigh out into this test tube any desired amt. of finely cut, washed and dried metal and push the tube down into a soln. of Cl_2 in SnCl_4 contained in a cylindrical vessel. When no more bubbles of gas are evolved and no more bright places remain visible on the metal surface, the reaction is almost over. After about 5 mins. longer, allow most of the SnCl_4 to drain off and then quickly plunge the test tube into a vessel containing benzene. Wash thoroughly with benzene and finally with a little ether, dry and weigh. The loss in wt. can be called Sn. The result is usually 0.1% of the original wt. too low. To prep. the reagent in quantity sufficient for 25-50 analyses, take 500 g. of SnCl_4 and sat. with Cl_2 . It will absorb about 30 g. of Cl_2 . W. T. H.

Microanalysis for the determination of iodine in organic materials. J. F. REITH. Centraal Lab. Volksgezondheid, Utrecht. *Chem. Weekblad* 26, 20-7(1929).—To destroy org. matter in which I is to be detd. heat 20 g. in an O_2 stream, absorb the gases in alkali and analyze the ash separately. B. J. C. VAN DER HOEVEN.

Critical studies of gasometric methods for determining nitrous oxide. HEINRICH MENZEL AND WALTER KRETZSCHMAR. Tech. Hochschule, Dresden. *Z. angew. Chem.*

42, 148-56(1929).—With 99.4% pure N_2O prepd. from NH_4NO_3 , the best-known methods of analysis lead to the following conclusions: Winkler's method, using a modified explosion pipet here described, gives results within 0.2 cc. of the truth in the analysis of gases contg. not more than 10% of N_2O . If more than this is present, the gas attacks Hg and it is impossible to read the vol. accurately. The explosion with detonating gas as recommended by Heymann cannot be used when more than 5% of N_2O is present; with higher content nitrous gases appear. Bunsen's method of reducing with H_2 under the conditions recommended by him and by Hempel gives good results with N_2O , varying from 0.4 to 100%, whether the reduction is made to take place in an explosion pipet or in a capillary contg. Pt. Thermic decompn. of N_2O and reduction by H_2 in a Dietz Pt capillary is absolutely unreliable. O_2 can be detd. in gases contg. N_2O by means of a P-pipet with Hg as confining liquid and only an extremely small quantity of water. After the removal of O_2 , the N_2O can be detd. by one of the methods recommended above as soon as the small vol. of H_2O is in equil. with the N_2O . W. T. H.

Electrolytic method for the analysis of nitrates. MARK RABINOVITCH AND A. S. FOKIN. *Z. Elektrochem.* 35, 18-20(1929).—The method depends upon the reduction of a sol. nitrate to NH_3 by the action of freshly prepd. Hg-Na in the presence of a catalyzer such as metallic W, $VOSO_4$ or H_2PtCl_6 . The Hg is prepd. by electrolytic reduction of NaOH using a current of about 4 amp. The Na-Hg does not react readily with dil. NaOH soln. and scarcely at all with concd. NaOH. The electrolyzing vessel is a beaker contg. a layer of Hg, 2-2.5 cm. deep. Into this Hg is placed a cylindrical vessel open at the bottom, arranged so that the shaft of a motor-driven stirrer can be inserted at the center through glass tubing sealed in the vessel. Any gas formed within the cylinder can escape through only one opening and here also the substance to be analyzed is introduced. Outside of this cylindrical vessel, the beaker contains a 45% soln. of NaOH; inside the cylinder is a 20% NaOH soln. These 2 solns. are sepd. by the Hg seal. A Pt electrode is placed in the outer compartment to serve as anode and the Hg at the bottom of the beaker is made the cathode. By electrolysis, Na-Hg is formed at the bottom of the beaker and this with the aid of the catalyst reacts with about 0.2 g. of dissolved alkali nitrate present in the inner compartment. NH_3 escapes from the cell together with H_2 and is made to pass into a measured vol. of standard H_2SO_4 . Finally, the contents of the beaker are heated to boiling to distil off the last traces of NH_3 . Then the excess acid is titrated, with methyl orange as indicator. The results obtained with pure KNO_3 agreed closely but showed only 97% of the theoretical value but comparative results obtained with Devada's alloy averaged somewhat lower. W. T. H.

A new method for the colorimetric determination of nitrates in soils and in waters. LUIGI UMBERTO DE NARDO. *Compt. rend.* 188, 563-5(1929).—Pyrogallolsulfonic acid is an excellent reagent for the nitrate ion. Take 5 g. of pyrogallol and heat for a few mins. with 10 cc. of concd. H_2SO_4 at 80-90°. Cool and add water to make 200 cc. A small quantity of $NaHSO_4$ may be added as preservative. This reagent is very sensitive to the nitrate. As little as 0.0005 mg. gives a pink color. With larger quantities a reddish brown or an olive-green shade is obtained. Take 10 g. of soil, agitate for an hr. with 200 cc. of water, filter and take 80 cc. of the filtrate. Add 1-3 cc. of satd. $Ba(OH)_2$ soln., boil, let settle, add 0.5-1 cc. of 50% Pb subacetate soln. and after 2-3 mins. ppt. the excess Ba and Pb by adding 5 cc. of satd. Na_2SO_4 soln. Dil. to 100 cc., mix well and filter. Take 10 cc. in a 50-cc. porcelain dish and if nitrites are presented decomp. with urea and 1 cc. of H_2SO_4 . After 10 mins., add 0.5 cc. of the reagent and mix with 20 cc. of concd. H_2SO_4 . Compare the color with standards. If the test is too strong, use pyrogallol as reagent instead of the sulfonic acid. W. T. H.

Method for determining small quantities of silicic acid in orthophosphoric acid. PH. ALBRECHT. *Chem.-Ztg.* 53, 118-9(1929).—Take 10-20 g. of approx. 83% H_3PO_4 in a Pt dish, add 5 times this wt. of $AgNO_3$, heat carefully to 100-120° and maintain this temp. for 2 hrs. Place the dish in a Jena beaker, heat with HNO_3 till the melt dissolves, dil. with water, remove the dish and filter. Recover the Ag in the filtrate by pptn. with Cl^- . Ignite the ppt. very carefully in a Pt crucible, weigh and treat with HCl and H_2SO_4 . W. T. H.

Acidimetry of phosphorous acid in presence of indicators. T. MILOBEDZKI AND K. BORATYNSK. *Roczniki Chem.* 8, 554-62(562 French)(1928).—The titration of carefully prepared H_3PO_3 showed the first H replaced by Na at $pH = 3.5-3.6$ and the second H^+ at $pH = 8.5-8.6$, values slightly lower than those obtained by Kolthoff.

JAROSLAV KUČERA

Precipitation of Group II acids (the chloride group) in the presence of other acid radicals. LOUIS J. CURTMAN AND WALTER W. PLECHNER. College City of N. Y. *Chem. News* 138, 65-7(1929).—The acids of Group II (HCl , HBr , HI , HCN , H_2S ,

$H_2Fe(CN)_6$, $H_3Fe(CN)_6$, and $HCNS$) may be pptd. in the presence of other acid radicals by means of $AgNO_3$ soln. if the soln. has been treated with 10% of its original vol. of concd. HNO_3 . To make a preliminary test for Group II, take 50 cc. of neutral soly., add 1 cc. of 0.25 N $AgNO_3$ and 5 cc. of concd. HNO_3 . Heat and stir. W. T. H.

Poisoning by bittersweet (*Solanum dulcamara*). HAROLD LOWE. *Analyst* 54, 153-4(1929).—The Stas-Otto method of extg. alkaloid from viscera is satisfactory but as solanine, the poisonous principle, is insol. in ether and in $CHCl_3$, a final extn. with warm amylalcohol from ammoniacal soln. is necessary. The most useful tests on the mixed alkaloids are: (1) A concd. soln. of the alkaloids in amyl alc. sets to a jelly. (2) Phosphomolybdic acid gives a cream-colored ppt. (3) Fröhde's reagent gives a violet color. (4) HNO_3 gives a purple color on heating. (5) Vanadic-sulfuric acid gives a red color. (6) Ethylsulfuric acid gives a red color. (7) Concd. H_2SO_4 with Br aq. gives red colors forming in streaks. (8) Selenic-sulfuric acid gives a red color. (9) The hemolytic action on blood. Two instances of poisoning are mentioned: that of a foal and that of a cow. W. T. H.

Determination of small quantities of mercury in the presence of organic and inorganic compounds. R. ROBINSON. *Analyst* 54, 145-52(1929).—By pptg. Hg with H_3PO_4 , filtering and titrating with 0.01 N I_2 and $Na_2S_2O_3$ solns., good results were obtained with samples ranging from 0.002-0.04% of Hg. The results are generally 0.3 mg. too low owing to volatilization of Hg. To the Hg soln. in a 350-cc. Erlenmeyer flask, add water to make 200 cc. and adjust the acidity with HCl so that 5 cc. of 2 N HCl is present in excess. Add 2 g. of $NaCl$ and 10 mg. of filter paper pulp. Then add 30 cc. of H_3PO_4 (d. 1.137) and allow the soln. to stand overnight. In the morning, heat on the water bath for 15 mins. and allow to stand 20 mins. Filter through a well-packed paper-pulp filter and wash with cold water. Transfer the filter and ppt. back to the original flask, wiping the sides of the funnel with paper to remove all Hg. Add 100 cc. of water and 2 cc. of 30% $AcOH$, followed by at least twice as much 0.01 N I_2 soln. as is required by the Hg present and 2 g. of KI . Allow to stand for 30 mins. with occasional shaking and then titrate with $Na_2S_2O_3$ and I_2 solns. Allow for the vol. of I_2 soln. required to give the iodo-starch color. When org. matter is present, digest 0.2 to 0.5 g. of the substance with 10 cc. of concd. H_2SO_4 in a Kjeldahl flask heated to 130-150° in a paraffin bath. Occasionally add a little KNO_3 to hasten the process. Cause the fumes to pass through 2 wash bottles. When the org. matter is destroyed and the contents of the flask no longer smell of SO_2 , add the contents of the wash bottles to the main soln. and filter. Neutralize and continue as above. W. T. H.

Perchloric acid as an agent for the clean destruction of organic matter. R. J. C. FABRY. *Chemist-Analyst* 18, No. 2, 8-9(1929).—It is frequently necessary to destroy tartaric acid which has been added to prevent pptn. of $Fe(OH)_3$ or H_2TiO_4 . Add to 600 cc. of soln. 15 cc. of concd. HNO_3 and 10 cc. of 20% $HClO_4$. Allow to stand overnight. W. T. H.

Determination of the acetone group. AD. GRÜN. *Ber.* 62B, 473-4(1929).—The method described by Elsner (*C. A.* 23, 1394) does not do justice to the similar procedure described by G. (*C. A.* 20, 2659). W. T. H.

Estimation of mixtures of methanol and ethanol. STANLEY KETTLE. *Chemist-Analyst* 18, No. 2, 7(1929).—Oxidize with H_2SO_4 and $K_2Cr_2O_7$. This oxidizes $EtOH$ to $AcOH$ and $MeOH$ to CO_2 and water. Pass the evolved gas into ammoniacal $BaCl_2$ soln. Filter off the $BaCO_3$ and titrate with HCl to det. the $MeOH$. W. T. H.

Estimation of acetone in denatured alcohols. WM. L. O. WHALEY. *Chemist-Analyst* 18, No. 2, 6-7(1929).—To 10 cc. of alc. add water to make 1 l. Mix and pipet off 10 cc. into a 250-cc. measuring flask with ground stopper. Add 100 cc. of water, 10 cc. of 5 N $NaOH$ soln. and cool in ice. To the cold soln. add 50 cc. of 0.01 N I_2 soln. and keep in ice 2 mins. longer. Dil. and titrate with $Na_2S_2O_3$. W. T. H.

Notes on the iodometric determination of glucose. VINCENT A. TOSCANI. *Chemist-Analyst* 18, No. 2, 7(1929).—To prep. a sensitive starch paste, triturate 1 g. of sol. starch with enough satd. $NaCl$ soln. to make a paste. Then add 100 cc. of hot, satd. $NaCl$ soln. This indicator is sensitive and stable. If a reducing sugar is present in acid soln. it is important to have the soln. slightly alk. before adding the alk. ferricyanide soln. For this purpose add a few drops of phenol red and 25% $NaOH$ until the soln. is alk. Then to det. glucose add a measured vol. of standard $K_3Fe(CN)_6$ soln. and 3 cc. of a mixt. of 1 g. KI , 2 g. $ZnSO_4$ and 10 g. $NaCl$ in 40 cc. of water. Make acid and titrate with thiosulfate. W. T. H.

Critical comments on the analysis of glycerol by the acetin method and the sources of error. OTTO BEHRN. Hess. Chem. Prüfungstation Gewerbe, Darmstadt. *Chem.-Ztg.* 52, 597-8(1928).—The errors in the International Standard Method for detg.

glycerol (by the acetin method) were traced to the presence of CO_2 in the NaOH soln. employed. For the correction of these errors, cf. *C. A.* 22, 3863, 4410. W. C. EBAUGH

New method of colorimetric determination of *d*-glucose. A. B. SHAKHKELDIAN. Timiriazev Rural Econ. Tech. *J. Russ. Phys.-Chem. Soc.* 60, 1517-20(1928).—All quantitative methods of mono- and polysaccharide detns. being based on their transformation in *d*-glucose, the latter is usually determined by its ability to reduce Cu_2O to Cu^{++} . As, however, the relation between the quantity of Cu_2O obtained and that of glucose taken is not constant and depends on the degree of concn. of the solns., the duration of heating and other operating details, S. now proposes a new method of glucose detn. which is based on the development of red-colored picramic acid, $\text{C}_6\text{H}_3(\text{OH})(\text{NH}_2)(\text{NO}_2)_2$, by the action of picric acid on *d*-glucose in alk. soln., having previously established that the relation between the quantity of glucose taken and that of picramic acid obtained is const. Salt-free glucose solns. of various concns. were thus detd. in a Duboscq colorimeter by a comparison with a standard colorimetric soln., and the detns. were found correct within 1%. Glucose solns. usually contain NaCl due to neutralization of glucose hydrochloride by Na_2CO_3 and, since NaCl has an influence on the picramic acid coloration, a modification of the method is suggested which also gives exact results in the presence of salt. BERNARD NELSON

Identification of fructose in presence of other carbohydrates. L. EKKERT. *Magy. Gyógy. Ért.* 5, 17-8(1929).—Dissolve 0.01-0.02 g. of substance in 3-4 drops of KOH soln., add 0.5-1 g. of solid KOH or NaOH . In the presence of fructose a red ring appears around the solid alkali and slowly the whole soln. turns red. Other carbohydrates do not give this reaction. S. S. DE FINÁLY

Compounds of oxygenated halogen acids with benzidine (KRETOV) 6. Colorimetric measurements (EGNER) 2. The solubility of Reinsch Sb films in water (CLARKE) 2. Fatal phenobarbital poisoning. Report of a case with toxicologic analysis (WRIGHT) 11H.

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8—MINERALOGICAL AND GEOLOGICAL CHEMISTRY

EDGAR T. WHERRY AND J. F. SCHAIERER

New mineral names and new data. W. F. FOSHAG. *Am. Mineral.* 14, 77-9 (1929); cf. *C. A.* 23, 1081.—A review of the properties and occurrence of the following minerals, with references, is given: monrepite, pseudoglaucophane and ferrothorite. New data are added on rhomboclase, szomolnokite, usbekite and tanatarite. A. M. B.

New data on atomic dimensions. EDGAR T. WHERRY. *Am. Mineral.* 14, 54-8 (1929).—A summary of recent work on at. dimensions is given in tabular form. The values are chiefly those deduced in the studies of V. M. Goldschmidt (*C. A.* 20, 2767, 3415) and Pauling (*C. A.* 21, 1434). W. prefers the term "atom-meter," symbol *am*, in place of "ångström." The application of the data to the study of replacements in minerals and in similar problems is briefly discussed. A. M. BRANT

Precision measurements of the lattice constants for various tetrahedrites. The formula and structure of tetrahedrite. FELIX MACHATSCHKI. Univ. Oslo. *Z. Krist.* 68, 204-22(1928); cf. *C. A.* 23, 1842.—Tetrahedrite is hextetrahedral and belongs to space group T_d^3 . The size of the unit cube varies with the compn. At. positions are given. The general formula is $R^I_4R^{III}_4\text{S}_4$, where R^I is chiefly Cu, and R^{III} chiefly Sb and As. There may be some replacement of R^I by R^{II} , usually Zn and Fe. In this case there is room in the structure for extra S. For ordinary tetrahedrite, Cu_4SbS_4 , $a = 10.32$ A. U.; with Ag replacing some of the Cu the value of $a = 10.40$; the substitution of As for Sb (tenuantite) gives $a = 10.19$; and the presence of some Bi replacing Sb causes a large increase in the size of the unit cube. L. S. RAMSDALL

The enargite group. Structure of sulvanite, Cu_3VS_4 . W. F. DE JONG. *Z. Krist.* 68, 522-30(1928).—Enargite, Cu_3AsS_4 , and famatinite, Cu_3SbS_4 , are isomorphous, and probably orthorhombic, but sulvanite is cubic. The space group is O_h^8 , with Cu at 24c, V at 8e, and S at 32a ($u = 1/8$). Eight mols. are contained in the unit cube, the edge of which is 10.750 ± 0.005 A. U. The calcd. d. is 3.97. This structure type is similar to that of bornite, Cu_5FeS_4 . An analysis of sulvanite gave Cu 51.20, V 14.20 and S 34.60%. L. S. RAMSDELL.

Pseudo-cubic quartz crystals from Artesia, New Mexico. W. A. TARR AND JOHN T. LONSDALE. *Am. Mineral.* 14, 50-3(1929).—Quartz crystals consisting dominantly of the + rhombohedron r , and closely simulating cubes, were found in the gypsum beds in the red sandy shale. They are most abundant in a zone just below the shale. Most of the crystals are colored by hematite, the color being dependent on the color of the gypsum. About 2% of the crystals are pseudo-cubic while the others are quartzoids or doubly terminated prisms. When the - rhombohedron s is present, its luster is less than that of the + form. Etching pits were found to have no definite orientation. The factor which prevented the development of the - form is not evident, but is probably of local distribution. A. M. BRANT.

The crystal structure of brookite. LINUS PAULING AND J. H. STURDIVANT. *Calif. Inst. Tech. Z. Krist.* 68, 239-56(1928).—Brookite, TiO_3 , is orthorhombic with symmetry V_h^{15} . There are 8 mols. in the unit cell, which has the dimensions $a = 9.106$, $b = 5.436$ and $c = 5.135$ A. U. At. positions are given, based on the assumptions that the structure consists of octahedra, with a Ti atom at the center and O atoms at the corners; that each octahedron shares 3 edges with adjacent ones; and that the Ti-O distance is about 1.95 A. U. L. S. RAMSDELL.

The structure of sillimanite and mullite. W. H. TAYLOR. *Manchester Univ. Z. Krist.* 68, 503-21(1928). (In English).—The unit cell of sillimanite is orthorhombic, with $a = 7.43$, $b = 7.58$ and $c = 5.74$ A. U. This cell contains 4 mols. of Al_2SiO_5 , and the symmetry is approx. that of V_h^{10} . An at. arrangement is proposed in which each Al atom is surrounded by 6 O atoms, and each Si atom by 4 O atoms, forming definite SiO_4 groups. The unit of mullite is 4 times that of sillimanite. Four cells of sillimanite would have $\text{Al}:\text{Si}:\text{O} = 32:16:80$, while one mullite would have $\text{Al}:\text{Si}:\text{O} = 36:12:78$. By substituting 4 Al for 4 Si and removing 2 O atoms, a very slight readjustment of positions gives the mullite structure. A similar situation exists with $\text{Na}_4\text{Ca}_2\text{Si}_2\text{O}_{10}$, which is cubic with 4 mols. in a cell with $a = 7.49$ A. U. and with $\text{Na}_4\text{Ca}_2\text{Si}_2\text{O}_{10}$, which is pseudo-cubic, with 2 mols. in a cell with $a = 7.54$ A. U. Equiv. units therefore contain $\text{Na}_4\text{Ca}_2\text{Si}_2\text{O}_{10}$ in the first case and $\text{Na}_4\text{Ca}_2\text{Si}_2\text{O}_{10}$ in the second. Kaolinite is entirely different from either mullite or sillimanite because in it $\text{Al}:\text{Si}:\text{O} = 36:12:108$. L. S. RAMSDELL.

Garnets. J. STEPH. VAN DER LINGEN. *Univ. of Cape Town. S. African L. Sci.* 25, 10-5(1929).—An address. ALBERT L. HENNE.

The chemical composition of apophyllite. B. GOSSNER AND O. KRAUS. *Z. Krist.* 68, 595-615(1928).—Analyses of apophyllite from 4 localities are given, and the formula obtained is $4(\text{Si}_2\text{O}_5\text{H}_2.\text{CaO}_2\text{H}_2)\text{KF}$, in which the F is replaceable by OH. Variable replacement in a single crystal may cause a zonal structure. As the formula indicates, the H_2O is not zeolitic, but is firmly held, and cannot be removed without destroying the structure. The unit cell contains 4 mols., and has the dimensions $a = 15.84$ and $c = 15.84$ A. U. The space group is D_{2h}^{12} . At. positions are given. L. S. RAMSDELL.

The structure of analcite. JOHN W. GRUNER. *Univ. of Minn. Z. Krist.* 68, 363-78(1928).—This article gives more complete data than a previous one (*C. A.* 22, 3116). Analcite dehydrated by heating to 700° shows very little structure alteration, the cube edge merely changing from 13.64 ± 0.05 to 13.59 ± 0.05 A. U. L. S. RAMSDELL.

Studies of chlorite. A. BIANCHI AND T. CARPANESI. *Univ. of Padua. Atti Ist. Veneto* 87, Part II, 145-60(1927-8).—A preliminary study of the dehydration of chlorite. B. and C. used an elec. furnace with a Pt/Pt Rh thermocouple and a direct-reading millivoltmeter. Penninite from Zermatt and clinochlorite from Punta della Rossa (Val Devero) show analogous behavior on dehydration with increasing temp. The curves show 3 sections, $15-480^\circ$, $490-520^\circ$ and $690-730^\circ$. The results point to a stable anhydride at 520° and 690° . Serpentine from Snarum and antigorite from Valsovaranche behave differently from chlorite. S. L. B. EHERTON.

Camsellite and szaibelyite. A. N. WINCHELL. *Am. Mineral.* 14, 48-9(1929).—Camsellite was found to be in microscopic lath-shaped crystals with X parallel and Y normal to the laths. A method of handling these laths is described. Camsellite was

found to be biaxial —, with $\gamma = 1.649$, $\beta = 1.620 \pm 0.005$, $\alpha = 1.575$; $2V = 80^\circ$. According to the best available data, szaibelyite is uniaxial —, with $\omega = 1.65 \pm$, $\epsilon = 1.58 \pm$. Hence the 2 minerals cannot be the same even if there is no chem. difference (cf. Schaller, *Am. Mineral.* 13, 230). By the same method *sussexite* was found to be biaxial —, with a small optic angle; $\gamma = 1.712 \pm 0.003$, β slightly higher than 1.70, $\alpha = 1.6388$, $\gamma - \alpha = 0.073$.

A. M. BRANT

The crystal form of calcium sulfate. L. S. RAMSDALL AND E. P. PARTRIDGE. *Am. Mineral.* 14, 59-74(1929).—X-ray diffraction patterns indicate the existence of 3 crystal forms of CaSO_4 , gypsum, the hemihydrate, and anhydrite. "*Soluble anhydrite*" is identical in crystal structure with the hemihydrate, the latter apparently belonging to the zeolitic class of substances, which lose and regain water of hydration without change in crystal structure. The equil. diagram of $\text{CaSO}_4 - \text{H}_2\text{O}$, compiled from various sources, is given and discussed. The transition temp. for the change from gypsum to anhydrite when in contact with H_2O is provisionally placed at 38° ; for the change from gypsum to hemihydrate when in contact with H_2O it is more definitely placed at 98° . Anhydrite has been experimentally obtained from gypsum in contact with H_2O at 100° , and gypsum from anhydrite in contact at $11-15^\circ$. In both cases there was evidence of setting similar to plaster of Paris. These conversions are analogous to that of hemihydrate to gypsum noted in the setting of plaster. In each case a more sol. unstable phase dissolves in H_2O with subsequent crystn. of a less sol. stable phase. A list of references is given.

A. M. BRANT

Relations of electrode potentials of some elements to formation of hypogene mineral deposits. B. S. BUTLER AND W. S. BURBANK. *Am. Inst. Mining Met. Eng., Tech. Publ.* 166, 3-15(1929).—The relation of the electrode potentials of the elements to their occurrence in hypogene ore deposits is brought out. Electrode potentials indicate certain fundamental properties having a direct and controlling influence on oxidation-reduction reactions. Such reactions are believed by B. and B. to have a vital bearing on ore deposition. Arranged in the order of their electrode potentials, the groups of elements show a periodicity and a definite and striking relation to their occurrence in primary ore minerals. Elements in each group with electrode potentials above +1 occur only in O combinations, those with — potentials as sulfides, allied minerals or native metals. Elements falling between the 2 groups occur both as O minerals and as sulfides. In ore deposits the O minerals of this intermediate group begin to form before the sulfides. The electrode potential of the sulfide ion falls in the intermediate group, and under conditions that would cause Fe^{++} to be oxidized to Fe^{+++} , the sulfide ion would probably be raised to a higher state of oxidation. The presence of barite and other sulfates formed before sulfides indicates that the S is, in part at least, in a very high state of oxidation prior to the deposition of sulfides. As some of the metals were present as oxidized compds. before they were deposited as sulfides, it is questioned whether most of the metals were not transported as oxidized compds. rather than as sol. sulfides. The groups of elements are deposited in the order of their potentials, and within the range of simple sulfides the metal sulfides tend to be deposited in the order of their potentials. Certain practical results are pointed out: if a vein contains Fe^{+++} minerals that have not been attacked or altered by the ore solns., the conditions are not favorable to the deposition of sulfides, and the latter are likely to decrease toward the source of the solns. Among the sulfide minerals there is an order of deposition from higher to lower temp. that corresponds with the electrode potentials of the metals.

ALBERT L. HENNE

Silver-bearing minerals of some ores from the Tintic Mining District. A. W. HAHN. *Am. Inst. Mining Met. Eng., Tech. Publ.* No. 202, 7 pp.(1929). E. H.

Field observations of electric resistivity and their practical application. J. G. KOENIGSBERGER. Univ. of Freiberg. *Am. Inst. Mining Met. Eng., Tech. Publ.* No. 129, 17 pp.(1928).—Practical applications are made (1) in the detn. of the continuity of a conducting orebody, (2) in the detn. of the surface area of an orebody, and (3) in the detection of a water-bearing fault in a salt mine. Observations are now given (1) on the influence of the depth of a ground-water table, (2) on the detection of gas under high pressure in coal seams. Two plane circular electrodes of Fe or brass are applied to the rock, a contact substance being used and the resistivity is measured on a Wheatstone bridge. The contact substance is powd. hematite with an aq. soln. of FeCl_3 and FeSO_4 or NaCl . Lab. detns. of resistivity of rocks are not useful in geophysics, and the detn. must be made in situ. The methods used in practice in solving various problems are described in detail.

S. L. B. ETHERTON

A comparison of the ore deposits of Långban, Sweden, with those of Franklin, New Jersey. CHARLES PALACHE. Harvard Univ. *Am. Mineral.* 14, 43-7(1929).—

A paragenetic classification of the Långban minerals (after Magnusson) is given. The principal ore minerals of the 2 localities are different and Zn is wholly absent from the Långban ores. The Mn-rich skarn present in large quantity at both is due at Långban to regional, and at Franklin, to contact metamorphism. The rarer elements, Pb, As and Sb seem to have been introduced with the ore at Långban, while at Franklin the comparable elements Pb, As, Cl and S came in with the later pegmatite.

A. M. BRANT

Venezuela of today. NOEL G. HACKNEY. *Mining J.* 164, 138-9(1929).—A brief account of the operating gold companies in Venezuela, with a map showing their location.

ALDEN H. EMERY

Diatomite, its occurrence, preparation and uses. V. L. EARDLEY-WILMOT. Canada Dept. of Mines, *Mines Branch*, No. 691, 180 pp.(1928).—A description of the world's occurrences of diatomite (Canadian in detail); methods of mining, prepn and manuf.; and the properties and uses of the raw and mfd. product. A 7-page bibliography is included.

ALDEN H. EMERY

Investigations of mineral resources and the mining industry, 1927. I. Bituminous sands of northern Alberta—experimental drilling and paving operations, 1927. S. C. ELLS. Canada Dept. of Mines, *Mines Branch*, No. 694, 60 pp.(1928); cf. C. A. 21, 42.—Detailed logs of 4 exploration wells, the equipment used and the methods recommended are given. The 1927 paving operations are described and costs estd. With reasonable freight rates and markets justifying adequate capital expenditure, the cost of road surfaced with bituminous sands should be materially less than other competitive methods.

ALDEN H. EMERY

Composition of Siberian bogheads in connection with the geological theory of their formation. G. L. STADNIKOV AND A. E. WEITZMAN. *J. Russ. Phys. Chem. Soc., Chem. Pt.*, 60, 1123-31(1928); G. L. STADNIKOV AND Z. I. VOZZHINSKA. *Kupor Chem. Inst. Ibid* 1133-6; cf. C. A. 22, 4417, 4418.—For the purpose of establishing the final products of transformation of fatty acids in the course of geologic period, a systematic study of the compn. of 2 different varieties of Irkutsk (Siberia) bogheads was made, the theory being that they were formed by bituminization of fats and alae waxes. 800 g. was taken from each of the 2 samples and both were subjected to the same treatment, which consisted in an extn. with C_6H_6 , followed by an exhaustive extn. with $CHCl_3$, after which the undissolved residues were repeatedly extd. first with boiling alc. NaOH, then with boiling NaOH soln. in isoamyl alc. and finally washed with C_2H_5OH and with H_2O . The C_6H_6 ext., which represented 1.6-1.8% of the samples, consisted of satd. and unsatd. univalent fatty acids contg. 12-22 atoms of C per mol., and also of some tar. The $CHCl_3$ ext., 0.46% of the quantity of the bogheads, consisted of a black tar, which has not been examd. The alc. and isoamyl alc. NaOH exts. were formed of soaps and fatty acids. Conclusion: Bogheads are products of profound polymerization and anhydriization of fatty acids. No wax was obtained in any of the exts., whereas peats and brown coals yielded waxes under similar conditions. B. N.

The temperatures of magmas. ESPEER S. LARSEN. *Am. Mineral.* 14, 81-94 (1929).—Available evidence from field and lab. petrology, geophysics and phys. chemistry seems to justify the conclusions that some basaltic magmas have temps. below 870° , many are below 1000° , very few are as high as 1200° , and probably most are not far from 800° to 900° . Rhyolitic magmas have lower temps., all being above 870° and below 870° . Nearly all are below the temp. of decompn. of biotite, about 870° , and that of common hornblende, about 750° . Probably most rhyolitic magmas have temps. in the neighborhood of $600-700^\circ$.

A. M. BRANT

Etna and its lava. A. RITTMANN. *Vulkaninst. Immanuel Friedländer, Neapel Naturwissenschaften* 17, 94-100(1929).—A short review is given of the types of eruption of Etna. The chem. compn. of the lavas is given in a table; mineralogically they contain plagioclases and augites with little olivite and nephelite. The compn. is SiO_2 49 to 58, Al_2O_3 17 to 20, Fe_2O_3 2.7 to 3.7, FeO 4.3 to 6.8, MnO 0.11 to 0.16, MgO 1.2 to 4.7, CaO 5.0 to 10.0, Na_2O 4.4 to 5.8, K_2O 1.6 to 2.8, TiO_2 1.3 to 2.0, P_2O_5 0.5 to 0.8% for 5 different types of lava. From geological data, changes in compn. of erupted lava with time are plotted in curves for the equiv. amts. of acids and bases. It appears that SiO_2 , Al_2O_3 and alkali have gone through a max., *fm. i. e.*, Fe, Mn and Mg oxides, and *c. i. e.*, CaO , through a min., both extremes lying in the Trifoglietto lava (prehistoric). At the present time the compn. is again almost as it was in the pre Etna (Pleistocene) lava.

B. J. C. VAN DER HOEVEN

Carpathian gneiss from Ostry Wierch near Góllnitz. MELLE JOSEFA NAYKOWNA. Krakow Univ. *Bull. intern. acad. Polonois* 1928, 431-8.—A description which includes a chem. and mic. optical

ALBERT L. HENNE

The origin of the Mediterranean red earths (Terra rossa). A. REIFENBERG. *Kolloid Chem. Beihefte* 28, Nos. 3-5, 55-147(1929); cf. *C. A.* 22, 2424.—A discussion of the influences affecting the formation of the red earths is followed by an exposition of the colloid chem. aspects of silicic acid protective action on the $\text{Al}(\text{OH})_3$ and $\text{Fe}(\text{OH})_3$ gels present.

The formation of red soil and of black vlei soil from dolerite at Salisbury, Southern Rhodesia. H. B. MAUPF. *Geol. Survey S. Rhodesia. S. African J. Sci.* 25, 156-67 (1929).—This article is chiefly geological, but includes chem. analyses of the various soils.

Relations between submarine sediments and the condition of the surface water. J. THOULET. *Inst. Españ. Oceanografía. Notas Resúmenes* 2, No. 5, 26 pp.(1924).—The filling of the ocean is effected (a) in the shallow parts near continents, by erosion, and (b) more remote from land, by dust carried by the wind and by CaO and SiO_2 deposits from animal or vegetable plankton. Murray's law, that the CaCO_3 content of a sediment varies inversely with the depth, is refuted by T. The bottom of the ocean differs greatly with locality and with time of observation.

The evidence of the kimberlite pipes on the constitution of the outer part of the earth. PERCY A. WAGNER. *S. African J. Sci.* 25, 127-48(1929).—The evidence obtained independently from seismic, astronomical, phys. and geological data leads to the conclusion that the earth exhibits gravitational stratification, being made up of a succession of concentric silicate shells, the d. of which increases progressively inward, surrounding a thick core of Ni-Fe. Between this core and the innermost silicate shell there is, according to certain geologists, a shell composed partly of Ni-Fe and partly of heavy silicates. Many also postulate the existence of a universal layer of basalt some 17 km. in thickness beneath the outermost silicate shell from which the vast outpourings of the plateau-basalts are presumed to have come. Kimberlite pipes with which the southern half of Africa is riddled afford valuable direct evidence in regard to the earth's outer shells. This is supplied mainly by the abundant xenoliths brought up from below by the kimberlite magma which originated at a depth of at least 60 km. The deep-seated rocks represented among the xenoliths include amphibolites of several types, gabbro, pyroxene, granulite, eclogite and a great variety of peridotites. There are 2 main types of eclogite corresponding with those differentiated in the Norwegian Archean. There is a complete absence among the xenoliths of any that could be referred to the hypothetical basaltic substratum, indicating that this does not exist beneath southern Africa. The granitic crust is apparently underlain by a shell composed predominantly of ortho-amphibolites accompanied by gabbroid and granulitic rocks. The lower-most part of the shell is believed to be occupied by a continuous layer of gabbroid eclogite in the form of basalt or basaltic glass. This in turn, is underlain by a universal peridotite or *sima* zone in which there are bands and lenses of pyroxenite and eclogite, both of types allied to peridotite. The chem. compn. and Ra content of the eclogites found in kimberlite do not support the hypothesis that these deep-seated eclogites are piezo-cryst. facies of plateau-basalt. Down to the depth at least from which kimberlite is derived, the deeper substratum consists predominantly of peridotite and not of eclogite. The universal layer of basaltic compn., the existence of which is sometimes considered as necessary to explain the surface history of the earth, may be represented by the hypothetical amphibolite-gabbro-granulite shell underlying the continental crust; the rocks composing the shell are all magmatically identical with basalt. On this view, which at present rests on a very slight foundation, the amphibolite-gabbro-granulite shell constitutes a vast potential reservoir of basaltic magma, and the plateau-basalts are to be ascribed to the periodic fusion of parts of the shell through the accumulation of radio-thermal heat, according to the hypothesis of Joly.

The biochemistry of iodine and the iodine cycle in nature. GULBRAND LUNDE. *Sætertrykk Norges Apotekerforenings Tids.* 1928, 1-17; cf. *C. A.* 23, 401, 1845.—The geochem. aspect of I is considered in view of the assumption that during the cooling and congealing process of the constituents of the earth, a segregation of the elements into several concentric zones (phases) took place. Besides the 4 inorg. phases there is an org. phase or biosphere in which all the life on earth developed, and in which the I concn. was greater than in any of the other phases, i. e., there was a greater striving for I by organisms. Three diagrams are given to show the I cycle in nature. I is continually liberated in the weathering of rocks, and a part of it is carried into the ocean and fresh waters, some into the soil, and some into the atm. Plants obtain I from the soil, and animals get it from plants. Fresh water plants are richer in I than land plants. The I concn. is higher in the ocean (0.02 mg. per l.) than in fresh water. Marine plants and animals contain more I per unit wt. than plants and animals of the land or fresh water.

Attention is called to (a) the high I concn. in (dry) plankton (10,000 times as great as in the ocean), (b) the I concn. in the human blood (0.1 to 0.15 mg. per l.), (c) the physiol. function of the thyroid glands, (d) the chemistry of thyroxine, (e) the prevalence of goiter in certain districts being inversely proportional to the I concn. in the available foods, (f) the amt. of I required per person per day (0.05 to 0.10 mg.). Also in *Chem. Reviews* 6, 45-61(1929).
E. O. ELLINGSON

An especially well crystallized blast-furnace slag (melilite-schefferite-olivine) (ANGEL) 9. Transformations undergone by pine stumps in the ground after cutting of the tree [formation of coal beds] (DUPONT, SOUM) 22.

9—METALLURGY AND METALLOGRAPHY

D. J. DEMOREST, R. H. ABORN

Flotation. J. TRAUBE. Tech. Hochschule Berlin. *Metall u. Erz* 25, 618-21 (1928).—A lecture in which the adsorption intensity and flotation, the measuring methods of the former and the significance of the Langmuir-Harkins theory are discussed.

J. BALOZIAN

Preliminary contribution on a new process of flotation of oxide ores. JOH. E. BARNITZKE. *Metall u. Erz* 25, 621-4(1928).—A lecture.

J. BALOZIAN

The influence of flotation on the development of the metallurgy of copper, lead and zinc. KIRMSE. *Metall u. Erz* 25, 603-10(1928).—A lecture.

J. BALOZIAN

An attempt to explain flotation processes by means of osmotic and solution pressures. C. BRUCHHOLD. *Metall u. Erz* 25, 610-8(1928).—A theory of flotation is developed offering an explanation for the presence of sulfides in the scum and gangue minerals in the slime, and based on the soln. pressure of the ore particles and the osmotic pressure of the slimes. Considerations show that the greater the excess of soln. pressure of a sulfide particle over the osmotic pressure of the slime the less is the flotation power of the ore. Further, it is shown that this power of an ore is a function of the soln. pressure of the sulfide particles (those with high pressure are floated with more difficulty than those with low) and the velocity of flow of the slime through the flotation machine. The change of the osmotic pressure and the use of alkali on the flotation is discussed.

J. BALOZIAN

Determination of alkalinity or acidity of pulp in the flotation process. C. BRUCHHOLD. *Bol. Minero (Mex)* 27, 106-17(1929).

E. M. SYMMES

Examination of Swedish tar oils for flotation. KARL RUTBERG. *Jernkontors Ann.* 82, 1-21(1927).—Flotation tests on Zn and Pb ore with tars and oils show that tars with a large distn. residue up to 240° give the largest concn. of sulfides. Tars with over 70% residue have generally given better results than tars with less residue. The residue can profitably go up to 80%, and 10% of the tar ought to distil between 200 and 240°. The frothing power of the tar can be increased by keeping it in open containers. The fraction which is best adapted to froth formation in flotation distills at about 200 to 210°. The lower fractions give less froth, and can often hinder the flotation process.

A. DROGSETH

Ore dressing tests to recover manganese in rhodochrosite ores. F. D. DE VANNEY AND WILL H. COGHILL. Miss. Valley Expt. Sta., Rolla, Mo. Bur. Mines, *Repts of Investigations*, No. 2902, 4 pp. (1928).—Differential flotation, gravity, concn. and magnetic concn. were applied to an ore contg. 40% rhodochrosite. Xanthate and pine oil floated the sulfides while soap flotation removed the $MnCO_3$. The sulfide concentrate contained 8.1% Pb, 18.4 of Zn and 21.3 of Fe. A satisfactory sepn. of the $MnCO_3$ on a lab. scale was secured at a cost of 15 cents per ton for reagents. Gravity concn. through 10 mesh gave a loss of 12.4% of the Mn in 55.4% of the insol. Magnetic concn. gave a promising sepn. of the $MnCO_3$. A composite of fine concentrates, secured by increasing the strength of the magnetic field in steps, contained 45% of the Mn. J. W. SIMPLEY

The reduction of alkaline-earth sulfates in metallurgical operations. G. CHARPY AND L. JACQUE. *Compt. rend.* 188, 473-5(1929).—In certain metallurgical operations, $BaSO_4$ does not combine with S as much as $CaSO_4$. This is due not to a difference in chem. properties of the two sulfates, but to certain phys. particulars.

FRANK V. JOHNSON, JR.

Heat utilization in metallurgical plants. L.-H. STCHEPINE. *Chaleur ind.* 9, 217-22(1928).—Every percentage of moisture prolongs the coking period by 1% and increases the expenses of cooling and draft by 3%. There is a loss of heat by radiation

from the walls and in the hot gases from the coking chamber, amounting to 400,000 cal./ton. For the blast furnace, the slag removes 4-5% of the total heat put in, and the melt removes 3%. Other losses are discussed and a heat balance is drawn up. The utilization of gas heating, the Martin furnace, the rolling mills and auxiliary services are treated.

S. L. B. ETHERTON

The application of the heat content-temperature diagram to metallurgical processes.

P. ROSIN. *Metall u. Erz* 26, 29-36(1929).—A lecture.

J. BALOZIAN

The troublesome formation of sulfuric acid in the waste gases of metallurgical processes. WALTER SCHOPPER. *Metall u. Erz* 26, 36-41(1929).—A lecture in which it is stressed that the formation of H_2SO_4 in metallurgical gases can be diminished by supervising the gas temps.

J. BALOZIAN

The El Moral metallurgical plant of the El Moral Mining Co. (Mexico). MAURILIO LÓPEZ NÚÑEZ. *Bol. Minero (Mex.)* 27, 118-21(1929).

E. M. SYMMES

Metallurgy of aluminum. V. FERRERI. *Ingegnere* 2, 76-81(1928); *Science Abstracts* 31B, 296.—This is a general survey of the present state of the Al industry, consisting of a summarized account of the various methods of extn. and purification and an indication of the lines along which progress is being made.

H. L. D.

Advances in the manufacture, testing and application of light metals. BR. SCHULZ. *Metall Wirtschaft* 7, 1373-5(1928).

E. H.

Technically useful properties of the light metal beryllium. P. SCHWERBER. *Metallhose* 18, 649-50, 705-6(1928).

E. H.

Copper-cuprous oxide eutectic in copper refining. W. STAHL. *Chem.-Ztg.* 53, 137(1929).—It is shown that an alloy contg. 96.5% Cu and 3.5% Cu_2O , or 99.62% Cu and 0.39% O (cf. Heyn, *Z. anorg. Chem.* 39 (1904) is present in Cu refining furnaces during the "poling period". Samples taken at that time have a stem-like instead of a fibrous structure, and show 0.35 to 0.39% O and 99.6 to 99.7% Cu.

W. C. EBAUGH

Development of high-duty cast iron. F. D. CORBIN. *Foundry Trade J.* 40, 83 4(1929).—The fundamentals of the phys. metallurgy of cast Fe are explained in order to understand more clearly the newer processes developed for the production of high-grade cast Fe.

DOWNES SCHAAF

The use of scrap in gray iron, malleable, and electric steel mixtures. E. K. SMITH AND F. B. RIGGAN. Stockham Pipe & Fittings Co., Birmingham, Ala. *Am. Foundrymen's Assoc.* (preprint), No. 29-3, 51-70(1929).—The use of scrap metal in foundries is an economic necessity, and may cause trouble, or improved quality of product, depending on the melting practice. Careful sorting of scrap, and definite specifications, are essential. The proper size classifications for cupola practice are discussed. Expts. showed that cupola charges might contain up to 75% scrap without bad effects. Burned material or borings in the cupola gave gray Fe that contained numerous fine inclusions, and should be used only in the blast furnace. A little Sn or Zn in cupola charges was not detrimental. Thorough mixing of the molten Fe is important. Steel scrap in gray Fe increases the strength. In scrap for malleable Fe, alloy steels, especially Cr, must be avoided. Rusty scrap should be avoided in acid elec. charges, but not necessarily in basic. By the use of Na_2CO_3 as a flux, the S content of gray Fe from scrap charges can be reduced, and slag inclusions also may be removed.

G. F. C.

Application of nitriding to the surface hardening of steel. ARMY TECH. STAFF OF OSAKA ORDANCE. *Bull. Ordnance* 6, 469-512(1928).—Cr-Mn, Cr-Ti, Si-Mn, various C-steels, Cr steels, etc., totaling 10 kinds in all, were annealed and nitrided by passing NH_3 gas at 560-760°, for 5-30 hrs. in an elec. furnace. Above 610°, Fe_3N is formed on the surface which makes the material brittle. For obtaining a hard and tough surface, the temp. must be between 560° and 610°. Nitriding goes deeper by long treatment, but it is difficult to increase the hardness of the surface, the longest time of treatment which is practically useful being 15 hrs. The Brinell, Shore and Martens hardness were measured with the samples heated for 5, 10 and 15 hrs., the microscopic observation of the samples being made at the same time. Results obtained with Brinell or Shore hardness are generally inaccurate. The steel which is best fitted for surface hardening by nitriding is Cr steel with a low C content; next comes very mild steel. High-C steels are not suitable.

K. SOMEYA

Investigations on molding sands. H. NIPPAR AND E. PIWOWARSKY. Tech. Hochschule Aachen. *Giesserei* 15, 1097-1108(1928).—The effect of the clay and moisture content, and of the size and shape of the grain on the permeability to gases of molding sands are investigated. With increasing clay content the max. permeability of the sand increases, the greatest permeability occurring at a definite clay content. With higher clay content at the max. the moisture is higher, for the same grain size,

being clearer with coarse than with fine grains. For coarse grains with the same clay content, the max. permeability is greater for the sharp than for the rounded grains. There is a pronounced max. for these sands, depending on their clay and H_2O content. The susceptibility of the sand mixts. to H_2O is less with coarse than with fine-grained sand. Further expts. are made to det. the change in permeability on complete drying of the mold.

J. BALOZIAN

Drying and cooling by adsorbents. CONSTANTIN REDZICH. *Apparatebau* 41, 37-9(1929).—Remarks on the advantages of silica gel as a driver for blast-furnace air, with a table showing economies effected in a furnace of 1330-ton output per week.

J. H. MOORE

The blast-furnace theory. RICHARD FRANCHOT. *Am. Inst. Mining Met. Eng., Tech. Publications*, No. 170, 3-20 pp.(1929).—A review of the theories of reduction of Bell and of Johnson is followed by the statement of the N hypothesis, which is in effect that as the blast heat is increased and the combustion temp. tends to rise, this effect is increasingly offset by increasing N activity; the difficulty of raising the hearth temp is increased by a resistance assocd. with the combustion itself. The effectiveness of the high blast heats now in common use is in substantial measure curtailed by an endothermic formation of N compds. in the combustion zone. Several supporting facts for this theory have been published and apparently the only objection is based upon the ground that certain measures of CN concn. made at a southern furnace fail to show substantial amts. of CN vapor in the hearth gases and suggestion is made that means of detg. the KCN concn. in this case might result in very low results. W. H. BOYNTON

New theory of the blast furnace process. II. F. WÜST. *Stahl u. Eisen* 48, 1273-87(1928); cf. C. A. 23, 71.—The literature on the oxidizing zone in front of the tuyères of a blast furnace is reviewed and a great no. of references are given. The presence of an oxidizing zone in front of the tuyères is assumed. Some of the Fe is reoxidized during its downward pass through this zone. FeO is continuously supplied to the slag, and is again reduced by the constituents of the pig Fe. As long as the slag contains a certain amt. of FeO which is easily reduced, no reduction of the oxides which are more difficult to reduce, such as SiO_2 and MnO , takes place. Consequently, the molten Fe bath cannot take up any Si or Mn. The old conception that these oxides are first reduced by the C from the molten slag, then the Mn and Si taken up by the molten Fe bath cannot be correct. The alloying constituents of the pig Fe are reduced and taken up above the tuyères. The Fe pellets suspended in the slag, obtained from 5 charcoal and 1 coke blast furnace, show as a rule a higher percentage of impurities than the pig Fe tapped from the same blast furnace. The compn. of these samples obtained during the working of the furnace proved conclusively that the pig Fe is formed above the tuyères. Lab. tests showed, furthermore, that SiO_2 and MnO can be reduced below the temp. of pig Fe and the alloying constituents can be taken up by cementation. In a H atm. at 1100° Fe absorbed 0.8% Mn from MnO in 7 hrs. At 1200° in a CO atm. it absorbed 3.8% Mn and 0.27% P. At 1170° in contact with C it absorbed in 5 hrs. 8% P, 5% Mn and 2.5% Si from their resp. oxides. From 9 cold blast furnaces, samples were taken from in front of the tuyères. Depending upon the type of the operation of the blast furnace the granules contained up to 60% Mn, 8% Si and 5% P. The higher amt. of these alloying elements showed that they could not have been taken up by the pig Fe in the short distance between the melting zone and the tuyères. They were taken up by the Fe in the solid state through cementation. The compn. of the samples taken during the regular working of the furnace showed that the formation of the pig Fe is already complete above the tuyères. The 173 samples taken during stops contain on the av. more Si than the tapped pig Fe samples. Part of the Si is, therefore, being burnt up either by the O of the hot blast in front of the tuyères or by the O of the FeO in the hearth. Under normal working conditions more Si is being introduced in the Fe than would be warranted by the final compn. of the pig Fe. The oxidizing zone reduces the efficiency of the furnace; every method eliminating this zone or decreasing its size will result in better operation.

J. A. SZILARD

An especially well-crystallized blast-furnace slag. (Mellite-schefferrite-olivine.) FRANZ ANGEL. *Z. Krist.* 68, 157-76(1928).—A thin section of the slag shows 55% mellite and 45% of pyroxene, olivine and glass, with the ratio of pyroxene to olivine about 3:1. According to the fractional chem. analysis the mellite consists of 70% $(Ca_2Al_2Si_2O_{12})$ and 30% akermanite $(Ca_2Mg_2Si_2O_{12})$, the pyroxene approximates scheferrite; and the olivine consists of 65% Mg_2SiO_4 , 30% Mn_2SiO_4 and 5% Fe_2SiO_4 . This slag is compared with other slags and with natural rocks.

L. S. RAMSDELL

The effect of barium oxide on the desulfurizing power of blast-furnace slag. C. E. WOOD AND T. L. JOHNSON. *Am. Inst. Mining Met. Eng., Tech. Publications*,

181, 3-19 pp.(1929).—A brief rept. of exptl. work to det. any increased desulfurizing action of blast-furnace slag due to BaO. The incomplete data tabulated and discussed indicate that: (1) percentages of BaO up to 5% do not markedly increase the desulfurizing action of the slag though it increases the molar basicity of the slag and increases its desulfurizing action; (2) the desulfurizing action of blast-furnace slag varies directly with its molar basicity; (3) the desulfurizing action of a slag is more closely related to the molar ratio of bases to acids than to basicity based upon percentages of bases and acids present; (4) desulfurization of metal by contiguous layers of slag was almost directly proportional to time of contact over a period of 60 mins.; (5) surface contact between slag and metal has an important bearing on desulfurization; (6) BaO is about $\frac{1}{3}$ as effective as an equal wt. of CaO in removing S and in fluxing SiO_2 and Al_2O_3 .

W. H. BOYNTON

Quality of pig iron and castings as affected by blast-furnace practice. A. I. BOEGEHOLD. General Motors Corp., Detroit. *Am. Foundrymen's Assoc.* (preprint), No. 29-5, 91-152(1929).—Eleven casts from 7 blast furnaces were tested for variations in properties, and used for making cast-Fe flywheels contg. 3 to 3.3% C, 2.25 to 2.35% Si, and 0.55 to 0.75% Mn, the cupola conditions in remelting being kept as const. as possible. Specimens for tensile, transverse, hardness, fluidity and shrinkage tests were also cast from each kind of pig Fe. Variations in atm. conditions must be allowed for. The large variations in blast-furnace operating conditions are described fully. These are due largely to differences in the quality of the coke, causing varied rate of combustion, speeds of descent of the charge, and outputs of pig Fe. The moisture in the blast is also very influential. The excessive air required by a slow-burning coke causes too much oxidation of the Si and C in the pig Fe in front of the tuyères. Pig Fe made under different furnace conditions, though of fairly similar analysis, showed decided differences in microstructure, fracture, and dilation-temp. curves, which are all illustrated. On heating to 930°, and cooling, the permanent growth of different lots of Fe varied between 0.052 and 0.024 in., resp. Each lot was used in the cupola for 3 weeks, and test-bars were cast when the influence of the preceding lot on the return scrap had been eliminated. All test-bars were cast at 1330 to 1370°. The design of each bar is shown, and the method of test described. The plotted results indicate trends rather than definite correlations, since it was impossible to vary only a single factor at once. High moisture content of the cupola blast increased the tendency of the Fe castings to have a chilled structure and higher combined C. A higher relative rate of production in the blast furnace gave Fe which shrank less, presumably because of its O or gas content. The dilation characteristics of the pig Fe were maintained practically the same after remelting in the cupola, but there was little individual variation in the dilation curve within any one lot. Machinability was better with less H_2O in the blast, and with well-deoxidized pig Fe, or pig Fe not produced too fast. Some lots of pig Fe gave considerable variation in Si content of different cupola melts, while with other lots the Si remained nearly const. Pig Fe from different lots differed greatly in hardness, though cast to the same section, and contg. the same amt. of Si. The tensile strength decreased, and the deflection increased, with the total C plus $\frac{1}{4}$ the Si content, but the different lots of Fe differed greatly in strength under the same conditions. The cast Fe cooled more quickly in dry-sand than in green-sand molds. The shrinkage was the same in nearly all lots; the fluidity varied, but the causes of variation were not detd. The results showed that the phys. character of pig Fe is influenced by conditions in the blast furnace, and is retained on remelting in the cupola. Classification of pig Fe according to the characteristics detd. by the blast-furnace practice is advocated. Variations in that practice must be controlled to secure pig Fe of uniform quality. The app. and procedure for a combustibility test for coke are described in an appendix. Also in *Foundry* 57, 322-5, 330(1929).

G. F. C.

Modern open-hearth practice in Germany. FRIEDRICH STEIN. *Blast Furnace & Steel Plant* 17, 409-14(1929).

E. H.

Basic open-hearth yields. C. D. KING. *Am. Inst. Mining Met. Eng., Tech. Publications* No. 186, 3-38 pp.; *Iron Age* 123, 596-8(1929).—A discussion purporting to stimulate the discussion and study of chem., phys.-chem. and metallurgical phases of cooperation and their relation to ingot yields. Losses are defined and calcd. Conclusion: For any given charge and desired slag analysis of steel there is a definite yield, varying largely with scrap produced and miscellaneous losses. The best yield does not necessarily produce the lowest ingot cost. This depends entirely on relative prices of materials making up the gross metallic charge for equal scrap recovery and the difference in cost in converting any type of metallic charge to ingots.

W. H. BOYNTON

Unreduced oxides in pig iron and their elimination in the basic open-hearth furnace.

C. H. HERTY, JR., AND J. M. GAINES, JR. *Am. Inst. Mining Met. Eng., Tech. Publications* No. 165, 3-20(1929).—Five open-hearth steel heats were made using Fe from a blast furnace, 3 from casts made when the furnace was operating normally, and 2 from casts made when the burden was increased to throw the furnace on the cold side. The operation of the blast furnace and open-hearth was followed closely, a large no. of samples, temp. readings and other data being taken. While the test results are not sufficient to correlate bad Fe with trouble in the finished steel, they do prove that the silicates in the Fe are higher when the blast furnace is operating irregularly than when it is running steadily, and that the higher the silicates are in the Fe the higher they are in the steel.

DOWNES SCHAAF

A study of a thirty-six inch cupola. F. B. COYLE. *International Nickel Co., Bayonne, N. J. Am. Foundrymen's Assoc.* (preprint), No. 29-2, 21-50(1929).—Details of the practice and results from 14 heats of gray Fe for Diesel-engine castings are given and the progressive changes during each heat are plotted in the form of graphs. The compn. was planned to be about 3.2% C, 1.2% Si and under 0.2% P in order to obtain the max. mech. properties. The cupola was lined to 36 in. diam.; the crucible held 3000 lbs. of molten Fe; there were 4 tuyères, each 4 by 14 in. The following conclusions and correlations were deduced from the results: The temp. of the metal tapped increased as the heat progressed, and also with the use of limestone as a flux. The S content was increased by accumulation of slag; the C and Si contents decreased as the heat progressed. The S content did not increase by use of scrap. The temp and melting rate depended on the wt. of the metal charges. 1000 lb. charges were found best for the cupola used. The tensile strength of the product increased with the melting rate and temp. up to 1500°. The Si and C contents decreased as the percentage of steel scrap in the charge was increased; but the Mn content was const. A coke bed 24 in. above the tuyères gave the hottest and strongest Fe. The blast pressure should be controlled to give a rapid melting rate, with higher blast pressure the temp. of the product was higher, and the C content lower. Subsequent operation of the cupola was controlled in accordance with these findings, with excellent results; the strength of the Fe was increased 30% to 40,000 lbs. per sq. in., though keeping the hardness at 200 to 220 Brinell.

GEO. F. COMSTOCK

An analysis of the performance of fifty-four inch cupolas based upon records of practical operation. EDWARD E. MARBAKER. *Whiting Corp., Harvey, Ill. Am. Foundrymen's Assoc.* (preprint), No. 29-4, 71-90(1929).—The efficiency of foundry cupolas has not been given sufficient attention. The results reported were obtained through a questionnaire sent to 136 cupola operators to det. the conditions of practical operation. The ratio of heat evolved from the coke to that used in melting the Fe was studied separately for 8 cupolas with vertical, and 8 with inclined (boshed), 54-in. linings. In estg. the output, only the Fe discharged through the cupola spout was considered as melted. The use of a boshed lining decreased the melting rate to that of a cupola straight-lined to the min. diam. of the bosh. The amt. of coke used for the bed varied greatly. The true melting ratio is the wt. of Fe melted by 1 lb. of C, rather than coke. This ratio varied from 7 to 9.3, irrespective of whether the lining was straight or boshed. The sp. heat of gray Fe is higher when molten than when solid, and more heat must be applied per degree rise of temp. for superheating than for heating to the m p. The calcn. of thermal efficiency is described, taken as the total heat needed for melting and superheating, divided by the total heat supplied by complete combustion of the coke. Data for this detn. are easily secured. The thermal efficiencies from the author's data varied from 25.4 to 37.2%, the form of lining again having practically no effect, and were not closely related to the coke ratios. The blast vol. is very important to insure proper combustion but the data show that this varies greatly from an excess to a deficiency of air, with but small relation to the thermal efficiency. For a thermal efficiency of 35%, and a melting ratio of 8.4, a calcn. is given showing that 6000 cu. ft. of air per min. would be required. The boshed lining has some value in economy of bed-coke, keeping tuyères cleaner, and improving blast penetration.

GEO. F. COMSTOCK

The operation of Siemens-Martin furnace with coke-oven gas. G. BULLE. *Stahl u. Eisen* 48, 1353-62(1928); cf. *C. A.* 23, 1802.—Coke-oven gas gives good results, even with short preheating, due to its high heating value; on the other hand, the flame so obtained has a low heat cond. When overheated coke-oven gas is decomposed, C seps. and a gas rich in H and CO is formed, which has a higher heating value than the original gas, so that the preheating is not a disadvantage. Coke-oven gas is often used with throat gas as mixed gas, with throat gas and producer gas as tri-gas, also as an addn. to producer gas. All 3 types of mixed gases are used in Germany and are more economical than pure producer gas. Several works are using a so-called cold gas, that is, coke-

oven gas blown without any preheating, by means of water-cooled burners into hot air coming from the regenerators.

J. A. SZILARD

Trial of a forge furnace with metal recuperators heated by blast-furnace gas. A. LEMONNIER. *Chaleur ind.* 9, 463-4(1928).—The gas had CO 28, H₂ 3.7, CO₂ 10, O₂ 0.05, N₂ 58.3%, outside temp. 25°, pressure 735 mm., lower cal. value 850 cal./cu. m., external forge temp. 40°. Other necessary data are mentioned. The furnace was run at 1215° on steel ingots. Of 11,300 cal. supplied to the furnace, 2300 cal. were utilized. The yield is calcd. at 16%, the necessary tables and analyses being given in the test.

S. L. B. ETHERTON

Recent services of metallurgy to engineering. H. C. H. CARPENTER. *Proc. Inst. Civil. Eng.* (London) 224, 291-342(1926-7); *Science Abstracts* 31B, 295.—The following aspects of metallurgical service are dealt with: (1) flotation concn. of ores; (2) suitable furnaces for the melting and extn. of such ores; (3) hydrometallurgical methods for the treatment of Cu and Zn ores; (4) elec. refining of steel; (5) "pearlite" cast Fe, its manuf. and properties; (6) sorbitic steels and their wearing properties; their use as rail steels; (7) Al and its growing industrial importance; (8) high-speed tool steels; (9) Ni Cr steels; (10) Mumetal and its magnetic properties; (11) corrosion and preservation of metals.

H. L. D.

Improving of alloys and new aging phenomena in iron. G. MASING. *Arch. Eisenhüttenw.* 2, 185-96(1928).—A theoretical paper in which improving the mech. properties of duralumin and Be-Cu alloys is discussed in the light of the theory of dispersed supersatd. mixed crystals. The improvement of Fe-C alloys after quenching from over 650° is described.

J. BALOZIAN

Theory of the plasticity of metals. HIKOROKU SHOJI. Tohoku Imp. Univ. *J. Study of Metals* 5, 357-63(1928); cf. *C. A.* 20, 2808.—S. has previously shown that, when a metallic wire is stretched with a const. load by a very small amt. beyond its elastic limit, the velocity of elongation gradually approaches a definite value, and that the plasticity of metals may be compared by the magnitude of the final const. velocity. The present paper is a theoretical discussion of the same phenomenon, which was made under the assumption, that the act of unloading the wt. from the end of the wire, which had been stretched by a const. load, was equiv. to the act of pushing the wire up from below without taking off the wt., and that the law of the wire contracting with time is the same as in the case of elongation. The result shows that the velocity of elongation of the wire which is subject to a permanent deformation must approach a definite value. When a metallic wire of length l and the sectional area S is stretched by a load W which is greater than its elastic limit W_0 , the definite velocity v_B finally attained is given by the relation $v_B/l = pW/S$ or $p = v_B S/W$, where p is a const. relating to plasticity, $W_0/S = W_0$ is another const., which together with p characterizes the plasticity of metals. Experimentally the order of the metals arranged according to the magnitude of p is Cd, Zn, Pb, Sn, Ag, Al, Cu and that arranged according to the magnitude of W_0 is Cu, Al, Ag, Zn, Sn, Pb, Cd. With the rise of temp. p increases and W_0 decreases.

K. SOMEYA

Alloy cast irons. ARTHUR B. EVEREST. *Foundry Trade J.* 40, 45-8(1929).—A general theory of cast Fe is proposed, showing that the ultimate structure is detd. only by the relative stability of carbide and graphite (chem. compn.), and the thermal history. The manner of origin of the various forms of white, pearlitic, gray, etc., cast irons is described. The addn. of Si, Ni or Al favors graphite formation, while Cr, S and sometimes Mn and P increase the stability of the carbide. The forms of graphite and pearlite are also affected by alloy addns. The P should be low in high-duty cast Fe. For practical value an alloy addn. must not be too costly, and must mix easily with the Fe without bad effects. Al addns. produced graphitization up to 7%, but from 7 to 15% Al caused the formation of a hard, brittle carbide. With over 15%, the alloys were unstable. In small amts., 2 parts Al were required to give the effect of 1 part Si. No advantage of Al over Si was found, and Al made the castings dirty. Ni is easily used without loss or troubles from dirt, and favors graphitization mildly enough so that pro-eutectoid cementite is decomposed without interfering with pearlite. Uniformity of structure and hardness throughout castings of varying section is thus promoted by the replacement of some of the Si content by Ni. The lower-Si cast Fe is also more sound and dense, and the mech. properties are improved. Cast Fe with a soft ferritic matrix is not subject to much improvement from Ni. The addn. of Cr makes the carbide more stable, increasing the hardness, but the mech. properties of the Fe may be improved by small amts. of Cr, especially when the chilling effect of Cr is counteracted by Ni. The use of the alloys may be convenient and economical from a foundry viewpoint, as well as necessary to obtain superior mech. properties. A study of the changes

possible in a cast Fe by adjustment of the Ni, Si and Cr contents is illustrated by graphs. GEO. F. COMSTOCK.

Nickel and chromium alloyed cast iron. E. PIWOWARSKY. *Giesserei* 15, 1073-8 (1928).—A lecture. J. BALOZIAN.

Influence of nickel-chromium on cast iron. ARTHUR B. EVEREST AND D. HANSON, Univ. of Birmingham. *Foundry Trade J.* 40, 5-10(1929).—Cast irons were prepd. contg. from 0 to 0.75% Cr and from 0 to 3% Ni. These were investigated as to chill, hardness, fracture and microstructure. Cr increases and Ni decreases the tendency of Fe to chill. The influence of Cr is very powerful, only a small amt. is necessary to turn the Fe completely from gray to white. Ni reduces the hardness of the thin sections and increases that of the thick. Cr hardens all sections having a gray or a mottled fracture. The effect on white-Fe structures is in the same direction but not quite so regular. With 0.23 to 0.43% Cr, Ni exerts its normal effect but with higher Cr content (0.75%) the addition up to 3% of Ni did not render the Fe machinable. Cr causes a marked refining of the grains while Ni in general does not open up the grains. Increasing the Cr gives a progressively finer form of graphite, while Ni tends to coarsen it; but the result of Ni-Cr additions in the balance ratio produces a definite refining of the matrix. Cr alone produces massive carbide areas, which are eliminated by the addition of Ni. The authors conclude that "Ni will harden the gray portions of cast Fe and at the same time will eliminate its chilling tendency; Cr, on the other hand, increases the hardness of the Fe, but also increases its tendency to chill. Consequently, Ni and Cr may be added to cast Fe together in a ratio, so balanced as to have no effect on the depth of chill given by the Fe under certain circumstances, but in virtue of the combined effects of the alloy-elements on the structure of the Fe, a very marked refining of both the graphite and the pearlite is obtained with consequent increase in the hardness of the casting." For high-grade pearlitic Fe Cr added and Ni-to-Cr ratio, resp., should be: Less than 0.2%, 3 to 1; 0.2 to 0.3%, 4 to 1; 0.3 to 0.4%, 5 to 1. J. W. BOLCK.

Some theories of graphitization. H. A. SCHWARTZ. *Foundry* 56, 871-3, 908-20, *Am. Metal Market* 35, No. 216, 2nd Sect. 1-5, 29-30; *Foundry Trade J.* 39, 297-300(1928).—The formation of free C during freezing is called primary graphitization and that during a subsequent heat treatment is called secondary graphitization. Various theories on the formation of secondary graphite and the effect of other elements are discussed. J. W. BOLCK.

Photomicrography and metallography of graphite flakes. A. L. NORRIS AND L. W. BOLTON. *Bull. Brit. Cast Iron Research Assn.* 1928, No. 22, 52-4. The effects of variations in methods of polishing and photographing on the apparent size of graphite flakes in cast iron are discussed. Polishing often rounds off the edges of the metal bounding the plate, causing them to appear larger, while burnish polishing on the other hand tends to bridge over the flakes and in some cases completely obscures them. J. W. BOLCK.

Alloy cast iron. D. HANSON. Birmingham Univ. *Foundry Trade J.* 39, 319-21 (1928).—Using a Fe-C alloy of approx. 3.5% C and adding Si and Ni, the author concludes that the four main effects due to Ni are "(a) It hardens white iron (when the iron is of such a character that the cementite is stable); (b) it decomposes iron carbide, giving graphite; (c) it hardens the matrix, converting pearlite into sorbite or martensite; and (d) with high nickel, a soft austenitic gray iron is formed." A comparison of the effect of Si and Ni indicates that "above the critical range Ni and Si may be said to supplement one another, but below this range Ni restrains the action of Si in decomposing pearlite, and maintains a structure free from ferrite, while its own matrix hardening through sorbite formation is definitely in the opposite direction to the effect of Si." Ni is effective in reducing chill and eliminating hard spots. Ni up to 3% refines the graphitic structure but above this amount the structure may be coarsened. By reducing the Si and addn. of Ni the equalizing effect in the structure and hardness of castings of variable sections is pronounced. With Ni replacing Si in a ratio of two to one a marked improvement in the strength is obtained. J. W. BOLCK.

Effect of copper upon cast iron. ASHIO HOTARI. Kyushu Imp. Univ. *Bull. Coll. Eng. Kyushu Imp. Univ.* 3, 169-80(1928).—H. measured the tensile strength and the Brinell hardness of 9 kinds of cupriferous cast iron contg. 0.-1.7% Cu, 3.4% total C, and 1.5% S. Both the tensile strength and the Brinell hardness increase to a certain extent with the addn. of Cu, the rate of increase becoming slower in steels of high-Cu content and being linear in those of low-Cu content. Thermal analysis shows that the arrests on the cooling curves lie at different points. Microscopic examn. and chem. analysis show the increase of graphite with the increase of Cu, so that Cu accelerates graphitization. The corrosion test was made by dipping the samples in 5% HCl.

HNO₃, H₂SO₄, 2% NaCl and 9% NaOH soln. for 48 hrs. and measuring the resulting wt. decrease. The results show that Cu increases the resistivity toward acids markedly, the effect being max. at 0.25% Cu.

K. SOMEYA

Oxygen in steel. L. PERSOZ. *Aciers spec.* 3, 259-62(1928).—The effects of oxygen in crucible, elec. furnace, acid open-hearth, basic open-hearth, acid Bessemer and Thomas steels are discussed in detail.

A. J. MONACK

Gases extracted from iron-carbon alloys by vacuum melting. N. A. ZIEGLER. *Am. Inst. Mining Met. Eng., Tech. Publ.* No. 168, 3-15(1929).—Numerical data are given for gas evolution by vacuum melting for a series of lab. Fe-C alloys, ranging from 0.0038 to 4.45% C, as well as some com. steels and cast irons. CO is the principal constituent of the gaseous mixts. in all cases, the amt. increasing with the increase of C in the original sample. H is evolved to a small extent by the open-hearth sample, but not by the lab. samples or cast Fe. CO₂ is evolved in relatively small quantities in all the samples. H₂O vapor is given off in very small amts. by the low-C lab. alloys and the steels, but not by the high-C alloys and cast irons.

DOWNS SCHAAF

Two space models of equilibria in the system iron-carbon-oxygen. ERNST JANECKE. *Z. anorg. allgem. Chem.* 178, 73-96(1929).—Two new models are constructed to establish the factors which det. the equil. in the system Fe-C-O. In one the relation between temp. and compn. is given (without reference to pressure) in a 3-sided prism. The other, a right-angled prism, shows the relation between temp. and pressure with respect to the compn. of the gas phase at equil. For both figures the invariant and monovariant equil. are discussed in detail, particularly those (invariant) which occur at the temp. of the first formation of FeO from Fe₃O₄ and Fe (550°), and at the temp. of the appearance of martensite (740°). In the first case the phases involved are Fe, FeO, Fe₃O₄, gas and C or cementite (metastable). In the second case the phases in equil. are martensite, Fe, FeO, gas and C or cementite. The equil. with cementite is metastable and occurs at lower temp. (700°).

H. STOERTZ

The gamma-alpha transformation in pure iron. ALBERT SAUVEUR AND C. H. CHOU. *Am. Inst. Mining Met. Eng., Tech. Publ.* No. 169, 3-18(1929).—Polished samples of electrolytic Fe were heated in a vacuum, maintained in the gamma range for several hrs. and quenched in Hg. Photomicrographs show that the alpha phase is formed first along the crystallographic planes of the gamma phase and around the grain boundaries. The martensitic structure resulting from the drastic quenching is proved to penetrate to a substantial depth by repolishing and etching. With magnifications of 500 diam. the so-called Widmanstätten patterns are clearly seen and a close relationship is established between this structure and that of martensite. Also in *Heat Treating and Forging* 15, 305-6, 325(1929).

DOWNS SCHAAF

The influence of cold rolling and annealing at different temperatures on the tensile properties and structure of high-grade soft iron sheets. E. MARKE. *Vereinigten Stahlwerke, Hütten i. W. Archiv Eisenhüttenw.* 2, 177-84(1928).—The influence of cold rolling (under the critical range) to give 20-30% thickness decrease, and subsequent annealing (at 580°, 680°, 800°, 930°) on the tensile properties of soft Fe sheets is investigated. It is shown that increased cold rolling causes a strong decrease in the Erichsen no. and breaking strain, and an increase in the elastic limit, tensile strength and Brinell hardness. With increasing cold rolling there is distortion and extension of the crystallites. By heat treating, the effect of cold rolling on the structural and mech. changes is annulled. The change in the mech. properties is large on annealing at 580° and small between 680° and 930°, the greatest being in the breaking strain and the smallest in the Erichsen no. These properties are influenced considerably by annealing 2-3 hrs. instead of one, especially at 580°.

J. BALOZIAN

Axle housings of electric steel. ETHELBERT FAVARY. *Iron Age* 123, 477-8 (1929).—Shrinkage cracks in axle housings made from elec. steel contg. 0.30% C and 1% Ni were overcome (1) by rounding off and adding metal to the corners, (2) by the proper location of chills and (3) by soft cores and the addn. of longitudinal ribs.

DOWNS SCHAAF

The effect of the temperature of rolling on the quality of the rails. R. STUMPFER. *Stahl u. Eisen* 49, 177-87(1929).—Efforts to improve the quality of steel rails by changes in the chem. compn. of the steel, such as the increase of the C content from 0.65% to 0.80-0.88%, also by increased Si and Mn contents, the development of special V steel with 0.25-0.28% V and of Ti steel with 0.2% Ti, finally by heat treatment, are reviewed. The quality of the steel depends not only on the amts. of pearlite, ferrite, etc., present, but also on the form of these constituents. Three characteristic types of grain structures occurring in rail heads are shown (granular, network and overheated structures). The granular structure is transformed into network structure between 0.4 and 0.5% C; at

this point the curve of the tensile strength as a function of the C content shows a greater increase, that of the elongation a greater decrease, than below this point. A granular structure consisting of fine grains of pearlite, surrounded by a noncoherent network of ferrite, is the best. This structure can be obtained by a low C content with a correspondingly increased Mn content. Three series of rolling expts. were carried out, the temp. of the finishing rolling being 950, 1050 and 1015°, resp. Test pieces were taken from the rail head, the middle part and the base. The yield point, tensile strength, impact value and elongation were found to decrease with increasing finishing temp. The finishing temp. had no appreciable effect on the Brinnell hardness. At 950° the structure shows an intermediate stage between granular and network structure; at higher temps. the network structure prevails.

J. A. SZILARD

Heat treatment and testing of tools of high-speed steel. F. RAPATZ. *Stahl u. Eisen* 49, 250-5(1929).—The best grain structure can be obtained by hardening at 1280-1320°, followed by tempering at 550-600°. The high hardening temps. often cause burnt tool edges. This can be eliminated by the use of a bath of $\text{Na}_2\text{B}_4\text{O}_7$. A NaCl bath does not prevent decarburization. The only disadvantage of a $\text{Na}_2\text{B}_4\text{O}_7$ bath is its corrosive action. The tempering should be carried out after the hardened steel is cooled to 150°. The transformation of the rest of the austenite into martensite is rather slow; therefore, it is advisable to use a tempering period of 30 mins. to 1 hr., depending on the compn. of the steel and the size of the tools, followed by air cooling. For the testing of the tools Rockwell hardness, microscopic examn. and filing are used. The possibility of the use of physical methods, such as the testing of elec. and magnetic characteristics (cf. Styri C. A. 22, 2012), is discussed.

J. A. SZILARD

X-ray investigation of iron-zinc alloys. ATOMI ÔSAWA AND YOSHIKI OGAWA. Tohoku Imp. Univ. Sendai. *Z. Krist.* 68, 177-88(1928). (In English).—X-ray analysis was carried out for the complete Fe-Zn system. The crystal forms of several phases are similar to those of Ag-Zn, Au-Zn and Cu-Zn alloys. The crystal form of FeZn_{10} (considered FeZn_7 by previous investigators) is cubic, with $a = 8.93$ A. U. and 52 atoms in the unit cube. The space group is either T_d^3 , O_h^9 or O^1 . FeZn_7 has a close-packed hexagonal lattice, with $a = 2.788$ and $c = 4.481$ A. U. This unit contains 2 atoms. An elementary cell with the value for the a axis doubled would contain 8 atoms (7 Zn and 1 Fe). With Fe atoms at (000) in this larger unit, both Fe and Zn would have a hexagonal distribution.

L. S. RAMSDALL

Some properties of manganese steel. KAZUO MORIDERA. Yahata Steel Works. *J. Study of Steel Manuf.* 104, 274-80(1928).—M. measured the hardness of 2 kinds of Hadfield steel (contg. 1% C and 12% Mn) at the temp. range of 100-1000° with the samples quenched at 950°, and also the same subsequently annealed. No marked change of hardness is observed up to 600°. Above 700°, the steel is gradually softened. The samples which had been heated at 300-1250° were pressed 3 times with a steam hammer, to det. a suitable forging temp. Hardness was detd. on specimens air cooled from a temp. of 100-1000°. The specimen air-cooled from 600° was the hardest and it had a martensitic structure. Mech. properties of the water-quenched and quench-tempered specimens were also tested; it was found that the tensile strength, elongation and bending rate changes in a similar manner, while the hardness change is in opposite direction to them.

K. SOMEYA

Effect of copper upon the properties of steel. KENNOSUKE HAYASHI. *Bull. Ordnance* 6, 401-68(1928).—H carried out tensile tests on Ni-Cr steel contg. 0.04-3.05% Cu, Ni-steel and Cu steel at various temps. ranging between room temp. and 1100° with the following results: The influence of Cu cannot be recognized in the test made at ordinary temp. but the tensile strength decreases rapidly at a temp. above the A_1 point, red shortness being also apparent. At high temp., increase in Cu causes decrease in elongation. Mn steels contg. C 0.25, Si 0.2, Cu 0.3 and Mn 0.4-1.3% were annealed at 900°, and tensile tests made at ordinary temp. and at 600-1100°, together with tensile tests of welded material. At room temp. the tensile strength and the elastic limit increase while elongation decreases with increase of Cu. At high temp. red shortness increases with increase in Cu content; above 1% Cu, the material is difficult to forge. But in the Mn-contg. steel the red shortness caused by Cu is somewhat mitigated, the best result being obtained with 0.7-1% Mn for 1% Cu. The tensile strength tends to increase up to 800°. Above 800°, no change is apparent. No satisfactory result was obtained with the tensile test of welded material. Microscopic examn. shows that the structure of the annealed samples consists of ferrite and pearlite, the pearlitic structure becoming finer with the increase in the Cu content. The transformation point is lowered with the increase of Cu and Mn.

K. SOMEYA

Action of the principal addition elements in steel. L. PERSOZ. *Aciers spec.* 3, 249-55(1928); *Foundry Trade J.* 40, 181-2(1929).—P. discusses in detail the effects in steel of the following elements: N, P, As, S, Mn, Si, Cr, Ni, Cu, W, V, Mo, U, Co, Ti, Al, B and Ce. The amts. of each that should be present in steel are given as well as the effects of excess amts.

A. J. MONACK

Zirconium in steel. L. PERSOZ. *Aciers spec.* 3, 256-8(1928).—Zr added to steel acts simultaneously as a deoxidizer, denitrifier and desulfurizer. When sufficient Zr is added so that some remains in the steel the toughness and tenacity are increased, the best results being obtained when the Zr is equal to or less than 0.15%. The quality is much improved even when the finished steel contains only traces of Zr. Higher percentages than 0.15 tend to cause slag inclusions and favor segregation. In general, Zr should not exceed 0.35%; larger amts. cause steel to become brittle. Zr steels are suitable for making armor-plate. Tests show that nickel-chrome steel of 16 mm. thickness, nickel-molybdenum steel of 13 mm. thickness, and nickel-zirconium steel of 10 mm. thickness have equal resistance to the passage of rifle bullets. A typical Ni-Zr steel contains C, 0.40%; Mn, 1%; Si, 1.5%; Ni, 2%; Zr, 0.34%. Zr is added as ferro-zirconium with 30-35% Zr after the other addns. have been made. An appendix gives complete lab. directions for the detn. of Zr in steel as the phosphate and the detn. by means of phenylhydrazine.

A. J. MONACK

Studies in stainless steel. I. YOSHIHIRO KAWAKAMI. *J. Army Research Staff. Iron and Steel* 14, 838-951(1928).—K. took 20 kinds of Japan-made and 24 kinds of foreign-made stainless steels and classified them according to their chemical compn. into 8 kinds, viz. (1) steel contg. 11-17% Cr, (2) that contg. above 15% Cr, (3) steel contg. Cr and Ni as its chief constituents and contg. less than 5% of Ni, (4) the same contg. more than 5% of Ni, (5)-(8) those steels which contain Si, W, Cu and V as their chief constituent. In the dilatometric test of these samples with Honda's app. for thermal expansion measurement, no transformation was detected with the alloys contg. above 15% Ni. Magnetic analysis showed that those steels contg. above 5% Ni are paramagnetic and have an austenitic structure. With quenched specimens the hardness is the greatest when the C content is above 0.3%, the Cr content above 11% Cr, or in samples having less than 11% Cr and less than 4% W. When the samples whose structures have become martensitic on quenching are annealed, the hardness decreases gradually with annealing temp. up to 500°, while between 500° and 900°, the hardness decreases faster. With an annealing temp. of 1000°, max. hardness is obtained due to self-hardening. When the quenched sample has an austenitic structure, the hardness is little affected by tempering. For destroying the self-hardening property, annealing at 900° or 1050° gives the best results and the cooling velocity must be such that several hrs. are required before the sample passes through the transformation range. Density increases with increase of W, Cu and Ni content, and decreases with increase of Si and Cr. In comparing the acid-resisting property of the quenched specimens, the rusting which occurs on exposing them to atm. for 2 months, and also on keeping them in various acid solns., was detd. In the latter case the samples were kept for 1-15 days in a dil. soln. of NaCl, NaOH, HNO₃, H₂SO₄, HCl, AcOH, (C₂H₃)₃, citric acid, and in concd. solns. of HCl, H₂SO₄ and HNO₃ and in glycerol, and the wt. decrease was measured. When the heat-treated and untreated specimens were tested by this method, it was found that the resistance of the treated steel was always greater. When rolled, the corrosion was found to be greater in the direction of rolling than that perpendicular to it. It was also found that in the same kind of specimen the resistance decreases with increase in inclusions.

K. SOMEYA

Influence of various elements upon the nitrogenation of steel. TSUYOSHI NAKAYAMA. Tohoku Imp. Univ. *J. Study of Metals* 5, 413-27(1928).—N. first made reduced Fe consisting of small grains and studied nitrogenation in the NH₃ stream, measuring the wt. increase by means of a thermobalance. Although the relation between the quantity of combined N₂ and temp. was ascertained, the atm. oxidation of the sample could not be completely prevented. Next the sample was placed in a silica tube and was nitrogenated by passing NH₃ gas and heating. Since the wt. increase and the chem. analysis gave identical N₂ content, the former was taken to represent the degree of nitrogenation in all the subsequent studies of the velocity of nitrogenation at various temps. The velocity of nitrogenation is very small below 300°, increases rapidly above 400°, increasing more with the rise of temp. But the N₂ content measured after 1 hr. shows a max. at 450°, amounting to 10%. At about 600°, it suddenly decreases, becoming almost zero above 750°. When the Fe grain is large, the velocity of nitrogenation is small, and the temp. for obtaining the max. nitrogenation is a little higher than when Fe of small grain is used. To exam. the effect of various elements upon nitrogenation,

Fe-Al, Fe-Si, Fe-Ti, Fe-V, Fe-Cr, Fe-Mo, Fe-W, Fe-Mn, Fe-Co, Fe-Ni, Fe-Cu and Fe-C alloys of varying compns. were prep'd. and the velocity of nitrogenation was studied by passing NH_3 gas over the sample for 1 hr. at various temps. Elements that form stable nitrides (as Al, Si, Ti, Cr) accelerate nitrogenation, and the max. N_2 content attained in 1 hr. treatment is max. at 500° . With elements that form no stable nitride (as Cu, Ni, Co) the max. N_2 content is obtained at 600° . Mn forms a stable nitride and makes the N_2 content larger, showing a max. at 600° . When Al, Si, Ti, Cr, Mn, etc., are present a large amt. of N_2 is retained even when heated at a high temp. K. S.

A metallographic study of tungsten carbide alloys. J. L. GREGG AND C. W. KÜTTNER. Am. Inst. Mining Met. Eng., *Tech. Publication No. 184*, 3-12(1929). Four of five different com. W carbide alloys were found by means of x-ray diffraction patterns and microscopic examn. to consist of W_2C and WC; the fifth contained little if any W_2C , being composed almost entirely of WC. Alk. ferricyanide and a mixt. of concd. HNO_3 and HF were used as selective etching reagents; the alk. ferricyanide attacks WC and not W_2C ; the acid mixt. attacks W_2C and not WC. Also in *Heat Treating and Forging* 15, 317-20(1929).
DOWNS SCHAAP

High-strength brasses. O. W. ELLIS. Am. Inst. Mining Met. Eng., *Tech. Publication No. 167*, 3-25(1929).—As a result of an extensive investigation, the effects of Al, Fe, Mn and Sn upon the mech. properties of brass contg. in the neighborhood of 56.5% Cu are found to be cumulative. Hence, given the analysis of a complex brass and knowing the mech. properties of the basic alloy, and the effects of the elements present in the alloy other than Cu and Zn, the mech. properties of the mixt. in the chill-cast state can be estd.
DOWNS SCHAAP

Some observations in heat treatment of Muntz metal. L. RUSSELL VAN WERT. Am. Inst. Mining Met. Eng., *Tech. Publication No. 180*, 3-10(1929).—Photomicrographs of a quenched alloy of Muntz metal (60% Cu, 40% Zn) reheated to 750° show the general tendency of the alpha soln. to segregate along cleavage planes, and the mechanism whereby the pptd. alpha is taken back into soln. with rise in temp. Heating a quenched alloy results (1) in the breakdown of the metastable beta soln. and the ptn. of the solute preferentially in the cleavage planes of the beta and (2) when the temp. is raised sufficiently, in the re-resolution of this solute. An interesting feature of this re-resolution process is its peculiar mechanism, i. e., soln. occurs exclusively at the ends of the rectangular areas, the alpha "islands" remaining const. in width during the dissolving process and decrease in size takes place through reduction in length alone. Reheating brass quenched from 800° to the beta range and again quenching gives an abnormally large grain size.
DOWNS SCHAAP

Silver-copper eutectic. J. A. A. LEROUX AND E. RAUB. Schwabisch Gmünd. Z. anorg. allgem. Chem. 178, 257-71(1929).—Ag-Cu alloys are studied within the range 68-75% by wt. of Ag. Electrolytic Cu and 99.98% Ag are used; the melts are heated to 1200° and cooled at different rates. In series I they are quenched in H_2O at 2° , in series II they are cooled at a velocity of $2^\circ/\text{sec.}$, in series III at a velocity of 0.18/sec. and in series IV at 0.02-0.03/sec. Microscopic examn. is made on sections etched with dil. H_2SO_4 . The simultaneous occurrence of primary Ag- and Cu-rich mixed crystals is found to be connected neither with undercooling nor with a sepn. of the melt, but is rather explained by the greater tendency toward crystn. of the Cu-rich mixed crystals. Eutectic crystn. is attained by a smaller time difference between the sepn. of the 2 types of crystals. Melts of Ag-rich mixed crystals show a strong tendency to undercooling, while Cu-rich crystals exhibit this tendency to a very limited extent. With increasing undercooling of eutectic melts the tendency toward crystn. becomes greater for the Ag-rich than for the Cu-rich constituents. The detn. of the eutectic concn. microscopically is therefore impossible, nor is thermal or chem. analysis free of objection, because of the non-uniformity in the distribution of the primary sepn. In most cases the eutectic colonies are identical with the grain, but in others several eutectic colonies form one crystal. The form of the colonies always det. the form of the crystal grain. Variation in the form of eutectic colonies is attributed to the strong tendency to directional growth of Cu-rich mixed crystals. The entire crystn. process of the eutectic melt appears to be detd. by the dominant properties of the Cu-rich mixed crystals. Photomicrographs are shown.
H. STORITZ

Gold-platinum alloys. A. T. GRIGOR'EV. Z. anorg. allgem. Chem. 178, 97-107(1929).—See C. A. 22, 4443.
H. STORITZ

Structure of some ternary alloys of copper, zinc and aluminum. A. J. BRADLEY AND C. H. GREGORY. Mem. Proc. Manchester Lit. Phil. Soc. 72, 91-100(1927) 81.—In metallic alloys if the proportions of the ingredients are other than what is required to give an ideal intermetallic compd., the term "solid soln. in an intermetallic compd."

has been used, but the authors prefer "complex solid soln." Three ternary alloys of Cu, Zn and Al were made up from binary alloys of Cu and Zn with the γ type of structure and alloys of Cu and Al with the analogous γ' structure, mixed in the ratios 3:1, 1:1, 1:3. They were found by the x-ray powder method with a tube of the hot-filament type to consist of homogeneous solid solns. with the same type of structure as the binary alloys. The structure in each case is a complex cubic arrangement contg. 52 atoms per unit cell, the lattice dimensions showing a continuous decrease as the Cu + Al content increases. The similarity of these alloys appears to be related to the fact that in each case the concn. of valency electrons is approx. the same. H. STOERTZ

Beryllium and its alloys. A. VALIANE. *Aciers spec.* 3, 240-8(1928).—V. has presented a very complete and detailed review of the subject. The following are discussed: Be-contg. minerals; prepn. of Be by electrolytic and other methods; properties of Be; Al-Be, Be-Ni, Co-Be, Fe-Be alloys—their properties and equil. diagrams. In conclusion, V. states that it is still necessary to rep. alloys of a d. of 4 to 5. A bibliography is appended. A. J. MONACK

Aluminum-silicon alloys: their properties and some applications. II. R. B. DEELEY. *Foundry Trade J.* 40, 87-90(1929); cf. *C. A.* 23, 1857.—Fifteen photographs show the replacement of parts made of wood, pressed steel and malleable castings by Al-Si alloys. DOWNS SCHAAF

Effect of arsenic on dispersion-hardenable lead-antimony alloys. K. S. SELJESATER. *Am. Inst. Mining Met. Eng., Tech. Publication No.* 179, 3-10(1929).—Micro-Brinell hardness figures were obtained for Pb-Sb alloys contg. from 1 to 4% of Sb and from 0 to 1% As for various lengths of time and temp. of aging. The elec. conductivities of Pb-As alloys contg. from 0 to 2.15% As were measured at 25° and 100°. The tensile strength was measured on the same alloys used in the cond. measurements after quenching from 282° and aging at various temps. An explanation is offered for the effect of As on dispersion-hardenable Pb-Sb alloys. DOWNS SCHAAF

An open-flame stationary hearth-type furnace for melting aluminum and its alloys. ROBERT J. ANDERSON, GEORGE E. HUGHES AND MARSHALL B. ANDERSON. Fairmont Mfg. Co., Fairmont, W. Va. *Am. Foundrymen's Assoc.* (preprint) No. 29-6, 153-62 (1929).—Furnaces larger than the usual Fe-pot type are useful in melting Al alloys in large quantities, because of the large-sized casting scrap to be remelted. An open-flame furnace lined with fire brick, suitable for this purpose in sizes from 2000 to 50,000 lbs. capacity, is described. Insulated walls, hearth and roof, and cross-firing by having the burners and stack at the same end of the furnace are recommended to secure fuel economy. A fuel efficiency of 24.75% was obtained, with a melting cost of \$1.48 per ton. GEO. F. COMSTOCK

Non-ferrous casting alloys. WESLEY LAMBERT. *Foundry Trade J.* 39, 345-6 (1928).—A brief description of the compn. and phys. properties of Admiralty gun metal, phosphor bronze and aluminum bronze. Compounding and casting procedure is touched upon. J. W. BOECK

Metal finishing division of the Pyrene Manufacturing Company. L. E. ECKELMANN. *Metal Industry* (N. Y.) 26, 507-10(1928).—A brief description of the Parkerizing, enameling and plating departments of the above Co. J. W. BOECK

An apparatus for corrosion tests. V. DUFFEK. *Gas Wasserfach* 72, 127-9 (1929).—See *C. A.* 23, 1097. R. W. RYAN

Correlation of laboratory corrosion tests with service: Weather exposure tests of sheet duralumin. HENRY S. RAWDON. *Am. Inst. Mining Met. Eng., Tech. Publication No.* 173, 3-24(1929).—R. compares lab. and weather exposure tests on sheet duralumin. A close parallelism was found between service and lab. tests proving the value of lab. tests in estg. performance in service. Corrosion is intercryst. in most cases. Chloride solns. are the most potent halogens causing this kind of attack. Rate of attack is accelerated by temp. Cold working increases susceptibility to intercryst. attack. Anodic oxide films afford protection only when well greased. Coatings of varnish and bituminous coatings fail rapidly. Al pigmented rubber coatings give excellent performance in lab. tests. Al spray coatings give excellent results. B. E. ROETHLI

Corrosion—an apparent relation of protective film to microstructure. CHARLES VAN BRUNT. *Ind. Eng. Chem.* 21, 352(1929).—The corrosion of teeth in a gear pump was most pronounced at the site of greatest relative movement between parts, indicating that the protective film had been sheared or rubbed off. It is believed that the segregation of impurities along grain boundaries causes a weakening of the structure of the rust film on cast iron and that with resistant alloys the segregated matter forms a very resistant deposit. B. E. ROETHLI

Some aspects of corrosion fatigue. T. S. FULLER. *Am. Inst. Mining Met. Eng.,*

Tech. Publication No. 172, 3-8(1929).—Steel samples exposed to conditions permitting the absorption of H prior to fatigue testing all showed a decrease in the no. of cycles necessary to fracture. Conclusion: in corroding media (10% H_2SO_4 or strong NaOH) permitting the absorption of H this factor lowers the fatigue strength while in other media pitting is the prime cause. Zn-coated specimens fail sooner than Sn-coated ones probably because of the brittle character of the bond between the steel and the Zn coating. B. E. ROETHELI

Corrosion of tin and its alloys. C. L. MANTELL. *Am. Inst. Mining Met. Eng., Tech. Publication, No. 171, 3-38(1929).*—An excellent review on the corrosion of Sn covering chem. properties; phys. corrosion (tin pest); chem. corrosion by inorg. acids, org. acids, bases, salts, halogens, S, org. compds. and food products. A summary of the corrosion and corrosion-resistant properties is given of binary alloys of Sn with Al, As, Ba, Hg, Cd, Ce, Cu, Au, Fe, Pb, Mg, Pt, K, Ag, Na and Si. B. E. ROETHELI

Acid handling in a metal finishing plant. PERCY C. KINGSBURY. *Metal Ind. (N. Y.) 27, 23-4, 78-9(1929).*—A description of the metal-pickling plant of the Siemens-Schuckert-Werke, Siemenstadt, Germany, based upon an article by Paul H. Perl in *Werkstattstechnik*. A sep. building is provided for acid storage and mixing, the acid is dumped into a storage vessel outside the building, elevated by compressed air to 254 gals. storage vessels on the ground floor, and then elevated by the same means to the rooms where needed. Ample vents and exhaust fans carry off fumes. W. C. E.

Oxygen and metals—some features in their relationship. F. JOHNSON. *Foundry Trade J. 39, 279-80(1928).*—The effect of O on corrosion, i. e., differential aeration, passivity and protective character of oxide films, is discussed. Oxidation at high temps. and in melting metals is also discussed. The detrimental effect of O in Cu to be rolled into sheets is pointed out. The subject of deoxidation of molten metals is treated briefly. J. W. BOECK

The practical rapid testing of rust-free steel. V. DUFFEK. *Chem. tech. Reichsanstalt, Berlin. Korrosion 4, 9(1929).*—Tests made by D.'s method (C. A. 21, 2454) are illustrated. J. H. MOORE

Electrochemical behavior of chromium steels and tendency to rust. OSCAR MEYER and KARL ROESCH. *Arch. Eisenhüttenw. 2, 119-25(1928)*—The electrochem. behavior of Cr steels, and the relation between the tendency to rust and the single potentials in aq. solns. of 1/1 N- KNO_3 , NH_4NO_3 (1:1), 0.5 molar $KCrO_4$, $CrSO_4$, cold standard K_2SO_4 , 1/1 N-KCl, sublimate soln. (1:1000), dil. HNO_3 (1:10), dil. H_2SO_4 (1:50), AcOH (4.5%), 1/1 N- $FeSO_4$ and in cond. H_2O are investigated, time-potential curves being obtained. Except in special cases, rusting of the Cr steels commences in the aq. solns. of the salts at $e_H < -0.015$ to -0.010 v. In the HNO_3 soln., after 45 hrs. the easily dissolved specimens show a higher potential than those which were more resistant. In the $FeSO_4$ soln. the rusting is found to be a function of the C content of the steel. The surface conditions of the steels exert a large influence on the potential values and the rusting. In general, the time-potential curves of the specimens treated with emery approach those of the polished specimens. The p. ds. produced at the various surfaces are greater with the hardened than with the forged or annealed materials. J. BALOZIAN

The story of Cu (HOWARD) 2. History of the manufacture of blast furnace cement at the Imperial Steel Works (TANI) 20. Equilibrium relations in the reduction, oxidation and carbonization of Fe (SCHENCK, KLAS) 6. Adsorption of H_2CO_4 by $Fe(OH)_3$ (TILLMANS, et al.) 2. Fibrous structure in metals deposited by the difference of electrolytic solution pressures (Tsuboi) 2. Embrittlement prevention in steam boilers (STRAUB) 14. Absorption of O by alkaline tannates (FAGER, REYNOLDS) 14. Apparatus for filtering solutions from ore slimes (U. S. pat. 1,706,400) 1. "Steam storer" or "heat accumulator" [for utilizing waste heat of blast furnace gas] (U. S. pat. 1,705,975) 1. Apparatus for grinding ores and separating the finer particles by the action of a fan (Brit. pat. 295,430) 1. Sorting machine for ore (Russ. pat. 5268) 1. Vacuum system of flotation separation of ores (U. S. pat. 1,706,281) 21. Detergent [for cleaning metal surfaces] (U. S. pat. 1,707,931) 18. Preventing gas absorption by liquids (Brit. pat. 295,319) 13.

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Apparatus for separating and cleaning ores, etc. REMBRANDT PEALE, WILLIAM S. DAVIES and WILLIAM S. WALLACE. Fr. 646,313, Dec. 12, 1927.

Treating ores with nitrates or nitric acid. S. C. SMITH. Brit. 295,224, April 5, 1927. Ores, concentrates, residues, etc., are treated with HNO_3 (or metal sulfate solns. obtained from ores, etc., are treated with $\text{Ca}(\text{NO}_3)_2$) to obtain the metals in soln. as nitrates from which the metal values may be recovered and HNO_3 or $\text{Ca}(\text{NO}_3)_2$ regenerated. When HNO_3 is used, the metals may be completely or fractionally pptd. by addition of CaO , $\text{Ca}(\text{OH})_2$ or CaCO_3 and the $\text{Ca}(\text{NO}_3)_2$ soln. thus formed treated with an acid such as H_2SO_4 to ppt. a Ca salt and regenerate HNO_3 or treated to obtain the $\text{Ca}(\text{NO}_3)_2$ for use as fertilizer. Various examples are given, including treatments of Pb Zn fume, a sulfate liquor contg. Cu and Zn and an oxidized Pb Zn ore. Mention is also made of applying a similar process to the *obtainment of pure MgO* from a mixt. of MgCO_3 and CaCO_3 .

Treating ores or the like containing lead and zinc. WILLIAM H. CORBOULD. U. S. 1,706,143, March 19. See Brit. 273,420 (C. A. 22, 2036).

Reducing ores. T. ROWLANDS. Brit. 295,338, Feb. 10, 1927. Ores or the like are heated with solid C or partly devolatilized coal and with reducing gases obtained by the low-temp. carbonization of coal or like material, the gases being treated to convert at least a large proportion of the CO_2 into CO and the low-temp. carbonization being effected by heat from the reduced ore and gases obtained at various stages of the process. An app. is described.

Reducing ores. PAUL GREDT. Ger. 471,271, Sept. 10, 1925. In reducing fine ores, particularly oolitic ores and slimes obtained from minette, a furnace of known kind is used, but the velocity with which the ore is conveyed through the furnace and

the temp. of the reducing gases supplied thereto are regulated in accordance with temp. measurements at various parts of the furnace.

Desulfurizing ores. DÉSIRÉ J. P. DELVILLE. Fr. 646,883, Jan. 9, 1928. Ores are desulfurized by roasting in a closed space, a gas contg. O and SO₂ being passed through so as to obtain a gas contg. sufficient SO₂ to produce H₂SO₄ economically.

Concentrating copper ores. JAMES A. HOLLADAY (to Union Carbide Sales Co.). U. S. 1,706,293, March 19. Oxidized Cu minerals are prep'd. for froth flotation by suspending the finely ground mineral in water as a pulp, treating with C₂H₂ and preventing aeration of the pulp during the process by displacing air with a noncombustible inert gas such as N so that the action of the C₂H₂ on the mineral particles is intensified.

Smelting tin-bearing tungsten ores. FREDERICK M. BECKETT and WILLIAM C. READ (to Electro Metallurgical Co.). U. S. 1,705,655, March 19. The ore is treated with a Cl comp'd. such as S chloride and the mixt. is then heated by an exothermic reaction between the ore and Si, to a temp. suitable for the formation and volatilization of Sn chloride.

Iron ore briquets, etc. K. GRÖPPEL, E. GRÖPPEL and A. WASCHKAU (trading as Maschinenfabrik F. Gröppel C. Lührig's Nachfolger) and C. P. DEBUCH. Brit. 295,910, March 2, 1928. Granular Fe ore or other Fe-bearing material such as blast-furnace dust is heated in a rotary oven and then while in a plastic condition is passed between cooled molding rollers (of an app. which is described).

Melting pot for magnesium or other light metals and alloys. JOHN E. HOY (to Dow Chemical Co.). U. S. 1,707,161, March 26. Structural features.

Melting stereotype metal, etc. MASCHINENFABRIK AUGSBURG-NÜRNBERG A.-G. Brit. 296,086, Aug. 26, 1927. Melting pots are heated by the satd. vapor of a liquid, the b. p. of which is near the casting temp. of the metal and the pressure of which is only a few atm. at the casting temp. Satd. CaCl₂ soln., tetraline, aniline, naphthalene, paraffin or Hg may be used. Structural details of double-walled melting pots are described.

Mixing apparatus suitable for use in treating molten lead with sulfur for refining, etc. HERBERT W. YORK (to American Smelting and Refining Co.). U. S. 1,706,722, March 26.

Treating molds for producing soft castings of ferrous metals. HUBERT A. MYERS (to Metal Castings Holding Co.). U. S. 1,706,858, March 26. The matrix of a mold, which may be formed from iron or an Fe alloy, is coated with a material contg. a CN salt, such as NaCN or KCN and the mold and coating are heated to liberate C from the CN salt. The cyanide may be mixed with plumbago or MgO.

Casting metal ropes, etc. EMIL HAMMERSCHMID. Ger. 471,492, Nov. 7, 1926. Addn. to 460,873. Ger. 460,873 describes app. for casting metal ropes, etc., in which the metal flows into a rotating channel. This is now modified by providing a stationary channel while moving the means for pouring the metal, and (or) by shaking the channel during the casting.

Increasing the density of cast metal. N. N. YAROTZKII. Russ. 5357, May 31, 1928. The d. is increased by giving a rotating motion to the molten metal and subjecting it simultaneously to a pressure of gases.

Treating sand for molding. GILBERT MICHEL. Ger. 471,461, Oct. 15, 1924. Molds for casting easily oxidized metals, e. g. Mg, are prep'd. from sand which has been pretreated by thorough incorporation with a mobile soln. of a resin in an oil.

Apparatus (with an adjustment to fix the time of treatment) for mixing and mulling foundry sand, etc. JOSEPH T. SIMPSON. U. S. 1,706,417, March 26. Structural features.

Oil burner for metallurgical furnace. SOC. TUBALCAIN. Fr. 646,068, Dec. 22, 1927.

Vertical retort furnace for treating ores, etc. F. L. WILDER, E. MORRIS, E. SCHIFF and E. S. KING. Brit. 295,226, April 6, 1927. A furnace suitable for roasting ores, sulfides, arsenides, etc., comprises a vertical retort surrounded by an annular heating chamber heated by producer gas, and successively surrounded further by an annular air passage (through which air for combustion is introduced) and an annular flue. Various structural details are described.

Rotating furnace for roasting sulfur ores and the like. METALLBANK and METALLURGISCHE GESELLSCHAFT A.-G. Fr. 646,881, Jan. 9, 1928. The furnace is divided into compartments by vertical partitions with openings, the partitions having projections or ribs between which the ore flows and which direct the ore to the opening into the next compartment.

Cupola furnace forehearth. CARL REHN. Ger. 471,460, Feb. 26, 1927. Addn.

to 402,438. The forehearth has a partition and the arrangement is such that the molten Fe from the furnace fills both compartments of the forehearth simultaneously.

Heat-treating furnace (cooled rim on cyanide pots). CRANSTON H. CARPENTER and ALVIN D. KEENE (to Westinghouse Elec. & Mfg. Co.). U. S. 1,705,714, March 19. A flange and cooling pipe is arranged to cool the rim of a crucible or cyanide pot used for heat-treating, in order to effect solidification of molten material creeping out of the crucible.

Furnace for heat-treating metal articles. THOMAS J. LAURENCE (to Chrysler Corp.). U. S. 1,705,621, March 19.

Furnace (with a continuous track) for bright annealing of balls for bearings, etc. JOHN F. BAKER (to Westinghouse Elec. & Mfg. Co.). U. S. 1,705,703, March 19.

Furnace with an annular heat-treatment chamber for heat-treating and quenching. JOHN F. BAKER (to Westinghouse Elec. & Mfg. Co.). U. S. 1,705,704, March 19. Structural features.

Recuperative furnace for annealing or similar heat treatments of wire in bundles, etc. JOHANN SCHNEPF (to Westinghouse Elec. & Mfg. Co.). U. S. 1,705,686, March 19. Structural features.

Regenerative welding furnace with two separately heated hearths. JULIUS BERTRAM. Ger. 471,478, Nov. 15, 1923.

Charging blast furnaces with compressed coal. OTTO VOM BOVERT. Fr. 646,734, Jan. 6, 1928.

Cast iron. EUGEN PIWOWARSKY (to Edeltgussverband G. m. b. H.). U. S. 1,705,995, March 19. Molten iron is heated above that temp. above which the formation of carbide will decrease while the formation of graphite will increase (this temp. being substantially higher than that of solidification, and suitably about 1400°).

Gray cast iron. HEINRICH HANEMANN (to Edeltgussverband G. m. b. H.). U. S. 1,705,972, March 19. In order to destroy the graphite nuclei in the metal, it is heated to 1250–1300° and this temp. is maintained for a few hrs. before casting until a substantially uniform distribution of finely divided nonlamellar graphite is effected throughout the metal.

Wrought iron containing nickel. INTERNATIONAL NICKEL CO. Brit. 295,857, Oct. 11, 1927. Wrought iron is prepd. with a C content of not more than 0.08% and Ni 0.25–5.0% and may contain "up to 1% or even 2%" of Cu, Cr and Mo. The presence of Ni 2% increases the tensile strength of the wrought iron 20%. Various details of procedure for prepg. wrought-iron alloys of this character are given.

Iron and steel. H. J. VAN ROYEN. Brit. 295,315, Aug. 9, 1927. Iron or steel suitable for use in the process described in Brit. 285,814 (C. A. 23, 87) is obtained by blowing through the molten metal (suitably under a new slag) a reducing noncarburizing gas which does not increase in volume on oxidation such as a mixt. of CO, CO₂ and N.

Carburizing iron and steel. ROBERT G. GUTHRIE and OSCAR J. WOZASEK (to Peoples Gas By-Products Corp.). U. S. 1,706,356, March 19. Iron or steel while heated and maintained at an elevated temp. in a container or retort is treated with a carbonaceous gas such as "town gas" and at the beginning of this treatment is also treated with a minute quantity of O to form an oxide catalyst so that the rapidity of penetration of the C into the iron or steel during the carburizing is increased.

Heating of steel. VEREINIGTE STAHLWERKE A.-G. Fr. 646,119, Dec. 23, 1927. Carburizing and superficial decarburizing of steel when heated to incandescence is prevented by using an atm. consisting of a mixt. of carburizing gases such as CO or CH₄ with decarburizing gases such as H, blast-furnace gas or N.

Chromium steel. ALEXANDER L. FEILD. Fr. 646,008, Dec. 17, 1927. Stainless steels contg. about 12–18% Cr and little C are made by incorporating ferrochrome contg. a high amt. of C in a Fe bath and C is eliminated by iron ore or scale, Cr also passing into the slag. The Cr is reduced from the slag by the addn. of a noncarbonaceous reducing agent, e. g., Fe-Si, and a base such as lime; it then passes into the bath. The content of Cr may be finally adjusted by the addn. of Fe or ferrochrome. Other alloying elements such as Ni, Cu, Mo or V may be added.

Semi-steel castings. J. ROBINSON. Brit. 296,080, Aug. 25, 1927. A mingled charge of molten cast iron and steel (such as that used for chill rolls and ingot molds) is intimately mixed by the reaction of aluminothermic material (such as 1% of aluminothermic reaction metal together with BaO₂) which is added to the charge.

Alloy. A. GUDZ. Swiss 127,824, Feb. 15, 1927. An alloy contg. Cu, Cr, Ni and Mg is prepd. by melting the metals together with the usual layer of KF, to form an intermediate alloy, in such percentages as to give the desired properties. A small amt.

of Mg is added. Thus, 50% Al, 25% Cu, 12½% Cr and 12½% Ni are melted together and a layer of powd. KF added. About 1% Mg is then added.

Alloys. SIEMENS & HALSKE A.-G. Brit. 295,971, May 21, 1927. Heavy metals such as Ni, Co and Pb or their alloys and Cu-P or Cu-Ni alloys contg. at least 10% Ni (but excluding Fe-Cu, Ag and Cu-Ni alloys contg. less than 10% Ni) are improved by alloying with 0.1-15% of Be. Mg, Sn, Zn, Sb, Al, Cd, C or Si may also be added. Various details of heat treatment of the alloys are given and they may be used for the manuf. of springs, for parts subjected to frictional stresses of elec. app., etc.

Alloys for bearings. ELECTROLYTIC ZINC CO. OF AUSTRALASIA, LTD. Brit. 295,991, Aug. 22, 1927. Alloys are formed of Cu 95-97 and Cd 3-5 parts, with or without addn. of up to 0.5% Mg. Rosin may be used as a flux in making the alloys. Cf. C. A. 23, 88.

Brazing alloy. ROBERT T. GILLETTE (to General Electric Co.). U. S. 1,706,154, March 19. An alloy is formed mainly of Cu and contains also Sn about 8% and Ag 8%. It has a m. p. of about 925°, and is suitable for brazing Cu to cast iron.

Alloy for use in telephone receivers. STANDARD TELEPHONES & CABLES, LTD., and S. T. BUER. Brit. 295,668, May 17, 1927. Pole pieces are formed of an alloy of Ni and Fe, or of Ni, Fe and Cr and are welded to the permanent magnet.

Magnetic alloys. W. S. SMITH, H. J. GARNETT and J. A. HOLDEN. Brit. 295,443, May 13, 1927. Iron alloys are formed contg. not more than 0.05% C and contg. Si 1-10 and Cr 1-10% (the Si content being, preferably, 3-5 times the Cr content). A deoxidizer such as Al may be used.

Magnetic alloys. W. S. SMITH, H. J. GARNETT and J. A. HOLDEN. Brit. 296,137, April 30, 1927. Alloys of high permeability suitable for loading telephone conductors contain Cr 1-10, Al 1-4% and the balance Fe. Mo may be used wholly or partly to replace the Cr and up to 1% of Mn or Si or both may also be added. The alloys may be made from iron contg. 0.04% C and may be heat treated to develop high magnetic permeability as by passing through a tube furnace at a temp. of 900° or may be annealed at 1020°.

Magnetic material. ISAAC F. KINNARD (to General Electric Co.). U. S. 1,706,172, March 19. A magnetic material having a temp. permeability characteristic which approaches unity at about 100° and which increases substantially uniformly with decrease in temp. below about 100° over a wide range of temp. contains Cu 40-20 and Ni 60-80 parts and a small quantity of Fe. U. S. 1,706,171 relates to temp. compensation of magnets such as those of an induction type watt-hour meter.

Aluminum alloys for bearing metals. T. GOLDSCHMIDT A.-G. Brit. 295,265, Feb. 25, 1926. Al is first treated with one or more of the metals Ca, Ba, Sr and Be, and afterward with one or more of the metals Ti, V, Mo, W, Cr, Fe and Mn or with B. Among the other materials which may be present are: Mg, Zn, Cu, Ce, Li silicide, Mg silicide, Si, Co and Ni.

Copper alloys. C. BILLINGTON. Brit. 295,769, May 25, 1927. Alloys of Cu are formed contg. also 7-28% Mn and either 2-9% Al or 2-9% Al and 2-8% Zn, or 3-20% Pb and 2-8% Zn. Up to 1% of Cr, Ni, V, Mo or Fe may also be added.

Alloys of lead with alkaline earth metals. GUILLAUME J. KROLL. U. S. 1,707,059, March 26. Lead is heated at a reacting temp. (not exceeding 1100°) with alk. earth metal carbides such as CaC₂ in the absence of any substance such as would form a protective layer around the carbide impenetrable by Pb.

Tungsten alloys low in tin and arsenic. FREDERICK M. BECKET (to Electro Metallurgical Co.). U. S. 1,706,344, March 19. Ores of W contaminated with Sn and As are reduced and Si is alloyed with the W as it is reduced to produce an alloy contg. at least 10% Si; most of the Si is then oxidized with a metal oxide such as W oxide in which the ratio of the total reducible metals to the total Sn and As is higher than in the ore first reduced.

Alloy screens in internal-combustion engine construction. R. W. BAILEY AND METROPOLITAN-VICKERS ELECTRICAL CO., LTD. Brit. 295,303, May 4, 1927. Screens which may be made of alloys of Ni and Cr or of ferrous metals contg. addns. of Ni, Cr or W, and which may be perforated or slotted, are attached to pistons, valve faces or cylinder walls of internal-combustion engines to reduce the transfer of heat from the combustion chamber. Various structural details are described.

Dissolving difficultly corrodible alloys. THEODOR KIRTL. Ger. 471,281, July 15, 1927. Alloys which normally resist attack by acids and anodic attack, e. g., alloys rich in Sn, Cu, and Sb, are rendered susceptible to attack by alloying them with "light elements," e. g., Na, Ca, P or Si. Waste of such alloys may be thus worked up.

Heat-resistant metal articles. WILLIAM E. RUDER (to General Electric Co.).

U. S. 1,706,130, March 19. Articles such as wires are formed mainly of iron with a surface layer alloyed with Al to form a heat-resisting coating and an interior portion substantially free from Al and contg. a material such as Cr or Ni to prevent penetration of the Al into the interior of the metal when the article is exposed to high temps. Cf. C. A. 22, 1130.

Heat treatment of steel railway rails. EDWARD F. KENNEY (to Bethlehem Steel Co.). U. S. reissue 17,240, March 19. See original pat. No. 1,619,025 (C. A. 21, 1247).

Hardening the heads of steel rails, etc., by water sprays. VEREINIGTE STAHLWERKE A.-G. Brit. 295,986, Aug. 22, 1927. Various mech. features and an app. are described.

Receptacle for holding metal articles during carburizing. WILLIAM J. MERTEN (to Westinghouse Elec. & Mfg. Co.). U. S. 1,705,674, March 19. Structural features.

Apparatus for pickling metal articles. HARRY F. WAHR. U. S. 1,706,718, March 26.

Ornamental effects on metal surfaces. K. BARANOWSKI. Brit. 295,889, Dec. 21, 1927. Metal articles are pickled, placed in an electrolytic bath to produce a granular surface and subjected to the action of a flame directly on removal from the bath or after coating with solns. such as NaOH soln. or with pastes made from salts such as AgNO_3 . A protective coating of enamel or varnish may be applied. The bath used may be formed from iron, brass, Ag or Cu but preferably is a 24° Bé. CuSO_4 soln. A voltage of 1-2 increasing to 10 volts may be used. Preferably, the article is preliminarily coated with Cu, and varnish resist designs may be applied to produce inlaid effects.

Increasing the elastic limit of metal rods, tubes, etc. G. KERÉKGYARTO. Brit. 295,390, Aug. 11, 1927. Various articles, especially those formed of wrought iron, have their elastic limit increased by applying torsional stress to cause permanent set and then removing the stress. The metal may be heated during twisting and further worked after the treatment. Rods, tubes, gun barrels, and shafts or airplanes or automobiles may be subjected to the treatment.

Copper tubing with highly flexible deeply corrugated walls. FRANK L. O. WADSWORTH (to Fulton Sylphon Co.). U. S. 1,706,198, March 19. Relatively deep and narrow corrugations are formed in a thin-walled tube, and the deeply corrugated wall is heated to 230-400° for about 1-5 hrs. in order to develop a high degree of elasticity.

Coating metals. SIMON B. WEINMANN. Ger. 470,118, June 7, 1925. A coating for metals contains aldehydes. A suitable mixt. contains water, polishing material such as siliceous chalk, NH_4OH , olein and aldehyde.

Coating metal bands, wires, etc. SPEZIALFABRIK FÜR ALUMINIUM-SPULEN UND LEITUNGEN G. m. b. H. Fr. 646,374, Dec. 27, 1927. Metal bands, etc., to be coated are passed through an electrolytic pptn. or other bath in a circuitous path over rollers so that the band becomes bent in different directions and the coating becomes elastic. Cf. C. A. 23, 370.

Apparatus for coating tubes, pipes, etc., with zinc by submerging in a zinc bath. GOTTFRIED BUCHERT. U. S. 1,706,348, March 19.

Protecting metals. COMPAGNIE FRANÇAISE POUR L'EXPLOITATION DES PROCÉDÉS THOMSON-HOUSTON. Fr. 645,990, Dec. 21, 1927. Metals are protected against corrosion by covering the surface with a mixt. of powd. Zn and a volatile binder having a basis of cellulose or nitrocellulose such as pyroxylin. An example contains Zn powder 454 g., soln. of pyroxylin 72, C_2H_5 36, AcOAm 18 cc. The mixt. may be projected with a pulverizing pistol De Vilbiss, type D.

Removing rust. I. G. FARBENIND. A.-G. (Carl Immerheiser, inventor). Ger. 471,172, Mar. 2, 1926. The affected objects are treated with sulfonation products of anthracene residues or of crude anthracene, alone or mixed with minor amts. of other org. or mineral acids and (or) with oils or fats.

Deoxidizing copper. SIEMENS & HALSKE A.-G. (Georg Masing, inventor). Ger. 571,209, Nov. 28, 1926. Li is used to deoxidize Cu. It may be added to the Cu before or during smelting, suitably as a Cu-Li or Zn-Li alloy. An addn. of less than 0.2% is sufficient. The deoxidized product has a higher sp. gr. and cond. than Cu.

Cuprous oxide on copper. HANOVIA CHEM. & MANUF. CO. Fr. 646,408, Dec. 27, 1927. Cryst. Cu_2O is obtained on Cu surfaces by placing the Cu in a furnace, reducing the partial pressure of the O and heating to within less than 58° of the f. p., increasing the partial pressure of O until the required thickness of Cu_2O is obtained without formation of CuO . The partial pressure is again reduced and the furnace cooled. As elec. currents pass easily from the Cu_2O to the Cu but not as easily from the Cu to the Cu_2O , the process is of value in the manuf. of elec. rectifiers. Fr. 646,409 describes a process

whereby a good elec. contact is obtained between Cu_2O and Cu by obtaining chemically or electrolytically a fine deposit of Cu or Ni on the Cu_2O .

Separating platinum. ÉTABLISSEMENT MÉTALLURGIQUE DE VIENNE and GEORGES A. L. R. COLLARD. Ger. 471,208, Feb. 11, 1927. The method of sepg. Pt from another noble metal in which the mixt. is fused with PbO and a S compd., the noble metals collecting in the Pb bath so obtained, is modified by adding to the bath at least 1% Cu calcd. on the Pb. The Cu sepg. on the surface carries with it the Pt and a little Au and Ag, while the Pb is free from Pt and rich in Au and Ag. The Pt-stanniferous layer may then be further refined by fusion with Pb free from Cu. The treatment is especially suitable for jewellers' filings, ashes, waste, etc.

Tin. E. A. ASHCROFT. Brit. 295,805, July 7, 1927. In reduction of Sn compounds, a salt which acts as a catalyst (such as ZnCl_2 , FeCl_3 or NH_4Cl) and a collecting metal such as Ni are added during or after the reduction and the mixt. is heated. The Sn and Ni may be recovered electrolytically.

Annealing metal bands. O. BUSSE and MANSFIELD A.-G. FÜR BERGBAU UND HÜTTENBETRIEB. Brit. 296,146, June 11, 1927. An intermediate layer of heat-resisting material such as asbestos is inserted between the bands and the sole of the annealing oven to take up dirt, splinters, etc., which may be attached to the bands.

Annealing metal sheets. AUSTIN LE BOUTILLIER (to Western Electric Co.). U. S. 1,706,725, March 26. Sheets of metal such as Ni-Fe alloy to be annealed are interleaved with metallic plates having an oxide scale to prevent welding of the sheets together during annealing.

Annealing silicon-steel sheets. WILLIAM E. CAUGHERTY and CARL J. STROBLE (to Allegheny Steel Co.). U. S. 1,706,438, March 26. A stack of sheets is built up upon a flat surface within a furnace heated to annealing temp. while ventilating the furnace so that the gases given off by the sheets during annealing are dissipated and their reabsorption is prevented.

Alumino-thermic welding of rails. F. LANGE. Brit. 295,774, May 28, 1927. Mech. features.

Electric arc welding. MICHAEL ZACK. U. S. 1,707,036, March 26. A system of operation is described in which electrodes are used, one of which is formed of carbon and another of metal.

Arc-welding electrodes. B. TURNER and FERRO-ARC WELDING CO., LTD. Brit. 295,514, Aug. 26, 1927. An insulating material of higher m. p. than the outside coating (which may be of blue asbestos yarn) is inserted between the individual wires of a twin electrode for use with a. c. to avoid unequal melting of the electrode metal. White asbestos may be used and may be treated with fluxes such as lime, china clay, Na silicate or Na_2CO_3 . Cf. C. A. 22, 4456.

Welding rails by the thermo-aluminic process. J. WATTMAN. Brit. 295,459, May 28, 1927. Mech. features.

10—ORGANIC CHEMISTRY

CHAS A. ROUILLER and CLARENCE J. WEST

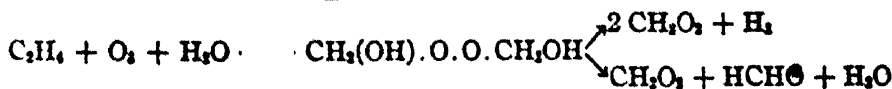
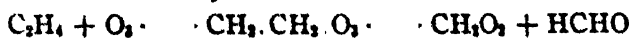
Structure of aliphatic hydrocarbons. F. M. SHERMYAKIN. *J. Russ. Phys.-Chem. Soc., Chem. Pt.* 60, 871-83(1928).—Baeyer's strain theory remains in force in the case of C rings contg. 5 members or less, as their atoms cannot be so arranged as to avoid strain. In the case of all other rings, the C atoms can be spatially arranged in several different ways which represent a consecutive series of configurations. The sizes and the angles of the centric configurations of C_6H_6 and C_6H_{12} have been calculated by the method of Ingold and Short, and the results, which have been verified experimentally, show that, for C_6H_6 , the configuration assigned by Henri (cf. C. A. 20, 329) is the most stable one, whereas for C_6H_{12} , C_7H_{14} and C_8H_{16} the most stable configuration is octahedric and for C_7H_{12} and C_8H_8 (with sym. disposed double links) the most stable configuration is the hexahedric one.

BERNARD NELSON

The action of sulfuric acid on olefins, etc. W. R. ORMANDY and E. C. CRAVEN. *J. Soc. Chem. Ind.* 47, 317-20T(1928).—It was shown in an earlier paper (C. A. 22, 2919) that paraffins are formed by the interaction of H_2SO_4 and olefins or alic. contg. 3 or more C atoms. This paper is another contribution on the mechanism of these reactions. From open-chain olefins ($\text{MeHC}:\text{CH}_2$, butylenes and amylenes) and an excess of 98% H_2SO_4 at a temp. below 25° were obtained large amts. of open-chain paraffins, which sepd. from the mixt., and "acid wash oils," which remained in the

acid soln., but after diln. could be extd. with pentane. No alcs. were formed from the higher olefins beginning with C_4 . The mean phys. properties of the paraffins, which were colorless, pleasant smelling, mobile oils of a very complex nature, were: $d_{20} 0.76$, $n_D^{20} 1.43$, $r_L 0.34$, b. $100-350^\circ$, mean mol. wt. 200, mean analysis C = 85%, H = 15%. They did not react with Na at 150° and absorbed only traces of Br. The acid wash oils had a high n and absorbed large quantities of Br; they resembled much the wash oils obtained from alcs. In the case of $MeHC:CH_2$, at least 3 mols. were absorbed by 1 mol. H_2SO_4 , before formation of paraffins occurred. Large amts. of open-chain paraffins were obtained by allowing H_2SO_4 to interact with olefins of higher mol. wt. A mixt. of amylene and PhH reacting with H_2SO_4 yielded phenylated paraffins of unknown constitution, while $MeHC:CH_2$ interacting with $PhSO_3H$ and H_2SO_4 gave only a small quantity of satd. hydrocarbons, the main product being an alkylbenzenesulfonic acid. The reaction of cyclic olefins with H_2SO_4 yielded paraffins of probably polycyclic character. Cyclohexane gave 45.6% sepd. oils, $d_{20} 0.8895$, $n_D^{20} 1.4815$, $r_L 0.3200$. From pinene were obtained 7.5% sepd. oils, $d_{20} 0.9238$, $n_D^{20} 1.4969$, $r_L 0.3166$. From open-chain alcs. ($PrOH$, Me_2CHOH , $BuOH$, Me_2CHCH_2OH), large amts. of paraffins were obtained, whose mean properties were: $d_{20} 0.73-6$, $n_D^{20} 1.41-3$, $r_L 0.33-4$, b. $80-350^\circ$, mol. wt. 170-200, C = 84.8%, H = 15.2%. The Br absorption was very low. The constitution of the acid wash oils could not be ascertained as yet. Me_2CHOH yielded wash oils of probably triolefinic character with the following properties: $d_{20} 0.9025$, $n_D^{20} 1.5$, mol. wt. 260, Br absorption 184%, C = 81.4%, H = 12.7%, S = 3.1%, O = 2.8%. Cetyl alc. yielded paraffin wax, m. 50° . The hydrocarbons obtained from cyclohexanol, and *o*-, *m*- and *p*-methylcyclohexanol were colorless, viscous, of high b. p. and of cyclic and dicyclic character. From mixts. of 2 different alcs. or an alc. and PhH, no condensed paraffins were produced. By bringing Me_2CHOH or $AmOH$ in contact with $PhSO_3H$ small amts. of open-chain paraffins were obtained. No other compds. than olefins and alcs. were found to give paraffins with H_2SO_4 . In the reaction with acetic esters, the formation of paraffins had been noted; however, it was discovered that this reaction was a coupled reaction, the formation of paraffins depending on the amt. of alcs. set free by hydrolysis. G. S.

Ozonization of unsaturated gaseous hydrocarbons. I. Ozonization of ethylene. II. Ozonization of propylene and a gas obtained by cracking. E. BRINER AND P. SCHNORF. *Helv. Chim. Acta* 12, 154-81, 181-6(1929).—An app. is described and illustrated for the prepn. and purification of O_3 , and the measurement of the quantities used in the reaction; it permits a mixing of the O_3 with the gas to be oxidized. The stable products of ozonization of C_2H_2 are $HCHO$ and HCO_2H which result from the decompn. of the ozonides formed by the addn. of 1 mol. O_3 to 1 mol. C_2H_2 :



By the action of H_2O the ozonide is converted into formaldehyde peroxide, which is identical with dihydroxymethyl peroxide (cf. C. A. 17, 2558). In the presence of H_2O and under the most favorable conditions 90% of the O_3 and 75% of the C_2H_2 reacted. The decompn. of the reaction products can be so conducted that the formation of aldehyde is increased at the expense of the formation of acid. The ozonization of C_2H_2 is similar to that of C_2H_4 ; the stable products are $HCHO$, AcH , HCO_2H and $AcOH$, which are formed by interaction of H_2O and the ozonide of C_2H_2 . A gas obtained by cracking, contg. about 15% C_2H_2 , 12% C_2H_4 and 8% C_2H_6 was ozonized; when a slight excess of the unsatd. gas was used the yields were 79% on consumption of O_3 and 59% on C_2H_2 ; with excess O_3 the yields were 55 and 68%, resp. N. A. L.

The reaction between β -pentenyl bromide and ethylmagnesium bromide. CHARLES PRÉVOST. *Compt. rend.* 187, 946-8(1928).— $EtMgBr$ and $EtCH:CHCH_2Br$ give $EtCH:CHPr$, b. 94° , $d^{20} 0.701$, $n_D^{20} 1.4017$, whose oxidation with $KMnO_4$ yields exclusively $EtCO_2H$ and $PrCO_2H$, in equimol. proportion, and $Et_2CHCH:CH_2$, b. 85° , $d^{20} 0.6948$, $n_D^{20} 1.3906$, whose oxidation gives Et_2CHCO_2H and whose bromination gives a dibromide b. 93.5° , $d^{20} 1.5251$, $n_D^{20} 1.5006$. These results confirm the existence of a β -pentenyl ion. The dibromide treated with KOH in alc. yields an acetylenic hydrocarbon b. 87° , $d^{20} 0.7272$, $n_D^{20} 1.4023$. It gives a ppt. with aq. or ammoniacal $AgNO_3$, which is sol. in H_2O , $EtOH$ or an excess of the hydrocarbon. A. L. H.

Methylene bromide. W. W. HARTMAN AND E. E. DREGER. *Org. Syntheses* 9,

56-7(1929).—Reduction of 540 g. com. CHBr_3 (88%) by Na_3AsO_3 (prepd. from 230 g. As_2O_3 and 445 g. NaOH) gives 88-90% of CH_3Br . C. J. WEST

Pentamethylene bromide. J. VON BRAUN. *Org. Syntheses* 9, 70-1(1929).—Benzoylpiperidine (80 g.), treated with cooling with 115 g. PBr_3 and then with 65 g. Br , gives a mixt. of $(\text{CH}_2)_5\text{Br}_2$, PhCN and POBr_3 ; the latter is hydrolyzed by H_2O and the PhCN is hydrolyzed by 40% HBr ; the yield of $(\text{CH}_2)_5\text{Br}_2$ is 65-72%. C. J. WEST

Methanol from hydrogen and carbon monoxide. II. Dimethyl ether. RALPH L. BROWN AND A. E. GALLOWAY. Pittsburgh Expt. Sta. *Ind. Eng. Chem.* 21, 310-3 (1929); cf. C. A. 22, 4104.—The production of Me_2O (I) as a side reaction of the synthesis of MeOH (II) over ZnCrO_4 at 300-400° and 180 atm. has been studied. The formation of I is slow and increases with temp. to 5.2% at 397°, while II reaches a max. of about 30% at 375° and then falls off. High space velocity favors the formation of II. A. S. CARTER

Butyl *p*-toluenesulfonate. A. T. ROOS, HENRY GILMAN AND N. J. BEABER. *Org. Syntheses* 9, 28-30(1929).—A mixt. of 148 g. BuOH and 210 g. $p\text{-MeC}_6\text{H}_4\text{SO}_2\text{Cl}$ is treated with 320 cc. 5 *N* NaOH at such a rate that the temp. does not exceed 15° (3-4 hrs.); another portion of 210 g. $p\text{-MeC}_6\text{H}_4\text{SO}_2\text{Cl}$ is added and then 320 cc. 5 *N* NaOH as before; extn. with petr. ether (b. 60-70°) or C_6H_6 gives 50-4% of $p\text{-MeC}_6\text{H}_4\text{SO}_2\text{OBU}$, b_{10} 170-1°. The ester should be distd. in small lots. The Me ester may be prepd. in a somewhat similar manner in 90% yields. C. J. WEST

Chloromethyl ether. C. S. MARVEL AND P. K. PORTER. *Org. Syntheses* 9, 58-9 (1929).—A mixt. of 350 g. MeOH and 900 g. tech. formalin (contg. 252 g. HCHO) is treated with a rapid stream of HCl for 4-5 hrs., giving 86-9% of ClCH_2OMe . C. J. WEST

Remark on the joint communication with Gustav Rutz: Method for the preparation of nitro- and chloronitroolefins. ERICH SCHMIDT. *Ber.* 61B, 2613(1928); cf. C. A. 23, 372.—The observation that substitution of Cl for H in the system $\text{C}:\text{CHNO}_2$ results in a depression of the refractive exaltation of the system is in agreement with similar observations by v. Auwers on conjugated systems derived from a pure C chain or an at. grouping $\text{C}:\text{CHC}:\text{O}$. C. A. R.

Influence of poles and polar linkings on tautomerism in the simple three-carbon system. I. Experiments illustrating prototropy and anionotropy in trialkylpropenylammonium derivatives. CHRISTOPHER K. INGOLD AND EUGENE ROTHSTEIN. Univ. of Leeds. *J. Chem. Soc.* 1929, 8-14.— $\text{ClCH}:\text{CHCH}_2\text{Cl}$ and Et_2NH give 75% of diethyl- γ -chloroallylamine, b_{10} 55°; HCl salt, m. 221°; picrate, m. 78°. EtI gives triethyl- γ -chloroallylammonium iodide (I), m. 210°; chloride (II), hygroscopic; picrate, m. 125°. The same salts were prepd. from $\text{ClCH}:\text{CHCH}_2\text{Cl}$ and Et_3N in EtOH . Trimethyl- γ -chloroallylammonium chloride (III), m. 63°; picrate, m. 141°. Warming I or II with EtONa gives the $\alpha\text{-EtO}$ deriv. (IV), whose picrate, m. 122-3°; the corresponding tri- Me deriv. (V), m. 111-2°. Warming the chloride of IV with concd. HCl gives triethyl- α -hydroxyammonium chloride, viscous liquid; picrate, m. 145°; chloroplatinate, orange. Similarly V gives an $\alpha\text{-HO}$ deriv., whose picrate m. 149°. $\text{Et}_2(\text{ClCH}:\text{CHCH}_2)\text{N}$ and O_3 give HCl , CO and a base, which may be $\text{Et}_2\text{NCH}_2\text{CHO}$. $\text{Me}_3(\text{ClCH}:\text{CHCH}_2)\text{NCl}$ and O_3 give HCl , CO and betaine. $\text{Me}_3(\text{EtOCH}:\text{CHCH}_2)\text{NOAc}$ and O_3 give HCHO and trimethylethoxyaldehydomethylammonium salts; the picrate m. 168°. Warming the latter with concd. HCl gives the corresponding HIO deriv., whose picrate, m. 182-4°. $\text{Me}_3(\text{HOCH}:\text{CHCH}_2)\text{NOAc}$ and O_3 give the same products as the EtO deriv. Triethyl- α -ethoxyallylammonium picrate, m. 110-1°; the corresponding HO deriv., m. 195-6°. These reactions indicate not only prototropic, but also anionotropic mobility in 3-C systems terminated by 1 NH_4 salt group only. C. J. WEST

Tertiary phosphines containing the butyl radical. WALTER C. DAVIES AND WM. JACOB JONES. Univ. College, Cardiff. *J. Chem. Soc.* 1929, 33-5.— BuMgBr (from 42 cc. BuBr) and 9 g. PCl_3 at 0° give 11 g. tributylphosphine, b_{10} 149.5°, d_4^{20} 0.8118; CS_2 addn. product, deep red, completely dissociated in hot Et_2O or EtOH ; HgCl_2 complex, plastic mass. Methyltributylphosphonium iodide, m. 133.5°; Et deriv., m. 153°. Using POCl_3 , there results tributylphosphine oxide, b. 300°, very hygroscopic needles; the oxide also results from the Bu_3P by boiling in a current of air and by oxidizing with warm 40% HNO_3 . Phenyltributylphosphine, in 16 g. yield from 19 cc. PhPCl_2 , b_{10} 184.5-5.5°, d_4^{20} 0.9115; HgCl_2 compd., m. 160.5°; phenylmethyltributylphosphonium iodide, m. 168°; Et deriv., m. 147°. *p*-Tolyltributylphosphine, in 15 g. yield from 20 cc. $p\text{-MeC}_6\text{H}_4\text{PCl}_2$, b_{10} 197°, d_4^{20} 0.9076; HgCl_2 addn. compd., m. 112°; *p*-tolylmethyltributylphosphonium iodide, m. 130.5°. C. J. WEST

Structure and activation of aliphatic aldehyde molecules. I. Analysis of the spectrum of formaldehyde vapor. SVEND AAGE SCHOU. *J. chim. phys.* 25, 665-721 (1928); cf. *C. A.* 22, 1907, 2325.—A review of the theoretical study of absorption spectra is given as a background to the consideration of the mechanics of the polyatomic system of CH_2O . Depolymerization of trioxymethylene furnished pure CH_2O for observation. In a concn. of 60 mg. per l., 35 bands were found between 3700 and 2500 A. U., with a max. at 2935 A. U. (F band). AcH and EtCHO gave max. absorption at 2940 and 2900 A. U., resp. An extensive mathematical analysis of the spectrum has been made. Rotational states of the mol. were evaluated from series of lines resolved from the bands. Rotational consts. were calcd. and comprehensive tables of observations and calcns. show a good agreement between the data and theory for the double rotation of the mol. The moments of inertia for both normal and activated mols. were detd. and thus the distance between H atoms were calcd. from the moments about the sym. axes through the CO linkages.

A. S. CARTER

α -Bromo- and hydroxyaldehydes. II. Bromination of valeraldehyde. RUDOLF DWORZAK AND ANTON ENENKEL. *Univ. Wien. Monatsh.* 50, 449-58 (1928); cf. *C. A.* 21, 3608.—The starting material was a fermentation AmOH from molasses, b. 128-131.3°, with $[\alpha]_D -2.47^\circ$, or contg. about 42% of $\text{EtMeCHCH}_2\text{OH}$; the aldehyde from this mixt. b. 90-2° and had $[\alpha]_D 0.35^\circ$; the paraldehyde obtained by the action of H_2SO_4 b.₁₀ 122-4° and had $[\alpha]_D 0.04^\circ$. Bromination of the paraldehyde with 4 mols. Br at -5° to -10° and treatment with abs. EtOH gives a mixt. of *monobromovaleraldehyde acetal* (I), b.₁₀ 83°, $d_{18}^{18} 1.29$, $[\alpha]_D 0.12^\circ$, and the *di-Br deriv.*, b.₁₀ 121°, $d_{18}^{18} 1.37$. Boiling I with 5 parts H_2O for 1 hr. gives α -hydroxyvaleraldehyde, b. 120°, which reduces Fehling soln. on warming. III. Preparation of crystalline lactaldehyde and its behavior toward dilute aqueous alkalis. R. DWORZAK AND WILHELM PRODINGER. *Ibid* 459-75.—Detailed directions are given for the sapon. of $\text{MeCHBrCH}(\text{OEt})_2$ and the extn. and distn. of the lactaldehyde (I) formed, 35.4% of I being obtained cryst. Mol. wt. detns. in H_2O indicate the presence of the dimol. form at first, but the monomol. form after 24 hrs. One g. CuO corresponds to 0.4882 g. I. Cryst. I gives the same derivs. as the previously studied liquid form. While I is stable toward air, it is easily oxidized in the presence of alkali. I in 1% NaOH, after 8 days' standing, reduced Fehling soln. only slightly, but considerable Cu_2O sepd. on heating. Four % NaOH after 5 days gave a yellowish brown sirup, corresponding to the compd. $3\text{C}_3\text{H}_4\text{O}_2 \cdot 1 \text{H}_2\text{O}$ (mol. wt. and analyses); this reduces Fehling soln., especially on boiling. Oxidation of I with $\text{Cu}(\text{OAc})_2$ gives AcCHO .

C. J. WEST

Atmospheric oxidation of esters of β -eleostearic acid with monohydric alcohols. A. B. MILLER AND K. L. ROHRBACH. *Ind. Eng. Chem.* 21, 338-42 (1929).—The following esters of β -eleostearic acid were prepd. by esterification of β -eleostearic acid (I), m. 45° (prepd. from American tung oil), and the corresponding alc. with dry HCl as condensing agent: *Me*; *Pr*, light yellow oil, $n_D^{25} 1.4982$; *iso-Pr*, dark oil, $n_D^{25} 1.4940$; *Bu*, dark oil, $n_D^{25} 1.4947$; *benzyl*, dark oil, $n_D^{25} 1.5312$. These esters oxidize rapidly (cf. *C. A.* 22, 943) and completely similarly to the esters of polyhydric alcs. but without drying; splitting forms simpler acids having a tendency to add to the ester mol.; hydrolysis with the formation of I occurs to a limited extent. Associates of several mols. of oxidized ester are usually dissolved in a dispersion of simple oxidized mols.; the acid set free from oxidized esters are mostly di- and polybasic. There is little neutral and no acid hydrolysis and since these esters form abundant strong acids on oxidation, hydrolysis is inhibited in an acid medium. The consts. of the end products vary with the no. of C atoms in the straight-chain alc. esters and are regularly higher or lower in the case of isopropyl and benzyl ester; this is attributed to the relative tendency of the esters to hydrolyze on oxidation, producing I. The *Me* ester oxidized in the presence of I gels, the acid forming an addn. product with the ester (stearic acid does not combine under these conditions). These results confirm the hypothesis that an important function of the alc. group in the esters of I is the stability imparted to the ester, thus detg. the tendency to split off I, which, because of addn. and aggregation of the long C chains, actively influences gel formation.

N. A. LANGE

Cyanoacetamide. B. B. CORSON, R. W. SCOTT AND C. E. VOSE. *Org. Syntheses* 9, 36-7 (1929).— $\text{NCCH}_2\text{CO}_2\text{Et}$ (400 g.), poured into 300 cc. concd. NH_4OH and the mixt. allowed to stand 1 hr., gives 86-8% of $\text{NCCH}_2\text{CONH}_2$, m. 119-20°. Gaseous NH_3 was tried with poor success. The following soly. data are given (g. in 100 cc. 95% EtOH): 0°, 1.3; 12°, 1.7; 26°, 3.1; 38°, 5.0; 44°, 7.0; 52°, 9.5; 62°, 14.0; 66°, 16.3; 69°, 18.7; 71°, 21.5.

C. J. WEST

Butyryl chloride. B. HELFERICH AND W. SCHAEFER. *Org. Syntheses* 9, 32-3

(1929).— SOCl_2 (56 g.), warmed on the H_2O bath and treated with 35.2 g. PrCO_2H , gives 85% of PrCOCl , b. $100-1^\circ$. C. J. WEST

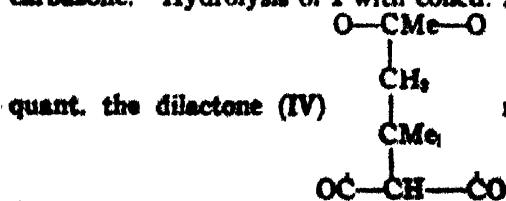
A modified Curtius degradation. II. C. NÄGGLI. *Helv. Chim. Acta* 12, 205-7 (1929).—Polemical. Answer to Lindemann's criticism (cf. C. A. 23, 827) of the term "modified Curtius degradation" (cf. C. A. 23, 113). N. A. LANGE

Symmetrical ethers of the alcohols, $\text{XCH}_2\text{CH}(\text{OH})\text{CH}_2\text{X}$ and $\text{XCH}_2\text{CH}(\text{OH})\text{CH}_2\text{OR}$. L. BLANCHARD. Faculty of Sciences of Angers. *Bull. soc. chim.* 45, 1194-1204 (1928).—Treating $\text{ClCH}_2\text{CH}(\text{OH})\text{CH}_2\text{Cl}$ (I) with SO_2Cl_2 gave 65% of the *dichlorohydrin chlorosulfonate*, $b_{11} 113-4^\circ$, $d_{20} 1.592$, $n_D^{20} 1.48325$. Distg. the chlorosulfonate at 160° produced $\text{CH}_2\text{ClCHClCH}_2\text{Cl}$, b. $154-6^\circ$. One mole SO_2Cl_2 to 4 or 5 moles of I gave the *dichlorohydrin ether*, $[(\text{CH}_2\text{Cl})_2\text{CH}]_2\text{O}$, $b_{11} 141-2^\circ$. From the alk. wash water there was obtained $\text{SO}_2(\text{ONa})\text{OCH}(\text{CH}_2\text{Cl})_2$. $\text{SO}_2(\text{OH})\text{Cl}$ and I liberated HCl and gave $\text{SO}_2(\text{OH})\text{OCH}:(\text{CH}_2\text{Cl})_2$. By substituting $\text{ClCH}_2\text{CH}(\text{OH})\text{CH}_2\text{Br}$ for I in the above reaction the chlorobromohydrin chlorosulfonate was not prepd. but dichloro-1,2-bromopropane, $b_{17} 74-5^\circ$. SO_2Cl_2 and $\text{ClCH}_2\text{CH}(\text{OH})\text{CH}_2\text{Br}$ (1:5) gave 85% of the *chlorobromohydrin ether*, $b_{28} 175-7^\circ$, and a residue of $\text{SO}_2(\text{ONa})\text{OCH}(\text{CH}_2)_2\text{BrCl}$. SO_2Cl_2 and dibromohydrin and chloriodohydrin gave no products that could be identified. B. was unsuccessful in obtaining derivs. of chloromethylin, chloroethylin and chloroamylin with SO_2Cl_2 . R. C. ROBERTS

Partial esterification of polyhydric alcohols. VII. The unreliability of proofs of the structure of disubstituted glycerols. ARTHUR FAIRBOURNE AND GEOFFREY WILSON COWDREY. King's College, London. *J. Chem. Soc.* 1929, 129-35; cf. C. A. 21, 1096.—Previous work has shown that the alleged structures of " β "-monoglycerides were untrustworthy; several " α,β "-disubstituted glycerols have now been prepd and found identical with their " α,γ "-isomers. " α,β "-Diphthalimidohydroxypropane, prepd. by the methods of Philippi and Seka (C. A. 18, 72) and of Gabriel (*Ber* 22, 224 (1889)), m. 204° and are identical; their *mono-Ac* derivs. have also been independently prepd. and found identical, as have the *Bz* derivs.; the former m. 194° , the latter, $194-5^\circ$. On the other hand, different dibromohydrin *p*-nitrobenzoates have been obtained (C. A. 21, 1090). *Allyl palmitate* was not obtained pure; the impure product m. $20-5^\circ$. α,β -Dibromohydrin palmitate, m. 34° ; α,γ -dibromohydrin palmitate, m. 35.5° ; neither reacts with K phthalimide. Either isomer, with $p\text{-O}_2\text{NC}_6\text{H}_4\text{CO}_2\text{Ag}$, gives the same *monopalmitin di-p-nitrobenzoate*, m. 102° . α,γ -Dichlorohydrin triphenylmethyl ether, m. $108-9^\circ$. When direct rotatory evidence is not available, and until the matter is better understood, it would seem reasonable, therefore, (a) when a disubstituted glycerol exists as 2 isomers, to assume, in the absence of proof to the contrary, that these have the structures of their respective parent substances or derivs., and (b) in all other cases, to appreciate that conversion may have occurred.

C. J. WEST

Keto-lactol tautomerism. I. Ring-chain tautomerism in α -carboxy- γ -acetyl- β,β -dimethylbutyric acid and a synthesis of γ -acetyl- β,β -dimethylbutyric acid. MUHAMMAD QUDRAT-I-KHUDA. Imp. College Sci. Tech., London. *J. Chem. Soc.* 1929, 201-9.—Evidence of the existence of the keto-lactol type of tautomerism in some δ -ketonic acids is presented; effect of alteration of the C tetrahedral angle, due to the presence of different substituents, on the tautomeric character of the various acids is also examd. Na (2.3 g.), 500 cc. abs. EtOH, 84 g. $\text{NCCH}_2\text{CONH}_2$ and 108 g. $\text{Me}_2\text{C}:\text{CHAc}$ give nearly quant. 6-hydroxy-2-keto-3-cyano-4,4,6-trimethylpiperidin (I), m. 272° (decompn.). I does not lose NH_3 on treatment with dil. NaOH, does not react with NaNO_2 in cold AcOH and on heating with POCl_3 for 2 hrs. gives 2 keto-3-cyano-4,4,6-trimethyl-2,3,4,5-tetrahydropyridine (II), m. 253° . $\text{NCCHNaCO}_2\text{Et}$ and $\text{Me}_2\text{C}:\text{CHAc}$ in EtOH, heated 4 hrs., give 70% of *Et* α -cyano- γ -acetyl- β,β -dimethylbutyrate (III), $b_{11} 160^\circ$, $d_4^{20} 1.03705$, $n_D^{20} 1.44652$, $[R_L]_D 54.39$ (calcd. 54.43), semicarbazone, m. 168.5° . Shaking with NH_4OH (d. 0.880) for 48 hrs. gives 6-amino-6-hydroxy- α -cyano- β,β -dimethylhexoamide, crystg. with 3 mols. H_2O , decomp. in the steam oven and loses NH_3 when heated with H_2O at 100° ; it does not give a semicarbazone. Hydrolysis of I with concd. HCl by heating 4 hrs. on the H_2O bath gives



quant. the dilactone (IV)

m. 137° (cf. Vorländer and Gärtner, *Ann.*

304, 17 (1898)), also obtained by the hydrolysis of II or III by concd. HCl ; IV slowly

decomps. at 200° with the loss of CO₂ and the production of the unsatd. lactone, Me₂CCH:CMc. O. CO. CH₂(V). Hydrolysis of I with concd. KOH (heating about

28 hrs.) gives α -carboxy- γ -acetyl- β , β -dimethylbutyric acid, m. 95°; semicarbazone, m. 177°; Et ester, b₁₅ 153°, d₄^{20.2} 1.03921, n_D^{20.2} 1.4413, [R_L]_D 65.59 (calcd. 65.55) (semicarbazone, m. 76°); oxidation of the acid with NaOBr gives α -carboxy- β , β -dimethylglutaric acid, m. 173°; heating the acid 5 hrs. at 130–40° gives 25% of IV and 72% of HO₂CCH₂CMc₂CH₂Ac (VI), b₁₆ 162°, d₄^{19.5} 1.03646, n_D^{19.5} 1.44652, [R_L]_D 40.6 (calcd. 40.69); Ag salt; semicarbazone, m. 172° (decompn.); Et ester (VII), b₁₇ 112°, d₄^{19.8} 0.96248, n_D^{19.8} 1.43047, [R_L]_D 49.97 (calcd. 50.05) (semicarbazone, m. 114°). This behavior of the acid suggests that the parent acid is a mixt. of the 2 forms AcCH₂CMc₂CH(CO₂H)₂ and Me₂C. CH₂. C(OH)Me. O. CO(CO₂H)CH₂, approx. in the ratio

of 3:1. β , β -Dimethylglutaric anhydride, heated with twice the calcd. quantity of abs. EtOH for 3–4 hrs., gives Et H β , β -dimethylglutarate, b₁₆ 164°, d₄^{18.1} 1.05574, n_D^{18.1} 1.4403, [R_L]_D 46.97 (calcd., 46.95); Ag salt; the chloride, b₁₄ 117°, with ZnMeI gives VII. The action of AcCl on VI gives V, b₁₆ 82°, d₄^{22.2} 0.98658, n_D^{22.2} 1.45573, [R_L]_D 38.55 (calcd. 38.13). VI, reduced with Na and boiling EtOH, gives β , β , δ -trimethylvalerolactone, b₁₈ 120°, d₄¹⁷ 0.98039, n_D¹⁷ 1.44743, [R_L]_D 38.73 (calcd. 38.70).

C. J. WEST

dl-Alanine. E. C. KENDALL AND B. F. MCKENZIE. *Org. Syntheses* 9, 4–7(1929).—Detailed directions are given for the prepn. of MeCH(NH₂)CO₂H, starting with AcH, NH₄Cl and NaCN, the resulting nitrile being hydrolyzed with concd. HCl; the alanine-HCl is extd. with 95% EtOH and the HCl removed by Pb(OH)₂ followed by Ag₂O. Yield, 52–60%.

C. J. WEST

Levulinic acid. B. F. MCKENZIE. *Org. Syntheses* 9, 50–1(1929).—Cane sugar (500 g.), heated with 250 cc. concd. HCl on the H₂O bath for 24 hrs., and the solid product extd. with Et₂O for 6–8 hrs., gives 22–3% of AcCH₂CH₂CO₂H, b₁₈ 137–9°, m. 30°. Starch may also be used.

C. J. WEST

The technical importance of adipic acid and its derivatives. WALTHER SCHRAUTH. *Chem.-Ztg.* 53, 41–3(1929).—Adipic acid has not been able to compete with other dibasic acids heretofore, but with the recent introduction of special methods of prepn. a product is now obtainable that can be used in baking powders, fruit essences, soft drinks, and hygienic and medicinal preparations in competition with tartaric and other acids. This is of importance as Germany now gets its tartaric acid raw materials from foreign countries. Advantages claimed for baking powders made from adipic acid, in comparison with tartaric acid, etc., are greater CO₂ formation per unit wt., stability of the baking powder itself, more gradual evolution of CO₂, better taste, lower cost, etc. Disadvantages include low soly. in H₂O (1.4 parts in 100 of H₂O at 15°); this is in part offset by its great soly. in hot H₂O, e. g., 180 parts of acid per 100 of H₂O at 100°. For this reason β -methyladipic acid is better to use in soft drinks, as its soly. is much greater. As raw material for making adipic acid *p*-methylcyclohexanol is most important, but the hydrogenated products of certain crude cresols can be used also, although mixts. of lower mol. wt. then result; since these can be employed as such in the leather industry, textiles, dyeing, etc., it really makes little difference technically. Derivatives of adipic and methyladipic acid, such as their esters, are also important, as in the celluloid, artificial leather, lacquer and photographic-film industries, synthetic fats and waxes, perfumes and analytical chemistry.

W. C. EBAUGH

Some transformations of propine- α , γ -dicarboxylic acid. FR. MAKULEC, R. MALACHOWSKI AND L. MANITIUS. *Roczniki Chem.* 8, 576–82; French 582(1928).—The propine- α , γ -dicarboxylic acid (glutinic acid) (I) could not be transformed into the cyclic anhydride (II); the dehydration by Ac₂O gave 4-acetyl-4,6-dihydroxy- α -pyrone (III). Di-Me glutinate, obtained by the action of CH₃N₃ on glutinic acid, b₅ 101.0–1.5°, d₄²⁰ 1.1657, n_D²⁰ 1.48779, has a pungent odor, gives a red color with NaOH and KOH. The *cis*- β -bromoglutaconic acid, C₅H₆O₄Br (IV), from I and 65% HBr, m. 143–4°, sol. in H₂O and alc. The β -bromoglutaconic anhydride, C₅H₄O₄Br (V), from IV and Ac₂O, m. 148–9°. The *cis*- β , γ -dibromoglutaconic acid, C₅H₄O₄Br₂ (VII), from I and Br in AcOH crystals from 35% HBr in needles, m. 132°, sol. in H₂O, alc., ether; its Ag salt is insol. in H₂O. The *cis*- α , β , γ -tribromoglutaconic acid, obtained by the further action of Br on VII, m. 151°. The β , γ -dibromoglutaconic acid anhydride, C₅H₂O₄Br₂ (VI), m. 93–96°, sol. in C₆H₆, CHCl₃, slightly sol. in ether.

JAROSLAV KUČERA

Replacement by chlorine of the hydroxyl group in esters of hydroxy acids by

means of phosphorus oxychloride and pyridine (steric course of the substitution). THEODOR WAGNER-JAUREGG. Technische Hochschule, Zurich. *Helv. Chim. Acta* 12, 61-3(1929).— POCl_3 can be used to replace OH by Cl in HO acids, provided pyridine is present. In its absence, dehydration often occurs. The chlorination is often accompanied by a reversal in polarity of the optically active acids. *d*-Chlorosuccinic ester is prepd. by treating 12.2 g. of *l*-malic acid ($\alpha_D^{16.6} -4.62^\circ$) and 11.9 g. pyridine with 11.5 g. of cold POCl_3 , allowing to stand for 1 hr. in a freezing mixt. After 12 hrs. standing at room temp., the mass is decompd. with H_2O and extd. with CHCl_3 . The ext. is washed with H_2O , dried with Na_2SO_4 and distd. It b_{10-1} 110-1° (yield 4.8 g.). After refractionation it b_{10-1} 106-7° (uncor.), $\alpha_D^{20} +36.6^\circ$. *Me phenylchloroacetate*: 7.4 g. of *d*-mandelic acid, α_D^{18} (CS_2) 172 (pure acid: 214°) + 7.1 g. pyridine + 6.8 g. POCl_3 yielded 4.2 g. b_{12-20} 133-40°. After refractionation it b_{12-20} 130-1 (cor.) $\alpha_D^{18} -62.2^\circ$ (calcd. for optically pure product -77.4°). *dl*-Isomer: 12.5 g. *dl*-mandelic acid + 12 g. pyridine + 11.5 g. POCl_3 gave 6.8 g. of *dl*-product; b_{12-18} 129-30° (cor.).

G. CALINGAERT

Modern tartaric acid industry. KARL DOPP. *Deutsche Essigind.* 33, 35 (1929).—A presentation mainly of statistical data covering the production of tartaric acid in European countries.

W. O. F.

Alkyl derivatives of octacyanotungstic acid. FRANZ HÖLZL. *Monatsh.* 51, 1 22 (1929); cf. *C. A.* 22, 3137; 23, 820 —H has prepd. intermediate products of the hydrolysis of isonitriles. Several Ag salts of $\text{H}_4\text{W}(\text{CN})_8$ with MeI yield simple and condensed alkyl derivs. which are shown to contain isonitrile groups. These add water or ale to form half-hydrolysis products of isonitrile, contg. the acid group $\text{HO}-\text{C}-\text{NHMe}$. Further hydrolysis yields acid and amines; NaOH and MeI give carbamines; analyses and structures of about 10 compds. are given. A typical simple formula is $\text{W}(\text{CN})_6(\text{CNMe})_2(\text{HO}-\text{C}-\text{NHMe})_2$.

VALENTINE F. HARRINGTON

Selenocyanopropionic acid. I. ARNE FREDGA. Univ. Upsala. *J. prakt. Chem.* 121, 56-69(1929).— $\text{MeCH}_2\text{BrCO}_2\text{K}$ and KSeCN in a little H_2O give 50-60% of the *K* salt, thin needles, hygroscopic, of $\text{MeCH}_2(\text{SeCN})\text{CO}_2\text{H}$ (I), m. 69-70° (Simon, *Monatsh.* 26, 959(1905), reports the acid as not m. at -15°); I decomp. in the air after several weeks, giving diselenodilactylic acid (II). The elec. cond. of the acid is reported at 25°. The strychnine salt of I yields a free acid with $[\alpha]_D^{19}$ (H_2O 0.1*N* soln.) but on further purification the acid was lost through decompn.; the quinine salt, crystg. with 3 H_2O , yields an inactive free acid. Active I was obtained from the active Br acid and has $[\alpha]_D^{19}$ 54.8° (as *K* salt), increased after 5 crystns. to 65°. β -Selenocyanopropionic acid, m. 58°; *K* salt; cond. values indicate that this acid is about 16 times weaker than I. If in the prepn. of I an equal vol. of concd. HCl is added and the soln. heated at 80-90° (HCN removed by a stream of air), there result, upon neutralization with KOH, 2 *K* salts, both crystg. with 2 H_2O , from which 2 forms of II are obtained, m. 70.5-25 and 107-8°; both have the mol. wt. of 304.4 (calcd. 372); the higher-melting form may be the *dl*-form. I is rather stable in neutral soln; NH_4OH does not attack it at room temp.; concd. alkali decomp. it with sepn. of Se, yet the principal product is II; in acid soln. the formation of I is quant. The reaction is probably monomol.

C. J. WEST

Butyl carbamate. TENNEY L. DAVIS AND STANLEY C. LANE. *Org. Syntheses* 9, 24-6(1929).—A soln. of 180 g. $\text{CO}(\text{NH}_2)_2$ in 1200 cc. BuOH is refluxed 30 hrs.; extn. with ligroin (b. 60-90°) gives 75-6% of $\text{C}_4\text{H}_9\text{CO}_2\text{NH}_2$, b_1 108-9°, m. 53-4°; the residue (9-14%) is practically pure cyanuric acid. The carbamate b. 203-4° with some decompn. into BuOH and cyanuric acid.

C. J. WEST

Derivatives of hydantoin-3-acetic acid. R. LOCQUIN AND V. CERCHEZ. *Compt. rend.* 188, 177-9(1929).—With SOCl_2 hydantoin-3-acetic acid (I) gave its chloride, from which its anilide, m. 215°, *Et* aminomalonate, m. 172-3°, *Et* glycoylate, m. 168°, and methyl-3-isopropyl-5-pyrazoline deriv., m. 185°, were prepd. Aq. NH_3 and I gave hydantoin-3-acetamide, m. 225-6°.

R. C. ROBERTS

Theory of color on the basis of molecular strain. V. Absorption spectra and dissociation constants of organic salts of violuric acid. NARENDRA NATH GHATAK AND SIKHIBHUSHAN DUTT. Allahabad Univ. *J. Indian Chem. Soc.* 5, 665-72(1928), cf. *C. A.* 21, 3194.—In the course of a study of the phenomenon of color in violates and violuric acid (I), G. and D. have studied the absorption spectra and detd. the disocn. consts. of 29 org. salts of I. The color produced by salt formation is in general directly proportional to the basic character of the org. base.

LOUISE KELLEY

Reduction behavior of sugars and their degradation products. F. FISCHLER, K. TAUFEL AND S. W. SOUQI. Univ. München. *Z. angew. Chem.* 41, 950-5(1928) —

Twenty-one sugar reagents are listed and their compns. given. A table shows the behavior of various sugars towards AgNO_3 , KMnO_4 , $\text{K}_2\text{Cr}_2\text{O}_7$, HgCl_2 , Fehling soln. and Ost's soln. under various conditions. The original should be consulted for the details and conclusions.

C. J. WEST

Reaction between sugars and amino acids. HANS V. EULER AND EDVARD BRUNIUS. Univ. Stockholm. *Ann.* **467**, 201-16(1928).—F. p. detns. on mixts. of dextrose and glycylglycine in H_2O at p_{H} 6.0-9.2 show that condensation increases rapidly with increasing p_{H} . This is contrary to the results of Waldschmidt-Leitz and Rauchalles (*C. A.* **22**, 2381), but is similar to the reaction between dextrose and glycine. The decolorization of methylene blue soln. by a mixt. of dextrose and glycylglycine at p_{H} 9.1 is rather slower than with a mixt. of dextrose and glycine. This last mixt. decolorizes methylene blue still more rapidly at p_{H} 10.5. A mixt. of levulose and glycine begins to decolorize methylene blue at p_{H} 9.1; at p_{H} 10.3, reduction is more rapid.

C. J. WEST

Decomposition of sugars and glucosamines in a dilute alkali solution. RYUKI MASUI. Osaka Med. Coll. (*Osaka J. Med.* **27**, 1137-46(1928).—The quantity of methylglyoxal formed on distg. a weakly alk. soln. (0.02 M Na_2CO_3 soln. mixed with Na_2SO_3 to make its amt. 6% of the Na_2CO_3) decreases in the order fructose, glucose and glucosamine, the distn. residue being lactic acid. The decompn. of glucose is retarded by the use of a phosphate buffer. No such reaction could be detected with starch, alanine and cane sugar.

K. SOMEYA

The chemistry of organic compounds with high molecular weight, with respect to the structural theories of Kékulé. XII. H. STAUDINGER. Freiburg-in-Breslau Univ. *Z. anorg. Chem.* **42**, 37-40, 67-73(1929).—A general article, in which S. summarizes the views advocated by himself in his previous publications: highly polymerized substances are formed by smaller units bonded together by ordinary linkages, not residual valences; the length of the C chain det. the characteristics of the compds.; in cryst. compds., the chain arranges in such a way that a lattice may result; x-ray investigations give no clue as to the magnitude of the chain, since one chain may involve several elementary cells.

ALBERT L. HENNE

General structural chemistry of the higher carbohydrates. M. BERGMANN. *Z. physik. Chem.* **130A**, 692-4(1928).—A short theoretical discussion of the structure of carbohydrates, based on the behavior of lactaldehyde and its derivs.

C. J. WEST

Aldehydes from acetylenecarbinols. IV. **1-Methyl-4-isopropylcyclohexylidene-3-acetaldehyde.** H. RUPE AND ALOIS GASSMANN. *Helv. Chim. Acta* **12**, 193-204(1929); cf. *C. A.* **23**, 2928.—*d*-Menthone (I) was prepd. in 90% yield by adding the theoretical quantity of H_2 to 300 g. pulegone and 100 g. Ni catalyst in 1500 cc. 70% EtOH during 3.5-4 hrs., steam distg. to remove EtOH (which was then fractionated to recover I and this was added to the residue from the steam distn.); the crude I was shaken with ice-cold KMnO_4 soln. until the KMnO_4 color was no longer discharged, then shaken with Beckmann's soln. keeping below 45° , warmed to 50° for 5 mins., Na_2CO_3 soln. added and steam distd.; it b_{12} 89° , $[\alpha]_D^{20}$ 25.7° ; semicarbazone, m. 181° ; oxime, purified by distn., b_{12} 132.3° , m. 59° . **1-Methyl-4-isopropyl-3-ethinylcyclohexanol** (II) is obtained when 350 g. I is added slowly (15-20 g. in 5 mins.) to 106 g. powd. NaNH_2 and 400 cc. pure PhH in a 1.5-l. flask with 3 necks and fitted with a dropping funnel, a reflux condenser closed with soda-lime, a stirrer and stuffing box, then warmed 2.5 hrs. longer on a water bath, cooled, filtered through glass wool into a 2.5-l. flask, the filter washed with abs. Et_2O , cooled, evacuated until the Et_2O begins to boil, then adding purified C_2H_2 with shaking and cooling until the pressure is 0.7 atm.; after standing in the ice box overnight, ice and dil. HCl are added, the Et_2O + PhH is layer sepd.; unchanged I is removed by adding 15 g. $\text{N}_2\text{H}_4\text{CONH}_2$, HCl + K_2CO_3 , allowing to stand 24 hrs., adding H_2O and removing II by steam distn.; it is a colorless oil with a slight peppermint odor, which was purified by forming the Ag salt (20 g. AgNO_3 in 60 cc. H_2O + the calcd. amount NH_4OH) and then decomp. with NH_4CNS and steam distg.; it b_{12} $101.5-2.5^\circ$; crude II can also be purified by prepn. of the Bz ester in $\text{C}_6\text{H}_5\text{N}$, steam distg. to remove I and then hydrolyzing the residue of pure Bz ester with alc. KOH. When 120 g. II in 600 g. 70% HCO_2H (5 parts techn. 86% HCO_2H and 1 part H_2O) was warmed under reflux with stirring for 0.75 hr., cooled with ice, neutralized with Na_2CO_3 , extd. with Et_2O , the ext. dried over MgSO_4 and distd., it gave 85 g. of crude **1-methyl-4-isopropylcyclohexylidene-3-acetaldehyde** (III), $\text{MeCH}_2\text{CH}_2\text{CH}_2\text{CH}(\text{C}_6\text{H}_7)\text{C}(\text{CHCHO})\text{CH}_3$, in the fraction b_{12} $107-13^\circ$; the

semicarbazone, m. $146-7^\circ$, was prepd. and on hydrolysis gave pure III, b_{12} 111° , $[\alpha]_D^{20}$

82.9°, d_4^{20} 0.9115; *oxime*, colorless crystals from EtOH, m. 93°, $[\alpha]_D^{20}$ 103.09° (PhH), d_4^{20} 0.8846; this *oxime* (15 g.) when hydrolyzed by boiling 0.75 hr. with 24 g. $H_2C_2O_4$ and 100 cc. H_2O gave I. Treatment of III in Et_2O with $EtMgBr$ gave [4-methyl-2-isopropylcyclohexylidene]methylethylcarbinol (IV), $CH_3.CHMe.CH_2.CH_2.CH(C_2H_5).C$.

H:CH.CH(OH)Et, which is partly dehydrated to [4-methyl-2-isopropylcyclohexylidene]-2-butene (V), $C_{10}H_{18}:CH.CH:CHMe$, which was sepd. by heating with sufficient Na to react with IV, then removing V by distn. *in vacuo*; V is an oil, b_{12} 99°; IV was obtained by adding dil. HCl to the Na alcoholate, extg. with Et_2O , washing with Na_2CO_3 and distg. *in vacuo*; it is a yellow, viscous oil, b_{12} 125°. Oxidation of 20 g. III in Na_2CO_3 with 5.2 l. 4% $KMnO_4$ added with stirring and cooling during 6 hrs., filtering, evapg. the filtrate to 1 l. acidifying with HCl, extg. with Et_2O and distg. *in vacuo* into 2 fractions gave 4-5 g. b_{12} 167°, which is a ketonic acid deriv. of β -methyl- δ -isobutyrylvaleric acid and forms a semicarbazone, m. 152° (cf. Baeyer and Oehler, *Ber.* 27, 1914(1894), 29, 27(1896)); the fraction b_{12} 206-12° (10 g.) is β -methyladipic acid. Reduction of 50 g. III in 350 cc. EtOH, 150 cc. H_2O and 100 g. Ni consumed 6.7 l. H_2 during 3 25 hrs.; after removing the EtOH with steam, extg. with Et_2O , drying with $MgSO_4$, evapg. the Et_2O , fractionally distg. at 12 mm. 25 g. of 1-methyl-4-isopropylcyclohexane-3-acetaldehyde, $C_{10}H_{18}CH_2CHO$, was obtained, b_{12} 106-7°, d_4^{20} 0.9032, $[\alpha]_D^{20}$ -51.28, n_D^{20} 1.46111; the semicarbazone, m. 222°; *oxime*, m. 102°, d_4^{20} 0.8855, $[\alpha]_D^{20}$ 34.11.

N. A. LANGE

Properties of conjugated compounds. VI. Dibromination products of cyclic butadienes. ERNEST H. FARMER AND WM. D. SCOTT. *Imp. College Sci. Tech., London. J. Chem. Soc.* 1929, 172-80; cf. *C. A.* 22, 3391.—When $\Delta^{1,4}$ -cyclohexadiene is dibrominated in C_6H_{14} or $CHCl_3$ below -15° and the solvent removed immediately, without application of heat, a mixt. of 2 isomeric di-Br derivs., a liquid and a solid, m. 68°, is obtained; from their behavior, they are probably isomeric 1,2-dibromo- Δ^2 -cyclohexenes. Each of these substances passes readily into a 3rd solid isomer at room temp. or, more rapidly, on heating; this is the 1,4-di-Br deriv., m. 108°. The isomerization of the original solid form is slow in the dry state, requiring several weeks, that of the liquid is more rapid (8% at 15° in 25 hrs., 40% at 100° in 15 mins.); both forms change readily in a solvent. The 1,4-di-Br isomer was the only product isolated when there was a delay of 3 days in working up the mixt. or when heat was used in removing the solvent. The 1,4-isomer is very slowly oxidized; the solid 1,2-isomer with $KMnO_4$ in Me_2CO at 0° gives 25% of 1,2-dibromo-3,4-dihydroxycyclohexane, m. 96-8°; the liquid 1,2-isomer gave only a trace of this compd. Further oxidation gave only $(CH_3CO_2H)_2$. Bromination of cyclopentadiene in C_6H_{14} at -15° gives a mixt. of *trans*-1,4-dibromo- Δ^2 -cyclopentene (I), m. 45-6°, and 1,2-dibromo- Δ^3 -cyclopentene (II), d_{20} 1.8867. The amt. of I that could be frozen out varied considerably with the proportion of diluent used. With $CHCl_3$, less than 2% of I was obtained, the product consisted of a mixt. of II and the *cis*-I. On distn. II is converted into *cis*-I. On oxidation these derivs. behave as reported by Thiele (*Ann.* 314, 296(1900)).

C. J. WEST

1,3,5-Diphenylcyclohexenone and its reactions. A. D. PETROV. *Leningrad Inst. Agron. J. Russ. Phys.-Chem. Soc., Chem. Pt.* 60, No. 9, 1441-5(1928).—1,3-Diphenyl-5-cyclohexenone was prepd. by the method of Knövenagel and Schmidt (*Ann.* 281, 59) and, after a series of recrystns., it m. 82-3°, and not 70-2° as found by K. For the identification of the ketone, the latter was hydrogenated under pressure with Ni_2O_3 and hexahydrotoluene, whereupon the 2 isomers of 1,3-dicyclohexylcyclohexene which have recently been studied by Schrauth (*C. A.* 17, 1221) were obtained. For the purpose of dehydrogenating the ketone, unsuccessful attempts were first made to obtain Br addn. products. The dehydrogenation had to be effected thus: 10 g. diphenylcyclohexenone was heated at 300° for 1.5 hrs. in a long-necked flask with 5 g. activated C with Pt deposited on its surface. Evolution of H was observed. On cooling, the dehydrogenation product was extd. with C_6H_6 and, after repeatedly being boiled with petroleum ether to sep. the small quantity of tar formed, m. 88-92°. $CH:CPh.CH_2.CPh.CH_2.CO \rightarrow H_2 + CH:CPh.CH:CPh.CH:C(OH)$. Thus

the action of a high temp. in presence of a dehydrogenating catalyzer is a more universal and powerful means of transforming unsatd. cyclic ketones into phenols than through the intermediate production of a bromide. The $Ph_2C_6H_3OH$, on being heated for 1.25 hrs. with $PhNCO$ in presence of C_6H_6 , gives, with an excellent yield, the phenylmethan, m. 180°. To obtain a hydrogenated product, 30 g. of the ketone was dissolved in 200

cc. abs. EtOH, 20 g. metallic Na was gradually introduced through the reflux condenser, then H_2O and dil. H_2SO_4 were added to weak acid reaction, after which the alc. was evapd. and the hydrogenation product was extd. with ether. 1,3-Diphenyl-5-cyclohexanol, $C_{18}H_{20}O$, which is thus obtained in 50% yield, formed after 3 crystns. snow-white needles, m. 127° . Its phenylurethan, m. 152° . By oxidation of 1,3-diphenyl-5-cyclohexanol either by boiling 6–8 hrs. with a chromic mixt. with frequent agitation, or by CrO_3 in AcOH, the corresponding ketone 1,3-diphenyl-5-cyclohexanone, $C_{18}H_{18}O$, is obtained in 70% yield in needles, m. $139-40^\circ$. The oxime, obtained by heating for 2 hrs. on a water bath 1 g. of the ketone with 1 g. $NH_2OH \cdot HCl$, 50 cc. H_2O and 5 cc. EtOH, m. 201° .

BERNARD NELSON

Nitrostyrene. DAVID E. WORRALL. *Org. Syntheses* 9, 66–8(1929).—Details are given of the condensation of BzH and $MeNO_2$ by NaOH, which gives 80–3% of PhCH:CHNO₂.

C. J. WEST

Iodobenzene. F. B. DAINS AND R. Q. BREWSTER. *Org. Syntheses* 9, 46–8(1929).—A mixt. of 381 g. I and 400 g. C_6H_6 at 50° , slowly treated with 275 cc. HNO_3 (d. 1.50), gives 86–7% of PhI. Stirring decreases somewhat the time of reaction. A test for the presence of NO_2 compds. is given.

C. J. WEST

***o*-Bromotoluene.** L. A. BIGELOW. *Org. Syntheses* 9, 22–3(1929).—Directions are given for diazotizing $o-H_2NC_6H_4Me$ in 40% HBr and for sepg. $o-BrC_6H_4Me$ in 42–7% yields.

C. J. WEST

Some derivatives of *p*-bromoethylbenzene and their organo-magnesium compounds. RAYMOND QUELET. *Bull. soc. chim.* 45, 75–97(1929); cf. *C. A.* 22, 231.—Addn. of 30 cc. of Br_2 to 110 g. of cold *p*-bromoallylbenzene (I) gave upon distn. 60% of 1-*p*-bromophenyl-2,3-dibromopropane (II), b_{11} $178-80^\circ$, d_4^{17} 1.950, n_D^{17} 1.622. Slow addn. of 120 g. of II to 200 cc. of AcOH contg. 25 g. of Zn, followed by boiling for 8 hrs., gave 60% of I, b_{11} 96° , b_{710} $222-3^\circ$. Heating I with K_2CO_3 in EtOH for 24 hrs. gave 40% of *p*-bromopropenylbenzene (III), b_{11} 110° , m. 35° , d_4^{16} 1.332, n_D^{16} 1.590; at higher temp. in AmOH, 75% was obtained in 6 hrs. With BzO_2H in $CHCl_3$, I gave *p*-bromobenzylethylene oxide, b_{10} 132° , d_4^{10} 1.430, n_D^{10} 1.570. 1-*p*-Bromophenyl-3-butene (IV) was prepd. (*C. A.* 21, 2466) and brominated to the 3,4-dibromobutane and again dehalogenated with Zn to give IV. One mol. of $p-BrC_6H_4MgBr$ with 45 g. of AcH gave 45% of 1-*p*-bromophenyl-1-ethanol (V), b_{11} 130° , d_4^{18} 1.464, n_D^{18} 1.574. Ninety-five percent of V was also prepd. by adding 80 g. of $p-BrC_6H_4CHO$ in ether to 0.5 mol. of $MeMgI$. Heating 5 g. of V with 3 g. of $PhNCO$ and crystg. from EtOH gave the phenylurethan deriv., m. $103-4^\circ$. V (30 g.) in 100 cc. of PhH was heated with 10 g. of P_2O_5 for 1 hr., washed with H_2O and distd., giving 10 g. of *p*-bromostyrene, b_{11} $87-8^\circ$, d_4^{18} 1.401, n_D^{18} 1.599, which gave *p*-bromophenyl-1,2-dibromoethane, m. 61° , with Br_2 . 1-*p*-Bromophenyl-1-propanol, b_{11} $140-1^\circ$, d_4^{18} 1.405, n_D^{18} 1.561 (phenylurethan, m. 102°) was prepd. from $p-BrC_6H_4MgBr$ and EtCHO and converted to 60% of III by heating with $KHSO_4$, or 80% by the use of P_2O_5 . With Br_2 , III gave 1-*p*-bromophenyl-1,2-dibromobutane, m. 62° ; with BzO_2H in $CHCl_3$, 80% of 1-*p*-bromophenyl-2-methylethylene oxide, b_{11} $123-4^\circ$, d_4^{11} 1.426, n_D^{11} 1.570. In a similar manner 1-*p*-bromophenyl-1-butene was prepd. (*C. A.* 22, 1341), but in this case, the use of P_2O_5 was not successful. A. S. C.

***o*-Nitroaniline.** LOUIS EHRENFELD AND MILTON PUTERBAUGH. *Org. Syntheses* 9, 64–5(1929).—2,4- $O_2N(HO_2S)C_6H_4NH_2$ (218 g.), refluxed with 775 cc. concd. H_2SO_4 and 950 cc. H_2O for 1 hr., gives 56% of $o-O_2NC_6H_4NH_2$.

C. J. WEST

Bis-semidine inversion in aromatic dihydrazo compounds. PRAPHULLA C. GUHA AND HIRENDRA K. BANERJEE. Univ. of Dacca and Indian Inst. Sci., Bangalore. *J. Indian Inst. Sci.* 11A, 231–9(1928).— $PhNHNHCS_2NH_2NPh$ (50 g.), heated at 80° for 3–4 hrs. and then at 90° , gives 30–40 g. $CS(PhNHNH)_2$; heating with 3% HCl for 30 mins. at 30° and then 1 hr. at $60-5^\circ$ out of contact with air, gives diaminodiphenylthiourea (I); attempts to isolate the free base, the HCl salt, the disulfide or metallic derivs. proved futile, black, tarry substances being obtained. The acid soln. of I, diazotized and treated with $\beta-C_6H_4OH$, gives thiocarbamidobisbenzenesazo- β -naphthol, deep orange, m. $131-2^\circ$; the dimethylaniline deriv., deep yellow, m. $164-6^\circ$; the resorcinol deriv., brick-red, m. 158° (explosively). The neutral soln. of I, heated with $PhNCS$ for 3–4 hrs., gives diphenylthiocarbamidodiphenylthiocarbamide, brown, m. $182-3^\circ$; $PhNCO$ gives diphenylcarbamidodiphenylthiocarbamide, m. $238-40^\circ$; $HCHO$ gives dimethyleneaminodiphenylthiocarbamide, does not m. 300° . Diaminodiphenylcarbamide, obtained by the inversion of $(PhNHNH)_2CO$, could not be isolated; the diazo soln. and $\beta-C_6H_4OH$ give carbamidobisbenzenesazo- β -naphthol, deep red, m. $131-2^\circ$; the dimethylaniline deriv., yellow, m. $160-1^\circ$; the resorcinol deriv., brick-red, m. 157° .

(decompn.). *Diphenylcarbamidodiphenylcarbamide*, m. 236-8°; *dimethyleneamino-diphenylcarbamide*, does not m. 300°. Reduction of $\text{CS}(\text{NHC}_6\text{H}_4\text{NO}_2\text{-}p)_2$ gives *p-aminophenyl-p-phenyleneguanidine* (II), m. 295° (decompn.); HCl salt, crystals with $2\text{H}_2\text{O}$, does not m. 300°; the diazo soln. gives a deep red azo dye with $\beta\text{-C}_{10}\text{H}_7\text{OH}$; PhNCS gives *phenylthiocarbamidophenyl-p-phenyleneguanidine*, does not m. 300°. $p\text{-C}_6\text{H}_4(\text{NHAc})_2$, CS_2 and EtOH , heated 3 hrs., give *p,p'-diacetylaminodiphenylthiocarbamide*, m. 239-40°, which on hydrolysis with HCl gives II. $\text{CO}(\text{NHC}_6\text{H}_4\text{NH}_2)_2$, diazotized and treated with $\beta\text{-C}_{10}\text{H}_7\text{OH}$, gives *Na carbamidobishenzeneazo- β -naphtholate*, red, m. 263°; with PhNCS there results *diphenylthiocarbamidodiphenylcarbamide*.

C. J. WEST

Action of phenylmagnesium bromide on phosphorus pentachloride. J. H. KOLI TOWSKA. *Roczniki Chem.* 8, 568-75 (575 French) (1928).—By the action of PhMgBr on PCl_5 the following compds. are obtained: Ph_2PPh , m. 79-80°; Ph_2PCl_2 ; *tetra-phenylphosphonium bromide*, $(\text{C}_6\text{H}_5)_4\text{PBr} \cdot 2\text{H}_2\text{O}$, m. 286-8°, sol. in H_2O , alc. insol. in ether, and crystals of the etherate $\text{PhMgBr} \cdot \text{MgBr}_2 \cdot \text{MgCl}_2 \cdot 4\text{Et}_2\text{O}$. PPh_3 forms with HgCl_2 a compd. $(\text{Ph}_2\text{P})_2\text{HgCl}_2$, white crystals, insol. in water and ether; the formation of this compd. can be used for titration of PPh_3 .

JAROSLAV KUČERA

β -Substituted alkylarsonic acids and derivatives. I. S. M. SHERLIN AND G. I. EPSTEIN. Moscow High Tech. *J. Russ. Phys.-Chem. Soc., Chem. Part* 60, No. 9, 1487-92 (1928).—By interaction of $\text{ClCH}_2\text{CH}_2\text{OH}$ with Na_2AsO_3 a thick non-crystg. sirup is obtained from which *di-Na β -hydroxyethylarsonate*, $\text{HOCH}_2\text{CH}_2\text{AsO}_3\text{Na}_2$, cannot be isolated, as has already been pointed out by Quick and Adams (C. A. 16, 1560-1). There are also very great difficulties in the way of sepg. the free acid, the latter being extremely hygroscopic. The reduction product obtained in the reaction $\text{HOCH}_2\text{CH}_2\text{AsO}(\text{OH})_2 + \text{SO}_2 = \text{H}_2\text{SO}_4 + \text{HOCH}_2\text{CH}_2\text{AsO}$ could not be sepd. either. *β -Hydroxyethylenearsonic dichloride* obtained by the reaction $\text{HOCH}_2\text{CH}_2\text{AsO} + 2\text{HCl} = \text{HOCH}_2\text{CH}_2\text{AsCl}_2 + \text{H}_2\text{O}$ was sufficiently little sol. to ppt. as a colorless and odorless transparent oil, but the attempt to purify it by a vacuum distn. failed on account of its decompn. accompanied by an abundant emission of gases. The oil is sol. in water, very easily in CHCl_3 , not so easily in Et_2O . Boiling water or alkalis decomp. it sepg. C_2H_4 . The dichloride was acetylated by mixing with a 20% excess of 95-6% AcOH and passing an energetic current of HCl gas: $\text{AcOH} + \text{HOCH}_2\text{CH}_2\text{AsCl}_2 = \text{AcOCH}_2\text{CH}_2\text{AsCl}_2 + \text{H}_2\text{O}$. The action of Ac_2O on the dichloride yields the same product. The *β -hydroxyethylidichloroarsine acetate* thus obtained was fairly stable and could be refractionated several times *in vacuo*; it b₁₀ 120-1° (yield 80-5%), is a colorless and almost odorless viscous oil, strongly refractive, hardly sol. in H_2O , easily in Et_2O and in CHCl_3 . On being boiled with alkalis, or with water, it quant. splits off C_2H_4 , this reaction apparently being due to a migration of the hydroxyl: $\text{HOCH}_2\text{CH}_2\text{As}(\text{ONa})_2 \rightarrow \text{CH}_2=\text{CH}_2 + \text{HOAs}(\text{ONa})_2$. This migration of the hydroxyl seems to be a property common to all β -hydroxy-fatty derivs. of trivalent As, and it explains the decompn. by heat of $\text{HOCH}_2\text{CH}_2\text{AsCl}_2$ and $\text{HOCH}_2\text{CH}_2\text{AsO}$. *Chloroethylidichloroarsine*, $\text{ClCH}_2\text{CH}_2\text{AsCl}_2$, was obtained in 70% yield by treatment of $\text{HOCH}_2\text{CH}_2\text{AsCl}_2$ with POCl_3 or PCl_5 followed by heating and vacuum fractionation, taking the fraction b₁₀ 88-92°; it is a colorless oil b₁₀ 90.8°, b₀ 87°, b₀ 80.6°, d_{20}^{20} 1.8401, hardly sol. in H_2O , easily in C_6H_6 or in CHCl_3 . Like the acetate, it is saponified by water or by alkalis, giving C_2H_4 quant. By its cautious oxidation with H_2O_2 , *chloroethylarsonic acid*, $\text{ClCH}_2\text{CH}_2\text{AsO}_3\text{H}_2$, was obtained in soln. After evapg. this soln. to a sirupy consistency *in vacuo* at 35-45°, the acid crystd. on cooling and could be purified either by a recrystn. from acetone or by pptn. from acetone with CCl_4 ; it forms brilliant small scales, m. 134°, easily sol. in water, MeOH and EtOH , less in acetone, totally insol. in CCl_4 . By the action of phosgene on *β -hydroxyethylidichloroarsine* an oil was obtained which possessed the characteristic odor of chlorocarbonic esters. The product is easily saponified with warm water with emission of CO_2 . In the course of a vacuum distn. it decompd. and gave a fraction b. 78-80° consisting of $\text{ClCH}_2\text{CH}_2\text{AsCl}_2$: $\text{ClCH}_2\text{CH}_2\text{AsCl}_2 \rightarrow \text{CO}_2 + \text{ClCH}_2\text{CH}_2\text{AsCl}_2$. The powerful influence of all enumerated substituents in β -position on the odor of EtAsCl_2 has been noted: under their influence the odor all but disappears.

BERNARD NELSON

Mercury diphenyl. H. O. CALVERY. *Org. Syntheses* 9, 54-5 (1929). Refluxing a mixt. of 900 g. 3% Na-Hg, 180 g. PhBr , 200 cc. dry PhMe or $\text{C}_6\text{H}_5\text{Me}$, and 10 cc. AcOEt for 12 hrs. and extg. with 600 cc. boiling C_6H_6 gives 32-7% of HgPh_2 , m. 121-3°.

C. J. WEST

Interactions of selenium oxychloride and phenols. GILBERT T. MORGAN AND FRANCIS H. BURSTALL. Chem. Research Lab., Teddington, Middlesex, Eng. *J. Chem. Soc.* 1928, 3260-70; cf. Michaelis and Kunckell, *Ber.* 28, 609 (1895); 30, 2833

(1897).—Phenols react with SeOCl_2 in the following two ways: (1) $3\text{HROH} + \text{SeOCl}_2 = (\text{HOR})_2\text{SeCl} + \text{HCl} + \text{H}_2\text{O}$; (2) $3\text{HROH} + \text{SeOCl}_2 = \text{Se}(\text{ROH})_2 + \text{ClROH} + \text{HCl} + \text{H}_2\text{O}$. 33.2 g. SeOCl_2 + 50 cc. CHCl_3 was added to a stirred soln. of 56.4 g. of phenol in 500 cc. of CHCl_3 . After an hr. the mixt. was refluxed until the insol. product had adhered to the containing vessel as a gum. Decantation of the CHCl_3 and trituration of the residue with MeAc gave *tri-4-hydroxytriphenylselenonium chloride* (I) as a white powder, prisms from $\text{EtOH-Et}_2\text{O}$, m. 232° (decompn.). I is a stable salt, dissolving readily in hot H_2O to an almost neutral soln. (p_H 5.7) from which it sepd. in anhyd. condition, insol. in other org. media. Concd. H_2SO_4 dissolved it with evolution of HCl ; the soln. became yellow to green on warming. FeCl_3 gave a reddish purple color. NaOH gave a pale yellow soln. from which CO_2 pptd. the amorphous *tri-4-hydroxytriphenylselenonium oxide* (II), decomp. 240° , insol. in neutral org. media, forms salts with mineral acids. Sulfate, decomp. $269-70^\circ$; bromide, decomp. 237° . AgNO_3 quant. pptd. the Cl in I. I_2 , PtCl_4 , decomp. 244° . I on methylation gave a gum which with HgCl_2 yielded *tri-4-methoxytriphenylselenonium mercurichloride*, identical with that by the method of Hilditch and Smiles (C. A. 3, 425). II stirred gradually into an excess of Br_2 , evapd. to dryness, triturated with Et_2O , and crystd. from EtOH yielded *tri-3,5-dibromotri-4-hydroxytriphenylselenonium bromide* (III), which after repeated evapn. with Br_2 gave prisms (from EtOH) decomp. 261° . $\text{Cl}_2\text{-H}_2\text{O}$ converted III into 4,2,6- $\text{ClBrC}_6\text{H}_2\text{OH}$. From the mother liquors of III, on evapn. and addn. of Et_2O was obtained *tri-3-bromotri-4-hydroxytriphenylselenonium bromide*, m. 251° , insol. in H_2O and org. media (except EtOH), sol. in NaOH (from which soln. CO_2 pptd. an oxide, m. 198°), which was converted by $\text{Cl}_2\text{-H}_2\text{O}$ into 2,4,6- $\text{Cl}_2\text{BrC}_6\text{H}_2\text{OH}$, m. $67-8^\circ$. The MeAc filtrate from I yielded on evapn. a sol. isomer of I which crystd. with $2\text{H}_2\text{O}$, decompd. 125° , sol. in hot H_2O but sepd. on evapn. as a gum. CO_2 pptd. an amorphous oxide from its soln. in NaOH ; methylation yielded a viscid tri-MeO deriv. whose mercurichloride, m. $54-5^\circ$. *o*-Cresol yielded *tri-4-hydroxytri-3-methyltriphenylselenonium chloride* (IV), insol. in H_2O and most org. solvents (except EtOH). Alc. FeCl_3 produced no color, while warm concd. H_2SO_4 gave a green tint. Oxide, decomp. 236° . Nitrate, decomp. 224° . *Tri-5-bromotri-4-hydroxytri-3-methyltriphenylselenonium bromide*, decomp. 253° . The corresponding oxide was decompd. by $\text{Cl}_2\text{-H}_2\text{O}$ into 5-chloro-3-bromo-*o*-cresol, m. 48° . *Di-4-hydroxydi-3-methyldiphenyl selenide* was sepd. from the CHCl_3 washings of IV by steam distn. of volatile substances and petroleum ether extn. of the residue. It was insol. in H_2O , sol. in NaOH and org. media; concd. H_2SO_4 gave a deep green tint. HI decompd. it into 5-iodo-*o*-cresol, m. 72° . *p*-Cresol gave *tri-2-hydroxytri-5-methyltriphenylselenonium chloride*, freed from alc. of crystn. at 110° , decomp. $260-5^\circ$, insol. in H_2O , sol. in NaOH or hot EtOH . Concd. H_2SO_4 gave an olive-green tint on warming; alc. FeCl_3 also gave an olive-green color. Oxide, decomp. 160° , gave with $\text{Cl}_2\text{-H}_2\text{O}$ 3,5-dibromo-*p*-cresol, m. 48° ; with Br_2 *tri-2-bromotri-2-hydroxy-5-methyltriphenylselenonium bromide*, pinkish prisms, decomp. 195° . *Di-2-hydroxydi-5-methylphenyl selenide*, m. 111° , and 5-chloro-4,4'-dihydroxy-3,3'-ditolyl, m. $129-30^\circ$ were obtained as by-products. The selenide yielded 3-iodo-*p*-cresol, m. 38° , on treatment with HI. From resorcinol was obtained *tri-2,4-dihydroxytriphenylselenonium chloride*, pptd. from EtOH by MeAc, m. 206° . FeCl_3 gave a reddish purple color, warm concd. H_2SO_4 a green tint. $\text{Br}_2\text{-H}_2\text{O}$ decompd. it completely. β -Naphthol gave *di-2-hydroxydi-1-naphthyl selenide*, prisms, m. 186° to a red liquid, sol. in alkali; FeCl_3 gave no color, cold concd. H_2SO_4 a green tint. 2-Chloro β -naphthol, m. 70° , was obtained as a by-product. Salicylic acid was condensed without a solvent. Extn. of the reaction mixt. with hot C_6H_6 followed by EtOH gave *disalicyl selenide*, yellowish plates, decomp. 272° , insol. in H_2O , CHCl_3 , C_6H_6 , sol. in Et_2O , MeAc, AcOH. Concd. H_2SO_4 gave a green color, FeCl_3 a bluish violet. *m*-Cresol, α -naphthol, and 2,3- $\text{C}_6\text{H}_3(\text{OH})\text{CO}_2\text{H}$ did not give well-defined products.

DAVID DAVIDSON

The alkyl esters of aromatic sulfonic acids as alkylating agents. V. M. RODIONOV. *Bull. soc. chim.* 45, 109-21(1929); cf. C. A. 20, 1795.—R. and co-workers have found that $\text{PhSO}_2\text{Me(I)}$ can successfully replace $p\text{-MeC}_6\text{H}_4\text{SO}_2\text{Me(II)}$ as an alkylating agent under practically the same conditions. Esters of naphthalenesulfonic acids are also good alkylating agents. The methylation of phenolic aldehydes is best accomplished with the addn. compd. of a Me aromatic sulfonate and PhNMe_2 , since Me halides and Me_2SO_4 , reacting only in alk. soln., give secondary products, perhaps through Cannizzaro reaction. Preliminary expts. indicate that the esters of $p\text{-MeC}_6\text{H}_4\text{SO}_2\text{H}$ cannot be used for alkylation and do not give addn. compds. with tertiary bases. I and hydrazine heated in H_2O give quant. the addn. compd. (III), m. 218° . III with dil. NaOH forms quant. methylhydrazine. Narcosine boiled in H_2O with II and KI gives narceonic

acid, m. 207–8°. p -MeC₆H₄SO₃CH₂CH:CH₂ and KCNS heated in H₂O give only CH₂:CHCH₂NCS (40–3%), b. 148°, which heated with NH₃ and alc. and evapd. forms thiosinamine (allylthiourea), m. 74–5°, in good yield. II warmed with 5% NH₃ in abs. alc. gives MeNH₂, isolated as the HCl salt (30%). EtNH₂ is formed in the same way in only minute amt., confirming R.'s earlier observation that Et esters are in general more inert than Me. Replacing NH₃ by MeNH₂ in the same reaction does not yield the expected secondary amine. Alkylated hydrazines could not be prepd. from N₂H₄ and II because of the violence of the reaction. The Me aromatic sulfonates of PhNMe₂ do not react at all with aliphatic alcs, (Schöpf, *Ann.* 452, 211–67). The Me p -toluenesulfonate of PhNMe₂ and dil. MeONa form PhNMe₂OH, which heated 1–1.5 hrs. with vanillin or protocatechualdehyde gives almost 86% and 58.3%, resp., of veratraldehyde, m. 41–2°. Salicylaldehyde is 72% methylated by II, and the m - and p -aldehydes, 88 and 70%, resp. Me and Et naphthalenesulfonates are prepd. from the sulfonyl chlorides (made from the Na salts of the SO₃H acids and PCl₅) with MeOH or EtOH and 35% NaOH below 20° with these yields: 82% of Me β -naphthalenesulfonate (IV), m. 56°; 68–70% of the Me α -ester (V), m. 72–3°; 65–6% of the Et α -(VI) and Et β -(VII) esters. IV and PhNMe₂ yield 87% of the addn. compd. (VIII), m. 206–8°. V, VI and VII also give addn. compds. with PhNMe₂; that with V, m. 161° and is formed almost quant. Phenol heated with IV gives 80% anisole (IX), b. 153–5°. V gives 70% IX. The Et α -naphthalenesulfonate of PhNMe₂ gives with phenol only phenetole (88%). VIII and morphine give 75% codeine. ClSO₃H and C₁₀H₈ at 85° form 88% 1,5-naphthalenedisulfonyl chloride (X), m. 183°. X is prepd. also from C₁₀H₈(SO₃Na)₂ and PCl₅ or ClSO₃H. X in NaOH and MeOH below 20° yields the di-Me ester (XI), m. 205°. The addn. compd. from XI and PhNMe₂ (in 70% yield), m. 260°, and with morphine gives 73–4% codeine. The quaternary bases of esters of aromatic SO₃H acids are constituted like leucotropes and can also be used to some extent in cotton printing. Leucotrope, PhNMe₂(CH₂Ph)Cl, and EtONa give PhNMe₂(CH₂Ph)OH, which with morphine at 115° forms only peronine (benzyl-morphine) (50%), m. 125–6°.

JANET D. SCOTT

Preparation of xylenols from technical xylydines and ethylphenols from benzene. HORST BRÜCKNER. Tech. Hochschule Dresden. *Z. angew. Chem.* 41, 955–6 (1928) — m -4-Xylydine and p -xylydine are sepd. successively as acetates from tech. xylydines, the m -2-, o -3- and o -4-isomers by means of H₂SO₄, each base being purified as formyl derivs. Waste xylydines, from which most of the m -4- and all the p -xylydine had been removed, gave 25% of m -4-, 21% of m -2-, 27% of o -3-, and 19% of o -4-xylydine. m -5-Xylenol is best prepd. from m -4-xylydine by acetylation, nitration, hydrolysis and diazotization, followed by treatment of the diazo compd. with NaOH and Zn(OH)₂, reduction of the 5-nitro- m -xylene so formed, diazotization and boiling with H₂O. Et-C₆H₄OH are conveniently obtained by ethylating C₆H₆ with C₂H₅I and AlCl₃, followed by nitration, reduction, diazotization and boiling with H₂O. C. J. WEST

Nitroarylsulfuric acids and their reduction products. GEORGE N. BURKHARDT AND HAROLD WOOD. Univ. of Manchester *J. Chem. Soc.* 1929, 141–52. — ClSO₃H (1.4 mols) was added to 3.7 mols. PhNMe₂ in 500 cc. CS₂ kept below 16°; to the mixt. heated to 35°, O₂NC₆H₄OH or O₂NC₁₀H₈OH (1 mol.) was added all at once; after stirring at 35° for 1 hr., the product was poured into dil. KOH; details for the sepn. of the K salts are given. *K o*-nitrophenyl sulfate, soly. in H₂O at 17° 6"; the p -isomer has the same soly.; *K 1*-nitro-2-naphthyl sulfate, pale yellow needles; the 4-nitro-1-naphthyl deriv. forms fine, pale yellow needles. These are all rapidly hydrolyzed by very dil. HCl at 70° and slowly at 100° by 10% Ba(OH)₂ or dil. AcOH contg. AcONa. Reduction with FeSO₄ in a suspension of CaCO₃ or BaCO₃ gives the corresponding NH₂ derivs., which give Ac and benzylidene derivs. without loss of the SO₄ group. *K o*-aminophenyl sulfate, gives with Br a faint violet color; the p -isomer crysts. with 1 H₂O, gives a violet color with Br and with HCl or AcOH and *H* deriv.; the *K benzylidene deriv.* crysts. with 0.5 H₂O. *K 1*-amino-2-naphthyl sulfate, crysts. with 0.5 H₂O; soly. in H₂O at 17° 1.1%; Br gives a dirty green ppt., changing to yellow with excess of Br; FeCl₃ gives an opalescence and then a blue ppt., which changes to brown; HCl or AcOH ppts. the *H* deriv., needles. p -H₂NC₆H₄SO₃H yields a diazo compd., which couples with m -C₆H₄(OH)₂, giving *K dihydroxybenzeneazophenyl sulfate*, orange plates with 1.5 H₂O; boiling with dil. HCl splits off the HSO₄ group; the 2-hydroxynaphthalene deriv., dark red, crysts. with 0.5 H₂O; ppts. are formed with BaCl₂, CaCl₂, HgNO₃ and MgSO₄. Results of dye tests with wool are given. The SO₄H group is removed when it is o - to the NH₂ group, but the diazo oxide results. Alk. reduction of o -O₂NC₆H₄SO₃K gives a mixt. of azo and hydrazo derivs. *K azobenzene 2,2'-disulfate*, orange plates with 0.5 H₂O, rapidly hydrolyzed at 70° by HCl. *K hydrazobenzene 2,2'-disulfate*,

needles; soly. in H_2O at 19° 3.2%, at 32° 5.4%; a satd. soln. at 20° with concd. HCl deposits 4,4'-diaminodiphenylene di- H 3,3'-disulfate, needles with 2.5 H_2O ; the K salt crystals with 1 H_2O ; characteristic reactions with Br and $FeCl_3$ are given. Diacetyl-dihydroxybenzidine, m. 292° (decompn.); heating at $300-20^\circ$ for 0.75 hr. gives the dianhydro deriv., m. $164-5^\circ$; the same compd. was prepd. from the sulfate.

C. J. WEST

Anisole. G. S. HIERS AND F. D. HAGER. *Org. Syntheses* 9, 12-4(1929).— $PhOH$ (235 g.) and 100 g. $NaOH$ in 1 l. H_2O , cooled below 10° , are treated with 315 g. Me_2SO_4 (during 1 hr.) and heated 0.5 hr.; then 235 g. $PhOH$ and 100 g. $NaOH$ are added and the mixt. is refluxed for 15 hrs. Yield of $PhOMe$: 72-5%; use of 0.5 this amt. of $PhOH$ gives a yield of 85-92%. $\beta-C_{10}H_7OMe$ was obtained in 65-73% yields.

C. J. WEST

Synthesis of polyphenol ketones. K. W. ROSENMUND AND HANS LOHFERT. Univ. Kiel. *Ber.* 61B, 2601-7(1928); cf. *C. A.* 22, 1579.—The observations that simple phenol ketones can be advantageously synthesized by the Friedel-Crafts reaction as modified by Behn and that the rearrangement of phenol esters into phenol ketones by means of $AlCl_3$ can likewise be smoothly effected in $PhNO_2$ have been utilized in the synthesis of polyphenol ketones. Thus, 4-chloroacetopyrocatechol is obtained in 60% yield by heating $o-HOC_6H_4O_2CCH_2Cl$ 15 mins. with $AlCl_3$ in $PhNO_2$. The simple pyrocatechol ketones can be prepd. in 3 ways: (1) $C_6H_4(OH)_2$ and $AlCl_3$ in hot $PhNO_2$ are treated with 1 equiv. acid chloride; (2) the di-esters of $C_6H_4(OH)_2$ are rearranged in hot $PhNO_2$ with $AlCl_3$, one acyl radical migrating to the nucleus and the other being split off; (3) the same as (2) except that an extra mol. of $C_6H_4(OH)_2$ is added and this reacts with the acyl group split off from the other mol. of $C_6H_4(OH)_2$ to form a 2nd mol. of ketone. In general, the best yields are obtained by heating 2 hrs. at 75° . Below are the yields (%) obtained by the 3 methods, resp.: 4-acetopyrocatechol, 34.0, 46.6, 88.0; 4-butyropyrocatechol (II), 27.0, 35.0, 70.0; quinacetophenone, 40, 23, 54; quinopropylphenone, 40, 34, 61. The phloroglucinol ketones are prepd. by allowing the $C_6H_3(OH)_3$ and $AlCl_3$ to react with each other in $PhNO_2$ until a complex has been formed and soln. is complete before adding the acid chloride. Pyrocatechol dipropionate, from $C_6H_4(OH)_2$ and $EtCOCl$ on the H_2O bath, b_{14} $153-7^\circ$, b_{160} 281° . Propionylpyrocatechol (39% from the preceding compd.), yellow, m. 146° . II, m. 146° . Pyrocatechol diisovalerate (yield, 70%), thick oil, b. $153-73^\circ$ in vacuo; isovaleropyrocatechol (yield, 40%), m. 108° . Pyrocatechol distearate, m. $83-5^\circ$; stearopyrocatechol, m. 70° . 3,4-(HO) $_2C_6H_3Bz$, m. 134° , is obtained almost quant. from $C_6H_4(OBz)_2$. Phlorobutyphenone, needles with 1 H_2O , m. $179-80^\circ$, was obtained in 2.7-3.4 g. yield from 3.5 g. $C_6H_3(OH)_3$; phlorocapronophenone, m. 100° (hydrated), 120° (anhyd.), in 63% yield; phloroisovalerophenone, m. 145° , was similarly prepd. Tribenzoylphloroglucinol (30% from $C_6H_3(OBz)_3$ and $AlCl_3$ at $130-40^\circ$), m. 185° .

C. A. R.

Synthesis of naringenin and phloretin. K. W. ROSENMUND AND MARGARETHE ROSENMUND. Univ. Kiel. *Ber.* 61B, 2608-12(1928); cf. preceding abstr.—Having found that their new method of synthesizing phloroglucinol ketones can be used for the prepn. of aromatic and aliphatic-aromatic ketones also, R. and R. undertook the synthesis of naringenin (I), at the time thought to have the chalcone structure $(HO)_3C_6H_2COCH:CHC_6H_4OH$ (II); Fischer from $PhCH:CHCN$ and $C_6H_3(OH)_3$ under the conditions of the Hoesch ketone synthesis had obtained, not the expected chalcone but the isomeric hydrocoumarin $(HO)_3C_6H_2.CHPh.CH_2.CO.O$ (III). By allowing

$PhCH:CHCOCl$ to stand several days below 20° in $PhNO_2$ with the complex from $C_6H_3(OH)_3$ and $AlCl_3$, R. and R. obtained, together with much resinous products, 2 cryst. compds. (IV and V). IV, $C_{18}H_{12}O_4$, m. 202° , depressed the m. p. (211°) of F.'s III to 176° and gave a strong $FeCl_3$ reaction (red-violet-brown). The compd. V, red-brown crystals, m. 210° , was not further studied because of the small quantity available. p -Carbomethoxycoumaryl chloride under the same conditions likewise gave 2 compds. $C_{17}H_{14}O_7$ (VI and VII). Elimination of the CO_2Me group from VII yielded I. At this time appeared the paper of Asahina and Inubuse (*C. A.* 22, 4526) showing that natural I is a flavanone, $(HO)_3C_6H_2.O.CH(C_6H_4OH).CH_2.CO$ (VIII),

and as IV and VII give the flavanone reactions described by A. (red color on reduction with Mg and HCl) their flavanone structure is proved, leaving the chalcone structure for VI and (presumably) V, i. e., in R. and R.'s expt. most of the II isomerized into VIII. The di-Me ether of the synthetic I m. $115-6^\circ$ (A. gives $116-7^\circ$ for the ether of natural I (sakuranetin Me ether)) but contrary to A.'s observation synthetic I can

be reduced catalytically with rupture of the ring and formation of phloretin. After this work had been presented in Sept., 1928, before the Naturforscher-Versammlung at Hamburg there appeared in the *Chem. Zentr.* an abstr. of the paper of Shinoda and Sato (*J. Pharm. Soc. Japan* 48, 109), who prepd. a no. of phloroglucinol ketones and flavanones by apparently the same methods. Benzophloroglucinol, m. 165°, was obtained in 1.7 g. yield from 2 g. $C_6H_5(OH)_2$ and $AlCl_3$ in $PhNO_2$ with $BzCl$. Phenylacetophloroglucinol, from $PhCH_2COCl$, m. 164-6°, gives a red-violet color with $FeCl_3$. Anisoylphloroglucinol, yellow, m. 177-8°, gives a red-violet color with $FeCl_3$. Dihydrocinnamoylphloroglucinol, yellow, m. 137-8°. [*p'*-Carbomethoxyoxy]benzophloroglucinol, 2,4,6-(HO), $C_6H_5COC_6H_4OCOC_2H_5$, from *p*- $EtO_2COC_6H_4COCl$, yellow, m. 172°. 5,7-Dihydroxyflavanone (IV), yellowish white. 4'-[Carbomethoxyoxy]-2,4,6-trihydroxychalcone (VI), yellow, m. 166°. 4'-[Carbomethoxyoxy]-5,7-dihydroxyflavanone (isopmethoxynaringenin) (VII), m. 183-4°. C. A. R.

The action of ethylamine and diethylamine upon the oxide of isosafrole. T. S. KUSNER. *J. Russ. Phys.-Chem. Soc.* 60, 655-9 (1928).—The NH_2Et deriv. of isosafrole oxide, $CH_3O_2C_6H_4CH(OH)CHMeNH_2$, was obtained by adding 7 g. of $EtNH_2$ in a mixt. of 1 part of alc. and 2 parts of water to 9 g. of isosafrole oxide and allowing the mixt. to stand for 3 days at 35°-40°, after which the reaction mass was freed from alc. and water by evapg. on the water bath. The resulting brown liquid, after drying over $CaCl_2$, was subjected to fractional distn., the fraction b_m 175-180° yielded 9 g. of a colorless, viscous liquid, which on standing solidified to an oily cryst. mass, and on recrystn. from ligroin produced needle-like crystals, m. 67°. The substance is readily sol. in alc., Et_2O , acetone, $AcOEt$, and sparingly sol. in water with alk. reaction. The HCl salt was obtained by conducting dry HCl gas into the soln. of the amino alc. in dry Et_2O ; the ppt. of the HCl salt is not hygroscopic, and is easily sol. in water. When recrystd. from alc. it m. 181°. The picrate, obtained by mixing alc. solns. of equimol. proportions of picric acid and the amino alc., and recrystg. from $AcOEt$, m. 168-9°. The diethylamine deriv. of isosafrole oxide, $CH_3O_2C_6H_4CH(OH)CHMeNEt_2$ was obtained by heating a mixt. of 7 g. of isosafrole oxide, 3 g. of NH_4Et , 3 g. of alc. and 3 g. of water in a sealed glass tube for 4 hrs. in a water bath. The reaction mass was removed from the tube and treated on the water bath to expel water and alc., after which it was dried over $CaCl_2$, twice fractionated, and the fraction b_m 174-8° was collected, yielding 6 g. of a mobile almost colorless liquid having an NH_2 odor and alk. reaction, and sol. in Et_2O , alc. and acetone. The HCl salt, m. 196-7°, and the picrate, m. 160°, were obtained by the same method as described above. CHAS. BLANC.

The ultra-violet absorption spectra curves of isoeugenol and of eugenol. J. SAVARD. *Bull. soc. chim.* [4], 43, No. 10, 1072-5 (1928); cf. C. A. 22, 3157.—The ultra violet absorption curve for eugenol gives a max. (A) at $\lambda = 2807$, and another (B) at about $\lambda = 2300$. It shortly bends again and continues upward thereafter. Isoeugenol gives a somewhat similarly shaped curve with a max. (A) at $\lambda = 2925$, another at (B) $\lambda = 2565$, after bending downward it then continues upward to the end. When an allyl chain is replaced by a propenyl one, thereby bringing the C:C group nearer the nucleus, the max. (A) is displaced toward the red about 120° A. U. (B) is likewise shifted, but to a greater extent, i. e., 280 A. U. (A) is probably due to the phenolic ether function and (B) to the C:C group. The curve for veratrole is similar in shape to, and near that of eugenol. When in veratrole a β, γ -C:C side chain is introduced, no notable change in the curve results; when the new C:C group is conjugated with the aromatic nucleus, and hence is in the α, β -position the curve is shifted toward the red. G. ALBERT HILL.

Phloroglucinol. H. T. CLARKE AND W. H. HARTMAN. *Org. Syntheses* 9, 74-6 (1929).—Details are given of the reduction of 2,4,6-(O_2N), $C_6H_2CO_2H$ with Sn and HCl to the tri- NH_2 deriv., which is then hydrolyzed by boiling H_2O , giving 46.5% of $C_6H_3(OH)_3 \cdot 2H_2O$. C. J. WEST.

γ -Phenoxypropyl bromide. C. S. MARVEL AND A. L. TANENBAUM. *Org. Syntheses* 9, 72-3 (1929).—Details are given of the reaction of $PhONa$ and $(CH_2)_3Br$, which gives 84-8% of $PhO(CH_2)_3Br$ (cf. C. A. 17, 260). C. J. WEST.

Dehydration of benzyl alcohol by phosphoric anhydride in presence of benzene. S. S. NAMETKIN AND D. N. KURBANOV. *J. Russ. Phys.-Chem. Soc., Chem. Pt.* 60, 917-20 (1928).—Nef has pointed out (cf. *Ann.* 298, 254 (1897)) that in the action of P_2O_5 on $PhCH_2OH$ in presence of C_6H_6 , dehydration of the alc. does not take place and CH_2Ph_2 is obtained. In repeating the expt., N. and K., after careful fractionation of the products of reaction, found that *p*- $C_6H_4(CH_2Ph)_2$ has been formed together with Ph_2CH_2 . The formation of the former substance apparently takes place in 2 stages: at first the alc. condenses with C_6H_6 , then the latter condenses with a 2nd mol.

of the alc.: $\text{CH}_3\text{Ph}_2 + \text{HOCH}_2\text{Ph} = \text{H}_2\text{O} + \text{C}_6\text{H}_4(\text{CH}_2\text{Ph})_2$. After driving off C_6H_6 , the distn. under 11 mm. of the products of reaction yields 2 fractions: 128–9° (22 g.) and 210–8° (12 g.); the 1st consists of CH_3Ph_2 , the 2nd is composed of $\text{C}_6\text{H}_4(\text{CH}_2\text{Ph})_2$. The residue is a thick, tarry substance which has not been examd. B. N.

***o*-Aminobenzyl alcohol.** ARNOLD REISSERT AND KARL CRÄMER. Univ. Marburg. Ber. 61B, 2555–66(1928).—Reduction of *o*- $\text{O}_2\text{NC}_6\text{H}_4\text{CH}_2\text{OH}$ with all of the usual reducing agents proved unsatisfactory for the prepn. of *o*- $\text{H}_2\text{NC}_6\text{H}_4\text{CH}_2\text{OH}$ (I), but 91–2% of crude and 88% perfectly pure I was obtained with NaSH , although according to Ger. pats. 99,542 and 106,509 *o*- and *p*- $\text{O}_2\text{NC}_6\text{H}_4\text{CH}_2\text{OH}$ and related compds. are converted by alkali sulfides into the corresponding amino aldehydes. The diazonium salts of I are extraordinarily labile. The diazotized HCl soln. decomp. so rapidly at 0° that in 3 hrs. the decompn. into N_2 and saligenin (II) is complete. The coupling of diazotized I with resorcinol and the naphthols (Paal and Senninger) has been in part repeated and coupling with *p*- $\text{MeC}_6\text{H}_4\text{NH}_2$, 2- $\text{C}_{10}\text{H}_7\text{NH}_2$ and 2,3- $\text{C}_{10}\text{H}_6(\text{OH})\text{CO}_2\text{H}$ has also been effected; PhOH and *o*- $\text{HOC}_6\text{H}_4\text{CO}_2\text{H}$ gave no products which could be purified. Of these azo dyes, those contg. only C_6H_5 nuclei are not anhydridized by concd. H_2SO_4 to compds. contg. the N:N group in an 8-membered ring but the dye from 2- $\text{C}_{10}\text{H}_7\text{NH}_2$ readily undergoes such a dehydration and those from 2- $\text{C}_{10}\text{H}_7\text{OH}$ and $\text{C}_{10}\text{H}_6(\text{OH})\text{CO}_2\text{H}$ yield SO_2H acids of the anhydro dye. Diazotized I gives by the Leuckart xanthate method a mixt. of xanthic esters with II. With Na_2S was obtained a mixt. of 13% (*o*- $\text{HOCH}_2\text{C}_6\text{H}_4$) $_2\text{S}$ (III), 17% II and 60% *o*- $\text{HSC}_6\text{H}_4\text{CH}_2\text{OH}$ (IV). The diazonium chloride cautiously treated with Na_2S_2 forms smoothly and in good yield an explosive compd. which with boiling H_2O gives ($\text{HOCH}_2\text{C}_6\text{H}_4$) $_2\text{S}_2$ (V); if the reaction is carried out in the presence of NaOH the primary diazo compd. decomp. at room temp. with a uniform evolution of N_2 . Zn dust and NaOH reduce V to IV. V never gave $\text{HOCH}_2\text{C}_6\text{H}_4\text{SCl}$ by the Zincke method, even in non-dissociating solvents; there was always formed the nucleus-chlorinated *o*- $\text{HOCH}_2\text{C}_6\text{H}_4\text{ClSO}_2\text{Cl}$ (VI). The nature of the solvent influenced only the yield of VI (almost quant. with AcOH , only 30–5% with CHCl_3). NH_3 in Et_2O not only replaces the Cl in the SO_2Cl group of VI but also splits off H_2O , giving 83% of the compd. $\text{ClC}_6\text{H}_4\text{CH}_2\text{NH}\cdot\text{SO}_2$ (VII).

PhNH_2 , on the other hand, gives the normal sulfonanilide (VIII), which with hot NaOH loses H_2O to form *N*-phenyl-*bz*-chlorobenzyl alc. sulfinide (IX), oxidized by HNO_3 or CrO_3 to the intensely sweet chlorobenzoic sulfinide, $\text{ClC}_6\text{H}_4\text{CO}\cdot\text{NH}\cdot\text{SO}_2$ (X), which is different

from the known 4- and 6-chlorosaccharins and which must, therefore, be the 3- or 5-deriv. Attempts to establish the position of the Cl atom by oxidation of VI or rupture of the ring in X and subsequent elimination of CO_2 gave only viscous oils. Cautious fusion of VI with KOH gave in very small yield a chloro-2-hydroxybenzyl alc. (XI) different from the 5- Cl compd. and X yielded a chlorosalicylic acid (XII) different from the 5- Cl acid. VI, VII and X can, therefore, contain the Cl atom only in the *o*-position to the S. In harmony with this structure is the fact that VI offers such resistance to hydrolysis that it can be distd. unchanged with steam. Attempts to prep. *o*- $\text{HONHC}_6\text{H}_4\text{CH}_2\text{OH}$ (XIII) by the Bamberger method gave a compd. XIV having the compn. of a mol. compd. of 1 mol. each of XIII and the azoxy alc. (XV) and quickly changing in the air into XV. XIV was also obtained by fusing together equimol. quantities of XIII and XV but 3 months later when it was again attempted to prep. XIV only XIII could be obtained. *p*-Toluenediazo-*o*-aminobenzyl alc., from diazotized I and *p*- $\text{MeC}_6\text{H}_4\text{NH}_2$ in AcOH with NaOAc , yellow, m. 108–9°, insol. in dil. acids and alkalies, easily sol. in concd. acids, converted by *p*- $\text{MeC}_6\text{H}_4\text{NH}_2$ and its HCl salt in hot H_2O into *p*-toluidine-*o*-azobenzyl alc., m. 112–3°, easily sol. in dil. acids. With *m*- $\text{C}_6\text{H}_4(\text{OH})_2$ in the calcd. quantity of NaOH diazotized I gives (HO) $_2\text{C}_6\text{H}_3\text{N}:\text{NC}_6\text{H}_4\text{CH}_2\text{OH}$ in deep red crystals with 1 H_2O , m. 159–60° and, after dehydration at 150°, m. 180–1° (Paal and Senninger describe it as anhyd. red-brown needles with metallic luster, m. 170°). β -Naphthol-*o*-azobenzyl alc., dark red, m. 185°, converted by concd. H_2SO_4 at 70° into anhydro- β -naphtholsulfonic-*o*-azobenzyl alc., $\text{HO}_2\text{SC}_{10}\text{H}_7\text{O}\cdot\text{CH}_2\cdot\text{C}_6\text{H}_4\text{N}:\text{N}$, m. above

300°. β -Naphthylamine-*o*-azobenzyl alc., orange-red, m. 150–1°, insol. in dil. acids, sol. in concd. H_2SO_4 with blue, in alc. and Et_2O with dark red color; anhydro deriv., light brown, m. 161°. 2,3-Hydroxynaphthoic-*o*-azobenzyl alc., m. 214–6°, easily sol. in alkalies, insol. in acids. Anhydro-2,3-hydroxynaphthoic-sulfonic-*o*-azobenzyl alc., m. above 320°. Et [*o*-hydroxymethylphenyl]xanthate (obtained through a yellowish cryst. intermediate product, probably the diazo compd., $\text{HOCH}_2\text{C}_6\text{H}_4\text{N}_2\text{SCSOEt}$, which decomp. explosively at 3°), oil which decomp. on distn. *o*-Mercaptobenzyl

alc. (IV), obtained from the above xanthate with boiling alc. KOH and isolated as the yellow to orange-red *Pb* salt; benzoate, m. 125–6°, insol. in alkalis and cannot be oxidized to the disulfide, indicating that the Bz group is on the S, not the O, mol. wt. in camphor 250.6. *o*-Benzyl alc. disulfide (bis-[*o*-hydroxymethylphenyl] disulfide) (V), from IV with FeCl_3 or H_2O_2 , m. 144°, is obtained in better yield (73%) from diazotized I and Na_2S_2 . *o*-Benzyl alc. sulfide (bis-[*o*-hydroxymethylphenyl] sulfide) (III), yellow, m. 164°. 1-Hydroxymethyl-3-chlorobenzene-2-sulfonyl chloride (VI), m. 62°, mol. wt. (Rast) 239, easily sapond. by boiling dil. NaOH, but stable toward steam even in 60% H_2SO_4 . 7-Chlorobenzyl alc. sulfinide (VII), m. 158°, easily sol. in NaOH, mol. wt. (Rast) 209.4, gives in NaOH with Me_2SO , the 2-Me deriv., m. 127°. VIII, m. 94°, mol. wt. (Rast) 294. 2-Ph deriv. (IX) of VII, m. 151°, insol. in alkalis and unchanged on boiling, mol. wt. (Rast) 271. X, m. 153.5°. 3-Chlorosaligenin (XI), m. 116°, gives a blue-violet color with FeCl_3 . XII, m. 170°, gives a red-violet color with FeCl_3 . XIV, m. 84°, sol. in dil. HCl, NaOH pptg. XV, m. 123°, from the soln.

C. A. R.

p-Methoxycinnamyl alcohol. P. KARRER. *Helv. Chim. Acta* 11, No. 6, 1209 (1928).—*p*-Methoxycinnamyl alc., reported as m. 73°, m. 79–80° when pure.

G. ALBERT HILL

The use of zirconium tetrachloride in organic synthesis. P. KRISHNAMURTI. *J. of Madras Univ.* 1928, 5 pp. (reprint).—Anhyd. ZrCl_4 , prepd. by passing Cl mixed with CCl_4 over strongly heated zirconia, resembles AlCl_3 in its phys. and chem. properties and can be used in Friedel-Crafts reactions. 65–70% of PhCOMe and 75% Ph_2CO were obtained from the acid chlorides and ZrCl_4 in dry C_6H_6 by the usual method. By the modified Gatterman synthesis, a poor yield of $\text{MeOC}_6\text{H}_4\text{CHO}$ was obtained from PhOMe, $\text{Zr}(\text{CN})_2$ and ZrCl_4 in dry C_6H_6 . Ph_3CH was obtained in poor yield from CHCl_3 . With PhCH_2Cl in C_6H_6 a mixt. of hydrocarbons was obtained from which 30% Ph_3CH_2 was isolated. 25% phenolphthalein was prepd. from $\text{C}_6\text{H}_5(\text{CO})_2\text{O}$ and PhOH. A theoretical yield of PhOH from PhOMe was obtained. PhNCO and C_6H_5 with ZrCl_4 gave PhNHCOPh. With PhMe, PhNCO gave *p*- $\text{MeC}_6\text{H}_4\text{CONHPh}$. *p*- $\text{C}_6\text{H}_4\text{Me}_2$ and PhNCO gave *p*- $\text{Me}_2\text{C}_6\text{H}_3\text{CONHPh}$. $\text{C}_6\text{H}_5\text{Me}_2$ and PhNCO gave $\text{Me}_2\text{C}_6\text{H}_3\text{CONHPh}$. With PhCl the yield of the anilide was very poor. PhCOMe and PhNCO gave $\text{MeOC}_6\text{H}_4\text{CONHPh}$. PhNCO would not react with PhNO_2 and PhCOMe. Since large quantities of the mineral Baddeleyite (ZrO_2) occur in Brazil and Ceylon, the use of ZrCl_4 as a lab. reagent is predicted. R. C. ROBERTS

p-Bromophenacyl bromide. W. D. LANGLEY. *Org. Syntheses* 9, 20–1 (1929)—*p*- $\text{BrC}_6\text{H}_4\text{Ac}$ (50 g.) in 100 cc. glacial AcOH, slowly treated at 20° with 40 g. Br (30 mins.), gives 69–72% of *p*- $\text{BrC}_6\text{H}_4\text{COCH}_2\text{Br}$.

C. J. WEST

o-Chlorobenzoyl chloride. H. T. CLARKE AND E. R. TAYLOR. *Org. Syntheses* 9, 34–5 (1929).—Directions are given for the chlorination of *o*- $\text{ClC}_6\text{H}_4\text{CHO}$ at 150–60° (Cl absorption complete after 15 hrs.); distn. gives 70–2% of *o*- $\text{ClC}_6\text{H}_4\text{COCl}$, b_{10} 93–5°, b_{76} 137–9°. With 2665 g. $\text{ClC}_6\text{H}_4\text{CHO}$, the yield was 81%. At 125–40°, the reaction requires about 30 hrs. for completion.

C. J. WEST

A case of the isomorphous replacement of the chlorine atom by the hydroxyl group in organic compounds. VICTOR VILLIGER. I.-G. Farbenindustrie Aktiengesell., Ludwigshafen a. Rh. *Ber.* 61B, 2596–9 (1928).—In attempts to prep. 2,4,5- $\text{Cl}(\text{HO})(\text{O}_2\text{N})\text{C}_6\text{H}_2\text{CO}_2\text{H}$ (I) by treating $\text{Cl}_2(\text{O}_2\text{N})\text{C}_6\text{H}_2\text{CO}_2\text{H}$ (II) with alkalis it was found that when the reaction had not gone to completion there were obtained products which, although apparently homogeneous (homogeneous cryst. form, sharp m. p.), were mixts. of I and II whose m. ps. lay between those of the I and II and which did not depress the m. p. of the lower melting I (161–3.5°). A 1:1 mixt. of the 2 compds. (II m. 202–4°) m. 183–6°, a 2:1 mixt. m. 174–6°. Grimm has undertaken the further study of this case of isomorphism and will report on it elsewhere. The I is prepd. by converting *p*- $\text{MeC}_6\text{H}_4\text{SO}_2\text{Cl}$ with Cl and SbCl_5 into 4,3- $\text{MeClC}_6\text{H}_3\text{SO}_2\text{Cl}$, chlorinating this at 150–200° in the absence of all metals, treating the resulting 2,4- $\text{Cl}_2\text{C}_6\text{H}_3\text{CCl}$ with concd. H_2SO_4 and nitrating the 2,4- $\text{Cl}_2\text{C}_6\text{H}_3\text{CO}_2\text{H}$ thus obtained. I is purified through the Ca, II through the red Ba salt, and mixts. of the II are sep'd. by means of the latter salt.

C. A. R.

Stovaine. I. RIBAS AND A. RANCAÑO. *Anales soc. españ. fis. quim.* 26, 430–4 (1928).—The apparently racemic stovaine has been found to be truly racemic by the Bakhuis Roozeboom criteria. By the van't Hoff dilatometric method the racemic form is stable from –10° to 175°, its m. p.

E. M. SYMMES

Acid ammonium *o*-sulfobenzoate. H. T. CLARKE AND E. E. DREGER. *Org. Syntheses* 9, 1–2 (1929).—Saccharin (188 g.) is heated with 565 cc. H_2O and 188 g. concd. HCl for 2.5–3 hrs. (soln. results); 188 g. of saccharin is again added and the

heating continued for 1.5–2 hrs.; on concg. the soln., 91–5% of $\text{HO}_2\text{CC}_6\text{H}_4\text{SO}_2\text{NH}_4$ is obtained. Recrystn. from an equal wt. of H_2O gives 90% of a purer product.

C. J. WEST

***o*-Sulfobenzoic anhydride.** H. T. CLARKE AND E. E. DREGER. *Org. Syntheses* 9, 80–2(1929).—*o*- $\text{HO}_2\text{CC}_6\text{H}_4\text{SO}_2\text{NH}_4$ (219 g.) and 200 cc. dry C_6H_6 , treated with 145 g. SOCl_2 , give 64–6% of *o*-sulfobenzoic anhydride; with larger quantities the yields are significantly increased.

C. J. WEST

Phenylsuccinic acid series. IX. Resolution of *dl*-diphenylsuccin- α - and β -naphthylamic acids into their optical antipodes. HENRY WREN AND EDWARD WRIGHT. Municipal College of Tech., Belfast. *J. Chem. Soc.* 1929, 136–8; cf. *C. A.* 19, 265.—*dl*-Diphenylsuccinic anhydride and α - $\text{C}_{10}\text{H}_7\text{NH}_2$ give *dl*-diphenylsuccin- α -naphthylamic acid, m. 217–9°, the quinine salt, repeatedly recrystd. from EtOH, gives the *d*-acid, m. 206–7°, $[\alpha]_D^{16}$ 205.8° (Me_2CO , *c* 0.8432); the sol. portion of the quinine salts, transformed into the cinchonidine salt, yields the *l*-acid, m. 206–7°, $[\alpha]_D^{17}$ –206.6° (Me_2CO , *c* 0.9484). Boiling 3% EtOH-HCl transforms the *d*-acid into *d*-diphenylsuccin- α -naphthil, m. 145°, $[\alpha]_D^{16}$ 139.2° (Me_2CO , *c* 1.0916), $[\alpha]_D^{17}$ 123.3° (CHCl_3 , *c* 1.2608); this is unusually readily racemized by EtONa in EtOH; crystn. from EtOH occasionally caused complete racemization; this was avoided by using EtOH contg. a trace of HCl. *dl*-Diphenylsuccin- β -naphthylamic acid, m. 201–2°, was also resolved by quinine; the *d*-acid, m. 188°, $[\alpha]_D^{16}$ 386.9° (Me_2CO *c* 0.7288); the *l*-acid could not be obtained pure. *d*-Diphenylsuccin- β -naphthil, m. 178–9°, $[\alpha]_D^{18}$ 104.9° (Me_2CO , *c* 0.8792). **X. Racemization phenomena observed during the action of water and bases on the optically active diphenylsuccinic anhydrides.** *Ibid* 138–41.—The production of substituted amic acids from the active anhydrides and PhNH_2 , *p*- $\text{MeC}_6\text{H}_4\text{NH}_2$, α - or β - $\text{C}_{10}\text{H}_7\text{NH}_2$ in the presence of cold C_6H_6 is accompanied by not more than slight, if any, racemization; *l*-diphenylsuccin- β -naphthylamic acid, m. 188–8.5°, $[\alpha]_D^{17.5}$ –388.2° (Me_2CO , *c* 0.7355). Interaction of H_2O and *d*-diphenylsuccinic anhydride in the presence of Me_2CO (20 cc. Me_2CO and 5 cc. H_2O) gives a product with 4.5% meso-acid; in $\text{C}_6\text{H}_6\text{N}$, 3.4%; in Et_2O , 2.8%; in AcOH, 3.6%. From the *dl*-anhydride, the % of meso-acid obtained by use of aq. Me_2CO , $\text{C}_6\text{H}_6\text{N}$ and Et_2O was 2.0, 2.0 and 1.0, resp. With AcOH the av. value (3 expts.) was 21%.

C. J. WEST

Hydrocinnamic acid. A. W. INGERSOLL. *Org. Syntheses* 9, 42–5(1929).—Details of the app. for and method of the electrolytic reduction of $\text{PhCH}_2\text{CH}_2\text{OH}$ to $\text{PhCH}_2\text{CH}_2\text{CO}_2\text{H}$ are given. The yields are 80–90%, depending upon the quality of acid used; a technical acid gave only 60% yield. By the same process β -furylacrylic was reduced, giving 60–70% of β -furylpropionic acid.

C. J. WEST

Carbonylbisamino acids and their transformation products. II. FRITZ WESSELY AND JOSEF MAYER. Univ. Wien. *Monatsh.* 50, 439–48(1928); cf. *C. A.* 22, 409.—(+)-*Et* carbonylbis- α -amino- β -phenylpropionate (I), $\text{CO}[\text{NHCH}(\text{CO}_2\text{Et})\text{CH}_2\text{Ph}]_2$, m. 142.5° (cor.), $[\alpha]_D^{16}$ 42.28° (EtOH), prepd. by the action of COCl_2 on (–)- $\text{PhCH}_2\text{CH}(\text{NH}_2)\text{CO}_2\text{Et}$, is converted by heating with HCl and AcOH into (–)- α -[5-benzyl-3-hydantoin]- β -phenylpropionic acid (II), m. 205.5°, $[\alpha]_D^{15}$ –210.7° (EtOH). The (–)-*Et* ester (III) corresponding to I, m. 142.5° (cor.), $[\alpha]_D^{15}$ –42.35° (EtOH), from (+)- $\text{PhCH}_2\text{CH}(\text{NH}_2)\text{CO}_2\text{Et}$, yields the (+)-acid (IV) corresponding to II, m. 205.5°, $[\alpha]_D^{15}$ 211° (EtOH). Equimol. mixts. of I and III and of II and IV, m. 144.5° (cor.) and 229.5°. While the *dl*-carbonylbisphenylalanines (V) previously described are unaffected by heating with 1 or 2 mols. *N* NaOH, the corresponding esters, m. 145° and 141.5°, resp., both yield a mixt. of the 2 *dl*-acids on hydrolysis with 2 mols. of alkali. With 1 mol. of alkali the former ester gives a mixt. of the 2 isomeric α -[5-benzyl-3-hydantoin]- β -phenylpropionic acids, m. 229° and 171°, resp., while the latter ester affords only the form m. 229°. The hydantoin deriv., m. 171°, is converted into its isomer, m. 229°, by treatment with 1 mol. of alkali, and both of these compds. are hydrolyzed by 2 mols. of alkali, forming the same mixt. of V. *Et* α -[5-benzyl-3-hydantoin]- β -phenylpropionate, m. 130° (cor.), is obtained by the action of MeCHN_2 on the corresponding acid, m. 171–2°, crysts. with 1.5 H_2O . (With E. KEMM.) Hydrolysis of *Et* carbonylbisaminoacetate with MeOH-KOH gives a mixt. of hydantoin-3-acetic acid and carbonylbisaminoacetic acid.

C. J. WEST

Esterification of aromatic and olefinic nitriles. P. PFEIFFER, ERMA ENGELHARDT AND WILLY ALFUSS. Univ. Bonn. *Ann.* 467, 158–90(1928).—A single *o*-substituent inhibits practically completely the conversion of an aromatic nitrile into a carboxylic ester by heating it with MeOH - or EtOH-HCl ; the chem. nature of the substituent

plays a minor part, for the Me, NO₂, Cl, Ph and vinyl groups all act the same way. The rule is similar to that which applies to the formation of imino ethers. Acting on the assumption that aromatic nitriles may be considered as a special class of olefinic nitriles, a no. of α -substituted PhCH:CHCN were examd. By starting with the *cis*- and *trans*-acids, dehydration of the amides gave the corresponding nitriles. The *trans*-compds. were in all cases easily esterified but the *cis*-compds. were esterified not at all or only very slowly under the usual conditions. This corresponds with the similarity of the configurations of the *cis*-compds. and *o*-substituted aromatic nitriles. Ease or difficulty of esterification is, in the absence of other evidence, indicative of *trans*- or *cis*-configuration, resp. While 4-Me₂NC₆H₄CH:CHPh, the 4'-NO₂ deriv. and the 4',2'-O₂N(NC) derivs. and the amide, acid and ester corresponding with the last are fluorescent, transposition of the NO₂ and CN groups yields a nonfluorescent compd. 2,4-O₂N(NC)C₆H₃CH:CHC₆H₄(NMe)₂-4 and the corresponding Me and Et esters are likewise nonfluorescent. The esterification of the nitriles was carried out by refluxing with 40 parts of anhyd. alc. for 2 hrs., while a stream of HCl was passed in the soln., and the amt. of ester in the washed product was detd. from the % of N. The following figures give the % of Me or Et esters, resp., found in the product; when only 1 figure is given, it refers to the Me ester. PhCN, 65.4, 35.1; MeC₆H₄CN, *o*-, 0, 0; *m*-, 92.1, 58.7; *p*-, 83, 80; O₂NC₆H₄CN, *o*-, 0, 0; *m*-, 87, 45; *p*-, both high, 2,3-Me(O₂N)C₆H₃CN, 0; 4,3-Me(O₂N)C₆H₃CN, high; ClC₆H₄CN, *o*-, 0, 0; *p*-, 97, 67.9; *o*-phenylbenzonitrile, b₁₆ 176-7°, obtained from the acid amide in 35% yield, 8.4, 5.6; *p*-PhC₆H₄CN, 82, 70.4; C₁₀H₇CN, α -, 0, 0; β -, 77.1, 77; 4',2',4-O₂N(NC)C₆H₃CH:CHC₆H₄NMe₂, 0; *p*-Me₂NC₆H₄CHO and 2,4-Me(O₂N)C₆H₃CONH₂, heated with a little piperidine at 120-30° for 1.5 hrs., give *p*-nitro-*p'*-dimethylaminostilbene-*o*-carboxylic amide, m. 242-3° (decompn.), which, heated 3 hrs. with 25% HCl, gives the free acid, m. 206° (decompn.); Me ester, m. 158-9°; Et ester, m. 139-40°. PhCH:CHCN, 96.2, 85; α -methylcinnamonitrile, b₁₆ 120°, 69.8, 36.8; *cis*- α -chlorocinnamonitrile, b₁₆ 128°, m. 19-21° (53% yield from the amide); *trans*-deriv., b₁₇ 138-9°, m. 34° (35% yield); both were esterified readily but inversion of the *cis*-form occurred, for the *trans*-ester was formed in each case. *cis*-PhCH:C(CN)Ph is not esterified. *trans*- α -Phenylcinnamonitrile, m. 49-51° (72% yield), gives 39 of the Me ester. *cis*- α -Phenyl-*m*-nitrocinnamoyl chloride, m. 101° (94% yield); amide, yellow, m. 176-80° (yield); nitrile, m. 133-4° (70% yield); this is not esterified with MeOH-HCl. The *trans*-chloride, m. 93° (94% yield); amide, m. 146° (78% yield); nitrile, m. 96 (68% yield); MeOH-HCl gives 51% ester. *cis*-PhCH:C(*p*-C₆H₄NO₂)C₆H₄ crystals with 1 H₂O, canary-yellow, and also with 0.5 mol. C₆H₆, m. 100-20°; the chloride, m. 88-91.5° (95% yield); amide, yellow, m. 208.5-10° (65% yield); nitrile, m. 121-2°, light yellow, 70% yield; it is not esterified. The *trans*-chloride, yellow, m. 95° (95% yield); amide, m. 183-4° (77% yield); nitrile, m. 183-4° (77% yield); MeOH-HCl gives 48% ester. The *cis*- and *trans*-Me₂NC₆H₄CH:C(*p*-C₆H₄NO₂)CONH₂ give on hydration the same *cis*-nitrile, m. 241-2°, which could not be esterified. Dibenzalpropionyl chloride, liquid, amide, m. 178-9°; *cis*-nitrile, m. 115-6°; neither MeOH nor EtOH esterifies the nitrile. *cis*-PhCH:C(C₆H₄SO₃H)CN is not esterifiable. α -Phenylcrotonic acid yields an amide, m. 98-9°, and the *cis*-nitrile, b₁₂₋₁₄ 125°; the % of esterification were 9.6 and 7.9. An attempt to prep. the nitrile by condensation of PhCH₂CN with paraldehyde was unsuccessful. PhCH₂CHPhCN is readily esterified (64% yield). C. J. WEST

Ethyl cinnamate. C. S. MARVEL AND W. B. KING. *Org. Syntheses* 9, 38-40 (1929).—Directions are given for the condensation of BrH and AcOEt by Na, with the formation of 68-74% of PhCH:CHCO₂Et; the AcOEt should be specially purified. C. J. WEST

Synthesis of isobipanic acid. SATYENDRA N. CHAKRAVARTI AND WM. H. PERKIN, JR. Dyson Perrins Lab., Oxford. *J. Chem. Soc.* 1929, 193-6.—5,2,3-(O₂N)₃MeO-C₆H₃CH:CHCO₂H (I), m. 231°, was prepd. by nitration of the 2,3-(MeO)₂ acid and also, which establishes its constitution, by condensation of 5,2,3-O₂N(MeO)₃C₆H₃CHO with CH₂(CO₂H)₂, using piperidine in C₆H₅N, the yield being nearly quant. Me ester, m. 154-5°; Et ester, dimorphous, m. 116°. Reduction of I with FeSO₄ and dil. NH₄OH gives 5-amino-2,3-dimethoxycinnamic acid, m. 233° (decompn.); diazotized and treated with KCN-CuCN there results the 5-CN deriv., m. 251°, which is oxidized by KMnO₄ in Na₂CO₃ soln. to 5-cyano-2,3-dimethoxybenzaldehyde, m. 135°; hydrolysis with concd. HCl on the steam bath for 3 hrs. gives isobipanic acid, m. 210-1° (first prepd. by Tiemann and Mendelsohn, *Ber.* 10, 397(1877)); the Me ester may be prepd. by hydrolysis in MeOH. C. J. WEST

Ozonization of nopinene and sabinene. HARRY SCHMIDT. *Z. angew. Chem.* 42, No. 5, 126-7(1929).—Nopinene, C₁₅H₂₄, from French turpentine oil, ozonized in alc.

and treated with steam, yielded, in the distillate, nopinone, $C_{10}H_{16}O$, b_{760} 209°, d_{20} 0.977, α_D 18.20°; semicarbazone, from MeOH, m. 188°; trichloride, from alc., m. 148°; benzal compd., from alc., m. 106°, slightly *l*-rotatory in alc. Another distillable product, $C_{10}H_{16}O_2$, a yellow, unpleasant smelling oil, also resulted from the O_3 treatment. It reacted slowly giving a disemicarbazone, $C_{10}H_{14}N_2O_2$, from alc., m. 210–2°, and probably is a stereoisomer of pinonic aldehyde. The α_D is -13.8° , whereas the known form gives 15° . Oxidation of this oil by 3% $KMnO_4$ gave a liquid, pinonic acid, d_{20} 1.095, giving, in MeOH, a semicarbazone, $C_{11}H_{15}O_2N_2$, m. 204–6°. The O_3 reaction also produced some neutral material and some pinonic acid, which were not volatile with steam. Sabinene, $C_{15}H_{24}$, treated as was the nopinene, gave colorless liquid sabinone, $C_{15}H_{22}O$, b. 217–9°, d_{20} 0.957, α_D -23° , stable to dil. $KMnO_4$. The semicarbazone, from dil. MeOH, m. 141°, gave the ketone with $(CO_2H)_2$.

G. ALBERT HILL

Structure of terpinol hydrate. A. S. GINZBERG AND M. S. ESHMAN. Leningrad Med. Inst. *J. Russ. Phys.-Chem. Soc., Chem. Pt.* 60, 1165–71 (1928).—The following expts. have led G. and E. to the conclusion that terpinol hydrate has a closed-chain formula and contains 1 mol. of crystn. H_2O : (1) Oxidation by $KMnO_4$ yields no product contg. an aldehyde or ketone group; (2) metallic Na, which does not act on terpinol at room temp., transforms terpinol hydrate into terpinol and 1 mol. H_2O ; (3) detn. of HO groups by means of Mg-org. compds. shows the presence of 2 HO groups and 1 mol. H_2O of crystn.; (4) $PhNCO$ acts on terpinol in anhyd. pyridine without formation of crystals or production of gas, whereas it produces both crystals and gas when reacting with terpinol hydrate, which circumstance indicates the presence of H_2O of crystn. in the latter; (5) benzoylation of terpinol hydrate in alk. soln. gives negative results, which would hardly be the case if the former contained a primary alc. group; (6) Nessler reagent, which is frequently utilized for detn. of primary alc. groups, does not react with terpinol hydrate. Terpinol hydrate is produced by the union with H_2O of *cis*- and not *trans*-terpinol.

BERNARD NELSON

Menthone series. VI. Crystallization of menthylamines with optically active acids. JOHN READ, CATHERINE CASSELS STEELE AND PETER GEORGE CARTER. Univ. of St. Andrews. *J. Chem. Soc.* 1929, 23–32; cf. *C. A.* 22, 86.—*dl*-Menthylamine and *dl*-neomenthylamine may be resolved by fractionally crystg. the H *d*-tartrates in the usual way; in each instance the salt contg. the desired form of the base was fortunately the less sol. of the 2 isomers; *dl*-isomenthylamine was not resolved when treated in a similar way. The tartrates and camphor-10-sulfonates gave essentially const. optical rotatory powers in dil. aq. solns. but with the α -bromocamphor- π -sulfonates considerable fluctuations were observed in the optical activity; with the latter only a partial resolution of the base could be achieved. Unexpectedly, however, the *d*-camphor-10-sulfonates prep'd. from the externally compensated bases exhibited very similar irregularities in their optical rotations and it was not found possible to resolve any of the cases with the help of this acid. *l*-Menthylamine *l*-camphor-10-sulfonate, $[M]_D$ -112° ; *d*-menthylamine *H d*-tartrate, m. 168°, $[M]_D$ 113°, $[M]_{589}$ 119°; *d*-neomenthylamine *l*- α -bromocamphor- π -sulfonate, m. 171°, $[M]_D$ -230° . The original should be consulted for the details of the variation of the optical activity on recrystn. and decompns. of these salts and others previously described.

C. J. WEST

Oxidation of dipinene. LINDSAY H. BRIGGS AND WALLACE F. SHORT. *J. Chem. Soc.* 1928, 3118–21; cf. Kondakov and Saprikin, *C. A.* 19, 3088; Carter, Smith and Read, *C. A.* 20, 1070.—To dipinene, from pinene with HCl and $FeCl_3$ in naphtha, in H_2SO_4 and H_2O was added com. MnO_2 . After refluxing 2.5 days more MnO_2 and H_2SO_4 were added. Soln. of oil was complete in 1 more day. Dila., filtration and extn. of the residue with dil. $NaOH$ followed. The alc.-free Et_2O ext. amounted to 6 g. from 22 g. dipinene. After soln. in NH_3 and filtration the Ag salts were obtained and methylated with MeI . The esters on fractionation and hydrolysis showed the presence of $BzOH$, terephthalic acid, and a $C_6H_5(CO_2H)_2$, probably mellitic. From one fraction no homogeneous substance was obtained. It is probable that diterpenes of this type contain 2 benzene rings united through 1 or 2 C atoms (cf. Ruzicka and Rudolph, *C. A.* 22, 1154).

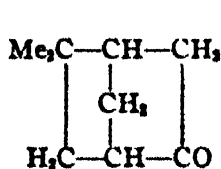
FOSTER DEE SNELL

Ultra-violet absorption curves of the pulegonenols. JEAN SAVARD. *Bull. soc. chim.* 43, 978–84 (1928).—A further study (cf. *C. A.* 22, 157, 3583) was made of the absorption spectra of pulegone and isopulegone, together with their enols, and also of butylpulegol and isobutylpulegol. The presence of even a small amt. of pulegone in the enol form causes the appearance of a max. point due to CO ; the enolization of pulegone, contg. $C:C$, lowers the max. absorption. The substitution of the alc. group for the ketone lowers the max. absorption of the double bond.

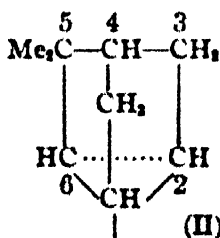
E. G. VANDER BOSCH

***l*-Menthone.** L. T. SANBORN. *Org. Syntheses* 9, 52-3(1929).—Oxidation of 90 g. menthol by 120 g. $\text{Na}_2\text{Cr}_2\text{O}_7$ and 100 g. concd. H_2SO_4 in 600 cc. H_2O gives 83-5% of *l*-menthone, b_{11} 98-100°, b 204-7°.

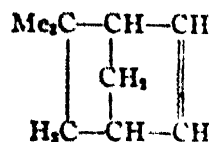
Camphenilane series. II. Apocyclene, camphenilene and some of their derivatives. S. S. NAMETKIN AND ZINAIDA ALEKSANDROVA. Second Univ. Moskau. *J. Russ. Phys.-Chem. Soc., Chem. Part* 60, 1535-44; *Ann.* 467, 191-200(1928); cf. *C. A.* 18, 3371.—The structure of α -isocamphenilone (I) has now been detd. by prepg. it from apocyclene (II) and examn. of the products of fission of the cyclopropane ring in the latter by hydration has shown that fission probably takes place in all 3 possible ways, for fission of either the C^1-C^6 or C^3-C^4 linkings must yield the alcs. corresponding with camphenilone (III) and I, and fission of the C^1-C^3 linking the alc. corresponding with apocamphor; all these ketones were isolated. II was prepd. from the hydrazone of III by oxidation with HgO in EtOH . Treatment of II with AcOH and 50% H_2SO_4 yields a mixt. of alcs., m . 51-60°, b_{11} 100.5-1°. After oxidation of this mixt. with CrO_3 - AcOH , apocamphor was sepd. by crystn. of its semicarbazone and yielded apocamphoric acid on oxidation with alk. KMnO_4 . After oxidation of the mixt. with concd. HNO_3 and then with alk. KMnO_4 , III and I, m . 65-6°, were sepd. by crystn. of the semicarbazones. *cis*-Apofenchocamphoric acid, derived from I, was sepd. from the product of the KMnO_4 oxidation. I was sepd. in largest amt. and this reaction provides a convenient method of prepn. Reduction of the ketones with Na and EtOH yielded a mixt. of the stereoisomeric α -isocamphenilols, b 196-8°. When treated with K and CS_2 and then with MeI this yielded *Me* α -isocamphenilylvanilate, which decomps. when heated at 150-60° to yield camphenilene (V), b 131-2°, m 27-8°. Oxidation of V with alk. KMnO_4 gives IV.



(I)



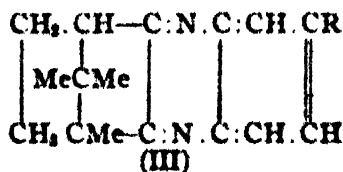
(II)



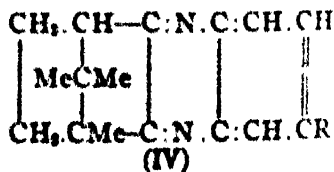
(III)

C. J. WEST

Quinoxalines (prepared) from camphorquinone and aromatic α -diamines. A. HEGKENDORN. Univ. Lausanne. *Helv. Chim. Acta* 12, 50-60(1929).—Only the simple camphorquinoxaline has been prepd. by condensation of camphorquinone (I) with α - $\text{C}_6\text{H}_4(\text{NH}_2)_2$ (II) (Singh and Mazumdar, *C. A.* 14, 1812). This prepn. is repeated and extended to substituted α -diamines. The compds. must be considered as true quinoxalines, since the camphor group hardly shows any longer the aromatic character. They bear only remote resemblance to azines, showing only faintly the characteristic H_2SO_4 reaction of azines. In the case of monosubstituted C_6H_4 rings, 2 products are theoretically obtainable (III and IV). Only one, however, is obtained in all cases, and its constitution has, therefore, not been elucidated.



(III)



(IV)

(A) **Camphorquinoxaline.**—Mol. proportions of I and II.2HCl are mixed in EtOH and heated. The product is obtained as a viscous mass by diln. with H_2O . It turns to an amorphous solid by rubbing. After careful drying, it seps. from petroleum ether in monoclinic or trigonal crystals, often twinned, m . 74°. Acetylation, benzoylation and nitration yield only the original materials. (B) **2-Methylcamphorquinoxaline.**—As above, using 1,2,3- $\text{C}_6\text{H}_3\text{Cl}(\text{NH}_2, \text{HCl})_2$, H_2O ppts. the product as an oil, which is extd. with Et_2O . Shaking with concd. HCl gives the HCl salt, which after sepn. of Et_2O and hydrolysis with H_2O gives the final product, also obtained by crystg. the oil by cooling with ice and salt in needles, insol. in H_2O , sol. in EtOH , Et_2O , C_6H_6 , petroleum ether and concd. acids, m . 50°. Yield, 60%. (C) **2-Chlorocamphorquinoxaline.**—As — (B) using 1,3,4- $\text{C}_6\text{H}_3\text{Cl}(\text{NH}_2)_2$. Yield, 55-60%. Dissolved in 1:1 petroleum ether- C_6H_6 , filtered, concd. and crystd. by rubbing, it softens, then m . 98°, sol. in EtOH , Et_2O , C_6H_6 , petroleum ether and concd. acids, in H_2SO_4 with yellow color.

The dehydration also takes place by heating in EtOH, or by allowing the ppt. to stand overnight in the mother liquor. The diquinoxaline, recrystd. from C_6H_6 , after decolorizing with charcoal, m. 333-5°, is sol. in concd. acids (the H_2SO_4 soln. is yellow), pptd. by H_2O , sol. in EtOH and C_6H_6 , slightly in Et_2O and petroleum ether. (b) 2,3-Diaminocamphorquinoxaline.—The condensation takes place in EtOH, with enough H_2O added to dissolve the HCl salt, and a small amount of dil. HCl. After short warming, the soln. turns dark red. No pptn. takes place on dilg. with H_2O . The EtOH is evapd. on a steam bath, and NH_3 is added. The mass is extd. several times with Et_2O , and the soln. is concd. This is then reextd. with fairly concd. H_2SO_4 . The soln. has the color of $KMnO_4$ (dibasic salt), and turns orange-red on diln. (monobasic salt). With an excess of concd. H_2SO_4 or with fuming acid, the soln. turns colorless, corresponding to the tri- or tetrabasic salt. The H_2SO_4 soln. of the dibasic salt is treated slowly with NH_3 , and the orange monobasic salt is pptd. This, treated with NH_3 , gives the free base as a yellow powder, sol. in Et_2O , EtOH, C_6H_6 , slightly sol. in H_2O , insol. in petroleum ether, all solns. being highly fluorescent, with the same cast as (F) above, while the unsym. isomer (G) above is not fluorescent. Purified by dissolving in C_6H_6 and pptg. by petroleum ether, it softens 130-40°, and m. 165°. Picrate, orange powder, m. 176°, preceded by softening. (K) 1,2-Benzocamphorquinoxaline.—A suspension of α - $C_{10}H_7(NH_2)_2$ in EtOH is added to I in EtOH. A few drops of HCl are added to clarify the soln., which is heated for 30 min. If a ppt. forms on cooling, the condensation is incomplete. The soln. is dild. with H_2O and extd. with Et_2O . This is treated as in (E) above, with HCl, H_2O , then NH_3 . If instead the HCl soln. is treated with only a small amount of H_2O and the sides are rubbed with a glass rod, a yellow ppt. of the HCl salt is formed, which turns colorless upon diln. or addn. of NH_3 (free base). Recrystd. it m. 85-6°, forms a blue soln. in concd., canary-yellow in dil. H_2SO_4 . (L) 2,3-Diaminoanthraquinone camphorquinoxaline.—By refluxing for 2 hrs. 1 mol. of I with 1 mol. of 2,3-diaminoanthraquinone in glacial AcOH, using 250 cc. of solvent per g. of I. The soln. is filtered, and, after cooling, dild. with H_2O . Yield, 75%. The product is dried, dissolved in hot C_6H_6 , the soln. filtered and a small amount of impurities pptd. by addn. of an equal vol. of petroleum ether. The filtrate is concd. and the product seps. on cooling in orange-yellow needles, m. 211°, sol. in EtOH, Et_2O , C_6H_6 , petroleum ether, glacial AcOH, Me_2O and concd. HCl. G. CALINGAERT

Molecular compounds of aromatic iodides. PAUL PFRIFER, HELMUT SCHMITZ AND TOSHI INOUE. Univ. Bonn. *J. prakt. Chem.* 121, 70-84(1929).— $PhCH_2I$ in $CHCl_3$ and Cl_2 give a dichloride, yellow, m. 102° (decompn.) (72% yield); the corresponding iodoso deriv., pale yellow, m. 225-30°, could not be obtained pure. $MeIC_6H_4I$, yellow, m. 109-10° (Stollé, *Ber.* 21, 1099(1888) gives 99-100°), the Cl deriv. m. 58-8.5° (S. gives 51°); the Br deriv. m. 71° (S. gives 58-9°); the iodide dichloride, yellow, m. 101-2° (decompn.). 3,3'-Dimethoxy-4,4'-diiodobiphenyl, orange yellow, m. 181.5-3°, results in 67% yield from *o*-dianisidine; the dichloride, greenish yellow, m. 109-10° (decompn.). 3,3'-Dinitro-4,4'-diiodobiphenyl, greenish yellow, m. 246-7°. 4-Iodostilbene, m. 152°; the 2- NO_2 deriv., greenish yellow, m. 110 (14% yield); 2-nitro-4-iodo-4'-methoxystilbene, golden yellow, m. 100-100.5° (18% yield). F.-p. data and curves are given for the systems p - IC_6H_4Ph and piperonalacetophenone (which do not form a compd.), dianisalacetone (which form a mol. compd. in the ratio of 1:2), dipiperonalacetone, sarcosine anhydride, α - $C_{10}H_7OH$, menthol, α - $C_{10}H_7NH_2$ and 1,3,5- $C_6H_3(NO_2)_3$ (none of which forms a mol. compd. with IC_6H_4Ph) and for Ph and dianisalacetone, which, likewise, do not form a mol. compd. C. J. WEST

Utilization of titanium tetrachloride in organic syntheses. G. L. STADNIKOV AND L. I. KASHTANOV. Moscow Coal Research Lab. *J. Russ. Phys.-Chem. Soc., Chem. Pt.* 60, 1117-22(1928).— $TiCl_4$ being analogous to $SnCl_4$, an investigation was made whether it has a similar behavior in org. reactions. Benzene does not react with $TiCl_4$. Benzyl Et ether in presence of $TiCl_4$ in C_6H_6 decomps., forming at first $PhCH_2Cl$, after which the latter reacts with C_6H_6 and gives mono- and disubstituted derivs. 50 g. $TiCl_4$ is dropped with agitation and cooling into a soln. of 72 g. benzyl ethyl ether in 350 g. of dry C_6H_6 , whereupon the soln. gradually darkens. After being boiled 10 hrs. on a water bath to drive off HCl fumes, the mixt. is decompd. with water and fractionated at 10 mm. 46.5 g. Ph_2CH_2 , and 17.8 g. of a mixt. of *p*- and *m*- $C_6H_4(CH_2Ph)_2$ have thus been obtained. Benzyl chloride.—20 g. $PhCH_2Cl$ was added drop by drop to 20 g. $TiCl_4$ in 200 g. dry C_6H_6 , the mixt. was boiled on a water bath till the cessation of HCl fumes and, after decompn. by H_2O , was fractionated, yielding 9.4 g. CH_2Ph_2 , 1.6 g. *p*- $C_6H_4(CH_2Ph)_2$, 1.8 g. *m*- $C_6H_4(CH_2Ph)_2$ and 6.6 g. residue. Benzoyl chloride and benzene in presence of $TiCl_4$ do not yield $PhCOMe$; $BzOH$ is obtained quant. The introduction of the Bz radical into the thiophene ring takes place easily: 22.2 g. $BzCl$

was added drop by drop to 13.3 g. thiophene and 30 g. TiCl_4 in 250 g. C_6H_6 , the mixt. was boiled on a water bath 5 hrs., then decompd. by water and, on being fractionated, yielded 27.8 g. crude benzothienone. If the expt. is made by dropping TiCl_4 into thiophene and BzCl in C_6H_6 , the yield of the ketone is 98%. This reaction may be utilized for the quant. detn. of thiophene in crude C_6H_6 . *Iso- and diso-Am esters of acetic and benzoic acids do not decomp. in presence of TiCl_4 in C_6H_6 .*

BERNARD NELSON

Dehydration of benzohydrol by the xanthate method. D. N. KURSANOV. *J. Russ. Phys.-Chem. Soc., Chem. Part* 60, No. 6, 921-4 (1928).—Among the products obtained by Nef (cf. *Ann.* 298, 235 (1897)), by heating Ph_2CHOH was supposed to be $(\text{Ph}_2\text{C})_2$, but it was not actually detected. By effecting the complete dehydration of Ph_2CHOH by the xanthate method of Chugaev, K. actually obtained $(\text{Ph}_2\text{C})_2$ as decompn. product. Twenty g. Ph_2CHOH , 4.7 g. metallic K and 90 cc. dry C_6H_6 were heated on a water bath 25 hrs. After removing the unchanged K (0.15 g.), 10 g. CS_2 was added which pptd. K benzohydrylxanthate, $\text{Ph}_2\text{CHOC}_2\text{S}_2\text{K}$. The pptn. having been completed on a water bath, the salt was esterified by boiling with 20 g. MeI for 3 hrs.; 27 g. of the ester $\text{Ph}_2\text{CHOC}_2\text{S}_2\text{Me}$ were obtained as a thick uncongealing yellow liquid. On heating the ester in a Würtz flask, the decompn. began at 190° and was completed at 260° . A few g. of crystals of $(\text{Ph}_2\text{C})_2$ were formed on the bottom of the flask; after recrystn. from a mixt. of alc. and C_6H_6 they m. $223-4^\circ$. $\text{Ph}_2\text{CHOC}_2\text{S}_2\text{Me} = \text{COS} + \text{MeSH} + \text{Ph}_2\text{C} < ; 2\text{Ph}_2\text{C} < = \text{Ph}_2\text{C}:\text{CPh}_2$.

BERNARD NELSON

Use of magnesium and methanol as a reducing agent. L. ZECHMEISTER AND P. ROM. *Univ. Pécs. Ann.* 468, 117-32 (1929).— Ph_2CO (9.1 g.) in 200 cc. abs. MeOH is reduced by 4.55 g. Mg during 2 hrs., giving 98% of Ph_2CHOH , m. 64° or 89%, m. 67.5° ; approx. the same yield can be obtained in a shorter time by the use of Mg and NH_4Cl in com. EtOH. $(\text{PhCH}_2)_2\text{CO}$ gives 89% of $(\text{PhCH}_2)_2\text{CHOH}$; BzMe gives 45.5% of PhMeCHOH , b_{780} 204° , and 11% of the pinacol, m. 124° . BzCH_2Br (7.96 g.) and 11.67 g. Mg in 300 cc. MeOH give 68% of PhMeCHOH ; the splitting off of the Br is quant. $p\text{-MeOC}_6\text{H}_4\text{Ac}$ gives 47% of $p\text{-MeOC}_6\text{H}_4\text{CH}(\text{OH})\text{Me}$, b_{780} 310° ; the distn. residue contains a little pinacol. $\text{PhCH}:\text{CHAc}$ gives 77% of $\text{PhCH}_2\text{CH}_2\text{CH}(\text{OH})\text{Me}$, b_{780} 238° , b_{11} $123-4^\circ$; $\text{CO}(\text{CH}:\text{CHPh})_2$ gives 70% of $\text{CH}(\text{OH})(\text{CH}_2\text{CH}_2\text{Ph})_2$, m. $42-4^\circ$. Ph_2CCl_2 , Mg and MeOH give 85.5% of $\text{Ph}_2\text{C}(\text{OMe})_2$. PhCl is not reduced; PhBr gives about 60% C_6H_6 , while PhI , $\alpha\text{-C}_{10}\text{H}_7\text{Br}$ and $\alpha\text{-C}_{10}\text{H}_7\text{Cl}$ are quant. reduced to C_6H_6 or C_{10}H_8 . PhNO_2 (6.15 g.), 110 cc. MeOH and 6 g. Mg give 27.5% $(\text{PhNH})_2$; if the crude product is not recrystd. but distd. with Fe or Mg powder, the yield is 70%. When 24.6 g. PhNO_2 , 600 cc. MeOH and 10.95 g. Mg are heated, there results 24.5% of azoxybenzene. $o\text{-O}_2\text{NC}_6\text{H}_4\text{Me}$ gives 57% of 2,2'-dimethylazoxybenzene; $m\text{-O}_2\text{NC}_6\text{H}_4\text{Me}$ gives 69% of the 3,3'- Me_2 deriv., while $p\text{-O}_2\text{NC}_6\text{H}_4\text{Me}$ gives 61% of the 4,4'- Me_2 deriv. $o\text{-ClC}_6\text{H}_4\text{NO}_2$ gives 60% of 2,2'-dichloroazoxybenzene (Mg and NH_4Cl give 57%; corresponding figures will be given for the other compds.); $m\text{-ClC}_6\text{H}_4\text{NO}_2$ gives 80% of the 3,3'- Cl_2 derivs. (90%); $p\text{-ClC}_6\text{H}_4\text{NO}_2$ gives 81% of the 4,4'- Cl_2 deriv. (81%); $o\text{-BrC}_6\text{H}_4\text{NO}_2$ gives 32% of the 2,2'- Br_2 deriv. (30%); $m\text{-BrC}_6\text{H}_4\text{NO}_2$ gives 70% of the 3,3'- Br_2 deriv. (59%); $p\text{-BrC}_6\text{H}_4\text{NO}_2$ gives 84% of the 4,4'- Br_2 deriv. (57%); 2,5- $\text{Br}_2\text{C}_6\text{H}_3\text{NO}_2$ gives 80% of 2,2',5,5'-tetrabromoazoxybenzene, light yellow, m. 166° (cor.), which gives an intense carmine-red color with concd. H_2SO_4 . C. J. W.

New substantive dyes derived from 2,7-diaminofluorene. A. NOVELLI AND C. CELSTINO RUIZ. *Anales asocn. quim. Argentina* 16, 56-64 (1928).—2,7-Diaminofluorene tetrazoate has been prepd. and coupled with two naphthylaminosulfonic acids. The respective bisazo compds. have thus been obtained. They are analogous in all properties to those obtained from benzidine. This is another evidence in favor of the similarity of fluorene and benzidine. The directions of Butler and Adams (C. A. 19, 3267), have been modified.

ALBERT L. HENNE

Ammonium salt of aurintricarboxylic acid. G. B. HEISIG AND W. M. LAUER. *Org. Syntheses* 9, 8-10 (1929).— $o\text{-HOC}_6\text{H}_4\text{CO}_2\text{H}$ (20 g.) is dissolved, at 20° , in a soln. of 10 g. NaNO_2 in 70 cc. concd. H_2SO_4 , the soln. cooled to 0° and treated with 5 cc. of 35-40% HCHO and the resulting acid dissolved in dil. NH_4OH ; evapn. of the soln. gives 83-96% of the light yellowish brown NH_4 salt, sufficiently pure for use as a test for Al.

C. J. WHEAT

Preservation of optical activity in splitting out water from optically active glycols. II. Formation of optically active ketones by the semi-pinacolin rearrangement. ROBERT ROGER AND ALAN MCKENZIE. St. Andrew's Univ. *Ber.* 62B, 372-84 (1929).—A soln. of *l*-Et mandelate treated with the Grignard reagent from PhCH_2Cl , decompd. by H_2O gave the *d*-glycol (*d*-2-phenyl-2-hydroxy-1,1-dibenzylethanol). On dehydration with cold concd. H_2SO_4 , racemization occurs (cf. C. A. 19, 491), but by boiling with 57% H_2SO_4 is obtained the optically active ketone *d*- α - γ -diphenyl- γ -benzyl-

acetone which is racemized by traces of alc. KOH or by soln. in cold. coned. H_2SO_4 . *l*-Benzoin treated with the Grignard reagent from PhCH_2Cl and decompd. by H_2O gives *l*-1,2-diphenyl-2-hydroxy-1-benzylethanol, which on dehydration with AcCl gives an inactive benzylhydrobenzoin. R. and McK. discuss the mechanism of the conversion of the glycol to the ketone with and without racemization on the basis of an intermediate ethylene oxide compd. or of a vinyl deriv. A. P. SACHS

Dihydro- and tetrahydronaphthoic acids obtained by catalytic hydrogenation. A. LEÓN AND A. CHARRO. *Anales soc. españ. fís. quim.* 26, 423-9 (1928); cf. C. A. 22, 777.—Catalytic hydrogenation by Pt oxide in the cold of naphthoic acids gave two isomers of dihydro- β -naphthoic acid, m. 132° and $140-1^\circ$, resp., not coinciding with any given in the literature. The corresponding amides, m. $133-4^\circ$ and 191° , resp. Tetrahydrogenation gave only one compd., m. 153° ; amide, m. 139° . Perhydrogenation of this acid gave the same decahydro acid as already obtained by direct perhydrogenation of $\beta\text{-C}_{10}\text{H}_7\text{CO}_2\text{H}$ (*loc. cit.*). E. M. SYMMES

ac-Tetrahydro- β -naphthylamine. E. B. H. WASER AND H. MÖLLERING. *Org. Syntheses* 9, 84-9 (1929).—Complete details are given for the reduction of $\beta\text{-C}_{10}\text{H}_7\text{NH}_2$ with Na and AmOH , the yield of the tetrahydro deriv. being 51-7%. The base b_1 118.5° , b_{11} $127.5-8^\circ$, b_{10} $140-40.5^\circ$. C. J. WEST

β -Naphtholphenylaminomethane. M. BETTI. *Org. Syntheses* 9, 60-3 (1929).—By allowing a mixt. of 144 g. $\beta\text{-C}_{10}\text{H}_7\text{OH}$ in 200 g. 95% EtOH, 212 g. BzH and 200 cc. 95% EtOH satd. with NH_3 at room temp. to stand 2 hrs. in a closed flask, then removing the stopper and, after 12 hrs., filtering, there results 85-92% of the condensation product $\text{PhCH}(\text{C}_{10}\text{H}_7\text{OH})\text{N}:\text{CHPh}$, m. $148-50^\circ$. This is treated with 3-4 times its vol. of 20% HCl and distd. with steam, giving 84-91% of the HCl salt of $\text{PhCH}(\text{C}_{10}\text{H}_7\text{OH})\text{NH}_2$, which is liberated with KOH; the yield of amine is 73-5%. C. J. W.

Synthesis of isonaphthothioxin. AARON COHEN AND SAMUEL SMILES. King's College, London. *J. Chem. Soc.* 1929, 209-13.—The diazo compd. from 1,2- $\text{C}_{10}\text{H}_6(\text{NH}_2)_2\text{SO}_2\text{H}$ and CuBr in HBr give 50% of the Br acid; PCl_5 gives 1-bromonaphthalene-2-sulfonyl chloride, m. $93-4^\circ$; reduction gives 60% of 1-bromonaphthalene-2-sulfinic acid (I), m. 146° (chloride, yellow, m. 110°). I is also obtained from 1,2- $\text{C}_{10}\text{H}_6(\text{BrNH}_2)_2$ through the diazo compd., SO_2 and Cu in 60% yield. I, reduced by SO_2 in EtOH contg. a little HI, gives 90% of di-1-bromonaphthyl 2-disulfide, m. 161° ; this also results nearly quant. by adding Br in AcOH to 2-naphthyl disulfoxide in AcOH, owing to reduction by the HBr liberated. Adding the theoretical amt. of Br in AcOH to 2-hydroxydinaphthyl 2,1'-disulfide in hot AcOH gives 95% of 1-bromo-2'-hydroxydinaphthyl 2,1'-sulfide (II), m. 154° (sometimes the product m. $135-6^\circ$, then resolidified and m. 154°). The structure of II was confirmed by heating I and $\beta\text{-C}_{10}\text{H}_7\text{OH}$ at $95-100^\circ$ for 2.5 hrs. Ac deriv. of II, m. $116-7^\circ$. The dry Na deriv. of II and a little $\text{Cu}(\text{OAc})_2$, heated at 1 mm., give 50% of isonaphthothioxin. C. J. WEST

Synthesis of meso-alkyl- and meso-arylanthracene derivatives. V. EDWARD DE B. BARNETT AND NORMAN F. GOODWAY. Sir John Cass Tech. Inst., London. *J. Chem. Soc.* 1929, 20-3; cf. C. A. 27, 3654.—1,5-Dichloro-9-benzohydrylanthracene (I), m. 191° , results in 50% yield from 1,5-dichloroanthracene, 20% KOH and PhCHCl by boiling 30 mins.; reduction gives 1,5-dichloroanthracene. I reacts with RMgX to give derivs. of benzohydryldichlorodihydroanthracene (the yield is only about 5% except in the case of the Me, Ph and PhCH_2 derivs.): Me, m. 160° ; Et, m. 140° ; $\alpha\text{-Pr}$, m. 185° ; $\beta\text{-Pr}$, m. 170° ; Bu, m. 182° ; iso-Bu, m. 212° ; iso-Am, m. 193° ; benzyl, m. 206° . Ph (II), m. 259° . I does not react with the *p*-anisyl, *o*-tolyl or α -naphthyl reagents. The Me, Et, benzyl and Ph compds., heated with AcOH contg. a little HCl, pass very easily into the corresponding alkyl- or arylanthracene. II, recrystd. from $\text{C}_6\text{H}_5\text{Me}$, shows a progressive rise in m. p. and when boiled 4 hrs., there results iso-1,5-dichloro-9-phenyl-10-benzohydryl-9,10-dihydroanthracene, m. 271° , which, with AcOH-HCl, gives 1,5-dichloro-9-phenylanthracene. C. J. WEST

Reduction products of the hydroxyanthraquinones. X. RICHARD W. HARDACRE AND ARTHUR G. PERKIN. Univ. of Leeds. *J. Chem. Soc.* 1929, 180-93; cf. C. A. 21, 2804.—Heating 1 g. 2,2'-diacetoxyhelianthron (I) and 3 g. I in 15 cc. $\text{C}_6\text{H}_5\text{N}$ gives 1.288 g. of 3,3'-diiodo-2,2'-dihydroxyhelianthron, maroon, whose di-Ac deriv., orange, m. $268-70^\circ$ (decompn.). I and Br in cold $\text{C}_6\text{H}_5\text{N}$ give the corresponding 3,3-di-Br deriv., brick-red; di-Ac deriv., orange-red, m. $293-6^\circ$. The 3-I deriv. of I (1 g.) in 1800 cc. C_6H_6 , exposed to light for 3 weeks, gives the pale yellow 3-iodo-2,2'-diacetoxy-naphthodianthrone, m. above 340° , which gives a red soln. in H_2SO_4 and evolves I when strongly heated. 2-Hydroxyanthraquinone in boiling 1% NaOH, gradually treated with NaOBr and boiled for 1 hr., gives the 1,3-di-Br deriv. (II), yellow, m. $216-7^\circ$; *o*-Ac deriv., yellow, m. 195° ; 2-MeO deriv., pale yellow, m. $226-7^\circ$. II heated with

concd. NaOH at 200° for 6 hrs. gives 3-bromoalizarin, whose di-Ac deriv., m. 201–2°. 1-Bromo-2-hydroxyanthraquinone, yellow, m. 185–7°; Ac deriv., yellow, m. 182–3°; MeO deriv., m. 247°; Bz deriv., yellow, m. 229–30°. The Br deriv., boiled in C₁₀H₈ with Cu, gives 2,2'-dihydroxy-1,1'-dianthraquinonyl (III). 1-Chloro-2-methoxyanthraquinone, yellow, m. 223–4°, does not react with Cu in boiling PhNO₂; the 2-Bz deriv., yellow, m. 228–30°, with Cu in C₁₀H₈, gives III. III, reduced with Zn and dil. NH₄OH, gives, after acetylation, a mixt. of 3,9-diacetoxyanthracene, m. 157–8°, and the tetra-Ac deriv., yellow, m. 267–8°, of 2,2'-dihydroxy-1,1'-dianthranolyl, yellow, m. about 290°. If the Zn is added all at once, only the latter product is formed. 1-Chloro-2-hydroxyanthraquinone, reduced with Al in H₂SO₄ at 30–40°, gives chlorohydroxyanthranol, greenish yellow, m. 230°, isolated through the di-Ac deriv., light yellow, m. 168°. 2-Hydroxyanthraquinone and I in C₆H₅N, boiled 15 mins., give the 3-I deriv. (IV), yellow, m. 278–9°, isolated through the Ac deriv. (V), yellow, m. 224–5°; 2-MeO deriv., pale yellow, m. 228–9°; treatment of the latter with MeONa at 110° for 12 hrs. removes the I, while concd. NH₄OH and a trace of Cu at 160–80° for 8 hrs. give 3-amino-2-hydroxyanthraquinone, reddish brown with metallic iridescence; the NH₂ group could not be replaced by OH. IV and BzCl in C₆H₅N give the 2-Bz deriv., yellow, m. 185°, which, heated with Cu in C₁₀H₈ and the product acetylated, gives 3,3'-diacetoxo-2,2'-dianthraquinonyl, m. 315°. Reduction of V with Al in H₂SO₄ gives 2-iodo-3-hydroxyanthranol, m. 239–40°, isolated through the di-Ac deriv., m. 196°. The latter, with FeCl₃ in AcOH, heated at 100° for 45 mins., gives 2,2'-diiodo-3,3'-dihydroxydianthrone (VI), yellow, m. 267–8°; H₂SO₄ and Ac₂O give a di-Ac deriv., m. 227–8°; boiling Ac₂O and C₆H₅N give the tetra-Ac deriv. of 2,2'-diiodo-3,3'-dihydroxydianthrone, yellow, crystg. with 2 mols. Me₂CO, m. 220°, then resolidifies and m. 290°; from Ac₂O, it m. 293–5°. VI and K₂Fe(CN)₆ in 10% NaOH give 2,2'-diiodo-3,3'-dihydroxydianthraquinone, whose di-Ac deriv., m. 306–8°. With K₂S₂O₈, VI gives 3,3'-diiodo-2,2'-dihydroxyheli-anthrone. Acetylanthrapurpurinanthranol and FeCl₃ in AcOH give a mixt. of a yellow and a blue amorphous compd., the former of which, with Ac₂O gives 3,4,6,3',4',6'-hexaacetoxydianthrone, m. 250–1°. The latter, exposed in AcOH to the sunlight, yields 3,4,6,9,3',4',6',9'-octaacetoxydianthrone, m. 239–40°.

C. J. WEST

Derivatives of aminomethylhydroxyanthraquinones and dihydroxydianthraquinonyl-ethylenes. HENRI DE DIESBACH AND PAUL GUBSER. *Helv. Chim. Acta* 11, 1098–1125 (1928).—D. and G. have studied the reaction of 3 methylols—PhCONHCH₂OH (I), Cl₃CCONHCH₂OH (II), C₆H₄(CO)₂NCH₂OH (III)—in concd. H₂SO₄ with 1-(IV) and 2-hydroxyanthraquinone (V), 1-(VI) and 3-hydroxy-2-methylanthraquinone (VII), 2-hydroxyanthraquinone-3-carboxylic acid (VIII), 2,3-(hystazarin) (IX), 1,5-(anthra-rufin) (X) and 1,8-dihydroxyanthraquinone (chrysazin) (XI), the following compds. being prepd.: 1-trichloroacetylaminomethyl-2-hydroxyanthraquinone (XII) from II and V, m. 215°, 1-benzoylaminomethyl-2-hydroxyanthraquinone from I and V, m. 250° (decompn.), N-[2-hydroxy-1-anthraquinonylmethyl]phthalimide, m. 265° (decompn.) and N-[2-hydroxy-1-anthraquinonylmethyl]phthalimidic acid (XIII) from III and V, 4-trichloroacetylaminomethyl-1-hydroxyanthraquinone, yellow, m. 197°, from II and IV, 4-benzoylaminomethyl-1-hydroxyanthraquinone, m. 208° and 2,4-bis[benzoylaminomethyl]-1-hydroxyanthraquinone, m. 276°, formed simultaneously from I and IV, 2,4-bis[phthaloylaminomethyl]-1-hydroxyanthraquinone, m. 295°, and bis-N-[1-hydroxyanthraquinonyl-2,4-methyl]phthalamidic acid, m. 178°, formed simultaneously from III and IV, 4-trichloroacetylaminomethyl-1-hydroxy-2-methylanthraquinone (XIV), m. 239°, from II and VI, 4-phthaloylaminomethyl-1-hydroxy-2-methylanthraquinone (XV), m. 285°, from III and VI, 1-trichloroacetylaminomethyl-2-hydroxy-3-methylanthraquinone, m. 227°, from II and VII, 1-phthaloylaminomethyl-2-hydroxy-3-methylanthraquinone, m. 244°, from III and VII, 1-trichloroacetylaminomethyl-2-hydroxyanthraquinone-3-carboxylic acid (XVI), decomp. without melting at 260°, from II and VIII, 1-phthaloylaminomethyl-2-hydroxyanthraquinone-3-carboxylic acid, m. 290°, from III and VIII, 1,4-bis[trichloroacetylaminomethyl]-2,3-dihydroxyanthraquinone (XVII), m. 253°, from II and IX, 1,4-bis[phthaloylaminomethyl]-2,3-dihydroxyanthraquinone, m. 272°, from III and IX, 4(?)-phthaloylaminomethyl-1,5-dihydroxyanthraquinone, decomp. 230°, from III and X, 2,4,6,8-tetra[trichloroacetylaminomethyl]-1,5-dihydroxyanthraquinone, decomp. 275°, from II and X, 2,4,5-tri[benzoylaminomethyl]-1,8-dihydroxyanthraquinone, decomp. 250° without melting, prepd. from I and XI, 2,4,5,7-tetra[phthaloylaminomethyl]-1,8-dihydroxyanthraquinone, from III and XI, 2,4,5,7-tetra[trichloroacetylaminomethyl]-1,8-dihydroxyanthraquinone, decomp. 260°, from II and XI. 2-Hydroxy-1,9-(N)isopyrrolanthrone (XVIII) is prepd. by treating XII with boiling 10% NaOH in H₂O 4 hrs. XVIII and BzCl in pyridine give 2-benzoyloxy-1,9-(N)isopyrrolanthrone. The treatment of XVIII with boiling AcOH gives sym. 1,1'-(2,3'-dihydroxydianthra-

quinonyl]glycol (XIX). XIX and BzCl in pyridine give 1,1'-[2,2'-dibenzoyldioxydianthraquinonyl]-dibenzoylglycol, which is very hygroscopic. sym.-1,1'-[2,2'-Dihydroxydianthraquinonyl]ethylene (XX) is prepd. by treating XII with boiling 10% NaOH in O (66%) as bronze crystals. Di-Bz deriv. prepd. from XX, BzCl and pyridine, 2-Hydroxyanthraquinone-1-carboxylic acid, formed as a secondary product in the prepn. of XX, m. 237°. Sapon. of XIII with 10% NaOH gives 1-aminomethyl-2-hydroxyanthraquinone (XXI). XXI, phthalic acid and AcOH in sealed tube at 170° for 4 hrs give sym.-1,1'-[2,2'-dihydroxydianthraquinonyl]ethylenediamine, which on heating in PhNO₂ gives XX. XIV with boiling 10% NaOH in H gives 1-hydroxy-2-methyl-4,10-(N)-isopyrrolanthrone, and in O gives sym-4,4'-[1,1'-dihydroxy-2,2'-dimethyldianthraquinonyl]ethylene. Sapon. of XV with NaOH gives 1-hydroxy-2-methyl-4-aminomethylanthraquinone (XXII) as an addn. product with phthalic acid, which when heated to 170° with AcOH in a sealed tube gives sym-4,4'-[1,1'-dihydroxy-2,2'-methyldianthraquinonyl]ethylenediamine. Sapon. of XVI in H gives 1-aminomethyl-2-hydroxyanthraquinone-3-carboxylic acid which is very unstable, forming sym-1,1'-[2,2'-dihydroxy-3,3'-dicarboxydianthraquinonyl]glycol. XVI with 10% NaOH at 70° gives sym-1,1'-[2,2'-dihydroxy-3,3'-dicarboxydianthraquinonyl]ethylene along with which is formed 2-hydroxyanthraquinone-1,3-dicarboxylic acid. XVII and 10% NaOH, 2-3 mins at 60°, followed by treatment with HCl gives the HCl salt of 1,1'-[2,2',3,3'-tetrahydroxy-4,4'-bis(aminomethyl)dianthraquinonyl]- α -hydroxy- β -aminoethane. F. C. H.

2-Aminoanthraquinone from chlorobenzene and phthalic anhydride. P. H. GROGGINS and H. P. NEWTON. *Ind. Eng. Chem.* 21, 369-75(1929).—Chlorobenzene, phthalic acid (I) is obtained in a com. pure state (96.7%) with almost theoretical yield when 3 mols. PhCl, 1 mol. C₆H₄(CO)₂O and 10% excess AlCl₃ are heated 5 hrs at 50° with thorough agitation, decompd. slowly with dil. H₂SO₄, steam distd. to remove PhCl, washed with H₂O, dissolved in 2.5% NaOH, blown with steam to remove traces of PhCl, cooled to 50° and added slowly to a large vol. of dil. H₂SO₄. When I is heated with H₂SO₄ (cf. C. A. 19, 2335), 2-chloroanthraquinone (II), m. 211°, is obtained—the yields (98-9%) and purity, which are dependent on conditions, were studied and are tabulated. Heating II with 28.5% aq. NH₃ at 215° from 6 to 18 hrs. gave 88% of 2-aminoanthraquinone (III), which may have as impurities II (from incomplete conversion), carbonaceous material (from excessive heating), dianthraquinonylamine (from a condensation reaction), traces of Fe (from the reaction vessel) and hydroxyanthraquinone (characteristic side reaction). The last mentioned impurity can be reduced by adding a small quantity of PhNO₂ to the 28.5% NH₃ or by using 40-50% NH₃. Purification of III by heating with 6-10 parts H₂SO₄ for 30 mins at 125°, dilg with H₂O, cooling, filtering, washing with hot H₂O and then boiling with a slight excess dil. Na₂CO₃ was found to be an economical method of producing a relatively pure (95-98%) product which is suitable for the prepn. of vat dyes. N. A. LANGRISH

Inductive method for the study of natural products. I. Naturally occurring anthraquinone derivatives. P. C. MITTER AND HAROGOPAL BISWAS. Univ. College of Science, Calcutta. *J. Indian Chem. Soc.* 5, 769-78(1928).—An examn. of naturally occurring C₁₄H₈O₂ derivs. shows that (1) none of them contains more than 1 Me (or CO₂H or carbinol) group or more than 3 OH groups, (2) the substances cont. the max. no. of substituents form the 4 fundamental types, (3) of the 4 substituents 2 (including Me or CO₂H or carbinol if present) occupy β -positions and 2 occupy α -positions, (4) if both the β -substituents are in one ring, the other groups are in the same ring, forming the 2 homonuclear types, (5) if the β -substituents are in different rings, the α -substituents are distributed so as to produce a sym. configuration, forming the 2 heteronuclear types. The homonuclear types are the chayroot (root of *Oldenlandia umbellata* (Linn)) and madder types; the heteronuclear are the emodin and morindone types. The following anthraquinones were prepd.: 1,5-dimethoxy-6-methyl, m. 170-7°; 1,5-dihydroxy-6-methyl, yellow, m. 190° (cf. Perkin and Hummel, *J. Chem. Soc.* 65, 857(1894), and Oesterle and Tisza, C. A. 2, 1997) and its Ac deriv., m. 230°. Condensation of hemipink anhydride with PhMe in presence of AlCl₃ gave 3-hydroxy-4-methoxy-2-*p*-toluoylbenzoic acid, m. 175-6°. This heated on the water bath with H₂BO₃, concd. H₂SO₄, and fuming H₂SO₄ gave 1-hydroxy-3-methoxy-6-methylanthraquinone (I), orange-yellow, m. 200°. *Ac deriv.*, m. 170°. Demethylated, I gave 6-methylanthraquinone, yellow, m. 220°. *Ac deriv.*, m. 190°. LOUISE KELLY

Pyrogenous dissociation of certain condensed cyclic compounds. N. A. OZLOV. Leningrad Acad. of Science. *J. Russ. Phys.-Chem. Soc.*, *Chem. Part* 60, No. 8, 1447-58(1928).—Having previously established (C. A. 22, 75) by using phenanthrene as an example, that condensed ring systems, when heated with compressed H₂, become hydrogenated before dissociating, O. now proceeds to a more detailed study of

the hydrogenation products of phenanthrene and of some related coal-tar hydrocarbons. The pyrolysis expts. were made in an 800-cc. Ipat'ev app., the initial H pressure was 70–75 atm., the max. 170 atm. at the temp. of 450–70°, the duration of heating being 7–9 hrs., after which the products obtained were fractionated and examd. Similar products were obtained by mere distn. with anhyd. AlCl_3 in a Würtz flask. The following hydrocarbons have thus been hydrogenated and dissociated: tetrahydropheanthrene (tetanthrene), methylisopropylphenanthrene (retene), fluorene, anthracene, tar oil. The conclusions are: Hydrocarbons with condensed rings suffer but partial hydrogenation, apparently chiefly to the stage of tetrahydride, after which the hydrogenated ring suffers a rupture with the formation of less complex alkyl-substituted hydrocarbons which in their turn hydrogenate further, but only to the stage of 1-ring benzene hydrocarbons. The alkyl radicals are easily split off and replaced by H. The action of a catalyzer, such as $\text{Fe}_2\text{O}_3 + \text{SiO}_2$ (1:1), consists in weakening the compds. at the points where hydrogenation takes place. When anhyd. AlCl_3 is used as catalyzer, the hydrogenation can take place even without the external action of compressed H, the needed H being supplied by a portion of the original substance which suffers a complete decompn. and a condensation resulting in the production of coke. The following deductions can be made with respect to the chemical process leading to the formation of coal-tar ring compds.: While the origin of C_{10}H_8 and of its homologs is usually ascribed to various condensation reactions of simpler compds., it is very likely that the higher fractions of the neutral primary tar oil contain hydrides of condensed ring hydrocarbons which by pyrolysis, particularly in presence of nascent H, produce C_{10}H_8 and its homologs; the dehydrogenation, which takes place simultaneously, leads to formation of typical hydrocarbons with condensed rings, their skeleton being formed at the expense of the bituminous component of the coal. B. N.

Furan compounds derived from sugars. II. Some acetyl derivatives of hydroxymethylfurfural. JUNJI KARASHIMA. *Physiol.-chem. Inst. Nagasaki. Z. physiol. Chem.* 180, 241–8(1929); cf. *C. A.* 21, 3912.—Acetoxymethylfurfural (I) was prepd. in 71.4% yield by heating hydroxymethylfurfural (II) 2 hrs. on a water bath with 2 mols. anhyd. NaOAc and 2.5 mols. Ac_2O , then dilg. with H_2O and evapg. *in vacuo*. Addn. of H_2O pptd. the Ac deriv. as a brownish oil, which gradually crystd. It showed the same m. p. 55°, as the prepn. Fenton and Gostling obtained by the use of AgOAc . Attempts to oxidize it to acetoxymethylpyromucic acid were unsuccessful. Metallic oxides, e. g., CuO , Ag_2O , HgO , not only oxidized the CHO but also sapond. the Ac, yielding hydroxymethylpyromucic acid. Alk. oxidizing agents, as KMnO_4 , carried the oxidation further, yielding dehydromucic and oxalic acids. Acetoxymethylfurfuracrylic acid, m. 134°, was obtained from I and also from II by the Perkin synthesis. The aldehyde was heated 6 hrs. in an oil bath at 160–70° with 3 mols. anhyd. NaOAc and 4 mols. Ac_2O , the reaction mixt. dissolved in aq. Na_2CO_3 , extd. with AcOEt to remove unchanged aldehyde, and the acid pptd. cryst. by addn. of HCl . The yield from I was 50% and from II 33.3%. Sapon. by $\text{Ba}(\text{OH})_2$, followed by treatment with CO_2 and H_2SO_4 to remove Ba, and extn. with Et_2O , yielded 72.5% hydroxymethylfurfuracrylic acid, m. 139°. This does not sublime like its Ac deriv. When fed to rabbits, dogs and chickens, I was excreted in the urine as hydroxymethylpyromucic acid, m. 167° (evolution of gas). The recovery of acid varied from 49.7 to 73.3%. Neither the Ac deriv. nor hydroxymethylpyromucic acid was found. A. W. DOX

Pyrrole. S. M. McELVAIN AND K. M. BOLLIGER. *Org. Syntheses* 9, 78–9(1929).—Mucic acid (630 g.) and 900 cc. NH_4OH (d. 0.9) are evapd. to dryness and the powd. NH_4 salt is mixed with 350 cc. $\text{C}_2\text{H}_5(\text{OH})_2$ and, after standing overnight, the mixt. is distd., giving 37–40% of pyrrole. C. J. WEST

Kakishibu. IV. Constitution of shibuol. 3. SHIGERU KOMATSU AND NAHIKO MATSUNAMI. *Mem. Coll. Sci. Kyoto Imp. Univ. Ser. A*, 11, No. 4, 205–9(1928) (reprint).—Benzene-azo-shibuol (I) was prepd. by treating fresh shibu free from pectin with PhN_2Cl . Its tinctorial properties were compared with those of the benzene-azo derivs. of myricetin, catechin and quercetin. In dyeing properties, shibuol and I greatly resemble myricetin and its benzene-azo compd. Reduction of shibuol in NaOH with Zn dust gave gallic acid and phloroglucinol. V. Methylation of shibuol. SHIGERU KOMATSU, NAHIKO MATSUNAMI AND MASAO KURATA. *Ibid* 211–5.—Methylation of shibuol in Na_2CO_3 with Me_2SO_4 gave dimethylshibuol; in NaOH trimethylshibuol (II) was obtained. Methylating in d. l. NaOH at a high temp. gave tetramethylshibuol (III) and II. In an acidic medium, methylation gave III. II treated with MeI gave III. Acetylation of II gave monoacetyltrimethylshibuol. These reactions indicate the presence of at least 4 free OH groups in the mol. of shibuol. R. C. ROWLANDS

Attempt to prepare γ -isoleidole. GORFREY W. FENTON AND CHRISTOPHER K.

INGOLD. Univ. Leeds. *J. Chem. Soc.* 1928, 3295-7.—F. and I. attempted to apply the reaction of Holmes and I. (*C. A.* 20, 2839) to the prepn. of ψ -isindole according to the following scheme: $o\text{-C}_6\text{H}_4(\text{CH}_2\text{Br})_2 \longrightarrow \text{C}_6\text{H}_4(\text{CH}_2)_2\text{NSO}_2\text{Ar} \longrightarrow \text{C}_6\text{H}_4\text{CH}_2\text{N:CH} + \text{SO}_2 + \text{ArH}$ but without success. 26.4 g. $o\text{-C}_6\text{H}_4(\text{CH}_2\text{Br})_2$ was

added to a cold suspension of 17.0 g. $p\text{-MeC}_6\text{H}_4\text{SO}_2\text{NH}_2$ and 10 g. Na_2CO_3 in a soln. of NaOEt (from 4.5 g. Na in 150 cc. EtOH). Gentle warming followed by boiling for 2 hrs., cooling, mixing with H_2O , nearly neutralizing with AcOH , and crystg. from EtOH yielded 13 g. $2\text{-}p\text{-toluenesulfonyldihydroisindole}$ (I), m. 176° . $2\text{-Benzenesulfonyldihydroisindole}$ (II), m. 140° . I distd. in N_2 with 85% KOH gave a distillate consisting of MePh and a small amount of basic product; the alk. residue contained tar, sulfite, no p -cresol. The picrate of the base, greenish yellow leaflets from EtOH , m. $196\text{--}7$ (decompn.) identified it as dihydroisindole (v. Braun, *C. A.* 17, 390). The same picrate was obtained from II. Since this result was unexpected it was confirmed in the following way: 1-Methyldihydroisindole (III) (Gabriel and Neumann, *Ber.* 26, 705(1893)) was converted into $2\text{-}p\text{-toluenesulfonyl-1-methyldihydroisindole}$ (IV), which on distn. with 75% KOH gave PhMe , sulfite, tar, no p -cresol but III, which was identified by conversion to the nitrosamine, m. 100° and its conversion into IV.

DAVID DAVIDSON

Phenylindene series. I. The β,β -diphenylhydrindone. CHARLES MOUREU, CHARLES DUFRAISSE AND PAUL M. DEAN. College de France, Paris. *Bull. soc. chim.* 43, 1367-71(1928).— $\text{Ph}_2\text{CCH}_2\text{CO}_2\text{H}$ may be prepd. (1) by condensing Ph_2CBr and the $\text{CHNa}(\text{CO}_2\text{Et})_2$ or (2) condensing Ph_2COH with $\text{CH}_2(\text{CO}_2\text{H})_2$. The latter method is the more practical and gave a 76% yield. The condensation of this acid by itself in H_2SO_4 gave β,β -diphenylhydrindone (I), which fuses at $129\text{--}30^\circ$ and gives an oxime, m. $155\text{--}6^\circ$. II. Passage of β,β -diphenylhydrindone into α,β -diphenylindone. CHARLES MOUREU, CHARLES DUFRAISSE AND FRANÇOIS BAYLOCO. *Ibid* 1371 80. —Br on I gave its *mono-Br* (II), m. $154\text{--}5^\circ$, and *di-Br deriv.* (III), m. 205° . PBr_3 on I or II gave a mixt. of II and III. PBr_3 did not react with III. Heating III in a closed tube at 170° gave 8% α,β -diphenylindone (IV), m. $151\text{--}2^\circ$. Dehydrogenating I gave IV. Heating II in a closed tube up to 200° gave 75% IV. Heating III gave IV easily and in good yield. Treating I with $\text{C}_6\text{H}_5\text{NO}_2$ and EtONa in abs. alc. gave the α -diketone monoxime, m. 220° . $\text{Ph}_2\text{CCH}_2\text{COCl}$ prepd. from the acid and SOCl_2 is changed to I by AlCl_3 in CS_2 . III. Some derivatives of α,β -diphenylindone. CHARLES MOUREU, CHARLES DUFRAISSE AND MARIUS BADOCHÉ. *Ibid* 1381-8. —Heating IV and PCl_5 gave dichlorodiphenylhydrindone (V), m. $132\text{--}3^\circ$. Treating V with Cu in C_6H_6 and Mg in Et_2O gave IV. Alc. KOH removed about 0.5 of the Cl from V but the product was not studied further. Treating IV in Et_2O with Na and decompg. the excess Na with H_2O gave a compd., m. $129\text{--}30^\circ$ consisting of IV to which 1 mol. H_2O had been added. P_2O_5 and ZnCl_2 removed the H_2O from this compd. giving IV. From the mother liquor of the reaction with Na, there was obtained 23% of the compd. $\text{C}_{14}\text{H}_{10}\text{O}$, which is IV contg. 2 extra H. Heating this compd. with PbO gave IV. Treating IV in AcOH with reduced Fe gave the same reduced product.

R. C. ROBERTS

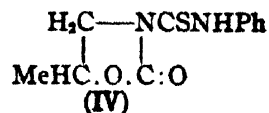
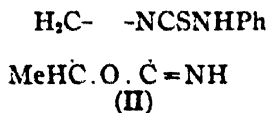
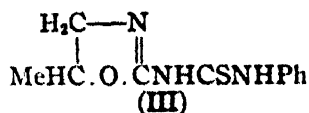
Synthesis of phenylindones from nitriles of the cinnamic acid series. P. FEFIEFFER, H. BEHR, H. KÜBLER AND H. RÜPING. Univ. Bonn. *J. prakt. Chem.* 121, 85-96 (1929).— $\text{O}_2\text{NC}_6\text{H}_4\text{C}(\text{CN})\text{:CHPh}$ (the *cis* form, since it is not esterified by MeOH and HCl), warmed on the H_2O bath with concd. H_2SO_4 , yields 4'-nitro-2-phenylindone, red, m. $156\text{--}7^\circ$; the concd. H_2SO_4 soln. is brownish red. $\text{O}_2\text{NC}_6\text{H}_4\text{C}(\text{CN})\text{:CHC}_6\text{H}_4\text{Cl}$ (*cis* form, m. 182°) and concd. H_2SO_4 give 4'-nitro-5-chloro-2-phenylindone, deep red, m. 195° , and the acid amide, $\text{O}_2\text{NC}_6\text{H}_4\text{C}(\text{CONH}_2)\text{:CHC}_6\text{H}_4\text{Cl}$, m. 230° . $p\text{-NCC}_6\text{H}_4\text{:CH}_2\text{CN}$ and BzH , condensed by heating with a few drops of piperidine at $100\text{--}10^\circ$, give p,μ -dicyanostilbene, m. $146\text{--}7^\circ$; with MeOH and HCl this yields *Me* μ -cyanostilbene-*p*-carboxylate, m. $146\text{--}7^\circ$; *Et ester*, m. $133\text{--}4^\circ$; with concd. H_2SO_4 there results quant $2\text{-phenylindone-4-carboxamide}$, orange, m. 198° . p,μ -Dicyano-*p'*-methoxystilbene, greenish yellow, m. $161\text{--}2^\circ$; MeOH and HCl give *Me* μ -cyano-*p'*-methoxystilbene-*p*-carboxylate, light yellow, m. 158° . $p\text{-NCC}_6\text{H}_4\text{C}(\text{CN})\text{:CHC}_6\text{H}_4\text{NMe}_2$, warmed 1 hr. on the H_2O bath with concd. H_2SO_4 , gives a diamide (?), yellow-brown, m. 268° ; heating this with 10% NaOH about 10 hrs. gives the monoamide of *p'*-dimethylaminostilbene μ,β -dicarboxylic acid, light yellow, crystg. with 1 H_2O ; the anhyd. form is reddish orange, m. 264° ; *Ba salt*, light yellow needles; *Me ester*, canary-yellow, m. 217° ; *Et ester*, canary-yellow, m. 185° .

C. J. WIST

1-*o*-Chlorophenyl-3-methyl-5-pyrazolone and its derivatives. Z. TOMASIK. *Roczniki Chem.* 3, 345-8(1928).— $o\text{-ClC}_6\text{H}_4\text{NHNH}_2$ condenses with $\text{AcCH}_2\text{CO}_2\text{Et}$ to yield 1-*o*-chlorophenyl-3-methyl-5-pyrazolone, m. 190° (4-benzylidene deriv., m. 157° ; 4-*o*-nitro-

benzylidene deriv., m. 160°), which when condensed with *o*-O₂NC₆H₄CHO yields *o*-nitrophenylbis-[1-*o*-chlorophenyl-3-methyl-5-pyrazolonyl]methane, m. 249°. B. C. A.

Tautomerism of some heterocyclic compounds. EMIL FROMM, REGINE KAPPELLER-ADLER, W. FRIEDENTHAL, L. STANGEL, J. EDLITZ, E. BRAUMANN AND J. NUSSBAUM. Lab. med. Chemie zu Wien. *Ann.* 467, 240-74(1928).—This work is an extension of the previous work on the tautomerism of aminooxazolines (*C. A.* 20, 2160). Amino-thiazolines react with thiocarbimides, yielding 2 series of thiocarbamides according to the conditions; no tautomerism is found in either the thiazole, oxazole or triazole series, in the 1st 2 cases presumably because of the aromatic nature of the ring systems. 2-Amino-5-chloromethyloxazoline (I), NH₄Cl and EtOH, heated 3 hrs. at 100° give β -chloro- β' -guanidinoisopropyl alc.-HCl, m. 112°; *picrate*, m. 147°; *tri-Bz deriv.*, m. 178°, identical with the compd. previously described as 2- μ -amino-5-aminomethylimidazoline tetrabenzoate (F. and Pirk). Heating I with dil. NH₄OH at 100° 4 hrs. gives 2- μ -amino-5-aminomethyloxazoline, oily, whose *picrate*, m. 172°; the *chloroplatinate* is red. I, NaOH and PhSO₂Cl give 5-chloromethyl-2- μ -iminooxazolinyl 3-benzenesulfonate, m. 111° (2-Bz deriv., m. 152°), hydrolyzed by cold dil. H₂SO₄ to 5-chloromethyloxazolidonyl 3-benzenesulfonate, m. 106°. The reaction product of NCNNa₂ and HOCH₂CH(OH)CH₂Cl, shaken with NaOH and PhSO₂Cl, gives the tribenzenesulfonate, m. 158°, of 2- μ -amino-5-hydroxymethyloxazoline, which does not react with BzCl and is stable towards dil. H₂SO₄. NCNHNa and HOCH₂CH₂CH₂Cl give an oily product which, shaken with NaOH and BzCl, gives 2- μ -amino-5-methyloxazoline dibenzoate, m. 75°; with PhNCS this gives 5-methyl-2-iminooxazolinyl-3-phenylthiourea (II), m. 98°; when this is heated above its m. p. or in EtOH for 2 hrs., the isomeric compd. (III), m. 152°, is formed, while hydrolysis with dil. H₂SO₄ gives 5-methyloxazolidonyl-3-phenylthiourea (IV), m. 114°



I, PhCH₂SH and NaOH, heated 2 hrs. in EtOH, give 2- μ -amino-5-thiobenzylmethyl-oxazoline (V), m. 92° (*di-Bz deriv.*, m. 112°); with PhNCS this gives 5-thiobenzylmethyl-2-iminooxazolinyl-3-phenylthiourea, m. 89°; heating in EtOH several hrs. gives the isomeric 5-thiobenzylmethyl-oxazolinyl-2-phenylthiourea, m. 129°; hydrolysis with dil. H₂SO₄ gives 5-thiobenzylmethyl-oxazolidonyl-3-phenylthiourea, m. 107°. V and CH₂:CHCH₂NCS give the corresponding 3-allylthiourea, m. 87°; heating with AmOH 4 hrs. gives 5-thiobenzylmethyl-oxazolinyl-2-allylthiourea, m. 100°, while dil. H₂SO₄ gives 5-thiobenzylmethyl-oxazolidonyl-3-allylthiourea, m. 59°. Aminothiazoline (VI) (*di-Bz deriv.*, m. 182°) and *p*-MeC₆H₄SO₂Cl with NaOH give 2-iminothiazolinyl 3-*p*-toluenesulfonate, m. 143°, hydrolyzed by H₂SO₄ to thiazolidonyl 3-toluenesulfonate, m. 158°. PhNCS in the cold converts VI into 2-iminothiazolinyl-3-phenylthiourea (VII), m. 60°, then resolidifies at 80° and again, m. 129° (*picrate*, m. 230°, explodes over 300°); dil. H₂SO₄ gives thiazolidonyl-3-phenylthiourea, m. 103°. PhNCS, VI and NaOH in hot EtOH gives thiazolinyl-2-phenylthiourea, m. 130°. 2-Iminothiazolinyl-3-allylthiourea (VIII), m. 71°, resolidifies at 79° and again m. 142°; hydrolysis gives thiazolinyl-2-allylthiourea, m. 111°. Hot CH₂:CHCH₂NCS gives thiazolinyl-2-allylthiourea, m. 143°. Detns. of the mol. wts. of VII and VIII in PhOH give values which are approx. 0.5 of the theoretical, indicating that they are additive compds. This possibility is discounted by the formation of thiazolidones by hydrolysis and also by the observation that Ph₂NCSNHMe gives a similar low value. C₂H₄(NH₂)₂ and CH₂:CHCH₂NCS give ethylenedi-allylthiourea, m. 102°; Br in CHCl₃ transforms this into ethylenedi[aminobromomethylthiazoline] (IX), m. 161°; Ag₂O gives the corresponding glycol, m. 108°; the *dinitrile*, m. 118° and the *dicarboxylic acid*, m. 147°. The action of EtOH-KOH on IX gives ethylenedi[aminomethylenethiazoline], m. 153°. Phenylthiazylamine (*Bz deriv.*, m. 124-5°; *benzylidene deriv.*, m. 127°; *p*-toluenesulfonate, m. 150°), heated with PhNCS on the H₂O bath 2-3 hrs., gives 5-phenylthiazolyl-2-phenylthiourea, yellow, m. 213°. Methylthiazylamine (*di-Bz deriv.*, m. 110°) gives 5-methylthiazolyl-2-phenyl- and -2-allylthiourea, m. 172° and 178°, resp., under all conditions. PhCH₂COBr and NCNHNa in H₂O give 2-amino-5-phenyloxazole, m. 216° (*Bz deriv.*, m. 182°; *Ac deriv.*, yellow, m. 134°); PhNCS gives as the only product 5-phenyloxazolyl-2-phenylthiourea, m. 195°, which is stable toward H₂SO₄. 3-Amino-5-anilino-1-phenyltriazole (*Bz deriv.*, m. 105°) yields the 3-phenylthiourea, m. 194°, and the 3-allylthiourea, m. 191°. 3-Amino-5-anilino-1,2,4-triazole, m. 163°, gives the corresponding 3-phenylthiourea, m. 203°, and the 3-allylthiourea, m. 133°. The phenyl-

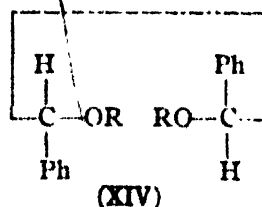
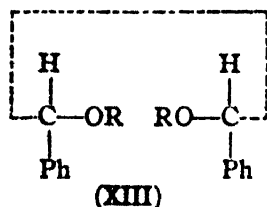
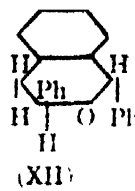
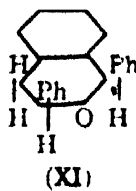
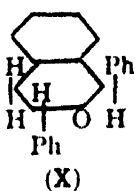
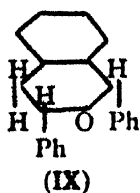
thiourea and *allylthiourea* derivs. of phenylguanazole, m. 252° and 220°, resp. Piperazinodi[phenylthiourea], m. 263°; the *diallylthiourea* deriv., m. 153°; the *di*[phenylbenzylthiourea], m. 102°. *Piperasinodi*[bromomethylthiazoline], m. 156°, from the allyl deriv. and Br in CHCl₃ (*di-HCl* salt, m. 248°); with EtOH-KOH this gives the *di*[methylenthiazoline], m. 166°, while *p*-MeC₆H₄SNa gives the *di*[thiocresylmethylthiazoline], m. 135°. HBr at 100° converts the allyl deriv. into the *di*[methylthiazoline], m. 120° (*di-HBr* salt, does not m. 280°). 1-Phenyl-5-thioltriazole-3-phenylthiourea, m. 264°; the 5-thiolbenzyl deriv., m. 188°; the 5-thiolmethyl deriv., m. 178°. 1-Phenyl-5-thiolbenzyltriazole-3-allylthiourea, m. 129°; the 5-thiolmethyl deriv., m. 138°. 1-Phenyl-3-thiolbenzyltriazole-5-phenylthiourea, m. 154°; the 5-allyl deriv., m. 138°. 1-Phenyl-5-amino-3-thiolbenzyltriazole dibenzoate, m. 125°. PhNH₂ and di-Me cyanamidodithiocarbonate give 5-amino-3-methylthiol-1-phenyltriazole, m. 105°. *Bz* deriv., m. 118°. The dibenzyl ester and N₂H₄·H₂O give 3-amino-4-benzylthio triazole, m. 109°; *HCl* salt, m. 100°; dibenzoate, m. 148°. 5-Benzylthioltriazolyl-3-phenylthiourea and the -3-allylthiourea, m. 155° and 116°, resp. 1-Phenyl-3-amino-5-methylthioltriazole (*sulfone* deriv., m. 304° (not sharply)) yields a *toluenesulfonate*, m. 142°. Oxidation of 1-phenyl-3-amino-5-benzylthioltriazole with KMnO₄ in AcOH gives a *compd.*, C₁₀H₁₂N₂S₂, m. 140°, probably an azo compd.

C. J. WEST

Organomagnesium derivatives. IV. The diphenylisochromans. A. GARCIA BANÚS. Facultad Ciencias Barcelona. *Anales soc. españ. fis. quim.* 26, 372 (1928).—Under certain definite conditions the reaction between PhCH₂MgCl and BzH proceeds in an anomalous manner. The interpretation of the course of this abnormal reaction depends logically on the nature of the resulting products; from the complex mixt. can be isolated, in good yield, PhCH(OH)CH₂Ph (I) (sometimes, depending on the treatment of the mixt., there is obtained PhCH:CHPh (II)), a substance (III) originally designated diphenylisochroman but which, for reasons given below, is now called *α*-diphenylisochroman, and, in smaller amount, an unsatd. substance (IV) called diphenylisochromene. It was assumed that the Grignard reagent reacts in an *o* quinoid form and with 2 mols. BzH gives a compd. *o*-PhCH(OH)C₆H₄CH₂CH(OH)Ph (V) which, when the reaction mixt. is worked up, loses H₂O to form III, but later work showed that this hypothesis is untenable. Nor can the abnormal reaction be explained by the series of reactions proposed by Marshall and confirmed by the author and Medrano (*C. A.* 18, 2144). Before attempting to explain the mechanism of the abnormal reaction it was imperative, therefore, to establish with certainty the structure of the products formed. The chief difficulty is that they do not readily form derivs. To be sure, it had been found that *α*-III can be converted into *α*-diphenylindene (VI) but this is far from being decisive proof of the structure of III. The O bridge is not ruptured by shaking *α*-III in C₆H₆ with K-Na alloy, but this failure to react with K at least confirms the absence of HO and C:O groups. As had already been found, *α*-III cannot be acetylated with Ac₂O in the presence of NaOAc or C₆H₅N or with boiling AcCl, but in the presence of traces of H₂SO₄ it is so sensitive to Ac₂O that unless the reaction is carried out with great care only resins and secondary products are obtained. Of the 2 resulting substances, m. 114-5° (VII) and 174-5°, originally thought to be acetates the latter is really VI. The relative amounts of the 2 compds. formed varies widely with the exptl. conditions. With very little heating and very little H₂SO₄ the *α*-diphenylisochroman acetate (VII) is obtained in good yield but with too much heating or an excess of H₂SO₄ only VI can be isolated; in any case there is always formed a large amount of resin from which VI can be obtained by distn. The compn. AcO content and mol. wt. of VII indicate that it has the structure *o*-PhCH(OAc)C₆H₄CH₂CH(OAc)Ph; with concd. H₂SO₄ it gives the green halochromism characteristic of *α*-III. VII is readily saponifd. to a *carbinol* which likewise shows the characteristic green halochromism with H₂SO₄ but, unlike *α*-III, gives the characteristic reactions of an alc., reacting with SOCl₂ and with Na and readily regenerating VII on simple boiling with Ac₂O. The compn. of this *diphenylisochroman hydrate* corresponds to formula V and it seemed possible that it might be present, as the primary product of the abnormal reaction between PhCH₂MgCl and BzH, in the resins which, on distn. *in vacuo*, yield III. To be sure, it itself distn. unchanged *in vacuo*, but there was a possibility that the resins contain a substance which catalyzes the dehydration and cyclization of V on distn. Of such catalysts, the one most likely to be present was a Mg salt, and as a matter of fact distn. of V *in vacuo* with a small quantity of MgCl₂ and Mg(OAc)₂ converts it into a mixt. of isomeric *α*- and *β*-III; the *β*-compd. is also formed in the abnormal reaction between PhCH₂MgCl and BzH but had hitherto escaped detection. With KMnO₄ in Me₂CO, V gives the same products as *α*-III, viz., BzOH, *o*-BzC₆H₄CO₂H and a neutral compd. (VIII), which from its compn. and

properties seems to be *o*-benzoylbenzil, $\text{BzC}_6\text{H}_4\text{COBz}$. Although the acetate and benzoate of I are readily obtained with Ac_2O and BzCl , resp., from the addn. product, $\text{PhCH}(\text{OMgCl})\text{CH}_2\text{Ph}$, of PhCH_2MgCl and BzH , the product of the abnormal reaction reacts entirely differently, giving only resins, so that the presence of V in this product cannot be detected by this means. III is obtained, as has been repeatedly described, by slowly adding PhCH_2MgCl in Et_2O with stirring to cold BzH , decomp. with dil. AcOH , washing the Et_2O layer with H_2O and Na_2CO_3 , evapg., distg. the resulting resin *in vacuo* and crystg. the fraction *b.* $230-50^\circ$ from Et_2O . There is thus obtained a product which is apparently homogeneous but m. indefinitely at $90-100^\circ$ and by means of C_6H_6 -petroleum ether can be sepd. into α - and β -III; both melt at practically the same temp. ($110-1^\circ$), show the same characteristic emerald-green halochromism with concd. H_2SO_4 , give the same VII on acetylation and yield the same products with KMnO_4 in Me_2CO ; the only difference thus far observed is in the cryst. form when they sep. from C_6H_6 -petroleum ether; from Et_2O both cryst. in apparently the same form. The β -compd. may itself sep. in 2 forms, m. $110-1^\circ$ and $136-7^\circ$ (γ -form) mutually transformable into each other. The change $\gamma \rightarrow \beta$ can be effected by simple crystn. from Et_2O and in 2 cases occurred spontaneously at room temp., once under a satd. soln. in C_6H_6 -petroleum ether and once in dry form in a sealed tube. The conditions for obtaining the γ -form have not been established; it has been obtained only but not always from C_6H_6 -petroleum ether; on several occasions it has been observed that if the β -form seps. and then the crystals and mother liquors are heated for a time and cooled slowly the γ -form seps. out; perhaps the β -form is stable at room temp., the γ -form above 70° (b. p. of the C_6H_6 -petroleum mixt.). IV on catalytic hydrogenation gives β -III. Assuming that the structure assigned to III is correct, there are 4 possible stereoisomeric forms (IX-XII), of which IX and XI, on the one hand, and X and XII, on the other, are mirror images and, therefore, can be isolated only as the racemates. It would be expected, however, that the 2 racemates would yield different acetates and carbinols (XIII, XIV, $\text{R} = \text{Ac}$ or H); possibly in the acetylation there occurs a sort of racemization resulting in the formation of the more stable form exclusively. This is the only exptl. fact thus far observed which cannot be explained on the basis of the structure assigned to the III and as the structure of these compds. is of fundamental importance in the interpretation of the abnormal reaction between PhCH_2MgCl and BzH , efforts must be made to synthesize the III or one of their close derivs. (With L. MEDRANO.) VII, m. $117-8^\circ$, mol. wt. in C_6H_6 $359-63$, is obtained in 2.5 g. yield from 4.5 g. α -III in 18 g. freshly distd. Ac_2O treated with 9 cc. Ac_2O contg. 1 drop concd. H_2SO_4 ; the mixt., which becomes quite warm and yellow, is heated on the H_2O bath below 45° until all the III has dissolved (about 10 mins.), allowed to stand 24 hrs. at room temp., dild. with 150 cc. Et_2O and 300 cc. H_2O , cooled with ice and neutralized to phenolphthalein with NaOH and, at the end, with Na_2CO_3 ; the Et_2O layer is washed with H_2O , dried with CaCl_2 , concd. to about 20 cc., dild. hot with petroleum ether and cooled, and the crystals which sep. (3 g.) are recrystd. from Et_2O . V, from VII in boiling alc. contg. a drop of phenolphthalein treated with alc. KOH to permanent alky., m. $114-5^\circ$. With the calcd. quantity of Beckmann's mixt., V is for the most part not attacked, giving only a little BzH , while with an excess of the reagent are formed the same products as had already been obtained from III with CrO_3 - AcOH . Boiled 2 hrs. in Me_2CO with 2 g. KMnO_4 , 2 g. V gives 0.4-0.5 g. $\text{BzOH} + o\text{-BzC}_6\text{H}_4\text{CO}_2\text{H}$ and 0.2 g. VIII, lemon-yellow, m. 94° . The dehydration of V into $\alpha + \beta$ -III can also be effected by merely heating the V in an open tube with the $\text{Mg}(\text{OAc})_2\text{-MgCl}_2$ catalyst 1 hr. at 230° . On refluxing with 1:1 H_2SO_4 the dehydration proceeds entirely differently; there are obtained 2 products, sepd. by careful crystn., both m. $108-10^\circ$ (mixed m. p. $92-4^\circ$), which do not show halochromism with concd. H_2SO_4 , and are supposed to have the structure $\text{PhCH}(\text{OH})\text{C}_6\text{H}_4\text{CH}:\text{CHPh}$. α -III seps. in fine silky needles, β -III in prisms, and they are sepd. by floating off the α -compd. 1,2-Diphenylethanol acetate (tolylene hydrate acetate), from PhCH_2MgCl in Et_2O slowly added to BzH in Et_2O , refluxed 0.5 hr., cooled, treated with Ac_2O and refluxed, sirupy liquid (17 g. from 30 g. PhCH_2Cl), *b.* $202-5^\circ$, decompd. by boiling alc. KOH into I and KOAc . Benzoxide, similarly obtained with BzCl (25 g. from 30 g. PhCH_2Cl), m. 70° . (With M. DÍAZ ROLDÁN.) 1-Anisyl-2-phenylethanol acetate (*p*-anisylbenzylcarbinol acetate) (35 g. from 27 g. PhCH_2Cl with Mg , $\text{MeOC}_6\text{H}_4\text{CHO}$ and Ac_2O), m. $81-2^\circ$, yields *p*- $\text{MeOC}_6\text{H}_4\text{CH}:\text{CHPh}$ on sapon. with boiling dil. H_2SO_4 , whereas when 5 g. is slowly treated in boiling alc. with 10% NaOH to permanent alky. it gives 3.5 g. of the free carbinol (XIII), m. $60-1^\circ$. Tolyene hydrate urethan (4 g. from 5 g. I mixed and allowed to stand some time with 4.5 g. PhNCO), m. $94-5^\circ$. Attempts to prep. the urethan of XIII in the same way gave a substance isomeric with and having the same

m. p. (135-6°), cryst. form and solubilities as *p*-MeOC₆H₄CH:CHPh but depressing the m. p. of the latter.



C. A. R.

Synthetical experiments in the isoflavone group. III. Synthesis of genistein. WILSON BAKER AND ROBERT ROBINSON. *J. Chem. Soc.* 1928, 3115-18; cf. *C. A.* 22, 2356.—Reduction of 3,4,5-(MeO)₃C₆H₂COCl in C₆H₅Me₂ by H in the presence of BaSO₄ gave 3,4,5-(MeO)₃C₆H₂CHO (I). I, PhCONHCH₂CO₂H and AcONa heated gave the azlactone. NaOH followed by SO₃ and by HCl gave 3,4,5-(MeO)₃C₆H₂CH₂COCO₂H (II). II and H₂NOH.HCl in aq. NaOH at 50° gave the oxime by HCl pptn. after 12 hrs. The oxime with Ac₂O gave 3,4,5-(MeO)₃C₆H₂CH₂CN (III), m. 77°. By dissolving III in 95% H₂SO₄ and pouring on ice after 24 hrs., (MeO)₃C₆H₂CH₂CONH₂, m. 121°, was obtained by CHCl₃ extrn. III and 4,5,1,3-(MeO)₂(HO)₂C₆H₂ in anhyd. Et₂O with HCl and ZnCl₂ at 0° gave 2,6-dihydroxy-3,4-dimethoxyphenyl 3,4,5-trimethoxybenzyl ketone (IV), m. 162°. No isomer could be detected. AcONa, Ac₂O and IV at 180° for 6 hrs. gave the Ac deriv. which hydrolyzed gave 5-hydroxy-6,7,3',4',5'-pentamethoxy-2-methylisoflavone (2-methylirigenin 7,3'-di-Me ether) (V), m. 179-80°; Ac deriv., m. 232-3°. Boiling V in MeOH with Me₂SO₄ and KOH gave 5,6,7,3',4',5'-hexamethoxy-2-methylisoflavone (2-methylirigenin tri-Me ether) (VI), m. 166°. Decompn. with alkali at 180° gave 3,4,5-(MeO)₃C₆H₂CH₂OH (antiarol) and 3,4,5-(MeO)₃C₆H₂CH₂CO₂H. Demethylation of V with HI at 130° for 1 hr. gave 5,6,7,3',4',5'-hexahydroxy-2-methylisoflavone (2-methylirigenol) (VII), m. 325° (decompn). Me₂SO₄ in H gave VI from VII. VII is similar in appearance and behavior to irigenin but is more sol. in org. solvents. Cinnamoylation of IV and alk. hydrolysis gave 5-hydroxy-6,7,3',4',5'-pentamethoxy-2-styrylisoflavone (VIII), m. 270°; Me ether, m. 214-5°. Alk. hydrolysis of irigenin gave iridic acid (IX), m. 118°. The Me ester of IX in NH₄OH after 24 hrs. gave 3,4,5-HO(MeO)₂C₆H₂CH₂CONH₂ (iridamide), m. 113°. PhCH₂CN and C₆H₅(OH)₂OMe in anhyd. Et₂O with HCl and ZnCl₂ at 0° gave 2,4-HO(MeO)₂C₆H₂COCH₂Ph (X), which by heating with Ac₂O and AcONa at 180° for 18 hrs. gave 7-methoxy-2-phenylisoflavone. From the NaOH washings was isolated 4,2-HO(MeO)₂C₆H₂COCH₂Ph (XI), m. 113°; Ac deriv., m. 68°. About 3 parts of X to 1 of XI were obtained. 3,5-HO(MeO)₂C₆H₂Me and PhCH₂CN similarly gave a mixt. sepd. mech., of plates of 4,2,6-HO(MeO)₂MeC₆H₂COCH₂Ph (XII), m. 93° Ac deriv., m. 88°, and needles of 2,4,6-HO(MeO)₂MeC₆H₂COCH₂Ph (XIII), m. 110°. Ac₂O and AcONa with XIII at 180° for 12 hrs. gave a product with no AcO group, 7-methoxy-2,5-dimethylisoflavone, m. 165°. About 17% as much XII as XIII was produced. 4,5,1,3-(MeO)₂(HO)₂C₆H₂ reacts persistently in position 2. The other phenolic ethers investigated were not as specific. IV. Synthesis of 2-methylirigenol. *Ibid.* 1929, 152-61; cf. *C. A.* 20, 196; 21, 246.—Methylation of 5,7-dihydroxy-4'-methoxy-2-styrylisoflavone with Me₂SO₄, MeOH and aq. KOH gave 5-hydroxy-7,4'-dimethoxy-2-styrylisoflavone (I), m. 245-6°, insol. in dil. aq. KOH. Ac deriv. (II), m. 203-4°. Hydrolysis of II gives I. Oxidation of II by KMnO₄ in Me₂CO at -10 to -15° was unsuccessful. I with Me₂SO₄ and aq. NaOH in Me₂CO gave 5,7,4'-trimethoxy-2-styrylisoflavone (III), m. 193°. Similarly 5-hydroxy-7,4'-dimethoxy-2-styrylmethylisoflavone gave 5,7,4'-trimethoxy-2-styryl-6(?)'-methylisoflavone, m. 211° (shrinking). Aq. KMnO₄ oxidation of III in C₆H₅N at 85° gave 5,7,4'-trimethoxyisoflavone-2-carboxylic acid (IV), m. 237° (sharp but decompn. followed). Heating IV above its m. p. gave 5,7,4'-trimethoxyisoflavone (genistein tri-Me ether) (V), m. 162-3°, needles or rhombic plates. Recovered V in AcOH demethylated with HI by boiling was acetylated.

Hydrolysis gave 5,7,4'-trihydroxyisoflavone (genistein, prunetol), softened 284°, m. 290-1°, mixed m. p. with natural genistein the same. The Ac deriv. and di-Me ether were the same as from the natural product. FOSTER DEE SNELL

Anthoxanthins. VIII. Synthesis of morin and of 5,7,2',4'-tetrahydroxyflavone. ROBERT ROBINSON AND KRISHNASAMI VENKATARAMAN. Univ. of Manchester. *J. Chem. Soc.* 1929, 61-7; cf. *C. A.* 21, 93.—A mixt. of 6 g. ω -methoxyphloracetophenone, 50 g. [2,4-(MeO)₂C₆H₃CO]₂O and 12 g. 2,4-(MeO)₂C₆H₃CO₂Na, heated 4 hrs. at 180-5°, and the product hydrolyzed by boiling with KOH in dil. EtOH, gives 7.3 g. of morin 3,2',4'-tri-Me ether (I), pale straw, m. 132°; FeCl₃ gives an olive-green color; penta-Me ether, m. 155-7°; the crude product from which I was obtained, on boiling with Ac₂O and C₆H₅N, gives *O*-2,4-dimethoxybenzoyl-*O*-acetylmorin 3,2',4'-tri-Me ether, m. 170°. Hydrolysis of I with HI and Ac₂O gives morin, crystg. with 1 H₂O, which is not lost at 130° in high vacuum; this is identical with natural morin as far as could be ascertained by direct comparison. Condensation of phloracetophenone, [2,4-(MeO)₂C₆H₃CO]₂O and 2,4-(MeO)₂C₆H₃CO₂Na, followed by hydrolysis, yields 5,7-dihydroxy-2',4'-dimethoxyflavone, pale yellow, m. 258-9°; HI and Ac₂O give 5,7,2',4'-tetrahydroxyflavone, m. 332-5° (decompn.), which showed little resemblance to loto-flavin (cf. Dunstan and Henry, *Phil. Trans* 194, 515(1901)). IX. Syringetin. TOM HEAP AND ROBERT ROBINSON. *Ibid* 67-73.—Condensation of ω -benzoyloxyphloracetophenone (I), [3,4,5-(MeO)₃C₆H₂CO]₂O and 3,4,5-(MeO)₃C₆H₂CO₂Na, by heating 9.5 hrs. at 180-5°, followed by hydrolysis with KOH, gives myricetin 3',4',5'-tri-Me ether (II), pale yellow, m. 290-3°; the yellow concd. H₂SO₄ soln. has a weak green fluorescence; FeCl₃ gives a deep brownish olive-green color; the Pb salt is a deep yellow. The *O*-tri-Ac deriv., nearly white, m. 195-5.5°. The action of fuming H₂SO₄ on II at 40° gives a monomethylmyricetinsulfonic acid, yellow, does not m. 330°; FeCl₃ gives an intense dark olive-green color; the yellow concd. H₂SO₄ soln. exhibits a green fluorescence. Syringic acid and BzCl in alkali give 49% of the *O*-Bz deriv., m. 229-32°; chloride, m. 116.5-8°; the anhydride could not be obtained pure. *O*-Benzylsyringic anhydride, m. 112-3°, results in 118 g. yield from 144 g. of the acid in 500 cc. Et₂O and 53 g. C₆H₅N with 74 cc. SOCl₂ in Et₂O; with I in the usual way there results syringetin 4'-benzyl ether, brownish orange, m. 240-1°; FeCl₃ gives an olive-green color; Pb(OAc)₂ gives a flocculant yellow ppt. The tri-Ac deriv., m. 191-4°. Prolonged boiling of the ether with concd. HCl and EtOH gives syringetin(5,7,4'-trihydroxy-3',5'-dimethoxyflavonol), pale yellow, m. 288-9°; concd. H₂SO₄ colors the crystals orange and gives a yellow soln. with a green fluorescence; alk. solus. are deep yellow; in dyeing properties it resembles isorhamnetin, of which it is a MeO deriv. *Tetra-Ac deriv.*, m. 224-6°. Me₂SO₄ converts it into myricetin hexa-Me ether, m. 159-61°. X. Synthesis of gossypetin and of quercetagetin. WILSON BAKER, RYUZABURO NODZU AND R. ROBINSON. *Ibid* 74-84.—Quercetagetin (I) occurs in the flowers of the African marigold, *Tagetes patula*, while gossypetin (II) occurs in the flowers of the Indian cotton plant, *Gossypium herbaceum*; both are derivs. of 1,3,4,5-C₆H₂(OH)₄. 1,2,3-C₆H₃(OH)₃ (50 g.), 240 g. K₂CO₃ and 300 cc. dry Me₂CO was refluxed in a H atm. for 30 hrs., 210 g. of PhCH₂Cl being gradually introduced, with the formation of 450 g. 1,2,3-tribenzyl-oxybenzene (III), m. 70°. HNO₃ (40 cc., d. 1.19), added to 80 g. III in 800 cc. AcOH at 40° and kept at room temp. for 4 hrs., gives 15 g. of the 5-NO₂ deriv., m. 139°; addn. of a 2nd lot of 40 cc. HNO₃ to the filtrate gives 30 g. 2,6-dibenzyl-oxy-*p*-benzoquinone, yellow, m. 201-2°; reduction with Zn and H₂SO₄ gives 2,6-dibenzyl-oxyquinol, m. 116-7°, which with alk. Me₂SO₄ gives 2,6-dibenzyl-oxy-1,4-dimethoxybenzene, m. 82-3°. Hydrolysis with HCl in AcOH gives 2,5-dimethoxyresorcinol, pale brownish yellow, m. 61-2° (with 2 H₂O), m. anhyd. 86-8°. The identity of this with iretol Me ether was not definitely established. Condensed with MeOCH₂CN by HCl in Et₂O there results 2,4-dihydroxy- ω ,3,6-trimethoxyacetophenone, m. 150-1° (FeCl₃ gives a deep bluish brown color), which in turn gives with K veratrate and veratric anhydride, followed by hydrolysis, 7-hydroxy-3,5,8,3',4'-pentamethoxyflavone(*O*-pentamethylgossypetin), yellow, m. 253-4°; with HI this gives II, yellow, m. 310-4°, identical with the natural specimen. The identity was further confirmed by prepn. of the hexa-Ac and hexa-Me deriva. 2,6,3,4-(HO)₂(MeO)₂C₆H₂COCH₂OMe with veratric anhydride as above gives 5-hydroxy-3,6,7,3',4'-pentamethoxyflavone (*O*-pentamethylquercetagetin), pale yellow, m. 159-60°; FeCl₃ in excess gives an intense dull olive-green color; the deep yellow concd. H₂SO₄ soln. becomes cherry-red on addn. of a trace of HNO₃; Me₂SO₄ gives the hexa-Me deriv., which exists in dimorphic forms, as reported for the deriv. from natural I. Hydrolysis with HI gives I, crystg. with 2 H₂O and m. 316° (decompn.); hexa-Ac deriv., m. 210°. Dyeing properties of I and II are reported. C. J. WEST

Action of calcium hydride on biphenylene oxide. WALTER FUCHS. Kaiser-

Wilhelm-Inst. f. Kohlen-Forschung in Mülheim-Ruhr. *Ber.* 61B, 2599-600(1928).—In a search for a general method of smoothly replacing heterocyclically bound O by H it was found that biphenylene oxide can be converted into Ph₂ by passing it over CaH₂ in H₂ at 450°. Each treatment lasted 10-15 mins. and by repeating it 3-6 times a 12-20% conversion of the oxide could be effected. No other reactions or decomps. were observed. The unchanged oxide is removed in petroleum ether with picric acid.
C. A. R.

Interaction of piperidine with nitro and halonitro derivatives of xanthone and diphenylene oxide. RAYMOND J. W. LE FÈVRE. Univ. College, London. *J. Chem. Soc.* 1928, 3249-52; cf. *C. A.* 21, 2673.—The expts. were carried out for the purpose of comparing the activities of the ethereal O atoms in xanthone and diphenylene oxide. Owing to the stability of these substances, their di-NO₂ derivs. were used. 3,6-di-nitrodiphenylene oxide was recovered unchanged after several hrs.' boiling with C₆H₁₁N(I) or PhNH₂(II). With I, α-dinitroxanthone gave (a) in the cold, a yellow substance which when isolated lost I, (b) when heated, a yellow powder which could not be crystd. β-Dinitroxanthone (III), when heated with I for 10 hrs. at 100°, gave 5,5'-dinitro-2'-piperidino-2-hydroxybenzophenone (IV), yellow, m. 155° (rapid heating). Heated at 200°, IV gave I and III. From IV was prepd. 5,5'-dinitro-2'-piperidino-2-acetoxybenzophenone, m. 253-5°. III with II in the cold gave a red addn. compd., but after 4 hrs.' boiling, III was recovered. Similar results were obtained with PhNHMe and o-MeC₆H₄NH₂. From 2,7-dibromoxanthone and fuming HNO₃ at 60° was obtained 2,7-dibromo-4,6-dinitroxanthone (V), m. 285-6°. V gave with I a gummy product which could not be sepd. Nitration of III gave 2,4,5,7-tetranitroxanthone (VI), did not m. 300°. VI with I in the cold gave a red color, but after heating 8 hrs. at 100°, VI was recovered.
LOUISE KELLEY

Chlorination of α-aminopyridine. A. E. CHICHIBABIN AND A. F. EGOROV. *J. Russ. Phys.-Chem. Soc.* 60, 683-90(1928).—The methods of chlorination of α-aminopyridine (I) (Sell, *C. A.* 3, 885 and Ger. pat. 400,191) give unsatisfactory yields of a mixt. of mono- and di-Cl derivs., depending upon the quantities of absorbed Cl. Best results were obtained by chlorinating in alc. Cl was conducted into an ice-cold soln. of 4.53 g. of I until 6.7 g. of Cl was absorbed, resulting in an 80% yield of chlorides, which on treatment with petroleum ether produced 68% of monochloroaminopyridine (II), m. 135-5.5°, and 0.9 g. of dichloroaminopyridine (III), m. 80-1°. When 3 g. of II is chlorinated under similar conditions until 2.5 g. of Cl is absorbed the yield of III is 75%. α-Nitroamino-β-chloropyridine is obtained when 3.38 g. of II in concd. H₂SO₄ is treated with 2 cc. HNO₃; the yield is 4.08 g., m. 159-160° (decomp.). The nitroaminochloropyridine is isomerized to aminonitrochloropyridine when 1.08 g. of the former in 20 cc. of concd. H₂SO₄ is heated for 1 hr. at 55°, poured on ice and made alk. with Na₂CO₃ (yield 2.63 g., m. 195-6°). A yield of 83% of di-chloro-α-hydroxypyridine, m. 163° is obtained by the action of KNO₃ upon a soln. of II in 20% H₂SO₄. Under somewhat similar conditions III produces dichlorohydroxypyridine, m. 177-8°, identical with the product obtained by Kenigsom (*Ber.* 17, 1832(1884); *C. A.* 3, 885). A yield of 3.5 g. of dichloropyridine, m. 59-60°, is obtained when 5 g. of II in 50 cc. HCl (d. 1.19) is treated with 5.5 g. of pulverized KNO₃, while 2.45 g. of III in 25 cc. of HCl (d. 1.19) treated with 2.1 g. of KNO₃ give 1.2 g. of trichloropyridine, m. 49-50°, which is identical with the product described in *Ber.* 17, 1837(1884).
CHAS. BLANC

Benzoylpiperidine. C. S. MARVEL AND W. A. LAZIER. *Org. Syntheses* 9, 169 (1929).—Detailed directions are given for the reduction of C₆H₅N with EtOH and Na, the residue, with NaOH and BzCl gives 77-81% of benzoylpiperidine, b₇₀ 190-4°, b₇₇ 191-4°, b₁₁₀ 240-4°. Direct benzoylation of piperidine gives 87-91% of the Bz deriv.
C. J. WEST

Preparation of quinaldiny chloride and ethyl quinaldinyacetate. DALZIEL L. HAMMICK AND WM. P. DICKINSON. Dyson Perrins Lab., Oxford. *J. Chem. Soc.* 1929, 214-5.—Quinaldinic acid and SO₂Cl₂ (even the purest SO₂Cl₂) give only the chloride, m. 175-6° (cf. Meyer, *Monatsh.* 23, 1199(1904); *Ber.* 38, 2488(1905)). However, the low melting chloride (97°; cf. Besthorn and Ibele, *Ber.* 38, 2127(1905)) is obtained from the acid and PCl₅ in ligroin. The low melting chloride and AcCH₃NaCO₂Et in C₆H₆ give 30% of Et quinaldinyacetate, m. 61°; Cu deriv., m. 178° (decomp.). Attempts to prep. the acetate from this deriv. failed; dry NH₃ in Et₂O gives quant. quinaldinamide; cold NH₃ and NH₄Cl have no effect; at 60° the amide is obtained.
C. J. WEST

Preparation of 1,3-benzodioxin. FREDERICK D. CHATTAWAY AND FERNANDO CALVERT. *Anales soc. españ. fis. quim.* 26, 417-22(1928).—1,3-Benzodioxin, the parent

substance of the condensation products of HCHO , CCl_3CHO , CHCl_2CHO and butyl-chloral with *p*-substituted phenols, has been isolated. Direct condensation of HCHO and phenol is impossible, but 6-nitro-1,3-benzodioxin on reduction gives 6-aminobenzodioxin, which by diazotization and reduction of the diazonium salt yields free 1,3-benzodioxin, colorless liquid, b_{765} 211–2°, with a peculiar odor.

E. M. SYMMES

N-Substituted derivatives of piperazine and ethylenediamine. I. Preparation of N-monosubstituted derivatives. TOM SIDNEY MOORE, MARY BOYLE AND VERA M. THORN. Royal Holloway College. *J. Chem. Soc.* 1929, 39–51.—To a concd. soln. of piperazine contg. some bromophenol blue, 2 *N* HCl was added until the neutral tint of the indicator appeared. Small quantities of ClCO_2Et and 2 *N* NaOH were run in at intervals, with vigorous stirring, and the process continued until a test showed that no piperazine remained (until the product of benzoylation of a few drops of the soln. is completely sol. in Et_2O); NaOH is then added and the dicarboethoxy deriv. extd. with Et_2O ; the soln. is then satd. with K_2CO_3 and extd. with Et_2O ; 38.8 g. of piperazine.6 H_2O gives 22.2 g. *Et* piperazine-1-carboxylate (*N*-carboethoxypiperazine) (I), b_{112} 116–7°, b_{170} 237°; CO_2 passed through I in Et_2O gives an addn. compd., which deliquesces in air and loses CO_2 in a desiccator; CS_2 forms an addn. compd., pale yellow, sublimes 130–40°, m. 148° (decompn.). BzCl gives the 4-*Bz* deriv., m. 82°. *N*-Benzoylpiperazine, m. 64°. The 4-*p*-toluenesulfonyl deriv. of I, m. 121°, and with 10% EtOH-KOH for 2 hrs. gives *N*-*p*-toluenesulfonylpiperazine, m. 110°; the CO_2 addn. compd., m. 107° (decompn.); the CS_2 addn. compd., pale yellow, m. 171°. *p*- $\text{MeC}_6\text{H}_4\text{SO}_3\text{Et}$ and I give the 4-*Et* deriv., b_{28} 136°; with concd. HCl this yields the HCl salt, deliquescent, of *N*-ethylpiperazine, b_{155} 8° (chloroplatinate; chloroaurate; CS_2 addn. compd., yellow, sublimes above 160°). Heating I with excess of $\text{ClCH}_2\text{CH}_2\text{OH}$ gives 70% of the 4- β -hydroxyethyl deriv., b_{17} 184°; concd. HCl gives *N*- β -hydroxyethylpiperazine-di-HCl, which forms a normal chloroplatinate and chloroaurate. I and $\text{ClCH}_2\text{CO}_2\text{Et}$ with Na_2CO_3 give *Et* 4-carboethoxypiperazinoacetate, b_{13} 183°; hydrolysis gives the HCl salt, orthorhombic crystals (for which crystallographic data are given), of piperazinoacetic acid, crystg. with 1 mol. H_2O , m. 279° (decompn.) if rapidly heated. Piperazino- β -propionic acid, m. 215°; HCl salt, deliquescent; *Et* 4-carboethoxypiperazino- β -propionate, b_{22} 198°; the γ -butyrate b_{21} 207°; piperazino- γ -butyric acid, m. 235°; chloroplatinate. Carboethoxyethylenediamine, b_{10} 135°; CO_2 gives an addn. compd., m. 102–3°; the CS_2 compd. differs from that of I but has not been obtained pure. The *N*-*Bz* deriv., m. 130°; the *N*-toluenesulfonyl deriv., m. 66°, and with 10% EtOH-KOH gives *N*-toluenesulfonylethylenediamine, m. 121°. *Et* *N*'-carboethoxyethylenediamino-*N*-acetate, could not be distd. and on hydrolysis gives the HCl salt of $\text{H}_2\text{NC}_4\text{H}_8\text{NHCH}_2\text{CO}_2\text{H}$, contg. 2HCl and 2 H_2O ; β -aminoethylglycine, very hygroscopic, m. 144°.

C. J. WEST

3-Chlorotropane and the non-existence of the bellatropine of Hesse. MAX POLONOVSKI AND MICHEL POLONOVSKI. *Compt. rend.* 188, 179–81 (1929).—Belladonine prepd. by polymerizing apotropine in acid or alkali gave a chloroplatinate m. 252° instead of 229° as given by Hesse. Its chloroaurate is amorphous, turns brown and softens at 150° and m. about 168° instead of 120°. H_2SO_4 hydrolyzes belladonine completely, giving tropine, from which the dehydrating action of H_2SO_4 produces a small amt. of tropidine. With HCl in a closed tube belladonine is sapond. not to bellatropine as given by Hesse but to 3-chlorotropane, which gives a HCl salt, m. 234°, a chloroplatinate, m. 227–8°, a chloroaurate, m. 215°, a picrate, m. 216–7°, a methiodide, m. 306°. Reduction of the latter with Zn and H_2SO_4 gives tropine-MeI. Oxidation of 3-chlorotropane with H_2O_2 gave the aminoxide, $\text{C}_8\text{H}_{11}\text{O}_2\text{NCl}$, whose HCl salt, m. 210°, and picrate, m. 175°, were prepd. HCl at 140° acting on apotropine, hyoscyamine and atropine produces 3-chlorotropane in each case. P. and P. recommend that the belladonine described by Hesse be stricken from the chem. literature.

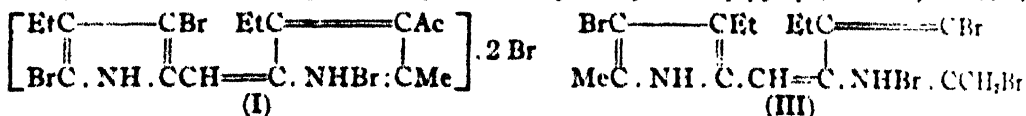
R. C. ROBERTS

Synthesis of 3,10-dimethoxytetrahydroprotoberberine. SATYENDRA NATH CHAKRAVARTI AND WM. HENRY PERKIN, JR. Dyson Perrins Lab., Oxford. *J. Chem. Soc.* 1929, 196–201; cf. *C. A.* 22, 86.—*m*- $\text{MeOC}_6\text{H}_4\text{CO}_2\text{H}$, 40% HCHO and concd. HCl, heated 1 hr. on the steam bath, give 4-methoxyphthalide, m. 120°; oxidation with cold alk. KMnO_4 did not give the expected 4-methoxyphthalaldehydic acid but 4-methoxyphthalic acid, m. 168–70°. A mixt. of *m*- $\text{MeOC}_6\text{H}_4\text{CO}_2\text{Me}$, Cl_3CCHO , H_2O and H_2SO_4 , allowed to stand 5 days, gives nearly quant. 4-methoxytrichloromethylphthalide, m. 135°, hydrolyzed by NaOH to 4-methoxyphthalidecarboxylic acid, m. 170°; with SO_2Cl_2 this is converted into the chloride and this condensed with *m*- $\text{MeOC}_6\text{H}_4\text{CH}_2\text{CH}_2\text{NH}_2$ in C_6H_6 , giving 4-methoxyphthalidecarboxy- β -*m*-methoxyphenylethylamide, m. 129°; with POCl_3 on the steam bath for 6 hrs., followed by reduction with Zn and

AcOH, this yields 3,10-dimethoxyprotoberberine, m. 180°; concd. H₂SO₄ gives a faint violet soln., changed by a drop of concd. HNO₃ to a green and then a deep violet-blue, which finally changes to a fine orange-red. Electrolytic reduction gives 3,10-dimethoxytetrahydroprotoberberine, m. 139°.

C. J. WEST

Porphyrin syntheses. XXI. Synthesis of octaethylporphin. H. FISCHER AND R. BAUMLER. *Ann.* 468, 58-98(1929); cf. C. A. 23, 1134.—Since the investigation of octamethylporphin, the only sym. substituted porphin thus far prepd., is difficult because of the poor yield and its slight soly., it seemed desirable to prep. the Et deriv. 2-Methyl-4-ethyl-5-carbethoxypyrrole, AcCl, AlCl₃ and CS₂ give the 3-Ac deriv., identical with the pyrrole derived from EtCOCH₂CO₂Et and Ac₂CH₃. Sapon. with NaOH in EtOH gives quant. 2-methyl-3-acetyl-4-ethylpyrrole-5-carboxylic acid, m. 208°, which loses CO₂ on heating and gives 2-methyl-3-acetyl-4-ethylpyrrole (I), m. 129°; with Br in AcOH this yields the 5-Br deriv., m. 149°, which, warmed with excess Br, gives 2-methyl-3-bromo-4-ethyl-5-bromopyrrole, m. 161°. Bromination of I with 4 mols. Br in AcOH gives a perbromide of the methene-HBr (II), red prisms with a bluish violet luster, which does not m. 260°; the free base could not be obtained in condition for analysis; attempts to prep. the porphyrin from the HBr salt failed as did the attempted prepn. of the Cu salt. Oxidation gave a small amt of bromoethylmaleinimide 2,4-Dimethyl-3-carbethoxypyrrole and Br in Et₂O give 88% of the 5-Br deriv., m. 96° (decompn.); with Br in AcOH this yields 5-bromo-4-methyl-3-carbethoxypyrrole-5'-methyl-4'-carbethoxy-3'-methylpyrrolenylmethene, m. 153°; the HBr salt does not m. 260°. I and 40% HCHO give bis[2-methyl-4-ethyl-3-acetylpyrrol]methane, m. 259°, excess Br in hot AcOH gives the brick-red compd. (III), which has no m. p. 2-Bromomethyl-3-acetyl-4-ethyl-5-carbethoxypyrrole, m. 129° (analyzed as the 2-hydroxymethyl deriv., m. 101°, since the Br compd. could not be crystd.), heated with H₂O contg. a little HCHO, gives bis[2-carbethoxy-3-ethyl-4-acetylpyrrol]methane, m. 115°.



2-Bromomethyl-3-bromo-4-ethyl-5-carbethoxypyrrole, prepd. with an excess of Br in CCl₄, m. 170° (80% yield). 2-Methyl-3-bromo-4-ethyl-5-carbethoxypyrrole, m. 124°; excess Br gives the above di-Br compd. (EtCO)₂CH₂ transformed into the isomitoso form and treated with Ac₂CH₃ and finally with Zn dust, gives 75% of 2-methyl-3-acetyl-4-ethyl-5-propionylpyrrole, m. 137°; heating with dil. H₂SO₄ at 65-70° splits off the α-EtCO group, giving I; if the reaction is carried out above 70°, there results 2-methyl-4-ethylpyrrole. When I or its 5 CO₂Et deriv. is heated with EtONa and N₂H₄·H₂O 12 hrs. at 100-70°, there is formed 2-methyl-3,4-diethylpyrrole (IV), b.p. 104-5°, b. 202-3°, d₄ 0.90996, n_D²⁰ 1.49879; picrate, m. 101°. Its physiol. action is discussed. With HCN and HCl in Et₂O there results 2-methyl-3,4-diethyl-5-formylpyrrole, m. 74°. Oxidation of I with fuming HNO₃ gives diethylmaleinimide, m. 68°, which was also synthesized; the crystallographic properties are given. The monoxime, m. 197°. IV and excess HCO₂H give 5,5'-dimethyl-3,4,3',4'-tetraethylpyrrolenylmethene (V) yellow-red, m. 92°, isolated from the reaction product as the perchlorate, red with bluish violet surface luster, m. 173°; HBr salt, m. 202°; Cu complex, greenish blue prisms, m. 176°. Heating with 2 mols. Br in AcOH at 100° for 1.5 hrs. gives the 5,5'-bromomethyl deriv. of V, red prisms, which do not melt. IV (1 g.) in 5 cc. AcOH, treated in the daylight with 7.5 cc. of a Br soln. (50 g. Br in 100 cc. AcOH), gives 54-55% of the perbromide, red with a bluish violet surface luster, m. 132°, of 5-bromo-3,4-diethylpyrrol-5'-methyl-3',4'-diethylpyrrolenylmethene, brownish red, m. 97°; HBr salt, red with green surface luster, m. 194°. The perbromide with HBr·AcOH or (CH₃CO₂H)₂ gives octaethylporphin (VI), blue-violet, m. 318° (Maquenne block by slow heating) (55% yield); reduction gives octaethylporphyrinogen, m. 184°. Spectroscopic data are given for VI in various solvents. The hemin of VI, C₂₈H₄₄N₄FeCl, bluish violet, sinters 280-300° (spectrographic data); the bromohemin forms blue needles; the iodohemin is blue-violet. The phyllin of VI, C₂₈H₄₄N₄Mg, is blue-violet and does not m. 400°, the Cu complex of VI is red and m. 310°. The behavior of VI on oxidation with fuming HNO₃ and with H₂O₂ is reported. VI and excess of Br in AcOH give the compd. C₂₈H₄₄N₄Br₈ light bluish violet with no m. p. IV and EtMgBr, followed by ClCO₂Et, give 55% of 2-methyl-3,4-diethyl-5-carbethoxypyrrole, m. 75°; Br gives an unstable 2-bromomethyl-3-acetyl-4-ethyl-5-carbethoxypyrrole, m. 105°; an excess of MeOH contg. a little HCHO gives bis[2-carbethoxy-3,4-diethylpyrrol]methane, m. 180°. 5,5'-Dibromo-3,4,3',4'-tetraethylpyrrolenylmethene-HBr, red, decompa. 206° (block). VI in CHCl₃ and AcOH, shaken with PbO₂

gives *octaethylxanthoporphinogen*, citron-yellow, crystg. with 2.5 H₂O, of which 2 mols. are retained at 100°, m. 274° (decompn.). 2,4-Dimethyl-3-isovaleroyl-5-carbethoxy-pyrrole, m. 99° (50–5% yield). XXII. Syntheses of hematoporphyrin, protoporphyrin and hemin. H. FISCHER AND K. ZEILE. *Ibid* 98–116.—Deuterohemin with Ac₂O and AlCl₃ or SnCl₄ gives *di-Me 1,3,5,8-tetramethyl-2,4-diactylporphin-6,7-dipropionate* (I), m. 236° (cor.); spectroscopic data; sapon. with concd. HCl gives *diactyldeuteroporphyrin* (II), whose spectroscopic behavior in various solvents is given. The Fe complex of I, m. 229° (cor.); spectroscopic behavior; the Cu salt, m. 230° (cor.). Heating II with KOH in abs. EtOH gives hematoporphyrin, isolated as the HCl salt (III); heating in a high vacuum 2 hrs. at 105° gives protoporphyrin, which yields the di-Me ester with MeOH-HCl, m. 228°. Reduction of III gives mesoporphyrin. For a discussion of these syntheses the reader is referred to the original paper. C. J. W.

Cholesterol. E. MONTIGNIE. *Bull. soc. chim* 43, 1103 5(1928); cf. C. A. 22, 4534.—Oxidation of cholesterol with HgO in glacial AcOH gave α -hydroxycholesterol. Heating cholesterol with Ac₂O in a closed tube at 150° for 20 hrs. gave the acetate of cholesterol. Heating cholesterol and camphoric acid at 190–200° for 15 mins. gave the neutral camphorate C₂₇H₄₄(CO₂C₁₀H₁₆)₂. The action of HClO₄ on cholesterol is a dehydrating one, giving α - and β -cholesterylene. R. C. ROBERTS

The odoriferous products from musk and the many-membered rings. L. RUZICKA. Univ. of Utrecht. *Bull. soc. chim* 43, 1145–73(1928).—An address reviewing the work done on musk and civet in detg. their compn. A bibliography is included.

R. C. ROBERTS

The rotatory power of tartrates of organic bases. Study of strong electrolytes (DARMOIS) 2. Dielectric constants of some organic solvents (MATSUIKE) 2. Electric dipole moments of organic molecules (ESTERMANN) 2. Simplification of laboratory procedure for low-pressure distillation (JEZIEŃSKI) 2. The crystal structures of indigo and fumaric acid (REIS, SCHNEIDER) 2. The crystal structure of *cis*-ethylene oxide-dicarboxylic acid (REIS, SCHNEIDER) 2. Connections between the photochemical reaction velocities and the fluorescence of organic compounds (KÖGEL) 3. Garlic (KUROSAWA) 11D. Synthetic drug studies. IV. Synthesis of S-contg. preparations (KAUFMANN, WEDER) 17. Synthetic drug studies. V. Preparation of benzyl compounds (KAUFMANN, RITTER) 17. Calorimetric investigations. XV. Thermochemical study of cycloparaffins and their derivatives. 1. Experimental data for 5- and 6-membered cyclic diols (VERKADE, *et al.*) 2. Reactions in liquid H₂S. V. Reaction with furfural (MEINTS, WILKINSON) 2. Making preparations through the use of catalysts in organic chemistry instruction (GOLDSCHMIDT, ORTHNER) 2. Study of the action of Fe catalyzers on mixtures of CO and H (AUDIBERT, RAINEAU) 2. Inhibition of chemical reactions. II. Mechanism of the inhibition of esterification by alkaline substances (BAILEY) 2. Hydrogenation at high temperature and high pressure (KLING, FLORENTIN) 21. Contact mass (Ger. pat. 467,220) 18. Maleic and succinic acids (Ger. pat. 469,234) 4. Catalysts for oxidation of organic compounds (Brit. pat. 295,270) 18. Catalyst (Fr. 646,263) 18. Catalytic apparatus (Fr. pat. 646,264) 1.

Organic bases. I. G. FARBENIND. A.-G. Fr. 646,711, Jan. 4, 1928. Org. bases are obtained by circulating at a raised temp., and with or without pressure, on catalysts composed of inorg. salts capable of forming ammoniates, vapors composed of C₂H₂ and NH₃ or primary or secondary alkyl-, aralkyl- or arylamines. In examples C₂H₂ and NH₃ are caused to circulate at 200° over pumice impregnated with anhyd. ZnCl₂. The product obtained contains NHEt₃, NEt₃ and methylpyridine and their hydrogenation products. If FeCl₃ is used as well as ZnCl₂ at 220–300°, the product contains homologs of pyridine. If PhNH₂ and C₂H₂ are circulated at 300–320° over ZnCl₂, the product contains quinaldine. If *o*-toluidine is used instead of PhNH₂, 8-methylquinaldine is obtained. If *m*-xylydine and C₂H₂ are circulated over CoCl₂, dimethylquinaldine is obtained. PhNHEt and C₂H₂ over ZnCl₂ give quinaldine, *N*-ethylindole, and *N*-ethylidihydroquinaldine, C₂H₂ and *o*-chloroaniline on ZnCl₂ give 8-chloroquinaldine.

Catalytic oxidation of organic compounds. A. O. JÄGER (to Selden Co.). Brit. 296,071, Aug. 26, 1927. Oxidations, especially those in the vapor phase, are effected by use of a catalyst contg. a multicomponent zeolite formed by the reaction of at least one sol. silicate, at least one metallate and at least one metal salt, the basic radical of which enters the non-exchangeable nucleus of the zeolite. The catalytic element may be contained in or combined with the zeolite or may be contained in a diluent with which the zeolite may be mixed. The silicate component consists of an alkali

metal silicate which may contain alkali salts of acids of the elements, B, P, S, N, Sn, Te, Se, As, or Sb. The metallate component consists of alkali metal compds. of the elements Al, Cr, Zn, V, Be, Sn, Pd, Os, Pt, Ti, Zr, Pb, W, B, Mo, U, Ta, Cu, Ni, Fe, Co, Ag, Cd, Mn, Bi, Th, or Ce. The metal may be present in complex ions formed with NH_3 , HCN, HCNS, oxalic, formic, tartaric or citric acids, glycerol or sugars. The metal salt component consists of a sol. salt of Cu, Ag, Au, Be, Zn, Cd, Al, rare earths, Ti, Zr, Sn, Pb, Th, Cr, U, V, Mn, Fe, Ni, or Co. The alkali metal in the zeolite may be replaced by base exchange by the cations, NH_4 , Cu, Ag, Au, Be, Mg, Ca, Zn, Sr, Cd, Ba, Al, Ti, Ti, Zr, Sn, Th, V, Cr, U, Mn, Fe, Co, Ni, Pd, or Pt, either as simple or complex ions. The zeolites may be treated to form salt-like compds. by treatment with acids or salts of acids of V, W, U, Cr, Mo, Mn, Se, Te, As, P, S, Cl, Br, F, N, or B, or with polyacids or peracids or their salts, or with compds. contg. complex anions such as ferro-, ferri-, sulfo-, or metal-CN, NH_3 complexes, etc. The catalysts are suitable for use in the oxidation of C_6H_6 , toluene, phenol, naphthalene, anthracene, fluorene, eugenol, isoeugenol, MeOH, or EtOH, etc., to produce their desired oxidation products or for selective oxidations in purification treatments. Cf. C. A. 23, 1135.

Catalytic production of alcohols, aldehydes, ketones, acids, ethers, esters, etc. SOC. CHIMIQUE DE LA GRANDE-PAROISSE AZOTE ET PRODUITS CHIMIQUES. Brit. 296,049, Aug. 24, 1927. Various O-contg. org. compds. are obtained by the reaction of CO (or a suitable gas contg. CO) on H_2O in the presence of a mixed catalyst contg. at least 1 element of the series K, Na, Mg, V, Cr, Mo, Mn, Fe, Co, Ni, Cu, Ag, Zn, Cd, Hg, Pb, As, Sb, Bi, in assocn. with at least 1 element of the series Be, Mg, Al, Ce, Si, Ti, Zr, Th, U, Li, Ca, Sr, Ba and W. Temps. up to 550° and pressures up to 600 atm may be used and the walls of the reaction vessels may be made of chrome, silicon or manganese steels or of Cu or Ag. Examples are given of the production of: (1) alcs. with a catalyst formed of Mn carbonate, MgO and Al_2O_3 ; (2) formic acid with a catalyst of Th oxide and K_2CO_3 ; (3) ethers with a catalyst of Cu, Th and Bi compds. pptd. on pumice; (4) alcs. with a catalyst formed of Mn oxide, MgO and Al_2O_3 ; (5) alcs. and other org. compds. with use of a catalyst comprising a ppt. obtained by treating a soln. formed from HCl, antimonious oxide and Th nitrate with $(\text{NH}_4)_2\text{CO}_3$; (6) alcs. with a catalyst formed by treating a soln. of Pb nitrate and Sr nitrate with $(\text{NH}_4)_2\text{CO}_3$, and (7) production of lower aliphatic alcs. and acids with a catalyst contg. Th and Co and prepd. similarly to the catalyst of "6."

Aldehydes, alcohols, etc. J. C. WALKER (to Empire Gas & Fuel Co.). Brit. 295,356, Aug. 10, 1927. Gases such as natural gas or gases from the thermal decomposition of coal, petroleum or shale, which may contain olefins, are mixed with air, O_2 , or one or C oxides in sufficient quantity to form aldehydes and alcs. with some of the hydrocarbons such as C_2H_4 and higher hydrocarbons while leaving the CH_4 unchanged and are treated catalytically to obtain a gaseous product (after removal of the oxidation products) of a uniform calorific power. The catalyst may be suitable for dehydration, dehydrogenation and oxidation reactions such as Pt, Pd, Au, Ag, Cu, Cr, Mn, Fe, and Ni and compds. such as oxides of Cu, Mn, Fe, Ni, V, Cr, Mo, Ce and other metals having higher and lower oxides and alloys or mixts. of such metals which may be used on carriers such as pumice, asbestos fiber or alundum. An app. and various details of procedure are described. Cf. C. A. 23, 848.

Organic oxygen compounds. I. G. FARBENIND. A.-G. Fr. 646,087, Dec. 22, 1927. Benzene hydrocarbons contg. a side chain with at least 2 atoms of C are oxidized in the liquid state by means of O at a high temp. in the presence of catalysts derived from heavy metals. It is found that the O has a special affinity for the C atom in the α -position and oxidation occurs there first. In examples, a mixt. of acetophenone and methylphenylcarbinol is obtained by passing air through PhEt at 120° in the presence of FeCl_3 or heated $\text{Cu}(\text{NO}_3)_2$ or oxide of Fe, etc. Isopropylbenzene with oxide of Cu gives acetophenone and dimethylphenylcarbinol.

Organo-arsenic compounds. G. NEWBERRY and MAY & BAKER, LTD. Brit. 295,744, March 23, 1927. *N*-Acetylhydroxy derivs. of arylarsonic acids are prepd. from *o*-aminohydroxyarylarsonic acids by first protecting the amino group (as by introducing an acyl group such as acetyl or benzoyl) and then treating the acid with an α -haloacetic acid or a readily hydrolyzable deriv. such as the amide or an ester. By hydrolysis of the product the protecting group is eliminated and the *o*-substituted residues condense to form the corresponding isoxazines compd. Examples are given of the production of 3-hydroxy-1,4-benzisoxazine-6-arsonic acid and 8-amino-3-hydroxy-1,4-benzisoxazine-6-arsonic acid; acetylation of the latter produces the 8-acetylaminoo compd. which is described in Brit. 278,444 (C. A. 22, 2571).

Organic antimony compounds. AUGUST ALBERT. Ger. 469,327, Jan. 13, 1923.

Mixed aliphatic-aromatic Sb compds. contg. carbonyl groups at noncyclic bonds, are treated with hydrazine or its derivs., especially semicarbazide, or with other reactive amino compds. Thus, an aq. soln. of *p*-acetophenonestibonic acid contg. NaOH is added to semicarbazide-HCl and warmed in a water bath. The clear filtrate is acidified with HCl to ppt. the colorless hydrazone product which is purified by redissolving in Na₂CO₃ and repptg. with acid. Its m. p. is 350°. An alc. soln. of 1-hydroxy-2-acetophenone-4-stibonic acid may be treated similarly. Other examples are given.

Benzyl compounds of antimony. I. G. FARBENIND. A.-G. (Max Hardtmann, inventor). Ger. 466,364, June 30, 1925. Benzylmagnesium halide is allowed to react with Sb trihalide. Thus, tribenzyl antimony is obtained by the reaction of benzylmagnesium chloride on a soln. of SbCl₃ in ether.

Aromatic amines. I. G. FARBENIND. A.-G. Brit. 295,824, Aug. 4, 1927. See Fr. 639,557 (C. A. 23, 605).

Amino alcohols. SOC. ANON. POUR L'INDUSTRIE CHIMIQUE À BALÉ. Brit. 296,006, Aug. 22, 1927. Hydrogenation of aryl aminoalkyl ketones to the corresponding carbinols is effected in alk. soln. (suitably by use of Ni or metals of the Pt group as catalysts); O should be excluded from the app. used. An example is given of the production of methylaminomethyl-3,4-dihydroxyphenylcarbinol from ω -methylaminoacetopyrocatechol.

Hydroxydiaryl ketones. I. G. FARBENIND. A.-G. Fr. 646,402, Dec. 27, 1927. Hydroxydiaryl ketones are prepd. by treating hydroxyarylcboxylic acid halides with aromatic hydrocarbons or their ring-substituted derivs., in the presence of acid condensing agents. In examples, 2,3-hydroxynaphthoyl chloride is dissolved in C₆H₆, AlCl₃ or ZnCl₂ is added and the mixt. heated to 70–75°, and 2,3-hydroxynaphthophenone, m. 161–162°, is isolated in known manner. If PhMe is used instead of C₆H₆, 2,3-hydroxynaphthyl tolyl ketone, m. 152–153°, is obtained. If anisole is used instead of C₆H₆, 2,3-hydroxynaphthyl anisyl ketone, m. 134–134.5° is obtained. 2-Hydroxy-6-naphthoic acid is dissolved in C₆H₆ with SOCl₂, and excess of C₆H₆ and SOCl₂ are distd. off. The remaining 2,6-hydroxynaphthoyl chloride is dissolved in CS₂ and heated with anisole and AlCl₃, producing 2,6-hydroxynaphthyl anisyl ketone, m., 196–197° (uncorrected). *m*-Xylenolcarboxylic acid is converted into its chloride with PCl₅ and heated with anisole and AlCl₃, to give 4-hydroxy-5-anisoyl-1,3-xylene, m. 105–106° (uncorrected). C₁₀H₈ and its derivs. also may be used.

Esters. HOLZVERKOHLE-INDUSTRIE A.-G. Brit. 295,275, Aug. 8, 1927. Esterification of alcs. with aliphatic acids is effected (preferably under 2–8 atm. pressure and at moderate temps. corresponding to the pressure used) in the presence of limited quantities of catalysts which maintain the reaction mixt. of p_H 1.5–3.0 and the ester formed may be continuously removed by distn. As catalysts, there may be used inorg. acids or strongly hydrolyzed salts such as sulfates of heavy metals, Al, Mg and NH₄, acid phosphates of alkali and alk. earth metals, borates, salts of complex acids and of org. sulfonic acids, and salt mixts. giving a buffer action. The preliminary stage of the esterification may be carried out before addn. of the catalyst if desired. An example is given of the continuous production of MeOAc from MeOH and HOAc in a column app. with use of H₂SO₄ and NaHSO₄ as catalysts.

Esters of diiodobehenic acid. I. G. FARBENIND. A. G. (August Wingler, inventor). Ger. 468,021, May 13, 1925. Esters liquid at ordinary temps. are prepd. by esterification or reesterification. The acid may be iodized after the esterification. Thus, diiodobehenic acid is treated with isobutyl alcohol contg. 4% concd. H₂SO₄ at 100°. Or, behenic acid is heated to 100° with isobutyl alcohol, and 4% concd. H₂SO₄ added. The ester is then dissolved in CS₂, dried and I added. The mixt. is exposed to bright light at 40° for some days. Alternatively, ethyl diiodobehenate, m. 37°, may be heated to 100° with isoamyl alcohol and 3% HCl added. Cf. C. A. 23, 241.

Esters of polycarboxylic acids. ROBERT H. VAN SCHAAECK, JR., and ROBERT CALVERT (to Van Schaack Bros. Chemical Works). U. S. 1,706,639, March 26. Diethoxyethyl phthalate, b. 200–2°, a colorless liquid which may be used as a solvent for nitrocellulose and a plasticizer in lacquers is made by digestion (suitably in a fractionating column) of phthalic anhydride and glycol monoethyl ether in the presence of a small quantity of H₂SO₄. Similarly, there may be prepd. diethoxy-*sec*-butyl phthalate, ethoxyethylbutyl phthalate and similar methyl, iso-Pr, iso-Am, Am, hexyl or benzyl derivs. Several formulas of lacquer compns. are given, including one of these esters, as are also details of making the diethoxyethyl phthalate and butylethoxyethyl phthalate. Esters of citric, tartaric, succinic, phenylmalonic or trimelic acids may be similarly prepd.

Bornyl and isobornyl esters. GAZA AUSTRIERWERN. Ger. 468,320, Sept. 26, 1925.

Nopinene is heated with org. acids in double mol. quantities in terpene or α -pinene to moderate temps. not exceeding 150° . Thus, nopinene and benzoic acid are dissolved in xylene and heated to 140 – 150° . After cooling, the mixed acid is washed out and the residue driven over a satd. soln. of Na_2CO_3 by steam. The residual bornyl ester is sapond. Oil of turpentine can be used instead of nopinene.

Aminodiaryl ethers. I. G. FARBERIND. A.-G. Fr. 645,963, Dec. 20, 1927. *o*-Aminodiaryl ethers are prepd. by reducing *o*-nitrodiaryl ethers which are obtained by reacting an alkali salt of a hydroxy aromatic compd., with or without a diluent on *o*-dinitrobenzene compds. In examples, *o*-dinitrobenzene and PhOK are heated to give *o*-nitrodiphenyl ether which can be reduced to *o*-aminodiphenyl ether, m. 41° . 3,4-Dinitro-1-chlorobenzene and PhOK are heated, giving 5-chloro-2-nitrodiphenyl ether, m. 85° (uncorrected), which is reduced to the amino compd., m. 40 – 1° (uncorrected). Na 2,5-dichlorophenolate is heated in alc. soln. with 3,4-dinitro-1-chlorobenzene, giving 5,2',5'-trichloro-2-nitrodiphenyl ether, m. 97 – 98° , which is reduced to the amino compd. m. 74 – 75° . In the same manner, 5-chloro-2-nitrophenyl β -naphthyl ether, m. 109 – 110° , and the corresponding amino compd., m. 108 – 109° , may be obtained. Among other new compds. which may be obtained are 5,4'-dichloro-2-nitrodiphenyl ether, m. 80 – 81° (uncorrected), and 5,4-dichloroaminodiphenyl ether, m. 76 – 77° .

Aminonaphthol ethers. I. G. FARBERIND. A.-G. Fr. 646,576, Dec. 30, 1927. Aminonaphthol ethers are obtained by treating hydroxynaphthalenecarboxamides with alkylating or aralkylating agents and submitting the naphtholcarboxamide ethers to a Hofmann decompn. In examples, a soln. of 2,3'-hydroxynaphthamide in NaOH soln. is mixed with Me_2SO , and boiled, giving 2,3-methoxynaphthamide, m. 170° (uncorrected). The latter is treated in MeOH with NaOCl and concd. NaOH to obtain 2,3-aminonaphthol Me ether, m. 107° (uncorrected). 1,2-Hydroxynaphthamide is ethylated with the Et ether of *p*-toluenesulfonic acid to give 1,2-ethoxynaphthamide, m. 154° (uncorrected), which with the Hofmann decompn. gives 2,1-aminonaphthol ether, m. 48 – 49° (uncorrected). Similarly, 2,6-hydroxynaphthamide, m. 206° (uncorrected), (from 2,6-hydroxynaphthoyl chloride and NH_3) gives with benzyl chloride 2,6-benzoxynaphthamide, m. 198° (uncorrected), and the latter after the Hofmann decompn. gives 2,6-aminonaphthol benzyl ether, m. 198° (uncorrected). In the same way 2,6-methoxynaphthamide, m. 224° (uncorrected), gives 2,6-aminonaphthol Me ether, m. 156 – 157° (uncorrected).

Alkylated naphthalenes. I. G. FARBERIND. A.-G. Brit. 295,990, Aug. 22, 1927. In a modification of the processes described in Brit. 285,601 (C. A. 22, 433) and Brit. 273,665 (C. A. 22, 1983) for the production of alkylated naphthalene derivs., propylene or its higher homologs are caused to react with C_{10}H_8 or a deriv. in the presence of a Friedel-Crafts catalyst such as AlCl_3 (suitably under reduced pressure).

Aromatic mercaptans. ERWIN HOFFA and PAUL JÖRG (to Grasselli Desulfur Corp.). U. S. 1,706,489, March 26. Mercaptans of the general formula R SH (in which R means a nonsubstituted or substituted benzene or naphthalene residue) are obtained in good yields from diazoaryls contg. no solubilizing group by reaction with sulfides such as those of Na or Ca contg. more S than that present in Na_2S or CaS . The reaction is preferably effected at temps. above 60° , since at lower temps. explosive diazo sulfides may be formed. Alk. substances such as a carbonate, bicarbonate or alk. silicate, or a catalyst such as Cu or a Cu salt may promote the reaction. Several examples are given.

Polymerizing ethylene to form liquid hydrocarbons. C. EPNER. Brit. 295,705, Aug. 18, 1927. Polymerization is effected by the action of dark or silent elec. discharges at ordinary or raised temps., with or without use of catalysts. The product contains both satd. and unsatd. hydrocarbons from which fractions suitable for motor fuel and lubricating oil can be obtained. The residual gas contains H and can be used to saturate the unsatd. hydrocarbons in the presence of catalysts as a part of a continuous process.

Acetonitrile and other organic nitrogen bases. I. G. FARBERIND. A. G. Brit. 295,276, Aug. 8, 1927. Reaction of C_2H_2 with NH_3 is effected by heating and use of a catalyst contg. a plurality of compds. such as oxides which are not reducible under the conditions of the reaction, e. g., a mixt. of active alumina gel with silica gel or a mixt. of ZnO with irreducible oxides of the third or fourth periodic group. According to one example of the process, a mixt. of C_2H_2 and NH_3 is passed at 350° through a tube contg. a catalyst prepd. by suspending oxides of Th and Zr in water and drying and breaking up the paste. The product includes acetonitrile and pyridine bases. Acetonitrile is also formed by passing a mixt. of C_2H_2 and NH_3 at 450° through a series of tubes contg. a catalyst prepd. by impregnating active silica with an aq. soln. of Zn and Th nitrates, drying and calcining.

Nitriles of benzanthrone. KALLE & Co. A.-G. (Maximilian P. Schmidt and Wilhelm Neugebauer, inventors). Ger. 467,118, Nov. 18, 1924. These nitriles are prep'd. by acting on the halogenated benzanthrone with CuCN. Thus, monobromobenzanthrone is mixed with CuCN and heated to 200–210°. The mass is ground up and the nitrile extd. with hot PhNO₂. Also, dibromobenzanthrone, m. 257°, is heated to 160° with CuCN and pyridine, and the mixt. diluted with NH₄OH. The dinitrile is extd. with PhNO₂.

Benzanthrone. I. B. ANDERSON, R. F. THOMSON, J. THOMAS and SCOTTISH DYERS, LTD. Brit. 295,213, Feb. 2, 1927. Benzanthrone derivs. are prep'd. by treating 3-alkoxy(or hydroxy)-4,4'-diamino-1,1'-naphthylphenyl-2'-carboxylic acid with an alkali in aq. soln. The starting material may also be substituted in the 2, 5, 6, 7, 3', 5' or 6' positions by univalent groups such as alkyl, halogen or alkoxy. A mixt. of 6-Bz-1-diamino-Bz-2-methoxybenzanthrone and 6-aminobenzanthrone Bz-1-Bz-2-oxide is formed when 4,4'-diamino-3-methoxy-1,1'-naphthylphenyl-2'-carboxylic acid hydrochloride is dissolved in NaOH soln. and heated until evolution of methylamine ceases; similar treatment of 4,4'-diamino-3-hydroxy-1,1'-naphthylphenyl-2'-carboxylic acid gives 6-Bz-1-diamino-Bz-2-hydroxybenzanthrone in the cold and, on heating, a mixt. of thio- and 6-aminobenzanthrone Bz-1-Bz-2-oxide by loss of NH₃. 4,4'-Diamino-3-alkoxy(or hydroxy)-1,1'-naphthylphenyl-2'-carboxylic acid is made by coupling β -naphthol with diazotized *m*-aminobenzoic acid, reducing the azo compd. formed in acid soln., and if desired alkylating the product.

Aminoanthraquinones. I. G. FARBENIND. A.-G. Fr. 646,130, Dec. 23, 1927. Aminoanthraquinones and their derivs. are prep'd. by oxidizing the corresponding leuco-amino compds. in the presence of an agent liberating O and with catalysts. In examples, leuco-1,4-diaminoanthraquinone is heated to 140° in PhNO₂ with the addn. of S₂Cl₂. If an excess of S₂Cl₂ is used 1,4-diamino-2,3-dichloroanthraquinone is formed. Leuco-1,4-diamino-5,8-dihydroxyanthraquinone is oxidized in the same way with piperidine as a catalyst, and leuco-1,4-dibenzylidiaminoanthraquinone is oxidized in *o*-dichlorobenzene with benzoyl peroxide as catalyst. Other catalysts are Et₃N and HCl.

Halogen substituted 2-pyridone. MAX DOHRN and RALPH DIRKSEN (to Schering-Kahlbaum A.-G.). U. S. 1,706,775, March 26. 2-Pyridone is dissolved in a solvent such as CHCl₃ or dil. HCl and halogenated, *e. g.*, by Cl gas (to form a mixt. of 2-hydroxy-5-chloropyridine and 2-hydroxy-3,5-chloropyridine) or with ICl (to form 2-hydroxy-3,5-iodopyridine).

Hydrocarbon halogen derivatives. M. POLANYI and S. VON BOGDANDY. Brit. 296,021, Aug. 23, 1927. In forming halogen derivs. of org. compds. as described in Brit. 289,795 (C. A. 23, 847) the vapor of Cd or Zn is used as an "initiator" of the reaction.

Derivatives of dimethoxydibenzanthrone. MARCEL BADER, CHARLES SUNDER and DURAND & HUGUENIN SOC. ANON. Swiss 127,948, Mar. 14, 1927. Addn. to Swiss 102,540. Stable water-sol. derivs. in the form of acid esters of H₂SO₄ are prep'd. by converting the leuco compds. by the action of aminosulfonic acid. Thus, finely powd. aminosulfonic acid is stirred with pyridine and heated to 80°, when the leuco compd. of Bz-2,Bz'-2-dimethoxydibenzanthrone is added, and the mixt. further stirred and heated. After standing, water-free NaOH is added and the pyridine blown off by steam. The Na salt of the H₂SO₄ ester of leuco-dimethoxydibenzanthrone is obtained by evap. to dryness.

Anthraquinone derivatives (intermediates for making dyes or pharmaceutical products). I. G. FARBENIND. A.-G. Brit. 295,943, Aug. 18, 1927. Nitro compds. are formed by treating 1,2,3,4-tetrahydroanthraquinone or its homologs or substitution products with a nitrating agent. By use of a mixt. of HNO₃ and H₂SO₄, a nitro group enters the *ar*-nucleus and no dehydrogenation occurs. Examples are given of the production of *ar*- α -nitro-1,2,3,4-tetrahydroanthraquinone together with a smaller proportion of the corresponding *ar*- β -nitro compd. from 1,2,3,4-tetrahydroanthraquinone of the production of 1,2,3,4-tetrahydro-8-nitro-7-methylantraquinone from 1,2,3,4-tetrahydro-7-methylantraquinone, and of the production of 1,2,3,4-tetrahydro-8-acetylaminoanthraquinone (by reducing and acetylating the *ar*- α -nitro-1,2,3,4-tetrahydroanthraquinone) which may be nitrated to form 1,2,3,4-tetrahydro-8-acetylamino-5-nitroanthraquinone. H₂SO₄ alone has a dehydrogenating action on tetrahydroanthraquinones and Br converts them into unstable derivs. contg. Br in the hydrogenated nucleus, which easily lose HBr and form the corresponding anthraquinones.

Naphthalene derivatives. I. G. FARBENIND. A.-G. Brit. 296,010, Feb. 21, 1927. Cyanonaphthalenesulfonic acids with at least one sulfo group in *o*- or *p*-position to

the CN group are heated with alk. reagents to produce the corresponding compds. of one of the types: (1) $C_{10}X_2(OH)(CN)$, (2) $C_{10}X_2(OH)(CONH_2)$, (3) $C_{10}X_2(OY)(CONH_2)$ or (4) $C_{10}X_2(OY)(COOH)$ in which X is H or a univalent substituent, and Y is an alkyl or aralkyl group. Examples are given of the production of 2,1- and 1,4-cyanonaphthols, 1,2- and 1,4-hydroxynaphthoic acids, 7-sulfo-2,3-hydroxynaphthoic acid, 2,7-dihydroxy-3-naphthoic acid, 6- or 7-sulfo-1,4-hydroxynaphthoic acid, the amides of 2,1-, 1,2- and 1,4-methoxynaphthoic, 2,1- and 1,4-ethoxynaphthoic, 2,1- and 1,4-butoxynaphthoic, and 1,2-benzoyloxynaphthoic acid, and of 1,2- and 1,4-methoxynaphthoic, 1,4-ethoxynaphthoic and 1,4-butoxynaphthoic acids. *o*- and *p*-Cyanonaphthalenesulfonic acids and their nuclear substitution products are obtained from the corresponding aminonaphthalenesulfonic acids by Sandmeyer's reaction.

Naphthostyryl derivatives. I. G. FARHENIND. A.-G. (Heinz Scheyer, inventor) Ger. 471,268, Jan. 13, 1927. *N*-Chloronaphthostyryls are prepd. by treating naphthostyryl or its nuclear substitution products with hypochlorites. Examples are given describing the prepn. of *N*-chloronaphthostyryl, m. 132°, and *N*-chloro-5-ethoxynaphthostyryl, m. 117°.

Naphthostyryl derivatives. I. G. FARHENIND. A.-G. (Heinz Scheyer, inventor) Ger. 471,269, Jan. 13, 1927. Naphthostyryl derivs. substituted in the nucleus with 1 atom of Cl are prepd. from the *N*-chloronaphthostyryls prepd. according to Ger. 471,268 (above) by treating them with acid condensing agents or by heating them alone or in a high-boiling org. solvent. Examples are given describing the prepn. of 4-chloronaphthostyryl and 4-chloro-5-ethoxynaphthostyryl from the corresponding *N*-chloro derivs.

Piperidine derivative. MARCEL DE MONTMOLLIN. Swiss 127,779, May 9, 1927. A deriv. of piperidine substituted in the β - and γ -positions is prepd. by treating the dinitrile with reducing agents and closing the ring in the diamine thus obtained by dry distn. of the hydrochloride. Thus, 2-methyl-1,3-pentanedinitrile is dissolved in alc., Na added and the mixt. boiled with a reflux condenser. On distg. the alc. the residue contains 2-ethyl-3-methylpentamethylenediamine, which is extd. with ether. The diamine is then treated with HCl, forming crystals of the hydrochloride, which is heated to give β -ethyl- γ -methylpiperidine.

Alkali salts of nitrosamines. I. G. FARHENIND. A.-G. Fr. 646,359, Dec. 26, 1927. Alkali salts of nitrosamines of aromatic amines are prepd. by introducing the *syn*-diazotate prepd. at low temp. into a sufficiently concd. caustic alkali lye and carefully maintaining the temp. of the reaction mixt. equal to or higher than the temp. of transformation into the *anti*-diazotate. In examples, a concd. soln. of *m*-chlorobenzenediazonium chloride is introduced at a temp. not above 5° into a soln. of 33° Bé. KOH. Secondary products are filtered off and the soln. of *syn*-diazotate thus obtained is poured with stirring into strong KOH soln. the temp. being kept at about 105°. The K salt of the nitrosamine of *m*-chloroaniline is obtained. In the same way the K salt of the nitrosamine of 3,4-dichloro-, 2,4,5-trichloro- and 2,4,6-trichloroaniline, and the Na salt of the nitrosamine of 2-chloro-5-bromoaniline are prepd. The *syn*-diazotate prepd. at a low temp. from the diazo compd. of 5-chloro-2-toluidine and KOH soln., is introduced into concd. KOH soln. at 115°, whereby the K salt of the nitrosamine of 5-chloro-1,2-toluidine is obtained, contg. the group-NKNO in the 2 position. Similarly at a transformation temp. of 110° a K salt of the nitrosamine of 4-chloro-1,2-toluidine and at 120° of 2,6-dichloro-4-amino-1,3-xylene and 5,6-dichloro-2-toluidine are obtained. The alkali salts of the nitrosamines of 4-bromo-2-toluidine, of 5-chloro-2-bromo-1,4-toluidine, of 4-chloro-1,3-toluidine, of 4,5-dichloro-1,2-toluidine, of 2,5-dichloro-1,4-toluidine, of 2,3-dichloro-1,4-toluidine, of 6-chloro-1,2-toluidine, are also described. The Na salt of the nitrosamine of 4-chloro-1,2-anisidine and of 4-chloro-1,2-dianisidine are prepd. at a transformation temp. of 110°. The K salt of the nitrosamine of 4-chloro-1,3-anisidine is prepd. at 115-120°, and of 1-aminoanthraquinone at 120-125°.

Sulfo acids. I. G. FARHENIND. A.-G. (Gerhard Balle and Karl Daimler, inventors) Ger. 466,362, March 1, 1925. Sulfo acids suitable for emulsifiers are prepd. by treating aralkylized mononuclear aromatic hydrocarbons with alc. during or after the sulfonation. Thus, benzyltoluene is treated with butyl alcohol at 50°. The temp. is then raised to 90° and a mixt. of chlorosulfonic acid and fuming H_2SO_4 added. Benzyltoluene and isobutyl alcohol are also mentioned in examples.

Acetic acid. HERMANN SUDA. Ger. 469,942, June 18, 1926. (See Austrian 111,566 (C. A. 23, 1419).)

Concentrating acetic acid. I. G. FARHENIND. A.-G. Brit. 29,338, May 4, 1927. See Fr. 633,817 (C. A. 22, 3669).

H. SUDA. Brit. 295,641, Aug. 15, 1927. Extr.

of HOAc from its aq. solns. is effected in the liquid phase by esters of univalent or multivalent alcs. with monobasic or polybasic cyclic acids, having b. ps. above 150° (such as di-Et or di-Bu phthalate, di-Me or dihexyl phthalate, esters of the naphthene acids and high-b.-p. esters of benzoic acid) and the extd. HOAc is sep'd. from the solvent by distn. The extn. may be carried out countercurrentwise. Cf. C. A. 23, 1909.

2-Aminonaphthalene-3-carboxylic acid. I. G. FARBENIND. A.-G. Fr. 645,875, Dec. 17, 1927. See Brit. 282,450 (C. A. 22, 3669).

Salts of 1-methyl-4-isopropylbenzenesulfonic acid. CHEM. FAB. VON HEYDEN A.-G. (Curt Philipp, inventor). Ger. 466,360, Nov. 27, 1924. Salts of this acid and its substitution products are prepd. by the reaction of sol. salts of the acid on sol. Mg salts. Thus, an aq. soln. of Na 1-methyl-4-isopropylbenzene-2-sulfonate is treated with an aq. soln. of MgCl₂ and allowed to stand, when the Mg salt seps. out as colorless crystals. Similarly, Mg sulfonates can be obtained from aq. solns. of Na 1-methyl-2-bromo-4-isopropylbenzene-5-sulfonate and MgSO₄, and from aq. solns. of Na 1-methyl-4-isopropylbenzene-3-sulfonate and MgCl₂.

Methane. COMPAGNIE CONTINENTALE POUR LA FABRICATION DES COMPTEURS ET AUTRES APPAREILS. Fr. 646,782, Dec. 24, 1927. Industrial gases, contg. a large proportion of CO, which are to be enriched in CH₄ are treated in 2 successive phases in the presence of appropriate catalysts, in the 1st of which the gas is enriched in H by the reduction of the steam, added or already contained in the gaseous mixt., by the CO, and in the 2nd the real production of CH₄ takes place.

Formaldehyde. CHEM. FAB. VON HEYDEN A.-G. (Rudolf Gebauer, inventor). Ger. 470,267, May 5, 1923. CH₂O soln. free from CH₂OH is prepd. from aq. aldehyde solns. contg. alc. by mixing with substances contg. alc. OH groups which form addn. compds. with the CH₂O and then segg. the alc. by fractionating. Thus, com. CH₂O is mixed with glycol and the mixt. fractionally distd. Glycerol and grape sugar are mentioned as the added substances in other examples.

Formaldehyde. HOLVERKOHLE-IND. A.-G. (Koloman Roka, inventor). Ger. 467,234, Aug. 29, 1922. CH₂O is prepd. by heating methylene chloride in a closed vessel in presence of water to 140–170°. The liquid must be kept in motion.

Formamide. I. G. FARBENIND. A.-G. Fr. 646,815, Jan. 7, 1928. Formamide is vaporized without decompn. by bringing it into contact with superheated surfaces, preferably under reduced pressure, so that vaporization takes place immediately on coming in contact with the surface without accumulation of liquid in the evaporator. The formamide may be used directly, *e. g.*, for the prepn. of HCN by thermal decompn. in the presence of catalysts.

Acetal. SOC. ANON. DES DISTILLERIES DES DEUX-SÈVRES. Fr. 646,666, Dec. 31, 1927. See Brit. 283,112 (C. A. 22, 3893).

Ether. FIRMA E. MERCK (Wilhelm Welke, inventor). Ger. 468,020, Oct. 17, 1926. Pure ether is preserved by adding a small amt. of tannin, *e. g.*, 1.0 mg. to 1 l. of ether.

Menthol. HANS JORDAN, WALTER SCHOELLER and REINHARD CLERC (to Chemische Fabrik auf Actien vorm. E. Schering). U. S. 1,706,784, March 26. A product of condensation of crude cresol which contains mainly *m*- and *p*-cresol and acetone is heated to about 300° to effect decompn. and the decompn. product is treated with H in the presence of a hydrogenation catalyst such as Ni and Cu, Co or Fe at a temp. of about 140–160° until 8 atoms of H have entered into the mol. combination; the resulting mixt. is then fractionally distd. Cf. C. A. 22, 4134.

Methylene chloride. I. G. FARBENIND. A.-G. Fr. 646,661, Dec. 31, 1927. See Brit. 283,119 (C. A. 22, 3893).

Urea. WARGÖNS AKTIEBOLAG and JOHAN H. LIDHOLM. Ger. 466,263, Sept. 11, 1924. Finely crystd. urea is prepd. from soln. by evapg. the soln. till it contains not more than 10% water and pouring the mass into molds to form blocks which can be granulated. Or the mass can be decanted drop by drop in an atm. of such temp. that the drops congeal as they fall.

Bs-1-Hydroxybenzanthrone and similar compounds. GEORG KRÄNZLEIN, HEINRICH VOLLMANN, HEINRICH GREUNE and ARTHUR WOLFRAM (to Grasselli Dyestuff Corp.). U. S. 1,705,868, March 19. Bs-1-Hydroxybenzanthrone, crystg. from high-boiling solvents as reddish orange needles, m. 317°, is prepd. by condensing anthrone in the presence of H₂SO₄ with acrylic acid dissolved in glacial HOAc at 70–110°, and, generally, a benzanthrone substituted in the Bs-nucleus can be produced by condensing an anthraquinone compd. reduction product contg. O in the central nucleus thereof, for instance an anthrone, anthranol or oxanthranol by means of an acid agent with an α,β -unsatd. carbonyl compd. of the general compn. $\text{RCOCR}^1\text{:CHR}^2$, wherein R stands

for alkyl or aryl or hydroxyl or alkoxy; R^1 stands for any univalent residue, for instance, hydrogen, halogen, hydroxyl, alkoxy, alkyl, aryl, aralkyl, acyl, aroyl, carboxylic ester or the like and R^2 stands for hydrogen, halogen, hydroxyl, alkoxy, alkyl, aryl, carboxyl or carboxylic ester. The reaction between anthrone (or anthranol) for instance and the said α,β -unsatd. carbonyl compds. takes place in such a manner that primarily an addn. of the anthrone to the double linkage occurs with formation of a colorless, well crystg. intermediate product, which intermediate product, in many cases, has *pharmaceutical properties*. Some of these addn. products have already been prepd. by Meerwein (*C. A.* 13, 1310). Contrary to the statement by Meerwein that the said addn. compds., when heated with concd. acids are re-split up into their components, it is stated that from these addn. compds. when working in a suitable manner, *i. e.*, by using an acid condensing agent, there may in all cases be obtained the corresponding benzanthrones by the closure of the ring. Numerous examples and details of procedure are given.

1,6-Dimethylacenaphthenequinone. I. G. FARBERIND. A.-G. (Rudolf Lesser and Georg Gad, inventors). *Ger.* 470,277, Nov. 22, 1925. 1,6-Dimethylnaphthalene is condensed with oxalyl chloride in the presence of a neutral solvent at low temps. by means of $AlCl_3$.

3,6-Tetramethyldiaminodiphenothiazinium cholate. CHEMISCHE FABRIK VORM SANDOZ. *Swiss* 128,326, Dec. 20, 1926. This compd. is prepd. by the action of cholic acid on the diphenothiazinium compd. It melts at 200° with decompn.

Naphthalene-1,5-disulfonyl chloride. I. G. FARBERIND. A.-G. (Bodo Klarmann, inventor). *Ger.* 466,441, Nov. 24, 1925. This substance is prepd. by the reaction of chlorosulfonic acid on one mol. of naphthalene below 100° . Thus, 1. naphthalene is stirred gradually into 400 parts of chlorosulfonic acid at $30-40^\circ$ till HCl ceases to be evolved. The mixt. is then allowed to cool and is filtered. The substance seps. out and is recrystd. from

oil tetranitrate. HENRY A. AARONSON. U. S. 1,705,690, March 19, 1928. When naphthalene is added to concd. HNO_3 and a temp. of about 15° is maintained, the acid and pentaerythritol tetranitrate are sepd. and the latter is freed from water and soda soln.

Acid. HERBERT W. DAUDT (to E. I. duPont de Nemours & Co.). U. S. 1,705,690, March 19, 1928. A reaction is effected between $EtMgCl$ and a Pb salt such as $PbCl_2$ in the presence of $EtCl$ and an alkyl iodide such as MeI . Cf. *C. A.* 23, 1143.

11—BIOLOGICAL CHEMISTRY

PAUL E. HOWE

A—GENERAL

FRANK P. UNDERHILL

Quinine hemolysis; influence of carbon dioxide. W. WEISE. *Abhandl. Geb. Auslandskunde* D26 ii, 5 pp. (1928).—Promotion of quinine hemolysis by CO_2 takes place, if at all, only under extreme conditions. Inhibition by small acid concns., observed by Rusznyák, holds also for CO_2 . The intensity of the hemolysis depends on the amt. of quinine brought into contact with a single blood corpuscle. B. C. A.

Action of formaldehyde on lecithin. Formation of methylated compounds on the organism. W. R. WITANOWSKI. *Acta Biol. Expt.*, Warsaw 2, 61-72 (1928).—Further quantities of choline are produced by the action of CH_2O on com. lecithin contg. cephalin, pointing to the partial conversion of the latter into lecithin by methylation of its free amino group. This increase in choline content varies from 10 to 53% of the original quantity. The optimum pH of the reaction lies between 5 and 7. The quantity of addnl. choline produced does not correspond with the no. of free amino groups present in com. lecithin, indicating either that the reaction does not proceed to completion or that amino-group-contg. impurities other than cephalin are present. The addn. of calf-liver ext. does not increase the yields of choline obtained. B. C. A.

Influence of ions on action of urease. E. M. MYRSKOWSKI. *Acta Biol. Expt.*, Warsaw 2, 211-24 (1928).—The influence of a no. of Na salts on the action of urease on urea was studied. Where inhibition takes place this is proportional to the concn. of salt added, and inversely proportional to the concn. of urease present. Certain salts which at low concns. accelerate the action of urease in every case retard its action at

higher concns. In unbuffered solns. the influence of the salts used, at mol. concns., is in the order of intensity acetate > sulfate > iodide > thiocyanate > tartrate > citrate > nitrate > chloride, while in buffered solns. the order is acetate > sulfate > iodide > thiocyanate > chloride > nitrate > citrate > tartrate. The influence of fluoride is specific, the inhibition curve obtained by adding increasing concns. of this salt being of the adsorption type, pointing to the inactivation of urease by adsorption of fluoride on its surface.

B. C. A.

Acetone and protein. P. CATELANI. *Arch. intern. Pharm.* 33, 420-39(1927); *Physiol. Abstracts* 13, 174.—The action of insulin on acetone *in vitro* was investigated. Acetone disappears in different amts. when mixed with insulin for 12 hrs. at 35°. The quantity transformed varies with the different preps. of insulin. The resemblance of the action of insulin to that of proteins is discussed, and the possible combinations of protein and acetone are considered, such as 2 mols. of acetone combining with protein with loss of a mol. of water. Albumin in soln. can fix or transform acetone and the combination may be chem. or a form of adsorption. Insulin does not affect this fixation. Acetone intoxication in dogs changes the acid-base equil. toward the alk. side.

H. G.

Alkaline hydrolysis of edestin. I. S. YAICHNIKOV. *J. Russ. Phys. Chem. Soc.* 60, 929-32(1928); cf. *C. A.* 22, 1371.—NaOH solns. hydrolyze edestin 3 to 4 times as rapidly as acids of the same concn.

B. C. A.

Biological reactions in gels—the influence of gel density. SILVESTER PRAT. *Kolloid-Z.* 47, 36-8(1929).—Cultures in nutrient media contg. agar responded markedly to variations in the firmness of the gel, tending to cluster with increasing firmness. Addition of salts having no effect on the growth in liquid media caused changes in gel media, presumably by effect on gel firmness. Growth of crystals (pptd. by respiration) was also affected by gel firmness.

G. CALINGAERT

Action of vapors of ethanol, methanol, ether, chloroform, and illuminating gas on isolated leucocytes. C. FORTI. *Atti accad. Lincei* 8, 700-5(1928).—0.10 cc. of leucocytes from *Bufo vulgaris* was suspended in its own serum and placed in a crystg. tube in the presence of vapors of the above substances. Even the vapors from 0.1 to 0.5 cc. of EtOH, MeOH, ether and CHCl₃ paralyze the motions of the leucocytes in about 2 mins. With illuminating gas, however, there is increased motion between 15 and 45 mins., decrease from then on up to 8-9 hrs. when the leucocytes again become paralyzed, but exposure to air causes a partial return of the motion. Exposure beyond 10 hrs. definitely destroys the motion.

A. W. CONTIERI

Occurrence and distribution of iodine in fish and in fish products. GULBRAND LUNDE. *Teknisk Ukeblad* 75, 201-03, 214-6(1928); cf. *C. A.* 23, 1964.—Salt-water fish contain more I than any other article of food examd. Muscle of *Gadus aeglefinus*, *Gadus morrhua* and *Gadus virens* contain, resp., 34.17, 22.20 and 13.37 mg. I per kg. dry substance. In the intestinal canals were found still higher values. Examin. of *Pandalus borealis*, *Asterias*, *Clupea harengus* and phytoplankton shows that the I content of the ocean is concd. in the phytoplankton, which contains 230.91 mg. I per kg. dry substance. To det. the nature of the I combinations the following method was used: The samples were extd. with alc. in a Soxhlet app. on the water bath, and then with CHCl₃. The total CHCl₃-sol. I combinations are characterized as lipid I. In the alc. fraction was detd. I in inorg. form. Then the sample was extd., first, in turn with H₂O, with 25% K₂CO₃ soln. on the water bath, and with cold 5 N HCl. In phytoplankton was found 27.4% sol. in alc. and CHCl₃ (1.5% lipid I), 3.0% sol. in water, 1.8% extd. with 5 N HCl, and 67.8% insol. residue. Norwegian preserved fish contain 0.45 to 6.60 mg. I per kg. dry substance. Cod-liver oils from Norway and New Foundland gave 4.5-15.2 mg. I per kg.

A. DROGSETH

Proteins of the muscle of various animals. K. BECK AND ERICH CASPER. *Chem. Lab. Reichsgsundheitsamts. Z. Untersuch. Lebensm.* 56, 437-57(1928).—Van Slyke N-partitions were made on the flesh of the ox, calf, hog, sheep, horse, goose and codfish. There was remarkable agreement in the several N components and amino acids among the several species of animals.

C. R. F.

Intracellular hydrion concentration studies. I. The relation of the environment to the p_H of protoplasm and of its inclusion bodies. ROBERT CHAMBERS. *Cornell Univ. Med. Coll. Biol. Bull. Marine Biol. Lab.* 55, 369-76(1928).—A study of the relation between the p_H of the protoplasm of a living cell and that of its environment has been made. Of the acids and bases which affect the p_H of the environment some penetrate living cells while others apparently do not possess this property. The presence of CO₂ or of NH₃ in the aq. medium surrounding the living cells readily changes the p_H of the intracellular inclusions which stain with neutral red, but do not change

the p_H of the protoplasm matrix nor of the nucleus as long as the cell is alive. II. The effect of injection of acids and salts on the cytoplasmic p_H of *Amoeba dubia*. PAUL REZNIKOFF AND HERBERT POLLACK. *Ibid* 377-82.—The cytoplasm of the living *Amoeba dubia* shows considerable buffering power to p_H change induced by the injection of salts and buffers. If HCl, injected into the amoeba, is immediately buffered by the cytoplasm, no toxic effect results. If the quantity injected is too great to be buffered, the affected portion of the cell dies, and is discarded. $CaCl_2$, $MgCl_2$, and Al_2Cl_3 , injected into amoeba colored with indicators, give colorimetric evid. of the production of acid greater in amt. than can be explained by acid produc. by mech. injury. Unless the color reverts immediately to that indicative of no. cytoplasm, the affected portion is discarded in the case of $CaCl_2$ and Al_2Cl_3 ; the entire cell dies when $MgCl_2$ is employed. Upon death, permeability changes occur so that the dead mass of the amoeba quickly assumes the H-ion concn. of the environment. III. The buffer action of *Amoeba dubia* and its use in measuring the p_H . HERBERT POLLACK. *Ibid* 383-85.—It is proved that the p_H of the amoeba is not less than 6.6 and not greater than 7.2. The micro-injection technic, with direct color comparison for reading the p_H values, was utilized. Regardless of the p_H value of the buffer soln. injected, the return of color of the indicator is quite rapid and const. If, however, sufficient buffer was applied to change the p_H of the cell, the cell died. Two important facts are emphasized: the cytoplasm has a considerable buffering power, and, when the p_H of the cytoplasm is changed, the cell dies.

FREDERICK G. GERMUTH

The effects of changes in medium during different periods in the life history of *Uroleptus mobilis* and other protozoa. III. The effect of yeast extracts. LOUISE H. GREGORY. Barnard Coll. *Biol. Bull. Marine Biol. Lab.* 55, 386-93(1928). cf. C. A. 20, 3750.—The effect of vitamins on the vitality of protozoa has been investigated. Three different yeast exts. (viz., Alpha bios No. 223, Beta bios and Gamma bios) were prepd. and subsequently employed in the tests. Expts. indicate that while the protoplasm of *Uroleptus mobilis* is usually depressed when treated with yeast exts. probably because of its weakened condition, that of *Dallasia*, *Pleurotrichna* and *Stelodonta* were definitely stimulated by the addn. of fractional exts. of yeast to the normal media. Alpha bios in general causes the least effect and Gamma bios the greatest increase in division rate. Tables furnishing interesting facts relative to this research are given.

FREDERICK G. GERMUTH

Observations on *Hydra* and *Pelmatohydra* under determined hydrogen-ion concentration. W. L. THRELKELD AND S. R. HALL. Univ. of Va. *Biol. Bull. Marine Biol. Lab.* 55, 419-30(1928).—The optimum range of H-ion concn. for both *Hydra viridissima* and *Pelmatohydra oligactis* lies within the range p_H 7.8 and 8.0. Polyps allowed to develop pronounced differentiation and resorption in a high H-ion concn. were induced completely to restore their lost parts when the medium was altered to be within the optimum range of p_H . Dedifferentiation and resorption are induced rather by unfavorable p_H than by inanition.

FREDERICK G. GERMUTH

Further observations on the chemical composition of Woods Hole sea water: the chlorine content and salt analysis. IRVINE H. PAGE. *Marine Biol. Lab. Biol. Bull. Marine Biol. Lab.* 55, 449-52(1928).—The Cl content of Woods Hole sea water has been ascertained over a 3 weeks' period, and shown to be const. within any large range. The method followed was that endorsed by A. O. A. C. (1925). Duplicate titrations were made, and the detns. but rarely disagreed. An analysis of the sea salt is furnished.

FREDERICK G. GERMUTH

The precipitation of calcium and magnesium from sea water by sodium hydroxide. ELEANOR M. KAPP. *Marine Biol. Assoc. Biol. Bull. Marine Biol. Lab.* 55, 451-8(1928).—During the course of an investigation into the modification of sea water for use as a perfusion medium, a knowledge of the relative amts. of Ca and Mg pptd. by NaOH was deemed of importance. Charts are furnished showing the effect of adding varying concns. of NaOH solns. to sea water and exptl. mixts. Mg is rapidly pptd. by NaOH at about p_H 10.2. At a region corresponding to the addn. of 0.1 mol NaOH per l. of sea water, the titration curve begins its second rise, while the Mg curve flattens out. A small quantity of Ca is pptd. throughout; it owes its first pptn. to the insol. of the carbonate, which is intermediate in this respect between $Mg(OH)_2$ and $Ca(OH)_2$.

FREDERICK G. GERMUTH

Permeability differences between nuclear and cytoplasmic surfaces in *Amoeba dubia*. YUN-ICHI MORITA AND ROBERT CHAMBERS. Cornell Univ. *Biol. Bull. Marine Biol. Lab.* 56, 64-7(1929).—*Amoeba*, stained yellow with methyl red and immersed in solns. of HCl, exhibits injury effects by a sudden change in color from yellow to red in localized regions on the periphery. These regions are pinched off and dis-

carded. In a moving amoeba this injury first occurs at the tip of the extending pseudopodia. Sublethal concentrations of HCl which do not penetrate the amoeba from without will, when injected into the ectoplasm, readily diffuse into the nucleus without causing irreversible injury. On the other hand, the wall of the contractile vacuole appears to be similar to that of the plasmalemma of the amoeba in regard to the non-penetrability of HCl.

FREDERICK G. GERMUTH

The culture of *Amoeba proteus* in a known salt solution. D. L. HOPKINS AND PERCY L. JOHNSON. Zoölogical Lab. of Johns Hopkins Univ. *Biol. Bull. Marine Biol. Lab.* 56, 68-73(1929).—A medium, the inorg. compn. of which is accurately known, was devised, in which *Amoeba proteus* grows and multiplies rapidly. By adding KH_2PO_4 buffer gradually, so as to allow time for adaptation on the part of the amoeba, a concn. of buffer may be added which is sufficient to hold the H-ion concn. const., and yet not interfere with the growth and multiplication of the organism. F. G. G.

The hydrolysis of ovalbumin by trypsin, in its relations to the formation of diketopiperazines. A. BLANCHETIÈRE. *Compt. rend.* 188, 112-3(1929); cf. C. A. 22, 1169.—The tryptic hydrolysis of natural and denatured ovalbumin was studied at p_H 8.5 and 38°. The formation of *N*-diketopiperazine from these substances was found to be inverse to that previously observed in the case of peptic hydrolysis. A. G.

The nutrition of *Polytoma uvella* (Ehrenberg) (flagellate chlamydomonadae) and the synthetic power of the heterotrophic Protista—the mesotrophic Protista. ANDRÉ LWOFF. *Compt. rend.* 188, 114-6(1929).—Media are described which are suitable for the growth of *Polytoma uvella*. Such media consist solely of simple org. compds. In this respect *Polytoma uvella* resembles the chlorophyllic autotrophic flagellate of the genus *Chlamydomonas*. The term mesotrophic is, therefore, suggested for the Protista of the type of *Polytoma*, while the term heterotrophic should be limited to the type of Protista exemplified by glaucoma. ARTHUR GROLLMAN

The effects of carbon arc radiation on the blood of dogs. H. S. MAYERSON AND HENRY LAURENS. Tulane Univ. *Am. J. Physiol.* 86, 1-14(1928).—A single exposure to C arc irradiation produced a temporary increase in plasma vol. of 6 to 37% with recovery to normal within 5 hrs. Repeated exposures increased the no. of red blood cells 10 to 19%, maintained for 3 to 6 weeks after the last irradiation. Color, vol. and satn indices showed that the cells in the post-irradiation period were usually smaller and less satd. than before irradiation. Platelets dropped in no. and vol. (35%) during irradiation with recovery usually within 5 hrs. after each exposure. Leucocytosis resulted from moderate irradiation and markedly low levels in the white blood cells followed stronger excessive exposures. Excessive irradiation also appeared to destroy red blood cells. J. F. LYMAN

Penetration of ultra-violet rays through clothing materials. II. HARRIET MORGAN. Utah Agr. Expt. Sta. *Am. J. Physiol.* 86, 32-8(1928); cf. C. A. 22, 3421.—Cottonseed oil was irradiated through cloth filters of various materials and weaves. The treated oils were than fed to rachitic rats and the healing effects noted. Conclusion: The mean interspace between threads and weight are factors limiting the ultra-violet ray transmissibility of clothing material. Kind of material is also an important factor, artificial silk being superior in transmissibility to cotton or mixed cotton and worsted of similar wt. and weave. J. F. LYMAN

The distribution of nitrogen in benzoyl casein. HIDEO KIMURA. Univ. Kyoto. *Acta Schol. Med. Univ. Imp. Kioto* 11, 117-9(1928).—Fifty g. of casein contg. 1.02% ash and 15.92% N (calcd. for ash-free casein) were benzoylated with 9.5 g. BzCl and N NaOH in the cold with the usual technic. The Bz casein contained 1.23% ash and 15.02% N (calcd. for ash-free casein). Then the casein and the Bz casein were analyzed for amino N, humin N, monoamino N, diamino N, histidine N, arginine N and lysine N. It was seen that the corresponding values in both compds. resembled each other closely. Conclusion: The introduction of Bz into casein is not accompanied by a noticeable disintegration of the protein mol. G. SCHWOCH

The enzymic cleavage of the benzoylamino acids. TSUTOMU KAWAI. Univ. Kyoto. *Acta Schol. Med. Univ. Imp. Kioto* 11, 121-9(1928).—The action of trypsin, erepsin and glycerol exts. of fresh pig kidneys and liver on Bz-*dl*-phenylalanine (I), monobenzoyl-*dl*-tyrosine (II) and Bz-*L*-leucine (III) was examd. Neither trypsin nor erepsin had the ability of breaking up the mols. of I, II and III, while the glycerol exts. produced cleavage, III being much more strongly hydrolyzed than I or II. G. S.

The action of erepsin on the dipeptides formed from racemic amino acids. TSUTOMU KAWAI. Univ. Kyoto. *Acta Schol. Med. Univ. Imp. Kioto* 11, 131-5(1928).—To 7 g. of *dl*-tyrosine H_2SO_4 -HCl in 100 cc. CHCl_3 was added with cooling 41 cc. of N NaOH . This mixt. slowly treated with 5 g. $\text{H}_2\text{CClCOCl}$ and 20-cc. soda soln. contg.

4.7 g. Na_2CO_3 , yielded *chloroacetyl-dl-tyrosine Me ester* (I). To prep. *glycyl-dl-tyrosine* (II), I was treated with an excess of aq. NH_3 (d. 0.88). After 3 days the NH_3 was evapd., H_2O added and the soln. filtered. The undissolved residue consisted of *glycyl-dl-tyrosine anhydride* (III), m. 255-7° after crystn. from hot H_2O ; insol. in EtOH and Et₂O, almost insol. in cold H_2O and dil. acids, sol. in alkali. *Glycyl-dl-phenylalanine* as well as II was hydrolyzed asymmetrically by erepsin, the digestion mixt. showing distinct *l*-rotation after a certain time. III was not hydrolyzed by erepsin, trypsin, glycerol exts. from kidneys, yeast press juice and taka-diastase. It was hydrolyzed by heating it with 25% H_2SO_4 under reflux for 14 hrs. G. SCHWOCH

The enzymic cleavage of proteins and peptones. TSUTOMU KAWAI. Univ. Kyoto. *Acta Schol. Med. Univ. Imp. Kioto* 11, 147-54(1928).—K. compared the digestion of gelatin (I), casein (II) and edestin (III) with that of the resp. peptones, using trypsin, erepsin or a combination of trypsin and erepsin as the enzymic agents. The peptones were prepd. by digestion of the proteins with HCl and pepsin. From his results K. comes to the conclusion that II and III are hydrolyzed more easily by the enzymes than are the peptones derived from these proteins, while there is little difference between the cleavage of I and gelatin peptone. G. SCHWOCH

Action of the proteolytic enzymes on the benzoylproteins. TSUTOMU KAWAI. Univ. Kyoto. *Acta Schol. Med. Univ. Imp. Kioto* 11, 267-71(1928).—In comparison with the original proteins, the derivs. of proteins are very resistant against the action of proteolytic enzymes. This fact was confirmed by K. Bz edestin (I) was digested by trypsin to a slightly lesser degree than was edestin (II). Erepsin had a much smaller effect on I than on II. While erepsin and trypsin combined had a greater hydrolyzing action on II than had trypsin alone, their action on I was not different from that of trypsin alone. Bz gelatin (III) was digested by trypsin at about the same rate as was gelatin (IV). Erepsin was almost without effect on III and IV. G. SCHWOCH

The thermodynamic activities of proteins. G. S. ADAIR. *J. Am. Chem. Soc.* 51, 696-707(1929); cf. *C. A.* 23, 323.—Formulas are derived correlating the thermodynamic activities of protein salts with measurements of osmotic pressure. In making a practical application of these formulas to sodium hemoglobinate, it is found that in certain respects, a close resemblance exists between protein salts and typical strong electrolytes. Sodium hemoglobinate, HbNa_n , differs from the latter in that the valence of the Hb ions is neither an integer nor a const., but an av. value, which varies from 0 to 80 according to variations in the activities of Na and OH ions. C. T. S.

Coagulation of blood and milk by electrolytes and the similarity between the clotting of blood and the formation of jellies. N. R. DHAR AND SATYA PRAKASH. *J. Phys. Chem.* 33, 459-66(1929).—Dil. blood and milk are coagulated less readily than concd. blood and milk by such electrolytes as Na citrate, K oxalate, NH_4NO_3 and HCl. The stabilizing effect of small amounts of Na citrate, tartrate, oxalate, etc., during the coagulation of blood and milk by CuSO_4 , is attributed to the adsorption of the negative ions by the particles of blood and milk, and not to the removal of pptg. Ca ions. In general, electrolytes coagulate blood and milk more readily in the presence of saponin or gelatin, except that gelatin has no effect in the presence of HCl. The clotting of blood seems to be guided by the same laws that operate in the formation of jellies of V_2O_5 , ceric hydroxide, silicic acid, etc. CORNELIA T. SNELL

Physicochemical study of proteins contained in the ginkgo. MAKOTO FURUICHI. Tottori Higher Agr. School. *Bull. Tottori Higher Agr. School* 1, 105-22(1928). Ginkgo contains starch 69.6, protein 12, fat 3%, and the ash of the seed contains K 0.406, Na₂O 8.4, CaO 4.8, $\text{Fe}_2\text{O}_3 + \text{Al}_2\text{O}_3$ 3.7, P_2O_5 21.6, SO_3 8.3 and SiO_2 4.9%. Solv. of the degreased sample is greatest in water, next in NaCl soln. and least in alc. Among the 4 proteins (globulin, albumin, protamine, glutelin) globulin is most abundant, of the total N, 60% is present as globulin. F. proposes to name the globulin ginkgoun. Tryp- tophan is contained in globulin in large quantity. On examg. the isoelec. point of each protein by dropping HCl into the alk. soln. it was found that the point of max. surface tension and the max. turbidity are in approx. agreement with each other. The least quantity of HCl is required in globulin, next comes albumin, the largest quantity being required by glutelin. This is supposed to be due to the difference of the amino and carboxyl groups which combine with the acid and alkali. K. SOMEYA

Mechanism of oxidative processes. XV. Nature of the acetic acid fermentation. HEDWICH WIELAND AND ALFRED BERTHA. *Bayr. Akad. Wiss. München Ann.* 467, 96-157(1928); cf. *C. A.* 22, 4320.—A series of investigations has been carried out on the AcOH fermentation by *Bacterium orleanense* (I), the mechanism of which is considered to be $\text{EtOH} (-2\text{H} + \text{O}) \rightarrow \text{AcH} + \text{H}_2\text{O}$; $\text{MeCH(OH)}_2 (-2\text{H} + \text{O}) \rightarrow \text{AcOH} + \text{H}_2\text{O}$. It was found impossible to sep. the enzymes from the bacteria and all

expts. were carried out with suspensions of the bacteria of known concn., buffered to pH 5.6. With EtOH as substrate, the consumption of free O was strictly proportional to time. In the presence of 0.0002 M HCN the velocity fell to 16% of the normal. Titration of the AcOH formed indicated a greater dehydrogenation of AcH than would be expected from its concn. relative to EtOH, an effect which is attributed to the preferential adsorption and reaction of AcH formed on the surface of the same enzyme which catalyzes the 1st stage of the reaction. When benzoquinone was used as H-acceptor in the absence of free O, the dehydrogenation was more rapid, but the same linear relation with time was found. The bacteria were shown to be unaffected by quinone or quinol in the concns. used. The reaction was much less sensitive to HCN than the reaction with free O; a concn. of 0.01 M 1st produced a noticeable retardation. The rate of hydrogenation of the quinone was only slightly lowered by the presence of free O. On the other hand, the free O began to be consumed only when the quinone was practically used up and thereafter was taken up at the normal rate. The same enzyme apparently catalyzes the reaction with both quinone and free O. The linear relation between reaction and time shows that adsorption on the enzyme surface is more rapid than the chem. reaction. Since quinone displaces free O as H-receptor when both are present, quinone must be strongly adsorbed and occupy the surface of the enzyme to the exclusion of O, i. e., it inhibits the O reaction for the same reason as HCN and the reaction with quinone is less retarded by HCN on account of this strong adsorption of quinone. The hypothesis of activation of both the H of the substrate and of free O is rejected; activation of the former alone is considered sufficient. There is no reason why quinone should be able to dispense with an activation inhibited by HCN if mol. O needs it. With methylene blue (II) as H-acceptor the reaction was very slow and its course was not linear. There was evidence of retardation of the reaction by excess of II. The non-linear course of the reaction made observation of times of complete decolorization quantitatively valueless. Retardation by HCN was 1st marked at 0.01 M . With II in the presence of free O, the latter was consumed at the normal rate, while when sufficient HCN was added normally to inhibit reaction with free O, free O was taken up at about 6% of the normal rate. This rate was increased somewhat by increasing the amt. of II and was presumably detd. by the rate of reaction of free O with leuco-II, which was found to be low and little affected by HCN. The interior of the cell, as well as its external walls, is active in the dehydrogenation process. The II is unable to penetrate the walls and reacts only on its outer surface, while mol. O, quinone and HCN can all diffuse into the interior of the cell, where 90% of the action takes place. A parallel series of expts was carried out with AcH as substrate. The reaction was little retarded by HCN and addn. of AcH restored the activity of a mixt., contg. EtOH as substrate, poisoned by HCN. These effects appeared to be due to formation of $MeCH(OH)CN$, which was shown to occur rapidly. The $MeCH(OH)CN$ itself, however, had a minor retarding effect. The course of the reaction of AcH with free O, quinone or II was similar to the reaction of EtOH, although slower. Mixts. of AcH and EtOH consumed EtOH at a rate which was the mean of the rate of consumption by each separately. The 2 reactions are, therefore, brought about probably by the same enzyme. Contrary to Neuberg and Windisch (*C. A.* 20, 929), the Cannizzaro reaction plays little part in the formation of AcOH from AcH. Carefully controlled expts. showed that the rate of consumption of O was naturally about 40 times that calcd. on the basis of dismutation alone, the rate of which was also measured. Similar expts. with *B. pasteurianum* showed that these bacteria brought about dehydrogenation of AcH at 100 times the rate of dismutation. $o-HOC_6H_4CHO$ and $o-HOC_6H_4CH_2OH$ were not dehydrogenated by I. Dithioglycollic acid (III) or cystine did not act as H-acceptors in the presence of EtOH. The dehydrogenation of $(CH_3CO_2H)_2$ by III in the presence of minced liver previously reported is erroneous (*C. A.* 19, 38). The catalase activity of I was also measured. H_2O_2 was rapidly decompd. in a reaction apparently of high order, retarded by HCN. This retardation was parallel to that of the dehydrogenation of EtOH. No free H_2O_2 could be recognized in any of the reaction mixts., whether contg. HCN or not, so that the inhibitory effect of HCN on the dehydrogenase activity must be of the same order. C. J. WESS

Lipases. I. Organ lipases and the inhibition of lipase action by poisons. KEN-SUKE GYOROKU. Univ. of Tokyo. *Proc. Imp. Acad. (Japan)* 4, 503-4(1928); cf. *C. A.* 22, 2579.—Serum and liver lipases are more sensitive to atoxyl than are other lipases. An atoxyl-sensitive lipase on purification becomes atoxyl-refractory. NaF has a poisonous effect on lipases. A poisoned lipase cannot be regenerated by dialysis. II. Determination of lipase in duodenal contents. K. GYOROKU AND SHOICHI TERASHIMA. *Ibid.* 505.—The duodenal contents are approx. diluted with a soln. of equal

parts of glycerol and 1% NH_4 phosphate. The resultant lipase soln. is very stable. The tributyrin method of Rona and Michaelis is used. III. Lipases and proteins. *Ibid* 506-7.—The lipases of blood serum, pancreatic and gastric juices are always found with the proteins pptd. by 60% satn. with $(\text{NH}_4)_2\text{SO}_4$. IV. Separation of lipase into two fractions. *Ibid* 508-9.—The addn. of quinine to gastric or pancreatic lipases yields 2 fractions, each of which alone is inactive but a mixt. of the 2 constituents has a strong lipolytic action. C. J. WEST

The biochemistry of I and the I cycle in nature (LUNDE) 8.

GASKELL, AUGUSTA: What is Life? Springfield, Ill. and Baltimore, Md.: Charles C. Thomas. 324 pp. \$3.50. Reviewed in *Ann. Internal. Med.* 2, 979(1929).

B—METHODS AND APPARATUS

STANLEY R. BENEDICT

Studies in mineral metabolism. IV. Determination of phosphorus compounds in blood by dry combustion. H. H. GREEN. *J. Agr. Sci.* 18, 372-5(1928); cf. *C. A.* 23, 2203.—Total P is detd. as follows: Into a 10-cc. calibrated measuring cylinder contg. a few cc. of water, pipet 2 cc. of citrated blood, make up to the mark with water, invert and mix. Pipet 2 cc. of this laked blood (= 0.4 cc. of whole blood) into a small porcelain dish contg. 2 drops of 10% $\text{Ca}(\text{OAc})_2$, evap. to dryness and ignite the residue. To the ash add 10 cc. of 10% H_2SO_4 , ext. on a steam bath for a few mins. and filter quantitatively into a 100-cc. measuring cylinder, washing up to approx. 60 cc. with cold water. Make slightly alk. with concd. NH_4OH (phenolphthalein), bring to approx. neutrality with a few drops of 10% H_2SO_4 , add 2 cc. of Denig's reagent (*C. A.* 15, 218) and make up to 100 cc. with water. Add 10 drops of fresh SnCl_2 soln. (1%), let stand 10 mins. and compare in colorimeter with a standard prepd. by similar treatment of a soln. of microcosmic salt of known P content. The lipid P is detd. by applying the preceding procedure to the method of Randles and Knudson (*C. A.* 16, 349). The total acid-sol. P is detd. as follows: Pipet 30 cc. of water into a small Erlenmeyer flask, run in 10 cc. of citrated blood and add at once 10 cc. of 20% trichloroacetic acid. Shake vigorously completely to ppt. protein. Allow to stand about $\frac{1}{2}$ hr. and filter. Take 5 cc. of filtrate (= 1 cc. of whole blood) and proceed as for total P. For the inorg. P, pipet 10 cc. of the trichloroacetic acid filtrate into a 25 cc. measuring cylinder, bring to a faint pink to phenolphthalein with NH_4OH , back to colorless with a drop of 10% H_2SO_4 , and add successively 1.5 cc. each of the usual Briggs reagent (*C. A.* 18, 2183), 1% hydroquinone and 20% Na_2SO_3 . The standard is prepd. simultaneously by adding 2 cc. of the trichloroacetic acid soln. to 10 cc. of the standard phosphate soln., neutralizing and adding the reagents precisely as in the case of the unknown. Make both up to the same vol., 17.5 cc., allow to stand 30 mins. and compare. The org. acid sol. P is detd. as the difference between the total acid-sol. and the inorg. P. P. R. D.

Supplementary note on the new ferricyanide method for blood sugar. OTTO POLIN. Harvard Univ. *J. Biol. Chem.* 81, 231-6(1929).—Several factors involved in detns. of blood sugar by the method of *C. A.* 22, 2762 are discussed. The dil. tungstic acid soln. should not be exposed to light nor should a preservative be employed. The Prussian blue employed is held in soln. by means of gum ghatti instead of gum arabic as previously described. ARTHUR GELLMAN

A time method for determination of reducing sugars, and its application to analysis of blood and urine. JAMES A. HAWKINS AND DONALD D. VAN SLYKE. Rockefeller Inst., N. Y. *J. Biol. Chem.* 81, 459-67(1929); cf. *C. A.* 23, 404.—The amt. of sugar present is detd. by the rate at which yellow ferricyanide is decolorized. The accuracy of the method is only $\pm 5\%$ but it is extremely rapid and simple. A. G.

Determination of small amounts of alcohol in the human subject. JOHN EVANS AND A. O. JONES. *Analyst* 54, 134-41(1929).—Slowly evap. 2 cc. of urine at 80° in a current of air which has been passed through concd. H_2SO_4 . Lead the vapors into a mixt. of 15 cc. 0.2 N $\text{K}_2\text{Cr}_2\text{O}_7$ and 20 cc. of concd. H_2SO_4 . Thereby the EtOH is oxidized to AcOH . Titrate the excess $\text{Cr}_2\text{O}_7^{--}$ iodometrically with 0.1 N $\text{Na}_2\text{S}_2\text{O}_3$. The concn. of alc. in the blood attains a max. value about 1.5 hrs. after consumption and falls at the rate of about 12 mg. per hr. per 100 g. of alc. The slower the rate of drinking, the lower the max. concn. Foods, especially bread and milk, lower the concn. of alc. in the blood. If a sample of urine is tested which has been excreted 1.5 hrs. after consumption of the liquor, the quantity of whiskey or beer drunk can be computed with a fair degree of accuracy. Thus 95 cc. of alc. are equiv. to 225 cc. of whiskey and correspond to 200 mg. alc. per 100 cc. of urine. The same amt. of alc. in beer corresponds to 1920

cc. and will show 178 mg. of alc. per 100 cc. of urine. The urine should be tested to make sure that no fermentable carbohydrate is present as this will make the interpretation of the results impossible.

W. T. H.

Electro microanalysis. RUDOLF KELLER. *Naturwissenschaften* 17, 100-3(1929).—A short review of microanalysis in electrobiology. Potentials of living tissues were detd. by indicators and dyes also by actual potential measurements by micromanipulation. From photographs it appears that the honey glands of plants (*Vicia faba*) attract, specifically *in vivo*, neg. dyes because of electrostatic fields. Therefore glucose, which acts as a negative colloid (Stary, C. A. 21, 2590), is attracted. In this migration of substances in and out cells their dispersion is of great importance; Fürth's micro-diffusion app. was used to advantage to det. this factor. B. J. C. v. d. H.

The quantitative extraction of cholesterol and its esters from tissues and body fluids. ERNST MÜLLER. Univ. Marburg. *Z. Biol.* 88, 132-8(1928).—A crit. review of several methods for the detn. of cholesterol with the suggestion that none of the methods which make use of a drying procedure is accurate. FRANCES KRASNOW

An accurate constant-rate injection apparatus. O. S. GIBBS. Dalhousie Univ., Nova Scotia. *J. Pharmacol.* 35, 63-5(1929).

C. RIEGEL

Comparison of assays of adrenaline in the suprarenal extract from oxen, pigs, cats, dogs and rabbits by means of the cat paradoxical eye reaction, the rabbit intestine segment method and the colorimetric method of Folin, Cannon and Denis. TADASHI SUGAWARA. Tohoku Univ. *Tohoku J. Exptl. Med.* 11, 410-32(1928); cf. following abstr.—The adrenaline content was detd. in parallel by the 3 methods, adrenaline chloride of Sankyo Co. being used as the standard. Of the medullary ext. of oxen and pigs the rabbit intestine method gave higher values than the other 2 methods which gave about equal values. Methods of extn. had no apparent relation to the ratios of the values obtained by the 3 methods. The Folin test gave a higher value in cases of cortical tissue than the other 2 tests. With the whole gland of dogs and cats the rabbit intestine method gave a higher value than the others. With ext. of rabbit suprarenals a smaller value was obtained by the rabbit intestine than by the Folin test, even in the medullary ext. The cortical ext. gave a higher value with the Folin test. When the sepn. of the cortical tissue from the medullary tissue was made after the lapse of some hrs the adrenaline by both the Folin and rabbit intestine methods was increased. Therefore, the adrenaline diffuses from the medulla to the cortex after extirpation of the gland. Manipulation of the capsule accelerates this diffusion. The amt. of substance in the cortex, detectable by Folin only but not by the intestine, was unaltered by such handling. Methylaminoacetocatechol-HCl (adrenaline-HCl) reacts to the Folin test with an intensity of about 1 to 2.3 of adrenaline-HCl, but to the rabbit intestine with 1 to 200 of the latter. ω -Aminoacetocatechol-HCl gives a color nearly equal in the Folin test to that of adrenalone-HCl, but has no inhibitory action on the rabbit intestine movements. E. H.

Colorimetric and biological estimation of the adrenaline content of suprarenals, particularly the cortical extract of normal rabbits. MASANOSUKÉ WATANABÉ AND HIROSHI SATO. Tohoku Univ. *Tohoku J. Exptl. Med.* 11, 433-48(1928); cf. preceding abstr.—The colorimetric method of Folin, Cannon and Denis gave a definite positive reaction for the pure isolated cortical suprarenal substance of rabbits, corresponding to about 1 mg. of adrenaline per g. of tissue. The rabbit intestine segment method, blood pressure test and cat paradoxical eye reaction completely failed to show any reaction. For the total suprarenal gland, the Folin method gave much higher values than the biological method. The colorimetric method of Suto and Inouye yielded about the same values as the biological method. E. H.

Examination of hydrogen-ion concentration by means of the micromanipulator.

VI. Experiments on the reaction of tissues. JUNTARO OGAWA. Tokyo Imp. Univ. *Central J. Med.* 26, 899-96(1928).—O. reexamined the Shimidsmann methods of detg. the H-ion concn. by inserting into the cell sap a grain of coloring matter, and compared it with Grift's method. He has described in detail the necessary precautions to be taken in the manipulation. The cell must be as fresh as possible. When it is partially broken the p_H of the cell is rendered acidic and unfit for examn. O. also made a table of the color tones, the use of which is claimed to afford a simpler and more exact p_H detn. K. SOMEYA

The preparation of colloidal gold for the Lange reaction. RAUL WERNICKE AND FERNANDO MONSIEU. *Rep. inst. bacteriol. dept. med. hig.* 5, 19-28(1927).—Many of the recognized methods for the prepn. of gold sols do not give good results in the hands of all workers because of the various factors to be controlled. The authors were able to produce very excellent gold sols for the Lange test by carrying out the electrodialysis

between 2 parchment membranes. The use of collodion membranes gave poor results. The use of glucose in an alk. soln. as a reducing substance also gave a poor gold sol. M. H. SOULE

Dyes [biological stains] (Brit. pat. 295,605) 17. Separating particles suspended in a liquid [in blood analysis] (Fr. pat. 646,027) 13.

WARSAMY, D.: *Examen du sang: physiologie, technique et séméiologie*. Paris: E. Le François. 472 pp.

C—BACTERIOLOGY

CHARLES B. MORREY

Cultural studies of *Bacillus larvae* White. A. G. LOCHHEAD. Central Exptl. Farm., Ottawa. *Sci. Agr.* 9, 80-9(1928).—The casual factor in foul brood of bees does not develop at all on ordinary lab. nutrient media. Plant exts. were useful in cultivating *B. larvae*, and a transparent medium contg. carrot ext. in addn. to peptone and yeast gave satisfactory development of the organism. Great variations in morphology were exhibited by the organism when grown under varying environmental conditions C. R. F.

Differentiation of the coli and aerogenes groups of bacteria. A. J. SALLE. *J. Am. Water Works Assoc.* 21, 71-8(1929).—After summarizing the various media and methods used for differentiation, crystal violet is considered far superior to brilliant green, which is now most generally used. D. K. FRENCH

Effect of ultra-violet light on the viability of the virus of foot and mouth disease. I. A. GALLOWAY. *Brit. J. Exptl. Path.* 9, 326-9(1928).—The virus of foot and mouth disease in filtrates is destroyed after 5 minutes exposure to the radiations of the Hg-vapor lamp in quartz flasks, which transmit radiations of wave lengths from 5720 to 2300 A. U.; it is inactivated in quartz flasks after 30 minutes exposure to the rays of the Hg-vapor lamp filtered through a sheet of vita-glass which allows the passage of rays of wave lengths from 5720 to 2800 A. U. The rays of wave lengths 5720-2300 A. U. have no lethal action on the virus of foot and mouth disease in flasks of ordinary glass. When the virus is suspended in unfiltered lymph or serum a protective action, due to selective absorption by the suspending fluid, was observed. HARRIET F. HOLMES

Bacterila calorimetry. I. General considerations. Description of a differential microcalorimeter. STANHOPE BAYNE-JONES. Univ. of Rochester. *J. Bact.* 17, 105-22(1929). II. Relationship of heat production to phases of growth of bacteria. STANHOPE BAYNE-JONES AND HENRIETTA S. RHEES. *Ibid* 123-40. J. T. M.

The virulence of *B. pestis* in media with and without sodium chloride. NESTOR M. VILLAZON. *Rev. inst. bacteriol. dept. nacl. hig.* 4, 385-92(1926).—Beef infusion agar was prepd. with and without the addn. of NaCl. *B. pestis* was grown serially on these 2 media for several generations. The medium contg. the NaCl (0.5%) gave uniformly the richer cultures. The morphology and the virulence of the germs were the same on both media. M. H. SOULE

A discussion of the microflora of alcoholic fermentation (WILLE) 16.

KENDALL, ARTHUR I.: *Bacteriology: General, Pathological and Intestinal*. Philadelphia: Lea & Febiger. 3rd ed., revised and enlarged. 733 pp. \$7. Reviewed in *J. Am. Med. Assoc.* 92, 1010(1929).

D—BOTANY

THOMAS G. PHILLIPS

The occurrence and characteristics of certain yeasts found in fermented honey. GEORGE E. MARVIN. Univ. of Wisconsin. *J. Econ. Entomol.* 21, 363-70(1928).—Thoroughly ripened honeys with a moisture content between 14 and 20% have been found which contain the potential elements for souring. Upon storage and with subsequent granulation of the honey, fermentation may begin. Several yeasts in the group *Zygosaccharomyces* have been isolated and detd. as new to science. Of the 3 known species, only one has so far been found. E. J. C.

Carbon dioxide assimilation. J. BOEDLER. *Bot. Arch.* 20, 143-78, Eng. abstr., 178(1927); *Expt. Sta. Record* 58, 624.—The main portion of this work presents a collective report, claimed to show for the first time the newer assimilation theories combined. H. L. D.

Microchemical studies of rootings and non-rooting rose cuttings. MARGARY C.

CARLSON. Northwestern Univ. *Bol. Gaz.* 87, 64-80(1929).—Dorothy Perkins cuttings (rose) contain more reserve starch than American pillar cuttings. As the starch in the canes is hydrolyzed, the content of reducing sugars increases. Asparagine is abundant in the branches after 8-11 days.

BENJAMIN HARROW

Growth of seedlings in light and in darkness in relation to available nitrogen and carbon. MARY E. REID. Yale Univ. *Bol. Gaz.* 87, 81-117(1929).—Growth of the seedling is influenced by the nature and relative quantities of the food reserves of the seed, as well as by differences in the external environment. Nitrates are synthesized into growth-promoting substances, both in light and in darkness. Nitrates favor the growth of shoots more than of roots. Light strongly favors the growth of roots. Seedlings developed from high-protein seeds benefit most under the influence of light.

BENJAMIN HARROW

Effect of chemical treatment on the assimilation of carbon dioxide. OSKAR WEHNER. *Planta* (Abt. E., *Z. wiss. Biol.*) 6, 543-90(1928).—Leaves of *Fontinalis* and of several mesophytic plants were subjected in a closed system to vapors of H_2SO_4 , HNO_3 , NH_3 and certain other solns. known to retard the assimilation of CO_2 . The degree of injury was detd. qualitatively by the plasmolytic method and quantitatively by dry wt. detns. or by comparing the gaseous exchange of treated and control leaves. Noack's method (*Z. Bot.* 17, 511; cf. *C. A.* 21, 2011) was used for detg. gaseous exchange. After $1\frac{1}{2}$ -2 hrs. of vapor treatment, leaves placed in direct sunlight bleached in 16 or 24 hrs., whereas those left in the dark for 72 hrs. remained normal. HNO_3 , H_2SO_4 and nitrosulfuric acid accelerated, retarded or inhibited assimilation, depending upon the concn. NH_3 and HCl were not stimulating at any concn. Used alone 0.0001 *N* HNO_3 retarded assimilation, but in the presence of 0.1 *N* $NaNO_3$ assimilation was increased by 40%. The addn. of Fe^{++} salts, especially ferroammonium citrate, to these injurious reagents lessened the detrimental effect on assimilation processes. The favorable effect of Fe^{++} salts was more pronounced with *Fontinalis* than with the mesophytic plants. It is still not clear just what part Fe plays in lessening vapor injury, but it is not regarded as a protoplasmic stimulation effect. Plant injury due to vapors emanating from industrial centers may thus be due to 1 or more of many factors, a complex situation which cannot be settled by chem. analysis of the air alone. A. E. H.

Correlation between hydrogen-ion concentration, surface tension, and growth. FERD. HERČÍK. *Planta* (Abt. E., *Z. wiss. Biol.*) 6, 679-83(1928).—When the p_H value of the expressed juice of pea seedlings was varied by the addn. of HCl , surface tension values were changed, reaching a max. at p_H 4.7 which was also the isoelec. point of the juice. Higher surface tension values were obtained for the juice of etiolated seedlings than were obtained for seedlings grown in normal light. It is believed, therefore, that a close correlation exists between the p_H value and surface tension of cell sap and growth. Surface tension detns. were made with du Noüy's app. and p_H detns. were made with the quinhydrone electrode.

A. E. HITCHCOCK

The process and mechanism of the dropping of leaves after a frost. A. MÜHL-DORF. *Botan. Inst. Univ. Cernauti. Ber. deut. botan. Ges.* 46, 635-52(1928).

LAWRENCE P. MILLER

Temperature measurements of the flowers of *Vinca minor*. K. SCHUBERT. *Ber. deut. botan. Ges.* 46, 653-66(1928).

LAWRENCE P. MILLER

Variations in pyrenoids during starch production. FR. STEINECKE AND H. ZIEGEN-SPECK. *Ber. deut. botan. Ges.* 46, 678-81(1928).—When cultures of *Spirogyra grevilleana* and *Zygnema stellinum* are transferred from darkness to light the pyrenoids become smaller and change in shape within 30 secs. This is still noticeable after 30 mins. but after 90 mins. the pyrenoids have their usual form. It is suggested that pyrenoids may play a role in connection with the enzymes of starch production.

L. P. M.

The chemistry of the exudation from the wood of *Pentaspodon motleyi*. A. R. PENFOLD AND F. R. MORRISON. Tech. Museum, Sydney. *J. Proc. Roy. Soc. N. S. Wales* 62, 218-24(1928).—If cuts are made into the heart wood of *P. molleyi* a heavy brown oil may be collected. This oil is non-volatile with steam and cannot be distd. without decompn. It gives a striking color reaction with $FeCl_3$ and is sol. in 8% $NaOH$. Elementary analysis, mol. wt. detn. by the b.-p. method, analyses of the Ag and Cu salts, and detns. of the acid no. and I no. indicate that over 90% of the oil consists of an unsatd. acid, $C_{26}H_{40}O_4$, with 1 $COOH$ and 2 OH groups.

LAWRENCE P. MILLER

Movement of fat in apple shoots. H. D. HOOKER. Univ. of Missouri. *Proc. Am. Soc. Hort. Sci.* 1927, 185-7.—Translocation of fat and N in apple trees was greater in ungirdled trees that bloomed heavily than in those that had little bloom. This indicates that greater storage in the trees that bloomed little the previous season and came

into full bloom the next year. Translocation of fat and N was greater in trees that received $(\text{NH}_4)_2\text{SO}_4$ than in unfertilized trees. The fertilizer treatment was responsible for 0.44 g. more N per 100 shoots being translocated to the tips. J. J. SKINNER

Garlic. V. JUNZO KUROSAWA. *Bull. Research Inst. South Manchurian Railway Co.* 12, 91-130(1928).—When Hg_2SO_4 is used instead of $\text{Pb}(\text{AcO})_2$, HgCl_2 , etc., in the isolation of the principle of garlic, a double compd. contg. Hg is obtained. This was fractionated into many fractions and a detailed examn. of each fraction was made. It is notable that the principle contains not only many common acids, but also such uncommon ones as cysteine, thiolactic acid, a complex organic phosphate contg. N and S (a peptide-like compd. which has not been obtained in a pure state). Cysteine was obtained as large crystals (decompn. temp. $221-3^\circ$), and its properties agree with those of the product obtained by the reduction of cystine as well as with the descriptions in previous literature. More S was found than theory by about 1%. As an explanation of the cause of this phenomenon K. mentions that by virtue of the reactions $\text{RSH} \rightleftharpoons \text{RS}^- + \text{H}^+$; $\text{RSH} + \text{H}^+ \rightarrow \text{R}^+ + \text{H}_2\text{S}$; $\text{RS}^- + \text{R}^+ \rightarrow \text{RSR}$, the neutral soln. of cysteine constantly produces, even when prepd. from other substances than garlic, a small quantity of H_2S gas. From the difference in the properties of the Ag salts thiolactic acid was proved to exist in the α and β forms. The disilver salt of the β -thiolactic acid, b_m 130° , was prepd. and the mechanism of its formation

AgNO_3 AgNO_3

was experimentally proved to be $\text{CH}_3\text{CH}(\text{SH})\text{COOH} \rightarrow \text{CH}_3\text{CH}(\text{SAg})\text{COOH} \rightarrow \text{CH}_3\text{CH}(\text{SAg})\text{COOAg}$. Further, K. compared the action of cysteine, thiolactic acid and H_2S upon photographic plate or $\text{Pb}(\text{AcO})_2$ paper and proved that the aq. soln. of these sulfohydryl compds. slowly produces H_2S , the effect of acid and alkali upon this action being also examd. K. showed that the thiolactic acid has, contrary to the descriptions in the literature, no bad odor, which is produced according to the above-mentioned reaction. Also the reaction toward photographic plate shows the presence of Ag_2S and Ag_2S_2 , with other Ag sulfides. K. SOMEYA

Studies upon wheat grown under constant conditions. I, II. H. L. VAN DE SANDE-BAKHUYZEN. *Stanford Univ. Plant Physiology* 3, 1-30(1928).—A pure strain of Hard Federation wheat was grown under const. conditions of temp. and ventilation in sand, with a 3-salt soln. (compn. not given) having an osmotic pressure of 1 atm. Fe was added as the tartrate. A moisture content of 10% was maintained throughout the expts. Under these conditions ripe (air-dry) seeds were obtained in 72 days. The moisture of the different organs throughout the life cycle was detd. by harvesting 6 plants every other day and later on every 4th or 5th day. Sampling errors were almost entirely eliminated by calcg. the moisture and dry wt. per unit stem length or per unit leaf area and also by calcg. the probable errors. From the lowest to the uppermost leaf, the dry wt. per unit of leaf area increases, while the moisture decreases. Throughout the life cycle the dry wt. of the leaves increases; the moisture increases until the time of flowering. A sudden drop of moisture occurs in all organs of the plant 1-2 days after the stamens have appeared. This drop is most pronounced in the lower leaves, sheaths and internodes. The drying of the plant, which finally causes death, begins, therefore, as early as 1-2 days after pollination, i. e., about the time of fertilization. In explanation of this loss of water, B. advances the theory that the imbibition capacity of the plasma colloids, which is kept up by means of the action of the growth hormones as long as a vegetative point is present, decreases, by the act of fertilization, as soon as this growing point is virtually lost to the vegetative plant. WALTER THOMAS

A method for the determination of inorganic nitrogen in plant extracts. A. C. SESSIONS AND J. W. SHIVER. *New Jersey Agr. Expt. Sta. Plant Physiology* 3, 499-511(1928).—The existing methods for detg. nitrate N in plant tissues are not very accurate (C. A. 15, 488; 17, 2123; 21, 3929). The following modification of the Devarda method gives good results. The water ext. of the plant material is freed from protein by means of 10% acetic acid and afterward concd. to 800 cc. Ammonia is first removed by the Folin aspiration method from a 50-cc. aliquot of the plant ext. to which has been added 50 cc. of a satd. soln. of Na_2CO_3 and 5 g. NaCl . The soln. is aspirated for 12 hrs. and the quantity of ammonia detd. by titration of the standard acid in the absorption tube. The ammonia-free plant ext. is now made 0.125 N with NaOH and 2.0 to 2.5 g. Devarda alloy (100 mesh) is added. The ammonia formed is again detd. by Folin's aspiration method. Nitrates are calcd. from the titration of the standard acid in the absorption tube. The aspirating system used by the authors and the expts. made to test the validity of the method are described in detail. WALTER THOMAS

Two plant material driers. A. O. WOOD. *Grove City College, Penna. Plant Physiology* 3, 515-7(1928).—Description with 4 figures of (1) a hot air drier and (2) a

H₂SO₄ drier devised to hasten the process of drying plant material in the study of their enzyme systems.

WALTER THOMAS

Iodometric estimation of Fe [in plants] (GREY) 7. The formation of essential oils and resin in conifers (PIGULEVSKII, RISINA) 17. A discussion of the microflora of alcoholic fermentation (WILLE) 16.

E—NUTRITION

PHILIP B. HAWK

Vitamin A content of flaxseed, flaxseed cake and linseed oil. A. SCHEUNERT. *Züchtungskunde* 4, 30-35(1929).—Linseed fed to rats as a supplement to a diet free from vitamin A proved to be a medium source, while linseed press-cake and linseed oil contain small amounts only, of vitamin A, confirming the work of Drummond and Zilva (cf. C. A. 16, 2164). Hardened fat from linseed oil failed to protect rats from vitamin A deficiency.

BYRON C. BRUNSTETTER

Studies in mineral metabolism. III. Breeding of cattle on phosphorus-deficient pasture. A. THEILER, H. H. GREEN AND P. J. DU TOIT. Div. of Veterinary Services, Onderstepoort, Pretoria. *J. Agr. Sci.* 18, 369-71(1928); cf. C. A. 21, 3070.—On the arid, sparse, P-deficient pasture of the Vryburg district of the Cape Province, grading up of scrub cattle by combining introduction of pure bred bulls with the feeding of bone meal to the cows is attended with great success so far as shown by the first crossing. Remarkable differences in favor of the mineral supplement are shown, in respect to reduced mortality incidence, increased fertility of cows and superior development of calves. V. Composition of bovine blood on phosphorus-deficient pasture. A. I. MALAN, H. H. GREEN AND P. J. DU TOIT. *Ibid* 376-83; cf. C. A. 23, 2198.—The outstanding characteristic of the P partition of the blood of cattle grazing on P-deficient pasture in the Union of S. Africa is a low inorg. P, with correlated reduction in total P. With feeding of a small ration of bone meal comparatively normal values are shown. Heifers nearly 2 yrs. old, thus fed from weaning, show a normal inorg. P fraction of 5 mg. per 100 cc. of blood; control heifers without bone meal show 2.3 mg. Control cows may drop to 1 mg. or less. Calves of control mothers are normal as long as the milk supply is adequate, but may show reduced inorg. P if aphosphorosis of the mother is acute. In general low inorg. P of the blood is assocd. with poor condition of the animal. Long-continued P deficiency leads to clinically recognizable symptoms of the disease, "stysiekte," especially in lactating animals. Less pronounced deficiency is manifested as stunting and malnutrition and can be detected by blood analysis.

P. R. DAWSON

The vitamin A and B content of the pigeon pea (*Cajanus indicus*). CAREY D. MILLER. Univ. of Hawaii. *J. Agr. Sci.* 18, 569-73(1928).—Feeding expts. with rats demonstrated that the plant meal of the pigeon pea (*Cajanus indica*) is a good source of vitamin A, due probably to the large amt. of green leaves in it; but the seed meal is a rather poor source. Both the plant and seed meals are excellent sources of vitamin B, which is characteristic of other legumes.

P. R. DAWSON

Some preliminary experiments on the value of small quantities of whole cow milk when fed to pigs. A. H. BLISSETT AND J. GOLDING. Univ. of Reading. *J. Agr. Sci.* 18, 642-8(1928).—Marked differences were observed when 0.5 pint of milk was fed in addn. to well balanced rations. The total dry matter consumed per lb. increase in live wt. was diminished. This supports the contention that milk may increase the extent to which a given foodstuff is digested.

P. R. DAWSON

Have histidine and arginine an influence on the purine synthesis of the growing human organism? P. GYÖRGY AND S. J. THANNHAUSER. Heidelberg Clinic and Dusseldorf Med. Acad. *Z. physiol. Chem.* 180, 280-304(1929).—From feeding expts. recorded in the literature it appears that histidine and arginine are required for purine synthesis by young growing rats but not by adult rats. In the expts. here described human infants 4-8 months old were used. One group was fed a basal diet of milk and sucrose, and another group a basal diet consisting of butter, Osborne-Mendel salts, and casein hydrolyzate from which the histidine and arginine had been removed by Ag-Ba pptn., and this loss of tryptophan and cystine compensated by addn. of the pure substances. Vitamin requirements were met by suitable addns. of cod-liver oil, yeast ext. and lemon juice. During the 8-14 day feeding periods, 24-hr. samples of urine were collected and detns. made of total N, NH₃ N, uric acid N, creatinine N, pH , acidity by titration and total phosphates. The excretion of uric acid and creatinine was practically the same for the milk diet and the histidine- and arginine-free casein diet. These

values were not altered in either case by the daily addn. of 1 g. histidine-HCl or 0.5 g. arginine- H_2CO_3 , both carefully neutralized.

A. W. DOX

The influence of the amount of food consumed on the growth of an animal. MARGARET C. HOUSE. Iowa State Coll. *J. Home Econ.* 21, 51-3(1929).—Data are presented emphasizing the advisability of keeping accurate food records and the necessity of taking into account the quantities of food eaten when comparing the gains in wt. of exptl. animals.

L. D. ELLIOTT

Rice polishings as a source of vitamin B. A preliminary report. HAZEL E. MUNSELL. U. S. Dept. Agr. *J. Home Econ.* 21, 124-9(1929).—Expts. on rats indicate that rice polishings are a good source of vitamin F but contain very little vitamin G. These terms are used to designate the thermolabile and thermostable factors, resp., of vitamin B.

L. D. ELLIOTT

Some remote effects of deficient diets on the rhythmical movements of the isolated intestine. H. E. MAGEE, WM. ANDERSON AND MISS J. M'CALLUM. Rowett Inst., Aberdeen. *Quart. J. Exptl. Physiol.* 19, 171-9(1928).—In normally fed animals 3 types of rhythm were found: (a) fine contractions, (b) tonus movements of short duration and (c) large sharp contractions, the a movements preponderating. In animals fed on deficient rations various degrees of disordered rhythm were found of a hyper-sensitive or hyposensitive type.

FRANCES KRASNOW

Vitamin B deficiency. STANISLAW K. KON. *Med. Doswiadczalna i Spooleczna* 8, 81-110 (Polish), 111-2 (English)(1927); cf. *C. A.* 22, 2399.—The voluntary food intake of pigeons when kept on a vitamin-B-deficient but otherwise complete synthetic diet was detd. and controlled by the administration of the same amt. of food to pigeons of the same wt. which in addn. received a liberal supply of vitamin B. No difference could be observed in these two groups of pigeons either in the utilization of food or in the rate of passage of a Ba meal through the gastrointestinal tract. The slowing of the passage of a Ba meal observed in the artificially fed birds is due to "barrier action" of the crop. Highly active pancreatic amylase preps. were obtained from the pancreas and intestine of the deficient birds as well as from controls. The view of Randoin and Simmonet that vitamin B controls the carbohydrate metabolism was not corroborated. The lack of appetite for the deficient food and acute nervous symptoms characterize vitamin B deficiency in pigeons. No relation could be found between the occurrence of acute nervous symptoms and degenerative changes in the nerves. Pathological changes due to inanition were present in both groups of pigeons. The role of vitamin B and the true nature of conditions induced by its deficiency are not considered as satisfactorily explained by any of the existing theories.

JAROSLAV KUČERA

Experimental studies on the alipogenetic dystrophy of Bloch. MARCO BERGAMINI. *Biochim. terap. sper.* 15, 396-410(1928).—The purpose was to show that the alipogenetic dystrophy of Bloch is not due to a deficiency in fats but to the absence of vitamins. McCollum's diet No. 3143 was defatted and fed to 24 mice divided into 2 groups of 12 each, a "heavy group" and a "light group." The animals were observed for: general behavior, wt.; radiographic and histologic examns. were made. Symptoms of dystrophy were noted in the "light group" 34 days after the beginning of the expt. At this period 2 mg. irradiated cholesterol was fed daily to each mouse. The results and conclusions are: (a) The syndrome shown by the mice which had been fed with the deficiency diet No. 3143 was similar to the alipogenetic syndrome of Bloch. (b) Irradiated cholesterol had a distinct beneficial action on the animals although the diet was still deficient in fats. (c) The young animals were much more sensitive to the deficiency diet than the adults. (d) A partial dystrophy in the production of the skin was observed in the animals fed with the deficiency diet. The dystrophy described by Bloch is not due to lack of fats, but to a deficiency of fat-sol. vitamins.

P. M.

Experiments on the action of lipoids. I. Weight and cytometric studies on guinea pigs treated with injections of lecithin and esters of cholesterol. ALDO BARCHIESI. *Boll. soc. ital. biol. sper.* 3, 803-7(1928).—Guinea pigs were treated with subcutaneous injections of lecithin for 15 successive days and fed with a normal diet. Other animals received the same diet but no lecithin injections. They served as controls. After 18 days the animals were killed 2 hrs. after the last meal. The animals receiving the lecithin showed a decided increase in wt. up to the 12th day; the wt. became constant for the next 6 days. The deduction is made that the lecithin modified the metabolism up to the 12th day and that afterwards an equilibrium was reached. Two other groups of animals were similarly treated except that the period of observation was prolonged to 42 days. The results were the same. Other expts. were made on fasting animals treated with and without lecithin. The lecithin-treated animals lived an av. of 5.33 days and lost 28.99% of their original wt.; the control animals lived an av. of 7.66 days

and lost 29.51% of their original wt. An examn. of the organs showed a complex mechanism; in the lecithin-treated animals the hepatic cells had a vol. of 4772 cu. microns; in the controls it was 12,292 cu. microns. Data for other organs are given. The conclusion is that lecithin does accelerate metabolic activity but the mechanism is very complex and must be studied further by histological methods aided by qualitative and quantitative chemical analysis. Also in *Rass. clin. terap. sci. affini* 27, 286-322 (1928).

PETER MASUCCI

Pharmacodynamic experiments on a sexual dystrophy of albino rats produced by feeding cereals. PIETRO DI MATTEI. *Boll. soc. ital. biol. sper.* 3, 807-10(1928).—Groups of 18 rats were fed with corn meal and with an appropriate dose (dropwise into the nose) of phosphorated oil, K metarsenite, NaI, Mn lactate, Zn lactate, Fe citrate or K_2SO_4 . None of the drugs had any definite corrective influence on sexual dystrophy. P, Mn and Ca exerted a marked influence on the general development as judged by the wt. but there was no improvement in the sexual development. The only substance which showed a fair activity was I_2 (0.01 g. KI per day). The retardation in growth and the sexual dystrophy of rats fed with cereals is not due to lack of mineral salts but probably to a qual. scarcity of amino acids.

PETER MASUCCI

The antirachitic properties of cod-liver meals. R. M. BETHKE, G. ZINZALIAN, D. C. KENNARD AND H. L. SASSAMAN. Ohio Agr. Expt. Sta. *J. Agr. Research* 36, 747-53(1928).—Dried residues remaining after the extn. of oil from fresh cod livers vary markedly in their antirachitic properties. The variation was not correlated with the residual fat content of the livers. The ether ext. was not as potent as ordinary cod-liver oil.

A. L. MEHRING

Effect of variation of potassium and chlorine in a wheat ration. J. L. ST. JOHN. Wash. Agr. Expt. Sta. *J. Agr. Research* 37, 55-64(1928).—Rats were fed on a basal ration of wheat to which varying amts. of K and Cl were added. When K in the form of $KHCO_3$ was present in excess of 1% of the ration, the rats lost wt. and did not reproduce. Young animals receiving rations contg. 0.4-0.8% K grew normally. K will not replace Na in a ration of wheat. Addition of Cl to the wheat ration was without benefit. Reproduction occurred in some cases but was not correlated with the quantity of Cl in the diet. Twelve references are given.

A. L. MEHRING

The energy metabolism of cattle in relation to the plane of nutrition. E. B. FORBES, WINFRED W. BRAMAN, MAX KRISS, C. D. JEFFRIES, R. W. SWIFT, ROWLAND B. FRENCH, R. C. MILLER AND C. V. SMYTHE. Pa. State Coll. *J. Agr. Research* 37, 253-300(1928); cf. *C. A.* 22, 984.—Five planes of nutrition were studied by methods of direct and indirect calorimetry with steers. The planes were, fasting, and $\frac{1}{2}$, 1, $1\frac{1}{2}$ and 2 times the maintenance requirements. The rations consisted of corn meal and alfalfa hay. Each plane of nutrition was maintained 28 days, the last 3 of which constituted a continuous respiration calorimetry expt. The area of the removed hide was taken as the surface area in computations. The R. Q. and feed residues in the alimentary tract as well as the heat production were used in detg. the fasting catabolism. The heat production was corrected to a uniform live weight and maintenance basis for comparison. Results with duplicate steers agreed exceptionally well. Heat production increased but little from fasting to a half maintenance diet but increased more rapidly as the maintenance level was approached. Above this the increase was much more rapid and at a uniform rate. The relation between heat production and food consumption above equilibrium is expressed by practically a straight line and below maintenance by a pronounced curve. This difference is explained by a new hypothesis not in harmony with the accepted idea. The lower value for fasting is assumed to be due to a specific dynamic effect or energy expense of utilization of body nutrients oxidized. Thus the heat production curve would be influenced by the dynamic effects of the differing proportions of food nutrients to body nutrients and of carbohydrate, fat and protein of body nutrients catabolized at different planes of nutrition. With rise in plane of nutrition, digestible energy rose slightly due to increased digestion of crude fiber and then decreased due to lowered digestion of carbohydrate and protein. The curves of methane, urine and total net energy were nearly straight lines and fell with rise in the plane of nutrition. The net energy values of alfalfa hay and corn meal were 1390 and 3085 Cals. at maintenance and 620 and 2485 Cals., resp., per kg. of dry matter at double the equil. ration. The proportion of gross energy eliminated as CH_4 varied from 6.42 to 9.83%. Comparable detns. of the sp. dynamic effects of feeds or nutrients can be made only at the same plane of nutrition.

A. L. MEHRING

The predominance of diatoms in the origin of cod-liver oil. KNUT WEJDLING. Univ. Stockholm. *Acta Med. Scand., Suppl.* XXVI, 324-34(1928).—The non-irradiated cod-liver oil from fish living at a depth of 100 meters and more, where very few rays

are acting, has the same antirachitic action as ultra-violet radiation. The explanation for this is the fact that diatoms contain 8% fat included in a shell of silicic acid that transmits the ultra-violet radiation, these diatoms forming the food of the fish. Phytosterol is found in considerable amts. in the diatoms living in a layer of the sea where they are exposed to much ultra-violet radiation from the sun. The action of irradiation on the lipoidal material of the living cells was studied photographically by means of the ultramicroscope. The transformation in dark cells is completed in 10 mins. and sometimes sooner. The fat substances then shine like silver and the diatoms either multiply in that stage or, if the radiation was too prolonged, they die but they still shine after death. The pigment, fucoxanthine present in the brown algae is thought to be attached to the activated ergosterol with its 3 unsatd. bonds. The energy liberated from the lipid leads to the depigmentation. This is produced within 10 mins. either by ultra-violet radiation or by ozonization in the dark. This is the time of the max. production of antirachitic action. Longer radiation is injurious, probably owing to the inactivation of ozonides through satn. of C atoms. S. MORGULIS

Feeding experiments on rats with oils and fats. E. FRIEDBERGER AND S. SEIDENBERG. Forschungsinst. für Hyg., Berlin-Dahlem. *Biochem. Z.* 200, 289-97 (1928). — Rats fed a diet of oats and bread contg. pure olive and cod-liver oil show considerable inhibition of growth as compared to rats receiving the same basic diet without the fat. This effect is produced whether the fat is fed naturally or by means of the tube, except that in the last case the peculiar skin effects do not appear. Similar results so far as the skin is concerned were also obtained upon feeding bacon fat or butter though the growth curve showed a much more favorable progress. S. MORGULIS

Estimation of vitamin A in cod-liver oil. Comparison between the colorimetric (Rosenheim, Drummond) and the biological methods. F. GOWLAND HOPKIN AND HARRIETTE CHICK. *Lancet* 1928, I, 148-50. — The same set of oils, one furnished by H. H. Dale and 6 by Prof. Poulson, were tested by different labs. The colorimetric tests were made by O. Rosenheim; the biol. tests by J. C. Drummond, E. Mellanby, V. H. Mottram and Sir Charles Martin. The $AsCl_3$, the $SbCl_3$ and the biol. methods used are described in detail. The colorimetric method gives information consistent with that derived from the biol. tests. There was a marked variation in the values obtained by the biol. method in different labs. for the same oil. The Accessory Food Factors Committee considers that more tests should be made by the colorimetric method on substances contg. vitamin A other than cod-liver oil, such as butter, palm oil, cereal oils, etc. F. B. SEIBERT

The relative content of the fat-soluble vitamins A and D. JOAN LEIGH CLARE AND KATHARINE M. SOAMES. *Lancet* 1928, I, 150-2. — The same 7 oils as tested by the Accessory Food Factors Committee (*Lancet* 1928, I, 148-50) were tested for their relative content of the 2 vitamins A and D. Vitamin A was detd. by the amt. of growth on a regulated dose. Vitamin D was assayed in 3 ways, (1) by the amt. of calcification occurring on a low-P, rickets-producing diet, to which were added small doses of the oils, (2) by detg. the ash content of the bones of animals fed on a diet not producing rickets and to which were added small doses of the oil, (3) by detg. the increase in the body wt. The degree of accuracy in these biol. methods is very small, but there is no doubt that the content of vitamin A in cod-liver oils bears no necessary relationship to that of vitamin D. F. B. SEIBERT

Comparative antirachitic value of various marine animal oils and cod-liver oil. MME. L. RANDOIN, E. ANDRÉ AND R. LÉCOQ. *J. pharm. chim.* 7, 529-39 (1928). Four fish oils from the livers of the following species were given chem. and biol. exams: (I) Haddock (*Merluccius merluccius* L.) from Lorient, 1926; (II) small shark (*Squalus Galus canis* Rondelet), Boulogne-sur-Mer 1926; (III) elephant seal (*Macrorhinus lewinus* L.) Kerguelen Islands 1926, and (IV) amber cod-liver oil of good type and known activity (detd. C. A. 21, 601). The chem. and phys. properties of these oils, resp. were: d_{20} , 0.9259, 0.9229, 0.9195 and 0.9243; n_D^{20} , 1.4809 (17°), 1.4787, 1.4741, 1.4790 (15°); $[\alpha]_D^{20}$, -0°, 34', -0°, 30', 0°, -0°, 19'; sapon. no., 175.0, 179.5, 182.2, 181.1; I no. (Hanus), 163.7, 191.0, 116.2, 148.7; acidity (calcd. as oleic acid), 2.85%, 0.20, 0.65, 3.75%; fatty acids 95.3%, 96.1, 97.0, 96.4%; unsapond., 3.3%, 2.35, 1.5, 2.4% I was liquid at 0°; II, m. 23-5°; III, m. 23-4°. The antirachitic power of these oils was tested on white rats in parallel sets with a view of detg. the preventive and the curative effects. The rachitic effect was produced with diets D (Pappenheimer, McCann and Zucker, C. A. 16, 1607) and RL (R. and L., C. A. 22, 2193); both diets gave about equal results: (1) The curative and preventive action of cod-liver oil was plainly noted. (2) Feeble doses (2% of the diet) of the oils examd. apparently had no clearly preventive effect. Larger doses (10%) gave after 20-25 days a pos. result with I and II, a neg.

result with III. (3) The curative action of III is nil; that of I and II, based on the rapidity of calcification, was, resp., 10% and 5% of the normal activity of cod-liver oil. However, as I and II were collected late in summer after the spawning season when the livers were small, oils obtained in the spring when the livers are large probably will show greater activity. Only oil of known origin should be collected, and its quality detd. by biol. tests. There is no close relation between the efficacy of these oils and their chem. and phys. characters.

S. WALDBOTT

F—PHYSIOLOGY

E. K. MARSHALL, JR.

The energy changes of skeletal muscle accompanying contraction under high pressure. MCKEEN CATTELL AND D. J. EDWARDS. Cornell Univ. Med. School. *Am. J. Physiol.* 86, 371-82(1928).—Frog's gastrocnemius muscle stimulated in a chamber under a hydrostatic pressure of 60 atm. produced in single contractions about 30% more heat and developed about 30% more tension than under normal conditions. Increased pressure had no effect on muscular efficiency, tension or heat produced during a prolonged contraction (tetanus). The results accord with the theory that stimulation increases the permeability of certain boundaries in the muscle permitting lactic acid to come into contact with the contractile mechanism. Under increased pressure the period of increased permeability seems to be increased.

J. F. LYMAN

Initial and recovery heat production in smooth muscle based upon experiments on a urinary bladder-nerve preparation from terrapin. C. D. SNYDER AND F. W. LIGHT, JR. *Am. J. Physiol.* 86, 399-422(1928).—The smooth muscle from the bladder of the terrapin was made to contract (1) in air, and (2) in N_2 after treatment of the muscle with cyanide and (3) in O_2 . The initial heat was nearly all anaerobic and per g. of muscle and per g. of tension was of the same magnitude as that for skeletal and cardiac muscles. Smooth muscle, like skeletal and cardiac muscle, liberated considerable delayed anoxidative heat, the mean value of which was greater than for the striated muscles. Oxidative delayed heat was considerably less for bladder muscle than for skeletal muscle. Whether the recovery processes are different in smooth and in striated muscles awaits further study. The results suggest a fundamental difference in the 2 muscles in such qualities as the kinds and amts. of the oxidative catalysts.

J. F. L.

Muscular activity. I. Determination of the rate of circulation of blood in man at work. A. V. BOCK, D. B. DILL AND J. H. TALBOTT. Harvard Univ. and Mass. Gen. Hosp. *J. Physiol.* 66, 121-32(1928).—App. and methods for detg., during exercise, the CO_2 pressure in oxygenated venous blood are described. The CO_2 pressure in arterial blood is detd. from the compn. of alveolar air. The CO_2 transported per 1000 cc. of blood is then calcd. from the difference between the CO_2 pressure of the venous and arterial blood and the CO_2 dissoen. curve of oxygenated blood. The total CO_2 production divided by the CO_2 transported per 1000 cc. of blood gives the blood flow. II. A nomographic description of expired air. D. B. DILL AND A. FÖLLING. *Ibid* 133-5.—A simplified D'Ocagne nomogram is described from which, the compn. of the expired air being known, one can read directly both the % of O_2 used and the respiratory quotient. III. Dynamical changes occurring in man at work. A. V. BOCK, C. VAN CAULAERT, D. B. DILL, A. FÖLLING AND L. M. HURXTHAL. *Ibid* 136-61.—Measurements on 4 subjects showed that phys. training increased lung capacity, induced a slow pulse rate, increased the stroke vol. of the heart, reduced systemic blood pressure during work and probably greatly increased the capillary diffusion area in the muscles as it did in the lungs. Failure to meet O_2 requirements in an untrained subject was reflected in a short time in the accumulation of lactic acid, diminution of blood bicarbonate, a falling pH , and a tendency to reach max. pulse and respiratory rates at levels that produced almost no embarrassment for the athlete. IV. The "steady state" and the respiratory quotient during work. A. V. BOCK, C. VAN CAULAERT, D. B. DILL, A. FÖLLING AND L. M. HURXTHAL. *Ibid* 162-74.—During continuous muscular exercise when a steady state was reached and the demand for O_2 was adequately met, the respiratory quotient of the excess metabolism due to work approached unity. Glycogen or some substance very closely related to it in normal metabolism is the immediate source of the energy of muscular contraction.

J. F. LYMAN

Studies in mineral metabolism. VI. Comparison of the blood of cow and calf in respect to mineral constituents. H. H. GREEN AND E. H. MACASKILL. *J. Agr. Sci.* 18, 384-90(1928); cf. *C. A.* 23, 2203.—The total P of the blood of the new-born calf may be over twice that of the mother, appearing to rise somewhat for the

1st few days and then falling steadily to as low a difference as 15% after 10 weeks. After weaning there may be hardly any difference. Although the total P of the plasma is also higher in the young calf, the main difference is in the red corpuscles and is largely accounted for by the org. acid-sol. fraction (phosphoric esters). This org. acid-sol. P appears to be confined to the corpuscles in both calf and mother and is over 3 times as high in the calf at birth. It then falls steadily. The red corpuscles of calf blood may also show an unknown P fraction, insol. in acid and probably of nuclear origin. The lipoid P fraction in the blood of the calf at birth may be similar in amt. to that of the mother or may be higher. It tends to rise over the 1st few weeks of life and may remain high for months, or may fall again. It appears to be distributed as about $\frac{1}{2}$ in the plasma and $\frac{1}{2}$ in the corpuscles. The inorg. P fraction of the new-born calf is appreciably higher than that of the mother, rises sharply within the 1st week, begins to fall again during the 2nd month and even after 10 weeks is still high. The inorg. fraction appears to be confined to the plasma, with very little in the corpuscles. The outstanding feature of calf blood is its very high K content, nearly twice as high for the plasma and over 4 times as high for the red corpuscles. This high value falls rapidly and after 10 weeks calf blood can be regarded as adult in respect to K. More than 0.8 of the total K may be locked up in the corpuscles. No characteristic differences in Ca, Mg, Na and Cl were shown between the blood of calf and mother. About $\frac{1}{2}$ of the Mg is in the corpuscles; about $\frac{1}{4}$ in the plasma. The Na is chiefly in the plasma; the Ca and Cl are exclusively so. VII. The unknown phosphorus fraction of calf blood. A. I. MALAN AND H. H. GREEN. *Ibid* 391-6.—An unknown P fraction frequently present in calf blood is shown to be nucleoprotein and due to the precursors of fully mature erythrocytes. The same fraction may also appear in small quantities in human blood and in horse blood; it always occurs in very large amts. in the nucleated erythrocytes of birds. VIII. Comparison of phosphorus partition in the blood of calf fetus, sheep fetus, and lambs, with corresponding maternal blood. A. I. MALAN. *Ibid* 397-400.—In respect to the P partition, the same general relationship holds between the blood of lambs and of the mother ewes, as between the blood of calves and of mother cows. A considerable proportion of an acid-insol. P fraction, probably nuclein, may be present in the red corpuscles of lamb blood and even in fetal blood. The org. acid-sol. fraction is confined to the corpuscles, both in young and adult blood, but in 1 case of a 6 months calf fetus a small proportion was noted in the plasma. P. R. D.

Color changes and adrenaline content of rabbit suprarenals after ligation of kidney vessels on both sides. MASANOSUKÉ WATANABÉ. Tohoku Univ. *Tohoku J. Exptl. Med.* 11, 449-67(1928).—The kidneys vessels on both sides in the rabbit were ligated, and as the blood sugar reached its max., the animal was killed by neck stroke, the suprarenals were removed and their adrenaline contents were detd. by both the Folin and rabbit-intestine-segment methods. Ligation of the kidney vessels had no apparent effect on the adrenaline content or the color changes of the gland. E. H.

G—PATHOLOGY

H. GIDEON WELLS

Studies in mineral metabolism. IX. The phosphorus partition of blood in anemia of cattle and sheep. A. I. MALAN. *J. Agr. Sci.* 18, 401-5(1928); cf. *C. A.* 23, 2207.—In cases of anemia in cattle and sheep of infectious or parasitic origin, or due to simple hemorrhage, the P partition of the blood reveals an "unknown fraction," confined to the corpuscles and evidently nucleoprotein. It is detd. by the difference between the total P and the sum of the total acid sol. and lipoid P. It is associated with the appearance of nucleated red cells and vanishes as they disappear. The amt. may make up a considerable proportion of the total P. P. R. DAWSON

Sulfate retention in dogs following bilateral adrenal extirpation. W. W. SWINBUR AND W. F. WENNER. Univ. of Iowa. *Physiol. zool.* 1, 37-44(1928); *Ber. ges. Physiol. exptl. Pharmacol.* 45, 666.—Sulfate detns. were made by the Denis and Reed method in 25-cc. blood removed from the heart. As soon as the first symptoms of adrenal insufficiency are evident, there was present a retention of inorg. sulfate S. Parallel with this increase there is an increase in the inorg. P and N. The retention of the SO_4 and PO_4 explains the acid intoxication of adrenal insufficiency. Org. acids play a much less important role. Outside of certain types of nephritis with N retention and acidosis, adrenal insufficiency appears to be the only cause for a SO_4 retention. R. C. WILLSON

H—PHARMACOLOGY

A. N. RICHARDS

Toxicology of certain chlorine derivatives of methane and ethane. G. A. HALOFF. *Arch. exptl. Path. Pharmacol.* 134, 168-72(1928).— CHCl_3 and CCl_4 produce fatty degeneration of the liver, while dichloromethane, ethylene dichloride, ethylidene chloride, and hexachloroethane have no such action.

B. C. A.

Fatal phenobarbital poisoning. Report of a case with toxicologic analysis. HAROLD N. WRIGHT. *Arch. Internal Med.* 43, 85-9(1929).—A method for the analysis and isolation of phenobarbital from the organs in a case of poisoning by this drug is described. The approx. amts. isolated per 100 g. tissue were: stomach 3-4 g.; liver 5 g.; brain 90 mg. Phenobarbital is not excreted in the urine.

J. B. BROWN

Mustard gas and tuberculosis. AMOS R. KOONTZ. *Arch. Internal Med.* 43, 90-5(1929).—168 rabbits were inoculated in the ear vein with virulent human tubercle bacilli. Half of these were gassed with mustard gas and the remainder kept as controls. At the end of 6-10 weeks 64% of the gassed animals had developed tuberculosis as against 83% of the controls. Mustard gas has an inhibitory effect on the development of pulmonary tuberculosis in rabbits.

J. B. BROWN

Estimation of thallium and its toxicology. C. STICH. *Pharm. Ztg.* 4, 231(1929); cf. *C. A.* 23, 1590.—Some addnl. data are presented relative to the toxicity of Tl-treated wheat grains on rats.

W. O. E.

Results obtained by the administration of daily small doses of quinine, cinchonidine and cinchonine on malaria in Algerian natives. E. SERGENT and A. CATENEL. *Arch. Inst. Past. Algerie* 4, 35-48(1926); *Rev. hyg. méd. prat.* 51, 68.—Cinchonidine had a more marked effect than cinchonine, which possesses only a feeble action on parasites in the peripheral blood. Cinchonidine and quinine act very similarly as malaria treatments for malaria.

C. R. F.

An active influence of organic lead compounds on experimental carcinoma in mice. ERICH KRAUSE. *Tech. Hochschule, Berlin. Ber.* 62B, 135-7(1929).—The following compds. were investigated as regards their toxicity and chemotherapeutic effect on exptl. carcinoma in mice: $(n\text{-C}_4\text{H}_9)_2\text{PbF}$, $(i\text{-C}_4\text{H}_9)_2\text{PbBr}$, $(i\text{-C}_4\text{H}_9)_2\text{PbI}$, tricyclohexyllead, tricyclohexyllead iodide, triphenylcyclohexyllead, $(\text{C}_6\text{H}_5)_3\text{Pb}$, $(\text{C}_6\text{H}_5)_2\text{Pb}$, $(\text{C}_6\text{H}_5)_2\text{PbBr}$, $(\text{C}_6\text{H}_5)_2\text{PbI}$, $(\text{C}_6\text{H}_5)_2\text{PbF}$, $(\text{C}_6\text{H}_5)_2\text{PbBr}_2$, $(\text{C}_6\text{H}_5)_2\text{Sn}$, $(\text{C}_6\text{H}_5)_2\text{SnBr}$ and $(\text{C}_6\text{H}_5)_2\text{SnI}$. The toxicity was dependent on the structure of the compd. rather than on its soly. in H_2O . Several of the compds., particularly $(n\text{-C}_4\text{H}_9)_2\text{PbF}$, showed prophylactic and curative effects against carcinoma in mice.

ARTHUR GROLLMAN

Guanidine structure and hypoglucemia. FRITZ BISCHOFF, MELVILLE SAHYUN and M. LOUISA LONG. Santa Barbara Cottage Hosp. *J. Biol. Chem.* 81, 325-49(1929).—A comparative study was made of the hypoglucemic activity of guanidineformic acid and its homologs, of aromatic guanidine bases, of synthalin homologs and other aliphatic guanidine bases. The basic derivs. with long aliphatic side chains had the most powerful hypoglucemic action. The derivs. of guanidineformic acid and its homologs were non-toxic. Hypoglucemic activity, lethal dose and liver damage ran nearly parallel. In all the derivs. except guanyl piperidine, in which hypoglucemia occurs the first hr., the glycogen reserve of the body was almost depleted before hypoglucemia occurred. Since the guanidine derivs. produce hypoglucemia by mechanisms other than glyconeogenesis, there is a possibility of their chem. relation to insulin.

ARTHUR GROLLMAN

The effect of insulin on the distribution of non-protein nitrogen in the blood. STANLEY E. KERR and VARTAN H. KRIKORIAN. Am. Univ. of Beirut, Syria. *J. Biol. Chem.* 81, 421-4(1929).—After the administration of insulin, there is a decrease in the amino acid N with a correspondingly larger increase in the urea N of the blood.

ARTHUR GROLLMAN

The influence of iodine on the excretion of creatine in exophthalmic goiter. WALTER W. PALMER, DONALD A. CARSON and LAWRENCE W. SLOAN. Columbia Univ. and the Presbyterian Hosp., N. Y. *J. Clin. Investigation* 6, 597-608(1929).—Administration of I markedly diminished the creatinuria in the cases of exophthalmic goiter, and "toxic adenoma" which were studied.

ARTHUR GROLLMAN

Studies on digitalis in ambulatory cardiac patients. II. The elimination of digitalis in man. HARRY GOLD and ARTHUR C. DE GRAFF. Bellevue Hosp. and Cornell Univ., N. Y. *J. Clin. Investigation* 6, 613-26(1929).—The excretion of digitalis at any given time was found to be proportional to the amt. of this substance present in the body at that time.

ARTHUR GROLLMAN

Biochemical studies on creatine and creatinine. I. NOBORU SATO. Tokyo Jikeikai Med. Coll. *Sei-I-Kwai Med. J.* 47, No. 10, Eng. Abstr. 1-2(1928).—Creatine

administered to rabbits is in part retained as such, in part converted to creatinine and in part excreted in the urine. After oral administration, the creatine contents of the kidneys and liver are increased; the muscle creatine increases until it reaches a max. after 12 hrs. and then it usually decreases. After oral administration of creatinine the urinary excretion of this substance is greater than the excretion of creatine after oral administration of the latter substance. Intravenous injection of creatine or creatinine leads to a greater urinary excretion and a lesser retention of these substances, than when equal dosages are administered orally.

ARTHUR GROLLMAN

Thyroxine studies. Thyroid gland action and nourishment. Dosage of thyroxine. W. KORNFIELD AND E. NOBEL. Univ. Clinic, Wiert. *Klin. Wochschr.* 7, 2377-80 (1928).—The minimum lethal dose of thyroxine for 200-250 g. guinea pigs that are on a milk-oat diet is 10-20 mg. The toxicity of thyroxine or of dried thyroid preps. is largely dependent upon the diet. Fairly constant results are obtained with animals that are on a milk-oat diet. Green fodder raises the resistance of guinea pigs to thyroxine; the variations are very large. Thyroxine is more toxic when injected into than when fed to animals on green fodder. These two modes of administration are about equally effective when the animals are on a milk-oat diet.

MILTON HANKE

The treatment of encephalitis e causa ignota with intravenous injections of urotropine solutions. P. H. OLIVIER AND P. M. VAN WULFFTEN PALTHE. *Geneeskund. Tijdschr. Nederland.-Indië* 68, 1023-35 (1928).—In 5 cases of encephalitis e causa ignota, and 1 case of myelitis transversa the authors got excellent results with intravenous injections of urotropine. In all cases 4 to 6 injections were given of a 20% soln. daily or at longer intervals, dependent on the condition of the patient. There was a rapid improvement. Little children and babies can be treated without danger; 1 cc. of a 20% soln. and even a 40% soln. may be used each time. No success was encountered with several cases of encephalomeningitis and 2 cases of meningitis tuberculosa. J. C. JURRIJENS

A case of fatal heroine poisoning. LOUISA KOHLBERG AND GOTTFRIED BECK. Univ. Zurich. *Deut. Z. ges. gericht. Med.* 12, 112-20 (1928).—Case report. F. K.

The determination of nervous disorder after carbon dioxide poisoning. FRIEDE RICH LEPPMANN. *Deut. Z. ges. gericht. Med.* 12, 121-32 (1928). FRANCES KRASNOW

Changes in the kidneys due to mercuric chloride poisoning. B. A. PHOTAKIS AND EM. NIKOLAIDIS. Univ. Athens. *Deut. Z. ges. gericht. Med.* 13, 28-32 (1929). HgCl₂ injuries not only the secretory epithelium but also the vascular system. This should be called angionephrosis.

FRANCES KRASNOW

Studies in malaria with special reference to treatment. VI. The treatment of benign tertian malaria with peracrina 303. J. A. SINTON, W. BIRD AND S. N. EATE. *Indian J. Med. Research* 15, 277-86 (1927).—Peracrina 303 cannot be substituted for quinine. VII. The intravenous injection of sodium stovarsol in the treatment of benign tertian malaria. J. A. SINTON. *Ibid* 287-99.—The results obtained from a study of 25 cases show that the intravenous injection of sodium stovarsol in varying doses up to a total of 4 g. during 5 days has produced a "true cure" in a very small no. of cases. VIII. The oral administration of quinine-stovarsol in the treatment of chronic benign tertian malaria. J. A. SINTON, W. BIRD AND S. N. EATE. *Ibid* 595-600 (1928).—Stovarsol is a useful adjuvant to quinine. Quinine stovarsol does not seem to be more efficacious than the two drugs given separately but it is more easily administered.

FRANCES KRASNOW

The pharmacological action of quinamine. R. N. CHOPRA AND J. C. DAVID. Calcutta School of Trop. Med. *Indian J. Med. Research* 15, 343-8 (1927).—Quinamine occurs in appreciable quantities in cinchona bark produced in India. The alkaloid has little effect on bacteria, protozoa and digestive enzymes. It stimulates the peristaltic movement of the intestine. Intravenous injections cause an increase in the vol. of the spleen and stimulate its contractions. The blood pressure falls but soon regains normal level. Respirations are slowed and there is slight but persistent dilation of the bronchi. On the uterus the effect is pronounced; dilns. of 1-500,000 produce a well marked tonic contraction of the isolated uterus of cat and guinea pig. The anesthetic action of quinamine on the cornea and blocking of impulses in nerve trunks is almost as marked as that of cocaine.

FRANCES KRASNOW

Studies on the effects of antimony salts. I. The effect of antimony salts on conception and pregnancy in animals. E. C. HODGSON, A. C. VARDON AND ZORAWAR SINGH. *Indian J. Med. Research* 15, 491-5 (1927).—Salts of Sb cause damage to female animals while they are receiving these periodic injections. The damage shows itself in failure of conception, abortion, damage of fetus. The effect passes off directly as injections are stopped.

FRANCES KRASNOW

Sodium hydnoearpate in leprosy. Suggested improvements in administration.

E. MUIR. Calcutta School of Trop. Med. *Indian J. Med. Research* 15, 501-5(1927).—The sodium salts derived from the low m. p. fatty acids of *Hydnocarpus wightiana*, *H. anthelmintica* and *H. alpina* block the veins less than the salts from the whole *H. wightiana* oil. Alternation of intravenous infiltration of hydnocarpus oil with cresote is advised.

FRANCES KRASNOW
The iodide-antimony treatment of leprosy. E. MUIR. Calcutta School of Tropical Medicine. *Indian J. Med. Research* 15, 507-10(1927).—A combination-treatment of KI and K₂Sb tartrate was found beneficial.

FRANCES KRASNOW
Provocative action of organic compounds of antimony in leishmaniasis. R. N. CHOPRA AND C. R. DAS GUPTA. *Indian J. Med. Research* 15, 565-70(1928).—Sb compds. have a provocative action in those cases of kala-azar in which the fibrotic changes in the liver and spleen are not too far advanced.

FRANCES KRASNOW
A comparative study of the action of cinchonia alkaloids on the uterus. R. N. CHOPRA, J. C. DAVID AND B. B. DIKSHIT. Calcutta School of Trop. Med. *Indian J. Med. Research* 15, 571-80(1928).—The cinchona derivs. stimulate the guinea-pig uterus to a greater degree than that of the cat. The latter acts best at pH 7.6, the former at 7.2. The dextro-rotatory alkaloids have a more powerful effect than do the levo-rotatory. They may be grouped in this order of activity: quinamine, ethylhydrocupreidine, isoctylhydrocupreine or vuzine and cinchonine, ethylhydrocupreine, quinine and quinidine, cinchonidine, isoheptylhydrocupreidine and isoheptylhydrocupreine. F. K.

The action of emetine on the gastrointestinal tract. R. N. CHOPRA, J. C. GUPTA AND K. VENKATACHALAM PILLAI. Calcutta School of Trop. Med. *Indian J. Med. Research* 15, 883-8(1928).—Traces (1 in 200,000) inhibit the action of ptyalin. Peptic digestion is stimulated by concns. higher than 1 in 2000; weaker solns. have no effect. Proteolytic and lipolytic digestions are inhibited by concns. below 1 in 10,000. A technic was devised by which simultaneous tracings of the different portions of the alimentary canal could be recorded after intravenous administration of emetine. Tone and movement of the gut are stimulated. The effects are due to the action of the alkaloid directly on the musculature of the tract and not through the nervous mechanism. F. K.

Results of trials of sodium hydnocarpate and Bruschetti vaccine in leprosy. C. B. LARA, B. DEVERA AND F. EUBANAS. Culion Leper Colony. *J. Philippine Islands Med. Assoc.* 8, 261-3(1928).—No definite effect was produced. FRANCES KRASNOW

The influence of thyroid preparations upon the cardiac and vascular nerves. HENRY DRYERRE. Edinburgh Univ. *Quart. J. Exptl. Physiol.* 19, 61-83(1928).—Thyroid ext. injection produces a fall in blood pressure in cats and dogs, not in rabbits. The injection has no const. specific effect on the response to subsequent stimulation of the cardiac fibers of the vagus. Exts. of liver or tonsil may or may not be followed by effects on the cardiac nerves. Thyroxine has no distinct effect. FRANCES KRASNOW

Studies on the Arnetz count. XII. The effect of the injection of thyroid extract on the polynuclear count in a perennibranchiate amphibian (*Necturus maculosus*). HARRY A. CHARIPPER. New York Univ. *Quart. J. Exptl. Physiol.* 19, 109-13(1928).—The normal count is similar to that in man and in rabbits. Injections of thyroid substance into the peritoneal cavity cause a deflection of the polynuclear count—an increase in the no. of cells of class I. Thyroid ext. will stimulate granulocytopoietic centers located in places other than the bone marrow. FRANCES KRASNOW

The action of drugs upon the movements of the stomach. E. D. M'CREA AND A. D. MACDONALD. Univ. Manchester. *Quart. J. Exptl. Physiol.* 19, 161-70(1928).—Adrenaline may produce both inhibitory or augmentor effects on the stomach of the cat and dog. It does not duplicate faradic stimulation of the splanchnic nerves. Pilocarpine, physostigmine and acetylcholine, like the vagus, can be both augmentor and depressor to the stomach. Atropine relaxes and paralyzes the stomach musculature and abolishes all response to nervous stimulation and to drugs. FRANCES KRASNOW

The influence of the thymus on muscle activity. PAUL HELD. Univ. Bern. *Z. Biol.* 88, 76-88(1928).—The subcutaneous or intravenous administration of thymus prepn. Thymaglandol (Hofman-LaRoche) apparently removed muscle fatigue. The effect is obtained on the active muscle also, producing increased activity. Intravenous injection of adrenaline does not produce the same effect. FRANCES KRASNOW

Influence of denervating the thyroid gland on urine volume. A question of secretory innervation of the thyroid gland. ERNST WACHTER. Univ. Bern. *Z. Biol.* 88, 227-38(1928).—Injection of a diuretic caused an increase in urine vol., chloride and carbonate. After denervating the gland there was a marked decrease in output. There is compensation upon administration of thyroxine. FRANCES KRASNOW

The significance of ammonia in nervous respiratory regulation. B. A. SHAZULLO.

Univ. Odessa, Ukraine. *Z. Biol.* 88, 363-8(1929).—Insulin antagonizes the action of atropine or the vagus in the lungs. FRANCES KRASNOW

The activity of the heart during muscarine poisoning. H. BERTHA. Univ. Tübingen und Berlin. *Z. Biol.* 88, 369-76(1929).—Elec. and mech. phenomena cease simultaneously. The irritability remains unchanged for a long time, then loses slowly in quality and finally diminishes rapidly. The duration of the monophasic is always shortened. FRANCES KRASNOW

The effect of nicotine and caffeine on the growth of chickens. RALPH E. CHASE. Univ. Oklahoma. *Am. J. Physiol.* 85, 527-30(1928).—Nicotine in graduated amts. of 0.009 to 0.57 g. per kg. of body wt. daily had no effect on the rate of growth of chicks. Caffeine in daily doses of 0.094 to 0.191 g. per kg. per day markedly retarded growth, but showed no immediate toxic symptoms. J. F. LYMAN

The effects of histamine, formaldehyde and anaphylaxis upon the responses to electrical stimulation of guinea-pig intestinal muscle. I. Agents applied to serous aspect of intestine. GEORGE H. BISHOP AND ARTHUR I. KENDALL. Washington Univ. School. Med., St. Louis. *Am. J. Physiol.* 85, 546-60(1928).—Guinea-pig intestinal muscle responded to elec. stimulation more intensely after treatment on the outside with histamine and less intensely after similar treatment with formalin. Homologous protein acted like histamine on muscle from a sensitized animal. Circular muscle was altered more easily by the chemicals, responded only to shocks above the threshold for the longitudinal, and only after a longer latent period. II. Agents applied to the mucosal aspect of the intestine. A. I. KENDALL AND G. H. BISHOP. *Ibid.* 561-8(1928).—When a strip of gut was irrigated with oxygenated Tyrode's soln., both rhythmicity and reactivity to elec. stimuli were depressed. Reactivity was restored upon stopping the irrigation or upon adding histamine or homologous protein in the case of a gut from a sensitized animal. Formalin added to the Tyrode bath fluid relaxed and depressed the muscle, whether under the influence of histamine or in moderate contraction induced anaphalactically. J. F. LYMAN

The action of colloidal sulfur (sulfosol) on the glucemic titer of the guinea pig during the action of pilocarpine, of ergotamine, and of atropine and vice versa. GIULIO BUCCIARDI. *Biochim. terap. sper.* 15, 411-8(1928); cf. *C. A.* 23, 1176.—The injection of pilocarpine in small or large doses, inactive by themselves, does not modify the hypoglucemic or hyperglucemic action obtained by the previous injection of sulfosol in small or large doses; *vice-versa*, active doses of pilocarpine causing hyperglucemia are not influenced by the S, but instead change the hypoglucemia of the S to hyperglucemia, or intensify an already existing hyperglucemia. Ergotamine does not modify the hypoglucemia or hyperglucemia of S, but if the latter is injected in small doses, it intensifies the ergotamine hypoglucemia, or if injected in large doses, it suppresses, or substitutes the hypoglucemia with hyperglucemia. Atropine does not modify the glucemic action of S; the latter, however, intensifies the hypoglucemia and hyperglucemic action of atropine according to the dose used. These results are of interest in comparing the action of insulin on the glucemic titer, when insulin is injected in combination with pilocarpine, ergotamine and atropine. They may serve as a basis for a new hypothesis regarding the action of S and insulin on the variations obtained in the glucemic titer after these two substances are injected. B.'s conclusion is that the exptl. facts do not support the view that there is an affinity of action between insulin and S especially with regard to the mechanism which regulates the blood sugar of the guinea pig. PETER MASUCCI

Salivary reflex action brought about by repeated injections of morphine. PIETRO DI MATTEI. *Boll. soc. ital. biol. sper.* 3, 810-13(1928).—If dogs are injected with small doses of morphine on successive days, salivation takes place, followed at times by vomiting. This phenomenon often manifests itself at the mere sight of the syringe in the hands of the operator, that is, before injection actually has taken place. M. has been unable to get any evidence of unconditional or absolute reflex action? Two interpretations explaining the phenomenon are given. PETER MASUCCI

Factors which modify the partition of drugs injected in the arteries. L. SCREMIN. *Boll. soc. ital. biol. sper.* 3, 862-3(1928).—Strychnine, caffeine, codeine, pyramidone and narcofine were injected into the carotid artery of rabbits. The minimum active dose of the drugs which acts on the spinal cord was always greater when injected into the carotid artery than when injected into the auricular or jugular veins. Even when twice the minimum active intravenous dose was injected into the carotid, the convulsions were not immediate but only after 1 to 2 mins. When cocaine, which acts both on the cerebral and spinal systems, was injected, the min. intravenous convulsive dose, when introduced into the carotid artery, produced only cerebral reactions. If KCl soln. was injected simultaneously with strychnine nitrate soln. the effect of the strychnine was immediate

whereas if injected alone the action would have been greatly delayed. Urethan had similar properties. From these results the conclusion is drawn that those substances which injure the capillaries in some manner either are able to hinder the fixation and absorption of convulsant drugs or else increase the cellular permeability and thus increase the absorption rate.

PETER MASUCCI

The effect of acridine derivatives on the blood sugar immediately following injection. OTTO J. NIELSEN. Staatshospital in Sønderborg. *Acta Med. Scand.* 70, 12-29(1929); cf. *C. A.* 23, 195, 1685.—Intravenous injections of septacrol have such a slight and inconst. influence upon the blood sugar in persons with normal carbohydrate metabolism and even following an ingestion of carbohydrate that it is denied all together. Likewise, in diabetics, although injection of the acridine derivs. may lower the blood sugar, the effect is totally different from that produced by insulin. S. MORGULIS

Experimental studies of the effect of oral administration of yeast on the carbon and oxidation quotients of urine. PAUL HOFFMANN. Pathol. Inst., Univ. Berlin. *Biochem. Z.* 204, 208-14(1929)—The administration of dry yeast ("Levuriose") increases the N excretion and also to a certain degree the urinary C. The effect is the lowering of the quotients C:N or "Vakat-O_{2:N. The evidence also points to an increased oxidation in the exptl. rabbits. S. MORGULIS}

The effect of adrenaline, sympathol, tyramine, ephetonine and histamine on the gaseous exchange and circulation in man. U. VON EULER AND G. LILJESTRAND. Karolinisches Inst., Stockholm. *Skand. Arch. Physiol.* 55, 1-25(1929).—In a well trained person the effect was investigated of *d*-adrenaline, sympathol, tyramine, ephetonine and histamine on pulse rate, O₂ consumption, systolic and diastolic blood pressure and minute vol. of the heart. The amplitude-frequency product is calcd. from the amplitude of blood pressure divided by the mean pressure and multiplied by the pulse rate, and gives a good measure of the relative blood flow from the heart. Furthermore, the optimum concn. was detd. which increases the reduction rate in the system methylene blue-muscle-phosphate. The many results are best summed up in tabular form, where 0 designates an effect not exceeding 5%, + an increase of 5-10% over the initial value, ++ 10-30% and +++ a change of more than 30%.

Substance	Dose, mg.	Pulse rate	Mean blood-pressure	O ₂ Consumption	Maximum effect Amplitude-frequency product	Minute vol.	Opt. concn. in methylene blue test
<i>l</i> -Adrenaline	0.7	+	+	++	+++	+++	10 ⁻¹²
<i>d</i> -Adrenaline	0.7	+	0	+	+++	+++	10 ⁻¹⁰
Sympathol	50-100	+	+	+	++	++	10 ⁻⁴
Tyramine	20-50	+	+	+	+++	+++	10 ⁻⁶
Ephetonine	50	++	0	+	+++	+++	10 ⁻⁶
Histamine	0.4-0.7	+++	+	+	+++	+++	10 ⁻¹¹

S. MORGULIS

Influence of yohimbine and ergotine on the blood pressure effect of lobeline. PETER WEGER. Kgl. Universitt, Upsala. *Skand. Arch. Physiol.* 55, 104-10(1929).—Neither yohimbine nor ergotamine has any effect on the blood pressure-lowering action of lobeline. S. MORGULIS

The influence of digitalis and strophanthin on the parasympathetic irritability of the intestine. PETER WEGER. Kgl. Universitt, Upsala. *Skand. Arch. Physiol.* 55, 111-30(1929).—The digitalis and strophanthin glucosides reverse to a considerable degree the motor effects produced upon the intestinal preps. by chem. stimuli acting upon the parasympathetic end organs. This alteration of reaction may be due to a change in irritability and contractility of the muscle cells or to an increased parasympathetic irritability. The fact that digitalis has generally a marked affinity for the parasympathetic nervous system and differs from such purely myogenic muscle poisons as BaCl₂ seems to indicate that the mechanism of the effect is through an altered parasympathetic irritability. S. MORGULIS

Relation between chemical constitution and pharmacological action of heart drugs. FERDINAND LEBERMANN. Vesalian Phys.-Chem. Inst., Basel. *Med. Welt* 2, No. 40 (1928).—A general article. WITHROW MORSE

Iodine therapy. P. SCHWILLENBACH. *Med. Welt* 2, No. 40(1928).—General. WITHROW MORSE

The neurotropic properties of relapsing fever spirochetes and the therapy of neuro-spirochosis. H. P. ROSENHOLZ, O. V. OVSYENNIKOVA AND I. A. TREFILOV. Der Medicinol. Inst. und Reichsanst. fr exper. Veterinrmedizin, Moskau. *Centr. Bakt. Parasitenk.*, 1. Abt., Orig., 110, 47-62(1929).—The tendency for *Sp. obermeiri* and

Sp. duttoni to enter and grow in nerve tissue bears no direct relation to their virulence. Arsphenamine preparations will not protect animals with spirochetes in the central nervous system. Such infections in mice with *Sp. obermeiri* form a useful method for studying chemotherapeutic agents and will aid in a search for a "Therapia sterilisans magna."
JOHN T. MYERS

ogenous alcohols. A contribution to the theory of narcosis. R. BEUTNER AND E. HYDEN. Univ. of Louisville, Ky. *J. Pharmacol.* 35, 25-30(1929).—From a mixt. of blood serum and an alkaloidal salt such as pilocarpine-HCl no alkaloid will pass through a parchment membrane. If an alc. be added to the mixt. the alkaloid will diffuse. The amt. of alc. which will just cause diffusion decreases gradually with increasing length of the C chain, until hexyl alc. is reached, with which the effect is maximal. A greater amt. of heptyl or octyl alc. is needed to cause diffusion of alkaloid. These results are contrary to the action of alcs. as narcotics, the narcotic effect increasing continuously with increasing length of C chain.
C. RIEGEL

Susceptibility of adrenalectomized rats to morphine intoxication. EATON M. MACKAY AND LOIS L. MACKAY. Stanford Univ. *J. Pharmacol.* 35, 67-74(1929).—In one group of rats both adrenals were removed, and in a second or control group the adrenals were exposed but not removed. Ten days after the operation adrenalectomized rats were 5 times as susceptible to morphine intoxication as control rats. The mean fatal dose was 0.067 mg. per g. and the min. lethal dose 0.1 mg. per g. For the control rats the M. F. D. was 0.395 mg. per g. and the M. L. D. 0.5 mg. per g. Twenty-five days after the operation adrenalectomized rats were 2.5 times as susceptible as control rats. For the adrenalectomized rats the M. F. D. was 0.15 mg. per g. and for the control animals 0.4 mg. per g.
C. RIEGEL

The pharmacological action of soaps. ANGELO RABBENO. Univ. Pavia. *Biochim. terap. sper.* 15, 113-49(1928); cf. *C. A.* 22, 460, 1394; 23, 206.—A review. Numerous references are given.
G. SCHWOCH

Synthalin. I. ASASHIGE SUGIURA AND MASAMITSU ITO. Aichi Med. Coll. *Aichi J. Med.* 35, 842-7(1928).—Confirmatory of the work of others.
K. SOMEYA

The mechanism of the increase of the narcotic action of cocaine hydrochloride caused by the addition of alkali. MITSUKUNI NAGASAKI. Chiba Med. Coll. *Chiba J. Med.* 6, 623-32(1928).—A nerve placed in alk. NaCl soln. swells more than in ordinary NaCl soln. Hence N. believes that a physico-chem. change in the nerve itself takes part in the action of alkalis, in increasing the narcotic power of cocaine.
K. SOMEYA

The influence of adrenaline and insulin upon the chlorine content of blood. ISHIN TAMURA. Keijo Med. College. *Chosen J. Med.* 87, 285-94(1928).—In rabbits, adrenaline decreases, and insulin increases, Cl content of the blood. Nervous influences are not concerned.
K. SOMEYA

The influence of choline chloride upon the sodium chloride excretion and the nitrogen metabolism. KAZUO AOKI. Kyoto Imp. Univ. *J. Jap. Loc. Internal Secrecion* 4, 515-27(1928).—Choline chloride, injected into dogs in daily dosage of 10-20 mg. per kg. for 4-5 days, causes a decrease in urinary NaCl and N with no change in their excretory ratio.
K. SOMEYA

The relation between the concentration of anesthetics and the time required for complete anesthetization. KO HAYASHI. Keio Univ. *Keio J. Med.* 8, 365(1928).—H. found that the Wo. Ostwald expression for anesthetic action $1/t = KCP$ (t = the time required for anesthetization, K and P are const. and C = concn. of anesthetics) holds good for various kinds of common anesthetics. H. further observed that the "const." P not only remains const. even when the kinds of the animal used are different, if the same anesthetic is used, but also that the value is the same for the same series of anesthetics. The value of K in the same series of anesthetics increases with the increase of the length of the C chain.
K. SOMEYA

Pharmacological study of amino acid derivatives. IV. The action of various derivatives of phenylalanine. SHINGO GORO. Osaka Med. Coll. *Osaka J. Med.* 27, 2275-310(1928).—The action of amides and esters of each of the isomeric phenylalanine deriva. upon the isolated toad heart and upon blood pressure and respiration of rabbit resembles that of amides and esters of tyrosine; cardiac depression, however, is less. The difference is apparently due to the OH group but this has little influence in amides. V. The action of ethyl esters of various isomeric alanines. *Ibid* 2311-26.—Sympathetic stimulation is stronger in the *l*- than in the *d*-compds. Phenol, 3,4-dihydroxyphenyl, and benzene nuclei increase the cardio-inhibiting power of amino acid esters.
K. SOMEYA

The oligodynamic action of metallic silver. R. WANDERKA, I. DORTZENBACH

AND J. DE LA BARRERA. *Rev. inst. bacteriol. dept. nacl. hig.* 4, 375-84(1926).—Strips of metallic Ag ($2 \times 70 \times 5$ mm.) were placed in doubly distd. H_2O and kept in an atm. of H_2 . After 2 months' contact with the Ag the H_2O exhibited no oligodynamic action when tested against *B. paratyphosus* B (Schottmüller). Exposed under similar conditions in an atm. of CO_2 , the distd. H_2O quickly acquired oligodynamic activity. Conclusions: Under these conditions, it is possible that the Ag changes to the oxide which is slightly sol.

M. H. SOULE

The modes of administration of bismuth salts in antisyphilitic use. M. PRON. *J. pharm. chim.* 7, 380-90(1928).—The advantages of the use of Bi salts in comparison with Hg and org. As compds. are less toxicity, hence larger possible doses, and more lasting activity, unless the mode of application introduces difficulty of the elimination of Bi. The various methods of application are reviewed. The use of aq. or oil solns. of Bi salts permits by intramuscular injection a rapid antisyphilitic action realized thus far only by injection of org. arsenicals. In aq. soln. ammoniacal Bi citrate and Bi cacodylate are well tolerated and are very active forms of administration. Prepn. of both are described. The presence of Hg (1:5) seems to intensify action. Oil soln. of Bi camphocarbonate is useful when aq. solns. are not tolerated.

S. WALDBOTT

Development of the chronic nephritis induced in the dog by uranium nitrate. A functional and pathological study with observations on the formation of urine by the altered kidneys. WM. DEB. MACNIDER. Univ. of N. Carolina. *J. Exptl. Med.* 49, 387-409(1929).

C. J. WEST

Functional and pathological response of the kidney in dogs subjected to a second subcutaneous injection of uranium nitrate. WM. DEB. MACNIDER. Univ. of N. Carolina. *J. Exptl. Med.* 49, 411-33(1929).

C. J. WEST

The influence of calcium on glucosuria. ALEXANDRE G. PHOCAS. *Arch. mal. appar. dig. et nutrit.* 17, 1113-5(1927); *Ber. ges. Physiol. exptl. Pharmacol.* 46, 276.—P. administered Ca in several juvenile glucosuric patients and noticed that the amt. of elimination was reduced, for example, from 50-60 g. per day to 12 g. per day. However, Ca is not a specific for diabetes but can influence only glucosuria of certain origins. Ca reduces only those glucosurias which are provoked by Na. The action of Ca is purely antagonistic in the sense of Loeb's idea of colloids. The ionic equil. Ca:Na is especially disturbed in nervous diabetes. The action of the diastatic enzymes and the hormone depends in a large degree upon the ions whose influence on glucolysis is known through the work of Lepine.

R. C. WILLSON

The influence of quinine on the thyroid gland and the suprarenal capsule. S. IGURA. *Folia endocrinol. japon.* 3, 1581-90(1928); *Ber. ges. Physiol. exptl. Pharmacol.* 45, 662.—Histological studies were made on the thyroid gland and suprarenal capsule of rats after injections of quinine. The thyroid gland showed a picture of colloid struma, but it could not be detd. whether this change was produced directly or indirectly. In the anterior lobe of the suprarenal capsule there was found hyperemia and an increase in and an enlargement of the eosinophile cells. Probably compensatory processes are present.

R. C. WILLSON

Comparative studies of different cinchophen preparations and their effect on the elimination of uric acid. The mode of action of cinchophen. TEMMIN KAKU. Univ. Keijo. *Folia pharmacol. japon.* 6, 312-28(1928); *Ber. ges. Physiol. exptl. Pharmacol.* 45, 556.—The preps. studied were: 2-phenylquinoline-4-carboxylic acid (cinchophen), 6-methyl-2-phenylquinoline-4-carboxylic acid (paratophen), 7-methyl-2-phenylquinoline-4-carboxylic acid, 8-methyl-2-phenylquinoline-4-carboxylic acid (isatophen), 6,8-dimethyl-2-phenylquinoline-4-carboxylic acid, 2, *p*-methoxyphenylquinoline-4-carboxylic acid, 6-methyl-2-methoxyphenylquinoline-4-carboxylic acid, 7-methyl-2-methoxyphenylquinoline-4-carboxylic acid, 8-methyl-2-methoxyphenylquinoline-4-carboxylic acid and 6,8-dimethyl-2-methoxyphenylquinoline-4-carboxylic acid. The effect of cinchophen on the elimination of uric acid is strengthened by the use of a $-CH_2O$ group in the phenyl ring. A similar effect results from the use of a $-CH_3$ group in the 8th position in the quinoline group; a $-CH_3$ group in the 7th position has no effect on the elimination, while this factor is decreased by one in the 6th position or by 2 $-CH_3$ groups in the 6th and 8th positions. The uric acid concn. of the blood is increased after the use of cinchophen preps. K. assumes that the cinchophen transports into the circulation the uric acid which is retained in the tissues. After the increase in the concn. of uric acid in the blood there is a secondary increase in the uric acid of the urine. All the cinchophen preps. examd. are antiphlogistic and antipyretic.

R. C. WILLSON

The production of immunity of the rabbit kidney against poisons. I. TSUNEMATSU TSURUMATSU, KIKUO OGII AND HITARO MARUI. *Folia pharmacol. japon.* 6, 329-

56(1928); *Ber. ges. Physiol. exptl. Pharmacol.* 45, 551.—Subcutaneous injection into rabbits of HgCl_2 or cantharidin caused marked kidney injury which manifested itself by pathological changes both in the urine and in the kidney tissue. However, if an animal withstood one such poisoning a second injection of these substances caused no further renal injury. This resistance of the kidney to the poison appears to a considerable degree from 3 to 5 days after disappearance of the nephritic urinary symptoms, and appears completely after 10 to 14 days. When aloin is injected and reinjected the same nephritic changes are evident each time in the urine and kidney tissue; the kidney does not create an immunity against aloin. Only a weak immunity is created against K_2CrO_4 . Repeated chromate injections cause repetition of the urinary changes although the nephritic picture in the tissue of the kidney is less clearly expressed than after the first injection. II. KIKUO OGIU AND EITARO MARUI. *Folia pharmacol. japon.* 6, 379-83 (1928); *Ber. ges. Physiol. exptl. Pharmacol.* 45, 551-2.—In normal rabbits the poisoning by HgCl_2 , K_2CrO_4 or cantharidin caused a very marked decrease in the elimination of phenolsulfonephthalein and a similarly marked increase in the blood residual N. After recovery from the HgCl_2 or cantharidin poisoning the residual N returns to normal, it exceeds normal after K_2CrO_4 poisoning. In immunized rabbits, examd the 2nd day after re-poisoning, the dye elimination after HgCl_2 and cantharidin poisoning was undisturbed and it was only slightly disturbed after K_2CrO_4 poisoning. Residual N after the first two poisons showed a slight increase, and after the K_2CrO_4 there was an increase not quite so intense as in the normal animal, but a rather strong increase nevertheless.

R. C. WILSON

Pharmacological studies of nickel. MATAO YAMAGAMI. Univ. Keijo. *Folia pharmacol. japon.* 6, 389-402(1928); *Ber. ges. Physiol. exptl. Pharmacol.* 45, 420. Y used a weakly acid reacting prepn., sodium oxy-nickel tartrate. After subcutaneous injections of this prepn. frogs and mice do not move freely, but remain quiet, moving only when disturbed. Cramps often appeared. The paresis changes into complete paralysis and the respiratory movements become irregular, then less frequent and finally cease. Intravenous injection of the prepn. lowers the blood pressure of the rabbit, probably because of paralysis of the vasomotor center. On the isolated frog heart dil. solns. irritate and concd. solns. paralyze. The prepn. has only a slight action on the peripheral vessels. On the isolated intestine and uterus of the rabbit, the prepn. in all concns. had a paralyzing effect. Isolated skeletal muscles of the frog were stimulated in dil. solns., paralyzed in concd. ones.

R. C. WILSON

The influence of acids and alkalies on the formation of edema. KAGEMASA KUWAHATA. Univ. Kyoto. *Folia pharmacol. japon.* 6, 440-54(1928); *Ber. ges. Physiol. exptl. Pharmacol.* 46, 142.—The blood vessels of the rabbit ear were perfused with 0.01 N HCl, chromic, acetic and lactic acids and 0.01 N NaOH and KOH. The development of the edema, which also occurs when Ringer soln. is used, is accelerated to a marked degree, in spite of the reduction of the vol. of flow which appears to be due to injuries to the vascular walls caused by the agents used.

R. C. WILSON

The vascular action of cholic acid. KANSHO RYO. Univ. Kyoto. *Folia pharmacol. japon.* 7, 48-58(1928); *Ber. ges. Physiol. exptl. Pharmacol.* 46, 278.—The femoral vessels of the frog reacted to weak concns. of cholic acid by contracting, while somewhat stronger solns. produced dilatation and contraction and very strong concns. affected principally contraction. When the vessels had been pretreated with adrenaline, cholic acid produced a strongly expressed dilatation. Cholic acid usually caused the vessels in the ear of the rabbit to dilate while very strong concns. produced a temporary dilatation and a subsequent strong contraction. The portal vein of the rabbit showed only a very slight dilation when treated with cholic acid. Cholic acid stimulates both the dilators and constrictors.

R. C. WILSON

The influence of different anions of the ammonium salts on the sugar in the blood and urine. H. MASAMUNE. Univ. Fukuoka. *Fukuoka-Ikwadaigaku-Zasshi* 20, 511-31(1927); *Ber. ges. Physiol. exptl. Pharmacol.* 46, 89; cf. following abstract. After subcutaneous injections of NH_4 salts into the rabbit, the blood sugar increased very sharply after the phosphate, less after the sulfate and chloride and least after the acetate. The anion has no influence on the duration of the hyperglucemia; a prolonged duration was noted only after the phosphate. Section of the splanchnic nerve suppressed the hyperglucemia produced by acetate, chloride and sulfate, while that following phosphate was only weakened.

R. C. W.

Which components play a role in the blood sugar increase following the application of ammonium salts? H. MASAMUNE. *Fukuoka-Ikwadaigaku-Zasshi* 20, 726-45 (1927); *Ber. ges. Physiol. exptl. Pharmacol.* 45, 512.— NH_4Cl lowers the blood alkali; acidosis increases the blood sugar. M. studied the variation of the blood CO_2 after the

application of different NH_4 salts and found that NH_4 acetate in small doses which do not reduce the alkali reserve can in contrast to NH_4Cl increase the blood sugar. This study was pursued further with Na acetate to det. if the AcOH ion has a sp. action on the blood sugar increase and led to a positive result. Urea, the intermediate product of NH_3 , has no effect whatever on the blood sugar, when the dosage has a N content equal quantitatively to that of the dosage of the NH_4 salts. The blood NH_3 increase after subcutaneous injection of NH_4 salts is detectable for a proportionately longer time. After the subcutaneous injection of NH_4OH the blood sugar rose, just as it did after the use of NH_4 acetate, NH_4Cl and $(\text{NH}_4)_2\text{SO}_4$, but this change did not appear in bilateral splanchnicotomized animals. Summarily, the blood sugar increase after the injection of some NH_4 salts can be attributed to the NH_4 ions only in such salts as NH_4 acetate, which has a very weak action on the blood alkali reserve.

R. C. WILLSON

The intra-spinal use of lobeline. F. HAZAMA. *Japan. J. Obstet. and Gynecol.* 10, 38-44(1927); *Ber. ges. Physiol. expll. Pharmacol.* 46, 284.—In normal rabbits there is no difference between the intravenous and the intraspinal action of lobeline; the no. and vol. of the respirations are decreased. In a 2100 g. rabbit from which 48-cc. blood had been withdrawn the action continued for 35 mins; the respiratory vol. was larger after the injection. In animals which had received 0.03 g. morphine intravenously, the respiratory vol. was increased even 90 mins. later (820 against 660). The respiratory vol. is less 21 mins. after the intravenous injection than it was before the injection. In all the expts. the injected dose was 0.2 cc. of 0.03% soln. of lobeline. Effects of intra-spinal injections persist longer.

R. C. WILLSON

The elimination of injected polonium. JEANNE S. LATTES AND A. LACASSAGNE. *J. radiol. et électrol.* 12, 16-9(1928); *Ber. ges. Physiol. expll. Pharmacol.* 45, 420.—After subcutaneous or intraperitoneal injection Po is eliminated by rabbits through the kidneys and intestines, is in the same order of magnitude, beginning at about the same time after the injection and gradually becoming smaller. Traces were found even several days later. Only about 10% of the injected 100-500 e. s. u. was recovered. The remainder could not be found in the bodies of the animals so it is assumed that it was eliminated in other ways, particularly by the skin and lungs. In further studies Po was injected with other metals as Fe, Bi and Hg; the resorption and elimination were retarded.

R. C. W.

Studies of auditory disturbances due to nicotine. KAN-ICHI FUKUYE. *Med. Akad., Kyoto. Kyoto-Ikadaigaku-Zasshi* 1, 953-960(1927); *Ber. ges. Physiol. expll. Pharmacol.* 45, 568.—Subcutaneous and intravenous injections of nicotine into rabbits produced atrophy of the organ of Corti, macula and crista acoustica and degenerate atrophy of the cochlear and vestibular nerves and of the spiral ganglion.

R. C. WILLSON

The influence of some stimulating poisons on the action of tetrodotoxin on the skeletal muscle. RYUZO KATAGI. *Univ. Okayama. Okayama-Igakkai-Zasshi* 39, 1869-80(1927); *Ber. ges. Physiol. expll. Pharmacol.* 45, 576.—Tetrodotoxin is a toxin which was isolated by Tawara from the ovaries of the toxic Japanese fish of the tetrodon class. This toxin has a curare-like action on the skeletal muscle and paralyzes the respiratory and vascular centers. On isolated neuro-muscular preps. the action of tetrodotoxin was antagonistic to that of guanidine, strychnine, caffeine, camphor, strophanthin and adrenaline, although the antagonism of the different substances is different: adrenaline stimulates the motor nerve-endings; caffeine, camphor and strychnine act chiefly on the muscle itself while guanidine and strophanthin probably stimulate both elements. Tetrodotoxin is active even in a concn. of 0.00005%. In intoxication with strong concns. of it, only caffeine, camphor and strophanthin are antagonistic.

R. C. WILLSON

The action of ethyl alcohol on dehydrating processes and the consumption of oxygen by muscular tissue. G. DI MACCO AND P. FORMICOLA. *Rivista patol. sper.* 3, 44-51(1928); *Ber. ges. Physiol. expll. Pharmacol.* 45, 618.—Expts. with frogs showed that EtOH in concns. of 2-4% changes the dehydrating process and the consumption of O by the tissue. The changes depend upon the dose. Small doses first increase and then decrease the dehydration, while larger doses effect a fleeting reduction which is followed by an increase. Small doses are temporarily inhibitive to oxidation; larger doses are temporarily activating. The O consumption of the organism is increased more by small doses of 2% alc. than it is by large ones. In alc. concns. which are not harmful to cellular operation, one part of the increased consumption of O is used for the combustion of alc. while another part defrays an increase of the cellular metabolism. If the alc. concn. exceeds a certain limit, there probably occur changes in the phys. and chem. equilibrium in the cell and the surrounding medium, which inhibit the O consumption.

R. C. WILLSON

The action of candiolin and levulose on the isolated heart. J. BIANCO. Univ. Rosario. *Rev. soc. Argentina biol.* 3, 611-6(1927); *Ber. ges. Physiol. exptl. Pharmacol.* 45, 382; cf. *C. A.* 22, 822.—Candiolin exerts a favorable influence on the isolated heart when its Ca content is equalized by K. The favorable effect depends upon the hydrocarbon portion of the mol. Candiolin, however, shows no advantage over glucose. In washing the isolated heart, it is suggested that Ringer soln. with levulose be used, since this is more active than Locke soln. with glucose. R. C. WILLSON

The mechanism of the secretion of saliva after atropine. V. KRIJLOV. *Russ. fisiol. zhurnal* 9, 156-7(1926); *Ber. ges. Physiol. exptl. Pharmacol.* 45, 567.—When atropine is introduced into the conjunctival sac of the cat, there follows a copious secretion of saliva. It was observed that the cats moved their tongues as if to eliminate the saliva. K. assumed that the poison had spread from the conjunctival sac into the mouth. Instillation of methylene blue into the eye colored the tongue. Other alkaloids, as cocaine, etc., when introduced into the eye also produced a secretion of saliva. From dogs with chronic salivary fistulas it was learned that the mucous membrane of the mouth is very sensitive to alkaloids (morphine, atropine and cocaine), even very weak solns. causing a copious secretion of saliva. R. C. WILLSON

The action of pyridine and its alkyl derivative on the ciliated epithelium. Experiment in tissue culture. T. UMEDA. Univ. Kyoto. *Acta dermatol.* 11, 273-7(1928); *Ber. ges. Physiol. exptl. Pharmacol.* 46, 356.—The test material was small pieces of ciliated epithelium of the frog throat, the ciliary movement of which was maintained in the tissue culture in a plasma medium. Both pyridine and its alkyl deriv. exert an accelerating influence on the ciliary movement. R. C. WILLSON

Pharmacological evaluation of digitalis preparations (Focke) 17.

I—ZOOLOGY

R. A. GORTNER

Oöplasmic intermicellar fluid. K. BIALASZEWICZ. *Acta Biol. Exptl.*, Warsaw 1, No. 11, 1-52(1928).—The K contents of the ash of eggs of birds, amphibia, fish, crustacea, mollusks, echinoderms and annelids are comparatively const., while the Na, Ca and Mg contents, which are considerably lower, are more variable. From 20 to 63% of the vol. of the oöplasm is taken up by org. colloidal substances. The greater part of the alkali metals and Cl present is to be found in the intermicellar fluid in a dialyzable form, while the alk. earth metals and H_2PO_4 are for the greater part adsorbed reversibly on the dispersed phase. The mineral content of the intermicellar fluid is fairly const. for the above-named species, 10 parts of Na, and 7 each of Ca and Mg being present for every 100 parts of K. B. C. A.

Mercurochrome as a fungicidal agent in the growth of amphibian embryos. S. R. DETWEILER AND G. E. MCKENNON. *Anal. Record* 41, 205-11(1929).—Mercurochrome in concns. from 1:500,000 to 1:1,000,000 was used successfully as a fungicidal agent in the growth of *Amblystoma* embryos. These concns. in continuous treatment were toxic to embryos under, but not to embryos over, two weeks old. BYRON C. BRUNSTETTER

Some digestive enzymes in the crop juice of native Pulmonata. Preliminary paper. ERICH GRAETZ. Univ. Berlin. *Z. physiol. Chem.* 180, 305-7(1929). Five species of snails, including herbivorous, omnivorous and fungivorous types, were examined with respect to enzymes present in their gastric juice. The feeding habits of the animals appear to have no influence on the concn. of enzymes which digest Witte peptone at the optimum pH of 7.6. Erepsin is present as shown by hydrolysis of alanylglycine at a pH optimum of 7.3, and probably a protease since casein and fibrin are also attacked. A lipase is present which hydrolyzes the lower neutral fats more readily than the higher fats or the lower esters. Its optimum pH with acetate buffer is 5.7; with glycine buffer 9. In its natural medium the lipase is more stable than that of vertebrates, and retains its activity for weeks. Quinine and NaF inhibit tributyrin cleavage. Carbohydrates whose cleavage was demonstrated polarimetrically are sucrose, maltose, raffinose, arabin and sol. amylose, but undissolved starch grains are not attacked. A. W. DOX

Growth rates of brook trout reared upon purified rations, upon dry skim milk diets, and feed combinations of cereal grains. C. M. McCAY, W. E. DILEY AND M. F. CROWELL. Animal Nutrition Lab. Cornell Univ. and Conn. State Hatchery, Burlington. *J. Nutrition* 1, 233-46(1929); cf. *C. A.* 22, 1771-1772.—Expts. attempting to define the fundamental nutritional requirements of the lower vertebrates are continued with brook trout. Exptl. groups were started for periods exceeding 20 weeks by feeding purified rations contg. a low level of protein and by feeding a limited amt. of a protein food, as raw liver. Alternating periods of stunting and growing indicate that

there is a tendency toward compensation during the growing period which makes the rate tend to exceed the normal optimum. The factor in raw meat which seems to be the most active agent in stimulating the growth of trout is not extd. by EtOH or Et₂O. It is not identical with any of the known vitamins. Synthetic purified rations of starch, casein, and salt mixt. with vitamin supplements will permit a limited growth in trout if the protein level exceeds 10%. Trout are equally stunted when the protein level is 10% whether the ration contains 3 or 8% mineral matter. Trout stunted upon low-protein diets live twice as long as those that are allowed to grow upon similar synthetic rations with a higher protein level. This indicates that their bodies contain a store of some substance that is essential for life but is consumed in growth. Expts. with various traces of mineral supplements to skim milk indicate that its failure is not due to deficiencies in Zn, Cu, Fe or I. Raw liver is a much more effective supplement for a milk diet than raw spleen. Dried buttermilk is slightly better as a trout feed than dry skim milk when each is employed singly. Trout are able to use corn gluten, flour and peanut meal for growth and maintenance. As a converter of matter, the trout compares very favorably with the most efficient of the higher mammals and is possibly somewhat superior.

C. R. F.

The urine of the goosfish (*Lophius piscatorius*): its nitrogenous constituents with special reference to the presence in it of trimethylamine oxide. ARTHUR GROLLMAN. Johns Hopkins Univ. *J. Biol. Chem.* 81, 267-78(1929).—A study was made of the urinary constituents of the goosfish. The chief nitrogenous constituents of this urine were found to be creatine, creatinine and amino acids. NH₃, urea and uric acid were present only in small amts. The remainder of the urinary N was made up chiefly of (CH₃)₃N.O which was isolated and identified. Specimens of urine obtained from the fish freshly caught in the Atlantic were found to contain much more N and much less inorg. salts than the analyses reported previously by other observers. A. G.

The composition of the body fluids of elasmobranchs. HOMER W. SMITH. Univ. of Va. and Mt. Desert Island Biol. Lab., Me. *J. Biol. Chem.* 81, 407-19(1929).—Analyses were carried out of the various constituents of the body fluids of *Raja stabuliformis* and *R. diaphenes*, *Carcharias littoralis* and *Mustelus canis*. The pericardial and perivisceral cavities of these fishes contain fluid which is extremely acid and differs markedly from the blood plasma in its compn. The cerebrospinal fluid approximates a protein-free ultrafiltrate from the plasma. Urea is approx. equally distributed per kg. of H₂O between the plasma and tissues but may occur in very different concns. in the various body fluids. The secretory functions of the pericardial and peritoneal membranes are emphasized.

ARTHUR GROLLMAN

Studies on blood cell metabolism. III. The effect of methylene blue on the oxygen consumption of the eggs of the sea urchin and starfish. The mechanism of the action of methylene blue on living cells. E. S. GUZMAN BARRON. Johns Hopkins Univ. *J. Biol. Chem.* 81, 445-57(1929); cf. *C. A.* 22, 4603.—Methylene blue produces an increased O consumption when added to sea urchin or starfish eggs. Narcotics inhibited this effect but CN⁻ was without effect. The increase in O consumption was proportional to the level of anaerobic metabolism. The oxidative action of methylene blue is considered as one of oxidative dehydrogenation, the dye playing a catalytic role because of its reversibility and spontaneous oxidizability by mol. O without a catalyst.

ARTHUR GROLLMAN

Changes in the nuclear-plasmic ratio of vertebrate poikilotherms during hunger. ANTHONY DMOCHOWSKI. Warsaw Univ. *Biochem. J.* 22, 1548-54(1928).—The nuclear-plasmic ratio (N.P.) was practically const. for frogs; in the case of axolotls it rose to 15% after 5 months of hunger and fell to 15% below normal after 11 months of hunger. The N.P. of trout after 80 days' hunger rose by 30% for fry and 49% for 2-year olds. Yearling trout exhibited an increase of about 50% after 90 days of hunger.

BENJAMIN HARROW

The action of minute thyroxine doses on the respiration of non-vertebrate. B. ROMKIS AND J. WÖR. Anatom. Anstalt, München. *Naturwissenschaften* 17, 104-5 (1929).—V. Dobkiewicz (*Arch. Entw. mechanik* 114, 458(1928)) has shown that a prolonged diet of thyroid has no influence on the morphology of insects. The effect of thyroid material on the respiration of non-vertebrates was studied. Winter pupae of *Papilio podalirius* (800 to 1000 mg. wt.) in a 12° thermostat were injected with 50 or 25 cu. mm. thyroxine soln. of varying concn. Their respiration was observed by Krogh's microrespirometer and by CO₂ absorption. Injection of 50 cu. mm. of a soln. of 1 mg. synthetic thyroxine dissolved with a trace NaOH in 500 cu. mm. 1% NaCl soln. (isotonic) as well as injection of 25 cu. mm. of a 1:250 thyroxine soln. gave during 8 to 14 days an increased O consumption of 80 to 80%. Without NaCl 25 cu. mm. 1:1000 thyroxine

soln. also gave a 50% rise. For more dil. solns. the action becomes quite different. For 1:10⁴ diln. down to 1:10⁶ no action results for 4 or 5 days; then, however, the O consumption increases for 1 or 2 days to a 10-, sometimes 30- or 40-fold value, subsequently rapidly dropping to normal or subnormal. Between 1:10³ and 1:10⁴ dilns. the initial period becomes 7 to 9 days but the temporary respiration peak is as high. The results are evidence of the remarkable action of hormones specially in minute doses. No resultant morphological change (e. g. shortening of metamorphosis period) was observed.

B. J. C. VAN DER HOEVEN

Relations of the liver to asphyxial hyperglucemia in fishes. W. W. SIMPSON. Pacific Biol. Sta., Nanaimo, B. C. *Quart. J. Exptl. Physiol.* 19, 197-9(1928).—The normal blood sugar of ling cod is of the same order as other teleosts. A delay occurs between asphyxiation and onset of hyperglucemia. Asphyxia following complete leparectomy in fish does not cause hyperglucemia. In "mock leparectomy" asphyxia causes high blood sugar.

FRANCES KRASNOW

12—FOODS

F. C. BLANCK AND H. A. LEPPER

Chemical apparatus in the food industry. A survey of the "Nutrition" exposition, Berlin, 1928. H. WINKELMANN. *Chem. App.* 15, 217-8, 257-8, 279-80(1928), 16, 14-6, 35-7(1929).—Descriptions of numerous types of app., with 27 cuts.

J. H. MOORE

Research, control and food manufacture in the Czechoslovakian Republic in the years 1918-28. FRANCIS HRUŠKA. *Chem. Obsor* 4, 3-5, 36-47 (47 English)(1929).

JAROSLAV KUČERA

Determination of phosphoric acid in foodstuffs. W. WHARTMANN. *Z. Unter such. Lebensm.* 55, 610-13(1928).—For the detn., the following solns. are prepd: (1) 210 g. NH₄ molybdate in 300 cc. of H₂O and 400 cc. of 10% NH₄OH soln., (2) HNO₃ (d. 1.2), (3) 1% soln. of KNO₃ solns. (1) and (2) are mixed shortly before use in the proportion of 1:2; 75 cc. of this mixt. is added to the phosphate soln. in the cold, 0.5 g. of (NH₄)₂SO₄ having been previously dissolved in the latter. The mixt. is stirred with a glass rod without touching the sides of the beaker until pptn occurs. After 4 hrs. the filtration is carried out on a close-grained BaSO₄ filter paper, and the ppt. is washed with 1% KNO₃ soln. until 10 cc. of the wash H₂O is neutralized to methyl orange by 1-2 drops of 0.1 N soda. The filter and ppt. are placed in a beaker, covered with a 1% KNO₃ soln.; the ppt. is dissolved by gradual addn of carbonate free N soda. The excess of soda is detd. by titration with N H₂SO₄. Satisfactory results were obtained for a standard phosphate soln., and detns. of H₃PO₄ in wine and of EtOH sol. H₃PO₄ in dried eggs gave results in agreement with those obtained by the Mg₃P₂O₇ method.

B. C. A.

The determination of moisture in wheat and flour. A study of "moisture testing" in water ovens and electric ovens. E. A. FISHER AND C. R. JONES. Research Assoc. of British Flour Millers, St. Albans. *J. Agr. Sci.* 18, 649-70(1928).—The nature of the problem of moisture detns. on materials such as flour and wheat is discussed. The electrically heated air oven is the most convenient and suitable instrument for routine purposes; comparative results show that it allows of far more reliable work than the water oven. Detns. of apparent moisture content were made on a sample of wheat flour in elec. ovens at temps. ranging from 90° to 140° and for periods of heating of 1-14 hrs. At several temps., variation in time of heating over a considerable range does not affect the values obtained. With ground wheat, the results differed from those with flour in that over the ranges studied at all temps. the figures obtained increased steadily but at diminishing rates with increasing time of heating up to about 12 hrs. The effects of the position of containers in the type of elec. oven used and of the size of sample are shown to be negligible. Ca carbide is shown to be as efficient a desiccating agent as H₂SO₄ and more suitable for routine work in mills.

P. R. DAWSON

The baking strength of Arizona Early Baart flour. MARGARET CAMMACK SMITH. Ariz. Agr. Expt. Sta. Tucson, *Tech. Bull.* 23, 549-607(1928); cf. C. A. 23, 446. Phys. and chem. tests place Early Baart wheat as a better class soft or semi-hard wheat. The crude protein content was 9.84% and the gliadin-glutenin ratio 0.402. The buffer action was high and a fair amt. of diastatic action was found. A moderate fermentation period gave higher loaf vols. than either short 1-period fermentations or long-continued periods. Four % of yeast and 6% of sugar yielded a max. loaf vol increase.

The sponge method gave a superior quality loaf as compared with the straight-dough procedure. The addn. of the sugar to the flour before sponging gave loaves of poor vol., color, texture and flavor probably due to the exhaustion of the yeast food before the last stages of the fermentation process. Mineral-salt mixts. (concn. 0.32%), when added to the basic formula, stimulated yeast activity and caused a rapid increase in H-ion concn. as was evidenced by a lower p_H value of the baked product. High-speed mixing (152 r. p. m.) mechanically modified the gluten of the flour, thereby aiding the action of the H ions in attenuation of the gluten network. A yield of 293 loaves of 1 lb. each of high-quality bread was obtained from 1 bbl. of flour. C. R. F.

Improving flour with gaseous chlorine. M. NEUMANN AND H. KALMIUS. *Russ. intern. Agr.* 1926, 444; *La chim.* 3, 141(1927).—In Golo's bleaching process gaseous Cl_2 is used together with 0.5–1.5% $NOCl$ and a certain quantity of air. The flour is agitated continually in a mixer; it absorbs with avidity the gas in the concn. 0.015–0.02%, remaining completely odorless, with no HCl or HNO_2 formation. Under the influence of the gas, the swelling capacity of the colloidal substances (albumin) increases, and these absorb more water and produce a more abundant tenaceous and softer paste. The action is caused by an increase in the acidity of the flour. The soly. of the N products also increases. When the two factors increase more than normally, which happens principally with soft grain, the action of the gas can be nullified. This also takes place by treating too long. The gas has no action on the preservability of the flour or on the activity of the enzymes. R. SANSONE

The microscopic examination of starches and flours. W. GARNER. *Ind. Chemist* 5, 119–20(1929). E. H.

Seasonal and monthly variations in the average composition of milk. R. L. ANDREW. Dominion Lab., Wellington, N. Z. *New Zealand J. Sci. Tech.* 10, 229–35(1928).—In Wellington, N. Z., the winter and summer milk is of medium quality. Autumn milk is the richest and spring milk is the poorest. These periods do not correspond with similar periods in England probably because of differences in climate, feeding methods, etc. The yearly averages for fat and solids not fat are:

Year	Fat	Solids not fat	Year	Fat	Solids not fat
1917	4.05%	9.06%	1922	4.21%	9.03%
1918	4.06%	9.04%	1923	4.12%	9.04%
1919	4.06%	8.97%	1924	4.21%	9.02%
1920	4.13%	9.03%	1925	4.22%	9.07%
1921	4.15%	8.99%	1926	4.27%	8.96%

RUSSELL C. ERB

Experiences with physical methods in milk analysis. J. KRENN. *Z. angew. Chem.* 42, 202–4(1929).—A critical discussion of several well-known phys. methods used in milk analysis. J. C. JURRGENS

Physical-chemical studies of cow milk and its preparations. MASAMI NAKAYAMA. Med. Akad., Kyoto. II. *Kyoto-Ikadaigaku-Zasshi* 2, 923–30(1928); *Ber. ges. Physiol. expil. Pharmacol.* 46, 353; cf. C. A. 23, 1963.—At the optimal p_H the separation of casein in cow milk and its manuf. preps. was not influenced by the temp. or by the duration of time. The isoelectric point of the casein at 40° was as follows: milk casein, p_H 4.37–3.82; casein from milk powder ("Kintaro," "dry milk," "Lactogen" and "Derigold"), p_H 4.16–3.32; casein from Nestle's milk food and the condensed milks (malted milk, "Eagle Brand" and "Bear Brand"), p_H 4.37–4.07. R. C. WILLSON

The buffer action of milk. M. COMEL. *Boll. soc. ital. biol. sper.* 3, 908–11(1928).—Filtered goat milk was added to $M/30 NaH_2PO_4$ and Na_2HPO_4 and to $M/60 Na_3PO_4$ in the proportions of 1:1, 1:2 and 1:4. The p_H of the mixts. was detd. potentiometrically. The results are given in tabular form and show (a) the p_H of the phosphate soln. alone, (b) the p_H of the mixt. as detd. potentiometrically, (c) the p_H of the mixt. calcd by averaging the p_H of the phosphate soln. and the milk, and (d) the difference between (c) and (d). Milk had a decided buffering action, especially marked in the extreme acid and alkaline range of the phosphate solns. The buffer action of milk plasma. *Ibid* 912–15.—By plotting (y) the p_H of the mixt. of phosphate soln. and milk against (x) the p_H of the phosphate soln. alone, the curve showed two points of inflection. To investigate the cause of this, the milk was centrifuged at 6000 r. p. m., the fat separated, and the skimmed milk filtered. The plasma was mixed with the phosphate solns. as described above and the p_H detd. The results were similar to those observed with whole milk except that they differed quantitatively. The buffer action of the whole milk was slightly greater. The buffer action of milk serum. *Ibid* 915–8.—In order to det. what part of the buffer action of milk is due to ionized proteins, milk was coagu-

lated by means of rennet; the serum was decanted, centrifuged at 6000 r. p. m. and filtered. Varying proportions of phosphate solns. were added to the serum and the p_H was detd. By comparing these results with those obtained with whole milk and skimmed milk, it was clear that the buffer action of milk serum was analogous to that of whole and skimmed milk. The p_H was shifted quantitatively, but not qualitatively, so that the curves obtained by plotting (y) against (x) were similar in shape. The buffer action of milk is, therefore, due principally to the presence or formation of complex acid salts, proteinates, or salts of protein acids, and to a lesser degree to the presence of proteins as such.

PETER MASUCCI

Calculation of dry weight of milk. R. SAAR. *Z. Untersuch. Lebensm.* 55, 573-7 (1928).—From Fleischmann's formula (*C. A.* 8, 3827) $t = 1.2f + 2.665 [100 - (100 - 0.25d + 0.26 + 0.2f + c)]$, in which t is the fat-free dry wt. %, d the lactodensimeter reading, and c a value depending on the sp. gr. of the milk. For $d = 21.7-23.7$, $c = -0.02\%$; for $d = 23.8-26.5$, $c = -0.01\%$; for $d = 26.6-38.4$, $c = 0$. The Herz formula $r = 0.25d + 0.2f + 0.26$ gives correct results except for highly dild. milk, for which the small correction c should be applied.

B. C. A.

Detection of the degree of heat in (pasteurized) milk. P. WEINSTEIN. Chem. Untersuchungsamt Bochum. *Z. Untersuch. Lebensm.* 56, 457-67 (1928).—Milk when heated to 85° for 1 min. gives a neg. Rothenfusser reaction for oxidase. At 70 for 30 mins., the oxidase reaction is pos. but the Schardinger aldehyde-reductase test is neg., i. e., the color does not appear within 22 mins. Normally, milk pasteurized by the holding method gives a pos. oxidase reaction and a low catalase value, the color appearing only after 10-11 mins. and producing only 8-10 cc. of O_2 per 100 cc. of milk. In sufficiently heated milk gives a catalase value above 10 and gives a pos. reaction for amylase. Milk heated to only $54-5^\circ$ gives a strong amylase value of 0.1-0.5 and a catalase value of from 30 to 50. Raw milk reacts strongly to both amylase and cat.

C. R. F.

The commercial application of *Lactobacillus acidophilus* milk. E. L. REICHAERT AND H. P. DAVIS. Neb. Agr. Expt. Sta., *Bull.* 228, 1-19 (1928).—Methods are given for prepg., storing and handling together with a summary of the available information on *acidophilus* milk.

C. R. F.

Changes produced in milk under the influence of change from dry feeding to pasture and from additions of calcium salts. N. PELEKHOV. *Zapiski Belorussian Gosudarstv. Akad. Sel'skogo Khosyaistva* (Memoirs Belorussian State Acad. Agr., No. 1, 1-10 (1926).—Expts. have shown that a sharp change in the feeding of cow from a dry ration to pasture increases the percent of fat, protein and ash. However, this increase is temporary and is apparent until the animal loses some of its excessive weight. The catalase content of the milk suffers a sharp decline, which is due to the acidifying processes which take place when the cow is turned out on pasture. Addition of Ca to the feed of the cows in the form of phosphate increases the Ca content of the milk. No such effects were noted when $CaCO_3$ was added.

J. S. J. D.

Influence of ultra-violet ray upon the milking cow. KENZO IGUCHI AND K. YARO MITAMURA. *J. Faculty Agr. Hokkaido Imp. Univ.* 24, Pt. 2, 39-60 (1928).—Expts. were carried on in 15-day periods, 6 days' prepn. and 9 days' expt. Ultra violet ray irradiation upon the cow's udder (both back and sides) at a distance of 25 cm. from the source of light and for 30 mins. a day produced an increase of 4.77% milk and butter fat. Irradiation upon the cow's food showed an increase of 2.92% of the total milk wt. and 4.24% of the total fat wt. in the av. of 2 cows. There was no change in the CaO and P_2O_5 of the milk drawn from irradiated udders.

R. C. E.

Detection of egg yolk in margarine. J. ANGERHAUSEN AND G. SCHULZE. Hygien. Staatsinst. Hamburg. *Pharm. Zentralhalle* 70, 183-7 (1929).—A comprehensive discussion is given of the difficulties incident to the detection of egg yolk in margarine leading to the conclusion that neg. results obtained via Fendler do not necessarily prove the absence of actually added constituent as claimed by the manufacturer, but may indicate rather that the egg yolk employed had in its prior treatment been rendered more or less completely insol. in 2% $NaCl$ soln. This can be detd. only after consultation with the manufacturer.

W. O. E.

The p_H of the white as an important factor influencing the keeping quality of hen eggs. P. F. SHARP. *Science* 69, 278-80 (1929).—Freshly laid hen eggs contg. very few microorganisms keep very well if the p_H of the white is maintained about 7.6, the normal figure. Stored eggs lose CO_2 ; this loss causes watery whites and a shift of the p_H from 7.6 to about 9.7. The addition of 1% CO_2 to the air in warehouses is not dan-

gerous to workmen, adds but little to the cost of the eggs and greatly assists in maintaining the normal appearance of the white.

G. H. W. LUCAS
Studies in cereal chemistry. I. The present position of cereal chemistry and its relation to chemical industry. T. H. FAIRBROTHER. *Ind. Chemist* 5, 91-2(1929).

E. H.
The question of the improvement of the manufacture of edible oils and fats. K. LÖFFL. *Chem.-Ztg.* 53, 125-6(1929).—Nutritional investigations have made new demands on the mfg. methods for edible fats and oils. These demands include: a consideration of the vitamin content of the finished product; the vitamin loss during the processes of extn. and refining; and the physiologically correct synthesis of artificial fats such as margarine, etc. Refining with NaOH, for instance, is a method that destroys a large percent of the vitamin content of fats.

RUSSELL C. ERB
Fruit juices and fruit beverages. JOHN H. IRISH. Agr. Expt. Sta., Berkeley, Cal. *Fruit Products J. and Am. Vinegar Ind.* 7, No. 11, 10-12; No. 12, 17-19 and 21; 8, No. 2, 15-17; No. 3, 12-14; No. 4, 12-14(1928); 8, No. 7, 13-15 and 19(1929).—In this series of papers I. discusses: general principles; equipment; hints on filtering; storage containers; bottle pasteurizers; filling machines; securing a distinctive and pleasing flavor in grape juice; crushing and stemming; extn. of colors; the most efficient methods of bottling, pasteurizing, canning, removing cream of tartar, and carbonating grape juice; pasteurizing in barrels and preserving with H_2SO_4 ; treatment of apple juice for bottling and canning; preserving loganberry, pomegranate and citrus juices; pasteurization vs. cold storage or the use of preservatives—I. recommends pasteurization; beverages from fresh fruits; and spoilage—the most serious type is not that caused by microorganisms but by chem. and enzymic action. Methods for overcoming this problem are discussed.

J. A. KENNEDY
The fluorescence of honey in ultra-violet light. G. ORBAN AND J. STITZ. *Inst. Kg. Ungarischen Elisabeth, Univ. Pécs. Z. Untersuch. Lebensm.* 56, 467-71(1928).—All of the samples investigated luminesced in ultra-violet light. The intensity of the luminescence depends upon the origin or derivation of the sample. After cooling to below 30°, samples of honey, which had been heated to 60°, 80° and 100°, had the same luminescence as before heating. The test is of doubtful application in the routine examn. of honeys.

C. R. F.
Dextrins of honey and artificial honey. J. FIEBE AND W. KORDATZKI. *Z. Untersuch. Lebensm.* 55, 602-8(1928).—Dextrins were obtained from various natural and artificial honeys by pptg. proteins, mucins and other substances by MeOH and then pptg. the dextrins by adding EtOH and Et_2O . All gave Jolles' diphenylamine test for levulose (C. A. 4, 785, 1185). Even after repeated pptn. and prolonged digestion with abs. EtOH to remove any traces of sucrose and levulose, a positive reaction for levulose was obtained. It is concluded that both in natural and artificial honey, dextrins contg. levulose mols. occur. To det. approx. the amt. of the levulose fraction a 1% dextrin soln. is heated with 2/5 of its vol. of 5 N HCl for 2 1/2 hrs. on the boiling H_2O bath. The dextrose is unchanged but the levulose forms among other substances hydroxymethylfurfuraldehyde. The difference in the I value detd. before and after extn. of the soln. with EtOAc is an approx. measure of the levulose originally present. Comparison of the results with those obtained for synthetic mixts. of dextrose and levulose indicate the presence of 20-30% of levulose mols. in the dextrins of honey and artificial honey.

B. C. A.
Simplified sugar and sirup calculations for preserves and canners. C. R. FELLERS AND M. J. MACK. *Mass. Agr. Coll., Amherst, Mass. Fruit Products J. and Am. Vinegar Ind.* 8, No. 7, 16-19(1929).

J. A. KENNEDY
Cacao beans and cacao products. V. Pigments of cacao beans and cacao products. Ash content of cocoa paste. H. FINCKE. *Z. Untersuch. Lebensm.* 55, 559-68(1928).—The 2 pigments of cacao beans are designated cacao-red and cacao-brown. Cacao-red is sol. in EtOH, is bright red in acid soln., violet in neutral soln. and green or greenish-blue in alk. soln. Cacao-brown gives cacao its characteristic color; it is only slightly sol. in EtOH but readily sol. in alk. aq. solns. Both are tannin substances. Cacao-red occurs in variable amts. in the fresh seeds, in com. fermented beans and in the finished cacao products. Cacao-brown does not occur in fresh seeds but is gradually produced from a colorless parent substance in the several processes of fermentation, roasting and grinding. Cacao-red is also transformed into cacao-brown in the fermentation process and in the prepn. of cacao powder with the addn. of alkali. Cacao-red is produced in the living plant, probably from the same parent substances as cacao-brown and its parent substance by the action of alc. HCl. Detns. on cacao material from several sources show an ash content of the dried paste of 2-4.5%. B. C. A.

Nutritional value of extracted cattle feed. G. B. VAN KAMPEN. *Chem. Weekblad* 26, 98-101(1929).—Soy-bean meal extd. with trichloroethylene caused severe sickness among cattle. It was found that this meal contained much less phosphatides than that extd. with benzene, and as soon as the meal extd. with trichloroethylene was taken off the market, the sickness disappeared. An attempt was made to find out if other substances were extd. by the trichloroethylene that were not extd. by the benzene. Ground soy beans were first extd. with benzene, then with trichloroethylene and this last ext. was dissolved in benzene. The insol. residue was a brownish yellow wax-like substance, of a 42.9% ash content contg. much P_2O_5 , considerable Ca and very little Mg, while there was a residue insol. in strong acids giving a pronounced SiO_2 reaction.

J. C. JURRJEHS

Experiences in ensilage at the Royal Hungarian Agricultural Academy in Keszthely. LADISLAUS V. CSIKI. *Deut. Landwirt. Tierzucht.* 33, No. 7, 121-2(1929).—Time-temp. and fodder height(cm.)-time curves are given for the ensilage of green corn. The temp. was kept at 40-50°. Analysis of the silage after 5 1/2 months gave H_2O 83.16%, ash 1.35, crude protein 0.85, digestible protein 0.60, crude fat 0.46, crude fiber 6.28 and N-free ext. 7.90. Parallel analyses are given for an air-dried sample. B. C. B.

The composition and nutritive value of sugar-beet pulp. H. E. WOODMAN AND W. E. CALTON. School of Agr., Cambridge Univ. *J. Agr. Sci.* 18, 544-68(1928).—Crude fiber (20.3%) and N-free extractives (65.7%) constitute together more than 0.8 of the dry matter of sugar-beet pulp, the latter being deficient in respect to proteim ash and oil. The carbohydrate of sugar-beet pulp is mainly in the form of a pectose. The pulp is shown to be highly digestible in the ruminant organism. It compares very favorably with maize meal in respect to the digestibility of its N-free extractives and total org. matter, as well as in its content of digestible org. matter. The process of drying in the factory does not impair its digestibility. As affecting digestibility it is immaterial whether dried pulp is included in the rations of ruminants in the dry or soaked condition. It is advisable, however, with liberal allowances of the dried product, to soften well in water prior to feeding. The fibrous constituent of sugar-beet pulp is very little inferior to the N-free extractives in respect to digestibility, justifying the conclusion that it is present almost wholly in the form of simple cellulose. Almost 0.8 of the total dry matter of sugar-beet pulp is digested not by enzymic processes but by the agency of bacteria. The dried pulp is to be regarded as a carbohydrate concentrate, 1 lb. of which is equiv. to 0.8 lb. of maize or 0.9 lb. of barley in the productive part of the rations of ruminants. It is a cheap source of digestible carbohydrate.

P. R. DAWSON

Occurrence and distribution of I in fish and fish products (LUNDE) 11A. Dairy waste waters, their properties and their purification (PRITZKOW) 14. Garlic (KUROSAWA) 11D. The occurrence and characteristics of certain yeasts found in fermented honey (MARVIN) 11D. Filter for beverages (U. S. pat. 1,706,250) 1. Fermentation of sugars (Brit. pat. 295,648) 16. Alcohol recovery apparatus for baking ovens (Ger. pat. 471,086) 1. Laboratory mill suitable for comminuting feedstuffs (U. S. pat. 1,706,643) 1.

Treating grain with potassium carbonate. HENRY J. WHITE (to Bethlehem Milling Co.). U. S. 1,706,760, March 26. Grain such as wheat is heated to about 200° with K_2CO_3 and sugar (suitably in dil. soln.) in order to improve the properties of flour made from the wheat for bread making.

Baking bread. ROBERT L. CORBY (to the Fleischmann Company). U. S. 1,705,636, March 19. One side portion of the crust of a loaf of bread, during baking, is heated to a greater extent than the other side of the crust, so as to control and localize splitting of the crust during baking.

Milk. HENRICH BÖNING. Fr. 645,941, Dec. 20, 1927. Oil or fat hardened of H at 30-32° is added to milk which is afterward homogenized. The or fat may be injected into the milk under a pressure of 175 atm. in which case the homogenizing is not necessary.

Milk. HENRI CORBLIN. Fr. 646,190, May 5, 1927. Milk is preserved for transport by causing a rapid formation of a thin layer of frozen milk on the interior of the walls of the vessels. The vessels filled with milk, preferably at 0°, are plunged into a well-stirred freezing mixt. Cf. C. A. 22, 3795.

Butter. ALFRED GORRE. Fr. 646,115, Dec. 23, 1927. Cream, for the manuf. of butter, is sepd. after milking, and put in contact with a pure lactic ferment "Chevrotin"; it is then into a container with double walls sunk in the

ground to allow keeping of the cream in all seasons for 8 days and to facilitate the centralization in the creameries of good creams of a characteristic aroma.

Margarine and similar products. AKT.-GES. FÜR MEDIZINISCHE PRODUKTE CHEMISCHE FABRIK. Brit. 295,884. In the manuf. of margarine and similar edible fats, lecithin and cholesterol or phytosterol and fat mixts. are obtained by alc. extn. from animal or vegetable oils or fats and these mixts. are added to the basic fat mass. Products from egg-yolk oil or soy-bean oil may be added to margarine.

Preserving egg material. A. H. PENFOLD. Brit. 296,012, May 23, 1927. Egg yolks or mixed yolks and whites are preserved by adding dextrose (suitably 10–20%) and storing at a temp. below freezing point (suitably about -25°).

Casein. CARL ALBRECHT BAECHLER. Swiss 127,781, June 29, 1927. Casein is obtained by adding a casein-pptg. medium to milk and stirring strongly. The product is mixed with dry casein until a homogeneous moist whole is formed. This is then dried.

Filter for coffee infusions or other beverages, etc. C. G. BROOKS. Brit. 295,812, July 18, 1927.

Freeing coffee berries from pulp and washing them before drying. F. KRUPP GRUSONWERK A.-G. Brit. 295,515, Aug. 31, 1927. An app. is described; and the mixt. of pulp and mucilage produced may be used to form combustible briquets.

Shaft drier for sliced fruits and vegetables. HANS TZITSCHKE. Ger. 471,452, Aug. 4, 1927.

Pectin. PECTINERIE DU KERVOR. Fr. 645,993, Dec. 21, 1927. Apples or apple waste is given a preliminary treatment with water contg. an inorg. acid to ext. sugar, salts and substances other than pectin, which is then extd. in the usual manner.

Activated product from yeast. I. S. MACLEAN. Brit. 295,757, May 23, 1927. Yeast is incubated in a soln. contg. phosphates and carbohydrates and the sterols or sterols and fats so obtained are subjected to activating radiation. The product may be added to margarine.

Yeast compositions. BAYLIS M. DAWSON (to The Fleischmann Co.). U. S. 1,706,564, March 26. A substantially dry compn. comprising yeast particles and assocd. solids (and which may also comprise malt-ext. solids) may be prepd. by a method of spray desiccation under properly regulated conditions, which are described. U. S. 1,706,565 relates to substantially dry compns. comprising yeast particles encapsulated by the solids of a fruit juice such as orange juice and which may also contain milk solids. U. S. 1,706,566 relates to a compn. in substantially dry form comprising particles of yeast encapsulated in and assocd. with malt-ext. solids and fruit-juice solids.

Drying hay, straw, beets, etc., by coiled heating pipes within a stack of the material. C. LYON. Brit. 295,482, July 4, 1927. Mech. details are specified of an app. in the heating coils of which water heated to above 100° is preferably used as the heating medium.

Drying hay, straw, beets, or other materials. C. LYON. Brit. 295,801, July 4, 1927. The material is arranged in a stack with internal heating coils through which water under pressure and heated to above 100° may be forced while air is forced through the stack. Devices may be provided to check the heating or circulation of the water if the air current is stopped.

13—GENERAL INDUSTRIAL CHEMISTRY

HARLAN S. MINER

The application of science to industry. G. E. LANDT. Diamond State Fibre Co., Bridgeport, Pa. *Ind. Eng. Chem., News Ed.* 7, No. 6, 5(1929). E. J. C.

The role of pure and applied science in industry. B. CALLOW. *Food Manuf.* 4, 67–9(1929). J. A. KENNEDY

The technical museum for industry and trade in Vienna. L. CROON. *Apparatebau* 41, 25–8(1929). J. H. MOORE

Electricity and the chemical industries. A. GIBB. *Elec. Rev.* (London) 102, 618–19(1928); cf. *C. A.* 22, 1814.—Statistics are given on the production and requirements of elec. power for various chem. industries. E. H.

National and provincial research in Canada. L. E. WESTMAN. *Can. Chem. Met.*, Toronto, Canada. *Ind. Eng. Chem., News Ed.* 7, No. 6, 1–2(1929). E. J. C.

Protecting ideas through patents and litigation. LOUIS BURGESS. *Chem. Met. Eng.* 36, 158–60(1929). E. H.

The right of protest in granting patents. GUSTAV SCHUCHARDT. *Chem.-Ztg.* 53,

61-2(1929); cf. *C. A.* 22, 3714.—Objections to current practice in German patent procedure are voiced. In many cases such protests are lodged only to embarrass the applicant, for the sake of competition, to delay proceedings or to give the objector access to information belonging properly to the applicant.

The demand for chemical engineers. W. BADGER. *Univ. of Mich. Ind. Eng. Chem., News Ed.* 7, No. 6, 3(1929). E. J. C.

The role of surface energy in chemical engineering. W. E. GIBBS. *Chemistry & Industry* 48, 127-37(1929).—G. gives a good discussion of the application of surface energy phenomena to chem. engineering. Surface energy is explained and its application is shown to adsorption, scale prevention, emulsification, emulsification and demulsification, flotation, lubrication and contact catalysis. M. C. ROGERS

Squandering fuel in commercial plants employing heat. W. GRAULICH. *Chem.-Ztg.* 53, 49-50(1929).—In a series of illustrations based upon actual practice the costs incident to so-called "trifling faults" in plants management and up-keep are shown. Included are leaky packing of joints, cutting out a feed-water heater, omitting feed-water purification, cleaning boilers, not saving condensate for boiler use, poor insulation, not preheating feed water, omitting superheating and condensation. Rigid accounting methods covering fuel and power costs and efforts to improve plant practice are bound to pay for themselves. W. C. EBAUGH

New coating for pressure stills. J. C. MORRELL, W. F. FARAGHER AND V. MEHLER. *Oil & Gas J.* 27, No. 29, 55, 150(1928).—A non-corrosive, adhesive, protective coating for still lining comprises furnace cement 60 lbs., white silica foundry sand 30 lbs., water glass (40-43° B ϵ), technical 1 gal.; asbestos, short fiber 1 1/4 lbs. and water 200-1000 cc. per 100-lb. batch. The coating is applied to the sand-blasted surface in layers preferably 1/16 to 3/16 in. thick and covered with a brushing soln. consisting of a mixt. of 5 lbs. furnace cement (50-50 Adamant-Sansé mixt.) and 1 gal. water glass (40-43° B ϵ) and about 3 pints water. The lining is cured by heating at a regulated rate to about 900° F. M. B. HART

Progress report of pipe line and production of the A. P. I. general committee on corrosion for 1928. E. P. BLV. *Am. Petroleum Inst., Bull.* 10, No. 2, 76-8(1929).—In a review of 120 questionnaires returned from 24 business units several valuable requirements have been suggested, such as applying the main coat or the prime coat at the mill, routing pipe lines around the corrosive area, giving more concd. thought to tankage corrosion, durable screens, casing and tubing. As a result of these activities a definite program has been laid out for future work involving (a) development of other codes of good practice for all materials showing merit as pipe line coverings, (b) making more extensive field investigations on present coatings to serve as a basis of future selections, (c) studying the economic aspects of pipe-line corrosion problems and (d) conducting cooperative field exptl. work with the Bureau of Standards, pipe-line companies, and coating manufacturers. J. L. E

The use and behavior of protective coatings on underground pipes. GORDON N. SCOTT. • *Oil & Gas J.* 27, No. 29, 127-8, 195(1928); *Am. Petroleum Inst. Bull.* 10, No. 2, 78-93(1929).—S discusses a few of the important aspects of care in the application of protective coatings, the types of failure which have been found to occur in service, and the manner in which false conclusions may be drawn from tests on specimens buried in selected soils. One of the objections to mill-coated pipe is the ease of rupture of the coating by rough handling before use. Continuity of the coating is essential so as to prevent localized corrosion; hence patch work, unless done very carefully, should be avoided. Since oil-soaked earth will readily dissolve the coating, it is necessary that all collars be properly caulked to prevent leaks. Air entrapped in the coating will cause rupture of the fabric. The added life that may be realized from the application of a particular coating is a function of the conditions of service to which the coating will be subjected. Generally, the destruction of a protective coating in service may be either chem. or phys. or a combination. A soil which expands or contracts with a change of moisture content and which has the ability to adhere to the coating causes considerable damage to certain classes of protective coatings; this may be called the "soil stress effect." Chem. changes may involve oxidation, loss of volatile constituents, and soly. of bitumens in oil. Phys. changes may be due to loss of bond between asphalt and metal, softening and flowing of the coating, distortion of the coating by movement of the earth caused by uneven trench bottoms and settling of the back-fill earth. Temp. changes cause considerable distortion, cracking, and checking of coatings. Lab. tests show that soils which give surface or subsurface checking may be expected to have a distorting effect upon coatings. Such soils are usually highly col-

loldal. No direct relation between soils which are corrosive to bare pipe and which are highly destructive to coatings was noted.

"Schades plastic protective binding" as a protection against corrosion for pipes. J. L. E. ERNST VOGELSLANG. *Chem. Fabrik* 1929, 77-8.—A recently introduced tape or binding material for protecting piping and cables against corrosion is said to yield good results. The fabric is coated with a wax-like substance consisting of paraffin hydrocarbons, and the tape is applied only "on the job" and not in the factory. W. C. E.

Are present cylinder test regulations practicable? GLEN D. BAGLEY. *Chem. Markets* 24, 169-75(1929).—Interstate Commerce Commission tests for gas cylinders demand that every cylinder must withstand a test pressure equal to $1\frac{2}{3}$ times the charging pressure at 70° F., with a permanent expansion not greater than 10% of the total and without any previous pressure greater than $\frac{1}{3}$ that of the test pressure having been applied. And one cylinder out of each 200 must stand a crushing test to 6 times the wall thickness without cracking, and also tensile test specimens from this cylinder or another must show an elongation of not less than 10% on an 8" specimen, with an elastic limit of not more than 70% of the ultimate. To obtain such information without harming the cylinders, tests were made and results plotted showing the relation between the expansion of a cylinder and the pressure applied up to a distance beyond the elastic limit. Curves were derived that showed the possibility of judging the fitness of a cylinder without destroying its usefulness. The only factor of serious consequence in the life of an initially satisfactory cylinder is internal corrosion. The extent to which it has occurred can be detd. by noting the elastic expansion of the cylinder, and measurements of this must be made every 5 yrs. to comply with ICC regulations anyway. Moreover tapping a cylinder with a light hammer will indicate by the sound whether serious corrosion has taken place. Thus simple non-destructive tests are available which make it possible to det. wall thickness and condition of the steel on every new cylinder; and the 5 yr. and hammer tests give information as to condition of the walls. W. C. EBAUGH

Crushing and grinding. II. The relation of measured surface of crushed quartz to sieve sizes. JOHN GROSS AND S. R. ZIMMERLEY. *Am. Inst. Min. Met. Eng., Tech. Publ.* No. 126, 8 pp.(1928).—Surface measurements were made by the soln. rate method developed by the authors (*C. A.* 22, 1072). Owing to fractures, the surfaces of which are measured in part, the ratio of measured to theoretical surface is much larger for coarse than for fine particles. The ratio varies from 2 for the 0.1 mm. size to 3.5 for the 0.7 mm. size. Ottawa sand, which is free from fractures, showed a const. ratio of about 1.3. The av. size of the particles in the material finer than 200-mesh is usually much less than 37 microns. III. Relation of work input to surface produced in crushing quartz. *Ibid Publ.* No. 127, 10 pp.—A crushing device was developed in which a heavy ball was allowed to drop upon a plunger in a steel mortar containing the quartz sample. The work not used in crushing was measured by the deformation of 3 Al wires placed radially under the mortar. The exptl. results showed that the new surface produced was directly proportional to the work input. The major portion of the work expended, even in comparatively coarse crushing, is consumed in making material smaller than 200-mesh. HANS C. DUUS

Industrial carbon monoxide poisoning. MAX GRÜNEWALD. *Brennstoff u. Wärme-wirtschaft* 11, 51-3(1929).—A review mainly of the physiological effects of CO. F. S. GRANGER

Loss calculations in dissolving, leaching and extraction. C. V. IREDELL. *West-inghouse Lamp Co., Bloomfield, N. J. Chem. Met. Eng.* 35, 685-6(1928); *Eng. Mining J.* 127, 201-2(1929).—The following equations show a method of computing losses without weighing the residue: (1) when the desired constituent remains in the residue in the same form in which it existed in the starting material
$$L = 100 B \frac{(1-A)}{A(1-B)}$$
 (2) when the desired constituent remains with the residue as an entirely different compd. than that in which it existed in the starting material
$$L_1 = \frac{100 B_1 (1-A)}{A(1-B_1 f)}$$
 (3) when the desired constituent remaining in the residue is partly as the unchanged original form and partly as the converted compd.:
$$L_1 = 100 (B + B_1) \frac{(1-A)}{A(1-B-B_1 f)}$$
 A = the wt. of the desired constituent in the starting material per unit wt. of starting material; B = the wt. of the unchanged desired constituent in the residue per unit wt. of residue; B_1 = the wt. of the desired constituent in the residue which has been converted to a different compd., per unit wt. of residue; A , B and B_1 are provided by chem. analysis; f = the

conversion factor of the desired constituent from its original form in the starting material to the sol. compd. existing in the residue; X = the wt. of total residue per unit weight of starting material; L = the loss in percent of the total desired constituent.

L. A. PRIDGON

Manufacture of magnesia insulating materials. FRIEDRICH E. M. BUSCHMANN. *Chem.-Ztg.* 53, 31-2(1929).—Basic Mg carbonate and asbestos wool serve as raw materials for making molded forms of insulators, the Mg compd. being made from burned magnesite, H_2O and CO_2 under definite conditions of temps. and pressure so as to get the desired phys. properties, i. e., low cond. and light weight per unit vol. The mech. operations involved are described briefly.

W. C. EBAUGH

The economics of insulating industrial heating equipment. J. D. VAN VANKENBURGH. *Fuels and Furnaces* 7, 277-94(1929).

E. H.

The technical importance of adipic acid and its derivatives (SCHRAUTH) 10.

"The Chemical Age" Year Book, Diary and Directory for 1929. London: Benn Bros., Ltd. 10s. 6d. Reviewed in *J. Textile Inst.* 20, P44(1929).

The Chemical Engineering and Chemical Catalogue. 5th ed. London: Leonard Hill, Ltd. 401 pp. 15s. Reviewed in *Chem. Trade J.* 84, 268(1929); *Paper Makers' Monthly J.* 67, 123(1929).

REEDY, JOHN H.: *Industrial General Chemistry.* Urbana, Ill. 384 pp.

ROTH, WALTHER A.: *Grundzüge der Chemie für Ingenieure.* 2nd ed. Braunschweig F. Vieweg & Sohn. Akt.-Ges. 265 pp.

Purification of gases. SOC. ANON. POUR L'EXPLOITATION DES PROCÉDÉS ÉDOUARD URBAIN. Fr. 646,462, May 18, 1927. Last traces of impurities are removed from gases, by liquefying the gas and treating with absorptive C.

Purifying gas admitted to transformers. A. G. ELLIS and METROPOLITAN-VICKERS ELECTRICAL CO., LTD. Brit. 296,160, June 30, 1927. Air or other gas is dried or deoxidized by passing over the surface of desiccants such as $CaCl_2$ or deoxidizing agents such as ground Cu and NH_4Cl or P arranged in layers. An app. is described.

Gas-purification plant. P. SCHLÄPPER. Swiss 128,189, Sept. 10, 1927. Impurities are removed from gases by washing and treating with a soln. which is insol. in the washing liquid and which forms easily removable double compds with the impurities.

Gas adsorption. S. PILAT. Brit. 295,874, Nov. 22, 1927. In passing a gas through adsorbent material, first in one direction and then in the opposite direction, it is passed in one direction through the whole height of the adsorbent material and in the opposite direction through only a part of it. By using several adsorption chambers in rotation the process may be made continuous.

Preventing gas absorption by liquids. FIRM OF P. LECHLER. Brit. 295,319, Aug. 9, 1927. In preventing corrosion of iron submerged in water, or for like purposes, the body of liquid is covered with another lighter liquid layer such as mineral oil which may contain dissolved bitumen to increase its viscosity.

Absorption of carbon dioxide from gases. GES. FÜR LINDER'S RISMACHINEN A.-G. Ger. 480,840, Aug. 11, 1926. Aq. NH_3 salt soln. with less than 5% free NH_4OH and more than 5% free $(NH_4)_2CO_3$ is employed as the absorbent.

Use of oil to facilitate separation of dust from air or other gases. O. SÖDERLUND, T. GRAM AND TECHNO-CHEMICAL LABORATORIES, LTD. Brit. 295,233, May 4, 1927. An app. is described.

Separating particles suspended in a liquid. KARL T. R. LUNDGREN. Fr. 646,027, Dec. 21, 1927. Tubes contg. the liquid are fixed in an inclined position on a frame on a rotating vertical axis, so that a centrifugal action is obtained. The app. may be used for blood analysis.

Separating liquids. CHARLES E. DERACKER. Fr. 646,421, Dec. 28, 1927. Liquids of different densities are sepd. by dipping into the liquids a container having a vertical tube opening below the edges of the container and terminating below the container in a funnel open at the base. The mouth of the funnel is placed below the surface of the heavier liquid which flows upward into the container.

Clarification of emulsions. G. STADNIEV, ROBERT KLASSON and VICTOR KIRICHENKOV. Ger. 468,185, Oct. 23, 1924. The sedimentation velocity of turbid liquids, the like is accelerated by stirring in coagulated colloids such as peat.

Thus, coagulated peat accelerated the sedimentation of pptd. CdS and Fe_2S_3 hydrosol. Cf. C. A. 23, 655.

Solvents and dispersing agents. I. G. FARBENIND. A.-G. Fr. 646,816, Jan. 7, 1928. Aliphatic or mixed aliphatic-hydroaromatic derivs. of NH_3 contg. one or more alkylhydroxylic or cycloalkylhydroxylic groups are used as solvents and dispersing agents for industrial substances of animal, vegetable or other origin. Examples are given of the use of cyclohexyldiethanolamine, cyclohexylmonoethanolamine and triethanolamine as *dispersing agents for dyes and solvents of oils, etc.* The butylethanolamines are also mentioned.

Effecting chemical reactions. VEREIN FÜR CHEM. IND. A.-G. (Hans Walter, inventor). Ger. 471,267, May 23, 1924. See Swiss 127,243 (C. A. 23, 1188).

• **Cooling steam.** SIEMENS-SCHUCKERTWERKE A. G. (Hans Gleichmann and Walde-mar Stender, inventors). Ger. 471,225, Aug. 17, 1924. App. is described for use in processes, e. g., *sugar manuf.*, in which it is desirable to use steam at a temp. not exceeding a given max. The steam is cooled by water in a surface heat exchanger, the amt. of steam being controlled in accordance with the pressure of the cooled steam, and the amt. of water in accordance with the temp. of the water.

Oil extracting. I. G. FARBENIND. A. G. Fr. 646,703, Jan. 4, 1928. Oil is extd. from solid substances contg. it, such as hydrogenated coal, by means of liquid SO_2 which may be mixed with C_6H_6 or other solvents.

Centrifugal lining of pipes and tubes with bituminous material. BRITISH MANNES-MANN TUBE CO., LTD., and R. F. WEISER. Brit. 295,267, April 5, 1927. A hot compn. is used comprising natural asphalt or bitumen including its normal mineral content, and a fluxing oil, e. g., Trinidad native bitumen having a siliceous content of 40% mixed with 20% of asphaltic oil.

Coating pipes with asphaltic or cementitious materials, etc. BRITISH MANNES-MANN TUBE CO., LTD., and R. F. WEISER. Brit. 295,340, April 5, 1927. The coating material is projected from a nozzle in the form of a flat strip the impact of which serves to rotate the body being coated, and the coating is smoothed by pressing during the rotation. An app. is described.

Gas masks. LES FILS AÎNÉS DE A. BAUDOU. Fl. 646,226, May 10, 1927. Rubber foil which is not attacked by yperite and may be used in masks is made by covering the foil with linseed oil and vulcanizing.

Refrigerator. GEORG THOMAS and PETER SCHLUMBOHN. Fr. 646,801, Jan. 6, 1928.

Refrigerating machine. PLATEN-MUNTERS REFRIGERATING SYSTEM AKTIEBOLAG. Ger. 471,475, Aug. 1, 1926. In a continuously operating absorption refrigerating machine of the kind contg. an inert gas for equalizing the pressure, the pipes conveying the cooling water are of Cu and are arranged in metallic contact with the Fe condenser coil and the Fe wall of the absorber. Cf. C. A. 23, 1971.

Refrigerating system of the absorption type. G. MAURI and R. F. BOSSINI. Brit. 296,109, Feb. 25, 1927. Various details are described of a system in which a pressure equalizing inert gas such as He, H, N or A may be used. Brit. 296,140 also describes a refrigerating system of the same general type.

Refrigerating system of the reversing absorption type. J. O. BOVING. Brit. 295,836, Aug. 31, 1927.

Refrigerating system of the reversing absorption type. SULZER FRERES SOC. ANON. Brit. 295,371, Aug. 11, 1927. An app. is described.

Compression refrigerating machine. ANDREW A. KUCHER. Ger. 471,456, Mar. 8, 1924. Corresponds to Brit. 217,178.

Refrigerating apparatus of the compression type. F. R. WEST (to Rice Products, Inc.). Brit. 295,583, Aug. 13, 1927. Structural features.

Pressure regulator for refrigerators. SOC. NOUVELLE DU FROID INDUSTRIEL. Fr. 646,354, May 12, 1927.

Thermostatic device for refrigerating apparatus. IRVIN G. THOMAS (to Westinghouse Elec. & Mfg. Co.). U. S. 1,705,690, March 19.

Heat insulating material from peat. GEORG KELLER. Ger. 467,223, May 7, 1924. Heat insulating material is made from peat by mixing it in a finely divided state with cork and grit or sand and pressing the mass in molds at 150° .

Porous silica suitable for use as a heat insulation material. H. L. WATSON (to British Thomson-Houston Co., Ltd.). Brit. 295,628, Aug. 15, 1927. Silica is rendered porous by heating and cooling, impregnated with an org. material, and then heated rapidly until plastic so that the org. material is volatilized and forms minute bubbles in the silica, e. g., quartz sand may be heated to about 1700° for a half hr., cooled, mixed

with shellac soln., molded, slowly heated to about 400° and then heated rapidly to about 1750°.

Electric cables. FELTEN & GUILLEAUME CARLSWERK A.-G. Brit. 295,932, Aug. 20, 1927. Paper tape insulation on high-tension cables is wound in an overlapping manner in the innermost layers and in an abutting manner in the middle and outer most layers.

Deep-sea electric cables. FELTEN & GUILLEAUME CARLSWERK A.-G. Brit. 295,923, Sept. 16, 1927. Cables such as those with paper or air insulation are armored with wires or flat strips of light metal such as Al alloy, assocd. with steel wires. The armoring is covered with gutta-percha or rubber and a lead sheathing is placed over this.

14—WATER, SEWAGE AND SANITATION

EDWARD BARTOW

Recent investigations in the field of water chemistry. W. STEFFENS. *Pharm.* **267**, 145-58(1929).—A review. W. O. L.

Electroosmotic purification of water. S. KOMAGATA. *Researches Electric Ind. Lab.*, Tokyo, Japan, No. **216**, 20 pp (1927). H. I. P.

The medicinal springs of South Africa. Supplement II. M. M. RINDL. Gray Univ. Coll., Bloemfontein. *S. African J. Sci.* **25**, 116-26(1929). Analyses are given of the waters of numerous medicinal springs of South Africa. A. I. H.

The hydrogen-ion concentration of surface waters around the Cape Peninsula. LANCELOT HUGHES AND ALEXANDER ZOOUD. Univ. of Cape Town. *S. African J. Sci.* **25**, 325-8(1929).—The pH of 34 samples of water taken at different places and times around the Cape of Good Hope peninsula have been determined. The mean av. results were 8.16 ± 0.028 in one series and 8.18 ± 0.024 in the other case. These results reinforce the view that sea water in different parts of the world varies very little in H-ion concn. ALBERT L. HENSEL.

Comparative study of sea-water densities determined by various methods. ENMA BARDAN MATEU. *Inst. Españ. Oceanografía Notas y Resúmenes* II, No. **14**, 1929, 12 pp.—Allémantet has obtained a max. difference of only 5 units in the 5th decimal place between Cl and the pycnometer method. But on comparing the data the errors are much greater than this, up to 2 in the 4th place. Densities from refractive indices have a max. difference of 3 or 4 units in the 4th place. Most upper values have been obtained by refractive-index methods. A plot is given of values obtained (a) by pycnometer method, (b) by refractometer, (c) from Cl detns. Errors to which the refractive index and Cl methods are liable do not obey any const. law. Alteration of density on keeping has been indicated by Makaroff, with very phosphor. salt water; he intimates that the organisms present may affect the density. Finally there may be biol., phys. and chem. reasons for the density variations. S. L. B. ELLIOTT.

Determinations of organic matter in sea waters. JOSE GIRAL PEREIRA. *Inst. Españ. Oceanografía Notas y Resúmenes* II, No. **4**, 25 pp.—The org. matter may include living cells of the microplankton and bacteria, spores, dead matter, hydrocol. cells and chemically dissolved matter. Hence albumins, fats, carbohydrates, carotinoids and anthocyanins may be present. From the dead detritus one may expect cotones, prosthetic groups, polypeptides, amino acids, amines, etc., and putrefactive products, zymases and diastases, mercaptans, and the like, cystine and the like. H₂SO₄ and H₂SO₃, glucosides, fats, lipoids and glycerides may be present. A sept. according to chem. orders of the org. matter is not possible, and analytical methods for these orders are very imperfect. The relation with O₂, CO₂ and oxidants has been studied particularly the action with permanganate. The Schulze-Trommsdorff (alk. KMnO₄ acidulation, addn. of oxalic and back titration) was used although recognized as tentative. The Algeiras Bay has a factory discharging org. matter into the water. The results for June-July 1922 are given in a table. S. L. B. ELLIOTT.

Variations in salinity and oxygen dissolved in sea water in Algeiras Bay during the voyage of the "Averroes." A. GILA Y ESTABAN. *Inst. Españ. Oceanografía Notas y Resúmenes* II, No. **7**, 1924.—Depth, temp., time, Cl‰, salinity ‰, etc., are given for some 192 samples, some of the data being set out graphically. Data collected by the "Thor" in 1910 in the Mediterranean are also given. The Mohr-Winkler method was used for Cl and Winkler methods for O₂. In Algeiras Bay there is a surface layer of min. salinity. Two classes of water exist analogous to waters in the Mediterranean.

One, less saline, floats, and produces a current parallel to the coast; the second, more saline, below, periodically receives injections of water from the Mediterranean. Variations in dissolved O_2 are insignificant at the surface but greatest at 30 m. below the surface. The relations calcd. by G. are not const. A bibliography of 58 references is given.

Reaeration of water by algae. EDWARD C. CROMWELL. *Public Works* 59, 346-7 (1928).—The effluent of the Baltimore sewage plant empties into the Back River. The dissolved-O content of the river was 80-180% satn. The supersatn. is due to the prolific growth in the water of algae, which is caused by the stimulating effect of the dissolved org. matter. Algae are very important factors in the reaeration of water and in the oxidation process.

The action of active chlorine on aquatic plants. K. GEMEINHARDT. *Kl. Mitt. Ver. Wasserversorg. Abwasserbesetig.* 2, 124-30; *Chem. Zentr.* 1927, II, 1743.—The introduction of strongly chlorinated waste water into streams causes damage to the vegetation and microorganisms, if the water contains more than 15 mg. Cl per l. For removing undesirable vegetation in water reservoirs of technical water, cooling towers, etc., about 100 mg. Cl per l. may be added to the water during a working pause and allowed to act as long as possible. Mechanical removal of the dead vegetable matter should bring relief from the nuisance for some time.

The water of several Hungarian city aqueducts, wells and bathing places near Lake Balaton and that of several railroad stations. I. SZANYI. *Kiserl. Kozl.* 31, 1-20 (1928).—891 samples of drinking water were analyzed. Water of city aqueducts was proved to be good; 52.8% of the examd. railroad-station wells and 37.5% of bathing place wells was found drinkable. The amount of water produced in cities with aqueducts varies from 29.7 to 182.5 l. to the person daily. Aqueducts should be established, if possible, since ordinary wells yield good drinking water only in case of frequent cleanings.

The chemical control of boiler plant. C. N. RIDLEY. *Ind. Management* 15, 360-1 (1928).—A discussion of boiler feed water treatment and of problems relating to combustion.

Embrittlement prevention in steam boilers. FREDERICK G. STRAUB. *Power Plant Eng.* 33, 173-4 (1929).—Boilers operated for 13 years at a pressure of 160 lbs., in which a ratio of Na sulfate to total alk., expressed as Na_2CO_3 , equal to 2 was maintained, show no embrittlement. Two plants in the Champaign Urbana district operated at 160 lbs. pressure on untreated water have encountered embrittlement. In another community a well water free from Na_2CO_3 received water treatment introducing a high Na_2CO_3 alk. and a low SO_4 content: a plant using this treated water encountered embrittlement while another using the raw water was free from trouble. Adoption of recommendations of the Am. Soc. of Mech. Eng. Boiler Code Comm. in 1926 advising ratios of alk. to Na_2SO_4 at various steam pressures has done much toward helping plants eliminate trouble. The proper ratio should be maintained at all times, as embrittlement may act quickly. Half the proper ratio is no better than none. Phosphate treatment, which maintains the proper ratio between alk. and sol. phosphate content (not total phosphate), seems to be more desirable as a lower ratio may be effective. Tannate and acetate are helpful in inhibiting embrittlement.

Absorption of oxygen by alkaline tannates. E. P. FAGER AND A. H. REYNOLDS. *Ind. Eng. Chem.* 21, 357-9 (1929).—A study at room temp. of the absorptive properties of various com. alk. tannates as regards their relative efficiencies in boiler-feed waters for the prevention of corrosion. Com. tannins in alk. soln. absorb large amts. of O_2 —in some cases almost as much as pyrogallol.

Definitions of terms used in sewerage and sewage-disposal practice. Am. Soc. Civil Eng. and A. P. H. A., *Joint Committee Rept.* 19 pp. 1928.

Sewage from dye works, its effect on streams, and the possibility of purifying it. A. PRITZKOW. *Kl. Mitt. Ver. Wasserversorg. Abwasserbesetig.* 1, 149-54 (1925); *Chem. Zentr.* 1927, II, 1745.—Dye waste waters may be discolored by bleaching, chem. clarifying, or filtering over brown-coal cinders.

Physical and chemical considerations of streams into which sewage is discharged. A. SCHULZE-FORSTER. *Kl. Mitt. Ver. Wasserversorg. Abwasserbesetig.* 3, 249-63; *Chem. Zentr.* 1927, II, 1745.—Water courses that receive sewage must be examd. as to what extent their properties are altered by such an influx. Numerous methods are discussed of taking samples and of carrying out the phys. examn. with regard to transparency, color, odor, reaction and cond. The use of the interferometer for detecting the origin of the pollution is discussed. Of the chem. methods of examn., particular stress is put on the significance of the acid-combining power of the stream, which is of importance

when acid waste waters are introduced into the stream. Acid-combining power is defined as the amt. of SO_2 in mg., with which 1 l. of the water can combine. G. S.

Dairy waste waters, their properties, and their purification. A. PRITZKOW. *Kf. Mitt. Ver. Wasserversorg. Abwässerbeseitig.* 1, 27-31(1925); *Chem. Zentr.* 1927, II, 1745. The purification of dairy waste waters may be limited to the retention of fatty constituents and of the coarse particles, if the conditions are favorable in the stream into which the waste is discharged. If they are unfavorable, as will be the case in most of the dairies, the waste water should be used on sewage irrigation fields or treated on trickling filters or by biol. methods. G. SCHWOCH

Chemical aspects of stream pollution by phenols. EMERY J. THERIAULT. *Ind. Eng. Chem.* 21, 343-6(1929).—A study of the purely chem. aspects of stream pollution by phenols as distinguished from problems of inspection, regulation, or sanitary control. Exptl. results indicate that under certain restrictive conditions, the Gibbs method is capable of giving reliable information. This procedure applied to domestic sewage indicates the presence of 100-500 parts per billion of phenol while with polluted waters values ranging from 1 to 2 parts per billion have been obtained. In the case of coagulated and filtered waters derived from polluted sources sep. evaluation of various modifying factors will be necessary before definite conclusions can be drawn concerning the occurrence of tastes following chlorination, which can be referred to substances of sewage origin. W. H. ROYCE

Biochemical oxidation of phenolic wastes. F. W. MOILMAN. Sanitary Dist. of Chicago. *Am. J. Pub. Health* 19, 145-56(1929).—A modification of the Gibbs colorimetric method for the detection of phenol in amts. less than 2500 p. p. b. was used. The reagent, 2, 6-dibromoquinone chloranide, was found to be sp. for phenols. Three large coke or steel factories add large quantities of phenolic wastes to the sewage. Lab. expts. show that the addn. of less than 2% of NH_3 -still wastes to sewage greatly increases the 5-day biochem.-O demand. Org. N and total bacteria also increase perceptibly. On a slow sand filter 1% (25-35 p. p. m.) or less of phenolic wastes could be handled satisfactorily. The activated-sludge process can handle 30-40 p. p. m. of phenol from NH_3 -still wastes without serious impairment of the quality of the effluent. Anaerobic bacteria are found to be more resistant to phenolic wastes than aerobes. Reinoculation, using 10% inoculum of a previously used aerated sludge, accelerates oxidation and reduces the time from 15 to 9 hrs. Phenolic wastes oxidize much more rapidly at higher temps. (130°). At 20° the phenol content is decreased to 100 p. p. b. in 3.4 days while at 10° it requires 7.4 days for a similar decrease. C. R. L.

Colorimetric determination of nitrates in waters (UMBERTO DE NARDO) 7. **Chemical composition of Woods Hole sea water** (PAGE) 11A. **Elimination of mosquito oöfers** broad market for special oils (GINSBURG) 22. **Differentiation of the coli and aerobes groups of bacteria** (SALLE) 11C.

Collection, Treatment and Utilization of Town's Refuse. London: Ernest Benn, Ltd. Written by staff members of Birmingham Salvage Dept. and edited by J. Jackson. 15s. net.

FOLWELL, AMORY P.: Sewerage. The Designing, Constructing and Maintaining of Sewerage Systems and Sewage-Treatment Plants. 10th ed., rewritten and reset. New York: J. Wiley & Sons, Inc. 390 pp.

Vom Wasser. Ein Jahrbuch für Wasserchemie und Wasserreinigungstechnik. Band II. Berlin: Verlag Chemie, G.m.b.H. Published by Division of Water Chemistry of the Verein Deutscher Chemiker. 280 pp. Paper, M. 14; bound, 16. Reviewed in *Ind. Eng. Chem.* 21, 393(1929).

Softening water. STANLEY A. SANFORD. U. S. 1,705,589, March 19. BaF_2 is used to ppt. the bases which cause temporary and permanent hardness, without addn. of any other coagulating substance.

Apparatus for softening water by chemical treatment. CHARLES P. EINHAEGER (to The Duro Co.). U. S. 1,706,777, March 26.

Filter for water, etc. J. MUCHKA. Brit. 295,520, Sept. 28, 1927. The filtering material, such as sand, gravel, quartz, or carbon, of a filter for water is sterilized by steam generated in the lower part of the filter or in an adjacent connected container. Various structural details are described.

Apparatus for aerating sewage. P. I. DONROKHOTOV. Russ. 5445, May 31, 1928.

Treating- and settling-chamber construction for bacterial purification of sewage. H. E. ELROD. Brit. 295,863, Oct. 24, 1927.

Sterilizing air. JOSEPH F. SCHILLER and WALTER U. WESCOTT. U. S. 1,706,594, March 26. Air is compressed to about 3 atm. and then expanded by successive steps in small streams to a pressure of about 2.5 atm. An app. is described.

15—SOILS, FERTILIZERS AND AGRICULTURAL POISONS

J. J. SKINNER

Soil investigations and subsoil treatments. FRANK H. ENO. Ohio State Univ. *Roads and Streets* 49, 39-44(1929).—E. describes soil properties and lab. methods of detg. the value of the properties in connection with the effect of the soils upon pavements laid upon them. Drainage and methods of changing the qualities of a soil are discussed. L. B. MILLER

Soil profile in the Eastern Gezira. H. GREENE. Wellcome Tropical Research Labs., Wad Medani, Sudan. *J. Agr. Sci.* 18, 518-30(1928).—Data are presented on the vertical distribution of salts in the soil, as estd. by the cond. method. Field observations on the soil profile are included. The distribution of salts is generally related to compactness of the soil profile as judged by the distribution of gypsum, CaCO_3 , aggregates and soil color. The relation already established between salt content and fertility is now expressed as a relation between compactness of profile and fertility. The data agree well with geological views as to the origin of the soil. Influences of which the soil profile is a product are also discussed. P. R. DAWSON

Soil permeability in the Eastern Gezira. H. GREENE. Wellcome Tropical Research Labs., Wad Medani, Sudan. *J. Agr. Sci.* 18, 531-43(1928).—An account is given of studies of moisture content in the field. The results agree with Joseph's (C. A. 20, 468) view that the relation between salt content and fertility is chiefly due to the effect of Na salts on soil texture. The effect of 14 days flooding is taken as a measure of permeability in the field and confirmatory results of this test were obtained when applied to 2 areas whose agricultural value had previously been measured by lab. studies and field observation of the soil profile. The genesis of the Gezira soil is discussed with regard to the relation between salt content and fertility and with regard to the use of gypsum as a corrective. Marked improvements in permeability have been brought about by application of this substance. P. R. DAWSON

The nitrogen content of Red River Valley soils. J. M. ELLIS AND WM. SHAPER. Manitoba Agr. Coll. Winnipeg. *Sci. Agr.* 9, 231-48(1928).—Numerous analyses showed a N content of 0.3-0.6% with an av. of approx. 0.42 in the surface 7 in. of soil. Many tongued intrusions occur in these soils. The N content of the intrusions was considerably higher than in the normal profiles. The cause of tongued intrusions is believed to be the cracking and opening up of the highly colloidal clay soils through shrinkage during drought. These fissures then become filled with surface soil and org. matter through the action of wind and rains. The dark tongued intrusions are shown to be of different forms, depending upon the phys. properties of the soil material. A peculiar broad and relatively shallow type, coexistent with a highly developed hummock condition of the surface, is caused by differential shrinkage and expansion where the profile was composed of clay underlaid by bedded very fine sandy clay. C. R. F.

Present knowledge concerning soil acidity. H. M. NAGANT. La Trappe, Can. *Sci. Agr.* 9, 186-91(1928).—A review. C. R. F.

Iodine in soils and plants. R. KÖHLER. Prussian Geological Inst., Berlin. *Z. angew. Chem.* 42, 192-7(1929).—Sixty-one soil samples were analyzed for I, humus and . . . The results varied with the kind of soil, previous treatment and location in the profile. Three of the soils were next used as germination beds for rye. After 18 days the plants were removed and the soils again analyzed for I. The content was distinctly lower. M. H. SOULE

Nitrogen fixation by soil microorganisms. P. G. KRISHNA. Cornell Univ. *J. Agr. Sci.* 18, 432-8(1928); cf. C. A. 22, 2428; 23, 1153. Fungi are responsible for the fixation of very small quantities of N, while the *Azotobacter* and *B. amylobacter* groups are the important N fixers in the soil. *B. amylobacter* is able to fix 4-5 mg. of N per g. of glucose consumed. It has an optimum range of pH between 6.0 and 7.0, while the optimum for *Azotobacter* lies between 7.0 and 8.4. *Azotobacter* utilizes the org. acids produced during the fermentation of glucose as sources of energy for N fixation in the absence of glucose; *B. amylobacter* does not, or only to a limited extent. Large

quantities of glucose do not favor an efficient N fixation, as large quantities of the org. acids produced affect the reaction of the media, rendering the organisms inactive. The N-fixing organisms appear to be equally well represented in the heavy and light soils.

P. R. DAWSON

The use of alcoholic salt solutions for the determination of replaceable bases in calcareous soils. O. C. MAGISTAD AND P. S. BURGESS. *Ariz. Agr. Expt. Sta., Tech. Bull.* 20, 481-97(1928).—The NH_4Cl method for the detn. of positive ions in base-exchange reactions is inaccurate in calcareous soils. The reasons are: (1) org. matter is dissolved from the soil by the NH_4Cl ; (2) a portion of the Ca appearing in the filtrate is dissolved Ca, mainly from CaCO_3 and is not exchangeable Ca; (3) the const. presence of dissolved Ca prevents the replacing action from going to completion and (4) an error may arise from the mech. loss of the dispersed base-exchange complex, whenever exchangeable bases are detd. by filtration or *percolation methods*. Two methods were studied experimentally, a percolation method especially adapted to routine analyses where large nos. of detns. are required and a *filtration method* adapted especially for small nos. of detns. The method here proposed for making detns. of replaceable bases in calcareous soils employs alc. (Et or Me) salt solns. as the displacing agents. The authors prefer 0.1 N BaCl_2 in 68% EtOH. It is found that the activity of such a soln. approaches that of an aq. soln. and that the soly. of CaCO_3 in the alc. soln. is extremely low (between 10 and 15 p. p. m.). By percolation methods, a large no. of detns. can be made at once with a min. of time and effort on the part of the analyst. The EtOH is evapd., the Ba pptd. as the chromate and the Ca, Mg, and other bases are detd. in the supernatant liquid by the soap-titration and by pptn. methods. Where all alk salts are present, they must be leached out with H_2O before percolation with the alc. salt soln. is begun.

C. R. F.

The determination of exchangeable calcium in carbonate-free soils. RICE WILLIAMS. Univ. College of N. Wales. *J. Agr. Sci.* 18, 439-45(1928).—The possibility of using HOAc as a reagent for extg. exchangeable Ca from CO_3 -free soils is discussed and exptl. results are presented showing that Ca is quantitatively pptd. from an HOAc medium. For the detn. of exchangeable Ca, 25 g. of soil (< 1 mm.) are treated in a beaker with 200 cc. of 0.5 N HOAc soln., stirred several times, allowed to stand at least 2 hrs., the supernatant liquid is poured into a filter and the filtrate collected in a 1000 cc. flask. The soil is then washed into the filter with 0.5 N HOAc and leached with the same (70 to 100 cc. at a time) until 1000 cc. of filtrate are collected. The CaO is estd. in 500 cc. of the leachings by treating with 5 cc. of concd. NH_4OH (d 0.88), 10 g. of NH_4Cl , and excess of $(\text{NH}_4)_2\text{C}_2\text{O}_4$ soln., vigorously stirring or boiling, letting stand over night, filtering off the pptd. CaC_2O_4 , dissolving the latter in dil. H_2SO_4 and titrating with standard KMnO_4 . The method gives results which check well with those by the Hissink NaCl method. Slightly higher values yielded generally by the latter may be attributed to very small quantities of Ca salts in the NaCl used. In the case of heavy clay soils it was found necessary to employ a 10 g. sample, instead of 25 g., and to wash by decantation, instead of leaching on a filter.

P. R. DAWSON

Treatment of soil for prevention of plant diseases. D. G. MILBRATH. Calif. State Dept. Agr., *Monthly Bull.* 18, 7-15(1929).—A review of the literature with 22 references appended.

C. R. F.

The effect of one element of plant food upon the absorption by plants of another element. J. F. BREAZEALE. *Ariz. Agr. Expt. Sta., Tech. Bull.* 19, 465-80(1928). The absorption of nutrient elements by the wheat plant was studied by the water culture method. NaNO_3 , K_2SO_4 and Na_2PO_4 were the resp. sources of the N, K and P in the nutrient solns. The amt. of adsorption was detd. by chem. examn. of the plants. Nitrate greatly stimulated absorption of K. At an early period of growth K is needed by the plant in a capacity similar to that of a catalyzer, and is much concerned in the translocation of the carbohydrates and in the building up of vegetative tissue. If N is available, much K may be necessary and it will be demanded by the plant; if N is not available, a small quantity of K will be demanded for the building up process and only enough will be absorbed for the other needs of the plant. Thus N may be the limiting factor in the absorption of K. The absorption of N from solns. by wheat seedlings was not affected by the presence of K, P or CaSO_4 . The absorption of P from solns. seems to be slightly increased by the presence of N, and diminished by an excess of CaSO_4 . The absorption of Ca does not seem to be affected by the presence of N, K or P. The absorption of K from solns. is increased by the presence of other plant foods, particularly N. The effect of N upon the absorption of K is carried over from 1 period when N is present, to another period when N is absent. This indicates that the effect is due, in part, to a demand within the tissues of the plant. This same phenomenon

is true in the effect of P and CaSO_4 upon the absorption of K. The effect of N upon the absorption of K seems to be manifested both within the tissues of the plant while the plant is not feeding and also during the act of absorption. This is shown by the more rapid absorption when solns. contg. N and K are mixed and the plant is grown half-time in this mixt. and half-time in distd. H_2O . The marked effect of N upon the absorption of K is closely correlated with a stimulated top growth and transpiration and not correlated with a stimulated root growth. C. R. F.

Factors affecting the iron and manganese content of plants with special reference to herbage causing "pinning" and "bush-sickness." W. GODDEN AND R. E. R. GRIMMETT. Rowett Research Inst., Aberdeen, and Dept. of Agr., N. Zealand. *J. Agr. Sci.* 18, 363-8(1928).—The malady of sheep called "pinning," as described by McGowan (*Scottish J. Agr.* 5, 274), has many points of similarity to the "bush-sickness" of N. Zealand. The latter has been shown by Aston (*C. A.* 19, 1320) to be assocd. with pasture of abnormally low Fe content. Comparative analyses of "pinning" and "bush-sick" soils show that the 2 have a similar mech. compn, both being sandy silts with a clay content of less than 3%. The former is higher in N, P and K, but lower in Ca. Pot expts. were conducted with "pinning soil," sand, and a local arabic soil to test the effects of lack of drainage, application of org. matter, application of Fe in various combinations, application of S (free or as FeSO_4) and application of lime on the Fe and Mn content of the crops (oats and mustard). In most cases the % of Fe was higher in mustard than in oats, while the reverse was true for Mn. In the sand cultures, S (either free or as SO_4) slightly increased the % of Mn in the crop. Lack of drainage increased the Mn content of oats approx. 6-fold and somewhat less in mustard. Water-logged and mildly reducing conditions apparently had more effect on Mn than on Fe in rendering it available. The addn. of 3% of clay to the sand had no definite effect on either Mn or Fe content of the crop. In the "pinning soil" the mustard failed to grow, possibly because of higher Fe requirement, and in the limed pot became markedly chlorotic before dying. The Fe content of the oats was fairly uniform throughout the series. Mn was much higher under undrained conditions, but the addn. of lime depressed it. Other treatments were without effect on either Fe or Mn. While the % of Fe in the crop was approx. the same as in the case of sand, the % of Mn was very much higher. In the local soil, both oats and mustard had a higher % of Fe than of Mn. Conclusion: On a given culture medium lack of drainage is the most potent factor in increasing the Mn content and Mn Fe ratio of the crop. Liming tends to decrease both of these. P. R. DAWSON

Certain soil properties in relation to sugar-beet growing. G. NEWLANDS. North of Scotland Coll. Agr. *Scottish J. Agr.* 11, 387-92(1928).—A study of a no. of Scottish soils indicated that poor growth of sugar beets is, in general, obtained when the p_{H} value of the soil falls below about 5.3. Poor growth is also usually obtained when the % of Ca sol. in dil. HCl is below about 0.12, or when the lime (CaCO_3) requirement is above 0.3%. These limits are affected by climatic conditions, type and mech. compn. of the soil, and other factors. K. D. JACOB

The significance of the soil solution for plants. S. P. KRAVKOV. *Sov. Gosud. Inst. Opytn. Agron. (Ann. State Inst. Expt. Agron. (Leningrad)* 4, 41-7(1926); *Expt. Sta. Record* 58, 614.-K discusses the following properties of the liquid phase of the soil system: (1) osmotic pressure; the influence of its increase or decrease on the growth of the plant, its part in the absorption of nutrients, the optimum pressure for normal growth, and methods of regulating the pressure; (2) the degree of electrolytic disson of the compds. which make up the soil soln.; (3) the H-ion concn. of the soil soln.; (4) stimulating substances; and (5) the quant. relationship among the nutrients found. H. L. D.

Barley laid and delayed in ripening owing to lack of phosphoric acid in the soil in consequence of smoke. E. G. DOERRELL. *Superphosphate* 2, 49-50(1929).—The low fertility of a plot of soil was traced to the indirect effect of smoke from railway engines and brown coal pits. The affected soil had p_{H} values of 4.1 to 4.3, while adjacent soils had the values 4.8 to 5.3. The affected soil also contained only 33% as much available P_2O_5 as the adjacent soils, as detd. by the Neubauer method. Laying of barley and delay in ripening was overcome by treating the affected soil with superphosphate. K. D. JACOB

Considerations on some soil and fertilizer problems in Ceylon. I, II. A. W. R. JOACHIM. *Trop. Agr. (Ceylon)* 69, 69-75, 133-40(1927); *Expt. Sta. Record* 58, 620.—The main factors affecting the Ceylonese and other tropical practice of scientific agriculture and soil management are summarized under the following headings: (1) fixation of atm. N in the soil and the use of legumes in increasing soil fertility, the

leaching of fertilizers from soils, the role of org. matter in plant nutrition in the tropics, the decompn. of org. matter in soil, the use of artificial farmyard manure and org. manure versus artificials; (2) the nature and importance of soil colloids, the soil moisture equil. as affected by colloids, absorption of fertilizers by soils, soil reaction—sourness and alky., pan and laterite formation, and the fertilizing of tropical crops. H. L. D.

The fertilizer triangle. FIRMAN E. BEAR. Ohio State Univ. *Ind. Eng. Chem.* 21, 382-5(1929).—The advantages of using the triangle diagram in plotting fertilizer ratio are discussed. Diagrams are shown on which are plotted fertilizer ratios adopted by regional conference for different sections of the country. J. J. SKINNER

Computation of no-filler fertilizer mixtures. A. B. BEAUMONT AND H. R. KNUDSEN. Mass. Agr. Coll. *Ind. Eng. Chem.* 21, 385-8(1929).—The recent addn. of a no. of coned. fertilizer materials to a constantly growing list of low- and medium-analysis org. and inorg. materials has made it easy to select the proper ingredients for no-filler mixts. of almost any grade. There is proposed a method for the computation of no filler mixts. based on the use of simultaneous algebraic equations contg. 2 or more unknowns. Various types of mixts. are discussed and methods for solving problems related to them suggested. Specific problems are presented and solved. The limitations and adaptations of certain classes of materials are pointed out. In general, single element components widen the ratio possibilities, and double-element components increase the no-filler possibilities. J. J. SKINNER

Nitrogen determination in cyanamide. STAN REYNAERT. Univ. Louvain. *Natuurw. Tijdschr.* 11, 27-8(1929).—N is detd. in fertilizers by the Kjeldahl method. It has been found that it is not necessary to heat until the mixture decolorizes—this would require 84 hours. A 6 hours' heating is sufficient. The results after short or long heating differ by only 0.01 to 0.03% N. ALBERT L. HENSEL

Lime for agricultural use. STAN REYNAERT. Univ. Louvain. *Natuurw. Tijdschr.* 11, 25-7(1929).—Lime is sold at different prices, according to empirical specifications and denominations. The prices are not proportional to the CaO content. If the detn. of the quantities required by a certain surface of soil, farmers often make mistakes, because they base their calcn. on the cost of the lime instead of the CaO content. ALBERT L. HENSEL

The significance of gypsum in agriculture. J. VITINS. *Z. Agrikulturchem.* 56, 298-9; *Chem. Zentr.* 1927, II, 1389. Gypsum is an important and cheap agent for preserving the fine particles of the soil in a crumbly structure. Its S is supposed to serve as a nutritive material on podsol soils. Gypsum is valuable for overcoming alkalinity in soils. G. SCHWACH

Preparation of potassium nitrate. A. L. MEHRING, WM. H. ROSS AND A. E. MERZ. Bur. of Chemistry & Soils, Wash., D. C. *Ind. Eng. Chem.* 21, 305-8(1929).—The advantages of KNO_3 as a fertilizer over other nitrates are discussed and various com. processes for its manuf. are reviewed. A preliminary rept. is given of a lab. study of the reactions involved in the conversion of KCl to KNO_3 by treatment with HNO_3 or NO_2 . J. J. SKINNER

Hygroscopicity of fertilizer materials and mixtures. J. R. ADAMS AND A. R. MEIER. Bur. of Chemistry and Soils, Wash., D. C. *Ind. Eng. Chem.* 21, 305-7(1929). The vapor pressures of satd. solns. of fertilizer salts have been detg. at intervals from 10° to 50° , and calcns. made of the relative humidities prevailing over the solns. The con. fertilizer salts, KNO_3 , NH_4 phosphate, and K phosphate, are among the least hygroscopic fertilizer salts. The hygroscopicity of a mixt. of fertilizer salts is, in general, greater than that of the more hygroscopic salt, though in some cases the hygroscopicity of the mixt. is less than that of the more hygroscopic salt. These detns. are of value in predicting the storage and handling qualities of fertilizer salt mixts. J. J. SKINNER

Hot fermentation process and artificial manure. G. RUSCHMANN. *Z. Spiritusind.* 51, 258-9, 266-7, 275-6, 284(1928); cf. *C. A.* 22, 3481; 23, 1205. —By closely following the Krantz process for the hot fermentation of manure there is no appreciable loss of easily oxidizable carbonaceous matter. Fermentation is stopped when the temp. reaches 70° . A. SCHULTZ

History and technic of the superphosphate industry. V. The superphosphate industry in Switzerland. ANON. *Superphosphate* 2, 41-5(1929); cf. *C. A.* 23, 661.

Some results secured in "top dressing" poor southeastern pasture land with phosphatic fertilizers. ARTHUR J. PERKINS. *J. Agr. S. Australia* 32, 11-24(1929). Analyses of soils and of crops are given in connection with the results of fertilization expts. M. S. ANDERSON

Nitrogen and carbon nutrition of plants. BORNEMANN. *Fortschritte Landw.* 3,

250-2(1928).—It is considered that plants are unable to utilize urea directly; the urea increases the activity of soil bacteria which, by producing more CO₂, increase assimilation by the plant.

B. C. A.

Annual report of the entomologist to Government, Punjab, Lyallpur, for the year 1925-26. R. L. CHOPRA. Rept. Operations Dept. Agr. Punjab, Year Ending June 30, 1926, I, Pt. II, 67-125(1928).—*Sugar cane pests*.—The ratoon crop of Yuba cane was more heavily attacked by cane aleurodidae (*Aleurolobus barodensis*) than the ordinary crop of the same variety, the total sugar and sucrose content suffering a serious loss. Sprays of tobacco infusion and of kerosene emulsion gave 83 to 87% mortality of adult aleurodidae. The nymphs were more resistant to sprays, the max. mortality being obtained with kerosene and naphthalene emulsions. Excellent control of *sugar cane mites* was obtained with lime-S sprays, but the eggs were not affected. *Fruit tree pests*.—Introduction of 0.5-1.5 g. KCN crystals into the stems of citrus trees gave 65 to 95% mortality of larvae of the citrus leaf miner (*Phyllocnistis citrella*) with comparatively little damage to the trees themselves. Perfect control of the larvae was obtained by fumigation with HCN. The results of expts. with various sprays for the control of *citrus psylla* and *mango-hoppers* are tabulated. Eucalyptus, clove and citronella oils gave the most promising results as attractant baits for various species of fruit flies. Complete control of insects in stored grain was obtained by fumigation with a min. dose of 42 g. Ca(CN)₂ per 100 cu. ft. for 18 hrs. Germination of wheat fumigated with Ca(CN)₂ at the rate of 2 g. per 1000 cc. for 3 hrs. was delayed somewhat as compared with that of untreated grain but the total final germination was not affected. Fumigation with excessive amts. of CS₂ and HCN did not greatly interfere with germination of wheat. Results of expts. with a wide variety of chemicals and insecticides for the control of white ant attacks on sugar cane, wheat and chillies are tabulated. Damage to buildings by white ants was prevented by treating the floors with 4% As solns. and covering with a layer of soil for a short time. The fraction of kerosene oil distg. between 158° and 184° was the best of a no. of substances experimented with as attractant baits for chironomid flies. The results of extensive expts. with various chemicals for the extermination of field rats and porcupines are tabulated. The rept. contains considerable information relating to expts. with various agr. poisons, which cannot be satisfactorily abstracted.

K. D. JACOB

Combating mites on Hevea nurseries. H. GONGGRIJP. Algemeen Proefstation A. V. R. O. S., Medan. Arch. Rubbercultuur 13, 79-89(1929). (In English 90-7).—Comparative expts. with S, Akar-Toeba ext. and Neoton for combating mites showed that the quickest and best results can be obtained with S sprayed by means of a Rebschwefler app. Moreover the cost of the S treatment was only 1/2-1/4 that of the other methods.

C. C. DAVIS

Bordeaux mixture in combination with arsenical sprays. WM. GOODWIN AND H. MARTIN. South-Eastern Agr. Coll., Wye, Kent. J. Agr. Sci. 18, 460-77(1928).—The interaction of Bordeaux mixt. with Pb arsenate and Ca arsenate was studied by an examn. of the effects produced when Ca(OH)₂ is added to the arsenical compds. and when CuSO₄ is added to the arsenical compds. and Ca(OH)₂. The nature of the interaction of Ca(OH)₂ and diplumbic H arsenate is shown to be most complex and to result in the complete decompn. of part of the Pb arsenate and the formation of basic Ca arsenates. There is no support to the view that CaCO₃ decomposes diplumbic H arsenate with the production of sol. As compds. When Pb arsenate, in water, is allowed to interact for long periods with excess of hydrated lime, the amt. of basic Ca arsenates formed is such that large quantities of As are brought into soln. by the action of CO₂. Under conditions where the Ca(OH)₂ is rapidly converted to CaCO₃, the amt. of As rendered sol. is slight. Conclusion: In actual spraying there is a definite reduction of the risk of As injury when hydrated lime is added to Pb arsenate and to Ca arsenate. When the conditions are such that the addn. of hydrated lime brings about a reduction of As injury, the use of an "equal-lime" Bordeaux mixt. congt. an equiv. amt. of Ca(OH)₂ will prove far more effective.

P. R. DAWSON

Oil spraying of plum and prune trees. T. D. URBANNS. Calif. State Dept. Agr., Monthly Bull. 18, 65-6(1929).—Quick-breaking oil emulsions for winter spraying consist of 3 to 7 gals. of oil emulsions per 100 gals. of H₂O, while crude oil emulsions for spring sprays may be as concd. as 12 gals. per 100 gals. of H₂O. Aside from a stimulating action on the tree itself, the most important use is in the control of scale insects, aphid eggs, brown mites, conker worms, moss and lichen growth.

C. R. F.

Comparative study of _____ in controlling the larvae of *Eudemis* and *Cochylis*.
CEL. BIRON. Rev. vit. 70, 25-7(1929); Prog. agr. vit. 91, [53], 635-7(1928).—The efficacy of various types _____

was studied by treating grape plots on June 25 and 26, 1928 and ascertaining the no. of punctured grapes per 100 clusters, 10 days after the treatment. The arsenicals used were (1) liquid Cu-lime arsenate composed of 1 part Pb arsenate paste, 2 parts CuSO_4 , 3 parts CaO ; (2) liquid Cu-lime arsenate composed 0.15 part dry Cu arsenate, 2 parts CuSO_4 , 3 parts CaO ; (3) powd. Cu arsenate; (4) powd. Na arsenate; (5) powd. Ca arsenate; (6) none. Arsenicals 1 and 2 are legalized sprays while 3 to 5 are prohibited in France. Since the no. of punctured grapes per 100 clusters can be considered as a measure of the efficacy of the particular type of spray, the no. of punctured, exposed and concealed grapes were counted and reported separately as follows: (1) 750 and 841; (2) 170 and 197; (3) 92 and 103; (4) 81 and 90; (5) 87 and 91; (6) 1012 and 1250. Conclusion: Dry, powd. sprays are much superior to liquid sprays in the control of the larvae of *Eudemis* and *Cochylis* but there is a health hazard attendant in their application. B. believes, however, that the enhanced efficiency of the dry spray warrants the introduction of special spraying equipment, including gloves and masks for the sprayers, which is at present commercially available. K. S. MARKLEY

The use of calcium cyanamide for preventing chestnut blight. L. PETRI. *Ed. reg. stazione patol. veget.* 1926, 135; *La conc.* 36, 42(1928).--A soln. of glucose and asparagine, a soln. of mineral salts, and a soln. of earth at the foot of a chestnut tree were treated with a weak CaCN_2 soln. With the 1st and 2nd, sterilized at a low or at high temp., a dose 1 part 1000 stopped the development of *Blepharospora cambicola*. The 3rd soln. required 2 parts 1000 and sterilizing at 100°. Doses of 1.5 parts 1000 had a decisive tonic action; 5 parts 1000 were not toxic; they were a source of available N for the fungus. By spreading 1-2 kg. CaCN_2 at the base of every healthy adult chestnut tree for a radius of 3-4 m. the blight can be prevented. R. SANSONE

Vapor pressures of fumigants. IV. Vapor pressure of nicotine. H. D. YOUNG AND O. A. NELSON. *Ind. Eng. Chem.* 21, 321-2(1929). The vapor pressure of nicotine has been detd. between 25° and 246.2°. The air satn. method was used up to 100° and the static method from this point to the b. p. Tables and curves are given. O. A. NELSON

Investigations on the interpretation of the stimulating action of Uspulun Universal on the coming up of seedlings. ANNELIESE NIETHAMMER. *Inst. f. Bot., Pflanz., Z. Pflanzenkrankh. u. Pflanzenschutz* 39, 120-2(1929), cf. *C. A.* 21, 115. A 0.25% soln. of Uspulun Universal, acting for 2 hrs., had a complete disinfectant effect on the 10 fungi and 10 bacteria tested. LAWRENCE P. MILLER

The toxic property of sulfur. ROBERT C. WILLIAMS AND H. C. YOUNG. *Ind. Eng. Chem.* 21, 359-62(1929). A study of the toxicity of S in its ordinary combinations and of products associated with it (H_2SO_4 , H_2SO_3 , polythionic acids) reveals that polythionic acids are most toxic to spores of "*S. cinerea*". Artificially oxidized sulfurs are effective in the control of "*V. inequalis*" provided the oxidizing agent does not destroy the polythionic acids. A. WHITE

Colorimetric determination of nitrates in soils (UMBERTO DE NARDO) 7. Potash from New Jersey greensands (THOENEN) 18. Future of the manufacture of oil from the skins of pressed grapes [ash as fertilizer] (MONTERO) 27. The formation of red soil and of black vlei soil from dolerite (MAUFER) 8. Precipitates of heavy metal salts [for protection of plants and vegetables] (Fr. pat. 646,507) 18. Laboratory mill suitable for comminuting fertilizers (U. S. pat. 1,706,643) 1.

Handbuch der Bodenlehre. Bd. I. Die naturwissenschaftlichen Grundlagen der Lehre von der Entstehung des Bodens. Berlin: Julius Springer. Edited by E. Blanck. 350 pp. M. 27; bound, M. 29.00. Reviewed in *Am. J. Sci.* 17, 288 (1929).

HEINE, E.: Die praktische Bodenuntersuchung. Berlin: Verlag von Gebrüder Borntraeger. 180 pp. Bound, M. 7, pfg. 20.

KRISCHE, PAUL: Die Untersuchung und Begutachtung von Düngemitteln, Futtermitteln, Saatwaren und Bodenproben. Berlin: Verlagsbuchhandlung Paul Parey 408 pp. Bound, M. 24.

Fertilizer. I. G. FARBENIND. A.-G. Brit. 295,477, June 25, 1927. In prepr. mixed fertilizer, KCl is converted into K_2SiF_6 , the latter is decomposed by aq. NH_3 , the mixed soln. of KF and NH_4F is treated with mono- or di-Ca phosphate or with a phosphate soln. obtained by treating crude or other phosphates with HNO_3 or HNO_2 together with H_2SO_4 (suitably after removal of a portion of the H_3PO_4), the CaF_2 is

filtered out, and the fertilizer is recovered from the filtrate. Various details and modifications of procedure are described. Cf. C. A. 23, 1984.

Fertilizers. I. G. FARBENIND. A.-G. Brit. 295,825, Aug. 5, 1927. A readily spreadable mixed fertilizer is prepd. by mixing an NH_4NO_3 soln. contg at least 92% NH_4NO_3 and heated sufficiently to keep it liquid, with solid fertilizer salts such as KCl or $(\text{NH}_4)_2\text{SO}_4$.

Phosphate fertilizers. F. L. SCHMIDT. Brit. 296,022, Aug. 23, 1927. A mineral phosphate is rendered citrate-sol. by roasting (suitably at $800\text{--}1300^\circ$) with K_2CO_3 obtained from K Mg bicarbonate (details of the manuf. and use of which are described).

Non-hygroscopic phosphatic fertilizer. HENRY BLUMENBERG, JR. (to Stockholders Syndicate). U. S. 1,706,101, March 19. Crude ground phosphate rock is mixed with H_3PO_4 in excess, using sufficient H_3PO_4 to convert the phosphate rock to acid Ca phosphate and leave an excess of 20% H_3PO_4 as compared with the quantity of acid Ca phosphate formed, and the mass is fused by heating to 600° and the product is ground.

Treating seeds to destroy bacteria, etc. AUGUST KLAGES. U. S. 1,706,695, March 26. The complex Hg compd. salt obtained by the action of HgCl_2 on aniline-HCl or dimethylaniline-HCl in aq. soln. is used together with an alkali metal chloride.

Emulsified sulfur. ALBERT HARTZELL and FRANK H. LATHROP (to Walter C. O'Kane and Paul Moore, trustees of the Crop Protection Institute). U. S. 1,705,862, March 19. An emulsified S compn. suitable for insecticidal and fungicidal use is formed from S dissolved in naphthalene as a distributing agent and emulsified with a soap soln.

16—THE FERMENTATION INDUSTRIES

C. N. FREY

Butyric acid fermentation. A. HEIDUSCHKA AND CH. REYMANN. Tech. Hochschule Dresden. *Pharm. Zentralhalle* 70, 87-92(1929).—A systematic study of the conditions obtaining in the production of butyric acid by fermentation in connection with the various analytical methods for control of the resulting acids (butyric, lactic, acetic). W. O. E.

The lime-pressure method of preparing absolute alcohol. OTTO VON KEUSZLER. *Chem. App.* 16, 33-5(1929); cf. C. A. 23, 234.—The advantages of working under pressure are: the entire charge is recovered as abs. alc.; a charge requires 10 instead of 48 hrs.; the steam consumption is reduced 75%; the resulting lime residue is easy to handle; the alc. is completely anhyd.; the loss is about 2%, against 5-8% by the lime method without pressure. App. for producing 6000 l. daily is shown. Cf. C. A. 21, 3251. J. H. MOORE

Estimating heat consumed in batch rectification of alcohol. GLEN S. HOUGHLAND. *Chem. Met. Eng.* 36, 89-91(1929).—A method has been evolved for detg. the av. theoretical heat consumption for intermittent rectification in app. of the type described. The method has been applied to the concn. of EtOH from H_2O solns. having initial concn. of 1-20% and yielding a distillate of 92-46% alc., the residue being exhausted to 0.1% alc., columns of 9-16 perfect plates and also of an infinite no. of perfect plates. To det. the heat consumption applying to a given wt. of distillate passed over, the compn. and residue in the kettle must be known. The wt. and compn. of the initial charge and the wt. and compn. of the distillate, therefore, must be detd. The following equation is applicable if the small residue of liquid in the column is disregarded: $w_1 = (w_0 H_0 - dD) / (H_0 - D)$, where H_0 = initial wt. of charge, w_0 = initial concn. of alc. in charge, w_1 = concn. of alc. in residue left in kettle, D = wt. of distillate produced, d = concn. of alc. in distillate. The theoretical heat quantities involved at the instant when a given wt. of distillate has passed over may then be calcd. by known methods (Lewis, C. A. 16, 2561). The instantaneous heat values used in the data presented were plotted from Table 13, Principles and Practice of Industrial Distillation by E. Hausbrand. The heat values so obtained were supplemented by additional values which were obtained by plotting the data from the table in a different manner. C. N. FREY

A discussion of the microflora of alcoholic fermentation. J. WILLE. *Mikro-kosmos* 22, 73-8(1928).—Fermentation is a complex process and is the result of enzymes produced by living cells. Alc. fermentation yields 48.4% alc., 46.6 CO_2 , 3.3 glycerol, 0.6 CH_3COCOOH , 1.1 fusel oils. A description of the characteristics of top and bottom yeast is given. "Wild" yeasts and Kahlm yeasts are discussed. *Mycoderma variabilis* does not contain invertase, and cannot ferment cane sugar, maltose, dextrin, raffinose,

lactose or inulin. *Schizosaccharomyces pombe* is distinguished by its power to ferment dextrins, all natural sugars except lactose and produces 15.5 alc. by vol. Two species of acetic acid bacteria, *B. orleanense* and *B. xylinum*, are described. C. N. FREY

Occurrence, detection and determination of lauric acid in alcoholic beverages. J. GROSSFELD AND A. MIERMEISTER. Staatlichen Nahr.-Untersuchungsanstalt., Berlin. *Z. Untersuch. Lebensm.* 56, 167-87(1928).—For the detn. of lauric acid, 500 cc. of the sample and 300 cc. of H_2O are distd. and the distillate (450 cc.), together with the 50 cc. of EtOH used to wash out the condenser, is boiled under a reflux condenser for 30 mins. with 5 cc. of a 75% soln. of KOH. The soln. is evapd. and the residue dissolved in 25 cc. of a soln. of 25 g. of $NaC_2H_3O_2$, 5 cc. of glacial AcOH and 1 cc. of 1% phenolphthalein soln. in 250 cc. of H_2O . Then 30% AcOH is added until only a faint color remains, which is then removed by 1 drop of acetate soln. and restored by the addn. of 0.1 N NaOH soln. After filtration in the presence of diatomaceous earth, the soln. is boiled, 5 cc. of the $MgSO_4$ soln. added and any red color again dispersed by the acetate soln. After 24 hrs. the ppt. is filtered on a Gooch crucible previously washed with a little Mg laurate soln., and dried in a steam oven, washed, gently heated and the crucible reweighed. The loss in wt. gives the lauric anhydride, which, multiplied by the factor 1.105, gives Mg laurate. After correction for the soly. of the salt (0.5-0.6 mg. according to vol.), the use of the factor 0.9472 gives lauric acid. Qualitatively 0.2 mg. of lauric acid may be detected in the presence of myristic acid or 3 mg. of caproic acid. The caprylic acid value is detd. by the addn. of 1 cc. of a 50% soln. of KOH to the distillate (95 cc.) from a 100 cc. sample. The mixt. is boiled under a reflux condenser for 30 mins., evapd. to dryness, the residue dissolved in 10 cc. H_2O , neutralized to phenolphthalein with 30% AcOH, dild. with 50 cc. of H_2O , and 25 cc. of a 1.5% soln. of $Mg SO_4$ added. After 24 hrs. the soln. is filtered, 10 cc. of a soln. of 50 g. $NaC_2H_3O_2$, 3.12 g. $CuSO_4$ and 5 cc. of 20% AcOH per l. added, and the ppt. filtered off, dried and weighed on a Gooch crucible. The soly. correction is 0.7 mg. calcd. as Cu laurate, and the factor 0.869 then gives the caprylic acid value in cc. of 0.1 N acid. The principal esters of the so-called grape or cognac oils are those of lauric instead of capric acid. The EtOH content of a beverage did not affect its lauric acid content. The acid may be removed from fusel oils by rectification and is obtained largely in the second runnings during distn. C. R. I.

The fermentation method of preparing glycerol. J. PENKOVSKI. *Chem. Tisloversicht* 53, 7(1929); *Listy Cukrovar. Rozhledy* 6(1929).—The sirup from sugar beets is diluted with an equal quantity of H_2O , boiled 1 hr. with the addn. of powd. peat and diluted to a sp. gr. 10-12° B $_6$. Nutritive salts, NH_4 , P_2O_5 , Ca, etc., are added together with yeast which is added in the amt. of 5% of the sugar in the sirup. The fermentation is conducted in an alk. medium in the presence of Na_2SO_4 , Ca and Mn salts. After 36-48 hrs. the EtOH and AcH are distd. off; the SO_4 is pptd. with Ca salts; after filtering, the ferment is neutralized with CO_2 and SO_2 and refiltered. The crude glycerol is concd. and then distd. in a vacuum with superheated steam. The yield shows: glycerol 20%, EtOH 17.5% and AcH 8%. The quality of EtOH is poorer than that from potato mash. •

Industrial applications of invertase. Fermentation of molasses with invertase. M. C. BASINI. *Zymol. chim. col. zuccheri*, 3, No. 3, 105-7(1928).—In prep. alc. by the sucrase process, molasses is treated with 2 parts per 1000 of NaF and 1-2.5 g. H_2SO_4 per l., boiled in a glass flask to evap. volatile fatty acids, sterilized in an autoclave for 20 mins., cooled and pure beer yeast is added to invert the sucrose. The inverted sugar then ferments. After 36-48 hrs. at 28-30° the contents of the flask are introduced into a mixt. in a fermentation app. of 1-2 l. From this, after fermentation, the mixt. is passed into tubs of 1000 l. and later into the mother yeast vat of 10,000 l. and finally into large fermentation vats of 30,000 l. The fermented mixt. is filtered and distd. A 10% saccharose soln. gave a weak inversion in the cold with 2.5 g. H_2SO_4 per l. Better results were obtained with more acid, or by warming. The H_2SO_4 acts indirectly, liberating organic acids with a weaker action on the sucrose, on which salts have an unfavorable influence. A min. inversion also follows with much H_2SO_4 . The inversion of sucrose is therefore detd. by the yeast invertase, the action of which is retarded by the mineral substances in the molasses. The enzyme must be acclimated to the medium in which it works; the resistance of the invertase is decreased by rapid passage from one medium to another. Acidity and high contents of sugar influence unfavorably the fermentation. If the mixt. is too concd., much alc. is produced at once, slowing the inversion. If the mixt. is too acid other noxious enzymes develop and fermentation is arrested before all the sugar is transformed. R. SANSONE

Analytical characterization of fermentation vinegar. L. A. JANKE AND F. POP-

BERGER. *Deutsche Essigind.* 31, 257-9, 265-7(1927).—Fermentation vinegar may be distinguished from dil. spirit vinegar by detn. of its I value (mg. of I required to react with that amt. of the original substance which contains 10 g. AcOH), which at 40° should be at least 50. A sample (about 40 cc.) is evapd. to approx. $\frac{1}{4}$ of its vol. and made up again to its original vol. To 10 cc. of this soln. are added 40 cc. of 0.01 N I and 8 cc. of 2 N NaOH more than are required for neutralization, and the whole is then warmed to 40°. After 2 hrs. 2 N HCl is added (4 cc. more than the vol. of NaOH previously required), and 8 mins. later the liquid is titrated with 0.01 N $\text{Na}_2\text{S}_2\text{O}_3$. Admixt. of fermentation vinegar cannot be detd. unless the I value is known. Filtration of the fermentation vinegar through wood charcoal lowers the I value because of the adsorption of a portion of the I-reacting constituents, which appear to be related to vitamin D.

B. C. A.

The future of the vinegar industry presents varied problems. A. E. ROWSE, JR. *Fruit Products J. and Am. Vinegar Ind.* 8, No. 7, 28-9(1929).

J. A. KENNEDY

The preparation, composition and classification of Samos wines. A. KICKTON AND P. BERG. Hyg. Staatsinstitut, Hamburg. *Z. Untersuch. Lebensm.* 56, 397-422 (1928).—Complete exams of 442 samples showed an av. EtOH content of 13-14% with wide variations, total solids 21-24%, titratable acidity 0.28-0.42%, sugar-free ext. 1.7-2.5%.

C. R. F.

The treatment of "mousy" wines with the Siemens ozonizer. ERICH WALTER. Inst. Gärungsgewerbe Berlin Korr. *Abt. Trinkbranntwein-Likorfabrikat.* 17, 20-1; *Chem. Zentr.* 1927, II, 1211.—Two wines treated with the ozonizer lost their disagreeable taste, which did not reappear afterwards. Also certain kinds of carbon are recommended for removing the "mousy" taste. In 1 expt., the disagreeable taste was removed, but at the same time also the coloring matter of the wine disappeared completely.

G. SCHWOCH

The examination and evaluation of wine brandies and distillates. G. BUTTNER AND A. MIERMEISTER. Staatlichen Nahr-Untersuchungsanstalt. Berlin. *Z. Untersuch. Lebensm.* 56, 492-8(1928).—Complete analytical data on 55 samples are presented in tabular form.

C. R. F.

New conceptions for brandy. CURT LUCKOW. *Deutsche Essigind.* 33, 26-8 (1929).—A discussion of certain tentative definitions for brandies and spirits during a meeting of the Ger. Food Manufacturers' and Dealers' Assocn.

W. O. E.

The extractives of brandy. WILLIAM PARTRIDGE. *Analyst* 54, 154-5(1929).—The 4th edition of *Aids in the Analysis of Foods and Drugs* states that the total solids of brandy are "about 1%." Since 1925, brandies usually contain less.

W. T. H.

Influence of various yeast-races and temperatures on fermentation and quality of beer. R. HORCH AND SCHULTEIS. *Wochschr. Brau.* 45, 394-8(1928).—The best quality of beer was produced at a pitching temp. of about 4° and a max. during fermentation of 7-8°. Since a powdery yeast has a higher fermenting power than a normally flocculated yeast it is suggested that the quality of the beer might be improved by adding the former toward the end of a fermentation to induce a strong secondary fermentation.

A. SCHULTZ

Extraction of sugar from grapevine prunings (CARRIÈRE) 28. Separating H and CO_2 [as in fermentation gas] (U. S. pat. 1,700,707) 18.

DEHNICKE, JOHANNES: *Laboratoriumsbücher für die chemische und verwandte Industrien.* Bd. XXVI. *Laboratoriumsbuch für die Brennerei-industrie.* Halle (Saale): W. Knapp. 392 pp.

Fermentation of sugars. P. LINDNER. *Brit.* 295,648, Aug. 16, 1927. Sucrose, glucose and fructose are fermented with production of CO_2 , alc. and lactic acid by use of a single kind of bacterium such as *termobacterium mobile* occurring in the aguamiel of the *lague americana*. The ferment may be prepd. by introducing the bacterium in sterilized milk with the addn. of sucrose, glucose or fructose. Fruit juices or plant exts. contg. any of these sugars may be fermented to produce a sparkling alc. and slightly lactic beverage. The bacteria may be used in bread making.

Waste waters from distilleries. RENÉ L. SALMON. *Fr.* 646,655, Dec. 31, 1927. An app. is described in which waste waters from distilleries may be vaporized for the production of utilisable steam with recovery of the waste products, particularly glycerol.

17—PHARMACEUTICAL CHEMISTRY

W. O. EMERY

Analysis of fluidextract of ergot. H. KAUL. *Süddeut. Apoth.-Ztg.* **68**, 195 (1928).—For the detn. of the total bases, the ext. (40 g.) is shaken with magnesia (2 g.) and a mixt. of equal parts of xylene and chloroform (40 cc.). After some time 7 g. of powdered tragacanth is added; 25 cc. of the filtered solvent is mixed with 20 cc. of 0.1 N HCl and sepd.; the acid soln. is titrated with 0.1 N KOH soln. with methyl orange. B. C. A.

Examination of extracts, etc., containing fat and mucilage. J. HÜBSCHER. *Süddeut. Apoth.-Ztg.* **68**, 205-6 (1928).—For the examn. of cod-liver oil and malt exts. the material is mixed with hot water, and boiled after addn. of concd. HCl; after cooling, the liquid is shaken with ether, and the emulsion sepd. by addn. of NaCl. The acid is washed out with water, and the ether evaporated. The residue, contg. traga anth, mucilage and cod-liver oil, is warmed for some time, dehydrated with Na_2SO_4 and treated with ether. B. C. A.

Sodium arsenite solution. W. MEYER. *Süddeut. Apoth.-Ztg.* **68**, 226-7 (1928).—The method for the analysis of the soln. of Na arsenite and hydroxide of the German pharmacopeia (6th ed.) is criticized. B. C. A.

Determination of bismuth in substances used in the treatment of syphilis. BOUILLÉNE AND M. DUMONT. *Compt rend. soc. biol.* **98**, 879-80 (1923). A microchem. method depending on the color reaction of Bi salts in the presence of KI is described. B. C. A.

Cedrol; its source and derivation. FRANK RABAK. *Am. Perfumer* **23**, 727-8 (1929).—In order to verify the conclusion that cedrol is a normal constituent of fresh cedar wood rather than of the old seasoned or weathered wood, test distns. were carried out with sawdust obtained from fresh cedar logs. Samples of oil were taken at intervals of 15, 30, 45, 60, 90 and 120 mins. All became more or less semi solid after standing 2 days through sepn. of cryst. cedrol. A composite sample of the oils contained 12.5% cedrol. The oil remaining after sepn. of the cedrol possessed properties similar to the cedar-wood oils of commerce, which are usually products obtained by distg. the waste sawdust and shavings that result from the manuf. of pencil slats made from old cedar fence rails. Comparing the chem. and phys. properties of cedar-wood oil from both fresh and old wood, the following values were obtained, resp., d_{20} 0.9623, 0.9606; n_D^{20} 1.5050, 1.5020; $[\alpha]$ -25.8°, -52.1°, soly in 95% alc. all proportions, 1 part in 5.5 vols.; acid no. 1.25, 0.26, ester no. 2.67, 0.87; Ac no. 38.6, 13.03, as acetate 1.25, 0.47%; combined cedrol 1.05, 0.40%; free cedrol 14.71, 4.80%; total cedrol 15.76, 5.20%. Two distinct sources for the production of cryst. cedrol are available: fresh cedar waste as also the drying kilns where great quantities of cedar lumber are annually treated. W. O. E.

Evaluation of D. A.-B. VI. Salves. W. BRANDRUP. *Apoth. Ztg.* **44**, 149 (1929).—Quant. procedures are suggested for detg. H_2BO_3 and Zn in the official Ger. prepn. Ung. acidi borici and Ung. zinci, resp. W. O. E.

Alkaloids of some Indian aconites. II. Pseudoaconitine. THOMAS M. SHARP. *J. Chem. Soc.*, Dec., 1928, 3084-106; cf. C. A. **22**, 3167. Most species of *Aconitum* so far examd. chemically contain alkaloids, each species in general yielding a different alkaloid. Pseudoaconitine has, however, been obtained from 2 species, *A. denser rhizum* and *A. balfourii*. These alkaloids may be divided in to the toxic (aconitine), and non toxic (atisine) types. With the exception of lycaconitine and kappa conitine, all alkaloids of the former type are similar in that they are all diacyl esters of other bases generically called aconines, which have in common Ac as one of the groups present. Aconitine is acetylbenzoylaconine. On heating aconitine in a sealed tube with MeOH, the Ac is replaced by the Me group, resulting in the formation of methylbenzoylaconine. Again, when the dry base is heated slightly above its m. p., one mol. of AcOH is split off and a new base, pyraconitine, is formed. It was thought that a careful study of these 2 reactions as applied to pseudoaconitine might throw some light on the relative position of the groups believed to be present in this alkaloid, i. e., $\text{C}_{19}\text{H}_{21} \left\{ \begin{array}{l} (\text{OCH}_3)_4(\text{CHOH})(\text{NCH}_3)(\text{OH})(\text{OCOCH}_3) \\ \text{OCOC}_6\text{H}_5(\text{OCH}_3)_2 \end{array} \right.$, and that it

might contain some weakened link affording a useful point of attack by oxidation or other degradation process. It is now shown that when pseudoaconitine is heated in a sealed tube with MeOH, the Ac is replaced by Me, the same reaction taking place but more slowly when the base is boiled with the alc. under reflux. A similar reaction also

takes place when tetracetylpsudaconine is treated with either MeOH or EtOH, only one of the Ac groups being replaced by the Me or Et group, the latter being introduced at a much slower rate. It is evident, therefore, that there is some group present in a particular relation to this Ac which facilitates the replacement. In an attempt to find such a group, a no. of Ac derivs. of comparatively simple structure were prepd. and treated with MeOH in the above indicated manner, but so far without success. The Ac group or groups in AcOPh, diacetylpyrocatechol, diacetylresorcinol, diacetylquinol, triacetylpyrogallol, acetylsalicylic acid, acetylpropenylguaiaicol, acetyleugenol, acetyl-isoeugenol, acetylcyclohexanol, pentacetylmethylinositol, and hexacetylmannitol are all unaffected in this way. On heating psudaconitine above its m. p. it loses AcOH with the formation of pyropseudoconitine, which has now been obtained in cryst. form. The presence of 2 OH groups in psudaconitine has already been previously indicated indirectly, and now directly by the formation of a diacetyl deriv., a fact showing that in the removal of AcOH none of the OH groups is involved. Tetracetylpsudaconine, which contains no free OH, loses 1 mol. of AcOH on heating, with the formation of triacetylpyropseudoconitine, and this on hydrolysis yields pyropseudoconitine, identical with the base obtained on hydrolysis of pyropseudoconitine. The latter yields, moreover, on acetylation a compd. contg. 3 Ac groups but has only 5 MeO groups, whereas pyropseudoconitine has 6. Analysis leaves no doubt that the substance has been formed by the acetylation of the 2 OH groups and by the replacement of 1 Me by an Ac group. The acconine obtained on hydrolysis of this substance is quite different from that obtained from pyropseudoconitine and triacetylpyropseudoconitine in that all attempts at crystn. have failed, while the base from other sources crystallizes readily. In view of the resistance of pyropseudoconitine to catalytic reduction by H, it is probable that the loss of AcOH takes place between the Ac group and an H atom attached to a remote C leading to the formation of a bridge linkage. The C in question would thus become asymmetric, a view receiving support from the specific rotations of pyropseudoconitine and triacetylpyropseudoconitine, which are much greater than those of the bases from which they are derived. The following compds. were prepd. and characterized for purposes of the present investigation: *Pyropseudoconitine*, $C_{21}H_{21}O_5N$, m. 132.5°, $[\alpha]_D^{16}$ 175.2° ($c = 1.154$ in alc.), is very sol. in the usual org. solvents, does not react with MeI, is hydrolyzed by alc. KOH to *pyropseudoconitine*, $C_{21}H_{23}O_5N$, m. 172°, $[\alpha]_D^{16}$ 227.5° ($c = 1.217$ in alc.); *triacetylpyropseudoconitine*, $C_{24}H_{25}O_8N$, m. 228°, $[\alpha]_D^{16}$ 284° ($c = 0.537$ in $CHCl_3$), yields on hydrolysis *dimethylpyropseudoconitine*, $C_{21}H_{25}O_5N$; *triacetylpyropseudoconitine*, $C_{24}H_{25}O_8N$, m. 155.8°, $[\alpha]_D^{16}$ 156.4° ($c = 1.202$ in alc.); *veratroylpsudaconine*, *HBr-salt*, $C_{28}H_{31}O_{11}N \cdot HBr \cdot H_2O$, m. 237.8°, $[\alpha]_D^{16}$ 2.15° ($c = 2.09$ in H_2O), yields the base, $C_{28}H_{33}O_{11}N$, m. 206.7°, $[\alpha]_D^{16}$ 29.8° ($c = 1.12$ in alc.); *HCl-salt*, m. 249-50°; *monoacetylveratroylpsudaconine perchlorate*, $C_{29}H_{33}O_{12}N \cdot HClO_4$, m. 240-2°; *triacetyl-methylpsudaconine*, $C_{22}H_{25}O_8N$, m. 280.2°, $[\alpha]_D^{16}$ 18.5° ($c = 0.766$ in alc.); *triacetyl-ethylpsudaconine*, $C_{23}H_{27}O_8N$, m. 171°, $[\alpha]_D^{16}$ 26° ($c = 0.98$ in alc.); *monobenzoylepsudaconitine perchlorate*, $C_{29}H_{27}O_{12}N \cdot HClO_4$, m. 236°; *diacetylpsudaconitine*, $C_{20}H_{23}O_8N$, m. 229°, $[\alpha]_D^{16}$ 24° ($c = 1.00$ in $CHCl_3$); *monoacetylpsudaconitine perchlorate*, $C_{20}H_{23}O_9N \cdot HClO_4$, amorphous.

W. O. E.

Preparation of mercury stearate, palmitate and oleate. G. FRIEDLANDER. Univ. Breslau. *Apoth. Ztg.* 44, 167-8 (1929). Methods for prep. these salts for use in salves, unguents, etc., are described.

W. O. E.

Comparative methods for the estimation of alcohol in tinctures. K. HERING. *Apoth. Ztg.* 44, 180-4 (1929).—In the present study about 150 alc. detus. were carried out to ascertain the procedure best suited to the purpose. It developed that contrary to the expectation of finding the Swiss procedure the most exact and advantageous the official Ger. Pharm. method with some minor modifications of the author proved entirely satisfactory in point of rapidity, simplicity and accuracy. Three types of app. used in these expts. are illustrated.

W. O. E.

Pulmonal. C. A. ROJAHN AND MAX HERTER. Univ. Halle-Wittenberg. *Apoth. Ztg.* 44, 211-2 (1929).—A liquid prepn. for colds, coughs, etc., appears to have the following compn.: succus liquiritiae and other exts. 5, sucrose 7, alc. 2, Na salicylate 0.3, water 85% together with small quantities of anis oil and menthol.

W. O. E.

Detection of hydrogen peroxide with potassium permanganate via the D. A.-B. 6. G. FRERICHS. *Apoth. Ztg.* 44, 225-6 (1929).—A discussion of the official Ger. procedure.

W. O. E.

German Pharm. standards for salve fats and oils. RICHARD EHRENSTEIN. *Apoth. Ztg.* 44, 197-8 (1929).—A tabulated compilation of standards for fats and oils specified by the D. A.-B. 6, together with a commentary thereon.

W. O. E.

Preparation of morphine and its most important derivatives. F. CHEMNITZ. *Pharm. Zentralhalle* 70, 101-4(1929).—The procedures treated in the present paper involve the prepn. of morphine, diacetylmorphine, apomorphine, codeine and ethyl morphine. W. O. E.

Detection of certain drugs by means of the Griebel microbeaker method. F. WEISS. *Apoth. Ztg.* 44, 237-40(1929).—The detection of certain volatile substances like CH_3O , MeCHO , AcMe , BzMe , hexamethylenetetramine, paraldehyde, amylene hydrate and lobeline, by means of *m*- or *p*-nitrophenylhydrazine as reagent is described, in connection with the type of app. used, and the form of crystals obtained with formaldehyde and acetaldehyde, acetone and acetophenone. W. O. E.

Rheumatism preparations. C. A. ROJAHN AND RUDOLF SEIFERT. Univ. Halle-Wittenberg. *Apoth. Ztg.* 44, 251-2(1929).—Two preps. were examd.; *Doloresum liniment* contained salicylic acid 0.6, Me salicylate 6, mustard oil 0.5, oil turpentine 6, CHCl_3 12, menthol 0.6%. *Tophiment* consisted essentially of NH_3 1.53, salicylic acid (fixed) 5.9, thiosinamine (calcd. to mustard oil) 0.43, turpentine oil and menthol 5.95, CHCl_3 10, fatty acids 1.26, mineral oils 7.34, phenylcinchoninic acid (as NH_4 salt) about 4.5%. W. O. E.

Iodex. C. A. ROJAHN AND WILHELM KLAUDITZ. Univ. Halle-Wittenberg. *Apoth. Ztg.* 44, 294(1929).—A description of a salve having a base of about $\frac{3}{4}$ vaseline and $\frac{1}{4}$ iodized fats, the latter with a total I content of about 4%, of which about 0.7% consists of free I. W. O. E.

Application of fluorescence in pharmacy. RICHARD WASICKY. *Pharm. Monatsh.* 10, 17-8(1929).—In the present discussion reference is made to certain classical examples of fluorescence in drugs and the manner of applying this behavior in their identification. W. O. E.

Estimation of ascaridole in oil of chenopodium. E. KNAFFL-LENZ AND A. HOPMANN. Univ. Wien. *Arch. Pharm.* 267, 117-28(1929).—The results of the present study show that a biol. evaluation is impossible; that the color reactions arising from the interaction of ascaridole with phenolphthalein, dimethylaminobenzaldehyde etc., are unsuited to a quant. estn., since a strict control of exptl. conditions surrounding oils of low ascaridole content is out of the question. Of the oxidimetric methods that of Paget involving TiCl_3 and an empirical factor yields good reproducible values. The reason why only a fraction of the theoretically possible quantity of TiCl_3 is consumed is seen in the action of HCl on ascaridole in the reaction mixt. An iodimetric estn. does not appear to be possible since ascaridole reacts violently with the pptd. I. The intensity of the brown coloration arising from the action of concd. HCl on 1% alc. solns. of the oils after some hrs. is proportional to the ascaridole content. If such coloration be compared with others produced by standards of known ascaridole content, an estn. may be effected accurately within a few percent. The phys. consts., as d., $[\alpha]$ and n_D can serve only in oils of like source and prepn., otherwise the $[\alpha]$ will show variations of several degrees, while the d. in unsophisticated samples will be approx. proportional to the ascaridole content. W. O. E.

Evaluation of bismuth oxyiodide. G. BÖMMING AND K. FERREIN. Berlin-Brütz. *Arch. Pharm.* 267, 142(1929).—A commentary on the method of evaluating this official Ger. prepn. with suggestions for improvement. W. O. E.

Pharmacological evaluation of digitalis preparations. C. FOCKE. *Arch. Pharm.* 267, 169-77(1929).—Of 4 preps. of Ger. manif. found in a Swedish apothecary and believed to be under strength, all proved on later examn. to be of standard strength. It is shown that certain digitalis preps. contg. glycerol are more slowly resorbed by the frog lymph sack than when free from this vehicle. An official evaluation of all such preps. is scarcely feasible on account of its magnitude; such control should rather be left to the producing firms whose greatest interest must be to maintain the highest standards. An improvement in the labeling might well be introduced, such as an indication of the date on which the package was filled. W. O. E.

Estimation of brucine as silicotungstate, and analysis of semen strychni. B. KLIATSHKINA AND M. STRUGADSKII. Chem.-Pharm. Forschungsinst. Moskau. *Arch. Pharm.* 267, 177-92(1929); cf. C. A. 22, 1213.—The results are given in a series of tables, and may also be expressed as follows: The ppt. of brucine silicotungstate has no const. stoichiometric compn. The mol. proportion between alkaloid and complex acid can vary from 4:1 to 1.5:1. The compn. of this ppt. is dependent upon the following 3 factors: (a) the acid or salt content of the soln., (b) the amt. of reagent used in pptn., (c) the pptn. temp. Both gravimetric and volumetric procedures are given in great detail. W. O. E.

Synthetic drug studies. IV. Synthesis of sulfur-containing preparations. H.

P. KAUFMANN AND E. WEBER. Univ. Jena. *Arch. Pharm.* 267, 192-211(1929).—An exptl. study confined mainly to the introduction of the SCN group into, and the influence of such groups, on certain antipyretics (aniline, phenetidine and phenylhydrazine) and disinfectants (thymol, cresols and hydroxyquinolines). The method of introducing SCN into the above compds. involves treatment in a suitable solvent with NaSCN and Br. Among the new compds. prepd. and characterized were the following: *p*-rhodanacetanilide, $C_8H_8ON_2S$, needles m. 188°; 1-amino-2-rhodan-4-ethoxybenzene, $C_8H_8ON_2S$, silky needles m. 67-8°, easily convertible to 2-amino-6-ethoxybenzthiazol; $C_8H_8ON_2S$, needles m. 161°; 2-diacetylamino-6-ethoxybenzthiazol, $C_{13}H_{14}O_3N_2S$, m. 245°; bis(1-amino-4-ethoxy)2-disulfide, $C_{16}H_{20}O_2N_2S_2$, m. 101°; sym-formyl-(*p*-rhodanphenyl)hydrazine, $C_8H_8ON_2S$, needles m. 132°; sym-Ac(*p*-rhodanphenyl), $C_8H_8ON_2S$, m. 171°; sym-benzoyl-(*p*-rhodanphenyl)hydrazine, $C_{14}H_{11}ON_2S$, m. 164°; sym-phthalyl-(*p*-rhodanphenyl)hydrazine, $C_{16}H_9O_2N_2S$, m. 213°; sym-acetyl-bis(*p*-rhodanphenyl)hydrazine, $C_{16}H_{11}ON_2S_2$, needles m. 160°; sym-benzoyl-bis(*p*-rhodanphenyl)hydrazine, $C_{21}H_{14}ON_2S_2$, m. 160°; α -hydroxy- γ -rhodanquinoline (4-rhodancarbostyryle), $C_{10}H_8ON_2S$, yellowish needles m. 141°; γ -rhodan- α -hydroxyquinoline, $C_{10}H_8ON_2S$, m. 134°; 1-methyl-4-isopropyl-3-hydroxy-6-rhodanbenzene (3-methyl-4-rhodan-6-isopropylphenol), needles m. 105°; 1-methyl-2-hydroxy-5-rhodanbenzene (*o*-methyl-*p*-rhodanphenol), C_8H_7ONS , m. 71°; 1-methyl-3-hydroxy-5-rhodanbenzene (*o*-methyl-*m*-rhodanphenol), C_8H_7ONS , needles m. 76°; 1-methyl-4-hydroxy-3-rhodanbenzene, C_8H_7ONS , m. 105°, yields with alc. HCl a *N*-free compd., $C_8H_6O_2S$, m. 83°.

W. O. E.

Synthetic drug studies. V. Preparation of benzyl compounds. H. P. KAUFMANN AND O. RITTER. Univ. Jena. *Arch. Pharm.* 267, 212-29(1929).—The study has been confined to the prepn. of certain benzylated hypnotics, anesthetics and laxatives, the following being more particularly characterized—1-phenyl-2,3-dimethyl-4-dibenzylamino-5-pyrazolone, $C_{22}H_{22}ON_4$, plates m. 102°; 5-benzyl- α -bromoisovaleryl urea, $C_{13}H_{17}O_2N_3Br$, leaflets m. 134°; *p*-phenacetylphenetidine, $C_{16}H_{17}O_2N$, long needles m. 128.5-30°; phenethenyl-*p*-diethoxydiphenylamidine, $C_{24}H_{23}N_2O_2$, leaflets m. 113°; *o*-benzylphenolphthalein, $C_{24}H_{26}O_4$, m. 175°; *O,O'*-diacetyl-*o*-benzylphenolphthalein, $C_{28}H_{30}O_6$, m. 134°; *O,O'*-phthalidene-bis(*p*-benzylphenol), $C_{24}H_{26}O_4$, leaflets m. 123°; *p*-rhodan-*N*-benzylamine, $C_{10}H_{11}N_2S$, needles m. 78°; *p*-rhodan-(*N*-methylbenzyl)aniline, $C_{13}H_{14}N_2S$, needles m. 63°; *p*-rhodan-(*N*-ethylbenzyl)aniline, $C_{16}H_{16}N_2S$, needles m. 54°; bis-(1-benzylamino-phenyl-4-)disulfide, $C_{20}H_{21}N_2S_2$, bright yellow needles m. 92°; bis-(1-methylbenzylamino-phenyl-4-)disulfide, $C_{22}H_{23}N_2S_2$, brassy needles m. 86-7°; bis-(1-ethylbenzylaminophenyl-4-)disulfide, $C_{24}H_{25}N_2S_2$, bright yellow needles m. 76°.

W. O. E.

New German Pharmacopeia. I. HERZOG. *Arch. Pharm.* 267, 233-46(1929).—An address (commentary) on certain features of the new Arzneibuch.

W. O. E.

Odor and constitution among the mustard oils. VI. Natural mustard oils. G. MALCOLM DYSON. *Perfumery Essential Oil Record* 20, 42-4(1929).—A treatment of the production of the various mustard seed from the earliest times, descriptive more particularly of the method of sepg. the glucoside sinigrin from the seed and of the conversion to allyl thiocarbimide and glucose. The specifications for pharmaceutical mustard oil, as found in the various pharmacopeias, are tabulated. The 2 main methods employed in making synthetic mustard oil are indicated. White mustard oil, so-called sinabin oil, is likewise discussed in connection with other natural oils.

W. O. E.

Pine-needle extract. BOHRISCH. *Pharm. Ztg* 74, 291-9(1929).—From a large no. of analytical exams. it appears that this commodity is very frequently subject to adulteration, notably with sulfite liquor. In the examn. of pine-needle exts. recourse can be advantageously had to capillary analysis.

W. O. E.

Liquid soaps and their preparation in the apothecary. A. THIEME. *Pharm. Ztg* 74, 299-301(1929).—Methods are described for the pharmaceutical production of liquid soaps.

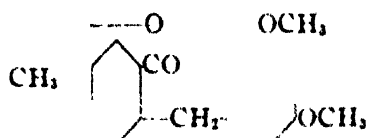
W. O. E.

Detection of heavy metals in magnesium salts. CREGOR KOGAN. *Pharm. Zentralhalle* 69, 449-50(1929).—The tests for heavy metals as prescribed in certain pharmacopeias (Russian and German) may lead to wrong conclusions in the presence of Fe, in which event the test should be carried out in HCl soln. Na_2S can be used as a reagent for heavy metals only in the absence of Fe.

W. O. E.

Constituents of red sandalwood. Homopterocarpin and pterocarpin. H. DIETERLE AND H. LEONHARDT. Univ. Berlin and Univ. Frankfurt a. M. *Arch. Pharm.* 267, 81-116(1929).—The results so far accomplished in the present investigation are given in the following summary: Homopterocarpin (A) has the formula $C_{17}H_{16}O_4$, m. 83-4°, and $[\alpha]_D^{20} -216^\circ 20'$. The Zeisel detn. shows the presence of 2 CH_2O groups which are *m*-substituents in a C_6H_4 nucleus. In spite of the fact that (A) possesses no

OH groups, it is nevertheless susceptible to acetylation, the resulting compd. being isomeric but not identical with *d*-acetyldihydro (*A*). (*A*) contains 2 O atoms in lactide-like combination with a 2nd aromatic nucleus. The hydroxy acid, representing this lactone, is known only in the form of its rather unstable ester. Attempts to acetylate the OH group resulted in hydrolysis of the ester, and reformation of the lactone. (*A*) contains no easily satd. double bond, since catalytic reduction effects no addn. of H, but rather the formation of 2 isomeric alkali-sol. dihydrohomopteroquinones, of which the *l*-dihydro (*A*) yields a dibromo deriv. The dibromohomopteroquinones contain a phenolic OH and have aldehyde character. Their formation is due presumably to a rupture of the lactone ring. Of the levo compd. Ac, Bz and CH₃O derivs. were prepd., while the optically inactive compd. yielded only the Bz deriv. *l*-Dihydro (*A*) is also formed on dehalogenation of dibromo (*A*) with nascent H in alk. media. Under like treatment (*A*) remains unchanged. Bromination, therefore, favors reduction. Against oxidative influences (*A*) is relatively stable. With HNO₃, however, it is changed 1st into dinitro (*A*) and a compd. of the formula C₁₈H₁₃O₈N₂, finally yielding trinitroresorcinol and oxalic acid. Distn. with Zn dust results in the formation of resorcinol dimethyl ether and methylanthracene. The latter cannot, however, be regarded as the fundamental hydrocarbon of (*A*), since in that case (*A*) would have to be considered a hydrogenated, not a methylated, deriv. of anthracene an assumption out of all harmony with its other characters. With all reserve, but chiefly as a foundation for further investigation, (*A*) is regarded as a deriv. of diphenylmethane with the following constitution:



Pterocarpin possesses the formula, C₁₈H₁₂O₄, m. 162.5–163°, and $[\alpha]_D^{20} = 220.1^\circ$. It contains a CH₃O and yields with Br a monosubstitution product. Its formula may be expanded to C₁₈H₁₂O₄(OCH₃). Among the compds. prepd. and characterized were *acetyldihydro* (*A*), C₁₈H₁₂O₆, needles m. 130–1°; *acetyldimethyl* (*A*), C₁₈H₁₄O₆, leaflets m. 220° (decompn.); *l*-*dihydro* (*A*), C₁₇H₁₀O₄, needles m. 153–4°; optically inactive *dihydro* (*A*), C₁₇H₁₀O₄, m. 76° (decompn.); *d*-*acetyldihydro* (*A*), C₁₈H₁₂O₆, needles m. 130.5–131°; *d*-*benzoyldihydro* (*A*), C₂₄H₁₈O₆, needles m. 99–100°; optically inactive *benzoyldihydro* (*A*), C₂₄H₁₈O₆, leaflets m. 67–70° (decompn.); *dihydro* (*A*) *methyl ether*, C₁₈H₁₂O₄, needles m. 57–8°; *acetyl* (*A*), C₁₉H₁₄O₄, leaflets m. 195°; *dibromo* (*A*), C₁₇H₁₀O₄Br₂, needles m. 184–5°; *dibromodihydro* (*A*), C₁₇H₁₀O₄Br₂, needles m. 199–200° (decompn.); *nitration products of* (*A*), (a) C₁₇H₁₀O₄N₂, needles m. 136–8°, (b) C₁₈H₁₂O₄N₂, needles m. 122° (decompn.); (c) C₁₈H₁₂O₄N₂, needles m. 244° (decompn.); *dihydropteroquinone*, C₁₈H₁₂O₄, m. 141–2°. Amorphous Se and (*A*) yield on heating under pressure the compd., C₂₄H₁₄O₄, leaflets m. 110° (decompn.), *acetyl deriv.*, C₁₉H₁₄O₆, scales m. 132°.

W. O. E.

Detection and differentiation of acetone, methanol and isopropyl alcohol simultaneously present in galenicals. WALTER MEYER. *Pharm. Ztg* 74, 230–1 (1929). The procedure suggested is as follows: Distil 50 g. of the tincture carefully and under perfect condensation. This quantity will correspond in most cases to an alc. content of about 30 g. Reserve the 1st 5 cc. of the distillate for the usual tests for MeOH and AcMe. Receive the next 20 cc. in an Erlenmeyer flask surrounded by a cooling mixt. Acidify the residue in the distg. flask with H₂SO₄ to fix any C₄H₉N possibly present, and continue the distn. Mix the 2nd fraction of 20 cc. uniformly and divide into 2 equal parts. Treat one portion with K₂Cr₂O₇ and H₂SO₄, then distil the product. Now test equal portions of the unoxidized and of the redistd. oxidized fractions in accordance with the usual methods (directions of D.A.-B.6., technical provisions, Ellram, Denigès) for AcMe. Should the unoxidized portion be colorless or only faintly colored, and the oxidized portion on the other hand more or less strongly colored, then the pos. test for AcMe obtained with the 1st fraction is indicative of the simultaneous presence of isopropyl alc. in the sample under examn. If, however, both portions of the 2nd fraction remain colorless or equally strongly colored, isopropyl alc. is absent. Treat the remainder of the oxidized portion, as also 2–3 cc. of the 1st fraction, with KMnO₄ and test for MeOH.

W. O. E.

Conservation of anesthetic chloroform. I. G. OBERHARD. *Pharm. Ztg* 74, 260–1 (1929).—After a discussion of the probable types of decompn. of both dry, wet and pharmacopeial CHCl₃, it is shown that the substances best calcd. to conserve this anesthetic are acids, notably anhyd. citric, oxalic, or tartaric acids, the first named being pre-

ferred. The soly. of these acids in CHCl_3 has been detd., *i. e.*, citric (monohydrate) 0.028, (anhyd.) 0.012; oxalic (hydrate) 0.04, (anhyd.) 0.036; tartaric 0.014. The amt. of citric acid (powd.) to be added to CHCl_3 is 0.1%.

W. O. E.

Alkali content of medicinal glassware. B. SCHWENKE. *Pharm. Ztg.* 74, 261-3 (1929).—A discussion of the Ger. Pharm. standards in connection with an exptl. study of various Ger. types of glassware, intended for drug containers.

W. O. E.

Protection of light-sensitive drugs by means of colored glassware. III. Permeability of druggists' glassware to ultra-violet light. J. EISENBRAND. *Pharm. Ztg.* 74, 263 (1929); cf. *C. A.* 22, 137. —An exptl. study of certain glasses with respect to their permeability by ultra-violet light.

W. O. E.

Inactivation of the oxidizing enzymes of gum arabic. L. ROSENTHALER. *Univ. Bern. Pharm. Ztg.* 74, 317 (1929). —In making up pharmaceutical preps. involving this gum it is shown that some artificial method of inactivation of the product is necessary, preferably through heat, to render the resulting prepn. stable.

W. O. E.

Unknown phenolic ether in oils of fennel and star anise. E. TAKENS. *Riechstoffind.* 4, 8-9 (1929). A fraction b_p 147°, d_{15} 0.967, α_D $\pm 0^\circ$, solidifying 21.5°, was isolated; it had a somewhat faintly insipid odor reminiscent of the higher ethers of eugenol. On distg. at atm. pressure the liquid foamed up at about 260°, at which temp. a phenol distd. over. Crystn. from C_6H_6 yielded crystals, m. 93-4°; it possesses a typical autumnal odor, and has the compn. of *p* propenylphenol, $\text{CH}_2\text{CH}=\text{CHC}_6\text{H}_4\text{OH}$.

W. O. E.

Essential oil of *Ambrosia mexicana*. B. N. RUTOVSKII AND I. V. VINOGRADOVA. *Riechstoffind.* 4, 10-1 (1929). The plants grown in the Crimea were subjected to various methods of distn. Fresh material yielded on steam distn. a viscous oil, while similar treatment of dry material gave a solid product. A sample of the liquid oil had the following characters: yield 0.022-0.039%, d_{20}^{20} 0.9532-0.9765, α_D 9.65-13.65°, n_D^{20} 1.4928-1.5116, acid no. 1.04-2.29, ester no. 78.61-105.95, ester no. after acetylation 123.96-154.13. The chief constituents appear to be a sesquiterpene alc. and a solid compd., m. 126-7.5°. A more comprehensive study is contemplated.

W. O. E.

Antiseptic action of essential oils. WALTER OBST. *Reichstoffind.* 4, 12-3 (1929).—A brief review.

W. O. E.

Russian essential oils. B. N. RUTOVSKII, *et al.* *Perfumery Essential Oil Record* 19, 391-3 (1928); cf. *C. A.* 22, 2436-7, 4716, 23, 239, 1717, 1721.—More new oils of possible value in perfumery have been obtained and investigated, and the resources of further districts examd.; each investigation comprises generally the examn. of oils from different plant parts at different periods. Thus, the twigs and needles of *Pinus halepensis* Mill grown in the Crimea gave 0.26% of an oil insol. in 90% alc., with the following consts: d_{20}^{20} 0.8960, α_D -49.44°, n_D^{20} 1.4940, ester no. 18.8 (after acetylation 54.83, total aces. 15.7%). Among the constituents identified were: α -pinene, camphene, primary and secondary aces. The yield of oil from *Cachrys alpina* grown in the Crimea varied from 0.16% from dry twigs to 1.09% from the umbels —from dry leaves 0.94%. A later distn. gave a much higher yield, 0.98% from fresh material (or 2.7% calcd. to the dry plant). This oil was insol. in 90% alc. gave no reaction for aldehydes and had d_{20}^{20} 0.8456, α_D 4.04°, n_D^{20} 1.4868, ester no. 3.9 (after acetylation 15.23); under atm. pressure 74% distd. from 178° to 183°, 20% from 183° to 195°, indicating a large proportion of terpenes. Among the identified products were: α -pinene, limonene and terpinene, an alc. and sesquiterpene. Of Caucasian *Thuja* oils, that from *T. occidentalis* was obtained in a yield of 0.46% and had d_{20}^{20} 0.9203, α_D -7.58°, n_D^{20} 1.4605, ester no. 25.46, (after acetylation 39.43); it was sol. in 0.2 vol. 90% alc. The identified constituents were α -pinene, α -thujone, fenchone, esters of AcOH and valeric acid. Fresh leaves of *T. varreana* gave 0.89% of oil in 1925, having d_{20}^{20} 0.9078, α_D -1.23°, n_D^{20} 1.4550, ester no. 16.36 (after acetylation 30.36); it was sol. in 0.1 vol. 90% alc. In it occurred sabinene, α -thujone and thujyl alc. In the same year the twigs of *T. gigantea* gave the enormous yield of 3.07% of oil having d_{20}^{20} 0.9145, α_D -1.21°, n_D^{20} 1.4552, ester no. 26 (after acetylation 47.15); it was sol. in 0.1 vol. 90% alc. It contained α -pinene, α -thujone and thujyl alc. During the course of the work the quant. soly. of thujone in aq. resorciol soln. was detd. and tested. The oil of *Siler trilobum* Scop. distd. in August, 1926, had d_{20}^{20} 0.8886, α_D +131.65°, n_D^{20} 1.4862, ester no. 41.58 (after acetylation 59.3); it contained aldehydes 40%, *d*-limonene 55%; α -pinene was indicated, *d*-perilla aldehyde was probable. The fresh oil had a blue color and probably contained azulene. In the course of the investigation into the odorous properties of aromatic and hydroaromatic analogs, several derivs. of perilla aldehyde were prepd., as *perillacrylic acid*, the

Me-Et and *isoamyl esters* of which were strongly scented. Besides the usual method in the presence of mineral acid, esterification to the Et ester was effected by the action of Et-OAc on perilla aldehyde in the presence of Na. By condensation of AcMe and AcH in the presence of 10% NaOH perilla aldehyde yielded perillydene acetone, diperillydene acetone and perillydene acrolein. With Bz glycine it gave a cryst. 2-phenyl-4-perillydene oxazolone-5, m. 137.8; a yield of 65-70% was obtained by warming equimol. proportions of the 2 substances with anhyd. NaOAc in Ac_2O . A Soudchum oil from *Laurus nobilis* L. was obtained in a yield of 0.915% and had the characters d_{20}^{20} 0.9167, α_D -19.6° , n_D^{20} 1.4690, ester no. 47.6 (after acetylation 67.3), cineole 50%, phenols 6%; it was sol. 1:2 in 80% alc. Other ingredients were: α -pinene, *l*- α -terpineol and a sesquiterpene. A Caucasian *Lavandula spica* gave a 0.7% yield of oil showing d_{20}^{20} 0.911, $\alpha_D + 2.02^\circ$, n_D^{20} 1.4675, ester no. 3.78 (after acetylation 108.23), camphor 25.5%, cineole 36%, α -pinene, *l*-linalol, borneol. Rotation-dispersion of essential oils was studied, the values for α_C , α_D , α_E and α_F at given temps. (all $20-1^\circ$) having been tabulated for 35 essential oils and 11 isolates, together with the dispersion ratio α_F/α_C . For most oils this value lies between 1.85 and 2.20. Noteworthy exceptions are *Piper nigrum* 2.81, *Juniperus virginiana* 2.80, *Eucalyptus globulus* 2.44, *Ocimum basilicum* and *Mentha pulegium* 2.75, *Andropogon nardus* 0.67. Of isolates, whose dispersion is generally higher, *d* camphor has 2.75, *l*-menthone 2.07, *d*-isomenthone 2.72, dihydrocarbone 3.30, methylcyclohexanone 2.50. It is recognized that this value may furnish another weapon against adulteration. The characters of 2 peppermint oils from the Saratov district were d_4^{15} 0.9156, 0.9210, $\alpha_D -17.93$, 14.39° ; n_D^{20} 1.4604, 1.4696; free menthol, 44.7, 41.2%; total menthol, 41.3, 48.1%; menthone, 5.3, 11.8%. From the tables given, the effect of age alone is evidently slight, there being simply a tendency for the rotation and ester value to rise a little. Essential oils of wild plants of Voronege district gathered in Aug. and Sept., 1926, yielded the following data in the order named: yield, d^{15} , α_D , n , ester no. (after acetylation), *Thymus odoratissimus*, 0.06%, 0.8682, 15.22° , 1.4755, 23.0 (50.2); *Achillea millefolium*, 0.15%, 0.904, -24.04° , 1.4742, 23.9 (81.0); *Mentha arvensis*, 0.12%, 0.9626, 28.2° , 1.4865, 47.4 (91.5); *Acorus calamus*, 1.05%, 0.9600, 12.00° , 1.5033; *Hyssopus creticus*, 1.05%, -0.9122 , -24.29° , 1.4743, 44.1 (88.0). A new method is suggested for the evaluation of coriander fruit. In each sample the foreign matter and the damaged fruit are detd., and the pure sample is passed through a series of sieves, giving the % of fruit of known diams. (a universal sieve of adjustable mesh was constructed for the purpose). The wt. of fruit in each group, the no. in 1 g., and the vol. (by submersion in water) were also detd. From these data the surface area of each group, and thence the total superficies are obtainable; the yields are considered a function of the total surface area. Examples are given showing that evaluations on this basis are commensurate with practical yields. The same principle has been applied to anise fruit, where, however, the size of the fruit also influences the oil yield.

W. O. J.

The scientific and economic importance of research on Indian medicinal plants. SUDHAMOY GHOSH. School of Tropical Med. and Hyg. Calcutta. *Indian Med. J.* 63, 650-3(1928).—The importance of standardization is stressed. Certain new drugs not accorded recognition by the B. P. or U. S. P. are given consideration. Statistics covering India's potential resources in this field are furnished. The importance of industrial enterprise to the production of various chem. commodities is emphasized. The manuf. of caffeine from tea-dust and of strychnine from *nux-vomica* seeds are examples of substances whose manuf. in India has proved economical. F. G. C.

The formation of essential oils and resin in conifers. XI. Characteristics of the oil and the resin in *Pinus silvestris* leaves in connection with the process of their formation. G. V. PIGULEVSKII AND N. B. RISKINA. Leningrad Univ. *J. Russ. Phys.-Chem. Soc.* 60, 1069-77(1928); cf. *C. A.* 22, 1433-4.—At the beginning of the growth of the acerose leaf, resin is formed first, then the production of oil also takes place, but the formation of resin always precedes that of oil. This militates in P.'s supposition that terpenes and sesquiterpenes are derived from complex resin acids. The secretion accumulates entirely during the first year of the growth of the acerose leaf; although some increase in the resin content is observed in the following years, it is merely due to the transformation of the essential oil into non volatile products. The oil of the leaves (without branches) is principally composed of pinene -14.88 , a complex ester, a free alc. and the sesquiterpene cadinene (rotation -5.52 ; $\alpha/\alpha_s = 8.96$). The ester content in the pine fluctuates widely (0.21 to 1.0%), the rotation of the polarization light fluctuates between $+10.84^\circ$ and -15.91° . The resin content of the pine fluctuates between 7 and 12%. The oil content in the acer-

tion of the 1-year leaves fluctuates between 3 and 8%. The oil content in 1-year branches changes within the limits 0.46-1.78%, rotation α_D -8.16° to -47.17° . **XII. The formation of the essential oil in *Pinus silvestris*.** G. V. PIGULEVSKII AND Z. M. ZAIKINA. Leningrad Univ. *Ibid* 1417-25; cf. C. A. 20, 1426.—The growth of the acerose leaf reaches its max. of development in mid-August. After Aug. 18, the increase of dry matter slows down. The max. accumulation of *essential oil* in the young leaves falls at the period from June 5 to 15; thus the intensive accumulation of the oil ceases before the intensive growth of the leaves is terminated. The oil content of the branches (without leaves) does not fluctuate much in the period of growth. The accumulation of oil in the branches commences earlier than in young leaves. The oil of the leaves is chiefly *l*-rotatory, though *d*-rotation from -15.44° to 7.52° is also encountered. The oil of the branches (without leaves) is *l*-rotatory from -15.3° to -45.68° . The resin accumulates in the acerose leaves in the early period of their development when the weight of 100 needles equals 0.29 g.; their max. resin content is July 15th. The resin accumulation precedes the essential-oil accumulation. The resin content increases somewhat in the 2nd year of the life of the leaves; as, however, the oil content does not increase, it may be supposed that the oil partly turns into non-volatile products. A considerable quantity of free acids and a little of complex esters enter in the compn. of the resin. A decrease of free acids is observed in the resin of 1-year leaves. B. N.

Essential oil of *Sesseli dychotomum*. V. I. NILOV. Timiriazev Acad. Rural Econ. *J. Russ. Phys.-Chem. Soc.* 60, 1575-7(1928).—*Sesseli dychotomum* of the family Umbelliferae, a plant which is grown in large quantity in Crimea, gave by steaming of its leaves an essential oil with a yield of 0.5% on the quantity of fresh material. The characteristics of 3 samples of the oil were: sp. gr. 0.8651 to 0.8754, rotation α_D -1.25 to -5.5 , n_D 1.4743 to 1.4783, acid no. 1.73 to 5.34, ester no. 11.24 to 15.74, ester no. after acetylation 20.3 to 40.22. To det. its compn. a 205-g. sample was distd. at 20 mm., whereupon 192 g. passed below 75° leaving a residue of 12.5 g. The distd. portion was fractionated at ordinary pressure and was found to consist of α - and β -pinene. The residue of 12.5 g. probably was composed of sesquiterpenes and of a small quantity of complex esters. BERNARD NELSON

Essential oil of the seed of *Smyrniun perfoliatum*. V. I. NILOV. Timiriazev Acad. Rural Econ. *J. Russ. Phys.-Chem. Soc.* 60, 1579-84(1928).—The essential oil obtained with a yield of 0.7% by steaming the seeds of *Smyrniun perfoliatum*, a Crimean wild plant, family Umbelliferae, is a wonderfully beautiful dark lilac-colored substance possessing an odor resembling patchouly. After distn., part of the oil crystd.; thus, 39 g. of the oil gave, on being cooled to -20° , 17.7 g. crystals and 21.3 g. liquid. The liquid consisted of a terpene, a sesquiterpene $C_{15}H_{24}$, and oxygenated compds. The crystals, which crystd. from EtOH in needles m. 56° , b; 143 - 144° , presented an oxygenated sesquiterpene of the compn. $C_{15}H_{22}O$; the properties of the latter indicate that it is a new compd. BERNARD NELSON

Mugho pine oil and its therapeutic uses. A. QUILICO. *Rivista ital. essenze profumi* 11, 7-8(1929).—The Cadore oil has a balsamic odor, is limpid, green-yellow, insol. in water, concd. alc., chloroform and ether, has $d_{20} 0.875$, rotates polarized light to the left 7 - 9° . It is a mixt. of *l*-pinene, phellandrene, silvestrene, cadinene and bornyl acetate. German mugho pine oil contains 5% bornyl acetate, and Italian 9-10%. R. SANSONE

The inapplicability of a test of the official Pharmacopeia on alcohol. G. MACCONE. *Boll. chim. farm.* 68, 55-6(1929).—The Italian Pharm. prescribes the following test for examg. 95% EtOH for the presence of AcH: 10 cc. of EtOH dild. with 10 cc. H_2O must not turn brown when heated with a few drops of a reagent consisting of 3 parts of $AgNO_3$, 30 parts of 4.5% NH_3 and 3 parts of NaOH in 30 parts of H_2O . M. points out that every com. EtOH will give a pos. reaction with this technic since the reagent alone on heating will turn brown spontaneously, which is due to the fact that addn. of NaOH makes the reagent unstable. G. SCHWOCH

The narcotics and the esters (and ethers) of morphine in regard to the rules laid down by the Geneva convention. D. MIGLIACCI. *Boll. chim. farm.* 68, 57-8(1929). G. SCHWOCH

Medicinal musts. I. CERUTI. *Giorn. farm. chim.* 78, 59-60, 63-4, 67-8(1929).—Directions are given for the prepn. of grape juices used in the making of elixirs, sirups, etc., for medicinal purposes. G. SCHWOCH

The standardization of insulin. S. E. DE JONGH. *Arch. nêerland. physiol.* 11, 454-9(1926).—J. notes that an extraordinary inconsistency appears in the published work on the standardization of insulin. His preliminary work was as follows: 15 rabbits were taken and divided into groups of 3; doses of insulin were injected subcutaneously, in the proportions 1, 2, 3, 4 and 5, to each group and the blood sugar was detd.

at the end of 2 hrs. The tests were continued for 5 successive weeks when each animal had had a dose of each of the 5 strengths of insulin. The expts. were continued on different batches of animals until the dose was found that reduced the blood sugar to 0.049% or less in 75% of the animals. The final tests were then carried out on 12 animals; the unknown sample was compared directly with the international standard. On the first day the animals were given 0.55 unit of the standard and the other 6 animals a dose of the sample estd. to be the equiv. of 0.55 unit. After a week the expt. was repeated with the groups reversed. The hourly blood sugars after the injection, taken for 4 hrs., were averaged and the means calcd. The means for all the animals on the unknown should not differ by more than 10% from the same animals on the standard. Consistent results were not obtained if only 3 animals were used in each group. M. H. SOUTE

The purification of insulin. E. DINGEMANSE AND E. LAQUEUR. *Arch. néerland. physiol.* 12, 259-64 (1927); cf. C. A. 22, 823.—Material having a strength of 1.1 to 1.5 mg. per convulsive dose can be purified from 4-5 times by electrolysis. To an acid soln. of the material a potential of 110 v. is applied for several hrs. The insulin and part of the albumin migrate toward the cathode, where the insulin and part of the impurities flocculate. Insulin of 0.15 mg. per convulsive dose cannot be purified further by electrodialysis; it is therefore shaken for $1\frac{1}{2}$ hr. with 0.01 N NaHCO₃. The insulin remains undissolved and is centrifuged off, dissolved in acid and pptd. with EtOH and Et₂O. A purification of from 2 to 6 times is thus effected, but the method is of no use with pure material. The insulin is, therefore, adsorbed on charcoal with 20 to 25% of the accompanying impurities, the charcoal is centrifuged off and dried *in vacuo*. The insulin is recovered by means of liquid phenol from which soln. it is pptd. by 30 vols. of slightly alk. H₂O (NaHCO₃). The convulsive dose is now 0.045 to 0.07 mg., the unit 0.015 to 0.025 mg. Crystals have been obtained but they are the same as those obtained from sepd. inactive material. M. H. SOUTE

The international regulation for the standardization of insulin. S. E. DE JONGH AND E. LAQUEUR. *Arch. néerland. physiol.* 12, 277-84 (1927). Different criteria have been used to det. equivalence of dosage in the blood sugar methods of standardizing insulin: (1) disappearance of x mg. sugar per 100 cc. of blood (MacLeod, etc.), (2) the av. fall expressed as a percentage of the initial blood sugar value (Marks, etc.), (3) the min. value reached, the initial value being of no importance (the authors). The authors have analyzed 200 injections in which 0.55 unit of the same prepn. has been given to the rabbits. The initial blood-sugar values are divided into 10 groups from 0.186 to 0.075%, by steps of 0.011, and the min. also into 10 groups from 0.095 to 0.006, by steps of 0.008. Initial values above 0.14% are uncommon and there is a tendency for a high min.; between 0.14 and 0.086%, the av. min. lies between 0.055 and 0.04%. Therefore, within limits the final value is independent of the initial value, while the amt. of sugar that disappears is not independent of this value. The same conclusion is drawn when the initial value corresponding to the groups of min. are found, thus between 0.071 and 0.024% min. values, the initials only vary from 0.113 to 0.105%, on the av. Below 0.024%, the initials tend to lie below 0.096%. The dose of insulin necessary to give the same effect in animals of different wts. is not proportional to the wt. M. H. SOUTE

Bio-assay of preparations of ovarian follicular hormone. E. P. BUGBELL AND A. E. SIMOND. Parke, Davis and Co. *J. Am. Pharm. Assoc.* 17, 962-6 (1928). Prepn. contg. ovarian follicular hormone are assayed for biological activity by injecting the solns. into white rats from which the ovaries have been completely removed. If adequate doses are injected the rats will come into estrus and show the same evidence of heat that normal rats show when in that condition. B. and S. propose the adoption as the standard unit in the bio-assay of prepn. of the ovarian hormone, the rat unit, originated and defined by Allen, Doisy and associates in 1925 (C. A. 19, 319). B. and S. propose the adoption of a standard technic for the bio-assay of prepn. of the ovarian follicular hormone. The technic is as follows: (1) Select normal, healthy, female white rats between 3 and 11 months of age, keep them in well ventilated, clean, dry quarters in which the temp. is maintained const. between 70° and 76° F. (2) Feed the rats an adequate amt. of a well-balanced diet contg. sufficient vitamins. (3) Examine vaginal smears daily for a period of 2 weeks to det. if the estrus cycles are regular. (4) Perform complete ovariectomy on those rats which have regular estrus cycles at intervals of 4-6 days. (5) If any doubt exists as to the completeness of the ovariectomy, take vaginal smears daily to make sure that there are no spontaneous estrus cycles. (6) Prevent atrophy of the uteri by the injection of sufficient follicular ovarian hormone every week or every 2 weeks to cause estrus growth of the uteri. (7) After ovariectomy allow 1 week for recovery from the operation before making use of the rats for testing

prepn. (8) In testing oil solns. of the ovarian follicular hormone give 3 subcutaneous injections at 4-hr. intervals in one day. (9) In testing aq. colloid solns. and true aq. solns. give 8 subcutaneous injections, 4 on each of 2 successive days. (10) Take vaginal smears at intervals of approx. 48, 52, 56, 72, 76 and 80 hrs. after the first injection. (11) The reaction caused by ovarian follicular hormone is the production of *typical estrus* in which stage 2 vaginal smears contain only squamous cells. (12) This reaction should occur in 48–51 hrs. after the first injection and should last several hrs. (13) Use at least 12 rats in testing a prepn., 3 to be given the same dosage. (14) The minimal effective dosage is that in which 2 out of 3 rats given the same dosage show *typical estrus*. (15) Consider the standard rat to be one weighing 140 g. (16) When rats weighing more than this standard are employed reduce the results to the 140 g. standard.

L. E. WARREN

Microchemical reactions for quinine. M. WAGENAAR. *Pharm. Weekblad* 66, 177–82(1929).—The reactions discussed are sublimation, pptn. as free base, pptn. as sulfate, selenate, ferricyanide, thiocyanate, nitroprusside, chromate, complex sulfate-periodide, selenate-periodide, chloraurate, mercuric chloride, and as salts of various org. acids including meconic and mellitic acids. Several of these reactions are sufficiently delicate to detect 2 mg. quinine at a diln. of 1:1000.

A. W. DOX

Determination of quinine as herapathite. GUSTAVE A. STICHT. *Chemist-Analyst* 18, No. 2, 10–11(1929).—To salt contg. about 0.477 g. of total alkaloid, add 25 cc. 95% EtOH and 1 cc. of 3.3 N H₂SO₄. Stir and heat to boiling on the water bath. When the solid has dissolved completely add 10 cc. of hot I₂ soln. and allow to stand for 2 hrs. Then filter, drain by suction and wash with alc. which is satd. with herapathite made by the same procedure as was used for the pptn. Dry at 100° and weigh. The wt. multiplied by 0.72 gives quinine expressed in terms of the anhyd. sulfate. To prep. the I₂ soln. dissolve 33 g. of KI in 700 cc. of 95% alc. and add 33 g. of powd. tartaric acid. Shake for some time to ppt. KHC₄H₄O₆, add 50 g. of I₂. Filter, wash with alc. and dil. to 1 l.

W. T. H.

Controlling fire and explosion hazards of anesthetics (WARDELL) 24. Odoriferous products from musk, etc. (RUZICKA) 10. Technical importance of adipic acid and its derivatives (SCHRAUTH) 10. Ether (Ger. pat. 408,020) 10. Anthraquinone derivatives [intermediates for making pharmaceutical products] (Brit. pat. 295,943) 10. Bz-1-Hydroxybenzanthrone and similar compounds (U. S. pat. 1,705,868) 10. Laboratory mill suitable for comminuting drugs (U. S. pat. 1,706,643) 1.

Therapeutic complex compounds of metals. I. G. FARBENIND. A.-G. Brit. 295,734, March 17, 1927. Sol. complex metallic compds. are formed by interaction of an oxide, hydroxide, or carbonate of a metal, with an alkali metal, NH₄ or amine salt of a pyrocatecholsulfonic acid, a pyrocatecholcarboxylic acid or a pyrogallolsulfonic acid. The amine salts may be those of ethylamine, benzylamine, or the like. Examples are given of the prepn. of the Cu, As, Cd, Mn, Sn, Cr and V compds. of the pyrocatechol-disulfonic acid obtained by sulfonating pyrocatechol with oleum; of the Cu, Al, ferrous and ferric compds. of the pyrocatecholmonosulfonic acid obtained by treating pyrocatechol with H₂SO₄; of the Cu, ferrous, ferric and Sn compds. of pyrotocatechuic acid; of the Sb, Bi, Sn, Cd, V, Mn and Pb compds. of the pyrogalloldisulfonic acid obtained by sulfonating pyrogallol with oleum; and of the Sb compd. of the pyrogallolmonosulfonic acid obtained by treating pyrogallol with H₂SO₄. Au and Ag compds. are also mentioned. Vanadyl hydroxide for use in prepg. the V compds. may be made by reducing NH₄ vanadate with hypophosphorous acid in HCl soln, followed by pptn. with Na₂CO₃.

Salts of alkaloidal bases, etc. I. G. FARBENIND. A.-G. Brit. 295,656, Aug. 16, 1927. The bases are combined with a methylene compd. of an aromatic carboxylic or sulfonic acid or a deriv., or double decompn. is effected in a solvent, such as water, between a salt of the base and a salt of the acid. *Therapeutic products* are obtained which are neutral or acid salts, tasteless, stable in air, sol. in water and readily decomposed by acids and alkalis into their components. Examples are given of reactions between 1-(N-methyldiethylaminoethyl)amino-4-aminobenzene and methylenebis(salicylic acid) and between methylenebis-β-hydroxynaphthoic acid and N-ethyldiethylaminoethylaniline, 1,2-dimethoxy-4-[N-bis(diethylaminoethyl)amino]benzene, 6-methoxy-N-diethylaminoethyl-8-aminoquinoline, 6-methoxy-N-(α-diethylamino-β-methylbutyl)-8-aminoquinoline, β-diethylamino-β'-(6-methoxy-8-quinolyl)aminoglycol di-Et ether, 6-methoxy-8-aminoquinoline, quinine and other cinchona alkaloids, and strychnine.

Derivatives of *m*-alkylaminobenzoic acid and sulfonates of the methane series. CHEMISCHE FABRIK VORM. SANDOZ. Swiss 127,962 to 127,966, Mar. 9, 1927. Addns. to Swiss 126,679 (C. A. 23, 612). Equimol. quantities of *m*-alkylaminobenzoate and CH_4 or C_2H_6 sulfonates are allowed to react. The products are used in *therapeutics*.

A saccharated compound of aluminum acetate. KALLE & Co. A.-G. (Edmund Birschel, inventor). Ger. 469,235, Sept. 4, 1924. A soln. of Al acetate is mixed with sol. carbohydrates and quickly evapd. to dryness, giving a stable compd. Thus, beet-sugar is dissolved in a soln. of Al acetate and evapd. *in vacuo* at about 60°. Other examples mention cane-sugar, lactose and dextrose as being treated in a similar way.

Ointments. I. G. FARBENIND. A.-G. Fr. 646,836, July 13, 1927. Ointments and the like are made by incorporating the usual constituents in aq. solns. of sulfenic acid, which possess wetting properties, or their salts, such as the Na salt of butyl- or isopropyl-naphthalenesulfonic acid.

Making preparations from isolated endocrine glands. K. N. KRAVKOVA. Russ. 5,293, Sept. 15, 1924. Ringer-Locke soln. is introduced into the vascular system of the isolated gland. The extract so obtained is filtered through a Chamberlain filter to obtain a sterile prepn.

Preparing an extract from the pituitary gland. O. A. STEPPUN. Russ. 4,957, Mar. 31, 1929. The pituitary gland freed from the capsule is finely macerated in a dil. HCl, neutralized with caustic, coagulated by boiling, subjected to the action of colloidal Fe_2O_3 , and added to a filtered chloretone soln.; the method is characterized by the maceration being carried out gradually with varying quantities of HCl and the finished ext. being slightly acidified to litmus with HCl.

Vitamins by irradiation. A. J. PACINI (to C. M. Richter). Brit. 296,053, Aug. 24, 1927. Substances contg. growth-producing vitamins (such as substances which may be obtained from typhoid bacilli, brown rot of peaches, sarcomatous tissue, *agaricus campestris* and ergot of rye, by soln. in alc. and acetone and by removal of fats to leave a residue insol. in water) are treated with various rays other than the ultra-violet rays to produce antirachitic substances. X-rays, rays from a Lenard tube, canal rays and cathode rays may be used although heating with infra-red rays is particularly suitable. Vitamins insol. in water are treated to obtain an active sol. product by digesting with aq. Na taurocholate and glycocholate at 100°. The soln. is filtered and evapd. to dryness, the residue dissolved in alc., neutral Pb acetate added to ppt. Pb glycocholate and basic Pb acetate added to ppt. the taurocholate. Excess Pb is pptd. with H_2S , and the alc. soln. when evapd. to dryness leaves an active residue sol. in water.

Vitamin D. I. G. FARBENIND. A.-G. Brit. 296,093, Aug. 26, 1927. In irradiating ergosterol with ultra-violet rays, the exposure is interrupted before all the ergosterol has been transformed, the interruption being preferably made at a point when the absorption of rays of wave lengths between $\lambda = 300$ and $\lambda = 230$ is approx. at a max.

Hormones. I. G. FARBENIND. A.-G. Brit. 295,680, Aug. 17, 1927. The hormones of the anterior lobe of the hypophysis and of the ovaries are obtained from the urine of pregnant women, or from other human or animal fluids or exts. of organs, by pptg. the former hormone with a large excess of alc., acetone, or the like and by extg. the ovarian hormone from the alc. or like filtrate, or from the starting material before the pptn. by ether, CHCl_3 , or other org. solvent immiscible with water. Numerous details of procedure are given. Cf. C. A. 22, 4204.

Hormones. SCHERING-KAHLBAUM A.-G. Brit. 295,361, Aug. 10, 1927. The process described in Brit. 291,005 (C. A. 23, 1218) for activating hormones from sexual organs by irradiation with ultra-violet rays is applied also to the treatment of hormones from vegetable organisms such as those described in Brit. 271,492 (C. A. 22, 1654). The irradiation may be applied to the vegetable materials before extraction or to the crude or purified extd. material.

Dyes. R. W. FRENCH and W. C. HOLMES. Brit. 295,605, Feb. 8, 1927. Addn. products which may be used as *bactericidal and therapeutic agents* or as *biological stains* are made by treating salts of basic dyes such as Bismarck brown R, Thioflavine T, Auramine O, Brilliant green, rosaniline, Methyl violet, acriflavine, Benzyl violet, Rhodamine B, Safranin T, New blue DA, Thionine and Pinachrome with phenolic compds. such as phenol, cresol, resorcinol, pyrocatechol, hydroquinone, guaiacol, phloroglucinol, or pyrogallol. The products may be obtained by the direct fusion of the ingredients or by mixing aq. or other solns.

Bacterial products for diagnosis and therapeutic uses. I. G. FARBENIND. A. G. Brit. 295,629, Aug. 15, 1927. Substances stated to show a "tuberculin action" are obtained by treating prepn. of bacteria of the coli group by the process previously applied to tubercle bacilli as described in Brit. 285,087 (C. A. 22, 4726).

Isolating filter-passing viruses. ERNST FRIEDBERGER. Ger. 471,105, June 8, 1927. The "capillary elevation method" for the sepn. of bacteria (see C. A. 14, 1839) is now applied to the sepn. of an invisible or filter-passing virus, e. g., the virus of small pox from accompanying bacteria. The virus ascends a wick of filter paper to a greater height than the bacteria.

18—ACIDS, ALKALIES, SALTS AND SUNDRIES

E. M. SYMMES

A new caustic soda and soda-ash process. WILHELM SIEGEL. *Chem.-Ztg.* 53, 145-7(1929).—The basis of the new process is: $\text{CaF}_2 + \text{SiF}_4 + 2\text{NaCl} (+ \text{acid}) = \text{Na}_2\text{SiF}_6 + \text{CaCl}_2$; Na_2SiF_6 (at 700°) $= 2\text{NaF} + \text{SiF}_4$; $2\text{NaF} + \text{Ca(OH)}_2 = 2\text{NaOH} + \text{CaF}_2$. No difficulties are found with the last reaction; the real problem is in converting the pptd. CaF_2 into NaF simply and cheaply. Various patents for this are considered. It is improbable that this process will compete with NaCl electrolysis or the Solvay process.

E. M. SYMMES

Potash from New Jersey greensands. Preliminary report. J. R. THOENEN. Bur. Mines, *Repts. of Investigations* No. 2910, 54 pp.(1929).—Although the area in which greensands have com. possibilities is cut to 3.7% of Washington's est. and 17.6% of Mansfield's calcn., and the K_2O content to 5.3% of Washington's and to 23% of Mansfield's est. there still remains a potential reserve capable of supplying this country's needs for nearly 500 years. At present no large-scale, successful process is in operation. Expansion of existing exptl. processes would encounter difficulties in marketing by-products. Foreign potash fertilizers can be distributed at seaboard and in interior points at lower freight rates than similar products from New Jersey.

E. M. SYMMES

The production of good lime in the gas-fired kiln. FRANZ MÜLLER. *Tonind.-Ztg.* 53, 291-3(1929).

F. O. A.

Barite industry in Missouri. W. M. WEIGEL. Am. Inst. Mining Met. Eng., *Tech. Publ.* No. 201, 26 pp.(1929).

E. H.

Recent literature on activated carbons. N. KAGANOV. *Nauchnuie Zapiski* 5, 359-66(1928).—A review.

V. E. BAIKOW

Montan wax (Brit. pat. 296,145) 21. **Desulfurizing ores** (Fr. pat. 646,883) 9. **Treating ores with nitrates or HNO_3** [for obtainment of pure MgO] (Brit. pat. 295,224) 9.

Asbestos. Its Sources, Extraction, Preparation, Manufacture, and Uses in Industry and Engineering. Berlin: Becker & Haag. 87 pp. Free. Reviewed in *Eng. Mining J.* 127, 448(1929).

KAUSCH, OSCAR: Der Schwefelkohlenstoff. Seine Eigenschaften, Herstellung und Verwendung. Berlin: Julius Springer. 265 pp. M. 32. Reviewed in *Ind. Eng. Chem.* 21, 392(1929).

Nitric acid. W. R. ORMANDY. Brit. 296,121, May 25, 1927. HNO_3 and N oxides are formed by combustion of oil or other fuel in a flame submerged in water in the presence of a catalyst such as a compd. of V, Ni, Cr, Fe or other metal which forms a plurality of oxides. The catalyst may be mixed with the fuel or with the air used for combustion. Lime or CaCO_3 may be added to the water to neutralize the acid formed and prevent corrosion of the app. The flame may serve also for generating steam.

Phosphoric acid and phosphates. I. E. WEBER, H. E. ALCOCK and B. LAPORTE, LTD. Brit. 295,848, Sept. 22, 1927. H_3PO_4 alone or in admixt. with acid phosphate is made by reaction of a mineral phosphate such as superphosphate with H_2SO_4 and heating to $150-200^\circ$ to destroy org. matter.

Removing dissolved silicic acid from aqueous liquids. A. ROSENHEIM. Brit. 295,317, Aug. 9, 1927. In processes similar to those described in Brit. 291,435 (C. A. 23, 1221) dissolved silicic acid may be removed from the liquid treated by the use of gels of titanatic acid, stannic acid, Th oxide, Zr oxide, tungstic or molybdic acid, or the oxides or hydroxides of Cu, Zn, Cd, Fe, Ti, Al, Mn or Mg. These substances may be mixed with or pptd. on other materials such as coke, activated C, charcoal, chalk, marble, pumice, calcined clay, textile fabrics, sawdust or cellulose. Water treated may be filtered through alternate layers of active and inactive substances. The active substances may be regenerated by treatment with sol. substances forming complex silicates such as tungstates or molybdates, or with alkali salts, hot water, steam or substances dissolving silicic acid or adsorbed bases.

Carbon dioxide. F. W. GEERE. Brit. 295,842, Sept. 9, 1927. Acid substances for admixture with carbonates or bicarbonates for controlled production of CO_2 , as described in Brit. 276,146 (C. A. 22, 2444), are prepd. by mixing a liquid acid such as H_3PO_4 or H_2SO_4 with an acid salt or with a neutral salt in proportion more than sufficient to form the acid salt and coating the particles of the mixt. with a material such as a fat, wax or hydrogenated oil. A further quantity of acid salt is added and the mixt. is ground.

Sulfur trioxide. A. O. JAEGER (to Selden Co.). Brit. 296,048, Aug. 24, 1927. Catalysts for SO_3 production comprise multi-component zeolites formed by the interaction of one or more silicates, one or more metallates and one or more metal salts, the basic radicals of which enter the non-exchangeable part of the zeolite. Catalytically active elements or radicals are combined in or used with the zeolite. The silicate component may be an alkali metal silicate or a silicate sol in alkali and may be partly replaced by alk. salts of acids of the elements S, N, Sn, As or Sb. The metallate component may be a sol. alkali metal compd. of Al, Cr, Zn, V, Be, Sn, Pd, Pt, Ti, Pb, W, B, Mo, U, Ta, Cu, Ni, Fe, Co, Ag, Cd, Mn, Zr, Th or Ce, or a complex compd. of these metals formed with NH_3 , HCN, sulfoxyonic acid, oxalic acid, formic acid, tartaric acid, citric acid, glycerol or sugars. The metal salt may be a water sol. salt of the elements Cu, Ag, Au, Be, Zn, Cd, Al, rare earths, Ti, Zr, Sn, Pb, Th, Cr, U, V, Mn, Fe, Ni and Co. Alkali metal cations in the zeolite may be replaced by the cations NH_4 , Cu, Ag, Au, U, Mg, Ca, Zn, Sn, Th, V, Cr, Sr, Cd, Ba, Al, Ti, U, Mn, Fe, Co, Pd, Ni, Pt or complex ions contg. them. Numerous details and modifications of the products are described. Cf. C. A. 23, 1221.

Oxidizing ammonia to nitric oxide. CLARK W. DAVIS (to E. I. du Pont de Nemours & Co.). U. S. 1,706,055, March 19. NH_3 and O contg. gas are passed through a catalyst comprising a Pt alloy contg. Rh 2-50%.

Formation of ammonia during the preparation of oxalates and formates. AMERICAN CYANAMIDE Co. Ger. 468,807, Dec. 11, 1924. A mixt. of cyanamides and cyanides of the alkali and alkaline earth metals is converted into NH_3 and formates or oxalates by water at high temps. or high pressures. Ca compds. are particularly suitable for the process.

Continuous concentration of ammonia solution. E. T. SHEVCHENKO. Russ. 5312, May 31, 1925. NH_3 soln. enters the lower chamber of an evapng. column divided into several vacuum chambers. A rotating shaft going through all chambers provided with a suitable equipment by which the NH_3 soln. is thoroughly mixed and a vacuum created, increasing with each chamber. The liquid passes gradually through the chambers, the gases being gradually withdrawn.

Porous solid material for storing ammonia or other gases or liquids. FREDERICK G. KEYES (to National Refrigerating Co.). U. S. 1,705,482, March 19. A porous material comprises an oxychloride cement of a metal of the second group such as Zn oxychloride and Na silicate together with CaCl_2 or a similar chloride. U. S. 1,705,483 specifies the use together of activated charcoal, Mg oxychloride and CaCl_2 for similar purposes. U. S. 1,705,484 specifies the use of a halide such as CaCl_2 capable of forming addn. products with fluids such as NH_3 together with oxychloride cement and alundum cement.

Purification of alkaline lyes. I. G. FARBENIND. A. G. Fr. 646,912, Jan. 10, 1928. Alk. lyes contaminated with org. substances are treated in an autoclave above 100° with O or gases contg. O, and if necessary any alkali carbonate formed is converted into the hydroxide by the addn. of oxides or hydroxides of alk. earth metals. Examples are given in one of which the lye contains α - and β -cellulose.

Precipitates of heavy metal salts. ALEXANDER WACKER GESELLSCHAFT FÜR ELEKTROCHEMISCHE IND. G. M. B. H. Fr. 646,507, Dec. 20, 1927. Ppts. of heavy metal salts to be used for the protection of plants and vegetables are obtained in a form which will dry to a powder. Thus, a concd. soln. of Pb acetate is pptd. by a soln. of Na_2CO_3 forming a ppt. of basic carbonate which dries to a powder and which may be mixed with water.

Alkali iodates. I. G. FARBENIND. A. G. (Heinrich Heimann and Hans B. Seeböhm, inventors). Ger. 468,213, Oct. 20, 1927. Addn. to Ger. 451,656. In the catalytic prepn. of alkali iodates from the iodides, metal oxides are used besides alkali hydroxides. Thus, a mixt. of KOH and KI was heated to 525° and Bi_2O_3 added to form KIO_3 . Al_2O_3 may be used as the catalyst. Cf. C. A. 22, 3744.

Aluminum compounds. T. R. HAGLUND. Brit. 295,227, May 2, 1927. Al sulfidiferous material is first treated to convert the Al sulfide into oxide under such conditions that sulfide impurities are substantially unchanged and these impurities are

then removed by treating the material with Cl or Cl compds. or their mixts., or with salts such as chlorides, sulfates and nitrates of metals which are pptd. by H_2S in acid soln. so that sulfides of metals such as Fe, Ti or Ca are converted into volatile or sol. salts. Before treatment with Cl, corundum crystals are sepd. from the decompn. product and $Al(OH)_3$ is heated to convert it into oxide. The treatment with Cl or with HCl, sulfochlorides or $AlCl_3$ preferably is effected at a sufficiently high temp. that chlorides of Fe and Ti are volatilized. Numerous details and modifications are described. Cf. C. A. 23, 673.

Ammonium sulfate. ESCHWEILER BERGWERKS-VEREIN. Fr. 646,814, Jan. 7, 1928. Highly concd. $(NH_4)_2SO_4$ is produced by neutralizing the H_2SO_4 with the gases contg. NH_3 in the same container as that in which the crystn. takes place.

Potassium dichromate. A. V. VINOGRADOV. Russ. 5356, May 31, 1928. $K_2Cr_2O_7$ is obtained from chromium iron ores by burning with sunflower ash with or without the addition of lime.

Potassium manganate. SOC. CHIMIQUE DES USINES DU RHÔNE. Brit. 296,074, Aug. 26, 1927. In a process such as that described in Brit. 292,991 (C. A. 23, 1480), KOH lyes contg. 50% KOH, instead of 60–80%, may be used for the prepn. of K manganate without using an excessive rate of flow of air or O, if the temp. is raised above 200° (preferably to 210 – 220°).

Red lead. E. HAYWARD. Brit. 295,975, Feb. 22, 1927. Reaction of Pb or a Pb compd. such as the carbonate or PbO under heat and pressure with air or O is effected continuously without loss of pressure in the reaction chamber and pressures of 20–30 atm. and temps. of 450–700° may be employed. A jacketed reaction chamber which may be heated by molten Pb and which is provided with special outlet and inlet valves and a screw conveyor is described.

Soda. SOC. FRANÇAISE DE SUCRATERIES (Brevets et procédés Deguide). Fr. 646,228, May 10, 1927. NH_3 is recovered in the manuf. of Na_2CO_3 or $NaHCO_3$ by treating the NH_4Cl formed with BaO instead of CaO. The $BaCl_2$ is treated with H_2SO_4 for the recovery of HCl, and BaO may be reformed from the sulfate.

Pulverizing saltpeter. I. R. KERICHEVSKII. Russ. 5494, May 31, 1928. Saltpeter is dissolved in hot water and emulsified with a liquid in which it is not sol. The saltpeter is then sepd. in the form of a fine powder after the soln. is cooled.

Purifying zinc salt solutions. ALBERT VOHL and WILHELM WACHTENDORF. U. S. 1,706,196, March 19. Zn salt solns. contg. impurities such as solns. resulting from vulcanized fiber manuf. are subjected to oxidation and compds. of the Fe group and pptg. agents other than Zn compds. are removed (suitably by addn. of $ZnCO_3$); the resulting soln. is evapd. and heated with an oxidizing agent such as $Zn(ClO_3)_2$ or $Ba(ClO_3)_2$ and Zn powder and HCl are added to reduce any remaining traces of Fe, the heating is continued, and the soln. is then suitable for reuse in mfg. processes. Cf. C. A. 22, 143.

Carbon disulfide. ALADAR VON VAIDAFFY. Ger. 469,839, Feb. 17, 1926. CS_2 is prepd. by treating S, or inorg. sulides which liberate S when heated, with org. compds. contg. exclusively or principally C and H at temps. between 380° and 450° . A contact agent may be used. C_2H_2 is mentioned as a suitable org. compd. The S source may be gas purification waste.

Carbon disulfide. ZAHN & CO., BAU CHEM. FAB. G. M. B. H. Ger. 469,170, Oct. 5, 1927. Addn. to Ger. 467,929 (C. A. 23, 1728). In the distn. and rectification of CS_2 , the impure liquid is first warmed in a container and then led into a S separator prior to the distn.

Apparatus for carbon disulfide manufacture and similar reactions. THOMAS GRISWOLD, JR. (to Dow Chemical Co.). U. S. 1,705,614, March 19. Vertical retorts are charged with solid material (such as charcoal for CS_2 manuf.) from magazines extending above the retorts, and reacting material (molten S in the case of CS_2 manuf.) is supplied to vaporizing compartments at the base of the retorts. For CS_2 manuf., the retorts are preferably made of ceramic material and the vaporizing compartments of cast iron. The vaporizer is made integral with a superposed ash-collecting compartment from which it is sepd. by a horizontal partition.

Hydrogen and nitrogen. HYDRAZOTE. Fr. 645,970, Dec. 20, 1927. In the production of H and N by the action of steam on reduced Fe, in which the reaction is endothermic, and of air in which the reaction is exothermic, the reactions are carried out in the same app. to economize heat. Details of construction are given.

Separating hydrogen and carbon dioxide. JOSEPH KEILLY and ETHELBERT W. BLAIR (to Commercial Solvents Corp.). U. S. 1,706,707, March 26. A mixt. contg. H and CO_2 such as fermentation gas is compressed and washed with a solvent liquid such

as water under pressure to remove a greater part of the CO_2 and the residual gas is then further washed under pressure to remove substantially all the CO_2 , the pressure is released on the solvent liquid to recover the dissolved H-bearing gas and the latter is returned to the raw gas under compression. An arrangement of app. is described.

Zinc. STANLEY COCHRAN SMITH. Fr. 646,664, Dec. 31, 1927. See Brit. 287,186 (C. A. 23, 487).

Active carbon. EDMUND KÜCHLER (Franz Krczil, inventor). Ger. 466,358, May 23, 1926. Addn. to Ger. 453,972. Highly active H_2SiO_3 contg. C is prepd. by coating granulated C with siliceous gel.

Active carbon. GES. FÜR CHEM. PRODUCTION M. B. H. and HELLMUTH MÜLLER-CLEMM. Ger. 468,212, July 6, 1923. Addn. to Ger. 461,884. Highly active bleaching C is prepd. from the waste liquor of cellulose sulfite lye by adding alkali sulfide, or polysulfide soln. until no further pptn. of CaCO_3 occurs, filtering off the ppt., evapg. the filtrate and carbonizing the residue. Thus, K_2S is added to waste liquor to ppt. the Ca content which is then filtered off. Or, CaO is dissolved in the min. amt. of water and waste liquor added under pressure and the whole heated. The ppt. is sepd. by pressing and dehydrated to the fullest extent. It is then treated with K_2S and boiled to dissolve org. substances. CO_2 is bubbled in to ppt. the C and the filtrate is evapd. and carbonized.

Active carbon. METALLBANK UND METALLURGISCHE GESELLSCHAFT A.-G. Fr. 646,481, Dec. 28, 1927. Active C is made by treating wood, cellulose, starch, sugar, lignite, etc., or C at high temps. with Na_2O . Other substances such as NaCl or Na_2CO_3 may be added. The process may be used for increasing the activity of or revivifying active C.

Active carbon. I. G. FARBENIND. A.-G. (Fritz Winkler, inventor). Ger. 469,277, July 11, 1925. Addn. to Ger. 463,772 (C. A. 22, 4212). Active C is prepd. from charcoal or carboniferous materials by the action of hot gases thereon in a shaft furnace. Air is blown into the furnace in the vicinity of the surface of the C layer.

Activated charcoal. I. G. FARBENIND. A.-G. Fr. 646,897, Jan. 9, 1928. See Brit. 283,485 (C. A. 22, 4212).

Vertical lime kiln and associated pyrometer construction. ARTHUR E. TRUESDELL. U. S. 1,706,423, March 26. Structural details.

Rollers and reciprocating grating for discharging shaft lime kilns. KLÖCKNERWERKE A.-G. ABT. MANNSTADTWERKE. Ger. 471,410, Aug. 20, 1925.

Catalyst. COMPAGNIE NATIONALE DE MATIÈRES COLORANTES ET MANUF. DE PRODUITS CHIM. DU NORD RÉUNIES ÉTABLISSEMENTS KUHLMANN. Fr. 646,263, May 13, 1927. A catalyst particularly for the partial oxidation of hydrocarbons of the aromatic series has a basis of oxides of V lower than V_2O_5 . Thus pumice may be impregnated with a soln. of vanadyl oxalate obtained by dissolving vanadic acid in oxalic acid in excess, and heated to 270° .

Catalysts for oxidation of organic compounds. A. O. JÄGER (to Selden Co.). Brit. 295,270, Aug. 8, 1927. Catalysts contg. a nonsiliceous base exchange material are formed by the reaction of one or more metallates with one or more metal salts, either by pptn. from aq. solns. or by fusion (in which case metal oxide and Na or K hydrates or carbonates may be used instead of metallates). The metallate component may consist of alkali metal salts of Al, Cr, Zn, V, Be, Sn, Pd, Pt, Ti, Zr, W, U, Ta, B or Mo or of complex compds. contg. NH_3 or cyanogen complexes. The metal salts may be sol. acid or neutral salts of Cu, Ag, Au, Be, Zn, Cd, Al, rare earths, Ti, Zr, Sn, Pb, Th, Cr, U, V, Mn, Fe, Ni, Co, Pt or Pd. Numerous details, modifications, examples and uses of the products are given.

Contact mass. RHENANIA-KUNIGIM VEREIN CHEM. FABRIK A.-G. and BERNHARD C. STUER (Bernhard C. Stuer, inventor). Ger. 467,220, Sept. 5, 1922. Contact masses for the prepn. of condensation and oxidation products of C_2H_2 are obtained by the partial reduction and dehydration of higher metallic oxides. Thus, H is passed over red hot $\text{Fe}_2\text{O}_3 \cdot n\text{H}_2\text{O}$ to form water-free FeO . A mixt. of C_2H_2 and NH_3 is then passed over the oxide at 400° to form acetonitrile, picoline and analogous bases. Instead of pptd. Fe(OH) , the mineral brown iron ore can be used. Another example gives V_2O_5 as the metallic oxide to be reduced to form the contact mass.

Plastic composition. G. F. JANLEY and O. PARDOEN. Brit. 295,372, Aug. 11, 1927. A compn. which is stated to be incombustible, acid-resistant and relatively non-conductive, for making molded articles or rolled sheets may be formed of asbestos powder 5, a "lamellate material" 2, "stearine vegetable gum" or oxides of Pb 1 and linseed oil 1 part. Hardening may be retarded by the addn. of alc. or ether.

Plastic compositions. PAUL HALLER and HANS KAPPELER. Swiss 127,950,

July 16, 1926. Addns. to Swiss 123,515. PhNH_2 or one of its salts is allowed to react with CH_2O in an acid medium till a jelly is formed. The mass is then treated with org. bases and dried. Thus, 1 mol. of PhNH_2 is suspended in water and 1 mol. of 25% HCl and $1\frac{1}{4}$ mol. of 40% CH_2O are added. The product is cooled to $40-60^\circ$, forming a plastic mass which can be molded to desired form. Methylamine is then added and the mass dried. In Swiss 127,951 the acid medium is replaced by a strong electrolyte and the org. base by an agent which is not basic but weakly acid such as NaF , ammonium oxalate, $(\text{AcO})_2\text{Zn}$, $(\text{AcO})_2\text{Pb}$, Na_2S , H_3BO_3 , CH_2O , HCO_2H , glycerol and pyrogallol.

Plastic material. MATHIEU VAN ROGGEN and JEAN É. D. DE GRANVILLE DE BIELIZE. Fr. 646,918, Jan. 10, 1928. Plastic materials are obtained by condensing phenol with a large excess of CH_2O , using MgO , Na_2CO_3 , or a mixt. of Na_2CO_3 and Na_2BO_3 as catalyst. A little paraffin may be added to make the material more elastic.

Plastic substances. PFENNING-SCHUMACHER-WERKE G. M. B. H. Fr. 646,877, Jan. 9, 1928. See Ger. 466,053 (C. A. 23, 1729).

Adhesives. CONSORTIUM FÜR ELEKTROCHEM. IND. G. M. B. H. (Wolfram Haehnel and Willy O. Herrmann, inventors). Ger. 471,278, May 12, 1926. See Can. 277,169 (C. A. 22, 2644).

Adhesives containing cellulose esters. I. G. FARBENIND. A.-G. Brit. 295,366, Aug. 10, 1927. Adhesives are formed of a cellulose ester such as nitrocellulose or waste film material, together with solvents, plastifiers, softeners or the like and finely divided solid substances such as bronze powders, sawdust, kaolin, talc, flour, gypsum or asbestos. Several examples with proportions of ingredients are given.

Casein. OTTO GERNGROSS. Ger. 470,287, Dec. 7, 1926. Casein which has been hardened by CH_2O is dissolved in NH_4OH of higher concn. than 5%. Heat or pressure may be used. Thus, powd. artificial horn is dissolved in 10% NH_4OH at 70° .

Molded receptacles of wood pulp and casein. JOHN OLSON. U. S. 1,705,780, March 19. A plastic mixt. formed of wood pulp, casein and water is pressed between dies under very high pressure so that the casein is caused to permeate the wood pulp and form a unitary rigid article, and the dies and molded article are relatively moved at high speed to finish the article.

Condensation products. FRANZ HASSLER. Ger. 466,269, Mar. 18, 1926. Aromatic hydrocarbons or their derivs., especially those contg. the OH , NH_2 and NH groups, condensed according to the process described in Ger. 405,994, are further heated. Thus, naphthalene, S and concd. H_2SO_4 are heated to 150° for 20 hours. The product is reheated to 150° and a further quantity of naphthalene stirred in. The condensation products obtained by the method of the prior patent may have added, phenol, benzidine, fuchsin, aniline and naphthylamine.

Condensation products from *p*-halogenated phenolic compounds and aldehydes. MAX WEILER, BERTHOLD WENK and HERMANN STÖTTER (to I. G. Farbenind. A.-G.). U. S. 1,707,181, March 26. Reaction is effected between an aldehyde such as CH_2O or a sulfo benzaldehyde and a phenolic compd. such as *p*-chlorophenol or *p*-bromophenol which contains at least 1 OH group with a halogen atom in *p* position to the OH and at least one free *o*-position to the OH group and which may be substituted in the other positions by "indifferent" substituents; a condensing agent such as H_2SO_4 may be used. The products are suitable for moth-proofing textile fabrics.

Artificial substances. SOC. ANON. POUR L'IND. CHIM. À BAËLE. Fr. 646,921, Jan. 10, 1928. Artificial substances prepd. by causing aromatic amines to react with CH_2O in an acid medium or otherwise till a solid jelly is formed have their density increased by pressure preferably when heated. Thus, PhNH_2 is condensed with CH_2O in the presence of HCl soln., the product is steeped in 3% NaOH soln., washed and submitted to a pressure of 110 atm. at 150° for 1 hr. The sp. gr. is increased from 0.6 to about 1.0. Fr. 646,922 relates to the removal of acid by one or more washings with NaOH soln. when aromatic amines are condensed with aldehydes in acid medium. A final pressure treatment as in Fr. 646,921 may be given.

Deodorizing and preserving substance. SOC. ANON. POUR L'IND. CHIM. À BAËLE. Swiss 127,967, Aug. 10, 1928. Addn. to Swiss 124,635. The substance consists of a solid mixt. of condensation products of urea or its derivs. sol. in water, and CH_2O , together with a substance possessing the deodorizing or preserving property, such as NaNO_2 .

Waterproofing vegetable protein-base glue. GEORGE H. OSGOOD. U. S. 1,706,674, March 26. A high-protein content vegetable meal such as peanut, cotton seed or linseed meal is used with $\text{Ca}(\text{OH})_2$, Na_2CO_3 , Na silicate and water and is admixed with a

witherite. Thorough mixing is necessary. The BaCO_3 should be present in slight excess. The reaction must be given time to go to completion. R. F. F.

Smooth-surface tile. V. S. SCHORY. *J. Am. Ceram. Soc.* 12, 75-8(1929).—A body which has proven satisfactory in service is: flint 7, Conn. feldspar 31, Tenn. feldspar 31, English china clay 23 and Ky. ball clay 8%. The kiln atm. is very important. It must not be too sharply reducing. C. H. KERR

A study of the absorption of two earthenware bodies and their resistance to crazing in the steam test. E. P. WRIGHT. *J. Am. Ceram. Soc.* 12, 118-22(1929).—An ivory and a white earthenware body, fired in different positions of periodic and tunnel kilns, and maturing to various absorptions were subjected to autoclave tests at 100 and 150 lbs. per sq. in. The ivory body resisted the crazing induced by this test for absorptions from 7 to 8% in the 100 lb. test. The white body withstood the test up to absorption of 8.5%. Thorough glaze firing had some effect in increasing the resistance. In the 150-lb. test, the critical resisting absorption was lowered to 6% for each body. C. H. KERR

The vapor absorption of a fired earthenware body. C. L. DEEDS. *J. Am. Ceram. Soc.* 11, 769-70(1928).—Trials fired at 3 temps. were placed over 10% H_2SO_4 for 30 days and the gain in wt. was detd. Up to a certain point, absorption was proportional to porosity, but the body with the highest absorption, 20.25%, took up a relatively higher amt. of H_2O . With an absorption of 8.81%, the max. H_2O vapor taken up was 0.13%. With 10.8% absorption the H_2O vapor taken up was 0.16%, and with 20.25% absorption it was 0.54%. C. H. KERR

The mathematical fundamentals of burning stoneware. W. SCHUBN. *Land. Ztg.* 53, 168(1929).—The method for calcg. kiln efficiency is given. A comparison is made of the various fuels. High-volatile coal is considered best. Gas coal and lignite briquet are suitable. Coke is not recommended. R. F. F.

The thermal expansion of pottery bodies. TOSAKU YOSHIOKA. *J. Japan Ceram. Assoc.* 35, 459-63, 506-10(1927).—The relations between heat treatment in clay working and strength of the products, thermal endurance of pottery and thermal expansion of bodies and glazes are discussed. S. KONO

Method of measuring thermal expansion of pottery body. TOSAKU YOSHIOKA. *J. Japan Ceram. Assoc.* 35, 508-72(1927).—Dilatometers are classified and special features of each are given. A dilatometer devised by Y. consists, in the main, of a silica tube, a mechanism to rotate a mirror, a lamp and a scale. S. KONO

Theoretical considerations on the thermal expansion of pottery bodies. TOSAKU YOSHIOKA. *J. Japan Ceram. Assoc.* 36, 11-19(1928).—The literature pertaining to the thermal expansion of pottery bodies, clays, quartz, tridymite, cristobalite, silica glass and feldspars, the transformation of cryst. and amorphous silica, vol. change occurring in the transformation of the modifications, and the influence of porosity and grain size on the thermal expansion of the bodies are reviewed and discussed. S. KONO

The fibrous structure of porcelain bodies. RYOICHI SHIGEMUNE. *J. Japan Ceram. Assoc.* 35, 615-21(1927); cf. *C. A.* 22, 853. —In porcelain bodies with fine feldspar grains passing through a No. 200 sieve, the original shapes of feldspar grains were rarely shown and the development of the fibrous structure was poor. Three bodies (A) composed of 30% orthoclase of the Hakuho Island of 50-80 mesh size, and of 70% Korean kaolin, (B) composed of kaolin-quartz mixt. corresponding to Al_2O_3 25.50%, and (C) pure alumina, were fired at 1350-1370° (Cone 12+) for 67, 23½, or 8½ hrs. The photomicrographs of the specimens show that the fibrous crystals were universally developed in the feldspar grains in the specimens which were fired long and had suitable groundmass. The fibrous structure was developed best in body B fired for 67 hrs., whereas no crystals were observable in body A fired for 23½, and 8½ hrs. in any specimens of body C. The observations of Morrey and Bowen (*C. A.* 16, 2824) led S. to an opinion that the fibrous crystals in porcelain bodies are probably leucite. Its formation is most influenced by the time of firing and the nature of groundmass. The fact, noted by Morrey and Bowen, that long heating is necessary for the formation of leucite is probably due to the viscosity of feldspar, which is lowered by long heating. The effect of the nature of the groundmass is not chem. but is entirely phys. The favorable influence of the highly siliceous groundmass in the body B is due to its low viscosity, which allows the effective development of the fluidity of the orthoclase grains and thereby aids in the formation of the fibrous structure. S. KONO

Pyrophyllite, a new ceramic raw material. O. R. SHELTON. *N. Car. State Coll. J. Am. Ceram. Soc.* 12, 79-82(1929); cf. *C. A.* 23, 1023. —N. Car. deposits are described. A typical analysis is: SiO_2 64.54, Al_2O_3 28.88, Fe_2O_3 0.45, MgO trace, CaO

0.36, Na_2O 0.12, K_2O 0.18, H_2O 5.40%. It promises to be of value in whiteware, and is being tested in refractory and glaze work. C. H. KERR

Scratch hardness tests of ceramic materials. LOUIS NAVIAS. *J. Am. Ceram. Soc.* 12, 69-74(1929).—Three sets of standard (1) a mineral set per Mohs' Scale, (2) a set of steel samples, (3) a set of Carboloy samples were prepd. and used on ceramic products with satisfactory results. C. H. KERR

New method of direct firing glazed ceramic bodies. F. A. WHITAKER. *J. Am. Ceram. Soc.* 12, 87-95(1929).—A description is given of an adaptation of Carboradiant principle to a rectangular kiln for sanitary ware. C. H. KERR

Some leadless borosilicate glazes containing nickel oxide. H. H. HOLSCHER. *J. Am. Ceram. Soc.* 12, 111-7(1929).— NiO has not proved useful in glossy, non-opaque glazes. It is not recommended for use where a deep (dark) color is desired but it can be made to produce very pretty opaque glazes, light tan in color and of a semimat character. C. H. KERR

Copper ruby glaze. I. TOSAKU YOSHIOKA AND SHO HIRAOKA. *J. Japan Ceram. Assoc.* 35, 608-14(1927).—Coarse grains of frits, Na_2O (1-4) SiO_2 , contg. 2% of CuO were heated in a current of H_2 , CO , CO_2 , N_2 or O_2 at 600-1000° for 1 hr. N_2 and CO_2 were found most suitable for the production of red. The following frits

(A) 0.5 Na_2O { 2.0 SiO_2	(B) 0.375 Na_2O { 0.075 K_2O	} 0.125 Al_2O_3 { 2.5 SiO_2	(C) 0.25 Na_2O { 0.15 K_2O
0.5 CaO { 0.5 B_2O_3	0.55 CaO { 0.375 B_2O_3		
0.25 Al_2O_3 { 3.0 SiO_2	(D) 0.125 Na_2O { 0.225 K_2O	} 0.375 Al_2O_3 { 3.5 SiO_2	and (E) 0.3 K_2O { 0.7 CaO
0.25 B_2O_3 { 0.65 CaO	0.65 CaO { 0.125 B_2O_3		

0.5 Al_2O_3 .4 SiO_2 , each contg. 1% CuO with or without 1% As_2O_3 , BaO , Fe_2O_3 , PbO , SnO_2 or ZnO , were reheated for 1 hr in an atm. of N_2 or CO_2 at 600-1200°. Frits of types A and B are unfit for the production of red. In frits of type C which contain PbO , Fe_2O_3 , SnO_2 or ZnO beautiful ruby reds were produced when they had been heated at 800° or better at 700°, SnO_2 being most favorable in this respect. Some grayish reds were obtained with frits D and E. An atm. of CO_2 produces brighter glazes than an atm. of N_2 . S. KONDO

Titanium crystal glazes. SEIJI KONDO. *J. Japan Ceram. Assoc.* 35, 431-58 (1927).—The results of expts. on Ti crystal glazes applied on hard biscuit porcelain tiles are reported. The glazes had the compn. $n\text{R}^{\text{I}}_2\text{O}$ (1 - n) $\text{R}^{\text{II}}\text{O}$. $m\text{SiO}_2$. (2 - m)- TiO_2 , in which R^{I} = K, Na or K + Na and R^{II} = Zn, Ca, Zn + Ca, Mg or Mn. Also, in one series the sum of SiO_2 and TiO_2 , instead of being 2, varied from 0.8 to 2.7. The ranges of compn. in which good glazes were produced and the cone nos. at which they were fired are indicated. S. KONDO

The influence of glaze on insulator strength. D. H. ROWLAND. *Gen. Elec. Rev.* 32, 136-8(1929).—Test data are given showing the tremendous effect of surface conditions on mechanical strength of porcelain. It is possible to increase or decrease strength of porcelain by glazing. Glaze and porcelain must be balanced to avoid tension. M. McMAHON

Some waste-heat drier calculations and charts. A. E. R. WESTMAN AND R. G. MILLS. Rutgers Univ. *J. Am. Ceram. Soc.* 12, 162-74(1929). C. H. KERR

Stoker-fired tunnel kilns used in burning fire brick. D. B. HENDRYX. *Fuels and Furnaces* 7, 225-8(1929). E. H.

A completely automatic decorating tunnel kiln. JOHN T. JANS. *J. Am. Ceram. Soc.* 12, 107-10(1929). C. H. KERR

A tunnel kiln refractories plant. B. E. WHITESSELL. *J. Am. Ceram. Soc.* 12, 96-106(1929). C. H. KERR

The arrangement of apparatus for testing refractory materials for resistance to the attacks of slags. WILLI M. COHN. *Chem. Fabrik* 1929, 75-7, 88-9.—A review of methods. Cf. Ferguson, C. A. 22, 1023. Bibliography appended. W. C. E.

The present state of operation control in the German refractory industry. H. KNUTH. *Tonind.-Ztg.* 53, 270(1929).—Eighty % of German manufs. employ tech. control methods. Directions are given for sampling raw material, unfinished products and finished products. R. F. F.

Silicon carbide as a refractory material. F. NIERLING. *Tonind.-Ztg.* 53, 227 (1929).— SiC refractories are most useful in cases that require a good resistance to load; in indirect heating because of its high cond.; and for resistance to abrasion because of its hardness. It is not attacked by acid gases and slags, but is attacked by basic slags. R. F. F.

Vitreous enamel and its defects. A. MALINOVSEKY. *J. Am. Ceram. Soc.* 12,

180-7(1929).—Various defects coming from ground coat and from the iron are described and photomicrographed.

C. H. KERR

Physical tests for vitreous enamels. I. Determining physical properties of vitreous enamels. C. J. KINZIE. *J. Am. Ceram. Soc.* 12, 188-92(1929).—Methods and app. are described for detg. resistance to thermal shock, resistance to mech. impact and resistance to abrasion.

C. H. KERR

The action of fluorine in enamel smelts. H. G. WILCOX AND F. C. WESTENDICK. N. Y. State School of Clayworking and Ceramics. *J. Am. Ceram. Soc.* 12, 83-6(1929).—All F is not volatilized from enamels. The duration of smelting and viscosity of the smelt affect the amt. driven off. The higher the Al_2O_3 content, the less the loss of F.

C. H. KERR

Plasticity [of clay] (PISTERS) 2.

KÖHNECKE, W.: Über Fehler und Mängel in der Einrichtung und im Betrieb von Emaillierwerken für die Badewannenfabrikation, ihre Aufdeckung, Ursachen und Beseitigung. Hanover: Tech. Hochschule. 87 pp.

Glass. CARL TRENN. *Fr.* 646,355, Dec. 26, 1927. See Brit. 282,768 (C. A. 22, 3968).

Glass making. NAAMLÖÖZE VENNOOTSCHAP MIJ. TOT BEHEER EN EXPLOIT VAN OCTROOIEN. *Fr.* 645,995, Dec. 21, 1927. Means for transporting the sheets to and through the coolers are described.

Apparatus (with a temperature-indicating device) for feeding molten glass. BRITISH HARTFORD-FAIRMONT SYNDICATE, LTD., and T. WARDLEY. *Brit.* 295,762, May 23, 1927.

Apparatus for precise determination of the level of molten glass in a tank furnace by use of light reflected from the glass surface. AIME MATHIE (to Hartford Empire Co.). U. S. 1,706,857, March 20.

Apparatus for making sheets of glass. NAAMLÖÖZE VENNOOTSCHAP MIJ. TOT BEHEER EN EXPLOIT VAN OCTROOIEN. *Fr.* 646,843, Nov. 7, 1927.

Laminated glass. LOUIS BARTELSTONE (to Indestructo Glass Corp.). U. S. 1,705,631, March 19. Glass sheets are united with an intervening sheet of material such as celluloid, the edges of which are sealed in by a film of linseed oil and resin and an associated wax filling.

Uniting glass sheets with celluloid, etc. J. DUCLAUX (to Soc. d'etude des vitres et glaces de surete). *Brit.* 296,026, Aug. 23, 1927. In a process of uniting 2 glass sheets with an intervening sheet of celluloid after the glass sheets have been preliminarily coated first with gelatin and then with nitrocellulose, the coating of gelatin is dried by immersion in a bath of EtOH, MeOH, BuOH or PrOH or of acetone or other suitable ketone or other suitable inorg. or org. dehydrating agent, and the adhesion may be increased by emulsifying with the gelatin soln. used a soln. of nitrocellulose, other suitable cellulose ester or ether or gums, waxes, bitumen, oils, Canada balsam, latex or the like, or by adding to the gelatin an aq. soln. of a substance capable of dissolving the core such as an amide or chlorinated deriv. or any solvent of nitrocellulose when the core is celluloid, and phenol, cyclohexanol or the like when the core is cellulose acetate. Numerous details and modifications of procedure are described.

Electric furnace for melting glass. SOC. ANON. DES MANUFACTURES DES GLACES ET PRODUITS CHIMIQUES DE ST. GOBAIN, CHAUNY, ET CIREY. *Brit.* 295,713, Aug. 19, 1927. Molten metal such as Sn is used as an electrode. Various structural details are described.

Construction of annular brick kilns from clay. ADOLF ARNDT. *Ger.* 411,553, May 21, 1926.

Method of feeding fuel to brick kilns. LAURITZ A. CHRISTENSEN. *Fr.* 646,936, Dec. 31, 1927.

Tunnel kilns suitable for bricks and other clay products. WILLIAM L. HANLEY, JR. U. S. 1,705,475 and U. S. 1,705,477, March 19. Structural features.

Tunnel kiln for firing spark-plug porcelains, insulators or other ceramic ware. T. G. McDONALD. *Brit.* 296,955, Feb. 21, 1927. Various structural features are described.

Multiple chamber kiln for ceramic materials. ROBERT MALVON and MARCELLIN CROCHAMER. *Ger.* 471,409, Nov. 20.

Filter press for ceramic materials. ETABLISSEMENTS ROUCHAUD ET LAMASSIAUDE. *Fr.* 646,230, May 10, 1927.

Articles made of zirconia. DEUTSCHE GOLD- UND SILBER-SCHNEIDANSTALT VORM. ROSSLER. Fr. 646,360, Dec. 26, 1927. See Brit. 282,795 (C. A. 22, 3969).

Forming articles of clear vitreous silica. B. F. NIEDERGESASS (to British Thomson-Houston Co., Ltd.). Brit. 296,059, Aug. 24, 1927. Heated silica particles are projected onto a support which is heated to a temp. approx. the m. p. of silica so that the particles coalesce and become incorporated with the support. An example is given of the formation of an astronomical mirror by deposition of clear vitreous silica on a foundation plate of opaque silica. An app. is described.

Abrasive wheels. L. E. SAUNDERS, L. H. MILLIGAN and M. F. BEECHER (to Norton Co.). Brit. 295,292, Aug. 8, 1927. Abrasive grains such as those of cryst. Al_2O_3 or SiC are bonded with a vitrified ceramic compn. having the same coeff. of expansion as the grains at temps. below the annealing range. A bond suitable for use with alumina may be formed of SiO_2 55, Al_2O_3 11.4, Fe_2O_3 4.3, MgO 2.8, CaO 5.9, Na_2O 6, K_2O 2.6, TiO_2 0.7 and B_2O_3 11.3 parts. Various details of the bonding and firing operations are given.

Enameling composition. RUDOLPH WEIMER. U. S. 1,706,866, March 26. A compn. suitable for coating cast iron, sheet iron or sheet steel is formed of ground silica 52-67, clay and lime 14-17, soda 24, H_2BO_3 12, broken pieces of glass and porcelain 40-60 parts and water and is suitable for application in cold condition.

20—CEMENT AND OTHER BUILDING MATERIALS

J. C. WITT

Early strength cements. A HASCH. *Tonind.-Ztg.* 53, 146-8(1929). F. O. A.

Graphical calculation of all possible practicable mixtures of more than two raw materials for hydraulic cements. F. W. MEIER. *Tonind.-Ztg.* 53, 211-3(1929).—Starting with a fixed hydraulic modulus H ($CaO/(SiO_2 + R_2O_3)$) calc. the amounts of the raw materials in pairs (for a total of three raw materials) which will give H and calc. the silica modulus S (SiO_2/R_2O_3) for each pair. Plot the results in a S -percentage diagram and draw smooth curves for each of the three mixes. When S is fixed the relative amounts of the three are fixed. For 4 raw materials proceed in the same way working with 3 at a time. F. O. ANDEREGG

Calcium sulfate and its action on the mechanical properties of cement. PETER P. BUDNIKOV AND V. M. LESHORV. *Pit (Quarry)* 17, No. 11, 47-51(1929).—The effects are given of varying percentages of gypsum and anhydrite on the tensile and compressive strengths, setting times and soundness of previously ground cement. Max. strengths are secured with the addn. of 3 to 4% after which the strengths drop off, although with 20% anhydrite the strength begins to increase a little. The anhydrite was prepd. by heating gypsum to 700° for 4 hrs. F. O. ANDEREGG

History of the manufacture of blast-furnace cement at the Imperial Steel Works. MUNEO TANI. *J. Japan. Ceram. Assoc.* 35, 573-9(1927). A brief history of the cement manuf., a description of the plant, and the properties of the cement manufd. from 1913 to the present time are given. S. KONDO

Aluminous cement. HENRY LECHATELIER AND ANDRÉ DUHAMEAUX. *Chimie et industrie Special No.*, 417-23(April 1928). See C. A. 22, 4751. A. P.-C.

Tensile strength of the mixture of alumina cement and portland cement. Eizo MIKI. *J. Japan. Ceram. Assoc.* 35, 622-3(1927).—Setting time and tensile strength of varying mixts. of a port. cement and alumina cement were studied. The mixts. contg. 30-80% of port. cement set too quickly for ordinary purposes. Twenty % of the alumina cements can be replaced by the port. cement without material decrease in their early strength, while small addn. of the aluminous cements to port. cement is injurious. S. KONDO

The hardening of portland cement and the formation of free lime. SIGERU YAMANE. *Bull. Inst. Phys. Chem. Research (Japan)* 7, 1177-90(1928); *Abstracts* 1, 113-4; (in Esperanto).—Free CaO was detd. by the NH_4 acetate method of Emley and of Lerch and Bogue. Tests with cement- H_2O mixts. show that the greater the amt. of H_2O , the more CaO is formed. In cement- H_2O 100:20, CaO began to form only after 5 hrs. and almost reached the max. at 8 days, which indicates that at least up to 5 hrs. the hardening may be due to formation of $3CaO \cdot Al_2O_3 \cdot nH_2O$. Tensile strength does not increase parallel with the amt. of CaO formed, which shows that $CaO \cdot SiO_2 \cdot mH_2O$ can appear from the supersatd. soln. independently of CaO formation. Only about $1/4$ of the $3CaO \cdot SiO_2$ in clinker is decompd. in cement- H_2O mixts. but mixts.

contg. sand can have a better efficiency. Calcn. shows that if $\text{CaO} \cdot \text{SiO}_2 \cdot m\text{H}_2\text{O}$ is the chief strength-producing constituent, the final ratio of strengths for a cement- H_2O mixt. 100:22 and a cement-sand- H_2O mixt. 25:75:12 should be 1:0.85, which agrees well enough with actual values. Hence the sand, beside other functions, acts as a conservator of H_2O , which increases the efficiency of the $3\text{CaO} \cdot \text{SiO}_2$ in clinker. By powdering and heating hardened cement and putting 1 g. in a mixt. of 5 cc. glycerol with 30 cc. abs. alc., shaking, heating and filtering, V. obtained an opalescent suspension which, with the ultramicroscope, showed slowly moving pointlike particles. Addition of H_2O coagulates it at once. This possibly proves that *colloidal particles* exist in hardened portland cement.

AUSTIN M. PATTERSON

Fuel economy in the rotary kiln burning portland cement clinker. R. D. PIKE, Pike and West, Emeryville, Cal. *Ind. Eng. Chem.* 21, 307-10(1929); cf. *C. A.* 23, 1733.—P. continues the discussion of possible fuel economy and gives theoretical results to be obtained in the rotary kiln. Data given in previous articles are used (*C. A.* 23, 255, 1733). Several curves are given and P. shows from these what the effect of kiln size, surplus air, exit gas temp., and fuel economy in waste-heat generation should be. P. states that the efficient rotary kiln can save heat by lengthening the kiln to utilize the waste heat in the gases for preheating the charge, as well as using a regenerative cooler to heat the secondary air with heat from hot clinker, and placing a layer of insulating brick back of the fire brick in the upper parts of the kiln. 1,100,000 B. t. u. per barrel is probably the ultimate economy to be obtained. Good operation should give an efficiency of 50 to 60%. The theoretical heat required is 405,000 B. t. u. per barrel, and one may expect in special kilns to obtain results such that the fuel consumption will be 700,000 to 800,000 B. t. u.

M. C. ROGERS

Strength increase of cement and concrete. STIG GIERTZ-HEDSTROM AND DONAVAN WERNER. *Tek. Tid.* 58, Kemi 6, 41-5(1928).—Equations are set up connecting the size distribution of a cement with the strength developed and checked by applying to 3 cements. The compressive strength developed is proportional to the square of the cement hydrated, indicating the importance of fine grinding for early strength.

F. O. ANDERSON

The use of blast-furnace slag in concrete. WILHELM KOSFELD. *Stahl u. Eisen* 49, 243-9(1929).—The possible use of slag in concretes and the economies obtained thereby are discussed.

J. A. S.

Thermal conductivities of walls, concretes, and plasters. E. GRIFFITHS. *Sci. Ind. Research Building, Research Tech. Paper No. 6*, 1928, 19 pp. A presentation of the methods used for detg. the heat transmission of materials commonly used for building purposes.

B. C. A.

Distilling tar (Brit. pat. 205,087) 21.

ALEXANDER VACKER GEMEINSCHAFT FÜR ELECTROCHEMISCHE IND. G. m. b. H. Fr. 645,910, Dec. 19, 1927. A good cement is made from the residue left in the production of C_2H_2 from CaC_2 , if only a small amt. of water is allowed to act on the CaC_2 , so that the residue remains quite dry.

Cement. ANNE-LUTHER WERKE BRAUNSCHWEIG DER "MIAG" MUHLENBAU UND IND. A. G. Fr. 640,077, Dec. 22, 1927. See Brit. 284,294 (*C. A.* 22, 4756).

Cement. ANGELO FALCHETTO. Swiss 127,975, Jan. 17, 1928. A waterproof cement is made by mixing cement, water, alkali carbonate, org. acids and a hydrocarbon. The acid may be AcOH , and the hydrocarbon petroleum.

Cement. G. POLYSIUS EISENGIESSENRII UND MASCHINENFABRIK. Ger. 4 Jan. 1, 1920. In melting cement, a part of the furnace gases is used to preheat the air or gases for combustion and the rest to dry and calcine the initial materials. A rotating tube furnace for use in the process is described.

Apparatus for making cement by the wet process. THOMAS RIGBY. U. S. 1,706,747, March 26. An upright tube for drying slurry is connected adjacent its lower end to a gas exit of a cement kiln and at its other end to a centrifugal dust separator and collector; a slurry spraying device is positioned at the lower end of the drying tube and a rotating scraper for removing the slurry operates against the inner wall of the tube. Various other structural details are also described. U. S. 1,706,748 relates to a process of making cement by the wet method in an inclined rotary kiln having a sep. drying zone and calcining and clinkering zones. A plurality of independently controlled streams of finely divided atomized slurry flow along converging axes to the interior of the surface of the drying zone and hot gases of combustion are passed counter-current to the atomized slurry and the slurry is maintained in suspension in the current

of gases until sufficiently dried that it will not tend to stick together and form large lumps. U. S. 1,706,749 relates to app. for carrying out a similar process of slurry treatment, as does also U. S. 1,706,750.

Rotary kiln suitable for cement manufacture. ROLAND E. MINOGUE (to Minogue Engineering Co.). U. S. 1,707,191, March 26. Structural details are given of a device for feeding flue dust to the kiln of a wet process cement plant.

Revoluble cement kiln and material feeder construction. ROBERT W. RYDER (to Santa Cruz Portland Cement Co.). U. S. 1,706,592, March 26.

Concrete. M. L. GLOVER. Brit. 295,545, Jan. 17, 1928. In forming roads, foundations, roofs, etc., an upper layer comprises aggregate of various sizes and cement proportioned to form interstices which are partly filled with stone chippings, gravel or sand and partly with bitumen, tar or like material applied as an emulsion, and a lower layer is formed of dense concrete, some of the aggregate of which interlocks with the aggregate of the upper layer.

Concrete. C. S. JOHNSON. Brit. 295,894, Jan. 9, 1928. In order to proportion water and aggregate in desired quantities for making concrete, aggregate having a variable moisture content is combined with water until the sum of their wts. at a given combined volume equals a predetd. amount. An app. is described including a telescopically adjustable hopper in which the ingredients may be proportioned by displacement of water by the solid materials such as moist sand used in the aggregate.

Molding faced concrete units. WILLIAM R. TUCKER. U. S. 1,706,865, March 26. In molding units such as building blocks, facing stones are placed on the bottom of a mold and the spaces between them are filled with material such as rock screenings; the stones and screenings are submerged to a suitable level in glue or other suitable adhesive, drained and dried, unattached screenings are sep'd. and the mold is filled with facing and backing concrete mixts.

Paving. KARL SCHNEBLE. Swiss 128,176, Sept. 26, 1927. A plastic mass composed of finely divided pumice stone, siliceous earth, cement and water is rolled over the surface to be paved and allowed to set.

Coloring stone chippings for pavements. A. EDGE. Brit. 295,956, March 15, 1927. Stone chippings and stone dust are heated and then impregnated with a pigment mixt. formed by adding a half gal. of "white spirit" or turpentine substitute to each lb. of a paste composed of linseed oil 144, a green or red dry pigment 112 and an aniline dye of corresponding color 1 part. The colors may be permitted to penetrate for several days and the product is suitable for use on tennis courts.

Pavement or roadway construction. SAMUEL S. SADTLER (to Amiesite Asphalt Co. of America). U. S. 1,706,077, March 19. A compact foundation course is formed of water-repellent clayey earth mixed with a small quantity of Zn stearate, and is overlaid with a surface course of asphaltic material which can be laid without heating. U. S. 1,706,078 specifies adding to clayey earth from 5 to 10% of caustic lime and water sufficient to produce a mixt. having a consistency similar to that of freshly mixed cement, heating this mixt. to 75-100° while thoroughly agitating it, and then laying it as a road foundation course. Cf. C. A. 23, 2009.

Road covering. HANS ARBLI & Co. Swiss 127,733, Jan. 10, 1928. A durable and cheap covering layer for roads is composed of rough stones mixed in cold asphalt.

Bituminous emulsions. HERMANN PLAUSON (to Mineral A. G. Brig). U. S. 1,706,590, March 26. In prepg. compns. suitable for use on roads, a bituminous material such as "Spramex" is melted and emulsified with a previously formed emulsion of a neutral glyceride such as bone fat or fish oil in an excess of alkali carbonate soln.

Tar emulsions. EUSTAS DELVAUX and SADI DELVAUX. Fr. 646,271, May 14, 1927. A compn. contg. tar, an emulsifying agent, such as resin soap, and a starchy material, such as flour and water, is used to emulsify tarry substances, asphalts, etc., for use on roads.

Building material. WILHELM BUCHMOLZ. Ger. 471,150, Jan. 13, 1928, addn. to 431,741, and 471,151, Feb. 18, 1928, addn. to 471,150. Ger. 342,593, 409,944, and 431,741 describe compns. for making rammed walls, etc., comprising dolomitic lime mixed with lava grit and (or) other volcanic deposits, blast-furnace slag, or concrete grit, a small addn. of a concrete cement being made to accelerate the hardening. Such compns. are now modified by addn. of trass or CaO to the initial mixt., to improve the thermal cond. (471,150), and by using warm Ca(OH)₂ soln. to bind the mass and further accelerate the hardening (471,151).

21—FUELS, GAS, TAR AND COKE

A. C. FIELDNER

The second industrial heating exhibition, 26 June-8 July, 1928, at Paris. ANON. *Chaleur ind.* 9, No. 98(1928).—This number is devoted to a general account of the exhibition. It was divided into A. (1) manuf. of solid fuels including lignite, peat, wood, briquets, (2) manuf. of liquid fuels including synthetic products, (3) manuf. of gaseous fuels including different kinds of gases and gas producers. B. Utilization of fuels including furnaces, grates, burners, construction work, refractories. C. Draft, natural and artificial. D. Heat utilization including high-pressure boilers, recuperators, steam-plant accessories. E. Heat Conservation. F. Heat control. G. Steam utilization. H. Heat technic. S. L. B. ETHERTON

Manufacture of smokeless fuel. P. WEISS AND N. BEAUGRAND. *Chaleur ind.* 9, 200-7(1928).—La Compagnie des Mines de Vicoigne, Noeux et Drocourt (V. N. D.) now sells an anthracite substitute called "anthracine" which is made from fines with 12-13% volatile matter mixed with a varying amt. of fatty or flaming coal and pitch, in a rotary press. The plant consists of 8 sheet-iron cylinders set around a central distributor. The cylinders are 5½ m. high by 3½ m. diam., with 2 poke holes. Steam may be admitted at the top or bottom and there are pyrometers at top, bottom and in the middle of the charge. The charge can be cooled before emptying from the furnace. The rate of heating is adjusted to previous lab. detns. The steam is withdrawn at 150-200° and contains tar which is worked up. There are 4 diagrams of the plant and 1 of the layout. S. L. B. ETHERTON

Fuels and their combustion. ROGER MARTIN. *Chaleur ind.* 10, 85-95(1929). The article deals with the detn. of the higher calorific value and the elementary analysis of a fuel, when its nature is known. The following cases are considered with graphical solns.: (A) Knowing the proximate analysis (1) to det. the elementary analysis of the fuel and its calorific value, (2) to det. the upper calorific value, (3) to det. the lower calorific value when (a) no C remains in the ash and (b) when C remains in the ash, (B) knowing the proximate analysis and its upper calorific value to find its elementary compn. The latter calcul. is asserted to be accurate. S. L. B. ETHERTON

Synthesis of fuels in Germany. M. MATIGNON. *Chaleur ind.* 9, 328-33(1928). Lignites or tars are hydrogenated by a modification of the Bergius process. The lignites are dried, grained, homogenized with tar or heavy products from earlier runs and hydrogenated in an autoclave similar to that used in NH₃ synthesis. Hydrogenation lasts 25-30 mins. at about 425-450° and about 80% of the C present in the lignite is liquefied. The refinery capacity is 50,000 tons. The generator is 35 m. high and makes 120,000 cu. m. hr. of gas. The problem of dust removal from the gas has not yet been solved. A short description of lignite mining is added. From 5 to 6 tons of lignite produce 1 ton of carburant, of which some 100,000 tons appear to be made; it is suitable for Diesel engine work. S. L. B. ETHERTON

Manufacture of lump fuels agglomerated by heating. HENRI DUPUY. *Chaleur ind.* 9, 292-3(1928).—Lean coal dusts are mixed with fatty coal dusts and are pressed in the usual briquetting press. These briquets are weak mechanically but can be charged to the skips used for heating. The heating lasts 40 mins., finishing at 680°. The loss in weight is about 5% calcd. on dry C and its volatile content is about 6%. The cohesion is better than that of ordinary briquets; the density is about 1.2, the hardness may be increased by finishing at a higher temp., and the fuel is ram and sun-proof. The fuel is heated in buckets by steam from a metal superheater. The gas obtained may be utilized. A sketch of the installation is added. S. L. B. E.

The different systems of storing liquid fuels. BRUNO MÖLLER. *Appar.-tech.* 41, 31-3(1929). J. H. MOORE

Low-temperature distillation. J. ARNOUL DE GREY. *Chaleur ind.* 9, 243-52(1928).—G. favors external heating with its admitted lower thermal yield, metal retorts because of better conduction and tightness, thin layers of charges, heating on one side and removing the gas on the opposite side, thereby avoiding cracking and other deleterious effects. Lower Thuringen lignite contains S 0.5-1, ash 5-10, moisture 30-50% and in the lab. gives 100-120 l. oil per dry ton. Before treating, the lignite is dried to 15-20% moisture. The semi-coke is briquetted for domestic consumption. The primary oil may be used in Diesel engines. A description of the Rolle plant is given. G. then classifies different types of retorts thus: (1) directly heated, (2) with refractory walls, (3) with thick metal enclosures, (4) with thin metal enclosures, (5) thin-walled furnace with perforated walls, discontinuous working.

(6) as in 5 but continuous charge and moving furnace and (7) as in 6 but with fixed furnace. G.'s retort is continuous, fixed, vertical and indirectly heated, it has a thin charge, and heating wall of metal; the opposite wall is perforated and also of metal; gas is drawn off there; a sketch is given. He has treated lignites and shales in his retorts. The resulting oil is sepd. from ammonia liquors by decantation. He then obtains 5-10 l. very light spirit, 15-30 l. light and heavy spirit, 30-45 l. lamp oil, 5-15 l. heavy oil per ton lignite. The retort may be heated either by gas obtained, the oil obtained or pulverized fuel. G. discusses the economics of this process and its exploitation at some length.

S. L. B. ETHERTON

The national interest in low-temperature distillation of fuel. The French process of André Hereng. CH. ROZAK. *Chaleur ind.* 10, 55-63(1929).—R. summarizes the work done on the chem. constitution of solid fossil fuels. He discusses the mechanism of low-temp. distn., coking tar production and distn. products from brown and black lignites and different types of coals charting the yields. Consumption and production figures are given for France and the general position low-temp. processes would have in that country is discussed. In considering typical installations R. emphasizes the seriousness of dust entrainment in the tar. An account is given of the Rolle furnace used in Germany for distn. of moist Saxony lignites. A description is given of the Tozer retort and the tar yield therefrom is considered not very satisfactory.

S. L. B. ETHERTON

Low-temperature distillation of coal. A. LEAUTÉ. *Chaleur ind.* 9, 208-16(1928).—L. gives a summary of the work on coking from 1918, including the prepn. and treatment of Trent amalgams. L.'s app. consists of a gas-heated superheater to heat steam to 500°, 3 pots in series, each contg. a perforated sheet iron basket of about 6 kg. capacity, a deoiler and a condenser. Conclusion: (a) Flaming coals alone under different heat treatment cannot be prevented from caking and swelling and the manuf. of a synthetic anthracite from this type of coal appears impossible; (b) with anthracene oil as a binder, dense and hard agglomerates can be obtained even with flaming coals, and mixed fat and lean coals may also be used to obtain this synthetic anthracite; (c) the use of anthracene oil as a binder avoids swelling; (d) for mixed coals, the use of anthracene oil is not vital; pitch will do or the Trent amalgam. Some notes are added on the tar produced.

S. L. B. ETHERTON

Low-temperature distillation of coal by gas currents. F. A. OETKEN. *Z. Ver. deut. Ing.* 73, 229 32(1929).—The use of heated gas circulating through coal, which is to be heated to about 500°, has these advantages: (a) intimate heat exchange, (b) high efficiency, (c) exact regulation of temp., (d) economical treatment of the products of distn., (e) simplicity of operation, and (f) freedom from breakdowns of app. and interruption of operation. The Lurgi process (cf. C. A. 19, 2121) employs a blast-furnace type of construction, with a hopper feed, a pre-heating zone below it, a distn. zone, and then a cooling compartment. Gas-air mixt. burners send heated gas into the middle of the preheating or drying zone and the distn. section of the shaft; volatilized products pass through an elec. (Cottrell) tar separator, a condenser and a light-oil washer. Methods of operation will vary greatly with the properties of the coals used. Typical installations are shown, with units treating up to 200 tons of lignite or other fuel per day, and converting them into semi-coke. Various com. conditions make it difficult to give figures on operation costs, etc. For the brown coal deposits of Germany, with their high bitumen content, the process offers great promise. Built in conjunction with power plants, gas works for supplying large-scale demands, or for supplementing city gas, the Lurgi process proves useful.

W. C. EBAUGH

Low-temperature distillation of coal and the utilization of semi-coke. ANDRÉ KLING AND DANIEL FLORENTIN. *Chaleur ind.* 9, 217-21(1928).—A brief survey. Low-temp. tar is of little value and its disposal is difficult.

S. L. B. ETHERTON

The present state of the low-temperature carbonization of coal and lignite. CH. BERTHELOT. *Chaleur ind.* 9, 253-4(1928).—A description of an installation at Heinitz, Mines Dominiiales de la Sarre. Washed slime with 32% volatile matter and 21% moisture is dried. The semi-coke at 500° with 13-14% volatile matter is mixed with washed fines and by the heat the moisture is reduced to 8%. The duration of carbonization at Heinitz is reduced by 20%. In the Saar, 85 parts of bituminous fines of 30-32% volatile are mixed with 15 parts of semi-coke. This mixture is carbonized in the usual way; it gives metallurgical coke of a structure resembling that at Mines de Nord and at the Pas-de-Calais.

S. L. B. ETHERTON

Hydrogenation at high temperature and high pressure. ANDRÉ KLING AND DANIEL FLORENTIN. *Chaleur ind.* 9, 231-6(1928).—Pyrogenation of org. compds. gives rise to complex mixts. The conversion of hydrates to anhydrides, alcs. to lac-

tones, acids to hydrocarbons by elimination of the CO_2 group, belong to one class of reactions. The cracking of hydrocarbons belongs to a second class of reactions. The product of pyrogenation depends on the temp. and upon the duration of heating, the latter being often the dominating factor. Cracking is still largely empirical and coal distn. even more so. K. and F. hydrogenated naphthalene and anthracene, phenols, cresols, naphthol, with and without catalysts, indicate their results. Hydrogenation permits the sepn. of aliphatic from cyclic and polycyclic mols., particularly with the use of catalysts of the type MX_3 .

S. L. B. ETHERTON

Coal resources of the Black Hills region. C. C. O'HARRA. *Black Hills Engineer* 17, 49-61(1929).—The coal deposits of the Black Hills region are Lower Cretaceous and Early Tertiary, i. e., they may be lignite or subbituminous. The Lower Cretaceous beds are 3-10 ft. thick; squeezes, rolls and partings occur. The coal makes good coke in the beehive ovens. The volatile matter is about 37%, fixed C about 44%, moisture 2-7%, S 4.7-6.8%; as high; calorific value averages 10,700 B. t. u. The gold value of the coke averages, \$2.46/ton, this occurrence of Au being rare. In east Wyoming and S. Dakota are the lignites. Air-dried lignites showed 10-20% moisture, volatile matter 32-4%, fixed C 33-40%, ash 7-15%, S 0.7-3%, av. moisture of mine samples 38.5%, calorific value 8750 B. t. u. The various types of lignites occurring are described and analyses of 12 samples from northwestern S. Dakota are given.

S. L. B. ETHERTON

Testing coal at the Government Testing Institute of Sweden. EVERT NORDIN. *Intern. Congress Testing Materials* 1927, II, 674-83.—Between 3.5 and 4.5 million tons of coal is used per year in Sweden; about 90% of this is imported largely from England and Scotland. For the past 30 years the examn. of coal has been carried out by the Government Testing Institute and during the last 5 years the author has made a comprehensive revision of the methods and app. employed in testing fuels; he is aided in this work by a close personal study of the procedures used in fuel labs. in Great Britain and in the U. S. A. Outline directions are given of the approved methods for taking samples of coal shipments and prepg. them for analysis, and for detg. moisture, ash, m. p. of ash, volatile matter and fixed C, combustion for C and H, S, N, P and heating value. Special emphasis is placed on methods of sampling; the wt. of the raw sample must be in correspondence with that of the parcel of coal and the properties of the coal, especially its piece-size. Tables are given showing the wts. of raw sample to be taken from a given wt. coal shipment (i. e., 100 tons or less—large coal, at least 500 kg., smalls, about 200 kg., up to 1500 kg. large coal from a shipment of 2000 tons or over), for the assembling of the part-samples, for reducing the raw sample to a final sample by means of successive crushing and halving, and % differences in % ash found in general samples taken from the same parcel of coal; the largest % difference found was 0.36%. Moisture or water-percentage is detd. in 2 or 3 stages. If the coal is wet the whole of the general sample (10-100 kg.) is dried; if the coal feels dry after drying is performed to a max. of 30°. The air-moisture which remains after the drying is detd. by heating for 1 hr. in a drying oven at 103°. For oxidation during drying there is added for older coals 0.2% and for younger coals 0.5%; corrections are obtained by check detns. with drying *in vacuo* and xylene-distn. methods. Ash is detd. by combustion in a gas muffle furnace with final temp. of 775°, measured by a pyrometer. Expts. showed that the effect of final temp. on ash-value varies but little within the temp. interval 600-1000° except for coal whose ash contained large units of certain carbonates. There appears to be no general connection between the color of ash and its m. p., although gray-white ashes have often a high m. p. The crucible test is frequently made; it is a slightly modified A. S. T. M. test for volatile matter and fixed C. An ocular examn. of the coke is considered of practical importance, cokes being reported in graded values as: (1) powder, not sintered; (2) sintered, not porous; (3) sintered, porous to some degree; (4) caked, very porous, with blistered appearance. S is detd. in the coal by Bachka's method and in the ash according to Hillebrand. N is detd. by Kjeldahl's method, with CuSO_4 instead of Hg as the contact substance. Expts. showed that results with CuSO_4 agree within 0.02% N with those obtained by using Hg. This avoids using the fetid Na_2S , usually added to ppt. the H_2 . An extended investigation comparing detns. for % N in coal by Kjeldahl's and by Dumas' methods showed that results were likely to be somewhat low by Kjeldahl's and a little too high when Dumas' system was employed. With Dumas' method it was found necessary to analyze the gas collected, since it frequently contained CH_4 . If any other gases beside N. When both detns. were carefully carried out results checked within an allowable margin. Heating values are detd. in a Berthelot-Mahler calorimetric bomb on air-dried pulverized coal, unbricketed, placed in a Pt crucible so there is

good access of O, but no spraying of the coal powder, which is ignited by a cotton thread running from a resistance thread in the bomb lid into the coal. Gross and net calorific values are calcd. Tests have proved that the % H in the coals imported is proportional to the production of gross calorific value and content of volatile matter in accordance with the formula, $\% H = 3.0 + 0.007 K_b G_i / 1000$. Since 1910, there has been employed in Sweden, on an ever increasing scale, the practice of buying coal against a regulation in price in accordance with analysis and accompanied by a guarantee of mine certificate. The theoretical basis for a price-fixing system is developed: $W = [(K_b - 54 H_b) (100 - A_i) (100 - F) / 10,000] - 6F$, where W = net calorific value of the coal, K_b = gross calorific value of combustible substance in the coal, H_b = % H in combustible substance of the coal, A_i = % ash in the H_2O -free sample and F = % water. The final price-formula given is $p = k K_b (100 - f A_i) (100 - F)$, where p = price to be paid for the given shipment of coal, k = a const., basic price for the standard coal of fixed ash % in water-free sample, A_i and net calorific value of coal as delivered = W ; f = a correction factor of from 1.5 to 2.5, usually 2 applied to A_i . For % ash there is a fixed tolerance of $\pm 1\%$ and for effective heating value of ± 150 cal. within which limits the price cannot be altered. Additions or reductions in price are made for each 0.5% variation in % ash, and each 50 cal. above or below tolerance limits, with certain fixed limits below which the purchaser is entitled to refuse to accept the parcel. The technical and economic aspects of certain of the analytical methods adopted and of the price-fixing system are discussed. W. W. HODGE

Testing of coal and coke. W. B. CALKINS, A. C. FIELDNER, W. H. FULWELER, W. A. SELVIO AND O. O. MALLERIS. *Intern. Congress Testing Materials* 1927, II, 641-55.—The variety of conditions under which coal and coke have to be sampled make it impossible to follow any one method without some deviation, but application of certain general principles will increase the value of samples taken. Coal should be sampled by taking: equal increments from a great many equal parts of the original quantity; increments of such size that the largest lumps may be included; such a quantity that the largest pieces of slate or impurities will be insignificant in proportion to the sample; in such a manner that a true proportion of all sizes will be secured and taken blindly, so far as slate and impurities are concerned. The original sample should be reduced in such a manner that the discarded part is exactly like that retained; there will be no unaccounted-for loss or gain in moisture; no dust or other material will be blown away or lost through cracks in the floor; no foreign matter will get into the sample. The same principles apply in sampling coke, but since by-product coke is usually much more homogeneous than the av. coal smaller samples will suffice. A review is presented of the work from 1899 of different committees appointed in America to study and devise standard methods for the analysis of coal and coke. Procedures are outlined for the standard shatter test and vol. of cell space of lump coke. Proposed tentative standard tests are given for the sieve test for detg. the size and uniformity of the coke pieces; the cu. ft. wt. test; and the hardness or tumbler test, designed to give a relative value for the resistance of coke to mechanical attrition in the blast furnace. The practical significance of results obtainable in these tests is stated. At present the results of the proximate analyses are relied upon for the preliminary information regarding the valuation of a gas coal. The gas coal should contain at least 35% volatile matter calcd. on the ash- and moisture-free basis; the ratio of fixed C to volatile matter, while not always a reliable index of the type of coal, should generally be between 1.4 and 2 for a gas coal and between 1.4 and 5.0 for coking coals. The moisture is a further rough check on the type of coal. If not subject to agreement by purchaser and seller, the mine moisture in the coal as mined should not exceed 4.0%. The ash in the dry gas coals should not be over 7%. The fusing temp. of ash of coals, for making domestic or industrial coke should not be below 2200° F.; for the coke to be used for manuf. of water gas the fusing temp. of the ash should preferably be higher than 2300° F. The compn. of the coal shall be such that the dry coke produced therefrom contain not over 1.5% S and the resultant gas contain no more than 30 grains of S in the form of compds. other than H_2S per 100 cu. ft. of gas. Gas coal shall produce a coke of sufficient size and strength to be suitable for domestic use or in the manuf. of water gas. A knowledge of the rank of the coal and its ultimate analysis is also helpful in judging as to probable characteristics of the gas, coke, tar and by-products it will produce upon carbonization. Various tests devised to give directly the yield of gas, coke, tar and ammonia are outlined and their relative value discussed. Utilization for exptl. purposes of 1 or more full-sized retorts of the type to be used industrially, or of lab. tests such as that developed by the U. S. Steel Corporation for detg. the by-product value of coals where suitable factors detd. by experience are applied to the lab.

data will probably give the nearest approach to results which will be obtained from large-scale operation. However, it is necessary that coal should be treated in large-scale app. under commercial operating conditions before one can be assured of its commercial value for gas manuf. A short general discussion follows the article. Many references to the literature on and to A. S. T. M. methods for sampling and analyzing coal and coke are given.

W. W. HODGE

New methods of investigating coal and coke. K. BUNTE. *Gas u. Wasserfach* 72, 124-7(1929).—At the Gasinstitut the following detns. are made on coal and coke: (1) ash detn., (a) cone m. p., (b) fusion curve of ash; (2) moisture detn.; (3) coking tests (a) "bubbling" test, (b) coking properties, (c) heat of coking, (d) detn. of percentage of coke-forming constituents; (4) volatile constituents; (a) calorific value of gas from gas coals, (b) distn. tests for coals to be used for low-temp. distn.; (5) reactivity of products of coking; (6) ultimate analysis. The tests are discussed critically and a bibliography is given.

R. W. RYAN

Why does coal coke? WILBERT J. HUFF. Johns Hopkins Univ. *Am. Gas J.* 130, No. 3, 40-3(1929).—Discussion of our present knowledge of the constitution of coal and the relation of this to its coking properties.

E. H.

Studies in the auto-combustion of coal. II. An observation of the characteristics of coal combustion. JIROSAEMON INABE, ICHIRO MIYAKAWA AND TO YAMADA. Kyushu Imp. Univ. *Bull. Tech. Dept. of Kyushu Imp. Univ.* 3, 210 7(1928).—Powdered coal was treated adiabatically with a definite quantity of O_2 gas and the rate of temp. rise $d\theta/dt$ was measured between 85.8° and 128.7°. This was substituted in the K of Arrhenius expression, $\ln K_1 - \ln K_2 = a[(1/\theta_1) - (1/\theta_2)]$, and after some transformation there was obtained the expression $\theta + a \ln \theta - (1/2)(a^2/\theta) - (1/2)(3)(a^3/\theta^2) - \dots - 1/((\gamma - 1)(\gamma)(a\gamma/\theta^{\gamma-1}) - \dots = K_1 + K'$, where K and K' are const. Calcn. showed that the temp. rises in 15 mins. at 22.5°, 52.5°, 82.5°, 112.5°, 142.5°, 172.5°, 202.5° and 232.5° are, resp., 0.005°, 0.07°, 0.3°, 1.4°, 5.2°, 16.4°, 78.1° and 208.3°. K. SOMEYA

Recent processes for the dry concentration of coal. W. BR. GUTACKER. *Montan. Rundschau* 21, 81-6(1929).—Dry concentrators for coal (and ore) work upon one of 3 principles, viz., concg. tables provided with a const. or intermittent air current; centrifugal force; or mixt. of air and sand. Descriptions and explanations are given for the Sutton, Steele and Steele concentrators developed in Texas and now used by the Birtley Iron Co. in Durham, England. Close classification of feed is necessary, but with the American Coal Cleaning Corporation's concentrator, provided with a Y-shaped table, greater variations in feed sizes are possible. Other concentrators of the same general type are those of Roberts and Schaffer Co., Chicago; Hugh Wood Co., Newcastle-upon-Tyne; Peale, Peacock and Ken Co., St. Benedict (Pen) and Woodall Duckham Co., London. With the Peale-Davis machine of 2 × 10 m., with an air consumption of 2000 cu. m./min., 100 tons per hr. can be treated. Pollock's and Pardee's spiral separators permit coal to flow down spiral chutes in such a way that the coal and refuse are sepd. by reason of their different coeffs. of friction. Such a separator 3-4 m. high and 1.5 m. in diam. has a capacity of 12 tons/hr.; many have been put into commission recently. In the Ayres concentrator coal is fed upon rotating plates, and in Mackley's belt concentrator it falls upon a tilted belt with roughened surface; in each case the sepn. is due to differences in friction coeffs. of coal and culm. The Bettisford concentrator depends upon the different elasticities of coal and gang; such a separator requiring 1.75 × 1.75 m. floor space can treat 15 tons/hr., but only with pieces of a min. size of 5 mm. Frazer-Yancey concentrators employ an air-sand mixt. of sp. gr. about 1.45 upon which the coal floats and through which the waste sinks; by sieving the sand is then recovered. This process does not have a wide adoption just now. Dry processes are better than wet in that the coal is left in a dry condition ready for shipment, briquet making, etc. On the other hand, coal contg. 3-4% admixed moisture must be dried before it can be dry-concd., the fire hazards are great, etc. Dry-concg. processes must be considered as still in the exptl. stage. A process of the Iron and Steel Smelting Co., Bochum, employs a combination of air currents on a veil of falling coal so regulated as to give good sepn. into different sizes and sp. gr.

W. C. EBAUGH

The pneumatic tables of Sutton, Steele and Steele in the mechanical preparation of coal and the consequent advantages. R. GUGL. *Chaleur ind.* 9, 63-7(1928).—The "Wye" separator is described. Superficial moisture does not matter in pneumatically sepg. coal larger than 3 mm. but is of the greatest importance in screening. Dust above 0.4 mm. is blown into sack filters. Dust is the chief problem in the dry cleaning of coal but the difficulty here is really the utilization of the collected matter. G. gives

2 tables showing ash content of various sized coals and considers advantages to the mine, the different industries and in coke and gas manuf. S. L. B. ETHERTON

Considerations of the present state of technic of pulverized coal. F. HORSARD. *Chaleur ind.* 9, 99-103(1928).—Most pulverizers are tube mills (Bonnot) or vertical pulverizers (Fuller-Raymond) of slow speed and the pulverized coal is sent directly to large hoppers before being transported to secondary hoppers at the point of consumption. The fuel before pulverizing is dried to 1% moisture. Individual pulverizers used at the point of consumption are almost universally high-speed impact machines and the coal is not dried but has a moisture content of 5% or exceptionally 7-8%. F. deals with the prepn. of the material for pulverizing and points out the recent tendency of reverting to individual pulverizers rather than to a central pulverizer. The tendency is to reduce combustion space and to reduce the size of the coal flame. To this end, air preheating and pronounced turbulence are of much help as is artificial cooling of the furnace walls. H. considers various methods of abating the dust emitted from chimneys of pulverized coal installations. S. L. B. ETHERTON

Oil recoveries from English coals. J. IVON GRAHAM. University of Birmingham. *Oil & Gas J.* 27, No. 31, 147(1928).—A review of recent expts. on the recovery of oil from the various constituents of coal by hydrogenation shows that the hydrogenation products vary with the type of coal used. Dried clarain dust hydrogenated at 420° and 124 atm. showed no considerable amt. of oil, the results showing that the initial reaction is one of removal of O₂ which may be removed by distn. with N and H. Suspension of the coal in phenol (2:1) and hydrogenating with or without catalysts in a 3-l. autoclave shows a final H pressure of 23 atm. as against 35 atm. initial pressure and when with N an initial pressure of 38 atm. and a final pressure of 41 atm. An analysis of the products of reaction in each case shows that in most coals an increase of oil content is obtained on hydrogenation. Parabittuminous coal gives best results. Gaseous products show an increase in every case except brown coal, which is probably due to cracking. On catalytic hydrogenation of coal, 3-10% phenols are formed. Although the original Bergius patents claimed non-catalytic hydrogenation, it is known that an Fe compd. is used ostensibly for the purpose of removing S. A study of catalytic hydrogenation using 5% FeO produced an increased yield of 2-3% oil. NiO is a better catalyst. Finely ground coal produces about 4% more oil than a noncoking coal. Boghead and cannel coal cannot be hydrogenated to give increased yields of oil. M. B. HART

Sorption of pyridine vapor by coal from Upper Silesia and by its petrographical modifications. W. SWIENTOSLAWSKI AND M. CHORAZY. *Bull. intern. acad. Polonaise* 1928, 361-5.—See C. A. 23, 953. ALBERT L. HENNE

Coal gasification in producers. FRITZ MORAWSKI. *Wartberg-Mürztal. Gas u. Wasserfach* 72, 149-54(1929).—Gasification of coal in a gas producer using (a) air alone, (b) air with water vapor and (c) air with water vapor and flue gas is discussed from a theoretical standpoint, giving theoretical gas and flame temps. When the gas is to be used hot, air alone is best, but when cold gas is to be burned, gasification with moist air is preferable. Warm water, heated by waste heat, is better than steam for humidifying the air blast. A saving of 5 to 7% of the coal may be realized by humidifying the air and humidification will also cause an increase in heating value of the gas. R. W. RYAN

Determination of the calorific value of coal from the proximate analysis. R. KATTWINKEL. *Teer u. Bitumen* 27, 49-52(1929).—The classification of coals and calcn. of their calorific values from their proximate analysis are discussed with extensive bibliography and data. The Goutal and König formulas are cited as the best, and the latter is recommended as giving very close approximations. F. S. GRANGER

The determination of the calorific value of brown coal by calculation. KARL D'HUARI. *Braunkohle* 27, 825-32(1928).—The various known methods are reviewed, with references. Three types of formulas exist, the first of which is based on elementary analysis, the 2nd on crucible analysis and the 3rd on the quantity of O₂ consumed in combustion. Of the first type, the Dulong formula gives uncertain values for brown coal. Better results are to be expected with the Vondrazek formula, since it is founded directly on expt. and checks other formulas based on expt. The Berthier method of the 3rd type, whose practicability has always been doubted, although based on unscientific assumptions, was found on trial to be not so inexact as has often been indicated by unfair comparison with the unsatisfactory Dulong formula. With the formulas based on crucible analysis, discrepancies of considerable magnitude between expt. and calcn. were obtained. If information on the coal field from which the specimen came is available, it is possible to det. the calorific value of the raw coal with

accuracy from the known calorific value of the pure coal and the moisture and ash content.

F. S. GRANGER

The gasification of Rhenish brown coal. HERMANN BECKER. *Braunkohle* 28, 121-6(1929).—The best working conditions, with reference to grate residues, piping, regulation and measurement of blast and gas pressure and flow, dust in gas and tar, hot vs. cold gas, tar, etc., are summarized.

F. S. GRANGER

Trials of a wood producer fed with peat. ALAIN LEMONNIER. *Chaleur ind.* 9, 289-92(1928).—Different results were obtained in the Valet producer by using granulated or straight peat. L. deduces that the calorific value of a fuel is insufficient to evaluate a fuel. L. favors the granulation process of Charles Roux, this giving better products in the producer. Crude peat is a very bad conductor, difficultly inflammable, but is very reactive, once it has been carbonized.

S. L. B. ETHERTON

Results obtained from the combination of a Sauvageot grate and a Siemen's producer. E. WIBRATTE. *Chaleur ind.* 9, 293-9(1928).—Such a combination (s) and a plain Siemen's producer (p) were run on the same fuel. The gas produced had (s) 3% CO₂, 0.7% O₂, 28.2% CO, 10.4% H₂, 55.6% N₂; (p) 9.6% CO₂, 1.2% O₂, 18.9% CO, 4.8% H₂, 64.7% N₂. The gas exit temp. (s) 700°, (p) 800° (the inlet air temp. being the same in each case), secondary air (s) 700°, (p) 800°; calories lost in ash (s) 74, (p) 587; lower calorific value of the gas (s) 1304, (p) 772; heat utilized (s) 82.6%, (p) 55-6%.

S. L. B. ETHERTON

Operating conditions of fused-ash producers and a comparative thermal balance. DESSEMOND and MAYENÇON. *Chaleur ind.* 9, 272-7(1928).—From shale contg. 50-60% ash, coke with 28-30% fixed impurity, some lime, etc., the gas obtained had a calorific value (lower) of 1200. Analyses of the slag and of the melt are given. The thermal balance is analyzed; the yield is 71.6%. The fused-ash producer is compared with (a) the blast furnace, (b) the ordinary producer of the steel works, (c) the special producer of Montrambert, with slow operation, automatic discharge, strong injection of steam and working on high-ash coke. The fused-ash does better than (a) and (b) but is just under (c). The question is also treated theoretically and the conclusions are that as regards the temp. of combustion, dry and warm draft is better than steam draft. If the temp. of combustion of the resulting gas is required to be higher, it is most economical to mix it with coke-oven gas. Theoretically the yield from the fused ash producer is good, but in addition it should be remembered that the fuel used contains about 50% ash, usually valueless. Working the producer on valueless shale gives enough heat for a warm blast for the blast furnace and also leaves a surplus heat. The discussion elucidates points in the paper.

S. L. B. ETHERTON

Recent improvements in producers for industrial gases and general installations of producers. M. GUÉRIN. *Chaleur ind.* 9, 278-81(1928).

S. L. B. ETHERTON

Study of gasification and the practical operation of producers. H. GUILLOU. *Chaleur ind.* 9, 581-7(1928).—A review of previous work shows that the theoretical study of the equil. conditions of C and its oxy compds. has given inadequate results. Steam injection has the advantage of lowering the temp. of the fuel bed, thereby avoiding fusion of the ash, converting sensible into latent heat, and it raises the calorific value of the gas. G. simply considers the production of CO, CO₂ and H₂ in the producer. Two qualities of mixed gas can be obtained (a) high in CO and N₂ and low in CO₂, (b) high in CO₂ and H₂ and low in N₂; the former has the higher calorific value, but is more difficult to make. Not all the steam injected is decomposed, the question of steam injection being considered at some length. The fuel bed is to be uniform in thickness, the fuel should be added evenly and ash should be regularly and evenly removed. The fuel should be well graded, with minimum fines. Combustion, blast and draft, should be uniform and well adjusted. Depth and surface pricking are taken up.

S. L. B. ETHERTON

Research—and a greater gas industry. ARTHUR D. LITTLE. *Am. Gas. Ass. Monthly* 10, 661-5, 682(1928).—The tremendous progress made by the electrical industries—lighting, power, the telephone, electric refrigeration, radio, television—is credited as the direct product of unremitting research. The technical, economic and publicity advantages to be gained by the gas industries cooperating with chem. research are mentioned. A no. of recent results of chem. research involving utilization of gas plant products are discussed: the gas-fired refrigerator, with the possibility of space cooling of homes, offices and factories, solid CO₂, the use of water gas in the synthesis of motor fuels, methane and other paraffin hydrocarbons, ammonia, methanol and other alcohols; and manif. of light oils and motor spirit by hydrogenation of coal and vapor phase cracking of gas oil. The beginnings of a great chem. industry based on natural gas are evident from the already achieved common production of ethylene

dichloride, ethyl chlorohydrin, ethylene glycol, amyl chlorides, alcohols and acetates. The energy-carrying capacity of a gas company's distribution system could be more than doubled by converting the blue water gas (300 B. t. u./cu. ft.) to methane (1000 B. t. u./cu. ft.) and a non-poisonous gas be thus supplied. If the CH_4 were mixed with 20% O_2 , the flame temp. would be raised about 10%. The present status and costs data for several of the processes are given. The creative power of research and its great possibilities when effectively applied to the gas industries are emphasized.

W. W. HODGE

A study of natural gas. K. STOCKFISCH. *Petroleum Z.* 24, 907-10(1928).—See C. A. 22, 4772.

M. B. HART

Chemical composition of Polish natural gases. K. KLING AND L. SUCHOWIAK. *Petroleum Times* 20, 919(1928); cf. C. A. 22, 4772.—The analyses of samples of natural gases from various districts and wells are given. The Jaeger-Ubbelohde-Czako method of analysis is used.

M. B. HART

The determination of low percentages of hydrogen sulfide in gas. H. BACH. *Gas u. Wasserfach* 72, 154-5(1929).—The usual methods of detg. H_2S in gas by gas analysis or by reaction with KI are not applicable to very small percentages of H_2S . B. passes 2 l. of gas, held over satd. (acidified) NaCl soln., through 25 cc. of 10% NaOH soln. in an inclined bubbling tube at the rate of approx. 1 l. per hr. The NaOH soln. is then diluted quantitatively to 100 cc. and a 10 cc. portion tested with 1 drop of alk. Pb acetate soln. (25 g. K Na tartrate, 5 g. NaOH , and 1 g. Pb acetate made up to 100 cc. with distd. water). If a strong brown color results, 10 cc. of the diluted sulfide soln. is made up to 100 cc. in a glass cylinder (Nessler tube) and 5 cc. of the Pb acetate soln. added and the soln. mixed well. Five cc. of the Pb acetate soln. and 95 cc. of distilled water are placed in a similar cylinder. As_2S_3 soln. (24 mg. per 100 cc.) is then added drop by drop with stirring until the color matches that of the unknown soln. One cc. of the As_2S_3 soln. is equal to 0.1 mg. of H_2S or 0.065 cc. at 0° and 760 mm. pressure. It is suggested that the As_2S_3 be prepd. in 1 g. tablets contg. 24 mg. As_2S_3 and 976 mg. anhyd. Na carbonate as these tablets are stable if kept in a dry dark place, while the soln. decomposes quickly.

R. W. RYAN

The manufacture of carbureted water gas. A. BARRIL. *Chaleur ind.* 9, 257-71 (1928).—B. studied the cracking of gas oil in a quartz tube electrically heated to 500° , 550° , 600° , 650° , 700° , 750° , 800° , 900° . The app. included means to catch tar, H_2S and naphthalene and a meter and gasholder. Cracking commences at 500° with a const. gas increment to 900° . The calorific value falls off, however, and the thermal yield increases to 650° and remains about 60-55% between 650° and 900° . At 700° there is much C_2H_4 . The tar yield falls with temp. but the density increases, the free C rapidly increases between 800° and 900° , while toluene and xylene fall off. Naphthalene is a max. at 750° . These results are clearly set out in curves and tables. To study the cracking of gas oil in the presence of blue water gas required a more complicated app.; a sketch is given of it. The results show that the thermal yield point is unchanged but yield is augmented. Max. yields are obtained by carburting between 650° and 690° ; naphthalene is max at 750° . Industrially it is desirable to crack between 650° and 700° . Cracking is endothermic. From the very numerous data in this paper and the price of gas oil the best working conditions can be calcd.

S. L. B. ETHERTON

The manufacture of low-gravity carbureted water gas. LEON J. WILLIEN. Bylesby Eng. Corp., Chicago. *J. Western Soc. Eng.* 34, 83-95(1929); cf. C. A. 22, 1226.—Mixing water gas with coal gas to care for peak production results in a marked variation in sp. gr. which frequently causes trouble in burner adjustment. Introducing 1.5 gals. of oil per M. into the top of the superheater during back runs decreased the CO_2 and increased the H_2 production, thus decreasing the sp. gr. to within the tolerance for coal gas (0.52) without reducing the B. t. u. The capacity of the set was increased 51% when using coal and 23% when using coke and the generator fuel was reduced from 29.7 to 21.9 per M. Introducing the oil into the carburetor was not satisfactory because of the failure to crack; introduction into the superheater was successful.

A. S. C.

Burning of coke breeze and blast-furnace gas under steam boilers. R. C. DUNOV AND OTTO DE LONNIZ. *J. Western Soc. Eng.* 34, 177-90(1929).—A no. of typical installations are described for burning (a) coke breeze alone, on travelling chain-grates; (b) lean blast-furnace gases, both dirty and cleaned; and (c) combinations of coke breeze and blast-furnace gases. The combination furnace has proved practical, its outstanding advantage being that it permits one boiler to be used for 2 kinds of fuel whose supply may vary greatly. In general, there is a practical advantage in locating both stoker and burner at the operating floor level, but this need not be the case when a

rear arch type of furnace is used. The type of furnace selected will be governed by the location of breeze bunkers, gas mains, type of boiler and ash-handling equipment. It is most desirable to have sep. furnaces for stokers and burners, with an adequate wall interposing to protect one from the other. In addn. there should be a large common combustion chamber located at and under the first bank of boiler tubes, and above the 2 sep. furnaces. Preheated air should be employed, especially with gas burners.

W. C. EBAUGH

The chemical utilization of coke-oven gas. VALLETTE. *Chaleur ind.* 9, 319-27 (1928); *Metallbörse* 18, 1856 (1928).—Coke-oven gas, after cleaning, etc., has the compn. by vol., H_2 50%, CH_4 25.2%, CO 7%, C_2H_4 1.2%, C_3H_8 0.3%, C_4H_{10} 0.5%, CO_2 2.6%, N_2 13%. H_2 can be removed and converted into NH_3 and thence into $(NH_4)_2SO_4$. The H_2 can also be converted into HNO_3 , NH_4NO_3 , etc., and also used in hydrogenation. The N_2 can be recovered but more will be required to be added if NH_3 is made. Since CO is a strong poison in NH_3 catalysis, its removal must be rigorous. Various methods are cited for the conversion of CO into alcs., aldehydes, etc., and the subsequent production of org. derivs. Divers cracking methods for CH_4 are considered and also the action of Cl_2 to obtain chlorohydrocarbons and of O_2 . It would be comparatively easy to remove C_2H_4 as its b. p. is -105° and it could be converted into $EtOH$ by absorption in H_2SO_4 or into Et_2O or Ca acetate or Et acetate. Reference is also made to working up into indigo and novocaine *via* ethylene chlorohydrin. C_3H_8 is converted into iso- $PrOH$ by the Standard Oil Co. and probably a similar process can be used by the coke-oven industry. This alc. is preferable to $EtOH$ in the perfume industry as having a more delicate odor. C_4H_{10} has not yet found extensive utilization. CO_2 is not utilized at present in the gas industry, but it may be easily removed and used in $(NH_4)_2CO_3$, $(NH_4)_2SO_4$, and urea manuf.

S. L. B. ETHERTON

Petroleum wash-oil thickening in the scrubbing of coke-oven gas. H. M. ULLMANN, D. S. CHAMBERLIN, C. W. SIMMONS AND M. A. THORPE. *Ichigh Univ. Ind. Eng. Chem.* 21, 313-4 (1929).—Heavy oil used to absorb light oils from coke-oven gas slowly increases in sp. gr. and "thickens," with reduction in absorptive capacity. This has been proved due to tar suspended in the gas which was pptd. by means of Cottrell pptn. The tar is high in S; hence the erroneous belief that S might be the cause of thickening. Coke gas contains 3.17 g. per cu. ft. of this tar.

A. S. CARTER

Corrosion of gas holders. J. S. THUNISSEN, JR. *Helv. Gas* 49, 104 9 (1929).—Expts. were made on the corrosion of iron plates in rain water and in gas holder water, the plates, exposed to air, were repeatedly moved up and down during periods of 1 to $1\frac{1}{2}$ years. When the plate was covered with "Imunol," a special paint oil used for protection of holders, practically no attack occurred; very little corrosion was found if a neutral engine oil were used instead. The water of the holder basin (contg. some cyanide) acted more vigorously than rain water; per sq. cm. surface 0.19 and 1.26 mg. of the material dissolved, resp. Plates hung up for 1 year in the holder tank at various elevations showed increased corrosion closer to the water surface. Inside the bell lubricating oil protected iron plates completely against corrosion.

B. J. C. VAN DER HOEVEN

Applications of centrifugal machines to various problems in gas transport. M. FARACCI. *Chaleur ind.* 9, 300 8 (1928).—The construction and details of multicellular centrifugal blowers are described and a longitudinal section is given together with a photograph of a winged extractor disk. The use of such machines for extn. of coke-oven gas is considered in some detail. The construction of monocellular extractors with radial vanes is described and their application to tar removal from gases is considered. The use of these machines in long-distance, high-pressure transmission is dealt with, and the handling of high-temp. steam and gas.

S. L. B. ETHERTON

The internal-combustion engine. Its working conditions and its eventual application to aviation. MAURICE ROY. *Chaleur ind.* 10, 11-8 (1929).—The development of the application of superheated steam and internal-combustion engines led to the study and use of special metals and alloys to withstand higher temps. Metals and alloys for an internal-combustion engine suited for aviation should be able to resist $800-1000^\circ$ at the turbocompressor exit, $1200-1400^\circ$ in the combustion chamber, and $700-860^\circ$ at the exit of the first distributor of the turbine. R. considers kerosene to consist of 40% $C_{12}H_{22}$, 25% $C_{14}H_{30}$, 15% $C_{16}H_{34}$, 20% $C_{18}H_{38}$, and, using Mallard-Le Chatelier and Pier-Bjerrum sp.-heat values, he calcs. the theoretical results obtainable under various cycles of operation and then discusses which conditions are feasible. If the degree of diln. of the combustion products be 300% and the degree of compression be between 5 and 45, then the degree of diln. will be almost 3 times that of the Diesel at 45 kg./sq. cm. Such diln. means added size and wt. To improve efficiency it will

be necessary first to improve the turbocompressor and also hot gas turbines. R. then discusses the requirements for aviation conditions. S. L. B. ETHERTON

The production and utilization of benzene in France. R. BRUNSCHWEIG. *Chaleur ind.* 9, 311-8(1928); cf. C. A. 22, 3760.—Production statistics for France, Germany and Great Britain are given. Utilization as a motor fuel is discussed. S. L. B. E.

Utilization of propane and butane. R. W. THOMAS, Phillips Petroleum Co., AND O. M. SETRUM, Philfuels Co. *Oil & Gas J.* 27, No. 22, 330, 332, 334(1928).—A survey of the properties and possible uses of natural-gas constituents indicates that at the present low gas-oil price levels butanes seem competitive at a common price per gallon for water-gas enrichment, and that this value will increase. Practical handling methods have been devised. The liquefied gases offer a potential sole raw material for economical gas manuf. M. B. HART

Determination of the calorific value of Diesel oil. F. V. WARNOCK. *Engineering* 126, 418(1928).—Satisfactory detns. of the calorific value of Diesel oil were made in a Darling calorimeter by absorbing the oil in kieselguhr before combustion. From 0.75 to 1.5 g. oil mixed with twice its weight of powd. kieselguhr gave the best results. Somewhat low values were given by this method because of heat losses from the calorimeter, but a control combustion with an oil of known calorific value provides a correction factor. J. W. SHIPLEY

Study of coke formation. R. A. MOTT AND TADAJI SHIMMURA. *J. Fuel Soc. (Japan)* 8, 172-90(1929).—See C. A. 23, 1247. F. I. NAKAMURA

The chemical control of boiler plant (RIDLEY) 14. Squandering fuel in commercial plants employing heat (GRAULICH) 13. The operation of Siemens-Martin furnace with coke-oven gas (BULLE) 9. Oil and gas from slack coal extracted by Hayes process (BALPH, McQUADE) 22. Propulsive efficiency of air and gas (POWER) 22. Automotive fuels and lubricants (SIBLEY) 22. Petroleum products for lighting and heating (SINGER) 22. Heat utilization in metallurgical plants (STCHEPINE) 9. Chemical aspects of stream pollution by phenols (THERIAULT) 14. Apparatus for drying granular coal (U. S. pat. 1,705,617) 1. Tunnel retort for the distillation of oil shale (U. S. pat. 1,706,128) 22. Carbon disulfide (Ger. pat. 469,839) 18. Rotary retort apparatus for distilling oil shale (Brit. pat. 295,225) 22. Freeing coffee berries from pulp and washing them before drying [to form combustible briquets] (Brit. pat. 295,515) 12. Oil extracting (Fr. pat. 646,703) 13. Heavy mineral oils (Ger. pat. 469,228) 22. Aldehydes, alcohols, etc. [from gases] (Brit. pat. 295,356) 10. Apparatus for grinding coal, etc., and separating the finer particles by the action of a fan (Brit. pat. 295,430) 1.

ARMSTRONG, J.: **Carbonization Technology and Engineering.** London: Charles Griffin and Co., Ltd. 36s. net.

Burning granular fuel. AUGUST FARNER. Ger. 471,325, Nov. 27, 1924. Incompletely consumed fuel is re-ground and returned to the combustion chamber.

Burning fuel of uneven particle size. GERTRUD FRANKE GEB. MOHNICKE, WOLFGANG FRANKE and CHRISTA RUHE GEB. FRANKE. Ger. 471,101, Nov. 25, 1924. Means are described whereby the fuel is winnowed on its way to the furnace and the fractions so obtained are fed separately and simultaneously to the furnace.

Agglomerating solid fuels. J. PINTSCH A. G. Brit. 295,327, Aug. 9, 1927. Pulverulent fuel such as brown coal is agglomerated in moist condition by subjecting it to a rotary motion such as may be given by a rotary cylinder which is slightly tilted.

Rotary retort apparatus (with internal shelves) for heating and distilling carbonaceous or other solid materials. H. NIELSEN and B. LAING. Brit. 295,755, May 18, 1927. Various structural details are specified.

Liquid fuel. EMILIO M. FLORES. Fr. 646,775, May 20, 1927. A liquid fuel is obtained by distg. products of any alc. or other fermentation along with carburants such as crude petroleum distn. products of mineral oils or coal, or synthetic carburants such as "tetralin," "decalin," "synthol," "synthene," "ketol," etc. Cf. C. A. 22, 1031.

Motor fuel. PAUL GIRARD, FERNAND PETIT and ALBERT CHARBONNEAU. Fr. 646,439, May 16, 1927. A fuel suitable for motors is obtained by reacting on the volatile substances or on the solid fuel itself in low-temp. distn. with a halogen or halogen acid or substances which liberate them on heating.

Fuel for internal combustion. LESTER KIRSCHBRAUN and CHARLES B. BELKNAP. U. S. 1,707,019, March. A relatively permanent emulsion is formed of

naphthenic acid, water and distillates comprising a mixt. of the gasoline, kerosene and gas-oil content of crude petroleum, in which the water is in the dispersed phase and the oil in the continuous phase. The distillates comprise at least 70% by volume of the product.

Vertical retort construction for low temperature carbonization of fuel. C. TURNER. Brit. 295,461, May 31, 1927. The charge is supported by a plurality of intermeshing vertical screws which also constitute a discharge device for the residual coke. Pipes are provided for the supply of superheated steam to the charge and for leading off gas, and various structural details are described.

Destructive hydrogenation. DEUTSCHE BERGIN A.-G. FÜR KOHLE- UND ERDÖL-CHEMIE (Arno Debo, inventor). Ger. 469,867, June 11, 1924. See U. S. 1,764,792 (C. A. 23, 2022).

Destructive hydrogenation. I. G. FARBENIND. A.-G. Brit. 295,947, Aug. 7, 1926. Metals of the 5th, 7th or 8th group of the periodic system or their compds. together with Al or its compds. are used as catalysts in destructive hydrogenation of carbonaceous materials. Brit. 295,948 specifies the use of U or its compds. together with elements of the second group of the periodic system or their compds. Brit. 295,949 specifies U or its compds. together with Al or its compds. as catalysts.

Destructive hydrogenation of carbonaceous materials. I. G. FARBENIND. A.-G. Brit. 295,587, Aug. 9, 1926. Destructive hydrogenation of coals, tars and their products is effected under a pressure of at least 20 atm. (and preferably 50 atm.) in the presence of a catalyst, consisting of Pb or Sn or their compds., on supports of magnesia or magnesite alone or mixed with other suitable substances.

Destructive distillation. ANTONIO G. PULT. Swiss 128,188, May 6, 1927. A still for the dry distn. of lignite comprises a straight chamber mounted at an angle to the furnace so that volatile products can escape at the upper end and liquid products at the lower end.

Distilling carbonaceous materials. ARTHUR M. A. STRUBEN. U. S. 1,706,468, March 26. Solid carbonaceous material to be distd. such as torbanite, oil shales, coal, brown coal, peat, lignite or tar sands, in comminuted form, is suspended in a hydrocarbon material such as a heavy oil or paraffin maintained in bulk in an enlarged zone and having a higher b. p. than that of the desired distillate of the solid carbonaceous material and heat is supplied directly to this zone and distn. is effected at as high a temp. as possible without distg. the bulk of the carrier material; the suspension is agitated, the distillate is removed, and the solid carbonaceous material remaining undistd. together with the hydrocarbon carrier allowed to settle in a separate zone, so that the carrier may be further used in the process. An app. is described.

Apparatus (with superposed material trays) for distillation of solid carbonaceous materials. F. M. SALERNI and METALLBANK UND METALLURGISCHE GES. A. G. Brit. 296,108, Feb. 25, 1927. See Can. 283,205 (C. A. 22, 4234).

Charging device for destructive-distillation retorts. AKT.-GES. DER MASCHINENFABRIK VON LOUIS GIROND. Swiss 127,745, Aug. 9, 1927. The device runs horizontally and has a suction app. to remove dust.

Vacuum system of flotation separation of coal, ores, etc. FRANK E. ELMORE. U. S. 1,706,281, March 19. An app. is described.

Apparatus for drying coal, etc. F. S. TUCKETT. Brit. 295,476, June 23, 1927. The material is passed over a series of superposed horizontal rotary plates co-acting with stationary scrapers and spreaders. A magnetic separator is arranged to separate iron from the material before it passes through the app.

Burning powdered fuels such as coal. RAY C. NEWHOUSE (to Allis-Chalmers Mfg. Co.). U. S. 1,706,300, March 19. The fuel and air are injected into a combustion chamber where the fuel is burned in suspension; the combustion products are mixed with combustion products, the temps. of which have been somewhat lowered, and this mixt. is passed through a heat-transfer device such as tubular steam boiler. An arrangement of app. is described.

Coking coal. SOC. ANON. D'OUGRÉE MARHAYE. Brit. 295,314, Aug. 9, 1927. Coals purified by a process such as is described in Brit. 295,312 (following abstract) so as to reduce their ash content to less than 1% are coked (suitably after briquetting with or without addn. of a binder) in a vertical or horizontal retort in which they are subjected to a current of highly heated fluid such as steam or N. Coke suitable for electrode manuf. may be thus obtained.

Purifying coal. SOC. ANON. D'OUGRÉE MARHAYE. Brit. 295,312, Aug. 9, 1927. A coal contg. less than 1.25% ash is reduced to granules of less than 10 mm. diam. and the coal is wetted by a succession of liquids of gradually increasing strength (such

as CaCl_2 solns. following a preliminary wetting with water) so that sepn. is finally effected by the "float-and-sink" method. Cf. C. A. 23, 1249.

Distilling coal or other solid carbonaceous fuels. WALTER E. TRENT (to Trent Process Corp.). U. S. 1,706,420, March 26. A plurality of heating mandrels in a retort are surrounded by the fuel to be distd. and these mandrels may be heated by combustion gases to effect distn. and carbonization. Details of the app. are described. U. S. 1,706,421 describes structural details of an app. with superposed hearths and rabbles for distg. carbonaceous materials such as coal or coal and oil mixts.

Apparatus (with superposed vertical retorts) for distilling coal, etc. PAUL DVOROKOVITZ. U. S. 1,706,825, March 26. Material such as coal is fed into the top of the upper retort, which is provided with an agitating device, and thence, through a valved connection into the lower retort; gas is supplied to the upper part of the retort chambers and gas outlets are provided at the bottom of both the upper and lower retort chambers. Various structural details are described.

Rotary drum apparatus for low-temperature distillation of coal, shale, oil, tar and carbonaceous refuse. J. H. ANDERSON. Brit. 295,503, July 25, 1927. The drum used contains loose metal bodies which free the drum from adhesions and serve also as heat distributors to the charge. Flanges extending inwardly from the walls of the drum (which is slightly inclined to the horizontal) serve to retain these metal bodies and keep them properly distributed throughout the drum. Various structural details are described.

Molding peat and the like. BOHUMIL JIROTKA. Ger. 466,987, Mar. 23, 1922. The method in which the peat, etc., is disintegrated and pressed into a continuous length, the length cut up and the pieces molded, is modified by sprinkling the cut pieces with dust, *e. g.*, coal dust, before the molding.

Montan wax. I. G. FARBENIND. A.-G. Brit. 296,145, June 9, 1927. Montan wax which has been bleached by oxidizing agents such as Cl , chromic acid, or air and HNO_3 , is treated by esterification or otherwise to convert the free org. acids at least in part into esters, metal salts, anhydrides, amides or their substitution products or ketones or other substances contg. the group $-\text{CO}-$ but not the group $-\text{COOH}$. A wax is thus obtained which does not crystallize and which is especially suitable for use in leather polishes or floor polishes. The treatment may be effected with EtOH , ethylene or butylene glycol, glycerol, butanol, $\text{Zn}(\text{OH})_2$, alkalis or alk. earths and if desired the fatty acids may in part be esterified and in part converted into salts. Cf. C. A. 23, 961.

Fractionating crude benzene. SOC. DES ÉTABLISSEMENTS BARBET. Brit. 295,591, Aug. 12, 1927. An arrangement of app. is described by which crude benzene is roughly sepd. into 4 products: benzene, toluene, xylene and solvent naphtha; the first 3 by continuous rectification under atm. pressure and the last by a discontinuous rectification *in vacuo*. Numerous structural details of the app. and details of procedure in its use are described.

Gas and liquid motor fuel from coal in a water-gas apparatus. DANIEL J. YOUNG. U. S. 1,706,686, March 26. Hot gases resulting from the blasting of fuel such as coal in a fuel chamber are passed through a heat-interchange chamber and, after desired temp. differences have been established in different zones of the app. used, fluids including air, steam, combustible gas and finely divided oil are admitted to the app. and subjected to heat treatment and reaction. The liquid and gaseous products are withdrawn and sepd. An app. is described.

Hot purification of distillation gases, etc. COMPAGNIE INTERNATIONALE POUR LA FABRICATION DES ESSENCES ET PETROLES. Brit. 295,272, Aug. 8, 1927. In hot purification of gases such as distn. gases used in the manuf. of liquid fuels in which metals or oxides (such as an oxide of Ni) are formed into sulfides and regenerated (one of 2 series of purifiers being placed alternately out of circuit for regeneration) an addnl. pair of small checking purifiers is arranged to follow the main app., each purifier being alternately placed in and out of circuit at much longer intervals and contg. metals such as Cu or oxides which form sulfides stable at the operative temp. of about 250° . Regeneration of the material in the main purifiers is effected in 3 stages. Numerous structural and operative details are described.

Reducing gases. AKTIESELSKAPET NORSK STAAL (ELEKTRISK-GAS-REDUKTION). Ger. 466,859, Dec. 20, 1927; Fr. 646,155, Dec. 24, 1927. Gases contg. CO_2 and steam are heated to about 1400° in an elec. arc and led through a layer of glowing carboniferous material. The heat so supplied not only permits the endothermic production of CO and H , but also melts the slag from the glowing material for tapping off. The carboniferous material may be in the same chamber as the arc.

Desulfurizing gases. FIRMA CARL STILL. Ger. 471,380, Sept. 14, 1927. The desulfurization of gases with an alk. suspension of Fe-O compds. is improved by using Fe-O compds. contg. at least 2% Mn, or by addn. of Mn to the suspension. Cf. C. A. 23, 2023.

Drying fuel gases. C. COOPER, D. M. HENSHAW and W. C. HOLMES & Co., Ltd. Brit. 295,411, April 7, 1927. In drying gases such as "town gas" with liquid absorbents, the rate of withdrawal of the liquid from the drying app. and its rate of return to the app. are maintained substantially constant during a complete sequence of diurnal or other cycle of variations in production and consumption so that the average concn. of the liquid and moisture content of the gas remain substantially constant. In case moisture deposits in the mains during a part of the cycle period, it is evapd. during another part of the cycle so that accumulation is avoided.

Treating coal gas, etc. C. OTTO & Co., G. M. B. H. Ger. 471,332, Aug. 10, 1926. In washing coal distn. gases prior to passing them through a tar separator and a saturator, the loss of washing liquid by evapn. is made good by using the condensate from a cooler arranged in advance of the tar separator.

Water gas. GAS UND TEER GES. Brit. 296,004, Aug. 24, 1927. In continuous generation of water gas from powdered fuel, steam and powdered fuel in a current of water gas are supplied through inlets near the bottom of a heated chamber and the water gas generated and the fuel residue passed through an outlet near the top of the chamber into a dust separator from which part of the water gas is discharged; the remainder of the water gas passes from the dust separator into a chamber where it is burnt with air, and the direction of materials through the app. is periodically reversed so that the chambers serve as heat regenerators. Various structural details are described.

Water-gas plant. FRANKFURTER GAS GES. and F. REICHARD. Brit. 295,900, Jan. 31, 1928. The blast gases are used to heat a steam boiler which is also heated by a continuous auxiliary fuel supply which is throttled during the blasting period.

Regenerative apparatus for continuous production of water gas. J. PINTSCH A.-G. Brit. 295,717, Aug. 19, 1927. Hot gas and steam enter a central tube of the app. and this tube is externally heated and surrounded by a regenerator. Powdered fuel is supplied to the central top portion of the tube. Various other structural details are described.

Hearth of gas-producer. LE CHAUFFAGE INDUSTRIEL. Fr. 646,581, Dec. 30, 1927.

Pyrogenic decomposition of hydrocarbon materials. I. G. FARBENIND. A. G. Brit. 296,034, Feb. 22, 1927. Coal, tars, mineral oils, bitumens, coal extn. products, coal hydrogenation products, oil shists or the like are atomized and heated with steam to effect decompn. with production of gases rich in olefins which are then heated, with or without pressure, and with or without catalysts, to produce liquid hydrocarbons of low b. p. which may in part be aromatic. A very large number of details are given as to catalysts which may be used and other features and modifications of the process.

Tar distillation. THE BARRETT CO. Fr. 646,858, Dec. 16, 1927. See Brit. 286,278 (C. A. 23, 266).

Distilling tar. S. P. MILLER (to Barrett Co.). Brit. 295,687, Aug. 17, 1927. A composite pitch compn. is obtained by subjecting tar to distn. by direct contact with hot coal gases to produce a high m. p. hard pitch residue which while still hot is blended with tar to form a homogeneous mixt. suitable for use as a liquid fuel, or creosoting or roofing compn. An arrangement of app. is described, in which pitches having a m. p. of about 150-200° may be obtained by the described procedure. Cf. C. A. 23, 961.

Distilling tar, oils, etc. W. RUNGE (to International Combustion Engineering Corp.). Brit. 295,945, Sept. 21, 1926. An arrangement of app. is described in which the material is heated by hot gases such as flue gases (by indirect contact) and these gases are subsequently used to condense vapors produced in the distn.

Distilling tars, oils, etc. W. RUNGE (to International Combustion Engineering Corp.). Brit. 295,946, Sept. 21, 1926. The hot gases produced in the distn. are freed from contained vapors by condensation and are then reheated and again introduced into the distn. chamber. An arrangement of app. is described which may include a still with a rotating casing as described in Brit. 277,952 (C. A. 22, 2497).

Oven for melting tar, asphalt, etc. MAX SCHULZE. Ger. 471,378, May 31, 1925.

Coking. GRASCHER SULZER A.-G. Swiss 127,684, Mar. 26, 1927. Addn. to Swiss 122,951. A dry cooling plant for glowing coke has a chamber near the ground with double walls forming a jacket into which cooling medium can flow from a reservoir.

Regenerative coking oven. HINDELMANN, KOKSOFENBAU, G. M. B. H. Ger. 471,190, Apr. 2, 1927. Addn. to 469,480.

Coking retort oven and regenerator construction. JOSEPH BECKER (to Koppers Co.). U. S. 1,706,476, March 26.

Coking retort oven and regenerator construction. JOSEPH VAN ACKEREN (to Koppers Co.). U. S. 1,705,841, March 19.

Coke oven wall construction. F. TOTZEK. Brit. 295,906, Feb. 16, 1928.

Semi-coke. KOKS- UND HALBKOKS-BRIKETTIERUNGS. G. M. B. H. (Ludwig Weber, inventor). Ger. 471,358, Oct. 15, 1926. Semi-coke is prepd. by low-temp. distn. of briquets prepd. from bituminous coal having more than 16% of volatile constituents and a water-sol. org. or inorg. binder, e. g., sulfite cellulose lye.

22—PETROLEUM, LUBRICANTS, ASPHALT AND WOOD PRODUCTS

W. F. FARAGHER

Apparatus and method for the separation, identification and determination of the chemical constituents of petroleum. EDW. WASHBURN, JOHANNES H. BRUUN AND MILDRED M. HICKS. *Bur. Standards J. Research* 2, 467-88(1929).—The heavier fractions of an Oklahoma petroleum were used, beginning with the gas-oil fraction. Distn. was conducted by holding the oil in the still at a const. temp., below cracking, and forcing dry pure CO₂ through it in streams of fine bubbles. The rectifying column of 20 plates had a sep. heating coil for each plate, so that complete control was possible. A temp gradient of 70° between bottom and top plate was maintained. The oil was distd. to 350° in 9 fractions. From some tests made as to the influence of an inert gas upon the amt. of cracking in the oil, estd. from the I no., it was clear that as between H, N and CO₂ there was little difference. When heating with CO₂ to 370° was continued for 20 hrs., the increase in I no. was less than 1/3 of that produced in contact with air by boiling for 20 hrs. under return condenser. For further fractionation of the fractions obtained as above, a series of all-glass vacuum stills was provided. Heating was by a bath of nickel shot electrically heated. Mol. stills were necessary for distg. the higher-melting paraffin waxes. Such stills are characterized by very high vacuum, large and clean vaporizing surface, short distance from vaporizing surface to condenser and sufficient temp. difference between vaporizing and condensing surface. Several forms of mol. still are shown. Where there is no recondensation on the evapg. surface, the rate of distn. of a given "molecular species" may be calcd. from Langmuir's formula, $n = pS\sqrt{1/2\pi MRT}$, in which n = no. of moles distg. per sec., p is vapor pressure at the evapg. surface at temp. T° K., S is the effective surface, M the mol. wt. and R the gas const. The temp. necessary for condensation may also be calcd.; or, the difference between vaporizing-surface and condenser-surface temp. may be taken to be not less than 60°. Crystn. and the equil. melting point method were applied to fractionation very successfully. No petroleum fraction was found which could not be crystd. readily. A metal-to-glass or glass-to-glass combustion app. gave accurate results and made it possible with the aid of a mol. wt. detn. to det. the empirical formula of any hydrocarbon up to C₁₀₀. EMMA E. CRANDAL

Petroleum industry in Japan. KEISABURO HASHIMOTO. *J. Fuel Soc. (Japan)* 8, 191-200(1929).—A review. F. I. NAKAMURA

Petroleum products for lighting and heating. L. SINGER. *Petroleum Z.* 24, 1125-9(1928).—A review of the literature and patents during 1927 relative to lighting and fuels including oil gas, carbureted water gas, air gas, etc., containing 71 references. M. B. HART

The development of the cholesterol question in petroleum chemistry. M. A. RAKUZIN. *Petroleum Z.* 24, 898-902(1928).—The literature on cholesterol and its decompn. products in petroleum since 1906 is reviewed and 29 references are given. M. B. HART

Animal and vegetable fats as mother substances of inactive constituents of petroleum. M. A. RAKUZIN. *Petroleum Z.* 24, 1519-20(1928).—Palmitic acid and stearic acid have been treated with AlCl₃ to produce in the former about 60% of a cryst. product which on purifying has been identified as a mixt. of paraffins having a mol. wt. of about 412 (Rast method) corresponding approx. to the compd. C₁₆H₃₄ and from the latter crystals having a mol. wt. of 511 corresponding approx. to the formula C₂₀H₄₂. M. B. HART

Bituminous shales and their relation to petroleum. A. F. V. STAHL. *Petroleum Z.* 24, 1171-2(1928).—Decayed sludge or sapropel is considered the source of petroleum,

the carbonaceous plant residue serving for the formation of bituminous shales whose oil content is too small to produce workable oil reservoirs. M. B. HART

Electrical dehydration of oil in the Comodoro Rivadavia Field Argentine. L. D. WYANT. *Natl. Petroleum News* 20, No. 42, 119-20, 124(1928).—Oil from the Comodoro Rivadavia oil field in the Argentine forms permanent emulsions which can be dehydrated by pipe stills as long as the water content is below 10%. Cottrell high-voltage elec. units operating at 80° with heavy oil and 65-70° for mixed oils have been used with success to dehydrate oils of higher water content. M. B. HART

Determination of halogens in the salt water of the Rumanian oil fields. P. PETRESCU. *Petroleum Z.* 24, 945-6(1928).—See C. A. 22, 3981. M. B. HART

Making oil-testing methods uniform. H. SCHLÖTER. *Petroleum Z.* 24, 699-701(1928).—Cf. C. A. 22, 2283, 2658. M. B. HART

Forty below zero chilling produces oil viscous when hot, fluid when cold. P. TRUESDELL. *Natl. Petroleum News* 21, No. 4, 27-8(1929).—A mixt. of Ranger and Burbank crude oils has been fire and steam distd. to a long residuum having a flash of 445° F., max. still temp. of 650° F., which was acid treated, neutralized, blended with naphtha and chilled to -10° F. as in the usual Sharples practice and then chilled by direct ammonia expansion to -40° F. and centrifuged in a Sharples machine. The chilled oil was split into 83.5% dewaxed oil and 16.5% petrolatum. The dewaxed oil was reduced by distn. and filtered to a 6 1/2 N. P. A. color to give an oil having the following properties: gravity 24.2, flash 445° F., fire 510° F., pour 0, cloud none at -8° F. The long residuum was also divided into overhead neutral and residual bright stock. M. B. HART

Forty below zero chilling produces oil viscous when hot, fluid when cold. M. B. MILLER. *Natl. Petroleum News* 21, No. 5, 69-70, 72(1929).—The ammonia absorption and direct expansion system used in cooling overhead oil or bright stocks, diluted with naphtha to -40° F., are described. M. B. HART

Oil and gas from slack coal extracted by Hayes process. J. BALPH, Coal Carbonization Co., AND M. J. McQUADE, Ben Franklin Coal Co. *Oil & Gas J.* 27, No. 39, 156, 167(1929).—The Hayes process for producing domestic fuel from slack coal is described. M. B. HART

Making bituminous coal from oil. WALTER F. RITTMAN. Carnegie Inst. Technology. *Oil & Gas J.* 27, No. 28, 54(1928).—See C. A. 23, 695. M. B. HART

Mechanical sniffer tells explosion hazard of oil-gas mixtures. H. H. HALL, S. O. Co. of California. *Natl. Petroleum News* 20, No. 52, 60-1(1928).—An electric detector comprising an elec. wheatstone bridge circuit having an electrically heated Pt filament in the circuit is used for the detection of explosive mixts. in tanks, cargo space on ships, etc. Samples of the gas to be tested are drawn over the Pt wire and the tendency to explode is read directly on an indicator dial. The Standard Oil Co. of California through Messrs. Williams and Johnson of Palo Alto, California, offer the app. to those interested. M. B. HART

Elimination of mosquito offers broad market for special oils. J. M. GINGRICH. *Oil & Gas J.* 27, No. 32, 150, 204(1928).—A suitable oil for mosquito extermination must kill rapidly, spread well and be long lasting. The specifications of such an oil are given: gravity, 30-34° B₆₀; flash, 130-140° F.; distn. range 10% over at 300° F., 40% over at 400-550° F., 50% over at 550-750° F.; viscosity 50 Saybolt at 100° F. Light fuel oil with proper blending to give the desired boiling range may serve as a basis for such an oil. The toxicity of 10 oil samples to salt marsh larvae is compared. M. B. HART

Determination of the properties of oils used in the absorption of gasoline from natural gas. L. D. McLOUTH. Pan American Petroleum Co. *Petroleum World (Los Angeles)* 13, No. 8, 102-6, 108(1928).—A series of expts. on absorption oils shows that oils having a distn. range of about 100° F. between 280° and 450° F. absorb more effectively as their gravities increase between 32 and 80 A. P. I. providing the initial b. p. is not less than 280° F. Absorption varies inversely with viscosity in this gravity range. Lean oil should be stripped as far as possible to insure absorption of volatile components. Absorption decreases with temp. increase between 40 and 100° and varies directly with abs. pressure, reaching a satn. point. Oil from a particular field does not appear to have a special relation to gas from that field. M. B. HART

Sulfur crude oils fast losing bad reputation. GEORGE RAIN. *Refiner & Gasoline Mfr.* 7, No. 8, 59, 62(1928).—Although the handling of high-S crude oils is attended by corrosion, by the use of chemicals for neutralization, the corrosion can be checked to a large extent and at very little addl. cost. The refining is completed by the usual methods with no redistn. of gasoline. M. B. HART

West Texas crude refining problems. H. H. HEWERTSON. *Beacon Oil Co. Oil & Gas J.* 27, No. 29, 118, 181, 182(1928).—The customary acid-doctor-rerun treatment of West Texas distillates does not remove the S. The use of large quantities of acid, e. g., 30 lbs. 66° acid per bbl., and rerunning reduced the S content of cracked distillates from 0.38 to 0.03% in the unsweetened gasoline. A preliminary treatment with doctor or hypochlorite tends to reduce the S but addnl. acid achieves the same result. Glacial acetic acid and sirupy phosphoric acid appear inert. Concd. HNO_3 apparently oxidizes and nitrates certain compds.; concd. halogen acids seem to form halides or addn. compds. with unsatd. compds. Hypochlorite does not remove S; vapor-phase clay treatment does not reduce the S content appreciably. Metallic chlorides sweeten but do not remove S; HgCl_2 forms compds. which cannot be washed out. Satd. solns. of mercuric salts, particularly the acetate, with H_2SO_4 reduce the S by 0.04 to 0.05% below that obtainable with acid alone. M. B. HART

The chemical composition of Rumanian crude oils according to source and geological occurrence. N. DANAILA AND V. STOENESCU. *Petroleum Z.* 24, 1303-9(1928).—Crude oil samples collected at the well have been fractionated to give fractions boiling below 145° and 145-300°, the first fraction being refractionated to give fractions 65-95°, 95-115°, 115-145°. Each fraction was dried over CaCl_2 for a day and distd. over metallic Na. Each fraction was analyzed to give the volatile content of aromatic hydrocarbons, olefins, hexahydroaromatics and satd. compds. Results obtained indicate that there is no relationship between chem. compn. of the oil and the geological era. M. B. HART

The low-temperature carbonization of shales. Present condition of the problem in different countries. DAVID BROWNLIE. *Chaleur et ind.* 9, 234-42(1928); cf. C. A. 23, 270.—Because of the development of oil fields, the exploitation of shales is having little success. Australia and Tasmania have worked at the problem for many years. The Pumphierston, Fell, Black and Bronder processes have been tried there but no com. solution has been found. Canada has large shale deposits which are under investigation on a large scale. Esthonia is one of the scientific leaders in shale exploitation. Importation of fuel is forbidden and the rich shales give 270-315 l. crude oil/ton; 750,000 tons of shale is thus utilized per yr. The Pintsch plant consists of very large vertical cylindrical retorts of sheet steel, internally heated by steam and air introduced at the base. As the charge descends, its temp. increases and vapors are evolved. B. says that France is not seriously studying the question of shale utilization. For modern working, very large retorts are required, allowing large charges of shale to be treated. The shale industry has made little progress in Germany, and in Gt. Britain, it is not prospering. The reasons assigned are: (1) Poorer shales are available; (2) the Pumphierston retort is imperfect; (3) the government is paying little attention to the industry. A brief description of the Crozier and Lamplough retorts is given. In Japanese Manchuria, there are vast deposits of shale from which Japan is endeavoring to obtain a fuel suitable for the Navy. The U. S. possesses very rich deposits of shale and in spite of the exploitation of petroleum, 75 processes for treating shale have been tried. Some information is given about the following processes: American Hydrocarbon Co., Brown, Cutlin, Chew, Crouse, Day-Heller, Debrey, Lamb and others. South Africa, Poland and Brazil are also giving attention to the exploitation of their shale deposits. S. L. B. ETHERTON

The use of bleaching earths in the mineral oil industry. O. ECKART. *Petroleum Z.* 24, 1441-3(1928).—Several references are cited in an attempt to bring the article by Typke (C. A. 22, 267) to date. M. B. HART

Improving mineral oil refining. F. SCHWARZ. *Petroleum Z.* 24, 803-10(1928).—In the pptn. method oils such as transformer oils are refined by alkali treatment of oils contg. naphthenic acids or by alkali treat of oils to which naphthenic acids have been added. The color-forming impurities in the oil are carried out by the colloidal action of soaps formed and removed by centrifugation. Oils so refined compare very favorably with oils refined by treatment with H_2SO_4 or acid and alkali treatment following the pptn. method. The use of acid treatment followed by the pptn. method is suitable for used oils. M. B. HART

A source of error in the determination of sulfur in mineral oils. K. FISCHER AND W. HESS. *Erdöl u. Teer B.* 83-4(1929).—An appreciable portion of the S appears as SO_2 in the combustion products, especially in the Hessinger app. in which the gases pass relatively slowly through a considerable length of tube at a temp. favorable to SO_2 formation. As a result of fog formation, it escapes absorption in the H_2O_2 soln. The fog can be caught completely by passing the gases leaving the absorber through a

moistened No. 4 Schott glass filter, or almost completely through 2 No. 3 filters in series. The latter permit a more rapid flow. F. S. GRANGER

The modifications of paraffin in various mineral oils. EWALD PYHÄLÄ. *Petroleum Z.* 24, 902-6(1928).—A study of the paraffin content of various Russian crude oils has shown that crude oil contains primary paraffin hydrocarbons with or without secondary mineral wax or ozocerite. The presence of dissolved ozocerite in paraffin contg. crude oils has been shown experimentally by the method of M. M. Tichwinsky, whereby the ozocerite is removed from emulsified oil by filtration. The formation of ozocerite deposits in rock fissures is due to the sedimentation of emulsified oil carrying flocculated ozocerite in suspension. The possible inorg. origin of ozocerite is pointed out. M. B. HART

Extinguishing burning mineral oils. M. A. RAKUZIN. *Petroleum Z.* 24, 1091-2 (1928).—Oil fires are readily extinguished by the action of 6-8% Na_2CO_3 and K_2CO_3 solns. whereas $(\text{NH}_4)_2\text{CO}_3$, NaCl , CaCl_2 , BaCl_2 , $\text{Fe}_2(\text{SO}_4)_3$, alum, $\text{Pb}(\text{OAc})_2$ and dil. and concd. NH_4OH solns. have no effect. The effect of the use of soda soln. on kerosene is to increase the sp. gr. and flash, and produce a brownish color which may be removed with H_2SO_4 . It is not improbable that Na salts of the naphthenic acids may exert fire-extinguishing effect. M. B. HART

Breakdown of insulating mineral oils. T. AIKAWA. *Electrotech. Lab. Tokyo, Japan, Circ. No. 46*, 47 pp.(1927); *Science Abstracts* 31B, 301. A review of the dielectric strength of mineral oils affected by moisture, temp. and impurities of low insulating property, with the results of many breakdown tests made on several com. transformer and switch oils. The electrodes used in the breakdown test were two brass balls of 12.5 mm. in diam. and 2.5 mm. apart. The phenomena of breakdown were observed by means of a telescope, oscillograph and high-speed motion-picture camera. The av. breakdown voltage (500-1000 tests) of each sample was above 25 kv., but the breakdown voltage sometimes dropped to 10 or 12 kv. in consequence of the presence of fibrous material, dust, etc. H. C.

New process for the filtration of insulating oils. F. SOCCART. *Rev. gén. élec.* 23, 749-52(1928); *Science Abstracts* 31B, 348. Sheets of specially prepd. collodion, which may be used in an ordinary filter press, are made by an impregnating process on a cotton or silk support, the peculiarity of the process being that it leaves the sheet perforated with closely spaced, minute holes of the order of millionths of a mm. in diameter. By "ultra-filtration" with these membranes colloidal C can be removed without choking the pores of the membrane, which can be surface cleaned and used again. Considerable improvement, both as regards the dielectric strength and the index of emulsification, is claimed for oil treated in this way. A filter press has been re-equipped with membranes 1 sq. m. in area, and is capable of cleaning 20 kg. of oil (presumably per hr.) at one pass with a pressure of 1 kg. per sq. cm. H. L. D.

Improving fractionation for cracking processes. D. B. KEYES. *Chem. Met. Eng.* 36, 78; *Natl. Petroleum News* 21, No. 11, 78-9(1929). Two methods are proposed for obtaining better fractionation of cracked products. Both methods consist essentially in passing the vapors to be fractionated through a heating coil in the lower part of the bubble tower before discharging the vapors into the tower at an intermediate point. The top of the tower is cooled by means of a coil through which fresh feed stock is passed. D. F. BROWN

Fractionation at low temperature. O. G. OBERFELL AND R. C. ALDEN. *Phillips Petroleum Co. (Oil & Gas J.)* 27, No. 22, 142, 364, 366, 368, 370, 372(1928). The modified Shepherd-Porter app. as developed in the lab. of the Phillips Petroleum Co. is described, together with the method of operation for natural gasoline, motor fuel and gases. M. B. HART

High-pressure fractionation method. G. G. OBERFELL, L. S. GREGORY AND T. W. LUCATEKI. *Oil & Gas J.* 27, No. 22, 251, 281(1928).—An app. for the fractionation of natural gasoline consists of a 5 gallon capacity still with an ordinary rectifying column, a dephlegmator, condenser, receiver and cooler. The rectifying column is filled with small pieces of metallic strips having deep corrugations. The set up and use of the app. are described. M. B. HART

in the vapor phase. S. J. M. AULD. *Petroleum Times* 21, 29-100, 186-60(1929).—The Hall, Rittman and Ramage processes have been of particular interest in the development of vapor-phase cracking-processes. The Ramage process under the name of the Gyro process is again of interest as a means of producing gasoline having high compression and anti-knock value. The process as now carried out is described and yields are given. M. B. HART

Tests show sulfur content of different fractions. H. L. KAUFFMAN. *Refiner*

Natural Gasoline Mfr. 7, No. 8, 73-4(1928).—The S content is given of gasoline, kerosene, gas, oil, wax distillate, fractions and bottoms of Lander, Wyo., crude oils having an original S content of 3.16% (bomb method) and Lost Soldier, Wyo., crude oils having an original S content of 0.23%.

M. B. HART

Formation of acetic acid in heat and pressure cracking. F. W. HALL AND R. DE M. TAVEAU. *Oil & Gas J.* 27, No. 29, 110, 286(1928).—The presence and source of fatty acids in cracking crudes have been proved by sapon. of gas oils and washing out the acids from the soap soln. Naphthenic acids were heated at 815° F. under a pressure of 200 lbs. per sq. in. in an exptl. still having a reflux condenser and after the Fe was removed from an aq. ext. of the material remaining in the still, the soln. was esterified with C_2H_5OH with the subsequent production of ethyl acetate and other esters. This indicates that fatty acids may be formed from naphthenic acids in cracking. Recent work with acid water from virgin gas oils in which the acids have been sepd. by the methods used for recovery of acetic acid from pyroligneous liquor shows the acetic acid content of the acid water to be about 1.54%. The analysis of a sample of volatile acids from the acid is given.

M. B. HART

Kvitko cracking still. A. M. TREGUBOV. *Proc. of the First All-Russian Scientific Tech. Mining Congress 1926* 5, 42-53(1928).—Mazout after preheating is cracked at 420-430° and 5 atm. pressure in a shell still 7.1 m. long and 0.885 m. in diam. which has been tested with cold solar oil at 25 atm. The heating is discontinued after 25% has distd. over and the cracking continued by radiant heat from the furnace until 50-60% of the original charge is left in the still. Fresh stock may be added during the operation if required, preheating it by contact with the hot vapors in the vapor-line. Three air-cooled dephlegmators are connected to the still, which may be used separately if desired. Each contains 19 tubes. The total cooling surface of the 3 dephlegmators is 16 sq. m. A pressure-reducing valve is placed after the dephlegmator, connecting with a large condenser which can handle 800 kg. of oil per hr. Two reducing valves are attached to the condenser, one discharging the condensate to the storage tank, the other discharging the gas through a scrubber, where it passes to the gas holder. A small cooling coil is attached to the dephlegmator to cool the condensed oil. Condensers are also provided on the safety valves and on the bottoms-discharge pipe on the still.

A. A. BOEHLINGK

Pure Oil Co. making further installations of Gyro cracking process. G. REID. *Refiner Natural Gasoline Mfr.* 8, No. 1, 68-70(1929). The Gyro process is being installed by the Pure Oil Co. at its Smith's Bluff, Texas, and Heath, Ohio plants. The process consists in passing vapors of any oil through a tube still and evaporator from which steam and oil vapors pass through a separator and into a catalyst chamber. The mixt. is heated to 1100° F. The catalyst consists of a cylindrical core of concrete impregnated with iron oxide. Vapors from the converter are passed through a tar leg, fractionating tower, vapor-phase treating tower, a second fractionating tower and condenser.

M. B. HART

The Lurgi retorting process. F. A. VETKEN AND O. HUBMANN. *Petroleum Z.* 24, 977-82(1928).—The Lurgi low-temp. process which operates on lignite, cannel coal, shales, etc., consists in passing the charge through drying, distn. and cooling zones in a vertical retort where it is heated by waste gases passing upwardly through the retort to which combustion gases are added as desired. Yields when running with lignite and brown coal are given.

M. B. HART

Kiton process. OTTO BAUMGARTNER. *Petroleum Z.* 24, 1617-8(1928).—The use of a special tar-bitumen emulsion "Kiton" is described.

M. B. HART

A simple graphical analysis found better than analytical methods for distillation problems. E. G. RAGATZ. *Petroleum World* (Los Angeles) 13, No. 12, 102-3, 115 (1928); *Oil & Gas J.* 27, No. 33, 140-1(1929).—The graphical method for absorption and distn. problems is developed with concrete examples.

M. B. HART

Progress in combating the corrosion of pressure stills. W. F. FARAGHER. *Am. Petroleum Inst., Bull.* 10, No. 2, 102-6(1928); *Petroleum Times* 21, No. 522, 43-4(1929).—Chromium steel tubes containing 17 to 20% of chromium resist the corrosive action of high-sulfur oils, but are too brittle for use. The alloys are said to be free from that defect if the chromium is limited to 14% or under. Tubes containing 5% of chromium last 3 to 4 times as long as plain steel tubes and cost 2½ times as much. Chrome iron tubes are resistant to corrosion and may be used for vapor-phase coils where their brittleness is not a drawback. Coke deposits in them more slowly than in steel tubes. Calorizing prevents corrosion by furnace gases and by hot corrosive cracked oils if the coating is not ruptured. Chromium plating gives very good protection in chambers, but in tubes the plating is so far too easily ruptured in cleaning. The use of soda or

lime as neutralizer is apparently not increasing. Lime is preferred because it has less tendency than soda to clog up the tubes. The Roxana Petroleum Corporation applies a coating of portland cement, sand, and pulverized fire brick mixed, to the interior of chambers, with good results. The Universal Oil Products Co. has developed a coating composed of water glass, sand, and furnace cement. In the best of the tests thus far made the coating has adhered well and given complete protection to the surface covered.

EMMA E. CRANDAL

Corrosion. H. F. PERKINS. *Am. Petroleum Inst., Bull.* 10, No. 2, 100-2(1928).—The Refinery Sub-Committee of the A. P. I. General Committee on Corrosion is engaged in collecting records of such tests and observations as are being made in the refineries looking to the reduction of corrosion. With a sufficient mass of such material collected and correlated it will be possible to send out to refiners standardized methods of testing and to equipment manufacturers the information necessary for perfecting their product with reference to its special use.

EMMA E. CRANDAL

Smooth operation of stabilizer by feeding through surge tank. E. R. COX. *Texas Co. Natl. Petroleum News* 21, No. 6, 70, 72(1929).—A discussion of various factors affecting stabilization indicates that the feed is best controlled by combining all streams in a surge tank and feeding the mixt. into the column at one level. The upper limit of column capacity is indicated when a column primes; the most effective head of liquid seems to be 4 to 6 in.

M. B. HART

Converting carbons by catalysis. CARL KRAUCH. I. G. Farbenindustrie. *Oil & Gas J.* 27, No. 39, 156, 158, 160(1929).—The conversion reactions of CH_4 and higher hydrocarbons in the presence of catalysts are discussed. The decompn. of CH_4 to give C_2H_2 and H_2 or C and H_2 is easily shifted and the first reaction is best conducted by heating in an elec. arc. With aliphatic hydrocarbons the C—C linkage is more easily broken than the C—H linkage, but catalysts vary in their attack on the molecule. C chains, are split by V, Mo, W, U and their oxides, while Cu, Ni, S and Se tend to promote dehydrogenation. Fe lowers the cracking temp. and favors dehydrogenation of aromatic and hydroaromatic hydrocarbons, but promotes condensation. AlCl_3 acts as a cracking or polymerizing catalyst. BF_3 and AlCl_3 are well suited for lubricating oil manuf. By oxidizing paraffin, fatty acids are produced. Antiknock compds. such as iron carbonyl, lead tetraethyl, etc., are neg. catalysts. Industrial hydrogenation is conducted with the oil or tar (1) in the form of a spray conducted over the catalyst (2) vaporized and (3) in the liquid phase. General hydrogenating conditions for oil and coal are reviewed.

M. B. HART

Use of catalytic agents in revivifying used filter clay. F. R. LANG, A. P. ANDERSON AND G. H. VON FUCHS. *Oil & Gas J.* 27, No. 29, 114, 258(1928).—Although the use of catalysts in the revivification of used clay at 1000° produces lighter colored clay than samples to which no catalysts were added, in all but two cases, Cd and Al, the decolorizing effect of the clay was impaired. Derivs. of Cu, Fe, or Zn showed the worst effect.

M. B. HART

Naphthalenesulfonic acids. ST. V. PILAT AND E. DAVIDSON. *Petroleum Z.* 24, 1550-61(1928).—Crude naphthalenesulfonic acids have been treated with dil. NaOH followed by repeated extns. with ether, the ether exts. evapd. and dried at 120°. The product so obtained has been studied by the acetone method and found to be a mixt. of monobasic acids. Two series of salts are formed which may be distinguished as α - and β -salts by their soly. in ether. The mol. wt. detn. of the ether-sol. Ba salts corresponds to a compd. having the formula $\text{C}_{10}\text{H}_7\text{SO}_3\text{H}$.

M. B. HART

Propulsive efficiency of air and gas. HARRY H. POWER. *Gypsy Oil Co. Oil & Gas J.* 27, No. 22, 164, 352, 354, 356, 359(1928).—The soly. of N_2 in oil is close to that of air and less than that of natural gas. Whereas increments of dissolved gas lower the abs. viscosity of oil, dissolved N_2 up to a certain crit. point lowers the abs. viscosity to a min. beyond which addnl. dissolved N_2 tends to increase the viscosity of the oil up to a certain satn. pressure (200 lbs.). N_2 is superior to natural gas as a propulsive agent. Up to this pressure the viscosities of the gas-satd. and N-satd. oils are close to each other while the Jamin effect is greater with natural gas.

M. B. HART

Specific gravity of liquefied gas. G. G. ONSFELD, T. W. LEGATSKI AND F. E. FRANK. *Phillips Petroleum Co. Oil & Gas J.* 27, No. 33, 148, 158(1929).—A new gr. bomb for volatile liquids is described giving specifications, calibration and test procedure. Filling densities for liquefied petroleum gases having gravities of 0.500-0.585 are tabulated.

M. B. HART

Determination of evaporation losses. E. C. HUNTZEL AND WILLIAM MENDIES. *Shell Refining Co. Oil & Gas J.* 27, No. 29, 124, 167-8(1928).—The detn. of rates

quantities and qualities of gases available from tankage under various conditions is reported. The data show that exhalation on full tankage is small with insulated roofs and water sprays; breathing is large with partially filled tanks, a water spray effecting greatest reduction; exhalation is major after sunrise, inhalation occurring in the cool of the late afternoon. "Pumping-in breathing" for gasoline and crude oil is about 160% of oil displacement representing an oil loss of 0.27%. Tables are given to show variation of properties of the gas for the range of temp. conditions, effect of temp. of oil and air on the characteristics of breathing from crude and gasoline storage, effect of tank pressure on pressure distillate gas. Possible gasoline recovery available from crude and light oil tankage in a 10,000 bbl. refinery is shown as follows: vol. exhaled gases, 500,000 cu. ft.; gross heat value of exhaled gases, 600,000 B. t. u.; liquid vol. of loss, 126 bbls.; liquid vol. recoverable from treating, 60 bbls. M. B. HART

Comparison of Soviet and American kerosenes. S. NAMETKIN. *Petroleum Z.* 24, 1515-9(1928).—See C. A. 22, 2459. M. B. HART

Flash-point determination in standard flash-point testers. G. MEYERHEIM AND FR. FRANK. Chem. Lab. für Handel u. Industrie, Berlin. *Petroleum Z.* 24, 1235-7 (1928).—See C. A. 22, 3039. M. B. HART

Third annual survey of Tulsa gasolines. W. T. ZIEGENHAIN. *Oil & Gas J.* 27, No. 31, 130-2(1928).—Samples of 19 gasolines representative of gasolines sold in the Southwest and Middle West show little change in motor grade from year to year in the product from any one company, that of different companies varying in volatility. Many regular grades are high in antiknock value as shown by high aromatic content. In premium-grade fuels stress is laid on antiknock value. The volatility of the last 50% is more than that a year ago. Blends are improved by the use of low end point naphtha and stabilized natural gasoline. Comparative tests on samples are tabulated. M. B. HART

Several factors to consider in blending natural gasoline. H. G. STEVENSON. Columbian Gasoline Corp. *Oil & Gas J.* 27, No. 36, 126, 133(1929).—The methods used in cold blending gasolines in tanks and cars are briefly described. M. B. HART

Notes on drip gasoline. ALEXANDER B. MORRIS. *Refiner Natural Gasoline Mfr.* 7, No. 8, 78, 80, 98, 100(1928).—In studying drip formation in natural gas lines, various drips were placed at key locations and the samples obtained daily from each were reported with the following data: air temp., gas temp., gasoline temp., state of weather and Standard Engler distn. of the sample. Results show that for the accumulation at any one drip there is no definite relation between winter and summer accumulations, those near the vacuum discharge making more in the winter, but those on the branch lines less in cold weather. M. B. HART

Distillation of natural gasoline. WALTER J. PODBIELNIAK. *Oil & Gas J.* 27, No. 28, 168, 170, 172, 174, 176(1928).—The phys. chem. principles of distn. are reviewed including vapor-pressure curves and their value, influence of pressure on the sepn. obtainable by vaporization of 2 or more hydrocarbons and application of Raoult's law. M. B. HART

Comparison of gasoline content as determined by charcoal test with that based on analysis. P. W. HILL. General Petroleum Corp. *Petroleum World* (Los Angeles) 14, No. 1, 101, 110-1(1929).—A comparison of the gasoline content of gas as obtained by fractionation and charcoal absorption shows that the charcoal test comes within, roughly, 10% plus or minus of the calcd. value and that the av. deviation is approx. 5%, in favor of the fractionation results. Possible causes of discrepancies are pointed out. M. B. HART

Molecular weight determination of Groznuil gasoline by its latent heat of vaporization and vapor tension. N. I. CHERNOZHUKOV. *Izvestiya Teplolekhn. Inst. (Trans. Thermo-Tech. Inst. (Russia))* No. 4, 1927, 25-7.—Mol. wts of Groznuil gasolines were calcd.

by the following equation worked out by C. Mx $\frac{T_2 T_1 M}{T_1 T_2}$ where T_2 and T_1 are the temps. abs. of the unknown compd. and T_1 and T_2 of the standard compd., which is a chem. homolog and therefore could be any satd. hydrocarbon, as hexane, octane, etc., for the mol. wt. detn. of Groznuil gasoline, composed mostly of paraffins. Logarithms P and T of the standard and the hydrocarbon of unknown mol. wt. are plotted on the axes and lines of identical vapor concns. drawn through these curves according to Hildebrand. The intersections of these lines with the curves of vapor tensions would then correspond to T_1 , T_2 , T_3 , and T_4 . A. A. BOEHLINGEK

Determination of the gasoline
POLZIK. *Izvestiya Teplolekhn. Inst.*

by the _____ method. I. M.
Thermo-Tech. Inst. (Russia)) 1927, No.

4, 14-18; cf. C. A. 22, 4239.—The American method was modified as follows: The bomb for gasoline was not rinsed before the test but immersed, together with the vessel contg. the sample of gasoline, in a water bath until the temp. of the bath was reached, requiring up to 1.5 hrs. It was necessary to check the pressure gage every two weeks. The table gives comparison tests of Krasnodar aviation gasoline. The temp. of gasoline was 5°; the gases were released at 20°. Pressure is given in lbs. per sq. in.

Temp. of heating	1st. expt. with rinsing	2nd. expt. with rinsing	3rd. expt. with rinsing
30°	6.4	6.3	6.5
40°	11.3	11.4	11.4
50°	16.8	16.6	16.7

Tables are given for tests with Krasnodar, Grozny aviation gasoline, first and second grade of Grozny gasoline, second-grade Baku gasoline, "Kalooha" gasoline (used in the manufacture of rubber boots); also for Krasnodar aviation gasoline of 80° final b. p.

A. A. BOEHTLINGER

Extraction of gasoline from gas. G. A. SARKISYANTZ. *Proc. of the First All-Russian Mining Scientific Tech. Mining Congress 1926*, 139-75(1928).—The following processes and installations are described: a casinghead manifold as used by the Surakhmud Division, a portable compressed-gas analyzer, a Westcott gas analyzer modified by S., a combined gas-absorption and compression app. (up to 16 atm.) and Tikhvinskii gasoline-absorption plant, where casinghead gas is used for re-pressuring wells. Some typical cases are discussed, e. g., absorption of gasoline with tetralin and the Burdell method. Various charcoal- and oil-absorption installations are described and yields calculated.

A. A. BOEHTLINGER

Gasoline from casinghead gas in Groznuii. S. KH. KHANBEKOV. *Proc. First All-Russian Scientific Tech. Mining Congress 1926*, 177-91(1928). Four hundred and eighty-two l. of casinghead gas from gusher No. 54-147 in the Solenaya Balka contained 475 cc. (985.5 cc. per cu. m.) of gasoline which was sepd. as follows: 150 cc. was retained by a gas trap and a Wolff bottle after cooling in a Cu coil surrounded by ice; 195 cc. was held by a solar oil absorber, and 50 and 80 cc., resp., by two charcoal absorbers. Of the total of 475 cc. absorbed, 28.2% could not be recovered from the absorbents. The absorbed gasoline contained the following fractions: initial b. p. 28°; 34°, 10 cc.; 37°, 20 cc.; 41°, 30 cc.; 45°, 40 cc.; 50°, 50 cc.; 55°, 60 cc.; 62°, 70 cc.; 75°, 80 cc.; 100°, 90 cc.; 114°, 95 cc. The sp. gr. of the absorbed gasoline was 0.649.

A. A. BOEHTLINGER

Significance of gum in gasoline. V. VOORHIES AND J. O. EISINGER. *Oil Chem. J.* 27, No. 31, 152, 155-6, 159(1928).—The various methods for detg. gum in gasoline are discussed. Various gum tests including steam oven, O, Cu dish, wt. of deposit in the inlet passage, and the wt. of C deposit on cylinder heads have been made on fuels. The results show that gasoline may have a high potential gum content as detd. by the Cu dish test and perform satisfactorily in the engine. The conclusions as to specifications for the gumming characteristics of fuel are that the permissible gum content at the time of use should be stated as well as gum stability. The steam oven test and the O gum test described are the most satisfactory. Results indicate that more than 10 mg. of actual gum per 100 cc. at the time of use may produce a deposit on the inlet passage and on the valves. Potential gum formation as detd. by the O test should be less than 10 mg. per 25 cc.

M. B. HART

Indian Refining Co. treats cracked gasoline before storing. GEORGE REID. *Refiner Natural Gasoline Mfr.* 8, No. 1, 60-2(1929).—The continuous treating plant and process for cracked gasoline is described.

M. B. HART

Preheaters at Okmulgee plant remove all gasoline fractions. GEORGE REID. *Refiner Natural Gasoline Mfr.* 8, No. 1, 57-9(1929).—At the Barnsdall Refineries, Inc., Okmulgee, Okla., plant crude oil is preheated by interchange in 6 interchangers with hot vapors and residuum and flashed into a chamber at the top of the first bubble tower. Gasoline vapors from the flashing section pass downwardly through two 6 in. down spouts into the bubble tower at about the third tray. The combined gasoline and kerosene vapors are removed through a reflux condenser section to the seventh tray of the second tower. The second bubble tower has a reboiler section at the bottom. Gasoline reflux is returned to the top of the second tower.

M. B. HART

The Valenta reaction in relation to its use with gasolines and gasoline-benzene mixtures. R. WELLER. *Petroleum Z.* 24, 706-73(1928).—The dimethylsulfate number has been shown to have no value as a means of judging the aromatic content of gasoline.

M. B. HART

Carbon monoxide from automobiles using ethyl gas. W. P. YANT AND L. B. BERGER. *Bur. Mines, Repts. of Investigations* No. 2908, 8 pp. (1929).—An investigation was made to det. whether there is any significant difference in the CO content of the exhaust gas of an internal-combustion engine when "ethyl fluid" (contg. PbEt₄) is substituted for straight gasoline. The equipment and the method of conducting the tests are outlined and results tabulated. Three series of tests were conducted. In one, with fixed adjustments and under prescribed conditions, no change was evident in the content of CO in the exhaust gas either when detonation was distinct or when inaudible. If the spark was retarded to decrease detonation during operation on straight gasoline, the amount of CO per h. p.-hr. was 5-7% less for ethyl gasoline than for straight gasoline.

W. H. BOYNTON

The electrical conductivity of certain organic substances as related to knocking. A. MORA AGÜES. *Anales soc. españ. fis. quim. (tecnica)* 26, 155-62 (1928).—The influence of elec. cond. in the liquid phase of motor fuels is shown. Cond. was calcd. from the time of discharge of an electrometer. Results agree well with the bouncing-pin app. of Midgley and Boyd. Two diagrams show variations of cond. on increasing the xylene and xylidene contents of a standard gasoline. Every antiknock substance has a high cond. in the liquid phase.

E. M. SYMMES

Economic phase of antiknock fuels. L. C. LIGHTY. *Yale Univ. Oil & Gas J.* 27, No. 36, 32, 142 4 (1929).—An analysis of the economic value of the use of high-compression fuel from the viewpoints of fuel cost, C-removal cost, and engine performance leads to the following conclusions: (1) the C-removal saving resulting from the use of doped fuel is highest for the lowest compression ratio; (2) fuel saving varies with compression ratio and cost of fuel for any given ratio; (3) for a given dope, C-removal saving varies only with the cost of removing the C; (4) with low fuel costs no saving seems to result from the use of doped fuels with the present compression ratios; (5) with higher fuel costs the net saving increases; (6) whether the use of doped fuel is economical at a compression ratio of 5 to 1 depends upon the C-removal saving; (7) under actual operating conditions, at lower speeds, the fuel economy resulting from higher compression with the existing gear ratio will be less than expected from a full load analysis; (8) gear reduction when decreasing compression results in fuel economy. It is pointed out that the use of high compression should be considered desirable as a means of conserving our national resources, even though the net saving to the consumer is questionable.

M. B. HART

The determination of paraffin hydrocarbons in commercial benzenes and motor fuels. R. HEILINGÖTTER. *Chem.-Ztg.* 53, 79 (1929); cf. *C. A.* 22, 4781.—A 25-cc. sample of material is shaken with 50 cc. of fuming H₂SO₄ contg. 4-5% of SO₃, in a reaction vessel provided with a cooling coil. When the temp. rises to 40-50°, the vessel is cooled. The process is repeated until no temp. increase is noted; the liquid is transferred to an attached measuring tube and the vol. of unaltered hydrocarbon detd. This residue is examd. with a Zeiss refractometer after washing with H₂O; if it reads more than 25 scale divisions, either incomplete sulfonation or the presence of tetralin is indicated. The residue must then be tested by the method of Formanek (*C. A.* 22, 2826).

W. C. ERAUGH

Automotive fuels and lubricants. B. E. SIBLEY. *Continental Oil Co. Oil & Gas J.* 27, No. 28, 148-9 (1928).—The present attitude of engineers toward compression ratio, volatility, initial b. p. and lubricants is expressed.

M. B. HART

Edeleanu sulfur dioxide process used in treating lubricating oils. RUDOLPH PLANK. *Natl. Petroleum News* 20, No. 46, 63-6, 68, 70-1; *Z. Ver. deut. Ing.* 72, 1613-18 (1928).—The Edeleanu process for the treatment of kerosene at low temps. (about 14° F.) with liquid SO₂ is applied to lubricating oils whereby it is claimed that resinous and asphaltic products as well as aromatics are extd. and S compds. are dissolved so that the refined oil contains only about 10% of the S present in the original distillate. Crude distillate and SO₂ at 14° F. are mixed and the refined oil is sepd. and heated with 15% SO₂ to 50° F. by indirect heat exchange with unrefined distillate and passed to the evaporator where the SO₂ is largely removed by exhaust steam. The ext. soln. is heated to about 54° F., the SO₂ driven off being returned to the condenser. The evaporator pressure is between 40 and 65 lbs. In actual practice a series of evaporators is used, the first stage operating at condenser pressure, the second at atm. pressure, the third under vacuum.

M. B. HART

Refining Pennsylvania lubricants. C. O. WILLSON. *Oil & Gas J.* 27, No. 24, 140, 142, 144 (1928).—The newer methods in use by lubricating oil refiners include the use of continuous instead of batch operation, contact filtration and centrifugal sepn. in the manuf. of bright stocks. Pipe stills are used for skimming, the topped crude

being run in a battery of shell stills. Vacuum distn. of lubricating oil stocks is being perfected on the following lines: topped crude is charged to a pipe still unit and discharged into a vaporizer of a large bubble tower unit. M. B. HART

Vaporization of lubricating fractions. W. A. PETERS, JR. AND J. V. JIRASEK. E. B. Badger & Sons Co. *Oil & Gas J.* 27, No. 29, 149, 262(1928).—A comparison of various methods of vaporization for lubricating fractions shows that there is no essential difference between vacuum and atm. or single- and double-stage operation. All available data seem to prove that there is a limit of temp. and time of heating which cannot be exceeded without changing the oil and that, if this limit is not exceeded, the products will be the same regardless of the method used. Vacuum units result in fuel economy although steam distn. will produce the same results. M. B. HART

Towers in series fractionate low cold-test lubricating distillate. GEORGE REID. *Refiner Natural Gasoline Mfr.* 7, No. 12, 57-9, 74(1928).—At the McMillan Petroleum Products Co.'s El Dorado refinery preheated Smackover crude oil is fed into a tube still under 40 lbs. pressure, operating at 600° F. Foxboro type automatic flow controllers are used on the crude charging lines. The heated oil is passed through a stripper tower from which the asphalt residue (50-52%) is charged to an asphalt plant, where it is blown with air to 140-160 penetration and 110° F. m. p. The fractionating app. is of the Boner and Sheldon type, side streams being removed when desired and steam-stripped in stripper towers, the vapors being returned to the main tower. Naphtha is fractionated in a third tower. The tower pressures vary, 25-30 lbs. being the outlet pressure of the tube still, 14-15 lbs. in the stripper columns, about 12 lbs. in the fractionating tower and 10-11 in the final naphtha tower. The naphtha is not treated before sale, liquid NH_4OH being introduced near the bottom of the tower to keep it slightly alk. The yields from Smackover crude oil are 10-12% naphtha, having the following properties: initial b. p. 160-170° F., end point 440-450° F., gravity 45-46 A. P. I.; gas oil 28-30% having a gravity of 26-27 A. P. I., flash 230-240° F., cold test below -50° F., lubricating oil distillate 10-12% having a viscosity of 250-260 at 100° F., flash 380-400° F., cold test 0 to -10° F. M. B. HART

Cylinder oils for steam engines. N. I. CHERNOZHUKOV. *Izvestiya Tekhnich. Inst. (Trans. Thermo-Tech. Inst. (Russia))* 1928, No. 4, 58-66.—Russian standards for lubricating oils for steam engines working on satd. steam.

Oil	Sp. gr.	Minimum flash open cup	Viscosity E° ₁₀₀	Max. for asphalt and ash
Cylinder				
2 bright	0.890-0.920	220°	1.8-2.2	ash not over 0.05
Nigrol L.				
dark	0.915-0.945	240°	5.0-7.0	.....
Viskozin				
3 dark	0.910-0.925	240°	3.0-4.0	0.3%
Viskozin				
5 dark	0.915-0.930	255°	5.0-6.0	0.4%
Vapor L.				
dark	0.895-0.910	265°	3.5-4.5	0.3%
Lubricating oils for superheated steam engines				
Vapor L.	0.895-0.910	285°	3.5-4.5	0.3%
Vapor M	0.900-0.915	300°	4.5-5.7	0.4%
Vapor T	0.905-0.920	320°	5.5-6.7	0.5%
T-Extra	0.905-0.920	330°	6.0-7.0	0.5%
Viskozin 7	0.920-0.930	300°	7.0-8.0	0.5%
Viskozin 10	0.925-0.940	325°	not below 9.5	0.6%
Cylinder oils or steam engines working on saturated steam				
Viskozin 3	.....	240°	3.0-4.0	0.1%
Viskozin 5	.....	240°	5.0-6.0	0.15%
Vapor L.	.....	280°	4.0-5.0	0.15%
Nigrol L.	.....	240°	5.0-7.0	0.3%
Mineral acids and mechanical admixtures, none				
Cylinder oils for steam engines working on sup				
Vapor L.	.....	280°	4.0-5.0	0.15%
Vapor T	.....	320°	5.5-6.5	0.20%
Viskozin 7	.....	300°	7.0-8.0	0.20%
Mineral acids and mechanical admixtures, none				

Uses of the above oils under various conditions are given. Specifications for bearing oils of the "Neftesindikats" are: machine oil No. 2, sp. gr. 0.890–0.915, open-cup flash not below 190°, viscosity E_{100} 5.5–6.5, sodium test not below 3, cold test not above -8° ; machine oil "T," bearings of steam engines and the main shaft, for heavy loads and medium speed of rotation, sp. gr. 0.895–0.918, open-cup flash not below 200°, viscosity E_{100} 7.0–8.2, sodium test not below 3, cold test not above -5° ; marine "L," sp. gr. 0.915–0.922, open-cup flash not below 205°, viscosity E_{100} 8.0–8.5; marine "T," sp. gr. 0.918–0.925, open-cup flash not below 215°, viscosity E_{100} 9.5–10.5. The last two oils are as a rule compounded with some vegetable oil to make them emulsify with water.

A. A. BOEHTLINGK

• Benzine for asphalt precipitation. H. BURSTIN AND J. WINKLER. Galicia Naphtharaffinerie, Drohobycz. *Erdöl u. Teer* 5, 26–8, 42–4, 62–4 (1929); cf. C. A. 22, 4786; 23, 1258.—For the prepn. of asphalt-pptg. benzine, corresponding to the requirements stated in Holde (Kohlenwasserstoffol u. Fette, 6th ed., p. 135), the exclusive use of American raw oil is not necessary. Suitable raw materials for the purpose were discovered also in benzines from Polish crude oil, in a natural-gas gasoline and cracked gasoline. Pptn. benzines, meeting the specifications, can be prepd. which do not have the same pptg. powers. On this account more precise conditions for asphalt-pptg. benzine are proposed.

F. S. GRANGER

Determining the penetration of asphalts. EDMUND GRAEFE. *Petroleum Z.* 24, 1599–1603 (1928).—Various types of penetrometers and methods of operation are described.

M. B. HART

Transformations undergone by pine stumps in the ground after cutting of the tree. G. DUPONT AND M. SOUM. Inst. du Pin, Bordeaux. *Bull. inst. pin* No. 55, 313–22 (1928).—The stump of a 65-yr. pine, cut 14 yrs. previously and found in slightly moist sand, looked like rotten wood, and could be crushed between the fingers and kneaded into a plastic, putty-like mass. From the appearance of the wood, which had practically kept its original vol., it had lost little in wt. since the tree was cut. It contained 11.7% of H_2O and 73.38% of (83.10% on the dry basis) Et_2O ext. The complete analysis on the dry basis was: ash 0.22, normal cellulose 0.33, incrusting matter (lignins) 21.75, pine oil 21.56, rosin acids 38.67, oxidized acids 1.35, free $AcOH$ 0.60, non-volatile H_2O -insol. acids 1.48, fats and esters 3.18, loss and undetd. 4.86%. The properties of the lignin had changed, but the proportion was of the same order of magnitude as in fresh wood. The cellulose had almost entirely disappeared, and since the wood had not undergone any great loss in wt., cellulose had probably been converted into resinous compds. Certain portions of the wood contained mycelia of a fungus that are possibly the cause of this transformation. D. and S. designate the product as "resinose." A fossil pine stump bored by marine erosion in the coastal regions of the Landes regions, which had probably been buried for centuries, had the appearance and properties of ordinary heartwood, gave the chief color reactions of lignin, and had the following compn.: H_2O 1.00, rosin acids (as $C_{20}H_{30}O_2$) 0.065, neutral Et_2O ext. 4.915, of which at least 2.5 was pure retene, total cellulose 47.27, lignin 35.66, ash 1.97%, other constituents undetd. About the only important difference from fresh wood was the presence of a large amt. of retene. It is suggested that the phenomena involved in the transformation of the 2 stumps are involved in the formation of coal beds.

A. PAPINEAU-COUTURE

The determination of active oxygen in oxidizing Russian turpentine. K. N. KOROTKOV. *Zapiski Belorusskoi Gosudarst. Akad. Sci'skogo Khimyaistva*. (Memoirs Belorussian State Acad. Agr.) 5, 16–24 (1927).—Turpentine dissolved in water acidified with small quantities of dil. H_2SO_4 was tested for its active O kept under conditions of (1) sun-light, (2) darkness and (3) darkness with frequent exposures to elec. light. The O was detd. on a 80 cc. sample with fresh MnO_2 as a catalyst. The Russian turpentine had a higher oxidizing value than the French. The sun is the chief factor responsible for the oxidation of the turpentine. In the dark with frequent exposures to elec. light the oxidation is less extensive. The products of oxidation sol. in water are stable compds. and are not decompd. upon heating; these products are not H_2O_2 . The oxidizing property of the turpentine soln. upon standing a month was not lost. The amt. of O obtained may be designated as the "oxygen number" of the turpentine.

J. S. JOFFE

New coating for stills (MORRELL, *et al*) 13. Petroleum wash-oil thickening in the scrubbing of gas (ULLMANN, *et al*) 21. Use and behavior of protective coatings on underground pipes (SCOTT) 13. Study of the action of Fe catalyzers on mixtures of CO and H (AUSTIN, RAINBOW) 2. Progress report of pipe line and

production of the A. P. I. general committee on corrosion for 1928 (Bly) 13. Pyrogenic decomposition of hydrocarbon materials (Brit. 296,034) 21. Apparatus for separating oil and water by gravity (U. S. pat. 1,707,077) 1. Apparatus for effecting separation of oil, gas and water by gravity and centrifugal action (U. S. pat. 1,705,660) 1. Tetraethyllead (U. S. pat. 1,705,723) 10. Apparatus for centrifugal treatment of hydrocarbon oils (U. S. pat. 1,705,934) 1. Rotary drum apparatus for low-temperature distillation of coal, shale, oil, tar and carbonaceous refuse (Brit. pat. 295,503) 21. Heaters for oil-refining (Fr. 646,642 and 646,643) 1. Purifying oils (Ger. pat. 471,076) 27. Oven for melting tar, asphalt, etc. (Ger. pat. 471,378) 21. Distilling carbonaceous materials (U. S. pat. 1,706,468) 21. Aldehydes, alcohols [from gases] (Brit. 295,356) 10.

"Cracking" petroleum oils. ALEXANDER SAKHANOV and MISTISLAV TILICHE'EV. Fr. 645,879, Dec. 17, 1927. The oils at the desired high pressure are led through 2 groups or sets of tubes in a chamber heated to the desired temp., the 1st set (the heating tubes) being of much smaller diam. than the 2nd (the reaction tubes).

Petroleum oil fractions. ALLGEMEINE GES. FÜR CHEMISCHE INDUSTRIE. Brit. 295,253, May 7, 1927. Gasoline or other petroleum products are sepd. into fractions, one of which boils below about 160-70° and the other above this temp., and unsatd. hydrocarbons are dissolved from the fraction of higher b. p. by liquid SO_2 or acetone, or a mixt. of both, and are added to the fraction of lower b. p. The satd. hydrocarbons remaining may be added to "illuminating oil."

Refining petroleum. AXTELL RESEARCH LABORATORIES, INC. Fr. 646,134, Dec. 23, 1927. Mineral oils have their S content reduced by a treatment with oleum satd. with an aromatic hydrocarbon, preferably of the C_6H_6 series, whereby sulfonation, oxidation or polymerization of the oil is prevented. Cf. C. A. 22, 3984.

Removing sulfur compounds from petroleum oils. WILLIAM N. DAVIS, WILLIAM H. HAMPTON and EDWIN N. KLEMGARD (to Standard Oil Co. of Calif.). U. S. 1,705,800, March 19. Cracked petroleum naphtha or other similar high-S petroleum distillates to be desulfurized are treated with H_2SO_4 and the polymerization of unsulfured compds. is reduced by use of an acid of lower freezing point than the treating temp. and effecting the treatment at a temp. of about 3° or lower. An arrangement of app. is described.

Petroleum sulfonic acids. PETER I. SCHESTAKOFF. U. S. 1,706,940, March 26. In order to isolate oil-sol. sulfonic acids, a sulfonated petroleum oil is treated with a water-sol. ester of HOAc such as MeOAc to dissolve the sulfonic acids.

White petrolatum. ERNEST B. COBB and AUGUST HOLMES (to Standard Oil Development Co.). U. S. 1,707,187, March 26. A petrolatum-yielding stock is dissolved in a solvent such as naphtha and the soln. is treated with fuming sulfuric acid, the sludge produced is withdrawn and the solvent and pure petrolatum are sepd. by distn. An arrangement of app. is described. Iso-Pr alc. may be used to ext. sulfonic compds.

Cracking hydrocarbon oils. JOHN C. BLACK (to Gasoline Products Co.). U. S. 1,706,396, March 26. The oil is heated in a series of tubular heaters such as pipe coils, in one of which the oil is brought to an active cracking temp. while in another the oil is further subjected to prolonged heat treatment while maintaining the temp. by supply of heat to compensate for that rendered latent by the endothermic reactions taking place; the heated hydrocarbons are then mixed with an addnl. supply of hydrocarbons at a lower temp. and the mixt. is subjected to a final heat treatment to effect cracking. Sufficient pressure is maintained on the material to prevent substantial vaporization. An arrangement of app. is described.

Cracking hydrocarbon oils. I. G. FARBENIND. A. G. Brit. 295,074, April 21, 1927. An app. is described in which oils are cracked by heating them with an elec. resistance heater which is immersed in the liquid and exposed to intermittent or continuous blasts of gases supplied through a pipe extending into the liquid. The gases may contain O, H, or gases and vapor capable of giving off H but free from C. Various exemplary details are given. Cf. C. A. 23, 2028.

Cracking hydrocarbon oils by the "tube and drum" method. A. C. SPENCER and E. W. LUSTRA (to Standard Oil Development Co.). Brit. 295,399, Aug. 11, 1927. Condensate from an intermediate stage is led away, reheated and returned to the unit from which it was taken. An arrangement of app. is described.

Purifying hydrocarbon oils. LAMUEL M. JOHNSTON and JAMES L. FARRELL. U. S. 1,706,614, March 26. In treating oils such as "cracked gasoline," a treating material such as fuller's earth or bentonite is formed into a paste or mud and strings of the latter are accumulated to form a porous column through which vapors of the oil are passed. An app. is described.

"Sweetening" hydrocarbon oils. H. G. M. FISCHER (to Standard Oil Development Co.). Brit. 295,728, Aug. 19, 1927. Oils such as kerosene are agitated with Na plumbite, blown with an O-contg. gas such as air, and S is added at intervals during the blowing. The mixt. is allowed to settle, the aq. layer is drawn off, and the oil is washed with water.

Removing paraffinic substances from hydrocarbon oils. ROBERT S. LANE (to Standard Oil Co. of Ind.). U. S. 1,706,120, March 19. In order to remove petrolatum from oil it is mixed with butanol and acetone, cooled and the waxy material sepd.

Cracking oils. JOHN R. MARDICK (to Universal Oil Products Co.). U. S. 1,706,629, March 26. Oil such as gas oil is heated and subjected to the action of previously electrically activated Cl in the absence of sufficient moisture materially to interfere with the cracking of the oil, and products of low b. p. are collected. An arrangement of app. is described.

Cracking oils. "LE CARBONE." Fr. 646,268, May 14, 1927. Active C at atm. pressure and a moderate temp. is used as catalyst in the transformation of mineral or vegetable oils to produce lighter oils.

Distilling and cracking oils. S. SEELIG. Brit. 296,000, Aug. 22, 1927. Distn. and cracking of oils contg. impurities such as resins or benzene is effected by passing them continuously through a molten metal bath, and clogging of the reaction vessel is prevented by pumping the oils from the source of supply through an asphalt separator and then distg. off the benzene (under slightly increased or diminished pressure) before passing the oils to the reaction vessel. Cf. C. A. 22, 1468.

Cracking oils and producing oil gas. A. FECHTER and P. BURGER. Brit. 295,938, Aug. 20, 1927. An app. is described in which a mixt. of hydrocarbons and H is ignited by an elec. sparking device.

Apparatus for making oil gas. N. A. MAL'VINSKII. Russ. 5525, May 31, 1928.

Distilling oils by a bath of molten metal. S. SEELIG. Brit. 295,935, Aug. 20, 1927. Direct contact of oil with the heated wall surrounding the bath of molten metal is prevented by an inner wall spaced from the outer wall to form an annular space through which a current of air may be circulated. The inner wall has pressure-equalizing openings, and the oil may be introduced by means of a coiled tube adjacent the inner wall. Cf. C. A. 22, 1232.

Distilling plant for heavy oils. SOC. DES ÉTABLISSEMENTS BARBET. Fr. 646,248, May 12, 1927.

Heavy mineral oils. ERDÖL- UND KOHLE-VERWERTUNG A.-G. Ger. 469,228, June 15, 1921. Heavy mineral oils, with or without distn or purification by C, are desulfurized and hydrogenated by treating with alkali metals under H pressure at about 300°, in order to disrupt the mols. Porous material such as wood charcoal or powd. coke can be added. Thus, granular dried mineral coal is heated with coal-tar oil and a little metallic Na in an autoclave. After several applications of compressed H, the disruption is so general owing to the coal that only 8% of the residue is unchanged. The product is distd. off for motor fuel.

Tunnel retort for the distillation of carbonaceous materials such as oil shale or coal.

HARRY M. ROBERTSON. U. S. 1,706,128, March 19. Structural details.

Rotary retort apparatus for distilling oil shale or other carbonaceous materials.

INTERNATIONAL BITUMEN-OIL CORP. Brit. 295,225, April 5, 1927. A rotary retort is described which is divided into zones of increasing temp.; the hot gases for internally heating each zone are used for heating a series of stills, each working at a different temp., through which oil from the retort charge is passed in series.

Clarification of benzine. JEAN J. WACK. Fr. 646,721, Jan. 5, 1928. Benzine is clarified by sapon. the oils and fats contained therein in the state of emulsions, by means of an alk. soln. into which the benzine is injected in an atomized condition. NaCl may be added to the alk. soln. (e. g., Na_2CO_3) to accelerate the sepn. of the emulsions. An app. is described. Cf. C. A. 23, 1515.

Lubricating oil. H. L. CALLENDAR, R. O. KING and E. W. J. MARDLES. Brit. 295,230, May 4, 1927. A heat-resisting lubricating oil comprises mineral, animal or vegetable oil together with a small proportion of Et_2Pb or similar Pb aryl or alkyl compd. which is sol. in the oil. An org. halogen compd. such as ethylene dibromide also may be added to counteract any deleterious effects which the treated oil might otherwise have.

23—CELLULOSE AND PAPER

CARLETON E. CURRAN

V

The cellulose industry and its products of manufacture. G. K. BERGMAN. III. *Nord. Kemistmötet* (Finland) 1928, 143-66.—An historical account of the cellulose industry in Finland during the last 75-80 yrs. Spruce or white fir, the main source for cellulose, has the following compn.: cellulose 53, hemicellulose 15, lignin 30, albuminates, oils, minerals, etc., 2%. Processing of wood for cellulose consists essentially in removing non-cellulose constituents, chiefly lignin. The quality of the finished product depends largely on the amt. of lignin present. There is a brief discussion of methods for detg. the adhesiveness of cellulose or the strength of paper. B. discusses Nägeli's micellular theory, which assumes that cellulose fibers are composed of minute cells made up of crystals with the following approx. dimensions: 7.9, 8.45 and 10.2×10^{-8} cm. It has also been shown that the crystal vol. can contain 4 dextro groups, making cellulose $(C_6H_{10}O_5)_4$. Chem. evidence as well as phys. evidence (photographing with monochromatic Röntgen rays) are given in support of the theory. The different opinions relative to lignin and cellulose are discussed. One group maintains that lignin is a by-product obtained from the sap of plants during growing periods, while others think that this product is in chem. combination with carbohydrates, e. g., esters. Nine photomicrographs are given, showing cellulose fibers after treatment with different reagents. O. A. NELSON.

The amphoteric character of cellulose and the relation to its purity. KYO KAWAMARU. Kiryu Higher Tech. School. *J. Textile Ind.* 4, 259-84(1928). Two g. samples each of purified standard cotton cellulose, oxycellulose, hydrated cellulose, nitrated and acetylated cellulose were dipped into 20 cc. of Clark's buffer soln. of various pH values; after equil. was attained the change in the pH value of the soln. was measured to det. the amphoteric character of the sample. The influence of various impurities likely to occur in cellulose was also examd. Ordinary cellulose contains firmly bound alkali and shows an amphoteric character corresponding to the alkali content, with its apparent isoelec. point on the acidic side. After acid treatment, the isoelec. point is on the acid side, while after alkali treatment and washing with H_2O , the isoelec. point shifts to the alk. side. Ordinary cellulose contains some decomposed or transformed cellulose, which influences the amphoteric character markedly. Oxycellulose has an acidoid, and hydrated cellulose a basoid character. As the result of the influence of these impurities ordinary cellulose behaves as an amphoteric substance, which has its isoelec. point at some definite acidity or alkyl. K. SOMMER.

The chemical analysis of cotton. The determination of cellulose by oxidation with chromic acid. CONSTANCE BIRTWELL and BERT P. RIDGE. Shirley Institute, Bolton. *J. Textile Inst.* 19, 341-8T(1928).—A description is given of the exact conditions, procedures and app. adopted by the Shirley Inst. for the oxidation of cellulose and its detn. by both the gas-volumetric and the titrimetric methods. For the former method, the procedure of Berl and Innes with slight modifications is used and is accurate for weights of carbohydrate from 0.01 to 0.1 g. A mixt. of H_3PO_4 and CrO_3 is a satisfactory oxidizing agent except when the cellulose content of the sample is low and the diln. of the H_3PO_4 slows up the oxidation rate. In such a case, H_2SO_4 is more satisfactory and the formation of SO_2 is avoided by taking care to provide for the excess of CrO_3 throughout the analysis. In the titrimetric method, the sample is boiled with excess standard $K_2Cr_2O_7$ and H_2SO_4 for about 1 hr.; the excess $K_2Cr_2O_7$ is either detd. iodometrically or titrated against standard $Fe(NH_4)_2(SO_4)_2$ with ferrixyanide as external indicator. To avoid loss of O_2 by decompn. of CrO_3 , the reaction mixt. should not contain more than 1 vol. of concd. H_2SO_4 to 1 vol. of aq. soln., the proportion generally employed being about 1 vol. of acid to 3 vols. of aq. soln. The accuracy of both methods is shown by the results of the application of each to the combustion of bleached cotton, starch, cellulose in cuprammonium soln., and modified cell papers in NaOH soln. RUBY K. WOESLER.

The form and size of the micelles of cellulose and rubber. J. HENCKENBERG and H. MARK. *Z. Krist.* 69, 271-84(1928).—The principles underlying the detn. of the size and form of small particles by the Laue method are investigated and discussed. Measurements on cellulose, rubber and artificial silk show micelles elongated parallel to the fiber axis. From photographs taken at the temp. of liquid air it was found that the coeff. of expansion for the direction parallel to the fiber axis is considerably smaller than that at right angles to the axis. L. S. RAMSDALL.

Transformations undergone by pine stumps in the ground after cutting of the tree (DUPONT, SOUM) 22. Effect of temperature on the viscosity and ease of precipitation of sols of cellulose acetate (WHITBY, GALLEY) 2. Esters of polycarboxylic acids [for use as solvent for nitrocellulose] (U. S. pat. 1,706,639) 10. Molded receptacles of wood pulp and casein (U. S. 1,705,780) 18. Purification of alkaline lyes (Fr. pat. 646,942) 18. Adhesives containing cellulose esters (Brit. pat. 295,366) 18. Different tints on paper (Brit. pat. 295,778) 25. Resins; paper (Fr. pat. 646,170) 26.

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HICKFORD, F.: **Essays on Paper Making and Paper.** Oxford, Eng.: Hall, The Printer, Ltd. 3s. Reviewed in *Paper Makers' Monthly J.* 67, 121 (1929).

Schriften des Vereins der Zellstoff- und Papier-Chemiker und Ingenieure. Bd. 18. **Theorie des Antriebs und Kraftbedarfs von Papiermaschinen.** H. RAPFOLD. **Theorie der Harzleimung.** E. ÖMAN. Berlin: Otto Elsner. 71 pp. M. 4. Reviewed in *Chemistry & Industry* 47, 1324 (1928).

Sheets or films of cellulose derivatives, etc. NON-INFLAMMABLE FILM CO., LTD., and H. J. MALLABAR. Brit. 295,797, June 27, 1927. Sheets or films with a matt surface are prepd. by casting celluloid, cellulose acetate or like compn. on a sheet or band (which may be formed of polished metal) having a matt surface prepd. by coating it with a layer of gelatin impregnated with starch, BaSO₄, fine Kieselguhr, or like materials.

Films. SPICERS, LTD. Fr. 645,912, Dec. 19, 1927. Films contg. esters or ethers of cellulose are freed from residual solvent and elec. charges by passing them through a space kept moist with steam.

Cellulose ethers. LEON LILIENFELD. Ger. 470,142, May 22, 1912. Derivs. or transformation products of cellulose, sol. in alkali, are treated with alkylating agents, especially alkyl esters of inorg. acids, in the presence of a basic substance. Thus, crude viscose is diluted with water and allowed to congeal in a water bath. It is then dissolved in 50% NaOH, diethyl sulfate added and the whole heated. Hot water is added and the mixt. acidified with dil. H₂SO₄ when the ether is pptd. Other examples are given.

Plastic compositions from cellulose ethers. I. G. FARBERIND. A.-G. Brit. 295,940, Aug. 19, 1927. Cellulose ethers such as ethylcellulose are kneaded with an alc. of the terpene series such as isoborneol (or the waste oil contg. fenchol and borneol produced in the manuf. of camphor), solvents and softening agents such as C₆H₆ or alc. also may be added. The material may be rolled, allowed to dry, comminuted and then subjected to hot pressing (a temp. of 125° being suitable). Benzyl alc. and isobutyl phthalate may be used in the compns.

Use of carbon disulfide as a solvent with cellulose derivatives. I. G. FARBERIND. A.-G. Brit. 295,942, Aug. 19, 1927. In making films, fibers, etc., a cellulose ester or ether, e. g., a benzene-sol. triethyl cellulose, is dissolved with CS₂, which may be used with other suitable solvents such as C₆H₆ or acetone.

Method of charging digesters and cellulose extractors by a current of gas. PER ALBERT FRESK. Fr. 645,961, Dec. 20, 1927.

Means for distributing viscose. WERNER CHATELAIN. Ger. 471,291, Feb. 14, 1928.

Artificial silk. ALBERT WAGNER (to the Firm Fr. Kuttner). U. S. 1,706,717, March 26. In producing fine fiber artificial silk, strands are first formed from a soln. of ammoniated Cu oxide cellulose by the stretch spinning method; these strands are treated in a bath contg. (NH₄)₂SO₄ soln., wound on spools or the like, then washed, treated with H₂SO₄ and further washed and dried.

Artificial silk. CURRUM SOC. ANON. Fr. 645,102, Dec. 23, 1927. In making artificial threads by drawing or spinning cuprammoniacal soln. the threads are led, during acidification, through thread-guides placed in the channels and having a perfectly uniform profile, their position being adjustable.

Artificial silk. "CURRUM" A.-G. Swiss 128,200, July 27, 1927. Strong fibers are formed by causing two or more contiguously spun filaments to stick together.

Artificial silk. HENRY DAVYD. Fr. 645,918, Dec. 19, 1927. Construction of spinning app. and pumps therefor.

Artificial silk. GRUNERT & GIANNETTI. Fr. 645,972, Dec. 20, 1927. See Brit. 282,670 (C. A. 22, 3777).

Artificial silk. NAAMLooZE VENNOOTSCHAP NEDERLANDSCHE KUNSTZIJDEFABRIEK. Fr. 646,850, Nov. 29, 1927. Artificial silk possessing good mechanical properties is made by submitting the thread after spinning to a gradually increasing tension, which is obtained by a long immersion of at least 50 cm. and by a long zig-zag path through the air over 5 or more rotating rollers before reaching the bobbins. Cf. C. A. 23, 2034.

Hollow filaments of artificial silk. HANS KARPLUS. U. S. 1,707,164, March 26. Solns. such as those of viscose, cuprammonium cellulose, cellulose acetate, or nitro-cellulose, before being spun, are incorporated with liquid or solid org. noncryst. substances such as bone oil, paraffin oil, or Na oleate, which during the following spinning and finishing operations do not produce bubble-forming gases or vapors; these substances are subsequently removed from the threads formed by use of suitable solvents.

Apparatus for making artificial silk filaments. I. G. FARBENIND. A.-G. Brit. 296,063, Aug. 25, 1927.

Apparatus for making artificial silk filaments from cellulose acetate solutions by the dry spinning method. SCIENTIFIL. Brit. 295,354, Aug. 10, 1927.

Spinning centrifuge for artificial silk. V. BLAESS. Brit. 296,104, Aug. 25, 1927.

Three-phase pump for artificial silk manufacture. ERNEST LUNGE and COURT AULDS, LTD. Ger. 471,217, Nov. 20, 1925. See Brit. 248,039 (C. A. 21, 650).

Pulping wood. FRANCIS G. RAWLING. U. S. 1,705,827, March 19. Wood is treated with solns. contg. Na sulfite, NaHCO_3 , or other suitable Na salt of a weakly ionized polybasic acid, and an excess of CO_2 , at temps. up to 190° , in order to obtain a pulp which is of light color.

Bleaching "chemical wood pulp." LINN BRADLEY and EDWARD P. McKEEFE. U. S. 1,705,897, March 19. Wood pulp such as that produced by cooking wood with alk. solns. is treated with a dil. acid such as a 0.5-1% HCl soln. and then with an alk. hypochlorite soln.

Paper. UMBERTO POMILIO and GIULIO CONSIGLIO. Fr. 646,154, Dec. 24, 1927. Straw, maize stalks, hemp, etc., are made into a semifine paper by a short preliminary treatment with dil. alkali or warm water under pressure, followed by a rapid incomplete chlorination with gaseous Cl.

Paper pulp. R. W. HOVEY. Brit. 295,759, May 23, 1927. A digester construction and steam and liquor circulation system are described. The charge of pulp may be undercooked to retain a portion of the liquid of the lignins, pentosans and sugars; the fibers are passed through a screen and those retained by the screen are reduced by a mech. device, which is described. Cf. C. A. 23, 514.

"Refining engine" for treating paper pulp. LUDWIG H. WESSEL (to Hermann Mfg. Co.). U. S. 1,706,944, March 26. Structural features.

sizing and impregnating paper. I. G. FARBENIND. A.-G. Brit. 295,288, Aug. 8, 1927. The effects obtained by the process described in Brit. 293,000 (C. A. 23, 1507) are modified by first coloring, sizing, impregnating, or otherwise treating the whole of the pulp or a portion of it from which the paper is made and afterward treating the paper as described in Brit. 293,000.

Impregnating paper with rubber or similar substances. REED P. ROSE and HAROLD E. CUDR (to General Rubber Co.). U. S. 1,705,537, March 19. Cotton fiber is cooked with Na_2CO_3 soln. to remove fats, oils, waxes and other noncellulosic substances without impairing the strength of the fiber, and formed into sheets; the latter are treated with a dispersion such as rubber or glue-glycerol compn.

De-inking printed newspaper. JENNINGS DEWITT. U. S. 1,705,907, March 19. The printed paper is soaked in a soap soln. for about 2 hrs., subjected to a shredding operation for about 15 mins., soaked while at rest for about 1 hr., further shredded for about 30 mins. and then subjected to shredding and washing for about 15 mins.; fluid material is sponged from the pulp. An app. is described both in this pat. and in U. S. 1,705,908, which relates to similar procedure.

Waterproof paper. ALBERT L. CLAPP (to Bennett, Inc.). U. S. 1,706,840, March 26. A sol. straight-chain fatty-acid soap such as Na stearate or Na oleate is incorporated into paper pulp together with Na silicate; a metal salt such as $\text{Al}_2(\text{SO}_4)_3$ or alum is added in sufficient quantity to ppt. both the soap and the Na silicate; the pulp is formed into paper. U. S. 1,706,841 specifies production of a waterproof and greaseproof paper by incorporating, with the paper-making pulp glue, an aq. dispersion of waterproofing material such as a wax, bitumen, or resin and Na silicate, and by adding Al sulfate as a pptg. agent to form a voluminous ppt. of Al silicate and to cause the glue and dispersed material to be fixed on the pulp.

24—EXPLOSIVES AND EXPLOSIONS

C. E. MUNROE

Table of common hazardous chemicals. NATIONAL FIRE PROTECTION ASSOC. 11 pp.—This table was prepd. by a Comm. of the Natl. Fire Protection Assoc. in conjunction with a similar comm. from the Am. Chem. Soc. and under the headings name, usual shipping container, fire hazard, life hazard, storage and remarks gives information from the fire protection standpoint for some 60 substances. The statements are tentative and this list constitutes the revision up to Jan., 1929. C. E. M.

Study of powders heated in dry and humid atmospheres at 75°. M. MARQUEYROL. *Mém. poudres* 23, 128-46(1928).—For samples heated in a dry atm. at 75°, the speed of denitration and decompn., whether in open or closed containers, was the same for both BAM and BD powders. Tests showed much greater denitration at 163 days when BAM and BD powders were mixed than at 280 days in which individual powder lots were kept sep. In a moist atm. the Am alc. powders became white, opaque, brittle and acid. Thirty days heating was without effect, but renewal of the air in the containers or aeration of the powders markedly accelerated their decompn. The diphenylamine powders were 3 times as stable as the Am alc. powders under the same conditions. Decompn. of the powders took place more rapidly when pure water was used in the containers (to furnish a humid atm.) than when 1.246° H₂SO₄ was employed. Analyses of the gases formed by heating the powders in tubes sealed with Hg and collecting the gases over Hg showed that NO is a very minor constituent of the evolved gases. Alc. nitrites were found present, more in the BAM than in the BD powders. The theory that decompn. is caused by the action of nitrous vapors formed from the interaction of NO and O is held untenable because of the very small quantity of NO liberated from the powders. Renewal of the air over the powders hastens decompn. and for this reason leaky containers are to be avoided. Thick strip powders, in every case, were denitrated more rapidly than thin strip powders. Thick BD strip powders were less rapidly affected than thick BAM strips. This is attributed to some action between alc. and nitrocellulose. Further work is promised. A. J. PHILLIPS

Analysis of deteriorated BD grains. M. DESMAROUX. *Mém. poudres* 23, 124-7 (1928).—Two diphenylamine-stabilized grains which had the appearance of decompd. BAM grains were examd. for color reactions with α -naphthylamine, KOH and KCN. The results showed unchanged diphenylamine in the interior and amine compds. on the surface which had been partly volatilized during the heating at 75°. A. J. P.

Analysis of BAM and BD powders. M. DESMAROUX. *Mém. poudres* 23, 116-23 (1928).—Total volatiles were measured after a water pptn. of the powder dissolved in ether-alc., followed by drying for 4 hrs. at 108.5°. For the diphenylamine powders, drying of the pptd. nitrocellulose in vacuum desiccators over H₂SO₄ was employed. For diphenylamine content the powders were pulverized, extd. with ether and the ether residue was taken up with chloroform, dried and weighed. Viscosity tests were made with 0.2% solns. in acetone, as compared with pure acetone, in a Kling viscometer at 15°, to see if indications could be obtained as to the mol. disintegration of the nitrocellulose during heating. Figures were submitted but without interpretation. N was detd. in a nitrometer and showed a drop from about 12.4 to 11.4%. Soly. was measured by pptg., drying and weighing the nitrocellulose in an aliquot portion of an ether-alc. soln. which was centrifuged after standing for 48 hrs. Heating caused the solubilities to increase from about 55 to 94%. A. J. PHILLIPS

Chemical and ballistic stability of BAM and BD powders. M. MAURIN. *Mém. poudres* 23, 70-112(1928).—Smokeless powders stabilized with 8% of Am alc. (BAM) and 2% of diphenylamine (BD) were heated for 170 and 185 days in water-jacketed containers at 75°. Observations made during the heating showed that the violet ink of the recording thermometers, the metallic parts of the thermometers and the linings of the containers were oxidized. Dry litmus paper in the heaters showed that the gases disengaged were acid in character. Up to 59 days the BAM powders remained a dark gray and then turned a pale yellow and became much more transparent. The BD powders blackened after 23 days and developed red spots. All powders remained flexible up to 23 days and became very brittle after 122 days. The loss in weight after 185 days was about 9% for the BAM powders and 5-6% for the BD powders. The coeff. of elimination for BAM powders increased rapidly after 59 days while with the BD powders it remained almost const. The coeff. of emission remained almost const. for all powder. All were much more hygroscopic after removal from the heaters. The coeff. for the rate of burning in a bomb decreased rapidly for the BAM powders and

increased slightly for the BD powders. In ballistic tests the BAM powders lost 10% of their speed and 20% of their pressures, while the BD powders retained or slightly increased their ballistic characteristics (speed, pressure and uniformity). A. J. P.

Transformation products of centralite in stored SD powders. H. LECORCHE AND P. L. JOVINET. *Mém. poudres* 23, 147-54(1928); cf. C. A. 22, 3779.—This study is concerned with the products formed which are non-volatile in steam. They are mononitro centralite and *p*-nitronitrosamine. *p*-Nitroethylphenylnitrosamine is volatile with steam but is converted into a non-volatile material when the nitrocellulose and nitroglycerin are hydrolyzed by soda for analytical purposes. As an index of the age of a powder, ethylphenylnitrosamine is detd. colorimetrically with alc. α -naphthylamine. Standards for comparison are made with alc. nitrosodiphenylamine and α -naphthylamine. Conclusion: Centralite is a better stabilizer than diphenylamine in the presence of nitroglycerin. A. J. PHILLIPS

Dust explosions. R. LOCH. *Z. Ver. deut. Ing.* 73, 247-9(1929).—A review of the literature and safety precautions in grinding. E. M. SYMMES

Flame propagation in the gaseous mixtures. YOSABURO NAGAI. Tokyo Imperial Univ. *J. Fuel Soc. (Japan)* 8, 145-62(1929).—The theory and mechanism of flame propagation are discussed. F. I. NAKAMURA

Ignition of gas by spark and its dependency on the nature of spark. TORAHIKO TERADA AND KIYOHiko YUMOTO. Inst. Phys. Chem. Research, Tokyo. *Proc. Imp. Acad. (Japan)* 4, 467-70(1928).—Morgan (C. A. 17, 2505, 19, 1982) inferred that the "capacity spark" is in general more effective in igniting the combustible gas mixt. than the "inductance spark." Results are reported with a mixt. of 16% CO and 84% air, satd. with water vapor at 25.7°; a 100 v. 1 kw. transformer being used for the excitation of the spark, ignition is completed when the primary current is greater than 2.0 amp., though the luminosity of the spark is rather faint; when a parallel capacity is inserted, a primary capacity of 4 amp. is insufficient for ignition, notwithstanding the remarkable brightness of the spark, with a series resistance the luminosity of the spark becomes fainter but ignition takes place whenever a spark is passed. Thus whether or not the flame will be extinguished or propagated depends upon the balance between the heat evolved and that lost during the period of "indecision" (0.01 sec.). C. I. W.

Auto-ignition temperatures of flammable liquids. NORMAN J. THOMPSON. Factory Mutual Laboratories, Boston. *Ind. Eng. Chem.* 21, 134-9(1929). The development of the app. is described and the effect of different constructional materials on ignition temps. is shown. Data for 37 org. liquids as detd. in app. of 6 comp. are given. ALDEN H. EMERY

Firedamp explosions within closed vessels. "Pressure piling." C. S. W. GEIGL AND R. V. WHEELER. *Safety Mines Research Board* (London), paper No. 49, 2-13 p. (1929).—This records results of a further study of the magnitude of the pressure developed in firedamp explosions within closed vessels such as the casings of elec. switch gear used in coal mines. In these expts. explosions of CH_4 + air originated in one vessel were allowed to travel through a small opening into another vessel similarly filled. In one set of tests the coupled casings differed in the ratio of 10 to 1 and in the second set by 100 to 6. From the results of the second set it is concluded that when an explosion from CH_4 + air travels from a relatively large vessel through a small opening into a relatively small vessel the pressure developed in the latter will be materially increased over that normally developed by a CH_4 + air mixt. initially at atm. pressure. C. I. M.

Controlling fire and explosion hazards of anesthetics. C. H. WARDLE. *M. J. Hosp.* 32, 50(1929). *Squibb Abstr. Bull.* 2, 137. Static electricity, one of the special hazards encountered in anesthetics, may be best controlled by the use of a proper humidification system, i. e., the relative humidities existing in surgeries should not be below 55%, and by the use of anesthesia equipment that has been made internally conductive to static by means of moisture and metallic devices. Some of the other precautions to be observed are the prohibition of open flames, or any source of ignition in the operating room; the use of vapor-proof type of elec. lights and switches; loose connections, worn elec. light cords, etc., should be eliminated. It is stressed that the effectiveness with which the fire hazards often occurring with such combustible anesthetic agents as Et_2O , ethylene, EtCl and mixts. of CHCl_3 and Et_2O may be reduced depends primarily upon the maintenance of humidity. A study of the phys. properties of ethylene and Et_2O has led to the conclusion that one is about as dangerous as the other with regard to flammability hazard. C. R. F.

HERBERT C. BUGHARD. U. S. 1,706,871, March 26. In prep. granular carbonized lignin residues (such as those obtained from waste soda pulp

liquor) for use as an absorbent for liquid O, the material is leached to remove substantially all water-sol. inorg. substances and to reduce the proportion of incombustible constituents to a minimum, and the grains of the carbonized material are reduced to such a size that their d. will be at least equal to about 0.20 and their degree or absorptiveness for liquid O at least equal to 2.6 times their own wt.

Blasting explosive. LEAVITT N. BENT (to Hercules Powder Co.). U. S. 1,706,517, March 26. Explosive ingredients such as NH_4BO_3 , NaNO_3 and nitroglycerin are used with spruce, pine or other wood normally of high d. which has been disintegrated by the release of high internal pressure.

High explosive. FREDRICH OLSEN. U. S. 1,705,874, March 19. An explosive which is suitable for use in hand grenades is formed from NH_4ClO_4 32, $\text{Ba}(\text{NO}_3)_2$ 28, vegetable-ivory meal 14, ferro-Si 10, trinitrotoluene 15 and graphite 1%.

Recovering explosives from shells. JOSEPH H. ROBERTS (one-half to Frank W. Olin). U. S. 1,706,938, March 26. In order to recover an explosive contg. NH_4NO_3 80 and trinitrotoluene 20% from shells, heated 95% alc. is run in the shells, the soln. formed is drained off and cooled to effect crystn. of the explosive which is then dried. An app. is described.

Rendering explosives nondeliquescent. LLEWELLYN J. W. JONES (to James F. O'Brien). U. S. 1,706,668, March 26. In prep. explosives with ingredients such as NaNO_3 contg. deliquescent impurities such as MgCl_2 and CaCl_2 , the material is mixed with dehydrated Na_2CO_3 , ground and dried, and the dried mixt. is coated with a mixt. of liquid nitrotoluenes.

Blasting fuses. J. FRITZSCHE. Brit. 295,406, Feb. 7, 1927. As a covering for the core of fuses there is used a material formed at least in part from prevulcanized rubber such as scrap rubber from old tires, to which may be added various other materials such as resins, waxes, pitch, hydrocarbons, bitumen or oils and fillers or fibrous materials such as kaolin, chalk, talc, cotton, wool or asbestos. A layer of China clay may be placed between the rubber compn. layer and the outer yarn covering of the fuse. Cf. C. A. 23, 1752.

Blasting fuses. J. FRITZSCHE. Brit. 295,730, Feb. 15, 1927. Safety blasting fuses are made with a core of powder in which the reactive ingredients (which may be KNO_3 and charcoal, with or without S) are less intimately in contact than in ordinary black gunpowder. The powder may be made without pressing or may contain light inert ingredients such as kieselguhr or MgCO_3 or finely divided pumice or kaolin and may be covered by materials such as paper, metal foil, kaolin, talcum or cement which are non-pervious or but slightly pervious to the gases of combustion. The powder may be treated as described in Brit. 295,406 (preceding abstract). Brit. 295,731 specifies protective waterproofing on fuses comprising rubber substitutes such as factis, linocyn or vulcanized stearin pitch, to which fillers, etc., also may be added.

Blasting fuse manufacture. J. FRITZSCHE. Brit. 295,266, Feb. 7, 1927. An app. is described.

Projectiles with a percussion fuse. O. MATTER. Brit. 295,585, Aug. 11, 1927. Structural features are described of projectiles which may contain a detonating charge of "a metallic salt of nitrogenhydrogen acid" protected by thin metal foil.

Miners' safety lamps and gas detectors. A. G. GULLIFORD and W. MAURICE. Brit. 295,773, May 27, 1927. In lamps with a Pt wire or like device for indicating the presence of CH_4 or similar gases, a variable resistance is included in the circuit of the indicator to enable the amount of CH_4 to be estimated. Various structural details are described.

-DYES AND TEXTILE CHEMISTRY

L. A. OLNEY

Process trends in dyeing, bleaching and finishing. PAUL F. HADDOCK. A. Khipstein & Co. *Cotton* 93, 281-3 (1929).

The transparency of textile fabrics in ultra-violet light. S. R. TROTMAN. *Textile Recorder* 47, No. 550, 63 (1929).—In defining transparency of fabrics, it is important to specify whether the ultra-violet light is transmitted in quantity sufficient to be of therapeutic value or in such minute quantities as to require tests of great delicacy to detect. The first is the important condition from the practical viewpoint. A simple method of testing consists in wrapping a piece of cotton dyed with a dyestuff very sensitive to light in the fabric to be tested, and exposing the wrapped samples to ultra-violet light. Tests carried out using as wrappers coarse wool web, high-grade wool web,

chlorinated wool, over-chlorinated wool, cotton, silk and viscose, cuprammonium, chardonnet and celanese rayons indicate that no ordinary textile fabric, even in a thin layer, transmits any appreciable quantity of ultra-violet light, unless it is loosely knitted. In this case, the rays pass through the interspace. RUBY K. WORNER

Consumers are demanding more durability in textiles. CHARLES F. GOLDTHWAIT Mellon Inst. Industrial Research, Pittsburg, Pa. *Textile World* 75, 1669-70(1929).

RUBY K. WORNER

The finishing industry and its development in the south. HARRY R. STEPHENSON *Cotton* 93, 264-5(1929).

RUBY K. WORNER

Increasing the tensile strength of artificial silk. S. R. TROTMAN. *Textile Recorder* 47, No. 551, 37(1929).—See C. A. 23, 1755.

RUBY K. WORNER

The chemical analysis of cotton. The action of sodium hydroxide solutions on modified cotton cellulose at the ordinary temperature. CONSTANCE BIRTWELL, DOUGLAS A. CLIBBENS AND ARTHUR GEAKE. Shirley Institute, Didsbury. *J. Textile Inst.* 19, 349-64T(1928).—For studying the relationship between soly. of a given modified cotton and concn. of the solu., a series of tests was carried out on 3 cottons, an oxycellulose of Cu no. 6.7 and 2 hydrocelluloses of Cu no. 2.95 and 2.29, resp. A 1-g. sample was stirred for 1 hr. with 25 cc. NaOH soln. varying in concn. from 0 to 10 N, and the soly. detd. volumetrically. In each case, the max soly. at 15° occurred at about 3 N NaOH, the soly. decreasing rapidly from that point with either increasing or decreasing alkali concn. A much greater soly. of the modified cotton is obtained when it is first treated with more concd. NaOH (6 to 15 N) and the alkali subsequently diluted (1 to 3 N) by adding water to the mixt. The max. soly. at 15° was realized by first steeping the cotton in 10 N and then dilg. the alkali to 2 N (10N-2N treatment). The soly. is not greatly affected by increasing the time of contact of the cotton with either the concd. or the dil. alkali. Temp. plays an important role, particularly between 15 and 25°, the soly. decreasing with rising temp. With loose cotton, shaking is not essential, but with cotton cloth, both shaking and disintegration are necessary. In studying the relationship between the soly. of modified cotton and the extent and nature of the modification, a standard method of extn. with 10N-2N NaOH at 15° was used. For hydrocelluloses, the Cu no. defines the soly., irrespective of whether the hydrocellulose is formed by 20% HCl acting for some days at 20° or by 0.5% H₂SO₄ acting for some hours at 100°. During the early stages of acid attack resulting in Cu no. up to 2 there is little increase in soly., but thereafter the soly. rises rapidly with Cu no. For oxycelluloses, in any one series of oxidized cottons formed by the action of the same oxidizing agent acting under the same conditions for varying times, the soly. is defined by the Cu no.; but for modified cottons produced by different agents or by the same agent acting under different conditions, there is no general relationship between the soly. and the Cu no. Between soly. and fluidity in cuprammonium soln., there exists for modified cottons in general, a close correlation which is independent of the method of modification and is unaffected by boiling the modified material with dil. alkali. The "reducing value" of the alkali-sol. fraction was measured by detg. the amt. of C reduced by 75 cc. alk. soln., and recalcd. the result to the basis of 100 g. dissolved cotton. Comparisons of the Cu nos. of modified cotton and the reducing properties of their alkali-sol. fractions show that with increasing modification of the cotton (Cu no.), the reducing value of the ext. rises rapidly at first but reaches a roughly const. value for Cu nos. above 2. This const. value is dependent on the type of modification being about 4 for hydrocelluloses irrespective of the method of their formation, 8 for oxycelluloses formed with neutral hypochlorite and with K₂Cr₂O₇ in H₂SO₄ soln., 12 for HOCl oxycelluloses and 20 for cotton oxidized with K₂Cr₂O₇ in H₂C₂O₄ soln. Oxycelluloses formed by the action of alk. hypobromite and all modified cotton which have been boiled with alkali have low reducing values and Cu nos. R. E. W.

Foreign matter in cotton fabric. HUGO KAUFFMANN. *Melliands' Textiltech.* 9, 575-7(1928).—The rate of decompn. of NaOCl may be expressed in the following form:

$$\frac{d[\text{OCl}]}{dt} = -K[\text{OCl}]^2$$

The catalytic action of various metal hydroxides is shown by the following values of K, obtained when small quantities were added to 0.05 M NaOCl at 25°: Co, 75; Ni, 51; Cu, 44; Sn, 2.5; and Fe, 0.5. In the pure soln. K = 0.01. The damaging possibilities of MgCl₂ in fabric coming to the bleachery are well-known. A convenient test for Mg in cloth is the blue color produced when a sample is dipped into an alk. soln. of p-nitrobenzenesazoresorcinol, and then into 10% NaOH. F. R. C.

Shaking of cotton warps. RICHARD G. KNOWLAND. *Textile Recorder* 46, No. 549, 63-4(1928).—The importance stressed of uniform conditions as to size, steam, temp.,

speed, etc. throughout the slashing operation in order to obtain uniformity in the amt. of size taken up by the warp and in the percentage of moisture left in it. R. K. W.

A new era for flax. GEORGE A. LOWRY. *Textile Recorder* 47, No. 551, 35-6(1929).—A new machine which threshes and scutches unretted or retted flax in one operation and gives double the yield of fiber previously obtained, together with a new degumming process, simplifies the handling of flax and reduces the production cost of the fiber.

RUBY K. WORNER

Preparing and spinning flax, hemp, jute and tow. CLIFFORD CARTER. *Textile Recorder* 47, No. 550, 37-8(1929).—A general discussion is given of the processes involved.

RUBY K. WORNER

Bleaching of Phormium tenax. P. W. AITKEN. *New Zealand J. Sci. Tech.* 10, 226-40(1928); cf. C. A. 22, 1790.—Sodium hypochlorite, bleaching powder and KMnO_4 are discussed as bleaching agents. As far as can be seen, the result of treatment with these compds. produces permanence of color. Tests show that there is no loss of strength in comparison with paddocked fibers. The greatest danger to strength lies in the use of acid Na hypochlorite, as the risk of chlorinating the fiber is great. R. C. E.

Wool accurately graded by microscopic measurement of diameter. H. B. GORDON. U. S. Testing Co., Inc. *Textile World* 75, 1671-3(1929).—Measurements made on top and raw wool standards prepd. by the U. S. Dept. of Agr. are reported. R. K. W.

The K. B. B. Fugitometer. KLEVIN, BOTTOMLEY & BAIRD, LTD. *Textile Recorder* 47, No. 550, 43(1929).—An illustrated description is given of this app., which has been designed for the rapid testing of fastness to light of dyed materials. The samples undergoing tests are surrounded by an atmosphere of known and const. humidity.

RUBY K. WORNER

2-Aminoanthraquinone from chlorobenzene and phthalic anhydride [vat dyes] (GROGGINS, NEWTON) 10. Substantive dyes derived from 2,7-diaminofluorene (NOVELLI, RUIZ) 10. Clarification of benzine (Fr. pat. 646,721) 22. Solvents and dispersing agents for dyes (Fr. pat. 646,816) 13. Condensation products from *p*-halogenated phenolic compounds and aldehydes [for moth-proofing textile fabrics] (U. S. pat. 1,707,181) 18. Anthraquinone derivatives [intermediates for making dyes] (Brit. pat. 295,943) 10. Dyes (Brit. pat. 295,605) 17.

Deutscher Färberkalender für das Jahr 1929. Wittenberg: A. Ziemsen. 38th Annual ed. Published by Deutsche Färber-Zeitung. 296 pp. M. 5. Reviewed in *Ind. Eng. Chem.* 21, 393(1929).

Dyes. L. B. HOLLIDAY & CO., LTD., and C. SHAW. Brit. 295,506, July 28, 1927. Gray to black vat dyes which are oxidation products of dibenzanthrone similar to those described in Brit. 277,125 (C. A. 22, 2470) are obtained by oxidizing dibenzanthrone (or its low oxidation products obtained with H_2SO_4 and HNO_3 or H_2SO_4 and MnO_2), with H_2SO_4 and salts such as NaClO_2 and KMnO_4 which are capable of reacting with H_2SO_4 to give unstable highly oxygenated acids or peroxides.

Dyes. J. G. KERN (to E. I. duPont de Nemours & Co.). Brit. 295,716, Aug. 19, 1927. Leuco esters of vat dyes are stabilized by treating them with an alkylolamine. The Na salts of the leuco esters may be dissolved in the alkylolamines such as diethanolamine, mono- or tri-ethanolamine, methyldipropanediolamine or the like, or the Na salts may be treated with an org. acid such as HOAc to liberate the acid esters which are then converted into the alkylolamine salts. The alkylolamine may also be added to a printing paste made up with a leuco ester and cotton, silk or wool may be printed with the paste and passed through a bath contg. FeCl_3 , NH_4 persulfate or NaNO_3 and H_2SO_4 .

Dyes. LEOPOLD LASKA and FRITZ WEBER (to Grasselli Dyestuff Corp.). U. S. 1,706,927, March 26. By combining aromatic *o*-hydroxydiazo compds. (such as those from 4-chloro-2-aminophenol, 4-nitro-2-aminophenol, *p*-nitro-*o*-aminosalicylic acid or picraminic acid) with 2,8-dihydroxynaphthalene-6-carboxylic acid mordant dyes are produced which dye wool brownish tints turning to fast brown to black when after-chromed.

Dyes. BRITISH DYESTUFF CORP., LTD., A. DAVIDSON and A. SHEPHERDSON. Brit. 295,770, May 26, 1927. Vat dyes are made by treating a 1-arylaminoanthraquinone-2-carboxylic acid at an elevated temp. in the presence of a solvent of high b. p. with a reagent capable of converting the COOH group into the carboxylic chloride group (this reagent being used in excess) and then treating the intermediate thus obtained

with a chlorinating agent at 160–190° with or without use of a catalyst such as I. Dyes thus prepd. from 1-anilino- and 1- β -naphthylaminoanthraquinone-2-carboxylic acid, by use of SOCl_2 in trichlorobenzene, followed by chlorination without isolation of the intermediate products give pink and orange-brown shades, resp. 1-*p*-toluinoanthraquinone-2-carboxylic acid is also mentioned as a suitable starting material. The intermediate products are probably 3,4-phthaloyl-9-chloroacridines.

Dyes. I. G. FARBENIND. A.-G. Brit. 296,106, Feb. 22, 1927. *N*-dihydro-1,2,1',2'-anthraquinone azine is made by caustic alkali fusion of 2-aminoanthraquinone, with or without use of oxidizing agents, in the presence of a salt of a lower aliphatic acid such as NaOAc together with a salt of an aliphatic acid contg. more than 3 C atoms such as Na amylate or K isobutyrate or an alcoholate or phenolate or a water-sol. compd. of high mol. wt. serving as a wetting agent such as sulfonic acid or bile acid salts.

Dyes. I. G. FARBENIND. A.-G. Brit. 295,289, Aug. 8, 1927. Monoazo dyes giving dyeings fast to kier-boiling and to light are formed either in substance or on the fiber by coupling diazotized 1-amino-3,4-dimethyl-6-halobenzenes with arylides of 2,3-hydroxynaphthoic acid. Several examples are given of dyes giving red to bluish-red dyeings.

Dyes. I. G. FARBENIND. A.-G. Brit. 295,645, May 14, 1927. Diphthalyl acridones are converted into vat dyes by treating them with nitrating agents, such as concd. HNO_3 or a mixt. of HNO_3 and H_2SO_4 . The products may be reduced to the amino derivs. and both the nitro and amino compds. dye cotton from the vat, usually in grayish-blue shades. The amino derivs. may be acylated, yielding gray vat dyes of good fastness. Several examples are given.

Dyes. I. G. FARBENIND. A.-G. Fr. 646,017, Dec. 21, 1927. Insoluble azo dyes giving violet shades are prepd. by coupling diazotized aminocarbazoles or their derivs. not contg. a sulfo group, with 2,3-hydroxynaphthoic arylamides. In examples, cotton is impregnated with a soln. of 2,3-hydroxynaphtho-*o* toluides and developed with 1-aminocarbazole. 2,3-Hydroxynaphthoaniside is coupled with diazotized amino-3,6-dichlorocarbazole. The β -naphthylamide, *p*-phenetide and *p*-aniside of 2,3-hydroxynaphthoic acid may also be used and coupled with diazotized 2-, 3- or 4-aminocarbazoles.

Dyes. I. G. FARBENIND. A.-G. Fr. 646,089, Dec. 22, 1927. Monoazo dyes which give violet to black shades on wool and fast shades on acetate silk are prepd. by coupling the diazo compds. of 4-nitroaniline-2-sulfonic acid, 5-nitro-2-aminobenzyl-sulfonic acid or a sulfonic acid of 4-nitro-1-aminonaphthalene with 4'-hydroxyphenyl-2-aminonaphthalene or its substitution products. In examples the prepn. of the dyes from 5-nitroaniline-2-sulfonic acid and 4'-hydroxyphenyl-2-aminonaphthalene or its 3'-carboxylic acid; 4-nitroaniline-2,5-disulfonic acid, 2-methoxy-4-nitroaniline-6-sulfonic acid or 5-nitro-2-aminobenzyl- ω -sulfonic acid and 4'-hydroxyphenyl-2-aminonaphthalene; 4-nitro-1-aminonaphthalene-5-sulfonic acid or 4-nitro-1-aminonaphthalene-6-sulfonic acid and 4'-hydroxyphenyl-2-aminonaphthalene is described. A list of components and the shades obtained on wool is also given.

Dyes. SOC. ANON. POUR L'IND. CHIM. A BALE. Brit. 295,257, Aug. 4, 1927. Methylaminanthraquinone- ω -sulfonic acids, contg. a further substituent in the methyl group, are made by the action of a bisulfite compd. of an aldehyde contg. more than 1 C atom, or of an aldehyde together with a bisulfite, on primary and secondary aminoanthraquinones. The products are suitable for use in dyeing and printing processes, generally, *e. g.*, for dyeing cotton, silk and cellulose acetate. Examples are given of the condensation of 1-amino-4-hydroxyanthraquinone with NH_4HSO_3 and benzaldehyde and of 1,4,5,8-tetraaminoanthraquinone with NaHSO_3 and benzaldehyde. Furfural, acetaldehyde and crotonaldehyde may also be used with various specified aminoanthraquinone derivs.

Dyes. SOCIÉTÉ ANON. POUR L'INDUSTRIE CHIMIQUE A BALE. Swiss 128,208, May 29, 1926. A stable dye prepn is obtained by intimately mixing a finely powd. almost insol. dye with salts of the sulfonation products of the distn. residu. of benzaldehyde. Examples of the dyes are the azo dye obtained from diazobenzene and 1-phenyl-3-methyl-5-pyrazolone, from diazotized *p*-nitroaniline and cresidine, and the dye from 1-amino-4-hydroxyanthraquinone.

Dyes. SOCIÉTÉ ANON. POUR L'INDUSTRIE CHIMIQUE A BALE. Swiss 128,228, May 7, 1927. A symmetrical Cr- and S-contg. dye is prepd. by treating the Cr compds. of the dye obtained from diazotized 1,2-aminonaphthol-4-sulfonic acid and α -naphthol with S. The new dye colors cotton a wash- and light-fast blue in a Na_2S bath.

Dyes. SOC. ANON. POUR L'IND. CHIM. A BALE. Fr. 646,062, Dec. 22, 1927. Dyes obtained by coupling *o*-hydroxydiazo compds. with 3-methyl-5-pyrazolone are treated with chroming agents, the products being sol. in water and dyeing animal fiber in fast

shades from orange to red. In an example, the dye obtained by coupling nitrated 2-hydroxy-1-diazonaphthalenesulfonic acid with 3-methyl-5-pyrazolone is dissolved in boiling water and Cr_2O_3 is added. In general orange dyes are obtained starting with the following: *o*-aminophenols, *o*-aminophenolsulfonic acid, 4-nitroaminophenol-6-sulfonic acid, 6-nitroaminophenol-4-sulfonic acid, 4-chloroaminophenol-5-sulfonic acid, *o*-aminophenol-4-sulfonamide, 4- and 5-nitroaminophenols, 4-chloroaminophenol, picramic acid, etc.

Azo dye. ERICH FISCHER and CARL E. MÜLLER (to Grasselli Dyestuff Corp.). U. S. 1,706,484, March 26. A monoazo dye dyeing cellulose esters bright intense yellow shades is formed by coupling diazotized *p*-aminoacetanilide with *p*-cresol.

Azo dyes. WERNER ZERWECK (to Grasselli Dyestuff Corp.). U. S. 1,706,946, March 26. Dyes are formed by combining various diazo compds. (not contg. a sulfonic acid group) with derivs. of 2,3-hydroxynaphthoic acid such as may be produced by condensing 2 mol. proportions of 2,3-hydroxynaphthoic acid with aromatic mono- or diamines contg. 1 or 2 triazolic groups or with the related aminotriazolic compds. which may be obtained by oxidizing correspondingly substituted *o*-aminoazo compd. The dyes thus formed produce good lakes and give dyeings which, when variously developed, range from yellowish to black. A large no. of examples are given.

Azo dyes. SOC. ANON. POUR L'IND. CHIM. A BÂLE. Brit. 294,883, July 30, 1927. Azo dyes are produced in substance or on the fiber or other substratum by coupling diazo compds. of aryl or aralkyl ethers of *o*-aminophenols with *o*-arylhydroxy- or *o*-aralkylhydroxyanilides of 2,3-hydroxynaphthoic acid. Several examples are given for producing products suitable for coloring varnishes, dyeing cotton, etc.

Azo dyes from hydroxynaphthodiazine derivatives. WILHELM HERZBERG and HEINRICH OHLENDORF (to Grasselli Dyestuff Corp.). U. S. 1,705,974, March 19. By the combination of components such as diazotized 1-aminobenzene-4-sulfonic acid and the compd. obtained by melting an alkali metal hydroxide with 4,8-disulfo-1,2-naphthophenazine or the like, monoazo dyes are obtained which dye wool and cotton various colors. Several examples are given.

Thiazoles and azo dyes. I. G. FARBERIND. A.-G. Brit. 295,295, March 30, 1927. Amino- or iminothiazoles are prepd. by treating a primary arylamine with a thiocyanate in the presence of a halogen; the arylamine used is one in which the *p*-position to the amino group is either substituted by a univalent radical or occupied in the formation of a ring while the *o* position is free. An *o*-aminothiocyano compd. is probably first formed and may then be converted either by standing or by warming to form the isomeric thiazole product. The products are suitable for use as *intermediates for the manuf. of dyes and pharmaceutical compds.* 2-Amino-6-ethoxybenzothiazole, prepd. from *p*-phenetidine, forms a diazo compd. which couples with resorcinol to form a red, with H-acid to form a blue, and with a 2-naphthol-7-sulfonic acid to form a reddish violet dye. Several other examples are given.

Azo dyes containing chromium. SOCIÉTÉ ANON. POUR L'INDUSTRIE CHIMIQUE A BÂLE. Brit. 295,944, Aug. 19, 1927. By the action of reagents such as Cr fluoride, Cr compds. are obtained from *o*-hydroxyazo dyes obtained by coupling diazotized 5-nitro-2-aminophenol with an *N*-acyl-2-amino-5-naphthol-7-sulfonic acid. A large no. of acyl derivs. are specified as suitable and the Cr compds. formed may be used for dyeing cotton or in coloring nitrocellulose varnishes, etc.

Monoazo dyes. I. G. FARBERIND. A.-G. Brit. 295,237, May 4, 1927. Monoazo dyes giving bluish violet to blue shades on "acetate silk" are formed by coupling diazotized picramide or its homologs with a sulfonic acid of a *N*-aralkyl-, or *N*-alkylaralkyl-aniline or a homolog or substitution product such as *N*-ethyl-*N*-sulfobenzyl-3-toluidine. Other examples also are given. The dyes may be used in a neutral Na_2SO_4 bath or an HOAc bath for dyeing "acetate silk" or in an acid bath for dyeing wool.

Disazo dyes. BRITISH DYESTUFF CORP., LTD., R. BRIGHTMAN and P. CHORLEY. Brit. 296,047, April 22, 1927. Disazo dyes are formed by coupling a tetrazotized 4,4'-diaminodiphenyl méno-, di- or tri-sulfide with 2 mol. proportions of a 2,8-aminonaphthol-sulfonic acid or an *N*-substituted deriv. or with 1 mol. proportion of such an acid or deriv. and 1 mol. proportion of a phenol or amine of the benzene of naphthalene series or a sulfonic, carboxylic or other deriv. The products yield dyeings fast to milling on wool and even dyeings on regenerated cellulose artificial silks. Several examples are given of the production of the dyes and of their use on "viscose silk."

Vat dyes. GEORG KALISCHER and WERNER ZERWECK (to Grasselli Dyestuff Corp.). U. S. 1,705,817, March 19. 1,1'-Dinaphthyl-8,8'-dicarboxylic acid or suitable substitution products which may contain halogen or other univalent substituents are treated with acid condensing agents under "moderate conditions" and the benzo-

benzanthronecarboxylic acids thus formed are further heated with alk. condensing agents and the products so formed are finally subjected to the action of acid condensing agents. The vat dyes thus formed are insol. in water, alkalies and the usual org. solvents, are sol. in concd. H_2SO_4 with a yellow to olive color, and with alkaline hyposulfite form blackish violet colored vats from which cotton is dyed blue to gray shades, fast to washing, Cl and light. Several examples with details of procedure are given. Cf. C. A. 23, 1282.

Vat dyes. MAXIMILIAN P. SCHMIDT and OTTO LIMPACH (to Grasselli Dyestuff Corp.). U. S. 1,706,902, March 26. Condensation of *o*-toluhydroxynaphthocarbazole and isatin-2-anilide forms a dye which gives a yellow vat with hyposulfite dyeing wool and cotton black tints on exposure to the air. 5-Chloroisatin-2-*p*-chloroanilide and like compds. form similar dyes.

Vat dyes. I. G. FARBENIND. A.-G. (Arthur Lüttringhaus, Heinrich Neresheimer and Hans J. Emmer, inventors). Ger. 471,377, Oct. 12, 1926. Vat dyes giving reddish brown shades on cotton are prepd. by treating diphthaloylanthraquinones with N_2H_4 . Examples are given describing the prepn. of dyes from N_2H_4 , H_2O and (1) diphthaloylanthraquinone prepd. by oxidizing isodibenzanthrone and (2) the chlorodiphthaloylanthraquinone prepd. by oxidizing 6,6'-dichloroisodibenzanthrone.

Vat dyes. I. G. FARBENIND. A.-G. (Paul Nawiasky, Hans Jos. Emmer and Alfred Ehrhardt, inventors). Ger. 470,184, Aug. 7, 1924. Ether-like compds are prepd. by reducing vat dyes in neutral soln. with metals, and alkylating the product in the absence of water. Thus, dibenzanthrone, Zn dust, the Me ester of toluenesulfonic acid and NaOH are stirred into trichlorobenzene and heated to boiling. The mixt. is cooled, filtered and washed, and the Zn removed by dil. HCl. The new compd. is crystd. from trichlorobenzene. Cu or other metals can be used instead of Zn. Other examples commence with isodibenzanthrone or its oxidation products.

Vat dye. SOCIÉTÉ ANON. POUR L'INDUSTRIE CHIMIQUE À BALLE. Swiss 128,371, Oct. 20, 1926. Addn. to Swiss 125,480. A new vat dye of the anthraquinone series is prepd. by treating violanthrone simultaneously with sulfonating and oxidizing agents, melting the product with KOH and then treating with a methylating agent. In a blue vat it dyes cotton a fast blue. Cf. C. A. 23, 2042.

Vat dyes of the anthraquinone series. WALTER MIEG (to Grasselli Dyestuff Corp.). U. S. 1,706,933, March 26. A 1-aminoanthraquinone-2-aldehyde is reacted on by an α -halogenanthraquinone compd. such as 1-chloroanthraquinone in the presence of a catalyst, *e. g.*, Cu powder, and of NaOAc or other suitable acid-binding agent. Dyes are obtained which dye cotton brownish yellow shades. Cf. C. A. 23, 525.

Vat dyes of the isodibenzanthrone series. ALOIS ZINKE (to Felice Bensan). U. S. 1,705,953, March 19. Dyes are formed by the action of alkali metal hydroxides while heated in the presence of an org. solvent such as aniline or quinoline on dibenzoyldibromoperylene or other suitable diaroyldihalogenperylene having 2 halogens in the perylene nucleus and with each aroyl group occupying a position peri to one of the halogens and having a free *o*-position. The dyes thus formed dye cotton blue or violet shades.

Indigoid dyes. I. G. FARBENIND. A.-G. Fr. 646,349, Dec. 24, 1927. Indigoid vat dyes of the 2-thionaphthene-2-indoleindigo series which dye the fiber violet are obtained by condensing the derivs. of 3-hydroxy-1-thionaphthene substituted in the ring with active compds. of 7-methylisatin substituted in the 5 (or 4 and 5) position by halogen or CH_3 , and in the 2 position by a halogen or an arylamine, which becomes replaced by the thionaphthene radical. Thus, 5-chloro-7-methylisatin is transformed into the corresponding isatin α -chloride by heating with PCl_5 in PhCl and is added to a soln. of 5-chloro-3-hydroxy-1-thionaphthene and the mixt. heated to 80-90°. The dye produced 5-chloro-2-thionaphthene-5'-chloro-7'-methyl-2'-indoleindigo dyes fiber from the vat fast violet shades. 7-Methyl-5-chloro-1-hydroxythionaphthene is heated in NaOH soln. and condensed with 5-chloro-7-methylisatin-4'-chloro-*o*-toluidide. 5,6,7-Trichlorohydroxythionaphthene is condensed with the 4'-chloro-*o*-toluidide of 5-chloro-7-methylisatin. 4-Methyl-5,7-dichlorohydroxythionaphthene is condensed with 5-chloro-7-methylisatin-4'-chloro-*o*-toluidide. Several other examples are given. Cf. C. A. 23, 1285.

Thioindigo dyes. I. G. FARBENIND. A.-G. Brit. 295,239, May 4, 1927. Products giving clear fast violet shades are obtained by bromination, in the presence of H_2SO_4 , of thioindigo dyes of the 2,2'-indolethionaphthene series having a single alkyl group in the indole nucleus. Examples are given.

Pyrazolone dyes. Soc. ANON. POUR L'IND. CHIM. À BALLE. Fr. 646,001, Dec. 22,

1927. Azo dyes particularly suitable for dyeing cellulose esters are prep'd. by diazotizing nonsulfonated homologs or substitution products of PhNH_2 and coupling with 3-methyl-5-pyrazolone. In examples, *m*-nitro-*p*-toluidine is diazotized and coupled with 3-methyl-5-pyrazolone. The product dyes acetate silk and lacs in fast yellow shades. Diazotized aminoazobenzene is introduced into a soln. of 3-methyl-5-pyrazolone contg. NaOAc . The product dyes cellulose esters and lac orange shades. Safranin MN is diazotized and coupled with 3-methyl-5-pyrazolone. The product may be used to produce violet lacs.

Disazopyrazolone dyes containing a 1,5-dihydroxynaphthalene nucleus. LEON W. GELLER (to National Aniline & Chemical Co.). U. S. 1,706,878, March 26. Disazo dyes are formed by coupling a diazotized aminobenzeneazoarylpyrazolone comp'd. with 1,5-dihydroxynaphthalene or by coupling a diazotized aminobenzeneazo-1,5-dihydroxynaphthalene comp'd. with an arylpyrazolone comp'd. The benzene nucleus in the aminobenzene radical or the aryl nucleus in the pyrazolone radical, or both, may contain substituents such as Cl , CH_3 , COOH , OH , SO_3H or SO_2NH_2 and those of the products contg. an acid radical such as COOH or SO_3H in the form of their Na salts are sol. in water and dye wool in an acid bath yellow to red shades which by after-chroming change to orange to red to brown tints. The products are suitable for the production of lakes and pigments.

Dyes of the phenonaphthosafranin series. J. R. GEIGY A.-G. Swiss 128,137 to 128,170, Feb. 8, 1927. Addns. to Swiss 124,764. These dyes are prep'd. by condensing di- or trisulfonic acids of 3-dialkylisrosinduline with monoaminosulfonic acids. The alkyl radical is usually methyl or ethyl. Among the amino acids mentioned are: 1-amino-5-methyl-4-monomethylaniline-2-sulfonic acid, 1-amino-4-dimethylaniline-2-sulfonic acid, 1-amino-4-ethylbenzylaniline-2-sulfonic acid and 1-amino-4-hydroxy-5-methylbenzene-2-sulfonic acid.

Sulfur dyes. OSKAR SPENGLER and RUDOLF WEIDENHAGEN (to Grasselli Dye-stuff Corp.). U. S. 1,705,840, March 18. S is melted together with 4-benzalamino-4'-hydroxydiphenylamine or other suitable leucoindophenol in which the H of the terminal amino group has been exchanged for an org. radical and which is able to undergo thiazole ring closure on heating with S; the products dye cotton blackish brown tints.

New mordant dyes. DURAND & HUGUENIN AKT.-GES. S. A. Fr. 646,720, Jan. 5, 1928. Mordant dyes are obtained by diazotizing an aminoazo comp'd. of the type $\text{R}'\text{N}=\text{N}-\text{R}^2\text{NH}_2$, in which R' is an aromatic group contg. an OH group *o*- to a COOH group, and R^2 is an aromatic group contg. a sulfonic or COOH group, and treating the diazo comp'd. in an alk. or acid medium at ordinary or raised temp. until its coupling power has disappeared. In examples (1) the aminoazo comp'd. in which R^2 is *p*-nitro-aniline-*o*-sulfonic acid and R' is salicylic acid is reduced and diazotized and stirred with dil. NH_3 until the blue color disappears and the soln. is acidified to ppt. the dyestuff which gives a fast reddish brown when chrome printed on cotton. (2) The diazo comp'd. of (1) is boiled with dil. HCl until a sample does not give a blue color with NH_3 . The product gives a yellower tint than that in (1). (3) The acetyl group of the aminoazo comp'd. in which R^2 is acetyl-*p*-phenylenediaminosulfonic acid and R' is *m*-cresotinic acid, is saponified, and the product diazotized and stirred with dil. NH_3 as in (1). The product yields a redder tint in chrome printing than that in (1). (4) The comp'd. obtained by nitration and reduction of the aminoazo comp'd., in which R^2 is anthranilic acid and R' is salicylic acid, is diazotized and stirred with dil. NH_3 as before. The dyestuff gives a yellower tint than that in (1).

Anthraquinone derivatives. BRITISH DYESTUFFS CORP., LTD. Fr. 645,999, Dec. 8, 1927. 1,4-Dialkyldiaminoanthraquinones are converted into products contg. fewer alkyl groups by treating with concd. H_2SO_4 above 150° , or with H_3BO_3 between 130° and 150° . The products dye acetate silk. In an example, 1,4-dimethyldiaminoanthraquinone is heated with H_2SO_4 (100%) at 180 – 200° , and the product, pptd. by diln. with water, dyes acetate silk bright bluish violet shades.

New anthraquinone derivatives. HEINRICH VON DIESBACH. Swiss 127,926 to 127,930, Sept. 23, 1928. Addns. to Swiss 124,526. In the first two patents, *N*-(hydroxymethyl)benzamide is condensed with 2-hydroxyanthraquinone, giving 1-benzoylamino-methyl-2-hydroxyanthraquinone or *N*-(2-hydroxy-1-anthraquinonylmethyl)phthalimide, according to the proportions, which melt at 250° and 265° , resp., with decompn. In the third patent, bis(hydroxymethyl)urea and 2-hydroxyanthraquinone are condensed to give *s*-bis(2-hydroxyanthraquinonylmethyl)urea, which melts at 250° with decompn. In the last two patents, alizarin is condensed with (hydroxymethyl)trichloroacetamide and bis(hydroxymethyl)urea, resp., giving (trichloroacetamidomethyl)dihydroxyanthraquinone which changes above 200° without melting, and α -(dihydroxyanthraquinonyl-

methyl)- β -hydroxymethylurea which decomposes at 204° without melting. These derivs. can be used in the prepn. of dyes and their intermediate products.

Diphthaloyl anthraquinones. ARTHUR LÜTTRINGHAUS, HEINRICH NERESHEIMER and HANS J. EMMER (to Grasselli Dyestuff Corp.). U. S. 1,706,493, March 26. Derivs. of this type are formed by subjecting an isodibenzanthrone to strong oxidation with chromic acid; they may be used for production of vat dyes and give orange-red vats with alk. hyposulfite soln. and have no affinity to vegetable fibers.

Chlorinated anthanthrones. L. CASSELLA & Co. Ges. Brit. 205,600, Aug. 11, 1927. Anthanthrone is chlorinated in H_2SO_4 contg. a small proportion of water (preferably acid of about 85-95% strength), with or without addn. of a Cl carrier and suitably at a temp. of about 45-50°. By this procedure a dye may be formed similar to that of the first example given in Brit. 260,998 (C. A. 21, 3467).

2,3-Aminonaphthol and its derivatives. I. G. FARBENIND. A. G. Fr. 645,919, Dec. 19, 1927. 2,3-Aminonaphthol or its derivs. substituted in the ring is obtained by submitting the arylsulfonates of 2,3-hydroxynaphthamide or its derivs. to the action of NaOCl or KOCl after the Hofmann reaction and sapon. the arylsulfonate of 2,3-aminonaphthol. Thus, *p*-toluenesulfonate of 2-hydroxy-3-naphthamide (from *p*-toluenesulfonyl chloride and 2,3-hydroxynaphthamide) is mixed with alc. and a soln. of NaOCl is added and the mixt. heated. The product, *p*-toluenesulfonate of 2,3-aminonaphthol, m. 144-145°, is sapon. with NaOH EtOH, giving 2,3-aminonaphthol. Similarly benzenesulfonate of 2-hydroxy-3-naphthamide gives benzenesulfonate of 2-aminonaphthol which is sapon. 6-Bromo-2,3-hydroxynaphthamide, m. 295°, (from 6-bromo-2,3-hydroxynaphthoyl chloride and NH_3) is dissolved in NaOH and heated with *p*-toluenesulfonyl chloride. The *p*-toluenesulfonate of 6-bromo-3-hydroxy-3-naphthamide, m. 185° (not corrected), gives after the Hofmann decompn. *p*-toluenesulfonate of 6-bromo-2,3-aminonaphthol, m. 105° (not corrected), which on sapon. gives 6-bromo-2,3-aminonaphthol, m. 222° (not corrected). The compds. are intermediates for dyes.

Dyes for "acetate silk." ROBERT E. SCHMIDT and ROBERT BERLINER (to Grasselli Dyestuff Corp.). U. S. 1,706,498, March 26. By treating hydroxyanthraquinones with ethylene chloride dark cryst. compds. are obtained which dye "acetate silk" generally red to bluish red shades.

Dyes and intermediates. I. G. FARBENIND. A. G. Brit. 205,593, Aug. 11, 1927. In producing 4-methyl-6-halo-3-hydroxythionaphthene and the corresponding thionaphthene dyes, 2-cyano-3-methyl-5-halo-1-thioglycolic acid is prepd. from 1-methyl-2-amino-5-nitro-5-halobenzene, by way of the corresponding 2-cyano-3-nitro-, 2-cyano-3-amino- and 2-cyano-3-diazonium compds. The diazonium compd. may be converted into the thioglycolic acid by forming the xanthic ester and treating with chloroacetic acid after saponifying or by treating with alkali sulfides, reducing to the mercaptan and finally coupling with chloroacetic acid.

Dyes and intermediates. I. G. FARBENIND. A. G. Brit. 205,604, Aug. 11, 1927. Cyanoaryl- α -thioglycolic acids are hydrolyzed to the corresponding carbamyl- α -thioglycolic acids by treatment with H_2O in alk. soln. and by further treatment with alkali hydroxythionaphthene may be formed. An example is given of the treatment of 2-cyano-5-ethoxybenzene-1-thioglycolic acid.

Dye intermediates. J. R. GEIGY AKT. GES. Fr. 645,867, Dec. 17, 1927. Disulfo-*N*-alkyliserosindulines and their derivs. are prepd. by treating 1-chloro-*N*-alkyliserosindulines in the presence of org. solvents with neutral or acid sulfates and oxidizing the products. In examples, 1-chloro-3-diethyliserosinduline-HCl (from phenyl-2-naphthylamine and nitroso-*m*-chlorodiethylaniline-HCl) reacts in aq. soln. with NaOAc, and the product is boiled in alc. with $NaHSO_3$, and air is afterward passed through, giving 1,6-disulfo-3-diethyliserosinduline. 1-Chloro-3-dimethyliserosinduline-HCl, 1-chloro-3-diethyl-11-methyliserosinduline sulfate and 1-chloro-3-diethyl-13-chloroiserosinduline may also be used. The products are intermediates for naphthosaffranine dyes.

Dye intermediates of the 1,9-anthrathiazole series. RALPH N. LULEK (to E. I. duPont de Nemours & Co.). U. S. 1,706,981, March 26. Compds. such as 1-chloro-anthraquinone-2-carboxylic acid or 1-chloroanthraquinone-2-aldehyde are heated with S, alkali sulfide and NH_3 to form products such as 1,9-anthrathiazole-2-carboxylic acid or 1,9-anthrathiazole-2-aldehyde which may be used as dye intermediates.

Dyeing. SOC. DE PRODUITS CHIM. ET MATIERES COLORANTES DE METZ-SE. Fr. 646,214, May 9, 1927. Pptn. by org. acids of sulfurized products of PhOH and its derivs. used as mordants for vegetable fiber, is prevented by the addn. of protective colloids such as cellulose extracts (sulfite lyes), British gum, gum arabic, gelatin or strong glue.

Dyeing cellulose esters. C. DREYFUS (to British Celanese, Ltd.). Brit. 295,579, Aug. 13, 1927. Materials comprising cellulose esters are colored by vat or sulfur dyes applied as printing pastes prep'd. with strong alkalis and the dyes are subsequently fixed in the usual manner. Solvent or softening agents for the cellulose ester such as ethylene dichloride may be included in the printing pastes, as may also suitable discharge agents such as formaldehydesulfoxylate and a leucotrope if it is desired to produce discharge effects by subsequent steaming. Colored discharge effects may also be obtained by adding a dye unaffected by the discharging agent.

Dyeing cellulose esters, etc. I. G. FARBENIND A.-G. Fr. 646,371, Dec. 27, 1927. Dyes insol. in water obtained by treating alkyl- ω sulfonic acid of primary or secondary aminoazo compds. of their salts with alk. agents are used for dyeing cellulose esters or ethers. In examples, the azo dye from diazobenzene chloride and Na methyl-aniline- ω -sulfonate, is heated to 90° in Na₂CO₃ or NaOH soln. The dye which ppts. is brought into suspension with Turkey red oil, etc., and dyes acetate silk in deep greenish yellow shades. If diazotized 3,4-dichloroaniline is used, an intense golden yellow shade is obtained, and if diazotized *p*-nitroaniline is used, strong orange shades are obtained. The dye from diazotized *p*-nitroaniline and the methyl- ω -sulfonic acid of monomethyl-aniline when treated with NaOH soln. gives a product which dyes acetate silk orange-red.

Dyeing cellulose fabrics. J. C. WATSON. Brit. 295,977, May 18, 1927. Fabrics such as those of cotton, or artificial silks such as viscose, cuprammonium or Chardonnet "silks" are made with the component threads in contrasting colors by treating one set of threads before weaving with a vat dye or deriv. and after weaving treating the fabric with a chemical reagent to dye the pretreated set of threads in a contrasting color to the other set of threads. Various examples are given. Brit. 295,982 specifies treating one or both sets of threads, before weaving, with an arylide of 2,3-hydroxynaphthoic acid or a diacetylacetic arylide and, after weaving, developing the color on the pretreated threads with a diazo compd. Examples are given.

Dyeing regenerated cellulose artificial silk. BRITISH DYESTUFFS CORP., LTD., R. BRIGHTMAN AND P. CHORLEY. Brit. 296,011, April 22, 1927. Dyeing in level shades is effected with the dyes obtained by coupling a tetrazotized 4,4'-diaminodiphenyl mono-, di-, or tri sulfite with 2 mol. proportions of an ammonaphtholsulfonic acid or a *N*-substituted deriv. of such an acid or with 1 mol. proportion of such an acid or deriv. and 1 mol. proportion of another coupling component. Several examples are given.

Dyeing, rinsing and other treatments of textile materials with liquids. GEORGE W. STEIGER. U. S. 1,706,827, March 26. The liquid used in several successive baths is caused to flow in alternately upward and downward direction by the action of intermittent vacuum. An app. is described.

Printing colors. I. G. FARBENIND A.-G. Fr. 646,372, Dec. 27, 1927. Flour of horse-chestnuts, preferably freed from saponin, is made into a starch paste and used as a thickening agent for printing colors. It may be mixed with other flour or starch or esters of higher fatty acids or resinic acids and alk. salts.

Color-printing paste. JEAN G. KERN and CHARLES J. SALA (to E. I. du Pont de Nemours & Co.) U. S. 1,705,818, March 19. A vat dye paste such as that formed in making Pensol blue GD is used with glycerol and diethanolamine, to form a paste mixt. suitable for producing bright uniform prints free from speckiness.

Different tints on paper. PACIFIC NORTHWEST PAPER MILLS. Brit. 295,778, May 30, 1927. A plurality of different tints from a single dye are produced on paper by passing it through a dye bath, submitting different portions of the paper to different degrees of pressure, again passing the paper through the dye and finally wringing it. Brit. 295,779 describes an app. for carrying out this process.

Apparatus for dyeing cones of yarn. LOUIS B. HASHPOCK (to Eclipse Textile Devices, Inc.). U. S. 1,705,761, March 19. U. S. 1,705,762 relates to a holder for yarn cones, and U. S. 1,705,763 specifies a special form of injector needle suitable for use in dyeing.

Perforated yarn spool for use in dyeing, bleaching, etc. GEORGE W. STEIGER. U. S. 1,706,826, March 26. Structural details.

Apparatus for continuous drying of warps of artificial silk, silk and schappe silk, etc. MASCHINENFABRIK RÜTI VORM. C. HONIGGER. Fr. 253,331, Aug. 11, 1927.

Roller, tank and spraying apparatus for dyeing fabrics. C. HACKENBROICH and C. D. FRANGOPULO. Brit. 295,569, Aug. 13, 1927. Various structural details are specified.

Device for holding fabrics while boiling, dyeing or delustering, etc. H. PLATT, N. C. SHANE and C. DREYFUS (to British Celanese, Ltd.) Brit. 295,283, Aug. 8, 1927.

Designs on fabrics of cellulose derivatives, etc. C. DREYFUS (to British Celanese,

Ltd.). Brit. 295,582, Aug. 13, 1927. A fabric comprising substances such as cellulose formate, acetate, propionate or butyrate or methyl or ethyl cellulose, animal fibers such as silk or wool, or mixts. of these, is provided with a design in cellulose. This may be produced by printing with viscose or cuprammonium cellulose and then converting the design into cellulose. The material may be subsequently dyed with dyes having selectively different effects on different portions of the material. Substances such as gelatin or casein also may be used for printing designs and if desired may be removed from the fabric after dyeing. Cf. C. A. 23, 289.

Coloring skins, furs, etc. I. G. FARBERIND. A.-G. Fr. 646,944, Jan. 10, 1928. Multicolor effects are produced on skins, furs, etc., by damping certain parts of the article with an alk. soln. or suspension, removing excess alkali by washing the article in water and dyeing with vat dyes.

Textile threads. JEAN BOVEUX. Fr. 646,184, May 5, 1927. Threads particularly of natural or artificial silk are immersed before or after dyeing in a bath containing rubber, mastic and (or) spermaceti dissolved in benzine or other volatile solvent, whereby the adherence of the fibers is increased.

Mercerizing yarns and fabrics. SILVER SPRINGS BLEACHING & DYEING CO., LTD. AND A. J. HALL. Brit. 295,488, July 9, 1927. Yarns and fabrics of cotton, linen or other material containing desulfurized "viscose silk" are mercerized with KOH (suitably of a strength of 60° Tw. at 30°) and may be stretched, washed with hot or cold water, passed through dil. H_2SO_4 and washed and dried; the process up to acidification may be performed in 80 sec.

Finishing fabrics with designs. H. LIVSKY, G. E. HOLDEN AND J. AND J. M. WORRALL, LTD. Brit. 295,203, March 15, 1928. A design is printed on a pile fabric with a strong oxidizing agent and the fabric is then singed to burn away the pile on the treated portions.

Fabric for use in aircraft manufacture. ISADORE M. JACOBSON and STAFF TRUSCOTT. U. S. 1,706,294, March 19. Fabrics are treated with a mixt. of regenerated cellulose and rubber dispersed in org. solvents such as benzene. U. S. 1,706,295 specifies a gas-retaining fabric such as mercerized cotton with a covering consisting of the solute from aq. soln. of a sol. salt of cellulose with glycolic acid or derivs. of such compds.

Apparatus for treating fabrics with liquids. GEORGE HANDBERLIN. U. S. 1,706,901, March 26.

Protecting textile materials against insects. I. G. FARBERIND. A.-G. Brit. 295,742, May 18, 1927. Wool, fur, textile materials, etc., are protected from moths or other insects by treatment with tri-K difluorodisulfate, mono-K monofluorophosphate, the addition product of the Na salt of *p*-toluenesulfonic acid and HF or K₂ fluoride or similar compds. to which other compds. such as org. or inorg. acids or salt also may be added. Several examples are given.

Moth-proof fabrics. I. G. FARBERIND. A.-G. Fr. 646,479, Dec. 28, 1927. Wool, fur, etc., is protected against moths by a soln. of salts having the formula MF(HF)_n in which M stands for a metal. Examples are KF(HF), KF(HF)₂, NaF(HF), NH₄F, HF.

Loading silk. R. CLAVEL. Brit. 296,017, Aug. 23, 1927. Silk in hanks is loaded by a continuous process in which the sep. stages are not interrupted by washing, acidification or neutralization. The loading, *e. g.*, by $SnCl_4$, is effected in the presence of acids or acid salts such as formic acid and phosphate, and the silk may also be treated with Na silicate. An app. is described, the pipes and treating vessels of which may be lined with acid-resisting material such as rubber. Brit. 296,018 also relates to similar process and app. Cf. C. A. 23, 719.

Acetate silk. SOC. POUR LA FABRICATION DE LA SOIE "RHODIASETA." Fr. 646,719, Jan. 5, 1928. The luster is restored to acetate silk by bringing the wetted fabric in contact with a surface heated to 125-170°, under a moderate pressure, preferably 0.3 to 0.5 kg. per sq. cm. The fabric may be wetted with water containing wetting agents such as soap, sol. oil or emulsions of fatty substances, or solns. of $CaCl_2$, $MgCl_2$ or $LiCl$.

Machines for sizing artificial silk or other textiles. BURGESS LEONARD & CO., LTD., and WILLIAM B. CROMPTON. Fr. 646,096, Dec. 23, 1927.

Hollow artificial fibers. ALMA SOC. ANON. Ger. 471,458, Feb. 19, 1928. See Brit. 214,197 (C. A. 18, 2610).

De-lustering artificial silk fibers. OSCAR F. MULLER (to Nyanza Color & Chemical Co.). U. S. 1,705,490, March 19. Artificial silk fibers are treated with an emulsion of olive-oil soap, glue and paraffin, the emulsifying liquid is removed and the material is treated with a bath containing infusorial earth in suspension.

Restoring luster of de-lustered mercerized cotton. CHEMISCHE FABRIK VORM

SANDOZ. Brit. 295,936, Aug. 20, 1927. Material which has been delustered by the "immunizing effect" of treatment with aromatic carboxylic and sulfonic chlorides as described in Brit. 195,619 (*C. A.* 17, 3613) has its luster restored by treatment with steam (preferably under pressure). The steaming increases the resistance of the material to substantive dyes and may be effected while the material is under tension if desired.

Cottonizing fibers such as flax or hemp. BRUNO POSSANNER VON EHRENTAL and KARL SCHOLZ. Ger. 471,103, Nov. 9, 1924. The fibers are held between endless perforated bands which convey them continuously over a series of rollers placed in and above a bath containing the treating liquid. The liquid is circulated by withdrawing it from the bath and introducing it again through nozzles placed closely against the conveying bands.

• **Apparatus for determining the moisture content of wool or other fibrous materials by regulated drying and weighing.** ROYLES, LTD., C. WILSON and E. H. TOWNEND. Brit. 296,157, June 25, 1927.

Scouring apparatus for washing fabrics of wool or wool mixtures. FERNANDO C. PLANELL. U. S. 1,706,349, March 19.

"Dry cleaning" apparatus with an air circulating system provided with a still and condenser. E. W. MISHAW. Brit. 295,548, Jan. 20, 1928. Structural features.

Securing looped pile material to fabric backings by use of vulcanized rubber coatings. P. S. SMITH (to Oryx Fabrics Corp.). Brit. 295,323, Aug. 9, 1927. An app. and various mech. details of operation are described.

26—PAINTS, VARNISHES AND RESINS

A. H. SABIN

Determination of wood oil in oil paints. VON REHNITZ. *Farben.-Ztg.* 34, 266-8 (1928).—Marcusson's method (*C. A.* 20, 2757) for the detn. of wood oil, depending on its polymerization with I to a solid mass, gives results about 10% low. In paints (without thinners) the extn. of linseed oil with chloroform is difficult and results are frequently high. A better approximation to the truth is obtained if the ascertained value is multiplied by the I value of the oil under test, and the product divided by the average of the I values of the boiled and unboiled oils. Small quantities of turpentine oil greatly hinder the polymerization of wood oil and should be removed by shaking with 90% alc. Marcusson's method is indirect since the wood oil is detd. as the difference between the original oil and the extd. linseed oil. The polymerized wood oil can, however, be saponified with 0.5 N alc. potash, the fatty acid pptd. with BaCl_2 and the excess alkali titrated with HCl. This method is described. Comparative tests between it and gravimetric analysis of pure wood oil and mixts. with linseed oil show good agreement. B. C. A.

(Casein-oil) emulsion vehicles. HANS WAGNER and JOSEF KESSELRING. *Farben.-Ztg.* 34, 947-54 (1929).—Casein is usually dispersed in water with KOH, soda, borax or ammonia. The consistencies of such systems range from thin sols to rigid gels. KOH produces the most viscous systems. The m. ps. and viscosities of the dispersions pass through a min. at neutrality. Gels prepd. with soda eventually exhibit syneresis. The effect of disinfectants on the consistency was slight. Ca caseinate prepd. from casein and $\text{Ca}(\text{OH})_2$ is completely insol. in water if not more than twice the stoichiometric proportions of $\text{Ca}(\text{OH})_2$ is taken, but the product resulting from the reaction of alkali caseinate and $\text{Ca}(\text{OH})_2$ tends to be peptized by the residual alkali. Usually casein-oil emulsions are of the oil-in-water type. During drying of films prepd. from such emulsions the oil seps. in drops, followed, if enough oil be present by coalescence (illustrated by photomicrographs). Neutral systems are the most rapid dryers. Linseed oil emulsions film well more in water and adhere less firmly to glass than do those containing oil. The presence of pigment tends towards smaller drops; the properties of some commercial emulsions are tabulated. G. G. SWARD

Emulsion vehicles. FRIEDRICH WAGNER. *Farbe u. Lack.* 1929, 67.—The expts. of Wagner and Kesselring (cf. preceding abstract) were not comparable to actual painting practice and therefore have no significance in paint technology. G. G. SWARD

Specific gravity and viscosity of varnishes, paints, etc. H. L. HAZELTINE. *Instruments* 2, 65-8 (1929).—Orifice type viscometers are not suitable for use with paints or varnishes, as partial closure of the orifice may occur with oxidation or drying of the material. Stormer and MacMichael viscometers are approved for paints and varnishes; a brief description is given of the use of the Stormer instrument. The viscosity of the

material depends on the nature of the solvent and of the non-volatile constituents, and on the percentage of base or useful material; therefore, viscosity measurements on different materials are not on a strictly comparable basis. C. Z. ROSECRANS

Plasticizers in the plastic and lacquer field. T. S. CARSWELL. *Plastics* 5, 80-1, 93(1929).—A satisfactory plasticizer for cellulose esters should meet as nearly as possible the following requirements: (1) have good soly. for the cellulose ester; (2) have little inflammability; (3) be colorless and odorless and not change color on exposure to light; (4) be stable against the action of cold, moderate heat, or moisture; (5) have no tendency to crystallize or sep. out of the film; (6) have a high b. p. and be practically non-volatile at ordinary temps.; and (7) have low acidity to prevent hydrolysis to cellulose ester. In general plasticizers suitable for nitrocellulose are not suitable for acetyl cellulose. There appears to be no relationship between the phys. properties of a chem. compd. and its value as a plasticizer. There are very few good plasticizers with a m. p. over 100°. In the toluenesulfonamide group, the presence of a Ph substituent in the sulfonamide-N decreases the light fastness, while an alkyl group increases it. Several common plasticizers are mentioned. W. H. BOYSTON

Ventilation of japanning ovens. WM. J. MISKELLA. *Fuels & Furnaces* 7, 415-8, 428(1929). E. H.

Report of committee D-17 on naval stores. F. P. VEITCH, et al. *Proc. Am. Soc. Testing Materials* 28, Pt. 1, 602-7(1928). The m. p. and viscosity of rosin were detd. on 4 samples by ring and ball and by capillary methods. In the capillary method the softening point is the temp. at which the rosin in the capillary tube begins to coalesce, and the m. p. is the temp. at which the rosin becomes transparent. The methods are described in 2 appendices. W. H. BOYSTON

The ultra-violet detector as an aid in distinguishing genuine amber from its imitations. I. G. KOSTKA. *Chem. Ztg* 53, 117-8(1929). Various kinds of genuine and artificial amber were examd. with the ultra-violet rays produced by a quartz lamp transmitting rays of wave length $\lambda = 440 - 280\mu$, the rays emanating from a H. lamp. Natural amber is strongly fluorescent, giving a greenish white light, but taking on a more yellow or bluish color in certain specimens. Non-transparent varieties appear to be bathed in a white light with bluish or greenish tints. Phenol formaldehyde plastic give no fluorescence, urtra-formaldehyde products show blue, casem derivatives appear bluish to bluish white; celluloid and celloid become bright blue. Differences in the appearances of native clear and of compressed specimens made from smaller pieces pressed together at a higher temp. are ascribed to variations in structure rather than to differences in compn. II. *Ibid* 138-9. The sp. gr. of amber is 1.05-1.06, while that of resite (artificial resin made from HCHO and C₂H₅OH) is 1.25-1.27 and that of other artificial resins is even higher. Hardness, n , behavior towards polarized light etc. offer no means of distinguishing genuine from artificial amber. The ultra-violet detector is undoubtedly the best test to apply. W. C. LEECH

The composition of oleoresin and colophony from Pinus silvestris as compared with that from other conifers and those from foreign products. V. SHKATULOV. *Zhurn. Belorusskoi Gosudarst. Akad. Sel'skogo Khozyaystva* (Memors. Belorussian State Acad. Agr.), 4, 113-27(1927). S. reports the analyses of oleoresin and colophony supplementing his previous work. (Cf. C. A. 2, 1714). He found that a product was obtained from fresh oleoresin which, contrary to former observations, was dextro-rotatory, $[\alpha]_D^{20} +5.26^\circ$. From this he isolated by the usual methods the 4 isomers α , β , γ , and δ . The acid no. in the untreated portion was 13.1% as compared with 17.2% from a French sample. The amt. of Ag found in the Ag salt formed was 24.46%. A comprehensive French summary is appended. J. L. LEECH

Alkyd resins as film-forming materials. R. H. KIENLE AND C. J. JOHNSON. *Ind. Eng. Chem.* 21, 349-52(1929). Alkyd resins include all complexes resulting primarily from the interreaction of a polyhydric alc. and polybasic acid. Alkyd resins are classed as: heat-non-convertible, heat-convertible, and oxygen-convertible. The prepn. and general properties of these resins are outlined. Two types of soln. can be prepd. with alkyd resins as base, i. e., baking and air-drying. W. H. BOYSTON

Ultra-violet light transmission characteristics of some synthetic resins. D. L. GAMBLE AND G. F. A. STUTZ. *Ind. Eng. Chem.* 21, 330-3(1929).—A comparative study was made in which the ultra-violet absorption characteristics of a no. of synthetic resins have been detd. and the resins classified according to these characteristics. Transmission measurements were made on unexposed resin and after exposure to ultra-violet light for 48 hrs. The degree of yellowing accompanying such exposure was detd. and the tabulated data correlated with results of exposure tests should give indications as to the ultra-violet absorption characteristics most desirable in a resin. W. H. BOYSTON

Formation of resin in conifers (PIGULEVSKII, RISKINA) 17. The effect of electrolytes on organic iso-colloidal systems (AUER) 2. Azo dyes containing Cr [for coloring nitro-cellulose varnishes] (Brit. pat. 295,944) 25. Apparatus for drying paints in currents of heated air (U. S. pat. 1,706,993) 1. Air circulating system for drying paints, varnishes, etc., in a tunnel kiln (U. S. pat. 1,706,554) 1. Esters of polycarboxylic acids [for use as plasticizer in lacquers] (U. S. pat. 1,706,639) 10. Azo dyes (Brit. pat. 294,883) 25.

Lead sulfate pigment. SYDNEY W. KENDALL. U. S. 1,706,301, March 19. Sulfide ore such as galena is heated in a reducing atm. to vaporize the sulfide without oxidation, the vapors are oxidized to sulfate and then immediately chilled by atomized liquid such as water injected in limited quantity so that it becomes completely vaporized, and sprayed with reagents such as ultramarine blue capable of modifying the character of the sulfate, finally cooled and sepd. by filtration.

Fire-resisting paint. NEVIL M. HOPKINS (to Burnot Fireproofing Products, Inc.). U. S. 1,706,733, March 26. A paint is formed with oil and pigments together with sufficient borax, in the form of an impalpable powder, to form an O-excluding glaze when exposed to heat on articles such as wood to which the paint may be applied, and contg. also a flux-promoting agent such as Pb borate or Zn borate which assists in the formation of the O-excluding glaze.

Paint, varnish, etc. GEORGES WISSNER. Fr. 646,195, May 6, 1927. Substances whose mols. are more active than the solvent of the paint, etc., and which do not become oxidized, are added to paint, etc., to form on the surface treated a thin layer to which the film of paint becomes united. Suitable substances are palmitic and stearic acids (e. g., 0.25-1%).

Colored varnishes. I. G. FARDENIND, A. G. Brit. 295,941, Aug. 19, 1927. Alc. solns. of natural or artificial resins are colored, fast to light, by use of basic dyes such as triarylmethane dyes together with a small proportion of a strong org. or inorg. acid, a salt of acid reaction or a nitrate sol. in the varnish, e. g., trichloroacetic, perchloric, or nitrous acids, HCl, H₂SO₄ or HNO₃, AlCl₃, FeCl₃, CuCl₂, bisulfates, or nitrates of Ca, Sr, Bi, Th, U and Co.

Synthetic resin varnishes, etc. BAKELITE GES. Brit. 295,335, Aug. 9, 1927. Phenolaldehyde resins in the "B state" are dissolved in solvents such as cyclic ketones (e. g. cyclohexanone) or cyclohexanol or other cyclic alcs. or their esters, furfural, hydrated phenols and naphthalenes, phenol esters and their mixts. such as with benzenoid hydrocarbons, gasoline, tetrahydrobenzene, benzene bromide, chlorinated hydrocarbons, linseed oil, poppy seed oil, wood oil, stand oil, etc. Small quantities of catalysts such as NH₃, org. bases, (CH₃)₃N₄, nitrophenols or nitrocresols, phenylaminocresol, picric acid, styphnic acid, bicamide, triutrophenatole, picramic and isopicramic acids, fillers and coloring substances, etc., also may be added to varnishes or lacquers. Similar compns. also may be used for impregnating, as cements or for molding, making grinding disks, etc.

Synthetic resins. BAKELITE CORP. Brit. 295,442, May 13, 1927. Dihydroxydiphenylethane (or a phenolic mixt. which contains it) is condensed by heating (suitably at 180-200°) with polymerized CH₂O, (CH₃)₃N₄ or other CH₂-contg. hardening agent. The products are generally similar to those of the phenol-CH₂O type.

Synthetic resins. LA BAKELITE and HENRI STEINMANN. Fr. 646,529, Dec. 29, 1927. Synthetic resins, such as "bakelite," are polymerized not by heat but by submitting them to long wave length radiations which extend into the ultra-violet region, obtained, e. g., from Hg vapor lamps.

Synthetic resin. EMIL E. NOVOTNY and CHARLES J. ROMIEUX (to John S. Stokes). U. S. 1,705,494, March 19. Phenol is boiled with a polyhydric alc. such as glycerol in the presence of H₂SO₄ in small quantity, and water is removed from the zone of the reaction as fast as it is formed.

Synthetic resin. EMIL E. NOVOTNY and DONALD S. KENDALL (to John S. Stokes). U. S. 1,705,495, March 19. In forming a potentially reactive synthetic resin, phenol and furfural are heated together after admixture, in such proportions (suitably 100 and 75 parts, resp.) as to insure substantially complete combination, in the presence of a basic catalyst such as K₂CO₃, 2 parts. Water evolved during the reaction is removed. U. S. 1,075,496 specifies the use of a furane deriv. such as furfuramide as a hardening agent to accelerate the conversion of resinous products such as those of the phenol-furfural type from a fusible to an infusible state.

Synthetic resins. I. G. FARDENIND, A.-G. (ARTHUR MOSS, inventor). Oct. 210,010, Sept. 30, 1927. Hard resinous products are prepd. by treating a phenol-formaldehyde

condensation product with a halogen-fatty acid, converting the product into its NH_4 salt, and heating this at a temp. above 100° . The NH_4 salts are sol. in H_2O and the solns. can be used as *lacquers* or mixed with fillers and molded. The final products are insol. and infusible. In an example, an alk. soln. of a condensation product from technical cresol and CH_2O is treated with ClCH_2COOH . The resin acid is pptd. with HCl , washed, and treated with NH_4OH . Cf. C. A. 23, 1764.

Industrial articles from synthetic resins. COMPAGNIE FRANÇAISE POUR L'EXPLOITATION DES PROCÉDÉS THOMSON-HOUSTON. Fr. 646,424, Dec. 28, 1927. Tiles, etc., of mineral compn. including asbestos are coated with a resin consisting of a polyhydric alc. and a polybasic acid, such as glycerol and phthalic anhydride. The resin may be colored with a dye and applied as a powder or by dipping, spraying or painting and afterward baked.

Phenol-furfural synthetic resin. EMIL E. NOVOTNY and DONALD S. KENDALL (to John S. Stokes). U. S. 1,705,493, March 19. Phenol and furfural are heated together under such conditions (suitably at a temp. of about 350° or lower) that substantially all the materials enter into chem. combination and form a sol., fusible condensation product, which by further heating is converted into an infusible-insol. form.

Resins; paper. DANIEL GARDNER. Fr. 646,170, Apr. 30, 1927. See Brit 289,774 (C. A. 23, 1000).

Coumarone-indene resins. RALPH L. EMERY (to Neville Chemical Co.). U. S. 1,705,857, March 19. A coal tar distillate is prepd. in which the content of coumarone or indene, or both, constitutes as much as 80% of the whole; this distillate is polymerized with the production of incidental ppts., the polymerized material is dild. with petroleum benzene in which the ppts. are insol., the ppts. are removed, and the dissolved resin is sep'd.

Artificial resinous materials. H. W. MATHESON and F. W. SKIRROW (to Canadian Electro Products Co., Ltd.). Brit. 295,322, Aug. 9, 1927. Products varying in consistency from tough rubber-like masses to soft sticky products are obtained by reaction of vinyl esters or halides such as vinyl acetate or formate with aldehydes such as acetaldehyde or CH_2O . The reaction may be effected at room temps. to temps. of 100° or higher and with or without increased pressure. Cf. C. A. 22, 3056.

27—FATS, FATTY OILS, WAXES AND SOAPS

E. SCHERUBEL

Recent advances in our knowledge of the structure of the more common fats. T. P. HILDITCH. *Chemistry & Industry* 48, 212-6 (1929). E. H.

Component glycerides of cacao butter. COLIN H. LEA. *J. Soc. Chem. Ind.* 48, 41-6T (1929).—Oxidation of cacao butter by means of KMnO_4 in acetone shows only 2.5% of satd. glycerides; these are apparently mixed palmitic—stearic compds., the proportion of palmitic to stearic acid being 2:1. From this proportion of fully satd. glycerides, their equiv. and that of the whole fat, and the amt. of unsatd. acid in the latter, it follows that the content of mono-oleo-disatd. glycerides must lie between 75 and 85% while the dioleo-mono-satd. glycerides cannot exceed 24.5% or that of olein 12.5%. The mol. ratio of satd. acids in mixed glycerides is 1.4:1. These calculations are supported by study of the monoazela-glycerides in the oxidation products. Fractional sepn. of the Li salts of the latter has indicated that over 70% of the original fat is accounted for in the form of monoazela-glycerides by analysis of these fractions. Isolation of these glycerides as Na salts has accounted for about 53% of the original fat. Little has been forthcoming as to the compn. of the dioleo-glycerides, but, from the ascertained distribution of the satd. acids, it is to be inferred that dioleostearin is present, probably in amt. greater than that of dioleopalmitin. The content of triolein can hardly exceed 4%. A general est. of the compn. of cacao is: satd. glycerides (mainly mixed palmitostearins) 2.5%, mono-oleo-disatd. glycerides (oleodistearins 10%, oleopalmitostearins, at least 50-60%) 77%, dioleo-mono-satd. glycerides (mainly dioleostearins) 16%, triolein (?) 4%. E. SCHERUBEL

The component glycerides of a mutton tallow. G. COLLIN, T. P. HILDITCH and C. H. LEA. *J. Soc. Chem. Ind.* 48, 46-50T (1929).—A sample of mutton tallow, the fatty acids of which consisted of 4.6% myristic, 24.6% palmitic, 30.5% stearic, 36% oleic and 4.3% linoleic, was oxidized by KMnO_4 in CH_2Cl_2 and the products of complete oxidation were exam'd. There was 26% of satd. glycerides, consisting of 6.1% myristic, 39.2% palmitic and 43.7% stearic acid. Fractional crystn. of the satd. glycerides

showed that a complex mixt. was present; evidence of tristearin, palmitodistearin, and dipalmitostearin was obtained. The proportion of satd. and unsatd. acids in the mixed satd.-unsatd. part of the fat was estd. (1) from the % of satd. glycerides, the mean equivs. of the latter and of the original tallow, and the amt. of unsatd. acids present in the tallow, and (2) from the compn. of the fatty acids present in the mixed satd.-unsatd. glycerides (detd. by the difference between that of the satd. glycerides and that of the whole fat). The same value was obtained by each method, 0.9 equiv. of satd. acids per equiv. of unsatd. acid. The following are limiting values for the various classes of glycerides present: fully satd. 26%, mono-unsatd.-di-satd. 30 to 52%, di-unsatd.-mono-satd. 44%, tri-unsatd. 0 to 22%. Examn. of the acidic products of oxidation by fractional crystn. did not give as good results as with cacao butter. The evidence obtained shows that there is probably a fairly large amt. of di-unsatd. glycerides present, and, correspondingly, a relatively small % of triolein.

E. SCHERUBEL

Attempts toward a determination of the higher unsaturated fatty acids. H. H. ESCHER. Pharmacol. Inst. Univ. Zurich. *Helv. Chim. Acta* 12, 27-49(1929).—Illustr. The difficulties are discussed of sepg. satd. from unsatd. fatty acids and the individual acids from each other. Expts. are then described leading to a quant. sepn. of the higher unsatd. acids by bromination, conversion into acid chlorides, condensation by *p*-aminoazobenzene and final fractional crystn. *Method*—2.10 g. of the oil are sapond. with a 13-18% soln. of KOH in MeOH at 30-40° for 1-3 days. The free alkali is titrated back against phenolphthalein at -10°, yielding the sapon. no.; titration is continued in dil. aq. soln. against methyl orange, furnishing the fatty acid no. The unsaponifiable may then be detd. by extn. The fatty acids are shaken out, washed, concd. at 30-40° and brought to const. wt. at 1-12 mm. vacuum over P₂O₅, giving the wt. of the fatty acids. The acids are brominated with an excess of a titrated 2/N soln. of dry Br, free from HBr, in dry CCl₄ at -15° in the dark. The excess Br is titrated back with a 50% Na₂S₂O₃ soln., with addn. of much H₂O and an excess of KI; this furnishes the Br no. The substituted HBr is detd. by the Mellinkey method with KIO₃, either gravimetrically by AgNO₃ in the presence of AcOH or volumetrically with 0.1 N NaOH and tropaeolin 0.0, furnishing the HBr no. The brominated acids are shaken out, washed, concd. as before at 30-40°, 1-10 mm. vacuum and P₂O₅, furnishing the Br absorption value. The "solid" Br acids are isolated by 2 pptns. with petroleum ether; since they crystallize well, they may be sepd. by fractional crystn., when their Br content furnishes the tetra- and hexabromide no. The mother liquor, contg. the "liquid" Br acids plus some solid satd. and unsatd. acids, is converted into acid chlorides with 15 times their mol. amt. of thionyl chloride at 90°; the excess of thionyl chloride is removed by low-boiling solvents and vacuum, this furnishes the acid chloride no. The acid chlorides are mixed at -15° with double the amt. of *p*-aminoazobenzene in some dry solvent for polymerization; after removal of the solvent by vacuum distn. the product is washed with 40% alc. contg. some HCl and is dried, yielding solid aminoazo compds, which are finally sepd. by fractional crystn. from MeOH contg. increasing amts. of H₂O; this yields the Br acids. Some of the properties of the *p*-aminoazo compds. are tabulated:

<i>p</i> -Aminoazo compd.	M. P.	Yield	% N		% Br	
			found	calcd	found	calcd.
Palmitic acid	98%	121.5-122.5	9.64	9.64	...	...
Stearic acid	98%	123-124	9.05	9.04	...	...
Oleic acid	97%	About 93-94	9.44	9.10	...	...
Elaidinic acid	97%	About 111.5-112.5	9.17	9.10	...	...
Dibromooleic acid	98%	About 90-91.5	6.85	6.76	25.31	25.74
Dibromoclaudinic acid	95%	About 131-132	6.58	6.76	25.34	25.74
Tetrabromolinolic acid	87.5%	About 137-138	5.60	5.40	40.52	41.03

P. ESCHER

Remarks on the distillation of the higher unsaturated fatty acids. H. H. ESCHER. Pharmacol. Inst. Univ. Zurich. *Helv. Chim. Acta* 12, 99-102(1929).—A review of the literature leads to the conclusion that the naturally occurring unsatd. fatty acids, especially oleic acid, are more sensitive to temp. than is commonly accepted and a rearrangement within the mol. is possible during heating. Holde and Gorgas' method (C. A. 21, 732) of prepg. oleic acid without heating from crystd. dibromooleic acid by debromination appears to be the only method yielding pure oleic acid.

P. ESCHER

Application of the hydrogen value to unsaturated fatty acids. H. I. WATERMAN, S. H. BERTRAM AND H. A. VAN WAGEN. *J. Soc. Chem. Ind.* 48, 50-51T(1929).—The method for the detn. of the H value described in *J. S. C. I.* 47, 303T, 1928, has been applied to elaidic, linoleic and stearolic acids. The observations with elaidic acid are

considered as standard measurements. It has been shown that $\Delta^{9,12}$ linoleic acid contains 2 double linkings. This fact proves that the abnormal behavior of thiocyanogen toward linoleic acid cannot be explained by the hypothesis of a triple and a double linking in this acid. The linoleic acid and the stearolic acid both consumed the theoretical quantity of H, viz. 2 mols. of H per mol. of the unsatd. fatty acid. The hydrogenation product in each of the 3 detns. was pure stearic acid. E. SCHERUBEL.

Conversion of the higher fatty acids into their barium soaps. H. H. ESCHER. Pharmacol. Inst. Univ. Zurich. *Helv. Chim. Acta*, 12, 103-5(1929).—By using MeOH in place of H_2O as a solvent for $Ba(OH)_2$, it is possible to titrate sharply stearic, palmitic, oleic and even dibromooleic and tetrabromolinolic acid in alc., ether, $CHCl_3$, CCl_4 , C_2H_5Cl soln., with phenolphthalein, naphthol or thymolphthalein as indicator. Such pptn. of the fatty acids from a hot mixt. of MeOH and $CHCl_3$ gives a granular ppt. easily filtered and can be used as a purifying means to prep. pure acids. Since the Ba salt of the brominated oleic acid is readily sol. in ether, $CHCl_3$ contg. a little H_2O or alc. and also in boiling dry EtOAc, while the Ba soaps of the satd. acids are nearly insol., a sepn. method might be developed on that basis, except for α -tetrabromolinolic acid which resembles the satd. acids in soly. P. ESCHER.

Identification of extracted oils. C. B. CAROCCI. *Ind. olii grassi* 1927, VII, Squibb Abstract Bull. 2, A-112(1929). C has found that in hundreds of samples of olive oils tested in one of the Italian expt. stations, the method recommended by Fachini and Dorta, for the identification of extd. oil according to Morawski's reaction has given exact and sharp reactions, even in samples contg. very small fractions of extd. oil. C further recommends Bellier's reaction generally characteristic for the presence of peanut oil, which method is a valuable aid in the identification of inferior grades of olive oil. Where as peanut oil in alc. soln. forms a flocculent ppt. with KOH, which ppt. dissolves in the alc. at temps. above 40° , the olive oils of inferior quality show turbidity or at most a gelatinous pptn. with the same reaction, which does not disappear even upon heating the alc. soln. to 70° . This reaction has not failed in any case and becomes uncertain only in the presence of larger amts. of peanut oil. No further information regarding these reactions is given. H. G.

Determination of the adsorption power in the discoloration of oils with bleaching earths. ANDERS WIBERG. *Z. anorg. Chem.* 41, 1338-42(1928). Data from the literature cannot be compared, because they were taken without making sure that the equil. point was reached. A method and app. are described by which the equil. point is rapidly reached. The temp. is 98° and a stirrer is used, revolving at 200 r. p. m. A higher temp. is not advisable because the oils would be acted upon by air, and because at 98° it takes only 15 mins. to reach the equil. point. The method was tested with cacao butter and soy oil. ALBERT L. HENSLER.

Determination of water and oil in soy beans. L. BURSCH. Hamburg. *Maschinen-Zhironoe Delo (Oil & Fat Ind. (Russia))* 1928, No. 2, 13-5. The use of Marcussen's H_2O detn. app. is recommended. Xylene is used as H_2O carrier. The results obtained by this method for whole beans are considered to be more accurate than by the old method of drying the beans at steam temp., as no losses are incurred through evaporation of volatile compds. present in the oil. Oil content of the whole bean is calcd. from detns. of H_2O content of the whole bean and oil and H_2O contents of the bean meal. A. A. BOEHLING.

Detection of coconut and palm-kernel oils by the lauric acid test. J. GROSSERUD AND A. MIERMEISTER. Staatlichen Nahr.-Untersuchungsanstalt, Berlin. *Z. Untersuch. Lebensmittel.* 56, 423-37(1928); cf. C. A. 23, 914. From 1 to 100 mg. of the fat is saponified in a test tube with 2.5 cc. of alc. 0.5 N KOH and evapd. The residue, dissolved in 2 cc. of H_2O , is mixed with 2 cc. of glycerol (300 g. per l.), placed for 5 mins. in a boiling water bath and pptd. with 2 cc. of $MgSO_4$ (150 g. per l.). After filtering while hot through a thick filter, and refiltering the first portion of the filtrate, a clear filtrate indicates no lauric acid is present; a turbidity indicates 10% or more of lauric acid (20% coconut oil) while a heavy white ppt. is proof of the presence of a large quantity of coconut or palm-kernel oil. By increasing the quantity of the sample, and using certain refinements, as little as 0.5% of lauric acid (1% coconut oil) may be detected. Lauric acid in small quantities was found in butter, hardened peanut and cottonseed oils. Cacao, soy bean and blubber oils gave neg. tests for lauric acid. C. R. F.

The future of the manufacture of oils from the skins of pressed grapes. JULIAN GIL MORRIS. *Quim. ind.* 6, 31-2(1929).—The solvent recovery problem has been solved. More powerful hydraulic presses are required. Continuous operation is required to avoid rancidity and driers were installed for the same reason and also to facilitate extn. and solvent recovery. Fuel consumption was taken in hand. The ash

of the skins, being rich in phosphates, makes a good fertilizer. Recently, dry destructive distn. was adopted in Italy and Spain to obtain products similar to those from wood distn. Hydrogenation of the oils produced from the skins gives a product contg. up to 60% of satd. hydrocarbons. These methods have been adopted to defend the industry from extinction.

Oil from *Luffa acutangula* and *cylindrica*, *Sisymbrium loeselli* L. and *Thlaspi arvense*. S. IVANOV AND N. TROITZKII. *Masloboino Zhirovoe Delo*. (Oil & Fat Ind. (Russia)) 1928, No. 1, 30-1.—The seeds of *Luffa acutangula* (1), *L. cylindrica* (2), both grown in south Russia, *Sisymbrium loeselli* L. (3), and *S. sophia* (4), both grown in middle Russia, and *Thlaspi arvense* L. (5), grown in middle-east Russia have, the following characteristics:

Nö.	% oil	Shell	Kernel	Oil in kernel	Acid no	I no	Sapon. no.
1	..	53.4%	46.6%	40.30%	7.92	114.8	..
2	..	48.8%	51.2%	42.51%	7.36	113.4	..
3	33.0%	..	..	..	1.34	141.3	183.29
4	28.7%	..	..	..	3.10	142.4	..
5	37.5%	..	..	..	3.03	95.14	170.45

A. A. BOEHTLINGK

Rhodan value of fish oils. H. P. KAUFMANN AND A. PROCKE. Univ. Jena. *Arch. Pharm.* 267, 229-32 (1929). An exptl. study of the rhodan as compared with the I value of certain fish and liver oils. A 24-hr. treatment is necessary to obtain a max. rhodan value. *Oleum jecoris aselli*, album showed a value of 107 (I value 168). A dozen different brands of cod-liver oil showed a variation in the rhodan value of 96.5 to 104 (I value 149 to 167), while various fish oils varied from 74.5 to 112 (I value 75 to 178).

W. O. E.

Modern direction of soap manufacture. KARL BRAIN. *Chem. Tech. Rundschau* 44, 280 (1929). A discussion of chem. and phys. factors which must be controlled in the manuf. of grain soaps.

E. PICKERING

Inhibition of the corrosion of aluminum by soaps. H. V. CHURCHILL. Am. Inst. Mining, Met. Eng. *Tech. Publication* No. 176, 3-6. Effective inhibition to corrosion of Al tubes by shaving creams is obtained by adding 0.20% Na_2SiO_3 to the soap.

B. E. ROETHLI

Solvents and dispersing agents (for oils, etc.). Fr. pat. 646,816 13. Heaters for oil refining (Fr. 646,642 and 646,643). 1. Apparatus for effecting separation of oil, gas and water by gravity and centrifugal action. U. S. pat. 1,705,669 1. Apparatus for separating oil and water by gravity. U. S. pat. 1,705,077. 1.

Fatty acids. OEL- UND FETT-CHEMIE GES. Brit. 286,079, Aug. 26, 1927. High-grade fatty acids are obtained from waste or low-grade material by distn. in a high vacuum, e. g., split fatty acids from bones or from cotton oil soap stock are distd. at a pressure of 4 mm. or less in a fractionating column app. until the residue amounts to 20%. Cf. C. A. 22, 2076.

Refining fatty oils. HENRY ODGEN. U. S. 1,705,824, March 19. Fatty oils such as cottonseed oil contg. free fatty acids and a small quantity of water are mixed with a finely divided solid adsorbent carrier material such as fuller's earth intimately assocd. with NaOH or other dry alkali in sufficient quantity to remove the impurities and water from the oil. U. S. 1,705,825 specifies a similar process with addn. of just sufficient water to promote rapid neutralization and agglomeration of the resultant soap stock.

Purifying oils. I. G. FARBENIND. A. G. (Martin Luther and Kurt Pieroh, inventors). Ger. 471,076, July 6, 1926. The lower alkyl formates or mixts. thereof are used as extg. agents in the purification or sepn. of oils. Examples are given describing the deacidification of sesame oil, the refining of a Mexican crude oil distillate and the extn. of a resin from the residues left after distg. the destructive hydrogenation products from a crude mineral oil, HCOOMe being the reagent in each case.

Apparatus for extracting oil from fruit and oleaginous grain. ANDRÉA ACQUARONE. Fr. 646,249, May 12, 1927.

Treating blubber. KURT BUCHHOLZ. Ger. 471,096, May 8, 1925. In extg. train oil, etc., from blubber, the sliced blubber is simultaneously pressed and triturated so that the cells are disintegrated and their contents set free. Suitable app. is described.

Soap. H. WATZMANE SÖMME. Ger. 471,140, Sept. 1, 1926. A neutral superfatted soap is prepd. by using an ordinary superfatting compn. mixed with NaHCO_3 .

It is stated that the reaction of the NaHCO_3 with the excess of alkali in the soap base is not completed until the soap is in use, and that the soap is accordingly better preserved.

Soft soap. OSCAR H. CARLSON. U. S. 1,705,852, March 19. A mixt. is formed of castile soap 3 lbs., NaHCO_3 4 oz., borax 4 oz., glycerol 4 oz., coconut oil 2 oz. and soft water 10 qts. This mixt. is boiled and there is added to it a mixt. formed by boiling together stearic acid 1 lb., sal soda 8 oz. and water 6 qts., the combined mixt. is boiled and "sulfuric ether" 2 oz. is added, to form a product which may be used for removing grease, tar, etc., from the hands or fabrics.

Washing powder. MAHLON J. RENTSCHLER (one-half to William R. Jeavons). U. S. 1,707,024, March 26. A mixt. suitable for use in washing dishes, clothes, etc. is formed of equal quantities by wt., of neutral tallow soap, Na_3PO_4 , sal soda, NaHCO_3 , and Glauber's salt.

28—SUGAR, STARCH AND GUMS

F. W. ZERBAN

Problems of the sugar industry. M. JEDLINSKY. *Lišty Cukrovar.* 47, 248-50 (1929).—A discussion. FRANK MARESH

Recent important changes in the sugar industry. K. RETTER. *Magy. Mérn. Ép. Közl., Supplement, Techn. és Körgazd.* 6, 73-4 (1928).—A brief summary is given of recent developments in raw-sugar production and refining, and in modern regeneration of bone black and of vegetable carbons. The position of the sugar-refining industry depends chiefly on the economic situation, price and production, and further on the duties on raw sugar. Modern sugar factories should produce and use steam very economically. Several factories have electrified their plants, leaving the remaining old steam engines as a reserve for an emergency. S. S. DE FINÁLY

The Argentine sugar crop of 1926. WM. E. CROSS. *Rev. ind. agr. Tucumán* Nos. 3-4, 67-94 (1928).—Data relating to sugar production in Australia, Argentine, Hawaii, Porto Rico, Java, Natal, Cuba and other countries are given. An analysis of mill performance, yield and loss is included for installations in Hawaii, Java, Natal, etc. Twenty-eight tables show the collated data. S. L. B. ETHERTON

Sugar-cane experiments at Allai. F. A. STOCKDALE. Ceylon Dept. Agr. *Tropical Agr. (Ceylon)* 71, 343-7 (1928).—Analyses are given of a no. of varieties of cane raised at Allai. A. L. MEHRING

Sugar-cane experiments. R. C. WOOD. Imperial Coll. Trop. Agr. St. Augustine *Trop. Agr. (Trinidad)* 5, 106-7 (1928).—Analyses of the juices produced from several varieties of canes are compared. All varieties gave relatively low sucrose contents because of the high relative humidity during the growing season. Badilla gave the highest percentage of sucrose, 15.37%. A. L. MEHRING

Experimental sugar factory. W. SCOTT. Imperial Coll. Trop. Agr. St. Augustine *Trop. Agr. (Trinidad)* 5, 202-3 (1928); cf. C. A. 22, 2480.—Reports for the years 1927 and 1928 are given. The following statistics cover the year 1928: av. analysis of cane, sucrose 13.09, fiber 12.80%; av. analysis of megass, sucrose 4.31, fiber 47.33 and moisture 47.29%; av. analysis of juice, sucrose 15.62% and glucose ratio 10.04; molasses, av. apparent purity 42.38; cane ground, 1272.65 tons; sugar made, 127.88 tons; cane syrup made, 800 gals., and fuel oil consumed 92.80 tons. Of the sucrose in the cane 91% was recovered in the juice and 75% in the final sugars. A. L. MEHRING

Phosphates in cane juice. H. B. SPRINGER AND J. G. DAVIES. Unpublished thesis in the library of the Imperial College of Trop. Agr. St. Augustine, Trinidad. A. L. MEHRING

The crystallization process in cane-sugar mills. K. W. GRANTZDÖRFFER. *Arch. Suikerrind.* 36, II, 1172-5 (1928).—The conditions necessary to obtain a grain of uniform size are discussed. Attention is called to the necessity of perfect circulation in the vacuum pan, obtained by better construction of the coils and even distribution of the feeding. Graining by introducing dust grain is to be preferred to the usual way of graining. P. R. P.

A modification of the sulfitation process. H. H. E. SUEBACH. *Arch. Suikerrind.* 36, II, 1187-9 (1928).—To obtain more complete pptn. of the colloids it is recommended to lime the raw juice to 250 mg. CaO per l., to heat to 55° , to hold the juice for about 5 min. at this reaction and temp., and then to add the balance of the lime and the SO_2 simultaneously to 7.4-7.8 p.p.m. as is done in de Haan's carbonatation process. Expts. showed that a clearer and lighter colored juice resulted; the color of the massécuites was also better. P. R. P.

Pan boiling. Its scientific control and the Zeiss industrial refractometer. S. J. SAINT. Dept. of Sci. Barbados. *Trop. Agr.* (Trinidad) 5, 279-83(1928).—The phys. chemistry of sugar crystn. from aq. solns. is discussed. Observations made at the Sandy Lane Factory in Barbados, using the 3-strike system indicate the opt. coeff. of supersatn. for sirup strikes to be 1.15, for strikes of mixts. of sirup and molasses during the drawing-in period 1.2, and for the boiling-off process 1.35 to 1.4. A table is given by which the correct concn. for the mother liquor in the pan can be detd. when the refractometer reading, the vacuum and the level of massecuite are known. Data are tabulated indicating that brasmoscope control is more difficult and less reliable than refractometer control.

A. L. MEHRING

• **Leaf reddening in some varieties of sugar cane.** G. L. FAWCETT. *Rev. ind. agr. Tucumán.* Nos. 3-4, 104-5(1928).—Microscopic examns. of the cells of the epidermis showed a colored liquid. Parasitic cryptograms are excluded as the cause, and it is considered to be due to the low temp. of 10° that was known to have prevailed at some time during the growth.

S. L. B. ETHERTON

The desirability of raising sugar beets for yield. OTTOKAR FALLADA. *Listy Cukrovar.* 47, 242(1929).—A discussion.

FRANK MARESH

The relation between the sugar content of beets and the yield. E. JELINEK. *Listy Cukrovar.* 47, 274(1929).—If d = sugar content of beets, z = total losses, m = sugar in the molasses per 100 beets, v = yield computed for 88%, p = polarization for the above yield, then $v = \frac{[(d - z - m) \times 100]}{p}$; but if $v = d$, then $\frac{100(d - z - m)}{p} =$

d also. If the polarization of a sugar based on an 88% yield is around 93%, $(93 + x)$ may be written for p , where x may have a neg. value; then $\frac{100(d - z - m)}{93 + x} = d$, and $z + m = 0.07d - \frac{d \times x}{100}$. Since x is not greater than 0.5, the $\frac{d + x}{100}$ will be about 0.1

and may be neg. when x is neg. Then $z + m = 0.07d \pm 0.1$. With a yield of 0.88, the total losses of sugar and the sugar in molasses will be: for a 17% digestion, $z + m = 1.10 \pm 0.1$, for an 18% digestion, $z + m = 1.26 \pm 0.1$, for a 19% digestion, $z + m = 1.33 \pm 0.1$. This shows that the yield can approach the sugar content of beets when the total losses and the sugar in molasses are minimal at the same time. This rarely occurs.

FRANK MARESH

The use of the De Vecchis method of working beets. JANKO PROCHÁZKA. *Listy Cukrovar.* 47, 260-3(1929).—For the Slovakian mill, P. finds the method limited economically by the large consumption of coal.

FRANK MARESH

Extraction of sugar from grape-vine prunings. CARRIÈRE. Faculté des Sciences de Montpellier. *Rev. vit.* 70, 37-47(1929).—With 20 g. vines and 200 g. acid soln. the following results were obtained: with 7.3% HCl, max. sugar 32%, time 2 hrs.; with 3.65% HCl, max. sugar 35%, time 4 hrs.; with 1% HCl, max. sugar 35.4%, time 7 hrs.; with 1% H₂SO₄, max. sugar 32%, time 13 hrs. No difference was found between 1 to 7 and 1 to 10 ratios of solid to soln. Different varieties of vines gave the same results, and up to 3 months elapsed time between gathering and hydrolyzing no difference in amt. of extractable sugar was observed. For larger-scale operations 20 l. Pyrex flasks were used and several battery processes of hydrolyzing and washing were studied. The most successful of these permitted the extn. of 31.5% sugar from the vines and resulted in a sugar concn. of 8% in the hydrolyzate. The actual decrease in the wt. of the vines amounted to 41.4%, the difference in percentages being accounted for by extd. salts and acids. Max. yields of alc., amounting to 48.6% of the sugar present in the hydrolyzate, were obtained by neutralizing 85% of the acidity with CaO, 5% with NH₃, and 5% with K₂CO₃, followed by the addn. of 3 g. Na₃PO₄ per l. of soln. and NaOAc equiv. to 5% of the acidity, inoculating the slightly acid soln. with pure culture yeast and fermenting for 3 days. Nutrition studies of feed prepd. both with the original sugar soln. and with the residues after fermentation are reported.

K. S. MARKLEY

The constitution and physical properties of molasses. K. ŠANDERA. *Exp. Inst. Cz. Sugar Ind., Prague. Listy Cukrovar.* 47, 251-9(1929); cf. C. A. 23, 2062. Metallic containers with close fitting stoppers were filled with molasses, an excess of sugar crystals, and a 200 gm. wt. for mixing. Various brands of com. molasses were used, and the sugar was of the brand "Export Crystal extra fine" measuring 0.06 mm.³. The vessels were immersed in thermostats and removed periodically to det. the refractive index of the soln. Four hrs. at 60° dissolved a large amt. of sugar, but complete equilibrium was not attained. About 48 hrs. are necessary for complete crystn. of the dissolved sugar. Several molasses having the same chem. consta., as n , ash, etc., showed wide ranges of

yield in crystals. This is due to variations in prepg. the molasses, as stirring, mixing, etc. A soln. of molasses and sugar satd. at 60° and crystd. at 20° for 48 hrs. will attain an equil. between crystals and soln.; upon cooling the soln. to 20° and continuing the crystn. at 20°, less sugar crystallizes than was dissolved. Ash content, total solids, or K:Na ratio show no indication as to when the sugar has been completely removed from soln.

FRANK MARESH

The limit of sugar extraction from cosettes in the diffusion process. S. S. KUTZEV. *Bull. Sakharotrestia (Bull. of the Sugar Trust)* 1928, No. 9, 65-8.—Several expts. were performed on extg. juice from beets. The juice drawn off from the diffusion battery was 120-160% of the wt. of beets. The time of diffusion was 120-200 mins. The sugar content of the pulp decreased from 0.52 to 0.17%, and that of the press water from 0.26 to 0.045%, corresponding to an increase of juice withdrawal from 120 to 160%. The purity of the juice from the last cell was resp., 45.6 and 36.9. In the first case 119 parts and in the second, 188 parts of non-sugar are dissolved per 100 parts of sugar. By defecation and carbonation a large part of the non sugars is pptd.; when drawing 110, 120 and 160% of juice, 33, 66 and 75% (on sugar) of the non sugars is eliminated. If 160% of juice is drawn (on wt. of beets), more org. non sugar is dissolved, which passes with the juice through the defecation and carbonation and adds to the color of the product. Better results could probably be obtained by reducing the time of diffusion, the com. optimum is unknown. A process of boiling massecuite with introduction of seed into the vacuum pan to start crystn. is also described; it is advisable to use it when spontaneous crystn. is difficult.

V. E. BAIKOV

Experiments on clarifying diffusion juice with magnesium sulfate instead of carbon dioxide (process of V. V. Shkatelov). V. I. KUZNETSOV. *Nachukn. Z. prikl.* 7, 158-63 (1928).—MgSO₄ may be used for clarification of diffusion juice instead of CO₂. In this reaction sucrose is liberated while Mg(OH)₂ and CaSO₄ are pptd. Mg(OH)₂ like Al(OH)₃, forms compds. with org. coloring matters. The solv. of Mg(OH)₂ in H₂O is only 0.0018 % by wt. To eliminate CaSO₄ from the juice it is necessary to heat it almost to the b. p. During evapn. the juice becomes cloudy because of pptn. of CaSO₄. To the diffusion juice, heated to 90°, 0.6% CaO and 1.5% CaCO₃ on the wt. of beet was added. After 20-25 mins. the juice was filtered and pumped to the satn. tank, maintained at the same temp. MgSO₄ soln. was added and the juice filtered through filter presses. The alk. of the filtered juice was 0.02%, and of the thick juice after evapn. 0.05. After sulfitation the thick juice was filtered through mech. filters, and a perfectly clear juice was obtained. 55.2% of white sugar of good quality was extd. on the wt. of massecuite. Low products served for massecuite of the second crystn. The expts. gave very satisfactory results. Conclusion from expts. Use of MgSO₄ instead of CO₂ with 0.75-0.5% of CaO and 1.75-1.60% of CaCO₃ on the wt. of beets and sulfitation of the thick juice gives as good results as using 2% CaO with double carbonation and sulfitation of thick juice. Mg(OH)₂ is a powerful adsorbent of coloring matter of juice. The small amt. of CaO required for the process permits buying of the lime instead of manufg. it in the factory. A defect of this process is the large quantity of CaSO₄ in the juice to be evapd.

V. E. BAIKOV

The determination and character of the alkalinity of raw sugars. VL. PREININGER. *Exp. Inst. Cz. Sugar Ind., Prague. Listy Cukrovar.* 47, 263-73 (1929).—P. measured the alk. of a large no. of raw sugars and recommends the following 2 methods for industrial work. I. For control work, 8 g. of sugar is weighed into 3 test tubes and dissolved in 20 cc. neutral distd. H₂O. To one test tube is added 10 drops of an indicator (0.2 cc.), the 3 are stoppered, mixed and compared in a Walpole comparator with a standard borax soln. made by dissolving Na₂B₄O₇·10H₂O 19.108 g., H₂BO₃ 12.404 g. and NaCl 2.925 gm. in 1 l. neutral distd. H₂O. II. The next detn. is made during an analysis from one weighing. A double normal wt. of raw sugar is dissolved to a vol. of 200 cc. in neutral distd. H₂O, and the H₂O detd. by a Pulfrich immersion refractometer. During the detn. of ash by the cond. methods, a conductometric titration is made on a 25-cc. sample. For a color detn., 2 25-cc. samples are placed in the cups of an objective photometer; to one soln. is added 10 drops of an indicator, and the increase in coloration is noted in % absorption. From curves the pH of the soln. is detd. The Walpole comparator may be used instead of the objective photometer, following method I. The remainder of the soln. is clarified with (CH₃COO)₂Pb and used for detg. polarization. From this simple pH detn. the state of alk. is inferred. The alk. of raw sugars is caused by basic substances among which the carbonates range from 33-50%. This information is gained by detg. the CO₂ and N₂ directly in raw sugars and from conductometric titration curves. The quantity and character of the non-sugars have been inferred from the same curves. Bromothymol blue and phenolphthalein

were used, for they are not affected by the reacting salts. A sugar of p_H 8.0–8.6 is medium in alk.; one of p_H 7.0–8.0 is mildly alk. and cannot be stored long, though inversion may not occur; at a p_H below 7.0 the sugar is acid and is in danger of becoming inverted.

The p_H values of sugar media and the possibility of their inversion. H. COLIN AND A. CHAUDUN. *Bull. assoc. chim. suc. dist.* 45, 626–42(1928).—A review.

Standardization of the boiling of fillmass in the refinery. M. YA. DEGTYAR. *Nauchnue Zapiski* 7, 26–33(1928). The injection of refined sugar powder at the moment of satn., with continuous flow of liquor to the vacuum pan is the best of 3 different processes of boiling refinery fillmass. This process does not require a very experienced boiler and produces regular crystals without false grain. 8.1% of the time of boiling and 15.2% of the time of further crystn. is saved. Regular crystals of slightly better quality and color are obtained.

Economical steam pressures in sugar mills. O. T. KORITNIG. *Listy Cukrovar.* 47, 216–8(1928).—A discussion.

The influence of carbon monoxide and other components of a saturating gas upon the rate of saturation. R. SIGMUND. Exp. Inst. for Cz. Sugar Ind. Prague. *Listy Cukrovar.* 47, 243–8(1929). A 15% soln. of clear refined sugar soln. was satd. with CO_2 prepd. by igniting $CaCO_3$. The $CaCO_3$ was pptd. by mixing $CaCl_2$ and $(NH_4)_2CO_3$. The CO was prepd. from formic acid. The rate of satn. of the refined sugar soln. with CO was reduced by a small (0.5%) quantity of CO_2 , the time to reach equil. varied from 270 to 350 mins. With 10% CO , the rate of satn. is reduced 50%. Other constituents of com. CO_2 , as H_2S and tar vapors, have an insignificant effect. Hydropectin and aspartic acid decrease the rate of satn. about 15%.

Permutite in the purification of sugar juices. I. MUTTI AND C. REGINELLI. *Zymol. chim. col. Zuccheri* 3, No. 3, 91–5(1928). The elimination of Na and K salts from sugar juices by means of Ca permutite was studied. Ca permutite was prepd. by treating Na permutite with a Ca salt soln. for some hrs. and washing. Sugar-beet paste was mixed with H_2O at 40° for 2 mins., the ext. sepd. and the process repeated with always warmer H_2O . The dil. ext. was concd. to the strength of ordinary ext. having a purity of 77.3 and polarization of 6.8. Ten g. Ca permutite was added to 200 cc. ext., the mixt. agitated 6 hrs., allowed to settle and filtered. One hundred g. of untreated ext. had 0.8586–0.8752 g. ash, and 100 g. of treated ext. 1.1512–1.1620 g.; the purity reached 78.26 and the polarization 7.2. Two hundred cc. of sugar juice was decolorized with 10 g. more Ca permutite in the warm, to a light yellow, like C-filtered juice. Five samples gave an av. purity of 79.50, the ash contained 97.90% less Na_2CO_3 and K_2CO_3 than that of the untreated juice.

Quality and quantity of wash water from bone-black filters. M. I. NAKHMANOVICH AND J. F. ZELIKMAN. *Nauchnue Zapiski* 7, 201–22(1928). It is better to send wash water from 5° to 0° Bè. and from 0° to last washing into evapn. with low products, than into the melt. Non-sugars carried by the wash water are poorly adsorbed by chars and, therefore, easily washed out. These non-sugars remain not only in unfiltered juice but also in filtered. With the same speed of washing the filters, the amt. of wash water returned to refining is in different refineries from 8 to 18% of the wt. of melted sugar and 90–100% of the wt. of bone black. Wash H_2O from 5° Bè. to last washing, returned to refining, represents 85% of all wash H_2O . With decreasing d. of the wash water, from 5° to 0° Bè., the purity drops from 92.9 to 77.7, and the acidity of the wash water increases. Reducing the speed of washing the filters gives wash H_2O of low purity and high acidity. With wash H_2O from 5° Bè. to last washing, returned to melt, 0.04% of non-sugars on the wt. of all raw sugar melted is returned, which represents 13% of all non-sugar entering fabrication with the raw sugar.

Studies on filter cloths. K. ŠANDERA. Expt. Inst. Cz. Sugar Ind., Prague. *Listy Cukrovar.* 47, 275–80(1929).—The strength of cloth as detd. by the self-elongation is not a governing factor, for only about 30% (on an av.) of the strength is consumed when the cloths are removed. Cotton is used until 63% of the original strength is lost, jute until 46% and only exceptionally until 58%, and linen until 63%. The percent elongation before tearing is variable and decreases with usage from 3–5%. For cotton it is 20–30%, for jute 10–15%. For linen the % elongation varies as much as 50% in the two directions of weave. The elongation of cotton cloths after soaking in water shows an increase of 4%. For cloths which have been used in practice, this test shows a decrease of 1%; jute, linen and most linen-cotton cloths shows an increase of 1%. The change of the rate of flow through the cloth during use shows an increase of 30% after 30 mins. of boiling. Ordinary use increases the time of flow for molasses 15–26% until

completely clogged, but decreases it for distd. H_2O , which has been made slightly acid, for the same cloth. This is not dependent upon viscosity, for in some cases it requires more time to pass neutral distd. H_2O than molasses. The absorption of light is increased with a denser weave and with incrustations. New cloths show a relative absorption of 70-80% for cotton, and the denser woven ones are above 80%. Usage shows a wide variation in the change of absorption; the decrease in relative absorption varies from 15-80% for cotton. Jute shows the greatest amt. of incrustation. Linen cloths become more transparent, for the fibers become thinner with use. With an acid treatment, the relative transparency of cotton is increased regularly 10-20%; no such regularity is found for jute or for a linen-cotton mixt. The quantity of incrustation is measured by weighing the ash. Used cotton filters show 8-18% ash; linen and linen-cotton combinations show greater variations. Treatment with HCl reduces this ash content 10-30%, in exceptional cases 50-80%.

FRANK MARESH

Pressure evaporation. KAREL VESELY. *Listy Cukrovár.* 47, 214 6(1928).—Polémique, with operating data from the sugar mill Wisington.

FRANK MARESH

Choice of the temperature gradation in multi-stage evaporators in the sugar industry. PAUL KOHN. *Chem. App.* 16, 13-4, 37-8(1929).—Means of selecting the most favorable temp. gradation, and methods of calcg. the heating surfaces and heat transmission for double and triple effects are given.

J. H. MOORE

Automatic apparatus for adding milk of lime at the second carbonation. A. SAMUS. *Nauchnie Zapiski* 5, 396-7(1928).—The automatic mixer described can be regulated so that a certain amt. of milk of lime enters into the carbonation tank at each revolution of the stirrer.

V. E. BAIKOW

Continuous automatic counter-current extractor for starchy and saccharine substances with press elevator. G. MEZZADROLI AND G. MAZZINI. *Zymologica* 3, 109-12(1928).—Four or 6 superposed, steam-jacketed, horizontal cylinders are provided with screws, which are driven from the outside and which have tubular axes for steam heating. The material, such as beet slices, is fed into the uppermost cylinder through a charger with hermetic seal and passes from end to end of each cylinder in turn. Water, previously pumped through a heater, traverses the cylinders in the opposite direction, to be discharged through a grid which is kept clear by the screw moving against it. The exhausted material is carried by a screw elevator against a pressure cone and so freed from most of the absorbed liquid. The app. is simpler than the diffusion battery, and requires less space and less labor, while the heat is more efficiently utilized and initial and maintenance costs are diminished.

B. C. A.

Determination of starch with the help of the interferometer, according to O. Wolff. B. ELEMA. *Z. angew. Chem.* 42, 199-201(1929).—The Wolff method (cf. C. A. 18, 2821, 3123) gives a starch content which is always deficient, because during trituration of the vegetal material with sand and water, a portion of the starch is dissolved. It is advisable to triturate the blank with sand also, to make the conditions as similar as possible, but this does not account completely for the deficiency. Starch grains triturated with sand for 10 mins. are easily acted upon by diastase. ALBERT L. HENNE.

Determination of starch in potato pulp. C. VON SCHERLE AND G. SVETKEY. *Z. Spiritusind.* 51, 290-1(1928).—Because of the presence of pectinous material the method of detg. starch in cereals gives too high results. Better results are obtained by quickly bringing the starch to a sol. form, pptg. the pectins with lead acetate, removing the excess of acetate with Na phosphate and detg. the starch in the filtrate by the polarimeter or refractometer.

A. SCHLEIZ

St. Vincent arrowroot. G. WRIGHT. *Trop. Agr. (Trinidad)* 5, 162 6(1928). The local process of mfg. starch from arrowroot is described.

A. I. MEHRING

The composition and nutritive value of sugar-beet pulp (WOODMAN, CALTON 12. Inexpensive filter for milk of lime (BURCHKOVSKI) 1. Certain soil properties in relation to sugar-beet growing (NEWLANDS) 15. Recent literature on activated carbons (KAGANOV) 18. The condition of the micelles in starch (SAMBC) 2. The microscopic examination of starches (GARNER) 12. Titration curves of some liquids titrated with phenolphthalein (alkaline sugar solutions) (MAJER) 7. Preparation of negatively charged sols by means of tartaric acid. II. The colloidal nature of Fehling solution (DEMANSEN, CHALISEV) 2. The fermentation method of preparing glycerol (PRNKOVSKI) 16. Drying beets by coiled heating pipes within a stack of the material (Brit. pat. 295,482) 12. Drying beets (Brit. 295,801) 12. Cooling steam (in sugar manufacture) (Ger. pat. 471,225) 13.

Treating sugar beets. B. J. OWEN and C. STRAD. *Brit.* 295,619, April 13, 1927.

Fresh whole sugar beets in mass or in piled layers are slowly dried in a continuous current of air at a temp. of about 27–32° with which CO₂ or SO₂ may be mixed. An app. and various details and modifications are described.

Apparatus for continuous saturation of sugar-beet juice. M. P. NOGACHEVSKII. Russ. 5310, May 31, 1928. Mechanical features.

Purifying sugar juices. G. E. VAN NES. Brit. 295,831, Aug. 18, 1927. After adding a base such as lime and "over-satg." with CO₂, the soln. is heated to not over 60°; more lime is added until an alky. of over 0.3 g. of lime per l. is obtained and the clear juice is sepd. by decantation. The turbid juice is further carbonated and heated to 80°, filtered, and together with final clear juice, may be added to a new batch of raw juice.

Material for decolorizing sugar. BÜTTNER-WERKE A.-G. and F. KLEINMANN. Brit. 295,623, May 14, 1927. See Fr. 635,916 (C. A. 22, 4741).

Crystallization apparatus for sugar solutions, etc. FERNAND LAFEUILLE. Ger. 471,075, June 30, 1925. Rotary horizontal crystn. chambers fitted with longitudinal tubes for the circulation of cooling water are provided with means for arranging the circulation so as to obtain uniform cooling.

Glucose from starch. CORN PRODUCTS REFINING CO. Brit. 295,830, Aug. 15, 1927. See Fr. 638,956–7 (C. A. 23, 541). The acid hydrolysis of starch to dextrose is effected in the absence of catalysts tending to polymerize the dextrose. Carbons which do not contain catalytic ingredients and which are capable of absorbing these are used; fuller's earth or silica gel also may be employed. The vessel used has a non-catalytic inner surface such as a glass enamel.

Determination of starch in potatoes by specific gravity. A. G. LOGINOV. Russ. 5260, Apr. 30, 1928. The sp. gr. is detd. by slicing potatoes, stamping out cylinders from the slices with a thin-walled tube of a known vol., and weighing. The amount of starch is then calcd. from the sp. wt.

29—LEATHER AND GLUE

ALLEN ROGERS

The hydration of animal skin by the volume-change method. EDWIN R. THEIS AND HARVEY A. NEVILLE. Lehigh Univ. *Ind. Eng. Chem.* 21, 377–9 (1929).—When gelatin jelly or animal skin swells in contact with aq. solns., there is a decrease in total vol. of the system protein plus soln. which can be measured by means of a simple dilatometer. When fresh-steer corium was soaked in water or dil. HCl, the vol. of the system decreased with time to limiting values corresponding to the swelling of the protein matter. But with cured hide in water or in solns. of HCl more dil. than 0.01 N, the vol. of the system decreased to a minimum in 3–6 hrs., then increased to a max. in 36–48 hrs., and then decreased again. With 0.1 N HCl, the increase did not occur. The decreases are attributed to the swelling of the protein and the increases to bacterial activity, resulting in degeneration of the protein. In contact with limewater or acid soln. of such concn. as to prevent bacterial action, only a contraction of the systems was observed.

J. A. WILSON

A new depilatory for the tanning industry. V. MASSERA. *Laboratorio Conceria Carini, Sondrio, Conceria* 36, No. 1103, Tech. Pt. 46 (1928).—A NaHS soln. of 25° B ϵ used as a depilatory has many advantages over Na₂S, especially because it is more economical and because in conjunction with lime it has a quicker depilating action than Na₂S.

G. SCHWOCH

Leather scrap and its chemical utilization. MARTIN MEIER. *Chem.-Tech. Rundschau* 44, 376 (1929).—By destructive distn. of leather scrap, there is obtained an inflammable gas, a liquid and a residue of animal charcoal contg. green dye known as *chrome oxide green*. The liquid consists of an aq. and an oily phase; the first contains NH₃, *pyrocatechol* and *pyrogallol*; the second is *pyrrole*. From the latter may be synthesized iodole and perfumes, especially *jasmine*. Pyrrole may be detected by the red coloration it imparts to cellulose paper, which has been soaked in concd. HCl.

E. PICKERING

Montan wax (Brit. pat. 296,145) 21.

Tanning. I. G. FARBENIND. A.-G. (Hermann Schütte, inventor). Ger. 466,440, July 11, 1925. Tanning material is prepd. from cellulose sulfite lye by condensing

it in the presence of H_2SO_4 and in the absence of water, with aromatic hydrocarbons, carbazole, or their sulfo acids, under such conditions that no free hydrocarbon or sulfonic acid remains. Thus, finely powd. dehydrated cellulose sulfite lye is mixed with H_2SO_4 , and finely powd. naphthalene is allowed to react till no free naphthalene remains. Anthracene is also given as an example.

Tanning materials. EDUARD JENA. Ger. 468,266, July 26, 1922. Resin or wax is treated with a large excess of fuming H_2SO_4 to break it down to sulfonated oxidation products, which are sol. in water and suitable for tanning. Thus, 300-400 parts of fuming H_2SO_4 contg. 20% anhydride is cooled and added to 100 parts of colophony powder. The product contains no C particles and is sol. in water.

Synthetic tanning material. JOSEF SCHÄFER (to J. R. Geigy (Akt. Ges.)). U. S. 1,706,325, March 19. Salts of H_2SiF_6 , such as Na_2SiF_6 , are mixed with salts of synthetic tanning substances resulting from the condensation of phenolsulfonic acids and CH_2O (rendered sol. in water by the presence of sulfo groups) in order to develop tanning properties, which the salts alone do not possess. Cf. C. A. 23, 730.

A compound for the analysis of tanning materials. V. S. SADIKOV. Russ. 5117, Apr. 30, 1928. A material contg. collagen is treated with caustic, dehydrated with alc., acetone, etc., and dried. Pax wax may be used as the material contg. collagen.

Leather. I. G. FARBENIND. A.-G. (Adolf Benischek, inventor). Ger. 468,094, Oct. 22, 1925. Liquid triaryl phosphates are employed as adhesives and preservatives for leather.

Drying leather. V. G. WALSH. Brit. 295,804, July 7, 1927. Vegetable-tanned leather is treated with substances such as $\text{Al}(\text{OH})_3$ having a high adsorptive capacity for the tan so as to remove excess from the surface layer of the leather and avoid deleterious oxidation during drying. Various details and modifications are described. Cf. C. A. 22, 3315.

Greasing leather. I. G. FARBENIND. A.-G. Fr. 646,395, Dec. 27, 1927. Sulfonated fatty acids of suint are used for greasing leather before or after dyeing.

"Leather substitute." R. P. ROSE and A. F. OWEN (to Mechanical Rubber Co.). Brit. 295,387, Aug. 11, 1927. A product of the "sole leather type" is formed by treating fiber such as cotton with an aq. rubber dispersion, forming the material into a wet sheet, cold-pressing at 50-500 lbs. per sq. in. (or in 2 stages up to 1200 lbs.), drying, and hot-pressing (at about 107-155°) at 1200-2000 lbs. per sq. in. or higher pressure. The fiber is partly hydrolyzed by heating in water, and fillers, protective colloids such as glue, treated starches or casein, may be added. A coagulant is added preferably in 2 stages; various mech. details of forming sheets of the material are described.

30—RUBBER AND ALLIED SUBSTANCES

C. C. DAVIS

Latex, its preservation and concentration. A survey of the patent literature of recent years. ALADIN. *Gummi-Ztg.* 43, 1047-9, 1105-6 (1929); cf. C. A. 22, 888. Eighty-five patents are included. C. C. DAVIS

The "freezing" of raw rubber. I. A. VAN ROSSEM and J. LOTICHIUS. Staatliel Kautschuk Forschungs-Institut and Tech. Hochschule, Delft. *Kautschuk* 5, 25 (1929).—The object of the investigation was to det. the nature of the changes which take place when rubber "freezes" and "thaws," *i. e.*, when it becomes hard and opaque at low temps. and subsequently becomes soft and elastic on warming. Measurements at increasing temps. of the d., hardness and light absorption of rubber which had been frozen for a long time showed a sharp decrease in all these values at 36-8°. There were no such breaks in the curves when rubber which had not been frozen was tested in the same way. These phenomena indicate that frozen rubber is partially crystd., and that the crystals fuse at 36-8°. This was further indicated by tests of the absorptive power of frozen and of unfrozen rubber for liquids, frozen rubber absorbing around 0.25 as much water as unfrozen rubber under similar conditions. Detns. of the heats of swelling of frozen and of unfrozen rubber in *PhMe* showed a difference which represented the heat of fusion of the rubber. The exptl. values of this heat of fusion varied but little with rubber from different sources and were 5.05 ± 0.28 cal. per g. of rubber. These values are not, however, the true value of the heat of fusion of cryst. rubber, for the proportion of cryst. rubber in frozen rubber was not known. This was in itself further evidence of partial crystn. Redetns. of the m. p. and of the change in d. on fusion of rubber kept frozen for 8 years showed an increase in the m. p.

from 31–3° to 35–7° and a change in the decrease of the *d.* on fusion from 0.029 to 0.031. These changes probably resulted from the growth of crystals during the 8 years. When frozen rubber was heated to 100° and was then frozen again and maintained at 4° and at –10°, resp., the *d.* and the hardness increased slowly over a period of some days, the rubber at 4° requiring longer than that at –10° to reach the max. *d.* and hardness which it showed originally. When these frozen rubbers were warmed, the decrease in *d.* and in hardness indicated a wide fusion range which was complete at 12–14°. The expts. indicate that crystn. depends upon 2 factors: (1) the no. of cryst. nuclei, and (2) the growth of the nuclei. The no. of nuclei increases with the degree of supercooling. At 4° and at –10° there is a great no. of crystals of much smaller size than those in rubber preserved for years. The different proportion and size of the crystals explain why the "m. p." after thawing and refreezing differed so much from that of rubber frozen a long time. In general the m. p. increased with the time during which the rubber was kept frozen. Furthermore the higher the temp. at which the rubber was kept frozen, the faster the growth of the crystals. Plasticizing rubber did not influence the subsequent crystn. phenomena on freezing. II. Röntgenspectrographic part. J. R. KATZ. Univ. of Amsterdam. *Ibid* 6–9.—Röntgenographic examn. of rubber frozen under the different conditions described (cf. above) confirmed the existence of crystals, and the fact that the "freezing" of rubber is its crystn. There was no conclusive evidence that any appreciable polymerization or depolymerization accompanies the crystn. process. The tendency of crystd. rubber to become amorphous when swollen in an org. solvent renders the isolation of crystals a difficult problem.

C. C. DAVIS

Diffusion of water through rubber. EARLE E. SCHUMACHER AND LAWRENCE FERGUSON. Bell Telephone Labs., New York City. *Ind. Eng. Chem.* 21, 158–62 (1929).—The rate of diffusion of water through rubber mixts. of various types was measured in 2 ways, in each case the rubber membrane being in contact with water on 1 side and a vacuum on the other; in 1 case the diffused water was measured by the vapor pressure of the water on the evacuated side, and in the 2nd case the diffused water was weighed after absorption by P_2O_5 . From calcns. based on the data obtained the following formula was derived: $\log_0[p_0/(p_0 - p)] = KA/(V)t$, where p_0 is the vapor pressure of the water on the reservoir side of the membrane, p the vapor pressure on the evacuated side, K a const., A the area of the membrane, V the vol. of the evacuated chamber which the water enters, and t is the time. K may be regarded as the *diffusion const.* and depends upon the thickness of the membrane, its degree of satn., the temp. and the age of the rubber. The results of the measurements show that (1) the rate of diffusion of water through a rubber membrane is inversely proportional to the square of the thickness; (2) the rate of diffusion diminishes greatly as the hardness increases; (3) the effect of satg. the rubber with water is to increase the rate of diffusion, probably because there is not only an increase in the vapor pressure of the water within the rubber but also a decrease in thickness of the membrane and (4) there is no close relationship between the rate of diffusion and minor variations in the compn. of the rubber. The rubber samples which were tested included pale crepe, smoked sheet and rewashed smoked sheet all cured with S, ZnO and an org. accelerator, rewashed smoked sheet cured with S, raw smoked sheet, pure rubber hydrocarbon, crepe low in protein cured with S and PbO, crepe treated with concd. H_2SO_4 , hard rubber, a rubber-"thermoprene" mixt. cured with S, ZnO and org. accelerator, rewashed smoked sheet cured with S and PbO and heavily loaded with silica, an inner tube mixt. (smoked sheet, S, ethylidene-aniline, "mineral rubber," ZnO and paraffin) and a white dental rubber.

C. C. DAVIS

A thermodynamic theory of rubber fillers. LOTHAR HOCK. Univ. Giessen. *Z. Elektrochemie* 34, 662–4(1928).—It is shown that simple cases of reënforcement of rubber mixts. by fillers can be treated on a strictly thermodynamic basis. In developing a theory of the reënforcing action of fillers, like C black and ZnO, the free surface energy between rubber and filler must be considered responsible for the increased work of breaking the loaded rubber. Attempts were therefore made to find a means of detg. this free energy. When a rubber-ZnO mixt. is swollen in benzine, the accompanying heat tone is not the sum of the heat of swelling of the same quantity of rubber and the heat of wetting of the ZnO when these are measured separately, the difference representing the *heat of adhesion of rubber and filler*. It also represents the *total surface energy* and is therefore not a measure of the free surface energy. Furthermore only part of the total surface of the filler comes into contact with the rubber because of incomplete wetting, and the greater the proportion of filler, the less nearly complete this contact. The *heat of wetting* is a function of the concn. of filler, and

reaches its max. value at infinite diln. of the filler. It can be detd. calorimetrically in an approx. way by extrapolation to 0 concn. of the diminishing heats of wetting. Calling U_0 the heat of wetting of 1 g. of filler when every particle is completely wetted, c the concn. of filler, and U , the actual heat of wetting, U/U_0 is the relative extent of actual surface contact. Thus with a rubber-C black (60-40) mixt., the heat of swelling is 0.1 cal. per g.; the heat of wetting of C black is 2.7 cal. per g. from which is calcd. a heat of swelling of the mixt. in benzine of 1.08 cal. per g. However, on account of the surface energy between rubber and C black, the observed heat of swelling was -0.15 cal., so that -1.23 cal. was the total surface energy. Therefore U_{10} was 3.08 cal. per g. of C black. The increase in the work of rupture due to the filler is the free surface energy A and may be detd. from the work expended in breaking the material. However, with increasing proportions of filler, a work of friction must become which is independent of free surface energy. Here too the limiting value A_0 can be detd. approx. by extrapolation to infinite diln. Expts. showed that the order of magnitude of A_0/U_0 is 0.5, i. e., about 0.5 of the calorimetrically detd. total surface energy takes part in the reinforcement, though the ratio varies with different fillers. It is thus possible to est. the phys. properties of a mixt. from a calorimetric detn. of the heat of swelling. That reinforcement depends upon free surface energy (contact surface tension δ multiplied by surface area of contact f) is supported by the fact that its temp. coeff. is of the same order of magnitude as the coeffs. of the surface tension of other 2-phase systems. Inherent difficulties in detg. A , may be avoided by testing the same filler in 3 degrees of fineness, where the relative surface areas are known fairly closely. There are 3 different values of U_0 , and f , n and m are the surface areas per g. (where only n and m must be known) and k is the fraction of U_0 which is equiv. to A_0 , then: (1) $\delta f = kU_0$; (2) $\delta n f = kU_0$, and (3) $\delta m f = kU_0$; in which δ is the unknown. With U in abs. units, δ is calcd. directly in dynes. The theory therefore allows the calcn. of the surface tension between rubber and fillers in general. One equation is sufficient for calcg. δ , since microscopic measurements give the abs. value of f , and k can be detd. by expt. from A . The smaller the heat of swelling of the rubber, the more precise can U be detd. With freshly milled rubber it was 0.1 cal. per g. in benzine, but after 9 months it was over 4 cal.; the great difference is probably caused by a heat of aggregation, corresponding to the increase in the work of rupture during storage. Swelling does not break up this aggregation, and after drying and swelling again rubber gives the same high value. By detg. calorimetrically k , U_0 and U of a filler, and A , by expt., it is possible to est. what proportion of the reinforcement results from the friction of the filler and what proportion from the surface energy, i. e., what part of the reinforcement is of the ideal type.

C. C. DAVIS

Chart for the estimation of equivalent cures. C. L. BRITTAI, Gutta Percha & Rubber, Ltd., Toronto. *Ind. Eng. Chem.* 21, 362-4(1929). A graphical method is described for evaluating and comparing cures under conditions where the rise and fall of temp. play an important part in the integral cure. It is not limited, like the method of Sheppard and Wiegand (cf. C. A. 22, 4272), to cures with a constant temp. rise, and where the intensity of curing action is a const. function of temp. The method evaluates precisely the curing effect of a variable temp. schedule, no matter how irregular. It is also reversible, i. e., a schedule with a certain desired curing effect may be obtained. There are 2 modifications of the method, depending upon whether abs. precision or an approx. result is desired.

C. C. DAVIS

Effect of antioxidants in typical rubber stocks. MARION C. REED, B. F. Goodrich Co., Akron. *Ind. Eng. Chem.* 21, 316-8(1929).—Natural and artificial latex tests of several different types of rubber mixts., including tire treads, inner tubes, foot-wear cured in dry air, sponge and steam hose, contg. the antioxidant "Agerite" are given. This substance improved the aging in all cases.

C. C. DAVIS

Colloidal investigations. XXIII. Contributions to the dispersoidology of rubber. 1. The structure of jellies and of other coagula of ammonia-preserved *Hevea latex* and *Hevea Vultex*. P. P. VON VEIMARN *et al.* *Rubber Chem. & Technology* 2, 104-37(1929).—See C. A. 23, 1010.

C. C. DAVIS

Contribution to the dispersoidology of rubber. P. P. VON VEIMARN. *French caoutchouc* 5, No. 46, 3-8(1928); 6, No. 48, 3-14(1929); cf. C. A. 23, 2069. A French version of C. A. 22, 4872, covering only the structure of jellies and other coagula of *Hevea ammoniated latex* and *Vultex*. Twenty-six reproductions are included.

C. C. DAVIS

Isomerization of rubber by electrical means (according to experiments by Guido Fromandl). LOTHAR HOCK. *Univ. Gießen. Z. Elektrochem.* 34, 604-7(1928).—A summary of expts. by Fromandl (cf. C. A. 23, 1009).

C. C. DAVIS

The isomerization of rubber to cyclorubber under the influence of high-tension alternating currents. GUIDO FROMANDI. *Rubber Chemistry & Technology* 2, 161-5 (1929).—See C. A. 23, 1009, 1525.

C. C. DAVIS

The question of priority in the discovery of thermoplastic gutta-percha-like, balata-like and shellac-like products from rubber and their classification. HARRY L. FISHER. U. S. Rubber Co. Labs., Passaic, N. J. *Kautschuk* 5, 47-8 (1929).—Polemical (cf. Kirchhof, C. A. 23, 307). Evidence is presented to show that the claims of K. are without foundation. Reply. F. KIRCHHOF. *Ibid* 48. Reply. HARRY L. FISHER. *Ibid* 65.

C. C. DAVIS

The accelerator "Tuads" and its imitations. FR. I. ÖBLEIN. *Kautschuk* 5, 38-9 (1929).—Comments on an article by Esch (cf. C. A. 23, 1526). Experience shows that "Thiuram" (a German com. grade of tetramethylthiuram disulfide) is quite similar to "Tuads" in its behavior as an accelerator.

C. C. DAVIS

Comparative investigations of Thiuram (a Vulcavit product) and Tuads. A. VAN ROSSEM. Staatl. Kautschukprüfungsamt, Delft. *Kautschuk* 5, 39-43 (1929); cf. preceding abstr. Analysis showed that "Thiuram" is purer than "Tuads," the latter contg. a trace of Mn and much higher ash and moisture contents. Comparative tests of their accelerating activities in different types of rubber mixts showed that in 2 cases the 2 products were virtually identical, while in another case the quality of the vulcanizate cured with "Thiuram" was superior. The relative tendencies to cause "scorching" were measured by keeping mixts at 100° and then measuring their hardness and their swelling in C₆H₆. Scorching was greater with "Tuads." "Thiuram" is considered superior to "Tuads."

C. C. DAVIS

Concluding remarks on the accelerator "Tuads" and its imitations. WERNER ESCH. *Kautschuk* 5, 62 (1929). Comments on articles by Öblein and by van Rossem (cf. preceding abstracts). It is considered that the data presented by the above authors show the superiority of "Tuads" over "Thiuram" rather than *vice versa*.

C. C. D.

Vulcanization and the structure of rubber. EUGENIO LINDMAYER. *Kautschuk* 5, 35-8 (1929).—The sulfurization and oxidation of oils and the vulcanization of rubber are explained in a hypothetical way by the aid of 3-dimensional space diagrams. No exptl. evidence is offered.

C. C. DAVIS

The form and size of the micelles of rubber (HENGSTENBERG, MARK) 23. Combating mites on *Hevea* nurseries (GONGGRIIP) 15. The resistance to bending of vulcanized rubber (ARIANO) 2. Effect of temperature on the viscosity and ease of precipitation of sols of rubber (WHITBY, GALLEY) 2. Impregnating paper with rubber (U. S. pat. 1,705,537) 23. Rubber printing plates (Brit. pat. 295,927) 18.

LUTTRINGER, A. D.: *La gomme de balata*. Paris, 49, Rue des Vinaigriers: A.-D. Gillard. 49 pp.

REINER, STEFAN.: *Laboratoriumsbücher für die chemische und verwandte Industrien. Bd. XXVII. Laboratoriumsbuch für die Kautschuk- und Kabelindustrie.* Halle (Saale): W. Knapp. 70 pp.

Treating rubber latex. P. MEYERSBERG. Brit. 295,600, Aug. 16, 1927. Natural or artificial latex is partially coagulated and rendered suitable for use in coating fabrics by adding weak org. acids such as rosin, elaine, stearic acid or linseed-oil acid, which react with the alkali which is present or which is added to form soaps. Fillers and disinfectants also may be added and if rosin is used it may be dissolved in colza or other suitable oil.

Improving the electric insulating properties of rubber products obtained directly from latex. K. D. P., LTD. Brit. 296,032, Aug. 23, 1927. The serum constituents are removed from latex, e. g., by dialysis, by the method described in German pat. No. 412,060, or by treating the latex with agglutinating agents as described in German pat. No. 442,856 and centrifuging.

Working up rubber. L. SZYNKOWSKI. Ger. 471,496, June 2, 1927. Crude natural rubber is cut up, given a short drying, and caused to swell by treatment with suitable hydrocarbons. The mass is then kneaded, filtered and worked up as usual.

Rubber compositions. ERNEST R. BRIDGWATER and AARON S. SLACK (to E. I. du Pont de Nemours & Co.). U. S. 1,705,712, March 19. In order to control the tendency of rubber to "scorch" or prematurely vulcanize during the necessary operations preceding vulcanization (such as dispersion of compounding ingredients with the rubber) and to improve the tensile strength and other properties of the rubber, it is incorporated

with a small proportion (suitably about 1-3%) of the reaction product of diphenyl-diaminomethane with stearic acid (or other suitable compd. formed by condensing 2 mol. proportions of a primary aromatic amine with 1 mol. proportion of an aliphatic aldehyde and treating the resulting diamine with a high aliphatic acid).

Thermoplastic rubber derivative. WILLIAM C. GEER and HERBERT A. WINKELMANN (to B. F. Goodrich Co.). U. S. 1,705,757, March 19. Rubber is incorporated with a softener such as pine tar and with concd. H_2SO_4 or other suitable isomerizing agent, and the mixt. is heated (suitably at a temp. of about 130° or higher) until it has assumed an inelastic thermoplastic condition and is then masticated to homogenize it.

Transformation products of rubber. THE B. F. GOODRICH CO. Fr. 646,414, Dec. 27, 1927. Conversion products of rubber are obtained by heating it with a phenol and one of the following: chlorinated rubber, rubber-HCl, rubber sulfur chloride, chlorinated rubber-HCl, pinene-HCl, diphenylamine-HCl, trichloroaniline-HCl, *m*-nitraniline-HCl, $HgCl_2$, $SnCl_4$, naphthalene tetrachloride, triphenylchloromethane, $ZnBr_2$, rubber dibromide, diphenylamine-HBr, $CaSO_4$, $Al_2(SO_4)_3$, $HgSO_4$, diphenylamine sulfate, diphenylamine trichloroacetate. Phenols include cresol, $PhOH$, catechol, resorcinol naphthols and *p*-chlorophenol. Several examples are given in which the temp. is kept at $134-160^\circ$ for 20 hrs. or longer.

Apparatus with an abrading drum for grinding or comminuting rubber. C. E. GARDNER. Brit. 295,434-5, May 12, 1927. Structural features.

Dipped rubber articles. E. HAZELL (to Naugatuck Chemical Co.). Brit. 295,700, Aug. 19, 1927. Deposition of rubber from latex on porous molds is accelerated by (1) diln., (2) addn. of substances increasing the rate of filtration of the aq. portion of the material through the deposit as it forms, (3) agitation, or (4) heating. For increasing the filterability, ZnO or a Zn salt and a sulfide such as that of Na, K, Li or NH_4 may be added. Various details of procedure are given.

Rubber articles from aqueous dispersions. P. KLEIN (to Anode Rubber Co. Ltd.). Brit. 296,107, Feb. 23, 1927. Rubber from aq. dispersions such as those formed from reclaimed or waste rubber is deposited by a continuous building-up process, upon a backing from which the product may be stripped either before or after subjection to vulcanization. The process may involve electrophoresis, suction or chemical action, and various details and modifications are described.

Forming vehicle bodies and associated parts of pliable "semi-hardened" rubber. A. LEVY-PICARD. Brit. 295,541, Dec. 21, 1927.

Synthetic rubber. I. G. FARBERIND. A.-G. Fr. 646,704, Jan. 4, 1928. Products of the nature of rubber latex are obtained by emulsifying butadiene, its homologs or analogs in water with the aid of emulsifying agents and polymerizing these emulsions with the addn. of buffers such as establish a pH value of 4 to 8.5. In examples, isoprene is emulsified with the addn. of NH_4 oleate and Na phosphates or Na oleate and Na isobutyl naphthalenesulfonate, or Turkey red oil and Na_2PO_4 , and heated for 2 or 3 weeks. The latex formed is coagulated by the addn. of $AcOH$, HCl , etc. Cf. C. A. 23, 2071. *

Vulcanizing rubber. MORRIS L. WEISS (to Dovan Chemical Co.). U. S. 1,705,948, March 19. Vulcanization is accelerated by use of a suitable substituted guan having 2 substituting aryl groups (at least one of the aryl groups being unsubstituted). Cf. C. A. 22, 1061.

Vulcanizing rubber boots. L. E. DE SANKTI-MAURO-GAEVSKII. Russ. Mar. 31, 1928. The usual vulcanization is carried out in an atm. of flue gases.

Vulcanization apparatus. THE AKRON STANDARD MOLD CO. Fr. 646,003, Dec. 13, 1927.

CHEMICAL ABSTRACTS

Vol. 23.

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No. 10

1—APPARATUS AND PLANT EQUIPMENT

W. L. BADGER

A new automatic pipet. L. N. MARKWOOD. *Ind. Eng. Chem., Anal. Ed.* 1, 82 (1929).—Hot liquids may be measured without danger of cooling, and suction with the mouth is eliminated. The accuracy is quite good. J. H. MOORE

Standard-joint apparatus. J. FRIEDRICHS. *Chem. Fabrik* 1928, 725-6; 1929, 5-6.—Descriptions, with 50 cuts, of glass lab. app. with interchangeable ground joint. J. H. MOORE

An apparatus for the filtration of solutions, for precipitation and the filtration of these precipitates in a nitrogen atmosphere. V. GRAFE AND K. FREUND. *Neue Wiener Handelsakademie. Biochem. Z.* 205, 258-63(1929). S. MORGULIS

Receiver for vacuum distillation. EDGAR J. POTH. Univ. of Texas. *Ind. Eng. Chem., Anal. Ed.* 1, 111-2(1929).—An app. without stopcocks in the distn. train is described. J. H. MOORE

A continuous still for conductivity water. C. C. DEWITT AND GEO. G. BROWN. Univ. of Mich. *Ind. Eng. Chem., Anal. Ed.* 1, 109-11(1929).—Detailed direction is given for constructing and operating a continuous, practically automatic fractionating column. J. H. MOORE

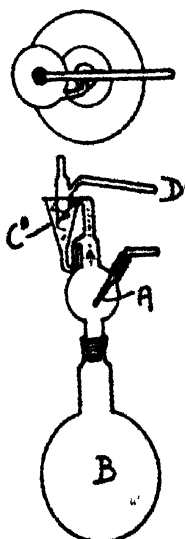
Apparatus for the distillation of strongly foaming liquids. F. FRIEDRICHS. *Glas. u. App.* 9, 70(1928); *J. Soc. Glass Tech.* 12, 306(1928).—The fractionation of strongly foaming liquids such as soap soln. is possible, provided the spray from the bubbles of rising foam is caught in an efficient trap. In the app. illustrated a capillary air jet, A, impinges on the foam, and the minute spray, together with vapor, enters the mixing chamber, C, tangentially, where the swirling action centrifuges the spray to the sides, from which it drains back to the distn. flask, B, and allows the vapor to pass on by way of the centrally inserted exit tube, D. H. L. D.

Coated spiral fractionating columns. THOMAS MIDGLEY, JR. Thomas and Hochwalt Laboratories, Dayton, O. *Ind. Eng. Chem., Anal. Ed.* 1, 86-8(1929).—M. describes metal fractionating columns with spiral packing coated with carborundum dust. The spiral is coated with shellac, and air satd. with alc. is blown through to remove the excess shellac. Carborundum dust is then blown through the column and the carborundum sticks to the shellac binder. The columns have proved considerably better for sepn. than any other packing used. A single spiral column, a multiple spiral column and an adiabatic spiral column are described. These columns are metal and suited especially for lab. sepn. M. C. ROGERS

Centrifuges for the chemical industries. CARL SCHMITZ. *Chem. Fabrik* 1929, No. 6, 63-5.—Short descriptions are given of several centrifuges with details of construction and operation. C. Z. ROSECRANS

Performance of the gas centrifuge. WALENTY DOMINIK. *Przemysl Chem.* 11, 115-21(1927).—A mathematical paper. Theoretical sepn. of gaseous mixts. by centrifugal force into fractions of different compns. is quite possible. The centrifuge used by Mazza (*Power* 1926, 23) applied to gaseous mixts. made up of components of widely different densities should give technically pure gases. Size and % compn. of fractions can be changed by changing the radius of rotation at which the mixt. is introduced. A. C. Z.

A simple speed controller especially adapted to the moisture-equivalent centrifuge. F. J. VANMETER AND C. V. GRAY. *California Agr. Expt. Sta. Soil Sci.* 25, 455-60(1928).—The principal feature of this device is a steel reed. The operating circuit



of the speed controller is diagrammatically shown and also two figs. The app. is especially designed for soils.

A new extraction apparatus. ST. J. GAŠPERÍK. *Chem. Listy* 23, 58-9(1929).—

E. F. SNYDER

The app. consists of 4 parts: (A) a wide-mouthed flask with 3 indentations for supporting an extn. vial, (B) the extn. vial consisting of a wide tube with an inserted vertical tube which is protected by another larger tube, (C) a pressed celluloid filtering case which may be replaced by glass wool for some work and (D) a condenser. The material for extn. is placed in C and this is placed in B.

FRANK MARESH

Extraction apparatus for liquids. II. J. FRIEDRICH. *Chem. Fabrik* 1929, 90-1; cf. C. A. 22, 3553. —Comparative tests are given upon distns. and extns. with 4 types of app., including that with the porous glass plate previously reported they indicate the superiority of the new form of extn. app.

W. C. EHAUGH

Viscometer for small quantities of liquids. TADEUSZ RABEK. *Chem. Research Inst., Warsaw. Przemysl Chem.* 11, 614-9(1927). —This is an improvement of the Bonté-Bill viscometer (*Z. physik. Chem.* 53, 303(1905)). This app. requires only 5-6 cc. of the liquid, is simple and rugged in construction, and so sensitive to temp. that changes in viscosity, due to a difference of 0.05° can be detected. It is so easy to manipulate that as many as 50 measurements daily can be made with it.

A. C. ZACHLEY

A device for measuring surface tension automatically. LECOMTE DU NOUY. *Science* 69, 251-2(1929). In static measurements of surface tension on colloidal solutions it is essential to apply the pull very smoothly and slowly, increasing at the rate of about 20 dynes per min. The mols. disturbed by the deformation of the liquid surface thus have time to reorganize themselves in the surface layer. Consequently the "personal coefficient" of the experimenter plays a large part. An elec. motor drives the tensiometer knob at a rate to apply from 20 to 40 dynes per min. as desired. The motor current is cut off automatically when the ring tears loose, and a quick-acting brake is applied, thus reducing over-travel to practically zero.

C. Z. ROSECRANS

Ebullioscopic apparatus for investigations at high pressure. W. SWIENTOSLAWSKI. *Compt. rend.* 188, 392-5(1929). —An app. is described for ebullioscopic detns. modified to be run at pressures ranging from 8 to 25 atms. The original paper includes full details and 2 self-explanatory cuts.

ALBERT I. HUNGE

New modification of the ebullioscope adopted for high pressures. A. ZMACZENY. *Compt. rend.* 188, 395-6(1929). —An improvement of the app. described in the preceding abstr. The original paper includes a full description and a good cut.

A. I. H.

A self-regulating gas flowmeter. LYMAN CHALKLEY, JR. *Penn. State Coll. Ind. Eng. Chem., Anal. Ed.* 1, 74-5(1929). —The essential parts are an electrically operated gas valve, a flowmeter consisting of a capillary tube with a manometer connected across it, and means for operating the valve by changes in the manometer level. The app. gives good operation and control of gas flow.

M. C. ROEHS

Indication of measured values by light indices. H. SPRUNNA. *Chem. Technik* 1929, No. 5, 53. —A light-beam pointer device has been developed for switchboard or wall type instruments to be used in cases when it is desired to read the scales from some distance. The usual devices responsive to measured magnitudes are used, the light-beam device being applied to the responsive element, such as a vapor pressure thermometer for temp. measurements. One example given is a thermometer reading from 300° to 400°, with a scale 1.0 m. long, easily readable at a distance of 100m.

C. Z. R.

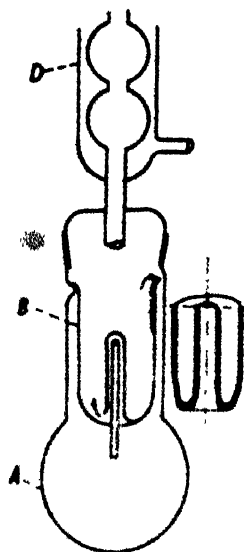
Apparatus for the determination of silicic acid in steel and iron by the chlorine process. P. DICKMAN. *Chem. Fabrik* 1929, 51-2. —The metal to be analyzed, iron or silicon for example, is heated to 900-1000° in a stream of dried Cl₂; it volatilizes and the silicic acid remains in the porcelain boat. Cl₂ is dried by concd. H₂SO₄; it is then passed through a porcelain tube at 900-1000° to burn out O₂. Final drying before passing into the combustion tube is by concd. H₂SO₄, CaCl₂, and P₂O₅. The whole app. is self-contained.

C. Z. ROSECRANS

Shaker for Clark hydrogen-ion electrode vessels. D. H. CAMERON AND ROSS SUGARMAN. *J. Am. Leather Chem. Assoc.* 24, 130-3(1929).

H. B. MERRILL

Automatic apparatus for determining the concentration of hydrogen ions. A. LAMMUN. *Ann. chim. anal. chim. appl.* 11, 66-71(1929); cf. C. A. 23, 734. —For



factory control of p_H values, the ballistic method for measuring e. m. f. can be used to advantage. In this paper an ingenious arrangement is described using the Carpentier model of the ballistic galvanometer such that one only has to start the app. and read the position of a luminous spot on a graduated scale. Thus, the p_H value of a liquid can be detd. without any manipulative skill. The values thus detd. are within about 7% of the truth.

W. T. H.

Tests of a new type of glass electrode. DUNCAN A. MACINNES AND MALCOLM DOLE. Rockefeller Inst. for Medical Research, New York. *Ind. Eng. Chem., Anal. Ed.* 1, 57-9(1929).—Great accuracy was obtained with electrodes with active glass surfaces only 0.001 mm. thick; also with active surface covering the ends of tubes only 0.75 mm. diam. They responded only to p_H concns. and were not influenced by oxidation-reduction potentials in the solns.

J. H. MOORE

New super-conductors. EDM. VAN AUBEL, W. J. DE HAAS AND J. VOOGD. *Proc. Acad. Sci. Amsterdam* 32, 218-25(1929).—See C. A. 23, 1544

E. C. M.

Apparatus for the determination of breakdown point of adsorbing systems. ANTON MACKERT. *Chem.-Ztg.* 53, 228(1929).—See C. A. 23, 1781.

E. C. M.

The fulgurator as an atomizer of salt solutions for flame spectra and the photography of its spark spectrum. WILHELM HIRSCHL. *Chem.-Ztg.* 53, 218-9(1929).—See C. A. 22, 1875.

E. C. M.

Evolution in conception of continuous furnaces and methods of heating them. A. HIRT. *Chaleur ind.* 9, 369-78(1928).—The first furnaces were for baking bricks; the fuel was added directly from above, as in the Hoffmann continuous furnace, with but fair results. Automatic feeding was then added and this improved combustion. For fine ceramic ware special furnaces were employed with a transverse grate working at 1300°. The primary air was regulated and good combustion was obtained. But the flame followed the air and there was a tendency to clinkering. This furnace was not tight and fuel consumption and labor were high. Intermittent ceramic furnaces often utilize external semi-gas firing. Primary air enters on the furnace grate and secondary air is heated by the cooling of products and by brickwork. Such furnaces require good coal, high in volatile matter. In the Faugeron furnace secondary air is heated by arches and has a zig-zag path; a low draft is required. Modern gas-fired furnaces have many advantages over coal furnaces. To bake a ton of refractory requires 500 m. of air for the combustion of the necessary coal, and 820 cu. m. are required for cooling off the same products. There is then an excess of air, which increases fuel costs and renders difficult the circulation of the product of combustion and produces uneven heating. H. considers better methods of heating in detail and gives temp. curves of the Hirt furnace. For furnaces requiring high temps. recuperators may be at the walls; waste heat app. may be installed. There are 18 diagrams with a discussion.

S. L. B. E.

Testing and rating of fuel-fired industrial furnaces. I. W. C. BUELL, JR. *Fuels and Furnaces* 6, 1505-14(1928).—Furnace tests may be either efficiency or balance tests. Percent efficiency of operation = B. t. u. absorbed by the product $\times 100$ / B. t. u. in the fuel. The balance test requires the heat data for input and distribution including stack losses, absorption by charge and radiation losses (this latter by difference). Proper allowance must be made for regenerators and for losses in ducts not an integral part of the furnace.

J. W. SHIPLEY

Steam drying oven with detachable base. HENRY J. S. SAND. Sir John Cass Tech. Inst., London. *J. Chem. Soc.* 1929, 214.—The base, or boiler section, of this oven is constructed as a sep. unit distinct from the rest, the junction between the 2 parts being made by a H_2O seal. Cleaning is thereby facilitated.

R. L. DODGE

Containers for caustic solutions. BYRON A. SOULE. Univ. of Mich. *Ind. Eng. Chem., Anal. Ed.* 1, 109(1929).—Bottles coated with Thermoprene, acid seal paint No. 1023 (B. F. Goodrich Co.), are satisfactory, at least up to 5 N solns.

J. H. MOORE

Elements of operation of the pneumatic table. ARTHUR F. TAGGART AND R. L. LECHMERE-ORRY. *Am. Inst. Mining Met. Eng., Tech. Publication* No. 196, 60 pp. (1929).—Results of an exhaustive series of expts. are shown. Several operating adjustments of an automatic table produce effects in the action of a given coal that may be grouped into two classes: stroke length, speed and rocker arm angle, which affect longitudinal travel; air supply and table slope (transverse and longitudinal), which det. transverse travel. The pneumatic table exerts, through the air supplied, a force on the articles upward away from the deck, but it lacks the positive control over cross travel which is supplied by the wash and feed waters. The paper is profuse with tables, charts and curves and explanations of results. "Pneumatic table practice has suffered from the effects of the assumption that the action on the table is the same as or closely similar to that on the deck of wet shaking tables."

W. H. BOYNTON

Heavy-duty thermostat. D. F. ORINGER. Univ. Mich. *Ind. Eng. Chem., Anal. Ed.* 1, 97(1929).—The app. is simple and rugged; it is designed to control at least 4000 w. of elec. energy and to hold the temp. of a small boiler const. to 0.02°. J. H. MOORE

A note on the Haughton-Hanson thermostat. A method of fine adjustment. P. J. DURRANT. Selwyn Coll., Cambridge. *J. Inst. Metals* (advance copy), No. 496, 4 pp.; *Engineering* 127, No. 3296, 327; *Metal Ind.* (London) 34, 315-6(1929).—The "cold bulb" of the H.-H. app. is held at a const. temp. by inserting a small toluene thermostat by means of which the temp. of the app. can be adjusted over a range of about 5° with an accuracy of 0.1°. Directions are given for varying the temp. or adjusting it to any desired point. J. H. MOORE

Use of crystalline quartz for spectrographic work (ELLIS) 3. Ostwald color theory (SACHS) 2. Leading-in wires of electric lamps, etc. (Brit. pat. 296,453) 4.

and Industrial Instruments. A catalogue of Negretti and Zambra. London, 38 Holborn Viaduct: Negretti and Zambra. 460 pp. Reviewed in *Chem. Trade J.* 84, 290(1929).

Wien-Harms Handbuch der Experimentalphysik. Band XIII. Teil 2. Glühelctroden und technische Elektronenröhren. Leipzig. Akad. Verlagsgesellschaft m. b. H. 492 pp. Bound, M. 46. Reviewed in *Science Progress* 23, 708(1929).

Adjustable clamp suitable for laboratory uses. CHARLES H. BONE. U. S. 1,754, April 2.

Thermocouple pyrometer. G. E. LLOYD and ELECTROFLO METERS CO., LTD. Brit. 297,261, Dec. 23, 1927. Structural features.

Filter. C. S. GARLAND. Brit. 296,359, May 30, 1927. A filter surface is formed of helically woven wire or strip-like mesh supported so that it can be stretched longitudinally and the area of the meshes extended or contracted to give a greater or less degree of permeability. Various structural features are described.

Filters. ÉTABLISSEMENTS SIMONETON (S & R. L.). Fr. 647,095, May 21, 1927. The filters are formed as hollow disks rotating on a hollow axle into which the liquid flows.

Filter for use with zeolites. WERNER NEUMANN. U. S. 1,708,704, April 9. Structural features.

Air filter. JULES L. E. ROUBAUD. Fr. 647,174, June 3, 1927. An arrangement of vertical metallic sheet filter elements is described.

Filter for air or other gases. ANDERS JORDAHL and KARL G. RUNBACK (to Mid-west Steel & Supply Co.). U. S. 1,708,065, April 9. Structural features.

Oil filter. WILLIAM W. NUGENT. U. S. 1,708,517, April 9. Structural features.

Sand filters. LOUIS E. RAINBERRY. Fr. 33,624, May 31, 1927. Addn. to 628,112. Constructional features. The celluloid cylinders are replaced by Pb or ceramic cylinders for filtering concd. acids.

Overflow-alarm device for filtering apparatus. WILLIAM W. NUGENT. U. S. 1,708,235, April 9. An elec. bell alarm is provided on filtering app. such as that used for filtering oil.

Filter drum. EUGEN GEIGER. Ger. 472,181, Aug. 5, 1926.

Apparatus for the continuous separation of suspended matter from liquids or gases. FRIEDRICH BARTLING and FRANZ LAWACZECK. Fr. 647,754, Dec. 30, 1927.

Device with truncated conical baffles for separating dust from air or other gases. HENRY R. DAVIES (to Industrial Research Corp.). U. S. 1,708,122, April 9.

Tank and baffle-plate construction for separating oil from water by gravity. S. LAUZ and GEORGE E. JUPP (to American Marine Device Corp.). U. S. 1,708,122, April 9.

Centrifuges. AKTIEBOLAGET SEPARATOR. Fr. 647,923, Jan. 28, 1927. The method of removing the liquid is described.

Centrifugal apparatus for purifying oils, etc. AKTIEBOLAGET SEPARATOR. Brit. 296,670, Sept. 3, 1927. Brine may be used periodically for removing solid impurities deposited in the app.

Plant for centrifuging liquids. KARL J. SVENSSON and KARL A. P. NIELING. Ger. 472,083, Nov. 30, 1926. The plant comprises a centrifuge, a feeder, 1 or more elec. preheaters and containers for washing liquid and for the products.

Means for lifting and tilting centrifuge drums. KARL J. SVENSSON and KARL A. P. NIELING. Ger. 472,034, Oct. 8, 1926.

Röntgen-ray apparatus. A. DEMBLON. Brit. 296,733, Sept. 6, 1927.

X-ray tube. GUSTAV BUCKY. U. S. 1,708,494, April 9. Structural features.

Thermionic valves. ALLOEMEINE ELEKTRICITÄTS-GES. Brit. 297,332, Sept. 17, 1927. An auxiliary electrode is arranged near a highly emitting or low-consumption cathode so as to collect pos. ions and to prevent deterioration of the emitting properties of the cathode. Various structural and elec. features are described.

Thermionic valves. COMPAGNIE FRANÇAISE POUR L'EXPLOITATION DES PROCÉDÉS THOMSON-HOUSTON. Fr. 647,096, May 24, 1927.

Photoelectric cell. ALBERT B. PAGE (to General Electric Co.). U. S. 1,708,773, Structural features.

Cathodes for photoelectric cells. SIEMENS-SCHUCKERTWERKE A.-G. Ger. 472,485, Jan. 29, 1927. The cathodes are formed from a mixt. or alloy of an alkali metal with another substance selected so that the mixt. or alloy has a higher m. p. than the alkali metal. A suitable compn. comprises K 90-95% and Ba 10-5% and may be prepd. by bringing the metals together in an evacuated vessel at a very low temp. and heating the mixt. to above its m. p.

Ionization chamber for radiation measurement. SIEMENS & HALSKE A.-G. Ger. 472,110, Mar. 29, 1925. An ionization chamber of the "thimble" type is constructed with an inner C electrode of a diam. at least equal to the width of the gas layer between the electrodes.

Low-pressure metallic vapor-containing electric discharge devices. J. W. MARDEN and E. A. LEDERER (to Westinghouse Lamp Co.). Brit. 296,781, Sept. 9, 1927. Metals, such as the alkali metals, are introduced into evacuated or gas-filled containers, such as electron discharge devices, by mixing a compd. such as $\text{Cs}_2\text{Cr}_2\text{O}_7$ or CsMnO_4 with a finely divided metalloid such as Si or B and effecting reduction inside the container. The $\text{Cs}_2\text{Cr}_2\text{O}_7$ and CsMnO_4 can be freed from moisture and the metalloids rendered gas-free by boiling in dil. HCl until evolution of gas ceases. The use of CsMnO_4 is preferred as O is evolved before the alkali metal is liberated; this O serves for oxidation of the filament. The temp. at which the Cs salt is decomposed is stated to be about 900° but may be reduced to about 700° by the addn. of about 1% of pure, grease-free, finely powdered Al or Al filings.

Furnace of the type in which substances to be heated are passed continuously. ARTHUR DE BOUW. Fr. 647,471, Jan. 19, 1928.

Cupola furnace with slag separator between forehearth and shaft. OTTO KIPPE. Ger. 472,139, July 12, 1925. Addn. to 431,628.

Annealing furnace. SIEMENS ELEKTROWÄRME-GESELLSCHAFT M. B. H. Fr. 33,605, May 25, 1927. Addn. to 612,730.

Annealing or tempering furnaces. AKTIEN GESELLSCHAFT, BROWN, BOVERI & CIE. Fr. 647,727, Nov. 7, 1927.

Muffle furnace for vitreous enameling, annealing, etc. GIBBONS BROS., LTD., and T. E. BRIDGFORD. Brit. 296,936, Jan. 4, 1928. Structural features.

Reduction furnace. JEAN SAUVAGEOT. Fr. 647,354, Jan. 10, 1928. A thin barrage of combustion gas is created across the hearth behind the furnace door to prevent entry of air when the door is opened.

Bakery furnaces using mazout. HENRI HERSANT. Fr. 33,397, April 21, 1927. Addn. to 615,217.

Furnace-roof construction. HENRY W. SPENCER. Fr. 647,900, Jan. 24, 1928.

Apparatus for charging tilting smelting furnaces. JOSEF E. GERLACH. U. S. 1,707,937, April 2.

Regulator for _____ ary air supply to furnaces. NICHOLAS HENNESSY. Fr. 647,297, Dec. 16, 1927.

Burners for gas furnaces. HILARION ROUSSET. Fr. 33,518, Feb. 2, 1927. Addn. to 579,369.

Gas burner. JOHN V. THOMAS and BEN D. BALTHIS. U. S. 1,707,451, April 2. Structural features.

Air regulator for gas burners. ÉTIENNE GHIO and ÉMILE P. L. LE BARBIER. Fr. 647,480, Jan. 19, 1928.

Burner for gaseous and powdered fuel. DEUTSCHE BABCOCK & WILCOX DAMPF-KESSEL-WERKE A.-G. Ger. 472,411, Mar. 31, 1925. The fuel mixt. is introduced into a side slit burner tube in 2 regulable, oppositely directed streams. The intensity and incidence of the heating are controlled by adjusting the pressure of 1 or both of the streams.

Burner for powdered fuel. CARL HOLD. Ger. 472,412, April 2, 1924. The combustion chamber is pear-shaped, the fuel-air mixt. entering under slight pressure or

suction at the top and the combustion products passing out through conduits at the side.

Feeding powdered coal to burners. BERG & CO. GES. FÜR INDUSTRIE-OFFENBAU U. FEUERUNGSBEDARF M. B. H. Fr. 648,008, Jan. 31, 1928.

Coal-dust burner. DEUTSCHE BABCOCK & WILCOX DAMPFKESSEL-WERKE A.-G. Ger. 472,185, April 28, 1926. Improvements are described in a burner of the kind in which radial plates impart a whirling motion to the air-fuel mixt.

Atomizing burner for liquid fuels. EDWARD J. Y. RUTHERFORD. Ger. 472,480, July 25, 1925. Steam for atomizing the fuel is generated in a special flash boiler. See Brit. 237,203.

Burner for liquid fuel such as coal-tar oil or mazout. ALBERT B. FOURNIEN. Fr. 647,517, Jan. 20, 1928.

Burner for liquid fuel such as mazout. AUGUSTE CHANARD. Fr. 647,190, June 4, 1927.

Oil burner with a number of differently directed atomizers. ATELIERS H. CUÉNOD S. A. Ger. 472,213, April 14, 1927.

Burner for oil and air under pressure. WILLIAMS OIL-O-MATIC HEATING CORP. Ger. 472,490, Oct. 8, 1926. A valve in the conduit to a gas igniter is held open by a membrane susceptible to the pressure of the fuel mixt. so long as the pressure remains in a given range.

Heat exchanger, especially for preheating air for combustion. NILS R. FORSSBLAD. Ger. 472,071, Feb. 1, 1925.

Heat-exchange apparatus suitable for use as a condenser-type heater. JOHN P. RATHBUN (to Westinghouse Elec. & Mfg. Co.). U. S. 1,708,031, April 9.

Heat-exchange apparatus suitable for heating air or gas supplied to blast furnaces. FREDERICK H. WILLCOX and JOHN C. HAYES, JR. U. S. 1,707,777, April 2. Structural features of a flue system, etc., are described.

Apparatus for control of heating apparatus, etc. RICHARD P. BROWN (to Brown Instrument Co.). U. S. 1,707,652, April 2.

Portable electrically heated steam superheating device. ALEXANDER VINOGRADOV. U. S. 1,707,453, April 2. Structural features.

Kilns. NICOLA LENGERSDORFF. Ger. 471,772, May 5, 1925. A gas heated kiln has 2 parallel heating chambers.

Continuous, multiple-chamber downdraught kiln construction. E. G. SPENCER-CHURCHILL. Brit. 296,844, June 29, 1927.

Gas-analysis apparatus. SVENSKA AKTIEBOLAGET MONO. Ger. 466,553, Aug. 29, 1925. Gas-analysis app. is described, particularly for flue gases, of the kind in which an oscillating Hg column draws a sample of gas into the app. and then forces it through an absorption liquid into a measuring bell. The absorption liquid is used to effect the movement of the Hg and to seal the bell.

Container for gases under pressure. PAUL BENKOWITZ. Ger. 472,059, Aug. 2, 1927. See Brit. 294,943 (C. A. 23, 1785).

Receptacles for holding carbon dioxide under high pressure. H. R. MINOR. Brit. 297,270, Jan. 16, 1928. The receptacles are provided with a safety disk of thin Cu or phosphor bronze and a pliable protective shield to conform with the shape of the disk and to resist any corrosive effects of the gas. The protective shield may be of thin celluloid or the disk may be plated with Au.

Containers for storing and transporting liquid gases of low boiling point. STUDIEN GESELLSCHAFT FÜR GASINDUSTRIE M. B. H. Fr. 647,272, Nov. 12, 1927.

Apparatus for treating liquids with other gases to remove air preliminary to irradiation of the liquid. H. SCHOLL. Brit. 297,086, Sept. 14, 1927. An app. is described suitable for use in processes such as described in Brit. 283,472 (C. A. 22, 4015). Brit. 297,088 also relates to deaerating and irradiating app. for treating liquids.

Gas-comparison apparatus for thermal conductivity comparisons. RICHARD P. BROWN (to Brown Instrument Co.). U. S. 1,707,624, April 2.

Combined gas washer and ventilator. FIRMA EDUARD THEISEN. Ger. 472,182, May 4, 1926. Addn. to 387,526.

Gas-washing apparatus (with intermeshing stationary and rotating baffle devices). HERMAN A. BRASSERT, CHARLES E. DOUGAN and EDMUND VON MALTITZ (to H. A. Brassert & Co.). U. S. 1,707,548, April 2.

Apparatus for producing gas from "petrol" or similar volatile liquids. LUCIEN BROCAUT. U. S. 1,707,249, April 2.

Glass spirals. MILOŠ KLAVIK. Ger. 472,315, Oct. 28, 1926.

Catalytic app. THE SILDEN CO. Fr. 647,770, Jan. 19, 1928. A catalytic

app. comprises at least one converter provided with cooling means, which enables it to work above normal output rate, and a converter of much less cooling capacity. Coolers or heat exchangers may be used between the two. A series of converters of progressively decreasing cooling capacity may be used and the strongly cooled converters may be designed so that the cooling is proportional to the rate of gas flow, this being obtained by passing the incoming gas through heat-exchangers embedded in the catalyst. Cf. *C. A.* 23, 1024.

Apparatus for carrying out reactions under pressure. JACQUES L. H. HUGUES and JEAN M. P. BLANDIN. *Fr.* 647,338, Jan. 5, 1928.

Still with a rotating heated pipe system dipping into the liquid. W. RUNGE (to Coal Oil Extraction, Ltd.). *Brit.* 296,430, Sept. 2, 1927.

Concentrating and dehydrating apparatus. CECIL F. HAMMOND and WM. SHACKLETON. *Fr.* 647,472, Jan. 19, 1928.

Apparatus for spray desiccation of liquids. B. F. UHL (to Industrial Spray-Drying Corp.). *Brit.* 296,421, Sept. 1, 1927.

Use of an atomizer for effecting chlorinations or other reactions. H. T. BUCHERER. *Brit.* 296,376, Aug. 30, 1927. Gas and liquid conduits of an atomizer device are calibrated and pressures are adjusted to secure the desired proportions of liquid and gaseous reagents in chlorination of org. liquids, in treating liquid S with air, in treating liquid bases with gaseous acids or other reactions.

Drying apparatus for casein and other powdered substances. GEORGES LIGRAUD. *Fr.* 647,911, Jan. 27, 1928.

Drying apparatus for casein and the like. HERMANN ALBERT AUDEMARS. *Fr.* 635,507, Jan. 26, 1927. Addn. to 626,978.

Extraction plant for sugar and other substances. ANCIENS ÉTABLISSEMENTS EGROT ET GRANGÉ. *Fr.* 647,239, June 8, 1927.

Air cooler. MASCHINENFABRIK CARL WIESSNER KOMM-GES. *Ger.* 471,543, Aug. 5, 1926. A wet air cooler with superposed stages has a no. of irrigating nozzles in the air current in each stage, corresponding to the position of the stage.

Device for indicating the carbide supply in an acetylene-generating system. EMIL MENZ. *Ger.* 471,781, Nov. 19, 1927.

Impact device for testing hardness of materials. DONALD C. DAVIS. *U. S.* 1,708,262, April 9. Structural features.

Wedge photometer apparatus for observing the color or turbidity of fluids. WILLIAM G. EYTON. *U. S.* 1,707,717, April 2.

Stand for calorimetric bombs. JAMES DARROCH. *U. S.* 1,708,754, April 9. Structural features.

Apparatus for holding and controlling the supply of liquid carbon dioxide, etc., for fire-extinguishing. D. MARAS (to W. Kilde & Co.). *Brit.* 296,404, Aug. 31, 1927.

Bubble-cap absorption tower suitable for absorption of nitrogen oxides. GUY B. TAYLOR (to E. I. du Pont de Nemours & Co.). *U. S.* 1,708,685, April 9. Structural features.

Porous metallic plates or objects, particularly for storage batteries and the like. A. GRÉGOIRE. *Belg.* 351,859, July 31, 1928. A granular metallic mass is heated in a mold so as to sinter it, thus causing partial coalescence at the points of contact.

Thermostats. WESTINGHOUSE ELECTRIC AND MANUFACTURING CO. *Fr.* 647,304, Dec. 21, 1927. The metal of low coeff. of expansion (A) is an alloy contg. Fe and Ni, while the metal of high coeff. of expansion (B) is an alloy contg. Fe and Mn. If (B) contains 10% Mn and 10% Ni, (A) contains 38-45% Ni, and if (B) contains 38% Ni and 4.6% Mn, (A) contains 42% Ni.

Thermostatic valve-control device. J. P. MORLEY and S. J. LONERGAN (to Bastian-Morley Co.). *Brit.* 296,973, Sept. 10, 1927. A device is described suitable for controlling gas burners used for heating water.

Thermostatic device for controlling electric heating devices. EARL K. CLARK (to Westinghouse Elec. & Mfg. Co.). *U. S.* 1,707,253, April 2.

Thermostatic or pressure control of fuel supplied to steam generators, etc. C. W. PATTISON. *Brit.* 297,148, June 16, 1927.

Thermostatic cut-off for gas burners. EDWARD A. KLEGA (one-half to George H. Stucke). *U. S.* 1,708,446, April 9.

Thermostatic and pressure-controlled valve mechanism suitable for control of gas burners of water heaters. JOHN H. KOLTA (to Pittsburgh Water Heater Co.). *U. S.* 1,708,508, April 9. Structural features.

2—GENERAL AND PHYSICAL CHEMISTRY

FREDERICK L. BROWNE

Jan Novák (1881-1929). V. ČECH. *Chem. Obsor* 4, 65-7(1929).—A biographical sketch with portrait.

The seventieth birthday of Hermann Thoma. K. W. ROSENMUND. *Z. angew. Chem.* 42, 273-4(1929).—Biographical note with portrait.

The twenty-fifth anniversary of the foundation of the chemical society of Holland and the ninth meeting of the International Union of Pure and Applied Chemistry. J. GIRAL AND O. FERNÁNDEZ. *Anales soc. españ. fís. quim.* 27, 32-42(1929).

Nobel prize in chemistry for 1927 and 1928: H. Wieland and A. Windaus. K. JOSEPHSON. *Svensk. Kem. Tids.* 40, 300-4(1928).—A brief sketch with portraits.

The recent Nobel prize winners in chemistry. ANON. *Tekniska Föreningens i Finland Förhandlingar* 49, 30-2(1929).—Biographical sketches of Adolf Windaus and Heinrich Wieland.

We demand system even in the realm of literature. KUTZNER. *Chem. Technik* 1929, 1-2.—A plea for better technical articles. Black type, paragraphing and headings save the searcher's time. In describing new apparatus points to be covered are, in order, purpose, applications already made and results obtained, manner of operation, labor and supervision needed, quality of product, size and weight of app., output, space requirement, motive power, heat and power consumption, probable repairs, construction in detail (with exact drawings), material used, patent information and other possible uses. New materials should be compared with similar known ones; phys. and chem. properties, uses, handling, working and forming should be described and full patent information given.

The nomenclature of high-school chemistry. J. O. FRANK. State Teacher's College, Oshkosh, Wis. *J. Chem. Education* 6, 72-5(1929).—A long study of high school texts shows that many almost useless new terms are used, that teachers are careless in the use of terms, that different authors use different terms for the same thing, that the special chem. meaning of terms like "normal," "condenser" are not explained and that definitions are often either avoided or incorrectly given.

Significance of symmetry in chemical combination. S. H. C. BRIGGS. *Chemistry and Industry* 48, 108-9(1929).—A plea for the retention of the words "molecule" and "coordination" in their original meaning and not merely in the restricted sense in which they are now being used by the protagonists of the electron theory of valency.

The rigidity and viscosity of nickel at the Curie point. T. GNESOTTO AND L. A. ALBERTI. *Atti ist. Veneto* 87, Part II, 735-56(1927-8).—From an examn. of the rigidity and viscosity of Ni at different temps. it is concluded that a fundamental change takes place at the Curie point which affects both the microstructure of the metal and the crystal structure itself.

Does pure iron have allotropic transformations? T. D. YENSEN. Research Lab. Westinghouse Elec. and Mfg. Co., East Pittsburgh, Pa. *Science* 68, 376-7(1928).—If α -Fe contains in soln. such impurities as C and O in excess of their soly. for the given temp., either the impurities will be pptd. or the Fe will change into the γ form. Si prevents this transformation, the amt. required being proportional to the C content. Assuming the absence of O, and extrapolating to zero C, the Si content necessary to eliminate the transformation should also be zero. That is, pure Fe can exist in the α form only. Equil. diagrams based on this hypothesis are in accord with exptl. evidence.

Allotropic modifications and solid solutions of phosphorus. V. I. NIKOLAEV. *J. Russ. Phys.-Chem. Soc.* 60, 1045-51(1928).—Four allotropes of P exist, viz., white phosphorus, d_{4}^{25} 1.82, ignition point (i. p.) 55°; purple, d_{4}^{25} 1.90, i. p. 200°; ruby red, d_{4}^{25} 2.11, i. p. 345°; and black, d_{4}^{25} 2.70, i. p. about 490°. At d. intermediate to the above a continuous series of solid solns. exists, in which the colors are also intermediate. Red phosphorus is a solid soln. of the ruby-red and the purple forms, while violet phosphorus consists of ruby-red and black phosphorus.

Magnetic susceptibility of ozone. V. I. VAIDYANATHAN. *Indian J. Physics* 3, 151-65(1935); cf. *C. A.* 22, 4349.—Expts. were made on mixts. of O₃ and O₂ by the rotational method, in which the gas surrounds the test-rod system. Errors due to current fluctuations, temp. changes, etc., were eliminated as far as possible. In every case the

magnetic force on the mixt. was less than that for pure O_2 . The possibility that O_2 is paramagnetic, as reported by some previous investigators, is discussed in some detail. On the basis of statistical probability as applied to the present series of expts. it is concluded that O_2 is definitely diamagnetic.

W. W. STIFLER

Diamagnetism and structure of ethylene. V. I. VAIDYANATHAN. *Indian J. Physics* 3, 165-74(1928).—Tests on C_2H_4 by the torsion method indicate that it is diamagnetic with a mol. susceptibility of -15.3×10^{-6} , not paramagnetic as reported by Lewis and by Quincke. It is shown that this is in fair agreement with Pascal's additive law. Various possible structures for the C_2H_4 mol. are discussed. W. W. S.

Electric moments of methyl chloride, ethyl chloride and chloroform. S. C. SIRCAR. *Indian J. Physics* 3, 197-208(1928).—By using the heterodyne beat method the dielec. consts. of the vapors of CH_3Cl , C_2H_5Cl and $CHCl_3$ were measured at several temps. between 20° and 100° and at pressures between 68 and 196 mm of Hg. The results agree with Debye's dipole theory. The permanent dipole moment for CH_3Cl is 1.69×10^{-18} e.s.u., which is in excellent agreement with the value 1.66×10^{-18} deduced from optical data. For C_2H_5Cl the present work gives 1.98×10^{-18} , while optical data give 1.76×10^{-18} . This disagreement is ascribed to the assumption made in the optical calcn. that the angle between the A axis of the optical anisotropy and the permanent moment is zero. For CH_3Cl the moment calcd. is 1.05×10^{-18} ; Sanger gives 0.95×10^{-18} .

W. W. STIFLER

Electric moment and its relation to chemical constitution. P. C. MAHANTI AND D. N. SEN GUPTA. *Indian J. Physics* 3, 181-96(1928).—The dielec. consts. of several org. halides were measured by a heterodyne beat method. From these results the following values are calcd. for the permanent dipole moments according to Debye's theory: CH_3I , 1.31×10^{-18} e.s.u.; C_2H_5Br , 1.78×10^{-18} ; and C_2H_5I , 1.62×10^{-18} . The corresponding values for the polarizability are 0.005761, 0.002200 and 0.007839, resp. Hence, in these compds., increasing at wt. of the halogen seems to be accompanied by weakening dipole moment. The permanent dipole moment seems to be due to a deformation of the electron orbits of the C and the halogen. The weakening of the bond of the shared electron as the at. wt. of the halogen increases is suggested to explain the increase in polarizability which accompanies it.

W. W. STIFLER

Studies of dipole-moment. KRISTIAN HØJENDAHL. Separate 1928, 160 pp.—The fundamental laws of Debye's dipole theory are discussed in detail. The pos. charges in the mol. and the electrons are considered as coned at 2 points, corresponding to their resp. "centers of gravity." The product of the distance between these points by the charge at either one is the dipole-moment of the mol. When placed in an elec. field, dipole mols. acquire an induced moment, because of orientation by the field, but this orientation is counteracted in part by the thermal agitation. Hence the induced moment and dielec. const. are dependent on the temp. as well as upon any deformation produced in the mol. A derivation is given for the Clausius-Mosotti equation and the induced moment is expressed in terms of the dielec. const. By the Lorenz-Lorentz equation the effect of the electron shift on the induced moment is expressed in terms of the n . The mol. polarization is considered to be made up of 3 parts, viz., mol.-electron, mol.-atom and mol.-orientation polarizations. The mol.-electron polarization is identified with the mol. refraction in the infra-red. For dil. solns. in non-polar solvents, or in the gaseous state, there is little assocn. of the solute mols. The mol.-atom polarization is negligibly small for this case. Hence the mol.-orientation polarization can be calcd. as the difference between mol. polarization and the mol.-electron polarization as given by optical data, and from this result the dipole-moment can be computed. The value obtained in this way is shown to be independent of the nature of the non-polar solvent. The relation between dipole-moment and structural formula is discussed, the data of various investigators being used. Since the dipole moment is approx. const. for a no. of univalent Alcs. it is suggested that the dipole-moment is a property of the polar group, and the group-moment is assumed equal to the dipole-moment of the mono-substituted hydrocarbon compd. Since dipole-moment is, by definition, a vector quantity, the dipole-moment of a mol. contg. 2 polar groups is the geometric sum of their individual moments. Since a single bond permits free turning, the angle between 2 polar groups joined by a single bond may be altered. Hence such a "pliable" mol. has no fixed dipole-moment. If a mol. possesses central symmetry, the vector sum of the moments is zero, and hence, if the mol. is rigid, the dipole-moment vanishes. Conversely, the vanishing of the dipole-moment for mols. contg. several polar groups indicates central symmetry. For such mols. the mol. polarization is independent of the temp., and the dielec. const. approx. so. Also, Maxwell's law holds approx., viz., that the dielec. const. equals the square of the n . The third section gives the details of H.'s exptl. in-

vestigations. Density, dielec. const. by a resonance method and n were measured for several solns. in benzene of each of a no. of org. compds. It was found that the vector-addition rule does not hold for the nitroanisoles and the nitroanilines. It is suggested that, at least for the nitroanisoles, this may indicate that the mol. is pliable, but this explanation cannot hold for the nitroanilines. In addn. to H.'s own results, dipole-moments are computed from Pohrt's data. The dipole-moments published up to 1928 are collected into a table filling 6½ pp., including 1 p. of inorg. compds. A bibliography of 210 items on dielec. consts. and dipole-moments is given and a table of the functions of Clausius-Mosotti and Lorenz-Lorentz is included. A no. of the most recent papers (1928) are discussed in the appended notes. W. W. STIFLER

Dielectric constant of superfused sulfur and of several sulfur solutions. STEFAN ROSENTHAL. Cracovie Univ. *Bull. intern. acad. Polonaise* 1928, 377-95.—The d. and the dielec. const. of superfused S were detd. between 150° and 95°. Liquid S, even superfused S, obeys the Clausius-Mosotti law; there are no elec. doublets. When S solidifies the dielec. const. increases very suddenly. The ds. and dielec. const. of several solns. of S in C₆H₆ and CS₂, and those of pure CS₂ were measured. All obey the Clausius-Mosotti relation. The polarization of the solns. investigated can be calcd. from those of S and its solvents by the Lorenz-Lorentz formula for mixts. A. I. H.

Magnetic properties in relation to chemical constitution. T. M. LOWRY AND F. L. GILBERT. *Nature* 123, 85(1929).—A no. of compds. to which formulas with single electron bonds have been assigned were examd. magnetically. With the exception of those contg. a metal of the transition series, all were found to be diamagnetic. Hence it is concluded that all the electrons are magnetically paired. HgCl, CuI and HgCl₂ are diamagnetic but CuCl₂ is strongly paramagnetic. The diamagnetism of HgCl is explained by the formation in soln. of the Hg⁺ ion. This is confirmed by x-ray analysis of crystals of calomel which indicates the presence of mols. of the formula Cl-Hg-Hg-Cl. Hence in mercurous salts the metallic atoms contain completed shells of 18 unshared O-electrons. The behavior of CuI indicates that cuprous salts contain only univalent metallic ions. But since CuS is diamagnetic like Cu₂S, it is suggested that the formula

may be in reality CuS— $\dot{S}\dot{C}u$.

W. W. STIFLER

The chemical union (valence) as an electrostatic phenomenon. A. E. VAN ARKEL AND J. H. DE BOER. *Chem. Weekblad* 26, 66-9, 114-8(1929).—An exposition of the modern conceptions of chem. valence, including the Bohr model of the atom, the periodic table derived therefrom and the configuration of ions. G. CALINGAERT

The constitution of high-molecular substances. H. STAUDINGER. *Naturwissenschaften* 17, 141-4(1929); cf. *C. A.* 23, 822.—A review of the work of S., in which it has been shown principally from work on synthetic "models" of high-mol. substances, that these are to be considered as actual chem. mols., not as micellae. Numerous references are given. B. J. C. VAN DER HOEVEN

Magnetic permeability of nickel in feeble oscillatory fields. R. G. LOVARTY. *Univ. Nac. La Plata, Estudio Ciencias* 1928, 209-16; *Science Abstracts* 31A, 501. Several authors have suspected a very pronounced max. in the magnetic permeability of Fe for feeble oscillations of a wave length of 100 m. but the work of Wait has shown the effect to be spurious. L. therefore exams. the result announced by Israel according to which the permeability of N shows a complicated structure between the wave lengths of 28 and 60 cm. He shows that it is also false and is due to the dependence of the damping upon the period. H. G.

The Kerr constant of nitrobenzene. R. MÖLLER. Hamburg Inst. angew. Physik *Physik. Z.* 30, 20-4(1929).—Nitrobenzene has the largest Kerr const. among liquids. Hence it is used in phototelegraphy, etc. Values given by Schmidt (1902), Leiser (*Abh. Bunsen-Ges.* No. 4 (1910)), Lippmann (Dissert. Leipzig, 1912), McComb (*Phys. Rev.* 29, 525(1909)), Lyon (Dissert. Freiburg, 1914), Szivessy (*Z. Physik* 2, 30(1920)) and Ilberg (*C. A.* 23, 339) do not agree; hence the present work. The chief difficulty is to obtain nitrobenzene of low enough cond. The nitrobenzene was distd. and kept *in vacuo*. M. concludes that the impurity in the nitrobenzene behaves as an electrolyte which deposits and has a different transformation velocity. If the field strength is too small, low values are obtained for the Kerr const. Lyon's value is too large, $B = 4.43 \times 10^{-4}$. The values of McComb and Szivessy and Ilberg are too small. What is now required is to obtain nitrobenzene of still lower cond., to improve the photographic appliances and to use these at higher field strengths. S. L. B. ETHERTON.

Ostwald color theory. ALBERT P. SACHS. *Instruments* 2, 53-5, 85-9(1929).—Description of Ostwald's color theory and of photometric app. WALLACE R. BRODE

A technic for the examination of crystal structures with many parameters. W. L.

BRAGG AND J. WEST. *Z. Krist.* 69, 118-48(1928). (English.)—This paper summarizes the recent developments in the technic of making direct detn. of complex structures such as found in the silicates. Although use is made of certain assumptions, such as the type of symmetry, the existence of at. groups, the probable dimensions of atoms, etc., for help in the preliminary detn., the final proof of structure can be based on abs. measurements.

L. S. RAMSDELL

The influence of crystal habit on Debye-Scherrer diagrams. J. BÖHM AND F. GANTER. *Z. Krist.* 69, 17-25(1928).—Variations in habit, such as are found in fibrous or foliated substances, may affect the breadth of the lines in the x-ray diagram, and may also change the relative intensities. This latter may be because reflections from certain planes have to pass through a greater thickness of material, or because of preferred orientations. With chalcotrichite (a variety of cuprite with elongated cubic fibers) the reflection from 001 is practically lacking, and the intensity of the line is contributed to only by 100 and 010.

L. S. RAMSDELL

The theory of liquid crystals. ERNEST ALEXANDER AND KARL HERRMANN. *Z. Krist.* 69, 285-99(1928).—Liquid crystals may be of 2 types, smectic and nematic. (Friedel, *C. A.* 17, 3267.) The known facts concerning liquid crystals are in accord with the assumption that the nematic type represents one-dimensional space groups and the smectic type two-dimensional space groups, while regular crystals, of course, are three-dimensional. There is given a list of the 80 space groups in which it is possible to have 2-dimensional development.

L. S. RAMSDELL

The crystal structure of rhenium. V. M. GOLDSCHMIDT. Mineral. Inst. Univ., Oslo. *Naturwissenschaften* 17, 134-5(1929).—Black rhenium powder (10.9 mg. with 0.3% Mo) has hexagonal structure with close packing, $a = 2.752 \pm 0.001$ A. U., $c = 4.448 \pm 0.002$ A. U.; it is similar in this respect to Os. The atom radius of Re is between those of W and Os, 1.371 A. U. By using Noddacks at. wt. of 188.71 ± 0.25 , a value of 21.33 for the d. of the exptl. material is calcd.; for pure Re is calcd. 21.40 ± 0.06 in agreement with measured values.

B. J. C. VAN DER HOEVEN

Hall effect in single metal crystals. P. I. WOLD. *Science* 69, 72(1929); cf. *C. A.* 22, 4339.—The Hall effect in a single crystal of Zn (close-packed hexagonal crystal structure) is 50% larger than in polycryst. Zn.

R. J. HAVIGHURST

Lattice constant of quenched carbon steel. SHINKICHI SEKITO. Tohoku Imp. Univ. *J. Study Metals* 5, 380-4(1928).—The crystal structure of martensite has formerly been supposed to consist solely of the body-centered cubic lattice, but recently Honda and S. proved that this lattice appears only in the interior of quenched steel, while in the portion near surface there appears a body-centered tetragonal lattice of the axial ratio of about 1.07. The present paper reports the exptl. results in which it is shown that the tetragonal structure appearing on the surface diminishes its axial ratio gradually as it goes deeper into the interior to become finally 1 (body-centered cubic lattice). It is further shown that when quenched C steels are annealed, the tetragonal structure gradually changes into the body-centered cubic, without passing through a stage of an intermediate axial ratio. The axial ratio of the tetragonal lattice varies according to the difference of the cooling rate, but generally speaking, the elevation of the quenching temp. and the increase of the C content make the ratio greater.

K. SOMEYA

The growth of solution bodies and spheres of rock salt. WALTER SCHNORR. *Z. Krist.* 68, 1-14(1928).—The final form resulting from crystal growth is independent of the original form. Spheres of NaCl, whether regular or irregular, whether cut or obtained by soln., all went through the same stages of growth and (100) was the final form. The occurrence in nature of the forms (100) + (111) + (210) is due to temporary or partial soln. and later renewed growth, which does not reach the final stage. In solns. contg. high concns. of MgCl₂, the development of (110) is strongly favored as opposed to (210) because of the change of the relative growth velocities.

L. S. RAMSDELL

The pressure transitions of the rubidium halides. LINUS PAULING. *Z. Krist.* 69, 35-40(1928). (In English.)—The vol. contractions accompanying the pressure transitions of RbCl, RbBr and RbI approx. those corresponding to the transition of CsCl, CsBr and CsI from the NaCl to the CsCl structure, so the latter structure is probably correct for the high-pressure forms of the Rb salts. Calcd. values for the increase in interionic distances accompanying the NaCl-CsCl transition agree with observed values. The CsCl structure is stable for alkali halides with high anion deformability and large radius ratio, found only in CsCl, CsBr and CsI, and approximated in case of RbCl, RbBr and RbI.

L. S. RAMSDELL

The crystal structure of tartaric acid, isohydrobenzoïn and rubidium tartrate. A. REIS AND W. SCHNEDDER. *Z. Krist.* 69, 62-76(1928).—Tartaric acid and isohydro-

benzoin ($C_{11}H_{10}O_2$) both crystallize like cane sugar in space group C_2^2 , with 2 formula wts. in the unit cell. A single formula wt. forms an unsymmetrical group. For tartaric acid, $a = 7.68$, $b = 6.03$, $c = 6.18$ A. U. and $\beta = 100^\circ 17'$; for isohydrobenzoin $a = 12.40$, $b = 7.92$, $c = 5.81$ A. U. and $\beta = 92^\circ 53'$. Rb tartrate crystallizes in space group D_2^4 . Each formula wt. forms a group with the symmetry C_4 , and there are 6 formula wts. in the orthohexagonal cell in which $b = 7.17$ and $c = 13.10$ A. U. L. S. R.

The form and potential energy of the isomorphous crystals, ruby and hematite. J. TOPPING. *Proc. Roy. Soc. (London)* A122, 251-73(1929); cf. *C. A.* 20, 2436.—By postulating crystals in which the ions are point charges between which the ordinary electrostatic and certain intrinsic repulsive forces are assumed to be operative, a good account can be given of the 3 parameters and the rhombohedral angle involved in the structure of the crystals Al_2O_3 and Fe_2O_3 . The problem is to det. positions of the point charges in which the potential energy due to the electrostatic and intrinsic repulsive forces is a min. The method is to assume the value of one of the parameters given by the crystal structure detn. to be correct, and to calc. the potential energy for a series of values of the other 2 parameters, the pair of values giving the lowest potential energy being taken as correct. The law of repulsive force between ions is of the form $\mu/r^{\mu+1}$, where r is the distance between ion centers and μ is a force const. which depends on the particular ions under consideration. Values of the force const. given for these ions by Lennard-Jones and Dent (*C. A.* 20, 319, 3252, 21, 679) must be changed, in order that the theoretical configuration of min. potential energy shall agree with the observed configuration. The hexagonal close-packing of O ions at a distance of 2.7 A. U. apart, which has been considered by Bragg and Brown (*C. A.* 20, 1154) as the principle which det. the structure of these and other crystals, is not theoretically possible, but there is a slight distortion from the close-packed arrangement, the calcd. amt. of distortion being very nearly that given by the exptl. data. R. J. HAYDHURST.

The crystal structure of anhydrous silicotungstic acid and related compounds and their probable molecular formulas. ARTHUR G. SCROGGIE AND GEORGE L. CLARK. Univ. of Illinois. *Proc. Nat. Acad. Sci.* 15, 1-8(1929).—By stepwise addn. of alkali to silicotungstic acid, the following modified acids were obtained: $2H_2O \cdot SiO_3 \cdot 10WO_3 \cdot 5H_2O$; $2H_2O \cdot SiO_3 \cdot 8WO_3 \cdot 4H_2O$; $3H_2O \cdot (SiO_3 \cdot 7WO_3) \cdot 4H_2O$. X ray examn. by the powder crystal method of the acid dried at 100° ($4H_2O \cdot SiO_3 \cdot 12WO_3 \cdot 4H_2O$) shows that it crystallizes as a body-centered cube with 2 mols. in a unit cell of side 12.16 A. U. The unit cell is found to be of the same size for the acids mentioned above contg. 8 and 10 W atoms, as well as for the following: $2H_2O \cdot SiO_3 \cdot 12WO_3$; $2H_2O \cdot SiO_3 \cdot 12WO_3 \cdot 6H_2O$. The anhydrous $SiO_3 \cdot 12WO_3$ has a much less symmetrical structure. From the chem. and x ray evidence, it is concluded that the acid has 2 mols. of water which are acidic in nature, and 6 mols. which are non-acidic or alc. in nature. Consequently the modified formula $2H_2O(6H_2O \cdot SiO_3 \cdot 12WO_3)$ or $H_4[(SiO_3)(W_{12}O_{36})(OH)_6]$ is suggested, along with a new spatial structure. Phosphodecimolybdic acid forms a body-centered cube with 16 of the unit cell 14.31 A. U. R. J. HAYDHURST.

Investigations of the structure of artificial ultramarines. IV. Ultramarines of thallium and similar compounds of the bivalent metals calcium, strontium, barium, zinc, manganese and lead. F. M. JASOON. Univ. Groningen. *Verslag van de Wetenschappen Amsterdam* 37, 937-47; *Proc. Acad. Sci. Amsterdam* 32, 156-66(1929); cf. *C. A.* 22, 1067, 1719.—Tl (univalent) ultramarine (I) was prepd. by heating a Guimet salt (I) $Na_4Al_3Si_3O_{14}S_4$ with 44 g. of $TlNO_3$ and 10 cc. H_2O in a sealed tube for 50 hrs. at 160° . The product, a pinkish purple powder, was washed and the x ray powder spectrogram detd. The same product was obtained when Tl_2SO_4 was used. The lattice constants remain practically identical with those of the Na compd. The ultramarines of Ca, Sr, Ba and Mn were prepd. in a similar manner from the 1 and 5 times the theoretical amt. of Ca, etc., iodides. They were washed free from AlI_3 by KCN. Ca, Sr and Ba gave nearly pure olive-green compds. of the type $M^{++}_2Al_3Si_3O_{14}S_4$. By fusing with $M^{++}I_2$, they were converted into colorless (I), from which nearly free (Ba) from Ag. The similar Zn compd. is nearly colorless, shows a light purple tinge. MnI_2 gave a product poorer in Al, corresponding to $Na_2Mn_2Al_3Si_3O_{14}S_4$ compd. contaminated by a small amt. of Al (I). The x-ray spectrograms show that all the belong to the true type, although their spectrograms differ in the distribution of intensity. The Pb (I) (yellow) prepd. as above, $Pb(NO_3)_2$ being used. Pb-Ag (I) (dark greenish gray) was prepd. by melting the Ag compd. with Hg . Attempts to prep. Hg^{++} and Hg^{+} compds. gave products contaminated with Hg salts, but no HgO was formed. Their structure is not cubic and is distinctly different from that of the other (I). V. The absorption reactions of ultramarines and the structure of

nosean (hauyne) and the ultramarines. F. M. JAEGER AND F. A. VAN MELLE, *Verslag Akad. Wetenschappen Amsterdam* 37, 957-70; *Proc. Acad. Sci. Amsterdam* 32, 167-81 (1929).—The rate of substitution of Ag by Na in ultramarine was studied by heating Ag (I) with NaI. The rate of substitution is greater at the beginning and is greater with greater NaI concns. The rate curves indicate that adsorption of NaI first takes place on the surface of the powd. (I). The rate decreases as more Ag atoms have been substituted. The x-ray spectrograms show a striking similarity between nosean ($\text{Na}_{10}\text{Al}_6\text{Si}_6\text{O}_{28}\text{S}_2$), hauyne and the S and Se (I). G. CALINGAERT

The x-ray investigation of pentaerythritol. H. MARK AND G. V. SUSICH. *Z. Krist.* 69, 105-17 (1928).—The symmetry of pentaerythritol as detd. by Nitta (*C. A.* 20, 2435) and Hendricks and Nehmiz (*C. A.* 22, 2089) is confirmed. The crystals are always intergrowths of several individuals, and there is a possibility that they are not tetragonal. Arguments for both tetragonal and orthorhombic symmetry are given. The final decision must be made on single crystals. L. S. RAMSDALL

Resistance hysteresis phenomena of tin, lead, indium and thallium at the temperature of liquid helium. W. J. DE HAAS AND J. VOOGD. *Proc. Acad. Sci. Amsterdam* 32, 206-13 (1929).—See *C. A.* 22, 4287. E. C. M.

Super-conductivity of gallium. W. J. DE HAAS AND J. VOOGD. *Proc. Acad. Sci. Amsterdam* 32, 214-7 (1929).—See *C. A.* 23, 1322. E. C. M.

Entropy diagram for hydrogen. W. H. KEESOM AND D. J. HOUTHOFF. *Rapports et comm. 5th Cong. intern. du froid*, Apr., 1928; *Comm. Phys. Lab. Univ. Leiden. Suppl. No. 65*, 25-8.—Equations and diagrams are given for the range -173° to 27° , based on exptl. results of Kamerlingh Onnes and others. The derivation of the equations is discussed. C. Z. ROSECRANS

Entropy and Mollier diagrams for helium. W. H. KEESOM AND D. J. HOUTHOFF. *Rapports et comm. 5th Cong. intern. du froid*, Apr., 1928; *Comm. Phys. Lab., Univ. Leiden. Suppl. No. 65*, 31-5.—Equations and diagrams are given for the range -173° to 27° , based on exptl. results of Kamerlingh Onnes and others. The derivation of the equations is discussed. C. Z. ROSECRANS

Entropy and Mollier diagrams for nitrogen. W. H. KEESOM AND D. J. HOUTHOFF. *Bull. mens. inst. intern. froid* [2], No. 2, Jan., 1927; *Comm. Phys. Lab., Univ. Leiden. Suppl. No. 65*, 17-22.—Equations and diagrams are given for the range -210° to 0° , based on exptl. results of Kamerlingh Onnes and others. The derivation of the equations is discussed. C. Z. ROSECRANS

Entropy and Mollier diagrams for methane. W. H. KEESOM AND D. J. HOUTHOFF. *Bull. mens. inst. intern. froid* [2], No. 1, July, 1926; *Comm. Phys. Lab., Univ. Leiden. Suppl. No. 65*, 3-8.—The equations and diagrams are based on the exptl. values of Keyes, Taylor and Smith (*C. A.* 17, 668), and cover the range -173° to 0° . The derivation of the equations is discussed. C. Z. ROSECRANS

Entropy and Mollier diagrams for ethylene. W. H. KEESOM AND D. J. HOUTHOFF. *Bull. mens. inst. intern. froid* [2], No. 1, July, 1926; *Comm. Phys. Lab., Univ. Leiden. Suppl. No. 65*, 11-4.—Equations and diagrams are given for the range -173° to 100° . These are based on exptl. results of Cailletet and Mathias, Cardoso and Arni and Villard. The derivation of the equations is discussed. C. Z. ROSECRANS

Kinetic theory of a gas in the neighborhood of a wall. M. BRILLOUIN. *Compt. rend.* 186, 553-8 (1928); *Science Abstracts* 31A, 479.—The radius of curvature of the wall is supposed great compared with the mean distance and mean free path of the gas mols. A double role is attributed to the wall as proposed by Maxwell in 1868: (1) The wall can reflect each incident mol. according to a rigorously defined law; the probability of speed after reflection is then defined by the incident velocity and the mol. circumstances of the impact. (2) The incident gaseous mol. may be absorbed (as in soln.) in the wall itself, perhaps later to be re-emitted without any relation to the speed or direction of the incident mol. In the immediate neighborhood of the wall the distribution of speeds depends too much on the wall for one to be able to define it by one continuous function. The discontinuity persists, but gets less and less away from the wall, but eventually ends in the law of distribution of Maxwell. Two sorts of mols. are considered: (1) Mols. which come from the gaseous mass without having touched the walls; (2) mols. which emanate directly from the wall. Six equations are evolved from which the author deduces the distributions and ds. in the layer of gas near the wall. H. L. D.

Deviations from Dalton's partial-pressure law and their chemical explanation. MAX TRAUTE AND MARTIN GÖRSCHMIDT. *Univ. Heidelberg. Z. anorg. allgem. Chem.* 179, 1-26 (1929).—Ewert (*Dis. Heidelberg* 1925) detd. pressure changes occurring on mixing pairs of inorg. gases, finding that these effects could be calcd. with a precision of about 0.1 mm. Hg from equations of van der Waals, van Laar and Berthelot. T. and

G. measured other pairs of gases, using Emert's app. and method (cf. T. and Emert, *C. A.* 20, 1737). Equal vols. of the components were mixed in const. total vol., and the pressure change was measured by a differential method with a precision of 0.0025 to 0.01 mm. Hg at room temp. Results are tabulated for mixts. of C_2H_4 and H_2 and of Me_2O with CO_2 , SO_2 or $MeCl$ at initial pressure between 700 and 760 mm. and temp. between 0° and 40° . The results are verified by calcs. according to Emert's methods from van Laar's consts. It is found that they agree well for C_2H_4 and H_2 mixts., Δp being of the order $+1.1$ mm.; for mixts. contg. Me_2O the calcd. values are of the order $+0.02$ (SO_2), measured from -17.5 to -10.3 and of the order $+1.0$ (CO_2), measured from -0.22 to $+0.05$. From the 16 pairs of gases so far detd. only those with Me_2O show deviations from the theory of more than 0.1 mm. Hg; the explanation for the behavior of Me_2O is sought in the formation of addn. compds. of the type $Me_2O.R$. It is therefore, assumed that a relation of the type $a_{12} = F \sqrt{a_1 a_2}$ (modified Berthelot) between the van der Waals consts. of compd. and components may hold with $F = \frac{1}{2} \sqrt{K'}$ and $K' = e^{W/T + \beta T}$ approx., in which K' is the equil. const. of the addn. reaction, W and β consts. From 2 Δp values at different temps. W and β can be calcd.; this was done for the 4 mixts. used. The values for Δp interpolated are in good agreement with the measured ones. Approx. values derived for the heat effects during the addn. are 2628 cal. for $Me_2O + SO_2$, 1783 cal. for $Me_2O + CO_2$, 500 cal. for $C_2H_4 + H_2$. It is evident that for the last reaction no real hydrogenation (21,000 cal. heat effect) takes place. By means of addnl. assumptions, the av. durations of the collisions leading to the dimerization are calcd.; they are of the order 10^{-11} to 10^{-12} sec.

B. J. C. VAN DER HOEVEN.

Studies on the permeability of metals to gases. VICTOR LOMBARD. *J. chim. phys.* 25, 587-604(1928). Expts. were made on Ni, Fe and Pt. N_2 , A, H_2 and He were used with Ni; and H_2 with Fe and Pt. Two films of Ni of 0.16 and 0.25 mm. were used with the N_2 and of 0.16 and 0.31 mm. for the other gases. It was found that N_2 penetrates Ni about 100 times as readily as H_2 under similar conditions. N_2 and A penetrate about equally readily while He penetrates Ni much more readily than either N_2 or A. The rate of flow of H_2 through Fe is a log. function of temp., confirming the expts. of Ryder; at a given temp. it is a linear function of the square root of the pressure but for H_2 on Ni; and O_2 on Ag the curve does not pass through the origin. The log. function with temp. holds for the system Pt - H_2 . There is evidence that the inverse law of thickness of film holds for this system.

RAYMOND H. LAMBERT.

The determination of the humidity of a gas with a high dew point. ROGER MARTIN. *Chaleur et ind.* 9, 200-4(1928). Analytical and mostly theoretical. There is given a table of temp., pressure and weight per cu. m. of water, of air measured dry and satd. at 0° and 760 mm. Hg, and the weight of water in g. in air satd. at t° . II. *Ibid.* 253-8. A theoretical discussion with some graphical solutions of aspects of this problem embracing (a) satn. curves, (b) relation between the calories contained in air, its entropy, its temp. and pressure in a mixt. of air and water vapor, (c) weight of water contained, as a function of the temp. of the air and the partial pressure of water, (d) method of using the consts. given in the paper for the detn. of moisture in a gas by means of the wet and dry-bulb thermometers.

S. L. B. ETHERTON.

Entropy and heat of vaporization. W. HERZ. *Z. anorg. allgem. Chem.* 179, 24-8 (1929).—The entropies at 25° and the heats of vaporization per g. at the normal b. ps. of metallic elements and of some halides are tabulated. For any group in the periodic table, the entropy rises and the heat falls with increasing period. The product $S^3 \Delta H$ is found to be approx. const. for each group.

JOSEPH FLEISCHER.

Terpenes and terpene alcohols. I. Vapor pressure-temperature relationship. C. A. PICKETT AND J. M. PETERSON. *Ind. Eng. Chem.* 21, 325-6(1929).—Vapor pressures of α -pinene, β -pinene, dipentene, terpinolene, fenchyl alc. and α -terpineol have been detd. by a modified Ramsey and Young method. B. ps. of the compds. are given.

O. A. NELSON.

The relations between the physical constants of a liquid. V. PRINSKE. *J. Russ. Phys.-Chem. Soc.* 60, 1019-35(1928); *Z. Elektrochem.* 35, 13-7(1929).—Every phys. const. of a liquid changes with temp. according to the equation $\log X = a + b \log T$, where T = crit. temp., X is the phys. const., and a and b are special consts. for the liquid. P. has applied this equation to d., surface tension, viscosity and heat of evapn. In the case of the sp. heat, κ and velocity of sound. From his equation, various elastic relationships between 2 or more phys. consts. of a liquid may be deduced.

S. L. B. E.

The relation between specific rotation and refractive index of a solution. V. *Z. Elektrochem.* 35, 17-8(1929); cf. preceding abstr.—P. applies his general

equation and now writes it $\log \alpha = a + b \log n$, where a and b are coeffs., independent of the concn., α is the sp. rotation and n the refractive index of a soln. S. L. B. E.

A viscosity formula for binary mixtures, the association degree of constituents being taken into consideration. I. TETSUYA ISHIKAWA. Inst. Phys. and Chem. Research, Tokyo. *Bull. Chem. Soc. Japan* 4, 5-15(1929).—The 2 following assumptions are made. "An assoc. mol. is a fast combined mol., a single mol. in which is quite different in any property from a singly existing mol. and is regarded to be a constituent as if it were of a chem. compd. mol." "An assoc. mol. is a group of single mols. which have the self-same dimension with singly existing mols., and the difference between them is no other than the abrupt greatness of the cohesion force of the former in comparison with that of the latter." Using this as his base, T. gives a formula by which the viscosity of a binary mixt. can be calcd. from the consts. of its constituents:

$$\eta = \eta_1 + (\eta_2 - \eta_1) \frac{k_2 a_2 z_m}{k_1 a_1 (1 - z_m) + k_2 a_2 z_m},$$

where a = the association degree, z_m = molar fraction, and k = field const. Using data from the literature, he shows that the calcd. and exptl. values check satisfactorily.

ALBERT L. HENNE

Super-cooled water. LEONARD HAWKES. *Nature* 123, 244(1929).—There appears to be a great change in the properties of supercooled H_2O between -9° and -12° . At -9° , H_2O is quite fluid, while at -12° water "froze," showing no signs of cryst. structure.

FRANK V. JOHNSON, JR.

Electric resistance of powdered bismuth in a magnetic field under various pressures. ALBR. ALTMANN. *Sitzb. Naturforsch.-Ges. Univ. Tartu*. 35, 8-20(1928).—The resistance increases in proportion of the 1.7 power of the field intensity; with increasing pressure the resistance diminishes following a hyperbolic law. Heavy-walled tubes cause a low increase of resistance; the action of the field on coarse powder is smaller than on line.

R. D. BUMBACHER

The influence of cold working on the chemical properties particularly of metals. G. TAMMANN. Univ. of Gottingen. *Z. Elektrochem.* 35, 21-8(1929); cf. *C. A.* 22, 2131.—A metal is less noble in the hard than in the soft condition as can be shown by e. m. f. measurements. Cold working diminishes the extent of the influence of nobler components. Since a hard metal is less noble than a soft metal, the former will ppt. nobler metals faster and this is shown in the use of Fe, Ni, Co, Ag, Au, Pt, Pd. Hg wets hard Ag and mixed crystals of Ag with Au, Sn and Cd easier than soft Ag. Fe, low in C, after much cold working, which thus makes it hard, has a greater soln. velocity in acid than soft iron. Hardened Pd foil absorbs gases much faster than soft Pd, this being also true for other metals. Reduction in size, which also hardens the substance, increases the soln. velocity. Cold working AgBr renders it more susceptible to reduction and an analogous phenomenon is the action of α - and γ -rays on NaCl. The NaCl becomes yellow and the color does not change in sunlight. Cold-working also produces color changes in Au, Ag and Cu alloys.

S. L. B. ETHERTON

Densities of single crystals of iron, nickel and aluminum. SEIJI KAYA. Tohoku Imp. Univ. *J. Study Metals* 5, 385-6(1928).—The d. of single crystals of Fe, Ni and Al were measured and compared with those of polycrystals. It was found that the d. of the single crystal is greater than that of polycrystal by 0.037% in Fe, 0.110% in Ni and by 0.034% in Al.

K. SOMEYA

The cause of thermo-tribo-electric abnormality of glass. M. C. MONTU. *Nuovo cimento* [N. S.] 5, 347-51(1928); cf. *C. A.* 22, 4043.—Expts. made in which strain in glass could be induced by mech. pressure show that mech. tension of the surface is not the preponderant cause of the phenomenon of thermo-tribo-elec. abnormality of glass.

L. T. FAIRHALL

Influence of heating the mercury in the phenomenon of tribo-electricity with glass. VIRGILIO POLARA. *Nuovo cimento* [N. S.] 5, 352-60(1928).—P.'s observations indicate that Hg aged from 8 to 24 hrs. and heated to $40-50^\circ$ is positively excited with respect to glass and, while slow cooling conserves the pos. charge for a period of time varying from 15 to 50 mins., rapid cooling causes the charge to become neg. at once. This is important in the interpretation of the phenomenon of tribo-electricity in that sudden variation in surface tension is not accompanied by aging.

L. T. FAIRHALL

Some adsorption isotherms on a plane platinum surface. WM. G. PALMER. St. John's Coll., Cambridge, Eng. *Proc. Roy. Soc. (London)* A122, 487-96(1929); cf. *C. A.* 19, 595; 20, 2437; 21, 2828.—The advantages of the elec. coherer in adsorption measurements are (1) adsorption takes place on a non-porous and chem. homogeneous surface; (2) a direct test for the bareness of a surface can be applied; (3) only surface films

play a part in the measurement. The disadvantage is that the amt. adsorbed is measured by the crit. cohering voltage rather than by direct measurement. With the coherer, the adsorption isotherms on Pt at 20° of C_6H_6 , EtOH and AcOH in gasoline (b. p. 40-44° and d. 0.640), were detd. The data obtained fit Langmuir's adsorption equation, $a = a_{\infty} \rho c / (1 + \rho c)$ in which ρ represents the "average life." The results are as follows at 20°: C_6H_6 0.18, C_6H_5OH 0.09 and CH_3COOH 0.15. These values compare favorably with Langmuir's for CH_4 , N_2 and O_2 at -183°. C_6H_6 will not sat. a Pt surface. Pt adsorbs only polar mols. to a great extent. ARTHUR FLEISCHER

Adsorption at a water interface. I. B. W. CURRIE AND T. ALTY. U. of Saskatchewan, Canada. *Proc. Roy. Soc. (London)* A122, 622-33(1929); cf. *C. A.* 19, 198; 20, 2005.—A bubble of air immersed in water acquires a neg. charge because of the adsorption of neg. ions at the interface. The measurements of the charge were carried out as in the previous work. It was found, as previously reported, that the charge decreased with the size of the bubble, the rate of decrease increasing with increasing rate of absorption of the bubble by the liquid. In an air-satd. liquid the equil. potential is not reached for 2000 secs. This accounts for the low values at high rates of absorption. A charge on a large bubble is independent of the diam. if measurements are made at equil. The long period for equil. to be reached in dil. NaCl solns. indicates very feeble binding forces between adsorbed ions and the surface. As the size of a bubble is decreased a point is reached where the charge decreases with the decrease in radius. In Type I the drop in charge takes place at first in steps and later continuously. In Type II there is a gradual decrease in charge; dil. NaCl solns. are of this type. In pure water having a cond. of 0.7×10^{-8} mhos there is a const. charge on a bubble down to a radius of 0.033 cm. of 5.4×10^{-4} e.s.u. Red, blue and ultra-violet light have no effect on the charge. Equil. is reached in less than 200 secs. in pure water. ARTHUR FLEISCHER

The equilibrium of heterogeneous systems including electrolytes. III. The effect of an electric field on the adsorption of organic molecules, and the interpretation of electrocapillary curves. J. A. V. BUTLER. Univ. of Edinburgh. *Proc. Roy. Soc. (London)* A122, 399-416(1929); cf. *C. A.* 21, 1048.—By using the electrostatic theory developed in the previous paper equations are derived for the effect of an elec. field on the adsorption of mols. at a Hg-water soln. interface. The max. in electrocapillary curves is shifted by many substances; the shift is ascribed to the orientation of dipoles. The equation deduced satisfactorily reproduces Gouy's data (cf. *Ann. chim. phys.* 20, 145(1903); 8, 291(1906); 9, 75(1906); *C. A.* 10, 3017, 11, 2291). The left-hand side of the curves deviate from the theoretical more than the right. Aliphatic acids, aldehydes, ketones, amides, nitriles and carbohydrates shift the max. to the right. Phenol and other aromatic hydroxy compds. shift it slightly to the left. Substituted NH_4 salts such as tetraethyl NH_4 sulfate shift the max. to the extreme right or to the neg. end of the curve. Pyridine gives a normal curve. On the basis of the dipole moments of disubstituted benzenes the dihydroxy derivs. are assumed to be oriented at the surface with the hydroxy groups in the same direction. No substance more polarizable than water has yet been studied. HCN proved to be inactive. A. L.

The adsorption of carbon dioxide and ammonia on silica gel. A. MAGNUS AND R. KISTNER. *Z. anorg. allgem. Chem.* 179, 215-32(1929).—Adsorption isotherms of CO_2 on silica gel were detd. at -21.2°, -11°, 0°, 25°, 50° and 100° over a pressure range extending from 0.1 to 760 mm. Hg. The heat of adsorption was calcd. from the linear portion of the isotherms by the use of the Clausius-Clapeyron equation, and was found to vary linearly with the temp. Data at higher pressures were used to calculate the repulsion const. in Magnus' equation, which was found to be const. for each isotherm. The H_2O content of the gel was found to have no significant effect on the course of the isotherms. The study of $TiCl_3$, $ZrCl_3$, CaF_2 , BaF_2 , $BaSO_4$ and $NiBr_2$ as adsorbents for CO_2 was attempted, but difficulties were encountered in drying and outgassing. Adsorption isotherms were detd. for NH_3 on silica gels of different H_2O content. The heat of adsorption on practically water-free gel was calcd. from the isotherms and checked calorimetrically. JOSEPH FLEISCHER

Studies of gas-solid equilibria. II. Pressure-concentration equilibria between benzene and (a) ferric oxide gel and (b) silica gel, directly determined under isothermal conditions. BERTRAM LAMBERT AND ARTHUR M. CLARK. Oxford Univ. *Proc. Roy. Soc. (London)* A122, 497-512(1929); cf. *C. A.* 22, 709.—The same samples as previously used were employed in this work. A sealed app. was used having (1) known wt. of gel at const. temp. and with accurate Hg manometer, (2) known wt. of C_6H_6 in an evacuated and calibrated reservoir, (3) means of transferring C_6H_6 from (2) to (1) and vice versa. For Fe_2O_3 isotherms were detd. at 40°, 50° and 60°. The points on the curves were obtained at increasing and decreasing pressures. Where the ascending and descending

isotherms coincided, equil. was reached in $\frac{1}{2}$ hr. In the hysteresis region 2 hrs. was required. The isothermals from pressure-temp. measurements in Part I correspond to the ascending isothermals. For SiO_2 gel, the isotherms were detd. at 15, 25, 40, 50, and 70° . The curves were reversible over the entire temp. range. There is a fundamental difference in the adsorption by Fe_2O_3 and by SiO_2 gel.

The lowering of the vapor pressure of liquid argon by active materials. ARTHUR FLEISCHER, F. HÜTTIG AND ROBERT JUZA. *Z. anorg. allgem. Chem.* 177, 313-22(1928).—The object of the investigation was to det. the capacity of A for entering into chem. combination, and to study the activity of different materials. The active materials were: active C, $\text{Sb}(\text{OH})_3$, active SiO_2 , stannic acid, colloidal NiS , active Ca and Sb_2O_3 . The expts. were made at approx. 84° abs. as follows: liquid A was allowed to condense on the surface or in the pores of the active materials and the change in vapor pressure noted. The wts. of both the active materials and the A were detd. Tables are given showing lowering of vapor pressure with increasing wts. of A condensed. Values of Q and p are calcd. from the equation:

$$\log p = (Q/4.571) + 1.75 \log T - (0.030795 T/4.571) + 1.07.$$

Active C and the oxides had the greatest influence. SiO_2 appears to form a stable compd. in stoichiometric proportions with A. The diameters of the capillaries in the active substances are computed.

O. A. NELSON

Adsorption. MARIE-THERESE ISSELSTEIN. *Phys. Inst. Munster, Westphalia. Physik. Z.* 29, 873-8(1928).—The adsorption of CS_2 , C_3H_8 , and CH_2Cl_2 by powdered glass was measured at 20° and at pressures between 54 and 276 mm. The extent of glass surface was estd. by Schelte's method (cf. *C. A.* 19, 1800). The adsorbed vapors correspond to layers as great as 35 mol. deep. The depth decreases with decreasing pressure.

R. L. DODGE

Absorption phenomena. J. RATELADE AND M. CHETVERGOV. *Rev. gén. mat. col.* 32, 302-5(1928).—The absorption of dyes from mixed solvents by filter-paper and by artificial silk has been investigated with reference to the percentage compn. of the solvent. With "direct diamine" dyes on filter-paper, minima were found with water-MeOH, water-EtOH, and water-pyridine mixts., but not with EtOH-MeOH or EtOH-pyridine mixts. In diphenylmethane and triphenylmethane dyes no minima were found. Similar results were obtained with viscose. The extn. of direct colors from filter-paper by water-alc. and water-pyridine mixts. also showed a min. (cf. Shilov and Pevsner, *C. A.* 20, 1009).

B. C. A.

Preparation of negatively charged sols by means of tartaric acid. V. Physico-chemical properties of tungstate-tartaric acid colloids. A. V. DUMANSKII AND S. I. D'YACHKOVSKII. *J. Russ. Phys. Chem. Soc.* 60, 1053-68(1928).—The addn. of Na tungstate to *d*-tartaric acid solns. gives rise to the formation of a series of colloidal double salts, which undergo hydrolysis on diln.; the degree of dispersion increases with the W content. These colloidal solns. exhibit mutarotation; on concn. they yield vitreous gels, which become blue on exposure to light.

• B. C. A.

Preparation of negatively charged sols by means of tartaric acid. IV. Formation of lead hydroxide sols and gels from alkali tartrates. A. V. DUMANSKII AND A. P. BUNTIN. *J. Russ. Phys.-Chem. Soc.* 60, 933-49(1928); cf. *C. A.* 23, 1333.—Solns. prepd. by dissolving PbSO_4 and $\text{Pb}(\text{OH})_2$ in alkali tartrate solns. in presence of excess of alkali or Pb tartrate in alkalies contain the complex $\text{C}_4\text{H}_4\text{O}_6\text{R}_2\text{Pb}$, where R is K, Na, or NH_4 . When the alky. of the soln. is small, colloidal solns. of $\text{Pb}(\text{OH})_2$ may form, passing into vitreous, transparent gels if the soln. contains more than 3% Pb. Lead alkali tartrates may be isolated by adding alk. alkali to solns. of Pb tartrate. Solns. of this salt are alk. and levorotatory, and on diln. their cond. changes considerably, indicating a high degree of hydrolysis. On dialysis, colloidal solns. of $\text{Pb}(\text{OH})_2$ are obtained. These sols are made up of negatively charged particles, readily coagulable by electrolytes and of the compn. expressed by $\text{Na}_2[\text{C}_4\text{H}_4\text{O}_6\text{Pb}.n\text{Pb}(\text{OH})_2]$.

B. C. A.

Chemical factors which determine the stability of colloids. LUIGI SABBATINI. *Atti. Ist. Veneto* 87, Part II, 321-4(1927-8).—The action of CHCl_3 on more than 30 org. and inorg. colloids was investigated. Invariably electronegative colloids were stabilized, but electropositive colloids were not.

S. L. B. ETHERTON

The kinetics of the coagulation of gold sols. ANN E. DAVIES. Univ. of Liverpool. *J. Phys. Chem.* 33, 274-84(1929).—D. finds that the rate of coagulation by electrolytes of Au sols maintained at 80° changes with time. The term "thermo-senescence" or "thermo-aging" has been coined to define the phenomenon. Thermo-senescence is very pronounced at 80° and consists of (a) a primary effect, which is a fall in the Smolouchowski coeff. β with increase of the aging period of the sol, until β reaches a min. after

various nitrates dissolved as follows: KNO_3 30.34 g., $\text{Sr}(\text{NO}_3)_2$ 8.4 g., $\text{Al}(\text{NO}_3)_3$ 10.6 g.; KNO_3 dissolved just as much as in pure water and in the satd. soln. of these 2 salts 16.8 g. of $\text{Sr}(\text{NO}_3)_2$ dissolved. In the satd. soln. of NaNO_3 with the 8.4 g. of $\text{Sr}(\text{NO}_3)_2$ dissolved, one may dissolve 30.34 g. of KNO_3 and in this soln. 8.4 g. more of $\text{Sr}(\text{NO}_3)_2$ could be dissolved. $\text{Ba}(\text{NO}_3)_2$ did not dissolve in the NaNO_3 soln. and did not ppt. it. In a satd. soln. of KNO_3 the various nitrates dissolved as follows: NaNO_3 9.6 g., $\text{Sr}(\text{NO}_3)_2$ 66.26 g., $\text{Ba}(\text{NO}_3)_2$ 1.6 g., and $\text{Al}(\text{NO}_3)_3$ 1.6 g. The soly. of $\text{Sr}(\text{NO}_3)_2$ is as great as in pure water. In this satd. soln. 44.8 g. of NaNO_3 dissolved. In a satd.

soln. of K_2SO_4 9 g. of anhyd. Na_2SO_4 dissolved, none of anhyd. ZnSO_4 . In a satd. soln. of Na_2CO_3 83 g. of K_2CO_3 dissolved, while in pure water 108 g. of K_2CO_3 dissolved. Five expts. were conducted in satd. solns. with a common cation, but a different anion. (1) In a satd. soln. of NaCl 2.2 g. of NaNO_3 dissolved. Only 1.6 g. NaCl dissolved in a satd. soln. of NaNO_3 . (2) In a satd. soln. of KCl 12.2 g. of KNO_3 dissolved, but no KCl dissolved in a satd. soln. of KNO_3 . The smallest quantity of KCl pptd. KNO_3 and the more KCl added the more KNO_3 came out of soln. and KCl went into soln. (3) In a satd. soln. of BaCl_2 8.74 g. of $\text{Ba}(\text{NO}_3)_2$ dissolved but in a satd. soln. of $\text{Ba}(\text{NO}_3)_2$ 37.24 g. of BaCl_2 dissolved. (4) In a satd. soln. of SrCl_2 37.6 g. of $\text{Sr}(\text{NO}_3)_2$ dissolved and in a satd. soln. of $\text{Sr}(\text{NO}_3)_2$ only 9 g. of SrCl_2 dissolved. (5) In a satd. soln. of NH_4Cl neither $(\text{NH}_4)_2\text{SO}_4$ nor $(\text{NH}_4)_2\text{C}_2\text{O}_4$ dissolved. The addn. of 0.1 g. of either of these pptd. NH_4Cl . In the second series of expts. tests were made with satd. solns., without common ions. In 100 cc. of a satd. soln. of NH_4Cl the following dissolved: NaNO_3 48.4 g., KNO_3 30.34 g., $\text{Ba}(\text{NO}_3)_2$ 1.20 g., $\text{Al}(\text{NO}_3)_3$ 44.6 g., Na_2SO_4 3.4 g. In the satd. soln. of NH_4Cl and NaNO_3 20.8 g. of KNO_3 could be dissolved. The temp. of the soln. drops when the NaNO_3 is added to the NH_4Cl ; it drops still further when the KNO_3 is added to the soln. of the 2 salts. The KNO_3 in NH_4Cl soln. dissolves as much as in pure water. An excess of the other salts mentioned causes a pptn. of the NH_4Cl . In a satd. soln. of $(\text{NH}_4)_2\text{SO}_4$ only 6.4 g. NaNO_3 and 0.4 g. NaCl could be dissolved. $\text{Ba}(\text{NO}_3)_2$, $\text{Al}(\text{NO}_3)_3$, KCl and BaCl_2 did not dissolve at all. In a satd. soln. of KCl 14.8 g. of NaNO_3 , 44.2 g. of $\text{Sr}(\text{NO}_3)_2$ and 8.74 g. of $\text{Ba}(\text{NO}_3)_2$ dissolved. In a satd. soln. of NaCl 30.34 g. of KNO_3 and 3.20 g. of $\text{Ba}(\text{NO}_3)_2$ dissolved. In a satd. soln. of BaCl_2 3.6 g. of NaNO_3 , 6.4 g. of KNO_3 and 2.4 g. of $\text{Sr}(\text{NO}_3)_2$ dissolved. In a satd. soln. of SrCl_2 19.2 g. of NaNO_3 and 30.4 g. of KNO_3 dissolved. In a satd. soln. of KNO_3 the various salts dissolved as follows: NaCl 30.4 g., SrCl_2 51.09 g., BaCl_2 5.6 g., HgCl_2 5.0 g. In a satd. soln. of $\text{Ba}(\text{NO}_3)_2$ the various salts dissolved as follows: NaCl 30.4 g., KCl 32.5 g., SrCl_2 4.4 g., NH_4Cl 36.4 g. In a satd. soln. of $\text{Sr}(\text{NO}_3)_2$ the salts dissolved as follows: NaCl 15.6 g., KCl 16.8 g., NH_4Cl 29.8 g. In a satd. soln. of NaNO_3 the salts dissolved as follows: KCl 5 g., NH_4Cl 12.3 g., $\text{Sr}(\text{NO}_3)_2$ 6.8 g.; BaCl_2 and HgCl_2 did not dissolve. In a satd. soln. of HgCl_2 the salts dissolved as follows: NaNO_3 83.97 g., KNO_3 30.34 g., $\text{Ba}(\text{NO}_3)_2$ 8.74 g., and NH_4Cl 36.4 g. In a table a list is given of 19 salts which dissolve in a satd. soln. of other salts in the same quantities as in pure water. A German summary of a theoretical discussion of the results is appended.

J. S. JOFFE

The system *o*-cresol-methanol-water. GAZA VON SZELÉNYI. Hochschule Budapest. *Z. Elektrochem.* 35, 33-7(1929).—The simultaneous soly. of the system is worked out for 10 different contents of MeOH from 0 to 44% and the crit. soln. temp. detd. The concn. of MeOH was detd. by the pycnometer. Only upper, max., and critical soln. temps. exist. The critical soln. temp. of the *o*-cresol-water mixt. was proved to be 169.7° with 39.5 weight % of *o*-cresol and 60.5 weight % of water. S. L. B. ETHERTON

A new method for measuring osmotic pressure. R. V. TOWNEND. *J. Am. Chem. Soc.* 50, 2958-6(1928).—Correction: The first sentence in the abstract *C. A.* 23, 752 should read: "The method is applicable to dil. solns. of any non-volatile solute in a volatile solvent."

DON BROUSSÉ

Ebullioscopic determination of complexes formed by mercuric chloride and alkali chlorides. Association of mercuric chloride. F. BOURION AND E. ROUYER. *Ann. chim.* 10, 263-355(1928); cf. *C. A.* 23, 557.—The assocn. of HgCl_2 in aq. soln. has been studied by the ebullioscopic method. The concns. ranged from 0.175 to 1.75 mol./l. At 25° and 40° (concn. 0.37) there is an equil. between simple and double mols., while at 100° (concn. 0.5 to 1.75) the equil. involves only simple and triple mols. Nevertheless, there is a possibility that double mols. exist at 100° when the concn. is smaller than 0.2. At 15° , the d. of a satd. aq. HgCl_2 soln. is 5. In the application of the ebullioscopic method to the detn. of complexes formed with alkali chlorides, it is necessary to consider the concns. of both the single and assocd. mols. of HgCl_2 . The max. devia-

tion of the rise in b. p. for corresponding solns. contg. HgCl_2 and KCl , NH_4Cl or NaCl from the additive value for the sep. salt solns. corresponds with 0.4 HgCl_2 and 0.6 alkali chloride. This suggests a mixt. of the complexes M_2HgCl_4 and MHgCl_3 , a view which is confirmed by other evidence. The values of $k = C_{\text{HCO}_2\text{Na}} \times C_{\text{HgCl}_2} / C_{\text{M}_2\text{HgCl}_4}$ are 0.0545 for KCl and 0.131 for NaCl , when the concns. are calcd. at 15° . A study of the reduction of HgCl_2 with Na formate shows that in the presence of a large excess of formate, the velocity coeff. corresponds to a bimol. reaction and is const. A similar result is obtained with NaOAc . Since these are stoichiometrically trimol. reactions, an explanation is suggested in terms of the complexes formed by HgCl_2 and NaOAc at 100° . The reduction is formulated: $[4\text{HgCl}_2 \cdot 5\text{AcONa}] + \text{HCO}_2\text{Na} = 2\text{HgCl}_2 + \text{HCl} + \text{NaCl} + \text{CO}_2 + 5\text{AcONa} + 2\text{HgCl}_2$. A const. bimol. reaction coeff. is obtained with a sufficient excess of formate or acetate, but otherwise the NaCl formed produces a stable, difficultly reducible complex with HgCl_2 , thus causing the coeff. to decrease as the reaction proceeds. $\text{Hg}(\text{CN})_2$ raises the b. p. normally at all concns. up to 1.75 mols/l. The absence of hydrolysis is due to the low value of the ionization coeff. (10^{-13}). The formation of complexes between $\text{Hg}(\text{CN})_2$ and alkali or earth-alk. halides has been investigated by methods analogous to those reported for HgCl_2 . The complexes with KCl , NaCl , NH_4Cl and KI are of the type $\text{M}'[\text{Hg}(\text{CN})_2]$; with MgCl_2 , CaCl_2 and SrCl_2 , they are of the type $\text{M}''[\text{Hg}(\text{CN})_2 \cdot \text{X}_2]$. All the complexes, except the 2 last ones, have been actually isolated. There was no evidence of complexes contg. a double mol. $\text{Hg}_2(\text{CN})_4$. With BaCl_2 , the complex $\text{Ba}[\text{Hg}_2(\text{CN})_4 \cdot \text{Cl}_2]$ was formed. The value of $k = C_{\text{Hg}(\text{CN})_2} \times C_{\text{MX}} / C_{\text{M}[\text{Hg}(\text{CN})_2]}$ is 1.3 for KCl and 0.87 for KBr , calcd. at 15° . The d. of a satd. aq. soln. of $\text{Hg}(\text{CN})_2$ is 4 at 15° .
A. L. HENSE

Estimation of p_H in salt solutions. ALFRED NEUMANN. *Pharm. Ztg* 74, 2, 8-10 (1929).
W. O. E.

Electrolytic solution force and electrolytic ion state. IV. Solution and solvation energies, their calculation and comparison. Are the electrolytic ions solvated ions? KARL FRIEDENHAGEN. *Chem. Inst Greifswald. Z. physik. Chem., Abt. A*, 140, 15-17 (1929); cf. *C. A.* 22, 2700. For a series of elements, F. defines and calculates: (a) the electrolytic soln. energy, which represents the transformation of a gas atom into a soln. ion, (b) the solvation energy, which represents the transformation of a gas ion into a soln. ion. In general, (b) is larger than (a). The soln. energy covers all the interactions between the solvent and the solute. There is actually no good reason to believe that soln. ions are solvated gas ions; this assumption would involve many difficulties. The partition coeff. of the ions between the gaseous and the liquid phases is of a different order of magnitude than the ratio of the dielec. consts. of the media. As was already pointed out in the previous papers, there is little possibility of representing the electrolytic dissocn. as a partition of charged ions between 2 media of different dielec. const.
A. L. HENSE

Properties of pure hydrogen peroxide. VI. G. L. MATHEWSON AND G. MAASS. McGill Univ. *J. Am. Chem. Soc.* 51, 674-67 (1929); cf. *C. A.* 19, 759. M_p curves were detd. in pure (98%) H_2O_2 and compared with the analogous curves in H_2O for KCl , K_2SO_4 , NaF and MeOH . Curves were also obtained for Et_2O and H_2SO_4 . H_2O_2 The oils which sep. on mixing anhyd. Et_2O solns. of amines and H_2O_2 were shown to be mol. compds. of the bases and H_2O_2 . The mol. heat of decompn. of pure H_2O_2 into H_2O and O_2 at atm. pressure and 20° was found to be 23,450 cal. A detn. of the vapor d. of H_2O_2 at 90° gave a mol. wt. of 34. At its b. p. (151°) pure H_2O_2 decomposes with a violent explosion, which is deadened by the addn. of a little H_2O or KCl .
J. K.

of hydrolysis of 1,2-oxide compounds in acid solutions. G. SMITH AND W. O. E. Lund Univ. *Swensk Kem. Tids.* 40, 221-6 (1928); cf. Smith and Wade *ibid.* 22, 328. The course of hydrolysis in glycerol glycidate soln. was followed by the change in vol. (cf. Bergsted and Gugenheim, *C. A.* 21, 2803). HClO_4 was used as catalyst, and since it affects the vol. measurements less than other acids. The reaction is bimol. with a deviation in k less than 1%. Rate const./acid concn. is 0.108 for 1:1 HClO_4 and HNO_3 at 25° . This ratio lies between ethylene oxide (0.22) and epichlorohydrin (0.021). Fumarylglucide acids are stronger than the tartaric acids formed on hydrolysis and these reactions were followed by potentiometric measurements. These expts. were made in closed vessels at 97° . Nearly identical titration values before and after the reaction ruled out errors due to formation of CO_2 . In the cat. contg. HClO_4 the rate const. came to 0.0047 for the 1st 15 mins. and increased to 0.0054 after 30 mins. All series showed the same increase. Hydrolysis takes place in the fumaric compds. without mineral acids. The rate increases with diln. and the degree of dissocn. but does not parallel the H^+ -ion concn. as is usual with neutral oxide compds. The mono-basic

ion of the acid hydrolyzes. The *trans*-configuration hydrolyzes slower than the *cis*-.

Monochloramine and hydrazine. II. Formation of hydrazine and decomposition of monochloramine in ammoniacal solution. MAX BODENSTEIN. Univ. Berlin. *Z. phys. Chem.*, Abt. A, 139, 397-415(1928); cf. *C. A.* 23, 754.—Raschig found that glue and similar substances favor the formation of N_2H_4 from NH_2Cl and NH_3 , and attributed the phenomenon to the presence of catalysts in the water of soln. B. finds that a complete purification of H_2O (distn. with a Pt or Sn condenser) does not change the yield. Cu, bivalent Fe and Co ions paralyze the reaction by adsorption of the metallic ions on the glue or mannitol. The N_2H_4 yield increases with the temp. N_2H_4 formation and decompn. are related. N_2H_4 formation is the primary step; if NH_2Cl is rapidly eliminated (high temp. and excess NH_3) it does not react with the N_2H_4 formed; but if the reaction is conducted slowly, N_2H_4 is reacted upon as soon as it is formed by NH_2Cl still present, and decomposes into N_2 and NH_4Cl . To prove the correctness of these views, kinetic measurements of the NH_2Cl decompn. were made. The conditions were so adjusted that no trace of N_2H_4 could be detected: this required a strong excess of NH_3 and a temp. $< 40^\circ$. The reaction was followed by measuring the N evolved and by titration; the results were not absolutely concordant, and the discrepancy is attributed to side-reactions. Nevertheless, it is safe to assume that the reaction is proportional to the NH_2Cl and NH_3 concns., that the temp. coeff. is large, and that Cu ions have only a small catalytic effect. The 2 steps of the reaction are: (I) $NH_2Cl + NH_3 = N_2H_4 + HCl$ and (II) $N_2H_4 + 2NH_2Cl = N_2 + 2NH_4Cl$. I is a relatively slow reaction and can be measured; it has a large temp. coeff. II is very rapid and its temp. coeff. is negligible; it is the only one to be catalyzed by Cu. Cu acts only when the N_2H_4 concn. is high, which was not the case in the present expts. The Raschig equation is the summation of I and II. Joyner made the statement that NH_4 salts decreased the N_2H_4 yield, and assumed that these salts were not acting as such, but brought some unknown catalysts into play; this explanation is not satisfactory.

A. R. ROSE

ALBERT L. HENNE

The oxidation potentials of some hypochlorite solutions. V. H. REMINGTON AND H. M. TRIMBLE. Okla. Agr. and Mech. Coll. *J. Phys. Chem.* 33, 424-34(1929).—A study was made of the potential in hypochlorite solns. between a Pt electrode and a 0.1 N calomel half-cell. Reproducible results were obtained only with new, clean Pt wire which had been glowd electrically to remove gases. Com. hypochlorite preps. were markedly affected by CO_2 . It was found possible, though tedious, to titrate hypochlorite solns. in absence of CO_2 electrometrically, end-points being obtained corresponding to neutralization of $HOCl$ and of HCl . Potentials in solns. made by adding pure hypochlorous acid to Sörenson's phosphate buffer mixts., and to Auerbach and Pick's carbonate-bicarbonate mixts., increased with increasing H-ion concn., but there was an unexplained discontinuity between the 2 series.

T. H. CHILTON

Velocity coefficients of hydrolysis of nitroacetanilide and of the secondary reaction of hydrolysis of *p*-nitroaniline with elimination of ammonia. A. A. KUROCHKIN. *J. Russ. Phys.-Chem. Soc.* 60, 1147-50(1928).—The velocity coeff. for the hydrolysis with 4% NaOH soln. of *p*-nitroacetanilide at 100° is 0.0025, and that of formation of *p*-nitrophenol from *p*-nitroaniline is 0.005.

B. C. A.

Partition of nitric acid between sodium and potassium hydroxide. V. I. NIKOLAEV. *J. Russ. Phys.-Chem. Soc.* 60, 893-904(1928).—A phase diagram for the quaternary system $K_2O-Na_2O-N_2O_5-H_2O$ is described.

B. C. A.

Water-gas equilibrium and flame temperature. YRJÖ KAUKO. *Nord. Kemi-smölet.* (Finland) 1928, 167-8.—Methods of detg. the flame temp. at which the water-gas equil. takes place are discussed. For an alc. flame the temp. is 1300° . O. A. N.

Reciprocal displacement of benzoic and salicylic acids from their combinations with *m*-phenylenediamine. G. K. GLININ. Vsesoyuz Acad. Nauk. *J. Russ. Phys.-Chem. Soc.* 60, 1641-53(1928).—Since Baskov (*C. A.* 9, 2173) has shown that an instantaneous equil. is established in systems of acids and bases, the study of the distribution of an org. base between 2 org. acids was undertaken by using the method of thermic analysis and taking as an object of study *m*-phenylenediamine, which, according to the investigations of Kremann and collaborators (*C. A.* 20, 1224), forms well-defined compds. with acids. The base, together with benzoic and salicylic acids, forms a reciprocal system of chem. interaction: $C_6H_4COOH.m-C_6H_4(NH_2)_2 + C_6H_4(OH)COOH \rightleftharpoons C_6H_4(OH)COOH.m-C_6H_4(NH_2)_2 + C_6H_4COOH$, which gives a diagram perfectly analogous to that of reciprocal systems of double decompn. (Bergman, *C. A.* 21, 523). Since benzoic acid is unable to displace salicylic acid from its combination with the base, the equil. tends toward the irreversible formation of $C_6H_4(OH)COOH.m-$

$C_6H_4(NH_2)_2$. The base is bivalent, but neutral salt is not formed with either of the 2 acids. The fusion curves of the following systems were studied: (1) *Benzoic acid and salicylic acid*: expts. show that this is a simple binary system with 1 eutectic at 108.5° , compn. 60.4 mol. % benzoic acid. (2) *Benzoic acid and m-phenylenediamine*: simple system with a eutectic at 81.5° corresponding to the compn. 64 mol. % benzoic acid. (3) *Salicylic acid and m-phenylenediamine*: simple system with an eutectic at 113° corresponding to the compn. 67.9 mol. % salicylic acid. (4) *Benzoic acid-m-phenylenediamine (1:1) and salicylic acid-m-phenylenediamine (1:1)* (difficulty was experienced with resinification): the lowest fusing temp. is 72° (the compn. being 22.2 mol. % salicylic acid-m-phenylenediamine). (5) *Benzoic acid-m-phenylenediamine and salicylic acid*: there was less resinification than in the preceding case, but obstinate over-cooling; there is a triple eutectic at about 85° for the compn. 65 mol. % benzoic acid, 30 mol. % salicylic acid-m-phenylenediamine and 15 mol. % salicylic acid; another eutectic at 66.5° corresponding to the compn. 22.5 mol. % benzoic acid, 15 mol. % salicylic acid-m-phenylenediamine and 62.5 mol. % benzoic acid-m-phenylenediamine. The curve shows 3 branches intersecting at 2 min. points corresponding to temps. 75.5° and 103.5° , the intersections representing 2 stable ternary systems. (6) *Benzoic acid and salicylic acid-m-phenylenediamine*: This is a simple system with an eutectic at 90° corresponding to 66 mol. % benzoic acid; there is practically no interaction between the 2 components. On the basis of above results, a *squire of interaction of the 4 components* C_6H_5COOH , C_6H_4COOH , $m-C_6H_4(NH_2)_2$, $C_6H_4(OH)COOH$ $m-C_6H_4(NH_2)_2$, and $C_6H_4(OH)COOH$ was constructed in which the fields of the components are shown delimited by lines of reciprocal crystn.; the directions of the lines are toward common centers, namely, triple eutectic points. The drawing discloses 4 fields; the one occupied by salicylic acid-m-phenylenediamine is the largest, which shows the stability of this compd. in the given system. The field corresponding to benzoic acid-m-phenylenediamine is very small.

BERNARD NELSON

The mechanism of the homogenous combination of hydrogen and oxygen. H. W. THOMPSON AND C. N. HINMELWOOD. *Proc. Roy. Soc. (London)* A122, 610-21 (1929). cf. *C. A.* 22, 3816, 4324. For a chain reaction, the equation $v = F(c) / (1 + a + b)$ (1 - a) holds in which v is velocity, $F(c)$ is the concn. of reacting substances to which the no. of chains formed per unit time is proportional, $f(c, r)$ is the concn. or surface of the vessel, governing the rate of breaking of the chains, A is a const. for one kind of mol.; a is the av. no. of mols. activated in each act of transformation. If $a \leq 1$, the expression for v is finite though it may be large. If $a > 1$, $v \rightarrow \infty$. This means that a small change in a may change a finite reaction velocity to ∞ , or that a small change in concn. may result in an abrupt transition from a slow reaction to an explosion. The reaction between H_2 and O_2 in the gas phase at 500-600° is a chain reaction. 1. chains are interrupted principally by deactivation at the walls. N_2O , between upper and lower limit of concn. can initiate instantaneous ignition in mixts. of H_2 and O_2 where the rate is normally negligibly small. If O_2 is allowed to enter a 2-l. cc. quartz bulb at 550° contg. an atm. of H_2 , immediate inflammation occurs at H_2 pressures between 30-40 mm. and 84 mm.; there is no inflammation above 84 mm. and very slow combination below 30-40 mm. If H_2 is added to O_2 the upper limit is 145 mm. To prevent ignition $3 \times$ the deficiency in pressure is added by introducing iron. If H_2 and O_2 are mixed before entering the reaction vessel, ignition occurs as soon as the lower limit is passed. This lower limit is difficult to find because of the weak explosion. The upper crit. pressure decreases with rise in the ratio of H_2 to O_2 . The upper limit is also lowered by A , though not considerably. The crit. pressure was found to be practically independent of the nature and extent of the surface of the reaction vessel. That the upper limit is independent of the surface is striking, since the velocity is greatly diminished above the upper limit by increasing the surface. Above the upper limit, the reaction chains are started by active steam mols. The chains are propagated with stationary velocities. At high pressures, the mechanism may be represented by the equation $2H_2 + O_2 = 2H_2O$. At low pressures the mechanism is: $H_2 + O_2 = H_2O_2$ and $H_2O_2 + H_2 = 2H_2O$. The upper and lower crit. pressures correspond to the N_2O crit. pressures. At the low pres., the stationary character of the reaction is maintained by wall deactivation, while at high pressures and hence high concn. of peroxide the mols. exert a mutually destructive effect and interrupt chains much as antiknock compds. do. The peroxide theory explains (1) crit. limits in pure H_2 and O_2 , (2) influence of N_2O , (3) bimol. process at low pressure and termol. at high pressure. It is more difficult to initiate flame in intensively dried mixts.; the water mols. act as centers of reaction. N_2O is less effective than N_2O_4 in initiating flame, HCl causes an acceleration, while SO_2 has no observable effect.

ARTHUR FLEISCHER

Note on the history of catalysis. EDMUND O. VON LIPPMANN. *Chem.-Zig.* 53, 22 (1929).—The term *catalysis* was used by Libavius in 1597, revived by Berzelius in 1835, and given its modern definition by Ostwald 50 years or more later. Albertus Magnus (1193–1280) and Bartholomaeus Anglicus (1230) refer to the action of demons in hastening changes, as when "sticks are turned into serpents" by magicians. St. Augustine (4th century) and Apulejus (2nd century), basing their statements upon oriental learning, said that the devil himself was responsible for such manifestations. W. C. E.

An extension of the intermediate-compound theory of catalysis in gas reactions. H. H. STORCH. *J. Phys. Chem.* 33, 456–8 (1929).—The theory proposed to account for the rates of unimol. gas reactions may be applied to cases of catalysis, by making the same assumption with regard to an intermediate compd. of the catalyst and reactant as is made with regard to the complex mols. that undergo unimol. decompn., namely, that some of the internal energy of such mols. with several degrees of freedom is available for activation by collision. T. H. CHILTON

Homogeneous catalysis. I. General relations. CH. MOUREU. *Trans. Faraday Soc.* 24, 704 (1928).—A crit. review is presented of a paper previously reported by Dhar (cf. C. A. 23, 1339). P. H. EMMETT

Homogeneous catalysis. I. General relations. A. EGERTON. *Trans. Faraday Soc.* 24, 697–701 (1928).—A discussion of 2 points of interest in combustion and the theory of *antiknock compds.*: (1) the nature of the primary centers which initiate combustion reactions and (2) the circumstances which affect the life of an active mol. P. H. EMMETT

Homogeneous catalysis. I. General relations. W. E. GARNER. *Trans. Faraday Soc.* 24, 701–2 (1928).—G. points out the exemplification of several types of catalytic action in the speeding up by H_2 or H_2O vapor of the gaseous combustion of CO in O_2 . P. H. EMMETT

The catalytic effect of ruthenium salts on the reduction of perchloric acid by hydrobromic acid. WM. R. CROWELL, DON M. YOST AND JAMES M. CARTER. *J. Am. Chem. Soc.* 51, 786–94 (1929).—The influence of Ru salts on the rate of reduction of $HClO_4$ by HBr was investigated. Tervalent Ru had a much greater catalytic effect than quadrivalent Ru. The authors postulate the oxidation of the tervalent Ru to the hexavalent or septivalent form as the step in the reaction detg. its rate. The high-valence form is then reduced almost immediately to the tervalent state. Br inhibits the reaction by slowly oxidizing tervalent Ru to the less active quadrivalent form. P. H. EMMETT

Chemical dynamics of autocatalytic processes. VII. Decomposition velocity of aqueous solution of bromosuccinic acid with liberation of hydrobromic acid. JAN ZAWIDZKI AND WANDA WYCZALKOWSKA. Polytechnikum Warsaw. *Bull. Intern. acad. Polonaise* 1928, 293–60; cf. C. A. 18, 2832.—The velocity with which HBr is liberated by bromosuccinic acid was measured. This process is autocatalytically retarded by the H and Br ions liberated. The decompn. velocity of bromosuccinic acid is represented by $dx/dt = k(a - x) 2x$. At 75° , $k = 0.000154$. The decompn. was also investigated in the presence of an excess of HBr , HCl , HNO_3 , Na_2SO_4 , $NaBr$, KBr and $NaCl$. The value of k was always 0.000154. ALBERT L. HENNE

Homogeneous catalysis. III. Neutral salt and activity effects. M. POLANYI. *Trans. Faraday Soc.* 24, 733–4 (1928).—The coincidence of the reaction velocity of the decompn. of N_2O_5 , as well as the racemization of pinene in the gas phase and in solns., can be explained by a suitable conception of the mechanism of chem. reactions going on in the interior of a mol. R. L. DODGE

Homogeneous catalysis. III. Neutral salt and activity effects. A. LAPWORTH. *Trans. Faraday Soc.* 24, 721–2 (1928).—Polemical. R. L. DODGE

Homogeneous catalysis. III. Neutral salt and activity effects. H. M. DAWSON. *Trans. Faraday Soc.* 24, 723–5 (1928).—Polemical. R. L. DODGE

The thermal decomposition of ammonia on iron catalysts. II. C. H. KUNSMAN. *J. Am. Chem. Soc.* 51, 688–95 (1929).—The rate of decompn. of NH_3 on finely powdered Fe catalysts coated on Pt filaments was detd. by a static method over a temp. range of 475 – 750° and at initial NH_3 pressures of from 2 to 30 cm. The decompn. is strongly inhibited by H_2 . The apparent energy of activation varies from 20,000 to 50,000 cal. per mol. of NH_3 . P. H. EMMETT

The gauze catalyst in ammonia oxidation. G. A. PERLEY AND M. W. VARRELL. Univ. of New Hampshire. *Ind. Eng. Chem.* 21, 222–3 (1929).—Expts. on the oxidation of NH_3 to NO by air at atm. pressure showed that a multi-layer Pt gauze catalyst had a greater capacity and a higher efficiency than a single gauze, irrespective of whether the layers were in direct contact or not. The use of sepd. Pt gauze layers with a pre-

heated gas mixt. gave nearly as high oxidation efficiencies, and no greater capacities than with catalyst layers in close contact. An inlet gas flow (9-10% NH_3 in air) of approx. 1.61 per sq. cm. per min., preheated to 470° gave the highest efficiency. The catalyst contact time was approx. 0.00019 sec.

R. L. DODGE

The phase rule and the boundary law of Euler. OTTO RÜDEL. Rio Grande do Sur. *Z. Elektrochem.* 35, 54(1929).—The phase-rule equation $P + F = C + 2$ is considered mathematically identical with the boundary law of Euler in crystallography, $F + E = C + 2$. The component number C of the phase rule is identical with the boundary number of Euler's rule. Algebraically, P is identical with the surfaces and also the corners of a crystal. Similarly, for the degrees of freedom. From the crystallographers standpoint, the surface corresponds to phases, corners to freedom and boundaries to components.

S. L. B. ETHERTON

Equilibrium diagram of the cobalt-molybdenum system. TAKESHI TAKAKI. Tohoku Imp. Univ. *J. Study of Metals* 5, 364-76(1928).—The equil. diagram was detd. by the dilatometric method, magnetic analysis and microscopic observation. This system has ϵ and η phases besides a γ phase, which is the solid soln. of Mo in Co, and a δ phase, which is the solid soln. of Co in Mo. The η phase, is considered to be a solid soln. between the δ phase and the compd. Co_3Mo , which is formed at 1550° and at 1340° decomposes into $\epsilon + \delta$. The ϵ phase is the solid soln. between the η phase and the compd. CoMo , which is formed at 1500°. This phase forms a eutectic with the γ phase. The γ phase changes into the H phase; the transition point (hexagonal \rightleftharpoons face-centered cubic), which is at 472° in pure Co, rises on heating with the addn. of Mo and lowers on cooling. With the alloy contg. 13-16% Co the transformation point is below room temp. Above 17% Mo, the transformation occurs at high temp. even on cooling, while with the alloy contg. more than 22% Mo the transformation points on cooling and on heating are identical. When the Mo content is 27 to 55%, the alloy undergoes the reaction $\gamma + \epsilon \rightleftharpoons \text{H}$ at 1040°. The alloys between 58 and 71% and those between 62 and 96% Mo contain two solid solns. ϵ and η as the result of the reaction $\text{L} + \eta \rightleftharpoons \epsilon$ at about 1500°, and $\text{L} + \delta \rightleftharpoons \eta$ at 1550°, resp.; the two solid solns. are mainly composed of CoMo and Co_3Mo . The ϵ phase produces a eutectic with the γ solid soln. while the η phase decomposes into the θ and δ solid solns at 1340°. The δ solid soln. dissolves about 2% of Co in Mo at room temp. The hardness of the cobalt-rich alloys was measured.

K. SOMEYA

Eutectic areas. W. WAHL. III. *Nord. Kemistmötet* (Finland) 1928, 180 3. A eutectic point appears in a quaternary system only in case all 4 components in crystallized forms are insol. in each other. If 2 compds. build mixed crystals in all proportions and these are insol. in each other a eutectic line is obtained. If 3 of the components form mixed crystals but the 4th is insol. in these, a eutectic area is obtained, which is defined by the 3 eutectic points and the 3 tertiary eutectic lines for the system. Likewise a eutectic area is obtained if the 4 components, pair for pair, form mixed crystals in all proportions, but these mixed-crystal series are not soluble in each other in crystallized form. The eutectic area in such a system takes in the 4 binary eutectic points and the four eutectic lines. The four-component system, naphthalene- β -naphthol-azobenzene-stilbene has been studied. In it the two binary systems, naphthalene- β -naphthol and azobenzene-stilbene form mixed crystals which are insol. in each other. A diagram of the results obtained together with a discussion is given. A number of natural products (rocks) are considered from the point of view of being four-component systems of the type investigated.

O. A. NELSON

Influence of cooling velocity upon eutectic structure. G. TAMMANN AND A. A. BORISCHWAR. Univ. Göttingen. *Z. anorg. allgem. Chem.* 178, 325-8(1929). With very slow cooling it is possible to effect a considerable sepn. of the two constituents of a eutectic through crystn., especially if one is much heavier than the other. Slow cooling leads to large crystals in the eutectic. Centrifuging a very slowly crystallizing eutectic results in a very considerable sepn. Eutectic compns. of the binary systems Bi-Sn, Bi-Pb, Bi-Cd, Pb-Sb and Sn-Pb were treated in this way. The liquid eutectic was placed in a furnace the temp. of which was 2-3° below the eutectic temp. Upon attainment of the eutectic temp. the alloy was cooled 2° during 2-6 hours. The quantity of metal used was 40-50 g. The sepn. of eutectic graphite in Fe-C alloys (C 3.00, Si 2.72, Mn 0.45, P 0.28, S 0.07%) is similar, but it is necessary first to break up the graphite dendrites which form a skeleton throughout the melt supporting itself in the melt. The structure of these eutectic alloys is illustrated by six photomicrographs. Similar sepn. in eutectic mixts. is found among igneous rocks, where the rate of cooling was very slow. Here the grains are almost always very large.

ROBERT F. MERRILL

Abnormal properties of eutectics of high dispersion. N. Y. AGEEV, S. A. POGODIN AND N. S. KURNAKOV. *Ann. inst. anal. phys.-chim.* (Leningrad) 4, 23-38(1928).—This article is a study of the effect of dispersion upon *elec. cond.*, *hardness* and *coeff. of linear expansion* in a eutectic mixt. Alloys of Sn with Pb, and of Ag with Cu were selected for study. The Brinell hardness tester was used. The increase in hardness of quickly chilled, as compared with slowly cooled samples is much greater for a eutectic alloy than for one of any other compn. The abnormal behavior of a eutectic mixt. is noticeable also on the diagrams of *sp. conductance* and *thermal coeff. of elec. cond.* When the alloys are annealed the difference between the slowly, and the quickly chilled alloys disappears.

REA MAIZEL

The equilibrium of some binary systems of 2,4,6-trinitro-*m*-xylene. N. N. EFREMOV AND A. M. TIKHOMIROVA. *Ann. inst. anal. phys.-chim.* (Leningrad) 4, 65-91 (1928).—The pure trinitro-*m*-xylene (I) was prepd. by recrystg. the com. product 5 times. The final product m. 180.2°. The temp. and percentage compn. by wt. of the second component in the eutectic for different systems were: I-naphthalene 76.0°, 82.4; I-acenaphthene 84.0°, 77.3; I-phenanthrene 86.0°, 73.0; I-anthracene 151.2°, 35.6; I-fluorene 100.6°, 64.5; I-*m*-dinitrobenzene 76.4°, 82.2; I-picric acid 105.8°, 78.3; I-trinitrocresol 84.6°, 82.8; I-styphic acid 141.3°, 62.5; I-teteryl 110.8°, 76.5; I-picryl chloride 73.2°, 87.0; I-1,3,5-trinitrobenzene 104.6°, 83.6; I-trinitrotoluene 75.2°, 92.0. The phase diagram indicates that I does not form compds. with any of the aromatic hydrocarbons studied.

REA MAIZEL

The system iron oxide-water. GUSTAV F. HÜTTIG AND HARRY GARSIDE. *Deut. Tech. Hochschule, Prag. Z. anorg. allgem. Chem.* 179, 49-76(1929).—The system $\text{Fe}_2\text{O}_3\text{-H}_2\text{O}$ was examd., special attention being paid to the aging of the various hydrates. The preps. examd. were: (I) ppt. of FeCl_3 soln. with NH_3 . After 6 hrs. air drying, rubbing, and 6 hrs. drying at 30° it analyzed $\text{Fe}_2\text{O}_3 \cdot 3.721 \text{ H}_2\text{O}$; repeated drying at 30° gave 1.233 H_2O ; drying over P_2O_5 at 40° gave 0.237 H_2O ; (II) mineral oxides, goethite (completely sol. in 20% HCl), $\text{Fe}_2\text{O}_3 \cdot 0.992 \text{ H}_2\text{O}$, and ruby mica; (III) product obtained by dehydrating (I) over P_2O_5 , extg. with dry acetone (0.610 H_2O) and drying over P_2O_5 *in vacuo* at 200° to 250°. The compn. became $\text{Fe}_2\text{O}_3 \cdot 0.145 \text{ H}_2\text{O}$; it was still active catalytically. It is concluded that complete dehydration of Fe_2O_3 with conservation of its activity is as yet impossible. Exptl. methods used for pressure and *sp. heat* detns. have been described previously; as a measure of the catalytic activity was taken the time (α , min.) required to liberate 100 cc. O_2 from a H_2O_2 soln. (0.200 g. Fe_2O_3 in 50 g. water, 5 cc. 30% H_2O_2 soln. added after 0.5 hr., 20°). For measurement of the chem. reactivity the no. cc. H_2S (β) was detd. with which the prepn. reacted in a specified time (0.200 g. Fe_2O_3 in tensi-eudiometer filled with H_2S). The rate of soln. of the preps. in HCl was detd. from the no. of min. (γ) required (0.200 g. Fe_2O_3 in 1000 cc. 0.5 *N* HCl at 20°, stirred). The isobaric dehydration curves of t (temp. at which $p_{\text{H}_2\text{O}} = 10 \text{ mm.}$) versus N (mols. water per mol. Fe_2O_3) are smooth hyperbolas for all freshly prepd. hydroxides independent of their initial H_2O content and typical for colloidal systems. After 3 months' aging a slight strengthening of the water-oxide bond is noticeable in lower p values. Entirely different are the t - N curves for the minerals; they may perhaps be regarded as the final stage of aging; one mol. of water is tenaciously held up to about 240°, goethite being apparently more stable than ruby mica. For the fresh preps. $\ln(p_0/p) = k/N$ (p_0 pressure for pure water, p that for N mols. water per mol. oxide) with k approx. 3.5. Better values are obtained on the assumption that all water is chemically bound, which gives a relation $k'N + N \ln(p_0/p) = k''$ with $k' = 1$ and $k'' = 5.55$. It is concluded for the fresh hydroxide gels that at least part of their water is chemically held; they show no traces of x-ray spectrum and are non-crystalline. For the heat effect of $\text{Fe}_2\text{O}_3 \cdot 1 \text{ H}_2\text{O} = \text{Fe}_2\text{O}_3 + \text{H}_2\text{O}_{\text{vapour}}$ 28,240 cal. is calcd. by Nernst's equation in the case of goethite and 26,373 cal. in the case of ruby mica. From the course of the *sp. heat* curves the rule is confirmed that the apparent *sp. heat* of water in hydrates is greater the more loosely it is held. Up to $N = 1$ ($c = 0.2249$) it runs proportional to N ; from there on it rises more steeply; below $N = 0.2$ it leaves the straight line to approach the *sp. heat* of *cryst. Fe(OH)* (0.1608). The extrapolated value from the straight line for $N = 0$ ($c = 0.175$) would be the *sp. heat* of anhyd., amorphous Fe_2O_3 . During the aging process the c values drop slightly. Qual. the activity, reactivity and soly. of the preps. are as follows. The three qualities run parallel, the preps. with low water content are the slowest to act, the activity has a max. for $N = 1$, min. between $N = 2$ and 3. A peculiar tendency of the activity to go up and down during a 55-day observation period was observed for $N = 0.783$. Less variation with time was found for $N = 3.731$. The rate of change of *sp. heat* seems to run parallel with that of activity. X-ray diagrams of goethite (dehydrated at 300°) and ruby mica

(dehydrated at 280°) showed cryst. Fe_2O_3 accompanied by amorphous material; the pptd. hydrate has no diagram after 60 days at room temp. B. J. C. VAN DER HOEVEN

Reflections on statistical thermodynamics. J. H. COBLYN. *Chaleur et ind.* 9, 527-34(1928).—C. discusses (a) moist vapors, lack of similarity of fluids and the function of the change of state, (b) vapor-tension curves, (c) mol. entropy of vaporization. He shows that even if the influence of pressure on the vol. of a liquid is negligible, it is not negligible on its calorimetric properties. S. L. B. ETHERTON

Statistical thermodynamics. J. H. COBLYN. *Chaleur et ind.* 9, 245-52(1928).—C. discusses Massieu's function, additivity of mol. heats, corresponding states, the kinetic theory, equipartition of energy and van der Waals' theory with some chem. applications. S. L. B. ETHERTON

Thermodynamics of irreversible reactions. Evolution of physical and chemical systems in time. N. A. KOLOSOVSKII. *J. Russ. Phys.-Chem. Soc.* 60, 1079-1115(1928).—The time factor is introduced as an independent variable into De Donder's thermodynamic theory of chem. reactions (*Mém. Acad. Roy. Belg.*, 9(1927)) and a series of expressions for velocity of reaction is derived from an exclusively thermodynamical point of view. Further equations are given expressing uncompensated heat of reaction in gaseous systems, which represent a generalization of the ordinary conditions of equilibrium in such systems. B. C. A.

A thermodynamic consideration of the synthetic methanol process. KENNETH K. KELLEY. Stanford Univ. *Ind. Eng. Chem.* 21, 353-4(1929). From new data, the following free-energy values for the reaction: $\text{CO(g)} + 2\text{H}_2\text{(g)} = \text{CH}_3\text{OH(g)}$ are obtained $\Delta F^\circ_{298} = -9040$ cal., and $\Delta H^\circ_{298} = -25,150$ cal. $\Delta F^\circ = -20,740 + 4500/T \log_{10} J - 0.015867T^2 + 1T$ where $T = 604$. J. H. PERKINS

The absolute zero of temperature: the specific heats of gases and deductions respecting quanta. F. H. LORING. *Chem. News* 138, 18-22(1929), cf. *Ibid* 137, 3-6(1928).—The ratio $\gamma = C_p/C_v$ is taken as Avogadro's const. multiplied by the abs. value of the abs. zero in the centigrade scale, divided by 10^{24} . This gives 6.061×10^{24} (273.194)/ $10^{24} = 1.65309 = \gamma$, agreeing fairly well with exptl. and theoretical values. A similar discussion is presented of the quantum theory. G. CALINGARI

Further studies on the thermochemical behavior of sodium hydroxide solutions. THEODORE W. RICHARDS AND LAWRENCE P. HALL. Harvard Univ. *J. Am. Chem. Soc.* 51, 731-6(1929).—The heat of diln. of NaOH-100 H_2O was measured at 16° and 20°. All this laboratory's heat capacity and heat of diln. data on NaOH were recalcd. The heat of neutralization of HCl and NaOH at infinite diln., and 20° was calcd. to be 13,650 cal. F. D. ROSSINI

The heats of dilution of sodium hydroxide, acetic acid and sodium acetate, and their bearing on heat capacities and heat of neutralization. THEODORE W. RICHARDS AND FRANK T. GUCKER, JR. Harvard Univ. *J. Am. Chem. Soc.* 51, 712-27(1929). Cf. *C. A.* 19, 2563; 15, 1844.—An improved calorimeter, which is described, was used to measure heats of diln. at 16° and 20°. Sp. heat and heat of diln. data on AcONa , NaOH and AcOH are given, and the heat of neutralization of NaOH and AcOH is calcd. as nearly 13,600 cal. at infinite diln. F. D. ROSSINI

The heat of neutralization of acetic acid. THEODORE W. RICHARDS AND BEVERIDGE J. MAIR. Harvard Univ. *J. Am. Chem. Soc.* 51, 737-40(1929).—The heat of neutralization of AcOH-100 H_2O and NaOH-100 H_2O was found to be 54,321 joules at 20°. The heat of the reaction, $\text{H}^+ + \text{OH}^- = \text{H}_2\text{O}$, at infinite diln., was calcd. to be 55,050 joules at 20°. F. D. ROSSINI

A study of the thermochemical behavior of weak electrolytes. THEODORE W. RICHARDS AND BEVERIDGE J. MAIR. Harvard Univ. *J. Am. Chem. Soc.* 51, 748-58(1929).—The heats of diln. of citric acid, sodium citrate and the sodium acid citrates in aq. soln. were measured. Data on the heat capacities and heats of diln. of the substances are given at 16° and 20°. The heat of neutralization of citric acid and the acid citrates with NaOH was measured and the temp. coeff. was calcd. F. D. ROSSINI

The calculation of the integral and differential heat of solution and dilution of potassium chloride and the molecular heat of potassium chloride solutions at great dilution. E. LANG AND J. MONHEIM. *Z. Elektrochem.* 35, 20-33(1929). L. and M. have calcd. the data from detns. at 12.5° and 25° for about 18 concns. The values are discussed and then compared with those of others. S. L. B. ETHERTON

Heats of combustion of organic compounds. M. S. KHARASCH. *Bur. Standards J. Research* 2, 359-430(1929).—The literature on the heats of combustion of org. compds. is critically reviewed. A table of "best" values for this const. is compiled covering all available information on record in the literature. A method for calcg. the heat of combustion from the structural formula of the compd. is described, and the value calcd.

according to this method are tabulated for comparison with the observed values. The comparison demonstrates that the calcd. values are sufficiently accurate for most practical purposes. The difference between calcd. and observed values seldom exceeds 1 to 2% except in cases where there is reason to doubt the accuracy of the observed value. In most cases the two values agree within the accuracy of the observed value.

G. CALINGAERT

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Inflammation of mixtures of the olefins and air in a closed spherical vessel (MAXWELL, WHEELER) 10.

3--SUBATOMIC PHENOMENA AND RADIO CHEMISTRY

S. C. LIND

The new theory of Einstein on the relation of gravitation and electricity. HANS REICHENBACH. *Z. angew. Chem.* 42, 121 3(1929).—The new theory is based on the Weyl-Eddington generalization of Riemann space, an outline of which is given. Although the phys. result of the connection between gravitation and electricity is not predicted by the theory, the importance of the relation cannot be overlooked.

H. F. JOHNSTONE

The limiting density of white dwarf stars. E. C. STONER. Univ. of Leeds. *Phil. Mag.* [7], 7, 63-70(1929).—Using Fermi statistics S. shows that under the influence of gravitational and electron "packing effects," the limiting density C of a uniform sphere of mass M , consisting of a mixt. of fully ionized atoms, is approx. given by $C = 3.85 \times 10^6 (M/M_\odot)^2$, where M_\odot is the mass of the sun. For spheres with the masses of Sirius B and O, Eridani B the limiting densities are 2.8×10^6 and 7.5×10^6 , resp. S. suggests that white dwarfs contain a core of material approaching the limiting density, the ratio of the radius of the core to the radius of the star being about 0.25.

and 0.61 for the 2 white dwarfs considered. S. believes the core to be in an almost incompressible or "quasi-liquid state," because of the congestion of the electrons. Jean's theory of the distribution of stars in the Russell temp.-luminosity diagram is discussed. It is shown that the quasi-liquid state required for stability may be attained in white dwarfs as a result of electron packing, without the necessity of assuming "jamming" of the few remaining K-ring atoms.

L. H. REYERSON

What happens during an electron jump? D. S. VILLARS. *Nature* 123, 240 (1929).—The Schrödinger theory answers the question as to what happens during an electron "jump." The electron does not jump, but at most, it undergoes a change in momentum and obeys a new force law.

Nonpolar valency binding and atomic refraction. II. FRANK V. JOHNSON, JR. *Z. Physik* 53, 380-403(1929).—See *C. A.* 23, 1874.

Quantization of the asymmetric top. H. A. KRAMERS AND G. P. ITTMANN. *Z. Physik* 53, 553-65(1929).—The method of phase integrals used for the quantization of the asymmetric top can be carried over to the quantum mechanics and gives a Lamé differential equation. The theory of the Lamé functions and their eigen-values can at once be applied to the problem of the asymmetric top. The energy levels, the transition to the symmetrical top and the case of large quantum nos. are discussed.

GEORGE GLOCKLER

Quantum mechanical dispersion formula for atomic hydrogen in the normal state. F. REICHE. *Z. Physik* 53, 168-91(1929).—A dispersion formula derived by Podolsky (*C. A.* 22, 2312) for the dispersion of at. H in the normal state is shown to be identical to the Ladenburg-Kramers formula (*C. A.* 22, 4364).

GEORGE GLOCKLER

The nonpolar bond in quantum mechanics. Confirmation from spectroscopy. W. HEITLER AND G. HERZBERG. *Z. Physik* 53, 52-6(1929).—Certain results of band spectroscopy are summarized and discussed and it is shown that certain atoms (for instance the C atom) can enter into stronger combination if they are first excited. For instance the C atom has in its normal state 1 electron pair in the L_1 shell and 2 non-paired electrons in the L_2 shell. Consequently C is bivalent in its normal state. In order for C to be quadrivalent it is necessary that one of the L_2 electrons be lifted into the L_1 shell. Then the 4 electrons are free (non-paired) valency electrons with parallel spin. This idea is tested on CN bands and it appears that quadrivalent C is in an excited (4S) state (about 1.6 v.) while the normal state is a 3P state.

GEORGE GLOCKLER

Radioactivity and quantum mechanics. J. KUDAR. *Z. Physik* 53, 61-6(1929).—Gamow's treatment (*C. A.* 23, 1047) of radioactivity by the methods of wave mechanics is somewhat faulty from a mathematical viewpoint, giving an approx. calcul. only for the decay const. Mathematical.

GEORGE GLOCKLER

Quantum mechanics and radioactivity. J. KUDAR. *Z. Physik* 53, 95-9(1929).—It is shown that the non-relativistic Schroedinger equation yields a quantum mech. description of α -ray disintegration. From the theory it follows that the α -particle can assume within the nucleus a finite set of states only. Mathematical. G. G.

Quantum mechanics and radioactivity. J. KUDAR. *Z. Physik* 53, 134-7(1929). cf. preceding abstr.—The three-dimensional case is discussed. The results are analogous to the one-dimensional case. A remarkable result is that an α -particle with pos. energy (i. e., in an unstable state) can exist within a nucleus only when the radius (where the Coulomb forces hold) is not too small. Mathematical. G. G.

Nernst's hypothesis of the creation of radioactive elements on the basis of wave mechanics. J. KUDAR. *Z. Physik* 53, 166-7(1929).—Gamow's wave-mech. theory of radioactive α -particle decay states that a given α -particle has a certain probability for leaving the nucleus. K. now states that it is a necessary consequence of wave mech. considerations that there also should exist a certain probability for the reverse process of an α -particle entering the nucleus. The α -particle must have an appropriate energy while approaching the nucleus. The probability of addn. of an α -particle to a given nucleus depends upon the decay constant of the resulting nucleus (*C. A.* 23, 1047).

GEORGE GLOCKLER

Quantum theory and radioactive disintegration. G. GAMOW. *Z. Physik* 53, 601-4(1929); cf. *C. A.* 23, 1565, 1807.—Polemical. Reply to remarks made by Laue (*C. A.* 23, 1565), regarding G.'s mathematical treatment of the appropriate wave equation (*C. A.* 23, 1047).

GEORGE GLOCKLER

New investigations of the penetrating radiation of H₂. E. STRINKE. *Z. Physik* 48, 647-89(1928); *Science Abstracts* 31A, 700.—A new app. was employed, with an ionization chamber filled with CO₂ under pressure, and with an Fe armor built up in sections, by means of which thicknesses of 4, 8 and 12 cm. of Fe can be obtained, with

different angles of complete or partial opening. The drift of the electrometer, due to radioactivity in the interior of the instrument, was much smaller than in previous ones, only 0.2 J. Intensity, absorption and direction measurements were made near sea-level, and at 1600 and 2500 m. Conclusion: The penetrating radiation is not homogeneous; the smallest absorption coeff. in Pb which has been measured is $\mu = 0.0042 \text{ cm.}^{-1}$, this radiation being about 100 times as penetrating as normal radium radiation, wave length estd. as 0.07 X. U., corresponding to an energy level of 177 million v., which approaches that which would be theoretically set free if matter were transformed into energy. Scattered energy is also important, and affects the ionization; scattering takes place in air and in Fe, but apparently the amt. of it in Pb is small. The daily variations in the intensity were studied for 4 days at 2500 m. elevation, and were found to be considerable though smaller than those measured by other investigators at the same height. Difficulties were found in explaining the effect of barometric height on the intensity.

H. L. D.

Yield in atomic disintegration experiments. W. BOTHE AND H. FRÄNZ. *Z. Physik* 53, 313-6(1929); cf. *C. A.* 22, 1902.—Discussion of differences in results obtained by B. and F. and Kirsch and Pettersson at Vienna (cf. *C. A.* 22, 1271).

GEORGE GLOCKLER

Two simple methods of purifying radium emanation. WM. G. MORAN. *Phil. Mag.* [7], 7, 399-404(1929).—A simple app. for the purification of Rn is described, it is low in cost and easy to operate. Liquid air is not needed and the removal of water vapor is unnecessary. One method ignites the O and H with a hot CuO filament, which also oxidizes the excess H. The other method uses a spark to unite the O and H while the excess H passes through a heated Pd tube. The Rn is pumped from soln. into a small purifying tube and from there forced directly into the thin-walled capillary. The Rn may be withdrawn and collected over Hg at any stage in purification. The concn. attained compares favorably with that obtained with complicated installations.

L. H. REYERSON

The separation of ionium from Fergan ore. A. N. PILKOV. Bureau of Weights and Measures. *J. Russ. Phys.-Chem. Soc.* 60, 835-41(1928).—The ore contained 0.17% Ce_2O_3 and traces of Th besides Ca, V, U, Cu, Mg, Mn, Fe and Al. U and V were removed according to the method of Meyer and Hauser ("Die Anal. der Selt. Erden," 1912, p. 237). $\text{H}_2\text{C}_2\text{O}_4$ was then added; the resulting ppt. of Ce oxalate contained adsorbed Io. The α -ray activity of this prepn. remained const. for 6 months while the intensity of penetrating rays, originally very small, further declined with time. The radioactivity was increased by igniting the oxalate to CeO_2 . The β and γ radiation is due to traces of other elements not related to Io. A scheme for the analysis of the ore is given.

B. SOYENKOFF

The counting of scintillations produced by α -particles I. J. CHARITON AND C. A. LEA. Cambridge Univ. *Proc. Roy. Soc. (London)* A122, 304-19(1929).—An app. is described which produced regular point flashes of light of known spectral constitution, the energy of the flash and the duration being controlled. The min. radiation visually perceptible was found to be 17 quanta of green line ($\lambda = 0.5\mu$) for trained observers and 30 for untrained. The effect of the duration of a flash on its perceptibility showed that for flashes of duration less than $1/100$ of a sec. the energy in the flash only was important and not the duration. The sensitivity of the observer was considerably increased under the influence of a tonic drug. II. The determination of the efficiency of transformation of the kinetic energy of α -particles into radiant energy. *Ibid* 320-34.—A detn. was made of the radiant and luminous efficiencies of various Zn sulfides when bombarded by α -particles. Surprisingly high values were obtained, namely, about 25 and 12%, respectively, the value previously reported for the radiant efficiency being about 1.5%. These high values are, however, in agreement with those calcd. from data concerning radioactive luminous paints and they were checked by two rough methods. III. Practical applications. *Ibid* 335-52.—The question of how the amt. of light entering the eye from an individual scintillation affects the no. of scintillations observed was investigated. Scintillations were observed with the naked eye, and it was found that a smaller fraction of the light from a scintillation produced a visual sensation when the eye was unaided than when a microscope was used. A partial explanation was given in view of the difference in the sizes of the retinal images in the two cases. The velocity of the slowest α -particle capable of producing a visible scintillation was measured and found to be 0.13 of the velocity of the α -particles from Ra C, in good agreement with previous results by Rutherford. The exptl. results obtained in all three parts of the paper are summarized and discussed.

MARIE FARNWORTH

Relative velocities of the α -particles emitted by certain radioactive elements. G. C. LAURENCE. *Proc. Roy. Soc. (London)* A122, 543-51 (1929).—The velocities of the α -particles from Th C and C' and Ra F have been measured by comparison of the magnetic deflections of the particles produced by a const. magnetic field with that of the α -particles from Ra C'. The sources are placed in a box, placed between the poles of an electromagnet, and contg. a photographic plate. The α -rays from different sources fall on different parts of the plate, the lines produced on the plate are measured by a microphotometer, the radii of curvature of the deflected beams are calcd. and the relative velocities thus obtained. The difficult measurement of the strength of the magnetic field is thus avoided. The velocity ratios of α -particles are found to be Ra F:Th C:Ra C':Th C' = 0.8277:0.8885:1.0000:1.0679 with a probable error of 0.05%. Taking the velocity of the α -particles from Ra C' as 1.923×10^9 cm./sec., the velocities of the α -particles from the other elements are Th C 1.709×10^9 , Th C' 2.054×10^9 , Ra F 1.592×10^9 cm./sec. W. WEST

Investigation of the ranges of the long range α -particles from Th C and Ra C using an expansion chamber. R. R. NIMMO AND N. FEATHER. *Proc. Roy. Soc. (London)* A122, 608-87 (1929).—The relative merits of the scintillation and expansion methods for measurement of ranges are discussed, and descriptions given of the use of the expansion chamber. Conclusion: Th C gives 2 groups of α particles having extrapolated ionization ranges of 11.70 and 9.90 cm. in standard air. Some tracks of greater range than 12.5 cm. were found and these are also thought to originate in α -particles from Th C. Ra C has a group of α -particles of range 9.16 cm., but tracks are also found of particles with ranges between 7.5 and 12.5 cm. The no. of long tracks is too small to show definitely whether these particles are emitted in groups of const. velocity but there are strong indications of groups of ranges 8.1 and 11.0 cm. W. WEST

Experimental study of the passage of α -rays through matter. SALOMON ROSENBLUM. *Ann. phys. [10], 10*, 408-71 (1928), cf. C. A. 22, 724. R. has continued, with improved app., previous investigations on the retardation of α rays upon passing through various metals. (1) α -rays undergo on traversing metals, a loss in velocity

according to the law: $N = K \left(1 - \frac{V}{V_0}\right) \left[1 - \log \left(2 - \frac{V}{V_0}\right)\right]$, where K is a const. characteristic of the metal traversed and a function of its at. no., V the max. per unit area of the screen and V/V_0 the ratio of final to initial velocity of the α rays from Th C'. (2) The curve of the values $\frac{dE}{dV} = \frac{m V_0^2 V}{K V_0^2} \frac{1}{2 - \frac{V}{V_0}} \frac{1}{1 - \log \left(2 - \frac{V}{V_0}\right)}$

where E is the active force of the α particle as a function of V/V_0 , has the same general form as the curve of Bragg, and the maxima of the 2 curves coincide. (3) The formula $X_p = K 36.3$ is proposed for the calcn. of the total path of α particles from Th C' in metals; the values so calcd. accord well with those found by other methods. (4) Two groups of α -rays of unit charge with approx. the same speed as the doubly charged particles were observed in the radiation from the active deposit from Th C' by the photographic method. (5) The expression $\frac{N}{\sqrt{N+4}}$ is proposed for the per cent of

retardation per atom; this formula more nearly conforms to exptl. results than those previously proposed, and the errors are less systematic. (6) An approx. accord has been found between the Bohr theory and the retardation of α -rays upon passing through screens of metals of low at. no. (7) Incidentally, it has been observed that certain substances (notably vaseline), become fluorescent under the impact of α particles and that certain metallic screens, when placed near strong sources of Th B, exhibit impressions corresponding to the image of the source. L. A. SARKER

The heat of the β - and γ -radiation of radium. A. DORANIALSKA. *Radiat. intern. acad. Polonois* A1928, 459-70; cf. C. A. 22, 1271, 23, 1888. —The heat effect of the β - and γ -radiation of Ra is detd. by means of an adiabatic microcalorimeter constructed by Swietoslowski and the author (cf. C. A. 22, 514). RaBr_2 equiv. to about 1.1 mg. Ra is used throughout. The heat is absorbed in Cu, Ag, Pb and Wood alloy calorimeters whose absorbent masses were 17.72, 27.42, 32.13 and 37.85 g. (sq. cm.), resp. the optimum heat capacity of the system was 1-4 cal. with temp. variations from 0.6 to 0.15°. The results found are: $Q_1 = 0.734$, $Q_2 = 0.690$ and $Q_3 = 0.687$ cal. per hour, where $Q_1 = q_\alpha + q_\beta + q_\gamma$, $Q_2 = q_\alpha + \frac{1}{2}q_\beta + \frac{1}{2}q_\gamma$, and $Q_3 = q_\alpha + \frac{1}{4}q_\beta + \frac{1}{4}q_\gamma$, q_α , q_β , q_γ being the heat values of α -, β - and γ -radiation, resp. Calcd. for 1 g. Ra

the heat effects are 132, 12.0 and 16.6 cal. per hr. for α -, β - and γ -radiation, resp. Thus the heat effect of the β -radiation is only 9.1%, that of the γ -radiation 12.4% of that of the α -radiation. These values, too low in regard to the theoretical ones, are due to the inclusions of Ra D and Ra E in the analyzed salt.

γ -Radiation of the radioactive elements. E. CHALFIN. *Z. Physik* 53, 130-3 (1929).—The production of γ -rays is nowadays assumed to take place in the following manner: After an electron (or in a few cases an α -particle) has left the nucleus, there follows a rearrangement of the remaining portions of the nucleus. This rearrangement is accompanied by radiation (γ -rays) whose energy equals the difference of certain nuclear energy levels. C now supposes that the larger the emitted energy (the harder the γ -rays) the more stable the resulting radioactive element should be. In other words, there should be a connection between the hardness of the emitted γ -ray and the life period of resulting radioactive element. Such seems to be the case. Furthermore, it is known that the γ -rays originate with the resulting radioactive element or after the rearrangement of the outer electron shells has taken place. There is then a certain period of retardation between the act of emission of the α - or β -particle and the γ -ray. This corresponds to the existence of an intermediate element.

The γ -rays of radium. J. A. GRAY. *Nature* 123, 241-2 (1929).—An outline of the method and the conclusions reached in the detn. of γ -ray wave lengths. These conclusions have been used in making an examn. of the results of cosmic ray expts.

GEORGE GLOCKLER

Is there a stable radium isotope in barium minerals? OTTO HAHN AND KARL DONAT. Kaiser Wilhelm Inst., Berlin Dahlem. *Z. physik. Chem., Abt. A*, 139, 143-50 (1928).—In view of the fact that Ra has an even at. no. and of the frequent occurrence of the alk. earths on the one hand and of U and Th on the other, expts. were performed to det. whether or not there existed in Ba minerals a stable Ra isotope independent of the radioactive isotopes which appear as disintegration products of U and Th. 220 kg. of BaBr₂ was concd. so that the concn. of the hypothetical Ra would be about 500,000 times its original concn. and the concentrate examd. for Ra spectroscopically. No Ra line was obtained. There was a concn. of radioactive Ra, as detd. by the electroscope but this did not reach a spectroscopically determinable amt. There is, therefore, no evidence for the existence of a stable Ra isotope in Ba minerals in an amt. greater than 2×10^{-10} g. per g. of Ba.

W. WEST

Detection of the isotopes of lead by the band spectrum method. SIDNEY BLOOMENTHAL. Univ. of Chicago. *Science* 60, 220 (1929).—A comparison was made of the band spectrum of ordinary Pb with at. wt. 207.2 contg. the isotopes 208, 207 and 206, and that of U Pb with at. wt. 206.1. The results are in good agreement with the theory on the basis of PbO as the emitter. The sepn. theoretically expected between the lines due to Pb₂₀₆O and Pb₂₀₇O near the head of the 5578.3 band is -0.37 wave no. The av. measured value was -0.43 wave no. The lines from the mols. of the lighter isotope are displaced toward lower frequencies with respect to those from the mols. of the heavier isotope.

H. F. JOHNSTONE

Contribution to the study of the isotope of lead. MME. B. PERRETTE-MONTAMAT. *Ann. phys.* [10], 10, 349-407 (1928). A comparative study has been made of the phys. properties of 2 carefully purified samples of Pb of different origins and at. wts. (one being ordinary Pb of at. wt. 207.2, the other extd. from pitchblende, with an at. wt. of 206.14) as follows: (1) Spectroscopic measurements of Merton relative to the difference of λ for a given radiation in 2 isotopes have been extended, by using an arc *in vacuo* as light source, and an interferential etalon of Fabry and Pécrot assocd. with a spectrograph having 2 quartz prisms. Results confirm the direction of the difference previously found, with diminution of the difference toward the ultra-violet; it is of the order of 0.007 Å. Å. for the Pb ray 4058, with an accuracy of the order of 0.0008 Å. Å. (2) Densities and solubilities. (a) The density of the ordinary metallic Pb was 11.336 ± 0.0004 at 0°, and that of the Pb from pitchblende was 11.278 ± 0.0004; this confirms the law of the constancy of at. vols. for isotopic elements. (b) The densities of the crystd. nitrates at 0° were 4.536 ± 0.0005 for ordinary Pb, and 4.523 ± 0.0005 for the Pb from pitchblende; these are new results and show that the mol. vols. of isotopic nitrates are also const. (c) The densities of the satd. solns. of the nitrates did not give satisfactory results, but confirmed the direction of the difference. (3) The indices of refraction of the nitrates were measured by the immersion method of Fabry; but in spite of the great sensitivity (of the order of 0.00015) no difference could be detected. The value found for n was 1.78185 at 10° for the ray 5890 Å. Å.

L. A. SARVER

Probability of excitation by electron-impact in neon. R. D'E. ATKINSON. *Proc. Roy. Soc. (London)* A122, 480-42(1929).—Results of Townsend and McCallum (C. A. 22, 2319) are analyzed by a new method derived from the quantum theory and it is shown that the mean probability of inelastic collisions is about 5%. This represents the sum of the probabilities of all the transitions that can occur at any given energy.

GREGG M. EVANS

Three-dimensional motion of an electron in the field of a non-neutral atom. M. A. HIGBAR. *Phil. Mag.* [7], 7, 31-52(1929).—On the basis of classical theory H. deduces mathematical expressions for the motion of an electron under the effect of an elec. doublet (neutral atom) and at the same time acted upon by a central charge or force inversely proportional to the square of the distance from the doublet itself.

L. H. REYERSON

Polarization of electron waves. E. RUPP. *Z. Physik* 53, 548-52(1929).—Twice-reflected electrons (120, 240, 380 v.) show no selective reflection depending on the position of the second reflector. Single Cu crystals were the reflecting surfaces. Electrons in a magnetic field behave as they do in a field-free space.

G. G.

The thermionic emission constant A. R. H. FOWLER. *Proc. Roy. Soc. (London)* A122, 36-49(1929).—The main object of the paper is to apply Nordheim's theory of the emission coeff. of electrons from metals so as to explain the remarkable relation between the consts. A and X of the thermionic emission formula, first recorded by Richardson and recently reformulated by Du Bridge. This theory regards the emission as due to the passage of electrons through simple surface potential steps and double layers, to be calcd. according to the wave mechanics. Conclusion: The theory gives a completely satisfactory account of the facts whenever it can be properly applied. The necessary conditions for its proper application are formulated. Certain apparent discrepancies in abs. magnitude between the observed and theoretical values of A are left outstanding and possible explanations of these are discussed. Though their precise cause cannot yet be specified they can certainly be explained and their existence is in no way antagonistic to the main theory.

MARIE FARNSWORTH

A case of the direct transition from ohmic to spark conduction in highly ionized gases at high pressure. RUDOLF THALLER. *Univ. Hamburg. Physik. Z.* 30, 59-61(1929).—A case is reported in which the current-voltage curve in an ionization chamber is not of the usual type, but shows a direct change from ohmic conduction to a spark discharge, with no satn. current intervening. The set-up was as described in *Physik. Z.* 29, 841-6(1928).—There was const. increase in ionization current with increasing voltage up to 35 kv., after which there was a rapid increase until, at 50 kv., there was a loud columnar discharge between the electrodes. This observation negates some of the work described in *loc. cit.*

LOUIS WALDBAUER

Ion rays. JOHANNES KAHRA. *Univ. Muenster. Ann. Physik* [5], 1, 135-66(1929).— $PbBr_2$, PbI_2 , and PbF_2 emit only neg. ions. This confirms the hypothesis that only that ion is emitted which migrates during electrolysis. The emission decreases with time and becomes const. after 20-30 mins. At 500°, pos. emission also takes place, which may be caused by the Pt wire or the decompn. of the 1st salt. Gases which penetrate into the salt loosen its lattice and increase emission. This is in agreement with the Smekal-Hevesy theory. $KClO_4$ does not emit below its m. p. (368°). Above this temp. it emits positively and to a slight extent negatively. KNO_3 and $NaNO_3$ also show no emission below the m. p. Glass emits only pos. ions. By increasing the temp., currents of 10^{-7} amp. may be obtained. The emission changes with time and reaches a const. final value.

FRANK URBAN

Time change of emission of ion rays. O. BIRKENHAGEN. *Univ. Muenster. Ann. Physik* [5], 1, No. 1, 157-68(1929).— CdI_2 in soln. transferred to a Pt wire and heated to a const. final emission value retains this value indefinitely in a vacuum. After the salt has come into contact with air, its emission is increased considerably. This is due to atm. moisture. Molten CdI_2 gave the same results. Sublimed CdI_2 acted differently. After heating it could be regenerated in a vacuum as well as by dry air, providing sublimation took place in air. Sublimed TlI_3 resembled CdI_2 . K_2CO_3 and $PbCl_2$ could be regenerated by moist air, but not $AgCl$. These facts can be satisfactorily explained by Smekal's theory.

FRANK URBAN

Probe and radiation measurements in the copper arc. W. B. NOTTINGHAM. *J. Franklin Inst.* 207, 299-314(1929).—A Langmuir probe is used in a study of normal arc between Cu electrodes to det.: (1) av. energy of electrons in the arc, (2) distribution of potential along the arc stream, and (3) pos.-ion concn. in central portion of the arc with different currents flowing. Variations in intensity of certain lines of Cu spectrum were measured for changes in arc current.

M. McMAHON

Diffraction of electrons at ruled gratings. B. L. WORSNOP. King's Coll., London. *Nature* 123, 164-5(1929).—A "collimated" beam of electrons from a coated filament was sent at a glancing angle of approx. 1° on to a ruled grating from which all light was carefully excluded. The photographic plate showed a diffracted line on each side of the directly reflected line. W. shows that the results obtained by Rupp, in which no diffracted line appeared on the small angle side of the diffracted beam, can be explained by the very small glancing angles which he used. W. W. STIFLER

Secondary electron emission from insulators. H. DAENE AND G. SCHMERWITZ. *Z. Physik* 53, 404-21(1929).—It is known from an observation by Wehnelt (*C. A.* 23, 333) that the secondary emission of electrons from an insulator decreases suddenly at a definite angle between primary beam and reflector. Klemperer (*C. A.* 22, 1903) and Joffe (*C. A.* 22, 2876) have attempted theories which are subjected to exptl. test and found wanting. A new theory assuming a neg. potential region on the surface of the reflector is developed and appears satisfactory. GEORGE GLOCKLER

Reflection of electrons on a surface where a potential discontinuity exists. O. KLIM. *Z. Physik* 53, 157-67(1929).—The problem of the reflection of an electron on a surface where a potential discontinuity exists is attacked by the methods of Dirac dynamics. According to the theory for large potential discontinuities the electrons have a probability to traverse the region of discontinuity and will arrive on the other side with neg. kinetic energy. This is a particularly striking example of the difficulty mentioned by Dirac which arises in relativistic quantum mechanics even in a purely mech. problem where no radiation processes are involved. GEORGE GLOCKLER

The structure of an electron. I. USAKI KAKINUMA. *Proc. Phys.-Math. Soc. Japan* [3], 10, 235-42(1928).—A mathematical discussion. C. H. BADGER

Sparking potential at pressures less than atmospheric. F. KLINGELFUSS. Basel. *Z. Physik* 53, 154-6(1929).—K. calcs. the elementary charge from the min. sparking potential and gives the value to 7 significant figures. GEORGE GLOCKLER

Wilson cloud chamber with carbon tetrachloride. K. PHILIPP. *Z. Physik* 53, 100-1(1929).—In order to exclude H atoms from the H_2O usually used in a Wilson cloud chamber during expts. on at. disintegration it is proposed to replace H_2O vapor by CCl_4 . The expts. tried show the new method to be very suitable. G. G.

Recombination spectra of ions and electrons in cesium and helium. F. L. MOHLER AND C. BORCKNER. *Bur. Standards J. Research* 2, 489-500(1929); cf. *C. A.* 22, 1101.—Thermionic discharges in Cs and He, adjusted to give strong continuous bands, were measured spectrophotometrically for their intensity distribution. Probe wire measurements were made of the elec. conditions. The results are explained on the basis of simple recombination. The probability of recombination is proportional to $1/\sqrt{v} - \kappa$. The relative values of probability of recombination as a function of electron energy are independent of discharge conditions. WALLACE R. BRODE

The attachment of electrons to the molecules hydrochloric acid and ammonia. V. A. BAILEY AND A. J. HIGGS. *Phil. Mag* [7], 7, 277-80(1929).—The method for the study of the attachment of electrons to mols. described (*C. A.* 20, 91) is applied to HCl and NH_3 . The results serve to indicate a certain correspondence between the probability of attachment to a given mol. and its elec. moment as deduced from variations of dielec. const. with temp. L. H. REYERSON

Production of hydrogen atoms by slow electrons. K. E. DORSCH AND H. KALLMANN. *Z. Physik* 53, 80-91(1929).—H atoms are formed in a primary electron impact with H_2 mols. when the electrons have a velocity of about 11-12 v. The effect increases considerably at 16 v. H_2 ions cause the formation of H atoms in a secondary act: $H_2^+ + H_2 \rightarrow H_3^+ + H$. A few H atoms can be detected below the resonance potential. But this point has not been investigated thoroughly. The probability of H-atom formation by exciting the H_2 mol. with 3- or 4-volt electrons to such high vibrational states that disocn. into atoms would result is very small. G. G.

The effects of an homologous series of amines on the mobilities of ions in hydrogen gas. LEONARD B. LOEB AND KARL DYK. *Proc. Natl. Acad. Sci.* 15, 146-56(1929).—Because of the measurements obtained with NH_3 in air and in H_2 in the study of the mobilities of ions in gaseous mixts. (cf. *C. A.* 21, 1222), further study was made with methylamine and propylamine. The results for pure methylamine (1) were 0.494 cm./sec. for + ions and 0.535 for — ions per v. cm. and in pure propylamine (2) at 75 mm. vapor pressure were, resp., 0.243 and 0.257 cm./sec. per v./cm. when compared with the accepted standards of air of 1.4 cm. sec. and 1.8 cm./sec. per v./cm. for + and — ions, resp. Curves are shown for H_2 + (1), for H_2 + (2) and for NH_3 in H_2 + (1) mixts. (2) in small traces adds to both + and — ions, producing a very great initial decrease of the mobility. The addn. of the amine was surprising, as NH_3

like compds. are not expected to attach to charges. The addn. of (1) in traces does not raise or lower the + mobility, while the — ion mobility is lowered considerably. Thereafter increasing amts. of the amine differ comparatively little from Blanc's law curves. Certain results obtained in this study indicated 2 mobilities could be observed for ions of the same sign in a gas at once but the authors show that such observations are false.

C. H. BADGER

Mercury lamp and radium as ionizers. Effect on electric spark. W. ROGOWSKI AND R. TAMM. *Arch. Elektrotech.* 20, 107-14(1928); *Science Abstracts* 31A, 721. — By using a cathode-ray oscillograph (*Arch. Elektrotech.* 18, 513-24(1927)) and app. similar to that previously employed (*Arch. Elektrotech.* 19, 235-56(1928)) an investigation was made of the effect of the light from a Hg lamp and of the radiation from Ra on the potential required to produce a spark between metal electrodes in air. It is shown that the Hg lamp used produced about the same effect as 7 mg. of Ra, both being about 10 cm. from the spark gap.

H. L. D

Electric breakdown in gases. W. ROGOWSKI. *Arch. Elektrotech.* 20, 99-106 (1928); *Science Abstracts* 31A, 715. — Various phenomena in connection with the elec. breakdown of gases are shown to be very difficult, if not impossible, to explain by means of Townsend's theory of the spark discharge. The effects are discussed in relation to ionization by impact and space charges. It appears probable that a satisfactory theory of elec. breakdown in gases must take account of space charge effects.

H. L. D

Electron scattering in helium. E. G. DYMOND AND E. E. WATSON. *Cambridge Proc. Roy. Soc. (London)* A122, 571-81(1929). In the previous expts. (*C. A.* 22, 1275) the curves relating the intensity of scattering of electrons by the atoms with angle of scattering were found to have sharp maxima, suggestive of diffraction maxima, as might be expected if the motion of electrons is governed by wave mechanics. This effect has not been confirmed in the present work, employing essentially the same method, and the maxima previously observed are now attributed to reflection of part of the initial electron beam at the charged glass walls into the receiving slits. The velocity distribution of the scattered electrons for a given angle of scattering and the angular distribution for given incident velocity are reported. At a const. scattering angle for each initial velocity maxima appear due to elastic collisions, and in addn. to excitation and ionization of the atom, resp. Ionization is at a max. with respect to excitation for incident electron velocities of about 200 v. The ratio of inelastic to elastic collisions increases with the incident velocity. The observed angular distribution curve for fixed electronic velocity for scattering in He agrees in form with Born's theoretical curve for H₂ calcd. for a somewhat lower voltage than was used in the He expt.

W. WEST

Photoelectric behavior of mercury during transition from the liquid to the solid state. MARGARETE GRÖTZMANN. *Ann. Physik* [5], 1, 49-73(1929). — The total photoelec. emission of Hg was found to be const. during transition through the m. p. Irrespective of light an elec. effect was noticed at the m. p. It seemed to be due to the formation of H vapors.

FRANK URBAN

Electrolytic manufacture of photoelectric cells and their application. L. MAEDEN AND E. ROSTAS. *Forsch. Lab. Tungstam Verrinigten Glühlampen und Elektricitats A. G., Ujpest.* *Z. tech. Physik* 10, 52-7(1929). — R. J. C. VAN DER HOEF

Directions of photoelectrons. PIERRE AUGER. *Compt. rend.* 187 1141-2(1928); cf. *C. A.* 22, 2317, 23, 1050. — Expts. on Mo similar to those previously performed with W have been made. Comparative Table:

Exciting Radiation	K α (0.21 A. U.)	Mo K α (0.21 A. U.)
	99°	
cos	0.313	0.169
"	3.3	1.97
"	1.31	1.32-1.41

L. D. ROBERT

Photoelectric effect of allotropic modifications of tin. A. GORTZ. *Z. Physik* 53, 494-525(1929). — The photoelec. effect is measured on molten Sn and on 2 of its allotropic modifications (β and γ tin). Photo-emission is independent of temp. as long as no change in phase occurs. A change in phase causes a change in intensity and in long wave length limit in the sense that the denser phase has the larger work function as with thermionic emission. The long wave length limits are: molten tin $\lambda_{2925} = 10$ A. U.; hexagonal (γ) Sn $\lambda_{2930} = 10$ A. U. and tetragonal (β) Sn $\lambda_{2740} = 10$ A. U. From the photoelec. m. p. curve it is shown that the hexagonal modifica-

tion is unstable below 200 20°. The efficiency (no. of electrons emitted per radiation absorbed) is discussed.

GEORGE GLOCKLER

Photoelectric emission and thermionic emission once more. EDWIN H. HALL. *Proc. Natl. Acad. Sci.* 15, 126-7(1929).—H. questions the conclusions of DuBridge that the photoelectric and the thermionic work functions of out-gassed Pt are equal within the limits of exptl. error (cf. *C. A.* 22, 1274) and also like conclusions of Warner for out-gassed W (cf. *C. A.* 21, 2424).

C. H. BADGER

Theory of galvanomagnetic effects. R. PEIERLS. Leipzig. *Z. Physik* 53, 255-66(1929).—It is shown that refinements added by Bloch (*C. A.* 23, 1564) to Sommerfeld's theory of electron cond. in metals (*C. A.* 22, 4347) give qual. correct statements concerning the galvanomagnetic effects. Especially does the new treatment give the 2 signs of the Hall effect and the order of magnitude of the resistance change of a conductor when placed into a magnetic field.

GEORGE GLOCKLER

Susceptibility and change of resistance of metals in a magnetic field. F. BLOCH. *Z. Physik* 53, 216-27(1929).—The paramagnetic behavior of electrons in a metal is investigated theoretically on the assumption that the conduction electrons are not free but are acted upon by a periodic force. It is further known that the normal resistance change suffered by metals in a magnetic field can be understood, at least as to order of magnitude, if one considers not only the Lorentz force acting upon the electrons but also the orientation they must suffer due to their intrinsic spin. Cf. *C. A.* 23, 1564 and Sommerfeld, *C. A.* 22, 4347.

GEORGE GLOCKLER

Magnetic moment of lithium atom. D. A. JACKSON. Oxford. *Z. Physik* 53, 458(1929).—Remark concerning Taylor's detn. (*C. A.* 23, 1568) of the magnetic moment of Li. T. claimed that the magnetic moment of the Li Kernel must be less than $\frac{1}{2}$ of the Bohr magneton. J. now remarks that the magnetic moment of the nucleus must be vanishingly small compared with the magnetic moment of an electron (in the ratio of 1:4000 of their masses).

GEORGE GLOCKLER

Magnetic moments of H-like atoms. F. B. PIDDUCK. Oxford Univ. *Nature* 122, 925(1929).—Polemical (cf. Breit, *C. A.* 23, 1348).

ALBERT L. HENNE

Evaluation of Debye-Scherrer x-ray pictures. G. KETTMANN. *Z. Physik* 53, 198-209(1929).—A graphical method is developed to det. the lattice const. from Debye-Scherrer pictures.

GEORGE GLOCKLER

X-ray tables. K. HERMANN. *Z. Krist.* 68, 288-98(1928).—A tabulation of all the space groups shows whether reflections are present or absent for all possible crystallographic planes.

L. S. RAMSDALL

Absorption of x-rays. H. R. ROBINSON AND C. I. YOUNG. Univ. College, Cardiff. *Nature* 123, 203-4(1929).—Attention is called to the inadequacy of the usual theories of x-ray absorption, since the "partial" absorptions of individual electron groups and sub-groups vary in a very complicated fashion with the wave length. The possible contributions in this field that might result from "magnetic spectrometry" of the secondary cathode rays from the absorber are outlined. This method has already yielded the result that the 2 K electrons of a Zn atom absorb as much, if not more, x-radiation (wave length 0.56 A. U.) as the 8 L electrons of H, although according to previous theories the L electrons of H should absorb from 4.8 to 5.2 times as strongly as the Zn K electrons.

W. W. STIFLER

X-ray absorption and valency. W. B. MOREHOUSE. *Phys. Rev.* 29, 924 (1927); cf. *C. A.* 21, 2223.—The absorption of heterogeneous x-rays by an element depends on its valency; the effect may differ for different wave lengths. If the screening const. changes, the absorption coeff. will change. With valency there must be a slight change in the electronic configuration of the atom.

B. C. A.

A new relation concerning x-ray absorption limits. S. BJÖERCK. *Z. Physik* 53, 228-33(1929).—A new empirical relation is given connecting the various absorption limits or x-ray terms one with the other. For instance, for elements from Mn (25)

to I (53) the M and N levels are connected by the relation $M(\text{III}) = [L(\text{III}) \sqrt[3]{M(\text{V})}] / (11.05)$ and others. The theoretical significance is not given.

GEORGE GLOCKLER

Secondary absorption edges in x-rays. B. H. RAY. *Nature* 122, 771-2(1928).—Nuttall examd. the x-ray absorption spectra of simple compds. like KCl and found 6 absorption edges both for the K and Cl atoms, all of which lie on the short wave length of the primary K-limit. Neither the valency nor the ionization theory adequately explains these absorption edges. Ray explains the observed phenomena as follows: In the ordinary absorption phenomena, the energy in the incident radiation is utilized in removing an electron from one of the energy levels to levels beyond the periphery of the atom. Radiation of higher frequencies is also absorbed and the

excess energy utilized in imparting kinetic energy to the ejected electron. In explaining the secondary absorption, it is assumed not only that a quantum of radiation can be absorbed by a single electron in an atom but also that the same quantum may be absorbed successively by 2 or more electrons occupying different energy levels. Those quanta which thus successively remove 2 or more electrons will be selectively absorbed, and will appear as absorption edges on the shorter-wave-length side of the primary K-limit. An example is given in explanation. L. L. QUILL

Estimation of the size of particles by means of x-rays. RUDOLF BRILL. *Z. Krist.* 68, 387-403(1928).—A comparison of the methods of Scherrer and of von Laue for detg. the size of small particles from the broadening of the spectral lines. The former method is useful only for relatively small particles with strong absorption. L. S. RAMSDELL

K x-ray levels of light elements. V. DOLEJSEK AND G. P. PESTRECOV. *Z. Physik* 53, 566-73(1929).—The ν/R values (ν = term value, R = Rydberg const.) can be represented empirically as a function of at. no.: $\nu/R = aN + bN^2 + cN^3 + dN^4$, where a , b , c and d are consts. and N is at. no. (from 12 to 30). The differences between the calcd. and exptl. values show periodic fluctuations. GEORGE GLOCKLER

Scattering of x-rays on graphite. W. EHRENBURG. *Z. Physik* 53, 234-6(1929). The Compton effect on graphite shows only the unmodified and the Compton line. E. cannot obtain any other scattered radiation as has been reported by Davis and Mitchell (*C. A.* 23, 765) who obtained 3 other lines which they ascribed to an excitation of the C atoms by the incoming quanta on the order of a Raman effect. G. G.

Use of the under-water spark with the Hilger sector photometer in ultra-violet spectrophotometry. H. J. McNICHOLAS. *Bur. Standards J. Research* 1, 939-49(1928).—The advantage of high-voltage discharge under water over arcs and sparks in air or other gases lies in the continuity and uniformity of its spectrum. This is most suitable for quant. spectrophotometric measurement and enables the accurate location of sharp absorption bands. The general theory of this method and a description of the app. have been given in *Bur. Standards, Sci. Paper* No. 440. M.'s description of the improved source of spark is intended for those contemplating the design and installation of similar equipment. The spark terminals are inclosed in a hard-rubber box, through which a stream of distd. water circulates. External adjustments are provided for the length of the spark gap and its position relative to the axis of the optical system. The effect of the dispersion introduced by the biprism and wedges of the sector photometer is discussed in its relation to the spark adjustment. M. suggests certain modifications in the photometer construction. A. J. MONACE

Broadening of spectral lines. B. TRUMPF. *Z. Physik* 53, 57-60(1929). The following causes may contribute to the width of a spectral line: (1) Doppler effect, (2) effect of inter-mol. fields, (3) dampening of radiation, (4) broadening due to impact, and (5) coupling factor. Another effect may be the interaction of radiation and kinetic energy described by Oldenburg (*C. A.* 23, 562), which may account for certain asymmetry of spectral lines noted when inert gases are present in the light-emitting vapor. GEORGE GLOCKLER

Duplicity of D terms in sodium and potassium. A. FRACHMIN AND S. FRISCH. *Z. Physik* 53, 326-30(1929).—The K lines, $2^2P_{1/2} - 5^2D_{5/2}$ 5832 and $2^2P_{1/2} - 6^2D_{5/2}$ 5360, have a weak satellite on their short-wave-length side. These satellites come from the duplicity of the $2D$ terms. The order of the $2D$ terms is reversed. $\Delta 5^2D_{5/2} = 0.62 \text{ cm.}^{-1}$. $\Delta 6^2D_{5/2} = 0.24 \text{ cm.}^{-1}$. The Na line $2^2P_{1/2} - 4^2D_{5/2}$ 5888 appears single with the optical equipment used. $\Delta 4^2D_{5/2} = 0.1 \text{ cm.}^{-1}$. The results are discussed from the point of view of regular doublet theory. G. G.

Width of resonance lines and displacement to the red due to multiple scattering. W. ORTMANN AND P. PRINGSHEIM. *Z. Physik* 53, 367-70(1929).—If the form of the spectral lines is mainly detd. (in a given discharge) by Doppler effect and impact damping, it is shown that a line reversal can take place through multiple scattering and without true absorption. However, under these conditions there cannot take place unsymmetrical displacement toward the red of the energy removed from the center of gravity due to successive Compton effects. This last effect can, however, take place if classical damping of the radiation alone is operative. A certain discussion by Fests (*C. A.* 21, 3555) of some work by Stuart (*C. A.* 19, 2009) concerning extinction of Hg resonance is criticized. GEORGE GLOCKLER

Optical properties of turbid solutions of non-metallic particles and some details of the Pulfrich step photometer. URSULA MÜLLER. *Ann. Physik* [5], 1, 229-59(1929).—The application of the Pulfrich step photometer to the measurement of absorption and lateral radiation is discussed at some length. Beer's law is tested and

found to apply over a wide range although it does not hold for very strong initial solutions. It is found that the ratio of absorption to concn. increases with concn. Depolarization measurements and observations on lateral radiation as a function of concn. are given for solns. of *mastic* and *gamboge*. J. B. AUSTIN

Use of crystalline quartz for spectrographic work. JOSEPH W. ELLIS. Univ. Calif. *J. Optical Soc. Am.* 18, 82-8(1929).—The presence of certain minima in the absorption bands of org. compds. in the infra-red is shown to be caused by a polarization effect in the quartz end plates. This effect can be enhanced or annulled by the introduction of a plane parallel glass in certain positions in the optical path. It is pointed out that considerable error in the measuring of relative intensities in the ultra-violet may result from this effect. WALLACE R. BRODE

Structure of multiplet S—states in diatomic molecules. H. A. KRAMERS. *Z. Physik* 53, 422-38(1929).—The unusual sepn. of the rotation levels of the 3S normal state of O_2 found by Mulliken (*C. A.* 22, 4063) can be explained theoretically if the mutual effect of the electron magnets is taken into consideration. G. G.

Intensity of forbidden lines. A. RUBINOWICZ. *Z. Physik* 53, 267-73(1929); cf. *C. A.* 23, 1053.—Quantum mech. relations for intensity and polarization for all transitions in the one-electron problem in a force field of spherical symmetry. GEORGE GLOCKLER

Investigations in the light-quantum theory. TOKIO TAKEUCHI. *Z. Physik* 50, 697-700(1928).—The Schrödinger wave equation for the motion of an electron is applied to the calcn. of the n s of a medium in a gravitational field, of the no. of light particles per unit vol., to the deduction of Brewster's law, and to superdispersion. W. W.

Isotope effect in iodine monochloride bands in neighborhood of the convergence. G. E. GIBSON. *Z. Physik* 50, 692-6(1928).—New absorption bands are found for ICl which have the same convergence frequency within the limits of the error of extrapolation as those previously reported. This new series is assumed to originate in ICl_7 . The theory of the isotope effect for harmonic oscillators according to the older quantum theory is generalized to include anharmonic oscillations of high quantum no. and found to give the correct relative positions of the vibrational terms of the 2 isotopes. W. WEST

Series in the arsenic VI spectrum. P. PATTABHIRMIAH AND A. S. RAO. *Z. Physik* 53, 587-91(1929).—Systematic assignment and arrangement of lines into series. GEORGE GLOCKLER

Spectrum of doubly ionized krypton. D. P. ACHARYA. *Nature* 123, 244(1929).—The strong group of lines about the wave length 3250 belongs to Kr^{++} , although a no. of irregularities are revealed. Data, so far obtained, are listed. F. V. J., JR.

The spectrum of doubly ionized potassium, K III. T. L. DE BRUIN. *Verslag Akad. Wetenschappen Amsterdam* 37, 984-91(1929).—Starting from the spectra of the neutral Cl atom, Cl I and of the mono-ionized A atom, A II, and by the use of the regular and irregular doublet law, B. derives the principal energy levels of the doubly ionized K atom, K III. Some regularities are recorded in the seven-electron systems F I, Ne II, Cl I, A II and K III. Also in *Science* 69, 47-8(1929). G. CALINGAERT

Spectrum of doubly ionized bromine. SURESH CHANDRA DEB. *Nature* 123, 244(1929).—The method of locating spectra by the horizontal comparison method of Saha and Majumdar being followed, the spectrum lines of doubly ionized Br were located. FRANK V. JOHNSON, JR.

Further triplets of trebly ionized arsenic (As IV). K. R. RAO. *Nature* 123, 244(1929).—Two more triplets were found due to As IV. FRANK V. JOHNSON, JR.

The theory of light scattering in liquids. C. V. RAMAN. *Phil. Mag.* [7], 7, 160-1 (1929); cf. *C. A.* 22, 2311.—A reply to the criticism of Rocard (cf. *C. A.* 22, 4065) and a defense of the priority claims of Raman and co-workers. L. H. REYERSON

The intensity of the scattered light from an unpolarized beam. W. S. STILES. *Phil. Mag.* [7], 7, 204-5(1929).—S. points out that Rayleigh inadvertently omitted a factor of $1/2$ in the expression for the intensity of scattered light from an unpolarized beam. The expression should be

$$\frac{A^2 (D' - D)^2}{8 D^2} (1 + \cos^2 \theta) \frac{\pi T^2 r^2}{\lambda^4 r^2}$$

where A^2 is the intensity in the primary beam and n the no. of particles in the given vol. element. The other terms have their usual significance. Rayleigh himself does not use the expression in later work; so the error is not propagated. The uncorrected result, however, has been copied in several standard works such as Wood's *Physical Optics*. L. H. REYERSON

Theory of the diffusion of light by a substance placed in an electric or a magnetic field. YVES ROCARD. *Ann. phys.* [10], 10, 472-88(1928).—Mathematical. Optical anisotropy is necessary, without which orientation effects disappear. Changes in intensity and polarization called for by theory are very small for exptl. observation at ordinary temps., but valuable results may be expected from work at low temps. L. A. S.

Reflecting power of beryllium, chromium and several other metals. W. W. COBLENTZ AND R. STAIR. *Bur. Standards J. Research* 2, 343-54(1929).—Data are presented on the ultra-violet reflecting power of various metals—Be, Cr, Co, Ni, Ag, speculum, stellite and stainless steel. For Cr and Be the observations extend into the infra-red. The observations show that contrary to the general experience with other metals, Be has a high reflectivity at 250 m. in the ultra-violet, followed by an appreciably lower reflectivity with a min. at about 400 m μ in the visible spectrum. Cr has a higher reflectivity than Ni in the ultra-violet and is, therefore, the more efficient as a reflector of ultra-violet radiation. The reflectivity of Cr is conspicuous for its relatively high max. (70%) at 425 m. followed by a wide, flat min., which extends from about 600 m. in the orange to wave lengths beyond 2000 m. in the infra-red.

G. CALINGAERT

The change in cathode-ray spectrum of nitrogen on cooling with liquid air. JONAS TAN AARS. *Ann. Physik* [5], 1, 216-28(1929).—It is shown that the distribution of intensity of the lines in the spectrum of N is not dependent on the gas pressure and the velocity of the cathode rays but is a function of the temp. alone. It is hoped that this method for detg. the temp. may prove of value in investigating the northern lights.

J. B. AUSTIN

Beryllium spectrum in the region λ 3367 1964. S. N. BOSE AND S. K. MUKHERJEE. *Phil. Mag.* [7], 7, 197-200(1929).—B and M obtained the arc spectrum of Be under different conditions of excitation. The following lines, λ 2351, 2175, 2126, 2056 and 2033, which are given as singlets by Millikan and Bowen, appear clearly as doublet but are probably triplets. A band spectrum was found with bands degraded to the red but the fine structure was not measured.

L. H. REYERSON

The infra-red emission spectra of the Bunsen and allied flames. C. R. BAILEY AND KUN-HOU LIH. *Univ. Coll., London. Trans. Faraday Soc.* 25, 29-32(1929). A sensitive thermopile-galvanometer combination in conjunction with a rock salt prism spectrometer was used to observe the infra-red spectra of the Bunsen flame and of the Meker burner in the region from 1 to 7 μ . The max. recorded are tabulated and for comparison are given those already detd. for CO, H and CH₄. The shifts which occur for the max. are attributed to the differences in temp. of the burner, the H₂O bands becoming of shorter wave length with increasing temp., and the CO bands becoming longer with increasing temp. Further, the intensity ratio of the bands at 2.8 and 4.5 μ was observed to vary greatly from flame to flame. C. C. K.

The infra-red emission spectra of the separated cones in the methane and Bunsen flames. C. R. BAILEY AND KUN-HOU LIH. *Univ. Coll., London. Trans. Faraday Soc.* 25, 32-6(1929).—The exptl. procedure described in the preceding abstr. was used to record the emission of the inner and outer cones of the CH₄ and Bunsen (total gas) flames from 0.5 to 8 μ . The max. observed are tabulated and the intensity ratios of the bands at 4.46 and 2.85 μ are given. From these data it is seen that radiation from the newly formed H₂O mole is much more intense in the inner than in the outer cone. No emission was observed from the newly formed CO mole in the inner cone. In the CH₄ spectra an emission band at 3.35 μ is attributed to thermal emission from the heated CH₄. C. C. K.

The series of the arc spectrum of tin. ADOLFO T. WILLIAMS AND FLORENTO CHACOLA. *Univ. of La Plata. J. phys. radium* VI 9, 377-85(1929).—A revision is made of the classification of the arc spectrum of Sn. With the aid of series formulas of the Hicks type it has been possible to establish the identity of hitherto unidentified terms and to find several new ones. Further, deep terms have been detected of which it is not possible at present to give the exact identification. The term structure is graphically shown by a Grottrian diagram and is seen to be in harmony with the requirements of Hund's theory. A list of all the classified lines from 5231 A. U. to 1756 A. U. is given. C. C. K.

The absorption spectra of the vapors of tin, silver and manganese from 5500 A. U. to 2140 A. U. R. G. LOYALTE AND A. T. WILLIAMS. *Univ. of La Plata. Pap. Z.* 20, 66-75(1929).—The absorption spectra of the vapors of Sn, Mn and Ag were photographed in the region 5500 A. U. to 2140 A. U., the observations being made through a range of temps. from 1200° to 2200°. The source of continuous light was a H discharge tube of special design. The absorption lines observed for Sn represent com-

binations of various higher terms with the 3 lowest terms 1S , 1D and 3P of Sn I; for Mn the lines observed represent combinations of higher terms with the basic term 4S of Mn I. For Ag, however, lines characteristic of Ag^+ were obtained in addn. to the doublet $1^3S_0 - 2^3P_{1/2}$ of Ag I.

C. C. KIESS

Stark effect of helium 2P-6D line by quantum mechanics. YOSHIO FUJIOKA. *Sci. Papers Inst. Phys.-Chem. Research* (Tokyo) 10, 99-106(1929).—(In English.) The components and their intensities in the Stark effect for the He line $2P - 6D$ at 4144 Å. U. are calcd. on the basis of the quantum mechanics. The results are presented in tabular form and are illustrated by a graph which is compared with a photograph of the line obtained by the Lo Surdo method with a max. field of 9.8×10^4 v./cm.

C. C. KIESS

The absorption spectrum of carbon disulfide in the near ultra-violet. EARL D. WILSON. *Ohio State Univ. Astrophys. J.* 69, 34-42(1929).—White light from an under-water spark was passed through CS_2 under a variety of conditions, such as different lengths of absorbing column, and different vapor pressures, to det. those most favorable for bringing out the absorption bands. From spectrograms obtained with a quartz spectrograph about 650 wave lengths were measured between the limits 3800 Å. U. and 2900 Å. U. in the ultra-violet. The intensities of the lines were estd. from curves obtained with a microphotometer. Some of the lines appear to be related through conf. wave-no. differences and these have been grouped into tentative series.

C. C. KIESS

The spectrum of the aurora borealis. JOSEPH KAPLAN. *Univ. of Calif. Science* 69, 296-7(1929).—Two weak lines of wave lengths 5176 Å. U. and 5149 Å. U. in the auroral spectrum are accounted for on the assumption that N atoms in the 3D state transfer their energy of 2.38 v. to N mols. in the metastable states A_0 and A_1 through collisions of the second kind. The mols. now raised to the B_0 and B_1 states, radiate the bands with heads at wave lengths practically coincident with those given above.

C. C. KIESS

Stark effect in neon. J. S. FOSTER AND W. ROWLES. *Phys. Rev.* 29, 925 (1927).—The observed symmetrical Stark patterns for the line groups of higher order were remarkably H-like in character. Each of the lines $2p_i - 4f$ and $2p_j - 5f$ appears as a doublet, and the 2 members of the doublet present nearly identical Stark effects.

B. C. A.

Relation intensities of the Stark effect components of $H\alpha$, $H\beta$ and $H\gamma$. H. MARK AND R. WIERL. *Z. Physik* 53, 526-41(1929).—See C. A. 23, 767.

G. G.

The spark potential of air in narrow channels. A. GYEMANT. *Siemens Schuckert A. G., Berlin. Naturwissenschaften* 17, 135(1929).—For electrode distances of 0.1 to 1 mm. the spark potential of air is up to 20% above the normal value if detd. in the thin air channels which occur in insulating masses with a ratio of channel diam. to channel length of at least 1:10. No retardation effect is believed to cause this; the values are well reproducible; irradiation with ultra-violet light does not influence it; the values are equally high during rapid repetitions. The explanation given by G. is energy absorption by the walls of the channel from deviating electrons.

B. J. C. VAN DER HOEVEN

The arc and spark spectra of the halogens. LEON BLOCH and EUGÈNE BLOCH. *Nature* 122, 171(1928).—The authors have given a complete sepn. of the arc and spark spectra, as well as a division of the latter into spectra of the first and second orders, for Cl, Br and I.

FRANK V. JOHNSON, JR.

Absorption of ultra-violet light by the glucosans. I. KWIECINSKI AND L. MARCILEWSKI. *Bull. intern. acad. Polonaise* 1928A, 263-9.—Since the glucosans are anhyd. glucoses possessing 3 rings, they could be expected to show selective absorption. β -Glucosan, m. 167°, $[\alpha]_D^{18} = -66.0^\circ$, showed an absorption band about $\lambda = 2700$. Recrystn. raised the m. p. and lessened absorption markedly and a second recrystn. brought the m. p. to 179.5° and eliminated all traces of an absorption band. Distinct and strong absorption by the mother liquors proved the original absorption to have been due to impurities which were removable by recrystn. α -Glucosan (unknown purity), m. 108-9°, $[\alpha]_D^{21} = +69.40^\circ$, gave a distinct absorption band at $\lambda = 2800$. This band may appertain to the pure α -glucosan but if due to impurities, it follows that they are not the same as those which produced absorption in the former case.

C. H. PEAR

The absorption of ultra-violet light by the inversion products of sucrose. I. KWIECINSKI AND L. MARCILEWSKI. *Bull. intern. acad. Polonaise* 1928A, 257-61. —Though neither reducing nor non-reducing carbohydrates show selective ab-

sorption of ultra-violet light when very pure, impurities generally present cause a band in the region $\lambda = 2700$ – 2800 . Fructose is an exception in that it has not been susceptible of sufficient purification to eliminate this band completely. Since *d*-glucose shows none and *d*-fructose only a very faint absorption band, the spectrum resulting from the inversion of very pure cane sugar should be predictable; but it is not, because glucose or fructose or both undergo changes which result in strong selective absorption in the vicinity of $\lambda = 2800$. The identity of the compd. causing the observed absorption band is not known but it can hardly be methylglyoxal since this has an absorption differing in position and structure from that observed. C. H. PEET

Absorption of ultra-violet light by arabinose, maltose, sucrose and raffinose and by mannitol and dulcitol. L. KWIECINSKI AND L. MARCHELEWSKI. *Bull. intern. acad. Polonaise* 1928A, 271–82.—*l*-Arabinose (?)—written "d" on fig. 1—impure, m. $146-7^\circ$, $[\alpha]_D^{17} = 88.85^\circ$, showed a band at $\lambda = 2800$; recrystd. thrice, m. 155° , $[\alpha]_D^{17} = 103.54^\circ$, showed no selective absorption. Maltose (com. "Maltose pur cryst.") E. de Haën, $[\alpha]_D^{20} = +136.36^\circ$, gave an absorption band at $\lambda = 2800$ which disappeared after 3 recrystns. The recrystallized product gave $[\alpha]_D^{20} = 136.84^\circ$. Sucrose—four samples from various sources but all of high purity—varied in transparency to transmitted ultra-violet light, but showed no selective absorption. Raffinose (com. E. Merck) recrystd. thrice from 50% alc., m. 81° , $[\alpha]_D^{15} = +105.4^\circ$, showed no absorption band. Mannitol (com. E. Merck) recrystd. thrice from 66% alc., m. 166° , gave no absorption. Dulcitol (com.) recrystd. thrice from 66% alc., m. 186° , showed no band. Previously reported absorption bands for reducing carbohydrates by other observers must have been due to insufficient purification. C. H. PEET

Absorption of calcium fluorides. STEPH. VAN DER LINGEN. *Z. Physik* 53, 581–6(1929).—The absorption of South African fluorite is compared with that of fluorite from England. Hilger's Infra-red spectrometer Type D 42 was used. G. G.

Absorption measurements in the principle series of cesium. F. WAIBEL. *Z. Physik* 53, 459–82(1929).—The broadening due to the vapor pressure of the emitting vapor of Cs is measured for pressure from 10 to 32 mins. The intensities in the principal series of Cs are detd. (5th to 14th series member) by making absorption measurements, a photographic photometric method being used. A large asymmetry is noted for the absorption of the lower series lines. The asymmetry disappears for higher no., beginning with line No. 10. The broadening is found approx. proportional to the square root of the vapor density. The half width decreases with increasing series no. but becomes const. for the higher series nos. The half width of the strong components is markedly greater than for the weaker ones. The intensity ratio of the components of the 5th and 6th doublet is detd. Total absorption, no. of resonators per atom and transition probabilities are measured absolutely from the 5th to the 14th series no. A microphotometer is described. GEORGE GLOCKLER

The absorption of ultra-violet radiation in ozone. A. LAUCHLI. *Z. Physik* 53, 92–4(1929).—The absorption of O_3 is detd. with the spectroscopic refinements possible today. The empirical relation of the absorption coeff. (α) as a function of wave length is found to be: $\log \alpha = 16.74 - 0.0536\lambda$ (λ in $m\mu$). Fabry and Buisson had found: $\log \alpha = 17.58 - 0.0564\lambda$ (C. A. 7, 2153). GEORGE GLOCKLER

Infra-red radiations of active nitrogen. P. K. KICHLU AND D. P. ACHARYA. *Proc. Roy. Soc. (London)* A123, 168–71(1929).—See C. A. 22, 3355. E. C. M.

Comparison of the absorption of water and quartz in the extreme ultra-violet. K. TSUKAMOTO. *Rev. d'optique* 7, 89–108(1928); *Science Abstracts* 31A, 613.—The detns. were made by the method of photographic photometry. A series of photographs, using const. exposure, were obtained on one plate using a source of const. intensity and weakened in successively known proportions. The effects produced by the water and quartz were compared with these standard spectra and their absorption coeffs. then compared. To obtain a source of const. intensity in the desired region 1830–2300 Å. U. a condensed spark discharge between metallic electrodes was used and a metallic grating used to reduce the intensity of the illumination. For water and quartz the absorption found for various wave lengths between 2200 and 1829 Å. U. is tabulated. For water the values are smaller than those found by Kreusler, while for quartz the values exceed Pfleger's. The wave-length-absorption curves for these 2 substances intersect for $\lambda = 1999$ Å. U. Water is very transparent for $\lambda > 1950$ Å. U. but below this value it decreases rapidly. The absorption of quartz increases slowly from 1890 to 2300 Å. U. H. L. D.

The transformation spectrum of the ruby. E. L. NICHOLS AND H. L. HOWES. *Proc. Natl. Acad. Sci.* 15, 139–45(1929).—A summary of the characteristics of the

luminescence of the ruby under cathodo- and under photo-excitation is given. A synthetic ruby with fairly smooth faces was mounted on an alundum splinter and heated to over 1000°. At this temp. the spectrum was continuous but no narrow emission bands were noticed. However, during repeated heatings and coolings of the crystal 21 narrow emission bands, called the transformation spectrum, were counted between 0.780 μ and 0.426 μ . The temp. range was studied under a prepd. black-body radiation by means of an optical pyrometer and found to be approx. 600° to 775° in the red. This corresponds to profound changes in the absorption of light in the ruby. No obvious relationship was found between the transformation spectrum and the bands of fluorescence and absorption mapped by DuBois and Elias, but when wave nos. ($1/\mu \times 10^3$) were taken instead of wave lengths both fell into sets having a common frequency interval of 36.7.

C. H. BADGER

The Raman spectra of scattered radiation. W. W. COBLENTZ. *Phil. Mag.* [7], 7, 203-4(1929).—C. gives a table comparing his measured values of the infra-red absorption bands for benzene and calcite with those calcd. by Raman and Wood from the frequency difference between the exciting line and the Raman line. The agreement is good.

L. H. REYERSON

Raman effect with hydrochloric acid gas: the "missing line." R. W. WOOD. *Nature* 123, 279(1929).—A Cooper-Hewitt lamp about 5 ft. long was placed parallel to and in contact with a tube contg. HCl gas at atm. pressure. A cylindrical reflector of highly polished Al was in contact with, and completely surrounded, the tubes. With this arrangement the temp. rose to about 100. With an exposure of 24 hrs. a sharp, distinct line was obtained at 4581 A. U. On the assumption that this modified line is excited by the Hg line 4046, the frequency difference corresponds to a line in the infra-red at 3.47 μ , almost exactly at the center of the vibration-rotation band. This identifies the line as the so-called "missing line" corresponding to a vibration transition unaccompanied by a change of rotation. Six lines have also been obtained immediately on the long-wave-length side of 4358.

W. W. STIFLER

Raman lines from hydrochloric acid gas. R. W. WOOD. *Nature* 123, 166(1929).—By using a long end-on tube excited by a parallel Cooper-Hewitt Hg arc with Al reflectors, the modified lines of gaseous HCl were obtained at atm. pressure, corresponding to the vibration-rotation absorption band at 3.6 μ .

W. W. STIFLER

Apparently anomalous Raman effect in water. JOSEPH W. ELLIS. *Nature* 123, 205-6(1929).—The Raman scattering by H₂O mols. yields only one modified frequency corresponding to the infra-red band at 2.90 μ . This seems anomalous since (1) the modified line is really a broad band in contrast to the sharp Raman lines produced by org. liquids; and (2) there is no infra-red band corresponding exactly with the center of the observed scattered band, the nearest one being 3.0 μ . E. explains these results by pointing out that the 3.0 μ band is probably double, being made up of an overtone of the 6.1 μ band and a new fundamental with wave length 2.9 μ . This makes the behavior of H₂O analogous to that of NH₃ in aq. solu. and various org. liquids. The comparatively great breadth of the scattered line is shown to be consistent with that of the infra-red bands of H₂O.

W. W. STIFLER

The width of the lines in the Raman spectrum of benzene. WALTER GERLACH. *Ann. Physik* [5], 1, 301-8(1929).—The Raman lines are not sharp but are diffuse. On account of the great intensity difference between the middle and the edge of the line it is not possible to det. the width directly; so round-about methods must be used. In regard to the structure of the infra-red bands of benzene it is indicated that they are not composed of unresolved vibrations of the same sort with a small frequency difference but are made by a principal frequency raised or lowered by a no. of secondary long-wave vibrations. Measurements of the widening of the Raman lines gives no data on the frequency differences of these long-wave vibrations.

J. B. AUSTIN

Intensity and temperature dependence of quartz-scattered light. G. LANDSBERG AND M. LEONTOVICH. *Z. Physik* 53, 439-48(1929).—The intensity of the most prominent red satellites of light scattered by quartz reaches 40% of the intensity of the principal line. With increasing temp. the intensity of this red satellite remains practically const., the intensity of the principal line increases proportionally to $\sqrt{\text{temp.}}$ and the intensity of the violet satellite increases still faster.

G. G.

Raman effect with quartz. M. CZERNY. *Z. Physik* 53, 317-25(1929).—See C. A. 23, 1812.

GEORGE GLOCKLER

The production of new radiations by light scattering. I. C. V. RAMAN AND K. S. KRISHNAM. *Proc. Roy. Soc. (London)* A122, 23-35(1929); cf. C. A. 22, 2707; 23, 37. The modified scattering exerted in C₂H₄, C₂H₂-CH₃, and CCl₄ by the 4358 group

of Hg lines is reported in detail. Satisfactory agreement is considered to exist between the infra-red frequencies calcd. from the modified frequencies and those obtained by direct measurement in the infra-red; moreover, the Raman spectra of $C_6H_6 \cdot CH_2$ and CCl_4 contain lines corresponding to hitherto unknown infra-red bands extending as far as 46μ in a region not readily accessible by direct measurement. Anti-Stokes lines are found in all 3 spectra, most conspicuously in that of CCl_4 . The unmodified lines are accompanied by a nebulosity, particularly strong in benzene, the origin of which is suggested to lie in a Raman effect between the pure rotational frequencies of the mol. and the incident frequency. All the unmodified lines are polarized to practically the same extent; the modified lines corresponding to a given frequency shift are polarized to the same extent, but differ in polarization from the unmodified, the modified lines corresponding to different frequency shifts are differently polarized, the anti-Stokes lines are polarized to the same degree as their long-wave companions, the continuous modified spectrum in Am alc. is strongly polarized. A tentative explanation of these effects is given. Preliminary qual. observations indicate that the intensity of modified scattering changes with wave length of the exciting line even more rapidly than according to an inverse 4th power law. W. WEST

Method for the measurement of weakly elliptically polarized ultra-violet light. G. SZIVESSY AND CL. MUNSTER. *Z. Physik* 53, 13-51(1929).—General discussion of elliptical polarization and description of a spectropolarimeter especially suited for the measurements in question. GEORGE GLOCKLER

Relation between luminosity and concentration in luminescent solid solutions. J. EWLERS. Univ. Leeds. *Proc. Leeds Phil. Lit. Soc., Sci. Sect.* 1, 341-5(1929).—A soln. of Bi in CaO being used the curve obtained from the intensity of luminescence and concn. of Bi in CaO, shows 2 maxima. This would require a formula of $I = Ae^{-n_1r} + Be^{-n_2r}$ to represent the luminescent intensity, where A , B , n_1 and n_2 are consts. and r is the concn. of Bi. The exptl. evidence supports the view that a luminescent solid soln. consists of a no. of active atoms distributed at random in a transparent lattice and that the luminescent center consists of 1 atom of active metal associated with a definite no. of lattice points. WALLACE R. BRODE

Influence of the walls on gas phosphorescence. MARIA MAJEWSKA AND W. BERNHARDT. *Z. Physik* 48, 137-40(1928); *Science Abstracts* 31A, 586-7. As a supplement to the work of Herzberg (*C. A.* 22, 1911) on the phosphorescence of N and O and the influence of the walls thereon, a few of the authors' previous results are given again. It is not sufficient to choose the pressure and excitation conditions, the tube must be "prepd." in a definite way. Conclusion: The walls are covered with some unknown gas (possibly N_2O_4) which catalytically decomposes the gas in the tube. H. L. D.

Theory of sensitized fluorescence. A. CARRELLI. *Z. Physik* 53, 210-6(1929). It has been known through the work of Cario and Franck (*C. A.* 18, 2288) and Bontler and Josephi (*C. A.* 21, 3021) that the most probable transfer of energy during a collision of the second kind is that transfer in which the exciting atoms and the to be excited system have nearly the same energy. C. derives this same result theoretically from considerations of Schroedinger wave-mechanics. GEORGE GLOCKLER

Photochemical studies. I. J. HOUERN AND W. FISCHER. *Arch. bot. series Land. Forstw.* 15, 601-8(1928). Photochem. decompn. of water into H and H_2O_2 or synthesis of CH_2O from CO_2 and water, could not be detected. CH_2O in ultra-violet light affords strongly reducing substances (pentoses); MeOH and KNO_3 produce formhydroxamic acid, which is rapidly decomposed by CH_2O in light. Neither purine substances nor α -amino acids were detected. Instead of alkaloid which Baly claims to have isolated, alkylamines giving the usual alkaloid reactions were obtained. B. C. A.

Refraction of beams of molecules. I. I. RABT. Univ. of Hamburg. *Zeit.* 123, 163-4(1929).—A modification of the Gerlach and Stern expt. is discussed for the case of a beam of alkali atoms shot into a uniform magnetic field at right angles to the lines of force. Such an arrangement is analogous to the case of refraction of light on passing from one homogeneous medium to another, and avoids the difficulties attendant upon measuring the gradient of an inhomogeneous magnetic field. The equation for the total deviation is deduced and it is shown that a measurable deflection should be obtainable. Similar considerations apply to a beam of atoms projected through the elec. field of a parallel-plate condenser. The complete discussion, with exptl. details is to be published in the *Zeit. f. Physik*. W. W. STIEGLER

Photochemical union of hydrogen and chlorine. A. J. ALLMAND AND EDWARD BUNNAY. King's Coll., London. *Nature* 123, 184(1929).—The photochem. union

of H_2 and Cl_2 was investigated for moist electrolytic gas, with special attention to the effects of intensity and wave length, monochromatic light from a quartz Hg lamp being used. The results for variations in intensity confirm the previous work of Mrs. M. C. Chapman, Kornfeld and Steiner, and Marshall. For the wave lengths 260, 313, 365, 405, 436 and 546μ the corresponding quantum efficiencies were found to be 0.10, 0.49, 0.53, 1.00, 0.67 and 0.22, resp. The sensitivity of the gas corresponded to a yield of approx. 200,000 HCl mols. per quantum of absorbed light. Expts. at 19.7° and 25° showed a small but definite increase in the relative temp. coeffs. of quantum efficiency for wave lengths between 313 and 436μ . When 2 monochromatic beams were allowed to act simultaneously, the results were additive. W. W. S.

Dissociation of hydrogen by collisions of the second kind. JOSEPH KAPLAN. Univ. of Calif. *Nature* 123, 162-3(1929).—A new explanation is offered for the Cario and Franck expt., based on the new 1^3S level for the H_2 mol. recently computed by Heitler and London. It is assumed that a collision between an excited Hg atom and a normal H_2 mol. results in the excitation of the H_2 mol. from the 1^1S to this new 1^3S level. The potential-energy curve in this level has no min. Hence this state is unstable and dissoen. immediately results. W. W. STIFLER

Zinc oxide and chlorophyll as optical sensitizers. JAKOB BÖHL. Tech. Hochschule, Zürich. *Helv. Chim. Acta* 12, 121-53(1929).—The source of radiation for these expts. was an Osram-Nitra lamp of 3000 c. p. Prussian blue in the presence of Zn oxide in water is converted into Berlin white. According to Baur's theory the photosensitizer acts as an oxidizing and reducing agent just as the 2 electrodes of an electrolytic cell, giving rise to oxidation and reduction products. With an anodic depolarizer such as grape sugar, B. found that there was a slight increase in the amt. of Prussian blue reduced. (Tables are given.) The photolysis of $CuSO_4$ in binary and ternary solns. is very interesting; in the first case CuO is formed; while in the presence of an anodic depolarizer the cupric ion is reduced first to cuprous and then to metallic Cu. (Exptl. details are fully explained.) Moist ZnO and a mixt. of H_2 and O_2 when illuminated result in the formation of H_2O and H_2O_2 . Some 25 dyes in MeOH soln. are reduced by illumination in the presence of chlorophyll. Oil of turpentine acts as an anodic depolarizer in such cases. Piperidine and phenylhydrazine were used in like manner. A considerable bibliography is given. All of the observed phenomena are related by B. to Baur's theory. WILLIAM E. VAUGHAN

The action of ultra-violet rays on the formation of sugars and of aldehydes from solutions of bicarbonates and carbon dioxide in the presence of reducing and colloidal catalysts. GIUSEPPE MEZZADROLI. *Rev. ind. agr. Tucumán* 19, Nos. 5-6, 154-9 (1928).—A Hg vapor lamp, "Original Hanau," was used, with an a. c. of 3.8 amp., 220 v., emitting 2000-6000 A. U. Much O_2 was formed on the surface of the liquid, oxidizing org. substances, and absorbing the shorter waves; hence antioxygen substances were added to the soln. exposed. An increase in reducing power of 30-50% is obtained in solns. of $Ca(HCO_3)_2$, $KHCO_3$ and of CO_2 in distd. water. Better yields are obtained when metallic Mg or Zn, $Cu(OH)_2$, $Al(OH)_3$, Ca bicarbonate, $CaCO_3$, or lime is added. The best results were obtained from $Ca(HCO_3)_2$ in the presence of very finely powd. metallic Mg. S. L. B. ETHERTON

Influence of quartz lamp irradiation on adsorptive power of certain adsorbents. E. V. ALEKSEVSKII. *J. Russ. Phys.-Chem. Soc.* 60, 1173-8(1928).—The irradiation of active charcoal and of Patrick's silica gel, using a quartz lamp, slightly enhances the adsorptive power of these substances. B. C. A.

Discoloration of thin silver iodide films by light. ERNST JENCKEL. Univ. Göttingen. *Z. anorg. allgem. Chem.* 179, 80-96(1929).—Illumination changes the interference colors of very thin films of AgI formed by the action of I_2 vapor on metallic Ag. The color changes are attributed to formation of Ag in the film. In a table the colors are indicated which illumination (up to 6 hrs. daylight) will cause in AgI films of thickness 0 to 834μ , and the color changes subsequently brought about if the films are again exposed to I vapor. From an equation of Mie (C. A. 2, 2485) are calcd. for particle sizes (Ag) of 20, 40, 60 and 80μ , resp., the colors of the scattered light; they are successively blue, green, yellow and red in agreement with the results found (brown taking the place of blue, which is typical for Ag). The appearance of the colors and their changes are discussed at length. B. J. C. VAN DER HOEVEN

Active nitrogen. II. Influence of surface on the afterglows in nitrogen and oxygen. III. Mutual effect of nitrogen and oxygen on their respective afterglows. BENARD LEWIS. *J. Am. Chem. Soc.* 51, 654-65, 665-74(1929).—Expts. have shown that the condition of the surface of the contg. vessel is a detg. factor which governs the visibility of the afterglow in N and O, the N afterglow being made observable

only after the surface of the vessel has been effectively a layer of gas. Studies were made with different mixts. a sequence of changes in the character of the afterglow is reduced in the same mixt.

by the absorption of N and O at various pre- recorded as the pressure

RANK V. JOHNSON, JR.

Active nitrogen. VI. The formation of iron nitride in the iron-nitrogen arc. ERIC J. B. WILLY. *J. Chem. Soc.* 1928, 2840-4; cf. *C. A.* 22, 3839.—When an arc is burned between Fe poles in an atm. of N, Fe_3N_2 is formed in the metal-vapor zone. The amt. of Fe present as the nitride in the vapor decreases from 12% of the total Fe in the inner zone to 6% in the outer zone. Examn. of the arc with a spectrometer failed to reveal the bands characteristic of the N afterglow spectrum. The results are interpreted as showing either that the active N is here non-luminous, or that, under the more intense current of the arc as compared with the condenser discharge, another and chemically more active modification of N is produced (cf. Lowry, *C. A.* 6, 2895).

H. F. JOHNSTONE

Photovoltaic cells with silver-silver bromide electrodes. I. W. VANSELOW AND S. K. SHEPPARD. *J. Phys. Chem.* 33, 331-53(1929).—Photovoltaic cells consisting of Ag-AgBr electrodes in soln. of KBr have been studied. The p. d.-time curve obtained is the resultant of 2 effects, viz., an initial neg. effect on which is superimposed a pos. effect. A hypothesis was developed explaining these in terms of the liberation of electrons and Br atoms from bromide ions on absorption of light. In agreement with this it is shown that the pos. effect can be suppressed, the neg. effect made more pronounced, by addn. of Br acceptors. The pos. effect is shown to be similar to that produced by allowing Br to diffuse through the AgBr layer to the Ag.

Investigations of the chemical action of electric discharge and spark in gases under low pressure. HENRI LEPEVRE AND PIERRE MONTAGNE. *Bull. soc. encour. ind. nat.* 1928, 917-23.—L. and M. accept the theory that in the elec. arc chem. actions are due to intense ionization of gases and to electron movements in the vicinity of the electrodes. They then proceed to det. what laws are obeyed when gas pressure or certain characteristics of the elec. circuit are modified. There is a decided similarity between the action of spark or discharge and that of heat. A digression is also made to study the particular case of activation of N by elec. discharge. CO_2 is chosen as gas for the investigation. Under the exptl. conditions disson. of CO_2 proceeds according to the equation $2CO_2 = 2CO + O_2 - 136.4 \text{ cal.}$, CO remaining unchanged when traversed by discharge or spark. The app. used is a glass tube with 2 electrodes connected to vacuum or to CO_2 generator; during the passage of sparks it is insulated from the rest of the app. Results from the action of condensed spark and continuous current are in perfect accord with prediction from study of thermal decomn. of CO_2 . Results from special investigation of N show that activated N acts as catalyzer, under its influence CO , unstable at ordinary temp., is transformed into CO_2 and C.

M. McMAHON

Is hydrogen peroxide formed in electrolytic gas by α -rays? BARNARD M. MILES. Univ. Minnesota. *J. Phys. Chem.* 33, 381-3(1929).—In previous work on the combination of H_2 and O_2 (electrolytic gas) at room temp. by the use of α -rays from Pu (*C. A.* 8, 3394), a static method had shown an excess of H_2 over that required for H_2O formation; this was attributed to the formation of H_2O_2 , as O_2 cannot exist in the presence of Hg. The present expts. were carried out in such a way that both O_2 and H_2O_2 could be detd. in the collected reaction products should they be present. O_2 , if present at all, was shown to be so in amts. less than the vapor pressure of O_2 at liquid-air temp. The amt. of H_2O_2 present was less than 1.5×10^{-7} equiv. The error in the previous work was probably due to the presence of Hg, which combined with the O_2 , leaving an excess of H_2 .

LOUIS WALLINGIER

Quantitative emission spectral analysis (THURNWALD) 7. Relation between the absorption spectra and chemical constitution of certain azo dyes. 4. The effect of position isomerism on the absorption spectra of Me derivatives of benzeneazophenol (BAUER) 10. Dipole-moment (HÄJENDAL) 2. Electric moment and its relation to chemical constitution (MAHANTI, SAN GUPTA) 2. Hydrogenation (Fr. pat. 641,613-18.

BOLE, MARCEL AND SALOMON, CHARLES: Introduction à la théorie des quanta, les équations de la mécanique et de l'électrodynamique. Paris: G. Doin et Cie. 1928. 100 pp.

BAER, ARTHUR: Wave Mechanics and the New Quantum Theory. Translated from German by L. W. Codd. London: Constable & Co., 10 Orange St., Leicester Square. 134 pp. 7s. 6d. net.

KOHLRAUCH, K. W. F.: Handbuch der Experimentalphysik. Vol. XV. Radio-

aktivität. Leipzig: Akad. Verlagsgesellschaft m. b. H. 885 pp. M. 79. Reviewed in *Phys. Rev.* 33, 628 (1929).

RAWLINS, F. I. G.: *Infra-red Analysis of Molecular Structure.* Cambridge, Eng.: The Univ. Press; New York: The Macmillan Co. 176 pp. 10s. 6d. net. Reviewed in *J. Franklin Inst.* 207, 576 (1929).

Comparison photometer for use with ultra-violet rays. I. G. FARBERIND. A.-G. Brit. 296,198, Sept. 8, 1927. There is exposed to irradiation a soln. of a phototropic coloring substance (such as one of the leucocyanides, carbinols or sulfurous compds. of basic coloring matters) to which is added a small proportion of a substance counter-acting the photochem. color change and the degree of color change produced is detd. by comparison with a scale of standard solns.

Röntgen-ray screens. C. HAIDER. Brit. 297,037, Sept. 12, 1927. Two glass plates sealed at their edges and with a rarified space between them, or two "cellon" plates compressed together, enclose between them a substance which phosphoresces under the action of Röntgen-rays, such as Zn sulfide, calcspar, siliceous calamine, magnesite or dolomite. Mention is also made of screens comprising Ba. cyanoplatinite and artificial willemite.

Photochemical reactions. I. G. FARBERIND. A.-G. Fr. 647,730, Nov. 14, 1927. Photochem. reactions are produced in gases or vapors by resonance radiations, the max. intensity of irradiation in the reaction chamber being obtained by arranging the app. so that the metallic vapor which emits the radiations surrounds the gases on all sides or the reaction chamber surrounds the source of the radiations. A relatively high intensity of the narrow resonance ray is obtained by the addn. of indifferent gases such as He, or the use of high-frequency vibrations. Examples are given of the production of aldehydes from mixts. of CO and H.

4—ELECTROCHEMISTRY

COLIN G. FINK

Recent developments in electric furnaces. D. F. CAMPBELL. *Institute of Metals* (advance paper) 482, 20 pp., *Engineering* 127, 439-42(1929); cf. *C. A.* 23, 1353.—The Ajax-Wyatt furnace for brass melting is built in 600, 1200 and 2240 lb. sizes. The largest size is used as a metal mixer when scrap of varying composition is charged, a large amount of metal being kept in the furnace at all times. Usually the bulk of the metal is poured, in which case the smaller units are preferred. The 1200 lb. furnace is 10% more efficient, but if many small castings are to be made the time out for pouring makes it more economical to use the 600 lb. unit. A large number of Ajax-Northrup furnaces, 800-2000 lbs. capacity, have been installed for Ni and Fe alloys. In these furnaces a new method of lining has reduced the lining cost to 24-72¢ per ton. This method consists of pouring a suitable lining material between the furnace coil and a metal liner. The heat induced in the metal frits the mixture into a crucible of the required composition. Elec. heat-treating furnaces may be advantageously substituted for coal, oil, or gas-fired furnaces in some cases. When close control at relatively low temps. (500-800°) is required, the elec. furnace will be preferred. Electricity lends itself to more efficient design than does gas; in one case with elec. energy at 1.4¢ per kw. hr. and gas at 66¢ per 1000 cu. ft. the loss of heat from a well-designed elec. furnace costs 42¢ per hr., as against \$1.58 per hr. as the heat-loss cost for an equivalent gas furnace. The first cost of elec. furnaces is high, especially when they are designed for high efficiency. This cost must be justified by the high unit cost of heat; high efficiency also reduces rating, which in turn lowers the max. demand charge. As an example of efficient design, a box-type furnace with a hearth area of 4 ft. 3 in. by 3 ft. 3 in. and a height of 3 ft. 6 in. is cited. It can be maintained at 800° by 10.5 kw., and requires 44 hrs. to cool from 700° to 260°. Elec. annealing furnaces for brass strip cost more than gas furnaces but give a light, even oxide film, reducing pickling costs and improving the surface. A short description of a completely electrified German brass works is given. This plant takes \$8,000,000 kw. hrs. per yr. The max. demand is 6260 kw., the power factor 0.929, and the load factor 62.1, so that a day rate of 0.6¢ and a night rate of 0.3¢ are earned, with power supplied by a fuel-burning station. B. M.

An electric heat-treating furnace. R. FR. RUSS. *Giesserei* 16, 61-2(1929).—A description of 3 elec. furnaces and their advantages over other types. J. B.

The electrochemical method of cadmium for rust prevention. S. WERNICK. *Metal*

Ind. (London) 34, 245-8(1929).—A brief discussion of Cd plating covers: the electrode efficiency ratio, compn. of solns. and effects of variations in content, effect of phys. conditions, such as temp. and c. d., addn. agents, throwing power of soln., properties of Cd deposit, reaction to chemicals, composite deposits and mech. properties. Electrode efficiency approaching unity may be secured with the following conditions: relatively high metal content (30 g./l. Cd), free CN to 100% without bad effect, and caustic alkali 15-30 g./l., c. d. 10-15 amp./sq. ft., and a moderate temp. Cd-Ni deposit is superior in protective capacity to Ni alone but inferior to that of Cd alone, a good Cd deposit having great adhesion. Addn. agents, in general, are undesirable for Cd plating. Two-soln. plating is often desirable. The first is a flash-cleaner soln. (low Cd-high caustic soln.) and the second the regular plating bath. W. H. B.

Methods of silver plating. F. C. MRSLE. *Metal Ind.* (N. Y.) 27, 128-30(1929). Recent improvements in Ag plating have been confined to solns. and control methods, analysis, attention to temp. and c. d. Distribution of current, agitation and filtration of soln. are discussed. CS_2 in very small quantities (1/500) is used as a brightener. KCN seems more desirable than NaCN, but the reason is unknown. W. H. B.

Applications of cadmium. N. F. BURGESS. *Elec. Rev.* (London) 102, 306-8 (1928); *Science Abstracts* 31B, 301. The use of Cd in batteries is first described, particularly with reference to alk. accumulators. One of the advantages over the ordinary lead-acid cell is that it may be completely discharged, or allowed to remain charged, though not in use, for any length of time without harmful results. On the other hand, the cost is about 3 times as much as for Pb-acid cells of the same amp. hr. capacity. In the manuf. of standard cells Hg-Cd alloys have an important application. If a Cd strip is immersed in the electrolyte of any cell and connected to one terminal of a low-reading voltmeter, the other terminal being connected to either the pos. or neg., a difference of potential can be recorded, and one can detect whether the pos. or neg. element is at fault in a weak cell. Cd is also used as a high-temp. resistor material. A Cd-vapor arc lamp has been devised, but probably one of the most important future applications of this metal lies in its addn. to Cu. H. I. D.

Theory of electrolytic precipitation of chromium from chromic acid solutions. ERICH MÖLLER AND PER EKWALL. *Z. Elektrochem.* 35, 84 (1929), cf. *C. A.* 20, 2995.

Reduction of Cr^{VI} to Cr^{III} takes place at a C cathode at potentials (against normal calomel electrode) up to 0.8 volt, while at Pt there is little or no reduction. In order to det. whether the absence of reduction was due to stratification, the region below 0.8 v. was investigated. The purest obtainable CrO_3 was treated with a small amount of $\text{Ba}(\text{OH})_2$, heated until the BaSO_4 pptd., and filtered through fritted glass. A rectangular cell, 2 by 3 by 2 cm., equipped with a glass cooling coil, was fitted with 2 identical new Pt electrodes, 1 by 2 cm., mounted parallel to each other at the smaller sides of the cell. A capillary siphon was brought in just under the cathode, with its opening touching the back side of the cathode. This back side, and the upper half of the front side, was covered with paraffin. The siphon led to another vessel, which contained 20% CrO_3 , and which in turn was connected to a normal calomel electrode by a KCl-filled siphon. The current through the cell was controlled to keep the cathode-calomel electrode potential const. during the run. After the expt. was concluded the cathode was removed, carefully washed and dried, and photographed at 50 diams. Runs were made with the pure 20% CrO_3 , with the same after making 0.001, 0.01, 0.05 and 0.1 normal with H_2SO_4 , and with 20% pure CrO_3 to which had been added sufficient H_2O_2 to reduce about 13% of the Cr^{VI} to the trivalent state. At potentials higher than -0.7 v. no change in the cathode surface could be seen in any case. As the voltage was decreased (by increasing the current) ppts. of various hues appeared, and finally metal was deposited. The appearance of cathodes from solns. containing sulfate ion was markedly different, in that metal was deposited with efficiencies of 100% whereas in the sulfate-free solns. only very small amounts were pptd. R. M.

Notes on the testing of electrodeposits on aluminum. G. B. BROOK AND GEORGE H. STORR. *Institute of Metals* (advance paper) 484, 9 pp.—An adhesion test for electrodeposits on Al consists of twisting a strip 8 × 0.5 in. around a 0.5 in. bar, which is held in the chuck of a lathe rotating at 20 r. p. m. One end of the strip is inserted into a slot in the bar, cut so that the angle of emergence is 60° and rounded to prevent fracture of the specimen; the other end is held firmly with pliers. Immersion of the sample in brackish water at half-tide level for three months was used as a corrosion test. Of 10 samples tested, five passed the adhesion test satisfactorily, 6 passed the corrosion test, 3 passed both tests, 3 failed under both tests, and one could not be fairly judged because the base metal failed in twisting. BENJAMIN MILLER

Alkaline electrolytic iron. STEWART J. LLOYD. *Am. Electrochem. Soc.* 1929,

(preprint) 7 pp.; cf. *C. A.* 15, 2591; 17, 1756.—The Estelle process is applied to pyrites roaster residue, limonite, red hematite, artificial $\text{Fe}(\text{OH})_3$, gray hematite and siliceous iron-bearing slag. Excellent results were obtained with the first two, fair results with the third and fourth and poor results with the fifth and sixth. The best conditions are: temp. 90° ; NaOH concn., 35%; ore ground to 200 mesh; thorough agitation; rotation of cathode; and c. d. 4 amp. per sq. dm. For 3 cm. spacing of electrodes the voltage is 2.5; the current efficiency is about 80%. Energy consumption is estd. at 3000–3300 kw. hrs. per ton of Fe. 75–85% of the SiO_2 and Al_2O_3 picked up from the ore could be pptd. by dilg. to a 20% NaOH concn. and adding $\text{Ca}(\text{OH})_2$. After re-toss as the cost of producing electrolytic Fe by this process in a 10-ton plant, with elec. energy at \$15 per h. p. yr.

BENJAMIN MILLER

The influence of current concentration in the electrolytic preparation of sodium perborate. F. GIORDANI AND R. INTONTI. *Rend. acad. sci. (Napoli)* [3], 34, 30–6 (1928).—The yield of sodium perborate, $(\text{NaBO}_2 \cdot \text{H}_2\text{O}_2 \cdot 3\text{H}_2\text{O})$, is high at low current density, as the loss of active O_2 is low; whereas, at high current density the yield is low because of decompn. of the perborate.

A. W. CONTIERI

The formation of perchlorate by electrolysis. A. V. PAMFILOV AND O. S. FEDOROVA. *Electrochem. Lab. Ivanovo-Voznesensk Polytechn. Inst. J. Russ. Phys.-Chem. Soc.* 60, 765–70 (1928).—Small quantities of NaClO_4 are formed in the electrolysis of aq. solns. of NaClO_3 even in the presence of 18% NaCl provided the c. d. is high (2 amps. per sq. cm.) When NaCl solns. are electrolyzed to form chlorate, the yield detd. chemically (FeSO_4 being used) is smaller than that calcd. from the vol. of gases given off. The formation of perchlorate (detd. colorimetrically with methylene blue) accounts for only a part of this difference.

B. SOYENKOFF

The electrolytic oxidation of methanol in alkaline solution. S. TANAKA. *Z. Elektrochem.* 35, 38–42 (1929). cf. *C. A.* 8, 2533, 16, 1078.— H is a product of the anodic oxidation of CH_3O and of MeOH in alk. soln. The theoretical explanation advanced for CH_3O cannot be used without modification for MeOH ; in the latter case H is evolved only at high-current densities, and then not to a great extent. To study the MeOH reaction, the following procedure was adopted: A soln. of NaOH (8 *N*) was mixed with an equal vol. of MeOH . The electrolyte so made was poured into a U-tube, in one arm of which was a Pt wire cathode, while in the other was a wire anode, 5 cm. long, 0.7 cm. in diam., of the metal to be investigated. By means of a potentiometer the voltage across the cell was raised stepwise, and at each setting the current and the potential of the anode against a normal calomel electrode were measured. The expt. was repeated with electrodes covered with Pt black. An earthenware diaphragm was placed between the electrodes, and electrolysis conducted for rather longer periods, with the potential between the anode and the calomel electrode kept approx. const. Three expts. were made with platinized Pt anodes, in one the anode potential was kept between -0.585 and -0.412 , in the second between -0.620 and -0.454 , and in the third between 0.00 and 0.02 v. After several hrs. the anolyte was analyzed for CH_3O and HCO_2H . The test for formaldehyde consists of treating the soln. under examn. with a satd. soln. of $\text{Cu}(\text{OH})_2$ in 12 *N* NaOH . A yellow ppt. of Cu_2O or a red ppt. of Cu in the deep blue soln. shows CH_3O if it is present in 0.002 *M* concn. or greater. Neither MeOH nor HCO_2H interferes. Since CH_3O was found absent in all cases, the estn. of formic acid consisted of heating to dryness, taking up the residue in water, adding NaHCO_3 to convert the NaOH to carbonate, and titrating with KMnO_4 . The first expt. showed a current efficiency of 97.7%, the second, 99.1% and the third, 70.8%. This indicates that in the basic range (potential negative) the only electrochem. reaction is the oxidation of MeOH to HCO_2H , while in the "noble" range (potential positive) there is some evolution of oxygen.

BENJAMIN MILLER

Electrolytic reduction of aldehydes. III. α - and β -Hydroxybenzaldehydes. G. SUMA. *Mem. Coll. Sci. Kyoto Imp. Univ.* [A], 11, 407–18 (1928).—Electrolytic reduction of salicylaldehyde to salicyl alc. is best carried out at 16 – 18° with a Hg cathode, an almost neutral catholyte, and a c. d. of 4 amp. 100 sq. cm. The yield of alc. is 85%. With an alk. catholyte there are formed dihydroxyhydrobenzoin (cf. Law, *C. A.* 1, 173) and 9,10-dihydroxy-9,10-dihydrophenanthrene. β -Hydroxybenzaldehyde gives a 92% yield of β -hydroxybenzyl alc. under the above conditions. IV. Vanillin and piperonal. *Ibid.* 419–27.—Reduction of vanillin suspended in a slightly acid catholyte at 8 – 10° gives hydrovanillin (10%) and 4-hydroxy-3-methoxybenzyl alc. (82%; *di-benzoyl* deriv., m. 130°). At higher temps. there is an increase in the amt. of hydrovanillin and other condensation products. In slightly alk. suspension the yield of

alc. is 92%. Under similar conditions piperonal gives a 90% yield of 3,4-methylenedioxybenzyl alc., m. 86° (lit. 81°; *benzoate*, m. 66°).

B. C. A.

Electrolytic oxidation of alcohols. III. Benzyl alcohol. S. KOMAZU, *Mem. Coll. Sci. Kyoto Imp. Univ.* [A], 11, 383-400 (1928).—Electrolytic oxidation of benzyl alc. in acid or alk. media gave, in most expts. made, a mixt. of benzaldehyde and benzoic acid. The expts. were carried out in a divided cell with a rotating cathode of iron plate, lead or nickel gauze, and a cathode soln. of either H_2SO_4 , NaOH, or Na_2CO_3 solns. enclosed in a porous cylinder. In acid soln. with Pb peroxide as anode material and Fe as cathode, the c. d. had no effect on the products formed but the amt. of aldehyde diminished with current quantity. With Pt or Au anodes and a Pb cathode, oxidation efficiency was low, but the product was almost free from benzoic acid. In Na_2CO_3 soln. the max. yield of benzaldehyde, free from benzoic acid, was about 71%. IV. Propyl alcohol in alkaline solution. *Ibid.* 391-400.—Electrolytic oxidation of MeOH in NaOH soln. at 15-17° at a Pt anode gives a mixt. of H 79-84.5, O 13.8-19.5, and CO 1.0-2.6% (cf. Müller, C. A. 15, 1511). After about 27 hrs. the proportion of H decreases rapidly, CO increases; CO_2 is formed also, presumably by oxidation of the aldehyde and acid produced. n-Propyl alc. in aq. MeOH NaOH soln. gives, in addn. to H, C_3H_4 and C_3H_6 , an increased amt. of the hydrocarbons being obtained at lower temps. The production of C_3H_4 is explained $CH_3Me-CH_2-O \rightarrow CH_3O + CH_3Me \rightarrow CH_3-CH_2 + H$; an analogous mechanism is suggested for the production of C_3H_4 during the electrolysis of propionates.

B. C. A.

The separation of hexone bases by electrolysis. TARO NOGUCHI, *Bull. Inst. Phys. Chem. Research Tokyo* 8, 153-5 (1929); *Abstract Ed.* 2, 22.—Solns. of amino acids have been electrolyzed in a 3-compartment cell. From the anodic compartment, the basic acids such as aspartic and glutamic acids were isolated. Suitable combinations of membranes and other conditions have been proposed. N. has used the hydrolyzates of casein and of ox blood, and has succeeded in isolating *arginine*, *histidine* and *leucine* from the cathodic compartment. By his method, it is not necessary to adjust the reactions of the solns. in the central compartment while the electrolysis is going on.

ALBERT L. HENNE

The electrolytic production of hydroxylamine. I. G. SICHERRAKOV AND D. M. LITINA. *Z. Elektrochem.* 35, 70-83 (1929).—Hydroxylamine can be produced by the electrolytic reduction of nitric acid at a Hg cathode in H_2SO_4 . The best conditions are: current density, 0.25 amp. per sq. cm., current concn., 10 amp. per liter, temp. 14-16°, HNO_3 concn. kept at N by continuous addn.; H_2SO_4 concn. 15 N at 1st, and 3 N at finish of run. The addition of HNO_3 should be discontinued before the end of the run, so that it may be used up as completely as possible. The remainder is removed by electrolysis with a Cu cathode, which reduces HNO_3 to NH_3 . The soln. made neutral to methyl orange, preferably with BaO, filtered, and the NH_4OH H_2SO_4 crystd. out. The current efficiency is 60-70%, and the material yield about the same. A voltage of 6 is assumed, leading to an estd. energy consumption of 16.7 kw. hr. per kg. of $NH_4OH \cdot H_2SO_4$. If impure HNO_3 be used a film forms on the Hg, causing 50% H_2 evolution and no reduction of the HNO_3 . During electrolysis *isomonoethylamine sulfate*, $(NH_4OSO_3H)_2H_2SO_4$, also is formed. This may be distinguished from $NH_4OH \cdot H_2SO_4$ by its property of oxidizing iodide ion to iodine in acid KI soln. During neutralization it hydrolyzes to form NH_4OH .

BENJAMIN MILLER

The solution of plain and amalgamated zincs in electric batteries. J. NEWTON FARRAR, *J. Inst. of Metals* 1929 (advance paper) No. 494, 4 pp.; *Engineering* 127, 645 (1929).—The objects of the investigation were to det. whether (1) 99.99% Zn, or amalgamated, could be used in place of amalgamated commercial 98-99% Zn in elec. batteries, or (2) failing this, whether amalgamated pure Zn would be better. The ordinary Zn tested contained Zn 98.82%, Pb 1.12%, Fe 0.05%, and As 0.008%. The impurities in the "pure" Zn are not stated. The expts. showed that pure Zn corroded more rapidly than amalgamated ordinary Zn in 10% H_2SO_4 , and in acid. NH_4Cl , that amalgamated pure Zn corroded more rapidly than amalgamated ordinary Zn in 10% H_2SO_4 , and that there was very little difference in the behavior of amalgamated pure Zn and amalgamated ordinary Zn in acid. NH_4Cl . No change from present practice is recommended.

BENJAMIN MILLER

The zinc electrode in dry cells. C. DEUTSCHMANN, *Chem.-Ztg.* 53, 29-31, 70-2, 65-6 (1929).—The Zn can of the dry cell is rapidly corroded by the electrolyte if the $HgCl_2$ is omitted, but is not attacked if amalgamation has been thorough. Amalgamation at room temp. in an electrolyte contg. 200 g. NH_4Cl , 75 g. $ZnCl_2$, and 4 g. $HgCl_2$ in 1000 g. H_2O is a slow process. After 4-5 days the Zn looks amalgamated, but several more days before the process is complete. When the meal is added amalgamation

is completed in a few hrs., while the cooking process used to set the paste causes the amalgamation to be completed in a few min. With a given electrolyte contg. a definite amt. of meal in suspension, the time required for complete amalgamation depends on the temp. and on the amt. of Hg salt in soln. With the electrolyte men-----, which was added 170 g. of yellow corn meal, amalgamation required 8 mins. at 60–65 or 4 mins. at 70–75°. With only 2 g. of HgCl_2 , 3 mins. sufficed at 70–75°, while 8 g. prolonged the time to 10 mins. at the same temp. Since the time and temp. of cooking depend on the meal being used, the proper amt. of HgCl_2 can be detd. The use of excess Hg salt does not give greater capacity, as has been claimed, but is injurious in that the longer cooking time required for amalgamation spoils the structure of the paste. Too small an amt. of Hg salt causes the amalgamated layer to be more brittle. In some cells made up with the anode assembly, irregularities appeared in the Zn surface. These took the form of craters, which started to appear about 12 hrs. after cooking, increased in number and depth up to 48 hrs., and then remained const. They had no influence on the quality of the cells when new, but after 10–12 months the paste became hard through crystn., whereas cells without craters were still moist. Expts. showed that this effect is due to different electrolyte concns. at various parts of the cell. If the Zn is kept from touching the outside covering of the anode assembly, the craters do not appear. It is therefore essential for long shelf life that the anode assembly be centered carefully, and that the insulating material coming next to the Zn be one which cannot cause changes in electrolyte concn. Expts. with specially cleaned, ordinary and deliberately soiled Zn showed that amalgamation was not affected by dirt, and that at the same time it protected against ill effects from accidental dust. Thin grease films were also without effect. To test the effect of foreign metals, 3 groups of cells were made up with Pb, Cu and Fe wires soldered to the Zn. A 4th group had several drops of solder on the inside surface. Precautions were taken to prevent the contact of foregoing metal and C, but otherwise the cells were cooked and sealed in the usual way. No difference in capacity was observed between the 4 groups and a fifth control group, either when new or at the end of 12 months. The paste in the vicinity of the Cu and Fe wires showed slight discoloration. Two groups of cells were made up with high-As and high-Pb Zn: one contained 0.84% Pb and 0.32% As, while the other contained 1.82% Pb and 0.002% As. The high-Pb cells showed slightly less capacity than the controls, and after 10 months deteriorated rather rapidly. The high-As cells had considerably less capacity than the controls, and after 10 months corrosion became so rapid that at least one cell in every battery had perforated at the end of 12 months. These results do not agree with the "local action" theory. Though the presence of foreign metals in the Zn is harmful only insofar as they influence the surface of the can, they are very deleterious when they occur in electrolyte-sol. form in anode assembly, insulation or electrolyte. Reducing agents, such as Fe^{++} , use up the depolarizer. Metals more noble than Zn are pptd. by it, wasting the latter and injuriously increasing the ZnCl_2 concn. An addn. of 1% As_2O_3 to the anode assembly decreases the initial e. m. f. from 1.55 to 1.47 v., reduces the short circuit current from 8 to 4.3 amp., reduces the time to 0.6 v. at 5 ohms from 4 hrs. 15 mins. to 3 hrs. 15 mins., and hardens the paste so that the cell is dead after 5 months on the shelf. Occasionally cells are produced which deteriorate in capacity and short circuit current in 5–14 days, although they have a const. initial e. m. f. of 1.5 v. In 2–3 months on the shelf the cans have corroded badly. Such cells, on being opened after discharge at the 5-ohm rate, or after standing without load 5–8 days, show a characteristic darkening of the Zn surface, which cannot be washed off. Neither analysis of the stain nor microstructure of the Zn showed the cause of this effect. By successively changing the ingredients in the cell, it was finally found that the MnO_2 was at fault. In another case the effect was traced to a meal of excessive gluten content. Poor insulation between Zn and C may have the same effect, which indicates that it is due to a high-resistance internal short circuit. The mechanism is not offered, except for the remark that the high-gluten meal caused the establishment of concn. cells. The suitability of a Zn for dry-cell use may be shown by the following test: 3 sheets, 50 mm. square, are quartered, and each of the 12 pieces is bent to a 90° angle. Four of the pieces are dropped into a Dewar flask contg. 50 cc. of 10% H_2SO_4 ; a two-hole stopper, carrying an accurate thermometer, is put into the mouth of the flask. A minute later 4 pieces are put into a second flask in the same way. A third set is placed in another flask. At the end of a min. the temp. of the first one is read. The thermometers are read at 1-minute intervals. The starting temp. is 11–13°. The time-temp. curve should be smooth. If at the end of 30 mins. the temp. has gone above 30°, the Zn is rejected.

BENJAMIN MILLER

Hot-cathode thyatrons (rectifier). I. Characteristics. ALBERT W. HULL. Gen.

Elec. Rev. 32, 213-23(1929).—The thyatron is an arc rectifier with electron-emitting cathode of pure W, thoriated W or Mo, barium-coated Ni (Wehnelt cathode), cesium-coated, or of Hg, whose starting is controlled by a grid, which completely surrounds the anode; after starting, the grid has no further control over the arc. The arc is extinguished by removing anode voltage; upon reapplying voltage the grid again controls starting of the arc, and by repetition of this procedure the grid serves to control the av. current. The small type of thyatron has a filament construction similar to that of vacuum tubes but the larger types require massive construction. Correct pressure, purity and constancy of gas in the tube must be maintained. For Hg the best range of pressure is between 1 and 50 microns; for other gases it is somewhat higher. Exhaust must be continued until a high vacuum is obtained before introduction of gas filling, since gas impurities are very undesirable, poisoning the cathode, increasing arc drop and causing loss of grid control. Expt. has proved that "monatomic gases will clean up very little if at all in the thyatrons, provided voltage drop is kept below disintegration value." Various types of thyatrons are illustrated and their characteristics are plotted.

M. McMAHON

Burn-out of incandescent lamps. A discussion of the phenomena influencing the life of gas-filled lamps. GORTON R. FONDA. *Gen. Elec. Rev.* 32, 200-12(1929).—The gas-filled lamp is characterized by low loss in wt. of filament (about 3%) at burn-out as compared with the vacuum lamp, which burns out at about 10% decrease in weight of filament. The causes underlying the behavior of gas-filled lamps were investigated by studying the tensile strength, crystalline changes, disintegration of filament under chemical changes and influence of ionization of the gas. Tensile-strength measurements were made of "218" or non-sag W wire, of W wire with 1.5% ThO₂ and of Pintsch wire contg. about 2% ThO₂; life tests on these filaments in gas showed no particular effect of tensile strength on burn-out. Photomicrographs showed striking changes in crystal structure of filaments on burning in gas due to evaporation phenomena in gas-filled lamps (*C. A.* 17, 2069; 23, 1509). The effect of gas on the life of filaments was apparent; for filament 1.6 mm. in diam. and 12 cm. long at 2870° K. in nitrogen the loss in weight at burn-out was 4.7%, in 80% A 6.7% and in 100% N 8.2%. The arcing in gas-filled lamps and its harmful effects were considered; reduced gas pressure and reduced spacing of the terminals caused leakage currents which might affect the life of the filaments under abnormal conditions.

M. McMAHON

Electrical precipitation. A. GROUNDS AND H. W. C. HENDERSON. *Elec. Rev.* (London) 102, 700-8(1928); *Science Abstracts* 31B, 437. An illustrated description of a Lodge-Cottrell industrial plant for the pptn. of dust particles from flue and other gases. There are two types: (1) a fine-wire electrode is suspended from an insulator in a vertical tube through which the gases pass; (2) the gases pass between plate electrodes. In each case the electrodes are maintained at a potential difference of about 50-60 kv. by a synchronously driven rectifying switch and transformer. The particles in the gas are ionized by collision and are driven by the intense field to the electrode and there deposited. At intervals of 3 to 4 hrs. the accumulated dust is removed by rapping, either by hand or by means of a machine. Typical plants are described handling up to 2 million cu. ft. a min. Tests show that a suitable plant can nearly always be designed to extract practically all the solid matter in the gases.

H. L. D.

Electrical purification of blast-furnace gases. KERALY. *Bull. soc. franç. élec.* 7, 136-55(1928); *Science Abstracts* 31B, 362-3. After a résumé of the methods ordinarily employed hitherto for the removal of dust from blast-furnace gas for use for power purposes, the author deals with elec. pptn. by passing the gas between parallel electrodes at a considerable difference of potential. The theoretical aspect of the question is briefly treated, and it is shown that the most favorable conditions are obtained with cylindrical electrodes. Continuous, or rather rectified, potentials are more efficient than alternating potentials because there is partial recombination of ions at each reversal in the latter case. An installation at the Dilling steel works is described. A pressure in the neighborhood of 50,000 v. is employed and is obtained by step-up transformers from the 500-v. 50-cycle supply. A commutator-type rectifier driven by a synchronous motor is used. The plant has a normal capacity of 12,000 cu. m. of gas (this being presumably per hr.) with considerable overload capacity and comprises 6 chambers, each contg. 2 groups of 7 vertical tubes, with central insulated electrodes, through which the gas is passed in an upward direction. Arrangements are made for periodically passing a counter-current of purified and reheated gas down the tubes to blow the collected dust out to the bottom of the chamber, while the tubes are vibrated by pneumatic hammers, which form part of the app.; the dust collecting at the base of the chamber is removed by a screw conveyor. The actuation of the necessary valves for this periodical

cleaning of each chamber is automatic. The app. is stated to work satisfactorily and to reduce the dust content of the gas from 4-6 g. per cu. m. to 0.025-0.002. The system has the advantage over wet processes of not needing large quantities of water and space for settling tanks; over other dry processes the further advantages are claimed of simplicity, less necessity for accurate temp. control, lower maintenance costs and lower power consumption. H. G.

Power factor and dielectric constant in viscous dielectrics. DONALD W. KITCHIN. Simplex Wire & Cable Co., Boston. *J. Am. Inst. Elec. Eng.* 48, 281-4(1929).—A study is made of the peculiar variation with temp. and frequency of the dielec. const. and power factor of *rosin*, *rosin oil* and *castor oil*, including data showing at several frequencies the relation of dielec. const. and power factor to the compn. of vulcanized rubber. Viscosity is shown to be a decisive factor controlling the elec. and optical behavior of rosin. The Debye dipole theory is outlined and the exptl. results are discussed on its basis. The behavior of viscous, homogeneous liquid dielectrics with respect to the change of power factor and dielec. const. with temp. appears best interpreted on the basis of molecular orientation according to this dipole theory—particularly the theory of anomalous dispersion and absorption. The elec. behavior of *rubber-S* compds. is discussed and it is claimed to be possible to predict qualitatively some elec. features that should be observed if the application of the orientation theory to rubber is permissible. There is a characteristic frequency for each compn. in the region where dipole molecules exist, the softer the rubber, the higher the characteristic frequency; the maxima in the dielec. const. and power factor occur at lower S contents the higher the applied frequency. A thorough study of the elec. properties of vulcanized rubber might throw considerable light on the nature of the vulcanization reaction. The application of the orientation hypothesis to rubber is only tentative and considerable critical exptl. work would be needed to place it on as firm a basis as in the case of viscous liquids. W. H. BOYNTON

Hydrogen cooling of large electrical machines. C. J. FECHHEIMER. *Elec. J.* 26, 127-30(1929). For high-speed app. such as steam turbine generators and synchronous condensers the substitution of H for air as the cooling medium effects reduction in windage losses and removal of harmful corona effects. The expense of modifying machines for this substitution limits its use to large machinery. M. McMAHON

The electric light sources for photomicrography. MASAO KURODA. *Bull. Inst. Phys. Chem. Research Tokyo* 8, 80-93(1929); *Abstract Ed.* 2, 11. —Types of small incandescent lamps are compared with a W arc lamp and a C arc lamp. Tests show that an incandescent lamp is preferable to arc lamps for small laboratories. A. L. H.

Chemical problems in the manufacture of cables (ADEL) 13. Be and its chloride (SCHMIDT) 6. Hydrogenation of coal, etc. (Fr. pat. 647,981) 21. Porous metallic plates or objects, particularly for storage batteries and the like (Belg. pat. 351,859) 1. Molded articles [storage-battery boxes] (U. S. pat. 1,707,585) 18. White enamel for incandescent lamps (U. S. pat. 1,708,743) 19. Treating hydrocarbon oils with corona arc discharges (U. S. pat. 1,708,126) 22. Rubber electrodeposition (Brit. pat. 296,138) 30.

Illustrated Technical Dictionaries. Vol. 2. **Electrical Engineering and Electrochemistry.** In six languages. Edited by Kurt Deinhardt and Alfred Schlomann. Berlin: Technische Wörterbucher-Verlag G. m. b. H. 1304 pp. Reviewed in *Chem. Markets* 24, 379(1929); *Metal Ind.* (London) 33, 412(1928).

Electric battery of the Bunsen type. H. KÖHNE and W. SUHRCKE. Brit. 296,184, July 28, 1927. Structural features.

Jars for electric batteries. J. E. MARSDEN. Brit. 296,613, Jan. 2, 1928. An inner glass container is formed with partitions and with electrode supports extending upwardly from its bottom and is enclosed in an outer casing of asbestos, cork, mineral plaster, cellulose, or other suitable material with an intervening layer of non-hardening material such as asphalt or tar. Various structural details are described.

Dry batteries. COMPAGNIE FRANÇAISE POUR L'EXPLOITATION DES PROCÉDÉS THOMSON-HOUSTON. Fr. 647,180, June 4, 1927. Constructional details.

Contact head for dry batteries. GEHR. KLEINMANN. Fr. 647,616, Jan. 23, 1928.

Storage batteries. JACQUES DELPECH and EUGÈNE VACHERON. Fr. 647,940, Jan. 30, 1928. Celluloid, ebonite, or synthetic resins are used as the support for the active material. The surface is rendered conductive by surface metallization, etc.

C. H. EVERETT and G. H. CARR. Brit. 296,660, Sept. 3, 1927.

Structural features.

Storage battery. G. M. RADULESCU (to A. Sismanopol, trading as Forta Intreprinderi Electro-Mecanice). Brit. 296,990, Sept. 10, 1927. The neg. electrode is formed of Pb coated with electrolytically deposited Cu and its area is less than half that of the pos. electrode, which is formed of PbO_2 . The lower end of the neg. electrode rests on the bottom of the container and the lower end of the pos. electrode is supported above the bottom.

Storage batteries. COMPAGNIE GÉNÉRALE D'ÉLECTRICITÉ. Fr. 647,287, Nov. 30, 1927 and Fr. 647,289, Dec. 2, 1927.

Storage batteries. I. G. FARNHIND. A.-G. Fr. 647,900, Jan. 28, 1928. Plates are made by forming a grating of Pb and prisms of Pb alloy which fit exactly into the cells of the grating, introducing the prisms by pressure and alloying the metal by soln. By this means alloying of the added metal with the Pb of the grating is prevented.

Electrode for "alkaline" storage batteries. ALLAN LEVIN (to Svenska Ackumulator Aktiebolaget Jungner). U. S. 1,708,889, April 9. Structural features.

Hydrometer suitable for testing storage battery electrolyte. J. H. COLLIER. Brit. 297,167, July 2, 1927. Structural features.

Electroplating non-metallic surfaces. K. BARANOWSKI. Brit. 297,260, Dec. 21, 1927. A cond. compn. for application to non-metallic surfaces prior to electrodeposition of metal on them is prepd. by boiling "carbon, soot, or synthetic graphite" with a dild. alc. or ether and adding a small quantity of water from time to time until the volatile solvent is completely evapd., then mixing the powdered product with "sol. glass" and heating the mixt.

Electric immersion heater for electroplating baths. H. ZANDER. Brit. 297,225, Oct. 1, 1927. Silica bars are connected in series or parallel and mounted in a casing which may be formed of Pb. Various structural features are described.

Cadmium plating. GUSTAVE J. DELATRE. Fr. 647,248, June 9, 1927. Salts of Sn, Ni, Cu, Zn, either singly or together, are added to the electrolyte to obtain a mixed deposit on the article to be plated. Thus, a deposit may be obtained from a soln. of sulfates of Cd and Ni contg. Cd 90 and Ni 10%.

Chromium plating. ERIC LIEBRICH. Fr. 33,527, Feb. 15, 1927. Addn. to 533,363. In the production of a Cr deposit by electrolysis of oxides of Cr, the reduction of the chromic acid is assisted by the addn. of finely divided cellulose, paper or the like, or albumin, pepsin, peptone or the like. Finely divided Al or Mg may also be added.

Coating with chromium. HARRY SCHMIDT. Ger. 472,157, Apr. 2, 1926. A fused borate melt contg. dissolved Cr is electrolyzed at a sufficiently high c. d. to cause sepn. of B-Cr. An example is given in which a bath contg. $Na_2B_4O_7$ 90 and Cr_2O_3 15 parts is electrolyzed at 950° with a c. d. at the cathode of 10,000 amp./sq. in.

Chromium electrodeposition. P. LAUTERBACH (to W. G. Poetzsch). Brit. 296,188, Sept. 10, 1927. An electrolyte is used comprising chromic acid with the addn. of a small quantity of an oxide or salt of Al or Mg (suitably the sulfates). The Al and Mg are not deposited. The total free and combined H_2SO_4 should not exceed 1.5% and should preferably be about 0.6-0.7% of the CrO_3 present. Brit. 296,189 specifies removing excess H_2SO_4 from Cr-plating baths consisting mainly of chromic acid, by addn. of a calcd. quantity of a Ba compd. such as $Ba(OH)_2$ or $BaCO_3$.

A non-oxidizable metallic coating. ÉLECTROLYSE BELGE ELPEWE. Belg. 352,106, June 30, 1928. Cd is deposited electrolytically, the object to be coated being the cathode and Cd plates the anode. The electrolyte consists of a soln. of a Cd salt and a cyanide.

Electrolytic cell. I. G. FARNHIND. A.-G. (George Pfeiderer, inventor). Brit. 471,925, Nov. 13, 1923. In an electrolytic cell, particularly for decompng. water, the elec. elements are arranged one behind the other and the electrolyte within each element is circulated by side spaces up the dividing walls.

Electrolytic preparation of matrices for sound records. GRAMOPHONE CO., LTD. and S. WYVRA. Brit. 296,459, May 2, 1927. An original record of wax or so. like material is brushed with finely divided Cu or a mixt. of Cu and graphite, coated with a Ag mirror by a reduction process; matrix metal is then deposited electrolytically on this prepd. surface. Various details are given.

Electrolytic recovery of metals from ores. L. GRUNSMAN. Belg. 352,106, July 31, 1928. The ore and an acid soln. are circulated in opposite directions, so that the ore comes in contact with acid of increasing concn. and temp. as its metal content decreases.

The soln. of the metal is then passed through a layer of sulfide of the same metals so as to displace the metal from the sulfide by the metallic impurities in the soln. before subjecting the latter to electrolysis. An app. is described. The process is particularly suitable for the extn. of Zn.

Apparatus for electrolytic mass production. LANGBEIN-PFANHAUSER-WERKE A.-G. Ger. 472,092, July 7, 1926. Addn. to 471,260. Modifications in the app. of Ger. 471,260 (C. A. 23, 2110) are described.

Aluminum alloys. VEREINIGTE ALUMINIUM WERKE A.-G. Fr. 646,990, Jan. 11, 1928. Al-Si alloys are made by the electrolysis of a fused mass in the bath of fluoride used for the extn. of Al, the Si being added in the metallic state.

• **Alkali chlorates.** VEREIN FÜR CHEMISCHE UND METALLURGISCHE PRODUKTION. Fr. 647,052, Jan. 13, 1928. In the electrolytic manuf. of alkali chlorates the danger of explosion is avoided by adding a gas free from or contg. little O to the mixt. of H and O. The O may be sepd. from the gaseous mixt. by a catalytic reduction.

Aluminum. SOCIETÀ ITALIANA DI ELETTOCHIMICA. Ger. 472,085, May 21, 1927. See Fr. 634,727 (C. A. 22, 3847).

Aluminum. I. G. FARBENIND. A.-G. Fr. 647,856, Jan. 6, 1928. See Brit. 283,949 (C. A. 22, 4071).

Cerium. FRITZ SOMMER (to Deutsche Gasglühlicht-Auer-G. m. b. H.). U. S. 1,707,450, April 2. In sepg. Ce from assocd. impurities such as didymium, Fe and La, a supersatd. cerous salt soln., which will yield a basic ceric salt by electrolytic oxidation, e. g., a soln. of cerous sulfate, is subjected to electrolytic oxidation at the anode; the basic ceric salt formed is sepd.

Copper. KASPAR WALTER. Ger. 471,576, Dec. 28, 1927. A device for polishing Cu ppt. during the coppering process in a galvanic bath consists of a cylinder with oblique polishing elements between which the ppt. slides as the cylinder rotates.

Hydrogen. C. EPNER. Brit. 206,428, Sept. 2, 1927. H or gases contg. H are obtained by treating hydrocarbon-contg. gases such as coke-oven gas with an a.-c. elec. field of high frequency and high tension, either at normal or elevated temps. Liquid products are obtained from CO and other C compds. present. Less volatile substances may be removed from the products by compression, use of oils, active C, silica gel, etc.

Electrolytic manufacture of oxygen and hydrogen. JOHN P. SCOTT. Ger. 472,398, July 26, 1922. See Brit. 210,102 (C. A. 18, 1617).

Ozone. EDMUND KUREK. U. S. 1,708,067, April 9. Air is introduced into the central portion of a receptacle in which an abrasive wheel revolves in contact with a steel tube or bar. The sparks thus generated serve to form O₃ and the receptacle is rotated to effect centrifugal concn. of the O₃ in an outer zone of the receptacle whence it is drawn off; residual gas high in N is withdrawn from the central portion of the receptacle. Various structural details are described.

Ozonizer. JOHANNES KUHLENSCHMIDT. Ger. 472,344, Mar. 27, 1927. In an ozonizer of the kind having no dielectric between the electrodes and at least 1 electrode subdivided into a no. of electrodes arranged in parallel, an impedance, preferably a condenser, is arranged in advance of each single electrode.

Electric furnace. FRIEDRICH SIEMENS A.-G. Ger. 471,525, Nov. 21, 1926. Addn. to Ger. 418,779. A d.-c. furnace has several sep. longitudinal chambers provided with regulatable means for leading off the gases.

Electric furnace for the reduction of oxides of metals. TURE R. HAGLUND. Fr. 647,952, Jan. 30, 1928.

Electric furnace for metals and alloys. ÉMILIEN BORNAND and HANS A. SCHLAEPFER. Fr. 646,964, Jan. 11, 1928.

Electric furnace for gas reactions. M. GOBERT. Brit. 206,642, March 14, 1928. Arc electrodes are in the form of disks mounted on rotary shafts so as to be movable lengthwise of the shaft to adjust the length of the arc. Various details are described.

Electric arc furnaces. SOC. D'ÉTUDES ET DE CONSTRUCTIONS METALLURGIQUES and GASTON GARNIER. Fr. 33,659, Feb. 22, 1927. Addn. to 624,280. A regulator for the current is described.

Electric induction furnaces. PAUL E. BUNET and ACIÉRIES DE GENNEVILLIERS. Fr. 647,152, 647,153 and 647,154, June 2, 1927.

Electric induction furnace for melting metals. O. GOTZE. Brit. 297,313, Sept. 17, 1927. The surface of the metal charge is heated by a naked flame in contact with the metal which serves to ensure complete melting when the charge is composed of shavings or waste mixed with oil or dirt. The air supply is controlled to produce a reducing flame, and a slightly super-atm. pressure may be maintained in the furnace (which is described).

Electric induction furnace for melting and refining, etc. E. F. NORTHROP. Brit. 296,464, May 30, 1927. Structural features.

Electric induction furnace for annealing metal articles. HIRSCH KUPFER- UND MESSINGWERKE A.-G. and M. TAMA. Brit. 297,311, Sept. 17, 1927. Various structural features are specified.

Electric resistance furnace for annealing metal articles in a gas-tight container. WILLIAM J. DIEDERICHS (to Westinghouse Elec. & Mfg. Co.). U. S. 1,707,300, April 2. Structural features.

Electric resistance-heated receptacle suitable for melting solder, babbitt metal, etc. ALVIN D. KEGNE (to Westinghouse Elec. & Mfg. Co.). U. S. 1,707,308, April 2. Structural features.

Electric vacuum furnace suitable for preparing vitreous silica. PHILIP K. DEVERS (to General Electric Co.). U. S. 1,708,833, April 9. Structural features.

Electrically heated oven. G. MELVILLE and MEASUREMENT, LTD. Brit. 296,552, Aug. 31, 1927. Various structural features of an elec. resistance-heated oven are described.

Cooling means for the conductors of induction furnaces. METROPOLITAN-VICKERS ELECTRICAL CO., LTD. Fr. 647,412, Jan. 17, 1928.

Electrodes for electric furnaces. PAUL L. J. MIGUET (to Soc. Électrometallurgique de Monfricher). U. S. 1,707,406, April 2. Structural features are specified relating to electrodes with coupled exterior sectors and a core filling.

Electrode spacing in cells. J. L. WOODBRIDGE. Brit. 297,246, Nov. 23, 1927. Structural features.

Rectifying elements of superficially cleaned silicon carbide. MINER L. HARTMANN and MORROW C. MILLER (to Carborundum Co.). U. S. 1,708,571, April 9. The surface of a fragment of silicon carbide is freed from associated impurities incidentally present from its manuf., e. g., by successive treatments with NaOH, HNO₃, and HF. U. S. 1,708,572 relates to detectors in which such superficially purified silicon carbide fragments are used in contact with a hard, flat plate of metal such as steel.

Electrolytic rectifier. S. D. WHITE and R. J. JONES. Brit. 296,641, March 13, 1928. An anode of 99.5% Al and a cathode of iron hardened and rendered resistant to corrosion by the addn. of W and Co are used with an electrolyte of a mixed soln. of molybdic acid, H₃PO₄, tartaric acid, oxalic acid, or acetic acid, NH₄ phosphate and Al acetate. Various structural details are described.

Full-wave electrolytic rectifiers. S. D. WHITE and R. J. JONES. Brit. 296,610, March 13, 1928.

Electric rectifiers of the copper-copper oxide type. SIEMENS-SCHUCKERTWERKE A.-G. Brit. 296,606, Sept. 3, 1927. Air ducts are provided for cooling and a heat cond. material such as Al may also be interposed between the electrodes for cooling purposes.

Electric rectifier units with ribbed plates of metal such as copper carrying an oxide coating. CLARENCE E. OGDEN (to Kodak Radio Corp.). U. S. 1,707,234, April 2. Structural features.

Electric-discharge apparatus. J. W. MARDEN (to Westinghouse Lamp Co.). Brit. 296,778, Sept. 8, 1927. Leakage between conductors of discharge tubes containing an alkali metal vapor is prevented by coating the insulating surfaces between the conductors with a mineral oil substance, which is non-volatile at the temps. to which the device is subsequently exposed. Petrolatum, which has been heated to 300-400° at a pressure of 1 or 2 cm., is suitable and may be applied dissolved in CHCl₃. To introduce the alkali metal vapor into the tube, a capsule of a compd. such as Cs₂Cr₂O₇ or CaMnO₄, mixed with a reducing agent such as Si, or of a mixt. of CsCl and Ca may be welded onto the anode support and heated by high-frequency induction currents.

Electric gas purification. METALLGESELLSCHAFT A.-G. Ger. 471,732, Aug. 22, 1928. App. is described.

Electrical dust-precipitating plant for gas purification. SIEMENS-SCHUCKERTWERKE A.-G. (Oscar Heymann, inventor). Ger. 471,795, Mar. 2, 1923.

Apparatus for electrical precipitation of suspended matter from gases. LORRÉ CORRELL, LTD. (Lurgi Apparatebau Ges.). Brit. 296,956, March 28, 1928. Structural features.

Electric rotary drying machine. SIEMENS-SCHUCKERTWERKE A.-G. (Adalbert Major, inventor). Ger. 471,521, Aug. 11, 1927. The cover of an elec. drying machine is prevented from opening during motion by a member under the influence of the cooling current of air.

Light rays for therapeutic purposes and for promoting plant growth. SIEMENS &

HALSKE A.-G. Brit. 296,724, Sept. 6, 1927. Rays are used having a wave length of 350-360 μ m; rays below 320 μ m are excluded. An arc lamp may be used with one electrode of Zn or Ag or Ag-cored material and the arc may be attenuated by such means as a "gas jacket in motion" having a quartz envelope or choke. Various specified color screens may be used to filter out undesired rays.

Leading-in wires of electric lamps, etc. W. DAWSON. Brit. 206,453, March 3, 1927. In forming leading-in wires and supports for elec. lamps and *thermionic valves*, a base of Ni-Fe is dipped into molten Zn and the coated base is heated in H to slightly above the m. p. of Zn; the metal is then drawn into strips or wires and these are passed between (but out of contact with) C plates immersed in a soln. of $K_2Cr_2O_7$ and H_2SO_4 while an elec. current is passed between the C plates.

Electric incandescent lamps for high-intensity projection use. NAAMLIOOZE VENNOTSCHAP PHILIPS' GLOELAMPENFABRIEKEN Brit. 297,170, July 4, 1927. A reflector is provided on the inner surface of the bulb and disintegration of the reflecting surface may be prevented by a coating of siliceous varnish or other suitable material.

Filaments for electric incandescent lamps. NEEL GLULAMPEN GES. (to Falk Stadelmann & Co., Ltd.) Brit. 297,052, Sept. 13, 1927. Single- or long-crystal W wire is used for making filaments for searchlights or for other high-intensity lamps, of spheroidal or ellipsoidal form, comprising 2 calotte-shaped coils with their largest turns united. Cf. C. A. 22, 2518.

Metallic cesium. RICHARD E. MIESSE (to New Process Metals Corp.). U. S. 1,707,637, April 2. A mixt. of $CsCl$ and a rare earth metal alloy reducing agent such as misch metal is placed in a closed glass vessel; the vessel is evacuated to less than 0.001 mm. Hg and heated to about 270° or higher while being exhausted to remove occluded gases from the surfaces inside the vessel, and finally the mixt. of Cs salt and reducing agent is heated in the evacuated vessel by an elec. current to effect reduction of the Cs. An app. is described.

5. PHOTOGRAPHY

C. E. K. MEES

Additivity of photographic densities. G. TICHOW. *Bull. Acad. Sci. Leningrad* 1927, 511-32; *Chem. Zentr.* 1928, I, 464. A study of the density produced by 2 light sources acting together, the density due to each separately being known. Stellar exposures were made experimentally and the results agree with those detd. by a calcn. in which the relation between the density and the intensity of exposure was known. C. E. K. M.

Use of standardized H. & D. curves in sensitometry. O. E. CONKLIN. *J. Optical Soc. Am.* 17, 463-5(1928). A set of transparencies contg. 413 standardized curves is described. One of these may be superimposed on the points of any H. & D. graph cor. for fog and may be used for detg. accurately the speed, gamma and other characteristics of the emulsion under investigation. M. S. VINCENT

Law of blackening of the photographic plate at low densities. E. A. BAKER. *Proc. Roy. Soc. Edinburgh* 48, 106-33(1928), cf. C. A. 19, 2458; 21, 2853.—A theory is developed in which each grain of a photographic emulsion is assumed to act as an absorbing and emitting system, the rate of development of the grain depending on the particular sequence of absorptions and emissions which it has undergone. Comparison of the theoretical results obtained when the proportion of grains which suffer given sequences of absorptions and emissions is small, with exptl. detns. of the variation of d. with exposure time, indicates that the grain requires 2 successive absorptions or 3 absorptions with one intermediate emission to render it susceptible, resp., to "full" or "partial" development. The development is "partial" when it is stopped at an early stage so that the grains developed are selected from those belonging to a small group of states of very similar properties. Development sufficient to blacken grains which have been reversed by short exposure to intense light is termed "full." The results apply over the whole range of wave length tested, from 480m μ to below 200m μ . A quant. theory of the action gives good agreement with the facts relating to pre-exposure, inefficiency of short exposure to intense light, proportions of grains affected by different exposures in single-layer plates (for small grains) and influence of development on Schwarzschild's index. In the case of the "curves of constant blackening" there is a disagreement between theory and experiment for long exposures, which indicates that the "emission," though spontaneous, does not obey the unimol. law. A new formula

for the characteristic curve of a plate with uniform grains, successful over the low and moderate d. region, is derived. B. C. A.

Practice of developing fine-grained images. A. LUMIÈRE, L. LUMIÈRE AND A. SEYEWITZ. *Sci. ind. phot.* 8A, 126-8(1928); cf. C. A. 23, 48.—Three methods of producing fine-grained images are: (1) phys. development after fixation; (2) use of a paraphenylenediamine-sulfite developer contg. $\text{Na}_2\text{B}_4\text{O}_7$ or Na_2CO_3 ; and (3) development with elon and hydroquinone developers contg. a large excess of sulfite and little alkali such as borax (E. K. borax developer) or Na_2CO_3 (Namias' formula). L., L. and S. have previously found that phys. development after fixation gives very fine dichroic images. Such phys. development methods are not practicable for ordinary processing. In recent tests a very slow (45 mins.-1 hr.) metol-hydroquinone formula gave as fine a grain as was obtained in the regular Eastman borax developer. The finest-grained images were obtained by developing for 1 hr. in the following formula: paraphenylenediamine (base), 10 g.; Na_2SO_3 (anhyd.), 60 g.; $\text{Na}_2\text{B}_4\text{O}_7$, 50 g.; H_2O to 1 l. Photomicrographs of the image grain obtained in the different developers are given.

L. E. MUEHLER

Metallic reflection effects by the action of dyes on photochemically mordanted gelatin. A. REYCHLER. *Bull. soc. chim. Belg.* 37, 403-8(1928).—A dichromated gelatin-coated plate printed as in the Pinatype process may be further dyed in a soln. of a basic dye, to give a metallized image which is a negative by reflected light. Suitable pairs of dyes and concn. are prescribed. An acid dye, such as eosin, which is not very appreciably affected by dichromate, may be incorporated in the film, when the procedure after the first printing can be varied to give either a negative or a positive metallized image. Finally, R. describes some properties of the salt-like substance obtained by mixing, *in vitro*, a soln. of acid violet and cryst. violet. E. R. BULLOCK

WALL, E. J.: Practical Colour Photography. London: Chapman & Hall. 280 pp. 15s. net.

Color photography. JENS H. CHRISTENSEN. Fr. 647,008, Jan. 1928. See Ger. 469,578 (C. A. 23, 1072).

Color photography. WM. T. TARBIN. Fr. 647,571, Jan. 21, 1928. See Brit. 283,765 (C. A. 22, 4073).

Color photography. EMIL WOLFF-HEIDE. Ger. 471,508, Jan. 7, 1927. Sensitized layer carriers are exposed, developed and fixed. The Ag image is either converted into a color-repelling compd., or the gelatin contg. the Ag hardened so that the part-negative desired to be formed by subsequent exposures is protected from the action of the developing soln.

Optical systems for color photography. MERRILL W. SEYMOUR (to Eastman Kodak Co.). U. S. 1,708,370-1, April 9.

Color cinematography. A. PILNY and O. PILNY. Brit. 296,422, Sept. 1, 1927. Optical features.

Photographic diazotype process. KALLE & Co., A.-G. Brit. 296,725, Sept. 6, 1927. Sensitive layers which yield pos. prints from neg. originals are produced by applying on a base a mixt. of 2 or more different diazo compds. which are preferably of different sensitiveness to light (or if of the same order of sensitiveness are mixed in different mol. proportions). Metal salts or metal compds. of the diazo compds. may be used for producing different tones. Various examples are given among which is the use of Cd and Sn compds. Cf. C. A. 23, 1832.

Photographic emulsions. I. G. FARBENIND. A.-G. Fr. 33,682, June 15, 1927. Addn. to 619,077. Dissocn. products of proteins obtained by electrodialysis are added to gelatin used for light-sensitive emulsions. Cf. C. A. 23, 1832.

Photographic reproductions. MME. ALBIN GUILLOT (née Laure Meifredy). Fr. 647,137, May 31, 1927. Beneath a layer of gelatin or the like sensitized with dichromate, etc., a layer of a substance such as Au or other precious metal is used to give color effects through the sensitized layer.

Photomechanical reproduction. THEODOR DITTMAN. Ger. 471,691, Sept. 30, 1927. Addn. to Ger. 457,654. First a half-tone negative together with a single-tone negative, and then a scale negative, are copied on the etching plate. The order may be reversed.

Desensitizing photographic layers. I. G. FARBENIND. A.-G. (Bruno Wendt, inventor). Ger. 472,095, Feb. 4, 1928. Small amts. of water-sol. derivs. of anthraquinone and phenanthraquinone are used to desensitize photographic layers, particularly layers of panchromatic Ag halide emulsion. The reagents may be applied before development or added to the developing soln. The use of Na 1-nitroanthraquinone-2-

carboxylate, alizarine direct blue B, anthraquinone violet and Na 2-anthraquinone sulfonate is described.

Desensitizing photographic layers. I. G. FARBENIND. A.-G. Ger. 472,096, July 25, 1926. Solns. of 1,3-, 2,4-, or 2,6-diaminophenazonium salts or their substitution products are used. The reagents may be applied before development, or the layers may be developed for a short time in a soln. to which the desensitizing agent has been added, and the development then completed in yellow or orange-red light.

Photographic plates. I. G. FARBENIND. A.-G. (Alfred Miller and Hans Zepter, inventors). Ger. 472,115, April 9, 1927. Halation effects are avoided by coating the glass, on the side away from the emulsion and before applying the emulsion, with a mixt. of cellulose derivs., alkali-sol. resins, and dyes, with or without a softening agent. Adhesion of the coating may be promoted by first treating the edges of the glass, or its whole surface, with a thin colorless layer of an alkali-sol. colloid, e. g., with an alc. shellac soln. or an ammoniacal casein soln. The alkali in the developing soln. acts on the coating so that it can be removed in large pieces. Cf. C. A. 22, 2332.

Four-color cinematographic film assembly. JOHN E. THORNTON. U. S. 1,707,825, April 2.

Photographic films and prints. KALLE & Co. A.-G. Fr. 647,273, Nov. 12, 1927. Prints, films, etc., contg. diazo compds. are made with Ti salts. Thus, a cellulose film is impregnated with an aq. soln. of Na 2,1-diazonaphthol-4-sulfonate, phloroglucinol and titanic oxalate of K. A neutral dark brown tone is obtained after exposure to light through a positive and development with NH_3 .

Light-sensitive papers. LOUIS LIBMANN. Fr. 647,547, Jan. 21, 1928. Leucosulf ethers of vat dyes, commonly called "indigosol," are used for the prepn. of light-sensitive papers, by dissolving them in warm water and coating them on the paper. When exposed to light and washed with water they give unalterable heliographs.

6—INORGANIC CHEMISTRY

A. R. MIDDLETON

Germanium. XXVII. Germanium dichloride. L. M. DENNIS AND H. L. HUNTER. Cornell Univ. *J. Am. Chem. Soc.* 51, 1151-4 (1929).— GeCl_2 was prepd. by passing GeCl_4 over heated metallic Ge, and a number of its properties were studied. T. H. C.

Beryllium and its chloride. M. J. M. SCHMIDT. *Science ind.* 13, 110 (1929).—Two methods have been studied for the production of BeCl_2 from which metallic Be is obtained. The first method involves the reaction of Cl and C on BeO, while the second utilizes the reaction between BeO and COCl_2 . BeCl_2 sublimes at about 450° . The following binary systems were studied in an attempt to find a mixt. which can be fused without decompn. or sublimation. BeCl_2 -NaCl (mixts. do not show much volatilization of BeCl_2 ; the eutectic fuses at about 215°); BeCl_2 -LiCl (eutectic fuses at 300°); BeCl_2 -AgCl (eutectic fuses at 235°); BeCl_2 -BaCl $_2$ (eutectic fuses at 372°); BeCl_2 -CaCl $_2$; BeCl_2 -MgCl $_2$; BeCl_2 -ZnCl $_2$; BeCl_2 -PbCl $_2$; BeCl_2 -TiCl $_3$; BeCl_2 -CdCl $_2$. The latter systems apparently show no eutectics. BeCl_2 is decomposed in water soln. but not in certain org. solvents. S. repeated the work of Debray by displacing Be from its chloride by Na and obtained a powder contg. 81% Be. Li gave a product contg. 71% Be. S. also prepd. Be by electrolysis of fused BeCl_2 . Another chloride of a metal was added to increase the elec. cond., to facilitate fusion, and to diminish volatilization. LiCl was found most useful for this purpose since the elec. resistance is low for mixts. rich in LiCl. A porcelain crucible with electrodes of iron and Acheson graphite was used for the electrolysis. At 2000° BeO can be reduced by carbon but the metal is rapidly re-oxidized by contact with air. The method giving the best results of any studied by S. was the electrolysis of a mixt. of fluorides of Be and Ba, with an anode of graphite as the contg. cylinder and a cathode of iron, cooled internally by cold water. The potential was 70 v. and the current was 50 amps. The electrolysis proper started when the temp. reached 1350° . A fluoride of carbon is formed and this is very harmful to the operator of the electrolysis cell. A Be metal of 99.5 to 99.8% purity was obtained. The metal may be tempered; it resists oxidation by air, and may be welded. A. J. MONACK

The preparation of some metallic chromates. SAMUEL H. C. BRIGGS. *J. Chem. Soc.* 1929, 242-5.—B. has repeated his previous prepn. of ZnCrO_4 (cf. C. A. 2, 955; 4, 882) to meet criticisms of Britton (cf. C. A. 20, 1163). Normal chromates of Cr, Co and Cd were also prepd. by the action of Na_2CrO_4 on an excess of concd. solns. of the corresponding

In addn., the following compds. were prepd.: 9ZrO_2 .-

$5\text{CrO}_3 \cdot 12\text{H}_2\text{O}$; $3\text{Al}_2\text{O}_3 \cdot 2\text{CrO}_3 \cdot 6\text{H}_2\text{O}$; $2\text{Fe}_2\text{O}_3 \cdot 4\text{CrO}_3 \cdot \text{H}_2\text{O}$; $3\text{Sb}_2\text{O}_3 \cdot 2\text{CrO}_3$; $2\text{Sb}_2\text{O}_3 \cdot \text{Cr}_2\text{O}_3$; and $3\text{Bi}_2\text{O}_3 \cdot 2\text{Cr}_2\text{O}_3$.

T. H. CHILTON

A practical method of preparation of sodium hypobromite reagent. O. CHARRO ARIAS. *Anales soc. españ. fis. quim.* 26, 446-9(1928).—Detn. of urea by the hypobromite method has been supplanted by microchem. methods on account of the instability of the hypobromite soln., but this can be prepd. by adding to 5.5 cc. of a soln. contg. 6 g. NaBrO_2 and 20.5 g. NaBr per 100 cc. H_2O 1 cc. of concd. HCl , shaking, letting stand several mins., adding 3.5 cc. of 30% NaOH , giving 10 cc. of reagent, the amt. required for the usual test on 2.5 cc. of urine. The accuracy of the results obtained with this reagent was checked by comparative tests.

E. M. SYMMES

The acidic properties of concentrated solutions of zinc chloride. S. A. VOZNESEN, SKII AND T. A. STRATONOVA. *J. Russ. Phys.-Chem. Soc.* 60, 771-82(1928).—Concd. solns. of ZnCl_2 react acid until dild. below 3-4 N . The acidic properties thus are not due to hydrolysis, since the latter increases on dildn. The $v. m. f.$ between aq. and non aq. solns. of ZnCl_2 changes in sign when the concn. is raised, and in very concd. solns. reaches values which are characteristic for acid chains. This suggests to V. and S. the existence of "aquo acids" $[\text{ZnCl}_2(\text{OH})]\text{H}$ and $[\text{ZnCl}_2(\text{OH})_2]\text{H}_2$. The effect of concd. ZnCl_2 on Landolt's reaction was next investigated. The concns. of HIO_3 and NaHSO_4 were so chosen that the reaction velocity was proportional to $[\text{H-ion}]^2$. The effect of viscosity was experimentally detd. from the reaction velocities in H_2O -glycerol mixts. of const. ρ_H . The reaction time in AcONa buffers of known ρ_H was also measured. The ρ_H of concd. ZnCl_2 solns. was calcd. from the reaction velocities and the above data; the ratio of the concn. of H ion to that of ZnCl_2 decreased with the latter. The reaction velocity also decreased with the concn. of ZnCl_2 in the presence of AcONa buffer. V. and S. conclude that $[\text{ZnCl}_2(\text{OH})_2]\text{H}_2$ hinders the reaction, while the $[\text{ZnCl}_2(\text{OH})]\text{H}$ ion exerts a favorable influence. KCl , CaCl_2 , MnCl_2 , LiCl and MgCl_2 increase the velocity in proportion to their concn. AlCl_3 in all concns. causes a great retard. CdCl_2 , $\text{Cd}(\text{NO}_3)_2$ and CdSO_4 retard the reaction when added in small amts., and accelerate it in large concns. The retarding action is probably due to complex formation by Cl^- ion and free I .

B. SOVENKOFF

Reaction of water on calcium aluminates. LANSING S. WELLS. *J. Res.* 33, 951-1006(1928). The mechanism of the reaction of H_2O with $\text{CaO} \cdot \text{Al}_2\text{O}_3$, $3\text{CaO} \cdot 3\text{Al}_2\text{O}_3$, $5\text{CaO} \cdot 3\text{Al}_2\text{O}_3$, and $3\text{CaO} \cdot \text{Al}_2\text{O}_3$ is discussed. Addn. of H_2O to $3\text{CaO} \cdot \text{Al}_2\text{O}_3$ produces a vigorous reaction and changes in compn. of the resulting aq. solns. could not be followed; the setting is probably due to the formation of hydrated tricalcium aluminate. The mechanism of the reactions of the other aluminates could be studied. During the early periods of the reaction CaO and Al_2O_3 in each case passed into $\text{Ca}(\text{OH})_2$ as the calcium salt of monobasic aluminic acid, the concn. of the aluminate form d. depending upon the compn. of the anhyd. aluminate or cement from which it was formed and upon the time of reaction. These monocalcium aluminate solns. are metastable and decomposed with pptn. of a portion of the CaO and Al_2O_3 . There was an increase in the molgr ratio of CaO to Al_2O_3 remaining in the soln. after pptn. Identical changes in the metastable solns. occurred when filtered from the reaction mixts. As equl. was approached, chem. analyses and microscopic exams. indicated that hydrated AlO and hydrated tricalcium aluminate were pptd. from the metastable solns. The constitution of the aluminates in soln. is reviewed with reference to previous investigations. The conclusion of Slade, Blum and Heyrovsky that aluminic acid is a relatively strong monobasic acid is confirmed. Changes in the aluminate solns. resulting from increased concns. of $\text{Ca}(\text{OH})_2$ were investigated. As the concn. of $\text{Ca}(\text{OH})_2$ is increased, increasing proportions of the total Al_2O_3 are pptd., until at a ρ_H of 12.0 or above the Al_2O_3 is completely pptd. Some CaO is pptd. with the Al_2O_3 . An aluminate of the compn. $4\text{CaO} \cdot \text{Al}_2\text{O}_3 \cdot 12\text{H}_2\text{O}$ seems to be formed at a ρ_H above 12.0. Changes in the aluminate solns. by the $\text{Ca}(\text{OH})_2$ liberated by the hydrolysis of tricalcium silicate are similar to those above. The hydrolysis of β -dicalcium silicate seems to be inhibited by the aluminate soln. The electrometric titration of AlCl_3 with $\text{Ca}(\text{OH})_2$ was made. AlO is completely pptd. as the hydruide between ρ_H 6.0 and 7.5; appreciable solution of the $\text{Al}(\text{OH})_3$ occurs when the ρ_H is greater than 9.0; $\text{Al}(\text{OH})_3$ redissolves completely at ρ_H 10.9; at higher alkalinities a calcium chloroaluminate is formed, its compn. approaching $3\text{CaO} \cdot \text{Al}_2\text{O}_3 \cdot \text{CaCl}_2 \cdot 10\text{H}_2\text{O}$ if the concn. of CaCl_2 exceeds 3%. The optical properties of this compd. were detd. and show $n = 1.550 \pm 0.003$ and $\epsilon = 1.51 \pm 0.003$. The crystals were thin uniaxial negative hexagonal plates. Ba chloroaluminate appears to be more sol. than Ca chloroaluminate. NH_4Cl and MgCl_2 both decompose Ca aluminate solns. with pptn. of $\text{Al}(\text{OH})_3$ by the NH_4Cl and formation of a mixt. of AlO and $\text{Mg}(\text{OH})_2$ by the MgCl_2 .

A. J. MONACK

The reaction between ferric sulfate solution and cuprous sulfide. LAWRENCE WHITBY. Chem. Res. Lab., Teddington, Eng. *J. Chem. Soc.* 1929, 60-1.— Cu_2S was prepd. by exposing Cu foil to H_2S . When small amts. of Cu_2S were immersed for 15 mins. at room temp. in 10 cc. of 40% $\text{Fe}_2(\text{SO}_4)_3$, the resulting reaction could be represented by the equation $\text{Cu}_2\text{S} + \text{Fe}_2(\text{SO}_4)_3 = \text{CuS} + \text{CuSO}_4 + 2\text{FeSO}_4$. The validity of this expression was established by analysis of the solid residue (CuS) and also by measurement of the amts. of $\text{Fe}_2(\text{SO}_4)_3$ reduced by known wts. of Cu_2S . Prolonged exposure caused further oxidation; $\text{CuS} + \text{Fe}_2(\text{SO}_4)_3 = \text{CuSO}_4 + 2\text{FeSO}_4 + \text{S}$. At 60–80°, the oxidation is so rapid that the reaction $\text{Cu}_2\text{S} + 2\text{Fe}_2(\text{SO}_4)_3 = 2\text{CuSO}_4 + 4\text{FeSO}_4 + \text{S}$ is a correct representation of the phenomenon. R. L. DODGE

The reaction between nitrous acid and hydrogen sulfide. LANCELOT S. BAGSTER. Univ. of Queensland, Brisbane. *J. Chem. Soc.* 1928, 2631-43. This reaction was studied by slowly passing measured vols. of NO into a vessel contg. H_2S in soln. and O_2 . The reaction products vary with the relative concns. When HNO_2 is in excess, NO and smaller quantities of N_2O are the principal reduction products. When H_2S is in excess, however, hydrogenated products are formed almost entirely, NH_3 and NH_4OH in acid soln., and chiefly NH_3 with a smaller amt. of NH_4OH in aq. soln. Except when HNO_2 is present in quantity and in excess, the H_2S concn. being small, H_2S is oxidized almost completely to S, with a relatively small amt. of SO_2 . Even when a rather concd. HNO_2 soln. is added to a fairly concd. H_2S soln., S predominates. The reaction between H_2S and NH_4NO_2 was also investigated. When H_2S was passed continuously through an approx. 0.05 N NH_4NO_2 soln., there was gradual but not complete reduction of nitrite to NH_3 , about 50% being reduced in 24 hrs. The low rate of oxidation compared to the high rate in the case of free HNO_2 suggests that the free acid, produced here by hydrolysis, is the active agent rather than the nitrite ion. The decrease in the rate of reaction on the addn. of $(\text{NH}_4)_2\text{S}$ and the increase on the addn. of $(\text{NH}_4)_2\text{S}_2$ or on the formation of S are ascribed to the influence of the polysulfide ion, which effects an increase in the concn. of the reducing ion. The following simple reactions are proposed, (1) and (2) for appreciable HNO_2 concn., (3) and (4) for small HNO_2 concn. and considerable H_2S concn.: (1) $3\text{HNO}_2 + \text{S}^{2-} \rightarrow 3\text{HNO} + \text{SO}_3^{2-} (+ 3\text{H}_2\text{O})$; (2) $\text{HNO}_2 + \text{S}^{2-} \rightarrow \text{HNO} + \text{S}^{2-} (+ \text{H}_2\text{O})$; (3) $\text{HNO}_2 + 2\text{S}^{2-} \rightarrow \text{NH}_4\text{OH} + (\text{H}_2\text{O}) + 2\text{S}$; (4) $\text{HNO}_2 + 3\text{S}^{2-} \rightarrow \text{NH}_3 + (2\text{H}_2\text{O}) + 3\text{S}$. As secondary products, NO may be formed by the reaction of HNO and HNO_2 , and N_2O and N_2 by the direct decompn. of HNO, or as secondary products of reaction (3). RUBY K. WORNER

Hypophosphoric acid. FRIEDRICH VOGEL. Univ. Berlin. *Z. anorg. Chem.* 42, 263(1929).—Replying to Speter's statement (*Z. anorg. Chem.* 41, 693; cf. *C. A.* 22, 198) that hypophosphoric acid is formed from the action of chloride of lime upon red P, and that a new form of P arises differing in its action toward oxidizing agents, it is shown that KMnO_4 in strongly alk. solns. changes P to $\text{H}_2\text{P}_2\text{O}_6$, and that H_2O_2 in alk. soln. or alone also oxidizes red P to $\text{H}_2\text{P}_2\text{O}_6$, and H_2PO_3^- . Exptl. results are given for detns. with $\text{Ba}(\text{PO}_3)_2$ obtained from given amts. of P used. No evidence of a new form of P was found. W. C. EBAUGH

Sulfurous acid and its salts. VI. Auto-decomposition of aqueous bisulfite solutions. F. FOERSTER AND E. HAUFFE. Tech. Hochschule, Dresden. *Z. anorg. allgem. Chem.* 177, 17-41(1929); cf. *C. A.* 21, 1420. It was shown earlier that bisulfite solns. decompd. as indicated by the equation $3\text{HSO}_3^- \rightarrow 2\text{SO}_3^{2-} + \text{H}^+ + \text{S} + \text{H}_2\text{O}$, and that the reaction occurred in 2 sharply defined phases, viz., (a) sulfates, thiosulfates and polythionates were formed, with almost complete disappearance of bisulfites, and (b) thiosulfates and polythionates were transformed into sulfates and free S with the re-formation of sulfites. The first phase was hastened catalytically by Se, which could be recovered quantitatively after the reaction. Exptl. detns. were made upon solns. of NaHSO_3 contained in glass flasks provided with suitable attachments for admitting and removing gases, measuring pressure, etc., at known temps., and for measured intervals of time. The decompn. of NaHSO_3 , the formation of sulfate, polythionate, acidity, amt. of Se and S sepd. and other necessary factors were detd. and the results presented in numerous tables and graphs. Conclusions are: (1) The auto-decompn. of bisulfite solns., whose velocity is known, is increased by the presence of Se and proceeds with increasing speed even autocatalytically. (2) This reaction yields at first $4\text{HSO}_3^- \rightarrow \text{SO}_4^{2-} + \text{S}_2\text{O}_4^{2-} + 2\text{H}_2\text{O}$. (3) The previously accepted idea that sulfate and tetrathionate were the decompn. products has proved to be erroneous. (4) The slower the reaction proceeds, the more time there is for the trithionate to change thus: $\text{S}_2\text{O}_4^{2-} + \text{H}_2\text{O} \rightleftharpoons \text{SO}_4^{2-} + \text{S}_2\text{O}_3^{2-} + 2\text{H}^+$. (5) The H ions, whose concn. increases, because of the disappearance of HSO_3^- , more rapidly than the acidity titrate-

able with methyl orange as indicator, are responsible for the autocatalytic course of the bisulfite decompn. (6) This effect depends upon the fact that the selenodithionate (formed immediately by Se or SeO_2 in a bisulfite soln.) is decompd. with increased velocity by H ions, thus: $\text{SeS}_2\text{O}_6^{--} + \text{H}_2\text{O} \longrightarrow \text{SO}_4^{--} + \text{SeSO}_3^{--} + 2\text{H}^+$. (7) SeSO_3^{--} reacts immediately with bisulfite solns. to form selenodithionate and trithionate presumably thus: (a) $\text{SeSO}_3^{--} + 2\text{H}^+ \longrightarrow \text{SeO} + \text{SO} + \text{H}_2\text{O}$; (b) $\text{SeO} + 2\text{HSO}_3^{--} \longrightarrow \text{SeS}_2\text{O}_6^{--} + \text{H}_2\text{O}$; (c) $\text{SO} + 2\text{HSO}_3^{--} \longrightarrow \text{S}_2\text{O}_6^{--} + \text{H}_2\text{O}$. (8) In the absence of Se the bisulfite is decompd. very slowly into sulfate and thiosulfate thus: $4\text{HSO}_3^{--} \longrightarrow 2\text{SO}_4^{--} + \text{S}_2\text{O}_6^{--} + 2\text{H}^+ + \text{H}_2\text{O}$. (9) The H ions so formed are responsible for the autocatalytically accelerated reaction velocity. (10) The exhaustive continuation of this process is applicable to the reactions involved even when no Se is present, yet the bisulfite decompn. proceeds with ever increasing velocity. VII. The mutual action of bisulfites and sulfhydrylates. F. FORSTER AND E. KIRCHHEISEN. Tech. Hochschule, Dresden. *Ibid* 42-60.—When H_2S and H_2SO_3 interact solns. of pentathionic and tetrathionic acids are formed, with some free S; and only traces of thiosulfuric and trithionic acids can be found. But if the primary alkali salts are used, i. e., the anions SH^- and SO_3H^- at small H-ion concn., a reaction occurs thus: $2\text{SH}^- + 4\text{SO}_3\text{H}^- \longrightarrow 2\text{SO}_4^{--} + 3\text{H}_2\text{O}$, and only small quantities of by-products are formed. Carefully prep'd solns. of NaSH and NaSO_3H were allowed to react and the formation of thiosulfates, etc., followed in detail. It is shown that (1) pure sulfhydrylate- and bisulfite-solns. mixed in the proportion $1\text{MSH} : 2\text{MSO}_3\text{H}$, at ordinary temps., interact almost instantaneously, yielding thiosulfates in practically theoretical amts., thus: $2\text{MSH} + 4\text{MSO}_3\text{H} \longrightarrow 3\text{M}_2\text{S}_2\text{O}_5 + 3\text{H}_2\text{O}$. (2) Sulfite and S are formed as by-products in the proportion $1\text{S} : 1\text{SO}_3^{--}$. (3) In the presence of bisulfites in quantity exceeding the above ratio, even at ordinary temps., instantaneous reaction occurs with the formation of trithionate and sulfite along with thiosulfate; the quantities of these products increase with increased excess of bisulfites used. (4) The reactions leading to the formation of thiosulfate proceed so extraordinarily rapidly that the effect of a marked excess only appears when the sulfhydrylate soln. is added to the bisulfite soln. When the procedure is reversed only thiosulfate is formed, and the bisulfite used in excess of the proportion $1\text{MSH} : 2\text{MSO}_3\text{H}$ remains unchanged. (5) Theories of the process involved show that the reaction probably proceeds thus: $\text{SO} + 2\text{HSO}_3^{--} \longrightarrow \text{S}_2\text{O}_6^{--} + \text{H}_2\text{O}$. VIII. Remarks on the contribution of H. Bassett and R. G. Durrant. The mutual relations of acids of sulfur. F. FORSTER. Tech. Hochschule, Dresden. *Ibid* 61-70; cf. C. A. 21, 2844. Polemical. Essential agreement as to the facts observed is acknowledged, but their theoretical interpretations are different. W. A. R.

Nitrosylsulfuric acid. II. CYRIL W. H. JONES, WM. J. PRICE AND H. J. BAKER. Warrs. Tech. Coll., Birmingham. *J. Chem. Soc.* 1929, 312-5, cf. C. A. 20, 1411. Nitrosylsulfuric acid (I) was prep'd from chlorosulfonic acid and N_2O_4 giving good evidence for the presence of an hydroxyl group in the structure of I. Attempts were made to prep. nitrosylsulfuric anhydride (II), by: (a) reaction of liquid SO_3 with N_2O_4 , (b) passing NO into liquid SO_3 , (c) distn. of I with P_2O_5 , (d) reaction of N_2O_4 with pyrosulfuric acid and (e) reaction of N_2O_4 with pyrosulfuryl chloride. Methods (a) and (e) gave a compd. considered as II with the compn. $\text{S}_2\text{N}_2\text{O}_6$, to which the structure $\text{O.NO.SO}_2\text{O.SO}_2\text{O.NO}$ is assigned. Methods (b) and (c), and distn. of II gave $\text{S}_2\text{N}_2\text{O}_6$ and $2(\text{2SO}_3\text{N}_2\text{O}_4)\text{SO}_3$ formed from II by absorption of SO_3 . I. H. C.

The equilibrium between water, sodium nitrate, and sodium chloride. A. CHRISTIAN AND E. CORNUC. *Compt. rend.* 188, 628-31 (1929).—Sol. measurements from -24.3° to 121.4° enable a phase diagram to be constructed showing the relationships between water, sodium nitrate, sodium chloride and sodium chloride dihydrate.

MALCOLM D. H.

The system: mercuric iodide-potassium iodide-acetone. (MISS M. J. JONES. *Compt. rend.* 188, 635-7 (1929); cf. C. A. 22, 1919.—The method of Schreiner is applied to the study of the solid-liquid equil. in the system HgI_2 , KI and acetone at 34° . The salt $2\text{HgI}_2 \cdot 3\text{KI}$ which exists at 56° is not found at 34° , but is replaced by a new salt $\text{HgI}_2 \cdot \text{KI} \cdot \frac{1}{2}\text{C}_2\text{H}_5\text{O}$.

MALCOLM D. H.

Attempted resolution of triethylenediaminenickel chloride. WILLIAM J. BUCKNALL AND WILLIAM WARWICK. Univ. of Birmingham, Edgbaston. *J. Chem. Soc.* 1929, 2739-42.—For the resolution, triethylenediaminenickel tartrate and triethylenediaminenickel *d*-camphorsulfonate were used, but with negative results. It appears either that the rotatory power of the active Ni triethylenediamine is very small or that the racemization in soln. is extremely rapid. Attempts to prep. the chloride tartrate by saturating the complex chloride with one equiv. of Ag tartrate result in a mixture of the normal tartrate and the original chloride. The tartrate, $[\text{Ni}(\text{en})_2][\text{C}_6\text{H}_5\text{O}_2\text{SO}_2]\text{H}_2\text{O}$.

was prepd. by this method, *vis.*, triturating the chloride soln. with the theoretical amt. of Ag tartrate, repeatedly extg. with hot H₂O and evapg. the soln. Two tartrates appeared to be present, one cryst. and one a gel. *Triethylenediaminenickel d-camphorsulfonate*, [Ni(en)₃](C₁₀H₁₆O₂S)₂·H₂O, was prepd. by adding Ag *d*-camphorsulfonate soln. in small quantities to a soln. of recrystd. triethylenediaminenickel chloride until the addn. of one drop caused no more pptn. of AgCl. RUBY K. WORTNER

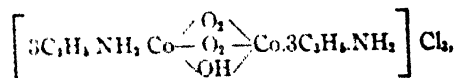
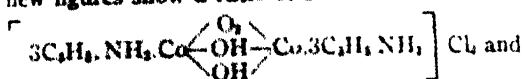
A cobaltic mono-amine. CLÉMENT DUVAL. *Compt. rend.* 188, 176(1929).—Na cobaltiammonio-borate, [Co(BO₂)₃·NH₃]₂Na₂, has been prepd.: it is the first known compd. of the type [CoNH₃·X]₂M₂. Its method of prepn. is: heat 10 g. [Co(NO₃)₃·(NH₃)₃] for 15 mins. at 45° with 50 cc. H₂O and 7.5 g. Na metaborate. The liquid becomes purple, and NH₃ is evolved. Cooling causes a purplish gray ppt., little sol. in H₂O (about 1 part in 3000). Wash with EtOH and then with Et₂O. A. L. H.

Cobalt allylamines: a supposed coordination number of eight for cobalt. WILLIAM R. BUCKNALL AND WILLIAM WARDLAW. Univ. of Birmingham, Edgbaston. *J. Chem. Soc.* 1928, 2648-54.—A reinvestigation has been made of the compd. for which Pieroni

(cf. *C. A.* 15, 3036-7) deduced the formula $\left[\text{Co} \begin{array}{c} 6\text{C}_3\text{H}_7\text{NH}_2 \\ 2\text{O}_2 \end{array} \right] \text{Cl}_2 \cdot \text{H}_2\text{O}_2$, thus assigning

to Co a covalency of 8. When N₂ is drawn through a satd. soln. of CoCl₂ in abs. alc., purplish red, needle-like crystals sep. on cooling. These crystals are very deliquescent and unstable, give a blue soln. with alc., and decompose in H₂O with the pptn. of CoCl₂. P. assigned them the formula CoCl₂·3C₃H₇NH₂. When dry air is drawn through the reaction flask contg. the crystals in contact with the methanol, the color from purplish red to blue.

It would agree with the data of P. and P. and by Pieroni, but differs markedly. Whereas the data of P. and P. indicate a ratio of Co:Cl = 1:3, the new figures show a ratio of 2:2.982. New formulations,



are proposed which assign to Co valencies of 3 and 4 and covalency of 6, which is in agreement with Sidgwick's rule. From analytical data and detns. of the mol. wt. and the mol. cond., the first formula seems the more probable. Red crystals of *hexaallylamine peroxodihydroxodicobalt trinitrate*, $\left[3\text{C}_3\text{H}_7\text{NH}_2 \cdot \text{Co} \begin{array}{c} \text{O}_2 \\ \text{OH} \end{array} \text{Co} \cdot 3\text{C}_3\text{H}_7\text{NH}_2 \right] (\text{NO}_3)_3$, are formed by

the action of HNO₃ or a soln. of any metallic nitrate on the complex chloride. This compd. liberates HNO₃ when moistened with H₂SO₄, is slightly sol. in cold H₂O, hydrolyzes with pptn. of the hydroxide on standing or warming, and evolves allylamine on warming with NaOH. When distd. with NaOH and Devarda's alloy, the nitrate groups are reduced to NH₃. When either of the complex salts is treated with concd. HCl, a dark green, insol. substance is formed which on warming dissolves to a bluish green soln. of CoCl₂ and allylamine chloride. H₂SO₄ decomposes the complex ion, forming CoSO₄. With AgNO₃, the complex chloride gives an immediate ppt. of AgCl, together with a red ppt. in concd. soln. of the complex nitrate. (NH₄)₂S produces an immediate ppt. of CoS. When the complex salts are warmed with KI soln., I₂ is liberated, but no similar oxidation could be detected with KBr. The study is being extended to the products of atm. oxidation of alc. solns. of Co salts in the presence of various other amines. RUBY K. WORTNER

Chromites and ferrites of nickel and cobalt. (MILLÉ) SUZANNE VEIL. *Compt. rend.* 188, 330-2(1929).—The chromites and ferrites can be considered as formed from 2 oxides, one tervalent and the other bivalent. Hence they may be classed as spinels. Equimolar solutions of the sulfates were pptd. in the cold by soda, dried in the cold, calcined, and the coefficient of magnetization measured. This coefficient has already been shown to be characteristic. On adding NiSO₄ or CoSO₄ to either Cr₂(SO₄)₃ or Fe₂(SO₄)₃, the curve of α —tion of the calcined anhydrides reaches a max. and then falls to the value of the added pure sulfate. The max. corresponds to ferrite and chromite of Ni and Co. The magnetization values obtained are about 1000 times those of the pure constituents. Hence the presence of Fe in Ni or Co is important,

and reciprocally. These facts also explain the variations in the magnetic coefficients of different mineralogical specimens.

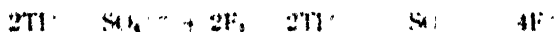
S. L. B. ETHERTON

A new kind of complex platinum compounds. Tervalent and quinquivalent platinum. PRAFULLA CHANDRA RAY AND KSHITISH CHANDRA BOSE RAY. *Z. anorg. allgem. Chem.* 178, 329-36(1929).—The methods of prepn. and compn. are given for 13 of a series of 14 sulfone derivs. of $[(C_2H_5)_2S_2PtCl]_n$ with NH_3 , alkyl and aryl amines, and piperidine. Mediating S atoms seem to serve as binding agents, making it possible for as many as 13 Pt atoms to occur in one mol. Pt in the mother substance has a valence of 5 but in the derivs. it has a valence of 3. Some contain a single quinquivalent atom. All the remaining valences of Pt after the Cl valence is subtracted must amount to a multiple of 4, so Pt never has an even valence in this series. The compds. contg. NH_3 , Cl, Pt_2Cl and Pt_3Cl all contain tervalent Pt and the remaining valences amount to a multiple of 4, but in compds. contg. 5 atoms of Pt, one must be quinquivalent. Graphic formulas are given for 2 such compds.

MARY E. LEAR

Studies on the physical and chemical properties of the cyanoplatinites. I. The hydrates of lithium cyanoplatinite. FRANK E. E. GERMAN AND O. B. MUENCH. *J. Phys. Chem.* 33, 415-23(1929). Methods of prepn. of cyanoplatinites and a review of the work on $Li_2Pt(CN)_4$ are given. Pure $Li_2Pt(CN)_4$ was prepd. and its hydrates were studied by a vapor-tension method. Canary-yellow anhyd. $Li_2Pt(CN)_4$ is formed at 25° with water vapor pressures below 1.02 mm. Hg. The only hydrate is $Li_2Pt(CN)_4 \cdot 4H_2O$; the others reported do not exist. $Li_2Pt(CN)_4 \cdot 4H_2O$ is variously colored, depending on method of prepn. and treatment. A tan modification is found at 25° by exposing the anhyd. salt to a pressure of water vapor greater than 1.02 mm. Hg. A blue modification is formed from the tan salt by exposing the latter to bright sunlight, ultra-violet light or water vapor at low pressures but above 1.02 mm. High water vapor pressures inhibit this change but it is catalyzed by hydrogen and cyanide ion. The grass-green form crystallizes in needles from water solns. The equil. vapor pressure of a satd. water soln. of $Li_2Pt(CN)_4 \cdot 4H_2O$ at 25° is 14.14 mm. Hg. C. W. W.

Oxidation with fluorine. XI. Action of fluorine on solutions of salts of thallium, manganese, copper and lead. FR. FICHTER AND ERNST BRUNNER. *Helv. Chim. Acta* 12, 214-21(1929). cf. C. A. 21, 2854. Tl_2SO_4 in neutral aq. soln. was treated with gaseous F_2 and reacted according to the equation



The presence of free H_2SO_4 aids the reaction by reducing hydrolysis. Tl_2SO_4 was dissolved in 3 N H_2SO_4 , cooled with ice and treated with gaseous F_2 and cryst. TlH was obtained. $TlNO_3$ soln. was also oxidized with F_2 . Manganous phosphate was oxidized to manganic phosphate. The action of F_2 on Cu and Pb salts is explained. Cu_2O can be obtained by the action of F_2 . Neutral or acid Pb soln. give only PbF_2 but alk. plumbite solns. treated with F_2 give PbO_2 . R. H.

The oxidation of cobalt sulfate and potassium cobalt oxalate with ozone. ERNST BRUNNER. *Helv. Chim. Acta* 12, 218-13(1929). A discussion is given of the conflicting theories on the oxidation of $CoSO_4$ to $Co_2(SO_4)_3$. A new method is for the prepn. of $Co_2(SO_4)_3$ by the action of ozonized O_2 on $CoSO_4$ in H_2SO_4 and is also given a new method for the prepn. of K cobaltic oxalate by the action of O_3 on K cobaltous oxalate. R. H.

Garnet sand at Hel, on the Baltic Sea (WATCKIN) 8.

7.—ANALYTICAL CHEMISTRY

W. T. HALL

Chart of indicators useful for pH measurements. CLARKE E. DAVIS and HENRY M. SALISBURY. *Ind. Eng. Chem., Anal. Ed.* 1, 92(1929).—The intervals of color change for 15 indicators are plotted all on the same scale of pH values so that at a glance one can at a glance which indicators are useful for any given case. W. T. H.

Cupric oxide as a standard in iodometry. T. F. BUEHNER AND C. MORGAN MASON. *Univ. Arizona. Ind. Eng. Chem., Anal. Ed.* 1, 68-70(1929).—Several samples of CuO were studied with respect to availability as standards in iodometry. The samples tested were 99.8-99.9 pure but more uniform than some samples of Cu foil. If, therefore, the Cu value of the well-mixed oxide, which has been ignited in O_2 at 400° and dried very carefully, is analyzed electrolytically, it will serve as an excellent standard.

If the H_2SO_4 soln. of the oxide is evapd. to dryness and then taken up in water, treatment with NH_4OH and HAcO is superfluous. In fact, the reduction of the Cu^{++} by KI succeeds in 0.2 N H_2SO_4 soln.

W. T. H.

Teaching of qualitative analysis in secondary schools. THEODORE D. KELSEY. *J. Chem. Education* 6, 486-92 (1929).—Since qual. analysis is more interesting to beginners than some other forms of lab. work, it is argued that this branch of chemistry should be taught in the secondary schools.

W. T. H.

New methods of quantitative, inorganic microanalysis. GULBRAND LUNDE. *Metallwirtschaft* 8, 253-5 (1929).—In reviewing the development of this branch of chem. analysis, particular attention is paid to the necessary app.

W. T. H.

• **Experimental studies on quantitative emission spectral analysis. I. The basic principles of quantitative spectral analysis.** HILDE THURNWALD. *Tech. Hochschule Prague. Z. anal. Chem.* 76, 260-1 (1929). The principles upon which quant. spectral measurements depend are described critically and the necessary app. is shown. The various factors influencing the intensity of the spectral lines are discussed and some exptl. results given. A bibliography shows 16 papers written since 1880.

W. T. H.

The determination of alkali in seepage water (in oil wells). K. L. MALYAROV. *J. Russ. Phys.-Chem. Soc.* 60, 829-34 (1928).—Treat 100 cc. of the water with a slight excess of BaCl_2 soln. at 100° . Filter, evap. the filtrate in a Pt dish to dryness together with 6-15 g. of oxalic acid. Heat to dull redness, cool, dissolve in hot water, filter and titrate with 0.1-0.5 N HCl . The analysis is based on the assumption that the residue contains Na_2CO_3 .

B. SOYENKOFF

Determination and separation of rare metals from other metals. XIII. Testing gravimetric methods for determining vanadium and comparison with two other methods for its determination. LUDWIG MOSER AND OSKAR BRANDL. *Monatsh.* 51, 169-80 (1929); cf. *C. A.* 23, 1838. For the detection of V the most characteristic reaction appears to be the test with 3-6% H_2O in strong H_2SO_4 soln. The coloration is probably due to $(\text{VO})_2(\text{SO}_4)_3$ rather than to HVO_4 , as is commonly assumed. The test with phosphotungstic acid is equally delicate. The thiocyanate test is less delicate and the test with tannin is good and suitable for the detn. of small quantities of V. The tests with diphenylamine and with strychnine are less satisfactory. The detn. of V as NH_4VO_3 is very accurate; if low results are obtained it is usually due to slight volatility of V_2O_5 when heated with NH_4Cl . After washing the ppt. with cold, satd. NH_4Cl , therefore, the dried ppt. should be heated for some time at about 150° to volatilize all the NH_4Cl . Final ignition with HNO_3 or NH_4NO_3 is unnecessary if proper pains are taken with the ignition. The detn. of V as AgVO_3 is very easy and accurate. It is also possible to det. V as Ag_3VO_4 if the soln. is kept near the neutral point by the addition of a very little NH_4OH and some NaOAc . In the presence of NaOAc , treatment with AgNO_3 gives a ppt. consisting largely of Ag_3VO_4 ; if the soln. is cold. On heating with excess AgNO_3 present, the ppt. changes to AgVO_3 . To det. V as AgVO_3 add 3 g. of NaOAc and 0.5 cc. of concd. NH_4OH to the neutral soln. contg. 0.2 g. V_2O_5 in 200 cc. Add an excess of AgNO_3 and heat to boiling. After standing 0.5 hr. on the water bath, add more AgNO_3 to see if the pptn. is complete. Filter, wash with hot water, dry and weigh. It is also possible to det. V accurately as $\text{Pb}_2\text{V}_2\text{O}_7$. Expts. indicate that the primary form of the ppt. is $\text{Pb}_2\text{V}_2\text{O}_7$; but in the presence of excess Pb and sinking acidity, this changes to $\text{Pb}_3\text{V}_2\text{O}_7$. To the neutral soln. contg. 0.2 g. of V_2O_5 in 200 cc., add $\text{Pb}(\text{NO}_3)_2$ until the ppt. begins to coagulate. Then add $\frac{1}{4}$ as much more of the reagent and enough HNO_3 just to dissolve the ppt. Now add 0.1 N NaOH until the soln. remains barely acid. Add 0.1 g. of KBrO_3 and while boiling the soln. introduce a stream of air to prevent bumping and at intervals of 10 mins. add 2 cc. portions of a soln. contg. 12 g. KBr and 3.37 g. KBrO_3 per 100 cc., using 10-16 cc. of this mixt. Boil 2 hrs. longer, filter, wash, dry at 110° and weigh as $\text{Pb}_2\text{V}_2\text{O}_7$. The detn. of V as V_2O_5 after pptn. as Hg_2VO_4 has been often recommended. Expts. show, however, that it is difficult to obtain a ppt. of definite compn. and definite soly. The presence of HgO appears to be necessary and the addn. of H_2O_2 appears to be favorable. The following modified procedure is suggested. To the hot, neutral or slightly acid (with HNO_3) soln., which must be free from NH_4 salt, add 3 cc. of 10% H_2O_2 and an excess of HgNO_3 soln. (40 cc. of the hot, satd. soln. for 0.1 g. of V_2O_5). Boil 0.5 hr., filter, wash with cold water, ignite and weigh as V_2O_5 . XIV. Separation of beryllium from the alkaline earth metals of the ammonium sulfide and arsenic groups. LUDWIG MOSER AND FERDINAND LUT. *Ibid.* 181-9. —This, the last of several papers, concludes the survey of methods for the complete sepn. of Be from other cations. To accomplish such sepn. one of the best ways is to make the accompanying ion form a complex with

tannin; in this way Be can be sepd. from Al, Fe, Cr, Ti, Zr, Th and W. Another possibility depends upon the hydrolysis of the Be salt; thus Be can be sepd. from Mo by the addn. of NH_4NO_3 to the dil. aq. soln. The purpose of the present paper is to generalize and apply these 2 methods to various concrete cases. *Seprn. of Be from alk. earths and Mg.*—Except with Ba, it is best to ppt. $\text{Be}(\text{OH})_2$ by hydrolysis, adding NH_4NO_3 to keep the H concn. low and removing the liberated HNO_3 as Me ester. With Ba, this method fails because com. NH_4NO_3 is likely to contain a little sulfate. In this case, it is best to ppt. BaSO_4 by the "extreme diln." method and ppt. Be in the filtrate with tannin. *Seprn. of Be from the monoxides and from Ti.*—Treatment with NH_4NO_3 and MeOH to cause pptn. of $\text{Be}(\text{OH})_2$ serves to sep. Be from all the cations of this group. With Zn, however, it is also possible to ppt. ZnS first from dil. sulfosalicylic acid solns. in the presence of NH_4OAc . With Cd also, it is permissible to ppt. CdS from dil. H_2SO_4 soln. With Ni, the Ni salt of dimethylglyoxime can be obtained if tartaric or sulfosalicylic acid is present to prevent pptn. of $\text{Be}(\text{OH})_2$, but the NH_4NO_3 method is easier. With Mn, it is well to ppt. MnO_2 from dil. H_2SO_4 soln. by adding $(\text{NH}_4)_2\text{S}_2\text{O}_8$ and heating. With Ti, it is possible to ppt. Ti first as Ti_2CrO_7 , but the presence of considerable CrO_3 causes difficulty in the Be detn. *Seprn. of Be from the As group.*—The removal of As as insol. sulfide or as volatile AsCl_3 serves for the seprn. of Be from As. Pptn. of Sb as Sb_2S_3 serves for the seprn. of Be from Sb. With Sn, H_2S pptn. or formation of metastannic acid does not work out well. The following procedure which depends upon the formation of an adsorption compd. of quadrivalent Sn with tannin is excellent. To the clear soln. of the chlorides, strongly acid with HCl, add 5 cc. of 10% tannin soln., 10–20 g. of NH_4OAc and 10–20 g. of NH_4NO_3 . Boil, allow to stand on the water bath 1 hr., filter and wash with hot water contg. a little tannin. If more than 0.2 g. of Sn is present, dissolve the ppt. in HCl and repeat the pptn. A short summary of methods of seprn. when other cations are present is given. With W, the pptn. of this element by tannin is often incomplete. To remove traces of WO_3 from the filtrate add a clear 15% soln. of antipyrine and heat for some time on the water bath. W T H

The confirmatory test for aluminum. RAYMOND GEMMILL, ROBERT BRACKETT AND C. R. McCrosky. Syracuse Univ. *J. Am. Chem. Soc.* 51, 1165(1929) = Parégnan and Solivan (*C. A.* 22, 3859) recently published a modification of the Thénard blue test for Al, using asbestos fiber instead of a filter paper. Similar tests were made at Syracuse prior to this publication. The modified procedure also works well in the Zn test. W T H

Determination of chromium, tungsten, molybdenum, vanadium, manganese and cobalt in highly alloyed steel. H. MENDE. *Chem.-Ztg.* 53, 178-9(1929) = *Ind.* Cr.—Treat 1 g. of metal (0.5 g. if more than 10% of Cr is present) with 25 cc. of concd. H_2SO_4 and 25 cc. of water. If W is present, add at the same time 25 cc. of 20% Na_2HPO_4 soln. Heat till no more gas is evolved and add 20 cc. of 50% $(\text{NH}_4)_2\text{S}_2\text{O}_8$ soln. This accomplishes the oxidation of all carbides. If the Cr content is high, evaporate, adding the persulfate, till the vol. is reduced $\frac{1}{2}$ in order to make the black residue light and flocculent. It may be necessary to dil. with water and repeat this evaporation several times in order to get all of the sample into soln. Then add the persulfate soln. After this addn., dil. with 500 cc. of water, add 5 cc. of 0.2 N AgNO_3 soln. and continue as usual for the persulfate method of detg. Cr, adding more persulfate if necessary to produce the permanganate color. *Detn. of Ni.*—Treat 0.5 g. of metal with concd. HCl, oxidize with HNO_3 and dil. with 3 vols. of hot water. After standing a short time, filter and continue as in the usual dimethylglyoxime method. *Detn. of Co.*—Dissolve 2 g. of steel in concd. HCl and oxidize with HNO_3 in a 500-cc. flask. Add an excess of ZnO suspension in water to ppt. Fe, Cr, V, Mo, Ti, Al, Si, Cu and W. Dil. to the mark, mix and filter off 100 cc. Add 10 cc. of HCl and 40–60 cc. of nitroso- β -naphthol soln. (2 g. of the solid dissolved in 100 cc. of alc.; or 25 cc. of a soln. of 2 g. of the reagent in 50 cc. of AcOH can be used). Filter, wash, ignite and weigh as Co_2O_3 . *Detn. of W.*—If less than 5% of Cr is present, the W can be obtained as WO_3 by treatment with concd. HCl and HNO_3 . The first ppt. should be filtered off and digested with 3 N HCl and KClO_3 . If the steel is rich in Cr, the WO_3 will be black and contain Cr carbide together with some Mo and V. In this case, wash the first ppt. of WO_3 with water contg. NH_4NO_3 and fuse it with soda. Treat the melt with water and some HCl, transfer to a 500-cc. flask and treat with alc. to reduce the Cr. Then add NH_4OH , boil for some time and make up to 500 cc. Filter, take 250 cc. of the filtrate, make neutral to methyl orange with HCl and add 10 cc. of 0.1 N H_2SO_4 . Ppt. the W, V and Mo that are present in the first insol. residue by adding benzidine-HCl. Fuse the ppt. with $\text{K}_2\text{S}_2\text{O}_8$ and treat the melt with cold water and a little HCl. The WO_3 ppt. should now be pure. *Detn. of Mo and V.*—In the filtrate from the WO_3 the Mo can be detd.

as MoO_3 after prior pptn. as MoS_3 by pouring the soln. slowly into boiling KOH soln., filtering, making slightly acid and introducing H_2S under pressure. In the filtrate from the MoS_3 pptn. the V can be detd. as follows: Boil off H_2S , oxidize with Br_2 , boil off excess Br, make slightly ammoniacal and add an aq. soln. of 1 g. MnCl_2 . Filter, dissolve the Mn vanadate ppt. in HNO_3 , evap. 3 times with concd. HCl , then with H_2SO_4 and titrate with KMnO_4 . Or, if desired, the V can be detd. colorimetrically with H_2O_2 . In this case treat 25-50 cc. of ammoniacal filtrate from the $\text{Cr}(\text{OH})_3$ pptn. with 20 cc. of concd. HNO_3 , add 30 cc. of H_3PO_4 and 2 cc. of 3% H_2O_2 . For the Mn detn., it is recommended to dissolve 5 g. of the material in 50 cc. of HNO_3 with a little HF , dil., and ppt. the Fe and Cr with ZnO suspension. Then ppt. the Co with KNO_2 in the filtrate. Filter and treat with 4 g. of urea to remove HNO_2 and finally titrate the Mn with KMnO_4 after adding more ZnO . W. T. H.

The detection of gold and the metals found with crude platinum. SPORCO. Soc. mines d'or Kilo-Moto, Belgian Congo. *Bull. soc. chim. Belg.* 38, 21-4(1929).— SnCl_2 gives characteristic color reactions with the pure chlorides of the following metals: Au, blue-black color or ppt.; Pt, brown; Pd, brick red; Ru, pale yellow; Ir, orange-yellow. It has been shown (with the bead obtained after cupellation) that 0.001 mg. Au can be detected. The method may be used in prospection, but requires a certain practice; an excess of SnCl_2 should be used to eliminate the color due to Fe in the mineral investigated. It is also possible to use this method to detect Pt in refined gold. The order of magnitude of the precious metal content may be estd. from the intensity of the colors: this also requires training. Mo, W, V, Cu or Cr interfere with the reaction, but since Au is generally sought in quartz, this case is rarely met. A. L. H.

The electroanalytic determination of lead. A. V. PAMFILOV AND A. A. BLAGONRAVOVA. Polytechnicum at Ivanovo-Voznesensk. *J. Russ. Phys.-Chem. Soc.* 60, 699-706(1928).—A study of various electrolytic methods confirms the general opinion that anodic disposition of PbO is preferable to cathodic deposition of Pb. B. S.

New method for the rapid determination of mercury. G. SPACU AND J. DICK. Rumanian Univ. at Cluj. *Z. anal. Chem.* 76, 273-7(1929).—If an aq. soln. of Hg^{++} salt is treated with solid $(\text{NH}_4)_2\text{Cr}_2\text{O}_7$ and then pyridine is added as soon as the dichromate has dissolved, a fine, orange yellow ppt. of a complex salt of Hg with dichromate and pyridine is obtained, corresponding to the formula $[\text{HgPy}_2]\text{Cr}_2\text{O}_7$. The ppt. is insol. in water contg. dichromate and pyridine, in alc. and in ether. To 100 cc. of Hg^{++} salt soln. add 2 g. of powd. $(\text{NH}_4)_2\text{Cr}_2\text{O}_7$ and 1 cc. of pyridine as soon as the dichromate has dissolved. These quantities of reagents are sufficient for 0.30 g. of Hg. Stir for 5-10 mins., filter through a Gooch crucible and wash 4-5 times with water contg. 0.5 g. of $(\text{NH}_4)_2\text{Cr}_2\text{O}_7$ and 0.5 cc. of pyridine per l. Then wash with 80% alc. contg. 1 drop of pyridine for each 10 cc. of abs. used in prepg. the 80% soln. Finally wash with ether, dry in the air or in vacuum at room temp. and weigh. The ppt. contains 34.90% of Hg. The results are accurate. W. T. H.

Potentiometric determination of titanium in the presence of other metals, particularly iron. H. BRINTZINGER AND W. SCHIEFERDECKER. Univ. of Jena. *Z. anal. Chem.* 76, 277-80(1929).—By titration with CrCl_2 it is possible to det. the end point corresponding to the reduction of Ti^{++++} to Ti^{+++} accurately, although the break in the titration curve is small. In the presence of Cu, potentiometric titration shows that the Ti reduction is intermediate between the reduction of Cu^{++} to Cu^+ and Cu^+ to Cu^0 . When Fe is present with Ti the first break in the curve corresponds to the reduction of Fe^{+++} to Fe^{++} and the second to the reduction of the Ti. Good results are reported for the potentiometric detn. of Cu and Ti in the presence of one another and for the detn. of Fe and Ti. W. T. H.

Determination of tin in wires insulated with rubber. A. LEJEUNE. Inst. Meurice-Chimie, Brussels. *Bull. soc. chim. Belg.* 38, 25-30(1929).—To det. Sn in rubber-insulated wires, it is imperative to use a 5-m. sample at least, since the Sn coating is usually uneven. Rubber is peeled off, and the last traces of it must be removed with C_6H_6 . The wire is then dissolved in HNO_3 (d. 1.36). SnO_2 is filtered and weighed. Cu has never been found in the ppt. ALBERT L. HENNE

Variations in silver assaying. F. C. JOHNS. *Chem. Eng. Mining Rev.* 21, 152-4(1929).—In N. S. W. in the Broken Hill field, it is stipulated that assays must agree within 0.5 oz. Ag per ton. With ores assaying 3-13 oz. Ag per ton, few umpire assays are necessary but when over 70 oz. of Ag per ton are present, the differences between the assays for the buyer and for the seller are so great that most of the assays have to be umpired. In this paper 3 methods of assay were studied to show the difficulty in getting concordant results. Two methods, that of scorification and pot assay using niter, give practically identical results; but pot assaying using an Fe rod for desulfurizing

causes greater losses in Ag. In spite of all that can be done, there are bound to be Ag losses due to volatilization and to absorption by the cupel. It is difficult to make proper allowance for these losses and considerable skill is necessary on the part of the operator.

W. T. H.

Zirconium. III. Influence of lithium, rubidium, cesium and magnesium upon the detection of potassium by zirconium sulfate. RUFUS D. REED AND JAMES R. WITHROW. Ohio State Univ. *J. Am. Chem. Soc.* 51, 1062 5(1929); cf. C. A. 23, 791.—With 2 cc. of reaction mixt., a soln. of $Zr(SO_4)_2$ contg. 8.7% of dissolved salt will show the presence of 1.0 mg. or more of K in the presence of Li, Rb, Cs, Mg, Na and NH_4 ions. Since this is not true of $Na_2Co(NO_2)_6$, H_2PtCl_6 and $HClO_4$, which are the best-known reagents for detecting K, the value of $Zr(SO_4)_2$ as a reagent is obvious.

W. T. H.

A new procedure for the detection of minute amounts of iodine. A. N. SUCHUKA REV AND SUISSOV. *J. Russ. Phys.-Chem. Soc.* 60, 609 71(1928). When a cell with Pt electrodes connected to a galvanometer is filled with 0.1 N KI soln. and placed between the poles of an electromagnet (field strength 2000 gauss), a deflection is produced which increases about 10 times on the addn. of a trace of I_2 to the soln. A similar effect is obtained when the cell is not placed directly in the magnetic field but in series with a loop of Al wire in the field. The phenomenon is explained as an increase in the induced current strength due to the depolarization of electrodes by I_2 . Similarly, when an e. m. f. of a few millivolts is applied to the cell electrodes the resulting current is 20 or more times larger in the presence of I_2 (or Cl_2 in 0.1 N KCl soln.). I_2 in concns. which produce no color with starch can be detected by this method. B. SEYENKOFF.

The origin of the alkali and alkaline earth metals as impurities in reagents. A. FROST. *Trans. Inst. Pure Chem. Reagents* (Moscow) 1927, No. 6, 38-40. By analyzing NH_4 alum and $CdSO_4$ it is shown that the traces of alkali and alkaline earth metals found are not introduced during the analysis but are present in the original reagents.

G. B. KISTIAKOWSKY.

Quantitative estimation of chloride ion in reagents. A. FROST. *Trans. Inst. Pure Chem. Reagents* (Moscow) 1927, No. 6, 35-7. The effects of acids and salts on the nephelometric detn. of Cl^- by $AgNO_3$ have been investigated. With 20 cc. of soln. it was found that 1 cc. of 0.1 N $AgNO_3$ produces the max. turbidity and that further additions of this salt have no effect. Nitric acid first increases and then decreases the turbidity. The max. was obtained with about 1.5% acid. H_2SO_4 acts similarly. NH_4NO_3 , KNO_3 , K_2SO_4 , Na_2SO_4 , $KClO_4$, $CdSO_4$ and $Zn(CH_3COO)_2$ present in quantities of 1 g. in 20 cc. of soln. increase all the turbidity by about 40% when chloride ion concn. is 0.55 to 0.020 mg. in 20 cc. and by about +20% when the concn. is 0.44 to 0.01 mg. in 20 cc.

G. B. K.

Determination of the fluosilicate anion and of the fluoride ion in general. H. BAYLE AND L. AMY. *Compt. rend.* 188, 702 4(1929). By heating a fluoride with SiO_2 and concd. H_2SO_4 in a 60-100 cc. flask it is possible to transform the fluoride into SiF_4 gas. This gas when passed into water gives H_2SiF_6 and H_2SiO_3 . The H_2SiF_6 can then be converted into K_2SiF_6 , insol. in alc. and this salt can be titrated with KOH soln., phenolphthalein being used as indicator. Place the substance together with some SiO_2 in the distg. flask and add 10-20 cc. of concd. H_2SO_4 . Pass a current of dry air through the flask for 30 mins. to expel all moisture. Then raise the temp. to 100° and keep at this temp. for several hrs. Pass the gas through a tube dipping under Hg , so that it does not become clogged, and then into water. At the end of the expt. wash out this tube. From the H_2SiF_6 soln. thus obtained in the receiver, ppt. K_2SiF_6 by the addn. of an excess of KCl and enough 95% alc. to double the vol. of the soln. It is well to add also some ether. Neutralize carefully with KOH, using phenolphthalein as indicator. With pure H_2SiF_6 this neutralization would correspond to 2 KOH for each mol. of H_2SiF_6 . The ppt. of K_2SiF_6 , however, can be made to react with 4 more mols. of KOH as follows: Add a few cc. of 0.1% $CaCl_2$ and evap. off the ether and alc. on the water bath. Take up in hot water and titrate with KOH, using phenolphthalein as indicator.

W. T. H.

Applications of ceric sulfate in volumetric analysis. V. Potentiometric study of the reaction between ferrocyanide and ceric ions. N. HOWELL FURMAN AND OLIVER M. BYAM. Princeton Univ. *J. Am. Chem. Soc.* 51, 1128-33(1929).—The potentiometric titration of $Fe(CN)_6^{4-}$ with $Ce(SO_4)_2$ is accurate in solns. which are 1-5 N in H_2SO_4 or 0.5-2 N in HCl . The reverse titration is only accurate when the greater part of the $Fe(CN)_6^{4-}$ is added very rapidly. In the former case, the presence of a little Fe^{+++} in the Ce^{++++} soln. causes a greenish coloration (due to Prussian blue, which

disappears sharply at the end point so that the titration can be carried out with a visual end point which is practically identical with the potentiometric.

water, add 5 cc. of the sample and 5 cc. of 10% KI. Let stand overnight in a closed vessel shielded from direct sunlight and titrate the free I_2 with 0.1 N $Na_2S_2O_3$. The results are high because of the liberation of some I_2 in the absence of active O. When this amt. of I_2 is subtracted, the corrected results agree closely with those obtained by gas analysis.

Determination of sulfuric acid in the presence of chromic acid. B. SOYENKOFF. *Trans. Inst. Pure Chem. Reagents* (Moscow) 1927, No. 6, 31-4. Pptn. methods being unsatisfactory for the detn. of H_2SO_4 in the presence of CrO_3 , it is best to det. the total free acid by adding an excess of NaOH soln. and titrating back with H_2SO_4 using Congo red as indicator. The end point corresponds to the formation of $Na_2Cr_2O_7$ and Na_2SO_4 . To det. CrO_3 , make the soln. strongly acid and titrate iodometrically. G. B. K.

Determination of selenium dioxide in sulfuric acid. Tz. RAIKHINSTEIN. *Trans. Inst. Pure Chem. Reagents* (Moscow) 1927, No. 6, 27-30. A colorimetric detn. of SeO_2 in concd. H_2SO_4 has been worked out by using codeine phosphate in a modified Dragendorff method. By adding 0.1 cc. of a 4% aq. soln. of codeine phosphate to 10 cc. of SeO_2 soln. in concd. H_2SO_4 one obtains convenient depth of color between concns. 0.01% to 0.00005% SeO_2 . Arsenic acid in H_2SO_4 gives no perceptible coloration when present in concn. less than 1%. Ferric salts give a blue coloration of a different hue than SeO_2 . First indications of color appear when the Fe content exceeds 0.0015%. In the presence of phosphoric acid color appears only when the concn. of Fe is greater than 0.0074%. G. B. KISTIAKOWSKY

Determination of chloride in bromides. R. K. McALPINE. Univ. Michigan. *J. Am. Chem. Soc.* 51, 1065-73 (1929). With 1 g. samples it is possible by the proposed method to remove the Br and weigh the chloride as AgCl within about 0.1% of the original wt. of sample. With 10 g. samples, directions are given which will det. as little as 0.2% chloride with satisfactory accuracy. The method depends upon the preferential oxidation of the bromide by treating with $KMnO_4$ in solns. of definite acidity and in the presence of acetone which unites with the Br as fast as it is oxidized. The excess of $KMnO_4$ is removed by treatment with H_2O_2 and the chloride pptd. by treatment with $AgNO_3$ in the presence of dil. HNO_3 . W. T. H.

Modified iodine pentoxide method for determination of carbon monoxide in air and blood. MATHEW J. MARTINEK AND WM. C. MARTI. Health Dept., Chicago. *Am. J. Public Health* 19, 293-9 (1929). The method depends upon the liberation of I_2 by the interaction of I_2O_5 and CO and titration with 0.02 N $Na_2S_2O_3$ in a microburet. The app. can be used for the detn. of as little as 0.001 cc. of CO in 3 cc. of blood and the av. error in detg. CO in gasoline exhaust was 6% of the actual CO content. The gases under examn. are sucked successively through cold, concd. H_2SO_4 , H_2SO_4 heated to 150°, cold, concd. H_2SO_4 , activated charcoal, soda lime, solid KOH and "dehydrite." Then they are passed through a tube contg. "seasoned" I_2O_5 heated to 150° and the liberated I_2 is absorbed in a specially constructed absorption bulb contg. 10% KI soln. The gases do not come in contact with rubber connections at any place. W. T. H.

Determination of water in micas. K. I. VISKONT AND I. P. ALIMARIN. *Trans. Inst. Econ. Mineral Met.* (Moscow) 1928, No. 40, 18 pp. Considerable difficulty has been encountered in the detn. of H in silicates, like the micas, which retain the combined H very persistently even at high temp. and because some of the H is likely to be evolved as such by the oxidation of FeO to Fe_2O_3 by H_2O at the high temp. These difficulties can be overcome, however, and the method of Penfield used to advantage, if the substance is placed in a Pt boat together with some Pt black some PbO and some dry Na_2WO_4 powder. W. T. H.

The value of the combustion method in the determination of the cotton content of asbestos products. H. SOMMER. Staatl. Materialprüfungsamt, Berlin-Dahlem. *Gummi-Ztg.* 43, 1107-8 (1929).—The proportion of combined water in asbestos depends upon the quality of the asbestos and varies considerably among various grades. Therefore, the loss on combustion of an asbestos product is an uncertain and misleading indication of the presence of cotton, and a loss on combustion may be made up of both cotton and combined water, or either alone. Because of uncertain results recorded in the literature, the hygroscopic water, the loss after several hrs. at 600°, and after 1 hr. at 900° were detd. in 18 types of asbestos from various countries. The hygroscopic water varied from 0.34 to 2.37%, the loss at 600° from 0.28 to 13.18% and the

loss at 900° from 0.45 to 15.80%. A survey of various methods leads to the conclusion that the only satisfactory method for detg. cotton is the cuprammonium method of Heermann and S. (cf. C. A. 16, 4068). Continued use of this method has shown its great reliability, and if the treatment is prolonged, silk can also be removed from the asbestos.

C. C. DAVIS

The chemical analysis of silicates. JOSEF ROBRITSCHER. *Sprechsaal* 61, 233-5, 257-60(1928); cf. C. A. 22, 3109.—The recent methods for pptg. various cations by *o*-hydroxyquinoline are applied to the analysis of silicates.

R. A. HEINDL

The determination of total carbon in metallurgical products. JOSÉ GONZÁLEZ-RODRÍGUEZ Y GRÍ. *Quim. ind.* No. 61, 24-39(1929).—After a critical discussion of (a) Fleming's method, (b) Strohm's method and (c) the Cain-Maxwell method, comparative results in the analysis of various samples of Fe, steel and Fe alloys, it is shown that F.'s method gives consistently good results, S.'s method gives low values and is inapplicable to Fe-Mn and resistant iron. C.'s method gives higher results and, on the whole, is not satisfactory.

S. L. B. ETHERTON

Analysis of chrome ores. THOMAS R. CUNNINGHAM AND THOMAS R. MCNEILL. Union Carbide Res. Lab. *Ind. Eng. Chem., Anal. Ed.* 1, 70-2(1929).—Methods are given for the detn. of Cr, Fe, Al, SiO₂, CaO and MgO. Cr is detd. in a sep. sample which is fused with Na₂O₂. After the melt is leached with water and the Fe crucible removed, the soln. is treated with dil. H₂SO₄ and then HNO₃ is added. Then, after treatment with KMnO₄, AgNO₃ and (NH₄)₂S₂O₈, the procedure follows the usual method for detg. Cr in steel by the persulfate method. For the detn. of the other constituent it is recommended to digest a sample of the ore with H₂SO₄ and HClO₄; or, if the quartz content is high, to fuse with soda and borax. In the latter case, the B is removed by treatment with HCl and MeOH. After complete reduction of the Cr₂O₇²⁻ to Cr³⁺, the Fe²⁺ is oxidized with HNO₃ and the Ti and Fe are pptd. with cupferron. The Fe and Ti are then detd. in the usual way. In the filtrate from the cupferron ppt. the excess reagent is oxidized and the Cr³⁺ converted to Cr₂O₇²⁻ again by evapn. and heating with KClO₃ and HNO₃. After this the Al is pptd. by NH₄OH. The wt. of Al₂O₃ should be corrected for P₂O₅ and Cr₂O₃ which it will contain in small quantities. It is next recommended to add (NH₄)₂HPO₄ and ppt. both Ca and Mg as phosphate. The ppt. is ignited and weighed. It is dissolved in HCl and from the soln. CaSO₄ is pptd. by evapn. and treatment with H₂SO₄ and alc. The CaSO₄ ppt. is dissolved in dil. HCl and the Ca finally pptd. as oxalate. In the filtrate from the CaSO₄ ppt. Mg is detd. by the bismuthate method. Mg is computed from the wt. of the previous phosphate ppt. after allowing for the Ca₃(PO₄)₂ and Mn₃P₂O₇ which it contains. No values are given to show the accuracy of this procedure.

W. T. H.

Determination of sulfur in organic compounds. E. A. SMITH AND J. W. LEIN. *Can. Chem. Met.* 12, 287-8(1928).—The S content of samples of Ba lignosulfonate was detd. by the following 5 methods: Eschka's method, fusion with Na peroxide followed by gravimetric detn. of sulfate, Klason's method in which the oxidation is carried out by the fumes from asbestos soaked in HNO₃ in a combustion tube, Apitzsch's method using Pt gauze and O₂, and Carius' method. The most consistent and highest results were obtained by Carius' method, which was closely approached by Apitzsch's method. Losses evidently occurred in the other methods, which gave very variable results.

R. C. A.

A colorimetric method for the determination of butyric acid. R. J. ALLEN, W. H. PETERSON AND E. B. FARR. Univ. of Wis. *J. Bact.* 17, 79-87(1929).—The soln. to be tested was made to a definite strength, treated with a CuCl₂-HCl reagent (8.26 g. of CuCl₂·2H₂O in 1000 cc. of N HCl) and the mixt. shaken with CHCl₃. Known mints. of butyric and acetic acids treated in the same manner were used as standards. By careful standardization, the results with 17 butyric-acid-producing cultures of bacteria checked well with the Duclaux method. Good results were obtained in the presence of either acetic or formic acids.

JOHN T. MILES

Examination of commercial carbolic acid. GABRIEL KOGAN. *Pharm. Z.* 70, 149-51(1929).—A discussion of various procedures and tests for the evaluation of low-grade carbolic acid.

W. C. E.

Microchemical reactions for quinidine. M. WACHHAAR. *Pharm. H.* 66, 187-200(1929).—The delicacy of various reactions in terms of min. concn. and min. amt. detectable are: pptn. of free base, 1:500 5 mg., KI + I, 1:500 5 mg., KBr + Br, 1:500 20 mg., KSCN, 1:500 4 mg., K₂Fe(CN)₆, 1:500 5 mg., AuCl₃, 1:2000 1 mg., meconic acid, 1:500 5 mg., C(CO₂H)₂, 1:500 10 mg., (HO)₂C₂H₂CO₂H, 1:2000 2 mg.

A. W. D.

Method for determining formaldehyde. FARRIS LUTHER. Univ. Prague *Z. chem.* 76, 241-54(1929).—The method consists in making the HClO combine

with KCN and detg. the excess of the latter. Add 10 cc. of approx. 1.7 N HCHO soln. to about 75 cc. of KCN soln. carefully measured into a distg. flask. Mix well and allow to stand about 5 mins. Then add 40 g. of tartaric acid dissolved in water. Dil. to 200 cc. and distil slowly, eventually using a stream of air to help drive over the HCN. Collect the distillate in 2 absorption flasks, each contg. 50 cc. of clear 10% KOH soln. Finally titrate the KCN formed with AgNO_3 by the Liebig method, adding KI soln. to sharpen the end point.

W. T. H.

Applications of the nitrile method. I. Binding of hydrocyanic acid by albumin. II. Determination of formaldehyde in albuminous media. III. Quantitative relations between formaldehyde and albumin. FRITZ LIPPICH. Univ. Prague. *Z. anal. Chem.* 76, 255-60(1929).—In the preceding abstr., it was shown that HCHO can be detd. satisfactorily by making it form acetonitrile by interaction with KCN. The nitrile holds the CN radical sufficiently strongly so that the excess KCN can be detd. by adding tartaric acid and distg. off HCN from the alkali cyanide alone. It is proposed to call this procedure "the nitrile method." Before applying the method to various media, it is necessary to det. by expt. the extent to which these media react with KCN. Expts. with egg albumin, peptone, gelatin and several casein products show that these do not combine with HCN to any appreciable extent, or at least to a degree such that the HCN is not liberated by treatment with tartaric acid. The mols. of genuine albumins, globulins, gelatins, caseins, etc., do not contain free aldehydic, ketonic or phenolic groups. For very exact measurements of small quantities of KCN, however, it is necessary to allow for a slight absorption of HCN by these substances. The nitrile method, therefore, seems suitable for studying the combination of HCHO with proteins. It is shown by expt. that the presence of these substances does not make the nitrile more readily decomposable by tartaric acid. The amt. of HCHO absorbed by gelatin soln. was studied by allowing the HCN soln. to react with gelatin soln. for periods ranging from 1 min. to 87 hrs. The amt. of HCHO absorbed by 1 g. of gelatin increased slowly with the time from 8.2 to 24.6 mg. With 4 samples of casein, 4 g. of the protein united with 3.3-9.8 mg. of HCHO.

W. T. H.

Dihydroxytartaric acid and its use in the detection and determination of Na (OKATOV) 10. Preparation of Na hypobromite reagent (ARIAS) 6.

8—MINERALOGICAL AND GEOLOGICAL CHEMISTRY

EDGAR T. WHERRY AND J. F. SCHAIER

Determination of the melting points of sulfide- and arsenide minerals. L. H. BORGSTRÖM. III. *Nord Kemistmodel* (Finland) 1928, 169-71.—The method discussed is very similar to the common method of detg. the m. p. of org. compds. For temp. baths the following were used: over 810° , NaCl , $630-850^\circ$, 7 pts. Na_2SO_4 and 3 pts. NaCl ; $380-650^\circ$, 3 pts. KCl and 1 pt. LiCl and $220-450^\circ$, 55 pts. NaNO_3 and 45 pts. KNO_3 . For temp. measurement a LeChatelier thermoelement, and for capillaries hard glass or quartz, were used. M. p. of AsS = 310° , As_2S_3 = 325° , Sb_2S_3 = 546° , Bi_2S_3 = 718° , $\text{Pb}_3\text{As}_2\text{S}_5$ = 450° , $\text{Ag}_3\text{Sb}_2\text{S}_5$ = 470° and Ag_3SbS_5 = 480° . Metal sulfides and arsenides gave m. ps. between 800° and 1200° , while many decomposed. Most of the m. ps. of metallo-sulfarsenides, sulfantimonates and related compds. fell between 400° and 600° , and some Bi sulfosalts above 800° .

O. A. NELSON

The presence of atacamite among the incrustations of Vesuvian lava in 1631. G. CARONNI. *Rend. accad. sci.* (Napoli) [3], 34, 78 83(1928).—Crystallographic measurement as well as chem. analysis has proved that crystals of atacamite, $\text{CuCl} \cdot 3\text{Cu}(\text{OH})_2$, are present in the lava incrustations from the eruption of 1631.

A. W. CONTIERI

X-ray investigation of the microcrystalline iron-hydroxide minerals. J. BÖHM. Univ. Freiburg. *Z. Krist.* 68, 567-85(1928).—The supposed existence of a series of hydrates of Fe_2O_3 , such as $\frac{1}{2}\text{H}_2\text{O}$ (hydrohematite or turgite), $\frac{1}{3}\text{H}_2\text{O}$ (hydrogoethite), $\frac{1}{4}\text{H}_2\text{O}$ (goethite), $\frac{1}{5}\text{H}_2\text{O}$ (limonite), $2\text{H}_2\text{O}$ (xanthosiderite) and $3\text{H}_2\text{O}$ (limnrite) is disproved. The only crystal. compd. is $\text{Fe}_2\text{O}_3 \cdot \text{H}_2\text{O}$, which is dimorphous, occurring as goethite (α -form) and lepidocrocite or "rubinglimmer" (γ -form). The α -form is orthorhombic, with $a = 4.60$, $b = 10.01$ and $c = 3.04$ A. U.; axial ratio for this 0.459:1:0.303. The calcd. d. is 4.195. The γ -form is also orthorhombic, with $a = 3.85$, $b = 12.5$, $c = 3.07$ A. U.; the axial ratio is 0.308:1:0.246 and the calcd. d. is 3.97. Powder photographs from 33 specimens, including xanthosiderite, limonite, ocher, "Bohners," "Schwarzhäuten," brown "Glaskopf," "Brauneisen-stalagmit," gave

patterns identical to those obtained from goethite or synthetic $\text{Fe}_2\text{O}_3 \cdot \text{H}_2\text{O}$. The only addnl. lines were due to impurities, such as quartz. There was evidence of amorphous material in a few of the samples. Addnl. water in excess of that called for by the formula is attributed to adsorbed H_2O or to impurities. Hydrohematite and red "Glaskopf" give the $\alpha\text{-Fe}_2\text{O}_3$ pattern. Some specimens of "Sumpferz" and "Pecherz" gave no lines at all, indicating an amorphous condition. No lines of $\gamma\text{-Fe}_2\text{O}_3 \cdot \text{H}_2\text{O}$ were obtained from any of the specimens. The structures of fibrous hematite and limonite are discussed. When a fiber of α -limonite is dehydrated, its b -axis becomes the c -axis of the new hematite structure, and, conversely, its c -axis becomes the new b -axis.

L. S. RAMSDELL

Pelargosite from Tremonti, Adriatic Sea. F. ONORATO. *Bull. soc. geol. ital.* **44**, 17(1926).—Pelargosite, $d. 2.834$, $H 4$, $n_D 1.529$, contained: CaCO_3 79.47, MgCO_3 3.13, SrCO_3 2.27, CaSO_4 3.94, Fe_2O_3 0.23, Al_2O_3 0.57, NaCl 3.66, KCl 1.63, SiO_2 0.47, H_2O 2.44, org. material 2.10%.

B. C. A

Stoichiometry of silicates. B. GOSSNER. Univ. Munich. *Z. angew. Chem.* **42**, 175-9(1929).—The compn. of natural silicates shows a slight deviation from a simple numerical relationship between SiO_2 and MO , a small excess of SiO_2 generally being found. This is investigated for a no. of *olivines*, *almandines* and *sandines*. With olivine, the relation $\text{SiO}_2:\text{M}'\text{O}$ is about 1:1.96, and the relation $\text{SiO}_2:\text{M}''\text{O}$ is about 1:2.03 ($\text{M}' = \text{Mg} + \text{Fe} + \text{Ca}$; $\text{M}'' = \text{Mg} + \text{Fe} + \text{Ca} + \text{H}_2$), a slight excess of SiO_2 in the first case and a slight deficiency in the second case. With almandine, the deviation from a simple numerical relationship is apparently very great, the ratio $\text{SiO}_2:\text{M}''\text{O}$ being about 2.75:1, but correcting for isomorphous replacements of the type $\text{SiFe} = \text{Al}_3$, there is then an excess of SiO_2 . With *nepheline* and the *zeolites*, a similar excess of SiO_2 is found, but with *sanidine* there is a slight deficiency. The occurrence of gaps in the structure is a possible explanation of this phenomenon. H. STOERTZ

Geologic remarks on phosphates from Niezwiska, Poland. JAN NOWAK. *Przemysl Chem.* **11**, 709-21(1927).

A. C. ZACHLIN

Polish phosphates. JULIAN TOKARSKI. LWOW Polytech. *Przemysl Chem.* **11**, 58-72(1927).—After a review of earlier work on the subject T. describes the phosphate deposits near Grodno and Rachow and those at Niezwiska.

A. C. ZACHLIN

Chemical composition of rock-making nephelite. JOZEF MOROZEWICZ. *Bull. intern. acad. Polonaise* No. 3A, 111-25(1928).—On the basis of 5 new chem. analyses and a complete survey of the literature, M. concludes that the correct formula for nephelite is $\text{K}_2\text{Al}_2\text{Si}_3\text{O}_{10} \cdot n\text{Na}_2\text{Al}_2\text{Si}_2\text{O}_8$ (where n is usually 4). Attention is called to the fact that nephelite is slowly attacked by moist air, which tends to alter its compn.

J. F. SCHAIER

The crystal structure of garnet. G. MENZER. Univ. Berlin. *Z. Krist.* **69**, 300-96(1928).—A detailed study of the garnet group, including the Ca-Al , Ca-Fe , Ca-Cr , Fe-Al , Mn-Al and Mg-Al varieties. Several new analyses are given. Garnet has a body-centered cubic lattice; the space group is O_h^{10} . The values for d_{100} are 11.840, 12.026, 11.950, 11.497, 11.603 and 11.510 ± 0.003 A. U., resp., for the above-mentioned varieties. The unit cell contains 8 mols. of $\text{M}_3'\text{M}_2'''\text{Si}_2\text{O}_{12}$. Other formulas proposed for garnet are incompatible with this unit cell. The positions of the bivalent, trivalent and the Si atoms are fixed by symmetry. The parameters for the O atoms are detd. for each variety. The arrangement is not the same as that of Nishikawa (C. A. **11**, 3170). Each Si atom is surrounded by O atoms at the corners of a tetragonal bipyramid, and each trivalent atom by O atoms at the corners of a distorted octahedron. Interatomic distances are calcd. and compared with values from other sources.

L. S. RAMSDELL

Garnet sand at Hel, on the Baltic Sea. W. WAROCKI. Krakow Univ. *Bull. intern. acad. Polonaise* 1928, 439-44.—A description of sand found at Hel together with the mechanical analysis, a sepn. of the lighter constituents with CHBr_3 , physical consts. and optical researches.

ALBERT L. HENNE

The chemical constitution of the micas. IV. Phlogopite. Part 1. JOHANN JAKOB. *Z. Krist.* **69**, 217-25(1928); cf. C. A. **21**, 3861.—Analyses are given for 8 phlogopites and 1 manganophyllite. Optical data are included for 5 of the specimens. The variations in compn. are explained by combinations in different proportions of simple mols. common to all.

L. S. RAMSDELL

The approximate content of gallium in the green kaolin from Tanokami. The existence of gallium in the solar chromosphere. S. IIMORI. *Sci. Papers Inst. Phys. Chem. Research, Tokyo*, Supplement 10, No. 8, 1-4(1928).—Ga has been estd. in the green kaolins from Tanokami (cf. C. A. **22**, 1119, 1121) by the optical method of Fapish

and Holt (*J. Phys. Chem.* 32, 142(1923)); the Ga content of the mineral is about 0.004 to 0.0004%. It is believed that Ga exists in the solar chromosphere, but the evidence is meager. The solar spectrum should be investigated in the near ultra-violet range with a view of finding the lines 2943.77 and 2944.29, which would be the best evidence of the presence of Ga.

ALBERT L. HENNE

The composition of tectites, particularly those from Cambodia. A. LACROIX. *Compt. rend.* 188, 284-8(1929).—The billitonite from Billiton, and the mineral called by Damour "explosive obsidianite from India" belong to the same deposit, represented by the large tectite in the Singapore museum. D. had noted that when attempting to break this obsidian, it shattered into fragments with violence. L. opened a spherical specimen 8 cm. in diam. with precautions described and found an eccentric spherical cavity of 6 cm. diam. The rupture is due to the presence of gas within. There are 3 types of tectites (a) Darwin glass, Tasmania, (b) moldavites of Moldavia and Bohemia, (c) australites and billitonites of Malaya and the tectites of Cambodia. Tectites have the common character of high free SiO_2 , high free Al_2O_3 , no phosphoric acid and a K content greater than the Na. L. gives a genetic hypothesis, and analyses of Darwin glass, moldavites, australites and billitonites, making 16 samples in all. The morphological, phys. and chem. properties of Cambodia glass resemble billitonite from Malaya and will be described later.

S. L. B. ETHERTON

• **Operative causes in ore deposition.** H. C. BOYDELL. *Bull. Inst. Mining Met.* No. 277, 85 pp.(1927); No. 280, 23-9; No. 284, 41-2; No. 285, 1-5; No. 287, 2 pp.(1928).—B. gives a general summary of the phys.-chem. principles underlying the deposition of ores from aq. solns., including in his paper such titles as H-ion concn. of ore solns., effect of temp. and pressure on concn., deposition due to evapn., change in temp., mixing of solns., length of time necessary for deposition, ore deposition from colloidal solns. and modes of deposition from colloidal ore-forming solns. The influence of pressure on limestone contact-metamorphic deposits is discussed at length and the reversibility of the chem. reactions stressed. In the discussion, V. M. Goldschmidt calls attention to a fundamental error in Boyde's statements concerning the reaction $\text{CaCO}_3 + \text{SiO}_2 \rightleftharpoons \text{CaSiO}_3 + \text{CO}_2$.

J. F. SCHAIRER

Ore genesis. JOHN A. GRIMES. *Mining and Met.* 9, 532-6(1928).—G. summarizes the modern theories concerning the genesis of ores genetically connected with igneous rocks. The result of progressive changes in the character of the solns. especially as regards their acidity is emphasized. Geological evidence points to the conclusion that the emanations from a cooling magma change radically from time to time and probably this change is continuous. The progressive change from the acid-gaseous to the alkaline-liquid type may be explained by the difference in pressures and temps. which would permit the escape of steam and acids as gases with attendant concn. of the ore-forming minerals in alk. soln.

J. F. SCHAIRER

The ferruginous sands of Necocha. Chemical composition and metallurgical application. PEDRO T. VIGNAU. *Rev. facultad cienc. quim. Univ. La Plata* 4, No. 2, 1-32(1927).—Microscopic examn. of the magnetic components showed magnetite, ilmenite, hornblende and picrotitanite. The coarser fraction of the nonmagnetic minerals contained quartz, plagioclase and hornblende. The fine fraction contained ilmenite, magnetite and some hornblende. Of a 10 kg. sample, there was 29.27% magnetite, 24.76% ilmenite, 27.89% medium sand and 80.3% common sand. These analyzed as follows:

Factor	Magnetite	Ilmenite	Medium Sand	Coarse Sand
Density	4.6908	4.2785	3.6093	2.8877
Moisture at 105°	0.079%	...	...	...
Fe_2O_3	76.599%	62.86%	41.114%	22.62%
TiO_2	15.940%	22.55%	8.5%	2.05%
SiO_2	1.80%	7.92%	45.3%	57.18%
MnO_2	3.71%	4.80%	1.71%	1.28%
Al_2O_3	1.19%	1.11%	2.22%	12.65%
MgO	0.50%	0.45%	0.31%	0.28%
CaO	0.08%	0.2%	0.71%	3.63%
Not detd.	0.1%	0.1%	0.11%	0.12%
Total Fe	55.44%	49.5%	29.76%	16.37%

The methods of analysis are discussed at length. Titaniferous sands are found on both sides of the Andes, along both sides of the South American littoral and in the interior, particular places being named. The Necocha sands extend about 15 km. at 30-80 m.

width and most deposits are similar so that there is no shortage of material. Similarity is brought out by the analyses given. Metallurgical products are discussed with analyses. V. adduces reasons for considering that economic working is practicable. The bibliography contains 72 references.

S. L. B. ETHERTON

Origin of iron ores of Iron Mountain and Pilot Knob. JOSEPH T. SINGEWALD, JR., AND CHARLES MILTON. *Am. Inst. Mining Met. Eng., Tech. Publication No. 197, Class 1, Mining Geology, No. 22*, 12 pp. (1929).—Evidence is deduced supporting Crane's theory of the origin of the specular hematite deposits of Mo. The ore bodies of Iron Mountain are of replacement character. In the mine are seen olive-green garnet rock contg. hematite, quartz, calcite and an amphibole. The porphyry contained orthoclase, plagioclase, quartz, hematite, sphene, chlorite, epidote and garnet, thus indicating high-temp. mineralization. The Shephard Mountain deposits are more decidedly fissure fillings and the mineral assemblage suggests hypothermal mineralization. The principal minerals of the rock at Cedar Hill are quartz, orthoclase and muscovite. The replacement and other phenomena indicate high-temp. mineralization under pegmatitic conditions. The relation of ore to gang and the constituent minerals at Pilot Knob indicate epigenetic high-temp. mineralization. All stages of replacement are seen.

S. L. B. ETHERTON

Geology and ore deposits of Kalgoorlie. F. R. FELDTMANN. *Ann. Progress Rept. Geol. Survey Western Australia for 1927*, 16-25 (1928).

H. C. PARKIN

Economic minerals of the pegmatites. JOSEPH P. CONNOLLY. *Black Hills Engineer* 17, 21-38 (1929).—The formation of spodumene $\text{LiAl}(\text{SiO}_3)_2$ is still not quite settled; it is mined for Li, and crystals 47 ft. long occur. The common material is variable; theoretically 9.4% Li_2O should be present, whereas it varies from 0.2 to 6%. LiOH is used in alk. electrolytic type storage batteries, LiBr , LiI in photography, LiCl for red light in signals, Li citrate and carbonate and phosphate in medicine. Amblygonite, Li-Al phosphate, should contain 10% LiO but runs less; it is more easily worked for Li and occurs in pegmatites. Lepidolite, a complex silicate of the mica class, is used now in special glasses. Black Hills lepidolite contains Cs and Rb. Triphylite, lithiophilite are Fe-Mn phosphates. Feldspar is abundant in this region. It is used for fine china and potteries, enamels, finer grades for artificial teeth, and as an abrasive in soaps. Mica, one of the principal minerals of the granite group, is used as separator in dynamo commutator segments, in condensers and the like, in lanterns, goggles, windows of conning towers on battleships, as diaphragms in phonographs, head phones, etc. Splittings are used to build up sheets with shellac. Mica occurs along with tin and may be profitably worked. Beryl, Be Al silicate, is found in the region. From it is made $\text{Be}_3(\text{NO}_3)_4$, which is used to harden gas mantles. The mineral greatly improves porcelain. Columbite tantalite is found, the first running 18-40% Ta oxide and the second up to 80%. It is used for steels and acid-resisting parts. Andalusite-sillimanite, AlSiO_3 , is used in spark plugs and has a future in the refractory industry. Quartz chiefly of the pink variety is found and a Cs silicate, pollucite, is also found. Small deposits of cassiterite, SnO_2 , are worked.

S. L. B. ETHERTON

Exposition at Karabugaz in 1927. B. L. RONKIN AND I. M. KUCHUK. *Inst. anal. phys. chim. (Leningrad)* 4, 225-46 (1928).—Natural deposits of NaCl and Na_2SO_4 are being worked in the Karabugaz district of the Caspian Sea. The Na_2SO_4 compd. is dehydrated by means of the natural solar heat. The actual yield of the anhydrous product is 25 to 27%.

REA MA

Relation of diatoms to petroleum formation. A. P. V. STAHL. *Petroleum* 24, 1278-9 (1928).—The presence of oil droplets in the cellular spaces of diatoms gives weight to the hypothesis that these organisms have played an important part in oil formation.

M. B. HARR

Contact relations of the Donagel granite. GERALD ANDREW. *Mem. Proc. Chester Lit. Phil. Soc.* 72, 211-20 (1927-8).—A. concludes that when rocks of similar mineralogical compn. are incorporated with a molten granitic magma, the incorporation is largely mechanical with only minor chem. readjustments aided by the volatile constituents of the magma. Analyses of an oligoclase = porphyroblast schist and banded gneiss are included.

J. F. SCHAGER

Composition of basaltic lava of Indo-China. A. LACROIX. *Compt. rend.* 186, 985-91 (1928).—The decompn. of these rocks gives rise to the red soil upon which are the chief riches of Indo-China—rubber and coffee plantations—hence the desirability of an accurate analysis of the rocks. The analytic limits are: SiO_2 41-54, Al_2O_3 11-17, Fe_2O_3 2-8, FeO 5-8, MgO 6-10, CaO 7-10, Na_2O 3-4, K_2O 0.5-2, TiO_2 2, P_2O_5 0.5, H_2O up to 2, MnO up to 0.2%. This basaltic series may have much free SiO_2 or, where there is a deficiency of SiO_2 , there may be much olivine. The first type includes

pyroxene and magnesian augite. Titanite and ilmenite may be found. The structure is doleritic and of variable grain.

S. L. B. ETHERTON
Deep prospecting by boring at Ferrières-en-Bray (Lower Seine, France). PIERRE PRUVOST. Univ. Lille. *Ann. office nat. comb. liquides* 3, 429-57, 851(1928).—Borings by means of diamond drills to a depth of 1172.7 m. show that neither petroleum, coal, salt, workable H_2O or a large reserve of H_2O exists under the region of Bray. The

R. E. SCHAAD
Processes involved in the decomposition of wood with reference to the chemical composition of fossilized wood. SELMAN A. WAKSMAN AND KENNETH R. STEVENS. New Jersey Agr. Expt. Sta. *J. Am. Chem. Soc.* 51, 1187-96(1929).—Decompn. of wood under anaerobic conditions, as in peat bogs or in the process of fossilization, brings about the disappearance of the celluloses and hemicelluloses and a marked accumulation of the lignin complexes. The nature of the chem. processes involved in the decompn. of wood under aerobic conditions depends largely upon the micro-organisms concerned in the process. There is no justification in assuming that in the decompn. (rotting) of wood, oxycelluloses are formed as an intermediary step in the formation of "humus" from celluloses. These results, with those of other investigators, definitely establish the fact that the process of decompn. of wood is largely microbiological in nature and the nature of decompn. will depend upon the organisms active in the process, as influenced by the environmental conditions and the chem. compn. of the plant constituents. Tables are given showing the chem. compn. of decompd. wood, healthy wood, 2 samples of fossilized wood and the influence of alkali treatment of lignin from straw and peat.

C. J. WEST
The form of organically deposited calcium carbonate, and the influence of the medium. F. ULRICH. *Z. Krist.* 66, 513-5(1928).— CaCO_3 deposited by Cyanophyceae from nutrient solns. contg. Ca, at $15-22^\circ$, is rhombohedral. The habit of the crystals varies with the concn. of agar-agar.

B. C. A.
Composition of mineral springs in Berg-Cannstatt. I. F. EGGER AND K. F. SCHMITT. *Jahr. Ver. vaterl. Naturkunde Württemberg* 83, 8 pp.(1927).

H. G.
The frequency ratios zirconium-hafnium and columbium-tantalum. G. VON HEVESY AND K. WÖRSTLIN. *Z. Physik. Chem.* 139A, 605-14(1928).—Since, on account of the great similarity of Hf and Zr, it is improbable that one or the other should be preferentially removed from the silicate shell of the earth's surface, the assumption can be made that the relative frequencies of their occurrence in rocks and minerals represents their proportions in the solar system which can be identified with the relative nuclear stabilities. For Zr:Hf, the ratio, determined by x-ray analysis of a no. of minerals, is 50:1; for Cb:Ta it is not essentially greater than 1:1. For the latter pair, chemical similarity is not so great as to prevent the occurrence of a mineral whose predominant constituent is Ta; but no minerals are known in which the principal constituent is Hf, or in which the Hf content exceeds the Zr.

W. WEST

Chromites and ferrites of Ni and Co (VEIL) 6. Eutectic areas (WAHL) 2. Influence of cooling velocity upon eutectic structure (TAMMANN, BOTSCHWAR) 2. The system: $\text{Fe}_3\text{O}_4\text{-H}_2\text{O}$ (HÖRTIG, GARSIDE) 2. Structure of topaz (ALSTON, WEST) 2.

BOWEN, N. L.: The Evolution of the Igneous Rocks. Princeton, N. J.: Princeton Univ. Press. 334 pp. \$5. Reviewed in *Eng. Mining J.* 127, 206(1929); *Am. J. Sci.* 17, 379(1929).

SMITHSON, FRANK: Patterns for the Construction of Crystal Models Representing Actual Minerals. London: Thomas Murby & Co.; New York: D. Van Nostrand & Co.

Structure of Typical American Oil Fields. A Symposium on the Relation of Oil Accumulation to Structure. Compiled and edited by J. P. D. Hull. Tulsa, Okla.: The Am. Assocn. of Petroleum Geologists; London: Thomas Murby & Co.

9—METALLURGY AND METALLOGRAPHY

D. J. DEMOREST, R. H. ABORN

Foundry technology in 1928. HUBERT HERMANN. *Giesserei-Ztg.* 26, 61-77 (1929).—The mech. side of foundry technology is reviewed. J. W. W. S.
Remodeling of industrial works into foundries. A. F. HAGER. *Giesserei-Ztg.* 26, 3-14(1929).—The transformation of a steel mill into a gray-Fe foundry and of a Cu

mill into a gray- and white-Fe foundry are described and illustrated, together with a general flowsheet of foundry materials.

JOHN W. W. SULLIVAN

Efficiency in hydraulic current classification of finely crushed ores. T. GRAHAM MARTYN AND M. E. JOHN. *J. Chem. Met. Mining Soc. S. Africa* 29, 140-4(1928); cf. *C. A.* 22, 4089.—A discussion by J. R. Thurlow describes 6 tests applying the classification to Pt ores crushed to different degrees of fineness. Results indicate that the application of the classifier to Au ore and to Pt ores, using the flotation process, is limited. It should be useful in grading an ore preparatory to gravity concn. and may have a field in connection with the prepn. of sand for concrete and building purposes, and under certain conditions be useful in dressing Sn ores.

W. H. BOYNTON

Crushing and concentrating molybdenum ore at Climax, Colorado. WILLIAM J. COULTER. *Eng. Mining J.* 127, 476-80(1929).—The crushing plant, the transportation of the ore to the mill by aerial tram, and concn. to a high-grade product are outlined. The mill has a daily capacity of 1000 tons (909,000 kg.) with 90% recovery and an 87% concentrate with an av. concn. ratio of 105:1 at a total cost of 70¢ per ton. A flow sheet of the concentrator and several illustrations are included.

W. H. BOYNTON

A study of differential flotation. C. R. INCE. *Am. Inst. Mining Met. Eng., Tech. Pub. No. 195*, 24 pp (1929).—Six series of tests were run as follows: gang-slime coatings, bubble tests on slime-coated particles, bubble tests on slime-free particles, absorption tests, absorption tests with collecting agents and migration of slime particles. Results are tabulated and 8 conclusions drawn: (1) Slimes do or do not coat sulfide particles according to the elec. charges existing on the surfaces of the two types of particles; (2) the nature and magnitude of the elec. charge may be altered by dispersion agents; (3) the amount of slime coating may be controlled by means of dispersion agents; (4) a slime-coated sulfide does not float as readily as a slime-free one; (5) the floatability of a particle depends in part on the presence of a collecting agent at its surface; (6) cyanide and $ZnSO_4$ do not affect slime coatings; (7) cyanide and $ZnSO_4$ decrease the concn. of collecting agent at the surface of certain sulfides, rendering them less floatable; and (8) $CuSO_4$ is capable of restoring the floatability by permitting the concn. of collecting agent at the surface of the sulfide.

W. H. BOYNTON

Oxidized ore flotation at Chief Consolidated Mill. G. H. WIGTON. *Mining and Met.* 9, 541-2(1928).—Flotation of the oxidized minerals from siliceous ores is brought about without adding a reagent for producing a sulfide film. With sulfide filming, efficiency decreases rapidly with increase of hydrated iron oxides in the ore. Aero float (cresylic acid and P_2S_5) with ethyl xanthate is used as a frothing agent and collector of sulfides and oxidized minerals. Na silicate is used for conditioning. Amounts of reagents used per ton are 3 lb. Na silicate soln., 0.6 lb. Aero float and 0.5 lb. ethyl xanthate. Flotation of the slime present in the ball mill feed was unsuccessful. Differences between lab. control and mill operation were found to be due to differences in H-ion concn. After the development of the H-ion control in the grinding and flotation circuits steady com. operation of the mill was begun on oxidized ores from various parts of the district. Ball mill pH is held at 6.8 to 7.0, the primary flotation cells at 7.0 and the scavenger cells at 7.2.

J. W. SHIPLEY

Experiments with flotation reagents. A. F. TAGGART, T. C. TAYLOR AND C. R. INCE. *Am. Inst. Mining Met. Eng., Tech. Pub. No. 204*, 75 pp (1929). The experimental work on flotation reagents was classified as follows: (1) collecting agents; (2) frothing agents; and (3) inorg. reagents. (1) is subdivided into: (a) a method for quantifying collecting effect; (b) coating with undissolved collecting agents; (c) action of dissolved collecting agents. (2) is subdivided into: (a) a method for quantifying frothing effect; (b) relation between frothing effect and chem. compn. (3) is subdivided into: (a) methods of studying the effects of these reagents; (b) effect of slime dispersion; (c) effect on sulfides. A statistical study is made of the relation between structure and soly. of org. compds. and their functions in flotation.

W. H. BOYNTON

The recovery of apatite from waste ore slimes by flotation. WALTER LEYKEN AND HANST BIERBRAUER. *Mitt. Kaiser-Wilhelm-Inst. Eisenforsch. Dusseldorf* 10, 317-21(1928).—In the Swedish mine, Lekomberg, the Fe ores are sep'd by flotation. An intermediate product contg. 42% Fe and 1% P is obtained in this process. On screening it is found that most of the P is in the fine-grained material. By using Na palmitate with 200 g. of material and 600 cc. water, it was found possible to obtain a concentrate with 13% to 15% P and a recovery of 74-85%. The relatively large quantities of Na palmitate consumed (5 kg. per ton) may be avoided by recirculating the flotation liquor. Semi-works scale operation confirmed the lab. results.

HANS C. DRUS

The theory and classification of concentration tables. WALTER LUYKEN. *Mitt. Kaiser-Wilhelm-Inst. Eisenforsch. Düsseldorf* 11, 1-14(1929).—General discussion.

Zinc from sulfide ores. V. P. IL'INSKII AND A. P. SAGAIACHNUI. *J. Applied Chem. (Russia)* 1, 109-12(1928).—In the calcination of Zn sulfide ores contg. Fe at 650° to 750° the following reactions take place: $2\text{ZnS} + 2\text{O}_2 \longrightarrow 2\text{ZnO} + 2\text{SO}_2$; $2\text{SO}_2 + \text{O}_2 \longrightarrow 2\text{SO}_3$ (catalytic reaction of Fe_2O_3); $\text{ZnO} + \text{SO}_3 \longrightarrow \text{ZnSO}_4$, the Zn being entirely converted into ZnSO_4 in the atm. of SO_2 . Ninety-five % of Zn is dissolved after treatment with concd. acids (H_2SO_4 or HCl), whereby about 40% of elementary S is sepd. Eighty % of Zn is obtained from calcined ores after treatment with caustics, the soln. being free from Fe and Cu.

Zinc and lead deposits in Helgeland, Northern Norway. J. C. TORGENSEN. *Norg. Geol. Undersøkelse* No. 131, 69 pp. (with English summary of 10 pp) (1928).

Economic size of the open hearth. F. A. KING. *Mining and Met.* 9, 550-1 (1928).—Increasing economic efficiency and quality of product followed the use of larger furnaces. Deep furnaces require less limestone per ton of metal and the tendency to oxidation is reduced. Tilting furnaces are as efficient as the stationary type. Little bottom trouble has been experienced with either type at Weirton. The largest stationary open-hearth furnace yet constructed, 300 tons, made its first cast Feb. 4.

Blast-furnace and open-hearth practice. C. A. MEISSNER. U. S. Steel Corp. *Blast Furnace and Steel Plant* 17, 289-400(1929); cf. following abstract.—The practice of iron and steel production in the U. S. compares favorably with European practice. Some furnaces produce 850-950 tons and occasionally over 1000 tons of iron per day. European open hearth furnaces use blast furnace gas with coke-oven gas, a practice not followed in America. The newer units under construction in Europe differ little from the standard American furnace. The dimensions of 8 typical blast furnaces are given.

European blast-furnace practice. C. A. MEISSNER. U. S. Steel Corp. *Mining and Met.* 9, 537-8(1928); cf. preceding abstract.—The European tendency is to place high-pressure, superheated steam turbines in all new installations. Cleaning blast-furnace gas electrically is not practised in Central Europe. Screening of ores or crushing of coke is not generally practised in Germany. The paper includes details of furnace practice in France and Germany.

The blast-furnace process. IVAR BOHM. *Jernkontorets Ann.* 82, 145-208(1927).—From a full-charged charcoal furnace samples were taken at different levels. Ores of different character were used. The reduction begins with transition of specular iron ore to magnetite, and continues with contemporary formation of metallic Fe and FeO. The last of the FeO disappears only after the iron is fluid. The speed of reduction depends largely on the physical and petrographical character of the ore. Dense ores that by heating become porous are reduced faster than sinter, though this is porous to begin with. In a charge with ore rich in SiO_2 the formation of slag is complicated. In certain parts of the shaft the slag is considerably more acid than the final slag. In a charge without addn. of limestone, the slag is formed essentially through melting down of gang. Examn. of the movement of the charge in the blast furnace has given results differing from those of earlier investigators. The paper contains a series of diagrams, and photographs of ores, partly reduced ores, slags, iron and coal from different levels of the blast furnace.

Blast-furnace practice. R. P. BETHELL. *Proc. Staffordshire Iron and Steel Inst.* 42, 76-93(1926-27).—The mech. equipment and operation of a blast-furnace plant are briefly described. Ways and means of overcoming furnace irregularities are discussed in some detail.

A comparison of the coal-dust rotary (Brackelsberg) furnace and the cupola for producing superior temper castings. H. KALPKERS. *Gießerei-Ztg.* 26, 78-82(1929).—Older investigations of temper castings report 34-38 kg. per sq. mm. tensile strength and 2-3% elongation; a more recent investigation of 26 cupola cast irons reports an av. tensile strength of 38.9 kg. per sq. mm. tensile strength and elongation of 3.8% in 60 mm. Foundry "A" employing the coal-dust rotary (Brackelsberg) furnace for making temper castings reports an av. for 38 runs of 46.4 kg. per sq. mm. tensile strength and 5.4% elongation in 60 mm. Foundry "B," also using the Brackelsberg furnace, reports an av. for 60 runs of 42.5 kg. per sq. mm. tensile strength and 6.3% elongation. The range of values for foundry A is 39.1-52.2 kg. per sq. mm. tensile strength and 4.2-7.5% elongation; for foundry B 38.3-47.3 kg. per sq. mm. tensile strength and

3.3-11.3% elongation. The Brackelsberg furnace is illustrated by a photograph and 2 sketches. A cost comparison of the cupola and Brackelsberg furnace, based on 2 assumptions regarding fuel consumption, indicates that the cost of running 1 ton of Fe in the cupola is 15.72 M. and in the Brackelsberg furnace 9.39 M.

JOHN W. W. SULLIVAN

The influence of oblique charging of the cupola on the smelting process. E. KNOPFICK. *Giesserei-Ztg.* 26, 109-10(1929).—Oblique mech. charging produces large variations in the compn. and temp. of the gas in the front and rear of the furnace. Mech. charging, despite its advantages, at present appears to be inferior to hand charging. Each of two cupolas was equipped with an oblique charging device, a sketch of which is given. The cross sections of the smelting zone were 1.2 m. and 0.8-1.0 m. in diam.; the cupolas were charged 35-45 times daily; the daily capacities were 900 and 600 kg. of iron; coke addns. varied from 8 to 15%. Twenty runs were made on each cupola to det. the effect of oblique charging. In each run the following data were taken: coke addn., blast pressure, and temp. and analysis of gas withdrawn from the front and rear of the furnace.

JOHN W. W. SULLIVAN

Changes in carbon during cupola furnace fusions. H. PINSL. *Giesserei-Ztg.* 26, 1293-1301(1928).—Studies are made on the effect of fusing in cupola furnaces with or without a forehearth, and in a Schürmann furnace, and of varying conditions of charge, coke and blast on the C content of the melt. In the cupola furnace with a forehearth, the desired C lowering (between 2.6 and 2.8%) may be obtained by properly increasing the amt. of Fe charged, and decreasing the coke. The C content is lowered further, but easily, rather than by difficultly, fused materials. The results are less certain and less favorable in cupola furnaces without a forehearth, and in Schürmann furnaces. In these the steel must be in the most easily fusible form to give a low C content. The C cannot be lowered below 3% by doubling the quantity of blast, or the Fe charged, or by reducing by the use of smaller scrap. A general discussion of the changing of the C content in cupola furnace fusions is given.

J. BALOGH

The question of carbonizing of steel chips in the cupola furnace. MARTIN MIELAU. *Giesserei-Ztg.* 26, 182-3(1929).—A theoretical paper in which the carbonizing of steel chips is considered generally. It is maintained that the degree of carbonizing is different in different furnaces. In fusing the steel it must be considered as fundamental that the furnace is suitably constructed, the passage through is hotter, the tapping time is kept correct and the chips are chosen suitably. Osann's rule for calc. the charge mixts. does not hold here in every case.

J. BALOGH

Magnesite or dolomite for basic bottoms. MICHAEL KARNAUKHOV. *Iron Furnace and Steel Plant* 17, 545-7(1929).—Directions are given for building and repairing open-hearth steel furnace bottoms with burned magnesite, and a comparison of costs is made between magnesite and dolomite for this purpose. Suitable compn. and proper burning temp. are very important in obtaining high-grade magnesite for furnace bottoms. The results of an investigation of the mineralogical compn. of magnesite bricks are included.

JOHNS SCHAE

Studies of the Lancashire process. GUNNAR VINELL. *Jernkontoret* 82, 131-42(1927).—The paper gives the results of exams. covering temp., slag, the course of the process and the Lancashire iron produced, together with photographs of slags and Lancashire iron. The slags are mainly FeO and Fe₂O₃, evolved in ferrous silicate. The SiO₂ content of the slags is less than 11%. During the melting down Fe, Si, Mn and P are quickly oxidized. The sepn. of P depends on the temp. At low temp. the slag can contain more P. The slag content of Lancashire iron varies generally from 0.6 to 1%. The total Mn and Si content of the iron is contained in that slag. P in some degree may reduce FeO during the cooling of the iron. The brittleness of Lancashire iron is largely caused by badly decarburized parts. A. DE SMIT

Quality cast iron, difficulties in its production and new manufacturing processes. LAUCKA. *Giesserei-Ztg.* 26, 104-6(1929).—This is a survey of making cast iron in the cupola, elec. furnace and rotary furnace.

JOHN W. W. SULLIVAN

Some factors in the production of sound gray-iron castings. R. W. KIEHL AND KURT S. CLOW. James B. Clow & Sons, Chicago, Ill. *Am. Foundrymen's Assoc. Preprint* No. 29-7, 163-63(1929).—Scientific control of foundry methods is advantageous and does not involve unwarranted expense. For efficient production, castings should be designed for economical and uniform distribution of metal, angle draft, straight parting lines, and means for holding and venting cores. Tensile and permeability tests are very useful on all mold materials, and may be made readily on the same specimen by a method illustrated. The fineness, fusion conc. and moisture content are also detd. on all sand. The strength of sand molds is increased by proper

moisture content, increasing clay content up to 20%, smaller and non-uniform grain-size, more intense mixing and ramming, and longer, slower drying. Permeability varies directly as the square of the grain diam., and is not greatly improved by drying. The blowability value, or gas pressure generated when molten Fe is poured on the permeability specimen, may be detd. with a device described, and should be below 10 g. for safe avoidance of scabby surfaces and gas pockets. Venting is important, and pouring in green sand must be rapid enough to develop ferrostatic pressure faster than mold pressure. Defects of metallurgical origin may be due to CO gas produced on mixing FeO with C in the metal, the oxide generally being formed in pouring. Pouring temps. should not be too high, the atm. in the mold should be reducing, and the Fe exposed to air as little as possible. The pouring basin should be so designed as to sep. the dirt from the metal entering the gate.

GEO. F. COMSTOCK

The production of cast-steel anvils. HEINRICH KREUTZ VON SCHEELÉ. *Giesserei-Ztg.* 26, 15-6(1929).—There is described briefly the manuf. of cast-steel smith anvils, weighing 30 to 80 kg., from steel melted in the basic elec. furnace and of the following analysis: C 0.52-0.65%, Mn 0.70-1.10, Si 0.30-0.40, P 0.04 max., S 0.04 max.

JOHN W. W. SULLIVAN

Lead poisoning in bronze foundries. FRANK G. PEDLEY AND GORDON SPROULE. *Montreal General Hosp. Can. Med. Assoc. J.* 19, 566-71(1928).—Bronze frequently contains Pb. In the melting operation a temp. is reached high enough to cause considerable volatilization. The volatility of Pb from bronze at the temp. of treatment for casting (2100° F.) is about 0.020 g. per sq. in. of surface per min. Ten cases of Pb poisoning under such conditions are reported.

A. T. CAMERON

Cobalt magnet steel. P. H. BRACE. *Elec. J.* 26, 111-21(1929).—Co-steels with addns. of W, Mo, Cr or preferably of both W and Cr are good permanent magnets. The additions reduce the rate of pptn. and crystn. of C. A max. energy product is obtained from alloy of Fe 57, Co 35, Cr 4, W 2, and C 0.9%. The costs of constituents are tabulated showing that high cost of Co limits its practical use to app. demanding special magnetic material such as the multiple element portable oscillograph. The precautions required for manuf. and treatment of these steels and their properties are described.

M. MCMAHON

The new (welding) burner made of light metal. ANON. *Apparatebau* 41, 55-6(1929).—Description of the "Griesogen" welding torch

J. H. MOORE

The temperature distribution in the acetylene welding flame. F. HENNING AND C. TINGWALDT. *Z. Ver. deut. Ing.* 72, 1828-30(1928); cf. *C. A.* 23, 1350.—In addn. to measuring the spatial distribution of the temp., H. and T. found that the maximum temp. was lowered 40° with 20% excess of O and 60° with 7% excess of acetylene.

F. D. ROSSINI

What is dross in the galvanizing pot? WALLACE G. IMHOFF. *Iron Age* 123, 536-8(1929).—Dross varies from 8 to 50%. The av. is 12 to 20%. Dross is a Zn-Fe alloy. Its compn. varies with temp. and quantities of Zn and Fe present. Zn will dissolve Fe to form a satd. soln.; then the addition of more Fe causes the sepn. of the Zn-Fe alloy crystals. This dross settles to the bottom of the pot. The satn. point is reached when more than 0.1% Fe is dissolved at a certain temp. At a higher temp. dross is dry and sandy while low-temp. dross is wet and metallic. The av. dross contains 3.8% Fe, 0.2% Pb and 96% Zn. Following are 6 sources of Fe in order of their importance: (1) pickling solns., (2) overheating Zn, (3) steel base, (4) Fe corrosion products, (5) material dropped in the pot, (6) Zn used. Probably 50 to 70% of dross produced is caused by pickling solns. From 788° to 860° F. the action of molten Zn on Fe is very slight. From 860° to 900° this action is accelerated, while at 900° it becomes violent.

H. C. PARISH

Absorption of gases by metals. A. SIEVERTS. *Z. Metallkunde* 21, 37-46(1929).—S. discusses the mechanism of absorption for H_2 , N_2 , SO_2 , H_2 , and inert gases in various metals and alloys, both isobars and isotherms being plotted. In an appendix numerical data are given in tables for the systems Ag- CH_4 , Cu- SO_2 , Fe- N_2 , CO- H_2 , Fe- H_2 , Ni- H_2 , Cu- H_2 , Ag- H_2 , Pt- H_2 , Pd- H_2 , the soly. of the gases being expressed in mg. of gas per 100 g. of metal, atoms of gas (or mols. of SO_2) per 10,000 atoms of metal, and vols. of gas per unit vol. of metal.

H. STORITZ

Investigation of gases in metals. W. HESSENBRUCH. *Z. Metallkunde* 21, 46-57(1929); cf. *C. A.* 22, 2625.—H. discusses the significance of impurities, the manner in which gases are held, and various methods for the detn. of gas in metals, with a description of app. melting in vacuum is given as the most important method, and the results of a few gas detns. by this method for Cu, Ni, Al, Zn and Fe are included. In

refined Cu at 1250° the gas content ranged from 0.73 to 2.72 cc. per 100 g. of metal, SO₂ predominating (33-61% by vol.), while in electrolytic Cu the gas content was 7.98 cc./100 g., H content being 39.5% by vol. Ni at 1470° contained much higher gas content (113-803 cc./100 g.), electrolytic Ni, however, showing about the same quantity as electrolytic Cu (7.88 cc./100 g.). Detns. on Sn showed that as the metal is heated from 20° to 1350° the gas given off contains about 60% CO, 15% CO₂ and 25% H₂, while the gas given off while the temp. is held at 1350° contains about 25% CO and 68% H₂. In one sample 8.24 cc./100 g. is evolved between 20° and 1350° and 4.00 cc./100 g. at 1350°.

H. STOERTZ

New dilatometric investigations. MAX HAAS. *Z. Metallkunde* 21, 58-63 (1929).—Comparative curves show the resemblance between the results obtained with the *new mech. differential dilatometer* of Chevenard and the *optical differential dilatometer*. Dilatometer curves of various technically important alloys are given, with special attention to Al-Si, Al-Cu and Cu-Be alloys as well as *laulil* and *elektron*.

H. STOERTZ

The properties of fused metals and alloys and their significance for the casting process. F. SAUERWALD. *Giesserei* Z. 16, 49-55 (1929).—The exptl. results of S and his co-workers are summarized.

J. BALOZIAN

Fatigue phenomena, with special reference to single crystals. I. HERBERT J. GOUGH. *J. Royal Soc. Arts* 76, 1025-44 (1928). A brief historical survey of early fatigue expts. is followed by a description of the machines used at the Natl. Phys. Lab. for applying cycles of direct, bending and torsional stresses. Typical endurance test data are given for C and alloy steels, cast Fe, cast steel, Al, Cu, Ni, Mg, duralumin, brass, bronze, Monel and Mg alloys. Tests made at room temp. as to the effect of frequency upon the fatigue limit show that no appreciable speed effect exists up to frequencies of about 7000 cycles per min. It is concluded from data showing the values of the limiting range of stress with various mean stresses on some ferrous and non-ferrous alloys, that there is no general relation for metals between the safe range of stress and the mean stress of the cycle. II. *Ibid* 1045-62. Exptl. results are cited showing the effects of sudden discontinuities of section, and of small surface defects on endurance limit. From the results of many fatigue tests at elevated temps. and the general behavior of these metals under prolonged statical loading at the same temp., it appears that the existence of a fatigue range at elevated temp. still remains an uncertainty, and that the lengthy endurance observed under high ranges of rapidly applied stress are probably really due to a "time" or "delayed creeping" phenomenon. III. *Ibid* 1065-81. The importance of the effect which environment may exert on the fatigue resistance of metals is shown by the expts. of Haigh, Lehmann, McAlpin and Moore. The work of Stanton and Bairstow on impact fatigue tests of steel is discussed to show that the ratio of the endurance limit to the impact fatigue limit for these materials varies but little and that no relation exists between the ordinary impact and the impact-fatigue value. IV. *Ibid* 1085-1114. As a result of the work of Bairstow on steel and that of several investigators of the Natl. Phys. Lab. on Ni-Cp and Armco FP, the cyclic stress-strain relationships during a fatigue test can be summarized, briefly, in 3 distinct stages, as follows: (1) during the first stage of the test relatively large unclosed loops are observed whose widths tend to diminish with subsequent cycles; (2) during the second stage the loop may maintain a const. width, or may slowly increase or decrease; (3) during the third stage of the test the rate of increase of permanent set and of cyclical permanent set usually increases and fracture results. Changes in the microstructure of steel, Armco Fe and Cu, under fatigue stress, are described and illustrated by photomicrographs. V. *Ibid* 1117-42. The work of other investigators on the static deformation of single metallic crystals is summarized before the behavior of single crystals of Al under fatigue stressing is considered. It is shown that the safe range of stress on a crystal of Al is a state not of "primitive" but of "acquired" elasticity, as with an aggregate. The change in shape of a crystal of Al subjected to reversed direct stresses showed that the crystal had deformed by a process of single shear on one set of planes in a particular direction, the plane of shear being in exact agreement with the plane containing the traces of the slip planes, thus proving that slip bands really represent the traces of gliding planes by which deformation proceeds. The mechanism of deformation under static, fatigue and impact stressing is proved to be of the same nature. The hardening of single crystals of Al, when deformed plastically, so as to be able to resist further cycles of stress without further deformation, is found to be a real effect and not due to stress redistribution. Slip on one plane results in a mass hardening of the material. Fatigue failure is recognized as a special case of the general problem of the cohesion of matter, and the main problems concerning it will be solved when a more complete under-

standing is obtained of 3 main phenomena, viz., the cause of the low initial strength of crystals and the mechanism and consequences of slip and strain hardening.

Choice of materials for steam-turbine blading. E. A. KRAFT. *Elektrotechnik und Maschinenbau* 46, 301-5(1928). Five % Ni steel and stainless steel are the materials which can be used in the blades.

DOWNES SCHAAP

Attempts to improve the resistance of steel blading by surface treatment were not satisfactory. Zn, lacquer, enamel, Cr and Ni were tried, but all the coatings were eroded away. At present, stainless steel is the best material to use, though it is probably not the final answer. A binding wire which is soldered on to long blades to stiffen their edges presented soldering difficulties, since stainless steel must not be heated over 800°, and the soldering cannot be done well at much lower temps. Good work depends on nice temp. control, and much of the responsibility rests on the solderer. As it is impracticable to measure the temp. of each individual blade while the soldering is being done, a comparison method is used. A blade like those being soldered is maintained at the proper temp. by accurate instruments, and the workman matches its color against that of the piece he is soldering. To get accurate matching the work is done in a dark room. Perfect work can be turned out by this method. Other soldering involving costly steels is conducted in accurately controlled elec. resistance furnaces, with H passing through to avoid oxidation.

BENJAMIN MILLER

Metals for blades of the modern steam turbine. A. BODMER. *Chaleur et ind.* 9, 163-81, 239-44(1928), cf. C. A. 22, 3385. Brass (72% Cu, 28% Zn, Pb trace) usually resists the chem. action of impure steam but its mech. resistance is too low over 200°. However, as it can be given any profile, its use has been extensive. With the increase in power of the turbine and in peripheral speed, better metals have been desired. Ni and Ni alloys of about 50% Cu, 10% Ni and 40% Cu-15% Ni have been used. As with brass, the resistance falls as the temp. rises. 80% Cu-15% Ni can stand 350° and this alloy is used for low and medium pressures. 65% Ni-28% Cu is good up to 300°, but does not resist erosion very well. Monel metal is hardly better than brass under high operating conditions. Iron-Ni alloys (25-36% Ni) although resistant to oxidation, rapidly give way under the action of steam. Steel with 5% Ni is the best metal at present. If the steam is pure, turbine-vane corrosion can be avoided, but if salts, etc., are present, corrosion is certain. Erosion is more difficult to avoid than corrosion. The higher the steam temp., other conditions being the same, the less is the corrosion. To prolong the life of the blades, these were coated with difficultly oxidizable metals, but the coating itself eroded. Electrically deposited Cr was no better. Steels with low Ni content but high in Cr have given no better results. Various stainless steels have been tried, they become fragile and undergo oxidation in due course. Alloys with high Ni and Cr contents (A. T. V. metal) are best of all. Their resistance to oxidation and erosion is very good even with high-temp. steam. Numerous photographs illustrate pitting, corrosion, erosion, fracture and failure of turbine blades.

S. L. B. ETHERTON

Some experiences in sand control. E. F. WILSON. Jefferson Union Co., Lockport, N. Y. *Am. Foundrymen's Assoc.* (preprint) No. 29 8, 183-98(1929).—The vibratory test of sand with water in a bottle was unsatisfactory. Permeability varied linearly with clay content up to 10%. The permeability when hot may be less than when cold, or even neg. if the sand contains org. matter coal or water. The time element is important in regard to hot permeability. The pressure of gases from the sand must be low by the time the metal solidifies, to avoid porous castings. Too sudden gas evolution from damp strong sand causes sand-holes, appearing like slag, in the metal. In addn. to standard sand-testing methods, a clay detn. by vol., and a compaction test, are advocated. Facing sand especially should be tested regularly. Addns. of new sand should be as small as possible without reducing the green strength. Moisture should be as low as is compatible with good workability, and clay content barely high enough to permit low moisture. Sea-coal in the sand is useful to provide a reducing atm. at the surface of the casting, so that FeO is not formed there to cause adherence of the sand. Dry strength of the sand is important, but if too high cracked castings result. The correct gating is related to sand condition. Mulling of old sand without clay increases the bond strength by exposing fresh absorbent material below the surface of the grains. Screening of old sand before mulling is advantageous.

G. F. C.

Baking practice for oil-sand cores. H. L. CAMPBELL. Univ. of Mich. *Am. Foundrymen's Assoc.* (preprint) No. 29-13, 289-94(1929).—In baking cores made of sand, water and linseed oil, the temp. must first be raised high enough to evap. the water. During the evapn. period the temp. of the cores did not rise much, but afterward hardening was produced by oxidation of the oil at 175° to 230°. Gases must be removed rapidly from the oven, and an oxidizing atm. maintained, for efficient hardening. As the baking temp. was increased, the time of treatment needed became less. The strength was lower after baking too long, or at too high temp. At the higher temps., the time of treatment must be more accurately controlled. No damage resulted from placing these cores directly in ovens at the max. baking temp. G. F. C.

Shrinkage in white cast iron. H. A. SCHWARTZ. Natl. Malleable and Steel Castings Co., Cleveland, O. *Am. Foundrymen's Assoc.* (preprint) No. 29-10, 205-34 (1929).—The type of shrinkage forming porous spots in white cast Fe is discussed, and the complexity of the subject is emphasized. The freezing of a sphere of ideal metal with uniform phys. characteristics at all temps., resulting in a central cavity, is described. The presence of temp. gradients in the casting, and of differences in cooling rates, explains the occurrence of shrinkage. Thus if cooling is much delayed, shrinkage is reduced. A higher coeff. of expansion for liquid as compared with solid Fe increases shrinkage, but expansion in freezing as in gray Fe decreases it. The d. of liquid cast Fe varies linearly with temp., but the rate of change is a function of the Si content between 0.5 and 4% Si. The d. of white Fe varies linearly with the C content; at the f. p. it is 1.0043 times the value at room temp. The solid Fe may be more or less dense than the liquid, depending on the Si content. Previous work on the change of vol. during freezing is also reviewed, a contraction of 1.4 to 3.6% being indicated for white Fe. Tests were made by means of spheres 2.5 in. in diam., cast from a small gate, so as to freeze quickly and allow the shrinkage to be detd. from the d. of the casting as a whole. One expt. showed the voids in metal poured hot to be 1.67%, and poured cold, 1.30%, 4 tests of each being in good agreement. Further tests are reported on metal with different Si and C contents, 2.53% C and 1425° pouring temp. giving the lowest percentage of voids. The errors involved in sp. vol. detns. are discussed. Specimens from 5 foundries were tested, and a formula was derived as follows: sp. vol. = $0.126491 + 0.001074 C + 0.000534 Si$, allowing the sp. vol. to be calcd. from the C and Si contents with as good av. accuracy as from a d. detn., or better than 0.1%. Other factors than the C and Si contents, however, have a marked influence on the shrinkage. Smaller spheres are recommended for further work. GEO. F. COMSTOCK

Practical aspects of white-fracture malleable. D. P. FORBES. Rockford North western Malleable Corp., Rockford, Ill. *Am. Foundrymen's Assoc.* (preprint) No. 29-22, 397-404(1929).—By "white-fracture" malleable is meant malleable Fe of good ductility and machinability, with no combined C, but breaking with a white cryst. fracture, caused by intercryst. sepn. The grain boundaries are weaker than the ferrite grains. Most occurrences were in Fe contg. over 1.1% Si and 0.2% P, annealed at a max. temp. over 850°, and cooled slowly to below 540°. Heating to 450° and quenching, as in galvanizing, very often caused the "white fracture," and oxidation or slow heating in melting had the same tendency. Heating to 650° and rapid cooling corrected the tendency toward "white fracture." Metal exhibiting this defect showed a constituent different from ferrite along the grain boundaries, and this may be a P compound. More research on the subject is required. GEO. F. COMSTOCK

Controlling the atmosphere in malleable annealing ovens. W. F. GRAHAM. Ohio Brass Co., Mansfield, O. *Am. Foundrymen's Assoc.* (preprint) No. 29-14, 205-204 (1929).—In a well-insulated furnace for annealing malleable Fe, fired by powdered coal in the usual way, it was impossible to maintain a neutral atm. during the high temp. holding period without having a higher temp. near the burner than at the front of the furnace, as excess air was required to distribute the heat uniformly. To remedy this condition, some of the waste gases were returned to the burner. This resulted in less than 1% O in the furnace atm., uniform temp. at both ends of the furnace, and annealed Fe of good quality. The mechanism adopted is illustrated. No saving of fuel is claimed. G. F. C.

Properties of cast iron of interest to the metallurgist, founder and engineer. SUB-COMMITTEE ON RESEARCH OF THE COMMITTEE ON GRAY CAST IRON, JAS. T. MAC-KENZIE, et al. *Am. Foundrymen's Assoc.* (preprint) No. 29-17, 331-42(1929). A list of properties, classified as "causative," "formative," and "effective," of cast Fe is presented in great detail. The causative properties are chem. compn. and phys. constitution. The formative properties are those affecting the making of castings and

condition of the finished metal. The effective properties are peculiarly of interest to the engineer. Methods of test for most properties listed are discussed very briefly. The present method of detn. of combined C by difference is unsatisfactory. Tension, impact, and fatigue tests are worthy of study. Resilience is a useful property for evaluating cast Fe.

GEO. F. COMSTOCK

Remarks on the work of D. Hanson: "The properties of silicon-carbon-iron alloys and a new theory of cast iron." ERICH SCHEIL. *Giesserei Z.* 15, 1086-8(1928).—The basic assumption of Hanson (*C. A.* 22, 4432), which lacks exptl. support, that equil. exists between graphite and cementite and that the double diagram of Heyn and Charpy contradicts the phase rule, is not acceptable. Numerous investigations are cited to support the contention that cementite is unstable. If this takes up only a small quantity of the third substance in solid soln, then it is most probably an unstable phase in ternary compds. At all experimentally obtainable pressures cementite is stable.

J. BALOZIAN

The mechanical properties of deoxidized cast iron. PETER BARDENHEUER AND KARL L. ZEYEN. Kaiser Wilhelm Inst. Eisenforschung, Düsseldorf. *Giesserei Z.* 15, 1124-8(1928).—The deoxidation of cast Fe with ferro-Ti, and the effects of this, S and P on cast Fe are studied. The no. of fusions is insufficient to give final conclusions on the removal of O from cast Fe with ferro-Ti. It is shown that on addn. of 0.25% Ti there is an increase in the C content. The tensile properties of cast Fe are made slightly worse by Ti, but the elongation of annealed chill castings is improved. With S addn. up to 0.27% an unfavorable influence on the mech. properties of cast Fe could not be detected, its effect being less than with ordinary cast Fe, however. In cast Fe contg. 0.3% P the bending and tensile strengths are max. With increase in P the sagging and impact strength decrease uniformly, while the hardness and brittleness increase.

J. BALOZIAN

High-test cast iron. R. P. LEMOINE. *Am. Foundrymen's Assoc.* (preprint) No. 29-12, 250 88(1929).—A graphical representation of the constitution of cast Fe is discussed. The best mech. properties are attained when the Fe is composed only of graphite and pearlite, with the lowest total C. Free cementite is less detrimental than free ferrite. The cooling speed must be controlled to get equally good properties in different thicknesses of section. The Si content has somewhat the same influence as the cooling speed, but it also tends to diminish the C content of pearlite, so that under certain conditions increased Si giving more graphite does not involve the formation of ferrite. With low total C and high Si, the effect of cooling speed is diminished, giving uniformity of structure in all sections, and high strength. The French practice in making semi-steel shells during the war is reviewed. The Lanz and Thyssen-Emmel processes, based on the pearlite-graphite structure, are not considered novel, or practical for varied work. The use of expensive alloys in cast Fe is not necessary for high mech. strength. Elec. melting is useful for the chem. improvement of poor raw materials, and for refining the graphite, possibly by allowing kish to float out at high temp. Steel scrap is the best base for elec. furnace charges, which can readily be brought by addns. to any desired compn. The cost may be reduced by using a cupola for melting, and refining electrically. In this duplex practice, the cupola product should be as near the correct C content as possible, to save current consumption. To obtain a low-C cast Fe from the cupola, melting of steel scrap must be hastened by high air-pressure with only 12 to 14% coke, so that the fused drops passing the tuyères contain only 2% C. The use of a bottom receiver is an advantage to raise the temp., and the absorption of too much C in the receiver is best prevented by replacing some of the coke in it with brick fragments. Low-C Fe made in this way from rusty scrap may be wild and oxidized, but with ample Si it should be sufficiently fluid and quiet. Losses of Si through the cupola are lessened with an acid slag. High-Si steel scrap and high-Si pig Fe in the charge, are useful, pig Fe contg. 2.7% C and 4% Si is practical and convenient, but addns. of ferro-Si may be resorted to. The quality of such cast Fe is between that of semi-steel and elec. cast Fe, and its cost is not excessive.

GEO. F. COMSTOCK

High-test gray cast iron. European developments. EDWARD E. MARBAKER. Whiting Corp., Harvey, Ill. *Am. Foundrymen's Assoc.* (preprint) No. 29-23, 405-16 (1929).—The work of Goarens in 1906 showed that for max. strength, cast Fe should have a pearlitic structure, with fine and evenly distributed graphite. Cast Fe made with steel addns. to decrease the C content is best melted in the elec. furnace. According to Wüst, the C should be 2.2 to 3%, with Si 1.2 to 2.2%, and Mn 1%. The Lanz process, involving the use of low-Si Fe in heated molds, is described. It is complicated, but gives excellent results. By superheating the molten Fe above 1500°,

Piwowsky and Hanemann showed that the graphite is made finer, and uniform structures are attained. The high temp. may be obtained in the cupola, by oil or high blast pressure (Corsalli process). Schüz proposed the use of the graphite eutectic, contg. 3.6% C and 3.3% Si, cast in chills, giving high strength and stability. Meehanite is made by adding Ca silicide in the ladle, with 2.2 to 2.7% C and 1 to 1.8% Si. Deschene's process is purely mech., involving jolting the molten Fe to dissolve C completely, and eliminate gas and slag. Mitinsky and Osann are quoted as advocating the use of eutectic cast Fe for high-strength castings. In a pure alloy, this would contain 4.3% C; but with 2% Si and 1% P, the eutectic contains 3.33% C. Kish or primary graphite crystals should be avoided; then with C not over the eutectic percentage, highest gray Fe is obtained. All the processes involve the above principle. The eutectic alloys do not pipe; there is no segregation and min. shrinkage. G. F. C.

The influence of carbon, manganese and silicon on the growth of cast iron. O. BAUER and K. SIPP. *Giesserei* Z 15, 1018 26(1928). The influence of Mn (0.5-1.5%), Si (0.5-3.0%) and C (2.5-3.5%) on the growth of cast Fe was investigated. The rods were annealed at 450° (4 × 40 hrs.), 650° (4 × 10 hrs.) and 850° (4 × 10 hrs.) in an electrically heated muffle furnace, and the growth was detd. by the change in length before and after the annealing. The effect of compn. increases with temp., being most evident at 850°. Si favors the growth of cast Fe, this being slight with low Si even at 850°. The influence of Mn is considerably less favorable than that of Si, the growth decreasing with increase in Mn. C causes practically no change, its influence being of no importance with high Si or Mn. With high Si and low Mn, the action of the latter in increasing growth is aided considerably by C. *Ibid* 1047 60. —Microscopic investigation showed that at 450° the amt. of ferrite increased slightly with high Si; Mn, C and low Si are without effect on the structure at this temp. At 650° and 850° the structure is greatly influenced by these elements, even with shorter annealing. With low Si, at these temps., the pearlite becomes granular, and the graphite flakes become larger and denser. With high Si there is a large increase in the amt. of ferrite. Mn behaves similarly to the "growth" expts., while C produces only a slight change in the structure. Specimens annealed at 850° in contrast to those at 450° and 650° show sharply bordered zones. Here cementite (free or in pearlite) does not sep. out, but C from the solid soln. appears. Numerous photomicro. and photomicrographs are given. J. BALOZIAN.

Comparative tests on the mechanical characteristics of cast steel at elevated temperatures. ANTON POMP. *Stahl u. Eisen* 48, 1321 30(1928). The work was undertaken to obtain information on the behavior of cast steel at elevated temp. so as to lay the foundation for the development of specifications for cast steel used at high temp. and pressure. Test pieces were prepd. from 8 Siemens Martin steels, 1 dec. and 7 Bessemer steels. The analyses and histories of the samples are given in the form of a table. Tests were carried out at 20°, 100°, 200°, 300°, 400° and 500°. The test pieces were heated up to 200° in an oil bath, above that in a bath consisting of equal parts of KNO₃ and NaNO₃. Elongation was measured with the Martens junior instrument. The elastic limit decreased linearly with increase of temp. The yield point shows a similar curve, except that the values for the higher temps. are not quite as low as those of the limit of elasticity. The values at high temp. are between 42 and 67% of the original values, the highest values being for Mn steels (0.85-0.1% Mn) from 3 Bessemer samples; the one with the lowest S and P content shows the lowest yield point, 12.5 kg./sq. mm. With increasing temp. the tensile strength at first decreases, then increases; it shows a max. between 200° and 300°, which may be higher or lower than the original value, after that it decreases to a point 45-68% of the original value at 500°. The least reduction was 60-61%, obtained with high Mn steel. The elongation and reduction in area show a min. between 200° and 300°, followed by a rapid increase. The curves of the impact strength show great variations in their form, but all have a max. between 100° and 300°. The impact strength values depend on the size of the test piece and its place in the casting. J. A. SHERMAN.

Alloy cast steels. DAVID ZUNGE. *Silver Steel Casting Co., Milwaukee, Wis. Am. Foundrymen's Assoc.* (preprint) No. 29-20, 361-84(1929). Only machinable alloy cast steels of high phys. properties are discussed. Cr produces a hard carbide, retards the austenite transformation, and refines the grain of cast steel. Ni also retards the transformation, and hardens the ferrite. Mn acts in both ways, improving the properties of pearlitic steels. V is a scavenger, but also forms double carbides, increasing the yield point without loss of ductility. Mo acts with other alloys to improve the ease and stability of hardening. V, or 1.2 to 1.6% Mn, are the alloys most used in castings which are heat-treated only by the usual simple anneal. Av. phys. properties

of these steels are tabulated. Compression tests of cylinders are illustrated to show the superior ductility and strength of the Mn steel over ordinary C steel. Quenching and drawing improved the phys. properties of the Mn steel as compared with the usual normalizing. Cr up to 1% has improved the abrasion resistance of steel castings. Ni up to 1.5% is generally added with Cr, and the properties are shown to be superior to those of the Cr steel after any heat-treatment. The Cr-Ni steel was better than the Mn-C steel when hardened to high Brinell value, but when normalized, at lower hardness, the latter had better ductility. Mo up to 0.35% imparts air-hardening properties to Cr-Ni cast steel. Intricate shapes may thus be air-quenched and drawn to develop over 200,000 lbs. per sq. in. tensile strength with 10% elongation. Phys. properties of this steel with C contents from 0.28 to 0.42%, and drawing temps. from 370° to 840° are tabulated. Even when drawn at 540° the hardness was 430 Brinell. In yield point and impact resistance this Mo steel was especially superior to the other alloy steels. Photomicrographs show that when normalized and drawn at 680°, the Mn-C steel showed marked ferrite sepn, while the Ni-Cr-Mo steel showed none, and the Ni-Cr had an intermediate structure. The high-alloy steels are more expensive than the alloy cost alone would warrant, because of difficulties in handling. The importance of other factors than chem. compn. is emphasized. G. F. C.

Nature of martensite. N. SELVAKOV. Physico-Tech. Lab., Leningrad. *Nature* 123, 204-5 (1929).—Three transition points, viz., 100°, 235° and 300°, exist in the tempering of quenched steel. X-ray studies show that tetragonal martensite disappears at 100° and according to Honda this is a transformation from a tetragonal to a cubic lattice. S. assumes that in the tetragonal martensite the positions of the C atoms are fixed at the centers of those faces which are perpendicular to the tetragonal axes, while in the case of the cubic lattice the positions of the C atoms are not fixed, some replacing Fe atoms in the lattice and some being situated at the centers of the faces. These irregularities in position give a continuous variation of lattice parameter and account for the decrease in the intensity of the spectral lines, but not for their broadening.

W. W. STIFLER

Relative safety of mild- and high-tensile alloyed steels under alternating and pulsating stresses. B. P. HAIGH. *Chemistry and Industry* 48, 23-30 (1929).—A wide variety of tests and expts. with alternating and pulsating stresses and the conditions under which fatigue cracking may be a source of danger are described. It is shown that the relation between the fatigue strength and yield point of mild steel is such that fatigue cracking is necessarily uncommon in mild steel with ordinary conditions of loading. In high tensile steels the relation between the 2 kinds of strength is often such that fatigue cracking is more frequent. The article constitutes a rather complete though brief treatment of fatigue for the engineer.

ROBERT F. MEHL

The elastic limit of steel at elevated temperature. F. KORBER. *Stahl u. Eisen* 49, 273-7 (1929).—The results obtained by K. Schleip and P. Fischer (cf. *Kruppsche Monatshefte* 6, 185 (1925)), Urbanzyk (cf. *C. A.* 22, 1940) and Korber and Pomp (cf. *C. A.* 22, 2536) are tabulated and the ratio $(\sigma_0/1T^\circ)/(\sigma_R/20^\circ)$ is called ρ where $\sigma_{0.2}$ is the stress corresponding to a permanent deformation of 0.2%, for various temps. (T° between 20° and 500°, for the steel samples tested, and σ_R is the tensile strength of the same steel at 20°. The same ratio was calcd. for 12 melts of steel: 3 C (0.12-0.53%) Siemens-Martin; 2 high-Mn (0.74-0.85%) steel samples (one Siemens-Martin, the other an elec. steel); 3 high-Mn (0.77-1.07%) Bessemer; 2 Si (0.84-0.92%), 2 Ni (1.05-2.08%) steel samples (the last 4 samples were from the Siemens Martin furnace). The values of this ratio for the various steel samples tested are at 20° between 0.54 and 0.68, at 100° between 0.43 and 0.66, at 200° between 0.41 and 0.59, at 300° between 0.33 and 0.51, at 400° between 0.21 and 0.43 and at 500° between 0.17 and 0.31. The ratio decreases only about 10% up to 200°, after that it decreases rapidly. While the exptl. results are not yet complete, deductions are made from the above figures for the construction of boiler plates operated at elevated temps.

J. A. SZILARD

Flocks in chromium steel. WALTER AICHHOLZER. *Stahl u. Eisen* 48, 1332-4 (1928).—Flocks are observed frequently in steels with 1-3% Cr. Steel specimens were investigated with 0.8-1.2% C, 1-3% Cr, 0.2-0.3% Si and Mn; the S and P contents were below 0.02%. In general more flocks are observed in tools made from large, than in those made from small blocks. The irregularities detected as flocks in the tools can be observed in specimens from the blocks before working, as fine hair fissures. The structure of the steel surrounding the fissures is not the normal structure, but shows patches richer in carbide. By proper heat treatment it was shown that these patches have different C and Cr contents than the rest of the steel. Thus, flocks consist of 2 constituents, A with about 1% C and 3% Cr (as intended), and B

a more highly alloyed steel with 2% C and 13% Cr. If the steel is hardened at 950°, it represents a considerable overheating of A, but is only the normal hardening temp. for B. Around the large carbide areas a structureless ground mass is visible, while the rest of the specimen shows a coarse martensitic structure. Tests showed that during hardening of a melt corresponding to A, its linear expansion is 0.135%, or 18 times as much as that of B, which is 0.0075%. The flocks are probably caused by internal stress, effective at higher temp. (pearlite transformation) than the hardening temp. The coarse crystalline, shiny appearance of the flocks cannot be explained by their chem. compn. according to which they should be of finer grain size than the surrounding normal structure. But, as just the opposite is true, flocks must represent hot cracks; this assumption was proved by breaking tests at red heat and room temp. J. A. S.

X-ray investigation of iron-nitrogen alloys. ATOMI ŌSAWA AND SHUJIRO IWAI-ZUMI. *Z. Krist.* 69, 26-34(1928). (English).—There are 2 compds. in the system Fe-N. Fe₃N is cubic, with $a = 3.86$ A. U. The calcd. d. is 6.57. Fe₂N is hexagonal; $a = 2.743$ A. U. and $c/a = 1.59$; calcd. d. = 5.02. The Fe atoms form a close-packed hexagonal lattice, with one N atom in each elementary parallelepiped. The mechanism of the change from the cubic to the hexagonal lattice is explained. The calcd. diameter of the N atom, 1.26 A. U., is in good agreement with the value of Bragg. L. S. R.

Hardness and magnetic properties of iron-copper alloys and their relation to the equilibrium diagram. A. KUSSMANN AND B. SCHARNOW. *Physik.-Techn. Reichsanstalt. Z. anorg. allgem. Chem.* 178, 317-24(1929).—The Rockwell hardness, magnetic satn., and coercive force in the system Fe-Cu was investigated. The hardness of the Fe-rich side of the diagram rises sharply, and in the heterogeneous range changes only slightly, whereas the coercive force rises even in the heterogeneous range because of contraction tensions. In a repetition of the work of Ishihara (*C. A.* 17, 719) the increase in soly. of Cu in Fe is shown by quenching expts., in which both hardness and coercive force were measured. The soly. increase above the A₂ point was detd. by both methods. Contrary to the work of Ishihara no irregular change in the coercive force or hardness was found at the A₂ transformation. ROBERT F. MEHL

Brass and special brasses. W. WUNDER. *Z. Ver. deut. Ing.* 73, 165-8(1929), cf. *C. A.* 22, 209(1928).—The following topics concerning brass are discussed: early history, equil. diagram, specifications for German standard brasses with their fabrication and industrial uses, recrystn. of α -brass, residual strains after forming and their removal by annealing. The normal tensile strength of 28,000 lbs./sq. in. for cast brass and 57,000 lbs./sq. in. for worked and annealed brass may be increased to 57,000 lbs./sq. in. for cast special brass and 90,000 lbs./sq. in. for worked and annealed special brass. The metals added to brass to increase its strength may be divided into two classes: those which displace the limit of the α -field toward the Zn side, e. g., Ni and those which displace it toward the Cu side, e. g., the remaining elements, Mn, Al, Zn, Mg, Si, Pb, Fe. The Zn equivalents of the elements are Al + 2, Sn + 2, Mg + 2, Si + 10, Pb + 1, Fe + 0.9, Mn + 0.5, Ni - 1.4. With the addn. of several of these elements the apparent Zn content may be calcd. by the formula $B' = (B + 2q)/A$, ($A + B + 12q$) where B' is the apparent Zn content, B is the true Zn content, A is the Cu content, q is the quantity of added elements of Zn equivalents (l). Two rules apply: (1) The apparent Zn content may not rise above 45%, since above this the alloy becomes brittle. For hot forming without cracking the Zn content should be between 45 and 38%; for cold forming between 0 and 38%. (2) Ni does not impart brittleness in any proportion of metals. With addn. of Ni more of the other element may be added than without Ni. The special brasses are prepd. usually by the use of master alloys. They are better than the ordinary brasses in strength, hardness and corrosion resistance. Occasionally their color is an advantage. Compositions for 9 special brasses are given. ROBERT F. MEHL

The repair of cast aluminum parts by welding. H. REININGER. *Gießerei-Z.* 26, 125-31(1929).—The prepn. of the weld, autogenous welding app. and microstructure of the weld are illustrated. JOHN W. W. SULLIVAN

X-ray investigation of the system: lead-thallium. F. HALLA AND R. STAUBER. *Z. Krist.* 68, 299-330(1928).—Additional discussion of a previous article (*C. A.* 22, 2058). It is concluded that there is no symmetrical distribution of the Pb and Tl atoms. L. S. RAMSDELL

The preparation of bearing metals. WALTER VOIGT. *Giesserei* Z. 15, 6(1928) (1928).—General metallographic principles are applied to the prepn. of the 17% Pb, 6.8% Sn, 1.8% Ni alloy. J. BALDWIN

Antifriction metals. J. DAUTERANDES. *Chaleur et Ind.* 9, 418-4(1928).—The following precautions should be observed on pouring: (a) The melt should be very well mixed

(b) it should not remain undisturbed for any long period since particles of different densities and hardness may segregate; (c) the part about to receive the antifriction metal should be previously heated to about 400° F.

Survey of Cu-Sn alloys. GIESSEI-Zig. 20, 91-103(1929).—This is a survey of (I) pure Cu-Sn bronzes, (II) the influence of small quantities of other elements on Cu-Sn bronzes, (III) the influence of larger amounts of Zn, Pb and P on the mechanical properties of bearing bronzes, and (IV) the separate constituents of the bronze bearing metals. In tabular form the following data are presented: (1) ultimate strength, elastic limit, elongation, Brinell hardness, and Fremont impact strength of (a) pure Cu-Sn alloys, (b) Cu-Sn alloys contg. 0.04 and 0.62% Zn, (c) Cu-Sn alloy contg. a trace of P; the friction, temp., and degree of wear of (a) Cu-Sn alloys Pb free, and (b) contg. 4.82-31.32% Pb; (3) wearing out strength and elongation in 2 in. of Cu-Sn alloys contg. 0.37-0.86% P; and (4) wearing out strength, elastic limit, and elongation in 2 in. of Cu-Sn alloys contg. 1-3% Zn.

JOHN W. W. SULLIVAN

Physical properties of dental materials (gold alloys and accessory materials). R. L. COLEMAN. Bur. Standards, *Research Paper No. 32*, 867-938(1928).—Methods of testing the properties of the different materials were developed and a large no. of tests were made on representative com. products. The more important results of the investigation follow: (1) the mech. properties of many of the Au alloys can be markedly improved by suitable heat treatment; (2) the porosity prevalent in dental Au alloy castings can be minimized by changes in sprue design and the placing of a feeder of suitable size close to the pattern; (3) net linear casting shrinkage of an alloy, contg. 90% Au and 10% Cu was found to be approx. 1.25%; (4) the thermal expansions of 5 inlay pattern waxes were found to vary from 0.7 to 0.8% in linear dimensions over the temp. range of 25-40°; (5) the usual investment for inlay castings expands approx. 0.25% on setting; (6) the compressive strength of the investments studied were not affected by heating to temps between 200° and 800°, but cooling from these temps. resulted in a marked loss of strength; (7) the investments expanded 0.2 to 0.3% by heating to 250-300°, contracted when heated to 350-450° and expanded up to 1.0% or contracted as much as 0.5% depending on the investment when heated to 600°.

DOWNES SCHAAF

Resistance of iron-nickel-chromium alloys to corrosion by acids. NORMAN B. PILLING AND DONALD E. ACKERMAN. Am. Inst. Mining Met. Eng., *Tech. Publication No. 174*, 3-33(1929).—The effects of compn. of Fe-Ni-Cr alloys and heat treatment thereof on the resistance in acids were studied for alloys varying from 0 to 100% Ni, 0 to 30% Cr and 0 to 100% Fe. Tests were made in air-satd. solns. with test pieces wholly submerged and rotated. Discontinuous changes in soly. occur in the corrosion of Fe-Ni-Cr alloys. In non-oxidizing acids, if the Ni content is below a certain critical amount, Cr increases the rate of soln. and Ni decreases this rate; this critical content of Ni is about 13%. Alloys contg. more Ni corrode at const. rates independently of Cr or Fe contents. The rates depend upon p_H and acid radical but the crit. Ni content does not. The latter is independent of microstructure or lattice structure of the alloys, but heat treatment, without effect on either of these, shows a marked effect on the location of the limit of attack. In the soly. in HNO_3 the points at which passivity is attained depends upon Cr content only. The Cr content necessary is a function of HNO_3 concn. The soly. in H_2SO_4 is markedly influenced by the presence of dissolved salts necessitating a change in Cr content for protection. The observed effects are not compatible with Tammann's theory relating corrosion resistance to lattice structure, but are believed to agree with current views on the electrochemical nature of corrosion.

B. E. RORTHELI

Corrosion phenomena appearing in aluminum bronze, brass and copper tubes in practice. A. MARR AND E. BRENNKE. Bergakademie Clausthal. *Giesserei Z.* 15, 1128-33(1928); cf. C. A. 22, 4099.—A metallographic study of the corrosion of Al bronze, brass and Cu condenser tubes under actual conditions, using neutral alkali chloride liquors (after operation for 4 weeks), river H_2O (after 15 years) and alkali chloride and $MgSO_4$ liquors, resp. In the Al-bronze tube the corrosion occurs in the grain boundaries and the slip bands (principally here), while in the brass tube it occurs in the grain boundaries of the brass. In both cases the influence of grain size is not great. These tubes should be annealed after cold working to remove internal strains. In the brass tube, Cu is present in the salt deposit and on the metal surface in consequence of the soln. of the brass and the subsequent pptn. of the Cu from the soln. It is recommended that these tubes should consist of homogeneous α -brass, and not of ($\alpha + \beta$)-brass. Here, tinning is of advantage only when it is uniform; otherwise it is a disadvantage.

The presence of seams and furrows in the structure of Cu tubes is explained by the corroding action of the salt particles, steam, and air.

J. BALOZIAN

The reaction limit of magnesium-cadmium alloys and their potential-concentration curve. C. KRÖGER. Univ. Göttingen. *Z. anorg. allgem. Chem.* 179, 27-48(1929).—The reaction of these alloys with MeOH, with which Mg reacts rapidly with the evolution of H, and toward which Cd is inert, was investigated. Cast and rolled (unannealed) plates gave a reaction limit at about $\frac{2}{3}$ mol. fraction Cd, but showed some reaction up to $\frac{4}{5}$ mol. fraction Cd. A 23-hour anneal in this range (55-73% Cd by wt.) at 430° sharpened the reaction limit and eliminated the reaction above $\frac{2}{3}$ mol. fraction Cd. Attack by EtI, contg. a little free I, gave exactly similar results. Calculation of the protective action of the insol. Cd atoms on the sol. Mg atoms on the basis of random distribution of the protective atoms in the space lattice gives a higher protective value than that actually found. By assuming, however, a regular distribution of Cd atoms, the reaction limit obtained becomes explicable. The electrode potential of these alloys was measured in a cell $\text{Cd} | \text{N MgSO}_4 | \text{Cd, Mg}$, and in each case a potential-time curve taken. Alloys with less than 50% Cd showed a rapid decrease in potential in the first 20 hrs., then remained const. for 25 hrs. and then again fell to more "noble" values. With more than 50% Cd the potential at first rose, in the course of 3 hrs. reached a max. and then behaved as before. The potential concn. curve showed a close correlation with the structure of the alloy (C. A. 21, 3528). The effect of band membranes upon the potential is discussed in detail.

ROBERT F. MEHL

Corrosion of metals as affected by stress, time and number of cycles. D. J. McADAM, JR. Am. Inst. Mining Met. Eng. *Tech. Publications No. 175*, 57 pp (1929). This paper discusses the interrelationship of stress, time and number of cycles in causing penetration of metals under corrosion. The resultant fatigue limit is used as a criterion of the depth and sharpness of corrosion pitting (cf. C. A. 22, 1318). Four variables and their interrelationship are considered. The paper first discusses the relationship between corrosion-stress and resultant fatigue limit with the other two variables held const. The form of the graph, representing this relationship, indicates local strengthening of the metal at the bottoms of the corrosion pits. The field of investigation is then extended to include stresses between zero and the endurance limit. By widening the range of corrosion-stresses it was then possible to extend the range of cycle frequencies so as to include frequencies as low as 5 cycles per hr. "Constant-damage" graphs were then developed so as to represent the stress-time cycle relationship with resultant fatigue limit held const. Const. damage graphs are discussed as various views of const. damage surfaces. Const. damage graphs and surfaces on a logarithmic scale are the most useful method of representing the relationship among the four variables. Graphs for alloy steels varying widely in comp. and physical properties are discussed. From the constant damage graphs, other graphs and surfaces are developed to represent the damage (due to cyclic stress) in excess of the amount of damage that would be caused by stressless corrosion alone.

B. E. ROETHLI

The direct determination of metal corrosion by the measurement of current density and its significance. F. TÖDT. *Z. Ver. deut. Zuckerind.* 79, 1-10(1929). A method is given whereby the corrosion of metals may be read off directly on a current indicator. The exptl. and theoretical bases for this method of measuring corrosion are discussed. The practical applications of the new process are presented in a general way and then specifically in relation to the sugar industry.

E. A. FINGER

Surface films protect metals against corrosion. P. N. SPELLER. *Chem. Met. Eng.* 36, 85-7(1929).—Various methods of corrosion protection are cited as being due to the formation of surface films. The passivity of Cr and Cr-Ni steels is attributed to the presence of a highly resistant surface film rather than to lowered soln. pressure.

B. E. ROETHLI

Laboratory corrosion tests of mild steel, with special reference to ship plate. HENRY S. RAWDON. *Bur. Standards J. Research* 2, 431-40(1929).—Total immersion and alternate wet and dry tests of ship plate and mild steels varying in Cu content up to 0.60% showed no significant differences in the corrodibilities of Cu bearing steels. The corrosion rate was uniform for all steels in submerged corrosion. The corrosion product was flocculent and easy to remove. The rate of attack in the wet and dry method was greater but the rate decreased because of the formation of a dense hard scale which was difficultly removable. It is believed that differences in service conditions will account satisfactorily for the alleged difference in corrosion behavior of these steels.

B. E. ROETHLI

Introductory address at the annual meeting of the Imperial Committee for Metal

Protection and report on the scientific work of the committee for the fiscal year. E. MAASS. *Korrosion Metallschutz* 5, 1-7(1929).—Metals placed in corroding solns. of various salts under conditions of total immersion in absence of air, total immersion in presence of air, partial immersion (liquid aerated), total immersion (soln. stirred) and total immersion (temp. 95-100°) corroded at relative rates for the order named of 1, 3, 3, 5 and 8.6. Ferrous metals were attacked most strongly while Cu, high-Cu brass, bronzes and special Fe alloys were attacked relatively slightly. Solid salts in an atm. having the same humidity as that outdoors attacked all metals to some degree. Ferrous metals were uniformly attacked, while the attack on resistant metals and special Fe-Cr-Ni alloys was slight, but of a pitting character. The order of corrosiveness of the salts investigated decreased for the following materials: $MgCl_2$, carnallite, rock salt, NaCl, KCl and $MgSO_4$. The corrodibility of Al in acid solns. is decreased by annealing and rolling. Paint pigments, when dusted on Fe electrodes, changed the electrode potentials as follows: Minium +0.01v. to -0.015v., lead peroxide +0.033v., lead oxide +0.047v., Pb (powder) -0.167v. (+ indicating more noble). Upon exposure the plates dusted with minium and Pb showed rust spots after 14 days while the other plates showed none. The protective influence of Pb oxide may be attributed to the formation of an alk. product upon immersion.

B. E. ROETHELI

• **Galvanized pipes - metal coatings.** BATTIGE. *Apparatebau* 41, 53-5(1929).—B. claims that galvanizing gives no permanent protection against corrosion in H_2O pipes.

J. H. MOORE

Turbine corrosion and degasification. G. PARIS. *Chaleur et ind.* 9, 188-90 (1928).—Corrosion may occur (a) on the blade or (b) on the edge of the blade and may be rust or just erosion by water droplets. Corrosion may result from faulty working, or from matter entrained in the steam. Among entrained matter may be (a) oxygen, (b) water, (c) solids. Among means for reducing corrosion are (1) to make the blades of difficultly oxidizable metal, (2) degasification of the water, physically or chemically. A line diagram shows a water purifier and deaerator system.

S. L. B. ETHERTON

Resistance of a few steels to chemical action in relation to carbon, nickel and chromium contents. FRITZ SCHMITZ. *Z. Metallkunde* 21, 64-5(1929).—The types of metal examd. were unalloyed steel with increasing C content (0.06-0.92%), steel with Cr content between 8 and 18% and Ni content increasing from 0.5 to 62%, and steel with high Cr content (15-18%) and relatively low Ni content, but with very high C content (1.33-1.84%). The reagents studied were cond. H_2O , sea water, HNO_3 (dil. and concd.), H_2SO_4 , H_2SO_4 (dil. and concd.), HCl (dil. and concd.), 80% acetic acid, citric acid (1:2), concd. NH_4OH , KOH (1:2), and aqua regia, and the results are expressed in terms of % loss in wt. after 180 hrs. treatment. In unalloyed steel the effect of increasing C content is increased protective action against sea water, cond. water, H_2SO_4 , dil. or concd. HCl and oxidizing gases, but action by dil. H_2SO_4 is more severe with high C content. The influence of increased Ni content in a Cr-Ni steel is at first an increase in attack with dil. H_2SO_4 , followed by reduction in attack. In cond. and sea water, dil. HNO_3 , citric acid, NH_4OH and KOH, increase in Ni content has very little effect. In HNO_3 and KOH, these Ni-Cr steels can be regarded as completely passive. The results show that in oxidizing agents the protective action is due solely to Cr, while in dil. H_2SO_4 and dil. and concd. HCl, the Ni is the constituent which exerts a protective action. Thus an alloy with 0.42% Ni and 14.5% Cr shows 38.5% loss in dil. H_2SO_4 , while an alloy contg. 54.4% Ni and 12.4% Cr shows only 0.193% loss in the same reagent.

H. STOERTZ

Clean coke and its value (MOTT) 21. Influence of cooling velocity upon eutectic structure (TAMMANN, BOTSCHWAR) 2. "Gasol" from low-temperature distillation gas, and low-temperature distillation gas for cutting and welding (SCHOLTZ) 21. Generalities on the mechanical preparation of minerals (CHARRIN) 13. Elements of operation of the pneumatic table (TAGGART, LICHMERE-OERTEL) 1. Testing of electrodeposits on Al (BROOK, STOTT) 4. Equilibrium diagram of the Co-Mo system (TAKEI) 2. Abnormal properties of eutectics of high dispersion (AGEEV, *et al*) 2. Lattice constant of quenched C steel (SEKIRO) 2. Application of Cd (RUDGEN) 4. Electrical purification of blast-furnace gases (KERALY) 4. The influence of cold working on the chemical properties, particularly of metals (TAMMANN) 2. The ferruginous sands of Necoches. Chemical composition and metallurgical application (VIGNAU) 8. Extraction of clay (from iron ores) (Fr. pat. 647,928) 13. Apparatus for washing ores (Brit. pat. 297,330) 21. Muffle furnace for annealing, etc. (Brit. 296,936) 1. Ni and Co carbonyls (Brit. pat. 296,558) 18.

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RÉGNAULD, M.: *Méthodes et procédés métallurgiques*. Paris: Gauthier-Villars & Cie. 342 pp. F. 60. Reviewed in *Mech. Eng.* 51, 325(1929).

Concentrating ores by flotation. A. H. FISCHER (to D. Guggenheim, M. Guggenheim, S. R. Guggenheim, S. Guggenheim, J. K. MacGowan and E. A. C. Smith (trading as Guggenheim Bros.)). Brit. 296,270, Dec. 29, 1927. Flotation sepn. is effected in the presence of frothing agents such as cresylic acid or pine oil together with a water repellent org. compd. contg. a thiocarbonyl group, e. g., ethoxythiocarbonyl ethoxy carbonyl sulfide (which is formed by allowing ethyl chlorocarbonate to react with an aq. soln. of K ethylxanthate at a temp. below 20° and dilg. with water and fractionally distg. to sepn. from xanthic anhydride). Cf. *C. A.* 22, 2136.

Recovering platinum and other precious metals from ferruginous sulfide ores. S. C. SMITH. Brit. 296,744, June 7, 1927. The ore is treated to remove silica and the resulting mat, comprising principally Cu sulfide, is treated with acid to dissolve Fe and Ni; the leached mat is then roasted and the product is treated with acid to dissolve most of the Cu and any remaining Fe and Ni. The residue is then treated for the extn. of Pt (suitably by the process described in Brit. 289,220) (*C. A.* 23, 2000). The H₂S liberated in leaching the mat may be used to ppt. Cu and Ni from the liquor obtained by leaching the roasted residue, or for conversion into H₂SO₄ for use in the leaching.

Pumping system for mining gold, etc., in placers by direct leaching with cyanide solutions, etc. B. STOKES. Brit. 296,813, June 9, 1927.

Roasting spathic iron ore and like ores. ANTON APOLD and HANS FLEISCHER. Ger. 472,194, June 25, 1926. See Austrian 100,862 (*C. A.* 23, 1009).

Jigs for treating tin ores or other materials. T. V. O'HARE. Brit. 296,889, June 26, 1927. Structural features.

Precipitating copper from solutions. I. G. FARBENIND, A. G. Brit. 296,831, June 9, 1927. In pptg. Cu by use of iron, the soln. is agitated by means of a gas (e.g., SO₂ and O (suitably air contg. a small proportion of SO₂ or waste gases from a plant for making H₂SO₄ by the contact process)).

Treating copper ores. F. DIRTZSCH. Brit. 296,869, Sept. 26, 1927. Oxidized Cu ores are leached with a soln. of HCl, the soln. is reduced by SO₂ during or after the leaching operation, Cu is pptd. by H₂S and the residual liquor (contg. free HCl) is either used in a further leaching operation or, when its H₂SO₄ content is sufficiently high, is used to generate H₂S for use in the process from a sulfide such as a mixt. of Ca and ferrous sulfides obtained by melting lime 3 with pyrites 10 parts. In treating sulfide ores, the SO₂ produced in the preliminary roasting of the ore is utilized in other stages of the process. Cf. *C. A.* 23, 1860.

Treating iron ore. VEREINIGTE STAHLWERKE A.-G. Brit. 297,096, Sept. 16, 1927. Fe ore is treated with Cl or HCl vapor, to form and volatilize FeCl₃, and the FeCl₃ is then reduced to Fe (suitably by H). The chlorination is preferably effected under 10 atm. pressure, and with alterations of pressure. Brit. 297,097 specifies the use, as chlorinating agents, of compds. such as NH₄Cl which can be used in a cyclic process alone or with other compds. such as Cl, HCl or MgCl₂. HCl liberated in the reduction of the FeCl₃ may be combined with NH₃ liberated in the chlorination stage, thus regenerating NH₄Cl.

Iron from ores. VEREINIGTE STAHLWERKE A.-G. Fr. 647,530, Jan. 22, 1928. Fe is prepd. from its ores by chlorination to FeCl₃ by means of Cl or substance contg. it and direct reduction to Fe by H. The chlorination is carried out under a pressure of 10 atm. and the reduction under pressure in the presence of a catalyst such as spongy Fe. If the ore contains As or Sb, it is first treated with HCl at temps. of about 100°. Cf. *C. A.* 23, 590.

Removing arsenic from ores. METALLGES. A.-G. and A. G. PAUL PALÉN. Ger. 472,475, Dec. 22, 1926. Arsenic is driven off as As_2S_3 from ores contg. As and S by heating the ores in an upright muffle in which the ore continuously descends while fresh ore is fed in from above. The As_2S_3 is withdrawn through a side pipe.

Centrifugal apparatus for casting metals. A. POSSENTI and C. SCORZA. Brit. 296,902, Sept. 28, 1927. Structural features.

Apparatus for centrifugal casting of pipe or similar metal articles. CARL PARDUN and PAUL VOETTER (to Centrifugal Pipe Corp.). U. S. 1,708,849, April 9.

Casting and rolling copper. ANACONDA COPPER MINING CO. Brit. 296,746, June 7, 1927. A cake of Cu for subsequent rolling into sheets is formed by casting endwise in a tapered mold which may also be formed of Cu.

Apparatus for subjecting castings or forgings to magnetic tests to detect irregularities of structure of the metal. ALLGEMEINE ELEKTRICITÄTS GES. (to International General Electric Co.). Brit. 296,303, Aug. 27, 1927.

Foundry molding apparatus. W. LEWIS. Brit. 296,568, Sept. 21, 1927. Mech. features.

Ingot mold. EMIL GATHMANN. Ger. 472,048, Dec. 25, 1924.

Semi-permanent sectional molds for casting cylinders of internal-combustion engines, etc. C. CROSTHWAITE and W. E. STYLES. Brit. 296,863, July 22, 1927. Structural features.

Blast furnace. AUGUST KUSEMANN. Ger. 471,884, May 4, 1927. An open cooling chest is provided.

Cupola furnace. WOLFGANG MANN. Ger. 471,870, Sept. 3, 1926. On the forehearth, one or more flat surfaces are built with gratings which hold back the slag and ore, but allow the molten metal to flow through and enable the gases to be blown in.

Furnace for heating metals such as steel scrap by a flame centrally projected into an annular mass of the metal. LYLE C. LOSBOUGH. U. S. 1,708,509, April 9. Structural features.

Rotary inclined chemical furnace suitable for smelting lead or zinc ore. LUIGI TOCCO and MICHELE LANDI (to Soc. "Le Four Chimique Rotatif"). U. S. 1,708,526, April 9.

Furnace and cyanide pot for use in heat treatment. WILLIAM J. MERTEN (to Westinghouse Elec. & Mfg. Co.). U. S. 1,707,313, April 2. A liquid seal is arranged to prevent creeping of molten material over the support on which the edge of a cyanide pot is mounted.

Heat-treating furnace including a pot or crucible for a fused cyanide bath. JAMES C. WOODSON (to Westinghouse Elec. & Mfg. Co.). U. S. 1,707,294 5, April 2. A seal or shield is provided for preventing material from the crucible creeping to its outer surface. Cf. C. A. 23, 2145.

Superposed hearth furnace for roasting ores. METALLGES. A.-G. (formerly Metallbank und metallurgische Ges. A.-G.). Brit. 297,053, Sept. 13, 1927. Structural features.

Apparatus for injecting powdered material through the tuyères of blast furnaces so as to modify instantaneously the nature of the slag. SOC. ANON. JOHN COCKERILL. Belg. 352,300, July 31, 1928. Mechan. features.

Porous slag. WILLY KINBERG. Fr. 647,573, Jan. 21, 1928. A porous slag is obtained by adding to the molten slag, particularly from blast furnaces, substances such as sand, charcoal or powd. stone which will form vapors at high temps.

Converter for transforming cast iron into steel or pure iron. LA CARBONISATION SOC. GÉNÉRALE D'EXPLOITATION DES CARBONES. Fr. 647,014, Jan. 12, 1928.

Malleable iron having a black fracture. C. E. KLUJTMANS. Belg. 351,246, June 30, 1928. A charge consisting of steel scrap, residues from previous melts, ferro-Si and ferro-Mn is melted in a cupola. Charcoal with very low S content is used as fuel. The castings are packed cold in sand and waste ore, and heat-treated in an annealing furnace. Cf. C. A. 23, 1863.

Malleable cast iron. LESLIE H. MARSHALL (to Ohio Brass Co.). U. S. 1,707,529, April 2. Iron is annealed in the hard iron condition by subjecting the iron to heating for a sufficient time to change the combined C into free or graphitic C, and the annealed iron is then stabilized by quenching it before its temp. has been allowed to drop below that which will cause the iron to be embrittled. A chart of times and temperatures is given.

Annealable white-iron casting. ALFRED L. BORGENHOLD (to General Motors Research Corp.). U. S. 1,707,753, April 2. An annealable white-iron casting free from flake graphite comprises Fe, C, a graphitizing agent such as Si capable of promoting

the formation of temper C during annealing and a suitable metallic ingredient such as Mo, V, Ni or Cu which serves to obstruct the formation of flake graphite during solidification of the casting.

Iron sponge. S. E. SIEURIN. Brit. 296,235, Dec. 6, 1927. In producing iron sponge by reducing pulverized briquetted ore embedded in a solid reducing agent intimately mixed with lime or magnesia, at a temp. below the m. p. of the metal and in the absence of air or other gas, an excess of the reducing agent, such as C, is used, such that free C is present in the ash when the reduction is completed. The cooling of the product is accelerated to prevent recombination of S with the reduced metal sponge.

Pearlitic iron with nodular graphite. C. KLUJTMANS. Belg. 351,110, June 20, 1928. Steel trimmings, residues from previous melts, ferro-Si and ferro-Mn are melted in an ordinary cupola provided with tuyères through which air is blown under a pressure depending on the diam. of the cupola. The castings are subjected to heat treatment depending on their thickness.

Iron salts. BRÜCK, KRETSCHEL & Co. and OTTO KIPPE. Fr. 647,497, Jan. 19, 1928. Fe salts for briquetting Fe ores or blast-furnace dust are obtained by dissolving hammer or rolling slag or Fe bloom in HCl.

Rendering iron and steel non-oxidizable. F. DEGRÖOTE. Belg. 351,800, July 27, 1928. After cleaning, the metal is immersed in a bath contg. an acid and a salt of an acid of which one or more of the acid functions has been neutralized by an alkali or alk.-earth metal or a metal of the Pb group, and also an inert oxide of a metal or of a metalloid.

Steel. FREDERICK C. LANGENBERG and MARCUS A. GROSSMANN. Fr. 647,541, Jan. 28, 1928. See U. S. 1,695,594 (C. A. 23, 812).

Steel. GRANULAR IRON CO. Fr. 647,587, Jan. 21, 1928. In the production of Fe "produced in the solid state" a sufficient proportion of oxide of Fe is retained in reduced to prevent liberation of P in the elementary state in the ultimate manufacture of steel from the Fe.

Purifying metals. HENRY HARRIS. Fr. 647,632, Jan. 24, 1928. Cu is removed from metals or alloys by submitting the molten metal or alloy to the action of sulfur gases yielding S in the absence of air, and removing the slag of sulfide formed. Reducing agents such as resin may be added to the melt.

Zinc. HENRY E. COLEY. Fr. 647,768, Jan. 18, 1928. Zn is obtained from its ores or oxide by preheating the ore, etc., and passing it at a temp. between 700° and 1100° through a zone where it comes in contact with a hydrocarbon fed in through a cooled tube, so that decomposition of the hydrocarbon occurs only in contact with the ore, which is thereby reduced.

Apparatus (with a rotary drum having internal pockets) for producing liquid zinc from blue powder. FILIP THAKALONEN. U. S. 1,708,403, April 9.

Thin nickel flakes. EDMUND BREUNING (to Electric Storage Battery Co.). U. S. 1,707,217, April 2. Sheets are formed with alternating layers of Cu and Ni and the Cu is dissolved in a soln. of ferric salts such as $Fe_2(SO_4)_3$ free from Cl and acid. $FeCl_3$ sulfate and air accelerate dissolving of the Cu.

Metals and alloys. HERBERT VACUUMSCHMELZE A.-G. and WILHELM P. Ger. 471,503, Sept. 7, 1926. C-free metals and alloys are prepd. by subjecting the C-contg. materials to the action of MgO in vacuo.

Chilled-roll alloy. FRANK D. TAGGART. U. S. 1,707,232, April 2. A chilled-roll alloy comprises Fe together with C 3.5, Cr 1.75, V 0.20, Si 1.0 and Mn 0.50, with small quantities of S and P.

Alloys for use as solders. AMERICAN MACHINE & FOUNDRY CO. Brit. 296,586, Oct. 20, 1927. Pb contg. 0.05-0.1% Pb phosphide, with or without about 0.5% of a "brightening metal" such as Al, Sb, Sn or Zn, is used for soldering.

Aluminum alloy. TH. GOLDSCHMIDT A.-G. Fr. 647,407, Jan. 17, 1928. An Al alloy contains Mg, Si 1.5 (± 0.2), Cu 1.2 (± 0.2), Ti 0.5 (± 0.2) and Mn 0.8 (± 0.2). This alloy, after mech. treatment, is heated to 520-550°, rapidly cooled and cooled at a higher temp. The elasticity is increased by exposing it to a temp. of 110-120° for 6-24 hrs., the tenacity by exposing it to a temp. of 130-145° for 6-24 hrs., or for a particular tenacity to a temp. of 145-160°. To obtain elasticity and resistance to corrosion the aging is not carried out until 6-48 hrs. after the initial heating and cooling.

Silver alloys. I. G. FARMENING A.-G. Brit. 297,105, June 30, 1927. Silver alloys are formed contg. up to 22% of a mixt. of Al and one or more of the elements Ti, Mg, Zn, As, Sb, Bi, Sn or Si; or contains up to 22% of a mixt. of Al and Mn and at least one of the elements As, Bi, Sb, Mg or Ti, with or without Zn, Sn or Si.

Lead and lead alloys. H. HARRIS. Brit. 296,557, Sept. 3, 1927. In the purification of Pb or its alloys, the molten metal (at a temp. between its m. p. and redness) is brought into contact with a reagent comprising molten caustic alkali, with or without NaCl or other fusible chloride) to which has been added one or more of the oxides of Pb or other metals having less affinity for O than that of the impurities to be removed. The oxides may be supplied in the form of a dross. Fractional and successive removal of different impurities may be effected, such as successive removal of As and Sn from antimonial Pb.

Iron alloys containing chromium and nickel. ELECTRO METALLURGICAL CO. Brit. 297,045, June 9, 1927. Various articles are formed by welding rolled members of an Fe alloy contg. Cr 15-40, Ni 2-15, Si 0.7-3.0%, Mn 0.7-3.0% and C not more than 1%.

Steel alloy. MAX BAEKE. Fr. 646,974, Jan. 11, 1928. A steel alloy particularly for tools contains C 0.6-1.5, Ni 0.5-3, W or V 1-5%.

Steel alloys. FRIED. KRUPP. A-G. Fr. 647,236, June 8, 1927. Steel alloys for the manuf. of articles hardened with N contain Si, Mn, Ni, Cr, Mo, W, V, Ti or Zr either singly or mixed 1-8, Al less than 0.5 and C up to 0.7%. If the content of Si, etc., lies between 4 and 8% the content of Al is preferably 0.5-2%.

High-phosphorus scale-resisting alloy steel. FRANK R. PALMER (to Carpenter Steel Co.). U. S. 1,707,364, April 2. An alloy steel which is suitable for use at high temps. contains C less than 1.50, P 0.05-0.50 and Cr 3-30%.

Apparatus for tempering ferromagnetic materials. EISEN- u. STAHLWERKE HORSCH and WILLY HEIDENHAIN. Fr. 647,296, Dec. 15, 1927.

Case-hardening. A. E. TAYLOR, H. W. BARTON and F. A. JONES. Brit. 297,163, June 25, 1927. A material for use in case-hardening mild steel or other ferrous metals comprises disintegrated dried or heat-treated doom palm nut, coquilla nut or apple nut, with or without corozo nut and BaCO_3 ; charcoal and Na_2CO_3 also may be added.

Apparatus for atomizing and spraying molten metals, etc. METALLISATOR BERLIN A-G. and E. GREISER. Brit. 296,546, Aug. 24, 1927. Structural features.

Metallization by spraying of parts of valveless motors. MINERVA MOTORS and J. DE JONG. Belg. 351,469, June 30, 1928. Light steel parts are sprayed with metals that are suitable for reducing friction to a min.

Apparatus for finishing metal sheets by rolling. SAMUEL E. DIESCHER (to S. Diescher & Sons). U. S. 1,708,411, April 9.

Preparing metal sheets for tinning. SAMUEL E. DIESCHER (to S. Diescher & Sons). U. S. 1,708,412, April 9. A pack of wet metal sheets after pickling is subjected to high pressure applied progressively from a mid-portion to the edges of the pack to remove water and assocd. chemicals remaining from the pickling operation.

Uniting metal bodies. CHARLES F. SHERWOOD. 1,708,193, April 9. In uniting metal bodies such as clips and flexible elec. conductors, a suitable metal powder, e. g., Cu, Sn, Pb and graphite, is placed between them and heated in a non-oxidizing atm. to effect union of the particles with each other and with the metal bodies to be united.

Rubber-lined metal tube. IRWIN F. KEPLER (to B. F. Goodrich Co.). U. S. 1,708,141, April 9. Mech. features.

Silvering. L. J. V. GRANIER. Brit. 296,667, Sept. 2, 1927. In silvering metals and alloys other than certain Sb alloys, AgCl is pptd. from a soln. of AgNO_3 by use of NaCl, the ppt. is washed and dissolved in Na thiosulfate soln. and NaHSO_4 soln. and whitening are added. The article to be silvered is wiped with a pad moistened with this product.

Coating iron sheets with aluminum. F. JORDAN. Brit. 296,474, June 1, 1927. Details of heating and rolling metal sheets or strips together are specified.

Protecting metal of electric conductors from chemical action of sulfur in insulating materials. F. KIRSCHNER and J. HESS. Brit. 297,161, June 23, 1927. Zn is used as a coating material for the conductor, preferably after a preliminary coating with Sn or a Sn alloy. A coating of Ni may also be applied before coating with Sn.

Apparatus for removing surplus spelter from galvanized articles by streams of air from blast nozzles. WAYNE RAWLEY and ORAND A. PLASKEY (to Blaw-Knox Co.). U. S. 1,707,770, April 2.

Mounting of electric cables to prevent corrosion. J. W. HOFMANN. Brit. 297,160, June 23, 1927. Parts of a clamp or tension mounting for an elec. cable which are in contact with the conductor are made of the same metal as the latter while other parts are made of iron or steel.

Rust preventing. Wm. H. COLZ. Fr. 647,314, Dec. 26, 1927. Fe and steel are

protected against rust by treating them with a soln. contg. phosphates of Al, Zn, Fe and Cr. Cf. C. A. 23, 138.

Electric welding. ERNEST LUNN (to Pullman Car and Mfg. Corp.). U. S. 1,707,405, April 2. Elec. current is applied at intervals of successively longer duration, in order to facilitate welding of "black stock" steel without preliminary picking or sand-blasting.

Electrode mounting for automatic electric welding apparatus. AUGUSTIN J. HAND (to Calif. Corrugated Culvert Co.). U. S. 1,707,433, April 2. Structural features.

Electrodes for arc welding. E. M. F. ELECTRIC CO. PROPRIETARY LTD. Brit. 296,509, June 28, 1927. Electrodes are provided with coatings contg. a substance which is decompd. in the arc to liberate H to protect the fused metal from oxidation and nitrogenization. A suitable coating mixt. comprises fluxes and slags and contains "vegetable black" or similar carbonaceous material and a hydrated Al silicate such as china clay, the combined water from which is liberated in the arc and is converted into H and CO. Various structural and other details are given. Cf. C. A. 23, 1612.

Arc-welding electrodes. COMPAGNIE FRANÇAISE POUR L'EXPLOITATION DES PROCÉDÉS THOMSON-HOUSTON. Fr. 647,002, Jan. 12, 1928. The electrodes are made by heating the wire forming the core in an alk. soln. contg. Fe_2O_3 , one or more Ca compds., e. g., CaO, and a small quantity of Na_2SiO_3 , until a thin homogeneous layer is formed. Cf. C. A. 23, 1106.

Welding cast iron. HENRY V. WILLE. U. S. 1,708,815, April 9. In producing a soft fusion weld on cast iron, there is added to the weld ferrous metal contg. 4-20% total C. Cf. C. A. 22, 1323.

Flux for welding and soldering aluminum and other metals. W. REUSS. Brit. 296,923, Nov. 10, 1927. H_3BO_3 or a mixt. of H_3BO_3 and borax is used with KOH or other free caustic alkali; e. g., an aq. soln. may be formed from equal quantities of borax, H_3BO_3 , and KOH. Cf. C. A. 23, 1100.

10—ORGANIC CHEMISTRY

CHAS. A. ROUILLER AND CLARENCE J. WEST

Inflammation of mixtures of the olefins and air in a closed spherical vessel. G. B. MAXWELL AND RICHARD V. WHEELER. Sheffield Univ. *J. Chem. Soc.* 1929, 245-51; cf. C. A. 22, 167.—Data are given for the inflammation of mixts. of C_2H_4 , C_3H_6 , and C_4H_8 and air, the mixts. initially at atm. pressure and room temp. and ignited by a secondary discharge at the center of a closed spherical vessel of bronze, the interior highly polished. As with the paraffins, there is with each olefin a marked displacement of the observed max. pressure mixt. from the theoretical mixt. for complete combustion toward excess of hydrocarbon. These displacements can only be attributed to the effects of dissociation, since the calcd. values, for which an allowance is made for dissociation, are similarly displaced. As with the paraffins, the close correspondence between the observed values for the max.-speed mixts. and the calcd. values for the max.-temp. mixts. shows that, for mixts. of a given combustible with air, flame temp. is the controlling factor in detg. the mean rate of development of pressure. C. J. WEST.

Some new tautomeric phenomena in the allylic series. CHARLES FRIEDEL. *Compt. rend.* 187, 1052-4 (1928).— $\text{CH}_2\text{CHCH}(\text{OH})\text{Et}$ (I) and $\text{EtCHCHCH}(\text{OH})\text{H}$ (II) are mesomeric at room temp. but at about 300° some transformation of I into II takes place. A pseudo-isomeric bromide corresponding to II is formed from I by action of PCl_5 , while the action of PCl_5 on I yields 2 different chlorides, $\text{CH}_2\text{CHCH}(\text{Cl})\text{Et}$, b. 93°, d^{20}_4 0.8966, n^{20}_D 1.4224, and $\text{CH}_2\text{CCH}(\text{Cl})\text{CH}_2\text{Et}$, b. 109.5°, d^{20}_4 0.8995, n^{20}_D 1.4146, resp. These chlorides are mesomeric and become desmotropic above 150°. After allowing them to react with NaOAc , only $\text{AcOCH}_2\text{CH}(\text{CH}_3)\text{CH}_2\text{Et}$ could be isolated while NaOEt with either chloride yields a mixt. of $\text{CH}_2\text{CHCH}(\text{OEt})\text{Et}$, b. 102°, d^{20}_4 0.8798, n^{20}_D 1.3996, and $\text{EtCHCH}(\text{OEt})\text{CH}_2\text{Et}$, b. 123°, d^{20}_4 0.7930, n^{20}_D 1.4009. A. L. HENRI.

Catalytic splitting off of alcohol from acetals (preparation of unsaturated ethers). FRITZ SIGMUND AND REINFRIED UCHMANN. Univ. Wien. *Monatsh.* 51, 234-52 (1920).— $\text{Me}(\text{CH}_2)_3\text{CH}(\text{OR})_2$, b. 203-5°, heated with a Ni catalyst, or with porous clay, splits off EtOH and gives amylinyl *Et ether*, b. 173-5°. Similarly, the di-*Pr* acetal gives 70% of amylinyl *Pr ether*, b. 184-7°. $\text{PhCH}_2\text{CH}(\text{OMe})_2$ gives β -methoxystyrene (36% yield); with brass turnings the reaction is incomplete at 400°. The di-*Pr* acetal

gives 70% of PhCH:CHOPr . MeCH(OEt) gives 60% of MeCH:CHOEt . PhC(OMe)Me gives 86% of PhC(OMe):CH_2 . $\text{PhC(OPr)}_2\text{Me}$ gives 97% of α -propoxystyrene, b. $214-9^\circ$ (cor.).

Allyl β -hydroxyethyl sulfide and derivatives. S. M. SHERLIN AND V. V. VASILEV-SKII. Moscow High Tech. *J. Russ. Phys.-Chem. Soc., Chem. Part* 60, 1629-32 (1928); *J. prakt. Chem.* 121, 173-6 (1929).—Allyl β -hydroxyethyl sulfide, $\text{HOCH}_2\text{CH}_2\text{SCH}_2\text{CH:CH}_2$, was prepd. thus: With uninterrupted stirring and strong cooling a concd. aq. soln. of 73 g. KOH was slowly poured into 87 g. crude allyl mercaptan. To the mercaptide thus obtained 104 g. $\text{ClCH}_2\text{CH}_2\text{OH}$ was cautiously added drop by drop with cooling. The mixt. was heated on a water bath till the emission of ethylene ceased. KCl pptd. and 2 liquid layers were formed, the upper presenting a light yellow oil and the lower a satd. aq. soln. of KCl. The reaction mixt. was dild. with H_2O to complete soln. of the KCl, the oil was sepd., dried with K_2CO_3 and fractionated *in vacuo*, the fraction b_{12-13} $87-95^\circ$ being refractionated. Thus 34.5 g. of the product was obtained, representing a 50% yield on the mercaptan. It is a colorless and almost odorless oil, b_{12} $90-2^\circ$, readily sol. in EtOH , Et_2O , almost insol. in H_2O . It rapidly decolorizes Br in cold CS_2 . Allyl β -chloroethyl sulfide.—Through a separatory funnel 30 g. PCl_5 was cautiously dropped into 52 g. of the β HO compd., after which the mixt. was heated 1 hr. on a water bath and, on cooling, poured into ice-water. An oil was formed which was sepd., washed with H_2O and dissolved in C_6H_6 . The C_6H_6 soln. was washed with 2% Na_2CO_3 until neutral, dried with CaCl_2 and, after evapn. of C_6H_6 , fractionated at 12-13 mm. taking the fraction b. $64-71^\circ$. After a refractionation, 27 g. of the product was obtained, the yield being 45%. It is a colorless liquid, b_{12} $67.5-69^\circ$, an unpleasant odor, insol. in H_2O , readily sol. in org. solvents. It slowly decolorizes Br in CS_2 .—*Acetoxyethyl allyl sulfide*.—Six g. Ac_2O and 1 drop H_2SO_4 were added with cooling to 5.3 g. of the HO compd., then the mixt. was heated 20 mins. on a water bath and the product obtained was fractionated, collecting the fraction b_{12-13} $93-7.5^\circ$ and distg. it again, this time taking the fraction b_{12} $94.5-96^\circ$; 3.5 g. of perfectly pure acetate was thus obtained. The same product can also be obtained thus: 10.5 g. of the β -Cl compd. is poured into a paste of 15 g. AgOAc and 22 cc. 86% EtOH and the mixt. is refluxed 10 hrs. on a water bath while agitating from time to time. The liquid is sepd. by suction from the AgCl formed, dried with CaCl_2 and fractionated. It is a colorless liquid with a fairly pleasant odor of fruit, insol. in H_2O , readily sol. in org. solvents. It instantly decolorizes Br in CS_2 . Gasparini and Savini's method of electrolytic oxidation (*Gazz. chim. ital.* 37, II, 437) had to be used to analyze the HO compd. and its acetate, as the attempt to analyze the latter by the Carius method provoked an unusually violent explosion. BERNARD NELSON

Action of acetylene on selenium. F. P. MAZZA AND L. SOLAZZO. Univ. Naples. *Rend. acad. sci. Napoli* 33 [3], 236-9 (1927).—Dry, pure HC CH reacted with finely powd. Se at $250-300^\circ$ with evolution of flames. A brown oil was formed and evolution of a gas (H_2Se) was noticed, which decompd. rapidly, giving a deposit of Se. The reaction product was extd. with EtOH . After evapn. of the EtOH the residue was subjected to fractional distn. The 1st fraction consisted of selenophene (I), reddish, b. $113-4^\circ$, while the selenophene obtained by Foa (*C. A.* 5, 693), b_{12-13} $147-8^\circ$. The 2nd fraction consisted of selenonaphthene (II), yellow crystals from $\text{PhH-Et}_2\text{O}$, m. $53-4^\circ$; picrate, golden yellow. II is probably formed by condensation of I with PhH , which latter may be formed from HC CH by polymerization. The H_2 liberated in this condensation combines with Se, giving rise to formation of H_2Se . G. S.

Esters of phosphoric acid. I. Phosphates of cetyl alcohol, cholesterol, chloroethyl alcohol and ethylene glycol. ROBERT H. A. PLIMMER AND WM. J. N. BURCH. St. Thomas' Hospital Med. School and Westminster School. *J. Chem. Soc.* 1929, 279-91.— POCl_3 (3.5 g.), added slowly to 5 g. cetyl alc. in CHCl_3 and heated 2 hrs. on the water bath, poured into water, neutralized with BaCO_3 and Ba(OH)_2 , the filtrate concd. and treated with EtOH , gives 60% (5.5 g.) of *Ba monoacetyl phosphate*, pale yellow, crystals with 1 H_2O ; dil. H_2SO_4 gives the free phosphate, m. 72° (Biehinger, *Ber.* 38, 3974 (1905)). Heating 9 g. POCl_3 and 25 g. cetyl alc. in CHCl_3 until HCl is no longer evolved and pouring into Ca(OH)_2 gives 5 g. *Ca monoacetyl phosphate*, and 10 g. (60%) of *diacetylphosphoryl chloride*, yellow, boiling the latter with Ba(OH)_2 for 10 hrs. gives *Ba diacetyl phosphate*, which is easily hydrolyzed by acid. Boiling cetyl alc. and POCl_3 in mol. proportions gives only cretine. POCl_3 (3 g.) gradually added to 5 g. cetyl alc. on the water bath gives *triacetyl phosphate*, m. 61° , also obtained by boiling an excess of the alc. with P_2O_5 in H_2O . POCl_3 (4.2 g.), slowly added to 12 g. cholesterol (I) in CHCl_3 , and after 24 hrs. poured into H_2O and neutralized with BaCO_3 and Ba(OH)_2 , gives a small yield of *Ba monocholesteryl phosphate*, crystg. with

4H₂O; dil. H₂SO₄ gives the *di-H deriv.*; the Pb and Ag salts are insol., the Cu and Na salts are sol. in H₂O. POCl₃ (2 g.) and 8 g. I, treated as above, give a very small yield of *Ba dicholesteryl phosphate*; the *di-II deriv.*, obtained with dil. H₂SO₄, could not be obtained by Euler and Bernton's method (C. A. 22, 89). *Tricholesteryl phosphate*, yellow, could not be freed from cholesteryl chloride. POCl₃ (15 g.) and 30 g. ClCH₂CH₂OH, after 24 hrs., give 3 cc. of *tri-β-chloroethyl phosphate*, b₅₅ 140°, d. 1.39, and 12 g. of a mixt. of Ba salts, from which was isolated *Ba β-hydroxyethyl phosphate* (II). Using 15 g. POCl₃ and 15 g. ClCH₂CH₂OH and heating 2 hrs. on the water bath, there results a mixt. of mono- and di-derivs., from which the *Ba δ-β-hydroxyethyl phosphate* is sepd. by crystn. from H₂O. ClCH₂CH₂OH (8.2 g.) in 40 cc. C₆H₅N at -20°, slowly added to 30.6 g. POCl₃ in 80 cc. C₆H₅N at -15°, gives 7 g. *Ba β-chloroethyl phosphate* (III), crystg. with 1 H₂O, decompg. 120°. III yields a *brucine salt*, crystg. with 4 H₂O, removing the brucine with NH₄OH and boiling with yellow PbO gives II. O₂POEt and ClCH₂CH₂OH give III. The action of yellow PbO or Ag₂O upon the trichloroethyl phosphate gives the *di-β-hydroxyethyl deriv.*; this also results from ClCH₂CH₂OH and Na₂PO₃; the Na salt crystals with 6 H₂O. (CH₃O)₂Na₂ and POCl₃ give very sol. products which may be salts of (CH₃O)₂POOH. The various esters of H₃PO₄ are completely hydrolyzed by dil. acid. The mono- and di-esters of the aliphatic alcohols with H₃PO₄ are not hydrolyzed and the tri-ester is hydrolyzed to the di-ester, by dil. alkali. All esters of PhOH with H₃PO₄ can be completely hydrolyzed by dil. alkali. II. The action of ethyl metaphosphate on alcohols, ammonia and some amino compounds. *Ibid* 292-300.—By the action of various alcs. on O₂POEt (I) there results a mixt. of esters of H₃PO₄ and usually a mixed ether, sometimes a simple ether. EtOH gives the mono- and di-Et esters; PrOH gives mono- and di-Pr and mono- and di-Et esters and Pr₂O; cetyl alc. gives the mono- and dicetyl and mono- and di-Et ester; and Et cetyl ether and dicetyl ether; PhOH gives the mono- and di-Ph and mono- and di-Et esters and EtOPh; cholesterol gives the mono-cholesteryl and -Et esters and Et cholesteryl ether. *Ba Et phosphate*, crystals with 1 H₂O; the *di-Et ester* is anhyd. 10 g. (I) give 10.9 and 4.5 g. of these esters, resp. I (11 g.) and 12 g. PrOH give 6 g. of the *di-Pr ester*, 11 g. di-Et ester and *Ba di-Pr pyrophosphate*, converted into *Ba Pr phosphate* by warming with dil. Ba(OH)₂. *Ba Ph phosphate*; *Ba di-Ph phosphate*, crystals with 4 H₂O. Tyrosine and I do not react. I and dry NH₃ in CHCl₃ appear to yield NH₄EtHPO₄. *di-NH₃ Et phosphate* results from the Ba salt and (NH₄)₂SO₄. *NH₃ Et phosphate* likewise results from the Ba salt and (NH₄)₂SO₄. I and NH₃ give apparently hydrazine *Et di H phosphate*, which yields with CuSO₄ hydrazine sulfate, blue, and EtCuPO₃. PhNHNH₂ gives a salt of itself and EtH₂PO₃. Alamine appears to give a salt with Et tri H pyrophosphate, which becomes a salt of Et di H phosphate on treatment with H₂O. *Guanidine di-Et pyrophosphate* results from I and guanidine carbonate in dry CHCl₃. C. J. WELSH.

Strength and volume relationships in organic linkages in molecules. F. E. HERTZ. Chem. Inst. Univ. Bonn. *Z. anorg. allgem. Chem.* 178, 292 (1929).—A study of the compds. formed when Ni(CN)₂ is combined with NH₃, MeNH₂, EtNH₂, PrNH₂, BuNH₂, Me₂N and Et₂NH. Stability was detd. by measuring the vapor pressures while analyses of the compds. gave the vol. relationships in their formation. R. C. ROBERTS.

A modified Curtius degradation. III. The degradation of saturated fatty acids and benzoic acid. C. NABGRI, LYDIA GRONTUCH AND P. LENDORFF. *Ber. chem. Ges.* 53, 1227-61 (1920); cf. C. A. 23, 113.—A flask fitted with a ground glass connected reflux condenser with a glass-stoppered side tube at the lower end which permits addition of NaN₃ (I) was used for the interaction of acid chlorides and I. The quality of I has a great influence on the rate and completeness of the reaction and it was found that I, prepd. by Thiele's method (cf. C. A. 2, 3315), was generally more active than that of other com. products. The rate of reaction is also greatly influenced by the quantity and kind of solvent; PhH appears to be the solvent of most general use; Et₂O cannot be used for aliphatic acids of low mol. wt. and for polybasic acids since the b. p. is below the temp. at which the azide is converted to the isocyanate and the reaction products are explosively unstable. *Heptadecylamine-HCl* (II) was prepd. by adding 1.5 g. I to 6 g. C₁₇H₃₅COCl (cf. Kraft and Bürger, *Ber.* 17, 1378 (1884); C. A. 22, 498). After warming for 2.5 hrs. nearly all of the N₂ was evolved, the mixt. was filtered from pptd. NaCl, washed with a small amt. of hot PhH, 10 cc. concd. HCl added to the filtrate, carbonate CO₂ warmed, the PhH removed by warming *in vacuo*; 5.4 g. II was sepd. by filtration and dried over KOH; recrystd. from abs. EtOH or by pptn. from EtOH with Et₂O at m. 188°. The *free base* (3.8 g.) was prepd. by treating 6 g. C₁₇H₃₅COCl with I in PhH as above, filtering the reaction product into a tubulated retort contg. 15 g. slaked lime.

then adding 15 g. more lime, closing the retort with a cork covered with Na silicate, distg. off the PhH and then distg. the base into a receiver protected from CO_2 with soda lime tube; at the end of the distn. the base is dissolved in ligroin, sepd. from H_2O , dried over KOH and then distd. over Na in an atm. of N_2 ; colorless crystals, m. 49° , were obtained. A 19% yield of *stearic heptadecylamide*, m. 88° , was obtained by interaction of 6 g. $\text{C}_{17}\text{H}_{35}\text{COCl}$ and 1.4 g. I in PhH, filtering, warming 1 hr. with glacial AcOH, removing PhH and AcOH by warming *in vacuo* and recrystg. the residue from EtOH; evapn. of the mother liquors gave 4.8 g. *acetic heptadecylamide* which was recrystd. from EtOH, then from ligroin and m. 62° . Similarly from palmitic acid, 80% *pentadecylamine*, m. 33.5° , b₇₆₀ 301° , 95.5% of its HCl salt, softens 164° and m. 199° , and 80% *acetic pentadecylamide*, m. 72° , were obtained. From lauric acid were obtained 80% *undecylamine-HCl* as colorless crystals which soften 180° and m. 190° , 71% *undecylamine*, m. $15-16^\circ$, and 76% *acetic undecylamide*, m. 48° , b₁₂ 192° . Isovaleric acid gave 71% *isobutylamine-HCl*, m. 164° , from which the free base was prepd., and 79% *acetic isobutylamide*, b. 227° . A 60% yield of $\text{MeNH}_2\cdot\text{HCl}$ was prepd. by adding 6 g. I to 6 g. AcCl in 20 cc. dry PhH, warming to $70-80^\circ$ until N_2 is evolved (cooling when the reaction becomes violent), adding 20 cc. concd. HCl with cooling, warming to $30-40^\circ$ until CO_2 is evolved, removing PhH by distn. *in vacuo*, drying the residue on a water bath and then at 110° , extg. with abs. EtOH and pptg. from EtOH with Et_2O . When 5 g. AcCl and 5 g. I in 50 cc. PhH are warmed to $65-75^\circ$ at such a rate that the N_2 is evolved in 20 mins. then treated with 30 cc. glacial AcOH, the PhH removed *in vacuo*, the residue distd., the distillate dissolved in Et_2O , treated with solid NaOH, filtered and fractionally distd., 72% of *acetic methylamide*, b₇₆₀ $202-4^\circ$, was obtained and from this a nearly theoretical yield of $\text{MeNH}_2\cdot\text{HCl}$ can be obtained by hydrolysis with HCl in a sealed tube. An 80% yield of *diphenylurea* was obtained by interaction of 3 g. BzCl and 1.5 g. I in PhH; when Et_2O replaced the PhH as the solvent 60-74% $(\text{PhNH})_2\text{CO}$, 17% BzOH and 4% PhNH_2 were obtained. A 75% yield of $\text{PhNH}_2\cdot\text{HCl}$ was obtained from BzCl and I in PhH in a manner similar to the prepn. of II. The prepn. of PhNHAc from BzCl and I in a manner similar to the prepn. of the other amides above gave only a 0.4% yield but when 10-15 cc. of glacial AcOH contg. 5% Ac_2O was used 90% of PhNHAc and 6% PhNHBz were obtained.

N. A. LANGE

Modification of the Curtius synthesis of primary amines. RICHARD H. F. MANSKE. Yale Univ. *J. Am. Chem. Soc.* 51, 1202-4 (1929).—It is suggested that the hydrolysis of alkylureas and urethans, when acid or alkali hydrolysis is impracticable, be accomplished by means of phthalic anhydride and subsequently with $\text{N}_2\text{H}_4\cdot\text{H}_2\text{O}$. Octamethylene-1,8-dimethylurethan (4 g.) and $\text{C}_6\text{H}_4(\text{CO})_2\text{O}$ (8 g.), heated at 230° for about 30 mins., give 7.4 g. of 1,8-diphthalimideoctane, m. 138° , hydrolysis gives octamethylenediamine. $\text{PhOCH}_2\text{CH}_2\text{CH}_2\text{CONHNH}_2$ from $\text{PhOCH}_2\text{CH}_2\text{CH}_2\text{CO}_2\text{Et}$ and $\text{N}_2\text{H}_4\cdot\text{H}_2\text{O}$, m. $81-2^\circ$, with NaNO_2 and HCl gives the azide which, heated with dil. AcOH, gives di- γ -phenoxypropylurea, m. 150° ; with $\text{C}_6\text{H}_4(\text{CO})_2\text{O}$ this yields γ -phenoxypropylphthalimide, m. 94° , hydrolyzed by $\text{N}_2\text{H}_4\cdot\text{H}_2\text{O}$ to $\text{PhOCH}_2\text{CH}_2\text{CH}_2\text{NH}_2$. β -[3-Indolylethyl]urea gives β -[3-indolylethyl]phthalimide, pale yellow, m. 164.5° ; hydrolysis with $\text{N}_2\text{H}_4\cdot\text{H}_2\text{O}$ gives tryptamine quant.

C. J. WEST

The influence of poles and polar linkings on the course pursued by elimination reactions. II. The mechanism of exhaustive methylation. CHRISTOPHER KELK INGOLD AND CHARLES CYRIL NORREY VASS. *J. Chem. Soc.* 1928, 3125-7; cf. C. A. 23, 2150.—The decompn. of quaternary NH_4 compds may occur along 2 lines: $\text{CHR}_1\text{R}_2\text{CR}_3\text{R}_4\text{NMe}_2\text{OH}$ gives $\text{CR}_1\text{R}_2\text{CR}_3\text{R}_4 + \text{NMe}_2 + \text{H}_2\text{O}$ (reaction A), or $\text{CHR}_1\text{R}_2\text{CR}_3\text{R}_4\text{NMe} + \text{MeOH}$ (reaction B). The following facts should favor B at the expense of A: R_1 and R_2 should have more influence than R_3 and R_4 ; when R_1 and R_2 increase, B should increase progressively until it reaches a const. value, when $\text{R}_1\text{R}_2\text{CH-}$ or any part thereof is branched, B should be greater than with the isomeric unbranched compd. These predictions have been verified by measuring the % olefins (reaction A) obtained when $\text{R}_3 = \text{R}_4 = \text{H}$, while R_1 varies. The results were: Et 95%; Pr 84%; Bu 79%; Am 77%; C_6H_{13} 76%; C_6H_{11} 74%; C_6H_9 75%. The const. value is thus 75%. The last prediction is verified by the fact that the value for Bu is 79% while for iso-Bu it is only 72%. III. The decomposition of dialkyl sulfones. GEOFFREY WILLIAM FENTON AND CHRISTOPHER KELK INGOLD. *Ibid* 3127-30.—Theory requires that dialkyl sulfones decomp., in a similar way to quaternary NH_4 hydroxides, into an olefin and an alkylsulfinic acid. It is experimentally found that Et_2SO , m. 71° , is decompd. by KOH at 200° into C_2H_4 and EtSO_2H . Ethyl octyl sulfone, m. 68° , prepd. by oxidizing the sulfide, b₁₀ $109-3^\circ$, with HNO_3 gives C_8H_{16} and octanesulfinic acid with KOH at 200° , but no octane or EtSO_2H . Diethyl sulfone, m. 76° , obtained

from the sulfide, b_p 180°, and HNO_3 (d. 1.49), is not affected by being refluxed with 90% KOH.

ALBERT L. HENNE

Action of the Grignard reagent on highly branched carbonyl compounds. J. B. CONANT AND A. H. BLATT. Harvard Univ. *J. Am. Chem. Soc.* 51, 1227-36(1929).—Besides the normal addn. of the Grignard reagent to CO compds., 3 other reactions—reduction, enolization and condensation—may take place; as the alkyl groups present in the CO compd. are increased in size and complexity, there is a decrease in the rate of the addn. reaction and the other reactions become predominant. The limiting case is $\text{Me}_3\text{CCO}_2\text{Et}$, which is recovered unchanged after boiling with *tert*-BuMgCl(I) for 10 hrs. I and AcH give 80% of $\text{Me}(\text{tert-Bu})\text{CHOH}$. Me_3CHCHO and Me_2CHMgBr give 78% of $(\text{Me}_3\text{CH})_2\text{CHOH}$, whose *phenylurethane* m. 96-9°. Me_3CHCHO and I give 20% of iso-BuOH and 44% of $(\text{Me}_3\text{CH})(\text{Me}_2\text{CHCH}_2)\text{CHOH}$. Et_2CO and BuMgBr give 60% of diethylbutylcarbinol, b_p 116-8°, d_4^{20} 0.8409, n_D^{20} 1.4390. No Et_2CHOH could be isolated; its 3,5-dinitrobenzoate, prepd. for comparison, m. 101°. No definite products could be isolated from Et_2CO and I. $\text{Me}_2\text{C}(\text{Ac})$ and BuMgBr give 25% of methylbutyl-*tert*-butylcarbinol, b_p 84-7°, d_4^{20} 0.8487, n_D^{20} 1.4400, and 30% of $\text{Me}_2\text{CCH}(\text{OH})\text{Me}$. With Me_2CHMgBr 50% of the $\text{Me}_2\text{C}(\text{Ac})$ was recovered, as is also true with I. $(\text{Me}_2\text{CH})_2\text{CO}$ and BuMgBr give 40% of diisopropylbutylcarbinol, b_p 115-8°, d_4^{20} 0.8487, n_D^{20} 1.4435, and 13% of reduction product; Me_2CHMgBr gives 78% of $(\text{Me}_2\text{CH})_2\text{CHOH}$; I gives 80% of the same reduction product. $\text{Me}_2\text{CCOCHMe}_2$ and MeMgI give 60% of methylisopropyl-*tert*-butylcarbinol, b_p 56-7°, d_4^{20} 0.8564, n_D^{20} 1.4430; Me_2CHMgBr gives 88% and I, 90% of $(\text{Me}_2\text{CH})(\text{Me}_2\text{C})\text{CHOH}$. $(\text{Me}_2\text{C})_2\text{CO}$ and MeMgI give 78% of di-*tert*-butylcarbinol, b_p 184-91°, m. 39-41°; Me_2CHMgCl gives unchanged ketone and $(\text{Me}_2\text{C})_2\text{CHOH}$; I gives 60% of the same carbinol. $\text{PhCH}_2\text{CO}_2\text{Et}$ and Me_2CHMgBr give 94% of $\text{PhCH}_2\text{COCHPhCO}_2\text{Et}$.

C. J. WEST

Trimethylacetaldehyde and dimethylethylacetaldehyde. J. B. CONANT, C. N. WEBB AND W. C. MENDUM. Harvard Univ. *J. Am. Chem. Soc.* 51, 1246-55(1929).— Me_2CMgCl and HCHO give 42-50% of $\text{Me}_2\text{CCH}_2\text{OH}$, m. 47-9°; a by-product is formaldehyde di-*tert*-butyl acetal, b_p 182-5°; the latter is recovered unchanged by steam distn. from 80% H_2SO_4 but is hydrolyzed by heating with an equal wt. of 95% EtOH contg. 2 cc. concd. HCl. Dehydration of the carbinol by passing over a Cu catalyst at 250-300° gives 60-65% of Me_2CCHO (I), b_p 74-6°. $\text{Me}_2\text{EtUCH}_2\text{OH}$ is obtained in 40-7% yields by the action of the Grignard reagent and HCHO; the by-product formaldehyde di-*tert*-amyl acetal, b_p 220-4°. Dehydrogenation of the carbinol yields 60-65% of Me_2EtCCHO (II), b_p 104-0.5°, d_4^{22} 0.8040, n_D^{22} 1.3975. Both I and II rapidly undergo autooxidation in the air; II gives 82% of $\text{Me}_2\text{EtCCO}_2\text{H}$. Both I and II undergo photochem. decompn. in bright daylight and in light from a Hg lamp; the effective wave lengths appear to be 2950-3200 Å. U. The products of the reaction are CO and the satd. hydrocarbon. The Cannizzaro reaction may be carried out with I if alk. KOH is employed. I (0.12 mol.) and PrMgBr give 0.06 mol. $\text{Me}_2\text{CCH}(\text{OH})\text{Pr}$, Me_2CHMgCl gives 0.04 mol. $\text{Me}_2\text{CCH}(\text{OH})\text{CHMe}_2$ and about 0.01 mol. $\text{Me}_2\text{CCH}_2\text{OH}$. Me_2CMgCl gives only $\text{Me}_2\text{CCH}_2\text{OH}$. II (0.1 mol.) and PrMgBr give 0.015 mol. $\text{Me}_2\text{CCH}_2\text{OH}$ and 0.045 mol. *tert*-amylpropylcarbinol, b_p 177-8°; 3,5-dinitrobenzoate, m. 71.5-2.5°. II (0.9 mol.) and Me_2CHMgBr give 0.030 mol. $\text{Me}_2\text{CCH}_2\text{OH}$ and 0.924 mol. $(\text{Me}_2\text{CCH}_2)(\text{Me}_2\text{CH})\text{CHOH}$. II (0.5 mol.) and Me_2CMgCl give 0.03 mol. $\text{Me}_2\text{CCH}_2\text{OH}$.

C. J. WEST

Study of some constitutions by means of ozone. RENÉ ESCOURROU. *Bull. soc. chim.* 43, 1088-1100(1928).—The hydrolysis of citral yields a methylheptenone, whose colorless ozonide is decompd. by ice water into Me_2CO and $\text{MeCOCH}_2\text{CH}_2\text{CHO}$, with a little $\text{MeCOCH}_2\text{CH}_2\text{CO}_2\text{H}$ and a high mol. polymer as impurities. The heptenone is thus given the formula $\text{Me}_2\text{C}=\text{CHCH}_2\text{COMe}$. The methylheptenone obtained as a by-product in the prepn. of ψ -ionone gives much HCHO on treatment with O_3 , which may be due to the presence of dipentene in the ketone; nevertheless, this ketone has its double bond located in the α -position, because the ozonide of benzylmethylheptenol, b_p 146-7° (obtained from the ketone by means of PhCH_2MgCl), also yields HCHO on treatment with water. The ozonization of the methylheptenone, b_p 60-1°, d_4^{20} 0.8531, n_D^{20} 1.46195, $[\alpha]_D^{20}$ -45.33°, obtained by fractionation of essence of lemon grass is vitiated by the presence of impurities contg. a terminal CH_2 group, but the ozonide of methylisomethylheptenone, b_p 120-2°, d_4^{20} 0.8555, n_D^{20} 1.45947 (prepd. from the above ketone), gives HCHO and Me_2CO , indicating thus that the original ketone was a mixt. of the α - and the β -forms, with the latter predominating. The dimethyl-

decadiene obtained by dehydration of methylbutylheptenol is $\text{Me}_2\text{C}:\text{CHCH}_2\text{CH}_2\text{CMe}:\text{CHPr}$, because its ozonization gives Me_2CO , PrCHO and $\text{MeCOCH}_2\text{CH}_2\text{CHO}$; since some HCHO is also obtained, the original dienic compd. contained some $\text{CH}_2:\text{CMeCH}_2\text{CH}_2\text{CH}_2\text{CMe}:\text{CHPr}$ as impurity. Quant. expts. in aq. AcOH as solvent confirm the results obtained previously with Java geraniol and citronellol. Similarly, limonene, b. $175-6^\circ$, d^{14}_D 0.847, n^{25}_D 1.4717, $[\alpha]^{17}_D$ 116.1, is shown to contain about 80% of the limonenic and 12% of the terpinolenic forms, the remaining 8% being probably α -terpene. Decompn. of the ozonide gives a small quantity of an insol. waxy substance, m. $88-9^\circ$. Analysis of methylisoamylheptenol shows that this product contains 10–11% of the α -form.

ALBERT L. HENNE

• **Catalytic hydrogenation under reduced pressure.** I. RENÉ ESCOURROU. *Bull. soc. chim.* 43, 1101–15 (1928); cf. following abstr.—Under reduced pressure and in the presence of pumice covered with Pt oxide, the methylalkylheptenols are reduced to the corresponding heptanols, but at atm. pressure in the presence of Ni, the corresponding satd. hydrocarbons are obtained. $\text{Me}_2\text{CH}(\text{CH}_2)_2\text{CHMe}_2$, b.₇₄₀ $133-4^\circ$, d^{11}_D 0.7203, n^{10}_D 1.40672; $\text{Me}_2\text{CH}(\text{CH}_2)_3\text{CHMeEt}$, b.₇₁₀ $158-9^\circ$, d^{11}_D 0.7410, n^{11}_D 1.41611; $\text{Me}_2\text{CH}(\text{CH}_2)_2\text{CHMeCHMe}_2$, b.₇₁₂ $173-6^\circ$, d^{11}_D 0.7637, n^{13}_D 1.4270; $\text{Me}_2\text{CH}(\text{CH}_2)_3\text{CHMeBu}$, b.₇₃₃ $193-6^\circ$, d^{10}_D 0.7642, n^{19}_D 1.42821; $\text{Me}_2\text{CH}(\text{CH}_2)_4\text{CHMePr}$, b.₇₄₅ $173-6^\circ$, d^{11}_D 0.7506, n^{11}_D 1.4214; $\text{Me}_2\text{CH}(\text{CH}_2)_3\text{CHMe}(\text{CH}_2)_2\text{CHMe}_2$, b.₇₄₅ $206-8^\circ$, d^{11}_D 0.7756, n^{11}_D 1.43362; $\text{Me}_2\text{CH}(\text{CH}_2)_4\text{CMe}_2\text{OAc}$, b.₇₄ $98-100^\circ$, d^{12}_D 0.861, n^{12}_D 1.42971. Poisoning of the catalyst may be occasioned by selective adsorption of reaction products, particularly in the reduction of nitriles. Reactivation may be effected by extrn. with Et_2O and combustion of the remaining traces in a current of O at 300° . Under reduced pressure, the activity of the catalyst is decreased and the removal of the reduction products is facilitated, thus favoring selective hydrogenation.

ALBERT L. HENNE

Catalytic hydrogenation under reduced pressure. II. Selective reduction in vacuo of citral, geraniol and limonene. Faculty of Sciences of Lyon. *Bull. soc. chim.* 43, 1204–14; cf. preceding abstr.—Reduction of citral with H_2 using Ni as a catalyst at 190° , gave citronellal, which was identified by its semicarbazone. Using an oxide of Pt as a catalyst and reducing geraniol with H_2 at 130° under a pressure of 50 mm. gave citronellol, identified by its allophanate. Reducing the double bond in the side chain of limonene gave carvomenthene but when the reduction was under diminished pressure only about 10% of the limonene was affected. This is explained by the presence either of an isomer or an impurity, which is easily hydrogenated. Limonene seems to contain about 80% limonene, 12% terpinolene and 8% perhaps of α -terpinene formed from the partial isomerization of terpinolene.

R. C. ROBERTS

Preparation of certain octadecanoic acids and their bactericidal action toward B. leprae. XV. W. M. STANLEY, MARIAN S. JAY AND ROGER ADAMS. Univ. of Illinois, *J. Am. Chem. Soc.* 51, 1261 6 (1929), cf. C. A. 22, 3144.—By using the usual procedure the following di-Et dialkylmalonates were prepd.: *methylpentadecyl*, b. $179-83^\circ$, n^{25}_D 1.4453, d^{25}_4 0.9119 (n and d will follow the b. p. for the following compds.); *methyltridecyl*, b. $167-70^\circ$, 1.4418, 0.9181; *ethyltridecyl*, b. $172-7^\circ$, 1.4461, 0.9163; *propyl-dodecyl*, b. $181-3^\circ$, 1.4423, 0.9249; *propyltridecyl*, b. $183-7^\circ$, 1.4475, 0.9048; *propylundecyl*, b. $178-9^\circ$, 1.4422, 0.9186; *butyldodecyl*, b. $175-80^\circ$, 1.4473, 0.9104; *butyldecyl*, b. $181-3^\circ$, 1.4424, 0.9229; *amylundecyl*, b. $180-5^\circ$, 1.4509, 0.9124; *amylnonyl*, b. $185-6^\circ$, 1.4462, 0.9282; *hexyldodecyl*, b. $185-8^\circ$, 1.4476, 0.9118; *hexyloctyl*, b. $175-8^\circ$, 1.4458, 0.9168; *heptylnonyl*, b. $193-7^\circ$, 1.4471, 0.9118; *diheptyl*, b. $178-80^\circ$, 1.4459, 0.9169; *dioctyl*, b. $192-5^\circ$, 1.4471, 0.9135; *isopropyltridecyl*, b. $179-83^\circ$, 1.4491, 0.9144; *isobutyldodecyl*, b. $180-5^\circ$, 1.4481, 0.9115; *isobutyldecyl*, b. $160-2^\circ$, 1.4428, 0.9207; *sec-butyldodecyl*, b. $180-4^\circ$, 1.4501, 0.9163; *sec-butyldecyl*, b. $196-8^\circ$, 1.4454, 0.9523; *sec-amylundecyl*, b. $175-8^\circ$, 1.4509, 0.9155. The following disubstituted AcOH (octadecanoic acids) were prepd.: $\text{Me}(\text{C}_{17}\text{H}_{33})\text{CHCO}_2\text{H}$, b. $179-83^\circ$, m. $34-5^\circ$; *ethyltridecyl*, b. $167-70^\circ$, m. $23-4^\circ$, n^{25}_D 1.4431, d^{25}_4 0.8767; *propyltridecyl*, b. $179-83^\circ$, m. $31-2^\circ$; *butyldodecyl*, b. $180-4^\circ$, m. $23-4^\circ$, n^{25}_D 1.4528, d^{25}_4 0.8747; *amylundecyl*, b. $180-5^\circ$, n^{25}_D 1.4519, d^{25}_4 0.8820; *hexyldodecyl*, b. $182-4^\circ$, n^{25}_D 1.4527, d^{25}_4 0.8741; *heptylnonyl*, b. $180-3^\circ$, n^{25}_D 1.4528, d^{25}_4 0.8747; *dioctyl*, b. $183-5^\circ$, m. $35-3^\circ$; *isopropyltridecyl*, b. $178-82^\circ$, m. $58-9^\circ$; *sec-butyldodecyl*, b. $178-83^\circ$, m. $38-9^\circ$; *sec-amylundecyl*, b. $175-8^\circ$, m. $37-8^\circ$; *hexadecanoic acids* were prepd. as follows: (substituents of AcOH are given) $\text{Me}(\text{C}_{17}\text{H}_{33})\text{CHCO}_2\text{H}$, b. $173-3^\circ$, m. 24° , n^{25}_D 1.4453, d^{25}_4 0.8765 (m. p., n and d will follow b. p. for acids listed below); *ethylundecyl*, b. $178-9^\circ$, 24° , 1.4460, 0.8808; *propyl-*

undecyl, b_p 178-9°, 16.5-7°, 1.4460, 0.8808; *butyldecyl*, b_p 175-6°, 13-4°, 1.4458, 0.8789; *amylnonyl*, b_p 178-9°, 9-10°, 1.4518, 0.8887; *hexyloctyl*, b_p 165-8°, —, 1.4495, 0.8768; *diheptyl*, b_p 187-9°, 26-7°, 1.4497, 0.8771; *iso-butyldecyl*, b_p 187-8°, 17.5-8°, 1.4448, 0.8763; *sec-butyldecyl*, b_p 185-6°, 38-9°, —, —. Bacteriol. tests with these acids indicate that no ring in the mol. is necessary for bactericidal action. The hexadecanoic acids were in practically every instance more bactericidal than the octadecanoic acid homologs. There is a marked difference, in both series, between the acid with the CO_2H at the end of the chain and acids with the CO_2H in any other position. The effect can hardly be attributed to a chem. specificity of the individual acids but must, probably, be due to a combination of phys. properties common to many of these acids. The mechanism of the bactericidal effect may be looked upon as an adsorption or soln. of the acid in the waxy coating of the bacteria, with a consequent smothering or suffocation of the organism. Comparative tests for a few of the acids toward *B. tuberculosis* and *B. leprae* are reported. A table of bactericidal values of a few acids toward 8 different strains of *B. leprae* is also given. C. J. WEST

Products of partial hydrogenation of higher monoethylenic esters. T. O. HILDITCH AND N. L. VIDYARTHI. London Univ. *Proc. Roy. Soc. (London)* A122, 552-63(1929), cf. Armstrong and Hilditch, *C. A.* 14, 884; 19, 1851.—Me oleate was partially hydrogenated in the presence of Ni on kieselguhr at 217-20°. KMnO_4 oxidation of the ester showed Me stearate produced by hydrogenation and free acids. The latter contained caproic, nonoic, capric and caprylic as monobasic acids and suberic, azelaic, sebacic and dodecanedicarboxylic acids. The evidence indicated that the isomeric acids contained mixts. of $\Delta^{8,9}$ - and $\Delta^{10,11}$ -octadecenic acids in *cis*- and *trans*-forms. Me oleate hydrogenated at 114-18° and oxidized gave similar results. Me palmitate hydrogenated at 170-80° and Me erucate at 200° gave corresponding results. With these 3 esters the product of hydrogenation and oxidation is a mixt. of acids with the ethylenic linkage adjacent to the position it occupied in the original compd. These acids together with the original acid are almost certainly present in both *cis*- and *trans*-forms. This is in harmony with earlier work. **Products of partial hydrogenation of some higher polyethylenic esters.** *Ibid* 563-70; cf. Armstrong and Hilditch, *C. A.* 14, 142; 19, 3054; Hilditch and Moore, *C. A.* 17, 1158.—Me linoleate from soybean oil was hydrogenated at 100-5° to approx. the monoethylenic stage and oxidized. The main component was $\Delta^{9,10}$, with some $\Delta^{8,9}$, and probably some $\Delta^{10,11}$, and a notable amount of $\Delta^{12,13}$, with some $\Delta^{11,12}$ -octadecenic acids. About 2 equivs. of H_2 to 1 of $\Delta^{12,13}$ -acid were present. Similar treatment of Me linoleate and oleate from cottonseed oil showed that the latter was not affected in such a mixt. and in general confirmed the above results. Et linolenate from linseed oil similarly showed $\Delta^{9,10}$ and $\Delta^{12,13}$ -acids. A 3rd isomeride is present in an amount to indicate only that a CO_2H acid contg. 14 or more C atoms was present. Differing from the previous 2 expts. the monobasic acids include members lower than hexoic acid. Hydrogenation of Et linoleate to the diethylenic stage and oxidation shows an acid of mol. wt. lower than 82. It is difficult to state definitely that the remaining unsatn. is at the $\Delta^{11,12}$ position. In these more unsatd. acids hydrogenation of different positions proceeds at different rates, greater the further from the CO_2H group. Isomerization occurs to a lesser degree than with monoethylenic esters. FOSTER DEE SMITH

Esters of α,β -dibromopropionic acid. V. DRULOFEU *Anales. soc. quim. Arg.* 16, 49-52(1928); cf. *C. A.* 22, 3881; 23, 596, 1109, 1110.—Me, Pr and iso-Pr α,β -bromopropionates were prepd. by heating the acid with the appropriate alcohol and H_2SO_4 . The *iso*-Pr ester b_p 212-5°. B. C. A.

Synthesis of the diastereoisometric trisubstituted α -glycols. J. PASCAL *Rev. soc. españ. fis. quim.* 26, 210-21(1928).—Polemical against Tiffeneau and Levy (1914, 18, 2507). B. C. A.

Some derivatives of the aliphatic glycols. GEORGE MACDONALD BENNETT AND FREDERICK HEATHCOAT. Univ. of Sheffield. *J. Chem. Soc.* 1929, 208-74.—The following compds. were prepd. as intermediates in the prepn. of chlorosulfoxides. $\text{HOCH}_2\text{CH}_2\text{OMe}$ (57 g.) in 109 g. PhNMe_2 , treated with 98 g. SOCl_2 , gives 28 g. of $\text{C}_6\text{H}_5\text{CH}_2\text{CH}_2\text{OMe}$, b_p 90.5°, d_4^{20} 1.036, d_4^{25} 1.031; soly. in H_2O 8% by wt. at room temp. From expts. (*C. A.* 19, 2186) on the prepn. of $\text{BrCH}_2\text{CH}_2\text{OR}$ could not be repeated. γ -Chloropropyl 3,5-dinitrobenzoate, m. 77°. PrSH , $\text{ClCH}_2\text{CH}_2\text{CH}_2\text{OAc}$ and NaOH in dil. EtOH, heated 1 hr., give 54% of γ -hydroxydipropyl sulfide, b_p 112°, d_4^{25} 0.9794, n_D^{20} 1.44789; phenylurethan, m. 36°; $\text{BuSC}_2\text{H}_4\text{OH}$ yields a phenylurethan, m. 44.5°. $\text{HO}(\text{CH}_2)_4\text{OH}$, b_p 127°, gives a bis- α -naphthylurethan, m. 198°; with S_2Cl_2 this yields *t*-chlorobutyl alc., b_p 86°, whose α -naphthylurethan, m. 66°. *t*-Chlorobutyl

acetate, b_{17} 87°, b_{21} 98°, results in 88% yield from $\text{HO}(\text{CH}_2)_4\text{OH}$ and AcCl , or from the glycol, S_2Cl_2 and then treating with AcCl ; d_4^{20} (vac.) 1.1024, d_4^{20} (vac.) 1.0803, n_D^{20} 1.43811, 1.44369, 1.45130 for α , β and γ . This condenses with EtSH to give 71% of *Et* δ -hydroxybutyl sulfide (after boiling with dil. EtOH-KOH), b_{19} 120°, d_4^{20} (vac.) 0.9794, n_D^{20} 1.48118 (*phenylurethan*, m. 37°). *Ph* δ -hydroxybutyl sulfide, m. 24° (96% yield); *phenylurethan*, m. 68.5°. $\text{HO}(\text{CH}_2)_6\text{OH}$ yields a *bisphenylurethan*, m. 174°, and a *bis- α -naphthylurethan*, m. 147°. S_2Cl_2 gives *ϵ -chloroamyl alc.*, isolated as the α -*naphthylurethan*, m. 72°. *ϵ -Chloroamyl acetate*, b_{18} 103°, d_4^{20} (vac.) 1.0648, n_D^{20} 1.0648. *Me* ϵ -hydroxyamyl sulfide, b_{18} 121°, d_4^{20} (vac.) 0.9846, n_D^{20} 1.488185 (56% yield); *phenylurethan*, m. 43.5°. *Ph* ϵ -hydroxyamyl sulfide, m. 31.5°; *phenylurethan*, m. 59°.

C. J. WEST

Conversion of tetramethyl- γ - and δ -gluconolactones into the corresponding mannonolactones and of the trimethyl- γ - and δ -xylonolactones into the corresponding lyxonolactones. WALTER N. HAWORTH AND CHARLES WM. LONG. Univ. of Birmingham. *J. Chem. Soc.* 1929, 345-50.—The method used to effect the epimerization of the methylated lactones was to dissolve 2 parts by wt. of the lactone in 1 part of $\text{C}_6\text{H}_5\text{N}$ and 14 parts of H_2O and heat in a closed flask on a boiling H_2O bath during 100-20 hrs., clarify with charcoal, dil. with H_2O and remove the H_2O and $\text{C}_6\text{H}_5\text{N}$ by distn. *in vacuo*, which causes hydrolysis of the $\text{C}_6\text{H}_5\text{N}$ salt. In this way 2,3,5,6-tetramethyl- γ -gluconolactone was converted into the corresponding γ -mannonolactone (60% yield); the reverse change was effected in the same manner; 2,3,4,6-tetramethyl- δ -mannonolactone was converted to the extent of 8% into the corresponding δ -gluconolactone, while the reverse change was 90% complete. 2,3,4-Trimethyl- δ -xylonolactone gives 63% of furancarboxylic acid; the residual sirup gave the *phenylhydrazide* of 2,3,4-trimethyl-lyxonic acid, m. 180.1°. The *phenylhydrazide* of the 2,3,4-trimethyl- δ -xylonic acid, m. 137-8.5°. 2,3,5-Trimethyl- γ -xylonolactone gives 60% of the corresponding γ -lyxonolactone; the *phenylhydrazide*, m. 142°.

C. J. WEST

Synthesis of *l*-2,3,4,6-tetramethyl- δ -gluconolactone and of *l*-2,3,4,6-tetramethyl- δ -mannonolactone from *l*-2,3,5-trimethylarabofuranose. WALTER N. HAWORTH AND STANLEY PEAT. Univ. of Birmingham. *J. Chem. Soc.* 1929, 350-7.—2,3,4-Trimethylarabinose (7.6 g.) condenses with KCN and ClCO_2Me , when cooled and shaken, to give a mixt. of a solid product, $\text{C}_{11}\text{H}_{17}\text{O}_5\text{N}$, m. 100-2°, probably the mannononitrile, and a liquid product, probably a mixt. of the glucono- and mannononitriles. The latter is not very stable. 2,3,5-Trimethyl γ -arabinose condenses with ice-cold KCN and ClCO_2Me to give 84% of a liquid mixt. of *l*-3,4,6-trimethyl 2-carbomethoxyglucono- and mannononitriles, which is somewhat unstable and was therefore hydrolyzed to the corresponding acids. In the 1st stage with HCl in Et_2O there was isolated *l*-2-carbomethoxy 3,4,6-trimethylmannonic acid, m. 155°, and a sirup; this was further hydrolyzed with $\text{N.3 Ba}(\text{OH})_2$ and the product sepd. by PhNHNH_2 ; the less sol. *phenylhydrazide*, m. 137-9°, is that of the mannono compd. Hydrolysis gives *l*-3,4,6-trimethyl- δ -mannonolactone, m. 90-7°, $[\alpha]_D^{20}$ -167° (H_2O , c 1.88), changing after 74 hrs. to 112.8° (const.). Reduction with Na-Hg was very slow. Ag_2O and MeI give *l*-2,3,4,6-tetramethyl δ -mannonolactone, low melting, $[\alpha]_D^{20}$ -150° (H_2O), changing to -58.2° after 150 hrs.; the *phenylhydrazide*, m. 183-4°, $[\alpha]_D^{20}$ 22° (CHCl_3 , c 1.37). From the more sol. *phenylhydrazide* of the original hydrolytic product there was obtained a lactone with $[\alpha]_D^{20}$ -90° (H_2O , c 1.6), changing to -27° in 30 hrs; methylation gave *l*-2,3,4,6-tetramethylgluconolactone, whose *phenylhydrazide* m. 115°. These values correspond with the *d*-enantiomorph.

C. J. WEST

Parachor and chemical constitution. X. Singlet linkages in chemical coordination compounds. SAMUEL SUGDEN. Univ. of London. *J. Chem. Soc.* 1929, 316-30; cf. *C. A.* 22, 2153.—The parachors of a no. of Ti , Be and Al derivs. of β -diketones have been detd. and found to exhibit precisely the negative anomalies predicted by S. Basic Be propionate and AlBr_3 are also found to contain singlet linkages in the mol. and structures for these compds. are suggested. An alternative hypothesis to account for these negative anomalies has been examd. and is shown to be incompatible with the available data for Hg and Th compds. The free β -diketones and certain derivs. are found to possess an open-chain structure and are not coordinated. The following atomic parachors have been detd.: Hg 69, Ti 64, Pb 76, Be 38, Al 39. The following data are reported: *Et* thallacetoneacetate, d_4^{20} 2.365, γ 30.94 at 94.5°, P 332.2. *Di-Me* Ti benzoylacetate, d and γ , 1.795, 1.783, 1.773, 1.763; 32.08, 31.1, 30.52, 29.85 at 133°, 142.5°, 149° and 157°, resp.; mean P 523.7. TiOEt , d and γ , 3.503, 3.475, 3.430; 38.7, 37.3, 36.2 at 16.5°, 28.5° and 44.5°, resp.; mean P 177.3. TiHCO_2d .

and γ , 4.952, 4.927, 4.912; 81.3, 78.8, 75.3 at 109°, 118° and 124°, resp.; mean P 150.3. $\text{TiCl}_3\text{H}_2\text{O}_2$, d and γ , 3.763, 3.729, 3.705, 3.682; 45.4, 45.0, 44.9, 44.5 at 139°, 150°, 173° and 204°, resp.; mean P 183.5. TiNO_2 , d and γ , 4.897, 4.877, 4.862, 4.843; 112.3, 111.7, 110.4, 109.6 at 211°, 223°, 231.5° and 243°, resp.; mean P 177.3. HgPh_2 , d and γ , 1.940, 1.916, 1.897, 1.879; 35.97, 34.63, 33.42, 32.75 at 129°, 144°, 156° and 168.5°, resp.; mean P 448.7. PbEt_2 , d and γ , 1.640, 1.620, 1.600, 1.586; 28.48, 27.40, 26.39, 25.10 at 20°, 32.5°, 45° and 53.5°, resp.; mean P 456.6. $\text{Be acetylacetonate}$, d and γ , 1.010, 1.001, 0.980, 0.974, 0.964; 27.6, 26.6, 25.3, 24.6, 23.8, 22.9, at 119°, 129°, 142°, 151°, 168° and 169°, resp.; mean P 470.4. $\text{Be propionylacetonate}$, d and γ , 1.038, 1.026, 1.015, 1.007; 31.78, 30.60, 29.20, 28.35 at 60°, 71.5°, 84° and 93°, resp.; mean P 539.0. $\text{Basic Be propionate}$, $\text{Be}_2\text{O}(\text{C}_2\text{H}_3\text{O}_2)_4$, d and γ , 1.054, 1.047, 1.034, 1.022, 1.008; 20.30, 19.59, 18.64, 17.61, 16.62 at 144°, 150°, 162°, 173° and 186°, resp.; mean P 985.4. $\text{Al acetylacetonate}$, d and γ , 0.980, 0.979, 0.971, 0.962, 0.949, 0.915; 18.20, 17.81, 17.28, 16.85, 15.72, 13.21 at 214°, 216°, 223°, 232°, 245.5° and 278.5°, resp.; mean P 680.5. $\text{Al propionylacetonate}$, pale yellow, m , 49°; d and γ , 1.080, 1.074, 1.065, 1.049, 1.036; 29.3, 28.4, 27.6, 25.6, 24.4, at 59°, 65°, 75°, 92° and 105°, resp.; mean P 788.0. Al_2Br_3 , d and γ , 2.632, 2.591, 2.569, 2.531, 2.515; 25.5, 21.2, 23.5, 22.5, 21.7 at 102°, 120°, 130°, 147° and 154°, resp.; mean P 457.6. Acetylacetone , d and γ , 0.973, 0.944, 0.917, 0.902; 32.13, 28.50, 25.70, 24.14 at 11°, 39.6°, 66° and 81°, resp.; mean P 245.4. Propionylacetone , d and γ , 0.959, 0.949, 0.937, 0.930; 30.38, 29.24, 28.10, 27.22 at 18.5°, 29.5°, 41° and 50°, resp.; mean P 279. Benzoylacetone , d and γ , 1.062, 1.054, 1.045, 1.036; 39.1, 38.3, 37.1, 35.8 at 60°, 78.5°, 89° and 100°, resp.; mean P 382.4. $\text{B acetylacetone difluoride}$, d and γ , 1.212, 1.197, 1.177, 1.160; 36.18, 34.55, 32.89, 31.29, at 60°, 74°, 92.5° and 109°, resp.; mean P 300.6. $\text{Sn bisacetylacetone dichloride}$, d and γ , 1.450, 1.444, 1.434; 28.40, 27.88, 27.12 at 208°, 213° and 221°, resp.; mean P 617.2. The following formulas for d are given: $\text{Di-Me Ti benzoylacetone}$, $1.975 - 0.00135d$; TiOEt , $3.543 - 0.00211d$; TiHCO_2 , $4.977 - 0.0028(d - 100)$; $\text{TiCl}_3\text{H}_2\text{O}_2$, $3.990 - 0.00170d$; TiNO_2 , $4.923 - 0.00195d$; HgPh_2 , $2.143 - 0.00158d$; PbEt_2 , $1.673 - 0.00163d$; $\text{Be acetylacetonate}$, $1.119 - 0.00092d$; $\text{Be propionyl acetate}$, $1.008 - 0.00064d$; $\text{basic Be propionate}$, $1.209 - 0.00108d$; $\text{Al acetylacetonate}$, $0.994 - 0.00100(d - 200)$; $\text{Al propionylacetone}$, $1.137 - 0.00096d$; AlBr_3 , $2.861 - 0.00225d$; AcCH_2Ac , $0.984 - 0.00101d$; EtCOCH_2Ac , $0.976 - 0.00093d$; BzCH_2Ac , $1.120 - 0.00080d$; $\text{B acetylacetone difluoride}$, $1.215 - 0.00105d$; $\text{Sn bisacetylacetone dichloride}$, $1.400 - 0.00122(d - 200)$. C. J. WEST.

Mechanism of the cleavage of diethyl α,α' -dibromosuccinate by secondary amines. A new synthesis of cyclobutane derivatives. RYKOLD C. FUSON AND TSI-YU KAO, Univ. of Illinois. *J. Am. Chem. Soc.* 51, 1536-9(1929).—*meso* $(\text{CH}_2\text{CHBr})_2$, refluxed with an excess of NaCN or KCN in abs. EtOH , gives 50-80% of *trans*-cyanocyclobutane-1,2-dicarboxylic acid, b , 152-4°, d_{20}^{25} 1.1103, n_D^{20} 1.4510. Hydrolysis by hot concd. $\text{Ba}(\text{OH})_2$ gives 85-95% of the Ba salt of cyclobutane-1,1,2,2-tetracarboxylic acid; with concd. H_2SO_4 this loses CO_2 to yield a mixt. of the *trans* and *cis* cyclobutane-1,2-dicarboxylic acids, which, treated with concd. HCl , gives the pure *trans* acid. This synthesis is interpreted as evidence in favor of the cyclobutane mechanism proposed for the cleavage of di-Et α,α' -dibromosuccinate by sec. amines. C. J. WEST.

Effect of heat on malic acid. FRANK W. MOUSE, Mass. Agr. Expt. Sta. *Bull. Div. Chem. Soc.* 51, 1276-9(1929).—Malic acid is partly transformed to an anhydride when dried between 75° and 95°, the amt. of change being dependent on both temp. and time of exposure. Solns. of partially dehydrated acid, when neutralized by alkali and then boiled for several hrs., are partially and sometimes completely restored to normal strength. When malic acid occurs in fruits the *detn.* of total acid will be nearer the truth when it is made on undried samples. C. J. WEST.

Dihydroxytartaric acid and its use in the detection and determination of sodium. A. P. OKATOV, University Leningrad. *J. Russ. Phys. Chem. Soc.* 60, 661-8 (1928). The acid was prepd. according to Fenton (*J. Chem. Soc.* 67, 48(1895)) from Et. and dihydroxymaleic acid in glacial AcOH . O. increased the yield to above 90% by adding to the AcOH filtrate sufficient water to decomp. the dihydroxymaleic acid. The soly. of the Na salt was detd. by titrating the solns. with KMnO_4 . At 0° there was 1 part by wt. of the salt in 3123 parts of water, at 10° in 1886 parts. At 0° an opalescence is produced in 5 mins. after the addn. of K dihydroxytartrate to 0.025 N NaCl , while 2 N MgCl_2 shows no change. The K salt cannot be preserved for longer than 2 days in aq. soln. The quant. *detns.* were made by filtering off the Na dihydroxytartrate, dissolving it in an excess of 2 N H_2SO_4 , and titrating with KMnO_4 . The precision averaged about 10 parts per thousand. B. SOYENKOFF.

Condensation products of urea and formaldehyde of high molecular weight. H. SCHREIBLER, F. TROSTLER AND E. SCHOLZ. *Z. angew. Chem.* 41, 1305-9(1928).—Urea and freshly distd. neutral HCHO give hydroxymethylcarbamide, (I), m. 110°. I and AcOH give insol. $(\text{NH}_2\text{CON}:\text{CH}_2)_{12}\cdot\text{H}_2\text{O}$, and sol. $(\text{NH}_2\text{CON}:\text{CH}_2)_{12}\cdot\text{AcOH}$. Treating I with AcOH, then Br, gives $(\text{NH}_2\text{CON}:\text{CH}_2)_3\cdot\text{Br}_2$, which is also obtained from the above high mol. compds. by a Br treatment. The AcOH-Br treatment converts dihydroxymethylcarbamide, m. 133°, into $(\text{HOCH}_2\text{NHCON}:\text{CH}_2)_3\cdot\text{Br}_2$ (II). A prolonged action transforms II into $[\text{CO}(\text{N}:\text{CH}_2)_2]_3\cdot\text{Br}_2$ (III). HCHO and urea condensed in the presence of a small amount of NH_4OH give hydroxymethylmethylenecarbamide, $(\text{HOCH}_2\text{NHCON}:\text{CH}_2)_3\cdot\text{H}_2\text{O}$, which is converted into II by the Br treatment. The product obtained from technical HCHO and urea is hydrolyzed by 20% OH gives HCHO and urea.

Ac_2O , sol. in CHCl_3 , and converted into III by Br. Dimethylurea and HCHO give hydroxymethyl derivs., but no condensation products, showing that the methylenecarbamide radicals are represented correctly by $(\text{NH}_2\text{CON}:\text{CH}_2)_n$. A. L. H.

Hypoglucemia-producing substances. I. **Synthesis of certain guanidine derivatives.** TAIZO KUMAGAI, SIN-ITI KAWAI, YOSHIO SHIKINAMI AND TATSUO HOSONO. *Sci. Papers Inst. Phys. Chem. Res. (Tokyo)* 9, 271-5(1928).—The authors had, previous to the publication of a paper by Frank in which he showed synthalin to be decamethylenediguanidine, synthesized hexamethylenediguanidine and had found it to be almost as effective as synthalin. Following the publication of F.'s paper the authors synthesized the octa- and decamethylenediguanidine compds.; they find the octa-deriv. is the most active. Complete details of the methods of synthesis are given.

G. H. W. LUCAS

Degradation of l-arabinose. VENANCIO DEULOFEU AND RAÚL J. SELVA. Facultad de ciencias exactas, F. y N., Buenos Aires. *J. Chem. Soc.* 1929, 225-7.—The action of MeONa on tetraacetylarononitrile in CHCl_3 or of $\text{Ba}(\text{OH})_2$ on arabononitrile gives 40 and 13%, resp., of erythrose (based on the reducing power), though the amt. actually isolated was very small.

C. J. WEST

Arabinosan. HANS VOGEL. *Helv. Chim. Acta* 11, 1210-13(1928).—Since ordinary arabinose shows decreasing values on mutarotation it is probably the α -form. Three anhydrides (1,2; 1,3; 1,4) are possible. By heating for 2 hrs. at 15 mm. at 160°, just above the m. p., a colorless product results, without loss of H_2O . This shows increasing values on mutarotation, and is the β -form. Continuing the treatment eliminates 11% of the material as H_2O , and produces an arabinosan, $\text{C}_5\text{H}_8\text{O}_4$, $[\alpha]_D^{20}$ 60.5°, m. 80-1°. This is sol. in alc. from which it is pptd. by Et_2O as a white powder. It does not exhibit mutarotation, is hygroscopic, and tastes slightly sweet. It is very sol. in H_2O , sol. in MeOH, HOAc, pyridine, Me_2CO , somewhat sol. in abs. EtOH, insol. in CHCl_3 and in Et_2O , reduces hot Fehling soln. and cold KMnO_4 as rapidly as does α -glucosan. Boiling H_2O regenerates arabinose, $[\alpha]_D^{20}$ 102.2°. Heating α -arabinose produces the β -form which, losing H_2O , gives β -arabinosan. The similarities to α -glucosan indicate here an ethylene oxide system at 1,2. This indicates a close proximity of OH groups on C atoms 1 and 2 in the α -form, in glucose this proximity of groups is found in the β -form. V. suggests that α be used henceforth to designate that form of a sugar showing diminishing values during mutarotation, and that β be used for that form giving, by similar treatment, increasing values. The β -arabinosan, heated with ZnCl_2 at 15 mm. and 150° for 1.5 hrs. gave diarabinosan $(\text{C}_5\text{H}_8\text{O}_4)_2$, $[\alpha]_D^{20}$ 18.9°, m. 153-5°, sol. in H_2O , pptd. by abs. EtOH as a pale yellow amorphous powder. It is very hygroscopic. It is insol. in Et_2O and does not reduce boiling Fehling soln. and it reduces KMnO_4 only slowly.

G. ALBERT HILL

The acetylation of carbohydrates with acetic anhydride and alkali thiocyanates. YOJIRO TSUZUKI. Tokyo Univ. *Bull. Chem. Soc. Japan* 4, 21-3(1929).—NaSCN or KSCN are used instead of NaOAc in the acetylation of starch, glucose and galactose with Ac_2O . The yields are unchanged. Less thiocyanate than acetate is required; also, it is superfluous to dehydrate the salt. The thiocyanates afford an excellent dispersion medium.

ALBERT L. HENNE

Preparation of α - and β -methyl glucosides. THOMAS S. PATTERSON AND JOHN ROBERTSON. Univ. of Glasgow. *J. Chem. Soc.* 1929, 300-2.—Pure anhyd. glucose (200 g.) in 400 g. MeOH (dried over CaO) contg. 3% HCl was boiled 4.5 hrs., 5 g. animal charcoal added and the reaction product filtered and cooled, after 0.75 hr. 82 g. α -Me glucoside, m. 163°. After distg. off 200 cc. MeOH an additional 44 g. crystd. (61.5% , recrystn. gives 93 g. pure I, m. 165-6°. From the mother

liquors 10.2 g. β -Me glucoside is obtained (4.8 g. pure compd., m. 110°). The best practical procedure is to boil overnight.

C. J. WEST

Methylene blue reduction by a mixture of fructose and amino acids. HANS VON EULER AND HUGO JOHANSSON. *Svensk Kem. Tids.* 40, 263(1928). (In German.)—Fructose and amino acids combine to form a substance which reduces methylene blue in alk. solns. and, like glucose-amino acids (C. A. 22, 4551), reduces a given amt. in shorter time as the alky. increases.

A. R. ROSE

Condensation of glucose and fructose. Synthesis of an isosucrose. JAMES C. IRVINE, JOHN W. H. OLDHAM AND ANDREW F. SKINNER. Univ. of St. Andrews. *J. Am. Chem. Soc.* 51, 1279-93(1929); cf. C. A. 22, 2552.—Fructose (65 g.) in 2285 cc. hot abs. EtOH, after cooling, is treated with 250 cc. EtOH contg. 26 g. HCl; the reaction reaches a max. value of $[\alpha]_D^{17}$ in about 10 mins., when it was arrested by adding EtOH to which had been added 18 g. Na; the γ -Et fructoside is isolated as a sirup and should be at once acetylated with Ac_2O and AcONa , giving 33-47 g. *tetraacetyl- γ -ethylfructose* (I), whose $[\alpha]_D$ varied from 39.0 to 47.9° (CHCl_3 , c 5) (because of varying mixts. of α - and β -forms), n_D 1.4528 to 1.4542. The tetra-Ac deriv. in AcCl (10% soln.) is satd. with HCl and allowed to stand at room temp. for 18 hrs., the solvent removed at 45° and the residue in C_6H_6 treated with Ag_2O , giving *tetraacetyl- γ fructose* (II), $[\alpha]_D$ 31.5° (CHCl_3 , c 1.808), 38.7° (C_6H_6 , c 5.379), n_D 1.4645. The same deriv. was obtained from inulin, through the tri-Ac deriv., together with some *triacetyl-anhydrofructose*, which will be described later. The relation of II to γ -fructose was established by methylation. *Tetraacetylchloro- γ -fructose* (III) may be obtained by the action of AcCl on I but is more conveniently prepd. from II; it is unstable and cannot be obtained pure. In attempts to synthesize sucrose from these reagents the following reactions were carried out: condensation of II with tetraacetylbromoglucose in the presence of a base (in this no condensation of the glucose and fructose residues took place); condensation of II with tetraacetylglucose (IV) in the presence of a base or of II and IV in the presence of a dehydrating agent. In each case the only crust product isolated was an *isosucrose octaacetate*, m. 131-2°, $[\alpha]_D$ 19.9° (CHCl_3 , c 3.762), 20.0° (Me_2CO , c 4.072); - 2.0° (C_6H_6 , c 3.918). No sucrose octaacetate was detected, although evidence was obtained that acetylated gluco-fructoses other than isosucrose octaacetate and also diglucoses were formed. The mixed products obtained in this condensation gave a sp. rotation identical with that of sucrose and are converted quantitatively into "invert sugar." This result is, however, fortuitous. *Isosucrose* has been isolated as needles, decomp. 104°, $[\alpha]_D$ 50.0° (MeOH , c 2.130), 34.2° (H_2O , c 5.254), both without mutarotation. Heated at 100° with 0.001 N HCl, inversion takes place, the const. value -19.2° being attained in 90 mins. (195 mins. for sucrose). The collective results lead to the conclusion that sucrose is β -glucosido- α (γ) fructose and that the isosucrose is β -glucosido- β (γ) fructose.

C. J. WEST

Crystalline turanose. C. S. HUDSON AND EUGEN PACSU. *Science* 69, No. 1784, 278 (1929).—Turanose, a disaccharide obtained by weak acid by hydrolysis of identical crystals, with difficulty. Crystals which formed in one sirup after years' standing have been used to seed other sirups freshly made and rapid crystal growth followed. Aq. solns. showed rapid mutarotation; at 20° in a soln. 3 mins. after prepn the rotation was $[\alpha]_D^{20}$ 43.5° and became const. within 20 mins. at 75.6°. It m. 157°. It is a β -form of sugar.

G. H. W. LEE

Progress in the utilization of saccharin by-products in 1927. WALTHER HILZOG. *Metallber.* 18, 903, 1015-6, 1126-7, 1183-4, 1248-9(1928).

E. H.

Carbohydrates. VII. Starch acetate. PERCY BRIGL AND RICHARD SCHNEIDER. *Landwirtschaftl. Hochschule Hohenheim. Ber.* 62B, 99-103(1929); cf. C. A. 23, 1625.—This preliminary report of a study which was undertaken on account of certain divergences between earlier results and those of Peiser (C. A. 21, 2881) is published now because Friese and Smith describe a starch acetate, prepd. by a very mild method (C. A. 23, 302), which differs considerably from B. and S.'s product.* To obtain an acetate of unchanged starch it is essential to use a mild acetylation method such as $\text{Ac}_2\text{O}-\text{C}_6\text{H}_5\text{N}$, whereas P. used $\text{Ac}_2\text{O}-\text{H}_2\text{SO}_4$. To be sure, she had first subjected the starch to swelling with H_2O , which greatly facilitates the attack of the acetylating mixt., but she overlooked the fact, established by B. and S., that such a pre-swollen starch is readily converted by $\text{Ac}_2\text{O}-\text{C}_6\text{H}_5\text{N}$ into a triacetate showing no trace of reduction and easily converted back into starch. Some change in the starch must, no doubt, have occurred, as the regenerated product is better sol. in cold H_2O , but the change is not material as the starch still gives the blue color with I and shows normal cleavage by diastase. P. and S.'s method is even milder; they swell the starch by shaking in $\text{C}_6\text{H}_5\text{N}$ and H_2O . I then acetylate it with $\text{Ac}_2\text{O}-\text{C}_6\text{H}_5\text{N}$ without removing

the swelling agent. They say, however, that their triacetate is practically insol. in org. solvents while B. and S.'s material dissolves well in CHCl_3 and AcOH , and a repetition of F. and S.'s work gave a product showing the same solubilities as the B. and S. compd., B. and S. cannot explain the contrary findings of F. and S. In attempts to det. its mol. wt. in boiling CHCl_3 or by Rast's method the triacetate behaved like a typical colloid and not a trace of it dialyzed in AcOH through a parchment paper which readily let through not only glucose acetate but even maltose acetate. Its mol. wt. must therefore be considerably greater than that of a disaccharide. C. A. R.

Electrolytic reduction of the imides of cyclic acids. Preliminary note. KORRI-AZATH N. MENON AND JOHN I. SIMONSEN. Indian Inst. of Sci., Bangalore. *J. Chem. Soc.* 1929, 302-5.—*Caronimide*, m. 120° , from the anhydride and dry NH_3 at 180° , on electrolytic reduction in H_2SO_4 gives 5% of 4,4-dimethyl-2-piperidone, thick oil; Bz deriv., m. 114° . *Cyclobutane-1,2-dicarboximide*, m. 121° , on electrolytic reduction gives 15% of the γ -lactam of 2-aminomethylcyclobutane-1-carboxylic acid, m. $127-8^\circ$; the NO deriv. is liquid. *Cyclopentane-1,2-dicarboximide*, m. 90° , gives 25% of the γ -lactam of 2-aminomethylcyclopentane-1-carboxylic acid, m. 83° ; *p*-nitrobenzoyl deriv., m. 123° . The lactams cannot be hydrolyzed with $\text{Ba}(\text{OH})_2$; the liquid NO derivs. with dil. alkali evolve N and give Na salts of the corresponding HO-acids.

Double salts of aniline hydrohalides with metal halides. GORDON D. BYRKIT AND WM. M. DEHN. Univ. of Washington. *J. Am. Chem. Soc.* 51, 1167-71 (1929).— PhNH_2 (I) exhibits a wide capacity to form compds. in combination with halogen and different metals; 17 types, including hydrated forms, are recognized. No correlation with properties can be made of all these compds. on the basis of modern theories. The octa-I compd. of Hg is easily prepd. and is of special interest. The known compds. are listed with literature references. The following new compds. are reported: 8(I.HCl). HgCl_2 , m. 231.5° ; 3(I.HCl) 2HgCl_2 , m. 167° ; I.HBr 2HgBr_2 , m. 150° ; I.HI.HgI $_2$, yellow, m. 61° ; 2(I.HCl) CoCl_2 , blue, m. 135° ; 2(I.HCl) AuCl_3 , golden, m. 95° ; I.HCl BiCl_3 , softens 210° (decompn.); I.HCl MnCl_2 ; 2(I.HCl) $\text{MnCl}_2 \cdot 2\text{H}_2\text{O}$, m. above 230° ; 3(I.HCl) AlCl_3 ; 3(I.HCl) SnCl_4 ; 3(I.HBr) AsBr_3 ; I.HgBr $_2$, m. 127° ; I.PbCl $_2$. C. J. WEST

Identification of amines. IV. Methanesulfonamides. C. S. MARVEL, M. D. HELFRICK AND J. P. BELSLEY. Univ. of Illinois. *J. Am. Chem. Soc.* 51, 1272-4 (1929); cf. C. A. 21, 99.—*Methanesulfonamides* are suitable derivs. for many amines and are more readily hydrolyzed than most sulfonamides; the following were prepd. by treating a C_6H_5 soln. of 2 mol. proportions of the amine with a C_6H_5 soln. of 1 mol. proportion of MeSO_2Cl and recrystg. from dil. EtOH: PhNH_2 , m. 100.5° ; *o*- $\text{MeC}_6\text{H}_4\text{NH}_2$, m. 103° ; *p*- $\text{MeC}_6\text{H}_4\text{NH}_2$, m. 102.5° ; *o*- $\text{MeOC}_6\text{H}_4\text{NH}_2$, m. 115.5° ; *p*- $\text{MeOC}_6\text{H}_4\text{NH}_2$, m. 116° ; *p*- $\text{EtOC}_6\text{H}_4\text{NH}_2$, m. 125° ; *o*- $\text{ClC}_6\text{H}_4\text{NH}_2$, m. 90.5° ; *p*- $\text{ClC}_6\text{H}_4\text{NH}_2$, m. 148° ; *p*- $\text{BrC}_6\text{H}_4\text{NH}_2$, m. 136° ; 2,5- $\text{Cl}_2\text{C}_6\text{H}_3\text{NH}_2$, m. 174° ; α - $\text{C}_{10}\text{H}_7\text{NH}_2$, m. 125.5° ; β - $\text{C}_{10}\text{H}_7\text{NH}_2$, m. 153.5° ; $\text{PhO}(\text{CH}_2)_2\text{NH}_2$, m. 79.5° ; PhNHMe , m. 76.5° ; PhNHEt , m. 59° ; PhNHPr , m. 76° ; PhNHBu , m. 73° ; PhNHCH_2Ph , m. 122° . The derivs. of *p*- $\text{MeC}_6\text{H}_4\text{NH}_2$, *o*- $\text{MeC}_6\text{H}_4\text{NH}_2$, *l*-methylamine, *sec*- BuNHPh , Et_2NH , Bu_2NH and Pr_2NH were oils. Derivs. of primary amines are sol. in 10% NaOH. Details are given of the sepn. of a mixt. of PhNH_2 , PhNHMe and PhNMe_2 . Some difficulties are encountered when MeSO_2Cl is used as a reagent for the sepn. of unknown amine mixts. C. J. WEST

A new method for the preparation of styrene (with an appendix on the identification of β -phenylethanol). SÉBASTIEN SABETAY. *Bull. soc. chim.* 45, 69-75 (1929).— $\text{PhCH}_2\text{CH}_2\text{OH}$ is nearly quantitatively converted to $\text{PhCH}:\text{CH}_2$ by heating with solid KOH ("from alc."). This reaction seems applicable to all alcs. of the general formula $\text{ArCH}_2\text{CH}_2\text{OH}$. The phys. consts. of styrene are collected as follows: b. 143° , b_{760} $52-3^\circ$, d_{20}^{20} 0.9038, n_D^{20} 1.5440. S. recommends detection of $\text{PhCH}_2\text{CH}_2\text{OH}$ in complex mixts. by selective dehydration with KOH to styrene and identification of the latter as $\text{PhCHBrCH}_2\text{Br}$ (m. 72°). M. A. DAHLEN

The stereochemistry of zinc and cadmium. W. WAHL. III. *Nord Kemist-molet* (Finland) 1928, 172-6.—Both *m*- and *p*- $\text{C}_6\text{H}_4(\text{NH}_2)_2$ give complex salts with ZnBr_2 and CdBr_2 . Thus with *m*- $\text{C}_6\text{H}_4(\text{NH}_2)_2$ diamines of the rosaniline series are obtained, also with *o*- $\text{C}_6\text{H}_4(\text{NH}_2)_2$, although with lower yields. With *p*- $\text{C}_6\text{H}_4(\text{NH}_2)_2$ a very slightly sol. compd. is obtained, which contains only 1 mol. *p*- $\text{C}_6\text{H}_4(\text{NH}_2)_2$ for each atom Zn. Probably the neutral complex is of the type: $[\text{Zn}(\text{p-phen.})\text{Br}_2]$. CuSO_4 gives an analogous *p*- $\text{C}_6\text{H}_4(\text{NH}_2)_2$ complex, very slightly sol. and stable. O. A. N.

Structure of organic molecular compounds. GEORGE MACDONALD BENNETT AND GERVASE H. WILLIAMS. Univ. of She. *J. Chem. Soc.* 1929, 256-68.—From a con-

sideration of the behavior of NO_2 and NH_2 groups, it follows that *o*-nitrobenzylidialkylamines should show intramol. coordination and that any corresponding self-coordination in the *m*- and *p*-isomers would necessarily be inter-mol. The *o*-isomer should, therefore, have a somewhat lower b. p. than the others and differences in soly. might also arise. The 3 isomeric $\text{O}_2\text{NC}_6\text{H}_4\text{CH}_2\text{NMe}_2$ show a marked difference in volatility, the *o*-, *m*- and *p*-isomers b_p 144°, 160° and 158°, resp. The 3 $\text{O}_2\text{NC}_6\text{H}_4\text{CH}_2\text{NMe}_2$ show a similar difference; *o*-nitrobenzylidimethylamine, b_p 144°; *m*-isomer, b_p 158°; *p*-isomer, b_p 160°; the *HCl* salt of the *o*-isomer, m. 215°; the 3 *picrates*, yellow, m. 143°, 217° and 149°, resp. B.-p. detns. by the Smith and Menzies' method are also given for these 6 amines. The soly. of C_{10}H_8 in these 6 amines and of these amines in $\text{HO}(\text{CH}_2)_2\text{OH}$ is given; in each case the *m*- and *p*-isomers have almost identical solubilities and the *o*-isomer differs to a small but definite extent. Me 5-nitroisophthalate and α - $\text{C}_{10}\text{H}_7\text{NH}_2$ give an orange mol. compd., m. 82°. 5,1,3- $\text{O}_2\text{NC}_6\text{H}_3(\text{SO}_2\text{Cl})_2$, m. 97-8°, crystals with 1 mol. C_7H_8 , yellow; with 1 mol. 1,3,5- $\text{C}_6\text{H}_3\text{Me}_3$, lemon-yellow, m. 68-70°, with 1 mol. PhOMe, bright yellow, m. 55-60°, and with 1 mol. C_{10}H_8 , bright yellow, m. 102-3°. $\text{O}:\text{C}_6\text{H}_4:\text{O}$ and $(\text{Me}_2\text{NC}_6\text{H}_4)_2\text{PhCOH}$ in abs. EtOH give a dark green compd., $\text{C}_{20}\text{H}_{16}\text{O}_7 \cdot 2\text{C}_{17}\text{H}_{12}\text{ON}_2$; it also gives with $(\text{Me}_2\text{NC}_6\text{H}_4)_2\text{CHPh}$ the pale purple compd., $\text{C}_{20}\text{H}_{16}\text{O}_7 \cdot 2\text{C}_{17}\text{H}_{12}\text{N}_2$, m. 71°. *sym*- $\text{Cl}_2\text{C}_6\text{H}_3\text{NH}_2$ yields a *picrate*, deep red, m. 80-3°. 2,3-Dimethylquinoxaline, heated with 7 times its wt. of a mixt. of equal vols. of BzH and PhCH_2OH or PhNO_2 at 180° for 0.5 hr., gives 3-styryl-2-methylquinoxaline, pale yellow, m. 137°; concd. H_2SO_4 gives an intense reddish purple color, which fades to an orange-yellow on diln. with H_2O . A table is given showing the comparative colorations of styrylquinoxalines with concd. H_2SO_4 . The unsubstituted compd. gives a deep reddish purple; the nitrostyryl bases give a less deep color, the methoxystyryl bases a deeper color than the parent compd. These 2 groups each have an increased effect when in the *o*- or *p*-position in the Ph group as compared with that exercised in the *m*-position.

C. J. WEST

Hexaaminobenzene. BERNHARD FLÖRSCHHEIM AND ERIC L. HOLMES. Royal Inst. J. Chem. Soc. 1929, 330-7. Reduction of 2,4,6,1,3,5 $(\text{O}_2\text{N})_6(\text{H}_2\text{N})_6\text{C}_6$ with PhNHNH_2 gives hexaaminobenzene, light brown cubic octahedra, m. 247-8° (decompn.) (atm. of H_2 , rate of heating, 5° per min.); in air the decompn. point is higher, owing to oxidation; moderately easily sol. in cold H_2O and in PhNHNH_2 ; the aq. soln. is light yellow, darkening to brown in a few hrs. and depositing a black solid in 24 hrs. *Hexa-1-deris.*, m. 356-7°, decompn. 363°. *Tetra-HCl salt*, pptd. from concd. HCl as needles which darken at 240°; the satd. aq. soln. with NH_3 gives a black amorphous powder. *Tripicrate*, dark green, infusible powder. *Pentaaminobenzene*, dark brown, m. 228° (decompn.), by the reduction of 2,4,6,1,3- $(\text{O}_2\text{N})_5(\text{NH}_2)\text{C}_6\text{H}$ with PhNHNH_2 . 2,4,6-*Trinitro-1-amino-3,5-dianilinobenzene*, light red, m. 264° (decompn.); no definite product was obtained by heating with PhNHNH_2 . The $\text{C}_6\text{H}_4(\text{NH}_2)_2$ and all known polyamino deriva. of C_6H_6 , its homologs and PhOMe are compared as regards their resistance to atm. oxidation.

C. J. WEST

1 of nitro compounds by aromatic ketols. II. Some *o*-, *m*-, and *p*-azoxy

HUGH B. NISBET. J. Chem. Soc. 1928, 3121-4. The reduction method previously described (cf. C. A. 22, 61) has been applied to *o*- and *m*-compds. but the yields were not so high as in the case of *p*-compds. This was due to difficulties encountered during the isolation of the azoxy compds. Using benzoin as reducing agent, the following new deriva. have been prepd. from the corresponding nitro compounds: *p*-azoxybenzylideneacetophenone, its *o*- and *m*-isomerides, m. 211-3°, 141-2° and 122-3°, resp.; 2-*o*-, 2-*m*-, and 2-*p*-azoxystyryl-3-methylchromones, m. 202°, 275.5° and 281°, resp.; *o*-, *m*-, and *p*-azoxybenzylidene-*p*-bromoanilines, m. 209°, 120° and 218°, resp.; *m*-azoxybenzylidene-*p*-toluidine, m. 150°; Et *p*-azoxybenzoate; 2-nitro-3-azoxystyrene, m. 164°. The condensation of 2,3-dimethylchromone with the appropriate $\text{O}_2\text{N}:\text{C}_6\text{H}_3\text{CHO}$ gives 2-*o*-, 2-*m*-, and 2-*p*-nitrostyryl-3-methylchromones, m. 161°, 212° and 236°, resp. The condensation of *m*- $\text{O}_2\text{NC}_6\text{H}_4\text{CHO}$ and *p*- $\text{BrC}_6\text{H}_4\text{NH}_2$ gives *m*-nitrobenzylidene-*p*-bromoaniline, m. 84°. PhNO_2 treated with benzoin, anisoin and furil gave 20-40%, 80% and 90% yields of benzil, anisil and furil, resp.

A. L. HILL

Relation between the absorption spectra and chemical constitution of certain azo dyes. I. The effect of position isomerism on the absorption spectra of methyl derivatives of benzeneazophenol. WALLACE R. BRUCE. U. S. Bur. Standards. J. Am. Chem. Soc. 51, 1204-12 (1929).— $\text{PhN}:\text{C}_6\text{H}_4\text{OH}$ (I) and the 11 possible mono- and di-Me deriva., in which not more than 1 Me substitution occurs in a C_6H_4 ring, have been prepd. and their absorption spectra measured in 2% aq. NaOH in the visible and ultra-violet regions of the spectrum to about 1250 to 1400 Å. The principal absorption bands appear to be composed of 3 component bands which, added together,

produce the observed bands. The equil. between the 2 components of a band is dependent on the nature of the solvent and the position of the substituting group. An *o*-substitution of the Me radical in I results in an increase in the lower frequency component, with a corresponding decrease in the higher frequency component. A *m*- or *o'*-substitution produces a reverse effect, while the equil. is not affected by either a *m'*- or *p'*-substitution. Substitution of a Me radical in the *p'*-position in I causes an increase in the intensity of the absorption bands irrespective of the type of solvent. Substitution of a Me radical in the *o'*-position in I causes a decrease in the intensity of the absorption bands. The data suggest the possibility of a method of structural analysis for the detn. of the position of a substituting group in a complex mol., and a reverse of this in the prediction of the absorption spectra of compds. of known formula and structure.

Color and constitution. IV. Absorption spectra of nitrophenylhydrazones in alcohol and in alcoholic potassium hydroxide. C. J. WEST
HERBERT H. HANCOCK

components in AcOH, m. 196°. *p*-Hydroxybenzaldehyde *p*-nitrophenylhydrazone, m. 262°. Absorption spectra are given for $\text{RC}_6\text{H}_4\text{CH}=\text{NNHC}_6\text{H}_4\text{NO}_2$, where R is NMe_2OH , Cl, OMe, NMe_2 , CH_3 , and OH. The order of the absorption curves of the hydrazones in EtOH-KOH is in agreement with the series as detd. by their effect in inhibiting or enhancing ionization but the order without the addn. of alkali is entirely different and is in accordance with the well known bathochromic effect of the NH_2 and HO groups.

C. J. WEST

The action of polyatomic alcohols and phenols on arsenic compounds. BERTIL ENGLUND. *Svensk Kem Tids.* 40, 278-85 (1928).—As compds. with low soly. in glacial AcOH react with alcs. and phenols having 2 or more OH groups, forming more sol. compds. The As compd., alc. or phenol and AcOH are kept at 25° in sealed glass tubes for 24 hrs. and the increase in dissolved As detd. by KBrO_3 titration. The g. mol. As/mol. $\text{R}(\text{OH})_2$ ratios are given in the protocols for the action of 27 compds. on $(\text{HO})_2\text{OAsCH}_2\text{CO}_2\text{H}$, 20 on As_2O_3 and 7 on $(\text{HO})_2\text{OAsC}_6\text{H}_4(\text{OH})_2$. For the As-AcOH series these ratios are: $\text{C}_2\text{H}_5(\text{OH})_2$ 0.200, $\text{C}_3\text{H}_7(\text{OH})_2$ 0.475, $\text{C}_4\text{H}_9(\text{OH})_2$ 0.800; $\text{C}_2\text{H}_5(\text{OH})_2$ 0.060; $\text{C}(\text{CH}_2\text{OH})_2$ 0.000, $[\text{Me}_2\text{C}(\text{OH})_2]$ 0.400; $[\text{Ph}_2\text{C}(\text{OH})_2]$ 0.050, *o*- $\text{HOCH}_2\text{CH}_2\text{CO}_2\text{H}$ 0.021; 3,4- $(\text{HO})_2\text{C}_6\text{H}_3\text{CO}_2\text{H}$ 0.053; $[\text{PhCH}(\text{OH})_2]$, *dl* 0.480, *meso* 0.360; $[\text{CH}(\text{OH})\text{CO}_2\text{H}]_2$, *d* 0.440, *meso* 0.200, 1,2- $\text{C}_6\text{H}_4(\text{OH})_2$, *cis* 0.430, *trans* 0.090; $\text{C}_6\text{H}_4(\text{OH})_2$, 0.170, *m* 0.015, *p* 0.002; $\text{C}_6\text{H}_3(\text{OH})_3$, 1,2,3 0.235, 1,2,4 0.210, 1,3,5 0.050; 3,4,5- $(\text{HO})_3\text{C}_6\text{H}_2\text{CO}_2\text{H}$ 0.087; $(\text{CH}_2\text{CO}_2\text{H})_2$ 0.000, $(\text{CHCO}_2\text{H})_2$ 0.000; $\text{HOCH}_2\text{CO}_2\text{H}$ 0.043, Ac_2O 0.021; Bz_2O 0.020. There is a marked increase in the soly. of As when two OH groups are on neighboring C atoms. The reaction takes place only when 5- or 6-atom ring systems can form. There is less increased soly. of As effect by OH groups in the 1,3-positions except for the set $\text{C}[\text{CH}_2\text{OH}]_2\text{-As}_2\text{O}_3$ in which the ratio is 10 times more than the effect of $\text{C}[\text{CH}_2\text{OH}]_2$ on the As-AcOH compd. Stereoisomers give different ratios: *d* $[\text{CH}(\text{OH})\text{CO}_2\text{H}]_2$ is 3 times more sol. than the *meso*-configuration with As from As_2O_3 and 1.5 times with As from the resorcinol compd. Substitutions influence the soly. effect. Mass law constn. are consistent for the 2 reaction types: $(\text{HO})_2\text{OAsCH}_2\text{CO}_2\text{H} + \text{R}(\text{OH})_2 \rightleftharpoons (\text{RO})_2\text{OAsCH}_2\text{CO}_2\text{H} + 2\text{H}_2\text{O}$ and $\text{AsO}(\text{OH})_2\text{CH}_2\text{CO}_2\text{H} + 2\text{R}(\text{OH})_2 \rightleftharpoons \text{As}(\text{RO})_2\text{CH}_2\text{CO}_2\text{H} + 3\text{H}_2\text{O}$. When both reactions apply the *k* for the former decreases and the latter increases with the increase in concn. of $\text{R}(\text{OH})_2$. A. R. ROSE

Heterocyclic compounds containing arsenic. IV. Carbamido derivatives of aryl-arsonic acids. RALPH WM. E. STICKINGS. *J. Chem. Soc.* 1928, 3131-4.—Na-*p*-arsanilate reacts with an aq. suspension of CNBr and yields *p*-carbamidophenyl-arsonic acid. Similarly 3,5- $\text{HO}(\text{H}_2\text{N})\text{C}_6\text{H}_3\text{AsO}_3\text{H}_2$ yields 5-carbamido-2-hydroxyphenyl-arsonic acid; 4,3- $\text{HO}(\text{H}_2\text{N})\text{C}_6\text{H}_3\text{AsO}_3\text{H}_2$ yields 1-aminobenzoxazole-4-arsonic acid; 3,4- $(\text{H}_2\text{N})_2\text{C}_6\text{H}_3\text{AsO}_3\text{H}_2$ yields 2-aminobenzimidazole-5-arsonic acid; 4,3,5- $\text{HO}(\text{H}_2\text{N})\text{-(AcNH)C}_6\text{H}_2\text{AsO}_3\text{H}_2$ yields 1-amino-6-acetamidobenzoxazole-4-arsonic acid and 3,4- $\text{H}_2\text{N}(\text{HO}_2\text{C})\text{C}_6\text{H}_3\text{AsO}_3\text{H}_2$ yields 2,4-diketo-1,2,3,4-tetrahydro-1,3-quinazoline-7-arsonic acid. V. Benzimidazolearsonic acids. MONTAGUE A. PHILLIPS. *Ibid* 3134-40.—The following new compds. are described: 2-methylbenzimidazole-5(6)-arsonic acid nitrate; 2,2'-dimethyl-5,5'-arsenobenzimidazole; 5,5'-arsenobenzimidazole; 2-ethylbenzimidazole-5(6)-arsonic acid and its Ca and Mg salts; 2- α -hydroxyethylbenzimidazole-5(6)-arsonic acid and its Mg salt; benzimidazole-4(7)-arsonic acid, m. 277° (decompn.), and its Ca and Mg salts; 4,4'-arsenobenzimidazole; 2-methylbenzimidazole-4(7)-arsonic acid, m. 280°, and its Ca and Mg salts; 2,2'-dimethyl-4,4'-arsenobenzimidazole; 2- α -hydroxyethylbenzimidazole-4(7)-arsonic acid and its Mg salt;

2,3-dihydroxyquinoxaline-6(7)-arsonic acid, m. $> 300^\circ$, and its Na, Na₂, Ca, Ba and Mg salts; 2,3-dihydroxyquinoxaline-5(8)-arsonic acid, m. $> 300^\circ$, and its Ca, Ba and Mg salts.

ALBERT L. HENNE

Action of phthalic anhydride on triaminoresorcinol. MARIO COVELLO. Univ. Naples. *Rend. accad. sci. Napoli* 33, [3], 240-3(1927).—Piutti obtained substituted quinones by oxidation of 2,4,6-triphthalyltriaminophenol with concd. HNO₃. In analogy with these expts. C. attempted to prep. a substituted hydroxyquinone. The HCl salt of 2,4,6,1,3-(H₂N)₃C₆H(OH)₂ (2.64 g.) was slowly heated with phthalic anhydride (4.44 g.) in CO₂. At 150° the mixt. liquefied and HCl and H₂O were eliminated. There resulted quantitatively 2,4,6-triphthalyltriaminoresorcinol (I), m. above 300°, insol. in H₂O and ordinary solvents; *Ac deriv.*, m. above 300°; *Bz deriv.*, m. 276°; 2,4,6-Triaminoresorcinol triphthalic acid (by dissolving 2.72 g. of I in a soln. of 0.84 g. KOH and neutralizing with HCl), m. 235°; *Ag salt*. When 5 g. of I were treated with HNO₃ (d. 1.48) for 24 hrs., extn. of the reaction product with EtOH yielded only phthalimide. The residue was resinous and could not be purified. G. Schwach

The diphthalyldiaminoquinones. MARIO COVELLO. Univ. Naples. *Rend. accad. sci. Napoli* 34, [3], 149-51(1928); cf. preceding abstr.—The HCl salts of 2,3-, 2,5- and 2,6-diaminohydroquinone (2.12 g.) were condensed with phthalic anhydride (2.92 g.) There resulted quant.: 2,3-, 2,5- and 2,6-diphthalyldiaminohydroquinone. All 3 comds. decomp. 250-300°. Oxidation of these comds. with HNO₃ (d. 1.4) gave 2,3-diphthalyldiaminoquinone, yellow, m. 320°; 2,5-diphthalyldiaminoquinone, yellow, m. 305°, and 2,6-diphthalyldiaminoquinone, yellow, m. 277°, which latter compd. was first prepd. by Piutti. G. Schwach

Some derivatives of tri-*p*-tolylsilicane. ALFRED R. STEELE AND FREDERICK S. KIPPING. Univ. College. *J. Chem. Soc.* 1929, 357 8.—SiCl₄ and *p*-MeC₆H₄MgBr give, among other products, tri-*p*-tolylsilicyl chloride, m. 115-6°, only slowly decompd. by H₂O; dil. NH₄OH-Me₂CO gives tri-*p*-tolylsilicol, m. 99-100°. Evapg. an EtOH soln. of the silicol contg. a few drops 10% NaOH and heating the residue 0.5 hr. on the H₂O bath, gives tri-*p*-tolylsilicyl oxide, m. 223-4°. C. J. WEST

Condensation of *o*-aminophenol and oxalic acid. Preliminary communication. ARTHUR A. LEVINE AND LESTER WEHRHOFF. State Coll. of Washington. *J. Am. Chem. Soc.* 51, 1243-6(1929).—(CO₂H)₂ (1 mol.) and 2 mols. *o*-H₂NC₆H₄OH, intimately mixed and heated at 180-200° for 0.5 hr., give quantitatively the compd. C₁₂H₁₀O₄N₄, red, m. 271-2°, crystd. from PhNO₂ or PhCH₂OH, repptd. unchanged from concd. H₂SO₄, decompd. by heating with alkali; acidifying an alk. soln. which has been heated gives CO₂ and a tarry substance; heating at 280° splits off 1 CO₂; heating at 320° causes complete decompn., CO₂, H₂O, *o*-H₂NC₆H₄OH and a compd. m. above 300° being formed. The di-Na salt may be recrystd. from 80% EtOH contg. a little NaOH, the K salt was more difficult to purify; both decomp. readily on heating in alc. or H₂O. PhNH₂ gives the compd. C₁₂H₁₂O₄N₄, m. 250°. The Na salt and Me₂SO₄ give the *Me ester*, C₁₁H₁₀O₄N₄, m. 240-7°. Ac₂O gives the *Ac deriv.*, red, m. 180°, which is completely decompd. by heating with PhCH₂OH for a few mins. It is reduced by Zn and NaOH, giving a colorless, unstable product. C. J. WEST

2-Substituted derivatives of *p*-cresol. MAURICE COPISAROW. Univ. of Manchester. *J. Chem. Soc.* 1929, 251-3.—A mixt. of 240 g. 99-100% H₂SO₄ and 2.12 mols. 86-92% HNO₃ at 10-12°, is gradually added to 240 g. (*p*-MeC₆H₄)₂CO₂ in 1200 cc. 99-100% H₂SO₄ at 12-15°; the crude product, boiled with 200 g. Na₂CO₃ in 2 l. H₂O, gives 70% 2-NO₂ deriv. (I) and some 3-NO₂ deriv. of *p*-MeC₆H₄OH. I (153 g.), 300 cc. PhMe, 140 g. Me₂SO₄ and 127 g. Na₂CO₃, heated at 110-2° for 4-5 hrs., give 77% of the *Me ether* (II); using the crude I, a 60% yield of the *Me ether* is obtained. *p*-Me(H₂N)C₆H₄OH was obtained by the direct and simultaneous reduction and hydrolysis of the 2-NO₂ carbonate with Na₂S (79% yield) and less satisfactorily with Fe in acid medium. Reduction of II with Fe and AcOH gives 78-82% of the 2-NH₂ deriv. (isocresidine). *p*-MeC₆H₄OH (108 g.) in 42-4 g. NaOH in 500 cc. H₂O below 10°, treated with COCl₂, gives 78-80% of *p*-MeC₆H₄OCOCl, b₁₀ 108°. C. J. WEST

Pyrolysis of benzaldehyde and of benzyl benzoate. CHARLES D. HURD AND C. W. BENNETT. Northwestern Univ. *J. Am. Chem. Soc.* 51, 1197-201(1929). The decompn. of BzH is very slow at 300° but about 33% of it decomp. largely into BzO-CH₂Ph, in 2 hrs. at 350°. A concurrent reaction of much less importance gives rise to CO and C₆H₆. No evidence could be obtained for PhMe or (PhCH₂)₂O as reaction products and BzOH is formed in negligible amts. By passing BzH through a Pyrex tube at 700° at a rate of 1/8 g. per min., about 66% was decompd. The major reaction was the formation of C₆H₆ by loss of CO. Side reactions gave rise to Ph₂ and 1,4-C₆H₄Ph₂. C₁₀H₈ was definitely absent. At 350° BzOCH₂Ph undergoes a reaction

of disproportionation. After 2 hrs.' heating, the major products are Bz_2O , $PhMe$ and BzH . Smaller quantities of $BzOH$ were also identified. Negative searches were made for stilbene, phenanthrene, C_6H_6 , Ph_2 and $(PhCH_2)_2O$ in the products of reaction.

C. J. WEST

The synthesis of the methyl ketones of *p*-tert-butyltoluene and *p*-cymene by the Friedel and Crafts method. MILLER, ALICE LACOURT. Brussels Univ. *Bull. soc. chim. Belg.* 38, 1-20(1929).—Pure *p*- $MeC_6H_4CMe_3$ (I) b. $192-3^\circ$ (cor.), d_{20}^{20} 0.8614, n 1.48709, 1.49187, 1.50175, 1.51006 for α , D , β and γ at 20° . Brought into contact with $AlCl_3$ at room temp., it yields: isobutane, $PhMe$, unchanged $MeC_6H_4CMe_3$, dibutyltoluene, tributyltoluene and a high-boiling residue. Pure *p*-cymene b. $176.2-7.2^\circ$ (cor.), d_{20}^{20} 0.8583, n_{α}^{20} 1.48676, n_D^{20} 1.49083, n_{β}^{20} 1.50089, n_{γ}^{20} 1.50930. Treated with $AlCl_3$ at room temp. it yields C_6H_6 , $PhMe$, $Me_2C_6H_4$, unchanged cymene, 1,3,5-diisopropyltoluene and a high-boiling residue. A mixt. of $AcCl$ and I is dropped into $AlCl_3$ in CS_2 cooled at -10° : the reaction yields 80% $MeC_6H_4AcCMe_3$, m. -2° , b_{12} $133.2-5.0^\circ$, b_{10} $131-4^\circ$, d_0^0 0.9757, d_{20}^{20} 0.9615, n_{α}^{20} 1.51595, n_D^{20} 1.52071, n_{β}^{20} 1.53279; semicarbazone, m. 189.8° ; oxime, m. $121.8-2.0^\circ$; it forms no cryst. compd. with H_3PO_4 , the $-CMe_3$ group is para to the Me group but the position of the Ac group is not indicated. The chief by-product of the reaction is *p*- MeC_6H_4Ac . A similar treatment involving II and $AlCl_3$ yields 97% of 1,2,4- $MeC_6H_3AcCHMe_2$, b_{12} $124.2-5.2^\circ$, d_0^0 0.9864, d_{20}^{20} 0.9654, n_{α}^{20} 1.51389, n_D^{20} 1.51849, n_{β}^{20} 1.53066, n_{λ}^{20} 1.54134. ALBERT L. HENNE

Synthesis of some chalcones. R. L. SHRINER AND E. C. KLEIDERER. Univ. of Illinois. *J. Am. Chem. Soc.* 51, 1267-70(1929).—Hyssopin (I), isolated from *Herba hyssopi* by Tunmann (*C. A.* 12, 2344) and from *Capsella bursa pastoris* by Oesterle (*C. A.* 16, 4013), was considered by the latter to be 2,4,6-(HO) $_3C_6H_2COCH:CHC_6H_3O_2CH_2-3,4$ (II), since piperonal, acetopiperone and 1,3,5- $C_6H_3(OH)_3$ were obtained on decompn. with 33% KOH . Since, however, acetopiperone predominated in the decompn. products, it would seem that I should be 2,4,6-(HO) $_3C_6H_2CH:CHCOC_6H_3O_2CH_2-3,4$ (III). Synthesis of II and III shows that I is really III. 1,3,5- $C_6H_3(OH)_3$ (15 g.) and 20 g. $AcCl$ in 200 cc. $PhNO_2$ and 200 cc. Et_2O , treated with 30 g. $AlCl_3$ during 0.5 hr., the Et_2O distd and 30 g. $AlCl_3$ again added, give 5 g. 2,4,6-trihydroxyacetophenone, light yellow, m. $213-4^\circ$ (cor.); $FeCl_3$ gives a wine-red color. Heating with piperonal and KOH in 50% $EtOH$ gives 2,4,6-trihydroxyphenyl 3,4-methylenedioxyethyl ketone (II), yellow, decomp. $300-10^\circ$; acetate, light yellow, m. $218-20^\circ$. 2,4,6-(HO) $_3C_6H_2CHO$ and acetopiperone, condensed with KOH , give 2,4,6-trihydroxyethyl 3,4-methylenedioxyphenyl ketone (III), orange, decomp. $265-70^\circ$; tri-*Ac* deriv., light yellow, m. $205-6^\circ$. C. J. WEST

New condensations of ketones with phenols. II. Further cresolphorones. JOSEPH B. NIEDERL AND RICHARD CASTY. New York Univ. and Univ. Graz. *Monatsh.* 51, 86-92(1929); cf. *C. A.* 22, 3629.— Me_2CO (1 mol.) and 1 mol. *o*- MeC_6H_4OH were mixed with concd. H_2SO_4 at 0° and allowed to stand 1 week at room temp., giving 35% of di-*o*-tolylphorone, m. 245° ; this also results by treating 1 mol. phorone and 2 mols. *o*- MeC_6H_4OH with concd. H_2SO_4 in the cold; the *Na* salt crysts. in needles; the *K* salt crysts. in plates; di-*Br* deriv., m. 220° ; di-*Bz* deriv., m. 130° ; di-*Me* ether, m. 154° . Me_2CO and *p*- MeC_6H_4OH with cold concd. H_2SO_4 give di-*p*-tolylphorone ether, m. 137° . C. J. WEST

Norephedrine and norpseudoephedrine. I. S. KANAO. *J. Pharm. Soc. (Japan)* 48, 947-58(1928).—K. succeeded in synthesizing ephedrine (*J. Pharm. Soc.* 47, 102(1927)). Employing the same method, reduction of $PhCH(OH)CH(NO_2)Me$ with Zn dust and dil. H_2SO_4 gave norephedrine (I) and nor- ψ -ephedrine (II). The HCl salts of I and II were sepd. by fractional crystn. in abs. alc. Stereoisomers: Nor-*dl*-ephedrine (III), $C_{11}H_{15}ON$, m. $104-5^\circ$; like other ephedrine forms many salts: Hydrochloride, m. 194° ; sulfate, m. $285-6^\circ$; oxalate, m. 245° ; dioxalate, m. $182-3^\circ$. Nor-*dl*- ψ -ephedrine (IV), $C_{11}H_{15}ON$, m. 71° ; sulfate, m. $290-1^\circ$; oxalate, m. 230° . Nor-*d*-ephedrine (V): the *dl*-base and *d*-tartaric acid in warm alc. gave $C_{11}H_{15}ON \cdot C_4H_6O_6 \cdot EtOH$, m. 160° , $[\alpha]_D^{27}$ 34.69° in water. HCl salt, m. $171-2^\circ$, $[\alpha]_D^{27}$ 33.4° sulfate, m. $285-6^\circ$, $[\alpha]_D^{27}$ 31.5° . Nor-*l*-ephedrine (VI). From the mother liquor of nor-*d*-ephedrine *d*-bitartrate, K. obtained nor-*l*-ephedrine *d*-bitartrate, m. 164° , $[\alpha]_D^{28}$ -34.46° in water; sulfate, m. $285-6^\circ$, $[\alpha]_D^{28}$ -31.39° in water. Nor-*l*- ψ -ephedrine (VII). IV and *d*-tartaric acid in warm water gave nor-*l*- ψ -ephedrine *d*-bitartrate, m. 202° , $[\alpha]_D^{20}$ -13.30° in water. HCl salt, m. $180-1^\circ$, $[\alpha]_D^{20}$ -42.68° in water; sulfate, m. $290-1^\circ$, $[\alpha]_D^{25}$ -39.99° . Nor-*d*- ψ -ephedrine (VIII). Nor-*d*- ψ -ephedrine *l*-bitartrate, m. 202° , $[\alpha]_D^{20}$ 13.36° in water.

HCl salt, m. 180-1°, $[\alpha]_D^{20}$ -42.53° in water. Sulfate, m. 280-1°, $[\alpha]_D^{25}$ 40.10° in water. Other chem. properties of nor- and nor- ψ -ephedrine are also given. F. I. NAKAMURA

Derivatives of *p*-methoxycinnamic acid. P. A. FOOTE. *J. Am. Pharm. Assoc.* 17, 958-62(1928).—*p*-Methoxycinnamic acid was obtained from the volatile oil of *Kaempferia galangal* L. The NH_2 salt, prepd. by passing NH_3 into a soln. of the acid in hot toluene, forms white flakes, sol. in H_2O , EtOH and Me_2CO . Ph ester, m. 76-7°, insol. in H_2O but sol. in org. solvents; ester value 217.5. β -Naphthyl ester, flesh-colored, m. 130-1°, ester value 204.1. Thymyl ester, m. 58-9°. Carvacryl ester, m. 78-9°, ester value 179.3. Eugenyl ester, m. 112-3°, ester value 171.0. Phenacryl ester, m. 136°. The ester values could not be detd. accurately. Monoxime of phenacryl ester, m. 116-7°. Carvacryl cinnamate, m. 65-6°, ester value 201.8. These compds. do not inhibit the growth of *Bacillus typhosus* or *B. staphisaurius*. Intravenous and subcutaneous injections into white rats showed no toxicity. L. E. WARREN

Catalytic hydrogenation of different types of unsaturated compounds. IV. Hydrogenation of conjugated systems: piperic acid. SERGEY V. LEBEDEV AND ANASTASIA O. YAKUBCHIK. Military Med. Acad., Leningrad. *J. Chem. Soc.* 1929, 220-5; cf. C. A. 22, 4460.—The hydrogenation of piperic acid in the presence of Pt black, as well as in the presence of colloidal Pt, proceeds according to type II of L.'s classification. The position of the crit. pt. depends upon the catalyst chosen; in the former method, in EtOH, it is at 75-8% H absorbed, whereas in the latter it is at 68-70% if the K salt is used in H_2O . The hydrogenation curves obtained with either catalyst must be related to the same type, although they differ in shape. C. J. WEST

Chlorination of phthalic anhydride in alkaline solution. ERNEST E. AVILES. Univ. College. *J. Chem. Soc.* 1929, 253-6.—A rapid stream of Cl_2 was passed into an ice-cooled soln. of 16.6 g. of $\text{C}_6\text{H}_4(\text{CO}_2\text{H})_2$ in 200 cc. H_2O contg. 28 g. KOH (3 mols. excess) until no apparent further pptn. of acid K salt occurred (total yield, 50%). This ppt. consists mostly of the 4-Cl deriv., with a little 4,5-di-Cl deriv. and some unchanged acid. The use of 5 mols. excess NaOH gives a much larger proportion of the di-Cl deriv., which could not be removed by the methods of purification recommended by Moore, Marrack and Proud (C. A. 16, 417). The sepn. of the 4-Cl deriv. is best accomplished by esterification with MeOH and HCl. The chlorination is not dependent upon the presence of the excess of alkali but results from the direct action of Cl_2 upon the phthalate in soln. The larger yield of pptd. acid salts obtained when excess of alkali is used is due to the salting out by the alkali formed. This is confirmed by comparative expts. with KOH and NaOH, the KOH reaction giving more of the Cl deriv., since the K H 4-chlorophthalate is only sparingly sol. and therefore salts out before dichlorination takes place. C. J. WEST

Rearrangement of pinocarveol and of sabinol. HARRY SCHMIDT. Zentrallaborat. Akt.-Ges. Lignosol. Ber. 62B, 103-7(1929).—If pinocarveol and sabinol are heated with small quantities of Al alcoholate to 150-70° an exceedingly vigorous reaction suddenly sets in, the mass boils violently and it must be cooled to prevent the temp. from rising too high. The original substance is completely changed, pinocarveol chiefly pinocampnone and sabinol tannacetone. The reaction is more or less violent, depending on the amount of catalyst and the length of heating. There are always formed as by-products resinous substances non-volatile with steam, and the elimination of a small quantity of H_2O cannot be avoided. The tannacetone from sabinol is also in part further isomerized to unsatd. ketones (isothujone and probably carvotanacetone). The ring-unsatd. verbenol and carveol, which also have the HO group adjacent to the double bond, do not behave in the same way. C. A. R.

Indian turpentine from *Pinus longifolia*, Roxb. V. The oxidation of *d*- Δ^1 -carene with Beckmann's chromic acid mixture. CHARLES S. GIBSON AND JOHN L. SIMON. Univ. of London. *J. Chem. Soc.* 1929, 305-11; cf. C. A. 18, 247. Oxidation of Δ^1 -carene with Beckmann's reagent gives *l*-trans-caronic acid and terpenylic acid in relatively large amts. and *d*-homoterpenyl Me ketone, terbic acid, *ca*-caronic acid and $\text{Me}_2\text{C}(\text{CO}_2\text{H})_2$ in small quantities. The original should be consulted for the methods of isolation and identification. H_2SO_4 (50%) in AcOH reacts with the hydrocarbon to give, as the main product, a diterpene, b_p 180-6°, d_{20}^{25} 0.9309, n_D^{20} 1.5168, $[\alpha]_D^{25}$ 5.60°. There also results a small amt. of a mixt. of monocyclic terpenes and a trace of *l*-borneol. The terpene fraction b. 174-6°, d_{20}^{25} 0.8500, n_D^{20} 1.4750, $[\alpha]_D^{25}$ -0.5°. Since neither the diterpene nor the terpene yielded cryst. derivs., these were not identified. C. J. WEST

Camphane-3-carboxylic acid and camphanyl ketones. H. RUPF AND H. HIRSCHMANN. Anstalt org. chem. Basel. *Helv. Chim. Acta* 11, 1180-1200(1928).—The reduc-

tion of Et camphane-2-carboxylate with Na + alc. yields 2-camphanylcarbinol, b_{11} 135°, m. 87–8°, $[\alpha]_D^{20}$ –27.75° in C_6H_6 , whose *p*-nitrobenzoate m. 123°. The same compd. is obtained by the reduction of camphane-2-carboxamide, m. 98°. The reaction between Me_2Zn and the acid chloride, $C_{10}H_{17}COCl$, gives 2-acetylcamphane (I), b_{11} 106°, d_4^{20} 0.96186, $[\alpha]_D^{20}$ –54.25°, whose semicarbazone m. 216°, and oxime m. 69°. I condenses with BzH in the presence of HCl , and gives $C_{10}H_{17}COCH:CHPh$, m. 46°, b_{11} 120–1° in cathodic vacuum, $[\alpha]_D^{20}$ 25.85° in C_6H_6 . The reduction of this gives $C_{10}H_{17}CO(CH_2)_3Ph$, b_{11} 200 1°, m. 36°, $[\alpha]_D^{20}$ –24.04° in C_6H_6 . The reaction between Et_2Zn and the acid chloride yields 2-propionylcamphane, b_{11} 128–9°, d_4^{20} 0.9549, $[\alpha]_D^{20}$ –55.69°, whose semicarbazone m. 186°, oxime m. 97–8°. A Friedel and Crafts reaction yields 2-benzoylcamphane, b_{11} 178 80°, d_4^{20} 1.0391, $[\alpha]_D^{20}$ 12.13°. I and $BzOEt$ in the presence of Et_2O and $NaNH_2$ give 2-benzoylacetylcamphane, m. 61°, while oxidation with $NaOBr$ yields an acid, $C_{10}H_{17}CO_2H$, m. 83 4°, $[\alpha]_D^{20}$ –12.99° in C_6H_6 , whose Me ester b_{11} 102°, d_4^{20} 1.0017, $[\alpha]_D^{20}$ –28.0°; it is isomeric with camphane-2-carboxylic acid, m. 73°, $[\alpha]_D^{20}$ –3.26° in C_6H_6 , whose Me ester b_{11} 104–5°, d_4^{20} 1.002, $[\alpha]_D^{20}$ –14.61°; secondary hydrazide, m. 300°. Both acids give the same toluidine salt, m. 185–5.5°. Mg -bornyl chloride and BzH seem to give phenyl-2-camphanylcarbinol, b_{11} 170–5°. A table gives the optical rotations of the above compds. for different wave lengths. The rotation-dispersions of the acids and their esters are normal or nearly so.

ALBERT L. HENNE

Individuality of humulene. A. CHASTON CHAPMAN. *J. Chem. Soc.* 1929, 359–60; cf. *C. A.* 22, 2377.—Reply to Deussen (*C. A.* 23, 1127).—C. sees no reason for changing his conclusion that humulene is not identical with caryophyllene, though, because of the close relation, it is not impossible that in certain reactions intramol. change occurs, the 1 being transformed into the other.

C. J. WEST

The preparation of diethylaminoethanol esters of diphenyl-2-carboxylic acid and derivatives. FRANK BELL. *J. Chem. Soc.* 1928, 3247 9.— o - PhC_6H_4COCl , b_{11} 163°, has a tendency to change into fluorenone by distn.; it yields diphenyl-2-carboxy-2'-diphenylamide, m. 194°, with 2-aminodiphenyl, it reacts with $Et_2NCH_2CH_2OH$ to give diethylaminoethyl diphenyl-2-carboxylate, b_{11} 183°, whose HCl salt m. 109–10° and exhibits anesthetic properties. In a similar way, p - PhC_6H_4COCl chloride yields diethylaminoethyl diphenyl-4-carboxylate, whose HCl salt m. 183°. $SOCl_2$ and diphenamic acid yield 2'-cyanodiphenyl-2-carboxylic chloride, m. 84°, b_{11} 225°; by distn. it gives 3% of 4-cyanofluorenone, m. 243 4°. Diethylaminoethyl 2'-cyanodiphenyl-2-carboxylate forms a HCl salt, m. 189°. The purpose of the work was to synthesize compds. with anesthetic properties.

ALBERT L. HENNE

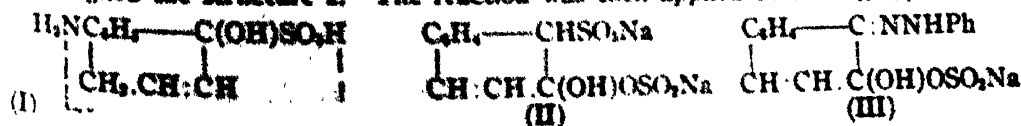
The action of methyl *p*-toluenesulfonate on α -naphthylamine. V. M. RODIONOV AND V. E. VVEDENSKII. *Bull. soc. chim.* 45, 121 4 (1929); cf. *C. A.* 20, 1795.— α - $C_{10}H_7NH_2$ (1 mole) + p - $MeC_6H_4SO_3Me$ (1 mole) yields 24% α - $C_{10}H_7NH_2$, 23% α - $C_{10}H_7NHMe$, 42% α - $C_{10}H_7NMe_2$ and 5% (α - $C_{10}H_7NH_2$, α - $C_{10}H_7NH_2$, (0.5 mole) + p - $MeC_6H_4SO_3Me$ (1 mole) yields 97% α - $C_{10}H_7NMe_2$ + a little (α - $C_{10}H_7NH_2$).

M. A. DAHLEN

Symmetry of naphthalene. K. LONSDALE (NÉE YARDLEY). Univ. Leeds. *Proc. Leeds Phil. Lit. Soc., Sci. Sect.* 1, 346 8 (1929). On the assumption that a C atom has 2 different kinds of valencies, a structure for $C_{10}H_8$ can be drawn which would explain the theory of de László (*C. A.* 22, 355) that there should be 2 isomeric β -derivs. but only 1 α -deriv.

WALLACE R. BRODE

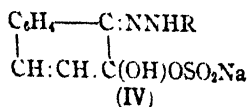
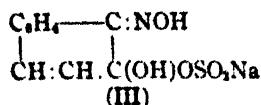
Naphthalene series. I. Mechanism of the bisulfite reaction of naphthol derivatives. N. N. VOROBYOV WITH A. G. KASSATKIN. Tech. Mendeleev-Inst. Moskau. *Izv.* 62B, 57–68 (1929).—Bucherer, who first studied the reaction whereby naphthylamines are converted into naphthols with acid sulfites and naphthols into naphthylamines with neutral $(NH_4)_2SO_3$ (+ NH_3) assumed that there is formed an intermediate naphthyl sulfite, $C_{10}H_7OSO_2Na$, but later V. isolated and analyzed some of these intermediate products and found their compn. corresponded to an addn. product of 1 mol. H_2SO_3 or sulfite to 1 mol. naphthol; to the product obtained from 5,1- $C_{10}H_6(NH_2)OH$ he assigned the structure I. The reaction was then applied to the $C_{10}H_6(OH)SO_3H$;



the results obtained with the 1,4-acid seemed to confirm V.'s view while those obtained

with the 1,5- and 1,8-acids apparently agreed with the ester structure for the compds. formed. In all these cases, however, the products were obtained by long boiling of the original acids with NaHSO_3 and it seemed quite possible they might have resulted from a secondary reaction. V. and K., therefore, undertook to make such of these products as could be prepd. in the cold, thereby obviating the possibility of secondary reactions. The di-Na salt of 2,1- $\text{C}_{10}\text{H}_6(\text{OH})\text{SO}_3\text{H}$ was accordingly treated in the cold with SO_2 and gave a product which, after drying, had the compn. II. No indication in favor of B.'s formulation was ever observed. To further confirm the correctness of formula II, the compd.'s behavior on diln. and under the influence of HO and H ions was studied. It decompn. even in H_2O into its components, the decompn. increasing with increasing diln.; the decompn. increases rapidly under the influence of H_2O ions (even with such weak alkalis as NaHCO_3); H ions increase the stability of the II and min. traces of acids prevent the decompn. The curves representing the decompn. under these various conditions are very similar to the corresponding curves for the benzeneazo- β -naphthol compd. (III) (cf. C. A. 18, 3374), a fact which, in connection with a whole series of analogies in the chem. character of the bisulfite compds. of the azonaphthol dyes on the 1 hand and the colorless naphthol derivs. on the other, brings out the prime significance in both cases of a reactive HO group for the formation of bisulfite compds. and confirms the structure assigned to the azo dye compds. Furthermore, various heavy metal salts (Ba , Cu , Zn , Hg) were prepd. from II; in every one the metal content corresponded to structure II. The 2,1- $\text{C}_{10}\text{H}_6(\text{ONa})\text{SO}_3\text{Na}$ was obtained in 20 g. yield from 50 g. β -naphthol essentially by Tobias' method. In the decompn. expts. the liberated SO_2 was detd. iodometrically. II. Action of sodium bisulfite on nitrosonaphthols. N. N. VOROZHTZOV AND S. V. BOGDANOV. Polytechn. Inst. Ivanovo-Vosnessensk and Technolog. Mendeleiev-Inst., Moskau. *Ibid.* 68, 80. Reports in the literature show that the reaction between SO_2 and nitrosophenols, if any occurs, is many-sided and generally leads to reduction of the NO group with simultaneous sulfonation in the nucleus. 1,2- $\text{C}_{10}\text{H}_6(\text{NO})\text{OH}$ has not only the ability to undergo such a transformation but also a tendency to the formation of an unstable bisulfite compd. (I) such as had hitherto not been observed with other nitrosophenols. The object of the present investigation was to establish the structure of I and to det. whether other analogous compds. are capable of existence. Although I has long been known its properties have been very incompletely described and the data in this respect do not always agree. Of the 3 structures which have been suggested for it, $\text{C}_{10}\text{H}_6(\text{NO})\text{OSO}_3\text{Na}$ does not agree with its compn., which, as found in this work, corresponds to $\text{C}_{10}\text{H}_6(\text{OH})\text{N}(\text{OH})\text{SO}_3\text{Na}$ (II) or to III. I greatly resembles in its properties bisulfite compds. of the azo dyes, for which evidence has been advanced that have the structure IV, derived from a quinone hydrazone rather than the true form of the dye. To det. whether 1,2- $\text{C}_{10}\text{H}_6(\text{NO})\text{OH}$ reacts with NaHSO_3 in nitroso or the quinone oxime form it was necessary to fix I of the forms. For purpose was chosen the Me ether, which has the latter form, $\text{O}-\text{C}_{10}\text{H}_6-\text{NOME}$. V with NaHSO_3 under the same conditions as with the naphthol itself, gives an product entirely similar in compn. and properties to I. Again, 1,2,6- $\text{C}_{10}\text{H}_6\text{N}(\text{OH})\text{SO}_3\text{Na}$ with NaHSO_3 and NaOH gives a light green di-Na salt, whose isolation, form and purification offered some difficulties because of its great soly., but the that was isolated and especially its easily prepd. and purified Ba salt confirmed the that it was an addn. product analogous to I. Application of the reaction to that of 2,1- and 4,1- $\text{C}_{10}\text{H}_6(\text{NO})\text{OH}$ resulting from the nitrosation of α -naphthol shows that only the 4,1-compd. reacts (with formation of an unstable compd.), although Schmidt claims that the 2,1-compd. forms with SO_2 an $\text{C}_{10}\text{H}_6(\text{NH}_2)(\text{OH})\text{SO}_3\text{H}$ and the 4,1-compd. remains unchanged. The observation of V. and B. can be made the basis of a new method, simpler than all the other ones, for sepg. the 2 isomers. To isolate the 4,1-deriv. from its NaHSO_3 compd., it suffices, after removing the insol. 2,1- $\text{C}_{10}\text{H}_6(\text{NO})\text{OH}$, to add alkali and decomp. the resulting salt with acids. It has not yet been possible to isolate the bisulfite compd. itself in sufficiently pure form. These results indicate that the tendency to form unstable NaHSO_3 addn. products is not limited to 1,2- $\text{C}_{10}\text{H}_6(\text{NO})\text{OH}$, but only those $\text{C}_{10}\text{H}_6(\text{NOH})-\text{O}$ (viz. the 1,2- and 1,4-compds.) react whose structure corresponds to the azo compds. which all react with NaHSO_3 . The bisulfite compds. of the NO derivs. must therefore have the same structure III as those of the azo derivs. I, from 1,2- $\text{C}_{10}\text{H}_6(\text{NO})\text{OH}$ and 2,1- $\text{C}_{10}\text{H}_6(\text{NO})\text{OH}$, allowed to stand in H_2O below 5° , salted out with NaCl and crystd. from H_2O in solvents; the H_2O solns. are yellowish at room temp. but on heating change to red or reddish; acids produce a reddish color without formation of SO_2 or $\text{C}_{10}\text{H}_6\text{N}-\text{OH}$.

after some hrs. the liquid becomes brown and deposits a brown-black substance sol. in alkalis with brown color. NaHCO_3 turns H_2O solns. of I yellow; from not too dil. solns. NaOH ppts. the green salt of $\text{C}_{10}\text{H}_6(\text{NO})\text{OH}$; moderate heating of the solns. of I with NaHSO_3 and HCl ppts. 1,2,4- $\text{C}_{10}\text{H}_5(\text{NH}_2)(\text{OH})\text{SO}_3\text{H}$.



C. A. R.

• **Naphthalic acid derivatives.** KAROL DZIEWONSKI AND ALEXANDER KOCWA. Univ. Krakow. *Bull. intern. acad. Polonaise* 1928, 405-30.—4-Sulfonaphthalic acid (I) has been obtained from acenaphthene by sulfonation with ClSO_3H and subsequent oxidation of the acenaphthenesulfonic acid with $\text{Na}_2\text{Cr}_2\text{O}_7$ in glacial AcOH . A KOH fusion of I (at 160° , then a few mins. at 240°) yields 4-hydroxynaphthalic anhydride (II), m. $350-1^\circ$, which yields α -naphthol by distn. over Ca(OH)_2 . The KOH fusion of II at high temp. yields 5-hydroxy-1-carboxynaphthalene, m. 235° , sol. in the ordinary org. solvents, and gives a purple-brown ppt. with FeCl_3 ; its Bz deriv. m. 241° . The Na salt of I heated at 250° with PCl_5 yields 4-chloronaphthalic anhydride (III), m. $216-7^\circ$. III has also been obtained from the anhydride of I. Boiling III with concd. aq. NH_4OH yields 4-chloronaphthalimide (IV), m. $301-2^\circ$. I and PBr_3 yield 4-bromonaphthalic anhydride (V), m. 296° . V in AcOH with $\text{PhNHNH}_2 \cdot \text{HCl}$ gives the phenylhydrazone, m. $223-4^\circ$. II and PBr_3 give 4-hydroxybromonaphthalic anhydride, m. $266-7^\circ$, insol. in C_6H_6 , $\text{Me}_2\text{C}_2\text{H}_4$, ligroin or CHCl_3 , sol. in AcOH , EtOH or boiling H_2O , sol. with a red color in pyridine and alkalis. The sulfonation of naphthalic anhydride with fuming H_2SO_4 at $100-5^\circ$ yields 3-sulfonaphthalic acid (VI), m. 198° , whose Na salt crystallizes with 1.5 H_2O , and whose anilide m. 297° . The Na salt of VI and PCl_5 yield 3-chlorosulfonaphthalic anhydride (VII), m. $212-3^\circ$. VII and concd. aq. NH_4OH yield 3-amidosulfonaphthalimide, m. 348° , little sol. in boiling H_2O . VI and an excess of PCl_5 yield 3-chloronaphthalic anhydride, m. $223-4^\circ$, whose imide m. 315° and whose fusion with resorcinol gives 3-chloronaphthalfluorescein, red-brown crystals, m. 170° (decompn.). PBr_3 and 3-hydroxynaphthalic anhydride give 3-hydroxybromonaphthalic anhydride, m. $284-5^\circ$, sol. with red color in alk. solns., whose imide m. 339° , Bz deriv. m. $252-3^\circ$. The sulfonation at high temp. of acenaphthene, followed by oxidation with $\text{Na}_2\text{Cr}_2\text{O}_7$, yields 2-sulfonaphthalic acid (VIII) whose PhNH_2 salt m. 290° . The KOH fusion of VIII at $150-80^\circ$ yields 2-hydroxynaphthalic anhydride (IX), m. $245-6^\circ$. The product obtained by coupling IX with PhN_2Cl m. $238-40^\circ$, with $p\text{-O}_2\text{NC}_6\text{H}_4\text{N}_2\text{Cl}$ m. $336-7^\circ$. The benzylation of IX causes the elimination of one of the CO groups, and 2-benzoyloxy-8-carboxynaphthalene, m. $196-7^\circ$, is thus obtained. The methylation of the anhydride of IX with Et_2SO_4 yields 2-methoxynaphthalic anhydride, m. 255° . The phenylhydrazone of IX m. $238-9^\circ$ and its imide m. $303-4^\circ$. A long KOH fusion of VIII at high temp. yields 2-hydroxy-8-carboxynaphthalene, m. 257° , whose Ac deriv. m. $221-2^\circ$ and whose anilide m. $200-10^\circ$. The Na salt of VIII or its anhydride and PCl_5 yield 2-chloronaphthalic anhydride, m. $246-7^\circ$, whose imide m. $332-3^\circ$. PBr_3 and the anhydride of VIII give 2-bromonaphthalic anhydride, m. $253-4^\circ$, whose imide m. 318° and phenylhydrazone m. $251-2^\circ$.

ALBERT L. HENNE

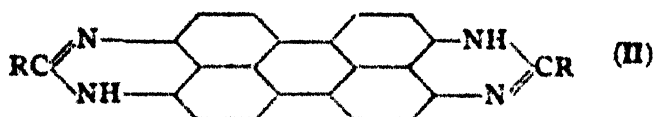
Structure of dihydroxybenzanthrone, obtained by condensation of alizarin with glycerol and sulfuric acid (Ger. 187,495). J. TURSKI AND J. GRYNWASSER. *Roczniki (Chem.)* 9, 78-82 (1929).—In order to det. the structure of dihydroxybenzanthrone, obtained by condensation of alizarin with glycerol and H_2SO_4 , three possible condensation products: 7,8-dihydroxy-1,9-benzanthrone (C. A. 14, 3221), 5,6-dihydroxy-1,9-benzanthrone (I), m. 185° , and 3,4-dihydroxy-1,9-benzanthrone (II), m. 285° , were prepd. I was prepd. by oxidation of 5,6-dihydroxydihydro-1,9-benzanthrone which was obtained from α -naphthyl 1,2-dihydroxyphenyl ketone, prepd. from catechol and $\alpha\text{-C}_{10}\text{H}_7\text{COCl}$. II was obtained from 2,3- $\text{C}_{10}\text{H}_7(\text{OH})_2$ by (a) Friedel-Crafts' and (b) Scholl's method (C. A. 6, 1000; 7, 790). Comparing the properties of I and II with those of the product obtained in the above patent, it was concluded that the product is identical with I. The following new compds. were prepd. in the course of this study: α -naphthyl 1,2-dihydroxyphenyl ketone, m. 118° (diacetate, m. 135°); 5,6-diacetoxy-1,9-benzanthrone, m. 109° ; 2,3-dihydroxy- α -naphthyl Ph ketone, m. 179° ; 2,3-dibenzoxy-1,9-benzanthrone, m. 235° ; 6,7-dibenzoxy-1,9-benzanthrone, m. 188° ; Bz-2,3-dibenzoxy-1,9-benzanthrone, m. 320° (decompn.); Bz-2,3-dihydroxy-1,9-benzanthrone, m. 192° .

JAROSLAV KUČERA

Chemistry of perylene. I. FREDERICK A. MASON. *Ind. Chemist* 5, 111-4 (1929).—A review with bibliography.

A. S. CARTER

Perylene and its derivatives. XIX. ALOIS ZINKE, W. HIRSCH AND E. BROZEK. Univ. Graz. *Monatsh.* 51, 205-20 (1929); cf. *C. A.* 23, 1130.—Reduction of 3,4,9,10-tetranitroperylene with NaHSO_3 , Na_2S or SnCl_2 gives dark violet leaflets, which do not m. 360° , which may be a quinhydrone-like mol. compd. of the tetra- NH_2 deriv. and a diaminoperylenequinondilimine ($\text{C}_{20}\text{H}_{12}\text{N}_4$ or $\text{C}_{20}\text{H}_{10}\text{N}_4$); it is best purified from PhNH_2 . Ac_2O gives the dark reddish brown compd., $\text{C}_{20}\text{H}_{12}\text{N}_4$, which does not m. 360° ; concd. H_2SO_4 gives a reddish brown soln. with green fluorescence; this may be of the form I or II. $(\text{COCl})_2$ gives the compd., $\text{C}_{20}\text{H}_{12}\text{N}_4\text{O}_4$, sol. in concd. H_2SO_4 with a red-violet color; the dye bath is violet and colors cotton yellow. BzCl gives the compd., $\text{C}_{24}\text{H}_{18}\text{N}_4$, brown leaflets or needles; concd. H_2SO_4 gives a reddish brown color. $p\text{-BrC}_6\text{H}_4\text{COCl}$ gives the dark brown compd., $\text{C}_{24}\text{H}_{18}\text{N}_4\text{Br}_2$, giving a golden brown color in concd. H_2SO_4 ; $p\text{-ClC}_6\text{H}_4\text{COCl}$ gives the compd., $\text{C}_{24}\text{H}_{18}\text{N}_4\text{Cl}_2$, brownish yellow. BzH gives the compd., $\text{C}_{24}\text{H}_{18}\text{N}_4$, brown, sol. in concd. H_2SO_4 with a reddish brown color. Heating 3,9-dichloro-4,10-dinitro-, the di- NO_2 or tetra- NO_2 deriv. of perylene with concd. H_2SO_4 at $150\text{--}60^\circ$, 150° or $130\text{--}40^\circ$, resp., for 6 hrs. gives 3,9,4,10-perylene-diquinone, recrystd. from 600 parts PhNO_2 , dark garnet-red needles with metallic luster; the vat is dark red with an intense brownish green fluorescence, which dyes cotton a dark reddish brown to olive, with Cr mordant, a deep brown. BzCl in NaOH in the vat gives tetrabenzoyloxyperylene, golden yellow, m. above 380° ; tetrabromobenzoyl deriv., golden yellow, crystg. with 1 PhNO_2 . The quinone and Br in PhNO_2



give the tetra-Br deriv., $\text{C}_{20}\text{H}_8\text{O}_4\text{Br}_4$, dark brown with metallic luster; concd. H_2SO_4 gives a bluish violet soln. with a similar fluorescence; the vat is wine-red and dyes cotton and rayon reddish brown; Cr-mordanted wool dyes a dark violet brown. Chlorination of the quinone gives a mixt. of di-Cl and tetra-Cl derivs.; BzCl gives the tetra-Bz deriv. of the di-Cl deriv., golden yellow; the concd. H_2SO_4 soln. is carmine red with a brick-red fluorescence. XX. KONRAD FUNKE, FRANZ KIRCHMAYER AND HERBERT WOLF. *Ibid* 221-7.—Reduction of dinitroperylene with PhNHNH_2 , N_2H_4 , H_2O in a bomb or in $\text{C}_6\text{H}_5\text{Me}$, or NaHSO_3 gives the diamino deriv., $\text{C}_{20}\text{H}_{12}\text{N}_2$, brown needles, which do not m. 400° ; concd. H_2SO_4 gives a dark green color. Di-Ac deriv., yellow; dichloroacetyl deriv., yellow; di-Bz deriv., yellow; di- p -chlorobenzoyl deriv., yellow; di- p -bromobenzoyl deriv., yellow; di- α -naphthoyl deriv., yellow; perylenediurethan, yellow; dibenzylidene deriv., light brown; di- α -hydroxybenzylidene deriv., Cu-red; monophthaloyl deriv., deep brown; diphtaloyl deriv., orange-red; monophthaloyl-mono- p -chlorobenzoyl deriv., light brown. XXI. ALFRED PONGRAIZ AND EMERICH PÖCHMÜLLER. *Ibid* 228-33.—Heating 3,9-dibenzoyl-4,10-dichloro- or di-bromoperylene with CuCN in quinoline about 1 hr. gives 3,9-dibenzoyl-4,10-diisocyanoperylene, brick-red leaflets, does not m. 360° , sol. in 300 parts PhNO_2 or 80-100 parts quinoline; the concd. H_2SO_4 soln. is emerald-green. Sapon. with concd. H_2SO_4 gives 3,9-dibenzoyl-4,10-diaminoperylene, dark needles with slight metallic luster, concd. H_2SO_4 gives an emerald-green soln., from which H_2O ppt. blue flakes; BzCl gives the tetra-Bz deriv., reddish yellow needles, sinters 350° but does not melt. Perylene, $p\text{-BrC}_6\text{H}_4\text{COCl}$ and AlCl_3 in CS_2 give the di- p -bromobenzoyl deriv., yellow, m. 260° ; the concd. H_2SO_4 soln. is ultramarine-blue; CuCN gives the compd. $\text{C}_{24}\text{H}_{12}\text{O}_4\text{N}_2$, reddish brown, m. 293° ; the sapon. product could not be crystd. Dipropionylperylene, brown, m. 247° ; the concd. H_2SO_4 soln. is blue-violet with red fluorescence. Dibutylperylene, yellow-brown, m. 253° . Zn distn. of these compds. gave unsatisfactory results.

C. J. WEST

Difurylethylene. PAUL F. BAUM. Iowa State Coll. *J. Am. Chem. Soc.* 51, 1270-1 (1929).—The polythiofurfuraldehyde obtained by Lintau (*C. A.* 5, 765) by the action of H_2O on furfural in dil. aq. soln., on distn. at $10\text{--}15\text{ mm.}$ ($90\text{--}135^\circ$) gives 18% of a compd., m. 100° , mol. wt. 162, which is believed to be difurylethylene; re-crystn. from EtOH causes the compd. to darken.

C. J. WEST

Constitution of matrine. IX. H. KONDO AND E. OCHIAI. Tokyo Imperial Univ. *J. Pharm. Soc. (Japan)* 48, 941-7 (1928); cf. *C. A.* 20, 2853.—By dry distn. of K matrine with soda lime K. obtained 2 fractions, one sol. in K_2HPO_4 and the other insol. By fractional distn. under reduced pressure of this insol. part K. and O. obtained the following fractions (I-V): $C_9H_{13}N$ (I), b_p 49-50°, gives the pine splinter reaction (p. s. r.). Oxidation of I with PbO_2 and H_2SO_4 gave a cryst. substance, m. 59-61°, which has the properties of succinic acid derivs. $C_{11}H_{15}N$ (II), b_p 65-95°, gives the p. s. r. Catalytic reduction of II with Pd and H gave $C_{11}H_{17}N$, b_p 75-80°. This shows the p. s. r. $C_{11}H_{17}N$ (III), b_p 115-20°, gives the p. s. r. IV is a dark brown substance and gives the p. s. r. Reduction of IV with Pd and H gave a yellow liquid, $C_{12}H_{17}N$, b_p 135-40°. Oxidation of $C_{11}H_{17}N$ and III with PbO_2 and H_2SO_4 gave acid and neutral substances. V is a dark brown liquid, b_p 180-210°. Recrystn. in alc. gave a white paraffin-like compd., $(CH_2)_n$, m. 60.1°. It is certain that the dry distn. of K matrine with soda lime gave pyrrole derivs. having the compns. $C_9H_{13}N$, $C_{11}H_{15}N$ and $C_{12}H_{17}N$. $C_{11}H_{15}N$ has 1 unsatd. double bond on the side chain while the other 2 compds. have no unsatd. side chain. All have a pyrrole nucleus. X. Distillation of α -matrinidin with zinc dust. H. KONDO, E. OCHIAI AND S. NAKAMURA. *Ibid* 1035-43.—Distns. of α -matrinidin with Zn dust gave the following constituents: I, ethereal base; II, sol. in K_2HPO_4 ; and III, insol. in K_2HPO_4 . II on further fractional distn. gave IV, b_p 73-6°, V, b_p 117-20°, and VI, b_p 178-80°. IV, $C_{10}H_{15}N$, is in harmony with the $C_{10}H_{15}N$ obtained by distn. of matrine with Zn dust. IV shows no Liebermann reaction. V, $C_{12}H_{17}N$, shows a positive Liebermann reaction. Pt salt, decomp. 317°. V is identical with dihydro- α -matrinidin (*J. Pharm. Soc.* No. 537, 907). VI, $C_{11}H_{15}N$, gives a positive Liebermann reaction. Pt salt decomp. 216-7°. Au salt, m. 120°. Picrate, m. 211°. VI is hardly reducible. III by fractional distn. gave VII, b_p 70-140°, and VIII, b_p above 140°. Both show a positive Liebermann reaction. Catalytic reduction of VII gave K_2HPO_4 -sol. and K_2HPO_4 -insol. fractions. The former is $C_{11}H_{15}N$, m. 150-1°, and the latter corresponds to $C_9H_{13}N$. Summary: Dry distn. of α -matrinidin with Zn dust gave dihydro- α -matrinidin, $C_{10}H_{15}N$, $C_{12}H_{17}N$, NH_3 , $C_9H_{13}N$ and other pyrroles. α -Matrinidin has a pyrroline nucleus and changes to pyrrole derivs. on dehydrogenation (*C. A.* 20, 2853). $C_9H_{13}N$ is formed by decomp. of α -matrinidin. Of two N atoms in $C_{11}H_{15}N$, one has no basic properties while the other acquires such a property on reduction. The former N forms a pyrroline nucleus in α -matrinidin and the latter a quinuclidine nucleus-forming N. The quinuclidine nucleus of α -matrinidin like the pyrroline nucleus loses its basic property on dehydrogenation. The quinuclidine nucleus is made up by condensation of 2 pyrrolidine nuclei and is called hypoquinuclidine. XI. H. KONDO, E. OCHIAI AND K. NISHIMURA. *Ibid* 1043-50.—Methylmatrine Me ester (*C. A.* 21, 2135) in 100 cc. abs. alc. and MeI (48 g.) and Mg (8 g.) in 100 cc. abs. alc. gave 11 g. of a tertiary alc., dimethylmethylmatrinol (I), b_p 174-5°, m. 47.5°. Pt salt decomp. 243-5°. Au salt decomp. 164-6°. Picrate, m. 140°. Methiodide, m. 234-5°. I cannot be acetylated. Dehydration of I gave negative results. I and PCl_5 in $AcCl$ at 100° gave $C_{11}H_{15}N_2Cl$ (II), b_p 171.5°; Pt salt, decomp. 242°. Attempts to take away HCl from II and produce a double bond ended in failure. The authors suggest that

the CO_2H group adjacent to the C of matrine is tertiary, $\begin{array}{c} C \\ \diagup \quad \diagdown \\ C \end{array} \rightarrow CCO_2H$. XII. *Ibid*

1051-64.—Kondo and Ochiai (*C. A.* 21, 2135) obtained by Hofmann's rearrangement of methylmatrine Me ester a primary amine, descarbonylmethylmatrinamine (I), b_p 188-9°. I neutralized with HBr and diazotized with $AgNO_2$ gave descarbonylmethylmatrinan, $C_{10}H_{15}N_2$ (II), b_p 141-4°, d_4^{20} 1.02927, n_D^{20} 1.52747, and descarbonylmethylmatrine alc. (III), $C_{10}H_{15}N_2O$, b_p 180.8°. II does not show Liebermann's reaction. It gave AgI corresponding to 2 Me groups. Pt salt, decomp. 264°. Au salt, decomp. 197°. II, red P and HI heated 5 hrs. at 260-70° gave $C_9H_{13}N$ (IV), b_p 74-5°, and $C_{11}H_{15}N_2$ (V), b_p 147-9°. IV shows no Liebermann reaction. Pt salt, decomp. 198-210°. Au salt, m. 115-7°. III shows Liebermann's reaction. Pt salt, decomp. 239-40°. III contains one HO and two Me radicals. Acetylation and benzoylation gave negative results. It is certain that II does not contain a double bond and on catalytic reduction it loses a Me radical attached to N and produces a secondary amine, $C_{10}H_{15}N_2$. The formation of an imido group in III is interesting. The fact that it gave AgI corresponding to two NMe groups indicates that the N of the pyrrolidine nucleus has the $>NMe$ form and the new $>NH$ radical is the result of the opening of the hypoquinuclidine nucleus and on thermal decompn. the char-

acteristic CH_2 group, which changes into CH , unites with the imido group. It is certain that III contains one OH radical.

F. I. NAKAMURA

Reactions between furfural, aniline and malonic acid. THEODOR BOEHM. Univ. Berlin. *Arch. Pharm.* 267, 129-41 (1929).—Summarizing the results of the present study it is shown that on heating a mixt. of furfural, aniline and malonic acid in alc. there is formed, contrary to the belief of Knoevenagel, furfuralmalonic acid in 50% yield (based on the wt. of furfural), provided the components react at room temp. The furfuralmalonic acid thus formed immediately unites with the condensation product of furfural and aniline, furfuraniline, to yield a salt having a pronounced dye-stuff character. The reactions involved are represented by the following equations: 1. $2\text{PhNH}_2 + 2\text{C}_4\text{H}_3\text{O}\cdot\text{CHO} \rightarrow 2\text{H}_2\text{O} + 2\text{PhN}:\text{CH}\cdot\text{C}_4\text{H}_3\text{O}$. 2. $\text{PhN}:\text{CH}\cdot\text{C}_4\text{H}_3\text{O} + \text{CH}_2(\text{CO}_2\text{H})_2 \rightarrow \text{C}_4\text{H}_3\text{O}\cdot\text{CH}:\text{C}(\text{CO}_2\text{H})_2\cdot\text{NHPh}$. 3. $\text{O}\cdot\text{CH}:\text{CH}:\text{CH}:\text{C}(\text{CO}_2\text{H})_2\cdot\text{NHPh} + \text{O}\cdot\text{CH}:\text{CH}:\text{CH}:\text{C}(\text{CO}_2\text{H})_2\cdot\text{NHPh} \rightarrow \text{PhNHCH}:\text{CH}:\text{CH}:\text{C}(\text{CO}_2\text{H})_2\cdot\text{NHPh}$.

$\text{CH}:\text{NPh} + \text{O}\cdot\text{CH}:\text{CH}:\text{CH}:\text{C}(\text{CO}_2\text{H})_2\cdot\text{NHPh} \rightarrow \text{PhNHCH}:\text{CH}:\text{CH}:\text{C}(\text{CO}_2\text{H})_2\cdot\text{NHPh}$ (I). Reaction 3 finds its

analogy in that between furfuraniline and $\text{PhNH}_2\cdot\text{HCl}$. In this connection a fact is worthy of mention which might lead to another interpretation. Namely, the condensation also takes place when aniline is replaced by the furfuraniline base, $\text{PhNHCH}:\text{CH}:\text{CH}:\text{C}(\text{OH})\text{CH}\cdot\text{NPh}$. On mixing the latter with furfural in alc. and adding the calcd. amt. of malonic acid, the above-mentioned malonic acid salt of the base seps. In the course of a few hrs., however, it passes completely into the furfuralmalonic acid salt (I). With furfural alone the furfuraniline base fails to react. The condensation cannot therefore in this case take place in the above formulated manner. It appears not improbable that in such case an immediate condensation is effected very like that between barbituric acid or malonitrile and aldehydes, and as occasionally observed between malonic acid anilide and aldehydes. This assumption should not be too readily ignored, since one can easily imagine that the methylene H atoms of malonic

acid in the system: $\begin{bmatrix} \text{CH}:\text{C}(\text{OH})\text{CH}\cdot\text{NPh} \\ | \\ \text{CH}:\text{CHNHPH} \end{bmatrix}$ $\begin{matrix} \text{HO}_2\text{C} \\ \text{HO}_2\text{C} \end{matrix} \text{CH}_2$ are, through require-

tion of the CO_2H groups by the base, brought into a similar condition of activation peculiar to the methylene H atoms of barbituric acid. Among the compds. prepd. and characterized in the present investigation are: *Furfuranilino furfuralmalonate*, $\text{C}_{17}\text{H}_{12}\text{O}_6\text{N}_2$, 0.5EtOH, when crystd. from EtOH, nearly black needles with violet sheen, m. 106-7° (the corresponding compds. from MeOH, m. 103-10°, from iso-PrOH, m. 99-100°, from AcOH, m. 117-8°); *HCl salt*, $\text{C}_{17}\text{H}_{12}\text{O}_6\text{N}_2\cdot\text{HCl}$, m. 167-9°; *p-toluidino furfuralmalonate*, $\text{C}_{17}\text{H}_{12}\text{O}_6\text{N}_2$, 0.5EtOH, greenish violet needles, m. 128-9° (decompn.); *m-toluidino furfuralmalonate*, violet needles, m. 98-100°; *p-chloroanilino furfuralmalonate*, $\text{C}_{17}\text{H}_{10}\text{O}_6\text{N}_2\cdot\text{Cl}$, nearly black crystals, m. 120-1°; *p-bromoanilino furfuralmalonate*, greenish black brilliant needles, m. 121-2°; *p-phenetidino furfuralmalonate*, $\text{C}_{19}\text{H}_{14}\text{O}_6\text{N}_2$, dark blue prisms, m. 135-6°; *pseudocumidino furfuralmalonate*, $\text{C}_{19}\text{H}_{14}\text{O}_6\text{N}_2$, 0.5EtOH, dark green crystals, m. 97-9° (decompn.); *furfuranilino malonate*, $\text{C}_{17}\text{H}_{12}\text{O}_6\text{N}_2$, 0.5EtOH, wine-red crystals, m. 107-8°; *furfuranilino oxalate*, $\text{C}_{17}\text{H}_{12}\text{O}_6\text{N}_2$, EtOH, carmine red prisms 135-6° (decompn.); *alc. free salt*, dark violet, m. 138-9°; *furfuranilino nitrate*, $\text{C}_{17}\text{H}_{12}\text{O}_6\text{N}_2$, $\text{C}_2\text{H}_5\text{O}_2$, blue-violet needles, m. 63°; *furfuranilino fumarate*, $\text{C}_{17}\text{H}_{12}\text{O}_6\text{N}_2$, 0.5EtOH, violet needles, m. 137-8°; *furfuranilino tartrate*, $\text{C}_{17}\text{H}_{12}\text{O}_6\text{N}_2$, 0.5EtOH, violet needles, m. 159-62° (decompn.); *furfuranilino citrate*, $\text{C}_{17}\text{H}_{12}\text{O}_6\text{N}_2$, 0.5EtOH, dark violet needles, m. 130-1° (decompn.). W. O. E.

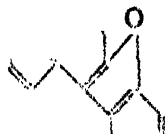
Formation of pyrrolines from γ -chloropropyl and cyclopropyl ketimines. JOHN B. CLOKE. Univ. of Chicago and Rensselaer Polytechnic Inst. *J. Am. Chem. Soc.* 51, 1174-87 (1929).—2-Phenylpyrroline (I) results by the action of PhMgBr upon $\text{Cl}(\text{CH}_2)_2\text{CN}$; most of the I is initially obtained in the form of its HCl salt (II) which results from the rearrangement of $\text{Cl}(\text{CH}_2)_2\text{C}(\text{NH})\text{Ph}$ (III). III was obtained impure from the above reaction if the heating was continued for only 2 hrs.; another portion of the reaction mixt. gave the impure HCl salt, m. 85-8°; its most significant property was the rate of reaction with H_2O at 0°, the const. k for a monomol. reaction being 0.363. If the reaction product of PhMgBr and $\text{Cl}(\text{CH}_2)_2\text{CN}$ is not heated, there is isolated the bromomagnesium deriv. of III, which crysts. with a mol. of EtO, decomps. with dil. HCl gives *phenyl γ -chloropropyl ketone*, b. 120-1°, d_4^{20} 1.149, n_D^{20} 1.55433; *semicarbazone*, m. 136-7°; with cold EtOH- NH_3 the ketone gives about 10% of I. Heating the HCl salt of III above its m. p. causes rearrangement into II. I is also formed by the action of heat on phenylcyclopropyl ketimine. Curves are given

which show the effect of temp. and the presence of the HCl salt on the stability of the base. These facts, together with a general study of ketimine stability, have led to the proof that de Booseré's so-called Et cyclopropyl ketimine-HCl, which is described as remarkably stable toward hydrolysis, is in reality a pyrroline deriv. C. J. WEST

Synthesis and structure in the series of tetrahydrodiphenylene oxides. F. EBEL. *Helv. Chim. Acta* 12, 3-16(1929).—PhONa (dry) and 2-chlorocyclohexanone heated in excess of phenol or an inert solvent yield 2-phenoxycyclohexanone (I), m. 64.5°. If the temp. rises above 84°, especially under the catalytic influence of HCl, H₂O is eliminated from I, yielding tetrahydrodiphenylene oxide (II). Other phenol or naphthol salts may be substituted for PhONa; but other halogenated ketones give negative results. I reacts with PhNHNH₂ forming cyclohexanol-2-one osazone (III), yellow needles, m. 152-3°. E. considers I to possess the cyclic acetal structure:

$\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}(\text{C}(\text{OPh})\text{O})$. I is unassociated in PhH, whereas the cor-

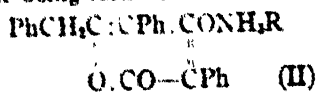
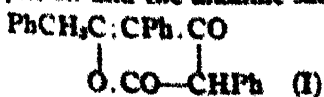
responding Et and Me ethers are bimol. E. therefore questions the structure of comps. prepd. by Kotz (cf. C. A. 7, 3748). II heated with S yields diphenylene oxide, but similar dehydrogenation of tetrahydrophenylene naphthylene oxide (IV) (the "brasane" of v. Kostanecki (cf. C. A. 2, 2938)) failed. E. believes IV has the angular structure



instead of the linear structure assigned to it by v. K. The following

comps. are described: 6-(3-Nitrotetrahydrodiphenylene oxide, yellow needles from alc., m. 120.5°. O-Anisyl-lactolide of cyclohexanol-2-one, white needles or prisms from petroleum ether, m. 67.5°. 8-Methoxy-3,4,5,6-tetrahydrodiphenylene oxide, m. 39.5°. β-Naphthyl-lactolide of cyclohexanol-2-one, m. 135°. Tetrahydrophenylene naphthylene oxide (IV), m. 145°. 8-Salicyloylvalerolactone peroxide, m. 191°. M. A. DAHLEN

Interaction of benzyldiphenylpyronone with ammonia and amines. I. SHETTLÉ. *Odessa Chem. Pharm. Inst. J. Russ. Phys.-Chem. Soc.* 60, 1521-33 (1928).—Benzyldiphenylpyronone (I), which was prepd. by Wedekind (C. A. 5, 1273) by condensing PhCH₂COCl by means of NEt₃, forms with NH₃ or amines addn. products (II) which may be regarded as salts, the pyronone acting as an acid. These reactions have now been studied by S. under various conditions, and the products obtained have been examd. These derivs. can be obtained either by passing a current of NH₃ or the corresponding amine into I in 10% aq. K₂CO₃, or by mixing a concd. soln. of the base with a concd. soln. of I, or by adding a concd. aqueous soln. of the HCl salt of the base to a soln. of 1 g. I in 15 cc. of 10% K₂CO₃ soln. The NH₃ deriv. was also prepd. by passing a current of dry NH₃ into fused I; this reaction does not work with amines. **Properties.**—All the derivs. are obtained in good yield. On being heated they commence to decomp. below their m. ps. The m. ps. (with decompn.) of the derivs. are as follows: NH₃, 190-1°, MeNH₂, 180.2°, EtNH₂, 180-3°, PrNH₂, 186-90°, PhNH₂, about 120°, NEt₃, 122-3°. By prolonged heating below their m. ps. they finally split off all NH₃ or the corresponding amine and yield the original pyronone. With the exception of the PhNH₂ and EtNH₂ derivs., they do not dissolve in cold C₆H₆, Et₂O, CHCl₃, ligroin, but have a better soly. in cold EtOH and are readily sol. in hot EtOH. The alc. solns. of the NH₃, PhNH₂ and NEt₃ derivs., after being evapd. 3-4 times, split off the base with formation of the original pyronone; the other amino derivs. are more stable and can be recrystd. without decompn. All the derivs. dissolve in warm carbonates or in cold caustic alkalis, NH₃ or the corresponding amine being split off and the alkaline salt of the pyronone being formed

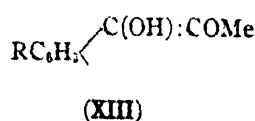
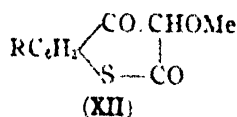
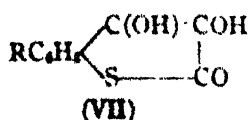
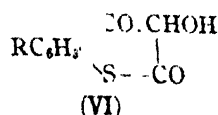
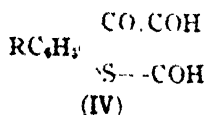
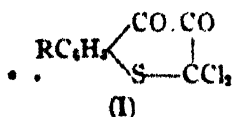


BERNARD NELSON

Thiochromonediols. F. ARNDT AND B. EISTERT. Univ. Breslau. *Ber.* 62B, 36-44(1929).—As was briefly mentioned by A. (C. A. 20, 1397) and described in detail by E. (Diss. Breslau, 1927), when 2,2-dichlorothiochromonol (I, R = H) is boiled with H₂O it gives, along with thionaphthequinone (II), a colorless compd. (III) to

which was assigned the structure of 2,3-dihydroxythiochromone (thiochromonediol) (IV). A short report on this work is now given because the results have a bearing on the detn. of the structure of the 2,3-dihydroxyquinoline described in the following abstr. The work was done chiefly with the 6-Me compds. ($R = \text{Me}$). Krollpfeiffer and Sommermeyer have pointed out that the S content of the III corresponds to that of a 2,3,4-triketothiochroman (V) but the analyses as a whole agree better with IV. Furthermore, V would be expected to be colored and the simultaneous formation of II could be ascribed only to a further secondary decompn. of V with elimination of CO_2 , whereas III is, as a matter of fact, not changed by H_2O and the treatment of I with H_2O always gives II and III in about equal quantities, with liberation of CO_2 in an amount corresponding to the equation $2\text{C}_{10}\text{H}_6\text{O}_2\text{Cl}_2\text{S}$ (I) $+ 3\text{H}_2\text{O} = \text{C}_{10}\text{H}_6\text{O}_2\text{S}$ (III) $+ \text{C}_8\text{H}_6\text{O}_2\text{S}$ (II) $+ \text{CO}_2 + 4\text{HCl}$. This can be explained by assuming that V is in fact formed first but that 2 mols. react with another mol. of H_2O , 1 being oxidized to II and CO_2 and the other reduced to VI, and the VI, being a ketol, tends to enolize into IV or the thiocoumarindiol VII. That III really contains two HO groups is shown by the easy formation with Ac_2O of a diacetate which is readily saponified back to the original III. On slow addn. of CH_3N_3 , III gives chiefly a mono-Me ether which must be an *O*-ether as it regenerates III with boiling concd. HCl , dissolves in concd. HCl (i. e., has the basic properties of the thiochromone system) and forms the intensely yellow alkali salts, difficultly sol. in 2 *N* alkalis, characteristic of thiochromones. There can be no doubt, therefore, that it is a 2-methoxythiochromonol (VIII) and that the Me radical has entered the 2-HO group. The free diol must, therefore, also contain a 2-HO group (formula IV), at least in part. On further methylation with CH_3N_3 , VIII slowly yields a homogeneous di-Me ether (IX) which can be only a 2,3-dimethoxythiochromone; it dissolves in 3 *N* HCl and on boiling loses one Me group, yielding a mono-Me ether (X) different from VIII and which must therefore be a 2-hydroxy-3-methoxythiochromone. X is also obtained from III with alk. Me_2SO_4 , showing that III dissolves in alkali without rupture of the ring; long boiling with alkalis, however, results in degradation, finally to the corresponding thiosalicylic acid. X reacts vigorously with excess of CH_3N_3 , about half regenerating IX and the other half forming an isomer (XI) of IX which likewise gives no HO or ketone reactions but is also almost completely devoid of basic properties. The difference in the behavior toward CH_3N_3 of VIII and X can be readily explained by assuming that VIII is incapable of further tautomerization while X can pass through the hypothetical keto form XII and then enolize to the coumarin form XIII; both XII and XIII can form with CH_3N_3 isomers of IX having no appreciable basic properties, XII an ethylene oxide, XIII a di-Me ether. As XI does not behave like an ethylene oxide, it is believed to be the 3,4-dimethoxythiocoumarin. Attempts to establish a relationship between XI with the simple thiocoumarin on the 1 hand and with 4-hydroxythiocoumarin on the other are described in R.'s dissertation; the results are in harmony with the structure XI but are not conclusive because the products cannot be characterized. XI is also obtained from the III with CH_3N_3 , in the mother liquors from the VIII, and is formed in larger amount when the III is treated from the very first with an excess of CH_3N_3 . As X is distinctly more acid than VIII, the 2- is more acid than the 3-HO group in III and is therefore methylated first by CH_3N_3 , whereas Me_2SO_4 methylates the 3-HO group so that the 2-MeO group is hydrolyzed by acids like a CO_2Me group, the 3-MeO group with difficulty, like a phenol ether. Again, the 3-HO group gives the characteristic color reactions of a phenolic HO group with FeCl_3 (chromonols and thiochromonols brown-violet, III dark green, VIII blue-green to blue-violet). X, on the other hand, gives a much weaker gray-brown color (undoubtedly because of the presence of XIII while IX and X give no color. Attempts to apply the above series of reactions to thiochromonols failed because the 2,2-dichlorochromonols could not be prepared; the most vigorous chlorination gave only the mono-Cl deriva. I ($R = \text{Me}$) gives 2-methylthiochromonol and SO_2Cl_2 , yellow, m. $138-9^\circ$ (decompn.), gives with boiling H_2O . 2,3-Dichlorothiochromonol (I, $R = \text{H}$), faintly yellow, (decompn.), gradually decompn. in solvents above 70° . 6-Methylthiochromone (IV, $R = \text{Me}$), sepa. from AcOH on slow cooling and scratching in stout mother liquors, on rapid cooling in fine felted needles which rearrange into the form of the mother liquors. At high temps. the felted type is the stable form; on the rearrangement into the stout form is slower than in AcOH . No difference in the behavior of the 2 forms toward CH_3N_3 could be noted. The IV sinters about 224° (decompn.) on rapid, at a lower temp. on slow heating, dissolves in NaOH only on heating, with faint yellow color; diacetate, m. 176° , gives no color with FeCl_3 is not attacked by Br in CHCl_3 . Thiochromonediol, sinters 190° , m. 210° (decompn.)

diacetate, m. 174°. 2-Methoxy-6-methylthiochromonol (VIII), colorless needles becoming yellow on standing, m. 157°. 2,3-Dimethoxy-6-methylthiochromone (IX), m. 120°. 2-Hydroxy-3-methoxy-6-methylthiochromone (X), slender needles with 1 H₂O from half-dild. MeOH, m. 106-7° and, anhyd., 125-6°, slowly reabsorbs the H₂O of crystn. from the air in the cold, dissolves easily in Na₂CO₃ and NH₄OH without color, also slowly in concd. HCl. 3,4-Dimethoxy-6-methylthiocoumarin (XI) (?), m. 52-3°, sol. in 2 N NaOH only on long heating with faint yellow color, K₂Fe(CN)₆ pptg. a colorless oil (dimethoxymethylthionaphthene²); it is insol. in half-concd. HCl and with much fuming HCl gives a cryst. magma of what is apparently an exceedingly unstable HCl salt. Isonitrosochromanone, faintly yellow, turns brown on recrystn., m. 155° (decompn.), is prepd. through the K salt (65-70% yield) from chromanone, K and AmONO in AmOH; 6-Me deriv., m. 162° (decompn.). Chromonol, obtained in 50-70% yield from the above K salt and boiling HCl, m. 181°; 6-Me deriv., m. 175°. 2-Chlorochromonol, from the chromonol with SO₂Cl₂ on the H₂O bath or at 120° or with Cl in CHCl₃, m. 208°, sol. in dil. alkalis with yellow color; 6-Me deriv., m. 192°.



C. A. R.

Syntheses with diazomethane. VI. The reaction of ketones and aldehydes with diazomethane. F. ARNDT, B. EISTERT AND W. ENDER. *Ber.* 62B, 44-56(1929); cf. C. A. 22, 2932.—It had already been pointed out that the reaction leading from an aldehyde to an ethylene oxide is also to be expected of ketones provided the C:O group is influenced by substituents analogously to the C=O group in those aldehydes which yield ethylene oxides, i. e., ketones having a pronounced hydrate-forming tendency. This expectation had been verified in expts. with ketomalonic and mesoxalic esters and alloxan, and the study of a 3rd example, isatin, which is the subject of the present report, had been carried out when there appeared a paper by Meerwein and Burneleit (C. A. 23, 97) which forced A., E. and B. to publish at once their own results and their plans for future work. M. shows that even the simplest ketones (Me₂CO) can react with CH₂N₂ in the presence of catalysts (e. g., H₂O and MeOH). As the chief product from Me₂CO he obtained *asym*-dimethylethylene oxide but he also found new ketones, especially MeCOEt, which, as he emphasizes, can be explained only by a migration

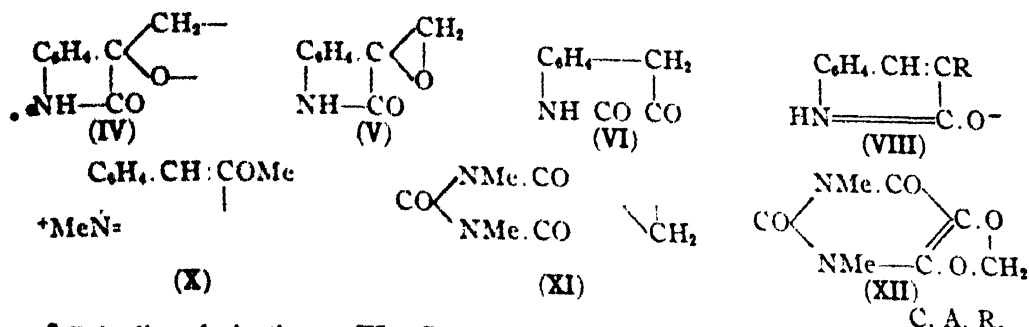
of a Me to the CH₂ group in the intermediate product $\text{MeC} \begin{array}{l} \diagup \text{O} \text{---} \\ \diagdown \text{Me} \end{array} \text{---CH}_2\text{---}$, and he considers

it probable that the O₂NC₆H₄CH₂COMe found by Arndt as by-products in the reaction between *o*- and *p*-O₂NC₆H₄CHO likewise result from a further reaction with CH₂N₂ of O₂NC₆H₄COMe partly formed, with migration of the O₂NC₆H₄ group. A. had interpreted this reaction as following the course $\text{RCHO} \rightarrow \text{RC} \begin{array}{l} \diagup \text{O} \text{---} \\ \diagdown \text{CH}_2\text{---} \end{array} \rightarrow \text{RCH}_2\text{---}$

$\text{CHO} \rightarrow \text{RCH}_2\text{COMe}$, as radical migration seemed little probable under the mild conditions of the reaction, but he now found that if pure *o*- and *p*-O₂NC₆H₄COMe (which give only a yellow color with alkalis in alc.) are allowed to stand 12 hrs. with CH₂N₂ in Et₂O, there are obtained on evapn. residues which in alc. with alkalis give the characteristic intense color reactions of O₂NC₆H₄CH₂COMe if H₂O or MeOH had been present. This strongly supports M.'s view, which is also adopted by A. The reaction of piperonal with CH₂N₂ fully supports A.'s contention, however, that it is the nature of the aldehyde itself, not the exptl. conditions, which det. the course of the reaction; catalysts under certain conditions may accelerate the reaction but do not change it qual. From isatin and CH₂N₂, Heller obtained 2,3-dihydroxyquinoline (I) as chief product, together with substances m. 175° (II) and 190-2° (III). It was to be expected that the real C:O group in isatin, i. e., that in position 3, would first form the intermediate product IV which would then in part form the ethylene oxide (V) and in part rearrange through VI into I. Such proved to be the case; H.'s II is in fact V, characterized by its chlorohydrin. I was also obtained along with the

II, but always with considerable quantities of its 3-Me ether (VII), m. 194°, probably identical with H.'s III. From the results obtained with the thiochromonediois (cf. preceding abstr.) it would have seemed that the 2-HO group in I would be methylated first by CH_3N_3 , but VII, although it forms a difficultly sol. Na salt, is sapond. by concd. HCl only with extreme difficulty and gives no color reaction with FeCl_3 , while 3-hydroxyquinoline does give a brown-red color; VII must therefore be the 3-Me ether and in I it is the 2-HO group which is the less reactive and less acid. VII (or its tautomeric form, for which the betaine structure (VIII, $\text{R} = \text{Me}$) is preferred to the quinolone formula) is only quite weakly acid and in the absence of H_2O is hardly, in its presence only slowly, further methylated to the di-Me ether (IX) which, in the liquid form and as a true quinoline deriv., is pronouncedly basic but rearranges spontaneously into the solid, hardly basic isomer X. All these facts are in harmony with Meyer's observations with carbostyryl. The study of the reaction between ketones and CH_3N_3 will be continued, not from the point of view of the influence of catalysts on the kinetics of the reaction but to det. the influence of constitutional factors on the qual. course of the reaction, including the intermediate stages. *p*-Nitrophenylethylene oxide (34) 3.8 g. from 10 g. $\text{O}_2\text{NC}_6\text{H}_4\text{CHO}$ allowed to stand 3-4 hrs. with 1.5 mols. CH_3N_3 in Et_2O with or without an equal vol. of MeOH , m. 84-5°, boils under atm. pressure without deflagration or material decompn., is only locally altered by moistening with concd. H_2SO_4 but with much acid reacts quite violently, blackening and evolving CO_2 ; concd. HCl liquefies it to the chlorohydrin; boiling 60%, H_2SO_4 gives no odor of HCHO ; HCl , BzCl and Ac_2O are added as with ordinary ethylene oxides but none of these addn. products has thus far been obtained in cryst. form. Along with the oxide are formed (with or without MeOH) 2.6 g. *p*-($\text{CH}_3\text{N}_3\text{C}_6\text{H}_4\text{COMe}$), m. 80°, and 0.3 g. (without MeOH) or 0.6 g. (with MeOH) of *p*-nitrophenylacetone, m. 62°. $\text{C}(\text{OH})_2(\text{CO}_2\text{Et})_2$ (15 g.) added to CH_3N_3 in Et_2O reacts at once with vigorous evolution of N and yields 12 g. di-Et ethylene oxide 1,1-dicarboxylate, b_p 127-8°, insol. in cold 2 *N* NaOH , slowly dissolves on heating with yellow color and development of the odor of alc., evolves CO_2 on acidification. With $\text{C}(\text{OAc})_2\text{Et}_2$ instead of $\text{C}(\text{OH})_2(\text{CO}_2\text{Et})_2$, CH_3N_3 reacts vigorously, to be sure, but there is no evolution of N until, after 2 hrs., the Et_2O is distl. off under atm. pressure. Di-Et ethylene chlorohydrin-1,1-dicarboxylate (41) from 5 g. of the oxide in cold alc. with HCl gas, b_p 152-3°, does not react with CH_3N_3 even in the presence of H_2O . With Ac_2O and FeCl_3 the oxide gives H_2O and a compd., b_p 152-6°. The ethylene oxide (X) obtained from alloxan and CH_3N_3 (described by Biltz and Paetzold as a methylene ether (XII), m. 170°), seps unchanged from Ac_2O after boiling 2 mins. but if a little FeCl_3 is added reaction takes place in the cold with appreciable evolution of heat. XI dissolves in very little 2 *N* NaOH with remarkable evolution of heat, the soln., if kept cold, remains clear (evolving CO_2 on acidification, but on boiling deposits an oil sol. in H_2O and insol. in Et_2O (presumably a uracil or hydantoin); on boiling with much dil. alkali the odor of HCHO develops. *Phenyl glycol*, $-\text{CO}_2\text{C}(\text{OAc})(\text{CH}_2\text{OAc})\text{CO}_2-$, from XI with Ac_2O and FeCl_3 , m. 97°. *Hydrin*, $-\text{CO}_2\text{C}(\text{OH})(\text{CH}_2\text{Cl})\text{CO}_2-$, shows the properties given by B. and P. for the compd. they formulated as $-\text{CO}_2\text{C}(\text{OH})\text{C}(\text{OCH}_2\text{Cl})-$; benzoate, from XI or the chlorohydrin with BzCl in $\text{C}_6\text{H}_5\text{N}$, m. 173-4°. From 10 g. isatin and the CH_3N_3 from 18 cc. $\text{MeN}(\text{NO})\text{CO}_2\text{Et}$ allowed to stand with frequent shaking in Et_2O for 3-4 hrs. at -5° are obtained 1.5-1.8 g. V, 1.5-6.2 g. VII and 2-3 g. I. The faster the action and the more H_2O or MeOH is present, the more completely is the isatin trans. formed but also the more is the I further methylated to VII; the above max. yields correspond to a min. of unchanged isatin. V, faintly yellow, m. 175°, gives no color with FeCl_3 , does not react with $\alpha\text{-O}_2\text{NC}_6\text{H}_4\text{NHNH}_2$, does not dissolve in cold 2 *N* Na_2CO_3 and on heating resinifies, dissolves at once in 2 *N* NaOH with evolution of heat and darkening, gradually dissolves in cold 60% H_2SO_4 and develops the odor of HCHO on boiling while H_2O gives a flocculent ppt. which decomps. around 120° and reduces FeCl_3 , possibly it is methylenedioxindole. 3-Chloromethyl-2-hydroxyindoline, from V and concd. HCl , m. 182-3° (decompn.), gives in aq. alc. no AgCl with AgNO_3 until it has stood for some time (more quickly on heating), gives no color with FeCl_3 , resinifies with BzCl in $\text{C}_6\text{H}_5\text{N}$, behaves like V toward alkalis. 3-Hydroxycarbostyryl (I or VIII, $\text{R} = \text{H}$), m. 257-8°, gives in alc. with FeCl_3 a dark blue-green color, dissolves readily and clear in cold 2 *N* NaOH and even Na_2CO_3 , absorbs Br in CHCl_3 without evolution of HBr , forming a red addn. product converted by alc. into a colorless substitution product which gives a FeCl_3 reaction. 3-Benzoyl, from I boiled a short time with 1 mol. BzCl in $\text{C}_6\text{H}_5\text{N}$, m. 286-7°, gives no color with alc. FeCl_3 , slowly sol. in cold, rapidly in hot 2 *N* NaOH , with hydrolysis in both cases. Dibenzoyl, from I boiled 3 mins. in $\text{C}_6\text{H}_5\text{N}$ with an excess of BzCl , m. 45-6°, slowly

sol. in 2 *N* NaOH, acids pptg. BzOH and a substance giving a FeCl₃ reaction (probably the 2-benzoate); concd. HCl hydrolyzes the dibenzoate to the 3-benzoate. 3-Br like I, the substitution product m. 283°. Benzoate, m. 130-1°, stable toward even boiling 2 *N* NaOH, sapond. by concd. HCl to VII. IX, oil forming in HCl a difficultly sol. complex with HgCl₂. *N*-Methyl-3-methoxycarbostryl (X), m. 70-1°, insol. in 2 *N*, sol. in concd. HCl.



*Quinoline derivatives. XI. Synthesis of substituted 2-phenyl-4-ethylquinolines. HANNS JOHN AND MAX E. SCHMIED. *J. prakt. Chem.* 121, 177-92(1929); cf. *C. A.* 22, 2358.—PhNH₂·HCl (10 g.) and 7.5 g. PhCH·CHCOEt, melted together, cooled, treated with 15 drops concd. HCl and 3.75 cc. H₂O and boiled for 16 hrs., give 14% 2-phenyl-4-ethylquinoline, m. 50°; using the appropriate amine the following derivs. were prepd.: 6,8-di-Me, m. 88° (7.5% yield); 8-MeO, m. 76° (13.1% yield); 5 (or 7)-Me, m. 112° (20% yield); 5 (or 7)-HO, m. 219° (13.9% yield); 5 (or 7)-MeO, m. 52°, from the HO deriv. and Me₂SO₄; 5 (or 7)-EtO, m. 118° (35.7% yield); 6-Me, m. 100° (10.8% yield); 6-Et, m. 158°; 6-Cl, m. 65.6° (2.3% yield); 6-HO, m. 149° (3.6% yield); 6-MeO, m. 193°; 6-EtO, m. 122-3°; the HO deriv., iso-BuI and KOH give the 6-iso-Bu ether, m. 96°; 6-iso-Am ether, m. 91°; 6-allyl ether, m. 116°; 6-phenacyl ether, m. 136°. The HCl, H₂SO₄, and HNO₃ salts are dual. described, as well as many double salts. C. J. WEST

β-Sulphydrylic-α-quinoline-γ-carboxylic acid and some quinoline derivatives. C. GRÄNACHER AND C. KOUNINOTIS. *Zurich Univ. Helv. Chim. Acta* 11, 1241-52 (1928).—Partially a correction to *C. A.* 17, 2424. The compd. previously described as oxindole-β-sulphydrylic acid, prepd. by the action of NaOH on β-rhodanal-oxindole, is now shown to be β-sulphydrylic-α-quinoline-γ-carboxylic acid, C₈H₆·C(CO₂H)·C(SH)·CONH (I), m. 165.7° (decompn.), whose thiobenzyl deriv.

m. 230°, thiocarboxymethyl deriv. m. 218-21° (decompn.). I is reduced by the Clemmensen method to 2-keto-1,2,3,4-tetrahydroquinoline-4-carboxylic acid, C₈H₆·CH(CO₂H)·CH₂·CO·NH, m. 218-9°. Similarly β-rhodanal *N*-methylloxindole

gives β-sulphydrylic-*N*-methyl-α-quinoline-γ-carboxylic acid, C₈H₆·C(CO₂H)·C(SH)·CO·NMe, m. 146-50° (decompn.), whose thiocarboxymethyl deriv. m. 210°.

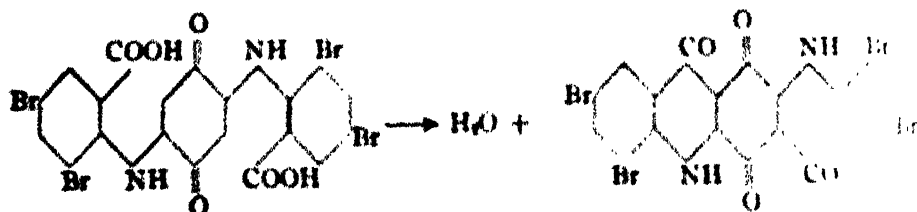
When I is treated with PhNHNH₂ in boiling MeOH, H₂S is eliminated and the pyrazolone deriv. $\begin{array}{c} \text{NPh} \text{---} \text{CO} \text{---} \text{C} \text{---} \text{C}_6\text{H}_5 \\ | \quad \quad \quad | \\ \text{NH} \text{---} \text{C} \text{---} \text{CO} \text{---} \text{NH} \\ 2 \quad \quad \quad 1' \end{array}$ is obtained. The methylation of this compd.

with MeI gives the 2-Me deriv., m. 266°; the 2-Et deriv., m. 256.8°. Further ethylation of these alkyl derivs. gives the corresponding 2-methyl-1' ethyl deriv., m. 212°, and the 2,1'-di-Et deriv., m. 173-4°. The action of PhNH₂ on I yields the 3-anilino deriv., hydrolyzed to 2,3-diketo-1,2,3,4-tetrahydroquinoline-4-carboxylic acid, while NH₂OH gives the anhydride of 3-oximino-2-keto-1,2,3,4-tetrahydroquinoline-4-carboxylic acid. ALBERT L. HENNE

A synthesis of nonhydrogenated isoquinoline derivatives. ERNST SPÄTH AND NIKOLAUS POLGAR. *Univ. Wien. Monatsh.* 51, 190-204(1929).—Homoveratrylamine (I) yields a formyl deriv., b.p. 170°, m. 40-2°, in 98% yield; with P₂O₅ this gives 72% of 6,7-dimethoxy-3,4-dihydroisoquinoline, whose picrate m. 201-3°; dehydrogenation with Pd (heating 1 hr. at 183-5°) gives 80% of 6,7-dimethoxyisoquinoline, m. 89-91°. I gives an acetate, m. 84-5°; with P₂O₅ in PhMe. there results 80% of the 3,4-dihydro

deriv., b, 165-70°, m. 106-7° (picrate, m. 210-2°), of 1-meth-7-dimethoxyisoquinoline, m. 111-2° (picrate, m. 247-9° (81% yield)), by dehyd. with Pd. The propionate of I, m. 60-1°; with P_2O_5 this gives 94% of the dihydro base (picrate, m. 195-6°), of 1-ethyl-6,7-dimethoxyisoquinoline, m. 75-6° (picrate, m. 213-4° (83% yield)). The butyryl deriv. of I, m. 54-5° (quant. yield), gives 93% of the 3,4-dihydro deriv. (picrate, m. 180-1°), of 1-propyl-6,7-dimethoxyisoquinoline, m. 83-4° (picrate, m. 186-7°). Homopiperonylamine yields a formyl deriv., m. 62-3°; Ac deriv., m. 105-6°. 3,4-Dihydro-6,7-methylenedioxyisoquinoline, m. 92-4° (picrate, m. 230-2°); 1-Me deriv., m. 89-91° (picrate, m. 242-4°); 1-Et deriv., m. 96-7° (picrate, m. 205-6°); 1-Pr deriv., m. 78-9° (picrate, m. 183-4°). 6,7-Methylenedioxyisoquinoline, m. 127-8° (picrate, m. 240-1°); 1-Me deriv., m. 159-60° (picrate, m. 263-4°); 1-Et deriv., m. 96-7° (picrate, m. 235-6°); 1-Pr deriv., m. 88-9° (picrate, m. 210-1°). C. J. WEST

Quinonediacridone derivatives. Indigo dyestuffs. V. V. SHARVIN AND D. I. GALPERIN. Moscow High Tech. J. Russ. Phys.-Chem. Soc. 60, 1493-9 (1928). Sharvin's method of quinonediacridone prepn. (C. A. 9, 3056) was slightly modified thus: The condensation product of *p*-benzoquinone with anthranilic acid in H_2SO_4 was poured in a porcelain dish and, after a current of steam had been passed over it for several hrs., abundant crystals of quinonediacridone sulfate pptd.; the latter on being decompd. by H_2O , gave crystd. quinonediacridone. If a strong current of Cl is passed for 2 hrs. into 1 part quinonediacridone in 50 parts $POCl_3$ contg. a few drops of HCl, and then the soln. is poured into cold water, an orange ppt. of the mono-Cl deriv. is formed. If instead of the Cl treatment the above soln. is refluxed for 2 hrs. with Br, the mono-Br deriv. is produced. No more than one Cl or Br atom can be introduced by this method. Both halogen derivs. are orange powders redder than diacridone, possessing properties very similar to the latter. While the attempts to obtain di- and tetra-Cl derivs. failed, dibromoquinonediacridone was prepd. by prolonged heating of quinonediacridone with an excess of Br in a sealed tube, and tetrabromoquinonediacridone was prepd. thus: 3.2 g. *p*-benzoquinone and 5.9 g. dibromanthranilic acid were gradually introduced into 50 g. boiling glacial AcOH and refluxed 5 hrs. giving a cryst. ppt. (small brown plates) of tetrabromoquinonediacridone with (yield, 40%). The crystals were heated in concd. H_2SO_4 3 hrs. at 200°, then dild. by H_2O , upon which tetrabromoquinonediacridone pptd.:

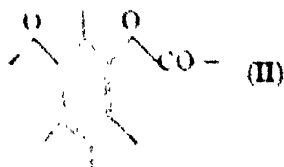
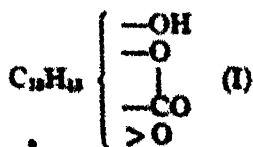


The ppt., washed with alkali, H_2O and EtOH, forms a dark red powder having solubilities and other properties similar to the non-brominated product; like the latter, it gives a cryst. sulfate and is reduced by hydrosulfite in presence of alkalis or Fe to a dihydro product (green-black), then into a tetrahydro deriv. (black violet). *p*-Aminoquinonediacridone was obtained thus: 3 g. dinitroquinonediacridone was triturated in a porcelain mortar with 20 g. cryst. Na_2S giving a black-blue paste which was dild. with 300 cc. H_2O and heated a few hrs. on a water bath; the amino deriv. is a dark lilac powder hardly sol. in $PhNO_2$, pyridine or glacial AcOH. With HCl or H_2SO_4 it gives dark green salts which only exist in presence of the acids and are hydrolyzed on being washed with H_2O . Dibenzoylaminoquinonediacridone was obtained on refluxing a mixt. of 1 g. diaminoquinonediacridone with 20 g. $PhNO_2$, 3 g. $BrCl$, 0.5 g. K_2CO_3 and some anhyd. $CuCl_2$; dildg. the reaction product with EtOH and filtering. Di-*o*-chlorobenzoyldiaminoquinonediacridone was prepd. in a similar manner by operating with *o*- $Cl_2C_6H_4COCl$, both the substituted and the non-substituted benzoyl chloride reacting with the 2 amino groups. The 2 products have very similar properties and present brown amorphous powders hardly sol. in $PhNO_2$ or pyridine. Dihydroxyquinonediacridone, obtained from the corresponding diamino product by diazotization, is a dark red powder dissolving with red color in concd. H_2SO_4 or in weak alkalis. It dyes wool in presence of NH_3 . Quinonediacridone and the above derivs., while stable and capable of reduction by hydrosulfite, do not possess the properties of indigo dyestuffs in view of the inability of their reduction products. They can be transformed into indigo dyestuffs by the introduction of the anthraquinone complex, thus forming compds. of the type $RNH.R'.NHR$, where R is the anthraquinone

complex and R' the quinonediacridone complex. As the halogen derivs. of anthraquinone do not react with diaminoquinonediacridone, *dianthraquinonyldiaminoquinonediacridone* was prepd. by heating a mixt. of 2 parts β -aminoanthraquinone and 1 part dibromoquinonediacridone in presence of C_6H_6 , anhyd. K_2CO_3 and anhyd. $CuCl_2$ for 20 hrs. After carefully washing the brown ppt., the latter was treated by hyposulfite in presence of alkalis and formed a red-brown soln. which, after filtration from a small quantity of undissolved powder, was pptd. by a current of air. It contained neither free amine nor Br and presented a cinnamon-colored indigo dyestuff. One part β -aminoanthraquinone was treated in the same manner with 4 parts tetrabromoquinonediacridone and also gave a dyestuff, but the latter contained Br. Both products were sol. with difficulty in C_6H_6 or pyridine and dyed cotton brown. B. N.

Pyrimidines. CV. A new test for thymine and 5-methylcytosine in the presence of uracil and cytosine. HENRY H. HARKINS AND TREAT B. JOHNSON. *Yale Univ. J. Am. Chem. Soc.* 51, 1237-42 (1929); cf. *C. A.* 23, 1905. —Thymine (0.01 g.) in 50 cc H_2O , is treated with Br until a red color is permanent; the excess of Br is then removed by boiling and to the soln. 1 g. $Ba(OH)_2$ crystals added, and the mixt. refluxed for 15 min. and then distd. $AcCH_2OH$ is found in the distillate and is tested for according to Baudisch (*C. A.* 13, 297). The test applies equally well to 5-methylcytosine; both pyrimidines can be detected in quantities as small as 1 mg. The test is applicable in the presence of uracil and cytosine. A synthesis for 5-methylcytosine is given. **CVI.** Leuco bases of a new class of dyestuffs containing pyrimidine rings. B. JOHNSON. *Ibid* 1274 G. — 2 Thiothymine aldehyde, $PhNMe_2$ and $ZnCl_2$, heated 4 hrs. at 100° , give 1.6 g. *p*-2-tetramethyldiaminodiphenyl-2-thiothymynylmethane, $NH.CS.NH.C[CH(C_6H_4NMe_2)]_2$ $CMcCO$, m 212.4° . *p*-2-Tetramethyldiaminodiphenyl-2-ethylmercaptothymynylmethane, m 218.9° . *p*-2-Tetramethyldiaminodiphenyl-thymynylmethane, m 197.8° . These undergo oxidation in acid soln., giving sol. dyestuffs which dye silk fiber with beautiful effects. These are being studied. C. J. W.

The constitution of nodakenin, a new glucoside from *Peucedanum decursivum* Maxim. I. JUNZO ARIMA. Keiogyaku Univ. and Kitasato Inst. for Infection Diseases at Tokyo. *Bull. Chem. Soc. Japan* 4, 16 (1929). — "Nodakenin" is a new glucoside, $C_{26}H_{34}O_8$, m. 215° , obtained from *Peucedanum decursivum* Maxim. It is hydrolyzed into 1 mol. of *d*-glucose and 1 mol. "nodakenetin," $C_{14}H_{14}O_4$, m. 185° . Nodakenetin is a neutral compd. insol. in cold alk. solns. It is not colored by $FeCl_3$, cannot be methylated, but gives a mono-Ac deriv., thus showing the presence of an alc. OH group. It has no MeO , CO nor CHO group. It dissolves in hot alk. solns. or alc. alk. solns. with a yellow color, and is recovered from these solns. by acid treatment. These properties, together with the esterification index show the presence of a lactonic group; the HO acid corresponding to the lactone cannot be obtained in a free state, but after prolonged heating with alc. KOH, another HO acid, m. 205.6° , is obtained and has been named "isonodakenetic acid." This is a monobasic acid, which gives a brown color with $FeCl_3$, and a di-Me deriv., m. 65.7° , with CH_2N_2 . The behavior of nodakenetin toward alkalis is very similar to that of the coumarin series. The KOH fusion of nodakenetin gives resorcinol, $AcOH$ and a new compd., $C_8H_6O_4$, m. $258-60^\circ$, showing thus the presence of a resorcinol radical, whose OH groups are linked to some other radicals, since nodakenetin exhibits no phenolic properties. From the above facts, it is concluded that the formula for nodakenetin must contain the groups indicated in I and also a nucleus similar to II.



ALBERT L. HENNE

Saponin of *Chamellia japonica* L. S. AOYAMA. *J. Pharm. Soc. (Japan)* 48, 717 (1929). — A study of the saponin of *Chamellia japonica* L. (I) was reported by

properties are: benzoylmonoacetylmapogenin, m. $150-65^\circ$; oxime of II, m. $175-97^\circ$. Hydrolysis of I, as proposed by A. is: $C_{26}H_{34}O_8 + 2C_6H_5O_2 + 3H_2O = C_{26}H_{34}O_4 +$

$8C_6H_{12}O_6 + 2C_4H_8O_4$. Oxidation of II gave an acid $C_{18}H_{30}O_5(CO_2H)_2$, m. 140° .

F. I. NAKAMURA

Metacholesterol bromide. I. LIPSCHÜTZ. *Arch. Pharm.* 266, 518(1929).—Metacholesterol dibromide is a colorless substance, m. 105° , and may be employed to demonstrate its dissimilarity to cholesterol dibromide. Metacholesterol and cholesterol are similar in character, but yield with Br 2 entirely different products.

W. O. F.

Cholesterol and its relation to the terpenes. E. MONTIGNIE. *Bull. soc. chim.* 45, 97-100(1929); cf. *C. A.* 23, 2185.—Discussion of reactions of cholesterol showing it to correspond to the formula suggested by Windaus or Wieland rather than to a terpene structure as advanced by Steinle and Kahlenberg. A bibliography is included.

R. C. ROBERTS

The equilibrium of some binary systems of 2,4,6-trinitro-*m*-xylene (EFREMOV, TIKHOMIROVA) 2. A thermodynamic consideration of the synthetic MeOH process (KELLEY) 2. Absorption of ultra-violet light by the inversion products of sucrose (KWIECIŃSKI, MARCHLEWSKI) 3. Absorption of ultra-violet light by the glucosans (KWIECIŃSKI, MARCHLEWSKI) 3. Absorption of ultra-violet light by arabinose, maltose, sucrose, raffinose and by mannitol and dulcitol (KWIECIŃSKI, MARCHLEWSKI) 3. Chemical studies of grape pigments. II. The anthocyanins of Clinton grapes (ANDERSON, NABENHAUER) 11D. Electric moment and its relation to chemical constitution (MAYHANT, SEN GUPTA) 2. Diamagnetism and structure of C_5H_4 (VAIDYANATHAN) 2. Electric moments of Me chloride, Et chloride and $CHCl_3$ (SRECAR) 2. Electrolytic oxidation of alcohols. III. Benzyl alcohol. IV. $PrOH$ in alk. soln. (KORDZEM) 4. Velocity coefficients of hydrolysis of nitroacetanilide and of the secondary reaction of hydrolysis of *p*-nitroaniline with elimination of NH_3 (KUROCHKIN) 2. The crystal structure of tartaric acid, isohydrobenzoin and Rh tartrate (REIS, SCHNEIDER) 2. Electrolytic reduction of aldehydes. III. *o*- and *p*-Hydroxybenzaldehydes (SHIMO) 4. Synthesis of optically active compounds by means of yeast. I. Synthesis of L-aspartic acid from fumaric acid (SUMIKI) 16. HCN and C_2H_2 (Brit. pat. 296,355) 18.

ARAHINA, *et al.* Melting Points of Organic Compounds. Tokyo Nankodo, Hongo-ku. \$5. Reviewed in *Am. J. Pharm.* 101, 231 (1929).

CONANT, JAMES B., ADAMS, ROGER, CLARKE, H. T., GILMAN, HENRY, MARVEL, C. S., WHITMORE, FRANK C., ALLEN, C. F. H., *et al.* Organic Syntheses. Vol. IX. New York: John Wiley & Sons, Inc. 108 pp. \$1.75

OFFENHEIMER, CARL. Grundriss der organischen Chemie. Leipzig G. Thieme 181 pp.

Halogenation of organic compounds. I. G. FARBENIND A. G. Fr. 647, Jan 18, 1928. See Brit. 283,877 (*C. A.* 22, 4129).

Catalytic hydrogenation. GEORGES MIGNONAC. Fr. 647,080, May. Ac_2O is used as hydrogenation solvent when using insol. metals such as Ni, etc. Thus, primary amines are produced by hydrogenation of oximes or nitriles in the presence of Ac_2O , the amines being finally liberated from the acylated compds. or separated. Acetonitrile is hydrogenated in Ac_2O in the presence of Ni, giving ethyl amide. Propionitrile, capronitrile, benzonitrile and benzaldoxime are hydrogenated in the same way, giving the acetyl amine in each case. Acetophenone oxime gives the acetyl amine of α -phenylethylamine, and benzophenone oxime gives acetylbenzohydrylamine, m. 146° and b_p $164-165^\circ$.

Introducing aldehyde groups into cyclic compounds. I. G. FARBENIND A. G. Fr. 648,060, Feb. 1, 1928. An aldehyde group is introduced into carbocyclic and heterocyclic compds. contg. a labile H atom by causing these compds. to react with compds. of the general formula $HCONX^1X^2$ (where X^1 and X^2 represent H, or an alkyl, alkyl or aryl group), in the presence of condensing agents contg. Cl and more particularly with primary reaction products of formylic compds. and condensation agents contg. Cl, preferably with the addn. of an org. solvent. Aldehydes contg. Cl are obtained by reacting substances contg. a ketonic and methylenic group, in cyclic configuration and which can react in the tautomeric endic form, with formylic compds. of primary or secondary amines, in the presence of acid condensing agents contg. Cl. In examples anisole is added to a heated mixt. of formylmethylaniline and $POCl_3$, giving anisaldehyde. In the same way tetrahydro- α -naphthyl methyl ether gives a 1-methyltetrahydro-naphthaldehyde, m. $59-60^\circ$. The prepn. is also described of 2-methyl- (m. $52-53^\circ$) and 2-ethoxytetrahydro-naphthaldehyde (m. $62-63^\circ$), anthracene-9-aldehyde (m. 104°), xylyldehyde, 2-naphthal-1-aldehyde (m. 81°), 2,7-dihydroxy-naphthalene-1-aldehyde,

4,8-dihydroxy-1-naphthaldehyde, **2-hydroxynaphthalene-3-carboxyl-1-aldehyde**, **4-methyl-6-chloro-3-hydroxythionaphthene-2-aldehyde** (aldazine, m. 277–278°), **6-ethoxy-3-hydroxythionaphthene-2-aldehyde** (aldazine, m. 248°), **N-ethylcarbazoaldehyde** (m. 87°), **3,10-dichloro-9-anthracenealdehyde** (m. 174°), **1,5,10-trichloro-9-anthracenealdehyde** (m. 197°), **1,2-dimethoxy-** (m. 172°) and **2,6-dimethoxy-10-chloro-9-anthracenealdehyde** (m. 233°), and **naphthostyrylaldehyde** (m. 233°).

Esterifying aldehydes. JACQUES SCHALCH and JOHN W. OLSON (to Van Schaack Bros. Chemical Works). U.S. 1,708,902, April 9. In the production of EtOAc from acetaldehyde or in similar production of esters from aldehydes in the presence of Al ethoxide or other alkyl oxide of a trivalent metal, there is used as a promoter $Zn(NO_3)_2$ or other suitable nitrate of a metal the hydroxide of which is a weak base.

Aromatic amines. I. G. FARBENIND. A.-G. Brit. 297,212, Sept. 10, 1927. The catalytic reduction of $PhNO_2$ or other nitro compds. with H to form $PhNH_2$ or other aromatic amines is effected under at least 20 atm. pressure and in the presence of S compds. (which may be added or may be present in the raw materials) which partly poison the catalyst (which may be Swedish spongy iron) and thus prevent formation of undesired by-products. Cf. C. A. 23, 605.

Isothiourea ethers. SCHIERING-KAHLBAUM A.-G. Brit. 296,782, Sept. 9, 1927. Isothiourea ethers are made by reaction of a mercaptan with a cyanamide, preferably in an aq. or alc. medium, as by passing the mercaptan in vapor form into a cyanamide soln. With disubstituted cyanamides the reaction proceeds slowly without heating but rapidly at 100°. *S*-Ethylisothiourea is obtained from ethylmercaptan and cyanamide, *N*-ethyl-*S*-methylisothiourea from methylmercaptan and ethylcyanamide, and *N,N*-dimethyl(or diethyl)-*S*-methylisothiourea from methylmercaptan and dimethyl(or diethyl)cyanamide.

Diolefins. B. W. BYSOW. Brit. 297,231, Oct. 20, 1927. Vapors such as those of naphtha, naphtha fractions or naphtha residues are passed through a preheating zone at a temp. of 300–400° and then through a short heating zone at 750–1000° with or without use of catalysts such as strips of Fe, Ni or Al or pumice. The app. may comprise an Fe tube and a connected brass tube with a cooling jacket and internal concentric cooling tube.

Aliphatic anhydrides. HENRY DREYFUS. Fr. 647,227, Jan. 16, 1928. Aliphatic anhydrides, particularly Ac_2O , are obtained by submitting the vapor of the corresponding acid to a heat decompn. in the presence or absence of catalysts, and passing the gases leaving the reaction zone over water-fixing substances such as bisulfates, $CaCl_2$ and $ZnCl_2$ kept at a lower temp., preferably much lower, than that of the reaction zone. An example is given in which $AcOH$ vapor is passed through a Cu or clay tube at 800–1000° and then over $NaHSO_4$ or phosphoric acid at 150–350°.

Alkylated guanidines. SCHIERING-KAHLBAUM A.-G. Brit. 297,029, Sept. 12, 1927. Alkylated guanidines are produced by reaction of dialkylcyanamides with an amine salt in the presence of the corresponding free amine. Examples are given of the condensation of diethylcyanamide with $PhNH_2$ or isoamylamine in the presence of their hydrochlorides and of the condensation of dimethylcyanamide with isoamylamine or ethylamine in the presence of the hydrochlorides.

Anthrahydroquinones. I. G. FARBENIND. A.-G. Brit. 297,042, April 13, 1927. 2-Acylamino-9,10-anthrahydroquinone ethers and esters, in which the acyl group is the residue of an aliphatic carboxylic acid such as acetic or formic acid, are formed by the catalytic hydrogenation of a 2-acylaminoanthraquinone and etherifying or esterifying the resulting leuco compd., e.g., with Me_2SO , chlorosulfonic acid or Na chloracetate.

Anthraquinone derivatives. I. G. FARBENIND. A.-G. Brit. 297,001, Sept. 9, 1927. *o*-Halooanthraquinonecarboxylic acids are prepd. by treating an anthraquinone-*o*-sulfocarboxylic acid with halogen or a halogenating agent; examples are given of the prepn. of 2-chloroanthraquinone-1-carboxylic acid, 2-chloroanthraquinone-3-carboxylic acid, 1-bromo-3-chloroanthraquinone-2-carboxylic acid, 4-bromo-2-chloroanthraquinone-1-carboxylic acid and 3,7-dichloroanthraquinone-2,8-dicarboxylic acid. Anthraquinone-*o*-sulfocarboxylic acids are obtained by hydrolysis of *o*-cyanoanthraquinonesulfonic acids. Examples are given of the production of anthraquinone-1-carboxylic 2-sulfonic, 3-carboxylic 2-sulfonic, 1-bromo-2-carboxylic 3-sulfonic and 2,6-dicarboxylic 3,7-disulfonic acids. *o*-Cyanoanthraquinonesulfonic acids are prepd. from *o*-aminoanthraquinonesulfonic acids by the diazo reaction. Examples are given of the prepn. of 1-cyanoanthraquinone-2-sulfonic acid, 3-cyanoanthraquinone-2-sulfonic acid, 1-bromo-2-cyanoanthraquinone-3-sulfonic acid, 1-bromo-2-cyanoanthraquinone-3-sulfonic acid, 4-bromo-1-cyanoanthraquinone-3-sulfonic acid and 2,6-dicyanoanthraquinone-3,7-disulfonic acid.

Anthraquinone derivatives. I. G. FARBENIND. A.-G. Fr. 647,685, Jan. 25, 1928. Valuable new compds., the nature of which is not known, are obtained by causing ethylenediamine to react with hydroxyanthraquinones. In examples, ethylenediamine hydrate is added to (1) quinizarin and heated to 35–40°. Crystals giving an intense bluish red color when dissolved in H_2SO_4 are obtained; to (2) purpurin and heated to 90–95°, the product giving a blue color in H_2SO_4 ; to (3) 1,4,8-trihydroxyanthraquinone, the product giving a greenish blue color in H_2SO_4 ; to (4) 1,2,4,5,8-pentahydroxyanthraquinone, the product giving a green color in H_2SO_4 .

Naphthoquinone derivatives. ANDRÉ WAHL and ROBERT LANTZ (one-half to Soc. Anon. des matières colorantes et produits chimiques de Saint-Denis). U. S. 1,708,001, April 9. 4-Arylamino-1-arylimino- β -naphthoquinones are made by the action of a primary aromatic amine such as aniline or *p*-toluidine on a 1-aryliminonaphthoquinone such as 1-phenylimino- β -naphthoquinone.

Derivatives of phthalic acid. I. G. FARBENIND. A.-G. Fr. 7,513, Jan. 20, 1928. Derivs. of phthalic acid which are sol. in water are obtained by using ethylene oxide or its homologs to act on phthalic acid with or without a solvent and with or without a catalyst. In examples, a viscous liquid is obtained by heating in autoclave to 60–65° equal parts of ethylene oxide and phthalic acid. NaCl or Na phthalate may be used as a catalyst. The products are solvents and plastifying agents.

***N*-Hydroxyethyl derivatives of 2-amino-1-hydroxybenzene.** I. G. FARBENIND. A.-G. Brit. 296,309, Aug. 26, 1927. 2-Amino-1-hydroxybenzene is treated with ethylene oxide (suitably in the presence of $CaCO_3$ in aq. suspension) to form compds. such as 2-di(hydroxyethyl)amino-1-hydroxybenzene or *N*-monohydroxyethylamino-1-hydroxybenzene (details of the prepn. of which are given).

Chlorination products of methane. S. KARPEN & BROS. Ger. 472,421, May 2, 1925. See Brit. 245,991 (C. A. 21, 415).

Aromatic acid chlorides; ethyl chloride. VEREIN FÜR CHEMISCHE UND METALLURGISCHE PRODUKTION. Ger. 472,422, Dec. 30, 1923. The reaction between EtOH and $PhCCl_2$ is effected in the presence of Fe or $FeCl_3$, whereby EtCl and $PhCOCl$ uncontaminated with $PhCOOEt$ are obtained. Homologs or substitution products of $PhCCl_2$ may be treated in the same way.

Fatty acid salts. HOLZVERKOHLUNGS IND. A.-G. Ger. 472,123, Oct. 31, 1926. Solid salts of fatty acids are prepd. by sapon. fatty acid esters with carbonates or bicarbonates, in the presence of a little water, at a temp. above the normal b. p. of the ester and preferably under pressure. The reaction mixt. should be thoroughly agitated. The process may be applied in working up crude AcOH.

Anhydrous fatty acid salts. HOLZVERKOHLUNGS IND. A.-G. Ger. 472,124, Nov. 21, 1926. Addn. to 463,829. The method of Ger. 463,829 (C. A. 22, 4131) is modified, when using an anhyd. alkali metal hydroxide, by omitting the solvent and thoroughly agitating the reaction mixt.

Benzene synthesis. I. G. FARBENIND. A.-G. Brit. 297,179, July 13, 1927. C_2H_4 and its homologs are produced by treating mixts of C oxide and H at a temp. above 300° with a catalyst comprising Fe and then heating the resulting olefins and CH_4 hydrocarbons to 600–800° with or without a catalyst. A noble metal is preferably used with Fe in the first stage and, in the second stage, substances which would cause deposition of C are avoided. Cu, Sn, Zn or Cr may be used to line the app. or as catalysts.

Symmetrical arsenobenzenes. I. G. FARBENIND. A.-G. Brit. 296,327, May 27, 1927. Arseno compds. are formed by reduction, with Na hypophosphite and HCl, of 3-chloro-4-hydroxy-5-acetamidobenzene-1-arsonic acid (described in Brit. 230,487), 2-chloro-4-hydroxy-5-acetamidobenzene-1-arsonic acid, 3-methyl-4-hydroxy-5-acetamidobenzene-1-arsonic acid (described in Brit. 254,086; C. A. 21, 2533) and 2-methyl-4-hydroxy-5-acetamidobenzene-1-arsonic acid. The 2-chloro-4-hydroxy-5-acetamidobenzene-1-arsonic acid is obtained by nitrating 2,4-dichlorobenzene-1-arsonic acid, heating the product with KOH, reducing and acetylating. 2-Methyl-4-hydroxy-5-acetamidobenzene-1-arsonic acid is formed by nitrating 2-methyl-4-acetamidobenzene-1-arsonic acid, replacing the acetamino group by OH by heating with KOH, reducing and acetylating.

Dichloroaminomethylbenzenes. I. G. FARBENIND. A.-G. Fr. 648,070, Feb. 1, 1928. 2,3-Dichloro- and 2,5-dichloro-4-amino-1-methylbenzenes are prepd. by treating 2-chloro-4-acetamido-1-methylbenzene with Cl at a low temp. and in the presence of AcOH contg. water, and sapon. the 2,5-dichloro-4-acetamido-1-methylbenzene which is pptd. in a pure state during the chlorination, and the 2,3-dichloro-4-acetamido-1-methylbenzene which is pptd. from the mother liquor by the addn. of water.

Purifying anthracene. DEUTSCHE HYDRAWAXWERKE A.-G. Ger. 472,183, Feb. 2, 1922. Addn. to 301,651. Crude $C_{14}H_{10}$ is purified by treatment with hydrogenated

$C_{10}H_8$, and a reagent for removing carbazole. Examples are given in which the purification is effected (1) by treatment at 100° with $C_{10}H_{12}$ and pyridine, the purified $C_{10}H_8$ sepd. on cooling; (2) by boiling with $C_{10}H_{12}$ and KOH, filtering the pptd. K-carbazole, and cooling the filtrate; (3) as in (1), but with MeCOEt instead of pyridine.

Acetic acid. H. SUIDA. Brit. 296,172, July 18, 1927. In extn. of HOAc from aq. solns. by treating the vapor with solvents of higher b. p. than HOAc as described in Brit. 230,447 (C. A. 19, 3272), there are used as solvent esters of cyclic carboxylic acid with mono- or polyhydroxy alcs. such as the Me, Et and Bu esters of the naphthene acids and of phthalic acid and the hexyl, heptyl, glycol and glycerol esters of phthalic acid. Cf. C. A. 23, 608.

Acetic acid. HOLZVERKOHLUNGS IND. A.-G. Ger. 472,399, Dec. 9, 1924. Concd. AcOH is recovered from dil. aq. solns. by evapg. the soln., passing the vapors over or through an adsorbent, *e. g.*, C, and recovering AcOH from the charged adsorbent by means of the vapor of an org. liquid easily separable from AcOH. It is better to use the vapor of an org. liquid forming a const. boiling mixt. with water, particularly AcOEt. Cf. C. A. 23, 1141.

Acetic acid. I. G. FARRENIND. A.-G. Fr. 647,682, Jan. 25, 1928. Dil. AcOH is concd. by adding alkyl acetic esters, or mixts. thereof with hydrocarbons or halogen derivs. of hydrocarbons, to lower the b.p. of the water, and rectifying. Examples are given in which AcOEt, AcOEt and C_4H_6 , AcOEt and $C_2H_4Cl_2$ are added. Cf. C. A. 23, 850.

Acetic acid. SOC. ANON. DES DISTILLERIES DES DEUX-SEVRES. Brit. 296,974, Sept. 10, 1927. HOAc is extd. from its aq. solns. by a solvent having a b. p. above that of HOAc but below 150° , such as AmOAc, which is insol. in water and will not form an azeotropic mixt. with HOAc. Water is then removed from the ext. by use of an auxiliary entraining liquid such as EtOAc which forms an azeotropic mixt. with water but not with HOAc, and the dried soln. is finally distd. to recover anhydrous HOAc and solvent. Various details of app. and procedure are described.

A derivative of isopropylallylbarbituric acid. J. HOFFMANN-LA ROCHE & Co. A.-G. Ger. 471,655, Nov. 1, 1921. Equimol. amts. of the acid and 1-phenyl-2,3-dimethyl-4-dimethylamino-5-pyrazolone are melted together.

Benzyl naphthalenesulfonic acids. I. G. FARRENIND. A.-G. (Karl Daimler and Gerhard Balle, inventors). Ger. 472,289, May 2, 1926. Addn. to 436,881. The method of prepg. benzyl naphthalenesulfonic acids described in Ger. 436,881 is improved by conducting the reaction between naphthalenesulfonic acids and $PhCH_2Cl$ at a temp. below 100° and in the presence of a considerable excess of H_2SO_4 . Products which do not discolor textiles are so obtained.

Phthalic anhydride. THE SELDEN CO. Fr. 647,880, Jan. 14, 1928. Phthalic anhydride prepd. by the catalytic oxidation of $C_{10}H_8$ is purified by heating it to boiling, with or without pressure and with or without condensation and polymerization catalysts such as MnO_2 , SiO_2 or zeolites, and (or) superheated steam, or treating the vapor thereof in this way.

Ethyl acetate. FRED C. ZEISBERG (to E. I. du Pont de Nemours & Co.). U. S. 1,708,460, April 9. EtOH vapor is passed over a dehydrogenation catalyst at a temp. of 250 – 500° and under a pressure above 10 atm., producing EtOAc and some assocd. products including normal BuOH. As catalysts, there may be used metals such as Cu, Ni, Co and Fe, alone or in admixture or with addns. of oxides such as those of Mn, Cr, Mg or Ca, or oxides alone may be used such as those of Zn, Mg, Cr or Mn.

Dibenzyl phthalate. ADOLPH ZIMMERLI (to Rhodia Chemical Co.). U. S. 1,708,404, April 9. Phthalic anhydride is dissolved in an excess of benzyl alc., the soln. is heated and subjected to gentle boiling for about 8 hrs., distd. to remove water, and the residue is subjected to a vacuum to distil off excess benzyl alc.

Methanol synthesis. HENRY H. STORCH (to Roessler & Hasslacher Chemical Co.). U. S. 1,707,331, April 2. A catalyst comprising Cu and Ce fluoride or other rare earth fluoride is used in the synthesis of MeOH from H and CO. Cf. C. A. 22, 3893.

1-Phenyl-2-methylaminopropanol. E. MERCK, CHEM. FAB. Ger. 472,466, Feb. 3, 1927. See Brit. 284,644 (C. A. 22, 4540).

Cresols. SCHERING-KAHLBAUM A.-G. Brit. 297,083, Sept. 14, 1927. *m*-Cresol is sepd. from mixts. such as those contg. also *p*-cresol by treatment with urea which forms an addn. product with *m*-cresol which is sepd. in cryst. form and then decomposed by use of water, dil. inorg. acids or solns. of $MgSO_4$ or Na_2SO_4 (any urea remaining in the *m*-cresol being decomposed by hydrolysis). Various details of procedure are given.

Menthol. HOWARDS & SONS, LTD., AND J. W. BLAGDEN. Brit. 297,019, June 8, 1927. Synthetic menthol is subjected to partial esterification (with aliphatic or aro-

matic acids or anhydrides), the unesterified portion is sepd. from the esterified portion and the latter is saponified; the parent material is thus divided into fractions of higher and lower m. p. than the starting material. A similar result is obtained by partially saponifying a menthol ester, sepg. the liberated menthol from the unsaponified ester, and saponifying the latter. Various details are given.

Paraformaldehyde. I. G. FARBENIND. A.-G. Brit. 296,847, July 1, 1927. Paraformaldehyde is obtained from the products resulting from the catalytic oxidation of MeOH by washing the products (preferably after cooling) with a warm strong soln. of CH_3O . An inert gas such as N may be added to the reaction products prior to or during washing, and it is preferred to cool the products only to such an extent that the temp. of the washing liquid is maintained sufficiently high to preclude the deposition of paraformaldehyde in the liquid during the washing process. CH_3O in the residual gases is recovered by washing with water. Cf. C. A. 22, 3171.

Fatty acids. HOLZVERKOHLLUNGS-INDUSTRIE A.-G. Fr. 647,219, Jan. 16, 1928. See Can. 284,062 (C. A. 23, 605).

11—BIOLOGICAL CHEMISTRY

PAUL E. HOWE

A—GENERAL

FRANK P. UNDERHILL

A non-specific pressor substance. J. B. COLLIP. *Trans. Roy. Soc. Can.* 22, 181-4(1928).—Potent pressor exts. have been made from skeletal muscle, liver, kidney, spleen, ovary, testis, stomach, intestine, whole fetus, and several com. preps. of both pepsin and pancreatin. The tissue is thoroughly minced and extd. with neutral or acidulated H_2O at boiling temp. for 5 min., the ext. filtered and the filtrate condensed *in vacuo* to a sirup. Add abs. $(\text{CH}_3)_2\text{CO}$ and shake violently. Allow the layers to sep., remove the acetone layer, again ext. the saline layer with $(\text{CH}_3)_2\text{CO}$, repeat several times, combine the $(\text{CH}_3)_2\text{CO}$ exts., filter and evap. *in vacuo* almost to dryness. Again ext. with abs. $(\text{CH}_3)_2\text{CO}$ and repeat as often as necessary to ensure removal of practically all inorg. and most of the depressor substances. The pressor principle is believed to be the same in all exts. so made from the different tissues. It is sol. in abs. alc., and in mixts. of $(\text{CH}_3)_2\text{CO}$, $(\text{C}_2\text{H}_5)_2\text{O}$ and H_2O . It can be fractionally pptd. from mixts. of abs. alc. and petroleum ether by addn. of the latter. The potency of the exts. is destroyed by addn. of Ac_2O . The active principle is removed by adsorption on norit at p_{H} 8 and is released by treating the norit with boiling water acid to Congo red. Intravenous injection of the exts. is followed by a rather sudden rise in blood pressure with a concomitant increase in lung ventilation. Intravenous injection of cocaine diminishes or abolishes the pressor effect; atropine is without effect; gynergen enhances the effect.

A. T. CAMERON

A bio-hydrographical investigation of the sea adjacent to the Fraser River mouth. II. Factors affecting the distribution of phytoplankton. A. H. HUTCHINSON. Univ. B. C. *Trans. Roy. Soc. Can.* 22, Sec. V, 293-309(1928); cf. C. A. 22, 1598. A. T. C.

Correlations between the total nitrogen of the bases and arginine nitrogen and between total nitrogen of the bases and lysine nitrogen, of various proteins. RALPH K. LARMOUR. Univ. Minnesota. *Trans. Roy. Soc. Can.* 22, Sect. V, 349-63(1928). From data for total basic N and arginine N taken from 214 analyses of various plant proteins the coeff. of correlation was $+0.794 \pm 0.017$. The coeff. of correlation between total basic N and the deviation of the arginine N from its most probable value, the mean, was $+0.211 \pm 0.044$. The coeff. of correlation between total basic N and lysine N was $+0.548 \pm 0.032$, and the coeff. of correlation between total basic N and the deviation of lysine N from its mean was $+0.03 \pm 0.046$. The data are considered to be indirect evidence in support of Kossel's hypothesis that arginine is the nucleus of the protein mol.

A. T. CAMERON

The occurrence of α - and β -glucosidase in taka-diastase. AKISUKE MATSUMOTO. *Acta Schol. Med. Univ. Imp. Kioto* 10, 285-6(1928).—Taka-diastase causes the hydrolysis of maltose, amygdalin, and salicin. It therefore contains maltase (α -glucosidase and also emulsin (β -glucosidase)).

DAVID DAVIDSON

A new enzyme. R. FOSAY AND A. BRUNEL. *Compt. rend.* 198, 426-8(1929).—The seeds of many plants such as *Soya hispida*, *Phaseolus vulgaris*, *Phaseolus lunatus* contain an enzyme capable of hydrolyzing allantoin to allantonic acid. The latter is identified as xanthylallantonic acid. The authors suggest the name "allantoinase" for this enzyme.

DAVID DAVIDSON

Fermentation problems. H. v. EULER AND K. MYRBÄCK. Univ. Stockholm. *Z. physiol. Chem.* 181, 1-14(1929).—Mainly a review of the phosphorylation and aldehyde mutation theory of alc. fermentation. The view is upheld that Robison's hexose-monophosphate is an intermediate in the formation of Harden's hexosediphosphate. The aldehyde mutation of the hexose is believed to occur after formation of the monophosphate. The presence of cozymase is essential for the aldehyde mutation and for the formation of diphosphate. The mutation of glucose is not in the strict sense a Cannizzaro reaction, since there is no formation of alc. (sorbitol) and acid (gluconic acid), but rather a shifting of energy from 1 part of the mol. to another, such as might result from migration of a H atom within the mol. itself. Without addn. of phosphate the fermentation begins sooner but does not attain the max. velocity of the fermentation with added phosphate. Neuberg's expts. where the initial fermentation velocity of hexosemonophosphate was as great as that of glucose are explained on the assumption that a pure substance was not used, since the Ba salt of the ester from which the Na salt was prepd. had a rotation of $27-8^\circ$ instead of 13° as found by Robinson and by the authors. Although the utilization of carbohydrates by yeast, muscle, and lactic and propionic acid bacteria requires the presence of cozymase, certain AcOH bacteria are lacking in cozymase and their fermentation of carbohydrate is not facilitated by addn. of cozymase from another source. In normal fermentation where dismutation is followed by cleavage into 3-carbon compds. no noteworthy quantity of AcOH is formed.

A. W. DOX

γ -Butyrobetaine, crotonbetaine and carnitine in the animal metabolism. WILHELM LINNEWEH. Univ. Würzburg. *Z. physiol. Chem.* 181, 42-53(1929).—After subcutaneous injection of 20 g. γ -butyrobetaine during 6 days, there was recovered from the dog's urine 40% of the unchanged substance, 3% as carnitine and a small amt. of NMe₃. A similar expt. with crotonbetaine yielded 33% of the original substance and about 0.2% of carnitine. Carnitine itself gave a recovery of 30%, but no oxidation products were found. The greater yield of carnitine (β -hydroxy- γ -butyrobetaine) from the satd. as compared to the unsatd. betaine is in harmony with Dakin's observation on the relative rates of oxidation of PhC:CCO₂H, PhCH:CHCO₂H and PhCH₂CH₂CO₂H. The pharmacol. effect of γ -butyrobetaine on mice consists in accelerated respiration, salivation, dilation of pupils, lachrymation, clonic convulsions, vaso-constriction, paralysis of motor nerve endings, defecation and finally death with the heart in diastole. The lethal dose is 70-80 mg. for a 15 g. mouse. Crotonbetaine gives the same curare-like symptoms but the lethal dose is somewhat smaller, 60-70 g. as the HCl salt. Carnitine, on the other hand, is non-toxic.

A. W. DOX

Carnitine, crotonbetaine and γ -butyrobetaine in putrefaction. WILHELM LINNEWEH. Univ. Würzburg. *Z. physiol. Chem.* 181, 54-7(1929).—Putrefaction of carnitine in the presence of glucose, Witte peptone and putrid pancreas for 3 weeks gave 95% γ -butyrobetaine and 1.2% NMe₃. Crotonbetaine under similar conditions yielded 70% γ -butyrobetaine and a trace of NMe₃. Probably carnitine is first formed by addn. of H₂O to crotonbetaine at the double bond before reduction to γ -butyrobetaine occurs. The base isolated by Brieger from the putrefaction products of horse meat and later recognized as γ -butyrobetaine was probably a reduction product of the carnitine originally present.

A. W. DOX

The question of the occurrence of methylguanidine in the animal organism. II. An attempt to separate methylguanidine from carnosine and creatinine. I. A. SMORODINTZEV AND A. N. ADOVA. Univ. Moscow. *Z. physiol. Chem.* 181, 77-82(1928); cf. C. A. 23, 1920.—After an involved series of pptns. with Hg salts and extns. with EtOH, an ext. of dog muscle finally yielded creatinine as the ZnCl₂ salt, and methylguanidine as the picrate.

A. W. DOX

Biological importance of sterols. ADOLF WINDAUS. *Pharm. Monatshefte* 10, 34(1929).—An address.

W. O. E.

Porphyrin-modalities. A. A. HIJMAN V. D. BERGH, P. MULLER AND A. J. HIJMAN. *Proc. Acad. Sci. Amsterdam* 32, 15-19(1929); cf. C. A. 23, 161.—Koproporphyrin, derived from etioporphyrin III, was obtained from a patient with porphyria. This is the first time that this substance has been shown to exist in nature, although it has previously been made synthetically.

ARTHUR GROLLMAN

Composition of bone. VII. Equilibration of serum solutions with secondary calcium phosphate. M. J. SHEAR, MARTHA WASHBURN AND BENJAMIN KRAMER. Jewish Hospital of Brooklyn. *Science* 69, 835-6(1929); cf. C. A. 22, 4328.—Equilibration of serum with CaHPO₄ always caused an increase in the concn. of the Ca or P or both, in all solns. with $[Ca] \times [P] < 45$. The mean value obtained for K'_{CaHPO_4} was 3.2×10^{-4} at room temp. and 3.4×10^{-4} at 38° .

ARTHUR GROLLMAN

A study of factors said to influence the nitrogen distribution of gelatin. FLOYD S. DART. Carlsberg Lab., Copenhagen. *Biochem. J.* 23, 149-60(1929).—Preliminary treatment of gelatin with acid or alkali has no effect on the percentages of non-amino N and of basic N.

BENJAMIN HARROW

Some influences of light on biochemical reactions. W. B. OSBORN. Univ. of the Witwatersrand. *J. South African Chem. Inst.* 12, 25-32(1929).—A survey chiefly concerned with the treatment of certain diseases by sun light. ALBERT L. HENNE

Differences observed in the conditions of the sea water at the margins of two opposing tidal currents. T. G. THOMPSON AND R. C. MILLER. Univ. of Washington. *Science* 68, 517-18(1929).—Analysis made on two samples of water taken from two opposing currents in the channel north of San Juan Island showed that in samples of water but a few feet apart there was a difference of 2.4° in temp., of 0.22 in p_H and of 2.8 parts per thousand in Cl. There were differences in sp. gr. and total CO_2 . It is suggested that such changes are of considerable biological importance. G. H. W. L.

The effect on the solubility of sparingly soluble calcium salts of proteins and the carbon dioxide-binding capacity of proteins. WOLFGANG PAULI AND THEODOR STENZINGER. Inst. med. Kolloidchemie, Wien. *Biochem. Z.* 205, 71-103(1929).—The solv. of $CaSO_4$ is markedly increased by the presence of proteins in this order: serum albumin, pseudoglobulin, hemoglobin. This effect is attributed to an equiv. inactivation of Ca^{++} and SO_4^{--} ions, probably because of the formation of multivalent amphoteric ions with protein. The considerably increased adsorption of Ca when protein is shaken with $CaCO_3$ is regarded as due to the formation of Ca proteinate as a result of hydrolysis of $CaCO_3$, and is therefore followed by a much increased cond., by an increased migration to the anode and a marked diminution in the heat and alc. coagulability. Correspondingly, the strongly acid serum albumin gives these reactions with $CaCO_3$ more than the other protein, which behavior is the exact opposite of that with $CaSO_4$. Evidence is also offered to show that proteins, especially the very acid neg. ovalbumin, become electropositive under the influence of CO_2 . This, however, is not through the formation of a dicarbonic acid (Siegfried's carbaninic acid) but of a compound of the NH_4HCO_3 type. S. MORGULIS

A new enzyme, glucosidase. IL. D. MÖLLER. Kgl. Landhauhochschule, Kopenhagen. *Biochem. Z.* 205, 111-43(1929); cf. *C. A.* 23, 160.—The press juice of *Aspergillus niger*, as well as alc., alc.-ether or acetone ppts. of the press juice, contains an enzyme that oxidizes glucose with the absorption of atm. O_2 . The glucose is oxidized to gluconic acid, as is evident both from the relation between the acid formation and the absorption and from the loss of glucose in relation to the acid formation. About 20% of the acid produced was isolated and detd. as the Ca compd. Expts. have shown that only 20% of this acid can be recovered from a soln. contg. proteins. The enzyme is designated glucose-oxidase, but it is not established whether or not it is a glucose dehydrase. The enzyme preps. from *A. niger* give off a very small amt. of CO_2 , which apparently has nothing to do with the sugar destruction. The enzyme oxidizes principally glucose, but in small amts. also mannose and galactose. However, it has no effect on fructose, xylose, arabinose, Ca gluconate, dihydroxy-acetone, glycerol or acetaldehyde. *A. niger* cultured on a mannose medium yields enzyme preps. with no greater oxidative power against mannose, and with the same glucose-oxidase content. Cultivated on fructose it contains the glucose-oxidase but no enzyme effective against fructose; this is also true for tartaric acid or glycerol cultures, which contain only the gluconoxidase. In a H atm. the enzyme has no effect on glucose. The optimum H⁺ ion concn. for its action is at p_H 5.5-6.5. The glucose-oxidase action increases from 0 to 30°, but the Q_{10} falls from 1.6 to 1.1. The temp. at which the enzyme is killed is 73°. The glucose-oxidase action is unaffected by the addn. of PO_4 ions or insulin. The enzyme rapidly loses its activity, and at 20° it is 75% inactivated in 2 1/2 hrs. The glucose-oxidase is present also in the press juice of *Penicillium glaucum*. S. M.

The behavior of insulin toward x-ray, radium and ultra-violet radiations. D. DEN HOND, S. E. DE JONGH AND A. E. J. PARK. Pharmako-Therapeutic Lab., Amsterdam. *Biochem. Z.* 205, 144-53(1929); cf. *C. A.* 22, 3894.—When air is absolutely excluded insulin is unaffected either by x-ray, Ra or ultra-violet radiations. Even in the presence of air x-rays have no effect whereas Ra radiations of even smaller energy content than the x-rays do weaken the insulin. Ultra-violet radiation destroys insulin to a great extent especially if there is a trace of O_2 in the aq. soln. In phenol soln. the insulin is unaffected. S. MORGULIS

The splitting of adrenaline in serum. M. CHIKANO AND M. KOMINAMI. Med. Acad., Osaka. *Biochem. Z.* 205, 176-9(1929).—The adrenaline content of serum was detd. by the chem. method of Chikano and these results were compared with detns.

made by biol. methods (blood pressure measurement in rabbits). The splitting of adrenaline in serum follows a very definite curve as can be detd. by either the chem. or the biol. method. Expts. with phosphate buffers of the p_H of blood show that the splitting of adrenaline proceeds with the same velocity as in serum. In Locke's soln. the splitting of adrenaline is considerably slower. It is thought that the PO_4 ions play an important role in the splitting of the adrenaline.

S. MORGULIS

The mode of action of animal phosphatase in stereochemical relations. ANTONIO GUALDI. Kaiser Wilhelm Inst. für Biochem., Berlin-Dahlem. *Biochem. Z.* 205, 320-4(1929).—Phosphatase from rabbit liver hydrolyzes the salts of *dl*-bornyl phosphate asymmetrically just as the plant phosphatase does.

S. MORGULIS

Diffusion of hemoglobin. R. E. LIESEGANG AND O. MASTBAUM. Univ. Frankfurt, a. M. *Biochem. Z.* 205, 451-6(1929).—The rate of diffusion of hemoglobin in a 10 or 20% gelatin soln. is discussed.

S. MORGULIS

Effect of hydrogen ions on the function and swelling of nerves. E. E. GOLDENBERG. State Inst. for Brain Research. *Zhurnal expl. Biol. Med.* 10, 622-30(1929).—The function of nerves ceases the more quickly the lower the p_H of its medium, and at $p_H = 1$ the function is lost in less than 5 mins. The curve of swelling rises rapidly at first, then more slowly. The swelling min. lies in a weakly acid medium.

S. M.

The neutralizing action of the nerve. E. E. GOLDENBERG. State Inst. for Brain Research. *Zhurnal expl. Biol. Med.* 10, 632-6(1929).—Nerves placed in an acid NaCl soln. cause the reaction to shift to the alk. side. The change in the p_H is greatest in slightly acid solns.; in strongly acid soln. the shift may not occur.

S. MORGULIS

Cozymase in yeast. KARL MYRBÄCK. *Svensk Kem. Tids.* 42, 3-8(1929); cf. *C. A.* 22, 3670. —The most convenient source for cozymase is brewer's yeast. The content is variable; that of good yeast is 100 units per g. dry wt. (cf. *C. A.* 18, 3064 and many subsequent abstracts of v. Euler and Myrbäck on nomenclature and assay methods). It gives pentose reactions but is not pptd. by $CuSO_4 + Cu(OH)_2$. It dialyzes, is destroyed on autolysis and by high temp. and prolonged heating. The yeast is repeatedly washed with water and then pressed to a 25% moisture cake. The press-cake is beaten up in 4 parts water at 80° for 10 mins. and centrifuged, then evapd. in vacuum and dialyzed. The liquid is purified with $Pb(AcO)_2$, excess Pb removed as PbS and the H_2S by aeration. The cozymase is pptd. by $Hg(AcO)_2$ and freed again with H_2S . $HgCl_2$ does not ppt. it. There is a 90% recovery. The best preps. are 80,000 units per g. dry wt.

A. R. ROSE

The increase in the viscosity of protoplasm due to the temperature and its relation to biological reactions. JAN BÉLEHRÁDEK. Univ. Masaryk, Brno. *Protoplasma* 3, 317-26(1928).—The formula $y = (a/X^b)$, where y is the time taken to obtain a certain result, X the temp., and a and b are consts., was applied to the pulsations of the heart of the cladoceran *Daphia*, b was identified as a measure of protoplasmic viscosity. When transferred suddenly from 15° to 4° the frequency of pulsations of *Daphia* heart diminished slowly in a regular curve and came to an equil in about an hr. The beat returned to normal in about 5 mins. when placed at room temp. Conclusion:—In the cooling a time factor intervened like that found in the change of viscosity as certain colloidal solns. are cooled.

M. H. SOULE

The viscosity of protoplasm. GERTRUD MISSBACH. *Protoplasma* 3, 327-44(1928).—Ions act on protoplasmic viscosity in the order monobasic < dibasic < tribasic. The action of Al is studied in particular.

M. H. SOULE

Influence of temperature on dispersion and flocculation of egg albumin. I. S. U'ZINO. Univ. Kyoto. *Kolloid-Z.* 47, 244-8(1929).—The opalescence of albumin sols contg. alc. increases when the temp. is raised or the alc. concn. increased. In protein + H_2O + NaCl + alc. systems, flocculation is the more complete the higher the NaCl concn. Opalescence is more pronounced at higher temp., while the stability is greater.

FRANK URBAN

Oxidases in natural mineral waters (GUIDI) 14. The catalytic power of medicinal mineral waters (FERNÁNDEZ) 14. Light rays for therapeutic purposes (Brit. pat. 296,724) 4.

B—METHODS AND APPARATUS

STANLEY R. BENEDICT

Detection of plasmochine. W. SCHULEMAN, F. SCHÖNHÖFER AND A. WINGLER. *Abh. Gebiete Aussenchemie* 26, n. II, 5 pp.(1928).—Plasmochine is detected in urine-free aq. soln. at a concn. of 1 in 2×10^5 by the development of a blue color with tetrachloro-

benzoquinone. Reaction with K mercuri-iodide, which is not specific, is sensitive to 1 in 10^4 . B. C. A.

A new respiration apparatus. ERNST SIMONSON. Abt. Arbeitsphysiol. Sozialhyg. Untersuchungsamtes, Frankfurt a. M. *Arbeitsphysiologie* 1, 224-57(1928).—The respiration app. is one of the open-circuit type for humans; it consists of mouthpiece, inspiratory and expiratory valves, a special aliquoting device and dry gas meter. The analyses of the aliquot sample are made with the Haldane app. Between the expiratory valve and the gas meter is a metal tube in which there is a circular baffle plate with a hole 8.66 mm. diam. The baffle plate provides enough resistance so that air is forced through capillary metal side tubes attached to the main metal tube between expiratory valve and the baffle plate. The cross sections of the capillary tubes can be varied and to them are attached rubber bags which hold 700 cc. without significant pressure. The aliquoting device is light enough to be carried on the back of the subject and therefore is suitable for studies in industrial work. No significant loss of CO_2 takes place if the duration of the periods is 15 mins. or less, but samples must be drawn from the rubber bags into glass containers if the analyses cannot be made immediately. A detailed discussion of the accuracy of the aliquoting system is given. Expts. were made with rubber materials, oiled paper, treated linen, and "cellophan" either with or without impregnation with com. liquids, and "cellophan" was found to be the most impermeable to CO_2 . The article concludes with a table of the comparative applicability and cost of several well-known methods of detg. the respiratory exchange of man. T. M. C.

Colorimetric estimation of cystine in urine. P. CRISTOL AND C. BENOIT. *Bull. soc. sci. med.* 8, 246-7(1928); *Physiol. Abstracts* 13, 243.—Colorimetric reading of cysteine (transformed from cystine) in cyanide medium, and observations of the influence of Na_2SO_3 on the blue color produced by uric acid, have led to the conclusion that colorimetric extn. of cystine by Looney's method is subject to numerous errors. H. L. D.

Estimation of sugar in urine by means of fermentation tubes. HANS MELCHER. *Apoth.-Ztg.* 44, 305(1929).—An experimental study showing that the Lohmstein type of fermentation saccharometer yields exact quant. results, provided due regard be given to the following requirements: Both the Hg (5 g.) and yeast (0.2 g.) must be accurately weighed; the urine should not be dild. with H_2O , but rather with normal urine; the fermentation should continue over a period of 9-10 hrs. at 37° . W. O. E.

Technic for Leishman's stain suitable for "field" application. J. C. CHUKERBUTI. Indian Military Hospital, Risalpur. *Indian Med. Gaz.* 63, 578(1928).—Directions are given for prepg. stained films suitable for the detection of malaria parasites and their effects upon cellular elements. This method is not suggested as an improvement on the historical Leishman's technic, but as a rough field method to be utilized where pure distd. H_2O free of CO_2 is difficult to obtain. FREDERICK G. GERMUTH.

A simplified bedside blood-sugar method. HARENDRA N. MUKHERJEE. Calcutta Michael Med. Coll., Calcutta. *Indian Med. Gaz.* 63, 624-6(1928).—A method is described for the estn. of blood sugar at the bedside of the patient. The detn. can be made with app. that a medical practitioner is expected to possess. The outlined procedure is a modification of the Polin (1928) method. The blood sugar is oxidized by alk. $\text{K}_3\text{Fe}(\text{CN})_6$ soln., and the ferrocyanide produced is measured colorimetrically as Prussian blue. The color so obtained is 5 times as intense as the tints observed when alk. Cu soln. is employed. The advantages of this method are: no special apparatus is necessary; a very small amount of blood (about one-fiftieth of a ml.) is sufficient. The results attained are accurate for clinical work. FREDERICK G. GERMUTH.

A new test for albumin in urine. CHUNILAL BORA. *Indian Med. Gaz.* 64, 17-18(1929).—The reagent used for the new test consists of saccharin in H_2O , prepd. by boiling the sulfinate in the solvent until a supersatd. soln. is obtained. The test is performed in the same manner as Heller's HNO_3 test. The reagent whose utilization is advocated possesses certain advantages over the HNO_3 test in that it fails to ppt. mucin, urea or urates. The presence of mucin in urine complicates the employment of the acetic acid test, while picric acid ppts. peptones and allied bodies. Comparative results obtained by the application of each of the 4 methods upon urine and other body fluids are presented in a table. The constitution of the compd. produced by the interaction of saccharin with albumin is unknown. FREDERICK G. GERMUTH.

A simple method for estimating blood cholesterol. G. FETTICH. *Klin. Wochenschr.* 8, 362-3(1929).—Mix 1 cc. serum with 0.2 cc. 25% KOH. Boil for 3 mins. Cool. Shake for 3 mins. with 5 cc. CHCl_3 . Filter. Mix two cc. of the filtrate with 0.5 cc. Ag_2O and 0.1 cc. H_2SO_4 . Compare the green color obtained with that of a standard prepd. in the same manner. MILTON HANKE.

Hemorrhage hyperglucemia. MICHAEL G. MALINOS. Columbia Univ. *Am. J. Physiol.* 86, 70-3(1928).—A marked rise in samples of blood sugar was noted after the withdrawal of about 16 cc. of blood per kg. of animal. The adrenals were not concerned in this rise of blood sugar. It may be due to diln. of the blood by tissue fluid richer in glucose than blood itself.

J. F. LYMAN

The use of nitrogen for determining the circulatory minute volume. E. K. MARSHALL, JR., GEORGE A. HARROP, JR. AND ARTHUR GROLLMAN. Johns Hopkins Univ. *Am. J. Physiol.* 86, 99-109(1928).—Circulatory rate was calcd. from the rate of N_2 elimination while the subject was breathing O_2 . A new method was devised for detg. N_2 in the presence of O_2 and CO_2 by use of the Van Slyke-Neill manometric gas analysis app. The soly. of N_2 in blood was 0.90 cc. per 100 cc. of blood. The results of applying the method in general lead to doubts as to the reliability of the method.

J. F. LYMAN

The time necessary for rebreathing in a lung-bag system to attain homogeneous mixture. ARTHUR GROLLMAN AND E. K. MARSHALL, JR. Johns Hopkins Univ. *Am. J. Physiol.* 86, 110-6(1928).—When a normal subject expired, to his residual air and then rebreathed from a rubber bag contg. 2.4 l. of a 5% mixt. of H_2 in air, equil. between the pulmonary gases and the mixt. rebreathed was attained in 15 secs. during which time about 5 deep respirations were made.

J. F. LYMAN

A method for the determination of the circulatory minute volume in man. E. K. MARSHALL, JR. AND ARTHUR GROLLMAN. *Am. J. Physiol.* 86, 117-37(1928).—The subject rebreathes a mixt. of ethylene and air or N_2O and air contained in a rubber bag of 2.5-3 l. capacity. Samples of gas for analysis are taken 15 secs. after the beginning of rebreathing and 12 secs. later. If A = difference in O_2 of 2 samples, B = difference of inert gas, C = cc. inert gas sol. in 100 cc. of blood and D = av. % inert gas during the expt. Then cc. of O_2 absorbed by 1 l. of blood during the expt. = $(A/B) \times C \times (D/100) \times (P/760)$. The O_2 absorbed by the subject per min. is detd. The min. circulatory vol. is then obtained by dividing this value by the O_2 absorbed by 1 l. of blood. Detns. on 16 normal persons in the sitting posture and under basal conditions gave values ranging from 3 to 5 l. Duplicate detns. on the same individuals always agreed within 10%.

J. F. LYMAN

Electron equilibria in biological systems. II. The simultaneous automatic recording of electrical potential and muscular contraction. FLOYD DE EDS, SAMUEL ROSENTHAL AND CARL VOGTLIN. U. S. Pub. Health Service. *Am. J. Physiol.* 86, 200-14(1928).—Methods and app. for continuous and simultaneous recording of muscular contraction and the potential changes in the muscle are described. Contraction was accompanied by a sharp fall in potential and relaxation was characterized by a building up of potential.

J. F. LYMAN

The hormone of the adrenal cortex. F. A. HARTMAN, K. A. BROWNELL, W. E. HARTMAN, G. A. DEAN AND C. G. MACARTHUR. Univ. Buffalo. *Am. J. Physiol.* 86, 353-9(1928).—Hashed adrenal cortex from cattle was shaken with 3 vols. of H_2O from 15 to 30 mins., then 0.1 N AcOH added to pH 4.4 to 4.9 and clarified by centrifugalization. The AcOH ext. was satd. with NaCl at pH 5.4 and the ppt. washed in the supercentrifuge with satd. NaCl soln. to remove adrenaline. The ppt. was dissolved in 0.9% NaCl so that 1 cc. contained the material from 1 g. of cortex and the pH adjusted at 7.35. Adrenalectomized cats showed an av. survival period of 31.1 days when treated with subcutaneous injections of *corlin*; untreated cats lived an av. of 5.7 days.

J. F. LYMAN

The reduction of *m*-dinitrobenzene as an index of the respiratory exchange of tissues and as a function of the pH. M. COMEL. *Boll. soc. ital. biol. sper.* 3, 919-21 (1928); cf. *C. A.* 22, 4605; 23, 163.—Four hundred mg. of muscle pulp was mixed with 100 mg. of finely powd. *m*-dinitrobenzene; the material was placed in a test tube and 2 cc. of phosphate buffer soln. of varying pH values was added. The mass was mixed, allowed to stand for 3 hrs., filtered and the pulp washed with 2 cc. more of the same phosphate soln. The filtrates were combined and the intensity of the color was detd. by Bürker's colorimeter. The color of the filtrate having a pH of 7.0 was given a value of 100. Filtrates of lower pH were compared to this. The results are given in tabular form showing (x) the pH of the phosphate soln., (x') the pH of the mixt. of the buffer and tissue pulp, and (y) the intensity of the color. By plotting (y) as a function of (x') the data fit approx. the hyperbolic curve $y = (a/x') + b$. There is, therefore, a parallelism between the reduction of *m*-dinitrobenzene, the respiratory exchange of tissue pulp and the pH of the pulp. The reduction of *m*-dinitrobenzene as an index of the respiratory exchange of tissues, the pH and the duration of the reducing period. *Ibid* 922-5.—The mixt. of tissue pulp and buffer soln. was allowed to stand for 30 mins.

and for 1 hr. The intensity of color was detd. as described above. The velocity of reduction of *m*-dinitrobenzene was affected by time in a different degree for the different p_H values. This was especially evident at lower p_H , e. g., at p_H 3.1, the intensity of reduction was 20% for $\frac{1}{2}$ hr., 26% for 1 hr. and 33% for 3 hrs. Expts. were then made by allowing tissue pulp at p_H 7.0 to stand varying periods of time. The reduction was proportional to the time only up to the 2nd hr. at the end of which it had reached a value close to the max. obtained at 3 hrs. The increase in reduction at 3 hrs. in comparison to that at the end of the $\frac{1}{2}$ hr. was 108% at p_H 7.0; 133% at p_H 5.8; 145% at p_H 5.2; 144% at p_H 4.1; 250% at p_H 3.1. These results show a different velocity of reduction at different p_H values which run parallel to the respiratory exchange of the tissues, and also a diminution of the reducing process at p_H 7.0 compared with lower p_H . The reduction of *m*-dinitrobenzene as an index of respiratory exchange of the tissues, p_H and temperature. *Ibid* 925-7.—The influence of temp. on the velocity of reduction of *m*-dinitrobenzene by muscle pulp was investigated. The technic already described being used, muscle pulp of varying p_H values was incubated at 20°, 30° and 40° for 3 hrs and the formation of *m*-nitrophenolhydroxylamine was detd. colorimetrically. The exptl. results indicated that the reduction of *m*-dinitrobenzene at varying p_H values does not follow the same curve at different temp. The diminution of the velocity of reduction at p_H below 7.0 is marked at 20°, more marked at 30° and very rapid at 40°. This behavior runs parallel to the respiratory exchange of tissue at the same temp. Also in *Arch. sci. biol.* 13, 158-84(1929).

PETER MASUCCI

A new test of renal function. R. T. BRAIN AND H. D. KAY. The London Hosp. Quart. J. Med. 22, 203-16(1929).—A new test for renal efficiency, the glycerophosphate test, is described. It depends on the excretion of extra P in the urine in the hour following the intravenous injection of a standard quantity of P in the form of Na glycerophosphate (550 mg.). In normal individuals, or in patients not suffering from renal disease, at least 150 mg. of extra P is excreted in this period; in cases of renal impairment the amt. varies from this figure down to 0, depending on the amt. of renal damage. The test is simple and does not possess as many errors as does the blood urea concn or the phenolsulfonephthalein test. The glycerophosphate test agrees very closely with clinical findings when the latter are typical, and if it diverges from the urea or phenolsulfonephthalein tests it agrees more closely.

JOHN T. MYERS

The determination of levulose in small quantities of blood. S. VAN CREVELD. Univ. of Amsterdam. Arch. nederl. physiol. 13, 521-33(1928).—The proteins were removed from the blood by the addn. of 1 part of 4% HCl and 2 parts of 5% HgCl₂ to 1 part of blood. To 1 cc. quantities of the filtrate were added 8-10 drops of a mixt. of diphenylamine and HCl. The material was then boiled. A blue color developed in the presence of levulose due to the reaction of this substance with the reagents. The color was compared with standard solns. of levulose. The outstanding advantage of this method is the small amount of blood (1 cc.) necessary for a detn. M. H. S.

A new method for preparing gold sol. O. WUTH. Munch. med. Wochschr. 75, 472-3(1928).—Pure chemicals and clean glass are essential. Preliminary process. To 100 cc. distd. H₂O there are added 1 cc. of 1% AuCl₃ and 2 drops of a 0.4% alc. soln. of phenol red. Sufficient K₂CO₃ (3% soln.) is added to produce a clear pink color which persists for 60-90 mins.; this is usually about 0.5 cc. Prepn. of gold sol. To 250 cc. of distd. H₂O are added 2.5 cc. AuCl₃ and the quantity of K₂CO₃ required in the preliminary process. After this has been well shaken, 1 drop of 0.1% tannic acid soln. is added and the whole heated to boiling (brisk). It is removed from the flame and 1.5 cc. of a 2.5% formaldehyde soln. is quickly added. The mixt. is stirred continuously until the color changes into a deep, clear red. The temp. must be kept near the boiling point until this change takes place. The sol. should be tested biologically with known cerebrospinal fluids before being used. This method gave gold sol. 50 times without a single failure.

R. C. WILLSON

The determination of catalase. P. GOLYZOV AND V. JANKOVSKI. Russk. fiziologicheskij Zhurnal 11, 33-41(1928); Ber. ges. Physiol. expil. Pharmacol. 46, 401. After testing experimentally several of the methods now used for the detn. of catalase, the authors conclude that the permanganate method of A. Bach and S. Zubkows in its original form is usually the most suitable test. To det. the active catalase number or index this method is altered in that 40-60 mg. H₂O₂ are used instead of 20 mg. To blood solns. which have been warmed to room temp. it is necessary to add a small amt. of ethyl alc. (1:8000) about 30 mins. before the catalase detn. to activate the inactive catalase.

R. C. WILLSON

Modified I₂O₅ method for determination of CO in air and blood (MARTINEK, MARRY) 7.

Handbuch der hygienischen Untersuchungsmethoden. Bd. I. 1088 pp. M. 48; bound, M. 54. Bd. II. 820 pp. M. 40; bound, M. 46. Bd. III. 808 pp. M. 40; bound, M. 46. Edited by E. Gotschlich. Jena: Verlag von Gustav Fischer.
 KÖHLER, A.: Handbuch der biologischen Arbeitsmethoden. Section II. Physiological Methods. Part 2, No. 6, Photomicrography. Berlin: Urban & Schwarzenberg. 287 pp. Reviewed in *Abstract Bull. Kodak Res. Labs.* 15, 144 (1929).

C—BACTERIOLOGY

CHARLES B. MORREY

Growth of *Bacterium radicola*. S. SNIESZKO. *Bull. intern. acad. Polonoise* 1928B, 55-74.—*B. radicola* from kidney bean, red clover, cultivated pea and hairy vetch does not grow on a synthetic medium of p_H above 7.0 or below 4.5. The H-ion concn. exerts considerable influence on the morphological changes observed in *B. radicola*.
 B. C. A.

Behavior of bacteria in milk. G. DEI GRISOGONO. *Zymologica* 3, 113-5(1928).—The existence of Gorini's two types of coagulation of milk (C. A. 21, 935, 3066) is confirmed. Organisms causing the first type of coagulation do not liquefy gelatin, whereas those producing the second type liquefy gelatin distinctly and rapidly. The only strain of streptococcus isolated from milk belongs to the second class.
 B. C. A.

Thermophilic and thermoduric microorganisms with special reference to species isolated from milk. V. Description of spore-forming types. PAUL S. PRICKETT. N. Y. Agr. Expt. Sta., *Tech. Bull.* 147, 5-58(1928).—Four hundred and eighty cultures were isolated from milk. The thermophilic bacteria are responsible for the production of pin-point colonies on nutrient media seeded with pasteurized milk. The source of these organisms is hay, straw, grain and equipment. These organisms produce undesirable changes in pasteurized milk that affect its com. life and salability. No evidence was adduced tending to show any public health significance.
 C. R. F.

Symbiotic gaseous fermentation (by bacteria). ALDO CASTELLANI. *Rev. hyg. med. prev.* 51, 232-40(1929).—The phenomenon is described wherein 2 bacteria, neither of which alone is able to ferment carbohydrates, are able to produce gas when grown in symbiosis. *B. typhosus* in symbiosis with *B. morgani* ferments maltose, mannitol or sorbite, yet neither organism alone attacks these sugars. *B. typhosus* alone produces only acid, while *B. morgani* alone produces neither gas nor acid. This phenomenon may be employed in the differentiation of various species of bacteria, for example, the 3 dysentery groups. Similarly, carbohydrates may be identified by employing the proper test organisms.
 C. R. F.

New ways for sterilization. RUDOLF DECKWITZ. *Klin. Wochschr.* 8, 342-8 (1929).—This is a good historical discussion of the concept of oligodynamic action. The original work discussed in this paper deals largely with the practical application of a highly dispersed metallic Ag prepn (solid, not colloidal) to water sterilization. This prepn. is so effective that when kept in contact with the bacteria it is capable of sterilizing emulsions contg. 100,000 colon bacilli per cc. in 10 mins. The expts. reported are too numerous and varied to be reported in abstract form.
 MILTON HANKE

Electrical phenomena of some species of *Leptospira*. W. AEG. TIMMERMAN. *Nederland. Tijdschr. Hyg., Microbiol. en Serol.* 3, No. 3, 241-7(1928).—Several species of *Leptospira* show a positive elec. charge in regard to the dil. rabbit serum in which they are grown. The measured cataphoretic speed is partly influenced by the displacement of the *Leptospira*. By adding CNS ions, it is possible to reverse the elec. charge in regard to this serum.
 J. C. JURRENS

Bacterial antagonism with special reference to the effect of *Pseudomonas fluorescens* on spore-forming bacteria of soils. I. M. LEWIS. Univ of Texas. *J. Bact.* 17, 89-103(1929).—*Pseudomonas fluorescens* produces a thermostable, filterable, dialyzable bacteriotoxin which is both inhibitory and bactericidal. The toxin is not sp. in its action but is more active against certain species than others. Fungi are more resistant than bacteria. Spore-forming bacteria and micrococci are very sensitive, while colon bacilli are resistant. The substance is not iso-inhibitory. The amt. of toxin produced depends on the compn. of the medium and the availability of O. Max. production occurs on sloped cultures on Uachinsky's agar. The toxin persists longer in agar than in broth cultures, and resists desiccation for long periods of time. It is sol. in alc. and is adsorbed by substances in soil and by charcoal. It is formed in sterilized manured soils inoculated with *Ps. fluorescens*. Alc. exts. from such soils are inhibitory for the more sensitive species only. Soils which have supported a vigorous growth of *Ps. fluorescens* in flask cultures are suitable for the growth of *B. cereus* after sterilization.

Samples of soil from fields, gardens, pastures and meadows failed to yield toxins by similar methods of extn. It appears that the toxin here studied is of a different nature from that of the thermolabile substances reported by others from soils. J. T. M.

Smooth-rough variation in bacteria in its relation to bacteriophage. F. M. BURNET. Lister Inst. *J. Path. Bact.* 32, 15-42(1929).—From most cultures that are rough by all the usual criteria it is possible to derive smooth forms by the use of suitable phages since certain phage types attack only smooth forms, others only rough strains and some attack both forms. Some rough forms could not thus be converted to smooth forms and the evidence suggests that the conversion can only occur when a trace of smooth antigen is retained in the antigenic makeup of the bacillus. It is suggested that bacterial resistance to phage is dependent in large part on the bacterial constituent which functions as the "heat-stable antigen." JOHN T. MYERS

Notes on intestinal bacilli with special reference to smooth and rough races. P. BRUCH WHITE. Natl. Inst. Med. Research, London. *J. Path. Bact.* 32, 85-94(1929).—The sol. specific substance may be extd. quantitatively from *Salmonella* and similar bacilli by hot dil. acid. Rough variants give an immediate reaction with Millon's reagent; smooth races react only when the sol. specific substance has been removed. Under ordinary circumstances of test, smooth bacilli of this group and filtrates of broth cultures are more toxic to lab. rodents than the corresponding rough forms. When the rough forms are treated with alc. their toxicity approaches that of the smooth forms. Mucoid growth in *Salmonella* is not related to smoothness and is not analogous to capsule formation. JOHN T. MYERS

The formation of optically active lactic acid from glucose and *dl*-lactic acid by bacteria. HIDEO KIMURA. Univ. Kyoto. *Acta Schol. Med. Univ. Imp. Kyoto* 11, 325-33(1928).—Degradation of glucosamine by *Bacillus prodigiosus* and *B. subtilis* yields *l*-MeCH(OH)CO₂H (I), while with *B. coli* *d*-MeCH(OH)CO₂H (II) is formed (Takao, C. A. 18, 2354). K. investigated the action of these bacteria on glucose and *dl*-MeCH(OH)CO₂H (III). A 2-day old culture of the bacteria was added to a soln. contg. 5.0 g. NaCl, 2.0 g. KH₂PO₄, 0.1 g. MgSO₄, 1.0 g. (NH₄)₂CO₃, 5 g. CaCO₃, and 3-20 g. of the substrate per l. The mixt. was kept at 37° for a certain period, after which it was examd. for MeCH(OH)CO₂H. In the expts. with glucose and *B. prodigiosus* or *B. coli* I was obtained. Glucose and *B. subtilis* yielded at certain times II and at other times III. In the expts. with III it was observed that all 3 species of bacteria chiefly utilized the *d*-form. G. SCHWACH

Initiation of growth of certain facultative anaerobes as related to oxidation-reduction processes in the medium. RENÉ DUBOS. Rockefeller Inst. Med. Research *J. Exptl. Med.* 49, 559-73(1929); cf. C. A. 23, 1929. The growth of many pathogenic organisms in plain meat infusion broth is possible only when a large inoculum is used. This requirement is much less strict when the broth cultures are incubated (a) under anaerobic conditions, (b) in fresh media very recently boiled or autoclaved, (c) in fresh media reduced by means of H₂, or to which small amts. of cysteine or of blood have been added. It is suggested that these findings can be accounted for by assuming that the bacterial species under consideration can multiply only in media, the oxidation potential of which is below a critical value. The favorable growth conditions obtained by the procedures enumerated above may be attributed to the establishment of a proper reduction potential in the medium; the same result is obtained by using a large inoculum, owing to the reducing properties of bacterial cells. C. J. WEST

Relation of the bacteriostatic action of certain dyes to oxidation-reduction processes. RENÉ DUBOS. Rockefeller Inst. Med. Research. *J. Exptl. Med.* 49, 575-92(1929). Oxidized indophenol and methylene blue are bacteriostatic for pneumococcus and hemolytic streptococci of human and bovine origin, while the indigos, malachite green and litmus are not toxic. 2-Chloroindophenol, the most positive of the indicators of oxidation-reduction potentials used, is also the only one to have a bacteriostatic action on cheese strains of *Streptococcus hemolyticus*. Methylene blue and the indophenols are no longer bacteriostatic when present in a reduced form in a medium capable of maintaining them in such a condition. A comparison of these results with the growth in plain broth of the organisms studied suggests that the "inhibiting" dyes "poison" the medium at an oxidation potential outside the range in which the inhibited organism can grow. The validity of this hypothesis is discussed and the significance for the use of dyes in therapeutics is considered. C. J. WEST

Cheshire cheese. I. Bacterial content (SADLER) 12. Fixation of atmospheric N by *Azotobacter* (MEYERHOF, BURK) 15. The bactericidal action of smoke (as used in smoke-curing of fish) (HESS) 12. Preparation of certain octadecanoic acids and their bactericidal action toward *B. lepras* (STANLEY, et al.) 10. Derivatives of *p*-methoxy-

cinnamic acid (FOOTE) 10. Colorimetric method for the determination of butyric acid (ALLGEIER, *et al.*) 7. The catalytic power of medicinal mineral waters (FERNÁNDEZ) 14.

DIBLE, J. HENRY: Recent Advances in Bacteriology and the Study of the Infections. Philadelphia: B. Blakiston's Son & Co. 363 pp. \$3.50. Reviewed in *Ann. Internal Med.* 2, 1116(1929).

D—BOTANY

THOMAS G. PHILLIPS

•• Metabolism of conifer leaves. J. DOYLE AND P. CLINCH. *Proc. Roy. Irish Acad. B*, 38, 116-127(1928).—Peroxidase, sometimes accompanied by an alc. sol. inhibitor, has been identified as the sole oxidizing enzyme in the leaves of conifers. Expts. have failed to establish a relationship between the p_H and the water-sol. pentosan fraction of the leaves.

B. C. A.

Catalase content of conifer leaves. J. DOYLE AND P. CLINCH. *Proc. Roy. Irish Acad. B*, 38, 128-47(1928).—The seasonal variation in the catalase content of conifer leaves is described and appears to be assocd. with the corresponding variation in starch content. The variations of the initial rate of the catalase activity with temp., enzyme and substrate concn. have also been detd.

B. C. A.

Composition of tobacco leaves. A. I. SMIRNOV, M. A. DRBOGLAV AND L. S. ERIGIN. U. S. S. R. State Inst. Tobacco Invest. 1928, *Bull.* 46, 1-59; cf. *C. A.* 23, 1929.—The variation in tobacco leaves with age has been detd. with reference to the following: dry wt., rate of respiration, total carbohydrate, sucrose, maltose, starch, dextrin, invertase, amylase, total N, protein, nicotine, amide N and hydroxy-acid contents.

B. C. A.

The transpiration ratio of farm crops and pasture plants in the Adelaide district. A. E. V. RICHARDSON AND H. C. TRUMBLE. *J. Agr. S. Australia* 32, 224-44(1928).—The av. transpiration ratio for cereal crops for a period of 3 years for dry matter and grain, resp., is: barley 339:828; wheat 328:1147; oats 379:1146; rye 469:1586. The transpiration ratio for cereals and pasture plants varies with the stage of growth. Grasses and clovers transpire relatively small quantities of H_2O in the early stages of growth. Absorption of nutrients by the roots is independent of the transpiration stream, for with barley the greater part of the N and mineral nutrients are absorbed at a comparatively early stage of growth, while transpiration increases exponentially and reaches a max. just after flowering. The application of sol. P results in a marked reduction of the transpiration ratio of certain plants. This effect is particularly marked in the early stages of growth and varies with the degree to which the soil is satd. with H_2O .

M. S. ANDERSON

A biochemical study of some soil fungi with special reference to ammonia production. A. K. THAKUR AND ROLAND V. NORRIS. *J. Indian Inst. Science* 11A, Part 12, 141-60(1928).—Fifty distinct species of fungi were isolated from soils and a part of these was used for subsequent studies. *Aspergillus flavus*, *Penicillium glaucum* and *Armillarius* were tested for N-fixing power and showed negligible fixation. A study of cellulose decompn. by 12 different soil fungi showed wide variation in the powers of the different organisms, varying from no decompn. to very strong action. Decompn. of org. matter in artificial media by *Aspergillus flavus* was studied with and without the presence of sugar. Total N, available N, ammoniacal N and p_H were detd. at frequent intervals over a period of 40 to 60 days. The chem. data as well as growth observations showed that the accumulation of NH_3 from the result of mold action took place at different stages in the life cycle of the organism. Amidase was isolated from *Aspergillus flavus*, and its influence on the rate of hydrolysis of amino acids and amides was studied. The reaction was autocatalytic in nature; the velocity curve first exhibited a period of lag, and then a period of acceleration as NH_3 was formed.

M. S. ANDERSON

The relation of nitrogen metabolism to plant succulence. W. H. PEARSALL AND JAMES EWING. *Ann. Botany* 43, 27-34(1929).—Radish and turnip were grown in 2 series of sand cultures watered with solns. contg. 1-2 mg. and 100 mg. of nitrate, resp. $NaNO_3$, $Ca(NO_3)_2$ and NH_4NO_3 were employed singly or in mixt., but gave results of similar character. Analyses of the plants were made at 5 and 8 weeks of age. In both radish and turnip the plants receiving low N supply had higher insol. N, lower sol. N, lower amino and amide N, higher total sugars, higher H-ion concn. and lower water content than those with high N supply. The total titratable acidity is higher in the high N series, but is chiefly due to amino acids, so that the actual acidity is lower. The

accumulation of amino acids under high N supply appears so to affect metabolism as to reduce acid production. The reduction of H-ion concn. thus brought about permits greater swelling of the protoplasmic colloids, which have a point of min. swelling at about pH 5.3-5.4. JOSEPH S. CALDWELL.

The phosphate requirement of barley at different periods of growth. WINIFRED E. BRENCHELY. *Ann. Botany* 43, 89-110(1929).—Cultures of Goldthorpe barley were grown in nutrient solns. with and without P (266.7 p. p. m. P_2O_5 were present in the complete soln.). At intervals of 2 weeks groups of plants were transferred from the P-free soln. to one contg. P, and a second group was transferred from complete to P-free medium. This gave 2 series grown, respectively, with and without P for 2, 4, 6, 8, 10, 12, 14 and 16 weeks, each then receiving the reverse treatment until harvest. Two addnl. groups were started with and without P, the treatments being reversed at 2-week intervals throughout their growth, so that each had P available for half its total growth period. Tiller production is detd. by the availability of P_2O_5 in the first 6 weeks of life, no tillering occurring in plants deprived of it for this length of time. If P_2O_5 is available for the first 4-6 weeks and is then removed, tillering continues for 2-3 weeks longer, then ceases and is not resumed when P_2O_5 is again supplied. Ear formation was not affected by deprivation of P_2O_5 after the end of 6 weeks, but deprivation for the first 4 weeks entirely inhibited ear formation. If P_2O_5 were supplied for the first 6 weeks, grain formation was little affected by its subsequent withdrawal, but deprivation in the first few weeks suppressed grain formation despite presence of adequate supplies later. Total dry weight was not reduced by withholding P_2O_5 after the first 6-8 weeks. The critical period in the life of the barley plant in relation to P supply is the first 6 weeks. JOSEPH S. CALDWELL.

Physiological studies in plant nutrition. 1. The effect of manurial deficiency on the respiration and assimilation rate in barley. F. G. GREGORY AND F. J. RICHARDS. *Ann. Botany* 43, 119-61(1929); cf. *C. A.* 22, 3904.—Four groups of plants of barley, variety Plumage Archer, were grown in sand cultures supplied with complete fertilizer, N deficient, K deficient and P deficient. Detns. of amt. of CO_2 given off or taken up were made on each group of plants at 4-day intervals from June 8 to August 18, employing Waller's katherometer. Various defects of the original instrument, with the methods adopted for remedying them, are stated. The respiratory rate of the K-deficient plants was markedly higher, that of N-deficient plants considerably lower, at all stages of growth than that of fully manured plants; that of P-deficient plants was quite irregular, exceeding the rate of plants on complete fertilizer in the first 4 weeks and again in the ninth to twelfth weeks of the expt. but falling below in the fifth to ninth weeks.—In all the plants with incomplete manurial treatments, the respiratory rate falls to a min. with a subsequent rise; with complete fertilizer it falls to a rate which remains const. after the first 5-6 weeks. The results with light of high and low intensity differ in that the rate of respiration falls off more sharply with increasing age under light of low intensity. JOSEPH S. CALDWELL.

The effect of small electric currents on the assimilation of *Elodea canadensis*. D. MARX. *Ann. Botany* 43, 163-72(1929).—Currents of densities varying between 1.5 and 6×10^{-7} milliamps. per sq. cm. were passed through the water in which the plants were growing, care being taken to protect the plants against the products of electrolysis. No increase in assimilation rate as measured by the bubble method was observed in any instance but a c. d. of about 1 milliamp. per sq. cm. caused a marked decrease in assimilatory rate. JOSEPH S. CALDWELL.

Susceptibility of wheat to mildew as influenced by carbohydrate supply. SAM F. TRELRASS AND HELEN M. TRELRASS. *Bull. Torrey Bot. Club* 56, 65-92(1929), cf. *C. A.* 22, 1378.—Detached leaves of wheat seedlings, previously depleted of carbohydrate by keeping in darkness, were inoculated with *Erysiphe graminis* and placed in 0.1 M solns. of various carbohydrates and alcs. In all of these, susceptibility was markedly increased, most in dextrose, levulose, sucrose and melzitose, somewhat less in xylose, galactose, lactose, maltose and glycerol, least in arabinose, rhamnose, mannose, starch, dextrin, inulin and mannitol. Even in the last named, growth and spore formation were more than 100-fold that on control leaves in tap water. In leaves placed in a series of sucrose solns. kept in darkness, development of mildew increased with increase of concn. up to 27.57 g. per 100 cc. Development of mildew increased with increase in osmotic concn. of sucrose, dextrose or glycerol up to about 19 atms., but fell off above this point. Mildew did not develop on leaves kept in light in chambers kept free of CO_2 unless the leaves were supplied with a carbohydrate soln. J. S. C.

The existence of resins in *Stigmatocystis nigra*. V. CHARLES POSTILLON. *Compt. rend.* 188, 413-6(1929).—The mycelium was washed with H_2O , dried and extd.

for 8 hrs. with EtOH. After cooling, the ext. was decanted from a ppt. and dild. to 70% EtOH, boiled to agglomerate the fat which was sepd. H₂O was then added in excess, the mixt. boiled and a drop of HCl added to coagulate the ppt. which was identified as a resin. The same result was obtained by means of Na₂CO₃ or Mg salts. The presence of a resin was confirmed by dissolving the fatty acids in Ac₂O, adding H₂SO₄, and obtaining a fugitive red or bluish violet color followed by a yellow-brown which was fluorescent.

DAVID DAVIDSON

Colorimetric determination of total phosphorus in plant solutions. R. W. GERDEL. Ohio Agr. Expt. Sta. *Ohio J. Sci.* 28, No. 4, 229-35(1928).—Although not as reliable as the usual volumetric methods, P may be detd. by a colorimetric method on the wet-digested dry samples. Hydroquinone seems the best colorimetric reducing agent for (NH₄)₂PO₄·12MoO₃. The color developed is neither proportionally nor geometrically progressive, consequently table or curve corrections cannot be made. The presence of H₂SO₄ and other compds. in the plant solns. interferes with the accuracy. R. C. E.

The determination of the freezing point of sugar-cane buds. G. L. FAWCETT. *Rev. Ind. Agr. Tucuman* 19, 123-31(1928).—The first application of the thermoelec. method for this purpose. A Cu-constantan thermocouple was made, the directions of Taylor being followed, and a Leeds Northrup potentiometer was adopted. Care was taken against supercooling. The f. ps. are: apple -1.93°, peach -1.44°, orange -2.21°, potatoes -1.78°, ripe tomatoes -0.90°, lettuce -1.0°, vetch -1.09°. The value for sugar-cane buds varied from -1.1° to -2.4°. The resistance of buds to cold seems to vary, possibly with evapn. The interior tissue of shoots freeze more easily than the buds.

S. L. B. ETHERTON

Nitrogen and carbohydrate distribution in organs of bearing apple spurs. A. E. MURNEK. Mo. Agr. Expt. Sta. *Research Bull.* 119, 3-50(1928).—The chem. compn. of leaves, new growth, and reproductive organs of bearing apple spurs of the Jonathan, Paynes, Late Keeper and King David varieties were ascertained at 15- to 30-day intervals during 1 season and 5- to 6-day intervals during another. Detns. were made of fresh and dry wts., total sugars, starch, hemicellulose, H₂O-sol. N, insol. N and total N. Characteristic chem. changes are correlated with specific functional activities and the attendant morphological development. Throughout the considered period and probably till the fruit attains full growth, the reproductive organs seem to dominate, directly or indirectly, the metabolism of the bearing spur complex. Flowering is characterized by marked increase in all active forms of carbohydrates and N. In the opened flowers in particular, total sugars and sol. N show very high percentages. An increase in these org. substances being likewise noted elsewhere in the spur at this time, translocation to the floral parts must have been very rapid. The sudden increase in sugars at full bloom most likely resulted from hydrolysis of starch, but a considerable fraction of sol. carbohydrates was supplied by hemicellulose, which shows a conspicuous drop at this period. The significance of hemicellulose as an available form of carbohydrates is emphasized. Not only sol. but total N as well comes to a max. concn. in the organs at flowering. Hence nitrogenous substances are moved into the bearing spur in abundance during fertilization and fruit setting. Both carbohydrates and N seemingly are reabsorbed from the dropping blossoms preparatory to their abscission. The former is again deposited largely as hemicellulose or as starch in the leaves and the new growth of the spur. N seems to return primarily to the foliage. Considerable quantities of org. substances, however, are lost through the various drops. After flowering the direction of movement of most org. compds. is to the fruits that have set. Throughout the growing season the total amts. of carbohydrates and N show an ever-increasing accumulation in the fruit. However, as a result of the rapid enlargement in vol. and increase in dry wt. of this organ, the % concn. of some of the nitrogenous substances naturally decreases. Hemicellulose accretion reaches a max. in the fruit in mid-summer, thence decreasing rapidly. Thus, in addn. to starch, hemicellulose must be considered a source of sugars for the flesh of the apple. The development of both leaves and fruit is characterized by an accumulation of N in H₂O-insol. form. Early in the season more total N is formed in the leaves than in the young fruit. As soon as the latter begins to develop this situation is reversed. Throughout its growth the fruit shows conspicuously higher % distribution of the total H₂O-sol. N and hence, in aggregate, more developmental activity than any other organ. Late in the season, however, the fruit is likewise a carbohydrate organ of incomparably larger vol. and higher concn. of sugars, starch and hemicellulose than the vegetative parts of the bearing spur system. Eighteen references are cited and discussed.

C. R. F.

Chemical studies of grape pigments. II. The anthocyanins of Clinton grapes. R. J. ANDERSON AND FRANK P. NAEHHAUER. N. Y. Agr. Expt. Sta., *Tech. Bull.* 146,

3-12(1928); cf. *C. A.* 21, 98, 3929.—The Clinton grape is a cultivated variety of *V. riparia* but probably also contains some blood of *V. labrusca*. The pigment occurring in Clinton grapes consists principally of a monoglucoside, anthocyanin. The anthocyanin chloride, $C_{25}H_{35}O_{11}Cl$, did not sep. in definitely cryst. form, but the picrate, $C_{25}H_{35}O_{11}C_6H_2(NO_2)_3OH$, crystd. in bright red prisms or needles. The glucoside is easily hydrolyzed by boiling HCl, yielding 1 mol. each of glucose and anthocyanidin chloride, $C_{17}H_{15}O_7Cl$, the latter crystg. from the hot soln. in prisms. The anthocyanidin chloride consists largely of a monomethyl ether of delphinidin, but the values for methoxyl were too high, indicating that it contained some delphinidin dimethyl ether. The absorption spectra of anthocyanin chloride and anthocyanidin chloride consist of 1 broad band extending from the yellow into the blue. III. The anthocyanins in Seibel grapes. R. J. ANDERSON. *Ibid* 13-21.—The anthocyan occurring in Seibel grapes is a monoglucoside and appears to be identical with oenin, the glucoside derived from *Vitis vinifera*. The pigment was isolated as the picrate which crystd. in red needles. The anthocyanin chloride crystd. in long prisms and corresponds to the formula $C_{25}H_{35}O_{11}Cl \cdot 3H_2O$. The anthocyanidin chloride, $C_{17}H_{15}O_7Cl + 1.5H_2O$, crystd. in prisms from the hot soln. on boiling the glucoside with 20% HCl. The values obtained for methoxyl indicate that the anthocyanidin consists largely of a dimethyl ether of delphinidin, but evidently some monomethyl ether of delphinidin is also present. The substance is very similar to or identical with the oenin obtained by Willstätter and Zollinger from *V. vinifera* (*C. A.* 11, 1408). The absorption spectra of the glucoside and of the sugar free pigment consist of 1 broad band extending from the yellow into the blue. Attention is drawn to the fact that in a cross between European and American varieties of grapes, such as the Seibel seedlings, the pigment peculiar to *V. vinifera* is inherited by the hybrid.

C. R. F.

Pineapple investigations. H. C. HENRICKSEN. Porto Rico Agr. Expt. Sta., *Rept.* 1927, 19-24.—Moisture content, sap reaction, carbohydrates, proteins, enzymes and inorg. substances in the pineapple leaf were studied in an effort to det. the causes of certain outward discernible differences in the pineapple plant. In the normal leaf, the approx. H_2O content was 91% in the white-base leaf, 85% in the middle section and 80% in the section adjoining the apex. Reddish colored leaves had less than 80% of H_2O . The pH value of the normal sap varied from 6 to 6.3. Carbohydrates in young leaves were 13% while in red senescent leaves the value reached 30-40%. The normal leaves contained much starch while the chlorotic leaves contained very little. Chlorotic pineapple leaves were considerably higher in mucilaginous substances which indicates that starch formation inhibited in the chlorotic leaf and explains the greater amt. of gum formation in such leaves. Mature leaves were in normal condition when the carbohydrate content was 3-4 times as high as the protein content. The average protein content was 6%. A high protein-carbohydrate ratio was always correlated with low chlorophyll, and a high reducing sugar content was correlated with a high anthocyan content. The normal pineapple leaves contain peroxidase, catalase, reductase and diastase in greater amts. than red and chlorotic leaves. $(NH_4)_2SO_4$ used as a fertilizer produced normal vigorous leaves while either $NaNO_3$ or KNO_3 produced abnormalities such as pale color, twisted and crinkled leaves and fruit and few or no slips. Expts. indicate that P is required only in very small quantity and its use is valuable only in obtaining early maturity of the leaf tissue. S is useful as a soil amendment but the use of S is not recommended where $(NH_4)_2SO_4$ is used.

C. R. F.

The banana. D. W. MAY. Porto Rico Agr. Expt. Sta., *Rept. of the* 1927, 7-8.—Analyses showed that K_2O is present in the banana plant in unusually large amts. The % of K_2O in the dry matter varied considerably in different varieties as follows: Gigante 2.89, Manzano 1.8, Señorita 3.7, Morado 4.02, Chamalaco (cooking variety) 1.83 and Enano 12.17. There was a striking relation between the K_2O content and freedom from disease, Enano being very resistant and Chamalaco very susceptible to diseases. Heavy K_2O applications also produced vigorous plants with desirable sucker growths.

C. R. F.

Respiration of sorghum grains. D. A. COLEMAN, B. E. ROTHGREN and H. C. FELLOWS. Grain Div., Bur. Agr. Economics. U. S. Dept. Agr., *Tech. Bull.* 100, 1-16(1928).—All cereals are similar in that hygroscopic moisture is in equil. at 25-28% with atm. of different relative humidities, the exception being that at above 75% humidity, sorghum grain contained less H_2O . At high moisture contents, cracked and broken sorghum kernels respire more vigorously than do normal whole kernels. Accordingly, an increased risk is involved in storing and transporting sorghum grains that contain appreciable quantities of broken kernels. The chief responsibility for the greater storage difficulties of the sorghum grains, as compared with other cereal grains

is in the high % of cracked kernels usually present in com. lots of sorghum grains. Heat-damaged sorghums likewise respire more vigorously than do sound kernels. Grain which has been exposed to incipient heating develops a condition which makes it unsafe for storage, as it seems to go out of condition more rapidly than does sound grain under the same conditions. Storage tests made under lab. conditions bear out in a general way the findings of the respiration studies, namely, that if the temp. is sufficiently high, 38° or more, sorghum grains that contain over 14% of moisture will go out of condition.

The constituents of corn silk. TARO NOGUCHI. *Bull. Inst. Phys.-Chem. Research (Tokyo)* 8, 143-51 (1929); Abstract Ed., 2, 21-22.- The Et₂O ext. of corn silk gives an alc. C₂₂H₄₀O, m. 74-5°, mol. weight 458-66 in camphor. Its Ac deriv. has been prepd. Phytosterol is found in the alc. ext. of corn silk. Ketoses, aldoses and pentoses are present in the sugar fraction. The basic Pb acetate fraction gives the flavone reaction. Vitamins A and B were proved to exist by animal expts. The presence of vitamin E is doubtful.

C. R. F.

ALBERT L. HENNE

Quantitative study of the course of fungal invasion of the apple fruit and its bearing on the nature of disease resistance. I. A statistical method of studying fungal invasion. F. G. GREGORY AND A. S. HORNE. *Proc. Roy. Soc. (London)* B102, 427-43 (1928).—Resistance to invasion is best measured by the rate of radial advance of the disease. II. The application of the statistical method to certain specific problems. A. S. HORNE AND F. G. GREGORY. *Ibid* 444-66.—High resistance to fungal invasion is assocd. with low H₂O content, high acidity, high K content, and low N content.

JOSEPH S. HEPBURN

Damages to vegetation from gases in smoke. KURT NOACK. *Z. angew. Chem.* 42, 123-6 (1929).—Small quantities of SO₂, HCl, NH₃ and H₂S in the gases in contact with plants may have a detrimental effect. The action of these substances in soln. on the soil is another factor to be considered. N. used clover, spinach, tobacco and corn. The poisoning seems to be due to an action on the Fe of the chloroplasts, interfering with its catalytic effects in assimilation. Apparently secondary changes affect the photochem. oxidative processes of the plant so that bleaching and the death of cells result. Since it seems impractical to attempt completely to eliminate these harmful constituents from industrial gases, growers should avoid planting unusually sensitive plants where contamination of the air may occur, and should pay particular heed to the effects of meteorological changes in this connection.

G. ALBERT HILL

Structure and chemical properties of the epidermis of *Clivia nobilis*. DONALD B. ANDERSON. *Jahrb. wiss. Botan.* 69, 501-14 (1928).—The structure and chem. properties of the epidermal layer of *Clivia nobilis* were studied by means of polarized light, staining and other reactions according to the methods of Kisser and Molisch. The epidermis was composed of 3 distinct layers: namely, a cuticle consisting of pure cutin; a cuticular layer composed of cutin, cellulose and pectic materials; and a cellulose layer contg. cellulose and pectic substances. Pectic substances were concd. between the cellulose and cuticular layers. The inner half of the cuticular layer was composed of cellulose and pectic substances which were infiltrated with cutin, the pectic substances decreasing toward the lumen side. The outer half of the cuticular layer consisted of cutin and none or only a trace of pectic substances, the cellulose decreasing and the cutin increasing toward the cuticle side. It is assumed that the increase in double refraction from the lumen toward the middle of the cellulose layer is due to a decrease in H₂O content in the cellulose lamella. These data represent the combined results of 3 different methods for detg. the structure and chem. properties of the epidermis.

A. E. HITCHCOCK

Biochemical characteristics of aging in leaves. A. I. SMIRNOV, P. S. ERIGIN, M. A. DUBOGLAV AND M. TH. MASHKOVZEV. *Planta, Abt. E., Z. wiss. Biol.* 6, 687-764 (1928).—Analyses showed that aging in sunflower and tobacco leaves is accompanied by the following changes: increased dry wt., increased ratio of maltose to sucrose, decreased activity of respiration enzymes, increased total N (except during flowering), an initial increase followed by a decrease in protein synthesis, and the accumulation of amino, amide and ammonia N in the form of org. acids. Nicotine N increased steadily in tobacco leaves. The trend of changes in other forms of N and carbohydrates was essentially the same in both plants, especially just before and after flowering, with the exception of sucrose. Flowering in the sunflower was characterized by a relatively high content of reducing sugars and a relatively low content of maltose, starch, sucrose, lexitrin, total N and protein N. A similar situation existed in the tobacco with the exception of sucrose which remained high. A higher content of total N in the upper compared to the lower leaves is believed to be due to a greater absorption capacity

in the upper leaves. Conclusion: Protein synthesis is dependent mainly upon the supply of carbohydrates during the first stages of growth, but later the amt. of respiration energy becomes an important factor. In the early stages of growth maltose is utilized as fast as it is formed and the accumulation of org. acids in the late stages of growth appears to be due to a decline in the rate of protein synthesis. A. E. H.

Carbohydrate metabolism in evergreen leaves during the year. HERMAN GUTTENBERG. *Planta Abt. E., Z. wiss. Biol.* 6, 801-8(1928).—The following conditions were found in leaves of *Ilex aquifolium* and *Hedera helix* during Oct.-March: total carbohydrates were low (starch and sucrose absent), and glucosides were high in Oct. only. The dry wt. of *Hedera* leaves was low during the entire period, while that of *Ilex* leaves was medium high, decreasing to a min. in March. From Apr. to Aug. *Ilex* and *Hedera* leaves both contained an abundance of starch and sucrose, but were low in glucose except during July. *Ilex* contained the max. amt. of glucosides (8% in old and none in new leaves during June) while *Hedera* contained traces only. The dry wt. of *Ilex* leaves was high during the entire period while that of *Hedera* was low in the spring, increasing to a max. in July. In spite of a low carbohydrate content the dry wt. of *Ilex* leaves continued to increase and remained high until the middle of Nov. For *Hedera* leaves on the contrary, the dry wt. remained low while carbohydrates were accumulating. It appears, therefore, that an increase in dry wt. is dependent upon factors other than the carbohydrate supply. *Pinus cembra*, in contrast to *Ilex* and *Hedera*, contained starch, sucrose and glucose during the entire year. A. E. HITCHCOCK.

The formation of chlorophyll and its relation to the blood pigment. KURT NOCK. Botan. Inst., Erlangen. *Naturwissenschaften* 17, 104(1929).—Protochlorophyll occurring in yellow leaves splits off Mg on acid treatment and allows reintroduction of Mg by Grignard reaction. The Mg-free compd., a red dye, has absorption bands almost identical with those of phyloerythrin (bilipurpurin). Amts. of the latter prepd. from gall of animals yielded, after Mg introduction, a green dye, almost identical to protochlorophyll in the spectrum. The phyloerythrin contains one or more carboxyl groups in lactone or lactam bond. From the Mg-free deriv. of chlorophyll a or c (pheophytins), from their allomers and from phytochlorins the Mg-free protochlorophyll deriv. could be made by reduction in acid soln. in good yield, without ester hydrolysis. Sapon. of the reduction products gives carboxylic acids which as well as their Me esters give the same absorption spectrum as sapond. phyloerythrin. Illumination (photooxidation) transformed these products into green substances. It is thus apparent that simple reduction is a bridge between the coloring matter of leaves and of blood. Chlorophyll formation in the plant is in its final stage a photooxidation; the influence of iron on it is considered catalytic. (C. A. 20, 2521.) B. J. C. VAN DER HOEVEN.

Studies on the role of phosphorus in the life of yeast and in alcoholic fermentation. E. ELION. *Nederland. Tijdschr. Hyg., Microbiol. en Serol.* 3, No. 3, 229-40(1928), cf. C. A. 22, 1174.—The action of P in fermentations produced by zymase or yeast preps. contg. zymase is quant., but neither the yeast production nor the activity of the yeast increased in proportion to the quantity of P added. P does not act quantitatively in fermentations caused by living yeast as, e. g., in fermentation caused by zymase produced from the living yeast cell. Every fermentation is accompanied by the formation of esters of H_3PO_4 . The pancreatic juice of the snail, *Helix pomatia*, retards the P esterification by an active zymine, caused by the presence of a substance of an enzymic nature, which splits up the esters after they are formed, and which is called phosphatase. Efforts to ferment mannitol, dulcitol, arabinose and galactose by active zymine produced neg. results. Conclusion: The non-fermentable sugars and even galactose do not form H_3PO_4 esters, and it seems that the configuration, which plays a role in fermentation, is also of importance in the formation of these esters. J. C. JUKRIENS.

The influence of different physical and chemical agents on the spores of one of the species of *Penicillium*. J. DE GRAAFF. *Nederland. Tijdschr. Hyg., Microbiol. en Serol.* 3, No. 3, 249-53(1928).—The spores of the species of *Penicillium* examined died at 60-65° in an aq. medium, in liquid fat at 80-90°. All spores died when exposed to the rays of a quartz Hg lamp at a distance of 30 cm. for 5 mins. Liquid fats cannot be sterilized by ultra-violet rays, even in thin layers. The spores could not be killed with a very concd. soln. of NaCl. H_2O_2 (0.05%) killed all spores within 1 day. Cloves are the most effective of the species to prevent mold growth. Quinine (0.1-0.5%) and eucupine (0.03-0.1%) prevent the growth of mold. J. C. JUKRIENS.

The assimilation of the molecular nitrogen of the air by lower plants, especially by fungi. G. SARR. *Biol. Reviews Biol. Proc. Cambridge Phil. Soc.* 3, 77-91(1928).—S. states that the ratio of org. to inorg. compds. on the surface of the earth remains

unaltered. The ratio of the mol. N of the air to the compds. of this element is also a const. Combustion and fermentation produce mol. N from its compds. Bacteria and fungi effect the reverse reactions—the fixation of N. Detailed discussion is given of the latter process.

L. B. MILLER

Qualitative and quantitative variations in the nitrogenous substances of a woody plant at the beginning of the vegetative period. M. PINEY. *Rev. gen. botan.* 41, 65-94(1929); cf. *C. A.* 21, 2015.—Beech trees, 3 years old at the beginning of the expt., were sampled every month for 8 months starting with Dec. 26th, and protein and non-protein N detd. Protein N is at a max. in the winter in stems and roots, while its max. in the leaves is at the time of their first appearance. Sol. N is highest before the development of the shoots. It then decreases regularly in all organs to a very low value in summer; the ratio of sol. N to total N varies from $\frac{1}{4}$ to $\frac{1}{11}$ throughout the period studied. In regard to N compds. the trees have a rest period of about 2 months only, physiol. activity starting about 2 months before the opening of the buds.

LAWRENCE P. MILLER

Non-nitrogenous constituents of corn silk. I. Y. TSUKUNAGA. *J. Pharm. Soc. (Japan)* 48, 981-90(1928).—The chief non-nitrogenous constituents of Manchurian corn silk are glucose, pentosan, galactan, phytosterol, etc. Org. acid and mineral substances are also found in small quantity.

F. I. NAKAMURA

The secretion of the aleurone layer and scutellum. J. GRUSS. *Wochschr. Brau.* 45, 497-500, 506-9(1928). Both the scutellum and the aleurone cells secrete diastase and peroxidase. The starch-contg. cells of the endosperm do not have the power of producing these enzymes.

A. SCHULTZ

An iodine liberator from Laminariae. THOMAS DILLON. Univ. Coll., Galway. *Nature* 123, 101-2(1929).—Fresh fronds of *Laminaria digitata* or *L. saccharina* were minced and treated with their own wt. of distd. H_2O contg. 5 cc. toluene per l. After standing for about 24 hrs. the liquid was filtered through a Buchner funnel without filter paper. On treating this liquid with HCl (or AcOH) and KI soln. there occurred liberation of I. The I-liberating principle dialyzes through parchment; it is not affected by boiling. It is of org. nature since its activity disappeared when 25 cc. of the dialyzed soln. was evapd. and the residue heated: a soln. of the heated residue in dil. HCl was inactive. D. thinks this I-liberating principle might enable algae to collect I from sea water, the liberated I combining with unsatd. compds. present in the algae. No liberation of I was observed in expts. with exts. from *Fucus*.

G. SCHWOCH

The percentage of nitrogen in different parts of soy-bean plants at different stages of growth. LEWIS W. ERDMAN. The Nitragin Co., Inc., Milwaukee, Wis. *J. Am. Soc. Agron.* 21, 361-6(1929).—When seed varieties are cut for hay they contain a higher % of N in their nodules than the regular hay varieties. Seed varieties are richer in protein than hay varieties. As the % of N in soy-bean nodules decreases there is a corresponding increase in N in the tops. Thus a translocation of N takes place from the nodules to the seeds of the plants. In the early growth stages there is a gradual decrease in the % of N in soy-bean tops, but during Sept. the % of N begins to increase and usually reaches a max. at maturity. Analyses of soy-bean plant roots that have been stripped of their nodules show very little variation in % of N during the various stages of growth; thus indicating that the translocation of N from the nodules is extremely rapid.

E. P. SNYDER

B in soils and irrigation waters of Southern California and its relation to citrus and walnut culture (KELLEY, BROWN) 15. Processes involved in the decomposition of wood with reference to the chemical composition of fossilized wood (WAKSMAN, STEVENS) 8. The form of organically deposited $CaCO_3$ and the influence of the medium (ULARCH) 8. Light rays for promoting plant growth (Brit. pat. 296,724) 4.

E—NUTRITION

PHILIP B. HAWK

Accessory dietary essentials—vitamins. GEORGE R. COWGILL. Yale Univ. *Am. Med.* 34, 771-80(1928).—A review.

FRANCES KRASNOW

The relation of vitamin B deficiency to infant mortality. BARNETT SURE. Univ. of Arkansas. *Am. Med.* 34, 780-92(1928).

FRANCES KRASNOW

Protein in nutrition. T. SWANN HARDING. *Am. Med.* 34, 798-803(1928).—A review.

FRANCES KRASNOW

Minerals and metabolism. ETHEL BROWNING. Pichett-Thomson Research Lab., London, Eng. *Am. Med.* 34, 803-6(1928).

FRANCES KRASNOW

- The importance of the mineral constituents in diet. GUY W. CLARK. Lederle Antitoxin Lab., Pearl River, N. Y. *Am. Med.* 34, 807-11(1928). F. K.
- Diet in health and disease. VICTOR E. LEVINE. Creighton Univ., Omaha, Neb. *Am. Med.* 34, 815-26(1928). FRANCES KRASNOW
- Influence of nutrition on general health. EUGENE E. MARCOVICI. *Am. Med.* 34, 826-37(1928). FRANCES KRASNOW
- The use of concentrated foods in infant feeding. JULIAN L. ROGATZ. *Am. Med.* 34, 858-63(1928). FRANCES KRASNOW
- Food allergy in infants. BRET RATNER. *Am. Med.* 34, 868-70(1928). F. K.
- Malnutrition: Its dietetic management. G. W. KUTSCHER. Richardson Children's Clinic, Black Mountain, N. C. *Am. Med.* 34, 871-4(1928). F. K.
- The dietary factor in the treatment of tuberculosis. D. CLIFFORD MARTIN. Department of Health, N. Y. C. *Am. Med.* 34, 895-903(1928). F. K.
- The diet in cases of myovascular insufficiency, hypertensive group. CHAS. J. BRIM. Beth Israel Hospital, N. Y. *Am. Med.* 34, 903-4(1928). F. K.
- The importance of allergy in prescribing diets. EDWARD HOLLANDER. Manhattan State Hosp., N. Y. *Am. Med.* 34, 918-20(1928). FRANCES KRASNOW
- Supplementary relations among nutritive values of foods (SHERMAN) 12.
- LECOQ, RAOUL: *Les aliments et la vie*. 2nd ed., revised and enlarged. Paris: Vigot Frères. F. 18. Reviewed in *Ann. fuls.* 22, 111 (1929).

F—PHYSIOLOGY

E. K. MARSHALL, JR.

Basal and resting metabolism after radiation with ultra-violet light. I. The effect of ultra-violet radiation on the resting metabolism of birds. ELIZABETH CROFTS. *Am. J. Hyg.* 8, 1014-9(1928).—In the canary exposure to ultra-violet radiation from the quartz Hg vapor lamp results in an abrupt drop in O consumption, the av. drop being about 14%. With heavy doses this fall is followed by a belated rise of 21% 2-6 days after the radiation. The initial drop lasted longer, and the interval before the rise was greater with extremely heavy doses. II. The effect of ultra-violet radiation on the basal metabolism of human subjects. *Ibid* 1020-3. Both light and heavy doses of ultra-violet radiation failed to affect the basal metabolism of 6 normal human subjects. III. The effect of ultra-violet radiation on the resting metabolism of normal rabbits. MARY HARDY. *Ibid* 1024-9. Ultra-violet radiation has no effect on the resting metabolism of normal rabbits. J. B. BROWN

Normal blood determinations in the South. MAXWELL M. WINTROBE AND MORRIS W. MILLER. *Arch. Internal Med.* 43, 96-113(1929).—Observations on the blood of 100 normal young men showed an av. red cell count of 5,850,000, 15.87 g. hemoglobin per 100 cc., and 46.5 cc. of packed red cells per 100 cc. The red cell count is somewhat higher than the av. elsewhere. J. B. BROWN

The influence of fatigue products upon muscular efficiency. NIKOLAUS KUENZLE, zsgw. Kaiser-Wilhelm-Inst. für Arbeitsphysiol., Berlin. *Arbeitsphysiologie* 1, 205-12 (1928).—The perfusion of a frog's muscle with Ringer's soln., which had passed through the blood vessels of a fatigued muscle, resulted in a lowering of the irritability, a rise of the threshold stimulus, a decrease in the height of contraction, a lowering of the stimulus frequency by which the muscle went into tetanus, a decrease of the work accomplished, and a shortening of duration of the capacity to react. When the perfusion liquid was satd. with O, its toxic action was considerably decreased. T. M. C.

Amount of blood, red corpuscles and hemoglobin in persons acclimated at sea level and at high level. R. MARGARIA AND E. SAREGNO. *Atti accad. Lincei* 8, 101-7 (1928).—Expts. on 12 persons show that when acclimated to high levels there is an av. increase of 12% in red corpuscles, 5% hemoglobin and 1.8% mass of blood. A. W. CANTERI

The mechanism of secretion of calcium and phosphorus in milk. NORMAN C. WRIGHT. Natl. Inst. for Research in Dairying, Univ. of Reading. *J. Agr. Sci.* 18, 478-85(1928).—The formation of colloidal CaHPO_4 by interaction of CaCl_2 and Na_2HPO_4 in the presence of neutral caseinates is demonstrated. The colloidal CaHPO_4 is shown to be non-diffusible across a cellophane membrane. A theory is formulated to account for the secretion of high concns. of Ca and P in milk from the low concns. of these elements in the blood. Two general mechanisms may be involved: (1) the action of the casein, synthesized in the milk cells of the mammary gland from the freely diffusible amino acids of the blood and capable of causing a selective absorption

of Ca by formation of the slightly dissociated Ca caseinate; (2) the process of supersatn. of this caseinate soln. with CaHPO_4 , leading to the formation of a colloidal and non-diffusible soln. of this salt which is trapped in the milk cells. P. R. DAWSON

Importance of hormones. HUBERT MACHON. *Apoth.-Ztg.* 44, 276-80(1929).—A discussion of the most important glandular exts., their physical characters and action.

W. O. E.

Physiology of the ruminant stomach (bovine). Study of the dynamic factors. A. F. SCHALK AND R. S. AMADON. N. Dak. Agr. Expt. Sta. Fargo, *Bull.* 216, 1-64 (1928).—An exhaustive physiol. study.

C. R. F.

The presence of glycogen in the kidney of the new-born and in non-diabetic individuals. The question of the so-called glycogen-free organs. STAM. DIAMANTOPOULOS. Univ. Bern. *Klin. Wochschr.* 7, 1962-3(1928).—This is a preliminary report. The detailed report is to appear elsewhere. Glycogen has been found in the kidney of 3 out of 10 cases studied (new born). Glycogen has also been found in the pancreas, fatty tissue, thymus, testicle and hypophysis. The kidneys of children and of adults occasionally contain glycogen.

MILTON HANKE

Changes in the water content of blood after the peroral administration of water. B. BRAHN AND P. BIELSCHOWSKY. *Klin. Wochschr.* 7, 2004-6(1928).—The peroral administration of water to rabbits (66% of the calcd. total blood vol. of the animal) leads to a slight (2%) diln. of the blood, an initial fall (5%) in plasma N and a subsequent greater fall (7%) in corpuscle N.

MILTON HANKE

Purine metabolism of muscle and the mother substance of the ammonia that occurs in muscle. II. J. K. PARNAS. *Klin. Wochschr.* 7, 2011-2(1928); cf. C. A. 22, 4600-1.—Adenine occurs in muscle only in the form of nucleotide. In June, the muscles of frogs contain 170 mg. % adenine nucleotide and 20% inosinic acid. Macerated muscle contains only 39 mg. % adenine nucleotide and 130 mg. % inosinic acid. A muscle that is forced by nerve stimulation to contract to the point of fatigue gives off an amt. of NH_3 that is exactly equal to the amt. of adenine nucleotide that is converted into inosinic acid. A muscle that contracts occasionally under conditions such that it does not become fatigued liberates more NH_3 than can be accounted for on the basis of the above transformation. Hypoxanthine nucleotide is transformed back into adenine nucleotide at the expense of the N contained in amino acids if sufficient time elapses between muscle contractions.

MILTON HANKE

The ability of the erythrocytes to take up levulose. G. EISNER AND F. LEWY. *Klin. Wochschr.* 7, 2111(1928). Erythrocytes remove glucose, *in vitro*, from the liquid in which they are suspended. The addition of insulin to this liquid does not, uniformly, have any effect upon the process. Levulose is not utilized by erythrocytes *in vitro* either in the absence or in the presence of insulin.

MILTON HANKE

Mechanism of secretion in the thyroid gland. I. The normal gland in prolonged functional activity. R. J. LUDFORD. Imp. Cancer Research Fund, London. *Proc. Roy. Soc. (London)* B104, 24-32(1928).—In the normal thyroid gland, even during prolonged increased functional activity, the cells discharge their secretion into the lumen of a vesicle which delivers it to the blood stream. Direct secretion into the capillaries does not occur. II. The gland in exophthalmic goiter. *Ibid* 32-9. In exophthalmic goiter in the mouse and man, the mitochondria and the Golgi app. become considerably enlarged, a condition characteristic of intense secretory activity. Frequently the polarity of the Golgi app. is reversed. In the mouse, the secretion droplets, formed in assocn. with the reversed app., are discharged directly into the blood capillaries.

JOSEPH S. HEPBURN

Respiratory quotient of the excess metabolism of exercise. C. H. BEST, K. FURUSAWA, AND J. H. RIDORT. Toronto, Cornell and London Univs. *Proc. Roy. Soc. (London)* B104, 119-51 (1929).—The respiratory quotient of the excess metabolism of muscular exercise is not invariably unity, but increases with the severity of the exercise from a value approx. the same as the basal quotient for very mild exercise, through unity for moderate exercise, to one considerably above unity for very severe exertion. If one disregards the excess metabolism and calcs. the quotient of the total metabolism of exercise and recovery, a similar rise with increasing intensity of exercise, from values characteristic of the resting state to quotients in excess of unity, is obtained.

JOSEPH S. HEPBURN

Free energy of glycogen-lactic acid breakdown in muscle. DEAN BURK. Univ. London. *Proc. Roy. Soc. (London)* B104, 153-70(1929).—The free energy of anaerobic glycogen-lactic acid breakdown in muscle is 1.5 to 2 times as great as the corresponding heat of reaction. In the aerobic breakdown, the free energy is only 1 to 6% greater than the heat of reaction.

JOSEPH S. HEPBURN

Functions of the corpus luteum. III. Factors concerned in the development of the mammary gland. A. S. PARKES. Univ. London. *Proc. Roy. Soc. (London)* B104, 180-97(1929).—Complete development of the mammary gland is due solely to prolonged endocrine action of the corpus luteum; no fetal factor is involved.

JOSEPH S. HEPBURN

Metabolic peculiarities of the growing organism. TH. BREHME, P. GYÖRGY AND W. KELLER. *Jahrb. Kinderheilk.* 120, 42-7(1928).—The anaerobic glycolysis of animal tissues was detd. by measuring in a manometer the gas evolved on incubation in Ringer-glucose soln. under an atm. of $N-CO_2$. The glycolytic activity of the kidney of the newborn rat is about 52% higher than that of the full-grown rat.

E. M. H.

The daily fluctuations of the carbon dioxide pressure the alveolar air. W. RADSMA AND MOEHAMAD JOENORS. *Geneeskund. Tijdschr. Ned.-Indië* 68, 781-801(1928).—Concerning the daily fluctuations, especially in the rise in pressure in the afternoon, there are individual differences. With subjects this increase takes place without exception, with others only occasionally, and with one subject it was not observed with certainty in 7 measurements. During the eclipse of Jan. 1926, an increase of alveolar CO_2 pressure was observed in 2 subjects. It is not clear yet what is the exterior cause of the fall and rise in pressure during the tropical day, especially not the typical sudden afternoon rise. The fluctuations do not go hand in hand with those of the intensity of metabolism; on the contrary, with a decrease of the latter in the afternoon hours, the alveolar pressure increases. A decreased lung ventilation causes the rise of the CO_2 pressure. Measurements of basal metabolism were made with 5 subjects, and the results were all lower than the standard nos. according to Benedict.

J. C. JURRIJNS

The alveolar carbon dioxide pressure of inhabitants of the tropics compared with those of Europe. W. RADSMA. *Geneeskund. Tijdschr. Nederland.-Indië* 68, 812-19(1928).—The typical fluctuations of the alveolar CO_2 pressure of one subject in the tropics were not observed in the same subject in Groningen, Holland. In 3 subjects the pressure in Groningen was considerable higher than in Batavia. In 35 male subjects in the tropics the av. alveolar CO_2 pressure was 36.7 mm., with a probable error of 0.41 mm.; the max. was 43.84 mm., the min. 28.52 mm. In 59 male subjects in Europe, the av. was 39 mm. with a probable error of 0.23 mm.; the max. was 46.91 and the min. 32.8 mm.

J. C. JURRIJNS

The absorption, deposition and transport of fat in the guinea pig. J. LOREAN SMITH AND THEODORE RETTIE. Univ. of Edinburgh. *Quart. J. Exptl. Physiol.* 19, 51-60(1928).—In the intestine a proportion of the fat absorbed from the food is deposited in the villi in the form of large immobile masses. Extracellular deposition of fat in lymphatic channels and perhaps tissue-spaces is peculiar to the guinea pig. In all other animals investigated deposition in tissues occurs in cells only. Reduction of fat in the diet to a trace (0.1%) is followed in a few days by complete reabsorption of this deposit. When a fat-contg. diet (4%) is restored, the deposits reappear in 2 to 3 days.

FRANCIS KRASNOW

The chemical physiology of the placenta with special reference to the occurrence of choline. II. H. SIEVERS. *Physiol. Inst. Marburg. Z. Biol.* 88, 145-52(1928). Fresh placenta was boiled with water and the ext. concd. An alc. ext. of the concentrate was satd. with sublimate, the ppt. sep'd. and decomposed with H_2SO_4 . The choline thus obtained was concd. and pptd. with $AuCl_3$, giving cholineaurate. The quantities found in normal placenta differed from those obtained for placenta of eclamptic cases, 0.10 to 0.12 g. in the former and 0.13 to 20 g. in the latter.

Metabolism in the athlete. O. FLÖSOMER AND F. KUTSCHER. Univ. Marburg. *Z. Biol.* 88, 382-9(1929). Hippuric acid, lactic acid, adenine, methylguanidine, phenylalanine, γ -butyrobetaine and choline were found in the urine.

Total sugar of blood and urine. II. The hydrolyzable sugar of blood. MARK R. EVERETT AND FAY SHEPPARD. Univ. of Okla. Med. School. *J. Biol. Chem.* 80, 255-68(1928); cf. *C. A.*, 21, 3919.—Evidence is presented to show that the hydrolyzable sugar of blood actually exists and is not due to analytical errors. Normal human plasma contains from 1.5 to 5 mg. (av. 3) of hydrolyzable sugar per 100 cc. (detd. by the Folin-Wu procedure) and whole blood 6 to 16 mg. (av. 10). The effects of fermentation and of alkali hydrolysis upon the hydrolyzable sugar indicate that it resembles glycogen but the latter has never been found in sufficient quantities in normal blood to account for more than a small part of the hydrolyzable sugar. A sample of leucemic blood contained more hydrolyzable sugar but not enough to indicate that the white cells are the chief source of this material. Essentials for the analysis of dil. sugar solns. are discussed.

A. P. LOTHROP

The concentration of acid and base in the serum in normal pregnancy. HARRY C. OARD AND JOHN P. PETERS. Yale Univ. and New Haven Hosp. *J. Biol. Chem.* 81, 9-27(1929).—The direct method of Peters, Bulger, Eisenman and Lee (*C. A.* 20, 1101) for detg. the total acid-base equil. of serum was used in the examn. of the sera of normal pregnant individuals. Inorg. P and chlorides show no change from the normal. There is a reduction of about 5% (8 milli-equivs. per l.) of total base, this being almost entirely at the expense of the Na. Accompanying this change in total base there is an equal reduction of the anion content, chiefly serum bicarbonate and org. acid but also to a lesser extent serum protein. The reduction of reserve alkali in the "acidosis of pregnancy" is assocd. with a diminution of base so that this term as connoting an actual collection of abnormal acids in the blood is misleading. The pregnant organism has a unique ability to tolerate a reduced concn. of serum electrolytes but there is no satisfactory explanation for the changes which occur. A. P. L.

The relations of the serum proteins and lipids to the osmotic pressure. ELLA H. FISHBERG. Beth Israel Hosp., N. Y. *J. Biol. Chem.* 81, 205-14(1929).—"The relationship between the concn. of proteins and the osmotic pressure of blood sera is expressed by the equation $p = \frac{c}{a}$, where p is the reciprocal of the osmotic pressure, c the reciprocal of the protein concn., and a a const. dependent on the particular serum; that is, that when the proteins decrease in arithmetical progression, the osmotic pressure decreases in geometric progression. The lipemia that follows intensive hemorrhage in rabbits may perhaps be correlated with an effort of the organism to compensate for the decrease in osmotic pressure following the loss of serum proteins. The osmotic pressure per g. of protein is higher in lipemic blood than in blood dild. to the same concn. of protein, and this difference becomes apparent at the same time that the total lipid content of the blood starts to rise." A. P. LOTHROP

Adrenal insufficiency. VI. The influence of "heat" on the survival period of dogs after adrenalectomy. J. M. ROGOFF AND G. N. STEWART. Western Reserve Univ. *Am. J. Physiol.* 86, 20-2(1928); cf. *C. A.* 22, 273.—When the adrenals were removed from bitches during heat the period of subsequent survival was markedly longer than in control dogs. Conclusion: The changes associated with heat compensate in some way for the adrenals. VII. Further blood studies (cholesterol and calcium) in control adrenalectomized dogs. *Ibid* 23-31.—After the removal of the adrenals in male dogs blood serum Ca was generally increased. This was not due to a concn. of the serum because its sp. gr. and cond. remained unaltered after the operation. The whole blood, however, had a much higher sp. gr. and lower cond. after adrenalectomy. The cholesterol content of the blood did not show any variations as a result of the removal of the adrenals that would offer support to the theory that these glands are concerned with cholesterol metabolism. J. F. LYMAN

Variations of the water content of the blood induced by atmospheric temperature changes in normal and splenectomized animals. F. T. ROGERS AND R. W. LACKEY. Baylor Univ. College Med. *Am. J. Physiol.* 86, 36-8(1928).—Exposure of cats to warm atm. (45 to 50°) for 15 to 30 mins. was followed by diln., and exposure to cold for 20 mins. was followed by a concn. of the blood. The same changes of similar magnitude were observed in splenectomized cats. J. F. LYMAN

Normal menstruation and gaseous metabolism. FRANCIS G. BENEDICT AND MARY D. FINN. Carnegie Inst., Washington. *Am. J. Physiol.* 86, 59-69(1928).—Intermittent measurements on one subject extending over 12 years and almost daily measurements extending over 2 months with the same subject show that O₂ consumption was lowest and most uniform during the menstrual period, and highest about one week after menstruation ceased. J. F. LYMAN

The spleen. II. Changes in hemoglobin following removal of the spleen. G. B. RAY. Western Reserve Univ. *Am. J. Physiol.* 86, 138-44(1928); cf. *C. A.* 23, 1168.—Detns. of total blood pigment, hemoglobin and O₂ capacity of the blood before and after the removal of the spleen in dogs showed that large amts. of non-functional pigment were present in the blood after the operation. This increase was not related to a decrease in the number of red blood cells nor to the total hemoglobin. J. F. LYMAN

Regulation of respiration. XIX. Central and peripheral action of sodium cyanide on respiratory movements. ROBERT GESELL. Univ. Michigan. *Am. J. Physiol.* 86, 164-70(1928).—Injections of NaCN via arteries and via veins by the isolated-head method (*C. A.* 20, 2444) showed that NaCN is absorbed readily by muscle and by nerve tissue. The action of NaCN on the lower nerve centers tended to excite respiration while its action on the head region, excluding the lower nerve centers, was unaccompanied by excitation. J. F. LYMAN

The diuretic-antidiuretic effect of the pressor principle of the posterior lobe of the

pituitary gland. E. P. BUGGER AND A. E. SIMOND. Parke, Davis and Co., Detroit. *Am. J. Physiol.* 86, 171-7(1928).—The pressor principle of the pituitary has a diuretic-antidiuretic effect on green-fed rabbits. The excretion of phenolsulfonephthalein was definitely depressed after administering the hormone. J. F. LYMAN

The inorganic phosphorus of blood and muscle. LAURENCE IRVING AND G. M. BASTEDO. Univ. Toronto. *Am. J. Physiol.* 86, 225-37(1928).—As lactic acid was produced in fatigued muscle, phosphocreatine decomposed, with consequent increase of inorg. phosphate. Under extreme fatigue conditions lactacidogen probably yields some inorg. phosphate. During moderate contractions phosphocreatine may decrease while lactacidogen increases. The inorg. P of the muscle did not appreciably influence the inorganic phosphorus concn. of the blood. J. F. LYMAN

Neural and hormonal factors in bodily activity. The prepotency of medulliadrenal influence in emotional hyperglucemia. S. W. BRITTON. Johns Hopkins Univ. *Am. J. Physiol.* 86, 340-52(1928).—Blood sugar in normal cats excited by dogs rose from 30 to 100% after 2 to 4 mins. excitement. Cutting the splanchnic branches to the liver had but little effect on the excitement blood sugar level. In animals whose adrenal medulla had been destroyed excitement was usually followed by a fall in blood sugar even though liver glycogen was within normal limits. Conclusion: The influence of the adrenals in the liberation of glycogen stores under conditions of urgency is preëminent. J. F. LYMAN

Observations upon adrenalectomized cats treated with the cortical hormone. F. A. HARTMAN, F. R. GRIFFITH, JR., AND W. E. HARTMAN. Univ. Buffalo. *Am. J. Physiol.* 86, 360-70(1928).—Symptoms of chronic adrenal insufficiency were produced in cats by operative removal of the adrenals and semi-daily injections of exts. of adrenal cortex. The survival period extended up to 300 days. The following symptoms were noted: metabolism usually fell after 7 to 20 days; there was no gain of wt., but usually a loss long before the onset of terminal symptoms. Blood urea was often abnormally high, especially so after overeating protein food. There was a high susceptibility to infections, a tendency to subnormal temps. and rapid fatigue on exercising. Removal of the thyroids or the gonads did not modify the survival period. J. F. LYMAN

Aglomerular and glomerular kidneys. II. Physiological. J. GRAHAM EDWARDS AND LUIGI CONDORELLI. Univ. Buffalo and Royal Univ. Naples. *Am. J. Physiol.* 86, 383-98(1928).—The excretion of dyes through the kidneys of various fish was studied and a comparison of the concn. of compds. in the blood and urine of fish, frog, fowl and man was made. The results indicate a role for the tubule not precisely accounted for by the filtration-reabsorption hypothesis. J. F. LYMAN

The presence of melanophore-expanding and uterus-stimulating substance in the pituitary body of early pig embryos. F. F. SNYDER. Univ. of Rochester. *Am. J. Anat.* 41, 399-409(1928).—Melanophore-expanding and uterus-stimulating substances are found in the pituitary of pig embryos of 30 mm. Crown-rump length, i. e., when the fetus is about $\frac{1}{4}$ its length at birth and when the weight of a single gland is about 0.05 mg. C. M. M.

Further experiments with an ovarian hormone in the ovariectomized adult monkey, *Macacus rhesus*, especially the degenerative phase of the experimental menstrual cycle. EDGAR ALLEN. Univ. of Missouri. *Am. J. Anat.* 42, 467-86(1928).—Five hormone exts. were prepd. Two of these were olive oil exts. of human placenta, which were combined with aq. exts. and in one case with liquor folliculi for injection. Attempts were made to substitute injections of these ovarian hormones for the endocrine functions of the ovaries of monkeys. Injections of each of the 5 exts. were made into ovariectomized monkeys over a period of 24 days. All injections yielded the sex characteristics of swelling and reddening of the "sexual skin." Some growth was produced in the mammary glands and genital tract. C. M. M.

Variations in the iodine number of fats in the liver during aseptic autolysis. UGO LOMBEROSO AND ANGELA DI FRISCO. *Boll. soc. ital. biol. sper.* 2, 320-30(1928). *C. A.* 22, 2801.—The I no. of the fatty acids extd. from liver pulp was compared to the fatty acid content of the tissue during aseptic autolysis. The scope of these exts. was to show if, during the process of lipo-diuresis which is accompanied by a more or less complete disappearance of fatty acids, the reduction is at the expense of the unsatd. fatty acids or whether all the fatty acids are involved; also, whether the relation between satd. and unsatd. fatty acids after autolysis was different from that before autolysis. The results of the expts. are summarized as follows: The I no. in those cases in which it was very high in normal samples showed in a few titrations a reduction of almost 50% of the original value. There is a parallelism between the reappearance of the fatty acid and the increase of the I no. but the latter does not reach its original

value. In cases where the I no. is low at the start, it may become still lower at first and later increase so as to reach values higher than the initial ones. As a whole the I no. of the fatty acids in liver during autolysis tends to be a const. regardless of its initial value, when the reformation of the fatty acids takes place. A study of the relation between the percentage diminution of the fatty acids and the reduction of the I no. shows that the latter is in some cases too high; this variation cannot be ascribed to the disappearance of the fatty acids but is due either to the satn. of the unsatd. acids or to some form of oxidation which blocks the reaction with I. PETER MASUCCI

Certain observations on the behavior of phosphagen in the muscle juice. G. MARTINO. *Boll. soc. ital. biol. sper.* 3, 824-6(1928); cf. *C. A.* 23, 406.—Muscle juice with and without addition of creatine and CaCl_2 was allowed to stand 2-24 hrs. at a temp. of 38° , $17-19^\circ$ and $10-12^\circ$. Creatine was added in the proportion of 0.01 g. per 5 cc. of juice. The phosphoric acid and phosphagen contents were detd. in each case. The results showed (1) the addition of creatine to muscle juice and kept at $17-19^\circ$ for 2 hrs. caused a distinct and const. increase of phosphagen and a corresponding decrease in inorg. phosphoric acid. However, detns. up to 24 hrs. after the addn. of creatine did not show any further increase. (2) At a temp. of $10-12^\circ$ there was also an increase of phosphagen but it was less marked than at $17-19^\circ$. (3) At 38° the phosphagen content did not show any difference compared with the creatine-free juice. (4) The addn. of CaCl_2 did not have any effect on the phosphagen content. PETER MASUCCI

The endocellular formation of fat. FRANCESCO CAPELLA. *Boll. soc. ital. biol. sper.* 3, 860-1(1928).—The purpose of these expts. was to det. from what source the fat is derived in fatty degeneration processes. The animal was bled to death, a glass cannula inserted in the portal vein, and artificial circulation was applied to the liver. In the control liver under investigation, circulation was maintained by means of Locke's soln. satd. with phosphine. The organs were then removed and examd. histologically and chemically. There was an increase of fat of 1-3% based on the wt. of the whole organ. The histological findings confirmed these results. C. concludes that the increase in the fatty content of the liver is due to substances which enter directly into the compn. of the hepatic cells. PETER MASUCCI

The occurrence and transformation of pyrophosphate in cells. III. Physiological behavior of pyrophosphate. K. LOHMANN. Kaiser Wilhelm-Inst. für Biologie, Berlin-Dahlem. *Biochem. Z.* 203, 172-207(1928).—Under physiol. conditions the pyrophosphate content of intact frog muscle remains unchanged. A sojourn of 20 hrs. in O_2 and mild stimulation cause no splitting of pyrophosphate, but under longer stimulation there is increasing splitting of pyrophosphate with formation of orthophosphate. In chloroform rigor the source of phosphate is exclusively the pyrophosphate while in heat rigor this is the predominant source. The pyrophosphate does not dialyze from the muscle into Ringer soln. In autolyzing frog muscle pulp or ext. in a NaHCO_3 -KCl soln. at 40° the pyrophosphate is completely hydrolyzed. About 75% of the increased phosphate in autolysis for 1-2 hrs. comes from decompd. pyrophosphate, the remaining 25% (for 0.2-0.3 mg P_2O_5 per g. muscle) come partly from the decompn. of Embden's ester. The enzymic hydrolysis of pyrophosphate is greatly depressed by orthophosphate. Respiration and the hydrolyses of carbohydrate by the cells are independent of the pyrophosphate fraction. The pyrophosphate is probably present in the muscle cell or in the fresh muscle ext. as a protein adsorption compd. Fluoride in large concn. (0.2 M KF) stimulates the hydrolysis of preformed pyrophosphate in fresh frog muscle exts.; intermediate concns. (0.1 M) inhibit this while very small concns. (M/100-M/333) again stimulate it; fluoride inhibits the hydrolysis of added pyrophosphate. Pyrophosphate administered by mouth is hydrolyzed to orthophosphate and is excreted as such through the urine. S. MORGULIS

The occurrence of β -stearodipalmitin in beef thymus. JUNJI KARASHIMA. *Physiol.-chem. Inst., Nagasaki. J. Biochem. (Japan)* 10, 183-7(1928).—Air-dried powdered thymus is extd. 24 hrs. with acetone, and the residue is washed several times with acetone on the filter. The residue freed from acetone is extd. with ether, and on cooling to 0° a substance crystallizes. The sepd. crystals are dissolved in 85% alc. at $45-50^\circ$; they reappear at room temp. They are once more recrystd. from warm abs. alc. The substance is easily sol. in ether, benzene, toluene, pyridine, CS_2 , and CHCl_3 , and somewhat sol. in AcOEt . It is almost insol. in cold acetone, ethyl, methyl or amyl alc.; it m. 50° . From its elementary compn. and other detns. it has been identified as β -stearodipalmitin. The thymus involution coincident to age is always accompanied by an increase in the β -stearodipalmitin fraction (7.4 to 25.7% of total fat with increasing age). S. MORGULIS

Influence of removal of the hemispheres on temperature, gaseous metabolism

and weight in pigeons. N. POPOV AND B. BAYANDUROV. *Zhurnal ekspl. Biol. Med.* 10, 235-45(1928).—Decerebrate pigeons gain even up to $\frac{1}{2}$ of their initial wt. on a diet which does not differ from that before the operation. The CO_2 production following decerebration, even when there is increased muscular activity, is generally diminished, though only for a short period. The increase in wt. frequently is accompanied by a rise in metabolism and temp.

S. MORGULIS

Experiments on the motility of the crop in thyroidectomized birds. A. S. LIEBERFARB. Sverdlov Communist Univ., Moscow. *Zhurnal ekspl. Biol. Med.* 10, 332-9 (1928); cf. C. A. 22, 1400.—Feeding dry thyroid or injection of thyroxine causes increased activity of the crop in chickens. Thyroidectomy causes inhibition of the crop motility, which even a year after the operation remains subnormal. On the contrary, the administration of thyroxine or feeding the dry thyroid powder produces an immediate return to normal behavior. The effect of satiety or of prolonged starvation on the motility of the crop. *Ibid* 341-8(1928).—Satiety generally leads to cessation of the movements of the crop. Both hunger and thirst may cause motility, and in case of thirst feeding instead of diminishing the movement may actually induce greater motility. With the prolongation of the starvation there is increased tonicity though the number and amplitude of the contractions are increased only when the fast is not of excessive duration.

S. MORGULIS

The effect of secretin in the regulation of the alkali reserve of the blood. I. The influence of secretin in experimental alkalosis. A. O. WOINAR. Inst. of Med. Odessa. *Zhurnal ekspl. Biol. Med.* 10, 414-22(1928).—Secretin plays an important part in the regulation of the alk. reserve. A direct dependence is observed between the variations in alky. and amt. of secretin in the pancreatic juice and the alky. of the blood. Under conditions inducing a drop in the alk. reserve of the blood there is likewise a diminution in the alky. of the secreted pancreatic juice. Raising the alk. reserve artificially causes an increase in the alky. of the secretion.

S. MORGULIS

Studies concerning the value of a solution of glucose in maintaining the acid-base equilibrium of the blood in pregnant animals. II. The effect of a period of chloroform anesthesia in pregnant animals. The lack of protection conferred by a solution of glucose. WM. DEB. MACNIDER. Univ. of North Carolina. *J. Pharmacol* 35, 31-48 (1929); cf. C. A. 21, 264.—Feeding glucose to pregnant dogs does not prevent the decrease in alkali reserve, in elimination of phenolsulfonephthalein, or in urine formation after CHCl_3 anesthesia. These disturbances after CHCl_3 are more marked in older animals far advanced in the gestation period than in younger animals early in the period of gestation.

C. RIDGE

Artificial blood circulation of the total organism with excluded heart. S. S. DRYKOWENKO. *Trans. Sci. Chem. Pharm. Inst. (Moscow)* 1928, No 20, 44-72. On several occasions the heart of an exptl. dog, after it had gone into fibrillations or had completely stopped, resumed its normal action when 0.5 cc. of a 1:1000 soln. of adrenaline was added to the perfusion fluid.

P. W. SALT

Combined sugar. A. GREVENSTUK. *Arch. niderland. physiol.* 12, 265-72(1929). The total amt. of sugar in the blood was detd. by hydrolyzing the blood with H_2SO_4 , pptg. the proteins with HgNO_3 , and then analyzing the filtrate for total sugar by the Folin-Wu method. The free sugar was detd. by the usual procedure. This value was then subtracted from the total amt. and gave the combined sugar. Rabbits received a subcutaneous injection of a unit of insulin; the total blood sugar fell but rapidly returned to normal. The combined sugar increased slightly in animals starved for 24 hrs. and sometimes in well-fed ones. It was, therefore, a product of metabolism and its absolute value was greater than that of the free sugar. Portions of the liver of rabbits were removed through an abdominal window. The free and total sugar and the glycogen were detd. in each sample of liver removed as well as the blood sugar. After 4 days' starvation the glycogen was usually less than 0.22%, and the combined sugar more than 0.55%. In 3 of the 16 animals and in 2 of these the combined sugar was low, suggesting an inverse relationship between the two. Over a period of 4 hrs. both varied in the same or different directions in the same or different animals; 0.05 to 5 units of insulin produced no variations different from those seen in the controls.

M. H. SALT

The secretion of hydrochloric acid into the stomach. J. R. F. RASSERS. Leyden. *Arch. niderland. physiol.* 12, 514-20(1928).—A "leicithalumin" was obtained from the mucosa of hog stomach. This substance was added in 0.5-g. quantities to 20 cc. of an 0.9% soln. of NaCl . The mixts. were incubated at 37° for 30 mins. and then treated with 0.01 N NaOH with phenolphthalein as indicator. Free HCl was present in the soln. Conclusion: The leicithalumin of the stomach mucosa is capable of de-

composing NaCl soles.; the Na^+ is adsorbed and free HCl is secreted into the stomach.

M. H. SOULE

Biometry of calcium, inorganic phosphorus, cholesterol and lipid phosphorus in the blood of rabbits. II. Repeated observations on normal animals. ALVIN R. HARNES. Rockefeller Inst. Medical Research. *J. Exptl. Med.* 49, 287-301(1929); cf. *C. A.* 22, 4161.—A series of detns. of inorg. P, Ca, cholesterol and lecithin was made on a group of 10 animals living in the lab. from Oct. 27, 1927 to May 17, 1928. A marked difference in both the trend and abs. values was noted in animals living in the lab. when compared with the values obtained for animals living out-of-doors. With animals living in the open, the trend of variation for Ca was found to be the same. However, animals living in the lab. maintained a higher level over the same period of time. The inorg. P and lecithin both showed a marked decrease and both maintained a lower level than was found in animals just received from the dealer. The cholesterol content of whole blood exhibited a similar trend in both groups of animals. However, it was found that animals living in the lab. maintained a lower level than animals living out-of-doors. The mean value for Ca was found to be 15.7 ± 0.05 , for inorg. P 4.65 ± 0.05 mg. per 100 cc. of blood serum, and for cholesterol 58.2 ± 0.39 and lecithin 118.4 ± 1.13 mg. per 100 cc. of whole blood. The coeffs. of correlation having the highest degree of mathematical significance were obtained from the mean values for individual animals.

C. J. WEST

The influence of the pancreas on the metabolism of creatine. A. CORBIA. Univ. Sassari. *Clin. pediatr.* 10, 195-212(1928); *Ber. ges. Physiol. exptl. Pharmacol.* 46, 393.—C. studied the changes in the creatine metabolism while the pancreas is partly or totally excluded. Dogs and cats were used as the subjects, since these animals normally show a slight amt. of creatine in the urine. The creatine in the urine was detd. by the Folin-Benedict method, that in the blood by the Folin-Doisy method with the Dubosecq colorimeter. The complete removal of the pancreas or its equiv. provokes at first a noteworthy increase in the elimination of creatine substances, particularly of creatine, while later the increase is less and just before death all values sink. The temporary exclusion of the pancreas produces the same increase but the total amt. of creatine is less definite and less const.; furthermore, the disparity between creatine and creatinine is less. As far as could be observed there is no change in the blood. The changes which were observed are not to be ascribed only to the suppressed endocrine function, but also and in a high degree to the increased external secretion through which the almost entirely suppressed resorption of fats, carbohydrates and protein and the subsequent use of the org. reserve is to be ascribed. When insulin is given to animals with or without pancreas, there is a decrease in the elimination of creatinine and especially a decrease in that of creatine.

R. C. WILLSON

Combined sugar and its ratio to total nitrogen in the normal Japanese. KUNITARO KITAMURA. *Med. Acad., Kyoto Kyoto-Ikadasigaku-Zasshi* 2, 241-6(1928); *Ber. ges. Physiol. exptl. Pharmacol.* 45, 85. The subjects were 25 normal Japanese who were studied with the Iizuka method. The amt. of combined sugar ranged from 0.067 to 0.107%, av. 0.091%. Generally the total N increased in proportion to the rise

in combined sugar. $\frac{\text{Total N}}{\text{combined sugar}}$ varied between 9.15 and 10.70, av. 10.10.

$\frac{\text{Free sugar}}{\text{combined sugar}}$ ranged from 0.83 to 1.37, av. 1.15. $\frac{\text{Combined sugar}}{\text{total sugar}}$ ranged from

0.420 to 0.545, av. 0.485. $\frac{\text{Free sugar}}{\text{total sugar}}$ ranged from 0.455 to 0.578, av. 0.518. The high

combined sugar value is assumed to be related to the diet of the Japanese.

R. C. WILLSON

Kidney filter and glucemia. L. PERELMAN. *Med Biol. Zhurnal* 3, 79-90(1927); *Ber. ges. Physiol. exptl. Pharmacol.* 44, 801.—The influence of the elimination of the kidney filter on the sugar was studied after operations of various types, as bilateral nephrectomy, ligation of the renal vessels. Blood sugar was detd. by the Hagedorn-Jensen method. After any of these operations had been performed on normal cats and dogs there was only a very insignificant rise in the blood sugar. In the hyperglucemia of diabetes, however, the blood sugar is increased 1.5 to 2.5 times. During phlorizin glucosuria, after the operation, there is a slight hypoglycemia. Phlorizin injections in uremic animals had either no effect on the blood sugar or caused only a very slight rise in it.

R. C. WILLSON

The influence of liver extirpation on the organism. M. DENISENKO. *Med. Biol. Zhurnal* 2, 22-23(1927); *Ber. ges. Physiol. exptl. Pharmacol.* 44, 801.

eg.) than the saline control. ———. Injections of 1 cc. of 1% lecithin soln. shortened the life of the animals about 30%. Daily NaCl injection lengthened the life of the subjects 50-60%. The hemolyzed blood of the animals on the 6-7th day after the operation exerted an inhibiting effect on the isolated heart of a normal frog.

R. C. WILLSON

The acidity of the gastric juice and of the urine in their connection with each other and with the acid-base equilibrium of the human body. HANS SCHULTEN. Univ. Hamburg. *Münch. med. Wochschr.* 75, 898-901(1928).—In 50 non-febrile subjects without any kidney maladies the whole day- p_H curve was detd. by means of urine tests made hourly or more frequently. The subjects were kept quiet in bed and the diet was a neutral one as far as possible. In subjects with normal gastric acidity (detd. 25 mins. after the ingestion of 200 cc. 5% alcohol), the night urine is usually acid (p_H about 6.0) but alk. was shown before or during breakfast (8.00 a. m.). The peak of the alk. (p_H about 8.0) is often reached after 2-3 hrs. and after temporary and repeated sinking of the p_H to the fasting value. After a reduction, the noon meal effects an increase which is not larger than that following the much smaller breakfast; this is not parallel to the detd. gastric acidity. The appearance of the curve varies considerably. In anacidity (especially in pernicious anemia) the fluctuations are small, rarely exceeding the limits of error. In some cases of achylia the curve is similar to that of normal acidity. An acid peak in the acidity curve was never observed after mealtime. The p_H curve of the urine certainly has something to do with the secretion of gastric juice. Alkaline peaks in the curve are absent after the evening meal.

R. C. WILLSON

Comparative study of the function of both kidneys in bitches. YOSHISUKE YOSHIDA. Univ. Okayama. *Okayama-Igakkaï-Zasshi*. 39, 1283-1311(1927); *Ber. ges. Physiol. expil. Pharmacol.* 44, 801.—The left kidney was generally found to be larger and heavier than the right one. In a given time more urine can be catheterized from the larger kidney than from the smaller one. The concn. of the fixed constituents of urine, NaCl, H_2PO_4 , total N, urea and NH_3 is usually less in the urine from the larger kidney although their abs. amts. are usually larger than in the urine from the other kidney. There is no fixed relation between the amt. of urine and its concn. Indigo carmine and phenol red were usually eliminated more rapidly from the right kidney than from the left. The concn. of the dye is usually higher, but the total amt. is less than that eliminated from the left kidney.

R. C. WILLSON

Experimental studies of the influence of hemolysis on the secretion of bile. KINJI SUGIY AND OZU HISASI. Med. Univ. Okayama. *Okayama-Igakkaï-Zasshi* 39, 1262-13(1927); *Ber. ges. Physiol. expil. Pharmacol.* 44, 779. Using dogs with gall bladder fistulas, the authors studied the effect of splenectomy alone and the injection of hemolyzing substances such as distd. H_2O , hemolysin, phenylhydrazine, nitrobenzene and tolulenediamine, before and after splenectomy, on the amt. and the Fe and bilirubin content of bile. Splenectomy caused a reduction in the amt. of the bile and its Fe and bilirubin content for 20-30 days after the operation, when these values slowly returned to normal. Injection of distd. H_2O or hemolysin (rabbit serum treated thrice with deg. erythrocytes) caused an increase in the amt. and Fe and bilirubin content of the bile both before and after splenectomy. The injection of phenylhydrazine at first causes a slight reduction in these 3 factors but from the 4th day on there is a considerable increase. This was also the case after splenectomy, but to a smaller degree. Nitrobenzene both before and after splenectomy causes an increase in the secretion of bile. Tolulenediamine injected before splenectomy effects an increase in all 3 factors, whereas after splenectomy the bilirubin content was decreased. This study seems to indicate a certain role of the spleen in the extrahepatic formation of bilirubin.

R. C. WILLSON

Studies of the acidity curve of the stomach after buffer-free alcohol test-potion; and remarks on the contents of the fasting stomach. TAKASHI MURAYAMA. Univ. Okayama. *Okayama-Igakkaï-Zasshi*. 40, 520-30(1928); *Ber. ges. Physiol. expil. Pharmacol.* 46, 405.—Ten healthy and 44 sick persons were studied, the Rehfuß tube being used to ext. the fasting contents of the stomach and also the contents after a test-potion of 200 cc. 3% buffer-free alc. soln. The free HCl was detd. with dimethyl yellow and the total acidity with phenolphthalein in the usual way. The fasting healthy stomach contained a rather large quantity of fluid, but it never exceeded 60 cc. The content showed an av. of 27.5 degrees acidity, gave no lactic acid or starch reaction and in many cases contained mucus. Duodenal back-flow was detectable in 60% of the cases. Fractional analysis of the contents after the buffer-free alcohol test-potion

that the titration curves with methyl orange and with phenolphthalein closely ended to those for the normal stomach. Up to about 50 mins. at which time the degree of acidity is usually reached, the difference between the 2 acidity curves is 3-15 degrees acidity. The buffering curve of the stomach appears to be very important for the diagnosis of certain gastric diseases and indeed more for the estimation of their course than for their functional diagnosis. The alc. test-potion is much more suitable for the examination of the gastric acidity than is the Ewald-Boas test-meal, except for the fact that duodenal back-flow occurs more frequently in the first.

R. C. WILLSON

The determination of the pancreatic secretion. SEIZABURO OKADA, EICHI SAKURAI, TSUNAMOTO IMAZU AND KWANICHI KURAMOCHI. *Imp. Univ., Tokio. Proc. Imp. acad.* 4, 131-3(1928); *Ber. ges. Physiol. expil. Pharmacol.* 46, 410.—With a duodenal sound, the stomach being empty, the secretion of the duodenum was removed for 3 hrs. with or without the use of stimulants such as ether, alcohol, H_2O or 0.2% HCl. Trypsin was detd. according to Gross' casein method, amylase with Okada's colorimetric method and lipase with the tributyrin method of Rona-Michaelis. Fifty cases were studied. Results: trypsin under 30 kilo-units, 1 case; from 30 to 120 kilo-units, 48 cases; above 120 kilo-units, 1 case. Amylase: under 50 kilo-units, 1 case; 50-100 kilo-units, 48 cases; above 300 kilo-units, 1 case. Lipase: under 50 units, 5 cases; 50-300 units, 41 cases; above 300 units, 4 cases. (A kilo-unit of trypsin signifies the complete digestion of 1 g. casein in 30 mins.; a kilo-unit of amylase, the production of 1 g. sugar from sol. starch in 15 mins.; a kilo-unit of lipase signifies 1000-fold of the reduction of 20 drops in 50 mins., that is one-half of the difference between a satd. tributyrin soln. and H_2O .) In a 3-hr. study, the use of stimulants makes but little difference, only HCl giving higher values. Results with women are usually lower than those of men; the quantity is also less. Shorter studies are of no value.

R. C. WILLSON

The internal secretion of the placenta. JOSEF PAZOUREK. *Rozhledy chir. gynaekol.* 7, 115-21(1928); *Ber. ges. Physiol. expil. Pharmacol.* 46, 763.—This isolated substance contains the particular hormone which appears to be common not only to the placenta and the corpus luteum but also to all the ovarian glands. Subcutaneous injections of the substance isolated from the human placenta and injected into a castrated mouse can provoke the individual phases of the vaginal cycle, indicating that the human hormone is identical with the animal hormone, at least as far as its action is concerned. The isolated substance which contains the hormone is a yellow, slightly opaque fluid, sol. in alc., ether, acetone and benzene and upon chilling assumes a solid form; it is oxidized in the air. This hormone is resistant to both low temps. and high ones (193°). It is unchanged by the digestive process and remains active since when mice are fed with placenta changes in the vaginal mucous membrane were observed.

R. C. W.

The biochemistry of the sense organs. F. BERENSTEIN. *Russ. Fisiol. Zhurnal.* 9, 205-16(1928); *Ber. ges. Physiol. expil. Pharmacol.* 44, 820.—The eyes of rabbits, sheep, cows and dogs were carefully freed from muscular tissue, cut into small pieces and macerated in a mortar with sterile sand. About 5 cc. sterile distd. H_2O was added for each g. of the organs and extraction made at room temp. for 24 hrs. under a layer of toluene. The enzymes were detd. in the filtrate from this extrn. Amylase was found in all but cow; invertase in all but dog; lactase in none; maltase in none; glucosidase only in dog; urease in none; erepsin in all but rabbit; pepsin in none; trypsin only in rabbit; lipase in none; lecithinase in none; catalase in all; reductase in all but rabbit; oxidase in all; peroxidase in all; alcoholase in none; lactolase only in cow; zymase in none; chymosin in sheep and dog.

R. C. WILLSON

The distribution of the enzymes in the organs and tissues of the animal body. F. BERENSTEIN. *Russ. Fisiol. Zhurnal* 9, 383-94(1928); *Ber. ges. Physiol. expil. Pharmacol.* 44, 821.—The following results were obtained for diff. enzymes in the testicles and ovaries of the dog, ram, bull, sow, ewe, and cow: amylase was found in all; invertase in ram and cow; lactase in none; maltase in none; glucosidase in bull; catalase in all; oxidase in all but dog; peroxidase in all; reductase in all but dog and ewe; lipase in all; lecithinase in ram, bull and sow; erepsin in all but dog; pepsin in dog and sow; trypsin in all; autolytic enzyme in all; urease in none; zymase in none; lactolase in all but dog and ewe; alcoholase in ram.

R. C. WILLSON

The external secretion of the pancreas. BORIS GOLDSTEIN. *Russ. Fisiol. Zhurnal* 11, 23-31(1928); *Ber. ges. Physiol. expil. Pharmacol.* 46, 675.—The actions of secretin and of pilocarpine on the isolated pancreas were studied. When the amt. of secreted juice from the isolated pancreas is less than 1%, both these agents act specifically on the pancreas secretion. Small amts. of secretin (less than 10 cc. of secretin soln. to

1 cc. Ringer-Locke soln.) do not stimulate the secretion of the isolated pancreas. Larger amts. of secretin increase the amt. of the secretion from the isolated pancreas as well as the concn. of enzymes (trypsin and amylase). Pilocarpine does not increase the amt. of secreted pancreatic juice to such a degree as does secretin, but its action on the concn. of the enzymes is stronger than that of secretin. R. C. WILLSON

Studies of the urine of the Marburg Olympian athletes. O. FLOESNER AND FR. KUTSCHNER. Univ. Marburg. *Sitzb. Ges. Beförderung Ges. Naturw. Marburg* 62, 283-93(1927); *Ber. ges. Physiol. expl. Pharmacol.* 46, 228.—The urine of 70 students 30 mins. before the beginning of their contests (400-m. to 10-km. runs and 100-1000-m. swims) totaled 8500 cc., while the first discharges after the contests amounted to 6000 cc. The previously collected urine (U-1) reacted partly neutral and partly acid while that after the contest (U-2) was always strongly acid. In U-1 albumin and sugar were always absent; in U-2 sugar was absent, but albumin was often present in traces. Both urines were divided (U-2 after deproteinization), boiled to a sirup, exhausted with H_2SO_4 soln. and extracted with ether. With steam 1 g. hippuric acid could be produced from U-1 and 0.67 g. from U-2; the smaller amt. of urine in U-2 was compensated for by the higher concn. From the residue after ether extn. in U-1 no crystallizable substances were obtained, but from U-2 came 14.8 g. zinc lactate which corresponds to 0.14 g. lactic acid per person in an av. of 85 cc. urine. From the ether-insol. portion of U-2 there came 0.5772 g. adenine-gold chloride, while xanthine, hypoxanthine and guanine were absent. The cause of this extreme alteration in the metabolism lies in the O deficiency. Arginine was absent in the arginine fraction, but 0.45 g. methylguanidine was found; this corresponds to 13 mg. methylguanidine per l. urine which is much more than normal. In the lysine fraction small amts. of phenylalanine were found; this was formerly found only after P-poisoning. The increased elimination of adenine, methylguanidine and lactic acid, the reduction in hippuric acid and the appearance of phenylalanine are all to be traced back to an extreme deficiency of O in the tissues. R. C. WILLSON

The conduct of calcium during the healing of fractures. JOSE SAGOVIA. *Z. orthop. Chir.* 48, 572-82(1927); *Ber. ges. Physiol. expl. Pharmacol.* 44, 749.—A subcutaneous fracture was reset in each of 5 rabbits, the animals were killed at different periods and the Ca content of the fractured and unfractured parts of the bones was detd. after detaching the soft parts. S found that the Ca content in no stage of the healing of the fracture was greater than in the unfractured part. Conclusion: The Ca for the ossification of callus is obtained from the broken bone itself and not from the Ca in the blood. Objective evidence of this transportation of Ca was seen in atrophy of the bone at other places. R. C. WILLSON

G—PATHOLOGY

H. GIDEON WELLS

Lactacidogen in experimental pancreas diabetes. M. VON FALKENHAUSEN AND H. HIRSCH-KAUFMANN. *Z. ges. expl. Med.* 58, 567-77(1927).—Lactacidogen metabolism (of dogs) is not disturbed by expl. pancreas diabetes. B. C. A.

Hematoporphyrinuria. H. H. VAN DER ZOO DE JONG. *Geneeskund. Nederlandsche Tijdschr.* 72, 1, 165-8(1929).—The urine of porphyrinuria patients seems to contain urofuscine bound to a brown dye, which serves to detoxify it. The urofuscine-porphyrin compd. decomposes on letting the urine stand as shown by the more intense brown coloration. By adding HCl and heating on a water bath the decompn. is accelerated. In congenital porphyrinuria the compd. is not formed chiefly on account of the excess of porphyrin present. R. BEUTNER

Albuminuria in the mechanism of detoxification. EDMUND ANDREWS, WM. A. THOMAS AND WM. F. WILKER. *Arch. Internal Med.* 43, 139-43(1929).—Human nephritic urine contains normal blood proteins, a relatively nontoxic peptone (which is coagulated with the albumins by heat) and a highly toxic blood protein that is so highly dispersed that it passes readily through a collodion membrane. It is suggested that albuminuria is a detoxicating mechanism for eliminating poisonous products of protein metabolism. J. B. BROWN

The cholesterol content of blood plasma in diabetes mellitus. I. M. RABINOWITZ. *Arch. Internal Med.* 43, 363-71(1929).—Two thousand observations in 385 cases show that the estn. of plasma cholesterol affords a reliable index to the true progress of the diabetic patient. It is suggested that this detn. should be made routine in the control of diabetes. J. B. BROWN

The cholesterol content of blood plasma in juvenile diabetes. I. M. RABINO-

Med. 43, 372-5(1929).—In juvenile diabetes glucosuria is usually hypercholesterolemia. As is the case with adults, the estn. of a reliable index to the true progress of the diabetes.

J. B. BROWN

in the urine of normal and nephritic rabbits. *HIDEICHI Med.* 12, 153-60(1929).—Urine of 3 sets of 4 rabbits

incubated with NH_3 after the production of exptl. nephritis than before. The amount of NH_3 after incubation at 40° for 50 mins. (CHCl_3 , thymol and phenol were used to prevent bacterial action) was greater in the nephritic than in the control urines, to be due to the increase in the ureolytic substance, which has the character of NH_3 in the blood. The larger quantity of NH_3 in nephritis was not due to NH_3 in the blood, but to the production of NH_3 in the kidney.

B. C. BRUNSTETTER

the action of duck serum upon normal and nephritic rabbits. *HIDEICHI Exptl. Med.* 12, 161-78(1929).—Extensive urinary analyses show

parenterally to normal rabbits is markedly diuretic: N excretion no inflammation was caused. Intravenous injection of duck serum

from K_2CrO_7 -nephritis but made rabbits nephritic from injection of $\text{UO}_2(\text{NO}_3)_2$ or cantharidin worse. Conclusion: A moderate dosage of duck serum be of value in the therapeutics of hydropsy when there is no kidney injury.

B. C. BRUNSTETTER

The basal metabolism in hypertension. ENAJI HAYASAKA. *Tôhoku J. Exptl. Med.* 12, 270-80(1929).—Cases of renal diseases with hypertension were classified according to Volhard and basal metabolisms of each type were detd. In 14 cases of benign hypertension the av. basal metabolic rate was -6% (referred to normal values prep'd. by F. B. Sanborn) but in 6 cases of malignant hypertension, the av. rate was $+18\%$. In 7 cases involving secondary contracted kidney, the av. rate was -14% . In one case in the uremic state, the basal metabolic rate was $+27\%$.

B. C. B.

Blood uric acid values in healthy and tuberculous individuals at high altitudes. PAUL BORCHARDT. Univ. Berlin. *Z. Tuberk.* 50, 473-80(1928).—The blood uric acid content of healthy individuals is only 0.7 to 1.7 mg. % at high altitudes compared to 3 to 5 mg. % in lowlands. No difference was noted between men and women. During early febrile disease or tuberculous relapse the uric acid increased with a diminution subsequently. Tuberculous individuals running a favorable course revealed normal values. No relation between the blood uric acid findings and leucocyte counts was observed.

H. J. CORPER

Potential blood alkalinity and its variations in pulmonary tuberculosis. T. D. KAHN. Sanat., Slobodka, Odessa. *Z. Tuberk.* 50, 480-5(1928).—The potential blood alk. is usually diminished in pulmonary tuberculosis, the grade being dependent upon the decompensation of the disease process but being little related to the anatomical Turban stage classification. The diminution is more marked in exudative than in fibroid and productive phthisis. With clinical improvement the potential blood alk. increases while complications, especially involving the kidneys, result in a diminution. The changes in the potential blood alk. are usually inversely proportional to those of the erythrocyte sedimentation and leucocytic index.

H. J. CORPER

The copper content of normal and pathological organs. I. Method. R. SCHÖNHEIMER AND F. OSHIMA. Univ. Freiburg. *Z. physiol. Chem.* 180, 249-52(1929).—Detns. of minute quantities of Cu in animal tissues by the usual methods are possible only with comparatively large samples. A colorimetric microchem. method was therefore devised which is applicable to small samples, e. g., 10 cc. of blood or 5-7 g. of normal liver, or still smaller samples where the Cu content is higher. It is a colorimetric adaptation of the Spæu reaction (C. A. 18, 2300), whereby a green CHCl_3 -sol. complex of Cu-pyridine-SCN is formed. The sample is ashed in a small Kjeldahl flask with H_2SO_4 - HNO_3 , the residue dissolved in H_2O and the Cu pptd. by H_2S . The ppt. and filter are then ashed in a test tube with Neumann's reagent, the residue is dissolved in H_2O , nearly neutralized with NH_4OH , and treated with NH_4SCN and pyridine. The mixt. is finally shaken with CHCl_3 and the CHCl_3 soln. compared in a microcolorimeter with a similar soln. obtained from a known amt. of Cu. The technic is described in detail. With 0.01 mg. Cu the max. error is 5%, and with 0.008 mg. it is 8%, the error increasing with decreasing amts. of Cu. II. The copper content of normal liver and of the liver in hemochromatosis, also that of gallstones and whole blood. F. OSHIMA AND R. SCHÖNHEIMER. *Ibid.* 252-8.—By the method outlined above Cu detns. were made on a considerable no. of human livers for comparison between normal and pathological conditions. Parallel detns. of Fe are reported in most cases. Six samples of gallstones showed 0.0438 to 0.237% Fe and 0.0159 to 0.206% Cu. Normal livers varied between

0.022 and 0.089% Fe, and between 1.32 and 3.92 mg. Cu per liver; on the other hand, contained 0.70 to 3.26% Fe and 0.01 to 0.03% Cu. Both Fe and Cu show an enormous increase over the normal value which showed 1.13 to 1.44 mg. Cu per kg.

Immunity and convalescence. B. V. ISSAKUTA. *Pharmazie* (1929).—An address in reference particularly to poisons.

A preliminary note on the decolorization of a solution of methylene blue left in contact with kala-azar serum. T. C. BOYD AND A. C. BOYD. *Indian Med. Gaz.* 63, 568 (1928).—When solns. of methylene blue are left in contact with a soln. of methylene blue contg. 1 part of the dye in 40,000 parts of water, colorization is discernible on the 3rd or 4th day; the addn. of a microorganism together inhibits the reaction. The presence of a microorganism may account for the fading observed. Further work on this subject.

A critical examination of the antimony tests for kala-azar. Kala-Azar Commission. *Indian Med. Gaz.* 63, 687-97 (1928).—Close the fact that the Sb test is much more delicate than that in which the aldehyde reaction is employed. Unfortunately, the former is not pos. in every case of kala-azar. The changes occurring in the serum of the patient affected with this disease occur also to a less extent in the serum of those suffering from malaria of the chronic type and certain other conditions of splenic enlargement; also, in phthisis and leprosy. Because of these conditions, the delicacy of the reaction is a distinct disadvantage. Rules are suggested to make the test one of clinical value. The dilution method is discussed, as are also the various diagnostic aspects encountered during treatment. It is suggested that a diagnosis be made on the combined results of the 2 tests. When either method is used alone, the results of the blood test are entirely unsatisfactory. F. G. G.

Homogentisuria (alkaptonuria) with glucosuria. J. P. BOSE AND SUDHAMOY GHOSH. School of Tropical Med., Calcutta. *Indian Med. Gaz.* 64, 61-6 (1929).—An extremely rare disease occurring in individuals, otherwise normal, whose urine, though of perfectly normal color when voided, turns black when exposed to the air, especially if rendered alk. The chem. compn. of several compds. whose presence is believed to be responsible for this abnormality is described in detail. It is believed that homogentisic acid (2,5-dihydroxyphenylacetic acid), a substance present in urines of the character described, is derived from phenylalanine and tyrosine in the system. Protein foods cause an increase of this acid in individuals so affected. Derivs. of homogentisic acid have been prepd. FREDERICK G. GERMUTH

Indican determination in the urine of diagnostic value? J. OLIVET. *Klin. Wochschr.* 7, 2439-40 (1928).—The amt. of indican in the urine is not an index of intestinal putrefaction. The indican probably originates in the intestine but other factors, such as destruction of indican by the body tissues, confuse the end result. Twenty-four-hr. specimens of urine may contain widely different amts. of indican on successive days although the condition of the patient has remained unchanged. MILTON HANKE

Enterotropie and the parenteral action of cholera poison. III. MARTIN HAHN AND JULIUS HIRSCH. *Klin. Wochschr.* 7, 2483-4 (1928).—The intravenous injection of cholera poison into rabbits leads to profuse diarrhea, fall in body temp., a loss of fluid amounting to 10-17% of the animals' body wt. and death within a few hrs. The microscopic picture of the intestines is identical with that obtained when the animals are infected with the cholera vibrio. Cholera poison is inactive when given by mouth or when it is injected into the lumen of the intestine. An isolated piece of intestine is paralyzed by cholera poison. The intestine is not affected when the poison is allowed to flow through the lumen of the intestine without coming in contact with the outside wall. MILTON HANKE

The existence of a histamine-like substance in cases of dermatographia. HEINZ KALE. *Klin. Wochschr.* 8, 64-6 (1929).—An intensive irritation to the skin of the back leads to the production of a substance which, like histamine, acts as a gastric secretory stimulant. MILTON HANKE

The relation between the colon bacillus invasion of the small intestine and liver therapy in pernicious anemia. H. ADLER, P. SINGER AND P. REIMANN. *Klin. Wochschr.* 8, 724 (1929).—Liver ext. is bactericidal to colon bacilli if a sufficient concn. of the liver ext. is present. The various com. preps. differ in this respect. The most effective was bactericidal in 5% concn., the least effective in 35% concn. It is possible to prep. an ext. that is effective in 2% concn. MILTON HANKE

A new syphilis reaction (M. K. R.). ERNST MANNICH. *Klin. Wochschr.* 8,

in this case of an alc. ext. of beef heart and toluich balsam as the ext. used in the M. T. R. Incu- and 10 times its vol. of a 3.5% NaCl soln. contg. 0.02% m. at 45°. Mix rapidly. The mixt. is turbid and not is then added. Mix thoroughly. A neg. serum dity of the mixt. A pos. serum ppts. the colloid and

MILTON HANKE

BRUNO MENDEL. *Klin. Wochschr.* 8, 169-70 as low as 0.001 M, inhibits the anaerobic gluco- completely without affecting the respiratory rate of that glyceraldehyde prevents the development of ism.

MILTON HANKE

and carbohydrate metabolism. F. DEPISCH AND R. 8, 202-4(1929).—The administration of 50 g. fat has in normal individuals and does not lead to an ex- curve in diabetics, after fat administration, parallels adrenaline 3 hrs. after the ingestion of fat leads to a ugar value than is the case with hunger patients. Ad- effectiveness of insulin.

MILTON HANKE

by work and exhaustion. Increase of magnesium ONHARD WACKER. *Klin. Wochschr.* 8, 244-9(1929); activity was induced in rabbits, under urethan

The Ca and Mg contents of the serum were ele- his stimulation. The excess of these ions disappears Ca and Mg ions that appear in the blood during the ivity probably originate in the muscles and they may muscle by the acid that is produced at this time. Rigor its about 3 hrs. after death. The electrically stimu- mins. A normal period of 3 hrs. is obtained in animals that have then been allowed to recover for 3 hrs. The

relation between the Ca and Mg content of the serum and the phenomenon of rigor mortis is obvious.

MILTON HANKE

The behavior of the thyroid during pregnancy and the reaction of Reid Hunt. R. BRÜHL. *Klin. Wochschr.* 8, 254-5(1929).—The blood of pregnant women does not protect mice against intoxication with acetonitril. This blood does not, therefore, contain substances such as are found in Basedow's disease.

MILTON HANKE

The behavior of the adrenaline-blood-sugar curve in hepatopathics with parenchy- mal involvement. BERNARD KUGELMANN. *Klin. Wochschr.* 8, 264(1929).—Although the injection of adrenaline leads normally to an elevation in the blood-sugar value, this is not true of hepatopathics with parenchymal involvement.

MILTON HANKE

Circulatory insufficiency and muscle metabolism. KURT DRESEL AND FRED HIMMELWEIT. *Klin. Wochschr.* 8, 294-6(1929).—The lactic acid content of venous blood from the arm of a normal individual is not appreciably changed when the arm is mildly exercised. The lactic acid produced by the muscular activity is either promptly oxidized or resynthesized to glucose. This is not true of persons afflicted with circulatory diseases, Basedow's disease or myasthenia. In these cases even the mildest exercise leads to an increase in the lactic acid content of the blood.

MILTON HANKE

Several cases of so-called bent-leg in sheep. A. D. THOMAS. Veterinary Re- search, Onderstepoort. *S. African J. Sci.* 25, 278-81(1929).—A few cases of bent- leg were observed in a large herd of sheep. The P_2O_5 and CaO contents of the fodder were known to be small, though they compared favorably with the general condition prevailing in South Africa. Conclusion: The disease cannot be attributed to a faulty balance in the mineral constituents of the diet. Heredity could be the cause.

ALBERT L. HENNE

Activation of proteolysis in animal organs, its significance for the metabolism of malign tumors. R. WALDSCHMIDT-LEITZ, I. J. BEK AND J. KAHN. *Techn. Hochschule Prag. Naturwissenschaften* 17, 85(1929).—The proteolytic system of animal organ (previous expts. on spleen, stomach, liver and kidney) consists of (1) an enzyme, opti- mum pH 4 to 5 which attacks genuine protein and (2) in larger amt. a peptidase, opti- mum pH 8, the latter being similar to the one of the digestive tract (cf. C. A. 21, 3061). The protease of the spleen, hemokathepsin, is accompanied by a natural activator formed by traces of autolysis, which enlarges the range of attack of the enzyme. B sepn. of enzyme: self itself only splits (adsorption method) it could be shown that the enzyme itself decomposes products whereas the activator enable

it to attack protein (egg albumin), gelatin or protamines to that of Grassmann and Dyckerhoff's yeast proteinase. The action of the activator can as well, in some cases even more effectively, be replaced by H_2S or HCN addn. to the enzyme. Proteins, acylated peptides, acetyl tyrosine, benzoyldiglycine, carbethoxyglycylleucine, etc., are attacked by the enzyme. In its action toward these synthetic products the enzyme is similar to trypsin, chymotrypsin, or papain; identity of the enzymes is for this reason not certain. The results merely indicate similar action on isoelec. protein. It is probable that a similar relation may exist between inhibitive action (of HCN or other substances) and activating effects on proteolysis as, e. g., that found in the case of trypsin caused by the same substances. An explanation of the connection between these cell degenerations by specifically increased proteolysis and the theory of progressive damaging by anaerobically formed products is not yet clear.

The cancer cell. ALBERT FISCHER. Kaiser Wilhelm Institut für Krebsforschung, Berlin. *Naturwissenschaften* 17, 157-60(1929).—A review.

The basic factor in the cause of goiter in the Pacific Islands. HOUDA. *Am. Med.* 34, 716-22(1928).

Diet and insulin in the treatment of uncomplicated diabetes. S. MONSIEUX. Arrowhead Springs Metabolic Clinic, Cal. *Am. Med.* 34, 691-6(1928).

Calcium fixation capacity of normal and rachitic cartilage. J. K. HARRIS. Univ. Würzburg. *Z. Biol.* 87, 537-42(1928).—In order to test the fixation capacity of cartilage, specimens were soaked for 24 hours in $CaCl_2$ soln. The tissues tested included calf epiphysis, cattle rib and shoulder cartilage, proliferating and non-proliferating zones of calf rib cartilage, rachitic and non-rachitic cartilage from children and proliferating and non-proliferating zones of cartilage from rachitic children. No relationship was noted between Ca fixation and calcification.

"Retention" of residual nitrogen and aromatic bodies in the blood and its anatomical localization in experimental renal insufficiency. MARJAN FRANK. *Med. Périodica* 9, 219-23 (Polish), 224 (French)(1928).—In exptl. renal change in dogs the high level of residual nitrogen (RN) and aromatic bodies (CA) is an inseparable symptom of a general grave state and of a considerable pathol. affection of the kidney, especially the renal epithelium. RN and CA of the blood in these cases running parallel though the multiplicity of the increase of these two groups is not the same which is due to their different origin. The anatomic cause of the increase of RN and CA in the blood in exptl. renal insufficiency is a pathol. state of the epithelium of the tubules of the kidney.

The effect of ligation of the common bile duct upon the appearance of tetany in thyro-parathyroidectomized dogs. JOHN C. BROUGHER. Univ. of Oregon Med. School. *Am. J. Physiol.* 86, 39-42(1928).—Obstruction of the common bile duct by tying prevented the appearance of typical parathyroid tetany in dogs. The result may have been due to (1) a lessened excretion of Ca from the body by way of the bile, (2) increase in absorption of Ca from the intestine because of the absence of the alk. bile salts; (3) depression of the nervous system by the absorbed bile.

The conditions of activity in endocrine glands. XXV. The polycythemia of acute anoxemia and its relation to the sympathico-adrenal system. J. J. IZQUIERDO. Harvard Univ. *Am. J. Physiol.* 86, 145-59(1928).—Normal cats kept for 50 min. period in a low-pressure chamber (5.5 to 9% O_2) without emotional excitement breathed rapidly with shallow respirations, and the red blood cell count increased markedly. Removal of the spleen was followed by a failure of the red blood cells to increase in anoxemia. CO_2 in the air (even up to 20%) had little or no effect on the red blood cell count.

The acid-base equilibrium of bilaterally nephrectomized and adrenalectomized dogs. W. W. SWINGLES. State Univ. Iowa. *Am. J. Physiol.* 86, 450-8(1928).—After removal of both kidneys from dogs there was (1) marked increase of sulfate, phosphate and urea in the blood; (2) an increased blood sugar; (3) diminished blood chlorides; and (4) no acidosis. After removal of both adrenals there were no changes in the blood constituents until symptoms developed. A marked acidosis then appeared, due apparently to retention of phosphate and sulfate. S. believes that the symptoms of adrenal insufficiency are simply those of a slowly developing acidosis. J. F. L.

The acid intoxication of adrenal insufficiency in dogs. FREDERICK F. VOCKMAN. State Univ. Iowa. *Am. J. Physiol.* 86, 471-83(1928).—After removal of both adrenals from dogs there was a marked acidosis, appearing with the first development of symptoms and accompanied by a retention of nitrogenous constituents, inorg. phosphates

is indicated as a direct consequence of the loss

J. F. LYMAN

serum diagnosis of lues. CESARE CLIVIO. *Boll. soc.*

8).—Out of 574 serums tested, 460 agreed exactly with the Wassermann and 345 neg. In 34 samples it was not possible to make a definite diagnosis because of the presence of corpuscles which clouded the tubes. In only 10 cases was there a disagreement between this test and the Wassermann. Of these, 7 were pos. but acetic anhydride neg. The remaining were 78 Wassermann pos., and of these only 3.35% or 18 cases showed positive results.

The technic of the test is as follows: to one cc. of physiological saline add 0.1 cc. of pure acetic anhydride and boil. Then add 0.1 cc. of the serum to be tested while still boiling. A pos. reaction quickly assumes a

pinkish color which changes to violet or carmine red. If the reaction is neg. the serum remains uncolored or may assume a pale mauve color later. The

test is read when the first tint appears, and 15 min. later when the color assumes the maximum intensity. Activated serums give a tint which makes it difficult to differentiate between the positives and the negatives, and, therefore, cannot be used. Guinea pig complement does not give the reaction. The reaction is pos. with egg albumin and egg yolk.

PETER MASUCCI

Experimental study of acquired resistance of the rabbit's renal epithelium to mercuric chloride. WARREN C. HUNTER. Univ. of Mich. *Ann. Internal Med.* 2, 789-806(1929).—HgCl₂ is not a satisfactory substance for use in the production of immunity in renal epithelium because of irregularity of absorption and local corrosive action following subcutaneous administration. There is danger of thrombosis and enterocolitis after intravenous injection. A slight degree of immunity can be demonstrated in regenerated epithelium and glomeruli. Glomerular injury is less frequent than in the normal kidney. A characteristic finding is the envelopment of neurotic cells by regenerating epithelium. In the rabbit, Ca deposition in casts is inconstant. JOHN T. MYERS

Report of a case of primary multiple myeloma with Bence-Jones protein in the pleural effusion. EUGENE E. MARCOVICI. *Ann. Internal Med.* 2, 881-911(1929).—In this case Bence-Jones protein was present in the pleural effusion before it appeared in the urine. There is a bibliography of 120 titles. JOHN T. MYERS

Familial glucosuria. Report of a large family. HAROLD M. BOWCOCK. *Ann. Internal Med.* 2, 923-31(1929).—Eighteen members of a family from 4 generations, representing 58% of the members studied, showed glucosuria without symptoms of diabetes mellitus. The blood and urine of 5 of the cases were studied. One case had the findings of mild diabetes, 2 those of renal glucosuria, and 2 those of cyclic renal glucosuria. JOHN T. MYERS

Focal calcification of heart muscle; case report. VINCENT DE PAUL KING. *Ann. Internal Med.* 2, 936-40(1929). JOHN T. MYERS

The effect of bone transplantation on the blood calcium level. GEORGE HALPERIN and E. L. WALSH. Northwestern Univ. *Arch. Surg.* 13, 819-23(1929).—Homologous bone transplants fail to raise the level of the blood Ca in normal dogs and rabbits. The blood Ca level is not as const. in rabbits as it is in dogs. JOHN T. MYERS

The relationship between the hemolytic complement and the opsonic power of normal guinea pig serum. JOHN GORDON, HUGH R. WHITEHEAD and ARTHUR WORMALL. School of Medicine, Leeds, and Coll. of Medicine, Newcastle-on-Tyne. *J. Path. Bact.* 32, 56-61(1929).—Destruction of the normal hemolytic power of guinea pig serum with NH₃ does not reduce to a significant extent the opsonic power of the serum for *Staphylococcus aureus*. Incubation of the normal serum at 37° for 2 hrs. with this organism in amounts sufficient to remove hemolytic and opsonic power does not remove the fourth component of complement; hence the fourth component is not necessary for the opsonic action of normal serum. JOHN T. MYERS

A case of diabetes mellitus with acromegaly and lipemia. JOHN GRAY. Aberdeen Univ. *J. Path. Bact.* 32, 71-7(1929). JOHN T. MYERS

Siderosis of the globus pallidus: its relation to bilateral necrosis. GEORGE HADFIELD. General Hosp., Bristol, and Royal Free Hosp., London. *J. Path. Bact.* 32, 135-48(1929).—The walls of the blood vessels of the healthy globus pallidus are often infiltrated with Fe salts derived from the nucleus itself. It is likely that the process is one of evolutionary atrophy. It predisposes to the acute bilateral destruction of these nuclei which are frequent in coal-gas poisoning. JOHN T. MYERS

Experiments on the nature of the carcinogenic agents in mineral oils. C. C.

TWORT AND J. D. FULTON. *J. Path. Bact.* 32, 149-61(the carcinogenic oils the active agent is sometimes the lower fraction. The active agent is concd. in methyl sulfate and picric acid, and the process is useful. There is no evidence that carcinogenic substances are or by extn. The carcinogenic activity of an oil is much by extn. with H_2SO_4 , oxidation, and by reduction.

Demonstration of the peculiar bodies of bodies") in material obtained by lung puncture and AND A. C. HADDOW. *J. Path. Bact.* 32, 172(1929).-yellow bodies were found in two cases of pulmonary had worked with asbestos for several years.

Improvement of diabetes in a pregnant woman. RENCE. King's Coll. Hosp. *Quart. J. Med.* 22, 11, twin pregnancy in a diabetic woman was studied. Up pregnancy the sugar tolerance deteriorated. From the of pregnancy it improved to the extent of 100 g. of carbohydrate per day. This tolerance was not maintained after labor and must be ascribed to fetal insulin aiding the mother. The renal threshold was lowered at the sixteenth week and returned to normal at the thirty-fourth week. There was no increase in ketosis or change in the fatty acid: glucose ratio tolerated. The pregnancy was complicated in the later months by a salt retention edema and a parenchymatous nephritis. JOHN T. MYERS

Febrile albuminuria with special reference to pneumonia. L. C. HILL. (*Quart. J. Med.* 22, 305-19(1929). -Albumin is present in considerable quantities in every case of pneumonia at some time during its course. The presence of a trace may be of diagnostic value in a doubtful case. The degree of albuminuria corresponds broadly with the height of the temp., but persists for some time after the temp. has dropped. There is no correlation between albuminuria and temp. during such complications as empyema or mastoid suppuration. There is no definite relationship between the quantity of urine secreted and the degree of albuminuria, though they tend to be inverse. On the whole the intensity of the albuminuria is proportional to the severity of the case. Large numbers of casts indicate an unusually severe attack. There is an increase in the intensity of the albuminuria just prior to death. The temp. is not the cause of the albuminuria. It is probable that febrile albuminuria in the strict sense of the word does not exist, but that there is always some renal damage. The kidney in such albuminurias shows degenerative changes but not inflammation. JOHN T. MYERS

Biocatalyzer in carbohydrate metabolism of cancer. H. V. EULER AND H. JOHANSSON. *Swensk Kem. Tids.* 40, 209-18(1928). (In German); cf. *C. A.* 23, 1. The corymase technic developed in v. Euler's lab. (*C. A.* 21, 2138, 1820, 1905), was applied to carcinomatous human liver tissues and compared with results from normal tissues of the same organ. The inhibiting factors of the pathol. cells have an effect on the "A-Z" (activator zymase units, i. e., cc. CO_2 per hour per g. dry matter of tissue). Tests with exts. from cancer liver gave A-Z value under 300 whereas the normal exts. exceeded this no. A-Z nos. were also obtained from hashed and desiccated organs; for the former the normal came to 30 and over and the pathol. 20, and for the latter 27 and 13, resp. The A-Z units could be concd. sevenfold by a procedure previously described (*C. A.* 22, 2384, 3671). A. P. LESTER

Histochemical researches on pulmonary anthracosis. A. POLICARD, S. L. BROW AND D. PILLET. *Compt. rend.* 188, 278-9(1929); cf. *C. A.* 22, 2062. The 2 varieties of pulmonary pigments, namely, the ferruginous one derived from the blood and the one consisting of exogenous C may be distinguished by micro-incineration or by microscopical examn. The C deposits contain also particles of minerals like carbonates, silicates, feldspars, etc. The residue obtained by igniting the C particles has a greater double refraction than had the original particles on account of the heat causing the silicates to crystallize and thus to become anisotropic. The pigments are isolated by destroying the pulmonary tissue with a strongly alk. soln. of $NaOCl$. The ferruginous particles, which may be dissolved by strong hot acids, sometimes include crystals of hematin or cholesterol esters; in order to distinguish them from inorg. crystals they are heated, by which process the org. crystals are destroyed. G. SCHWARTZ

The total proteins (serum albumin and serum globulin) in sera of guinea pigs with scurvy. The presence of albumin and hemoglobin in the urine of these in the last stage of the disease. (MILAN.) A. MICHAUX. *Compt. rend.* 188, 853-4(1929).-In guinea pigs suffering from scurvy (I) the total protein in the serum was detd. from the 10th to the 32nd day after starting them on a scurvy-producing diet.

d were compared with the corresponding values from guinea and guinea pigs on a complete, synthetic diet (III). The values were slightly lower than those in II. The values found in I and in other except on the 16th day and the next few days therein in I were considerably lower. On the days preceding the appearance of albumin and hemoglobin were present in their urine. Globulin was found to be sensitive to a diln. of 1:100,000,000.

G. SCHWOCH

and pathological sera (oxidizability of sera). R. DOURIS, M. PLESSIS. *Compt. rend.* 188, 587-8 (1929); cf. C. A. Power of normal and pathol. sera was examd. in the following: 1 cc. serum and 9 cc. H_2O was boiled for 2 mins. with 1 cc. of concd. H_2SO_4 and 9.80 g. of $K_2Cr_2O_7$ per l. After cooling the $K_2Cr_2O_7$ in excess was detd. by titration with a 0.2% $K_3Fe(CN)_6$ being used as an outside indicator. The values for 1 cc. of serum were 128-44 in normal sera, 80-120 in syphilitic sera. A diagnostic method based on this procedure

G. SCHWOCH

hemolysis. K. C. SEN, A. C. RAY AND N. N. MITRA. *Univ. Sci. Bull.* 42(1929).—Sachs (C. A. 3, 1549) showed that the hemolysis was accelerated if normal blood serum was subjoined to the hemolysate. Ponder (C. A. 18, 2727) obtained similar results with taurocholate. In continuation of earlier studies (Sen and Mitra) found that in expts. conducted with oleate and taurocholate quantities of serum added to an erythrocyte-hemolyte suspension caused inhibition; larger amounts, however, caused acceleration.

Effect of serum on hemolysis. This effect of serum is not specific, since dil. solns. of NaOH had a similar effect. The action of serum may be due to a change of the pH produced by the serum proteins. No acceleration of hemolysis could be obtained with saponin as the hemolyte.

G. SCHWOCH

Biochemical study of the adder venom. III. CHOKURO KUBAYASHI. *Osaka Med. Col. Osaka J. Med.* 27, 770-80 (1928). The effect of venom upon the substance in the blood of a rabbit which reacts with iodate is studied. A subcutaneous injection of the min. quantity of the venom for poisoning (0.001 g.) or for the fatal quantity (0.003 g.) was given to a rabbit weighing 2 kg., the reagent being dissolved in 1 cc. of distd. H_2O . The variation of the substances reacting with iodate was examd. at various time intervals. In poisoning, the substance which reacts with iodate gradually decreases, returning to the normal condition with the disappearance of the poisoning symptom. With the fatal quantity the decrease is a little more rapid and continues just up to the moment of death. When the poisoning quantity is repeatedly injected with the time interval of 7-10 days, the decrease becomes less and less marked. V. VII. *Ibid* 1405-10, 1411-8.—When the poisoning quantity, 0.001 g., is subcutaneously injected, the increase of the residual N in the blood is gradual and appears to be parallel with the progress of the symptom. The urine contains a weakly acidic protein and some blood pigment, together with some blood sugar, but it contains no urine sugar. With the disappearance of the symptoms, the residual N returns to the normal condition, the urine becoming alk. and the proteins and the blood pigment disappear. When the fatal quantity, 0.003-0.009 g., is injected, the increase of the residual N reaches a max. at the moment just before death and may sometimes reach double the amt. in the normal condition. In the urine, sugar also appears. When the fatal quantity or more of the venom is heated at 37° for more than 1 hr. in the medium whose pH value is 4.15-9.97 the poisoning effect does not decrease markedly. Heating in the medium of pH 2.96 or 11.08 makes the local poisoning action weaker, while at pH 1.06 or 12.95 the poisoning action disappears. VIII. *Ibid* 1725-30.—K. describes some attempts at the sepn. of the venom. This substance does not pass through a collodion membrane; the lecithin decomn. products ppt. with globulin when salted out by means of $(NH_4)_2SO_4$. The substance which poisons the whole body of the victim is present with albumin. The former is easily destroyed in a weakly alk. soln. while the latter is weak in its resistance toward alkali.

K. SOMEYA

The action of certain aldehydes upon diphtheria toxin and upon experimental diphtheria. C. H. PICO AND J. M. MIRAVENT. *Rev. inst. bacteriol. anal. hig.* 4, 695-702 (1920).—Diphtheria toxin was destroyed when mixed with ACH, valeric aldehyde or benzaldehyde *in vitro*. The addn. of formaldehyde to diphtheria toxin *in vitro* destroyed the toxin but preserved the antigenic properties. A very active anatoxin

was obtained by the addn. of formaldehyde to the toxin

General metabolism in uterine carcinoma. I. Int. N. LOUROS AND E. GAESSLER. Staat. Frauenklinik, Dresden. 191-218(1929).—The first of a proposed series of articles, in general features of metabolism in cancer and a review of the 15 cases of cancer of the cervix in various stages. The findings in the blood, reduced surface tension and increased viscosity values from f.p. determinations, increased rapidity of alkali reserve, increased plasma vol., slight increase in total abs. and relative increase in fibrinogen, moderate abs. and corresponding decrease in albumin, regularly an increase in total cholesterol of the blood, normal values for lactic acid and sugar, NaCl, marked decrease in K, normal Ca, slight increase in metabolism. These results are discussed at length, and a lack is thought to be responsible for much of the observed changes for therapy on this basis.

H - PHARMACOLOGY

A. N. RICHARDS

Solganol treatment. A clinical contribution to gold treatment in pulmonary tuberculosis. A. FREUND. Hasenheide, Berlin-Neukölln. *Beitr. klin. Tuberk.* 68, 606-24(1928).—Solganol is less toxic than other Au preps. Injury to the kidney was never observed, while exanthemas of the skin and mouth mucus membranes were frequent, but retrogressed rapidly under adrenaline treatment. The action of Solganol is similar to that of Sanocrysin but is better tolerated. Favorable results attained in fresh forms of pulmonary tuberculosis while in chronic cirrhotic cases a bare action was observed.

H. J. CORPSE

Problems of chemotherapy in tuberculosis. A critical review. F. JESSEN. *Beitr. klin. Tuberk.* 68, 711-3(1928). J reviews the various endeavors of chemotherapy in tuberculosis and arranges them in three types: (1) an attempt to destroy the tubercle bacilli without injuring the tissues (a *therapia magna sterilisans*), which he believes not likely attainable; (2) an endeavor to retard the spread and development of the tubercle bacilli in the body (as exemplified by the dietetic treatments of Gerson, Hermannsdorfer and Sauerbruch); and (3) endeavors to reinforce the immunologic resistance of the organism (such as Walbum's metal salt therapy).

H. J. CORPSE

Combined febrile and expectorant treatment in pulmonary tuberculosis. MAX BAUMWELL. *Z. Tuberk.* 50, 229-31(1928). Neo-Toramin (trichlorobutylmalonic acid dimethylaminophenyldimethylpyrazolone) is recommended as a combined antipyretic and expectorant treatment. Its effects are obtained without the associated undesirable actions of the narcotics of the morphine group. Neo-Toramin possesses the advantage over pyramidone in producing antipyretic effects with a smaller dose. It also possesses the advantage of not acting directly on the heat center and thus avoiding the harmful excessive perspiration occurring with pyramidone as the result of its action on the sleep center. Focal and general reactions in pulmonary tuberculosis have never been observed.

H. J. CORPSE

The influence of insulin and adrenaline injections on the formation of conjugated glucuronic acids. AKISUKE MATSUMOTO. *Acta Schol. Med. Univ. Imp. Kioto* 10, 271-6(1928).—The excretion of trichloroethylglucuronic acid by dogs after injection of chloral is not affected by the injection of insulin or adrenaline.

DAVID DAVIDSON

Pharmacological investigation with strips of the outer and inner layers of the heart ventricle. I. Poison especially affecting the myocardium. JUN TAKAHASHI. *Schol. Med. Univ. Imp. Kioto* 10, 353-60(1928).—A strip of the outer and inner layers of the heart ventricle of *Rana esculenta* can perform automatic contraction. The impulse-conducting bundle of the ventricle develops mainly in the inner part and the left side. BaCl₂, helleborein, and strophanthin act mainly on the heart muscle but they still have an influence on the impulse-conducting bundle. BaCl₂ can cause the periodic contraction of the heart muscle without relation to the impulse-conducting bundle. The impulse-conducting bundle has a property resembling that of the heart muscle concerning the action of the above-mentioned substances. The difference in the actions of these substances on the outer and inner strips is as follows: Helleborein and strophanthin increase the amplitude of the contractions, the frequency and the tonus of the inner strip with more dil. concns. than those of the outer, and the difference

by the increase of the tonus. The cessation of the con-
dil. concns. on the outer strip than on the inner. That is
ter strip is somewhat feebler than that of the inner. It is
sensitive to BaCl_2 and can be acted on with more dil. concns.
The strength of its contractions is feeble by nature, so that
its tonus increases less and falls into cessation earlier." II.
The autonomic nervous system and aconitine. *Ibid* 361-5.—
atropine and pilocarpine are just the same on the outer and
entricle [of the frog]. Therefore, it is considered that the
autonomic nervous system in the outer and inner strips is nearly
its very distinct action on the inner strip; therefore, it is
the impulse-conducting bundle." DAVID DAVIDSON

The oligodynamic power of copper by solutions of electrolytes—
ra. P.-L. VIOLE AND A. GIBERTON. *Compt. rend.* 188,
"dies in several hrs. in a mixt. of equal parts of distd.
allowing 250 cc. H_2O to stand in contact with 5 g. of Cu

or Saint Nectaire the fish are still alive in it after 24 hrs. This result is not affected
by the ultra-filtration of the mineral waters. The "vairon" lives in 0.01 N Na_2SO_4 ,
 NaHCO_3 , CaCl_2 and MgCl_2 , but dies when these are diluted with the Cu soln except with
 CaCl_2 . The antitoxic action of the mineral waters is therefore attributed to Ca^{++} .
The effective agent in the Cu soln is positively colloidal $\text{Cu}(\text{OH})_2$. Anions of multiple
charge protect this colloid. Among the cations, Na, K, Mg and Sn are not actively anti-
toxic; only Ca is tox antitoxic; Ce, Fe and Al in dilns in which they are tolerated by the fish
are not antitoxic toward the Cu soln

DAVID DAVIDSON

The chemism of adrenaline action. I. S. EDLHACHER AND J. KRAUS. Univ.
Heidelberg *Z. physiol. Chem.* 178, 239-49 (1928). In order to gain some insight
into the chem. reactions whereby adrenaline exerts its sp. effect on animal metabolism,
a study was made of its behavior toward amino acids. In the presence of adrenaline
a slow stream of O or air breaks up glycine with liberation of equimol proportions of
 NH_3 and CO_2 . The max. yield was 45% of the theory; the only other product identified
was a trace of CH_3O . This reaction occurs over a p_{H} range of 6-11, with optimum
at 7.7. At 38° an equil. is reached in about 12 hrs., after which a further addn. of ad-
renaline has little effect. In the absence of O , or when the glycine or adrenaline is
nated separately, no NH_3 or CO_2 is formed. Oxidation occurs more readily in dil.
than in concd. solns. of glycine. Although increasing concns. of adrenaline give in-
creasing yields of the cleavage products, the mol. performance ratio diminishes. Thus,
25 cc. 0.02 N glycine soln. contg. buffer and 1-125,000 adrenaline yields 1.6 cc. 0.02
N NH_3 or a cleavage of 20 mols. of glycine per mol. of adrenaline, whereas a similar
soln. contg. 1-270 adrenaline yields 2.3 cc. of 0.02 N NH_3 or a cleavage of 0.42 mols.
of glycine per mol. of adrenaline. Over the temp. interval from 20° to 70° the reaction
increases almost in proportion to the rise in temp. Other amino acids, viz., alanine,
valine, leucine, *dl*-phenylalanine, tyrosine, lysine, arginine, histidine, tryptophan,
dl-proline, cystine and taurine, with the possible exception of cystine, yield only traces
of NH_3 . Glycylglycine, however, undergoes an oxidation, but the NH_3 formed is
far in excess of the CO_2 . Uric acid, adenine, guanine, hypoxanthine, thymine, uracil
and creatinine fail to react. Adrenaline is apparently a catalyst which is sp. for the
oxidation of glycine by mol. O . Catechol acts in precisely the same way as adrenaline.
Its isomers, *m*- and *p*- $\text{C}_6\text{H}_4(\text{OH})_2$, as well as ephedrine and guaiacol, are inert. The
presence of NaF , NaBr , KI , H_3AsO_3 , KSCN , MnSO_4 , FeCl_3 or urethan does not
appreciably influence the reaction. It is probable that both adrenaline and catechol
function as oxidation catalysts in this particular reaction by rearrangement to an *o*-
quinonoid structure.

A. W. DOX

The action of sulfur on carbohydrate metabolism. EUGEN FOLDS. *Z. ges. exper.*
Med. 60, 571-82 (1928).—Following the rubbing of S into the ears of rabbits there is a
hypoglycemia (20-45% below the controls) lasting from 1 to 4 days. Continued
applications resulted in a hyperplasia of the suprarenals and an increase in the glycogen
content of the liver. Adrenaline produced a hyperglycemia. In one rabbit adrenaline
produced a hypoglycemia and death. This rabbit did not have hyperplasia of the
spleen nor any increase in the glycogen content of the liver. F. L. DUNN

The location of the insulin effect in muscle. M. BURGER AND H. KRAMER. Univ.
Kiel *Z. ges. exper. Med.* 61, 449-64 (1928).—The effect of clamping the iliac and sub-
clavian arteries in dogs on the blood sugar was studied following the injection of insulin.
The hypoglycemia was only slight when the vessels were clamped but on release a sharp

hypoglycemia occurred. B. and K. conclude that inan musculature.

Action of hexetone on respiration. P. GUNS. *Arch. intern. pharmacodyn.* 33, 380-99(1927); *Physiol. Abstracts* 13, 158; cf. C. A. 22, 1 in chloroform narcosis. It is only in light ether narcosis on respiration. This is of no practical interest. The are due in part to the salicylate. Rabbits were used. varies somewhat from 5 to 10 mg. or more per kg. in chl.

The action of histamine on the heart with certain pharmacodynamic 33, 409-19(1927); *Physiol. Abstracts* Ca histamine fails to affect the sympathetic and dimin effect is less on the atropined heart, which suggests that. The supposed pilocarpine-like action of histamine on the accord with its lack of effect on the isolated atropined heart trope effect in the absence of Ca. Histamine in present in its absence vagotrope. The action of histamine on bl previous introduction of Ca. The action of Sr, Ba and Mg

H. L. D.

Physiological study of some derivatives of homocholine, the methyl ether of γ -phenylhomocholine. A. SIMONART. *Arch. intern. pharmacodyn.* 34, 15 (1928); *Physiol. Abstracts* 13, 262. Expts on chloralosed cats in which the central nervous system is destroyed show that the methyl ether of γ -phenylhomocholine is deprived of muscarine-like properties. It exhibits, on the contrary, a marked nicotine-like effect in excitation of vegetative ganglia, followed by their paralysis. On the frog it has the same effect as nicotine, causing contracture and a condition like that due to curare on skeletal muscles. This action on skeletal muscle is also easily demonstrated on the eel. The effects are confirmed by expts. on the blood pressure, and by ocular and splan reactions.

H. L. D.

Experiments with strychnine. W. BURRIDGE. *Arch. intern. pharmacodyn.* 34, 105-12(1928); *Physiol. Abstracts* 13, 261. (1) Strychnine perfused in very small concn in unbalanced soln is a strong cardiac stimulant. (2) Large amts of strychnine are markedly depressor. (3) The effects produced by strychnine vary according to the perfusing soln. Hence, any experimenter working with a single perfusing soln, even though it be the best he knows, will only see through it a portion of the picture of drug's actions on the heart. The use of a single perfusing soln being common, it may well be that many gaps exist in our knowledge of the cardiac action of strychnine.

H. L. D.

Experiments with quinine. W. BURRIDGE. *Arch. intern. pharm.* 34, 113-8(1928); *Physiol. Abstracts* 13, 261. Quinine exerts two groups of cardiac actions of concn and reactions of diln. Concn reactions are depressor. Diln reactions are augmentor. Speculation is indulged in concerning the possibilities of the exploitation of the two groups of actions.

H. L. D.

Action of synthalin. H. J. ARNDT, E. MÖLLER AND E. SCHEMANN. *Klin. Wochenschr.* 6, 2263-7(1927); *Physiol. Abstracts* 13, 249. Rabbits were used and the experiments designed to det. (1) the effect of a single dose and (2) the effect of continued administration of small doses. The effects on blood sugar, glycogen metabolism, and the histology and appearance of the organs (especially liver) were investigated. Hypoglycemia was constantly obtained with single doses of 5 to 6 mg. per kg. With doses of 2 to 3 mg. per kg., hypoglycemia was not often produced. With the higher dose (5 to 6 mg. per kg.) a preliminary rise in blood sugar lasting for a few hours. If the animal was bled when the hypoglycemic state had supervened, practically no glycogen was found in liver and muscles. A deposition of glycogen in the liver was obtained with doses of 2 to 3 mg. per kg. were given to rabbits that had fasted for 4 days, but the doses had no effect on muscle glycogen. Small doses (2 or 3 mg. per kg.) given every day for long periods eventually proved lethal, and the animals lose wt. No other morphological changes in the liver or other organs apart from loss of glycogen were observed in these animals.

H. L. D.

Synthalin. Its action on blood sugar, glycogenesis, experimental diabetes, metabolism, diuresis, temperature, the general condition, and its toxicity in the normal rabbit. H. VAPLA PUENTES, J. A. COSSANO AND P. RINIS. *Rev. med. Argentina* 40, 409-49(1927); *Physiol. Abstracts* 13, 172; cf. C. A. 22, 1, 1684.—The action of synthalin on the blood sugar is irregular; given by mouth it produces hypoglycemia, by mouth hyperglycemia. The total blood N. increased without any relation to the dose; amino acids also increase with large doses. Large

same time as synthalin do not cause glucosuria. Hypo-spiratory rhythm, polyuria, tonic and clonic convulsions, of synthalin; the liver is much congested and fatty.

H. L. D.

ected into the portal vein. B. VARELA FUENTES, J. A. *Rev. asoc. med. Argentina* 40, 613-30(1927); *Physiol.* [23, 1924.—While insulin is destroyed by the action of the ected. Injection of synthalin into the portal vein is sugar and in total non-protein N; occasionally by an of the blood.

H. L. D.

the metabolism of the normal rabbit. Ingestion of small A. COLLAZO AND B. VARELA FUENTES. *Rev. asoc. med. Physiol. Abstracts* 13, 172; cf. *C. A.* 22, 3702.—Daily ly wt. do not produce toxic results. There is no regular the glycogen in the liver is increased; the muscle glycogen

H. L. D.

surgical anesthesia. R. I. MACKAY AND S. C. DYKE. [1; *Squibb Abstr. Bull.* 2A, 66.—The chloride content of the while that of the whole blood remains const., there the red cells to the plasma. The fixed Cl_2 of the plasma but the fall tends to become slower and to cease altogether Meanwhile the blood sugar rises quickly at first, becoming by reaching the original level. No apparent relationship duration of the variation of the chlorides and the fixed [1 hand, and of the sugar content of the blood on the other.

C. R. F.

cer. G. LOEWY AND J. LOISELEUR. *Bull. Cancer* 549, 1. 2A, 182-3.—Glycogen was used as a vehicle for colloidal ly. The authors claim no clear case of cure, but believe in the very great general improvement observed in some

C. R. F.

Toxicity studies of colloidal gold. G. E. JORGENSEN. *Clin. Med. & Surg.* 36, 38(1929); *Squibb Abstr. Bull.* 2A, 52.—A colloidal Au contg. traces of K aurate and AuCl_3 was tolerated neither by rabbits nor mice. Semi-weekly intravenous injections of 1.5 cc. of pure colloidal Au (Colladaurum) in a rabbit with carcinoma of the mammary gland presented no ill effects; furthermore, after 16 weeks' therapy the carcinoma growth had been reduced in size and consisted of much connective tissue that had replaced the gland tissue, while the remaining traces of true carcinomatous tissue indicated total obliteration of the lumen of all ducts; no metastasis was observed in the animal. The danger of contaminated colloidal Au preps. as well as the harmlessness of pure preps. even when administered in enormous doses is made apparent by these studies.

C. R. F.

Tropine and atropine. RAYMOND HAMET. *Compt. rend.* 188, 820-2(1929).—A pharmacol. test using a dog anesthetized with chloralose, with the intestine *in situ*, showed that tropine acts diametrically opposite to atropine; in fact, tropine increases tonus while atropine decreases it.

C. R. F.

Clinical application of urinary antiseptics. H. W. E. WALTHOUR. *Southern Med. J.* 32, 161(1929); *Squibb Abstr. Bull.* 2A, 138.—Mercurochrome and neutral acriflavine are effective, but not widely applicable because of the unpleasant side-effects produced, since the desired effect was not produced with hexylresorcinol within 10 days. Pyridium acts upon bacteriuria promptly and effectively. Whereas bacilli and cocci are retarded from the very first dose of the drug, it is in gonococcal infections that pyridium seems to have a real selective action. In acute gonorrhea, it is a most valued adjunct and proved effective. The av. dose of pyridium (condensation product of α - and β -isomers of phenylazo- α, α -diaminopyridine-HCl) per day is 0.6 g. The drug is contra-indicated in severe hepatitis, and chronic parenchymatous nephritis.

C. R. F.

The influence of ergotamine on blood-sugar concentration. L. RIGÓ AND L. VESZELSZKY. *Péter Univ. Hungarian Medical Archiv* 29, 517-9(1928).—Subcutaneous injection of small doses of ergotamine (0.5-1.0 mg. per kg.) into fasting rabbits caused transient hypoglycemia. Larger doses (2-5 mg.) caused hyperglycemia. The results agree with the observations of Lang, Vas and Rigo on the action of parasympathetic poisons on blood sugar (*C. A.* 22, 1625)

G. H. v. F.

Action of album salivum on smooth muscle. G. LIO AND R. AGNOLI. *Arch.*

intern. pharmacodynamic 33, 400-8(1927); *Physiol. Abstracts* 18, 100-101(1927).—Cause increase and then diminish the tone of smooth muscle. In weaker joints cause increase of irritability without the atonic effect. The lowering of tone is probably a factor in the hypotensive action of garlic.

The therapeutic activity of liquid preparations of ergot on the Calcutta General Hospital. R. N. CHOPRA AND PREMANKOR DE. School of Tropical Medicine, Calcutta. *Indian Med. Gaz.* 63, 519-21(1928).

A case of auricular fibrillation after aspirin. A. K. DUTT GUPTA. Calcutta General Hospital. *Indian Med. Gaz.* 63, 531-2(1928).

Quinine intolerance. BINODE KRISHNA BANERJI. Calcutta General Hospital. *Indian Med. Gaz.* 63, 533(1928).

The successful treatment of vitiligo diffusa by injections of arsenic. MOHAMMED ABDUL QUIYUM. District Board, Durhanga. *Indian Med. Gaz.* 63, 582(1928).—A case history.

Berberine in the treatment of oriental boil. B. M. DAS GUPTA. School of Tropical Med. and Hyg., Calcutta. *Indian Med. Gaz.* 63, 577-78(1928).

Berberine sulfate inhibits the growth of *Leishmania tropica* even in high dilns. like 1 in 80,000. Stibosan has no local action on the parasite. This may account for the fact that Sb ointments are useless in the treatment of oriental boil. Berberine sulfate given by infiltrating the tissues around the edge of a sore brings about complete cure in 2 or 3 weeks. This drug promises to be a specific cure for the affection.

Intravenous calcium therapy. S. RAMA IYER. *Indian Med. Gaz.* 63, 77-8(1929).—Favorable action in gonorrheal orchitis is reported.

The behavior of easily removable blood iron toward carbon monoxide, oxygen and hydrocyanic acid. GEORG BARKAN AND EVA BERGER. *Klin. Wochschr.* 7, 1868(1928); cf. following abstract. Preliminary report.

Differentiation of the readily separable iron of the blood upon the basis of its reactions with carbon monoxide and oxygen. GEORG BARKAN AND EVA BERGER. Univ. Frankfurt a. M. *Arch. expul. Path. Pharmacol.* 136, 278-99(1928); cf. preceding abstract.—A portion (about 65%) of the readily dissociable Fe from the blood reacts reversibly with CO and O_2 . Satn. with CO or removal of the dissociable Fe completely prevents the sepn. of this portion by means of acid. A smaller portion of the Fe (about 35%) does not react with O_2 and CO, at least when under atm. pressure, and in this fraction is to be found the acid-sol. Fe of the serum and plasma. HCN is without effect on this readily separable Fe. CO has also an effect in the living person, and the changes induced can be observed in CO intoxication earlier and in convalescence longer than can CO hemoglobin.

Hypertension after tetrahydronaphthylamine and blood leucocytes. G. ROSENOW. *Klin. Wochschr.* 8, 24(1929).—Administration of tetrahydronaphthylamine leads to a marked rise in body temp., but the leucocyte count remains unchanged.

The biological action of the active iron preparation, Siderac. L. FRESNIUS AND K. HARPUDE. *Klin. Wochschr.* 8, 69-71(1929). The administration of Siderac has no effect upon the C/N quotient in the urine. This is contrary to the findings of Goldbloom (*Z. expul. Med.* 59, 514(1928), cf. *C. A.* 22, 4649). The reasons for the discrepancy are discussed in detail.

The acute and chronic action of morphine. E. GRUNTHAL AND P. HOEFER. *Klin. Wochschr.* 8, 104-7(1929).—Morphine acts acutely by reducing the sensitiveness of the skin to pressure and pain; but it has no effect upon the sensitiveness of the skin to temp. changes. The repeated administration of morphine leads to a tolerance of the pain centers to this drug, thus making it necessary to give larger doses to produce the previous degree of desensitization. The pressure and temp. centers do not acquire a tolerance.

The behavior of iodine in the body fluids after the oral administration of iodides and of iodized protein. GEORG BARKAN AND WILHELM LEISTNER. *Klin. Wochschr.* 8, 117-8(1929).—Iodide is detd. in 2 forms, namely: inorg., that pptd. by Ag in HNO₃ soln. and org., that which is not pptd. under these conditions. Administration of inorg. I never leads to the appearance of org. I in the blood or in the urine. The oral administration of iodized protein leads to the appearance of org. I in the blood and in the urine. The concn. in the urine is higher than that in the blood. Org. I is not excreted into the stomach or into the saliva.

Cobalt and blood. KLARA WALTNER AND KARL WALTNER. Biol. Inst. Tibury and Univ. Kinderklinik Szeged. *Klin. Wochschr.* 8, 313(1929).—Administration of a diet contg. 2% of metallic Co to white rats leads to a 20-25% elevation in the erythrocyte count and hemoglobin value. The metal is quite toxic. The animals do not grow.

for 5-6 weeks. Animals can be kept alive for 6-7 months on a diet contg. Co. The animals grow normally, but lose their fertility. The erythrocytes increased to over 10 million and the hemoglobin to 165%. The hemoglobin and erythrocytes can be increased 20% in 24 hrs. by a single injection of 0.1 g. $\text{Co}(\text{NO}_3)_3$.

MILTON HANKE

Use of chewing gum as an oral disinfectant. WOLFGANG WEICHARDT. *Klin. Wochschr.* 8, 861(1929).—Chewing gum was mixed with Silargel (a colloidal AgCl prepn.). Chewing for 2.5 hrs. reduces the bacterial flora of the mouth by about one half. The prepn. appears to be particularly effective against hemolytic streptococci.

MILTON HANKE

Experimental studies with gold preparations. WOLFGANG HEUBNER. *Klin. Wochschr.* 8, 393-5(1929).—Colloidal gold and electropositive gold in complex or simple combination show marked differences in their mode of retention by the animal tissues. Thus Goldprotasin, a colloidal gold prepn., is retained for days. Practically all of the injected Au can be recovered from the liver and spleen, 95% of it being in the liver. A very small amt. is excreted into the gall bladder. The kidneys and lungs contain very little. NaAuCl_4 or Sanoecrysin ($\text{Au}(\text{S}_2\text{O}_4)_2 \cdot \text{Na}_2 \cdot 2\text{H}_2\text{O}$) is excreted into the urine. The largest portion of the injected Au is found in the kidneys. The liver and spleen contain very little Au.

MILTON HANKE

Treatment of morbus basedowii with Neodorm. The action of substances that affect surface tension and can lead to a displacement of hormone. H. W. BANSI AND H. KRETZSCHMAR. *Klin. Wochschr.* 8, 395-7(1929).—Neodorm, α -bromo- α -isopropylbutyramide, markedly reduces the surface tension of water. It is readily adsorbed by charcoal from an aq. soln. Charcoal absorbs some adrenaline from an aq. soln. Much less adrenaline is adsorbed by charcoal from a soln. that also contains Neodorm. Two tablets, 0.6 g. Neodorm, will induce sleep in a normal individual. The same amt. will produce a feeling of restfulness (but will not induce sleep) in patients afflicted with Basedow's disease. The pulse rate remains high in the latter cases. A combination of Neodorm with I (as iodide) leads to a feeling of restfulness, a reduction in the pulse rate and an increase in body wt.

MILTON HANKE

Physiological action of chloralose. R. BARGY AND J. GAUTRELET. *Compt. rend. soc. biol.* 99, 700-5(1928). Chloralose in the normal dog does not modify practically the vago-sympathetic excitability. It causes no change of the blood p_{H} or alk. reserve and no increase of arterial pressure, or of oculo-cardiac reflex. For exptl. anesthesia it is the choice par excellence.

E. H.

Tolerance of uranyl nitrate. MARCEL GARNIER, E. SCHULMANN AND J. MAREK. *Compt. rend. soc. biol.* 99, 707-9(1928); cf. *C. A.* 22, 3703.—By subjecting dogs or rabbits to progressively increasing doses of $\text{UO}_2(\text{NO}_3)_2$ by subcutaneous injection, a tolerance is acquired for doses which would be rapidly fatal if administered for the first time.

E. H.

Cotarnine and some of its quaternary derivatives. C. MLADQVEANU. *Compt. rend. soc. biol.* 99, 742-7(1928).—The toxic actions of the chloromethylate and iodomethylate of cotarnine on dogs, rabbits, mice and frogs are from 2 to 4 times that of cotarnine-HCl. Their actions on the heart, respiration, pupils and neuro-muscular system are generally opposite to that of cotarnine-HCl. The iodomethylate usually exercises a stronger action than the chloromethylate.

E. H.

Mode of action of certain extracts of the anterior lobe of the hypophysis. L. BROUHA AND H. SIMONNET. *Compt. rend. soc. biol.* 99, 750-60(1928).—Certain exts. of the anterior lobe are able to accentuate the phenomenon of ovarian luteinization and of thus causing the arrest of cyclic activity throughout the genital tract. It is probable that the secretion of the anterior lobe has a part in the regulation of the phases of ovarian cyclic activity.

E. H.

Cancerigenic power of coal tar to which has been added certain chemicals. ANDRÉ DE COULON. *Compt. rend. soc. biol.* 99, 805-7(1928).—Expts. were made with rabbits to develop cancers by treatment with coal tar to which one or more of naphthalene, anthracene, carbazole or acridine had been added. It is possible that carbazole added to coal tar promotes the cancerigenic properties of the latter.

E. H.

Action of the lacrymal extract on the spleen and the kidney. D. MICHAEL AND P. VANCEA. *Compt. rend. soc. biol.* 99, 893-4(1928).—The lacrymal ext. caused a contraction of the spleen and kidney by its strong vasoconstrictor action.

E. H.

Action of intravenous injections of bile salts on the rhythm of the normal pulse in man. DUMITRESCO-MANTE AND D. HAGIESCO. *Compt. rend. soc. biol.* 99, 913-4(1928); cf. *C. A.* 22, 3931.—In the 15 cases studied, Na glycocholate in physiol. saline intravenously injected in doses equiv. to 0.2 to 0.5 g. each 5 to 15 mins. had but slight

and transient action on the pulse rhythm, arterial tension (cholate administered the same way showed a transient t. on the cardiac rhythm and arterial tension were slight and

Contraction of the spleen by the injection of adrenaline and blood in animals. A. BORYSIEWICZ. *Compt. rend. soc. biol.* 99, with dogs indicate that the erythrocytes concd. in the spleen & pheric blood by contraction of the organ after the injection crease of erythrocytes in the peripheric blood was noted in remains 40% of neg. results to be explained.

Action of ergotamine on the dog heart. (Ele COELHO. *Compt. rend. soc. biol.* 99, 937-8(1928).—Ergotamine heart in a manner antagonistic to that of adrenaline. It c. of adrenaline on the electrocardiogram, but annuls the dis which are caused by strong doses of adrenaline.

Mechanism of action of ergotamine on the gastric che AND J. CANDIDO DE OLIVEIRA. *Compt. rend. soc. biol.* 99, 22, 3460.—In the majority of cases it appeared that small doses of ergotamine acted as paralyzers and large doses as exciters of the sympathetic. On the vegetative nervous system its action varied according to the dose, the functional state of the organ tested and perhaps the neurotonic constitution of the subject examd. E. H.

Influence of extracts of the suprarenal cortex on frog muscle. J. STRYL. *Compt. rend. soc. biol.* 99, 985-7(1928). Ox suprarenals contain a substance which excites frog muscle and which is easily extd. at an elevated temp. by means of H_2O_2 . The method used insures the destruction of adrenaline without changing the activity of the substance, and at the same time the H_2O_2 preserves the ext. The substance is not affected by boiling except to form a coagulum which disappears on cooling. The action of this substance cannot be attributed to choline as its action is stronger after the removal of choline. The substance suppresses muscular fatigue and increases the contraction of muscles sometimes as much as 100%. E. H.

Action of derivatives of guanidine in diabetes. M. R. CASTEX AND M. SCHREIBGART. *Compt. rend. soc. biol.* 99, 989-1000(1928). A therapeutic study of the action of synthalin and of glukhormet in 23 cases of diabetes showed that these agents had a more favorable action on the glucosuria than on the glucemia in cases of mild or medium diabetes. These drugs increase the tolerance for carbohydrates. In grave cases these drugs are of slight use. In this series of cases synthalin caused gastro-intestinal disturbances when the dose exceeded 20 mg. per day. Such disturbances did not follow the administration of glukhormet. E. H.

Hypoglucemic action of an extract of the pancreas administered per os. S. HORNUNG. *Compt. rend. soc. biol.* 99, 1030(1928). Exts. of cat, dog and calf pancreas were prepd. by grinding the fresh gland and boiling the pulp for 30 mins. in dil. alc. After neutralization with HCl the mass was filtered and the residue was extd. with alc. The alc. and aq. exts. were united and filtered anew and the alc. was removed from the filtrate by evapn. This alc.-aq. ext. administered by mouth in doses of 1.5 to 7.0 g. of the organ per kg. of body wt. caused a lowering of the glucose in cats and dogs in every case. E. H.

Action of glukhormet on the normal dog. S. HORNUNG. *Compt. rend. soc. biol.* 99, 1031(1928); cf. C. A. 22, 1404, 1621.—A comparison of the effects of a prolonged administration of glukhormet with those following a prolonged administration of synthalin showed no appreciable differences between the actions of these medications. E. H.

Toxicity of benzoic and salicylaldehydes in man. J. DADLER. *Compt. rend. soc. biol.* 99, 1038-9(1928).—From a study of 2 cases it is concluded that 40 cc. of salicylaldehyde or 50 to 60 cc. of benzaldehyde by mouth would be followed by death in the human subject in the absence of prompt treatment. E. H.

Influence of ergotamine tartrate, adrenaline and atropine on cerebrospinal fluid pressure. C. I. URUCHIA AND L. DRAGOMIR. *Compt. rend. soc. biol.* 99, 1039-40(1928).—Ergotamine caused a diminution of tension of the cerebrospinal fluid in 8 out of 10 cases of dementia and paralysis and allied conditions. An increase of the tension was observed in 10 similar cases following the injection of adrenaline, while atropine caused an increase in tension in 8 out of 10 similar cases. E. H.

Treatment of chorea by alkalosis. C. I. URUCHIA AND G. POPOVICH. *Compt. rend. soc. biol.* 99, 1072-4(1928).—The administration of adrenaline by injection of ephedrine (racemic synthetic ephedrine) by mouth, assoc. with hyperventilation, gave favorable results in 3 out of 4 cases of chorea. Cardiac complications intervened

one case. During hyperventilation the blood P diminished. were inconst. and less than those of P. E. H.

decrementless theory of propagation of the nerve impulse.

[narcotization and recovery upon the motor nerve. KENICHIRO

id. J. 47, No. 9, Eng. abstr. 2-3(1928).—Isolated nerve was

such that an entire nerve trunk might be made to react

The extinction and recovery times became shorter with repe-

recovery. By "recovery time" is meant the time from the mo-

quired for recovery of the nerve. With Ringer soln. contg. NH_4

to that contg. cocaine, the extinction time was longer than the

chlorethane narcosis, the extinction time and recovery times were

state that the extinction time of one fiber must be much less than

stem. The differential quotient of narcosis, dn/dt , must be considered

as a factor for the theories of decrement and decrementless conduction of nerve

to be applied. X. Changes in the rate of nerve conduction during narcotiza-

MICHIOTOSHI TAMURA. *Ibid* Eng. abstr. 3-4. —Changes in the rate of conduction of nerve impulse during narcotization and recovery were measured. The sciatic-gastrocnemius prepn. of the Japanese toad (*Bufo vulgaris formosus* Baulenger) was used with Ringer soln. modified so as to contain (1) 0.01% NH_4 , (2) 0.2% cocaine and 0.2% NaHCO_3 , (3) 0.2% cocaine and 0.02% NaHCO_3 , (4) 2.5% urethan, (5) 0.14% chlorethane, (6) 2.5% chloral hydrate. The rate of conduction at room temp. was about 20 m. per sec. This rate decreased gradually with narcotization. The minimal rates of conduction for each of the solns. used were (1) 1.12, (2) 1.84, (3) 1.12, (4) 2.5, (5) 0.68, (6) 0.8 m. per sec., resp. Just previous to extinction, the av. rate was 1 m. per sec.

W. D. LANGLEY

The action of adrenaline on blood pressure in relation to the various methods of introduction into the organism. G. CARDONARO. *Boll. soc. ital. sper.* 3, 413-6(1928).—Adrenaline soln. in various concns. was introduced into dogs by the following routes: intravenous, subcutaneous, intramuscular and gastro-enteric (stomach, small intestine, rectum). Adrenaline exerted its usual hypertensive action when introduced directly

into the circulation, even in min. doses (0.001 mg. per kg. The introduction of the drug by other routes in doses 500 times that used intravenously did not show a clear, well-defined, const. hypertension. C. assumes that the drug is either very slowly absorbed, or other factors influence its hypertensive action. The other physiol. effects of adrenaline such as glucosuria, hyperglucemia and toxicity in high doses were always detected regardless of the route of introduction.

PETER MASUCCI

The biological action of thallium acetate. G. TRUFFI. *Boll. soc. ital. biol. sper.* 3, 433-4(1928).—Various animals, rats, guinea pigs, cats, rabbits, etc., were given various doses of Tl acetate (1) by mouth, (2) by the rectal route and (3) by injection. Those receiving the drug by routes (1) and (2) developed diffused depilation with varying intensity; the most intense was in the rat, the least in the guinea pig. Those animals treated by route (3) showed a circumscribed depilation around the point of application. There was no modification of depilatory action by the simultaneous administration of glandular substances. The hypothesis that Tl alopecia is the result of a neuro-endocrine disturbance does not seem tenable. The depilatory action of the metal is exerted directly on the hair follicles.

PETER MASUCCI

Modification of the amino acid curve by the action of thyroxine. EMILIO MARTINI. *Boll. soc. ital. biol. sper.* 3, 451-4(1928).—The effect of thyroid exts. on N metabolism was investigated. The normal amino acid curve on dogs was first established, and then 2 to 1 g. of glycocholi were injected intravenously and its effect on the curve was noted. Conclusions: (a) The amino acid curve was modified by thyroid exts.; the velocity of deamination was accelerated. (b) The action of these exts. is qualitatively and quantitatively comparable to doses of synthetic thyroxine contg. equal quantities of I. (c) A pharmacol. test may be used for standardizing thyroid exts., based on the change in the amino acid curve and this is compared to that of a definite dose of thyroxine. (d) The lipid fractions of the thyroid are inert. (e) Very large doses of thyroxine do not produce a corresponding change in the velocity of deamination.

PETER MASUCCI

Variations in the fibrinogen content of the blood rendered incoagulable by the injection of morphine into the mesenteric veins. A. C. BONGIORNO. *Boll. soc. ital. biol. sper.* 3, 468-70(1928).—The aim of this investigation was to det. whether the fibrinogen content of blood plasma varied after the injection of morphine into the mesenteric veins. To 5 cc. of plasma there was added 150 cc. of an 0.8% soln. of NaCl and 5 cc. of a 2.5% soln. of CaCl_2 . The coagulum was filtered and washed 4 or 5 times

with 0.8% salt soln. and then transferred to a Kjeldahl flask. The plasma rendered incoagulable by morphine did not. By adding 5 cc. of normal serum and then dilg. as above a content of this was also detd. Two samples of blood were artery; one was used to obtain a 0.5% oxalate plasma and serum. The results are given in tabular form. They show phine into the mesenteric veins causes a diminution of fit 46%. This diminution is not sufficient to explain the — for if it depended on the fibrin content alone the diminution The phenomenon is not one of retardation but of a other explanation is given.

The influence of histamine on pancreatic secretion.

Boll. soc. ital. biol. sper. 3, 928-31(1928). Systematic studies were made on the secretion of pancreatic juice under the influence of histamine by using the fistula method. Dogs were anesthetized with chloral and morphine. A temporary fistula was made which impeded the gastric juice produced by the action of insulin from passing into the duodenum and stimulating the formation of secretin. The intravenous injection of 1 cc. of a 0.1% soln. of histamine diluted with 20 cc. Ringer soln. into dogs weighing 15-20 kg. caused the secretion of 1 cc. of pancreatic juice. Successive injections did not give a corresponding amt. of secretion, but a large quantity of gastric juice released by the action of histamine accumulated in the stomach. If 3 cc. of 1% soln. of atropine sulfate was injected a few mins. before 2 cc. of 0.1% histamine soln., only a trace of pancreatic juice was secreted. Under the same conditions, secretin did not lose its power to excite secretion if injected after the histamine, but before the atropine. The tryptic power of pancreatic juice stimulated by histamine when activated with enterokinase was very high and could not be differentiated from the juice stimulated by secretin. Histamine, therefore, undoubtedly excites to a moderate degree pancreatic secretion; this is a distinct property of the substance itself and is not influenced by gastric or biliary secretion.

PETER MASCOTT.

The gastric secretion of histamine studied in dogs operated for "small stomach" according to the Pavlov method. PIETRO MOLINARI TOSATTI. *Boll. soc. ital. biol. sper.* 3, 931-4(1928). A comparative study of gastric secretion was made between that induced by histamine and that by food. A dog with a "small stomach" was used for this purpose. Histamine, when injected subcutaneously in 1-2 mg. doses, excited the secretion of gastric juice from 1 to 1½ hrs. afterward. The fluid was thick and clear with only an occasional speck of mucus. The gastric secretion excited by food was at first very small but later was fairly abundant and lasted 2½-3 hrs. The free HCl content of this juice was at first 0.379% compared to 0.518% in the juice from histamine, but later the acidity and peptic power of the juice equaled that from histamine. The action of histamine on gastric secretion is interpreted by attributing its most characteristic property, that of dilating the capillaries. The histamine stimulus is more intense than the normal stimuli present during the intestinal phase of digestion, but gives rise to a secretion which is comparable to one of those phases. It is possible that normal gastric secretion is caused by some substance similar to histamine or that to histamine itself.

PETER MASCOTT.

Studies on the effect of theophylline on the chloride and water elimination of rabbits with an artificial chronic tubular nephritis. JOHANNES FRANDSEN AND KNUD MØLLER. Univ. Copenhagen. *Acta Med. Scand.* 68, 385-402(1928). A chronic tubular nephritis can be produced in rabbits through repeated injections of small amt. of $K_2Cr_2O_7$. The glomeruli are practically unaffected. Administration of theophylline causes a very great increase in the Cl and H_2O excretion in rabbits with an artificial chronic tubular nephritis, much more so than in normal rabbits. Loading of the tubular animals with NaCl leads to a quicker elimination under the influence of theophylline than in normal animals, whereby also a larger quantity of water is removed.

Insulin, synthalin, glukhorment. A comparative investigation of their influence on the fixation of glucose by cells. EASY B. SALÉN AND T. NYRÉN. I. Med. Eksp. Stockholm. *Acta Med. Scand.* 69, 69-98(1928). In the presence of insulin the fixation of glucose by red blood cells under standard conditions is greatly increased, reaching 180%. The fixation is definitely greater when the glucose is offered in plasma than in 0.9% NaCl. Synthalin and glukhorment show quantitatively the same effect (increase in glucose fixation 149 and 140%, resp.).

S. MOLLER.

The effect of lecithin on the number and the resistance of the red blood cells. ALBERT GRÖNNERÖ AND ANNE LUNDBERG. Hospital Royal, Copenhagen. *Acta Med. Scand.* 69, 99-118(1928).—Lecithin increases the resistance of the red cells to

in vivo. *In vitro* the increased resistance in the presence of the hemolyzing action of saponin and both gave evidence of a rise in the no. of red cells.

S. MORGULIS

The cholesterol content of the blood of normal and AND ISTVAN RECHT. Univ. Budapest. *Biochem.* An injection of histamine causes the cholesterol then this goes back to normal. In splenectomized blood diminishes after similar histamine injections that the histamine produces diametrically opposed red dogs.

S. MORGULIS

ium phosphate on the respiratory metabolism. E. SCHMUTZ-

Univ. Hamburg. *Biochem. Z.* 200, 407-13(1928).—The addn. of Na_2HPO_4 to glucose and meat does not reduce their specific dynamic action. The respiratory quotient rises slower in the first hr. when phosphate is added to glucose, but ultimately reaches the same height as in control expts. The effect of the addn. of 50 g. glucose manifests itself on the respiratory metabolism of the fasting dog in an increase which exceeds by 4.26% the total calories from the sugar. This corresponds to the results found in human subjects (4.25%).

S. MORGULIS

The influence of arsenic and antimony compounds on the enzymic functions of the organism. V. The cause of the inhibitory action of arsenites and arsenates on the salivary amylase. I. A. SMORODINTZEV AND E. A. ILIN. State Univ., Moscow. *Biochem. Z.* 201, 34-47(1928).—Arsenates and arsenites differ sharply in their behavior to buffer solns. In a buffered medium of pH 6.8 Na_2HASO_4 neither accelerates nor inhibits the digestion of starch by salivary amylase. The most acid phosphate-citrate buffer does not diminish the basic reaction of arsenite. K HASO_3 causes a greater shift to the alk. side and has a stronger effect than Na_2HASO_4 . The inhibitory action of salts of quinquevalent As on amylase can be explained by a shift in the pH of the medium to the alk. side of the optimum activity of the enzyme on starch, whereas with trivalent salts the As also exerts its action independent of the change in the active reaction.

S. MORGULIS

The influence of different preparations of the quinine group on the enzymic functions of the organism. X. The influence of quinine on the dynamics of the protein decomposition and of the oxidation-reduction processes. I. A. SMORODINTZEV. State Univ., Moscow. *Biochem. Z.* 201, 66-76(1928).—cf. C. I. 23, 201. The influence of quinine on the organism is detected by analyzing its effect on each enzyme of the plasma. Quinine as a paralyzing poison disturbs the coordination of the enzymic processes of the protoplasm, which at first diminishes the activity and then causes the death of the plasma. The balance between the function of the oxidative and the autolytic enzymes forms one of the most essential regulators of purposeful activity. Quinine paralyzes the oxidative enzymes, whereby the autolytic enzymes gain predominance. A 0.005% quinine soln. inhibits the activity of the blood oxidases and the synthesis of hippuric acid. Following its primary effect upon the balance of enzymic processes, quinine produces the paralyzing effect. Thus, through injury to the tissue oxidases it causes a diminution in the amt. of O_2 consumed and CO_2 produced. The increased protein decompn. leads to a greater N elimination in the urine but is soon followed by diminution in N metabolism. The autolysis of liver is at first increased by small quinine doses (0.001-0.050%); then it becomes slower and ceases altogether. As a result of this, the gaseous and N metabolism are lowered and the heat production is reduced, which explains the antipyretic action of quinine. Antipyrine, unlike quinine, lowers the heat production through its effect on the central nervous system. The diminished elimination of uric acid and of urea under the influence of therapeutic doses of quinine is likewise the result of its direct effect on tissue proteases.

S. MORGULIS

Further studies on the effect of cyanide on the living cell. MICHAEL S. RESNICHENKO. Timirjaseff-Forschungsinst., Moscow. *Biochem. Z.* 201, 110-24(1928).—The respiration of ascaris eggs is partially inhibited by KCN of even high concn. because lipids of the egg membrane make it very poorly permeable to the KCN. On the contrary, HCN represses the oxidative process in the ascaris egg very powerfully. In this respect the ascaris eggs form no exception, other cells showing the same behavior. The semipermeable lipid membrane protects the egg cell from most salts, inorg. acids and bases, but HCN diffuses with great ease and completely represses oxidation. On the contrary, KCN diffuses very poorly and does not attain within the egg cell such concn. as completely to inhibit its oxidation. The difference in permeability between HCN and KCN is also shown by frog skin which is very permeable to the cyanide

at $pH < 5$ but almost entirely impermeable at $pH > 9$. The peculiar ascaris egg membrane to KCN is responsible for the peculiar effect on respiratory activity during the initial stages of the KCN action. Only the min. traces of KCN which enter the cell and through hydrolysis in OH concn. KCN in an acid medium or HCN does not produce asphyxiation. The depression of respiration which occurs later is due to the

Changes in the non-protein nitrogen in the perfusion fluid of isolated organs under the influence of adrenaline and ergotamine. Military Med. Acad., Leningrad. *Zhurnal ekspl. Biol. Med.* 10. On perfusing an isolated organ (ox testicle, dog liver or cat lung) in Ringer-Locke soln., the amt. of non-protein N in the perfusion fluid, adding ergotamine (1:100,000) to the perfusion fluid there is a lowering of the N, frequently however preceded by a rise. On adding adrenaline there is always a considerable increase in the non-protein N of the perfusion fluid. This effect of the adrenaline is removed if ergotamine acts upon the organ first. This action of sympathetic drugs suggests that the sympathetic nervous system exerts an influence on the N metabolism of the tissues. S. MORGULIS

The treatment of diabetes with special reference to accessory forms of treatment. WALTER M. BARTLETT. *Ann. Internal Med.* 2, 334-40(1928).—Diet and insulin are the accepted methods of treatment in diabetes. Synthalin is toxic if the dosage exceeds 50 mg. per day. Dechulin in doses of 0.5 g. for each 10 mg. will decrease its toxicity. The action of myrtillin, blueberry leaf ext., is unsatisfactory and uncertain. Its therapeutic value is difficult to ascertain. JOHN T. MYERS

Krysolgan in the treatment of lupus erythematosus: report on twenty-eight cases. WILLIAM H. GOECKERMAN. Mayo Clinic, Rochester, Minn. *Ann. Internal Med.* 2, 428-34(1928).—Doses of Krysolgan varying considerably in amt. gave satisfactory results in 50% of the 28 cases. Patients vary enormously in sensitiveness, but dangerous complications did not develop in this series. JOHN T. MYERS

Tannic acid treatment of burns. End results in 114 cases compared with 32 cases treated by other methods. FENWICK BEEKMAN. *Arch. Surg.* 18, 981-6(1929). Tannic acid is the most satisfactory method of treatment. It prevents absorption of split protein products. JOHN T. MYERS

Parkinsonian rigidity. A clinical and instrumental study of the effect of stramonium, hyoscine, and other alkaloids. E. ARNOLD CARMICHAEL AND F. H. K. GOODE. St. Bartholomew's Hosp., London. *Quart. J. Med.* 22, 51-64(1928). Tincture of stramonium in large doses lessens the Parkinsonian rigidity and increases the ability to perform fine rapid movements as graphically recorded. It seems to improve the mental condition of the patient. It does not affect the tremor. It is as efficient as hyoscine in large subcutaneous doses, is better than hyoscine by mouth, and can be given over long periods of time. The optimum dosage lies usually between 45 and 60 minims three times a day. Toxic symptoms even from large doses are rarely seen. They may be combated by 1/4 drop of eserine in the eye, and by tincture of jalap. Tincture of stramonium is more efficacious than atropine or l- or d-hyoscyamine. It is palliative, not curative. JOHN T. MYERS

The treatment of certain forms of infantile tetany with atmospheres enriched in oxygen and carbon dioxide. EDITH P. W. MCCREA AND H. S. RAPER. Univ. of Manchester. *Quart. J. Med.* 22, 269-79(1929).—When a case failed to respond to all the methods of treatment, it was exposed to a concn. of 40% O and the expired CO₂ was allowed to accumulate until it reached a concn. of 2 to 3%. All but one of 21 cases improved. In all cases the quantity of NH₄ in the urine dropped and the CO₂ combining power of the blood plasma increased. Increasing the concn. of both O and CO₂ was better than increasing O alone. JOHN T. MYERS

The quinidine treatment of auricular fibrillation. JOHN PARKINSON AND NATHAN CAMPBELL. *Quart. J. Med.* 22, 281-303(1929).—Quinidine is more efficient than digitalis in the treatment of paroxysmal fibrillation whenever the attacks are of sufficient length or frequency as to justify continuous medication, providing the patient is well enough in the intervals. Used thus, it is devoid of risk. It is preferable if the fibrillation is of recent onset, or in the absence of serious failure or much cardiac enlargement. If the fibrillation has continued longer than 6 months, digitalis is better. JOHN T. MYERS

Studies on the toxicity of various lead compounds given intravenously. BISCNOFF, L. C. MAXWELL, RICHARD D. EVANS AND FRANKLIN R. NUZUM. Hospital, Santa Barbara, Calif. *J. Pharmacol.* 34, 85-100(1928).—The Pb compounds studied can be divided into 4 groups according to the effect on erythrocytes. The Pb with

action were the glycerophosphate, the oleate and the palmitate. They were the basic carbonate, the oxychloride and the carbonate were very slightly toxic, while PbS, and the acid phosphate of prep. the Pb compds. are described. C. RIEGEL

[205] in the stabilization of blood in transfusion. O. A. STEPPUNKO. *Trans. Sci. Chem.-Pharm. Inst. (Moscow)* 1928, No. 20,ayer 205" in blood transfusions is recommended in preference for the following reasons: (1) It does not react with Ca or thromboplastin and fibrinogen; (2) it is not toxic in other ways in doses non-coagulability of the blood; (3) the vol. of its aq. soln. is less than one tenth of the vol. of an aq. soln. of Na citrate. *In vivo* a complete hemophilia was obtained in rabbits by an a soln. equiv. to 1.5 g. per kg. No deleterious effects were observed when doses were doubled. A dose of 0.3-0.35 g. per kg. body wt. produced a complete hemophilia in dogs without any toxic effects. Doses of 0.8-1.0 g. per kg. produced a complete hemophilia in some animals. A dose of 1.5 seems to be universally toxic. P. W. SALIT

Re. on the pharmacological action of phenylguanidines. I. CANNAYO. *Arch. farmacol. sper.* 45, 249-79 (1928); cf. C. A. 22, 4642. -C. examined the action of phenylguanidine (I) and diphenylguanidine HN C(NHC₆H₅)₂ (II) in regard to their blood sugar-lowering ability, toxicity and the clinical symptoms produced in dogs, rabbits, guinea pigs and white rats. The animals fasted 24 hrs. previously to the expts. Solns. of the nitrate of I in distd. water and of II in slightly acidulated water were applied intravenously, subcutaneously, intramuscularly or by mouth. From the exptl. data given in detail, C. concludes that I and II have a hypoglycemia-producing action. The toxicity of I is greater than that of guanidine, II is still more toxic than I. The margin between the toxic and fatal dose is small. The fatal dose of I varied between 100 and 400 mg., the amt. depending on the species of animal and the kind of administration employed. For II, the fatal dose lay between 5 and 50 mg. The symptoms exhibited by the animals prove that I and II exert a poisoning action on the nervous centers, the symptoms being more grave in the case of II. Administration of glucose or adrenaline did not bring about recovery in the animals treated with I. As to the animals treated with II, glucose often had a beneficial effect on the symptoms, while the action of adrenaline was uncertain. G. SCHWOCH

Narcotics. I. Cause of the changed action of calcium salts in magnesium narcosis. SHIGEH YAMAWAKI. Univ. Wien. *Arch. exp. Path. Pharmacol.* 136, 1-33 (1928).—Cats deprived of cerebrum can be awakened from Mg narcosis by CaCl₂ provided corpus striatum is intact, but Ca does not exert this action in thalamus animals; and in such animals CaCl₂ seems to intensify the narcosis, just as it augments the effect of paraldehyde, chloral hydrate, veronal and luminal. Thalamus rabbits are rendered quiet and sleepy by CaCl₂ alone. When but a mild degree of narcosis is induced by small doses of paraldehyde, chloral hydrate, veronal, luminal and urethan, Ca injected intravenously destroys the narcosis, but if larger doses of the narcotics are given and a more profound narcosis established the Ca intensifies the effect. Reactions in cats resemble those in rabbits, although in this species Ca salts incompletely remove Mg narcosis. In frogs deprived of the fore brain CaCl₂ does not remove Mg narcosis as it does in the normal frog, nor does it overcome luminal and scopolamine narcosis in these animals. When injected into the fore brain of frogs MgCl₂ in doses of 0.1 to 0.1 mg. causes narcosis, while CaCl₂ injected into the mid brain is active in doses of 0.01 mg., and is without effect when injected into the fore-brain. The effect of Ca on Mg narcosis is apparently due to a motor stimulation of the cerebrum or corpus striatum. G. H. S.

Influence of functional narcosis and of mechanical exclusion of the brain upon the capillaries of the lung. HERMANN STERNBERG AND MAUREN TAMARI. Univ. Wien. *Arch. exp. Path. Pharmacol.* 136, 34-42 (1928).—Even in deep narcosis the capillaries of the lung remain patent, permitting the passage of ink, and such animals can withstand the injection of relatively large amts. of ink. Animals which are but slightly narcotized or normal animals die from suffocation when ink is injected, the lungs presenting a more intense and more diffuse staining with the entire arterial vascular system of the lung filled with the ink. The alveolar capillaries are free of ink and the pulmonary capillaries are for the most part occluded. Guinea pigs from which the cerebrum has been extirpated behave as do normal animals when given ink injections, but when the mid-brain is removed they react as do animals under deep narcosis. These

observations suggest that reflexes originating in the mid-brain medulla contract the capillaries of the lung.

Mode of action of hypophysin on water and chloride narcosis on the excretion of sodium chloride induced by hy Univ. Wien. *Arch. expil. Path. Pharmacol.* 136, 43-51(1928).—chlorotone causes an inhibition of both water and NaCl di markedly augments the excretion of NaCl and secondarily excretion. In some instances luminal inhibits the water output, effect, but in general NaCl excretion is somewhat increased. in conjunction with hypophysin the water excretion is inhibit both relative and abs. is increased. Paraldehyde and hy cause at times a reduced water output or have no effect, but in tion of NaCl is strongly increased. II. *Ibid* 52-62. The effect of diuresis is detd., in part at least, by the amt. of water present in the large amts. of water are given hypophysin causes a marked in spontaneous diuresis is unchanged or but slightly increased. In diuresis does not depend upon an interference with the transfer of water to tion, but is apparently due to the fact that large amts. of water lead to an increased irritability of the water center and that only under such conditions does the effect of hypophysin become manifest. III. Mechanism of the effect of hypophysin upon the excretion of chlorides. *Ibid* 63-71. In rabbits deprived of kidney the subcutaneous injection of hypophysin causes an increased NaCl concn in the blood. This persists for several hrs. When water is given along with the hypophysin the hydremia masks the increased NaCl. With the increased blood NaCl there occurs after injections of hypophysin an hydremia, even though water is not given, explaining perhaps the increase in spontaneous diuresis caused by hypophysin alone. Obviously the point of attack of hypophysin as regards its effect on NaCl excretion is in the tissues.

G. H. S.

Effect of various experimental procedures upon the water exchange in mammalian muscle. A. GLASS. Univ. Wien. *Arch. expil. Path. Pharmacol.* 136, 72-87(1928).

Neither extirpation of the cortex nor the changes induced by ether, chloral hydrate, paraldehyde, chloralose or morphine modify the water exchange of rabbit muscle. Agents such as chlorotone and luminal which act upon the brain stem are effective as is extirpation of the cortex and corpus striatum and destruction of a portion of the thalamus. Preliminary treatment with hypophysin causes a more prompt and more outspoken effect. Adrenaline and ergotamine are without influence. Water absorption by the muscle is increased by section of the sciadic nerve, but section of the spinal cord between the fourth and fifth cervical vertebrae is without effect. Motor nerves exert no essential regulatory function in water exchange. G. H. S.

Effect of damage to the brain stem and to the sympathetic upon pulmonary edema due to adrenaline. A. GLASS. Univ. Wien. *Arch. expil. Path. Pharmacol.* 136, 88-93 (1928). In both normal animals and those deprived of cerebrum the intravenous injection of 2 mg. of adrenaline invariably causes pulmonary edema. That normal animals have an increased resistance and if the corpora quadrigemina is damaged the percentage of animals to survive is increased. Figure injury to the cerebrum, or the thalamus causes no change in resistance but if a like injury is caused to the corpora quadrigemina the tendency to adrenaline intoxication and pulmonary edema is diminished. Unilateral section of the sympathetic prevents pulmonary edema but bilateral section is without effect. G. H. S.

Surviving Purkinje fibers of the cat heart. F. STRASSER. Univ. Wien. *Arch. expil. Path. Pharmacol.* 136, 101-12(1928). As indicators of pharmacologic activity surviving Purkinje fibers are very sensitive, particularly to strophanthin. G.

Penetration of narcotics of the barbituric acid and urea types into the central nervous system. O. EHRLSMANN. Univ. Berlin. *Arch. expil. Path. Pharmacol.* 136, 1 (1928). The presence of adaline and of bromural in the central nervous system can be demonstrated, as can that of such agents as veronal, luminal, dial and noctal. Both of the urea derivs. are to be found more particularly in the cerebrum and mid brain. Veronal may also be found in the spinal cord. Interruption of veronal narcosis by caffeine does not influence the retention of veronal in the brain, nor can its excretion be prevented by preliminary treatment with urethan, chloral hydrate, ether, scopolamine. G. H. S.

Production from histidine by means of ultra-violet irradiation of a substance which stimulates the intestine and causes a fall in blood pressure. FRIEDRICH LUTINGER. Univ. Berlin. *Arch. expil. Path. Pharmacol.* 136, 129-57(1928).—When exposed to ultra-

1% soln. of histidine-HCl yields a substance which acts like histamine upon the intestine and in inducing a fall in blood pressure. Only about 1% of the histidine is thus transformed and the substance produced can be isolated by means of the isolation of histamine. Within limits the transformation of histidine to histamine is not with an excessive acidity the change does not occur. The effect of irradiation is also, within limitations, not a detg. factor. Substances such as eosine and FeCl_3 do not increase the yield, but by means of irradiation it can be shown that wave length has an important influence upon the transformation. Irradiation of serum failed definitely to increase the quantity of histamine-like substances present, but exts. prepd. from irradiated skin areas in which histamine showed a greater activity than did exts. from normal skin. G. H. S.

Mechanism of the action of thymophysin: Intensifying the action of hormones. E. KRAUS-FAUSTOVA, Univ. Wien. *Arch. exp. Path. Pharmacol.* 136, 158-71 (1928).--Thymus ext. added to a dose of hypophysis ext. which is in itself inert causes an inhibition of the action of a degree comparable to that normally induced by 3 or 4 times as large a dose of hypophysis. A like effect is not exhibited by exts. of mammary glands, ovary, placenta, adrenal and parathyroid, but exts. from muscle influence the effect of hypophysis as does thymus ext. Apparently the effectiveness of the exts. depends in large part on their content in protein and protein-split products. Peptone is effective. G. H. S.

Two members of the adrenaline group, β -hydroxyphenylethanolmethylamine and its ketone. O. KRAMER and G. MALOFF, Univ. Berlin. *Arch. exp. Path. Pharmacol.* 136, 197-207 (1928).--In its physiol. effects upon blood pressure, the heart, intestine and uterus β -hydroxyphenylethanolmethylamine closely resembles adrenaline, while its ketone exhibits some of the attributes of adrenaline, causing mydriasis and hyperglucemia, but causing a reduced blood pressure. The type of reaction following administration of the ketone is somewhat dependent upon the dosage. Upon isolated intestine high concns. of the ketone cause effects like those of adrenaline; low concns. do not. G. H. S.

Anti-insulin and pancreatic secretion. ROBERT MEYER BISCH, DOROTHEE BOCK and WILLI WOHLKENBERG, Univ. Göttingen. *Arch. exp. Path. Pharmacol.* 136, 185-202 (1928).--When human pancreatic juice is subjected to ultra-filtration and injected intravenously into rabbits the immediate effect is an increase in blood pressure followed by the development of toxic symptoms. The pancreatic juice from dogs is less toxic and also has less effect upon the blood pressure. The influence of the exts. is somewhat related to the diet upon which the injected animal has been kept, since weakly active diets cause an elevated blood pressure only in animals which have been upon a diet yielding an acid metabolism. The active substance functions as an anti-insulin, and also is effective in increasing the protein content of the lymph and in reducing its alk. reserve and sugar content. Apparently both insulin and anti-insulin are to be found admixed in pancreatic juice. G. H. S.

Study of coramine. HEINZ KOHLHOFF, Univ. Leipzig. *Arch. exp. Path. Pharmacol.* 136, 331-48 (1928). In rabbits coramine causes a purely stimulating effect as regards the position and labyrinthine reflexes, and the respiration is both deepened and accelerated. After subcutaneous injection or oral administration the effects of coramine become quickly evident, but some 5 to 6 times as much must be given by these routes as is effective after intravenous injection. Absorption takes place from the stomach. The convulsions assoc. with the administration of coramine develop not only in the intact animal but also in those deprived of cerebrum and mid-brain. Deep narcosis induced by chloral hydrate or paraldehyde is not overcome by coramine, but in a slight narcosis the antagonistic effect is exhibited. G. H. S.

Total metabolism and the specific dynamic action of protein in nephrectomized dogs. FR. STRAUSS, Univ. Würzburg. *Arch. exp. Path. Pharmacol.* 136, 349-59 (1928).--The removal of the kidney function interferes with the increase in metabolic activity assoc. with protein administration. G. H. S.

Regulation of insulin production. III. Effects of anhydro-carbohydrates, sugar derivatives and sugar-split products. E. GRAFF and F. MEYTHALER, Univ. Würzburg. *Arch. exp. Path. Pharmacol.* 136, 300-9 (1928); cf. C. A. 22, 4159. --Injections of the substances under test, such as salabrom, glucosamine, sorbite and glyceraldehyde, were given into both the femoral and pancreaticoduodenal arteries. The effects, as measured by the values for blood sugar indicated that some of these substances favor the production of insulin. G. H. S.

Changes induced by ergotamine and adrenaline in the amount of residual nitrogen

in the effluent of isolated organs. G. A. MEDNICKIANZ. *Arch. exptl. Path. Pharmacol.* 136, 370-80(1928).—When an isolated organ the amt. of residual N in the effluent; adrenaline is added to the perfusion fluid the residual N; ergotamine incorporated in the fluid a reduction in the N; this loss is followed by increased amts. The characte. obtained when the organ has been previously perfused.

Toxicological study of coal-tar dyes. II. Their intestinal canal of rabbit and their relation to the Kyoto Imp. Univ. *Kyoto J. Med.* 25, 530-8(1928).—study of 60 coal-tar dyes used in foods, and also of 9 white poisonous, and their influence upon the isolated int. toxicity of these substances is auramine, methyl violet, rhodamine, metanil yellow, orange II, Martins yellow; speaking, the toxic action is greater in basic coloring in definite relation between the chemical constitution and t. nized. III. Their influence upon the isolated heart of upon respiration. *Ibid* 620-33.—The order of the toxic brilliant green, orange II, safranin, methyl violet B, rh Bismarck brown; generally speaking, basic coloring matte acidic, but the orange II belonging to the acidic group w action upon the isolated intestinal canal of a mouse or strongly toxic in its action upon the heart. Those whic blood pressure of a rabbit are: brilliant green, auramine, methyl violet B, Martins yellow, metanil yellow and Bism basic coloring matters are more strongly toxic than

The perfusion of organs with diacetoneglucose in co acidosis and of insulin. J. H. M. A. MARTENS. *Arch.* (1927).—Blood contg. diacetoneglucose or acetone and the liver, kidney, lung, muscles and bones of the extre of the ox and calf. The free and combined acetone co was detd. before and after perfusion by the Messinger-Huppert method. A con tion of acetone and glucose was not detected under the influence of insulin; acetoneglucose was not destroyed by the organs examd. About half of the injected in the form of di- or monoacetoneglucose can be recovered from the air and urine in dogs and rabbits.

The action and biologic assay of ephedrine. PAUL S. PITTENGER. Sher Dohme. *J. Am. Pharm. Assoc.* 17, 634-40(1928). Ephedrine and adrenalin similar in chem. constitution and qual. physiol. effect. Quant. effects are detd. Ephedrine is much less powerful than adrenalin in raising blood pressure, but effect is sustained much longer. Ephedrine acts through oral administration, ad line is destroyed. P's expts indicate that the rise in blood pressure by oral ministration of ephedrine is 4.5-12 times greater than has been previously rep. Ephedrine solns. are stable in light and air. Under these conditions ad solns. decomp. rapidly. No satisfactory biologic assay for ephedrine is known.

Experimental study of the action of a small quantity of iodine administered by stomach. M. MINOWADA. Imp. Univ., Kyoto. *Acta Dermatol.* 11, 191-203. *Ber. ges. Physiol. exptl. Pharmacol.* 46, 807. —Daily for 50-75 days, doves received cc. 0.1% KI soln. The birds were then killed and the organs examd. macro- and microscopically. The thyroid showed a small but definite increase in wt. The blood vessels were not dilated, but the follicles were filled with a thick colloid fluid, the epithelial layer was thinner than usual; briefly, there were signs of a colloid struma, but that the organ from the functional standpoint was in a state of depression. In the spleen the follicles and the reticulo-endothelial cells showed an increase. The vessels of the ovaries were hyperemic. The tubules of the testicles were dilated. Signs of maturity of spermatozoa appeared everywhere; both sex glands were in condition of heightened activity. The liver, pancreas and heart showed no histologic changes, but were heavier than normal.

The combined application of insulin with other different spasmodics or narcotics. ICHISUKU ISHIGAMI. Univ. Kyoto. *Folia pharmacol.* 6, 403-14(1928). *Physiol. exptl. Pharmacol.* 46, 610.—The convulsant action of hexetone, barbituric acid is uninfluenced by insulin, while that of strychnine and picrotoxin is considerably increased. Guanidine is synergistic with insulin, while caffeine is antagonistic.

Narcotics, such as urethan, chloral hydrate and NaBr spasm.

R. C. WILLSON

line on the vagus. KIKUO OGIU. Univ. Kyoto. *Folia pharmacol. japon.* 6, 455-65(1928); *Ber. ges. Physiol. exptl. Pharmacol.* 46, 508.—

Adrenaline on the vagal endings can be detd. in many different al section adrenaline slows the pulse; this effect is removed ed rabbit intestine there is an increased sensitivity to acetyl- st dose of adrenaline.

R. C. WILLSON

line on low blood pressure. KAGEMASA KUWAHATA. Univ. japon. 6, 455-65(1928); *Ber. ges. Physiol. exptl. Pharmacol.*

Adrenaline was studied on rabbits whose blood pressure had by chloral hydrate, amyl nitrite or blood letting. The d, but not to the normal condition. The increase in blood cases which had received chloral hydrate, somewhat greater a, greater after bleeding and greatest after splanchnic or

R. C. WILLSON

iting action of "rhizoma, polygonati." PIUNGKI MIN.

acol. japon. 6, 466-78(1928); *Ber. ges. Physiol. exptl. Phar-*

macol. 46, 839.—The action of the alcoholic extract of "rhizoma polygonati" on the blood sugar of the rabbit was studied. This substance at first increases and later decreases the blood sugar. The increase probably has its origin in the carbohydrates of the ext. It also checks adrenaline hyperglucemia and this action is much stronger than the same action of Chosen-ginseng for which "rhizoma polygonati" is a substitute. The latter has no influence on the hyperglucemia produced by NH_4Cl .

R. C. W.

The action of pituitrin on the isolated frog heart. ICHISUKE ISHIGAMI. Univ. Kyoto. *Folia pharmacol. japon.* 6, 415-22(1928); *Ber. ges. Physiol. exptl. Pharmacol.* 46, 509.—Pituitrin is always inhibiting and never stimulating to the isolated heart and strips of heart. This action is uninfluenced by atropine. Adrenaline shows its own action even during the action of pituitrin. Ba is antagonistic to pituitrin. Pituitrin reduces considerably the elec. irritability of the chloralized frog heart. It is indicated that the inhibiting action of pituitrin has nothing to do with the sympatheticus or the parasympathicus, but is concerned only with the muscle itself. Administration of Ca or K exerts no influence on the cardiac action.

R. C. WILLSON

The action of yohimbine on the body temperature. MASASHI YAMAUCHI. Univ. Okayama. *Folia pharmacol. japon.* 6, 479-490(1928); *Ber. ges. Physiol. exptl. Pharmacol.* 46, 526; cf. C. A. 23, 1691.—When yohimbine is administered subcutaneously or intravenously into healthy rabbits, the body temp. is reduced by doses which do not show any external effects. Adrenaline subcutaneously in doses of 0.0001-0.002 g. per kg. lowers the body temp. and after a preliminary dose of adrenaline, the action of yohimbine is weak and when used together the action of the two drugs is less than that of each single drug. The action of adrenaline is almost unchanged by a preliminary dose of yohimbine or it is only slightly strengthened. From the results, it seems probable that the temp.-decreasing action of yohimbine and adrenaline depends chiefly on the peripheral sympathetic nervous system and thus causes changes in the cellular metabolism. Furthermore, it is not impossible that yohimbine acts on the tonus of the blood vessels.

R. C. WILLSON

The activity of adrenaline applied intrapulmonarily. FUMIO SETO. Univ. Kyoto. *Folia pharmacol. japon.* 7, 1-10(1928); *Ber. ges. Physiol. exptl. Pharmacol.* 46, 818.—Adrenaline was introduced into the lungs of rabbits by inhalation, by spraying through a tracheal cannula or by intratracheal injection. When administered in these ways the action of adrenaline on the blood pressure is slower and weaker than when it is given intravenously, but at the same time it is much more rapid and stronger than when administered subcutaneously. The greatest height of the blood pressure follows the inhalation administration; the longest duration follows insufflation and the action starts soonest after intratracheal injection.

R. C. WILLSON

The value of different amino-alcohol esters of the aromatic unsaturated carboxylic acids as local anesthetics. I. The amino-alcohol esters of the unsaturated carboxylic acids containing the piperonyl nucleus. KAGAMASA KUWAHATA, AKIRA OCHIAI AND YOSHIIHIDE NUKITA. Univ. Kyoto. *Folia pharmacol. japon.* 7, 11-29(1928); *Ber. ges. Physiol. exptl. Pharmacol.* 46, 812.—The esters studied included piperocaine (piperonylacryl- β -diethylaminoethanol hydrochloride), piperthesine (piperonylacryl- γ -diethylaminopropanol hydrochloride), piperocaine-PJ (piperonylacryl- β -piperidylaminoethanol hydrochloride) and pipecaine (piperinic acid β -diethylaminoethanol hydrochloride). All these substances are practical anesthetics. Pipecaine is as strongly

anesthetizing as cocaine, while its toxicity is the same anesthetizing power is increased by the addn of adren. by heating. The other three substances act more weakly of toxicity in mice are: first accelerated respiration and then clonic spasms and finally cessation of respiration. 7 of the unsaturated carboxylic acids containing the phe (1928); 46, 813.—The esters studied were apocaine (phenol-HCl), apocaine-PJ (phenylacryl- β -diethylaminoethar (phenyldiacryl- β -diethylaminoethanol-HCl). Apocaine powers equal to cocaine with a toxicity comparable to less thermostable than cocaine. The anesthetizing pov slightly changed by heat sterilization. Lethal doses kill

The production of immunity of the rabbit kidney against mercury. OGURI AND EITARO MARUI. Univ. Kyoto. *Folia pharm. Ber. ges. Physiol. exptl. Pharmacol.* 46, 499; cf. C. A. 23, various studies the authors studied whether and how far the the kidneys after HgCl₂ application is different in normal. The Hg elimination in the urine was detd for 24 hrs after the injection of HgCl₂ according to a modification of the Schumacher Jung method. In animals which had received more than 1 injection of HgCl₂ the amt. of Hg eliminated was about 3 times that after the first injection. Since the kidneys of the animals which withstood the HgCl₂ poisoning show considerable resistance against HgCl₂ in spite of a much increased elimination of Hg, the immunity which was suspected in former expts. is confirmed. R. C. WILLSON

The action of morphine. K. ONO. Univ. Fukuoka. *Fukuoka-Ikkadogaku Zasshi* 20, 543-70 (1927); *Ber. ges. Physiol. exptl. Pharmacol.* 46, 520.—The chronic addn of morphine effects a reduction in the respiratory exchange of the mouse, on the basis of a reduction in the activity of the thyroid gland and the sex glands. Agents which are stimulating to the sympathetic nervous system reduce this action of morphine on the respiratory exchange, increase the respiratory exchange and strengthen the action of morphine, while parasympathotropic stimulating drugs do not alter the influence of morphine on the respiratory exchange. Accordingly there is some relation between the action of morphine and the hormones or the "tension" of the vegetative nervous system. The chronic administration of morphine to rabbits accelerates the blood sedimentation reaction. The viscosity is uninfluenced. There appears a decided reduction in the immunization capacity as is shown by the pathol. changes in the spleen, bone marrow and internal secreting organs. R. C. WILLSON

Studies of the urea-secretoary constant after the use of soporifics. GUYARD, FATTOVICH, MAMESSIMO PROVA, ANCONA. *Note riv. psichiatr.* 16, 9-22 (1928); *Ber. ges. Physiol. exptl. Pharmacol.* 46, 719.—The Ambard constant was detd in 66 mental patients and on the following day redetd, after 2-2 cc. somnifen was administered intramuscularly. Several hrs. later, after the passing of the effects of the drug, another detn. was made. In 65% of the cases the Ambard const. was higher than normal, in 21% less. There was no relation between the age or the type of psychosis and the height of the const. During agitation or confusion higher values were found almost regularly, probably on account of a slight azotemia during decreased permeability of the kidney. Before the injection of somnifen the const. ranged from 0.019 to 0.105 and during the effects of the drug from 0.052 to 0.291. Diuresis was increased in 50% of the cases while an oliguria was noted in 39%. After the passing of the influence of the drug the const. was lessened in 71% of the cases, in 24.2% of these cases it was lessened to a value less than the original one. R. C. WILLSON

The action of adrenaline and pituitrin upon the glomerular capillaries and on their diuretic action. MASANORI OKADA. Univ. Okayama. *Okayama-Igakkai Zasshi* 40, 440-6 (1928); *Ber. ges. Physiol. exptl. Pharmacol.* 46, 440.—Frogs were anesthetized and the superficial capillaries of the kidneys examined microscopically under reflected light. When 1:100,000 adrenaline was added there followed a constriction of the glomerular capillaries and a disappearance of many formerly visible glomeruli. Adrenaline 1:10⁴ and weaker solns. caused capillary dilatation and the appearance of new glomeruli. Pituitrin acts basically the same, constricting in high and dilating in low concns. (1:10). A diuretic action of adrenaline and pituitrin is seen in their dilating effect on the capillaries of the glomeruli. R. C. WILLSON

The influence of termine on the blood pressure of the rabbit. TAKATO HAYAKAWA AND TOYOTA YOSHIDA. Univ. Okayama. *Okayama-Igakkai Zasshi* 40, 1-5 (1928)

exptl. Pharmacol. 46, 503.—Subcutaneous injections of (ylamine) do not change blood pressure; intravenous pe a slight increase of short duration, while moderate or ss decrease, followed in about half the cases by a slight s of moderate and larger doses produce the same picture. atropine and section of the cervical vagus have no effect ssure produced by termine. Preliminary treatment with increase of blood pressure after the small dose of termine, ecreasing action of the larger doses. It is concluded that re through termine depends upon neither a central nor a but chiefly upon a stimulation of the sympathetic center; crease is principally dependent upon a peripheral sympa-

R. C. WILLSON

poisons on animals kept in a closed chamber. MASAMI *Okayama-Igakki Zasshi* 40, 533-44(1928); *Ber. ges.* 805. The mice which were used in this expt. were kept ch were closed by rubber balloons under const. air pressure. is proportionate to the size of the exptl. chamber. When the re- d with KOH, the duration of life is shortened and the content of as formerly. Accordingly CO₂ can produce an economy doses of morphine reduce the O consumption and increase eficiency. Somewhat larger doses reduce the resistance e accumulation of CO₂ here has a favorable effect. The appears to be able to balance the paralyzing effect of mor- center. Hexetone increases the O consumption and thus e life. When the CO₂ is removed the shortening of life is more pronounced. In suitable doses of alc. with a narcotic effect, duration of life is extended; irritating doses have the opposite effect. Paraldehyde acts similarly to alc.

R. C. WILLSON

The action of bromide salts on the intestines of warm-blooded animals. I. NOLLE. *Univ. Moscow. Russkii Fiziol. Zhurnal* 11, 77-80(1928); *Ber. ges. Physiol. exptl. Pharmacol.* 46, 807. From expts. with the isolated intestine it was concluded that the stimulating and inhibiting action on the neuromuscular app. of the intestine is effected by the cations. By changing the concn. of the electrolyte the neuromuscular app. of the intestine can be stimulated or inhibited. Na and NH₄ salts increase the intestinal peristalsis, while K salts inhibit the spontaneous movements. Sr salts increase the amplitude of the intestinal contractions.

R. C. WILLSON

The influence of natural glucosides on the effects of cocaine. JUNG, Z. *Hals-, Nasen u. Ohrenheilk.* 18, 267-76, 268-70(1928); *Ber. ges. Physiol. exptl. Pharmacol.* 46, 837. J. studied the anesthetic action of a series of glucosides: adonidin, verbenalin, scillaren, peristaltin, arbutin, helletsuren, convallamarin, cymarinn and amygdalin alone and in combination with cocaine. He observed a strong potentiation of adonidin cocaine solns. on the cornea of the rabbit. While cocaine increases the action of adonidin on the heart, adonidin lessens the cramping action of cocaine. Clinical tests of adonidin-cocaine solns. as a surface anesthetic gave very satisfactory results. This soln. is available commercially under the name "adocaine." R. C. W.

Derivatives of *p*-methoxycinnamic acid (Ester): 10. The preparation of diethyl-aminomethanol esters of diphenyl 2-carboxylic acid and derivatives (Bull.) 10.

I. ZOÖLOGY

R. A. CORTNER

The lactic acid in the muscle of the inkfish. AKINEKE MATSUMOTO. *Acta Schol. Med. Univ. Kyoto* 10, 277-80(1928). The lactic acid extd. from fresh inkfish muscle is optically inactive. The amt. of acid is increased by 72 hours autolysis. The occasional occurrence of some activity in the acid from the autolyzate is being investigated.

DAVID DAVIDSON

Lactic acid formation in the Octopus muscle during autolysis. HIRAO KIMURA. *Univ. Kyoto. Acta Schol. Med. Univ. Imp. Kyoto* 11, 187-92(1928). Matsumoto (cf. preceding abstract) had shown that during the autolysis of the cuttlefish muscle the content of MeCH(OH)CO₂H (I) increased and that some of the isolated Zn salts showed distinct dextrorotation. K. investigated the undecided question whether the dextrorotation is due to formation of *l*-MeCH(OH)CO₂H. Fresh muscles of *Octopus* were divided in 5 equal parts. The 1st part was immediately analyzed for I and the

sp. rotation of the isolated and weighed Zn salts was . . . 4 portions were digested with $\text{CHCl}_3\text{-H}_2\text{O}$ at 37° for 2, 4, . . . treated as the 1st portion. In 3 out of 4 expts. the sp. . . while increasing dextrorotation was observed in the 2 or . . . 1 or 2 portions the dextrorotation was smaller than in . . . of the Zn lactate generally increased for the first 4 or 7 . . . The Zn lactate obtained from the autolyzed material . . . and subjected to fractionated crystn., Zn content, wat . . . were detd. in the 3 fractions. It was seen that the Zn . . . l-lactate. Conclusion: During the autolysis, fo . . . occurs. $d\text{-MeCH(OH)CO}_2\text{H}$ is probably decompd., whil . . . No explanation for the strong decrease in dextrorotat

The extractives of surume-ika (*Ommastrephes* . . . *Acta Schol. Med. Univ. Imp. Kioto* 10, 281-4(1928).—Yields in the "histidine fraction" the picrate of a base . . . same m. p. (225°) as octopin picrate (Morizawa, C. A. . . (C 32.1, H 3.6 and N 22.2%) is different.

The increased oxygen consumption of marine . . . pressures—its variation as a function of the intensit . . . FONTAINE. *Compt. rend.* 188, 460-1(1929).—The O . . . *platessa* increases with increasing pressure up to 150 kg. . . the animals die within 20 mins. After the decrease . . . becomes less than normal; there is, thus, a sort of con

Bionomics of the vinegar eelworm. B. G. PETERS. *Analyst* 53, 661-2.—The vinegar eelworm is a free-liv . . . 2 mm. in length and about 0.04 mm. in breadth, whicl . . . in vinegar. In this paper a full summary and review . . . gators are given (with bibliography), and the industrial . . . have been separately discussed. P.'s expts. on the behavior of the eelworm under . . . phys. and chem. stimuli have confirmed previous observations that the worms have . . . little need of O; they can live for many days in paraffin oil and in olive oil. Under . . . completely air-tight conditions (e. g., in an atm. of H) they usually die in about 3 days, . . . though some may remain alive after 2 weeks. The concn. of the worms in infested . . . vinegar varied from about 1000 to 2000 worms per cc. The eelworm tolerates temps . . . between 0° and 35° , can survive for short intervals at -20° , and can live for several . . . days at 37° . It is practically indifferent to light. Both the worm and its larva are . . . susceptible to drying, surviving for only a few mins. after complete evapn. of water in . . . which they were placed. The toleration limits for H-ion concn. are p_H 1.6 on the acid . . . side and about p_H 11 on the alk. side. So far as can be ascertained, the worm tends . . . to make the medium in which it lives slightly but more permanently acid than it would . . . otherwise have been. It is very sensitive to I, NH_3 , and CHCl_3 , but is extraordinarily . . . resistant to most chem. substances, including acidity indicators and buffer solns. It . . . can be grown in most culture media, and has been cultivated aseptically by Zimmer . . . mann, who finds that either bacteria (living or dead) or an unknown substance from . . . the autolyzate of yeast is essential as food. All the evidence goes to show that the . . . worm is non-pathogenic to man. As regards the vinegar industry, it is only demon . . . strably harmful when it occurs in the acetifiers, from which it can be excluded by a . . . suitably high temp. (40°). Nothing is definitely known as to its origin in vinegar, . . . but it has been suggested that it may be conveyed on the legs of the vinegar fly, *Dros . . . phila funebris*, and Henneberg claims that he has demonstrated this mode of trans . . . ference. In former communications (*J. Helminth* 5, 133, 183(1927)), P. has dealt with . . . the nomenclature of the vinegar eelworm and with its anatomy. As genera are already . . . recorded with the names *Anguillina* and *Anguillulina*, a new genus *Turbatrix* is created, . . . comprising: (1) *T. aceti* (Müller, 1783) var. *aceti* (in vinegar); (2) *T. aceti* (Müller, . . . 1783) var. *dryophila* (Leuckart, 1887), de Man, 1910 (in the slime-flux of the oak); . . . (3) *T. Ludwigii* (de Man, 1910) (in the slime-flux of the oak); (4) *T. rediviva* (Linnaeus, . . . 1767) (in sour paste).

Physico-chemical characteristics of the breeding migration fast of (Amur River) . . . Keta salmon. B. P. PENTECOV, YU. N. MENTOV AND E. F. KUMMAEV. *Bull. Pacific . . . Sci. Fishery Research Sta. (Vladivostok)* 2, Pt. 1, 3-64(1928); Russian text with English . . . summary.—Specimens of *Oncorhynchus keta* were obtained at the mouth, along the . . . course and at the sources (spawning grounds) of the Amur River. The spawning . . . grounds were approx. 1200 miles from the sea. The wt. of the head, genital organs, . . . skin and bones of both sexes greatly increased during the spawning migration. The

from 68.65 to 85.73%, or, *vice versa*, the dry matter 14.27%; in females, the H_2O content increased from 66.95 substances decreased from 33.05 to 15.37%. Fat content of 9 to 0.17%, and, of females, from 11.28% to 0.49%, or for 1.22% for males, and from 34.13% to 3.17% for females. l, in males, from 21.08 to 13.26%, and for females, from % protein in the dry matter increased from 67.26% to 92.89% 8% to 90.81% for females. Ash content for males diminished nd for females, from 1.09% to 0.92%, or, for dry matter, the 5 to 5.89% for males, and from 3.29% to 6.02% for females. content (F) in the muscular tissue was parallel to the decrease ter (ΔI) and on the av. $\Delta F = 1.3 \Delta I$. Based on wt. data and several pts. with a body of av. standard size, the reserve of air loss from the sea to the given pt., was detd. It was found time of death at the spawning ground, the loss of fat in males 97.27%, proteins 57.29% in males, and 57.68% in females, and 47.07% in females, H_2O 15.18% in males, and 20.74% in

Males lost 77.21% of their reserves of energy, and females 78.75%. The proportion of the expenditure of the energy of fat to the expenditure of protein energy at first increases, but afterward decreases. On the av. for 1 km. of distance to 1 kg. of the live wt. of the fish, from the first pt., up to the river Hor (1200 km. from the sea) the decrease for males was 505 cal., and, for females, 579 cal. As regards wt. and reserves of energy from the previous pt., the av. of decrease for kg. to km. is 638 cal. for males and 695 for females. The max. expenditure of energy decreases where the current is swiftest. The speed of the fish is in inverse ratio to the speed of the current and both these are, on the av., 115 km. every 24 hrs. The av. daily expenditure of energy in their passage up the river is, for males 25,810 cal., and for females 28,390 cal., for each kg. of live wt. The av. loss of proteins every 24 hrs., up to the Hor, is, for males, 1.734%, and for females, 1.385% of the remaining proteins. The C and N content in the dry, fatless, muscular tissue, from the sea to the time of death, decreases, and the difference between protein content, detd. by difference and by Kjeldahl, increases from 1.09% to 4.63% for males, and 1.21% to 4.02% for females. After the expenditure of $\frac{1}{2}$ of the common reserve of energy (570 km. from the sea) a great change takes place in the proteins, in connection with its greater consumption in relation to fat. This change in the proteins is discovered by the increase of the factor of absorption, *i. e.*, the no. of mg. of methylene blue absorbed by 1 g. of dry flesh from 50 cc. of 0.1% of H_2O soln. The capacity for absorption of the dry muscular tissue contg. fat (factor of absorption $Am.$) increases together with the decrease of fat content (F) in this tissue and with the increase of its H_2O content (W) and $F = W/Am.$ According to the degree of starvation of the salmon the I nos. of fat increase and the sapon. nos. decrease. The degree of change in protein and fat is directly dependent on the expenditure of reserves of energy. The data are collected in 29 tables and 13 figures. A bibliography is appended.

C. R. F.

The resistance of the larvae of the Italian *Anopheles* to the salt content of waters. LIDIA LAFACE. Expt. Sta. Antimalaria Campaign, Rome. *Riv. Malarilogia*. 7, 18-30(1928); English summary 81; *Tropical Disease Bull.* 25, 819.—*Anopheles elutus* in the lab. is more tolerant of NaCl than *A. maculipennis* and the tolerance of *A. superpictus* is intermediate to the two.

C. R. F.

The effect of neurophil drugs on the fiddler crab, *Uca pugnax*. OSCAR W. RICHARDS. Marine Biol. Lab. *Biol. Bull. Marine Biol. Lab.* 56, 28-31(1929).—A reversal of the usual motor responses of the legs of the male fiddler crab has been observed when the animals have been in solns. of picrotoxin, strychnine, phenol pilocarpine, or veratrine in sea water. Camphor increases the irritability of the animals. Atropine, apomorphine, morphine, codeine, caffeine and digitonin are without effect on these crabs. The results of the expts. are discussed in relation to those made with other arthropods.

FREDERICK G. GERMUTH

The carbon dioxide tension of the blood of the snail, *Helix pomatia*, during its annual cycle. MARCEL DUVAL. *Compt. rend.* 188, 104-6(1929).—The CO_2 content of snail blood is const. throughout the year. This constancy maintains an ionic reaction in the blood which is independent of the snail's activity.

ARTHUR GROLLMAN

Action of hydrogen sulfide on the protoplasm of *Amoeba proteus*. FLOYD J. BRINLEY. Battle Creek Coll. *Science* 69, 336(1929); cf. *C. A.* 22, 4179.—The toxicity of H_2S on *Amoebae* is due to its action on the surface membrane. The internal protoplasm of the cell is not injured by H_2S .

ARTHUR GROLLMAN

Metabolism studies on the cold-blooded animal heart. different types of work. G. EISMAYER AND H. QUINCKER. *Z. Biol.* 88, 139-44 (1928).—Just as in warm-blooded animals, the from the nutrient fluid after it has used the reserve material.

Biochemistry of selachians. I. Investigations on the FLÖSSNER AND F. KUTSCHER. *Univ. Marburg. Z. Biol.* was isolated as the picrate ($C_8H_5N_3AgNO_3$, m. 280°) from In the lysine fraction were found choline, purified as the au. m. $244-245^\circ$, slightly sol.), niosin, isolated as neosinaurate (Ca , easily sol.). The mother liquor yielded histidine as the result picrate of which m. 190° . The filtrate from this showed demonstrated in the filtrate from phosphotungstic acid treat. This substance is the same as that isolated by Kutscher and *vulgaris*. It is slightly sol. in cold water, easily sol. in hot wat biuret, tryptophan, ninhydrin and Morner reactions were ne Millons reactions were pos. The m. p. was between 191° and valerician acids were also obtained.

FRANCIS KRASNOW

Chemical composition of the ovaries of Octopus ocellatus. TSUTOMU KAWAI. *Univ. Kyoto. Acta Schol. Med. Univ. Imp. Kyoto* 11, 137-45 (1928).—Fresh, fully developed ovaries (2186 g.) of *Octopus ocellatus* were finely ground and extd. with $EtOH$ and Et_2O . This ext. gave a ppt. with Me_2CO . The ppt. consisted of a diamino-phosphatide with choline as the N-contg. base. The fraction sol. in Me_2CO yielded cholesterol. The dry ovaries (475 g.) remaining as a residue from the $EtOH-Et_2O$ extn. gave almost all protein reactions. They contained 12.52% N, 0.67% P, 1.00% S and 5.70% carbohydrates (as glucose). Two hundred g. of dry ovaries were hydrolyzed with 600 cc. of fuming HCl and analyzed for the constituents of the proteins and nucleoproteins. The following amts. were obtained: 0.19 g. guanine, 1.43 g. adenine, 0.35 g. hypoxanthine, 0.75 g. glycine, 4.23 g. alanine, 0.88 g. valine, 22.32 g. leucine, 0.21 g. isoleucine, 0.24 g. proline, 2.38 g. phenylalanine, 5.86 g. glutamic acid, 3.14 g. aspartic acid, 1.32 g. serine, 1.78 g. tyrosine, 1.60 g. histidine, 5.14 g. arginine, 7.12 g. lysine and 0.72 g. choline. Xanthine and tryptophan were present. G. S.

The influence of some physical-chemical factors of the perfusion liquid on the frog's heart. S. SARGENESSNIKOV. *Univ. Irkutsk. Russk. Zool. Zhurnal* 11, 100-20 (1928); *Ber. ges. Physiol. exper. Pharmacol.* 46, 705. Solutions of different pH values were perfused through the heart by means of an aortic cannula. The pH was determined colorimetrically by the Michaelis method. Fourteen solutions were used the pH ranging from 6.0 to 8.35. The action on the heart was based on the height of contraction produced. The solutions were divided into 3 groups: (1) optimum solutions, pH 7.0-7.6, height of contraction above 20 cm.; (2) contraction 10-20 cm., pH 6.5-6.9; (3) contraction below 10 cm., pH 7.8-8.35 and 6.0-6.1. Stronger concns. both alk. and acid, reduced the amplitude of the contractions. R. C. WILLSON.

12 - FOODS

F. C. BLANCK AND H. A. LEPPER

Supplementary relations among nutritive values of foods. H. C. SHERMAN. *Columbia Univ. Am. Med.* 34, 767-70 (1928).—Review. FRANCIS KRASNOW.

The zinc content of the chief vegetable foods. GABRIEL HERTRAND AND BOE BENZON. *Bull. soc. hyg. aliment.* 16, 457-63 (1928); cf. C. A. 23, 1696. Zn was determined in a large no. of food products on 200-1500-g. samples by the Ca zincate method of B., *Compt. rend.* 115, 939, 1028 (1902); B. and Javillier, *Bull. soc. chim.* [4], 1, 63 (1906); B. and Mokrugats, C. A. 18, 363. With coconut "milk" only 82 g. was available and no Zn was detected. The following results were obtained, expressed in mg. per kg. on the fresh material, on the dry basis and on the ash, resp.: whole mushrooms (*Agar camp. L.*) 2.8, 44.4, 308; whole excellent boletus (*Bolet. ed. Fr.*) 5.1, 36.0, 277; whole edible agaric (*Canth. cib. Fr.*) 12.4, 42.6, 711; agar-agar (*Gelid* and *Grua* spp.) 7.7, 17.4; kernel of *Pinus pinus* 55.5, 59.3, 1329; whole oat seed (*Aven. sat. L.*) 10.0, 22.0, 542; oat straw—, 4.3, 84; whole wheat seed (*Trit. sat. Lamk.*) 10.0, 18.7, 84; — straw—, 21.8, 387; wheat bran 32.4, 38.0, 659; whole corn seed (*Zea mays L.*) 18.0, 20.4, 1385; whole millet seed (*Panic. mil. L.*) 17.0, 19.6, 810; whole barley (*Hord. vulg. L.*) 18.0, 21.2, 737; polished rice seed (*Oryza sat. L.*) 2.5, 2.9, 769; bran 30.0, 33.3, 160; whole rye seed (*Secal. cer. L.*) 12.0, 13.5, 716; rye straw

alum seed (*Sorg. vulg. Pers.*) 12.0, 13.8, 420; whole canary-grass seed dry gramineous hay—, 24.0, 323; stone-free dates (*Phoen. dact. L.*) 31.7, 734; fresh asparagus sprouts (*Asp. off. L.*) 3.2, 51.6, 582; onion 13.8, 100.0, 1915; root-free leeks (*All. porr. L.*) 2.3, 23.8, 235; pine-apple (*Lind.*) 2.6, 19.7, 353; edible portion of bananas (*Musa parad. L.*) 10.0, 10.3, 400; hazelnut kernel with tegument (*Coryl. avell. L.*) 1.9, 4.1, 170; nut kernels with 20.0, 24.2, 1259; whole fresh violet figs (*Pic. car. L.*) 1.2, 8.5, 164; whole hemp-seed 82.8, 90.3, 1280; whole leafstalks (*Beta vulg. L.*) 0.2, 3.6, 16; red beet roots 9.3, 68.9, 283; whole spinach leaves (*Spinac. oler. L.*) 6.2, 120.7, 252; eggplant (*Solan. escul.*) 2.0, 11.3, 286; full-grown red potato tubers 4.0, 13.7, 420; com potato starch 1.0, 1.2, 444; whole tomato fruit (*Lycop. esc. Dun.*) 3.4, 66.6, 511; sweet potato tubers (*Conr. bat. L.*) 2.3, 5.1, 186; aerial portion of endive chicory (*Cichor. end. L.*) 0.4, 7.5, 76; green aerial portion of chicory (*Cichor. end. L.*) 1.9, 22.4, 134; aerial portion of cabbage-lettuce (*Lact. sat. L.*) 4.7, 105.2, 500; aerial portion of Roman lettuce (*Lact. sat. L.*) 1.8, 41.9, 316; aerial portions of dandelion (*Tarax. off. Wigg.*) 9.7, 35.4, 212; salsify root (*Trag. porr. L.*) 2.2, 18.8, 576; whole sunflower seed (*Heliant. ann. L.*) 17.0, 11.4, 215 (there is evidently a misprint, as the Zn content given for the fresh plant is higher than that on the dry basis); whole Jerusalem artichoke tubers (*Heliant. tub. L.*) 2.8, 101.0, 400; aerial portions of lamb's lettuce (*Valerian. ed. Poll.*) 5.4, 74.7, 344; carrot root (*Dauc. car. L.*) 1.1, 9.7, 133; carrot leaves 4.0, 25.0, 190; whole celery tubers (*Apron. gran. L.*) 2.1, 16.1, 214; whole red currants (*Ribes rub. L.*) 2.0, 13.9, 263; whole gooseberries (*Rib. ucr. L.*) 1.0, 8.1, 130; whole cucumber fruit (*Cuc. sat. L.*) 1.6, 43.6, 337; edible portion of melon (*Cuc. mel. L.*) 0.9, 16.2, 183; edible portion of pumpkin (*Cuc. max. L.*) 2.1, 44.4, 438; inner portion of pomegranate (*Punic. gran. L.*) 2.5, 11.9, 410; fleshy pericarp of apricots (*Armen. vulg. Lammk.*) 0.4, 3.3, 46; whole fresh almonds (*Amygd. comm. L.*) 10.0, 10.6, 842; fresh almond pericarp 3.8, 11.4, 344; dried almond kernels 18.5, 21.5, 724; tegument of dried almonds 23.7, 73.6, 1286; dried almond shells 4.2, 5.0, 188; fleshy cherry pericarp (*Ceras. vulg. Mill.*) 1.5, 5.6, 305; strawberries (*Frag. ves. L.*) 0.9, 4.4, 131; whole medlar fruits (*Edon. vulg. Pers.*) 1.9, 7.3, 270; fleshy pericarp of peaches (*Pers. vulg. Mill.*) 0.2, 2.0, 36; edible portion of russet apples (*Malus comm. Poir.*) 0.4, 2.0, 98; edible portion of another variety of apples (not specified) 1.0, 9.2, 632; edible portion of pears (*Pyr. comm. L.*) 1.6, 9.2, 452; fleshy pericarp of plums (*Prun. dom. L.*) 0.3, 2.0, 62; whole peanut seeds (*Arac. hyp. L.*) 16.0, 16.8, 780; seedless carrot (*Cerat. sat. L.*) 6.9, 7.9, 161; whole kidney-bean seeds (*Phas. vulg. L.*) 52.5, 56.4, 1500; whole young green bean pods (*Phas. sp. P.*) 0.8, 8.3, 96; whole lentil seeds (*Fer. lens L.*) 34.5, 28.0, 1140; aerial portions of lucern (*Medic. sat. L.*) 4.0, 14.2, 160; whole pea seeds (*Pis. sat. L.*) 44.5, 48.5, 1620; whole soy seeds (*Soni. hisp. Moench.*) 20.0, 22.6, 615; whole vetch seeds (*Vic. sat. L.*) 23.0, 26.7, 754; whole white grapes (*Vit. vin. L.*) 2.0, 12.9, 444; whole black grapes 1.2, 9.1, 240; almost seedless dry Malaga grapes 2.0, 2.5, 88; juice from lemon slices (*Citr. limon. Russo.*) 1.7, 24.0, 594; pressed lemon peel and residue 3.3, 23.7, 455; seedless mandarin slices (*Citr. aur. Russo.*) 0.8, 7.5, 176; mandarin peel 3.9, 17.5, 323; seedless orange slices (*Citr. aur. Russo.*) 1.7, 12.3, 280; orange peel 5.4, 20.2, 424; whole flax seed (*Lin. sat. L.*) 19.0, 30.0, 531; whole white-headed cabbage (*Brass. al. cap. D. C.*) 1.0, 21.2, 176; white edible portion of cauliflower 2.3, 25.4, 205; cross stems and leaves (*Nast. off. R. Br.*) 5.6, 83.7, 500; turnip root (*Brass. nap. var. D. C.*) 0.8, 18.2, 118; turnip leaves 2.1, 38.3, 154; pink radish roots (*Raph. sat. L.*) 1.6, 22.8, 196; pink radish leaves 4.5, 71.7, 280; Swedish turnip root (*Brass. nap. L.*) 3.0, 28.8, 333. Also in *Bull. soc. chim.* 45, 168-75 (1929).

Numbering of flours. JONAS SPONSTA. (*Chem. Abstr.* 4, 76 (1929) English) (1929).—Individual flour grades cannot be evaluated by means of a numerical system. The fat and ash content as well as the acidity vary in the case of the same grade of flour according to the wheat variety, its age, year of harvesting, etc.; therefore, the only deciding factor for judging the quality of flour is the chem. analysis. J. K.

Application of the bromate differential test in the estimation of baking quality of Canadian hard red spring-wheat flour. RALPH K. LARMOUR AND ALAN G. MACLEOD. *Dept. Chem. Univ. Sask. Saskatoon. Sci. Agr.* 9, 477-90 (1929).—Experimentally

milled flours, aged 3 months, were subjected to the Basic (22, 2007). Because of lack of material, 100 g. loaves were from 11.2 to 17.4% crude protein. The action of KBrO_3 "prover" to increase the loaf vol. was studied. A soln. of 0.0 the dough in such concn. that each loaf contained 0.0005 g. that the KBrO_3 test gives a more accurate est. of the more closely approximates com. practice. The Basic potentialities of flours when submitted to com. usage. Us limited no. of samples indicates that the degree of stimulation the protein content. Some flours show no stimulation or flours exhibit high baking quality by the Basic Standard Test to have been developed to nearly the optimum point. The com. flours belong to this class, but occasionally an uncharacteristics of full development.

Does mercury from disinfectants go into the harvest? ALFRED STOCK and WILHELM SIMMERMAN. *Z. angew. Ch.* Grains or flour obtained from plants whose seeds had been material have been analyzed with a view of detecting Hg in order of magnitude of $1/100,000$ mg. or less were found.

Effectual control of milk supply. JOHN W. S. MCCLE Ontario. *Am. Med.* 34, 792-3(1928).

Milk and medical science. JAMES A. TOBRY *Am. Med.*

Rapid methods for the determination of bacteria in milk. Gemeente lab. stad Gent. *Natuurw. Tijdschr.* 11, 9 14(1929) methods used for the detn. of the acidity in milk. The methods are ties and on the direct counting of the microbes. The Skar method is convenient, since it requires only 15 mins., but it gives results which None of the slower methods is absolutely reliable.

Metals in dairy equipment; metallic corrosion in milk products and its effect on flavor. O. F. HUNZIKER, W. A. CORDEN and B. H. NISSEN. *J. Dairy Science* 12, 140-81(1929). The materials used included 19 different metals, plated metals and alloys used in the form of strips 4 in. long and $1\frac{1}{4}$ in. wide as follows. Al, Cu, Fe, Ni, Sn, Zn, galvanized Fe, tinned Cu (edges bare and tinned), Cu Retm, tinned Fe (edges bare and tinned), Mn-Al alloy (Al plated), Allegheny metal, Ascolay, Enduro, type "A," Mn-Al alloy, Monel metal and Ni-Ag. The action of weak org. and mineral acids, sweet and sour milks and creams as well as the effect on the flavor of the milk products were observed. The liquids consisted of 1% solns. of HCl , H_2SO_4 , AcOH , butyric and lactic acids, and 0.2% solns. of citric acid, and the following milk products: sweet milk, acidophilus milk, butter culture, butter milk, sweet and sour cream, and sour neutralized cream. A numerical alignment according to the relative merit of the different metals used is given.

J. C. JUNKENS

Chemical sterilization of dairy utensils. M. J. PRUCHA. III Agr. Expt. Sta. *Circ.* 332, 1-11(1929); cf. *C. A.* 22, 1414.—Solns. contg. 50-100 p. p. m. of active Cl are recommended for pumping through milk-plant equipment, 70-100 p. p. m. for dipping, and 200 p. p. m. for spraying. The Cl may be derived from Cl gas, hypochlorite compds., or chloramine-T. A 10-sec. contact at warm temps. (not above 50°C) gives most efficient results. Utensils must be absolutely clean and free from all traces of milk, grease, or other dirt to be sterilized. Solns. of Cl compds. should not be re-used on dairy utensils.

C. R. F.

Contaminated water as a source of surface flavor in pasteurized creamery butter. DONALD B. SMYTH. Ontario Agr. Coll., Guelph. *Sci. Agr.* 9, 316-20(1929).—Surface flavor in butter was prevalent in rural creameries especially after prolonged periods of wet weather. Five creameries were inspected. All produced butter of a sewage-like, unclean, or putrefactive odor. The water supplies at all the creameries contained *Pseudomonas fluorescens* in large nos. Sterile butter when inoculated with *P. fluorescens* at 25° for 28 days developed typical surface odor and flavor. Where water supplies contain this organism must be used, pasteurization of the water at 93° for 10 mins. renders it safe for use. Neutralization of the cream to not less than 0.35% acid is recommended.

C. R. F.

The proportion of the citrates of milk incorporated in the curd during cheese making. N. S. GOLANOW. *Trans. Roy. Soc. Can.* 22, Sect. V, 237-42(1928).—The citrates in milk are not held by the curd in any greater proportion than that assocd. with the whey

the very small proportion of citric acid or its decomposition in the ripening of cheese. A. T. CAMERON study of the bacterial content. WILFRED Vancouver. *Sci. Agr.* 9, 346-62(1929).—The total Cheshire cheese was 15 million rod-shaped bacteria. It dropped to 93,000. Numerous bacteria were isolated. C. R. F.

ERMAN JAMES. Manitoba Agr. Coll. Winnipeg. *Sci.* 1.7 million gals. of ice cream were used in Can. in 1928. modification (C. A. 20, 2545) of the Babcock-Gerber and that the fat in 28 samples of com. ice cream varied from 32.7 to 41.7% and the bacteria per g. a pint of ice cream ranged from 9 to 21.2 oz. Four varied from 9.2 to 13.2 oz., while 14 pints dished from the vol. of 14 bricks filled from a machine ranged from C. R. F.

of certain salts on the physical properties of ice cream mixes. J. C. HENING AND A. E. DAHLBERG. *J. Dairy Science* 12, 129-39(1929).—Addn. of Na citrate, K oxalate and Na_2HPO_4 to ice cream before pasteurization and homogenization reduced their viscosity and caused them to whip more easily, while the size of the fat-globule clumps were smaller. There appeared to be a relationship between the size of these clumps and viscosity. Ca lactate increased both, making it more difficult to whip. A natural increase of lactic acid to approx. 0.3% or addn. of lactic or citric acids before pasteurization and homogenization caused slight curdling, great viscosity and difficulty to whip, while the ice creams were hard and crumbly. Oxalic acid added before or after, or citric or lactic acids added after homogenization did not have this effect. The addn. of NaHCO_3 and NaOH to mixes of normal acidity caused lower viscosity and easier whipping, while the addn. of the former as neutralizer produced a better flavored ice cream than other neutralizers. It appears probable that the relative amts. of Na and Ca salts in the ice cream mix made from normal dairy products varies sufficiently to affect the whipping properties. When difficult whipping was encountered, it was uniformly corrected and a less viscous mix resulted by the addn. of 0.1% baking soda prior to pasteurization. J. C. JURRIENS

Vanilla flavors do not freeze out of ice cream. P. S. LUCAS AND A. C. MERRILL. Mich. Agr. Expt. Sta., *Quart. Bull.* 11, 118-20(1929).—In order to test out the popular belief that vanilla exts. freeze out in the process of ice cream manuf., various combinations of Mexican, Bourbon and Tonka beans with and without the addn. of vanillin and coumarin were used. The exts. were added in the usual amts. to ice cream mixes of identical compns., the mixes frozen and held in storage. Samples were withdrawn at intervals up to 3 months and compared with freshly prep'd samples. No diminution in flavor strength after storage was detected. The Mexican beans gave the best flavor followed by a mixt. of Mexican and Bourbon beans. Concd. exts. gave results of equal value to single-strength exts. Volatility tests under controlled conditions showed that complete aeration of vanilla exts. did not affect the strength. Similar results were obtained by melting and refreezing ice cream mixes contg. vanilla exts. C. R. F.

The density of lard. W. HALDEN AND R. KUNZE. Univ. Graz Med. Chem. Inst. *Chem. Umschau Fette, Oele, Wachse Harze* 36, 61 2(1929).—The usual statements in the literature for the density of lard, viz., d_{20}^20 0.931-0.938, are too high; a tabulated collection of available records places the normal d_{20}^20 at 0.915-0.923. P. ESCHER

Fat determination in crude lard. B. TYUTYUNNIKOV. *Oil and Fat Industry (Russia)* 1928, No. 4, 14-5.—Ten g. of the lard was ground with 15 g. of CaSO_4 and extd. with ether in a Soxhlet app. This method was found to be superior to the old one, i. e., the preliminary dehydration of the fat tissue with alc., followed by the ether extn. A. A. BOEHTLINGK

The bactericidal action of smoke (as used in smoke-curing of fish). ERNEST HESS. Fisheries Exptl. Sta., Halifax. *Contributions Can. Biology Fisheries* 4, 27-76(1928). Three strains of bacteria (a staphylococcus, *Proteus vulgaris* and a member of the *Sal. typhimurium* group) were exposed to det. the bactericidal action of smoke under various conditions. Smoke from hard wood, soft wood and mixt. of both showed practically no difference in bactericidal power. Dense smoke showed a higher concn. of disinfecting constituents. The spore forms were very resistant to the smoke. HCHO is a very important disinfecting constituent of smoke. In concn. of 3 or more g. per 100 cu. ft. of air it is as bactericidal as smoke itself. M. H. SOULE

Oysters and possible pollution. J. H. ORROR. *Munic. Eng. Sanit. Record* 82,

99-100(1928).—Oysters are liable to accumulate so much colored green. This interferes little with the oyster's green they could apparently be eaten with impunity by

The acids of fruits. E. K. NELSON. U. S. Dept. Am. Med. 34, 812-5(1928).—The total acidity of most fruits and the degree of ripeness. The relative proportions of the various with the degree of ripeness, variety of climatic and soil conditions are the principal acids, which in moderate quantities are readily oxidiz

Some factors in packing of fruits in wine sirup. H. A. HARNBY AND Res. Lab., Glass Container Assoc., N. Y. Glass Container 8, No. 4, 1 acts J. Am. Vinegar Ind. 8, No. 6, 11-3, 21(1929).—The EtOH wined fruits, packed under U. S. Govt. permit, was 3.75%. The EtOH tributed in both fruit and sirup after 7 days' storage. EtOH in canned has little if any preserving action against spoilage. Analyses show that has been added to canned fruit and the latter given a heat treatment, the yield of EtOH will be recovered from the jar of fruit. There is very little loss of EtOH through the jar seal.

The cold-pack method of preserving berries in the Northwest. H. C. DUBIN U. S. Hort. Field Lab. Wenatchee, Wash. Glass Packer 2, 115-20(1929). The use of sucrose in the ratio of 2 parts of fruit to 1 of sucrose in the cold-pack method of preservation retards yeast and mold development, reduces the danger of fermentation, preserves the color of the fruit and to some extent maintains the characteristic flavor and aroma of the berries. Temps. of -15° to -9° are used for freezing the berries, but storage at the latter temp. is satisfactory. Even at -17° , a 50-gal. bbl. of fruit and sugar (2:1) reached a temp. of 5° only after 36 to 48 hrs. The f. p. of a 2:1 pack of berries and sugar is from -3° to -4° . Numerous tests proved that the characteristics of berries, which are of importance in the manu. of jams, jellies and juices, were not significantly affected by the storage of the fruit in the frozen state.

Apple pectins. ROGER PAUL. Ann. fols. 22, 78-82(1929). A brief review of the compn. and properties of pectic juices, with a discussion of their possible uses in the confectionery industry.

Different forms of pectin and how to handle them in manufacturing. C. P. WILSON, Calif. Fruit Growers' Exchange. Glass Packer 2, 113-4(1929). This is a brief informal discussion. Powd. citrus pectin is standardized and marketed according to its jelly strength, that is, the quantity of sugar which 1 lb. of pectin will carry in the manu. of a jelly contg. 65% of sugar. The dry powder dissolves best if added to the fruit juice before the addn. of acid. In that procedure, the set of the jelly is more rapid. Some samples of pectin set very rapidly, others require 24 hrs., still both are of eq. strength. The factors underlying the set of pectin jellies are not fully known. If ion concn. is but 1 of the influencing factors. POWELL WILLIAMS. Speas Mfg. Co., Kansas City. Ibid. 114. In the manu. of pectin jellies best results are obtained by adding the acid to the container and pouring the jelly over it. Lactic, malic, citric, tartaric and H_2PO_4 acids are suitable acids for use in pectin jellies. Lactic acid produces a slow set in jellies and may be added early in the jelly process. Other acids should be added only after complete concn. has been carried on. Powd. apple pectin dissolves readily if mixed with 7 or 8 times its wt. of sugar, added or sprinkled slowly into cold H₂O and gradually brought to the b. p. with agitation.

A rapid method for detecting saccharin in lemonades. JIKI VONDRÁK. Cukrovar. 47, 323-4(1929).—The method depends upon the difference in sweetening between saccharin and glucose (500:1). Solns. of equal degree of sweetness show difference in density, n and polarization. For the n an immersion or sugar refractometer is used, but the free CO_2 has to be removed by aeration or agitation. The density is detected by making small spheres of a mixt. of "carnauba" wax and asphalt in the ratio 1:1. The balls have a density equal to that of a 6% glucose soln. and are just suspended in this concn. If the sugar is replaced by saccharin, the spheres drop to the bottom; this is an indication of saccharin. Such solns. are sent to the bureau for further analysis for saccharin.

Should cinnamon contain a minimum of 18% alcoholic extract? JOHANNES PRASCHER. Chem. Untersuchungsamte der staatlichen Auslandsfleischbeschauanstelle, Stettin. Z. Untersuch. Lebensm. 56, 474-8(1928).—Analysis of 16 samples of cinnamon and cassia from widely sepd. localities showed EtOH exts. varied from 6.5 to 17.76% the ash content from 2.50 to 10.48% and the sand from 0.23 to 7.02%. Some of the

samples showed gross adulteration. An 18% standard for EtOH ext. is unreasonable.

Cyanide.—Coming from bitter apricot kernels. B. E. READ AND C. T. FENG. *Med. J.*, 151(1927); *Quart. J. Pharm.* 1, 109.—Bitter apricot kernels, a source of essential oil of almonds, are a common cause of poisoning in China. The authors describe various food products made from bitter apricot kernels, and give analyses showing that HCN is present only in traces, which, although sufficient for flavoring purposes, is not dangerous.

W. O. E.

The detection of maltol and salicylic acid in the presence of maltol. THEODOR MEHL AND HELMUT BEITTER. *Deut. Forschungsanstalt für Lebensmittelchemie, München. Z. Untersuch. Lebensm.* 56, 472-4(1928); cf. C. A. 21, 2747.—Maltol is formed in the process of malting roasting barley and certain cereals in the manuf. of roasted malt beverages. It is not present in unmalted cereals. To detect maltol, a mixt. of 10 g. of the finely ground sample (usually a coffee substitute), with 1.5-2 g. of blood charcoal (Merck) and 25 cc. CHCl_3 in a small flask are boiled for a short time, cooled and filtered. The filtrate shows a yellowish tinge. Ten cc. is then shaken in a small separatory funnel with 1-2 cc. of H_2O . After sepn. of the CHCl_3 layer, the latter is filtered into a small centrifuge tube. One cc. of very dil. FeCl_3 (2 drops of a 10% soln. in 20 cc. of H_2O) is added, the mixt. thoroughly shaken and finally sepd. by the centrifuge. The presence of maltol is indicated by the characteristic violet color. This reaction is likewise pos. for salicylic acid; hence to detect the latter the following procedure was carried out: Boil 20 g. of the finely ground sample, 3 g. of blood charcoal and 50 cc. of CHCl_3 for a few min. in a flask, cool and filter. Use 10 cc. of the filtrate for the maltol test as just described. Evap. 10 cc. of the CHCl_3 filtrate on the water bath, using a current of air and without boiling. To the residue add 5 cc. of H_3PO_4 (d. 1.7) and 15 cc. of H_2O . Distil, using a small Liebig condenser, until approx. 15 cc. of the distillate is collected. To this distillate add a few drops of a 5% $\text{Ba}(\text{OH})_2$ soln., transfer to an evap. dish and evap. to dryness on a water bath. To the cooled residue add 10 drops of glacial AcOH and 3 drops of Mandelin's reagent (*Z. anal. Chem.* 23, 235). The presence of salicylic acid in the residue is indicated by an indigo blue color. The test will detect about 0.025 mg. of salicylic acid.

C. R. FELLERS

Barley, cull beans and potatoes as feeds for dairy cattle. C. F. HUFFMAN AND A. C. BALTZER. *Mich. Agr. Expt. Sta., Extension Bull.* 73, 18(1929).—Corn has slightly more total digestible nutrients but less protein than barley. Barley and corn are equal lb. for lb. in the ration of milking cows, growing heifers and calves. Two lb. of ground cull beans are equiv. to 1 lb. of cottonseed meal as a protein supplement in the ration of dairy cattle. Cows may be fed 12-20 lb. of cooked beans per day without ill effects although, for best results, beans should be introduced gradually into the ration. Potatoes are approx. equal lb. for lb. to corn silage as a succulent feed for dairy cows. The butter fat produced from dairy cows fed potatoes tends to be silvy; hence potatoes should be fed with caution and should be accompanied by such feeds as a good legume hay and a concentrate similar to cottonseed meal.

C. R. F.

Chemical composition and the nutritive value of yellow and white oats. F. HONCAMP, W. SCHRAMM AND H. WIKSMANN. *Landwirtschaftl. Versuchsstation Rostock. J. Landw.* 76, 113-27(1928); cf. C. A. 23, 1445.—The higher feeding value of yellow oats depends more particularly on its higher starch equiv. and lower proportion of husk than on its slightly larger content of digestible protein.

E. F. SNYDER

The protein content of grass, chiefly meadow foxtail (*Alopecurus pratensis*), as influenced by frequency of cutting. FRANK T. SHUTT, S. N. HAMILTON AND H. H. SELWYN. *Div. of Chem. Dominion Exptl. Farm, Ottawa, Can. J. Agr. Sci.* 18, 411-20(1928).—Data are presented which show a steadily declining C. of moisture in the grass with the lengthening of the periods between cuttings. Frequency of cutting markedly influences the protein content: the shorter the period of growth, the higher the C. of protein. This is correlated with lower fiber content. The seasonal yield of protein per acre was highest with cutting of the grass every 3 weeks. While grass cut every week and every 2 weeks showed a higher protein concn., the total yield was less. Grass cut for hay, including aftermath, yielded total protein only slightly less than that cut every 3 weeks, because of the high protein concn. of the aftermath. P. R. D.

Comparative tests of certain feeds in rations for pigs. E. A. LIVESAY AND E. C. STILLWELL. *W. Va. Agr. Expt. Sta., Bull.* 213, 3-16(1928).—Yellow corn was found superior to white corn in fattening young pigs. In 2 out of 3 trials the pigs fed white corn developed rickets; there is evidence that vitamin D is present in less quantity in white corn than in yellow corn. The fermentation of corn and wheat middlings for 36-48 hrs. by the use of 1 lb. of yeast to 100 lb. of feed does not increase the rate or the

economy of gains. *Fish meal* is approx. equal to tankage as a supplement to corn, buckwheat middlings and a mineral mixt.

Progress in the utilization of saccharin by-products in 1927. (Günzberg) 10. Piration of sorghum grains (COLEMAN, *et al*) 11D. Detection of butter adulteration by means of benzoic peroxide (BODENDORF) 27. Regulations in the edible industry (PENTRADO) 27. Chemicals in the apiary (HUTSON) 15. Behavior of lactose in milk (DEI GRISOGONO) 11C. Bakery furnaces using mazout (Fr. pat. 32,300) 27. Extraction of oil from livers (Fr. pat. 647,941) 27. Substances which can be activated nourishing properties to foods (Belg. pat. 350,983) 17. Antiseptics preserving foods (Brit. pat. 297,074) 17.

Food preservation. THE SMOKED PRODUCTS CO. Fr. 647,367, Jan. 12, 1928. A food preservative is obtained by mixing salt with the constituents of smoke resulting from the combustion of a suitable material such as hickory wood, the constituent being obtained by elec. pptn. The salt may be placed in a rotating drum in which the constituents of the smoke are pptd.

Sterilizing food products in receptacles by use of water heated by steam. JAM. W. PARCELL (dedicated to the citizens of the U. S.). U. S. 1,708,105, April 9, 1928. app. is described.

Apparatus for mixing dough or other materials. BENJAMIN GOULD. U. S. 1,708,550, April 2. Structural features.

Bread making. ELEKTROCHEMISCHE WERKE MÜNCHEN, DR. ADOLPH PIETZSCH. Co. Fr. 647,550, Jan. 21, 1928. H_2O_2 or addnl. products of H_2O_2 are added to the flour before or during the prepn. of the dough.

Apparatus for pasteurizing milk. HALVOR HOLTE. Fr. 647,772, Jan. 21, 1928.

Apparatus for evaporating milk. THE BORDEN CO. Fr. 647,307, Dec. 22, 1927.

Cream powders. J. E. NYROP. Brit. 297,256, Dec. 14, 1927. In producing powders from emulsions such as cream or from emulsions of fatty substances with skimmed milk, the emulsion is homogenized and spray-dried at a low temp. into a gaseous medium, which is free or nearly free from O_2 and which may contain small particles of fat. A product is obtained which may be added to margarine to give it a vitamin content.

Ice cream containing cocoa butter and chocolate. SAMUEL H. BERCH. U. S. 1,708,252, April 9.

Lactose. JULES P. L. BLIER and EUGÈNE P. VITOUX. Fr. 647,252, June 10, 1927. Lactose is obtained from milk coagulated with rennet or acid by cooling to temp. below 0° , removing the liquid from the frozen mass, bringing the extd. liquor quickly to 0° and recovering the crystals of lactose formed.

Determining butter fat in butter. CHESTER E. GRAY. U. S. 1,708,307, April 9. Moisture is evapd. from a sample of butter; the receptacle and contents are then weighed and a solvent for the butter fat alone such as "petroleum ether" is applied to the sample in the same receptacle in which the evapn. was effected; the butter fat soln. is filtered out and the fat content detd. by difference in wt. A special app. is described, which may be used for the evapn. and extn.

Margarine. ALBERT K. EBERMAN. U. S. 1,707,800, April 2. A warm aq. emulsion is formed of suitable fatty substances; it is stabilized by bringing it into contact with a colder medium such as water, the temp. of which is sufficiently low to solidify it into discrete particles; these are then conveyed in thin layers through a body of relatively warmer medium such as warmer water, the temp. of which is below the m. p. of the solidified emulsion; the warmed particles are then worked into a plastic mass.

Cheese. HERMAN P. KERNEN. U. S. 1,708,099, April 9. A sterile cheese is formed from milk by one continuous process comprising coagulating the milk, forming the curd, artificially developing the requisite acidity in them within a relatively short time, sterilizing while stirring and then cooling. U. S. 1,708,100 specifies coagulating the milk, forming the curds and adding to them about 0.375% of Ca phosphate, 0.375% of Ca lactate and 0.375% of NH_4 citrate, heating to about 55° for about 25 min. while stirring in the presence of an emulsifying agent such as Na citrate and then allowing the product to cool.

Food (similar to macaroni) formed of powdered cheese and ground cereals. L. M. JENNINGS and J. L. HAIN (to Skinner Mfg. Co.). Brit. 297,025, Sept. 12, 1927.

Preserving egg material. HOO PATRICK, LTD., and A. MURDOCH. Brit. 297,462, May 25, 1927. Egg yolks or whites, separately or together, are mixed with a small

- portion of glycerol (0.1-5.5% in case of whites alone and somewhat more with yolks) then evapd. (suitably by spray desiccation) to a condition of substantial dryness. Food comprising dried yeast and peanut butter. BANESVAR DASS (to Ellis Co.). U. S. 1,708,914, April 9.
- Pestis solutions. POMOSIN-WERKE G.M.B.H. Fr. 647,451, Jan. 18, 1928. See 284,273 (C. A. 22, 4671).
- Apparatus for extracting juice from grapes, etc. JACQUES PAUL. Fr. 647,168, 1927.
- Preserving and removing residual poisons from fruits. REGINALD H. ROBINSON and HENRY HARTMAN (to the citizens of the United States). U. S. 1,708,330, April 9. Fruit is treated with aq. solns. of HCl and CH₂O.
- Apparatus for treating fruits with sprays of liquids to neutralize and remove insect residues, etc. AUGUST GUIGNARD, AUGUST BOSSE and JOHN GUIGNARD. B. 1,707,610, April 2. Structural features.
- Cleaning and precooling vegetables for shipment. JOHN W. BELL and THOMAS J. BELL. U. S. 1,708,253, April 9. An app. is described.
- Bait blocks for licking by animals. W. ELLIS. Brit. 297,235, Oct. 26, 1927.
- Mineral substances such as Ca phosphate, which are not sol. in water or animal saliva, are mixed with sol. substances such as salt, sugar, or glucose to serve as a binding agent; they are molded into blocks under pressure. The product may be thinly coated with sugar, salt, wax, or other suitable material.

13—GENERAL INDUSTRIAL CHEMISTRY

HARLAN S. MINER

- Cooperation in science and industry. JOCELYN F. THORPE. *Chemistry & Industry* 48, 281-8(1929). E. H.
- Graphic control in the chemical industry. MICHAEL BORNSTEIN. *Przemysl Chem.* 11, 677-683(1927); cf. C. A. 23, 1180. A. C. Z.
- The legal significance of the industrial hazards for the chemical industry. PAUL REIWALD. *Z. angew. Chem.* 42, 217-9(1929). An analysis of the legal status of the chem. industry with respect to its responsibility for accidents, injury to health and property, etc., with illustrations and citations from German cases. W. C. EBAUGH.
- Conveying of liquids (pumping). M. TAILLEFERRE. *Science ind.* 13, 111-25 (1929).—T. describes in detail various types of app. for the conveyance and pumping of liquids. Emphasis is laid on the conveyance of liquids in the chem. industries, acids in particular. T. offers the following classification of the apparatus involved: A. direct pressure app. I. depth app. (1) emulsion, (2) elevating and (3) ejection app. II. surface or excess pressure app. (1) intermittent, (2) continuous. B. indirect pressure app. I. liquid pistons II. membrane pumps III. separators for inert or acid. gas. C. mech. app. Different types of app. under each heading are described and illustrated. A. J. MONACK.
- The discharge of thin liquid layers in centrifuges. H. V. WARTENBERG and H. PERTZEL. *Chem. Fabrik* 1929, 61-3. Poiseuille's law for flow in small tubes is modified and extended to cover the case of the thin liquid layer left in a centrifuge after discharge of the material in process. Expts. on centrifuging of various oils have confirmed the truth of the equations developed, from which it is possible to calc. the thickness of the layer from the viscosity, d , speed of revolution, and centrifuge radius. The influence of capillarity on the layer thickness is discussed. C. Z. ROSECRANS.
- The utilization of raw materials considered from a chemico-economic standpoint. ALBERT SULZMAN. *Chem. Fabrik* 1929, 109-11, 122-4. The need for men with a broad economic outlook as well as a specialized chem. training in the conduct of industries is emphasized, and the ways in which by-products and end products, waste materials and raw materials may reverse their positions with changed conditions are illustrated by many examples. To facilitate the use of (apparent) waste materials, and at the same time to protect manufacturers from the loss of trade secrets, it is proposed that a central bureau—such as a reputable trade journal—act as neutral intermediary in all transactions involving the procurement and distribution of materials, the history of which is not to be divulged. "Works blindness," or the lack of economic vision or sense of proportion that comes to men who stick too closely to their own specialties, makes it desirable to have surveys and suggestions made by neutral and disinterested parties to insure a technical concourse's keeping out of ruts and operating to best advantage. W. C. EBAUGH.

Generalities on the mechanical preparation of minerals. M. V. CHARRIN. *Sci. ind.* 13, 79-86(1929).—C. gives a detailed review of the subjects of crushing and sifting, classification, and concn. of minerals.

Determination of dust and smoke in the inhaled and exhaled breath of man. DRINDER, R. M. THOMSON AND J. L. FINN. *Zentr. ges. Hyg. Grenz.* 18, 17-8(1928); *Wg. u. Abwasser* 25, 186; cf. *C. A.* 22, 3938.—In order to det. danger limits for injurious (which are inhaled, use was made of freshly prepd. ZnO, diam. of particles 0.4μ , (another kind of ZnO), diam. of particles 0.15μ , and marble-dust, diam. of pa. $0.3-0.6\mu$. Definite quantities of these dusts were liberated in a room which contained besides the subject, an elec.-pptn. app. The subject was equipped with a mask which he inhaled the dusty air. Controls were made without the use of masks; exhaled breath was passed into the elec. pptn. app. Thus the quantity of dust in inhalation and exhalation was detd., and the amt. of dust retained by the subject was calcd. Only slight differences were found among the 3 dusts so far as body burden was concerned. The amt. retained averaged from 5.5 to 9.4% of the total inhaled. There were no significant differences between mouth or nose breathing. C. R. F.

The limitation of the production of smoke and other atmospheric impurities. F. KOUDELÁK. *Paliva a Topeni* 10, 185-91(1929).—A statistical study of the sources of smoke and gases in Prague, a description of the present stage of alleviation, and a review of present-day successful installations for decreasing the production of smoke.

FRANK MARESH

Filter cloth investigations. K. ŠANDERA. *Exp. Inst. C. Sugar Ind. Prague. Listy Cukrovar.* 47, 284-8(1929); cf. *C. A.* 23, 2317.—In studying the effect of pressure upon the edges of cloths which are pressed against the frames, found a loss of strength if projections occurred between the cloth and frame, either as roughness, sediment deposits, or sand. Low pressures (55 kg. per sq. cm.) have an insignificant effect; higher pressures (100-550 kg. per sq. cm.) lower the strength. Unfolded cloths were subjected to 550 kg. per sq. cm. for 10 mins.; the tensile strength of cotton fell 66%; of jute 90%. Cloths which were folded and subjected to 550 kg. per sq. cm. disintegrated under a slight pull; 440 kg. per sq. cm. left only one cloth intact, for 330 kg. per sq. cm. cotton cloths retained 10-20% of their original strength, jute 12.5%. Sand placed between the leaves of the cloths in the press and subjected to 550 kg. per sq. cm. decreased the strength of wet cotton cloths 50-83%, of jute 75-92%, of linen 55%. Linen is very resistant to the crushing action of sand when wet; it does not resist this action when dry. Folding a wet cloth before compression is detrimental; cotton cloths lost 51-88% of their tensile strength, jute and linen 100%—the cloth was sheared at the fold by the pressure. Damp cloths were clamped between two 2 mm. steel wires and placed over a tray of H_2O contg. a normal amt. of CO_2 . After 5 days the tensile strength was detd. The tensile strength decreased 6-28%; in all cases the tear occurred in the region of contact with the steel wire. On soaking the cloths in an alk. medium (CaO soln.), the rusting was retarded, and the decrease in tensile strength was within the exptl. error. The resistance to impact delivered by an automatic hammer (2750 g., dropping 200 mm. was best in cotton cloths; a thicker cloth is more resistant than a thin one. The effect of impact was greatest in used cloths. Artificial incrustation with $CaCO_3$ by impregnating the cotton cloths in a CaO soln. and placing them in an atm. with CO_2 or a soln. with CO_2 , decreased the flow of dust H_2O by 5%; for thick cotton cloths the rate of flow was decreased 50-66%, for liquors 15-26% B \acute{e} ., for thin cloths only 33%. Incrustation has the greatest effect upon jute cloth, decreasing the flow 66-75%; the effect upon linen cotton cloths is the same as for thick cotton ones.

FRANK MARESH

Five cases of lead poisoning occurring on board U. S. S. "Wyoming" during the year 1926. W. W. HARGRAVE. *U. S. Naval Med. Bull.* 26, 1018-24(1928). *Pub. Health Eng. Abstr.* E-785b, 2.—Five Pb-poisoning cases occurred as a result of chipping and handling red-lead paint on board ship in confined, ill-ventilated places. During the period 1913-1927 a total of 299 acute cases of Pb poisoning with 1 death, and 197 chronic cases with 1 death are reported in the U. S. Navy.

C. R. F.

Lead poisoning on board the U. S. S. "Seattle." JACOB STEFF. *U. S. Naval Med. Bull.* 26, 1011-7(1928); *Pub. Health Eng. Abs.* E-785b, 1.—Eight members of the crew engaged in extensive chipping and painting operations involving red lead paint developed symptoms of Pb poisoning. Short shifts and the use of portable ventilating sets especially in the double bottoms resulted in an abatement of the outbreak.

C. R. F.

Carbon dioxide refrigerating machines. J. C. GOOSMANN. *Power* 6, 718-9(1928).—The first CO_2 compressor was designed by Windhausen in 1880 and 10 yrs.

a machine of similar design was first made in the U. S. The most successful modern compressor is of the dual type, contg. 2 suction ports for operation with 2 suction pressures. This development has been brought about by the need of *liquid cooling*, which is accomplished by partial evapn. of the liquid in a sep. intermediate receiver. Liquid cooling occurs upon dropping the condenser pressure to that adjusted in the intermediate receiver. The liquid temp. immediately drops to that corresponding with the lower pressure, while the vapor liberated from the liquid due to change in temp. runs directly to the compressor through the high-pressure suction port." Thus, capacity may be increased 60% while a reduction in h. p. per ton up to 20% is possible.

D. B. DILL

- **Chemical problems in the manufacture of cables.** ERNST ADEL. *Gummi-Ztg.* 43, 1174, 1236(1929).—A discussion of the quality of the Pb, tar, paper, mineral oil and rosin required.
C. C. DAVIS

- **Laminated mica products** (U. S. pat. 1,707,277) 18. **Mercury** (U. S. pat. 1,707,471) 18. **SiO₂** [for absorbent or insulating material] (Brit. pat. 296,832) 18.

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British Chemicals, Their Manufacturers and Uses. Being the official directory of the Assoc. of British Chem. Mfrs. for 1929. London: Ernest Benn, Ltd. 10s. 6d.

The Chemical Manufacturers' Directory, 1929. London: Simpkin Marshall, Ltd. 61st ed. 200 pp. 4s. 6d. Reviewed in *Chem. Trade J.* 84, 290(1929).

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SEVERNS, WILLIAM H. AND DEGLER, HOWARD E. *Steam, Air and Gas Power.* New York: John Wiley & Sons, Inc. 425 pp. \$4. Reviewed in *J. Franklin Inst.* 207, 575(1929).

Gas purification. **OBERSCHLESISCHE APPARATE U. EISENWERKE G.M.B.H.** Ger. 471,986, Aug. 13, 1927. The gas is driven through several folds of an endless band filter running over a series of rollers and dipping at the bottom into an absorption liquid.

Cooling gases. **KARL SENSSENBRENNER.** Ger. 472,291, Oct. 27, 1926. Hot gases are cooled by supplying them in turn to the distn. vessel and the evaporator of an absorption refrigerating machine having no compressor between the evaporator and the absorber.

Drying gases. **W. C. HOLMES & CO., LTD.** Fr. 647,888, Jan. 16, 1928. In drying gases, particularly gases obtained by the *distn. of coal*, the removal of liquor for regeneration and return of regenerated liquor is so arranged and so regulated that the variation of the concn. of the liquor being used is negligible.

Absorption of gases by liquids. **L'AZOTE FRANÇAIS.** Fr. 647,108, May 25, 1927. Gases are absorbed by a liquid in a column, each plate of which contains fibrous material such as silicic fibers, etc., kept moist by capillary action.

Gas and gas contact system. **GEORGE F. HURT** (to George F. Hurt Engineering Corp.). U. S. 1,708,179, April 9. In operations such as denitration in H₂SO₄ manuf., gas under pressure is discharged upwardly into a body of liquid so that the latter is projected in drops of larger than entrainable size into a body of the gas overlying the liquid. An app. is described.

Recovering volatile products. **MARIUS BLANC.** Fr. 647,423, Jan. 18, 1928. Volatile products such as obtained in the treatment of cloth, drying varnishes, sizing silk, etc., are recovered by means of an endless band coated with an absorbing substance, which is caused to travel past the surface giving off the volatile products. Cf. C. A. 23, 1515.

Recovery of volatile solvents. **I. G. FARBENIND. A.G.** Fr. 647,038, Jan. 13, 1928. In the recovery of volatile solvents from plastic material, etc., which are passed

in a continuous band through a drying chamber contg. air or inert gas, sep. are provided at the point of entry and exit of the band; in these chambers a gas or air at a pressure higher than atm. and higher than that in the drying chamber is circulating to remove impurities from solids. GEORGES BILLARD-VILAS. *Fr.* 647,23, 1928. Substances such as tapioca are spread on a traveling screen and are removed by flexible vacuum tubes.

Separating solids from gases. SOC. ANON. DES CHEMINÉES LOUIS PRAT & INDUR. *Fr.* 647,494, Jan. 19, 1928. Suspended substances are sep'd. from gases, particularly combustion gases, by the addn. of steam and centrifuging.

Separating carbon tetrachloride and alcohol or other liquid mixtures by use of adsorbents such as silica gel. I. G. FARBENIND. A.-G. *Brit.* 296,301, Aug. 27, 1927. A mixt. contg. CCl_4 84 and EtOH 16% when allowed to trickle through a layer of micro-porous silica gel 40 cm. thick undergoes selective adsorption of the EtOH .

Evaporation of liquids. JAMES A. REAVELL. *Fr.* 647,264, Oct. 17, 1927. Liquids are atomized and dried or sep'd. from solids contained therein by bringing the liquid onto the inner face of a rotating disk or cup, from which it is ejected into a drying chamber.

Treating liquids with gases. I. G. FARBENIND. A.-G. *Fr.* 648,004, Jan. 31, 1928. Liquids to be treated with gases are caused to descend a helical path having a simple or multiple pitch, and the gas is caused to ascend or descend in the tower. Grooves may be made in the spiral path and the direction of rotation of the helix may be changed several times.

Distilling liquids suspended in hot gases. J. PINTSCH A.-G. *Brit.* 297,122, Sept. 16, 1927. An app. is described in which liquids are distd. by direct contact with hot gases; the hot vapors obtained, after sep'n. of condensable constituents, are burned with air in a regenerator, which is used for initially heating the gases.

Distillation. THOMAS E. PERKS. *Fr.* 647,861, Jan. 9, 1928. An app. is described for sepg. miscible liquids by distn. In the app. the liquids are circulated in the interior of a closed vessel and heated progressively during their circulation, a no. of sep. collecting chambers being arranged above the liquids in which the liberated vapors are condensed.

Preparation of sols and their utilization for clarification of hot liquids. R. HENRY. *Belg.* 351,967, July 31, 1928. Starchy liquid is mixed with the chem. agent (nature not specified); the liquid to be clarified is added and the whole is emulsified by passing through a pump; it is finally sent to a decantation tank. An app. is specified.

Storing heat chemically. HARRY LE ROY CROOKER. *Fr.* 647,572, Jan. 21, 1928. An unstable soln. of AcONa (contg. 40% water) 500, CaCl_2 6.25 g. and 6% of water is used as a heat-storing medium.

Use of hydrogen for cooling steam turbo-generator sets. MASCHINENFABRIK OBERLION. *Brit.* 297,109, Sept. 15, 1927. H_2 used is obtained by reduction of the steam, e. g., by oxidation of iron; during peak loads H_2 may be drawn from an accumulated reserve supply while the full supply of steam is used.

Removing stains from fabrics, paper, etc. A. WARTEL. *Belg.* 351,152, June 30, 1928. The stain is covered with a mixt. of H_2O , KMnO_4 , H_2SO_4 , and HCl and then with a mixt. of Na_2SO_3 , S and H_2O_2 .

Forming interfelted laminated and compressed articles from pulp. MINKER P. CHAPMAN (to Fidelity Trust Co.). U. S. 1,707,429-30, April 2. Mech. features.

Extraction of clay. CHEMISCHE FABRIK IN BILLWÄRDEN (formerly Hell et Schmitz A.-G.) *Fr.* 647,928, Jan. 28, 1928. See *Brit.* 280,456 (*C. A.* 23, 265).

Refrigerating plant. MASCHINENFABRIK ESSLINGEN. *Ger.* 471,625, Dec. 4, 1926. The compression and absorption chambers are arranged so that the first produces a low temp. during the heating period of the latter.

Refrigerating system of the absorption type. A. LORRINO (to Electrolyt. Ltd.) *Brit.* 297,067, Sept. 13, 1927. The heat-delivering parts of an absorption app. are cooled by the evapn. of volatile liquid into an inert gas, both contained in a closed system independent of the refrigerating system. Air may be employed as the cooling medium for the independent system, which may contain H_2 and liquefied NH_3 , or N_2 or CH_4 , together with propane, butane, EtCl , or other suitable volatile medium. Various structural features are specified.

Periodically-operating absorption refrigerating machine. MANNESMANN KALT-TECH. A.-G. *Ger.* 472,126, Oct. 20, 1926.

Refrigerating system of the intermittent-absorption type. IVAR AMUNDSEN and ROY STEPHANSEN (Stephanesen to Amundsen). U. S. 1,707,803, April 2. Structural

Refrigerating system of the reversing absorption type. S. K. D. M. VAN LIER. 296,478, Dec. 21, 1927. Structural features.

Refrigerating system of the reversing absorption type. NAAMLIOOZE VENNOOTS-KODOWA REFRIGERATOR CO. Brit. 296,792, Aug. 4, 1927. Structural features.

Expansion unit for refrigerating apparatus suitable for use with sulfur dioxide as refrigerating agent. WILLIAM E. LEIBING (to Magnus Fruit Products Co.). U. S. 1,708,390, April 9. Structural features.

Purifying sulfur dioxide in refrigerating systems. A. C. THAYER. Brit. 296,498, June 16, 1927. A chamber filled with Fe or Zn chips is placed in the circulating system to remove any corrosive acids formed in the refrigerant.

Insulation for electric conductors exposed to high temperatures and to the action of oil. J. E. ALLAN and S. B. FREEMAN. Brit. 296,684, March 4, 1927. Flexible elec. conductors suitable for use in boiler rooms or in similar locations are provided with a series of insulation layers of homogeneous reverted or esterified cellulose alternating with layers of pliable material such as fabric tape.

Electric insulation. F. W. HARRISON (to British Thomson-Houston Co., Ltd.). Brit. 297,035, Sept. 12, 1927. Insulation comprising felted cellulose pulp, cotton or other org. fabric or other cellulosic material is freed from trapped air or other gases by immersing the conductors carrying the insulation in an oil bath, which is heated to 120–200°. A bath of PhNO_2 , higher alcs., beeswax, or varnish also may be used.

Electrical insulation. WILLIAM W. WINSHIP. U. S. 1,707,590, April 2. A covering of strengthening material such as hard rubber or fiber is shrunk onto a body of fused silica which may be in the form of a tube.

14—WATER, SEWAGE AND SANITATION

EDWARD BARTOW

Twenty-second annual report of the Metropolitan Water Board for year ending Dec. 31, 1927. ALEXANDER HUSTON. 101 pp; *Pub. Health Eng. Absts.* E-785a, 40.—Considered financially, the use of CI has made unnecessary expenditures of large sums of money for addnl. storage accommodation and increased filtration area. The important effect of storage upon the raw Thames, Lee and New River waters is presented in a series of tables indicating decided improvement bacteriologically. As a result of 40 months of tests at the Barn Elms filters in which stored water was first treated in rapid filters at a rate of 134 gals. per sq. ft. per hr. and then passed through the exptl. filter at 3 or more times the customary London rate (which was less than 2 gals. per sq. ft. per hr.), the following results were obtained under comparable conditions: (1) a final effluent product practically as good, on the av., as that resulting from the ordinary slow sand filtration process; (2) comparative freedom from algal trouble or those caused by an excess of suspended matters, owing to the useful work carried out by the primary filters; (3) a much greater output of water per acre of filtration area, allowing for the space covered by the primary rapid filters per unit of time. Treatment of raw Thames River water stored in the Walton reservoirs by rapid filters at a rate of 119.7 gals. per sq. ft. per hr. followed by secondary filtration at 5.1 gals. per sq. ft. per hr. and chlorination at 0.261 p. p. m., showed a reduction in *B. coli* from pos. in 82.9% of 1 cc. samples to neg. in 96.4% of 100 cc. samples. Favorable rates of filtration and chem. results were also obtained. Certain tests with non-spore-forming aerobic, lactose-neg. microbes show that with waters not giving, so far as is known, rise to disease, there are apparently no microbes occurring on the "rehipelagar" and "rehipesagar" slopes, made from the primary lactose bile salt peptone media, liable to be mistaken for the bacteria belonging to the food-poisoning group. C. R. F.

Design of small water works system. JULIAN MONTGOMERY. *Can. Eng.* 56, 345(1929).—The 5 major considerations in planning a water-works system for a small city are promotion, financing, design, construction and operation. E. HERWITZ

Establishing classifications of public water supplies of West Virginia. First official classification. E. S. TISDALE. *W. Va. Coll. of Eng. Tech. Bull.* No. 1, 8–12 (1927).—For 12 yrs. the Division of Sanitary Engineering of the W. Va. State Health Dept. has been grading public water supplies as (1) good, (2) doubtful, and (3) bad, based on kept yearly bacteriol. records and on periodic inspection of the water supply or treatment plant by trained sanitary engineers. (1) are from properly constructed and adequately protected plants, which produce over a certain period of time water equal to or better than the U. S. and State bacteriol. standard. (2) include those plants

shown to be slightly faulty in operation but which produce a water which meets standard 90% of the time. (3) include those plants of faulty design and without protection and which are unsafe an unreasonable portion of the time. One hundred and fifty-four cities of over 500 population have been classified; 82 with 433,408 population as good, 44 with 78,234 population as doubtful and 28 with 47,001 population as bad. A map showing the location of these places, whether surface or ground is used, and the kind of treatment, is attached.

C. H. BADGER

Clarksburg, W. Va., filtration plant. Performs many extra services for public. PERKINS BOYNTON. W. Va. Coll. of Eng., *Tech. Bull.* No. 1, 27-30, Nov. 1927 (Series 13, No. 3).—Some of the different and occasional unusual uses by the public of such instruments as gages, thermometers, barometers, etc., set up by the Weather Bureau in the plant are mentioned as an aid in creating good will. An educational campaign by means of circulars and free personal supervision and advice regarding sanitary privies, septic tanks, wells, etc., is being conducted to improve the water shed. The plant produces 3,000,000 gals. of water per day. Alum and sometimes lime are used as coagulants. Cl is added to the filtered water.

C. H. BADGER

Grafton, W. Va., new filtration plant. JOHN M. RICE. W. Va. Coll. of Eng., *Tech. Bull.* No. 1, 93-6, Nov., 1927 (Series 13, No. 3). The proposed plant, sufficient to 1945, will consist of 4 equal units supplying 3,000,000 gals. per day. Three units will be built now. Coagulation basins, rapid sand filters and Cl after filtration will be used. Certain improvements, especially in the reduction of high-working pressures, and provisions against possible breaks in the main in the present over-worked system are described.

C. H. BADGER

Wheeling, W. Va., filtration plant. Operating data and costs. G. F. RICKARD. W. Va. Coll. of Eng., *Tech. Bull.* No. 1, 75-89, Nov., 1927 (Series 13, No. 3), cf. *Ch. Eng.* 19, 396, 1908. A machine successfully feeding pulverized quicklime into the water is used. Detailed graphs attached show daily pumpage, hourly filter runs, lime and alum added, turbidity, Fe, Cl, and alk., or acidity in raw and filtered water from June, 1925 to Jan., 1928. The av. lb. free Cl added per million gals. was 2.10 in 1925, 1.84 in 1926 and 2.19 in 1927, min. 0.98, max. 4.58. A graph shows the large reduction in the typhoid fever rate. Av. bacteria found in the raw water at 37° was 2110, in settled water 207, in filtered 16, in finished 10. Operating costs for 1919-27 are given.

C. H. BADGER

Data on rapid sand filtration plants. T. C. HENSHEN. *Can. Eng.* 56, 327 (1929). Space is conserved and economy effected by building rectangular sand filters and by using the walls to support the building covering them. Other factors to be considered in building a filter of given capacity are size and no. of units necessary for efficient operation, keeping in mind future requirements, depth of filter, the under-drain system, selection of filter medium, wash troughs, controls for uniform flow and gage to prevent loss of head.

E. HURWITZ

Water-sampling apparatus (Olszewski-Keyl). W. OLSZEWSKI. *Chem. Ztg.* 53, 149 (1929).—A modified Spitta-Imhoff sampler for water, to open automatically at specified depths, is described briefly.

W. C. ERAUGH

Water-sampling devices for the water works operator. J. D. E. BRIHAM. *Man. News and Water Works* 75, 3-4 (1928); *Pub. Health Eng. Abs.* E 739, 26. Four types of water samplers are described.

C. R. F.

Rapid titrimetric determination of sulfate in drinking and service waters with the aid of visual conductivity titration. H. FEHN, G. JANDER AND O. PFUNDT. *Z. anorg. Chem.* 42, 158-9 (1929).—Boil 50 cc. of water to cause deposition of CaCO_3 . Cool to freezing mixt. to room temp. and filter into the cond. glass. Add an equal vol. of alk. and titrate quickly with standard $\text{Ba}(\text{OAc})_2$ using a mirror galvanometer instead of a telephone for the cond. detn. The whole detn. can be carried out in 10 mins.

W. T. B.

What price safe drinking water. PERKINS BOYNTON. W. Va. Coll. of Eng., *Tech. Bull.* No. 1, 21-7, Nov., 1927 (Series 13, No. 3).—A semi-technical discussion of the natural sources of water supplies, natural and artificial purification, mechanism of filter action and the control tests used in a modern filter plant.

C. H. BADGER

Drinking water from sea water. H. T. ELLIS. *Dock and Harbor Auth. (London)* 8, 71; *J. Am. Water Works Assoc.* 20, 592 (1928).—Purification by freezing and by distn. is discussed.

D. K. FRIEDMAN

The catalytic power of medicinal mineral waters. OMBULIO FERNANDEZ. *Rev. Soc. esp. fis. quim.* 27, 45-8 (1929).—Many theories have been proposed. It is not a question of decompn. of H_2O_2 by microorganisms contained in or introduced into the H_2O during bottling or testing in the lab. The microbes in H_2O contain a class

H_2O_2 to H_2O and mol. O. Detns. of catalytic activity are valueless in test-mineral waters unless made only to det. bacterial purity. E. M. SYMMES
—ses in natural mineral waters. G. GUIDI. *Arch. intern. pharmacodynamie* 3(1928); *Physiol. Abstracts* 13, 222.—The reagent employed for showing the of oxidases was not affected by atm. O. It was a specially prepd. leuco base from malachite; in AcOH it turns to turquoise in the presence of O, being very sensitive. It is a yellowish amorphous powder sol. in dil. acid. The change for is certainly due to an oxidative reaction. A millinormal soln. of KMnO_4 dild. required was used for contrast with the sample of water, and gave a measure of the value of the color change. The intensity of the reaction varies in different varieties of mineral water and in samples of the same water at different seasons and periods after collecting. H. I. D.

Approved water-purification apparatus at "The Technical City" exposition in Dresden. OSKAR KAUSCH. *Chem. App.* 16, 49-51(1929).—Softening, chlorinating and clarifying app. are shown, with 6 cuts. J. H. MOORE

Water purification. S. R. DE BRITO. *Rev. brasil. engenharia* (Rio de Janeiro) 15, 165-7; *J. Am. Water Works Assoc.* 20, 732(1928).—A discussion of drifting sand filters and of the use of lime and Al sulfate. D. K. FRENCH

• The problem of purifying water by coagulation. I. I. KRASIKOV AND A. LITYAGO. *Zapiski Belorusskoi Gosudarstvennoi Akad. Nauchn. Khim. i Tekhn. (Memoirs Belorussian State Acad. Agr.)* 4, 261-70(1927).— $\text{KAl(SO}_4)_2 \cdot 12\text{H}_2\text{O}$ and $\text{Fe}_2(\text{SO}_4)_3 \cdot (\text{NH}_4)_2\text{SO}_4 \cdot 12\text{H}_2\text{O}$ were used as coagulants and the amounts necessary to coagulate the particular water without increasing the Al content was studied. The K alum proved to be the better coagulant and by the addition of 0.1 g. per l. did not increase the Al_2O_3 content. J. S. JOFFE

Water purity increased by progress of chlorination. W. J. ORCHARD. *Water Works Eng.* 81, 404; *J. Am. Water Works Assoc.* 20, 712-3(1928).—The increasing use of Cl in both water and sewage treatment is considered and its limitations are outlined. D. K. FRENCH

Effect of chlorine on alum reaction. WILLIAM B. MEYER. *Proc. 2d Ann. Mich. Conf. on Water Purif.* 1928, 35-40; *Health Eng. Abs.* E-739, 26.—It was observed that where Cl was added to Huron River water previous to coagulation, the reaction of the floc was sharper and also faster, giving a better color removal. The tests indicate that where Cl is added to raw water in excess of 1 p.p.m., a reduction of from $\frac{1}{2}$ to 1 grain of alum per gal. may be made, where formerly the alum added was 3 grains. This reduction, however, also depends on the amt. of Cl that may be used without producing a noticeable taste. C. R. F.

Comments on methods for determination of residual chlorine. LINN H. ENSLOW. *Sewage Works J.* 1, 30(1928); cf. *C. A.* 23, 1972.—Of the 4 well-known methods for the detn. of residual Cl, e. g., (1) starch iodide titration, (2) starch iodide colorimetric, (3) benzidine-HCl, (4) o-tolidine, the last named seems to be most reliable as an index of effective chlorination of sewage. Iron and nitrates do not interfere with color development. Manganous compds. and nitrites do. Other factors that must be considered when using this method are pH value, temp., and time of reaction. E. HURWITZ

Improvements in equipment and technic of operation of chlorine disinfection apparatus. R. C. CLEMENT. *W. Va. Coll. of Eng., Tech. Bull.* No. 1, 90-2, Nov., 1927 (Series 13, No. 3).—There are about 130 places in W. Va. now using Cl disinfection machines, about 80 of which are the pulsating meter type. Certain reminders in the operation of this machine are given. The place and use of o-tolidine as a control for dosage are described. The advantages of new, manually controlled- and semi-automatic-soln. feed machines are given. C. H. BADGER

Sterilization of water by chlorine. F. DIENERY AND P. FERRILLARD. *Compt. rend.* 188, 826-9(1929); cf. *C. A.* 22, 610, 3008.—The hypothesis is adhered to that the sterilizing action of Cl is derived from its ability to unite with the org. protoplasm of bacteria and to destroy them. Approx. 1000 cells of *B. coli* and *B. typhosus* were introduced into 2 flasks of River Seine water filtered through Chamberland bougies. Sterilization was effected by 0.2 mg. Cl after 2 to 24 hrs. according to the org. content of the water. The same results were obtained when 0.4 mg. $\text{Na}_2\text{S}_2\text{O}_4$ was added to destroy the free Cl 5 mins. after its introduction. To River Seine water after sterilization by passing through a bougie, 0.2 mg. of Cl was added followed in 5 mins. by 0.4 mg. of $\text{Na}_2\text{S}_2\text{O}_4$, which destroyed all of the free Cl present; finally 1000 cells of living *B. coli* or *B. typhosus* were added. After 24 hrs. all the bacteria were still viable, that is, there was present in the water no antiseptic substance except the free Cl itself. Conclusion:

As long as a water carries free Cl as indicated by the *o*-tolidine test, all cells or *B. typhosus* are destroyed. Thorough mixing of the Cl and water is advised. C. R.

Note in regard to the manganese determination in water. J. DE Weekblad 26, 103-4(1929).—In samples of H_2O which cannot be analyzed short time a certain amt. of Mn adheres to the sides of the bottles, and if not may cause a considerable discrepancy in the analysis. It will most likely be in H_2O from which a sediment of $CaCO_3$ has formed. J. C. J.

Treatment of water supply for iron removal. E. V. PEDERSEN. Am 126-7; J. Am. Water Works Assoc. 20, 733(1928).—Aeration, coagulation and filtration are discussed. D. K. FRENCH

Note on base-exchange water softeners. C. O. CLARK. Soc. Dyers Colourists 45, 36-9(1929).—Base-exchange systems, both natural and synthetic, of softening water are compared with chem. systems, and information is furnished regarding points of superiority of the latter. Facts are given regarding the proper maintenance of base-exchange water-softening plants and the advantages of water of zero hardness over hard in the textile, tanning and paper industries. H. H. MOSHER

Natrolite filter for softening water. STEN TYNEN. Gefle, Sweden. Svensk Kem. Tid. 40, 250-6(1928).—A Swedish water softener, "Natrolite," is analyzed and tested. It is closely related to the American "Zeolite" and contains: SiO_2 62.9, Fe_2O_3 8.5, Al_2O_3 17.0, TiO_2 1.0, CaO 1.4, MgO 1.3, K_2O 1.9, Na_2O 2.7, H_2O 3.3 and difference from 100%, 0.11. Tap water was allowed to flow through the filter at 4 l. per day and l. samples analyzed from time to time. The original material was not very efficient. The filtering properties renewed by salting and washing caused it to remove completely the alk. earths in the first 15 l. One cu. m. softens 112.4 (metric) tons of local water [8.6 CaO and 0.9 g. MgO per 100 l.]. A. R. ROSE

Water softening on a large scale by the zeolite process. H. C. KNEELAND. W. Va. Coll. of Eng., Tech. Bull. No. 1, 66-74, Nov., 1927 (Series 13, No. 3).—A description of the 4-million gal. zeolite water-softening plant is given. The 4 units consist of covered horizontal steel tanks 9×22 ft., operated under 5 lbs. pressure; they are similar in construction to rapid sand filters. They contain 39 in. of green sand (100 cu. ft.) uniformity coeff. 1.46, 60% finer than 0.51 mm. and 10% finer than 0.35 mm. over 18 in. of 2 grades of gravel. The loss of head in green sand is about twice that of filter sand of the same size. The water is reduced 12-15 to 4-5 grains hardness (water of 0 hardness is objectionable because of its persistent lathering qualities) by operating the units on a prearranged time schedule. Water of 0 hardness is delivered at the rate of 4.5 gals. per sq. ft. per min. for 3.5 hrs., which exhausts the filter; hard water then continues to pass for 1 hr. when the unit is taken out of service for 0.5 hr. for regeneration. An inadequate dose of brine is used in order to cause hard water to appear at just the proper time. The softener has also eliminated trouble from clogged filters by removing 2.5 p. p. m. Mn and the crenothrix which fed upon it. Total cost of plant not exceed \$0.03 per 1000 gals. C. H. BARNES

Tastes and odors in water supplies with special reference to waste liquors from by-product coke plants. W. W. HOBBS. W. Va. Coll. of Eng., Tech. Bull. No. 1, 40-54(1927)(Series 13, No. 3).—A review and discussion of the classes of materials causing bad odors or tastes in water are given. Although the pipe and fittings of an old line were burned well before reconstructing into a water line delivering to Morgantown, W. Va., an oily taste persisted in the water for weeks. A tabulation of experiments on by-product waste liquors by 8 collaborators is given. It was detected by 7 in 1 to 1000 ppm. Waste liquors from a by-product plant going into the Monongahela River 20 miles above Morgantown caused disagreeable tastes at the intake. After the study of different methods the company recovers 96% of the phenolic wastes by the use of two sets of counter scrubbing towers. Cf. C. A. 22, 2358. C. H. BARNES

Eliminating tastes and odors by algae in water. C. COHN. Am. City 38, 12-13, 1928. J. Am. Water Works Assoc. 20, 446(1928).—C. describes the use of $CuSO_4$ and $Al_2(SO_4)_3$. D. K. FRENCH

Control of algal growths in the water supply of Los Angeles. C. WILSON. West Constr. News 3, 355-6; J. Am. Water Works Assoc. 20, 732(1928).—The use and methods of application of $CuSO_4$ are described. D. K. FRENCH

The protection of impounded reservoirs. HELMAN ROSENTHAL. Mun. Eng. and Water Works 75, 85-8(1928).—As a result of information obtained through replies to a questionnaire and from R.'s own studies on the Dallas water supplies, it is concluded that from use for recreational purposes can be made by reservoir drainage areas if proper sanitary regulations are enforced. C. R. F.

venting corrosion by water treatment, deaeration, deactivation. H. T. HALL. *Eng.* (Chicago) 124, 29-32; *J. Am. Water Works Assoc.* 20, 730-1(1928).—

the methods mentioned in title represent those in general use. D. K. FRENCH

latest developments in feed-water treatment. D. BROWNLIE. *Eng. and Boiler Rev.* (London) 41, 533-4; *J. Am. Water Works Assoc.* 20, 591(1928).—A review of developments in America with especial reference to embrittlement and to the uses of gases and phosphates. D. K. FRENCH

Modern treatment of supplementary feed water for steam power plants. BALCKE. *Wärme* (Berlin) 51, 411-6; *J. Am. Water Works Assoc.* 20, 729(1928); cf. C. A. 22, 2018.—The paper is devoted largely to a discussion of the advantages of evapn., aeration, and thermochem. treatment of water. D. K. FRENCH

Treatment of feed water for evaporators. T. A. SOLBERG. *Mar. Eng. and Shipg.* Age 33, 283; *J. Am. Water Works Assoc.* 20, 443(1928).—S. recommends the use of Na silicate. D. K. FRENCH

Deoxygenating feed water. CHR. HUELSMEYER. *Eng. Progress* (Berlin) 11, 118; *J. Am. Water Works Assoc.* 20, 443(1928).—H. describes a device that uses manganese-steel wool. D. K. FRENCH

Filtering and softening boiler feed water. H. M. MARSH. *Power House* 22, 33-4; *J. Am. Water Works Assoc.* 20, 591(1928).—M. describes the use of sand filters with and without zeolite softeners. D. K. FRENCH

Treating boiler water. L. M. WILLIAMS. *Refiner Natural Gasoline Mfr.* 8, 98, 100, 102(1929). A treating plant for the treatment of water having high sulfate and chloride content and chem. control methods for such a plant are described. M. B. HART

Chemical and physical changes in a cast-iron well casing. G. THIEM. *Gas u. Wasserfach* 71, 1239-41(1928).—A cast-iron well casing that had been in use for about 30 yrs. under a water with an av. CO_2 content of 56.3 mg./l., showed a sp. gr. of 2.97 as compared to a normal sp. gr. of 7.25. The Fe content had decreased from about 93% to 52% and the percentages of C, Mn, Si, P and S had increased. The casing retained its shape and would have been usable if left in place, and not subjected to mechanical stress. R. W. RYAN

The significance of the colon bacilli in water. Its relationship to the typhoid organism. Tests for *B. coli*. R. S. SPRAY. *W. Va. Coll. of Eng., Tech. Bull.* 1, 13-20, Nov., 1927.—S. discusses the difficulties of finding the typhoid bacillus in water as there are probably not more than 20 proven instances of its isolation even in water known to be polluted or which caused epidemics. Fecal streptococci (a), proteolytic and fermentative anaerobes (b), and the colon bacillus group (c) as indices of pollution, and the unreliability of (a) and (b) as such are discussed. The differentiation between *B. aerogenes* and *B. coli* is shown. S. would not condemn a water which shows a low total count and gas in more than 1 tube if the gas is *B. aerogenes*. C. H. BADGER

Notes on Doncaster (England) sewage disposal scheme. W. H. PRICE. *Munic. Eng. Sanit. Record* 82, 105(1928).—Land drainage is to be replaced by a sewerage system consisting of a new intercepting sewer costing £50,000, detritus, storm water, settling and humus tanks, sludge lagoons, and percolating filter beds. Much of the equipment will be electrically driven. C. H. BADGER

Losses caused by heating liquefied sewage solids. H. HECKELEKIAN. N. J. Agr. Expt. Sta., New Brunswick. *Ind. Eng. Chem.* 21, 324-5(1929).—Sewage solids in soln., when dried at 100-5° lost from 33 to nearly 100% of their C, the % increasing with the ripeness of the sludge. There is also a considerable loss in N. The loss in wt. due to drying ordinary sewage may reach 25% of the total solids. Low gas yields accompanied by decrease in volatile matter in dried sewage is explained on this basis. C. R. F.

Control of scum in sewage tanks. A. M. BUSWELL. State Water Survey Div., Urbana, Ill. *Ind. Eng. Chem.* 21, 322-3(1929).—Liquor from beneath the scum was pumped and allowed to flow on to the scum in a gentle stream. Ten days' circulation under these conditions completely disintegrated a 26' layer of stiff scum and the gases evolved during digesting were allowed to escape smoothly into the gas collector. Circulation for from 5 to 10 mins. a day prevented any further scum formation. Circulation for 3 to 5 mins. at a time was sufficient to break the foam, and routine circulation for 5 to 10 mins. per day was usually sufficient to prevent foam formation. Power costs will not be high, and the method is effective. J. A. KENNEDY

Activated sludge plant at Grand Canyon, National Park, Arizona. JANE RIDER. *Southwest Water Works J.* 10, 12-4; *J. Am. Water Works Assoc.* 21, 157(1929).—This

article describes in more or less detail the plant equipment, operating details obtained.

Modern public cleansing and salvage. A. L. THOMSON. *Munic. En. Record* 82, 125-6, 150-1, 176-7(1928).—A discussion. T. holds that the ha sorting of refuse does not generally cause disease.

D. K.

C. H. B.

The use of p_H control in a sanitary laboratory. LEWIS V. CARPENTER. V Coll. of Eng., *Tech. Bull.* 1, 55-65(1927).— p_H control has made it possible to when sufficient chemicals have been added for coagulation; otherwise, both insol. and sol. Al is usually found in the effluent. Expts. on these pptns. were made in qt. jars on 6 local waters. When sufficient alk. was present, the p_H value corresponding to the amt. of alum which gave the quickest floc was the optimum. When alkali was necessary, a known amt. of alum was added (2 grains per gal.), and the amts. of Na_2CO_3 and lime were varied until the best floc was obtained. After obtaining such p_H value the min. amts. of chemicals needed for coagulation were found by further tests. A procedure for the control of plants is given, based on keeping the p_H value at an optimum point. Such point will sometimes have to be retd. because of variations in the supply. It may be more economical to add less chemicals than are needed to give the optimum p_H value if sufficient time is allowed for settling. Indicators were used in the tests.

C. H. BADGER •

Chlorination in the field of sanitation. LINN H. ENSLOW. Chlorine Inst., Inc., N. Y. *Eng. J. Can* 12, 135-40(1928), cf. *C. A.* 22, 1818, 23, 1455.—New uses of chlorine in the treatment of sewage, in water conditioning, in decolorizing of stack gases and in the treatment of "white water" from paper mills, are described in this paper. Prechlorination of sewage inhibits the formation of H_2S and the consequent production of H_2SO_4 , which disintegrates the sewers. Objectionable odors from manholes, weirs and filter sprays are diminished, flocculation of non-settleable matter in the flow chambers is obtained and the growth of algae and sludge-producing organisms reduced by prechlorination of the sewage. Chlorination reduces the oxygen demand of sewage. Slime-like growth in the vats, stock chests, etc., of paper mills is reduced by chlorination of the "White water"; this permits the recirculation of this water for use in the mill. Chlorinated ferrous sulfate makes a very satisfactory coagulant in water purification. Chlorine applied to the exit gases from meat packing establishments, garbage-disposal plants and other objectionable odor-producing stacks reduces the nuisance by destroying the odor-producing compounds.

J. W. SHIPLEY

The treatment of organic waste. W. WEAVER. *Munic. Eng. Sanit. Record* 82, 97(1928); cf. *C. A.* 23, 1975.—At the Birmingham, England, plant, vegetable matter is thoroughly pulverized and dried for fertilizer. Foreign materials are extracted. The treatment of fertilizers and feeding meals is kept separate.

C. H. BADGER

Eliminating turbidity and trade wastes. C. E. RICKARD. *Water Works Eng.* 81, 671-2, 686, 689-90, 693; *J. Am. Water Works Assoc.* 20, 592(1928).—Operating experiences and results obtained at the new Wheeling, West Virginia, plant are discussed.

D. K. FRENCH

The comparative values of air treatment as applied to ventilation. W. H. DUPRE. *Domestic Eng.* 48, 3-7(1928); *Bull. Hyg.* 3, 668-9.—A device is described by means of which it is possible successfully to collect flue dust at chimney tops as an alternative to the method of lengthening chimneys and slowing up the air column moving through them in order to settle the flue dust by gravity. It is also suggested that spacious roof chambers be used as dust settling chambers; in this manner frequent cleaning of dust filters is avoided. The removal of dust from air is best achieved by washing in a fine water spray, and then removing the excess moisture by impinging the air on oil-coated surfaces.

C. R. F.

Determination of dust and smoke in the inhaled and exhaled breath of man (DRINDER, et al.) 13. The determination of alkali in seepage water [in oil wells] (MAL'YAROV) 7. Differences observed in the conditions of the sea water at the margin 2 opposing tidal currents (THOMPSON, MILLER) 11A. The character of ground water in Balakhanui (KREMS) 22. New ways for sterilization [of water] (DECKWITZ) 11C. Turbine corrosion and degasification (PARIS) 9. Mixing and precipitation apparatus suitable for precipitating saccharates from Steffens waste waters (U. S. 1,708,332-28.

Water filter. GEORGE J. MEYER. U. S. 1,708,140, April 9. Structural features.
Valve for water-softening apparatus. BENJAMIN H. TEN BUNST. U. S. 1,701,602, April 2. Structural features.

707,302, April 2 An app. is described comprising a series of inclined chambers contacted by intermediate vertical chambers, with rotatable screw conveyors in the inclined chambers, in which the entire charge of base-exchange material is uniformly agitated and circulated during the stages of the process. Raw water is passed through mineral in one phase of the process and the exhausted mineral is reconditioned in another phase.

Apparatus for separating oil from boiler-feed water. THOMAS A. SHORT. U. S. Pat. 2,303,883, April 9. An alarm device is provided for indicating when oil accumulates in the feed-water supply.

Sewage-sludge digestion. M. PROCESS Brit 297,250, Dec. 8, 1927. To maintain the temp. in a sludge digestion chamber at about 25°, the fresh sludge, before introduction into the chamber, is heated to above this temp. An app. is described.

Septic tank. CHARLES L. CARLISTER and WILLARD E. JAQUITH. U. S. 1,708,118, April 9. Structural features.

15—SOILS, FERTILIZERS AND AGRICULTURAL POISONS

J. J. SKINNER

The factor of climate in the genesis and classification of soils. H. M. NAGANT. Institut Agr. d'Oka, La Trappe, P. U. *Sci. Agr.* 9, 321-34(1929).—The literature and some data are discussed, showing the great importance of the climate factor in soil genesis and classification. C. R. F.

The dynamics of the physicochemical processes in the soil. S. I. BUNTYAKOV. *Zhurnal Opušnoi Agron. Yugo-Vostoka (J. Expt. Landw. Sudost. Eur.-Russlands)* 3, No. 2, 60-74 (1927); *Eng. Abstr.* 171, *Expt. Sta. Record* 58, 612 3.—Summarizing the results of expts., the author states the following conclusions: (1) The influence of tillage is definitely expressed in the intensity of the process of nitrification; tillage has little or no influence on the mobilization of other nutrients. (2) The porosity of the plowed soil drops toward autumn, the greatest porosity was noted in the chernozem soils, followed by the columnar solonch and finally the dark-chestnut and sandy soils. (3) Favorable conditions for the accumulation of nitrates are from 60 to 66 per cent aeration, 23 to 26 per cent of moisture, and 17 to 22° temp. (4) Following a soil increases the amt. of nitrates 3 times over that of a soil left undisturbed; spring crops increase the nitrates only twice. (5) With a May fallow the max. accumulation of nitrates takes place in July, with spring crops in June. (6) The changes in the amts. of nitrates in various types of soils under conditions of uniform tillage are about alike and may be expressed by identical curves. (7) Under conditions of uniform tillage in various types of soils the max. accumulation of nitrates is quantitatively alike and is to be noted during the month of June. (8) Spring wheat exerts a strong influence on the amts. of nitrates and lime, in respect to other nutrients its influence is negligible. (9) The greatest loss of nitrates under spring wheat takes place on chernozem and dark-chestnut soils; little less on the columnar and sandy soils. This phenomenon is especially marked on all soils at the time of forming the straw. H. L. D.

A comparison of the Robinson, International and Buoyoucos methods of mechanical analysis on non-organic soils and the analysis of such soil with and without preliminary treatment with hydrogen peroxide. J. H. DENNETT *Malayan Agr. J.* 16, 374-7 (1928).—The international method is interchangeable with the Robinson method from which it may be readily obtained by interpolation of the summation curves. As a matter of convenience it is as accurate to det. the clay fraction at the end of 24 hrs. at a depth of 30 cm. by the International method as at the end of 8 hrs. at a depth of 10 cm. It is unnecessary to use H_2O_2 for preliminary treatment of non-org. soils. The methods of Buoyoucos are of great utility for routine purposes for detg. the general limits of the soil concerned. It is more accurate to det. the total sand by direct sedimentation in this latter method rather than by difference. E. F. SNYDER

An improved method of fusion for soils. J. H. DENNETT. *Malayan Agr. J.* 16, 372-8 (1928).—Caustic potash is used in place of Na_2CO_3 and 2 objections to its use are overcome, namely, by previous fusion of the caustic potash and by the use of Ni crucibles instead of Pt. The Ni crucible is only slowly attacked by caustic potash and most

Ni removed in this way does not seem to go into soln. in the acid but filter paper. Any Ni which goes into soln. does not affect the detn. of alumina. The great advantages of this method of fusion lie in the rapidity & it is carried out (a few min. to a quarter of an hr.) and the completeness with sesquioxides and silica are broken down. E. F. SNYDER

The use of highly viscous fluids in the determination of volume-weight. S. H. BACKSTETTER. Calif. Agr. Expt. Sta. *Soil Sci.* 25, 481-3(1928).—The method for vol.-wt. detns. was as follows: The soil mulch was removed from an 11 3 sq. ft. carefully leveled. An auger hole was then put down to the depth soil removed being conserved and its dry wt. obtained by drying out at a 11 F. The auger hole was then rapidly filled with the fluid, heavy road heavy cane sirup, the vol. added being detd. by weighing the container and before and after filling the hole. From the dry wt. of soil and the vol. of the fluid, the vol.-wt. was detd. The trials thus far conducted with this method indicate that it furnishes a rapid and accurate means of verifying the results of vol.-wt. detns. as obtained by the soil-tube method. Comparative results are given in a table. E. F. SNYDER

The colorimetric estimation of phosphorus in acid soil extracts. W. N. C. BELGRAVE. *Malayan Agr. J.* 16, 361-71(1928).—The direct application of the Denigès colorimetric method to acid soil exts. is frequently impossible because of ferric iron and the need of H-ion control. A method of reduction with Zn. and H-ion control with acetates, thymol blue being used as an indicator, is described. Comparative results on different soils between the colorimetric and the volumetric methods are given. Results of analyses, by different methods and different workers, of test solns. are given. It is claimed that the colorimetric method, as modified, is sufficiently accurate, easy to manipulate and particularly suited to tropical labs. E. F. SNYDER

Soil surveys once more. F. S. EARLE. *Facts About Sugar* 24, 64(1929), cf. C. A. 23, 460.—E. agrees with Koningsberger that the physical soil type and the Arrhenius methods of soil analysis are complementary. Some remarks on Prof. Earle's article. O. W. WILLCOX. *Ibid.* 65. M. J. PROFFITT

Some comments on soil surveys in Java and Cuba. A. G. MCCALL. *Facts About Sugar* 24, 158-60(1929); cf. Willcox, C. A. 22, 4701; Earle, C. A. 23, 228.—Modern soil science undertakes to group soils on the basis of all their definitely determinable characteristics, chemical and physical as well. Bennett and Allison (C. A. 22, 2801) made their classification of Cuban soils primarily as a guide for experimentation. The *pu* of every detd. type of soil in the island was looked into as a matter of course, but not in such detail as was necessary in Arrhenius' studies of Java soils. As reported by W., A. found between the best soils and the most acid ones in Java a max. diff. in yield of sugar of only 6.5%, while B. and A. found yield differences equiva. to over 200% in sugar production due solely to differences in the physical conditions of the types of soil compared. The physico-mechanical versus the plant physiological basis of soil surveys. O. W. WILLCOX. *Ibid.* 160.—W. replies to M. M. J. PROFFITT

Some remarks upon the investigation of Java soils. C. H. VAN HANDEL. *Facts About Sugar* 24, 226-7(1929).—Historical M. J. PROFFITT

The profile of a common sandy soil type in Norfolk County, Ontario. F. F. MURPHY. *Ontario Agr. Coll. Guelph. Ser. Agr.* 9, 301-12(1929).—The acidity was highest in the leached horizon of the virgin soils and in the surface horizon of the cultivated soils. The virgin soils contained more org. matter and were more acid than the cultivated soils. The max. colloidal content is in the lower surface horizon and is held to be an important factor in controlling the moisture supply. Org. matter was highest in the surface layers. C. R. FELLERS

Technic of pot experiments (with plants). E. MAIWALD. *Agrikulturchem. und bakteriol. Inst. der Univ., Breslau. Landw. Vers.-Sta.* 107, 342-63(1928).—The whole technic is reviewed and various minor errors are discussed. E. F. SNYDER

The decomposition of urea in sand cultures and in soil. KLEMMER. *Landw. Vers.-Sta.* 107, 296-301(1928).—The speed of decompn. varies with the texture of the soil; in general, the lighter the soil the quicker the decompn. Heating to 300° or treatment with 2% HCl destroys these differences, but they persist after treatment with CHCl₃. E. F. SNYDER

Field and vegetation experiments on mineral soils showing exchange acidity. ROEMER. *Landw. Vers.-Sta.* 107, 307-14(1928).—By using kainite rather than other K salts substantially higher yields of rye and oats were obtained in field expts. Pot expts. in which the several constituents of kainite were employed showed that the benefit could be ascribed to Mg salts. This explanation was further substantiated by a comparison of Mg phosphate with other phosphates. E. F. SNYDER

Decomposition of peat measured by carbon dioxide evolved. ROBT. H. BEDFORD. Univ. of Alta, Edmonton. *Sci. Agr.* 9, 522-32(1929).—The object of the expt. was to determine whether the measurement of CO_2 evolved is indicative of the fertility of sphagnum peat. Chem. and bacteriol. examns. as well as vegetative pot expts. were carried out on an undecomposed peat contg. 43.4% C and 1.31% N. The filtrate resulting from 2% acid hydrolysis of straw being used as an energy medium with or without the fn. of inorg. salts, the CO_2 evolved and the N fixed were measured daily for 2 weeks. The rhythmic rise and fall of CO_2 evolved was analogous to the fluctuations in bacterial N and K were limiting factors for plant growth in the peat soils. N fixation increased steadily for 2 weeks and CO_2 evolution decreased greatly. Conclusion: CO_2 evolution cannot be used alone as an index of fertility when applied to peat soils. Fungal population is characteristic of sphagnum peat. C. R. FELLERS

Conditions of formation and constitution of the argillo-humic complex of the soil DEMOLON AND G. BARRIER. *Compt. rend.* 188, 654-6(1929).—Colloidal clay is a factor in fixation of the humic colloids in the soil. The investigations of D. and B. furnish exptl. basis for the notion of the argillo-humic complex. The cations absorbed by the clay, and in particular Ca, condition the formation of this complex, which can be reproduced by starting from its constituents and which permits of the equil. reactions. E. F. SNYDER

A study of nitrate production in virgin soils of Alberta. ROBT. H. BEDFORD. Univ. of Alta, Edmonton. *Sci. Agr.* 9, 301-9(1929).—Four soils were examd. A definite relationship was found between % org. matter, bacterial nos. and nitrates. An inverse relationship exists between nos. of bacteria per g. of soil and total org. matter in 100 g. of soil. N is a limiting element in the peat under investigation when measured against the N content of the org. matter of the mineral soils. The nos. of microorganisms of peat and mineral soils are shown to be wholly divergent, when calcd. upon their org. matter content. The soils of Alberta are plentifully supplied with nitrates. C. R. FELLERS

Boron in the soils and irrigation waters of Southern California and its relation to citrus and walnut culture. W. P. KELLEY AND S. M. BROWN. Trop. Agr. and Citrus Expt. Sta., Riverside. *Horticult.* 3, 415-58(1928). B was detd. by distn. with MeOH, followed by double titration of the distillate with standard alkali; *p*-nitrophenol and phenolphthalein were used as indicators and mannitol was used as a catalyzer. One kg. of soil leached with 200 cc. distd. H_2O or 4 l. of irrigation water were used for samples. B free reagents and app. were used. Contents of B that are toxic to citrus and walnut trees occur in certain irrigation waters of southern California. In a few relatively small areas the soil contains an enormous quantity of sol. B, which has probably accumulated as a result of purely natural causes. Citrus trees show the toxic effect of B by a yellowing of the older leaves around the margins and between the veins and a dying back of the tips and margins. The new growth may not show the injury until it is several months old. Many of the affected leaves fall off in the winter and early spring months. When walnut trees are injured by B, the leaves turn brown around the margins and between the veins during Aug. and Sept. Earlier in the year the leaves may not show any evidence of B injury. B-affected walnut leaves tend to fall prematurely. Citrus and walnut trees absorb B readily and this element tends to accumulate in the leaves. The detn. of the B content of the leaves of citrus and walnut trees gives valuable indication as to whether this element is the cause of abnormal leaf conditions. When introduced into the soil as a constituent of the irrigation water, B gradually accumulates in the upper layers of the soil as a result of evapn. Heavy rains probably carry down some of the B from time to time and thus retard the accumulation of sol. B in the region of tree roots. Fourteen references are discussed. C. R. FELLERS

The fixation of atmospheric nitrogen by Azotobacter. OTTO MEYERHOF AND AN. BUNG. Kaiser Wilhelm Inst. für Biologie, Berlin-Dahlem. *Z. physik. Chem.*, Abt. A, *Haber-Bd.* 139, 117-42(1928).—The respiration and N fixation of aerobic *Azotobacter chroococcum* in liquid cultures and short time expts. were investigated. The magnitude of respiration in air is, apart from the activity of different salts of the soln., primarily detd. by the presence of sugar and is in its presence 10 to 15 times as great as in a sugar-free soln. Narcotics and HCN act similarly as with other cells. The magnitude of respiration per unit of dry wt. subsides strongly with the increasing age of the liquid culture, from an initial value (at 20°C). Also, the speed of growth subsides after 24 hrs., which must be traced back to the aggregation of the bacteria. Under av. behavior the increase of the bacteria no., the dry wt. and the N no. run exactly parallel. The max. respiration lies at 15 to 20% of the O_2 content of the atm. and

falls off strongly toward both sides. In pure O_2 the respiration is only $1/3-1/2$ of that in air. In comparison for short periods it is independent of the presence of N_2 , and O_2-H_2 mixts. it is equal to that corresponding to concd. O_2-N_2 mixts. The rise of the respiration as an expression of the growth is, in the absence of added NH_4 salts, independent of the N_2 content of the atm. In O_2-H_2 it is zero; in 1 and 2% N_2 it is not detectable becoming first perceptible at 5% N_2 ; in 20% N_2 it approaches a value as great as that in air. The O_2 concn. has a considerable influence on the magnitude of the fixation and upon the ratio: $\frac{\text{mol. } N_2 \text{ fixed}}{\text{mol. } O_2 \text{ consumed}}$. While the abs. max. of fixation growth lies at 4 to 5% O_2 , the fixation rate increases continuously with decreasing pressure. While in 60% O_2 , however, it is zero, in air 0.003 to 0.008, it is at about 5% O_2 0.02, at 1 to 2% O_2 about 0.03, at 0.12% O_2 about 0.10. The energy output of the oxidation increases therefore with decreasing O_2 pressure, calcd. from air from about 0.5% to about 12%. Also the assimilation of added NH_4 in N_2 -free atm. increases with decreasing O_2 pressure; however, the ratio $\frac{N \text{ assimilated}}{O_2 \text{ consumed}}$ is hereby apparently little altered.

E. F. SNYDER

Effect of date of seeding of winter wheat upon some physiological changes of the plant during the winter season. GEORGE JANSSEN. Univ. of Arkansas. *J. Am. Soc. Agron.* 21, 168-200(1929).—Changes in the compn. of the crown of the wheat seedling were studied during 2 consecutive winter seasons. In general there seemed to be a pos. correlation between the total sol. carbohydrate compds. and better dates of seeding or winterhardiness for the yr. 1923. The Sept. 21 seeding, the best date of seeding, showed in 1923, particularly, the greatest % of total sugars as well as total carbohydrate compds. However, for the 2 yrs' results, winterhardiness could not be attributed to the hexose carbohydrate compds. alone. The total N compds. remained about the same throughout the winter months, being somewhat higher in the younger plants than in the older plants. The H_2O -sol. N and sol. N, which is coagulable by heat, increased during the fall months as the temp. decreased. The sol. N, which is coagulable, increased with the lowering of the temp. to the f. p. after which it greatly decreased. The % of H_2O -sol. N which is coagulable was greatest for the favorable dates of seeding, before the plants were frozen, but after freezing occurred, the coagulable N was much less for plants from the favorable than from the unfavorable seedings. The plants from the most favorable dates of seeding have a greater capacity of changing the protein N from a precipitable to a nonprecipitable form.

E. F. SNYDER

The role of potassium in the culture of the sugar beet. J. PH. WAGNER. *C. r. rend. acad. agr. France* 15, 190-3(1929).—The increasing yields, both in roots and in sugar, correspond regularly to the increasing amts. of K salts.

E. F. SNYDER

Soil reaction studies on the Connecticut tobacco crop. P. J. ANDERSON. Conn. Tobacco Substation. *J. Am. Soc. Agron.* 21, 156-8(1929).—Considering both yield and quality the optimum reaction for tobacco soils is between 5.0 and 5.6. An explanation of the injurious effect of extreme acidity is given along with a discussion of how the farmer may keep his soil at optimum reaction.

E. F. SNYDER

Tobacco as an indicator plant in studying nutritional deficiencies of soils under greenhouse conditions. M. F. MORGAN. Conn. Agr. Expt. Sta. *J. Am. Soc. Agron.* 21, 120-6(1929).—Tobacco (Turkish) has been used with very successful result as an indicator plant to show the fertilizer response of soils under greenhouse conditions. A deficiency in available supply of a nutrient element is evidenced by significant yield reduction and physiol. characteristics of tobacco grown on soils unfertilized with that particular element. No correlation between response and total amts. of N , P_2O_5 , or K_2O was observed on any of the 24 different soil types under investigation. A good correlation existed between P_2O_5 response and amts. of soil P_2O_5 sol. in 0.01 N H_2SO_4 as detd. by the oxalcomolybdate method. K availability was apparently reduced by liming under the condition of these expts. Lime had no beneficial effect except on soils at pH values below 4.8. On soils below pH 4.2 abnormal plant were produced; the injurious effects of this degree of acidity may be assocd. with toxicity of sol. Al or Mn or both. Data given in this paper are incidental to the discussion, and final conclusions should not be attempted until the investigations are completed.

E. F. SNYDER

Nutritional problems of bright tobacco. E. G. MOSS. U. S. Dept. Agr. *J. Am. Soc. Agron.* 21, 137-41(1929).—For the successful production of bright tobacco the phys. and chem. properties of the soil are of first importance. The effects on this tobacco of individual plant nutrients such as N, K_2O , Cl, MgO and their sources are

discussed. The P_2O_5 , CaO and S requirements considered from a practical standpoint are not of special importance at the present time.

Nutritional deficiency studies on tobacco. J. E. McMURTRY, JR. U. S. Dept. Agr. *J. Am. Soc. Agron.* 21, 142-9(1929).— K_2O , MgO, CaO deficiency, the distinction between K_2O deficiency and MgO deficiency and the effects produced when more than one element is deficient are discussed.

Some factors affecting the nicotine content of tobacco. CHARLES W. BACON. S. Dept. of Agr. *J. Am. Soc. Agron.* 21, 159-67(1929).—Topping not only has a profound effect on the nicotine content, but also det. in no small degree the characteristics of the tobacco type itself. The nicotine content also increases during the maturing ripening of the leaves. High N application also increases the nicotine content. The effect of hybridization is also discussed.

A water culture technic for studies in tobacco nutrition. A. B. BEAUMONT AND G. J. LARSISOS. Mass. Agr. Expt. Sta. *J. Am. Soc. Agron.* 21, 150-5(1929).—Four devices and methods of using them are described and devices pictured.

The chemical approach to the study of problems of tobacco fertilization. D. E. HALBY. Pennsylvania State College. *J. Am. Soc. Agron.* 21, 114-7(1929).—The K requirement is one of the most important factors involved in the production of good-quality cigar leaf tobacco. Several well-established facts of a chem. or biochem. nature bearing directly or indirectly on this subject are considered along with a formulation of a chem. interpretation for a no. of unexplainable observations noted by different workers in their investigations dealing with the relationship of K to the plant itself and to the quality of the product.

The lime requirement of acid soils. EUGÈNE ROUX AND CH. BRIOUX. *Compt. rend. acad. agr. France* 15, 185-90(1929).—The lime requirement detd. in the lab. is insufficient for assuring the neutralization of the soil in the field; it should be multiplied by a coeff., probably variable, according to the nature of the soil, and which, for soils of the same nature, appears greater for those which are less acid than for those of an acidity equal or greater than 0.50 per 1000. The coeff. to employ varies between 2 and 3; but to state precisely, it should be necessary to multiply the test in the different regions and on the soils of varied geological nature. Christensen and Jensen arrived at analogous conclusions, and for Danish soils the coeff. by which the lab. lime requirement should be multiplied should be higher than 2.5.

The use of ground limestone (for soil improvement). M. LENGLEN. *Chimie & industrie* 21, 396-400(1929). A discussion of the importance of the nature (phys. structure) of the limestone and its fineness.

Value of lime on Cecil clay loam soil. C. B. WILLIAMS, S. K. JACKSON AND F. T. MEACHAM. N. Carolina Agr. Expt. Sta., *Bull.* 261, 3-26(1928).—As a result of field expts. conducted over a period of 8 yrs., the use of CaO without fertilizer gave the greatest increase in actual % yields with all crops. However, CaO alone did not promote as large increases in actual yields per acre as when combined with fertilizers. In a clover, corn, wheat and cotton rotation, the favorable effect of CaO is attributed to the larger amts. of clover which was produced, and turned under the soil. The use of CaO with P and K is recommended for red clover. For non-leguminous crops, the addn. of N, P and K in moderate amts. to the CaO was profitable. The inference is made that CaO either liberates P_2O_5 and K_2O from the soil for assimilation by the crops, or that the materials supplying these constituents serve to a considerable extent in duplicating some of the functions of CaO in the soil.

Value of lime on Norfolk sandy loam soil. C. B. WILLIAMS, H. B. MANN AND R. E. CURRIN, JR. N. Carolina Agr. Expt. Sta., *Bull.* 262, 3-21(1928).—Results are based on field expts. conducted for 4 yrs. for the purpose of detg. the effect of CaO upon the yield of corn, cotton and peanuts grown in rotation and treated with different amts. and combinations of fertilizers. Contrary to results on the Cecil clay loam soil of the Piedmont section of the state, CaO used alone on corn and cotton grown on the Norfolk sandy loam soil of the Coastal Plain has not usually been found to increase yields. Generally, the increase made from its use as a supplement to different fertilizer mixts. was not sufficient to pay for the cost of its application. In many cases it actually reduced the av. yield of these crops as well as that of peanuts. The use of CaO seemed to be most harmful to the yields of corn, cotton and peanuts under the following fertilizer treatments: with corn when only 2 of the essential constituents of plant food were supplied, and when complete fertilizers, high in N and K_2O , were used; with cotton when only P_2O_5 and K_2O or N and K_2O were supplied, and when complete fertilizers, high in P_2O_5 or K_2O , and when high amts. of complete fertilizer were applied; with peanuts when only P_2O_5 and N or N and K_2O were supplied, and when complete

fertilizers high in P_2O_5 , N and K_2O each were used. These 3 crops grown in -- are rarely benefited enough from applications of CaO to justify its use on this t soil.

C. R. FELL

The changes in soil reaction effected by long-continued fertilizing. BRV THOMAS AND F. J. ELLIOTT. *J. Soc. Chem. Ind.* 48, 51-4T(1929).--The o effects of different fertilizers on the reaction and exchangeable base content of a soil are given in the table.

Fertilizers	Effect on lime status of soil as indicated by measurements of	
	pH	Exchangeable b
Cake fed to sheep	No significant effect	No significant effe
Superphosphate	No significant effect	No significant effe
Dissolved bones	No significant effect	Slight increase
Basic slag	Slight increase	Large increase
Lime	Large increase	Very large increase

E. F. SNYDER

The manufacture of fertilizers and its relation to the agriculture of Hawaii.

G. OWEN. Assoc. Hawaiian Sugar Technologists. *Planter and Sugar Mfr.* 81, 363 (1928).--See C. A. 23, 230.

J. F. BREWSTER

Recent European fertilizer developments. H. R. SMALLEY. National Fertiliz Assoc., Washington, D. C. *Ind. Eng. Chem.* 21, 375 7(1929).--Comparison of po war (1925-1927) with the pre-war (1913-1914) years shows a marked increase in t consumption of fertilizers in Germany, Holland and France but no increase in Gr Britain. During the period 1913 to 1927 there have been big increases in the use fertilizer N and K_2O , with P_2O_5 making little, if any, gain. A comparison of pre-w and post-war crop yields in Germany and France shows that German yields have declined 14%, while French yields have increased 9%. The disparity in yields attributed to unfavorable weather in Germany in recent years and also to a lack of P_2O_5 . There has been a marked decline in consumption of Chilean NO_3 in Europe, especially in Germany where its use has been practically discontinued, and a tremendous increase in the consumption of synthetic N, largely $(NH_4)_2SO_4$ and cyanamide. There is a decided trend toward the use of complete fertilizers in Europe. In Great Britain 50-60% of the total fertilizer tonnage is factory-mixed, and the use of complete fertilizers is on the increase.

E. F. SNYDER

The determination of potassium in mixed fertilizer. A. STRAIN. Kalifornische Anstalt, Berlin. *Z. anorg. Chem.* 42, 179 82(1929).--The detn. of K in mixed fert in the previous form is bothersome and leads to inaccurate values. By the new meth the addn. and expelling by ignition of NH_4 salts are avoided, the NH_4 of the mixed fertilizer is expelled with caustic soda and the phosphoric acid not pptd. The method is therefore simple, is quickly carried out and yields uniform and accurate K_2O values. This works especially well with the Neubauer analysis.

E. F. SNYDER

Polish phosphates. Fertilizer value of pulverized phosphates from Nierzwiska. PIOTR TERESZCZENKO (with STRZEMINSKI AND HELENA SOWINSKA). *Jagell. Inst. Przemysl Chem.* 11, 81-101(1927).--Pot expts. with oats were performed to study the Nierzwiska phosphates in comparison with Thomas slag and pptd. phosphate. Flours passing 0.16 mm. mesh were used. The Nierzwiska phosphate contained 25.2% P_2O_5 and 21.43% $CaCO_3$. The pots were filled with 1.5 kg. clayey earth of low P_2O_5 and $CaCO_3$ content, showing very nearly neutral reaction. Samples were run without addn. of phosphates, with 0.5, 1, and 2 g. P_2O_5 per pot, with 0.6 g. K_2O and 1 g. N introduced as KNO_3 and NH_4NO_3 , and as K_2SO_4 and $(NH_4)_2SO_4$. Introduction of phosphates to the soil increased the grain yield 2.6-3.3 times and the straw yield 1.5-2.5 times. The phosphate flour used even in very nearly neutral soil equalled the pptd. phosphate and fell only slightly below the slag in its action. Increasing the amt. of the phosphate flour and substituting physiologically acid K, N fertilizer for the neutral increased the crop of grain and its % content of P_2O_5 . Similar effects were also found on the yield of the straw. Assimilation of P_2O_5 with K, N physiologically neutral, was not much lower from the Nierzwiska phosphate than that from the ppt. and the slag, with K, N physiologically acid, it was clearly higher. The active acidity of the soil raised by the addn. of the fertilizer, and was lowered later during the growth of the

A. C. ZIMMIS

ish phosphates. Fertilizer value of phosphate from Nierzwiska and from Lubel. WLADYSLAW VORBRUDY (WITH NIDA AND ZAKRZEWSKI). *Przemysl Chem.* 11, 78-81 (1927).--Flower pot tests with oats showed a decided increase in the yield of grain and

law with both these phosphates in physiologically neutral soil, and still greater yields in physiologically acid soil over yields in soils having no added P_2O_5 . A. C. Z.

Polish phosphates. Possibility of using them in agriculture. JERZY PFANHAUSER. Chem. Lab. Dr. Roman May, Lubon, Poland. *Przemysl Chem.* 11, 101-14(1927).—When phosphates from Kielce, Poland, Florida (hard rock) Gals, Tunis and Constantine are treated with an amt. of H_2SO_4 sufficient to produce dibasic phosphates and also in amounts greater and less than this, an equil. is usually established in which there is 80% and more of monobasic phosphates, and only 10-30% of dibasic phosphates. A period of 2-6 months in general does not make the equil. shift in favor of the dibasic compds. In treating the Polish phosphates (from Kielce), after a time, there can be noticed a diminution of P_2O_5 sol. in 2% citric acid; it amounts to 4% of the original citric-acid sol. P_2O_5 . The other phosphates studied show either more or only a slight diminution in that sense, up to 10%. This diminution in citric-acid sol. P_2O_5 in Polish phosphates can be brought down by mixing with them the foreign phosphates and bone flour. About 45% of the P_2O_5 in the Kielce phosphates is in a form which can be assimilated by plants.

A. C. ZACHLIN

Polish phosphates: their solubility in citric acid. WLADYSLAW VORBRDZ (with STRZEMIENSKI and ZAWADZKI). Jagiello Univ. *Przemysl Chem.* 11, 72-8(1927).—The soly. of Polish phosphates from Niezwiska and from Rachow in 2% citric acid solns. was studied. By increasing the ratio of the solvent to the pulverized phosphate or by prolonging the time of digestion, complete soln. could be effected. A greater concn. of the acid produced the same effect. Thus, these phosphates contain only compds. sol. in dil. citric acid.

A. C. ZACHLIN

Solubility of Polish phosphates in citric acid. ZYGMUNT KOEHLER (and A. SIEGEL). Jagiello Univ. *Przemysl Chem.* 11, 619-24(1927); cf. *C. A.* 22, 4705.—Finely ground (passing 4000 mesh) samples of phosphates from Niezwiska and Kutyska on the Dniestr, Rachow and Nalbow on the Vistula, and Smordwa near Pelcza, Volhyn, were treated with 2% citric acid in ratios of 1:100 and 1:500 parts of sample to soln. These phosphates contain no compds. insol. in 2% citric acid (cf. preceding abstr.).

A. C. ZACHLIN

The production of artificial manure from oats straw under control conditions. P. E. BROWN and F. B. SMITH. Iowa State Coll., Ames, Iowa. *J. Am. Soc. Agron.* 21, 310-22(1929). Composting oats straw with $(NH_4)_2SO_4$ and CaO or $NaNO_3$, or with urea under conditions in the greenhouse for 5 months led to rapid decompn. The application to the straw of 1% or less of N in the form of various nitrogenous materials permitted the production of a good artificial manure after 5 to 9 months' composting under optimum moisture and temp. conditions. With addns. smaller than 1% the treatment with NH_4 , SO_4 and lime seemed to be preferable. The rate of decompn. of various mixts. of straw and chemicals in sand as measured by CO_2 production in the lab. was very rapid when NH_4 , SO_4 with $CaCO_3$ or urea were employed. The other nitrogenous materials were less effective and cyanamide gave a depression. The results of a field expt. indicate that decompn. was more rapid in various compost mixts. than with straw alone. The decompn. in the open, however, was not so rapid as in the greenhouse and there were no great differences among the different composts. The artificial manures produced in the greenhouse, with 2 exceptions, showed as great or greater effects than farm manure on the nitrate content of a virgin Carrington loam. The nitrifying power of the soil was stimulated by practically all of the mixts., but to a less extent than by manure in the early days following treatment, although later the effects were greater than those brought about by manure. In some cases the nitrate-assimilating power of the soil was stimulated by the artificial manures but not to a large extent. The effects, however, were very similar to those brought about by farmyard manure. The production of an artificial manure which will have similar beneficial effects to farm manure seems quite possible. E. F. S.

The economics and synthesis of ammonia for use in fertilizers. I. F. GOODWIN. Queen's Univ., Ontario, Canada. *Can. Chem. Met.* 13, 39-44(1929).—The various synthetic NH_3 processes and catalysts are discussed along with the chief economic factors entering into the manuf., such as, cost of H_2 and N_2 , capital cost of conversion plant, and cost of elec. power. The NH_3 problem has become a H problem, the cost of the raw material accounting for nearly 80% of the manuf. cost. What process to be employed for the synthetic production of NH_3 must be carefully considered in regard to adaptation to local conditions.

E. F. SNYDER

The action of large amounts of nitrogenous fertilizers on the content of protein material in wheat. EUGENE ROUX. Inst. Recherches Agron. *Compt. rend. acad. agr. France* 15, 181-5(1929).—If an insufficiency of N is revealed, in certain cases, by a

depression of the gluten content, the application of N fertilizers, according to the agricultural practice and up to the extreme limits compatible with the sanitary of the yield, remains without appreciable influence on the content of protein mat in wheat.

E. F. SNYDER

Fertilizers for wooded soils. F. A. WYATT AND A. S. WARD. Univ. Alta, monton. *Sci. Agr.* 9, 423-33(1929).—The wooded soil belt constitutes $\frac{1}{3}$ of the area of Alta and neighboring provinces. Mineral plant foods were less abundant in the wooded soils than in the black or brown prairie soils. The first foot of the black soil contained 6 times as much N, twice as much Ca and more Mg than is found in the same depth of the wooded soil. Pot expts showed that where P was applied, a germination was more rapid, plant growth was more vigorous, maturity was hastened, total yield of produce was greater than in controls without added P. Av. crop increa. for fertilizer treatments were P 53, N 16, CaO 29, manure 47, CaO and P 65, and mix fertilizer 63. Virgin wooded soil supported vigorous nitrification, which was still further stimulated by the addn. of CaO. P retarded nitrification. The treatment of CaO plus P showed less nitrates than CaO alone. While P depressed nitrification and the N content of the crops was lower accompanying the P treatment, the crop yields were actually increased because of the P treatment. This indicates that P is not a limiting factor in virgin wooded soil to the same extent as CaO or P.

C. R. FELLERS

Some effects of sub-soil fertilization on the tops and root system of H-109 cane. D. M. WELLER. *Facts About Sugar* 24, 278-82, 288(1929). Expts. were made in boxes contg. a 3-in. layer, 15-19 in. below the surface, of soil treated with (a) $(\text{NH}_4)_2\text{SO}_4$ in the proportion of 500 lb. of N per acre, (b) superphosphate in the proportion of 500 lb. of P_2O_5 to the acre, and (c) K_2SO_4 in the proportion of 4500 lb. of K_2O per acre. Compared with controls, the fertilized soils increased (1) the linear growth of the cane by (a) 63.2%, (b) 68.3%, and (c) 93.7%; (2) the dry wt. of the tops by (a) 78.4%, (b) 111.1%, and (c) 111.0%; and (3) the dry wt. of the roots by (a) 61.6%, (b) 90.5%, and (c) 84.6%. The proportion of total root development in each of the various 8-in. layers and the ratio of tops to roots was not affected materially by the presence or absence of any of the three fertilizers. Chemotropism of the roots to fertilizer was not indicated in any case and the stimulation of the root development extended equally to the fertilized and the unfertilized sides of the box. The increase of root development came from the shoot roots and not from the growth of the seed-piece roots.

M. J. PROFFITT

A study of the influence of fungicides: the toxicity of fungicides. M. F. MARKOVA. *Zap. Leningrad. Selsk. Khok. Inst. (Mem. Inst. Agron. Leningrad)* 3, 270-7(1929). *Expt. Sta. Record* 58, 845. Following a discussion of the chemistry and the toxic properties of fungicides, the author presents data showing the influence of FeSO_4 and of the double salt $(\text{NH}_4)_2\text{SO}_4 \cdot \text{FeSO}_4 \cdot 6\text{H}_2\text{O}$ on the conidia of *Erysiphe graminis* and on the uredospores of *Puccinia dispersa*. The former are more sensitive to a given concn. of the fungicide. The FeSO_4 is more toxic than is the double salt, due supposedly to the fact that the latter contains the $(\text{NH}_4)_2\text{SO}_4$ mol., which antagonizes the FeSO_4 .

H. L. D.

Laboratory method for measuring relative adhesive qualities of fungicidal dusts. ROBERT C. WILLIAMS. Ohio Agr. Expt. Sta. *Ind. Eng. Chem., Anal. Ed.* 1, 81-2(1929). The dusts were introduced through a glass tube in the top of a bell jar by means of a test tube atomizer. Shellacked microscope slides and also apple leaves were placed in the bell jar. The lab. tests are in accord with tedious field tests even though the conditions of the expt. were at variance. A table is given showing the ranking of dusts by lab. and field tests.

E. F. SNYDER

Tar-distillate winter washes and the apple capid bug. S. G. JARY. *J. Missouri Agr.* 35, 917-21(1929).—The tar-distillate washes and the various combinations used in these expts. gave only a partial control of the apple capid bug, although spraying was done more thoroughly than would be possible under com. conditions. In order to prevent serious fruit marking a spring spraying would still have been necessary. Two sprayings at an interval of 2 days gave no better control than 1 spraying. The inclusion of caustic soda, either as a preliminary wash or in combination with a tar-distillate wash, did not increase the killing power. When used in combination with a tar-distillate wash, caustic soda has certain advantages. Tarry material which clogs the spraying machinery is thrown out and floats on the surface of the wash. A composite caustic soda and tar-distillate wash (wash No. 4) was much more economical in use than an ordinary tar-distillate wash; on aphids and winter moth cat. puparia it gave an equally good result.

E. F. SNYDER

Naphthalene treatment of beet seeds to repel parasites. V. STRANIS. *Exptl.*

ation at Semčice u Dobruvice, Bohemia. *Listy Cukrovar.* 47, 309-14(1929).—Naphthalene does not repel parasites from beets. FRANK MARESH

Chemicals in the apiary. RAY HUTSON. New Jersey Agr. Expt. Sta., *Circ.* 11, 1-8(1929).— $\text{Ca}(\text{CN})_2$ is recommended for bee-pest control while CH_2O solns. are active for the disinfection of such combs infected with American foul brood as can be salvaged at a profit. In regard to the relative merits of EtOH and CH_2O solns., the former under controlled conditions demonstrated a lower cost in favor of CH_2O with an equal chance of eliminating disease. C. R. FELLERS

Bruchus obtectus Say. HAROLD E. BOX. *Rev. ind. agr. Tucumán* 19, Nos. 5-6, 146-54(1928).—After a description of the biology and damage of this insect, with numerous diagrams, preventive and control measures are considered. The store should be fumigated with 40% HCHO . Small balls of naphthalene at a concn. of 0.5 kg. per 1000 g. of grain will prevent entry of the insect. Beans for seed can be preserved by immersion in kerosene for an hour without affecting germinating power. Beans for consumption may be treated with lime. Other methods, non-chemical, are discussed. S. L. B. ETHERTON

Does Hg from disinfectants go into the harvested grain and in the flour? (STOCK, *ZIMMERMANN) 12. Damages to vegetation from gases in smoke (NOACK) 11D. A bio-chemical study of some soil fungi with special reference to NH_3 production (THAKUR, NORRIS) 11D. The transpiration ratio of farm crops and pasture plants in the Adelaide district (RICHARDSON, TRIMBLE) 11D. Geologic remarks on phosphates from Niezawiska, Poland (NOWAK) 8. Polish phosphates (TOKARSKI) 8. A simple speed controller especially adapted to the moisture equivalent centrifuge (VEHMEYER, GIVAN) 1. Physiological studies in plant nutrition. I. The effect of manurial deficiency on the respiration and assimilation rate in barley (GREGORY, RICHARDS) 11D. The limestone resources of the Ponton Fairbury region (LAMAR) 18. SiO_2 [for agricultural purposes] (Brit. pat. 206,832) 18. Solution for use in separating different seeds (U. S. 1,708,435) 18.

METCALP, C. L.: *Destructive and Useful Insects. Their Habits and Control.* London: McGraw-Hill Pub. Co. 918 pp. 27s. 6d. net.

Fertilizers. EMIL BAUER and FISLER ET SCOLD. Fr. 647,267, Nov. 3, 1927. Molasses residues (vinasses) are mixed with the satm. scums formed in sugar refinery to produce fertilizers. Cf. C. A. 22, 5017, 4709

Fertilizers. SELBI (Soc. d'exploitation de licences de brevets industriels). Fr. 33,696, June 18, 1927. Addn. to 623,227. A dry non hygroscopic fertilizer is obtained by adding 3-4% H_2SO_4 to vinasses from distilleries or sugar factories before adding superphosphate as in the prior patent.

A rational compost for all crops. F. J. B. C. DE TRAY. Belg. 651,201, June 30, 1928. Peat is impregnated with a soln. contg. fertilizing compds. supplying nourishment to the plants and also with catalytic fertilizers, which facilitate assimilation of the nourishing fertilizers. The resulting compost is crushed and then sprinkled with liquid manure.

Phospho-ammonium fertilizer. P. FOCHT and L. DIDIERE. Belg. 351,523, June 30, 1928. A very finely divided natural phosphate is thoroughly kneaded with NH_4Cl and allowed to stand for several days so as to give rise to a certain proportion of sol. phosphate.

Insecticide. WILLIAM H. VOLCK (to Calif. Spray Chemical Co.). U. S. 1,707,465, April 2. A substantially non-volatile viscous mineral oil substantially free from phytocidal ingredients, such as "Oronite crystal oil," is used with a poison such as Pb arsenate and with water as a spray for citrus trees, etc. U. S. 1,707,466 specifies a similar mixt. comprising oil and water emulsified together with an emulsifying ingredient, such as a mixt. of alkali oleate, caseinate and resinate, so that the emulsion reverts to aq. and oily films almost immediately after contact with foliage or other solid surface to which the emulsion is applied in use. U. S. 1,707,467 specifies fungicidal emulsions of a similar oil and water, which may contain a small proportion of S, and an emulsion-stabilizing material. U. S. 1,707,468 specifies the use, in like compns., of an oil having a viscosity between 50 sec. and 350 sec. Saybolt, sp. gr. 0.8-0.9, b. p. 150-400°, substantially free from unsatd. constituents; when agitated, with air at 100° for 284 hrs., it does not produce more than about 25% of substances, which can be removed by 1.84 sp. gr. H_2SO_4 , washing with NaOH and filtering through fuller's earth.

Herbicide. COMPTOIR PARISIEN D'ENGRAIS ET DE PRODUITS CHIMIQUES. 647,104, May 25, 1927. An herbicide contains, e. g., soap 10, heavy oil 25, and or metal borate 5 in 1000 parts of water.

Oil emulsion for spraying plants. HUGH KNIGHT (to Calif. Spray Chemical Co.). U. S. 1,707,469, April 2. A substantially non-volatile oil practically free from phytocidal properties is used with an emulsifier such as oleic acid substantially insol. in water as compared with oil; these substances are agitated with substantially pure water to form an emulsion, the disperse globules of which are visible with a low-power magnifying glass such as one having a magnification of 5 diam. U. S. 1,707,470 sprays contg. similar oil preps. together with a poison such as PhNO_2 or p -dichlorobenzene.

Composition for curing cereal diseases. HANS P. STOLDT. Can. 288,417, Apr. 2, 1929. A compn. for curing cereal (wheat, etc.) diseases comprises an aq. soln. of FeSO_4 67.5, CuSO_4 18.5, NH_4NO_3 13.4 parts and a powder contg. As_2O_3 13.8, FeSO_4 67.5, and CuSO_4 18.5 parts.

Aqueous extract of mowrah seed for killing earth worms. PREMIER OIL EXTRACTING MILLS, LTD., and W. E. WATERHOUSE. Brit. 236,608, Dec. 19, 1927.

Toxic fumigant. EDMUND P. KAMPA and PHILIP N. HYMAN (Kampa to Hyman). U. S. 1,707,727, April 2. A soln. of tetrachlorodinitroethane in a volatile halogenated hydrocarbon solvent of the paraffin series such as ethylene dichloride is used for killing insects, bacteria and vermin.

16—THE FERMENTATION INDUSTRIES

C. N. FREY

Butyric acid fermentation of calcium lactate. V. N. SHATOSHNIKOV AND I. ZAKHAROV. *Trans. Sci. Chem.-Pharm. Inst. (Moscow)* 1927, No. 18, 7-25. A soln. of Ca lactate with phaseolm as the N source was inoculated with a mixt. of bacteria. From a vol. of 3 l. contg. 450 g. Ca lactate only 2 g. of ethyl and propyl alcs. were obtained. From H_2SO_4 soln. the acids were sep'd with ether from Na salts. Two liq. formed; the upper oily layer contained primarily the volatile acids. The quant. of the acids was accomplished by the method of fractional pptn. of the Ag salts; these acids obtained butyric comprised 90.25%, acetic 8.07%. Valeric, formic, capronic acids were present in small amounts. In the lower layer upon extr. with ether acetic and succinic acids were det'd. as 0.3 and 0.4357 g., resp. No trace of lactic acid were found. J. S. J.

The first phases of the chemistry of the dissimilation of the hexoses. H. KLUIJVER and A. P. STRUIJK. *Verslag Akad. Wetenschappen Amsterdam* 37, 70. *Proc. Acad. Sci. Amsterdam* 31, 882-93 (1928); cf. C. A. 22, 1168, 1785. The process was studied of the hexose mono- and diphosphate esters produced after the phosphorylation period, maceration juice mixed with 1 part of a 5% soln. of NaOH and an initial concn. of glucose of 10% being used. In all cases the amt. of the diphosphate ester exceeded to a large degree that of the monophosphate ester.

n. of zymase produces an increased production of hexose-diphosphate ester. It is all probability there are only 2 catalytic actions in the entire process of alc. fermentation, namely, an oxidoreductase- and a phosphatase one. Decrease of concn. of zymase in a fermentation medium increases the formation of Robinson's monophosphate ester. The theories of other investigators are critically discussed. Conclusion: the theory is the only one that connects in a logical way the phenomena of the alc. fermentation and the fermentative dissimilation of the hexoses by the living yeast. J. C. J.

Estimating the yield in the production of unfermented and fermented raisins and raisin vinegar. HEDWICH KRIEGER. *Inst. Gärungsgewerbe, Berlin*. *Essigind.* 23, 80-91 (1929).—An exptl. study giving the essential details of process and results obtained. W. E.

The use of potassium ferrocyanide and phosphoric acid in oenology. *Feuille de Pharm., Alger.* *Ann. (als.)* 22, 94-100 (1929).—A discussion of the advantages and drawbacks of the use of $\text{K}_4\text{Fe}(\text{CN})_6$ for the pptn. of Fe from wines by subsequent pptn. in the finished wine. A. PAFINEAU.

Rationalization in the brewing industry. ALON STADNIK. *Chem. (Russ.)* 4, 39 (1929).—The rationalization in the brewing industry is chiefly manifested by the use of by-products, as malt-gums, malt-lunks and yeast. The utilization of... JAROSLAV F. STARA

The wine industry in Poland. LEONARD BIER. Inst. for Research on Foods and Utensils, Krakow. *Przemysl Chem.* 11, 693-706, 721-5(1927).—It is not possible to duce from unselected fruits wines good enough to compete with the grape wines. As an aid to the industry the establishment of a special trade school, and government support and regulation are recommended.

Stabilizers for wine samples. FONZES-DIACON. *Ann. fals.* 22, 77-8(1929); *J. C. A.* 22, 3950.—It was found that Na benzoate is far from being as effective as salicylic acid for preserving wine samples from acidification by *Mycoderma aceti*.

A. C. ZACHLIN
A. PAPINEAU-COUTURE

The resistance of beer to infection. ERN. BEKAERT. *Bull. assoc. étres inst. sup. fermentations Gand* 30, 103-14(1929).—An address discussing the chief causes of infection of beer and the factors by means of which it can be prevented.

Synthesis of optically active compounds by means of yeast. I. Synthesis of *L*-aspartic acid from fumaric acid. YUSEKE SUMIKI. Tokyo Imp. Univ. *Bull. Jap. Soc. Ferment* 23, 33-41(1928).—*L*-Aspartic acid was synthesized as follows: To Na fumarate is added twice the quantity NH_4Cl and the resulting mixt. are added beer yeast, Clark and Lubb's buffer mixt. of pH 6.8-7.0 and PhMe . The mixt. is kept at $37-40^\circ$ under reduced pressure and is shaken once a day. Max. yield is 75.59%. Some succinic acid was also obtained; this indicates the possibility of the conversion of fumaric acid through succinic acid besides the direct conversion. It is also possible that succinic acid is formed from fumaric acid through aspartic acid.

K. S.

Bionomics of the vinegar edworm (PETERS) 11L. Role of P in the life of yeast and in alcoholic fermentation (ELION) 11D. The detection of malol and salicylic acid in the presence of malol (MERL, BEITTER) 12. Fusel oil test of the D. A.-B. 6 for absolute alcohol and spirit (DIETRICH, JEGLINSKI) 17. Fertilizers [from vinasses from distilleries] (Fr. pat. 5,700,15). Rotting flax by use of yeasts (U. S. pat. 1,708,812) 25.

GOSLICH, W. AND FEHRMANN, K. *Brauerei-Maschinenkunde*. 4th ed., edited by K. Fehrmann. Berlin. Verlagsbuchhandlung Paul Parey. 276 pp. M. 20.

Vinegar. H. FRINGS. *Brit.* 230,950, Feb. 21, 1928. See Fr. 643,996 (*C. A.* 23, 1715).

Alcohol. SELMI (Soc. d'exploitation de licences de brevets industriels). Fr. 647,879, Jan. 13, 1928. Alc. is recovered from gases escaping from fermentation vats by passing the gases through absorption towers.

Yeast and alcohol. AKTIESELSKABET DANSK GAERINGS INDUSTRI. Fr. 647,492, Jan. 19, 1928. See *Brit.* 283,970 (*C. A.* 22, 4201).

Yeast and alcohol. AKTIESELSKABET DANSK GAERINGS INDUSTRI. Fr. 647,493, Jan. 19, 1928. See *Brit.* 283,969 (*C. A.* 22, 4201).

Lactic acid. I. G. FARBENFABR. A. G. Fr. 647,515, Jan. 20, 1928. See *Brit.* 230,464 (*C. A.* 23, 849).

Mash tub for treating massecuite, etc. A. ROLZ. *Brit.* 297,054, Sept. 13, 1927. Structural features are specified relating to supply of liquid to the tub through perforated branched pipes.

17—PHARMACEUTICAL CHEMISTRY

W. O. EMERY

Microchemical reactions for cinchonine. M. W. ENAAR. *Pharm. Werkblad* 66, 250-3(1929).—The delicacy of various reactions in terms of min. concn. of alkaloid and min. amt. detectable are: pptn. of free base, 1:1000, 2 mg.; K_2CrO_4 , 1:500, 10 mg.; $\text{K}_3\text{Fe}(\text{CN})_6$, 1:1000, 5 mg.; $\text{K}_3\text{Fe}(\text{CN})_6$, 1:1000, 5 mg.; gentisic acid, 1:2000, 1 mg.; NH_4SCN , 1:300, 30 mg.

A. W. DOX

Decomposition of chloroform under the action of light and oxygen, and its conservation. KURT BODENBONN. Univ. Berlin. *Monatsh. Chem.* 44, 351-3(1929).—Exception is taken to the findings of Oberhard (cf. *C. A.* 23, 2245) on the conservation of anesthetic CHCl_3 . The conditions affecting the keeping qualities of this drug are far more complicated than those assumed by Oberhard. It is shown experimentally that alkali and H_2O promote decomposition, markedly, probably by favoring the process: $\text{CHCl}_3 \rightarrow \text{CCl}_2 + \text{HCl}$, which is, however, not dependent solely on the presence of those 2 im-

purities, since pure CHCl_3 is itself subject to decompn. The slight increase in decompn. through presence of I (0.2%) is probably due to its photochem. influence as sensitizer. Of all the substances tested EtOH (2%) proved the best stabilizer. CHCl_3 thus and kept in the dark in fully filled and dark glass bottles remained practically changed for indefinite periods. W. O. E.

Characterization of homeopathic drugs. H. NEUGEBAUER. *Apoth. Ztg.* 44, 381-4 (1929); cf. C. A. 22, 4718.—Detailed procedures are indicated for the evaluation apomorphine-HCl, morphine-HCl, codeine phosphate, HgCl_2 , $\text{Hg}(\text{OCN})_2$, Hg_2Cl_2 and HgI, in their several potencies. W. O. E.

Fusel oil test of the D. A.-B. 6 for absolute alcohol and spirit. K. R. DIETRICH AND H. JEGLIŃSKI. *Pharm. Ztg.* 74, 436-7 (1929).—A commentary on the official Ger. method. W. O. E.

Dihydrated sodium phosphate. E. RIPP. *Apoth. Ztg.* 44, 399-400 (1929).—This salt, official in the Dutch and Russian pharmacopoeias, has certain advantages over the other two salts having 7 and 12 mols. H_2O of crystal, resp., notably in the prepn. of buffer solns. The salt is conveniently prepd. by heating a weighed quantity of $\text{Na}_2\text{HPO}_4 \cdot 12\text{H}_2\text{O}$ on the H_2O bath under const. stirring until the loss in wt. is exactly one-half the original. The product is kept in tightly stoppered bottles. W. O. E.

Examination of liquor cresoli saponatus D. A.-B. 6. WALTER MEYER. *Chem.-Ztg.* 53, 43 (1929).—For the new pharmacopoeia (*Arzneibuch*) the following test is suggested for Liquor Cresoli saponatus: Mix 3 parts of the sample in a beaker with 7 parts boiling H_2O and stir with glass rod. No offensive odor of animal oils should be immediately or even after the lapse of 3 min. perceptible. There should on the contrary be a pure cresol odor along with the typical odor of caustic alkali liquor. W. O. E.

Misjudgment and adulteration of vegetable drugs. EDUARD SKARNITZL. *Heil- und Gewürz-Pflanzen* 11, 171-7 (1929).—Many examples are cited in the adulteration and misjudgment of crude drugs. W. O. E.

A few compositions having flowery odors. OTTO GERHARDT. *Parfumerie moderne* 22, 91-5 (1929).—Formulas are given for acacia, "cassie" (*Cassia fernexiana* Willd.), and cyclamen perfumes. A. PAPINEAU-COUTURE.

Estimation of morphine in powdered opium, opium extract and its tinctures. THEODOR BÖHM. *Pharm. Monatsh.* 10, 34-5 (1929); cf. C. A. 23, 1409.—An address dealing principally with methods of the Ger. Pharm. W. O. E.

Curative sera and their preparation. A. MÖSSY. *Tetartzi Hochschule, Budapest Pharm. Monatsh.* 10, 36 (1929).—An address briefly descriptive of the procedures followed in the prepn. of sera from specially immunized animals, as horses, cattle, sheep and swine. W. O. E.

Notes on the Mexican Pharmacopoeia V. H. ALFARO. *Pharm. Ztg.* 74, 35-350-3 (1929).—A commentary. W. O. E.

Pharmacochemical results in the examination of domestic drug plants. I. KROGGER. *Pharm. Ztg.* 74, 364-6 (1929); cf. C. A. 22, 1213.—Exts. made with parts H_2O and 7 parts EtOH yielded values as follows.

	d	Dry residue	Ash
Ext. Anagallis arvensis fluid	1.075	27.20%	3.40%
Ext. Erythraee centaurei fluid	1.065	22.75%	1.05%
Ext. Eupatorii cannabini fluid	1.018	12.25%	1.55%
Ext. Euphrasiae officinalis fluid	1.079	21.00%	2.35%
Ext. Meliloti officinalis fluid	1.122	38.05%	3.60%
Ext. Plantaginis lanceolatae fluid	1.103	31.20%	3.70%
Ext. Spiraeae ulmariae fluid	1.009	15.90%	2.15%
Ext. Stipitis cerasorum fluid	1.039	16.30%	2.30%
Ext. Vaccinii myrtilli fluid	1.029	13.65%	1.00%

The several exts. are discussed at some length, notably with respect to their odor, taste and behavior when treated with H_2O , EtOH, and other reagents like FeCl₃, tannic acid, Mayer's, Lugol soln., Fehling's, $\text{Pb}(\text{OAc})_2$, etc. W. O. E.

Estimation of the camphor content of oleum camphoratum. LAJOS DAVID. *Univ. Josef-Jun., Szeged. Pharm. Ztg.* 74, 437-8 (1929).—See C. A. 23, 1990. W. O. E.

Color reactions of morphine. LAD. FERRER. *Parmany-Peter-Univ., Budapest Pharm. Zentralhalle* 70, 165-7 (1929).—See C. A. 23, 1990. W. O. E.

Perfumes, essential oils and cosmetics in the world's economy. KARL LÖFF. *Hamburg. Pharm. Zentralhalle* 70, 183-5 (1929).—An economic study showing the extent of production and marketing of perfume requisites in European countries. W. O. E.

termination of iodine in thyroid glands. L. U. VAN DER BERG. *Int. Pharm.* 17; *Quart. J. Pharm.* 1, 85.—Cameron and Carmichael have shown that the titration of thyroid glands can be accomplished by detn. of the percent content of iodine. The matter must be completely destroyed, and org. I must be converted into inorganic. The best method is to destroy org. matter by use of an oxidizing agent. Excess reagent is then removed, and the I liberated in acid soln. and titrated. This method is preferred to the alternative, involving calcination with alkali, because (1) destruction of org. matter is complete; (2) oxidation to iodate is easier than reduction to iodide; and (3) the titration takes place in the reaction liquid, thus preventing loss. The method of the U. S. P. is recommended. W. O. F.

Quinisol is a valuable antiseptic, since it is a phenol. It has recently been found serviceable in the treatment of fungoid infections of the skin, in the form of the following lotion and cream: (1) quinisol 0.5 to 1, alc. (95%) 50, glycerol 20, boiled H₂O 100. Dissolve the quinisol in the H₂O, then add the alc. and glycerol; (2) quinisol 0.5, and boiled H₂O 5, anhyd. wool fat 25, vaseline 70. Dissolve the quinisol in the H₂O, incorporate with the wool fat, then mix in the vaseline. Quinisol is also put on the market in the form of "Dippol," which consists of sheets of cardboard paper impregnated with quinisol. The sheet is macerated in the prescribed amt. of H₂O. The paper becomes white and the water yellow when soln. is complete. W. O. E.

Digitalis leaves of the new pharmacopeias. MEULENHOF. *Int. Pharm. Fed.* 1927; *Quart. J. Pharm.* 1, 120-1. Am., Ger. and Dutch pharmacopeias now introduce a biol. standardization instead of attempting to obtain av. activity by limiting the period of collection of the leaves. The prepn. of a 0.5% aq. infusion ensures complete extr., and the cat method of Hatcher is recommended for the assay. Dutch plants vary greatly in activity, but the influence of drying between the temps. of 15° and 100° is of little importance. A mean temp. of 53° is recommended as the optimum for drying. The leaves retain their activity for several yrs. even when kept under bad conditions. An inquiry into the choice of extr. media, both for assay and galenical prepn., afforded evidence that both H₂O and strong alc. completely exhausted the leaves. Of the galenicals, the acetum is inferior to tincture and infusion. The Liquor Digitalis of the latest Dutch Pharm. is suitable for injection, and its use is recommended in preference to proprietary articles. In a short reference to *Sirophanthus*, chem. assay is advocated after a comparison of chem. and physiol. methods. Finally, it is reported that digitalis preps. decrease in strength when in contact with strong alc.; the effect is sometimes marked, but not const., and depends on factors which at present are unknown. W. O. E.

Presence of magnesium ammonium phosphate in commercial licorice extract. A. JERNSTAD. *Norge Apot. Tidsskr.* 54, 1927; *Quart. J. Pharm.* 1, 121-2.—A Swiss wholesale house recently received a consignment of com. licorice ext., which contained a considerable amt. of a substance insol. in H₂O. This consisted of a cryst. shining powder, in which black specks of extractive matter were scattered. J. found that the cryst. residue was MgNH₄ phosphate. This salt is probably formed in the crude licorice "juice." It is known that the glycyrrhizin thereof occurs as an NH₄ compd. and that Mg and phosphates are present. Probably its occurrence in crude "block licorice" has been hitherto overlooked, since the insol. matter which it contains has not been carefully examd. W. O. E.

New constituents of East Indian lemongrass oil. F. ELZE. *Riechstoffind.* 4, 22-3 (1929).—The oil obtained after removal of the citral gave on refractionation methylheptenol, nerol and farnesol. W. O. E.

Apricot oil as a substitute for almond oil. G. KOGAN. *Chem. Umschau Fette, Oele, Wachs Harze* 36, 83-3 (1929).—K.'s observations lead him to the following conclusions: The general trade is offering only apricot oil, for which the proper name would be oleum Armeniacae. Its phys. consts. lie very close to those of true almond oil and its low acid no. (not above 2.0) permits its use for subcutaneous injection; its acid no. is lower than that of almond oil. The German Pharm. should, under "oleum Persicarium," which includes apricot oil, lower the max. acid no. to 2.0 and require that no alk. ash be left on ignition. P. ESCHER.

Study of commercial lecithins and specialties with lecithin as base. I. JACQUES SONOL. *Rev. faculté chim. quim. Univ. La Plata* 4, No. 2, 95-110 (1927); cf. C. A. 23, 237.—Lecithin is C₂H₅(OR)(OR')OP(O)(OH)OC₂H₅N(OH)Me₃, where R and R' may

be palmitic, oleic or stearic acid radicals and may be the same or may differ from each other. No agreement is yet reached upon the amount in various parts of the body. The brain may contain 11-16%, yolk of egg 6-12%, cardiac muscle 12.5%. Methods for prep. lecithin of Diakonow and Hoppe-Seyler, Gibson, Wart, B. Thomas and Fischer, S. believes that lecithin is lost in the ether or acetone used. Methods of Smith, Strecker, Bergell, MacLean and Lami are reviewed. The author's method, for which he claims good solvent recovery, excellent and perfect stability: The tissue is dried over acetone, and then extd. for 12 three times, at 50°, with abs. EtOH. This is removed *in vacuo* and before the yellow is decanted from the red liquid below it. It is now concd. *in vacuo* and treated with a little Et₂O. The lecithin is pptd. with acetone thrice and dried to remove traces of the latter. Lecithins should be sol. in abs. EtOH, CHCl₃, Et₂O, olive oil, liquid vaseline and other solvents. The commercial products are yellow to brown and become rancid in air; some are neutral, others acid. The purest specimens contain cholesterol and other substances.

S. L. B. HERTON

Hemlock and coniine. A. R. VALENTINI. *Boll. chim. farm.* 68, 155-9 (1929).—The pharmacol. effect and the therapeutic value of hemlock and coniine and the chem. properties of coniine are described.

G. SCHWACH

Preparation of oil-soluble bismuth salts, hexahydrobenzoate and camphocarboxylate. M. PICON. *J. pharm. chim.* 8, 206-11 (1928); cf. C. A. 23, 2215.—These salts cannot be prepd. pure, *i. e.*, free from Na by the glycerol method of double decomp. (C. A. 21, 2359). To prep. *Bi hexahydrobenzoate*, (C₆H₁₀O₆)₂Bi, (A), add to C₆H₁₀CO₂H the theoretical quantity of yellow Bi₂O₃ to form the neutral salt, heat the mixt. on the boiling water bath with mech. stirring until the mass is a white solid. Dissolve the powd. mass in warm C₆H₆, filter, distil off the solvent and remove adhering traces by heating *in vacuo* on the water bath. A is a faintly yellow, amorphous, transparent mass, insol. in H₂O, sol. in org. O-free solvents, but insol. in solvents contg. O (excepting oils). The latter, *e. g.*, MeOH, cause disoccn. of A with formation of BiO.C₆H₁₀O₆. The same compd. is formed when H₂O acts on the C₆H₆ soln. of A. A absorbs H₂O from the air, becoming viscous and transparent, then opaque. *Neutral Bi camphocarboxylate*, (C₁₁H₁₈O₄)₂Bi, (B), is prepd. similarly to A. Heat camphocarboxylic acid with the equiv. quantity of Bi₂O₃, adding, however, a little H₂O to hasten the reaction. Cool and decant the H₂O, then treat the mass with C₆H₆ as with A. Distn. of the solvent will remove the rest of the H₂O. B is faintly yellow, amorphous, sol. in all org. solvents including those contg. O, and is insol. in H₂O; this has no action on it in C₆H₆ soln. Soly. in oil of A is 0.05 g. Bi per cc. or 12.5% of the salt; soly. of B is 0.01 g. Bi per cc. or 33% of the salt, but as this soln. is too viscous, a soln. of 0.05 g. Bi per cc. is preferred for injection. Oily solns. of A, like A itself, are very hygroscopic, and solns. of B are permanent. The soly. of A and B in oil is caused by the satd. soln. of the constituent acids. Elimination of Bi after intramuscular injection of A or B in oil-soln. is much more rapid than that of oily suspension of inorg. Bi salts, *e. g.*, BiCl₃. Bi carbonate. •

S. WALDRON

Derivatives of *p*-methoxycinnamic acid (FOOTE) 10. Hypoglucemia producing substances. 1. Synthesis of certain guanidine derivatives (KUMAGAI, *et al.* 10). 2. Oxidation of commercial carboic acid (KOGAN) 7. Extraction of oil from liver (U. S. pat. 647,941) 27. Condensation products of indene with phenols [for disinfectants (Brit. pat. 297,075) 18. Toxic fumigant (U. S. 1,707,727) 15. Soap [for treating rheumatism] (Ger. pat. 472,440) 27. Purifying oils (Ger. pat. 472,212) 27.

Calcium gluconate solutions. CHEN. FAB. VORM. SANDOR. Ger. 472,346. Nov. 27, 1926. Stable supernatd. solns. of Ca gluconate for medical use are prepd. by dissolving a hot, sterile soln. of the salt into ampoules, hermetically sealing the ampoules, and heating them in steam at intervals until crystn. no longer occurs on cooling. The solns. may be injected intramuscularly without inflaming the tissues.

Derivative of isobutylallylbarbituric acid. CHEMISCHES FABRIK VORM. SANDOR. Fr. 647,718, June 3, 1927. A compd. having therapeutic properties is obtained by melting together isobutylallylbarbituric acid and 1-phenyl-2,2-dimethyl-4-dimethylamino-5-pyrazolone. The purified compd. m. 83-85°.

Hypnotic and sedative solution. WALTER KNOFF (to Winthrop Chem. Co.) U. S. 1,707,863, April 2. Therapeutic compds. such as allylrotylbarbituric acid are dissolved in a mixt. of acetamide and ethylurethane and water, or in a similar mixed solvent.

Antiseptic anesthetic compounds. RICHARD H. VOLWILER and DONALD L. TABERN

Abbott Laboratories). U. S. 1,708,712, April 9. Butyl *p*-aminobenzoate is combined with halogenated aromatic sulfonic acids contg. a phenolic OH group (suitably by mixing solns. of the reacting substances and sepg. the crystals which form) to obtain products suitable for local anesthetic and antiseptic effect. Examples are given of the production of butyl aminobenzoate salt of 2,6-diiodophenol-4-sulfonic acid, m. (decompn.) 200° and of the corresponding compds. of 2,6-dibromophenol-4-sulfonic acid, m. 216–18° and 7-iodo-8-hydroxyquinoline-5-sulfonic acid, m. 235–40°.

Antiseptics. I. G. FARHENIND, A.-G. Brit. 297,074, June 14, 1927. A phenol ether or deriv. of such an ether without free phenolic groups is used in disinfecting for various pharmaceutical purposes or for preserving foods; e. g., marmalade may be preserved with an addn. of 0.15% Na anisate; acetanisidine is used in a foot-dusting powder with ZnO, wheat starch and talc; a disinfecting hair-wash comprises pyrocatechol dimethyl ether in alc. soln.

Substances which can impart activated nourishing properties to foods and drugs. G. DUBOIS, Belg. 350,983, June 30, 1928. Yeast and bacteria from the stomachic flora are isolated, cultivated and dried in order to obtain the digestive enzymes and diastases, and the product is combined with vegetable diastases developed by the action of ultra-violet light on cereal germs.

Capsuled material for heating body tissues. JOHN G. HOMAN, U. S. 1,707,762, April 2. A capsule suitable for rectal treatment or similar uses comprises a casing which may be formed of a gelatin compn. contg. a mixt. of Mg and a metallic oxide such as Cu oxide together with cacao butter or other suitable medicating vehicle.

Tuberculosis antibodies. ROLF GRIESBACH, Ger. 472,080, Mar. 29, 1927. Specific antibodies for tubercle bacilli are prepd. in the following way. A guinea pig or other suitable animal is inoculated 3 times, at intervals of 9 days, with a glycerol emulsion of virulent living tubercle bacilli, the inoculations being performed percutaneously on a depilated part of the abdominal skin. Ten days after the 3rd inoculation, the suprarenal capsules are removed, cut up, and extd. with aq. glycerol in a darkened vessel. The ext. is stored in a cool place, with frequent shaking, and after 3 days is heated on the water bath for 20 mins., centrifuged, and filtered. Powd. cryst. thymol is then added.

Treating bacteriolytic products. KALLE & CO. A.-G. (G. Deycke, inventor). Ger. 472,221, Apr. 1, 1924. The toxic components are isolated after bacteriolysis, particularly of tubercle bacilli, by treating the filtrate with CCl_3COOH or tannin. The toxic components ppt. and are sepd. and redissolved.

Composition for pyorrhea treatment. LEONARD E. HARRIMAN, Can. 287,613, Mar. 5, 1929. A compn. for the treatment of pyorrhea consists of lanolin 116.96 g., 9% NaCl soln., 4.32 g., iodophenolsulfonic acid 7.85 g. (or AgI), and BiONO_3 350.87 g.

Face powder. SIDNEY PEEKER, to Crystal Chemical Co., U. S. 1,707,684, April 2. A powder such as talc, MgCO_3 , ZnO and Zn stearate is mixed with a small quantity of olive oil to form a coating on the particles of the powder which give them better adhesive properties when applied to the skin (although leaving the powder dry to the touch).

18—ACIDS, ALKALIES, SALTS AND SUNDRIES

E. M. SYMMES

New system for large-scale manufacture of sulfuric acid. HUMBERTO J. PAOLI, *En. facultad cienc. quim.* (Univ. La Plata) 4, 111 23(1927).—The Mills-Packard towers, truncated in shape, externally water cooled, and exposed to the weather, have a low first cost and low lead consumption. The Gaillard tower walls are cooled and protected by specially distributed dil. acid. The resp. yields are 18–21 kg. and 15.5 kg. of acid per cu. m. Later improvements are (1) alteration in the shape of the Pb chamber to obtain better wall washing; (2) centrifugal pumps are replaced by pulsometers; (3) natural draft S furnaces have been replaced by mechanically rotated ones with artificial draft, charged automatically; (4) the Glover-Suntil, vertically divided tower has been adopted. P. obtains 24 kg. per cu. m. 52 B \acute{e} acid, with a HNO_3 consumption of 3%, with 3 men per 24 hrs. One section of the Glover tower denitrates and the other concentrates to 64 B \acute{e} . Less land is required and the lead work is completely preserved.

S. L. B. ETHERTON

Preparation and industrial use of solid carbonic acid. R. PLANK, *Z. Ver. deut. Ing.* 73, 221–4(1929).—A review of American practice in the prepn. and use of solid CO_2 or "dry ice."

W. C. EBAUGH

Dry ice, the new refrigerating and preserving agent and its production. A. STEN-SALMONY. *Chem.-Tech. Rundschau* 44, 275(1929).—The characteristics of solid CO_2 are described, as well as the method of its production by the Carba Akt.-of Bern. This method consists in chilling at a pressure of over 5 atm. and yields a of sp. gr. 1.4–0.5. This is contrasted with other processes which yield first a somewhat spongy CO_2 -snow, which must be further compressed.

Purification of hydrogen [for use in the manufacture of ammonia]. G. I. L. DES YLOUSS. *Science ind.* 11, 53(1927).—Liquefiable impurities, e. g., H_2S and carbonyl sulfide, and the last traces of CO are removed from H_2 recovered from water by treatment with liquid N under pressure at -180° .

Lead sulfate. H. SCHRADER. *Farben-Ztg.* 34, 268-9(1928).— PbSO_4 is produced as a by-product of the manuf. of Al acetate for waterproofing tarpaulins, etc. It may be used as a starting point for chrome yellow, first being converted into carbonate and then treated with $\text{K}_2\text{Cr}_2\text{O}_7$ and H_2SO_4 ; the process has some advantage in the cheapness of Pb as sulfate. Other variants of the method are: conversion of PbCO_3 into basic nitrate or chloride by treatment with acid and double decomposition with alkali dichromate; decomposition of the PbSO_4 with NaOH or CaO and treatment of the basic sulfate with dichromate; production of basic sulfate by treatment of the normal salt with dilute HOAc and then proceeding as in the previous method.

Method of ascertaining the origin of Guggenheim saltpeter. JAN HAMPL. *Chem. Obsor.* 4, 33-4(1929).—The detn. of I can easily be misleading, as not every lot of Guggenheim saltpeter shows the I reaction. Guggenheim saltpeter contains more Na_2SO_4 than synthetic saltpeter, whereas the amt. of NaCl present cannot serve as a criterion. Furthermore, in the case of Guggenheim saltpeter the sum of the refraction index and quantity of NaNO_3 (calcd. from the amt. of N found) is less than 100, as it is in the case of synthetic saltpeter.

Activated carbons. R. G. W. FARNELL. British Sugar Processes, Ltd. *South African Chem. Ind.* 12, 21-4(1929).—A survey of the industrial uses of activated carbons.

Activated charcoals. FRAN PODREKINIK. *Inst. du Vin. Bull. int. vin* No. 5 78-82(Feb., 1929).—A review of the theory of activated charcoals, their processes of manuf. and uses.

Charcoal as an adsorbent. M. M. DUBININ. *J. Russ. Phys. Chem. Soc.* 6 850-60(1928); *cf. C. A.* 23, 1547.— HNO_3 , NH_4 , K and Ba nitrates, chloric acid and NaOH solns. remove adsorbed Cl ions almost quantitatively from charcoal. This is not due to preferential adsorption, for AcOH , which is more strongly adsorbed than HNO_3 , does not show this effect. A very highly adsorbent charcoal, contg. practically no adsorbed acid, is prepd. by heating ordinary charcoal at 800° for 1 hr., and then wetting it with 4 N HNO_3 . After 3-4 hrs. excess of HNO_3 is removed by filtration, and the charcoal boiled for 2 hrs. with 2 l. of water. The product is dried and heated in the blow-pipe for half an hr. in a closed porcelain crucible, when the adsorbed HNO_3 is decomposed with oxidation of part of the charcoal. The resulting product strongly adsorbs acid and neutral salts, but not alkalis.

Asbestos in 1927. OLIVER BOWEN AND B. H. STODDARD. *Bur. Mines, Mineral Resources of the U. S. 1927*, Pt. II, 200-311 (preprint No. 25, published February 1929).

Phosphate rock in 1927. H. L. JOHNSON. *Bur. Mines, Mineral Resources of the U. S. 1927*, Pt. II, 312-26 (preprint No. 26, published March 11, 1929).

Flotation tests on phosphorite from Esthonia. JAAK KIVSK. *Sitil. Akad. Form. Ges. Univ. Tartu* 35, 71-9(1928).—Preliminary tests were made with fatty acids as flotation reagents and with shale oil fractions $170-250^\circ$ as a stabilizer. The best results were obtained with train oil acid, at the ratio of 1% of the wt. of oil in the absence of a stabilizer, or at the ratio of 1/2% and using shale oil fraction 170-250°, in neutral or slightly alk. soln.; however, such impurities as CaCO_3 , CaSO_4 , etc., would also be floated under these conditions.

The limestone resources of the Pontiac-Fairbury region. J. E. LAMON. *Ill. State Geol. Survey, Rept. of Investigations No. 17*, 7-27(1929).—There are tracts some probably 200 acres or more in extent, underlain by limestone. A 200-acre tract underlain by 11 ft. of limestone would contain about 3,500,000 cu. yd. or about 2,000,000 tons of limestone. Many of these tracts are located on or near a railroad. The overburden varies from 1 to 5 ft. and probably averages about 3 ft. The limestone is suitable for agricultural limestone, macadam roads, portland cement, portland road ballast, flux and CaO . The outstanding use for which the limestone is now employed is the manuf. of portland cement which is favored by the presence of a suitable

and assocd. clay, shale and argillaceous limestone, which provide the necessary materials. Fuel can probably be obtained locally and local labor is regarded as

H. C. PARISH

Manufacture of synthetic bleaching clays. M. NEKRITCH. *Z. anorg. allgem. Chem.* 177, 86-90(1928).—Lab. tests were made to demonstrate that a product similar to bentonites is formed, when sodium silicate and $Al_2(SO_4)_3$ react. The product gains considerable cryst. material, purifies mineral and vegetable oils; the Al_2O_3 content is not completely sol. in acids; and the adsorption of gases varies inversely with the temp. The formula $Al_2O_3 \cdot 7SiO_2 \cdot nH_2O$ is assigned to the product.

T. P. KELLER

The thermal decomposition of NH_3 on Fe catalysts (KUNSMAN) 2. Generalities on the mechanical preparation of minerals (CHARRIN) 13. The gauze catalyst in NH_3 oxidation (PERLEY, VARRELL) 2. Condensation products of urea and CH_2O of high molecular weight (SCHEIBLER, *et al.*) 10. Drying apparatus for casein and other powdered substances (Fr. pat. 647,911) 1. Drying apparatus for casein and the like (Fr. pat. 33,567) 1. Bubble cap absorption tower suitable for absorption of N oxides (U. S. pat. 1,708,985) 1.

Nitric and sulfuric acids. I. G. FARNENIND. A. G. Fr. 647,744, Dec. 17, 1927. HNO_3 and H_2SO_4 and their salts are prepd. by passing mixts. of NH_3 , volatile compds. of S and cyanogen compds. such as obtained from the liquids used for washing industrial gases, after adding O or gases contg. it, over catalysts at a high temp. to obtain oxides of N and S. Suitable catalysts are Pt gauze or a mixt. of Ni, Fe and Cu.

Sulfuric acid. H. PETERSEN to Soc. générale métallurgique de Hoboken). Brit. 206,602, Sept. 3, 1927. In the lead chamber process of H_2SO_4 manuf., reaction towers (preferably packed) are inserted between the Glover tower and the first chamber or between the chambers, and are irrigated with H_2SO_4 rich in N oxides or with a large quantity of H_2SO_4 contg. N oxides such that the acid discharged from the towers still contains N oxides at least equal to 0.5% (called as HNO_3 of 36° Bé. The acid is introduced at a temp. not above 35°.

Sulfuric acid. METALLURGES A. C. Ger. 472,420, Dec. 8, 1925. Addn. to 378,610. See Brit. 202,397 (C. A. 21, 3715).

Hydrocyanic acid and acetylene. SOC. ANON. POUR L'IND. CHIM. A BAILE and H. ANDRIESSENS. Brit. 206,355, Aug. 29, 1927. Gaseous mixts. contg. CH_4 (or petroleum vapors) and N are treated in a flaming arc to produce HCN and C_2H_2 ; and the gases leaving the arc are treated to sep. the HCN and at least a part of the C_2H_2 before being returned to the arc. A gas circuit as described in Brit. 195,239 (C. A. 17, 3555) may be used and the HCN may be absorbed in alkali and the C_2H_2 by water under pressure.

Acid-resisting coatings. I. G. FARNENIND A. G. Fr. 647,588, Jan. 20, 1928. Containers are covered with molten Si or alloys of Si contg. Fe, Cu, Mn, Cr or W.

Ammonia synthesis. RALPH S. RICHARDSON to Nitrogen Engineering Corp.) U. S. 1,707,417, April 2. Incoming gases at high temp. and pressure are passed through the catalyst in heat-exchange contiguity but out of direct contact, in one direction, and then, in the same direction, in actual contact with the catalyst. Cf. C. A. 23, 1908.

Heat-interchange apparatus suitable for use in ammonia synthesis. FRANCIS H. BRAMWELL (to Atmospheric Nitrogen Corp.). U. S. 1,708,887, April 9.

Cyanides. I. G. FARNENIND A. G. Fr. 647,619, Jan. 23, 1928. Cyanates are reduced to cyanides by reducing gases such as H or CO at a temp. of 700-750°.

Pure sulfide. I. G. FARNENIND A. G. Ger. 471,776, Oct. 1, 1926. Addn. to Ger. 431,253. The sulfide lye purified by salt in the manner of the prior patent is concd. by degrees in vacuo.

Lead salts. STANLEY C. SMITH. Fr. 647,761, Jan. 4, 1928. See Can. 283,213 (C. A. 22, 4271).

Separating alkali or alkaline earth salts. SALZWERK HEILBRONN A. G. and LEUWIG KATNER. Ger. 472,100, Oct. 16, 1925. Individual alkali or alk. earth salts are sep'd. from a mixt. of such salts by fractional crystn. from the fused mixt. The melt is allowed to cool slowly in an insulated bath and the salt which seps. first is removed by suitable means. The sepn. of NaCl from its mixt. with sulfates and from crude K salts is mentioned.

Ammonium phosphate. CHEMICAL PRODUCTS CO. Brit. 207,009, June 10, 1927. Phosphate rock is treated with NH_4HSO_4 soln. to produce NH_4 phosphate soln. contg. some $(NH_4)_2SO_4$ and H_3PO_4 . The pptd. $CaSO_4$ is mixed with $(NH_4)_2CO_3$ soln. or with

NH_4 soln. into which CO_2 is passed to form CaCO_3 and $(\text{NH}_4)_2\text{SO}_4$ soln. which is converted into NH_4HSO_4 . The phosphate soln. is treated with NH_3 to form P which is crystd. and heated to form NH_3 and mono- and di- NH_4 phosphates.

Calcium nitrate; alumina; phosphorus; and silica. I. G. FARBERMAN. A. G. Brit. 296,832, June 16, 1927. A raw phosphate is fused with coaly material and minous material such as bauxite, kaolin, clay or loam to distil off P , and the slag is converted and sepd. into $\text{Ca}(\text{NO}_3)_2$, alumina and silica. The process is preferably so conducted that Fe present is reduced and tapped out as a "phosph" pig iron and the addn. of bauxite and other materials is so regulated that the slag retained contains 45-60% CaO , 10-40% oxides of Fe and Al and 30-10% silica; the slag disintegrates readily on cooling and is readily decomposed by acids. The is treated with HNO_3 to dissolve the Ca and Al and the silica is sepd. and may be as an absorbent or insulating material or for agricultural purposes. Al and Fe are pptd. from the nitrate soln. by use of milk of lime or CaCO_3 , preferably in the presence of small quantities of substances such as brown coal-tar oils, coal-tar oils, or tetrahydronaphthalene to reduce the bulk of the ppt. From the remaining soln. the $\text{Ca}(\text{NO}_3)_2$ is recovered in solid form. A Moroccan phosphate may be used as raw material.

Copper sulfate. H. LAWARR. Belg. 351,876, July 31, 1928. Cu is treated with an aq. soln. of H_2SO_4 and HNO_3 , the proportion of HNO_3 being such that the amount of NO_2 formed is not in excess of the amount that is sol. in the soln. An app. is described.

Nickel and cobalt carbonyls. I. G. FARBERMAN. A. G. Brit. 296,558, Sept. 5, 1927. Ni and Co carbonyls are made by the action of CO on the corresponding metals prepd. from NH_3 compds. such as are obtained by leaching ores with ammoniacal solns. The pure metals may be obtained from the resulting carbonyls.

Osmotic purification of caustic soda. LEONARDO CERINI. Fr. 33,608, May 21, 1927. Addn. to 616,821. The arrangement of diaphragms is given.

Sodium silicate. SIMON TARIK. Fr. 647,132, May 30, 1927. The soda lys. obtained as a residue in the manuf. of paper pulp from maritime pine or other woods is heated with hydrated SiO_2 from the manuf. of $\text{Al}_2(\text{SO}_4)_3$ and alums by the action of H_2SO_4 on kaolin or ordinary clays.

Sodium stannate. HORACE R. McILKENNEY (to Vulcan Detinning Co.). U. S. 1,708,292, April 9. An aq. soln. of Na stannate and Na_2CO_3 such as that obtained by treating Sn -bearing material with NaOH is concd. by heating, in the course of which the soln. is continuously circulated until a substantial proportion of Na stannate crystallizes from the hot soln. while substantially all the Na_2CO_3 remains in soln.; the crystals of Na stannate are permitted to settle from the soln. upon a porous medium such as a filter screen and the residual hot soln. is sepd. from the layer of crystals. An app. is described.

Titanium oxide. JOSEPH BLUMENFELD (to Commercial Pigments Corp.). U. S. 1,707,248, April 2. Preliminary to Ti oxide manuf., FeSO_4 is removed from a soln. contg. Ti , ferrous Fe and H_2SO_4 by cooling the soln. to about 5° or lower and separating the FeSO_4 crystals which form.

Titanium dioxide. I. G. FARBERMAN. A. G. Brit. 296,720, Sept. 5, 1927. Hydrolysis of Ti -bearing solns. such as those obtained from the treatment of ores with H_2SO_4 , is effected in the presence of HF or a sol. fluoride. An easily filterable product is obtained which remains white even when ignited at 900° . In effecting the hydrolysis the soln. may be boiled and water may be added as the hydrolysis proceeds to reduce the action of free H_2SO_4 .

Titanium tetrachloride. CHARLES DE ROCHER (to Commercial Pigment Corp.). U. S. 1,707,257, April 2. Carbon (suitably in the form of coke or charcoal) is mixed with a titaniferous substance such as Ti ore and a colloidal suspension of TiCl_4 ; the mixt. is dried to form a tough mass, and fragments of the mass are subjected to the action of Cl_2 .

Preparation of hydrogen sulfide and its derivatives. SOC. STRUCKS REFINERIE DE LA HAZEL. Belg. 350,419, July 31, 1929. H and S are made to react in presence of a catalyst such as activated charcoal; e. g., H is passed through molten S and fresh H is added to the mixt. of H and S vapors to convert the excess of entrained S . The S remaining after the catalysis is removed by washing with $(\text{NH}_4)_2\text{S}$. An app. is described.

Storing alkali or other readily oxidizable metals in capillary tubes. D. H. BROPHY and W. A. RUTLAND (to British Thomson-Houston Co., Ltd.). Brit. 296,317, Aug. 29, 1927. A device is described in which, e. g., a mixt. of Ca and CaCl_2 may be heated to melt the metal which after deposition in the desired portion of the app. may be

with kerosene or paraffin and sealed in a capillary tube to which it is trans-

JOHN W. TURRENTINE. U. S. 1,708,287, April 9. In order to concentrate a com. scale, vapors of I such as those obtained by steam distn. from solns. contg. I counter-currentwise to a stream of liquid absorbent such as NaOH soln. **JULIEN BELLAY.** Fr. 647,478, Jan. 19, 1928. See Can. 282,952 (113). Pure H is obtained by producing water gas by the continuous treat-
e, lignite, peat, charcoal, etc., in an externally heated producer, enriching
by treatment with superheated steam in a heated column contg. fireclay
ad charcoal and purifying the resulting gas by passage through soda-lime
— tubes contg. masses of soda lime

hydrogen. **FRANZ GÖLKER.** Fr. 647,277, July 20, 1927. In the production of
the conversion of CO and H₂O in the presence of catalysts the reaction is carried
out in the presence of substances which will absorb CO₂, whereby the amt. of H₂O
may be reduced to that theoretically necessary. A mixt. of MgO and CaO may be
used. Cf. C. A. 22, 2247.

Catalytic production of hydrogen. **M. CASALE SACCHI.** Brit. 297,135, June 13,
1927. A mixt. of O (with or without N) and CO₂ is passed over carbonaceous fuel
heated to a high temp. and the CO thus formed is catalyzed with steam to produce H.
Catalyst poisons from the fuel are converted into an easily removable condition, e. g.,
S is converted into SO₂.

Mercury. **JAY G. DEREMER** to Savage DeRemer Corp., U. S. 1,707,471, April
2. In order to purify Hg for use in contact with EtCl in refrigerating app., it is mixed
with EtCl until the formation of solid matter as a result of the admixture ceases, and
the Hg and assocd. solid matter are then sep'd.

Phosphorus. **I. G. FARBENIND A. G.** Fr. 647,567, Jan. 21, 1928. Slags ob-
tained when crude phosphates are fused with C and aluminiferous material with distn.
of the P as such or as oxide are treated with HNO₃. The SiO₂ is filtered off. Al₂O₃
is pptd. by addn. of CaCO₃ or CaO, and Ca(NO₃)₂ is recovered from the filtrate by
evapn. Cf. C. A. 23, 1236.

Phosphorus and cement. **I. G. FARBENIND A. G.** Fr. 648,029, Jan. 31, 1928.
P or phosphoric acid and hydraulic cement in the latent state are produced simul-
taneously from crude phosphates, coke and material contg. SiO₂ and Al₂O₃, by heating
in an elec. or other furnace, the addns. being so made that the slag produced has a
compn. similar to that of blast-furnace slag (Al₂O₃ 12-35, SiO₂ 18-38, CaO 40-55%)
and being capable like it of conversion into blast furnace cement. Examples are given.
Cf. C. A. 23, 489.

Active carbon. **ERNST BERL.** Fr. 647,457, Jan. 18, 1928. See Brit. 283,968
(C. A. 22, 4212).

Carbon black. **ROY H. UHLINGER** to Thermatomic Carbon Co., U. S. 1,707,775,
April 2. See Can. 283,032 (C. A. 23, 940).

Gas carbon. **LOUIS GUMZ.** Ger. 472,345, June 26, 1927. In the manuf. of C by
the thermal decompn. of light hydrocarbons, a group of sep. cells having thin walls of
fireproof material is charged into an externally heated furnace. Hydrocarbon gases
are then led from above into each cell.

Sulfur. **KÄLMAN SZOMBATHY** and **ERICHARD VON AMMON.** Fr. 647,578, Jan. 21,
1928. Pure S, not contg. tar, is obtained from the mass used in gas purification, by
boiling the mass with excess of an alk. earth oxide or hydroxide and water, adding at
the same time or afterward an alkali carbonate or sulfate or both, filtering and treating
the filtrate with SO₂ or CO₂.

Pressure sulfur burner. **HENRY HOWARD** to Grasselli Chemical Co., U. S.
1,708,004, April 9. An app. is specified comprising a vertical, heat insulated, pressure-
resisting chamber with a vaporizing and burning section at its top, one or more com-
bustion sections below the vaporizing and burning section, and inlets for air and S
under superatm. pressure into the vaporizing and burning section, and an outlet for
withdrawing products of combustion at the bottom of the combustion chamber.

Sulfonated product for use in wetting, emulsifying, etc. **KARL MARX, KARL
BREDERSEN** and **KARL BITTNER** (to I. G. Farbenind A. G.) U. S. 1,708,103, April 9.
A mixt. of a brown coal-tar oil and solvent naphtha, tetrahydronaphthalene, PhCl or
other similar suitable compd. contg. an aromatic nucleus is treated with a sulfonating
agent such as chlorosulfonic acid.

Condensation products of indene with phenols. **I. G. FARBENIND A. G.** Brit.
297,075, June 14, 1927. Products suitable for use as intermediates, disinfectants and as
bases for lacquers are obtained by condensing indene and polyhydric phenols in the

presence of a halogen acid such as HCl. Indene and PhOH yield an oily product which after purification by distn. *in vacuo* is dissolved in a hydroaromatic hydrocarbon to produce crystals of hydrindylphenol; evapn. of solvent from the mother liquor leaves a viscous oily product insol. in alkali. The hydrindylphenol gives with bases, such as $(\text{CH}_2)_6\text{N}_4$, well-defined compds. Examples also are given of the condensation of a solvent naphtha fraction and crude cresol, indene and α -naphthol, α -xylylindene (prepd. by heating indene and xylyl chloride with KOH) and crude cresol or phenol, and indene fractions and *o*-cresol or resorcinol. Amino-, nitro- and chlorophenols, thymol or pyrocatechol also may be used.

Condensation products of urea or its derivatives and formaldehyde. I. G. FARBENIND. A.-G. Brit. 296,361, Feb. 28, 1927. The process described in Brit. 266,752 (C. A. 22, 849) is extended to the treatment of hydroxymethylurea, or hydroxymethyl compds. obtainable by condensing urea derivs. such as thiourea, *N*-methylurea and *N*-methylthiourea, with CH_2O , or the higher-mol. amorphous products resulting from such methylol compds. by splitting off water by the action of alk. condensing agents. Products are obtained which may be used for lacquers or other products. Phenols, colophony and protein-contg. materials such as casein and yeast may be added.

Condensation products of phenols and ketones. I. G. FARBENIND. A.-G. Fr. 647,464, Jan. 18, 1928. Phenols of the benzene series are condensed with cyclic hydroaromatic ketones by means of halogen acids, preferably in a soln. of AcOH. The products may be distd. in vacuum. Thus, cyclohexanone, phenol, AcOH and HCl are heated to 50° ; the product corresponds to 4,4'-dihydroxyphenylcyclohexane, which on distn. gives a new compd. probably 4-hydroxyphenylcyclohexane, m. 124° . In the same way cyclohexanone and *o*-cresol give 4,4'-dihydroxy-3,3'-dimethyldiphenyl-1,1'-cyclohexane, m. 186° , and *p*-methylcyclohexanone and phenol give 4,4'-dihydroxy-1,1'-diphenyl-4'-methylcyclohexane, m. 179° .

Purifying phenolic condensation products. BRITISH DYESTUFFS CORP., LTD., N. STRAFFORD and E. E. WALKER. Brit. 296,514, July 7, 1927. Free phenol and sol. condensation products such as those of low mol. wt. are removed from resinous phenolic condensation products by incorporating the resins with an inert filler such as wood meal or pulp, cotton or similar wastes, china clay or fuller's earth and extg. with a solvent such as water, C_6H_6 or ether. A similar extn. may be applied to fabrics impregnated with the material and after the extn. the sheets (such as paper or cloth) may be dried and pressed to form laminated products. The $p\text{H}$ is preferably adjusted to between 3.5 and 7.0 before the extn.

Plastic compositions. SINIT A.-G. Ger. 471,835, Aug. 19, 1924. Addn. to Ger. 455,551. In the prepn. of plastic masses according to the prior patent, aldehyde condensation products are used instead of C_2H_2 condensation products. Phenol-formaldehyde condensation products are given as an example.

Coloring plastic substances. GRIGORI PETROFF. Fr. 33,532, Feb. 18, 1927. Addn. to 629,251. Plastic condensation products of phenols with aldehydes to be colored with org. dyes are first treated with an aq. soln. of a phenol, sulfonic acid or sulfonated oil with or without an org. solvent. In some cases the phenol, etc., may be added with the dye.

Plastic compositions, lacquers, etc., containing cellulose esters or ethers. I. G. FARBENIND. A.-G. Brit. 296,796, April 9, 1927. Plasters, putties, "knifing" and filler compns. and lacquers comprise a cellulose ester or ether, a solvent and graphite or talc or both and may contain other fillers such as mica, asbestos, slag-wool, lithopone, white lead or ground slate (at least 3 times as much filler as cellulose deriv. being used). Plasticizing agents, resins, coloring substances, etc., also may be added, and various examples are given.

Molded articles. CHARLES E. TURRELL (to Monobloc Co.). U. S. 1,707,585, April 2. In forming hard molded articles such as storage-battery boxes, a suitable base such as a mixt. contg. gilsonite is mixed with cotton or other fibrous material and with vulcanizable rubber, S and cement while heating sufficiently to effect vulcanization of the rubber, and a definite quantity of the heated material thus prepd. is placed in a mold, molded and allowed to cool and harden.

Molding. ERICH WILL. Ger. 471,612, Aug. 11, 1925. A protective coating for a permanent mold is composed of a groundwork of kieselguhr in which borax or water-glass has been mixed.

Hydrogenation. LOUIS BOURDELLES. Fr. 647,075, May 20, 1927. Substances to be hydrogenated are acted upon in admixt. with H by ultra-violet or other short radiations.

Cleansing agents. JULIUS LAMPFERHOFF. Fr. 647,103, May 25, 1927. An

agent for dry cleaning walls, paint, etc., contains water 100g, flour 800, Zn stearate 100, CuSO_4 50, chrome alum 30 g.

Polishing liquid. PETER LANCHICK. Can. 288,382, April 2, 1929. A liquid polish suitable for automobiles comprises the expressed juice of orange fruit 1 part, alc. 2 parts, spirit of turpentine 3 parts, highly pulverized chalk 1 part, paraffin wax $\frac{1}{4}$ part dissolved in 1 part of coal oil, and viscous oil $\frac{1}{8}$ part.

Mixture for polishing varnished or other surfaces. ROBERT F. RAYNOR. U. S. 1,708,801, April 9. Benzine 4.75 oz. and paraffin oil 2.25 oz. are mixed with the product formed by pptg. a soln. of gum sandarac 15 grains in alc. 4.75 oz. by means of vinegar 4.75 oz. and sepg. the white ppt. which forms.

Composition for polishing silver, brass or other metals. G. RAWLINSON. Brit. 296,875, Aug. 11, 1927. Pptd. CaCO_3 4 lbs., NH_3 soln. 2 oz. and "Reckitt's blue powder" 0.5 oz. are used together.

Polishing cloth. JOHN C. KOUGH, JR. (one-half to Charles S. Chapman). U. S. 1,707,485, April 2. A compn. of mild abrading powders including whiting as a main ingredient and which also may include Sn oxide, rouge, etc., is incorporated by pressure in the interstices and fibers of a cotton fabric made of soft twisted loosely woven yarns, together with finely powdered rosin which serves as a retaining agent for the abrading powder. The cloth thus prepd. is suitable for polishing metals, varnished surfaces, etc.

Annular lime kiln. EDMUND JEENICKE. Ger. 471,920, April 12, 1927. A kiln for burning lime has compressed air admission pipes in the bottom of the burning chamber.

Regenerating kieselguhr after use for filtration. ALPHONSE M. DUPERU. U. S. 1,708,362, April 9. Moist kieselguhr such as that which has been used in filtering sugar solns. is mixed with finely divided dry kieselguhr to give it a "mealy" consistency and the mixt. is passed through a drying kiln, comminuted and subjected to burning while agitated with air; dust from the drying and burning kilns is collected in water and the water and assocd. dust is mixed with dry kieselguhr from a calcining kiln and the kieselguhr is freed from surplus water and washed. An app. is described.

Laminated mica products. TORAZO OKURI. U. S. 1,707,277, April 2. A binder for use with mica laminae in forming products such as elec. insulating plates is prepd. by heating under pressure an aq. mixt. including fire clay, an alkali metal borate, an alkali metal silicate, Mg chlorate and NaOH.

Compositions for indicating humidity. EMIL HUBER. Ger. 472,366, Aug. 3, 1927. Compns. of the kind comprising CoCl_2 , gelatin, and H_2O are improved by addn. of glycerol. A suitable compn. contains 2 kg. gelatin, 600 g. CoCl_2 and 120 cc. glycerol in 2 l. distd. H_2O .

Solution for use in separating different seeds. HARRY R. WARREN (to Warren-Teed Seed Co.). U. S. 1,708,435, April 9. A mixt. comprising NaNO_3 77, Na phosphate 3 and commercial glucose 20 parts is used for sepg. seeds by immersing the mixed seeds in the soln.

Dynamo brushes from powdered material. CHARLES F. SHERWOOD. U. S. 1,708,192, April 9. Powdered metals such as a mixt. of Cu, Pb, Sn and graphite are molded into the form of a brush with a portion of a preformed conductor molded into the brush, and the material is then sintered in a bath of molten Na salt such as NaCN having a m. p. between 650° and 815° and having a fluxing action on the metals being sintered.

Lead matrices for making printing surfaces. C. WINKLER. Brit. 297,289, March 15, 1928. Lead foil is pressed on to a form at a temp. of about 100 – 120° at which it is sufficiently plastic to receive a good impression in one operation. An ordinary steam or electrically heated stereotype matrix press may be used.

Printing on celluloid or similar materials. P. ALLMAN and H. N. MORRIS. Brit. 296,461, May 3, 1927. In printing on materials such as celluloid, rubber, phenol- CH_2O and casein- CH_2O condensation products, inks are used comprising a soln. of a coloring substance in a hydrogenated deriv. of phenol, naphthalene or naphthol or their isomers, esters or mixts. so selected that a soln. of the coloring substance is used, the solvent of which has a penetrating action on the material printed. The printing is preferably effected by the photogravure process.

Glazing. EMIL SPIDLER. Ger. 471,598, Nov. 22, 1927. Leather, wood and metal objects are glazed by squirting atomized material such as wax soln. or emulsion from a container carried by the brushing or polishing device.

Gear blanks formed of layers of fibrous cords impregnated with synthetic resin. WILLIAM H. ADAMS. U. S. 1,708,166, April 9. Structural features.

Stencil sheet. SHINJIRO HORII. U. S. reissue 17,267, April 9. See original pat. No. 1,587,954 (C. A. 20, 2567).

Foil transfer sheet. CARL H. VON HOESSLE and WALTER RICHTER (to Chemische Fabrik von Heyden). U. S. 1,707,828, April 2. A carrier film of smooth non-porous material such as cellulose, a cellulose ester or gelatin is used with a layer consisting mainly of waxes and a minor proportion of colophony, a middle layer of coloring material such as a bronze powder and a top layer of adhesive resinous materials encasing the particles of the middle layer. Sheets thus formed are suitable for ornamenting and printing purposes.

Artificial hair. JEAN BOYEUX. Fr. 647,178, June 3, 1927. Artificial hair is made by coating sized artificial silk with a soln. in alc. of gum lac or resin lac.

Dental amalgams. JOSEPH P. A. HUSNOT. Fr. 647,550, Jan. 21, 1928. Alloy^s are readily amalgamated with Hg in the presence of a few drops of dil. H₂SO₄ satd. with PhNO₂ and tinted red with erythrosin.

Composition for dental molds. LOUIS J. WEINSTEIN. U. S. 1,708,436, April 9. Plaster of Paris and silica are used with an admixture of H₃BO₃ (suitably about 2-5%).

Vermin-destroying composition. ANDREAS BURTSCHER. Ger. 472,498, July 22, 1926. See Swiss 127,471 (C. A. 23, 1231).

Fire-extinguishing composition. GUIDO BLENIO. U. S. 1,707,597, April 2. A compn. which generates a fire-extinguishing foam is formed by mixing Al oleate or other suitable Al soap with a carbonate.

Waterproof substance. DU PONT CELLOPHANE CO., INC. Fr. 647,330, Dec. 30, 1927. A substance which can be made into thin waterproof sheets is made by mixing a base, a gum, a wax and a plastifying agent and dissolving the mixt. in a solvent which will maintain the substances in complete soln. during drying. The soln. is dried at a temp. higher than the m. p. of the wax and preferably in a slightly moist atm. Examples contain (1) nitrocellulose 52, ester gum 35, dibutylphthalate 8.7, paraffin 4.3%, a solvent for which consists of alc. 25, ether 43, toluene 18 and AcOBu 14%; (2) nitrocellulose 50, gum Damar 34, tricresylphosphate 12, paraffin 4%, the solvent contg AcOEt 62, toluene 27, alc. 9 and AcOBu 2%.

19—GLASS, CLAY PRODUCTS, REFRACTORIES AND ENAMELED METALS

G. E. BARTON, C. H. KERR

The chemical surface treatment of glass. W. MINDT. *Glas- und App.* 9, 11 (1928); *J. Soc. Glass Tech.* 12, 236.—A general article dealing with etching media and the action of these, methods of use, advantages and disadvantages of the chem. treatment of glass, special etching processes such as ice and line etching and acid polishing.

H. L. D.

Chemical action in the annealing of glass. GUSTAVE KEPPELER. *Tech. Hochschule, Hannover. Sprechsaal* 61, 300-5(1928).—The two distinct actions in annealing glass are: (1) action in mass as a whole, (2) action on the surface. Data are presented based on these considerations which show the effect with no annealing compared with one and two annealings when the glasses are treated with different solns. R. A. H.

The behavior of glasses toward saturated water vapor. FRITZ FRIEDRICKS. *Sprechsaal* 61, 261-3, 282-5(1928).—The work of Förster and Hodkin, and Turner is reviewed. The 4 partial reactions occurring in connection with the conduct of glass toward satd. water vapor are (1) hydrolysis of the glasses, (2) the soln. of glass in water, (3) peptization of the silicic acid, (4) mineralization of the glasses. These 4 reactions are investigated by the autoclave method of Förster. The data obtained on 22 chem. glasses are given in tables and curves.

R. A. HEINDL

Studies on the production of glasses colored by sulfur. H. HEINRICHS AND C. A. BECKER. Kaiser Wilhelm Inst. *Sprechsaal* 61, 411-4(1928).—A discussion on the use of metallic sulfides, such as those of Cd, Al, Fe, Mg, Ni and Cu for the production of yellow tints and colors in glasses and the conditions under which these colors are best produced.

R. A. HEINDL

The durability of colors for painting on glass. F. GREINER. *Diamant* 50, 577, 598 (1928); *J. Soc. Glass Tech.* 12, 374-5.—A coloring matter for glass is a Pb silicate in combination with an inorg. color. An important factor in durability is the burning temp. This should be as high as is consistent with safety. The melting in of the flux materials may cause a diminution of the resistance of the glass. Blackening and

opacity of the blues have been eliminated. The durability of the glass is very much affected by the burning on of the colors. Reducing gases in the furnace result in the colors being badly fixed. New muffles absorb Pb and flux from the color. Muffles should always be burned out before use and a preliminary run with red lead given. For good burning, an oxidizing flame is necessary. Heated rooms have a bad effect by causing excessive perspiration which attacks the glass together with CO₂. A good protecting layer can be made by painting with a soln. of beeswax in turpentine.

H. I. D.

Physical examinations of glasses of considerable transparency to ultra-violet rays. A. RUTTENAUER. *Sprechsaal* 61, 449-50, 453-5(1928).—Although since 1907 there have been glasses which have transmitted ultra-violet rays, those glasses were rather unstable and were made only in the lab. The latest ultra-violet glasses are produced commercially and in most cases permit the passage of larger percentages of the waves under 300 μ than the old Schott and Company's Uviol glasses. The physiol. importance of the ultra-violet glasses lies in the fact that they may be used as window panes or as filters or casings when used in the building up of org. tissues and the prevention of diseases. Only the quantitatively detd. ultra-violet transmissibility of glasses permits their proper valuation. Detns. were made of the ultra-violet transmissibility of glasses used in therapeutic work. A simple test method is described. The transmission decreases with increasing temps. and also by intensive passage of the rays.

R. A. HEINDL

The manufacture of fused bifocal spectacle lenses. ROBERT J. MONTGOMERY. *J. Am. Ceram. Soc.* 12, 274-303(1929).—A crown glass, n 1.5230, is fused with a Pb glass, n 1.616 or 1.66 or 1.69. The problems involving thermal expansion, surface crystn., surface bubbles and the softening temps. of the glasses are difficult to control. The glass compns. are given. The so-called colorless bifocals are made by using a Ba glass in place of the Pb glass.

C. H. KERR

Method of determining free aluminum oxide in silicate mixtures and its application to the study of clays. L. A. SHMELEV. *Trans. Ceram. Research Inst.* (Moscow) 1928, No. 14, 24 pp.—A small quantity of the powd. silicate mixt. is treated in a test tube with a hot alc. soln. of alizarin red, the soln. having been previously satd. at the b. p. with boric acid to prevent coloration of the alkalies and alk.-earths. The contents of the test tube are boiled and decanted, and the residue is washed with a hot, satd. alc. soln. of boric acid. The extent to which the residue has become stained red indicates the amount of free Al₂O₃ present. Hydrargillite and diasporite do not react with the alizarin red soln., but they become strongly colored after heating for 2-5 mins. in the Bunsen flame. No liberation of Al₂O₃ from the kaolinite mol. was detected by this method between the temp. limits of 550° and 1100°.

B. C. A.

The compressive and transverse strength of brick. J. W. MCBURNEY. U. S. Bureau of Standards. *J. Am. Ceram. Soc.* 12, 217-29(1929); cf. C. A. 22, 1023.—Data are given on 27 makes.

C. H. KERR

Effect of typical slags on fire brick with a method of determination correlated to service. CHESTER E. GRIGSBY. *J. Am. Ceram. Soc.* 12, 241-63(1929).—In a rotary, slagging test furnace, tests were made on 50 fireclay and diasporite mixes, using high Fe₂O₃, high CaO and high Na₂O slags. Results are given in detail.

C. H. KERR

Masonry failures due to vertical shear. FRED T. HEATH. *J. Am. Ceram. Soc.* 12, 230-40(1929).

C. H. KERR

Concentration of hydrogen ions in ceramic materials. JOSEF ROBITSCHKE. *Chem. Ober* 4, 5-9(1929).—The properties of ceramic materials depend in no small degree on H-ion concn. of H₂O used for their manuf. The expts. performed with various clays showed that the max. strength of ceramic materials made from clays with high content of Al₂O₃ was obtained at $p_H = 7$. No effect of change of p_H , however, was observed with clays poor in Al₂O₃ and rich in SO₂. Cf. C. A. 20, 3547.

J. K.

Some properties of glaze slips. EDWARD SCHRAMM AND ROBERT F. SHERWOOD. *J. Am. Ceram. Soc.* 12, 270-3(1929).

C. H. KERR

Organic agents as aids to the adhesion and suspension of glazes. E. S. FOSTER. *J. Am. Ceram. Soc.* 12, 264-9(1929).

C. H. KERR

The failure of refractory materials at very high temperatures. M. W. TRAVERS. *Chemistry & Industry* 48, 106-7(1929).—The failure of refractory materials in most cases is a function of the viscosity of the interstitial glass. Freshly vitrified fireclay, e. g., shows in microscopic section little but homogeneous, opaque or glassy material with a few needle crystals of mullite. On further heating, especially if in contact with mineralizers, microscopic examn. shows the fireclay material to consist of increased numbers of mullite crystals in a glassy matrix of low viscosity. Failure of the refractory

may now occur especially under load. *Sillimanite* on heating forms mullite crystals and a highly viscous matrix of SiO_2 , which accounts for the excellence of sillimanite refractories.

L. B. MILLER

Deformation of refractory material under load at high temperatures. E. KÖHLER. *Trans. Ceramic Research Inst. (Moscow)* 1928, No. 12, 119 pp.—The various methods of detg. refractoriness-under-load are reviewed, and preference is given to the method which measures the degree of deformation under a given load under the influence of a gradually rising temp. Tests were carried out with app. consisting essentially of an elec. C-resistance furnace provided with a system of levers for applying the load. A pointer recorded the movements of the test piece, magnified 10 times, on a suitable scale. A constant load of 1 kg./sq. cm. was applied, and the temp. rose at the rate of 300° per hr. up to 950°, and thereafter at 240° per hr. Temps. were measured with a thermo-element, protected by a special tube passing through the bottom of the furnace, the junction of the element being level with, and in close proximity to, the lower third of the test piece. The test pieces were cylinders 50 mm. high and 35.7 mm. in diam. The results of tests made on Russian clays showed that the finer the grog, the higher was the temp. of initial softening; a 40% deformation, however, occurred at a lower temp. with the fine grog mixts. than with the coarser grog mixts. Bodies contg. mixed grog sizes showed greater resistance to deformation than bodies with one fraction, whether fine or coarse. With mixts. made from one clay, a close relationship was noted between the max. strength (cold), the temp. at which a 4% deformation took place under load, and the firing shrinkage corresponding to the max. cold strength. A low-fired grog produced better cohesion between the grog grains and the bonding clay. The ratio of grog to bond, within the limits of 35 to 55% of bond, had no effect on the strength under load. Kaolin-grog bodies were also prepd. and fired to different temps. Best results in the under-load test were obtained with bricks fired at cone 28.

B. C. A.

The chemical analysis of silicates (ROBITSCHER) 7. Evolution in conceptions of continuous furnaces and methods of heating them (HIRT) 1. The cause of thermo-tribo-electric abnormality of glass (MONTE) 2. Muffle furnace for vitreous enameling (Brit. pat. 296,936) 1. Colored bituminous compositions for making tiles, blocks, etc (Brit. pat. 296,626) 22. Extraction of clay [from crude or waste coal, iron ores, etc] (Fr. pat. 647,928) 13.

MILLER, G. B.: **Etching of Glass** (in German). Berlin: A. Hartleben. \$1 25
Reviewed in *Ceram. Ind.* 12, 226(1929); *Ceram. Abstracts* 8, 245(1929).

Glass transparent to ultra-violet rays. SOC. ANON. DES MANUF. DES GLACES ET PRODUITS CHIM. DE SAINT-GOBAIN, CHAUNY ET CIREY. Fr. 647,188, June 4, 1927. See Brit. 291,468 (C. A. 23, 1235).

Glass making. NAAMLÖÖZE VENNOOTSCHAP MIJ TOT BEHEER EN EXPLOIT. VAN OCTROOIEN. Fr. 647,650, Jan. 24, 1928. Guides for sheet glass between the rollers, etc., are described. Cf. C. A. 23, 2262.

Apparatus for gathering glass by suction, etc. S. HUNT. Brit. 297,142-3, June 15, 1927. Structural features.

Apparatus for supplying molten glass. DEUTSCHER VERBAND DER FLASCHENFABRIKEN G. M. B. H. Ger. 472,140, Aug. 24, 1924.

Apparatus for temperature regulation and delivery of viscous glass from furnaces. OLIVER M. TUCKER and WILLIAM A. REEVES (to Hartford-Empire Co.). U. S. 1,708,037, April 9. U. S. 1,708,069 also relates to similar app.

Apparatus for cooling sheet glass. JESSE W. WILDERMUTH (to Libbey-Owens Sheet Glass Co.). U. S. 1,707,242, April 2.

Producing designs on sheet glass. EDWARD DANNER. Ger. 472,314, June 21, 1925. A stream of glass is guided on to an impression roller provided with designs and while plastic is forced into contact therewith by gas pressure.

Rolling and annealing glass sheets. SOC. ANON. DES MANUFACTURES DES GLACES ET PRODUITS CHIMIQUES DE ST.-GOBAIN, CHAUNY ET CIREY. Brit. 296,282, Feb. 18, 1928. Mech. features.

Annealing sheet glass in tunnel leers. EMPIRE MACHINE CO. Ger. 472,142, Mar. 11, 1924. Gases are supplied to the tunnel above and below the glass level and the of the streams are adjusted so as to obtain uniform cooling on both faces of the

Leer for annealing glassware. VERGIL MULHOLLAND (to Hartford-Empire Co.). U. S. reissue 17,263, April 9. See original pat. No. 1,571,137 (C. A. 20, 976).

Surfaces for working plastic glass. SENDLINGER OPTISCHE GLASWERKE G. M. B. H. Ger. 472,141, July 10, 1925. Surfaces such as chamotte plates on which glass is to be worked while soft are coated with H_2WO_4 or H_2SnO_3 , or compds. thereof such as $CaWO_4$, to prevent adhesion of the glass.

Hollow bodies from quartz glass. FRITZ ECKERT. Ger. 472,143, April 22, 1927. In making hollow bodies from quartz glass by melting powd. quartz on to a quartz glass hollow body, a cooling agent is led through the hollow body during the melting.

Reinforced glass. P. J. PORT and J. NEWTON. Brit. 296,825, June 13, 1927. One face of each of 2 sheets of glass is coated with a soln. of albumin in distd. water, the coatings are dried and there is then applied to them a soln. of pyroxylin in ether or absolute alc. or $AmOAc$ which is also dried. The 2 sheets are then united under pressure, at a temp. of 40–50°, with a celluloid sheet which has been immersed in an alc. soln. of dimethylamine to which a small proportion of $HOAc$ also may have been added. The edges of the compound sheet may be sealed by collodion or celluloid.

Making wire glass. HENRY F. CLARK (to Window Glass Machine Co.). U. S. 1,708,662, April 9. Mech. features.

Bricks, tiles, etc. ÉMILE FRANKEN. Fr. 647,350, Jan. 7, 1928. Sawdust or wood shavings is agglomerated with Na_2SiO_3 and made into bricks, tiles, etc.

Burning argillaceous material to reduce light-weight aggregate for concrete sewer pipe, brick, etc. STEPHEN J. HAYDE (to American Aggregate Co.) U. S. 1,707,395, April 2. The material is subjected to the highest temp. used in burning, at the beginning of the burning process, in order to produce a vesicular material and the product is crushed.

Apparatus for sifting potters' slip, etc. J. W. RATCLIFFE and E. COTTON, LTD. Brit. 296,959, April 5, 1928. Structural features.

Continuous furnace for ceramic ware. JOSEPH A. DEDOUCH. U. S. 1,708,083, April 9. Structural features.

Continuous furnace for ceramic products. JOSEPH A. DEDOUCH. U. S. 1,708,124, April 9. Structural features.

Kiln for burning terra cotta, sanitary ware, etc. CARBORUNDUM CO., LTD. Brit. 297,241, Nov. 12, 1927. Structural features.

Apparatus for feeding plastic ceramic material to molds. WM. J. MILLER. Fr. 647,763, Jan. 17, 1928.

Casting porcelain articles such as artificial teeth. KUNSTZAHN GES. Brit. 296,765, Sept. 7, 1927. A raw material for use in casting teeth or fillings consists of porcelain grains of substantially spherical form produced by casting a viscous porcelain mass onto a chemically inert base, breaking the casting into small pieces after it has cooled, and subsequently rendering the pieces sufficiently fluid that they assume the desired form.

Glaze. KARL STOLL. Fr. 647,834, Dec. 29, 1927. See Brit. 282,786 (C. A. 22, 3971).

Refractory materials. UNITED STATES METALS REFINING CO. Fr. 33,578, May 6, 1927. Addn. to 607,611. In the manuf. of molded refractory materials the magnesite used is powdered to different degrees of fineness, before its mixt. with siccative oil so that during mixing and molding the fine particles penetrate between the larger and give a denser product.

Diaphragm for surface combustion apparatus. FREDERICK J. COX. U. S. 1,707,976, April 9. A molded porous diaphragm is formed of refractory material, partly in granular and partly in powdered form, together with a binding material, e. g., of fire clay and Na silicate.

Abrasives. H. R. POWER (to Carborundum Co., Ltd.). Brit. 296,195, Aug. 30, 1927. See U. S. 1,661,849 (C. A. 22, 1452).

Enamel having a cement base. J. PEETERS. Belg. 352,464, July 31, 1928. The enamel is formed of a mixt. of cement, $CaCO_3$ and coloring oxides rendered liquid by addn. of an aq. rosin emulsion. After being coated with this enamel, the objects are heated in a closed vessel.

White enamel for incandescent lamps. FRANZ SKAUPY, HEINZ NACHOD and GEORG GAIDIES (to General Electric Co.). U. S. 1,708,743, April 9. A white enamel is formed of Pb oxide 65, ZnO 15, B_2O_3 20 and "arsenic" 0.5 part.

20—CEMENT AND OTHER BUILDING MATERIALS

J. C. WITT

Waste-heat equipment for portland-cement mills. L. ECK. *Pit and Quarry* 17, No. 7, 59-63(1929).—A description of the installation of waste-heat equipment back of the rotary kilns. Full details of the installation in a Halle cement mill are given.

J. W. SHIPLEY

Some observations concerning the health of cement workers. A. J. R. CURTIS. *Rock Products* 31, No. 20, 75-7(1928); *Public Health Eng. Absts.* E-785b, 1.—This paper deals with a study of the health of the workers in a portland cement plant. The case histories of the 21 cases suspected or positive for tuberculosis are quoted and the chief finding, that portland cement does not incite the development of pulmonary tuberculosis, is discussed. C. points out that while this study disclosed a high rate of upper respiratory disease affection, there is ground for belief that exposure to the weather and low standards of living have a great deal to do with this high rate of minor respiratory disease. As proof of this he cites the experience of various mill executives to the effect that no higher rate of absenteeism exists in dusty mills than in non-dusty ones. The existence of other ailments such as skin diseases is mentioned and the importance of personal hygiene emphasized. Conjunctivitis is also stressed with reference to personal hygiene.

C. R. F.

Impregnation of wood by electroösmosis. B. F. SCHWARZ. *Inst. du Pin. Bull. inst. pin* No. 57, 88-90(Feb., 1929). See *C. A.* 23, 948.

A. PAPINEAU-COUTURE

The treatment of mine timber. W. ENGELS. *Glückauf* 64, 1473-82(1928).—Pressure impregnation is preferable to dipping as it causes deeper penetration not only during treatment but also during use. The best preservatives both from the point of view of protection against fungi and economy are dil. solns. (1 or 2%) of Basilit (89% NaF and 11% dinitrophenylaniline) and Triolith (85% NaF, 10% dinitrophenol and 5% $\text{Na}_2\text{Cr}_2\text{O}_7$). Their use increases the life of the timber to 20 yrs. Chem. combination between dinitrophenol and the outer portion of the wood may account for protection from the outside, while diffusion of NaF into the interior destroys the possibilities of decay there. Glückauf Basilit (85% Triolith and 15% NaCl), although it renders timber less in flammable, is not as effective because of the leaching out of NaCl. While HgCl_2 solns. can be applied only by the dipping process they increase the life of timber to 10 yrs. provided no Fe (which destroys the preservative) is used in construction. The use of NaCl solns. doubles the life of timbers, the fungus resisting properties depending not on any toxic action of NaCl but on its removing from the fungus the H_2O necessary for life. The coating processes "Torkret" and "Velo" are also of minor value; The cement used acts like a valve, preventing decay only in an atm. contg. less than 85-95% moisture. The fungicidal action of tar oil may be attributed to the volatile tar-acid portion, the concn. of which decreases in time. The strength of the timber is inversely proportional to the salt content. Tar oil causes a 10% increase in strength but destroys the wearing properties of wood in consequence of the transformation of the cell walls into a horn-like substance. Comparison of the effect of various preservatives should be made with timbers having similar structure and thickness as well as similar moisture content. Before treated timber is installed economic factors must be considered such as the rock pressure, lifetime of the workings, and that of the raw wood. Timber should be treated only when calcs. show that the life of the timber will be at least doubled thereby.

J. B. SHOHAN

Reaction of water on Ca aluminates (WELLS) 6. **Rubber roadways (CHAPMAN) 30.** **Chemistry of road tar (MALLISON) 22.** **Trinidad asphalt in road building (ANON) 22.** **The limestone resources of the Pontiac-Fairbury region (LAMAR) 18.** **Colored bituminous compositions for road surfaces, etc. (Brit. pat. 206,626) 22.** **Glaze (Fr. pat. 647,834) 19.** **Cement (Fr. pat. 648,029) 18.**

Cement. INTERNATIONAL PRECIPITATION CO. Fr. 647,250, Aug. 24, 1927. Portland cement is mixed with a plastifying and impermeablizing agent contg. a natural mixt. of earthy material such as a clay schist or diatomaceous earth and an oily or bituminous substance. The proportion is preferably 1 of plastifying agent to 10-20 of cement.

Feeding cement slurry to rotary kilns. NIELS NIELSON (to F. L. Smidth & Co.). U. S. 1,708,705, April 9. Slurry is introduced into the kiln as a fine spray and dust passing out of the feed end of the kiln is collected and delivered into the path of the

slurry spray so that the latter carries the escaping dust back into the kiln. Various structural features are described.

Rotary kiln suitable for burning cement. JOHAN S. FASTING (to F. L. Smidth & Co.). U. S. 1,708,693, April 9. Structural features.

Waste-heat-boiler plant for operation with cement kilns. FRANK G. McKELVY and JOHN E. BELL. U. S. 1,707,964, April 2. Various structural features are specified.

Fibers for cement. SOC. GÉNÉRALE D'EXPLOITATIONS INDUSTRIELLES. Fr. 647,089, May 23, 1927. Mineral fibers such as asbestos to be used in cement making are treated with dil. H_2SO_4 to facilitate opening up. Fibers which are not attacked by dil. acid are treated with alk. silicate and subsequently with an acid.

Siliceous stones. CONTOR FEUERFESTER MATERIALIEN G. M. B. H. Fr. 647,702, Jan. 26, 1928. Finely basic cements are used as agglutinants in the manuf. of siliceous stones by calcination of quartzites, siliceous and cryst. quartz, etc., of medium quality at a temp. above 1500° .

Artificial stone. GEORGES BIA and J. É. DOUZAL DE GRANVILLE DE BIELIZE. Fr. 647,083, May 21, 1927. Artificial stone is formed of chlorosulfates of Mg and Zn by mixing $MgSO_4$ and $ZnSO_4$ with MgO and $MgCl_2$. Stone dust, waste sand, etc., may be added.

Pavement construction. LEON R. MACKENZIE. U. S. 1,707,939, April 2. A course of asphaltic material is laid which contains aggregate having a dimension greater than half the thickness of the course and expanded steel or other material in the central portion of the layer serves to permit vertical movement of the rock aggregate under compression (by traffic or otherwise) without permitting any substantial horizontal movement.

Repairing cuts in pavements with wet self-hardening paving material. LE VERN FOX. U. S. 1,707,391, April 2. Mech. features.

Residues from lubricating oils for use on roads. WILHELM H. SCHMITZ. Fr. 647,897, Jan. 21, 1928. Residues from the purification of lubricating oils are emulsified in water with asphalt and used on roads.

Forming thick sheets of asbestos-concrete or like material. JOHN C. MACILLOWIE (to Asbestos Wood and Shingle Co.). U. S. 1,708,842, April 9. Mech. features.

Composition of fiber and thermoplastic rubber derivative. HARLAN L. TRUMBULL (to B. F. Goodrich Co.). U. S. 1,708,111, April 9. A compn. suitable for use in sheet or board form comprises sulfite pulp, straw, cotton or other fibrous material, the individual fibers of which are sepd. from each other and surrounded with a thermoplastic rubber deriv. such as that produced by the action of *p*-toluenesulfonic acid and H_2SO_4 on rubber.

Building felt. RAY P. PERRY (to The Barrett Co.). U. S. 1,707,491, April 2. An aq. mixt. of paper-making stock and an emulsion contg. waterproofing material such as asphalt and stearite is formed into sheets on a paper-making app.

Building boards from waste wood products. ARTHUR E. MILLINGTON. U. S. 1,708,586, April 9. Waste wood material such as slabs or bark is disintegrated, softened by treatment with a soln. of salt and Na_2CO_3 and water and steam under pressure, refined and formed into boards.

Agglomerating wood charcoal. ÉMILE A. BARBET. Fr. 647,173, June 3, 1927. Wood charcoal is agglomerated with sugar molasses which has been treated with viscous ferments such as "sugar gum" or "frog spawn," whereby the agglomerating properties are greatly increased.

Artificial wood. GEORGES BIA and JEAN É. DOUZAL DE GRANVILLE DE BIELIZE. Fr. 647,082, May 21, 1927. Artificial wood is made by mixing sawdust and asbestos with linseed oil and the condensation products of $PhOH$ and CH_2O , MgO , $MgSO_4$ or $ZnSO_4$ may be added.

Preserving wood. W. IWANOWSKI and J. TURSKI. Brit. 296,332, April 28, 1927. See Fr. 634,106 (C. A. 22, 3756).

Permeating wood with metallic substances. KAISER-WILHELM-INSTITUT FÜR EISENFORSCHUNG. Brit. 296,986, Sept. 10, 1927. Wood or similar fibrous material is impregnated with liquid metals or liquid alloys for producing an elec. cond. material, or for preserving the wood or obtaining a product retaining the fibrous grain and which can be polished like metal.

The cold impregnation of wood to protect it from parasites such as termites, etc. C. DE ZUTTERE. Belg. 351,173, June 30, 1928. The product consists of primary tar obtained by the carbonization of coal and certain lignites at a temp. below 560° , of oil obtained by fractionation of the said tar and contg. 47-60% phenols, of a light benzene oil and of crude commercial $PhNH_2$. Cf. C. A. 23, 2010.

21—FUELS, GAS, TAR AND COKE

A. C. FIELDNER

Notes on recent developments in fuel technology. R. WIGGINTON. *Fuel in Science & Practice* 8, 51-3, 101-3(1929); cf. *C. A.* 23, 1242.—Brief reviews of the following subjects: giant power, thermal energy from the sea, dry cooling of coke, hydrogenation of Australian coal, fine chemicals from petroleum; oil gas, steam storage, the K. S. G. low-temp. carbonization process.

D. A. REYNOLDS

Excerpts from the report of the national fuel and power committee. ANON. *Fuel in Science & Practice* 8, 58-65(1929).—Summarized findings of the national fuel and power comm. are given. These pertain to fuel research (British), fuel economy in Germany, general carbonization, the gas industry and the coke-oven industry.

D. A. REYNOLDS

The spontaneous combustion of semi-coke from brown coal: Its causes and prevention. P. ROSIN. *Fuel in Science & Practice* 8, 66-78(1929); *Braunkohle* 27, 241-56, 282-92(1928); cf. *C. A.* 22, 2453.

D. A. REYNOLDS

The maximal carbon dioxide content. R. NITZSCHMANN. *Metallbörse* 18, 1968 (1928).—For every fuel, solid, liquid, or gaseous, let A = combustible C, a = C present as CO_2 , B = free H_2 , C = free O_2 , D = gaseous N_2 , all in weight %, n = vol. % O_2 , $100 - n$ = vol. % N_2 of the air for combustion and k_{\max} = highest possible vol. % CO_2 in the water-free combustion gases; then $k_{\max} = 100n(A + a)/[100A + (100 - n)(3B - 0.375C) + n(a + 0.428D)]$. For pure O_2 , $n = 100$ and $k_{\max} = (A + a)/(A + a + 0.428D)$. When $n = 20.9$, i. e., for air, $k_{\max} = 100(A + a)/(4.784A + 11.354B - 1.4192C + a + 0.428D)$. Thus for the liquid fuels C_nH_m , as $A = [(12n/12n + m)]100$ and $B = [(m/12(n + m))]100$, k_{\max} can be calcd., e. g., for benzene, naphthalene, pentane, hexane, heptane, $k_{\max} = 17.5, 18.04, 14.17, 14.29, 14.39$ (all %), respectively, while in pure O_2 , all obviously give $k_{\max} = 100$. In gaseous fuel let $V_1, V_2, V_3, V_4, V_5, V_6$ be the respective vol. % of $\text{CO}_2, \text{CO}, \text{CH}_4, \text{O}_2, \text{H}_2, \text{N}_2$; then $A = 0.00536(V_2 + V_3)$, $a = 0.00536 V_1$, $B = 0.000893(2V_3 + V_4)$, $C = 0.00715(V_2 + 2V_4)$, $D = 0.0125 V_6$. $k_{\max} = 200(V_1 + V_2 + V_3)/[2V_1 + V_2 - 2V_3 + 2V_4 - V_5 + 2V_6 + (100/n)(V_2 + 4V_3 - 2V_4 + V_5)]$; whence for pure O_2 , $n = 100$, $k_{\max} = 100(V_1 + V_2 + V_3)/(V_1 + V_2 + V_3 + V_5)$ and for air, $\text{O}_2 = 20.9$, $k_{\max} = 100(V_1 + V_2 + V_3)/(V_1 + 2.892 V_2 + 8.568 V_3 - 3.784 V_4 + 1.892 V_5 + V_6)$.

S. L. B. E.

Fuel consumption of large furnaces. M. LAFFARGUE. *Chaleur ind.* 9, 379-83(1928).—Some furnaces require 700,000 cal. per ton of iron charged (cold); better furnaces require 350,000 cal. and these improved results have been obtained with very poor fuel. Actually, heating the iron to 1250° requires about 200,000 cal. per ton. The losses are (a) heat radiated by the furnace, which can be measured and (b) heat taken off by the gases, which can also be detd. L. found a large loss of radiant heat from the top of the reheating furnace. Heat loss through the chimney varies with the amt. of inert matter in the fuel, amt. of excess air, and with the temp. of the gases. The flues act as recuperators of the heat losses from the chamber. The heating chamber may be treated as a const. source of heat and the temp. of the flame in the chamber should be const. The temp. of the furnace will depend upon the theoretical temp. of the flame, concn. of the flame, heat capacity of the walls, etc., and surface of iron to be reheated. Each of these factors is dealt with in turn. A discussion is given.

S. L. B. ETHERTON

Steam generation at high pressures and temperatures. I. Preliminary study. ST. LOEFFLER. *Tech. Hochschule, Charlottenburg. Power* 69, 486-9(1929). A discussion of standard boilers used in high-pressure steam generation. II. The Loeffler boiler. *Ibid* 524-7.—A detailed and illustrated description. "The heating medium is steam which, taken from the vaporizer and forced to circulate by the pump, is superheated in a coil set in a furnace, and then blown into the water contained in the vaporizer. A portion of the superheated steam is led away to be used by the engine."

D. B. DILL

A résumé of high steam pressures in the industrial plant. P. W. SWAIN. *Power* 69, 582-5(1929).—The possibilities of by-product power justify a wide pressure range in industrial plants. A chart shows the expansion of steam in a series of 10 stages, from 0 to 1450 lbs. per sq. in. The adiabatic heat drops in each stage are taken such that with a stage efficiency of 70% the stage will produce 1 kw. hr. from each 100 lbs. of steam passing through the turbine.

D. B. DILL

Coal. F. C. WIRZ. *Intern. Congress Testing Materials* 1927, II, 659-63. Emphasis is given to the importance to buyers, miners and dealers of a knowledge of

the compn. and characteristics of a given fuel as making it suitable for specific uses: power plant, metallurgical, gas manuf. and coke production. The relative values of different tests and methods used to det. the compn. and properties of coal and coke are discussed.

of the results of their investigations, but no references are given to the journals in which the articles were published. A no. of the tests developed for detg. the swelling, coking and reactivity properties of coal and coke are outlined and compared from the practical standpoint.

W. W. HODGE

A new method of studying the microstructure of coal: Etching by tetralin. CHOZO IWASAKI. *Fuel in Science & Practice* 8, 143-4(1929).—Tetralin at 190 to 200° generally dissolves well the newly formed humic substance in coal. Very young coals and highly coalified ones are dissolved only with difficulty; hence this solvent, as an etching agent, is suitable to black lignites and low-rank bituminous coals. When less coalified plant remains are embedded in a comparatively well coalified ground-mass, the former stands in relief while the latter is etched by the reagent. Thus either anthraxylon or attritus may be the more greatly attacked by tetralin, depending upon the relative degree of coalification of these constituents.

D. A. REYNOLDS

The significance of the inorganic constituents of coal in fuel technology. K. BAUM. *Glückauf* 64, 1733-41(1928).—B. reviews the literature on coal ash—its economic importance, compn. and effect on coking and combustion processes. He further reviews the older methods of fusion-point detn. and describes the recent method of Bunte and Baum (C. A. 22, 145). The work of Prost, Teume, Haslam and others on the system $\text{SiO}_2\text{-Al}_2\text{O}_3$ -bases is discussed, and an explanation offered for the mechanism of slag formation. This is governed essentially by three factors (1) the melting or soln. process which is explained by the fusion curves, (2) the atm. (oxidizing or reducing) in the fuel bed, (3) the nature of the fuel in which the ash is distributed. J. B. S.

A rapid method for the determination of nitrogen in coal. J. W. WHITAKER. *Fuel in Science & Practice* 8, 145(1929).—The coal is rapidly oxidized with strong H_2SO_4 and KMnO_4 and the NH_3 estd. by nesslerizing. Specific details of the method are given. The results by this method check well with those obtained by the method of Kjeldahl, Wilfarth and Gunning.

D. A. REYNOLDS

Use of pulverized coal in marine engines. B. D. MOORE. *Iron & Steel Can.* 11, 368-71(1928).—Tests made by the U. S. Shipping Board on the 9730-ton cargo ship *Mercer*, on four round trips between New York and Rotterdam, using pulverized coal in Scotch marine boilers, were highly successful. Pulverized coal (75% through a 300 mesh) and high-flame turbulence combined with equal distribution of coal to the furnaces were found necessary for the best results. Storage of pulverized coal over inert CO_2 at the quay-side is suggested as practicable. Ships with double bottoms on long voyages would find oil fuel more economical but where bunkering does not affect the cargo-carrying capacity pulverized-coal-burning ships would have an advantage over oil-fired ships or motor boats.

J. W. SHIPLEY

Trenton Channel Station eliminates powdered coal dust from cyclone vents. H. E. MACOMBER. *Detroit Edison Co. Power* 69, 464-7(1929).—Bag-filter equipment efficiently recovers coal dust. Hoppers and ducts are heat insulated and preheated air is added to the vent mixt. to prevent condensation.

D. B. DILL

Lignite gives 71 per cent efficiency. G. W. WELSH. Otter Tail Power Co., Washburn, N. D. *Power* 69, 385-7(1929).—The lignite used has 6000 to 6500 B. t. u. per lb., 40% H_2O , 6 to 8% ash, 28% fixed C and 27% volatile. Details of operation are described.

D. B. DILL

The influence of inorganic materials in lignite carbonization. A. W. GAUGER AND D. J. SALLEY. *Fuel in Science & Practice* 8, 79-85(1929).—The effect was studied of the addn. of various inorg. reagents to lignite from the Truax-Traer mine at Velva, N. Dakota, upon its carbonization. The lignite was air dried and ground to pass a 20-mesh sieve, then ground together with 5% of reagent (in aq. soln.) in a mortar. Briquets were made of the mixts. thus prepd. and these were carbonized in a Fischer Al retort at 500° for 1.5 hrs. Tests were made at 850°, a similar retort made of Cu being used. The yields of char, tar and gas were measured and the character of the chars was studied. Conclusions: (1) Inorg. materials may exert a specific effect on

the structure of the char as well as on the yield of char, tar and gas. (2) Hydrates of AlCl_3 , $\text{Al}_2(\text{SO}_4)_3$, $\text{Al}(\text{NO}_3)_3$, MgSO_4 , MgCl_2 and SrCl_2 alter the structure of the char produced, yielding a hard pseudo-coke differing materially from the soft, powd. char of the untreated coal, whereas the anhyd. salts produce soft, fine chars. (3) FeCl_3 hydrate increases the yield of char at the expense of the tar. (4) Na_2CO_3 decreases char and tar yields and increases gas yields. (5) SiO_2 is without effect. D. A. R.

Low-temperature carbonization developed commercially. G. L. MONTGOMERY. *Power* 69, 593-5(1929).—The plant nearing completion at New Brunswick, N. J., has a capacity of 250,000 tons per yr. Each ton yields 1200 lbs. salable smokeless fuel, 300 lbs. fines used to make producer gas, 3500 cu. ft. of 900 B. t. u. gas, 25 gals. of tar, and about 2.5 gals. of light oil (a satisfactory anti-knock motor fuel). The set-up and operation of the plant are described. D. B. DILL

Recovery of primal substances through the distillation of coal. CONSTANTIN, REDZICH. *Apparatebau* 41, 49-52(1929).—Description, with 4 cuts, of plants for the production of motor fuels, benzene, oils, paraffin, creosotes, asphalt, tar, etc.

J. H. MOORE

The work of the Emscher association on the recovery of phenol from ammonia liquors of the Ruhr mining companies. H. WIEGMANN. *Glückauf* 64, 397-404, 435-451(1928).— NH_3 liquor is washed with benzene, toluene or other suitable extn. liquid, the wash medium is sepd., and the solvent is recovered and reused. The phenol-contg. benzene may also be washed with soda lye and the alkali regenerated and reused after caustification. Accounts are given of the installations at Dorsfeld, Mathias Stinnes, and König Ludwig and Jacobi mining companies and of the Emscher association, together with 5 flow sheets. The plants comprise, in general, a raw-liquor vessel, filter, clear-water container, heat exchanger, mixing pump, sepg. vessel, distn. app., benzene reservoir, phenol reservoir and coolers. As a rule, a plant will treat 120-150 cu. m./day of liquor contg. about 3-4.5 g. phenol/l. Cost figures for the installations are analyzed. Phenol removal from the waters is improved by warming, by better contact with benzene, by having purer ammonia water and washing by counter current. The operation, the layout, efficiencies and results are discussed in detail for every installation. In each company the ammonia water and washing benzene were different but it is of the utmost importance to use a benzene suitable to the wash water. At one place a light benzene, b. 77.5° , 44% at 80° , 96% at 85° , was best; at another place normal benzene (90%) was used; and at a third place the benzene used was almost a toluene, i. e., 15% at 100° , 74% at 110° , 90% at 114.5° , 95% at 118° . Benzene contg. pyridine exts. the phenol better than pure benzene. The direct and indirect recovery of wash fluid is discussed. The purest crude phenol oil obtained by benzene washing of NH_3 liquor contains PhOH 85, C_6H_6 6, $\text{C}_6\text{H}_5\text{N}$ 4 and tar 5%. At another plant was obtained a phenol oil of the compn phenol 75, C_6H_6 15, $\text{C}_6\text{H}_5\text{N}$ 4 and tar 6%. The crude phenol oil was readily salable. Since the chief item of expense in the recovery is steam, alkali washing of the benzene ext. was tried. Alkali washing involves a plant for recovery of pyridine bases. Such a combination has given good results in the U. S., but German practice has not yet gone so far. A phenol balance and concn. of phenol in gas liquor are discussed. The waste liquor after phenol extn. contains 0.7-0.8 g./l. About 25% benzene, on the waters, is required, and about 1.2-1.4 g./l. remains in the water and must be recovered. The utilization of the process in the Emscher district has given 5000 tons of phenol, 75% crude phenol now brings 75-8¢/kg., the material being easily marketed. S. L. B. E.

The economic position of dephenolating plants. A. WEINDEL. *Glückauf* 64, 498-502(1928).—The water soly. of phenol homologs falls with increasing mol. wt., hence extn. with an org. solvent will preferentially remove the cresols and xylenols while the more sol. phenol will tend to remain and be lost, thereby defeating water pollution regulations and also diminishing revenue. In attempting to improve phenol recovery, a distn. process of removing the benzene is ruled out because of excessive steam charges. A better recovery can be obtained with alkali treatment. All that is required is to treat the liquors with alkali more often and to regenerate the alkali in between. The cost of additional pumping, etc., is negligible compared with added steam costs. Such improvements will enable plants whose liquors contain but 2 g./l. phenol also to come within the scheme of recovery. W. considers there is more pyridine in the ammonia liquors than in the crude light oils, about 0.3 g./l. of crude liquor and pyridine recovery would be an advantage. A serious difficulty in the phenolate process is deposition troubles. W. discusses in detail two suggestions for carrying out the phenolate process and gives estns. and calcns. connected with yield, costs and revenue that correspond. S. L. B. ETHERTON

The phenol solubility of humic acids. M. SOUM AND F. PODBREZNIK. *Inst. du Pin. Bull. inst. pin.* No. 57, 61-4 (Feb., 1929).—It is shown that humic acids, which up till now had been considered sol. only in C_6H_5N and in alkalis, can also be dissolved by $PhOH$, which shows their similarity with lignin and would seem to confirm the hypothesis of Fischer and Schrader according to which humic compds. in fossil fuels are formed from lignin. $PhOH$ not only dissolves free humic acid, but also renders the more highly condensed humic compds. sol. by a depolymerization which is very probably similar to that obtained by fusion with alkali. It is suggested that humic compds. could be detd. in fuels by extn. with $PhOH$, as lignin can be in wood. A. P.-C.

Study of the possibility of using wood carbonized at low temperature as a fuel in gas producers (for motor vehicles). G. DUPONT, LUSSAUD AND ALLARD. *Inst. du Pin. Bull. inst. pin.* No. 57, 64-5 (1929).—The advantages of charcoal for the above purpose are uniform compn., fairly high calorific value of the gas, a very small amt. of condensate in the gas-purifying app.; its drawbacks are its friability, difficulties of handling (which can be overcome by agglomerating, but this greatly increases the cost), large heat consumption in the carbonization of the wood, loss of over 33% of the available heat of the wood. The advantages of wood are that it is hard and non-friable, easy to handle, gives a gas with very high calorific value because it has a higher H content (in the case of dry hardwoods only), permits utilizing all the available heat of the wood; its drawbacks are variable compn. (white woods with high moisture content yield a gas with low calorific value), large amt. of condensate in the gas-purifying app., which chokes the piping or fouls the motor, useless transportation of H_2O and CO_2 . It was thought it might be possible to combine the advantages of the two and eliminate the chief drawbacks by carbonizing the wood at a temp. which would remove practically all the H_2O and the gases with low calorific value. I. **Study of the distillation of various woods at different temperatures.** *Ibid* 65-9.—The distn. tests were carried out in an electrically heated furnace holding 500-600 g. of wood (dried 2 hrs. at 100°), which could be heated to a uniform and closely regulated temp. With pine wood: (a) Up to 275° slow decompn. takes place, H_2O being evolved almost exclusively, and the gases contg. 75% CO_2 and 25% CO ; (b) toward 300° there occurs an exothermic reaction with evolution of large amts. of gas, pyroigneous acid and tar, the gases contg. 60% CO_2 and 40% CO ; (c) toward the end of the distn. (350 – 550°) there is a considerable decrease in the amt. of volatile matter given off, the proportion of CO_2 and CO in the gases decreases, and the proportion of hydrocarbons and H (which appear at about 325°) increases steadily; (d) analysis of the charcoal and calen. of its calorific value by Mahler's formula show that the final calorific yield (no. of available cal. in the charcoal from 1 kg. of wood) is completely preserved with carbonization up to about 275° , falls off sharply during the exothermic reaction at 300° , and then decreases progressively. The results indicate it would be advantageous to use wood carbonized a little below 300° , in motor-vehicle gas producers. A series of distns. carried out on ash, oak, poplar, elm and *Argania sideroxylon* showed that: (a) The general trend of the distn. is the same in all cases, there being an exothermic decompn. at 300° (at 350° in the case of *A. sideroxylon*); (b) the yields at the end of the distn. are all of the same order of magnitude, being approx. 12.5% gases, 40.0% pyroigneous distillate, 8% tar (except oak and ash which gave 2.50 and 3.40, resp.), 34.0% charcoal; the fact that the same yields of tar were obtained with the hardwoods as with pine is attributed to the fact that the pine used was low in resins (about 2%) and that the distn. was carried out rapidly and without overheating; (c) the compn. of the gases obtained at the various stages of the distn. is approx. the same for the different woods. The use of a catalyzer (impregnation with a 1% $NaOH$ soln.) did not affect the general trend of the distn., increased the yields of gas and of charcoal, and altered considerably the compn. of the gases as compared with that obtained from wood alone. The general trend of the distn. is the same in the case of cellulose and of lignin, the exothermic reaction taking place at 300° with cellulose and about 350° with lignin; lignin gives an appreciably higher charcoal yield and lower pyroigneous liquid and gas yield than cellulose, the nature of the gases produced at the various temps. being practically the same in both cases. II. **Tentative theory on the gasification of wood charcoal to determine the most suitable carbonization temperature.** G. DUPONT. *Ibid* 69-71. From theoretical considerations based on the results obtained in the above distns. D. concludes that: (a) The calorific value of the gas obtained in the producer is practically const. and max. for wood distd. at 100 – 200° , and the calorific value per cu. m. of cylinder volume of the motor, which is the most important characteristic from the standpoint of its utilization in the motor, follows a practically parallel curve. (b) The calorific efficiency in the motor, i. e.,

the no. of calories which can be obtained from 100 g. of the original dry wood, at the producer, at various moisture contents or for various degrees of carbonization, is also a max. for wood carbonized at 100–290°; it falls off sharply when carbonization is carried beyond the point of the exothermic reaction, and continues to fall off considerably as the carbonization temp. is increased. (c) The heat of combustion of the gas produced from 100 g. of charcoal, and also the vol. of the gases produced, increase progressively with the carbonization temp. These results clearly show the advantages of using wood carbonized at 275–90°; and it is hoped to give exptl. confirmation of these conclusions in the near future.

A. PAPINEAU-COUTURE

Boiler firing with simultaneous combustion of coal dust and (coke-oven) gas. A. SAUERMANN. *Glückauf* 64, 525–31(1928).—The burning of coal dust requires space not allowed for in the ordinary boiler installation, thus necessitating the attachment of an expensive combustion chamber. Diminution of this chamber is possible only by accelerating the time of combustion of the coal particle. To effect this, simultaneous combustion with coke-oven gas was tried, i. e., with a medium whose period of combustion is much less than that of coal dust. Sketches of the installation are given. The combination was tried on a tubular boiler whose steam output was 34 kg./sq. m. heating surface when the heat ratio of gas and coal dust was 1:2.74. When the heat ratio was 1:3.82, 29 kg./sq. m. heating surface was obtained with good utilization of the fuels and no added combustion chamber. Details of the steam trials are given including coal and gas analyses; gas pressure variations and heat balances. Curves for flame temp., raw-gas temps., % CO₂, steam pressure and steam temp. are given. These performances could be improved by various modification, for which diagrams are shown. Combustion took place with the combined fuels only in the tubes, whereas, before, much pre firing was necessary. A diagram of an app. for continuous removal of ash entrained from the tubes is given. The combination of fuels is suited for inclined-tube boilers and for foundries and the like. Very good results have been obtained with lean coal and although coke-oven gas was used in the tests, blast-furnace and producer gas could also be used if they and the air were preheated.

S. L. B. ETHERTON

Chart for finding heat loss due to incomplete combustion. C. A. KULMANN. *Power* 69, 473(1929).—A nomogram for facilitating estn. of heat loss due to incomplete combustion.

D. B. DILL

How much heat goes up the chimney? DAVID M. MYERS. *Power* 69, 437–40(1929).—Boiler losses are analyzed. Dry chimney loss is variable and can be reduced by stopping leaks, reducing draft and adjusting stoking until flue gases have a min. temp., max. CO₂ and no CO.

D. B. DILL

"Gasol" from low-temperature distillation gas, and low-temperature distillation gas for cutting and welding. H. SCHOLTZ. *Chem.-Ztg.* 53, 159(1929).—"Gasol," a mixt. of C₂H₄ and C₂H₆ with their higher homologs, has not given good results when used for welding purposes. This is due to the small explosive range when used with air—only 3.4–7.8%, approximating those of Et₂O (2.75–7.7%) and C₆H₆ (2.65–6.5%). When mixed with O₂ the explosive range increases to 3.4–43.2%. The addn. of C₂H₄ also proved advantageous, welds then being possible, and the cost being lower than with C₂H₂ alone as a fuel, as long as the iron is 6 mm. or under, but not with thicker material. Welding with low-temp. distn. gas alone required very much longer time than with C₂H₂, giving good welds nevertheless. This gas mixed with 20% C₂H₄ proved more economical than the C₂H₂ alone.

W. C. EBAUGH

A contribution to Feld's method for determining cyanogen compounds in washing liquors and hydrocyanic acid in illuminating gas. F. PERNA. *Plyn a Voda* 8, 139(1928); *Paliva a Topeni* 10(1929).—Feld's method gives good results with pure ferrocyanide, but with wash liquors the values are lower than the actual content of cyanogen in the soln. A certain quantity of the ferrocyanide does not dissociate, which can be confirmed by the green coloration of the distn. residue. Higher and more precise results are obtained if the alk. soln. is pptd. in the cold by adding drops of MgCl₂ and HgCl₂ with continuous stirring, washed into a distg. flask, and boiled 5 mins. This modification gives higher and more reliable results than Feld's method for determining cyanogen in illuminating gases.

FRANK MARSH

Heat value of natural gas on the basis of analytical results. WACLAW LESNIEWSKI AND KAROL KATZ. *Chem. Research Inst. (Poland). Przemysl Chem.* 11, 131–41, 294–7(1927).—Differences between values calcd. on the basis of compn. and exptl. calorimetric results amount to about 1%. It is quicker and simpler to calc. the fuel value of natural gas by the theoretical formulas here derived than to go through an involved analysis.

A. C. ZACHLIN

Chart for determining loss due to moisture in flue gas. C. A. KULMANN. *Power* 69, 543(1929).—Well-known formulas for this calcn. are expressed in a d'Ocagne nomogram.

D. B. DILL

Modern gas producers in the chemical and allied industries. WALTER KIRNICH. *Chem. Fabrik* 1929, 85-8.—Gas producers of the older types, with stationary grates, natural draft, etc., represent obsolete equipment, and ought to be replaced with modern producers, equipped with rotating hearths, automatic removal of ash, const. drive and mech. supply of air. Such generators permit the use of inferior grades and cheaper sizes of fuel, give cleaner ash, more uniform gas, afford quicker response to changed gas demands and are much more economical in operation. Illustrations and descriptions of Korting producers are shown, with general statements as to the efficiency of this type of plant. With auxiliary app. the thermal efficiency reaches 92.3%, and tar (low-temp. distn.) recovery 99% of the theoretical.

W. C. E.

Gas firing in central plants for heating and for preparing warm water. BATTIGE. *Apparatebau* 41, 33-4(1929).—A comparison of gas and coke; 1 kg. coke equals 0.8 cu. m. gas.

J. H. MOORE

The separation of tar clouds from gases. A. FISCHER. *Chem. Fabrik* 1929, 101-2.—A lab.-scale Cottrell app. was built from a chrome-plated steel pipe 50 cm. long and 50 mm. diam., provided with two 3-l. glass flasks attached to the ends. Through one set of openings in these flasks passed a wire 0.3 mm. directly through the pipe longitudinally, and the other pair served for the passage of gas under investigation. A 220 v. a. c. was stepped up to 10,000 v. by an oil transformer and then rectified by a "sending tube" (Firma Telefunken) whose filament was heated by a current from a 220-10 v. transformer. The pulsating 10,000 v. d. c. was connected with the wire passing through the steel pipe, while the steel pipe itself and the filament were grounded. Thorough cleaning of gas from tar was obtained, with gas velocities from 10 to 1500 l. per hr. passing through the app.

W. C. EBAUGH

The composition of tars from coals in northern Bohemia. BRĚTISLAV ŠIMEK. *Paliva a Topeni* 10, 157-60(1929).—Š gives tables of analysis of 12 tars showing the moisture content, source of coals, Engler distn., sp. gr., phenol and paraffin content. Seven tars were prepd. in the lab. by distg. 3 kg. of the lignite in an elec. furnace; 2 others were prepd. in a Fischer Schrader retort; the remaining ones were prepd. by firms in the northern district. A summary follows in French.

FRANK MARESH

Examination of tars from peat. G. I. STADNIKOV AND N. G. TITOV. *Brennstoff-Chem.* 9, 325-6(1928).—Three samples of peat dried to a 13% H₂O content were carbonized both in the Gracfe lab. app. and in the Fischer 25-kg. rotary retort. Yields by the former method were: coke 41.1, gas 24.3, tar 9.1 and H₂O 25.5%; by the latter: coke 42.0, gas 24.5, tar 12.0, and H₂O 21.5%. In both cases the figures are on the dry basis. Extn. of the peat with hot C₆H₆-EtOH soln. yielded 16.8% bitumen. Six % of the tar was insol. in (CH₃)₂O; 42% of this material (not carbon or peat dust) was sol. in pyridine. The portion sol. in (CH₃)₂O was distd. with steam and fractionated. It had a sp. gr. of 0.8567 and contained 0.48% bases and 2.4% tar acids. Of the tar 11.2% was a wax having an iodine no. of 44.6, sapon. no. 33.8 and acid no. 18.0. Asphaltenes (11.6%) and 13.8% resins were also found in the tar.

J. D. D.

Clean coke and its value. R. A. MOTT. *Fuel in Science & Practice* 8, 123-32 (1929).—Clean coke is of primary importance in blast-furnace use. Calcs. show that the C requirements of a furnace cause an increase in coke consumption of more than 1% when the coke-ash content is increased by 1%. Large-scale tests have shown that the saving in coke consumption per ton of pig for a reduced ash content of 1% averages approx. 0.4 cwt. A reduction of 1% ash in coke is worth at least 12¢ per ton of coke to the iron maker. Slurry produced in wet-washing may contain up to 25% ash. This product of the washery, often a large proportion, may be cleaned by the Rheolavener slurry washer, concg. tables or froth-flotation units. The practical working of these methods is discussed. Coke made from washed slurry is cheaper to transport, is of better quality, increases the output of the ovens and promotes the smooth working of a battery.

D. A. REYNOLDS

The new coking plant of the Lothringen Company. H. TRAMM. *Glückauf* 64, 719-29(1928).—The general layout is briefly described and a line plan is given. A somewhat more detailed account is given of (1) drying plant, (2) oven installation, (3) coke cooler, (4) by-product plant. The drying plant has a 3000-ton rotary drum, the inside of which has a coat of 2 mm. rustless steel to prevent corrosion. It is most economically heated by waste gas so that the coal entering with 12-14% moisture leaves with 6-7%. Reasons and advantages for this drying are discussed at length and the

economics of this operation are dealt with. The oven installation contains 60 high-production ovens in one setting, 54 being Koppers, for rich and poor gas, av. width 360 mm., 3730 mm. high, and 11,600 mm. between doors, capacity 10.2 tons dry coal, throughput period 11.5 hrs. Details of heating are described and also the discharging gear. Quenching can be done both dry and wet. The dry quencher will handle the complete 24-hr. throughput, *i. e.*, 1000 tons coke. The sensible heat in the coke is transferred to the inert gases of the waste-heat boilers where it is withdrawn and the waste gases are recirculated. A line sketch shows the coal tower, filling wagons, ovens, discharge machines, coke wagons, hot and cold gas mains, waste heat plant, etc. Cooling takes 4 hrs. Construction and other details are given. Dry-quenched coke has a better appearance, is stronger and larger and there is less breeze. Moreover, every ton of hot coke gives 0.39 ton steam. The economics of the installation are discussed. Some innovations were adopted in the by-product plant. The gas riser was as short as possible and lined with refractory to avoid tar condensation and consequent graphite deposition. The gas is water-sprayed to 150°, thus avoiding thick tar deposition. The gas is then washed to 85° and then cooled. The rest of the installation is described, including ammonia and benzene recovery and the related economics. The installation utilizes steam and vapor to the best extent, requires the least power, material and man power, and has utilized mechanical arrangements to the fullest extent.

S. L. B. ETHERTON

Gaseous explosive reaction. A study of the kinetics of composite fuels (STEVENS) 24. Evolution in conceptions of continuous furnaces and methods of heating them (HIRT) 1. Elements of operation of the pneumatic table (TAGGART, LECHMERE-OERTEL) 1. Examination of commercial carboic acid (KOGAN) 7. Water-gas equilibrium and flame temperature (KAUKO) 2. Homogeneous catalysis. I. (EGERTON) 2. Extraction of clay [from crude or waste coal, etc.] (Fr. pat. 647,928) 13. Gas analysis apparatus [especially for flue gases] (Ger. pat. 466,553) 1. Drying gases (Fr. pat. 647,888) 13. Apparatus for producing gas from "petrol" or similar volatile liquids U. S. pat. 1,707,249) 1.

ENDRES, WILHELM: *Der Verbrennungsvorgang in Gas- und Vergaser-Motor*. Berlin: Julius Springer. 80 pp. M. 6.80. Reviewed in *Mech. Eng.* 51, 326(1929).

Gas Chemists' Handbook: 3rd ed., revised. Edited by A. F. Kunberger, W. H. Fulweiler, C. A. Lunn, N. F. Prince and C. C. Tutwiler. New York, 420 Lexington Ave.: Am. Gas Assocn. 795 pp. \$7. Reviewed in *Chemicals* 31, No. 14, 5(1929), *Chem. Markets* 24, 379(1929).

HARTNER-SEBERICH, RICHARD. *Der Zündverzug bei flüssigen Brennstoffen*. Berlin: V. D. I. Verlag. 23 pp. M. 3.75. Reviewed in *Mech. Eng.* 51, 326(1929).

MAILHE, A.: *Encyclopédie leauté. Les combustibles liquides artificiels*. Paris: Gauthier-Villars & Cie, Masson & Cie. 280 pp. F. 30. Reviewed in *J. Franklin Inst.* 207, 577(1929).

Fuel. JULIUS THIECKE, MINIMAX A. G. and HERMANN HERZOG. Fr. 647,009, Jan. 12, 1928. A fuel is made by mixing NH_4NO_3 with an org. substance such as wood charcoal.

Gaseous fuel. LÉON MIRLESSE. Fr. 33,512, Jan. 29, 1927. Addn. to 608,620. An app. for gasifying heavy hydrocarbons for use in furnaces, motors, etc., is described.

Distillation of fuel. EUGÈNE HUREZ and PIERRE P. VIRELY. Fr. 33,609, May 27, 1927. Addn. to 620,307. A movable wall in the furnace chamber is moved up the sloping hearth to the charging opening; it is afterwards displaced progressively toward the lower end of the furnace as the charge enters.

Fuel briquets. A. L. J. VOINCHET and A. A. LERCIU. Brit. 297,085, Sept. 14, 1927. Fuels such as fine coal, sawdust, granular or powdered cork are mixed with kaolin, pipe clay or similar silicates or with mixts. which react to form similar silicates. Alk. silicates or substances reacting to form them are added during or after mixing and the mixt. is pressed into blocks and may then be treated with a reagent such as CaCl_2 to render the blocks resistant to moisture. In order to prevent superficial efflorescence, there may also be added acids such as HCl , H_2SO_4 , H_3BO_3 , H_2PO_4 , or formic, acetic or oxalic acid or glycerol or glucose.

New process for the gasification and utilization of fuel. J. BRAET, G. DE WILDE, P. WAUTERS, M. HERREBOUDT and E. MEIRLAEN. Belg. 352,163, July 31, 1928. Constructional features.

Externally fired horizontal retort for carbonizing solid fuel, etc. J. FENTON and

R. BAIN. Brit. 296,255, Jan. 24, 1928. A rotating retort is described which is preferably formed of steel and of truncated conical shape (material being fed in at the smaller end and discharged at the larger end).

Retorts for distilling carbonaceous materials. RICHARD B. PARKER. Fr. 647,765, Jan. 17, 1928.

Destructive hydrogenation. I. G. FARBENIND. A.-G. Brit. 296,431, Sept. 1, 1927. In order to obtain hydrocarbons of low b. p., coal suspensions, tars, oils or the like are treated with H in several stages under diminishing pressure. In treating American crude petroleum a pressure of 200 atm., a temp. of 450° and a catalyst contg. Mo and Cr may be used in the first stage.

Destructive hydrogenation. I. G. FARBENIND. A.-G. Brit. 296,700, Sept. 5, 1927. Oils of low b. p. are obtained from coals, tars and the like by subjecting the starting materials to a continuous cracking process with or without H under such conditions that carbonaceous deposits are formed with a minimum production of gas and then, in a second stage, treating the resulting products and carbonaceous deposits with H under high temp. and pressure in the presence of catalysts which may contain Mo and Cr.

Destructive hydrogenation. I. G. FARBENIND. A.-G. Brit. 296,984, Sept. 10, 1927. Motor fuels which do not "knock" are produced directly by the destructive hydrogenation of a liquid carbonaceous material mixed with another carbonaceous liquid adapted to produce aromatics, low-boiling and low-freezing hydrocarbons, naphthenes, etc., in which the products from the first-mentioned liquid would be deficient, e. g., liquid products from bituminous coal are subjected to destructive hydrogenation together with similar products from coals poor in bitumen, or crude petroleum and coal tar are destructively hydrogenated together (suitably at 460° under 200 atm. pressure), or crude petroleum and a liquid from the destructive hydrogenation of lignite are further destructively hydrogenated together.

Destructive hydrogenation. STANDARD DEVELOPMENT CO. Brit. 296,536, Aug. 8, 1927. A finely ground mass of solid carbonaceous material such as coal or a coke-like residuum is subjected to the action of a hydrocarbon oil and aq. liquid to sep. most of the ash, and the remaining carbonaceous material wetted with hydrocarbon oil is subjected to destructive hydrogenation (suitably at temps. of about 370-540° under 50-200 atm. pressure and in the presence of catalysts such as oxides of Mo or Cr). The product may be directly used as a fuel or may be mixed with fuel oil or may be distd. or cracked.

Destructive hydrogenation of coal, etc. I. G. FARBENIND. A.-G. Brit. 296,429, Sept. 1, 1927. Hydrocarbons of low b. p. are obtained by heating coal pastes, tars, oils or the like contg. large quantities of S and asphaltic substances with H and preferably catalysts in the liquid phase so that no destructive hydrogenation occurs and the S and asphaltic compds. are eliminated and then subjecting the material to a cracking treatment. A catalyst contg. Mo, Zn and Mg may be used for treating a "middle oil" with H at 430° and under 180-200 atm. pressure.

Hydrogenation of coal, etc. FRIEDRICK J. M. HANSEN. Fr. 617,981, Jan. 28, 1928. Coal, hydrocarbons or C are hydrogenated by the action of an elec. arc or sparks from a condenser discharge between electrodes immersed in a solvent for the products. One electrode is made of, or contains, a catalytically active metal such as Ni or contains a salt such as NiCO_3 which becomes dispersed in the liquid. Examples are given of the hydrogenation of coal and water gas.

Apparatus for distilling coal or other carbonaceous materials. PIERO M. SALERNI and EDOARDO M. SALERNI (to E. M. S. Industrial Processes, Ltd.). U. S. reissue 17,251, April 2. See original pat. No. 1,541,071 (C. A. 19, 2269).

Distilling solid carbonaceous materials. FABRIQUE NATIONALE DE PRODUITS CHIMIQUES ET D'EXPLOSIFS SOC. ANON. Brit. 296,443, Sept. 2, 1927. Before carbonizing coal, lignite, peat or oil shale, oxidizing agents such as oxides of Fe or Mn or carbonates of alkali metals or alk. earth metals are added to the charge. The yield of tar is increased and a porous coke is obtained which contains metal oxides or finely divided metals and may be used as a catalyst in synthetic processes such as production of condensable hydrocarbons and alcs. from CO, H and gaseous hydrocarbons produced in the distn. Pulverulent Fe ore, residues of roasted pyrites or Mn ore may be added and the residue together with the assocd. coke transferred to a reducing app.

Destructive distillation of coal, etc. P. DYORKOVITZ. Brit. 296,793, March 8, 1927. In a superposed retort system (structural details of which are described), coal or the like is distd. to obtain oils of the paraffin series by being first heated in the upper retorts and then passed into lower retorts and further heated to obtain heavier oils.

The retorts are externally heated by hot gases from a furnace and gases such as H₂, water gas, producer gas or coal gas are heated in a coil and passed through the charge (which may be agitated by a screw device).

Distillation of coal. IMPERIAL CHEM. INDUSTRIES, LTD. Fr. 647,604, Jan. 23, 1928. In the distn. of coal or the like by means of superheated steam, the steam coming from the retorts is cooled only to a certain extent, i. e., to a temp. well above condensation point, by means of water or oil. If water is used it is used in such limited amt. that it becomes wholly vaporized and the resulting oil is obtained free from water. The cooled steam is used as a source of heat for producing fresh steam.

Rotary retort for low-temperature distillation of bituminous coal. GABRIEL E. ROEMER (to National Coal Distillation Corp.). U. S. 1,708,740, April 9. Coal is fed through the annular chamber of an internally and externally heated horizontal rotary retort, the outer wall of which is provided with lifting baffles and the inner wall of which is provided with retarding baffles, and is alternately advanced and retarded and subjected to different degrees of distn. temp. from opposite sides of the annular distn. chamber, to produce gas and other by-products. Various details of the app. are described.

Carbonization of coal. COMPAGNIE HOUILLÈRE DE BESSÈGES. Fr. 647,112, May 27, 1927. See Brit. 291,341 (C. A. 23, 1249).

Coking coal. JOSEPH BECKER (to Koppers Co.). U. S. 1,707,427, April 2. A vertical and horizontally extended mass of coal is formed with a lower portion thinner than the upper portion and extraneously developed coking heat is applied to the sides of the mass during coking so that coking of the lower portion of the mass is accelerated and shortened relatively to the upper portion and the lower portion of the mass is completely coked before the upper portion. When the lower portion of the mass is substantially completely coked, steam is introduced into the lower portion until the upper portion is coked, thus increasing the gas production from the charge and retarding overcoking of the lower portion. An app. is described.

Device for burning pulverized coal in suspension in a current of air. JOHN VAN BRUNT (to Combustion Engineering Corp.). U. S. 1,707,335, April 2. Structural features.

Apparatus (with an oscillating screen) for washing coal, ores, etc. N. DESCAMPS. Brit. 297,330, Sept. 17, 1927. Structural features.

Briquetting coal fines, lignite fines, coke or semi-coke fines, etc. A. MEIRO. Belg. 351,793, July 31, 1928. The fines are worked into a paste with cereals, boiled vegetable oils and water, are pressed into briquets and dried. According to Belg. 351,794, the fines are mixed with Na silicate, powdered asbestos and water, pressed into briquets, and dried.

Removing soot from heating surfaces such as those of water-tube boilers, etc. GEORGE F. FENNO. U. S. 1,707,803, April 2. Soot is dislodged by gas eddies and vortices are produced by exploding a mixt. such as an explosive powder or air and gas which effects deflection of the normal flow of gases adjacent to the soot deposits which are to be removed.

Briquetting brown coal. MASCHINENBAU-ANSTALT HUMBOLDT. Ger. 472,462. July 10, 1926. The coal is disintegrated and the dust is sepd. from the granules. The dust is then briquetted without drying and the granules after drying.

Cooler for dried brown coal. WERSCHEN WEISSENFELSER BRAUNKOHLEN A.-G., MAX JASCHKE and FRANZ KIENAST. Ger. 472,397, Aug. 19, 1925.

Cooling plant for lignite. MASCHINENFABRIK HARTMANN A.-G. Ger. 471,538, July 13, 1927. The plant has a metal cooling column, at one end of which cool air is fed and at the other removed; the areas of the admitting and leading-off tubes are equal.

Peat. BOHUMIL JIROTKA. Ger. 471,607, Apr. 25, 1922. Pulp-like masses of peat are pressed through curved nozzles so that the material forms coils offering a large surface area to the drying air.

Peat. BOHUMIL JIROTKA. Ger. 471,608, Jan. 21, 1923. A device for the disintegration of peat comprises a milling cylinder in which rotates an axle with wave-like projections.

Peat. BOHUMIL JIROTKA. Ger. 471,609, Dec. 12, 1924. Addn. to Ger. 471,608. The ends of the rotating axle with the wave-like projections are provided with convex plates carrying brushes bearing against concave surfaces for assisting the milling and drying processes.

Apparatus for disintegrating and dewatering peat. ALLGEMEINE KOMMERZGES. A.-G. Ger. 472,342, Dec. 18, 1925.

Organic compounds from coal, tar, etc. I. G. FARBENIND. A.-G. Fr. 647,742, Dec. 16, 1927. Org. compds. of great value are obtained by treating coal, tar, wood, bituminous schists, etc., with hydrocarbons of high b. p. or high mol. wt. or their derivs. below the coking temp. of the hydrocarbons and at high pressure, and if necessary with the addn. of gases, with the exception of H, in appreciable amts., and catalysts. The products may be used for the production of *lubricating oils, Diesel oils or motor fuel.*

Chlorinated organic compounds for impregnating kindling materials. I. G. FARBENIND. A.-G. Fr. 647,656, Jan. 24, 1928. Org. Cl compds. such as tetrachloronaphthalene when used for impregnating papers, etc., for starting fires are rendered non-irritant to the skin by the addn. of non-irritant substances of a like phys. nature such as paraffin, waxes, rubber, gum and (or) alk. substances such as CaO , Na_3PO_4 , MgO , pyridine, tetrahydroquinoline and urea.

Gas. DAVID J. SMITH and REGINALD F. CLAYTON. Ger. 471,823, June 23, 1925. The plant has 2 coaxial gas chambers over which the fuel container is placed. Annular chambers surround these chambers so that the gas produced may circulate therein to preheat the fuel.

Purifying gas. JOSEPH N. REESON and WILLIAM L. MOSS. U. S. 1,708,590, April 9. Coal gas or the like contg. H_2S is treated with a soln. formed from a base such as Na_2CO_3 , an Fe salt such as the sulfate and citric acid.

Purifying gases. C. STILL. Brit. 297,061, Sept. 13, 1927. Gases contg. H_2S are treated with an aq. soln. of an alkali carrying in suspension an oxide or hydrated oxide of Mn or of both Mn and Fe. Brit. 297,062 specifies regeneration of spent gas purification liquors of this general type, with S recovery, by aeration with foam-producing materials.

Purifying gases. KALI-INDUSTRIE A.-G., C. T. THORSELL, and A. KRISTENSSON. Brit. 297,114, Sept. 16, 1927. H_2S is removed from gases by treatment with a suspension of basic ferric salts (such as a basic ferric chloride corresponding to the formula $\text{FeCl}_3 \cdot 6\text{Fe}(\text{OH})_3$) in a ferric salt soln. such as may be prepd. by oxidation of FeCl_2 with HNO_3 . S liberated in the gas purification is filtered out and the soln. reoxidized for further use.

Purifying fuel gases. J. H. BREGEAT. Brit. 296,925, Nov. 24, 1927. Gaseous fuel mixts. are brought into intimate contact with hydrogenated derivs. of naphthalene, hydrogenated cresols or hydrogenated terpenes, or their mixts., so as to retain impurities such as naphthalene, until the gas is cooled to effect their sepn. and condensation from the absorbing liquid. In order to scavenge distributor conduits, the purifying agent may be carried through them to absorb deposits. "Tetralin" (tetrahydride of naphthalene) may be used.

Mixed water gas and coal gas. CHARLES W. ANDREWS and HERMAN A. BRASSERT. U. S. 1,707,651, April 2. In generating mixed gas in a plurality of similar units, a procedure is followed comprising alternately air blasting and steaming through carbonaceous residue in certain of the units, passing the water gas generated through heated carbonaceous residue in another unit so that its temp. is raised, passing the heated gas through a body of fresh coal in the last-mentioned unit (so that volatile constituents from the coal are removed and mixed with the water gas), and agitating the mass of coal. Details of the app. are described. Cf. C. A. 23, 1497.

Gas producer. I. G. FARBENIND. A.-G. Brit. 296,713, April 2, 1927. Structural features.

Gas producer. I. G. FARBENIND. A.-G. Brit. 296,751, April 2, 1927. Details of construction of a producer are described which is suitable for use in a process in which a fuel gas is obtained by blowing air (or steam and air) through small-size ignited fuel with sufficient force to cause strong agitation of the charge. An auxiliary steam supply is provided for use when desired in producing water gas rich in H.

Gas producers. THE WELLMAN SMITH OWEN ENGINEERING CO., LTD., and ALFRED V. KEMP. Fr. 647,711, Jan. 26, 1928.

Lean-gas producer. E. WILLAUME. Belg. 352,060, July 31, 1928. Constructional features.

Continuous producer for mixed or double gas, for high- or low-temperature distillation with complete recovery of internal heat. H. J. M. WASTEELS. Belg. 351,527, July 31, 1928. Washed coal fines are introduced into a vertical retort by means of a rotary distributor. The bottom of the retort is sealed off by means of water, into which the coke falls and from which it is removed by means of an inclined worm conveyor. The retort is heated by means of compressed air and gas nozzles which are submerged under the water, and the air and gas are preheated in a chamber formed

by the inner wall of the retort and a surrounding wall made of suitable non-conducting material.

Gas producer construction (with separately rotatable fuel section and ash section). CHARLES W. LUMMIS (to Morgan Construction Co.). U. S. 1,707,811, April 2. Various structural details are described.

Gas retort assembly and regenerator construction. HEINRICH KOPPERS (to Koppers Development Corp.). U. S. 1,707,734, April 2. Various structural details are described.

Gas-making plant. PATENT RETORTS, LTD., and T. M. DAVIDSON. Brit. 296,161, July 2, 1927. In a complete gasification app. having a retort placed over a water-gas generator and externally heated by the gases generated, the generator and the checkered brickwork surrounding the retort are provided with one or more division walls and the charge leaving the retort is divided on entering the generator. Various other structural details are described.

Control for non-continuous water-gas generators. COMPAGNIE CONTINENTALE POUR LA FABRICATION DES COMPTEURS ET AUTRES APPAREILS and ALBERT BREISIG. Fr. 647,499, Jan. 19, 1928.

Valve control system for water-gas apparatus. WALTER BARR (to Western Gas Construction Co.). U. S. 1,708,375, April 9.

Timing devices for operating valves or other control mechanism of water-gas plants or similar apparatus. TULLY, SONS & CO., LTD., and L. DE REDON. Brit. 296,243, Dec. 30, 1927.

Montan wax. A. RIEBECK MONTANWERKE A.-G. Brit. 297,102, Sept. 16, 1927. In refining montan wax, it is deresinified (suitably by treatment with a solvent such as EtOAc) and is then refined with a solvent and decolorizing agent such as EtOAc or butanone and "Carboraffin" and fuller's earth.

Emulsions of tar, etc. HENRY BASSET and VICTOR SZIDON. Fr. 33,627, May 31, 1927. Addn. to 630,168. Emulsions of tar, asphalt, pitch, etc., which are insol. in water are made by using soap insol. in water as emulsifying agent.

Horizontal coke furnaces. CARL WESSEL. Fr. 647,599, Jan. 23, 1928. The method of heating is described.

Coke oven battery. JOSEPH VAN ACKEREN (to Koppers Co.). U. S. 1,707,419, April 2. Structural features.

Regenerative coke oven (which can be heated by "strong gas" or "weak gas"). CARL OTTO. U. S. 1,707,537, April 2. Structural features.

Coke oven construction (with a horizontal rotary drum and an interior tubular roller chamber). EMIL RAFFLOER. U. S. 1,708,152, April 9.

22—PETROLEUM, LUBRICANTS, ASPHALT AND WOOD PRODUCTS

W. F. FARAGHER

Position and problems of the oil industry today. AXTELL J. BYLES. *Mining J.* 164, 122-3 (1929).—B. discusses the present status of the industry—large amts. of available oil, increased gasoline production, oversupply of fuel oil, etc.—and forecasts the position of the industry for 1929. Demand for gasoline will probably be 408 million barrels, which can be supplied as follows: cracked, 142 million; natural, 37 million; imports, 10 million, and straight run, 219 million. The present production will meet these needs. Plans for rationalization are discussed. A. H. E.

Oil friction and flow orientation. S. KYRIPOULOS. *Z. tech. Physik* 10, 46-52 (1929); cf. *C. A.* 23, 1794. Dynamic viscosity changes, which are of great importance in lubrication, are largely due to orientation of the lubricant mols. in the direction of flow so that they assume positions of least mutual friction. The dynamic viscosity, therefore, depends on the force applied, decreasing with increasing force. If the temp. is kept const., the friction coeff., f , of a journal in a bearing depends on the velocity of rotation, U ; it decreases at first as the journal rises from the bottom of the bearing and the lubricating film becomes thicker. As this film, h , approaches half the clearance, f will increase with increasing dU/dh , the velocity gradient. The min. value of f is about 6% lower than the value for the journal at rest, f_0 . In the range of thin lubricating film (to the left of the min.) the so-called semi-liquid friction often occurs with considerable decrease in dynamic viscosity; for practical purposes a rather substantial film is most desirable; it eliminates the hazards of oil impurities and imperfect

bearing surfaces. Small castor oil addns. thicken the film considerably. From a mol. viewpoint the effects of various kinds of oil can be explained satisfactorily. Of the usual oil types, the highly viscous mineral oils with long mols. and large micellae ($d_{18} \leq 0.9$) will suffer considerable flow orientation at higher temp. and speeds; the medium to highly viscous oils of shorter mols. give less orientation, particularly if they are partly unsatd. ($d. > 0.9$); the sol-type oils consisting of a base oil with small mols. and addns. of very long mols. show orientation even at low speeds; non-viscous mineral oils with small mols. have little orientation; dipole oils, especially castor oil, with large complexes (dielec. const. = 4.65) orientate little. The stronger the tendency of an oil to become orientated (thin lubricating film by decrease in dynamic viscosity), the greater will be the effect of small quantities of inhibitors to orientation, e. g., castor oil which by its dipole qualities disturbs the orientated mol. groups and also adheres firmly to the walls. Possibly also the smaller compressibility of castor oil (close to that of water) causes the lubricating film to become thicker. At low temp., long-chain mineral oils (a "Valvoline" oil had a mol. wt. of 825) will give the desirable thick film for heavy load, at high temp. they will give low friction by decreased viscosity. They are, therefore, good for over-all use in explosion engines where both conditions occur. Recent work of Wolff on the exact detn. of the thickness of lubricating films by interference methods (Forsch. Arb. Gebiete Ing. Wesens, V. D. I. Verlag Berlin, 1928) largely corroborates the theory given here. From these observations (curves of h vs. T) it is again concluded that the film thickness is detd. by rotation velocity and dynamical viscosity, the latter depending on the former and on the temp. Rise in temp. will promote orientation by dissoen., but it also counteracts orientation by rotational heat motion of the mols., thus causing a max. orientation for a given velocity and temp. This max. is generally higher for heavy oils; it corresponds to a min. in h . Other points are discussed at length. B. J. C. VAN DER HOEVEN

Heats of combustion of petroleum oils. C. S. CRAIGIE, U. S. Bureau of Standards. (*Chal. et ind.* No. 102, 337-46 (1928)). A theoretical and practical study. C. used the Parr bomb of 400 ml. capacity. He shows how he corrected for (a) HNO_3 from the atm. N_2 , (b) HNO_3 from N_2 in the oil, and (c) H_2SO_4 from the S in the oil. If Q , is the total heat of combustion at const. vol. and d the sp. density at 15° , $Q_p = 12000 - 2100d$. The content of H is given by the equation $\% \text{H} = 26 - 15d$. C. gives tables and analyses of 50 fuels carried out by the U. S. Bureau of Standards, the heat of combustion of 36 petroleum products carried out by the U. S. Bureau of Mines, values of Constam and Schlapfer, values obtained by the U. S. Bureau of Mines on a no. of California crude oils, 70 values of Sherman and Kropff on petroleum oils, values of Ricardo, and heats of combustion of petroleum oils free from water, ash and S. A no. of plots are given and the analytical results are discussed. S. L. B. ETHERTON

Review of recent research in crude oil in Russia. IWAN YELIN. *Petroleum Z.* 25, 352-61 (1929). A short review of work done by Russian authors. A. A. BOEHLTLING

New process for separating heavy oil fractions. MAX MORGENTHAU. *Petroleum Z.* 25, No. 9, Special Section 3-4 (1929). A description of a new phys. chem. process, which is not disclosed, by which oils of a superior quality are obtained. Heavy bottoms are used for making high grade cylinder stocks from asphalt-base crudes, leaving an asphalt of gum-like consistency with a softening point of about 100° (Kraemer-Sarnow). An oil sepd. by the above process from Moreni residues is characterized in the table:

	Residue treated	Oil obtained
Sp. gr.	0.985	0.941
Viscosity E_{100} . . .	8.50	2.75
Solidifying pt. . . .	plus 10°	
Flash pt.	245°	245°
Hard asphalt.	7.5°C	0
Color	black	Dark greenish reddish brown.

A. A. BOEHLTLING

Continuous distillation of crude oil. S. VISHETRAVSKII. *Azerbeidzanskoye Neft-vanoye Khozyaistvo* 1928, No. 10, 55-66. Crude oil preheated in a vapor-heat exchanger enters through the upper part of a dephlegmator and is discharged into the first still of 3 sep. units from which it is led (in succession) through 2 other stills of each unit. The bottoms from the third still are pumped into the upper part of the second bubble tower and the reflux is sent through the fourth, fifth and sixth stills to the third tower; the oil from this tower flows into the seventh still. The final bottoms are withdrawn from the eighth still. The vapors from the first 3 stills enter the first bubble tower and are partly condensed and recycled; vapors from Stills 4, 5 and 6 are subjected

to the same operations in No. 2 bubble tower; and the vapors from Stills 7 and 8 enter No. 3 bubble tower. Good fractionation and economy in fuel are claimed.

A. A. BOEHLINGK

Air repressuring oil wells. G. SADOVNIKOV. *Azerbeidzhanskoye Neftyanoye Khozyaistvo* 1928, No. 6/7, 42-6.—The Marietta air-repressuring method was introduced on nearly exhausted oil wells in Ramanui; the yield in oil was increased 100% and in some cases even more. The oil so produced had an increased sp. gr., a change which is explained by oxidation due to injected air.

A. A. BOEHLINGK

Distilling Russian mazout. M. BESTUZHEV. *Azerbeidzhanskoye Neftyanoye Khozyaistvo* 1928, No. 10, 66-71.—Russian mazouts began to crack at about 350° in shell stills, which proved to be inferior to tube stills, and also when distd. at high vacua (up to 7 mm.). The f. p. of lubricating oils is higher when distg. with insufficient steam because the paraffin is transferred from the residue to the lubricating oil fractions. No formation of paraffin could be observed when oil products were distd. without steam.

A. A. BOEHLINGK

Emulsified and saponified oils. I, II, III. L. SINGER. *Petroleum Z.* 25, No. 7, Special Section 6-8; No. 9, Special Section 4-5 No. 12, Special Section 8-9(1929).—A review.

A. A. BOEHLINGK

Some characteristics of amorphous wax. LEO D. JONES AND F. E. BLACHLY. Sharples Specialty Co., Philadelphia. *Ind. Eng. Chem.* 21, 318-20(1929).—The various differences between cryst. wax and amorphous wax are described, as well as the various conditions whereby wax is pptd. in a petroleum lubricating stock in a cryst. or amorphous state. A surface tension and colloidal theory is proposed, to account for the occurrence of amorphous wax.

G. CALINGAERT

Comparison of methods for the determination of water in fuel oils. N. I. CHERNOZHUKOV. *Izvestiya Teplotekhn. Inst. (Tran. Thermo-Tech. Inst. (Russia))* 1928, No. 10, 11-2.—Dry oil was mixed with known quantities of water and the mixtures were analyzed by the method of Dean and Stark, which was found accurate within 0.2%, by that of Lissenko, which was rejected as giving errors up to 98%; by the centrifuge method, which was accurate within 1%; and by Denmark's method, which with paraffinic mazouts gave negative results for water content.

A. A. B.

The character of ground waters in Balakhanui. A. KREMS. *Azerbeidzhanskoye Neftyanoye Khozyaistvo* 1928, No. 4, 34-7.—Various theories on the location of water in different strata are discussed. The percentage compn. of water obtained from different depths is:

Depth of bore hole in meters	Cl	CO ₂	SO ₂	CaO	MgO
129.5	0.344	0.088	trace	0.0708	0.0238
279.2	0.51	0.186	trace	0.0116	0.0369
7.0	0.89	0.204	0.074	0.010	0.025
72.0	3.71	0.7	0.0524	0.0096	trace
193	3.12	0.518	0.048	0.0088	trace.

A. A. BOEHLINGK

Present tendencies of the cracking industry. ANDRÉ GAERTZ. Office nat. comb. combustibles liquides. *Ann. office nat. combustibles liquides* 3, 779-832(1928).—Thermal reactions of individual paraffin, olefin, acetylene, naphthene and aromatic hydrocarbons are reviewed (160 references). In addn., 18 references deal with asphalt and 37 with oxidation of gaseous hydrocarbons. G. urges cooperative research by the mining, chem. and refining industries in order to eliminate waste of petroleum products. The importance of the refining industry in relation to national defense is mentioned.

R. E. SCHAAD

Cracking petroleum. A. P. SACHS. *Chem.-Ztg.* 53, 65-6, 86-8, 107-8, 117-9, 167-8(1929).—A short incomplete review of the literature on cracking with particular reference to the Burton, Cross, Dubbs, Holmes-Manley and Richey processes.

D. F. BROWN

Selecting metal for cracking coils. I. ILOVAISKI AND L. DEMBO. *Azerbeidzhanskoye Neftyanoye Khozyaistvo* 1928, No. 4, 64-9.—Steel used in the drawn tubes of the Lomax cracking coil supplied to the Azneft had the following chem. compn.: C 0.125, Mn 0.52, Si 0.07, P 0.009 and S 0.028%. It was of fine ferritic-perlitic structure. A sample of a ruptured tube had a coarse Widmanstedt structure due to local overheating and still contained about 1% of C, a proof that the steel was heated close to its m. p., i. e., 1400-1450°. That it was not burned was proved by a heat-treating test, which converted the coarse structure to fine-grain. Mech. tests with new tubes

at temps. from 300° to 620° indicated that the safety factor fell nearly to zero at 610–620°. The proportional limit decreased from 16.1 to 2.2 kg./sq. mm.; the sp. elongation, from 26.7 to 42.1%; and the sp. contraction, from 57.1 to 98.1%. Conclusion: This steel is unsuitable for cracking coils. The use of Cr alloy steel is recommended.

A. A. BOEHLINGK

Vaporization of gasoline-benzene mixtures. N. I. CHERNOZHUKOV AND N. D. GRAMENETSKII. *Izvestiya Teploekh. Inst. (Trans. Thermo-Tech. Inst. (Russia))* 1927, No. 4, 19–24.—Vaporization tests conducted with various proportions of crude C_6H_6 and gasoline indicate that crude C_6H_6 can be used in a mixt. with motor gasoline. This C_6H_6 must be absorbed by solar oil and not by tar, as is usual; it must be free from naphthalene, treated with H_2SO_4 and NaOH, and the heavy ends (above 150°) removed. For mixing with Grozny aviation gasoline, the "120°" C_6H_6 should have no fractions above 120° and it must be acid treated and neutralized with caustic before blending.

A. A. BOEHLINGK

The determination of benzene, gasoline, alcohol and ether in liquid motor fuels. J. FORMÁNEK. *Chem. Obzor* 3, 4(1928); *Paliva a Topeni* 10(1929); cf. C. A. 22, 2826.—Some dyes, indanthrene dark blue BT, indanthrene violet RT, chlorviolanthrene, algol red B, algol red 2G and algol red 5G dissolve in benzene and color it and its homologs blue or red. In benzene the dyes are insol.; in EtOH and Et₂O only slightly sol.; and in tetralin they become sol. The powd. dye (0.01 g.) is added to the liquid, shaken well and filtered. The color gives a qual. test. For detn. the tetralin is sepd. by distg. at 170°, each fraction is tested separately. Aniline blue 2B is sol. in EtOH and colors it blue; its behavior toward aldehydes and ketones is the same; in benzene, gasoline, Et₂O and tetralin it is insol. Ether is detected with perchromic acid, which it colors blue. To 5 cc. of liquid are added 5 cc. of 1% $K_2Cr_2O_7$, a few drops of H_2SO_4 diluted 1:3, and 2 cc. of 3% H_2O_2 . The perchromic acid does not dissolve in hydrocarbons: alcs, aldehydes and ketones are also colored blue but the color soon changes to green or yellowish green. Ether is best detected in a fraction of b. p. below 40°. In a mixt. of alc., gasoline or benzene, the alc. is detd. in 100 cc. of the mixt. by adding 150 cc. of H_2O colored by fuchsin, and reading the vol. of uncolored liquid after shaking well, the difference is alc. In an alc.-Et₂O combination, 50 cc. of benzene is added to 100 cc. of the mixt. and diluted with 100 cc. of H_2O ; the change in vol. after shaking represents Et₂O. The upper layer contains 50 cc. benzene and the Et₂O to which a correction of 8 cc. is necessary for the soly. of Et₂O and H_2O . Benzene can be detected in a fuel if to 5 cc. of the unknown 3 cc. of aniline colored with aniline blue 2B is added and the mixt. heated. Upon cooling, the aniline seps. and the benzene remains uncolored. The sepn. of aniline occurs only if tetralin is absent and if the amt. of C_6H_6 , alc., or Et₂O is less than 35%.

FRANK MARESH

Knock ratings of pure hydrocarbons. A. W. NASH AND DONALD A. HOWES. Univ. of Birmingham, England. *Nature* 123, 276–7(1929).—The failure of chem. analysis of gasoline to indicate its knock value is due to the difference in knock values of the members of a given series. The antiknock values of some hydrocarbons were detd. by the bouncing-pin method. The following are cc. of ethyl fluid equiv. to 20% of the substance tested: cyclohexane 1, benzene 2.1, cyclohexene 2.4, toluene 2.75, 2-pentene 3.5, trimethylethylene 4.5, diamylene 6.0, diisobutylene 6.6. The diamylene is the olefin corresponding to Edgar's octane.

ARTHUR FLEISCHER

Instructions for laboratory tests of mineral-oil fuel. COMMISSION FOR THE UNIFICATION OF METHODS FOR LABORATORY TESTS OF FUEL. *Izvestiya Teploekh. Inst. (Trans. Thermo-Tech. Inst. (Russia))* 1927, No. 4, 77–96.—The following items are covered: fuel mazout, motor fuels, sampling from tanks, tankers and tank cars, and also from tanks in power plants.

A. A. BOEHLINGK

Paraffin plant in Grozny. A. ABLOVATSKII AND V. BRAZHNIKOV. *Azerbeidzhanskoye Neftyanoye Khoriyaistvo* 1928, No. 6–7, 59–68. The first paraffin plant built in Russia consists of two series of shell stills with four dephlegmators each. Grozny mazout is preheated by the bottoms from the last still, enters the first still, where its temp. is again raised, is then pumped to the following stills, losing successive fractions which are collected and form the "semi paraffin" stock. This stock is sent through a second series of stills in which it undergoes the same treatment. The oil so obtained is easily worked up in the paraffin presses at lower pressures than those normally used. The sweating operation is improved and a high-quality wax which could not be obtained through a single distn. of the mazout is obtained. A total of 40–45% of wax distillate is distd. from the mazout.

A. A. BOEHLINGK

Purification of lubricating oils by centrifuging. B. P. SVETLOV. *Izvestiya Teploekh. Inst. (Trans. Thermo-Tech. Inst. (Russia))* 1928, No. 10, 19–27.—The use of

centrifuges in various power plants for purifying used and fresh oil is described. Cost of equipment and savings in oil are given. A. A. BOEHLINGK

Carbonization of lubricating oils and fuel oils. N. I. CHERNOZHUKOV. *Thermo-Tech. Inst., Moscow. Ind. Eng. Chem.* **21**, 315-6(1929).—Under the conditions of the Conradson carbon-residue test, the carbonization depends on the amts. of asphaltenes and tars in an oil. Colorless oils and paraffins do not give appreciable amts. of coke when evapd. in the Conradson app. Conradson carbonization values are not representative of the carbonization of oils in service. More reliable information can be obtained by detg. the stability of the oils with regard to sludge formation. This method is based on the oxidation of oils by O_2 or air at high temps. and pressures. Different crude oils, lubricating oils and their tars give different amts. of sediment or sludge under the same conditions of oxidation. G. CALINGAERT

The structure of lubricating films and lubrication with colloidal graphite. H. KARPLUS. *Petroleum Z.* **25**, 375-86(1929).—The failure of the old hydrodynamic theory of lubrication is demonstrated and the latest investigations of the factors which control lubricating action are reviewed. An extensive list of references is given. It was found that colloidal graphite added to lubricating oils is better than fatty acids or other substances, because of the laminary structure of graphite and its chemical inertness. A. A. BOEHLINGK

Economical use of motor oil. KRONRAFF. *Petroleum Z.* **25**, No. 7, Special Section 9(1929).—Lubricating oil from motor-test benches is recovered mostly by centrifuging, heating, filtering and chem. treatment; it is then sent back to the crankcase or first mixed with fresh oil. The residue from used oil contains 77.5% of Fe, 17.7% of combustible material, 4.8% of ash, sand and sometimes up to 2.7% of water. The purified used oil has a slightly turbid appearance which does not affect its quality. A. A. B

Selection of the proper method for the determination of the oxidizability of transformer and turbine oils. N. I. CHERNOZHUKOV. *Izvestiya Teploekh. Inst (Trans Thermo-Tech. Inst. (Russia))* **1928**, No. 10, 13-8. The following tests and methods are briefly described: Waters method, Life test, Schwarz-Marcusson method, Stager method, the French method, the Italian method, the Belgian method, Michie sludge test, the Russian method (not described), the sludge accelerator test, Rogers and Miller method, the German method, Allgemeine Elektrizitäts-Gesellschaft method, Sligh test, and Butkov method. A. A. BOEHLINGK

Determination of the aging tendency of insulating and steam turbine oils. A. BAADER. *Reprint from "Elektrizitätswirtschaft." Communications* No. 461 and No. 463, 12 pp. (June, 1923). The aging of an oil is essentially an oxidation process which is accelerated by elevated temp. and by contact with certain materials, especially metals. There are 2 fundamental errors in the present methods of testing oils for their aging tendency, both in Germany and elsewhere. The first is, that all the causes of aging are allowed to act in combination upon a single sample of the oil being tested. The result is that the refiner does not know how to correct the technic of the refining process so as to produce an oil better adapted to its intended use. A Pb sensitive oil could be used in Pb-free units; a temp.-sensitive oil could be used where the temp. is always under 55°. The second error is, that movement of the oil while the test is in progress is entirely neglected, with the result that in order to accelerate aging, air or O must be conducted in or pressure applied, thus introducing conditions different from those under which the oil is normally used. A testing app. is described which avoids both errors. Four samples of the oil, held at the same temp. (95°) in a thermo-stat, are stirred continuously for 48 hrs. One stirrer consists of a glass spiral, one of Pb, one of Cu and one of Fe or of steel. At the end of the period the sapon no. and H_2SO_4 reaction are detd. for each sample of oil. The 2 detns. together require but a small fraction of the time and expense necessary for a tar-no. detn. The sapon no. for a sample stirred with glass spiral minus sapon no. for untreated oil represents the heat-sensitiveness of the oil; sapon no. for sample stirred with Fe minus that of sample stirred with glass represents the Fe-sensitiveness of the oil. Cu-sensitiveness and Pb-sensitiveness are found similarly. So also a set of sensitiveness figures is obtained based on the acid no. found for each sample. The acid no. is obtained by shaking 10 cc. of the oil with 10 cc. of 96% H_2SO_4 , letting stand for 3 hrs., and reading off the increase in vol. of the acid. The acid nos. found were low, making the percentage of error high. A table of data for 24 oils tested in the manner described is given, and the results are compared and discussed fully. The sensitiveness estd. from the acid no. did not always accord with that based upon the sapon no. The acid no. has for its basis only a part of the products of aging. Fe-sensitiveness is probably independent of temp.-sensitiveness. Fifty % of the oils were Cu-sensitive and 67% Pb-sensitive.

There is reason to believe that Pb-sensitiveness is acquired in some way in the refining process, and can therefore be prevented. An oil refined by the present-day Edeleanu process did not age half as rapidly as a H_2SO_4 -refined oil from the same crude.

EMMA E. CRANDAL

New Austrian standards (not yet accepted) for natural and mineral-oil asphalts. II. ÖNIG. *Petroleum Z.* 25, 404-10(1929).—The following items are included. (I) Sampling. (II) Phys. tests: (1) sp. gr., (2) breaking pt. by the Church method, (3) softening pt. by the ring-and-ball method, (4) penetration test, and (5) flash pt. (III). Chem. tests: (1) bitumen content, (2) water, (3) sulfur, (4 and 5) oil content and paraffin no., (6 and 7) acid no. and sapon. no., and (8) stability test. Nomenclature: (subdivisions according to origin). (I) Natural asphalts: (1) asphalts or mined pitches, (2) asphalts or glossy pitches, (3) asphalt minerals. (II) Mineral-oil asphalts. Characteristics: (I) natural asphalts, (II) mineral-oil asphalts. Testing: (I) Sampling. (II) Phys. tests: (1) density, (2) breaking test by the Church method, (3) softening pt. by the ring-and-ball method, (4) penetration test, (5) ductility, (6) flash pt. (III) Chem. tests: (1) bitumen content, (2) water, (3) ash, (4) S, (5) oil content by Marcusson and Eickmann method, (6) paraffin no., (7) acid no., (8) sapon. no., (9) stability, (10) adulteration test.

A. A. BOEHLINGK

The determination of the softening point of pitch and asphalts. A. SPILKER. *Z. angew. Chem.* 42, 263-4(1929).—Because of the possibility (rather remote, according to S.) of poisoning from Hg used in the conventional Kraemer-Sarnow method for detg. the softening point of pitch and asphalt, the suggestion has been made by Mallison, *et al.* that this standard procedure be replaced by some other, *e. g.*, "ball-and-ring," etc., method. But if this is done data now recorded will not be comparable with the newer detns.; to avoid this disadvantage and still get away from the use of Hg, S. recommends that a smooth Pb-Sb (80/20) rod, 5 mm. in diam. and weighing 8.0 g., hemispherical at the lower end and cut off straight at the top, be substituted for the 5 g. of Hg called for in the standard method, and that the instant when the rod, falling through the pitch, touches the beaker be taken as the end point. Some 15 series of comparative tests, involving 200 detns., are reported; they show deviations well within the limits of exptl. error, \pm , from -0.7 to $+0.7^\circ$.

W. C. BRAUGH

Determination of melting points in pitches and asphalts by the Kraemer-Sarnow method. D. HOLDE. *Petroleum Z.* 25, 411-2(1929).—Polemical discussion relating to the Hg method *vs.* the Cu-strip test.

A. A. BOEHLINGK

Fillers in bituminous materials. H. SUDA AND A. SCHMOLZER. *Petroleum Z.* 25, 351-5(1929).—Various proportions up to 70% by wt. of powd. brick, powd. lime, powd. granite, powd. quartz and asbestos were mixed with Trinidad pitch, coal-tar pitch and petroleum pitch. The customary phys. tests indicated that lime is unsuitable as filler for coal-tar pitch because of the free acid in the pitch, which reacts with the lime. Trinidad and petroleum pitch gave satisfactory mixts. for road pitch. Asbestos gave high elongation values because of its fibrous nature. Powd. quartz and granite behaved very much alike. A detailed report of further work will follow.

A. A. BOEHLINGK

Paraffin content of road asphalts. H. BURSTIN. *Petroleum Z.* 25, 257-60(1929).—Paraffin wax, which sometimes runs as high as 6% in artificial asphalts (Russian asphalts), was formerly considered undesirable in road asphalt; it does not affect the quality of asphalt, particularly if high-melting-point paraffin, which is elastic because of its noncryst. structure rather than brittle, is present. Three paraffin detn. methods were tried; preference is given to that of Marcusson, because it is considered the most accurate. Comparative tests of 3 different asphalts are given in the table:

	Paraffin content		
	"Mexfalt"	"Galbit"	"Molfalt" (asphalts)
Kraemer-Sarnow test	53°	49°	39°
Paraffin tests by:			
Schwarz	8.1%	0.10%	
Marcusson	5.5%	0.46%	0.22%
Cracking	6.2%	0.60%	0.35%

A. A. BOEHLINGK

Chemistry of road tar. H. MALLISON. *Petroleum Z.* 25, 399-403(1929).—Three sets of specifications for road tars adopted in Germany are given. They include "No. 1 coal tar," "anthracene-oil tar 60/40" and "anthracene-oil tar 50/50." The usual tests and characteristics in detail as well as a no. of photomicrographic reproductions of diluted tars are given.

A. A. BOEHLINGK

Trinidad asphalt in road-building. ANON. *Petroleum Z.* 25, 415-21(1929).—The asphalt shipped from Trinidad is purified before shipment; it has the following characteristics: CS_2 -sol. bitumen 56.5%, ash 38.5%, org. insol. compds. 5.0%, sp. gr. 1.40, softening pt. 85° , m. p. 112° , and penetration at 25° 4. This asphalt is mixed before use with mineral oil of the following specifications: sp. gr. at 15° 0.92-0.93, flash 177° , loss after heating for 7 hrs. to 162° , not more than 5%. Various methods of applying are described.

A. A. BOEHLINGK

Dust preventives on roads. W. v. PIOTROWSKI. *Petroleum Z.* 25, 260(1929).—"Drozol" tar oil, which is a soln. of petroleum asphalt in oil, is a suitable dust preventive, having a sp. gr. above unity, which prevents water from seepg. below the soln. It also has high penetrating ability, covering the pieces of gravel individually and filling the seams, whereby direct contact between the individual pieces is eliminated and friction decreased to a min. The life of the road is accordingly prolonged. The gravel road remains rough and the good traction insures the safety of vehicles even in damp weather.

A. A. BOEHLINGK

Ethyl alcohol from wood waste. FAUCONAU. Faculté des Sciences, Bordeaux. *Bull. inst. pin* No. 57, 57-61(1929).—The work of Kressman (*C. A.* 16, 2026) is reviewed. F. found that the optimum conditions for the saccharification of Bordeaux pine sawdust (the expts. described were carried out on 1 kg. of wood) were: dry wood 100, H_2O 200-400, HCl 2.5 parts, pressure 6.5 kg. per sq. cm., time of cooking 5 mins. After washing, the liquor is neutralized with NH_4OH and rendered slightly acid with AcOH . F. succeeded in fermenting 73% of the total sugars, with a yield of 100 l. of alc. per ton of dry wood.

A. PAPINEAU-COUTURE

Production of wood charcoal in the Landes forest. LOUIS DE LAPASSE. *Bull. inst. pin* No. 57, 71-7(Feb., 1929).—A discussion of the interest (particularly in France) in the production of wood charcoal, in the production at the present time, and in the possibilities of extending this production in the Landes forest.

A. P.-C.

Auto inflammability of different charcoals. HILDING BERGSTRÖM. *Jernkontorets Ann.* 82, 21-8(1927).—B. has examd. the O_2 absorption of different charcoals at 35° through a period of 2 yrs. The O_2 absorption is large for the first 50 days, but proceeds more slowly from that point, continuing, however, for more than 2 years. The results vary greatly for different charcoals. From 12 to 78 cc. of O_2 is absorbed per g. of dry charcoal in 500 days. Damp charcoal absorbs O_2 faster than dry. A. D.

Detection of adulteration of spirits of turpentine. (MISS) M. H. BARRAUD. *Inst. du Pin. Ann. fuls.* 22, 5-18, 83 90(1929).—The most reliable method is considered to consist in a distn. test, with sepn. into 5 fractions and examn. and comparison of the original sample and the 5 fractions: Place 200 cc. in a 500-cc. Pyrex flask surmounted by a 2-coil Lebel distg. column connected to a 90-cm. Liebig condenser and provided with a thermometer in the top of the column. The b. p. is taken as the temp. when the first drop falls into the receiver. Conduct distn. at the rate of about 1 drop per sec., collect four 40-cc. fractions (the 5th fraction being the residue in the flask) and det. d_{40} or d_{25} , n and acidity of the original sample and fractions 1, 3 and 5, and $[\alpha]$ of the original sample and all the fractions. The most valuable indications are given by the differences in d , n and $[\alpha]$ of the 1st and 3rd and 3rd and 5th fractions, resp. Numerous data are given from the results obtained with samples of known purity and different origins and also on samples adulterated in the lab. with known amts. of white spirit. The results give valuable indications as to the nature of the chief constituents of pure samples, and adulteration with as little as 2% of white spirit can be detected. The glycerol test (*C. A.* 22, 173) is described, explained, and discussed at some length. It is suggested the test might be improved by using powd. glass having the same n as glycerol, which renders the phenomenon much more brilliant. Massy's densimetric test (based on the difference in d of the sample as compared with 80.7% alc. by vol.) has the drawback of being applicable only to French spirits of turpentine. The turbidity test (temp. at which turbidity occurs in presence of PhNH_2) should be carried out on the various fractions obtained in the distn. test in order to obtain max. sensitivity: it can detect adulteration, but cannot det. it quantitatively. Detn. of ethylene linkages either by catalytic hydrogenation or by fixation of halogens may be of considerable value in scientific investigations, but is not practical in control methods. The Herzfeld method (detn. of residue unpolym. by H_2SO_4) gives fairly satisfactory results, but is considered rather long. Burton's method as modified by Marcussen (oxidation with fuming HNO_3 at -10° , cf. *C. A.* 4, 1541) is considered the most satisfactory method for the detn. of adulteration. The residue obtained on oxidizing pure spirits of turpentine consists of a thin, brown, oily film, free from foam when the result of the test is doubtful, by applying it to the 1st fraction of the distn. test.

adulteration may be detected with certainty and detd. quantitatively with sufficient accuracy for practical purposes. Salvaterra's method (C. A. 15, 1819) of oxidation by means of $\text{Hg}(\text{OAc})_2$ or yellow HgO in presence of AcOH is of particular interest for the analysis of kienöls. The work previously published (C. A. 22, 2659) on the Mau-mené no. is again described.

Spanish turpentine and their improvement. MARIANO TOMEO. *Servicio Forestal Investigaciones y Experiencias* 1, 98-108; *Pine Inst. Am. Abstracts*, Chem. Sect. 2, 184(1928).—The turbidity of Spanish turpentine is not eliminated by distn. *in vacuo* or in the presence of an inert gas. The efficiency of 12 filtering media is shown. The red color of Spanish turpentine is due to the presence of Fe 0.75 cc. of concd. H_2SO_4 in 7.5 cc. water completely decolorizes 600 cc. of turpentine and the oil is not unduly acidified by the process. The properties of turpentine from 4 species of Spanish pines were compared with those of Portuguese, French, American, Greek and Indian turpentine. The results show clearly that the production of Spanish and Portuguese turpentine, especially Portuguese, is not as efficient as to quality as the American and the French.

W. H. BOYNTON

The speed of an explosive wave (LAFFITTE, DUMANOIS) 24. The determination of alkali in seepage water [in oil wells] (MALYAROV) 7. Relation of diatoms to petroleum formation (v. STAHL) 8. Homogeneous catalysis [theory of anti-knock compounds] (EGERTON) 2. Organic compounds from coal, tar, etc. (Fr. pat. 647,742) 21. Tank and baffle plate construction for separating oil from water by gravity (U. S. 1,708,021) 1. Purifying oils (Ger. pat. 472,212) 27. Destructive hydrogenation (Brit. pat. 296,431) 21. Distilling solid carbonaceous materials (Brit. pat. 296,443) 21. Residues from lubricating oils for use on roads (Fr. pat. 647,897) 20. Emulsions of tar, etc. (Fr. pat. 33,627) 21. Centrifugal apparatus for purifying oils, etc. (Brit. pat. 296,670) 1. Overflow alarm device for filtering apparatus (U. S. pat. 1,708,235) 1.

Purification of petroleum. ALEXANDRE M. NASTYUKOV. Fr. 647,662, Jan. 24, 1928. Crude petroleum or its residues or derivs is purified by treatment with formol and concd. H_2SO_4 to form solid condensation products which absorb the satd. hydrocarbons. The reaction may be carried out in the cold or with heat, with or without a current of steam passing through the mass. The solid ppt obtained may be used for industrial purposes.

Cracking petroleum hydrocarbons. CHARLES R. DOWNS (to Weiss & Downs, Inc.). U. S. 1,708,303, April 9. Vapors from boiling S are used as a heating medium (out of direct contact with the hydrocarbon material) and the temp. of the S vapors is regulated by the pressure maintained on them. An app. is described.

Cracking petroleum oils. STANDARD DEVELOPMENT Co. Brit. 296,919, Oct. 22, 1927. Oil to be cracked and fractionated is passed through a heating app. such as a bank of tubes, thence through a heat insulated receptacle, and to fractionating towers connected in series. The last tower receives vapors near the middle point of its height and is provided with an independent reflux control at its upper end. Various details of operation are described.

Heating petroleum oils in pipe coils. JOHN C. BLACK (to Gasoline Products Co.). U. S. 1,708,076, April 9. In heating oil preliminary to distn. or for cracking, the oil is first passed through that part of a coil in the hottest portion of a furnace, thence, in the same direction as the combustion gases flow to heat the furnace, to the part of the furnace having the lowest temp. and then in a reverse direction to an outlet intermediate the zones of highest and lowest temp. An app. is described.

Treatment of acid sludge from the refining of petroleum oils by means of sulfuric acid. J. MASR. Belg. 351,175, June 30, 1928. After addn. of cold H_2O or dil. H_2SO_4 , hot air is passed through the sludge. The SO_2 evolved is recovered, the liquid is allowed to stand and the upper layer of sulfonated compds and the lower layer of H_2SO_4 are sepd. and recovered.

Cracking hydrocarbons. PAUL GRENFÉ. Fr. 33,504, Jan. 22, 1927. Addn. to 638,517 (C. A. 23, 274). Losses due to the formation of permanent gases are avoided by working in an atm. of industrial gases such as coke-oven gas, water gas, town gas, etc.

Cracking hydrocarbons. CHARLES P. TOLMAN. Fr. 617,721, Sept. 17, 1927. Hydrocarbons are cracked by vaporizing and mixing the vapors with superheated Hg vapor. A suitable app. is described.

Apparatus for distilling and other heat-treatment of hydrocarbons. I. G. FAR-BENIND. A.-G. Brit. 296,683, March 3, 1927. App. for processes such as distg,

extg., or dehydrogenating is formed of or lined with noble metals, ferro-Si, alloys of Cr, Mn, Mo or Co or steels contg. Cr, Mn or W, to prevent deposition of C. Catalysts used, if any, should be materials which do not promote C deposition such as silica, pumice, BaCO_3 , charcoal treated with Ba salts, W, B, etc., with or without a coating of lustrous C. Brit. 296,693 relates to the similar use of Al-lined or Al app. to prevent deposition of C. Brit. 296,694 relates to the use of app. coated with lustrous C for catalytic hydrocarbon treatment, cracking, etc.

Apparatus for high-temperature treatments of hydrocarbons. I. G. FARBERNIND. A.-G. Brit. 296,752, March 3, 1927. In order to prevent deposition of C on highly heated parts of the app., these are treated at high temps. with metalloids such as B, As, Sb, Bi, P, Se or compds. of any of these, or with Si. Small quantities of these are sufficient and they may be applied separately in the form of vapors or solns. of suitable compds. or may be supplied in the form of volatile compds. together with the hydrocarbons under treatment. An example is given of the treatment of a Cu tube with H_3BO_3 soln. before use for the catalytic conversion of C_2H_4 into C_6H_6 . Brit. 296,753 specifies app., the highly heated parts of which are formed of or lined with Mo, Ta or Cr to prevent deposition of C. Cf. Brit. 296,683 (preceding abstract).

Cracking hydrocarbon oils. EVELYN S. L. BEALE, GEORGE H. COXON and ALBERT E. DUNSTAN (to Anglo-Persian Oil Co., Ltd.). U. S. 1,708,782, April 9. Oil to be cracked is heated to cracking temp. while being passed through a pipe coil or like device of restricted cross-section, while subjected to the action of a feed pump and a surging pump which together impart both a generally forward feed and an alternately reciprocating movement to the oil stream, serving to check C deposition. An app. is described.

Cracking hydrocarbon oils. GUSTAV EGLOFF (to Universal Oil Products Co.). U. S. 1,707,348, April 2. Charging oil is brought into contact with evolved vapors passing through a dephlegmator and the charging oil and reflux condensate pass from the dephlegmator to an enlarged vaporizing zone counter-current to the flow of vapors. A pool of the charging oil and reflux condensate is maintained in the enlarged zone and preheated material from this pool is passed through a heating zone such as heating tubes where it is heated to a cracking temp. and thence to an independent pool in the enlarged vaporizing zone whence unvaporized residual oil is continuously withdrawn from the system but from which no oil is returned to the heating zone. An app. is described. U. S. 1,707,349 specifies heating the oil to a conversion temp. (suitably in a pipe coil) and then delivering it to an enlarged expansion zone where it overflows from one oil body to a second oil body, while removing vapors and subjecting them to reflux condensation and returning reflux condensate to the second body of oil; heavy C-contg. residue is withdrawn from the first mentioned body of oil in the enlarged zone and the second oil body in this zone is heated. Both this process and that of U. S. 1,707,348 are carried out under super-atm. pressure. An app. is described. Cf. C. A. 23, 2028.

Cracking hydrocarbon oils. EDWARD W. ISOM (to Sinclair Refining Co.). U. S. 1,708,180, April 9. A body of oil is maintained at a cracking temp. by circulating oil from the body through heating tubes and back to the body, vapors are taken off from the latter and the vapors are subjected to two successive refluxing operations, reflux condensate from the first refluxing operation is returned to the original body of oil, and reflux condensate from the second refluxing operation is forced through a sep. heating conduit and there heated to a cracking temp. and hot oil products from this heating conduit are discharged into the first-mentioned body of oil. An app. is described. Cf. C. A. 23, 2028.

Distilling hydrocarbon oils. FRANK B. FETTER (to National Refining Co.). U. S. 1,707,606, April 2. Oil to be cracked is rapidly impelled through a heater (which may be in the form of a pipe coil) under an extraneous pressure of approx. 1000 Ps. per sq. in. so as to attain a "working temp." for the oil of above 425° and graduated volumes of the hydrocarbon material are permitted to escape from the heater through an accelerating vent having the characteristics of a Venturi tube into a vaporizing chamber at approx. atm. pressure, and heavier and lighter products are sep'd. An app. is described.

Fractional distillation of hydrocarbon oils. JOHN PRIMROSE (to Foster Wheeler Corp.). U. S. 1,707,369, April 2. A batch of oil is circulated through a closed system comprising a storage tank and a fire-heated tubular oil heater with such velocity of flow through the oil heater as gradually to raise the temp. of the oil in the system, so as to keep the difference between the temp. at which the oil enters the heater and the temp. at which the oil leaves the heater small enough to permit the formation of relatively clean distn. "cuts," and not in excess of a predetd. and relatively small amount;

different vapor fractions successively liberated are withdrawn at successively higher temps. as the batch of oil is progressively heated. An app. is described.

Apparatus for heat conversion of hydrocarbon oils. JOSEPH B. WEAVER (to Gyro Process Corp.). U. S. 1,708,247, April 9. Liquid oil is heated in a pipe still and thence passed to an expansion chamber, vapors from the expansion chamber are subjected to heating to effect their conversion in the vapor phase and the same products used for heating the vapors are further used at a lower temp. for heating the oil in the still. The app. used is described.

Treating hydrocarbon oils with corona arc discharges. WILHELM ISMARCH (to Siemens & Halske A.-G.). U. S. 1,708,126, April 9. Hydrocarbon material such as oil is treated in the presence of air and between closely adjacent surfaces formed by water-cooled electrodes, with corona-arc high-frequency discharges produced by an a. c. of about 10,000 periods. Cf. C. A. 22, 4072.

Purifying oils. SIGBERT SEELIG. Ger. 472,070, Oct. 18, 1927. Hydrocarbon oils are purified by treatment with a plumbite soln. contg. free PbO in suspension.

"Soaking-drum" apparatus for cracking oils. HENRY H. HEWETSON (to Beacon Oil Co.). U. S. 1,707,520, April 2. Structural features.

Gasifying heavy oils. C. CHILOWSKY. Brit. 296,785, Sept. 8, 1927. See Fr. 640,686 (C. A. 23, 903).

Extraction of oil from oil sands by displacement. H. ATKINSON. Brit. 296,213, Oct. 10, 1927. A strong alk. soln. such as one comprising soap, soda ash and NaOH or KOH is used to displace residual oil. Various details of operation are given. Cf. C. A. 22, 682.

Digestion of bituminous shale, etc. WILLIAM H. HAMPTON. U. S. 1,707,759, April 2. Solid material such as bituminous shale is mixed with a mineral oil within the kerosene range and digested at a temp. sufficiently high to liquefy bituminous substances present and under sufficient pressure substantially to retard vaporization of the kerosene and heavier fractions, volatilized products are conducted away and recovered, and solid matter is sepd. from the residue of the digested mixt. An app. is described. Cf. C. A. 23, 2030.

Distilling mineral oil. ARTHUR E. PEW, JR. (to Sun Oil Co.). U. S. 1,707,448, April 2. Steam generated from deaerated water is used for distg. oil to obtain distillates of good color. An app. is described.

Oil-soluble sulfonates. HAYM E. BUC (to Standard Oil Development Co.). U. S. 1,707,506, April 2. In order to improve the color-stability when heated of the Na salt of an oil sol. sulfonic acid derived from the treatment of petroleum oil with a sulfonating agent, the salt is heated to above 150° in an alk. medium such as NaOH, 3%.

Paraffin. AKTIEBOLAGET SEPARATOR NOBEL and K. G. MALM. Brit. 296,805, June 7, 1927. Paraffin is sepd. from liquid hydrocarbons by pptg., dilg. and centrifuging in a separator having a mech. device for removing the ppt. The sepn. may be fractional, and portions of oil from which paraffin can be crystd. in an easily filterable state may first be removed by distn. Preferably the crude oils are distd. with steam and under reduced pressure, the distillate is dild., chilled slowly and centrifuged in a separator of a special type which is described. The sepd. paraffin is heated to remove solvent and then cracked to obtain a product sufficiently crystd. to be "sweated."

Lubricant. PRESTON C. GOSS. U. S. 1,708,058, April 9. A lubricant suitable for use in internal combustion engines comprises a petroleum lubricating oil mixed with an aq. ext. of the inner bark of slippery elm.

Lubricants. T. H. SANDERS. Brit. 297,201, Aug. 19, 1927. Lubricating oil for internal-combustion engines or other mineral, fatty or mixed lubricating oils have incorporated with them a small proportion of an org. ester such as AmOAc or Bu lactate, of low viscosity, to reduce the "oil drag" of the lubricant.

Lubricants for internal-combustion engines. STANDARD DEVELOPMENT CO. (FORMERLY STANDARD DEVELOPMENT Co.) and C. ARNOLD. Brit. 297,068, May 9, 1927. There is added to a hydrocarbon lubricating oil less than 0.5% of an alkali, alk. earth or other soap (such as a soap formed from corn oil, oleic acid and NaOH, or Na stearate or palmitate) and the mixt. is heated to above 175° but below the b. p.

Lubricating oil. JULES MORELLE. Fr. 647,501, Jan. 19, 1928. A lubricating oil is obtained by sapong. wool-grease pitch by NaOH lye, mixing with a coal-tar oil and adding fillers such as slaked lime, talc, etc.

Lubricating oils. HARALD NIELSEN and BRYAN LAING. Fr. 647,877, Jan. 13, 1928. An app. is described for distg. fuel to obtain crude oils which may be used to produce lubricants.

Lubricating grease from crank-case oil. EDGAR N. HILBERT. U. S. 1,707,633, April 2. After heating crank-case oil there is added to it a filler in powder form produced from NaOH 3, milk of lime 12 and a fat 15 parts, the agglomerate mass is agitated while heated and ignited to burn off the more volatile oils, and the remaining product is withdrawn for use as a lubricant. A heating and agitating app. is described.

Imparting a green fluorescence to lubricating oil stock. JOHN C. BLACK, WIRT D. RIAL and JOHN R. MCCONNELL (to Pan American Petroleum Co.). U. S. 1,708,563, April 9. Fluorescent substances are extd. from an uncracked petroleum pitch with the lubricating oil to be treated in sufficient quantities to give the oil the desired fluorescence.

Imparting green fluorescence to lubricating oil. WIRT D. RIAL and WHITFORD R. BARRATT (to Pan American Petroleum Co.). U. S. 1,708,592, April 9. In order to purify and improve the quality of lubricating oil contg. acid constituents, the oil is commingled with Ca(OH)_2 and a coal-tar pitch contg. green fluorescent substances at a temp. of about 110° or somewhat higher in quantities sufficient to neutralize and adsorb the acid constituents and add green fluorescent substances to the oil, and the oil is then sepd. from the excess of Ca(OH)_2 and coal-tar pitch residue.

Imparting green fluorescence to lubricating oil, etc. JOHN C. BLACK, WIRT D. RIAL and JOHN R. MCCONNELL (to Pan American Petroleum Co.). U. S. 1,708,602, April 9. A concd. ext. of green fluorescent substances is prepd. by extg. such substances from a coal-tar product with a mineral lubricating oil.

Refining used lubricating oils. ROBERT V. AYCOCK and WILLIAM D. HARRIS (to RefinOil Mfg. Corp.). U. S. 1,707,671, April 2. Used oil such as that from internal combustion engines which contains water and hydrocarbon diluents is heated to about 50° , H_2SO_4 is added to the hot oil, the mixt. is agitated and resultant sludge is removed, diluents are vaporized from the oil, and the latter is passed upwardly through an active adsorbent agent such as fuller's earth so that the latter is temporarily suspended in the oil; the suspended adsorbent is then allowed to settle as a cake and the oil is passed downwardly through this cake. U. S. 1,707,672 relates to an app. suitable for such filtration.

Regenerating lubricating oils. FIRMA HERMANN BENSMANN. Ger. 472,184, Mar. 26, 1926. See Brit. 268,284 (C. A. 22, 1233).

Apparatus for refining used lubricating oils. KARL GRIMM, MAX GRIMM and FRIEDRICH ANDERSEN. Ger. 472,439, Nov. 4, 1926. The app. is based on the observation that when used lubricating oils are heated to about 250° the oil ascends the sides of the heater while the impurities remain behind. The app. accordingly comprises a heater carrying a no. of arc-like plates, one end of each plate dipping into the oil in the heater and the other end being bent so as to deliver the rising oil to a collecting channel.

Apparatus for refining used lubricating oil by distillation and clarification. FRANK LIN O. KRIEGER (to RefinOil Mfg. Corp.). U. S. 1,707,673, April 2.

Reclaiming waste oils. RUDOLPH R. ROSENBAUM. U. S. 1,708,488, April 9. The alkali sol. content of used oil such as crank-case oil or transformer oil is saponified (suitably by Na silicate and a per-salt) and the saponified matter is withdrawn from the oil; fuller's earth impregnated with SO_2 is then mixed with the oil, and the oil is filtered to sep. the fuller's earth and adsorbed coloring matter and impurities. An app. is described.

Filter for lubricating oils, etc. OVE PETERSEN. Fr. 647,983, Jan. 28, 1928.

Filter for lubricating oil, etc. A C SPARK PLUG CO. Fr. 647,535, Jan. 20, 1928.

Bituminous emulsions. LESTER KIRSCHBAUM. U. S. 1,707,800, April 2. Emulsions which may be used with fibrous material for paper manuf. are formed of bituminous material such as asphalt together with a fluid vehicle such as water and colloidal clay or other emulsifying agent, and, after the emulsion is formed, there is added to it sol. salts such as Na_2SO_4 and ZnSO_4 , forming by chem. reaction *in situ* a protective coating for the emulsified particles without tending to change the size of the dispersed bituminous particles.

Colored bituminous compositions for making tiles, blocks, road surfaces, etc. F. MORYON. Brit. 296,626, Jan. 28, 1928. Coal-tar pitch or blast-furnace pitch having a "twisting point" between 40° and 65° is mixed with an aggregate of small chippings of granite and a filler (which may comprise sand and Fe oxides or limestone dust) suitable for making a product of the desired color.

23—CELLULOSE AND PAPER

CARLETON E. CURRAN

The effect of air on the processing of pure cellulose for fine quality viscose rayon. W. A. DYKS. *Chem.-Ztg.* 53, 185-6(1929).—By protecting alkali cellulose from CO_2 by known methods stronger filaments are obtained. Patent literature is reviewed, particularly with reference to American practice. A higher α -cellulose standard for the finished product is advocated.

Note on the dispersion of dissolved cellulose. H. ZEISE. Lab. I. G. *Kolloid-Z.* 47, 248-51(1929).—The conclusions of Hess (*C. A.* 18, 1381) regarding the presence of $\text{C}_6\text{H}_{10}\text{O}_5$ groups in cellulose-copper ammino hydroxide solns. are not justified. The value $\varphi = (\text{adsorbed copper})/(\text{rotation per millimol. of glucose})$ is not const. The copper adsorption isotherm shows two breaks, one of which appears to coincide with the disappearance of the characteristic x-ray spectrum of cellulose. FOSTER DEE SNELL.

Changes in sugar in the course of cellulose sulfite boiling. ERIK HÄGGLUND AND T. JOHNSON. *Svensk Kem. Tid.* 41, 8-11(1929); cf. *C. A.* 22, 866 (In German).—The decrease in sugar in sulfite liquors is due to the hydrolytic effect of the acids, dependent on the pH , and also to oxidation by HSO_3 ions, in which the CaO concn. is a factor. A. R. ROSE

Chlorination in the field of sanitation (ENSLAW) 14. Removing stains from paper (Belg. pat. 351,152) 13. Bituminous emulsions [for paper manuf.] (U. S. 1,707,809) 22. Forming interfelted laminated and compressed articles from pulp (U. S. pats. 1,707,429-30) 13.

Cellulose from beechwood, bamboo, etc. R. RUNKEL. *Brit.* 296,547, Aug. 24, 1927. Highly lignified plant material such as that of bamboo, beechwood, or other hard woods is comminuted and steeped or softened in hot or cold basic or acid liquors or boiled in water, then reduced to fiber by an edge runner or other suitable crushing app., compressed to a pulp or ribbon, impregnated with basic liquor, and then, as a pulp concn. exceeding 8%, is subjected to alternate chlorination and washing with alkali; after each washing it is treated in a centrifuge or worm press to secure the desired concn. Various details as to the use of Cl carriers such as SnCl_2 and of various softening agents are given.

Cellulose acetate. J. P. FOLCHI and L. J. DIDIÈRE. Belg. 352,522, July 31, 1928. Cellulose is dissolved in boiling glycerol, H_2SO_4 is added and the soln. is treated with Ac_2O vapors.

Cellulose acetate of high viscosity. HENRY DREYFUS. U. S. 1,708,787, April 9, 1928. Cellulose is esterified with a strong condensing agent such as Ac_2O and H_2SO_4 in the presence of a quantity of HOAc at least about 6 times the wt. of the cellulose.

Colored celluloid, etc. BADISCHE ANILIN & SODA-FABRIK. Fr. 33,596, May 21, 1927. Addn. to 588,903. Colored masses of celluloid and other cellulose derivs. are obtained by incorporating in the celluloid large amts. of dye in the manner indicated in the prior patent and then mixing with more uncolored celluloid or other plastic substances, in the presence or absence of solvents, till the desired color is obtained.

Artificial ebonite. KARL WEGNER. Fr. 644,011, Nov. 15, 1927. Derivs. of cellulose such as acetyl or nitrocellulose mixed with filling materials, solvents and softening agents, are submitted to a mech. treatment during which the mass is dried and reduced to fragments. Articles are made from the powder by pressing in heated steel molds, and may be used instead of articles made from ebonite.

Fireproofing cellulosic materials. H. PLATT and C. DREYFUS to British Celanese, Ltd.). *Brit.* 296,344, Aug. 29, 1927. Yarns, fabrics, paper, wood, or other materials are treated with solns., pastes, or other preps. of phosphoric acids, acid phosphates, arsenic acids, or stibinic acids; other fireproofing agents such as Al acetate may also be present in the prepn. used, which may also contain dyes. Various examples are given.

Artificial silk. ERNST GESSNER A.-G. Ger. 471,063, Dec. 4, 1926. A combined spinning and drying machine is described.

Artificial silk. HERMINGHAUS & Co. G. M. B. H. Ger. 471,61 Feb. 14, 1925. Porous or porous-coated spools for artificial silk are each connected to a sep. container so that the amt. and pressure of the washing fluid for the silk can be varied individually.

Artificial silk. J. P. BERNBERG A.-G. Fr. 647,001, Jan. 23, 1928. In the spinning

of artificial silk the troughs for the coagulating liquid are provided with narrow openings for the threads and are arranged to move to and fro in a horizontal direction transversely to the threads. The troughs may be provided with several compartments; the openings form guides for the threads. The liquid overflowing from the troughs is directed toward the cylinders on which the threads are being wound.

Artificial silk. I. G. FARBENIND. A.-G. Fr. 647,197, Jan. 14, 1928. Properties of artificial silk, such as extensibility, resistance to rupture and dye-absorbing properties, are improved by causing the thread after spinning to pass over guides, which alter the path of the thread on its way to the bobbins. Cf. C. A. 23, 702.

Artificial silk. NORDDEUTSCHE VERWALTUNGSGESELLSCHAFT M. B. H. Fr. 647,352, Jan. 9, 1928. See Brit. 283,481 (C. A. 22, 4246).

Artificial silk. OSCAR KOHORN & CO., and ALFRED PERL. Fr. 648,061, Feb. 1, 1928. In spinning and drawing artificial silk from cellulose in cuprammonium solns. the water used for pptn. of the threads is freed from NH_3 and Cu in known manner; after sepn. of the mud it is used again for pptn. To avoid accumulation of salts such as Na_2SO_4 or NaCO_3 , part of the water is replaced by fresh water each time.

Artificial silk from viscose. S. OHSAKA. Brit. 297,047, June 13, 1927. A soln. of an albumin assocd. with fatty oils, such as the protein of soy beans, sesame, earth nuts, or milk or blood-albumin is added to a viscose soln. in a proportion not greater than 20% the wt. of the cellulose used; the ripened soln. is passed into a coagulating bath, heated to 70-100° and then dried. Cf. C. A. 23, 278.

Artificial silk from cuprammonium cellulose solutions. C. R. LINKMEYER. Brit. 297,060, Sept. 13, 1927. Water used as precipitant in forming artificial silk filaments by the stretch-spinning process is subjected to a vacuum at a temp. somewhat above the temp. of the spinning bath to effect deaeration.

Washing, bleaching, desulfurizing and other treatments of artificial silk in the spinning boxes. I. G. FARBENIND. A.-G. Brit. 297,118, Sept. 15, 1927. An app. is described.

Spinning box for artificial silk manufacture. H. EGGERT. Brit. 296,253, Oct. 3, 1927. A bell member, which may be formed of Al, is detachably secured to a base of acid-resistant material. Various structural details are described.

Apparatus for producing artificial silk filaments. ERNST BERL. U. S. 1,707,595, April 2. Structural features.

Spinning pump for artificial silk. NAAMLOOZE VENNOOTSCHAP NEDERLANDSCHE KUNSTZIJDEFABRIK. Fr. 648,053, Feb. 1, 1928. Constructional details.

Apparatus for making artificial silk by the stretch-spinning process. BRYSIKA, LTD., and F. W. SCHUBERT. Brit. 296,856, July 15, 1927. Structural features.

Treating tubular cellulose articles (such as those formed from viscose) with cleaning baths. KALLE & Co. A.-G. Brit. 297,103, Sept. 15, 1927. The tubular material is passed successively around rollers within and above the cleaning bath, to lessen difficulties from development of gas within the material. An app. is described.

Paper. ANTON J. HAUG. U. S. 1,708,724, April 9. Mech. features.

Paper pulp. S. D. WELLS. Brit. 297,319, Sept. 17, 1927. In producing pulp suitable for the manuf. of paper as described in Brit. 285,277 (C. A. 22, 4817), a stronger pulp and better yield is obtained by increasing the ratio of dry pulp to water in the material treated in the rod mill to 7.5-9.5%. Structural features of a rod mill are described.

Paper-making apparatus. WALTER VOGEL (to the Firm A.-G. der Maschinenfabriken Escher Wyss & Cie.). U. S. 1,707,376, April 2. Structural features.

Paper-making apparatus. V. ANTOINE. Brit. 297,098, Sept. 15, 1927. Means are provided for applying coloring or sizing material over one face of the paper when passing to a distributing roller in front of pressure rollers. Various structural details are described.

Paper-making apparatus. CHARLES A. TIFFT. U. S. 1,708,434, April 9. A pipe discharges directly from a "Jordan" to a paper-making app.; the pipe is carried in a uniform pitch and the flow through it is controlled by a gate.

Apparatus and method of paper manufacture. JOHN TRAQUAIR (to Mead Pulp & Paper Co.). U. S. 1,707,333, April 2. A filter mat is formed of fibrous stock and tray water is caused to flow onto the surface of the filter mat. Various mech. details are described.

Wire gauze for paper-making apparatus. ALBERT ELSSENHANS. U. S. 1,707,757, April 2. See Brit. 266,931 (C. A. 22, 703).

Control mechanism for paper-making machines. JOHN WHITE. Fr. 648,058, Feb. 1, 1928.

Sizing paper. E. LECOCQ. Belg. 351,917, July 31, 1928. Sizing is carried out by means of a mixt. contg. an adhesive and a filler contg. 1 part of $Al_2(SO_4)_3$ and 2-3 parts of $NaHSO_4$.

Apparatus for regulating the density of paper stock. FRED B. WELLS (to Ohio Boxboard Co.). U. S. 1,707,966, April 2.

Tuning oscillatory electric circuit apparatus for determining the moisture content of paper, etc. ALBERT ALLEN (to Atlantic Precision Instrument Co.). U. S. 1,708,073, April 9. U. S. 1,708,074 also relates to similar app., which may be applied to the control of paper-making app.

Upright device for dissolving old paper. FRITZ PFEFFNER. Ger. 471,965, Dec. 3, 1925. Details of construction.

Paper containing bituminous material. LESTER KIRSCHBRAUN and ALBERT L. CLAPP (Clapp to Flintkote Co.). U. S. 1,708,926, April 9. Fibrous stock contg. a bituminous-pitch type base in aq. dispersion together with a dispersion agent such as colloidal clay is treated (suitably by adding Na silicate and alum) to cause the dispersed bituminous base to deposit in an unaltered state and to clot upon the fibrous stock solely by the addn. of reacting inorg. substances. U. S. 1,708,927 (LESTER KIRSCHBRAUN) specifies reducing bituminous material such as asphalt to relatively dry comminuted form, applying a protective coating, such as may be formed from Na silicate and Al sulfate, to the particles, mixing the product with fibrous stock and felting the stock to form a sheet.

Staining colors for printing paper. PAUL ROHLAND and FRITZ STOLZE. Ger. 471,931, Feb. 28, 1923. The raw material for the color is ground up with gypsum or marble to colloidal dimensions and added to the pulp in liquid suspension.

De-inking paper. HARRY C FISHER (to Richardson Co.). U. S. 1,707,604, April 2. In order to remove ink from fibrous pulp, the pulp is soaked in a soln. of alkali such as Na_2CO_3 to loosen the inky matter from the stock; it is then agitated with C_6H_6 or other suitable volatile liquid immiscible with water to form an emulsion contg. the inky matter; the volatile liquid is then vaporized, which causes the inky matter to float on the surface of the soln. whence it can be removed by skimming or spilling.

Renovating carbon papers. B. STÖCKEL and M. VON TENSPOLE. Brit. 297,309, Sept. 17, 1927. The paper may be passed in contact with an electrically heated cylinder maintained at a temp. of about 60-80° and thus subjected to heat and pressure without mech. rubbing. An app. is described.

24—EXPLOSIVES AND EXPLOSIONS

C. E. MUNROE

Explosives' aid to the hydrographic surveyor. D. L. PARKHURST. *Explosives Engineer* 7, 134-6(1929).—A bomb near the ship is fired, sending vibrations to the ship's hydrophone and to two off-shore hydrophones. The latter transmit the reception to their shore radio amplifying sets, which signal to the ship's chronograph the time of arrival of the sound on shore. By plotting the geographic point of the previously mechanically detd. depth the map sounding is obtained. Fulminate blasting caps, TNT and tetryl, in weak and strong bombs, gave no difference in amplitude or frequency of sound. TNT is considered safer. E. M. SYMMES

Influence of temperature on the formation of the explosive wave. P. LAFFITTE. *Ann. office nat. comb. liquides* 3, 499-501(1928).—See C. A. 22, 2665. R. E. S.

The speed of an explosive wave. P. LAFFITTE and P. DUMANOIS. *Ann. office nat. comb. liquides* 3, 121-2(1928); cf. C. A. 22, 1475.—Measurements made at initial pressures of 1 to 7 atms. in mixts. of H and O, CH_4 and O, and in similar mixts. contg. 0.1% of $PbEt_4$ show that the speed of propagation of the explosive wave is not affected by the antiknock compd. R. E. SCHAAD

New type of permissible explosive increases lump coal production. C. E. MUNROE. *Explosives Engineer* 7, 137(1929).—Reduction in d. of explosives involves the use of very light carbonaceous ingredients such as ground balsa wood, bagasse pith, ground corn stalks, ground oat hulls, dried beet pulp or pop corn, or using at a low temp. an explosive salt, an oxidizing salt, and a salt contg. H_2O of crystn. and impregnating absorptive carbonaceous material. The latter makes possible 500 cartridges $1\frac{1}{4} \times 8"$ per 100 lbs., a very high figure compared to that in 1909. E. M. SYMMES

Specifications for cellulose for use in manufacture of smokeless powder. FRED OLSEN. *Ind. Eng. Chem.* 21, 354-6(1929).—This is a detailed analysis of the specifica-

tion of the Ordnance Dept., War Dept. U. S. A., by comparison with data drawn from experience. It appears that much traditional misinformation encumbers the present specifications and that linters instead of being the best may prove an inferior source of the cellulose sought. The results are also published in the hope that those now engaged in the fundamental study of methods of processing cotton, or other forms of cellulose, may not be hampered by striving to have their products conform to present specifications.

CHARLES E. MUNROE

Nitrocellulose and smokeless powder. FRED OLSEN. *Army Ordnance* 9, 248-52 (1929).—Attention is called to the variability in compn. of dipping charges. A batch testing 12.65 N content actually consisted of material ranging from 11 to 13% N content. Even prolonged dipping failed to give complete uniformity. A reason for this is found in the physical variations in a mass of cellulose. The use of "popped" wood fiber is suggested as offering a greater assurance of uniformity. An app. for the purification of nitrocellulose by electro-endosmose is described. Many suggestions as to improvements in the methods of drying smokeless powder grains are offered and a new design for a solvent recovery box is presented.

CHARLES E. MUNROE

Decomposition of smokeless powder. C. G. STORM. *Army Ordnance* 9, 230-4 (1929).—Symptoms, causes and effects are discussed. The first factor is the instability of nitric esters due to impurities introduced by foreign substances present in the raw materials treated, or to products of nitration which produce N oxides; that, in the presence of air and moisture, act catalytically on the esters. The quantity of Ph_2NH introduced into the smokeless powder as a stabilizer has been raised from 0.5%, used during the war, to 1%. It cannot be increased above this because it affects the ballistics unfavorably and because the increased quantity decreases the stability of the smokeless powder. Because of the solvent left in the grains and the hygroscopicity of the latter the finished powder must be stored in hermetically sealed containers, in cool, dry, well-ventilated magazines. By making the grains non-hygroscopic the stability of the smokeless powder is much increased. Whether or not smokeless powder will be exploded spontaneously depends on a wide variety of conditions. Examples are cited of complete decomposition without explosion. Excellent photographs are given of grains in various stages of decomposition.

CHARLES E. MUNROE

Examination of BAm and BD Powders. M. DESMAROUX. *Mem. poudres* 23, 113-5 (1928).—Analysis of gases from the heated samples showed that the diphenylamine stabilized powders emitted 4 times as much NO_2 as did the Am alc.-stabilized powders.

A. J. PHILLIPS

Gaseous explosive reaction. A study of the kinetics of composite fuels. F. W. STEVENS. *Natl. Advisory Comm. Aeronautics Rept. No. 305*, 18 pp. (1929); cf. *C. A.* 22, 2058; 23, 516.—A series of studies of the kinetics of gaseous explosive reactions where the fuel, instead of being a simple gas was a known mixt. of simple gases, was made. In practical applications of gaseous explosive reactions as a source of power in gas engines the fuels used are composite, with characteristics that are apt to be due to the characteristics of their components and hence may be somewhat complex. The simplest problem in an investigation either of the thermodynamics or kinetics of the gaseous explosives reaction of a composite fuel is a sep. study of reaction characteristics of each component of the fuel and then a study of reaction characteristics of various known mixts. of those components forming composite fuels more and more complex. This order was followed.

E. M. SYMMES

Some properties of flame and combustion. W. E. GARNER. *Chemistry and Industry* 48, 186-9 (1929).—A review and discussion as to whether radiation from flames is due to thermal causes, i. e., the emitters of radiation are the mols. of CO_2 and water produced in the process of combustion as held by Paschen or due to chemi-luminescence as held by Pringsheim. O_2 and N_2 as gases were added to an explosive mixt. of $2\text{CO} + \text{O}_2$ and burnt in a closed cylindrical bomb fitted with a fluorite window, partial pressures being considered. The radiation fell on a thermopile attached to a galvanometer and was measured. The addn. of these gases increased the radiation, an effect contrary to that anticipated by Paschen's theory, as the inert gases added do not emit radiation themselves and would lower the temp. of the flame. The relationship between catalytic effect and the radiation emitted from flame was studied. A tabulation shows the effect of adding H_2 to a dry mixt. of CO and O_2 . Twenty % of the total chem. energy is emitted as radiation by carefully dried CO and O_2 . This is reduced to $1/4$ on addn. of 2% water or H_2 . This addn. must increase the temp. and hence be partly responsible for the increase in speed which occurs.

C. H. BADGER

Inflammability of hydrogen. VII. Dew point, density and range of inflammability of the treated hydrogen. YOSHIO TANAKA AND YUZABURŌ NAGAI. Tokyo Imp.

Univ. *Proc. Imp. Acad. (Japan)* 5, 80-1(1929); cf. *C. A.* 22, 2466. —T. and N. have calcd. the dew points and d. of H treated with explosion suppressors and give the results, with the range of inflammability as a table; the added compds. were: SnMe_4 , PbMe_4 , SeEt_2 , SeMe_2 , EtBr , C_6H_6 , C_6H_{12} , cyclohexane, Me cyclohexane, Et_2O and Me_2CO . SnMe_4 is the best explosion suppressor for H to be used in balloons or air ships; SeMe_2 and EtBr also are good, while Et_2O and Me_2CO are not suitable, owing to the phenomenon of the cool flame.

"Muditing" in coal mines. D. HARRINGTON AND F. E. CASH. *Bur. Mines, Circ. No. 6099*, 9 pp.(1929).—This report describes the use of "mudite," a mixt. of water and finely divided incombustible soil, or dirt, applied in some coal mines as a means of attempting to limit or prevent widespread explosions. It was tested out at the experimental mine at Bruceton. The final conclusion is that while muditing is probably more dependable than watering, especially in haulageways that also act as intake airways, it is probable that adequate rock-dusting methods would in the long run be more dependable and less expensive.

C. J. WEST
CHARLES E. MONROE

- Explosion in closed cylinders. I. Methane-air explosions in a long cylinder. II. The effect of the length of the cylinder.** WILLIAM A. KIRKBY AND RICHARD V. WHEELER. *J. Chem. Soc.* 1928, 3203-4.—The expts. were made in a gun-metal cylinder 200 cm. long, 10 cm. internal diam., having a capacity of about 16 l. with an igniting device at one end, a pressure gage at the other and windows at the side through which to view or photograph the phenomena taking place inside, and other devices to control the operations. Many are given but no general conclusions are presented. **III. Manner of movement of flame.** OLIVER C. DE C. ELLIS AND RICHARD V. WHEELER. *J. Chem. Soc.* 1928, 3215-8.—This presents an interesting series of photographs of flame produced in a cylindrical, horizontal tube as viewed through windows on the side of the tube which give much information as to the movements and changes in the structure of flames as they traverse the cylindrical vessel (cf. *C. A.* 22, 2841). C. E. M.

Granulating explosives. O. MATTER. *Brit.* 296,600, Nov. 25, 1927. An explosive substance to be granulated is dissolved in a solvent and the soln. is added to a liquid in motion which mixes in all proportions with the solvent but does not dissolve the explosive; e. g., a mixt. of pentaerythritol tetranitrate and tetranitromethylaniline is dissolved in acetone and the soln. in thin threads is run into water and the explosive sepd. and dried *in vacuo*.

Perchlorate explosives. C. G. LUIS. *Brit.* 296,794, March 9, 1927. In forming explosives contg. a perchlorate, there is used as an ingredient the husk or shell of *Terminalia chebula* which contains a relatively larger proportion of chebulinic acid than the other myrobalans. Other substances such as NaNO_3 , agar agar, castor oil, colza or rape oil, glycerol or a resinous gum such as red gum also may be added, and perchlorate of NH_4 , Na or K may be used.

Tracer composition for projectiles. STERNER ST. P. MEEK. U. S. 1,708,186, April 9. A tracer compn. is formed of an O-contg. compd. of an alk. earth metal, salts of a rare earth metal, a fuel and a binder, e. g., of Mg , BaO_2 , Yt and Zr nitrates, Ca resinate and Pb thiocyanate. U. S. 1,708,187 specifies a tracer compn. comprising Mg, a metal resinate such as Ca resinate and a Zn compd. such as $\text{Zn}(\text{NO}_3)_2$ and various other optional ingredients.

Igniting mixture for pyrotechnic or projectile tracer compositions. LOUIS HENDLER (to Secretary of War as trustee for the Government of the United States). U. S. 1,708,174, April 9. A peroxide of an alk. earth metal such as BaO_2 is mixed with Pb_3O_4 and a "metallic fuel" such as Mg.

- Pyrotechnic or projectile tracer composition.** HENRY C. PRITHAM. U. S. 1,708,151, April 9. Salts of Th and Ce, such as the nitrates, are used with Ca resinate or other suitable binder. $\text{Sr}(\text{NO}_3)_2$ and Mg also may be used.

Detergent for removing fouling from firearms. J. WAGNER. *Brit.* 296,550, Aug. 29, 1927. See *Fr.* 640,294 (*C. A.* 23, 985).

25—DYES AND TEXTILE CHEMISTRY

L. A. OLNEY

Interesting sources of natural dyestuffs. C. D. MELL. *Textile Colorist* 51, 188-90 (1929).—*Cassia fistula* is widely cultivated in tropical North Africa and throughout India for its bark, wood, gum, leaves, flowers and fruit. Its bark, commonly referred

to as "tanner's bark of cassia," is rich in tannin and is said to produce a bright red dye. The sap of the cujute tree (*Crescentia cujute*) is reported as a source of dye used by the early Spanish settlers in Panama for dyeing silk black. RUBY K. WORNER

Color chemistry and dyeing from the academic point of view. F. M. ROWE. *J. Soc. Dyers Colourists* 45, 5-10(1929).—See C. A. 23, 709. H. H. MOSHER

The colloid theory of dyeing. WILDER D. BANCROFT. *Am. Dyestuff Rept.* 18, 148-56(1929).—The dyeing of wool, silk and cotton is considered. In almost all cases if the amt. of dye on the fiber is plotted against the amt. of dye left in the bath, a typical adsorption curve is produced showing that compd. formation does not take place. Different behavior of different acids cannot be explained entirely on the basis of pH . Dyeing with acid and basic dyes, mordant dyes, substantive dyes, developed dyes, vat dyes, sulfur dyes, and inorg. dyes is explained by means of adsorption. Fastness to washing and light is discussed. The mercury-vapor lamp is not considered satisfactory for fading tests, because it does not give light comparable to sunlight. A plea is made for more systematic work on the action of light on dyestuffs. T. G. HAWLEY, JR.

The development of fast dyeing and dyes. JAMES MORTON. Morton Sundour Fabrics, Ltd. *Textile Recorder* 47, No. 552, 55-7(1929). RUBY K. WORNER

Package dyeing in circulating machines. HAROLD SCHROEDER. *Cotton* 92, 1019-20, 1065-7; *Ibid* 1242-4. Using direct colors in package machines. *Ibid* 93, 134-6(1928). Package dyeing of sulfurs in circulating machines. *Ibid* 93, 381-2, 437-43(1929).—Practical. RUBY K. WORNER

Tendered goods not always due to faulty dyeing. GEORGE RICE. *Textile Colorist* 51, 170-1, 174(1929).—A case of tendering of worsted fabric due to the overloading of virgin wool with reworked wool and mill waste is cited. An illustrated description is given of a device of the boring type for testing the wear-resisting qualities of cloth. RUBY K. WORNER

Shade matching in textile dyeing. NOEL D. WHITE. *Cotton* 93, 335 9(1929); cf. C. A. 23, 280.—Practical. Specific methods are given for matching shades. The sample is first matched in a beaker and from this the formula for use in the machine is calcd. RUBY K. WORNER

Selecting the proper dyestuffs. NOEL D. WHITE. *Cotton* 93, 453 4, 486(1929).—The testing for fastness to different conditions is discussed. RUBY K. WORNER

Thickening for vat print colors. L. S. BENDER. *Textile Colorist* 51, 169 70 (1929).—The thickenings in use are of a vegetable character and may be divided into 2 groups, starch or starch compds. and gum. Although either may be applied separately, the best results with vat colors are obtained by a combination of the 2 groups. Methods and formulas are given for prepg. thickenings. RUBY K. WORNER

Effect of twist changes on strength, feel and appearance of cotton yarn. A. A. MERCIER AND CHARLES W. SCHOFFSTALL. U. S. Bur. of Standards. *Textile World* 75, 1813-5(1929). RUBY K. WORNER

Determining the strength of the individual cotton fiber. HORACE L. PRATT. *Cotton* 93, 374-6(1929).—A detailed and illustrated description is given of the tentative method developed by the Bur. of Agr. Economics, U. S. Dept. of Agr. in cooperation with Clemson Coll. (cf. C. A. 23, 711). RUBY K. WORNER

Bleaching of cotton. WACLAW KACZKOWSKI WITH N. KROL. *Warsaw Polytech. Przemysl Chem.* 11, 568-81, 628 34(1927).—After the usual preliminary treatment with 1% H_2SO_4 at 25-30° the material is rinsed and boiled in 12 25% alkali, depending on the goods, kind of cotton, and final treatment. For white goods a 15-16% soln. is used; for those to be dyed later solns. up to 25% are used. The boiling is just above 100°; it is at atm. pressure and there is no exclusion of air beyond making sure that all goods are completely immersed. The boiling lasts 40-90 mins. The quantity of soln. need not exceed 200% of the wt. of the goods. The goods are next acidified with $HOAc$ or H_2SO_4 not over 25% at about 10° for 40-50 mins.; they are never allowed to be exposed to the air. After being rinsed again the goods are washed with a soap soln. at 50-60° and rinsed for the last time. The use of suitable wetting agents is very helpful in these operations. It should be borne in mind that concns., temps. and duration of treatment at the various stages depend on the goods and their eventual consignment. Fiber treated by this method has sometimes as much as ten-fold better susceptibility to certain dyes, especially the vat dyes, than that treated by the usual methods. Several advantages in mfg. are enumerated for this method of bleaching cotton. Cf. C. A. 23, 522. A. C. ZACHIN

Bleaching cotton with hydrogen peroxide. H. G. SMOLENS. *Am. Dyestuff Rept.* 18, 49-50(1929).—For bleaching ordinary American, Indian or China cotton, use silicate of soda and caustic soda (pH 12.0), $1\frac{1}{2}$ gal. H_2O_2 (100 vol.) per 100 gals. of water,

at 210° F. for 1½-2 hrs. Wet ratio of cotton to bleach liquor is not greater than 1:6.

Bleaching cotton goods in kiers with hydrogen peroxide. H. G. SMOLENS. *Am. Dyestuff Rept.* 18, 11-5(1929).—Factors involved in the kier bleaching of cotton with H₂O₂ by the one-boil and two-boil bleach processes are discussed. H. LEUPOLD

Hydrogen peroxide bleaching of wool, silk and cotton under chemical control. H. G. SMOLENS. *Am. Dyestuff Rept.* 18, 123-5(1929); cf. *C. A.* 23, 281.—Formulas are given for bleaching worsteds, silks and cotton under various conditions, together with the general method of controlling total alk., pH and peroxide. H. LEUPOLD

Treatment of wool with active chlorine in an organic carrier. G. L. ARMOUR. *Am. Dyestuff Rept.* 17, 819-20(1928).—Objections to the use of inorg. compds. of available Cl on textile materials, especially wool, for purposes of desizing, chlorination, etc., can be overcome by the use of aktivin, the Na salt of *N*-chloro-*p*-toluenesulfonamide. Some properties of the latter and a wool chlorination formula are given.

Woolen and worsted cloth analysis. II. GEORGE PRIESTLEY. Univ. of Leeds. *Textile Recorder* 47, No. 552, 49-51(1929).—The detn. of the basic material and its quality and the detection of the presence of reworked material are discussed. R. K. W.

Soaps used in the textile industry. THOMAS F. HUGHES. *Textile Colorist* 51, 160-3 (1929).—General. RUBY K. WORNER

A discussion of soap in its relation to the degumming of silk. IV. Double bath process for boiling-off silk. PROCTER AND GAMBLE. *Silk Degumming Bull.* No. 5, 9 pp.—The products of the degumming reaction and their influence in slowing the process are discussed. The double bath boil-off possesses a no. of advantages. Every batch of silk is thoroughly and uniformly boiled-off in respect to sericin and coloring material. Most of the gum is removed in the first soap. The fresh liquor used for the second boil does not become loaded with dissolved gum, color, oil and fatty acid from the decomposed soap. Oil spots are eliminated. The process requires 10% less soap than the single-bath boil-off. Also in *Textile Colorist* 51, 254-6(1929).

FREDERICK C. HAHN

Relation between the absorption spectra and chemical constitution of certain azo dyes. I. The effect of position isomerism on the absorption spectra of Me derivatives of benzeneazophenol (BRODE) 10. Naphthalene series (VOROZHTZOV, KASSATKIN) 10. Pyrimidines. CV. A new test for thymine and 5-methylcytosine in the presence of uracil and cytosine (HARKINS, JOHNSON) 10. Quinonediacridone derivatives. Indigo dyestuffs (SHARVIN, GALPERIN) 10. Perylene and its derivatives (ZINKE, *et al.*) 10. Absorption phenomena (RATELADE, CHETVERGOV) 2. Artificial hair [from artificial silk] (Fr. pat. 647,178) 18. Fireproofing cellulose materials (Brit. pat. 296,344) 23. Benzylnaphthalenesulfonic acids [for textiles] (Ger. pat. 472,289) 10. Removing stains from fabrics (Belg. pat. 351,152) 13. Condensation products of indone with phenols [for intermediates] (Brit. pat. 297,075) 18. Sulfonating oils, etc. [for treating textile materials] (Brit. pat. 296,935) 27.

Die textilen chemische Technologie der Zellulose. Stuttgart: C. E. POESCHEL. Edited by V. Grafe. 770 pp. \$12. Reviewed in *Abstract Bull. Kodak Res. Labs.* 15, 141(1929).

The Silk and Rayon Directory and Buyer's Guide of Great Britain 1929. Manchester, Eng.: John Heywood, Ltd. 387 pp. 21s. net or \$5.50. Reviewed in *Dyer and Calico Printer* 61, 122(1929); *Textile World* 75, 2079 (1929).

Year Book of the American Association of Textile Chemists and Colorists, 1928. New York: Howes Pub. Co., 90 William St. 251 pp. Reviewed in *Textile World* 75, 49(1929).

Dyes. I G. FARBENIND. A.-G. Brit. 296,373, Aug. 30, 1927. Halogenated anthranthrones (such as the mono- and di-bromo- and dichloroanthranthrones prep'd. as described in Brit. 287,020; *C. A.* 23, 524) are condensed with 1-aminoanthraquinone-2-aldehyde in the presence of an acid-absorbing agent and of a catalyst such as Cu, producing brown vat dyes.

Dyes. I G. FARBENIND. A.-G. Brit. 296,386, May 30, 1927. Vat dyes are formed by treating anthrapyrimidine, anthrapyrimidone, or their derivs. with alk. condensing agents and the products obtained from anthrapyrimidones, may be further treated with alkylating agents. All the products may be purified by treatment with oxidizing agents or by fractional pptn. from their solns. in concd. H₂SO₄. Several ex-

amples are given of the production of dyes which dye cotton from the vat orange, yellow or brown shades changing somewhat on exposure to the air.

Dyes. I. G. FARBENIND. A.-G. Brit. 296,473, June 1, 1927. Azo dyes are formed, in substance, on a substratum or on the fiber, by coupling a diazotized 2,5-dimethyl-4-haloaniline, in which one of the 3- or 6-positions is occupied by halogen and the other by H, with an arylide of 2,3-hydroxynaphthoic acid or of a β -keto-carboxylic acid. Examples are given of the manuf. of such dyes and of 2,5-dimethyl-4,6-(and 3,4)-dichloroaniline (which may be used as starting materials in making the dyes).

Dyes. I. G. FARBENIND. A.-G. Brit. 296,490, June 9, 1927. The action of acid condensing agents such as oleum, chlorosulfonic acid or AlCl_3 on *Bz*-1-2-methylbenzanthrone forms a mixt. of a black vat dye and the lactam of *Bz*-1-aminobenzanthrone-2-carboxylic acid from which the latter may be extd. by glacial HOAc or hot dil. caustic alkali soln.; this hydrolyzes the lactam to the free amino acid, which is then pptd. by acid. The pure lactam, extd. by org. solvents, may be similarly hydrolyzed.

Dyes. I. G. FARBENIND. A.-G. Brit. 296,616, Jan. 11, 1928. Azo dyes obtained by coupling *o*-hydroxydiazotized compds. with pyrazolones are converted into Cr compds. by heating them in aq. soln. under pressure, in the absence of a water-sol. org. solvent, with Cr compds. (such as the formate) in such proportions as to provide at least one atom of Cr for each chromable group of the dye molecule. An example is given of the chroming of the dye formed from diazotized 4-nitro-2-aminophenol-6-sulfonic acid and 1-phenyl-3-methyl-5-pyrazolone.

Dyes. I. G. FARBENIND. A.-G. Brit. 296,758, Sept. 7, 1927. Anthraquinone vat dyes are formed by treating a dye obtainable (as described in Brit. 12,921 of 1910 or 15,846 of 1909 or Ger. 240,080, C. A. 6, 2177 or Ger. 251,350, C. A. 7, 267) by condensation of 1,5- or 1,8-di- α -anthraquinonylaminoanthraquinone with concd. H_2SO_4 , dilg. with water and oxidizing (suitably with NaOCl).

Dyes. I. G. FARBENIND. A.-G. Brit. 296,817, June 10, 1927. Anthrone or its homologs or halogen substitution products are condensed with glyoxal or its bisulfite compd., sulfuric acid ester, or other compd. capable of giving rise to glyoxal, with or without use of a solvent or of an acid or acid-reacting salt. The products are vat dyes giving yellow shades on cotton. Examples are given of the condensation of anthrone and the chloroanthrone prepd. by reduction of α -chloroanthraquinone with glyoxal sulfate in glacial HOAc.

Dyes. I. G. FARBENIND. A.-G. Brit. 297,234, Oct. 25, 1927. Hydroxy and alkoxy derivs. of anthanthrone are formed by the action of acid condensing agents such as H_2SO_4 or ZnCl_2 and Ac_2O on hydroxy or alkoxy derivs. of 1,1'-dinaphthyl-8,8'-dicarboxylic acid; several examples are given of dyes of orange or violet shades. The 6,6'-dimethoxy deriv. of 1,1'-dinaphthyl-8,8'-dicarboxylic acid (one of the starting materials used) is made from 6-methoxynaphthostyryl, by hydrolysis, diazotization and treatment with ammoniacal Cu_2O . The 4,4'-dihydroxy deriv. is made by alkali fusion of the 4,4'-disulfonic acid.

Dyes. I. G. FARBENIND. A.-G. (Georg Kränzlein and Martin Corell, inventors) Ger. 472,135, Dec. 18, 1925. Acid dyes are prepd. by sulfonating *o*-aminoanthraquinonethiohydriens under sufficiently mild conditions to avoid the production of the corresponding thiomorpholines. Examples are given describing the sulfonation of 1-aminoanthraquinone-2-thiohydrin and 1-amino-4-*p*-toluinoanthraquinone-2-thiohydrin, the products dyeing wool red and blue, resp. The products from 1,4-diamino-2-chloroanthraquinone-3-thiohydrin (violet) and 1,5-diaminoanthraquinone-2,6-dithiohydrin (reddish brown) are also mentioned.

Dyes. I. G. FARBENIND. A.-G. (Max Weiler, inventor). Ger. 472,136, July 9, 1926. Ger. 423,093 describes the manuf. of chromable dyes by condensing 2,4- or 2,6-dihydroxybenzoic acid or its derivs. with aromatic aldehydes substituted (otherwise than with OH) in the *o*-position to the CHO group, the leuco compds. so obtained being worked up and, if desired, sulfonated. Ger. 430,832 modifies this process by using aromatic aldehydes unsubstituted in the *o*-position to the CHO group and also not contg. OH in the *p*-position thereto. It is now found that the dyes prepd. according to Ger. 423,093 and 430,832 are impure and can be sepd. from by-products by converting them into salts and sepg. the difficultly sol. salts of the dyes from the more easily sol. salts of the by-products. The purification of the dye prepd. from 2,6-dichlorobenzaldehyde and 2,4-dihydroxy-3-methylbenzoic acid is described by way of example.

Dyes. I. G. FARBENIND. A.-G. (Walter Mieg, inventor). Ger. 472,356, July 11, 1924. Dyes for wool are prepd. by treating dianthraquinonylamines with fuming H_2SO_4 under moderate conditions and, if desired, in the presence of H_3BO_3 or an *O*-carrier. The products are single oxidation products of the dianthraquinonylamino-

sulfonic acids formed in the first stage of the reaction. One example is given in which 1,1'-dianthraquinonylamine is treated with oleum at 120–125° for a long time with exclusion of moisture. The product obtained after dilg., salting out, etc., is a sulfonated oxazine of 1,1'-dianthraquinonylamine; it dyes wool in brownish violet shades not affected by mordanting or chroming. Other examples are given describing the manuf. of dyes from 1,2'-dianthraquinonylamine. In these examples, the treatment with oleum is effected in the presence of H_2BO_3 and HgO , and the products dye wool in dark violet and dark blue shades, resp.

Dyes. I. G. FARBENIND. A.-G. Fr. 647,514, Jan. 20, 1928. The monoazo dye from diazotized metallic acid and salicylic acid is heated with Cr formate and evapd. The chromed dye obtained dyes wool in pure greenish yellow shades, and may be used for printing cotton.

Dyes. KALLE & Co., A.-G. (Maximilian P. Schmidt and Otto Hermann, inventors). Ger. 471,637, June 7, 1925. An indigoid dye is produced by condensing the reaction products of sulfites on isatin α -chloride and its homologs or derivs., with compds. contg. the group $CH:C.OH$ or $CH_2.CO$. Thus, 1,4-bromonaphthol is dissolved in a dil. soln. of NaOH or Na_2CO_3 and a 10% soln. of the compds. resulting from the reaction of NaS and *p*-chloroisatin chloride added. A blue dye, 4-bromonaphthalene-2-*p*-chloroindoleindigo, is formed. If condensed with oxycarbazole, a black dye is formed.

Dyes. SOC. ANON. POUR L'IND. CHIM. À BÂLE. Brit. 297,002, Sept. 9, 1927. A benzanthrone is sulfonated with oleum at ordinary temp. and the sulfonic acid obtained is fused with caustic alkali at a temp. of 255–310° to produce a vat dye which may be alkylated. Examples are given of gray and blue dyes.

Dyes. SOC. ANON. POUR L'IND. CHIM. À BÂLE. Fr. 647,943, Jan. 30, 1928. New dyes are obtained by treating 1-hydroxy-, or 1-alkoxy-, or 1-amino-4-aminoanthraquinones with aromatic diamines or their derivs. or substitution products. Thus, 1-methoxy-4-aminoanthraquinone is heated with *p*-phenylenediamine and $PhNMe_2$ giving 1-(*p*-aminophenylamino)-4-aminoanthraquinone, m. 247–248°. It dyes acetate silk or varnishes fast bluish green shades. 1-Hydroxy-4-aminoanthraquinone and *p*-phenylenediamine give the same product and this may be sulfonated with oleum, giving a product which dyes wool greenish blue shades. *p*-Phenylenediamine may be replaced by dimethyl-*p*-phenylenediamine, *m* toluylenediamine, benzidine or 5-amino-2-methylbenzimidazole.

Dyes. SOC. ANON. POUR L'IND. CHIM. À BÂLE. Ger. 472,210, April 29, 1927. Vat dyes giving blue shades on cotton are prepd. by sulfurizing the leuco compds. of indophenols prepd. by condensation of nitrosophenols with carbazoles, the sulfurization being effected in the presence of an aliphatic nitrogenous compd. and, if desired, of an aromatic base and (or) a substrate. E. g., the indophenol prepd. by condensing nitrosophenol with carbazole is reduced with Na_2S_2 soln. and the product is sulfurized in the presence of $CNNH_2$ and NaCl. Instead of $CNNH_2$ there may be used $CO(NH_2)_2$, $NH_2CONHNH_2$, $CS(NH_2)_2$, $AcNH_2$, NH_4CNS , or salts of $NH_2C(NH)NH_2$. Examples are given also in which an aromatic base, viz., carbanilide or di-*o*-tolylurea, is also present during the sulfurization. The manuf. is described of dyes from condensation products of nitrosophenol with a mixt. of carbazole and *N*-ethylcarbazole.

Azo dyes. I. G. FARBENIND. A.-G. (Bartholomäus Vossen, inventor). Ger. 472,488, Aug. 20, 1926. See Brit. 276,353 (C. A. 22, 2470).

Azo dyes. I. G. FARBENIND. A.-G. Fr. 647,618, Jan. 23, 1928. Azo dyes insol. in water are produced in substance or on the fiber by coupling arylamides of 2,3-hydroxynaphthoic acid with diazo compds. of those *as-m*-xylinides which carry in the *m*-position another amino group, the H atoms of which may be replaced by alkyl, aralkyl, benzoyl or arylsulfo groups. In examples, cotton is impregnated with benzoylamino-*as-m*-xylinide hydroxynaphthoic α -naphthylamide and developed with benzoylamino-*as-m*-xylinide ($NH_2, CH_3, CH_3, NH-CO-C_6H_5 = 1,2,4,5$); (2) 2,3-hydroxynaphthoic 5-chloro-2- $(NH_2, CH_3, CH_3, NH-CO-C_6H_5 = 1,2,4,5)$; (3) 2,3-hydroxynaphthoic 5-toluidide and developed with methylbenzoylamino-*as-m*-xylinide ($NH_2, CH_3, CH_3, NH-CO-C_6H_5 = 1,2,4,5$), or dichlorobenzoylamino-*as-m*-xylinide ($NH_2, CH_3, CH_3, NH-CO-C_6H_3Cl_2 = 1,2,4,5$), or developed with methyltoluene sulfamino-*as-m*-xylinide ($NH_2, CH_3, CH_3, N.SO_3, C_6H_4, CH_3 = 1,2,4,5$). Red or bluish red dyes are obtained in each case.

Azo dye. SOC. ANON. POUR L'IND. CHIM. À BÂLE. Ger. 472,355, July 13, 1926. Diazobenzene is coupled with 1-(2-chlorophenyl)-3-methyl-5-pyrazolone. An aq. suspension of the product gives yellow shades on cellulose acetate. Cf. C. A. 23, 1261.

Vat dyes. I. G. FARBENIND. A.-G. Fr. 647,509, Jan. 19, 1928. Vat dyes are obtained by submitting an arylthioglycolic acid mixed with a condensable diketone or its derivs. to the action of P_2O_5 . Thus, a mixt. of P_2O_5 and silicic anhydride is added to a

heated soln. of 1-chloronaphthalene-2-thioglycolic acid and isatin in dichlorobenzene. The product obtained dyes fiber Bordeaux-red shades from the vat. A product giving brown shades is obtained in the same way from α -naphthylthioglycolic acid and 5,7-dibromoisatin in PhCl, and a red dye is obtained from 6-methyl-4-chlorophenyl-1-thioglycolic acid and acenaphthenequinone in PhCl.

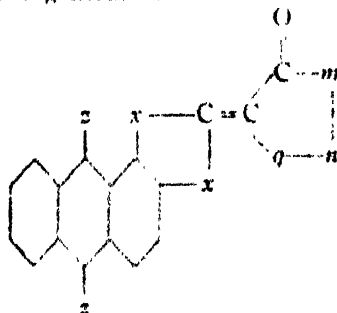
Vat dyes. I. G. FARBENIND. A.-G. Fr. 647,736, Dec. 1, 1927. New vat dyes are obtained by halogenating the 8,8'-dihydroxy-1,2,1',2'-dinaphthazines or their acyl derivs. preferably in the presence of a diluent and a catalyst, and removing the halogen as halogen acid. Thus, 8,8'-dihydroxy-1,2,1',2'-dinaphthazine is boiled with Ac_2O and Cl is passed in. The product which is pptd. by the addn. of water contains 8 to 10 atoms of Cl in the mol. If dissolved in H_2SO_4 , HCl is given off and the product obtained on diln. with water dyes cotton in fast red shades from the vat. Several other examples are given.

Anthraquinone vat dyes. I. G. FARBENIND. A.-G. Brit. 297,133, June 11, 1927. AlCl_3 fusions of anthraquinone derivs. for prepg. vat dyes are carried out in the presence of an aromatic tertiary base such as pyridine, quinoline or dimethylaniline (which is preferably first mixed with the AlCl_3 to form a compd. sol. in an excess of the base). Examples are given of the manif. of flavanthrone from β -aminoanthraquinone and of the manif. of other vat dyes.

Preparations of leuco compounds of vat dyes. J. R. GRIGY A.-G. Ger. 472,341, Aug. 17, 1926. See Brit. 276,023 (C. A. 22, 2471).

Azine dyes. BRITISH DYEING CORP., LTD., and W. A. SILVESTER. Brit. 296,803, June 7, 1927. Substantive cotton dyes which also dye regenerated cellulose and are substituted ureas are formed by the action of phosgene upon acid wool azine dyes having a primary or secondary amino group. Examples are given of the production of the dyes and of starting materials used.

Indigoid dyes. BERTRAM MAYER and JAKOB WÜRGLER (to Soc. anon pour l'ind. chim. à Bâle). U. S. 1,707,918, April 2. A large number of examples are given of the production of dyes of the general formula



wherein one of the two x 's stands for a S atom and the other for a CO group, z for a H or an O atom and m , n and q for 3 members of a 5-membered nucleus of which 2 at least are C atoms adjacent to each other and belonging to an aromatic system, the third being S, NH or C, which products form yellowish green to gray, brown, violet and black powders, dissolving in concd. H_2SO_4 with yellowish green to green, blue and violet coloration which are more or less bright or blackish, in dil. caustic soda soln. on addn. of hyposulfite with yellow-brown to olive and bluish red coloration, dyeing cotton green to brown, Bordeaux, violet and gray fast tints. A table is given showing properties of 38 different dyes made from various components and numerous details and modifications of procedure for making the dyes are described.

Sulfuretted dyes. I. G. FARBENIND. A.-G. Brit. 297,123, Sept. 15, 1927. The indophenols and leuco indophenols prepd. as described in Brit. 285,382 (C. A. 22, 4833) are subjected to polysulfide fusion. Examples are given of dyes producing bluish violet and green shades on cotton.

Sulfuretted dyes. I. G. FARBENIND. A.-G. (Erwin Kramer, inventor). Ger. 472,357, Aug. 18, 1926. See U. S. 1,675,498 (C. A. 22, 3304).

Sulfuretted dyes. I. G. FARBENIND. A.-G. (Erwin Kramer, inventor). Ger. 472,358, Aug. 18, 1926. See U. S. 1,675,499 (C. A. 22, 3304).

Triphenylmethane dyes. FARBENFABRIKEN VORM. F. BAYER & Co. June 17, 1927. Fr. 33,689, addn. to 593,774. The dyes obtained according to Fr. 593,774 by condensing 2,4- or 2,6-dihydroxybenzoic acids or their mixts. with aromatic aldehydes and oxidizing the resulting leuco compds. are converted into their salts, and the difficultly sol. pyrone salts are sepd. from the more easily sol. accessory products.

Substantive dyes of the stilbene series. ALFRED RHEINER (to Chemische Fabrik vorm. Sandoz). U. S. 1,708,897, April 9. See Brit. 263,792 (C. A. 22, 170).

Dyes of the anthraquinone series. FARBENFABRIKEN. VORM. F. BAYER & Co. Fr. 33,541, May 18, 1927. Addn. to 567,767. A better result than that obtained in the prior patent is secured by carrying out the process as follows: 10 parts of 1,1'-dianthraquinonylamine is dissolved in oleum contg. 15% SO₃ and heated to 95–100° until a sample is completely sol. in water with a brownish yellow color. The cooled mass is poured into 600 parts of water, boiled, and the dye pptd. by the addn. of salt and washed.

Metal compounds of dyes. SOC. ANON. POUR L'IND. CHIM. À BAËLE. Brit. 297,003, Sept. 10, 1927. Disazo and polyazo dyes contg. metals such as Cu or Cr are obtained either by introducing the metal into a dye formed as an intermediate or by treating the finished dye with an agent yielding one or more metals. In some cases coupling may be effected in the presence of a reagent yielding one or more metals. Several examples are given of the use of Cu, Cr and Ni compds.

Metal compounds of azo dyes. SOC. ANON. POUR L'IND. CHIM. À BAËLE. Brit. 297,331, Sept. 17, 1927. Compds. of azo dyes contg. metals such as Cr, Cu, Fe, Mn, Ni, Co, V, U, Ti, Sn or Al (in which mols. of the same or of different dyes are united by the metal) are prepd. by treating a metal compd. of one of the azo dyes with the same or a different azo dye capable of fixing metal or by treating a mixt. of different azo dyes with metallizing agents. Several examples are given of dyes suitable for use on wool, silk, leather or cotton or for coloring varnishes.

Soluble metal compounds of monoazo dyes. I. G. FARBENIND. A.-G. Brit. 296,819, May 20, 1927. Azo dyes contg. an alkoxy group in *o*-position to the azo group are treated with metal compds. such as Cr formate under conditions suitable for splitting off of the alkyl group, as by boiling under pressure or prolonged boiling under reflux. Products are obtained in better yield than when the usual process of prepg. the *o*-hydroxyazo dye and treating it with metal compd. is employed. Several examples are given.

Chromium compounds of azo dyes. SOC. ANON. POUR L'IND. CHIM. À BAËLE. Brit. 295,504, Aug. 13, 1927. Azo dyes are converted into Cr compds. by treatment in the presence of an alk. reducing agent, with hydrated Cr oxide, with or without pressure, and in some cases in the presence also of a protective colloid or inorg. salt. Numerous details and examples are given. Cf. C. A. 23, 2042.

Azo dyes containing chromium. SOCIÉTÉ ANON. POUR L'IND. CHIM. À BAËLE. Brit. 296,680, Sept. 3, 1927. Chromable azo dyes are baked with reagents yielding Cr such as Cr acetate or fluoride (suitably for 24 hrs. at 145–160°) in the presence of glycerol or of salts such as NaCl, KCl, NH₄Cl, (NH₄)₂SO₄ or of acid-binding salts. Examples are given of the production of dyes which may be used for dyeing cotton, wool, silk, weighted silk, artificial silk or for coloring varnishes. Cf. C. A. 23, 2301.

Dyes containing chromium. SOC. ANON. POUR L'IND. CHIM. À BAËLE. Brit. 296,310, Aug. 27, 1927. Cr-contg. dyes obtained by chroming dyes derived from triaryl-methanes are used to produce dyeings fast to washing, alkali and water on animal fibers, particularly silk and leather, and are also used together with azo dyes contg. Cr to produce dyeings fast to light on the same materials (either in a single bath or in successive baths). Several examples are given.

Dye pastes. E. I. du PONT DE NEMOURS AND Co. Fr. 647,954, Jan. 30, 1928. See U. S. 1,705,818 (C. A. 23, 2305).

Dyes and intermediates. I. G. FARBENIND. A. G. Brit. 296,761, Sept. 7, 1927. Thiophene-2,3-dicarboxylic acid or its anhydride and substitution derivs. are condensed with phenols having 2 unsubstituted adjacent atoms by use of an acid condensing agent; e. g., benzohydroquinone is condensed with thionaphthene-2,3-dicarboxylic acid anhydride or 5-chloro-7-methylthionaphthene-2,3-dicarboxylic acid anhydride and hydroxy-benzohydroquinone with thionaphthene-2,3-dicarboxylic acid anhydride. Thionaphthene-2,3-dicarboxylic acids of the naphthalene and anthracene series are also mentioned as suitable starting materials. The products are hydroxylated 2,3-phthalylthionaphthenes. AlCl₃ with or without NaCl and FeCl₃ may be used as condensing agent.

Dye intermediates. I. G. FARBENIND. A.-G. Brit. 297,129, May 12, 1927. Cinnamylideneanthrone or its derivs. are obtained by heating anthrone or its derivs. with cinnamic aldehyde or its addn. products such as the bisulfite compd., with or without an acid condensing agent such as H₂SO₄, ZnCl₂ or POCl₃. Examples are given of the condensation of cinnamic aldehyde with anthrone, α -hydroxyanthrone and β -chloroanthrone. Benzanthrone or its derivs. are made by heating the cinnamylideneanthrones

with AlCl_3 . *Bz*-1-Phenylbenzanthrone or its derivs. are made by heating the cinnamylideneanthrones to about 250–300° alone or in suspension or soln. as in fused KHSO_4 or a mixt. of NaOAc and KOAc . *Bz*-2-Phenylbenzanthrone or its derivs. are obtained by isomerizing the *Bz*-1-phenylbenzanthrones by heating with AlCl_3 and NaCl . α -Hydroxyanthrone is made by reduction of α -hydroxyanthraquinone by use of Cu and Al and H_2SO_4 . β -Chloroanthrone is prepd. similarly from β -chloroanthraquinone.

Dye intermediates. BRITISH DYESTUFFS CORP., LTD., J. B. PAYMAN and E. G. BAINBRIDGE. Brit. 296,458, May 2, 1927. 1,8-Naphthasultonesulfonic acids are converted, by the action of P halides, into the sulfonyl halides, and the latter are treated with NH_3 or with a primary amine, with substantial exclusion of water, to produce 1,8-naphthasultonesulfonamides, which may be further treated with alkalis to give 1-naphthol-8-sulfonic acid sulfonamides or with NH_3 soln. to give di- or poly-sulfonamide derivs. of α -naphthol. Examples are given.

Anthraquinone condensation products. I. G. FARBENIND. A.-G. Fr. 647,254, June 21, 1927. Anthrone or its derivs. or substitution products is condensed with glyoxal or its higher homologs, or bisulfite compds. or sulfuric esters or other compds. yielding dialdehydes. The reaction is carried out in a solvent and if necessary with the addn. of an acid or a salt with an acid reaction. The products are *intermediates for dyes* and also *dye cotton* from the vat. In examples, glyoxal sulfate is added to a boiling soln. of anthrone in AcOH , giving a product which dyes cotton a clear yellow. With α -chloroanthrone a deep green is obtained.

Dyeing. I. G. FARBENIND. A.-G. (Wilhelm Neugebauer, inventor). Ger. 471,731, May 5, 1926. Goods are dyed by adding to the usual vat dye, the oxidation products of 1,3-dihydroxynaphthalene or its derivs. Thus, the product obtained by the oxidation of 1,3-dihydroxy-2-phenylnaphthalene by FeCl_3 is added to Turkey red oil and water. Soda lye and hyposulfite powder are added and the mixt. is diluted. The goods to be dyed are then immersed. Cotton is dyed a fast brown color by this process.

Dyeing. CHEM. FABRIK A. SCHMITZ. Ger. 471,788, Jan. 31, 1926. Colors fast to rubbing are dyed on materials made from animal or vegetable fibers by treating them with alkali stannate, aluminate or silicate, or with Al acetate, formate, lactate, tartrate or sulfate, before dyeing them in the usual way in an acid-free bath. Albuminous substance such as casein, and alkali or NH_4 borate, and an NH_4 salt of an inorg. or an org. acid are added to the dye liquor.

Dyeing by the aniline black and similar processes. MANCHESTER OXIDE CO., LTD., R. H. CLAYTON and F. SCHOLFIELD. Brit. 296,530, Aug. 4, 1927. Carbonyl-ferrocyanides of the alkali and alk. earth metals are used as O -carriers in dyeing and printing processes involving oxidation. Examples are given of the use of Na carbonyl-ferrocyanide in an aniline black process and in a process for chlorate discharge of indigo. Reference is also made to the discharge of S colors.

Apparatus (with a submerged burner for heating and effecting circulation of the liquid) for dyeing or washing textile materials, etc. C. F. HAMMOND and W. SHACKLETON. Brit. 296,525, April 13, 1927. The supply of fuel and air to the burner may be controlled by a thermostat or by the pressure in the bath.

Dyeing silk. I. G. FARBENIND. A.-G. Fr. 33,576, May 5, 1927. Addn. to 612,169. See Brit. 271,089 (*C. A.* 22, 1693).

Dyeing artificial silk. I. G. FARBENIND. A.-G. Fr. 648,068, Feb. 1, 1928. Artificial silk is dyed by means of azo dyes contg. at most one sulfonic or carboxylic acid group obtained by coupling the diazo compds. of aromatic amines and their substitution products with compds. contg. a heterocyclic ring of 5 members condensed with a benzene ring and having a H atom which reacts easily with diazo compds. Thus, 4-sulfoanilineazomethylketol gives a pure yellow, fast to light on acetate silk; 2,5-dichloroanilineazomethylketol gives clear yellow shades; 2-sulfoanilineazo-3-hydroxythionaphthene gives a deep orange; and 6-chloro-2-aminotolueneazoöxindole gives clear yellow shades tending toward the green.

Dyeing materials of regenerated cellulose. BRITISH DYESTUFFS CORP., LTD., J. BADDLEY, R. BRIGHTMAN and P. CHORLEY. Brit. 296,485, June 7, 1927. Level shades are produced by use of disazo dyes derived from tetraazotized 2,4,4'-diaminodiphenyls (excluding 2,2'-dinitrobenzidine) and 2-mol. proportions of a single or of 2 different coupling components. Several examples are given of products dyeing in various shades. Cf. *C. A.* 22, 3636.

Dyeing and bleaching cellulose esters and ethers. SOC. POUR LA FABRIKATION DE LA SOIE "RHODIASÉTA." Brit. 297,186, July 26, 1927. Material such as that comprising cellulose acetate, after dyeing, is discharged wholly or partially by treatment with substances such as animal charcoal having high adsorbing properties, with or without

addn. of swelling agents and suitably in the form of pastes contg. thickening agents. Several examples are given.

Dyeing fabrics containing both wool and silk. I. G. FARBENIND. A.-G. Brit. 297,124, Sept. 16, 1927. Wool fabrics contg. effects of silk are dyed with wool dyes with the addition of an org. sulfonic acid capable of pptg. gelatin and glue from acid solns. (suitably sulfonated condensation products from phenols and $C_{10}H_8$ and CH_2O —which may be added to the dye bath after the dyeing is complete, or before after-chroming if chromable dyes are used). Examples are given in which the wool is dyed while the silk remains pure white. Cf. C. A. 22, 1243.

Dyeing yarn on perforated beams. JOHN H. HOLTON. U. S. 1,708,417, April 9. Mech. features.

Dyeing animal fibers. BERNHARD SCHÖNER and PAUL VIRCK (to Grasselli Dye-stuff Corp.). U. S. 1,708,635, April 9. Animal fibers such as wool are treated with sulfonated derivs. of naphthylamines such as 4'-aminosulfo-phenyl-2-naphthylamine, 1,4-di(6-sulfo-2-naphthylamino)benzene, 4- α - (or β -) naphthyl-amino-4'-aminodiphenylamine-2'-sulfonic acid, the Na salt of 4- β -naphthylamino-4'-hydroxydiphenylamine-2-sulfonic acid, the Na salt of 1,4-di(4- β (or α)-naphthylamine-2-sulfo-phenylamino)benzene, 1,5-di(4-paramethylphenylamino-3-sulfo-phenylamino)naphthalene or 2,6-di(4-amino-2-sulfo-phenylamino)naphthalene and then treated with an oxidizing agent such as $K_2Cr_2O_7$ and H_2SO_4 . Generally, dark green or black dyeings are produced.

Dyeing apparatus. BRATÍ JOKLOVE. Fr. 647,659, Jan. 24, 1928. Constructional details.

Dyeing apparatus. FRANTISEK RUDOLF. Fr. 647,594, Jan. 23, 1928. An app. is described for dyeing cloth on the full width and in the piece.

Apparatus for dyeing textile materials wound on bobbins mounted in columns in vats. J. ANNICQ. Brit. 296,603, Dec. 5, 1927.

Apparatus (with a vat containing upper and lower sets of rollers) for washing, dyeing, mordanting or other treatments of lengths of cloth. F. RUDOLF. Brit. 296,621, Jan. 18, 1928.

Apparatus for dyeing hats. VELOUR UND FILZHUTFABRIK SINDERMAN & Co. Ger. 472,188, July 5, 1927. See Austrian 108,691 (C. A. 23, 994).

Apparatus for printing cloth simultaneously with several colors. JEAN DUFOUR. Fr. 647,234, June 8, 1927.

Producing colored designs on textiles. I. G. FARBENIND. A.-G. (Kuno Franz and Ehrhart Franz, inventors). Ger. 472,474, Jan. 31, 1926. Textiles are treated with substances convertible into dyes, or with dyes having little affinity for the fibers, while unevenly applying moisture and (or) heat. It is then found that the intermediate or dye distributes itself unevenly over the textile, deeper shades resulting at wetter and warmer parts than at drier and colder parts. Regular or irregular designs can be so produced and the effects can be varied by using stencils, etc., or more than 1 dye. In treating wool or other animal fibers, it is generally necessary first to reduce the affinity of the fibers for dyes, e. g., by bringing on to the fibers cellulose esters or ethers, or starch. Examples are given.

Color printing cloth. JAMES MORTON. Fr. 848,013, Jan. 31, 1928. Fabrics are woven with a pattern by a jacquard or like selecting mechanism and are then printed to produce a colored pattern by rollers or blocks which apply the color but do not form a design, the yarns or threads having been treated so that the ground or other part obscures or changes the colors applied.

Textile threads. JEAN BOVEUX. Fr. 647,177, June 3, 1927. The compn. of linseed oil and beeswax used for treating textile threads to prevent unraveling during weaving, etc., is more easily removed by adding a small quantity of Na or NH_4 sulforinate to the compn. before use. Cf. C. A. 23, 2306.

"Lenosation" of fibers. CHARLES L. FIEVET. Fr. 647,521, Jan. 20, 1928. Vegetable fibers are treated to produce lenosation in a 1% Na_2CO_3 soln., then to an alk. soln. of a vegetable oil solubilized in "tetrapol," then to the action of a 35° Bé. soda soln. contg. monopol soap. The fibers are neutralized, bleached and dried by SO_3 , SO_2 and warm air.

Treating cloth. THE KOPPERS Co. Fr. 647,949, Jan. 30, 1928. See Can. 285,372 (C. A. 23, 719).

Surface treatment of cloth. GEORGES R. J. MOHA. Fr. 647,447, Jan. 18, 1928. The appearance of silk or of gold or silver is given to cotton, etc., by applying a layer of rubber soln. and then a powd. metal such as Au, Ag or bronze.

Obtaining fibers from flax and other materials. ABBEY SYNDICATE, LTD., and D. R. NANJÍ. Brit. 296,333, April 29, 1927. Materials such as flax, hemp, sisal, ramie

and bamboo are treated with a 0.1–0.5% soln. of a neutral salt of one of the alkali metals or of NH_4 (preferably neutral tartrates, citrates, oxalates, sulfates and phosphates which ppt. the alk. earth metals with which the pectinous substances are assocd.), e. g., ramie ribbons in fresh condition may be treated with 0.1–0.5% $(\text{NH}_4)_2\text{SO}_4$ soln. under 1–2 atm. pressure for 60–20 mins., and, after removal of the pectinous complexes, heated in an autoclave with a 2–4% soda soln. under 6–10 atm. pressure for 20–60 mins. to remove fats, waxes, resins, etc. The product may then be bleached. Brit. 396,334 also relates cooking of either the raw or spun or woven material with alk. solns. under pressure to produce a lustrous finish.

Retting flax by use of yeast. MARTIN WADDELL and HENRY C. WATSON (to Watson-Waddell Ltd.). U. S. 1,708,812, April 9. Alc. may be obtained as a by-product.

Artificial fibers. ERSTE BÖHMISCHE KUNSTSEIDEFABRIK A.-G. Fr. 33,612, May 27, 1927. See Brit. 282,687 (C. A. 22, 3778).

Desulfurizing, decoppering and other treatments of artificial fibers. H. RATHERT (to Herminghaus & Co. Ges.). Brit. 297,000, Sept. 10, 1927. The treating liquid is sprayed on to bobbins on which the fiber is wound in twisted condition. Various mech. details are described.

Handling cakes of artificial thread. I. G. FARBENIND. A.-G. Brit. 297,112, Sept. 15, 1927. Mech. features.

Treating cakes of artificial silk manufactured by the can spinning-method. HUGO KÜTTNER (to the Firm Fr. Küttner A.-G.). U. S. 1,708,583, April 9. The cakes are pressed flat and then rinsed and subjected to any further treatment.

Artificial silk. HENRY A. GARDNER. Fr. 647,013, Jan. 12, 1928. See U. S. 1,692,372 (C. A. 23, 719).

Artificial silk. SOC. POUR LA FABRICATION DE LA SOIE "RHODIASETA." Fr. 647,865, Jan. 11, 1928. Cloth or threads of cellulose esters or ethers, such as cellulose acetate, are decolorized totally or in parts by means of highly adsorbent agents such as animal black. The adsorbent may be applied as a paste which may contain swelling agents.

Artificial silk. H. ELLING (to Herminghaus & Co. Ges.). Brit. 297,063, Sept. 13, 1927. Artificial threads prepd. from cellulose derivs. are, in the case of "viscose silk" desulfurized, and in the case of "cuprammonium silk" decoppered, and then bleached, acidified, washed and dyed while wound in the twisted condition on porous bobbins or on perforated bobbins with a porous covering. An app. is described.

Textile lubricant containing an alkali metal lactate. JOSEPH J. SCHAEFER, JR. (to Niocet Chemical Corp.). U. S. reissue 17,264, April 9. See original pat. No. 1,677,852 (C. A. 22, 3306).

Apparatus for applying edge-binding or other coating materials to opposite sides of cloth or similar materials. MARK HAMBURGER and CLAUD H. FOGLE (Fogle to Hamburger). U. S. 1,707,611, April 2.

Waterproofing artificial silk, etc. C. DREYFUS (to British Celanese, Ltd.). Brit. 296,450, Sept. 2, 1927. Open-mesh fabrics such as those made from cellulose acetate are treated with a waterproofing compn. such as a rubber soln. which fills the interstices of the fabric and produces a smooth coating. Fabrics comprising various cellulose esters and ethers may be similarly treated.

Waterproofing embossed fabrics comprising cellulose esters or ethers. C. DREYFUS and W. R. BLUME (to British Celanese, Ltd.). Brit. 296,451, Sept. 2, 1927. Embossed fabrics comprising various cellulose esters or ethers, which may be prepd. as described in Brit. 273,406 (C. A. 22, 2068), are treated with a waterproofing material such as a rubber soln., which is preferably applied by spraying to the under side of the embossed material.

Bleaching. OTTO FLEISCH. Ger. 471,877, May 21, 1927. Textile goods, especially wool, are bleached by gaseous H_2SO_3 in a canal-like chamber of which the inlet and outlet for the goods are permanently open. The gas is blown in by app. so arranged that it sucks in air and does not escape from the bleaching chamber.

Laundering textile fabrics. ROBERT A. PHAIR (to H. Kohnstamm & Co.). U. S. 1,708,519, April 9. Fabrics such as cotton are washed in a usual manner and then rinsed in water to which is added a protective agent such as CaCO_3 or $\text{Mg}(\text{OH})_2$, which remains in the goods and serves to prevent destructive action of acid vapors and formation of destructive acids in the fabric.

Machine for washing several hanks of yarn simultaneously. MASCHINENFABRIK UND EISENGIESSEREI WILHELM QUADE G. M. B. H. Ger. 471,621, Dec. 10, 1926. Details of construction.

26—PAINTS, VARNISHES AND RESINS

A. H. SABIN

Luminous paints. OTAKAR WEBER. *Chem. Listy* 23, 59-60(1929).—A review showing that the color is evolved in 2 phases: (1) an intense light of great brilliance lasting a few mins., (2) a mild glow which usually remains overnight and lacks intensity and depth. The intensity cannot be increased by applying a thicker layer of the paint.

The present state of the lead paint question. K. WÜGGH. *Korrosion Metall-schutz* 5, 14-8(1929).—The development of uses of mixed lead pigments in paints is reviewed with reference to toxicity and discoloration on exposure. B. E. R.

Experience with fume paints (smoke-proof paints). W. VAN WULLEN-SCHOLTEN. *Farben-Ztg.* 34, 1061 3(1929).—Paints prepd. with white lead and lamp black ground in a linseed-oil varnish on the one hand and in a tung-oil, stand-oil varnish on the other were spread on bare iron panels and also on panels which had been primed with red-lead paint. These panels were placed in a smoke stack and subjected to the fumes therein. The linseed-oil paints showed better durability. G. G. SWARD

A new method of observing the progress of drying. HANS WOLFF AND W. TORLDT. *Farben-Ztg.* 34, 1060 1(1929).—A 2% soln. of brilliant scarlet in linseed oil is spotted at suitable intervals onto the film being tested. As drying proceeds the successive drops spread to a decreasing extent, which passes through a min. at the dust-free stage. G. G. SWARD

Oxidation and polymerization of sunflower oil. G. NEMIROVSKII. *Oil and Fat Industry* (Russia) 1928, No. 4, 23 6. The formation of hydroxy acids as well as the increase in sp. gr. and viscosity depends on the amount of air used in the blowing process, on the temp. and on the catalysts present, such as Mn and Pb acetates and linoleates of Mn, Pb and Co. Mn salts have less influence on the formation of hydroxy acids and the increase in sp. gr. than Pb salts. A temp. increase during the reaction with the above salts has less influence on the speed of reaction than the duration of contact, particularly for Mn acetate. Co linoleate gives a higher yield in hydroxy acids than the other catalysts. A. A. BOEHTLINGK

Contributions to forensic chemistry. TIMM. Univ. Leipzig. *Deut. Z. ges. gericht. Med.* 11, 185 8(1928).—On autopsy Pb was found in the kidney (4.47 mg. per 150 g. of tissue) and blood (1.33 mg. per 150 g.) of a man employed for 20 yrs. in a lacquer factory. FRANCES KRASNOW

Bitumen as a protection against corrosion in the chemical industry. A. W. RICK. *Chem. Fabrik* 1929, 100-1.—Far better than oil paints, tar paints, crude asphalts and petroleum pitch as protectives against corrosion of materials are specially prepd. bituminous lacquers and thicker solns. of bitumen or bituminous compns. These give the necessary impenetrability, toughness, resistance to attacks by chemicals, etc. Instances are cited. W. C. EBAUGH

A new color reaction for resin. M. MAMONT. *Ind. olii min. e grassi* 9, 43-4 (1929).—Place a mixt. of 0.2-1 g. of the dry substance and CaO in a glass test tube of 5-10 mm. diam., warm slowly on a direct flame and pass the vapors over a few drops of HNO₃, d. 1.40. With resin a violet red color results. The condensation products form drops on the acid first violet, then green and blue. With soaps the reaction is sensitive with 1-2% of resin. Waxes, excepting shellac, do not give the reaction. Autoxidized resin does. R. SANSONE

The principles of synthetic resin formation. JOHANNES SCHEIBER. *Farbe u. Lack* 1929, 86-9, 102-3.—The resinous state is usually one of supercooled or solid soln. & briefly reviews the factors which promote crvstn. as developed by Tamman, Haber, and von Veimarn. The principal groups involved in the formation of resins are $-\text{CH}=\text{CH}-$, $-\text{C}=\text{O}$, $-\text{C}=\text{NH}$, etc. The polymerization factor of unsatd. compds. varies with the groups attached to the doubly bound C atoms. The desirable properties, such as chem. resistance, elec. resistance, soly., etc., are sometimes more easily attained with synthetic compds. than with the natural ones. Shellac, being a mixed animal and vegetable resin, has properties more difficult to reproduce. G. G. SWARD

The reason for the low melting point of rosin extracted from wood stumps. E. LYUBARSKII. *Oil and Fat Industry* (Russia) 1928, No. 4, 26-30.—Heavy ends of turpentine are left in the stump shavings on distg. off turpentine; they contaminate the rosin obtained by the extn. process. A small part of the org. solvent is also left in the rosin on distn. The remedy suggested is to distill off the light compds. from the stump

shavings, saponify the rosin in the presence of shavings, boil the soap soln. until all heavy oils are evapd. and sep. from dirt, etc. The rosin soap can be converted to rosin by the usual methods, or left as such to be used in the soap industry. A. A. B.

Consistency and gel formation (WAGNER) 2. The durability of colors for painting on glass (GREINER) 19. Condensation products of indene with phenols [for bases for lacquers] (Brit. pat. 297,075) 18. Condensation products of urea or its derivatives and CH_2O (Brit. pat. 296,361) 18. Glaze [from urea-formol resin products] (Brit. pat. 647,834) 19. Plastic composition, lacquers, etc., containing cellulose esters or ethers (Brit. pat. 296,796) 18. Azo dyes containing Cr [for coloring varnishes] (Brit. pat. 296,680) 25.

Bakelite Technic. Molding Materials. New York and Chicago: Bakelite Corp. 104 pp.

SCHEIBER, JOHANNES, AND SÄNDIG, KURT: *Die künstlichen Harze. Band XIV of Chemie Einzeldarstellungen.* Stuttgart: Wissenschaftliche Verlagsgesellschaft m. b. H. 376 pp. M. 26; bound, M. 28.

Device for mixing constituents of paints in cans. HENRY C. KIESELBACH. U. S. 1,707,968, April 2.

Iron oxide pigment. F. RIVERS. Brit. 296,598, Nov. 17, 1927. A material suitable for use in paints is prep'd. by burning a clay contg. not less than 25% Fe oxide and crushing the burned product. Various details are described.

White lead. T. GOLDSCHMIDT A.-G. Brit. 297,116, Sept. 15, 1927. In producing colloidal white lead by the treatment of Pb oxide with CO_2 in the presence of water, an accelerator is used such as NH_3 which is of a neutral or alk. character and has no appreciable solvent action on the Pb oxide but assists in its conversion to carbonate.

Oil paints and varnishes. I. G. FARBENIND. A.-G. Brit. 296,679, Sept. 2, 1927. Oil paints and varnishes such as those comprising linseed oil have added to them an aliphatic carboxylic acid unsat'd. in the α - β or β - γ position or derivs. such as acrylic acid or its polymerization products, crotonic acid or sorbic acid, which give good covering and brushing properties to the paints or varnishes and enable larger quantities than usual of pigments to be added.

Oil paints and varnishes. I. G. FARBENIND. A.-G. Brit. 296,991, Sept. 10, 1927. Hydroxy acids such as glycolic, phenoxyacetic or cresoxyacetic acids are used in small proportions in oil paints and varnishes such as those formed with polymerized linseed oil, driers, thinners and pigments. Brit. 296,902 specifies the similar use of amides such as hydroxymethylbenzamide, butyl urethan, hydroxymethylbutyl urethan or ethylglycol urethan.

Oil paints and varnishes. I. G. FARBENIND. A.-G. Brit. 297,034, Sept. 12, 1927. Paints or varnishes such as those formed with linseed oil also contain an aromatic hydroxy carboxylic acid or deriv., e. g., a small proportion of β -hydroxynaphthoic acid. A lacquer may be formed with addn. of drier, thinner and zinc white.

Fireproofing material for use with paints. FERNANDO S. VIVAS (to International Fireproof Products Corp.). U. S. 1,707,587, April 2. An aq. soln. is formed from H_3BO_3 , borax, ZnSO_4 and Na tungstate and this soln. is combined with a soln. of gelatin and a paint filler such as "asbestine pulp" and TiO_2 is added to form a paste which is further mixed with a "fireproof drying oil" such as an oil mixed with borax, NH_4Cl , H_3BO_3 and Na tungstate to form a paint. Cl. C. A. 23, 908.

Oxidizing drying oils. I. G. FARBENIND. A.-G. Ger. 472,111, Aug. 12, 1927. Drying oils are treated with air or O while suspended in a liquid in which they are insol. e. g., in water, aq. solns. of org. acids, alcohols, etc. Colloids, e. g., gelatin, may be added to prevent coagulation of the oxidized oil, and accelerators, e. g., comp'd. of Pb, Mn or Co, may be present also. Examples are given.

Varnish. SOC. DES VERNIS TAB. Fr. 647,161, June 2, 1927. Casein is made sol in alc. for use in varnishes by swelling it with water or alc., adding either (1) substs. which act on the acid groups of the casein such as alkalis, carbonates, bicarbonates, phosphates, lime or org. amines, (2) substances which act on the amino groups of the casein such as oxalic, phosphoric, citric, benzoic, acetic or phthalic acids, or (3) substances whose action is difficult to define such as sulfates, chlorides, oxalates, fluo. phenol or thymol, mixing and heating till a homogeneous paste is obtained and then adding the required amt. of alc.

Varnish. THEODOR SCHUCHARDT G. M. B. H. Ger. 471,725, June 29, 1927.

non-cracking varnish coating with a nitrocellulose foundation is obtained by adding resin, resin esters or oil to the layer painted over the colored layer.

Varnishes containing synthetic and natural resins and organic cellulose derivatives. W. H. MOSS and C. DREYFUS. Brit. 296,675, Sept. 3, 1927. Cellulose derivs. such as cellulose acetate, formate, propionate and butyrate or methyl or ethyl cellulose ethers are used with either synthetic resins such as those formed from a phenol and aldehyde or with natural resins such as dammer, kauri, manila, sandarac, copals, ester gums, plasticizers, solvents, pigments, etc.

Varnishing. I. G. FARBENIND. A.-G. (Adolf Benischek and Carlos Thode, inventors). Ger. 471,599, Mar. 27, 1927. The article to be varnished is immersed in a boiler filled with varnish which is caused to circulate by a current of warm air.

Polish. JOHANNES FLECKEN. Ger. 471,862, Jan. 18, 1927. A silk-like polish is imparted to varnished goods by treating with a soln. of $(\text{CH}_3)_2\text{CO}$, oil and turpentine, and washing with water.

Cellulose acetate lacquers, etc. I. G. FARBENIND. A.-G. Ger. 472,311, Nov. 27, 1924. Lacquers, impregnating agents, etc., comprising solns. of cellulose acetate in a monochlorhydrin, with or without other solvents, are rendered more stable by addn. of a small amt. of a cyclic org. base, e. g., PbNH_2 , pyridine, or quinoline.

Marking or printing ink. H. PLATT and C. DREYFUS (to British Celanese, Ltd.). Brit. 296,759; Sept. 7, 1927. An ink unaffected by dyeing or bleaching processes consists of a pigment such as vermillion, ultramarine (or, preferably, Pb chromate), a drying or semi-drying oil (suitably linseed oil or china wood oil), and a cellulose deriv. (suitably nitrocellulose dissolved in ether and alc., or, preferably, in EtOAc). The ink is especially suitable for marking cellulose acetate fabrics.

Coloring materials for making India ink, etc. I. G. FARBENIND. A.-G. Brit. 297,076, March 14, 1927. "Soot" or other finely divided coloring materials are prep'd. by grinding with an addn. of sulfonic acids or their salts such as those obtained by sulfonating mineral oils, oil distillates, brown coal-tar oils or similar mixts. contg. aromatic, hydroaromatic and sat'd. or unsat'd. cyclic and aliphatic compds. An example is given of the treatment of "soot" and of the treatment of umber with the Na salt of the sulfonated product obtained from a mixt. of naphthenic acids.

Molding mixture. LEWIS M. HULL (to Radio Frequency Laboratories). U. S. 1,708,576, April 9. A molding mixt. suitable for condenser parts comprises a low hysteresis phenolic resin and a filler such as mica which is substantially non-reactive during the molding process and which does not substantially increase the hysteresis loss in the molded product; the product is characterized by a phase difference not exceeding about 1° .

Purifying resins. HERCULES POWDER CO. Fr. 647,543, Jan. 20, 1928. Resin is heated to a temp. below its f. p. and sufficient to distil all the volatile constituents by causing it to flow on a heated surface below atm. pressure and with the introduction of superheated steam.

Artificial resins. ALLGEMEINE ELEKTRICITÄTS GES. (to International General Electric Co.). Brit. 296,787, Sept. 8, 1927. Artificial resins such as those produced from condensation of glycerol and phthalic acid are obtained in a practically colorless condition by effecting the condensation in an atm. substantially free from O (suitably in H_2 , CO_2 or in a vacuum).

Phenol-acetylene resin. HOWARD W. MATHESON and JULIUS A. NIEUWLAND (to Canadian Electro Products Co.). U. S. 1,707,940, April 2. A condensation product of a phenol such as PhOH with C_2H_2 is treated with C_2H_2 at a temp. above 100° , producing a product substantially free from uncombined phenolic material, and which is rendered infusible and insol. by heat and pressure. U. S. 1,707,941 also relates to the production of synthetic resins by reaction of phenol and C_2H_2 in the presence of a catalyst such as H_2SO_4 and HgSO_4 .

Synthetic (phenol-aldehyde) resins. W. H. MOSS and C. DREYFUS (to British Celanese, Ltd.). Brit. 296,674, Sept. 3, 1927. In the formation of fusible and sol. resins (suitable for use in varnishes together with org. esters of cellulose or cellulose ethers), at least the final stage of the condensation is effected in the presence of a sol. di-H phosphate such as that of an alkali or alk. earth meta. or of NH_4 . The condensation may be initiated in the presence of H_3PO_4 and alk. earth oxide or hydroxide or Na_2CO_3 , subsequently added to form the di-H phosphate. Equi-mol. proportions of a phenol and aldehyde are preferably used, and the products are preferably washed with hot water and steam or subjected to vacuum distn.

27—FATS, FATTY OILS, WAXES AND SOAPS

E. SCHERUBEL

Influence of metal on the quality of glycerol. A. BAG. *Oil and Fat Industry* (Russia) 1928, No. 4, 13-4.—Pure glycerol contg. 0.005% ash and 0.008% H_2SO_4 was heated in a glass flask at 120–125° in the presence of various metals. Al and Cu have the smallest and Fe and Pb the greatest effect on the quality. The glycerol was greatly improved after filtering through paper and blood charcoal. Most of the mineral admixtures could be removed. A. A. BOEHTLINGK

Detection of cacao butter adulteration by means of benzoic peroxide. KURT BODENDORF. Univ. Berlin. *Pharm. Ztg.* 74, 384-5 (1929).—The method involves treatment of the sample with a CHCl_3 soln. of benzoic peroxide, as follows: To a soln. of 2 g. of the sample in 10 cc. of CHCl_3 add 40 cc. of reagent (see below), the content of which has been carefully detd., so that for 5 cc. about 12–13 cc. 0.1 N $\text{Na}_2\text{S}_2\text{O}_3$ will be consumed. The temp. (about 40°) should remain const. during the entire operation by immersion in a water bath. From time to time (the reaction is complete after the lapse of 170 mins.) remove 5 cc. of the CHCl_3 soln. to an acidified KI soln. and after vigorous agitation titrate the pptd. I with 0.1 N $\text{Na}_2\text{S}_2\text{O}_3$. The end point is reached when no further recession in the amt. of pptd. I is observable, at which time there should still be an excess of benzoic peroxide present. Curves constructed on values (based on time of action and benzoic peroxide consumed in terms of $\text{Na}_2\text{S}_2\text{O}_3$) obtained in examn. of pure cacao fat and other fats likely to be used in adulteration show 2 possible groups of fatty admixt.: (1) of fats having greater, and (2) of fats having less unsatn. than cacao butter. The relative position of the curves of samples in question to that of pure cacao butter permits estn. of the extent of adulteration. The paper contains several series of analyses with the corresponding curves. *Prepn. of reagent.* Dissolve 10 g. benzoic peroxide in 100 cc. of $\text{Et}_2\text{O} \cdot \text{CHCl}_3$ mixt. (1:1) and cool to 0°, add an equally cooled soln. of 1 g. Na in 20 cc. of alc. in a thin stream with proper agitation, immerse $\frac{1}{2}$ hr. in ice water, then dissolve the magma in 200 cc. of ice water, sep. the mixt. in a separatory funnel, acidify with dil. H_2SO_4 and ext. the benzoic peroxide with two 150-cc. portions of CHCl_3 . Dry over Na_2SO_4 , filter and adjust by addn. of more CHCl_3 so that 5 cc. is equal to about 12–13 cc. 0.1 N $\text{Na}_2\text{S}_2\text{O}_3$. W. O. E.

Fat splitting and neutral fat saponification. K. MÜLLER. *Seifensieder Ztg.* 56, 67-8 (1929); cf. C. A. 22, 4851.—M. discusses the variations of glycerol content in lye due to different kettle charge conditions, basing his views on F. Merklen's investigations as published in his book on settled soaps. P. ESCHER

Preparations resembling Turkey red oil in soaps. J. AUGUSTIN. Munich. *Seifensieder Ztg.* 56, 69-71 (1929).—"Cimol-Neutral," a prepn. resembling Turkey red oil (compn. not given), was added to soaps, and results are tabulated for free alkali, lathering power and emulsifying power to show its beneficial effects. P. ESCHER

Olein analysis. M. KELLER. *Seifensieder Ztg.* 56, 57-8 (1929). Answer to Dittmer's criticism (C. A. 22, 2476, 4845, 23, 1005). P. ESCHER

Determination of the saponification value of fatty oils. THEODOR BOEHM AND PHILIPP FRESNIER. Univ. Berlin. *Apoth. Ztg.* 44, 349-51 (1929). The results obtained in the present study indicate that a preliminary series of tests is superfluous to det. the action range of alc. KOH; it is entirely sufficient if the factor of alc. KOH is detd. in the usual way in the subsequent examn. It is important that the sapon be carried out in a 200-cc. Jena glass (with mark). The procedure followed is: Weigh 1 to 2 g. of the sample into a 200-cc. Jena flask, add 25 cc. alc. KOH, close with a cork carrying a 75-cm. long cooling tube, then heat the mixt. about $\frac{1}{2}$ hr. on the water bath, agitating the liquid from time to time but avoiding contact with both stopper and tube. In the clear hot soln. titrate the KOH excess with 0.5 N HCl in the presence of phenolphthalein. W. O. E.

Polymerization of the highly unsaturated acids. I. YOSHIYUKI TOYAMA AND TOMOTARO TSUCHIYA. Tokyo Imp. Inst. Chem. Tech. *Chem. Umschau Fette, Oele, Wachse Harze* 36, 45-9 (1929).—See C. A. 23, 1873. P. ESCHER

Hydrogenation of the highly unsaturated acids. II. Hydrogenation of their methyl esters with platinum black. YOSHIYUKI TOYAMA AND TOMOTARO TSUCHIYA. *Chem. Umschau Fette, Oele, Wachse Harze* 36, 49-52 (1929).—The methyl esters of the highly unsatd. acids of a Japanese sardine oil (cf. above abstr.) were dissolved in alc. and hydrogenated at room temp. and atm. pressure with $3\frac{1}{4}\%$ Pt black by shaking, and samples of the product were taken at intervals. The acids of the Me esters were composed of $\text{C}_{20}\text{H}_{38}\text{O}_2$, $\text{C}_{20}\text{H}_{36}\text{O}_2$, $\text{C}_{20}\text{H}_{34}\text{O}_2$ and $\text{C}_{22}\text{H}_{36}\text{O}_2$; they yielded 133.2% ether-insol.

bromides of 71.22% Br content, and 170.9% of petroleum-ether-insol. bromides of 66.81% Br content. When the original I no. of 354.8 had fallen to about 170 during hardening, the product was semi-solid and the sepd. 40% solid acids had an I no. of 55 and m. p. of 73°. The yield of the insol. bromides fell with increasing hydrogenation and at I no. 119.9 their yields were only 3.24% ether-insol. and 25.83% petroleum-ether-insol. bromides. From their yields and Br content it is concluded that at best only a small quantity of the acids $C_nH_{2n-6}O_2$ and $C_nH_{2n-5}O_2$ are present during hydrogenation, although they could be formed from the more unsatd. acids. These solid acids formed from the very start of hydrogenation and thus the Pt catalyst differs from the Ni catalyst, which latter sats. all of the more unsatd. acids to the oleic acid stage before any solid acids are formed. There were also found some solid acids of the $C_nH_{2n-4}O_2$ group which showed a higher m. p. than the naturally occurring C_{20} and C_{22} members of that group. All results are detailed in tables. P. ESCHER

Regulations in the edible-oil industry. MARIO S. PENTEADO. *Chimica industria* 3, 498-503(1928).—After a brief general consideration of the constitution and properties of fats and oils, P. considers that drying oils become rancid largely as a result of the suspended org. detritus present serving as residence for hydrolytic enzymes. Density, fusion pt., solidification pt., acidity, index of refraction, butyrefractive index, sapon. no., iodine no., Hehner no. and Reichert-Meissl no., are briefly considered and a table of values is given for 7 oils. It was common to sophisticate butter with water sometimes up to 79%. Some regulations are quoted, among which are: (1) It should contain not over 18% moisture and not less than 80% milk matter. (2) It should be kept below 15° and 100 g. should not show a greater acidity than 8 cc. N alkali. (3) Butter to which salt has been added but otherwise prepd. according to regulations previously stated should be labeled butter preserved by salt. (4) Such butter should have acidity not over 15 cc alkali. (5) Vegetable colorants may be added. (6) All other preservatives are prohibited except salt, which may not exceed 10%. (7) Butter which has been revived shall be called renovated butter and its acidity shall not exceed 25 cc. N alkali. (8) Edible fats simulating cow butter shall not be exposed for sale under the name of butter. (9) Margarine and the like shall neither be made, deposited, nor sold in dairies. (10) Mixts. of vegetable fats plus a max. of 10% butter shall be termed margarine. (11) Fatty substitutes may be sold under the term vegetable butter but the origin must be indicated. S. L. B. ETHERTON

Oil from grape kernels. N. KOZIN. *Oil and Fat Industry* (Russia) 1928, No. 8, 24-6.—Kernels from white muscat grapes from Nikitskii Botanical Garden (Crimea) from 1926 crop had the following compn.: Moisture 8.59, fat 13.58, crude protein 11.08, epidermis 35.25 and ash 2.92%. The oil obtained by cold pressing was of a greenish yellow color changing into golden yellow after standing; it had a raisin-like odor and agreeable taste. Its characteristics are: d_{15}^4 0.9220, n_{40}^D 1.4678, acid no. 3.33, sapon. no. 192.57, I no. 131.24, unsapon. matter 0.92%, drying at 21° in 114 hrs.; the O no. of oil boiled with water is 14.1%, not treated with water 14.4%. The Russian grape kernels are lower in oil than Italian. It can be used for edible purposes and has a taste similar to that of olive oil. It is easily sol. in glacial acetic acid at 70° and becomes turbid at 60.5°, is only partly sol. in 95° alc.; its drying qualities are inferior. Hot-pressed kernels give a dark oil of disagreeable taste. A. A. BOEHLINGK

The "Wecker" method. "KRONOS." *Seifensieder Ztg.* 56, 63-4(1929).—Critical discussion of Keutgen's article on oil neutralization and fatty acid distn. (C. A. 23, 2052). P. ESCHER

Extraction of orujos with carbon disulfide. J. BOHLE. *Chem.-Ztg.* 53, 165-7, 187-9(1929).—Orujo is the press cake of olive-oil mills, contg. 6-15% oil with an av. of 10-12%. The cake is coarsely ground, dried in drum driers to 15-16% H_2O and these are extd. with CS_2 , furnishing the "sulfur oil" of the trade, which contains 4-50% free fatty acids. By using trichloroethylene in place of CS_2 , a non-bleaching oil results; this fact and economic conditions prevent abandoning the use of the inflammable CS_2 in favor of the safe C_2HCl_3 . Details of construction and operations are given. An unsolved problem of this industry is the prevention of fermentation processes in the rapidly accumulating masses of cakes in the early weeks of the harvest. P. ESCHER

Solubility tests of castor oil. H. P. TREVITHICK and M. F. LAURO. *Oil and Fat Ind.* 6, No. 3, 27-9(1929).—Failure to pass the soly. tests for castor oil, especially those specifying alc. of less than 95% strength, should not be considered as proof of adulteration. While all authors state that the filtration and distn. methods of detg. the acetic acid liberated from acetylated oil give the same results, T. and L. were unable to obtain concordant results by the filtration method and propose the following: boil 20 g. of

dry filtered oil with 20 cc. acetic anhydride and 10 g. of anhyd. Na acetate in a round-bottom 150-cc. flask with air-jacketed reflux condenser for 2 hrs. allowing no caking. Cool somewhat and rinse the condenser with 50 to 80 cc. H_2O . Pour the flask contents into 500 cc. H_2O in a beaker and boil 30 min. with glass beads to prevent bumping. Siphon off the H_2O and boil the oily layer with H_2O until no longer acid to litmus. Sep. the acetylated fat from H_2O , filter and dry at 100° . Weigh 2-4 g. of this fat into a 500-cc. Erlenmeyer flask, add 50 cc. alc. KOH (40 g. per l.) and saponify 1 hr. Evap. the alc. and dissolve soap in H_2O , acidulate the soap soln. of the saponid. acetylated fat with H_3PO_4 , using Me orange and distil with steam into an Erlenmeyer flask contg. 40 cc. of 0.25 N NaOH until 400 cc. has passed over. Titrate back with acid and continue to distil until 100 cc. does not require more than 0.1 cc. of the NaOH. The total cc. of NaOH $\times 2.5 \times 5.61 \div$ by wt. of sample = acetyl value. E. S.

Benzine and alcohol as solvents for castor oil. A. SLASHCHIEV. *Mussloboino Zhirovye Delo* 15, No. 7(1928); *Chem. Umschau* 36, 42; *Squibb Abst. Bull.* 2, A-207 (1929); cf. C. A. 22, 2674.—Comparative expts. were performed with regard to the extn. of castor-oil seeds of various grades with benzine, C_6H_6 , EtOH, petroleum ether, etc., with the result that benzine was found to be a very satisfactory extn. solvent; it is comparable in efficacy to C_6H_6 and CS_2 , giving the same yields of castor oil. EtOH extn. produces greater yields (48.16% as compared with 47.58% for benzine) but the resultant oil is not free from foreign matter; with benzine a light castor oil is obtained, while with the other extn. solvents, especially CS_2 , a more or less colored product is the rule. The extn. was performed at $30-55^\circ$, the seeds being totally oil-free at the end of 12 hrs.; by the addn. of 2.5-10% of C_6H_6 to the benzine, the soln. of the seed oil in the latter is considerably enhanced. C. R. F.

Determination of neutral fat in sulfonated oils. RALPH HART. *J. Am. Leather Chem. Assoc.* 24, 120-1(1929).—By detg. the sapon. no. of a sulfonated oil, % neutral oil can be detd. if the sapon. no. of the original oil is known. Alc. soln. of the sulfonated oil must first be neutralized to phenolphthalein. NH_4 soaps, if present, act like free fatty acids toward this indicator. Satisfactory agreement was obtained in comparing this method with the usual sepn. method for neutral oil. H. B. MERRILL

Soaps from organic bases. R. B. TRUSLER. *Soap* 4, No. 7, 33-5(1929); cf. C. A. 23, 2056.—Soaps from hydroxyalkylamines, known as the ethanolamines, when anhyd. depend for their consistency upon the nature of the fatty acid employed. The oleate of mono-ethanolamine is like petroleum jelly, while the oleates of di- and triethanolamine are only slightly more viscid, while the mono-ethanolamine stearate is a hard, wax-like solid. Among the uses of these soaps it has been found that from 0.3 to 1% dissolved in lubricating oils, increases their viscosity so that they are non-running and become suitable for pressure oiling and cup greases. The most important application of the oleate soap is in dry-cleaning, as it remains in soln. in the solvent in the presence of small quantities of H_2O . Ethyl, methyl, and benzylamine form soaps with fatty acids. Ethylenediamine is a double amine which can combine with 1 or 2 fatty acid mols. The mono-oleate and mono-stearate of ethylenediamine are strongly basic in H_2O and froth readily. E. SCHERUBEL

Cold-made toilet soaps. EUGENE SCHUCK. *Am. Perfumer* 23, 772-4; 24, 61 (1929).—This is a discussion of the manuf. of coconut-oil soaps. Because these soaps contain about 15% of unsapond. oil, it is thought that this might explain the tendency toward rancidity which they possess. This unsapond. portion consists of 83% diglyceride and 17% monoglyceride of lauric and oleic acids. The free fatty acids present in the unsapond. oil consist of a low mol. mixt. of capronic and caprylic acids. The unsapond. glycerides do not contain these, which have a peculiar odor and the faculty of rapid oxidation. S. believes that here is a clue to the development of rancidity. E. SCHERUBEL

Alkaline earth stearate emulsions. ALAN P. LEE AND JOHN E. RUTZLER. *Oil and Fat Ind.* 6, No. 3, 15-8(1929).—The peptizing action of these soaps is due to their concn. at the liquid interface and to the subsequent formation of a tough elastic film of particles of the soap around the drops of H_2O . From the character of the soaps dealt with, it appears that the hydrophobic film consists of discrete particles. The variations found in viscosities can be explained upon the assumption that there is a diff. in the H_2O particle size under the diff. conditions. The soly. of the soap in the oil can take but little, if any, part in detg. the character of these emulsions, for the work was done with concns. in excess of the solubilities of the several soaps at the temps. employed. E. SCHERUBEL

Soaps used in the textile industry (Hucams) 25. Emulsified and saponified oils

(SINGER) 22. Overflow alarm device for filtering apparatus (U. S. 1,708,235) 1. Centrifugal apparatus for purifying oils, etc. (Brit. pat. 296,670) 1. Tank and baffle plate construction for separating oil from water by gravity (U. S. pat. 1,708,021) 1.

Vegetable fats. FABBRICA CHIMICA ARENELLA. Fr. 33,640, June 8, 1927. Addn. to 635,628. The yield of fatty substances obtained by the process of Fr. 635,628 (C. A. 22, 4853) from grape skins is increased by a preliminary treatment with steam.

Separation of lipid mixtures. SCHERING-KAHLBAUM A-G. (S. Loewe, inventor). Ger. 466,363, Sept. 11, 1925. Lipoid mixts. of which the components possess differing degrees of dispersion in aq. and org. solvents, are sepd. by using a membrane which allows only the components of higher dispersive power to pass. Thus, a soln. of salicylic and stearic acids in alc. is dialyzed by a colloid membrane with 70% alc. After repeated changes of alc., the stearic acid is found to have left the original soln., which contains only salicylic acid. Other examples are given.

Sulfonated fatty acids. I. G. FARBENIND A-G. Brit. 296,999, Sept. 10, 1927. Acid- and lime-resisting products are obtained by sulfonating unsatd. fatty acids such as oleic acid with fuming sulfuric acid in the presence of halogenated unsatd. hydrocarbon derivs.: e. g., oleic acid is treated with fuming sulfuric acid in the presence of trichloroethylene; or castor oil may be similarly treated. Cf. C. A. 23, 1512.

Sulfonating oils, etc. ERBA A-G. Brit. 296,935, Nov. 22, 1927. The process described in Brit. 294,621 (C. A. 23, 2057) for sulfonating castor oil or similar fatty oils in the presence of bleaching agents is used for the sulfonation of other animal or vegetable oils, fats, fatty acids or waxes which are capable of sulfonation; e. g., polybasic acids such as mucic, adipic or suberic acids and waxes such as Japan wax, beeswax or carnauba wax. The sulfonation may be carried out with org. sulfonic acids such as β -naphthalenesulfonic acid, with or without H_2SO_4 , and the products may be used for treating textile materials and are capable of softening natural or artificial fibers or spun yarns.

Sulfonated oils. H. TH. BOHME A-G. Fr. 647,417, Jan. 17, 1928. Fatty acids or their glycerides are sulfonated with excess H_2SO_4 at a temp. below 0° , if necessary with the addn. of diluents to keep the mass liquid. An example is given of the sulfonation of ricinoleic acid with an equal weight of H_2SO_4 at -10° and in the presence of half the weight of C_6H_6 .

Extraction of oil from livers. ALFRED EHRENREICH. Fr. 647,941, Jan. 30, 1928. An oil is extd. from the livers of plagiostomes, especially sharks, by grinding and pressing or steaming or by org. solvents. It m. -15° and may be used as a food or in pharmacy.

Purifying oils. AKT.-GES. FÜR KOHLENSÄURE IND. and E. B. AUERBACH. Ger. 472,212, Feb. 13, 1927. Addn. to 460,531. Ger. 460,531 describes the purification of mineral oil mixts. or their sepn. into constituents by extr. with liquid CO_2 . This method is now applied to other oils, e. g., fatty, resin, or ethereal oils, or to mixts. of such oils with mineral oils. Examples are given describing (1) the sepn. from an illuminating oil of petroleum and colza oil, and (2) the purification of (a) crude colza oil, (b) crude amber oil, and (c) residues from the manuf. of turpentine.

Moistening cottonseed meats preliminary to extraction. HERMAN C. GRAEBE (to Proctor & Gamble Co.). U. S. 1,707,949, April 2. An app. is described in which the meats are moistened while passing through a continuous feeding device and then are allowed to stand in a closed receptacle for at least 1 hr. before further treatment.

Soap. ERNST FLAMMER and L. C. KELBER. Ger. 472,047, April 12, 1925. Addn. to 428,878. Ger. 428,878 describes the manuf. of flaky products from a mixt. of a soap having 8-14% H_2O with a compd. evolving O , e. g., a perborate. It is now found that these products can be rendered transparent by including in the mixt. a higher hydrocarbon of the CH_4 or C_4H_8 series, or a hydroxy compd. or ester derived from such a hydrocarbon. Examples are given describing the use of cetyl palmitate and gently oxidized paraffin free from acid. Cf. C. A. 22, 508.

Soap. HANS HOFFMÜLLER VON KORNATZKI. Ger. 472,410, Aug. 27, 1925. See U. S. 1,684,336 (C. A. 22, 4266).

Soap. INDUSTRIAL SPRAY-DRYING CORP. Fr. 647,341, Jan. 5, 1928. An app. is described for producing a soap in the form of globular particles of a uniform size by injecting molten soap into a gas heated to about 149° . Cf. C. A. 22, 4854.

Soap cakes with flat fillers of wood, celluloid, paper or other material insoluble in water. ROGERA UNKAMP. U. S. 1,707,334, April 2. Structural features.

28—SUGAR, STARCH AND GUMS

J. K. DALE*

Possible economies in the sugar industry. V. SÁZAVSKÝ. *Listy Cukrovar.* 47, 294-9(1929).—A discussion.

Sugar technology in the year 1928. O. W. WILLCOX. *Facts About Sugar* 24, 230-2, 236(1929).—Recent trends and improvements in the technology of beet and cane sugar are briefly reviewed.

Aid to a sugar chemist. OTTO SCHÄFFER. *Listy Cukrovar.* 47, 315(1929).—S. describes a logarithmic rule which computes the quotient and percentage of sugar from polarization readings and sp. gr. and which eliminates the use of tables.

Does the Petree process pay in Tucumán? W. M. GRAYSON. *Planter & Sugar Mfr.* 81, 381-3(1928); *Intern. Sugar J.* 31, 75-81(1929).—At the present time of low prices and overproduction of sugar in Tucumán, it is very important to consider how production costs may be lowered without impairing yields and quality of output. The Petree process has for its objective the elimination of the filter press station with its costly upkeep in filter press cloths, labor, extra evapn., and addnl. lime, and to increase the capacity of the evaporators and of the mills. All of these items of saving being reviewed, it was found over a period of 4 years that the saving amounted to \$0.47 (Argentine currency) per ton of cane and about \$0.06 per 10 kg. of sugar; the answer is that it does pay.

The maintenance of vacuum in sugar factories. ALFRED L. WEBER. *Facts About Sugar* 24, 233-6, 254-7(1929).—W. discusses the pressure relations required, the functions of vacuum pumps and condensers, the effects of condenser-water temp., selection of condensers, the advantages and disadvantages of the use of individual condensers for each evaporator or pan versus central condenser plants, and the advantages of multijet condensers versus vacuum pumps. The article is well illustrated with charts.

The lime kiln in the sugar factory. A. BERINGER. *Sucr. Belge* 48, 61-9, 81-7, 141-50, 164-70, 181-90(1928-29). The subject is discussed at great length. The theoretical side is well handled, and conclusions are drawn as to the practical application of the theory. The following topics are covered: ratio of C to CaCO_3 ; ratio of air to C; time of contact of solid and gas; relative size of the C and CaCO_3 ; irregularities of the currents; relative speed of the currents; control of the kiln. An analysis of the phenomena which occur in a kiln is given.

Conductivity ash determination in sugar factories in Natal and Mauritius. R. G. W. FARNELL. *Intern. Sugar J.* 31, 86-7(1929); cf. *C. A.* 21, 1025, 2569, 2394; 22, 2677. —The results of work with the "Salometer" in some factories in Natal and Mauritius are reported. The factors correlating cond. and gravimetric ash were detd. experimentally and found to agree with those of Zerban and Lundén. The ash throughout is higher in Natal than in Mauritius raw sugar factories. The high chlorides in Natal juices are notorious and adversely affect the recovery. There is invariably an increase in ash during clarification by sulfo-defecation. In the raw sugar factory the cond. ash method provides the chemist with a new simple means of controlling the clarification, since an excessive rise in cond. points to irregularities in defecation.

Rapid method for the determination of phosphoric acid in sugar factory and refinery products. R. G. W. FARNELL. *Intern. Sugar J.* 31, 149-52(1929). The important role of phosphates in clarification of cane juices is now being generally recognized. It is known that the P_2O_5 content of mixed juices should be about 0.005 or over, and in Natal this is sometimes raised to 0.05 or 0.06 on account of the high colloid content of the juice. It is highly desirable, in order to insure the satisfactory clarification of cane juices, to det. the P_2O_5 content of the juices and to increase it when necessary. A rapid method for the detn. of P_2O_5 would be very valuable as a method of control in sugar house operations. The coeruleomolybdate method of phosphate detn. depends on the formation of a blue color formed on the addn. of acidified NH_4 molybdate to a very dil. phosphate soln., followed by a few drops of SnCl_2 . Two solns. of reagents are required: (1) 25 g. of NH_4 molybdate dissolved in 250 cc. of H_2O .

* Doctor Dale has kindly consented to do the editorial work for this section while Dr. F. W. Zerban is away on a trip of several months. Dr. Zerban has gone to Java. He will resume charge of the section on his return to the United States.

to which is added 750 cc. of H_2SO_4 , 50% by vol.; (2) 0.1 g. pure tin dissolved by warming in 10 cc. of concd. HCl , to which is added one drop of a 4% soln. of CuSO_4 . The standard phosphate solns. are prepd. as follows. (A) A soln. of 1.34 gs. of $\text{Na}_3\text{PO}_4 \cdot 12\text{H}_2\text{O}$ in 250 cc. of H_2O contains 1 mg. P_2O_5 per cc. This soln. is diluted to make standards contg. 0.01 and 0.005 mg. of P_2O_5 per cc. The color developed in solns. tested with standard reagent is compared with that of the standards. 97.1% of the P_2O_5 in the treated juices is removed as $\text{Ca}_3(\text{PO}_4)_2$ during the clarification and settling, at a pH of 7. Experience has shown that the application of phosphatic fertilizers to the soil increases the P_2O_5 of the mixed juices from the cane grown on the soil.

W. L. OWEN

The control and accounting of a cane sugar factory. R. H. KING. *Planter and Sugar Mfr.* 81, 261-3, 283-300(1928).—A complete and critical discussion of chem. control and sugar accounting.

J. F. BREWSTER

The cane sugar industry of Spain. J. VAN HARREVELD. *Planter and Sugar Mfr.* 81, 161-3(1928).—See C. A. 22, 4857.

J. F. BREWSTER

Sugar cane varieties in Cuba. F. S. EARLE. *Planter and Sugar Mfr.* 81, 361-2, 383-5, 404-5, 424-39, 443-60, 462-4, 482-4(1928).—A comprehensive survey including the history of cane varieties in Cuba with tables showing sucrose content, purity, etc., of the different varieties.

J. F. BREWSTER

Note on the canes common in northern India. NOEL DEERR. *Planter and Sugar Mfr.* 81, 485-500(1928).

J. F. BREWSTER

The respective merits of the P. O. J. 36, 213 and 234 canes in Argentina. W. E. CROSS. *Planter and Sugar Mfr.* 81, 421-4(1928).—From a partial census of the cane varieties grown in Argentina the relative merits of the 3 varieties are discussed on the basis of germination, growth habit, response to fertilizer, resistance to frost and to diseases and pests, fiber content, yield, etc. Preference is in favor of P. O. J. 36 while the use of 234 has practically ceased.

J. F. BREWSTER

A clean culture system of sugar cane insect control. W. D. PIERCE. *Planter and Sugar Mfr.* 81, 481(1928). Ratooning may sometimes be a disadvantage in the Philippines. Elimination of grass and weeds is recommended.

J. F. BREWSTER

Tillage and cultivation practices which will aid in field drainage. GENEROSA VILLANUEVA AND ATHERTON LEE. Philippine Sugar Assoc. *Planter and Sugar Mfr.* 81, 461-2(1928). Standing water on cane fields is held to be the worst enemy of the cane in the Philippines. Methods of promoting drainage are suggested.

J. F. BREWSTER

Studies in sugar cane physiology: germination gradients. AUGUSTO BONAZZI. *Planter and Sugar Mfr.* 81, 181-3, 203-19, 225-39, 244-60(1928).

J. F. B.

Sugar cane seedlings. J. A. VERRET. *Facts About Sugar* 24, 182-5, 189(1929); cf. C. A. 22, 2677. Extensive expts. on the preservation of cane seed in the atms. (a) air, (b) O_2 , and (c) CO_2 , with various degrees of desiccation for each gas, leads V. to recommend the following procedure: Air-dry the tassels promptly, using a desiccated atm. if necessary, until the fuzz is crisp and shatters easily. Strip the fuzz from the tassels and place it in cans. Introduce CO_2 to displace the air. Desiccate the atm. with 9 g. CaCl_2 for each 1000 cc. of the volumetric capacity of the can. Place the CaCl_2 in four or five small cans covered with cheesecloth and distribute these cans throughout the fuzz mass in each seed can. Again introduce CO_2 , cover the seed cans and seal them air-tight with paraffin or sealing wax. Place the sealed cans in cold storage at 31°F . The whole procedure from cutting the tassels to placing in cold storage must be carried out within 7 days. Some of the seeds will be viable even after 9 months. Covering the fuzz in the germination flats with a thin dressing of volcanic ash is distinctly beneficial. The article contains a description of the methods used in the Hawaiian centralized cane-breeding work and a summary of the replies to the questionaire on seedlings.

M. J. PROFFITT

The gummosis of sugar cane. MELVILLE T. COOK. P. R. Insular Agr. Expt. Sta. Rio Piedras. *J. Dept. Agr. P. R.* 12, 143-79(1928).—Gummosis of sugar cane is a bacterial disease caused by *Bacterium vascularum*. The organism lives in the tracheary tissues of the fibrovascular bundles. Sometimes it dissolves the cell walls and spreads into the surrounding tissues of susceptible canes and into young tissues of somewhat resistant canes. The organism produces a gum which oozes out of the cut ends of the infected canes. The disease kills many young canes and causes a reduced yield, varying with the susceptibility of the variety and the severity of the attack. The gum interferes seriously with the crystn. of the sugar in the mills. The % of infection is higher on plant than on ratoon cane, but in all cases the yield on the ratoons was reduced. The leaf symptoms are more pronounced during wet than dry

weather. Many of the best varieties in P. R. are immune or highly resistant. Infected cane should never be used for com. planting. C. R. F.

The purchase of cane by its analysis. E. E. DOMINGUEZ. *Facts About Sugar* 24, 88-91, 95(1929).—Formulas and a method of operation of a proposed new system for Cuba are given. M. J. PROFFITT

Individual composition of sugar canes in a furrow and its importance in the method of sampling for analyses. WM. E. CROSS, A. S. ALVAREZ AND ISAAC MENOFF. *Rev. ind. agr. Tucumán*. 19, 141-5(1928).—The yield in the factory often differs from that calcd. by the planter or the Expt. Sta. (Tucumán). This has hitherto been explained by the difference in extn. conditions. But there is now found to be considerable variation in wt. and chem. compn. of stalks in the same furrow. Wts., Brix, sucrose and purity are given for 493 cane stalks; it is concluded that the custom of estg. the yield from a field or row of canes from the analysis of 1 or 2 stalks or even 3, may lead to erroneous results. A probability table of errors is shown for analyses of samples of 5, 10 and 20 canes. A sampling method is given, which uses at least 20 stalks. S. L. B. ETHERTON

The Maxwell crusher shredder. ANON. *Intern. Sugar J.* 31, 24-5(1929).—A report of the Java Sugar Expt. Sta. on the Maxwell crusher shredder, verifying the guarantee that the Popah factory would obtain with its milling train of a crusher shredder, 30 × 60 in., and 3 mills, 32 × 72, at a crushing capacity of 1100 tons daily, the same results as obtained in a similar factory having a crusher and 4 mills. Conclusion: A Maxwell shredder roller equals one mill. W. L. OWEN

Yield determination from crusher juice analysis. J. A. ROIG. *Facts About Sugar* 24, 283(1929).—For judging the quality of the cane being ground, R. proposes a formula which is based on the sucrose content and on the Brix of the crusher juice, but which involves also various "constants" that are characteristic of the individual factory's performance, including its Java ratio (sucrose in crusher juice/total sucrose in cane). M. J. PROFFITT

Cane-wax complex in juices from cane-sugar mills. C. F. BARDORF. *Ind. Eng. Chem.* 21, 366-8(1929).—Evidence from the migration of the cane-wax complex traced through 4 Cuban mills shows that the complex remains stable throughout all of the process of the mill, whether the source of the juice is from normal, old, or dead canes. C. F. ROGERS

Insoluble solids in raw cane juice. E. M. CORP. *Facts About Sugar* 24, 210-1(1929).—C. describes a method of computing the quantity of insol. solids from the data ordinarily recorded in sugar mills. M. J. PROFFITT

Digestion of sugar juices. BEDŘICH NEUMAN. *Listy Cukrovar.* 47, 330-2(1929). A sample computation of yields in a refinery gained in the last season. F. M.

Methods of boiling sugar. ANON. *Intern. Sugar J.* 30, 652-5(1928).—A discussion of the methods of sugar boiling in Cuba, Hawaii, Argentina and Queensland, at the Second Conference of the Intern. Society of Sugar Cane Technologists. W. L. OWEN

Judging sugar by taste. A. A. RICHTER. *Zhurnal Opuitnoi Agron. Yugo Vostoka (J. Exptl. Landw. Sudost. Eur.-Russlands.* 3, 101-6(1927); *Exptl. Sta. Record* 58, 611). Various concns. of solns. of glucose, sucrose and fructose were prepd. in the same manner and placed in beakers; 10 cc. of each was tasted, and the presence, absence or doubt of presence of sugar was recorded. From these data the ratio of sweetness was estd. as follows: fructose 100, sucrose 66, glucose 45. H. L. D.

Molasses formation. O. SPENGLER, F. TÖDT AND CH. SHEN. *Z. Ver. deut. Zuckerind.* 78, 747-59(1928).—The results of Schukow (*Z. Ver. deut. Zuckerind.* 1900, 291-321) on the soly. of sugar in salt solns. are recalc'd. It is shown that the power of the salt for increasing the soly. of sugar is inversely proportional to the degree of hydration of the salt. This was checked by cond. measurements. Detns. of the salt-sugar solns. show a relationship between salting-out action and the mol. vol. of the salt. The work shows that a highly hydrated salt has a low equiv. cond. and a small tendency to dissolve sugar, while a salt with a low hydration has a high cond. and a great tendency to dissolve sugar. The series in order of affinity for sugar is KBr, KCl, NaCl, LiCl. Thus, if the same amt. of sugar is added to solns. of LiCl and of KBr, the sugar would have the greatest effect on the cond. of the LiCl. It is shown that for salt solns. below 0.1 N the affinity of salt for water is without influence on equiv. cond.; thus in dil. solns. the affinity of salt for sugar can be observed. This gives a series of salts which one would expect from Schukow's work. E. A. F.

Influence of the basicity of basic lead acetate in the clarification of molasses solutions. R. SOMMER. *Z. Zuckerind. Tschoslovak. Rep.* 53, 45-52(1928). The basic Pb ace-

tate prescribed for sugar analysis contains 31.9% of its Pb in the form of oxide. If solns. contg. a higher proportion of oxide to normal acetate are used, lower values are obtained for the polarization of beet molasses, assuming that the same total amt. of Pb is used for a given wt. of molasses. If the defecant contains 57% of its Pb as oxide, it may lower a molasses polarization of 50 by 1-2 units. The extent of the lowering is a direct function of the original alky. (p_H value) of the molasses; but no alky. likely to occur in practice will produce any lowering when basic Pb acetate of the usual compn. is employed. The decolorizing effect (always assuming the use of the same total amt. of Pb for a given wt. of molasses) increases with the proportion of PbO until this reaches 39-52%, but beyond this limit it diminishes rather rapidly. With 48% of the total Pb as oxide, decolorization is much better than with the usual proportion; the lowering of polarization can be prevented by previous neutralization of the soln. with acetic acid.

B. C. A.

Vegetable char refining on the plantation. J. P. FOSTER. *Intern. Sugar J.* 30, 595-8; *Planter and Sugar Mfr.* 81, 304-5 (1928).—F. reviews the arguments that have been published in favor of the manufl. of refined sugars by the sugar factories both in La. and in Cuba, and concludes that the arguments for the latter country apply as aptly to Hawaii. At present there is no incentive to make 98 or 99 test sugar; to do so means a penalization for the extra polarization of these grades. There is no difficulty of redesigning the av. sugar factory so as to have an adequate supply of fuel for refining. Much of the app. used in refining is a duplication of the equipment used in raw sugar manufl. The cost of erecting a sugar refinery for the use of vegetable chars in connection with a sugar factory may be roughly estd. at \$120,000 for a 100-ton plant, \$200,000 for a 200-ton plant, and \$275,000 for a 300-ton plant. The cost of refining with vegetable char on a La. estate has been estd. at 25.1cts. per 100 lbs. during the grinding operations and 45.7cts. during the dead season.

W. L. OWEN

The behavior of oxalic acid during clarification. O. SPENGLER AND C. BRENDL. *Z. Ver. deut. Zuckerind.* 78, 729-46 (1928).—Ca oxalate is found in the scale of the 3rd cell of the evaporators. A series of lab. expts. is described. Conclusions: (a) The soly. of Ca oxalate is altered only slightly, ranging from 0.0008 to 0.0010% for sugar solns. of 12 to 60° Brix.; the temp. has hardly any effect. (b) Ca oxalate goes into soln. in not insignificant quantities during the liming of the juice; but these quantities are reduced to the low figure of some 0.001% Ca oxalate in the first carbonatation. In the second carbonatation the Ca oxalate still present in soln. is changed into CaCO_3 or CaSO_4 by double decompn. with Na_2CO_3 or Na_2SO_4 , while the oxalic acid remains in soln. as alkali oxalate, and, because of the presence of sufficient natural alky., is not able to be converted into Ca oxalate. In practice sometimes a heavier scale than can be expected is formed in a very short time. Here one may assume as a most probable explanation for the great amt. of Ca oxalate found in the scale, that the non-sugar, perhaps colloids, hinders the pptn. of the Ca oxalate in the first carbonatation; that the amt. of Ca oxalate present in soln. remains as such, and that in the final carbonatation it is not transformed if the natural alky. is low even for a short time. E. A. F.

Cleanliness for evaporators. LOUIS BORSY. *Sucr. belge* 48, 201-5 (1928).—A review is given of hand and mech. devices for removing incrustations from evaporators. The advantages of the new Devoorde mech. scale-remover are discussed. E. A. F.

Methods for determining the speed of crystallization. M. I. NAKHMANOVICH AND I. F. ZELIKMAN. *Nauchnuie Zapiski* 6, 32-53 (1928).—A review of the literature.

V. E. BAIKOW

Experiments on measuring the speed of crystallization of sucrose from beet products. M. I. NAKHMANOVICH AND I. F. ZELIKMAN. *Nauchnuie Zapiski* 6, 109-22 (1928).—Kukhareenko's method was used. The relation between concn. of non-sugars and speed of crystn. was investigated, but not the influence of viscosity or compn. of non-sugars. First and second massecuites and greens were used, with a purity of 90, 80 and 70%, resp. The speed of crystn. was calcd. by the formula: $\eta = (\Delta M / (s \times t))$, where ΔM is the wt. of sugar in the surface of the crystal in mg.; $s = (4.12 \sqrt[3]{M^2})$ is the av. surface of the crystal in sq. mm.; t is the duration, in min., of the contact of the crystal with the soln.; M is the wt. of the crystal. Expts. were made to det. the relation between speed of crystn., degree of supersatn. and purity. It was found that for materials of high purity the rate of crystn. increased very rapidly with increasing supersatn. With low purity products (about 70) increase of supersatn. produced only a slight increase in speed. For any given purity the speed of crystn. was found roughly proportional to the coeff. of supersatn. Increase of concn. of non-sugars in factory products sharply lowered the speed of sucrose crystn. The results of lab. expts. and factory work were somewhat different, but this is due to the modern crystallizers, which

should be modified because only large lumps of fillmass are mixed and diffusion is not sufficient. A no. of tables and diagrams are shown. V. E. BAIKOW

Significance and determination of temperature coefficients in the study of inversion. V. ZAFOUK. *Z. Zuckerind. čechoslovak. Rep.* 53, 73-9(1928).—Measurements of the inverting capacity of weak acids at different p_H values showed that no inversion occurs beyond about p_H 6. The p_H values of solns. of weak acids, or of mixts. of the acids and their salts, vary to some extent with temp.; the variations are not the same with different acids; differences up to 0.1 in p_H value were observed between 20° and 70°. Curves are given showing the p_H values and corresponding temp. coeffs. for different stages of neutralization of succinic, aspartic, acetic, glutimic and glutamic acids. For practical purposes a factory juice which is slightly alk. to phenolphthalein will be safe from inversion, provided it has no tendency to become more acid in course of time or on heating. B. C. A.

Studies of the diffusion liquors with respect to the possible inversion of sucrose and effect of microorganisms. VOJTECH MAKEŠ. *Listy Cukrovar.* 47, 290 4(1929); cf. C. A. 22, 2481.—Previous investigations show that diffusion liquors contain 0.1% more invert sugar than beets, and that the increase seems to be due to the acid reaction of the liquor. Diffusion liquors were digested at 90° for as long as 6 hrs. with and without lime. The difference in polarization between the two liquors is greater than can be effected by CaO and is ascribed to the acidity of the juice, for enzyme or microbiological action is not possible at 90°. The purification of the liquor progresses further at 90° than when the CaO is added to a cold soln. A yeast growth upon a batch of liquor showed a predominance of *Torula utilis* Henneberg, which grows upon glucose-agar media in circular, gray colonies of concentric layers and elevated centers. The forms of yeast are irregular, elongated, coarsely granular and without vacuoles. The content of glycogen and albumin depends upon the type of media used for culture. The structure is greatly influenced by the N_2 present in the substrate. This yeast is not a spore former and ferments glucose, fructose, maltose and sucrose. It has an optimal temp. slightly above 30° and a max. at 40°; in diffusion liquors a fruity odor is evolved. It is also widely distributed with vegetation, H_2O , soil, etc. *Zygosaccharomyces* was also isolated from the same batch. It ferments, intensively, a 10-20% soln. of sucrose, glucose and fructose and forms a cloudy sediment, which settles well and is not covered by a scum. In sugar solns. or on a substrate of solid sugar, a weak fruity odor is evolved. The forms are round or oval; older forms become granular and contain vesicles, but do not contain vacuoles as a rule. Upon agar 1-3 round spores form, and prior to their formation, copulation of the yeast cells occurs; this act differentiates them from *Saccharomyces cerevisiae*. To 1 l. of sterile diffusion liquor is added 2.62 g. of yeast cells settled in the basin and maintained at 30° (the 2.62 g. represents the concn. of cells in the soln. in the factory basin). The polarization during 15-min. intervals shows a drop of 0.97% during the 1st interval and continues to act more rapidly. Fermentation changes the p_H from 5.9-6.1 to 5.1-5.2 with an evolution of CO_2 and great amount of foaming after shaking. The odor is mild and fruity. An addn. of 0.25% Ca before fermentation stops or prevents the action of yeast cells. M. advises the addn. of CaO as a preventive of losses of sugar in infected liquors which cannot be sterilized by heat; in normal juices the addn. of CaO has a bad effect upon subsequent purification of said solns. FRANK MARSH

Steam accumulators. J. LEWIS RENTON. *Intern. Sugar J.* 31, 19 23(1929). This is an app. that stores the heat energy of steam at satn. pressure and temp. and releases this energy in the form of steam under decreasing pressure. It enables the plant load to fluctuate between wide limits without necessitating any change in the firing of the boilers to maintain uniform steam pressure. The 2 types in use are the high-pressure flash type and the large-capacity storage type. The high-pressure type is not applicable to sugar house work, but the large-capacity storage type has found wide application in the industries of Europe and is receiving much attention in America. The advantages claimed for the Ruths steam accumulator are: reduction in fuel consumption, reduction in boiler maintenance, simplification in boiler control, maintenance of const. steam pressure, maintenance of uniformity of product, increase of production and reduction in initial cost of new boiler installation, and increase of steam-generating capacity. W. L. OWEN

Deposits in the carbon dioxide pipes. O. SPENGLER AND C. BRENDEN. *Z. Ver. deut. Zuckerind.* 78, 644-5(1928).—During the last campaign white-gray deposits were noticed in the valves of the CO_2 pumps, in 2 factories, reducing the efficiency of the pumps. The phenomenon has been previously recorded on several occasions. The deposit consists mostly of K_2SO_4 , Na_2SO_4 , and some NaCl. It is thought that

the alkali sulfate is volatilized from the kiln as alkali carbonate, which later combines with the SO_2 from the coke. On locating the place where the deposit is formed, steam and water may be used to wash it off. Tarry matter may be removed from the valve chambers of the pumps by the injection of petroleum.

The performance of the continuous diffusion battery of E. R. Kraevskii. I. DUSH-SKII, *et al.* *Nauchnuie Zapiski* 5, 380-3 (1928).—A committee report. E. A. FIEGER

Factors in milling. J. LEWIS RENTON. Assoc. Hawaiian Sugar Technologists. *Planter and Sugar Mfr.* 81, 222-4 (1928).—See *C. A.* 22, 1247. V. E. B. J. F. BREWSTER

Tarlac factory, Philippine Islands. ANON. *Planter and Sugar Mfr.* 81, 401-4 (1928).—A description of a factory designed, engineered and delivered complete to the Compañia General de Tabacos de Filipinos at Tarlac, P. I. J. F. BREWSTER

Some aspects of the manufacture of starch and glucose. J. A. McLACHLAN. *J. South African Chem. Inst.* 12, 3-15 (1929).—A summary and description of the industrial operations. ALBERT L. HENNE

The role of K in the culture of the sugar beet (WAGNER) 15. Java soils (VAN HARREVELD-LAKO) 15. Some effects of sub-soil fertilization on the tops and root system of H-109 cane (WELLER) 15. C_{10}H_8 treatment of beet seeds to repel parasites (STEHLIK) 15. Filter cloth investigations (SANDERA) 13. Soil surveys once more (EARLE) 15. Soil surveys in Java and Cuba (McCALL) 15. Carbohydrates. VII. Starch acetate (BRIGL, SCHINLE) 10. Direct determination of metal corrosion by the measurement of current density and its significance [in sugar industry] (TÖDT) 9. Extraction plant for sugar (Fr. pat. 647,239) 1. Fertilizers [from vinasses] (Fr. pat. 647,267) 15. Fertilizers [from vinasses] (Fr. pat. 33,696) 15. Regenerating kieselsol after use for filtration [of sugar solutions] (U. S. pat. 1,708,362) 18.

Sugar recovery from scums. H. CLAASSEN. *Brit.* 296,985, Sept. 10, 1927. Sugar remaining in the exhausted scums of beet-sugar works is recovered by mashing and digesting the scum cake, removing from the filters with water at a "fairly high" temp. and sepg. the particles of sediment by filtering or otherwise, and returning the sugar-contg. liquid as wash liquid for the filter presses or introducing it at another stage of the refining process.

Mixing and precipitation apparatus suitable for precipitating saccharates from Steffens waste waters. RALPH W. SHAFOR, ALPHEUS R. NEES and ROBERT J. BROWN. *U. S.* 1,708,332, April 9.

Drying saccharate scums. RAFFINERIE TIRLEMONTAISE (SOC. ANON.). *Fr.* 647,056, Jan. 13, 1928. See *Brit.* 290,265 (*C. A.* 23, 1007).

Lixiviating apparatus for bagasse, etc. NICOLAAS NOBEL. *Fr.* 647,823, Dec. 19, 1927.

29—LEATHER AND GLUE

ALLEN ROGERS

Standards in the leather industry. C. H. SPIERS. *J. Intern. Soc. Leather Trades Chem.* 12, 602-8 (1928).—Standards imply specifications, and the promulgation of a specification implies (1) that it is known what the desirable qualities are; (2) that these qualities can be measured; (3) that it is known what the most desirable value for each desired and measurable quality is and (4) that the manuf. process is such that the specified values can be attained in practice with reasonable effort. The state of affairs regarding specifications in the leather industry is reviewed. *Hides and skins.*—Virtually no specifications exist. Specifications defining and limiting physical defects, method of curing, % H_2O_2 and % mineral matter could and should be drawn. *Accessory materials.*—Most of these are more or less homogeneous and capable of analysis. The lack of specifications in buying these materials is not justified. *Tannery liquors and semi-finished products.*—Methods of analysis exist but interpretation of results is often difficult. Each tannery should work out a set of data corresponding to normal working. *Finished leather.*—Here the tanner often cannot avoid working to specifications. It is very difficult to connect up desirable qualities with conventional, measurable qualities. Existing specifications cover very few types of leather, and most of them are defective. The situation may improve in the near future as the result of committee work now in progress.

Casein in the leather industry. G. GENRIN. *Halle aux cuirs* 1928, 373-8; 1929, 13-9.—A review. H. B. MERRILL

Determination of (enzyme) strength of a bate. ALBERT BOLDIN. *J. Intern. Soc. Leather Trades Chem.* 12, 614-25(1928).—The casein method has been adopted by the I. S. L. T. C. for detg. the enzyme strength of a bate. Expts. were undertaken to det. the effect of various factors upon that method. The procedure consisted in digesting casein soln. with different concns. of enzyme, acidifying, filtering undigested casein, and detg. digested casein (1) from the wt. of ppt. and (2) from the N content of filtrate. In general both methods gave the same results. Two specimens of pancreatic enzyme, and 2 bacterial cultures were employed. p_H value of pptn.—Complete pptn. is obtained at p_H = about 4.6, and the p_H value may be lowered to 2.5 without redissolving any casein. *Buffer salts.*—Phosphates retard the digestion and are difficult to wash out of the ppt. Casein dissolved in the vol. of NaOH previously detd. to give a soln. of p_H = 7.5-7.6 is in itself a good enough buffer to maintain the constancy of the p_H value within 0.1-0.2 unit. p_H value of digestion.—For pancreatic enzyme, the optimum is at p_H = 8. Bacterial enzymes have a wide optimum range. *Method of dissolving casein.*—Quantity of sol. N in a given specimen of casein is const., regardless of whether the casein is dissolved at 40° or at 100°. *Time of digestion.*—The rate of digestion falls off after 1 hr., which period is recommended. *Temp. of digestion.*—The rate of digestion increases with temp. up to 60°. Temp. has more effect on pancreatic than on bacterial enzyme. *Effect of hydrolysis products.*—Hydrolyzed casein inhibits the pptn. of unhydrolyzed casein. A mixt. of 16 parts of unaltered casein with 84 parts of hydrolyzed casein gave no ppt. upon acidification. For this reason, any method employing the complete digestion of casein as an end point is bound to be in error. H. B. MERRILL

Tannins. HELMUT THALER. *Mikrokosmos* 22, 94-6(1929).—A description of the chem. reactions and histology of the vegetable tannins. Photomicrographs of sections fixed with formol and stained with $Fe(NH_4)_2(SO_4)_2$ show the occurrence of tannin in (1) pine needle, (2) branch of *Betula verrucosa*, and (3) seed of *Adacta spicata*. H. B. M.

Influence of tannin on the p_H value of different acids. N. CHERNOV and S. SIPINA. *Vestnik (Organ of the All-Russian Leather Syndicate)* 1927, No. 8, 285; *Collegium* 1929, 45.— p_H values of solns. of HCl, H_2SO_4 , HOAc and lactic acid, dild. from 0.1 N to 0.02 N with H_2O and with 1° Bé. solns. of different tanning exts., are tabulated. All tanning exts. lower the H-ion concn. more than H_2O . The effect is greatest for weak acids. The magnitude of the rise in p_H value varies with the material. H. B. MERRILL

Determination of insolubles in tanning extracts. ANDREW TURNBULL. *J. Am. Leather Chem. Assoc.* 24, 121-4(1929); cf. *C. A.* 22, 2681.—A filtering layer of kaolin is formed on a porous glass septum in a Buchner funnel. Non-plastic kaolin is made by grinding white fireclay brick to pass a 100-mesh sieve, digesting with HCl and HNO_3 , washing with water, and mixing with 0.1 part of ordinary kaolin. McCandlish and Atkin's filtration app. is used. The results obtained check satisfactorily with the filter candle method and the filter paper-kaolin method. H. B. MERRILL

Tanning experiments with synthetic tanning materials. J. BERKMANN. *Vestnik (Organ of the All-Russian Leather Syndicate)* 1928, No. 5, 211-3, No. 6/7, 203-6; *Collegium* 1929, 35-9.—Analyses are given of leathers tanned with a wide variety of mixt. of synthetic, vegetable and chrome tanning materials. H. B. MERRILL

Chrome tanning. XVIII. Analytical figures for leather, especially chrome. D. BURTON and H. CHARLTON. Wm. Walker & Sons, Ltd., Bolton, Eng. *J. Intern. Soc. Leather Trades Chem.* 12, 210-6(1928); cf. *C. A.* 22, 4269.—The sum of the percentages of grease (gasoline ext.), H_2O -sol. matter, ash, hide substance and H_2O should be slightly less than 100. Analyses of numerous leathers show that the total is frequently 5-12% less than 100. This is attributed: (1) To failure of gasoline to ext. all fatty matter. Material not extd. by gasoline and not included in any other analytically detd. quantity includes (a) some animal skin fat, (b) sulfonated oil, (c) neutral soap, (d) oxidized fat (e) rosin, and (f) S. Data are presented illustrating (b) and (d). (2) To failure to ext. all matter sol. in H_2O . (3) To interference of grease in waterproofed leathers with the Kjeldahl detn. of N. It is recommended that such leathers be degreased before Kjeldahl digestion. The Hg-displacement method for detg. sp. gr. is advocated. H. B. MERRILL

Effect of heat on wetted vegetable-tanned leathers. H. W. J. CHATER. Northampton Tech. Coll., Northampton, Eng. *J. Intern. Soc. Leather Trades Chem.* 12, 608-14(1928); cf. *C. A.* 23, 1768.—Strips of pelt pretreated with acid, alk. and mineral solns. have characteristic shrinkage curves. Leather contg. excessive amts. of mineral acid begins to shrink at a lower temp. than normal leather. This is advocated as a method of detecting mineral acid. H. B. MERRILL

Effect of neutralization of chrome leather upon fat absorption. HENRY B. MERRILL and JOSEPH G. NIDDERCORN. *Ind. Eng. Chem.* 21, 364-6(1929).—When Cl₂ is thirt

samples were neutralized with increasing amts. of either borax or NaHCO_3 and subsequently fat-liquored with sulfonated neatsfoot oil, the samples from which the least H_2SO_4 was removed took up the most oil, when the fat-liquor contained an excess of oil and when the time of fat-liquoring was 30 mins. Upon increasing the time of fat-liquoring, the amt. of fat taken up by the more completely neutralized samples approached that taken up by the samples contg. the most H_2SO_4 . The excess oil absorbed by the more incompletely neutralized samples is found entirely in the surface layers of the skin. The quantity of oil absorbed is not a function of the pH value of the neutralizing bath, except insofar as this det. the amt. of acid left in the leather. The effect is explained as due to the lowering of the p d between oil droplets and skin which results from neutralization of the leather.

H. B. MERRILL

State of combination of acid sulfate in chrome leather. HENRY B. MERRILL AND JOSEPH G. NIEDERCORN. A. F. Gallun & Sons, Milwaukee. *Ind. Eng. Chem.* 21, 252-3 (1929).—Previous work has shown that much of the acid sulfate of Cr-leather is attached to Cr, and that the diffusion-neutralization titration with methyl red is the most reliable means for detg. protein bound sulfate. From the behavior of the leather in neutralization it is deduced that the difference in hydrolyzability between protein-bound and Cr-bound sulfate is so small that if all the former is removed more will be regenerated by hydrolysis of the latter. From this it follows that the % of protein-bound acid is a function of the acidity of the sulfato-chromi complex. This is shown experimentally to be the case for leather contg. a sulfato-chromi complex of acidity = 0.17-0.33. When acidity is < 0.17, no protein bound sulfate is present, and if leathers of acidity 0.33 are treated with acid, all the acid taken up is protein bound.

H. B. MERRILL

Removal of chrome salts from leather. F. C. HEMMINGS AND M. C. LAMB. Leathersellers' Tech. Col., London, Eng. *J. Intern. Soc. Leather Trades Chem.* 12, 599-602 (1928).— $(\text{NH}_4)_2\text{C}_2\text{O}_4$ has long been known as a stripping agent. Free $\text{H}_2\text{C}_2\text{O}_4$ works much more rapidly. The liquor produced is deep purple, turning to green on addn. of NH_3 . $\text{Cr}(\text{OH})_3$ is not pptd. even on boiling. NaOH ppts. $\text{Cr}(\text{OH})_3$ on long boiling. Na phosphate gives no ppt., and CaCl_2 only a very slight ppt. even on boiling. The soln. contains an oxalato-chromate, perhaps trioxalato chromium, $\text{Cr}(\text{C}_2\text{O}_4)_3$, described by Werner. To form trioxalato chromium, Cr-leather shaving contg. 4% Cr_2O_3 would require 10 lbs. $\text{H}_2\text{C}_2\text{O}_4$ per 100 for complete stripping. This proportion was tried, and complete stripping was obtained in several days, but quicker results were obtained by using 15 parts per 100 of $\text{H}_2\text{C}_2\text{O}_4$, and by washing out with NH_4OH , probably because NH_4 oxalato-chromates are more sol.

H. B. MERRILL

Properties of shoe leather. VII. Temper and break. JOHN A. WILSON. A. F. Gallun & Sons Corp., Milwaukee. *J. Am. Leather Chem. Assoc.* 24, 112-9 (1929); cf. C. A. 20, 3005.—Temper has 2 component factors, flexibility and recovery. An app. for measuring both factors is described. A strip of leather 1×6 in. is bent into a circle of exactly 4 cm. diam., and secured to a block. A scale pan suspended from a coil spring is made just to touch the leather by adding weights, and the addnl. weight (called W_1) required to crush the circle to $\frac{1}{4}$ its initial diam. is detd. Allowance is made for the thickness of the leather. The weight (W_2) required to lower the pan to the same level in the absence of the leather is detd. The flexibility factor, in g., is the difference between W_1 and W_2 . Flexibility factors, and % recovery are given for 16 leathers. The recovery factor is measured by noting the percent of return to the initial diam. after removing the wts. Bellies have lower flexibility factors than butts, but percent recovery varies very little. Splitting lowers the flexibility factor without having much effect on recovery. Break is measured by counting the wrinkles per cm. in a strip of leather drawn tightly around a glass rod 3.2 mm. in diam., grain side in. Values for break of 16 leathers are given.

H. B. MERRILL

Dyeing of goatskins. FRANK H. SCHORTEMAYER. *Dyestuffs* 30, 17-21 (1929); cf. *Leather* 2076.—Bark-tanned goatskins are usually retanned with chrome when good color penetration is desired as in stock for suede or grain finished leathers. Formulas, procedures and suitable dyes are suggested for clearing, retanning, dyeing, fat-liquoring and finishing the stock for both the suede and grain finish.

DON BROUSE

Consistency and gel formation (WAGNER) 2.

Borax and Boric Acid in the Tannery and Currying Shop. New York, Chicago and Oakland: Pacific Coast Borax Co. 96 pp. Gratis.
Gerbereichemisches Taschenbuch (Vagda-Kalender). 2nd ed., revised and enlarged. Edited by the Vereinigung akademischer Gerbereichemiker Darmstadt. Dresden and Leipzig: Verlag von Theodor Steinkopff. 218 pp. M 7.50.

Tanning leather. HERMANN BOLLMANN and BRUNO REWALD. Fr. 647,456, Jan. 18, 1928. An ingredient for facilitating the tanning of leather is obtained by swelling in water, or fatty oil such as fish oil, or fatty oil and sulfonated oil, lecithin of animal or vegetable origin with final soln. or emulsification in water. The mixt. contains a certain amt. of alkali or soap.

Tanning and finishing skins. MYRON LASKIN. U. S. 1,708,020, April 9. After tanning and buffing the flesh side of a skin the latter is treated with an aq. soln. of direct aniline black dye and gum tragacanth, and, after drying, the flesh side is further treated with a compn. formed from beeswax or carnauba wax soln., shellac, casein, albumin, oil of mirbane, prepd. blood, lampblack and water; after further drying, a shellac, casein and albumin coating is applied, and the flesh side is then dried and finally glazed or polished.

Textile fibers from fish skins. ALFRED EHRENREICH. 647,030, Jan. 13, 1928. Skins of fish, particularly chondropterygian selachians, are treated with lime and then submitted to the action of diastatic enzymes, rinsed and tanned for the production of textile fibers. Cf. *C. A.* 22, 4835.

Impregnating leather. OTTO RÖHM. Ger. 471,675, May 9, 1925. Addn. to 470,552. The method of Ger. 470,552 (*C. A.* 23, 1770) is modified by using, instead of water, an aq. soln. of substances having a clarifying or slight bleaching effect on the leather. Suitable substances are alkalies, e. g., NH_3 , alk. salts, e. g., Na_2CO_3 , and org. acids, e. g., $(\text{COOH})_2$.

Powdered-leather agglomerate. J. M. GONNISEN. Belg. 351,717, June 30, 1928. Leather dust is mixed with an adhesive prepd. by an acetone soln. of celluloid, the resultant paste is put through a press or is molded, and after removal of the excess of adhesive the articles are allowed to dry.

Artificial leather. E. I. DU PONT DE NEMOURS AND CO. Fr. 647,255, June 21, 1927. Artificial leather consisting of a fabric support and a film of a cellulose ester, e. g., pyroxylin, has a superficial layer which will reduce surface tension and is impermeable, non-viscous and flexible, preferably of casein mixed with a polyhydric alc. such as glycerol.

Imitation leather. E. KATZ. Brit. 206,661, Sept. 3, 1927. A fabric is finished with a dressing compn. contg. starch, calendered under high pressure, and treated with a dye (suitably an aniline dye) so as to produce an indistinct design, dried, treated with dye again (preferably of a darker shade than that first applied) and again dried. This treatment may be repeated, followed by further calendering and ornamentation such as graining.

30—RUBBER AND ALLIED SUBSTANCES

C. C. DAVIS

The oxidation of vulcanized rubber. A. VAN ROSSEM and P. DEKKER. Staatl. Kautschuk Forschungs-Institut, Delft. *Kautschuk* 5, 13-21 (1929). The expts. represent a systematic study of the nature of oxidation of vulcanized rubber. A rubber, S (97.5-7.5) mixt. was cured to different degrees, the vulcanizates were finely divided, were then stored exposed to air in diffused light, and periodically up to 18 months their wts., acetone exts., free S, combined S, alc. KOH ext., oxidation products in the alc. KOH ext. and aq. exts. were detd. The alc. KOH exts. were detd. by swelling the acetone-extd. samples in C_6H_6 , extg. with alc. KOH, filtering, washing, evapg. to a small vol., dissolving in water, acidifying and extg. with Et_2O . The products consisted of oxidation products and fatty acids from esters which were insol. in acetone. The alc. KOH ext. was a very sensitive quant. measure of the extent of oxidation, for it began to increase much sooner than did the acetone ext., reaching around 1/2 its original value before the acetone ext. increased appreciably. The aq. ext. increased even more slowly than did the acetone ext. When oxidation was extensive, a part of the alc. KOH ext. was insol. in Et_2O , so that detns. were impracticable beyond a certain stage of oxidation. The proportion of oxidation products in the alc. KOH ext. was detd. by boiling the dried original alc. KOH ext. with 0.5 N alc. KOH, extg. the insol. residue with water and drying the raw residue at 100° (cf. Dekker, *C. A.* 21, 195). A special investigation showed that (1) swelling with C_6H_6 was essential for accuracy in the detn. of the alc. KOH ext.; (2) equal parts of C_6H_6 and alc. should be used, and (3) if the sample swollen in C_6H_6 was extd. with alc. alone instead of alc. KOH, the oxidation products were extd. During the early stages of oxidation, the oxidation products were insol. in acetone, but were sol. in C_6H_6 -alc. mixt. and in Et_2O .

As oxidation progressed, products were formed which were sol. in the C_6H_6 -alc. mixt. but not in Et_2O . Extn. with $CHCl_3$ after the acetone extn., and the temp. of drying of the alc. KOH ext. and of the oxidation products, were both without material influence on the detn. of the oxidation products. During oxidation the proportion of oxidation products increased much faster than did the total alc. KOH ext. The higher the combined S, the faster was the increase in the oxidation products during a given time of aging. This was also true of a rubber-S-ZnO vulcanizate. The alc. KOH ext. and the oxidation products of rubber-S mixts., 1 of which contained normal rubber and the other of which contained acetone-extd. rubber, were then detd. With the vulcanizates contg. normal rubber the proportion of oxidation products increased slowly with the degree of vulcanization, while with the vulcanizates contg. extd. rubber, it increased rapidly. The acetone ext. (minus free S) remained virtually const. throughout in each case. A large quantity of oxidation products were obtained by alc. KOH extn. of a rubber-S vulcanizate contg. acetone-extd. rubber, and purifying the KOH ext. with water. The mixt. was a brown, opaque mass with little elasticity, and insol. in C_6H_6 , xylene, benzene and Et_2O . Tabulated data give the ash, N, combined S, C and H of the acetone-extd. rubber products from vulcanizates of different degrees of vulcanization, and show that the ash content of the oxidation products originated from the KOH treatment, that the oxidation products contained combined S, and that the products contained 3.7–5.2% O. When the cure was increased from 2 to 6 hrs., the oxidation products increased from 0.4 to 1.4%. In the same way a rubber-S vulcanizate (from acetone-extd. rubber) was analyzed after increasing times. The results are tabulated. After 2 weeks the alc. KOH ext. was no longer completely sol. in Et_2O . Both the Et_2O -sol. and the Et_2O -insol. portions contained combined S in smaller proportion than in the acetone-extd. vulcanizate. The Et_2O -sol. portion increased from 3.4 to 5.3% during the 8 months' aging. The Et_2O -insol. portions had higher O contents than the Et_2O -sol. portions after the same periods of aging. Expressed in terms of H/5C, the ratios of H to C in the acetone-extd. vulcanizates, in the Et_2O -sol. and in the Et_2O -insol. portions of the alc. KOH exts. diminished gradually with the time of aging. This indicates that during oxidation H is oxidized out of the mol., probably as H_2O (cf. Kirchhof, C. A. 7, 4083). In conjunction with the theory of Wieland (*Handbuch der Biochemie des Menschen und der Tiere*, 2nd Ed., 1925, II, 252), it is probable that H_2O is split off and condensation takes place with O as a bridge. Similar tests were also made of vulcanizates (acetone-extd. rubber-S) aged by the Geer oven method. The O contents of the Et_2O -sol. portions of the alc. KOH exts. increased in the same way as in natural aging, but the combined S contents were disproportionately low. Here again the ratios H/5C decreased slowly. The oxidation products were in turn oxidizable, their O content increasing rapidly on exposure to air. Changes in the alc. KOH ext. offer a sensitive method of testing the aging of rubber products, and of formulating specifications for the aging properties of rubber products. This is particularly true when mech. tests cannot be made.

C. C. DAVIS

Rubber manufacture. T. F. H. O'BRIEN. Rubber Research Scheme, Peradeniya. *Trop. Agr. (Ceylon)* 70, 232–9(1928); cf. C. A. 22, 1494.—Complete coagulation was obtained in some trials with Na_2SiF_6 when latex was diluted to 1.5 lb. per gal., but in other tests it was not complete. The coagulum was softer than that produced with $AcOH$. In both lab. and factory tests, entirely satisfactory results at 0.5 the usual cost were obtained with a suspension of 8 parts of Na_2SiF_6 in 1 part of HCO_2H and 1600 parts of H_2O , when the latex was diluted to 2 lbs. per gal. This soln. produced sheets remarkably free from bubbles, but it cannot be used with Al equipment. *p*-Nitrophenol added to the coagulant soln. at the rate of 0.025% by wt. did not affect the rubber in any observable way but largely prevented the development of fungi and molds, even under very adverse conditions.

A. L. MEHRING

Balata in Para. FREDERIC M. BRAGA. *Bol. Agr. Ind. Com.* 2, 428–35(1928).—Climatic conditions in the balata area, various species of *Mimosa*s which yield balata latex, methods of extn. and market conditions are discussed, including data on products and exports. The following % analysis of British Guiana balata (crude and dry, resp.) was made at the Imp. College of Georgetown: moisture 1.9, —; gutta 49.7, 50.7; resins 44.0, 44.8; proteins 3.8, 3.9; ash 0.6, 0.9.

S. L. B. ETHERTON

Use of rubber in the chemical industry. J. PANEM. *Rev. gén. caoutchouc* 6, No. 49, 15–7(1929).—An illustrated description of recent development.

C. C. DAVIS

Adsorption and diffusion of gases through rubber and through balloon fabrics. ANDRÉ DUBOSC. *Rev. gén. caoutchouc* 6, No. 49, 14(1924).—A review (cf. C. A. 22, 2078).

C. C. DAVIS

The absorption of oxygen by rubber. G. T. KOHMAN. Bell Telephone Labs, J. Phys. Chemistry 33, 226-43 (1929).—The expts. deal with the absorption of O by raw and vulcanized rubber, and with the relation between the rate of O absorption and natural aging, the ultimate object being the development of an accelerated aging test. The influence of surface area on the rate of O absorption, the rate of O absorption as a function of the state of cure, the influence of the extent of milling on the rate of O absorption, the effect of antioxidants and of ozonized O on the rate of O absorption, the changes in tensile strength which result from the O absorption and the effect of heating in inert gases on tensile strength were studied. The absorption app., which is described and illustrated, allowed the maintenance of a const. temp. and a const. O pressure. With rubber-S vulcanizates in O at 80°, expts. indicated that oxidation by O is autocatalytic and comprises at least 2 reactions, an addn. to the double bonds and a decompn. of the mol., the latter reaction continuing after the first was complete. The proportion of O absorbed was greater than the theoretical quantity to sat. the double bonds. With continuation of the reaction, the rate of absorption of O approached a const. value; water was formed, but almost no CO₂. When 0.02-0.05 mol. of O per C₁₅H₁₆ was absorbed, the vulcanizates became tacky, then weak; when they had absorbed 0.5 mol. of O, they lost their tackiness; with an absorption of 1.0 mol. of O they became hard and brittle. Surface checking was evident in some cases, this phenomenon being regarded as a preferential surface oxidation. At 80° the rate of absorption of O was noticeably influenced by the surface area per unit wt. when the area was small, but when the area was 40 or more sq. cm. per g., small variations in area were without much effect, probably because then the rates of diffusion of O were great enough to keep the rubber satd. with O. Expts. on the influence of the state of cure on the rate and extent of O absorption indicated that there was a close relationship between natural aging and O absorption at 80°, the same reactions probably occurring. The mechanism of O absorption by raw rubber differed from that by cured rubber, curing increasing both the rate and the proportion of O absorbed and changing the character of the absorption curve. The rate of absorption increased with the degree of cure. After curing, the relative rates of absorption of rubber milled to different extents indicated that O was absorbed during the milling process. Antioxidants have a neg. catalytic action rather than preferential absorption. In their presence the rate of absorption was retarded to an extent which varied with the concn. and the character of the antioxidant. In 1 case too small a proportion of an antioxidant hastened oxidation instead of retarding it. The character of the absorption of ozonized O differed considerably from that of pure O, the former being absorbed far more rapidly at first, but the rate diminished so that it ultimately became less than that of pure O. The reaction between rubber and ozonized O was not autocatalytic; the ozonized O apparently protected the rubber from the action of pure O, since the rate of absorption was much less in ozonized O, and on subsequent treatment with pure O the normal rate of absorption with the latter was not reached. Detns. of the relations between the proportion of absorbed O and the tensile strength of vulcanizates showed that as long as well-cured vulcanizates retained sufficient tensile strength to be of practical value, the deterioration was directly proportional to the proportion of O absorbed at 80°. When 0.5% O was absorbed, the tensile strength diminished nearly to 0.5 its original value. When undercured vulcanizates were heated in inert gases (N and CO₂), the tensile strength increased at first, as a result of further curing, but then diminished at a rate which was insignificant compared with that in O. In CO₂ the vulcanizates turned black, suggesting a reaction involving CO₂. The results in general indicate that natural aging is essentially a result of an absorption of atm. O. Forty-two references to closely related work are included.

The standardization of rubber. FERDINAND BRÜCKMANN. Gummi Ztg 52, 1163-6 (1929).—It is proposed to classify raw rubber not primarily according to method of prepn. and superficial appearance but according to its cleanliness. Raw rubber would thus be divided first of all into (1) pure rubber, which is clean enough without washing for any ordinary use, and (2) crude rubber, which is contaminated with dirt sufficiently to necessitate washing. Plantation rubbers fall into each of these classes, depending upon their condition. Within these classes, rubbers are grouped according to whether they are prepd. by artificial or by natural coagulation and then in turn according to their thickness, color, general condition, origin, etc.

Some practical aspects of rubber evaluation. E. P. DIMMORA. Goodyear Tire & Rubber Co. India Rubber World 79, No. 6, 77-8 (1929).—There may be as great variation among individual bales of a lot of rubber or even within a bale as among different lots. As a result, blended batches vary day by day when tested experimentally.

in accelerated mixts., in tread and solid tire stocks, etc.; this variation also holds true under service conditions. Ordinary methods of blending are not effective in minimizing to a satisfactory extent this normal variation, and the only advisable procedure is to mass as much rubber as practicable on mills, to test each batch and to classify the batches as high-, medium- and low-grade. These individual grades are then used in different rubber formulas in which each is most suitable. In testing the batches, modulus tests of formulas, which have been found to be reliable criteria of the behavior in service of the factory stocks concerned, are essential, but short cures at high temps. with cold water conditioning make complete control tests possible in 25 mins., *i. e.*, within practical working limits.

C. C. DAVIS

Rubber as it is revealed by x-rays. G. L. CLARK. Univ. of Illinois. *India Rubber World* 79, 55-9(1929).—C. shows that unstretched rubber gives broad diffraction haloes characteristic of "amorphous" substances, but that stretched rubber gives a diffraction pattern characteristic of cryst. substances. He then tabulates the essential exptl. facts derived from x-ray studies of rubber by Katz, Hauser and Mark, Feuchter, Meyer and Mark, Clark, and others. Natural rubber in practically every state, *e. g.*, coagulated latex, crepe, smoked sheet or vulcanized sheet, produces a cryst. diffraction pattern on stretching, whereas synthetic rubber does not. The initial appearance of a pattern is at about 75% elongation for raw rubber and above 250% for vulcanized rubber. The intensity of the diffraction spots increases linearly with increasing elongation, while the intensity of the broad halo decreases simultaneously. The positions of the interferences are const. with increasing elongation, while their breadths are const. with increasing elongation to at least 800%. The size of colloidal micelles may be calcd. When stretched isothermally, *i. e.*, very slowly, the interferences are very faint or absent, but when stretched adiabatically, *i. e.*, very rapidly, the interferences attain their max. intensity at the same elongation. The pattern appears instantaneously on stretching, and it disappears at about 60°. The pattern disappears on releasing the tension, though sometimes it persists some time after release, especially if the specimen is cooled after stretching. Stretched specimens placed in solvent vapors no longer produce cryst. diffraction patterns. By "racking," rubber can be stretched 10,000%; and it then gives as sharp a diffraction pattern as do pure org. compds.; it is insol. or largely non-swelling in the usual org. solvents. Extd. rubber, free from resins and proteins, gives the pattern on stretching. The positions and appearance of the interferences are independent of the botanical source. "Frozen" rubber gives sharp concentric rings corresponding to the same spacings as the interferences of stretched rubber. These sharp rings are replaced by broad haloes on warming the specimen. Cryst. fillers give characteristic patterns, usually with a random arrangement of the filler crystals, while the usual rubber pattern also appears. Calendering introduces a fibrous structure detected by x-rays even without stretching. Mastication tends to destroy the cryst. orientation even when strongly stretched. Synthetic rubber and rubber-like polymers produce broad "amorphous" haloes; which remain unchanged up to the highest elongations, though some workers have noted slight changes in some of these patterns, especially at low temp. Orientation apparently occurs in 1 or 2, but not in 3 dimensions. Dimensions calcd. from the "amorphous" pattern of unstretched rubber give values of 14.88 (inner ring) and 6.05 A. U., while very pure extd. rubber gives values of 11.15 and 5.97 A. U. The presence of a solvent increases the former to 14.76 A. U. The inner ring is characteristic of polymers. The most accurate values show the unit cell to be rhombic, $a = 12.3$, $b = 8.3$, $c = 8.1$ A. U., contg. 8 C_6H_8 groups. The colloidal micelle seems to have the shape of a long flat bundle, contg. 10,000 to 20,000 unit cells, or 80,000 to 150,000 C_6H_8 groups. C. points out that though the unit cell contains only 8 C_6H_8 groups, this is not a contradiction of the large mol. wt. The unit cell here, as in the polyoxymethylenes (Hengstenberg, *Z. physik. Chem.* 126, 425 (1927)), contains only part of the chem. mol., the long chain mol. extending through many adjacent unit cells. This chain-like mol., bound by primary valences, is estd. to contain 75 to 150 C_6H_8 groups. These results indicate a very long, preformed mol., in which the C_6H_8 "links" lie on screw axes. In a stretched condition these chains lie parallel, giving a cryst. structure. In the unstretched state they coil and lose the parallel arrangement, resulting in "amorphous" x-ray diagrams. Elasticity is due to ethylenic linkages. Vulcanization, in removing double bonds, should ultimately result in hard rubber without elasticity and in an increase in size of the colloidal micelle. Recent work by C. fully verifies this increase in particle size.

G. R. Y.

Rubber structure research and its bearing on the elastic properties of colloids in general. E. A. HAUSER. Metallgesellschaft, A.-G., Frankfurt. *Ind. Eng. Chem.* 21, 249-51(1929).—Recent research on the structure of rubber is discussed from 8 points

of view: (1) the isolation of 2 components, (2) the transformation of 1 component into the other, and (3) interpretations of the structure from x-ray data. It is suggested that all fibrous substances are constituted of main valency chains bundled together by micellar forces to form parcels of parallel chains. The elasticity will depend largely upon the form of the smallest element, whether this is a ring as in cellulose or a straight chain as in rubber, and especially upon the helix angle. The appearance of x-ray fiber diffraction patterns depends upon the condition of these chains, *i. e.*, whether or not they are swollen. Thus, stretched rubber in solvent vapors loosens the pattern. *Celluloid* is analogous to rubber, for when unstretched, it gives an "amorphous" scattering, since the nitrocellulose has been swollen by the camphor. Whenever elastic stretch compensates for plastic internal flow for a sufficient time, and the viscosity of the lower polymerized phase does not prevent orientation (producing an inelastic product as with many resins), a similar x-ray diffraction pattern is obtained. This has been proved for *gelatin*, other *jellies* and *polymerized oils* in still unpublished work. C. C. D.

Report of the raw rubber specifications committee. ENLWOOD B. SPEAR, *et al.* *Ind. Eng. Chem., Anal. Ed.* 1, 55-6(1929).—Comparative tests of 2 different rubber mixts. by 4 industrial labs. and 1 univ. lab. are given to show the wide variations in the results obtained when the same rubber was distributed to the various labs. The 2 series of vulcanizates were prepd. and tested under conditions as nearly identical throughout as possible. C. C. DAVIS

Hard-rubber dust and one of its recent developments: direct grinding of the dust. FRANK, A. BATH. *Caoutchouc & gutta-percha* 25, 14222-4, 14262-3(1928).—Descriptive, with particular reference to the patented process of Rissik-Fraser & Co. C. C. DAVIS

The recovery of volatile solvents by the system of A. Boecler. A. BOECLER. *Bensin Condensation Syst.* Boecler, Malmoe (Sweden). *Rev. gén. caoutchouc* 6, No. 49, 18-20(1929).—An illustrated description (cf. *C. A.* 22, 2493). C. C. DAVIS

Electrical behavior of rubber-sulfur compounds. DONALD W. KITCHIN. *Simplex Wire & Cable Co.*, Boston. *Rubber Age* (N. Y.) 24, 671-2(1929).—The observation of Curtis, McPherson and Scott (cf. *C. A.* 22, 330) that power factor and dielec. const. maxima correspond to simple chem. compds. is without significance, for by changing the test frequency the maxima can be shifted over a wide range of compn. Boggs has suggested that certain rubber-S compds. are dipole mols. and that, though the raw rubber mol. is electrically neutral, formation of an unsymmetrical rubber-S mol. would produce a dipole, while further addn. of S to form a symmetrical mol. would involve loss of dipole properties. With a low proportion of S, probability favors the formation of dipole mols., while increase of S increases the probability of compensation, and the compn. indicated by the proportion of combined S at max. power factor or dielec. const. would not correspond to the mol. of max. dipole moment. With increase of combined S from 0, the power factor and dielec. const. should increase to a maximum, and then diminish. The dipole power loss would arise from a heat loss from motion, but the mols. would be held by elastic forces, so that in a changing field the surrounding medium would undergo rapid stretch and release. In rubber this would cause friction losses evidenced as elec. power losses. Moreover, with increasing S, the rubber becomes more rigid, so even if the no. of dipoles remained const., the motion would change greatly with changing compn. Vulcanized rubber offers, therefore, a more complicated problem than liquids. However, there should be a characteristic frequency for each compn. in the range where dipole mols. exist, and the softer the rubber the higher this frequency. The higher the applied frequency, the lower the S content at which the max. power factor and dielec. const. should occur, which is shown by means of curves to be true. A progressive decrease in the max. dielec. const. with increasing frequencies is explained by the fact that from 0 to 14% S the no. of dipoles increases nearly linearly, and that, though there are more dipoles at 10 than at 6% S, the dielec. const. for 380,000 cycles is greater at 6% S (the stiffness at higher S contents being too great for dipole response). Even a d. c. test probably does not show the compn. at which the max. no. of dipoles are present, for at high S contents the speed of orientation may become so low that the d. c. test does not permit full orientation. Such studies are important because they may aid in explaining the nature of vulcanization. C. C. DAVIS

The production of glossy spread rubber goods by the aid of vulcanization in ultra-violet light. RUDOLF DITMAR. *Kautschuklaboratorium*, Graz. *Gummi-Ztg.* 43, 1172(1929).—The process of Bernstein for curing rubber mixts. at relatively low temps. in ultra-violet light (cf. *German Patent* 262,708, Class 39b, Gr. 3(1912)) must be carried out in an inert gas or *in vacuo* to prevent oxidation by the O_2 . Expts. show, however, that if tetramethylthiuramdisulfide is used as an accelerator to minimize the curing

time and therefore the exposure, and Se red (cf. D., C. A. 23, 1526) as a protective agent, the spread material may be cured in air. Thus, the mixt. rubber 100, S 3.5, tetramethylthiuramdisulfide 2, $\text{ZnSO}_4 \cdot 5\text{NH}_3$ 7, $\text{Na}_2\text{S}_2\text{O}_8$ 2, Se red 1.8, TiO_2 2, is dissolved in C_6H_6 , spread, dried and exposed to ultra-violet light for a few mins.; the rubber is thoroughly cured and acquires a high gloss.

C. C. DAVIS

Rubber roadways. T. H. CHAPMAN. Rubber Roadways, Ltd. *Rubber Age* (London) 9, 439-43 (1929).—A review and discussion, dealing with road-surfacing materials in general use, difficulties in new surfaces, a survey of past exptl. roadways and the results, and future prospects.

C. C. DAVIS

Problems of vulcanization. J. DUGUÉ. *Rev. gén. caoutchouc* 6, No. 49, 13 (1929).—A reply to Bary (cf. C. A. 23, 2070). Further comments on the subjects already discussed are added.

C. C. DAVIS

Power factor and dielectric constant in viscous dielectrics (KITCHIN) 4. Rubber-lined metal tube (U. S. pat. 1,708,141) 9. Composition of fiber and thermoplastic rubber derivative (U. S. pat. 1,708,111) 20.

Rubber. ELBERHARD MEYER-BURSCHE. Ger. 471,879, July 6, 1924. Addn. to Ger. 463,290. Artificial objects are prepd. by impregnating tissues, textiles, paper, pasteboard, wood and leather with rubber and esters of tetrahydronaphthols, with or without simultaneous treatment with a volatile solvent. Filling material is subsequently added.

Rubber. THE ANODE RUBBER CO. (England), LTD. Fr. 647,413, Jan. 17, 1928. In the treatment of natural latex to produce rubber objects, an artificial dispersion of rubber is added to the latex before coagulation. The rubber may be mastic or non-mastic or a mixt. of both. The compn. of the dispersion may be modified by adding during the formation of the deposit a dispersion contg. more mastic rubber than the initial dispersion. Cf. C. A. 23, 1777.

Rubber. SOC. ANON. DES CHARBONS ACTIFS. Fr. 647,151, June 1, 1927. Absorbent substances, preferably in a quasi-colloidal state and dried, are used as

Artificial rubber. 28. Artificial rubber is prepd. by polymerizing, alone or

with drying agents,

dimethyl-

polymeriza-

alkali oleate

-70°; they are stirred

in Na isobutyl-naphthalene-

bicarbonate at a moderate temp. Fr.

above hydrocarbons are polymerized by means

without the addn. of inorg. hydroxylic compds. and

Example, isoprene, glycerol and Na are stirred at 60° in

mixture being obtained. The glycerol may be replaced by starch,

isoprenic alc.

Artificial rubber. R. P. DINSMORE (to Goodyear Tire & Rubber Co.). Brit. 7,050, Sept. 13, 1927. In effecting polymerization of rubber-forming hydrocarbons such as isoprene or dimethyl butadiene, the hydrocarbons are treated with an emulsifying agent such as NH_4 oleate or K oleate, and with a protective colloid such as a protein, e. g., casein or egg albumin. A product of improved quality is stated to be obtained, presumably due to the production of an emulsion of the hydrocarbon, the minute globules of which are subsequently polymerized.

Deposition of rubber, etc. THE ANODE RUBBER CO. (England), LTD. Fr. 647,232, Jan. 16, 1928. Layers of org. substances, particularly rubber, obtained by deposition from aq. dispersions, are dried throughout by keeping a higher temp. on the side opposite to that at which moisture is evapd. than on the latter side. Moist air may be circulated on the side at which drying is retarded. If the drying takes place on metallic molds, the molds are heated, if on porous molds, the surrounding air is heated.

Rubber electrodeposition. P. KLEIN (to Anode Rubber Co., Ltd.). Brit. 296,138, March 16, 1927. The uniformity of thickness of the deposits is influenced by screens which may be formed of insulating material such as hard rubber or celluloid or may be conductive to form equi-potential surfaces. If sep. anode and cathode chambers are used, the screens are preferably placed in the cathode chamber. Cf. C. A. 23, 2067.

Preserving rubber. A. M. CLIFFORD (to Goodyear Tire & Rubber Co.). Brit.

296,398, Aug. 31, 1927. There is added to rubber a reaction product of a dia naphthalene deriv., such as the compound β -naphthylamine, by mixing mol. proportions of β -naphthylamine and ethylenediamine with one-half mol. anhyd. CaCl_2 and heating for 5-8 hrs or the reaction product of a naphthol and phenylenediamine.

Preservation of rubber. THE GOODYEAR TIRE & RUBBER CO. FR. 296,398, Nov. 29, 1927. Rubber is preserved by incorporating in the mixt. to be preserved the reaction product of a phenol and an amine. Suitable compds. include (or α)-naphthylamine and diaminodiphenyl- β -naphthylmethane (by reacting β -naphthylamine with CH_2O to form methylene-di- β -naphthol, which is heated to 280° with the presence of CaCl_2). Cf. preceding abstract.

Rubber dispersions. P. KLEIN and A. SZEGVARI (to Anode Rubber Co. Ltd.) BRIT. 296,454, March 4, 1927. Aq. dispersions of substances such as vulcanized rubber, rubber waste, reclaimed rubber, rubber substitute, synthetic rubber or gutta percha, or mixts. of such substances are prepd. by bringing them into a plastic condition by mech. treatment and then successively adding substances which react to form a dispersing substance, such as oleic acid and NH_3 . Volatilizing substances may be added to the plastic material before dispersing.

Apparatus for maintaining rubber dispersions in circulation to keep them in form condition. P. KLEIN, S. GOTLEB, A. SZEGVARI and G. F. WILSON (to Anode Rubber Co. Ltd.) BRIT. 296,454, March 3, 1927.

Compounding "conditioning substances" with rubber dispersions. P. KLEIN and ANDREW SZEGVARI (to Anode Rubber Co., Ltd.) U. S. 1,708,181, April 9, 1928. A rubber dispersion is treated with "conditioning substances" in the form of a solid material, the particles of which consist of a combination of 2 or more different substances, such as S and vulcanized oil.

Uniting different pieces of rubber. P. KLEIN, F. GABOR and A. SZEGVARI (to Anode Rubber Co., Ltd.) BRIT. 297,127, March 16, 1927. Two or more pieces of rubber, such as those for making articles, formed from natural or artificial rubber dispersions by electrical coagulation, pressing, spreading, spraying, or impregnating, are brought into contact with each other, and the union is effected by heating.

Use of rubber. PATENTEN-VERFAHREN FÜR DIE HERSTELLUNG VON GUMMI-ARTIKELN. AKTIESELSKAPET I NORDENSKO TEKNISK-KEMISK FABRIK. SWED. 297,127, March 16, 1927. In joining articles of rubber, the articles are first roughened, treated with a solution of rubber or latex solns. containing a vulcanizing agent, and then the articles are further treated with a solution of rubber or latex solns. containing a vulcanizing agent.

Apparatus for forming articles of rubber. THE GOODYEAR TIRE & RUBBER CO. BRIT. 296,976, Sept. 13, 1927.

Utilizing waste rubber. COMMONWEALTH RUBBER CO. LTD. BRIT. 296,395, Aug. 31, 1927. See FR. 640,000, Aug. 31, 1927.

Grinding fibrous rubber scrap or similar material. THE PHILADELPHIA RUBBER WORKS CO. U. S. 1,708,123, April 9, 1928. The material is ground in a high-speed mill in the presence of steam at such low pressure as to effect partial wetting of the material. An apparatus is described.

Rubber articles. THE ANODE RUBBER CO. (ENGLAND), LTD. FR. 296,398, Nov. 29, 1927. In the production of articles by repeated dipping of a mold into organic solutions, particularly of rubber, the mold is heated between the dippings and, if desired, during dipping. Between the dippings the mold should be kept moist. Means for promoting coagulation, such as gypsum molds or porous molds through which the article is drawn, may be used.

Flower pots, vases, etc., made of rubber. C. PAPWORTH and E. JARVIS. BRIT. 296,583, Oct. 20, 1927. Various structural details as to reinforcing the rubber are described.

Rubber vulcanization accelerators. L. B. SEBRELL (to Goodyear Tire & Rubber Co.) BRIT. 297,051, Sept. 13, 1927. An accelerator is made by reaction of a mercaptobenzothiazole with an aldehyde amine condensation product, e.g., mol. proportions of mercaptobenzothiazole and crotonaldehyde aniline reaction product are mixed and refluxed for 2 hrs. or longer. Other reagents which may be used include: mercaptobenzothiazoles, mercaptomethylthiazoles and reaction products of acetaldehyde and aniline, crotonaldehyde and methylamine, propionaldehyde and methylamine, butyraldehyde and aniline, butyraldehyde and toluidine, heptaldehyde and aniline, heptaldehyde and toluidine, and cinnamic aldehyde and aniline.